PART

8

TRANSPORT AND TRAFFIC

> Traffic Impact Assessment prepared by Cardno

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TRAFFIC IMPACT ASSESSMENT
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Adani Rail/Mining Camp

Transport Statement – Camp 3

750890

Prepared for
Adani Mining Pty Ltd

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Contact Information

Cardno (Qld) Pty Ltd
ABN 57 051 074 992

Level 11 Green Square North Tower
515 St Paul's Terrace
Locked Bag 4006
Fortitude Valley Qld 4006

Telephone: 07 3369 9822
Facsimile: 07 3369 9722
International: +61 7 3369 9822

transportqld@cardno.com.au
www.cardno.com.au

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Version	Date	Author	Author Initials	Reviewer	Reviewer Initials
1	31 October 2012	Neale McCracken	NM	Andrew Johnston	ASJ

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1 Introduction

Cardno has been commissioned by Adani Mining Pty Ltd, the proponent of the Carmichael Coal Mine and Rail Project, to provide traffic and transport advice in relation to the construction accommodation camps, east of Moranbah in the Isaac Regional Council area, Queensland.

Adani proposes to develop an open cut and underground coal mine in the north Galilee Basin known as the Carmichael Coal Mine Project. The proposed mine will have a total per annum production of approximately 60 million tones and an operational lifespan of 90 years. The mine site is situated approximately 160km northwest of Clermont and is proposed to be serviced by a new 179km rail corridor along which all coal will be transported.

The construction of the proposed coal mine and rail corridor requires the employment of large volumes of workers that are separate from those that will be employed when the mine is in operation. These workers must be accommodated in locations that are within close proximity to the rail corridor and the mine site itself to reduce travel times to the required work locations. Given the remote nature of the locality and lack of accommodation infrastructure, temporary construction workers accommodation camps must be established.

The construction of the required rail infrastructure involves the establishment of a total of three temporary rail construction camps at regular intervals along the rail corridor each containing a total of 407 beds. The construction of the mine facility requires the establishment of one camp located at the mine site itself accommodating a total of 510 beds.

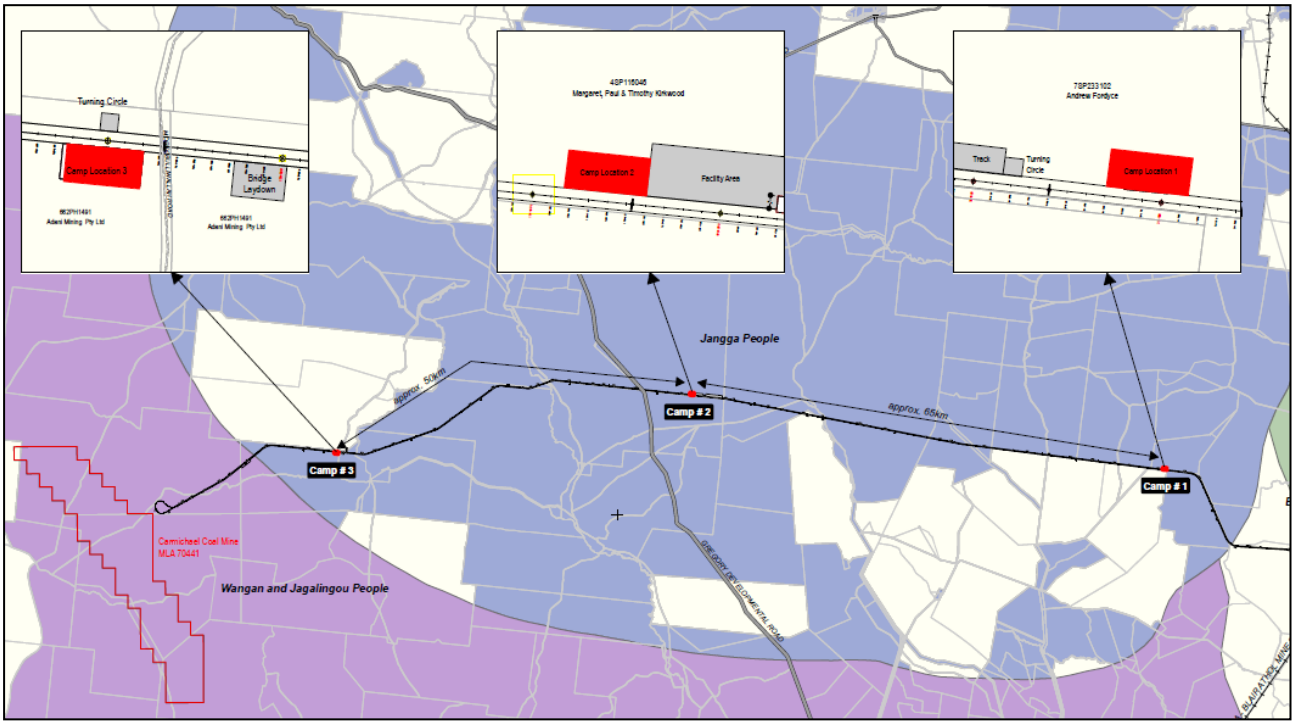
Figure 1-1 below provides a general illustration of the overall proposal including the three proposed rail construction camps. It is noted that the proposed mine camp is not shown on the figure below, but lies west of Camp 3 along the proposed rail line. Note that the exact locations of Camps 2 & 3 have altered slightly since this drawing was produced.

It should be note that following discussions with Isaac Regional Council, it has been identified that certain road names have changed in the area around Camp 3. To maintain consistency with other documents submitted in support of this project, the following naming convention is adopted in this technical memorandum.

Table 1-1 Road Naming Convention

Previous Road Name (used in this document)	Current Road Name
Moray-Carmichael Road	Doongmabullah Road
Moray-Bulliwallah Road	Bulliwallah Road
Moray-Carmichael Boundary Road	Elgin Road

Figure 1-1 General Outline of Rail Corridor and Camp Locations (Indicative Only)



2 Existing Situation

2.1 Study Area and Subject Site

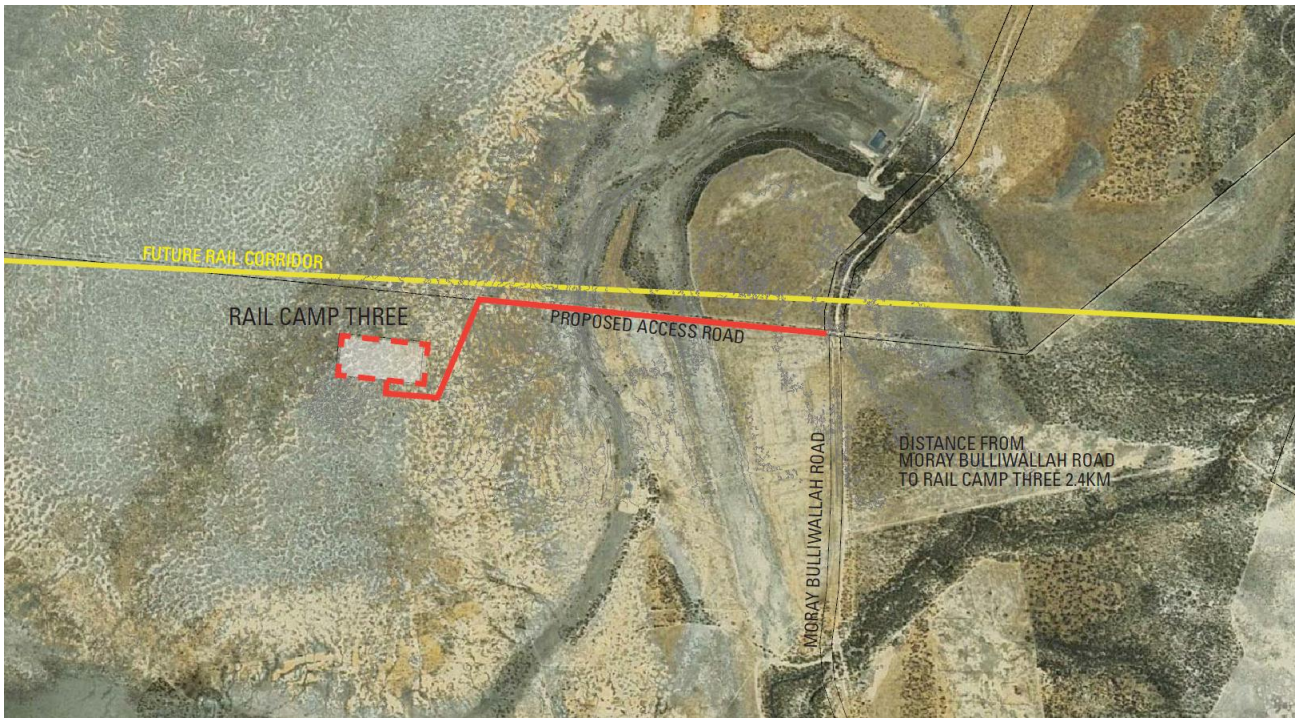
The subject area is located in Queensland's Central West region. The site is situated in an isolated location that is a substantial distance from the nearest urban centres of Clermont to the south and Moranbah to the east. The region is dominated by cattle grazing and extractive industry uses.

The subject site is located 2.4km from the proposed access to Moray-Bulliwallah Road, as shown in Figure 2. The access point itself is located approximately 1.7km from the intersection of at the Moray-Carmichael Road Moray-Bulliwallah Road Moray-Carmichael Boundary Road Intersection

It is noted that the nearest Airport for fly-in/fly-out construction workers is located south of the construction camp, west of Clermont, along Clermont-Alpha Road. This airport is approximately 200km from the construction camp and would entail a journey time of approximately four hours.

The next nearest airport is located south of Moranbah. Using the current road network layout, this journey would be approximately 260km in length and take approximately four and a half hours. Current information from Adani states that it is likely that Moranbah Airport would be utilised by fly-in/fly-out trips.

Figure 2-1 Rail Construction Camp 3 – Locality Plan



2.2 Moray-Bulliwallah Road

Moray-Bulliwallah Road is part of the local road network and is therefore under the control of Isaac Regional Council. This road runs on an approximate north-south alignment and lies within a road reserve of approximately 60 metres south of the proposed site access and 100m north of the proposed site access. The road begins at an intersection with Moray-Carmichael Road and Moray-Carmichael Boundary Road, travelling north towards Gregory Developmental Road. The road is unsealed for its entire length within the Isaac Regional Council jurisdiction.

2.3 Moray-Carmichael Road/Moray-Carmichael Boundary Road

Moray-Carmichael Road/Moray-Carmichael Boundary Road is part of the local road network and is therefore under the control of Isaac Regional Council. This road runs on an approximate east-west alignment and lies within a road reserve of approximately 60 metres. Moray-Carmichael Road begins at Moray-Bulliwallah Road and departs west towards Carmichael. Moray-Carmichael Boundary Road begins at Moray-Bulliwallah Road and departs east towards Gregory Developmental Road. The route is unsealed for its entire length within the Isaac Regional Council jurisdiction.

2.4 Moray-Carmichael Road/Moray-Bulliwallah Road/ Moray-Carmichael Boundary Road Intersection

This intersection is located approximately 1.7km south of the proposed site access point. The intersection is a basic priority controlled T-intersection, with Moray-Bulliwallah Road and Moray-Carmichael Boundary Road forming the north-south leg and Moray-Carmichael Road departing to the west. The road surface is entirely unsealed in the vicinity of the intersection.

2.5 Traffic Volumes

Traffic volume data received from Isaac Regional Council for roads in the vicinity of the site are presented in Table 2-1. It is noted these traffic volumes are based on an average of a continuous count over a period of approximately 40 days on each road. No peak data is available although from the counted volume it is apparent these roads serve the equivalent of perhaps two or three dwellings or other properties.

Table 2-1 Recorded Traffic Volumes Near Moray-Bulliwallah Road

Road	Year	AADT	HV %
Moray-Bulliwallah Road	2012	8	15%
Moray-Carmichael Road	2012	14	54%
Moray-Carmichael Boundary Road	2012	18	35%

2.6 Crash Data

Cardno has requested a detailed crash history from TMR for the both Moray-Bulliwallah Road and Moray-Carmichael Road. The received information indicates there is no crash record along either of these roads.

3 Proposed Development

3.1 Development Overview

The proposed mixed use development will consist of temporary and demountable accommodation units arranged to form a fully functioning worker community. The camp is intended to be established for the entire period that is required for construction of this particular section of the railway corridor. At this point in time it is estimated that this will take approximately 2 years to complete.

The proposed mixed use development site is spread over an area of 9.38 hectares and will consist of the following land uses:

- 405 Accommodation Units
- 2 Disabled Units
- 123 Car Parking Spaces
- 2 Disabled Car Parking Spaces
- 2 Bus Parking Spaces

3.2 Internal Layout

3.2.1 General Layout

The proposed site layout is shown in Figure 3-1 below. The site is bisected by a central spine road, with the workers accommodation units arranged in groups either side. Communal buildings are in the centre of the development site and will provide recreational, dining and gym facilities as well as being the collection point for transport to and from the rail construction sites.

The access road from Moray-Bulliwallah Road and the main circulatory road within the site are proposed to be a minimum of 7.5 metres wide, allowing two heavy vehicles to pass if required.

A one-way road system is used in the pick-up/set-down area and within the car park, this will provide a legible route through the site, simplifying traffic flow and minimising accident potential.

Figure 3-1 Proposed Site Layout – Rail Construction Camp 3

3.2.2 Service Vehicles

All roads, intersections and service vehicle turning points within the site have been designed using swept path analysis, with a 19 metre articulated vehicle used as the largest expected vehicle.

The service road accessing the sewage treatment plant is proposed to be a minimum of 5.0 metres wide, and will provide access for a 19m semi-trailer. Vehicles accessing the sewage treatment plant will be required to use the turnaround area before reversing into the loading position, this will allow one-way traffic to safely utilise this facility.

The electricity generator has been positioned to be accessed from the sewage treatment plant service road, and will therefore share the turning area with the sewage treatment plant. Feasibly the overflow truck parking area could be used to turn around rather than using the full length of the service road.

General servicing required for the day-to-day operation of the construction camp will take place in a dedicated loading bay located next to the communal buildings. The loading area will be provided with a turning circle, as shown in Figure 3-1, and will accommodate all manner of vehicles, including articulated vehicles and buses should the need arise.

The location of the sewage treatment plant access road, the car park exit and the loading bay creates an intersection with five approaches in close proximity. Normally this would be of concern; however, the servicing areas will be used at most four times a day, and general traffic flow within the site is expected to be very low compared to an urban residential development.

3.2.3 Pedestrian Facilities

While no specific walking or cycling facilities will be provided beyond the boundary of the camp, all areas of the camp will be readily accessible on foot.

Footpaths within the site have been arranged adhere to pedestrian desire lines, minimising walking distances and provide maximum connectivity between the accommodation units and focal points such as the communal facilities and safe, convenient access to buses. It is noted the sheltered bus waiting area is approximately 250 metres from the furthest accommodation block, a two minute walk at a leisurely pace.

Recreational walking/cycling trails are also proposed to be provided around the perimeter of the accommodation units and within communal open spaces.

3.2.4 Public Transport Facilities

It is proposed that construction workers are transported to the construction sites by bus and/or four-wheel drive vehicles. A pick-up and set-down area will be provided within the site and will provide extensive sheltered waiting areas, protecting workers from the weather while queuing to board a bus. The waiting area is designed to be large enough to accommodate the tidal nature of workers travelling to and from the construction sites.

The bus stop is generously apportioned at over 40 metres long and will accommodate up to three standard buses or coaches, or two articulated buses. Two bus parking spaces are provided off the exit roadway while an overflow area is provided off the sewage treatment plant service road. It is also feasible that the loading area could be used to temporarily accommodate buses if required.

3.2.5 Parking Provision

Parking provision is discussed in Section 3.4 of this report.

3.3 Access Route Layout

It is proposed to access the camp along the property boundary, west of the Moray-Bulliwallah Road and south of the proposed rail corridor. Access to the external road network will be taken from a priority controlled intersection with Moray-Bulliwallah Road. The alignment of the proposed access route is as highlighted in red on Figure 2-1.

Moray-Bulliwallah Road connects to Moray-Carmichael Road and Moray-Carmichael Boundary Road at three-way intersection approximately 1.7km south of the site access point.

3.4 Vehicle Parking

3.4.1 Parking Requirements – Rural Zone Code

Acceptable Solution AS19.1 of the Rural Zone Code states that car parking must be provided in accordance with the requirements set out in Schedule 1, Division 2 of the scheme. This particular section of the scheme identifies car parking number requirements for defined uses. In regard to 'Residential Activities' the scheme states that one space per 'accommodation unit' must be provided for a proposed development.

The unique nature of the development means that it does not fit easily into the category of 'Residential Activities', especially given the proposed fly-in/fly-out nature of the development with bus transport being provided for residents.

The specification of one space per residential dwelling is therefore not considered to be appropriate for an isolated location where residents will be bussed to and from work. Therefore, performance criteria PC19 is applicable to the proposal. PC 19 states the following:

"Vehicle parking and service vehicle provision is adequate for the "use" and ensures safe and functional operation for motorists and pedestrians."

This performance criteria outlined in the local plan allows for a reasonable provision of parking provision to be provided based on the intended operation and use of the site.

3.4.2 Parking Provision

In consultation with Adani and in accordance with their specific requirements, it is proposed to provide a total of 123 sealed car parking spaces and two disabled spaces located opposite the communal buildings. Two dedicated bus parking spaces will also be provided as part of the proposed camp designs.

An unsealed overflow parking area is also proposed to be provided, accommodating all manner of vehicles that will be used to access and service the camp. It is noted that the overflow car park would also be accommodate excess heavy vehicles and buses in a double parked arrangement if these were required on special occasions.

The main car park will be used for parking of site management vehicles, four-wheel drives, visitor parking and other vehicles used to transfer workers to and from the construction site. These vehicles will not be used to access the external road network on a day-today basis, but will instead simply be used to get to and from the camp to the construction site on tracks running alongside the rail line.

The number of parking spaces provided on site have been specified by Adani to match the maximum operational requirement to traffic staff to and from site, and to accommodate service vehicles and buses. It is important to note that this car park is not likely to be used to accommodate workers personal vehicles.

All parking spaces within the main car park have been designed to comply with Australian Standard AS2890.1 Off-Street Parking. Parking spaces and aisle width have been specified for User Class 1, suitable for day-long employee and commuter parking.

Parking for disabled users has been designed to comply with AS2890.6, Off-Street Parking for People with Disabilities. This entails a standard space 2.4 metres wide, with a 2.4 metre wide dedicated shared area provided alongside.

Footways have been provided between the parking rows in each aisle, this will minimise pedestrian-vehicle interaction within the car park.

3.5 Traffic Generation

3.5.1 Rail Construction Camp Traffic

It is important to note from the outset that the majority of traffic movements will not impact the external road network, but will be largely confined within the camp and along tracks servicing the rail line construction sites that will run from the camp alongside the rail line as construction progresses. This has been confirmed in discussions with Adani.

Therefore the only vehicles that will typically impact the external road network are those which transfer workers to and from airports and urban centres such as Clermont and Moranbah, and those providing essential services to the camp. This has also been confirmed in discussions with Adani.

The traffic generation associated with typical day-to-day operations is therefore as specified in Table 3 below.

Table 3-1 Rail Construction Camp 3 - Traffic Generation

Trip Type	Mode	Weekly Volume	Daily Volume	Peak Hour Volume
Fly-in/Fly-out	Coach	10 vehicles in/out	2 in/out	2 in/out
Servicing	AV (semi-trailer)	10 vehicles in/out	4 in/out	2 in/out
Total		20 vehicles in/out	6 in/out	4 in/out

Table 3-1 indicates that on a typical day, traffic generation is expected to be minimal. The peak hour for vehicles movements will not necessarily interact with the peak flow on the external road network. The main activity will be from servicing, and tasks such as deliveries will be coordinated and will largely occur outside of times when peak construction worker trips are occurring. This is undertaken mainly as a safety precaution to minimise interaction of heavy service vehicles with camp residents as they travel to and from work; however it will also have the effect of reducing peak hour vehicle activity.

3.5.2 Rail Construction Camp Traffic Distribution

Fly-in/fly-out worker trips and service vehicles will arrive and depart from the accommodation camp via Moray-Bulliwallah Road, south of the site access and use Moray-Carmichael Boundary Road to reach Gregory Developmental Road.

3.5.3 External Traffic

Existing traffic volumes on the external roads in the vicinity of the site are very low at approximately 8 vpd along Moray-Bulliwallah Road and less than 20 vpd elsewhere. For the purposes of this assessment it will be assumed that half of the existing traffic flow occurs during the peak hour.

The Environmental Impact Statement (EIS) prepared by GHD indicates that Moray-Carmichael Road will function as a transport corridor for the delivery of materials to the rail corridor construction and mine construction sites. The GHD report indicates this section of Gregory Developmental Road will serve the following transport corridors:

> TC01: Townsville to Rail Camp 2, Rail Camp 3 and Mine Camp – Gregory Developmental Road/Flinders Highway. 525 vpd worst case.

In combination with the existing traffic and construction camp traffic, this indicates an overall flow of approximately 550 vpd, and approximately 70 to 80 vehicles in the peak hour along Moray-Carmichael Road and Moray-Carmichael Boundary Road. It is noted that the majority of the traffic associated with transporting materials for the construction of the rail line will be heavy vehicles.

It is assumed that Moray-Bulliwallah Road will carry 50% of the construction materials delivery traffic for the rail line (TC01), around 260 vpd, and will therefore Moray-Bulliwallah Road carry at most 280 vpd, and around 30 vehicles in the peak hour, as outlined below.

In terms of traffic flow on Moray-Carmichael Road, upon review of the EIS, traffic associated with the delivery of materials is based on a return journey, and while individual vehicles may not make the return journey in the same day, others from the previous day will, creating a balanced daily two-way flow. Therefore the

directional split of construction traffic is expected to be 50/50 east/west along Moray-Carmichael Road on a daily basis in the vicinity of the site access. The EIS further indicates that the peak for deliveries would be approximately 10% of the daily total in a one hour period. Figure 3-2 shows the expected peak hour traffic flow at the camp access to the external road network

The additional traffic associated with the mine accommodation camp is assumed to be four vehicles in either direction, travelling along Moray-Carmichael Road and Moray-Carmichael Boundary Road only. This has been added to the traffic flows considered at this intersection.

Traffic flows are expected to reach 30 vehicles during the peak hour along Moray-Bulliwallah Road (50% of the existing AADT plus eight movements associated with Camp 3 plus 26 vehicles associated with delivery of construction materials). Figure 3-2 and Figure 3-3 shows the expected peak hour traffic flow at the Camp 3 Site Access intersection and Moray-Bulliwallah Road/Moray-Carmichael Road/Moray-Carmichael Boundary Road intersection.

Figure 3-2 Expected Traffic Flow at Camp 3 Moray-Bulliwallah Road/Site Access Intersection

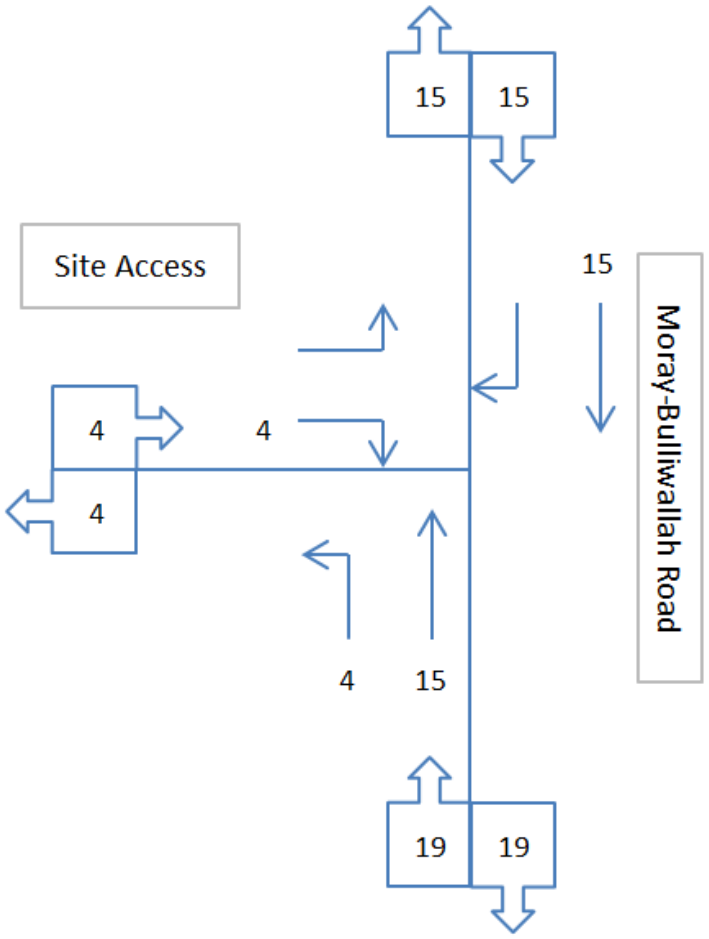
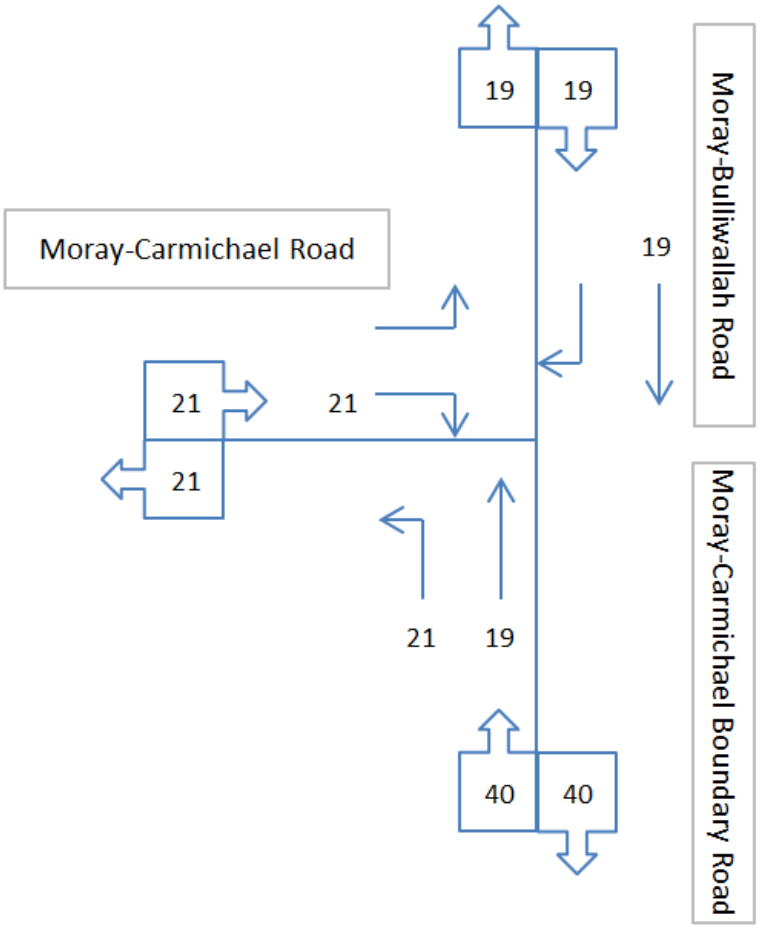


Figure 3-3 Expected Traffic Flow at Moray-Bulliwallah Road/Moray-Carmichael Road/ Moray-Carmichael Boundary Road Intersection



3.6 Intersection Geometry Requirements

The following commentary sets out the general geometry requirements for both the Camp 3 site access intersection with Moray-Bulliwallah Road and the Moray-Bulliwallah Road/ Moray-Carmichael Road/Moray-Carmichael Boundary Road intersection.

3.6.1 Turn Warrants

A turn warrant assessment identifies when a turn treatment is required to improve road safety. Rural turn lane warrants at both key intersections have been assessed in accordance with the procedure described in Austroads Guide to Road Design, Part 4A: Signalised and Unsignalised Intersections.

It is also important to note that the method used measures the cost of providing an improved turning treatment compared to the cost of potential crashes occurring over a ten year period. The construction camp is likely to be in operation for only two years and therefore the usual method for turn warrant analysis is not wholly appropriate.

Furthermore, the turning movements and general traffic flows are sufficiently low that, dedicated turning treatments would technically not be required in this instance. However, in evidence of this, a turn warrant analysis has been carried out at both study intersections. This has been undertaken for the peak hour using the traffic flows specified in Figure 3-2 and Figure 3-3; the results are illustrated in Figure 3-4 and Figure 3-5 respectively.

Figure 3-4 Turn Warrant Analysis: Camp 3 Moray-Bulliwallah Road/Site Access

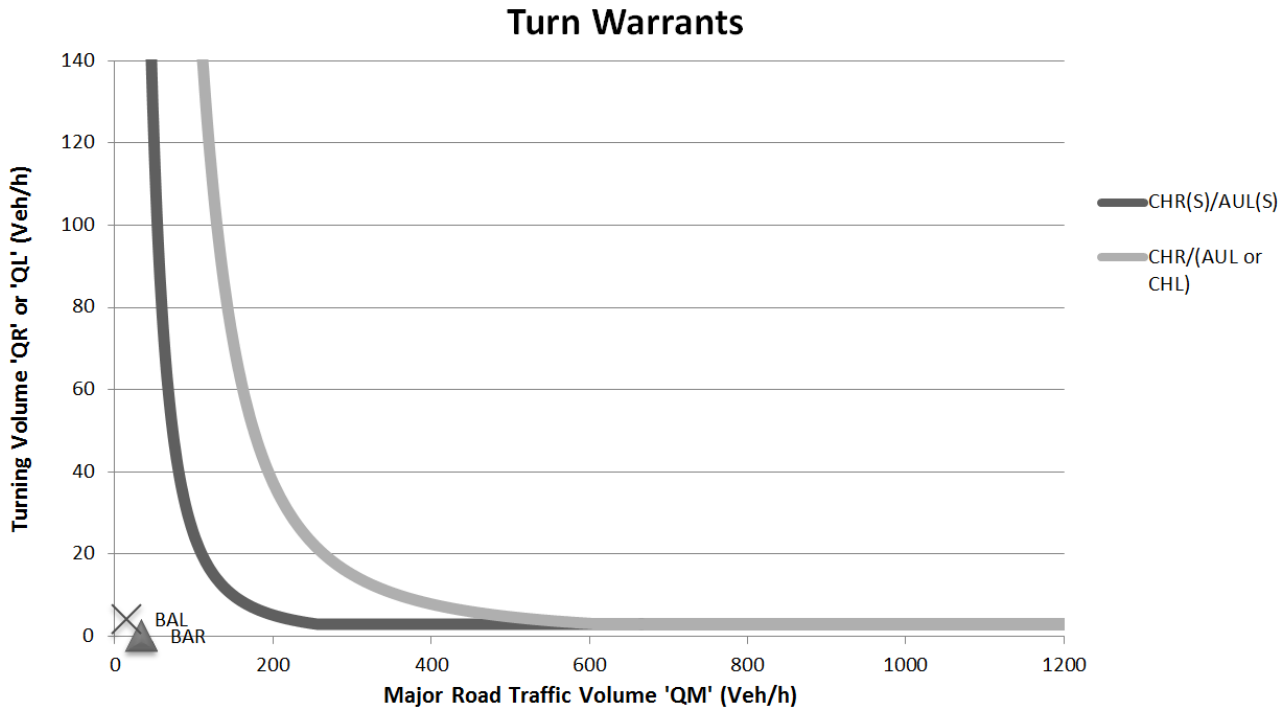
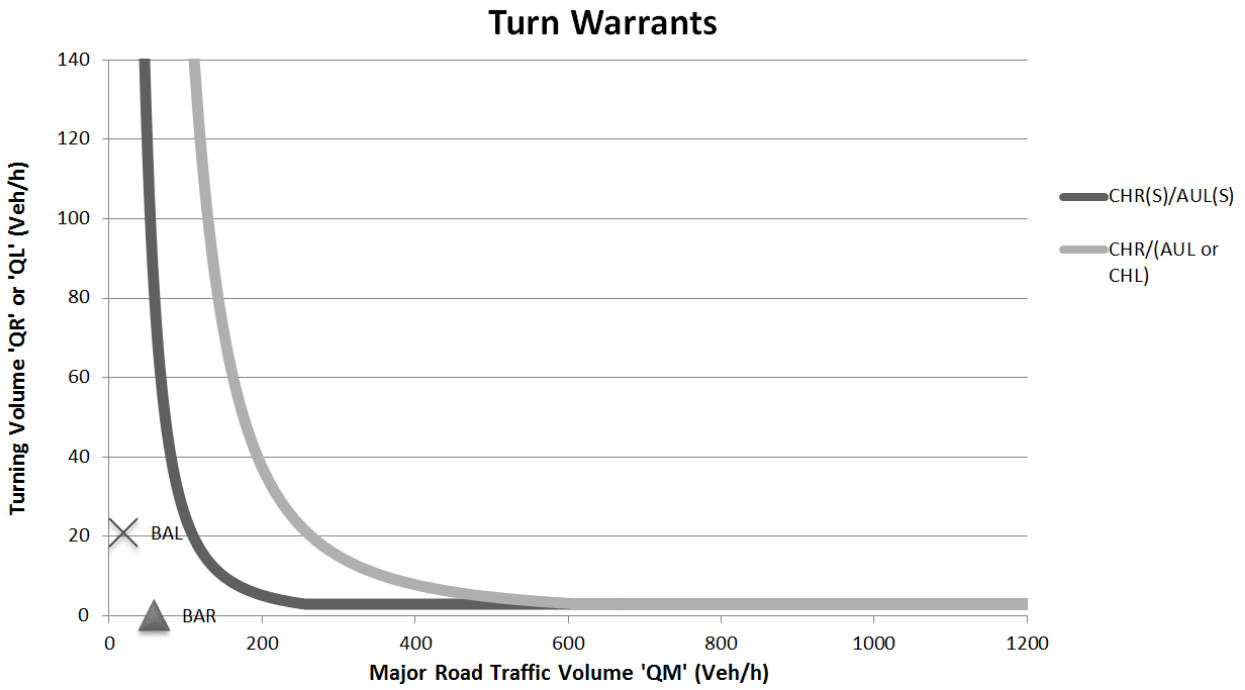


Figure 3-5 Turn Warrant Analysis: Moray-Bulliwallah Road/Moray-Carmichael Road/Moray-Carmichael Boundary Road



The results illustrated in Figure 3-4 and Figure 3-5 confirm that dedicated turning treatments are not required at either intersection. However, to minimise accident potential, a major-minor left turning treatment should be provided at both intersections for the following reasons:

- The majority of vehicles will approach each intersection from a southerly direction and will therefore turn left into the minor arms;
- The majority of traffic in the area will be heavy vehicles
- Heavy vehicles may travel in convoys with reduced headways rather than being spread apart

Alternative rural left turn treatments are shown in Figure 3-6 below. Figure 3-6 shows an Auxiliary Left turn (AUL) arrangement with localised road widening where turning vehicles would break from through traffic into a turning lane, vehicles making the opposing right turn from the major road would yield to the left turn in this instance.

Figure 3-6 Auxiliary Left Turn (AUL) Treatment

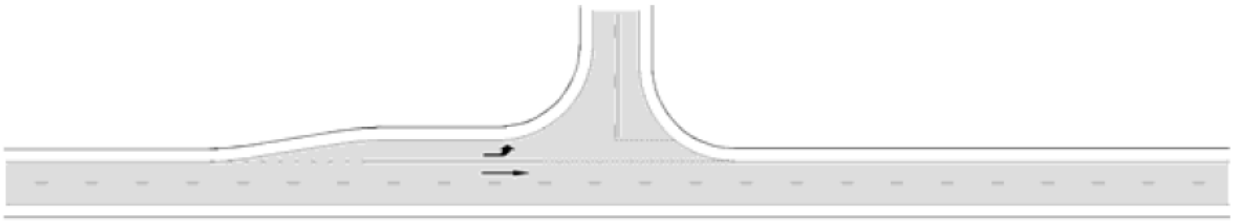


Figure 3-6 shows a Channelised Left turn (CHL) arrangement where turning vehicles would break from through traffic into a turning lane, vehicles making the opposing right turn from the major road would have priority over the left turn in this instance.

At both intersections the left turn is expected to be greater than the right turn movement and therefore the AUL treatment (Figure 3-6) is the recommended arrangement at the Moray-Carmichael Road/Moray=Bulliwallah/ Moray –Carmichael Road intersection

3.6.2 Sight Distances

Sight distance at intersections provides sufficient distance for a driver of a vehicle on the major road to observe a vehicle on a minor road approach moving into a collision situation (e.g. in the worst case, stalling across the traffic lanes) and to decelerate to a stop before reaching the collision point. Sight distance also allows traffic waiting in the minor road to assess gaps in the traffic in the major road traffic flow.

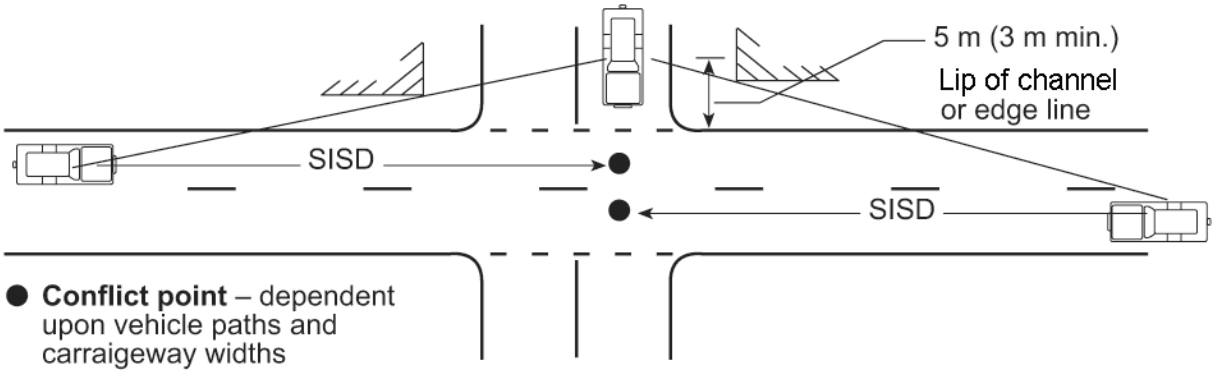
Guidance on required safe intersection sight distance (SISD) is set out in Austroads Guide to Road Design, Part 4A: Signalised and Unsignalised Intersections. SISD is dependent on the design speed of the road, which is approximated using the posted speed +10 km/h.

At both intersections it is assumed that the maximum speed for the vehicles travelling these roads is 100 km/h.

Under these circumstances the required SISD at the site access is 248 metres, and should be measured as illustrated in Figure 10. Given that both study intersections are expected to be lightly trafficked; it is considered that 248 metres SISD is sufficient at both intersection locations.

In order to ensure that this sight distance can be met it is proposed that the area required for sight lines would be kept clear of vegetation and permanent obstructions to visibility such as signage and electric/street light poles.

Figure 3-7 Sight Distance Measurement



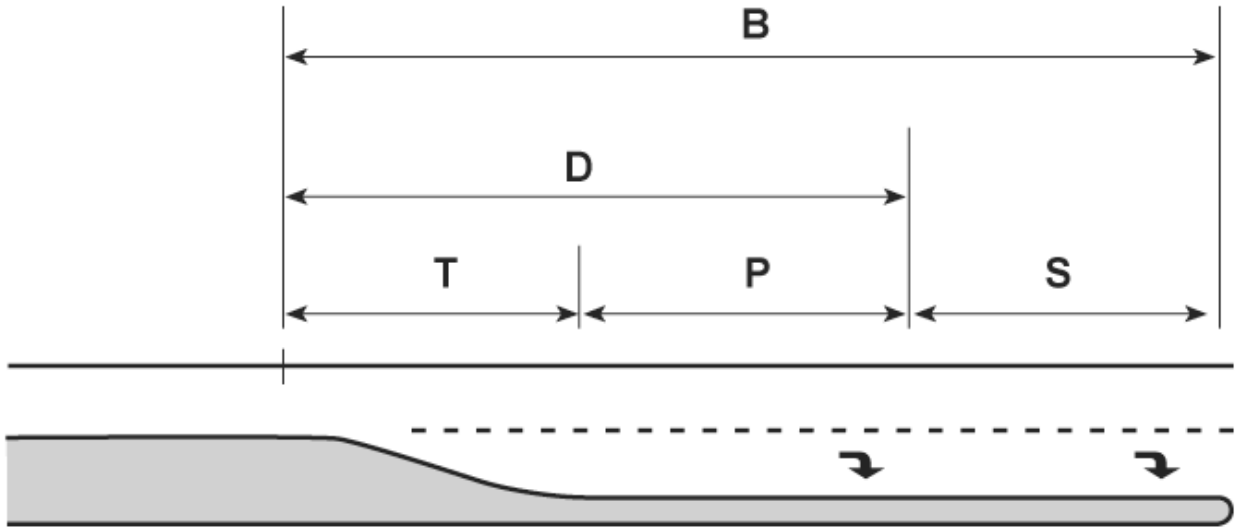
3.6.3 Geometry

The salient characteristics of the proposed AUL arrangement are specified in in Section 5 of the Austroads Guide to Road Design, Part 4A: Signalised and Unsignalised Intersections. These components are shown in Figure 11, and for a 100 km/h design speed are as follows:

- D - Deceleration Length:155m, consisting of
  - T – Physical Taper: 33m
  - P – Parallel: 122m
- S – Storage Length: Nil

It is noted the above parameters are in agreement with the TMR Road Planning and Design Manual, Chapter 13: Intersections at Grade.

Figure 3-8 Components of a Deceleration Lane



The following geometric elements should be adopted at both the Camp 3 site access intersection with Moray-Bulliwallah Road and the Moray-Bulliwallah Road/ Moray-Carmichael Road/Moray-Carmichael Boundary Road intersection:

> The minor arm should have one entry and one exit lane as separate left and right turning lanes are not required due to the low flow.
> The entry and exit radii should be 15m allow heavy articulated and rigid vehicles to enter and exit easily.

4 Summary & Conclusions

This Transport Statement set out to assess the impact of the proposed rail construction accommodation camp upon the surrounding road network and has provided advice on the transport infrastructure within the development site and its connection with Moray-Bulliwallah Road and Moray-Carmichael Road/Moray-Carmichael Boundary Road.

Construction workers will be accommodated within 407 demountable units in a temporary village. Buses will collect workers and transport them to and from the rail construction sites. These buses will use tracks running alongside the rail line as construction progresses.

External traffic movements are expected to be low but will consist largely of heavy vehicles, and when combined with the additional heavy vehicle movements expected on Moray-Bulliwallah Road and Moray-Carmichael Road/Moray-Carmichael Boundary Road, it is recommended that a an Auxiliary Left turn (AUL) be provided at both the Camp 3 site access intersection with Moray-Bulliwallah Road and the Moray-Bulliwallah Road/ Moray-Carmichael Road/Moray-Carmichael Boundary Road intersection.

Aside from this, the impacts of the proposed construction camp on the external road network are expected to be negligible; therefore this transport statement has focused on the internal aspects of the site.

Pedestrian access within the site has been designed to facilitate pedestrian movement along desire lines between accommodation units and communal buildings, the bus stops and open space.

The bus stop is designed to accommodate up to three buses or two articulated buses; a sheltered waiting area has been provided of sufficient size to manage the tidal nature of workers travelling to and from the construction sites.

Servicing the accommodation camp will take place from a dedicated loading area and turning circle adjacent the communal buildings, as well as from a service road linking to the sewage treatment plant. It is recommended that any heavy vehicle manoeuvring and waiting areas are provided in reinforced concrete.

In conclusion, the development of these lands for temporary construction worker accommodation has been considered in detail from a transport perspective. The result will be the delivery of a safe internal layout for camp residents and a safe connection to the external road network for site traffic movements.

PART

9

ENVIRONMENTAL HEALTH

> Not Applicable as part of this Application