



Appendix I

Charbon Colliery - Level crossing impact assessment





Charbon Colliery - Modification 2

Level crossing impact assessment

Prepared for Charbon Coal Pty Limited
August 2020





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Charbon Colliery - Modification 2

Level crossing impact assessment

Report Number

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Client

Charbon Coal Pty Limited

Date

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Version

Final

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25 August 2020

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1 Introduction

1.1 Overview

Charbon Colliery (Charbon) is an underground and open cut coal mine owned and operated by Charbon Coal Pty Limited (Charbon Coal), a joint venture between Centennial Coal Company Limited (Centennial) and SK Networks Resources Australia Pty Ltd. Charbon is approximately 87 kilometres (km) north-west of Lithgow and 3 km south of Kandos in the Western Coalfields of New South Wales (NSW) within the Mid-Western Regional local government area (LGA) (Figure 1.1). The project site boundary shown on Figure 1.1 covers an area of 2,692 hectares (ha) (the site) and comprises historical underground workings and open cut areas.

Charbon was approved as a Major Project under the now repealed Section 75J Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) on 7 September 2010 (PA 08_0211).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

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

Charbon Coal undertakes rehabilitation and mine closure activities at the site pursuant to SSD 08_0211. While mining is permitted to continue until 31 August 2025, only rehabilitation and mine closure activities are currently being undertaken and these activities are approved to continue beyond 31 August 2025. In addition to rehabilitation activities, water is currently transferred from Charbon's existing surface water dams via rail to Centennial Airly Pty Limited's (Centennial Airly's) Airly Mine (Figure 1.1) in accordance with the relevant conditions of SSD 08_0211 and Airly's development consent (SSD-5581). Under SSD-5581, this activity is approved until 31 January 2037.

It is proposed to use coarse coal reject (CCR) material from Centennial's Clarence Colliery (Clarence) to enhance rehabilitation at Charbon. Clarence is an underground coal mining operation utilising bord and pillar mining and partial extraction techniques. It is situated in the Western Coalfields of NSW, approximately 10 km east of Lithgow in the Lithgow LGA (Figure 1.1). Clarence operates under DA 504-00 which was granted in 2005 by the NSW Department of Infrastructure, Planning and Natural Resources (now NSW Department of Planning, Industry and Environment (DPIE)). Clarence is managed by Centennial.

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

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

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

At the same time Charbon Coal is seeking to modify SSD 08_0211, Centennial will submit a modification application for DA 504-00 to allow for the exportation of CCR from Clarence to Charbon by rail.

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

Based on a review of the local rail network, each train is expected to traverse a total of 21 level crossings. Three types of level crossings have been identified along the proposed route:

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

The locations of these level crossings are shown on Figure 1.2 to Figure 1.6.

1.2 Assessment requirements

As part of consultation with DPIE on the content of the modification applications for the proposed modifications to SSD 08_0211 (29 April 2020) and DA 504-00 (7 April 2020), DPIE requested that the application identify potential impacts on the rail network.

As there are no level crossings between Clarence (Newnes Junction) and Lithgow, no operational impacts are expected to occur on this section of the rail network as a result of the proposed modification.

1.3 Purpose of the report

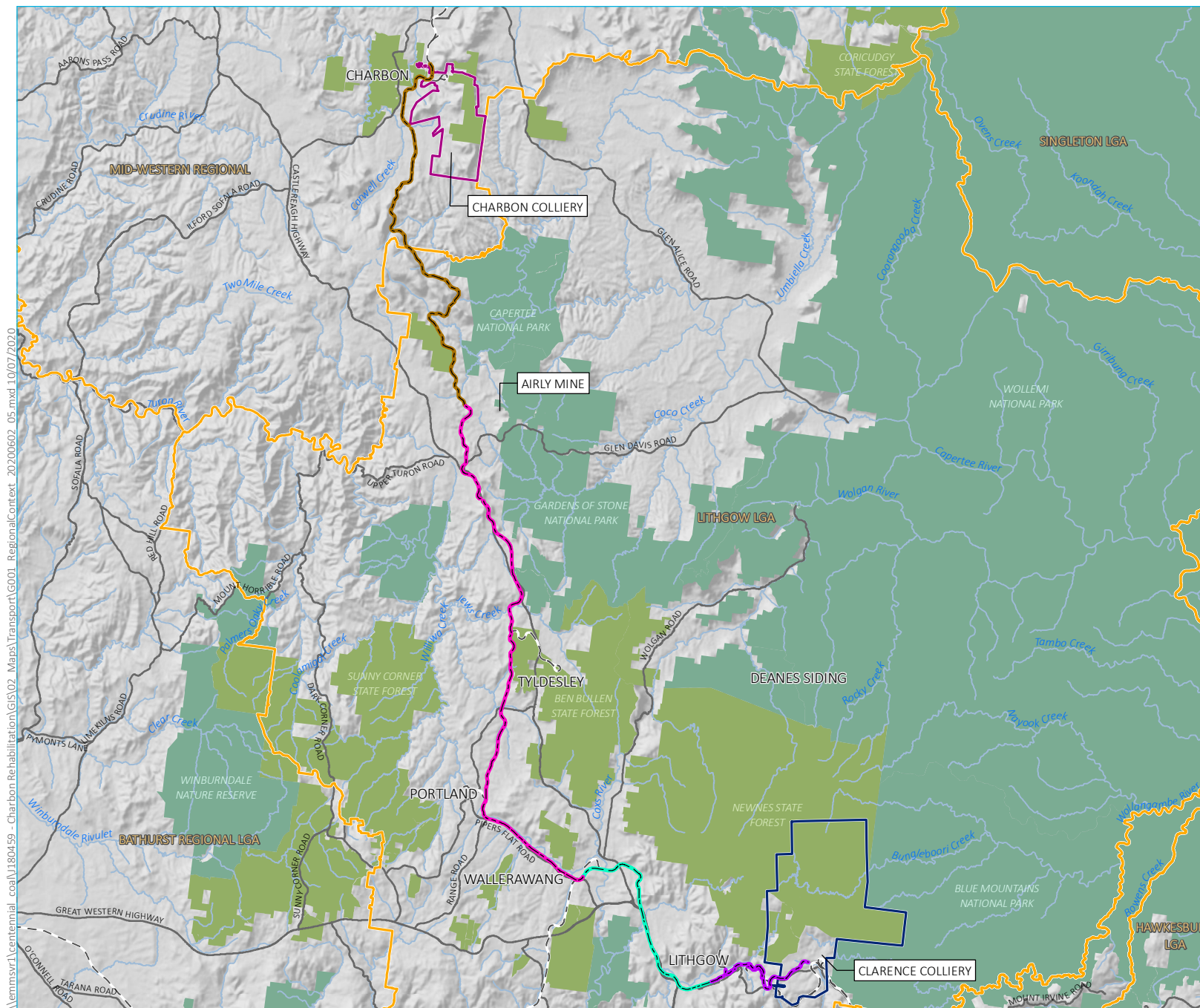
This level crossing impact assessment includes:

- a review of the rail network, existing train frequency and relevant statutory planning policies;
- the outcomes of a site inspection at each level crossing between Charbon and Clarence;
- identification of key issues or constraints at each level crossing (from the site inspection);
- an inventory of the rail crossings over the length of the route;
- a capacity and timetable constraints analysis of the existing rail network (including coal and water train movements) to accommodate the proposed transport of CCR; and
- a future level crossing traffic delay and safety assessment (including estimation of typical additional delays to vehicular traffic from the train operations associated with the proposed transport of CCR).

1.4 Community concerns

As part of the scoping stage of this assessment, Centennial noted that there has been community concern associated with existing rail movements in the Western Coalfields of NSW, including train movements at Wallerawang (associated with the operation of Lidsdale Siding), Airly Mine and Clarence. Existing train movements at Wallerawang and Airly Mine will not change as a result of the proposed transfer of CCR from Clarence to Charbon.

Of relevance to the proposed transfer of CCR from Clarence to Charbon, some residents at Newnes Village have sought clarification in relation to the number of daily train movements and potential impacts. Engagement with these residents is ongoing.



- KEY**
- Project site boundary
 - Clarence Colliery holding boundary
 - LGA boundary
 - Rail line
 - Main road
 - Watercourse
 - NPWS reserve
 - State forest
 - Study section**
 - Airly to Charbon
 - Wallerawang to Airly
 - Lithgow to Wallerawang
 - Lithgow to Clarence Colliery (Newnes Junction)

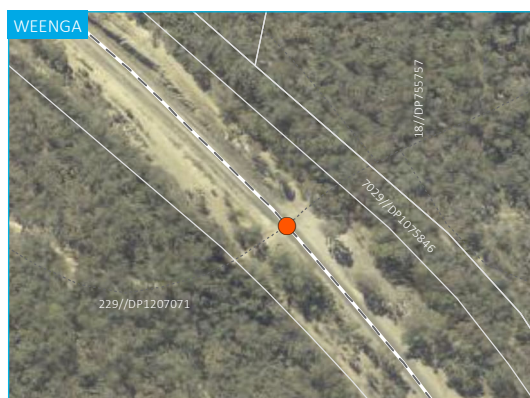
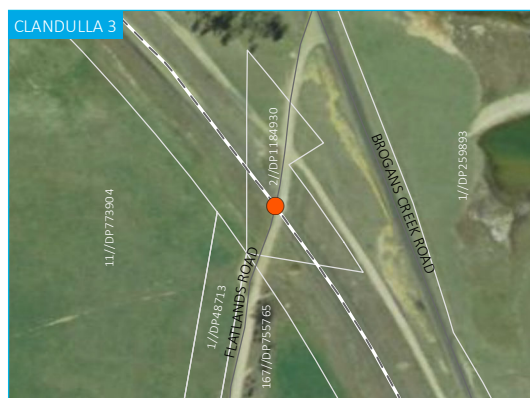
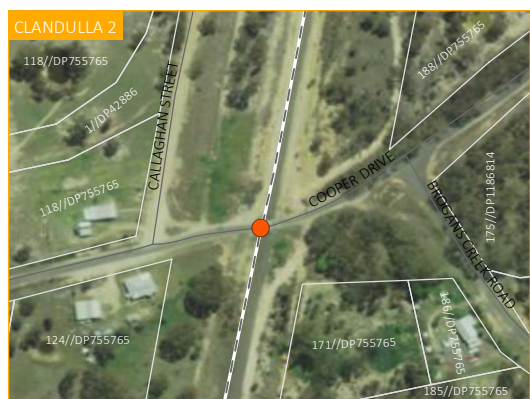
Regional context

Charbon Colliery – Modification 2
Level crossing impact assessment
Figure 1.1

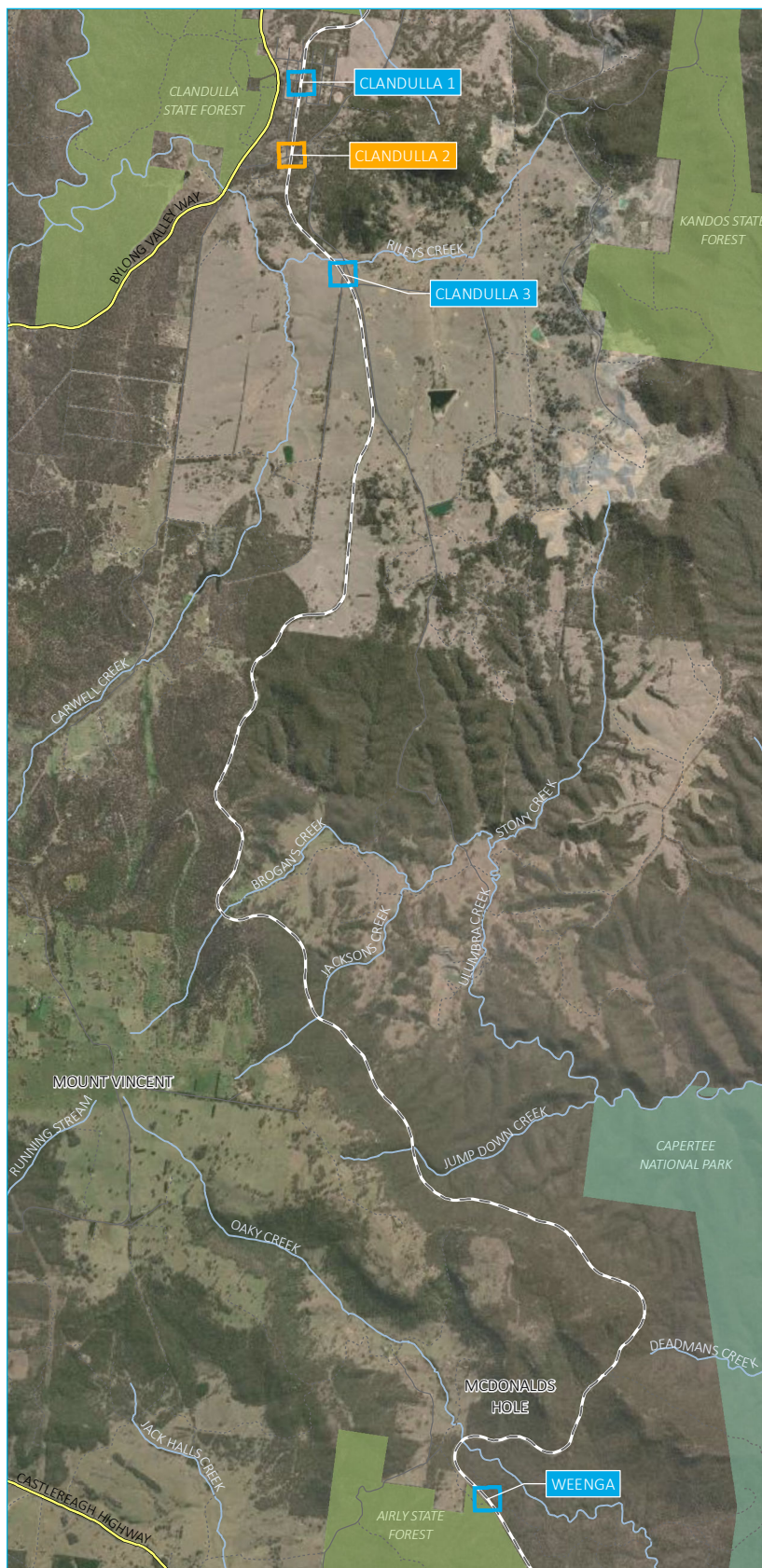


Source: EMM (2020); Centennial (2019); DFSI (2017); GA (2011)





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

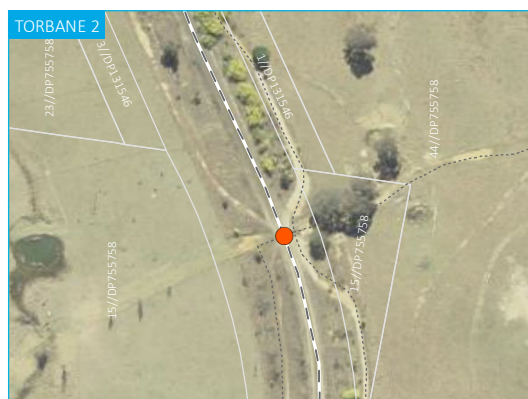
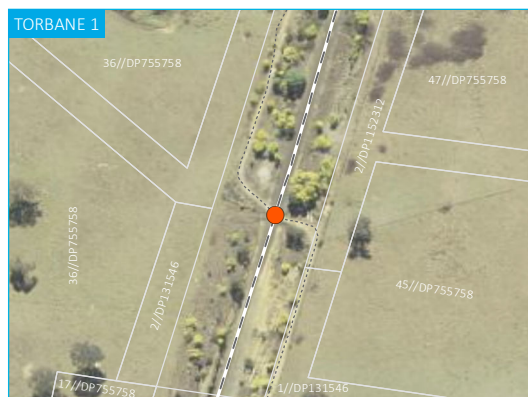
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KEY

- Rail line
- Major road
- Minor road
- Vehicular track
- Named watercourse
- NPWS reserve
- State forest
- Level crossing location
- Rail level crossings
- Passive crossing
- Active lights and bells and boom gate barriers

Rail level crossings (north)

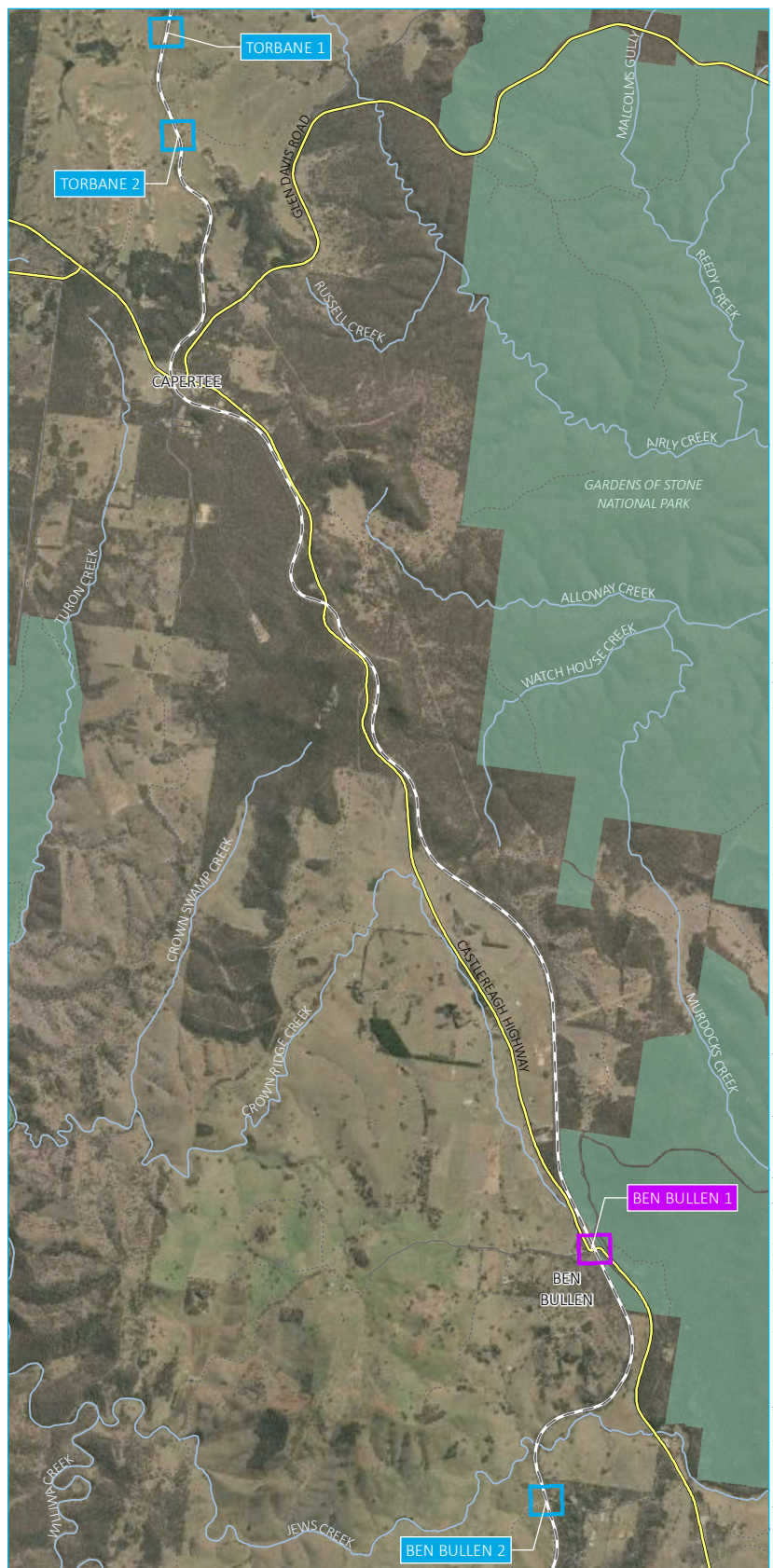
Charbon Colliery – Modification 2
Level crossing impact assessment
Figure 1.2



0 50 100
m

KEY

- Rail line
- Major road
- Minor road
- Vehicular track
- Named watercourse
- NPWS reserve
- Level crossing location
- Passive stop signs
- Active lights and bells

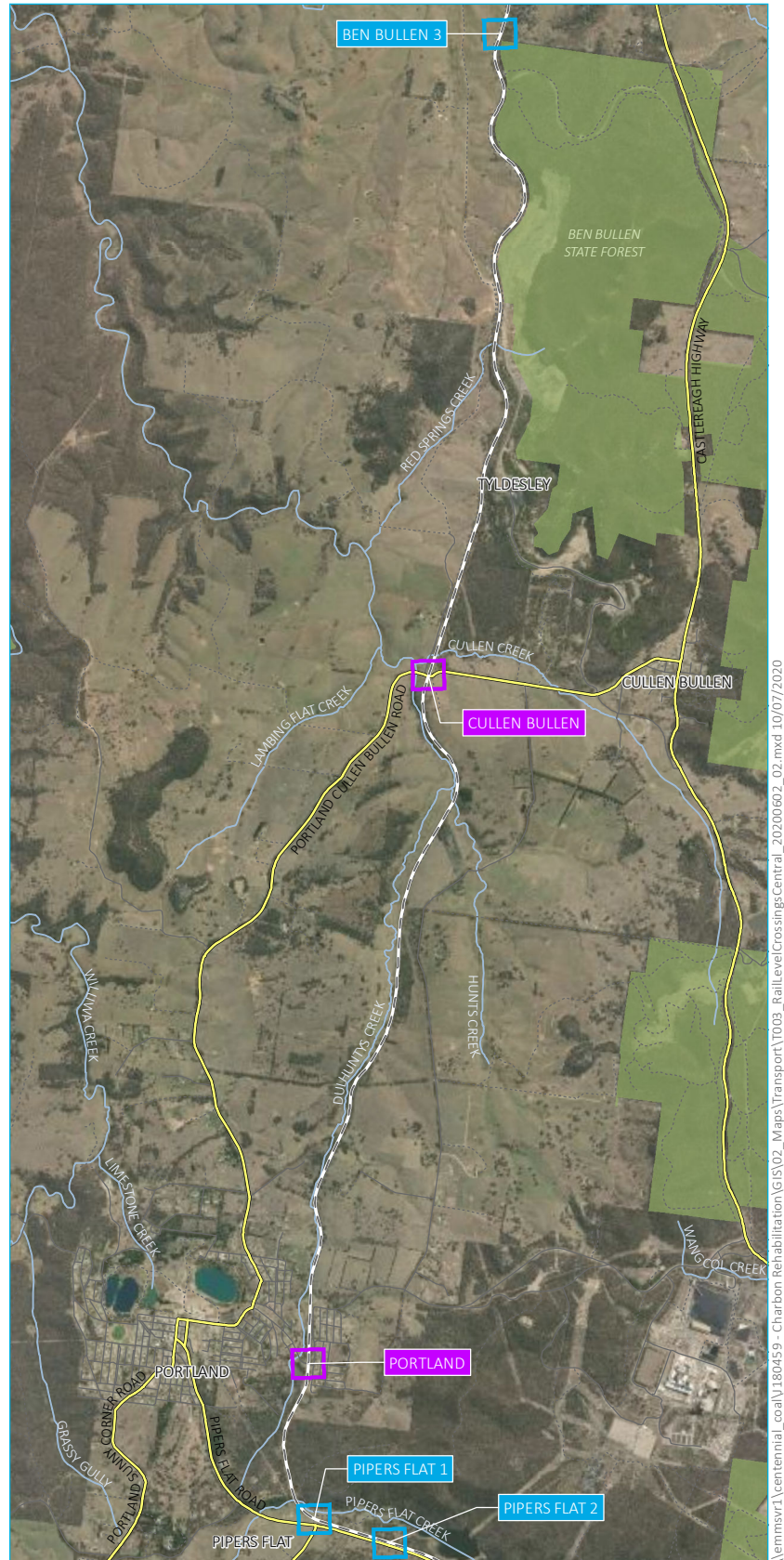
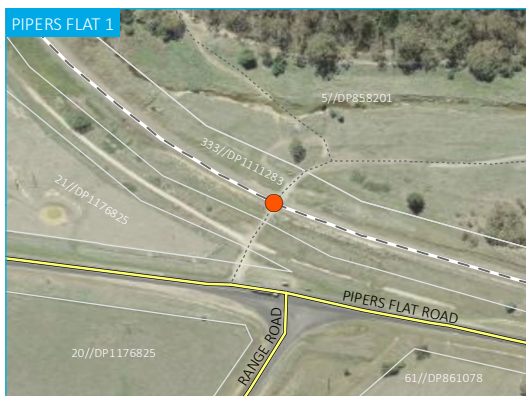
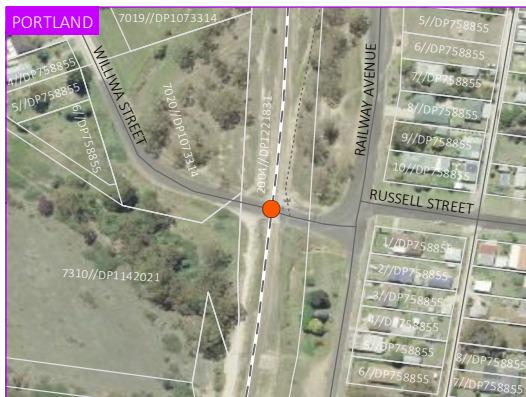
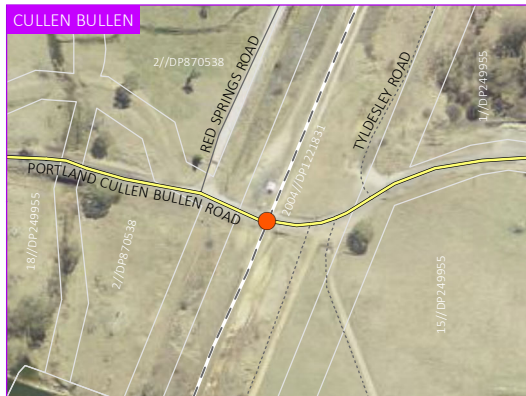


Source: EMM (2020); DfSI (2017); GA (2011); ASGC (2006)

0 0.5 1
km
GDA 1994 MGA Zone 56
N

Rail level crossings (north central)

Charbon Colliery – Modification 2
Level crossing impact assessment
Figure 1.3



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

KEY

- Rail line
- Major road
- Minor road
- Vehicular track
- Named watercourse
- State forest
- Level crossing location
- Rail level crossings
 - Passive stop signs
 - Active lights and bells

Rail level crossings (central)

Charbon Colliery – Modification 2
Level crossing impact assessment
Figure 1.4



0 50 100
m

KEY

- Rail line
- Major road
- Minor road
- Vehicular track
- Named watercourse
- State forest
- Level crossing location
- Rail level crossings
- Passive stop signs

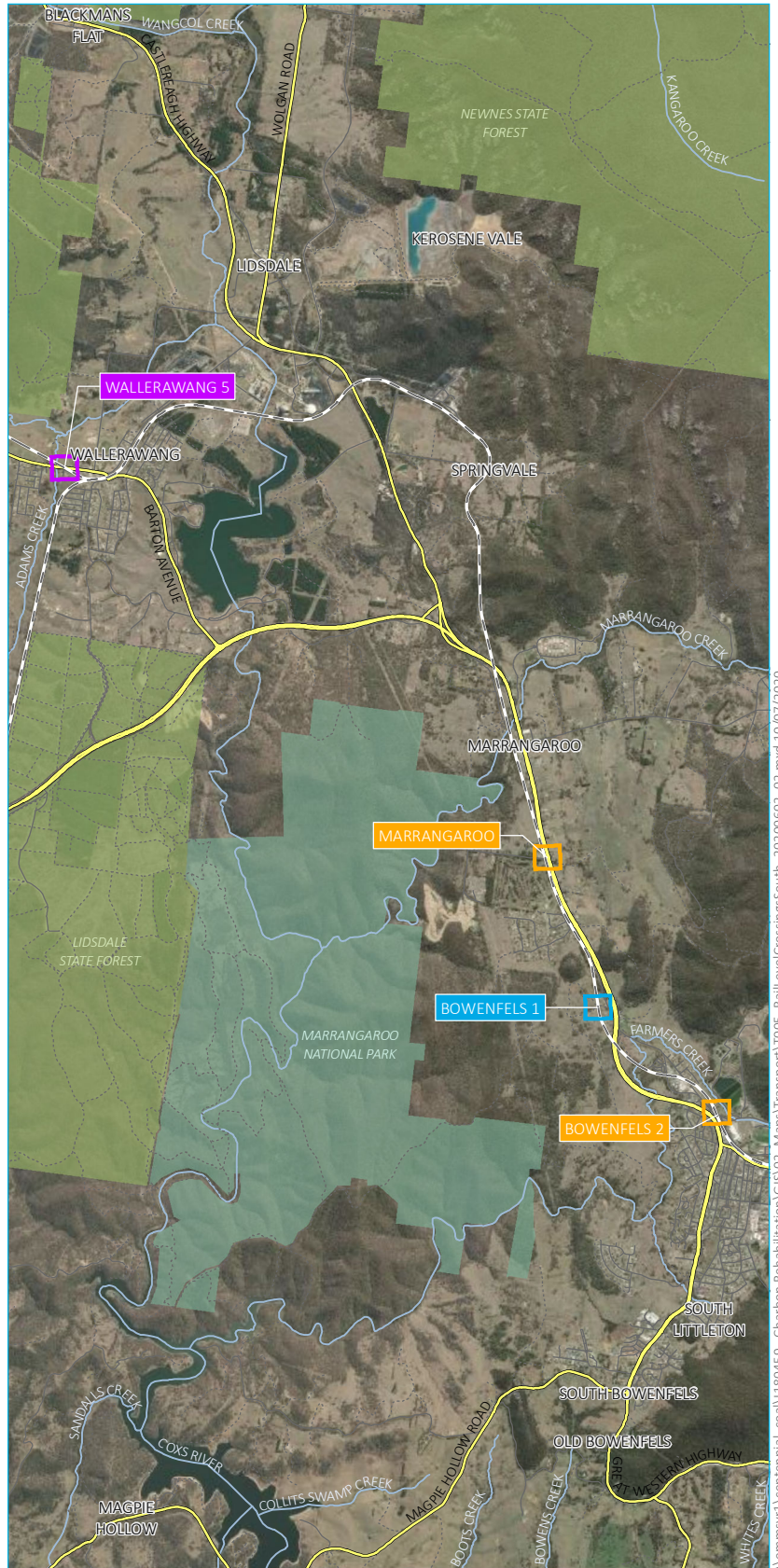
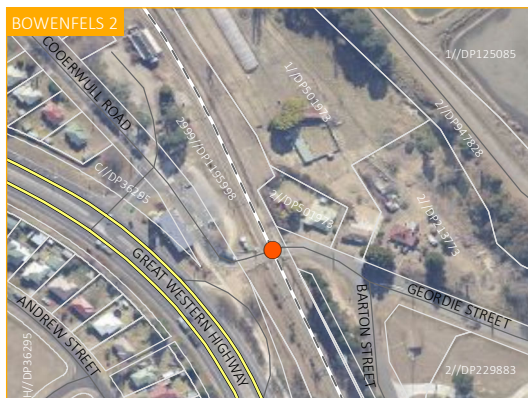


Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006)

0 0.5 1
km
GDA 1994 MGA Zone 56
N

Rail level crossings (south central)

Charbon Colliery – Modification 2
Level crossing impact assessment
Figure 1.5



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

KEY

- Rail line
- Major road
- Minor road
- Vehicular track
- Named watercourse
- NPWS reserve
- State forest
- Level crossing location
- Rail level crossings
 - Passive stop signs
 - Active lights and bells
 - Active lights and bells and boom gate barriers

Rail level crossings (south)

Charbon Colliery – Modification 2
Level crossing impact assessment
Figure 1.6

2 Existing rail network

The rail network between Charbon and Clarence (Figure 1.1) is jointly managed by Sydney Trains and John Holland:

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

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

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

The Country Rail Network line is currently used by the following trains:

- an infrequent heritage train;
- a water train – daily between Airly Mine and Charbon on weekdays (may be discontinued in 2020 due to improved water security at Airly Mine); and
- coal trains, including:
 - 4 trains weekly between Airly Mine and Lidsdale Siding;
 - 4 night trains weekly between Airly Mine and Port of Newcastle; and
 - 2 trains weekly between Airly Mine and domestic power stations (including Eraring and Vales Point).

These train movements correspond to approximately four train movements daily (two in each direction) on the Country Rail Network line between Wallerawang and Airly Mine and approximately two train movements daily (one in each direction) on the Country Rail Network line between Airly Mine and Charbon.

The existing daily train movements on the Main Western line between Lithgow and Wallerawang are significantly greater than between Wallerawang and Airly/Charbon and are summarised in Table 2.1.

Table 2.1 Daily train movements between Lithgow and Wallerawang (two-way)

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

3 Proposed rail movements

3.1 Timing of proposed train

The proposed transport of CCR from Clarence to Charbon will be via one loaded train daily (ie two train movements with the empty train returning to Lithgow Siding). The train will stop or idle at Clarence for approximately 2.5 hours for loading and shunting and at Charbon for approximately 3.5 hours for unloading and shunting. The intended timing of the train is summarised in Table 3.1.

Table 3.1 Proposed timing for daily CCR train movements

Location	Arrival	Departure
Lithgow Siding	-	06:00
Newnes Junction	06:20	06:30
Clarence Colliery	06:35	09:00
Newnes Junction	09:10	09:20
Wallerawang Junction	-	09:47
Airly Junction	-	10:36
Charbon Colliery	11:15	14:45
Airly Junction	-	15:36
Wallerawang Junction	-	16:36
Lithgow Siding	16:55	-

3.2 Train operating speeds

The average line speeds for the proposed CCR train operations have been calculated in Table 3.2, based on the proposed route lengths and the proposed train operating details (Table 3.1).

Table 3.2 Train operating speeds

Line section	Length (km)	Travel time northbound (minutes)	Average speed northbound (km/hr)	Travel time southbound (minutes)	Average speed southbound (km/hr)
Newnes Junction to Lithgow Siding	14.1	13	65	20	42
Lithgow Siding to Wallerawang	15.8	14	68	19	50
Wallerawang to Airly Junction	40.4	49	49	60	40
Airly Junction to Charbon Junction	32.4	37	53	46	42

As shown in Table 3.2, the range of typical train operating speeds at various locations along the line between Lithgow and Charbon will generally be between 40 km/hr and 60 km/hr, with trains generally travelling faster in the northbound (uphill) direction.

3.3 Capacity constraints on the rail network

None of the affected sections of the rail network are considered to have any significant capacity constraints that would potentially affect the proposed CCR train movements in either direction.

The Lithgow to Wallerawang section of the Main Western Line currently has 25 (two-way total) daily train movements, which is on average one train every two hours in each direction. The line is double track and this current level of usage does not present any significant capacity or timetabling constraints to the proposed CCR train movements.

East of Lithgow towards Clarence, there are three additional electric passenger train movements in each direction each weekday, which travel to and from Sydney's Central Station. Even with these additional train movements using the lines east of Lithgow, there is still adequate capacity for the proposed CCR train movements.

North-west of Wallerawang, to and from Airly and Charbon, where the line is only single track, the current average weekday train movements are significantly less frequent. Typically, there are two trains per day in each direction between Wallerawang and Airly and one per day in each direction between Airly and Charbon. There is adequate capacity for the proposed CCR train movement in each direction on these sections of the route.

4 Impact assessment

4.1 Level crossing operations

An inspection of the level crossings between Charbon and Clarence was carried out on 5–6 May 2020. Twenty-one operational level crossings were identified along the rail line between the two operations.

The inspection record and inventory details of each level crossing are included in Appendix A. A ten-minute sample count of road traffic movements was undertaken at each level crossing for the purposes of estimating the likely daily range of road traffic movements.

The current type of level crossing control and associated road and rail traffic volumes is summarised in Table 4.1.

Table 4.1 Existing controls and approximate traffic volumes at level crossings

Figure reference	Level crossing	Level crossing location	Type of control	Daily road traffic volume range	Existing daily train movements
Figure 1.2	Clandulla 1	Canary Street, Clandulla	Passive -stop signs	50-100	2
Figure 1.2	Clandulla 2	Cooper Drive, Clandulla	Active (boom barrier, flashing lights and bells)	150-300	2
Figure 1.2	Clandulla 3	Flatlands Road off Brogans Creek Road, Clandulla	Passive -stop signs	<20	2
Figure 1.2	Weenga	Minor road off McDonalds Hole Road, Weenga	Passive -stop signs	<20	2
Figure 1.3	Torbane 1	Minor road, Torbane	Passive -stop signs	Private and service traffic only*	4
Figure 1.3	Torbane 2	Minor road, Torbane	Passive -stop signs	Private and service traffic only*	4
Figure 1.3	Ben Bullen 1	Castlereagh Highway, Ben Bullen	Active (flashing lights and bells)	500-1,000	4
Figure 1.3	Ben Bullen 2	Red Springs Road, Ben Bullen	Passive -stop signs	<20	4
Figure 1.4	Ben Bullen 3	Minor road south of Red Springs Road, Ben Bullen	Passive -stop signs	Service traffic only*	4
Figure 1.4	Cullen Bullen	Portland Cullen Bullen Road, Cullen Bullen	Active (flashing lights and bells)	500-1,000	4
Figure 1.4	Portland	Williwa Street, Portland	Active (flashing lights and bells)	Approximately 1,000	4
Figure 1.4	Pipers Flat 1	Minor road off Pipers Flat Road near Range Road, Wallerawang	Passive -stop signs	<20	4
Figure 1.4	Pipers Flat 2	Minor road off Pipers Flat Road, Wallerawang	Passive -stop signs	<20*	4
Figure 1.5	Wallerawang 1	Minor road off Pipers Flat Road near Irondale Road, Wallerawang	Passive -stop signs	<20	4
Figure 1.5	Wallerawang 2	Minor road off Pipers Flat Road, Wallerawang	Passive -stop signs	<20	4
Figure 1.5	Wallerawang 3	Minor road off Pipers Flat Road, Wallerawang	Passive -stop signs	<20*	4
Figure 1.5	Wallerawang 4	Minor road off Pipers Flat Road, Wallerawang	Passive -stop signs	<20	4
Figure 1.6	Wallerawang 5	Pipers Flat Road, Wallerawang	Active (flashing lights and bells)	3,000-4,000	4
Figure 1.6	Marrangaroo	Oakey Forest Road, Marrangaroo	Active (boom barrier, flashing lights and bells)	500-1,000	25
Figure 1.6	Bowenfels 1	Minor road off Great Western Highway, Bowenfels	Passive -stop signs	<20	25
Figure 1.6	Bowenfels 2	Geordie Street, Bowenfels	Active (boom barrier, flashing lights and bells)	Approximately 2,000	25

*Inaccessible during site inspection

The sight distances for road traffic to observe any approaching train are important, especially at passive level crossings where the road traffic needs to stop and check for any approaching train. The current visibility to the left and right, for each side of the passive level crossings that were accessible (no locked gates) are illustrated in Plate 4.1 through Plate 4.7.

Generally, the observed rail corridor sight distances were a minimum of 200–300 m either side of each level crossing which is acceptable for train travel speeds of up to 80 km/hr and typically most sight distances were in the range 300-500 m which is acceptable for train travel speeds of up to 100 km/hr.



Plate 4.1 Sight distances from Canary Street (Clandulla 1)



Plate 4.2 **Sight distances from Flatlands Road off Brogans Creek Road (Clandulla 3)**



Plate 4.3 Sight distances from minor road off Pipers Flat Road near Range Road (Pipers Flat 1)



Plate 4.4 **Sight distances from minor road off Pipers Flat Road near Irondale Road (Wallerawang 1)**



Plate 4.5 **Sight distances from minor road off Pipers Flat Road (Wallerawang 2)**



Plate 4.6 **Sight distances from minor road off Pipers Flat Road (Wallerawang 4)**



Plate 4.7 **Sight distances from minor road off Great Western Highway (Bowenfels 1)**

4.2 Level crossing delays

4.2.1 Active level crossings

The typical delays to road traffic at level crossings, when a train is passing, are determined by consideration of a number of factors.

The first delay factor is the warning time for road users prior to the arrival of a train at the level crossing. The Australian Rail Track Corporation (ARTC) standard for single track railway level crossings using flashing lights and warning bells is 25 seconds advance warning time (ARTC 2005).

During the site inspection, two passenger trains were observed during the level crossing inspection at Geordie Street, Bowenfels (Bowenfels 2), which is a dual track level crossing on the western main line (Photograph 4.1 and Photograph 4.2). The observed warning times and other delay components for road traffic at this active level crossing (boom barrier, flashing lights and bells) were recorded (Table 4.2).

Table 4.2 Level crossing delays at Bowenfels 2

Delay factors	Passenger train 1 (seconds)	Passenger train 2 (seconds)
Warning time	45	41
Train passing time	5	11
Time out	3	3
Total(s)	53	55

As a conservative approach, the maximum observed warning time of 45 seconds should be adopted for the calculation of typical road traffic delays at all the active level crossings considered as part of this assessment.

The second delay factor is the 'passing time' taken for the train to traverse the level crossing. This time is based on train length and speed. From Table 4.2, the typical passing time for a passenger train was 5–11 seconds.

In addition to the passenger train observations, a single loaded coal train was also observed traversing the passive level crossing at Red Springs Road, Ben Bullen (Ben Bullen 2) which had an observed passing time of 70 seconds (Photograph 4.3). Freight trains do not normally pass each level crossing at their maximum speed. Assuming the loaded coal trains are normally operating at lower average speeds than the empty coal trains, the corresponding typical passing time for an empty coal train is estimated at approximately 47 seconds (ie 70×0.66).

The third factor is the small allowance once the train has cleared the level crossing for the deactivation of the warning systems. For this assessment, the observed nominal time of 3 seconds has been adopted. With the total warning, passing and clearance times, the typical existing delay times for all passenger and freight trains at an 'active' type level crossing are:

- for passenger trains $(45 + 11 + 3) = 59$ seconds at each active level crossing;
- for loaded freight trains $(45 + 70 + 3) = 118$ seconds at each active level crossing; and
- for empty freight trains $(45 + 47 + 3) = 95$ seconds at each active level crossing.



Photograph 4.1 **Passenger train 1 traversing the level crossing at Bowenfels 2**



Photograph 4.2 **Passenger train 2 traversing the level crossing at Bowenfels 2**



Photograph 4.3 Coal train traversing Ben Bullen 2

4.2.2 Passive level crossings

It is noted that the typical road traffic delays occurring at passive level crossings (stop sign controlled) would normally involve a shorter waiting time than at active crossings. At each passive level crossing, a lower warning (waiting) time of approximately 10 seconds would normally be applicable on top of the train passing and clearance times (ie if an approaching train was more than 10 seconds away the vehicle would likely traverse the level crossing without waiting for the train to clear).

With the total warning, passing and clearance times, the typical existing delay times for all passenger and freight trains at a 'passive' type level crossing are:

- for passenger trains $(10 + 11 + 3) = 24$ seconds at each passive level crossing;
- for loaded freight trains $(10 + 70 + 3) = 83$ seconds at each passive level crossing; and
- for empty freight trains $(10 + 47 + 3) = 60$ seconds at each passive level crossing

4.2.3 Potential delays for CCR trains

As noted in Section 1.1, as part of the proposed modification, one CCR-laden train will be used per day (ie two rail movements) to transport CCR from Clarence to Charbon.

It is anticipated that each train will consist of 2 locomotives (each approximately 20 m long) and 30 wagons (each approximately 18.3 m long), providing a total train length of 589 m.

For the purpose of this assessment, a typical average train passing speed for all level crossings has been assumed to be 40 km/hr for laden trains and 60 km/hr for empty trains.

This corresponds to each CCR train taking approximately 53 seconds (loaded) and 36 seconds (empty) to pass each level crossing.

As summarised in Table 4.3, this translates into overall delay times of:

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

Table 4.3 Calculated delay times at level crossings due to proposed train movements

Delay factors	Laden CCR train	Empty CCR train	Laden CCR train	Empty CCR train
Type of crossing	Active		Passive	
Warning time	45	45	10	10
Train passing time	53	36	53	36
Time out	3	3	3	3
Total	101	84	66	49

4.3 Comparison of existing and proposed delays and vehicle numbers

4.3.1 Length of delay

The total existing daily level crossing delays for road traffic are presented in Table 4.4 for the Lithgow to Wallerawang section of the route, which currently has the highest daily train movements.

Table 4.4 Total daily delay for existing level crossings (Lithgow to Wallerawang only)

Level crossing control	Existing			Proposed additional CCR train (ie 2 train movements)
	Freight (14 train movements)	Passenger (11 train movements)	All trains (25 train movements)	
Active (flashing lights and bells, with or without boom barrier)	$(118 \times 7) + (95 \times 7)$ = 1,491 seconds	$59 \times 11 = 649$ seconds	2,140 seconds	$101 + 84 = 185$ seconds
Passive	$(83 \times 7) + (60 \times 7)$ = 1,001 seconds	$24 \times 11 = 264$ seconds	1,265 seconds	$66 + 49 = 115$ seconds

The typical increased daily delay at each level crossing due to the proposed additional two train movements along the Lithgow to Wallerawang section of the route will be 185 seconds for each active level crossing and 115 seconds for each passive level crossing. This will increase the likelihood of any road vehicle being delayed at a level crossing by:

- a factor of 1.086 (or 8.6%) for each active level crossing; and
- a factor of 1.091 (or 9.1%) for each passive level crossing.

The total existing daily level crossing delays for road traffic are presented in Table 4.5 for the Wallerawang to Airly section of the route, which has significantly less daily train movements than the Lithgow to Wallerawang section (coal trains only) on a typical weekday.

Table 4.5 Total daily delay for existing level crossings Wallerawang to Airly

Level crossing control	Existing			Proposed additional CCR train (ie 2 train movements)
	Freight (4 train movements)	Passenger (no train movements)	All trains (4 train movements)	
Active (flashing lights and bells, with or without boom barrier)	$(118 \times 2) + (95 \times 2)$ = 426 seconds	No delays	426 seconds	$101 + 84 = 185$ seconds
Passive	$(83 \times 2) + (60 \times 2)$ = 286 seconds	No delays	286 seconds	$66 + 49 = 115$ seconds

The typical increased daily delay at each level crossing due to the proposed additional two train movements along the Wallerawang to Airly section of the route will increase the likelihood of any road vehicle being delayed at a level crossing by:

- a factor of 1.43 (or 43%) for each active level crossing; and
- a factor 1.4 (or 40%) for each passive level crossing.

Although proportionally significant, the increased delay times will not be significant as the daily likelihood of any road vehicles actually being delayed by a train movement is currently very low along this section of the route.

Based on the calculated daily level crossing closure time divided by the total number of seconds in a day (ie 86,400 seconds), the actual chance of a road vehicle being delayed at level crossings along this section of the route is currently:

- $426/86,400$ (ie 1 in 203) at each active level crossing, and
- $286/86,400$ (ie 1 in 302) at each passive level crossing.

Similarly on the Airly to Charbon section of the route, although the likelihood of a road vehicle being delayed by a train movement will almost double due to the proposed additional two daily train movements, the existing likelihood of road vehicles being delayed is even lower than on the Wallerawang to Airly section of the route and is approximately:

- $213/86,400$ (ie 1 in 406) at each active level crossing, and
- $143/86,400$ (ie 1 in 604) at each passive level crossing.

4.3.2 Number of vehicles delayed

The existing and proposed average daily number of vehicles delayed at a level crossing can be calculated as the product of the daily vehicle traffic and the likelihood a delay will occur at any given time of the day.

The average daily number of vehicles delayed for the existing and proposed total two-way daily train movements for the busiest road traffic usage crossing on each section of the route (Table 4.1) is presented in Table 4.6.

Table 4.6 Busiest active and passive level crossings for different levels of train movements

Route section	Level crossing location	Type of control	Daily road traffic volume range	Existing daily train traffic movements (total daily level crossing closure-seconds)	Proposed daily train traffic movements (total daily level crossing closure-seconds)	Average delayed vehicles per day (Existing)	Average delayed vehicles per day (Proposed)
Lithgow to Wallerawang	Bowenfels 2 (Geordie Street)	Active - boom barrier, flashing lights and bells	Approx. 2,000	25 (2,140)	27 (2,325)	50	54
Lithgow to Wallerawang	Bowenfels 1 (Minor road)	Passive -stop signs	<20	25 (1,265)	27 (1,380)	0.3	0.3
Wallerawang to Airly	Wallerawang 5 (Pipers Flat Road)	Active - flashing lights and bells	3,000-4,000	4 (426)	6 (611)	20	28
Wallerawang to Airly	Ben Bullen 2 (Red Springs Road)	Passive -stop signs	<20	4 (286)	6 (401)	0.1	0.1
Airly to Charbon	Clandulla 2 (Cooper Drive)	Active - flashing lights and bells	150-300	2 (213)	4 (398)	0.7	1.4
Airly to Charbon	Clandulla 1 (Canary Street)	Passive -stop signs	50-100	2 (143)	4 (258)	0.2	0.3

Note: Average delayed vehicles per day is calculated using daily traffic times the ratio of level crossing closure time to 86,400 seconds per day.

The typical extent of additional delay at either an active or a passive level crossing from the proposed additional train movements for CCR transport will be between an additional 115 and 185 seconds delay per day (ie approximately 2–3 minutes of additional level crossing closure time).

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

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

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

These impacts represent only a minor level of traffic delay impact to the typical traffic flow and journey times each day for motorists travelling in these areas.

4.4 Level crossing safety

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

All level crossings have a risk profile which can be defined on the basis of the following factors:

- visibility – how well motorists can see oncoming trains;
- existing protection at the crossing;
- frequency of trains passing over the crossing;
- the number of tracks;
- the volume and type of road traffic over the crossing;
- nearby road geometry; and
- the likelihood that motorists will queue over the crossing.

The existing level crossing safety of the 21 existing level crossings between Clarence and Charbon has been reviewed from direct site observations (Appendix A). The existing level of safety (including either active or passive control) of all assessed level crossings is considered to be appropriate and acceptable.

4.5 Capacity constraints on the rail network

No capacity constraints with potential to affect the proposed CCR train movements have been identified on the assessed sections of the rail network.

5 Conclusion

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

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

As part of the proposed modification, one CCR-laden train will be used per day (ie two rail movements) to transport CCR from Clarence to Charbon. Each train will traverse a total of 21 level crossings requiring negotiation with vehicular traffic including a combination of:

- passive crossings (14 locations);
- active - flashing lights and bells (4 locations); and
- active - boom barrier, flashing lights and bells (3 locations).

As part of this assessment, an inspection was carried out of all accessible level crossing to confirm the existing level crossing controls and conditions. In summary, the results of this assessment are:

- the highest average number of additional daily vehicles delayed at an active level crossing due to the proposed additional train movements is likely to be eight vehicles per day for which a typical additional delay of between 84 and 101 seconds will occur;
- at most of the existing passive level crossings, the daily traffic volumes are sufficiently low that there is a negligible number of daily vehicles affected by either the existing or proposed train operations; and
- the existing level of safety (including either active or passive controls) of all assessed level crossings is considered to be appropriate and acceptable.

6 References

ARTC 2005, *Engineering Standard NSW – Signalling – SMS 13 – Road Level Crossing Protection Equipment*, March 2005, Australian Rail Track Corporation.



Appendix A

Level crossing inspection summary



Assessment locations

Number	Location	Road name	Figure
1	Clandulla 1	Canary Street	Figure 1.2
2	Clandulla 2	Cooper Drive	Figure 1.2
3	Clandulla 3	Flatlands Road (off Brogans Creek Road)	Figure 1.2
4	Weenga	Minor Road (off McDonalds Hole Road)	Figure 1.2
5	Torbane 1	Minor Road (unsealed)	Figure 1.3
6	Torbane 2	Minor Road (unsealed)	Figure 1.3
7	Ben Bullen 1	Castlereagh Highway	Figure 1.3
8	Ben Bullen 2	Red Springs Road	Figure 1.3
9	Ben Bullen 3	Minor Road (south of Red Springs Road)	Figure 1.4
10	Cullen Bullen	Portland Cullen Bullen Road	Figure 1.4
11	Portland	Williwa Street	Figure 1.4
12	Pipers Flat 1	Minor Road (off Pipers Flat Road) near Range Road	Figure 1.4
13	Pipers Flat 2	Minor Road (off Pipers Flat Road)	Figure 1.4
14	Wallerawang 1	Minor Road (off Pipers Flat Road) near Irondale Road	Figure 1.5
15	Wallerawang 2	Minor Road (off Pipers Flat Road)	Figure 1.5
16	Wallerawang 3	Minor Road (off Pipers Flat Road)	Figure 1.5
17	Wallerawang 4	Minor Road (off Pipers Flat Road)	Figure 1.5
18	Wallerawang 5	Pipers Flat Road	Figure 1.6
19	Marangaroo	Oakey Forest Road	Figure 1.6
20	Bowenfels 1	Minor Road (off Great Western Highway)	Figure 1.6
21	Bowenfels 2	Cooerwull Road – Geordie Street	Figure 1.6

Location 1 – Clandulla 1 – Canary Street

Type of crossing (Passive - stop sign)	
Observed road traffic (10 minute survey = no traffic)	Approx. 50-100 vehicles per day
Road width (sealed or unsealed)	6.6 m sealed (Concrete slab at crossing)
Road speed limit (if signs present)	50 km/hr
Road alignment and visibility (towards north or east)	Straight, visibility approx. 500 m
Road alignment and visibility (towards south or west)	Straight to T junction, less than 100 m
Rail speed limit (if signs present)	No signs, 80 km/hr probably (60 km/hr for coal trains)
Rail alignment and visibility (towards Charbon)	Straight, visibility approx. 500m
Rail alignment and visibility (towards Lithgow)	Straight, visibility approx. 500m
Other rail line or road traffic observation	Rail line is single track and runs moderately downhill to the south, but generally level to the north Old Railway Station (Clandulla) is located approximately 100 m to the north

Location 2 – Clandulla 2 – Cooper Drive

Type of crossing (Active – flashing lights with barriers)	
Observed road traffic (10 minute survey = 3 vehicles)	Approx. 150-300 vehicles per day
Road width (sealed or unsealed)	8.3 m sealed (Concrete slab at crossing)
Road speed limit (if signs present)	80 km/hr
Road alignment and visibility (towards north or east)	Curved, then straight, visibility approx. 100 – 200 m due to road bend
Road alignment and visibility (towards south or west)	Straight, visibility approx. 100 -200-m due to road crest vertical curvature
Rail speed limit (if signs present)	No signs, 80 km/hr probably (60 km/hr for coal trains)
Rail alignment and visibility (towards Charbon)	Straight, visibility approx. 500m
Rail alignment and visibility (towards Lithgow)	Straight then curved, visibility approx. 500m
Other rail line or road traffic observation	Rail line is single track and runs moderately uphill to the north and downhill to the south.

Location 3 – Clandulla 3 – Flatlands Road (off Brogans Creek Road)

Type of crossing (Passive - stop sign)	
Observed road traffic (10 minute survey = no traffic)	Probably less than 10 daily vehicles (one rural property)
Road width (sealed or unsealed)	3.4 m unsealed (Metal plate at crossing)
Road speed limit (if signs present)	Road travel conditions 30 km/hr maximum
Road alignment and visibility (towards north or east)	Locked gate after crossing (rural property access)
Road alignment and visibility (towards south or west)	Straight to major road T junction, approx. 100 m
Rail speed limit (if signs present)	No signs, 80 km/hr probably (60 km/hr for coal trains)
Rail alignment and visibility (towards Charbon)	Curved then straight to the north, visibility approx. 500 m
Rail alignment and visibility (towards Lithgow)	Curved to the south, visibility 300 - 500 m
Other rail line or road traffic observation	Rail line is single track and runs moderately uphill to the north but is generally level to the south

Location 4 – Weenga – Minor road (off McDonalds Hole Road)

Type of crossing (Passive - stop sign)	
Observed road traffic (10 minute survey = no traffic)	Probably less than 20 daily vehicles (rural property and Rail Corridor access)
Road width (sealed or unsealed)	3.5 m unsealed
Road speed limit (if signs present)	Road travel conditions 20 km/hr maximum
Road alignment and visibility (towards north or east)	Sharp curve and steep gradient, visibility less than 100 m
Road alignment and visibility (towards south or west)	Sharp curve and steep gradient, visibility less than 100 m
Rail speed limit (if signs present)	No signs, 80 km/hr probably (60 km/hr for coal trains)
Rail alignment and visibility (towards Charbon)	Straight, visibility approx. 500m
Rail alignment and visibility (towards Lithgow)	Straight, visibility approx. 500m
Other rail line or road traffic observation	Rail line is single track and runs moderately downhill to the south and uphill to the north. Site of Old Railway Station (Weenga) is located approximately 200 m to the north

Location 5 – Torbane 1 - Minor road (unsealed)

Type of crossing (Passive - stop sign)	
Observed road traffic (10 minute survey = no traffic)	Locked gate at Green Gully Orchard (Likely Private Property and Rail Corridor service traffic only)
Road width (sealed or unsealed)	3 m unsealed
Road speed limit (if signs present)	Road travel conditions 20 km/hr maximum
Road alignment and visibility (towards north or east)	Not observed
Road alignment and visibility (towards south or west)	Not observed
Rail speed limit (if signs present)	Not observed
Rail alignment and visibility (towards Charbon)	Not observed
Rail alignment and visibility (towards Lithgow)	Not observed
Other rail line or road traffic observation	Not observed

Location 6 – Torbane 2 – Minor road (unsealed)

Type of crossing (Passive - stop sign)	
Observed road traffic (10 minute survey = no traffic)	Locked gate at Green Gully Orchard (Likely Private Property and Rail Corridor service traffic only)
Road width (sealed or unsealed)	3 m unsealed
Road speed limit (if signs present)	Road travel conditions 20 km/hr maximum
Road alignment and visibility (towards north or east)	Not observed
Road alignment and visibility (towards south or west)	Not observed
Rail speed limit (if signs present)	Not observed
Rail alignment and visibility (towards Charbon)	Not observed
Rail alignment and visibility (towards Lithgow)	Not observed
Other rail line or road traffic observation	Not observed

Location 7 – Ben Bullen 1 – Castlereagh Highway

Type of crossing (Active – flashing lights)	
Observed road traffic (10 minute survey = 8 vehicles)	Approx. 500-1,000 vehicles per day
Road width (sealed or unsealed)	7.9 m sealed (Concrete slab at crossing)
Road speed limit (if signs present)	35 km/hr advisory signs on both approached
Road alignment and visibility (towards north or east)	Sharply curved, then straight, visibility less than 100 m due to road curvature
Road alignment and visibility (towards south or west)	Sharply curved, then straight, visibility less than 100 m due to road curvature
Rail speed limit (if signs present)	No signs, 80 km/hr probably (60 km/hr for coal trains)
Rail alignment and visibility (towards Charbon)	Straight, visibility approx. 500m
Rail alignment and visibility (towards Lithgow)	Straight, visibility approx. 500m
Other rail line or road traffic observation	Rail line is single track and runs moderately downhill to the south, but generally level to the north Old Railway Station (Ben Bullen) is located approximately 100 m to the north

Location 8 – Ben Bullen 2 – Red Springs Road

Type of crossing (Passive - stop sign)	
Observed road traffic (10 minute survey = no traffic)	Probably less than 20 daily vehicles (rural property and rail corridor access)
Road width (sealed or unsealed)	3.2 m unsealed
Road speed limit (if signs present)	Road travel conditions 30 km/hr maximum
Road alignment and visibility (towards north or east)	Curved uphill, less than 100 m
Road alignment and visibility (towards south or west)	Curved uphill, less than 100 m (locked gate to rural property straight ahead)
Rail speed limit (if signs present)	No signs, 80 km/hr probably (60 km/hr for coal trains)
Rail alignment and visibility (towards Charbon)	Straight track into rock cutting then curved, visibility approx. 500m
Rail alignment and visibility (towards Lithgow)	Straight then curved, visibility approx. 500m
Other rail line or road traffic observation	Rail line is single track and runs moderately uphill to the north and downhill to the south

Location 9 – Ben Bullen 3 – Minor road (south of Red Springs Road)

Type of crossing (Passive - stop sign)	
Observed road traffic (10 minute survey)	Unsealed access road follows the rail line corridor from Red Springs Road (Likely Rail Corridor service traffic only)
Road width (sealed or unsealed)	3 m unsealed (Rocky surface)
Road speed limit (if signs present)	Road travel conditions 20 km/hr maximum
Road alignment and visibility (towards north or east)	Not observed
Road alignment and visibility (towards south or west)	Not observed
Rail speed limit (if signs present)	Not observed
Rail alignment and visibility (towards Charbon)	Not observed
Rail alignment and visibility (towards Lithgow)	Not observed
Other rail line or road traffic observation	Not observed

Location 10 – Cullen Bullen - Portland Cullen Bullen Road

Type of crossing (Active – flashing lights)	
Observed road traffic (10 minute survey = 7 vehicles)	Approx. 500-1,000 daily vehicles
Road width (sealed or unsealed)	6.3 m sealed (Concrete slab at crossing)
Road speed limit (if signs present)	100 km/hr (maximum 60 km/hr due to curves)
Road alignment and visibility (towards north or east)	Multiple curves then downhill, approx. 100 m
Road alignment and visibility (towards south or west)	Straight downhill then curved, approx. 200 m
Rail speed limit (if signs present)	80 km/hr northbound 75 km/hr southbound
Rail alignment and visibility (towards Charbon)	Straight and level, visibility approx. 500-1,000 m
Rail alignment and visibility (towards Lithgow)	Curved track into rock cutting, visibility approx. 200-300m
Other rail line or road traffic observation	Rail line is single track and runs generally level to the north and moderately downhill to the south

Location 11 – Portland - Williwa Street

Type of crossing (Active – flashing lights)	
Observed road traffic (10 minute survey = 11 vehicles)	Approx. 1,000 Daily Vehicles
Road width (sealed or unsealed)	9.6 m sealed (concrete slab at crossing)
Road speed limit (if signs present)	50 km/hr
Road alignment and visibility (towards north or east)	Curve to the east, approx. 100 m
Road alignment and visibility (towards south or west)	Straight with dip to the west, 100 - 200 m
Rail speed limit (if signs present)	No signs, 80 km/hr probably (60 km/hr for coal trains)
Rail alignment and visibility (towards Charbon)	Straight, visibility approx. 500-1,000 m
Rail alignment and visibility (towards Lithgow)	Curved, visibility approx. 200-300 m
Other rail line or road traffic observation	Rail line is single track and runs generally level to the north and moderately downhill to the south. Road traffic includes school buses

Location 12 – Pipers Flat 1 – Minor road (off Pipers Flat Road) near Range Road

Type of crossing (Passive - stop sign)	
Observed road traffic (10 minute survey = no traffic)	Probably less than 10 daily vehicles (Centennial Coal)
Road width (sealed or unsealed)	3 m unsealed (Metal plate at crossing)
Road speed limit (if signs present)	Road travel conditions 20 km/hr maximum
Road alignment and visibility (towards north or east)	Locked gate after crossing (Centennial Coal)
Road alignment and visibility (towards south or west)	Straight to major road T junction, approx. 50 m
Rail speed limit (if signs present)	No signs, 80 km/hr probably (60 km/hr for coal trains)
Rail alignment and visibility (towards Charbon)	Curve to the north, visibility approx. 300 m
Rail alignment and visibility (towards Lithgow)	Straight to the south, visibility over 500 m
Other rail line or road traffic observation	Rail line is single track and runs moderately downhill to the south

Location 13 – Pipers Flat 2 – Minor road (off Pipers Flat Road)

Type of crossing (Passive - stop sign)	
Observed road traffic (10 minute survey = no traffic)	Not Publicly Accessible (Centennial Coal and Rail Corridor Access). Probably less than 10 daily vehicles
Road width (sealed or unsealed)	3 m unsealed (Metal plate at crossing)
Road speed limit (if signs present)	Road travel conditions 20 km/hr maximum due to gate location
Road alignment and visibility (towards north or east)	Locked gate after crossing (Centennial Coal)
Road alignment and visibility (towards south or west)	Locked gate before crossing (Rail Corridor Access)
Rail speed limit (if signs present)	No signs, 80 km/hr probably (60 km/hr for coal trains)
Rail alignment and visibility (towards Charbon)	Straight to the north, visibility approx. 500 m
Rail alignment and visibility (towards Lithgow)	Curved to the south, visibility 300 - 500 m
Other rail line or road traffic observation	Rail line is single track and runs moderately downhill to the south

Location 14 – Wallerawang 1 – Minor road (off Pipers Flat Road) near Irondale Road

Type of crossing (Passive - stop sign)	
Observed road traffic (10 minute survey = no traffic)	Probably less than 20 daily vehicles (rural property access to 3 houses)
Road width (sealed or unsealed)	3.3 m unsealed (Metal plate at crossing)
Road speed limit (if signs present)	Road travel conditions, likely 30 km/hr maximum
Road alignment and visibility (towards north or east)	Curved, approx. 200m
Road alignment and visibility (towards south or west)	Straight to major road T junction, approx. 50 m
Rail speed limit (if signs present)	No signs, 80 km/hr probably (60 km/hr for coal trains)
Rail alignment and visibility (towards Charbon)	Straight then curve to the north, visibility approx. 500 m
Rail alignment and visibility (towards Lithgow)	Straight to the south, visibility over 500 m
Other rail line or road traffic observation	Rail line is single track and runs moderately downhill to the south

Location 15 – Wallerawang 2 – Minor road (off Pipers Flat Road)

Type of crossing (Passive - stop sign)	
Observed road traffic (10 minute survey = no traffic)	Gate locked not publicly accessible (Energy Australia) Probably less than 10 daily vehicles
Road width (sealed or unsealed)	3 m unsealed (Metal plate at crossing)
Road speed limit (if signs present)	Road travel conditions likely 20 km/hr maximum due to gate location
Road alignment and visibility (towards north or east)	Not observed
Road alignment and visibility (towards south or west)	Not observed
Rail speed limit (if signs present)	Not observed
Rail alignment and visibility (towards Charbon)	Not observed
Rail alignment and visibility (towards Lithgow)	Not observed
Other rail line or road traffic observation	Not observed

Location 16 – Wallerawang 3 – Minor road (off Pipers Flat Road)

Type of crossing (Passive - stop sign)	
Observed road traffic (10 minute survey = no traffic)	Gate locked (not publicly accessible) Probably less than 10 daily vehicles
Road width (sealed or unsealed)	3 m unsealed
Road speed limit (if signs present)	Road travel conditions likely 30 km/hr maximum
Road alignment and visibility (towards north or east)	Not observed
Road alignment and visibility (towards south or west)	Not observed
Rail speed limit (if signs present)	Not observed
Rail alignment and visibility (towards Charbon)	Not observed
Rail alignment and visibility (towards Lithgow)	Not observed
Other rail line or road traffic observation	Not observed

Location 17 – Wallerawang 4 – Minor road (off Pipers Flat Road)

Type of Crossing (Passive - stop sign)	
Observed road traffic (10 minute survey = no traffic)	Probably less than 10 daily vehicles (1 house)
Road width (sealed or unsealed)	3 m unsealed (Metal plate at crossing)
Road speed limit (if signs present)	Road travel conditions likely 30 km/hr maximum
Road alignment and visibility (towards north or east)	Curve downhill to north, with locked gate after crossing
Road alignment and visibility (towards south or west)	Curve uphill to south, less than 100 m
Rail speed limit (if signs present)	No signs, 80 km/hr probably (60 km/hr for coal trains)
Rail alignment and visibility (towards Charbon)	Gentle curve, visibility approx. 300 m
Rail alignment and visibility (towards Lithgow)	Gentle curve, visibility approx. 300 m
Other rail line or road traffic observation	Rail line is single track and runs moderately downhill to the south

Location 18 – Wallerawang 5 – Pipers Flat Road

Type of crossing (Active – flashing lights)	
Observed road traffic (10 minute survey = 37 vehicles)	Approx. 3,000-4,000 daily vehicles
Road width (sealed or unsealed)	7.5 m sealed (Concrete slab at crossing)
Road speed limit (if signs present)	50 km/hr
Road alignment and visibility (towards north or east)	Straight with dip in the road, approx. 300 m
Road alignment and visibility (towards south or west)	Straight with dip in the road, approx. 300 m
Rail speed limit (if signs present)	80 km/hr northbound 50 km/hr southbound
Rail alignment and visibility (towards Charbon)	Straight, visibility at least 500 m
Rail alignment and visibility (towards Lithgow)	Straight, visibility approx. 200 – 300 m then left hand curve
Other rail line or road traffic observation	Rail line is single track and generally level Southbound trains may travel relatively slowly as they approach the main line junction at Wallerawang

Location 19 – Marangaroo – Oakey Forest Road

Type of crossing (Active – flashing lights with barriers)	
Observed road traffic (10 minute survey = 7 vehicles)	Approx. 500-1,000 daily vehicles
Road width (sealed or unsealed)	7.0 m sealed (Concrete slab at crossing)
Road speed limit (if signs present)	60 km/hr (40 km/hr for Trucks)
Road alignment and visibility (towards north or east)	Straight downhill to major road, Stop Sign within 50 m
Road alignment and visibility (towards south or west)	Straight uphill, visibility 100-200 m
Rail speed limit (if signs present)	No signs, 100 km/hr probably (60 km/hr for coal trains)
Rail alignment and visibility (towards Charbon)	Straight, visibility approx. 500-1,000 m
Rail alignment and visibility (towards Lithgow)	Straight then curve, visibility approx. 300-500 m
Other rail line or road traffic observation	Rail line is dual track and generally level Road traffic has a high proportion of trucks (from a nearby quarry)

Location 20 – Bowenfels 1 - Minor road (off Great Western Highway)

Type of crossing (Passive - stop sign)	
Observed road traffic (10 minute survey = no traffic)	Probably less than 20 daily vehicles (2 houses)
Road width (sealed or unsealed)	3.3 m unsealed (Concrete slab at crossing)
Road speed limit (if signs present)	Road travel conditions 20 km/hr maximum
Road alignment and visibility (towards north or east)	Steep downhill to north, less than 100 m
Road alignment and visibility (towards south or west)	Steep uphill to south, with locked gate after crossing
Rail speed limit (if signs present)	100 km/hr westbound 95 km/hr eastbound
Rail alignment and visibility (towards Charbon)	Straight then curved, approx. 300-500 m
Rail alignment and visibility (towards Lithgow)	Curved, approx. 200 m–300 m
Other rail line or road traffic observation	Rail line is dual track and runs moderately downhill to the east

Location 21 – Bowenfels 2 – Coorwull Road – Geordie Street

Type of crossing (Active – flashing lights with barriers)	
Observed road traffic (10 minute survey = 23 vehicles)	Approx. 2,000 Daily Vehicles
Road width (sealed or unsealed)	9.3 m (either sealed or concrete surface)
Road speed limit (if signs present)	50 km/hr
Road alignment and visibility (towards north or east)	Multiple curves to the east, less than 100 m
Road alignment and visibility (towards south or west)	Sharp curve then straight to the west, approx. 100 m
Rail speed limit (if signs present)	80 km/hr westbound 85 km/hr eastbound
Rail alignment and visibility (towards Charbon)	Straight then curved, approx. 200 m
Rail alignment and visibility (towards Lithgow)	Straight then curved, approx. 300 m
Other rail line or road traffic observation	Rail line is dual track and generally level. Large Brick Hut and visitor centre carpark by the Level Crossing (west side). Old Bowenfels Station is approx. 150 m to the west.



