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 – Mine Camp

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Prepared for
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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.

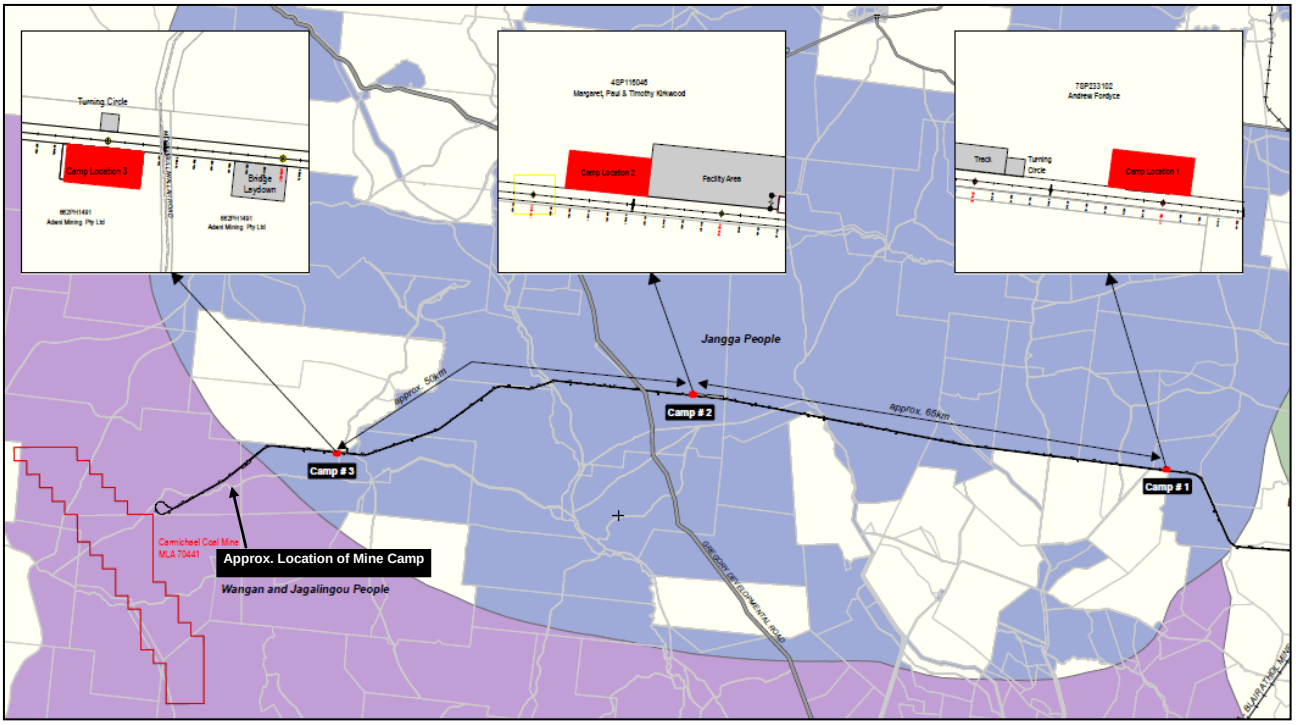
0 below provides a general illustration of the overall proposal including the three proposed rail construction camps. It is noted that the proposed mine camp is not shown on the figure below, but lies west of Camp 3 along the proposed rail line. Note that the exact locations of Camps 2 & 3 have altered 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 4. 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 1-2 General Outline of Rail Corridor and Mine/Rail Camp Locations (Indicative Only)



2 Existing Situation

2.1 Study Area and Subject Site

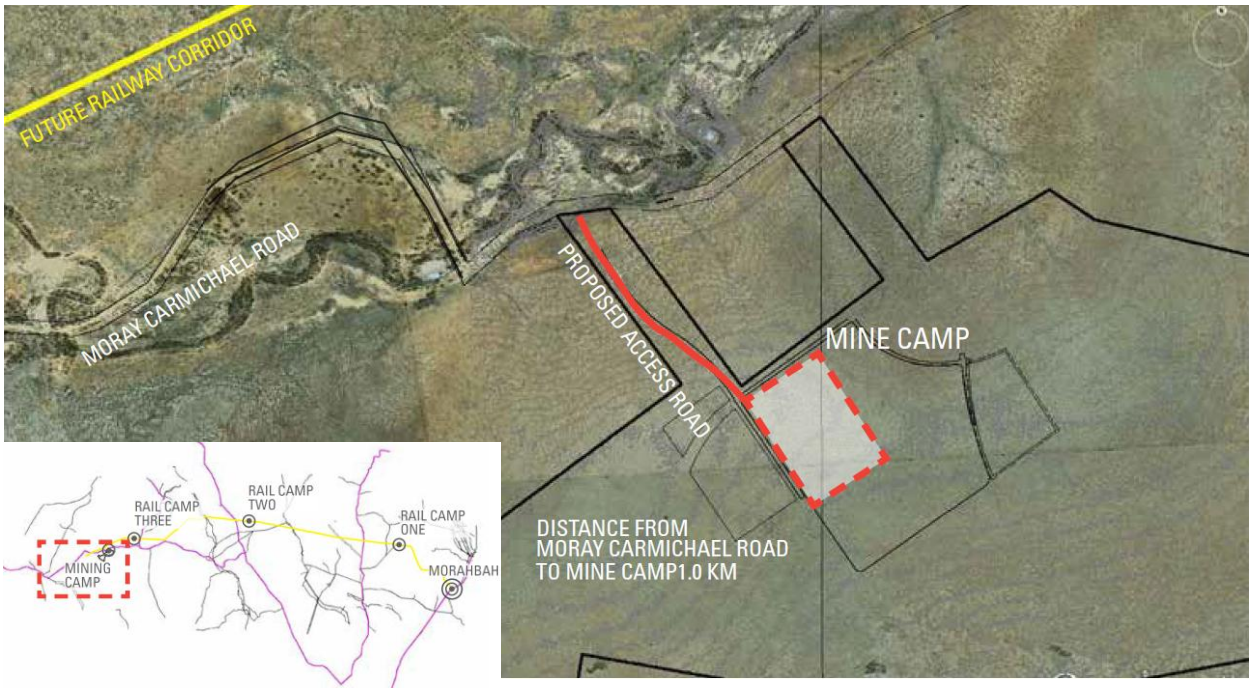
The subject area is located in Queensland's Central West region, approximately 160km west of Moranbah, and is situated within a property described as Lot 2 which has a total area of 1,111ha. The subject site is located approximately 1km south of Moray Carmichael Boundary Road, as shown in Figure 2-1.

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 215km from the construction camp and would entail a journey time of approximately four and a half hours.

The next nearest airport is located south of Moranbah. Using the current road network layout, this journey would be approximately 275km in length and take approximately five hours. Current information from Adani states that it is likely that Moranbah Airport would be utilised by fly-in/fly-out trips.

It is noted that there are other local airstrips in vicinity of the mine site, although these would likely be considered too small serve worker movements.

Figure 2-1 Mine Camp – Locality Plan



2.2 Moray -Carmichael Road

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

2.3 Traffic Volumes

Traffic volume data received from Isaac regional Council for Moray-Carmichael Road is 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 Bulliwallah Road

Road	Year	AADT	HV %
Moray -Carmichael Road	2012	14	54%

2.4 Crash Data

Cardno has requested a detailed crash history for Moray -Carmichael Road from TMR. The received information indicates there is no crash record along this road.

3 Proposed Development

3.1 Development Overview

It is proposed to establish a workers camp to support the construction of the proposed mine and railway linking the Carmichael Coal Mine with the port terminals situated to the east. The developed site is to contain accommodation units to house approximately 510 staff with all associated amenities and services.

The proposed mixed use development will consist of temporary and demountable accommodation units arranged to form a fully functioning worker community. The development site is spread over an area of 20.7 hectares and will consist of the following land uses:

- 504 Accommodation Units
- 6 Disabled Units
- 209 Car Parking Spaces
- 6 Disabled Car Parking Spaces
- 6 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 general bounded by access roads to the north, south and west and by open space to the east. A network of pedestrian paths is provided throughout, with the workers accommodation units arranged in groups either side. Communal buildings are located in the southeast corner of the development site and will provide recreational, dining and gym facilities. The collection point for transport to and from the mine site is located along the site northern boundary.

The access road from Moray -Carmichael 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.

Car parking is provided along the eastern access road as well as adjacent the bus stop waiting area. Six bus spaces are provided at the bus stop area, these are arranged in a sawtooth layout.

Figure 3-1 Proposed Site Layout – Mine Camp

LEGEND

- COMMUNAL BUILDING
- ACCOMMODATION UNIT
- DISABLED UNIT
- LAUNDRY
- PATH
- INFRASTRUCTURE
- COMMUNAL OPEN SPACE
- DETENTION BASIN

1 - Recreation Centre/ Wet Mess IT & Telephone
2 - BBQ & Shelter Areas
3 - Gym
4 - Kitchen/Dining
5 - Waste
6 - Maintenance / Linen Store
7 - Office
8 - Ablution M&F
9 - Ablution (Disabled)
10 - First Aid
11 - Lockers
12 - Water Treatment Plant
13 - Generator
14 - Detention Basin
15 - Sewerage Treatment Plant
16 - Communal Open Space
17 - Fire Break (30M wide)
18 - Spine Path (3.5M wide) with Freestanding Awning
19 - Central Path (2.0M wide)
20 - Walking Track / Maintenance (1.2M - 2.5M
Fire Tank Water
Perimeter Bund
Perimeter Fence

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 semi-trailer vehicle used as the largest expected vehicle.

The service road accessing the sewage treatment plant and water treatment plant is proposed to be a minimum of 5.0 metres wide, and will provide access for a 19m semi-trailer. Vehicles accessing this area will be required to load/unload as needed, use the turnaround area then exit back onto the main access road, this will allow one-way traffic to safely utilise these facilities. Feasibly the overflow truck parking area could be used to turn around or alternatively as a waiting area.

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 dedicated service road and turning circle, as shown in Figure 3-1, and will accommodate all manner of vehicles expected to use the mine accommodation site.

The location of the sewage treatment plant access road, the car park exit and the loading bay creates an intersection with four approaches in close proximity. Normally this would be undesirable; 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 750 metres from the furthest accommodation block, an seven or eight minute walk at a leisurely pace.

3.2.4 Public Transport Facilities

It is proposed that construction workers are transported to the mine site 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 has been designed to accommodate six buses in a sawtooth pattern. This will allow buses to exit in forward gear one after the other as each fills with passengers. Alternatively buses will enter the stop in forward gear and reverse into the circulation aisle before exiting the bus stop area. An overflow area is provided off the sewage/water treatment plant service road; this is planned to serve both buses and other heavy vehicles.

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 a peninsula of the lot which extends towards Moray - Carmichael Road. Access to the external road network will be taken from a priority controlled intersection with Moray - Carmichael Road. The alignment of the proposed access route is as highlighted in red on Figure 2-1.

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 209 sealed car parking spaces plus six disabled spaces located opposite the communal buildings. Six 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 parking areas, to the north and east of the accommodation village, 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-to-day basis, but will instead simply be used to get to and from the camp to the mine site along tracks leading to various parts of the mine.

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 car parks 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 each car park.

3.5 Traffic Generation

3.5.1 Mine 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 mine. 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 3-1 below.

Table 3-1 Mine Camp - 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

Figure 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.

1.1.1 Mine Camp Traffic Distribution

Fly-in/fly-out worker trips and service vehicles will arrive and depart from the mine camp via Moray - Carmichael Road and travel east of the site access.

1.1.2 External Traffic

Existing traffic volumes on Moray - Carmichael Road are currently low at approximately 14 vpd. For the purposes of this assessment it is assumed that approximately 50 percent or eight vehicles currently use this road during the peak hour, four in each direction.

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 construction corridor and mine construction site. The GHD report indicates that Moray - Carmichael Road will serve the following transport corridors:

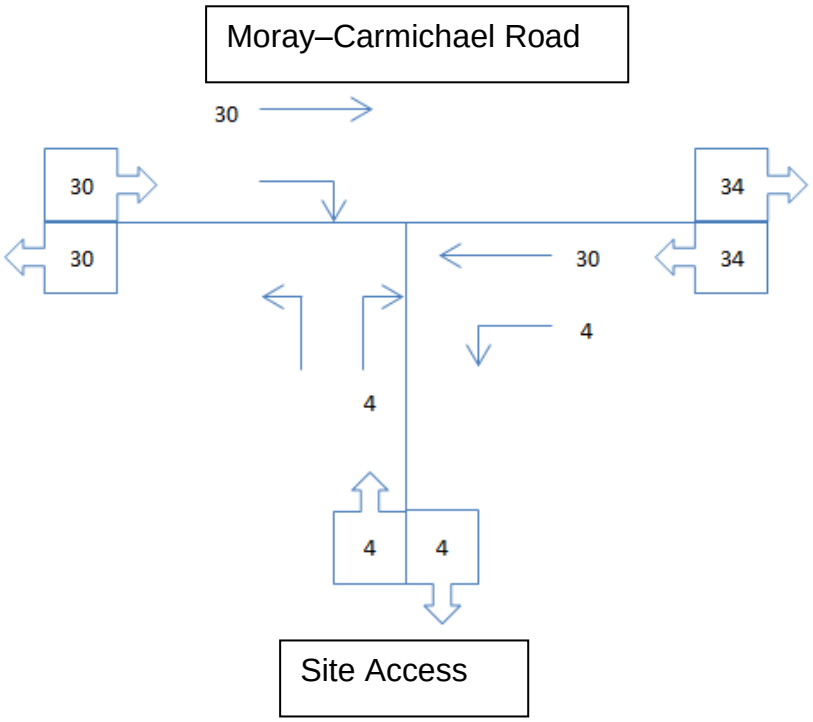
> TC01: Townsville to Rail Camp 2, Rail Camp 3 and Mine Camp – Gregory Developmental Road/Flinders Highway. 525 vpd worst case.

In combination with the existing traffic and construction camp traffic, this indicates an overall flow of approximately 550 vpd, and 60 to 70 vehicles in the peak hour. It is noted that the majority of the traffic associated with transporting materials for the construction of the mine and rail line will be heavy vehicles, that being said, the low volume of traffic is well within the traffic capacity of a sealed road.

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 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.

Figure 3-2 Expected Traffic Flow at Construction Camp Access Intersection



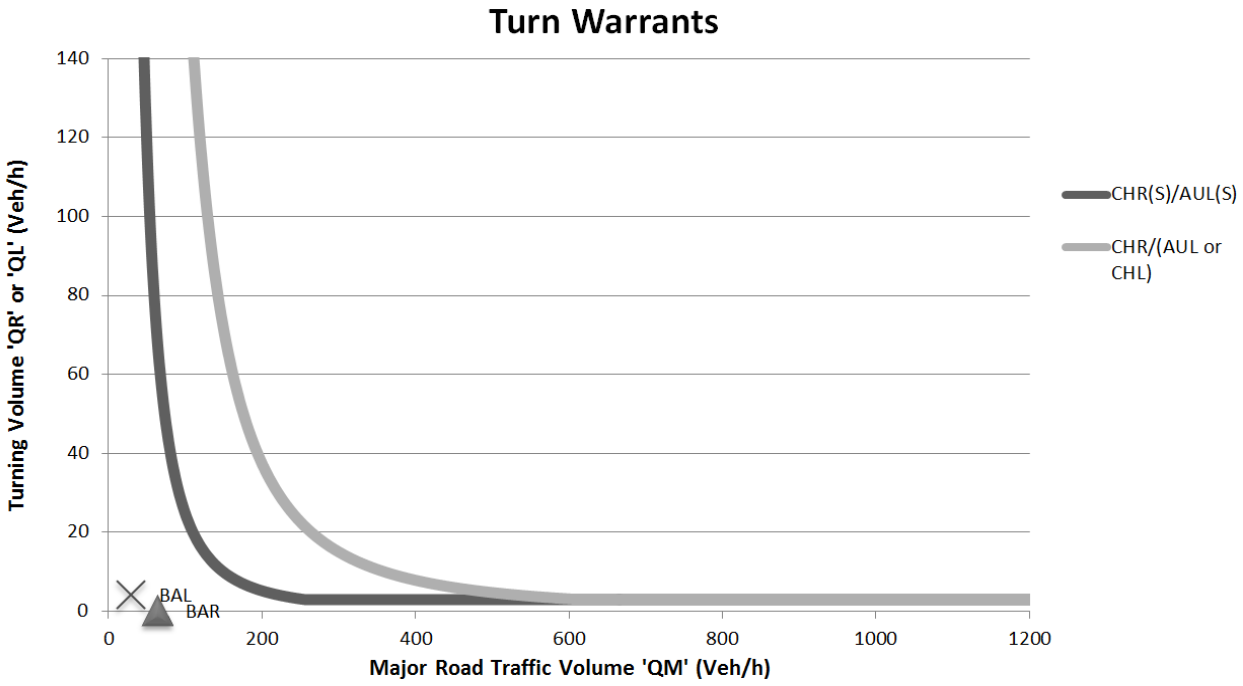
3.6 Site Access

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 mine camp is a temporary operation and therefore the usual method for turn warrant analysis may not be wholly appropriate. However, in evidence of this, a turn warrant analysis at the site access has been undertaken for the peak hour using the traffic flows specified in Figure 3-2, the results are illustrated in Figure 3-3.

Figure 3-3 Turn Warrant Analysis



The results in Figure 3-1 indicate with access traffic totalling only eight movements (four in/out) in any given one-hour period, and given that traffic on the external road network is expected to reach only around 70 total vehicles per hour, only basic turn treatments (BAL, BAR) would technically be required in this instance.

However, to minimise accident potential, a left turning treatment should be provided at the site access for the following reasons:

- The majority of vehicles will approach the camp from the east and will therefore turn left into at the site access intersection;
- The majority of traffic on Moray -Carmichael Road 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 3-4 and Figure 3-5 below. Figure 3-4 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 3-4 Auxiliary Left Turn (AUL) Treatment

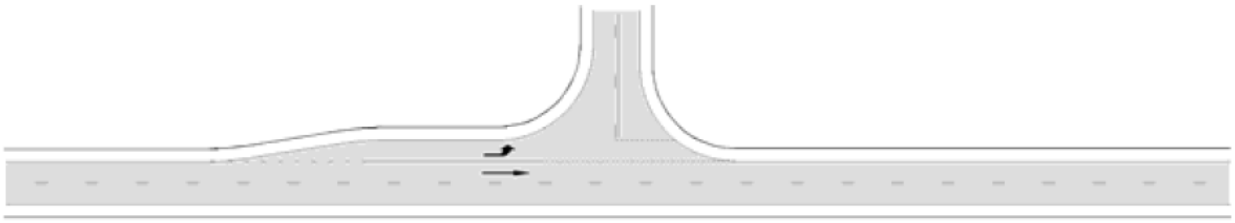
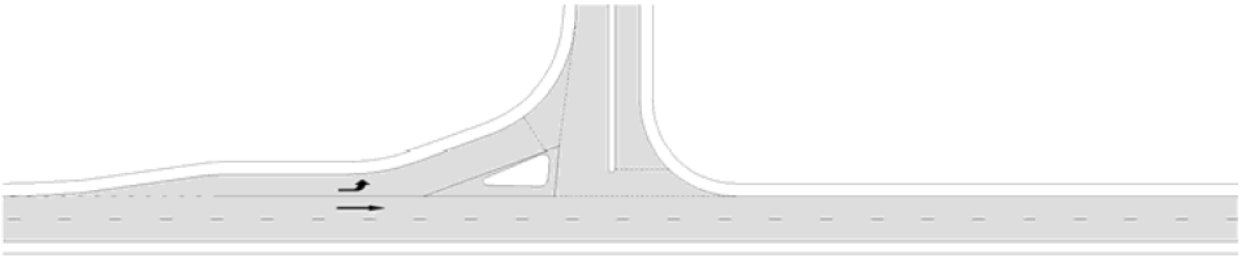


Figure 3-5 shows a Channelised Left turn (CHL) arrangement where turning vehicles would break from through traffic into a turning lane, vehicles making the opposing right turn from the major road would have priority over the left turn in this instance.

Figure 3-5 Channelised Left Turn (CHL) Treatment



In this instance the left turn is expected to be greater than the right turn movement and therefore the AUL treatment is the recommended arrangement.

1.1.3 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.

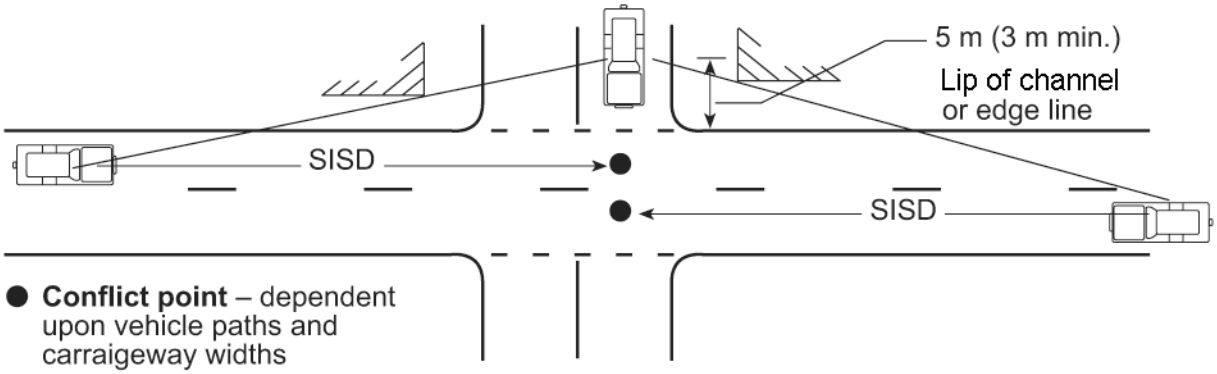
Guidance on required safe intersection sight distance (SISD) is set out in Austroads Guide to Road Design, Part 4A: *Signalised and Unsignalised Intersections*. SISD is dependent on the design speed of the road, which is approximated using the posted speed +10 km/h.

In this instance it is assumed that the maximum speed for the majority of vehicles travelling along Moray - Carmichael Road 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 8. Given the access road is expected to be very lightly trafficked; it is considered that 248 metres SISD is sufficient at this access location.

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 3-6 Sight Distance Measurement



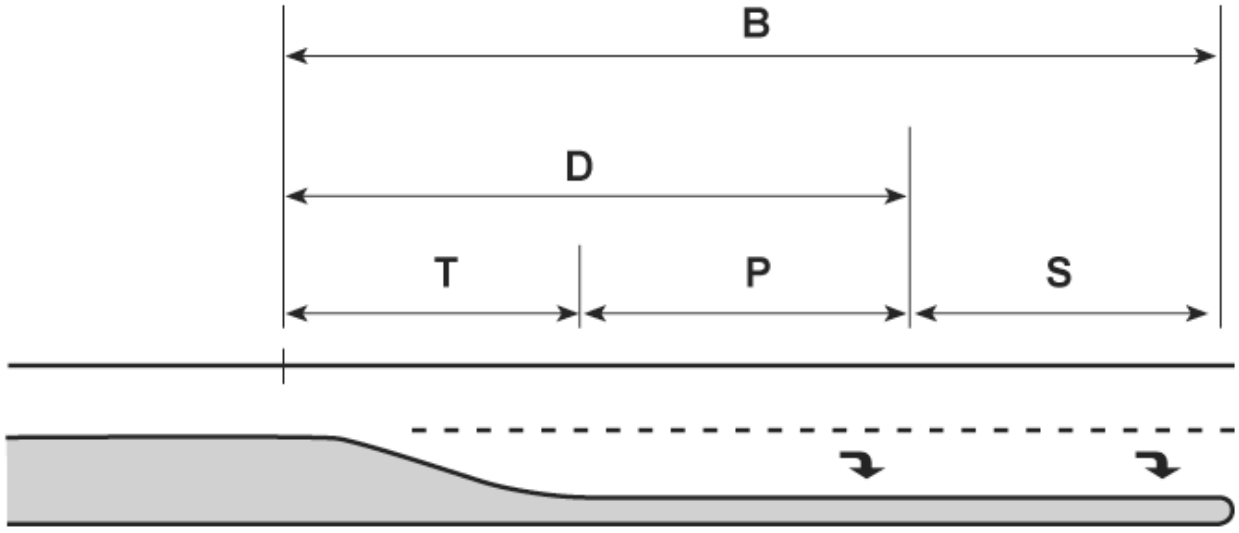
1.1.4 Geometry

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 3-6, 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 3-7 Components of a Deceleration Lane



The remaining geometric elements at the camp access intersection are straightforward:

- The access road should have one entry and one exit lane as separate left and right turning lanes onto Moray -Carmichael Road 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 mine camp upon the surrounding road network and has provided advice on the transport infrastructure within the development site and its connection with Moray - Carmichael Road.

Construction workers will be accommodated within 510 demountable units in a temporary village. Buses will collect workers and transport them to and from the mine. Worker trips will not take place on the external road network.

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 - Carmichael Road, it is recommended that an Auxiliary Left turn (AUL) be provided at the priority controlled site access.

Aside from this, the impacts of the proposed mine 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 six buses in a sawtooth arrangement; 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 mine camp will take place from a dedicated service road, loading area and turning circle adjacent the communal buildings, as well as from a service road linking to the sewage/water treatment plants. It is recommended that any heavy vehicle manoeuvring and waiting areas are provided in reinforced concrete.

In conclusion, the development of these lands for mine 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.