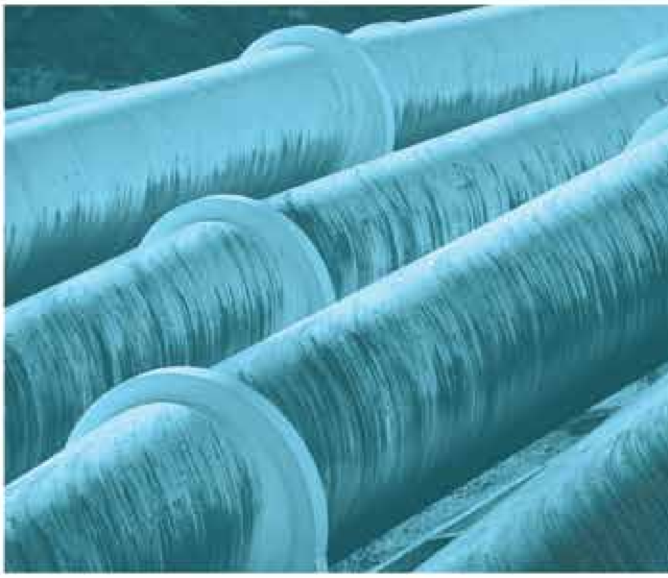
Myuna Colliery

Modification report for modification to project approval MP 10_0080

Prepared for Centennial Myuna Pty Limited
July 2020



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Myuna Colliery

Modification report for modification to project approval MP 10_0080

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Client

Centennial Myuna Pty Limited

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Final

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3 July 2020

Executive Summary

Myuna Colliery (Myuna) is an existing underground coal mining operation that supplies thermal coal to Eraring Power Station. Myuna operates under two development consents, SH110_148 and MP 10_0080. MP 10_0080 was granted by the Minister of Planning and Infrastructure on 18 January 2012 under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and has since been declared a State significant development (SSD). Myuna is owned and operated by Centennial Myuna Pty Limited (Centennial Myuna).

In recent months, Centennial Myuna has been experiencing fluctuations in coal quality with some product coal from Myuna not meeting Eraring Power Station specifications. Centennial Myuna has assessed a number of options to ensure that it can continue to meet its contractual obligations to supply coal to Eraring Power Station. This assessment found that the best option is to blend coal from Myuna with coal from Mandalong Mine. Blending will occur both at Myuna's pit top and Cooranbong Entry Site (CES). This will allow Centennial Myuna to continue to provide a secure supply of coal to Eraring Power Station and to secure ongoing employment for Myuna's workforce.

Centennial Myuna is seeking to modify MP 10_0080, pursuant to Section 4.55(2) of the EP&A Act, to allow coal to be transferred between Myuna's pit top and CES, blending of this coal at both sites, and associated activities. Coal will be transported between Myuna's pit top and CES by truck.

The NSW Department of Planning, Industry and Environment (DPIE) and key stakeholders have been consulted regarding the proposed modification to assist in identifying all of the relevant issues to be assessed. This modification report (MR) and supporting technical assessments examine the potential impacts from the proposed modification.

The proposed modification has been designed to avoid and minimise adverse biophysical, social and economic impacts where possible. The proposed modification 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 Myuna's existing environmental management strategy.

The proposed truck movements can be accommodated by the existing road network with minimal overall impact to road capacity or traffic delays. To reduce potential impacts on the local road network and existing road users: truck movements will be limited during peak hour periods; road widening works will be undertaken at the intersection of Wangi Road and Wangi Point Road; additional truck warning signage will be installed and a Code of Conduct focused on good driver behaviour will be developed and implemented for all truck drivers.

While there are some unavoidable impacts, the proposed modification will allow an ongoing supply of coal to Eraring Power Station from Myuna's pit top and CES. The continued supply of coal of suitable quality from both of these operations will help support the ongoing and efficient operation of Eraring Power Station and continued supply of electricity to NSW.

All aspects relating to environmental management will continue in accordance with MP 10_0080, Environment Protection Licence (EPL) 366, approved management plans and other elements of the development consent.

The proposed modification of MP 10_0080 is of minimal environmental impact and will remain substantially the same development for which consent was originally granted. As such it is considered the modification 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

Myuna Colliery (Myuna) is an existing underground coal mine owned and operated by Centennial Myuna Pty Limited (Centennial Myuna). Myuna's pit top is 25 kilometres (km) south-west of Newcastle, New South Wales (NSW), in the Lake Macquarie local government area (LGA) (Figure 1.1). Myuna operates under two development consents:

- SH110_148, which was granted by Lake Macquarie City Council (LMCC) in 1977 under the provisions of the now repealed NSW *Local Government Act 1919,* for the development and operation of the Myuna and Cooranbong collieries; and

- MP 10_0080, which was granted by the Minister of Planning and Infrastructure on 18 January 2012 under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for continued mining in areas outside the area defined by SH110_148. MP 10_0080 also authorises the use of bord and pillar methods in the Wallarah, Great Northern and Fassifern coal seams and the continued use of existing on-site infrastructure until 31 December 2032.

MP 10_0080 has since been declared a State significant development (SSD) under Clause 6 of Schedule 2 of the NSW Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017. Accordingly, Myuna now operates under an SSD approval.

1.1.2 Modification overview

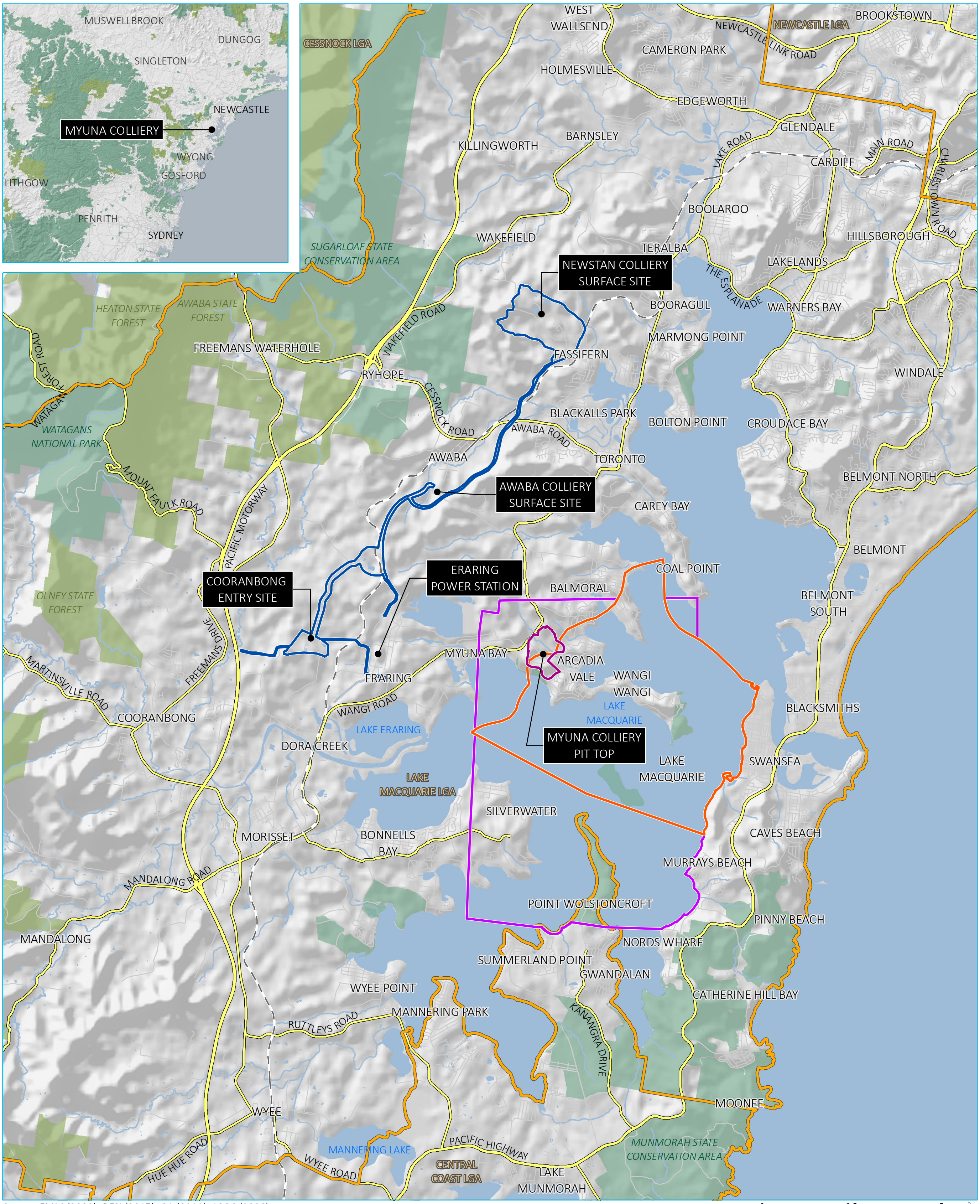
Coal produced at Myuna is transferred from Myuna's pit top to the Eraring Power Station (about 4 km west of the pit top) by overland conveyor. Coal from Myuna that does not meet Eraring Power Station specifications, is stockpiled at Myuna's emergency coal stockpile until it can be reclaimed and blended with coal to meet these specifications. However, there is limited capacity to store coal at Myuna's pit top prior to blending and dispatch.

In recent months, Centennial Myuna has been experiencing fluctuations in coal quality with some product coal not meeting Eraring Power Station specifications. Centennial Myuna has assessed a number of options to ensure that it can continue to meet its contractual obligations to supply coal to Eraring Power Station. This assessment found that the best option is to blend coal from Myuna with coal from Mandalong Mine, with blending occurring both at Myuna's pit top and at Cooranbong Entry Site (CES). This would allow Centennial Myuna to continue to provide a secure supply of coal to Eraring Power Station and to secure ongoing employment for Myuna's workforce.

Centennial Myuna is seeking to modify MP 10_0080, pursuant to Section 4.55(2) of the EP&A Act, to allow coal to be transferred between Myuna's pit top and CES, blending of this coal at Myuna, and associated activities. Coal would be transported between Myuna's pit top and CES by truck. Centennial Myuna also requests the inclusion of a condition in MP 10_0080 to address the environmental management of exploration activities and minor surface infrastructure (Section 4.5).

A separate application is underway to modify the Northern Coal Logistics Project consent (SSD-5145) to allow coal from Myuna to be received, handled and blended at CES (EMM 2020).

EMM Consulting Pty Limited (EMM) has been engaged by Centennial Myuna to prepare this modification report (MR) to accompany an application to modify the consent. This MR assesses the impacts of the proposed modification and, where required, proposes mitigation measures to minimise potential impacts.



Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006)

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GDA 1994 MGA Zone 56

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KEY

- Rail line
- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest
- Local government area
- Myuna Colliery surface facilities area

Development consent boundaries

- Myuna Colliery development consent boundary (SH110_148)
- Myuna Colliery project approval boundary (MP 10_0080)
- Northern Coal Logistics development consent boundary (SSD-5145)

Regional context

Myuna Colliery Modification 2
Modification report
Figure 1.1

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1.2 Proponent

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

Centennial Myuna is the proponent for the modification. The relevant address is:

Centennial Myuna Pty Limited
Level 18, 1 Market Street
Sydney NSW 2000

1.3 Background

The development of Myuna began in 1979 and underground mining using bord and pillar mining methods commenced in 1982.

Coal has been recovered from three seams (Wallarah, Great Northern and Fassifern) within the project approval boundary (MP 10_0080) and development consent boundary (SH110_148) (Figure 1.1). The majority of the mine is under Lake Macquarie.

Myuna has an approved life until 12 December 2032 (pursuant to MP 10_0080) and operates 24 hours per day, 7 days per week. Myuna is approved to extract up to 3 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal within the project approval and development consent boundaries. All product coal from Myuna is transported by an enclosed overland conveyor to Eraring Power Station.

Myuna and its operations are described in Chapter 3.

MP 10_0080 has been modified once to allow for an increase in ROM coal extraction (ie up to 3 Mtpa) and an increase in Myuna's workforce (ie up to 300 fulltime equivalent (FTE) personnel). The previous modification is described in Section 3.2.1.

Myuna also operates under Environment Protection Licence (EPL) 366.

1.4 Related operations

The other operations referenced in this MR are outlined below.

1.4.1 Eraring Power Station

Origin Energy Ltd (Origin) owns and operates Eraring Power Station, Australia's largest power station, with a generation capacity of 2,880 megawatts (MW). All product coal from Myuna is transferred to Eraring Power Station via Origin's overland conveyor, which connects the pit top to the power station.

Eraring Power Station (Figure 2.1) is approximately 4 km west of Myuna's pit top.

1.4.2 Mandalong Mine

Mandalong Mine is an existing underground coal mining operation near Morisset, approximately 35 km south-west of Newcastle. Mandalong Mine is operated by Centennial Mandalong Pty Limited (Centennial Mandalong) and produces thermal coal that is supplied to domestic and export markets. Mandalong operates under SSD-5144, which permits the delivery of ROM coal from the underground workings to CES. CES's coal handling and processing facilities are approved under the Northern Coal Logistics Project (SSD-5145).

As part of the proposed modification:

- coal from Myuna will be transported from Myuna's pit top to CES by truck; and
- coal from Mandalong Mine will be blended with coal from Myuna on-site at Myuna's pit top.

No modifications to SSD-5144 are required to allow coal to be transferred between Myuna's pit top and CES, blending of this coal at both sites, and associated activities.

1.4.3 Northern Coal Logistics Project

The Northern Coal Logistics Project regulates coal handling, processing, and transport operations at the Newstan Colliery surface site, CES and associated private haul roads, as well as the use of various other surface infrastructure items. The Northern Coal Logistics Project operates under SSD-5145. Each component of the project is operated by Centennial Northern Coal Services Pty Limited (Centennial NCS).

Coal handled at CES is delivered to either Eraring Power Station via overland conveyor or to Newstan Colliery for further processing and transfer into the export market.

CES is approximately 6 km west of Myuna (Figure 1.1).

Centennial NCS is seeking to modify SSD-5145, pursuant to Section 4.55(2) of the EP&A Act, to allow for the transfer of coal between CES and Myuna's pit top, blending of this coal at CES, and associated activities. As part of that modification, the development consent boundary for the Northern Coal Logistics Project will be amended to connect the Awaba Private Haul Road through to Wilton Road (Figure 4.1).

1.4.4 Awaba Colliery

Awaba Colliery ceased operating as a producing mine in 2012; however, pit top infrastructure at the Awaba Colliery surface site, approximately 1 km south of Awaba (Figure 1.1), continues to be used for the nearby Newstan Colliery. Awaba Colliery is approved under Development Consent PA 10_0038.

Awaba Colliery surface site is approximately 5.3 km north-west of Myuna (Figure 1.1).

Trucks used to transport coal between Myuna's pit top and CES will access the private haul road network via Wilton Road and the Awaba Colliery surface site.

No modifications to PA 10_0038 are required to allow coal to be transferred between Myuna's pit top and CES, blending of this coal at both sites, and associated activities.

1.5 Objectives

Centennial Myuna propose to blend coal from Myuna with coal from Mandalong Mine both on-site at Myuna's pit top and at CES. The proposed transport route is shown on Figure 4.1. This MR has been prepared to support the application to modify MP 10_0080.

It is not proposed to modify the project approval (MP 10_0080) or development consent (SH110_148) boundaries, the approved life of mining operations or Myuna's approved extraction rate.

The proposed modification is described in Chapter 4.

1.6 Justification and alternatives

Origin Energy Ltd (Origin) owns and operates Eraring Power Station, Australia's largest power station, with a generation capacity of 2,880 megawatts (MW). All product coal from Myuna is transferred to Eraring Power Station via Origin's overland conveyor, which connects the pit top to the power station.

Centennial Myuna propose to blend coal from Myuna with coal from Mandalong Mine at Myuna's pit top and at CES so that the blended coal meets Eraring Power Station specifications.

As noted in Section 1.1.2, Centennial Myuna has assessed a number of alternatives, including:

- Installing and operating a coal beneficiation plant at Myuna's pit top to improve the quality of coal before it is sent to Eraring Power Station. This option was discounted because of: the high capital costs associated with the additional infrastructure; the potential for increased noise levels at sensitive receptors close to Myuna's pit top; and the ongoing management of reject material requirements.
- Blending coal on-site at Eraring Power Station to improve the quality of Myuna coal before it is used for energy production. This option would also reduce on-site stockpile capacity at Eraring Power Station and does not align with Origin's preferred coal delivery strategy.
- Alternative transport coal routes between Myuna and CES. The proposed transport route reduces the length of time heavy vehicles will be on public roads and avoids residential areas. Preliminary feasibility investigations did not identify any issues with heavy vehicle traffic using the proposed transport route , including the right-hand turn from Wangi Point Road onto Wangi Road (Figure 4.1).

The proposed modification will allow ongoing supply of suitable coal from Myuna's pit top and CES to Eraring Power Station. This will support the ongoing and efficient operation of Eraring Power Station and continued supply of electricity to NSW. Failure to provide coal of sufficient quality to Eraring Power Station could risk the ongoing employment of Myuna's workforce.

1.7 Report contents

This MR describes the site, surrounding area, existing operations at Myuna, details of the proposed modification, legislative framework and stakeholder consultation. It provides an environmental assessment and justification of the proposed modification. This MR is accompanied and supported by the following technical assessments:

- a noise and vibration impact assessment (NVIA) prepared by EMM (Appendix A);
- an air quality impact assessment (AQIA) prepared by EMM (Appendix B);
- a traffic impact assessment (TIA) prepared by EMM (Appendix C);
- an assessment of socio-economic effects prepared by AIGIS Group (AIGIS) (Appendix D); and
- a greenhouse gas (GHG) emission assessment prepared by EMM (Appendix E).

2 Site description

2.1 Site location

Myuna is 25 km south-west of Newcastle, NSW in the Lake Macquarie LGA (Figure 1.1). A small portion of the southern extent of the project approval boundary, at Point Wolstoncroft, is in the Central Coast LGA (Figure 1.1).

As noted in Section 1.1, Myuna operates under two development consents. The project approval boundary (Figure 1.1) is applicable to MP 10_0080 and encompasses an area of 3,773 hectares (ha). The development consent boundary (Figure 1.1) is applicable to SH110_148 and encompasses an area of 3,105 ha. Myuna's surface facilities area, the 'pit top', is within the project approval boundary.

Myuna's pit top is currently only accessed directly from Summerhill Drive (Figure 2.1). A locked gate prevents entry to Myuna's pit top via a Centennial-owned section of Wangi Point Road off Wangi Road (Figure 2.1).

Myuna's pit top is west of the residential area of Arcadia Vale, north-west of Wangi Wangi and is adjacent to the site of the former Wangi Power Station (Figure 2.1).

2.2 Land use and ownership

Land uses surrounding Myuna's pit top include a mix of mining, industrial (including the now closed Wangi Wangi Power Station) and residential (including the suburbs of Wangi Wangi and Arcadia Vale). Lake Macquarie is approximately 400 m south-west of Myuna's pit top at its closest point. Wangi Road, Donnelly Road and Summerhill Drive are to the north-west, north-east and south of Myuna's pit top, respectively (Figure 2.1).

Underground coal extraction occurs at a number of collieries surrounding Lake Macquarie, including Chain Valley Colliery (Delta Coal), Mannering Colliery (Delta Coal), Mandalong Mine (Centennial Mandalong) and Newstan Colliery (Centennial Newstan). As a result of these coal resources, power generation is a significant industry in the surrounding areas, with Eraring Power Station west of Myuna's pit top and Vales Point Power Station to the south.

There are a number of residences in the area surrounding Myuna's pit top (Figure 2.1). The closest residence, 2 Moani Street, Wangi Wangi, (referred to as 'R2' in this assessment), is approximately 500 m south-east of Myuna's pit top. Vegetation separates Myuna's pit top from the residential areas of Arcadia Vale and Wangi Wangi.

The majority of the project approval boundary is beneath Lake Macquarie which is NSW Government Crown land. The remaining land within the project approval boundary is predominantly privately-owned. Myuna's pit top is on land owned by Centennial Fassifern Pty Ltd, a sister company of Centennial Myuna. Land ownership at Myuna's pit top and immediate surrounds is shown on Figure 2.2.

2.3 Land zones

Due to the diversity of land uses, land zones within the project approval and development consent boundaries are variable (Figure 2.3). The majority of the project approval boundary is zoned a mix of W1 Natural Waterways, E2 Environmental Conservation, R2 Low Density Residential and RE1 Public Recreation under the Lake Macquarie Local Environmental Plan 2014 (Lake Macquarie LEP).

As noted in Section 2.1, the southern extent of the project approval boundary is within the Central Coast LGA where land zone is defined under the Wyong Local Environmental Plan 2013 (Wyong LEP) or Gosford Local Environmental Plan 2014 (Gosford LEP). Some land within the project approval boundary is zoned E1 National Parks and Nature Reserves under the Wyong LEP.

Myuna's pit top is on land zoned SP1 Special Activities and E2 Environmental Conservation under the Lake Macquarie LEP.

2.4 Environmental setting

2.4.1 Geology, soils and topography

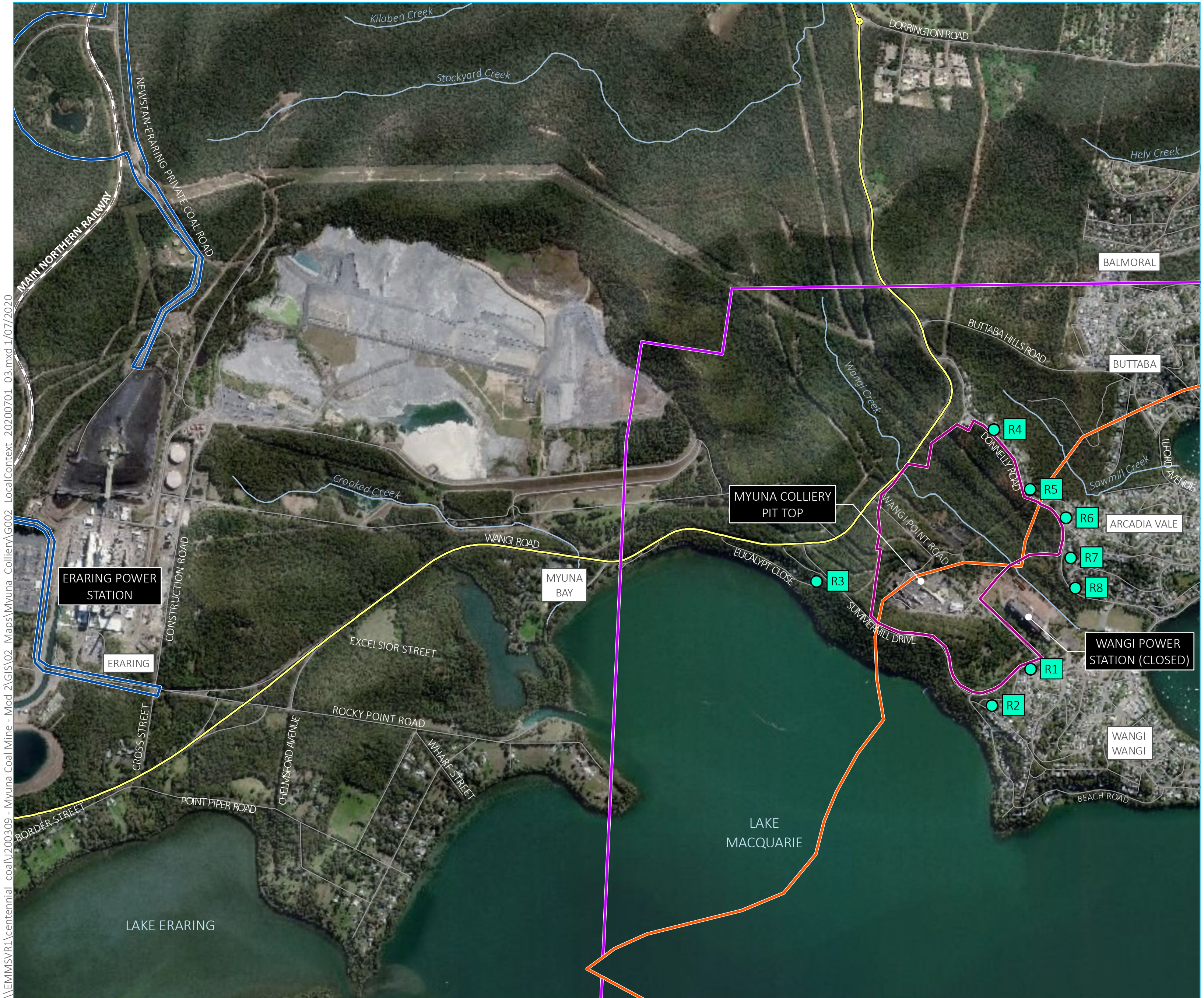
Myuna is in the northern portion of the Sydney Basin and currently extracts coal from the Wallarah, Great Northern and Fassifern seams of the Newcastle coal measures.

Soil landscapes within the project approval and development consent boundaries are characterised by the Awaba, Doyalson and Wyong soil landscapes.

Topography at Myuna's pit top is considered uncomplex terrain and is generally flat. Elevations within the project approval boundary vary from 0 metres Australian Height Datum (mAHD) to 70 mAHD.

2.4.2 Climate

Myuna's pit top area experiences light winds with mean wind speeds ranging from 1.3 metres per second (m/s) in winter to 1.7 m/s in spring and summer. The annual percentage of calm conditions range from 10.7% in summer and 17.5% in autumn. Wind in spring and summer is dominantly from the east. Wind in autumn and winter is dominantly from the west. Ground-based temperature inversions are occasionally observed. Rainfall in the region is typically lower during the winter months than during the summer months.



KEY

- Myuna Colliery development consent boundary (SH110_148)
- Northern Coal Logistics development consent boundary (SSD-5145)
- Myuna Colliery project approval boundary (MP 10_0080)
- Myuna Colliery surface facilities area
- Sensitive receptor
- Rail line
- Major road
- Minor road
- Named watercourse

Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

Local context

Myuna Colliery Modification 2
Modification report
Figure 2.1

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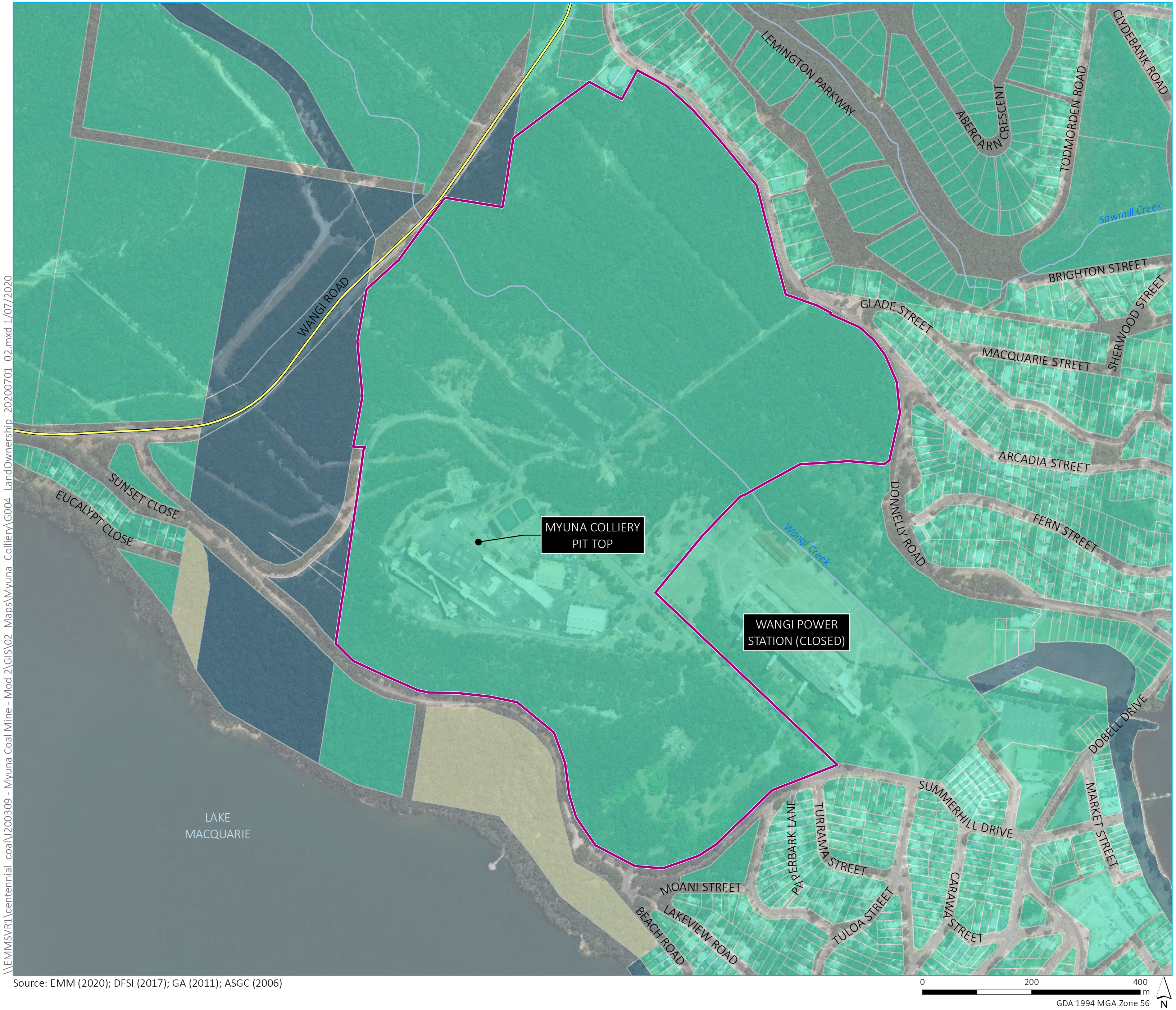

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Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006)

Land ownership

Myuna Colliery Modification 2
Modification report
Figure 2.2

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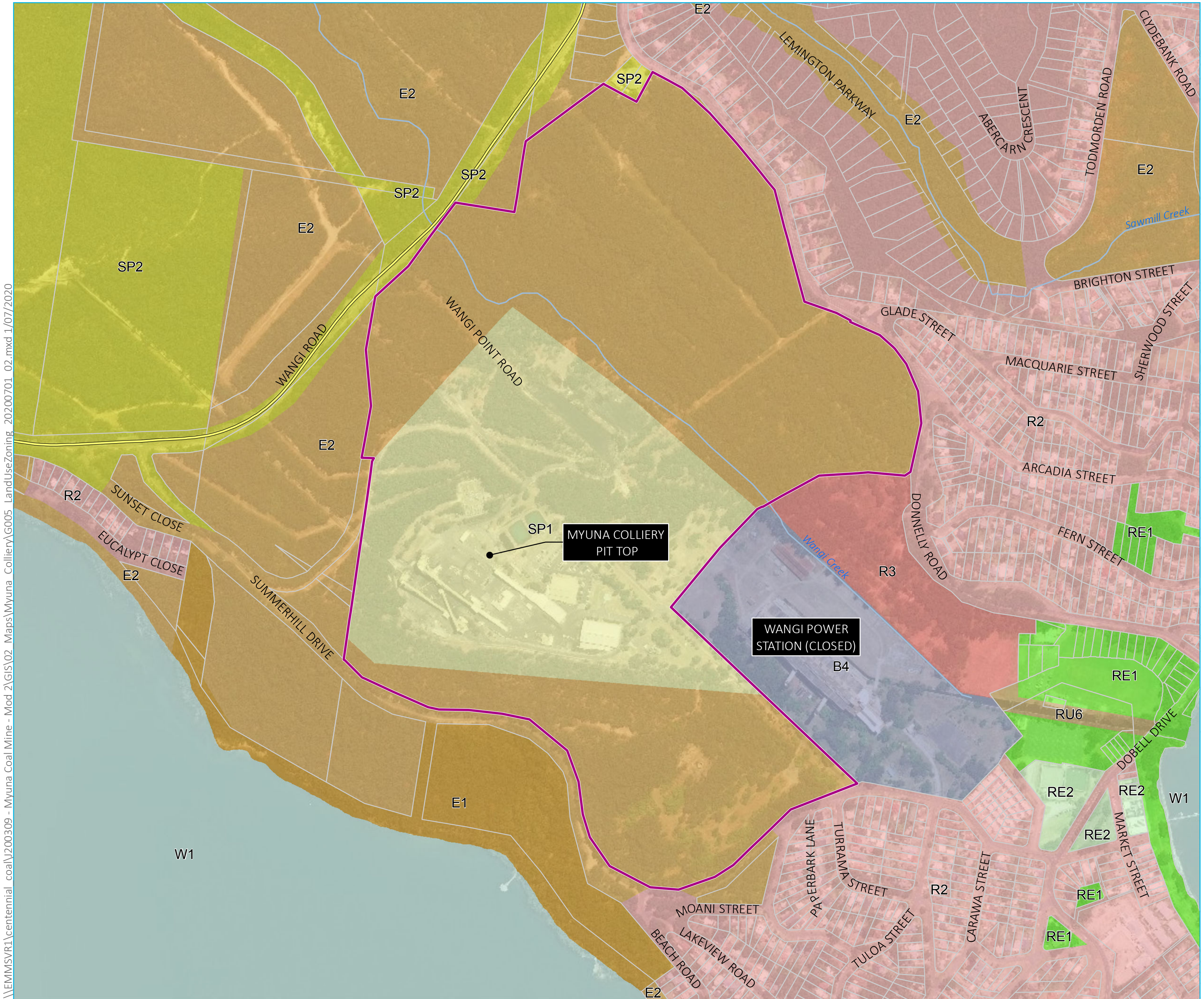

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KEY
- Myuna Colliery surface facilities area
- Cadastral boundary
- Major road
- Named watercourse

Land use zoning (Lake Macquarie LEP)
- B4 Mixed Use
- E1 National Parks and Nature Reserves
- E2 Environmental Conservation
- R2 Low Density Residential
- R3 Medium Density Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU6 Transition
- SP1 Special Activities
- SP2 Infrastructure
- W1 Natural Waterways

Source: EMM (2020); DFSI (2017); DPE (2017); GA (2011); ASGC (2006)

0 200 400 m
GDA 1994 MGA Zone 56
N

Land zones

Myuna Colliery Modification 2
Modification report
Figure 2.3

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3 Existing operations

3.1 Overview of operations

As noted in Section 1.3, Myuna comprises underground workings (predominantly beneath Lake Macquarie) and supporting infrastructure within Myuna's pit top area.

Underground coal mining at Myuna commenced in 1982. Myuna has an approved life until 12 December 2032 (pursuant to MP 10_0080) and operates 24 hours per day, 7 days per week. Myuna is approved to extract up to 3 Mtpa of ROM coal within the project approval and development consent boundaries. All coal from Myuna is transported via an enclosed overland conveyor to Eraring Power Station.

Existing surface features at Myuna's pit top are shown on Figure 3.1.

3.2 Existing approvals and licences

3.2.1 Development consents

The primary activities authorised under Myuna's existing approvals are:

- underground coal mining using bord and pillar methods in the Wallarah, Great Northern and Fassifern seams within the development consent (SH110_148) and project approval (MP 10_0080) boundaries (Figure 1.1);
- production, handling and distribution of up to 3 Mtpa of coal using existing infrastructure (with all coal distributed to Eraring Power Station);
- employment of up to 300 FTE personnel; and
- operation of Myuna, ancillary infrastructure and services for 24 hours per day, 7 days per week.

MP 10_0080 was modified under Section 75W of the EP&A Act on 27 February 2015 to allow for an increase in ROM coal extraction (from 2 Mtpa to 3 Mtpa) and an increase in employment (from 210 to 300 FTE personnel).

3.2.2 Environment protection licence

Myuna operates under EPL 366 which is administered by the NSW Environment Protection Authority (EPA) under Sections 43(b) and 48 of the NSW *Protection of the Environment Operations Act 1997* (POEO Act).

EPL 366 covers mining for coal to a scale of 2–3.5 Mtpa, coal works to a scale of 2–5 Mtpa and water discharge from two licenced discharge points (LDPs).

No changes to EPL 366 are proposed as part of this modification.

Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006)

\\EMMSVR1\centennial coal\J200309 - Myuna Coal Mine - Mod 2\GIS\02 Maps\Myuna Colliery\G003 SurfaceFacilities 20200701 04.mxd 1/07/2020

KEY

- Myuna Colliery surface facilities area
- Major road
- Named watercourse
- Assessment location (sensitive receptor)
- Proposed weighbridge

Existing surface features

1. Emergency coal stockpile sediment dam pumphouse
2. Emergency coal stockpile sediment dam
3. Emergency coal stockpile area
4. Power factor correction banks
5. ROM bin
6. Overland conveyor switch room
7. Finished prospect bin
8. Breaker
9. Downcast air shaft
10. Materials reclaim area
11. Drive house
12. Crusher
13. Conveyer drop portal
14. Materials yard
15. Oil storage
16. Washdown bay & oily water separator
17. Hydrocarbon recycling depot
18. Workshop and store
19. Washhouse
20. Upcast shaft
21. Main gate
22. Bathhouse & administration office
23. Service bay
24. Employee & materials portal
25. Ramp
26. Winder
27. Water management infrastructure
28. Haul road

Myuna Colliery surface facilities area

Myuna Colliery Modification 2
Modification report
Figure 3.1

EMM
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3.2.3 Mineral authorities

Exploration, mining and mining-related operations at Myuna occur under the provisions of various mineral authorities (Table 3.1).

Table 3.1 Mineral authorities

Reference	Title	Description	Expiry date
ML 1370	Mining Lease	Title that provides rights to mine the coal resource of approximately 635 ha.	7 March 2033
MPL 334	Mining Purposes Lease	Title to construct and operate prescribed mine-related plant and infrastructure of approximately 33 ha.	20 October 2036
ML 1632	Mining Lease	Replaced Part Consolidated Coal Lease (CCL) 762, a title including an area for coal or mining purposes of approximately 10,820 ha.	13 October 2022
EL 4444	Exploration Lease	Licence granted to allow exploration to be undertaken to determine the occurrence and extent of the coal resource and to assess the potential for mining of 5,164 ha.	23 October 2017 (renewal sought)
EL 6640	Exploration Lease	Licence granted to allow exploration to be undertaken to determine the occurrence and extent of the coal resource and to assess the potential for mining of 1,599 ha.	23 October 2017 (renewal sought)

3.2.4 Mining operations plan

Myuna's *Mining Operations Plan* (MOP) (Centennial 2015) outlines the proposed operations at Myuna (as approved by MP 10_0080 and SH110_148) and has been prepared for the seven-year period from 1 January 2016 to 31 December 2022.

3.3 Approved mining operations

The mining at Myuna includes a combination of:

- multi-seam mining: first workings, or non-caving partial pillar extraction systems, where multiple seams are to be mined; and
- single-seam mining: first workings, partial pillar extraction or wide panel full extraction.

Two subsidence zones are in place within Myuna's underground mining area (Appendix 3 of MP 10_0080):

- Zone A – long-term stable mining systems generating up to 20 millimetres (mm) surface subsidence (ie no noticeable surface impacts) on sensitive surface features including land and seagrass beds; and
- Zone B – mining systems generating up to a maximum of 650 mm surface subsidence (under Lake Macquarie).

3.4 Materials handling, processing and distribution

Coal extracted from the underground workings is transferred to Myuna's coal handling plant (CHP) by underground conveyors. This ROM coal is initially delivered to the ROM bin on the surface and then fed through a primary screen before being transported to a rotary breaker for initial breaking.

From the rotary breaker, the coal travels through three feeders and three screens, into three crushers. Once the coal has travelled through the crushers, coal with a final product size of generally less than 40 mm is loaded into the final product bin.

From the final product bin, product coal is loaded onto Origin Energy's enclosed overland conveyor and delivered to Eraring Power Station. The operation of this conveyor is approved under Section 21 of the NSW *Eraring Power Station Act 1981*.

In the event of break downs or servicing of the enclosed overland conveyor, Centennial Myuna temporarily store coal in a dedicated stockpile area in the north of the pit top area (Figure 3.1). Once the conveyor returns to operation, coal is recovered from the stockpile by front end loader, loaded onto trucks and emptied into the CHP reclaim hopper for transportation to Eraring Power Station.

All product coal from Myuna is currently transported via the overland conveyor to Eraring Power Station. No product coal is currently transported via the local road or rail network.

3.5 Water management

Water is managed in accordance with Myuna's approved Water Management Plan (WMP). Water management is primarily achieved through the separation of clean and dirty water. The primary water management infrastructure at Myuna's pit top includes:

- the CHP dam which receives water from dirty water catchment areas;
- the mine water settling ponds 2 and 3;
- a drive-in primary settlement tank;
- a decanting pump to underground;
- LDP A (at weir of emergency stockpile sediment dam) and LDP B (at outlet of mine water settling pond 3);
- the emergency coal stockpile sediment dam;
- a first flush settlement tank; and
- drains associated with water management on-site.

3.6 Waste management

As Myuna does not wash ROM coal, there is no coal reject material produced on-site. A negligible amount of waste rock from the CHP is transported from the waste bin to the Awaba Landfill and Waste Transfer Station for disposal or is stored on-site.

General refuse and non-recyclable materials are separated and stored within dedicated waste bins adjacent to various site buildings. Waste sorting is undertaken by contractors on-site and is monitored via weekly environmental inspections.

All general wastes and routine maintenance consumables from the daily servicing of equipment are collected on a regular basis by a licensed contractor for off-site disposal at a suitably licensed waste management facility. Recyclable material is collected by licensed contractors for recycling on an irregular (as needs) basis. Metals are collected and stored in surface bunkers and collected by a licensed contractor.

3.7 Environmental management

Myuna operates under an environmental management strategy (EMS) developed in accordance with Centennial's EMS Framework and is generally consistent with 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 Myuna. It also provides a means for continued improvements in environmental performance.

A comprehensive set of environmental management plans have been developed and implemented at Myuna as part of the EMS. The implementation of these plans is a focus at Myuna. These plans are reviewed and updated, as necessary, to reflect operational changes and incorporate additional/amended requirements.

Compliance with the environmental management plans is determined through an environmental monitoring network. Monitoring results are reported monthly on Centennial's website and in Myuna's annual review documents.

4 Proposed modification

4.1 Overview

It is proposed to modify MP 10_0080 to:

- allow up to 1 Mtpa of Myuna coal to be trucked from Myuna's pit top to CES via the public and private road networks and blending with coal from Mandalong Mine before transfer to Eraring Power Station by conveyor;
- allow up to 0.2 Mtpa of Mandalong Mine coal to be backloaded by truck from CES to Myuna's pit top and blending with coal from Myuna before transfer to Eraring Power Station by conveyor;
- allow construction and operation of a vehicle weighbridge at Myuna's pit top;
- allow trucks to access Myuna's pit top via Wangi Road and Wangi Point Road; and
- include a consent condition to address the environmental management of exploration activities and minor surface infrastructure.

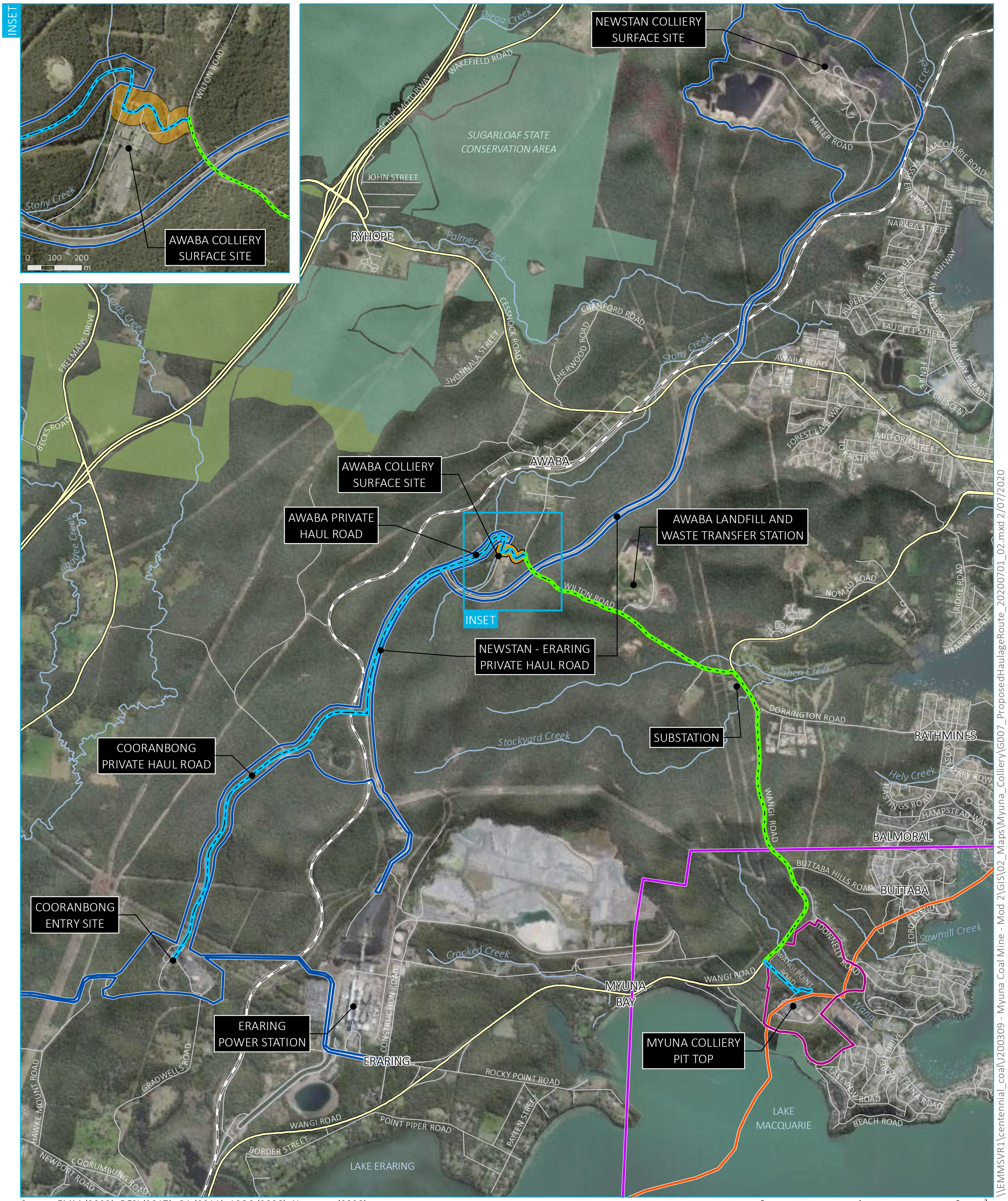
The proposed transport route consists of Wangi Point Road from Myuna's pit top area, public roads (ie Wangi Road and Wilton Road) between Myuna and the Awaba Colliery surface site and private haul roads between the Awaba Colliery surface site and CES. The proposed transport route is shown on Figure 4.1.

Truck movements will be limited to 7.00 am–6.00 pm Monday to Saturday.

Truck numbers along the private haul road network between the Awaba Colliery surface site and CES will be within previously assessed and approved limits under SSD-5145 (ie 32 truck movements per hour).

All trucks leaving Myuna will be weighed using a vehicle weighbridge proposed to be installed at Myuna's pit top (Figure 3.1). A truck wheel wash will also be used by all trucks before leaving site via a privately-owned section of Wangi Point Road (Figure 4.1).

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



Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006); Nearmap (2020)

0 1 2 km
GDA 1994 MGA Zone 56
N

KEY

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

Proposed transport route

- Private road
- Public road

- Myuna Colliery surface facilities area

Development consent boundaries

- Myuna Colliery development consent boundary (SH110_148)
- Myuna Colliery project approval boundary (MP 10_0080)
- Northern Coal Logistics development consent boundary (SSD-5145)
- Proposed amendment to Northern Coal Logistics development consent boundary (SSD-5145)

Proposed transport route between Myuna Colliery and Cooranbong Entry Site

Myuna Colliery Modification 2
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Figure 4.1

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Table 4.1 Comparison of existing operations and the proposed modification

Aspect	Approved operations	Proposed modification
Mine life	Under MP 10_0080, mining operations are permitted to 31 December 2032.	No change.
Development consent boundary	As shown in Figure 1 of Appendix 3 to MP 10_0080.	No change.
Underground mining area	As shown in Figure 1 of Appendix 3 to MP 10_0080.	No change.
Hours of operation	Myuna operates 24 hours a day, 7 days per week.	No change.
Employment	Myuna currently has provision to employ up to 300 FTE personnel.	No change.
Mining method	Conventional underground bord and pillar mining methods within two subsidence zones.	No change.
Mining production	Approved to extract up to 3 Mtpa of ROM coal.	No change.
Supporting surface infrastructure	Infrastructure at Myuna's pit top is designed to control and manage water, ventilation, materials delivery, equipment maintenance and coal handling and processing.	Installation of a new vehicle weighbridge and truck wheel wash (Section 4.2).
Coal handling and processing	Transferred from underground working to surface CHP via a number of underground conveyors. CHP includes breaker and crusher, feeders, coal storage bins and surface conveyor systems.	Up to 1 Mtpa of ROM coal will be transferred by truck from Myuna's ROM coal bin to the middlings coal stockpile at CES. Up to 0.2 Mtpa of Mandalong Mine coal will be backloaded from CES to Myuna's pit top. On arrival at Myuna's pit top, this coal will be temporarily stored at Myuna's emergency coal stockpile area before being reclaimed through Myuna's existing coal handling infrastructure.
Coal transport	All product coal from Myuna is transported via the overland conveyor to Eraring Power Station. No product coal is transported via the local road or rail network.	Truck movements will be restricted to the route identified on Figure 4.1 and will be limited to 7.00 am–6.00 pm Monday to Saturday.
Rejects management	As Myuna does not wash ROM coal, there is no coal reject material produced on-site. A negligible amount of waste rock from the CHP is transported from the waste bin to the Awaba Landfill and Waste Transfer Station for disposal or stored on-site.	No change.
Site access	The only approved access to Myuna's pit top is from Summerhill Drive.	Trucks used to transport coal will access Myuna's pit top via a privately-owned section of Wangi Point Road (ie direct from Wangi Road - Figure 4.1). All other vehicles will continue to access Myuna's pit top from Summerhill Drive. Road widening works will be undertaken on Wangi Point Road (within Myuna's pit top) to establish a minimum sealed width of 7 m for a distance of approximately 50 m from the nearest traffic lane on Wangi Road. Additional signage will be installed prior to the commencement of coal transport between Myuna and CES (Section 4.4).
Water management	In accordance with the approved WMP.	No change.

Table 4.1 Comparison of existing operations and the proposed modification

Aspect	Approved operations	Proposed modification
Waste management	Management systems in place for the various non-production waste streams, including general waste, maintenance consumables, waste oils and grease and sewage.	All waste water from the truck wheel wash will be treated and reused on-site or disposed of at a licensed waste management facility.
Post mining closure and rehabilitation	In accordance with the approved MOP.	No change.
Environmental management	Myuna's EMS provides a framework under which environmental matters are managed.	Myuna's management plans will be reviewed and updated, as necessary, to reflect operational changes and incorporate additional/amended requirements. Prior to carrying out exploration activities that would cause temporary surface disturbance, or exploration activities within the waters or lake bed of Lake Macquarie, or the construction and/or upgrade of minor surface infrastructure on-site, Centennial Myuna will prepare an Exploration Activities and Minor Surface Infrastructure Management Plan (see Section 4.5).

4.2 Construction activities

As described above, a new vehicle weighbridge and wheel wash will be installed at Myuna's pit top.

The weighbridge will be installed on previously disturbed, cleared land adjacent to a privately-owned section of Wangi Point Road (Figure 3.1; Photograph 4.1 and Photograph 4.2). There is an inactive weighbridge and supporting infrastructure at this location that will need to be removed.

It is anticipated that construction will be completed in three stages:

- Stage 1 – mobilisation and site preparation (approximately two days) – including decommissioning the existing weighbridge and supporting infrastructure;
- Stage 2 – installation (approximately five days) – including establishing a concrete pad and securing the new weighbridge and supporting infrastructure; and
- Stage 3 – commissioning (approximately one day) – including testing with empty and full loads.

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: 7.00 am–6.00 pm;
- Saturday: 8.00 am–1.00 pm; and
- no work on Sundays and public holidays.

No additional employees will be required during construction.

A truck wheel wash will be constructed on-site. It is anticipated that this infrastructure will be constructed adjacent to the proposed weighbridge. All waste water from the truck wheel wash will be treated and reused on-site or disposed of at a licensed waste management facility.

The construction of the truck wheel wash is considered exempt development under Clause 10(h) of State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP). The construction and operation of the truck wheel wash does not form part of this modification application.

Photograph 4.1 Proposed location of the new vehicle weighbridge – looking south

Photograph 4.2 Proposed location of the new vehicle weighbridge – looking north

4.3 Material handling

Up to 1 Mtpa of ROM coal from Myuna will be transferred by truck directly from Myuna to the middlings coal stockpile at CES.

Up to 0.2 Mtpa of Mandalong Mine coal will be backloaded from CES to Myuna's pit top. A front end loader will be used to load trucks at CES.

On arrival at Myuna's pit top, coal from CES will be tipped onto, and temporarily stored at, Myuna's emergency coal stockpile area before being reclaimed through Myuna's existing coal handling infrastructure (Figure 3.1).

A front end loader will be used at Myuna's emergency coal stockpile to load the trucks that will transport the coal to Myuna's existing below ground reclaimer.

Blending of Myuna coal with Mandalong Mine coal will occur either at Myuna's emergency coal stockpile or within Myuna's CHP.

The proposed importation of up to 0.2 Mtpa of Mandalong Mine coal from CES will not exceed previously approved coal handling limits at Myuna's pit top (3 Mtpa). Coal handling activities will continue to occur 24 hours a day, 7 days a week and coal will continue to be transferred from Myuna to Eraring Power Station by the overland conveyor system (Figure 3.1).

4.4 Proposed truck transport

The proposed transport route (Figure 4.1) consists of:

- the private access road (Wangi Point Road) between Wangi Road and Myuna's pit top;
- public roads (Wangi Road and Wilton Road) between Myuna and Awaba Colliery surface site; and
- the private haul road between Awaba Colliery surface site and CES.

This route has been selected by Centennial Myuna to avoid trucks travelling through residential areas. There are no residences immediately adjacent to, or with driveways on, the parts of Wangi Road and Wilton Road that are part of the transport route. The closest residences to the proposed transport route are residences on Donnelly Road, Arcadia Vale, which are approximately 80 m from Wangi Road at their closest point.

Truck movements between Myuna's pit top and CES will be limited to 7.00 am–6.00 pm Monday to Saturday. There will be a maximum of 10 loaded trucks (20 truck movements) per hour departing from Myuna's pit top. Between 3.00 pm and 4.00 pm Monday to Friday, truck movements will be restricted to 5 loaded trucks (10 truck movements) per hour to minimise impacts during the afternoon peak hour.

Centennial will manage truck numbers along the private haul road network between the Awaba Colliery surface site and CES to ensure they remain within previously assessed and approved limits under SSD-5145 (ie 32 truck movements per hour).

All trucks leaving Myuna will be weighed using the proposed vehicle weighbridge. The truck wheel wash will also be used by all trucks before leaving site (Figure 4.1). All loads will be covered.

As discussed in Section 7.3.4, road widening works will be undertaken on Wangi Point Road (within Myuna's pit top) to establish a minimum sealed width of 7 m for a distance of approximately 50 m from the nearest traffic lane on Wangi Road. This will allow two trucks to safely pass each other when entering/exiting Wangi Point Road. No vegetation clearing is required to undertake the proposed road widening works.

Signage will be installed approximately 100 m from the intersection of Wangi Road/Wangi Point Road and Wilton Road/Awaba Colliery surface site to warn motorists of turning trucks. All truck drivers will be required to adhere to a Drivers Code of Conduct.

All trucks leaving Myuna will be weighed using a vehicle weighbridge proposed to be installed at Myuna's pit top (Figure 3.1). A truck wheel wash will also be used by all trucks before leaving site via a privately-owned section of Wangi Point Road (Figure 4.1).

4.5 Conditions of consent

Centennial Myuna is seeking to modify:

- Conditions 6 and 7 of Schedule 2 of MP 10_0080, which prohibit the transport of coal from Myuna on public roads and prescribe that all coal from Myuna is transported from the site via the enclosed overland coal conveyor to Eraring Power Station. These conditions need to be amended to allow for the transportation of coal between Myuna and CES along the proposed transport route, which includes public (Wangi Road and Wilton Road) and private roads (between Awaba Colliery surface site and CES and Wangi Point Road).

- Condition 11 of Schedule 3 of MP 10_0080, which specifies Myuna's noise criteria. As demonstrated in Section 7.1, Centennial Myuna complies with the daytime noise criteria under both existing and proposed operations. Subsequently, Centennial Myuna request the removal of the 'emergency day' criteria from Table 3 of MP 10_0080, which apply during the day period when the Eraring Power Station overland conveyor is not in operation and Myuna's emergency coal stockpile must be used. The proposed modification includes the ongoing operation of the emergency coal stockpile 24 hours a day, 7 days a week. This activity can be undertaken within the existing daytime noise criteria at all assessment locations (shown as sensitive receptors on Figure 2.1).

- The list of definitions, which should be updated to include reference to this MR.

- Figure 2 of Appendix 3, which should include the proposed weighbridge.

Centennial Myuna also request the inclusion of a condition to specifically address the environmental management of exploration activities and minor surface infrastructure. This is a standard contemporary condition that explicitly addresses these activities, rather than relying on more general conditions for preventing harm to the environment.

> Exploration Activities and Minor Surface Infrastructure Management Plan
>
> Prior to carrying out exploration activities on the site under this consent that would cause temporary surface disturbance, or exploration activities within the waters or lake bed of Lake Macquarie, or the construction and/or upgrade of minor surface infrastructure on the site, the Applicant must prepare an Exploration Activities and Minor Surface Infrastructure Management Plan for the development to the satisfaction of the Planning Secretary. This Plan must:
>
> (a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;
>
> (b) be prepared in consultation with MEG, NSW Maritime Division of TfNSW, NSW Fisheries and BCD;
>
> (c) include a description of the measures to be implemented for:
>
> - managing exploration activities;

- managing construction and operation of minor surface infrastructure and associated access tracks;
- consulting with and if necessary, compensating affected landowners;
- assessing noise, air quality, traffic, biodiversity, heritage, public safety and other impacts;
- beneficial re-use or flaring of drained hydrocarbon gases, wherever practicable;
- avoiding significant impacts and minimisation of impacts generally;
- avoiding or minimising impacts on threatened species, populations or their habitats and EECs;
- minimising clearance and disturbance of native vegetation (including seagrasses);
- minimising and managing erosion and sedimentation; and
- rehabilitating disturbed areas.

The Applicant must implement the Exploration Activities and Minor Surface Infrastructure Management Plan as approved by the Planning Secretary.

It is acknowledged that the naming conventions for government agencies also need updating and MP 10_0080 should be updated to include contemporary standards for general administrative and reporting conditions to align these conditions with DPIE's standard conditions for State significant underground mining developments.

5 Legislation and policy

5.1 Introduction

This chapter describes the relevant Commonwealth and State legislation and regulatory framework under which the proposed modification 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.

Myuna was referred to the Commonwealth Government Department of the Environment (now DAWE) as part of the Myuna Colliery Extension of Mining Project in 2011. On 8 June 2011, the project was determined not to be a controlled action.

Ecological and heritage impacts are discussed in Section 7. The proposed modification will not significantly change previously assessed and approved impacts. The weighbridge and truck wheel wash will be constructed on previously disturbed, cleared land adjacent to a privately-owned section of Wangi Point Road (Figure 3.1). No vegetation clearing is required for the proposed road widening works along Wangi Point Road.

The proposed modification will not have a significant impact on any MNES as listed in the EPBC Act and consequently has 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

Myuna operates under two development consents. MP 10_0080 was granted by the Minister of Planning and Infrastructure on 18 January 2012 under Part 3A of the EP&A Act. MP 10_0080 has since been declared SSD. Accordingly, Myuna now operates as an SSD approval. MP 10_0080 was most recently modified on 1 February 2015.

Myuna is seeking to modify MP 10_0080 pursuant to Section 4.55(2) of the EP&A Act to allow for the transfer of coal between Myuna's pit top and the CES and associated activities. Compliance of the proposed modification with the requirements of Section 4.55(2) is summarised in Table 5.1.

Table 5.1 Compliance with EP&A Act Section 4.55(2) requirements

Section 4.55 (2) requirements	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. The proposed modification is seeking to change the handling and distribution of coal at Myuna's pit top. Additional infrastructure to facilitate the proposed modification will be limited to construction of a weighbridge and minor road widening works along Wangi Point Road. All surface disturbance activities will be on previously disturbed, cleared land within Myuna's approved surface facilities area. The proposed modification will allow an ongoing supply of coal to Eraring Power Station from Myuna's pit top and CES and will help support the ongoing and efficient operation of Eraring Power Station.
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 Myuna has consulted with NSW Department of Planning, Industry and Environment (DPIE) as part of the preparation of this MR. DPIE confirmed the approval pathway for the modification is by way of Section 4.55(2) of the EP&A Act. Further consultation information is provided in Chapter 5.3.2.
c) it has notified the application in accordance with: i) the regulations, if the regulations so require, or	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.
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	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 Myuna 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 and 8.

5.3.2 NSW Environmental Planning and Assessment Regulation 2000

Clause 115 of the EP&A Regulation lists the information required in an application made under Section 4.55(2) of the EP&A Act. Table 5.2 provides an outline of where this information is provided.

The proposed modification is not considered designated development under the EP&A Regulation.

Table 5.2 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 of this MR and Appendix 1 of MP 10_0080.
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.
f) a description of the expected impacts of the modification,	Chapter 7 of this MR.
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 of this MR.

Table 5.2 EP&A Regulation Clause 115 information requirements

Clause 115 information requirement	Where addressed
h) 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*,	There will be no increase in impacts to biodiversity values (Table 7.11). The proposed modification will not significantly change previously assessed and approved impacts. The weighbridge will be constructed on previously disturbed, cleared land adjacent to a privately-owned section of Wangi Point Road (Figure 3.1). No vegetation clearing is required to undertake proposed road widening works along Myuna's Wangi Point Road.
i) 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.
j) 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 application is not being made to the NSW Land and Environment Court.
k) 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 is provided in Table 5.3

Table 5.3 Other relevant NSW State legislation

NSW legislation	Comment
POEO Act	Myuna is a 'premises-based scheduled activity' under Schedule 1 (10) and (28) of the POEO Act. Myuna operates under EPL 366 which is administered by the NSW EPA under Sections 43(b) and 48 of the POEO Act. No changes to EPL 366 are proposed as part of this modification. The modification, as outlined in Chapter 4 will operate under EPL 366.
NSW *Coal Mine Subsidence Compensation Act 2017*	The land within the development consent and project approval boundaries is within the West Lake and Swansea North Entrance Mine Subsidence Districts. Myuna's surface facilities area is within the West Lake Mine Subsidence District. Under the Act, construction guidelines are provided to ensure structures will tolerate the expected levels of subsidence in an area. Due to the minor extent of additional surface infrastructure (ie weighbridge), it is anticipated that subsidence impacts will be negligible.
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 Myuna hold all necessary approvals under the Act and operations will continue to be regulated under the provisions of the Act.
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 allocation are required as a result of the proposed modification.

Table 5.3 Other relevant NSW State legislation

NSW legislation	Comment
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. Myuna 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 *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 NSW *Mining Act 1992*. No changes to Centennial Myuna's existing mining tenements are required as part of the proposed modification.

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 Lake Macquarie LEP or Wyong LEP that would otherwise operate to prohibit the proposed modification has no effect. The proposed modification is therefore permissible with development consent.

5.5 Local environmental plans

As noted in Section 2.3, the majority of the project approval boundary is zoned a mix of W1 Natural Waterways, E2 Environmental Conservation, R2 Low Density Residential and RE1 Public Recreation under the Lake Macquarie LEP. The southern extent of the project approval boundary is within the Central Coast LGA and is zoned E1 National Parks and Nature Reserves under the Wyong LEP. Of relevance to this modification, Myuna's pit top is on land zoned SP1 Special Activities and E2 Environmental Conservation under the Lake Macquarie LEP (Figure 2.3).

6 Stakeholder consultation

6.1 NSW Department of Planning, Industry and Environment

Centennial Myuna wrote to DPIE on 14 May 2020 to introduce the proposed modification and seek advice with regard to the assessment pathway and scope of this MR. DPIE responded on 1 June 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 F. 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

Matter raised	Response
DPIE agreed that the application will be assessed as a Section 4.55(2) application under the EP&A Act.	The approval pathway for the modification is nominated and described in Section 5.3.1 of this MR.
DPIE acknowledged that a detailed TIA of the proposed coal transport route between Myuna Colliery and Awaba Colliery would be a key component of the MR.	EMM has undertaken a TIA to assess the potential impacts of the proposed coal transport on the local road network (Section 7.3 and Appendix C).
DPIE requested that the MR include consideration of:	-
• Noise and air quality impacts of the proposed coal handling operations at the Myuna surface facilities.	EMM has undertaken a NVIA (Section 7.1 and Appendix A) and an AQIA (Section 7.2 and Appendix B) to assess the potential noise and vibration and air quality impacts of the proposed modification, respectively.
• Ensuring public roads are kept free of materials tracked by trucks.	A truck wheel wash will be used by all trucks before leaving site at Myuna and CES.
• For any areas of ground disturbance, consideration of Aboriginal cultural heritage and surface water management.	The potential impacts of the proposed modification on Aboriginal cultural heritage and water resources are considered in Table 7.11.
• Ensuring that the capital investment value of the proposed modification is correctly estimated.	Centennial Myuna estimates the capital investment value of the proposed modification will be in the order of $150,000.
• Whether there are any conditions of consent that would benefit from being updated, such as condition(s) related to minor surface infrastructure and exploration.	Proposed revisions to the conditions of MP 10_0080 are detailed in Section 4.5.

6.2 Lake Macquarie City Council

A letter was sent to LMCC on 22 May 2020 to introduce the proposed modification and notify LMCC that an MR will be submitted to DPIE (Appendix F). LMCC responded to the letter on 11 June 2020 and acknowledged that the proposed modification has potential to impact the public road network (namely Wangi Road and Wilton Road). EMM has undertaken a TIA to assess the potential impacts of the proposed coal transport on the local road network (Section 7.3 and Appendix C).

6.3 Transport for NSW

A letter was sent to Transport for NSW (TfNSW) on 22 May 2020 to introduce the proposed modification and notify TfNSW that a MR will be submitted to DPIE (Appendix F). TfNSW responded to the letter on 20 June 2020 and provided commentary on the content of the TIA. The TIA prepared by EMM considered the input from TfNSW (Section 7.3 and Appendix C).

6.4 Myuna Colliery Community Consultative Committee

The Myuna Colliery Community Consultative Committee (CCC) comprises of representatives from the local community and LMCC and is independently chaired. The CCC meets twice a year and provides a forum for open discussion between Centennial Myuna, the community, LMCC and other stakeholders on issues directly relating to Myuna's operation, environmental performance and community relations.

Correspondence was sent to the members of the CCC on 22 June 2020 to introduce the proposed modification and notify them that a MR will be submitted to DPIE (Appendix F). No feedback regarding the proposed modification has been received to date. The proposed modification will also be discussed at the CCC meeting on 7 October 2020. Minutes from CCC meetings are available on the Centennial Myuna website:

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

6.5 Newstan/Awaba Community Consultative Committee

The Newstan/Awaba CCC comprises of representatives from the local community and LMCC and is independently chaired. The CCC meets on a quarterly basis and provides a forum for open discussion between Centennial Newstan, the community, LMCC and other stakeholders on issues directly relating to Newstan and Awaba collieries operations, environmental performance and community relations.

Correspondence was sent to the members of the CCC on 30 June 2020 to introduce the proposed modification and notify them that a MR will be submitted to DPIE (Appendix F). No feedback regarding the proposed modification has been received to date. The proposed modification will also be discussed at the CCC meeting on 27 August 2020. Minutes from CCC meetings are available on the Centennial Newstan website:

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

6.6 Mandalong Community Consultative Committee

The Mandalong Mine CCC comprises of representatives from the local community and LMCC and is independently chaired. The CCC meets on a quarterly basis and provides a forum for open discussion between Centennial Mandalong, the community, LMCC and other stakeholders on issues directly relating to Mandalong Mine's operation, environmental performance and community relations.

A presentation on the proposed modification was provided to the members of the CCC on 23 June 2020 to introduce the proposed modification and notify them that a MR will be submitted to DPIE. A copy of the presentation slides presented to the CCC is provided in Appendix F. No feedback regarding the proposed modification was received. Minutes from CCC meetings are available on the Centennial Mandalong website:

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

7 Assessment of impacts

This section addresses the potential impacts of the proposed modification.

7.1 Noise

7.1.1 Overview

A noise and vibration impact assessment (NVIA) was prepared by EMM (Appendix A) for the proposed modification taking into consideration the noise assessment completed for the original EA (AECOM 2011). 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 three locations surrounding Myuna's pit top in March 2020 to establish the existing ambient noise levels. The noise loggers were in place from 6 to 17 March and were programmed to record statistical noise level indices in 15-minute intervals.

On-site observations identified distant traffic, insects and local residential activity as being the main contributors to ambient noise levels. It was noted that Myuna's operations were only audible at one location, 25 Summerhill Drive, Wangi Wangi (NM1 on Figure 2.3 of Appendix A), during lulls in traffic. Myuna's operations were inaudible at the other two monitoring locations.

Eraring Power Station is a contributor to night-time ambient noise levels in the area.

ii Assessment locations

The closest noise and vibration sensitive receptors are residences (Figure 2.1). Representative assessment locations are shown in Figure 3.1. The numbering of these receptors is consistent with that utilised in previous noise assessments for Myuna and MP 10_0080.

iii Existing noise emissions

The NVIA considered data collected as part of quarterly noise compliance reporting for Myuna between Q2 2017 and Q1 2020 (ie 12 rounds of monitoring). Myuna has predominantly been compliant with existing noise limits. One exceedance of the relevant $L_{Aeq,15min}$ noise limit occurred during Q3 2018 at R1 (Figure 3.1). An investigation into this event determined the likely cause of the elevated noise level was non-prevailing noise-enhancing weather conditions at the time.

As per the results presented in the quarterly compliance monitoring report for Q2 2019, it was identified that the difference between the measured C-weighted noise level (L_{Ceq}) and the measured A-weighted noise level (L_{Aeq}) from Myuna was greater than 15 dB at R2 (Figure 3.1), which is representative of other residential receptors in Wangi Wangi. This triggered a detailed assessment of low frequency noise. The detailed assessment identified that Myuna's noise emissions did not exceed the NPfI low frequency noise thresholds and, as such, modifying factors were not applicable.

It is noted that low frequency noise or tonality has not been reported as being associated with Myuna's noise emissions at any other location during the last three years. Hence, modifying factors to account for the potential of increased annoyance due to low frequency noise emissions do not apply to noise emissions from Myuna and have not been applied as part of the NVIA.

iv Existing noise criteria

Noise criteria for Myuna are provided in Schedule 3 Condition 11 of MP 10_0080 and Condition L5 of EPL 366. Noise limits are consistent between these two documents and are summarised in Table 7.1.

Table 7.1 Myuna Colliery noise criteria

Location	Day[1]	Emergency day[2]	Evening[1]	Night[1]	
	$L_{Aeq,15min}$ (dB)	$L_{Aeq,15min}$ (dB)	$L_{Aeq,15min}$ (dB)	$L_{Aeq,15min}$ (dB)	$L_{A1,1min}$ (dB)
R1, R2, R3	35	40	35	35	45
R4	35	44	40	38	49
R5, R6, R7, R8	37	44	42	39	49
All other privately-owned land	35	40	35	35	45

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. Emergency day noise limits only apply during the day period when the Eraring Power Station overland conveyor is not in operation and Myuna's emergency coal stockpile must be used.

As discussed in Section 4.5, Centennial Myuna request the removal of the 'emergency day' criteria from Table 3 of MP 10_0080, which applies during the day period when the Eraring Power Station overland conveyor is not in operation and Myuna's emergency coal stockpile must be used. The proposed modification includes the ongoing operation of the emergency coal stockpile 24 hours a day, 7 days a week. This activity can be undertaken within the existing daytime noise criteria at all assessment locations (Table 7.3).

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	43	40	38	53	43	38	43	40	38
R2	43	40	38	53	43	38	43	40	38
R3	45	45	45	53	43	38	45	43	38
R4	44	39	37	53	43	38	44	39	37
R5	44	39	37	53	43	38	44	39	37

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]
R6	44	39	37	53	43	38	44	39	37
R7	44	39	37	53	43	38	44	39	37
R8	44	39	37	53	43	38	44	39	37

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.

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

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 days.

Given the limited extent and duration of the construction activities, construction noise impacts are not expected as a result of the proposed modification and were not assessed as part of the NVIA.

iii Operational noise assessment

Predicted noise levels for operation of Myuna and for operations including the proposed modification are presented in Table 7.3. Noise-enhancing weather conditions have been considered and the highest predicted noise level is presented for each period.

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

Assessment location	Period[1]	Predicted existing noise level (dB)	Predicted noise level with proposed modification (dB)	PNTL $L_{Aeq,15min}$ (dB)
		Noise-enhancing	Noise-enhancing	
R1	Day	34	34	43
	Evening	34	34	40
	Night	34	34	38
R2	Day	35	35	43
	Evening	35	35	40
	Night	35	35	38
R3	Day	32	32	45
	Evening	32	32	43
	Night	32	32	38
R4	Day	32	32	44
	Evening	33	33	39
	Night	33	33	37
R5	Day	35	35	44

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

Assessment location	Period[1]	Predicted existing noise level (dB)	Predicted noise level with proposed modification (dB)	PNTL $L_{Aeq,15min}$ (dB)
		Noise-enhancing	Noise-enhancing	
	Evening	35	35	39
	Night	35	35	37
R6	Day	37	37	44
	Evening	37	37	39
	Night	37	37	37
R7	Day	37	37	44
	Evening	37	37	39
	Night	37	37	37
R8	Day	37	37	44
	Evening	37	37	39
	Night	37	37	37

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.

Operational noise emissions are predicted to satisfy the PNTLs at all assessment locations for both existing operations and for operations including the proposed modification. The results show no changes in noise emissions between existing and proposed operations.

The predicted levels during the night at assessment locations R6 and R7 are 1 dB lower than the highest measured levels at each of these locations. This implies the potential for a negligible (+1 dB) exceedance of the PNTL during the night-time period.

iv Sleep disturbance assessment

Myuna is approved to operate 24 hours a day, 7 days a week (including coal handling activities). Myuna'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 Myuna include trucks being loaded, dozer operations or bangs from the CHP. A typical maximum sound power level of L_{Amax} 126 dB has been adopted for all such events and is based on EMM's measurements of similar activities.

Predicted maximum noise levels from Myuna are generally conservative (higher) compared to those measured during historical noise compliance surveys. Measured and predicted maximum noise levels at the assessment locations are below the relevant sleep disturbance screening levels (as presented in Table 7.4 of Appendix A). Hence, as per the NPfI requirements, a detailed maximum noise level event assessment is not required as sleep disturbance at nearby residences is unlikely to occur.

v Road traffic noise assessment

Noise from vehicles on private roads are assessed as part of on-site industrial noise, while that from public roads are assessed using the *Road Noise Policy* (RNP) (DECCW 2011).

As described in Section 4.4, total truck numbers using the private haul road network between the Awaba Colliery surface site and CES will be within previously assessed and approved limits under SSD-5145 (ie 32 truck movements per hour). Therefore, noise levels will not be increased as a result of the proposed modification.

The proposed transport route has been selected by Centennial Myuna to avoid trucks travelling through residential areas. There are no residences immediately adjacent to, or with driveways on, the parts of Wangi Road and Wilton Road that are part of the transport route. The closest residences to the proposed transport route are residences on Donnelly Road, Arcadia Vale, which are approximately 80 m from Wangi Road at their closest point.

Results of traffic tube counts conducted in November 2019 indicate annual average daily traffic on this section of road is 6,979. Traffic generated by the proposed modification (ie 20 truck movements per hour) represents a negligible increase (less than 7%) in total traffic on Wangi Road.

Therefore, road traffic noise impacts are not expected as a result of the proposed modification and a detailed assessment of road traffic noise has not been prepared.

7.1.4 Mitigation and management

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

The NMP outlines the noise mitigation and management measures common to all of Centennial's operations within the northern region, where applicable, as well as those specific to Myuna. The NMP also describes the short-term and long-term monitoring program for Myuna including both attended and real-time, unattended noise monitoring.

7.1.5 Conclusion

The proposed modification is not predicted to change existing operational noise emissions.

Operational noise emissions from Myuna are predicted to satisfy the PNTLs at all assessment locations. Predicted maximum noise levels are below the maximum screening criteria and generally consistent with or conservative when compared to the results of previous noise compliance monitoring. Hence, as per the NPfI requirements, a detailed maximum noise level event assessment is not required and the likelihood of sleep disturbance is predicted to be unlikely.

Noise emissions from Myuna 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) was prepared by EMM (Appendix B) to assess potential air quality impacts associated with Myuna's existing and proposed operations on the surrounding environment. 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 industrial operations, including the Eraring Power station, CES, Awaba Colliery surface site and Awaba Landfill and Waste Transfer Station;
- 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;
- sea salts contained in sea breezes; 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 Myuna maintains an air quality monitoring network for its operations, which consists of four dust deposition gauges (recording monthly dust deposition rates), a meteorological station (recording wind speed and direction, temperature, solar radiation, rainfall and atmospheric pressure) and a high volume air sampler (HVAS) (measuring PM_{10} and TSP concentrations). Data from this equipment and CES's tapered element oscillating microbalance (TEOM) air quality monitor were 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 Myuna or CES. Therefore, DPIE's air quality monitoring station (AQMS) at Wyong was used to establish average $PM_{2.5}$ concentrations.

The background air quality values adopted for the AQIA were:

- 24-hour PM_{10} concentration – daily varying;
- annual average PM_{10} concentration – 17.5 µg/m³;
- 24-hour $PM_{2.5}$ concentration – daily varying;
- annual average $PM_{2.5}$ concentration – 6.5 µg/m³;
- annual average TSP concentration – 38 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 7.4. These are designed to maintain ambient air quality for the protection of human health and well-being.

Table 7.4 Impact assessment criteria for particulate matter

PM metric	Averaging period	Impact assessment criterion
TSP	Annual	90 µg/m³
PM_{10}	24 hours	50 µg/m³
	Annual	25 µg/m³
$PM_{2.5}$	24 hours	25 µg/m³
	Annual	8 µg/m³
Dust deposition	Annual	2 g/m²/month (increment only)
		4 g/m²/month (cumulative)

Notes: µg/m³: micrograms per cubic metre; g/m²/month: gram per square metre per month.
Source: EPA (2016).

ii Construction

The proposed modification will include minor construction activities which have the potential to generate dust emissions. Construction phase emissions will principally consist of particulate matter emissions related to the construction of the weighbridge at Myuna's pit top and road widening works along Wangi Point Road. The duration of the construction is likely to be approximately eight days. Given the short timeframe and small scale of the construction activities, dust emissions from these activities have not been assessed.

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 activities associated with the handling and distribution of up to 1 Mtpa of coal off-site to CES and receipt of up to 0.2 Mtpa of coal from CES.

A range of best practice dust mitigation measures are currently, and will continue to be, employed at Myuna. These include the use of water carts and sprays, paved roads, enclosed conveyors, enclosed processing plant and watering of the emergency stockpile (Section 5.3 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 scenario and Figure 7.2 for the proposed modification scenario. The most significant source of particulate matter emissions from Myuna's operations (existing and proposed) is associated with the upcast ventilation shaft, with a less significant contribution from material handling activities (eg loading and unloading of coal).

As shown in Section 5.2 of Appendix B, there will be an increase in emissions under the proposed scenario. This primarily relates to material handling activities associated with an additional 0.2 Mtpa of coal received from CES.

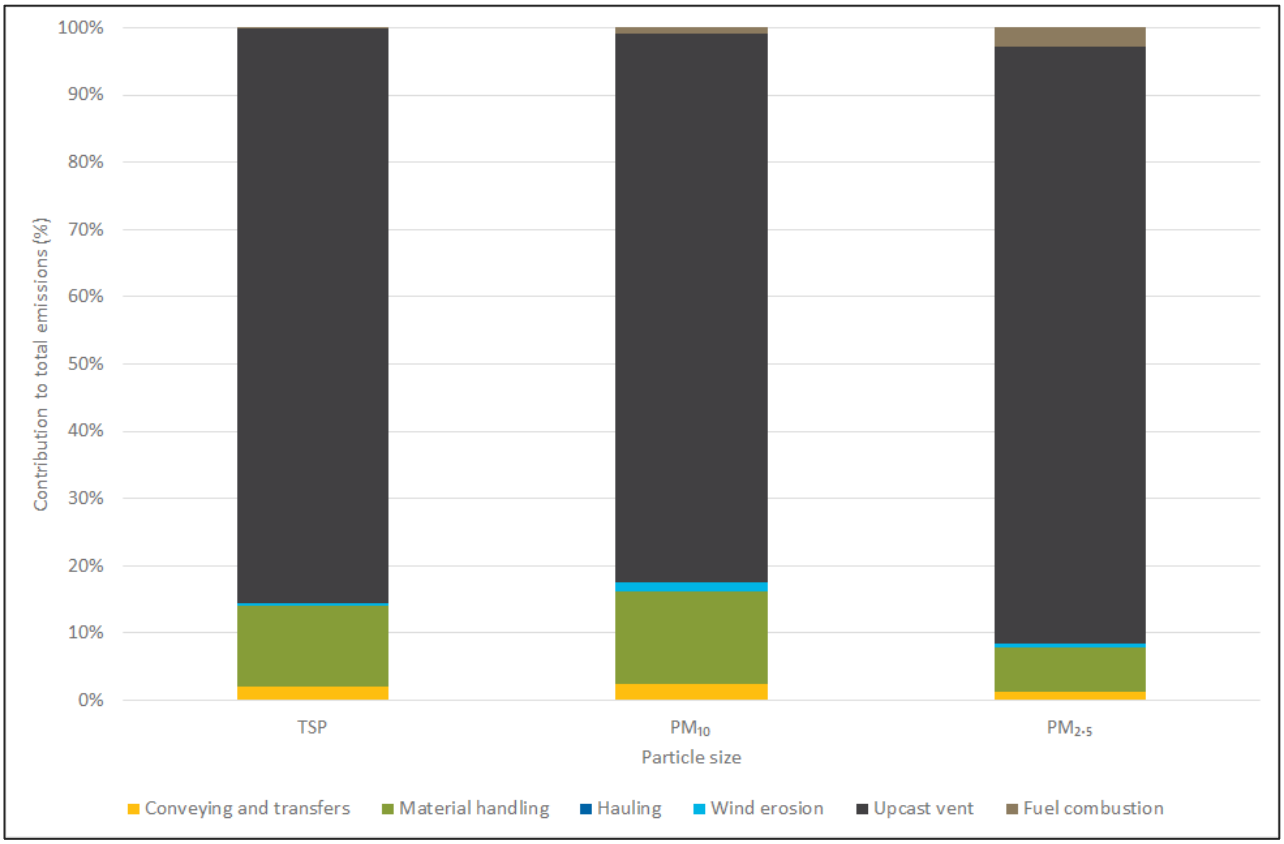

Figure 7.1 Contribution to annual emissions by emissions type and source – existing scenario

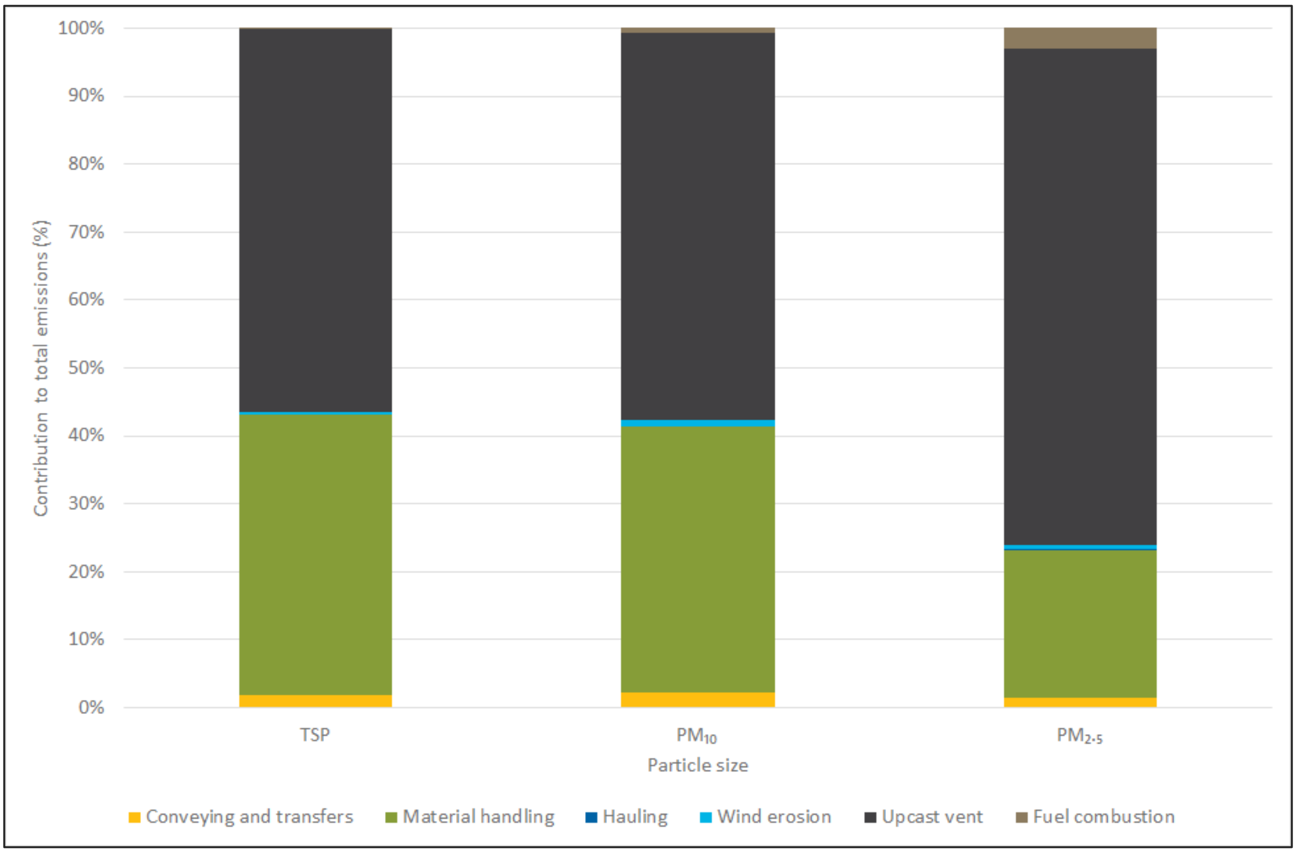

Figure 7.2 Contribution to annual emissions by emissions type and source – proposed scenario

b Air dispersion modelling

Atmospheric dispersion modelling was completed using the CALPUFF model system. Hourly meteorological observations from 2018, collected at a range of Centennial or other mine-owned stations, and one monitoring station operated by the Bureau of Meteorology, were used as input 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 (Table 7.5) and proposed modification (Table 7.6) scenarios.

Table 7.5 Incremental (existing scenario only) 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**
R1	0.6	1.1	0.2	0.3	0.1	0.1
R2	0.4	0.8	0.2	0.3	0.1	0.1
R3	0.8	1.2	0.3	0.4	0.1	0.2
R4	0.1	0.5	<0.1	0.2	<0.1	<0.1
R5	0.4	1.2	0.2	0.4	<0.1	0.1
R6	0.5	1.0	0.2	0.3	0.1	0.1
R8	0.7	1.0	0.3	0.3	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.

Table 7.6 Incremental (proposed scenario only) 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**
R1	1.1	2.7	0.6	0.8	0.2	0.1
R2	0.9	2.3	0.5	0.8	0.2	0.1
R3	1.9	3.6	0.8	0.9	0.2	0.4
R4	0.3	1.6	0.1	0.4	<0.1	<0.1
R5	1.9	5.5	0.7	1.3	0.2	0.3
R6	1.8	4.2	0.9	1.1	0.2	0.2
R8	2.2	4.2	1.1	1.2	0.3	0.3

Note: Criteria for TSP, PM_{10} and $PM_{2.5}$ are applicable to cumulative (increment + background). Criteria is provided for comparison purposes only.

Cumulative impacts were assessed by combining modelled impacts with recorded ambient background levels. The cumulative results showed that compliance with applicable EPA impact assessment criteria is predicted at all assessment locations for all pollutants and averaging periods under both the existing (Table 7.7) and proposed modification (Table 7.8) scenarios.

Table 7.7 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	6th highest 24-hour[1]	Annual	3rd highest 24-hour[2]	Annual	Annual
Criterion	**90**	**50**	**25**	**25**	**8**	**4**
R1	44.3	48.3	17.7	23.1	6.5	1.2
R2	44.1	48.2	17.7	23.0	6.5	1.2
R3	44.5	48.0	17.7	23.0	6.5	1.3
R4	43.8	48.0	17.5	23.0	6.5	1.1
R5	44.1	48.0	17.6	23.0	6.5	1.2
R6	44.2	48.0	17.7	23.0	6.5	1.2
R7	44.4	48.0	17.8	23.1	6.6	1.2
R8	44.5	48.2	17.8	23.1	6.6	1.3

Note:[1] Due to five exceedances and exceptional events in the background dataset, the 6th 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.

Table 7.8 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	6th highest 24-hour[1]	Annual	3rd highest 24-hour[2]	Annual	Annual
Criterion	**90**	**50**	**25**	**25**	**8**	**4**
R1	44.8	49.0	18.1	23.2	6.7	1.2
R2	44.5	48.5	18.0	23.1	6.7	1.2
R3	45.6	48.0	18.2	23.0	6.7	1.5
R4	44.0	48.0	17.6	23.0	6.5	1.1
R5	45.5	48.0	18.2	23.0	6.6	1.4
R6	45.4	48.1	18.4	23.0	6.7	1.3
R7	45.9	48.6	18.6	23.2	6.8	1.4
R8	45.5	48.9	18.4	23.4	6.7	1.4

Note:[1] Due to five exceedances and exceptional events in the background dataset, the 6th 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.

7.2.4 Mitigation and management

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

7.2.5 Conclusion

The proposed modification will result in an increase in Myuna'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. Similarly, the cumulative results show that compliance with applicable EPA impact assessment criteria is still predicted at all assessment locations for all pollutants and averaging periods.

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

7.3 Traffic

7.3.1 Overview

A traffic impact assessment (TIA) was prepared by EMM (Appendix C) in accordance with the requirements of the NSW Roads and Traffic Authority's (RTA's) *Guide to Traffic Generating Developments* (RTA 2002). The assessment:

- identified the surrounding road network potentially affected by the modification;
- identified the existing daily and peak hourly traffic volumes using the rod network, including intersection capacity assessments;
- identified the accident history record and any road safety issues for these roads;
- assessed the vehicular ingress and egress at Myuna and the Awaba Colliery surface site;
- identified additional future daily and peak hourly traffic movements generated by the proposed modification; and
- assessed the future effects of this traffic on traffic capacity and safety of the road network and intersections and any need for mitigation measures to address these impacts.

Site inspections and traffic surveys (including tube and intersection counts) were performed in 2019 and 2020.

The TIA included consideration of vehicle movements both to and from Myuna and CES.

7.3.2 Existing environment

i Roads

The proposed transport route is shown on Figure 4.1 and includes part of Wangi Point Road, Wangi Road, Wilton Road and the private haul road network between the Awaba Colliery surface site and CES. This route has been selected by Centennial Myuna to avoid trucks to travelling through residential areas. There are no residences immediately adjacent to, or with driveways on, the parts of Wangi Road and Wilton Road that are part of the transport route.

Wangi Road is a State road managed by TfNSW. Wilton Road is a local road managed by LMCC. Wangi Point Road is a private road controlled by Centennial Myuna, which provides access from Myuna directly onto Wangi Road. A description of Wangi Road, Wilton Road and Wangi Point Road is provided in Table 2.1, Table 2.2 and Table 2.3 of Appendix C, respectively.

The following private haul roads connect the Newstan Colliery surface site, Awaba Colliery surface site, CES, Hawkmount Quarry and Eraring Power Station (as approved under SSD-5145):

- Newstan-Eraring Private Haul Road – approximately 13-km long, linking the Newstan Colliery surface site with the Eraring Power Station;
- Cooranbong Private Haul Road – approximately 3.4-km long, linking the Newstan Colliery surface site and CES via the Newstan-Eraring Private Haul Road; and
- Awaba Private Haul Road – approximately 770-m long, linking Awaba Colliery surface site to the Newstan-Eraring Private Haul Road.

These roads are approved under SSD-5145 to be used to haul coal, coal rejects and stone material. These private haul roads are sealed to minimise dust and noise generation and have been constructed to include surface water drainage and management. Any coal spilt on the road is removed regularly.

ii Intersections

Three key intersections were considered as part of the TIA:

- Wangi Road/Wangi Point Road – a T-junction;
- Wangi Road/Wilton Road – a seagull type T-junction; and
- Wilton Road/Awaba Colliery surface site access road– a T-junction.

The identified peak hours at each of these three intersections were determined as follows:

- Wangi Road/Wilton Road:
  - morning (AM) peak: 7-8 am; and
  - afternoon (PM) peak: 3-4pm;
- Wilton Road/Awaba Colliery surface site:
  - morning (AM) peak: 7.30-8.30 am; and
  - afternoon (PM) peak: 3.30-4.30 pm;
- Wangi Road/Wangi Point Road:
  - morning (AM) peak: 7-8 am; and
  - afternoon (PM) peak: 3-4 pm.

Safety at these three intersections and all significant T-intersections along the proposed transport route between Myuna and Awaba Colliery surface site was assessed:

- Wangi Road/Donnelly Road;
- Wangi Road/Buttaba Hills Road;
- Wangi Road/Dorrington Road;
- Wangi Road/substation access; and
- Wilton Road/Awaba Landfill and Waste Transfer Station access.

These five intersections will not experience any additional truck turning movements as a result of the proposed modification. Therefore, no intersection capacity modelling has been undertaken at these five locations.

iii Traffic safety

The TfNSW Centre of Road Safety traffic accident data for Wangi Road and Wilton Road has been analysed for the years between 2014 and 2018 inclusive.

A total of 10 traffic accidents were recorded on Wangi Road, primarily at intersections. The majority of accidents occurred in 2014 and 2015. In more recent years, the magnitude of accidents decreased noticeably. This is evidently a benefit from the various road safety improvements including guard rails and jersey kerbs that have been installed at various locations along Wangi Road over the past five years.

A total of three accidents were recorded along the relevant section of Wilton Road.

None of the recorded accidents involved heavy vehicles.

The annual traffic accident volumes for the assessed road network indicate that safety concerns are relatively minor and do not generally warrant further road safety upgrades along the assessed road network.

Sight distances and other potential safety issues at intersections along the route between Myuna and Awaba Colliery surface site have been inspected and assessed (Section 4.3.2 of Appendix C).

All minor road T-intersections have adequate sight distance and there are generally low minor road traffic volumes (with the exception of the intersection with Dorrington Road, which features a roundabout) such that the existing intersection designs are acceptable and do not warrant any intersection turning lane or other capacity upgrades.

7.3.3 Impact assessment

i Proposed daily traffic volumes

All coal at Myuna is currently transported via an enclosed overland conveyor to Eraring Power Station with no truck transport of coal permitted.

Traffic generation for the proposed transport of coal between Myuna and CES was calculated based on an average truck capacity of 32 t and 300 active days per annum (excludes Sundays and public holidays). Transportation of 1 Mtpa of coal requires 31,250 trucks per annum or approximately 104 truck trips (208 movements) per active day.

Assuming inbound and outbound truck movements occur within the same hour, there will be 10 trips (20 movements) in the morning peak hour, 5 trips (10 movements) in the afternoon peak hour and 10 trips/hour (20 movements/hour) at other times during the day.

Between 3.00 pm and 4.00 pm Monday to Friday, truck movements will be restricted to 5 trips (10 movements) per hour to avoid potential impacts during the local road network’s busiest peak hour period.

It has been assumed that there will be no additional traffic generation from the backloading of coal from CES to Myuna as all trucks delivering coal to CES will travel back to Myuna (with or without a load).

Due to the short-term nature of construction activities, construction traffic volumes have not been considered.

ii Traffic safety

The accident volumes along the assessed road network are minor and do not warrant any immediate upgrades based on either the existing or proposed traffic volumes. Sight distances and other safety concerns at intersections along the route between Myuna Colliery and Awaba Colliery surface site have been inspected and assessed (Section 4.3 of Appendix C).

All minor road T-intersections have adequate sight distance and, with the exception of Dorrington Road (which features a roundabout), experience low minor road traffic volumes such that the existing intersection designs are acceptable and do not warrant any intersection turning lane or other capacity upgrades as a result of the proposed modification.

iii Intersection performance

The TIA assessed the morning and afternoon peak hour intersection and daily road traffic flow impacts of the proposed modification.

The SIDRA intersection analysis results for the three key intersections are shown in Table 7.9.

Table 7.9 Summary of existing and predicted intersection operations

Intersection	Assessment period	Period	Level of service (LoS)*	Average delay (seconds)*	Degree of saturation (DoS)	95% queue length (m)
Wangi Road/Wangi Point Road	Morning peak 7–8 am	Existing	A	7.0	0.155	0.0
		Proposed coal transport	A	9.9	0.164	0.9
	Afternoon peak 3–4 pm	Existing	A	7.0	0.189	0.0
		Proposed coal transport	A	11.8	0.192	0.6
Wangi Road/Wilton Road	Morning peak 7–8 am	Existing	B	17.5	0.473	4.6
		Proposed coal transport	B	20.6	0.473	7.2
	Afternoon peak 3–4 pm	Existing	A	13.3	0.455	6.4
		Proposed coal transport	A	13.8	0.455	7.3
Wilton Road/Awaba Colliery surface site	Morning peak 7.30–8.30 am	Existing	A	6.9	0.080	0.1
		Proposed coal transport	A	7.7	0.089	0.7
	Afternoon peak 3.30–4.30 pm	Existing	A	6.9	0.087	0.1
		Proposed coal transport	A	7.8	0.087	0.4

Note *The table presents the maximum average delay and worst LoS of any particular movement (usually the longest delay occurs for the right-turning movement from the minor road).

The Wangi Road/Wilton Road intersection will continue to operate at acceptable LoS (A or B) with no reduction as a result of the proposed modification and only slightly higher average vehicle delays as a result of the proposed modification.

Minimal additional traffic delays are anticipated at the intersection of Wangi Road/Wangi Point Road and Wilton Road/Awaba Colliery surface site.

iv Mid-block capacity of Wangi Road and Wilton Road

The existing and forecast peak hour mid-block LoS for Wangi Road and Wilton Road are provided in Table 7.10.

Table 7.10 Comparison of mid-block peak hourly level of service (existing and proposed modification)

Road	Peak hour	Existing			Proposed modification		
		Volume (HV)	HV%	LoS	Volume (HV)	HV%	LoS
Wangi Road	Morning	1,467 (40)	3	E	1,487 (60)	4	E
	Afternoon	1,716 (28)	2	E	1,726 (38)	3	E
Wilton Road	Morning	248 (21)	9	A	268 (41)	16	B
	Afternoon	287 (16)	6	B	297 (26)	9	B

On the busiest section of Wangi Road, near the Wilton Road intersection, the peak hour LoS will be E, which is defined as 'unstable flow with no freedom for traffic to select a desired travel speed', with or without the proposed additional heavy vehicle traffic.

On Wilton Road, there will be a transition from LoS A to LoS B with the proposed heavy vehicle traffic in the morning peak hour but the afternoon peak hour traffic will remain at LoS B. Both these levels of service provide either excellent or generally good traffic flow conditions.

v Swept path assessment

A swept path assessment was undertaken for a 19 m semi-trailer to determine if the Wangi Road/Wangi Point Road and Wilton Road/Awaba Colliery surface site intersections can adequately accommodate the proposed truck turning movements. The results are presented in Appendix D of Appendix C and indicate:

- Wangi Road/Wangi Point Road intersection – no widening or improvement works are required on Wangi Road to facilitate the efficient entry/exit of heavy vehicles proposed to be used to transport coal from Myuna to Awaba Colliery surface site; however, road widening works (to a minimum sealed width of 7 m) are required along Wangi Point Road, within Myuna's pit top, for a distance of approximately 50 m from the nearest traffic lane on Wangi Road.

- Wilton Road/Awaba Colliery surface site access road intersection – no widening works are likely to be required at this intersection due to the low likelihood of simultaneous truck turning movements in both directions occurring at this intersection. Widening of the existing access gate may help to provide more room for inbound/outbound trucks, reducing the potential overlap identified in the swept path analysis (Appendix D of Appendix C).

The Wangi Road/Wilton Road intersection has recently been widened and upgraded by RMS (now TfNSW). These intersection improvements are considered to have been constructed to the required design standard to accommodate turning movements by heavy vehicles (such as semi-trailers) and further assessment of the intersection design by swept path analysis was not considered necessary for this intersection.

vi Cumulative impacts

LMCC's website does not show any current major development applications within proximity of the assessed roads. Therefore, no analysis of potential cumulative traffic impacts has been undertaken.

As part of the Newstan Mine Extension Project (SSD-10333), Centennial Newstan Pty Ltd (Centennial Newstan) is seeking approval for the construction of a new gas flaring facility and two new ventilation fans within the existing disturbance footprint of the Awaba Colliery surface site. Within the TIA prepared by EMM (2019) as part of the Newstan Mine Extension Project, it was assumed that up to 50 personnel will be required during the proposed construction activities. All personnel will likely access the Awaba Colliery surface site via Wilton Road using their own car, representing up to 100 daily light vehicle movements.

Should the Newstan Mine Extension Project (SSD-10333) be approved, no coal transport will take place between CES and Myuna Colliery for the duration of the proposed construction activities. This will eliminate potential for cumulative traffic impacts on the local road network.

7.3.4 Mitigation and management

i Truck volumes

a Public roads

Between 3.00 pm and 4.00 pm Monday to Friday, truck movements will be restricted to 5 trips (10 movements) per hour to avoid potential impacts during the local road network's busiest peak hour period.

b Private roads

Truck numbers along the private haul road network between the Awaba Colliery surface site and CES will be within previously assessed and approved limits under SSD-5145 (ie 32 truck movements per hour).

ii Road upgrades

Road widening works will be undertaken on Wangi Point Road, within the Myuna pit top, to establish a minimum sealed width of 7 m for a distance of approximately 50 m from the nearest traffic lane on Wangi Road. This will allow two trucks to safely pass each other when entering/exiting Wangi Point Road. No vegetation clearing is required to undertake the proposed works.

iii Additional signage

To facilitate the safe transport of coal on the public road network, signage will be installed approximately 100 m from the intersection of Wangi Road/Wangi Point Road and Wilton Road/Awaba Colliery surface site to warn motorists of turning trucks. Approval under Section 138 of the NSW *Roads Act 1993* will be obtained prior to the installation of any signage along the public road network.

iv Driver awareness and training

A Code of Conduct will be developed and implemented for all truck drivers operating on the public road network as part of the proposed modification. It will focus on good driver behaviour.

7.3.5 Conclusion

The proposed modification will generate up to 10 loaded trucks per hour Monday to Saturday (ie 20 truck movements), with the exception of 3–4 pm Monday to Friday where truck movements will be restricted to 5 loaded trucks per hour (ie 10 truck movements).

The proposed truck movements can be accommodated by the existing road network with minimal overall impact to road capacity or traffic delays and no intersection improvements are warranted.

The swept path analysis for the intersection of Wangi Road/Wangi Point Road indicates that minor widening works are required along Wangi Point Road within the Myuna pit top. Warning signs will also be installed on Wilton Road and Wangi Road to warn motorists of turning trucks.

7.4 Socio-economic

7.4.1 Overview

An assessment of socio-economic effects was prepared by AIGIS (Appendix D) 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 Northern Coal Logistics' SSD-5145. 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.

Given the scale of the proposed modifications to MP 10_0080 and SSD-5145, a standalone social impact assessment (SIA) and economic assessment (EA) were not required (see DPIE correspondence in Appendix F). The SIA scoping tool was used to determine the extent of reporting required for potential effects.

7.4.2 Impact assessment

i Potential social impacts

a Truck movements on public roads

The proposed modification will generate up to 10 loaded trucks per hour Monday to Saturday (ie 20 truck movements), with the exception of 3–4 pm Monday to Friday where truck movements will be restricted to 5 loaded trucks per hour (ie 10 truck movements). The TIA (Appendix C) concludes that the proposed truck movements can be accommodated by the existing road network with minimal overall impact to road capacity or traffic delays and no intersection improvements are warranted.

b Air quality

The AQIA (Appendix B) concludes that the proposed modification will result in an increase in Myuna's operational air quality emissions; however, the results 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. Similarly, the cumulative results show that compliance with applicable EPA impact assessment criteria is still predicted at all assessment locations for all pollutants and averaging periods.

c Noise effects

Myuna's proposed operations are predicted to result in no change to existing operational noise emissions.

Operational noise emissions from Myuna are predicted to satisfy the PNTLs at all assessment locations. Predicted maximum noise levels are below the maximum screening criteria and generally consistent with or conservative when compared to the results of previous noise compliance monitoring.

ii Potential economic impacts

The potential economic impacts of the proposed modification are likely to be positive and include:

- continued employment of Myuna's existing workforce with derived economic effects of employees' households maintaining normal levels of activity in the local and regional economy; and
- additional work for transport contractors associated with proposed transport of coal between Myuna and CES.

Without the proposed modification, Myuna's ability to supply coal to Eraring Power Station may be jeopardised and consequently, Myuna may not be able to sustain its workforce at the approved operational level. The economic stimulus provided by Myuna's employees in the regional economy is estimated to range between approximately $1.52 million and $2.13 million per annum (Appendix D). Scaling back or interrupting mining due to coal not meeting Eraring Power Station specifications would reduce these benefits.

Production issues at Myuna could also affect other contractors and suppliers in Myuna's supply chain, as well as community organisations that receive sponsorship and/or support from Myuna. A decline in profitability resulting from a disruption to production would likely affect Myuna's capacity to provide continuing employment and/or support to contractors, suppliers, local organisations and initiatives.

7.4.3 Mitigation and management

A number of mitigation and management measures have been proposed to reduce the potential impact of the proposed modification on the local road network (Section 7.3.4).

To ensure public roads are kept free of materials tracked by trucks and reduce dust generation, all trucks leaving Myuna and CES will use a truck wheel wash before leaving each site and all loads will be covered.

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

7.4.4 Conclusion

The proposed modification is an operational contingency provision designed to support the continued supply of coal from Myuna to Eraring Power Station. The potential social and economic impacts of the proposed modification will be limited.

The proposed modification will help secure continued employment for Myuna's existing workforce with derived economic effects of employees' households maintaining normal levels of activity in the local and regional economy.

7.5 Other environmental aspects

An assessment of other environmental aspects as a result of the proposed modification is provided in Table 7.11.

Table 7.11 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 EMS and the *Northern Region Biodiversity Management Plan* (BMP). The EMS and BMP will continue to operate under the proposed modification.
Land and agricultural resources	No areas of biophysical strategic agricultural land (BSAL) will be impacted by the proposed modification. 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.
Aboriginal cultural/historical heritage	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 *Northern Region Aboriginal Cultural Heritage Management Plan* (ACHMP) and *Northern Region Historic Heritage Management Plan* (HHMP) will be followed. Aboriginal cultural and historic heritage will continue to be managed in accordance with the ACHMP and HHMP, respectively.
Visual amenity	As noted in Section 2.2, vegetation separates Myuna's pit top from the residential areas of Arcadia Vale and Wangi Wangi. The new vehicle weighbridge will not be visible from neighbouring properties or by passing motorists travelling along Wangi Road. The proposed modification will not result in additional visual amenity impacts. No additional mitigation measures for potential visual amenity impacts are considered warranted.
Waste	No waste product is predicted to increase as a result of the proposed modification. Construction waste generated as a result of the installation of the new vehicle weighbridge and road widening works 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.
Water resources	It is anticipated that construction will be completed in eight days with limited disturbance works and excavation required. All excavation works will be shallow with no potential to impact groundwater sources. Once constructed, surface water runoff from the weighbridge area will be considered clean water as there will be no coal storage, transportation, handling or processing or any disturbance, as it is unlikely to be contaminated with coal fines or sediment. All disturbance activities will be managed in accordance with the approach and guidelines outlined in the *Northern Operations Regional Water Management Plan* (RWMP). Surface water and groundwater will continue to be managed in accordance with the WMP.

Table 7.11 Potential impacts of the proposed modification

Environmental consideration	Impact assessment
Greenhouse gas emissions	An updated summary of GHG emissions from Myuna, and specifically, changes to GHG emissions as a result of the proposed modification was completed by EMM (Appendix E). The GHG emissions sources considered in the assessment are listed in Table 2.1 of Appendix E and include scope 1, 2 and 3 emissions. It is noted that the only differences between the existing and proposed modification scenario in the GHG emissions calculations were the additional diesel used to transport coal to and from CES and an increase in the amount of coal stockpiled at Myuna to account for coal delivered from CES. It is not proposed to increase Myuna's approved extraction rate. Annual average GHG emissions (Scope 1 and 2) generated by Myuna in the existing scenario represent approximately 0.547% of total GHG emissions for NSW and 0.134% of total GHG emissions for Australia, based on the National Greenhouse Gas Inventory for 2018 (DoISER 2020). Annual average GHG emissions (Scope 1 and 2) generated by Myuna in the proposed scenario represent approximately 0.551% of total GHG emissions for NSW and 0.135% of total GHG emissions for Australia, based on the National Greenhouse Gas Inventory for 2018 (DoISER 2020). The proposed modification will result in a 0.9% increase in annual Scope 1 and Scope 2 GHG emissions at Myuna when compared with Myuna's existing operations. Scope 3 emissions are approximately 7.3 Mtpa under both the existing and proposed scenarios and will increase by 0.0008% or 56 tpa as a result of the proposed modification. Mitigation of GHG emissions will continue to be conducted in accordance with the AQGHGMP.

8 Evaluation of merits

A description of the need and justification for the proposed modification 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.

8.1 Modification impacts

This MR examines the potential impacts that may result from the proposed modification. The assessment of environmental issues has been multi-disciplinary and involved consultation with DPIE and other key stakeholders (including LMCC, TfNSW and Centennial's CCCs).

The proposed modification 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 Myuna's existing EMS.

8.2 Modification benefits

The proposed modification will allow an ongoing supply of coal to Eraring Power Station from Myuna's pit top and CES. The continued supply of coal of suitable quality from both of these operations will help support the ongoing and efficient operation of Eraring Power Station and continued supply of electricity to NSW. Failure to provide coal of sufficient quality to Eraring Power Station could risk the ongoing employment of Myuna's workforce.

The proposed modification is a minor alteration to the handling and distribution of coal at an approved coal mine operation which represents an orderly and economic use of a resource approved for extraction for use in domestic power generation. Additional infrastructure to facilitate the proposed modification will be limited to construction of a weighbridge and minor road widening works. All surface disturbance activities will be within previously disturbed, cleared areas within Myuna's approved surface facilities area.

All aspects relating to environmental management will continue in accordance with MP 10_0080, EPL 366, the approved management plans and other elements of the development consent. The proposed modification will enable continued operations at Myuna.

8.3 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 Myuna is committed to the principles of ESD and understands that biophysical, social and economic objectives are interdependent. Centennial Myuna acknowledges that a well-designed and effectively managed operation will avoid significant and/or costly environmental impacts or degradation.

The proposed transport route has been selected by Centennial Myuna to avoid trucks travelling through residential areas. In addition, between 3.00 pm and 4.00 pm Monday to Friday, truck movements will be restricted to ten truck movements (ie five loaded trucks) per hour to avoid potential impacts on the local road network's existing peak hour period. Where impacts are unavoidable, the proposed works have been designed to reduce the impacts to a level which is as low as is reasonably practicable. Appropriate management measures have been identified to mitigate any residual impacts from the proposed modification.

Consideration has been given to appropriately identifying, avoiding, mitigating and managing environmental risks. This demonstrates environmental due diligence and will provide for ongoing and adaptive monitoring and management of Myuna's operations in line with the principles of ESD outlined in the following sections.

8.3.1 Precautionary principle

This MR has enabled an understanding of the potential impacts of the proposed modification on biophysical, social and economic factors. The proposed truck movements can be accommodated by the existing road network with minimal overall impact to road capacity or traffic delays and no intersection improvements are warranted.

The proposed modification will result in an increase in Myuna'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.

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

8.3.2 Inter-generational equity

Centennial Myuna undertakes ongoing environmental monitoring with mitigation measures to provide effective environmental management across its 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.

8.3.3 Conservation of biological diversity and maintenance of ecological integrity

The potential environmental impacts of the proposed modification and the existing and/or additional measures to ameliorate these potential impacts are detailed in this MR. The proposed modification is unlikely to cause any impacts to threatened species or endangered ecological communities within or adjacent to the project approval and development consent boundaries.

8.3.4 Improved valuation and pricing of environmental resources

Centennial Myuna will optimise the valuation and pricing of the coal resource within the development consent boundary at Myuna by continuing to efficiently extract coal resources utilising existing approved infrastructure. The proposed modification promotes the objectives of Myuna's approval, being the extraction, handling and transportation of coal for delivery to Eraring Power Station for domestic power generation. The proposed modification will also support the ongoing, efficient operation of Eraring Power Station and the supply of electricity to NSW.

8.4 Conclusion

The proposed modification has been designed to avoid and minimise adverse biophysical, social and economic impacts. The proposed truck movements can be accommodated by the existing road network with minimal overall impact to road capacity or traffic delays and no intersection improvements are warranted. While there are some minor unavoidable impacts, the proposed modification and ongoing operation of Myuna will provide long-term benefits to the local community, region and State.

The proposed modification is 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 development originally approved. There will be ongoing economic investment and employment benefits both locally and regionally, while minimising potential environmental and social impacts. All aspects relating to environmental management will continue in accordance with MP 10_0080, EPL 366, the various approved plans and other elements of the consent.

Abbreviations

ACHMP	Northern Region Aboriginal Cultural Heritage Management Plan
AHD	Australian height datum
AQGHGMP	Northern Region Air Quality and Greenhouse Gas Management Plan
Banpu	Banpu Public Company Limited
BMP	*Northern Region Biodiversity Management Plan*
BoM	Bureau of Meteorology
BSAL	biophysical strategic agricultural land
CCC	community consultative committee
Centennial	Centennial Coal Company Limited
Centennial Myuna	Centennial Myuna Pty Limited
Centennial NCS	Centennial Northern Coal Services Pty Limited
CES	Cooranbong entry site
CHP	coal handling plant
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DPIE	NSW Department of Planning, Industry and Environment
EIS	environmental impact statement
EL	exploration licence
EMM	EMM Consulting Pty Limited
EMS	environmental management strategy
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPL	environment protection licence
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EP&A Regulation	NSW Environmental Planning and Assessment Regulation 2000
ESD	ecologically sustainable development
FTE	full-time equivalent
GHG	greenhouse gas
Gosford LEP	Gosford Local Environmental Plan 2014
ha	hectares
HHMP	Northern Region Historic Heritage Management Plan

ICNG	*Interim Construction Noise Guideline*
km	kilometres
Lake Macquarie LEP	Lake Macquarie Local Environmental Plan 2014
LDP	licenced discharge point
LGA	local government area
LMCC	Lake Macquarie City Council
LoS	level of service
Mining SEPP	State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007
ML	mining lease
mm	millimetres
MNES	matters of national environmental significance
MOP	mining operations plan
Mtpa	million tonnes per annum
MR	modification report
MW	megawatts
NMP	Northern Region Noise Management Plan
NPfI	*Noise Policy for Industry*
NSW	New South Wales
POEO Act	NSW *Protection of the Environment Operations Act 1997*
RNP	*Road Noise Policy*
ROM	run-of-mine
RTS	response to submissions
RWMP	Northern Operations Regional Water Management Plan
SEPP	State Environment Planning Policy
SSD	State significant development
t	tonnes
WAL	water access licence
Water Act	NSW *Water Act 1912*
WM Act	NSW *Water Management Act 2000*
WMP	Myuna Colliery Water Management Plan

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Appendix A

Noise and vibration impact assessment




Myuna Colliery - Modification 2

Noise and vibration impact assessment

Prepared for Centennial Myuna Pty Ltd
July 2020

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Myuna Colliery - Modification 2

Noise and vibration impact assessment

Report Number

J200309 RP4_NVIA

Client

Centennial Myuna Pty Limited

Date

1 July 2020

Version

Final

Prepared by	Approved by
Katie Teyhan	**Najah Ishac**
Associate	Director
1 July 2020	1 July 2020

This report has been prepared in accordance with the brief provided by the client and has relied upon the information collected at the time and under the conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of the client and no responsibility will be taken for its use by other parties. The client may, at its discretion, use the report to inform regulators and the public.

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1 Introduction

1.1 Overview

Myuna Colliery (Myuna) is an existing underground coal mine owned and operated by Centennial Myuna Pty Limited (Centennial Myuna). Myuna's pit top is 25 kilometres (km) south-west of Newcastle, New South Wales (NSW), in the Lake Macquarie local government area (LGA) (Figure 1.1).

Myuna operates under two development consents:

- SH110_148, which was granted by Lake Macquarie City Council (LMCC) in 1977 under the provisions of the now repealed NSW *Local Government Act 1919* for the development and operation of the Myuna and Cooranbong collieries; and

- MP 10_0080, which was granted by the Minister of Planning and Infrastructure on 18 January 2012 under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for continued mining in areas outside the area defined by SH110_148. MP 10_0080 also authorises the use of bord and pillar methods in the Wallarah, Great Northern and Fassifern coal seams and the continued use of existing infrastructure on-site until 31 December 2032.

MP 10_0080 has since been declared a State significant development (SSD) under Clause 6 of Schedule 2 of the NSW Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017. Accordingly, Myuna now operates as an SSD approval.

Coal produced at Myuna is transferred from Myuna's pit top to the Eraring Power Station (about 4 km west of the pit top) by overland conveyor. Coal from Myuna that does not meet Eraring Power Station specifications, is stockpiled at Myuna's emergency coal stockpile until it can be reclaimed and blended with coal to meet these specifications. However, there is limited capacity to store coal at Myuna's pit top prior to blending and dispatch.

The Northern Coal Logistics Project regulates coal handling, processing, and transport operations at the Newstan Colliery Surface Site, Cooranbong Entry Site (CES) and associated private haul roads, and also the use of various other surface infrastructure items. The Northern Coal Logistics Project operates under SSD-5145, which was granted by the Minister for Planning on 29 September 2015.

CES is approximately 2 km north of Dora Creek in the Lake Macquarie LGA (Figure 1.1). It was originally developed as part of Cooranbong Colliery. CES comprises a coal handling plant (CHP), coal stockpiles, workshop building, administration building, car park and water management infrastructure. CES is approved to receive and process ROM coal from Mandalong Mine (SSD-5144). Coal handled at CES can be delivered to either the Eraring Power Station via overland conveyor or to Newstan Colliery for further processing and transfer into the export market.

In recent months, Centennial Myuna has been experiencing fluctuations in coal quality with some product coal not meeting Eraring Power Station specifications. Centennial Myuna has assessed a number of options to ensure that it can continue to meet its contractual obligations to supply coal to Eraring Power Station. This assessment found that the best option is to blend coal from Myuna with coal from Mandalong Mine, with blending occurring at both at Myuna's pit top and at CES. This would allow Centennial Myuna to continue to provide a secure supply of coal to Eraring Power Station and to secure ongoing employment for Myuna's workforce.

Centennial Myuna is seeking to modify MP 10_0080, pursuant to Section 4.55(2) of the EP&A Act, to allow coal to be transferred between Myuna's pit top and CES, blending of this coal at Myuna, and associated activities. Coal would be transported between Myuna's pit top and CES by truck.

At the same time Centennial Myuna is seeking to modify MP 10_0080, Centennial Northern Coal Services Pty Limited (Centennial NCS) will submit a modification application for SSD-5145 to allow coal from Myuna to be received, handled and blended at CES.

1.2 Site description

As noted in Section 1.1, Myuna operates under two development consents. The project approval boundary (Figure 1.1) is applicable to MP 10_0080 and encompasses an area of 3,773.2 hectares (ha). The development consent boundary (Figure 1.1) is applicable to SH110_148 and encompasses an area of 3,105.4 ha. Myuna's pit top sits within the project approval boundary.

The majority of the project approval boundary is beneath Lake Macquarie which is NSW Government Crown land. The remaining land within the project approval boundary is predominantly privately-owned. Myuna's surface facilities area is on land owned by Centennial Fassifern Pty Ltd, a sister company of Centennial Myuna.

Myuna's pit top is currently only accessed directly from Summerhill Drive (Figure 1.2). A locked gate prevents entry to Myuna's pit top via a Centennial-owned section of Wangi Point Road off Wangi Road. Myuna's pit top is west of the residential area of Arcadia Vale, north-west of Wangi and is adjacent to the site of the former Wangi Power Station (Figure 1.2). Eraring Power Station (Figure 1.1) is approximately 4 km west of Myuna's pit top.

Land uses surrounding Myuna's pit top include a mix of mining, industrial (including the now closed Wangi Wangi Power Station) and residential (including the suburbs of Wangi Wangi and Arcadia Vale). Lake Macquarie is approximately 400 m south of Myuna's pit top at its closest point. Wangi Road, Donnelly Road and Summerhill Drive are to the north-west, north-east and south of Myuna's pit top, respectively (Figure 1.2).

There are a number of residences in the area surrounding Myuna's pit top (Figure 1.2). The closest residence is R2, approximately 500 m south-east of Myuna's pit top. Vegetation separates Myuna's pit top from the residential areas of Arcadia Vale and Wangi Wangi.

1.3 Assessment guidelines and requirements

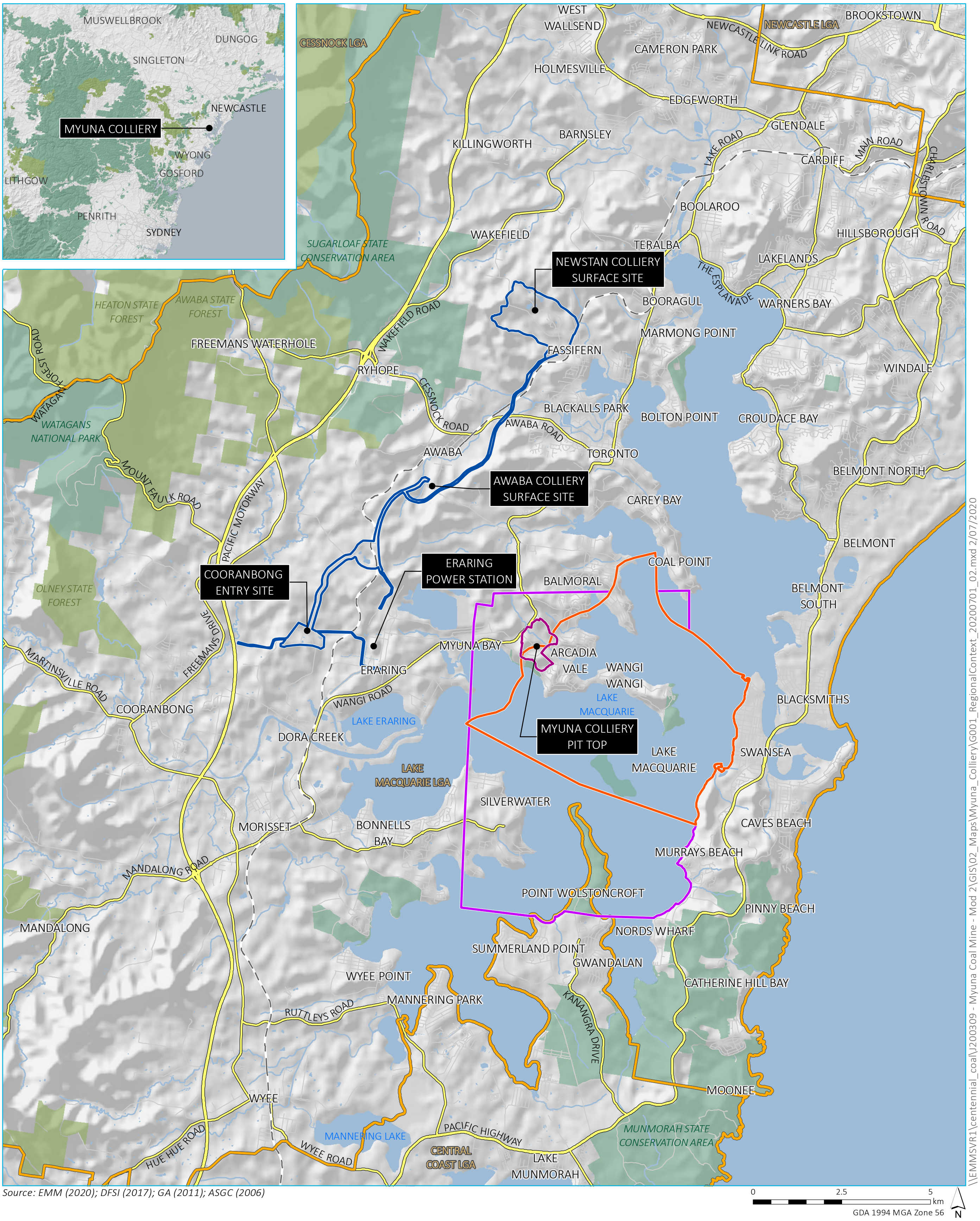
This noise and vibration impact assessment (NVIA) has been prepared to accompany the modification report and assesses the noise and vibration impacts of the proposed modification on existing noise-sensitive receptors in the surrounding area.

This NVIA has been completed with reference to the following guidelines and policies:

- NSW Environment Protection Authority (EPA) 2017, *Noise Policy for Industry* (NPfI);
- NSW Department of Environment and Climate Change (DECC) 2009, *Interim Construction Noise Guideline* (ICNG);
- NSW Department of Environment, Climate Change and Water (DECCW) 2011, *Road Noise Policy* (RNP); and
- Department of Environment and Conservation NSW 2006, *Assessing Vibration: a technical guideline*.

A number of technical terms have been utilised throughout this report for the discussion of noise and vibration. These are explained in the Glossary.

A separate NVIA will assess the noise and vibration impacts associated with the proposed modifications to existing operations at CES (as approved under SSD-5145).



Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006)

KEY

- Rail line
- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest
- Local government area
- Myuna Colliery surface facilities area

Development consent boundaries

- Myuna Colliery development consent boundary (SH110_148)
- Myuna Colliery project approval boundary (MP 10_0080)
- Northern Coal Logistics development consent boundary (SSD-5145)

Regional context

Myuna Colliery Modification 2
Noise and vibration impact assessment
Figure 1.1

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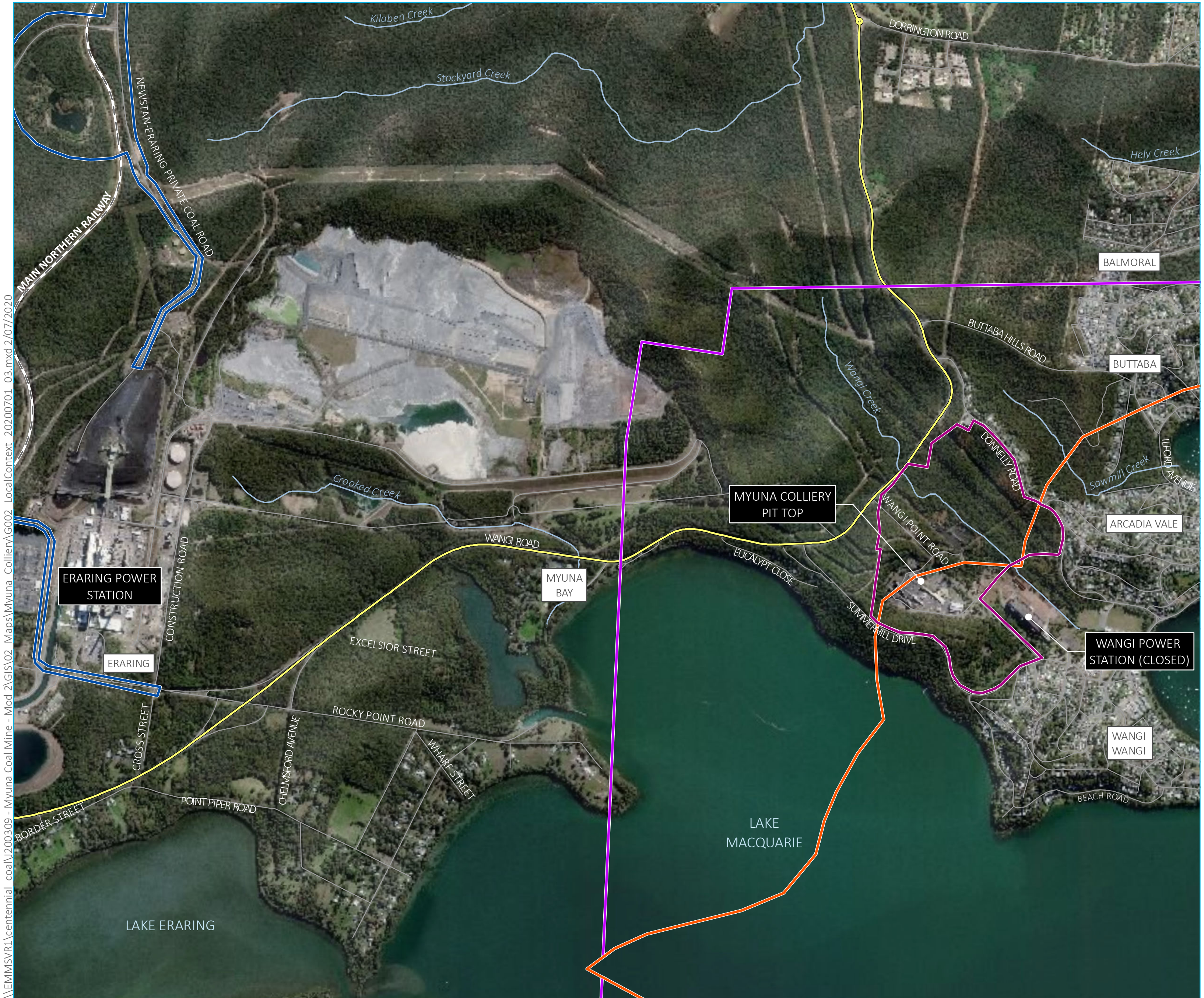

Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

KEY

- Myuna Colliery development consent boundary (SH110_148)
- Northern Coal Logistics development consent boundary (SSD-5145)
- Myuna Colliery project approval boundary (MP 10_0080)
- Myuna Colliery surface facilities area
- Rail line
- Major road
- Minor road
- Named watercourse

Local context

Myuna Colliery Modification 2
Noise and vibration impact assessment
Figure 1.2

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2 Proposed modification

2.1 Overview

To ensure that Myuna can continue to meet its contractual obligations to supply coal to Eraring Power Station and secure ongoing employment for Myuna's workforce, Centennial Myuna propose to blend coal from Myuna with coal from Mandalong Mine both on-site at Myuna's pit top and at CES.

It is proposed to modify MP 10_0080 to:

- allow up to 1 million tonnes per annum (Mtpa) of Myuna coal to be trucked from Myuna's pit top to CES via the public and private road networks and blending with coal from Mandalong Mine before transfer to Eraring Power Station by conveyor;
- allow up to 0.2 Mtpa of Mandalong Mine coal to be backloaded by truck from CES to Myuna's pit top and blending with coal from Myuna before transfer to Eraring Power Station by conveyor;
- allow construction and operation of a vehicle weighbridge at Myuna's pit top;
- allow trucks to access Myuna's pit top via Wangi Road and Wangi Point Road; and
- include a consent condition to address the environmental management of exploration activities and minor surface infrastructure.

The proposed transport route consists of Wangi Point Road from Myuna's pit top area, public roads (ie Wangi Road and Wilton Road) between Myuna and the Awaba Colliery surface site and private haul roads between the Awaba Colliery surface site and CES. The proposed transport route is shown on Figure 2.1.

Truck movements will be limited to 7.00 am–6.00 pm Monday to Saturday.

Truck numbers along the private haul road network between the Awaba Colliery surface site and CES will be within previously assessed and approved limits under SSD-5145 (ie 32 truck movements per hour).

All trucks leaving Myuna will be weighed using a new vehicle weighbridge proposed to be installed at Myuna's pit top. A truck wheel wash will also be used by all trucks before leaving site via a privately-owned section of Wangi Point Road (Figure 2.1). All loads will be covered.

No revisions to the project approval (MP 10_0080) or development consent (SH110_148) boundaries for Myuna are required as part of the proposed modification. The proposed modification will not change the approved life of mining operations and does not include an increase to Myuna's approved extraction rate of 3 Mtpa.

2.1.1 Construction activities

As described above, a new vehicle weighbridge and wheel wash will be installed at Myuna's pit top.

The weighbridge will be installed on previously disturbed, cleared land adjacent to a privately-owned section of Wangi Point Road (Figure 2.2). There is an inactive weighbridge and supporting infrastructure at this location that will need to be removed.

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: 7.00 am–6.00 pm;
- Saturday: 8.00 am–1.00 pm; and
- no work on Sundays and public holidays.

No additional employees will be required during construction.

The proposed construction schedule is described in Table 2.1.

Table 2.1 Proposed construction schedule for truck weighbridge

Construction stage and activity	Estimated duration	Plant and equipment
Stage 1: Mobilisation and site preparation: • mobilise to site; • disconnect/remove redundant equipment; • dismantle existing steel weighbridge; and • lift old steel bridge panels.	2 days	Flat-bed truck Mobile crane Light vehicles Hand tools
Stage 2: Construction: • enlarge existing weighbridge pit to suit wider weighbridge (including concrete cutting); • form up, reinforce and pour new concrete plinths; • dwell 3 days for concrete to cure - install data logger adjacent whilst curing (no noise generating works); • install load cells on concrete plinths (concrete drill) - wire into datalogger; and • lift, locate and secure new steel bridge onto load cells.	5 days	Concrete cutting saw Concrete truck Mobile crane Concrete drill Flatbed truck
Stage 3: Commissioning: • truck and dog trailer brought to weighbridge and tested unladen; and • tests repeated with partially and then fully loaded truck.	1 day	Light vehicle Truck and dog

2.1.2 Material handling

Up to 1 Mtpa of ROM coal from Myuna will be transferred by truck directly from Myuna to the middlings coal stockpile at CES.

Up to 0.2 Mtpa of Mandalong Mine coal will be backloaded from CES to Myuna's pit top. A front end loader will be used to load trucks at CES.

On arrival at Myuna's pit top, coal from CES will be tipped onto, and temporarily stored at, Myuna's emergency coal stockpile area before being reclaimed through Myuna's existing coal handling infrastructure (Figure 2.2).

A front end loader will be used at Myuna's emergency coal stockpile to load the trucks that will transport the coal to Myuna's existing below ground reclaimer.

Blending of Myuna coal with Mandalong Mine coal will occur either at Myuna's emergency coal stockpile or within Myuna's CHP.

Coal from Myuna will continue to be transferred to Eraring Power Station via the existing coal handling plant and overland conveyor system (Figure 2.2).

2.1.3 Proposed truck transport

The proposed transport route (Figure 2.1) consists of:

- the private access road (Wangi Point Road) between Wangi Road and Myuna's pit top;
- public roads (Wangi Road and Wilton Road) between Myuna and Awaba Colliery surface site; and
- the private haul road between Awaba Colliery surface site and CES.

This route has been selected by Centennial Myuna to avoid trucks travelling through residential areas. There are no residences immediately adjacent to, or with driveways on, the parts of Wangi Road and Wilton Road that are part of the transport route. The closest residences to the proposed transport route are residences on Donnelly Road, Arcadia Vale, which are approximately 80 m from Wangi Road at their closest point.

Truck movements between Myuna's pit top and CES will be limited to 7.00 am–6.00 pm Monday to Saturday. There will be a maximum of 10 loaded trucks (20 truck movements) per hour departing from Myuna's pit top. Between 3.00 pm and 4.00 pm Monday to Friday, truck movements will be restricted to 5 loaded trucks (10 truck movements) per hour to minimise impacts during the afternoon peak hour.

Centennial will manage truck numbers along the private haul road network between the Awaba Colliery surface site and CES to ensure they remain within previously assessed and approved limits under SSD-5145 (ie 32 truck movements per hour).

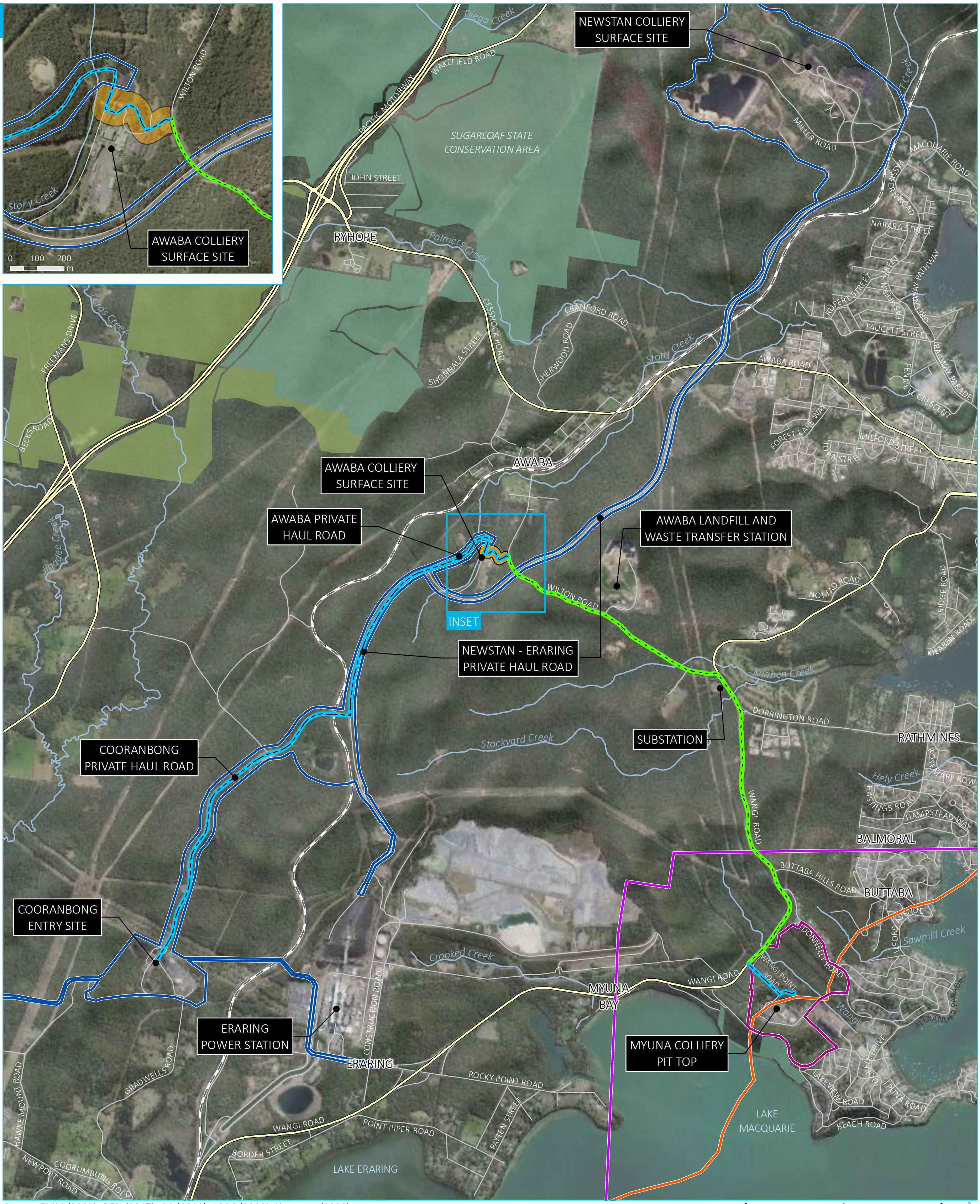
All trucks leaving Myuna will be weighed using the proposed vehicle weighbridge. The truck wheel wash will also be used by all trucks before leaving site (Figure 2.2).

2.2 Assessment locations

The nearest noise and vibration sensitive receptors (herein referred to as assessment locations) are shown in Figure 2.3 and described in Table 2.2. The numbering of these assessment locations is consistent with that utilised in previous noise assessments as well as MP 10_0080.

Table 2.2 Assessment locations

Assessment location	Address	Type
R1	2 Turrama Street, Wangi Wangi	Residence
R2	2 Moani Street, Wangi Wangi	Residence
R3	3 Sunset Close, Wangi Wangi	Residence
R4	119 Donelly Road, Arcadia Vale	Residence
R5	93 Donelly Road, Arcadia Vale	Residence
R6	83 Donelly Road, Arcadia Vale	Residence
R7	63 Donelly Road, Arcadia Vale	Residence
R8	53 Donelly Road, Arcadia Vale	Residence



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Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006); Nearmap (2020)

0 1 2 km
GDA 1994 MGA Zone 56 N

KEY

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

Proposed transport route

- Private road
- Public road

- Myuna Colliery surface facilities area

Development consent boundaries

- Myuna Colliery development consent boundary (SH110_148)
- Myuna Colliery project approval boundary (MP 10_0080)
- Northern Coal Logistics development consent boundary (SSD-5145)
- Proposed amendment to Northern Coal Logistics development consent boundary (SSD-5145)

Proposed transport route between Myuna Colliery and Cooranbong Entry Site

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Noise and vibration impact assessment
Figure 2.1

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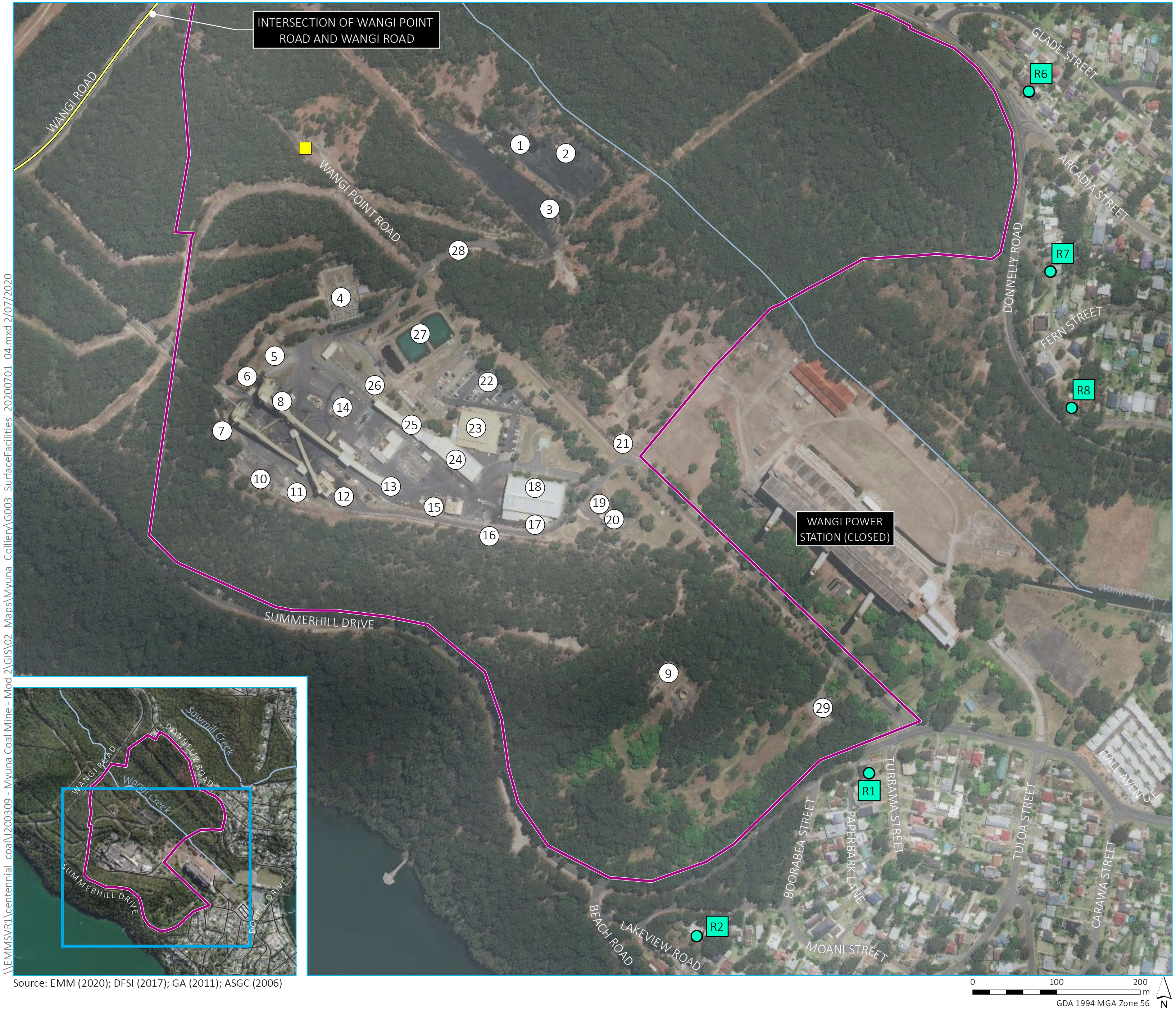

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Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006)

KEY

- Myuna Colliery surface facilities area
- Major road
- Named watercourse
- Assessment location
- Proposed weighbridge

Existing surface features

1. Emergency coal stockpile sediment dam pumphouse
2. Emergency coal stockpile sediment dam
3. Emergency coal stockpile area
4. Power factor correction banks
5. ROM bin
6. Overland conveyor switch room
7. Finished prospect bin
8. Breaker
9. Downcast air shaft
10. Materials reclaim area
11. Drive house
12. Crusher
13. Conveyer drop portal
14. Materials yard
15. Oil storage
16. Washdown bay & oily water separator
17. Hydrocarbon recycling depot
18. Workshop and store
19. Washhouse
20. Upcast shaft
21. Main gate
22. Bathhouse & administration office
23. Service bay
24. Employee & materials portal
25. Ramp
26. Winder
27. Water management infrastructure
28. Haul road
29. Ballast borehole

Myuna Colliery surface facilities area

Myuna Colliery Modification 2
Noise and vibration impact assessment
Figure 2.2

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KEY

- Myuna Colliery surface facilities area
- Noise monitoring location
- Assessment location

Existing environment

- Major road
- Minor road
- Named watercourse

Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)

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Noise monitoring and assessment locations

Myuna Colliery Modification 2
Noise and vibration impact assessment
Figure 2.3

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3 Assessment methodology

3.1 Applying the NPfI to existing sites

The NPfI provides a methodology for the assessment of noise from existing industrial sites. The NPfI acknowledges that some industrial sites were designed for higher allowable noise emissions than those outlined in current NSW noise policy and may have been in existence before neighbouring noise-sensitive developments. The range of mitigation options available for such sites can be limited or costly.

Section 6.1 of the NPfI states that:

> The project noise trigger levels should not be applied as mandatory noise limits. The project noise trigger level is the level used to assess noise impact and drive the process of assessing all feasible and reasonable control measures.

Where noise emissions from the existing site exceed the project noise trigger levels (PNTLs) as defined in the NPfI, the relevant regulatory authorities and proponent will determine achievable noise limits for the site through negotiation and discussion with relevant stakeholders as required.

The process for applying the NPfI to existing sites is outlined in Section 6.1.1 of the NPfI and is summarised as follows as applicable to the amended project:

1. Undertake an initial evaluation, including whether approvals/licences include noise limits and whether they are being met.
2. Establish relevant PNTLs, in accordance with the NPfI, to establish a benchmark level to assess the need to consider noise mitigation.
3. Measure/predict the noise levels produced by the source in question, having regard to meteorological effects such as wind and temperature inversions.
4. Compare the measured/predicted noise level with the PNTLs.
5. Where the PNTLs are exceeded, assess feasible and reasonable noise mitigation strategies.
6. Develop and refine achievable noise limits that will become long-term noise goals for the site. This may involve interaction between the regulator and proponent as well as consultation with the community. Regulators and operators need to consider the technical practicalities and cost of noise reduction measures, and how long it will take to implement these measures, along with the environmental consequences of exceeding the PNTLs.
7. Monitor compliance with the agreed noise limits, and review and amend the noise performance of the site as required.

3.2 Operational noise limits - NPfI

Noise from industrial sites or processes in NSW is regulated by the local council, NSW Department of Planning, Industry and Environment (DPIE) and/or the EPA and usually have a licence and/or development consent conditions stipulating noise limits. These limits are normally derived from operational noise levels applied at assessment locations. They are based on EPA guidelines (ie NPfI) or noise levels that can be achieved at a specific site following the application of all reasonable and feasible noise mitigation measures.

The reaction to noise is highly subjective. Hence, it is not possible to adopt noise levels that will guarantee that no one will experience an impact. Adherence with the PNTLs should not be interpreted to mean that industrial noise will be inaudible, or that all members of the community will find the noise acceptable. The PNTLs for industry provide a benchmark for assessing a proposed or existing industrial development.

Both the increase in noise level above background levels (ie the intrusiveness of a source) as well as the absolute level of noise are important factors in how a community will respond to noise from industrial sources. To ensure both of these factors are considered, the EPA provides two separate noise trigger levels: intrusiveness and amenity. The fundamental difference being intrusiveness noise levels apply over 15 minutes in any period (day, evening or night), whereas the amenity noise levels apply to the entire assessment period (day, evening or night).

3.2.1 Assessing intrusiveness

The intrusive noise trigger levels require that $L_{Aeq,15\ minute}$ noise levels from the site during the relevant operational periods (ie day, evening and night) do not exceed the rating background level (RBL) by more than 5 dB. The NPfI recommends that the intrusive noise trigger level for evening be set at no greater than the intrusive noise level for daytime and that the intrusive noise level for night-time should be no greater than the intrusive noise level for day or evening. Intrusive noise trigger levels are applicable at residential assessment locations only.

A long-term, unattended ambient noise survey was undertaken during March 2020 to establish background noise levels at neighbouring noise sensitive receptors.

3.2.2 Assessing amenity

The amenity assessment is based on noise targets specific to land use and associated activities. The targets relate only to industrial-type noise and do not include road, rail and/or community noise. Where the measured existing industrial noise approaches the recommended amenity noise level, it needs to be demonstrated that noise levels from new industry will not contribute to existing industrial noise such that amenity noise levels are exceeded.

To ensure that total industrial noise levels remain within the recommended amenity noise levels for an area, the project amenity noise level for the subject development is the recommended amenity noise level (outlined in Table 2.2 of the NPfI) minus 5 dB.

Residences have been categorised in the NPfI suburban amenity category as per the definition provided in the NPfI:

> An area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry.

An extract from the NPfI that relates to the amenity noise levels relevant to the proposed modification is given in Table 3.1.

Table 3.1 Amenity noise levels - Recommended L_{Aeq} noise levels from all industrial noise sources

Type of receptor	Noise amenity area	Time of day[1]	Recommended $L_{Aeq(Period)}$ noise level (dB)[2]
Residence	Suburban	Day	55
		Evening	45
		Night	40

[1] Daytime: 7 am to 6 pm; Evening: 6 pm to 10 pm; Night-time: 10 pm to 7 am. On Sundays and Public Holidays, Daytime: 8 am - 6 pm; Evening: 6 pm - 10 pm; Night-time: 10 pm - 8 am.

[2] The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

3.2.3 Project noise trigger levels

PNTLs are the lower of the derived intrusiveness and amenity levels.

It is commonly acknowledged and accepted amongst regulators and industry that average noise levels are typically 3 dB higher over a 15-minute worst case assessment period when compared to an entire day (11 hour), evening (4 hour) and night (8 hour) assessment period. This is outlined in the NPfI and has been used in this assessment to standardise the time periods for the intrusive and amenity noise levels.

3.2.4 Low frequency noise

Fact sheet C of the NPfI (EPA 2017) provides guidelines for applying modifying factor corrections to account for low frequency noise emissions. The NPfI specifies that a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels identifies the potential for an unbalanced spectrum and potential increased annoyance.

Where a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels is identified, the one-third octave noise levels recorded should be compared to the values in Table C2 of the NPfI (EPA 2017), which has been reproduced in Table 3.2 below.

Table 3.2 One-third octave low-frequency noise thresholds ($L_{zeq,15minute}$)

Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB (Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

The following modifying factor correction is to be applied where the site 'C-weighted' and site 'A-weighted' noise emission level is 15 dB or more and:

- where any of the one-third octave noise levels in Table 3.2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period; or

- where any of the one-third octave noise levels in Table 3.2 are exceeded by more than 5 dB and cannot be mitigated, a 5 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period and a 2 dB positive adjustment applies for the day period.

3.2.5 Sleep disturbance

The difficulty in establishing an absolute noise level criterion that would correlate to an acceptable level of sleep disturbance is acknowledged by relevant governing authorities.

The NPfI suggests that a detailed maximum noise level event assessment should be undertaken where night-time noise levels at a residential location exceed:

- $L_{Aeq,15\ minute}$ 40 dB or the prevailing RBL plus 5 dB (whichever is the greater); and/or

- L_{Amax} 52 dB or the prevailing RBL plus 15 dB (whichever is the greater).

The NPfI also references guidance regarding potential for sleep disturbance provided in the RNP. The RNP calls upon a number of studies that have been conducted into the effect of maximum noise levels on sleep. The RNP provides the following conclusions from the research on sleep disturbance:

- maximum internal noise levels (L_{Amax}) below 50–55 dB are unlikely to awaken people from sleep; and
- one or two noise events per night, with maximum internal noise levels (L_{Amax}) of 65–70 dB, are not likely to affect health and wellbeing significantly.

It is commonly accepted by acoustic practitioners and regulatory bodies that a facade including a partially open window will reduce external noise levels by 10 dB. Therefore, external noise levels in the order of 60–65 dB calculated at the facade of a residence is unlikely to awaken people according to the RNP.

If noise levels over the NPfI screening levels are identified, then additional analysis would consider factors such as the maximum noise level, the extent to which the maximum noise level exceeds the RBL, and the number of times this happens during the night-time period.

Other factors that may be important in assessing the extent of impacts on sleep include:

- how often high noise events will occur;
- the distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the subject development;
- whether there are times of day when there is a clear change in the noise environment (such as during early-morning shoulder periods); and
- current scientific literature available at the time of the assessment regarding the impact of maximum noise level events at night.

3.3 Voluntary Land Acquisition and Mitigation Policy

Consent authorities are required to consider the Voluntary Land Acquisition and Mitigation Policy (VLAMP) (DPE 2018) when assessing and determining development applications and modification applications for SSD mining developments. Page 17 of VLAMP states the following with regard to the application of voluntary mitigation and voluntary land acquisition:

> A consent authority can apply voluntary mitigation and voluntary land acquisition rights to reduce:
>
> - operational noise impacts of a development on privately-owned land; and
>
> - rail noise impacts of a development on privately-owned land near a non-network rail line (private rail line), that is on, or exclusively servicing an industrial site (see Appendix 3 of the *Rail Infrastructure Noise Guideline* (RING) (EPA 2013));
>
> But not:
>
> - construction noise impacts, as these impacts are shorter term and can be controlled;
>
> - noise impacts on the public road or rail network; or
>
> - modifications of existing developments with legacy noise issues, where the modification would have beneficial or negligible noise impacts[13].
>
> [13]Noise issues for existing premises may be addressed through site-specific pollution reduction programs under the NSW *Protection of the Environment Operations Act 1997*.

Of most interest is the last point above relating to the relative noise impact of the proposed operation compared to the existing development. This report demonstrates that the noise emissions from the proposed modification are predicted to be the same compared to existing Myuna operational noise emissions at all assessment locations.

The characterisation of the noise impacts (as outlined in the VLAMP) are generally based on human perception to changes in noise levels as explained in the glossary of the acoustic terms in this report. For example, a change in noise level of 1–2 dB is typically indiscernible to the human ear. The characterisation of a residual noise impact of 0–2 dB above the PNTL is therefore considered negligible.

3.4 Construction noise

A new vehicle weighbridge will be constructed at Myuna's pit top. The weighbridge will be constructed on previously disturbed, cleared land adjacent to a privately-owned section of Wangi Point Road (Figure 2.2).

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 days (Table 2.1).

Given the limited extent and duration of the construction activities, construction noise impacts are not expected as a result of the proposed modification and have not been assessed within this report.

3.5 Road traffic noise

To transport coal between Myuna's pit top and CES, trucks will need to access the public road network (including Wangi Road and Wilton Road) between Myuna and the Awaba Colliery surface site. A private haul road connecting the Awaba Colliery surface site to CES will then be used by trucks to transport the coal from Myuna on to CES (and vice versa).

Noise from vehicles on private roads are assessed as part of on-site industrial noise, while that from public roads are assessed using the RNP.

Truck numbers along the private haul road network between the Awaba Colliery surface site and CES will be within previously assessed and approved limits under SSD-5145 (ie 32 truck movements per hour).

As noted in Section 2.1.3, truck movements between Myuna's pit top and CES will be limited to 7.00 am–6.00 pm Monday to Saturday. There will be a maximum of 10 loaded trucks per hour departing from Myuna's pit top. Between 3.00 pm and 4.00 pm Monday to Friday, truck movements will be restricted to five loaded trucks per hour to further avoid potential impacts on the local road network's existing peak hour period.

The proposed transport route has been selected by Centennial Myuna to avoid trucks travelling through residential areas. There are no residences immediately adjacent to, or with driveways on, the parts of Wangi Road and Wilton Road that are part of the transport route. The closest residences to the proposed transport route are residences on Donnelly Road, Arcadia Vale, which are approximately 80 m from Wangi Road at their closest point.

Results of traffic tube counts conducted in November 2019 indicate annual average daily traffic on this section of road is 6,979. Traffic generated by the proposed modification (ie 20 truck movements per hour) represents a negligible increase (less than 7%) in total traffic on Wangi Road.

Therefore, road traffic noise impacts are not expected as a result of the proposed modification and a detailed assessment of road traffic noise has not been prepared.

3.6 Operational and construction vibration

Vibration from operational activity is not expected to change as a result of the proposed modification compared to that currently approved.

Given the limited amount of construction activity proposed and the separation distance between the proposed location for the vehicle weighbridge and the nearest residences (ie >500 m), vibration impacts from construction activities are not expected. Thus, a detailed assessment of vibration impacts has not been included in this report.

4 Existing mine noise

4.1 Existing noise criteria

Myuna was granted development consent MP 10_0080 by the Minister of Planning and Infrastructure on 18 January 2012 under Part 3A of EP&A Act. MP 10_0080 was modified pursuant to Section 75W of Part 3A of the EP&A Act on 27 February 2015 to allow for an increase in ROM coal extraction (from 2 Mtpa to 3 Mtpa) and an increase in employment (from 210 to 310 personnel). Myuna is also licensed under the POEO Act through Environment Protection Licence (EPL) 366.

Noise criteria for Myuna are provided in Schedule 3 Condition 11 of MP 10_0080 and Condition L5 of EPL 366. Noise limits are consistent between these two documents and are summarised in Table 4.1.

Table 4.1 Myuna Colliery noise criteria

Location	Day	Emergency day[1]	Evening	Night	
	$L_{Aeq,15min}$ (dB)	$L_{Aeq,15min}$ (dB)	$L_{Aeq,15min}$ (dB)	$L_{Aeq,15min}$ (dB)	$L_{A1,1min}$ (dB)
R1, R2, R3	35	40	35	35	45
R4	35	44	40	38	49
R5, R6, R7, R8	37	44	42	39	49
All other privately-owned land	35	40	35	35	45

1. Emergency day noise limits only apply during the day period when the Eraring Power Station overland conveyor is not in operation and Myuna's emergency coal stockpile must be used.

As part of the proposed modification, Centennial Myuna request the removal of the 'emergency day' criteria from Table 3 of MP 10_0080, which apply during the day period when the Eraring Power Station overland conveyor is not in operation and Myuna's emergency coal stockpile must be used. The proposed modification includes the ongoing operation of the emergency coal stockpile 24 hours a day, 7 days a week. This activity can be undertaken within the existing daytime noise criteria at all assessment locations.

4.2 Existing noise emissions

A summary of the quarterly noise monitoring results, as provided in the quarterly noise compliance reports, for the period between Q2 2017 and Q1 2020 (ie twelve rounds of monitoring) is shown in Table 4.2 and Table 4.3 together with the existing criteria applicable at each location.

Table 4.2 Summary of quarterly noise compliance monitoring results – $L_{Aeq,15min}$

Location	Estimated night-time Myuna $L_{Aeq,15min}$ (dB)														
	2017			2018				2019				2020	Highest	Log average	Existing criteria
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1			
R1	33	35	25	30	34	38	35	IA	30	30	IA	32	38	33	35
R2	28	28	23	<30	32	31	30	IA	33	33	30	<30	33	31	35
R3	IA	IA	24	IA	NM	IA	IA	NM	30	30	NM	IA	30	29	35
R4	32	IA	24	<30	IA	IA	35	33	32	32	<30	34	35	33	38
R5	36	25	<21	<30	NM	25	35	33	29	<30	30	34	36	32	39
R6	37	35	26	38	IA	27	36	32	31	31	30	36	38	34	39
R7	36	35	27	38	31	NM	37	31	34	34	36	35	38	35	39
R8	27	34	22	<30	IA	37	31	25	32	32	33	<30	37	32	39

IA: inaudible, NM: not measurable.

Table 4.3 Summary of quarterly noise compliance monitoring results – $L_{A1,1min}$

Location	Estimated night-time Myuna $L_{A1,1min}$ (dB)													Existing criteria
	2017			2018				2019				2020	Highest	
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1		
R1	35	36	26	32	36	40	37	IA	32	32	IA	33	40	45
R2	29	29	25	<30	39	33	32	IA	40	40	33	31	40	45
R3	IA	IA	25	IA	NM	IA	IA	NM	32	32	NM	IA	32	45
R4	34	IA	26	<30	IA	IA	37	34	33	33	30	37	37	49
R5	38	26	<23	<30	NM	27	37	34	30	30	31	35	38	49
R6	39	41	40	39	IA	29	38	34	33	33	32	37	41	49
R7	39	36	28	40	33	NM	39	33	38	38	38	39	40	49
R8	29	35	23	<30	IA	39	33	26	34	34	34	30	39	49

IA: inaudible, NM: not measurable.

Results of quarterly noise monitoring surveys indicate that Myuna has been predominantly compliant with existing noise limits. One exceedance of the relevant $L_{Aeq,15min}$ noise limit occurred during Q3 2018. An investigation into this event determined the likely cause of the elevated noise level was non-prevailing noise-enhancing weather conditions at that time.

As per the results presented in the quarterly compliance monitoring report for Q2 2019, it was identified that the difference between L_{Ceq} and L_{Aeq} noise levels from Myuna was greater than 15 dB which triggered the need for a more detailed assessment of low frequency noise. The detailed assessment identified that Myuna's noise emissions did not exceed the NPfI low frequency noise thresholds and, as such, modifying factors were not applicable. It is noted that low frequency noise or tonality has not been reported to be associated with Myuna's noise emissions at any other location during the period considered (ie the last three years).

4.3 Noise and vibration complaints history

Centennial Myuna confirmed that no complaints have been received in relation to noise or vibration emissions from Myuna.

5 Existing acoustic environment

To establish ambient and background noise levels unattended noise monitoring was completed by EMM at three locations surrounding Myuna's surface facilities area in March 2020 in accordance with the NPfI (Figure 2.3).

The noise loggers were in place from 6 to 17 March 2020 and were programmed to record statistical noise level indices continuously in 15-minute intervals. Calibration of each noise logger was checked prior to and following unattended noise monitoring. Drift in calibration did not exceed ±0.5 dB. The equipment carried appropriate and current NATA calibration certificates. Weather data for the unattended noise monitoring period was obtained from the on-site automatic weather station. Wind speed and rainfall data were used to exclude noise data during periods of any rainfall and/or wind speeds in excess of 5 m/s (approximately 9 knots) in accordance with the methodology provided in the NPfI.

The locations of relevant long-term noise loggers and short-term operator-attended noise monitoring are shown on Figure 2.3.

A summary of the background and ambient noise monitoring results is provided in Table 5.1. Detailed graphs of the data obtained by EMM are provided in Appendix A.

Table 5.1 Summary of existing measured background and ambient noise levels (March 2020)

Monitoring location	Period[1]	RBL[2] (dB)	$L_{Aeq, period}$ noise level[3] (dB)
NM1 – 25 Summerhill Drive, Wangi Wangi	Day	38	61
	Evening	35	57
	Night	33	52
NM2 – 107 Donnelly Road, Arcadia Vale	Day	39	59
	Evening	34	60
	Night	32	52
NM3 – 8 Eucalypt Close, Wangi Wangi	Day	40	55
	Evening	40	50
	Night	44	51

Notes: 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: 10 pm to 7 am.
2. The RBL is an NPfI term and is used to represent the background noise level.
3. The energy averaged noise level over the measurement period and representative of general ambient noise.

Based on observations whilst on-site, the main contributors to overall ambient noise levels are as follows:

- NM1 – distant traffic, insects and local residential activity with Myuna's operations just audible during traffic lulls;
- NM2 – insects and traffic on Donnelly Road (mine operations inaudible); and
- NM3 – insects and traffic on Wangi Road (mine operations inaudible).

Based on our experience in the area, Eraring Power Station is also a contributor to night-time ambient noise levels.

6 Operational noise targets

6.1 Project noise trigger levels

6.1.1 Intrusiveness

The intrusiveness targets require that $L_{Aeq,15min}$ noise levels from site during the relevant operational periods (ie day, evening and night) do not exceed the relevant RBL by more than 5 dB. It is noted that where the RBL for the evening or night period is higher than the day period RBL, the lower RBL for the day period has been adopted as the evening and night period RBLs in accordance with the NPfI.

The RBLs utilised for determination of the intrusiveness target are based on the background noise monitoring results presented in Chapter 5. It is noted that Myuna was identified as a contributor to the ambient noise environment at NM1. Since Myuna has been operating in compliance with relevant noise limits for a significant period of time it is considered to be a normal part of the acoustic environment. Hence, ambient noise levels inclusive of Myuna have been utilised for the purpose of this assessment as per the methodology described in the NPfI.

The project intrusive noise levels are presented in Table 6.1.

Table 6.1 Intrusive noise levels

Assessment and representative noise monitoring locations	Adopted RBL (dB)[2]			Project intrusive noise level, $L_{Aeq,15min}$ (dB)		
	Day[1]	Evening[1]	Night[1]	Day	Evening	Night
R1 / NM1	38	35	33	43	40	38
R2 / NM1	38	35	33	43	40	38
R3 / NM3	40	40	40[2]	45	45	45
R4 / NM2	39	34	32	44	39	37
R5 / NM2	39	34	32	44	39	37
R6 / NM2	39	34	32	44	39	37
R7 / NM2	39	34	32	44	39	37
R8 / NM2	39	34	32	44	39	37

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. Where the RBL for the night period is higher than the day or evening period RBL, the lower RBL has been adopted as the night period RBL in accordance with the NPfI methodology.

6.1.2 Amenity

The assessment of amenity is based on noise targets specific to the land use. Assessment locations have been categorised in the NPfI (EPA 2017) suburban amenity category in accordance with the NPfI definition of a suburban receiver type (ie an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry).

To ensure that total industrial noise levels remain within the recommended amenity noise levels for an area, the project amenity noise levels for Myuna are the recommended amenity noise level (outlined in Table 2.2 of the NPfI) minus 5 dB. This accounts for the potential cumulative industrial noise levels in the area.

As described earlier, a 3 dB adjustment is adopted for 15-minute worst case period noise levels from Myuna for the entire day (11 hour), evening (4 hour) and night (8 hour) assessment periods. This assumption is outlined in the NPfI and has been used in this assessment to standardise the time periods for the intrusive and amenity noise levels.

The corresponding recommended amenity noise levels for all assessment locations are given in Table 6.2.

Table 6.2 Project amenity noise levels

Assessment location	Indicative area	Project amenity noise level ($L_{Aeq,15min}$) (dB)		
		Day	Evening	Night
R1	Suburban	53	43	38
R2	Suburban	53	43	38
R3	Suburban	53	43	38
R4	Suburban	53	43	38
R5	Suburban	53	43	38
R6	Suburban	53	43	38
R7	Suburban	53	43	38
R8	Suburban	53	43	38

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.

6.1.3 Project noise trigger levels

The PNTLs are the more stringent of either the project intrusive or amenity noise levels and are shown in Table 6.3.

Table 6.3 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	43	40	38	53	43	38	43	40	38
R2	43	40	38	53	43	38	43	40	38
R3	45	45	45	53	43	38	45	43	38
R4	44	39	37	53	43	38	44	39	37
R5	44	39	37	53	43	38	44	39	37
R6	44	39	37	53	43	38	44	39	37
R7	44	39	37	53	43	38	44	39	37
R8	44	39	37	53	43	38	44	39	37

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.

6.2 Sleep disturbance

Based on the guidance provided in the NPfI, Table 6.4 provides the sleep disturbance screening levels for the residential assessment locations.

Table 6.4 Sleep disturbance screening levels for residential assessment locations

Assessment location	Adopted RBL (dB)	Sleep disturbance screening levels (dB)	
		$L_{Aeq,15min}$	L_{Amax}
R1	33	40	52
R2	33	40	52
R3	40	45	55
R4	32	40	52
R5	32	40	52
R6	32	40	52
R7	32	40	52
R8	32	40	52

Reference has also been made to the conclusions presented in the RNP regarding assessment of the potential for sleep disturbance.

7 Operational noise assessment

7.1 Overview

This section presents the methods and base parameters used to model noise emissions from Myuna's existing operations and the proposed modification, including the effects of noise-enhancing meteorological conditions.

Noise modelling was based on three-dimensional digitised ground contours of the surrounding land and surface infrastructure. The operational noise model represents a snapshot of typical operations, with equipment placed at various locations and heights, representing realistic scenarios.

Noise predictions were carried out using the iNoise software, created by the same developers responsible for B&K's Predictor software. iNoise calculates total noise levels at assessment locations from concurrent operation of multiple noise sources. The model considers factors such as the lateral and vertical location of plant, source-to-receptor distances, ground effects, atmospheric absorption, topography of the surface facilities area and surrounds and applicable meteorological conditions.

7.2 Meteorology

During certain weather conditions, mine noise emissions at the assessment locations may increase or decrease compared with noise during calm conditions. This is due to refraction caused by the varying speed of sound with increasing height above the ground that occurs during winds or where air temperature changes with height.

A simple yet conservative approach has been selected for the consideration of potentially noise-enhancing weather conditions with reference to Fact Sheet D of the NPfI. Noise emissions from Myuna have been predicted for noise-enhancing conditions. This provides a conservative approach since the noise emissions predicted under noise-enhancing conditions are expected to represent the upper range of noise emissions from Myuna.

7.3 Plant and equipment

The operational noise model considered a representative snapshot of surface operations with equipment placed at locations representing a realistic operational scenario. Adopted locations of plant and equipment are shown in Appendix B.

Acoustically significant fixed and mobile equipment items considered in the noise model are provided for expected day, evening and night operations in Table 7.1. Most of the sound power data were obtained from noise measurements of existing activities at Myuna. Where this was not possible, sound power data has been obtained from previous noise studies undertaken at Myuna or an EMM database of similar plant and equipment.

Table 7.1 Acoustically significant plant and equipment for noise modelling

Item (location)	Sound power level per item (dBA)	Operating during this period		
		Day	Evening	Night
Existing mine operations				
Vent fan – upcast[1]	95	✓	✓	✓
ROM bin	98	✓	✓	✓
Front end loader	105	✓	✓	✓

Table 7.1 Acoustically significant plant and equipment for noise modelling

Item (location)	Sound power level per item (dBA)	Operating during this period		
		Day	Evening	Night
Forklift[1]	100	✓	✓	✓
Drift drive[1]	103	✓	✓	✓
Compressors[1]	104	✓	✓	✓
Breaker[1]	112	✓	✓	✓
CHPP[1]	110	✓	✓	✓
Final product drive[1]	100	✓	✓	✓
Road truck[3]	105	✓	✓	✓
Water truck[3]	105	✓	✓	✓
Sweeper[3]	105	✓	✓	✓
Underground transport	97	✓	✓	✓
Workshop	104	✓	✓	✓
Product bin	98	✓	✓	✓
Proposed modification				
Road truck	105	✓	✓	✓

1. Measured by EMM, March 2020.
2. Sourced from previous study.
3. Sourced from EMM database.

It is noted that a coal tram occasionally operates at the ballast borehole site (Figure 2.2). Operations of the coal tram are infrequent and of short duration during daytime hours only and as such have not been included in the noise model.

7.4 Noise model validation

Noise from existing operations was modelled and compared to the results of historical operator-attended noise surveys as reported in the quarterly noise monitoring reports. This comparison is summarised in Table 7.2.

Table 7.2 Predicted $L_{Aeq,15min}$ noise levels compared to results of historic noise compliance monitoring

Location	Measured range of noise emissions (dB)	Log average of measured noise emissions (dB)	Predicted (including noise enhancing weather conditions) (dB)
R1	IA to 38	33	34
R2	IA to 33	31	35
R3	IA to 30	29	32
R4	IA to 35	33	33
R5	<21 to 36	32	35
R6	IA to 38	34	37
R7	27 to 38	35	37
R8	IA to 37	32	37

IA: inaudible.

The predicted noise levels, with the adoption of noise-enhancing weather conditions, are approximately at the top end of the measured range and typically within ±2 dB of the highest measured level at each location. The exception to this is at R1 where the highest measured level is 4 dB higher than the predicted level. It is also noted that this monitoring event determined a contribution 3 dB higher than any other monitoring event in the last three years. This monitoring event was the subject of a detailed investigation and believed to be the result of non-prevailing noise-enhancing weather conditions at that time. The predicted noise level at this location is consistent with the average measured noise level and within 1 dB of the next highest measured mine contribution at this location (as summarised in Table 4.2). The operational noise model is therefore considered appropriate for the purpose of determining noise impacts from Myuna.

The results of historical operator-attended noise compliance surveys have identified that modifying factors are not applicable to noise emissions from Myuna in relation to low frequency noise or tonality. Hence, modifying factors have not been applied here to noise predictions.

7.5 Operational noise assessment

Predicted noise levels for operation of Myuna and for operations including the proposed modification are presented in Table 7.3. Noise-enhancing weather conditions have been considered and the highest predicted noise level is presented for each period.

Indicative night-time noise contours for the proposed modification under noise-enhancing weather conditions are provided in Appendix C.

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

Assessment location	Period[1]	Predicted existing noise level (dB)	Predicted noise level (proposed modification) (dB)	PNTL $L_{Aeq,15min}$ (dB)
		Noise-enhancing	Noise-enhancing	
R1	Day	34	34	43
	Evening	34	34	40
	Night	34	34	38
R2	Day	35	35	43
	Evening	35	35	40
	Night	35	35	38
R3	Day	32	32	45
	Evening	32	32	43
	Night	32	32	38
R4	Day	32	32	44
	Evening	33	33	39
	Night	33	33	37
R5	Day	35	35	44
	Evening	35	35	39
	Night	35	35	37
R6	Day	37	37	44
	Evening	37	37	39
	Night	37	37	37
R7	Day	37	37	44
	Evening	37	37	39
	Night	37	37	37
R8	Day	37	37	44
	Evening	37	37	39
	Night	37	37	37

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.

Operational noise emissions are predicted to satisfy the PNTLs and the existing development consent noise criteria at all assessment locations for both existing operations and the operations associated with the proposed modification. The results show no changes in noise emissions between existing and proposed operations.

It is acknowledged that the predicted levels during the night at assessment locations R6 and R7 are 1 dB lower than the highest measured levels at each of these locations. This implies the potential for a negligible (+1 dB) exceedance of the PNTL during the night-time period.

Centennial Myuna will continue to implement the existing noise mitigation and management measures as provided in the *Northern Region Noise Management Plan* (NMP) (Centennial 2019) (Section 7.7).

7.6 Sleep disturbance

Consideration has been given to likely maximum noise level events at the nearest residential assessment locations. It is noted that Myuna's operations will not significantly change as a result of the proposed modification when compared to currently approved operations. Myuna is approved to operate 24 hours per day, 7 days a week. Hence, maximum noise levels are expected to remain the same as those currently experienced. As summarised in Table 4.3, L_{Amax} noise levels up to 41 dB have been measured at assessment location R6 and up to 40 dB at R1, R2 and R7.

Typical maximum noise level events at Myuna include trucks being loaded, dozer operations or bangs from the CHPP. A typical maximum sound power level of L_{Amax} 126 dB has been adopted for all such events and is based on EMM's measurements of similar activities. These events represent the likely highest maximum noise level events from Myuna.

Predicted maximum noise levels for operation of Myuna are presented in Table 7.4 for all assessment locations.

Table 7.4 Predicted L_{Amax} noise levels and sleep disturbance assessment

Assessment location	Night predicted mine noise level (noise enhancing)		Sleep disturbance screening levels	
	$L_{Aeq,15min}$	L_{Amax}	$L_{Aeq,15min}$	L_{Amax}
R1	34	44	40	52
R2	35	39	40	52
R3	32	35	45	55
R4	33	42	40	52
R5	35	43	40	52
R6	37	47	40	52
R7	37	46	40	52
R8	37	44	40	52

Predicted maximum noise levels from Myuna are generally conservative (higher) compared to those measured during historical noise compliance surveys. Measured and predicted maximum noise levels at the assessment locations (Table 7.4) are below the relevant sleep disturbance screening levels. Hence, as per the NPfI requirements, a detailed maximum noise level event assessment is not required as sleep disturbance at nearby residences is unlikely to occur.

7.7 Noise mitigation, management and monitoring

Noise emissions from Myuna will continue to be managed in accordance with the existing NMP (Centennial 2019).

The NMP outlines the noise mitigation and management measures common to all of Centennial's operations within the northern region, where applicable, as well as those specific to Myuna. Relevant measures include:

- Northern Region:
  - a region-wide monitoring rationalisation to make better use of real-time noise monitoring data to provide more informative data and enable more timely response to elevated noise levels from mining operations;
  - procurement of quieter equipment whenever new items or maintenance work is required;

- regular (annual) reviews of monitoring and management measures; and
- impact assessments undertaken of future changes/expansions to operations.

- Myuna:
  - all doors on the enclosures for the rotary breaker, crusher and crusher conveyor drive house remain closed during the night-time period, specifically roller shutter doors on the north-east and south-west facades of the crusher enclosure and doors on the north-east facade and northern corner of the rotary breaker;
  - the forklift does not conduct activities such as moving metal objects around the materials yard during the night-time period; and
  - a real-time noise monitor is used with the capability of sending an alert to relevant personnel in the event that a pre-set noise level (representative of a potential exceedance at a noise sensitive receiver) is exceeded.

The NMP also describes the short-term and long-term monitoring program for Myuna including both attended and real-time, unattended noise monitoring. Where required, the NMP will be updated following determination of the proposed modification.

Implementation of additional mitigation measures is triggered by a range of methods including, but not limited to, the following:

- results of operator-attended noise compliance surveys indicating an exceedance of noise criteria;
- on-site noise levels continuously monitored by a real-time noise monitor indicating the potential for an exceedance of noise criteria;
- site inspections and/or observation of unusually noisy equipment; or
- a complaint relating to noise from mining operations.

Myuna operates in accordance with the trigger action response plan (TARP) provided in Section 5.2 of the NMP.

8 Conclusion

EMM has prepared this NVIA to accompany a modification report for a proposed modification to MP 10_0080. A quantitative assessment of noise emissions associated with mine operations has been undertaken. The assessment included ambient noise monitoring, establishment of PNTLs and computer noise modelling which has shown that Myuna's proposed operations are predicted to result in no change to existing operational noise emissions.

Operational noise emissions from Myuna are predicted to satisfy the PNTLs and the existing development consent noise criteria at all assessment locations. Predicted maximum noise levels are below the maximum screening criteria and generally consistent with or higher than the results of previous noise compliance monitoring. Hence, as per the NPfI requirements, a detailed maximum noise level event assessment is not required and the likelihood of sleep disturbance is predicted to be unlikely.

Noise emissions from Myuna will continue to be managed in accordance with the existing NMP, which describes the monitoring program for Myuna including both attended and real-time, unattended noise monitoring. The NMP will be updated following determination of the proposed modification (as required).

Glossary

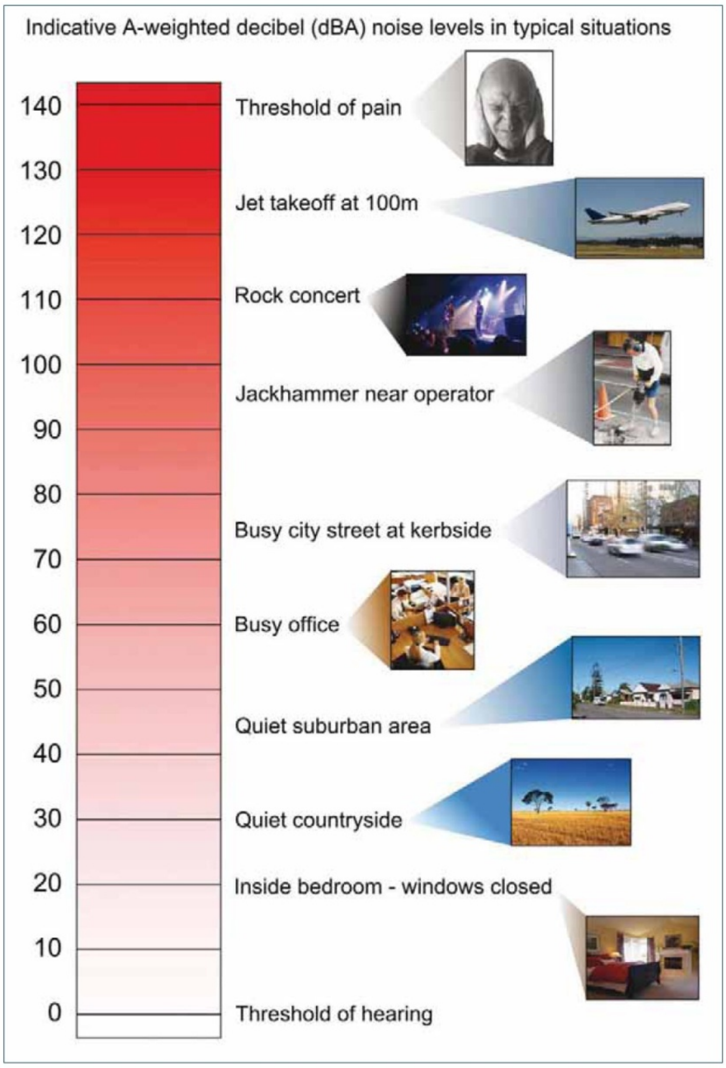
Table G.8.1 Glossary of acoustic terms and abbreviations

Abbreviation or term	Definition
ABL	The assessment background level (ABL) is defined in the INP as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L_{A90} statistical noise levels.
Amenity noise level	The amenity noise levels relate to the overall level of industrial noise subject to land zoning or use
A-weighting	There are several different weightings utilised for describing noise, the most common being the 'A-weighting'. This attempts to closely approximate the frequency response of the human ear.
Day period	Monday–Saturday: 7.00 am to 6.00 pm, on Sundays and public holidays: 8.00 am to 6.00 pm.
dB	Noise is measured in units called decibels (dB).
DPIE	NSW Department of Planning, Industry and Environment
EMM	EMM Consulting Pty Limited
EP&A Act	NSW *Environmental and Planning Assessment Act 1979* (NSW)
EPA	NSW Environment Protection Authority (formerly the Department of Environment, Climate Change and Water).
Evening period	Monday–Saturday: 6.00 pm to 10.00 pm, on Sundays and public holidays
ICNG	Interim Construction Noise Guideline
Intrusive noise level	The intrusive noise level refers to noise that intrudes above the background level by more than 5 dB.
L_{A1}	The A-weighted noise level exceeded for 1% of the time.
L_{A10}	The A-weighted noise level which is exceeded 10% of the time. It is roughly equivalent to the average of maximum noise level.
L_{A90}	The A-weighted noise level that is exceeded 90% of the time. Commonly referred to as the background noise level.
L_{Aeq}	The A-weighted energy average noise level. This is the equivalent continuous sound pressure level over a given period. The $L_{Aeq(15\text{-minute})}$ descriptor refers to an L_{Aeq} noise level measured over a 15 minute period.
L_{Zeq}	The unweighted energy average noise level. This is the equivalent continuous sound pressure level over a given period without any frequency weighting applied.
L_{Amax}	The maximum A-weighted sound pressure level received during a measurement interval.
Night period	Monday–Saturday: 10.00 pm to 7.00 am, on Sundays and public holidays: 10.00 pm to 8.00 am.
NMP	Noise management plan
PNTL	The project noise trigger levels are targets for a particular industrial noise source or industry. The PNTLs are the lower of either the project intrusive noise level or project amenity noise level.
POEO Act	NSW *Protection of the Environment Operations Act 1997* (NSW)
RBL	The rating background level (RBL) is an overall single value background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the average background levels.
RNP	Road Noise Policy
Sound power level (L_w)	A measure of the total power radiated by a source. The sound power of a source is a fundamental property of the source and is independent of the surrounding environment.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.

It is useful to have an appreciation of decibels (dB), the unit of noise measurement. Table G.8.2 gives an indication as to what an average person perceives about changes in noise levels. Examples of common noise levels are provided in Figure G.8.1.

Table G.8.2 Perceived change in noise

Change in sound level (dB)	Perceived change in noise
3	just perceptible
5	noticeable difference
10	twice (or half) as loud
15	large change
20	four times (or quarter) as loud



Source: Road Noise Policy (Department of Environment, Climate Change and Water 2011)

Figure G.8.1 Common noise levels

References

NSW Department of Environment and Conservation 2006, *Assessing Vibration: A Technical Guideline.*

NSW Department of Environment, Climate Change and Water (DECCW) 2011, *Road Noise Policy* (RNP).

NSW Environment Protection Authority (EPA) 2017, *Noise Policy for Industry*.

- 2009, *Interim Construction Noise Guideline* (ICNG).

NSW Government 2018, *Voluntary Land Acquisition and Mitigation Policy For State Significant Mining, Petroleum and Extractive Industry Developments*.

Appendix A

Measured existing ambient noise levels

Date	ABL Day	ABL Evening	ABL Night	$L_{Aeq,11\ hour}$ Day	$L_{Aeq,4\ hour}$ Evening	$L_{Aeq,9\ hour}$ Night	$L_{Aeq,15\ hour}$ Day	$L_{Aeq,24\ hour}$ Day	$L_{Aeq,8\ hour}$ Night
Friday, 06-03-20	0	38	36	0	57	51	0	0	50
Saturday, 07-03-20	0	33	33	0	56	54	0	57	54
Sunday, 08-03-20	36	32	32	58	55	52	57	56	50
Monday, 09-03-20	38	34	31	60	56	53	59	57	51
Tuesday, 10-03-20	38	35	33	60	57	52	59	58	50
Wednesday, 11-03-20	38	37	33	61	56	52	60	59	49
Thursday, 12-03-20	38	36	34	65	57	53	64	62	52
Friday, 13-03-20	38	36	34	60	56	51	59	57	50
Saturday, 14-03-20	0	0	34	0	0	51	0	0	51
Sunday, 15-03-20	39	34	32	58	55	53	58	56	51
Monday, 16-03-20	39	35	0	60	58	0	59	58	0
Tuesday, 17-03-20	38	37	36	59	61	53	60	58	51
Wednesday, 18-03-20	0	0	0	0	0	0	0	0	0
Summary Values	38	35	33	61	57	52	60	58	51

Notes:

0 indicates periods with too few valid samples due to weather or logger operation

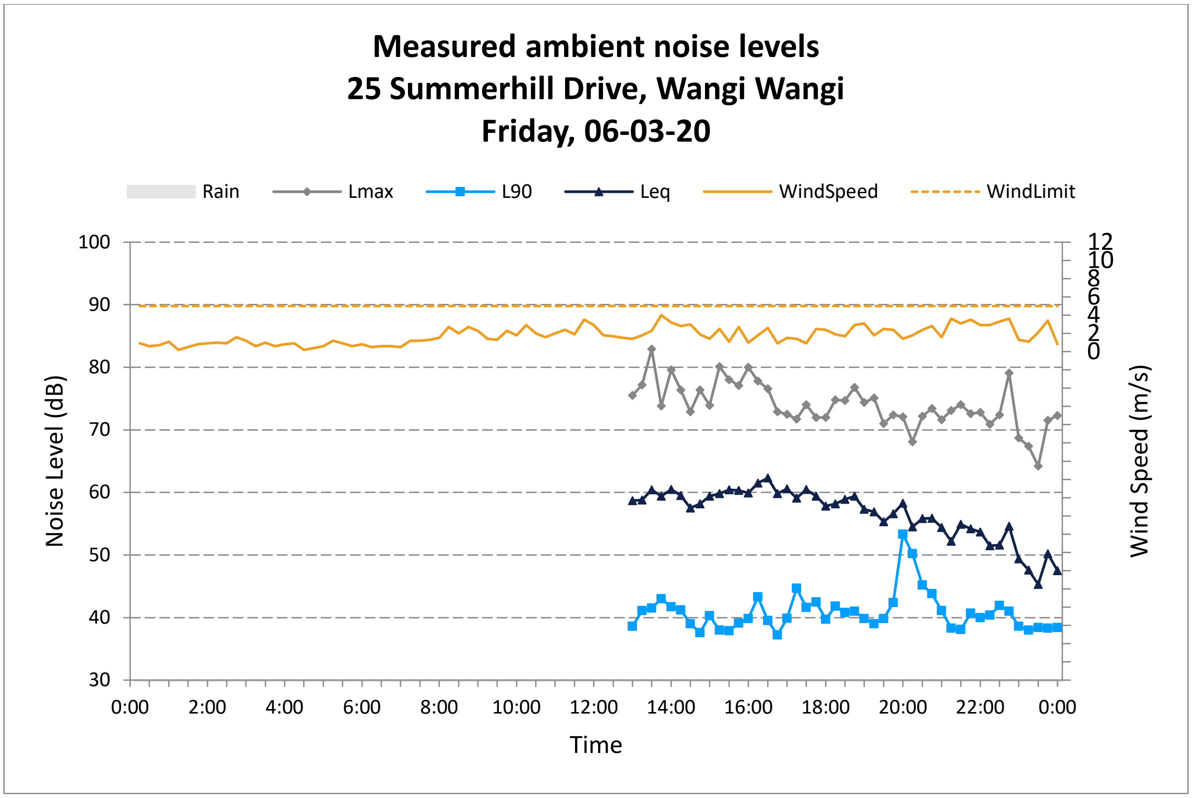
Leq24hr encompasses the period 7am to 7am

Date	ABL Day	ABL Evening	ABL Night	$L_{Aeq,11\ hour}$ Day	$L_{Aeq,4\ hour}$ Evening	$L_{Aeq,9\ hour}$ Night	$L_{Aeq,15\ hour}$ Day	$L_{Aeq,24\ hour}$ Day	$L_{Aeq,8\ hour}$ Night
Friday, 06-03-20	0	38	36	0	57	51	0	0	50
Saturday, 07-03-20	0	33	33	0	56	54	0	57	54
Sunday, 08-03-20	36	32	32	58	55	52	57	56	50
Monday, 09-03-20	38	34	31	60	56	53	59	57	51
Tuesday, 10-03-20	38	35	33	60	57	52	59	58	50
Wednesday, 11-03-20	38	37	33	61	56	52	60	59	49
Thursday, 12-03-20	38	36	34	65	57	53	64	62	52
Friday, 13-03-20	38	36	34	60	56	51	59	57	50
Saturday, 14-03-20	0	0	34	0	0	51	0	0	51
Sunday, 15-03-20	39	34	32	58	55	53	58	56	51
Monday, 16-03-20	39	35	0	60	58	0	59	58	0
Tuesday, 17-03-20	38	37	36	59	61	53	60	58	51
Wednesday, 18-03-20	0	0	0	0	0	0	0	0	0
Summary Values	38	35	33	61	57	52	60	58	51

Notes:

0 indicates periods with too few valid samples due to weather or logger operation

Leq24hr encompasses the period 7am to 7am


Measured ambient noise levels
25 Summerhill Drive, Wangi Wangi
Friday, 06-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
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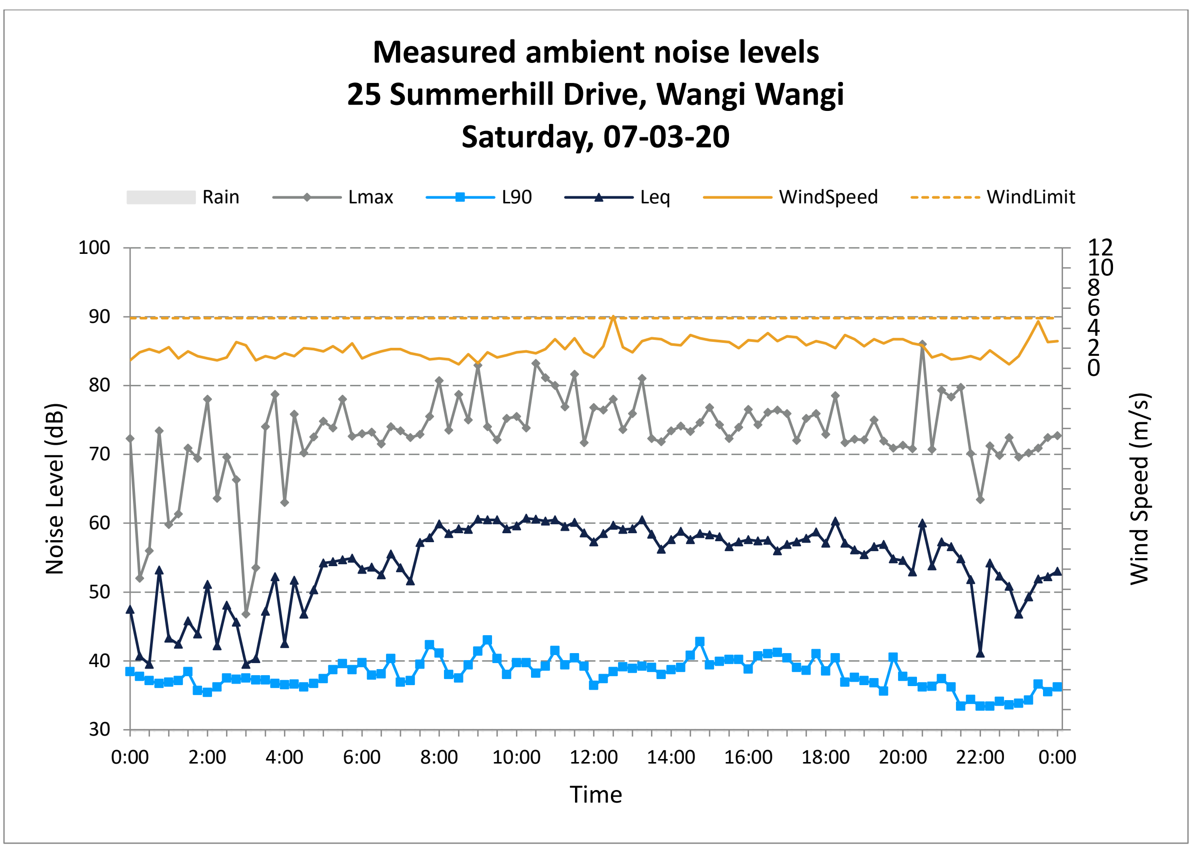
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Measured ambient noise levels
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Saturday, 07-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
0:00
2:00
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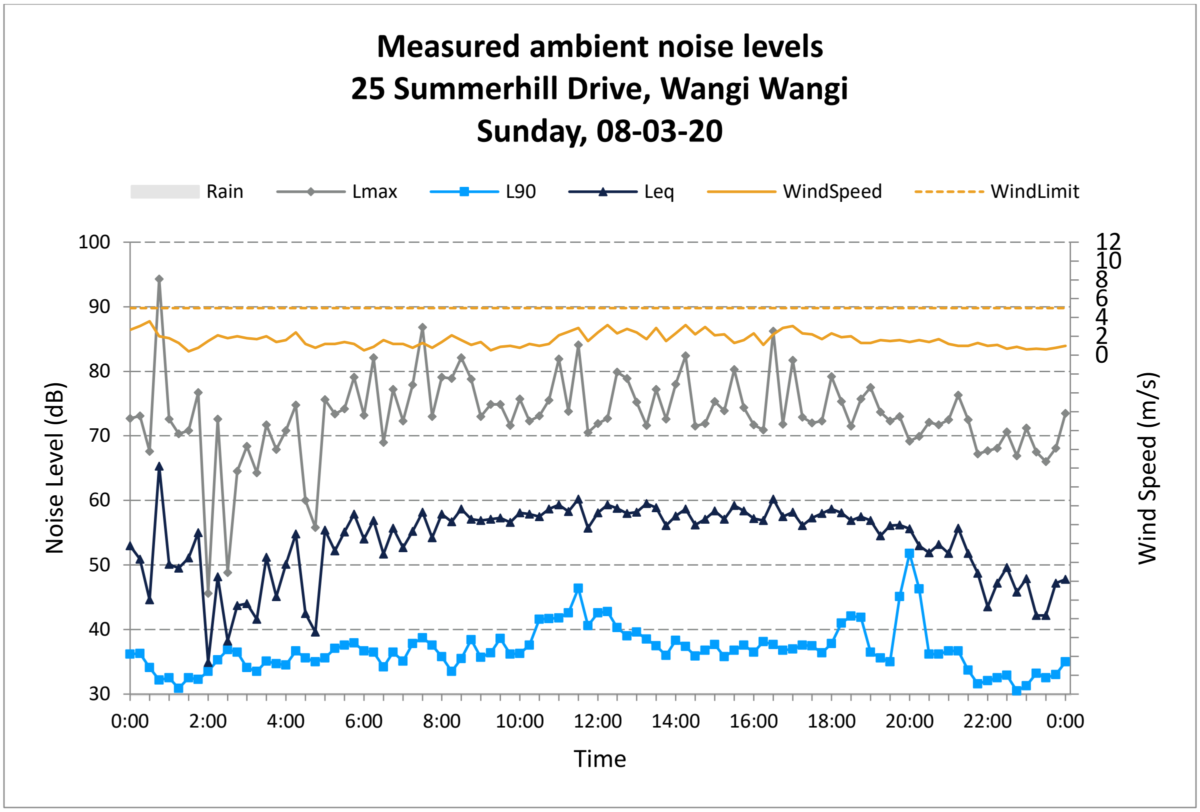

Measured ambient noise levels
25 Summerhill Drive, Wangi Wangi
Sunday, 08-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
0:00
2:00
4:00
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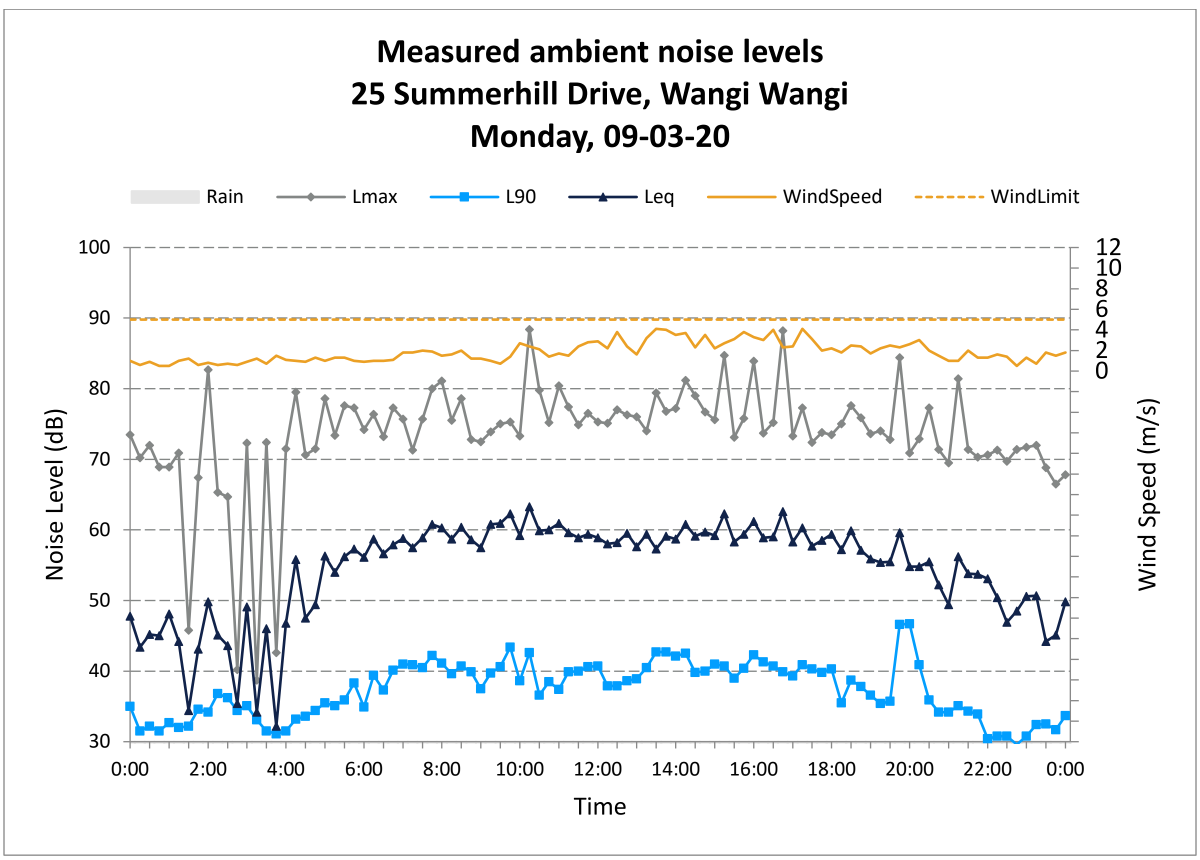

Measured ambient noise levels
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Monday, 09-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
0:00
2:00
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14:00
16:00
18:00
20:00
22:00
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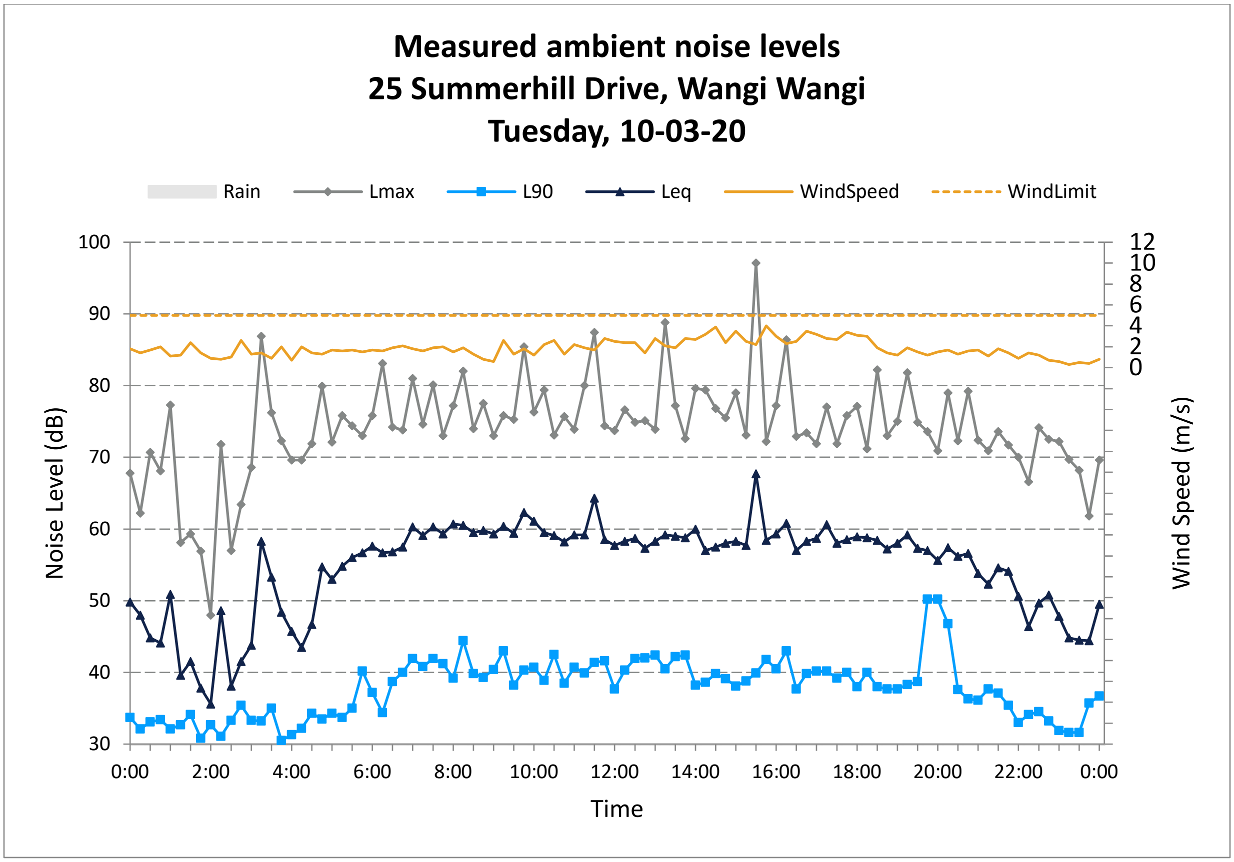
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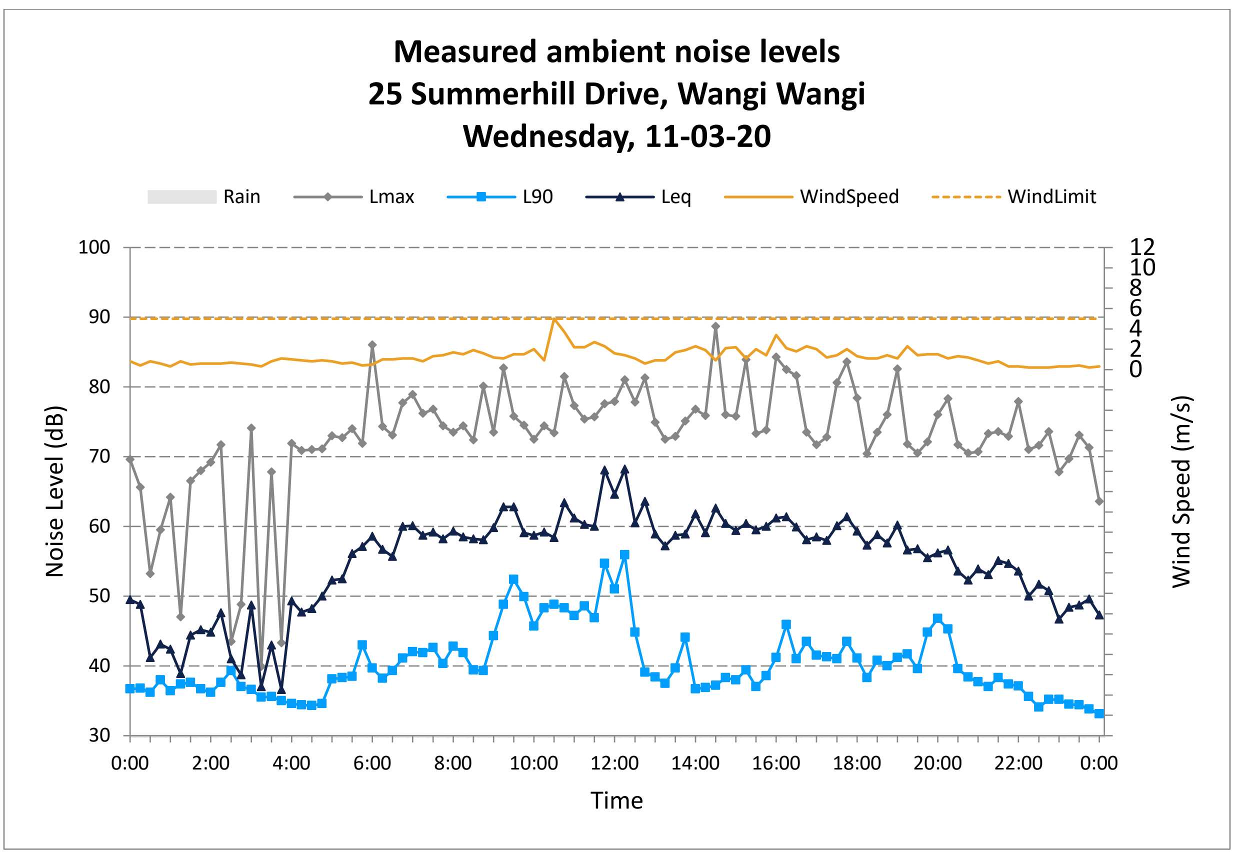
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time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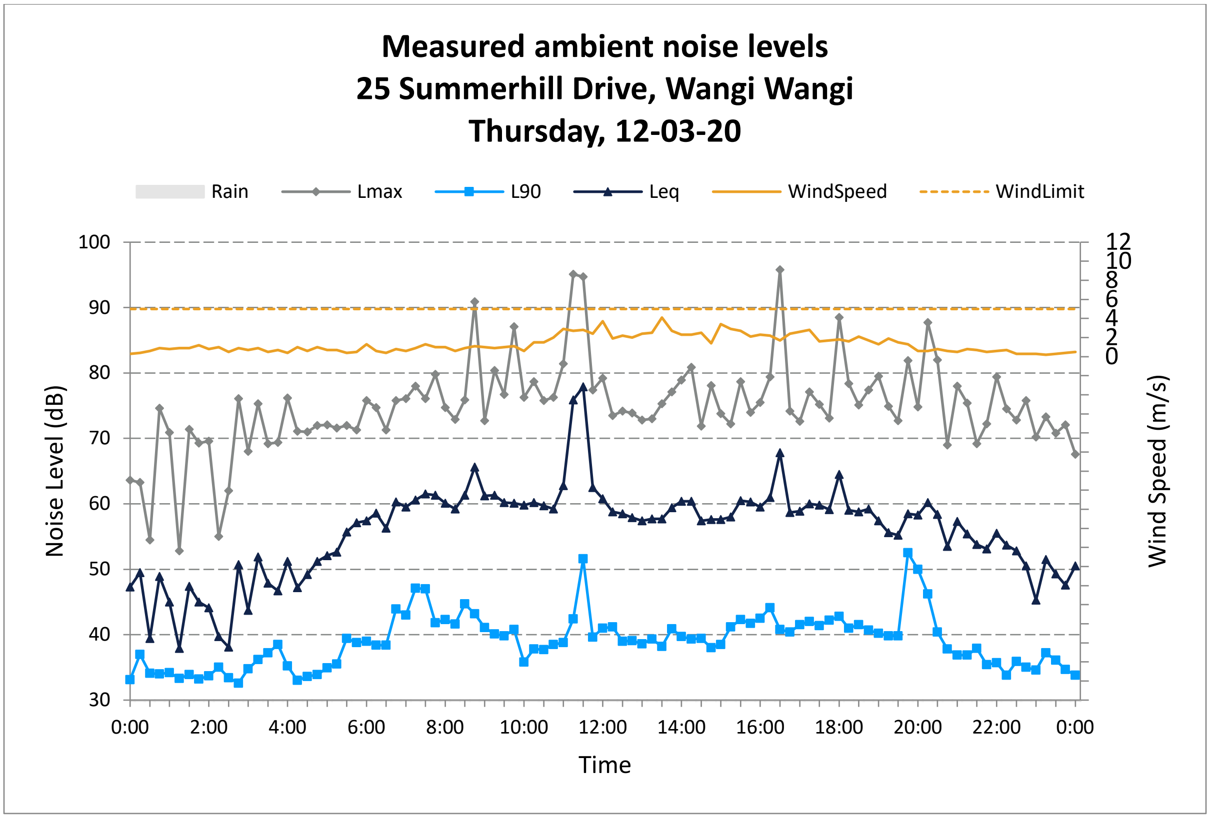
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time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Thursday, 12-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
100
90
80
70
60
50
40
30
Wind Speed (m/s)
12
10
8
6
4
2
0
0:00
2:00
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12:00
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18:00
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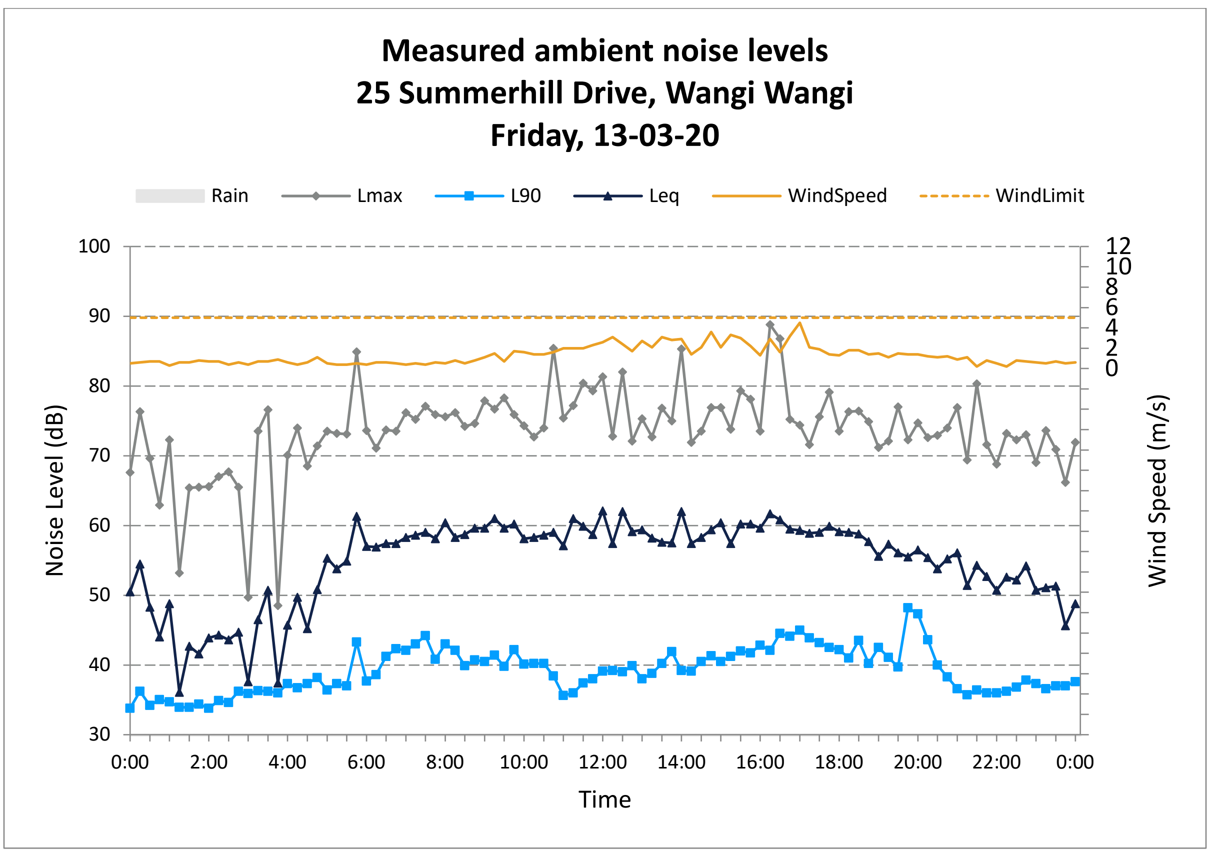
Time


Measured ambient noise levels
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Friday, 13-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
100
90
80
70
60
50
40
30
Wind Speed (m/s)
12
10
8
6
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0:00
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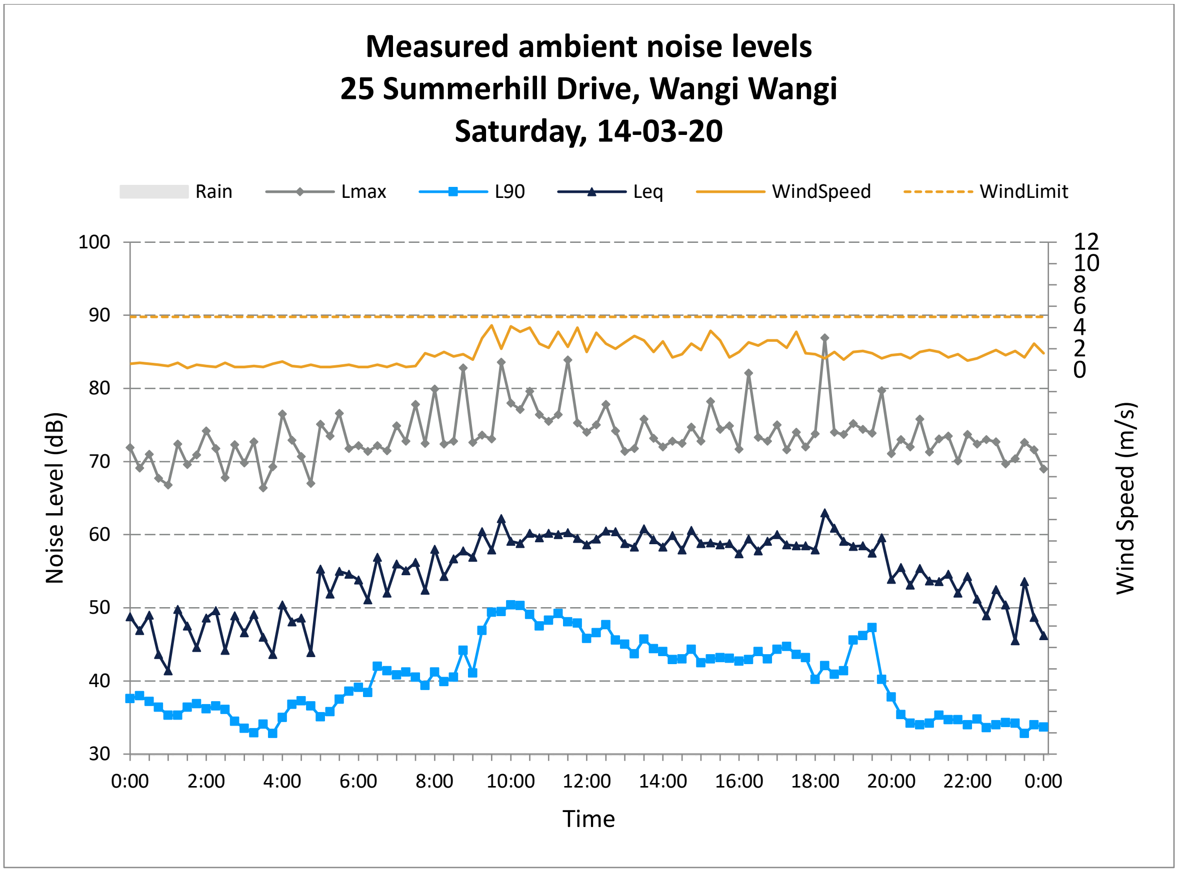
Time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L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
100
90
80
70
60
50
40
30
Wind Speed (m/s)
12
10
8
6
4
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0:00
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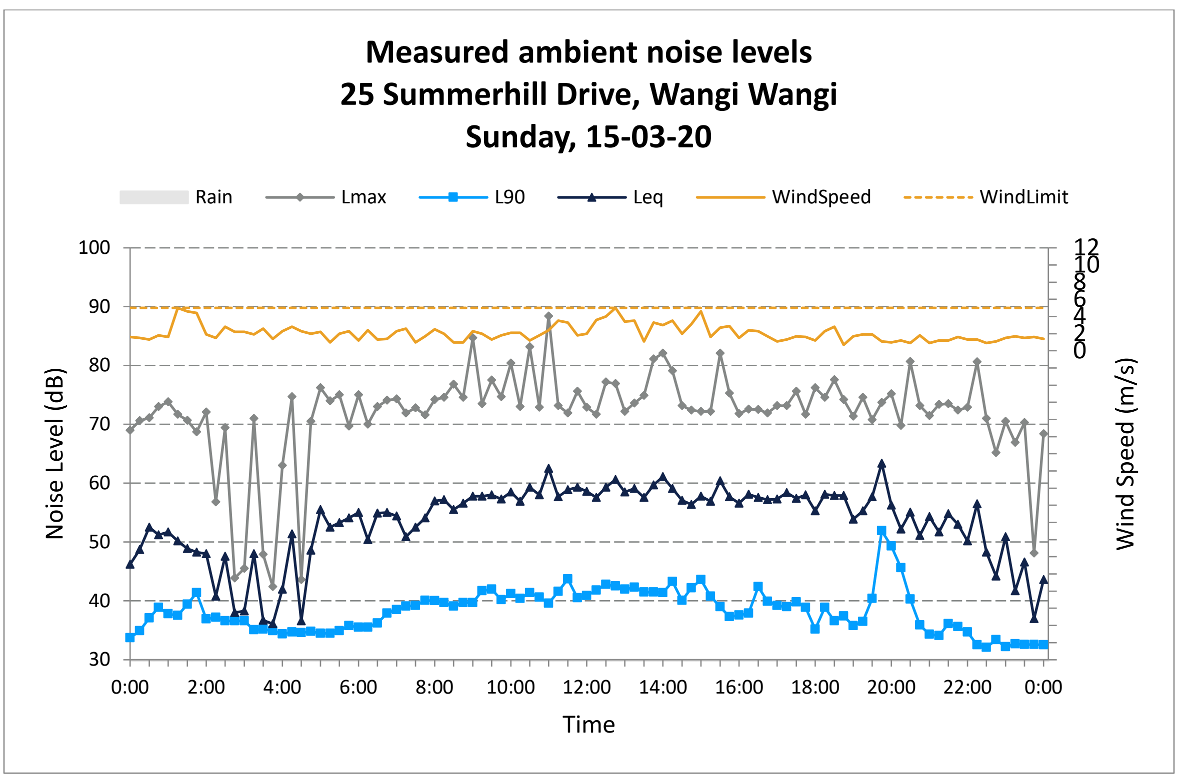
Time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Sunday, 15-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
100
90
80
70
60
50
40
30
Wind Speed (m/s)
12
10
8
6
4
2
0
0:00
2:00
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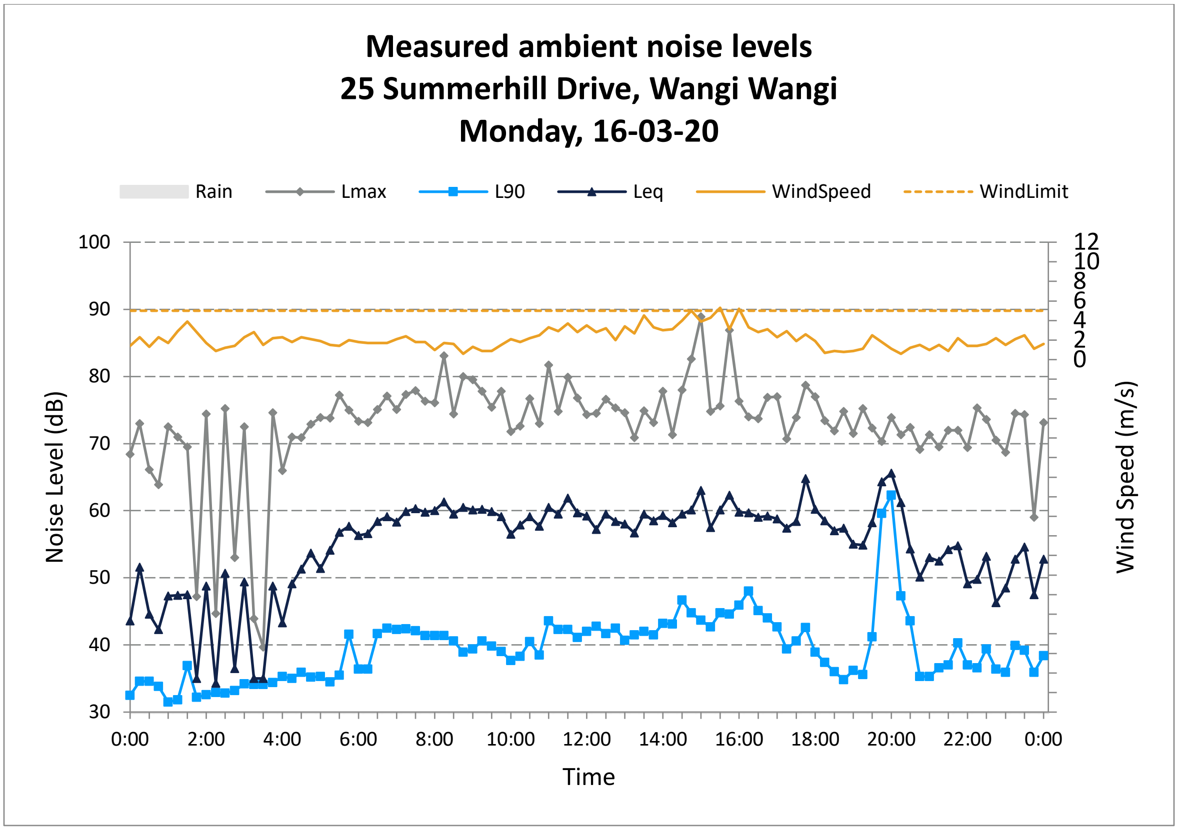
Time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Rain
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L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
0:00
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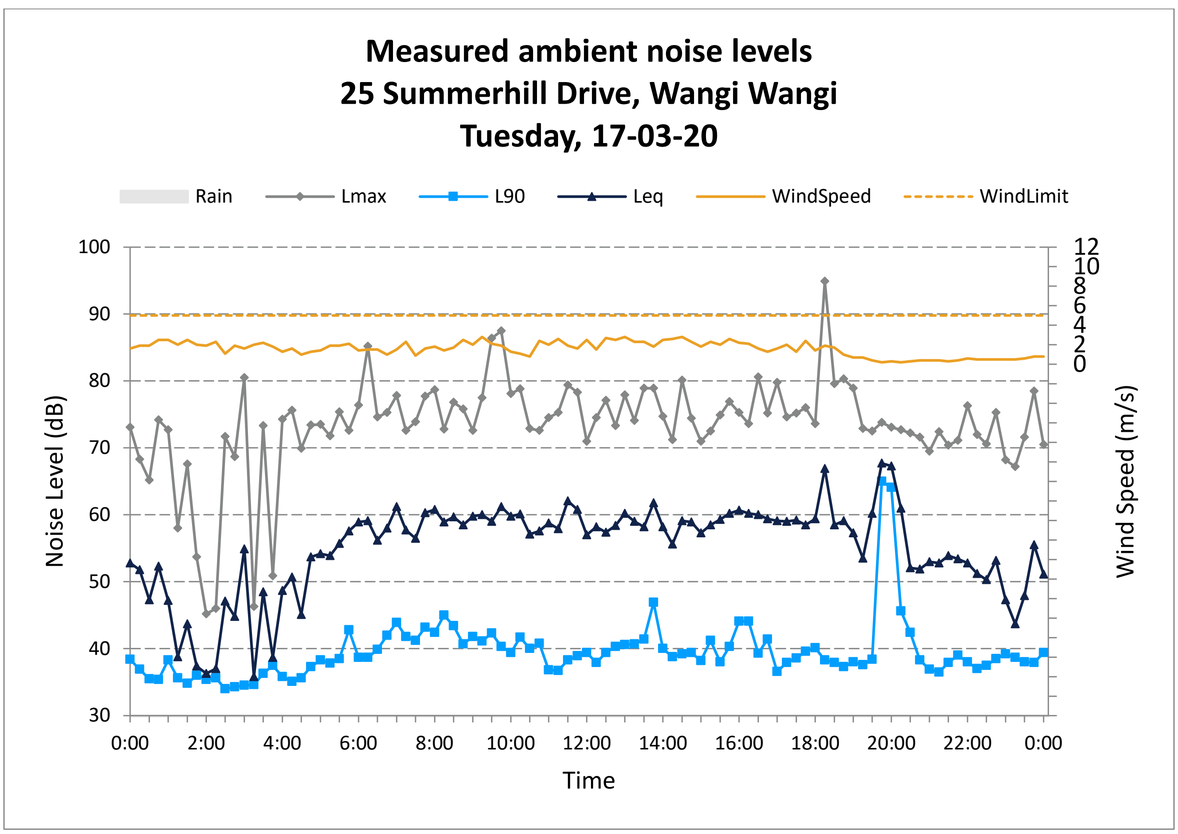
Measured ambient noise levels
25 Summerhill Drive, Wangi Wangi
Tuesday, 17-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
0:00
2:00
4:00
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22:00
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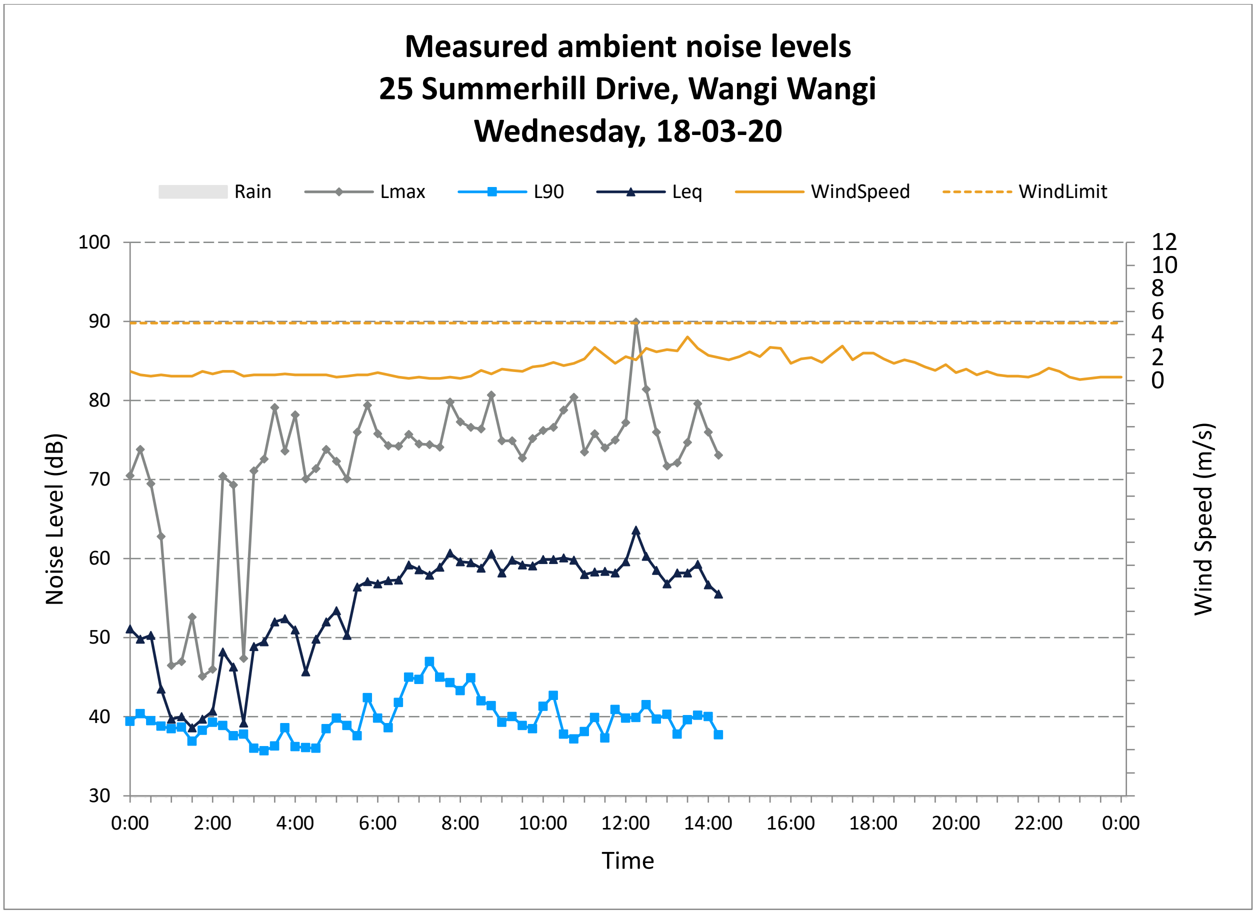
Measured ambient noise levels
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Wednesday, 18-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
100
90
80
70
60
50
40
30
Wind Speed (m/s)
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time

Date	ABL Day	ABL Evening	ABL Night	$L_{Aeq,11\ hour}$ Day	$L_{Aeq,4\ hour}$ Evening	$L_{Aeq,9\ hour}$ Night	$L_{Aeq,15\ hour}$ Day	$L_{Aeq,24\ hour}$ Day	$L_{Aeq,8\ hour}$ Night
Friday, 06-03-20	0	41	37	0	64	51	0	0	51
Saturday, 07-03-20	0	35	32	0	55	50	0	56	50
Sunday, 08-03-20	36	33	32	57	60	52	58	57	50
Monday, 09-03-20	41	34	33	59	55	54	58	57	50
Tuesday, 10-03-20	40	34	28	60	60	52	60	58	50
Wednesday, 11-03-20	39	31	29	59	58	52	59	58	49
Thursday, 12-03-20	41	32	30	60	58	53	60	58	51
Friday, 13-03-20	38	34	28	60	59	50	60	58	49
Saturday, 14-03-20	0	0	35	0	0	51	0	0	51
Sunday, 15-03-20	39	36	0	59	60	0	59	0	0
Monday, 16-03-20	0	0	0	0	0	0	0	0	0
Summary Values	39	34	32	59	60	52	59	57	50

Notes:

0 indicates periods with too few valid samples due to weather or logger operation

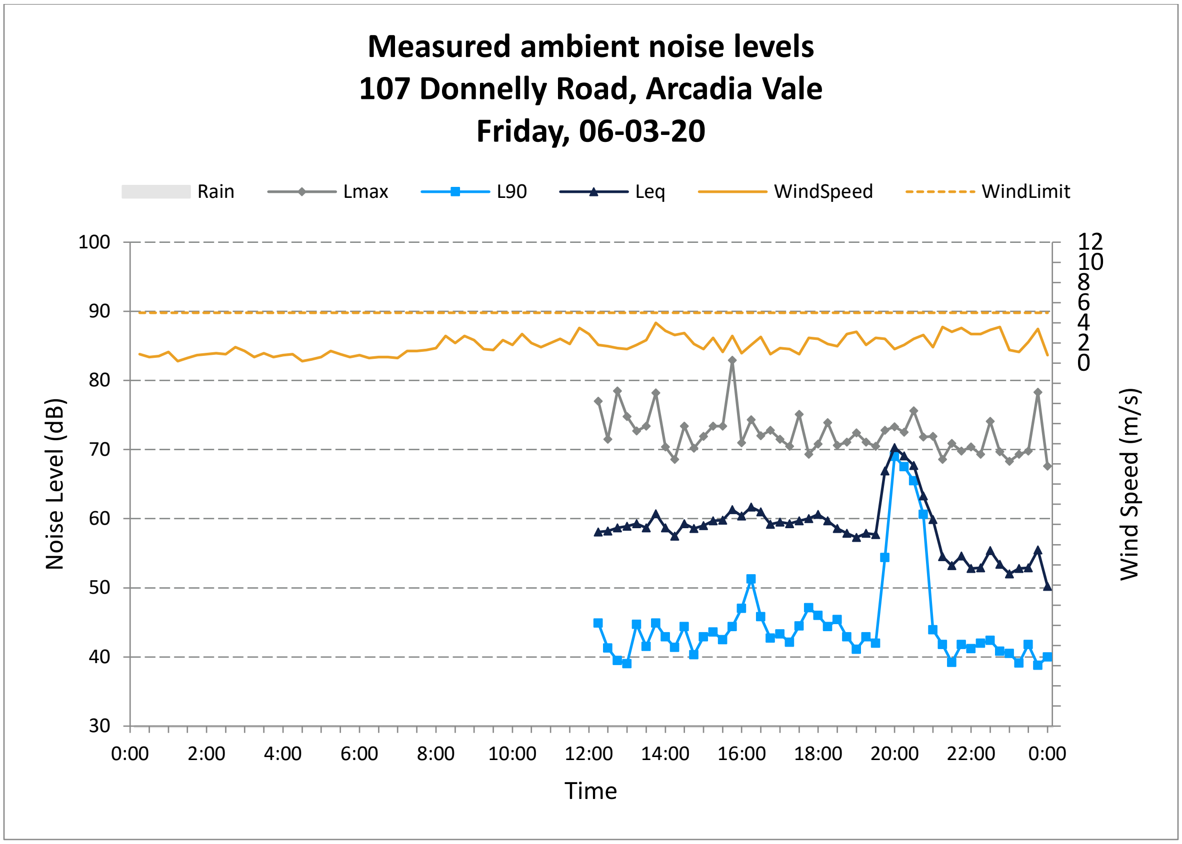
Leq24hr encompasses the period 7am to 7am

Date	ABL Day	ABL Evening	ABL Night	$L_{Aeq,11\ hour}$ Day	$L_{Aeq,4\ hour}$ Evening	$L_{Aeq,9\ hour}$ Night	$L_{Aeq,15\ hour}$ Day	$L_{Aeq,24\ hour}$ Day	$L_{Aeq,8\ hour}$ Night
Friday, 06-03-20	0	41	37	0	64	51	0	0	51
Saturday, 07-03-20	0	35	32	0	55	50	0	56	50
Sunday, 08-03-20	36	33	32	57	60	52	58	57	50
Monday, 09-03-20	41	34	33	59	55	54	58	57	50
Tuesday, 10-03-20	40	34	28	60	60	52	60	58	50
Wednesday, 11-03-20	39	31	29	59	58	52	59	58	49
Thursday, 12-03-20	41	32	30	60	58	53	60	58	51
Friday, 13-03-20	38	34	28	60	59	50	60	58	49
Saturday, 14-03-20	0	0	35	0	0	51	0	0	51
Sunday, 15-03-20	39	36	0	59	60	0	59	0	0
Monday, 16-03-20	0	0	0	0	0	0	0	0	0
Summary Values	39	34	32	59	60	52	59	57	50

Notes:

0 indicates periods with too few valid samples due to weather or logger operation

Leq24hr encompasses the period 7am to 7am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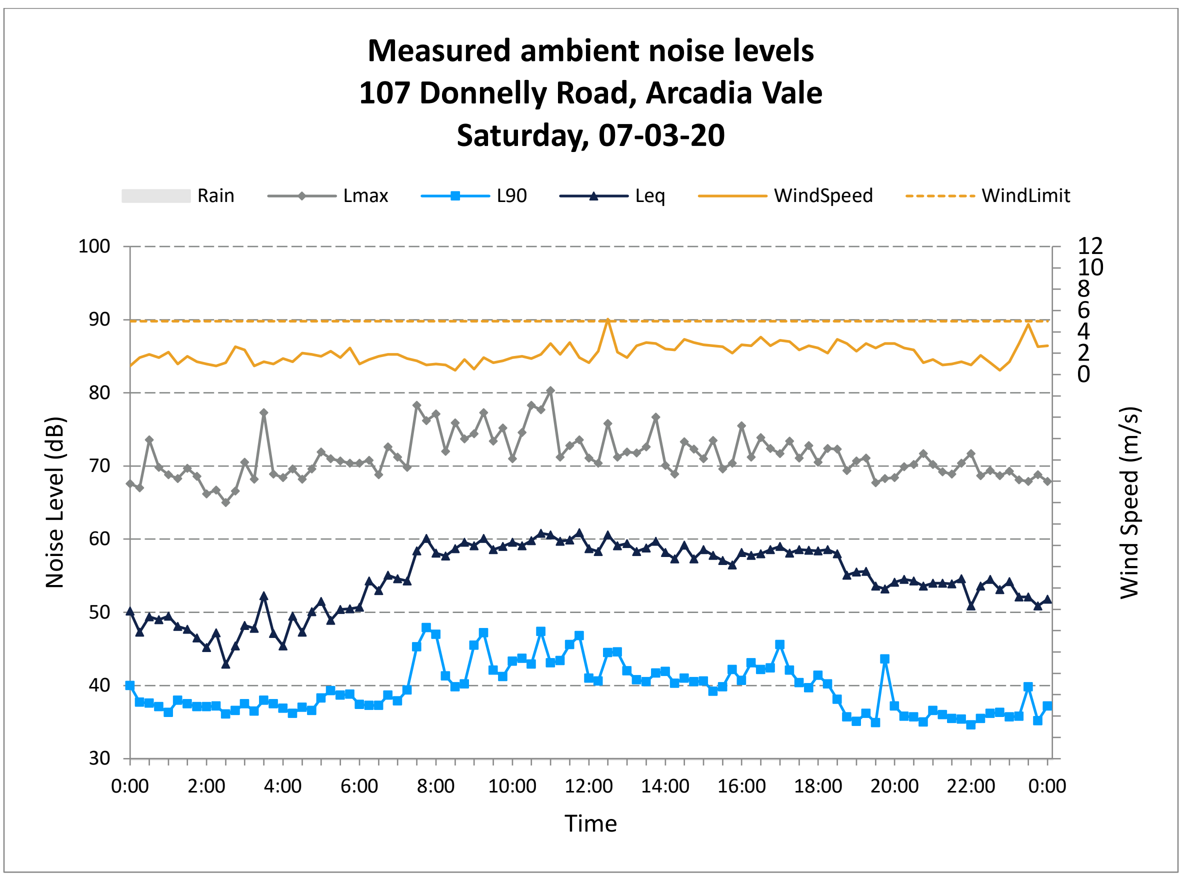
Friday, 06-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
Wind Speed (m/s)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time


Measured ambient noise levels
107 Donnelly Road, Arcadia Vale
Saturday, 07-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
Wind Speed (m/s)
0:00
2:00
4:00
6:00
8:00
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14:00
16:00
18:00
20:00
22:00
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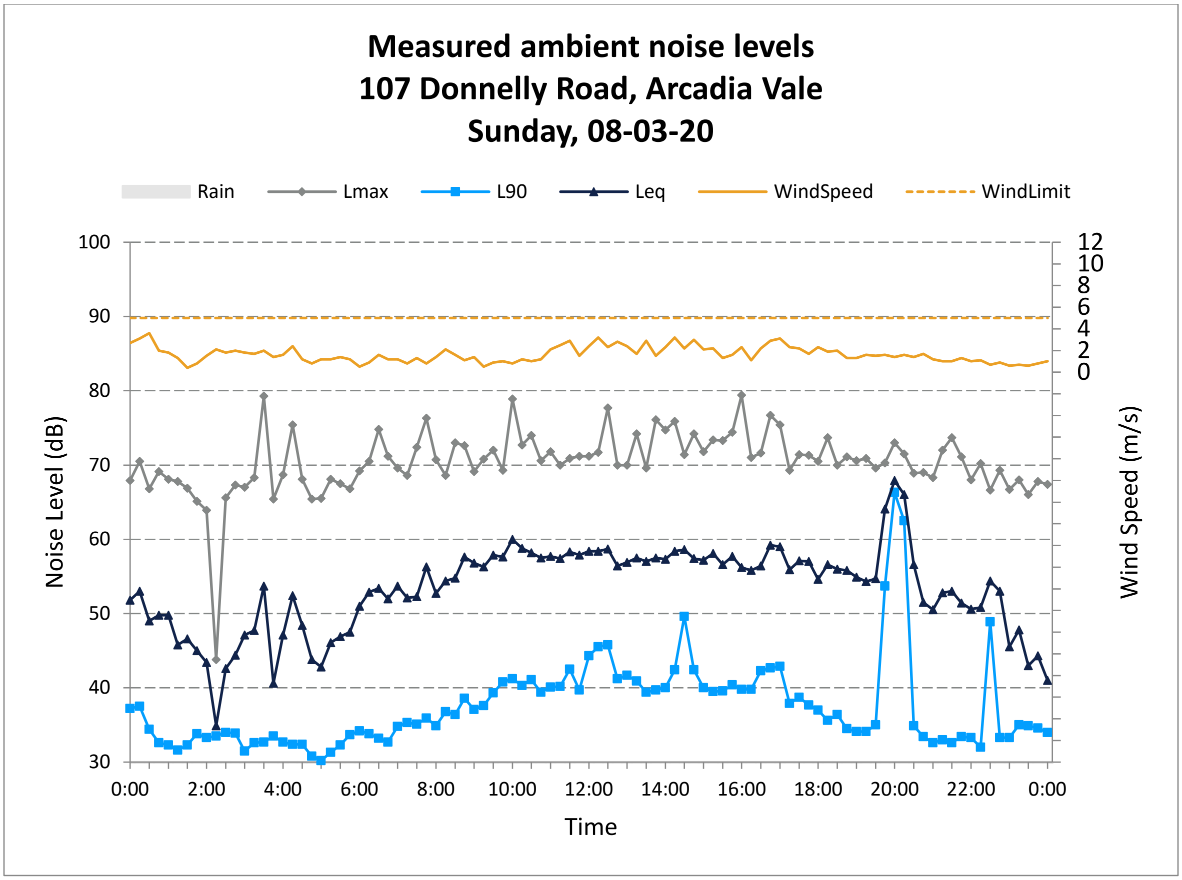
Time


Measured ambient noise levels
107 Donnelly Road, Arcadia Vale
Sunday, 08-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
0:00
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8:00
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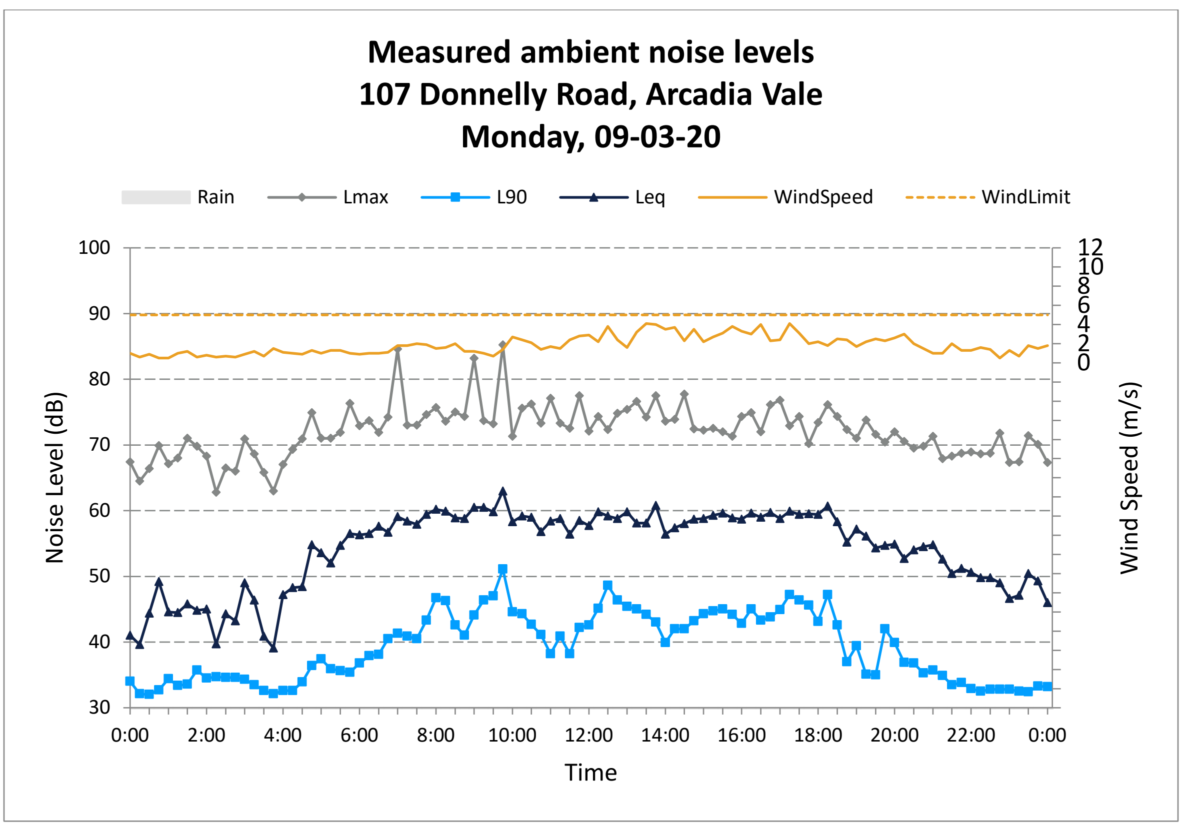
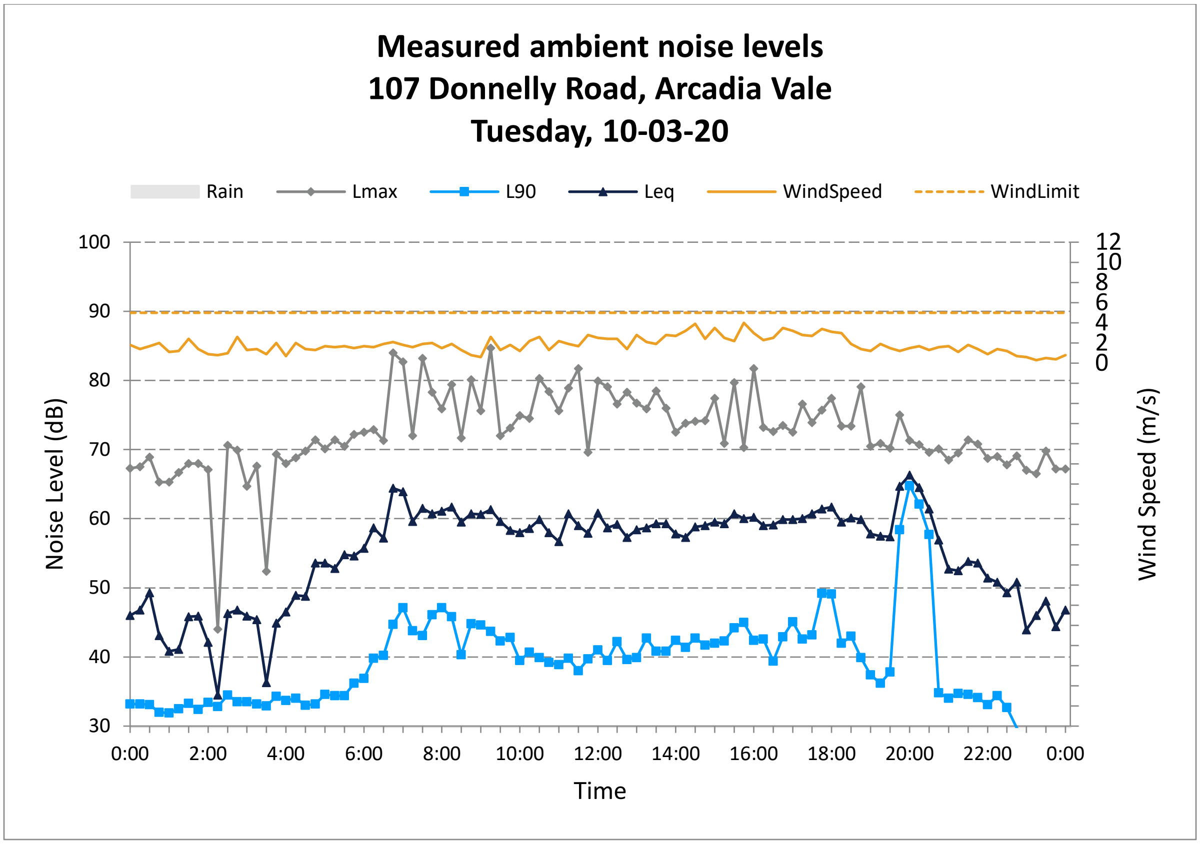
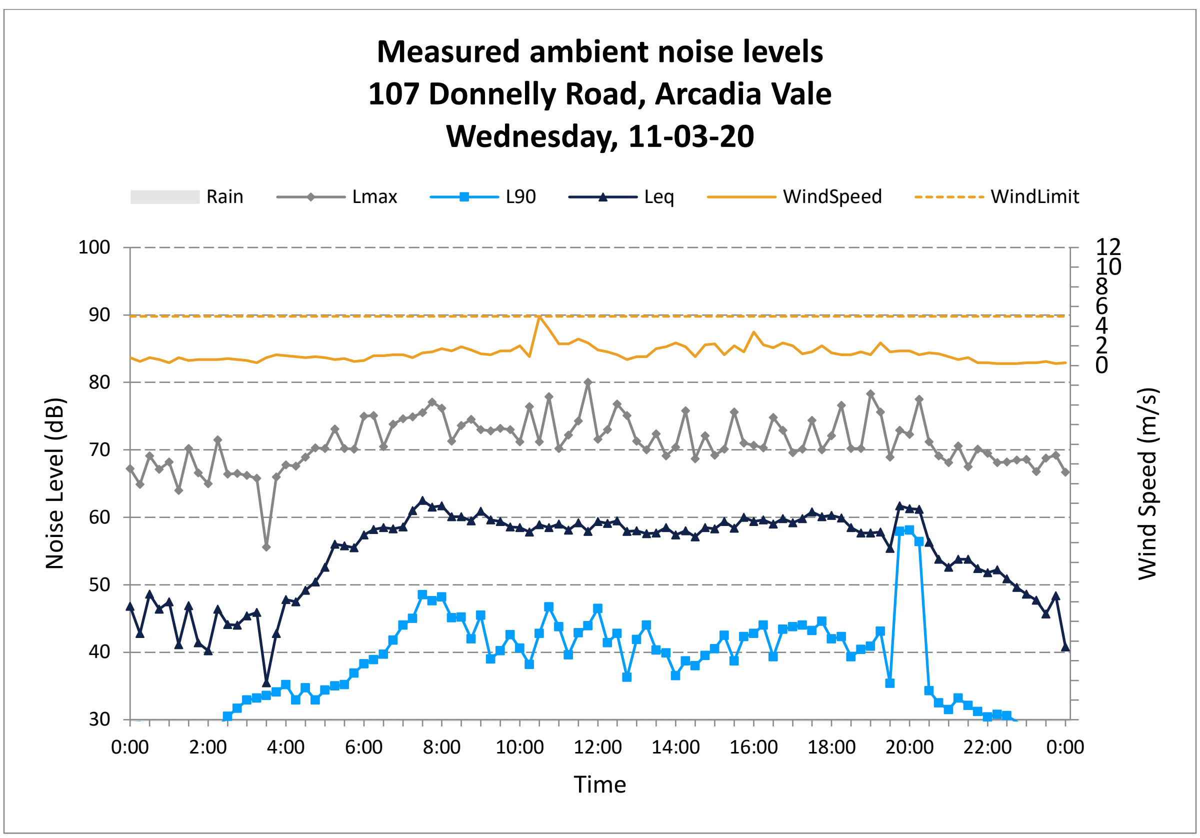
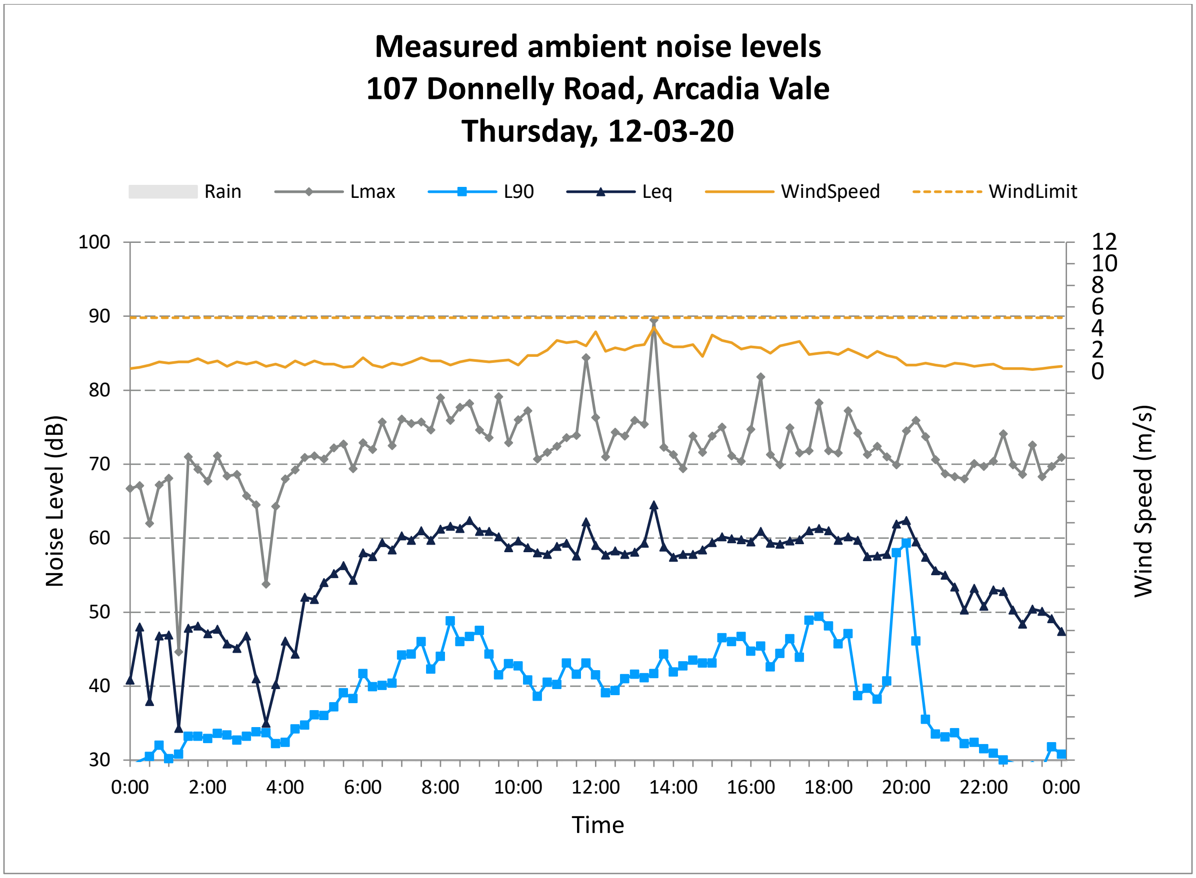
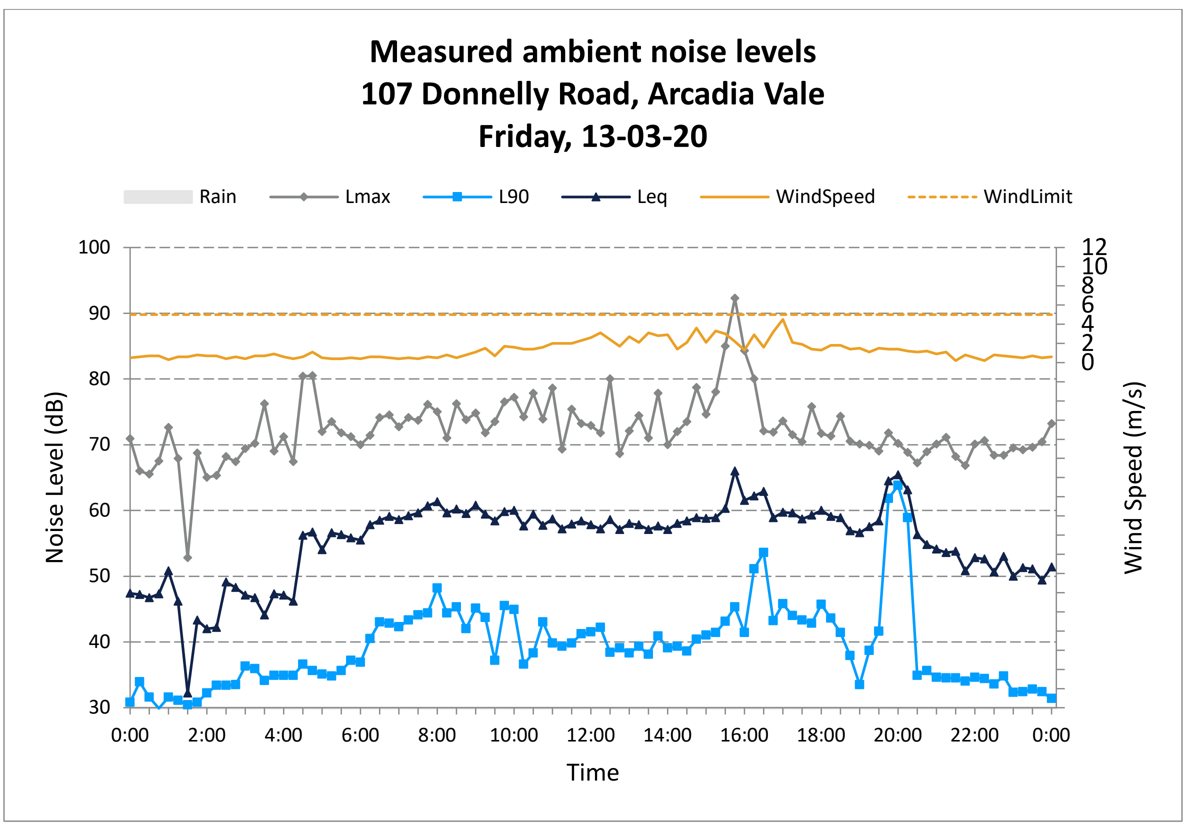
12:00
14:00
16:00
18:00
20:00
22:00
0:00

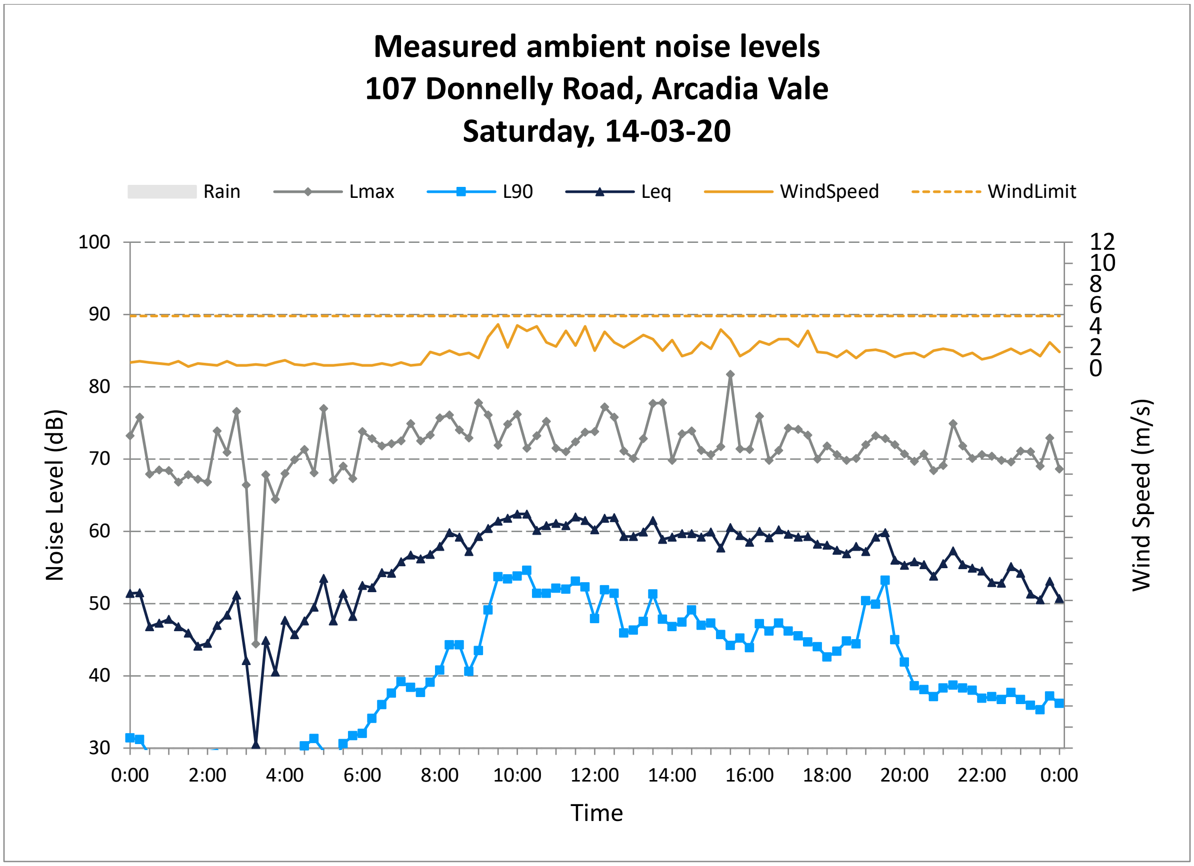

Measured ambient noise levels
107 Donnelly Road, Arcadia Vale
Monday, 09-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

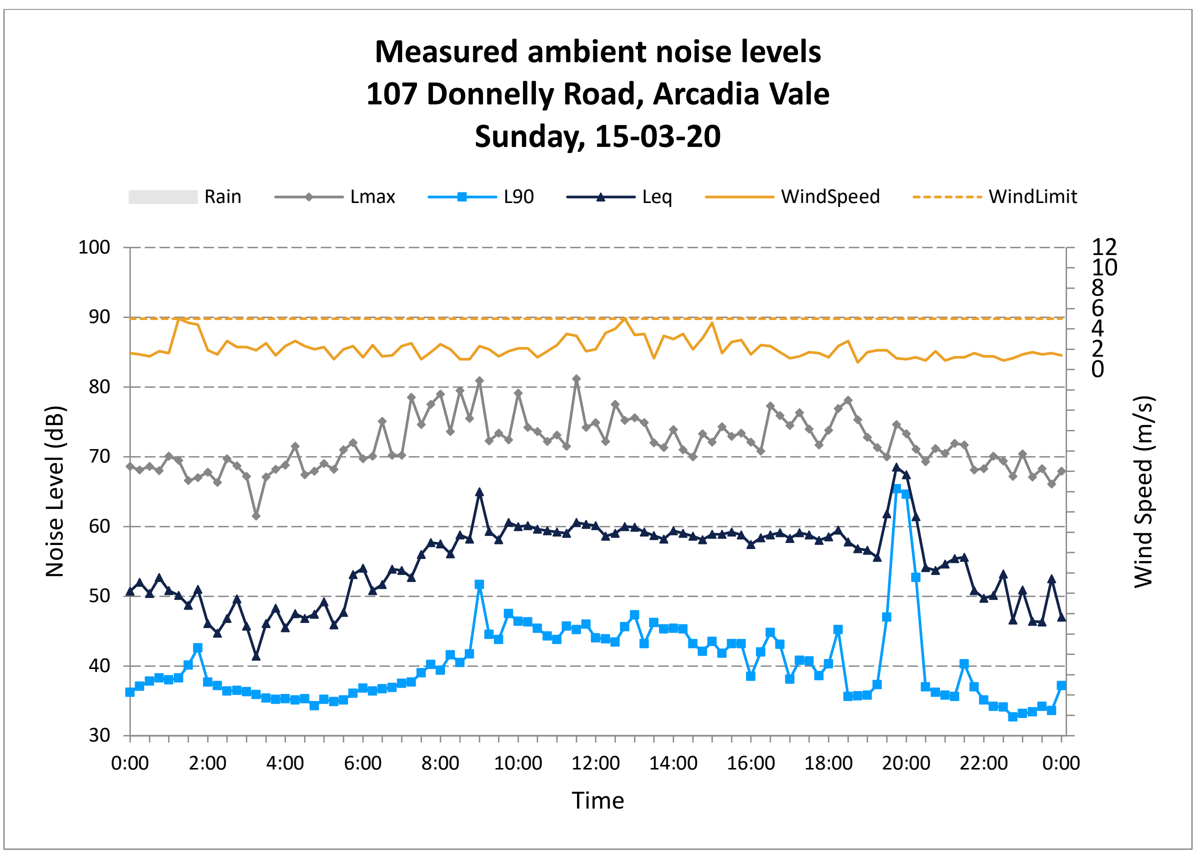

Measured ambient noise levels
107 Donnelly Road, Arcadia Vale
Tuesday, 10-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

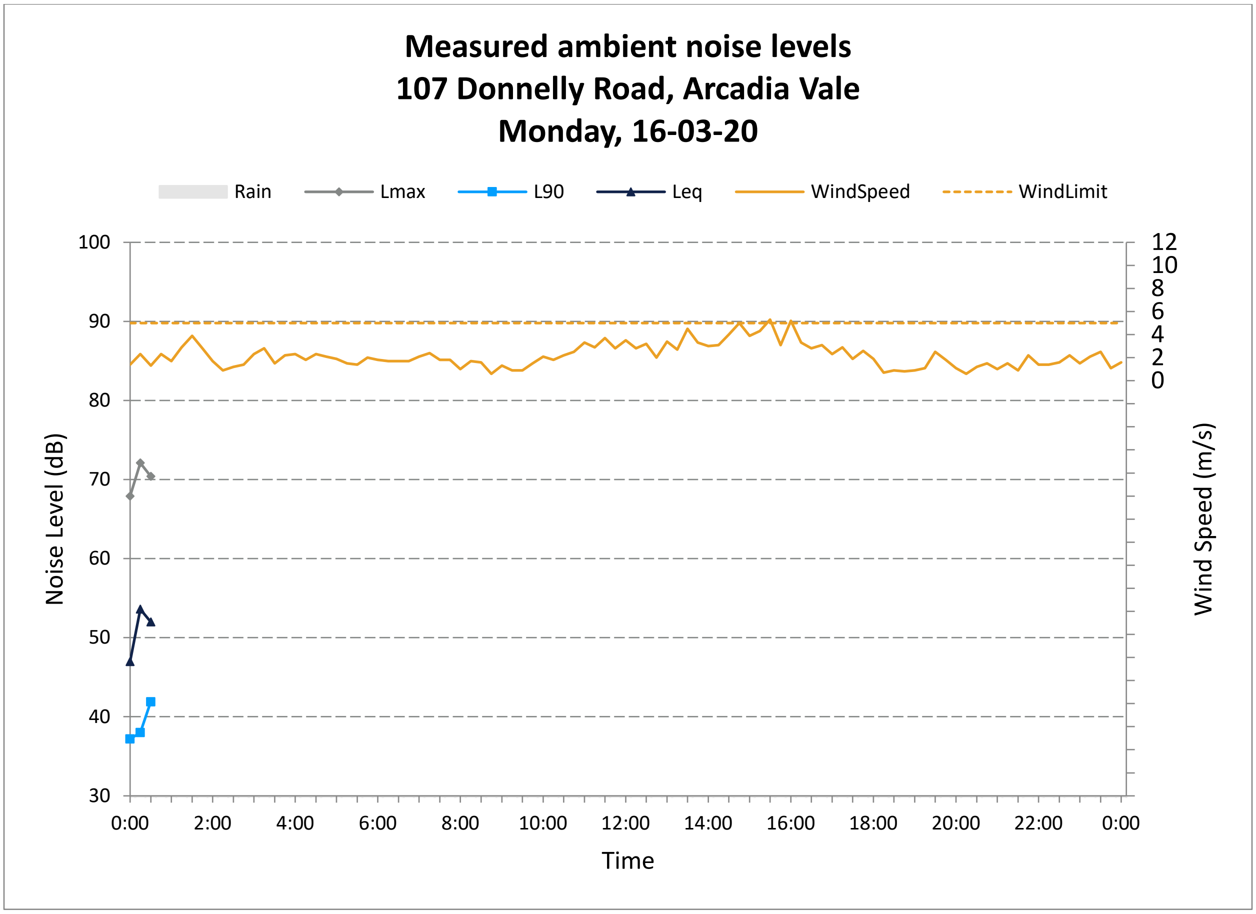

Measured ambient noise levels
107 Donnelly Road, Arcadia Vale
Wednesday, 11-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Measured ambient noise levels
107 Donnelly Road, Arcadia Vale
Thursday, 12-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Measured ambient noise levels
107 Donnelly Road, Arcadia Vale
Friday, 13-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Measured ambient noise levels
107 Donnelly Road, Arcadia Vale
Saturday, 14-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time


Measured ambient noise levels
107 Donnelly Road, Arcadia Vale
Sunday, 15-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time



Measured ambient noise levels
107 Donnelly Road, Arcadia Vale
Monday, 16-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
100
90
80
70
60
50
40
30
Wind Speed (m/s)
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time

Date	ABL Day	ABL Evening	ABL Night	$L_{Aeq,11 hour}$ Day	$L_{Aeq,4 hour}$ Evening	$L_{Aeq,9 hour}$ Night	$L_{Aeq,15 hour}$ Day	$L_{Aeq,24 hour}$ Day	$L_{Aeq,8 hour}$ Night
Friday, 06-03-20	0	47	48	0	52	54	0	0	54
Saturday, 07-03-20	0	42	42	0	48	52	0	51	53
Sunday, 08-03-20	40	39	44	61	50	50	59	58	50
Monday, 09-03-20	42	41	43	50	50	50	50	50	50
Tuesday, 10-03-20	40	40	46	49	51	49	50	50	49
Wednesday, 11-03-20	38	39	45	48	49	49	49	49	49
Thursday, 12-03-20	37	38	41	50	51	47	50	49	47
Friday, 13-03-20	0	0	0	0	0	0	0	0	0
Summary Values	40	40	44	55	50	51	54	52	51

Notes:

0 indicates periods with too few valid samples due to weather or logger operation

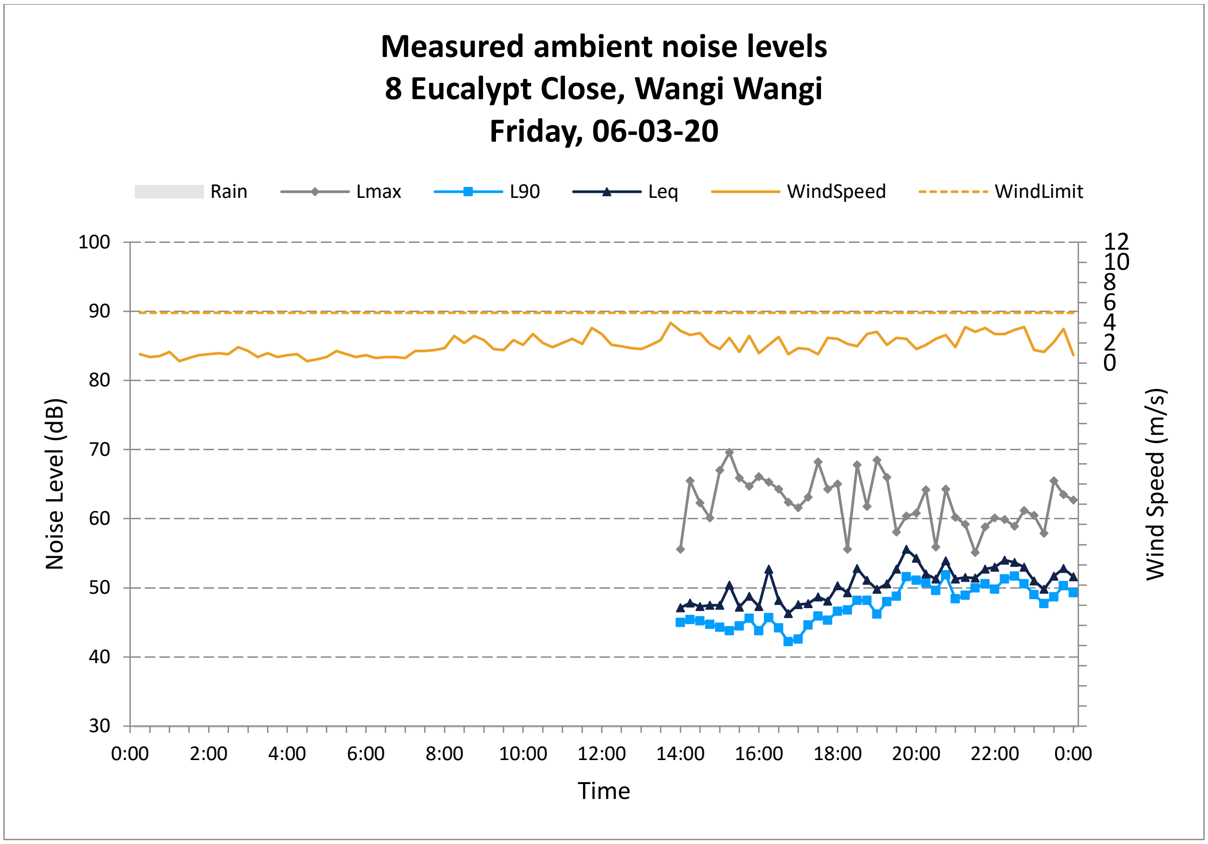
Leq24hr encompasses the period 7am to 7am

Date	ABL Day	ABL Evening	ABL Night	$L_{Aeq,11\ hour}$ Day	$L_{Aeq,4\ hour}$ Evening	$L_{Aeq,9\ hour}$ Night	$L_{Aeq,15\ hour}$ Day	$L_{Aeq,24\ hour}$ Day	$L_{Aeq,8\ hour}$ Night
Friday, 06-03-20	0	47	48	0	52	54	0	0	54
Saturday, 07-03-20	0	42	42	0	48	52	0	51	53
Sunday, 08-03-20	40	39	44	61	50	50	59	58	50
Monday, 09-03-20	42	41	43	50	50	50	50	50	50
Tuesday, 10-03-20	40	40	46	49	51	49	50	50	49
Wednesday, 11-03-20	38	39	45	48	49	49	49	49	49
Thursday, 12-03-20	37	38	41	50	51	47	50	49	47
Friday, 13-03-20	0	0	0	0	0	0	0	0	0
Summary Values	40	40	44	55	50	51	54	52	51

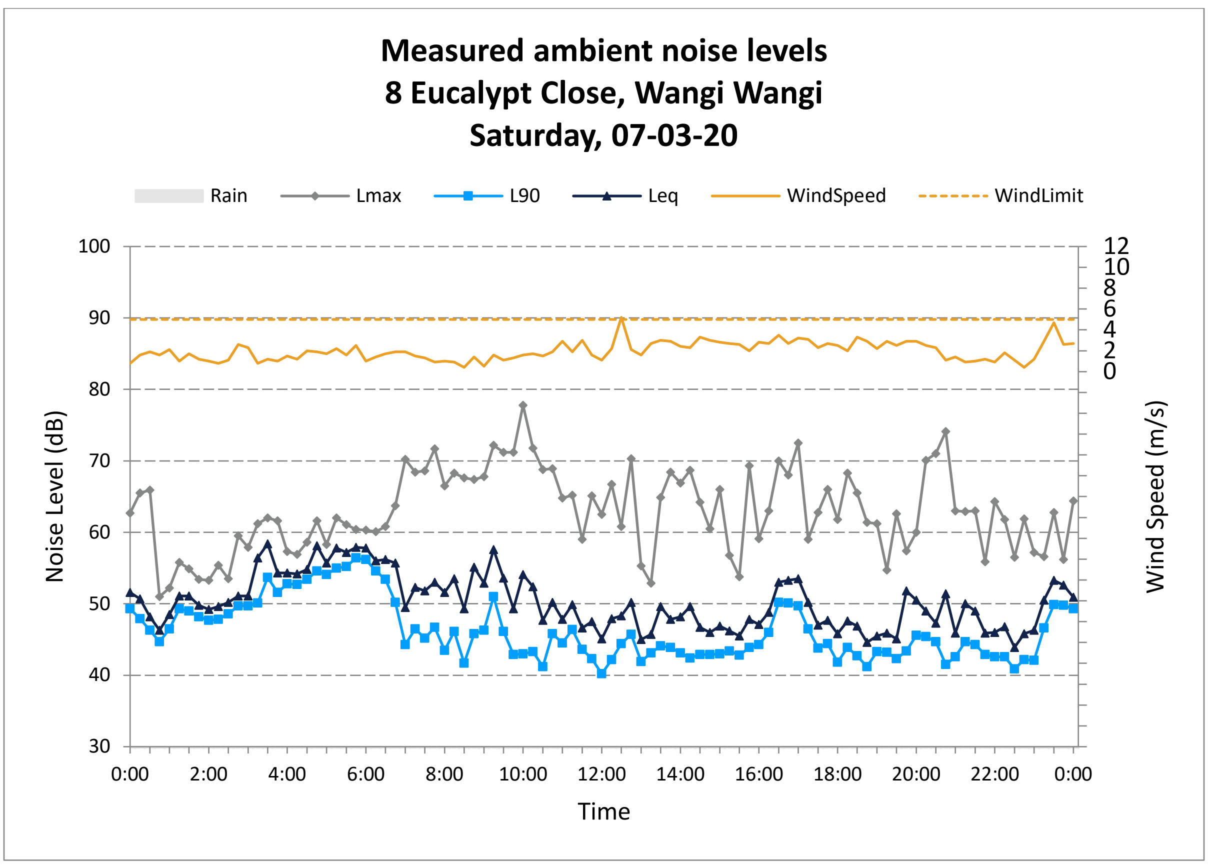
Notes:

0 indicates periods with too few valid samples due to weather or logger operation

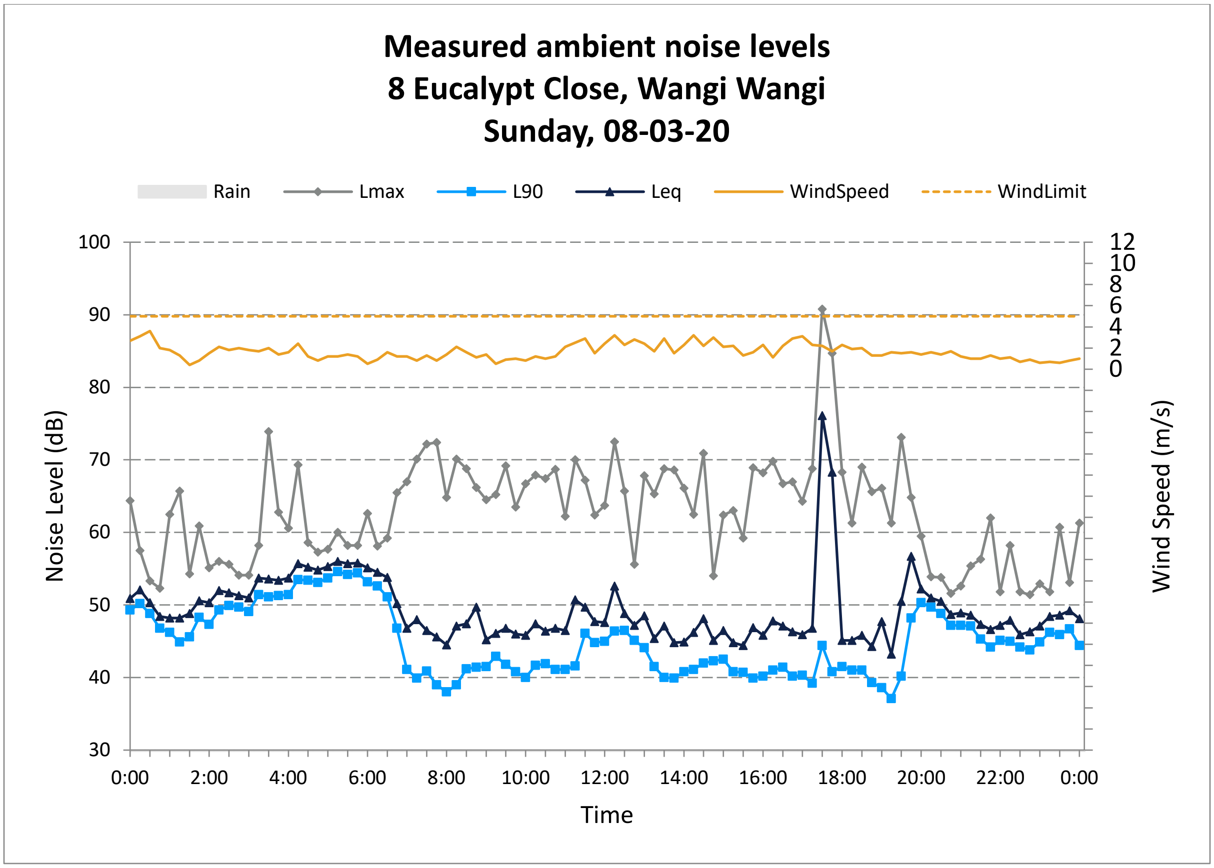
Leq24hr encompasses the period 7am to 7am

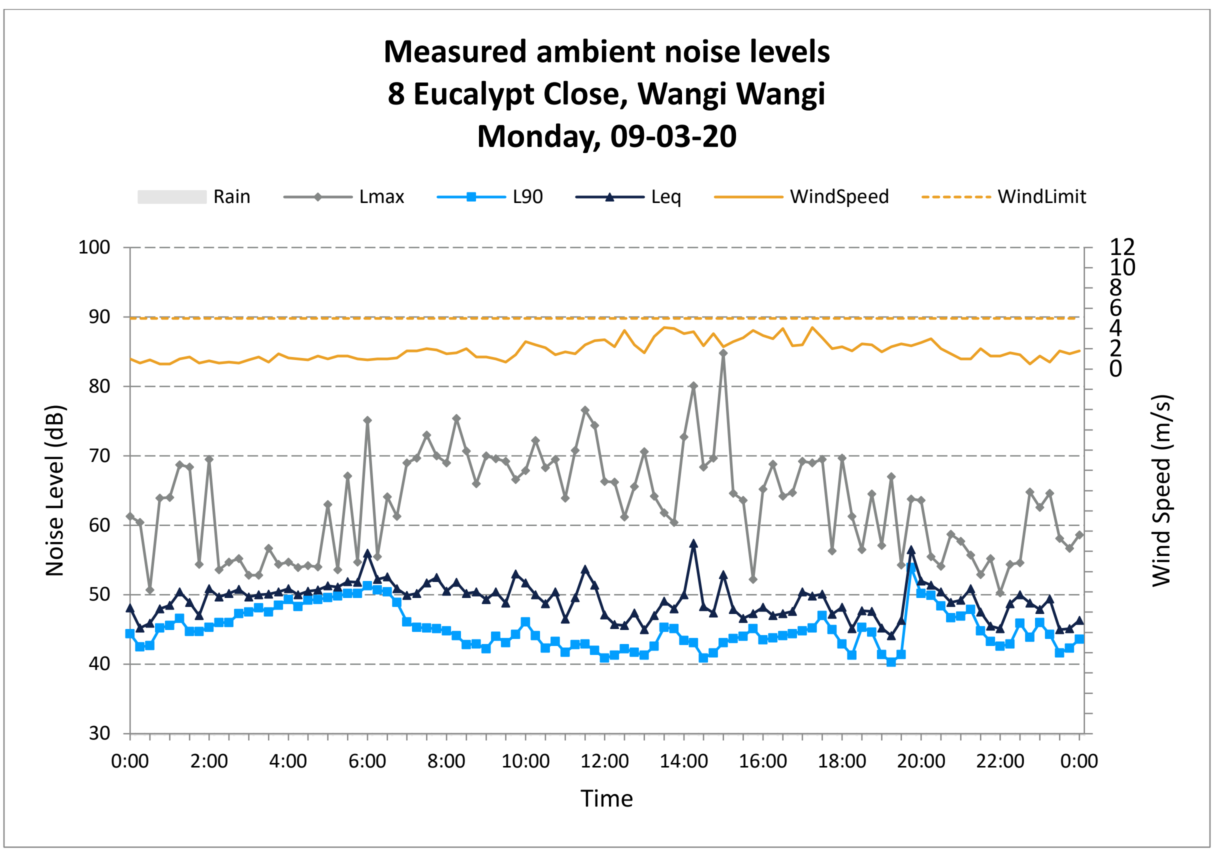


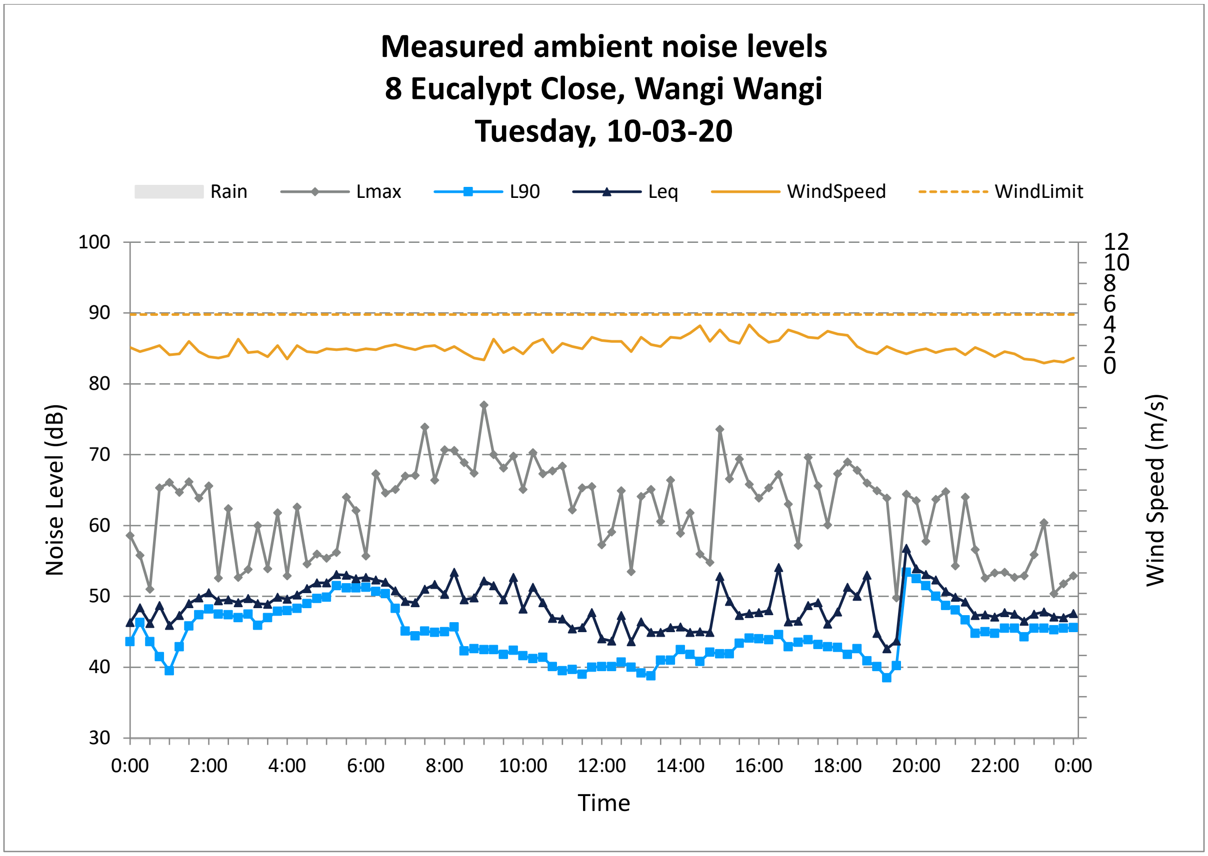
Measured ambient noise levels
8 Eucalypt Close, Wangi Wangi
Friday, 06-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time

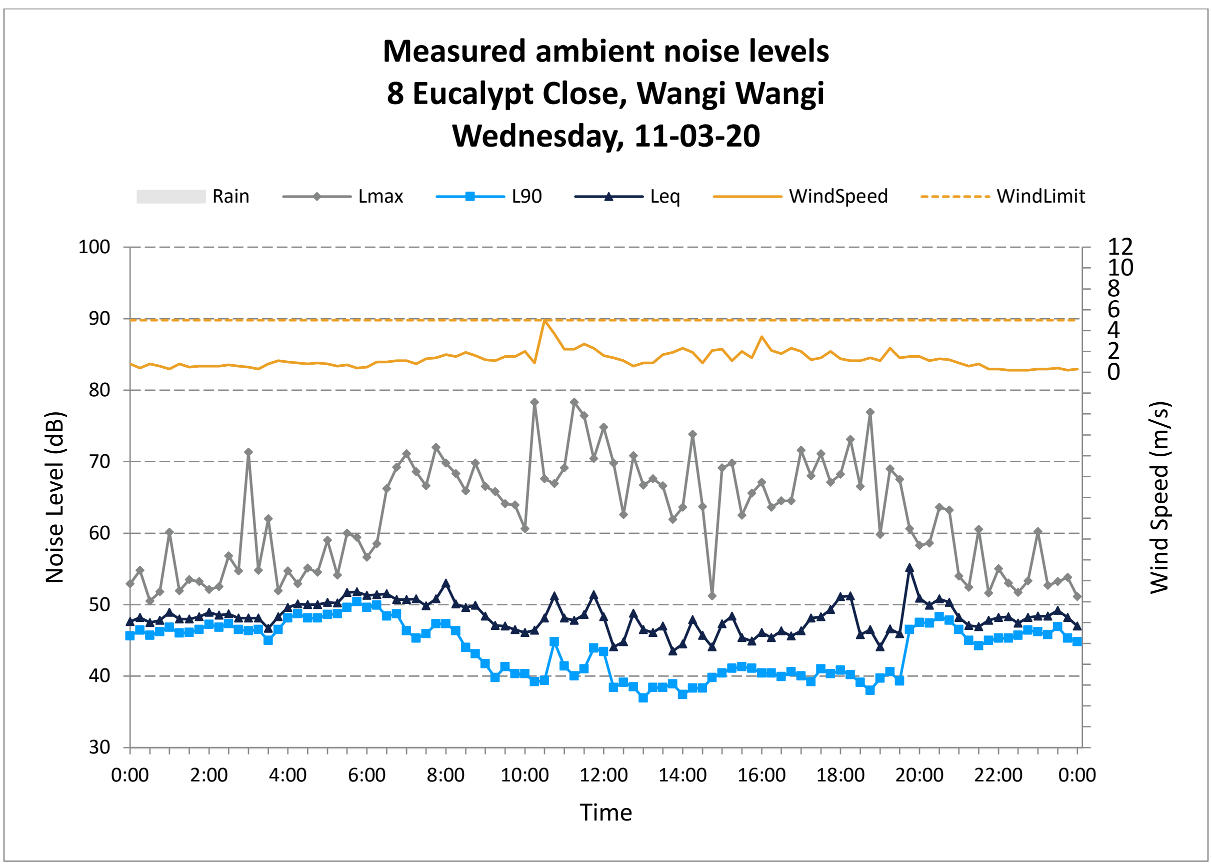


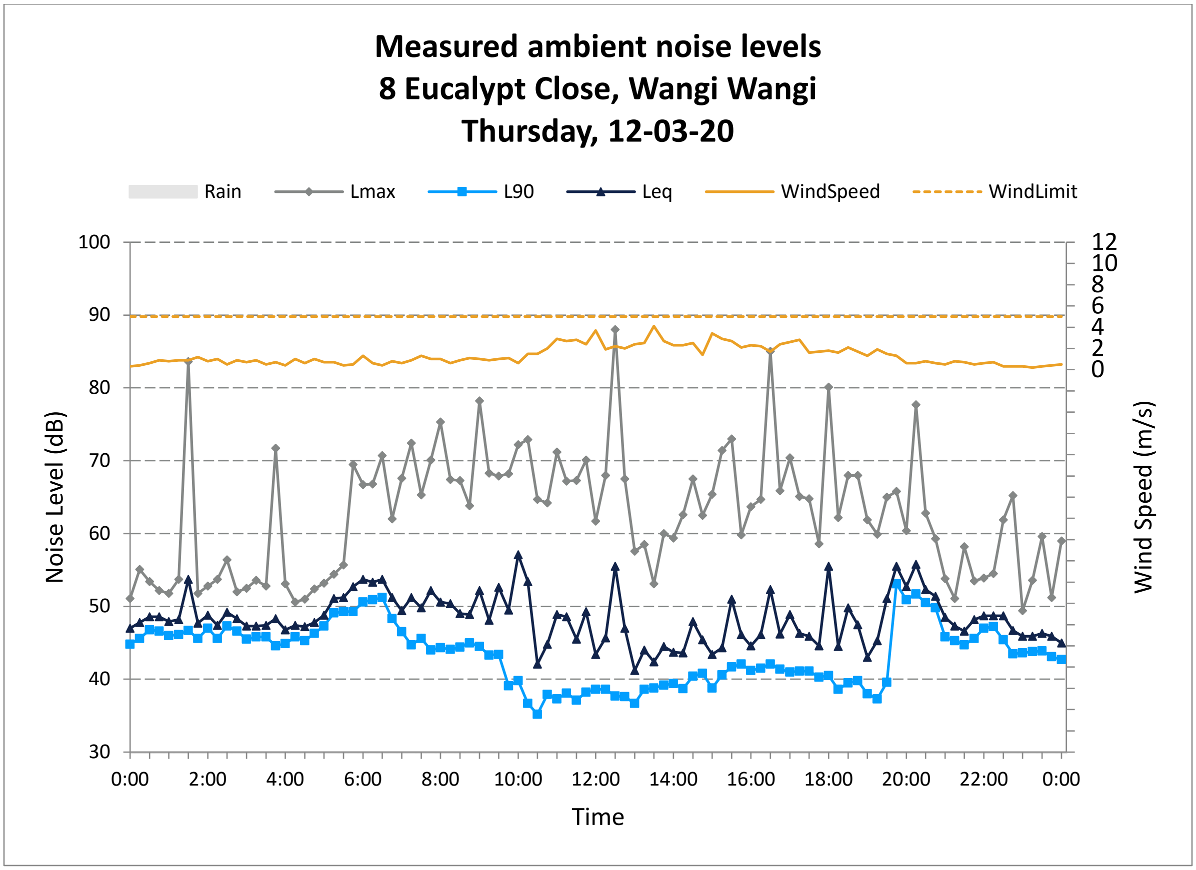
Measured ambient noise levels
8 Eucalypt Close, Wangi Wangi
Saturday, 07-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time

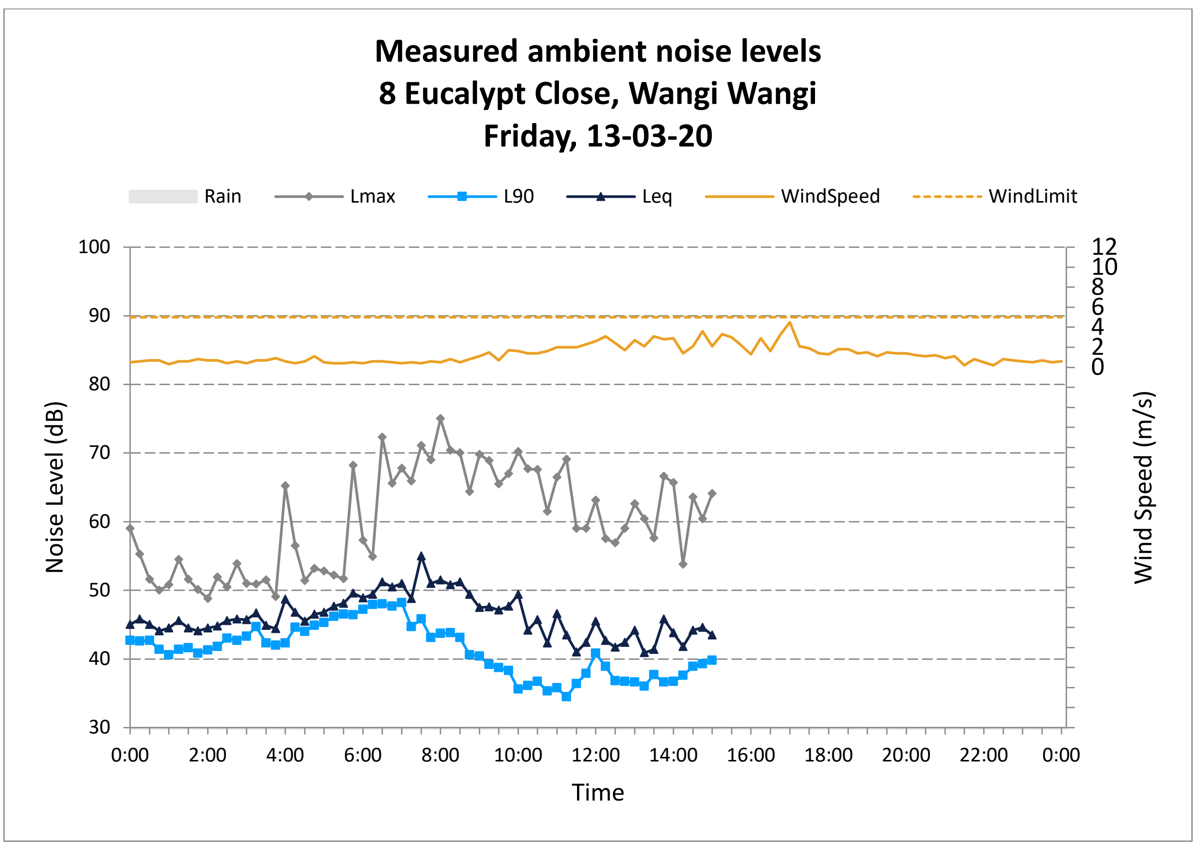

Measured ambient noise levels
8 Eucalypt Close, Wangi Wangi
Sunday, 08-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Measured ambient noise levels
8 Eucalypt Close, Wangi Wangi
Monday, 09-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Measured ambient noise levels
8 Eucalypt Close, Wangi Wangi
Tuesday, 10-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Measured ambient noise levels
8 Eucalypt Close, Wangi Wangi
Wednesday, 11-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time
100
90
80
70
60
50
40
30
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Measured ambient noise levels
8 Eucalypt Close, Wangi Wangi
Thursday, 12-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time


Measured ambient noise levels
8 Eucalypt Close, Wangi Wangi
Friday, 13-03-20
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
Wind Speed (m/s)
Time

Appendix B

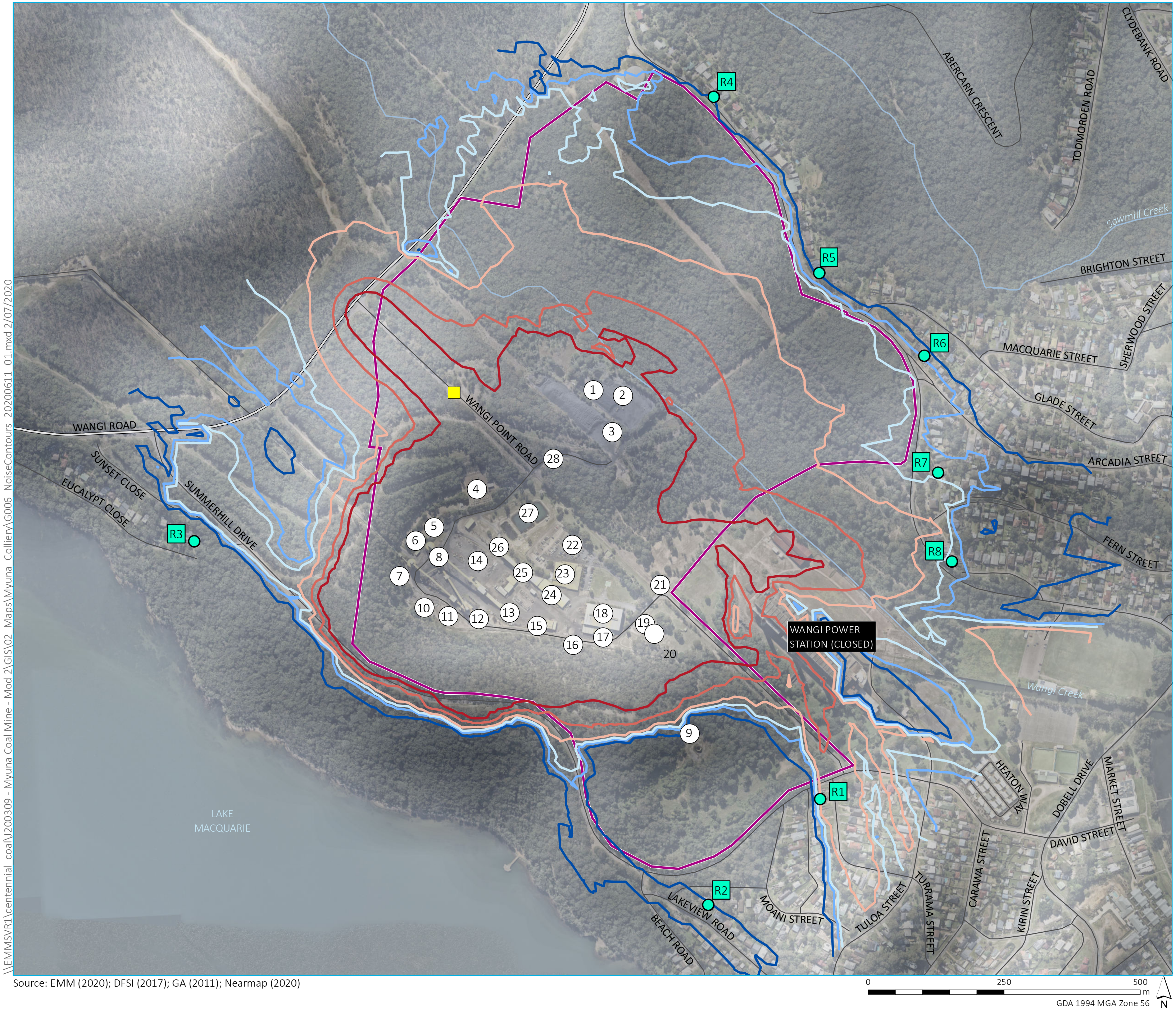
Modelled noise source locations


0 m
100 m
scale = 1 : 2955
FEL
Water Cart
Haul Truck
RoM Bin
Prod. Bin
Breaker
Drive
Drive
Drive
CHPP
Forklift
Transport
Workshop
Compressor
Vent Fan


0 m
100 m
scale = 1 : 2955
Road Truck
FEL
Water Cart
Haul Truck
RoM Bin
Prod. Bin
Breaker
Drive
Drive
Drive
CHPP
Forklift
Transport
Workshop
Compressor
Vent Fan

Appendix C

Operational noise contours - proposed modification



Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)

\\EMMSVR1\centennial_coal\J200309 - Myuna Coal Mine - Mod 2\GIS\02_Maps\Myuna_Colliery\G006_NoiseContours_20200611_01.mxd 2/07/2020

KEY

Myuna Colliery surface facilities area
Major road
Minor road
Named watercourse
Assessment location
Proposed weighbridge

Night period noise level contour
- 35 dB(A)
- 37 dB(A)
- 38 dB(A)
- 40 dB(A)
- 45 dB(A)
- 50 dB(A)

Existing surface features
1. Emergency coal stockpile sediment dam pumphouse
2. Emergency coal stockpile sediment dam
3. Emergency coal stockpile area
4. Power factor correction banks
5. ROM bin
6. Overland conveyor switch room
7. Finished prospect bin
8. Breaker
9. Downcast air shaft
10. Materials reclaim area
11. Drive house
12. Crusher
13. Conveyer drop portal
14. Materials yard
15. Oil storage
16. Washdown bay & oily water separator
17. Hydrocarbon recycling depot
18. Workshop and store
19. Washhouse
20. Upcast shaft
21. Main gate
22. Bathhouse & administration office
23. Service bay
24. Employee and materials portal
25. Ramp
26. Winder
27. Water management infrastructure
28. Haul road

Operational noise contours- proposed modification - night-time, noise enhancing meteorology

Myuna Colliery Modification 2
Noise and vibration impact assessment
Figure C1

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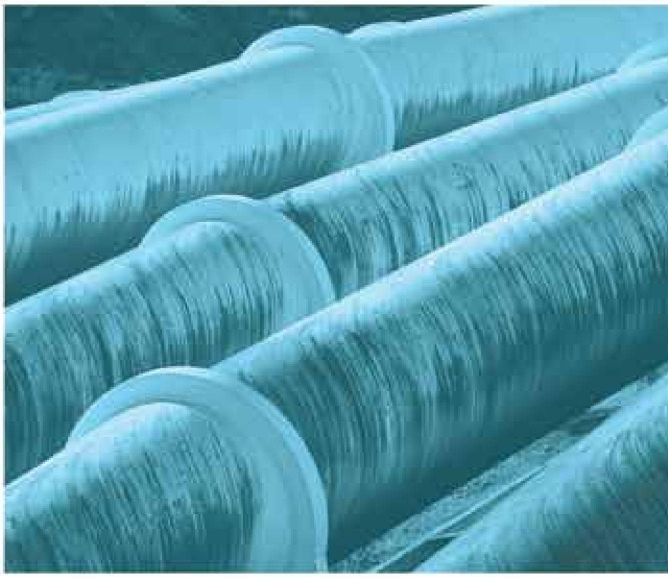
Appendix B

Air quality impact assessment

Myuna Colliery - Modification 2

Air quality impact assessment

Prepared for Centennial Myuna Pty Limited
July 2020



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Perth WA 6000
T 02 9339 3184

CANBERRA
Level 8, 121 Marcus Street
Canberra ACT 2600

Myuna Colliery - Modification 2

Air quality impact assessment

Report Number

J200309 RP#1

Client

Centennial Myuna Pty Limited

Date

1 July 2020

Version

Final

Prepared by	**Approved by**
	
Francine Manansala	**Scott Fishwick**
Associate - Air Quality	Associate - National Technical Leader, Air Quality
1 July 2020	1 July 2020

Executive Summary

This air quality impact assessment (AQIA) supports an application for a modification to operations at the Myuna Colliery (Myuna), an existing underground coal mine owned and operated by Centennial Myuna Pty Limited (Centennial Myuna). The Myuna pit top is 25 kilometres (km) south-west of Newcastle, New South Wales (NSW), in the Lake Macquarie local government area (LGA). Centennial Myuna is seeking to modify their approval to allow for the transfer of coal between Myuna's pit top and the Cooranbong Entry Site (CES) and associated activities.

The AQIA documents the existing air quality and meteorological environment, applicable impact assessment criteria, air pollutant emission calculations, dispersion modelling of calculated emissions and provides an assessment of predicted impacts relative to criteria.

The AQIA has been prepared in general accordance with the guidelines specified by the NSW Environment Protection Authority (EPA) in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2016).

Local meteorological conditions were quantified primarily using data from the Centennial Myuna Automatic Weather Station (AWS). Meteorological modelling for the surrounding region was undertaken using a range of Centennial, Delta Coal and Bureau of Meteorology-owned weather stations. Background air quality was characterised primarily from Centennial-owned air quality monitoring networks in the local area.

Emissions estimation and dispersion modelling was completed for an existing operational scenario corresponding to a maximum coal processing rate of 3 million tonnes per annum (Mtpa). A proposed operations scenario included the same maximum processing rate plus an additional 0.2 Mtpa of coal being received from CES.

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 modelled.

The atmospheric dispersion of air pollutant emissions was simulated using the CALPUFF model.

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) were below the applicable impact assessment criteria at all assessment locations.

Cumulative impacts were assessed by combining modelled Myuna 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.

A range of best practice dust mitigation measures are currently and will continue to be employed at Myuna. These include the use of water carts and sprays, paved roads, enclosed conveyors, enclosed processing plant and watering of the emergency stockpile. These measures have been taken into account in the emissions estimation and modelling of each scenario.

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1 Introduction

1.1 Overview

Myuna Colliery (Myuna) is an existing underground coal mine owned and operated by Centennial Myuna Pty Limited (Centennial Myuna). Myuna's pit top is 25 kilometres (km) south-west of Newcastle, New South Wales (NSW), in the Lake Macquarie local government area (LGA). Figure 1.1 shows Myuna in a regional context and Figure 1.2 shows Myuna in a local context.

Myuna operates under two development consents:

- SH110_148, which was granted by Lake Macquarie City Council (LMCC) in 1977 under the provisions of the now repealed NSW *Local Government Act 1919* for the development and operation of the Myuna and Cooranbong collieries; and

- MP 10_0080, which was granted by the Minister of Planning and Infrastructure on 18 January 2012 under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for continued mining in areas outside the area defined by SH110_148. MP 10_0080 also authorises the use of bord and pillar methods in the Wallarah, Great Northern and Fassifern coal seams and the continued use of existing infrastructure on-site until 31 December 2032.

MP 10_0080 has since been declared a State significant development (SSD) under Clause 6 of Schedule 2 of the NSW Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017. Accordingly, Myuna now operates as an SSD approval.

Coal produced at Myuna is transferred from Myuna's pit top to the Eraring Power Station (about 4 km west of the pit top) by overland conveyor. Coal from Myuna that does not meet Eraring Power Station specifications, is stockpiled at Myuna's emergency coal stockpile until it can be reclaimed and blended with coal to meet these specifications. However, there is limited capacity to store coal at Myuna's pit top prior to blending and dispatch.

The Northern Coal Logistics Project regulates coal handling, processing, and transport operations at the Newstan Colliery Surface Site, Cooranbong Entry Site (CES) and associated private haul roads, and also the use of various other surface infrastructure items. The Northern Coal Logistics Project operates under SSD-5145, which was granted by the Minister for Planning on 29 September 2015.

CES is approximately 2 km north of Dora Creek in the Lake Macquarie LGA (Figure 1.1). It was originally developed as part of CES. CES comprises a coal handling plant (CHP), coal stockpiles, workshop building, administration building, car park and water management infrastructure. CES is approved to receive and process ROM coal from Mandalong Mine (SSD-5144). Coal handled at CES can be delivered to either the Eraring Power Station via overland conveyor or to Newstan Colliery for further processing and transfer into the export market.

In recent months, Centennial Myuna has been experiencing fluctuations in coal quality with some product coal not meeting Eraring Power Station specifications. Centennial Myuna has assessed a number of options to ensure that it can continue to meet its contractual obligations to supply coal to Eraring Power Station. This assessment found that the best option is to blend coal from Myuna with coal from Mandalong Mine, with blending occurring at both at Myuna's pit top and at CES. This would allow Centennial Myuna to continue to provide a secure supply of coal to Eraring Power Station and to secure ongoing employment for Myuna's workforce.

Centennial Myuna is seeking to modify MP 10_0080, pursuant to Section 4.55(2) of the EP&A Act, to allow coal to be transferred between Myuna's pit top and CES, blending of this coal at Myuna and associated activities. Coal would be transported between Myuna's pit top and CES by truck.

At the same time Centennial Myuna is seeking to modify MP 10_0080, Centennial Northern Coal Services Pty Limited (Centennial NCS) will submit a modification application for SSD-5145 to allow coal from Myuna to be received, handled and blended at CES.

This air quality impact assessment (AQIA) has been prepared by EMM Consulting Pty Limited (EMM) on behalf of Centennial Myuna, to assess potential air quality impacts associated with Myuna's existing and proposed operations on the surrounding environment. The AQIA has been prepared in general accordance with the guidelines specified by the NSW Environment Protection Authority (EPA) in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2016), referred to herein as 'the Approved Methods for Modelling'.

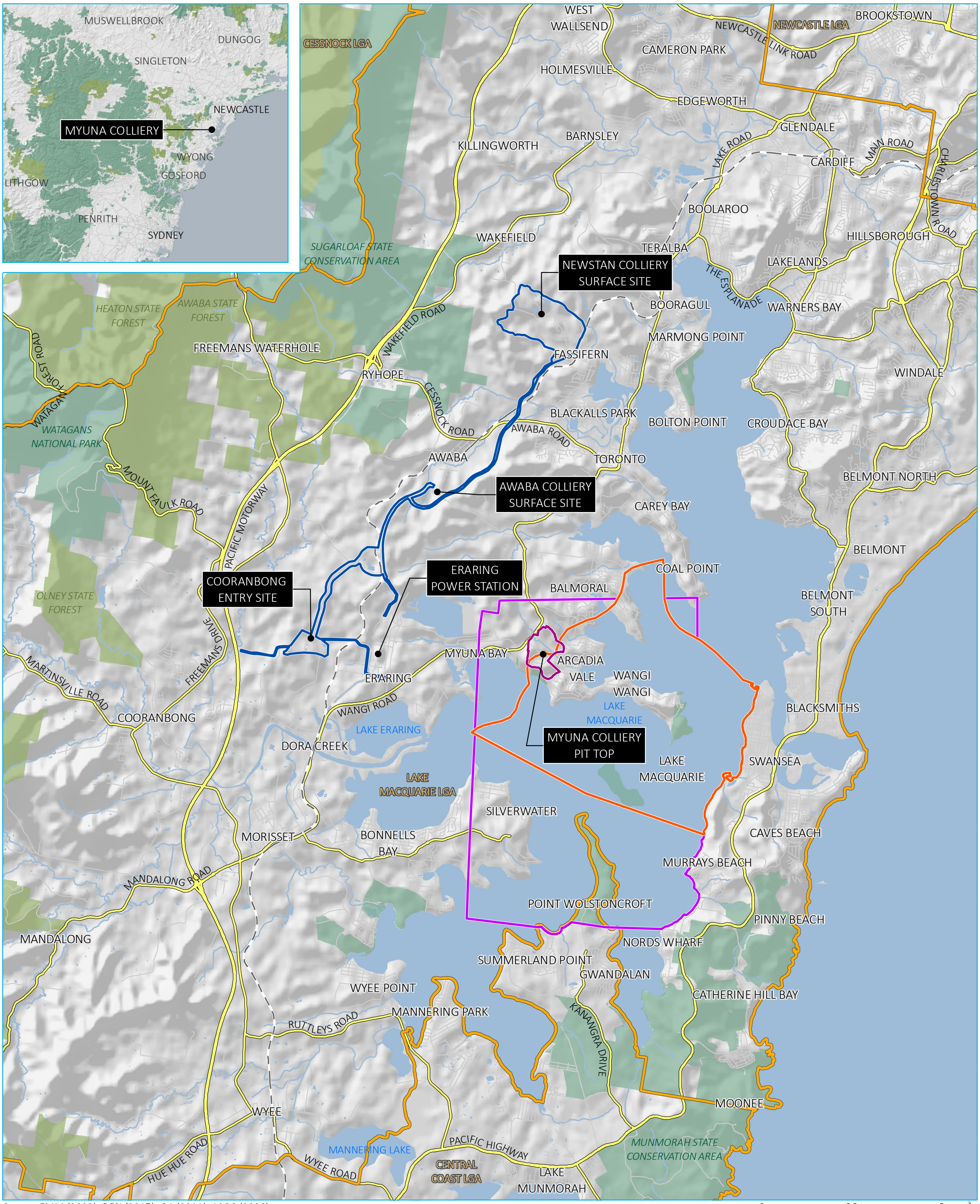
In 2014, SLR Consulting prepared an AQIA for a modification to MP 10_0080 (SLR 2014).

1.2 Purpose of this report

This AQIA documents the existing air quality and meteorological environment, applicable impact assessment criteria, air pollutant emission calculations, dispersion modelling of calculated emissions and assessment of predicted impacts relative to criteria.

This AQIA consists of the following sections:

- a description of the local setting and surrounds of Myuna;
- the pollutants which are relevant to the assessment, and the applicable impact assessment criteria;
- a description of the existing environment, specifically:
    - the meteorology and climate; and
    - the existing air quality environment;
- detailed air pollutant emissions inventories for Myuna;
- atmospheric dispersion modelling for the quantified emissions, including an analysis of mine-only and cumulative impacts accounting for baseline air quality; and
- an overview of best practice dust mitigation measures employed at Myuna.



Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006)

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KEY

- Rail line
- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest
- Local government area
- Myuna Colliery surface facilities area

Development consent boundaries

- Myuna Colliery development consent boundary (SH110_148)
- Myuna Colliery project approval boundary (MP 10_0080)
- Northern Coal Logistics development consent boundary (SSD-5145)

Regional context

Myuna Colliery Modification 2
Air quality impact assessment
Figure 1.1

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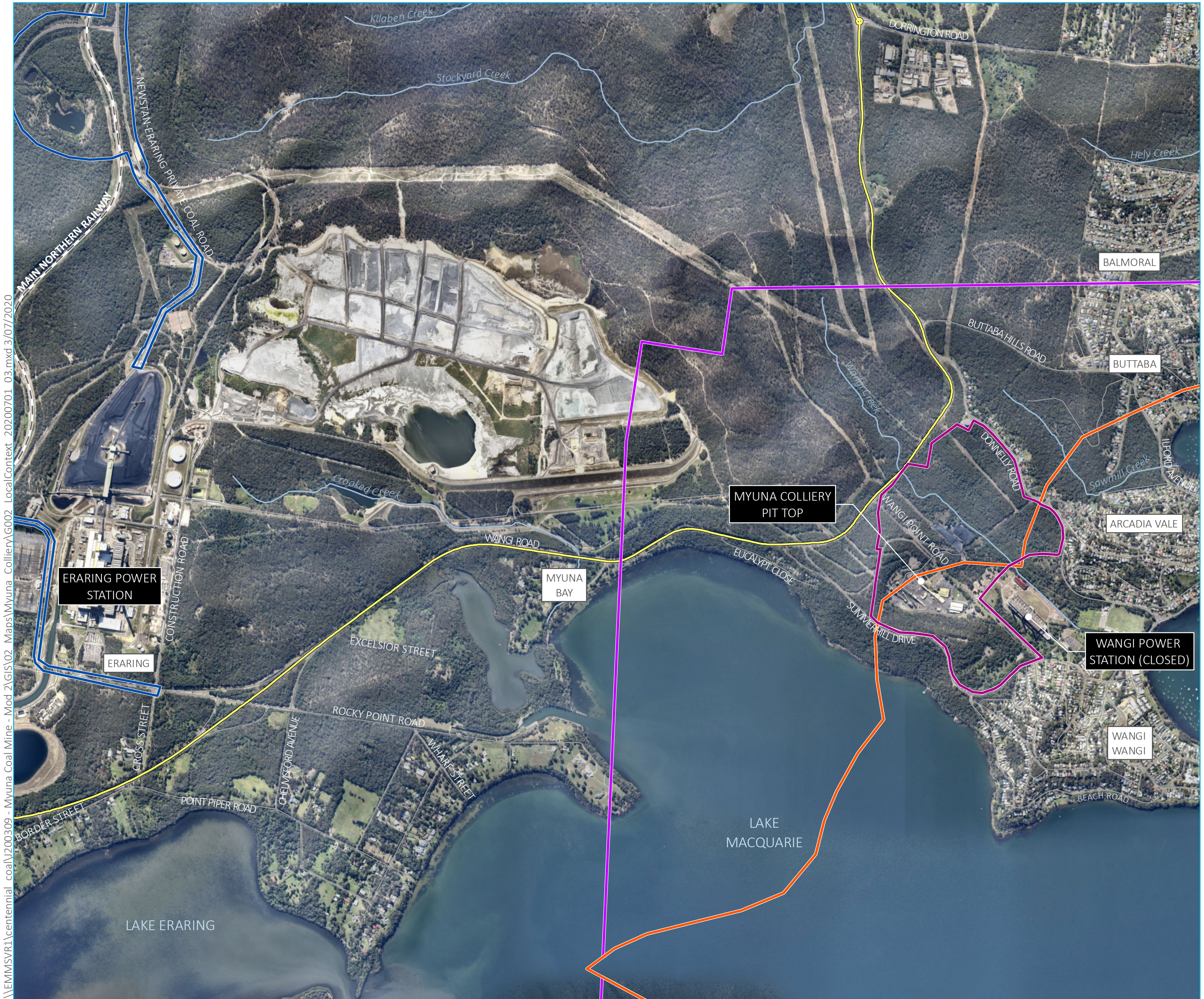

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Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)

KEY
- Myuna Colliery development consent boundary (SH110_148)
- Northern Coal Logistics development consent boundary (SSD-5145)
- Myuna Colliery project approval boundary (MP 10_0080)
- Myuna Colliery surface facilities area
- Rail line
- Major road
- Minor road
- Named watercourse

Local context

Myuna Colliery Modification 2
Air quality impact assessment
Figure 1.2

creating opportunities

1.3 Proposed modification

To ensure that Myuna can continue to meet its contractual obligations to supply coal to Eraring Power Station and secure ongoing employment for Myuna's workforce, Centennial Myuna propose to blend coal from Myuna with coal from Mandalong Mine both on-site at Myuna's pit top and at CES.

It is proposed to modify MP 10_0080 to:

- allow up to 1 million tonnes per annum (Mtpa) of Myuna coal to be trucked from Myuna's pit top to CES via the public and private road networks and blending with coal from Mandalong Mine before transfer to Eraring Power Station by conveyor;
- allow up to 0.2 Mtpa of Mandalong Mine coal to be backloaded by truck from CES to Myuna's pit top and blending with coal from Myuna before transfer to Eraring Power Station by conveyor;
- allow construction and operation of a vehicle weighbridge at Myuna's pit top;
- allow trucks to access Myuna's pit top via Wangi Road and Wangi Point Road; and
- include a consent condition to address the environmental management of exploration activities and minor surface infrastructure.

The proposed transport route consists of Wangi Point Road from Myuna's pit top area, public roads (ie Wangi Road and Wilton Road) between Myuna and the Awaba Colliery surface site and private haul roads between the Awaba Colliery surface site and CES. The proposed transport route is shown on Figure 4.1 of the modification report.

Truck movements will be limited to 7.00 am–6.00 pm Monday to Saturday.

Truck numbers along the private haul road network between the Awaba Colliery surface site and CES will be within previously assessed and approved limits under SSD-5145 (ie 32 truck movements per hour).

All trucks leaving Myuna will be weighed using a vehicle weighbridge proposed to be installed at Myuna's pit top (Figure 1.3). A truck wheel wash will also be used by all trucks before leaving site via a privately-owned section of Wangi Point Road.

No revisions to the project approval (MP 10_0080) or development consent (SH110_148) boundaries for Myuna are required as part of the proposed modification. The proposed modification will not change the approved life of mining operations and does not include an increase to Myuna's approved extraction rate of 3 Mtpa.

Myuna's surface facilities are shown on Figure 1.3.

1.3.1 Material handling

Up to 1 Mtpa of ROM coal from Myuna will be transferred by truck directly from Myuna to the middlings coal stockpile at CES.

Up to 0.2 Mtpa of Mandalong Mine coal will be backloaded from CES to Myuna's pit top. A front end loader will be used to load trucks at CES.

On arrival at Myuna's pit top, coal from CES will be tipped onto, and temporarily stored at, Myuna's emergency coal stockpile area before being reclaimed through Myuna's existing coal handling infrastructure (Figure 1.3).

A front end loader will be used at Myuna's emergency coal stockpile to load the trucks that will transport the coal to Myuna's existing below ground reclaimer.

Blending of Myuna coal with Mandalong Mine coal will occur either at Myuna's emergency coal stockpile or within Myuna's CHP.

The proposed importation of up to 0.2 Mtpa of Mandalong Mine coal from CES will not exceed previously approved coal handling limits at Myuna's pit top (3 Mtpa).

Coal handling activities will continue to occur 24 hours a day, 7 days a week and coal will continue to be transferred from Myuna to Eraring Power Station by the overland conveyor system.

1.3.2 Proposed truck transport

The proposed transport route is described in Chapter 4 of the modification report. This route has been selected by Centennial Myuna to avoid trucks travelling through residential areas. There are no residences immediately adjacent to, or with driveways on, the parts of Wangi Road and Wilton Road that are part of the transport route. The closest residences to the proposed transport route are residences on Donnelly Road, Arcadia Vale, which are approximately 80 m from Wangi Road at their closest point.

Truck movements between Myuna's pit top and CES will be limited to 7.00 am–6.00 pm Monday to Saturday. There will be a maximum of 10 loaded trucks (20 truck movements) per hour departing from Myuna's pit top. Between 3.00 pm and 4.00 pm Monday to Friday, truck movements will be restricted to 5 loaded trucks (10 truck movements) per hour to minimise impacts during the afternoon peak hour.

All trucks leaving Myuna will be weighed using the proposed vehicle weighbridge. The truck wheel wash will also be used by all trucks before leaving site. All loads will be covered.

1.4 Site and surrounding area

As noted in Section 1.1, Myuna operates under two development consents. The project approval boundary is applicable to MP 10_0080 and encompasses an area of 3,773.2 hectares (ha). The development consent boundary is applicable to SH110_148 and encompasses an area of 3,105.4 ha. Myuna's pit top sits within the project approval boundary.

The majority of the project approval boundary is beneath Lake Macquarie which is NSW Government Crown land. The remaining land within the project approval boundary is predominantly privately-owned. Myuna's surface facilities area is on land owned by Centennial Fassifern Pty Ltd, a sister company of Centennial Myuna.

Myuna's pit top can be accessed directly from Summerhill Drive. A locked gate prevents entry to Myuna's pit top via a Centennial-owned section of Wangi Point Road off Wangi Road. Myuna's pit top is west of the residential area of Arcadia Vale, north-west of Wangi Wangi and is adjacent to the site of the former Wangi Power Station. Eraring Power Station is approximately 4 km west of Myuna's pit top.

Land uses surrounding Myuna's pit top include a mix of mining, industrial (including the now closed Wangi Wangi Power Station) and residential (including the suburbs of Wangi Wangi and Arcadia Vale). Lake Macquarie is approximately 400 m south of Myuna's pit top at its closest point. Wangi Road, Donnelly Road and Summerhill Drive are to the north-west, north-east and south of Myuna's pit top, respectively.

The area surrounding Myuna is characterised by elevated terrain. Elevation directly surrounding Myuna ranges from approximately 19 m AHD to 56 m AHD. A three-dimensional representation of the local topography is presented in Figure 1.4.

Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006)

KEY

- Myuna Colliery surface facilities area
- Major road
- Named watercourse
- Assessment location
- Proposed weighbridge

Existing surface features

1. Emergency coal stockpile sediment dam pumphouse
2. Emergency coal stockpile sediment dam
3. Emergency coal stockpile area
4. Power factor correction banks
5. ROM bin
6. Overland conveyor switch room
7. Finished prospect bin
8. Breaker
9. Downcast air shaft
10. Materials reclaim area
11. Drive house
12. Crusher
13. Conveyer drop portal
14. Materials yard
15. Oil storage
16. Washdown bay & oily water separator
17. Hydrocarbon recycling depot
18. Workshop and store
19. Washhouse
20. Upcast shaft
21. Main gate
22. Bathhouse & administration office
23. Service bay
24. Employee & materials portal
25. Ramp
26. Winder
27. Water management infrastructure
28. Haul road

Myuna Colliery surface facilities area

Myuna Colliery Modification 2
Air quality impact assessment
Figure 1.3

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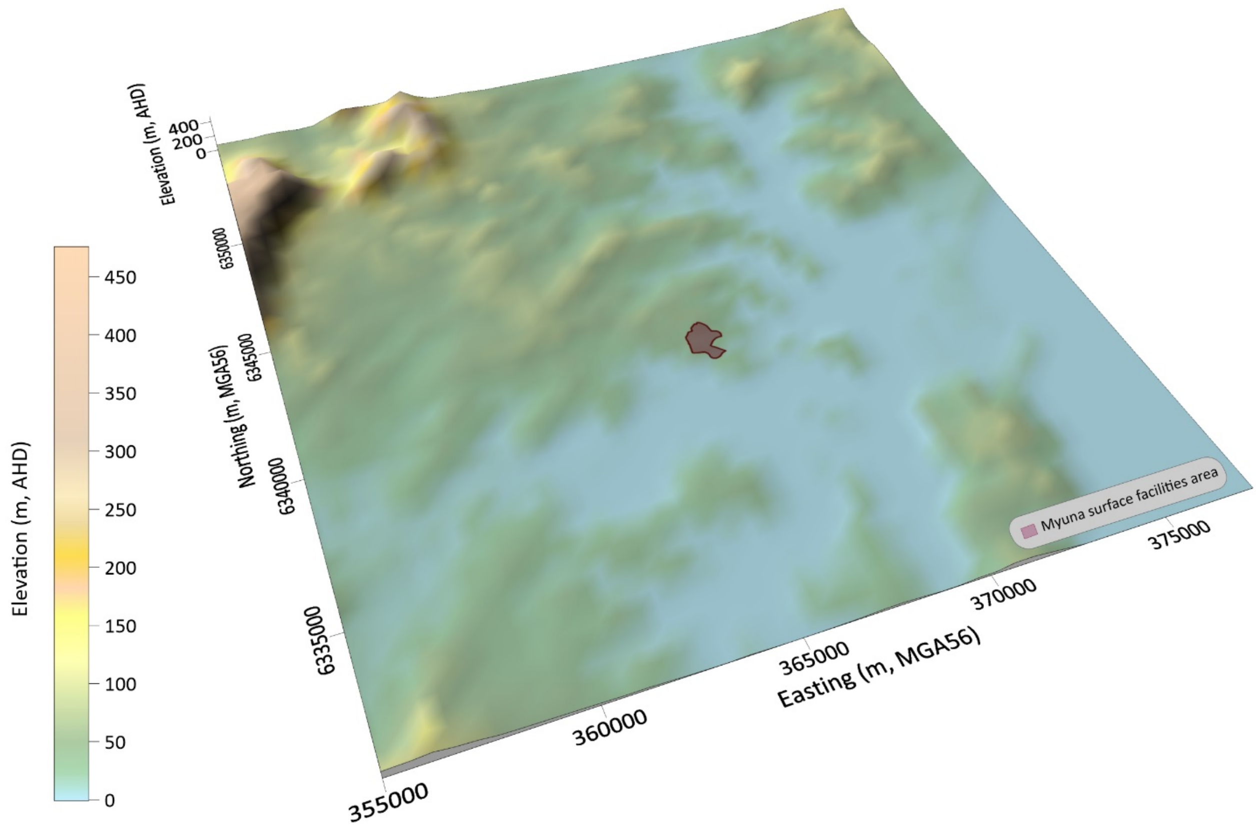


Figure 1.4 3-dimensional topography surrounding Myuna

Source: NASA Shuttle Radar Topography Mission data

1.5 Assessment locations

There are a number of residences in the area surrounding Myuna. The closest residence is R2, approximately 500 m south-east of Myuna's pit top.

The nearest representative air quality sensitive locations to Myuna have been identified for the purposes of assessing potential air quality impacts. Details are provided in Table 1.1 and their locations are shown in Figure 1.2. They are referred to in this report as assessment locations.

Table 1.1 Air quality assessment locations

Location ID	Description	Assessment location type	Easting	Northing
R1	2 Turrama Street, Wangi Wangi	Residential	366858	6340370
R2	2 Moani Street, Wangi Wangi	Residential	366645	6340189
R3	3 Sunset Close, Wangi Wangi	Residential	365707	6340844
R4	119 Donnelly Road, Arcadia Vale	Residential	366665	6341677
R5	93 Donnelly Road, Arcadia Vale	Residential	366857	6341348
R6	83 Donnelly Road, Arcadia Vale	Residential	367049	6341185
R7	63 Donnelly Road, Arcadia Vale	Residential	367079	6340971
R8	53 Donnelly Road, Arcadia Vale	Recreation	367096	6340814

2 Pollutants and assessment criteria

2.1 Potential air pollutants

This assessment includes consideration of potential impacts from operational emissions at Myuna for existing and proposed scenarios (explained further in Section 5).

Emissions will principally consist of particulate matter emissions from the conveying and transfer of ROM coal, coal sizing, hauling coal and wind erosion of exposed areas.

The proposed modification will include some minor construction activities which have the potential to generate dust emissions. Construction phase emissions will principally consist of particulate matter emissions related to the construction of the weighbridge at Myuna's pit top and road widening works along Wangi Point Road. The duration of the construction is likely to be approximately eight days. Given the short timeframe and small-scale of the construction activities, this has not been assessed further.

A detailed description of the emission sources associated with the existing and proposed operations at Myuna is presented in Section 5. The main air pollutants emitted will be:

- Particulate matter, specifically:
  - total suspended particulate matter (TSP);
  - particulate matter less than 10 micrometres (µm) in aerodynamic diameter (PM_{10}); and
  - particulate matter less than 2.5 µm in aerodynamic diameter ($PM_{2.5}$).
- Gaseous pollutants, specifically:
  - oxides of nitrogen (NO_x)[1], including nitrogen dioxide (NO_2);
  - sulphur dioxide (SO_2);
  - carbon monoxide (CO); and
  - volatile organic compounds (VOCs).

Of the above listed pollutants, this assessment will focus on emissions and impacts from particulate matter (TSP, PM_{10} and $PM_{2.5}$). Impact assessment criteria applicable to particulate matter is presented in the following sections as defined in the Approved Methods for Modelling (EPA 2016). The impact assessment criteria are designed to maintain ambient air quality that allows for the adequate protection of human health and well-being.

Myuna generates and will continue to generate emissions of gaseous pollutants, including NO_x, CO, SO_2 and VOCs from fuel combustion. Surface emissions from diesel fuel combustion are expected to be low considering the small surface area, limited surface-based equipment and the use of conveyors on-site. The majority of diesel combustion is generated underground and will be released from the ventilation shaft (accounted for in the calculated ventilation shaft emissions).

It is also noted that the AQIA prepared by SLR (2014) included an assessment of odour emissions from the upcast ventilation shaft under a maximum 3 Mtpa ROM coal extraction scenario. Under existing and proposed scenarios,

[1] By convention, NOx = nitrous oxide (NO) + NO_2.

the underground ROM coal extraction rate will remain at 3 Mtpa. As a result, no change to the potential for odour emissions or impacts are anticipated from the 2014 SLR AQIA. No further consideration of odour emissions or impacts is presented within this report.

2.2 Applicable air quality assessment criteria

2.2.1 Particulate matter

The NSW EPA's impact assessment criteria for particulate matter, as documented in Section 7 of the Approved Methods for Modelling, are presented in Table 2.1. The assessment criteria for PM_{10} and $PM_{2.5}$ are consistent with the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM) national reporting standards (DoE 2016).

TSP, which relates to airborne particles less than around 45 µm in diameter (US EPA 1998a), is used as a metric for assessing amenity impacts (reduction in visibility, dust deposition and soiling of buildings and surfaces) rather than health impacts. Particles less than 10 µm and 2.5 µm in diameter, a subset of TSP, are fine enough to enter the human respiratory system and can lead to adverse human health impacts. The NSW EPA impact assessment criteria for PM_{10} and $PM_{2.5}$ are therefore used to assess the potential impacts on human health of particulate matter concentrations.

The Approved Methods for Modelling classifies TSP, PM_{10}, $PM_{2.5}$ and dust deposition as criteria pollutants. Assessment criteria for criteria pollutants are applied at the nearest existing or likely future off-site sensitive receptor and compared against the 100th percentile (ie the highest) dispersion modelling prediction in the case of 24-hour impacts. Both the incremental (assessed project impacts only) and cumulative (project including background) impacts need to be presented, the latter requiring consideration of existing ambient background concentrations for the criteria pollutants assessed.

For dust deposition, the NSW EPA (2016) specifies criteria for incremental and cumulative dust deposition levels. Dust deposition impacts are derived from TSP emission rates and particle deposition calculations in the dispersion modelling process.

Table 2.1 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.

3 Meteorology and climate

3.1 Introduction

Meteorological mechanisms govern the generation, dispersion, transformation and eventual removal of pollutants from the atmosphere. To adequately characterise the dispersion meteorology of a region, information is needed on the prevailing wind regime, ambient temperature, rainfall, relative humidity, mixing depth and atmospheric stability.

Analysis of meteorology for the local area is presented based on the Myuna automatic weather station (AWS), approximately 190 m east of the main surface activities. Data from this station is available between January 2017 and December 2019.

Data from the Myuna AWS has been supplemented with data from other Centennial or other mine-owned meteorological stations in the area as well as the closest Bureau of Meteorology (BoM) monitoring stations as follows:

- Centennial Awaba AWS, approximately 5.4 km north-west of Myuna;
- Centennial Mandalong AWS, approximately 11.4 km south-west of Myuna;
- Delta Coal's Mannering AWS, approximately 12.8 km south of Myuna (previously owned by Centennial); and
- BoM Cooranbong (Lake Macquarie AWS), approximately 9.9 km south-west of Myuna.

Cloud amount and cloud height data were not measured at the above sites and therefore these data were incorporated in CALMET through the use of the prognostic 3-dimensional data extracted from The Air Pollution Model (TAPM).

The locations of the meteorological stations used in the assessment are shown in Figure 3.1.

3.2 Prevailing winds and selection of a representative year

Meteorological data recorded by the Myuna AWS for the period between 2017 and 2019 were analysed for the purposes of characterising the existing environment and selecting a representative year for dispersion modelling.

Figure A.1 shows that data availability for all years was between 91.8% and 100% across the most important parameters for modelling.

Inter-annual profiles for wind speed, wind direction, air temperature and relative humidity for 2017 to 2019 are shown in Figure A.3 to Figure A.6 were also comparable between 2017 and 2019.

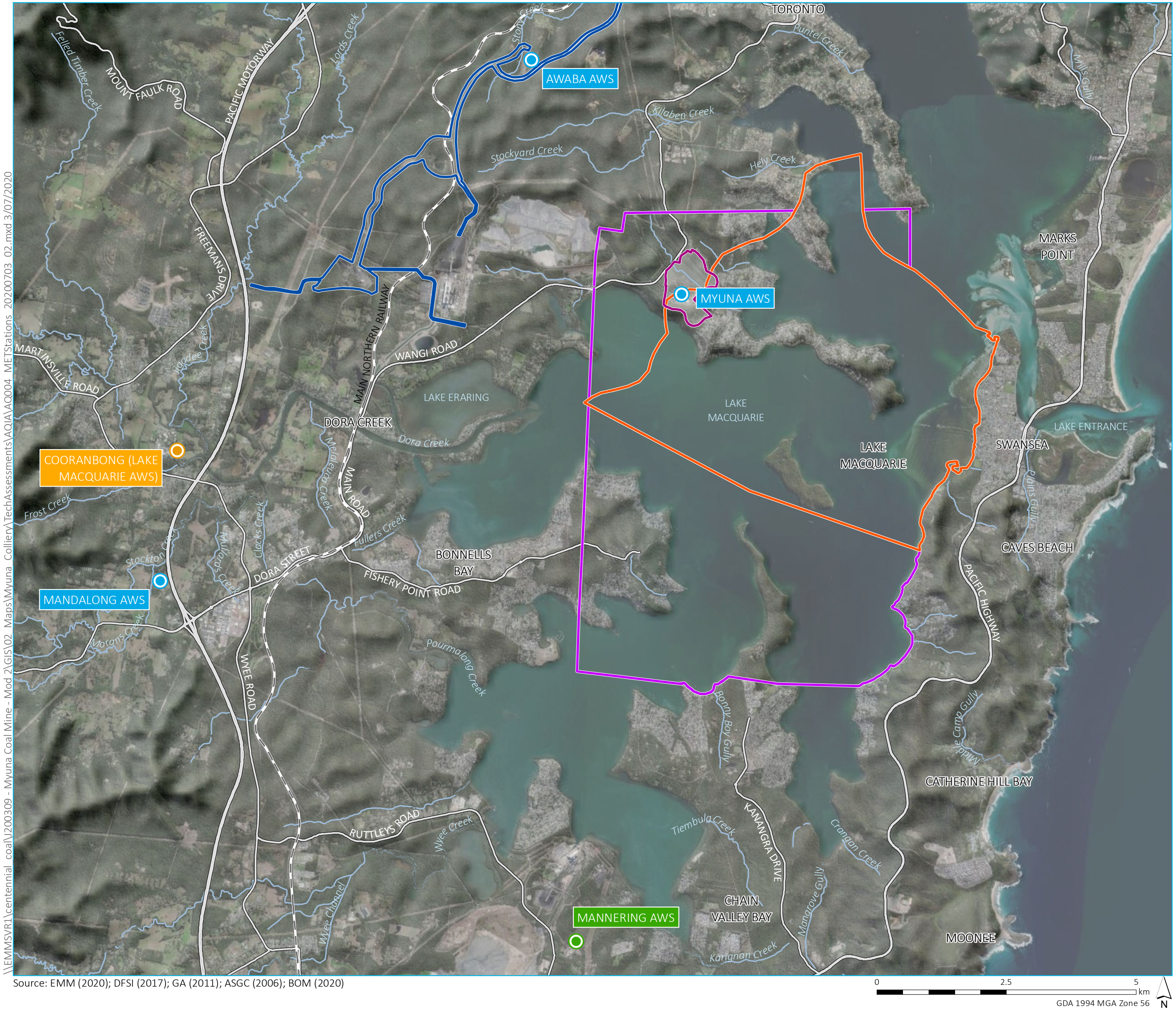
Annual wind roses created from wind speed and direction data collected at the Myuna AWS from 2017 to 2019 are presented in Figure A.6. The wind roses show a similarity across years for both wind speed and wind direction. The winds recorded by the Myuna AWS across all three years were predominately from the west and east. Annual average wind speeds ranged between 1.5 m/s and 1.6 m/s. The annual average frequency of calm conditions (wind speeds less than 0.5 m/s) ranged between 13.2% and 15.7%.

Seasonal wind roses for the Myuna AWS 2017 to 2019 are shown in Figure A.7. The mean wind speed ranges from 1.3 m/s in winter to 1.7 m/s in spring and summer. The annual percentage of calm conditions ranged from 10.7%

in summer and 17.5% in autumn. The wind patterns in spring and summer were very similar displaying dominant easterly winds. In autumn and winter the dominant winds were from the west.

Variation in wind patterns was more pronounced on a diurnal basis. Diurnal wind roses for the Myuna AWS are shown in Figure A.8. Easterlies and westerlies were prominent during daytime hours and westerlies and north-easterlies were prominent during night-time hours. The average wind speed during the day was 1.9 m/s compared to 1.2 m/s at night-time. The percentage of calms during the day was 7.4% compared to 21.7% at night.

The 2018 calendar year was adopted as the 12-month modelling period for the purpose of this AQIA given the data availability and consistency of the data year-on-year. The modelling year was also chosen with regard to background air quality which is discussed in Section 4.3. The annual wind rose for the Myuna AWS for 2018 is shown in Figure 3.2. The wind rose displays the same characteristics as that described above, specifically dominated by winds from the eastern and western quadrants.



KEY
- Myuna Colliery surface facilities area
- Myuna Colliery development consent boundary (SH110/148)
- Myuna Colliery project approval boundary (PA 10_0080)
- Northern Coal Logistics development consent boundary (SSD-5145)
- Major road
- Rail line
- Named watercourse
- Centennial
- Bureau of Meteorology
- Delta Coal

Location of meteorological stations

Myuna Colliery Modification 2
Air quality impact assessment
Figure 3.1

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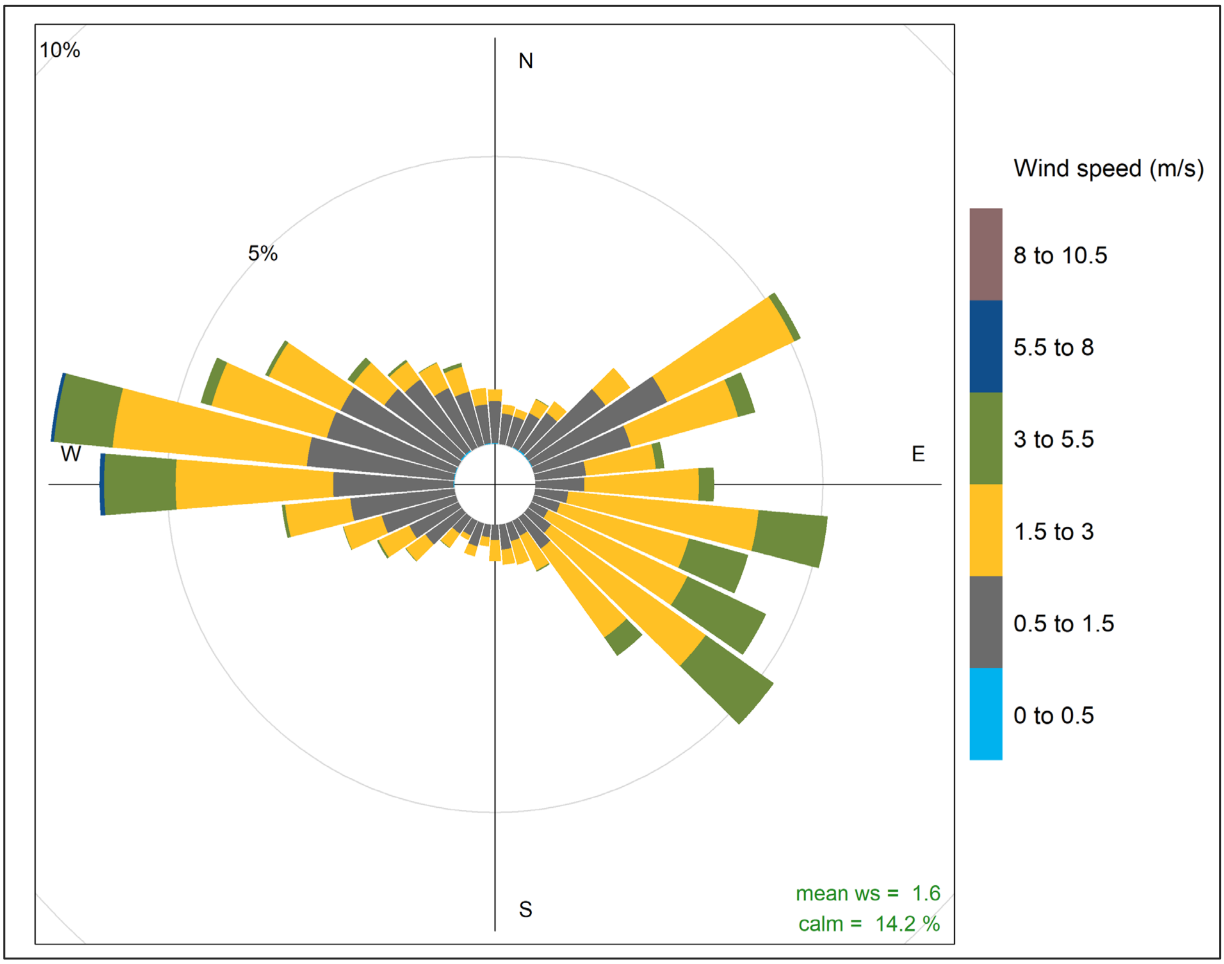


Figure 3.2 Recorded wind speed and direction – Myuna AWS – 2018

3.3 Meteorological modelling

3.3.1 Overview

Atmospheric dispersion modelling for this assessment has been completed using TAPM and the CALMET/CALPUFF model suite.

Section 4.1 of the Approved Methods for Modelling specifies that meteorological data representative of a site can be used in the absence of suitable on-site observations. The data should cover a period of at least one year with a percentage completeness of at least 90%. Data can be obtained from either a nearby meteorological monitoring station or synthetically generated using the CSIRO prognostic meteorological model TAPM.

Hourly average meteorological data from Centennial's Myuna, Awaba and Mandalong, and Delta Coal's Mannering AWSs as well as the BoM Cooranbong (Lake Macquarie AWS) was used as observations in the TAPM and CALMET modelling.

Further details of the TAPM and CALMET meteorological modelling is presented in Appendix A.

3.3.2 CALMET predicted winds

As stated, hourly observations from the Myuna AWS, Centennial-owned stations and the BoM Cooranbong station were used as input to the CALMET meteorological modelling completed. Hourly meteorological predictions were extracted at Myuna's pit top to compare with the measured data at the Myuna AWS and verify the performance of CALMET in predicting local meteorological conditions. Verification was completed to confirm that the predicted winds at the pit top appeared reasonable and reflected local terrain features. Adopted CALMET settings, such as the RMAX and R1 factors are further explained in Appendix A.

An annual wind rose created from the CALMET data extract at Myuna's pit top is presented in Figure 3.3.

The annual wind rose created from the CALMET data is very similar in pattern to the wind rose created from the observations as shown in Figure 3.2. The annual average wind speed for both datasets is 1.6 m/s. The annual percentage of calms is 14.2% in the observed data and 11.4% from the CALMET extracted data.

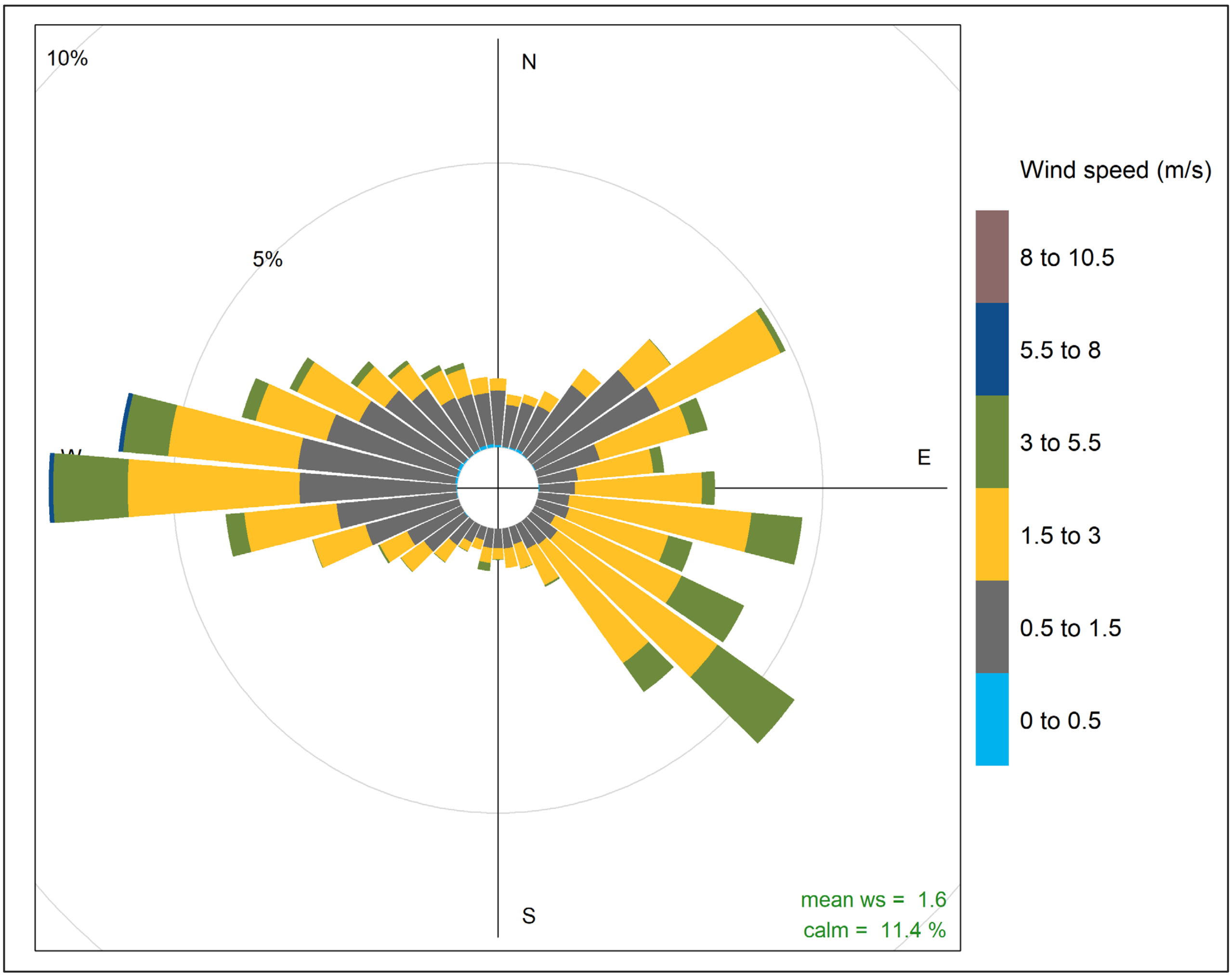


Figure 3.3 CALMET-predicted wind speed and direction – Myuna – 2018

3.3.3 Atmospheric stability and mixing depth

Atmospheric stability refers to the degree of turbulence or mixing that occurs within the atmosphere and is a controlling factor in the rate of atmospheric dispersion of pollutants.

The Monin-Obukhov length (L) provides a measure of the stability of the surface layer (ie the layer above the ground in which vertical variation of heat and momentum flux is negligible; typically, about 10% of the mixing height). Negative L values correspond to unstable atmospheric conditions, while positive L values correspond to stable atmospheric conditions. Very large positive or negative L values correspond to neutral atmospheric conditions.

Figure 3.3 illustrates the diurnal variation of atmospheric stability, derived from the Monin-Obukhov length calculated by CALMET, extracted at the Myuna AWS. The diurnal profile shows that atmospheric instability increases during the daylight hours as the sun generated convective energy increases, whereas stable atmospheric conditions prevail during the night-time. This profile indicates that the potential for effective atmospheric dispersion of emissions would be greatest during daytime hours and lowest during evening through to early morning hours.

Mixing depth refers to the height of the atmosphere above ground level within which the dispersion of air pollution can be dispersed. The mixing depth of the atmosphere is influenced by mechanical (associated with wind speed) and thermal (associated with solar radiation) turbulence. Similar to the Monin-Obukhov length analysis above, higher daytime wind speeds and the onset of incoming solar radiation increases the amount of mechanical and convective turbulence in the atmosphere. As turbulence increases, so too does the depth of the boundary layer, generally contributing to higher mixing depths and greater potential for the atmospheric dispersion of pollutants.

Figure 3.5 presents the hourly-varying atmospheric boundary layer depths generated by CALMET. Greater boundary layer depths occur during the daytime hours, peaking in the mid to late afternoon.

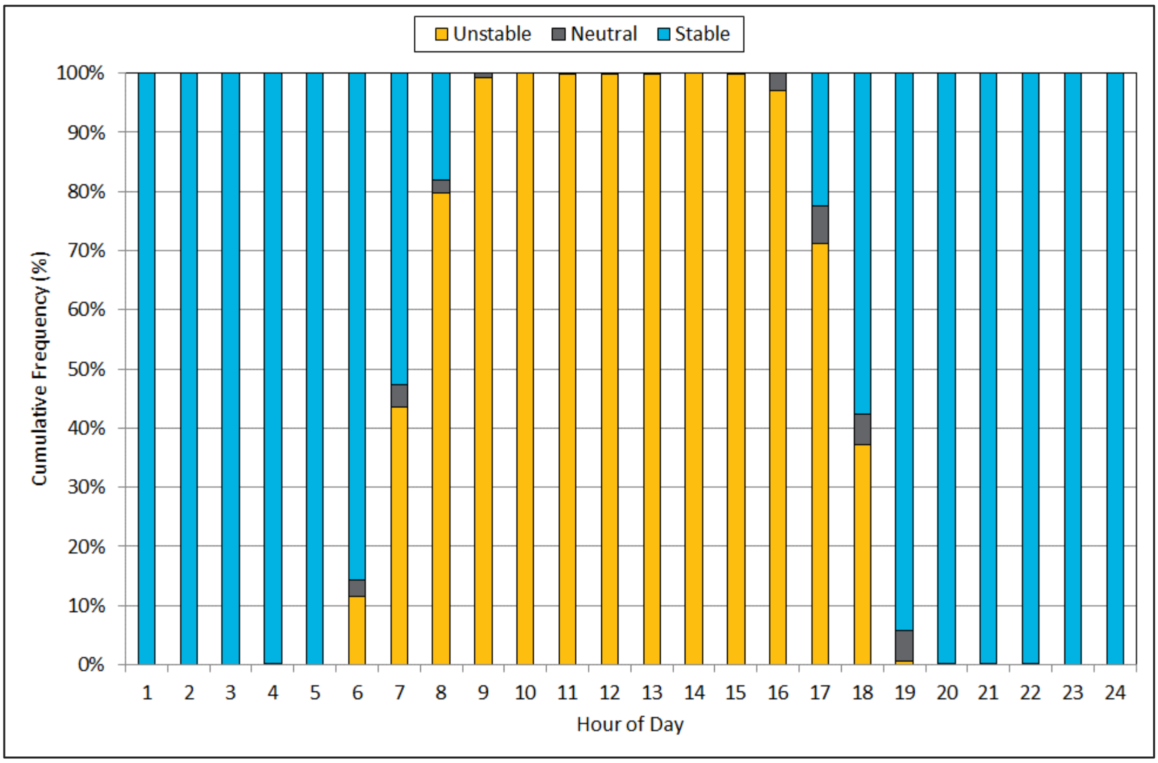


Figure 3.4 CALMET-calculated diurnal variation in atmospheric stability – Myuna AWS 2018

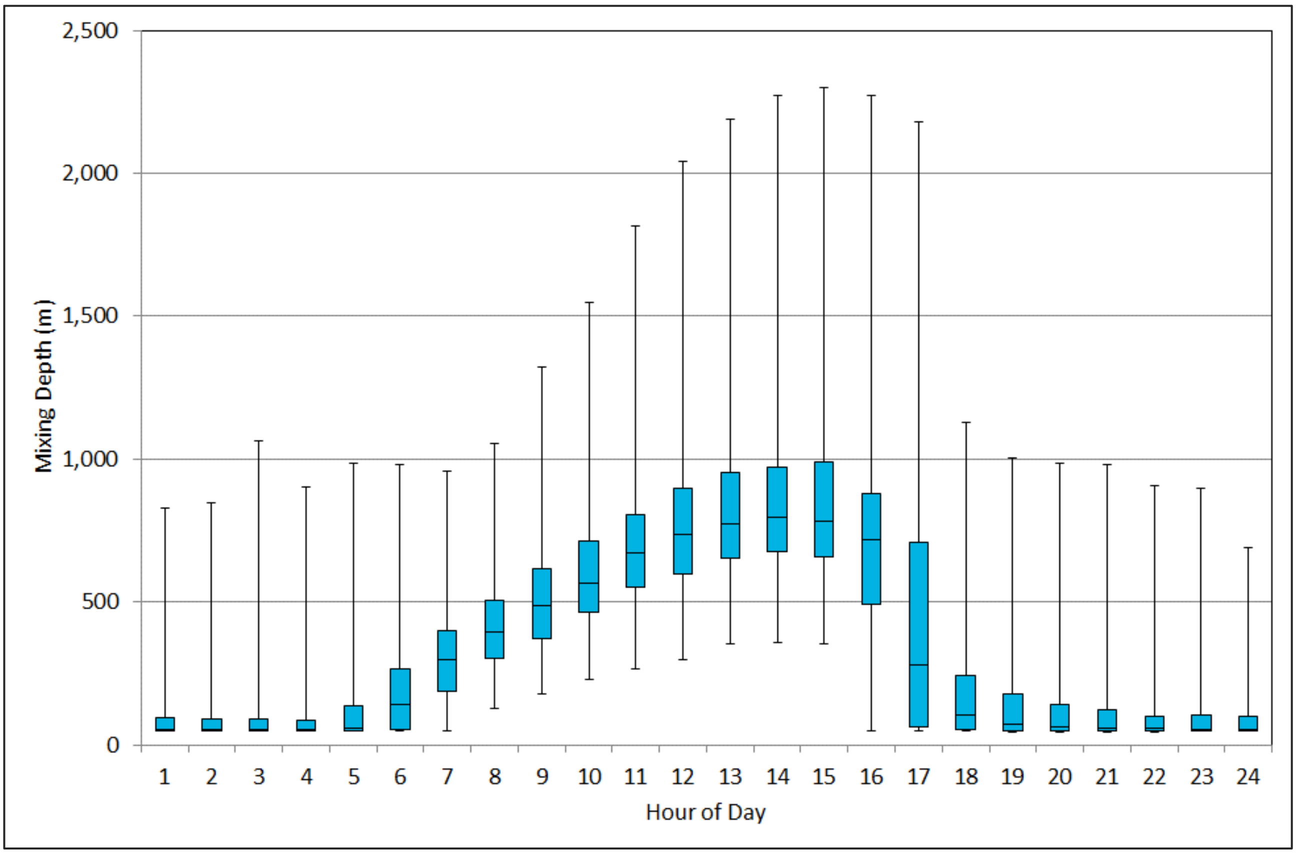


Figure 3.5 CALMET-calculated diurnal variation in atmospheric mixing depth – Myuna AWS 2018

4 Baseline air quality

4.1 Introduction

The local airshed will also be influenced by:

- emissions from existing industrial operations, including the Eraring Power station, Awaba Colliery surface site and Awaba Landfill and Waste Transfer Station;
- 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;
- sea salts contained in sea breezes; and
- long-range transport of fine particles into the region.

More remote sources which contribute episodically to suspended particulates in the region include dust storms and bushfires. It is considered that all of the above emission sources are accounted for in the monitoring data analysed in the following sections of this report.

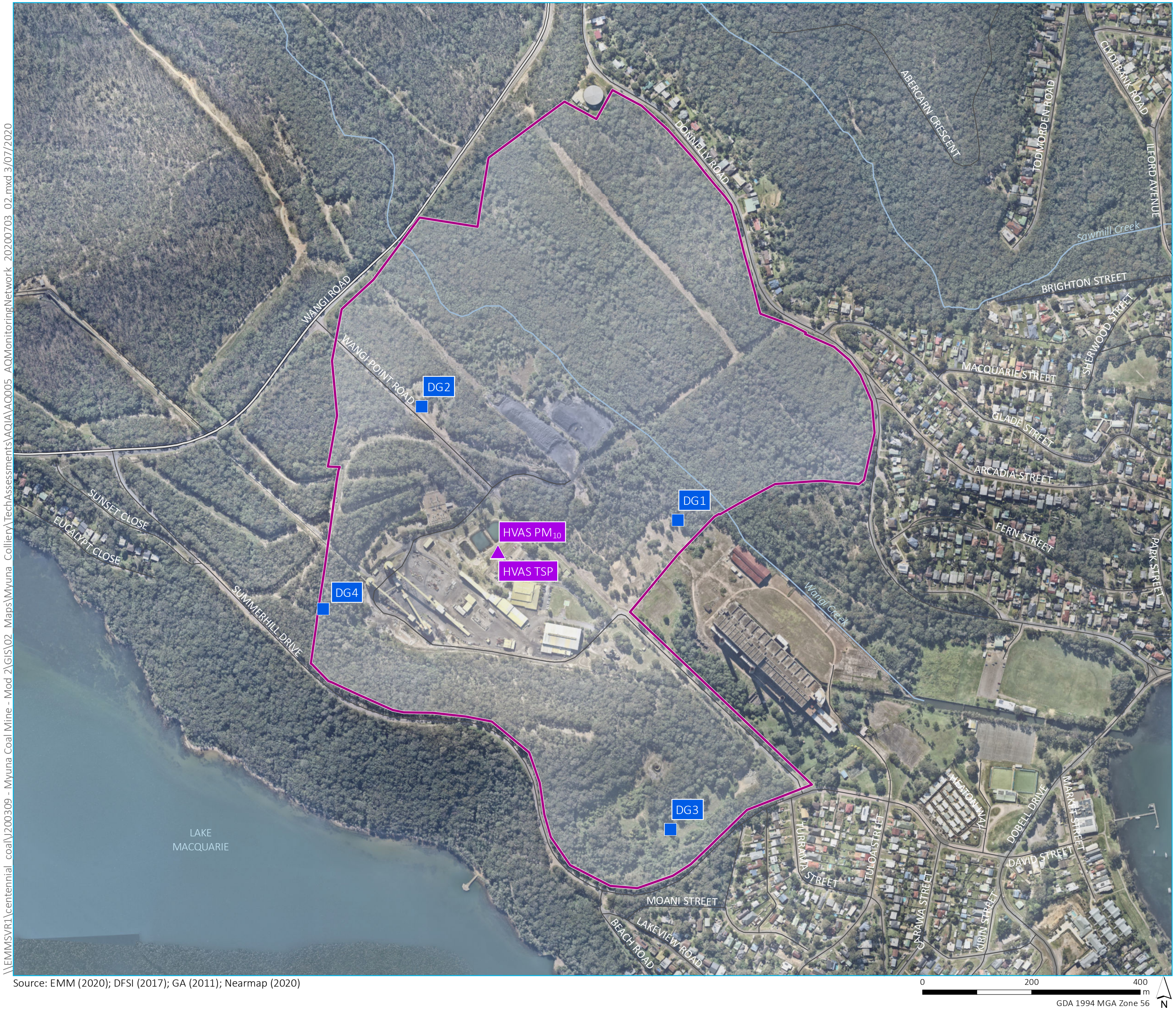
4.2 Air quality monitoring data resources

Centennial Myuna maintain an air quality monitoring network for its operations. The network consists of the following monitoring equipment:

- one high-volume air sampler (HVAS) measuring PM_{10} and TSP concentrations on a one-in-six day run cycle;
- four dust deposition gauges for recording monthly dust deposition rates; and
- one meteorological station recording weather conditions, including wind speed and direction, temperature, solar radiation, rainfall and atmospheric pressure.

The locations of Myuna's monitoring equipment are shown in Figure 4.1.

Hourly average concentrations of PM_{10} for the period 2014-2018 were obtained from the CES Tapered Element Oscillating Microbalance (TEOM), approximately 5.8 km west of the Myuna.



Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)

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Location of air quality monitoring network

Myuna Colliery Modification 2
Air quality impact assessment
Figure 4.1

EMM
creating opportunities

4.3 Background air quality

4.3.1 PM_{10}

i Myuna HVAS data

As stated above, 24-hour average PM_{10} concentrations are recorded at the Myuna HVAS on a one-in-six day run cycle. A summary of key statistics for the five years of analysed data from the HVAS is presented in Table 4.1.

There were five exceedance of the NSW EPA 24-hour average criterion of 50 µg/m³ recorded in 2019. On four of these exceedance days, the CES TEOM (see below) also recorded PM_{10} concentrations at or above 50 µg/m³. Given that the CES TEOM is approximately 5.8 km away from Myuna, the data suggests that the elevated concentrations recorded on these days may have been the result of a regional weather event.

The data also shows concentrations increasing from 2015 to 2019. As reflected here and in the CES TEOM data below, the increase in concentrations in 2019 are attributed to state-wide extreme drought conditions and a high frequency of days influenced by smoke from major bushfires and hazard reduction burn events across Australia during this time.

Table 4.1 Statistics for PM_{10} concentrations – Myuna HVAS – 2015–2019

Monitoring year	PM_{10} concentration (µg/m³)		
	Maximum 24-hour average concentration (µg/m³)	Annual average concentration (µg/m³)	Number of days greater than 50 µg/m³
2015	34	13.2	0
2016	39	12.0	0
2017	33	10.9	0
2018	41	15.8	0
2019	135	22.5	5

ii CES TEOM data

Although PM_{10} (and TSP) concentrations are monitored at Myuna, the data are measured on a one-in-six day run cycle and therefore cannot be used alone in a contemporaneous 24-hour average cumulative analysis. Therefore, data from the CES TEOM has been analysed and used for the purposes of this assessment.

A summary of key statistics for the five years of analysed data from the CES TEOM is presented in Table 4.2. Exceedances of the air quality criteria of 50 µg/m³ were recorded in 2015, 2017, 2018 and 2019 with an upward trend in concentrations seen from 2015.

Table 4.2 Statistics for PM_{10} concentrations – CES TEOM – 2015–2019

Year	Maximum 24-hour average concentration (µg/m³)	Annual average concentration (µg/m³)	Number of days greater than 50 µg/m³	Data recovery
2015	102.7	13.3	3	88%
2016	40.3	14.2	0	98%
2017	70.2	16.5	3	96%
2018	121.1	17.2	5	95%
2019	160.9	22.1	20	99%

Note: Monitoring commenced in February 2015.

A time series of recorded 24-hour average PM_{10} concentrations at the CES TEOM for the period 2015 to 2019 is presented in Figure 4.2. The recorded 24-hour average PM_{10} concentrations fluctuated throughout the period however there is a clear upward trend of concentration since 2015. As stated above, the increase in concentrations in 2019 are attributed to state-wide extreme drought conditions and a high frequency of days influenced by smoke from major bushfires and hazard reduction burn events across Australia during this time. As a result, 2019 was not considered representative of the local area for use in describing background air quality levels.

For the 2018 calendar year, Figure 4.2 shows an increase in PM_{10} concentrations towards the end of 2018, which is likely due increasing drought conditions across NSW and the occurrence of a number of bushfire events in this period. This is reflected in the recorded annual average PM_{10} concentration for 2018 (17.2 µg/m³), which is higher than the three preceding years of data. Furthermore, there are five days were the 24-hour average PM_{10} exceeded the NSW EPA impact assessment criterion which again is higher than the three preceding years.

Due to the increased number of exceptional events and occurrence of drought conditions, the 2018 calendar year PM_{10} dataset from the CES TEOM is therefore considered an elevated representation of background PM_{10} concentrations typically experienced in the local area. The dataset features a high data capture rate (95%) meeting the requirements of the Approved Methods for Modelling. The 2018 dataset is also consistent with the selected meteorological dataset year from the Myuna AWS (Section 3.2).

To develop a complete background dataset for 2018, periods of missing data have been supplemented by the recorded annual average concentration for 2018 (17 2 µg/m³). Following this adjustment, the annual average PM_{10} concentration for 2018 is 17.5 µg/m³.

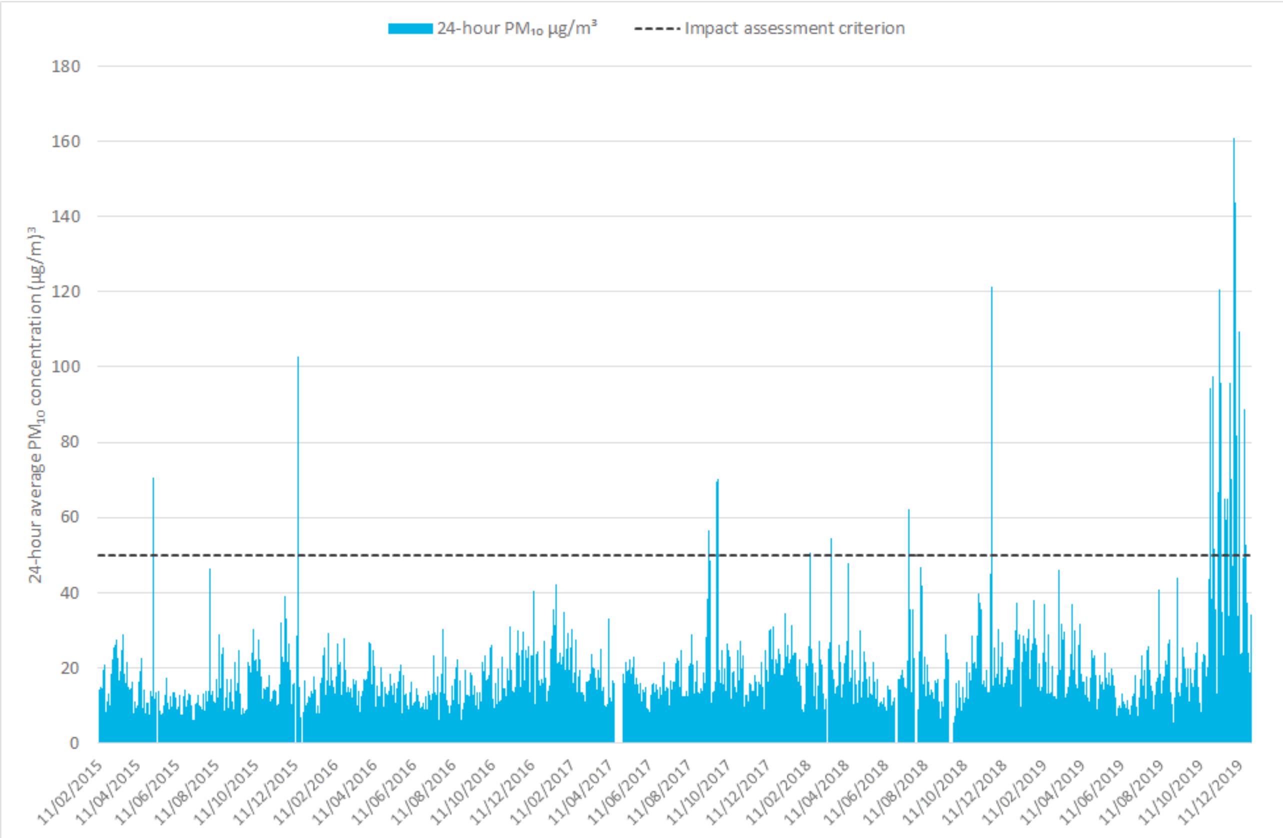


Figure 4.2 Time series of 24-hour average PM_{10} concentrations – CES TEOM – 2015–2019

4.3.2 $PM_{2.5}$

No monitoring of $PM_{2.5}$ is conducted by the existing air quality monitoring network at Myuna or CES. The NSW Department of Planning, Industry and Environment (DPIE) operates an Air Quality Monitoring Station (AQMS) at Wyong which collects continuous 24-hour PM_{10} and $PM_{2.5}$ data.

Daily-varying concentrations of PM_{10} and $PM_{2.5}$ data recorded at the Wyong AQMS for 2018 were analysed for the purposes of establishing $PM_{2.5}$ background levels for use in this assessment. A time series of the recorded 24-hour average PM_{10} and $PM_{2.5}$ concentrations at the Wyong AQMS is presented in Figure 4.3.

A ratio of $PM_{2.5}$:PM_{10} was quantified for every day of the year. The average ratio of all data in 2018 was 0.37 ($PM_{2.5}$:PM_{10}). This ratio was applied to the 24-hour PM_{10} data collected at the CES TEOM for 2018 to establish a concurrent synthetic 24-hour $PM_{2.5}$ concentration dataset. The timeseries for the resultant data set is shown in Figure 4.4. It can be seen that there are two days above the NSW EPA impact assessment criterion. These coincided with consecutive elevated 24-hour average PM_{10} concentrations recorded at the CES TEOM associated with a regional-scale dust storm event. The annual average $PM_{2.5}$ concentration for 2018 is 6.5 µg/m^3. This value has been adopted as background for this assessment.

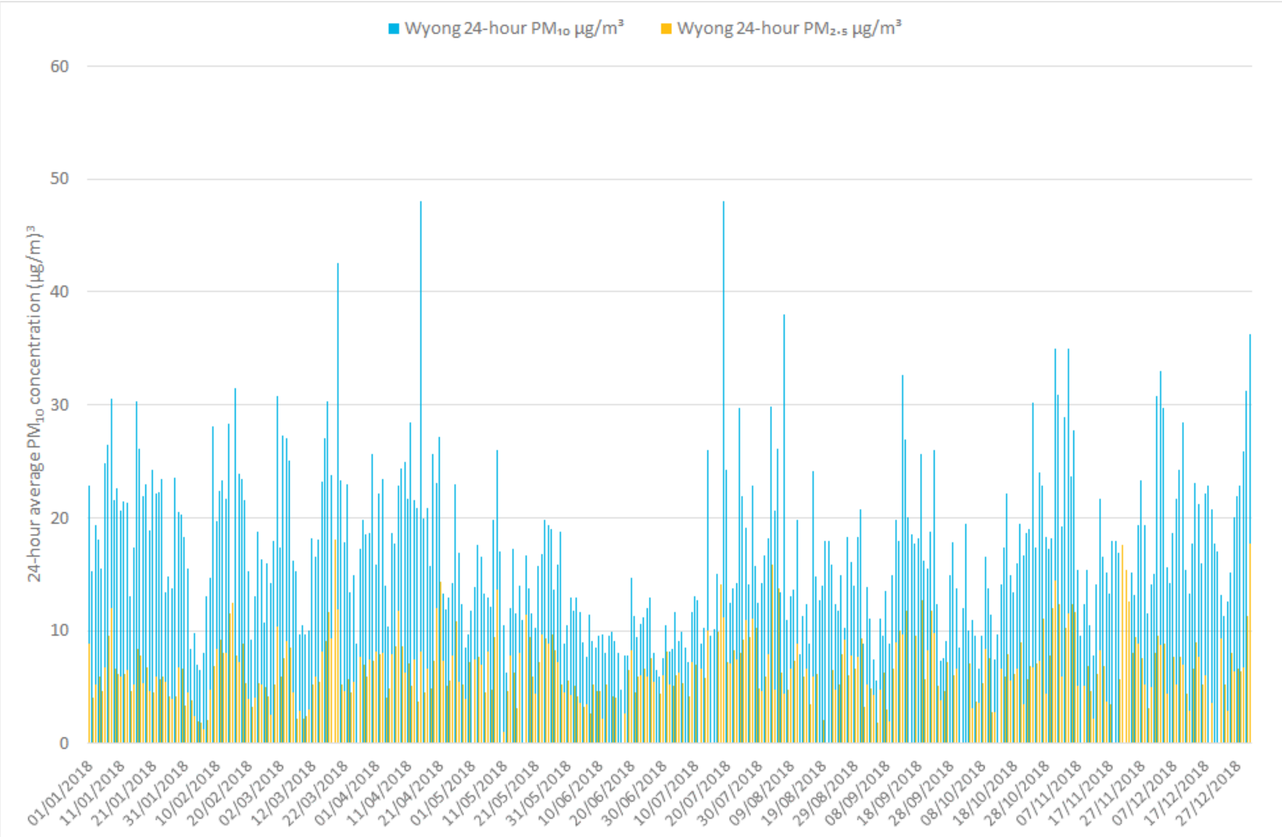


Figure 4.3 Time series of 24-hour average PM_{10} and $PM_{2.5}$ concentrations – DPIE Wyong AQMS – 2018

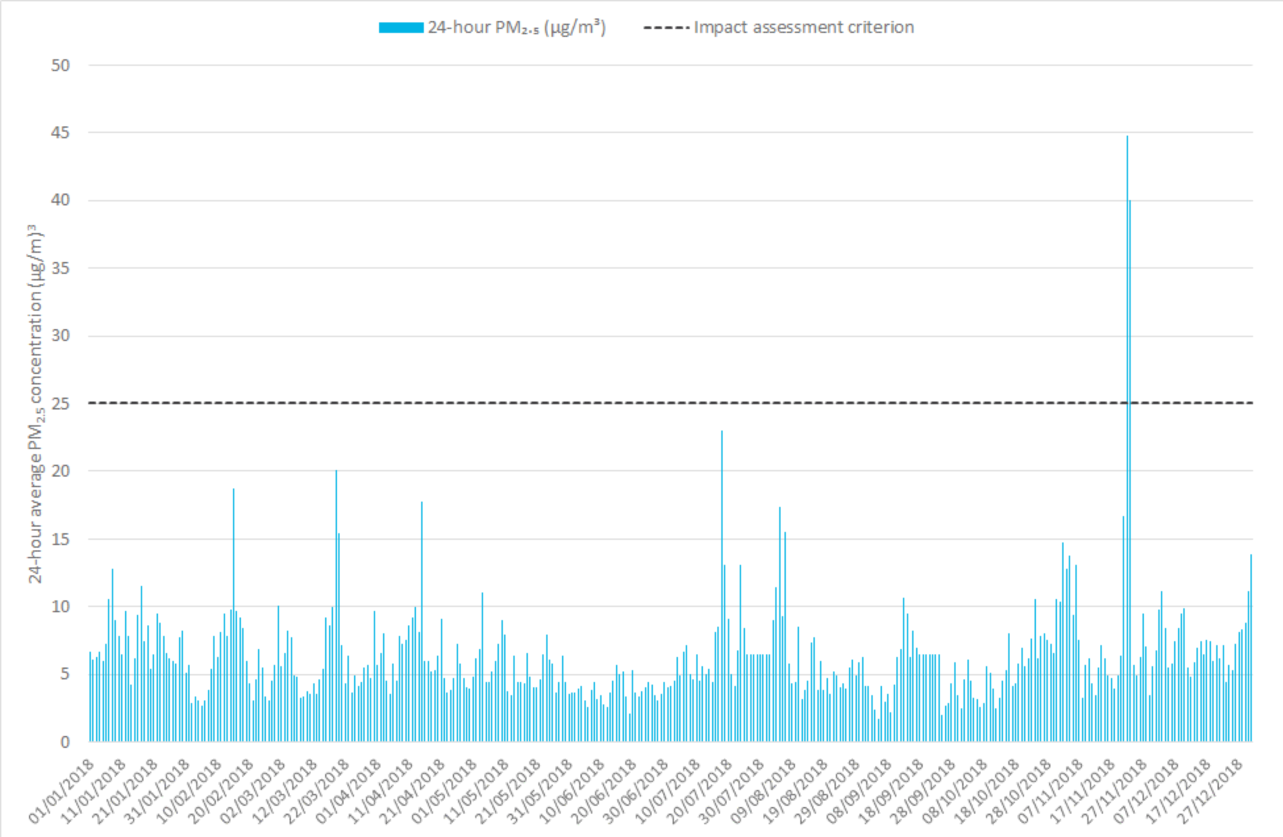


Figure 4.4 Synthetic time series of 24-hour average $PM_{2.5}$ concentrations – 2018

4.3.3 TSP

TSP concentrations are recorded at Myuna by HVAS on a one-in-six day run cycle. A summary of key statistics for the five years of analysed data from the Myuna HVAS is presented in Table 4.3. As with the PM_{10} concentrations shown in Section 4.3, Table 4.3 shows that measured TSP concentrations have been increasing since 2015 and are highest in 2019. Again, this is likely to be due to drought conditions across the state in these years.

Table 4.3 Statistics for TSP concentrations – Myuna HVAS – 2015–2019

Monitoring year	TSP concentration (µg/m³)
	Annual average concentration (µg/m³)
2015	26.6
2016	27.7
2017	26.1
2018	31.4
2019	44.8

Taking the corresponding Myuna HVAS PM_{10} concentrations into account, the PM_{10}:TSP ratio for each year between 2015 and 2019 was calculated. The average PM_{10}:TSP ratio for these years from the HVAS was 0.46.

As stated previously, in order to undertake a contemporaneous cumulative PM_{10} assessment, the daily varying PM_{10} concentration dataset from the CES has been adopted for background concentrations at Myuna rather than the one-in-six day HVAS dataset from Myuna. Using the annual average PM_{10} concentration for 2018 at CES of 17.5 µg/m^3 (see Section 4.3) and PM_{10}:TSP ratio of 46%, an annual average background value of 38 µg/m^3 is derived. It is noted that this concentration is higher than the Myuna HVAS TSP annual average concentration for 2018; however, this difference is likely attributable to the difference in the number of datapoints between the two datasets.

4.3.4 Dust deposition

Centennial Myuna maintain a network of four dust deposition gauges in the vicinity of Myuna's pit-top. Dust deposition data from each of the four dust gauges has been analysed for the period 2015 to 2019. Annual average dust deposition levels at each monitor is provided in Table 4.4. The highest annual average dust deposition level recorded for the 2016 period was 3 g/m^2/month at gauge D4. This appears to be due to an elevated level of 18.5 g/m^2/month recorded in July 2016.

The overall average of the data for all years and across all dust deposition gauges is 1.2 µg/m^3. This value has been adopted as background for this assessment.

Table 4.4 Annual dust deposition results – Myuna monitoring network

Year	Annual average dust deposition levels (g/m^2/month)			
	D1	D2	D3	D4
2015	0.9	1.2	1.5	1.0
2016	0.8	0.7	1.4	3.0
2017	1.1	0.8	1.1	1.1
2018	1.2	0.7	1.0	1.3
2019	1.1	1.2	1.3	1.6

4.4 Assumed background concentrations

In summary, the following background values were adopted for cumulative assessment:

- 24-hour PM_{10} concentration – daily varying;
- annual average PM_{10} concentration – 17.5 µg/m^3;
- 24-hour $PM_{2.5}$ concentration – daily varying;
- annual average $PM_{2.5}$ concentration – 6.5 µg/m^3;
- annual average TSP concentration – 38 µg/m^3; and
- annual average dust deposition – 1.2 g/m^2/month.

5 Emissions inventory

5.1 Introduction

Two emission scenarios have been developed to quantify particulate matter impacts from Myuna and to understand the significance of the proposed modification to approved operations. These scenarios are:

- existing scenario – processing of a maximum of 3 Mtpa of coal at Myuna but does not include receipt of coal from CES; and
- proposed scenario – existing scenario plus the proposed modification (ie handling and distribution of up to 1 Mtpa of coal to CES and receipt of an additional 0.2 Mtpa of coal to Myuna from CES).

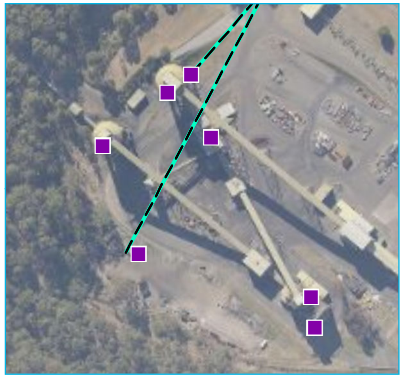
5.2 Emissions estimates

Fugitive dust sources associated with the existing and proposed operations at Myuna were quantified through the application of US-EPA AP-42 emission factor equations. Particulate matter emissions were quantified for the three size fractions – TSP, PM_{10} and $PM_{2.5}$. Emission rates for coarse particles (PM_{10}) and fine particles ($PM_{2.5}$) were estimated using ratios for the different particle size fractions available in the literature (principally the US-EPA AP-42).

The calculated annual TSP, PM_{10} and $PM_{2.5}$ emissions for each activity occurring at Myuna are shown in Section 5.2.1 below. Each activity has been represented in the modelling as a point, volume or line-volume source. Site diesel combustion was attributed equally to all activities (except wind erosion). The modelled source locations for the existing and proposed scenarios are shown in Figure 5.1 and Figure 5.2 respectively.

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

It is noted that there are two operational power stations in the wider area surrounding Myuna. These are Eraring Power station (approximately 4.5 km west of Myuna) and Vales Point Power Station (approximately 10.6 km south of Myuna). It is acknowledged that there will be particulate emissions in the existing environment as a result of these operations. These operations have not been specifically modelled as separate sources in this assessment as it is assumed that measurements taken at the CES TEOM (approximately 1.3 km west of Eraring Power Station and 5.8 km west of Myuna) includes contribution of particulate matter from the entire surrounding environment (including power stations). It is noted that data from the TEOM was not available at the time of the 2014 SLR AQIA.



KEY

Myuna Colliery surface facilities area

Major road

Minor road

Named watercourse

Model source type

Point source

Volume source

Line-volume source

Model source locations-
existing scenario

Myuna Colliery Modification 2
Air quality impact assessment
Figure 5.1

EMM
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Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)

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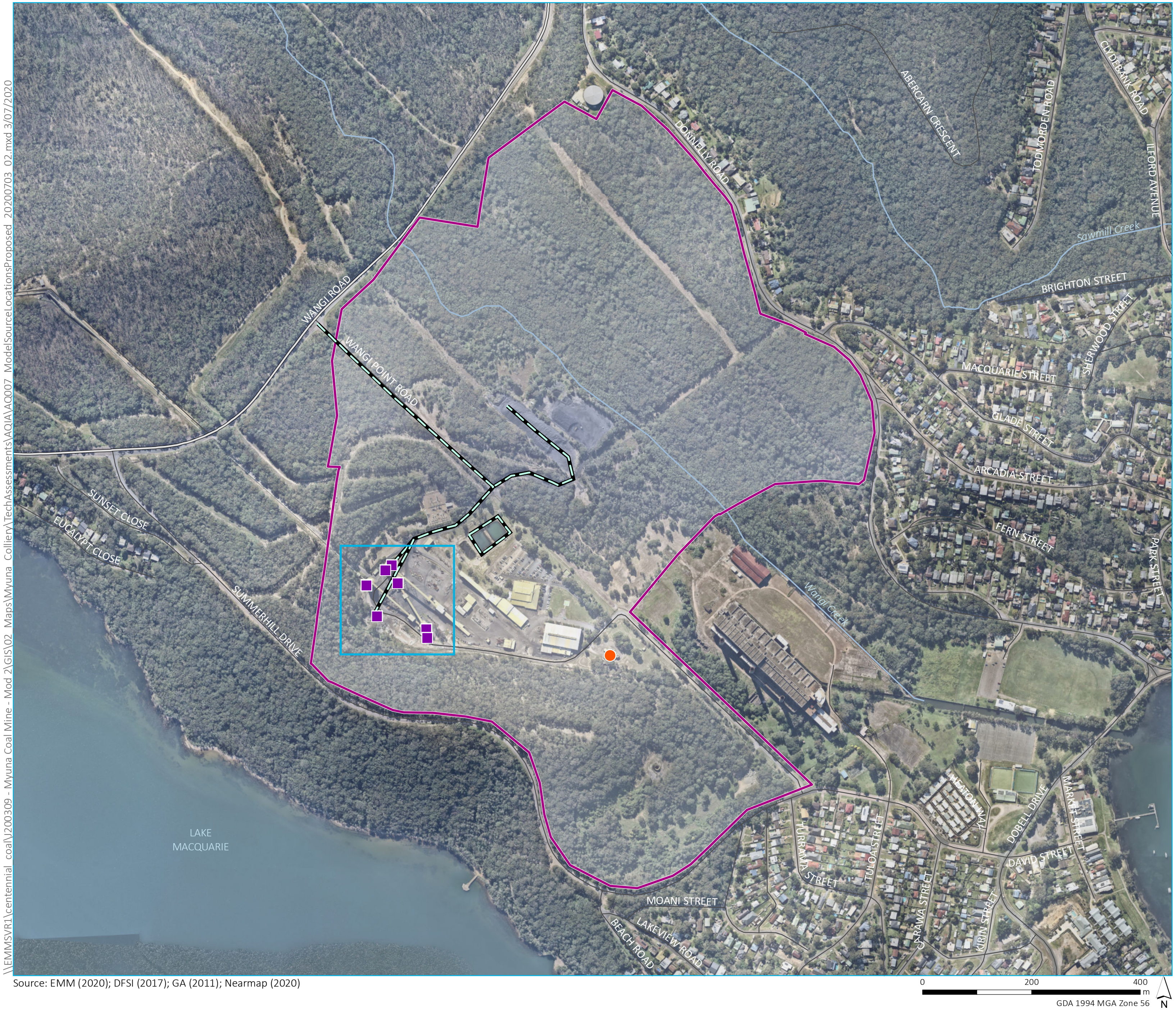
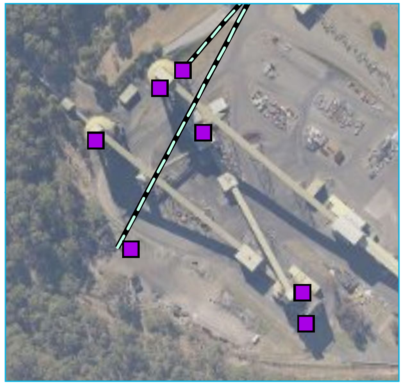




Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)

KEY

- Myuna Colliery surface facilities area
- Major road
- Minor road
- Named watercourse

Model source type

- Point source
- Volume source
- Line-volume source

Model source locations - proposed scenario

Myuna Colliery Modification 2
Air quality impact assessment
Figure 5.2

EMM
creating opportunities

5.2.1 Emissions summary

A graphical summary of the contribution to annual dust emissions by source type is provided in Figure 5.3 for the existing scenario and Figure 5.4 for the proposed scenario. Calculated annual emissions by emissions source is presented in Table 5.1 and Table 5.2 for the existing and proposed scenarios respectively. Particulate matter control measures, as documented in Section 5.3 are accounted for in these emission totals.

From the data presented in the following figures and tables, the most significant source of particulate matter emissions from Myuna's operations is associated with the upcast ventilation shaft, with a less significant contribution from material handling activities (eg loading and unloading of coal). The data shows that there is an increase in emissions under the proposed scenario. This primarily relates to material handling activities associated with an additional 0.2 Mtpa of coal received from CES.

Further details regarding emission estimation factors and assumptions are provided in Appendix B.

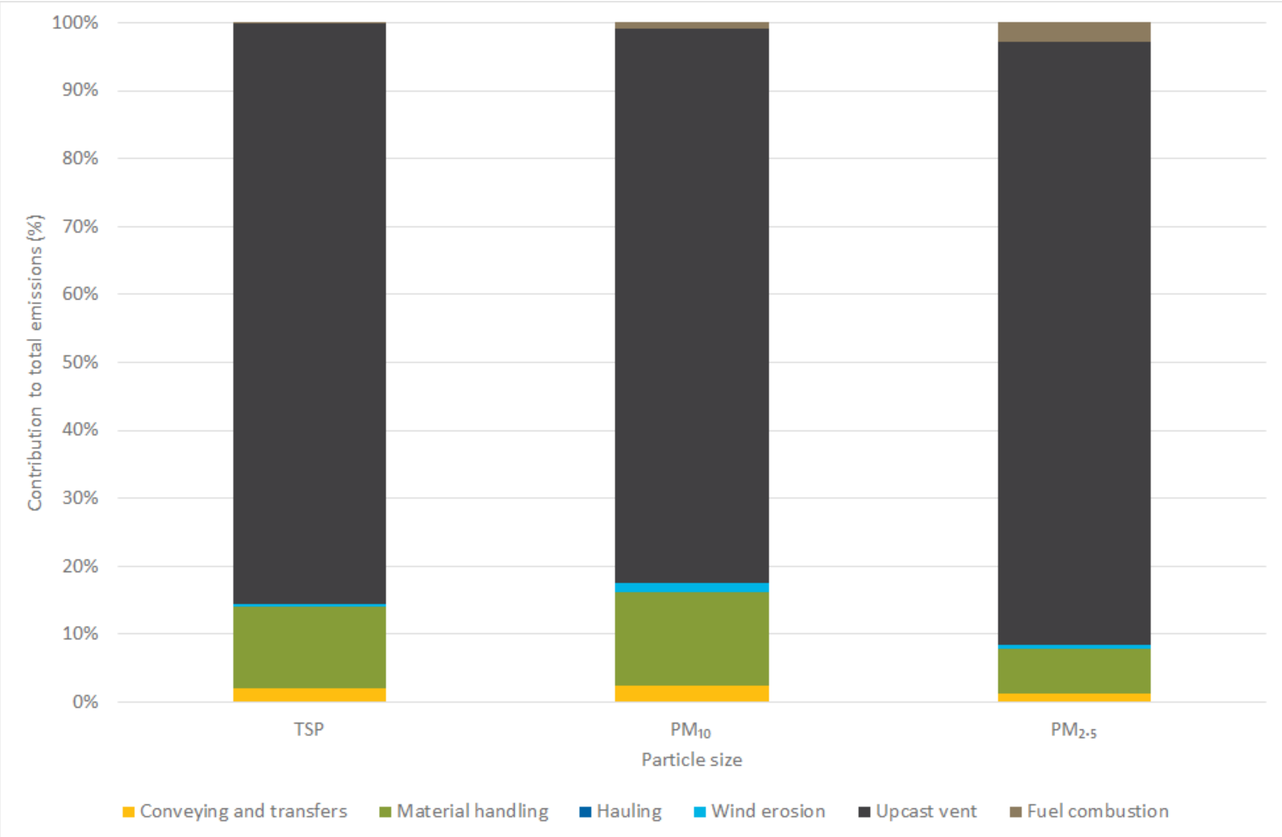


Figure 5.3 Contribution to annual emissions by emissions source type and particle size – existing scenario

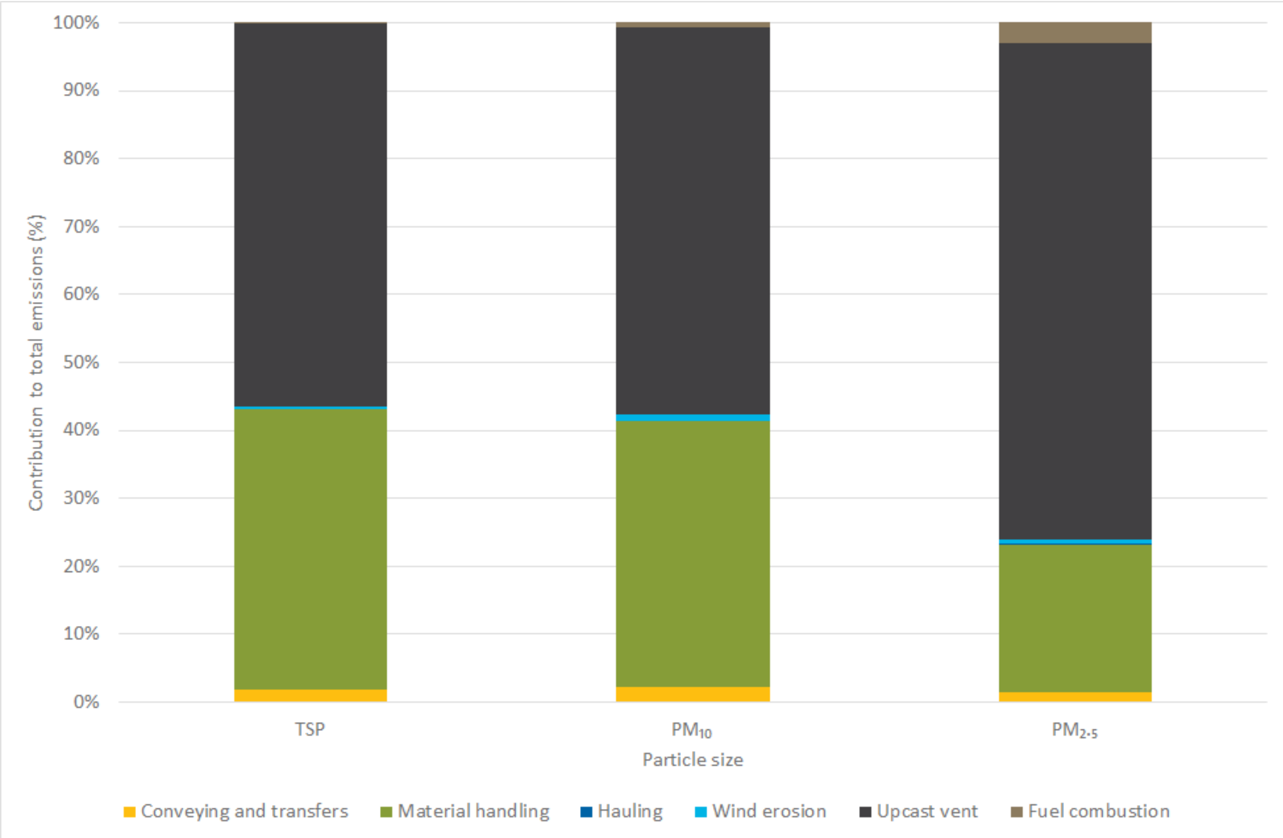


Figure 5.4 **Contribution to annual emissions by emissions source type and particle size – proposed scenario**

Table 5.1 Calculated annual TSP, PM_{10} and $PM_{2.5}$ emissions – existing operational scenario

Emission source	Calculated annual emissions (kg/annum) by source		
	TSP	PM_{10}	$PM_{2.5}$
Conveyor transfer point from portal to surface ROM bin	138	27	4
Unloading coal from ROM bins to trucks	12	2	0
Hauling coal from ROM bin to Emergency stockpile on paved road	1	0	0
Unloading coal at Emergency Stockpile	1,047	147	20
Loading coal at Emergency stockpile to trucks	2,094	294	40
Hauling coal from Emergency stockpile to reclaimer on paved road	1	0	0
Unloading coal at reclaimer	733	103	14
Conveyor transfer from ROM bin to breaker	138	27	4
Coal breaking	270	122	23
Conveyor transfer from breaker to screen	138	27	4
Coal screening	495	167	11
Conveyor transfer from screener to crusher	138	27	4
Coal crushing	270	122	23
Conveyor transfer from crusher to product bin	138	27	4
Conveyor transfer from product bin to Eraring Power Station	138	27	4
Wind erosion of Emergency Stockpile	145	73	11
Wind erosion of water storage dams	26	13	2
Upcast vent shaft	34,918	5,643	1,764
Site diesel combustion	62	62	57
Total	**40,905**	**6,911**	**1,988**

Note: Emission totals incorporate particulate matter management measures (refer Section 5.3). The sum of the emissions from activities provided above is slightly different to the totals shown due to rounding.

Table 5.2 Calculated annual TSP, PM_{10} and $PM_{2.5}$ emissions – proposed operational scenario

Emission source	Calculated annual emissions (kg/annum) by source		
	TSP	PM_{10}	$PM_{2.5}$
Conveyor transfer point from portal to surface ROM bin	138	27	4
Unloading coal from ROM bins to trucks	308	60	9
Hauling coal from ROM bin to Emergency stockpile on paved road	1.0	0.2	0.0
Hauling coal from CES to the emergency coal stockpile on paved road	5	0.9	0.2
Unloading of coal at Emergency Stockpile	6,545	920	124
Loading coal at Emergency stockpile to trucks	13,091	1,841	249
Hauling coal from Emergency stockpile to reclaimer on paved road	5	1	0
Unloading coal at reclaimer	4,582	644	87
Conveyor transfer from ROM bin to breaker	138	27	4
Coal breaking	270	122	23
Conveyor transfer from breaker to screen	138	27	4
Coal screening	495	167	11
Conveyor transfer from screener to crusher	138	27	4
Coal crushing	270	122	23
Conveyor transfer from crusher to product bin	138	27	4
Conveyor transfer from product bin to trucks	461	91	14
Hauling coal from product bin to Wangi Point Rd (for transport to Awaba and then CES)	27	5	1
Wind erosion of Emergency Stockpile	145	73	11
Wind erosion of water storage dams	26	13	2
Upcast vent shaft	34,918	5,643	1,764
Site diesel combustion	77	77	71
Total	**61,917**	**9,914**	**2,409**

Note: Emission totals incorporate particulate matter management measures (refer Section 5.3). The sum of the emissions from activities provided above is slightly different to the totals shown due to rounding.

5.3 Overview of best practice dust control

In order to manage particulate matter emissions from Myuna's existing and proposed operations, a range of mitigation measures and management practices are required. Table 5.3 provides an overview of the relevant applicable best practice dust control management measures as listed in the *NSW Coal Benchmarking Study: International Best Practice to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining* (Katestone 2011) (The Best Practice Report). The Best Practice Report was a study prepared by Katestone Environmental Pty Ltd in 2011 and was commissioned by the NSW EPA. The table also includes the percentage control factor applied in the dispersion modelling.

Measures implemented at Myuna and included in the emissions estimation for both the existing and proposed scenarios include:

- enclosures at conveyor transfer points;
- water sprays at conveyor transfer points;
- watering at the emergency coal stockpile;
- watering, dust suppression and sweeping on paved haul roads;
- unloading coal to underground reclaimer fitted with water sprays;
- vegetative wind breaks around the emergency coal stockpile;
- water sprays on the peripheries of the water storage dams;
- enclosure of coal crusher and screen; and
- watering at coal crusher and screen.

It can be seen from the summary provided in Table 5.3 that, wherever practical to do so, Myuna currently implements dust control measures that are consistent with accepted best practice mitigation measures for all significant operational sources of particulate matter emissions.

Table 5.3 Overview of best practice measures employed at Myuna

Emissions source category	Best practice control measures (Katestone 2011)	Currently adopted or proposed for implementation at Myuna	Comments	Effectiveness of reduction in emissions inventory
Conveyors and transfers	Application of watering at transfer points	Yes	Watering applied at transfer points.	50%
	Enclosure of transfer points	Yes	All transfer points enclosed.	70%
	Wind shielding of conveyor belts – roof and/or side wall	Yes	Enclosed as above.	As above.
	Belt cleaning and spillage minimisation	Yes	Enclosed and water sprays applied as above.	As above.
Haul roads	Surface treatment - watering	Yes	25% of the paved road has water carts available.	50%
	Surface treatment - chemical suppressants	Yes	75% of the paved road has dust suppression sprinklers available.	Not included due to part of the road having water sprays only. Considered conservative.
	Surface improvements - low silt aggregate	Yes	Regular sweeping and water sprays assist with the reduction of silt loading.	Water carts in operation as above.
	Surface improvements - pave the surface	Yes	All haul roads on site are paved and swept at least once a week or more when coal is being transported.	Paved roads US-EPA equation adopted
	Reduction in vehicle travel speed	Yes	Truck travel speeds will be maintained below 40km/hr	N/A
	Use larger vehicles rather than smaller vehicles to minimise number of trips	Yes	Haul truck mean weight is 75 t.	Haul truck weight included. No specific control applied.
	Use conveyors in place of haul roads	Yes	Conveyors used around site.	Conveyors used in place of hauling.
Wind erosion from coal stockpiles	Avoidance - bypassing stockpiles	No	Not practical. The stockpiles at Myuna are necessary for the routine operation of site and cannot be avoided.	N/A

Table 5.3 Overview of best practice measures employed at Myuna

Emissions source category	Best practice control measures (Katestone 2011)	Currently adopted or proposed for implementation at Myuna	Comments	Effectiveness of reduction in emissions inventory
	Surface stabilisation - watering	Yes	Watering emergency stockpile when in use	50%
	Surface stabilisation - chemical suppressants and crusting agents	No	Not practicable for implementation as coal stockpiles are regularly disturbed through loading and unloading.	N/A
	Surface stabilisation - carry over from wetting from load in	Yes	Coal features high moisture content along with additional moisture from water sprays.	N/A
	Enclosure - silo with baghouse	No	Not practicable for the operation of site.	N/A
	Enclosure - cover storage pile with tarp during high winds	No	Not practicable for implementation as coal stockpiles are regularly disturbed through loading and unloading.	N/A
	Wind speed reduction - vegetative wind breaks	Yes	Vegetation surrounds the emergency stockpile.	30%
Wind erosion from coal stockpiles Loading and dumping ROM coal Crushing/screening	Wind speed reduction - reduced pile height	Partial	Height of stockpiles limited by the capacity of the stockpile area.	N/A
	Wind speed reduction - wind screens/wind fences	No	Not practicable the constraints of site.	N/A
	Wind speed reduction - pile shaping/orientation	No	Not practicable for the constraints of site.	N/A
	Wind speed reduction - three-sided enclosure around storage piles	No	Not practicable. The constraints of site and safe operation of equipment around stockpiles.	N/A
	Avoidance - bypassing stockpiles	No	Not practicable. The stockpiles at Myuna are necessary for the routine operation of site and cannot be avoided.	N/A

Table 5.3 Overview of best practice measures employed at Myuna

Emissions source category	Best practice control measures (Katestone 2011)	Currently adopted or proposed for implementation at Myuna	Comments	Effectiveness of reduction in emissions inventory
	Truck dumping - minimise drop height	Yes	Wherever possible, material drop heights will be minimised when unloading trucks. Trucks unload to the reclaimer underground.	30%
	Truck dumping - water sprays at ROM pad	Yes	Water sprays are applied at the reclaimer area and when unloading to the emergency coal stockpile.	50%
	Truck dumping - three sided enclosure at truck unloading ROM hopper	Partial	Trucks unload to the reclaimer underground therefore the drop is sheltered on all sides except the roof.	30% applied to account for underground drop as above.
	Water spays	Yes	Application of water sprays at crushing/screening area.	50%
	Enclosed building	Yes	Crushing/screening occurring in an enclosed building.	70%

6 Air dispersion modelling

6.1 Dispersion model selection and configuration

Dispersion modelling for this assessment uses the CALPUFF modelling system, which is commonly used in NSW for applications where non-steady state conditions may occur (ie complex terrain or coastal locations) or when calm wind conditions are important (ie for odour assessment). In the absence of available upper air measurements, CALMET (the meteorological pre-processor for CALPUFF) can be run using prognostic upper air data (as a three-dimensional '3D.dat' file). Gridded upper air data were derived using The Air Pollution Model (TAPM), which is then used in CALMET to derive an initial wind field (known as the Step 1 wind field). CALMET then incorporates mesoscale and local scale effects, including surface observations, to adjust the wind field. This modelling approach is known as the 'hybrid' approach (TRC 2011) and has been adopted for this assessment. TAPM and CALMET model settings are described in Appendix A and selected in accordance with recommendations in EPA (2016) and TRC (2011). Surface observations are included in the modelling (referred to as data assimilation) and are discussed and described in Section 3.

In addition to the eight individual assessment locations (documented in Section 1.5), air pollutant concentrations were predicted over a 3 km by 3 km domain with 100 m resolution.

Specific activities (listed in Section 5) were represented by line-volume, volume and point sources which were located according to the layout of the Myuna pit top. The modelled source locations for the existing and proposed scenarios are shown in Figure 5.1 and Figure 5.2, respectively. Simulations were undertaken for the 12-month period of 2018.

6.2 Incremental results

Predicted incremental TSP, PM_{10}, $PM_{2.5}$, and dust deposition levels from the existing and proposed scenarios are presented in Table 6.1 and Table 6.2 for each of the assessment locations.

The predicted concentrations and deposition rates for all pollutants and averaging periods are below the applicable NSW EPA assessment criterion at all assessment locations. Except for dust deposition, the assessment criteria listed are applicable to cumulative concentrations. Analysis of cumulative impact compliance is presented in Section 6.3.

Figure 6.1 shows a comparison of the predicted maximum 24-hour average PM_{10} concentrations at each assessment location for the existing and proposed operational scenarios. There is a clear increase in predicted maximum 24-hour average PM_{10} concentrations for the proposed operations scenario which is due to the additional 0.2 Mtpa of coal being received from CES. However, as noted previously, all incremental results are well below 50 µg/m^3.

Contour plots, illustrating spatial variations in incremental TSP, PM_{10} and $PM_{2.5}$ concentrations and dust deposition rates for the proposed scenario only are provided in Figure 6.2 to Figure 6.7 below. Isopleth plots of the maximum 24-hour average concentrations presented do not represent the dispersion pattern on any day, but rather, the maximum daily concentration that was predicted to occur at each model calculation point given the range of meteorological conditions occurring over the 2018 modelling period.

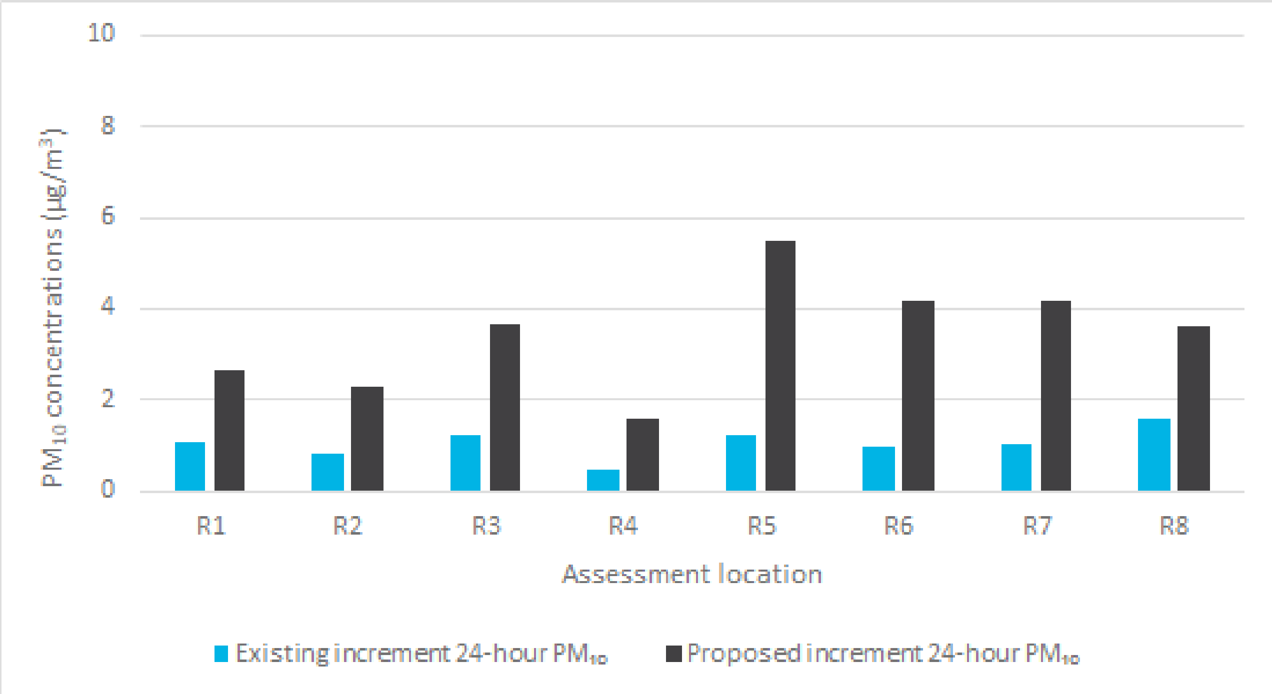


Figure 6.1 Comparison of predicted maximum 24-hour average PM_{10} concentrations for the existing and proposed scenarios

Table 6.1 Incremental (existing scenario only) concentration and deposition results

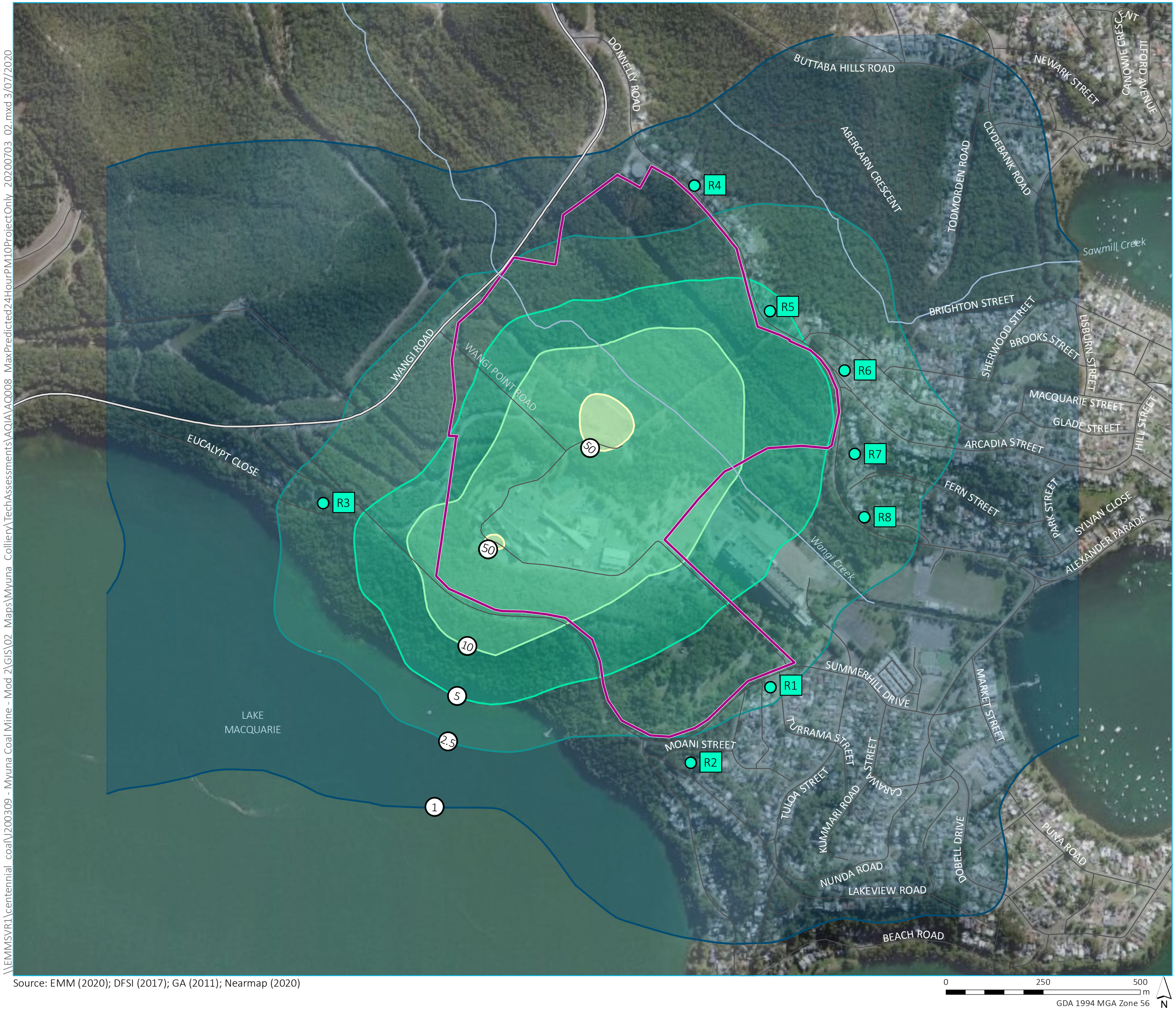
Assessment location ID	Predicted incremental concentration (µg/m³) and deposition rate (g/m²/month)					
	TSP	PM_{10}		$PM_{2.5}$		Dust deposition
	Annual	24-hour maximum	Annual	24-hour maximum	Annual	Annual
Criterion	**90**	**50**	**25**	**25**	**8**	**2**
R1	0.6	1.1	0.2	0.3	0.1	0.1
R2	0.4	0.8	0.2	0.3	0.1	0.1
R3	0.8	1.2	0.3	0.4	0.1	0.2
R4	0.1	0.5	<0.1	0.2	<0.1	<0.1
R5	0.4	1.2	0.2	0.4	<0.1	0.1
R6	0.5	1.0	0.2	0.3	0.1	0.1
R7	0.7	1.0	0.3	0.3	0.1	0.1
R8	0.8	1.6	0.3	0.5	0.1	0.2

Note: Criteria for TSP, PM_{10} and $PM_{2.5}$ are applicable to cumulative (increment + background). Criteria is provided for comparison purposes only.

Table 6.2 Incremental (proposed scenario only) 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**
R1	1.1	2.7	0.6	0.8	0.2	0.1
R2	0.9	2.3	0.5	0.8	0.2	0.1
R3	1.9	3.6	0.8	0.9	0.2	0.4
R4	0.3	1.6	0.1	0.4	<0.1	<0.1
R5	1.9	5.5	0.7	1.3	0.2	0.3
R6	1.8	4.2	0.9	1.1	0.2	0.2
R7	2.2	4.2	1.1	1.2	0.3	0.3
R8	1.8	3.6	0.9	0.9	0.3	0.3

Note: Criteria for TSP, PM_{10} and $PM_{2.5}$ are applicable to cumulative (increment + background). Criteria is provided for comparison purposes only.



Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)

KEY

- Myuna Colliery surface facilities area
- Assessment location
- Major road
- Minor road
- Named watercourse

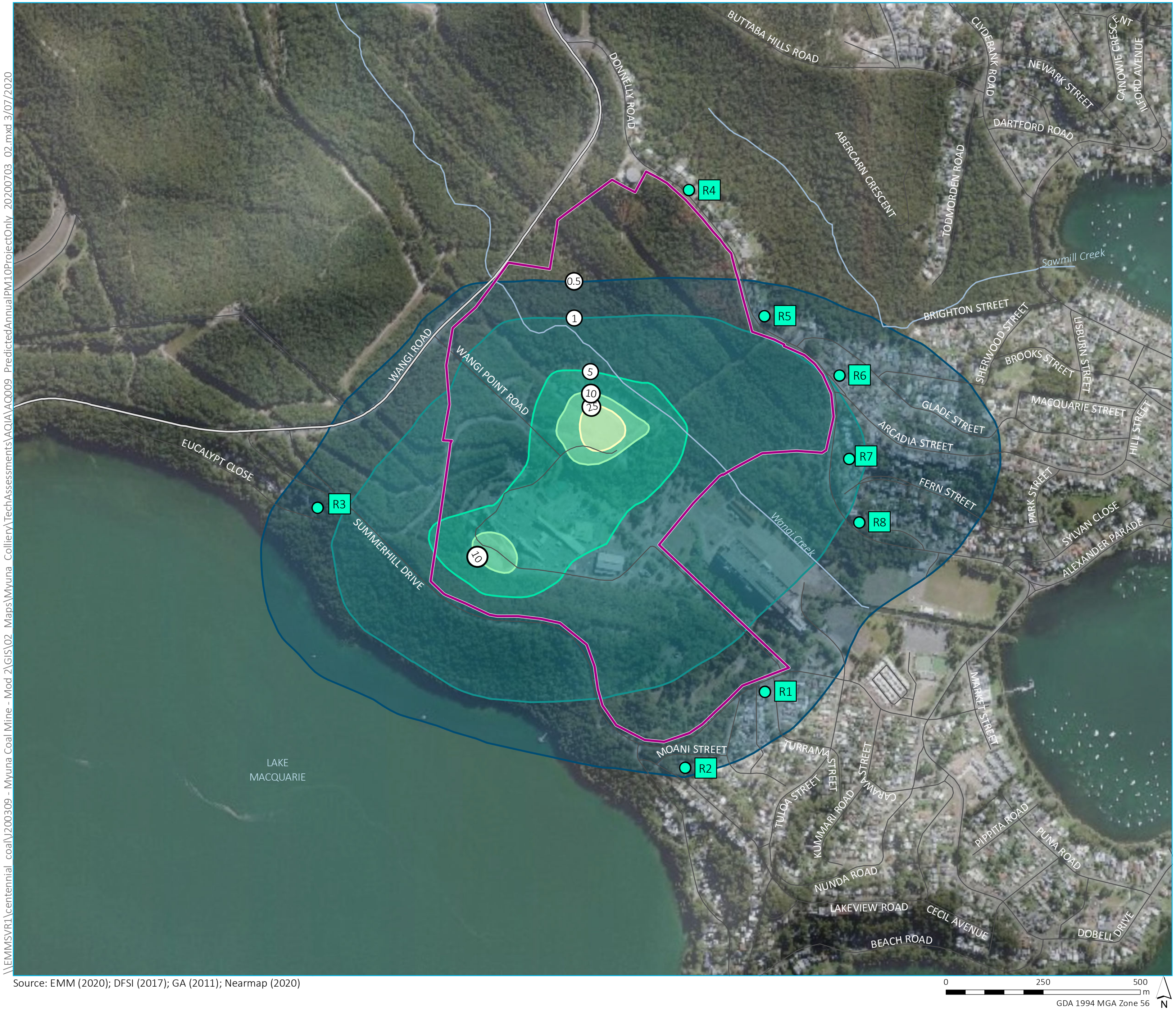
PM_{10} concentration (µg/m^3)

- 1
- 2.5
- 5
- 10
- 50

Maximum predicted 24-hour average PM_{10} concentrations – mine only (proposed scenario)

Myuna Colliery Modification 2
Air quality impact assessment
Figure 6.2

EMM
creating opportunities



KEY

- Myuna Colliery surface facilities area
- Assessment location
- Major road
- Minor road
- Named watercourse

PM_{10} concentration (µg/m^3)

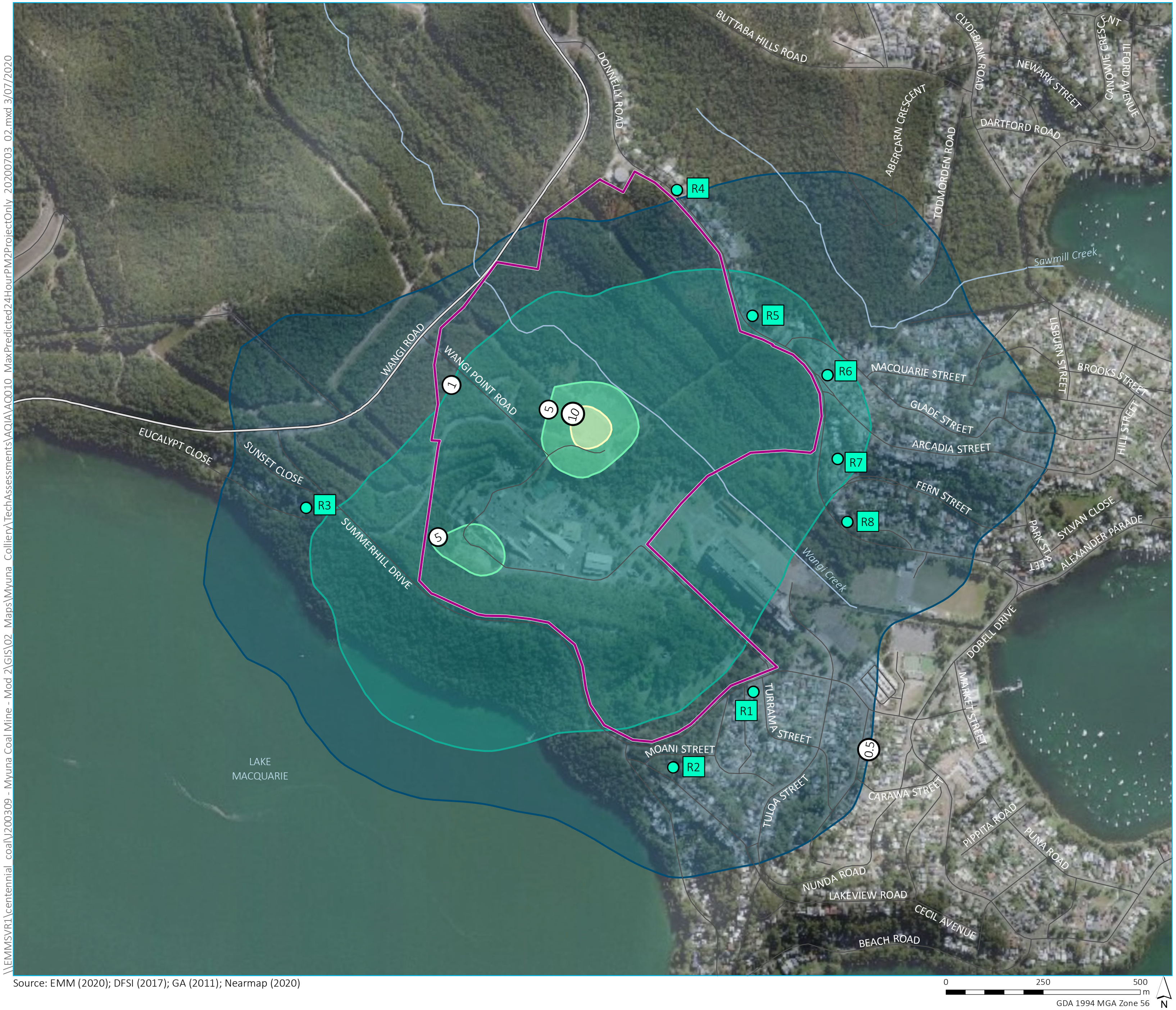
- 0.5
- 1
- 5
- 10
- 25

Predicted annual average PM_{10} concentrations – mine only (proposed scenario)

Myuna Colliery Modification 2
Air quality impact assessment
Figure 6.3

Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)

\\EMMSVR1\centennial coal\J200309 - Myuna Coal Mine - Mod 2\GIS\02_Maps\Myuna_Colliery\TechAssessments\AQ\AQ009_PredictedAnnualPM10ProjectOnly_20200703_02.mxd 3/07/2020



\\EMMSVR1\centennial_coal\200309 - Myuna Coal Mine - Mod 2\GIS\02_Maps\Myuna_Colliery\TechAssessments\AQ\AQ010_MaxPredicted24HourPM2ProjectOnly_20200703_02.mxd 3/07/2020

Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)

KEY

- Myuna Colliery surface facilities area
- Assessment location
- Major road
- Minor road
- Named watercourse

$PM_{2.5}$ concentration ($\mu g/m^3$)

- 0.5
- 1
- 5
- 10

Maximum predicted 24-hour average $PM_{2.5}$ concentrations– mine only (proposed scenario)

Myuna Colliery Modification 2
Air quality impact assessment
Figure 6.4

EMM creating opportunities

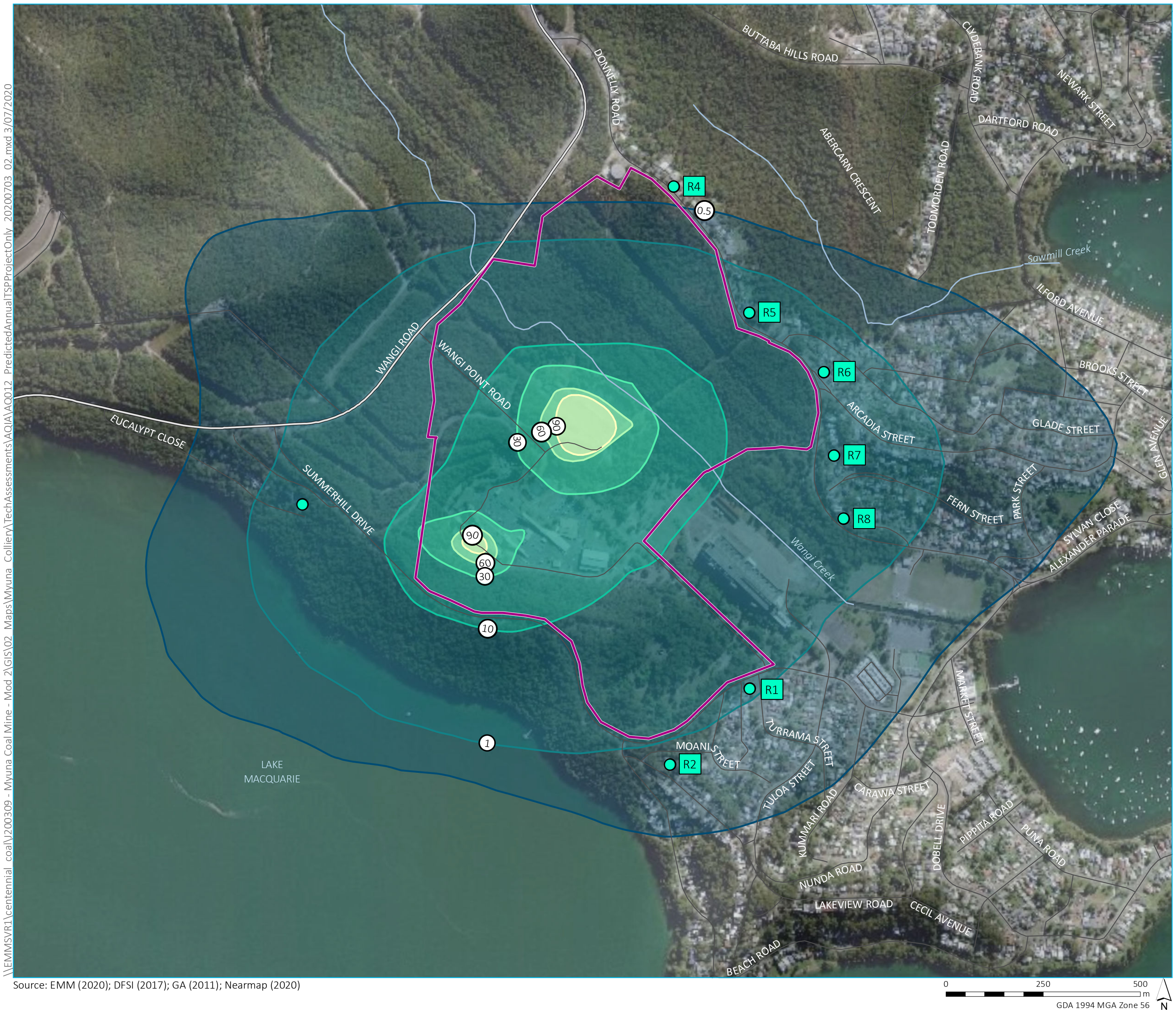
\\EMMSVR1\centennial coal\J200309 - Myuna Coal Mine - Mod 2\GIS\02_Maps\Myuna_Colliery\TechAssessments\AQIA\AQ011_PredictedAnnualPM2ProjectOnly_20200703_02.mxd 3/07/2020

Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)

Predicted annual average $PM_{2.5}$ concentrations– mine only (proposed scenario)

Myuna Colliery Modification 2
Air quality impact assessment
Figure 6.5

EMM
creating opportunities

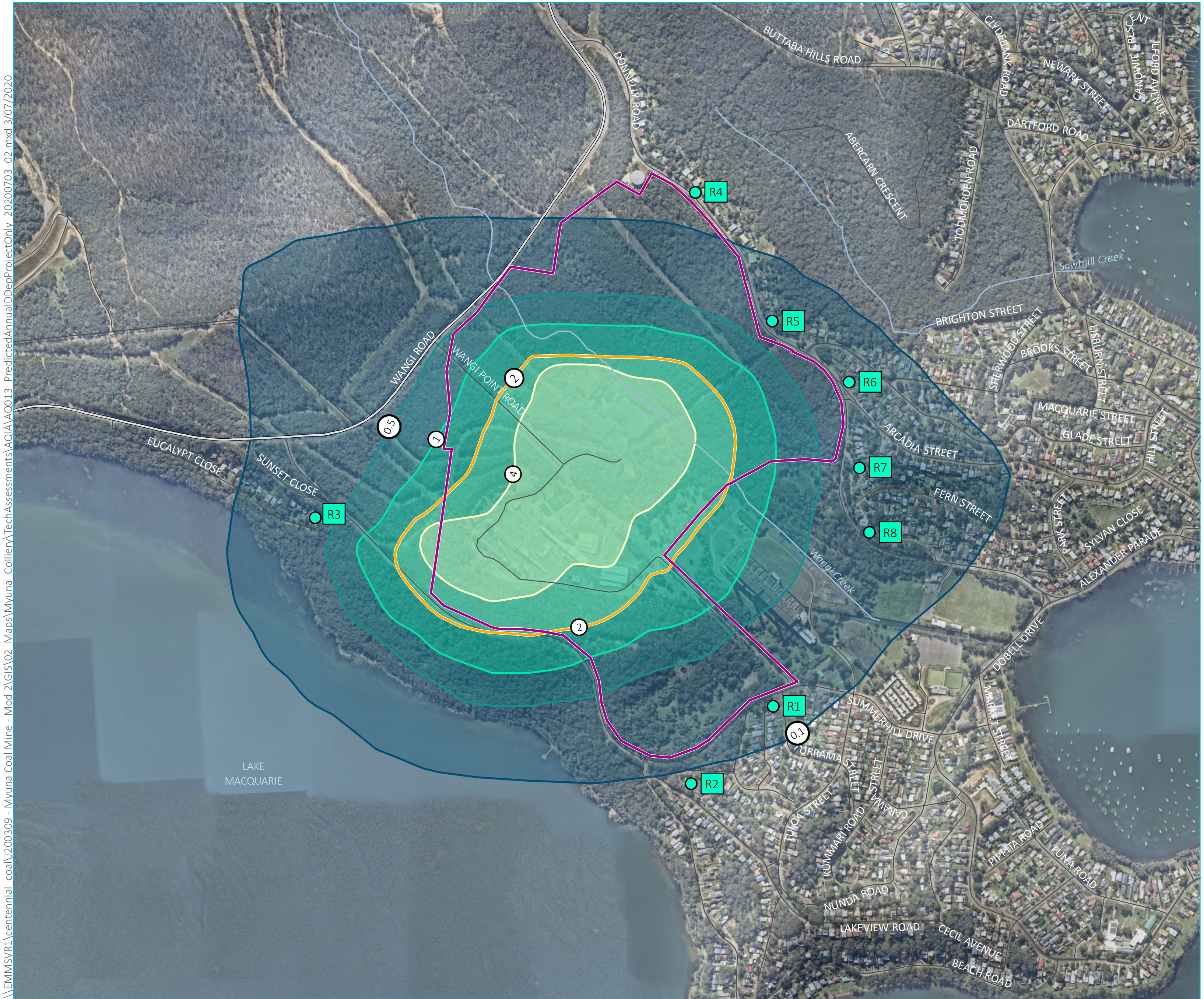


Predicted annual average TSP concentrations– mine only (proposed scenario)

Myuna Colliery Modification 2
Air quality impact assessment
Figure 6.6

EMM creating opportunities

Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)



\\EMMSVR1\centennial coal\J200309 - Myuna Coal Mine - Mod 2\GIS\02_Maps\Myuna_Colliery\TechAssessments\AQIA\AQ013_PredictedAnnualDDepProjectOnly_20200703_02.mxd 3/07/2020

KEY
- Myuna Colliery surface facilities area
- Impact assessment criterion
- Assessment location
- Major road
- Minor road
- Named watercourse

Deposition level ($g/m^2/month$)
- 0.1
- 0.5
- 1
- 2
- 4

Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)

Predicted annual average dust deposition levels- mine only (proposed scenario)

Myuna Colliery Modification 2
Air quality impact assessment
Figure 6.7

EMM
creating opportunities

6.3 Cumulative results

Cumulative impacts (ie Myuna operations plus background) at each of the assessment locations surrounding Myuna have been assessed in the following way:

- for 24-hour average concentrations - each daily-varying predicted 24-hour average concentration for PM_{10} and $PM_{2.5}$ from Myuna has been combined with the corresponding concentrations from the adopted 2018 background concentration datasets (Section 4.3 and Section 4.3); and

- for annual average concentrations - the predicted annual average concentrations have been paired with the corresponding background annual average concentration (Section 4.3.4).

As stated in Section 4.3 and Section 4.3, the adopted 24-hour average PM_{10} and $PM_{2.5}$ background datasets contain five days and two days respectively above the applicable NSW EPA impact assessment criterion. For cumulative impact assessment purposes, these are therefore classed as existing exceedances.

Section 5.1.3 of the Approved Methods for Modelling states that in the event of existing ambient air pollutant concentrations in exceedance of applicable impact assessment criteria, the assessment must:

> …demonstrate that no additional exceedances of the impact assessment criteria will occur as a result of the proposed activity and that best management practices will be implemented to minimise emissions of air pollutants as far as is practical.

As identified in Section 5.3, Myuna currently implements particulate matter control measures that are consistent with accepted industry best practice measures wherever practical to do so.

To demonstrate that no additional exceedances of the applicable criteria will occur as a result of emissions from Myuna, the cumulative analysis presents the 6^{th} highest and 3^{rd} highest cumulative 24-hour average PM_{10} and $PM_{2.5}$ concentrations, respectively. Data has not been removed from the analysis but simply, the next highest result not affected by background above the criterion is shown in this section.

Predicted cumulative TSP, PM_{10}, $PM_{2.5}$, and dust deposition levels from Myuna's existing and proposed scenarios are presented in Table 6.3 and Table 6.4 for each of the assessment locations.

The predicted cumulative concentrations and deposition rates for all pollutants and averaging periods are below the applicable NSW EPA assessment criterion at all assessment locations.

Contour plots, illustrating spatial variations in cumulative TSP, PM_{10} and $PM_{2.5}$ concentrations and dust deposition rates for the proposed scenario only are provided in Figure 6.8 to Figure 6.11 below.

Table 6.3 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	6th highest 24-hour[1]	Annual	3rd highest 24-hour[2]	Annual	Annual
Criterion	90	50	25	25	8	4
R1	38.6	48.3	17.7	23.1	6.5	1.2
R2	38.4	48.2	17.7	23.0	6.5	1.2
R3	38.8	48.0	17.7	23.0	6.5	1.3
R4	38.1	48.0	17.5	23.0	6.5	1.1
R5	38.4	48.0	17.6	23.0	6.5	1.2
R6	38.5	48.0	17.7	23.0	6.5	1.2
R7	38.7	48.0	17.8	23.1	6.6	1.2
R8	38.8	48.2	17.8	23.1	6.6	1.3

Note:[1] Due to five exceedances and exceptional events in the background dataset, the 6th 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.

Table 6.4 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	6th highest 24-hour[1]	Annual	3rd highest 24-hour[2]	Annual	Annual
Criterion	90	50	25	25	8	4
R1	39.1	49.0	18.1	23.2	6.7	1.2
R2	38.8	48.5	18.0	23.1	6.7	1.2
R3	39.9	48.0	18.2	23.0	6.7	1.5
R4	38.3	48.0	17.6	23.0	6.5	1.1
R5	39.8	48.0	18.2	23.0	6.6	1.4
R6	39.7	48.1	18.4	23.0	6.7	1.3
R7	40.2	48.6	18.6	23.2	6.8	1.4
R8	39.8	48.9	18.4	23.4	6.7	1.4

Note:[1] Due to five exceedances and exceptional events in the background dataset, the 6th 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.

KEY

- Myuna Colliery surface facilities area
- Impact assessment criterion
- Assessment location
- Major road
- Minor road
- Named watercourse

PM_{10} concentration ($\mu g/m^3$)

- 20
- 25
- 30

Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)

0 250 500 m

GDA 1994 MGA Zone 56

N

Predicted annual average PM_{10} concentrations– mine plus background (proposed scenario)

Myuna Colliery Modification 2
Air quality impact assessment
Figure 6.8

EMM
creating opportunities

KEY

- Myuna Colliery surface facilities area
- Assessment location
- Impact assessment criterion
- Major road
- Minor road
- Named watercourse

$PM_{2.5}$ concentration ($\mu g/m^3$)

- 7
- 8
- 9

Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)

0 250 500 m

GDA 1994 MGA Zone 56

N

Predicted annual average $PM_{2.5}$ concentrations– mine plus background (proposed scenario)

Myuna Colliery Modification 2
Air quality impact assessment
Figure 6.9

EMM creating opportunities

\\EMMSVR1\centennial coal\200309 - Myuna Coal Mine - Mod 2\GIS\02_Maps\Myuna_Colliery\TechAssessments\AQIA\AQ016_PredictedAnnualTSPProjectPlusBackground_20200703_02.mxd 3/07/2020

KEY
- Myuna Colliery surface facilities area
- Assessment location
- Impact accessment criterion
- Major road
- Minor road
- Named watercourse

TSP concentration (µg/m³)
- 60
- 90
- 120

Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)

0 250 500 m

GDA 1994 MGA Zone 56

N

Predicted annual average TSP concentrations - mine plus background (proposed scenario)

Myuna Colliery Modification 2
Air quality impact assessment
Figure 6.10

EMM
creating opportunities

Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)

Predicted annual average dust deposition levels- mine plus background (proposed scenario)

Myuna Colliery Modification 2
Air quality impact assessment
Figure 6.11

EMM creating opportunities

\\EMMSVR1\centennial coal\J200309 - Myuna Coal Mine - Mod 2\GIS\02_Maps\Myuna_Colliery\TechAssessments\AQIA\AQ017_PredictedAnnualDDepProjectPlusBackground_20200703_02.mxd 3/07/2020

7 Conclusion

Dispersion modelling has been completed for two operational emission scenarios:

- existing operational scenario at Myuna with a maximum coal processing rate of 3 Mtpa; and
- proposed operational scenario, corresponding to the existing operations plus an additional 0.2 Mtpa of coal being received from the CES.

Atmospheric dispersion modelling was completed using the CALPUFF model system. Hourly meteorological observations from 2018, collected at a range of Centennial or other mine-owned stations, and one BoM operated monitoring station, were used as input 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 and proposed scenarios.

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.

A range of best practice dust mitigation measures are and will continue to be employed at Myuna. These include the use of water carts and sprays, paved roads, enclosed conveyors, enclosed processing plant and watering of the emergency stockpile. These measures have been taken into account in the emissions estimation and modelling of each scenario.

References

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TRC 2011*, Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into the 'Approved Methods for the Modelling and Assessments of Air Pollutants in NSW'*, prepared for the Office of Environment and Heritage by TRC.

US-EPA 1998a, *Guideline on speciated particulate monitoring*, prepared for the USEPA by Desert Research Institute, August 1998.

- 1998b, AP-42 Chapter 11.9 – *Western surface coal mining*.
- 2006a, AP-42 Chapter 13.2.4 – Aggregate Handling and Storage Piles.
- 2006b, AP-42 13.2.5 – *Industrial wind erosion*.
- 2011, AP-42 Chapter 13.2.1.3 – *Paved roads.*
- 2016, *Nonroad Compression-Ignition Engines: Exhaust Emission Standards* (EPA-420-B-16-022, March 2016)

Xstrata Coal 2012a*, Tahmoor Colliery – Coal Mine Particulate Matter Control Best Management Practice Determination*, prepared by Xstrata Coal, September 2012.

- 2012b, *Oceanic Coal Australia Limited Coal Mine Particulate Matter Control Best Management Practice Determination*, prepared by Xstrata Coal, September 2012.

Abbreviations

AHD	Australian height datum
Approved Methods for Modelling	*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*
AQIA	Air quality impact assessment
AWS	Automatic weather station
BoM	Bureau of Meteorology
CES	Cooranbong Entry Site
CHP	Coal handling plant
CO	carbon monoxide
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DoE	Commonwealth Department of the Environment
DPIE	Department of Planning, Industry and Environment
EPA	Environment Protection Authority
EPL	Environment protection licence
LGA	Local government area
LMCC	Lake Macquarie City Council
Mtpa	Million tonnes per annum
Myuna	Myuna Colliery
NCS	Northern Coal Services
NO_x	Oxides of nitrogen
PM_{10}	Particulate matter less than 10 microns in aerodynamic diameter
$PM_{2.5}$	Particulate matter less than 2.5 microns in aerodynamic diameter
ROM	Run-of-mine
SO_2	Sulfur dioxide
SSD	State significant development
TAPM	The Air Pollution Model
TEOM	Tapered Element Oscillating Microbalance
TSP	Total suspected particulates
US-EPA	United States Environmental Protection Agency
VOC	Volatile organic compound


Appendix A

Meteorological processing and modelling




A.1 Meteorological data analysis for the Myuna AWS, 2017-2019

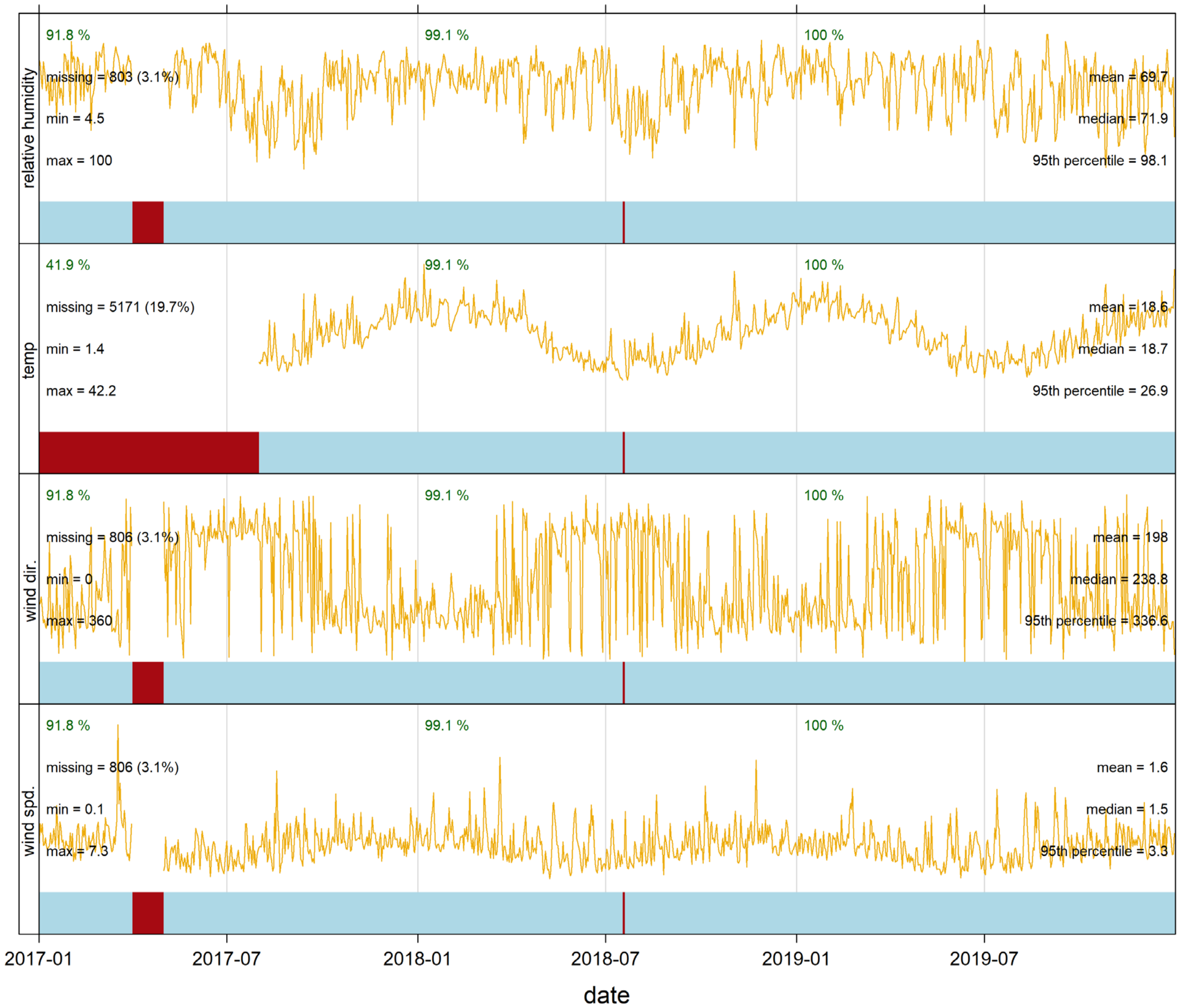


Figure A.1 Data completeness analysis plot – Myuna AWS – 2017 to 2019

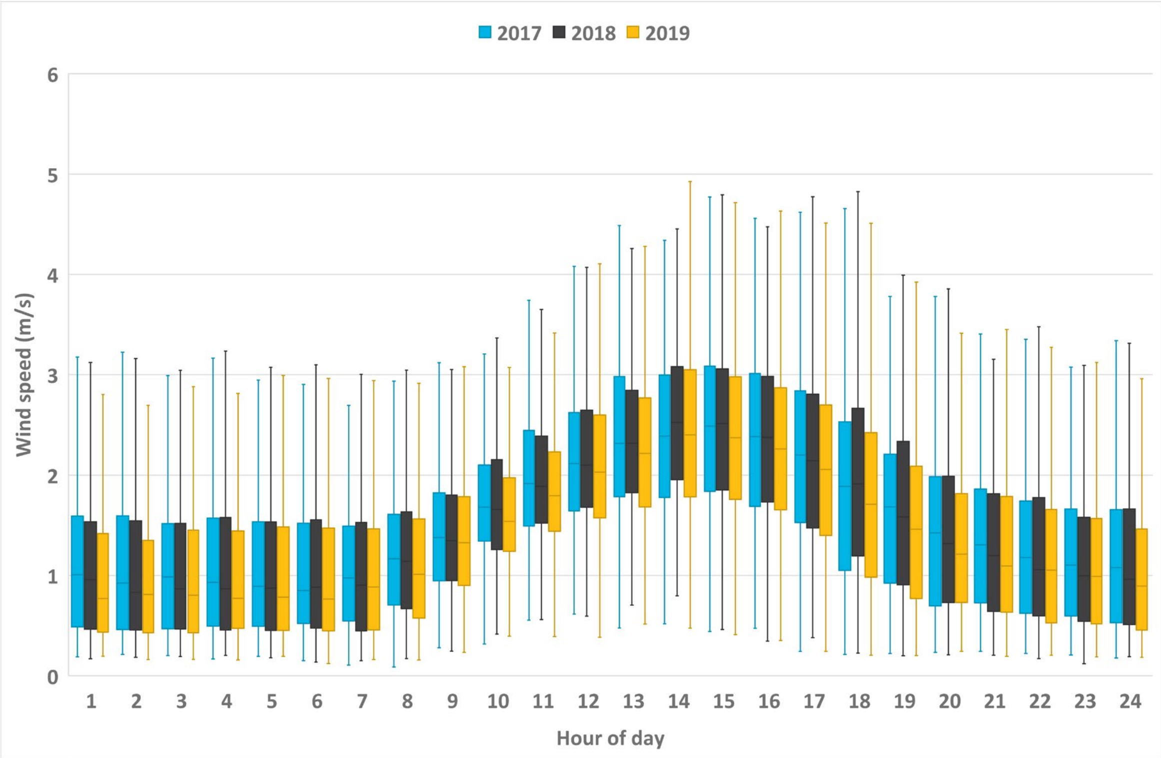


Figure A.2 Inter-annual variability in diurnal wind speed – Myuna AWS – 2017 to 2019

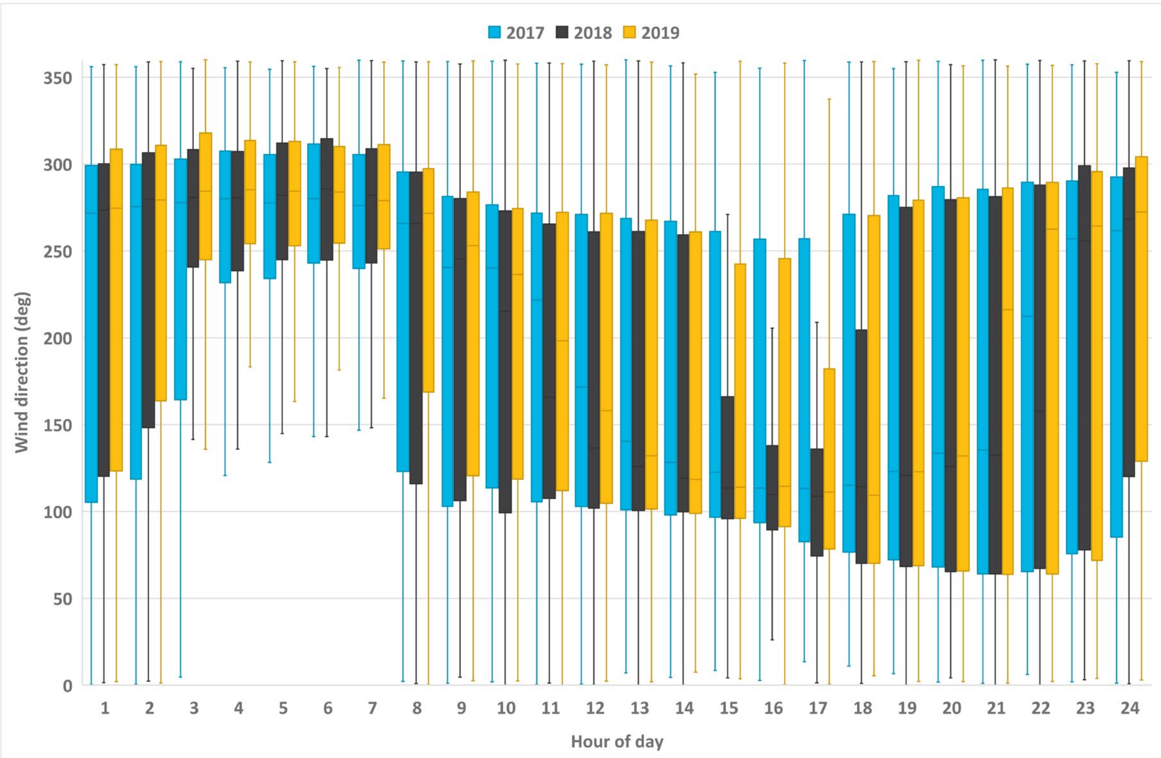


Figure A.3 Inter-annual variability in diurnal wind direction – Myuna AWS – 2017 to 2019

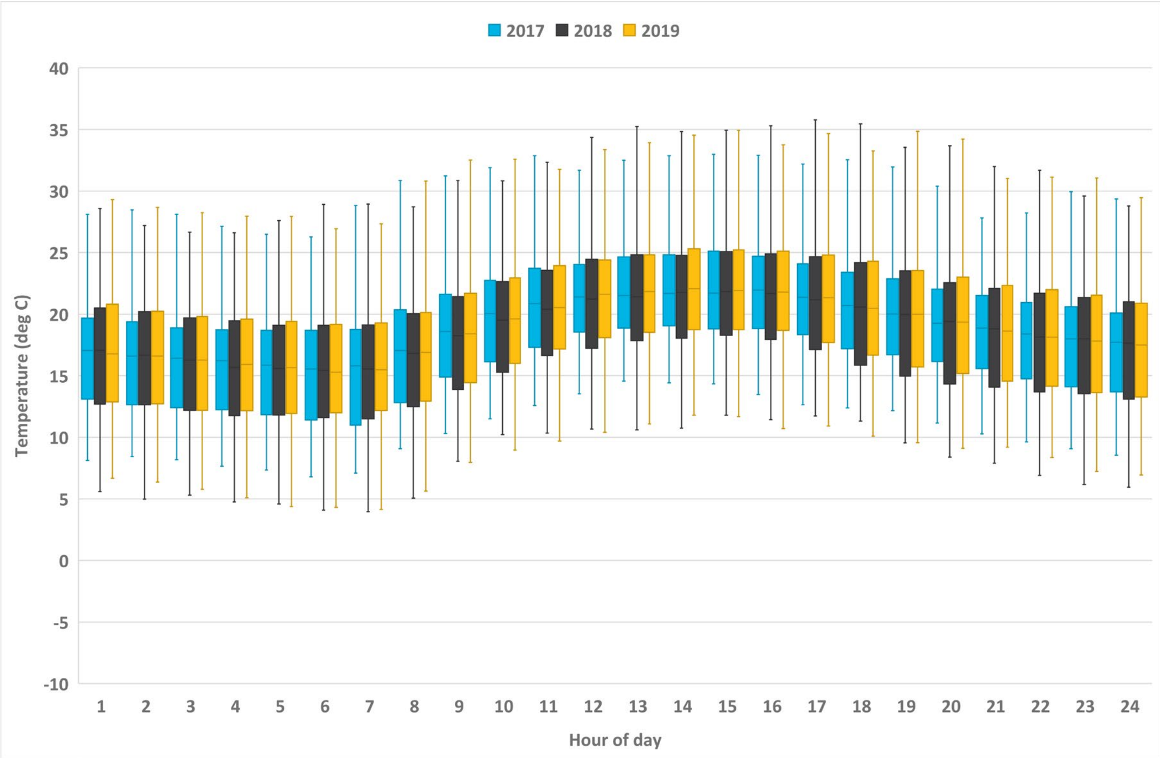


Figure A.4 Inter-annual variability in diurnal air temperature – Myuna AWS – 2017 to 2019

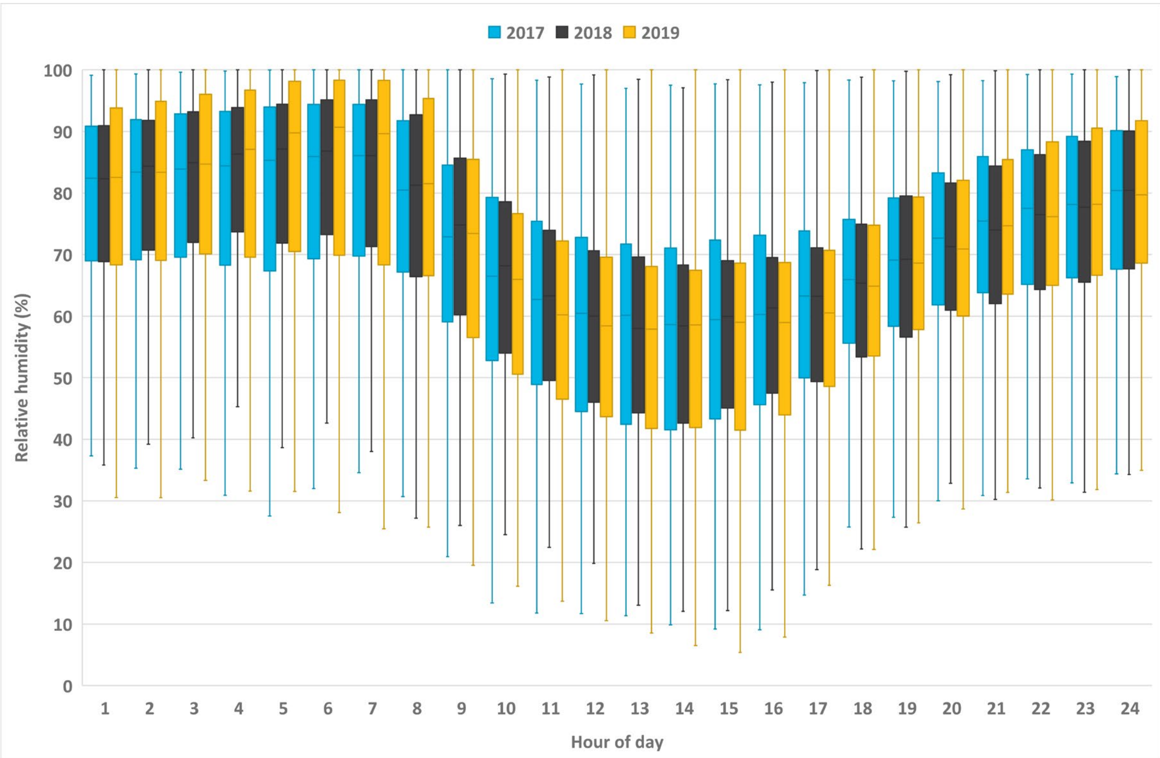


Figure A.5 Inter-annual variability in diurnal relative humidity – Myuna AWS – 2017 to 2019

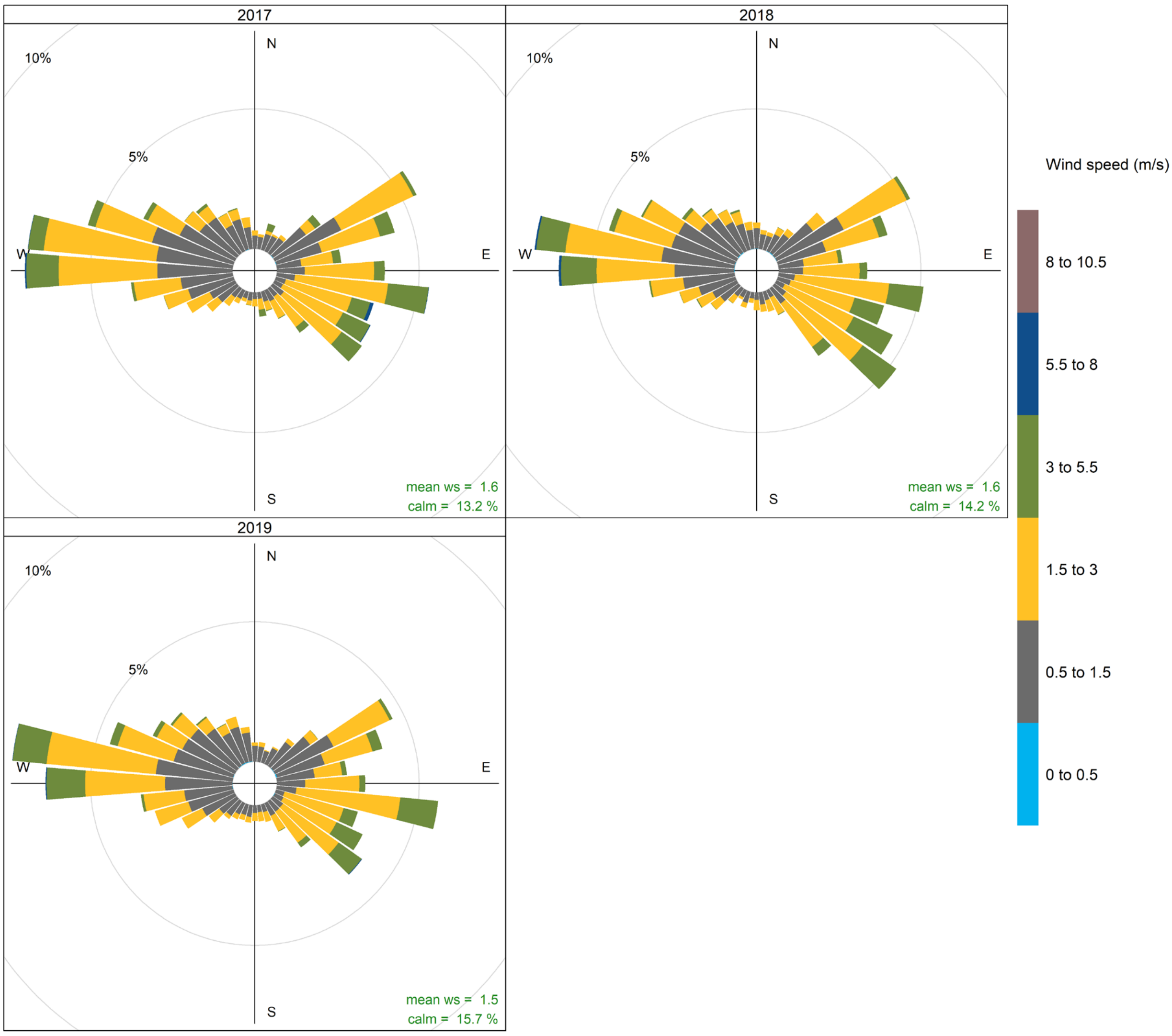


Figure A.6 Inter-annual comparison of recorded wind speed and direction – Myuna AWS – 2017 to 2019

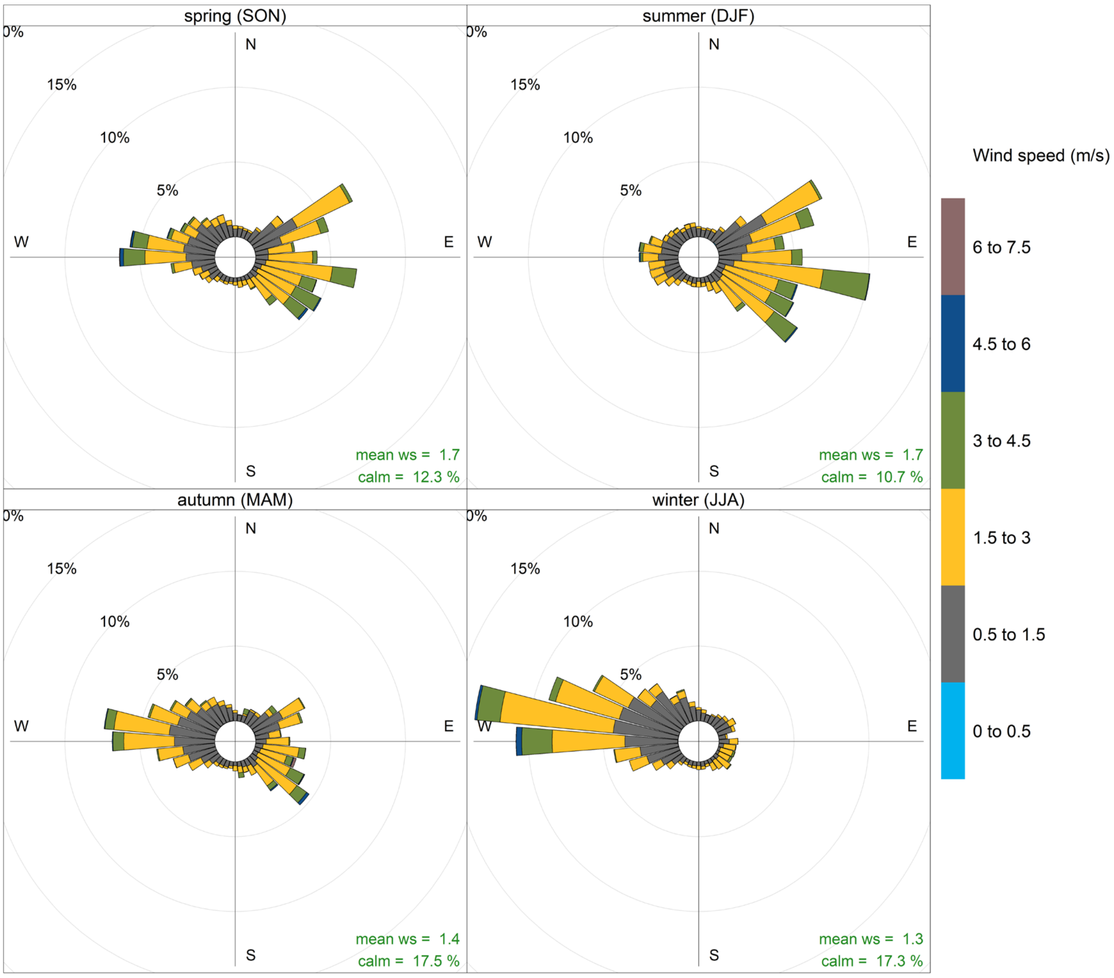


Figure A.7 Seasonal wind speed and direction – Myuna AWS – 2017-2019

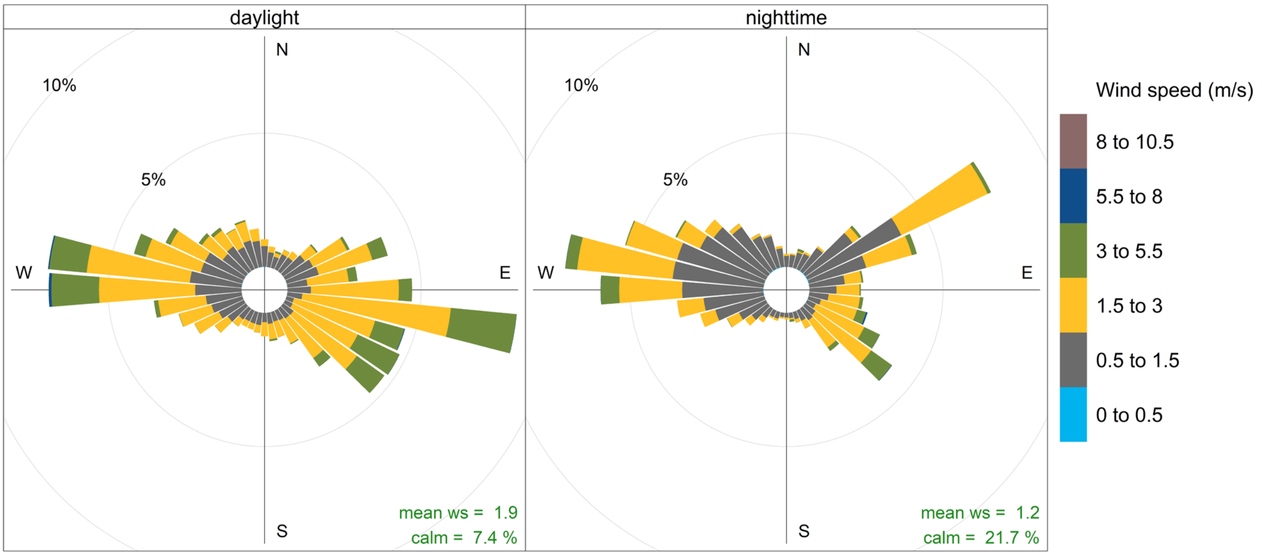


Figure A.8 Diurnal wind speed and direction – Myuna AWS – 2017-2019

A.2 Meteorological modelling

i TAPM modelling

To supplement the meteorological monitoring datasets adopted for this assessment, the Commonwealth Scientific and Industry Research Organisation (CSIRO) prognostic meteorological model The Air Pollution Model (TAPM) was used to generate required parameters that are not routinely measured, specifically cloud content and height data.

TAPM was configured and run as follows:

- TAPM version 4.0.5;
- inclusion of high resolution (90 m) regional topography (improvement over default 250 m resolution data);
- grid domains with cell resolutions of 30 km, 10 km and 3 km. Each grid domain features 25 x 25 horizontal grid points and 35 vertical levels;
- TAPM default databases for land use, synoptic analyses and sea surface temperature;
- TAPM defaults for advanced meteorological inputs; and
- two 'spin-up' days allowed at the beginning and end of the run.

A surface observations file was included in TAPM with meteorological data from:

- Myuna AWS;
- Centennial Awaba AWS;
- Centennial Mandalong AWS;
- Delta Coal's Mannering AWS; and
- BoM Cooranbong (Lake Macquarie AWS).

ii CALMET

The CALMET/CALPUFF model suite was chosen for this study. CALMET was used to produce 3-dimensional meteorological fields for use in the CALPUFF model.

In the absence of upper air measurements, CALMET can be run using prognostic upper air data (as a three-dimensional '3D.dat' file), which is used to derive an initial wind field (known as the Step 1 wind field in the CALMET model). The model then incorporates mesoscale and local scale effects, including surface observations, to adjust the wind field. This modelling approach is known as the 'hybrid' approach (TRC 2011) and is adopted for this assessment. TAPM was used to generate gridded upper air data for each hour of the model run period, for input into CALMET.

A CALMET grid of 30 km by 30 km was run with a resolution of 500 m. Surface meteorological data from the Myuna AWS, Centennial-owned stations at Awaba and, Mandalong and Delta Coal's Mannering and the BoM Cooranbong (Lake Macquarie AWS) was incorporated into the modelling. Cloud amount and cloud height data were incorporated in CALMET through the use of the prognostic 3-dimensional data extracted from TAPM.

The observations at the surface stations provided the dominant influence on the derived wind field and the resultant dispersion meteorology within the model. The distance at which the observation influences the model (radius of influence) is determined by the CALMET setting 'RMAX'. The relative importance of the observation in the model (relative weighting of the Step 1 wind field and the observation) is determined by the CALMET setting 'R1'.

An RMAX of 3 km and R1 of 1.5 km was assigned in the model to reflect the likely influence of local scale topographical features.

The detailed CALMET model options used are presented in Table A.1. These were selected in accordance with recommendations in in TRC (2011). Surface observations were included in the modelling (referred to as data assimilation) to provide real-world observations and improve the accuracy of the wind fields.

Table A.1 CALMET model options used

Flag	Descriptor	Default	Value used
IEXTRP	Extrapolate surface wind observations to upper layers	Similarity theory	Similarity theory
BIAS (NZ)	Relative weighting given to vertically extrapolated surface observations versus upper air data	No default	-1, -0.989, -0.971, -0.937, -0.868, -0.731, -0.479, -0.089, 0.427, 1.0
TERRAD	Radius of influence of terrain	No default (typically 5-15 km)	3
RMAX1 and RMAX2	Maximum radius of influence over land observations in layer 1 and aloft	No default	3, 3
R1 and R2	Distance from observations in layer 1 and aloft at which observations and Step 1 wind field are weighted equally	No default	1.5, 1.5


Appendix B

Emissions inventory detail




B.1 Introduction

Particulate matter emissions were quantified through the application of accepted published emission estimation factors, collated from a combination of United States Environmental Protection Agency (US-EPA) AP-42 Air Pollutant Emission Factors and US-EPA Exhaust Emissions Standards, including the following:

- US-EPA AP-42 Chapter 13.2.4.4 – Aggregate handling and storage piles (US-EPA 2006a);
- US-EPA AP-42 Chapter 13.2.1.3 – Paved roads (US-EPA 2011);
- US-EPA AP-42 Chapter 11, Table 11.19.2-1 – Tertiary crushing (controlled) (US-EPA 2004);
- US-EPA AP-42 Chapter 11, Table 11.19.2-1 – Screening (controlled) (US-EPA 2004);
- US-EPA AP-42 Chapter 11, Table 11.19.2-1 – Tertiary crushing (controlled) (US-EPA 2004);
- US-EPA AP-42 Chapter 13.2.5.3 – Industrial wind erosion (US-EPA 2006b);
- US-EPA AP-42 Chapter 11, Table 11.9-4 – Wind erosion of exposed areas (US-EPA 1998b); and
- US-EPA Nonroad Compression-Ignition Engines: Exhaust Emission Standards (EPA-420-B-16-022, March 2016).

Annual projections of diesel consumption were sourced from Centennial Myuna. Assumptions adopted were:

- the proposed construction equipment fleet comprised primarily of equipment with an engine power greater than 130 kW;
- for engines greater than 130 kW, the corresponding USEPA (USEPA 2016) Tier 2 emission standards for PM of 0.2 g/kWh was selected;
- the g/kWh emission standard was converted to g per litre of diesel by applying a scaling factor of 3, as per the notes for Table 35 in *NPI Emission Estimation Technique Manual for Combustion Engines* (NPI 2008); and
- the PM emission standard is assumed to correspond to PM_{10}, with $PM_{2.5}$ emissions derived from the relationship between PM_{10} and $PM_{2.5}$ emission factors presented in Table 35 in NPI, 2008 (91.7%).

Particulate releases were quantified for TSP, PM_{10} and $PM_{2.5}$ as documented in subsequent sections.

B.2 Particulate matter emissions inventory

Emissions inventories developed for the existing and proposed scenarios are presented in Table B.1 and Table B.2.

Table B.1 Existing scenario emissions inventory

Source name	Emission estimate TSP (kg/year)	Emission estimate PM_{10} (kg/year)	Emission estimate $PM_{2.5}$ (kg/year)	Activity rate	Units	TSP emission factor	PM_{10} emission factor	$PM_{2.5}$ emission factor	Unit	Parameter 1	Unit	Parameter 2	Unit	Parameter 3	Unit	Parameter 4	Unit	Reduction factor	Emission control	Emission factor source
Conveyor transfer point from portal to surface ROM bin	138	27	4	3,000,000	t/y	0.0003	0.0001	0.00001	kg/t	1.63	Average wind speed (m/s)	7.4	Moisture content (%)					0.85	Enclosure and water sprays	USEPA AP-42 13.2.4 - Materials handling
Unloading coal from ROM bins to trucks	12	2	0	40,000	t/y	0.0003	0.0001	0.00001	kg/t	1.63	Average wind speed (m/s)	7.4	Moisture content (%)							USEPA AP-42 13.2.4 - Materials handling
Hauling coal from ROM bin to Emergency stockpile on paved road	1	0	0	1,465	VKT/year	1.1077	0.2126	0.0514	kg/VKT	4.3	Road silt loading (g/m²)	1.2	Return haul distance (km)	1,250	Loads/year	75	Average weight (t)	0.5	Water cart	USEPA AP-42 13.2.1 - Paved roads
Unloading coal at Emergency Stockpile	1,047	147	20	40,000	t/y	0.0524	0.0074	0.00099	kg/t			7.4	Moisture content (%)					0.5	Watering	USEPA AP-42 13.2.4 - Materials handling
Loading coal at Emergency stockpile to trucks	2,094	294	40	40,000	t/y	0.0524	0.0074	0.00099	kg/t			7.4	Moisture content (%)							USEPA AP-42 13.2.4 - Materials handling
Hauling coal from Emergency stockpile to reclaimer on paved road	1	0	0	1,468	VKT/year	1.1077	0.2126	0.0514	kg/VKT	4.3	Road silt loading (g/m²)	1.2	Return haul distance (km)	1,250	Loads/year	75	Average weight (t)	0.5	Water cart	USEPA AP-42 13.2.1 - Paved roads
Unloading coal at reclaimer	733	103	14	40,000	t/y	0.0524	0.0074	0.00099	kg/t			7.4	Moisture content (%)					0.65	Watering & reduced drop height	USEPA AP-42 13.2.4 - Materials handling
Conveyor transfer from ROM bin to breaker	138	27	4	3,000,000	t/y	0.0003	0.0001	0.00001	kg/t	1.63	Average wind speed (m/s)	7.4	Moisture content (%)					0.85	Enclosure and water sprays	USEPA AP-42 13.2.4 - Materials handling
Coal breaking	270	122	23	3,000,000	t/y	0.0006	0.00027	0.00005	kg/t									0.85	Enclosure and water sprays	USEPA AP-42 11.19.2-1 - Tertiary crushing
Conveyor transfer from breaker to screen	138	27	4	3,000,000	t/y	0.0003	0.0001	0.00001	kg/t	1.63	Average wind speed (m/s)	7.4	Moisture content (%)					0.85	Enclosure and water sprays	USEPA AP-42 13.2.4 - Materials handling
Coal screening	495	167	11	3,000,000	t/y	0.0011	0.00037	0.00003	kg/t									0.85	Enclosure and water sprays	USEPA AP-42 11.19.2-1 - Screening
Conveyor transfer from screener to crusher	138	27	4	3,000,000	t/y	0.0003	0.0001	0.00001	kg/t	1.63	Average wind speed (m/s)	7.4	Moisture content (%)					0.85	Enclosure and water sprays	USEPA AP-42 13.2.4 - Materials handling
Coal crushing	270	122	23	3,000,000	t/y	0.0006	0.00027	0.00005	kg/t									0.85	Enclosure and water sprays	USEPA AP-42 11.19.2-1 - Tertiary crushing
Conveyor transfer from crusher to product bin	138	27	4	3,000,000	t/y	0.0003	0.0001	0.00001	kg/t	1.63	Average wind speed (m/s)	7.4	Moisture content (%)					0.85	Enclosure and water sprays	USEPA AP-42 13.2.4 - Materials handling
Conveyor transfer from product bin to Eraring Power Station	138	27	4	3,000,000	t/y	0.0003	0.0001	0.00001	kg/t	1.63	Average wind speed (m/s)	7.4	Moisture content (%)					0.85	Enclosure and water sprays	USEPA AP-42 13.2.4 - Materials handling
Wind erosion of Emergency Stockpile	145	73	11	0.48	Area (ha)	864	432	65	kg/ha/year									0.65	Watering and vegetative windbreaks	USEPA AP-42 13.2.5.3 - Industrial wind erosion of exposed areas
Wind erosion of water storage dams	26	13	2	0.06	Area (ha)	850	425	64	kg/ha/year									0.5	Watering	USEPA AP-42 11.9.2 - Wind erosion of exposed areas
Upcast vent shaft	34,918	5,643	1,764																	
Site diesel combustion	62	62	57																	
Total	**40,905**	**6,911**	**1,988**																	

Table B.2 Proposed scenario emissions inventory

Source name	Emission estimate TSP (kg/year)	Emission estimate PM_{10} (kg/year)	Emission estimate $PM_{2.5}$ (kg/year)	Activity rate	Units	TSP emission factor	PM_{10} emission factor	$PM_{2.5}$ emission factor	Unit	Parameter 1	Unit	Parameter 2	Unit	Parameter 3	Unit	Parameter 4	Unit	Reduction factor	Emission control	Emission factor source
Conveyor transfer point from portal to surface ROM bin	138	27	4	3,000,000	t/y	0.0003	0.0001	0.00001	kg/t	1.63	Average wind speed (m/s)	7.4	Moisture content (%)					0.85	Enclosure and water sprays	USEPA AP-42 13.2.4 - Materials handling equation
Unloading coal from ROM bins to trucks	308	60	9	1,000,000	t/y	0.0003	0.0001	0.00001	kg/t	1.63	Average wind speed (m/s)	7.4	Moisture content (%)							USEPA AP-42 13.2.4 - Materials handling equation
Hauling coal from ROM bin to Emergency stockpile on paved road	1.0	0.2	0.0	1,831	VKT/year	1.1077	0.2126	0.0514	kg/VKT	4.3	Road silt loading (g/m²)	1.2	Return haul distance (km)	1,562	Loads/year	75	Average weight (t)	0.5	Water cart	USEPA AP-42 13.2.1 - Paved roads
Hauling coal from Cooranbong to the emergency coal stockpile on paved road	5	0.9	0.2	8,578	VKT/year	1.1077	0.2126	0.0514	kg/VKT	4.3	Road silt loading (g/m²)	1.4	Return haul distance (km)	6,250	Loads/year	75	Average weight (t)	0.5	Water cart	USEPA AP-42 13.2.1 - Paved roads
Unloading of coal at Emergency Stockpile	6,545	920	124	250,000	t/y	0.0524	0.0074	0.00099	kg/t			7.4	Moisture content (%)					0.5	Watering	USEPA AP-42 13.2.4 - Materials handling equation
Loading coal at Emergency stockpile to trucks	13,091	1,841	249	250,000	t/y	0.0524	0.0074	0.00099	kg/t			7.4	Moisture content (%)							USEPA AP-42 13.2.4 - Materials handling equation
Hauling coal from Emergency stockpile to reclaimer on paved road	5	1	0	9,173	VKT/year	1.1077	0.2126	0.0514	kg/VKT	4.3	Road silt loading (g/m²)	1.2	Return haul distance (km)	7,812	Loads/year	75	Average weight (t)	0.5	Water cart	USEPA AP-42 13.2.1 - Paved roads
Unloading coal at reclaimer	4,582	644	87	250,000	t/y	0.0524	0.0074	0.00099	kg/t			7.4	Moisture content (%)					0.65	Watering & reduced drop height	USEPA AP-42 13.2.4 - Materials handling equation
Conveyor transfer from ROM bin to breaker	138	27	4	3,000,000	t/y	0.0003	0.0001	0.00001	kg/t	1.63	Average wind speed (m/s)	7.4	Moisture content (%)					0.85	Enclosure and water sprays	USEPA AP-42 13.2.4 - Materials handling equation
Coal breaking	270	122	23	3,000,000	t/y	0.0006	0.00027	0.00005	kg/t									0.85	Enclosure and water sprays	USEPA AP-42 11.19.2-1 - Tertiary crushing
Conveyor transfer from breaker to screen	138	27	4	3,000,000	t/y	0.0003	0.0001	0.00001	kg/t	1.63	Average wind speed (m/s)	7.4	Moisture content (%)					0.85	Enclosure and water sprays	USEPA AP-42 13.2.4 - Materials handling equation
Coal screening	495	167	11	3,000,000	t/y	0.0011	0.00037	0.00003	kg/t									0.85	Enclosure and water sprays	USEPA AP-42 11.19.2-1 - Screening
Conveyor transfer from screener to crusher	138	27	4	3,000,000	t/y	0.0003	0.0001	0.00001	kg/t	1.63	Average wind speed (m/s)	7.4	Moisture content (%)					0.85	Enclosure and water sprays	USEPA AP-42 13.2.4 - Materials handling equation
Coal crushing	270	122	23	3,000,000	t/y	0.0006	0.00027	0.00005	kg/t									0.85	Enclosure and water sprays	USEPA AP-42 11.19.2-1 - Tertiary crushing
Conveyor transfer from crusher to product bin	138	27	4	3,000,000	t/y	0.0003	0.0001	0.00001	kg/t	1.63	Average wind speed (m/s)	7.4	Moisture content (%)					0.85	Enclosure and water sprays	USEPA AP-42 13.2.4 - Materials handling equation
Conveyor transfer from product bin to trucks	461	91	14	3,000,000	t/y	0.0003	0.0001	0.00001	kg/t	1.63	Average wind speed (m/s)	7.4	Moisture content (%)					0.5	Watering	USEPA AP-42 13.2.4 - Materials handling equation
Hauling coal from product bin to Wangi Point Rd (for transport to Awaba and then Cooranbong)	27	5	1	48,456	VKT/year	1.1077	0.2126	0.0514	kg/VKT	4.3	Road silt loading (g/m²)	1.6	Return haul distance (km)	31,250	Loads/year	75	Average weight (t)	0.5	Water cart	USEPA AP-42 13.2.1 - Paved roads
Wind erosion of Emergency Stockpile	145	73	11	0.48	Area (ha)	864	432	65	kg/ha/year									0.65	Watering and vegetative windbreaks	USEPA AP-42 13.2.5.3 - Industrial wind erosion of exposed areas
Wind erosion of water storage dams	26	13	2	0.06	Area (ha)	850	425	64	kg/ha/year									0.5	Watering	USEPA AP-42 11.9.2 - Wind erosion of exposed areas
Upcast vent shaft	34,918	5,643	1,764																	
Site diesel combustion	77	77	71																	
Total	**61,917**	**9,914**	**2,409**																	

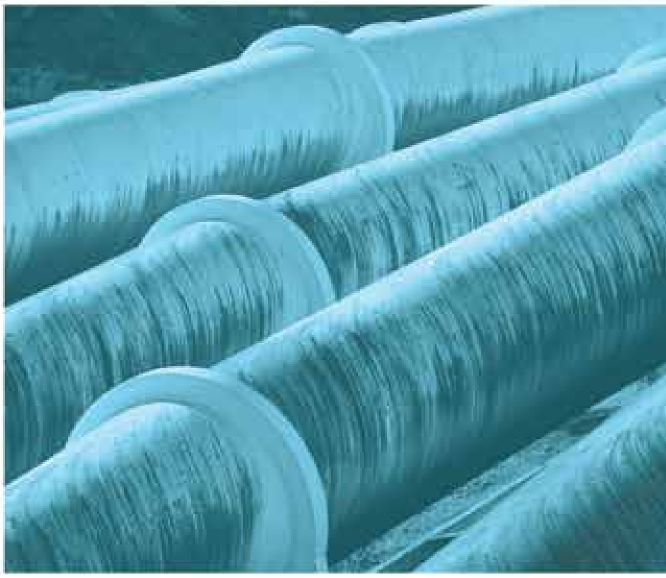
B.3 Project-related input data used for particulate matter emission estimates

The main inputs used in the emission estimates are summarised in Table B.3. All material volumes and loads per year were provided by Centennial Coal.

Table B.3 Inputs for emission estimation

Material properties	Value	Source of information
Paved road silt content (%)	4.3	Site-specific data were not available, therefore 4.3% was taken as the average paved road silt content from samples taken at the Wallsend and Tahmoor mines (Xstrata Coal 2012a and Xstrata Coal 2012b).
Coal moisture (%)	7.4	Average of monthly Myuna coal moisture samples taken on-site in 2018.
Diesel consumption for 2018 (L/y)	103,842 (existing scenario) 128,602 (proposed scenario)	Total diesel provided by Centennial. Surface diesel use estimated conservatively at 20% of total diesel.
Average wind speed (m/s)	1.63	Calculated from CALMET extract at Myuna.
Average truck weight (t)	75	Provided by Centennial.
Industrial wind erosion parameters	Number of disturbances per year = 8,760 Erosion potential (fastest mile of wind) (m/s) = 1.27 Threshold friction velocity at 10 m (m/s) = 0.62	No. of disturbances - The entire pile area is conservatively assumed to be disturbed every hour. Erosion potential (fastest mile) - (SKM 2005) 'Scraper trucks on coal pile' per Table 13.2.5-2 of US-EPA AP-42. It is noted that when using the threshold friction velocity corresponding to 'uncrusted coal pile', the wind erosion emission result was 0.



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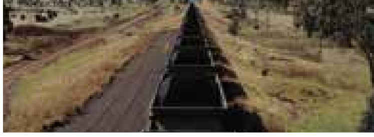
Appendix C

Traffic impact assessment



Myuna Colliery - Modification 2

Traffic impact assessment

Prepared for Centennial Myuna Pty Ltd
July 2020

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Myuna Colliery - Modification 2

Traffic impact assessment

Report Number

J200309 RP#2

Client

Centennial Myuna Pty Ltd

Date

1 July 2020

Version

Final

Prepared by

Eric Lei
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1 July 2020

Approved by

Tim Brooker
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1 July 2020

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1 Introduction

1.1 Overview

Myuna Colliery (Myuna) is an existing underground coal mine owned and operated by Centennial Myuna Pty Limited (Centennial Myuna). Myuna's pit top is 25 kilometres (km) south-west of Newcastle, New South Wales (NSW), in the Lake Macquarie local government area (LGA) (Figure 1.1).

Myuna operates under two development consents:

- SH110_148, which was granted by Lake Macquarie City Council (LMCC) in 1977 under the provisions of the now repealed NSW *Local Government Act 1919* for the development and operation of the Myuna and Cooranbong collieries; and

- MP 10_0080, which was granted by the Minister of Planning and Infrastructure on 18 January 2012 under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for continued mining in areas outside the area defined by SH110_148. MP 10_0080 also authorises the use of bord and pillar methods in the Wallarah, Great Northern and Fassifern coal seams and the continued use of existing infrastructure on-site until 31 December 2032.

MP 10_0080 has since been declared a State significant development (SSD) under Clause 6 of Schedule 2 of the NSW Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017. Accordingly, Myuna now operates as an SSD approval.

Coal produced at Myuna is transferred from Myuna's pit top to the Eraring Power Station (about 4 km west of the pit top) by overland conveyor. Coal from Myuna that does not meet Eraring Power Station specifications, is stockpiled at Myuna's emergency coal stockpile until it can be reclaimed and blended with coal to meet these specifications. However, there is limited capacity to store coal at Myuna's pit top prior to blending and dispatch.

The Northern Coal Logistics Project regulates coal handling, processing, and transport operations at the Newstan Colliery Surface Site, Cooranbong Entry Site (CES) and associated private haul roads, and also the use of various other surface infrastructure items. The Northern Coal Logistics Project operates under SSD-5145, which was granted by the Minister for Planning on 29 September 2015.

CES is approximately 2 km north of Dora Creek in the Lake Macquarie LGA (Figure 1.1). It was originally developed as part of Cooranbong Colliery. CES comprises a coal handling plant (CHP), coal stockpiles, workshop building, administration building, car park and water management infrastructure. CES is approved to receive and process ROM coal from Mandalong Mine (SSD-5144). Coal handled at CES can be delivered to either the Eraring Power Station via overland conveyor or to Newstan Colliery for further processing and transfer into the export market.

In recent months, Centennial Myuna has been experiencing fluctuations in coal quality with some product coal not meeting Eraring Power Station specifications. Centennial Myuna has assessed a number of options to ensure that it can continue to meet its contractual obligations to supply coal to Eraring Power Station. This assessment found that the best option is to blend coal from Myuna with coal from Mandalong Mine, with blending occurring at both at Myuna's pit top and at CES. This would allow Centennial Myuna to continue to provide a secure supply of coal to Eraring Power Station and to secure ongoing employment for Myuna's workforce.

Centennial Myuna is seeking to modify MP 10_0080, pursuant to Section 4.55(2) of the EP&A Act, to allow coal to be transferred between Myuna's pit top and CES, blending of this coal at Myuna, and associated activities. Coal would be transported between Myuna's pit top and CES by truck.

At the same time Centennial Myuna is seeking to modify MP 10_0080, Centennial Northern Coal Services Pty Limited (Centennial NCS) will submit a modification application for SSD-5145 to allow coal from Myuna to be received, handled and blended at CES.

1.2 Assessment guidelines and requirements

This traffic impact assessment (TIA) has been prepared to accompany the modification report and assesses the traffic impacts of the proposed modification on the local road network.

It has been prepared in accordance with the requirement of the NSW Roads and Traffic Authority's (RTA's) *Guide to Traffic Generating Developments* (RTA 2002). This guideline remains current despite the incorporation of the RTA into NSW Roads and Maritime Services (RMS) and now Transport for NSW (TfNSW).

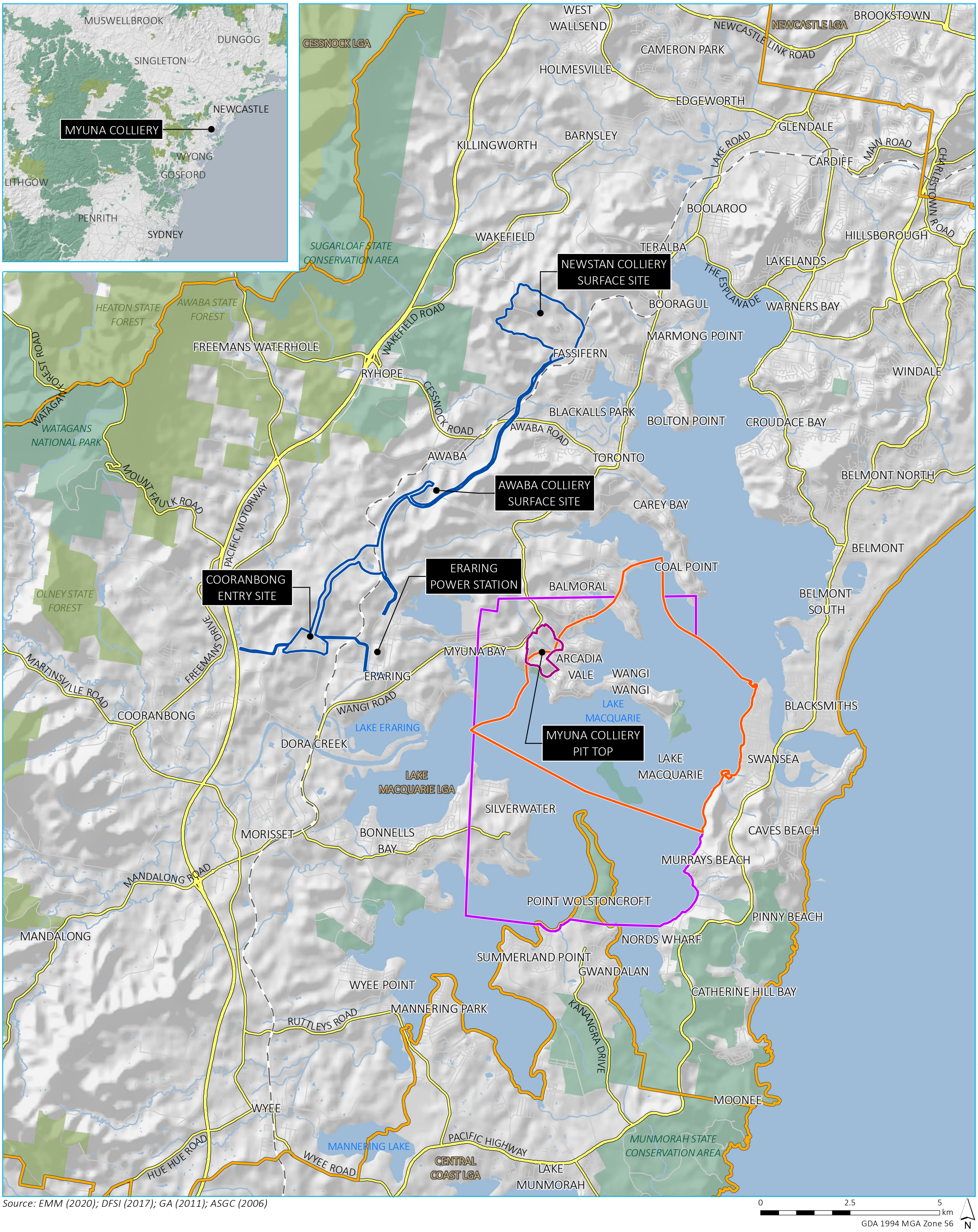
This TIA includes:

- an assessment of Myuna's existing traffic and transport arrangements;
- an assessment of road safety based on publicly available traffic accident data;
- determination of the forecast traffic generation of the proposed modification and its impacts on the local road network;
- an assessment of the vehicular ingress and egress at Myuna and the Awaba Colliery surface site as well as on the local road network; and
- an assessment of the overall impact of the proposed modification on the local road network, transport safety and efficiency.

The TIA has also considered the following guidelines:

- Austroads (2016) *Guide to Traffic Management Part 3: Traffic Studies and Analysis*;
- Austroads (2017a) *Guide to Road Design Part 4: Intersections and Crossings General*; and
- Austroads (2017b) *Guide to Road Design Part 4A: Unsignalised & Signalised Intersections*.

This TIA includes consideration of vehicle movements both to and from Myuna and CES.



Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006)

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KEY

- Rail line
- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest
- Local government area
- Myuna Colliery surface facilities area

Development consent boundaries

- Myuna Colliery development consent boundary (SH110_148)
- Myuna Colliery project approval boundary (MP 10_0080)
- Northern Coal Logistics development consent boundary (SSD-5145)

Regional context

Myuna Colliery Modification 2
Traffic impact assessment
Figure 1.1

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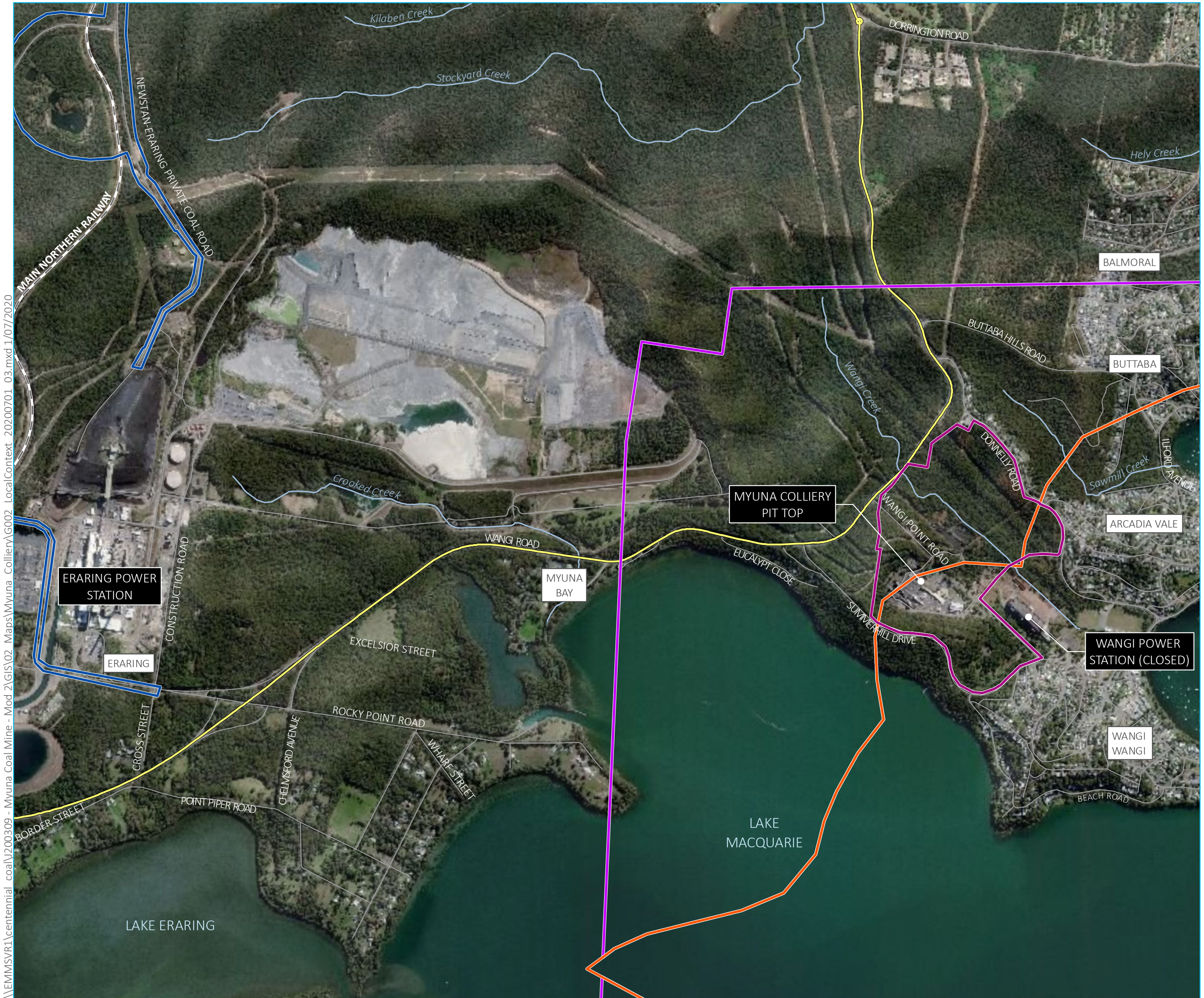

Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006)

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KEY

- Myuna Colliery development consent boundary (SH110_148)
- Northern Coal Logistics development consent boundary (SSD-5145)
- Myuna Colliery project approval boundary (MP 10_0080)
- Myuna Colliery surface facilities area
- Rail line
- Major road
- Minor road
- Named watercourse

Local context

Myuna Colliery Modification 2
Traffic impact assessment
Figure 1.2

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2 Existing road network

2.1 Site description

As noted in Section 1.1, Myuna operates under two development consents. The project approval boundary (Figure 1.2) is applicable to MP 10_0080 and encompasses an area of approximately 3,773 hectares (ha). The development consent boundary (Figure 1.2) is applicable to SH110_148 and encompasses an area of approximately 3,105 ha. Myuna's surface facilities area (or pit top) sits within the project approval boundary on land owned by Centennial Fassifern Pty Ltd, a sister company of Centennial Myuna.

Myuna's pit top is currently only accessed directly from Summerhill Drive (Figure 1.2). A locked gate prevents entry to Myuna's pit top via a Centennial-owned section of Wangi Point Road off Wangi Road. Myuna's pit top is west of the residential area of Arcadia Vale, north-west of Wangi Wangi and is adjacent to the site of the former Wangi Power Station (Figure 1.2). Eraring Power Station is approximately 4 km west of Myuna's pit top.

Land uses surrounding Myuna's pit top include a mix of mining, industrial (including the now closed Wangi Wangi Power Station) and residential (including the suburbs of Wangi Wangi and Arcadia Vale). Lake Macquarie is approximately 400 m south of Myuna's pit top at its closest point. Wangi Road, Donnelly Road and Summerhill Drive are to the north-west, north-east and south of Myuna's pit top, respectively (Figure 1.2).

2.2 Road network

The NSW administrative road hierarchy comprises the following classifications, which align with the generic road hierarchy as follows:

- State roads – freeways and primary arterials (TfNSW-managed);
- regional roads – secondary or sub arterials (Council-managed and part funded by the State); and
- local roads – collector and local access roads (Council-managed).

Wangi Road is a State road managed by TfNSW. Wilton Road is a local road managed by LMCC. Wangi Point Road is a private road controlled by Centennial Myuna, which provides access from Myuna directly onto Wangi Road.

A description of Wangi Road, Wilton Road and Wangi Point Road is provided in Table 2.1, Table 2.2 and Table 2.3, respectively.

Table 2.1 Wangi Road (B53)

Aspect	Description
Road classification and connectivity	Part of State road route B53, which connects Mandalong (south-west) and Wallsend (north-east).
Alignment	Generally, north to south between Pacific Motorway at Mandalong and Newcastle Link Road at Wallsend.
Number of lanes	Generally, one lane each way with additional capacity at intersections and passing lanes at some sections. Separate cycleway lanes also available at some intersections.
Carriageway type	Sealed road with narrow road shoulder at some sections.
Carriageway width	Generally, 9–10 m, approximately 3.5 metres (m) travel lane with sealed shoulders.
Posted speed limit	80–90 km/hr at straight and flat sections and lower speed at bends and in urban areas.
Heavy vehicle access	RMS approved 25/26 m B-double route.
Traffic function	Carries local and regional traffic, providing access to many significant traffic generating sites.

Plate 2.1 Wangi Road at Wangi Wangi

(Source: Google Earth)

Table 2.2 Wilton Road

Aspect	Description
Road classification and connectivity	Local road between Awaba (west) and Rathmines (east).
Alignment	Generally north-west to south-east between Cessnock Road at Awaba and Wangi Road at Rathmines.
Number of lanes	One lane each way.
Carriageway type	Sealed road with narrow shoulder.
Carriageway width	Generally 8 m, approximately 3.5 m travel lanes with narrow sealed shoulder (typically 0.5 m) at sections.
Posted speed limit	80 km/hr.
Heavy vehicle access	RMS approved 25/26 m B-double route.
Traffic function	Carries local and regional traffic (including access to Awaba Landfill and Waste Transfer Station).

Plate 2.2 Wilton Road at Awaba

(Source: Google Earth)

Table 2.3 Wangi Point Road

Aspect	Description
Road classification and connectivity	Private road providing access from Wangi Road to Myuna's surface facilities area.
Alignment	North-west to south-east.
Number of lanes	Two-way; however, no centre or edge line provided.
Carriageway type	Sealed road, no shoulder.
Carriageway width	Approximately 6–6.5 m.
Posted speed limit	None currently, assume 50 km/hr if reopened (at Wangi Road intersection).
Heavy vehicle access	Yes.
Traffic function	Currently closed - Provides direct access to Myuna's surface facilities area.

Plate 2.3 Wangi Point Road at Myuna

(Source: Google Earth)

2.3 Key intersections

Three key intersections have been considered as part of this assessment:

- Wangi Road/Wangi Point Road;
- Wangi Road/Wilton Road; and
- Wilton Road/Awaba Colliery surface site access road.

The potential safety concerns at all significant T-intersections along the route between Myuna and Awaba Colliery surface site have also been considered. This includes the following intersections:

- Wangi Road/Donnelly Road;
- Wangi Road/Buttaba Hills Road;
- Wangi Road/Dorrington Road;
- Wangi Road and existing substation access; and
- Wilton Road and Awaba Landfill and Waste Transfer Station access.

As these intersections are not key intersections in terms of additional truck turning movements along the proposed transport route, no intersection capacity modelling has been undertaken at these locations.

2.3.1 Wangi Road/Wangi Point Road

This intersection is a 'give way' controlled T-intersection whereby vehicles on Wangi Point Road have to give way to traffic on Wangi Road. A right turn bay is provided (approximately 45 m long) on Wangi Road for vehicles turning right into Wangi Point Road. The geometry of the intersection is large enough for simultaneous left and right turn movements from Wangi Point Road to Wangi Road (Plate 2.4). There is a separate southbound bike lane at this intersection. Access to Myuna is currently closed via Wangi Point Road, hence there is no current traffic activity at this intersection, except the through traffic on both directions of Wangi Road.

Plate 2.4 Wangi Road/Wangi Point Road intersection

(Source: Nearmap and Google Earth)

2.3.2 Wangi Road/Wilton Road

This intersection is approximately 3.3 km north of Wangi Point Road. It is a seagull type T-junction and was upgraded by RMS (now TfNSW) to reduce delays and improve safety for the minor approach (ie Wilton Road). Right-turning vehicles from Wilton Road only need to give way to northbound vehicles and right turning vehicles on Wangi Road. After execution of the right turn, there is sufficient storage to wait and then merge safely with southbound traffic on Wangi Road. An approximately 200-m-long left turn lane allows northbound through traffic on Wangi Road to obtain an uninterrupted flow, separate from the left turning traffic. Additional road width is provided at Wilton Road on approach to the intersection for better visibility and to ensure smoother turns for heavy vehicles (Plate 2.5).

Plate 2.5 Wangi Road/Wilton Road intersection

(Source: Nearmap and Google Earth)

2.3.3 Wilton Road/Awaba Colliery surface site access road

The intersection of Wilton Road/Awaba Colliery surface site access road is approximately 2.5 km west of Wangi Road. No road signs are in place at this intersection. It is a T-intersection whereby vehicles leaving Awaba Colliery surface site give way to traffic on Wilton Road. The geometry allows heavy vehicles to execute turns without difficulty (Plate 2.6).

Plate 2.6 Wilton Road/Awaba Colliery surface site access road intersection

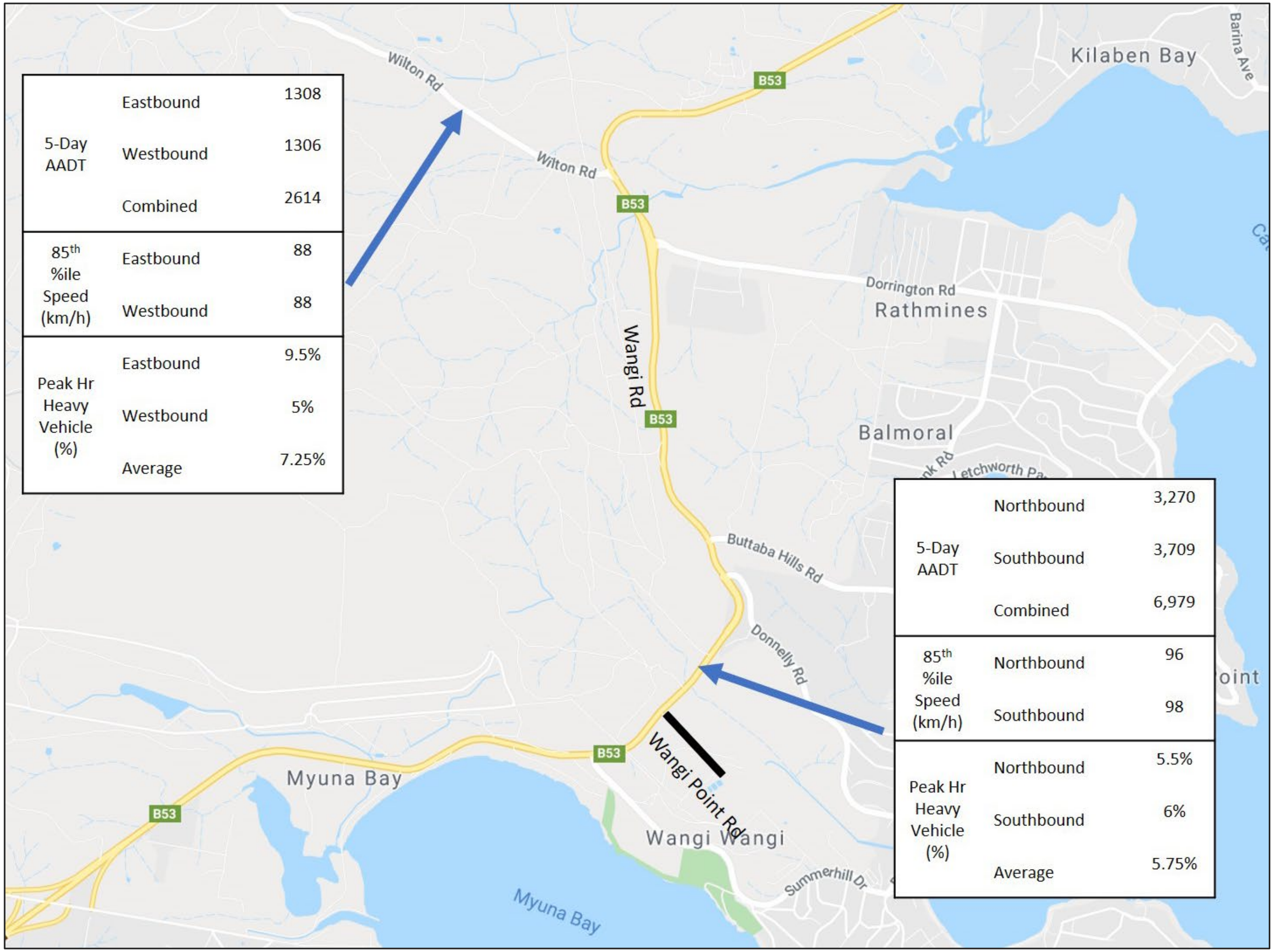
(Source: Nearmap and Google Earth)

2.4 Traffic surveys

To determine existing traffic on Wangi Road and Wilton Road, two forms of traffic surveys were undertaken by private contractors (Roar Data and CFE), namely automatic tube counts and intersection surveys at a number of locations. The results are discussed below.

2.4.1 Tube counts

Tube counts were undertaken on Wangi Road and Wilton Road from 19 to 25 November 2019, which was outside of school holiday periods (Appendix A). A summary of the tube count data is presented in Figure 2.1.



5-Day AADT	Eastbound	1308
	Westbound	1306
	Combined	2614
85th %ile Speed (km/h)	Eastbound	88
	Westbound	88
Peak Hr Heavy Vehicle (%)	Eastbound	9.5%
	Westbound	5%
	Average	7.25%

5-Day AADT	Northbound	3,270
	Southbound	3,709
	Combined	6,979
85th %ile Speed (km/h)	Northbound	96
	Southbound	98
Peak Hr Heavy Vehicle (%)	Northbound	5.5%
	Southbound	6%
	Average	5.75%

Figure 2.1 Traffic survey results on Wangi Road and Wilton Road

The results indicate that bidirectional daily traffic volumes on Wangi Road near Myuna are approximately 7,000 vehicles. The recorded speed on Wangi Road at this location is, on average, approximately 10% over the posted speed limit of 90 km/hr. Based on the tube count, Wangi Road carries an average of 5.75% heavy vehicles.

The results indicate that Wilton Road carries an average of 2,614 vehicles on a typical weekday. Speed in both directions is, on average, more than the posted speed limit of 80 km/hr; but marginally within 10% of the upper limit. Based on the tube counts, Wilton Road carries an average of 7.25% heavy vehicles. Heavy vehicles related to the Awaba Landfill and Waste Transfer Station use this section of Wilton Road.

2.4.2 Primary intersection counts

Intersection counts were undertaken during peak periods on 21 August 2019 and 19 November 2019 at the intersections of Wangi Road/Wilton Road and Wilton Road/Awaba Colliery surface site access road, respectively (Appendix B). No intersection counts were undertaken at the intersection of Wangi Road/Wangi Point Road as the locked gate currently prevents access to Myuna at this location. However, the northbound and southbound through traffic volumes on Wangi Road were extracted from the nearby tube count data.

The identified peak hours at each of the three intersections were determined as follows:

- Wangi Road/Wilton Road:
    - morning (AM) peak: 7-8 am; and
    - afternoon (PM) peak: 3-4pm;
- Wilton Road/Awaba Colliery surface site access road:
    - morning (AM) peak: 7.30-8.30 am; and
    - afternoon (PM) peak: 3.30-4.30 pm;
- Wangi Road/Wangi Point Road:
    - morning (AM) peak: 7-8 am; and
    - afternoon (PM) peak: 3-4 pm.

The three intersections are at least 2.5 km apart. Therefore, as a conservative approach, the AM and PM peak hour traffic volumes at each of the intersections were taken as their individual peaks.

The results of the intersection counts are presented in Figure 2.2.

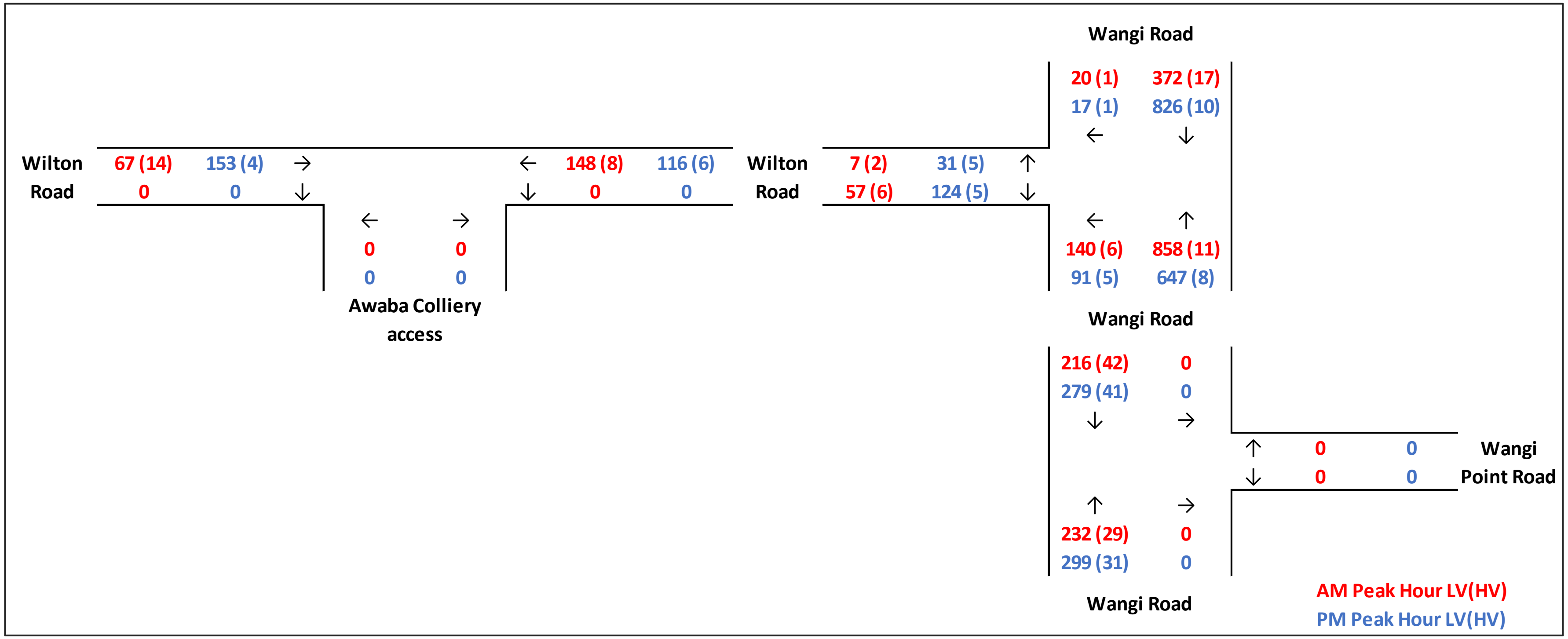


Figure 2.2 Primary intersection counts

2.4.3 Secondary intersection counts

In addition to the key intersection counts, 10-minute sample traffic counts were also undertaken during the morning peak periods on 1 June 2020 at three other intersections as part of a review of their intersection designs and traffic safety considerations for traffic movements along Wangi Road, including:

- Wangi Road/Donnelly Road;
- Wangi Road/Buttaba Hills Road; and
- Wangi Road/Dorrington Road.

There will be no truck traffic turning at these intersections as a result of the proposed modification.

The survey results were multiplied by six to obtain the approximate morning peak hour traffic turning volumes. As the peak hourly traffic movements on Wangi Road are generally tidal (ie heavy northbound bias in the morning and heavy southbound bias in the afternoon), the afternoon peak hour turning volumes were estimated as the reverse of the AM peak hour traffic movements (ie the afternoon peak right turning traffic volumes from Wangi Road into Dorrington Road are equal to the morning peak left turning traffic from Dorrington Road onto Wangi Road). Additionally, the through traffic movements along Wangi Road were available from other nearby intersection counts (Figure 2.2).

Based on their proximity to the nearest surveyed intersection, the through traffic volumes at each intersection were taken as follows:

- Wangi Road/Dorrington Road – adopted from Wangi Road/Wilton Road;
- Wangi Road/Buttaba Hills Road – adopted from Wangi Road/Wangi Point Road; and
- Wangi Road/Donnelly Road – adopted from Wangi Road/ Wangi Point Road.

The combined through traffic and turning traffic volumes for these three intersections are presented in Figure 2.3. As these three intersections are not identified as key access intersections as part of this assessment, their operating safety and intersection design standards have been reviewed; however, no intersection traffic capacity or delay analyses have been undertaken.

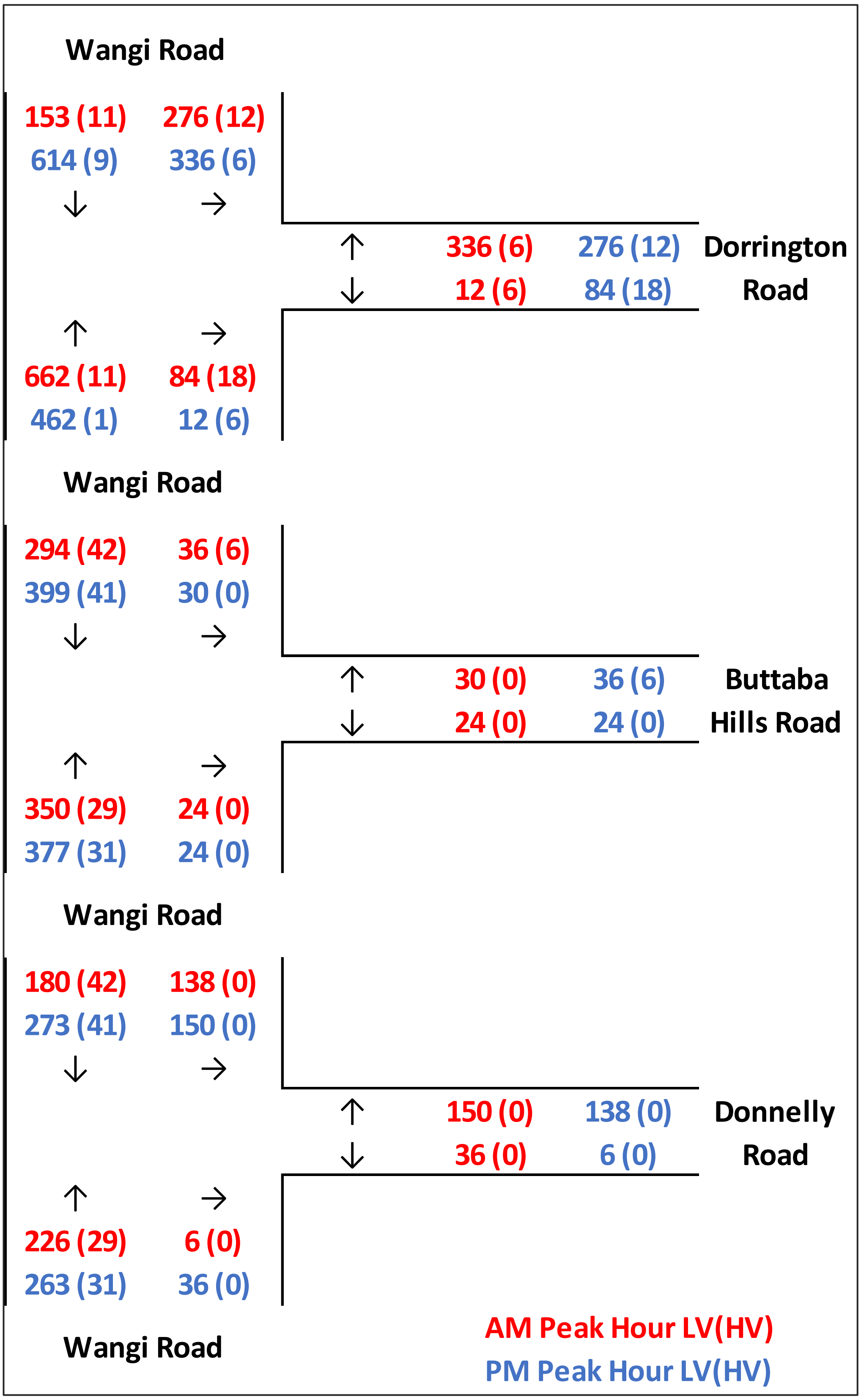


Figure 2.3 Secondary intersection counts

2.5 Road safety

The TfNSW Centre of Road Safety traffic accident data for Wangi Road and Wilton Road has been analysed for the years between 2014 and 2018 inclusive.

2.5.1 Wangi Road (between Wangi Point Road and Wilton Road)

A total of 10 traffic accidents were recorded on Wangi Road, primarily at intersections (Figure 2.4 and Table 2.4).

Source: TfNSW 2019

Figure 2.4 Accident data for Wangi Road (2014–2018)

Table 2.4 Traffic accident data for Wangi Road

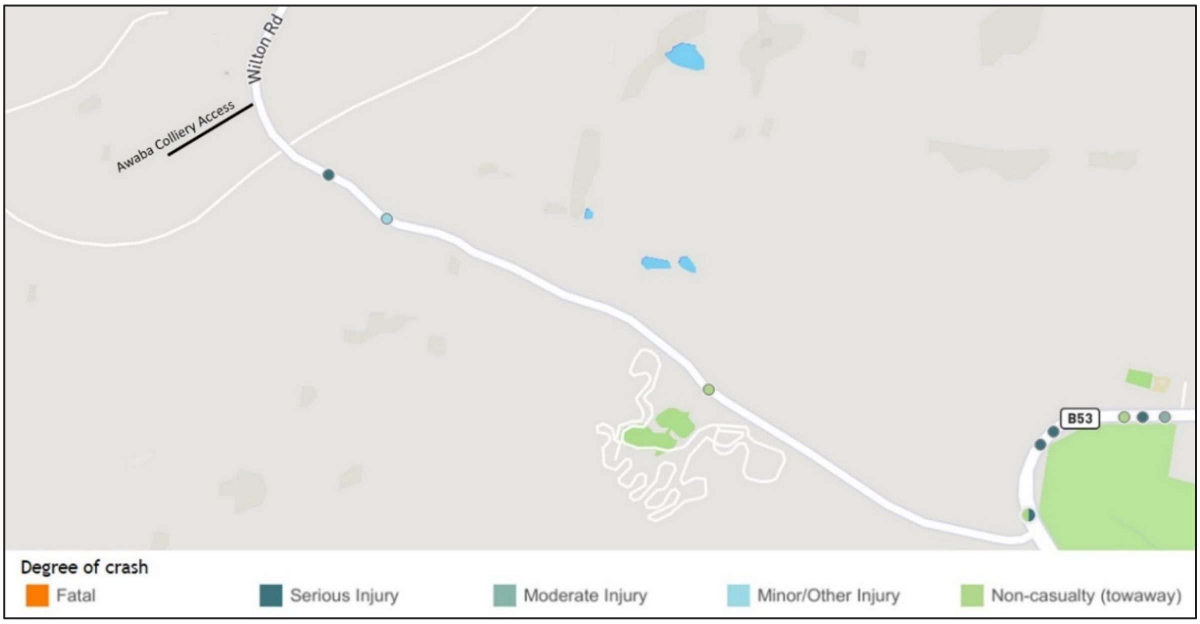
Year	Accident ID	Degree of accident	Accident type	Natural lighting	Type of vehicle involved
2014	1029028	Serious Injury	Off road at bend	Daylight	Light vehicle
2014	1024372	Non-casualty	Rear end	Daylight	Light vehicle
2014	1024535	Non-casualty	Cross traffic at T-Junction	Daylight	Light vehicle
2014	1040913	Non-casualty	Rear end	Daylight	Light vehicle
2015	1068733	Moderate Injury	Other straight	Darkness	Light vehicle
2015	1086960	Serious Injury	Cross traffic at T-Junction	Daylight	Light vehicle
2015	1087960	Moderate Injury	Right through	Daylight	Light vehicle
2017	1138384	Non-casualty	Right near at T- junction	Dusk	Light vehicle
2017	1163580	Moderate Injury	Over adjustment at T-junction	Daylight	Light vehicle
2018	1184659	Moderate Injury	Right near at T-junction	Daylight	Light vehicle

The majority of accidents occurred in 2014 and 2015. In more recent years, the magnitude of accidents decreased noticeably. This is evidently a benefit from the various road safety improvements including guard rails and jersey kerbs that have been installed at various locations along Wangi Road over the past five years.

The seagull turning lane and associated intersection geometry upgrade at Wangi Road and Wilton Road are also likely to have contributed to the reduction in the annual number of accidents occurring along this section of Wangi Road.

2.5.2 Wilton Road (between Wangi Road and Awaba Colliery surface site)

A total of three accidents were recorded along the relevant section of Wilton Road (Figure 2.5 and Table 2.5).



Source: TfNSW 2019

Figure 2.5 Accident data for Wilton Road (2014–2018)

Table 2.5 Accident data for Wilton Road

Year	Accident ID	Degree of accident	Accident type	Natural lighting	Type of vehicle involved
2014	1048590	Minor Injury	Off left at right bend	Daylight	Light vehicle
2015	1086866	Serious Injury	Struck animal	Daylight	Light vehicle
2018	1179804	Non-casualty	Off Road object	Daylight	Light vehicle

None of the recorded accidents involved heavy vehicles. One of the accidents involved a collision with an animal.

2.5.3 Summary

The annual traffic accident volumes for the assessed road network indicate that safety concerns are relatively minor and do not generally warrant further road safety upgrades along the assessed road network.

3 Proposed modification

3.1 Overview

To ensure that Myuna can continue to meet its contractual obligations to supply coal to Eraring Power Station and secure ongoing employment for Myuna's workforce, Centennial Myuna proposes to blend coal from Myuna with coal from Mandalong Mine both on-site at Myuna's pit top and at CES.

It is proposed to modify MP 10_0080 to:

- allow up to 1 million tonnes per annum (Mtpa) of Myuna coal to be trucked from Myuna's pit top to CES via the public and private road networks and blending with coal from Mandalong Mine before transfer to Eraring Power Station by conveyor;
- allow up to 0.2 Mtpa of Mandalong Mine coal to be backloaded by truck from CES to Myuna's pit top and blending with coal from Myuna before transfer to Eraring Power Station by conveyor;
- allow construction and operation of a vehicle weighbridge at Myuna's pit top;
- allow trucks to access Myuna's pit top via Wangi Road and Wangi Point Road; and
- include a consent condition to address the environmental management of exploration activities and minor surface infrastructure.

The proposed transport route consists of Wangi Point Road from Myuna's pit top area, public roads (ie Wangi Road and Wilton Road) between Myuna and the Awaba Colliery surface site and private haul roads between the Awaba Colliery surface site and CES. The proposed transport route is shown on Figure 3.1.

Truck movements will be limited to 7.00 am–6.00 pm Monday to Saturday.

Truck numbers along the private haul road network between the Awaba Colliery surface site and CES will be within previously assessed and approved limits under SSD-5145 (ie 32 truck movements per hour).

All trucks leaving Myuna will be weighed using a new vehicle weighbridge that will be constructed at Myuna's pit top. A truck wheel wash will also be used by all trucks before leaving site via a privately-owned section of Wangi Point Road (Figure 3.1).

No revisions to the project approval (MP 10_0080) or development consent (SH110_148) boundaries for Myuna are required as part of the proposed modification. The proposed modification will not change the approved life of mining operations and does not include an increase to Myuna's approved extraction rate of 3 Mtpa.

3.1.1 Construction activities

As described above, a new vehicle weighbridge and wheel wash will be installed at Myuna's pit top.

The weighbridge will be installed on previously disturbed, cleared land adjacent to a privately-owned section of Wangi Point Road (Figure 3.2). There is an inactive weighbridge and supporting infrastructure at this location that will need to be removed.

It is anticipated that construction will be completed in three stages:

- Stage 1 – mobilisation and site preparation (approximately two days) – including decommissioning the existing weighbridge and supporting infrastructure;
- Stage 2 – installation (approximately five days) – including establishing a concrete pad and securing the new weighbridge and supporting infrastructure; and
- Stage 3 – commissioning (approximately one day) – including testing with empty and full loads.

Due to the short-term nature of construction activities, construction traffic volumes have not been considered.

No additional employees will be required during construction.

A truck wheel wash will also be constructed on-site. It is anticipated that this infrastructure will be constructed adjacent to the proposed weighbridge. All waste water from the truck wheel wash will be treated and reused on-site or disposed of at a licensed waste management facility.

3.1.2 Material handling

Up to 1 Mtpa of ROM coal from Myuna will be transferred by truck directly from Myuna to the middlings coal stockpile at CES.

Up to 0.2 Mtpa of Mandalong Mine coal will be backloaded from CES to Myuna's pit top. A front end loader will be used to load trucks at CES.

On arrival at Myuna's pit top, coal from CES will be tipped onto, and temporarily stored at, Myuna's emergency coal stockpile area before being reclaimed through Myuna's existing coal handling infrastructure (Figure 3.2).

A front end loader will be used at Myuna's emergency coal stockpile to load the trucks that will transport the coal to Myuna's existing below ground reclaimer.

Blending of Myuna coal with Mandalong Mine coal will occur either at Myuna's emergency coal stockpile or within Myuna's CHP.

Coal from Myuna will continue to be transferred to Eraring Power Station via the existing coal handling plant and overland conveyor system (Figure 3.2).

3.1.3 Proposed truck transport

i Overview

The proposed transport route (Figure 3.1) consists of:

- the private access road (Wangi Point Road) between Wangi Road and Myuna's pit top;
- public roads (Wangi Road and Wilton Road) between Myuna and Awaba Colliery surface site; and
- the private haul road between Awaba Colliery surface site and CES.

This route has been selected by Centennial Myuna to avoid trucks travelling through residential areas. There are no residences immediately adjacent to, or with driveways on, the parts of Wangi Road and Wilton Road that are part of the transport route. The closest residences to the proposed transport route are residences on Donnelly Road, Arcadia Vale, which are approximately 80 m from Wangi Road at their closest point.

Truck movements between Myuna's pit top and CES will be limited to 7.00 am–6.00 pm Monday to Saturday. There will be a maximum of 10 loaded trucks (20 truck movements) per hour departing from Myuna's pit top. Between 3.00 pm and 4.00 pm Monday to Friday, truck movements will be restricted to 5 loaded trucks (10 truck movements) per hour to minimise impacts during the afternoon peak hour.

All trucks leaving Myuna will be weighed using the proposed vehicle weighbridge. The truck wheel wash will also be used by all trucks before leaving site (Figure 3.1). All loads will be covered.

ii Public roads

The proposed transport route includes part of Wangi Road and Wilton Road. Wangi Road is a State road managed by TfNSW. Wilton Road is a local road managed by LMCC. Photographs from the public roads to be used for coal transport between Myuna and Awaba Colliery surface site have been provided in Appendix E.

iii Private roads

Private haul roads connect the Newstan Colliery surface site, Awaba Colliery surface site, CES, Hawkmount Quarry and Eraring Power Station:

- Newstan–Eraring Private Haul Road – approximately 13-km long, linking the Newstan Colliery surface site with Eraring Power Station;
- Cooranbong Private Haul Road – approximately 3.4-km long, linking the Newstan-Eraring Private Haul Road and CES; and
- Awaba Private Haul Road – approximately 770-m long, linking Awaba Colliery surface site to the Newstan-Eraring Private Haul Road.

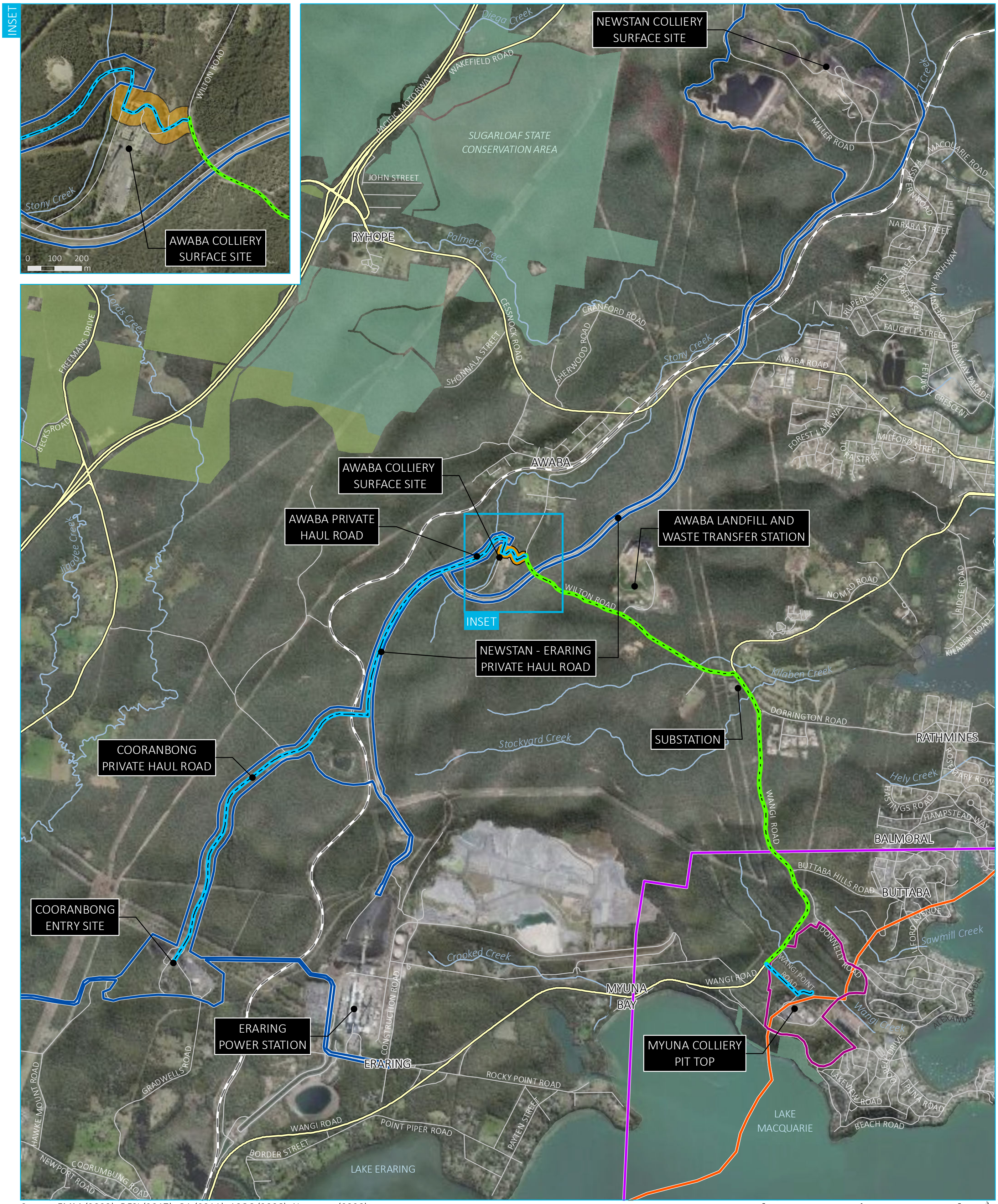
These roads are approved under SSD-5145 to be used to haul coal, coal rejects and stone material. These private haul roads are sealed to minimise dust and noise generation and have been constructed to include surface water drainage and management. Any coal spilt on the road is removed regularly.

Centennial will manage truck numbers along the private haul road network between the Awaba Colliery surface site and CES to ensure they remain within previously assessed and approved limits under SSD-5145 (ie 32 truck movements per hour). The relatively low number of heavy vehicle movements is primarily due to the large capacity of the trucks and the ability to backload.

Photographs from the private haul roads to be used for coal transport between Awaba Colliery surface site and CES have been provided in Appendix F.

Vehicle numbers on the private haul road network will not exceed previously assessed and approved limits as part of the proposed modification.

As part of the proposed modification to SSD-5145, the development consent boundary will be extended approximately 450 m from the Awaba Private Haul Road through to Wilton Road (. This section of road has historically been used by light and heavy vehicles accessing the Awaba Colliery surface site and the private haul road network.



Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006); Nearmap (2020)

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KEY

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

Proposed transport route

- Private road
- Public road

- Myuna Colliery surface facilities area

Development consent boundaries

- Myuna Colliery development consent boundary (SH110_148)
- Myuna Colliery project approval boundary (MP 10_0080)
- Northern Coal Logistics development consent boundary (SSD-5145)
- Proposed amendment to Northern Coal Logistics development consent boundary (SSD-5145)

Proposed transport route between Myuna Colliery and Cooranbong Entry Site

Myuna Colliery Modification 2
Traffic impact assessment
Figure 3.1

EMM
creating opportunities

Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006)

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KEY

- Myuna Colliery surface facilities area
- Major road
- Named watercourse
- Proposed weighbridge

Existing surface features

1. Emergency coal stockpile sediment dam pumphouse
2. Emergency coal stockpile sediment dam
3. Emergency coal stockpile area
4. Power factor correction banks
5. ROM bin
6. Overland conveyor switch room
7. Finished prospect bin
8. Breaker
9. Downcast air shaft
10. Materials reclaim area
11. Drive house
12. Crusher
13. Conveyer drop portal
14. Materials yard
15. Oil storage
16. Washdown bay & oily water separator
17. Hydrocarbon recycling depot
18. Workshop and store
19. Washhouse
20. Upcast shaft
21. Main gate
22. Bathhouse & administration office
23. Service bay
24. Employee & materials portal
25. Ramp
26. Winder
27. Water management infrastructure
28. Haul road

Myuna Colliery surface facilities area

Myuna Colliery Modification 2
Traffic impact assessment
Figure 3.2

EMM
creating opportunities

3.2 Traffic generation

Traffic generation for the proposed transport of coal between Myuna and CES has been calculated based on an average truck carrying capacity of 32 t and 300 active days per annum (excludes Sundays and public holidays). Transportation of 1 Mtpa of coal requires 31,250 trucks per annum or approximately 104 trucks per active day.

Assuming inbound and outbound truck movements occur within the same hour, the morning peak hour, other daytime and afternoon peak hour truck return trips of 10, 10 and 5, respectively, will generate an additional 20, 20 and 10 truck movements per hour. The additional traffic generation from the backloading of coal from CES to Myuna has not been considered specifically as it is assumed that all trucks will need to travel back to Myuna (with/without a load).

As noted in Section 3.1.1, due to the short-term nature of construction, construction traffic volumes have not been considered as part of this assessment.

In terms of additional employee trips, the future truck fleet involved in the proposed transport of coal will be based off-site and there will not be any additional staff or light vehicle traffic movements during Myuna's existing shift change times (ie beyond what has previously been assessed and approved under MP 10_0080.

The forecast additional truck traffic during the morning and afternoon peak hours is presented in Figure 3.3. The future total traffic is obtained by combining the surveyed traffic volumes and the proposed additional traffic and is presented in Figure 3.4.

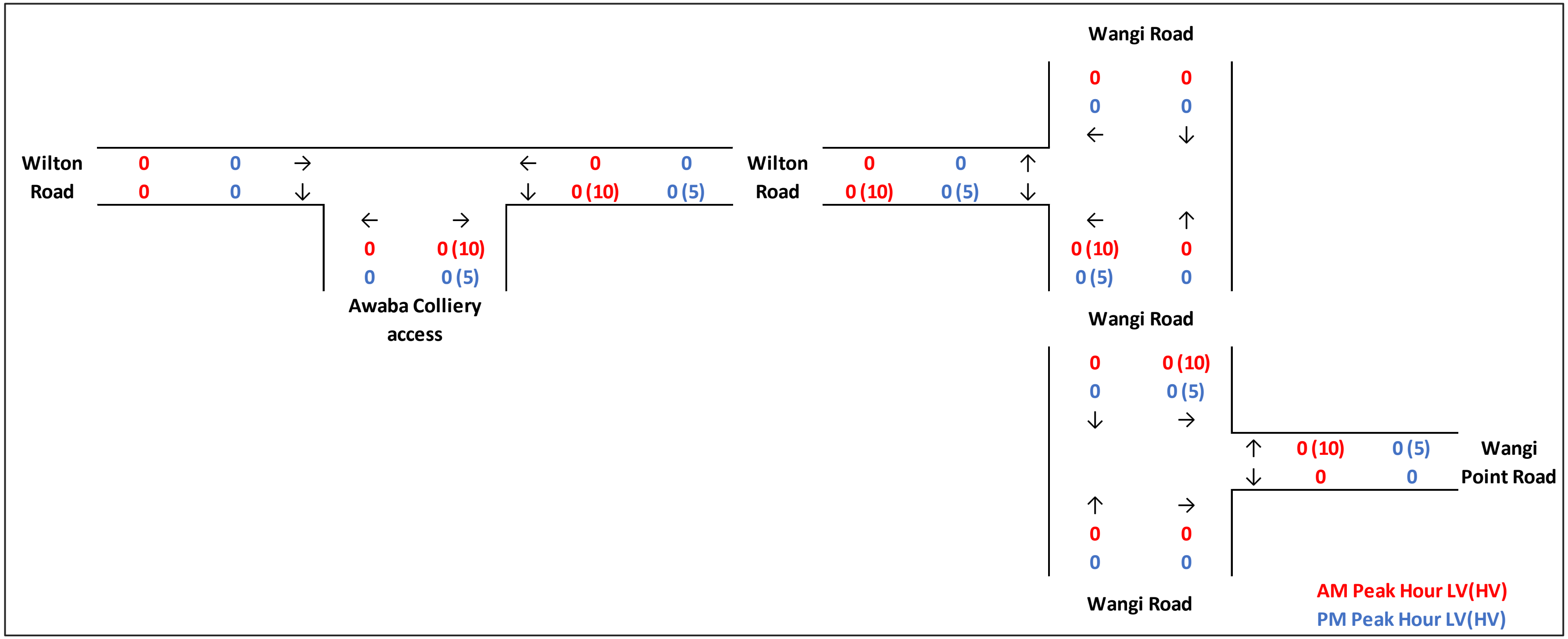


Figure 3.3 Forecast additional project-related traffic during peak hour periods

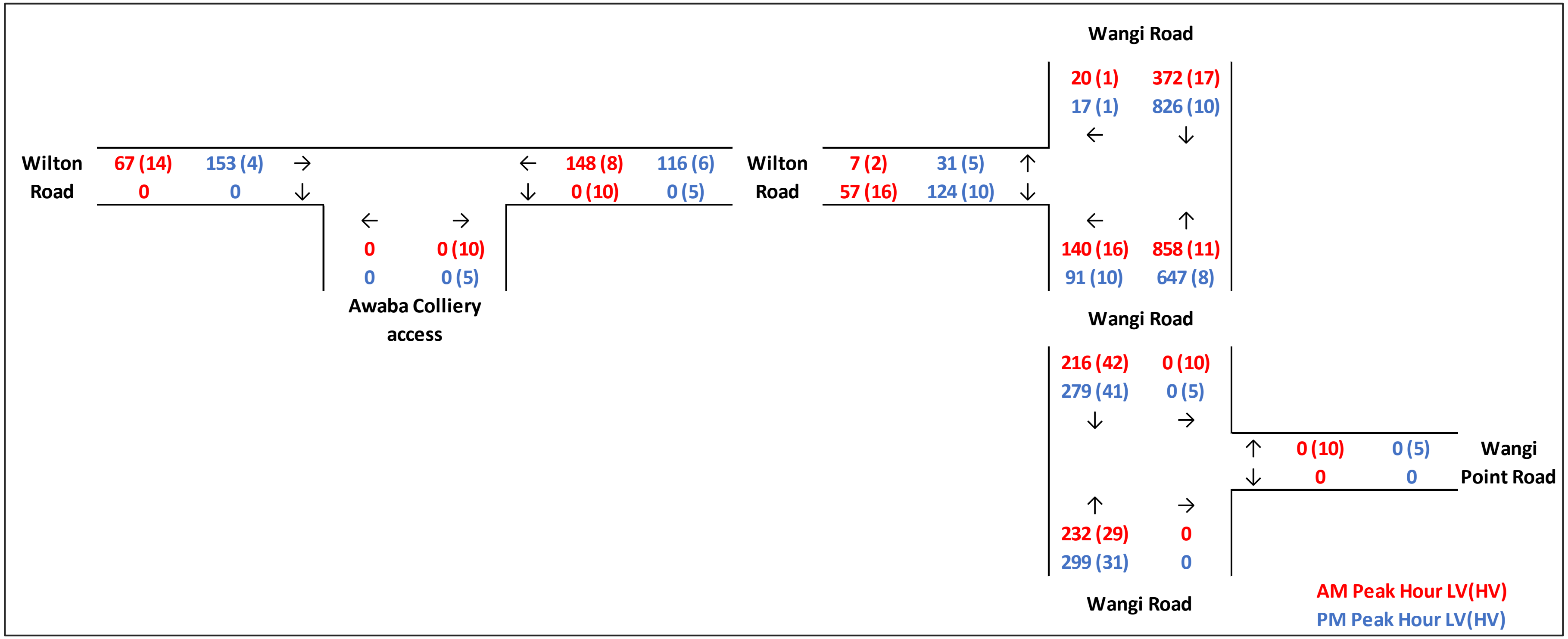


Figure 3.4 Total peak hour traffic volumes (existing and project-related)

3.3 Consideration of cumulative impacts

LMCC's website does not show any current major development applications within proximity of the assessed roads. Therefore, no analysis of potential cumulative traffic impacts has been undertaken.

As part of the Newstan Mine Extension Project (SSD-10333), Centennial Newstan Pty Ltd (Centennial Newstan) is seeking approval for the construction of a new gas flaring facility and two new ventilation fans within the existing disturbance footprint of the Awaba Colliery surface site.

Within the TIA prepared by EMM (2019) as part of the Newstan Mine Extension Project, it was assumed that up to 50 personnel will be required during the proposed construction activities. All personnel will likely access the Awaba Colliery surface site via Wilton Road using their own car, representing up to 100 daily light vehicle movements.

Should the Newstan Mine Extension Project (SSD-10333) be approved, no coal transport will take place between CES and Myuna for the duration of the proposed construction activities. This will eliminate potential for cumulative traffic impacts on the local road network.

Newstan Mine Extension Project will generate some additional daily traffic movements along Wangi Road and Wilton Road; however, this will primarily be restricted to the short-term construction of the aforementioned infrastructure at the Awaba Colliery surface site. No long-term impacts on the assessed road network are anticipated as a result of the Newstan Mine Extension Project.

4 Impact assessment

4.1 Intersection performance

Using the intersection baseline traffic survey data and proposed heavy vehicle traffic volumes, an analysis was performed using SIDRA Intersection 8.0 software and included consideration of the following performance indicators:

- degree of saturation (DoS) – the total usage of the intersection expressed as a factor of 1 with 1 representing 100% use or saturation (eg 0.8=80% saturation);
- average delay – the average delay encountered by all vehicles passing through the intersection (Note: it is important to review the average delay of each approach as a side road could have a long delay time, while the large free flowing major traffic will provide an overall low average delay);
- level of service (LoS) – this is a categorisation of average delay and is a good indicator of overall performance for individual intersections (Table 4.1); and
- 95% queue lengths (Q95) – the queue length in metres that has only a 5% probability of being exceeded during the analysis time period, transforming average delay into measurable distance units.

Table 4.1 Intersection performance – level of service standards

Level of service	Average delay (seconds/vehicle)	Intersection treatment	
		Traffic signals or roundabout	Give-way or stop signs
A	<14 seconds	Good operation.	Good operation.
B	15–28 seconds	Good with acceptable delays and spare capacity.	Acceptable delays and spare capacity.
C	29–42 seconds	Satisfactory.	Satisfactory, but accident study required.
D	43–56 seconds	Operating near capacity.	Near capacity and accident study required.
E	57–70 seconds	At capacity. At signals, incidents would cause excessive delays. Roundabouts require other control mode.	At capacity, requires other control mode.
F	>70 seconds	Extra capacity required.	Extreme delay, major treatment required.

Source: *Guide to Traffic Generating Developments* (RTA 2002).

Existing and forecast SIDRA intersection capacity analyses for the three primary intersections are presented in Table 4.2 and Appendix C.

Table 4.2 Existing and proposed SIDRA intersection analysis results

Intersection	Assessment period	Period	Level of service (LoS)*	Average delay (seconds)*	Degree of saturation (DoS)	95% queue length (m)
Wangi Road/Wangi Point Road	Morning peak 7-8am	Existing	A	7.0	0.155	0.0
		Proposed coal transport	A	9.9	0.164	0.9
	Afternoon peak 3-4pm	Existing	A	7.0	0.189	0.0
		Proposed coal transport	A	11.8	0.192	0.6
Wangi Road/Wilton Road	Morning peak 7-8am	Existing	B	17.5	0.473	4.6
		Proposed coal transport	B	20.6	0.473	7.2
	Afternoon peak 3-4pm	Existing	A	13.3	0.455	6.4
		Proposed coal transport	A	13.8	0.455	7.3
Wilton Road/Awaba Colliery surface site access road	Morning peak 7.30-8.30am	Existing	A	6.9	0.080	0.1
		Proposed coal transport	A	7.7	0.089	0.7
	Afternoon peak 3.30-4.30pm	Existing	A	6.9	0.087	0.1
		Proposed coal transport	A	7.8	0.087	0.4

Note * The table presents the maximum average delay and worst LoS of any particular movement (usually the longest delay occurs for the right-turning movement from the minor road).

4.1.1 Wangi Road/Wangi Point Road

The intersection is currently operating at LoS A on both approaches of Wangi Road during the morning and afternoon peak hours. The intersection has approximately 81% spare capacity to accommodate additional vehicles on the through traffic movements, which are the only traffic movements using the intersection currently.

With the addition of the proposed heavy vehicles, the intersection will continue to operate at LoS A, including right-turn movements from Wangi Point Road onto Wangi Road. All assessed parameters will marginally increase but remain within acceptable levels with significant spare capacity (approximately 80%) to accommodate additional vehicles on both the through traffic and turning traffic movements.

4.1.2 Wangi Road/Wilton Road

As noted in Section 2.3.2, this intersection was recently upgraded by RMS (now TfNSW). Currently during the morning peak hour, all approaches are operating at LoS A, except the left and right-turn movement from Wilton Road onto Wangi Road (LoS B). Queuing is approximately one vehicles (4.6 m) for the right-turning lane on Wilton Road during the morning peak hour. During the afternoon peak hour, all approaches are currently operating at LoS A.

With the addition of the proposed heavy vehicles during the morning peak, the LoS for the right-turning vehicles from Wilton Road to Wangi Road will remain at LoS B and there will be marginal increases to the average delay and queue length. The intersection will still have approximately 53% spare capacity following addition of the proposed heavy vehicles during the morning peak.

With the addition of the proposed heavy vehicles during the afternoon peak, the LoS for the right-turning vehicles from Wilton Road to Wangi Road will remain at LoS A. All the assessed intersection parameters will remain within acceptable levels. It is anticipated that the intersection will still have 54% spare capacity following addition of the proposed heavy vehicles during the afternoon peak.

4.1.3 Wilton Road/Awaba Colliery surface site access road

This intersection is operating at LoS A on both approaches along Wilton Road during the morning and afternoon peak hours. There are currently only limited amounts of light vehicle traffic using the intersection (associated with care and maintenance activities at Awaba Colliery surface site).

With the addition of the proposed heavy vehicles, the intersection will continue to operate at LoS A for all approaches, including the future right-turning traffic from the Awaba Colliery surface site onto Wilton Road.

4.2 Mid-block capacity of Wangi Road and Wilton Road

As intersections are less frequent on two-lane major roads in rural areas, mid-block traffic flow (including requirements for overtaking opportunities) need to be considered. The mid-block LoS is determined by average travel speeds and the percentage of time spent delayed. The key assessment criterion is to check the maximum volume threshold for each LoS transition from A/B to E/F.

Section 4.2 and Table 4.5 of *Guide to Traffic Generating Developments* (RTA 2002) provides the two-way hourly road capacities for two-lane roads for different LoS with a design speed of 100 km/hr based on different terrain types. The mid-block traffic flow conditions for each LoS are defined by the RTA (2002) as:

- LoS A - free flow unrestricted travel speed;
- LoS B - stable flow reasonably constrained travel speed;
- LoS C - stable flow significantly constrained travel speed;
- LoS D - approaching unstable flow;
- LoS E - unstable flow, no freedom to select desired travel speed; and
- LoS F - forced flow with traffic delays and queuing.

The capacity assumes a 60/40 directional split of traffic. For 80 km/hr design speed, the resulting capacities need to be adopted between 85-95% of figures quoted for 100 km/hr design speed.

As the speed limits along Wangi Road and Wilton Road vary from 80–90 km/hr, 90% of the peak hour flow is considered appropriate as suggested in RTA (2002).

The recalculated traffic volume thresholds for each LoS transition are outlined in Table 4.3.

Table 4.3 RMS roadway hourly capacity analysis for two-lane two-way rural roads

Terrain	Level of service transition	Effect of percentage of heavy vehicles (in traffic flow)			
		0%	5%	10%	15%
Level	A/B*	284	266	252	239
	B/C	567	531	504	477
	C/D	927	873	828	783
	D/E	1467	1395	1332	1269
	E/F	2367	2250	2151	2061

Notes: *Assumed as 50% of upper limit of B/C LoS

The morning and afternoon peak hour traffic flow and heavy vehicle proportions for the existing traffic flows using Wangi Road and Wilton Road are presented in Table 4.4 and Table 4.5, respectively.

Table 4.4 Heavy vehicle proportions for Wangi Road and Wilton Road (morning peak)

Road	Direction	Hourly volume	Heavy vehicle volume
Wangi Road	Northbound	1015	17
	Southbound	452	23
	Combined	1467	40 (3%)
Wilton Road	Eastbound	81	14
	Westbound	167	7
	Combined	248	21 (9%)

Table 4.5 Heavy vehicle proportions for Wangi Road and Wilton Road (afternoon peak)

Road	Direction	Hourly volume	Heavy vehicle volume
Wangi Road	Northbound	751	13
	Southbound	965	15
	Combined	1716	28 (2%)
Wilton Road	Eastbound	165	10
	Westbound	122	6
	Combined	287	16 (6%)

The comparison of the existing and future forecast peak hour mid-block LoS for Wangi Road and Wilton Road, immediately to the south and east of their intersecting point (with and without the proposed additional heavy vehicle traffic) has been calculated from the data presented in Table 4.3, Table 4.4 and Table 4.5 and the results are summarised in Table 4.6.

Table 4.6 Comparison of mid-block peak hourly LoS (existing and proposed)

Road	Peak hour	Existing			Proposed coal transport		
		Volume (HV)	HV%	LoS	Volume (HV)	HV%	LoS
Wangi Road	Morning	1,467 (40)	3	E	1,487 (60)	4	E
	Afternoon	1,716 (28)	2	E	1,726 (38)	3	E
Wilton Road	Morning	248 (21)	9	A	268 (41)	16	B
	Afternoon	287 (16)	6	B	297 (26)	9	B

On the busiest section of Wangi Road, near the Wilton Road intersection, the peak hour LoS will be E, which is defined as 'unstable flow with no freedom for traffic to select a desired travel speed', with or without the proposed additional heavy vehicle traffic.

On Wilton Road, there will be a transition from LoS A to LoS B with the proposed heavy vehicle traffic in the morning peak hour but the afternoon peak hour traffic will remain at LoS B. Both these levels of service provide either excellent or generally good traffic flow conditions.

4.3 Safety assessment

4.3.1 Accident data

As stated in Section 2.5, TfNSW traffic accident data between 2014 and 2018 indicates that there have been a low number of accidents along Wangi Road (n=10) and Wilton Road (n=3) during this period. The accident volumes along the assessed road network are minor and do not warrant any immediate upgrades based on either the existing or proposed traffic volumes.

4.3.2 Sight distances at assessed intersections

i Wangi Road/Wangi Point Road

There are adequate sight distances to the left and right from Wangi Point Road to Wangi Road (see Plate 4.1). The sight distances have been estimated based on a 100 km/hr design speed due to known speeding at this section of Wangi Road (based on tube count data – Section 2.4.1). Estimates are based on 'line of sight' as confirmed by photographs taken at the intersection and measurement of distances using Google Earth.

In accordance with *Austroads Guide to Road Design Part 4A: Unsignalised & Signalised Intersections* (Austroads 2017b) for a 100 km/hr road, the minimum safe intersection sight distance (SISD) required for a general minimum 2 second driver reaction time is 248 m.

At Wangi Point Road, the observed intersection sight distances to the right and left are 330 m and 250 m respectively, which both exceed the minimum requirements as illustrated by (Figure 4.1). Hence, there are no issues associated with sight distance at the intersection of Wangi Road and Wangi Point Road. Also, no adverse safety impacts associated with the continued use of the existing cycleway lane are expected.

Looking left

Looking right

Plate 4.1 Sight distance from Wangi Point Road looking onto Wangi Road

Figure 4.1 Sight distance from Wangi Point Road onto Wangi Road

ii Wilton Road/Awaba Colliery surface site access road intersection

There are adequate sight distances to the left and right from the Awaba Colliery surface site access road onto Wilton Road (Plate 4.2). The posted speed limit on Wilton Road at this location is 80 km/hr; however, vehicle speeds along this road were recorded close to 90 km/hr (based on tube count data – Section 2.4.1). Therefore, this assessment has been undertaken based on a speed limit of 90 km/hr.

In accordance with Austroads Guide to Road Design Part 4A: Unsignalised & Signalised Intersections (Austroads 2017b), for a 90 km/hr design speed road, the minimum SISD required for the general minimum 2 second driver reaction time is 214 m.

The observed sight distances to the right and left (Figure 4.2) are slightly below the minimum requirement. However, this is considered acceptable given the generally level alignment and low volumes of existing traffic on Wilton Road at this location. It is also noted that truck drivers will generally be higher in their vehicle than a standard light vehicle enabling better visibility of oncoming light vehicle traffic.

Looking left

Looking right

Plate 4.2 Sight distance from Awaba colliery surface site access road looking onto Wilton Road

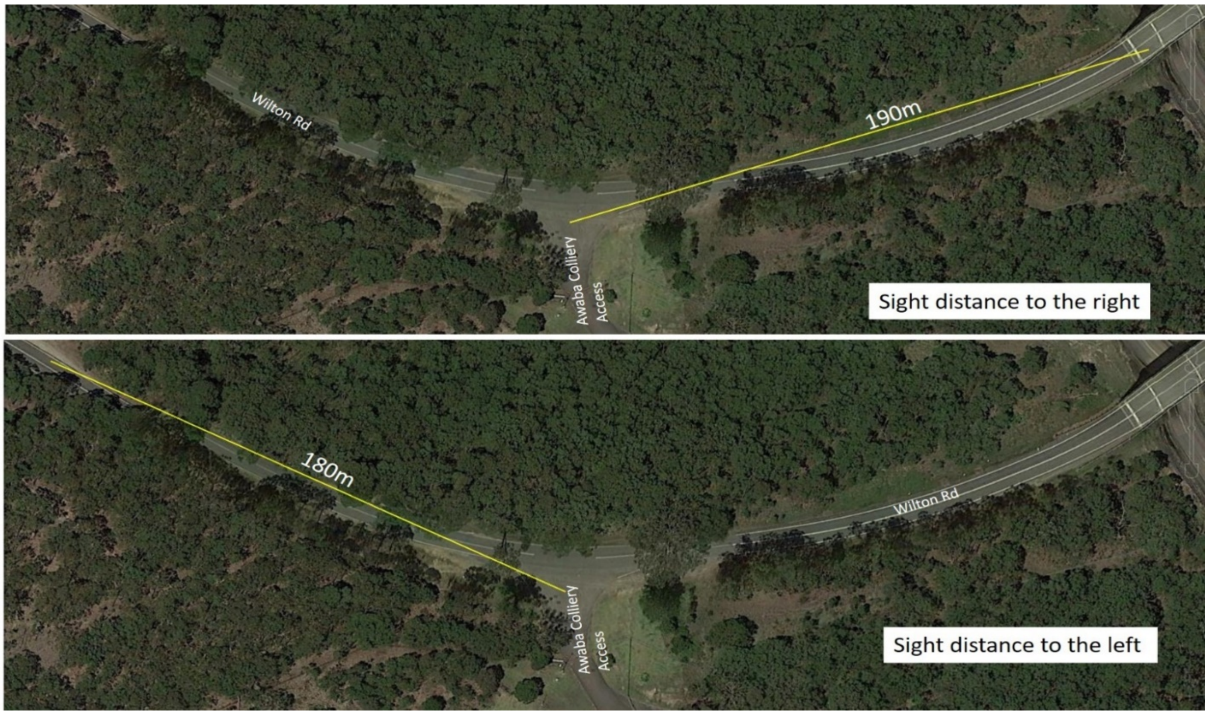


Figure 4.2 Sight distance from Awaba Colliery surface site access road onto Wilton Road

iii Donnelly Road

The ‘seagull’ intersection layout allows for a two-stage right turn from the minor road (Plate 4.3). The sight distance requirement to the left is not generally relevant as the right-turning traffic from Donnelly Road can merge with the other northbound traffic after making the right turn. Based on a 100 km/hr design speed, the minimum SISD required for a general minimum 2 second driver reaction time is 248 m for drivers giving way to vehicles on their right.

The estimated intersection sight distance to the right is 180 m (Figure 4.3), which is below the minimum requirement. However, this is considered acceptable given the generally lower volumes of existing traffic on this section of Wangi Road, compared to on other sections further to the north and the good locality accident history based on the analysis of traffic accident data in Figure 2.4. No adverse safety impacts associated with the use of the existing cycleway lane are expected.

Looking left **Looking right**

Plate 4.3 Sight distance from Donnelly Road looking onto Wangi Road

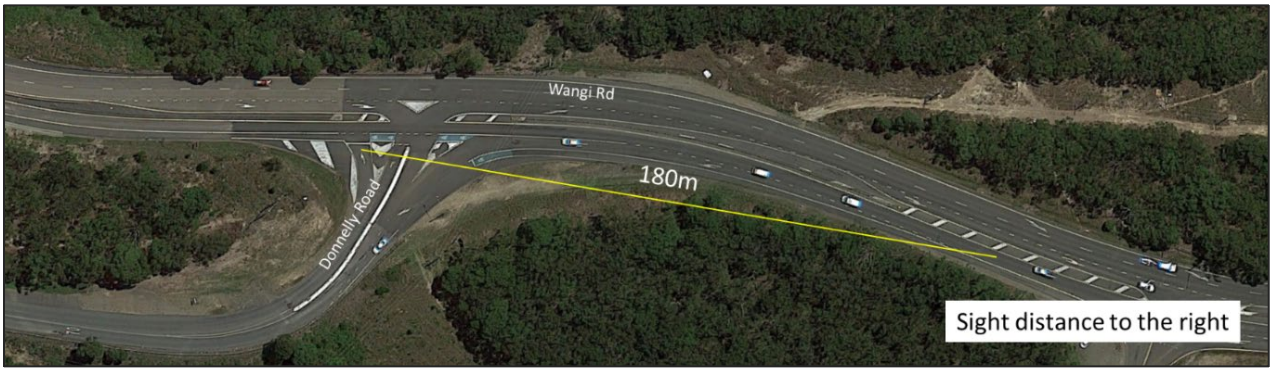


Figure 4.3 Sight distance from Donnelly Road onto Wangi Road

iv Buttaba Hills Road

In accordance with *Austroads Guide to Road Design Part 4A: Unsignalised & Signalised Intersections* (Austroads 2017b), for 100 km/hr design speed, the minimum SISD required for a general minimum 2 second driver reaction time is 248 m. There is adequate sight distance to the right from Buttaba Hills Road onto Wangi Road (Figure 4.4).

The estimated sight distance to the left is 190 m (Figure 4.4), which is below the minimum requirement; however, this is considered acceptable given the generally level alignment and low volumes of existing traffic on this section of Wangi Road and good locality accident history based on the analysis of traffic accident data.

Looking left **Looking right**

Plate 4.4 Sight distance from Buttaba Hills Road looking onto Wangi Road

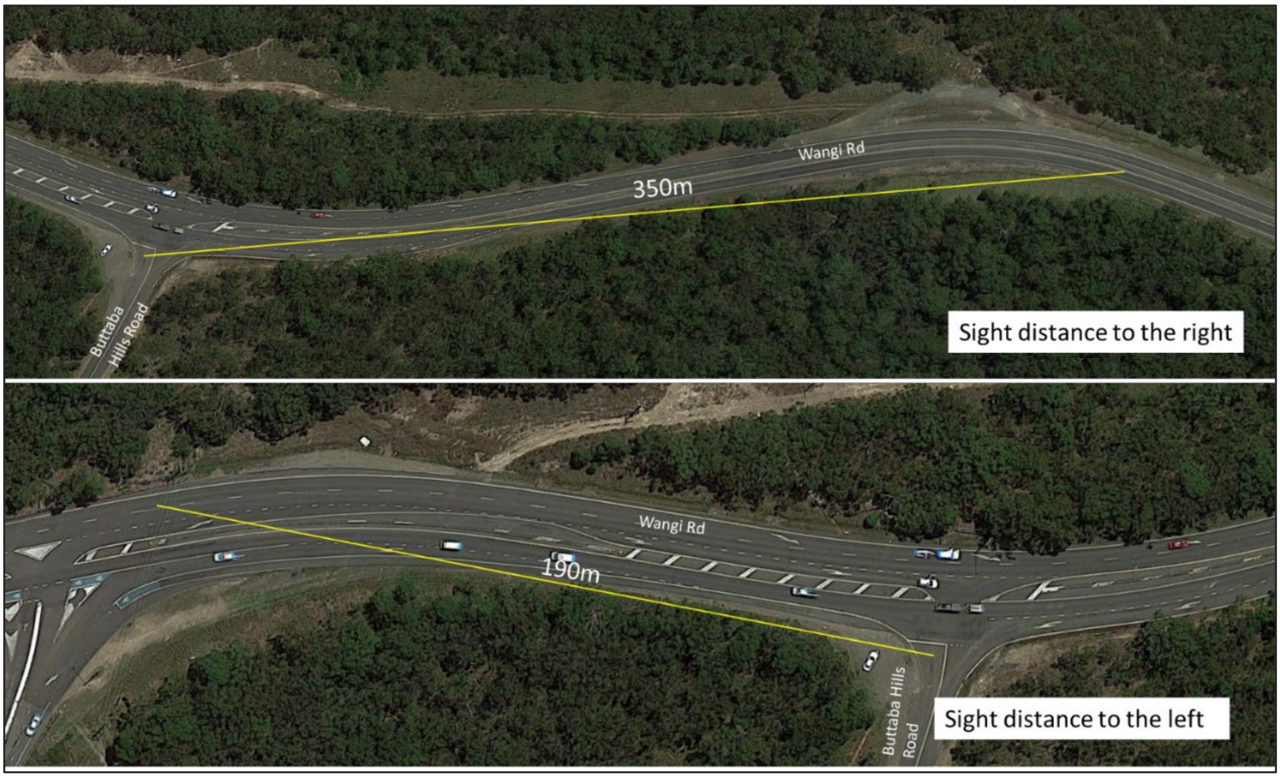


Figure 4.4 Sight distance from Buttaba Hills Road onto Wangi Road

v Dorrington Road

There are generally fewer sight distance issues associated with a roundabout as vehicles slow down on their approach to the roundabout. The sight distance from Dorrington Road (Plate 4.5) are considered adequate for a roundabout.

Looking left

Looking right

Plate 4.5 Sight distance from Dorrington Road looking onto Wangi Road

vi Substation access

At the Wangi Road and substation access intersection a median barrier prohibits right turn movements from the substation access (Plate 4.6). Therefore, the sight distance to the left has not been considered in this assessment. The sight distance to the right is 260 m (Figure 4.5), which meets the minimum SISD requirement of 248 m set out in *Austroads Guide to Road Design Part 4A: Unsignalised & Signalised Intersections* (Austroads 2017b).

Left turn only

Looking right

Plate 4.6 Sight distance from the substation access intersection looking onto Wangi Road

Figure 4.5 Sight distance from the substation access intersection onto Wangi Road

vii Wangi Road and Wilton Road

The sight distances to the left and right from Wilton Road to Wangi Road are shown in Plate 4.7. There are generally fewer sight distance issues associated with a 'seagull' type intersection such as this as vehicles turning right from the minor road (Wilton Road) can merge with the other southbound traffic after making the right turn across the northbound traffic. The sight distance from Wilton Road looking to the right is adequate as the road is straight with clear visibility for at least 500 m in this direction.

Looking left **Looking right**

Plate 4.7 Sight distance from Wilton Road looking onto Wangi Road

viii Awaba Landfill and Waste Transfer Station access

There is a posted speed limit sign of 80 km/hr on Wilton Road in the vicinity of this access (Plate 4.8). In accordance with *Austroads Guide to Road Design Part 4A: Unsignalised & Signalised Intersections* (Austroads 2017b), for a 80 km/hr design speed road, the minimum SISD required for the general minimum 2 second driver reaction time is 181 m.

The estimated intersection sight distance to the right and left are 190 m and 240 m, respectively, which both exceed the minimum requirement (Figure 4.6). Hence, there are no traffic safety issues associated with sight distance at this intersection.

Looking left **Looking right**

Plate 4.8 Sight distance from the Awaba Landfill and Waste Transfer Station access intersection looking onto Wilton Road

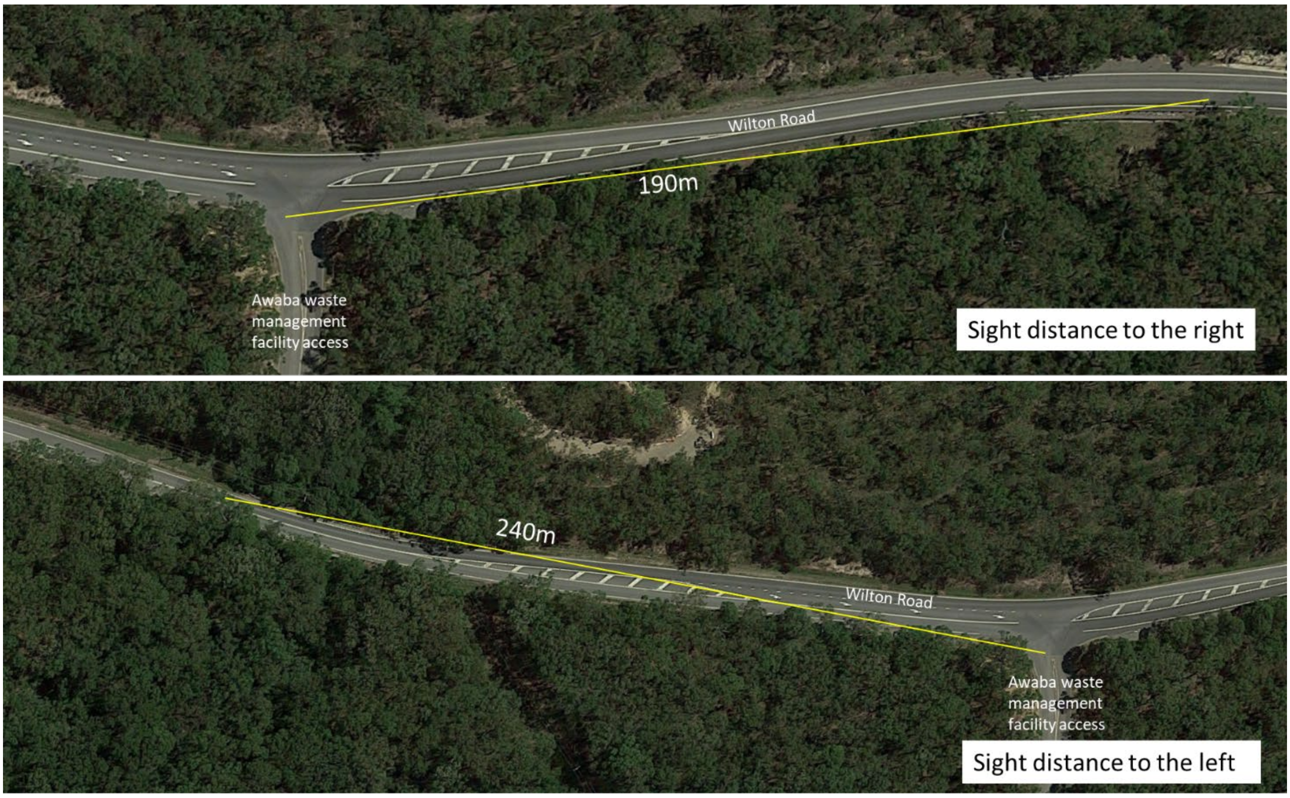


Figure 4.6 Sight distance from the Awaba Landfill and Waste Transfer Station access intersection onto Wilton Road

4.3.3 Cycling safety

As shown in Plate 4.1, the existing intersection design at Wangi Road and Wangi Point Road incorporates a cycle lane. Given the generally low observed volumes of existing cycling traffic and proposed truck turning traffic at this intersection, the potential for future traffic conflicts between cyclists using the cycleway (ie travelling in a southbound direction) and traffic turning either left from Wangi Road onto Wangi Point Road or right from Wangi Point Road onto Wangi Road are likely be minor.

4.4 Austroads intersection guidelines

Rural intersection operations are assessed from a combination of the peak hourly through and turning traffic movements that occur at each intersection. This determines the need for additional intersection turning lanes in accordance with the current intersection design standards *Guide to Road Design Part 4: Intersections and Crossings General* (Austroads 2017a). The warrant criteria are presented in Figure 4.7, where:

- Curve 1 (red line) represents the boundary between a basic right turn (BAR) and a channelised short right turn (CHR(S)) turn treatment and between a basic left turn (BAL) and an auxiliary short left turn (AUL(S)) turn treatment; and

- Curve 2 (blue line) represents the boundary between a CHR(S) and a full length CHR treatment and between an AUL(S) and a full length AUL or channelised left turn bay (CHL) treatment. The choice of CHL over an AUL will depend on factors such as the need to change the give way rule in favour of other manoeuvres at the intersection and the need to define more appropriately the driving path by reducing the area of bitumen surfacing.

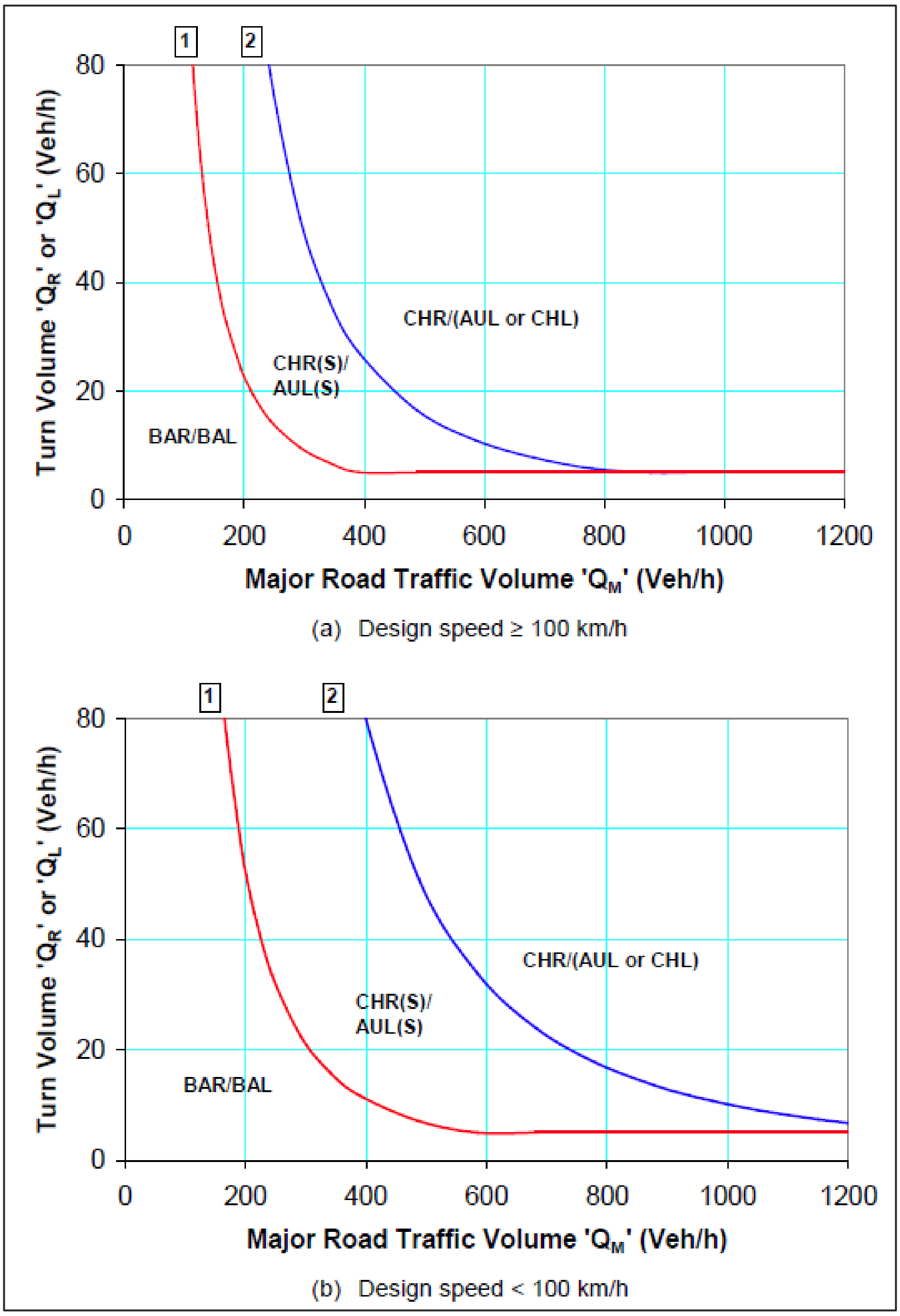


Figure 4.7 Austroads warrant design charts for rural intersection turning lanes

There are separate design charts for roads with design speeds either 100 km/hr and greater ((a) in Figure 4.7), or less than 100 km/hr ((b) in Figure 4.7). TfNSW recommends intersections should be designed for a travel speed 10 km/hr greater than the posted speed limit. As Wangi Road and Wilton Road have posted speed limits of 90 km/hr and 80 km/hr, respectively, their intersections (including any requirements for turning bays at Wangi Point Road and Awaba Colliery surface site access road) should be designed for 100 km/hr and 90 km/hr, respectively.

The Austroads turning lane requirements for each of the assessed intersections are summarised below.

4.4.1 Wangi Road/Wangi Point Road

For a design speed of 100 km/hr or greater, the requirements for additional left or right-turn traffic lanes are measured from Chart (a) of Figure 4.7. There is no right-turn requirement for Wangi Road as all incoming trucks will turn left from Wangi Road onto Wangi Point Road. Hence, the assessment is only required for a possible left-turn bay from Wangi Road.

For the projected increase of 10 turning vehicles per hour (ie trucks turning left from Wangi Road onto Wangi Point Road) and an existing average of 258 southbound vehicles on Wangi Road in the morning peak as well as 5 turning vehicles with 320 southbound through traffic movements in the afternoon peak, no turn treatment is warranted.

4.4.2 Wilton Road/Awaba Colliery surface site access road

For design speeds lower than 100 km/hr, requirements for additional left or right-turn traffic lanes are measured from Chart (b) of Figure 4.7. There is no right-turn requirement for Wilton Road to the Awaba Colliery surface site access road as all incoming trucks will turn left from Wilton Road into Awaba Colliery surface site. Hence, this assessment has been done for the requirement for a left-turn bay from Wilton Road only.

For the projected increase of 10 turning vehicles per hour (ie trucks turning left from Wilton Road into Awaba Colliery surface site) and an existing peak hourly average of 156 westbound vehicles on Wilton Road, no auxiliary left-turn lane is required.

4.4.3 Wangi Road/Donnelly Road

The Wangi Road/Donnelly Road intersection currently has a full length (minimum length over 60 m) CHL and CHR for traffic turning into Donnelly Road, which are the highest level of turn treatment, plus a seagull type treatment for right turning traffic turning out of Donnelly Road. The turn warrant assessment will determine whether the existing CHL and CHR turn treatments are appropriate for the existing level of turning traffic which will not change at this intersection.

The existing morning and afternoon peak hour traffic volumes (Figure 2.3) are presented in Table 4.7 where the major road traffic for assessment of left-turn treatment includes only the southbound through movements. For assessment of right-turn treatment, the major road traffic includes through movements from both directions as well as the left turning traffic into Donnelly Road.

Table 4.7 Traffic volumes for turn treatment warrant - Wangi Road/Donnelly Road

Assessed movement	Major road traffic volume	Turn volume
Left turn into Donnelly Road	222 (morning)/314 (afternoon) – southbound only	138 (morning)/150 (afternoon)
Right turn into Donnelly Road	615 (morning)/758 (afternoon) – both directions	6 (morning)/36 (afternoon)

The presented traffic volumes indicate the CHL and CHR treatments are appropriate for the existing and proposed levels of traffic at this intersection.

4.4.4 Wangi Road/Buttaba Hills Road

The Wangi Road/Buttaba Hills Road intersection currently has a full length AUL and CHR for traffic turning into Buttaba Hills Road which are the highest level of turn treatment. Therefore, the turn warrant assessment will determine whether the existing turn treatments are appropriate for the level of traffic.

The existing morning and afternoon peak hour traffic volumes (Figure 2.3) are presented in Table 4.8.

Table 4.8 Traffic volume for turn treatment warrant - Wangi Road/Buttaba Hills Road

Assessed movement	Major road traffic volume	Turn volume
Left turn into Buttaba Hills Road	336 (morning)/440 (afternoon) - southbound only	42 (morning)/30 (afternoon)
Right turn into Buttaba Hills Road	757 (morning)/878 (afternoon) – both directions	24 (morning)/24 (afternoon)

The presented traffic volumes indicate the AUL and CHR treatments are appropriate for the current and proposed levels of traffic at this intersection.

4.4.5 Wangi Road/Dorrington Road

The Wangi Road/Dorrington Road intersection is a one-lane roundabout with a bypass lane for northbound traffic where the overall intersection traffic volumes are 1,587 and 1,836 vehicles in the morning and afternoon peak hours, respectively. This level of traffic is within the typical capacity range of this type of 'bypass lane' roundabout and does not warrant any intersection improvements.

4.4.6 Substation access

This access point would only attract a limited amount of turning traffic associated with the operation of the substation. No right-turns are permitted and there is no requirement for any additional turning lane treatments.

4.4.7 Wangi Road/Wilton Road

The Wangi Road/Wilton Road intersection has recently been widened and upgraded by RMS (now TfNSW) to provide high standard type CHL and CHR turning lanes for traffic turning into Wilton Road and a 'seagull' type acceleration and merge lane for the right-turning traffic turning out from Wilton Road.

These intersection improvements are considered to have been constructed to the required design standard and additional intersection improvements are not required for either the current or proposed levels of turning traffic at this intersection.

4.4.8 Awaba Landfill and Waste Transfer Station access

The Wilton Road and Awaba Landfill and Waste Transfer Station access intersection currently has a full length (minimum length over 70 m) CHR and minimum standard BAL for right and left turning traffic heading into the waste management facility, respectively. These turning lanes are considered to be an appropriate standard of turn treatment for this T-intersection as it is anticipated that the majority of the facility's light and heavy vehicle traffic travels to and from the east on Wilton Road, in the direction of where the Lake Macquarie LGA's major population centres are located. It is anticipated that this access intersection will not require any additional intersection treatment for the proposed additional through traffic on Wilton Road.

4.5 Swept path assessment

A swept path assessment has been undertaken by a 19 m articulated vehicle (AV) to ensure that both the Wangi Road/Wangi Point Road and Wilton Road/Awaba Colliery surface site intersections can adequately accommodate the proposed truck turning movements. The results are presented in Appendix D and discussed below.

4.5.1 Wangi Road/Wangi Point Road

The results indicate that no widening or improvement works are required along Wangi Road to facilitate the efficient entry/exit of heavy vehicles proposed to be used to transport coal from Myuna to Awaba Colliery surface site.

Road widening works (to a minimum sealed width of 7 m) are required along Wangi Point Road for a distance of approximately 50 m from the nearest traffic lane on Wangi Road. This is to allow two trucks to safely pass each other when entering/existing Wangi Point Road.

The concrete blocks at the entrance to Wangi Point Road will also need to be removed to allow two trucks to safely pass each other.

4.5.2 Wilton Road/Awaba Colliery surface site access road

The results of the swept path analysis indicate that some minor widening works may be justified on the approach to the Awaba Colliery surface site access road in order to fully separate the entering and exiting vehicle swept paths. However, depending on the likelihood of simultaneous entry/exit of trucks, the slight overlap shown in Appendix D may be acceptable.

Widening of the existing access gate may help to provide more room for inbound/outbound trucks, further reducing the potential overlap identified in the swept path analysis (Appendix D).

4.5.3 Wangi Road/Wilton Road

The Wangi Road/Wilton Road intersection has recently been widened and upgraded by RMS (now TfNSW) to provide high standard type CHL and CHR turning lanes for traffic turning into Wilton Road and a 'seagull' type acceleration and merge lane for the right-turning traffic turning out from Wilton Road.

These intersection improvements are considered to have been constructed to the required design standard to accommodate turning movements by heavy vehicles (such as semi-trailers) and further assessment of the intersection design by swept path analysis is not considered necessary for this intersection.

4.6 Road pavement condition

An inspection has been undertaken along the public and private road sections of the proposed transport route to confirm that the existing road width and alignment and the structural/surface condition are adequate and acceptable to accommodate the proposed truck movements without adverse impacts to traffic safety or the road pavement condition/durability.

Photos captured during the inspection are presented in Appendix E (public roads) and Appendix F (private roads).

The existing road pavement width and surface conditions along both Wangi Road and Wilton Road are considered to be generally good such that significant additional road pavement damage is considered unlikely to occur.

5 Management and mitigation measures

5.1 Truck volumes

5.1.1 Public roads

Between 3.00 pm and 4.00 pm Monday to Friday, truck movements will be restricted to 5 trips (10 movements) per hour to avoid potential impacts during the local road network's busiest peak hour period.

5.1.2 Private roads

Truck numbers along the private haul road network between the Awaba Colliery surface site and CES will be within previously assessed and approved limits under SSD-5145 (ie 32 truck movements per hour).

5.2 Road upgrades

Road widening works will be undertaken on Wangi Point Road to establish a minimum sealed width of 7 m for a distance of approximately 50 m from the nearest traffic lane on Wangi Road.

This will allow two trucks to safely pass each other when entering/exiting Wangi Point Road.

No vegetation clearing is required to undertake the proposed works.

5.3 Additional signage

To facilitate the safe transport of coal on the public road network, signage will be installed approximately 100 m from the intersection of Wangi Road/Wangi Point Road and Wilton Road/Awaba Colliery surface site access road to warn motorists of turning trucks.

Approval under Section 138 of the NSW *Roads Act 1993* will be obtained prior to the installation of any signage along the public road network.

5.4 Driver awareness and training

A Code of Conduct will be developed for all truck drivers operating on the public road network as part of the proposed modification and will focus on good driver behaviour including:

- keeping appropriate distances between vehicles;
- overtaking with care;
- observing designated speed limits;
- making sufficient allowance for slowing down and stopping of vehicle;
- exercising caution in reduced visibility conditions;
- considering cyclists and pedestrians; and
- convoying.

6 Conclusion and recommendations

Myuna is an underground coal mine that supplies coal directly to Eraring Power Station via overland conveyor. Due to recent issues with coal quality, it is proposed to transport up to 1 Mtpa of coal by road to CES (via Awaba Colliery surface site) and up to 0.2 Mtpa of coal back to Myuna for on-site blending.

This report has considered the potential road transport impacts, primarily road capacity and safety, for the proposed transport of coal from Myuna to CES (via the Awaba Colliery surface site), which includes sections of the public road network (ie sections of Wangi Road and Wilton Road). On average, up to 105 loaded trucks per day will travel over the proposed transport route to facilitate coal transfers between Myuna and CES (excluding Sundays and public holidays).

In summary:

- The proposed modification will generate up to 10 loaded trucks per hour Monday to Saturday (with the exception of 3-4 pm where truck movements will be restricted to 5 loaded trucks per hour). The proposed truck movements can be accommodated by the existing road network with minimal overall impact to road capacity or traffic delays and no intersection improvements are warranted.
- Assuming inbound and outbound truck movements occur within the same hour, the morning peak hour, other daytime and afternoon peak hour truck return trips of 10, 10 and 5, respectively, will generate an additional 20, 20 and 10 truck movements per hour. The additional traffic generation from the backloading of coal from CES to Myuna has not been considered specifically as it is assumed that all trucks will need to travel back to Myuna (with/without a load).
- Sight distances and other safety concerns at intersections along the route between Myuna and Awaba Colliery surface site have been inspected and assessed. All minor road T-intersections have adequate sight distance and generally low minor road traffic volumes such that the existing intersection designs are acceptable and do not warrant any intersection turning lane or other capacity upgrades.
- The intersection of Wangi Road and Wilton Road will continue to operate at acceptable delay levels. The SIDRA analysis shows no change in the peak hour LoS and only slightly higher average vehicle delays as a result of the proposed modification.
- From the peak hour SIDRA intersection analysis, minimal additional traffic delays are anticipated at the intersection of Wangi Road/Wangi Point Road and Wilton Road/Awaba Colliery surface site access road.
- The swept path analysis for the intersection of Wangi Road/Wangi Point Road indicates that widening works are required along Wangi Point Road for a distance of approximately 50 m from the nearest traffic lane on Wangi Road (to provide a minimum sealed width of 7 m).
- The swept path analysis for the intersection of Wilton Road/Awaba Colliery surface site access road indicates that no widening works are likely to be required at this intersection due to the low likelihood of simultaneous truck turning movements in both directions occurring at this intersection.
- Additional warning signs will be installed on Wilton Road and Wangi Road approximately 100 m from the intersection of Wangi Road/Wangi Point Road and Wilton Road/Awaba Colliery surface site access road to warn motorists of turning trucks. A Code of Conduct will also be developed for all truck drivers operating on the public road network as part of the proposed modification and will focus on good driver behaviour.

References

Austroads 2017a, *Guide to Road Design Part 4: Intersections and Crossings General*.

- 2017b, *Guide to Road Design Part 4A: Unsignalised & Signalised Intersections*.

- 2016, Guide to Traffic Management Part 3: Traffic Studies and Analysis.

EMM 2019, *Newstan Mine Extension Project – Traffic impact assessment*. Report prepared by EMM for Centennial Newstan.

RTA 2002, *Guide to Traffic Generating Developments*. NSW Roads and Traffic Authority.


Appendix A

Tube counts




WANGI ROAD, MYUNA Between WANGI POINT ROAD and WILTON ROAD
710 3@2M NB ABC 711 3@2M SB BCD
On guard rails 250m north of Wangi Point Road

Lane	Count Nun	Time	Mon			Tue			Wed			Thu			Fri			Sat			Sun		
			18-Nov-19			19-Nov-19			20-Nov-19			21-Nov-19			22-Nov-19			23-Nov-19			24-Nov-19		
			Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13
Direction 1	8033	100	3	0	0	20	1	0	19	3	0	18	4	0	12	1	0	10	0	1	10	0	0
Direction 1	8033	200	2	1	0	5	0	0	4	0	0	8	0	0	5	1	0	10	0	0	10	1	0
Direction 1	8033	300	3	0	0	4	0	0	5	0	0	4	1	0	3	1	0	6	0	0	3	0	0
Direction 1	8033	400	7	3	1	8	1	1	5	0	0	6	3	1	6	1	2	3	0	0	5	0	0
Direction 1	8033	500	25	6	1	16	1	0	13	3	4	19	2	0	17	0	2	14	0	0	11	1	0
Direction 1	8033	600	71	5	1	92	6	0	71	11	1	73	4	0	77	9	1	36	3	0	18	1	1
Direction 1	8033	700	181	24	2	184	20	4	176	24	1	197	17	4	153	15	3	60	6	2	49	3	0
Direction 1	8033	800	218	30	0	230	19	0	255	29	1	254	25	3	203	35	2	98	8	0	36	2	0
Direction 1	8033	900	245	19	0	275	35	2	255	18	1	277	19	0	234	21	0	131	7	0	67	9	0
Direction 1	8033	1000	226	18	1	208	16	2	218	27	2	192	26	1	197	27	4	178	21	0	136	10	0
Direction 1	8033	1100	188	17	1	170	17	4	179	35	0	179	15	1	147	29	0	171	12	0	149	11	0
Direction 1	8033	1200	191	14	3	179	24	1	182	19	1	197	16	1	167	16	2	171	19	0	159	10	0
Direction 1	8033	1300	149	18	1	169	25	3	173	21	4	141	21	1	182	23	6	164	15	3	164	9	1
Direction 1	8033	1400	157	26	0	151	15	2	160	30	2	191	17	1	193	21	2	148	5	2	133	9	0
Direction 1	8033	1500	202	20	3	201	22	1	206	20	2	196	26	2	204	17	3	143	8	1	131	12	0
Direction 1	8033	1600	266	27	1	299	23	1	304	35	2	325	31	1	300	30	4	116	7	0	104	13	0
Direction 1	8033	1700	232	28	1	228	16	2	260	21	2	232	24	3	200	14	0	113	3	1	114	7	0
Direction 1	8033	1800	218	21	1	217	9	0	216	20	1	206	13	0	190	17	2	146	10	1	115	16	0
Direction 1	8033	1900	105	7	0	110	4	0	117	9	0	117	7	0	128	12	0	93	7	0	81	2	0
Direction 1	8033	2000	70	10	0	60	5	0	68	3	0	77	4	0	71	2	0	59	8	0	60	3	0
Direction 1	8033	2100	43	4	1	48	0	0	63	2	0	54	2	0	50	4	0	56	4	0	56	3	0
Direction 1	8033	2200	30	1	1	37	1	0	43	4	0	37	1	0	51	2	0	41	1	0	29	0	0
Direction 1	8033	2300	25	1	0	26	0	1	21	1	0	27	1	0	27	0	1	37	3	0	20	1	0
Direction 1	8033	2400	14	0	0	14	2	0	12	1	0	20	3	0	20	0	0	24	1	0	10	0	1

WANGI ROAD, MYUNA Between WANGI POINT ROAD and WILTON ROAD
710 3@2M NB ABC 711 3@2M SB BCD
On guard rails 250m north of Wangi Point Road

Lane	Count Num	Time	Mon			Tue			Wed			Thu			Fri			Sat			Sun		
			18-Nov-19			19-Nov-19			20-Nov-19			21-Nov-19			22-Nov-19			23-Nov-19			24-Nov-19		
			Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13
Direction 2	8033	100	7	0	0	10	1	1	12	1	0	7	3	1	9	0	0	14	2	0	18	5	0
Direction 2	8033	200	6	0	0	4	1	0	6	2	0	4	1	0	8	1	0	8	1	0	11	0	0
Direction 2	8033	300	4	1	1	5	1	0	6	1	0	4	2	0	7	0	0	7	1	0	5	2	1
Direction 2	8033	400	11	1	0	15	2	1	8	2	0	12	1	0	10	1	1	3	1	0	11	0	0
Direction 2	8033	500	31	5	0	31	6	0	27	6	1	27	11	2	28	4	2	11	4	0	9	4	0
Direction 2	8033	600	132	21	0	133	31	1	145	34	0	128	29	0	124	21	1	53	9	0	42	3	0
Direction 2	8033	700	234	62	2	287	62	1	272	62	1	267	71	3	243	52	2	71	8	0	41	10	0
Direction 2	8033	800	198	36	1	229	53	1	235	44	3	224	40	1	190	26	1	72	8	0	57	7	1
Direction 2	8033	900	197	32	2	218	38	2	219	37	2	223	32	1	185	29	1	117	24	0	84	8	1
Direction 2	8033	1000	185	30	1	187	32	0	166	34	1	182	27	1	157	30	3	147	26	2	117	15	2
Direction 2	8033	1100	152	33	2	172	22	0	173	30	1	175	32	1	151	16	0	176	13	0	143	24	0
Direction 2	8033	1200	163	35	6	159	25	4	178	35	1	175	33	3	179	27	6	150	28	1	154	22	1
Direction 2	8033	1300	153	26	2	207	29	0	179	30	4	177	37	0	188	23	3	164	23	2	153	23	1
Direction 2	8033	1400	195	16	4	203	24	2	178	26	4	198	37	0	205	20	0	156	17	3	139	12	0
Direction 2	8033	1500	204	21	2	220	28	4	219	34	2	187	38	2	230	43	4	164	22	1	133	28	0
Direction 2	8033	1600	273	34	4	274	38	4	272	40	1	292	50	1	281	29	2	173	20	2	164	14	0
Direction 2	8033	1700	269	20	0	236	30	0	274	21	1	249	38	1	254	30	3	146	10	1	138	19	0
Direction 2	8033	1800	218	22	0	231	25	0	233	35	3	231	23	1	240	41	1	117	16	3	118	18	0
Direction 2	8033	1900	153	20	0	171	20	1	182	23	2	146	12	1	153	24	1	98	18	0	82	8	0
Direction 2	8033	2000	80	14	0	67	4	1	86	17	0	80	21	0	67	13	0	76	8	0	56	11	1
Direction 2	8033	2100	65	8	0	87	6	0	83	12	1	92	10	1	54	13	0	60	3	0	78	7	0
Direction 2	8033	2200	61	10	0	72	12	1	82	2	0	105	11	0	70	8	0	91	8	0	53	7	0
Direction 2	8033	2300	18	3	0	29	1	2	32	2	1	28	5	0	45	3	0	50	1	0	27	4	0
Direction 2	8033	2400	11	0	1	10	3	0	12	2	0	17	1	0	28	3	0	33	4	0	19	2	1

WILTON ROAD, MYUNA Between WANGI ROAD and AWABA
712 NB 3@2M ABC713 SB 3@2M BCD
Midblock between Wangi Rd and Awaba Community Recycling Centre ELP 7010

Lane	Count Nur	Time	Mon			Tue			Wed			Thu			Fri			Sat			Sun		
			18-Nov-19			19-Nov-19			20-Nov-19			21-Nov-19			22-Nov-19			23-Nov-19			24-Nov-19		
			Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13
Direction 1	8034	100	2	0	0	6	0	0	8	3	0	6	2	0	8	0	0	1	1	0	3	0	0
Direction 1	8034	200	1	0	0	3	0	0	1	0	0	5	0	0	1	0	0	0	0	1	1	0	0
Direction 1	8034	300	2	0	0	4	1	0	2	0	0	3	1	0	2	0	0	1	0	0	2	0	0
Direction 1	8034	400	5	1	0	6	0	0	7	0	0	0	2	0	4	2	0	2	0	0	2	0	0
Direction 1	8034	500	42	4	1	29	1	1	27	3	0	30	7	1	32	4	1	7	0	0	8	1	0
Direction 1	8034	600	58	9	0	71	8	1	72	11	0	80	10	0	66	10	0	20	5	0	14	2	0
Direction 1	8034	700	106	12	2	99	13	0	100	19	0	91	10	2	85	11	1	20	5	0	17	2	0
Direction 1	8034	800	119	24	3	125	22	1	128	26	2	115	18	4	99	21	3	42	4	0	24	2	1
Direction 1	8034	900	99	21	3	102	13	1	91	20	2	83	17	2	69	19	4	58	9	1	35	4	1
Direction 1	8034	1000	58	24	3	50	26	2	66	15	2	66	21	1	62	21	2	58	10	3	46	3	2
Direction 1	8034	1100	45	8	3	47	14	3	43	22	2	35	16	3	35	22	6	57	6	1	64	10	1
Direction 1	8034	1200	47	15	2	60	14	4	42	18	0	44	11	3	54	14	0	58	13	1	66	10	2
Direction 1	8034	1300	43	25	3	28	15	5	41	18	6	45	19	1	38	14	2	66	9	1	49	5	1
Direction 1	8034	1400	41	9	4	35	12	4	45	22	3	45	17	3	53	15	2	46	7	1	42	4	3
Direction 1	8034	1500	51	24	1	56	14	4	61	27	4	54	19	3	64	19	3	56	3	2	64	7	0
Direction 1	8034	1600	88	21	0	95	20	1	99	19	2	112	19	1	110	13	2	55	6	0	47	13	0
Direction 1	8034	1700	76	6	1	65	9	0	72	11	3	82	4	5	56	6	1	40	5	0	56	1	0
Direction 1	8034	1800	54	7	1	85	3	2	71	3	2	53	6	0	41	6	2	35	3	0	30	2	1
Direction 1	8034	1900	24	1	0	38	3	1	18	1	0	21	3	0	27	1	0	23	4	0	27	2	1
Direction 1	8034	2000	12	0	0	18	2	0	15	1	1	14	2	1	24	2	1	17	1	0	13	2	0
Direction 1	8034	2100	19	0	0	22	0	0	17	2	0	11	0	0	10	2	0	9	1	1	15	1	0
Direction 1	8034	2200	13	0	0	7	2	0	9	0	0	9	2	0	11	0	0	9	0	0	3	1	0
Direction 1	8034	2300	4	0	1	4	0	0	2	0	0	8	0	0	12	2	0	8	0	0	2	1	0
Direction 1	8034	2400	2	0	0	3	1	0	3	0	0	6	0	0	3	0	0	8	0	0	4	0	0

WILTON ROAD, MYUNA Between WANGI ROAD and AWABA
712 NB 3@2M ABC713 SB 3@2M BCD
Midblock between Wangi Rd and Awaba Community Recycling Centre ELP 7010

Lane	Count Num	Time	Mon			Tue			Wed			Thu			Fri			Sat			Sun		
			18-Nov-19			19-Nov-19			20-Nov-19			21-Nov-19			22-Nov-19			23-Nov-19			24-Nov-19		
			Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13	Class 1-2	Class 3-5	Class 6-13
Direction 2	8034	100	0	0	0	3	2	0	3	3	1	4	2	0	4	2	0	4	2	1	5	0	0
Direction 2	8034	200	0	1	1	2	1	0	3	4	0	2	2	0	2	0	1	2	1	0	4	0	0
Direction 2	8034	300	0	0	0	3	1	0	0	2	0	0	1	0	0	1	0	0	5	0	1	1	0
Direction 2	8034	400	0	1	0	1	4	0	2	1	0	2	1	0	2	1	0	1	0	0	0	1	0
Direction 2	8034	500	0	1	1	1	1	0	0	3	0	5	2	0	6	4	0	5	3	0	1	2	0
Direction 2	8034	600	21	14	0	24	16	1	31	14	0	19	16	0	17	18	0	11	5	0	5	3	0
Direction 2	8034	700	60	26	0	61	38	0	57	44	1	71	25	3	63	29	1	13	6	0	6	4	0
Direction 2	8034	800	39	22	4	44	17	1	49	23	1	46	19	0	30	23	1	16	10	0	17	5	0
Direction 2	8034	900	49	22	3	53	34	2	51	28	1	37	18	4	40	24	4	22	12	0	20	6	0
Direction 2	8034	1000	35	31	0	51	27	0	30	29	2	50	25	0	42	20	3	50	11	0	35	10	1
Direction 2	8034	1100	42	19	2	48	20	3	54	22	1	42	26	1	45	15	1	57	12	0	50	12	1
Direction 2	8034	1200	43	24	3	38	21	7	36	23	1	49	16	1	42	27	2	66	19	1	72	16	0
Direction 2	8034	1300	52	27	2	48	23	3	59	25	1	56	24	2	44	20	0	54	12	4	63	8	1
Direction 2	8034	1400	41	23	4	40	18	1	39	24	2	41	22	2	61	31	2	47	10	2	42	11	1
Direction 2	8034	1500	64	17	4	55	19	3	56	32	1	48	18	1	60	35	0	45	3	0	43	10	2
Direction 2	8034	1600	75	36	0	85	34	1	96	38	0	77	33	5	85	26	0	33	23	1	48	14	1
Direction 2	8034	1700	102	25	1	121	29	1	126	36	0	102	36	3	103	32	3	44	11	2	37	17	1
Direction 2	8034	1800	99	33	0	115	27	0	110	35	1	93	51	0	98	24	1	45	9	0	37	9	0
Direction 2	8034	1900	48	22	1	49	9	0	46	18	1	36	28	2	51	18	0	17	14	0	21	9	0
Direction 2	8034	2000	24	7	0	29	19	0	18	12	0	22	10	1	16	5	0	20	3	0	13	9	0
Direction 2	8034	2100	10	7	0	13	6	0	17	6	0	9	10	0	11	8	0	15	6	0	18	6	0
Direction 2	8034	2200	14	6	0	8	10	1	14	9	0	13	3	0	26	9	0	9	7	0	9	3	1
Direction 2	8034	2300	7	2	0	7	2	0	5	4	0	5	3	1	14	3	0	13	2	0	7	2	0
Direction 2	8034	2400	6	3	0	7	0	0	6	3	0	8	5	0	8	2	1	8	2	0	3	1	0

Appendix B

Intersection counts

R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Mob.0418-239019

Client : EMM
Job No/Name : 7163 FASSIFERN Intersection Counts
Day/Date : Wednesday 21st August 2019

Lights

	NORTH		WEST		SOUTH		
	Wangi Rd		*Wilton Rd*		*Wangi Rd*		
Time Per	**T**	**R**	**L**	**R**	**L**	**T**	**TOT**
0600 - 0615	8	1	0	15	23	127	**174**
0615 - 0630	119	0	0	23	25	138	**305**
0630 - 0645	114	1	0	35	28	158	**336**
0645 - 0700	153	0	1	30	26	16	**226**
0700 - 0715	77	5	0	11	29	158	**280**
0715 - 0730	77	9	1	14	41	230	**372**
0730 - 0745	96	5	3	17	32	184	**337**
0745 - 0800	122	1	3	15	38	286	**465**
Per End	**766**	**22**	**8**	**160**	**242**	**1297**	**2495**

Heavies

	NORTH		WEST		SOUTH		
	Wangi Rd		*Wilton Rd*		*Wangi Rd*		
Time Per	**T**	**R**	**L**	**R**	**L**	**T**	**TOT**
0600 - 0615	3	1	0	1	0	1	**6**
0615 - 0630	2	0	0	1	1	0	**4**
0630 - 0645	2	0	0	0	0	1	**3**
0645 - 0700	1	0	1	0	0	2	**4**
0700 - 0715	1	0	0	1	1	3	**6**
0715 - 0730	7	1	1	3	2	5	**19**
0730 - 0745	4	0	0	1	1	2	**8**
0745 - 0800	5	0	1	1	2	1	**10**
Per End	**25**	**2**	**3**	**8**	**7**	**15**	**60**

Combined

	NORTH		WEST		SOUTH		
	Wangi Rd		*Wilton Rd*		*Wangi Rd*		
Time Per	**T**	**R**	**L**	**R**	**L**	**T**	**TOT**
0600 - 0615	11	2	0	16	23	128	**180**
0615 - 0630	121	0	0	24	26	138	**309**
0630 - 0645	116	1	0	35	28	159	**339**
0645 - 0700	154	0	2	30	26	18	**230**
0700 - 0715	78	5	0	12	30	161	**286**
0715 - 0730	84	10	2	17	43	235	**391**
0730 - 0745	100	5	3	18	33	186	**345**
0745 - 0800	127	1	4	16	40	287	**475**
Per End	**791**	**24**	**11**	**168**	**249**	**1312**	**2555**

Lights

	NORTH		WEST		SOUTH		
	Wangi Rd		*Wilton Rd*		*Wangi Rd*		
Peak Per	**T**	**R**	**L**	**R**	**L**	**T**	**TOT**
0600 - 0700	394	2	1	103	102	439	**1041**
0615 - 0715	463	6	1	99	108	470	1147
0630 - 0730	421	15	2	90	124	562	**1214**
0645 - 0745	403	19	5	72	128	588	**1215**
0700 - 0800	372	20	7	57	140	858	**1454**
PEAK HR	**372**	**20**	**7**	**57**	**140**	**858**	**1454**

Heavies

	NORTH		WEST		SOUTH		
	Wangi Rd		*Wilton Rd*		*Wangi Rd*		
Peak Per	**T**	**R**	**L**	**R**	**L**	**T**	**TOT**
0600 - 0700	8	1	1	2	1	4	**17**
0615 - 0715	6	0	1	2	2	6	17
0630 - 0730	11	1	2	4	3	11	**32**
0645 - 0745	13	1	2	5	4	12	**37**
0700 - 0800	17	1	2	6	6	11	**43**
PEAK HR	**17**	**1**	**2**	**6**	**6**	**11**	**43**

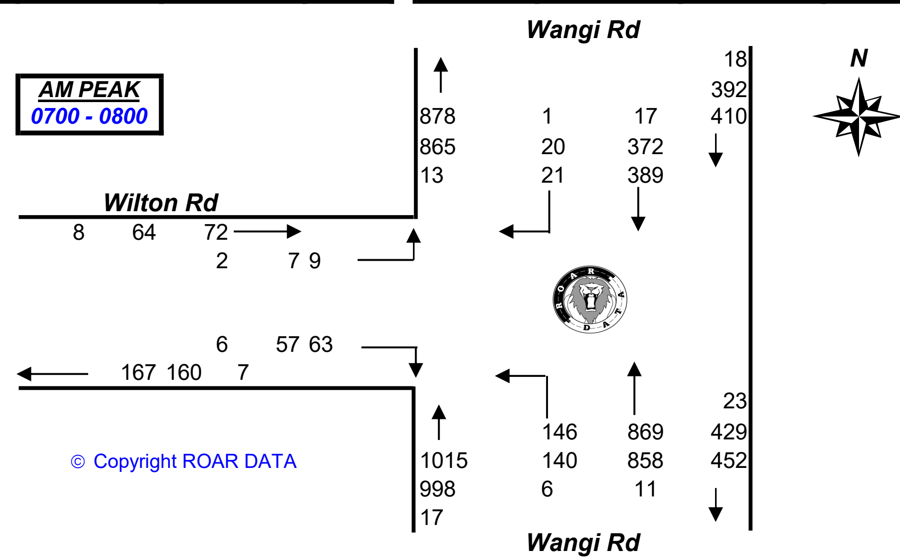
Combined

	NORTH		WEST		SOUTH		
	Wangi Rd		*Wilton Rd*		*Wangi Rd*		
Peak Per	**T**	**R**	**L**	**R**	**L**	**T**	**TOT**
0600 - 0700	402	3	2	105	103	443	**1058**
0615 - 0715	469	6	2	101	110	476	1164
0630 - 0730	432	16	4	94	127	573	**1246**
0645 - 0745	416	20	7	77	132	600	**1252**
0700 - 0800	389	21	9	63	146	869	**1497**
PEAK HR	**389**	**21**	**9**	**63**	**146**	**869**	**1497**

Peds

	NORTH	WEST	SOUTH	
Time Per	**Wangi Rd**	**Wilton Rd**	**Wangi Rd**	**TOT**
0600 - 0615	0	0	0	**0**
0615 - 0630	0	0	0	**0**
0630 - 0645	0	0	0	**0**
0645 - 0700	0	0	0	**0**
0700 - 0715	0	0	0	**0**
0715 - 0730	0	0	0	**0**
0730 - 0745	0	0	0	**0**
0745 - 0800	0	0	0	**0**
Per End	**0**	**0**	**0**	**0**

	NORTH	WEST	SOUTH	
Peak Per	**Wangi Rd**	**Wilton Rd**	**Wangi Rd**	**TOT**
0600 - 0700	0	0	0	**0**
0615 - 0715	0	0	0	**0**
0630 - 0730	0	0	0	**0**
0645 - 0745	0	0	0	**0**
0700 - 0800	0	0	0	**0**
PEAK HR	**0**	**0**	**0**	**0**



R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Mob.0418-239019

Client : EMM

Job No/Name : 7163 FASSIFERN Intersection Counts

Day/Date : Wednesday 21st August 2019

Lights

	NORTH		WEST		SOUTH		
	Wangi Rd		*Wilton Rd*		*Wangi Rd*		
Time Per	T	R	L	R	L	T	TOT
1400 - 1415	123	4	0	9	7	104	**247**
1415 - 1430	171	2	6	14	14	127	**334**
1430 - 1445	170	5	5	21	11	132	**344**
1445 - 1500	146	3	3	19	14	104	**289**
1500 - 1515	182	3	6	16	14	146	**367**
1515 - 1530	203	5	14	38	15	122	**397**
1530 - 1545	195	4	6	29	21	185	**440**
1545 - 1600	246	5	5	41	41	194	**532**
Per End	**1436**	**31**	**45**	**187**	**137**	**1114**	**2950**

Heavies

	NORTH		WEST		SOUTH		
	Wangi Rd		*Wilton Rd*		*Wangi Rd*		
Time Per	T	R	L	R	L	T	TOT
1400 - 1415	2	0	2	1	0	1	**6**
1415 - 1430	0	0	0	1	0	0	**1**
1430 - 1445	2	1	1	3	3	2	**12**
1445 - 1500	2	0	3	1	4	1	**11**
1500 - 1515	3	0	3	1	3	1	**11**
1515 - 1530	4	1	1	0	1	4	**11**
1530 - 1545	2	0	1	1	1	1	**6**
1545 - 1600	1	0	0	3	0	2	**6**
Per End	**16**	**2**	**11**	**11**	**12**	**12**	**64**

Combined

	NORTH		WEST		SOUTH		
	Wangi Rd		*Wilton Rd*		*Wangi Rd*		
Time Per	T	R	L	R	L	T	TOT
1400 - 1415	125	4	2	10	7	105	**253**
1415 - 1430	171	2	6	15	14	127	**335**
1430 - 1445	172	6	6	24	14	134	**356**
1445 - 1500	148	3	6	20	18	105	**300**
1500 - 1515	185	3	9	17	17	147	**378**
1515 - 1530	207	6	15	38	16	126	**408**
1530 - 1545	197	4	7	30	22	186	**446**
1545 - 1600	247	5	5	44	41	196	**538**
Per End	**1452**	**33**	**56**	**198**	**149**	**1126**	**3014**

Lights

	NORTH		WEST		SOUTH		
	Wangi Rd		*Wilton Rd*		*Wangi Rd*		
Peak Per	T	R	L	R	L	T	TOT
1400 - 1500	610	14	14	63	46	467	**1214**
1415 - 1515	669	13	20	70	53	509	**1334**
1430 - 1530	701	16	28	94	54	504	**1397**
1445 - 1545	726	15	29	102	64	557	**1493**
1500 - 1600	826	17	31	124	91	647	1736
PEAK HR	**826**	**17**	**31**	**124**	**91**	**647**	**1736**

Heavies

	NORTH		WEST		SOUTH		
	Wangi Rd		*Wilton Rd*		*Wangi Rd*		
Peak Per	T	R	L	R	L	T	TOT
1400 - 1500	6	1	6	6	7	4	**30**
1415 - 1515	7	1	7	6	10	4	**35**
1430 - 1530	11	2	8	5	11	8	**45**
1445 - 1545	11	1	8	3	9	7	**39**
1500 - 1600	10	1	5	5	5	8	34
PEAK HR	**10**	**1**	**5**	**5**	**5**	**8**	**34**

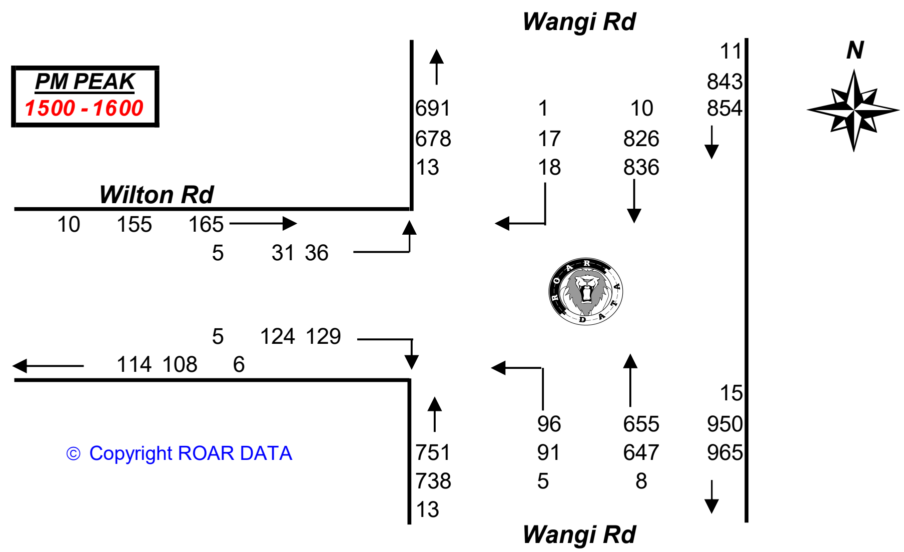
Combined

	NORTH		WEST		SOUTH		
	Wangi Rd		*Wilton Rd*		*Wangi Rd*		
Peak Per	T	R	L	R	L	T	TOT
1400 - 1500	616	15	20	69	53	471	**1244**
1415 - 1515	676	14	27	76	63	513	**1369**
1430 - 1530	712	18	36	99	65	512	**1442**
1445 - 1545	737	16	37	105	73	564	**1532**
1500 - 1600	836	18	36	129	96	655	1770
PEAK HR	**836**	**18**	**36**	**129**	**96**	**655**	**1770**

Peds

	NORTH	WEST	SOUTH	
Time Per	Wangi Rd	Wilton Rd	Wangi Rd	TOT
1400 - 1415	0	0	0	**0**
1415 - 1430	0	0	0	**0**
1430 - 1445	0	0	0	**0**
1445 - 1500	0	0	0	**0**
1500 - 1515	0	0	0	**0**
1515 - 1530	0	0	0	**0**
1530 - 1545	0	0	0	**0**
1545 - 1600	0	0	0	**0**
Per End	**0**	**0**	**0**	0

	NORTH	WEST	SOUTH	
Peak Per	Wangi Rd	Wilton Rd	Wangi Rd	TOT
1400 - 1500	0	0	0	**0**
1415 - 1515	0	0	0	**0**
1430 - 1530	0	0	0	**0**
1445 - 1545	0	0	0	**0**
1500 - 1600	0	0	0	**0**
PEAK HR	**0**	**0**	**0**	**0**



Project Name Turning Movements Intersection Awaba Colliery
Project Date 11/19/2019

		WILTON ROAD WESTBOUND						WILTON ROAD EASTBOUND						COLLIERY ENTRANCE NORTHBOUND						
		LEFT			STRAIGHT			STRAIGHT			RIGHT			LEFT			RIGHT			
	15 Mins	LV	HV	**LV+HV**	LV	HV	**LV+HV**	LV	HV	**LV+HV**	LV	HV	**LV+HV**	LV	HV	**LV+HV**	LV	HV	**LV+HV**	Totals
19-Nov-19	600-614	0	0	**0**	20	4	**24**	18	1	**19**	0	0	**0**	0	0	**0**	0	0	**0**	43
19-Nov-19	615-629	0	0	**0**	24	0	**24**	25	3	**28**	0	0	**0**	0	0	**0**	0	0	**0**	52
19-Nov-19	630-644	0	0	**0**	29	3	**32**	34	1	**35**	0	0	**0**	0	0	**0**	0	0	**0**	67
19-Nov-19	645-659	0	0	**0**	28	0	**28**	29	6	**35**	0	0	**0**	0	0	**0**	0	0	**0**	63
19-Nov-19	700-714	0	0	**0**	24	1	**25**	15	4	**19**	0	0	**0**	0	0	**0**	0	0	**0**	44
19-Nov-19	715-729	0	0	**0**	22	2	**24**	21	2	**23**	0	0	**0**	0	0	**0**	0	0	**0**	47
19-Nov-19	730-744	0	0	**0**	41	1	**42**	14	3	**17**	0	0	**0**	0	0	**0**	0	0	**0**	59
19-Nov-19	745-759	0	0	**0**	45	2	**47**	16	4	**20**	0	0	**0**	0	0	**0**	0	0	**0**	67
19-Nov-19	800-814	0	0	**0**	28	3	**31**	20	3	**23**	0	0	**0**	0	0	**0**	0	0	**0**	54
19-Nov-19	815-829	0	0	**0**	34	2	**36**	17	4	**21**	0	0	**0**	0	0	**0**	0	0	**0**	57
19-Nov-19	830-844	0	0	**0**	18	3	**21**	15	1	**16**	0	0	**0**	0	0	**0**	0	0	**0**	37
19-Nov-19	845-859	0	0	**0**	18	3	**21**	13	2	**15**	0	0	**0**	0	0	**0**	0	0	**0**	36
		0	0	**0**	331	24	**355**	237	34	**271**	0	0	**0**	0	0	**0**	0	0	**0**	

	WILTON ROAD WESTBOUND						WILTON ROAD EASTBOUND						COLLIERY ENTRANCE NORTHBOUND						
	LEFT			STRAIGHT			STRAIGHT			RIGHT			LEFT			RIGHT			
Hourly	LV	HV	**LV+HV**	LV	HV	**LV+HV**	LV	HV	**LV+HV**	LV	HV	**LV+HV**	LV	HV	**LV+HV**	LV	HV	**LV+HV**	Totals
600-700	0	0	**0**	101	7	**108**	106	11	**117**	0	0	**0**	0	0	**0**	0	0	**0**	225
615-715	0	0	**0**	105	4	**109**	103	14	**117**	0	0	**0**	0	0	**0**	0	0	**0**	226
630-730	0	0	**0**	103	6	**109**	99	13	**112**	0	0	**0**	0	0	**0**	0	0	**0**	221
645-745	0	0	**0**	115	4	**119**	79	15	**94**	0	0	**0**	0	0	**0**	0	0	**0**	213
700-800	0	0	**0**	132	6	**138**	66	13	**79**	0	0	**0**	0	0	**0**	0	0	**0**	217
715-815	0	0	**0**	136	8	**144**	71	12	**83**	0	0	**0**	0	0	**0**	0	0	**0**	227
730-830	0	0	0	148	8	156	67	14	**81**	0	0	**0**	0	0	**0**	0	0	**0**	237
745-845	0	0	**0**	125	10	**135**	68	12	**80**	0	0	**0**	0	0	**0**	0	0	**0**	215
800-900	0	0	**0**	98	11	**109**	65	10	**75**	0	0	**0**	0	0	**0**	0	0	**0**	184

Project Name Turning Movements Intersection Awaba Colliery
Project Date 11/19/2019

		WILTON ROAD WESTBOUND						WILTON ROAD EASTBOUND						COLLIERY ENTRANCE NORTHBOUND						
		LEFT			STRAIGHT			STRAIGHT			RIGHT			LEFT			RIGHT			
	15 Mins	LV	HV	LV+HV	LV	HV	LV+HV	LV	HV	LV+HV	LV	HV	LV+HV	LV	HV	LV+HV	LV	HV	LV+HV	Totals
19-Nov-19	1500-1514	0	0	**0**	15	2	**17**	21	1	**22**	0	0	**0**	0	0	**0**	0	0	**0**	39
19-Nov-19	1515-1529	0	0	**0**	30	2	**32**	22	1	**23**	0	0	**0**	0	0	**0**	0	0	**0**	55
19-Nov-19	1530-1544	0	0	**0**	30	3	**33**	34	0	**34**	0	0	**0**	0	0	**0**	0	0	**0**	67
19-Nov-19	1545-1559	0	0	**0**	30	2	**32**	41	2	**43**	0	0	**0**	0	0	**0**	0	0	**0**	75
19-Nov-19	1600-1614	0	0	**0**	33	1	**34**	45	1	**46**	0	0	**0**	0	0	**0**	0	0	**0**	80
19-Nov-19	1615-1629	0	0	**0**	23	0	**23**	33	1	**34**	0	0	**0**	0	0	**0**	0	0	**0**	57
19-Nov-19	1630-1644	0	0	**0**	18	0	**18**	44	1	**45**	0	0	**0**	0	0	**0**	0	0	**0**	63
19-Nov-19	1645-1659	0	0	**0**	11	1	**12**	36	0	**36**	0	0	**0**	0	0	**0**	0	0	**0**	48
19-Nov-19	1700-1714	0	0	**0**	35	0	**35**	39	0	**39**	0	0	**0**	0	0	**0**	1	0	**1**	75
19-Nov-19	1715-1729	0	0	**0**	29	3	**32**	35	3	**38**	1	0	**1**	1	0	**1**	0	0	**0**	72
19-Nov-19	1730-1744	1	0	**1**	16	0	**16**	47	0	**47**	0	0	**0**	0	0	**0**	0	0	**0**	64
19-Nov-19	1745-1759	0	0	**0**	15	0	**15**	28	0	**28**	0	0	**0**	0	0	**0**	0	0	**0**	43
		1	0	**1**	285	14	**299**	425	10	**435**	1	0	**1**	1	0	**1**	1	0	**1**	

	WILTON ROAD WESTBOUND						WILTON ROAD EASTBOUND						COLLIERY ENTRANCE NORTHBOUND						
	LEFT			STRAIGHT			STRAIGHT			RIGHT			LEFT			RIGHT			
Hourly	LV	HV	LV+HV	LV	HV	LV+HV	LV	HV	LV+HV	LV	HV	LV+HV	LV	HV	LV+HV	LV	HV	LV+HV	Totals
1500-1600	0	0	**0**	105	9	**114**	118	4	**122**	0	0	**0**	0	0	**0**	0	0	**0**	236
1515-1615	0	0	**0**	123	8	**131**	142	4	**146**	0	0	**0**	0	0	**0**	0	0	**0**	277
1530-1630	0	0	**0**	**116**	6	**122**	153	4	**157**	0	0	**0**	0	0	**0**	0	0	0	279
1545-1645	0	0	**0**	104	3	**107**	163	5	**168**	0	0	**0**	0	0	**0**	0	0	**0**	275
1600-1700	0	0	**0**	85	2	**87**	158	3	**161**	0	0	**0**	0	0	**0**	0	0	**0**	248
1615-1715	0	0	**0**	87	1	**88**	152	2	**154**	0	0	**0**	0	0	**0**	1	0	**1**	243
1630-1730	0	0	**0**	93	4	**97**	154	4	**158**	1	0	**1**	1	0	**1**	1	0	**1**	258
1645-1745	1	0	**1**	91	4	**95**	157	3	**160**	1	0	**1**	1	0	**1**	1	0	**1**	259
1700-1800	1	0	**1**	95	3	**98**	149	3	**152**	1	0	**1**	1	0	**1**	1	0	**1**	254

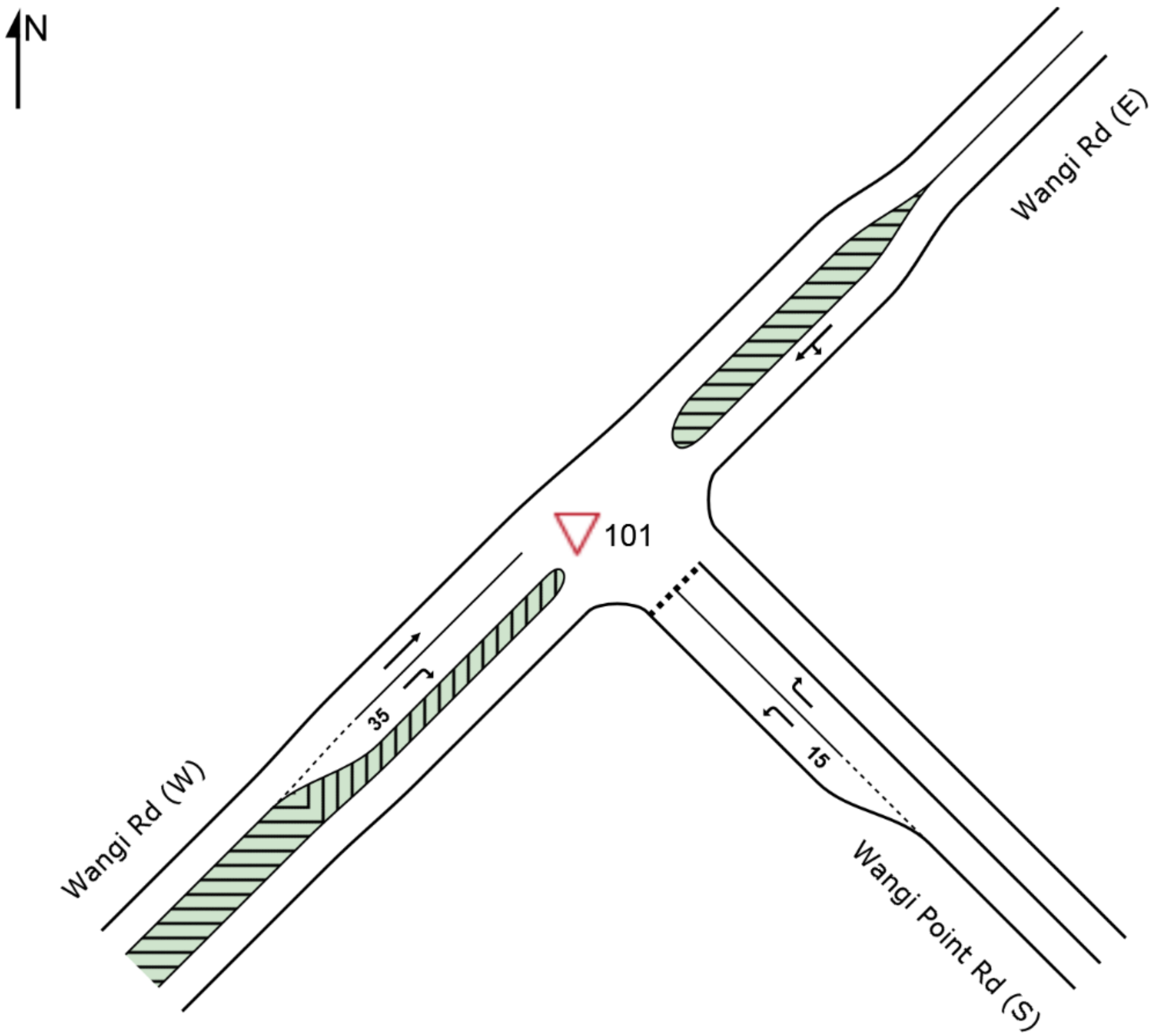
Appendix C

SIDRA modelling results

SITE LAYOUT

Site: 101 [Wangi Rd/ Wangi Point Rd(EX AM)]

Existing AM
Site Category: (None)
Giveway / Yield (Two-Way)

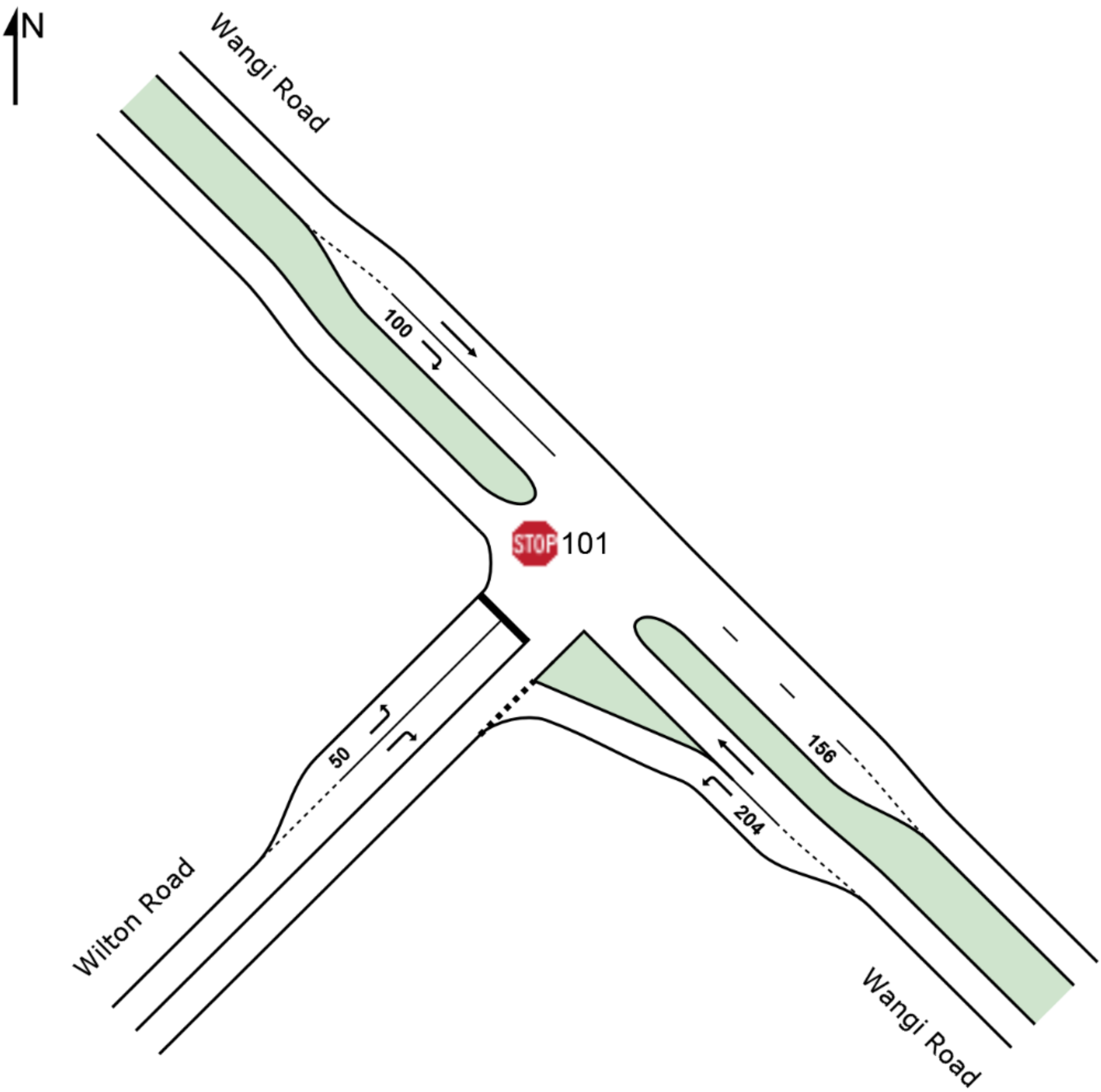


Organisation: EMM CONSULTING | Created: Tuesday, 16 June 2020 2:09:26 PM
Project: \\emmsvr1\centennial_coal\J200309 - Myuna Coal Mine - Mod 2\Technical studies\Transport\SIDRA\J200309 TBSIDRAReview.sip8

SITE LAYOUT

Site: 101 [Wangi Rd/ Wilton Rd (EX AM)]

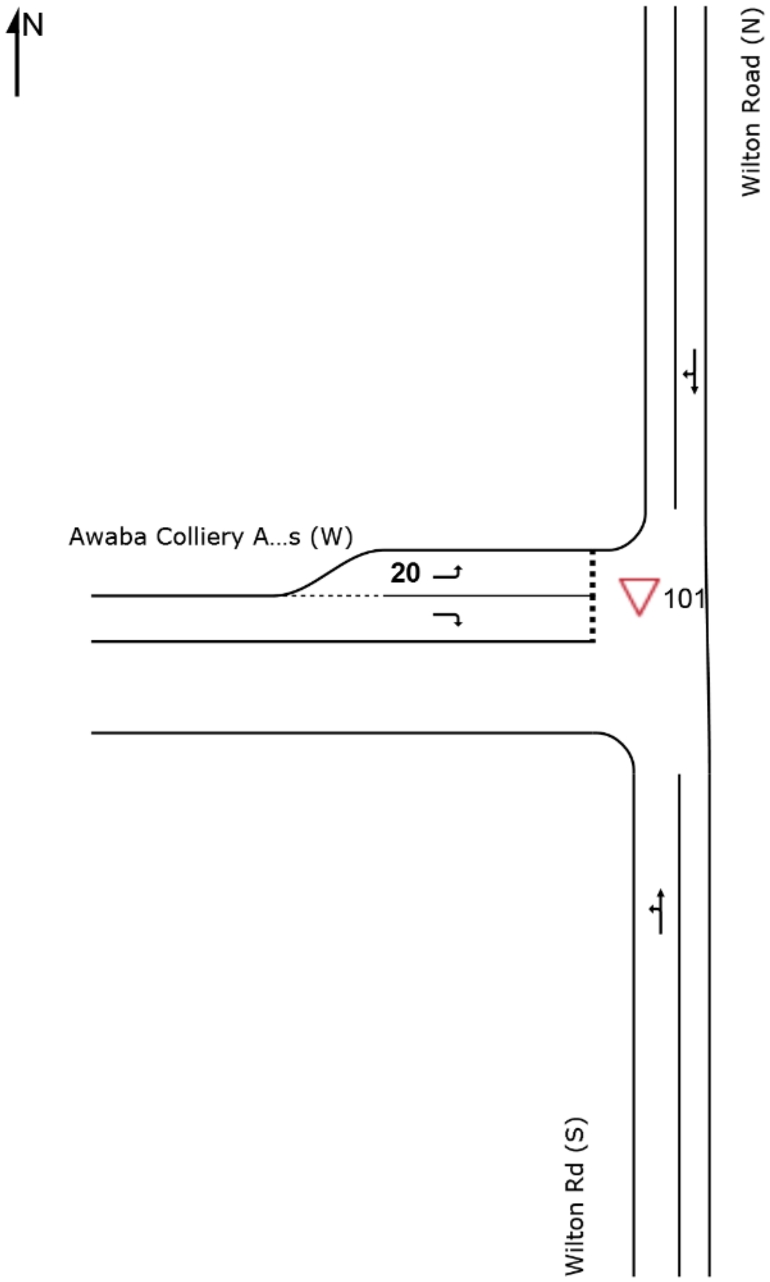
New Site
Site Category: (None)
Stop (Two-Way)



SITE LAYOUT

▽ Site: 101 [Wilton Rd/ Awaba Colliery Access (EX AM)]

Existing AM
Site Category: (None)
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

▽ Site: 101 [Wangi Rd/ Wangi Point Rd(EX AM)]

Existing AM
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Wangi Point Rd (S)												
21	L2	1	0.0	0.001	5.2	LOS A	0.0	0.0	0.35	0.47	0.35	53.1
23	R2	1	0.0	0.001	6.3	LOS A	0.0	0.0	0.43	0.56	0.43	52.5
Approach		2	0.0	0.001	5.8	LOS A	0.0	0.0	0.39	0.52	0.39	52.8
NorthEast: Wangi Rd (E)												
24	L2	1	0.0	0.155	7.0	LOS A	0.0	0.0	0.00	0.00	0.00	74.5
25	T1	272	16.3	0.155	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
Approach		273	16.2	0.155	0.0	NA	0.0	0.0	0.00	0.00	0.00	79.7
SouthWest: Wangi Rd (W)												
31	T1	275	11.1	0.151	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
32	R2	1	0.0	0.001	5.2	LOS A	0.0	0.0	0.38	0.47	0.38	45.6
Approach		276	11.1	0.151	0.0	NA	0.0	0.0	0.00	0.00	0.00	79.7
All Vehicles		551	13.6	0.155	0.1	NA	0.0	0.0	0.00	0.00	0.00	79.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 101 [Wangi Rd/ Wangi Point Rd(EX PM)]

Existing PM
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Wangi Point Rd (S)												
21	L2	1	0.0	0.001	5.4	LOS A	0.0	0.0	0.39	0.48	0.39	53.0
23	R2	1	0.0	0.001	6.9	LOS A	0.0	0.0	0.48	0.59	0.48	52.1
Approach		2	0.0	0.001	6.2	LOS A	0.0	0.0	0.43	0.53	0.43	52.5
NorthEast: Wangi Rd (E)												
24	L2	1	0.0	0.188	7.0	LOS A	0.0	0.0	0.00	0.00	0.00	74.5
25	T1	337	12.8	0.188	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
Approach		338	12.8	0.188	0.0	NA	0.0	0.0	0.00	0.00	0.00	79.8
SouthWest: Wangi Rd (W)												
31	T1	347	9.4	0.189	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
32	R2	1	0.0	0.001	5.4	LOS A	0.0	0.0	0.42	0.47	0.42	45.5
Approach		348	9.4	0.189	0.0	NA	0.0	0.0	0.00	0.00	0.00	79.7
All Vehicles		688	11.0	0.189	0.1	NA	0.0	0.0	0.00	0.00	0.00	79.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Wangi Rd/ Wilton Rd (EX AM)]

New Site
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Wangi Road												
4	L2	154	4.1	0.098	5.7	LOS A	0.4	3.0	0.08	0.52	0.08	53.8
5	T1	915	1.3	0.473	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1068	1.7	0.473	0.9	LOS A	0.4	3.0	0.01	0.08	0.01	58.9
NorthWest: Wangi Road												
11	T1	409	4.4	0.216	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	22	4.8	0.027	9.6	LOS A	0.1	0.8	0.67	0.77	0.67	50.2
Approach		432	4.4	0.216	0.5	NA	0.1	0.8	0.03	0.04	0.03	59.4
SouthWest: Wilton Road												
1	L2	9	22.2	0.022	16.4	LOS B	0.1	0.6	0.74	0.96	0.74	47.0
3	R2	66	9.5	0.193	17.5	LOS B	0.6	4.6	0.76	1.01	0.79	46.2
Approach		76	11.1	0.193	17.3	LOS B	0.6	4.6	0.76	1.01	0.78	46.3
All Vehicles		1576	2.9	0.473	1.6	NA	0.6	4.6	0.05	0.11	0.06	58.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Wangi Rd/ Wilton Rd (EX PM)]

New Site
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Wangi Road												
4	L2	101	5.2	0.064	5.7	LOS A	0.3	2.0	0.07	0.52	0.07	53.8
5	T1	689	1.2	0.356	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		791	1.7	0.356	0.8	LOS A	0.3	2.0	0.01	0.07	0.01	59.0
NorthWest: Wangi Road												
11	T1	880	1.2	0.455	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
12	R2	19	5.6	0.017	7.9	LOS A	0.1	0.6	0.59	0.66	0.59	51.4
Approach		899	1.3	0.455	0.2	NA	0.1	0.6	0.01	0.01	0.01	59.7
SouthWest: Wilton Road												
1	L2	38	13.9	0.052	12.4	LOS A	0.2	1.6	0.60	0.94	0.60	49.4
3	R2	136	3.9	0.247	13.3	LOS A	0.9	6.4	0.63	1.02	0.70	48.7
Approach		174	6.1	0.247	13.1	LOS A	0.9	6.4	0.63	1.00	0.67	48.9
All Vehicles		1863	1.9	0.455	1.7	NA	0.9	6.4	0.07	0.13	0.07	58.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 101 [Wilton Rd/ Awaba Colliery Access (EX AM)]

Existing AM
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wilton Rd (S)												
1	L2	1	0.0	0.080	6.9	LOS A	0.0	0.0	0.00	0.00	0.00	41.0
2	T1	164	5.1	0.080	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.7
Approach		165	5.1	0.080	0.1	NA	0.0	0.0	0.00	0.00	0.00	79.4
North: Wilton Road (N)												
8	T1	85	17.3	0.049	0.0	LOS A	0.0	0.1	0.01	0.01	0.01	79.5
9	R2	1	0.0	0.049	5.0	LOS A	0.0	0.1	0.01	0.01	0.01	72.1
Approach		86	17.1	0.049	0.1	NA	0.0	0.1	0.01	0.01	0.01	79.4
West: Awaba Colliery Access (W)												
10	L2	1	0.0	0.001	5.0	LOS A	0.0	0.0	0.25	0.48	0.25	55.9
12	R2	1	0.0	0.001	5.4	LOS A	0.0	0.0	0.29	0.49	0.29	55.9
Approach		2	0.0	0.001	5.2	LOS A	0.0	0.0	0.27	0.48	0.27	55.9
All Vehicles		254	9.1	0.080	0.1	NA	0.0	0.1	0.00	0.01	0.00	79.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 101 [Wilton Rd/ Awaba Colliery Access (EX PM)]

Existing PM
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wilton Rd (S)												
1	L2	1	0.0	0.063	6.9	LOS A	0.0	0.0	0.00	0.01	0.00	41.0
2	T1	128	4.9	0.063	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	79.6
Approach		129	4.9	0.063	0.1	NA	0.0	0.0	0.00	0.01	0.00	79.3
North: Wilton Road (N)												
8	T1	165	2.5	0.087	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	79.8
9	R2	1	0.0	0.087	4.9	LOS A	0.0	0.1	0.00	0.00	0.00	72.5
Approach		166	2.5	0.087	0.0	NA	0.0	0.1	0.00	0.00	0.00	79.7
West: Awaba Colliery Access (W)												
10	L2	1	0.0	0.001	4.9	LOS A	0.0	0.0	0.22	0.48	0.22	56.1
12	R2	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.32	0.49	0.32	55.8
Approach		2	0.0	0.001	5.2	LOS A	0.0	0.0	0.27	0.48	0.27	55.9
All Vehicles		298	3.5	0.087	0.1	NA	0.0	0.1	0.00	0.01	0.00	79.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 101 [Wangi Rd/ Wangi Point Rd(Future AM)]

Future AM
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Wangi Point Rd (S)												
21	L2	1	0.0	0.001	5.2	LOS A	0.0	0.0	0.35	0.47	0.35	53.1
23	R2	11	100.0	0.023	9.9	LOS A	0.1	0.9	0.53	0.72	0.53	41.5
Approach		12	90.9	0.023	9.5	LOS A	0.1	0.9	0.52	0.70	0.52	42.3
NorthEast: Wangi Rd (E)												
24	L2	11	100.0	0.164	7.8	LOS A	0.0	0.0	0.00	0.05	0.00	56.5
25	T1	272	16.3	0.164	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	78.3
Approach		282	19.4	0.164	0.6	NA	0.0	0.0	0.00	0.05	0.00	77.2
SouthWest: Wangi Rd (W)												
31	T1	275	11.1	0.151	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
32	R2	1	0.0	0.001	5.2	LOS A	0.0	0.0	0.39	0.47	0.39	45.6
Approach		276	11.1	0.151	0.0	NA	0.0	0.0	0.00	0.00	0.00	79.7
All Vehicles		569	16.8	0.164	0.4	NA	0.1	0.9	0.01	0.04	0.01	77.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 101 [Wangi Rd/ Wangi Point Rd(Future PM)]

Future PM
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Wangi Point Rd (S)												
21	L2	1	0.0	0.001	5.4	LOS A	0.0	0.0	0.39	0.48	0.39	53.0
23	R2	5	100.0	0.014	11.8	LOS A	0.0	0.6	0.62	0.76	0.62	40.6
Approach		6	83.3	0.014	10.7	LOS A	0.0	0.6	0.58	0.71	0.58	42.3
NorthEast: Wangi Rd (E)												
24	L2	5	100.0	0.192	7.8	LOS A	0.0	0.0	0.00	0.02	0.00	57.0
25	T1	337	12.8	0.192	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	79.3
Approach		342	14.2	0.192	0.3	NA	0.0	0.0	0.00	0.02	0.00	78.8
SouthWest: Wangi Rd (W)												
31	T1	347	9.4	0.189	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
32	R2	1	0.0	0.001	5.4	LOS A	0.0	0.0	0.42	0.47	0.42	45.5
Approach		348	9.4	0.189	0.0	NA	0.0	0.0	0.00	0.00	0.00	79.7
All Vehicles		697	12.4	0.192	0.2	NA	0.0	0.6	0.01	0.02	0.01	78.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Wangi Rd/ Wilton Rd (Future AM)]

New Site
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Wangi Road												
4	L2	164	10.3	0.108	5.8	LOS A	0.5	3.5	0.09	0.52	0.09	53.6
5	T1	915	1.3	0.473	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1079	2.6	0.473	0.9	LOS A	0.5	3.5	0.01	0.08	0.01	58.8
NorthWest: Wangi Road												
11	T1	409	4.4	0.216	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	22	4.8	0.027	9.6	LOS A	0.1	0.8	0.67	0.77	0.67	50.2
Approach		432	4.4	0.216	0.5	NA	0.1	0.8	0.03	0.04	0.03	59.4
SouthWest: Wilton Road												
1	L2	9	22.2	0.022	16.4	LOS B	0.1	0.6	0.74	0.96	0.74	47.0
3	R2	77	21.9	0.260	20.6	LOS B	0.9	7.2	0.80	1.04	0.90	44.4
Approach		86	22.0	0.260	20.1	LOS B	0.9	7.2	0.79	1.03	0.88	44.7
All Vehicles		1597	4.2	0.473	1.9	NA	0.9	7.2	0.06	0.12	0.07	58.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Wangi Rd/ Wilton Rd (Future PM)]

New Site
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles													
Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Wangi Road												
4	L2	106	9.9	0.069	5.8	LOS A	0.3	2.2	0.08	0.52	0.08	53.6
5	T1	689	1.2	0.356	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		796	2.4	0.356	0.8	LOS A	0.3	2.2	0.01	0.07	0.01	59.0
NorthWest: Wangi Road												
11	T1	880	1.2	0.455	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
12	R2	19	5.6	0.017	7.9	LOS A	0.1	0.6	0.59	0.66	0.59	51.4
Approach		899	1.3	0.455	0.2	NA	0.1	0.6	0.01	0.01	0.01	59.7
SouthWest: Wilton Road												
1	L2	38	13.9	0.052	12.4	LOS A	0.2	1.6	0.60	0.94	0.60	49.4
3	R2	141	7.5	0.267	13.8	LOS A	1.0	7.3	0.65	1.03	0.73	48.3
Approach		179	8.8	0.267	13.5	LOS A	1.0	7.3	0.64	1.01	0.70	48.6
All Vehicles		1874	2.5	0.455	1.7	NA	1.0	7.3	0.07	0.13	0.08	58.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 101 [Wilton Rd/ Awaba Colliery Access (Future AM)]

Future AM
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wilton Rd (S)												
1	L2	11	100.0	0.089	7.7	LOS A	0.0	0.0	0.00	0.07	0.00	38.4
2	T1	164	5.1	0.089	0.0	LOS A	0.0	0.0	0.00	0.07	0.00	77.5
Approach		175	10.8	0.089	0.9	NA	0.0	0.0	0.00	0.07	0.00	74.6
North: Wilton Road (N)												
8	T1	85	17.3	0.049	0.0	LOS A	0.0	0.1	0.01	0.01	0.01	79.5
9	R2	1	0.0	0.049	5.1	LOS A	0.0	0.1	0.01	0.01	0.01	72.1
Approach		86	17.1	0.049	0.1	NA	0.0	0.1	0.01	0.01	0.01	79.4
West: Awaba Colliery Access (W)												
10	L2	1	0.0	0.001	5.0	LOS A	0.0	0.0	0.25	0.48	0.25	55.9
12	R2	11	100.0	0.018	7.2	LOS A	0.1	0.7	0.38	0.56	0.38	40.4
Approach		12	90.9	0.018	7.0	LOS A	0.1	0.7	0.37	0.55	0.37	41.4
All Vehicles		273	16.2	0.089	0.6	NA	0.1	0.7	0.02	0.07	0.02	74.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: 101 [Wilton Rd/ Awaba Colliery Access (Future PM)]

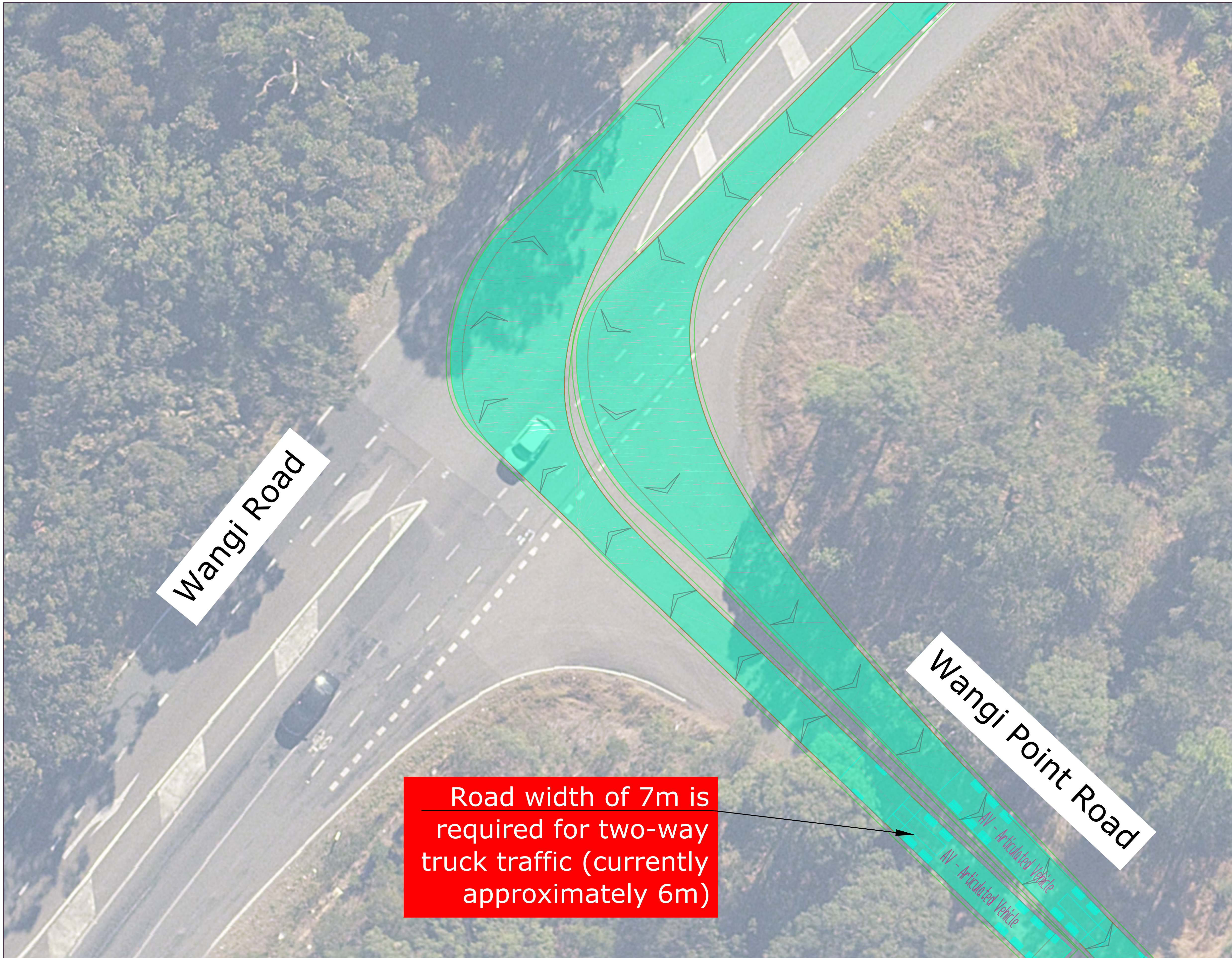
Future PM
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wilton Rd (S)												
1	L2	5	100.0	0.067	7.8	LOS A	0.0	0.0	0.00	0.05	0.00	38.8
2	T1	128	4.9	0.067	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	78.3
Approach		134	8.7	0.067	0.6	NA	0.0	0.0	0.00	0.05	0.00	76.4
North: Wilton Road (N)												
8	T1	165	2.5	0.087	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	79.8
9	R2	1	0.0	0.087	5.0	LOS A	0.0	0.1	0.00	0.00	0.00	72.5
Approach		166	2.5	0.087	0.0	NA	0.0	0.1	0.00	0.00	0.00	79.7
West: Awaba Colliery Access (W)												
10	L2	1	0.0	0.001	4.9	LOS A	0.0	0.0	0.22	0.48	0.22	56.1
12	R2	5	100.0	0.009	7.5	LOS A	0.0	0.4	0.40	0.56	0.40	40.2
Approach		6	83.3	0.009	7.1	LOS A	0.0	0.4	0.37	0.54	0.37	42.2
All Vehicles		306	6.9	0.087	0.3	NA	0.0	0.4	0.01	0.03	0.01	77.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

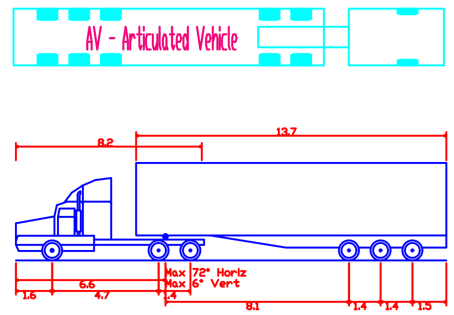
Appendix D

Swept path assessment



COMMENTS

A3



AV - Articulated Vehicle

Overall Length	19.000m
Overall Width	2.500m
Overall Body Height	4.301m
Min Body Ground Clearance	0.418m
Track Width	2.500m
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	12.500m

EMM creating opportunities

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Ground Floor
20 Chandos Street,
St Leonards NSW 2065

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REV	DATE	COMMENT	DRAWN	REVIEWED	REV	DATE	COMMENT	DRAWN	REVIEWED
1	15/04/20	FOR INFORMATION	EL	AU					

PROJECT: Myuna Colliery

DRAWING TITLE: 19m AV Swept Path

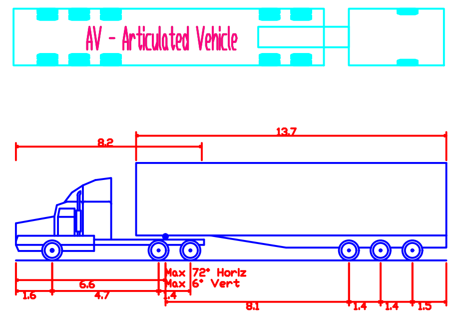
Intersection of Wangi Road with Wangi Point Road

CLIENT:	Centennial Coal
DRG. #:	EMM-001
PROJECT #:	J190752
SCALE:	1:250

REV: 1

COMMENTS

A3



AV - Articulated Vehicle

Overall Length	19.000m
Overall Width	2.500m
Overall Body Height	4.301m
Min Body Ground Clearance	0.418m
Track Width	2.500m
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	12.500m

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REV	DATE	COMMENT	DRAWN	REVIEWED	REV	DATE	COMMENT	DRAWN	REVIEWED
1	15/04/20	FOR INFORMATION	EL	AU					

PROJECT:
Myuna Colliery

DRAWING TITLE:
19m AV Swept Path

Intersection of Wilton Road with Awaba Colliery Site Access

CLIENT:	Centennial Coal
DRG. #:	EMM-002
PROJECT #:	J190752
SCALE:	1:250

REV: 1

Appendix E

Public road photographs

Wangi Road northbound

Wangi Road southbound

Wilton Road eastbound

Wilton Road westbound

Appendix F

Private road photographs

Photographs of Awaba Private Haul Road

0.1 km from Wilton Road

0.2 km from Wilton Road

0.3 km from Wilton Road

0.4 km from Wilton Road

0.6 km from Wilton Road

0.7 km from Wilton Road

0.8 km from Wilton Road

0.9 km from Wilton Road

Photographs at Intersection of Awaba and Newstan-Eraring Private Haul Roads

Approach to the intersection looking south

At the intersection looking south

At the intersection looking east

Approach to the intersection looking north

At the intersection looking north

Photographs of Newstan-Eraring Private Haul Road

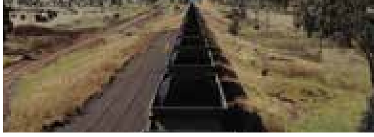
Approx 0.25 km south of intersection

Approx 0.5 km south of intersection

Approx 0.75 km south of intersection

Approx 1 km south of intersection

Approx 1.5 km south of intersection



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Appendix D

Assessment of socio-economic effects




Myuna Colliery
Northern Coal Logistics Project

Proposed modifications to:
MP 10_0080
and
SSD-5145

Assessment of socioeconomic effects

Centennial Myuna Pty Limited
Centennial Northern Coal Services Pty Limited

July 2020

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Abbreviations

ABS	Australian Bureau of Statistics
AEMO	Australian Energy Market Operator
BAU	Business as usual
CBA	Cost Benefit Analysis
CES	Cooranbong Entry Site
CHP	Coal Handling Plant
DPIE	Department of Planning, Industry & Environment
EA	Economic Assessment
EPA	Environment Protection Authority (NSW)
EPS	Eraring Power Station
LEA	Local Effects Analysis
LGA	Local Government Area
LMCC	Lake Macquarie City Council
NCLP	Northern Coal Logistics Project
NCS	Northern Coal Services
NEM	National Energy Market
NMP	Noise Management Plan
NPfI	Noise Policy for Industry
NSWMC	NSW Minerals Council
PNTL	Project Noise Trigger Level
ROM	Run of Mine
SIA	Social Impact Assessment
SSD	State Significant Development

1 Purpose of report

1.1 Brief overview

This report presents a description of the socioeconomic implications of the modification of two existing consents held by Centennial Coal Company entities, MP 10_0080 (Myuna Colliery) and SSD-5145 (Northern Coal Logistics Project). The modifications relate to changes in coal handling, processing, and transport methods, to support operations at Myuna Colliery. Supporting information and a detailed description of the proposed modifications is presented in Sections 2 and 3.

1.2 Approach

This report addresses potential social and economic effects of the proposed modification. Based on the scope of the modifications, a full social impact assessment (SIA) and economic assessment (EA) are not required. Rather, the relevant aspects of the modifications are assessed and presented as an integrated assessment. As social and economic effects commonly represent two alternative mechanisms for assessing the same effect/s, such integration is considered as not derogating from appropriate assessment of either social or economic effects for modifications of this scope and scale.

1.2.1 Assessment of social impacts

As noted, given the relatively limited scope of the modifications, social impacts are assessed in compliance with NSW Department of Planning, Industry and Environment's (DPIE's) *Social Impact Assessment Guideline for State Significant Mining, Petroleum Production and Extractive Industry Development* (DPIE 2017) (the guideline). It is noted that a further limitation on scope was the relatively low number of third parties that may be directly affected by the modifications. There are a number of existing, identified, residential receptors who may be further impacted. However, there are no additional residential or other land users who have been identified as potentially being affected by the modifications. There is some prospect of effects on other users of Wangi Road and Wilton Road in particular, however such interactions are likely to be occasional at most, and infrequent more generally. Given the contingent and limited nature of the modification, broader effects are unlikely to be material.

Consistent with the approach required under the guideline, the SIA scoping tool was applied to determine the extent of reporting required for potential effects. The effects indicated as requiring further assessment are addressed in this report, in compliance with the requirements, and with particular regard to stakeholders who may potentially be affected.

1.2.2 Application of DPIE SIA scoping tool and outputs

The preliminary assessment of potential social impacts based on the DPIE scoping tool identified that the matters listed in Table 1 required further investigation. The scoping tool identified matters concerning the opportunity costs of employment effects and alternative fuel supply requirements for Eraring Power Station (EPS) as not requiring treatment in the SIA component. These matters are, however, addressed in the economic assessment component of this combined report.

Table 1: Matters identified for further investigation; DPIE SIA scoping tool

Matter	Description	Probability	Particulars	Assessment required
Amenity	Acoustic	Likely	Truck movements departing Myuna Colliery; operations at Myuna Colliery and Cooranbong Entry Site (CES).	Desktop SIA.
Access	Road and rail network	Likely	Truck movements on Wangi Road and Wilton Road.	Desktop SIA.
Economic	Opportunity cost	Likely	Potential employment effects at Myuna Colliery; maintain fuel supply to EPS.	No SIA required.
Air	Particulate matter	Likely	Diesel emissions/dust from additional truck movements/ Plant movements on sites.	Desktop SIA.

1.2.3 Assessment of economic impacts

As is the case with social impacts, assessment of economic impacts is limited by the scope of the proposed modifications. However, to the extent practicable, the assessment has been prepared to comply with DPIE's (2015) *Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals* and the supporting *Technical Notes* (DPIE 2018) (the guidelines).

The limited scope of the modifications does not necessitate preparation of a cost-benefit analysis (CBA), as there are no changes to annual or total production limits or related aspects, which would result in changes to, for example, NSW Government royalty revenues. The project will support ongoing current levels of employment at Myuna Colliery. Any construction related employment associated with the modification is considered to be limited in scale and duration.

An additional consideration is the potential economic effects of disruption to supply of coal to Eraring Power Station (EPS). There are several approaches to resolution of this issue. These may impose additional costs on the parties involved. The modifications are proposed as the most efficient means of providing greater security around supply, with the costs borne by Centennial Myuna. Furthermore, due to the contingent nature of the modifications, these may be considered as of limited materiality in the context of overall operations at Myuna Colliery, Cooranbong Entry Site (CES) and EPS.

Consequent to these considerations, the approach adopted is consistent with the local effects analysis (LEA) component of the holistic economic assessment directed under the guidelines. This approach is considered appropriate, as the effects are likely to be highly localised, and potentially more likely to be assessed and explained qualitatively rather than quantitatively, for an application of this nature.

2 Introduction to proposed modifications

2.1 Myuna Colliery

Myuna Colliery (Myuna) is an existing underground coal mine owned and operated by Centennial Myuna Pty Limited (Centennial Myuna). Myuna's pit top is 25 kilometres (km) southwest of Newcastle, New South Wales (NSW), in the Lake Macquarie Local Government Area (LGA).

Myuna operates under two development consents:

- SH110_148, which was granted by Lake Macquarie City Council (LMCC) in 1977[1] under provisions of the now repealed NSW *Local Government Act 1919* for the development and operation of the Myuna and Cooranbong Collieries; and
- MP10_0080, which was granted by the Minister of Planning and Infrastructure on 18 January 2012 under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for continued mining in areas outside the area defined by SH110_148. MP 10_0080 also authorises the use of bord and pillar methods in the Wallarah, Great Northern and Fassifern coal seams, and the continued use of existing infrastructure on-site until 31 December 2032.

MP 10_0080 has since been declared State Significant Development (SSD) under Clause 6 of Schedule 2 of the NSW Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017. Accordingly, Myuna now operates as an SSD approval.

Centennial Myuna is seeking to modify MP 10_0080, pursuant to Section 4.55(2) of the EP&A Act, to allow coal to be transferred between the Myuna pit top and CES, blending of this coal at Myuna, and associated activities.

2.2 Northern Coal Logistics Project

The Northern Coal Logistics Project (NCLP) regulates coal handling, processing, and transport operations at the Newstan Colliery surface site, CES and associated private haul roads, and also the use of various other surface infrastructure items. NCLP operates under SSD-5145, which was granted by the Minister for Planning on 29 September 2015. Each component of NCLP is operated by Northern Coal Services Pty Limited (Centennial NCS).

CES forms part of NCLP and is approximately 2 kilometres (km) north of Dora Creek in the Lake Macquarie LGA. It was originally developed as part of Cooranbong Colliery. CES

[1] Then Municipality of Lake Macquarie.

comprises a coal handling plant (CHP), coal stockpiles, workshop building, administration building, car park and water management infrastructure.

CES is currently approved to receive and process run-of-mine (ROM) coal from Mandalong Mine (SSD-5144). Coal handled at CES is delivered to either EPS via overland conveyor, or to Newstan Colliery for further processing and transfer into the export market.

Centennial NCS is seeking to modify SSD-5145, pursuant to Section 4.55(2) of the EP&A Act, to allow coal to be transferred between the Myuna pit top and CES, blending of this coal at CES, and associated activities.

2.3 Background to proposed modifications

Coal produced at Myuna is transferred from the Myuna pit top to the EPS (approximately 4 km west of the pit top) by overland conveyor. Coal from Myuna that does not meet EPS specifications, is stockpiled at the Myuna emergency coal stockpile until it can be reclaimed and blended with coal to meet these specifications. However, there is limited capacity to store coal at the Myuna pit top prior to blending and dispatch.

In recent months, Centennial Myuna has been experiencing fluctuations in the quality of coal produced from underground mining operations at Myuna. A reduction in coal quality has potential to impact infrastructure at EPS. Centennial Myuna has considered a number of options to ensure that it can continue to meet its contractual obligations to supply coal to EPS. Failure to provide coal of sufficient quality to EPS could risk the ongoing employment of the Myuna workforce and continuation of commercial activity in the region and other parts of NSW associated with operations.

EPS has a generation capacity of 2,992 MW (megawatts)[2]. Nominally, this is approximately 5.5% of the total capacity of the National Electricity Market (NEM)[3].

3 Proposed modifications

To ensure that Myuna can continue to meet its contractual obligations to supply coal to EPS and secure ongoing employment for the Myuna workforce, Centennial Myuna proposes to blend coal from Myuna with coal from Centennial's Mandalong Mine, both onsite at the Myuna pit top, and at CES, during possible periods when Myuna coal does not meet EPS specification.

[2] Origin Energy 2019 Sustainability Report: https://www.originenergy.com.au/content/dam/origin/about/investors-media/documents/2019-sustainability-report-final-oct.pdf

[3] AEMO (2020). Capacity of 54,421MW reported as at December 2017. https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/about-the-national-electricity-market-nem

It is proposed to modify Myuna's development consent (MP 10_0080) to:

- allow up to 1 million tonnes per annum (Mtpa) of Myuna coal to be trucked from the Myuna pit top to CES via the public and private road networks and blending with coal from Mandalong Mine before transfer to Eraring Power Station by conveyor;
- allow up to 0.2 Mtpa of Mandalong Mine coal to be backloaded by truck from CES to the Myuna pit top and blending with coal from Myuna before transfer to Eraring Power Station by conveyor;
- allow construction and operation of a vehicle weighbridge at the Myuna pit top;
- allow trucks to access the Myuna pit top via Wangi Road and Wangi Point Road; and
- include a consent condition to address the environmental management of exploration activities and minor surface infrastructure.

It is proposed to modify Northern Coal Logistics Project's development consent (SSD-5145) to:

- allow up to 1 Mtpa of coal to be transported from Myuna to CES;
- allow up to 1 Mtpa of coal transported from Myuna to be handled at CES and blended with coal from Mandalong Mine before transfer to Eraring Power Station by conveyor;
- allow an increase in the total volume of coal that can be received at the 3,000 tonne (t) middlings stockpile at CES from 0.5 Mtpa to 1.5 Mtpa;
- allow up to 0.2 Mtpa of Mandalong Mine coal to be backloaded from CES to the Myuna pit top for blending with coal from Myuna before transfer to Eraring Power Station by conveyor;
- allow trucks from Myuna to access CES via Awaba Colliery surface site and the private haul road network; and
- extend part of the Northern Coal Logistics Project development consent boundary, so that it includes the Awaba Private Haul Road through to Wilton Road.

To transport coal between the Myuna pit top and CES, trucks will need to access the public road network (specifically Wangi Road and Wilton Road) between Myuna and the Awaba Colliery surface site. The existing private haul road between the Awaba Colliery surface site and CES will then be used for the remainder of the movements in each direction.

Truck numbers along the private haul road network between the Awaba Colliery surface site and CES will be within the limit of 32 two-way truck movements per hour[4] as previously approved under SSD-5145. The total volume of coal that will be handled at the Myuna pit top will not exceed the currently approved limit of 3 Mtpa.

[4] i.e. 16 return trips.

All trucks leaving Myuna will be weighed using the new vehicle weighbridge, to be constructed at the Myuna pit top (as previously identified). A truck wheel wash will be used by all trucks before leaving the site via a section of Wangi Point Road which is privately-owned by Centennial Myuna. A diagram indicating all sites and infrastructure is presented at Annexure 2.

As is noted throughout this report, the operations under the modification are contingent. Activation would only occur in the circumstances in which specification-quality coal for EPS cannot be directly produced by Myuna.

4 Assessment of social impacts

4.1 DPIE scoping tool assessment outputs

Section 1.2.2 and Table 1 summarised the initial outputs of the application of the DPIE social impact assessment scoping tool. The analyses based on the scoping process and the material presented in this SIA is presented in Table 2. The DPIE social risk matrix on which the assessment is based, is reproduced in Figure 1 for reference.

Figure 1: Social risk matrix

			Consequence Level				
			1	**2**	**3**	**4**	**5**
			Minimal	Minor	Moderate	Major	Catastrophic
Likelihood Level	**A**	Almost certain	A1	A2	A3	A4	A5
	B	Likely	B1	B2	B3	B4	B5
	C	Possible	C1	C2	C3	C4	C5
	D	Unlikely	D1	D2	D3	D4	D5
	E	Rare	E1	E2	E3	E4	E5
Social Risk Rating							
	Low		Moderate		High		Extreme

Table 2: Summary of assessment of social impacts

Impact description			Impact assessment (with mitigation)		
Impact	**Timing**	**Affected parties**	**Impact characteristics**	**Social Risk Rating**	**Residual Risk Description**
Noise – Myuna Colliery	During operations under the modifications	Possible receptors in the vicinity of site	Noise associated with truck loading/unloading, truck movements and operation of other plant	**B1**	Low, due to contingent nature of modifications
Noise - CES	During operations under the modifications	Identified receptors on Gradwells Road	Noise associated with truck loading/unloading, truck movements and operation of other plant	**B3**	Low, due to contingent nature of modifications
Access – truck movements on public roads.	During operations under the modifications	Other road users	Potential road safety, traffic, and road pavement effects	**C2**	Low, due to contingent nature of modifications
Air – generation of particulate matter	During operations under the modifications	Receptors in the vicinity of sites; other road users	Dust & vehicle emissions.	**B1**	Low, due to contingent nature of modifications

4.2 Identification of potential sensitive receptors

The segment of the proposed transport route that comprises public roads is essentially parts of Wangi Road and Wilton Road. The total length of public road to be used has been assessed by Centennial Myuna as 6.3 km. As is identified in the image of the proposed route (Annexure 2), there are no residential properties that would be directly passed by trucks traversing Wangi Road and Wilton Road under the modifications. There are eight (8) receptor locations in the vicinity of Myuna Colliery (Donnelly Road and Summerhill Drive) that have been previously identified for the purposes of noise monitoring in relation to existing approved operations at the mine site. These are identified in Annexure 3. There are no additional sensitive residential receptors identified for this area of operations consequent to the modifications.

There are nine (9) identified sensitive receptors residing along Gradwells Road, which leads directly into CES. These are identified in Annexure 4. Seven (7) of these are identified as being locations at which exceedances of the project noise trigger levels are predicted to occur, which relate to operational noise from CES itself. These impacts have been identified in continuing engagement between these residents and Centennial NCS. It is noted that Gradwells Road and therefore, these receptors, are not located on the transport route proposed under the modifications. However, there is traffic relating to the ongoing use of CES that passes directly by their properties (e.g. CES employees).

4.3 Effects of truck movements on public roads

The modifications will create heavy vehicle movements (generally semi-trailer vehicle configuration) on the public road network, specifically Wangi Road and Wilton Road. The remainder of the transport route from the Awaba Colliery surface site to CES will be completed on private haul roads. Potential impacts relating to public road use can be summarised as: road safety; effects on traffic flows; potential pavement damage; noise; air quality (dust); and vehicle emissions.

As is the case with all effects assessed in this report, the potential scale and duration of these effects are difficult to determine accurately, due to the contingent nature of the modifications. However, it is noted that truck movements have been modelled to reduce the number of movements coinciding with times at which southbound traffic volumes on Wangi Road are at their peak. This will reduce potential road safety issues relating to laden trucks turning across the southbound carriageway travelling from Myuna to the Awaba Colliery surface site, and trucks crossing the northbound carriageway and merging into the southbound carriageway on Wilton Road on return travel to Myuna. With respect to the latter, the intersection with Wangi Road has existing traffic separation lanes to facilitate such movements.

There may be some cumulative impacts in relation to heavy vehicle traffic on Wilton Road, as Lake Macquarie City Council's Awaba waste management facility also has its primary access/egress on that road. There is also potential interaction on Wilton Road between trucks used in the modifications, and other vehicles travelling to and from the waste facility and using the road for other purposes. The relevant section of Wilton Road is approximately 2.2 kilometres in length. It is noted that truck movements under the modifications do not pass through the Awaba township.

As part of the Newstan Mine Extension Project (SSD-10333), Centennial Newstan Pty Ltd (Centennial Newstan) is seeking approval for the construction of a new gas flaring facility and two new ventilation fans within the existing disturbance footprint of the Awaba Colliery surface site. Within the Traffic Impact Assessment (TIA) prepared by EMM (2019) as part of the Newstan Mine Extension Project, it was assumed that up to 50 personnel will be required during the proposed construction activities. All personnel will likely access the Awaba Colliery surface site via Wilton Road using their own car, representing up to 100 daily light vehicle movements. Should the Newstan Mine Extension Project (SSD-10333) be approved, no coal transport will take place between CES and Myuna Colliery for the duration of the proposed construction activities. This will reduce potential for cumulative traffic impacts on the local road network.

Newstan Mine Extension Project will generate some additional daily traffic movements along Wangi Road and Wilton Road; however, this will primarily be restricted to the short-term construction of the aforementioned infrastructure at the Awaba Colliery surface site. No long-term impacts on the assessed road network are anticipated as a result of the Newstan Mine Extension Project.

The TIA for the modifications (EMM 2020) details the following mitigation approaches. Centennial Myuna and Centennial NCS will enforce their own Code of Conduct for all drivers transporting coal between Myuna and CES. In addition, signage will be installed close to the Wangi Point Road and Awaba Colliery surface site intersections to alert other motorists to potential truck traffic. In other respects, drivers will be required to operate within the traffic rules relating to public and private haul roads on the transport route. Observance of these requirements will promote road safety to the greatest possible extent.

With regard to impacts relating to air quality, and in particular PM_{10} emissions, dust etc, all trucks leaving both Myuna and CES will travel through a wheel wash to reduce dust generation. Furthermore, all loads will be covered, further reducing dust generation. There will be an increase in vehicle emissions during periods in which operations occur under the modifications. However, given the contingent nature of the modifications and the prospect that activation is expected to be occasional, the extent of these increases is unlikely to be material. Air quality effects for the modifications overall are discussed in Section 4.4.

4.4 Air quality effects – all modification elements

EMM (2020) has prepared separate Air Quality Impact Assessments (AQIA) for Myuna Colliery and the CES. In combination, the two assessments address all effects of the modifications, across all operational areas, including public and private haul roads, and Centennial sites. The assessment concluded that '*the predicted concentrations and deposition rates for incremental particulate matter (TSP, PM_{10}, $PM_{2.5}$ and dust deposition) were below the applicable impact assessment criteria at all assessment locations.*

Cumulative impacts were assessed by combining modelled Myuna and CES 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' (EMM AQIA, 2020:56).

4.5 Noise effects

4.5.1 Myuna Colliery

A Noise and Vibration Impact Assessment (NVIA) has been prepared by EMM for operations at Myuna Colliery under the modification. The conclusion presented in the NVIA is reported below:

'*A quantitative assessment of noise emissions associated with mine operations has been undertaken. The assessment included ambient noise monitoring, establishment of Project Noise Trigger Levels (PNTLs) and computer noise modelling which has shown that Myuna's proposed operations are predicted to result in no change to existing operational noise emissions.*

Operational noise emissions from Myuna are predicted to satisfy the PNTLs at all assessment locations. Predicted maximum noise levels are below the maximum screening criteria and generally consistent with or higher than the results of previous noise compliance monitoring. Hence, as per the Noise Policy for Industry (NPfI) requirements, a detailed maximum noise level event assessment is not required and the likelihood of sleep disturbance is predicted to be unlikely'.

EMM's assessment also included the following recommendations in respect of mitigation of effects:

'*Noise emissions from Myuna will continue to be managed in accordance with the existing Noise Management Plan (NMP), which describes the monitoring program for Myuna including both attended and real-time, unattended noise monitoring. The NMP will be updated following determination of the proposed modification (as required)*' (EMM 2020(a).

Based on EMM's assessment, the likelihood of additional impacts relating to the Myuna modification is low. As is the case with other aspects of the modifications, operations under the modifications are not planned to be continuous. This further reduces the likelihood of impacts.

4.5.2 Cooranbong Entry Site

As noted in Section 4.2, there are seven (7) residential receptor locations relevant to consideration of possible effects of modifications at CES. The NVIA prepared by EMM for CES (2020), concluded that;

‘*Operational noise emissions from CES are predicted to be above the PNTLs at seven of the nine assessment locations and above the existing noise criteria at all but one assessment location.*

Predicted maximum noise levels are below the maximum screening criteria and generally consistent with the results of previous noise compliance monitoring at CES. Hence, as per the NPfI requirements, the likelihood of sleep disturbance is predicted to be unlikely.

Noise emissions from CES will continue to be managed in accordance with the existing NMP, which describes the monitoring program for CES including both attended and real-time, unattended noise monitoring’.

EMM and Centennial NCS have conducted a detailed assessment of the most appropriate mitigation approaches in respect of these potential effects. The findings of that assessment are reported in Table 8.1 of EMM’s CES report, with negotiated agreements with these receptors being determined as the most effective response. The approach to finalising such agreements was summarised as follows:

‘The proposed modification will result in no changes to noise emissions compared to existing emissions for approved operations at all assessment locations.

Centennial NCS will consult with those receptors identified as experiencing mine noise emissions above PNTLs.

Residences will be invited to meet with Centennial NCS representatives to discuss the scope of the proposed modification and provide the findings of this NVIA.

The type of mitigation measures that could be implemented at the residences and/or the nature of any agreement between Centennial NCS and the landowner will depend on the outcomes of relevant negotiations.

Once finalised, DPIE and EPA will be advised of any negotiated agreement that is in place’.

5 Economic profile of operations and proposed modifications

As was noted in the introductory material (Section 1.2.3), the nature and scale of the operational changes under the modifications do not involve changes to annual or total production limits, or to changes in approved workforce size. As a result, the economic effects of the modifications are more accurately expressed as the potential for changes in activity level and employment as between the 'business as usual' (BAU) case and the modifications.

5.1 Base case assumption

The assumed base case or BAU assumption is that Centennial Myuna and Centennial NCS will continue operations on the current basis. As has been the case recently, periodically there may be occasions when Myuna is unable to meet its product quality obligations to EPS. Without the modifications, such occurrences may jeopardise the ability of Myuna to supply EPS and consequently to sustain its workforce at normal operational level. The principle reason for this is that there is limited approved stockpile space at the Myuna pit top, and no space within the existing footprint to accommodate additional stockpiling capacity. In the event of a prolonged period of producing coal that does not meet specification, production would necessarily be curtailed to ensure that Myuna does not exceed its consent conditions in respect of pit top stockpiling.

The modifications have been designed to effectively eliminate the likelihood of such occurrences. With the exception of construction of the pit top weighbridge at Myuna, some minor widening works on the private section of Wangi Point Road near the pit top, and the use of public roads as part of the proposed coal transport, the modifications utilise existing Centennial sites and infrastructure.

A crucial aspect of the modifications is that they relate to essentially an operational contingency provision on the existing consents. There may be periods during production at Myuna Colliery during which temporary decline in coal quality may necessitate corresponding activation of operations covered by the modifications. Generally, however, Myuna would be assumed to be producing coal of suitable quality for direct dispatch to EPS under approved operations.

5.2 Changes in employment due to proposed modifications

The modifications will result in additional employment for the transport contractor/s engaged on works under the modifications. The extent of this additional employment and its associated benefit cannot be estimated with any accuracy, on the following bases:

- The contractor's approach to modification-related works may vary. Alternative approaches may include the allocation of work to existing employees; the employment of casual drivers for the required period; or the retention of subcontractors as required.

- Further operational specifics cannot be accurately determined, such as the number of drivers and vehicles assigned to this task during the periods when operations are required, or the duration of individual operational periods.

It is concluded that a qualitative acknowledgement of the potential for additional employment in required transport services is the most practical and appropriate means for recognising this potential outcome.

5.3 Effects on Myuna Colliery employment

A comparison of the alternative BAU and modification outcomes is the most effective means for assessing the potential for effects on the Myuna workforce. The alternative outcomes are summarised as:

1. BAU: potential for periods of production during which coal quality does not meet EPS specifications. This may result in the need to reduce or suspend production to allow for alternative dispatch of accumulated (non-specification) product from the limited capacity surface stockpile. The precise extent of any such action cannot be accurately determined given the contingencies identified in Section 5.1 and elsewhere in this report.
2. Approval of modifications: Employment maintained at full operational levels, with modification works allowing dispatch of blended Myuna/Mandalong product to EPS (from both Myuna and CES) to meet contractual obligations, as required.

As is noted in Section 5.1, the proposed modifications are essentially a contingent operational plan that would be activated only as required and not as the usual mode of operations. This being the case, the estimates presented in the following subsections identify the total economic activity generated through Myuna Colliery's operations. The extent to which these outcomes would be affected is dependent upon the occurrence, frequency and duration of periods during which product quality may need to be augmented under the modifications.

5.3.1 Employment data

A brief quantitative profile of current employment at Myuna is presented in Table 3. The profile is based on continuing full production at Myuna. Data for the average number of contractors employed at Myuna are also included. These are additional to the identified number of direct employees.

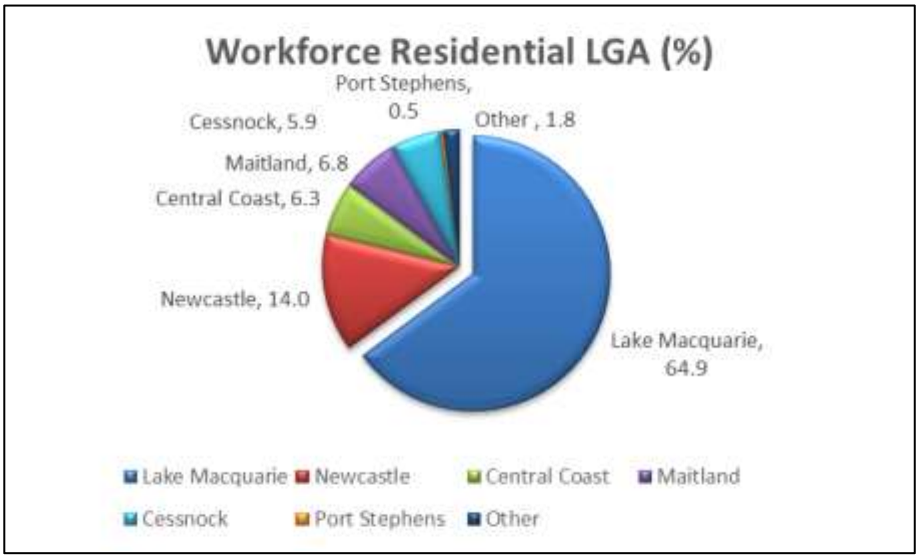
Table 3: Summary of employment effects – Myuna Colliery

Workforce characteristic	Measure
Number of employees (including apprentices) full-time equivalent (FTE)	300
Average employee income (net)	≈ $136,200
Average number of production contractors (FTE)	12
Average contractor income (net)	≈ $120,000

5.3.2 Estimate of net employee benefit

The method for assessing the net employment benefit for direct Myuna employees is presented in Annexure 1. Application of the method is aimed at providing an estimate of the contribution to the local and regional economies that workers' incomes may represent, which is the surplus of employee incomes over a calculated reservation wage adjusted for alternative employment outcomes. Figure 2 shows the residential distribution of the Myuna workforce. This supports a conclusion that a considerable proportion of employee incomes would be spent in the local and regional economies. Table 4 presents the estimate of net employment benefit per year.

Figure 2: Residential distribution - Myuna employees[5]



Approximately 65% of Myuna's employees live in the Lake Macquarie LGA and around 75% in the Newcastle – Lake Macquarie region. 98.2% of employees lived in the broader region, including the Central Coast LGA immediately adjoining Lake Macquarie to the south. The assessment of net employee benefit and associated economic effects excludes contractors. Despite the likelihood that all or most of these would also reside in the region, this has not been ascertained, thus warranting exclusion in the interests of producing a conservative assessment.

Table 4: Net annual employment benefit Myuna Colliery direct employees

Description	Estimated benefit
Net benefit 300 FTE, estimate 1 ($9,804/employee)	$2,941,200
Net benefit 300 FTE, estimate 2 ($10,222/employee)	$3,066,600

[5] Data current at December 2018.

Total net employment benefit is approximately $2.94 million to $3.07 million per year. Based on the proportion of employees residing in the region approximately 98% of this net benefit would accrue to households in the region ($2.88 million to $3.01 million). A proportion of these incomes is assumed to be spent in the local economies in which employees live. For example, ABS (2017) estimated that average total weekly household expenditure on goods and services was approximately 67.8% of mean gross weekly income. Removing housing costs, domestic fuel and power and communications costs, some significant proportion of the benefit of which may not accrue to the local economy, expenditure was 50.5% of mean gross income[6]. Table 5 provides an estimate of the proportion of employee incomes that may accrue to the regional economy, using these two estimates (67.8% and 50.5%) as upper and lower bounds respectively.

Table 5: Annual regional economic effect of employee incomes

Net employee benefit regional residents	Upper bound (67.8%)	Lower bound (50.5%)
$2,882,376	$1,954,251	$1,455,600
$3,005,268	$2,037,572	$1,517,660

Based on these adjusted estimates, the economic stimulus provided by Myuna employees in the regional economy may range between approximately $1.46 million and $2.04 million per annum. An interruption to mining operations as described in Section 5.2 would be likely to reduce the extent of further economic activity and benefit associated with Myuna's workforce and their incomes, to an extent commensurate with the occurrence, frequency and duration of resort to the modification provisions.

Notionally, in circumstances where Myuna was unable to provide suitable product to EPS, it would be likely that the most apparent alternative solution is the transfer of product from Mandalong Mine to EPS. This would not create additional work at that operation, as the required coal would be produced within existing approved production parameters. It is likely that the same outcome would apply to other alternative suppliers to EPS. This being the case, although product can be substituted, the positions at Myuna may not necessarily be replaced in a situation in which product quality issues interrupt supply to EPS. The potential for such an outcome for Myuna would remain under the BAU case.

5.4 Effects on Myuna's contractors, suppliers and other parties

Production issues at Myuna would also be likely to affect other contractors and suppliers in the Myuna supply chain. As noted previously, the scale of effects would be dependent on the duration of a relevant production-related problem.

[6] ABS Cat No. 6540 (2017 [latest release]): Microdata: Household Expenditure, Income and Housing, 2015-16; https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6540.02015-16?OpenDocument

5.4.1 Contractors

As is noted in Section 5.3.1 and Table 2, Myuna generally provides employment for 12 FTE production contractors. Other contractors providing, for example, certain maintenance-related functions, are also retained by Myuna from time to time. As would be anticipated, reducing or suspending the employment of contractors would generally be an early action in reducing the level of activity of Myuna, in the case of production issues under the BAU assumption. Given that production contractors are essentially employed on an FTE basis at Myuna, it would be necessary for their employers to either find alternative work for them, or take other necessary actions should alternative work be unavailable. As was noted in Section 5.3.2, as the origin of contractors is not known, further assessment of the regional economic effects of them becoming temporarily redundant at Myuna cannot be determined with any certainty. It is noted however, that on the basis of the residential location of employees, the size of the regional workforce and the relatively large concentration of mining services firms in the region, some proportion of contractor employees would be locally based.

5.4.2 Suppliers

Myuna also procures a range of goods and services from suppliers each year. Table 6 presents a summary of transactions for a recent one-year period for transactions with businesses in the Lake Macquarie LGA, Hunter Region and NSW. Interruptions to operations at Myuna may also result in some proportion of this economic activity being deferred or cancelled.

Table 6: Regional & NSW supplier transaction & contractor engagement data[7]

Measure	Local (Lake Macquarie LGA)	Regional (Hunter)	NSW
Supplier transactions (per annum)			
Number of firms/entities	62	200	298
Total transaction value	$2.9 million	$17.7 million	$32.1 million

5.4.3 Other parties

Myuna also supports a range of community organisations. These include sponsorship and/or support of:

- Wangi Lions Club and the Dobell Arts and Craft Festival;
- Wangi RSL Amateur Sailing Club and the Australia Day Regatta;
- Sponsorship of the Wangi Arcadia Netball Club;
- Sponsorship of the Wangi Lions Club Beautifying Wangi Project;
- Toronto Learning Community Band through the Arcadia Vale School;
- Rathmines Scouts.

[7] For the 12-month period 1 December 2017 to 30 November 2018.

A decline in profitability resulting from a disruption to production would directly affect Myuna's capacity to provide continuing support to these and other local organisations and initiatives.

5.5 Economic effects on other (third) parties

As was discussed in Section 4.5.2, one proposed means for mitigating noise impacts on sensitive receptor residents on Gradwells Road is the uptake of negotiated agreements. Such agreements may involve a pecuniary benefit for these stakeholders.

Given the contingent nature of the modifications and the relatively limited scope of the changes it entails, it is considered unlikely that other third parties will experience material economic benefits or costs as a result. This conclusion presupposes compliance with all regulatory obligations and consent conditions under which the modifications will proceed.

6 Conclusion

The proposed modifications are essentially an operational contingency provision aimed at supporting continuing supply of coal by Myuna to EPS. At times when it may become necessary to undertake operations under the modifications, there would potentially be several effects. A general assumption in respect of these effects is that their frequency and magnitude is limited by the contingent nature of the modifications.

The most apparent operational effect is the potential for increased noise at CES, affecting certain residences on Gradwells Road. As is recommended in EMM's NVIA for CES, Centennial is in ongoing engagement with these residents in relation to noise generated at CES and will work towards resolving these issues individually with each household, as recommended by EMM.

The second effect will be truck movements on the public road section of the route between Myuna and the Awaba Colliery surface site, via Wangi Road and Wilton Road. Planned operations under the modifications include the reduction of truck movements during peak traffic periods. Compliance with road rules and internal operational protocols are also expected to mitigate the likelihood of effects. Operational conditions requiring the use of the wheel wash prior to leaving Myuna and CES, and covering of loads while in transit, will reduce impacts relating to dust generation.

As is the case with potential social and environmental effects on stakeholders, economic effects would also be limited to circumstances in which operations occur under the modifications. There are two potential economic effects of the modifications, each of which are likely to be positive. These are:

- Continuing employment of Myuna staff at full operational level, with derived economic effects of employees' households maintaining normal levels of activity in the local and regional economies.

- Additional work for transport contractors during the period of required works.

It is also likely that notwithstanding the additional logistics activities required under the modifications, that this would remain more efficient for EPS than sourcing fuel from alternative suppliers, which are likely to be more distant from the power station.

Given the contingent nature of the modifications and the consequently limited prospect and scale of effects that may eventuate, it is concluded that, on balance, the modifications will result in limited effects on internal and third-party stakeholders. This assumes that all feasible avoidance, management and mitigation recommendations included in operational plans and specialist consultant reports are adopted in respect of operations.

Annexure 1: Method for estimation of net economic benefit to workers

Internal data on current local/regional operations is assumed as indicative of the residential status of Myuna workforce members. The conclusion is that the workforce is likely to be largely resident in the immediate region (refer to Table 9). There is a relatively large existing coal mining workforce in the region (approximately 55% of the total NSW coal mining workforce). The regional industrial base would also support a conclusion that the majority of workers will originate within the region. This being the case, the EA presents an assessment of the potential economic contributions of the workforce on the basis of regional residence.

The assessment method presented below permits calculation of the residual or surplus economic contribution (labour surplus) of future employees of Myuna, taking into account alternative employment outcomes. The approach taken is to adopt a 'reservation wage' and compare this to the assumed wage level for ongoing employment, producing an estimate of 'labour surplus'. The reservation wage is derived as:

$$\mathbf{RW = (1 - p)AW + pB}$$

Where:
RW = reservation wage;
p = probability of a worker remaining unemployed and thus claiming unemployment (Newstart Allowance[8]) benefit. The Australian Government Job Outlook website[9] was referenced to obtain information to inform an assumption on this probability. Findings for relevant occupations are included in Table A1.

Table A1: Job outlook information

Identifier	Occupation	Unemployment	Employment growth	$/week (median)	$ annualised
1	Drillers, Miners & Shot Firers	lower	stable	2,500	130,000
2	Mine Deputies[10]	lower	stable	2,812	146,224
3	Mining Engineers	lower	decline	3,118	162,136
4	Other Construction and Mining Labourers	average	moderate	1,683	87,516
5	Geologists, Geophysicists & Hydrogeologists	lower	very strong	2,192	113,984
6	Production Managers	lower	moderate	2,258	117,416
7	Earthmoving Plant Operators	lower	stable	1,491	77,532

[8] Currently referred to as Jobseeker Allowance.
[9] Information current at January 2020.
[10] Included in the occupational group 'Other Building and Engineering Technicians'.

Based on internal information, the workforce comprises ≈90% operations (mining) personnel and ≈10% staff/management personnel. Category 1 was assumed as the average wage for operations (mining) personnel and the average of categories 2,3 and 5 for staff. These estimates were then used as a basis for assessing the assumed alternative wage. Applying the proportional distribution based on the structure of the proposed workforce resulted in an estimated median industry income of $131,100. Incidence of unemployment is assumed as average, therefore, the unemployment rate for NSW may be considered as reflecting the likelihood of a displaced employee being unable to find work. At February 2020, the unemployment rate for NSW was 4.5%[11]. For the purposes of recognising the higher level of unemployment in the region, an estimate is also provided based on the unemployment rate for the Newcastle Lake Macquarie SA4, reported at February 2020, of 4.9%[12].

AW = assumed alternate wage. In this instance the alternate wage is assumed as the median wage for the mining sector, adjusted for the structure of the proposed workforce ($131,100 annualised).

B = Newstart Allowance. The benefit is assumed at partnered level, $510.80 per fortnight[13] (each) annualised ($26,562). Therefore, the reservation wage would be alternatively:

$$(0.955 \times \$131{,}100) + (0.045 \times \$26{,}562) \therefore$$
$$\$125{,}201 + \$1{,}195 = \mathbf{\$126{,}396}$$

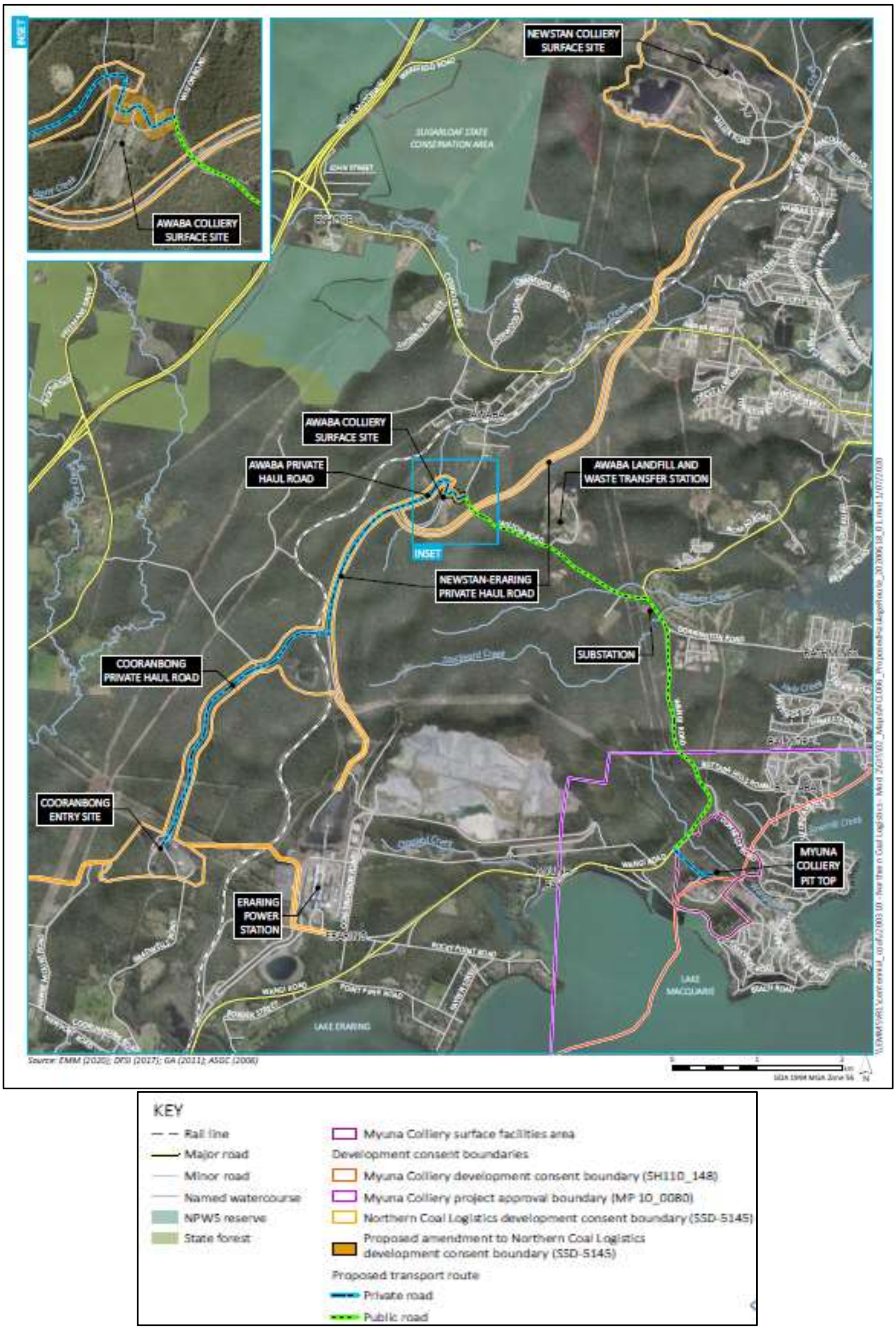
OR

$$(0.951 \times \$131{,}100) + (0.049 \times \$26{,}562) \therefore$$
$$\$124{,}676 + \$1{,}302 = \mathbf{\$125{,}978}$$

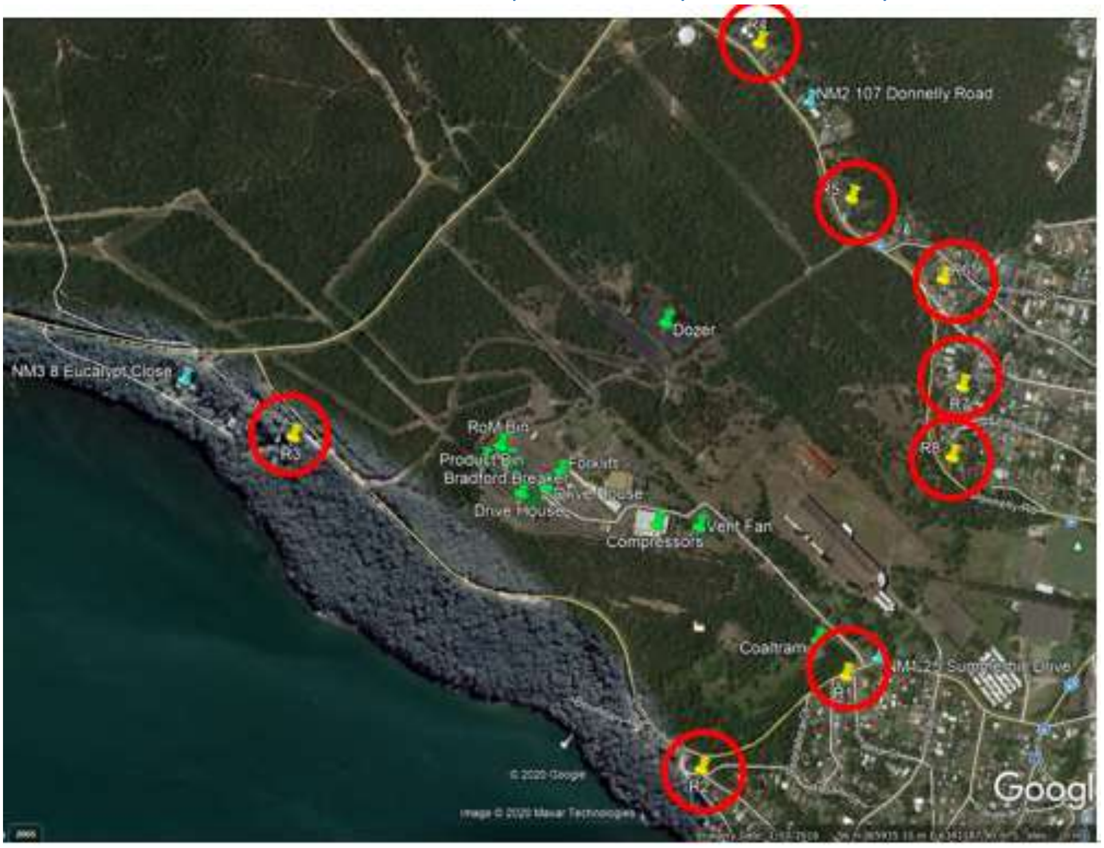
The assumed wage rate at the time of preparation of the economic impact assessment was estimated at $136,200[14]. Consequently, the difference, and the labour surplus value assumed for estimation of the employment effects in the regional economy is **$9,804 (Estimate 1)** and **$10,222 (Estimate 2)**.

[11] Data for NSW are available to April 2020, however this is not adopted for this assessment on the basis of temporal equivalence with the SA4 data and also noting the subsequent effect of COVID19-related employment market effects.
[12] Australian Government Department of Employment (2020): *Labour Market Information Portal*. https://lmip.gov.au/
[13] Australian Government Department of Human Services (2020)
[14] Based on internal data at May 2020.

Annexure 2: Relevant sites and infrastructure diagram



Annexure 3: Sensitive receptors – Myuna Colliery



Annexure 4: Sensitive receptors – CES (Gradwells Road)


Appendix E

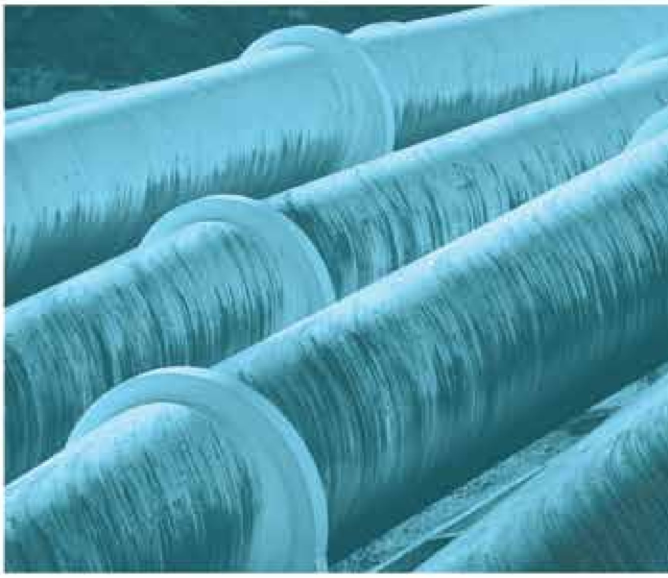
Greenhouse gas emissions assessment




Myuna Colliery

Greenhouse gas assessment

Prepared for Centennial Myuna Pty Limited
July 2020



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Myuna Colliery

Greenhouse gas assessment

Report Number

J200309 RP#7

Client

Centennial Myuna Pty Limited

Date

1 July 2020

Version

Final

Prepared by	**Approved by**
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1 July 2020	1 July 2020

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1 Introduction

Myuna Colliery (Myuna) is an existing underground coal mine owned and operated by Centennial Myuna Pty Limited (Centennial Myuna). Myuna's pit top is 25 kilometres (km) south-west of Newcastle, New South Wales (NSW), in the Lake Macquarie local government area (LGA).

Centennial Myuna is seeking to modify MP 10_0080, pursuant to Section 4.55(2) of the EP&A Act, to allow for the transfer of coal between Myuna's pit top and the Cooranbong Entry Site (CES) and associated activities.

This greenhouse gas (GHG) assessment has been prepared to support the modification report. It provides estimates of Scope 1, 2 and 3 emissions and a comparison to State and National inventories. It also provides a comparison of GHG emissions for existing and proposed scenarios on an annual basis.

This GHG assessment has been prepared in accordance with the guidelines specified by the Department of Environment and Energy (DoEE) *National Greenhouse Accounts Factors* (NGAF) workbook (DoEE 2019).

2 Greenhouse gas calculations

2.1 Introduction

The estimation of GHG emissions for Myuna was based on the DoEE (2019) NGAF workbook. The methodologies in the NGAF workbook follow a simplified approach, equivalent to the 'Method 1' approach outlined in the *National Greenhouse and Energy Reporting (Measurement) Technical Guidelines* (DoE 2014). The Technical Guidelines are used for the purpose of reporting under the Commonwealth *National Greenhouse and Energy Reporting Act 2007* (the NGER Act).

For accounting and reporting purposes, GHG emissions are defined as 'direct' and 'indirect' emissions. Direct emissions (also referred to as Scope 1 emissions) occur within the boundary of an organisation and as a result of that organisation's activities. Indirect emissions are generated as a consequence of an organisation's activities but are physically produced by the activities of another organisation (DoEE 2019). Indirect emissions are further defined as Scope 2 and Scope 3 emissions. Scope 2 emissions occur from the generation of the electricity purchased and consumed by an organisation. Scope 3 emissions occur from all other upstream and downstream activities, for example the downstream extraction and production of raw materials or the upstream use of products and services.

Scope 3 is an optional reporting category (Bhatia et al 2010) and should not be used to make comparisons between organisations, for example in benchmarking the GHG intensity of products or services. Typically, only major sources of Scope 3 emissions are accounted and reported by organisations.

2.2 Emission sources

The GHG emission sources included in this assessment are listed in Table 2.1, representing the most significant sources associated with Myuna.

GHG emissions from Myuna are estimated using the methodologies outlined in the NGAF workbook, using fuel energy contents and scope 1, 2 and 3 emission factors for diesel and electricity use in NSW.

Table 2.1 Scope 1, 2 and 3 emission sources

Scope 1	Scope 2	Scope 3
Direct emissions from diesel combustion.	Indirect emissions associated with the consumption of purchased electricity.	Indirect emissions from the extraction, production and transport of diesel.
Direct emissions from LPG use.		Indirect emissions from the extraction, production and transport of LPG.
Fugitive emissions of coal seam methane (CH_4) and CO_2 from the ventilation shafts.		Indirect emissions from electricity lost in delivery in the transmission and distribution network.
Direct emissions from the use of oils and greases.		Indirect emissions from product coal combustion.
Direct emissions from the use of sulphur hexafluoride (SF_6).		Indirect emissions from the extraction, production and transport of oil and grease.
Direct emissions from post-mining activities (eg stockpiling).		Indirect emissions from fuel for employee travel.

2.3 Excluded emission sources

It is noted that Scope 3 emissions from the transport of product coal via rail or ship have not been included in this assessment. This is because currently, coal from Myuna is transported via conveyor to Eraring Power Station, approximately 4.5 km west of Myuna. In the proposed scenario, up to 1 million tonnes per annum (Mtpa) of coal is transported via trucks to CES.

GHG emissions from potential diesel or electricity used during post-mining rehabilitation and decommissioning of Myuna has also not been included. The exact amount of diesel and electricity to be used in this phase is unknown at this point; however, Centennial Myuna estimates that the amount required will be significantly less than that used during mining operations. These emissions therefore have not been specifically quantified.

2.4 Activity data

Estimates of fuel, substances and electricity consumption associated with the existing and proposed operations scenarios at Myuna have been provided by Centennial Myuna. The adopted activity data for the emission estimates is presented in Table 2.2.

It is noted that the only difference between the existing and proposed scenarios is the additional diesel used in the proposed scenario (to account for the transportation of coal to and from CES) and an increase in the amount of coal stockpiled (to account for coal from CES being handled at Myuna).

Table 2.2 Activity data inputs for GHG calculations

Process	Existing operations	Proposed operations (modification)
Annual ROM production (t)	3,000,000	3,000,000
Coal stockpiled (t)	40,000	250,000
Diesel used for stationary energy purposes (L)	27,784	27,784
Diesel used for transport energy purposes (L)	519,118	925,368
LPG (L)	35	35
Employee travel fuel (L)	471,966	471,966
Electricity (kWh)	266,755,455	266,755,455
Fugitive emissions from ventilation shaft (m^3/s)	315	315
Oils (L)	377,838	377,838
Greases (L)	4,882	4,882
Sulfur hexafluoride (SF_6) (kg)	18	18

2.5 Emission estimates

2.5.1 Maximum annual emissions

The estimated annual GHG emissions for each emission source for the existing and proposed scenarios are presented in Table 2.3 and Table 2.4, respectively. Details of the GHG emissions calculations are provided in Appendix A.

The significance of Myuna's GHG emissions relative to State and National GHG emissions is made by comparing annual average GHG emissions against the most recent available total GHG emissions inventories (calendar year 2018[1]) for NSW (131,685 kt CO_2-e) and Australia (537,446 kt CO_2-e).

Annual average GHG emissions (Scope 1 and 2) generated by Myuna in the existing scenario represent approximately 0.547% of total GHG emissions for NSW and 0.134% of total GHG emissions for Australia, based on the National Greenhouse Gas Inventory for 2018.

Annual average GHG emissions (Scope 1 and 2) generated by Myuna in the proposed scenario represent approximately 0.551% of total GHG emissions for NSW and 0.135% of total GHG emissions for Australia, based on the National Greenhouse Gas Inventory for 2018.

The proposed modification will result in a 0.9% increase in annual Scope 1 and 2 GHG emissions at Myuna when compared with Myuna's existing operations. This increase is related to the additional diesel used to transport coal to CES and an increase in the amount of coal stockpiled at Myuna.

Table 2.3 Estimated annual GHG emissions – existing operations

Source	Scope 1 (t CO_2-e/year)	Scope 2 (t CO_2-e/year)	Scope 3 (t CO_2-e/year)	Total
Diesel combustion	1,488	-	76	1,564
LPG	0.1	-	0.003	0.1
Fugitive emissions from vent shafts	501,888	-	-	501,888
Oils and greases	204	-	53	258
SF_6	4	-	-	4
Post-mining emissions	680	-	-	680
Electricity consumption	-	216,072	24,008	240,080
Product coal combustion	-	-	7,308,630	7,308,630
Total	**504,264**	**216,072**	**7,332,767**	**8,053,104**

1 https://ageis.climatechange.gov.au/SGGI.aspx

Table 2.4 Estimated annual GHG emissions – proposed operations

Source	Scope 1 (t CO_2-e/year)	Scope 2 (t CO_2-e/year)	Scope 3 (t CO_2-e/year)	Total
Diesel combustion	2,593	-	132	2,726
LPG	0.1	-	0.003	0.1
Fugitive emissions from vent shafts	501,888	-	-	501,888
Oils and greases	204	-	53	258
SF_6	4	-	-	4
Post-mining emissions	4,250	-	-	4,250
Electricity consumption	-	216,072	24,008	240,080
Product coal combustion	-	-	7,308,630	7,308,630
Total	**508,940**	**216,072**	**7,332,824**	**8,057,836**

3 Conclusions

This GHG assessment supports a modification application for Myuna. It provides estimates of Scope 1, 2 and 3 emissions and a comparison to State and National inventories. The assessment has been prepared in accordance with the guidelines specified by DoEE's (2019) NGAF workbook.

Annual average GHG emissions (Scope 1 and 2) generated by Myuna in the existing scenario represent approximately 0.547% of total GHG emissions for NSW and 0.134% of total GHG emissions for Australia, based on the National Greenhouse Gas Inventory for 2018.

Annual average GHG emissions (Scope 1 and 2) generated by Myuna in the proposed scenario represent approximately 0.551% of total GHG emissions for NSW and 0.135% of total GHG emissions for Australia, based on the National Greenhouse Gas Inventory for 2018.

The proposed modification will result in a 0.9% increase in annual Scope 1 and 2 GHG emissions at Myuna when compared with Myuna's existing operations. This increase is related to the additional diesel used to transport coal to CES and an increase in the amount of coal stockpiled at Myuna. Scope 3 emissions are approximately 7.3 Mtpa under both the existing and proposed scenarios and will increase by 0.0008% or 56 tpa as a result of the proposed modification.

Mitigation of GHG emissions will continue to be conducted in accordance with Centennial's *Air Quality and Greenhouse Gas Management Plan: Northern Region* (Centennial 2019).

References

AEGIS 2015, *Australian Greenhouse Emissions Information System*, viewed 26 June 2020, https://ageis.climatechange.gov.au/SGGI.aspx.

Bhatia, P, Cummis, C, Brown, A, Rich, D, Draucker, L & Lahd, H 2010, Greenhouse Gas Protocol. *Corporate Value Chain (Scope 3) Accounting and Reporting Standard*. Supplement to the GHG Protocol Corporate Accounting and Reporting Standard, World Resources Institute & World Business Council for Sustainable Development.

Centennial 2019, *Air Quality and Greenhouse Gas Management Plan: Northern Region*.

DoE 2014, *National Greenhouse and Energy Reporting (Measurement) Technical Guidelines*, Department of Environment.

DoEE 2019, *National Greenhouse Accounts Factors*, Department of Environment and Energy.

Abbreviations

CES	Cooranbong Entry Site
CO_2-e	carbon dioxide equivalent
DoEE	Department of the Environment and Energy
GHG	greenhouse gas
kW	kilowatt
LGA	Local government area
Myuna	Myuna Colliery
NGAF	National Greenhouse Accounts Factors

Appendix A

Greenhouse gas calculation data

A.1 Fuel consumption

A.1.1 Diesel

GHG emissions from diesel consumption were estimated using the following equation:

$$E_{ij} = \frac{Q_i \times EC_i \times EF_{ijoxec}}{1000}$$

Where:

E_{ij}	=	Emissions of GHG from diesel combustion	(t CO_2-e)
Q_i	=	Quantity of fuel	(kL)
EC_i	=	Energy content of fuel	(GJ/kL)[2]
EF_{ijoxec}	=	Emission factor (scope 1 or 3) for diesel consumption	(kg CO_2-e/GJ)[3]

The quantity of diesel used in the existing and proposed scenarios are listed in Table 2.2. The increase in diesel in the proposed scenario is due to the additional coal being transported to, and handled at, Myuna.

GHG emission factors and energy content for diesel were sourced from the NGAF (DoEE 2019). These are presented in Table A.1.

The estimated annual existing and proposed scenario GHG emissions from diesel are presented in Table A.2.

Table A.1 Diesel GHG emission factors

Fuel type	Energy content (GJ/kL)	Scope 1 Emission Factors (kg CO_2-e/GJ)			Scope 3 Emission Factor (kg CO_2-e/GJ)
		CO_2	CH_4	N_2O	CO_2
Stationary energy	38.6	69.9	0.1	0.2	3.6
Transport energy	38.6	69.9	0.1	0.5	3.6

Table A.2 Estimated CO_2-e (tonnes) for diesel consumption per year

Scenario	Diesel use (L/annum)	Emissions (t CO_2-e)		Total
		Scope 1	Scope 3	
Existing scenario	546,902	1,488	76	1,564
Proposed scenario	953,152	2,593	132	2,726

2 GJ = gigajoules

3 kg CO_2-e/GJ = kilograms of carbon dioxide equivalents per gigajoule

A.1.2 LPG

GHG emissions from LPG consumption were estimated using the following equation:

$$E_{ij} = \frac{Q_i \times EC_i \times EF_{ijoxec}}{1000}$$

Where:

E_{ij}	=	Emissions of GHG from LPG combustion	(t CO_2-e)
Q_i	=	Quantity of fuel	(kL)
EC_i	=	Energy content of fuel	(GJ/kL)
EF_{ijoxec}	=	Emission factor (scope 1 or 3) for LPG consumption	(kg CO_2-e/GJ)

The quantity of LPG used in the existing and proposed scenarios are listed in Table 2.2.

GHG emission factors and energy content for LPG were sourced from the NGAF (DoEE 2019). These are presented in Table A.3.

The estimated annual existing and proposed scenario GHG emissions from LPG are presented in Table A.4.

Table A.3 LPG GHG emission factors

Fuel type	Energy content (GJ/kL)	Scope 1 Emission Factors (kg CO_2-e/GJ)			Scope 3 Emission Factor (kg CO_2-e/GJ)
		CO_2	CH_4	N_2O	CO_2
LPG	25.7	60.2	0.2	0.2	3.6

Table A.4 Estimated CO_2-e (tonnes) for LPG consumption per year

Scenario	LPG use (L/annum)	Emissions (t CO_2-e)		Total
		Scope 1	Scope 3	
Existing scenario	35	0.055	0.003	0.1
Proposed scenario	35	0.055	0.003	0.1

A.1.3 Employee travel

GHG emissions from employee travel were estimated using the following equation:

$$E_{ij} = \frac{Q_i \times EC_i \times EF_{ijoxec}}{1000}$$

Where:

E_{ij} = Emissions of GHG from gasoline combustion (t CO_2-e)

Q_i = Quantity of fuel (kL)

EC_i = Energy content of fuel (GJ/kL)

EF_{ijoxec} = Emission factor (scope 3) for gasoline consumption (kg CO_2-e/GJ)

The quantity of employee fuel (assumed as gasoline) used in the existing and proposed scenarios are listed in Table 2.2.

GHG emission factors and energy content for gasoline were sourced from the NGAF (DoEE 2019). These are presented in Table A.5.

The estimated annual existing and proposed scenario GHG emissions from employee travel are presented in Table A.6.

Table A.5 Gasoline GHG emission factors

Fuel type	Energy content (GJ/kL)	Scope 3 Emission Factor (kg CO_2-e/GJ)
		CO_2
Gasoline	34.2	3.6

Table A.6 Estimated CO_2-e (tonnes) for employee travel

Scenario	Gasoline use (L/annum)	Emissions (t CO_2-e)
		Scope 3
Existing scenario	471,966	58,109
Proposed scenario	471,966	58,109

A.2 Post-mining activities

Emissions for Scope 1 post-mining activities were calculated using the 'post mining activities associated with gassy underground mines' per the NGAF. The NGAF provides a CH_4 emission factor of 0.017 tonnes CO_2-e/tonne of ROM coal.

Centennial Myuna has provided the amount of ROM coal stockpiled for the existing and proposed scenarios. This is provided in Table 2.2. The increase in coal stockpiled in the proposed scenario includes coal from CES being handled at Myuna.

The estimated annual existing and proposed scenario GHG emissions from post mining activities are presented in Table A.7.

Table A.7 Estimated CO_2-e (tonnes) for post-mining activities

Scenario	ROM coal stockpiled (t/annum)	Emissions (t CO_2-e)
		Scope 1
Existing scenario	40,000	680
Proposed scenario	250,000	4,250

A.3 Fugitive emissions from mine ventilation air

Fugitive methane emissions will be generated from mine ventilation air at Myuna.

Centennial Myuna has provided monthly fugitive gas data from the ventilation shaft at Myuna. The following information was derived for use in the fugitive emissions calculations:

- the average flow rate for 2019 was taken to be 315 m^3/s
- the average contribution of CO_2 was 0.036%
- the average contribution of CH_4 was 0.294%

The percentages of CO_2 and CH_4 in the mine ventilation air were calculated using the above ratios. CO_2 and CH_4 adjustment factors[4] to convert gas from m^3 at standard temperature and pressure (STP) to t CO_2-e are as follows:

- CO_2 adjustment factor = 1.861×10^{-3}
- CH_4 adjustment factor = $6.784 \times 10^{-4} \times 25$

The estimated annual existing and proposed scenario GHG emissions from mine ventilation air are presented in Table A.8.

Table A.8 Estimated CO_2-e (tonnes) for mine ventilation air

Scenario	Air flow (m^3/y)	Emissions (t CO_2-e)
		Scope 1
Existing scenario	9,918,755,280	501,888
Proposed scenario	9,918,755,280	501,888

[4]www.cleanenergyregulator.gov.au/DocumentAssets/Documents/Estimating%20emissions%20and%20energy%20from%20coal%20mining%20guideline.pdf

A.4 Oil use

GHG emissions from oil use were estimated using the following equation:

$$E_{ij} = \frac{Q_i \times EC_i \times EF_{ijoxec}}{1000}$$

Where:

E_{ij}	=	Emissions of GHG from oil use	(t CO_2-e)
Q_i	=	Quantity of oil	(kL)
EC_i	=	Energy content of oil	(GJ/kL)
EF_{ijoxec}	=	Emission factor (scope 1 or 3) for oil use	(kg CO_2-e/GJ)

The quantity of oil used in the existing and proposed scenarios are listed in Table 2.2.

GHG emission factors and energy content for petroleum based oils were sourced from the NGAF (DoEE 2019). These are presented in Table A.9.

The estimated annual existing and proposed scenario GHG emissions from oil use are presented in Table A.10.

Table A.9 Oil GHG emission factors

Fuel type	Energy content (GJ/kL)	Scope 1 Emission Factors (kg CO_2-e/GJ)	Scope 3 Emission Factor (kg CO_2-e/GJ)
		CO_2	CO_2
Oils	38.8	13.9	3.6

Table A.10 Estimated CO_2-e (tonnes) for oil use per year

Scenario	Oil use (L/annum)	Emissions (t CO_2-e)		Total
		Scope 1	Scope 3	
Existing scenario	377,838	204	53	257
Proposed scenario	377,838	207	53	257

A.5 Grease

GHG emissions from grease were estimated using the following equation:

$$E_{ij} = \frac{Q_i \times EC_i \times EF_{ijoxec}}{1000}$$

Where:

E_{ij}	=	Emissions of GHG from grease	(t CO_2-e)
Q_i	=	Quantity of grease	(kL)
EC_i	=	Energy content of grease	(GJ/kL)
EF_{ijoxec}	=	Emission factor (scope 1 or 3) for grease	(kg CO_2-e/GJ)

The quantity of grease used in the existing and proposed scenarios are listed in Table 2.2.

GHG emission factors and energy content for petroleum based greases were sourced from the NGAF (DoEE 2019). These are presented in Table A.11.

The estimated annual existing and proposed scenario GHG emissions from grease use are presented in Table A.12.

Table A.11 Grease GHG emission factors

Fuel type	Energy content (GJ/kL)	Scope 1 Emission Factors (kg CO_2-e/GJ)	Scope 3 Emission Factor (kg CO_2-e/GJ)
		CO_2	CO_2
Greases	38.8	3.5	3.6

Table A.12 Estimated CO_2-e (tonnes) for grease per year

Scenario	Grease use (L/annum)	Emissions (t CO_2-e)		
		Scope 1	Scope 3	Total
Existing scenario	4,882	0.7	0.7	1.3
Proposed scenario	4,882	0.7	0.7	1.3

A.6 Sulfur hexafluoride (SF_6)

Emissions of SF_6 may be released at Myuna through the use of gas in insulated switch gear and circuit breaker applications.

GHG emissions from SF_6 were estimated using the following equation:

$$E_{jk} = \frac{Stock_{jk} \times GWP}{J_{jk}}$$

Where:

E_{jk}	=	Emissions of gas type	(t CO_2-e)
$Stock_{jk}$	=	Stock of gas type	(t CO_2-e)
GWP	=	Global Warming Potential	
L_{jk}	=	default leakage rates for a year of gas type	

The default leakage gas rate for SF_6 as given in the NGAF is 0.0089. The GWP value given in the NGAF for SF_6 is 22,800.

The quantity of SF_6 used in the existing and proposed scenarios are listed in Table 2.2.

The estimated annual existing and proposed scenario GHG emissions from SF_6 are presented in Table A.13.

Table A.13 Estimated CO_2-e (tonnes) for SF_6

Scenario	SF_6 use (kg/y)	Emissions (t CO_2-e)
		Scope 1
Existing scenario	18	3.7
Proposed scenario	18	3.7

A.7 Electricity use

GHG emissions associated with electricity consumption were estimated using the following equation:

$$E_{CO_2-e} = \frac{Q \times EF}{1000}$$

Where:

$E_{CO2\text{-}e}$	=	Emissions of GHG from electricity consumption	(t CO_2-e)
Q_i	=	Quantity of electricity	(MWh)[5]
EF	=	Emission factor (scope 2 or 3) for electricity consumption	(kg CO_2-e/kWh)[6]

The quantity of electricity used in the existing and proposed scenarios are listed in Table 2.2.

GHG emission factors for electricity use were sourced from the NGAF (DoEE 2019). These are presented in Table A.14. the Scope 3 emissions were taken from the NSW 'latest estimate' section of the NGAF.

The estimated annual existing and proposed scenario GHG emissions from electricity are presented in Table A.15.

Table A.14 Electricity GHG emission factors

Use	Emission Factors (kg CO_2-e/kWh)	
	Scope 2	Scope 3
Electricity	0.81	0.09

Table A.15 Estimated CO_2-e (tonnes) for electricity consumption

Scenario	Electricity use (kWh)	Emissions (t CO_2-e)	
		Scope 2	Scope 3
Existing scenario	266,755,455	216,072	24,008
Proposed scenario	266,755,455	216,072	24,008

5 MWh = megawatt hours

6 kg CO_2-e/kWh = kilograms of carbon dioxide equivalents per kilowatt hour

A.8 Energy production from product coal (end use)

GHG emissions associated with energy production from product coal were estimated using the following equation:

$$E_{CO_2-e} = \frac{Q \times EC \times EF}{1000}$$

Where:

$E_{CO2\text{-}e}$	=	Emissions of GHG from electricity consumption	(t CO_2-e)
Q	=	Quantity of coal burnt	(t)
EC	=	Energy Content Factor for bituminous coal	(GJ/t)
EF	=	Emission factor for bituminous coal combustion	(kg CO_2-e/GJ)

The quantity of product coal in the existing and proposed scenarios are listed in Table 2.2.

GHG emission factors for fuel combustion were sourced from the NGAF (DoEE 2019). These are presented in Table A.16. The Scope 1 emission factors were used to calculate the Scope 3 emissions from the burning of Myuna's product coal per Appendix 4 of the NGAF.

The estimated annual existing and proposed scenario GHG emissions from energy production from product coal are presented in Table A.17

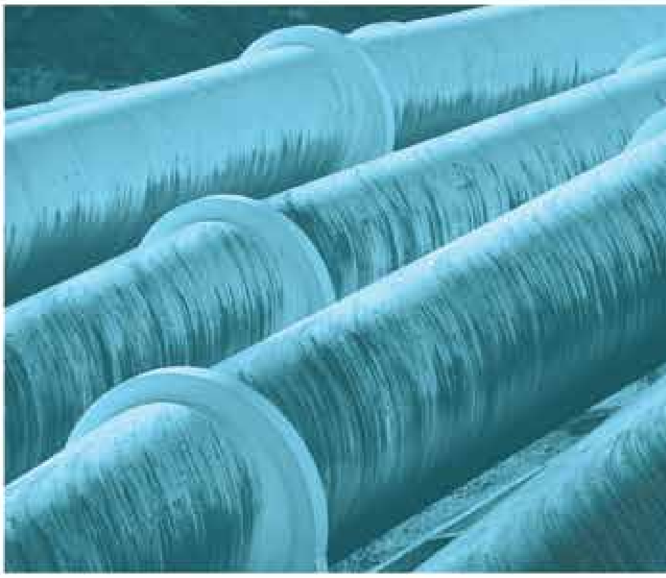
Table A.16 Fuel combustion GHG emission factors

Fuel type	Energy content (GJ/t)	Scope 1 Emission Factors (kg CO_2-e/GJ)		
		CO_2	CH_4	N_2O
Bituminous coal	27.0	90	0.03	0.2

Table A.17 Estimated CO_2-e (tonnes) for energy production from product coal per year

Scenario	Product coal (t/annum)	Emissions (t CO_2-e)
		Scope 3
Existing scenario	3,000,000	7,308,630
Proposed scenario	3,000,000	7,308,630




Appendix F

Stakeholder correspondence




Mr James Wearne
Group Approvals Manager

Centennial Myuna Pty Limited
PO BOX 1000
Toronto New South Wales 2283

01/06/2020

Dear Mr Wearne

Myuna Colliery (PMA-616)
Proposed Blending of Coal at Cooranbong Entry Site

I refer to your letter concerning a proposed modification to the **Myuna Colliery**.

The Department has reviewed the proposed approach to preparing a Modification Report and agrees with the presented approach. A detailed Traffic Impact Assessment of the proposed coal haulage route between Myuna Colliery and Awaba Colliery would be a key component of the Modification Report. In addition, the Department requests the following matters be addressed in the Modification Report:

- Noise and air quality impacts of the proposed coal handling operations at the Myuna surface facilities;
- Ensuring public roads are kept free of materials tracked by trucks;
- For any areas of ground disturbance, consideration of Aboriginal cultural heritage and surface water management;
- Ensuring that the Capital Investment Value of the proposed modification is correctly estimated; and
- Whether there are any conditions of consent that would benefit from being updated, such as condition(s) related to minor surface infrastructure and exploration.

Your next step will be to lodge your Modification Report through your dashboard on our new major projects website (http://www.planningportal.nsw.gov.au/major-projects).

If your proposal is likely to have a significant impact on matters of National Environmental Significance, it will require an approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This approval would be in addition to any approvals required under NSW legislation and it is your responsibility to contact the Commonwealth Department of the Environment to determine if an approval under the EPBC Act is required (http://www.environment.gov.au or 6274 1111).

If you have any questions, please contact Colin Phillips, who can be contacted on 9274 6483 / colin.phillips@planning.nsw.gov.au.

Yours sincerely,

Matthew Sprott
Director
Resource Assessments (Coal & Quarries)

CENTENNIAL
MYUNA

22 May 2020

Georgie Williams
Senior Development Planner
Lake Macquarie City Council
126-138 Main Road
Speers Point NSW 2284

Dear Georgie

RE: Proposed Modification to the development consents for Myuna Colliery (MP 10_0080) and Northern Coal Logistics Project (SSD-5145)

1. Introduction

Myuna Colliery (the mine) is an existing underground coal mine owned and operated by Centennial Myuna Pty Limited (Centennial Myuna). The mine's pit top is 25 kilometres (km) south-west of Newcastle, New South Wales (NSW), in the Lake Macquarie local government area (LGA).

The mine operates under two development consents:

- SH110_148, which was granted by Lake Macquarie City Council (LMCC) in 1977 under the provisions of the now repealed NSW Local Government Act 1919 for the development and operation of the Myuna and Cooranbong collieries; and

- MP 10_0080, which was granted by the Minister of Planning and Infrastructure on 18 January 2012 under Part 3A of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act) for continued mining in areas outside the area defined by SH110_148. MP 10_0080 also authorises the use of bord and pillar methods in the Wallarah, Great Northern and Fassifern coal seams and the continued use of existing infrastructure on-site until 31 December 2032.

MP 10_0080 has since been declared a State significant development (SSD) under Clause 6 of Schedule 2 of the NSW Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017. Accordingly, the mine now operates as an SSD approval.

Centennial Myuna is seeking to modify MP 10_0080, pursuant to Section 4.55(2) of the EP&A Act, to allow for the transfer of coal between Myuna Colliery's pit top and the Cooranbong Entry Site (CES) and associated activities.

At the same time Centennial Myuna is seeking to modify MP 10_0080, Centennial Northern Coal Services Pty Limited (Centennial NCS) will submit a modification application for the Northern Coal Logistics Project (SSD-5145) to allow for the transfer of coal between CES and Myuna Colliery's pit top and associated activities.

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This letter has been prepared to inform Lake Macquarie City Council (LMCC) of the proposed modifications to MP 10_0080 (ie Myuna Colliery) and SSD-5145 (ie Northern Coal Logistics Project). It provides a brief description of the proposed modifications and a summary of the proposed assessment approach.

2. Background

Run-of-mine (ROM) coal produced at Myuna Colliery is transferred from the mine's pit top to the Eraring Power Station by overland conveyor. When coal extracted at the mine does not meet Eraring Power Station specifications, it is stockpiled at the mine's emergency coal stockpile until it can be reclaimed and blended with coal to meet these specifications. However, there is limited capacity to store coal at the mine's pit top prior to blending and dispatch.

The Northern Coal Logistics Project regulates coal handling, processing, and transport operations at the Newstan Colliery Surface Site, CES and associated private haul roads, and also the use of various other surface infrastructure items. The Northern Coal Logistics Project operates under SSD-5145, which was granted by the Minister for Planning on 29 September 2015.

CES is approximately 2 km north of Dora Creek in the Lake Macquarie LGA. It was originally developed as part of Cooranbong Colliery. CES comprises a coal handling plant (CHP), coal stockpiles, workshop building, administration building, car park and water management infrastructure. CES is approved to receive and process ROM coal from Mandalong Mine. Coal handled at CES can be delivered to Eraring Power Station via overland conveyor or to Newstan Colliery for further processing and transfer into the export market.

In recent months, Centennial Myuna has been experiencing fluctuations in the quality of coal produced from underground mining operations at Myuna Colliery. A reduction in coal quality has potential to impact infrastructure at Eraring Power Station. Centennial Myuna has considered a number of options to ensure that it can continue to meet its contractual obligations to supply coal to Eraring Power Station.

Myuna Colliery has approval to employ up to 300 fulltime equivalent (FTE) personnel. Failure to provide coal of sufficient quality to Eraring Power Station could risk the ongoing employment of the mine's workforce.

3. Proposed Modification

To ensure that Myuna Colliery can continue to meet its contractual obligations to supply coal to Eraring Power Station and secure ongoing employment for the mine's workforce, Centennial Myuna propose to blend coal from Myuna Colliery with coal from Mandalong Mine both on-site at the mine's pit top and at CES.

Subsequently, Centennial Myuna propose to modify MP 10_0080 to allow:

- up to 1 million tonnes per annum (Mtpa) of Myuna Colliery coal to be trucked from Myuna Colliery's pit top to CES via the public and private road networks – to be blended with coal from Mandalong Mine before transfer to Eraring Power Station by conveyor;

- up to 0.2 Mtpa of Mandalong Mine coal to be backloaded from CES to Myuna Colliery's pit top– to be blended with coal from Myuna Colliery before transfer to Eraring Power Station by conveyor; and

- construction and operation of a vehicle weighbridge at Myuna Colliery's pit top.

At the same time, Centennial NCS propose to modify SSD-5145 to allow:

- up to 1 Mtpa of Myuna Colliery coal to be delivered to, and handled at, CES;
- an increase in the total volume of coal that can be received at the 3,000 t middlings stockpile at CES from 500,000 tpa to 1.5 Mtpa; and
- up to 0.2 Mtpa of Mandalong Mine coal to be to be backloaded from CES to Myuna Colliery's pit top.

To transport coal between the mine's pit top and CES, trucks will need to access the public road network (including Wangi Road and Wilton Road) between Myuna Colliery and the Awaba Colliery surface site. A private haul road connecting the Awaba Colliery surface site to CES will then be used by trucks to transport the coal from Myuna Colliery on to CES (and vice versa). The proposed haulage route is shown on **Figure 1**. This route avoids the need for trucks to travel through residential areas. There are no residences immediately adjacent to, or with direct access from, the relevant sections of Wangi Road or Wilton Road.

Truck movements between Myuna Colliery's pit top and CES will be limited to daytime hours only (ie 7.00 am–6.00 pm) Monday to Saturday. There will be a maximum of 10 loaded trucks per hour departing from either Myuna Colliery's pit top (via a privately-owned section of Wangi Point Road) or CES (via Awaba Colliery surface site). Between 3.00 pm and 4.00 pm Monday to Friday, truck movements will be restricted to five loaded trucks per hour to further avoid potential impacts on the local road network's existing peak hour period.

Truck numbers along the private haul road network between the Awaba Colliery surface site and CES will be within previously assessed and approved limits under SSD-5145 (ie 32 two-way truck movements per hour). The total volume of coal that will be handled at Myuna Colliery's pit top and CES will not exceed the previously assessed and approved limits of 3 Mtpa and 6 Mtpa, respectively.

All trucks leaving Myuna Colliery will be weighed using a new vehicle weighbridge that will be constructed at the mine's pit top. A truck wheel wash will also be used by all trucks before leaving site.

Similarly, all trucks leaving CES will be weighed using an existing vehicle weighbridge. The existing truck wheel wash will also be used by all trucks before leaving CES.

4. Approval Pathway

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.

Centennial Myuna and Centennial NCS are seeking to modify MP 10_0080 and SSD-5145, respectively, pursuant to Section 4.55(2) of the EP&A Act, to allow for the transfer of coal between Myuna Colliery's pit top and CES and associated activities.

The proposed modifications will allow Centennial Myuna to continue to extract coal resources utilising existing approved infrastructure and will secure the ongoing employment of the mine's workforce.

No revisions to the project approval boundary (MP 10_0080) or project application area (SSD-5145) are required as part of the proposed modifications. The proposed modifications will not change:

- the approved life of mining operations at Myuna Colliery;

- Myuna Colliery's approved extraction rate (ie 3 Mtpa);
- the total volume of coal that can be received and handled at CES; or
- the total volume of coal that can be transferred to Newstan Colliery or Eraring Power Station from CES.

5. Proposed environmental assessment requirements

Two separate modification reports (MRs) will be submitted to DPIE to support the modification applications. The MRs will include:

- overviews of the proposed modifications;
- strategic context for the proposed modifications;
- justification for the proposed modifications; and
- alternatives considered.

Quantitative assessments of air quality and noise will be undertaken with reference to existing limits in the developments consents as well as criteria established in accordance with relevant NSW Government guidelines. The assessments will include modelling results for existing and proposed operations and provide recommendations for additional mitigation and management measures (where required).

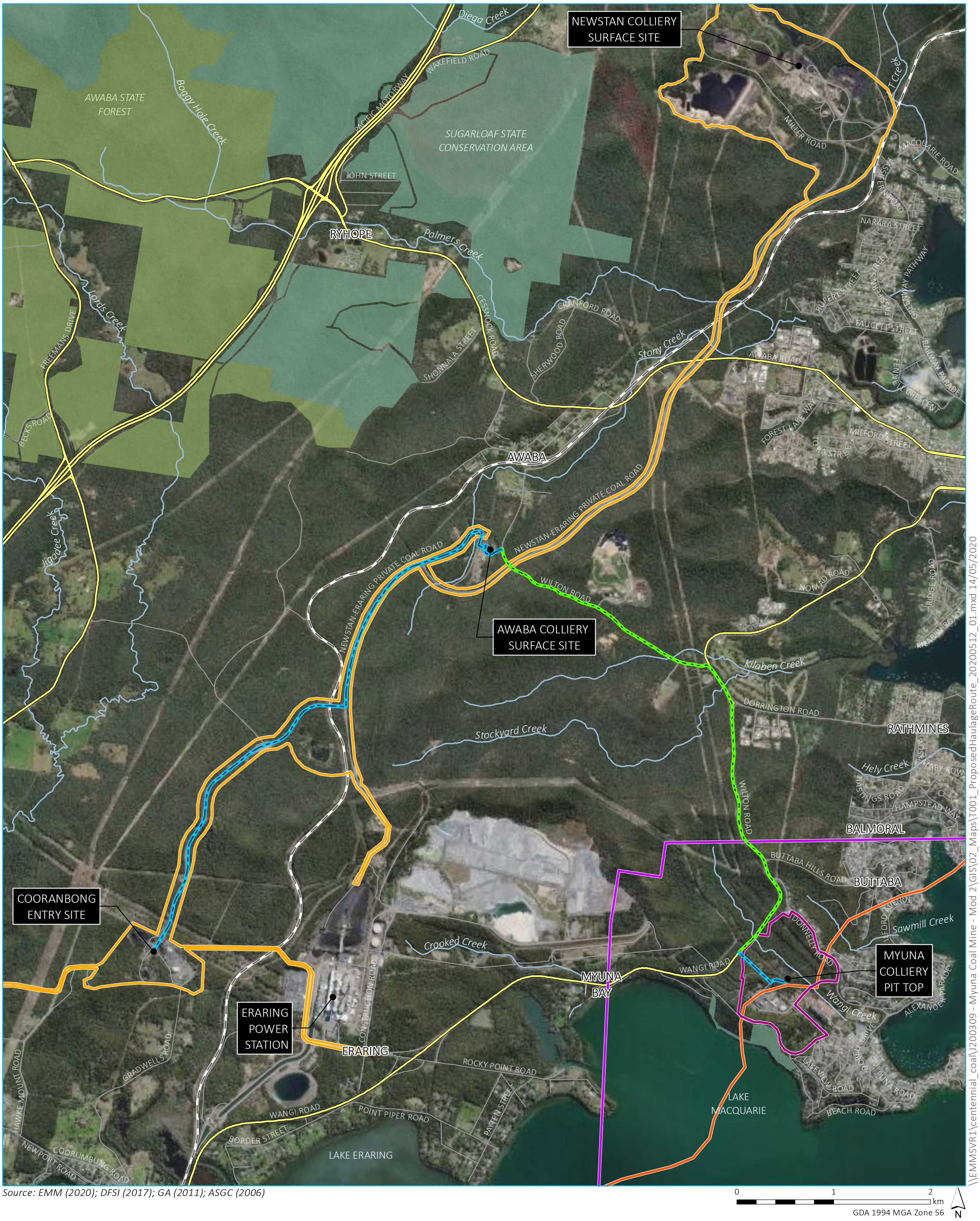
A traffic impact assessment will also be undertaken to assess the potential impacts on the public road network between Myuna Colliery's pit top and the Awaba Colliery surface site. As noted in Section 3, to reduce potential adverse impacts on existing users of the local road network between Myuna Colliery's pit top and the Awaba Colliery surface site, there will be a maximum of 10 loaded trucks per hour departing from either Myuna Colliery's pit top or CES. Between 3.00 pm and 4.00 pm Monday to Friday, truck movements will be restricted further to only five loaded trucks per hour.

6. Closing

We would welcome the opportunity to discuss the proposed modifications in further detail. Should you have any questions or if you would like to arrange a time for a more detailed briefing, please do not hesitate to contact me on 0407 207 530 or james.wearne@centennialcoal.com.au.

Yours sincerely

James Wearne
Group Manger Approvals



Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006)

KEY

- Rail line
- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest
- Myuna Colliery surface facilities area

Development consent boundaries

- Myuna Colliery development consent boundary (SH110/148)
- Myuna Colliery project approval boundary (PA 10_0080)
- Northern Coal Logistics development consent boundary (SSD-5145)

Proposed haulage route

- Private road
- Public road

Proposed haulage route between Myuna Colliery and Cooranbong Entry Site

Figure 3.1

EMM
creating opportunities

22 May 2020

Marc Desmond
Land Use Assessment Hunter Region
Roads and Maritime Services
Locked Bag 2030
Newcastle NSW 2300

Dear Marc

RE: Proposed Modification to the development consents for Myuna Colliery (MP 10_0080) and Northern Coal Logistics Project (SSD-5145)

1. Introduction

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This letter has been prepared to inform Roads and Maritime Services (RMS) of the proposed modifications to MP 10_0080 (ie Myuna Colliery) and SSD-5145 (ie Northern Coal Logistics Project). It provides a brief description of the proposed modifications and a summary of the proposed assessment approach.

2. Background

Run-of-mine (ROM) coal produced at Myuna Colliery is transferred from the mine's pit top to the Eraring Power Station by overland conveyor. When coal extracted at the mine does not meet Eraring Power Station specifications, it is stockpiled at the mine's emergency coal stockpile until it can be reclaimed and blended with coal to meet these specifications. However, there is limited capacity to store coal at the mine's pit top prior to blending and dispatch.

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In recent months, Centennial Myuna has been experiencing fluctuations in the quality of coal produced from underground mining operations at Myuna Colliery. A reduction in coal quality has potential to impact infrastructure at Eraring Power Station. Centennial Myuna has considered a number of options to ensure that it can continue to meet its contractual obligations to supply coal to Eraring Power Station.

Myuna Colliery has approval to employ up to 300 fulltime equivalent (FTE) personnel. Failure to provide coal of sufficient quality to Eraring Power Station could risk the ongoing employment of the mine's workforce.

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Subsequently, Centennial Myuna propose to modify MP 10_0080 to allow:

- up to 1 million tonnes per annum (Mtpa) of Myuna Colliery coal to be trucked from Myuna Colliery's pit top to CES via the public and private road networks – to be blended with coal from Mandalong Mine before transfer to Eraring Power Station by conveyor;

- up to 0.2 Mtpa of Mandalong Mine coal to be backloaded from CES to Myuna Colliery's pit top– to be blended with coal from Myuna Colliery before transfer to Eraring Power Station by conveyor; and

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At the same time, Centennial NCS propose to modify SSD-5145 to allow:

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To transport coal between the mine's pit top and CES, trucks will need to access the public road network (including Wangi Road and Wilton Road) between Myuna Colliery and the Awaba Colliery surface site. A private haul road connecting the Awaba Colliery surface site to CES will then be used by trucks to transport the coal from Myuna Colliery on to CES (and vice versa). The proposed haulage route is shown on **Figure 1**. This route avoids the need for trucks to travel through residential areas. There are no residences immediately adjacent to, or with direct access from, the relevant sections of Wangi Road or Wilton Road.

Truck movements between Myuna Colliery's pit top and CES will be limited to daytime hours only (ie 7.00 am–6.00 pm) Monday to Saturday. There will be a maximum of 10 loaded trucks per hour departing from either Myuna Colliery's pit top (via a privately-owned section of Wangi Point Road) or CES (via Awaba Colliery surface site). Between 3.00 pm and 4.00 pm Monday to Friday, truck movements will be restricted to five loaded trucks per hour to further avoid potential impacts on the local road network's existing peak hour period.

Truck numbers along the private haul road network between the Awaba Colliery surface site and CES will be within previously assessed and approved limits under SSD-5145 (ie 32 two-way truck movements per hour). The total volume of coal that will be handled at Myuna Colliery's pit top and CES will not exceed the previously assessed and approved limits of 3 Mtpa and 6 Mtpa, respectively.

All trucks leaving Myuna Colliery will be weighed using a new vehicle weighbridge that will be constructed at the mine's pit top. A truck wheel wash will also be used by all trucks before leaving site.

Similarly, all trucks leaving CES will be weighed using an existing vehicle weighbridge. The existing truck wheel wash will also be used by all trucks before leaving CES.

4. Approval Pathway

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.

Centennial Myuna and Centennial NCS are seeking to modify MP 10_0080 and SSD-5145, respectively, pursuant to Section 4.55(2) of the EP&A Act, to allow for the transfer of coal between Myuna Colliery's pit top and CES and associated activities.

The proposed modifications will allow Centennial Myuna to continue to extract coal resources utilising existing approved infrastructure and will secure the ongoing employment of the mine's workforce.

No revisions to the project approval boundary (MP 10_0080) or project application area (SSD-5145) are required as part of the proposed modifications. The proposed modifications will not change:

- the approved life of mining operations at Myuna Colliery;

- Myuna Colliery's approved extraction rate (ie 3 Mtpa);
- the total volume of coal that can be received and handled at CES; or
- the total volume of coal that can be transferred to Newstan Colliery or Eraring Power Station from CES.

5. Proposed environmental assessment requirements

Two separate modification reports (MRs) will be submitted to DPIE to support the modification applications. The MRs will include:

- overviews of the proposed modifications;
- strategic context for the proposed modifications;
- justification for the proposed modifications; and
- alternatives considered.

Quantitative assessments of air quality and noise will be undertaken with reference to existing limits in the developments consents as well as criteria established in accordance with relevant NSW Government guidelines. The assessments will include modelling results for existing and proposed operations and provide recommendations for additional mitigation and management measures (where required).

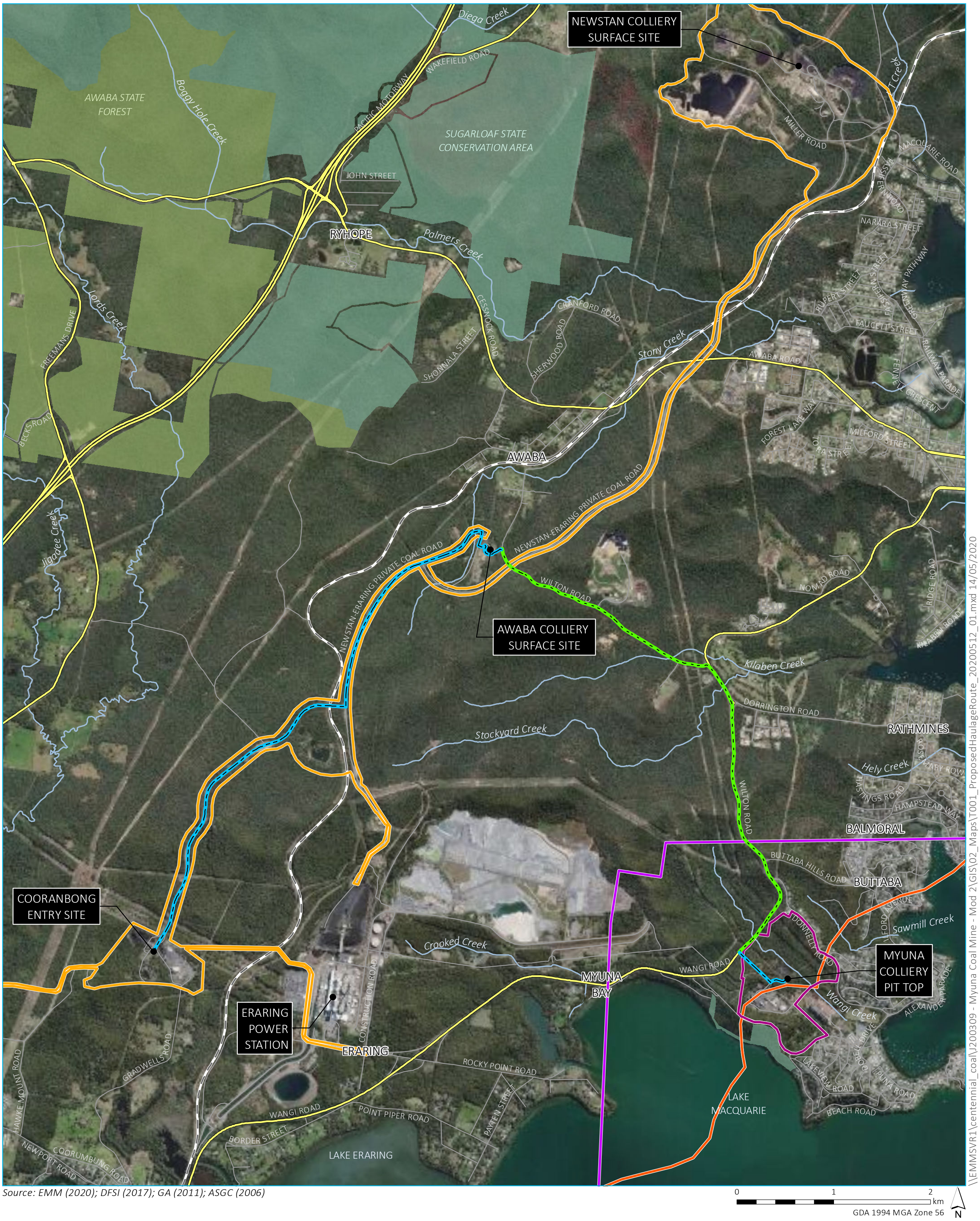
A traffic impact assessment will also be undertaken to assess the potential impacts on the public road network between Myuna Colliery's pit top and the Awaba Colliery surface site. As noted in Section 3, to reduce potential adverse impacts on existing users of the local road network between Myuna Colliery's pit top and the Awaba Colliery surface site, there will be a maximum of 10 loaded trucks per hour departing from either Myuna Colliery's pit top or CES. Between 3.00 pm and 4.00 pm Monday to Friday, truck movements will be restricted further to only five loaded trucks per hour.

6. Closing

We would welcome the opportunity to discuss the proposed modifications in further detail. Should you have any questions or if you would like to arrange a time for a more detailed briefing, please do not hesitate to contact me on 0407 207 530 or james.wearne@centennialcoal.com.au.

Yours sincerely

James Wearne
Group Manger Approvals



KEY

- Rail line
- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest
- Myuna Colliery surface facilities area

Development consent boundaries

- Myuna Colliery development consent boundary (SH110/148)
- Myuna Colliery project approval boundary (PA 10_0080)
- Northern Coal Logistics development consent boundary (SSD-5145)

Proposed haulage route

- Private road
- Public road

Proposed haulage route between Myuna Colliery and Cooranbong Entry Site

Figure 3.1

EMM creating opportunities

Approvals Update

OUR WAY IN ENERGY

Myuna MOD 2 & Northern Coal Logistics MOD 2

- Centennial is seeking to modify the Myuna Colliery development consent (MP 10_0080) and Northern Coal Logistics consent (SSD 5145) to allow for the transfer of coal between Myuna Colliery's pit top and the Cooranbong Entry Site.
- Modification required to enable blending of Myuna Coal to meet power station coal quality requirements.
- A Modification Report is currently being prepared.

Myuna MOD 2

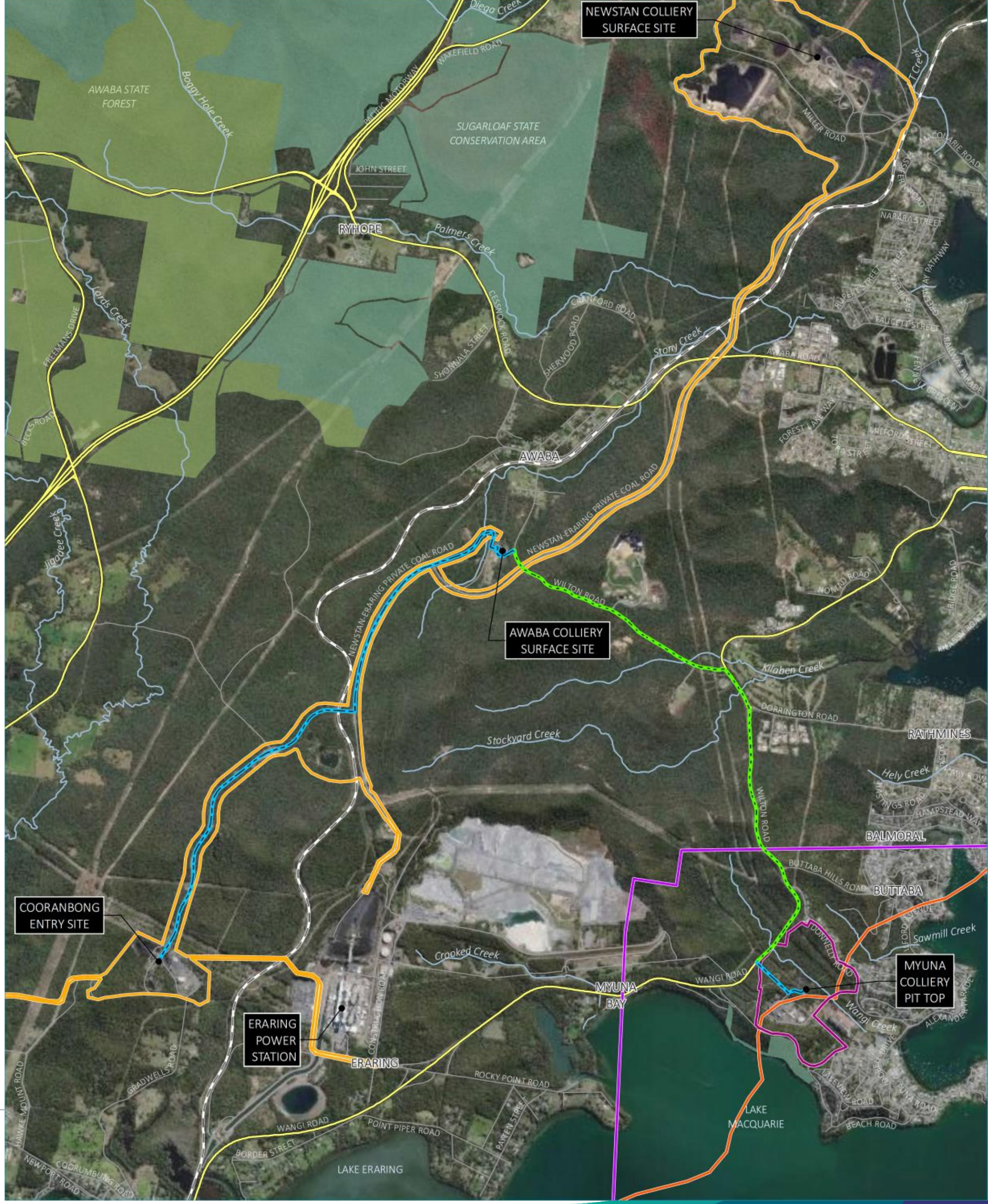
- Myuna propose to modify MP 10_0080 to allow:
  - up to 1 million tonnes per annum (Mtpa) of Myuna Colliery coal to be trucked from Myuna Colliery's pit top to CES via the public and private road networks – to be blended with coal from Mandalong Mine before transfer to Eraring Power Station by conveyor;
  - up to 0.2 Mtpa of Mandalong Mine coal to be backloaded from CES to Myuna Colliery's pit top– to be blended with coal from Myuna Colliery before transfer to Eraring Power Station by conveyor; and
  - construction and operation of a vehicle weighbridge at Myuna Colliery's pit top.

Northern Coal Logistics MOD 2

- Northern Coal Services propose to modify SSD 5145 to allow:
  - up to 1 Mtpa of Myuna Colliery coal to be delivered to, and handled at, CES;
  - an increase in the total volume of coal that can be received at the 3,000 t middlings stockpile at CES from 500,000 tpa to 1.5 Mtpa; and
  - up to 0.2 Mtpa of Mandalong Mine coal to be to be backloaded from CES to Myuna Colliery's pit top.

Proposed Haulage Route

- The proposed haulage route avoids the need for trucks to travel through residential areas.
- Truck movements between Myuna Colliery's pit top and CES will be limited to daytime hours only (ie 7.00 am–6.00 pm) Monday to Saturday.
- There will be a maximum of 10 loaded trucks per hour and only 5 loaded trucks per hour during 3-4pm to minimise potential impacts on the local road network.



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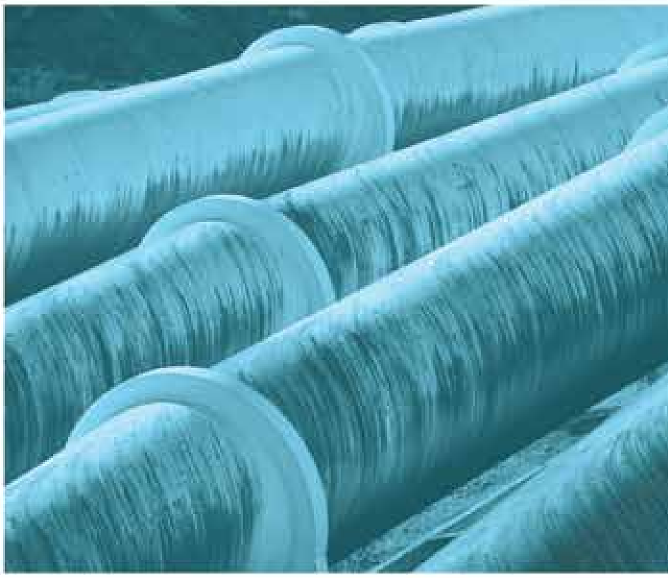
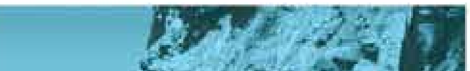


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