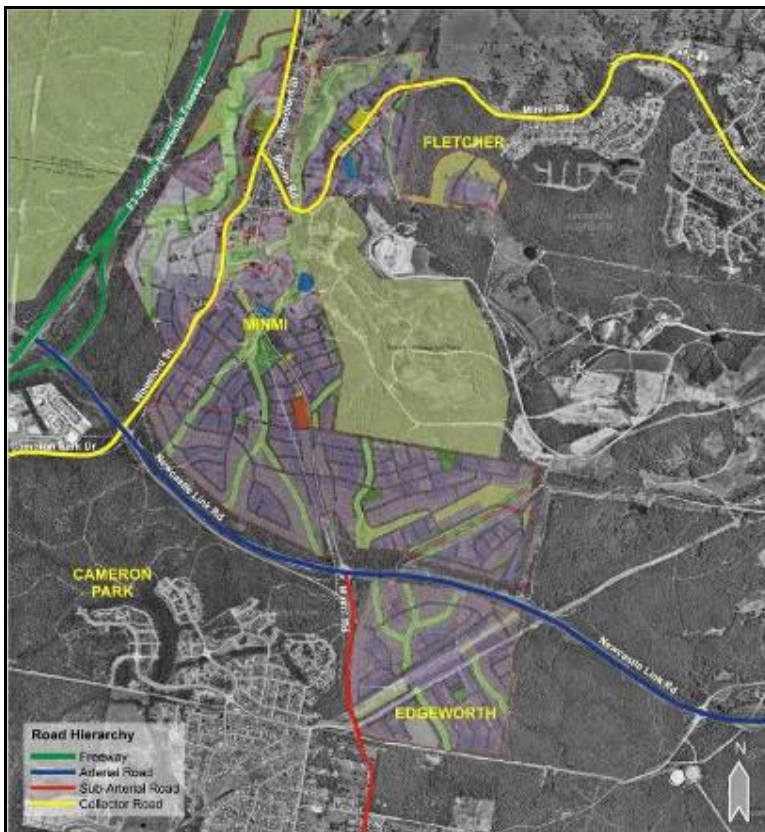


Coal & Allied Industries Ltd

Lower Hunter Lands Project

Minmi Link Road & Stockrington

Traffic and Transport



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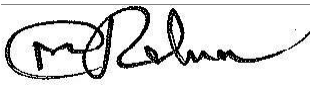



Coal & Allied Industries Ltd

Lower Hunter Lands Project

Minmi Link Road & Stockrington

Traffic and Transport

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FINAL

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1 Introduction

1.1 Background

It is proposed that the entire Coal & Allied Industries Limited (Coal & Allied) owned Minmi/Link Road and Stockrington sites be rezoned/listed as a 'State Significant Site' (SSS) in Schedule 3 of State Environmental Planning Policy (Major Development). A draft Schedule 3 listing has been prepared with the Concept Plan Application. The Concept Plan for a residential subdivision of the Minmi/Link Road site will apply to the entire 537ha Minmi/Link Road and 1,544ha Stockrington site. The key parameters for the future development of the site are as follows:

- Dedication of 1,561ha of conservation land to the New South Wales Government (NSWG) that is identified in the Lower Hunter Regional Strategy and Lower Hunter Regional Conservation Plan, comprising 1,544ha of the Stockrington site and approximately 17ha in the northern section of the Minmi/Link Road site.
- Dwelling yield of approximately 3,300 dwellings over 520ha.
- Indicative development staging. The number of lots and extent of staging for release areas will be largely dictated by the service infrastructure requirements as well as responding to market forces.
- The provision of associated infrastructure.
- Torrens title subdivision of the Minmi/Link Road site. The Torrens title subdivision of Coal & Allied land will enable the following:
 - To dissect land on either side of the F3 Freeway and to separate the development lot from the conservation land.
 - To enable the transfer of approximately 17ha of land at Minmi/Link Road to the North of the Minmi Rural Fire shed to NSWG for conservation purposes.

Approval will not be sought under the Concept Plan for a specific lot or road layout. An indicative lot layout will indicate how the dwelling yield of approximately 3,300 dwellings could be achieved on the site. Similarly, approval will not be sought under the Concept Plan for subdivision or construction of individual houses. However, the desired future character of the proposed concept plan will be included in Urban Design Guidelines. Urban Design Guidelines have been prepared to inform the Concept Plan in respect of urban form, built form, open space and landscape, access and movement and visual impact for the site. It is proposed to dedicate land for conservation purposes as part of the Major Project Application via a Voluntary Planning Agreement (VPA) between Coal & Allied and the NSWG in accordance with s.93F of the Environmental Planning & Assessment Act, 1979 (EP&A Act).

The proposed Concept Plan and a Plan showing the proposed development areas and conservation areas is included in the Environmental Assessment (EA) prepared by Urbis.

This traffic and transport report details the impact from the residential development in the northern area comprising Minmi, Newcastle Link Road north and south. The land is currently low density residential or greenfield sites, but has the potential for further residential development. A Concept Plan for the subject site has been developed containing approximately 3,300 dwellings which are planned for release over the next 25 years.

1.2 Director General's requirements

The Director-General's Requirements (DGRs) for the subject land were issued on the 19th of August 2010 and are summarised as follows:

- (1) Provide a traffic study in accordance with the *RTA Guide to Traffic Generating Developments*, which includes:
 - a) All relevant vehicular traffic routes and intersections for access to/from the area;
 - b) Current traffic counts for all the above traffic routes and intersections;
 - c) The additional vehicular traffic generated from the proposed development and associated trip distribution on the road network;
 - d) Consideration of the traffic impacts on existing and proposed intersections and the capacity of the local and classified road network to safely and efficiently cater for additional vehicular traffic generated by the proposed development. The assessment should also include the cumulative traffic impact of other proposed development in the area;
 - e) Consideration of the impact of the planned Hunter Expressway;
 - f) Details of necessary road network infrastructure upgrades required to maintain existing levels of service both on the local and classified road network;
 - g) Intersection analysis, as well as a micro simulation model to determine the need for intersection and mid block capacity upgrades, as well as to ensure traffic signal co-ordination;
 - h) Details on the efficiency of emergency vehicle access/egress;
 - i) Measures to introduce and promote public transport usage and mode share, including identification of bus routes;
 - j) Proposed pedestrian and cycle access within and to the site that connects to all relevant transport services, existing and proposed adjoining suburbs and other key off-site locations (for example schools, shops, parks recreation and community facilities) having regard to the *NSW Planning Guidelines for Walking and Cycling* (2004), and the *NSW Bike Plan* (2010);
 - k) Timing of delivery of proposed transport infrastructure including road and intersection upgrades, pedestrian and cycle paths, and public transport infrastructure; and
 - l) Consideration of impact on existing property access;
- (2) Identify road design that is responsive to the proposed land use and associated urban form including proposed transport linkages between the subject land and surrounding key destination points such as existing centres, recreational areas and employment/industrial centres. Road design should be in accordance with any requirements of the relevant agency that will have responsibility for its ongoing ownership and management;
- (3) Assess the proposal against the objectives of the Integrating Land Use and Transport policy package;
- (4) Assess the impact of the proposal on future access arrangements to the Summerhill Waste Management Centre.

Coal & Allied commissioned Hyder Consulting Pty Ltd (Hyder) to carry out the traffic study to address the DGR's and examine the traffic and transport issues associated with the Concept Plan of the subject site. Hyder has consulted the various state and local government planning policies and instruments that may apply to this study. Hyder met with the RTA on 17 September 2010 and discussed issues and traffic works in relation to the above DGRs'.

1.3 Study area

The Minmi Link Road site is located approximately 20 kilometres west of Newcastle within the both Newcastle and Lake Macquarie local government areas. Figure 1-1 shows the regional road network that provides access to the Minmi Link Road site. The Minmi Link Road site adjoins the existing Minmi Township and is close to the emerging Glendale centre and Glendale/Cardiff renewal corridor identified in the Lower Hunter Regional Strategy (LHRS). The subject sites are adjacent to the Blue Gum Hills Regional Park and Hexham Swamp Wetlands.

Due to the large size of the proposed residential development, it is anticipated that potential traffic impacts from this development will not be limited to immediate access points with the Minmi Road and the Newcastle Link Road, but will extend to the wider road network connecting the F3 Sydney Newcastle Freeway (F3 Freeway) and Newcastle Link Road. The Hunter Expressway is shown in Figure 1-1.

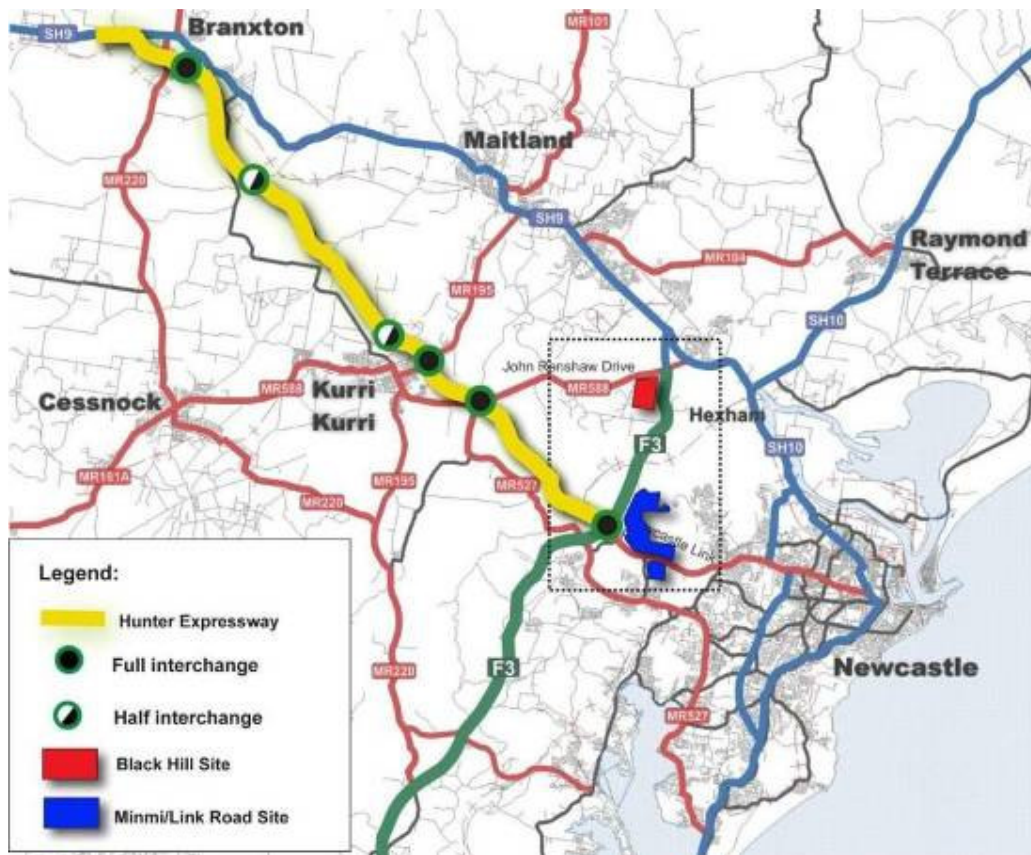


Figure 1-1 Regional road network

1.4 Study objectives

The purpose of the traffic study is to assess existing traffic patterns, undertake traffic projections for the study area and to assess the traffic implications of the proposed Minmi/Link Road development on the surrounding road network. Key specific purposes were to:

- Address the Director-General's Requirements (DGRs) specifically for Traffic and Transport;
- Assess the impact on the road network from regional traffic growth in the absence of development of the Coal & Allied site;
- Assess the overall impact of the proposed residential developments on the road network considering traffic data at all relevant vehicular traffic routes and intersections;
- Identify key access points for the proposed development considering the existing constraints and opportunities from the perspective of both traffic and road safety;
- Determine the capacity of key intersections providing access & egress for the proposed development;
- Estimate additional development traffic based on the RTA's Guide to Traffic Generating Developments (2002) and recent trip generation survey data obtained from similar residential sites in the Lower Hunter;
- Use RTA's Lower Hunter Transport Model (LHTM, TransCAD) to estimate impact at key access points with the Newcastle Link Road (MR 82) and Minmi Road. The assessment considered the impact of the Hunter Expressway. Hyder used Paramics and SIDRA modelling software to assess the existing and future intersection performance; and
- Analyse the cumulative traffic impact considering other proposed developments assumed in the RTA's traffic model.

1.5 Approach to traffic investigation

Future traffic conditions on the regional road network in the vicinity of Coal & Allied sites will be determined by a number of complex driving factors. They are:

- Lower Hunter Regional Strategy which forecasts a population increase of about 160,000 and an additional 66,000 jobs over a 25 year planning horizon between 2006 and 2031. The forecast population and employment growth was a key input to the RTA's LHTM model. The Newcastle – Lake Macquarie Western Corridor planning strategy is a supporting document.
- Currently, key transport corridors including Newcastle Link Road, F3 Freeway and John Renshaw Drive carry a significant amount of regional traffic. In the future the predicted population and employment growth will have significant impact on traffic operations on these roads and associated intersections. This means that the cumulative impact will have implications for the access strategy adopted for the Coal & Allied site.
- The Hunter Expressway and the proposed F3 to Raymond Terrace Link will have significant contributions in changing the future traffic distributions on the F3 Freeway, John Renshaw Drive and Newcastle Link Road. It is anticipated that the Hunter Expressway will open to traffic by the end of 2013.

- Due to the complexity of future travel patterns within the corridor, Hyder used RTA's traffic model¹ for assessing Coal & Allied traffic impact on the road network.

1.6 Report structure

This report has the following structure:

Chapter 1: Introduction – background to the study, outlining the subject area, study objectives and the approach used for traffic investigation.

Chapter 2: Regional and Local Transport Context – overview of the existing conditions regarding the road network, land use, demographics, public transport, Journey to Work data, and traffic growth. The results from traffic surveys are included.

Chapter 3: Impact Assessment – describes the impacts on regional and local road network from the proposed Coal & Allied development at Minmi/Link Road. The proposed road and intersection upgrade works from staged Coal & Allied development were identified. This chapter includes discussion regarding strategies for public transport, walking and cycling initiatives through out the development. A broader assessment of the proposal against the objectives of Integrated Land Use and Transport Policy (ILUT) is included in this chapter.

Chapter 4: Summary of Findings – the summary of findings from the investigations, modelling and analysis includes referencing to Director General's requirements.

¹ Lower Hunter Traffic Model (LHTM) was developed by using TransCAD software. Hyder obtained a model licensing agreement from the RTA for this study.

2 Regional and local transport context

2.1 Road hierarchy and network

The RTA Road Design Guide defines the functional road hierarchy in an urban area to establish a consistent basis for traffic management. There are four road categories and their functions are stated as below:

Arterial roads – predominantly carry through traffic from one region to another, forming principal avenues of communication for urban traffic movements;

Sub Arterial Roads – connect the arterial road to areas of development and carry traffic directly from one part of a region to another. They may also relieve traffic on arterial roads in some circumstances;

Collector Roads – connect the sub-arterial roads to the local road system in developed areas; and

Local Roads – are the sub-divisional roads within a particular developed area. These are used solely as local access roads.

Figure 2-1 shows the existing road hierarchy around the Minmi Link Road proposed development site. The key roads and associated junctions of the proposed development are summarised in Table 2-1 and Table 2-2.

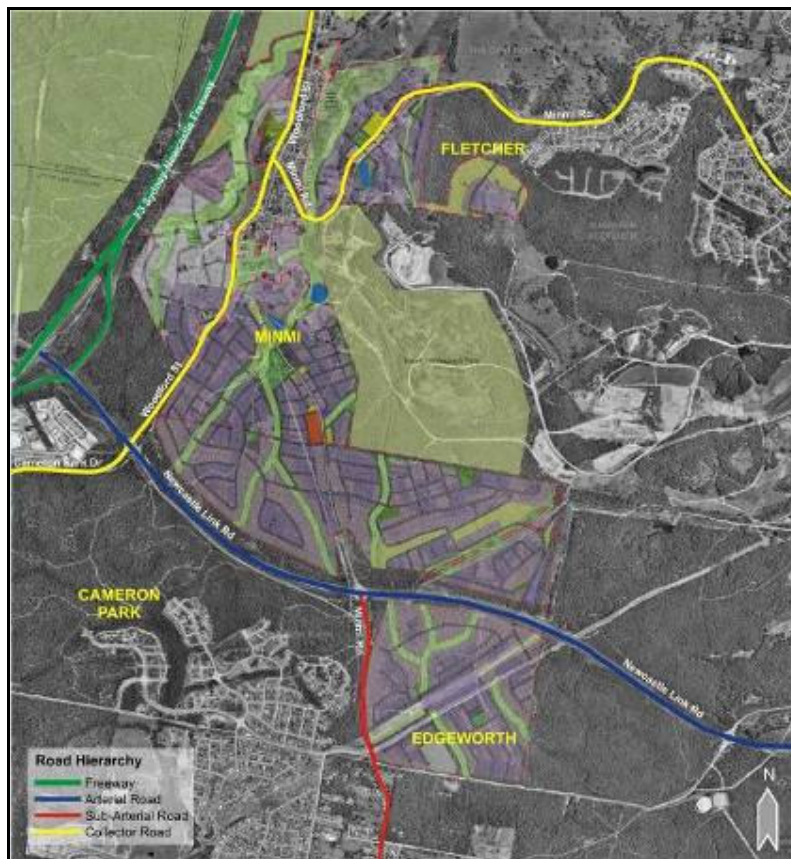


Figure 2-1 Road hierarchy in the context of Minmi Link Road development proposal

Table 2-1 Existing road network characteristics

Road Names	Road Hierarchy	Speed Limit (kph)	Characteristics
Sydney-Newcastle Freeway (F3)	Arterial	110	The Sydney-Newcastle Freeway (F3) is the main traffic route in the vicinity of the site. There are two lanes north and two lanes south with a median. An interchange to Newcastle Link Road is located 800m northwest of the Woodford Street Intersection, which is to the south-west of the subject site. F3 is an Auslink route and a national freight carrier. Although classified as a <i>national highway</i> under the former road classification scheme, it has always fallen under the care and control of the Roads and Traffic Authority of New South Wales (RTA). Sydney-Newcastle Freeway is an important link in the state's highway network and is classified as a freeway.
Newcastle Link Road	Arterial	90	Newcastle Link Road is the main traffic route from the F3 to Newcastle through Minmi and Edgeworth. It is classified as an arterial road and has four lanes in the vicinity of the site, two eastbound and two westbound.
Minmi Road (Minmi)	Sub-arterial	70/80	There are two roads called Minmi Road in the vicinity of the site. One is located in Minmi and the other one is located in Edgeworth, to the south of Newcastle Link Road. Although they are both within the study area, they are not connected to each other. Minmi Road (Minmi) is a two lane undivided road (one lane each direction) and is classified as a sub-arterial road under Council's road hierarchy. It provides an east-west link between Minmi and Maryland. Minmi Road (Minmi) joins Woodford Street at a signalised T-junction in the existing Minmi village
Minmi Road (Edgeworth)	Sub-arterial	70/60	Minmi Road (Edgeworth) forms the western boundary of the proposed Link Road South site. It is a two lane undivided road (one lane each direction) and is classified as a sub-arterial road in terms of Council's road hierarchy. It provides a north-south link between Edgeworth and Minmi. It joins Newcastle Link Road at the north end as a roundabout adjacent to the north west corner of the Link Road South site. The speed limit along Minmi Road (Edgeworth) from Newcastle Link Road intersection is 70 km/h and decreases to 60 km/h on approach to Northlakes Drive
Woodford Street	Collector	80/60 50/40	Woodford Street is a two lane undivided road (one lane each direction) and is classified as a collector road under Council's road hierarchy. It provides a north-south link between Minmi and West Wallsend. It joins Newcastle Link Road / Cameron Park Drive at the south end as a roundabout and Lenaghans Drive at the north end. The speed limit along Woodford Street in the rural section is 80km/h, before the Minmi township 60km/h, in the Minmi township 50km/h respectively. It further decreases to 40km/h in the school zone of the Minmi Primary School.

Table 2-2 Key intersections

ID	Intersection	Control type and characteristics
I-01	Newcastle Link Road/Woodford Street/Cameron Park Drive	Intersection is an existing four-way roundabout
I-02	Newcastle Link Road/Minmi Road (Edgeworth)	This intersection currently operates as a three-way roundabout.
I-03	Minmi Road (Minmi) /Woodford Street	This intersection is currently a signalised T-junction and permits all turning movements.

2.2 Land use

In general, the Minmi Link Road study area contains the established settlement areas of Minmi Village and North Lakes estate. The Minmi landscape, industrial, social, built and archaeological heritage are significant in the context of NSW's history. Minmi Village only occupies a small proportion of the total land in the study area, with the majority of land previously used for mining purposes or occupied by forest and open green space. The concept plan shows that the majority of the land in the subject site will be developed for residential purposes, with a mix of lot sizes and housing styles, complemented by some retail and mixed-use development to support the proposed future community. The concept plan also provides for land to be used for community facilities and various parks and open spaces.

2.3 Demographics

Minmi is currently a community of 732 people (ABS 2006 census) residing on the edge of the Newcastle local government area (LGA). Proposed Minmi Link Road development sites are located across the LGA's of Newcastle and Lake Macquarie. Table 2-3 shows car ownership and average household income statistics for the Newcastle and Lake Macquarie LGAs.

Table 2-3 LGA car ownership (ABS Census 2006)

LGA	0 vehicle	1 vehicle	2 vehicles	3 vehicles	4 or + vehicles
Newcastle	15.1%	41.9%	32.6%	7.8%	2.7%
Lake Macquarie	9%	37.9%	37.3%	11%	4.8%

It can be seen from the Table 2-3 above that the majority of households have one or two vehicles. Also limited public transport in and around the area would lead to higher private vehicle usage. The high proportion of households with no vehicle in Newcastle LGA can be explained by the fact that it is a highly urbanised area with better access to public transport. Lake Macquarie, on the other hand, has a more scattered urbanisation with limited public transport services resulting in a higher reliance on private vehicles.

2.4 Journey to work analysis

An analysis of the 2006 Census Journey to Work (JTW) data shows that around 78% of work trips for those working and living in Newcastle and Lake Macquarie LGA's are by private vehicle. The private car usage for Minmi will be higher than the average LGA figure. The data also reflects the car dependency across the Lower Hunter region. The residential development at Minmi is located across Newcastle – Outer West and Lake Macquarie – North. The results are shown in Table 2-4.

Table 2-4 Travel to work data-Newcastle Outer West and Lake Macquarie North

Place of Work	Car	Public Transport	Other	Total
Newcastle	19,150	705	4,060	23,915
Lake Macquarie	11,379	231	3,860	15,470
Cessnock	577	3	98	678
Port Stephens	1,474	7	197	1,678
Maitland	1,515	33	201	1,749
Central Coast	492	32	89	613
Sydney	447	118	180	745
Other – NSW	2,562	57	520	3,139
Other States	73	14	60	147
Total	37,669	1,200	9,265	48,134
Percentage	78.3%	2.5%	19.2%	100%

The table above shows that only 2.5% of trips within the study area were undertaken by public transport (train and buses) and 78% by private car (both as drivers or passengers). That demonstrates the population's high reliance on private vehicles for commuting. The usual place of work for people, in the study area, is within the LGA of Newcastle and Lake Macquarie (82%) and to a lesser extent towards the Maitland and Port Stephens areas. Figure 2-2 shows the travel to work data from Newcastle Outer West SLA.

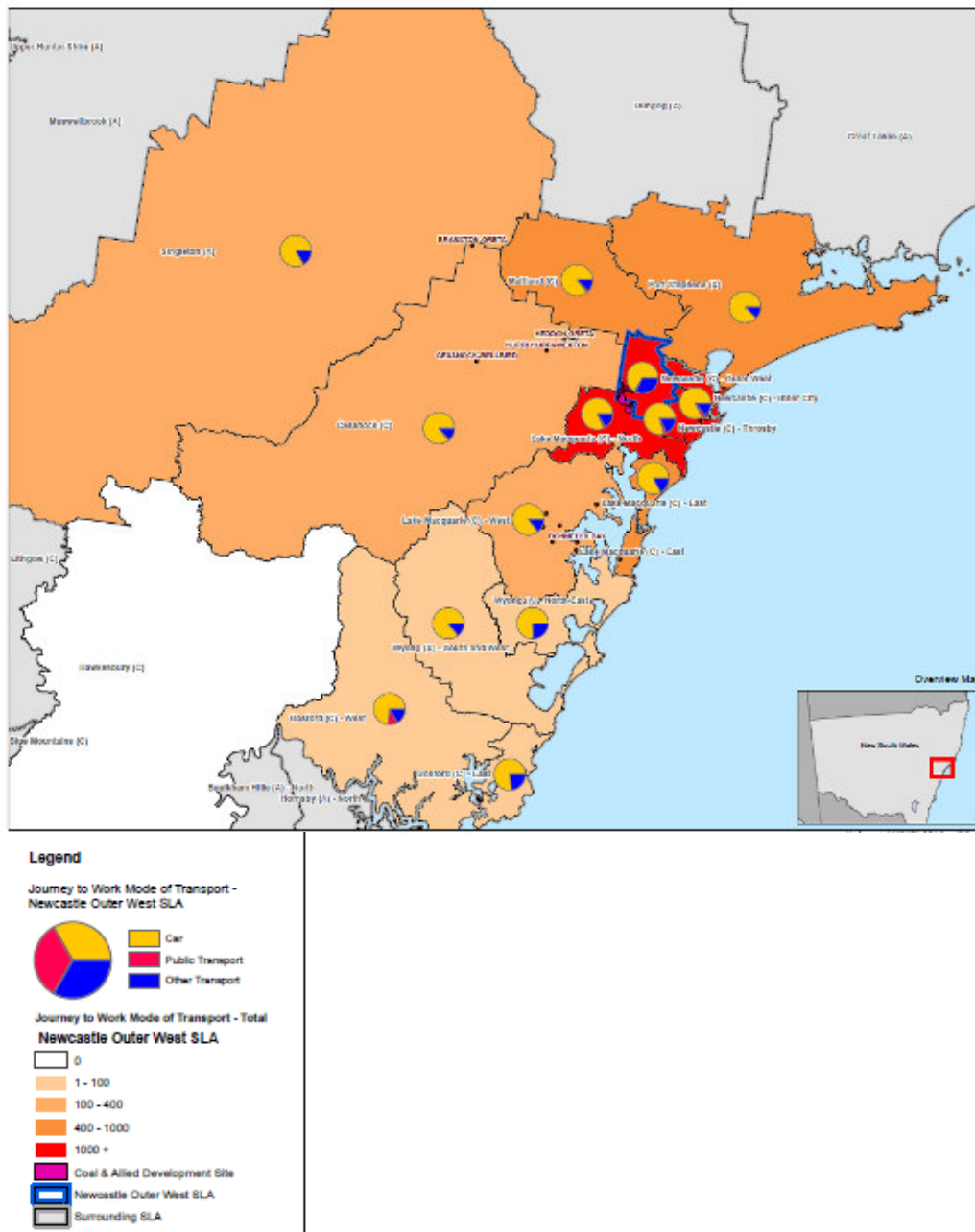


Figure 2-2 Travel to work from Newcastle Outer West

2.5 Public transport network and use

The public transport network in the vicinity of the Minmi Link Road development site comprises buses and train services, running within a few kilometres of the development site. As described in the previous section, the use of public transport for commuting only has a 2.5% mode share. The trips are mainly made towards places located in the City of Newcastle and the City of Lake Macquarie.

2.5.1 Bus services

Minmi Township is part of the Lower Hunter bus network. Currently, two bus services are running in the vicinity of the proposed development site:

- Route 260 Minmi – Maryland – Wallsend; and
- Route 265/266 Cameron Park – Glendale – Charlestown – Newcastle University.

The frequency and hours of service for the routes are summarised in Table 2-5.

Table 2-5 Bus Services Frequency

Route	No of services weekday (2-way)	No of services weekends (2-way)	Span of hours weekday
260	15	6	6am – 8:45pm
265/266	14	4 on Saturdays/no service Sundays	7am – 7pm

The bus network around Minmi is shown in Figure 2-3. Route 260 is operated by Hunter Valley Buses and links Minmi Township with Fletcher, Maryland and the Wallsend interchange. It runs along the Minmi Road to the north of the study area. Sugar Valley Coachlines operates routes 265 and 266 which connect Seahampton and Cameron Park to Glendale, Charlestown and Newcastle University. The bus routes run through Cameron Park, just south of the proposed development site. In light of an integrated public transport network (promoted by the Transport taskforce of Lake Macquarie Combined Chambers), these services allow access to the Glendale interchange and Cardiff Railway Station.

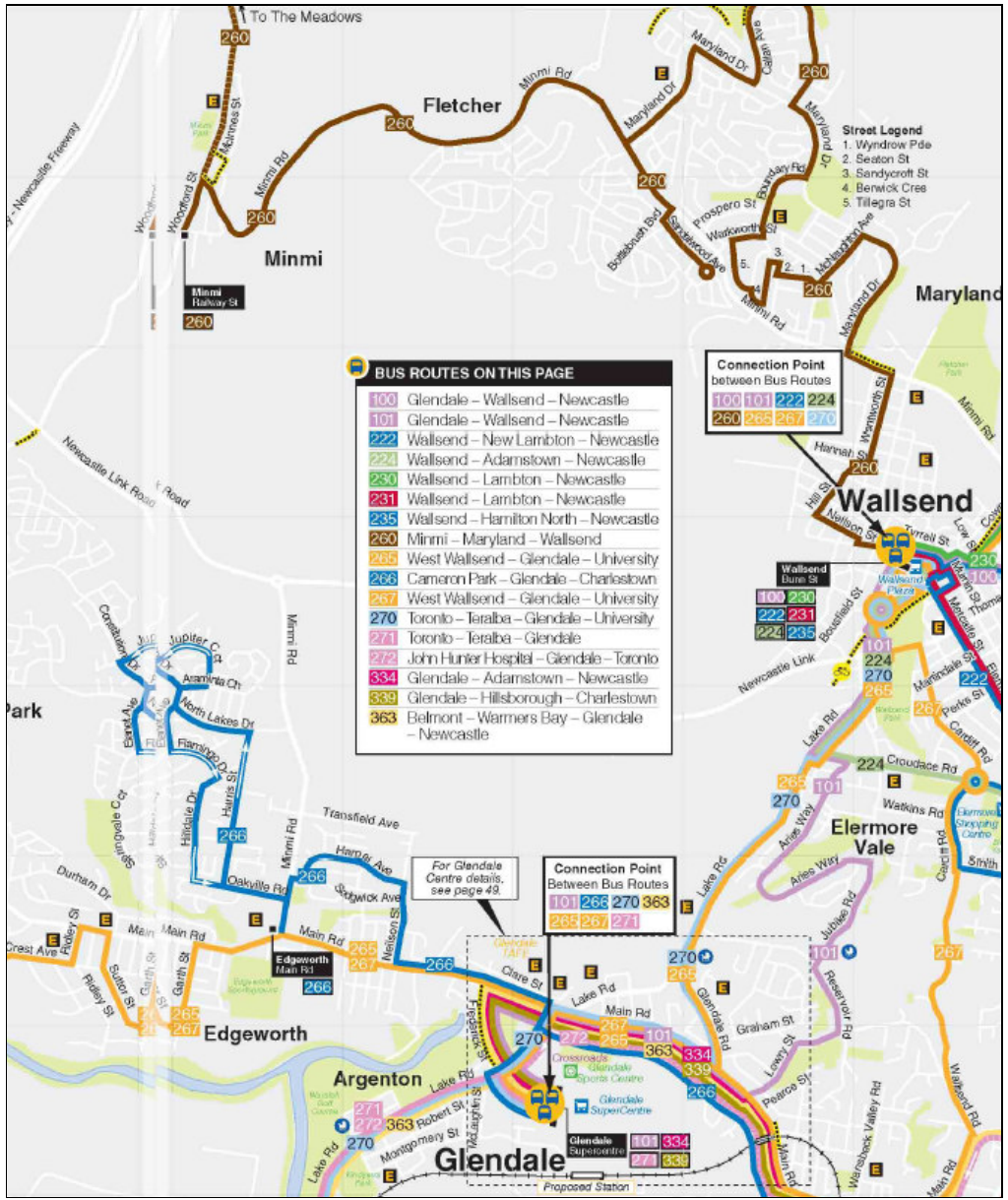


Figure 2-3 Existing bus routes

2.5.2 Rail services

The nearest train station to the proposed residential development is Cardiff Railway Station located eight kilometres to the southeast (see Figure 2-4). Cardiff Station is serviced by frequent train services on the City Rail line between Sydney and Newcastle. The frequency of services during weekdays, towards Newcastle, Central Coast and Sydney, is every 20-30 minutes and an hourly service runs on weekends. Access to the station can be made by public transport from Minmi (with transfers from bus route 260 at Wallsend interchange) and from Cameron Park (direct from bus route 265/266).

Other train services currently operating in the area include:

- Sydney – Brisbane Country Link services at Broadmeadow Station; and
- Newcastle – Maitland – Dungog – Scone City Rail services at Sandgate or Beresfield Stations.



Figure 2-4 Rail network (www.railmaps.com.au)

2.6 Pedestrian and cyclist network

The current pedestrian and cycle network at Minmi has been developed and managed by Newcastle City Council. All local streets are designated as shared cycling and pedestrian zones. Regional arterials, such as the Newcastle Link Road, are also designated as shared vehicular and cycling routes. Currently, only a small section of off-road cycle path is located in the centre of Minmi Township, along Woodford Street. As Minmi currently has a low level of development, there would be limited interaction between pedestrians/cyclists and motorised traffic.

2.7 Parking

Currently no parking restrictions are in place on either side of Woodford Street. No parking is allowed on the Newcastle Link Road between F3 Freeway and Lake Road.

2.8 Historical traffic growth

Historical traffic growth data was obtained from the RTA on Newcastle Link Road and Minmi Road (at Edgeworth). Table 2-6 shows 2007 survey data on both roads. It should be noted that the 2007 data is in vehicles, whereas data from other surveyed years is in axle pairs.

In 2008, traffic volumes on Newcastle Link Road were in the order of 23,000 vehicles per day compared with 20,500 in 2004. This indicates an average traffic growth between 2% and 3% per annum on the Newcastle Link Road. The recent growth on the Newcastle Link Road is consistent with the general growth trend observed on other state roads in the Hunter region which is between 1% and 2% per annum.

Table 2-6 AADT data, RTA traffic count sites

Station Road		1995	1998	2001	(Survey)		
					2004	2007	2008
05.496	Newcastle Link Road, W of Minmi Road *	N/A	N/A	17,631	20,407	22,400	22,954
05.945	Minmi Road, Edgeworth – S of Link Road to F3	8,168	9,287	10,522	11,553	14,000	N/A

Note: Traffic count data for 2007 was obtained from survey undertaken for this study.

2.9 Crashes data analysis

This assessment is based on the crash data supplied by the RTA for the six-year period from 1 October 2004 to 30 September 2010 including provisional data between 1 October 2009 and 30 September 2010. Table 2-7 summarises the number of crashes recorded on F3 Freeway, Newcastle Link Road, Minmi Road through Fletcher and Minmi Road through Edgeworth. The following points are noted from crash data showed in Table 2-7:

- In the six-year dataset period, about 63 crashes occurred on F3 Freeway between Cedar Hill Road and Ladysmith Road. Of these, two fatal crashes were recorded on the F3 Freeway.
- During the same period, about 73 crashes occurred on Newcastle Link Road between F3 Freeway and Transfield Avenue. No fatal crashes were recorded on Newcastle Link Road.
- About 64 crashes occurred on Minmi Road (through Fletcher) between Boundary Road and Newcastle Link Road. No fatal

crashes were recorded on this section of Minmi Road (through Fletcher).

- About 24 crashes occurred on Minmi Road (through Edgeworth) between Transfield Avenue and Newcastle Link Road. No fatal crashes were recorded on this section of Minmi Road (through Edgeworth).

Table 2-7 Summary of the crash data for the period from 1 October 2004 to 30 September 2010.

Location	Total Number of Crashes	Fatal Crashes	Injury Crashes	Non Injury Crashes	Casualties		
					Killed	Injured	Total
F3 Freeway between Cedar Hill Road and Ladysmith Road	63	2	21	40	2	29	31
Newcastle Link Road between F3 Freeway and Transfield Avenue	73	0	27	46	0	37	37
Minmi Road between Boundary Road and Newcastle Link Road	64	0	36	34	0	36	36
Minmi Road between Transfield Avenue and Newcastle Link Road	24	0	12	12	0	15	15

Figures 2-5 to 2-8 show crash locations along the F3 Freeway, Newcastle Link Road, Minmi Road (through Fletcher) and Minmi Road (through Edgeworth). Crash data on these roads show that crashes occurred along the full length but are more concentrated at key intersections with the Newcastle Link Road, Minmi Road and F3 interchange with the Newcastle Link Road.

Newcastle Link Road between F3 to Transfield Avenue, Minmi

Crash Period: 1st October 2004 to 30th September 2009 (Finalised Data)
Raw Provisional Data (which is incomplete & subject to change) from December Quarter 2009

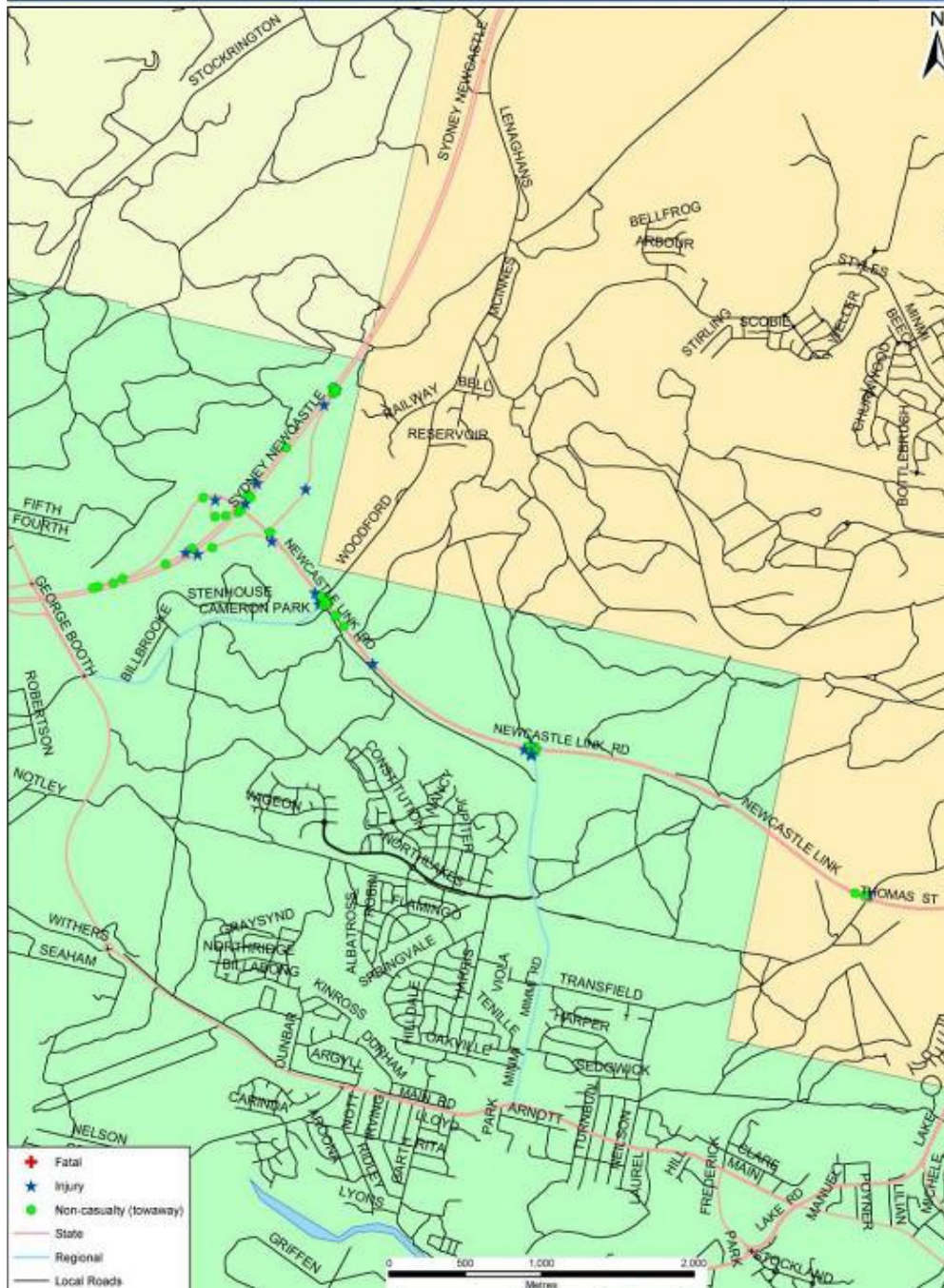


Figure 2-5 Newcastle Link Road, spatial distribution of crashes (1 October 2004 to 30 September 2010.)

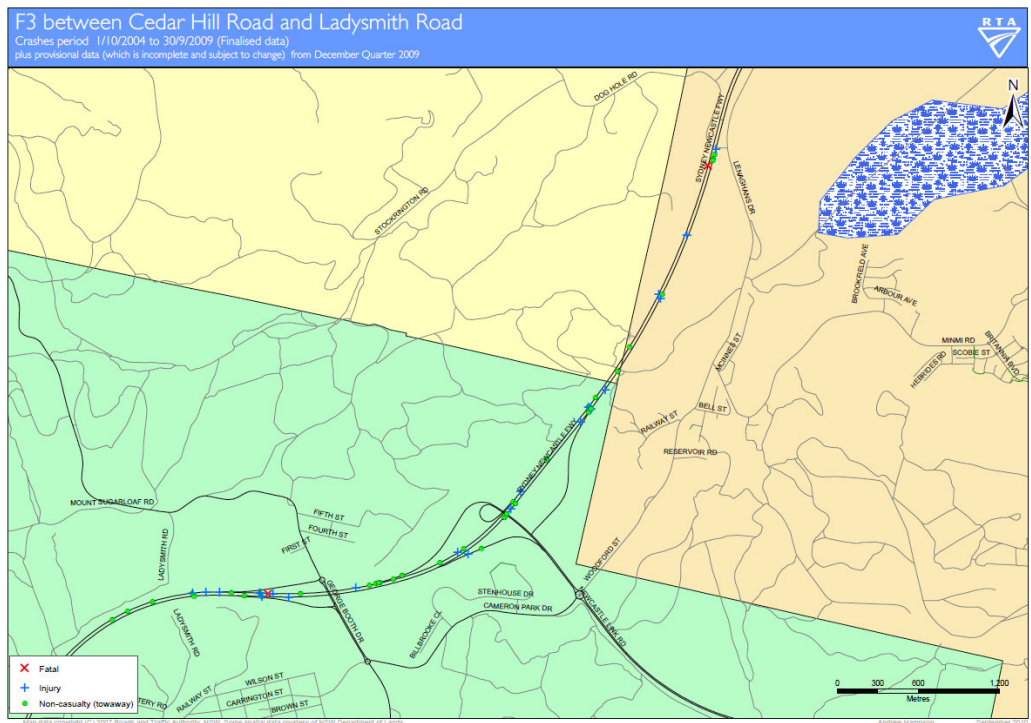


Figure 2-6 F3 Freeway, spatial distribution of crashes (1 October 2004 to 30 September 2010.)

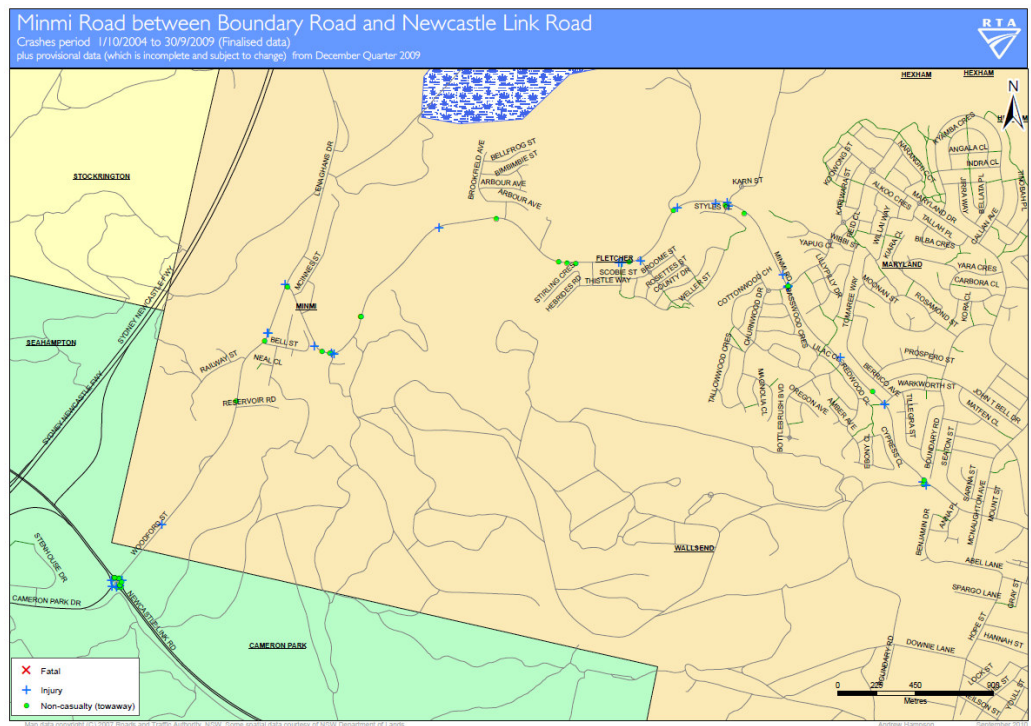


Figure 2-7 Minmi Road (through Fletcher), spatial distribution of crashes (1 October 2004 to 30 September 2010.)

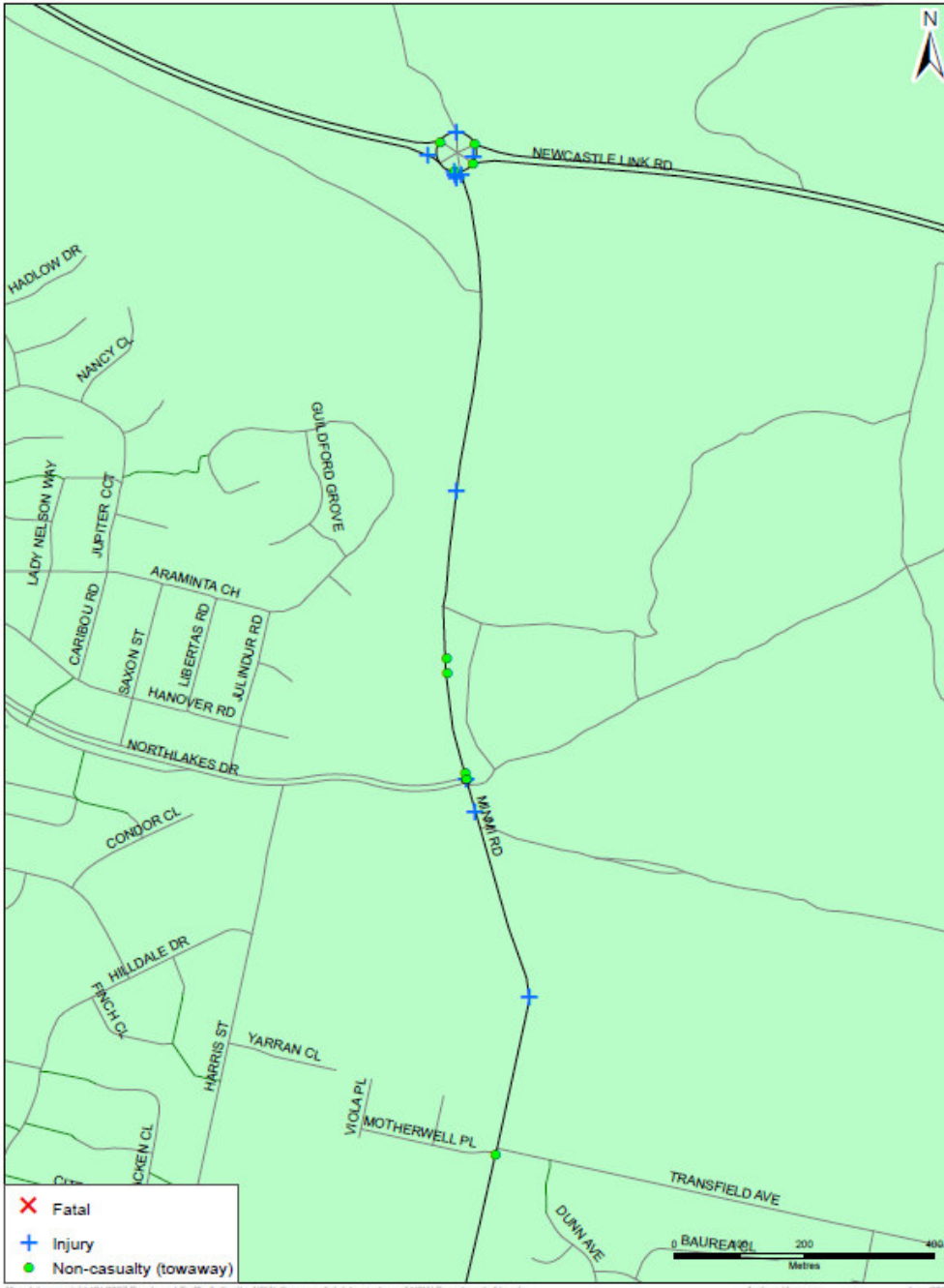


Figure 2-8 Minmi Road (through Edgeworth), spatial distribution of crashes (1 October 2004 to 30 September 2010.0)

2.10 Traffic data

Coal & Allied previously commissioned traffic count for key roads and intersections for the Minmi/Link Road site. These counts were undertaken during October 2007. The RTA provided new traffic data for 2010 at two key roundabouts with the Newcastle Link Road (see Table 2-8, below). The following sections summarised findings from traffic survey data. For Minmi/Link Road site, the following two categories of survey were carried out:

- Mid-block tube counts for periods of at least a week; and
- Intersection turning movement counts during morning and afternoon peak periods.

For the mid-block tube counts, Hyder selected the following six key locations that could potentially be affected by the Minmi/Link Road proposed development. These are also shown in Figure 2-9.

- M-1 Newcastle Link Road, west of Woodford Street;
- M-2 Newcastle Link Road, east of Minmi Road
- M-3 Minmi Road, south of Newcastle Link Road
- M-4 Woodford Street, north of Newcastle Link Road;
- M-5 Minmi Road through Minmi/Fletcher; and
- M-6 Lenaghans Drive, north of Peter Street.

From this count data all vehicles were then classified into the twelve standard Austroads vehicle classes. In addition to the mid-block counts, key locations were selected for intersection counts:

Table 2-8 Intersection traffic survey location

ID	Location	Survey period
I-01	Newcastle Link Road/Woodford Street	July 2010
I-02	Newcastle Link Road/Minmi Road	July 2010
I-03	Woodford Street/Minmi Road (Minmi)	October 2007

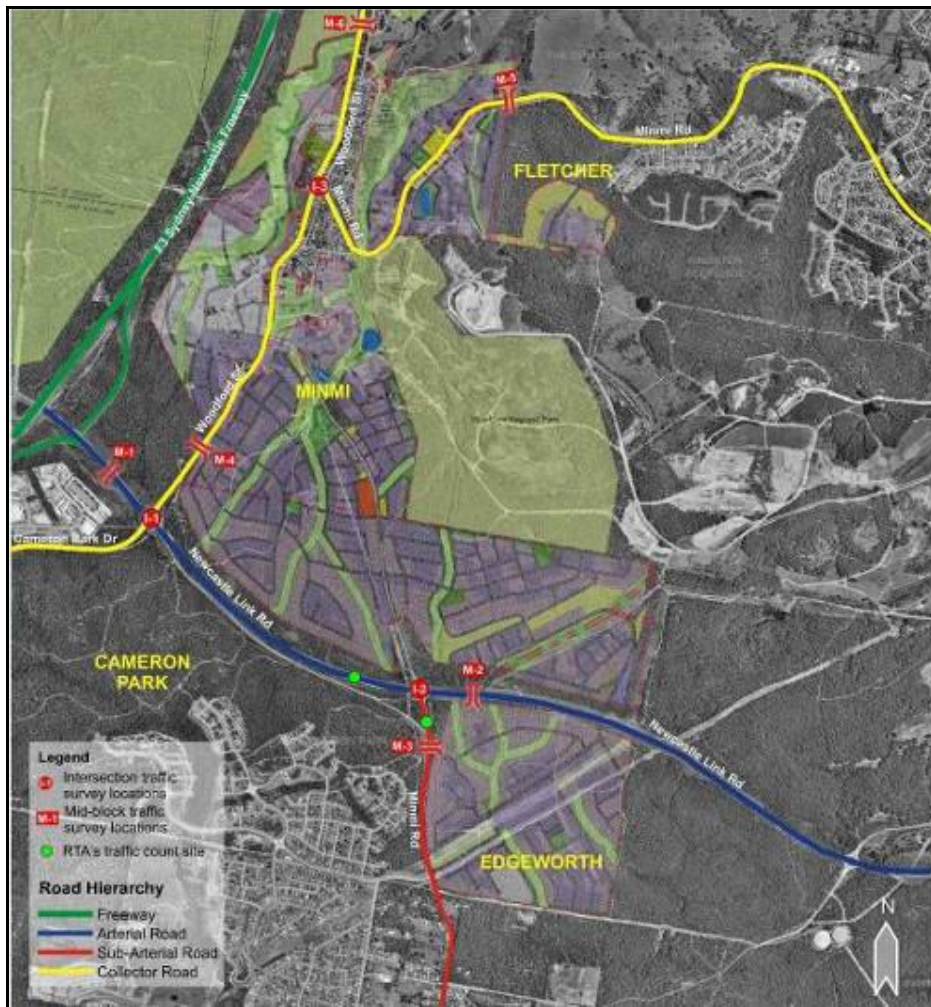


Figure 2-9 Traffic survey locations

2.10.1 Average weekday and weekend traffic

Daily traffic volumes on six count locations are shown in Table 2-9 for an 'average weekday' and an 'average weekend' traffic condition. The variations of traffic count are derived from the mid-block survey conducted during a 'typical' week, i.e. not during school holidays.

Table 2-9 Daily traffic volumes on key roads

Site ID	Road sections	Average weekday	Average weekend	Traffic changes (weekend)
Arterial road:				
M-1	Newcastle Link Road, west of Woodford Street	22,900	15,300	-33%
M-2	Newcastle Link Road, east of Minmi Road (Edgeworth)	22,400	15,100	-33%
Collector road:				
M-3	Minmi Road (Edgeworth), south of Newcastle Link Road	14,000	9,700	-31%
M-4	Woodford Street, north of Newcastle Link Road	3,200	3,000	-6%
M-5	Minmi Road, through Minmi/Fletcher	4,900	3,700	-25%
M-6	Lenaghans Drive further north of Peter Street	3,900	2,700	-31%

The following points are noted from traffic data showed in Table 2-9:

- Newcastle Link road carried about 23,000 vehicles per day during a weekday. The weekend traffic was approximately 33% lower than weekday traffic. This implied that Newcastle Link Road at this location carried a high proportion of commuter traffic to/from Newcastle.
- Minmi Road (through Edgeworth) carried about 14,000 vehicles per day during a weekday. Similar to Newcastle Link Road, the weekend traffic on Minmi Road was approximately 31% lower than weekday traffic.
- During weekday Woodford Street carried about 3,200 vehicles per day. Lenaghans Drive carried about 20% higher traffic than Woodford Street in the order of 3,900 vehicles per day.
- Minmi Road (through Minmi/Fletcher) carried about 4,900 vehicles per day. Weekend traffic was about 25% lower than weekday traffic.

2.10.2 Hourly variation

The hourly profile data (see Figure 2-10 below) for all survey sites suggested that morning peak was between 8 and 9 am and afternoon peak was between 5 and 6 pm respectively. In general, AM peak traffic was about 8% of daily traffic. PM peak was slightly higher than AM peak about 8.8% of daily traffic. The peak hour percentage to daily traffic was found to be consistent with traffic data on other roads in the Hunter which was about 8% to 10% of total daily traffic. Detailed traffic variations observed at six survey sites are included in Appendix A.

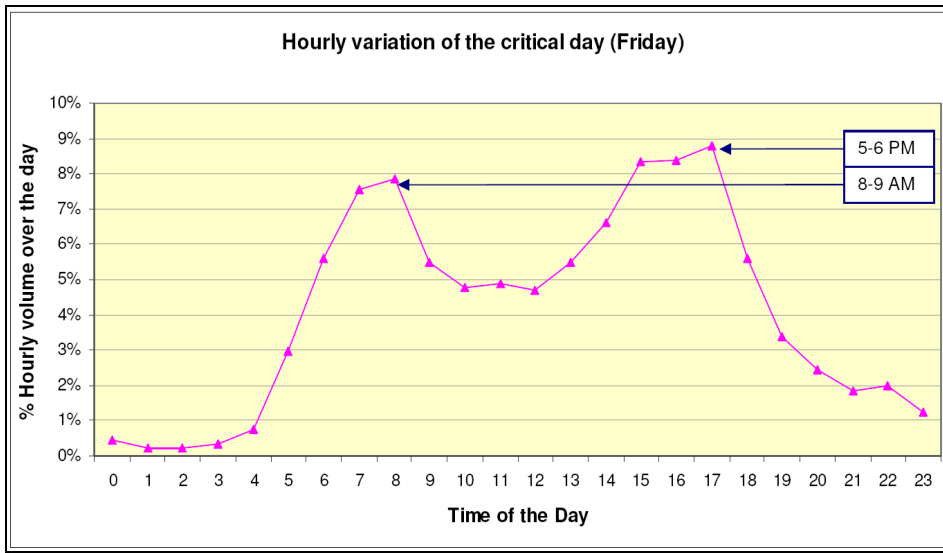


Figure 2-10 Hourly variation of the critical day (Friday) –Combined for all sites

Table 2-10 below shows the peak one hour traffic volume on key roads in the vicinity of Minmi/Link Road site. The following points are noted from traffic data presented in Table 2-10:

- Morning traffic reached its highest point between 8 AM and 9 AM for the majority of surveyed locations;
- The afternoon peak occurred between 5 PM and 6 PM on the Newcastle Link Road and Minmi Road (south of Newcastle Link Road) as would be expected for commuter trips;
- For collector roads including Minmi Road, Woodford Street, the afternoon peak occurred earlier, between 3 PM and 4 PM, suggesting a heavier influence of local trips, such as shopping and school traffic;
- The highest peak hour traffic (PM peak) on the Newcastle Link Road was about 2,200 vehicles. This is significantly below the notional capacity for a four lane arterial road. Typically, an arterial road with dual carriageway such as Newcastle Link Road at this location would have a notional capacity of 6,000 vehicles per hour, assuming 1500 vehicles per hour per lane. This implies current 2/2 lane road has adequate capacity for further growth provided that key intersections (roundabouts) can accommodate the additional traffic.

Table 2-10 AM and PM peak hour volumes on key roads (Friday)

Site ID	Road sections	AM peak (8 to 9am)			PM peak (5 to 6pm)		
		NB/EB	SB/WB	Total (2-way)	NB/EB	SB/WB	Total (2-way)
Arterial road:							
M-1	Newcastle Link Road, west of Woodford Street	910	1,010	1,920 (8,4%)	970	1,230	2,200 (9.6%)
M-2	Newcastle Link Road, east of Minmi Road	1,150	770	1,920 (8,6%)	980	1,280	2,260 (10%)
Collector road:							
M-3	Minmi Road, south of Newcastle Link Road	660	440	1,100 (7,8%)	490	850	1,340 (9.5%)
M-4	Woodford Street, north of Newcastle Link Road*	120	180	300 (9,3%)	150	170	320 (10%)
M-5	Minmi Road, through Minmi/Fletcher*	260	270	530 (10,8%)	260	250	510 (10.8)
M-6	Lenaghans Drive further north of Peter Street*	190	180	370 (9,5%)	180	210	390 (10%)

Note: *Data represents PM peak for 3 to 4 pm.

2.10.3 Directional traffic distribution

The directional analysis is important as road capacity and level of service can vary substantially as per directional distribution. Table 2-11 below, summarises the directional split of daily flows at the mid-block count locations. The result shows that:

Newcastle Link Road, west of Woodford Street, has a directional split of 44% eastbound and 56% westbound;

Newcastle Link Road, east of Minmi Road, has an equal split of 50/50 directional distribution; and

All other collector roads have balanced traffic flows with directional distribution around 50:50.

Table 2-11 Directional distribution of daily traffic on key roads (typical Friday)

Site ID	Road sections	NB/EB	SB/WB	2-way
Arterial road:				
M-1	Newcastle Link Road, west of Woodford Street	10,800 (44%)	13,900 (56%)	24,700 (100%)
M-2	Newcastle Link Road, east of Minmi Road	12,200 (50%)	12,100 (50%)	24,300 (100%)
Collector road:				
M-3	Minmi Road, south of Newcastle Link Road	7,300 (50%)	7,400 (50%)	14,700 (100%)
M-4	Woodford Street, north of Newcastle Link Road	1,700 (49%)	1,800 (51%)	3,500 (100%)
M-5	Minmi Road, through Minmi/Fletcher	2,600 (49%)	2,700 (51%)	5,300 (100%)

Site ID	Road sections	NB/EB	SB/WB	2-way
M-6	Lenaghans Drive further north of Peter Street	2,100 (50%)	2,100 (50%)	4,100 (100%)

2.10.4 Heavy vehicles

According to Austroads vehicle classification system, 'heavy vehicles' include trucks with two or more axles, buses, semi-trailers and B-doubles. Table 2-12 below shows the number of heavy vehicles recorded during the morning and afternoon peak hours and over the entire day. The numbers in brackets indicate the proportion of the total traffic volume made up of heavy vehicles. The heavy vehicle data showed the following patterns:

- On Newcastle Link Road about 1,600 to 2,200 heavy vehicles were recorded for a weekday being approximately 7% to 9% of total traffic; and
- Number of heavy vehicles on collector roads is generally less than 500 vehicles per day.

Table 2-12 Heavy vehicles (2-way) on key roads (Friday)

Site ID	Road sections	AM peak (8-9am)	PM peak (5-6pm)	Daily
Arterial road:				
M-1	Newcastle Link Road, west of Woodford Street	190 (10%)	150 (7%)	2,180 (9%)
M-2	Newcastle Link Road, east of Minmi Road	140 (7%)	110 (6%)	1,590 (7%)
Collector road:				
M-3	Minmi Road, south of Newcastle Link Road	40 (3%)	40 (3%)	500 (3%)
M-4	Woodford Street, north of Newcastle Link Road*	20 (6%)	30 (8%)	250 (7%)
M-5	Minmi Road, through Minmi/Fletcher*	50 (9%)	40 (8%)	470 (9%)
M-6	Lenaghans Drive further north of Peter Street*	40 (10%)	30 (9%)	490 (12%)

Note: *Data represents PM peak for 3 to 4 pm.

2.11 Existing intersection capacity

SIDRA was used for assessing the intersection capacity. Table 2-13 below shows standard level of service (LoS) criteria for intersection assessment.

Table 2-13 LoS Criteria

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	<14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, requires other control mode
F	>70	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing

Source: RTA Guide to Traffic Generating Developments

The RTA's guideline has recommended that with roundabout, Stop and Give Way sign control intersections, the LoS value is determined by the critical movement with the highest delay per vehicle. With this type of intersection control, some movements suffer high levels of delay while other movements have minimal delay. When the degree of saturation (DoS) exceeds 0.8 – 0.85, overflow queues start to become a problem.

Previously Hyder modelled Newcastle Link Road/Woodford Street and Newcastle Link Road/Minmi Road roundabouts using 2007 traffic data. The 2007 peak hour data predicted LoS B at both roundabouts for the worst movement. The peak hour DoS value was predicted between 0.43 and 0.62. The DoS value for Woodford Street/ Minmi Road signal was 0.30 with LoS A to B.

Two roundabouts on the Newcastle Link Road were re-analysed using the 2010 turning movements data (see Figure 2-11 below). The model predicts that LoS remains unchanged with LoS B for the worst movement. The recent data suggest peak hour DoS value has increased slightly from 2007 data in the order of 0.61 to 0.66. In general, LoS analysis indicates that key intersections that provide access to Minmi/Link Road site operate at LoS A to B with a satisfactory performance during the AM and PM peak hour.

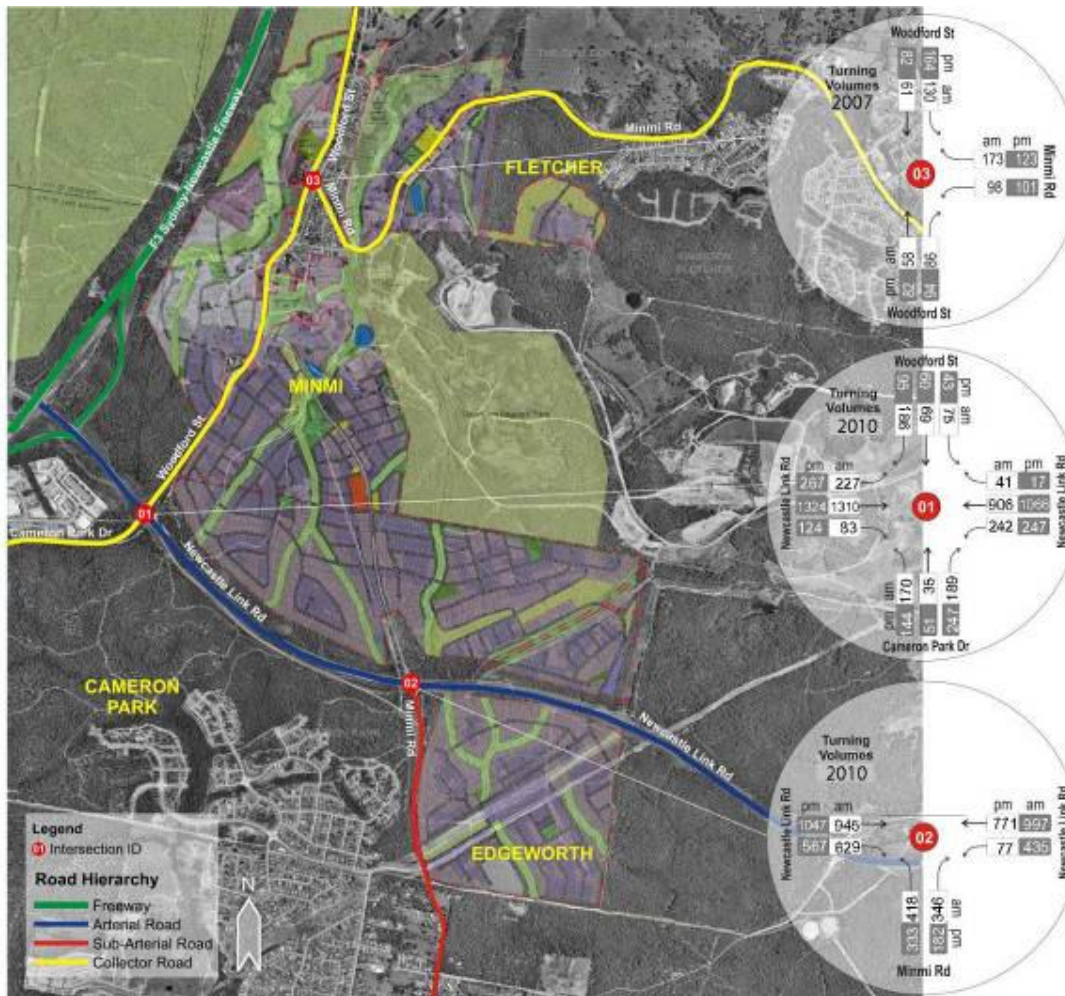


Figure 2-11 Turning volumes 2007 and 2010 (AM, PM peak) on key intersections

3 Impact assessment

3.1 Overview of modelling approach and assumptions

The current road network in and around the Coal & Allied sites provides a number of route choices or alternative accesses. This implies that motorists will have a number of options on how they will access the Coal & Allied developments. Key roads including the F3 Freeway, John Renshaw Drive and Newcastle Link Road carry a significant volume of regional and local traffic. By 2031, the population and employment growth predicted in the Lower Hunter Regional Strategy will impact traffic operations on these roads and associated intersections. The Hunter Expressway (HEX) and proposed F3 to Raymond Terrace Link (F32R) will involve a further redistribution of traffic impact on these roads.

In accordance with the DGR's, the following traffic models were used for assessing the Coal & Allied proposed Minmi Link Road development.

1. RTA's Lower Hunter Traffic Model (LHTM). This model was developed using TransCAD software. This model was used to estimate the future traffic growth from Coal & Allied developments and cumulative growth from other planned development in the Hunter. The impacts from Hunter Expressway and F3 to Raymond Terrace Link are modelled. The LHTM model covers the entire Lower Hunter Region, comprising the six Statistical Local Areas (SLAs) of Newcastle – inner, Newcastle – Remainder, Lake Macquarie, Cessnock, Maitland and Port Stephens. The model network includes all National, State and Regional roads, and local roads generally down to the level of collector roads. Previously Hyder calibrated the LHTM model for the Coal & Allied study area using 2007 counts data at surveyed locations. The AM peak period model (7- 9am) was calibrated with the observed counts within the 10% target. Between 2007 and 2010, the AM peak hour traffic change on key roads in the Coal & Allied study area was low (within 5% in 3 years) and is unlikely to affect the calibration target achieved for the Coal & Allied study area.
2. Micro simulation model. This model was developed using Paramics software. Hyder developed a Paramics model for assessing the Coal & Allied traffic impact. The model covers the area bounded by F3 Freeway, Newcastle Link Road and John Renshaw Drive. Key collector and local roads including Woodford Street, Minmi Road, Cameron Park Drive, Northlakes Drive and Lenaghans Drive are included in the Paramics model. Traffic demand from LHTM was used as input to the Paramics model. The Paramics model was developed as per relevant guidelines including the "Paramics Micro-Simulation Modelling – RTA Manual Version 1.0". The calibration and validation of base year Paramics model is documented in Appendix B.
3. SIDRA model. This model was developed using SIDRA software.

The RTA's LHTM model was updated to include the Minmi/Link Road residential development of approximately 3,300 dwelling units, and the

Black Hill employment development with a capacity of 800,000 square metres gross leasable floor area (GLFA). Coal & Allied's proposed development was assessed for three planning horizon years 2016, 2026 and 2031 based on land use assumptions predicted in the Lower Hunter Regional Strategy (LHRS). The development projections contained in the RTA's model were also in line with the anticipated growth projections outlined in the Newcastle-Lake Macquarie Western Corridor Planning Strategy. In conjunction with the Coal & Allied lands in the Northern Estates, the western corridor planning strategy also recognises potential residential and employment development from other key landholders including Xstrata and Hunter Development Corporation. It is anticipated that in the future, traffic generation from all potential major greenfields developments in and around the Newcastle Link road corridor will have a cumulative impact.

Traffic forecasts for the LHRS land use scenario were referred to as V12 (V stands for version). By 2016 the V12 land use projection assumed significant growth from greenfield developments. It is likely that expected growth will be delayed in the region particularly for the short and medium time frame due to major changes to global economic growth as a result of the Global Financial Crisis (GFC). The revised land use data was used for the Coal & Allied study. Figure 3-1 shows revised population forecasts for the Hunter region up to 2031.

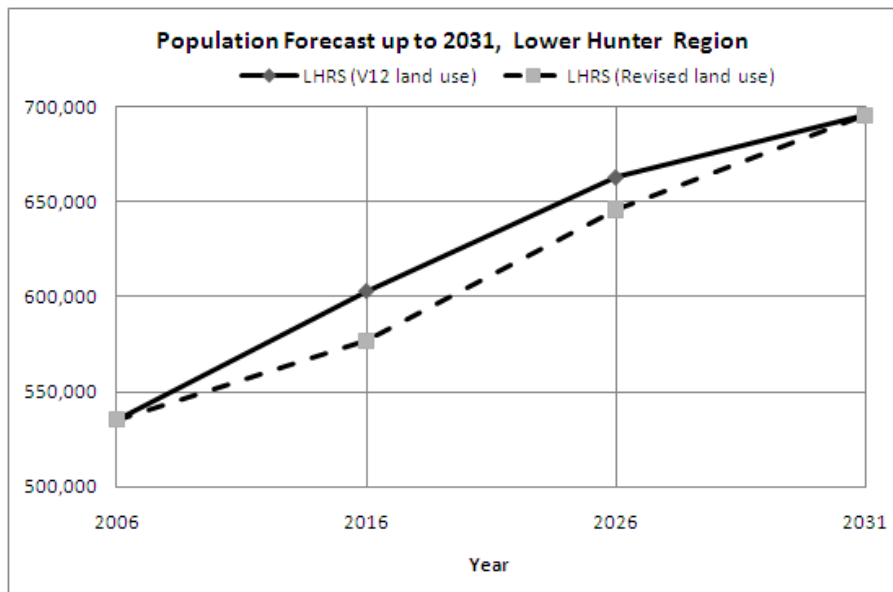


Figure 3-1 Population forecast for the Hunter Region up to 2031

Key modelling assumptions for Minmi/Link Road site are summarised as follows

- Inclusion of Hunter Expressway in modelling;
- Deletion of RTA unfunded future roads;
- Inclusion of the proposed F3 to Raymond Terrace Link bearing in mind that construction of the F3 to Raymond Terrace Link is not expected until after 2026.

3.2 Development program

Five developable precincts are proposed under the Concept Plan, located around the existing Minmi township and to the north and south of Link Road. The proposed developable areas have been established on the basis of detailed investigations in respect to available and proposed infrastructure, existing environmental constraints and opportunities for future sustainable growth. The concept plan shows approximately 3,300 dwellings to be developed into five stages. This is as follows:

1. Minmi East: Proposed to be located between the existing Minmi township and The Outlook, to act as a “gateway” to the east. This Precinct is proposed as stage 1 with subdivision programmed to commence 2013 with a development period of approx three years.
2. Link Road South: Proposed to be located south of the Newcastle Link Road, including a connector road linking the proposed development with Cameron Park and other future developments as Stage 2 – Years 2016 – 2018.
3. Minmi Extension: Proposed to be located south and west of the existing Minmi township incorporating proposed Garden House and Workshop heritage parks. This precinct is proposed as Stage 3 – Years 2019 – 2020.
4. Village Centre: Proposed to be located in the centre of the site, and is proposed as a new activity hub for the area which will be Stage 4 – Years 2021 2023.
5. Link Road North: Proposed to be located along the northern boundary of the Newcastle Link Road, acting as “gateway” to existing and future development in the south. This precinct is planned as Stage 5 - Years 2024 – 2032.

3.3 Proposed site accesses

Coal & Allied proposes to develop the Minmi Link Road site into five stages. Figure 3-2 shows an indicative staging plan for the site. Each phase of the staging determines access requirements and then determines the road and intersection capacity needed to service the demand from dwelling yields.

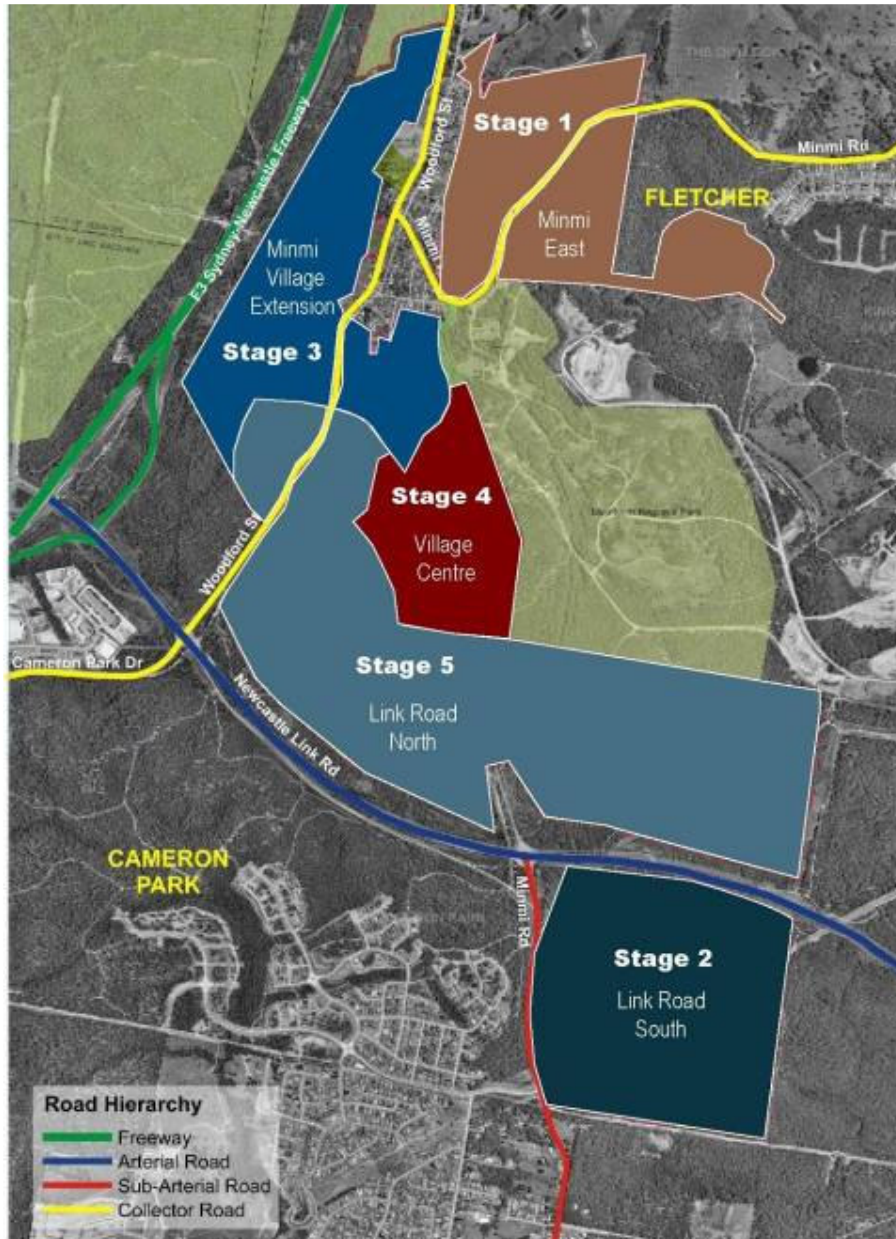


Figure 3-2 Proposed indicative staging plan for Minmi/Link Road development

Based on each development stage, the proposed access routes are:

- Stage 1 (Minmi East). The first stage of development is provisionally titled 'Minmi East' and is to be based on the land around the eastern edges of the current Minmi village. This stage is expected to provide approximately 530 residential dwelling units. Access to stage 1 development will be provided via existing Minmi Road and Woodford St. Internal roads will be built to cater for the stage 1 development, which also provides additional access points on the Minmi Road (Minmi High St).
- Stages 2 to 4 (Link Road South, Minmi Extension, Village Centre). Stages 2 to 4 included three precincts 'Minmi Village Extension', 'Village Centre,' and 'Link Road South'. Approximately 1,284 dwelling units are proposed to develop within these three precincts. The first two precincts are located on the northern side of Newcastle Link Road. The 'Link Road South' precinct is located on the southern side of Newcastle Link Road. To service the development sites north of Newcastle Link Road it is proposed that a new road through the site ('Minmi Boulevard') be constructed to join Newcastle Link Road (at the current three-leg roundabout with Minmi Road, Edgeworth) and Woodford St. The new Minmi Boulevard road is proposed to be main collector road feeding traffic from Coal & Allied development. It is expected that Minmi Boulevard road will be constructed at the commencement of development of stage 4. The 'Link Road South' site can be accessed via Minmi Road (Edgeworth) at the current Giveway intersection with Northlakes Drive, creating a new 4-leg roundabout; and
- Stage 5 (Link Road North). The fifth, and final, stage is expected to release approximately 1,486 dwelling units on the 'Link Road North' site, north of Newcastle Link Road. The Link Road North precinct is expected to develop beyond year 2026. The Minmi Boulevard road will provide the primary access to and from Link Road North precinct.

Two emergency accesses (left out only) are proposed on the Newcastle Link Road from 'Link Road South' and Link Road North precincts. At each stage of the Coal & Allied development, the site will have multiple accesses to comply with the emergency services requirements. This will give any emergency vehicles access and egress when required. In principle, RTA supported emergency access (left out only) from 'Link Road South' and Link Road North precincts.

3.4 Summerhill Waste Management Centre traffic access

Summerhill Waste Management Centre (SWMC) is located off Minmi Road, Wallsend. Current access to the SWMC is provided via Minmi Road. Newcastle City Council is planning to increase the commercial viability of its SWMC site. Previously, Hyder assessed the following two access options on the Newcastle Link Road (see Figure 3-3):

- Option A – a new access for waste truck at the Newcastle Link Road/Minmi Rd intersection. This would create a five-leg roundabout; and

- Option B – a new combined access on the Newcastle Link Road for Coal & Allied and waste traffic to the east of the Coal & Allied site. This was proposed to be left in and left out.

RTA did not support either of these two access options.

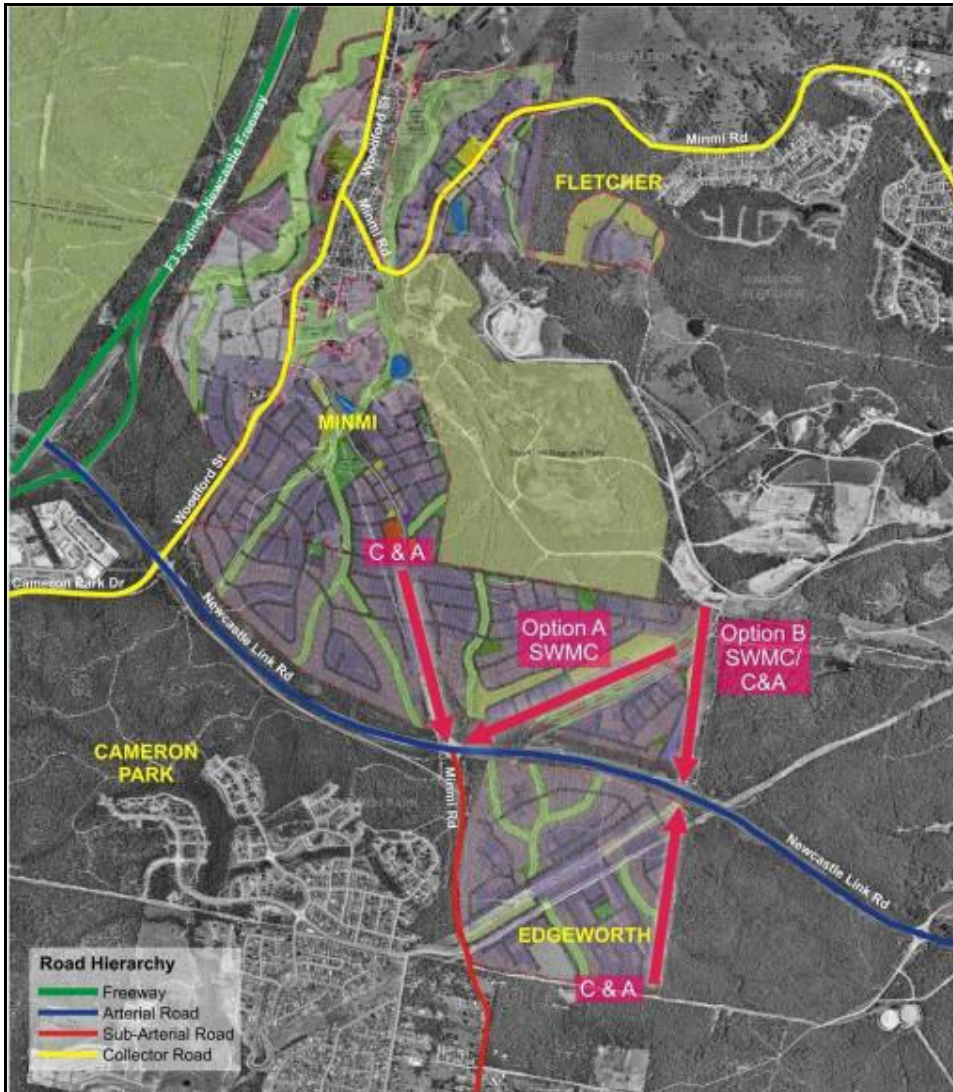


Figure 3-3 Possible access options on the Newcastle Link Road for Coal & Allied and SWMC sites

3.5 Internal road network within concept plan

The internal road network and intersections for the proposed development has been designed to allow circulation and ease of movement for pedestrians, cyclists and vehicles, including public transport and service vehicles.

The Environmental Assessment (EA) includes the Concept Plan and road cross sections of Minmi Link Road. Comparing the road characteristics (contained in the Concept Plan) it appears that the proposed road geometry is generally consistent with the Council's recommended guidelines. Turning paths for the internal road network using Autotrack for a standard design vehicle (12.5 metres, equivalent to a bus or garbage truck) have been checked. All trafficable ways within the development will be at least 5 m wide, which conforms to NSW Rural Fires Services GTA's, that require all roads provide a minimum width of 5m.

The cross-sections and road reserves allow for segregated shared space for pedestrians and cyclists in most locations. These will provide attractive and safe routes for leisure trips and access to public transport. Facilities for non-car modes are detailed further in Section 3.10 of this report.

When completed, the internal layout will also provide for bus routes through the development site, and for express services to use the main roads where applicable. This will allow for a range of bus, or other public transport, services to access the site in future. The main site link, 'Minmi Boulevard,' will be designed with roundabouts at the majority of its intersections which is an appropriate intersection control with respect to the 10,000-12,000 vehicles per day expected to use this link. Within the Concept Plan, the local road network was developed by ensuring that the internal layout has multiple accesses to each area. In the event of an emergency situation the emergency services will have sufficient access to properties, even if a road has been adversely affected by the situation.

3.6 Traffic generation

In general, traffic generation is a key input into the traffic model and should be examined carefully prior to assessing future network impact. A common source for trip generation rates is the RTA's *Guide to Traffic Generating Developments (2002)*. However, trip generation rates vary from one site to another due to the number of factors such as available modes of travel and household sizes. The trip generation rates for the proposed Coal & Allied development were estimated from the following two sources including:

- RTA's trip generation rates (2002) and
- Residential trip generation survey data obtained from Maitland Council.

Standard trip rates for residential units from both sources were compared. A key factor assumed in the trip generation rate was 'self-containment trips.' RTA guideline states about 25% of trips are *internal* to the subdivision, involving local shopping, schools and local social visits. The residential trip generation rate from the Maitland survey was about 8.4 daily trips per dwelling. The RTA guideline recommended approximately 9.0 daily trips per dwelling which included the self contained trips. In considering a 25% self containment trip, the RTA's discounted trip rate will be in the order of 6.75 daily trips per dwelling. Table 3-1 and Figure 3-4 summarised residential trip generation survey sourced from Maitland.

Table 3-1 Hourly trip generation rates obtained from Maitland Survey

Hour	Weekday average		
	Aberglasslyn (1290 dwelling units)	Thornton (905 dwelling units)	Average
0	0.02	0.02	0.02
1	0.02	0.01	0.01
2	0.01	0.01	0.01
3	0.02	0.01	0.01
4	0.04	0.03	0.04
5	0.21	0.14	0.18
6	0.35	0.29	0.33
7	0.50	0.50	0.50
8	0.76	0.70	0.74
9	0.58	0.45	0.53
10	0.42	0.35	0.39
11	0.41	0.29	0.36
12	0.44	0.32	0.39
13	0.44	0.35	0.40
14	0.53	0.47	0.50
15	0.81	0.67	0.75
16	0.80	0.70	0.76

Hour	Weekday average		
	Aberglasslyn (1290 dwelling units)	Thornton (905 dwelling units)	Average
17	0.88	0.79	0.84
18	0.66	0.59	0.63
19	0.40	0.33	0.37
20	0.25	0.21	0.23
21	0.19	0.19	0.19
22	0.10	0.08	0.09
23	0.07	0.06	0.06
Total Daily	8.9	7.5	8.4

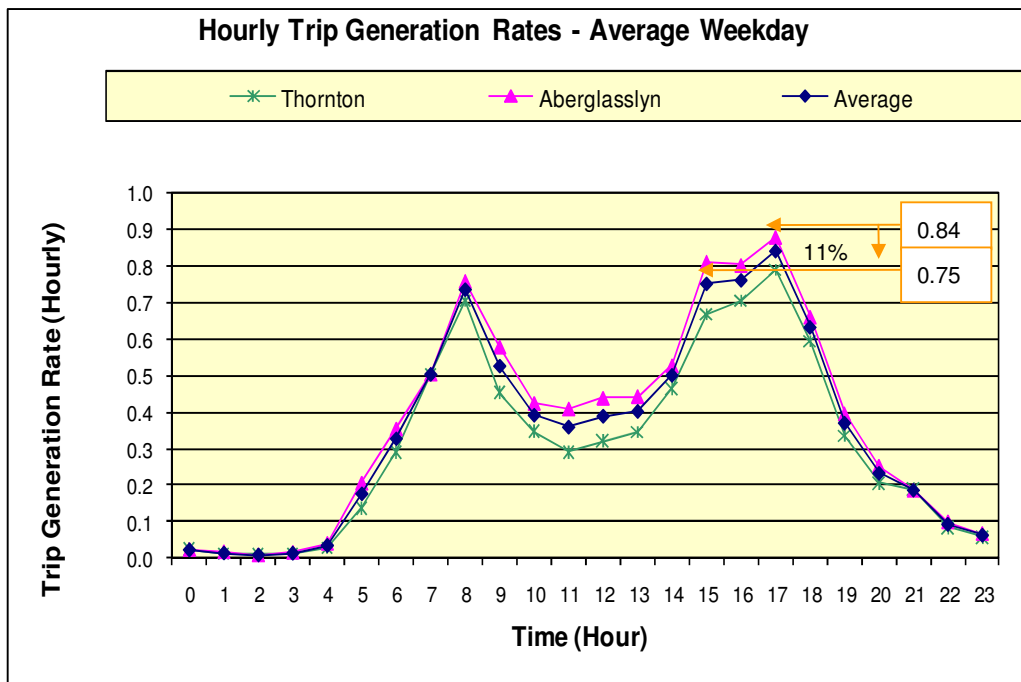


Figure 3-4 Hourly residential trip generation rates

The following points are noted from Maitland survey data presented in Table 3-1 and Figure 3-4.

- PM peak generation was observed to be higher than for the AM peak;
- PM peak duration was longer (as seen by the broad peak on the graph) compared to the AM peak, which had a short peak;
- AM peak trip generation rate varied between 0.50 and 0.74 trips per household; and
- PM peak trip generation rate was higher than AM peak between 0.75 and 0.84 trips per household.

- In general, PM peak trip generation rate was about 26% higher than AM peak trip rate.

Based on the RTA guidance on the self containment rate and taking into account the local facilities that will be provided in this development (as per the Coal & Allied Concept Plan), approximately 25% self-containment trips have been assumed. These trips are expected to be spread through the local areas with schools, shops, and community facilities as the key generators. Table 3-2 summarises the type of dwellings and expected generated trips from the proposed Coal & Allied development.

Table 3-2 Trip Generation from Coal & Allied development using the RTA rates

Type of Dwelling	Number of dwelling units	Percentage	RTA's Trip Generation Rat		Trip Generation (without self containment)		Trip Generation (with self containment)	
			PM Peak	Daily	PM Peak	Daily	PM Peak	Daily
Townhouse dwelling units	127	3.9%	0.575	5.75	73	730	55	548
Village Courtyard dwelling units	469	14.4%	0.45	4.5	211	2111	158	1583
Traditional dwelling units	1589	48.7%	0.85	9	1351	14301	1013	10726
Lifestyle dwelling units	700	21.4%	0.85	9	595	6300	446	4725
Lifestyle Heritage dwelling units	86	2.6%	0.85	9	73	774	55	581
Independent Living Units	155	4.7%	0.2	2	31	310	23	233
Minmi High Street Medium Density	41	1.3%	0.575	5.75	24	236	18	177
Minmi High Street Mixed Use/Retail	50	1.5%	0.29	3	15	150	11	113
Village Centre Mixed Use/Retail Including Community Facility	49	1.5%	0.29	3	14	147	11	110
Total	3266	100.0%			2386	25059	1790	18794
	3300*				2411	25319	1808	18990

Note: Number of dwelling units was sourced from the Concept Plan. *There is a minor difference between yields shown in Concept Plan and dwelling yields figure used in traffic model. Hyder used trip generation from 3,300 dwelling units.

The data from Table 3-2 suggested that using the RTA's trip generation rate for various types of dwellings, the Coal & Allied site is expected to generate about 25,000 daily vehicle trips when fully developed. The analysis has conservatively assumed that the generation would be to 22,000 daily vehicle trips, when self contained trips are removed. When considering highest one hour peak trips, the full Coal & Allied development could generate about 1,800 trips which are in line with the RTA's trip rate.

3.7 Trip distribution

The distribution of the additional trips generated by the proposed Coal & Allied residential development is a key factor in determining its impact on the road network. The trip distribution on Newcastle Link Road, Minmi Road (through Fletcher), Minmi Road (through Edgeworth), F3 Freeway and Hunter Expressway was estimated using the traffic model. The future year 2031 AM peak hour outbound traffic from the Minmi/Link Road development suggests the following distribution trend:

- About 40% of Coal & Allied traffic is forecast to travel via Minmi Boulevard Road and Newcastle Link Road to access Newcastle and Greater Lake Macquarie areas;
- About 15% traffic is forecast to travel via Minmi Road (through Edgeworth) and Main Road (MR527) to access Glendale;
- About 10% traffic is forecast to travel via Hunter Expressway to access Cessnock/Kurri Kurri and the Upper Hunter;
- About 10% traffic is forecast to use the F3 Freeway;
- Minor traffic is expected to use Cameron Park Drive (about 6%);
- Minor traffic is expected to use Minmi Road through Fletcher (about 7%); and
- About 12% of traffic is forecast to use Lenaghans Drive to access Black Hill and Beresfield.

Previously, at RTA's request, additional investigations were undertaken to determine why a relatively high proportion of Minmi/Link Road residential traffic uses Lenaghans Drive. Modelling work suggested that in 2031 increased congestion on the Newcastle Link Road, particularly between the F3 Freeway and Woodford Street, leads some traffic to use the alternative Lenaghans Drive instead of the F3 Freeway. The RTA is currently undertaking a route development study on the Newcastle Link Road. That study is expected to quantify the impact on the Newcastle Link Road particularly the potential need for widening the Newcastle Link Road. The potential Link Road widening issue is outside of the Coal & Allied responsibility and hence beyond the scope of this traffic modelling work.

3.8 Future growth

Future traffic conditions on the F3 Freeway and Newcastle Link Road corridor will be influenced by a combination of background growth and a redistribution of traffic effect from the Hunter Expressway. This means future traffic on the Newcastle Link Road will be influenced not only by the Coal & Allied Minmi/Link Road development traffic, but background growth and redistribution of traffic effect from the Hunter Expressway also impacting future corridor flows.

Future traffic growth on the Newcastle Link Road corridor was estimated with and without the Coal & Allied's Minmi/Link Road development. In both cases, the redistribution of traffic effect from Hunter Expressway was included. The future growth is estimated for daily traffic. The growth is calculated in terms of the cordon traffic. Noting the cordon traffic includes five roads including Newcastle Link Road (east/west), Minmi Road through Fletcher (north), Minmi Road through Edgeworth (south), Cameron Park Drive (south), and Lenaghans Drive (north). Figure 3-5 shows the location of the cordon line.

The Hunter Expressway would lead to a significant increase in traffic flows along the Newcastle Link Road between F3 Freeway and Lake Road. By 2016, traffic model predicts the growth up to 5% per annum driven by the combined effect of the Hunter Expressway redistribution traffic and predicted population and employment growth. However, the Hunter Expressway redistribution traffic will be the prime contributor leading to this high growth. Between 2016 and 2031 (15 years), background growth is forecast in the order of 1.7% per annum. The full Coal & Allied development at Minmi/Link Road is forecast to increase the growth in the order of 2.5% per annum. During the same period, the cumulative traffic from other planned major greenfields developments (inclusive of Coal & Allied) is expected to grow the Newcastle Link Road flows up to 4% per annum. The impact on Minmi Road through Minmi/Fletcher from Hunter Expressway will be minimal.

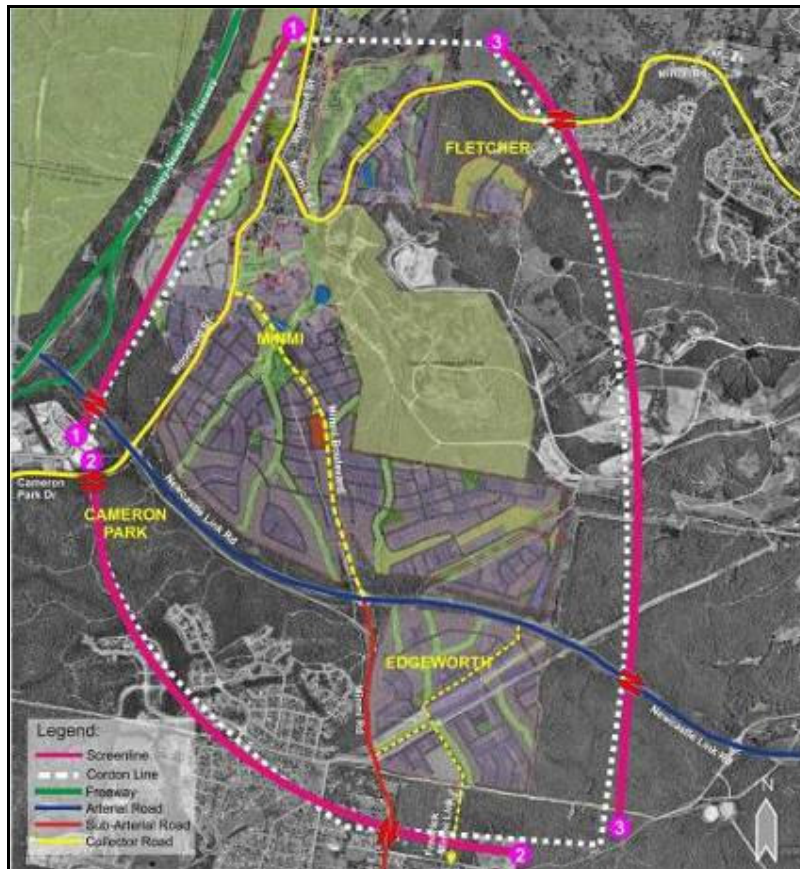


Figure 3-5 Location of Cordon Line

3.9 Modelling results

3.9.1 Impact without Coal & Allied development

In the future with planned major greenfields development in the Newcastle Link Road corridor, the capacity of the network will be largely governed by the performance of individual intersections rather than midblock sections between intersections. Hyder re-analysed the capacity of two roundabouts (at Woodford Street and Minmi Road) with the Newcastle Link Road which will be impacted from both Coal & Allied development and the Hunter Expressway.

Intersection capacity was determined with and without the Coal & Allied development for three horizon years 2016, 2026 and 2031. In both cases, the impact from the Hunter Expressway was included. Table 3-3 shows the intersection performance results at two roundabouts for future years without the Coal & Allied development.

Table 3-3 Intersections performance without Coal & Allied development

ID	Intersections	Traffic Control	2016			2026			2031		
			DoS	Delays	LoS	DoS	Delays	LoS	DoS	Delays	LoS
AM Peak											
I-1	Newcastle Link Rd/ Woodford St/Cameron Park Drive	Roundabout (existing)	1.1	>70	F	1.2	>70	F	1.4	>70	F
I-2	Newcastle Link Rd/Minmi Rd	Roundabout (existing)	0.70	19	B	0.77	23	B	0.91	31	C
PM Peak											
I-1	Newcastle Link Rd/ Woodford St/Cameron Park Drive	Roundabout (existing)	0.73	40	C	1.03	>70	F	1.09	>70	F
I-2	Newcastle Link Rd/Minmi Rd	Roundabout (existing)	0.75	20	B	0.92	29	C	0.99	59	E

The results from Table 3-3 indicate the following outcomes:

- With the Hunter Expressway and background growth, the model shows capacity problems resulting in low level of service on the Newcastle Link Road in the section of F3 Freeway and Woodford Street (see Figure 3-6 below). The traffic model predicted a low level of service at the Newcastle Link Road/Woodford Street/Cameron Park Drive roundabout. By 2016, the model forecasts LoS F during AM peak and LoS C during the PM peak. Beyond 2016, the model predicted LoS F for both AM and PM peak periods and showed significant delays and overflow queues on the Woodford Street and Cameron Park Drive approaches. The lane merging issue (3 to 2 lanes) on the Newcastle Link Road (west of Woodford Street) arising

from Hunter Expressway is expected to further impact the roundabout capacity. As a result, the traffic model identified the need for an upgrade of Newcastle Link Road/Woodford Street/Cameron Park Drive roundabout. The analysis indicated that new signals would be required by 2016. The intersection was re-analysed for post upgrade condition (new traffic signals) and result indicated LoS between C and D up to 2031.

- Until 2026, the modelling result does not indicate a significant capacity problem at Newcastle Link Road/Minmi Road roundabout arising from the Hunter Expressway. The model forecasts LoS between B and C in 2026. The roundabout capacity is expected to reduce in year 2031. Model predicts LoS C to E. The predicted queues from Paramics model are shown in Figure 3-7, below.

The capacity of Woodford Street/Minmi Road intersection (signals) was previously assessed. The model predicted LoS B with DoS value 0.4 until 2031. The impact at the Woodford Street/Minmi Road intersection from Hunter Expressway is expected to be low.

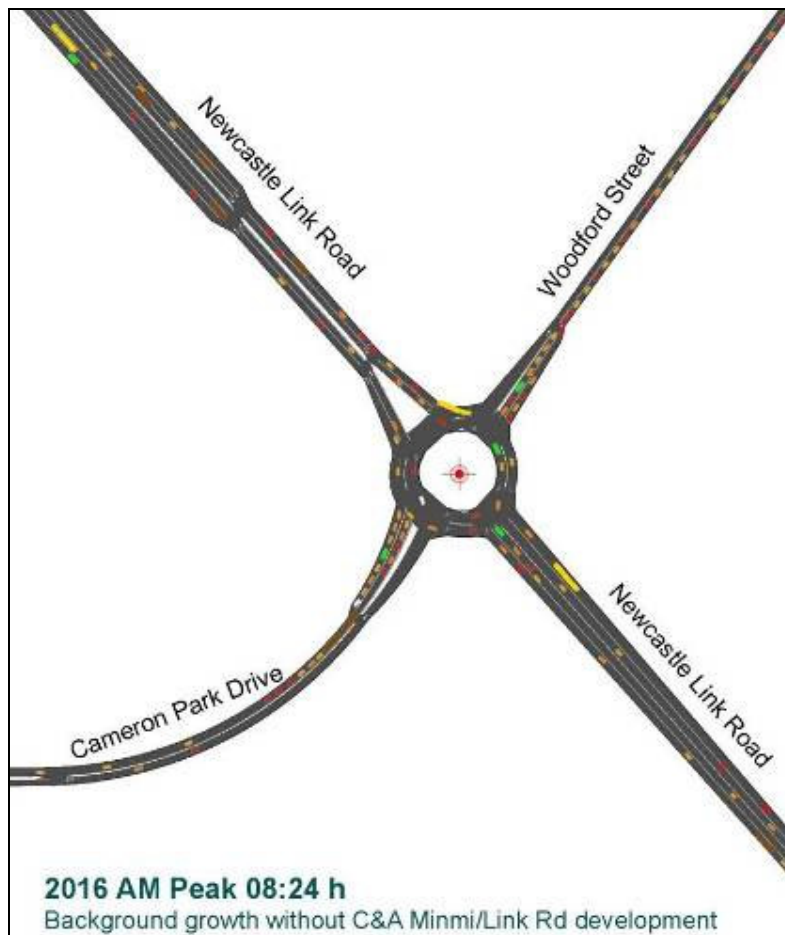


Figure 3-6 Paramics snapshot 2016 AM Peak background growth with HEX (without Coal & Allied development)



Figure 3-7 Paramics snapshot 2026 AM Peak background growth with HEX (without Coal & Allied development)

3.9.2 Impact from staged Coal & Allied development

Coal & Allied proposes to develop the Minmi Link Road site in five stages.

The first stage of development 'Minmi East' will be based on the land around the eastern edges of the current Minmi village. This stage is expected to provide approximately 530 residential dwelling units by 2016. The traffic model identified the need for new signals at the Newcastle Link Road/Woodford Street/Cameron Park Drive intersection following the opening of the Hunter Expressway. The analysis suggested that new signals on the Newcastle Link Road at the intersection with Woodford Street would have adequate capacity to accommodate additional traffic from Coal & Allied's stage 1 development. Traffic model predicted LoS C with Coal & Allied's stage 1 traffic. Model predicted minor impact on Woodford Street/Minmi Road and Newcastle Link Road/Minmi Road intersections arising from Coal & Allied's stage 1 development. The LoS is predicted as B at both intersections when accounting for stage 1 of the Coal & Allied development.

Stages 2 to 3 included two precincts, 'Link Road South' and 'Minmi Village Extension'. The 'Link Road South' site will be accessed via Minmi Road at the intersection with Northlakes Drive, creating a new 4-leg roundabout. The Minmi Village Extension precinct will be accessed via Woodford Street. The new Minmi Boulevard Road is not constructed. The traffic model assumed that by year 2026, approximately 970 dwelling units would be developed from stages 2 to 3. The additional Coal & Allied traffic generated from stages 2 and 3 development is forecast to reduce signal capacity at the Newcastle Link Road/ Woodford Street intersection. The

traffic model forecasts LoS E for year 2026. The data suggested that new signal on the Newcastle Link Road with Woodford Street would have capacity to accommodate up to stage 3 Coal & Allied development. The analysis identified the need for new Minmi Boulevard Road at the commencement of development of stage 4.

Stages 2 and 3 of the Coal & Allied development are expected to reduce roundabout capacity at the Newcastle Link Road/ Minmi Road intersection. The traffic model forecasts LoS C during AM peak and LoS F during PM peak respectively.

Table 3-4 below summarises the modelling results accounting for the traffic generation up to stage 3 of the Coal & Allied development which is expected to be fully occupied by 2026. Figure 3-8 below shows Paramics snapshot for Newcastle Link Road/Woodford Street/Cameron Park Drive intersection (new signals).

Table 3-4 Intersections performance with Coal & Allied development up to stage 3

ID	Intersections	Traffic Control	2016			2026		
			DoS	Delays	LoS	DoS	Delays	LoS
AM Peak								
I-1	Newcastle Link Road/ Woodford Street/Cameron Park Drive	New Signals	0.85	38.7	C	1.0	61	E
I-2	Newcastle Link Road/Minmi Road	Roundabout (existing)	0.76	19	B	0.9	33	C
PM Peak								
I-1	Newcastle Link Road/ Woodford Street/Cameron Park Drive	New Signals	0.81	37.2	C	1.04	68	E
I-2	Newcastle Link Road/Minmi Road	Roundabout (existing)	0.81	22	B	1.1	>70	F

Note: Impact on Woodford Street/Minmi Road from Coal & Allied development is expected to be low. Model forecasts LoS B and DoS 0.58 up to stage 3 development.

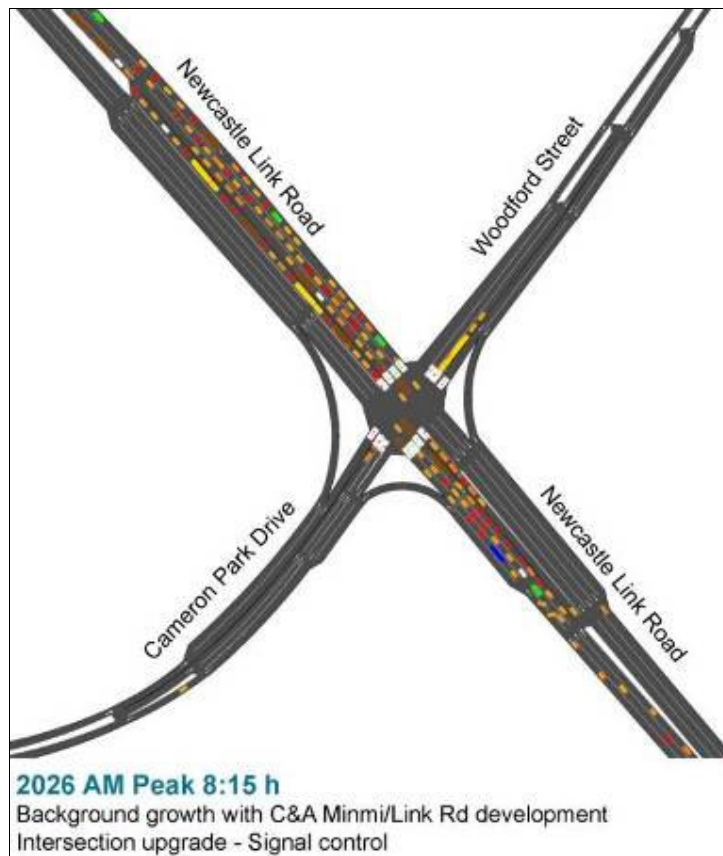
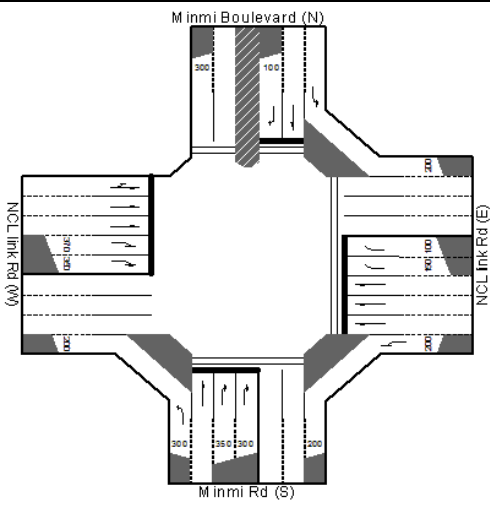


Figure 3-8 Paramics snapshot 2026 AM Peak background growth with HEX and with Coal & Allied development (Upgrade layout-signal control)

The traffic model assumed trip generation from approximately 1800 dwelling units within the stages 4 to 5. To service the development from stages 4 and 5 at the Minmi Village Centre and Link Road North sites it is proposed that a new road through the site ('Minmi Boulevard') be constructed to join Newcastle Link Road (at the current three-leg roundabout with Minmi Road) and Woodford Street. Minmi Boulevard is proposed as the main collector road feeding traffic from the Coal & Allied development.

Before stage 4 of the development commences, the analysis identified the need for potential upgrade of the Newcastle Link Road/Minmi Road roundabout. The analysis therefore adopted an iterative modelling process to determine the optimum lane configuration at Newcastle Link Road/ Minmi Road/ Minmi Boulevard intersection. The intersection configuration was modified with new signals until a satisfactory level of service was achieved (see Table 3-5). The expected queue length on the Newcastle Link Road was also examined using the Paramics model. Table 3-5 below summarises intersection modelling result for new signals at Newcastle Link Road/ Minmi Road/Minmi Boulevard. The traffic model assumed full Coal & Allied development along with expected cumulative traffic from other planned developments. The 2031 modelling result suggests that this intersection will require major upgrade with full traffic control signals. The model predicted a satisfactory LoS C should Newcastle Link Road be upgraded to three lanes.

Table 3-5 Summary of LOS at Newcastle Link Road/Minmi Road/Minmi Boulevard in 2031 with full Coal & Allied development

	AM Peak			PM Peak		
	DoS	Delays (Secs)	LoS	DoS	Delays (Secs)	LoS
	0.8	41.5	C	0.8	39.9	C

Previously, intersection performance at the Minmi Road/Main Road signals and Newcastle Link Road/Lake Road (MR217)/Thomas Street roundabout were assessed. Table 3-6, below summarises the modelling result for Minmi Road/Main Road (MR527) signalised intersection, and the Newcastle Link Road/Lake Road (MR217)/Thomas Street roundabout. The analysis indicates that the impact of the Coal & Allied proposed Minmi/Link Road development on both intersections would be low. The background/cumulative traffic growth is likely to trigger the need for upgrading works at both intersections. The proposed two lane roundabout at Minmi Road/Northlakes Drive, with the Link Road south development access was

reassessed. The proposed roundabout is expected to operate at a good LoS A (see Table 3-6, below).

Table 3-6 Summary of LOS on other intersections in 2031 with Hunter Expressway

Scenarios/ Intersections	AM Peak			PM Peak		
	DoS	Delays (Secs)	LoS	DoS	Delays (Secs)	LoS
Main Road (MR527) / Minmi Road Signal						
Existing	0.94	33.2	C	1.03	26.9	B
Background growth plus Coal & Allied (2031S7D-ImpE)	1.23	>90	F	1.03	56.5	D
Cumulative growth (2031BH6G)	1.25	>90	F	1.26	>90	F
Newcastle Link Road / Lake Road Roundabout						
Existing	1.42	>90	F	1.24	56.3	D
Background growth plus Coal & Allied (2031S7D-ImpE)	3.59	>90	F	3.04	>90	F
Cumulative growth (2031BH6G)	2.67	>90	F	5.33	>90	F
Proposed Minmi Road / Northlake Drive / Link Road South Access Road Roundabout						
Background growth plus Coal & Allied (2031S7D-ImpE)	0.47	7	A	0.52	7	A
Cumulative growth (2031BH6G)	0.56	7	A	0.61	7	A

Note: Scenario definition: 2031S7D- Background growth up to 2031plus full Minmi/Link Road development plus Hunter Expressway, 2031BH6G –Cumulative growth up to 2031plus full Minmi/Link Road development plus Hunter Expressway

3.10 Integrating Land Use and Transport Policy Package

This section summarises the investigation undertaken to assess the proposal against the objectives of the Integrating Land Use and Transport policy package. The public transport network in the vicinity of the Minmi Link Road development site comprises buses and train services. Currently, two bus services are running in the vicinity of the proposed development site. The Lower Hunter Integrated Transport Plan has set out a 20% target for the future non-car mode share in the Lower Hunter. To achieve this target, the new residential development at Minmi/Link Road needs to be fully integrated with the bus network and efficiently linked to the surrounding rail network. The Newcastle-Lake Macquarie Western Corridor Planning Strategy identifies public transport initiatives (bus, rail), pedestrian and cycle links for Minmi and surrounding areas. A new bus and rail interchange is proposed as part of the emerging Major Regional Centre at Glendale. The proposed bus and rail interchange should improve public transport efficiency and reduce the community's reliance on private car. An overview of proposed public transport, pedestrian and cycling strategies for the proposed development is discussed in the following sections.

3.10.1 Public transport strategy

The proposed development site is currently serviced by two bus routes, linking the area to major interchanges at Wallsend, Glendale and to the Cardiff Railway Station. In the proposed strategy, links to major centres would be reinforced to make public transport more attractive than private vehicles for both work and non work related trips. New road links are proposed to take place within the development, with a major spine road, 'Minmi Boulevard', linking areas to the south and the north of the development (Newcastle Link Road to Minmi Township). The Ministry of Transport advised of a need to commence bus services early in the development stage to introduce public transport as an alternative and effective transport choice.

New bus route

It is recommended that a new bus route be created linking Cardiff Station, Glendale Interchange, Edgeworth, the proposed residential development, Minmi Township, and Thornton Station. The new route would run along Minmi Road and the proposed Minmi Boulevard road through the development. This new route would create connections to:

- The entire Newcastle bus network (through Glendale Interchange);
- The Sydney to Newcastle rail line at Cardiff Station; and
- The Newcastle to Maitland line at Thornton Station.

New bus stops are proposed along the new bus route. Within the development it is proposed to create bus stops on:

- Minmi Road, south of Newcastle Link Road;
- The proposed Minmi Boulevard, north of Newcastle Link Road, in the new Minmi Village Centre;

- The proposed Minmi Boulevard, in the new Minmi Village Centre; and
- Woodford Street, within the existing Minmi Township.

A 400m catchment (buffer) was applied along the new bus route. A map of the proposed indicative new bus route and bus stops is shown in Figure 3-9.

Extension of bus route 260

In addition to a new bus route, the need for extending the existing bus route 260 from Minmi Township to the proposed new village centre is identified. From its existing terminus on Woodford Street, route 260 would run along the proposed 'Minmi Boulevard' to the new Village Centre where a new terminus would be created. This initiative would create a direct access from the new development to Wallsend Interchange. The Ministry of Transport advised that bus services were continually under review and that more frequent services would be considered as additional residential development occurs in Minmi, Cameron Park, Edgeworth and Killingworth. It is proposed, in consultation with the Ministry of Transport, to review the route between Minmi and Wallsend to create a more direct service through Fletcher and Maryland. The increase in route directness would therefore minimise travel time and make route 260 more attractive to new passengers. A new bus stop is proposed along the route extension at:

- The future Minmi Boulevard in the new Village Centre.

The proposed new bus route and the bus stops are shown in Figure 3-9.

Implementation strategy

The development at Minmi/Link Road is proposed to be rolled out in five stages by year 2032. The proposed new bus route and the extension of bus route 260 could take place before completion of the Village Centre.

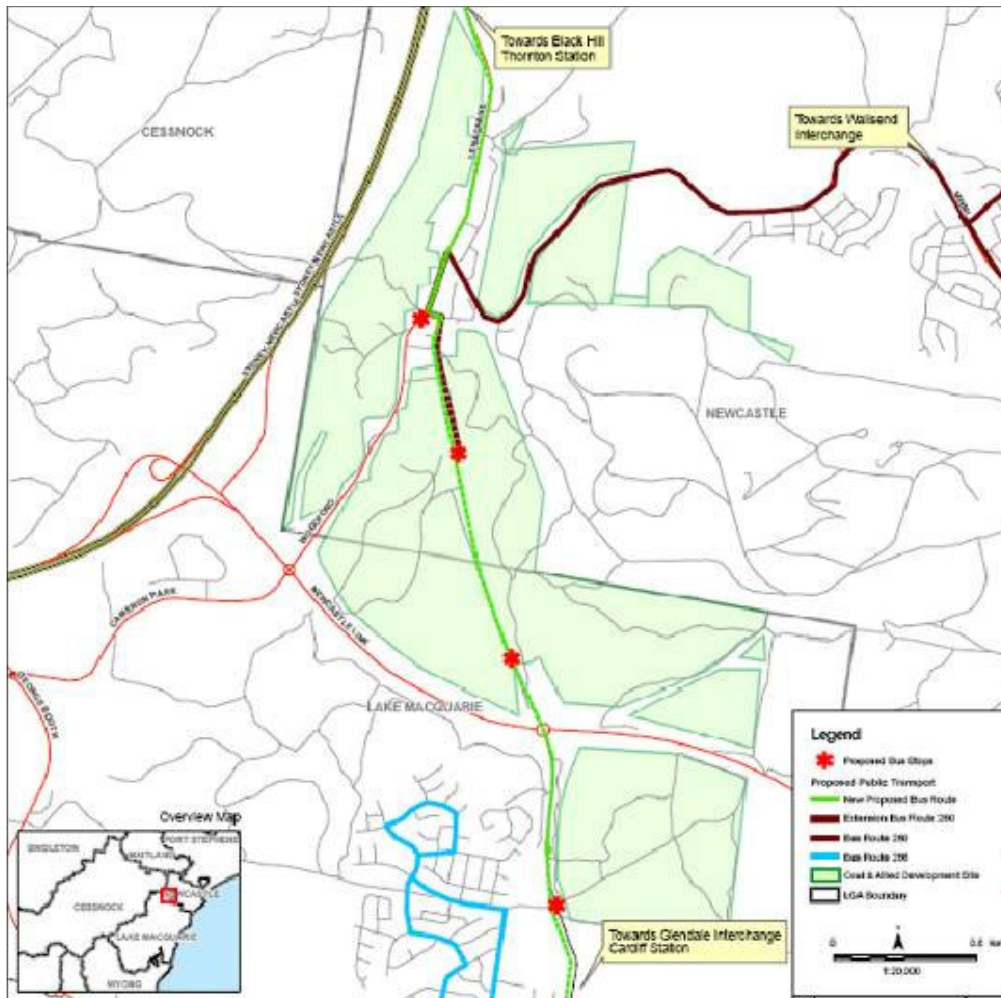


Figure 3-9 Proposed bus routes within the Coal & Allied development

3.10.2 Pedestrian and cycling strategy

Pedestrian and cycle paths linking local needs such as schools and shops to new residential areas will be required as an alternative form of non-car transport for local/short trips. In addition, linkages from new and existing employment areas to residential areas, transport nodes and other pathway networks will provide opportunities for walking and cycling as journey to work modes. The Newcastle-Lake Macquarie Western Corridor Planning Strategy has identified the continuation of the regional cycleway network (see Figure 3-10). This regional route proposes to connect Glendale and the western areas of Lake Macquarie with Wallsend, Minmi, Beresfield, Newcastle University and Newcastle CBD. The continued expansion of this major route is an important action to strengthen non-car transport opportunities. The proposed new road network, riparian corridors and open space within the Minmi development will allow for the introduction of cycle ways within the development as well as providing connectivity to the proposed regional cycle way network. A cycle way is proposed along the proposed Minmi Boulevard through the development and on to Minmi Road (Edgeworth). This proposed cycle way would also create a direct link between the Minmi development and the activity centre at Glendale. It is proposed to use relevant standards and guidelines to create secure and suitable footpaths along the new road network. The new roads would allow for shared paths for pedestrians and cyclists. This will take place within the development at each stage of its implementation.

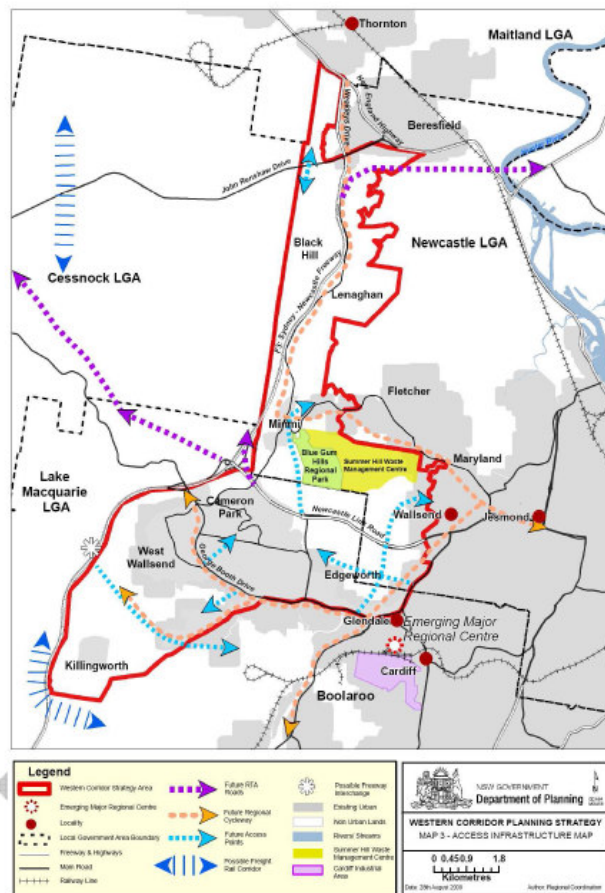


Figure 3-10 Future regional cycleway (source, Newcastle-Lake Macquarie Western Corridor Planning Strategy)

Table 3-7 summarises broader assessment of the proposal against the objectives of the Integrated Land Use and Transport policy (ILUT) package.

Table 3-7 ILUT objectives and compliance

ID	ILUT objectives	Compliance
1	Improving access to housing, jobs and services by walking, cycling and public transport	A pedestrian and cycleway network will be provided to facilitate the movement of pedestrians and cyclist through the development area. Within the development proposal, the street and riparian corridor network will be designed to provide safe walking routes and bicycle routes that link the site with the existing services and facilities in Minmi and other nearby areas. Through the NSW Government's Bike Plan, the Government will work in partnership with local councils communities and business to encourage bike riding growth and safer cycling in New South Wales. The Newcastle-Lake Macquarie Western Corridor Planning Strategy identifies public transport initiatives (bus, rail), pedestrian and cycle links for Minmi and surrounding areas. Newcastle and Lake Macquarie City Council's cycleway policy is to designate local streets for cycling and pedestrian use. Both policies should ensure that road extensions that link to Minmi/Link Road developments will also contain provision for pedestrian and cyclists.
2	Increasing the choice of available transport and reducing dependence on cars;	The concept plan for Minmi/Link Road proposal will create an environment that is friendly to pedestrians, cyclists and public transport users. A pedestrian network will be installed to provide for movements of pedestrians throughout the development area. The local roads including the Minmi Boulevard within the development will be designed to provide safe walking and bicycle routes that link with other existing services and facilities in Minmi. Previous Sections 3.10.1 and 3.10.2 identified public transport, pedestrian and cycling strategies for the Coal & Allied's development.
3	Reducing travel demand including the number of trips generated by development and the distances travelled, especially by car	The study recommended that new bus route be created linking Cardiff Station, Glendale Interchange, Edgeworth, the proposed residential development, Minmi Township, and Thornton Station. The new route would run along Minmi Road and the proposed Minmi Boulevard road through the development. New bus stops are proposed along the new bus route. Within the development it is proposed to create bus stops on Minmi Road, Minmi Boulevard, and Woodford Street. Pedestrian and cycle routes within the development will connect with the above

ID	ILUT objectives	Compliance
		mentioned roads.
4	Supporting the efficient and viable operation of public transport services	The public transport network in the vicinity of the Minmi Link Road development site comprises buses and train services, running within a few kilometres of the development site. Currently, two bus services are running in the vicinity of the proposed development site. The Lower Hunter Integrated Transport Plan has set as a target mode shift to secure 20% of peak hour work related trips to be other than by private car. Reaching this target will reduce peak vehicle trips and contribute to a reduction in congestion on the arterial road network. The key to meeting this target will be to provide Minmi/Link Road development with regular bus services, particularly at peak hours, and to provide safe and convenient bicycle and pedestrian links to nearby residential/employment areas. Previous Sections 3.10.1 and 3.10.2 identified public transport, pedestrian and cycling strategies for the Coal & Allied's development.
5	Providing for the efficient movement of freight	Not applicable for Minmi/Link Road site.

4 Summary of findings

The Lower Hunter Regional Strategy (LHRS) has identified the Coal & Allied Minmi/Link Road site as future residential development. Hyder has been commissioned to carry out the traffic study to address the DGRs and assess the traffic and transport issues associated with the concept plan of the site. This traffic and transport report details the impact from the proposed residential development at the Minmi/Link Road site.

A Concept Plan for the subject site has been developed containing approximately 3,300 dwelling units and that are planned for release in five stages or precincts over the next 25 years period. This site is expected to be operational from year 2016 as stage 1 with subdivision is programmed to commence in year 2013 with a development period of approx three years.

The first stage of development is to be based on the land around the eastern edges of the current Minmi village. Access to stage 1 development will be provided via existing Minmi Road and Woodford St. Stages 2 to 5 included four precincts 'Minmi Village Extension', 'Village Centre,' 'Link Road South' and 'Link Road North' respectively. It is proposed that a new road through the site ('Minmi Boulevard') be constructed to join Newcastle Link Road (at the current three-leg roundabout with Minmi Road). The new Minmi Boulevard road is proposed to be the main collector road feeding traffic from Coal & Allied development. The 'Link Road South' precinct can be accessed via Minmi Road (Edgeworth) at the current intersection with Northlakes Drive, creating a new four-leg roundabout. Two emergency accesses (left out only) are proposed on the Newcastle Link Road from 'Link Road South' and Link Road North precincts. At each stage of the Coal & Allied development, the site will have multiple accesses to comply with the emergency services requirements. Key findings from the traffic investigations are as follows:

- Most trips in the Minmi/Link Road area are undertaken by car. Journey to work data shows that private cars account for about 78 percent of work trips.
- Public transport is limited. Currently, two bus services are running in the vicinity of the proposed development site.
 - Route 260 Minmi – Maryland – Wallsend; and
 - Route 265/266 Cameron Park – Glendale – Charlestown – Newcastle University.
- The current road network in and around the Coal & Allied Minmi Link Road site provides a number of route choices or alternative forms of access. The Newcastle Link Road is the major east-west arterial road providing access to the proposed site via Minmi Road and Woodford Street. Access to the site can be made via Lenaghans Drive and Minmi Road (through Minmi/Flletcher).
- Newcastle Link Road carries over 22,000 vehicles per day during a weekday, with weekend traffic around a third lower than on an average weekday. This implies that the Newcastle Link Road carries a high proportion of commuter traffic demand to/from Newcastle. The heavy vehicles on the Newcastle Link Road were recorded between 1,600 and 2,200 vehicles per day comprising between 7% and 9% of total traffic. After the opening of the Hunter Expressway, the traffic increase on the Newcastle Link Road is forecast up to 50% of current traffic.
- Minmi Road (through Edgeworth), south of Newcastle Link Road carried approximately 14,000 vehicles per day during a weekday. Woodford Street, Lenaghans Drive and Minmi Road (through Minmi, Fletcher) carries between 3,500 and 5,300 vehicles per day.

- Between 2004 and 2008, Newcastle Link Road traffic grew by about 2% to 3% per annum. The recent growth on Newcastle Link Road is consistent with the general growth trend observed on other state roads in the Lower Hunter region which is between 1% and 2% per annum.
- Currently two key roundabouts on the Newcastle Link Road with Woodford Street and Minmi Road operate satisfactorily with an LoS of B for both the morning and evening peak periods. A similar LoS (A/B) is predicted on the Minmi Road with Woodford Street intersection (currently signals).
- Future traffic conditions on Newcastle Link Road corridor will be influenced by a combination of background growth and the redistribution traffic effect from the Hunter Expressway. It is anticipated that the Hunter Expressway will open to traffic by the end of 2013. The Hunter Expressway would lead to a significant increase in traffic flows along the Newcastle Link Road between the F3 Freeway and Lake Road. The traffic increase on the Newcastle Link Road is forecast up to 50% of current traffic. By 2016, the model predicts corridor growth up to 5% per annum, primarily driven by the traffic redistribution effect from the Hunter Expressway. Between 2016 and 2031 (15 years), background growth is forecast in the order of 1.7% per annum. During the same period, the Coal & Allied's Minmi/Link Road development is forecast to increase at up to 2.5% per annum. The impact on Minmi Road through Minmi/Fletcher from the Hunter Expressway would be minimal.
- With the Hunter Expressway and background growth, the model indicates capacity problems resulting in low level of service on the Newcastle Link Road in the section of F3 Freeway and Woodford Street. The traffic model predicted low level of service at the Newcastle Link Road/Woodford Street/Cameron Park Drive roundabout. The traffic model identified the need for potential upgrade of the Newcastle Link Road/Woodford Street/Cameron Park Drive roundabout. The analysis indicated that new signals would be required by 2016.
- Up to 2026, the modelling result does not suggest the significant capacity problem at Newcastle Link Road/Minmi Road roundabout arising from the Hunter Expressway. The roundabout capacity is forecast to reduce in year 2031 as LoS is predicted between C and E. Impact at Woodford Street/Minmi Road intersection from Hunter Expressway would be low.
- The Coal & Allied's stage 1 development will have minor impact at key intersections including the Woodford Street/Minmi Road, Newcastle Link Road/Woodford Street (assumed to be new signal – required not as a result of any development by Coal & Allied) and Newcastle Link Road/Minmi Road (roundabout).
- The additional Coal & Allied traffic generated from stages 2 and 3 development is forecast to reduce the signal capacity on the Newcastle Link Road with Woodford Street. The analysis suggested that new signal on the Newcastle Link Road with Woodford Street would have a capacity to accommodate up to stage 3 of Coal & Allied's development. The analysis identified the need for a new Minmi Boulevard Road at the commencement of development of stage 4.
- Before stage 4 of Coal & Allied's development commences, the analysis has identified the need for potential upgrade of the Newcastle Link Road/Minmi Road roundabout. The modelling result suggests that this intersection will require upgrade with full traffic control signals. The model predicted LoS C with traffic signals.
- The traffic model suggested low impact at other remote locations/ intersections on the Newcastle Link Road from the Minmi/Link Road development including the Minmi Road/Main Road signals and Newcastle Link Road/Lake Road/Thomas Street roundabout.

- It is recommended that the new residential development at Minmi/Link Road is fully integrated with the bus network. The Newcastle-Lake Macquarie Western Corridor Planning Strategy identifies public transport initiatives (bus, rail), pedestrian and cycle links for Minmi and surrounding areas. A new bus route is proposed linking the Cardiff Station, Glendale Interchange, Edgeworth, the proposed residential development, Minmi Township, and Thornton Station. The new route is proposed to run along the Minmi Road and the new Minmi Boulevard road through the development. New bus stops are proposed along the new bus route. In addition to new bus route, the need for extending the existing bus route 260 from Minmi Township to the proposed new village centre is identified. The Ministry of Transport advised that bus services were continually under review and that more frequent services would be considered as additional residential development occurs in Minmi, Cameron Park, Edgeworth and Killingworth.

Director General's requirements

Table 4-1 Director General's Requirements

DG Requirement	Relevant Report Chapter(s)
1) Provide a traffic study prepared in accordance with the RTA Guide to Traffic Generating Developments, which includes;	
(a) All relevant vehicular traffic routes and intersections for access to/from the subject area;	Chap. 2.1, 3.3
(b) Current traffic counts for all of the above traffic routes and intersections;	Chap. 2.10
(c) The additional vehicular traffic generated from the proposed development and associated trip distribution on the road network;	Chap 3.3, 3.6, 3.7
(d) Consideration of the traffic impacts on existing and proposed intersections and the capacity of the local and classified road network to safely and efficiently cater for the additional vehicle traffic generated by the proposed development. The assessment should also include the cumulative traffic impact of other proposed developments in the area;	Chap 3.8, 3.9
(e) Consideration of the impact of the planned Hunter Expressway;	Chap 3.8, 3.9
(f) Details of the necessary road network infrastructure upgrades that are required to maintain existing levels of service on both the local and classified road network;	Chap 3.8, 3.9
(g) Intersection analysis as well as a micro simulation model shall be submitted to determine the need for intersection and mid-block capacity upgrades, as well as ensure traffic signal co-ordination;	Chap 3.1, Appendix B
(h) Details on the efficiency of emergency vehicle access/egress;	Chap 3.3
(i) Measures to introduce and promote public transport usage and mode share including identification of bus routes;	Chap 3.10.1
(j) Proposed pedestrian and cycle access within and to the site that connects to all relevant transport services, existing and	Chap 3.10.2

proposed adjoining suburbs and other key off-site locations (for example schools, shops, parks recreation and community facilities) having regard to the *NSW Planning Guidelines for Walking and Cycling* (2004), and the *NSW Bike Plan* (2010)

(k) Timing of delivery of proposed transport infrastructure including road and intersection upgrades, pedestrian and cycle paths, and public transport infrastructure;

Chap 3.9, 3.10

(l) Consideration of impact on existing property access;

Chap 3.9

(2) Identify road design that is responsive to the proposed land use and associated urban form including proposed transport linkages between the subject land and surrounding key destination points such as existing centres, recreational areas and employment/industrial centres. Road design should be in accordance with any requirements of the relevant agency that will have responsibility for its ongoing ownership and management

Chap 3.9.2

(3) Assess the proposal against the objectives of the Integrating Land Use and Transport Policy package.

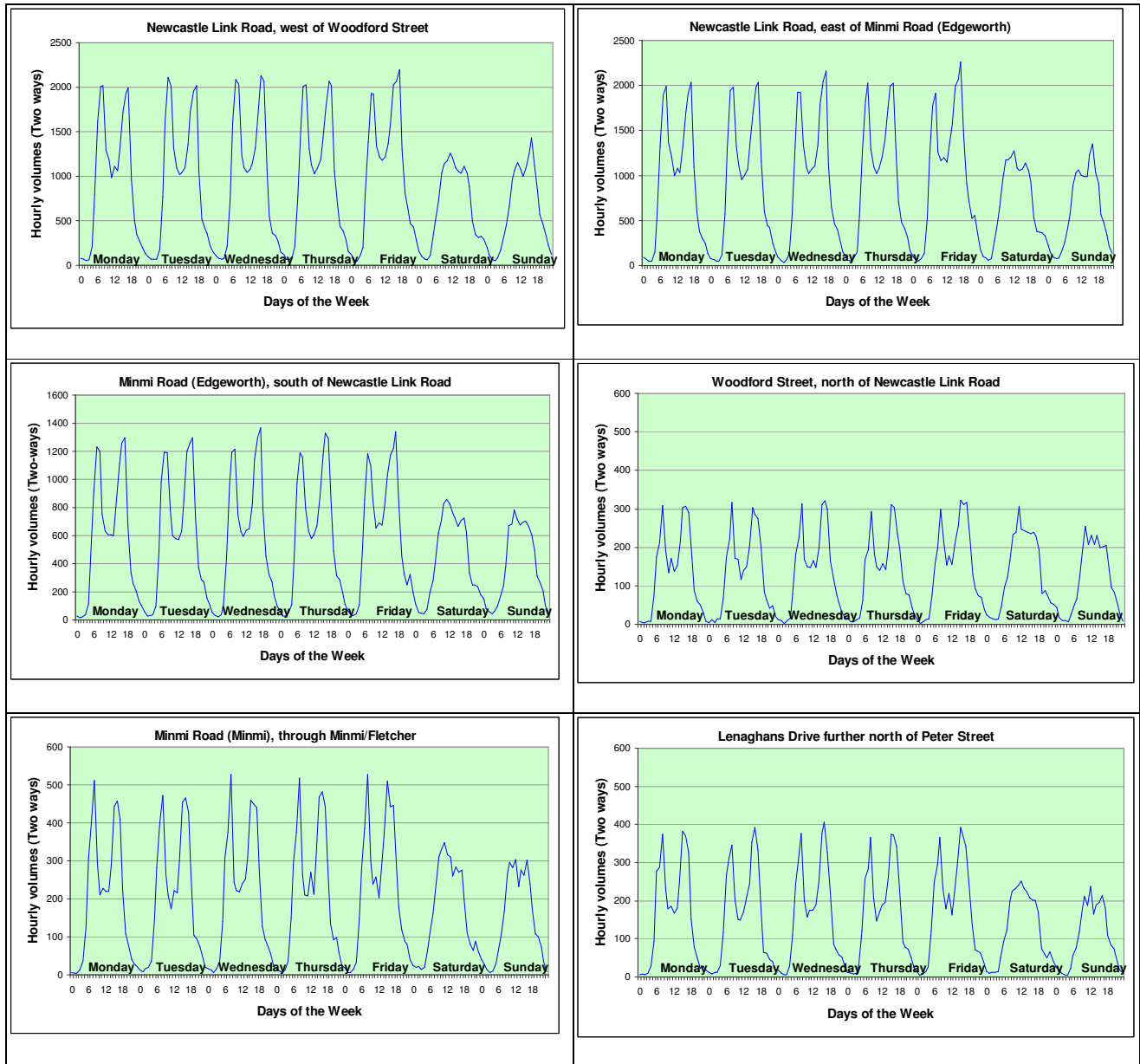
Chap 3.10

(4) Assess the impact of the proposal on future access arrangements to the Summerhill Waste Management Centre.

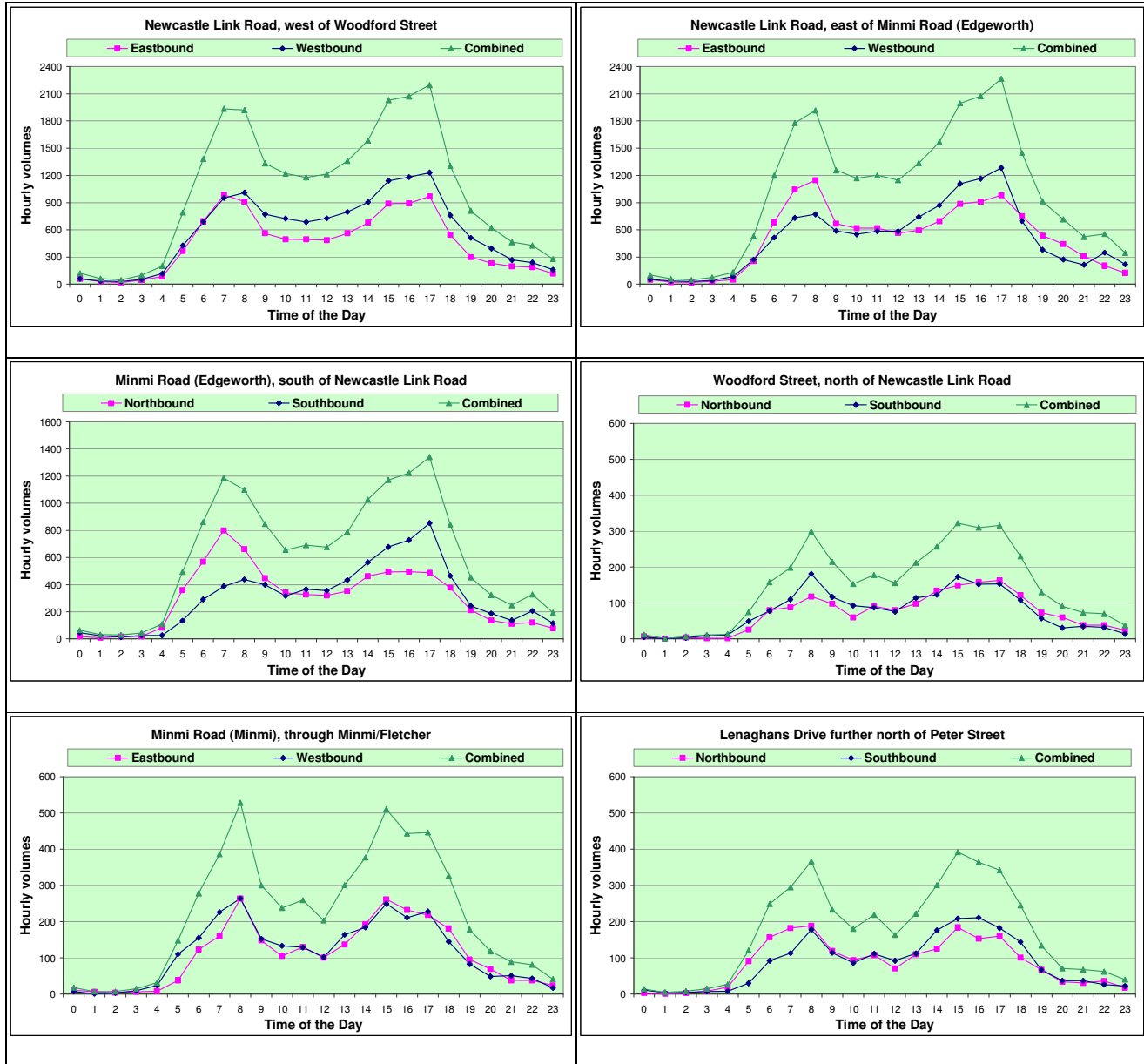
Chap 3.4

Appendix A

Traffic Data



Appendix A Figure 1 Daily traffic volume on key roads in Minmi



Appendix A Figure 2 Hourly traffic variation at key roads in Minmi

Appendix B

Local area model calibration

B1. Local area model calibration

Local area model calibration for Coal & Allied sites involved both TransCAD and the Paramics model. The following sections provide an overview of model calibration at both network and intersection levels.

B2. TransCAD model calibration

Model calibration is the process of matching the modelled flows with the observed traffic flows after adjusting the model parameter and inputs in a logical manner. The calibration of the model confirms the consistency of the future year model and assessment of the impact of increased traffic and network changes in the future. Table B-1 shows the comparison of existing base model forecasts with observed traffic flows counted in year 2007 at key roads in the study area. The result showed that TransCAD model was calibrated with observed counts within the 10% target.

Table B-1 Comparison of surveyed flows (in vehicles) with modelled flows (AM peak 1 hour, 2 way)

Road	Location	Traffic Count'07	Existing Base Model	Difference %
Newcastle Link Rd	East of Minmi Road	2114	1947	-9%
Minmi Road	South of Newcastle Link Rd	1304	1284	-2%
John Renshaw Dr.	West of Weakleys Drive	782	780	0%

Note: 2010 counts on Newcastle Link Road = 2139 vph, Minmi Road = 1470 vph, John Renshaw Drive = 758 vph.

Between 2007 and 2010, AM peak hour traffic change on key roads in the Coal & Allied study area was low (within 5% in 3 years) and is unlikely to affect the above calibration target achieved for Coal & Allied study area.

B3. Paramics model calibration

The Paramics model covers the area bounded by the F3 Freeway, Newcastle Link Road and John Renshaw Drive. Key collector and local roads that feed traffic to above arterial and freeway are also included. Woodford Street, Minmi Road, Cameron Park Drive, Northlakes Drive and Lenaghans Drive provide key connections to Coal & Allied lands and are therefore included in the existing Paramics model. Figure B-1 shows coverage of the Paramics model.

In developing the Paramics model, relevant guidelines were adopted as per "Paramics Micro-Simulation Modelling – RTA Manual Version 1.0, May 2009. The Paramics demand matrix was estimated from the TransCAD model using a sub area technique. Both cars and heavy vehicles were modelled separately. All-or-nothing assignment approach was used. The route choice between origin and destination was based on the minimum generalised cost between the origin and destination.

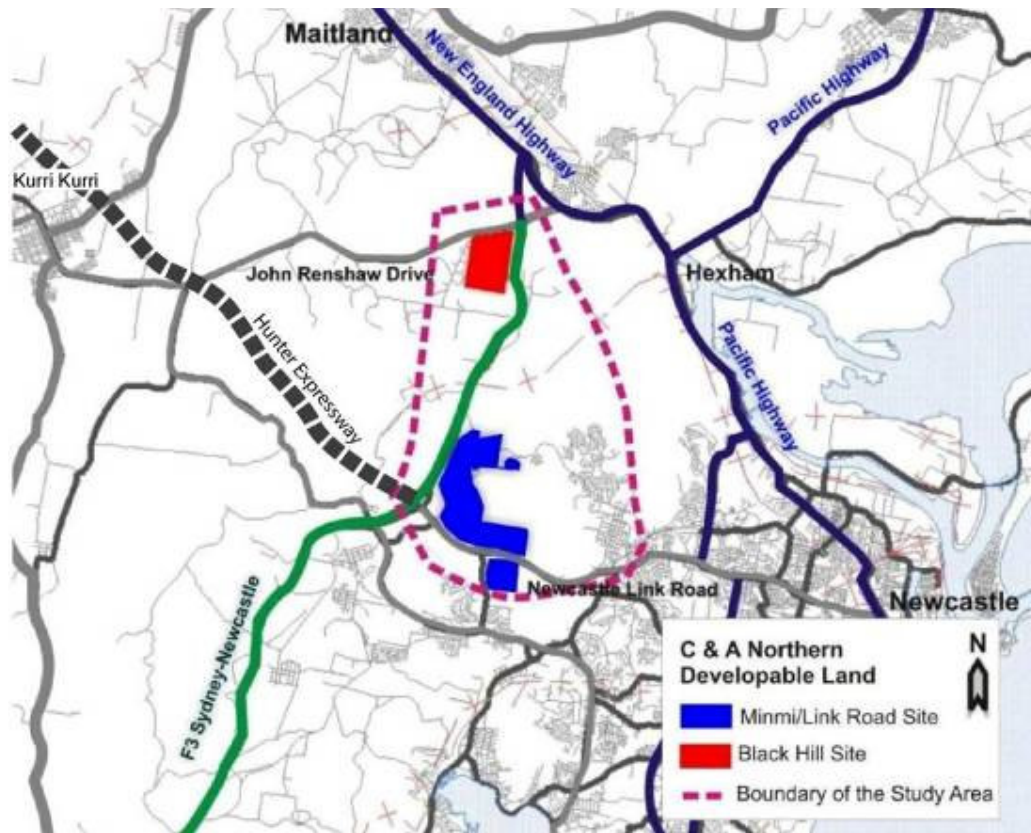


Figure B-1 Extent of Study Area, Paramics

The base Paramics model covers the two hour AM peak period (7:00 am to 9:00 am) demand consistent with the TransCAD model. The model period was extended by a 15 minutes warm up period to allow vehicles to load into the network.

In the Paramics model stability criteria were sourced from the RTA. Calibration criteria, which was based on the UK guidelines described in the Design Manual for Roads and Bridges (DMRB). The DMRB uses GEH statistics to test the model stability against observed flow.

The GEH statistics is calculated as:

$$GEH = \sqrt{2(M - C)^2 / (M + C)}$$

Where M is the model volume and C is the observed traffic count.

A GEH parameter of 5 or less indicates an acceptable fit between model and counts. Table B-2 and Table B-3 summarised calibration indicators used for Paramics model.

Table B-2 Mid-Block Calibration Results for AM Peak period

GEH	Percentage of Link Flow Target	Overall
<5	96%	85% Pass
<10	100%	100% Pass

Table B-3 GEH Statistics for Inbound and Outbound Traffic

GEH statistics	GEH<5	Target	Overall
Percentage of Inbound counts (destinations)	100	85	Pass
Percentage of outbound counts (origin)	100	85	Pass

To check the Paramics model stability, hourly modelled flows were used for model runs using five different seed values. The seed values were selected as per the RTA standard. RTA guidelines state that total variation for different seed value runs should be within 5% (vehicle per hour). Table B-4 shows the seed values and the modelled traffic flows on midblock sections. The percentage variation was about 2% therefore confirming that the model achieved RTA's stability criteria.

Table B-4 Traffic Flows in selected locations for different selected seed value runs

Road	Location	Direction	560	28	7771	86524	2849	% Diff
Newcastle Link Road	West of Woodford Street	NB/WB	1076	1103	1081	1109	1095	3%
		SB/EB	1041	1086	1086	1066	1071	4%
Newcastle Link Road	East of Minmi Road	NB/WB	854	878	834	883	851	6%
		SB/EB	1196	1240	1242	1236	1236	4%
John Renshaw Drive	West of Weakleys Drive	NB/WB	307	314	305	297	314	6%
		SB/EB	518	494	495	491	514	5%
Total Modelled Flows			4992	5114	5044	5083	5083	2%

Figure B-2 shows the number of released vehicles in the current network at every minute for five runs using different seed (560, 28, 7771, 86524 and 2849). The Figure B-2 shows a consistent traffic patterns for all five seeds. This indicates the base model is stable between model period of 7:00 am and 9:00 am and can be used for future years.

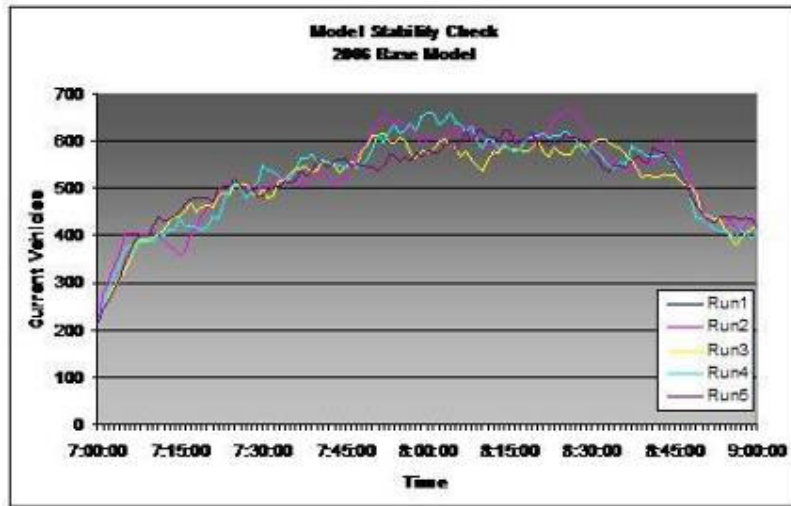


Figure B-2 Model Stability Check

Similar to TransCAD, the results from Paramics model were also measured at intersection level. Table B-5 summarises LoS and delays obtained from Paramics and aaSIDRA. Both model results showed a close match confirming that appropriate parameters are used in model calibration.

Table B-5 Intersections LoS comparison between surveyed and modelled for AM Peak hour

Intersection	Control	Paramics Result		Traffic Counts,07	
		Avg Delay	LoS	Avg Delay	LoS
Woodford Street / Newcastle Link Road	Roundabout	4	A	5	A
Newcastle Link Rd / Minmi Rd	Roundabout	4	A	7	A
Woodford Street / Minmi Rd	Signalised	7	A	15	B
John Renshaw Dr / Weakleys Dr	Roundabout	16	B	11	A

Note: Delay for roundabout is shown for average for all movements.

Table B-6 shows the maximum queue length observed at key intersections during the simulation period (AM peak period, 7-9). Due to the close proximity of Black Hill and Minmi/Link Road sites, model results were compared on key roads including Newcastle Link Road and John Renshaw Drive. The model indicated no significant queue at Woodford St and Minmi Road roundabouts with the Newcastle Link Road. However, occasional queues were observed at Cameron Park Drive and Minmi Road southern approach, due to the priority movements provided on the Newcastle Link Road traffic. At F3/John Renshaw Drive intersection, a queue was observed on F3 (south approach). Figures B-3 to B-5 show the screen captured from the Paramics model at key intersections on Newcastle Link Road and John Renshaw Drive.

Table B-6 Max Queue Length (meters) observed in Paramics

ID	Intersection	Control	North	East	South	West
I-01	Newcastle Link Road and Woodford Street	Roundabout	25	14	41	14
I-02	Newcastle Link Road and Minmi Road	Roundabout	--	18	57	27
I-03	Woodford Street and Minmi Road	Signalised	19	52	22	--
I-04	John Renshaw Dr and Weakleys Dr.	Roundabout	129	54	114	162

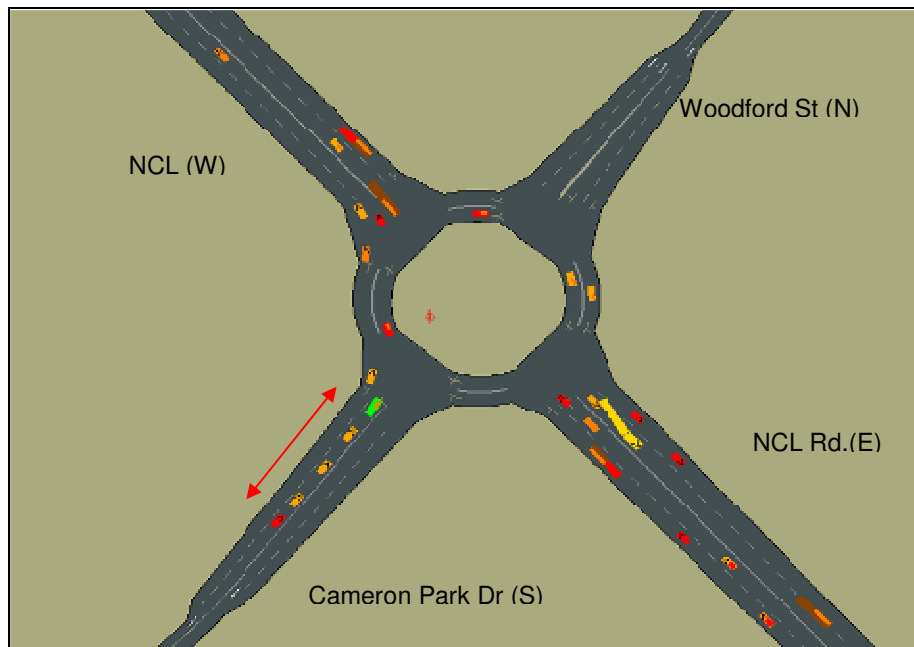


Figure B-3 Queue length observed in Newcastle Link Rd / Woodford Street roundabout(I- 01) –Time 7:52 AM

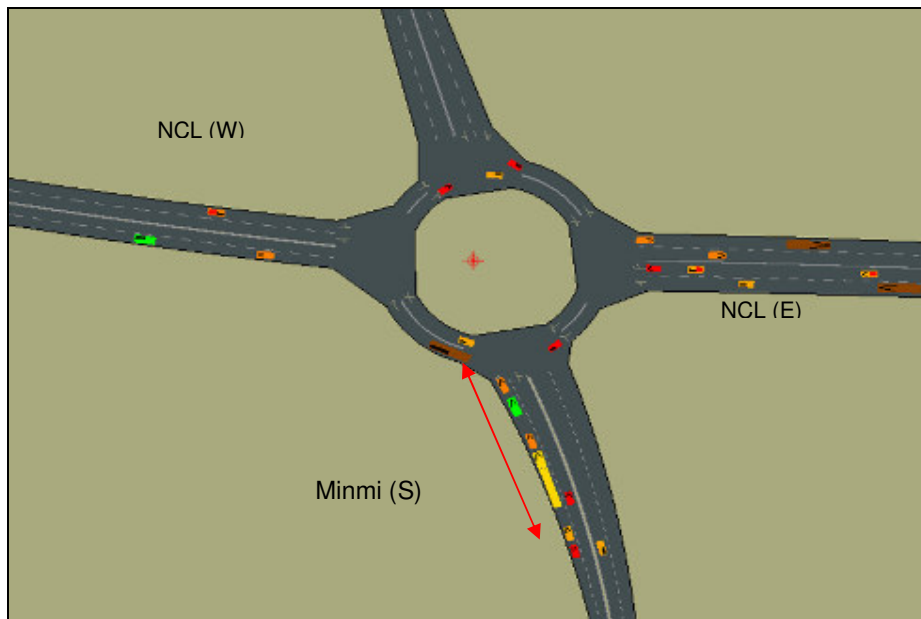


Figure B-4 Queue length observed in Newcastle Link Rd / Minmi Road roundabout
(Time 8:13 AM)

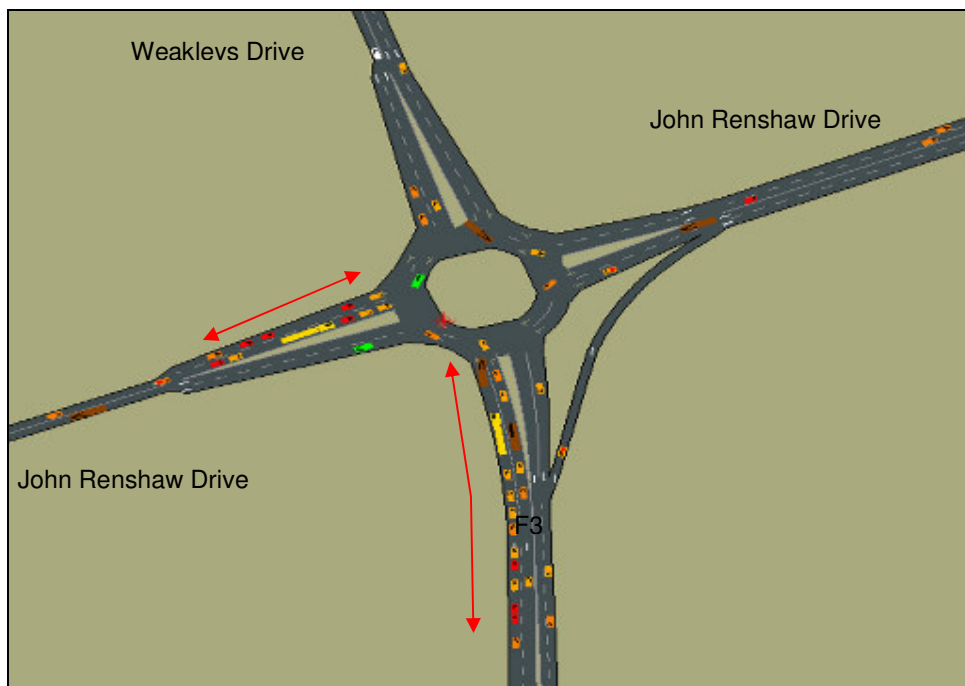


Figure B-5 Queue length observed in John Renshaw Drive / Weakleys Drive Roundabout
(Time 8:25 AM)