11. Transport

This section provides a summary of the traffic and transport investigations undertaken, and the potential impacts identified, in regards to the Project (Rail) during construction and operation. The assessment was undertaken in accordance with the requirements of the Terms of Reference (ToR) and a table cross-referencing these requirements is provided in Volume 4 Appendix C ToR Cross Reference Table. A detailed transport assessment is included in Volume 4 Appendix AG Rail Transport Report.

11.1 Introduction

The Rail Transport Report at Volume 4, Appendix AG addresses how existing transport infrastructure will be affected by project transport at the local and regional level, and across each project-affected mode (road, rail, air and sea). This section sets out a summary of the investigations set out in that report, including a Traffic Impact Assessment (TIA) for the construction and operational stages of the Project (Rail).

The TIA has been undertaken with reference to the Department of Transport and Main Road's (DTMR) *Guidelines for Assessment of Road Impacts of Development* (GARID) (DTMR, 2006) and other network relevant evaluating criteria. The main performance criteria adopted as part of GARID for the assessment of projects of this type is detailed in Table 11-1.

Table 11-1 Performance Criteria (GARID) – Assessment

Performance Measure	Criteria Adopted
Level of Service (LOS)	LOS C can be considered the minimum standard in a rural context, although LOS D may be considered satisfactory where weekend peaks are the defining event and occur on recreational occasions. LOS E should be considered the limit of acceptable urban area operation and remedial works would be needed if LOS F would otherwise result.
Per cent increase in daily traffic on the state-controlled road network	An increase within five per cent is generally considered acceptable

Access routes within the Study Area generally have flat terrain and are two-lane two-way rural roads (one lane per direction), with the exception of the road sections on the state highways that lead into the major urban centres. The AUSTROADS *Guide to Traffic Engineering Practice - Part 2: Roadway Capacity* defines level of service as a qualitative measure describing operational conditions within a traffic stream. The term Level of Service (LOS) and its characteristics for rural roads are defined in Table 11-2.

Table 11-3 shows the performance range values for a two-lane two-way rural road with level terrain under varying peak hour volume to Annual Average Daily Traffic (AADT) (expressed as number of vehicles) ratios.

Table 11-2 Level of Service for Rural Roads

LOS	Description	Description
A	Free, unrestricted flow	Satisfactory
B	Mostly free flow, few disruptions	
C	Stable flow	
D	Mostly stable flow, some delays	Consideration of safety implications required
E	Congested flow, delays common	Unsatisfactory
F	Forced flow	

Source: *AUSTROADS Guide to Traffic Engineering Practice Part 2: Roadway Capacity*

Table 11-3 Performance Criteria for Rural Roads with Level Terrain

Design Hour Volume to AADT Ratio	Level of Service (LoS) and Daily Traffic Flows				
	A	B	C	D	E
0.10	2,400	4,800	7,900	13,500	22,900
0.11	2,200	4,400	7,200	12,200	20,800
0.12	2,000	4,000	6,600	11,200	19,000
0.13	1,900	3,700	6,100	10,400	17,600
0.14	1,700	3,400	5,700	9,600	16,300
0.15	1,600	3,200	5,300	9,000	15,200

Source: *AUSTROADS Guide to Traffic Engineering Practice, Part 2: Roadway Capacity*, Table 3.9, from TRB Highway Capacity Manual (1985) Table 8.10.

The study has included and taken into consideration consultation with DTMR, Isaac Regional Council (IRC) and the Queensland Police Services (QPS).

The investigation of impacts was undertaken as part of a desktop assessment. The desktop assessment included the collection and review of the following data sets:

- A review of aerial photography and other mapping information
- Existing traffic count data for state-controlled roads (SCR) obtained from DTMR
- Traffic data for local roads in the Study Area provided by the IRC
- DTMR crash data for state and local authority controlled roads in the Study Area

11.2 Description of Existing Situation

11.2.1 Study Area

For the purposes of this report, the Study Area is defined as the Project (Rail) alignment and existing road and rail network expected to be utilised and impacted by the construction and operation of the Project (Rail). For clarification, additional capacity requirements on existing rail networks and at ports (existing or proposed) do not form part of this assessment and will be undertaken by others as appropriate. This report also includes all road crossings along the Project (Rail) corridor and roads that are potentially impacted by traffic movements generated by the construction and operation of the Project (Rail).

11.2.2 Roads

11.2.2.1 Classification of Roads

The classification of roads along the existing road network can be used as an indication of the functional role each road plays with respect to the volume of traffic they should appropriately carry and its ability to accommodate Project (Rail) related traffic. DTMR has jurisdiction over roads of State or regional significance and has four administrative classifications in its hierarchy of roads, herein all referred to as SCRs. These are:

- National Highway
- State Strategic Road
- Regional Road
- District Road

The Project (Rail) corridor will traverse one state-controlled road, namely the Gregory Developmental Road, and a number of other public local roads, governed by the Isaac Regional Council. Table 11-4 provides a summary of the roads that the Project (Rail) corridor intersects and the type of crossing treatments proposed to be provided[1].

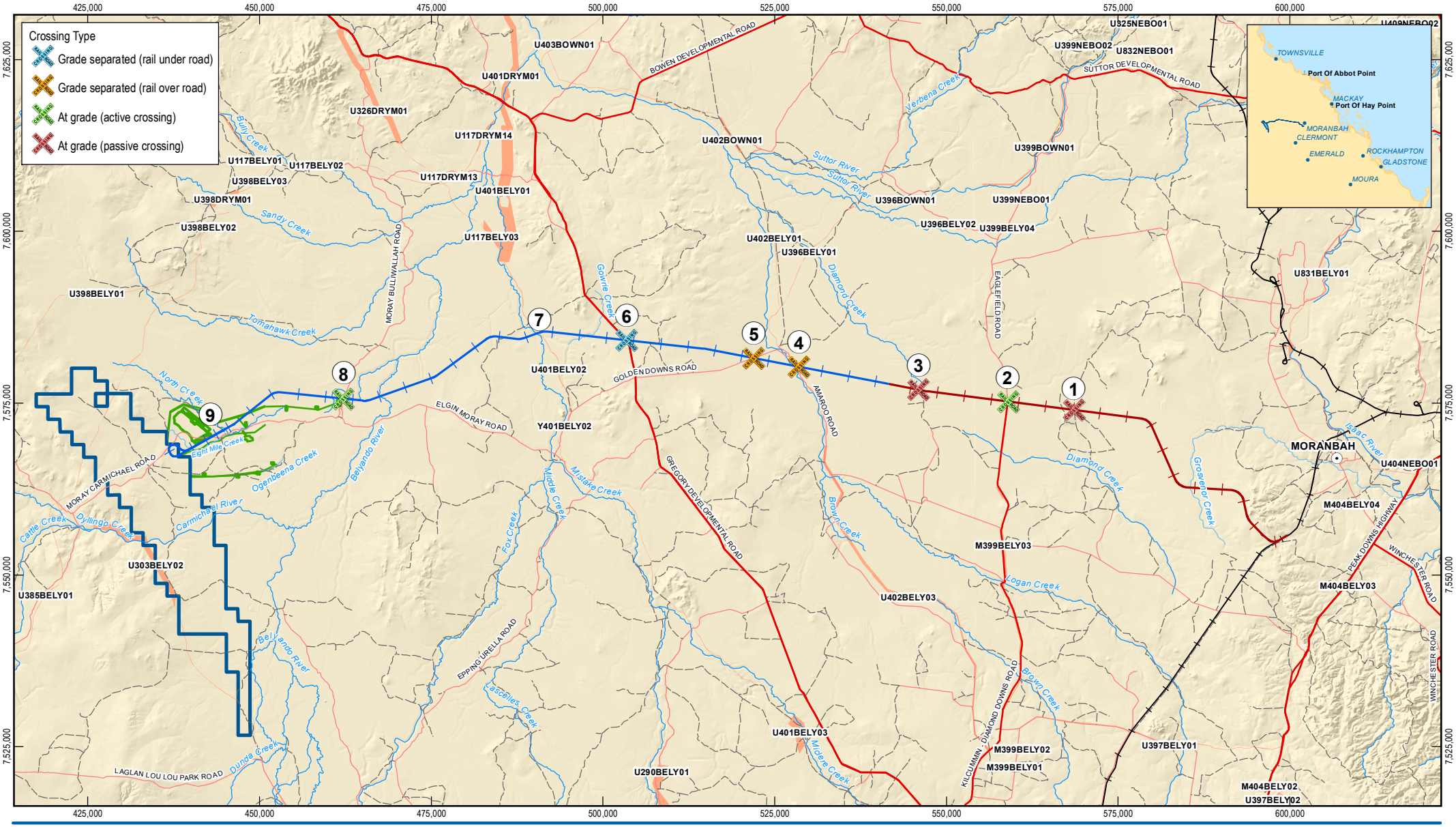
Figure 11-1 provides a more detailed understanding of the Project (Rail) corridor and interfaces with the existing State and local road network. The Study Area encompasses several transport corridors of national, state, regional, district and local significance. These types of roads are under the management and control of either DTMR (the State road authority) or in the case of local roads, IRC.

Table 11-5 provides the classification of each road within the Study Area and identifies the road authority that manages each road.

[1] Proposed intersection types are based on preliminary concept design. It is likely that intersection types will change upon further discussion with stakeholders and the development of the design.

Table 11-4 Roads and Stock Crossings intersecting the Project (Rail) Corridor

ID	Road/Crossing Name	Chainage	Proposed Treatment Type*	Description
1	Eaglefield Road / Kilcummin Diamond Downs Road	51.2	◗ At grade active crossing ◗ Stock crossing separately by culvert	IRC local road State Controlled Road (south of the Project (Rail)) Stock route (M399BELY03)
2	Amaroo Road	82.1	◗ Grade separated (rail over road) ◗ Stock route along road	IRC local road Stock route (U402BELY03)
3	Avon Road	88.7	Grade separated (rail over road)	IRC local road
4	Gregory Developmental Road	107.4	Grade separated (rail under road)	State controlled road
5	Mistake Creek Crossing	120.4	Provide sufficient clearance for stock under the waterway bridge over creek	Stock route (Y401BELY02)
6	Moray Bulliwallah Road	151.6	At grade active crossing	IRC local road
7	Moray Carmichael Road	173.1	Realigned to run parallel on the southern side of the Project (Rail). No crossing treatment required.	IRC local road



1:750,000 (at A4)

0 5 10 15 20 25

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

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LEGEND

- Town
- Other Rail Network
- Watercourse
- State Road
- Local Road
- Track
- Stock Route
- Project (Mine)
- Mine (Offsite)
- Rail (West)
- Rail (East)

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Carmichael Coal Mine and Rail Project

Project (Rail) Road Crossings and Proposed Treatments

Job Number	41-25215
Revision	G
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Figure: 11-1

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Level 4, 201 Charlotte St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: GHD: Crossing Types (2011); DERM: DEM (2008), DCDB (2010), Physical Road Network (2011); DME: EPC1690 (2010), EPC1080 (2011); © Commonwealth of Australia (Geoscience Australia): Localities, Railways (2007); Adani: Alignment Opt9 Rev3 (SP1&2) (2012); Gassman/Hyder: Mine (Offsite) (2012). Created by: BW, jvc

Table 11-5 Classification of Roads in the Study Area

Road Name	Road Authority	Classification	Heavy Vehicle Designation*
Flinders Highway (Charters Towers to Townsville)	DTMR	State Strategic Road	Road Train
Gregory Developmental Road (Charters Towers to Clermont)	DTMR	State Strategic Road	Road Train
Bowen Developmental Road (Bowen-Collinsville)	DTMR	District Road	Road Train
Bowen Developmental Road (Collinsville – Belyando Crossing)	DTMR	District Road	Road Train
Suttor Developmental Road (Nebo-Mount Coolon)	DTMR	Regional Road	Road Train
Peak Downs Highway (Clermont – Nebo)	DTMR	State Strategic Road	Road Train
Peak Downs Highway (Nebo – Walkerston)	DTMR	State Strategic Road	Road Train
Peak Downs Highway (Walkerston – Bruce Highway)	DTMR	State Strategic Road	Road Train
Kilcummin Diamond Downs Road	DTMR	District Road	Road Train
Oxford Downs – Sarina Road	DTMR	District Road	Road Train
Marlborough – Sarina Road	DTMR	District Road	
Diamond-Downs/Eaglefield Road	IRC	Local Road	
Amaroo Road	IRC	Local Road	
Moray Bulliwallah Road	IRC	Local Road	
Elgin Moray Road	IRC	Local Road	
Golden Downs Avon Road	IRC	Local Road	
Moray Carmichael Boundary Road (Doongmabullah Rd)	IRC	Local Road	

*Heavy vehicle designation is referenced from http://www.tmr.qld.gov.au/Business-industry/Heavy-vehicles/Multi-combination-vehicles/Maps/Map-of-south-Queensland/Section-10-maps.aspx

11.2.2.2 Description of Existing Road Conditions

Flinders Highway

Flinders Highway road runs in an approximate east-west direction and is approximately 760 km in length. The road connects Townsville to east with Cloncurry in the west. Flinders Highway intersects with Gregory Developmental Road at a priority controlled T-intersection immediately south of the township of Charters Towers. Flinders Highway has the following general characteristics:

- Sealed pavement in good condition
- Heavy vehicle traffic and functioning as a haulage route
- Two-way two-lane road

Gregory Developmental Road

Gregory Developmental Road runs in an approximate north-south direction and is approximately 360 km in length. The road links Charters Towers to the north with Clermont to the south. Gregory Developmental Road intersects with the Bowen Developmental Road at a priority controlled T-intersection immediately south-east of Mount Douglas, and ends at a priority controlled T-intersection with Peak Downs Highway north of Clermont. Gregory Developmental Road has the following general characteristics:

- Sealed pavement in good condition
- Heavy vehicle traffic and functioning as a haulage route

Bowen Developmental Road

Bowen Developmental Road is a regional road under the jurisdiction of the DTMR. It intersects with the Bruce Highway at a T-intersection in the township of Bowen and then proceeds in a south western direction passing Bogie, Mount Coolon and the town of Collinsville and ends at T-intersection with Gregory Developmental Road. Bowen Developmental Road has the following general characteristics:

- Sealed pavement in good condition
- Heavy vehicle traffic and functioning as a haulage route

Suttor Developmental Road

Suttor Developmental Road is a partly sealed road and connects Mount Coolon to the west to Nebo to the east. Suttor Developmental Road currently carries an average of 50 to 70 vehicles per day and is therefore considered to be lightly trafficked. It stretches from Mount Coolon at a T-intersection with Bowen Developmental Road to Collinsville Elphinstone Road.

Peak Downs Highway

Peak Downs Highway links Moranbah and Goonyella to Mackay. The Peak Downs Highway alignment travels through undulating terrain for a distance of approximately 265 km with over 1.2 km of its length travel across vertical grades that are steeper than five per cent. Peak Downs Highway has the following general characteristics:

- Sealed pavement in good condition
- Heavy vehicle traffic characteristics indicating that this is currently used as a haulage route

Kilcummin-Diamond Downs Road

Kilcummin-Diamond Downs Road runs in an approximate north-south alignment. The Kilcummin Diamond Downs Road is a state-controlled road which turns into an IRC local controlled road in the vicinity of the Project (Rail), namely Eaglefield Road. Continuing south from the intersection with Eaglefield Road, the Kilcummin-Diamond Downs Road intersects with Gregory Developmental Road at a priority controlled T-intersection located to the north of Miclere

Moray Bulliwallah Road

Moray Bulliwallah Road is an IRC local controlled road running north from the intersection of the Elgin Moray and Moray Carmichael Roads.

Moray Carmichael Boundary Road

Moray Carmichael Boundary Road is a local road under the jurisdiction of the IRC. The road runs in an approximate east-west alignment and is approximately 115 km in length. The road forms a priority controlled T-intersection with Bulliwallah Road at its eastern end and forms a priority controlled T-intersection with Ulcanbah Road at its western end. Moray Carmichael Road traverses the Project (Mine).

Elgin Moray Road

Elgin Moray Road is a local road under the jurisdiction of the IRC. The road runs in an approximate north-south alignment. The road intersects Epping Elgin Road via a priority controlled T-intersection at its southern end and forms a priority controlled T-intersection with Moray Carmichael Boundary Road at its northern end.

Golden Downs Avon Road

Golden Downs Avon Road is a local road under the jurisdiction of the IRC. The road runs in an approximate north-south alignment and intersects Kilcummin-Diamond Downs Road via a priority controlled T-intersection at its southern end.

Diamond Downs Eaglefield Road

Eaglefield Road runs north from the junction with Kilcummin-Diamond Downs Road. The road forms a priority controlled T-intersection with Suttor Developmental Road to the south-east of Mount Coolon. Eaglefield Road is an IRC local controlled road. Kilcummin-Diamond Downs Road and Eaglefield Road also comprise part of the State's stock route network (stock route M399BELY03).

Amaroo Road

Amaroo Road is an IRC local controlled road leading south from Golden Downs Avon Road. Amaroo Road is also part of the State's stock route network (stock route U402BELY03).

11.2.2.3 Existing Traffic Volumes on State Controlled Roads

Existing traffic count data was obtained from the DTMR in the form of AADT flows and percentage of traffic comprising of heavy vehicles along state-controlled roads. The highest daily counts are typically associated with locations in close proximity to either the Bruce Highway and/or an urban centre and lower daily counts are generally situated some distance from other SCRs or urban centres. Based on the trends it is apparent that SCRs are utilised as existing haulage routes.

11.2.2.4 Existing Traffic Volumes on Local Council Roads

The IRC provided traffic volume data for Elgin Moray and Golden Downs Avon Roads. The AADT is 350-2,000 and 40, respectively, with heavy vehicles making up 40 and 30 per cent, respectively.

In general, local roads carry relatively low traffic volumes.

11.2.2.5 Roadway Capacity for Two-Lane Two-Way Rural Roads

From the current performance as a LOS, it is evident that that all state-controlled roads act as haulage routes. All except a section of the Peak Downs Highway operate satisfactorily and have some spare road capacity to accommodate additional traffic. In the peak periods, the Peak Downs Highway, between Walkerston and the Bruce Highway, operates at LOS E. Consideration will be given to this during the operational planning.

11.2.2.6 Crash History

All historical crash data was obtained from the DTMR for roads impacted by the Project (Rail) for the period 2005 to 2009.

Flinders Highway

A review of crash data was undertaken for the section of Flinders Highway situated between Queenton and Wulguru which is approximately 126 km in length. The crash data reveals:

- In total 99 crashes occurred along the surveyed section, which is an average of 0.05 per day or 19.8 per year
- 6 per cent of crashes included a fatality, 61 per cent of the crashes resulted in an injury and 33 per cent in a non-casualty
- 65 per cent were single vehicle crashes, 29 per cent were multi-vehicle crashes, and 20 per cent of crashes occurred at intersections
- 71 per cent occurred on a weekday, and fatigue was recorded as a contributing factor in 19 per cent of all crashes
- 94 per cent occurred in dry clear conditions and 59 per cent in daylight

Gregory Developmental Road

A review of crash data was undertaken for the section of Gregory Developmental Road situated between Peak Downs Highway and Flinders Highway, approximately 370 km in length. The crash data reveals:

- In total 65 crashes occurred, which is an average of 0.04 per day or 13 per year
- Five per cent of crashes included a fatality, 55 per cent of the crashes resulted in an injury and 40 per cent in a non-casualty
- 83 per cent were single vehicle crashes, and 11 per cent were multi-vehicle crashes.
- 48 per cent of crashes hit an object or animal, and fatigue was recorded as a contributing factor in 26 per cent of the crashes
- 74 per cent occurred on a weekday and only five (5) per cent of crashes occurred at intersections.
- 91 per cent occurred in dry clear conditions and 80 per cent in daylight

Bowen Developmental Road

A review of crash data was undertaken for the section of Bowen Developmental Road situated between Gregory Developmental Road and Bruce Highway, approximately 260 km in length. The crash data reveals:

- In total 64 crashes occurred, which is an average of 0.04 per day or 13 per year
- Five per cent of crashes included a fatality, 75 per cent of the crashes resulted in an injury and 20 per cent in a non-casualty
- 72 per cent were single vehicle crashes, and 22 per cent were multi-vehicle crashes
- 45 per cent of crashes hit an object or animal, and fatigue was recorded as a contributing factor in 27 per cent of the crashes
- 69 per cent occurred on a weekday and 11 per cent of crashes occurred at intersections
- 91 per cent occurred in dry clear conditions and 61 per cent in daylight

Suttor Developmental Road

A review of crash data was undertaken for the section of Suttor Developmental Road situated between Bowen Developmental Road and Peak Downs Highway, approximately 160 km in length. The crash data reveals:

- In total 21 crashes occurred, which is an average of 0.01 per day or 4.2 per year
- 76 per cent of the crashes resulted in an injury and 24 per cent in a non-casualty
- 76 per cent were single vehicle crashes, and 19 per cent were multi-vehicle crashes
- 48 per cent of crashes hit an object or animal, and fatigue was recorded as a contributing factor in 29 per cent of the crashes
- 71 per cent occurred on a weekday and 19 per cent of crashes occurred at intersections
- 100 per cent occurred in dry clear conditions and 71 per cent in daylight

Peak Downs Highway

A review of crash was undertaken for the section of Peak Downs Highway situated between Gregory Developmental Road and Bruce Highway, approximately 270 km in length. The crash data reveals:

- In total 305 crashes occurred, which is an average of 0.17 per day or 61 per year
- Four per cent of the crashes resulted in a fatality, and 55 per cent of the crashes resulted in an injury and 41 per cent in a non-casualty
- 50 per cent were single vehicle crashes and 44 per cent were multi-vehicle crashes, and two per cent involved pedestrians
- 78 per cent occurred on a weekday, 84 per cent occurred in dry clear conditions and 66 per cent in daylight
- Fatigue was a contributing factor in 21 per cent of the crashes

Marlborough – Sarina Road

A review of crash was undertaken for the section of Marlborough – Sarina Road situated between Oxford Downs Sarina Road and Sarina, approximately 55 km in length. The crash data reveals:

- In total 49 crashes occurred, which is an average of 0.03 per day or 10 per year
- Two per cent of the crashes resulted in a fatality, and 55 per cent of the crashes resulted in an injury and 43 per cent in a non-casualty
- 39 per cent were multi-vehicle crashes and 55 per cent were single vehicle, and two per cent involved pedestrians
- 53 per cent occurred on a weekday, and 84 per cent occurred in dry clear conditions and 74 per cent in daylight

Bruce Highway (Sarina to Mackay)

A review of crash data was undertaken for the section of Bruce Highway situated between Sarina and Mackay, approximately 35 km length. The crash data reveals:

- In total 371 crashes occurred, which is an average of 0.20 per day or 74 per year
- One per cent of the crashes resulted in a fatality, 56 per cent of the crashes resulted in an injury and 43 per cent in a non-casualty
- 71 per cent were multi-vehicle crashes and 25 per cent were single vehicle, two per cent involved pedestrians
- 76 per cent occurred on a weekday, and 85 per cent occurred in dry clear conditions and 70 per cent in daylight

Summary of Crash History

The key trends identified from the review of road corridor impacted by the Project (Rail) are:

- Most roads are over 30 km in length, are high speed travel environments and have at least one (1) recorded fatality
- Single vehicle crashes are a significant contributing crash trend along with crashes involving animals and fatigue

11.2.2.7 Urban Areas

Townsville, Charters Towers, Bowen, Collinsville, Mount Coolon, Mackay, Sarina, Nebo, Moranbah and Clermont are some of the primary townships located along the potential haulage routes, which may be impacted during the construction of the Project (Rail). Most of the haulage routes avoid key regional centres, and routes to the port are planned to utilise designated heavy vehicles heavy vehicle routes to minimise impact on towns.

11.2.3 Railways

The Project (Rail) will provide a connection between the Mine and the existing Goonyella rail system. The planned junction with the existing Goonyella rail system is anticipated to be located approximately 8 km south of Moranbah.

Coal from the Mine will be transported to ports at Hay Point (Dudgeon Point expansion) and Abbot Point. Figure 11-2 shows the Project (Rail) in relation to the existing rail network.

LEGEND

- Town
- Major Port
- Project (Mine)
- Mine (Offsite)
- Rail (West)
- Rail (East)

Other Rail Networks

- Finch Hatton Branch
- Goonyella System
- Great Northern Line
- Newlands System
- North Coast Line
- Townsville Mount Isa

1:2,000,000 (at A4)

0 10 20 30 40 50

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

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Adani Mining Pty Ltd

Carmichael Coal Mine and Rail Project

Job Number 41-25215
Revision D
Date 11-09-2012

Project (Rail) Existing Rail Network Figure: 11-2

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Data Source: © Commonwealth of Australia (Geoscience Australia): Towns, Railways (2007); DERM: LGA (2011); DME: EPC1690 (2010), EPC1080 (2011); Adani: Alignment Opt9 Rev3 (SP1 & 2) (2012); Gassman/Hyder: Mine (Offsite) (2012). Created by: BW, JVC, MS

11.2.3.1 Goonyella Rail System

The Goonyella rail system is owned and operated by QR National and comprises of approximately 925 km of narrow gauge rail line servicing 30 coal mines in the Bowen Basin. The Goonyella rail system is fully electrified, with the overhead line equipment operating at 25,000 volts, 50 Hertz alternating supply, and the predominant train type is three electric locomotives hauling 120 wagons. The track is a bi-directional duplicated track between Dalrymple Junction, near Hay Point and Wotonga, near Moranbah, with the remainder being single line.

QR National has a current program of capacity upgrades which will initially increase capacity from the current 129 Mtpa to 140 Mtpa for export via the Port of Hay Point (and the proposed Dudgeon Point expansion).

The Goonyella Abbot Point Expansion (GAPE) project, completed in December 2011, provides a link from the existing Goonyella rail system to the Newlands rail system, therefore enabling export of coal from the northern Bowen Basin through the Port of Abbot Point. The completion of the GAPE project sees the capacity of Abbot Point Coal Terminal 1 increase to 50 Mtpa.

11.2.3.2 Newlands Rail System

The Newlands rail system is owned and operated by QR National and comprises of approximately 190 km of narrow gauge single track rail line. The Newlands rail system is capable of operating with diesel trains which predominantly consist of three diesel locomotives hauling 82 wagons.

It services three coal mines in the northern Bowen Basin and is currently contracted to export 17 Mtpa. QR National is developing master plans for the expansion of the Newlands Rail Line to accommodate rail movement transporting 120 Mtpa of coal.

11.2.4 Sea Ports

It is anticipated that the following ports, as shown on Figure 11-3, could be utilised for both the transfer of supplies and equipment and the export of coal in the Project's operational phase:

- Port of Townsville – major port with nine working berths currently accommodates international shipping and supporting warehousing facilities. Commodities are supplied to the port via both rail and road. The Port of Townsville provides facilities suitable for the import of construction materials, components and pre-assembled modules for the Construction of the Project (Rail). Investigations are currently underway (the Port Expansion Project) which will include development of six new berths and reclamation of approximately 100 ha.
- Port of Mackay – port with four working berths currently accommodates international shipping and supporting warehousing facilities. Cargo is supplied to Mackay via both rail and road. Mackay provides facilities suitable for the import of construction materials, components and pre-assembled modules for construction of the Project (Rail).
- Port of Hay Point – comprises two separate coal export terminals, Dalrymple Bay Coal Terminal (DBCT), leased from the State government by DBCT Management Pty Ltd, and the Hay Point Coal Terminal (HPCT), owned and operated by BHP Billiton Mitsubishi Alliance (BMA). Each terminal comprises rail in-loading facilities, onshore coal handling and stockpile areas, and offshore wharves. The offshore wharves are serviced by conveyor systems, supported jetties to deliver coal to the offshore facilities. The DBCT wharf is 3.8 km offshore and includes three ship-loaders and HPCT is 1.8 km offshore with two ship-loaders. In 2010-11, total throughput for the port was approximately 88

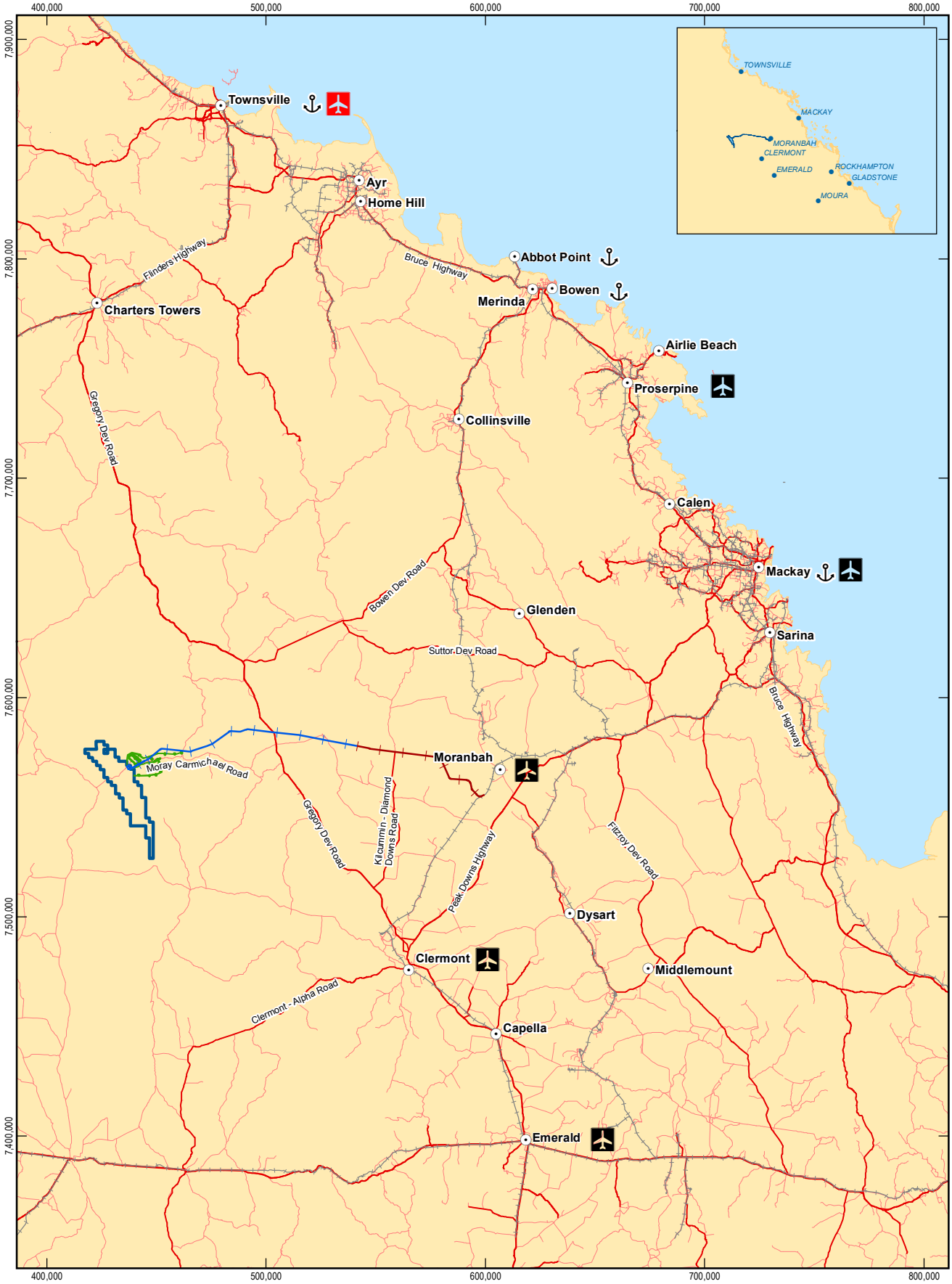
Mt, of which 33 Mt was through HPCT and 55 Mt through DBCT which was supplied by the Goonyella rail system.

- NQBP is currently undertaking environmental and engineering studies for the development of the Dudgeon Point expansion at the port. The expansion comprises two new terminals providing an expected 150 to 180 Mtpa additional capacity to the port. Adani and Dudgeon Point Project Management Pty Ltd were selected as preferred developers of the Dudgeon Point project in 2010. Dudgeon Point is expected to commence operations in 2015/2016.
- Port of Abbot Point - comprises a single coal export terminal, Abbot Point Coal Terminal 1 (APCT 1) which is operated (under long-term 99 year lease) by Adani Abbot Point Terminal Pty Ltd (Adani APT), also a subsidiary of the Adani Group. APCT 1 comprises a rail in-loading facility, coal handling and stockpile areas, and a dual trestle jetty and conveyors connected to two berths and ship-loaders, located 2.75 km offshore, with a capacity of 50 Mtpa. Coal is supplied to the port via the Newlands rail system. Adani APT is proposing to develop a second terminal, Terminal 0, in 2013, which will provide an additional rail in-loading facility, coal handling and stockpile areas, and a second trestle jetty and conveyors connected to two additional berths and ship-loaders. This will be located east of the existing terminal and have an initial capacity of 35 Mtpa and a future planned expansion to 70 Mtpa. Two other terminals, Terminal 2 and Terminal 3, are also currently proposed for development in 2013-2014 each having a nominal capacity of 60 Mtpa.

11.2.5 Airports

There is one international airport, two domestic airports, one regional airport and numerous additional local airstrips in the vicinity of the Study Area (refer Figure 11-3). A proposed personnel transport strategy for the rail construction phase is likely to require a proportion of fly-in fly-out (FIFO) with the workforce transported by coaches for transfer between construction camps and airports. Domestic and regional airports and local airstrips that could potentially serve construction workers as part of FIFO employment contracts are located at:

- Townsville (International)
- Mackay (Domestic)
- Proserpine (Domestic)
- Emerald (Regional)
- Moranbah
- Clermont
- Bowen
- Collinsville



LEGEND

- Town
- Major Port
- Airport International
- Airport Regional
- State Road
- Local Road
- Existing Rail Network
- Project (Mine)
- Mine (Offsite)
- Rail (West)
- Rail (East)

1:2,500,000 (at A4)

0 20 40 60 80 100

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

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Adani Mining Pty Ltd

Carmichael Coal Mine and Rail Project

Job Number	41-25215
Revision	E
Date	11-09-2012

Project Area Ports and Airports

Figure: 11-3

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Level 4, 201 Charlotte St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data Source: GA: Gazetted Names (2008) - Airports/Ports; DMR: State Roads (2008); DME:EPC1690 (2010), EPC1080 (2011); Adani: Alignment Opt9 Rev3 (2012); Gassman/Hyder: Mine (Offsite) (2012). Created by: BW,JVC.

11.2.6 School and Public Transport Services

No public transport or school bus services have been identified in close proximity to the Project (Rail). Services are assumed to occur in the wider region.

School bus routes in and around Clermont and Moranbah utilise sections of the Peak Downs Highway between Moranbah and Clermont.

11.2.7 Asset Condition

The Project (Rail) will cross dedicated public road reserves, private (farm) trails within private property and stock crossings. A number of these roads which would intersect the Project (Rail) are currently unsealed. These unsealed road conditions may be impacted if used as a haulage route during the construction of the Project (Rail) from the deterioration of road condition under heavy and repetitive loadings, particularly in wet conditions.

Narrow carriageways and/or undulating road alignments along some of these routes could also create safety or operation issues for some large construction vehicles accessing the Project (Rail).

11.3 Potential Impacts and Mitigation Measures

11.3.1 Overview

A direct construction access is proposed to be provided adjacent to all rail works along the Project (Rail) corridor, and will be sized to allow free flow and unhindered access for all construction and support traffic vehicles. These access points will also be utilised for the transport of water, personnel, fuel and materials for maintenance purposes. Construction access would be provided adjacent to the rail works and typically be located on the northern side of the Project (Rail) corridor. The intersections of the construction access road with the primary access roads will need to be designed and constructed during the site preparation/mobilisation period.

Transport corridors have been identified for the purposes of assessing the impact of construction traffic on the surrounding highway network. These corridors comprise both state and local controlled roads and will be used as the primary routes during the construction phase for transporting of equipment and materials. These routes are identified in Figure 11-4 and Table 11-6.

LEGEND

- Town
- Major Port
- Other Rail Network
- State Road
- Local Road
- Rail (West)
- Rail (East)
- Mine (Onsite)
- Mine (Offsite)
- Local Government Area

1:2,000,000 (at A4)
0 10 20 30 40 50
Kilometres
Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

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Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project

Project (Rail)
Indicative Haulage Routes

Job Number 41-25215
Revision G
Date 13-09-2012

Figure: 11-4

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Level 4, 201 Charlotte St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data Source: © Commonwealth of Australia (Geoscience Australia): Town, Railways, Watercourses, Roads (2007); DME: EPBC1690 (2010), EPC1080 (2011); GHD: Rail Options, Major Ports (2010), Adani: Alignment Opt9 Rev3 (SP1&2) (2012); Gassman/Hyder: Mine (Offsite) (2012), DERM: Local Government Boundaries (2012). Created by: BW, AJ

Table 11-6 Indicative Transport Corridors

Transport Corridor (TC)	State Road	Local Road	Comments
TC01	Gregory Developmental Road		Access from Townsville to west end of the rail line
	Flinders Highway	Moray Carmichael Road	Covers 497 km of which 84 km is unsealed.
	Gregory Developmental Road	Elgin Moray Road	
		Moray Bulliwallah Road	
TC02	Flinders Highway		Access from Townsville to Kilcummin Diamond Downs Road on the eastern side of Project (Rail).
	Gregory Developmental Road		Covers 529 km with 53 km unsealed.
		Kilcummin Diamond Downs Road	
TC03	Peak Downs Highway	Goonyella Road	Access from Mackay to the construction depot near Gregory Developmental Road
	Bruce Hwy		Covers 193 km of sealed road.
		Hay Point Road	

11.3.2 Construction Traffic Generation

11.3.2.1 Construction Activity

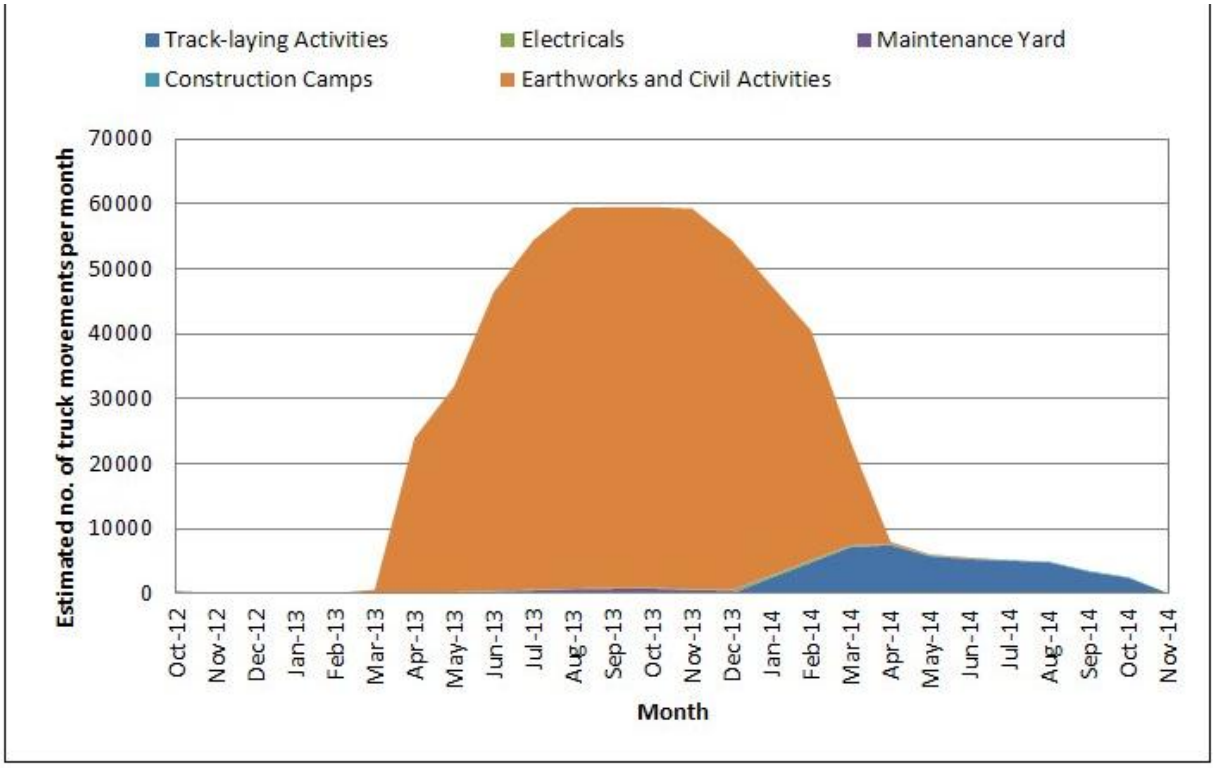
The peak traffic generation during the construction phase is likely to be associated with the transporting of plant, equipment and material deliveries. Estimated truck movements associated with the construction of the Project (Rail), based on the Project's Logistics Study (GHD, 2012) are provided in Table 11-7. It is noted that traffic movements provided are trips to and from site (two-way or return trips) and have been estimated on the basis of an inbound and outbound movement per delivery. Project (Rail) construction truck movements provided have been used to estimate peak daily heavy vehicle generation along each transport corridor. Figure 11-5 provides an understanding of the expected heavy vehicle traffic profile over the duration of the Project (Rail). The timeframes provided are indicative only and will vary according to actual start dates for construction.

Peak traffic volumes are associated with earthworks and civil works (91 per cent of truck movements) over the first year of construction.

Table 11-7 Summary of Estimated Rail Line Construction Truck Movements

Category	Estimate of Rail Line Construction Truck Movements (two-way/return)
Track-laying Activities	48,430
Maintenance Yard	2,150
Construction Camps	3,220
Earthworks and Civil Activities	540,900
Total	594,700

Figure 11-5 Heavy Vehicle Traffic Profile Across the Project



11.3.2.2 Traffic Distribution

The following principles have been considered in the development of traffic distribution for proposed transport corridors:

- The majority of materials associated with earthworks and track laying (ballasting) activities would be sourced from local quarry and borrow locations, where suitable material is available, and would utilise the rail corridor access track in addition to the following roads:
  - Gregory Developmental Road
  - Moray Carmichael Road

  - Kilcummin Diamond Downs Road
  - Suttor Developmental Road
- All remaining construction traffic travelling to the western end of the Project (Rail), including the construction camp situated at the Mine, will utilise the Gregory Developmental Road for the movement of construction site material and equipment to/from Townsville.
- Construction traffic travelling to the eastern end of the Project (Rail), including construction camps, will utilise Peak Downs Highway for the movement of site materials and equipment to/from Mackay.
- It is assumed that construction of the Project (Rail) will progress from the construction depot near Gregory Developmental Road. The track would first be laid from the construction depot towards the mine and thereafter from the construction depot towards Moranbah. The track works will require all bridges, drainage structures and formation capping layers to be completed ahead of rail infrastructure and trade installations.

Table 11-8 estimates the number of heavy vehicle construction movements for each transport corridor using activity proportions as presented in the Logistics Study (GHD, 2012).

Table 11-8 Heavy Vehicle Traffic Generation

Category	Number of Heavy Vehicle Construction Movements (two way) per transport corridor (TC)		
	TC01 (Camps 3 and 4)	TC02 (Camp 2)	TC03 (Camp 1)
Track-laying Activities	-	-	48,430
Maintenance Yard	2,150	-	-
Construction Camps	1,620	810	810
Earthworks and Civil Activities	180,300	180,300	180,300
Total	184,070	181,110	229,540
Proportion	31%	30%	39%

In summary the estimated average daily construction vehicle movements along each transport corridor are:

- TC01 - western end (TC01), Gregory Developmental Road and construction camps 3 and 4 = 31 per cent
- TC02 - Kilcummin Diamond Downs Road and construction camp 2 = 30 per cent
- TC03 - Moranbah Peak Downs Highway and construction camp 1 = 39 per cent

11.3.2.3 Heavy Vehicle Movement

The average heavy vehicle generation is the total number of truck movements generated over the duration of the Project (Rail) divided by the number of months (24) and days (30 days per month) respectively, as presented in Table 11-9. Table 11-10 provides a summary of the worst case

construction heavy vehicle movements along the state roads. The Project (Rail) construction related movements, which attracts peak construction movement of approximately 50,910 vehicle trips per month

Table 11-9 Estimated Average Heavy Vehicle Traffic Generation (two way)

Transport Corridor (TC)	Monthly Heavy Vehicle Traffic	Daily Vehicle Traffic	State Controlled Roads to be Impacted
TC01	7,700	260	Gregory Developmental Road/Flinders Highway
TC02	7,580	250	Kilcummin Diamond Downs Rd/Gregory Developmental Road/Flinders Highway
TC03	9,600	320	Peak Downs Highway

Table 11-10 Estimated Worst Case Heavy Vehicle Generation (two way)

Transport Corridor (TC)	Monthly Heavy Vehicle Traffic	Daily Vehicle Traffic	State Controlled Roads to be Impacted
TC01	15,760	525	Gregory Developmental Road/Flinders Highway
TC02	15,510	517	Kilcummin Diamond Downs Rd/Gregory Developmental Road/Flinders Highway
TC03	19,640	655	Peak Downs Highway

11.3.2.4 Construction Workforce Movements

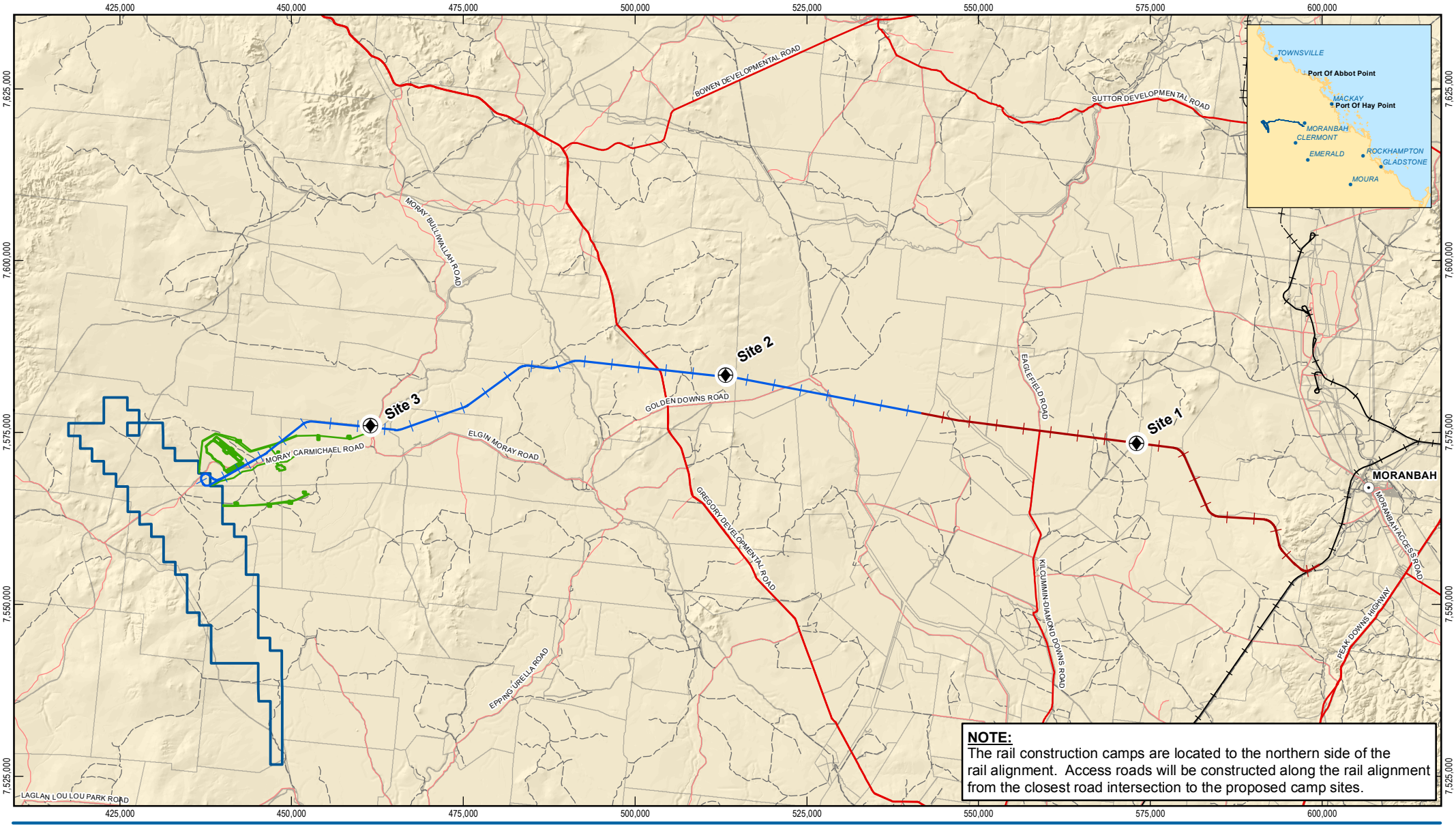
Workers camps will have spacing of less than 60 km between each temporary camp along the Project (Rail), as indicated in Figure 11-6.

Workers will be transported from workers camps to work sites by four wheel drive vehicles or buses. Travel time to the furthest work site is estimated at 35 minutes.

It is estimated that there would be up to 400 people at each workers camp. Construction workers will operate on a FIFO basis to airports in the vicinity of the Project (Rail), primarily Moranbah in the short-term. Personnel would then be transferred to the construction camps via buses.

The workforce is expected to leave the construction camp between the hours of 5:00 and 7:00 a.m. and return between 5:00 pm and 7:00 pm. Staff will be situated in the vicinity of the Project (Rail), and as a result will have minimal impact on the external road network.

The estimated peak movements per week for personnel transport are assumed to be spread over a working week with one flight per construction camp in a day or eight flights in total and ten bus loads from each campsite to Moranbah airstrip per week. The maximum daily two way movement is likely to be between six and ten coaches.



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0 5 10 15 20 25

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

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LEGEND

- Town
- Construction Camp
- Existing Railway
- State Road
- Local Road
- Track
- Rail (West)
- Rail (East)
- Mine (Onsite)
- Mine (Offsite)
- Cadastral Parcel

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project

Project (Rail)
Location of Construction Camps

Job Number 41-25215
Revision D
Date 11-09-2012

Figure 11-6

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Data source: DERM: DEM (2008), DCDB (2010), Physical Road Network (2011); DME: EPC1690 (2010), EPC1080 (2011); © Commonwealth of Australia (Geoscience Australia): Localities, Railways (2007); Adani: Alignment Opt9 Rev3 (SP1&2) (2012), Construction Camps (2011); Gassman/Hyder: Mine (Offsite) (2012). Created by: BW, jvc

11.3.2.5 Other Light Vehicle Traffic Generation

Additional vehicle movements will also be generated by service vehicles supplying the construction camps. This would typically include services such as food transport, linen laundering, fuel supplies, waste management contractors and maintenance servicemen. For the purposes of this assessment, it has been assumed that there would be approximately 20 service vehicle (light vehicle) movements per week at each construction camp.

Movements attributed to the servicing of construction camps are assumed to consist of 80 light vehicle movements each week (20 to each construction camp), which will be spread out throughout the day. For purposes of a worst-case scenario, it is assumed that 50 per cent of the light vehicle movements would occur during the peak hour. Based on this assumption it is likely that there will be 10 vehicle movements per camp during the peak hour, or 40 in total.

It is expected that the construction of the Project (Rail) would generate up to ten bus movements per week between the airport at Moranbah and each of the four workers camps. The proposed construction camps will be situated in vicinity of the Project (Rail), and as a result trips between the camps and Project (Rail) will have minimal impact on the external road.

11.3.3 Operation Traffic Generation

The Project (Rail) will connect the Mine in the west to the existing Wotonga- Blair Athol Branch line in the east and include a mine rail loop at its western end. The junction on the existing Wotonga-Blair Athol Branch line is anticipated to be located approximately eight km south of Moranbah. All coal produced by the Mine will be transported to Ports at Hay Point (Dudgeon Point expansion) and Abbot Point.

The number of trains operating within the rail system reflecting the production of coal from the Project (Mine) comprises:

- Ten trains per day each way to transport up to 30 Mtpa product, consisting of three locomotives and 120 narrow gauge wagons
- Twelve trains per day each way to transport up to 60 Mtpa product, consisting of four locomotives and 164 narrow gauge wagons
- Eighteen trains per day each way, including standard gauge wagons, to transport up to 100 Mtpa product

Trains are expected to run 24 hours per day, 320 days a year.

The estimated length of trains along Project (Rail) will be approximately 2.5 km long for narrow gauge consists and 4 km for standard gauge. The maximum operation speed of a loaded train will be 80 km/h. Empty (unloaded) trains will travel at a maximum speed of 100 km/h. Trains will have an average traveling speed of approximately 60 km/h when crossing at level crossings.

11.3.4 Construction

11.3.4.1 Transport of Heavy Vehicles and Equipment

Coach vehicle movements will comprise of ten vehicle movements per week for personnel travelling between the airport and workers camps. It is likely that the arrival of personnel will occur before the AM peak hour and the departure of personnel could coincide with the PM peak hour. Based on the above

assumption, it is likely that a maximum of two coach trips or four coach movements would be generated during peak periods.

Heavy vehicle movements associated with the floating of earth moving equipment and supply of plant and material have been estimated and then distributed along each haulage corridor identified in Section 11.3.2.3. The proportion of movements occurring during the morning (am) and evening (pm) peak periods has been estimated at approximately 10 per cent, which is a worst case estimate for the movement of these types of products. Table 11-11 summarises the estimated total vehicle movements during morning and evening peaks under a worst-case scenario.

Table 11-12 presents the estimated average daily traffic on state-controlled roads within the Study Area and includes additional construction traffic movements.

Table 11-11 Estimated Total Vehicle Movements (Worst-case Scenario) Generated during Construction

Vehicle Movements	Daily (vehicles per day)	Peak Hour (vehicles per hour)
Light vehicle movements by service personnel	10	4
Heavy vehicle movements on:		
Flinders Highway	1,042	105
Gregory Development Road	1,042	105
Peaks Down Highway	655	66
Kilcummin Diamond Downs Rd	517	52

Table 11-12 Estimated Average Daily Construction Traffic

Road Name	Existing		With Project			
	Average Daily Traffic	Heavy Vehicles (%)	Light (per day)	Heavy (per day)	Average Daily Traffic	Heavy Vehicles (%)
Flinders Highway (14A) (Townsville to Charters Towers)	4,894	20	2	1,042	5,938	34
Gregory Developmental Road (98B) (Charters Towers to Belyando Crossing)	633	17	4	1,042	1,679	68
Gregory Developmental Road (98A) (Belyando Crossing to Clermont)	412	28	4	1,042	1,458	79

Road Name	Existing		With Project			
	Average Daily Traffic	Heavy Vehicles (%)	Light (per day)	Heavy (per day)	Average Daily Traffic	Heavy Vehicles (%)
Peak Downs Highway (33A) (Clermont – Nebo)	3,435	13	0	655	4,090	27
Peak Downs Highway (33B) (Nebo – Walkerston)	6,006	11	2	655	6,663	20
Peak Downs Highway (33B) (Walkerston to Bruce Hwy)	15,990	10	2	655	16,647	14
Kilcummin Diamond Downs Road (5309)/Eaglefield Road	53	23	2	517	572	93

11.3.4.2 Impact of Rail Construction

Table 11-13 provides a summary of the percentage increase in traffic and the expected LOS on state-controlled roads in the Study Area and includes additional increase in traffic (based on highest daily counts) associated with the construction of the Project (Rail).

Table 11-13 Construction Traffic Impact on State Controlled Roads

Road ID	Road Name	AADT	Per cent Impact	LOS
14A	Flinders Hwy (Townsville to Charters Towers)	5,938	21	C
98A	Gregory Developmental Road (Charters Towers to Belyando Crossing)	1,679	165	A
98A	Gregory Developmental Road (Belyando Crossing to Clermont)	1,458	254	A
33A	Peak Downs Highway (Clermont – Nebo)	4,090	19	B
33B	Peak Downs Highway (Nebo – Walkerston)	6,663	11	C
33B	Peak Downs Highway (Walkerston – Bruce Hwy)	16,647	4	E
5309	Kilcummin Diamond Downs Road	572	979	A

Note: LOS based on Table 11-2

The estimated traffic generated by the construction phase of the Project (Rail) will exceed the threshold of five per cent increase in AADT in most cases. The analysis undertaken for this study indicates that the expected increase in traffic associated with the construction of the Project (Rail) (based on the worst

case scenario) would only occur over a period of approximately 18 months and would not impact on midblock[2] LOS Performance.

11.3.4.3 Impact of At Grade Crossing during Construction

The Project (Rail) will cross a number of roads as described in Table 11-4 and presented in Figure 11-1. The method for constructing level crossings is yet to be determined. Based on typical delivery profiles for the construction of level crossing it is expected that a temporary closure of one lane is likely to be required during the construction of the Project (Rail). To mitigate any impact associated with this construction, it is proposed that site specific traffic management plans be developed in consultation with the IRC and DTMR prior to construction starting. Based on the information available for roads with proposed level crossings, it is expected that there would be minimal delays to traffic during the construction of the level crossings given that in most cases daily traffic movement is low.

In some cases it is noted that there may be a need to divert traffic around the crossing on a temporary track and this will be addressed as part of developing site specific traffic management plans. This plan and any associated analysis would be undertaken and addressed in the detailed design phase of the Project (Rail).

11.3.4.4 Impact of Grade Separated Crossing during Construction

It is proposed that a grade separated (rail under road) crossing will be provided at the intersection with the Gregory Developmental Road. Grade separated (rail over road) treatments are proposed for Amaroo Road (IRC local road) and Avon Road (IRC local road). It must be noted however that final treatment options will be developed during detailed design in accordance with DTMR and IRC specifications.

It is considered that the construction of grade separated crossings along the Project (Rail) is unlikely to cause any significant traffic delays to traffic travelling across the existing road network. The delivery of bridge structures and abutments may require closing one lane along each of the above roads for a short period of time.

Any impact on the road network during the construction of the proposed grade separated crossings will be managed through the provision of site specific traffic management plan highlighting specific treatments and staged works. This will be developed in consultation with DTMR at the design stage of the Project (Rail).

11.3.4.5 Impact on School Bus Routes

Haulage routes for the Project (Rail) may overlap with school bus routes in the region. However, given the relatively low number of school bus services, townships situated along the routes, and the likely short period of time of operation within the day, it is expected that there would be a negligible impact on the safe operation of current school bus services. Any potential impacts will be addressed in detail when traffic management plans for construction and operation are prepared. Communication and promoting awareness to the community of the proposed rail operations and construction activity will be critical to managing impacts on school bus services during both construction and operation of the rail line. Bus operators will be made aware.

[2] Midblock assessment refers to a midblock road link assessment (i.e. assessment of a section of road rather than at an intersection)

11.3.4.6 Impact on Public Transport Routes

The potential impact of the construction traffic on public transport operations will be addressed as part of developing a construction traffic management plan. Site specific traffic management plans will be prepared to mitigate any potential impact on the public transport operation.

11.3.4.7 Mitigation Measures

The expected increase in traffic associated with the construction of the Project (Rail) can be accommodated on most state-controlled roads that provide access to the site. However, a number of mitigating measures have been identified to ensure that transport and traffic impacts arising from the construction are minimised. These measures will be incorporated through the development of the Construction Traffic Management Plan.

An important measure relating to construction traffic impacts is the implementation of a community information awareness program. This program will be initiated prior to construction commencing and throughout the entire construction period to ensure that local residents are aware of the construction activities, with particular regard to construction traffic issues.

Other initiatives that will be undertaken as part of the Construction Traffic Management Plan include:

- Consultation with DTMR, IRC and Queensland Police Services
- Reviewing speed restrictions along transport corridors
- Install specific warning signs at access roads to the construction corridor to warn road users of entering and exiting traffic
- Provide advance notice of road/lane closures and advice on alternative routes
- Provide appropriate traffic control and warning signs for areas identified where potential safety risk issues exist
- Managing the transportation of construction materials to maximise vehicle loads in order to minimise vehicle movements
- Manage the transportation of construction materials, using the Queensland Police Services and Pilots to maximise vehicle loads in order to minimise vehicle movements.

11.3.5 Operation

11.3.5.1 Maintenance Activities

It is expected that there would be a limited number of trips to the Project (Rail) for maintenance work and periodic inspections. This is unlikely to occur on a daily basis and as a result its impact would be negligible.

Maintenance works at rail/road crossings may be required on a periodic basis and would result in the short term closure of traffic lanes for safety reasons. In this instance, a site specific traffic management would be prepared in consultation with DTMR and/or IRC.

11.3.5.2 Impact at Grade Separated Crossings During Railway Operation

There would be no impact to vehicles travelling along roads where grade separated crossings are provided across the Project (Rail).

11.3.5.3 Impact to Existing Rail Operations

It is expected that the Project (Rail) will connect to the current Goonyella rail system, approximately eight km to the south of Moranbah. The 924 km Goonyella rail system in Central Queensland currently services 30 coal mines in the northern Bowen Basin. Coal is transported by rail from these mines to the Port of Hay Point, where it is exported through the Hay Point Coal Terminal operated by the BMA and the DBCT operated by DBCT Management Pty Ltd.

QR National is currently investing to expand and upgrade the Goonyella rail system. The initial rail expansion projects for the Goonyella System would increase the haulage capacity from 129 Mtpa to 140 Mtpa. The projects approved in the initial works program include:

- Track duplication south of Hay Point to service both coal terminals. This would improve operations and provide additional train holding capacity.
- Replacing the existing Track Sectioning Cabin (TSC) at Wotonga near Moranbah with a feeder station, and construct new TSCs in Carborough Downs and Grosvenor. This would provide improved power system reliability and result in more efficient train operations.

Further upgrading and expanding options for rail infrastructure on the Goonyella rail system across the Isaac and Mackay regions are also being considered by QR National.

The number of trains operating along the Project (Rail) will increase as the Mine is developed (between 2015 and 2024). A maximum of 18 train consists per day each way would operate along the Project (Rail) by 2025. It is understood that the additional trains associated with the Mine's production can be accommodated on the existing rail network or on other rail lines proposed for development within the Galilee Basin. Any impact will be managed through the scheduling of trains which will be undertaken in consultation with QR National and third party operators.

11.3.5.4 Impact on At Grade Crossings During Railway Operation

A number of at grade crossings are proposed to be provided on public local roads, which are intersected by the Project (Rail). Each of these roads have been identified to have minor road function and carry relatively low daily traffic volumes.

The following attributes have been used to consider the impact at level crossings during Project (Rail) operation. At grade crossing will be subject to individual risk assessments, but for the purpose of this assessment indicated speed has been used. These include:

- IRC has provided an average daily traffic estimate of 10-30 vehicles per day along local roads impacted by the Project (Rail), which consist of 20 per cent heavy vehicles.
- The design of level crossings and their control treatments will take into account the required sight lines distances to ensure that safety and visibility is maximised.
- Trains are estimated to have a travel speed of approximately 80 km/h when crossing all local roads with train lengths of approximately 2.5 km and 4 km, for narrow and standard gauge consists, respectively.
- Estimated train frequency will ramp up as follows:
  - Ten trains per day each way to transport up to 30 Mtpa product, consisting of three locomotives and 120 narrow gauge wagons

  - Twelve trains per day each way to transport up to 60 Mtpa product, consisting of four locomotives and 164 narrow gauge wagons
  - Eighteen trains per day each way, including standard gauge wagons, to transport up to 100 Mtpa product
- At maximum operational capacity train frequency equates to approximately three train movements per hour over a 24 hour period

Based on the above assumptions, assuming a 2.5 km long train travelling at 80 km/h, it would take in the order of one minute and 52 seconds for a train to pass each level crossing. Allowing an additional minute before the train arrives and after the train departs the crossing, there would be a maximum required wait time of three minutes and 52 seconds at the crossing. Assuming three trains per hour, this would equate to a wait time of 11 minutes and 40 seconds out of each hour.

For a train travelling at 80 km/h that is 4.0 km in length, it would take in the order of 3 minutes for a train to pass each level crossing. Allowing an additional minute before the train arrives and after the train departs the crossing, there would be a maximum required wait time of five minutes.

Assuming there would be a maximum 200 vehicles per day on each local road, with 20 trips (10 per cent of daily trips) occurring during the peak hour, a maximum of four vehicles (for a 2.5 km long train) or five vehicles (for a 4.0 km long train) would be impacted by train movement during the peak hour at at-grade crossings. These vehicles would be required to wait for a maximum of three minutes and 52 seconds (2.5 km train) or five minutes (4.0 km train).

11.3.5.5 Impact at Stock Routes

The Project (Rail) alignment crosses three stock routes. The stock routes and associated proposed crossing treatment are as follows:

- Kilcummin Diamond Downs Road is a stock crossing (Stock route (M399BELY03) and it is proposed that the crossing treatment will comprise a large culvert.
- Amaroo Road (stock route U402BELY03) is proposed to be grade separated with stock passing under the proposed rail bridge structure (ie rail over road) (to be confirmed through detailed design).
- Mistake Creek is also a stock crossing (stock route (Y401BELY02). Mistake Creek crossing is proposed to be grade separated with stock passing under the proposed rail bridge structure necessary for crossing the watercourse.

At grade stock movement treatments across the Project (Rail) between properties and across private accesses will be discussed and agreed between Adani and the relevant landholders (refer Volume 4 Appendix Z Rail Land Use Report.

11.4 Summary of Traffic and Transport Assessment

Construction of the Project (Rail) is expected to occur over a period of approximately two years commencing in 2013 and 2014. The volume and intensity of truck movements will vary over the construction period. The worst case construction period was identified to generate approximately 50,910 trips per month or 1,697 daily trips. The analysis of the road network during this period indicates that the expected increase in traffic associated with the construction of the Project (Rail) can be adequately accommodated and does not impact the operating performance of the road network. It is also recognised that this impact is short term and occurs within a two year construction period.

The analysis of the estimated traffic generated by the Project (Rail) will exceed the threshold of a five per cent increase in average daily traffic along the majority of the proposed haulage roads. However, the analysis undertaken for this study indicates that the expected increase in traffic associated with the construction of the Project (Rail) is based on the worst case scenario and would only occur over a period of approximately 18 months. In addition, the increase in traffic associated with the construction of the Project (Rail) would not impact on midblock LOS Performance of these roads.

The delivery of materials and equipment are spread over the two year construction period and will be managed in order to minimise impact on the local community. Special consideration will be given to traffic levels on the eastern end of Peak Downs Highway during peak periods. Construction of level crossings and grade separated crossings will be planned and managed to minimise delays and will ensure that adequate warning is available to motorists.

Traffic management issues will be addressed through the preparation and implementation of a Construction Traffic Management Plan, which will be developed during the detailed design phase. This plan will be developed in consultation with the relevant DTMR Regional offices, IRC, police and local authorities.

Traffic management will address key safety and logistical issues that may arise from the construction of the Project (Rail) and focus on:

- Vehicle crossings at major and minor road intersections
- Safety risks brought about by increased heavy vehicle traffic and movement of stock
- Lane closures and the use of single-lane local access roads

A number of mitigating measures have been identified to ensure that transport and traffic impacts associated with the construction and operation of the Project (Rail) are minimised. These measures will be incorporated into traffic management plans for the Project (Rail). An important mitigation measure relating to construction traffic impacts is the implementation of a community information and awareness program. This program will be initiated prior to construction commencing and continue throughout the entire construction period to ensure that local residents are fully aware of the construction activities, with particular regard to construction traffic issues. The awareness program will identify communication protocols for community feedback on issues relating to construction vehicle driver behaviour and construction-related matters.

Other initiatives that will be undertaken as part of traffic management planning include:

- Ongoing consultation with the DTMR and IRC to identify mitigation measures to address increases in traffic levels of over five per cent on Gregory Developmental Road and Downs Highway, during the construction period,
- Ongoing consultation-with DTMR and IRC to ensure that general signposting of construction access roads are appropriate and provide adequate warning of heavy vehicle and construction activity
- Review signposted and non-signposted speed restrictions along the road network and where necessary, provide additional signposting of speed limitations
- Distribute construction activity warning notices to advise local road users of scheduled construction activities
- Provide advance notice of road/lane closures and advice on alternative routes

- Install appropriate traffic control and warning signs for areas identified to have existing potential safety risks
- Manage the transportation of construction materials to maximise vehicle loads and minimise vehicle movements in consultation with DTMR, IRC and the Queensland Police Services
- Consult with the Queensland Police Service to mitigate impacts of heavy (multi-dimensional) vehicles on the roads
- Use logistics technology to plan heavy vehicle movements and the loading of equipment on these vehicles to address the appropriate Queensland Police Service and Pilot support when delivering equipment
- Whenever practical, promote the use of internal and haulage access roads rather than public roads by construction vehicles
- Project induction training for truck and vehicle operators.

Key off-site traffic issues mainly relate to:

- Use of identified road segments on the road network for access by heavy vehicles for the delivery of plant and material
- Disruption to traffic due to road/lane closures brought about by construction activities at road crossings
- Increase in travel time to existing road users due to road works and increase in heavy vehicle movement

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