Midland Activity Centre Structure Plan Appendices

city of swan

HASSELL

Document Control

Version	Date Issued	Approved	Modifications
1.0	14.09.12	SD	SD
2.0	10.01.13	SD	SD
3.0	17.01.13	SD	SD
4.0	20.09.13	SD	SD

Midland Activity Centre Structure Plan

Transport Assessment

Prepared for City of Swan
July 2013

Document Information

Prepared for	City of Swan
Project Name	Midland Activity Centre Structure Plan Transport Assessment
File Reference	CEP02170
Job Reference	CEP02170
Date	July 2013

Document Control

Version	Date	Author	Author Initials	Reviewer	Reviewer Initials
DRAFT	17 May 2012	Jacob Martin	JM	Ray Cook	RJC
FINAL	11 Dec 2012	Jacob Martin	JM	Ray Cook	RJC
REVISED	7 Jul 2013	Jacob Martin	JM	Ray Cook	RJC

Table of Contents

Cardno
Shaping the Future

Figures

Tables

Cardno
Shaping the Future

1 Introduction

1.1 Background

The City of Swan has been working in partnership with the Midland Redevelopment Authority (now the Metropolitan Redevelopment Authority) towards the continued revitalisation of the Midland City Centre for many years now. In 2007, an Enquiry by Design Process was held incorporating both organisations, State Government agencies, community members and other professionals to establish ideas and principles and prepare indicative design concepts to guide future planning and development for Midland. From this process, the result was 'Midland 2017 – The Challenge'- a detailed report of outcomes which has been utilised by the City and the MRA to drive the vision for Midland since this time.

The key objective of the Enquiry by Design process, and subsequently 'Midland 2017 – The Challenge' Detailed Outcomes Report, was to develop a set of consolidated 'actions' that the City and MRA could collaboratively work towards to assist in revitalising Midland. These include both design responses and initiatives to update previous plans and bring them into alignment with new ideas and technology as well as the development of entirely new proposals which could be integrated into the planning for the Centre to overcome existing challenges, and create a world class TOD / Activity Centre. The actions for Midland are broken into 'City Wide Proposals'- relating to streetscape, movement and urban amenity driven actions, including improvement of the public realm, transport infrastructure, integrated parking provision and legibility, and also precinct specific plans dealing with the thirteen identified precincts spanning both City of Swan and Midland Redevelopment Authority management areas.

With the introduction of State Planning Policy (SPP) 4.2 – Activity Centres for Perth and Peel, gazetted on the 31st August 2010 replacing SPP 4.2 - Metropolitan Centres Policy, there is now a requirement that Activity Centre Structure Plans be prepared and endorsed for strategic metropolitan centres within three (3) years of the gazettal of the Policy and also that structure plans be in place prior to the approval of major developments within centres. In achieving revitalisation, and being proactive in the encouragement of appropriate new development and investment in the Midland City Centre, the City of Swan considers the preparation of a consolidated, cohesive and integrated structure plan drawing together land use, sustainability, transport, and urban form to be a priority.

As part of this process, a Transport Assessment for the Midland Centre is required pursuant to SPP 4.2 – Activity Centres for Perth and Peel, in order to complete the 'Movement' component of the Structure Plan.

1.2 Context Plan

The Midland Activity Centre is defined to be the area bounded by Helena River to the south, Lloyd Street to the east, Morrison Road/Amherst Road to the west, and Morrison Road to the north. The extent of the Midland Activity Centre is shown in **Figure 1**.

Figure 1 Midland Activity Centre Context Plan

1.3 Points of Arrival

The point of arrival experienced by visitors to the Centre is influenced by their chosen transport mode. As such, the key entrance locations should be designed to accommodate the desired transport modes.

Private Vehicles

The main approach routes to the Midland Activity Centre include Great Eastern Highway from the west and east, and Lloyd Street from the north. Great Eastern Highway bisects the Activity Centre and is the designated route for regional traffic passing through the Centre. Local traffic accessing the Activity Centre will be encouraged to use alternative routes to minimise the traffic along Great Eastern Highway. To accomplish this, public car parking is proposed to be located near the point of arrival, or accessed via Morrison Road.

Morrison Road forms the northern boundary of the Centre and is supported as a primary local access route with access to large-scale public commuter and visitor car parking. This redirection of local traffic away from Great Eastern Highway should assist in minimising the impact of regional traffic growth on pedestrian crossing, caused by the existing road form and traffic volumes.

Public Transport

The Midland Station operates as a major interchange hub to regional rail services. It also forms a gateway to the Activity Centre for commuters and visitors. A relocation of this station is proposed from its existing location near the western boundary of the Centre towards a more centralised location with better access to the proposed activity, including the Midland Health Campus and development south of the rail line.

Cycling

With the proposed extension of the WABN Principal Shared Path (PSP) network through to Midland Station, this corridor becomes the primary entrance point for commuters to the west of the Centre. The Activity Centre Structure plan proposes a fine-grained network of on- and off-street provisions that support cycling as a viable mode choice both for commuters and visitors. Existing on-street cycling routes from the east of the Centre will be supplemented and improved to increase the available route options, including Great Eastern Highway, Clayton Street, the rail corridor and Morrison Road. Each of these routes will tend to cater for a different segment of the population and the interface between route alignment and end-of-trip facilities will be managed to reflect the target demographic.

1.4 Key Sites

To facilitate access to key sites within the Activity Centre, the Midland Station is proposed to be relocated toward the centre of the City. This will improve accessibility and support the transition towards sustainable transport. Key sites at the Activity Centre core include the Midland Health Campus and the likely ancillary health nexus to the north of Railway Road, Midland Gate Shopping Centre and Midland Oval Precinct. These sites are all generally located along the Cale Street corridor which extends north from the relocated Midland Station to Morrison Road.

2 Existing Situation

2.1 Road Network

The MRWA Metropolitan Functional Road Hierarchy (MFRH) classifies the roads within Midland Activity Centre as shown in **Table 1**.

Table 1 Metropolitan Functional Road Hierarchy (MFRH) Classifications

Great Eastern Highway	Primary Distributor
Victoria Street	Primary Distributor
Morrison Road	District Distributor (A)
Lloyd Street	District Distributor (A)
The Crescent	Local Distributor
Railway Parade	Local Distributor
Helena Street	Local Distributor
Keane Street	Local Distributor
Sayer Street (between The Crescent and Morrison Road)	Local Distributor
Amherst Road	Local Distributor
Clayton Street	Access Road
Cale Street	Access Road
Padbury Terrace	Access Road
Sayer Street (between Great Eastern Highway and Railway Parade)	Access Road
Brockman Road	Access Road

These classifications are defined in the MFRH as follows:

> *Primary Distributors*: These provide for major regional and inter-regional traffic movement and carry large volumes of generally fast moving traffic. Some are strategic freight routes and all are National or State roads. They are managed by Main Roads.
> *District Distributor A*: These carry traffic between industrial, commercial and residential areas and generally connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining property. They are managed by Local Government.
> *Local Distributors*: Carry traffic within a cell and link District Distributors at the boundary to access roads. The route of the Local Distributor discourages through traffic so that the cell formed by the grid of District Distributors only carry traffic belonging to or serving the area. These roads should accommodate buses but discourage trucks. They are managed by Local government.
> *Access Roads*: Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. These roads are bicycle and pedestrian friendly. They are managed by Local government.

Figure 2 shows the MRFH map for the Midland Activity Centre.

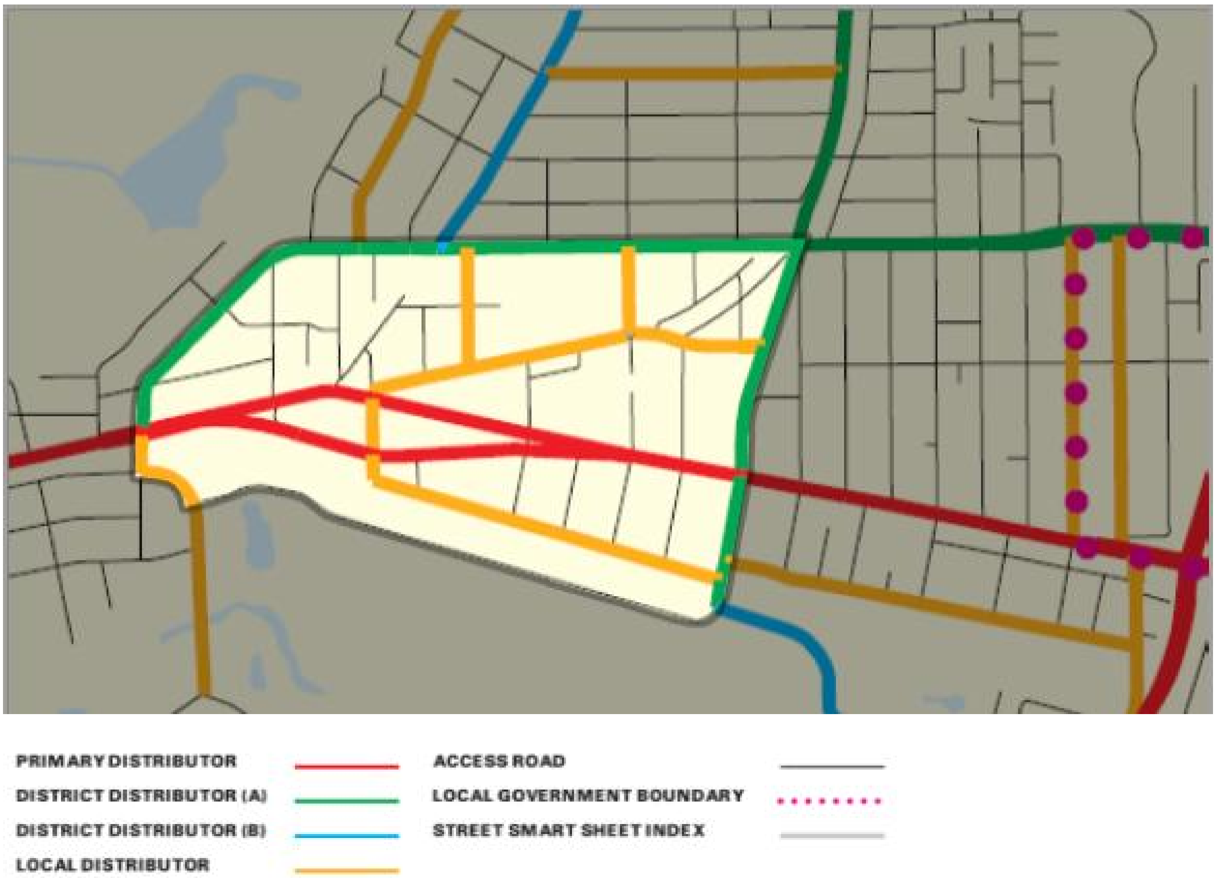


Figure 2 Main Roads Functional Road Hierarchy

2.2 Traffic Volumes

Existing traffic volumes are shown in **Figure 3**, as obtained from Main Roads Link Counts and SCATS data.

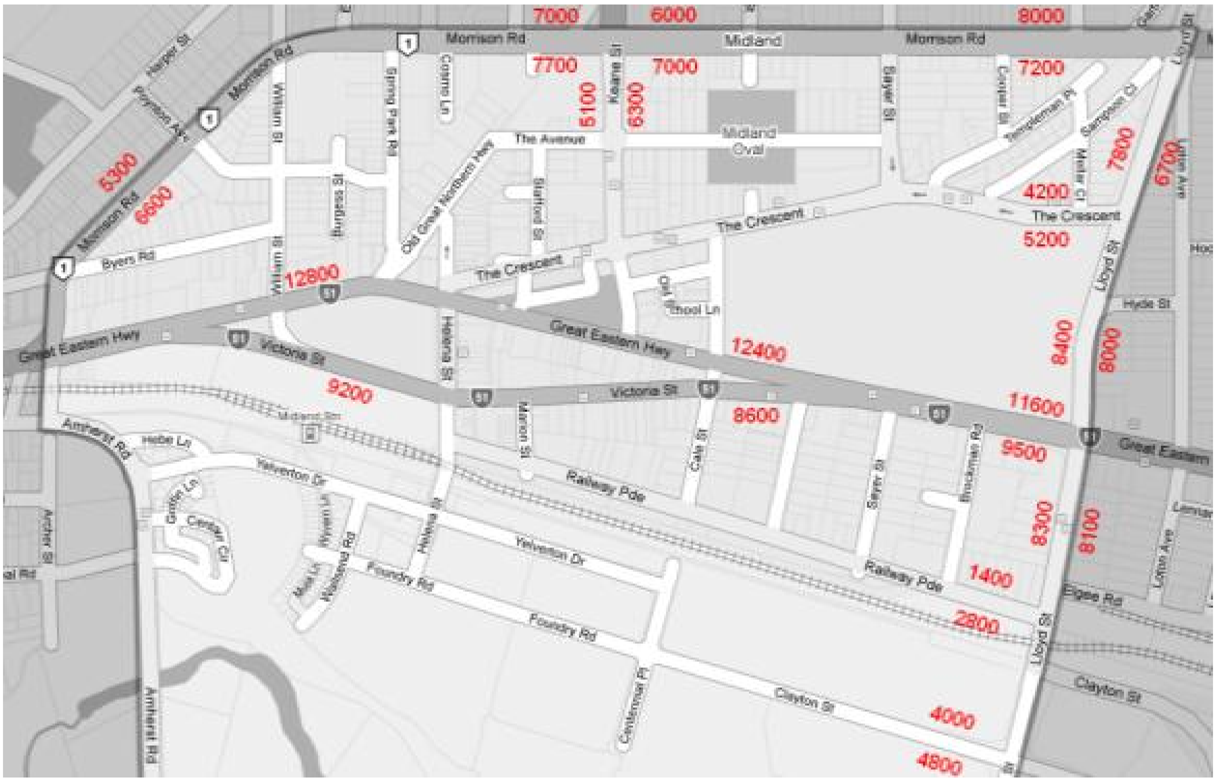


Figure 3 Existing Traffic Volumes

2.3 Public Transport

Public transport serving Midland Gate is provided by Transperth bus and train services. The majority of the bus services run east-west along either Great Eastern Highway or The Crescent, between Midland Train Station and surrounding suburbs. The existing bus route network is shown in **Figure 4**.

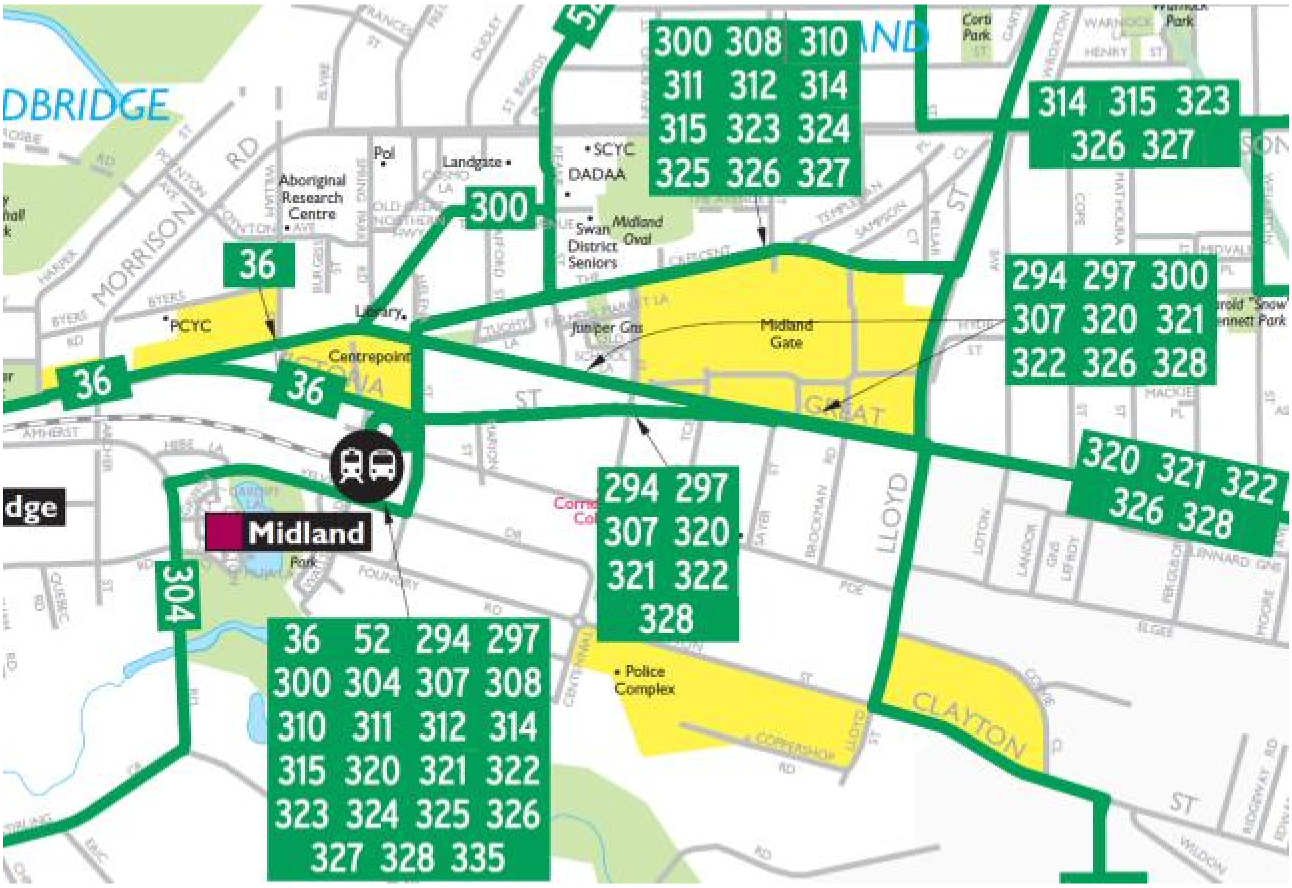


Figure 4 **Existing Transperth Bus Routes**

The Midland Train Station is located approximately 1km from Midland Gate and is considered to be beyond walking distance for the majority of customers. Therefore, connections to and from Midland Gate are mostly made by bus services from the Midland Station or from the eastern suburbs.

The typical frequency of bus services is summarised in **Table 2**, while additional coverage service provision is shown in **Table 3**.

Table 2 Bus Service Frequency

Route	Peak Frequency	Off-Peak Frequency
Great Eastern Highway		
36 (Midland – Perth)	20 min	60 min
294 (Midland – Westfield Carousel)	60 min	60 min
297 (Midland – Kalamunda)	30 min	60 min
320 (Midland – Mundaring)	20 min	60 min
321 (Midland – Glen Forrest)	20 min	60 min
322 (Midland – Glen Forrest)	20 min	60 min
The Crescent		
308 (Midland – Swan Districts Hospital)	30 min	60 min
310 (Midland – Upper Swan)	30 min	60 min
311 (Midland – Bullsbrook – Muchea)	30 min	60 min
312 (Midland – Baskerville)	30 min	60 min
314 / 324 (Jane Brook – Midland)	10 min	15 min
315 / 325 (Stratton – Midland)	10 min	15 min
323 / 327 (Swan View – Midland)	10 min	15 min
326 (Midland – Midvale)	10 min	15 min
Midland Shuttle		
300 (Midland Gate Shopping Centre)	20 min	20 min

As **Table 2** shows, the frequency of bus services is generally fairly high during the peak hour, particularly for high demand routes. Off-peak frequency is relatively poor, with 60 minute headways for the majority of routes. Some high frequency routes do service the Midland area, from Swan View, Jane Brook and Stratton, making these areas convenient to access via public transport throughout the day.

Table 3 Infrequent Bus Services

Route	Services per Day
307 (Midland – Helena Valley)	3 per day
328 (Midland – Wundowie)	3-4 per day
52 (Morley – Midland)	3 per day
335 (Ellenbrook – Midland)	3 per day
304 (Midland – South Guildford)	10 per day

The infrequent bus services shown in **Table 3** are run as coverage routes only and are not effective in providing reliable connection to Midland.

A summary of the typical service frequency by time period for Midland train services is provided in **Table 4**. Services are generally run to a timetable which is easy for passengers to accommodate. The half-hourly service frequency on weekday evenings and on weekend morning and evenings is, however, a disincentive for travel during such periods.

Table 4 Midland Train Services

Time	Frequency	Time
Weekdays	– Peak Periods*	10 mins
	– Off Peak	15 mins
	– Evening (7:30pm onwards)	30 mins
Weekends	– Day	15 mins
	– Morning/Evening	30 mins

*Peak periods are 7:00am to 8:30am and 4:00pm to 6:00pm

2.4 Existing Pedestrian/Cycle Networks

The existing pedestrian / cycle network in the immediate area surrounding Midland Gate is shown in **Figure 5**. The existing network provides a number of good quality pedestrian / cycle routes adjacent to Midland Gate, facilitated through a network of shared paths as well as on-street provisions along Yelverton Drive/ Clayton Street and sections of Great Eastern Highway and The Crescent.

Figure 5 Existing Pedestrian / Cycle Network

There are designated pedestrian crossings within the intersections of The Crescent/Lloyd Street, Lloyd Street/Great Eastern Highway and Great Eastern Highway/Padbury Terrace. Overall there are good connections between Midland Gate, the surrounding suburbs and the Midland Station.

3 Proposed Development

3.1 Precinct Locations

The Midland Activity Centre has been separated into precincts which each reflect a different character, land use mix and transport environment. These precincts are shown in **Figure 6**.

3.2 Land Use

The proposed Midland Activity Centre Structure Plan consists of a significant increase in land use mix and density, as shown in **Table 5**.

Table 5 Land Uses by Precinct

Precinct	Retail (sq.m)	Office (sq.m)	Food (sq.m)	Residential (units)	Education Culture (sq.m)	Health (sq.m)	Police (sq.m)	Bulky Goods (sq.m)
Old Town/Pedestrian Centre	48,698	94,960	19,334	621	2,500			
Midland Oval	20,368	57,930	9,976	648				
Midland Gate	75,000							
Morrison Road East				281	1,000			
Brockman/Railway Core	17,452	148,379	3,208	1,898				
Police & Health Precinct						146,371	29,393	23,073
Railway Workshops Precinct	450	43,167	1,876	528	91,979			
Woodbridge Lakes								
Entry Streets		14,755						14,755
Morrison Road West				731	6,500			

3.3 Parking Locations

To support these land uses, public parking will be provided for long-stay commuters at the periphery of the Activity Centre, reducing private vehicle trips through the Activity Centre and particularly along Great Eastern Highway, while short-stay retail/visitor parking will be located adjacent to major activity nodes. Private parking will be minimised to assist in improving efficiency.

A large park ‘n’ ride car park is proposed to be constructed at the site of the new Midland Station. It is suggested that this car park be transitioned over the long-term to a public facility catering for short-stay visitors with direct connection to the City Centre along attractive pedestrian desirelines.

Large-scale multi-deck parking is also proposed along Morrison Road, accessed via Spring Park Road and a new Midland Oval car park entrance. This parking has the advantage that it is easily accessed from the primary road network without creating congestion through the Activity Centre. The location of these bays also creates a desireline through the Activity Centre, generating passing trade for business along The Crescent and in the Old Town Precinct. A new road link between Spring Park Road and The Crescent would assist to direct pedestrian traffic and improve legibility within the Morrison West Precinct.

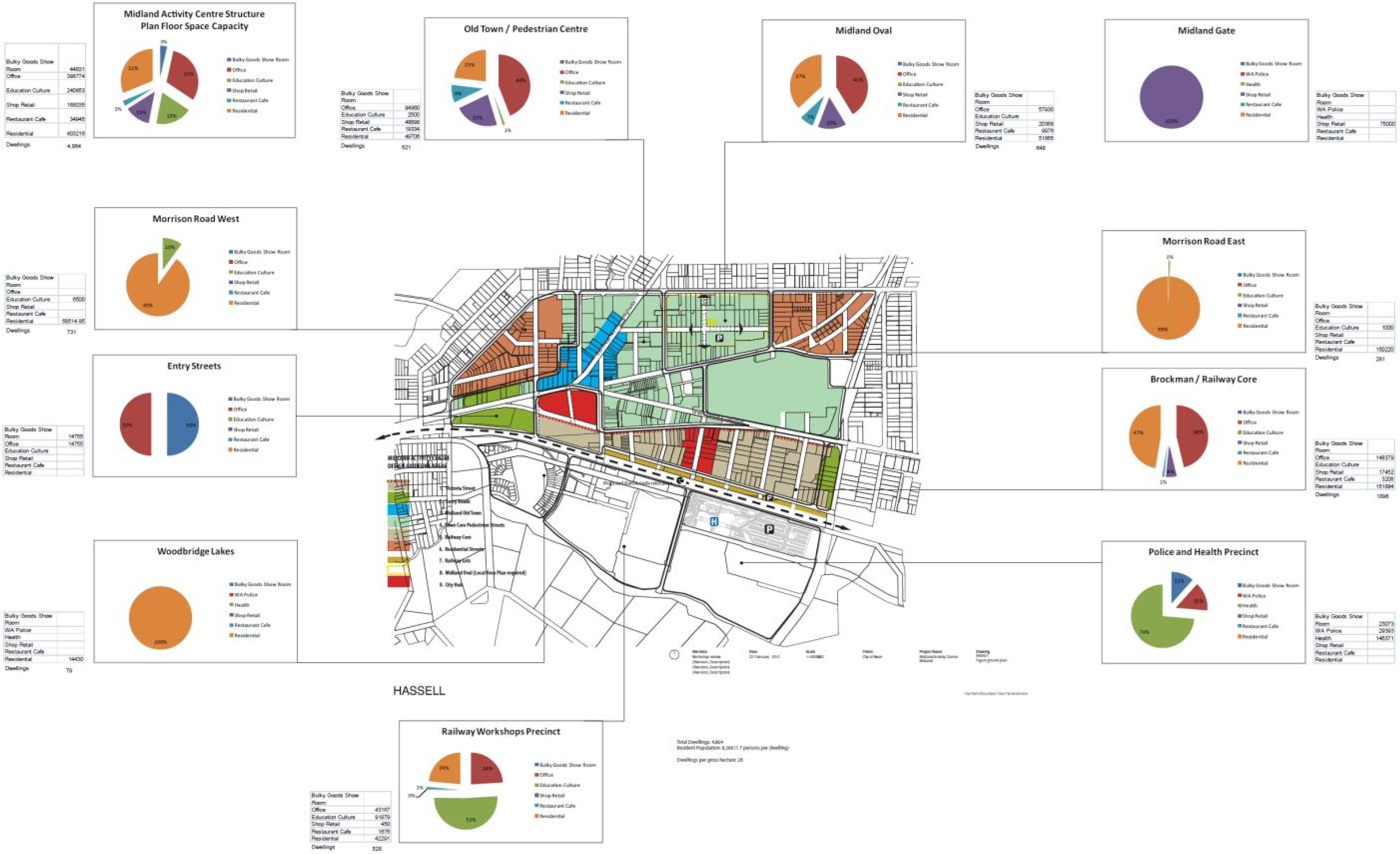


Figure 6 Midland Activity Centre Precinct Plan

3.4 Transport Concept

The Midland Activity Centre has been designed under a *SmartRoads* framework consistent with the Department of Transport's *Moving People Strategy*. Each road corridor has been assessed for function and capacity, with transport modes assigned to the network according to a needs assessment. In general, regional traffic is retained along Great Eastern Highway, while local access traffic is encouraged to use alternative routes; Morrison Road, Clayton Street and Lloyd Street. Activated streets will be designed for pedestrian legibility, with a low-speed roadway and high quality footpaths. The low-speed environment will encourage cyclists to share the road in activated precincts, rather than the footways.

3.5 Integration with MRA

The Midland Activity Centre Structure Plan area extends into precincts under development by the Metropolitan Redevelopment Authority. In general, this assessment seeks to integrate with the scale and intent of the MRA, given the extensive planning work already completed for this area. To this end, the outputs generated by the MRA concerning traffic movement, urban form and streetscape improvements have been incorporated into our analysis, except where the addition of the remainder of the structure plans results in a higher demand necessitating change. In particular, the findings from the *Midland Health Campus and Railway Workshops Precinct Traffic and Transport Assessment* have been used as inputs into the traffic assessment.

4 Road Hierarchy and Use

4.1 Access Priority

Access priorities have been established through consideration of *SmartRoads* principles. Transport modes have been assigned to road corridors so as to provide a comprehensive movement network while minimising conflicts between modes. A map of access priorities is shown in **Figure 7**.

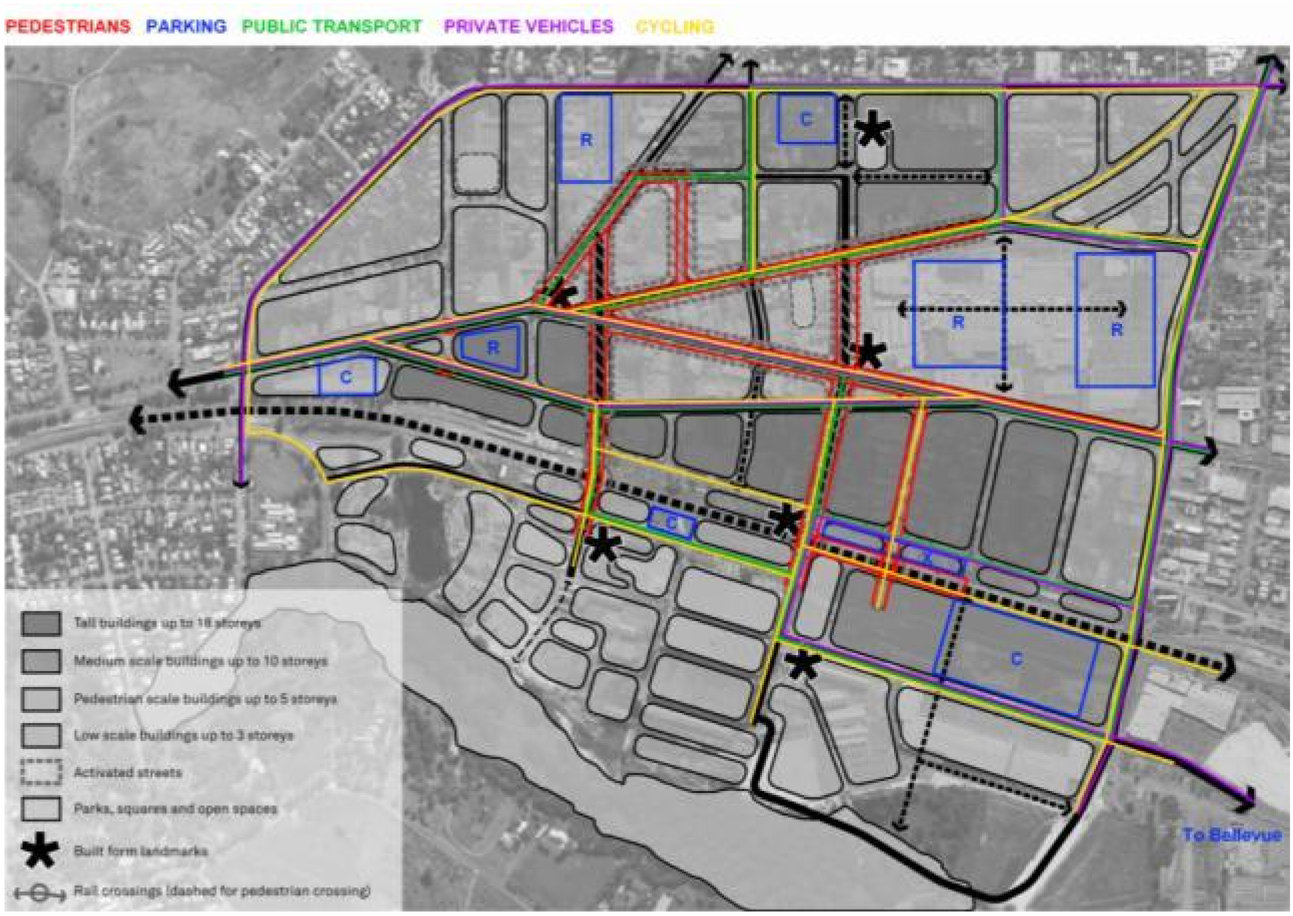


Figure 7 Access Priority Map

Mode choice is driven by traveller preference and is affected by a number of factors, particularly travel times and costs. As such, any measures intended to decrease the demand for private vehicles within the Activity Centre through supply or demand management measures must be offset by an increase in alternative transport options. This would include such initiatives as increased public transport frequencies and new routes, improved cycling facilities and more attractive pedestrian environments.

For the purpose of determining transport provision, a parking-based approach has been developed which determines the level of unsatisfied demand for a maximum parking supply scenario. This unsatisfied demand is then distributed across the remaining modes according to the likely uptake in mode share.

Road capacity analysis has also been employed to investigate a theoretical maximum trip generation that can be supported by the existing road environment, with the proposed function changes. The results of this assessment suggest that trip generation can increase by as much as 50% over existing peak hour rates before intersection Level of Service reaches F.

A target mode share proportion has been established for non-resident trips to the Activity Centre, consisting of the following:

> Private Vehicles: 65%
> Bus: 18%
> Train: 10%

> Cycling: 5%
> Pedestrian: 2%

This is a significant shift from the 95% private vehicle mode share currently seen for non-resident trips.

For the purpose of this assessment, all internal trips (trips between land uses within the Activity Centre), are assumed to be taken by non-car modes. A general split for internal trips has been assumed for the purpose of infrastructure provision:

> Pedestrian: 70%
> Cycling: 10%
> Shuttle Bus: 20%

The anticipated generation for the Activity Centre is in the order of 140,000 non-residential trips per day including 48,000 internal trips. The above target mode share would create approximately the following two-way demands:

> Private Vehicles: 60,000 trips
> Train: 9,200 trips
> Bus: 16,000 trips (plus 9,600 internal)
> Cycling: 4,600 trips (plus 4,800 internal)
> Pedestrian: 1,800 trips (plus 34,000 internal)

4.2 User Hierarchy

Private Vehicles

There is a significant existing supply of long-term parking within the Midland Activity Centre, either free or priced at a low daily rate. As development intensifies, an unrestrained future parking scenario will not only result in an unsustainable parking demand but also a range of negative traffic and environmental issues within the Activity Centre, such as congestion, noise, pollution and safety. According to Census 2006 data from the Australian Bureau of Statistics, 95% of people travelling to work in Midland do so by private vehicle modes, either as a driver or passenger. If this a scenario continues into the future, private vehicles within the Activity Centre will contribute to the congestion as well as being a safety risk for pedestrians and also detract from the desired activity centre environment. As such, a balance between providing vehicular access and minimising traffic impact is needed.

A hierarchy of use has been determined for the centre incorporating fundamental *SmartRoads* principles. In general, private vehicle use is supported along the periphery of the site through strategic location of peripheral car parking. Regional traffic will be retained along Great Eastern Highway, with local access encouraged along alternative routes. This segregation is intended to disperse traffic in the area and preserve capacity within the internal road network for other transport modes. Local traffic will be slowed through reduced speed limits and Local Area Traffic Management to create a better integration with pedestrian and cycling modes. Car parking is generally located on or near the higher-order road network to minimise the volume of traffic in pedestrian-oriented areas.

Pedestrians

The activated central core, including a significant length of Great Eastern Highway will be oriented towards pedestrian accessibility, with wide, attractive pedestrian footways and legible road crossings. Areas nearer to the edge of the Centre, where densities are lower, will not have as significant a pedestrian-focused design. A consistent provision of safe crossing points and high quality pedestrian facilities will be employed across the Activity Centre particularly focused on identified desire lines from between major transport and land use nodes.

Public Transport

Public transport is a high priority for the Centre as it provides regional connection to the Activity Centre and interchange opportunities at Midland station. These regional coverage services would be contained within higher-order road corridors to minimise delays and promote their existing core function. The Midland Shuttle and other potential local services would run along minor streets to create an internal public transport network that operates at high frequencies. The alignment of these services will be chosen to maximise access to the proposed activity nodes.

Service/Loading

Regional freight traffic is not supported along Great Eastern Highway due to the adverse impact on pedestrian and cycling amenity. Instead, Roe Highway and the Great Eastern Highway Bypass will continue to act as bypass routes. Local delivery traffic will be encouraged to utilise Morrison Road, Lloyd Street and Clayton Street, though there will be provision both on-street and within development for service and delivery as required to ensure effective operation.

Cycling

Cycling modes are well supported by existing provisions along major corridors. Additional facilities are proposed to create a comprehensive network across the Activity Centre. This will provide separated cycling corridors along regional roads, including Great Eastern Highway, and through the majority of the MRA development. Where streets are activated and significant pedestrian volumes are proposed, traffic volumes and speeds will tend to be low and cycling is generally supported in mixed traffic.

4.3 Form and Cross-Section

Each road in the proposed Activity Centre network has been assessed according to function to determine a desirable road cross-section. Liveable Neighbourhoods has been used as the primary source for road designation, with modifications to the standard form as described in **Figure 8**.

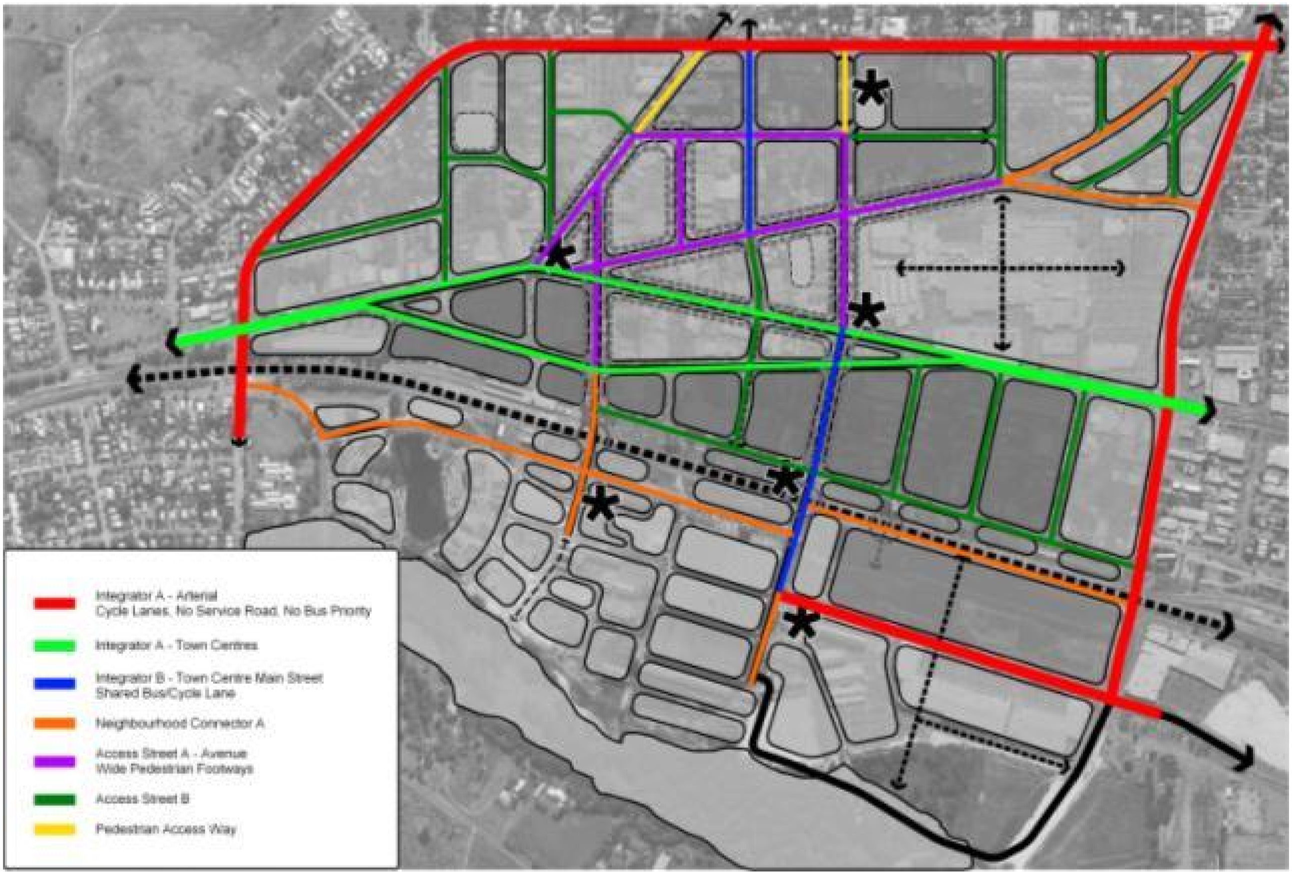


Figure 8 Representative Road Cross-Sections

Significant changes to the internal road environment are proposed to manage traffic flows through the Centre precincts. Vehicular traffic is accommodated within a few key streets and controlled through cross-section and priority measures, as well as the location of large-scale car parking. Modification of road sections will be undertaken with consideration for all modes of transport, and particularly cycling.

Speed Zones

To promote the desired safe and legible pedestrian environment, the speed limit within the Midland Activity Centre is proposed to be decreased to 40km/hr on all internal streets, and 50km/hr along Great Eastern Highway as in other Town Centres such as Mundaring. Morrison Road would remain at 60km/hr to facilitate efficient local connections. Streets within the Activity Centre will be kept to a narrow road width to promote low speed, while an additional signalised intersection at the intersection of Great Eastern Highway and Cale Street will reinforce safe pedestrian crossings along this primary north-south desire line.

To minimise the impact of this additional signal on regional bypass traffic, coordination of this signal with those to the east and west is recommended.

Great Eastern Highway

The primary road corridor through Midland consists of Great Eastern Highway, which is generally constructed as an undivided 4-lane road, transitioning to a one-way pair west of Padbury Terrace. This form is consistent with the existing function of Great Eastern Highway as a strategic corridor serving a regional purpose.

The future structure of the Midland Activity Centre includes significant development of the Great Eastern Highway corridor, extending south across the rail line. This will result in a significant proportion of internal trips, primarily pedestrian trips, across Great Eastern Highway. To facilitate this movement, local traffic is proposed to be relocated to Morrison Road and the cross-section of Great Eastern Highway modified to support pedestrian legibility and safety. This would involve construction of wider footpaths, on-road cycle lanes and improved crossing provisions, facilitated through a reduced on-street parking provision.

The road widening initiative currently being undertaken by Main Roads to the east of Padbury Terrace will assist in improving the pedestrian environment by permitted the provision of a wide central median to create a pedestrian refuge. Streetscape improvements along the northern verge resulting from the Midland Gate redevelopment would be complemented by trees and shaded areas on the southern verge.

Further to the west in the one-way sections, the road form would remain similar to existing geometry, with streetscape upgrades to improve the pedestrian environment and provide continuous on-road cycling lanes. These improvements are likely to require removal of some existing on-street parking.

Development of a Great Eastern Highway Access Strategy is recommended for the Midland City Centre area, focused on achieving the best environment for pedestrians and regional traffic movements.

Morrison Road

Traffic along Morrison Road is expected to remain at existing volumes west of Great Northern Highway, while experiencing some additional growth to the east. This is a result of the proposed changes to the regional road network which will redirect a substantial proportion of external traffic north along Great Northern Highway and Lloyd Street. Regional traffic will largely be replaced with the additional local traffic anticipated to use Morrison Road to access car parking and facilities within the Activity Centre. The existing form of Morrison Road is therefore considered sufficient to accommodate future demands, though function will be improved by extending the existing 4-lane form to Great Eastern Highway. Minor improvements, consisting of the installation of right- and left-turning pockets on some major road connections, are advised to ensure local traffic is encouraged to use Morrison Road in preference to Great Eastern Highway.

Cale Street / Keane Street

Cale Street is proposed to continue from the Workshop Precinct south of the rail line through the Midland Oval Precinct. It will be a major north-south link for pedestrians and cyclists, but measures will be put in to limit the effectiveness of this route for private vehicles. In particular, connection through the Midland Oval Precinct to Morrison Road is not supported. As an alternative, Keane Street will form the highest priority north-south link from the City Centre, with existing and proposed private car parking accessed via Keane Street. Keane Street provides direct connection to both Morrison Road and Great Northern Highway, and so minimises the impact of vehicular traffic on local streets.

To mitigate the high demand for trips along Keane Street, an additional significant intersection is proposed to allow access from Morrison Road directly into the Midland Oval development car park. This access should reduce traffic along Keane Street

Cale Street will be redeveloped in concert with the current expansion of Midland Gate to a more activated street consisting of entertainment and retail uses, greater use of public space and a less intrusive parking arrangement.

Spring Park Road Link

A new link road is proposed between Spring Park Road and The Crescent, to the south of a large-scale multi-deck car park. This road is intended to improve pedestrian and vehicular connection through the Morrison West Precinct and to support the desireline between this car park and the main activity nodes in the Old Town Precinct and further to the south and east.

Old Great Northern Highway

The existing configuration of Old Great Northern Highway includes a pedestrian-only section between The Crescent and Morrison Road. This creates an attractive pedestrian space adjacent to the existing City of Swan and Landgate buildings.

Previous planning in Midland has discussed opening this section back up to traffic to create more passing trade for local business. However, the effect of this modification would be to create an attractive alternative route between Great Eastern Highway and Great Northern Highway for regional traffic. This traffic is unlikely to provide any passing-trade advantages for local business and would instead reduce the amenity for pedestrian traffic.

Rail Crossings

Connectivity between the existing Midland City Centre and the Railway Precinct is compromised by the location of passenger and freight rail lines that bisect the Activity Centre. Improvements to north-south connections are recommended which include an additional rail crossing at Cale Street. This proposed crossing and all existing crossings (Archer Street, Helena Street, Cale Street and Lloyd Street) would greatly benefit from grade separation. However, with the exception of Lloyd Street, traffic and adjacent intersection operations will continue to operate at an acceptable level following the proposed realignment of regional freight rail. In the event that freight rail relocation is significantly delayed, grade separation will become more critical to the function of the Activity Centre.

5 Parking Calculation

5.1 Methodology

A parking demand model has been developed which incorporates the theoretical parking generation of the individual land uses within the existing and proposed developments and calibrates this model to the observed parking demand for a design day scenario. As part of this analysis the impacts of shared and reciprocal parking have been included.

5.2 Nomenclature

Parking Supply

Parking supply is the total quantum of parking spaces that are built or available within the study area, regardless of whether or not they are utilised. Parking supply only includes marked spaces and does not include areas designated for standing vehicles.

Parking Demand

Parking demand is the accumulation of vehicles parked within the study area at a point in time. Parking demand includes all parking associated with the associated land uses, whether in an off-street facility, parked illegally, parked on-street or in remote parking lots. Parking demand does not include standing vehicles awaiting the pick-up or drop-off of passengers.

Shared Parking

Shared parking is parking that is used by 2 or more land uses instead of restricting parking to the exclusive use of a single land use - the more exclusive the parking is, the less effective it becomes for the development as a whole.

Reciprocal Parking

Reciprocal parking occurs when a visitor has more than one purpose within an area and hence only one trip is required to serve two or more purposes. As the Midland Activity Centre is a substantial mixed-use development with retail, office, residential and entertainment venues, there is likely to be a high degree of reciprocity at all times.

The degree of reciprocal parking occurring depends on the type of land use in the vicinity and the time of day. For the purpose of this assessment, reciprocal parking rates have been taken from the *National Cooperative Highway Research Program (NCHRP) Report 684* (March 2011).

The most important component to determine the rates of reciprocal parking is the proximity of the land use pairs. As all developments within the Midland Activity Centre are generally located within acceptable walking distances, and all parking within the precinct will be managed through paid parking or supply management, the reciprocal parking rates given in the NCHRP Report can therefore be considered to be reasonable estimates. By accommodating reciprocal parking a lower total parking supply will therefore be required to satisfy demand for the Activity Centre.

Efficiency

The efficiency of parking is a measure of the practical maximum utilization rate of parking within a study area. An efficiency factor of less than 100% reflects a perception by drivers that all available parking within the study area is occupied, when in fact there may be parking spaces available. This may be in the form of parking spaces that are available only for some purposes, allocated to individual businesses, difficult to find or in the wrong location.

Increasing the efficiency of parking can be accomplished by better signage to inform drivers of the locations of parking spaces, or by introducing a method (through technology or dynamic signage) of alerting drivers when parking becomes available.

5.3 Theoretical Calculation of Existing Demand

The existing theoretical parking demand for the Midland Activity Centre was calculated by using the floor areas, residential dwelling numbers, employment opportunities and student enrolments provided by the Department of Planning (DoP) from their *Strategic Transport Evaluation Model (STEM)* and from the *Main Roads WA Regional Operations Model (ROM)*, for the 2011 and 2031 horizon years, as shown in **Table 6**.

Table 6 STEM residential, employment and education enrolment assumptions for 2011

Zone Number	227 (Midland City Centre) 2011 horizon	227 (Midland City Centre) 2031 horizon
Population in Private Dwellings	1135	1491
Occupied Private Dwellings	383	590
Employment Opportunities:		
> *Agriculture*	*12*	*18*
> *Manufacturing*	*131*	*116*
> *Construction*	*177*	*170*
> *Retail*	*1772*	*1898*
> *Wholesale*	*77*	*84*
> *Transport and Storage*	*42*	*49*
> *Communications*	*55*	*79*
> *Finance and Business*	*1062*	*1970*
>*Public*	*2532*	*3484*
> *Health*	*535*	*754*
> *Welfare and Community*	*765*	*1025*
> *Entertainment and Recreation*	*593*	*604*
Primary and Secondary School Enrolments	200	200
Tertiary Institution Enrolments	45	57
TAFE Enrolments (Part Time/Night Classes)	537	645

This information was then used to calculate the theoretical parking demand based on parking demand rates published in *Parking Generation, 3rd Edition* by the Institute of Transportation Engineers, along with time-of-day utilisation rates for the different land uses. Based on this methodology, the gross peak parking demand for the existing (2011) land uses was determined to be 12,530 bays. This assumed exclusive parking associated with each land use (no reciprocal parking) and not calibrated to any observed data.

5.4 Calibration to Observed Parking Demand

Data calibration was performed to establish a theoretical peak parking demand, using observation data from the *Midland Parking Strategy* (October 2002) over the time period of Thursday evening 16:00-19:00. The theoretical gross peak parking demand for 2002 was determined to be 11,087 bays for a 12:00-13:00 peak period, disregarding the effects of reciprocal and shared parking.

As the Midland City Centre in 2002 already included a wide range of land uses, the impact of reciprocal and shared parking reductions were included in the calibration. Shared parking was determined by application of the profile set described in **Figure 9**, reducing the theoretical peak hour parking demand to 10,375.

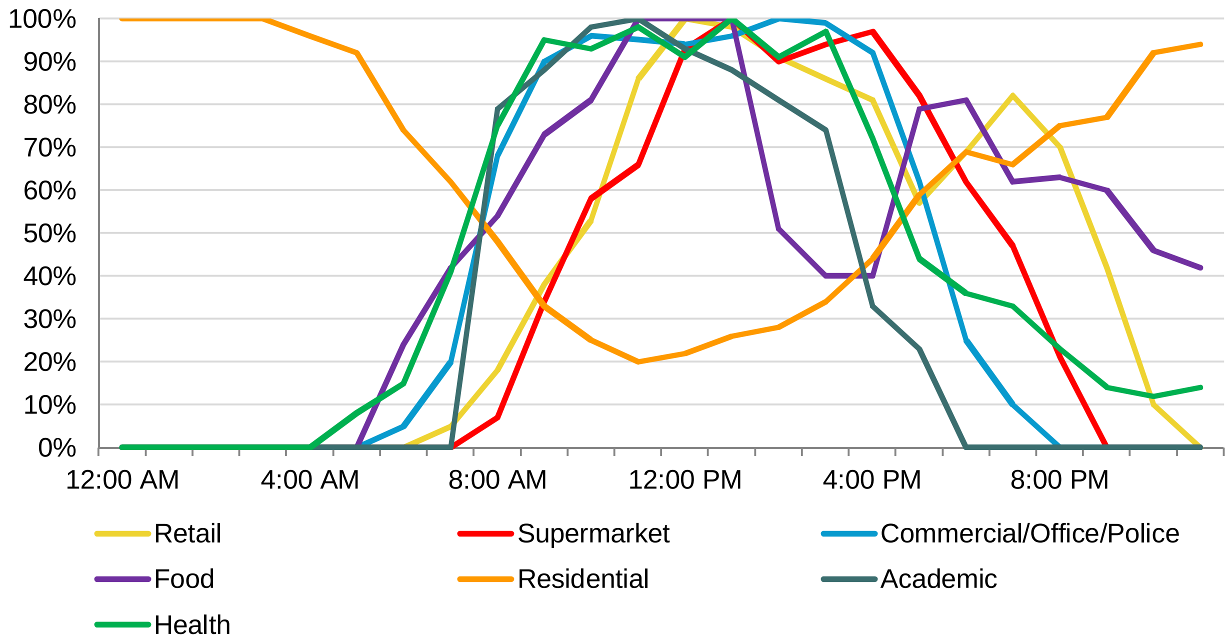


Figure 9 Theoretical Parking Demand Profile for a Typical Weekday

The level of reciprocal parking was determined through the use of best-practice reciprocity rates published by the National Cooperative Highway Research Program (NCHRP) *Report 684 (March 2011).* Residential parking was not included in the theoretical parking demand but was included in the reciprocal parking estimation, as residents are likely not to use their car within the Midland Activity Centre.

Table 7 shows the calculated amount of reciprocal parking likely to have been present during the parking survey, based on the NCHRP reciprocal parking rates.

Table 7 Calculated Reciprocal Parking for Existing Land Uses (2002)

Time	Retail & Office	Residential & Office	Retail & Residential	Food & Retail	Food & Office	Food & Residential	Total Reciprocal
16:00 – 17:00	345	76	180	391	18	129	1139
17:00 – 18:00	235	57	241	372	35	132	1072
18:00 – 19:00	136	31	282	285	36	125	896

Through application of these demand reduction effects, a utilisation factor was determined which relates the observed data to the levels predicted by theoretical analysis. **Table 8** shows the how this utilisation factor was determined and the effect on peak hour parking demand for the observed (2002) scenario.

Table 8 Existing Theoretical and Observed Parking Demand

Time	Theoretical Parking Demand (no reciprocal parking)	Theoretical Parking Demand (including reciprocal parking)	Observed Parking Demand	Utilisation Factor (Observed / Theoretical)
16:00 – 17:00	8,326	6,764	4996	74%
17:00 – 18:00	6,365	5,103	4210	83%
18:00 – 19:00	4,023	4,598	3311	72%
Calculated Peak Parking (12:00 - 13:00)	10,375	9,171	-	-
	Projected Existing Peak Parking Demand			6,982

For the purpose of comparison, the additional development constructed since 2002 was included with further demand analysis to provide an indication of current day (2011) demand. This assessment determined a peak hour parking demand for a typical weekday of approximately 7,900 bays. When compared to the existing parking supply of approximately 10,500 bays, it can be seen that even with the minimal parking fees in the Midland City Centre, demand for parking remains significantly below supply.

5.5 Anticipated future parking demand

The 2031 parking demand was determined using the methodology described above, with land use and dwelling yields as defined in the *Midland Activity Centre Structure Plan* prepared by Hassell. Based on this information, an uncalibrated gross peak parking demand of 21,414 non-residential bays was determined for the 2031 future scenario. By including the effects of reciprocal and shared parking, the anticipated parking demand was reduced to 14,926. This number was then scaled to represent the increase in sustainable transport mode, in line with the 65% private vehicle mode target. This assessment results in a final anticipated demand for non-residential parking within the Activity Centre of 10,212 bays. Adding the 800-1,000 bays to be constructed for park 'n' ride at the relocated Midland Station brings the peak occupied parking demand to about 11,000 bays. Comparing this to the road capacity analysis indicates that the road network would be sufficient in its current form to accommodate the demand associated with the Midland Activity Centre, for the 2031 background growth scenario.

However, the above figure assumes that all parking is full and does not take into account the widely dispersed nature of current and future parking supply. An efficiency rate of 85% was assumed to account for the spread of the parking bays throughout the Midland Activity Centre, which suggests that a total of 13,000 bays would be required to sufficiently accommodate the 2031 parking demand.

6 Parking Management

6.1 Parking Management Principles

Midland operates as a significant strategic centre for both the local community and a wider catchment that extends into the Wheatbelt and to relatively remote residential catchments such as Ellenbrook and Mundaring. For this reason there will always be an important place for private vehicles, as these represent the only viable transport mode for a large proportion of this population. High quality parking will be required to accommodate this demand, as well as that of other visitors, residents and commuters.

However, a higher provision of car parking will result in an increase in demand for private vehicle modes, potentially beyond the capacity of the road network to support it. Car parking management methodologies will need to be introduced to maintain a level of supply and demand which can be sustained by the local road network.

6.2 Parking Priorities

The public parking supply can be segregated to provide parking for a range of needs. The two broadest categories for non-residential parking consist of commuter and retail parking. These have overlapping but separate demand profiles and should be managed in different ways.

Retail and entertainment parking should be provided centrally, close to destination areas and easily accessible from the development. Parking is ideally supplied on street or in decked car parking with a demand responsive parking fee that promotes turnover.

Commuter parking tends to be of lesser value to the Centre and should be supplied on the periphery of the City in large-scale parking structures priced to support all-day parking.

Other specialised parking categories are also important and should be included in the on- and off-site parking supply. This includes:

- Disabled parking, demand for which will increase markedly over the next 20 years and should represent 2-3% of the overall non-residential supply;
- Loading bays adjacent to retail and entertainment or mixed-use developments which do not include on-site provision for service/delivery;
- Bus stops along service routes;
- Taxi stands in areas with high demand;
- Other types of very short-stay parking (ATM, post boxes, emergency service zones, etc.)

6.3 Distribution of Parking

Preliminary assessment of potential parking structure locations has been undertaken by the City of Swan and reassessed for the proposed development scenario. **Figure 10** shows potential locations for large public and private parking, to be supplemented by smaller-scale parking at the individual development level. Public car parks are proposed to be accessed primarily from the peripheral roads, avoiding direct links to Great Eastern Highway wherever possible.

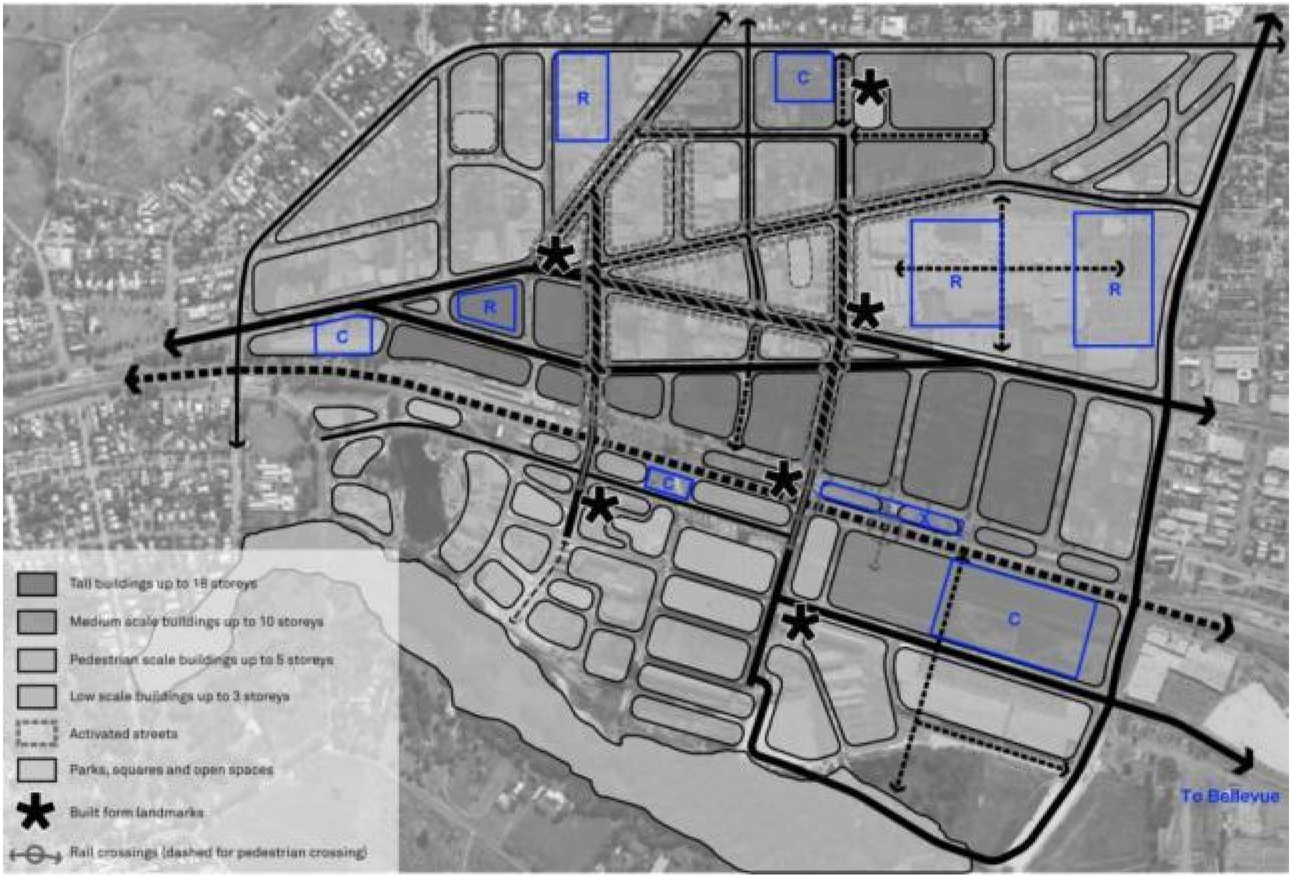


Figure 10 Location of Public Parking

6.4 Commuter Parking

Location

Commuter parking is proposed to be provided on the periphery of the City in large-scale parking structures priced to support all-day parking. Commuters tend to arrive during the roadway peak and have a significant impact on traffic operations. Removing this demographic from the main activity improves pedestrian and cycling safety, public transport efficiency and intersection operation. Commuters are also willing to walk longer distances, particularly if the pedestrian environment is attractive.

The large park 'n' ride area immediately adjacent to the relocated Midland Station is likely to remain priced for commuter trips in the medium-term. However, construction of off-site parking in the Bellevue area would alleviate the pressure on the local road network and allow the proposed multi-deck car park adjacent to the station to be used for short-term retail/commercial parking set at hourly rates.

Quantum

Parking analysis shows that the unrestrained demand for commuter parking is approximately 8,800 parking bays. Mode shift towards alternative transport to achieve a 65% mode share would imply that approximately 6,000 commercial parking bays will be required to satisfy the demand. It can be reasonably assumed that commuters represent expert users and the corresponding efficiency of commercial parking will be relatively high. If we assume a 90% peak occupancy rate, this corresponds to a commuter parking provision of approximately 6,700 bays across the Activity Centre. Excluding the hospital development from this total leaves 5,800 parking bays designated as commuter parking (excluding park 'n' ride). Of these, approximately 30-40% could be expected to comprise large-scale off-street commuter parking facilities, potentially shared with retail users.

Access

Access to commuter parking will be primarily via major approach roads (Morrison Road, Great Eastern Highway), to minimise the impact of commuter traffic on the operation of the internal road network.

Price

While it has been shown that the unrestrained demand for commuter parking exceeds the proposed supply, the willingness of commuters in the Midland area to pay for parking has not been satisfactorily demonstrated. Anecdotal evidence suggests that it is unlikely that the workforce will support commuter parking prices at economically sustainable levels, capable of funding the construction of commercial car parks. However, assuming the proposed mandatory cash-in-lieu policies are put in place, it is likely that daily parking rates could meet or exceed levels sufficient to pay for upkeep and maintenance of public facilities. (i.e. in excess of $8 per day).

6.5 Residential Parking

Maximum Parking Rates

Residential traffic is generally not considered to impact significantly on the Activity Centre road network due to its prevailing contra-flow direction. However, Midland's location in the regional context means that a high volume of regional traffic travels past Midland from the hills area, towards employment centres to the west of Midland. Therefore, residential traffic generated in the Activity Centre may have a significant effect on local intersections.

To address this impact, it is proposed that a maximum residential parking rate be imposed for multiple and group dwellings within the Activity Centre. This would restrict parking provision to a maximum of 1 bay per unit and would assist in supporting a sustainable transport environment by reducing private vehicle mode shares by residents.

Unbundled Parking

The cost of parking for residential and commercial units is usually passed on to the occupants indirectly through the rent or purchase price (bundled) rather than through a separate transaction. This means that tenants or owners are not able to purchase additional parking if required or given the opportunity to save money by reducing their parking demand. Giving the tenants or owners the opportunity to rent or sell the parking spaces separately may also reduce the total amount of parking required for a development. The unbundling of parking can be introduced in several different ways:

> Facility managers can unbundle parking when renting building space;
> Developers can make some or all parking optional when selling buildings;
> Renters can be offered a discount on their rent for not using some or all of their allocated parking spaces; and
> Parking costs can be listed as a separate line item in the lease agreement to show tenants the cost and enable them to negotiate reductions.

Providing tenants or owners with the opportunity of unbundled parking is also likely to create a market for available parking spaces. It should be noted that if an unbundled parking policy is introduced, it is important to consider the cost of alternative parking in the nearby area. If there is a supply of free or low-cost parking nearby, there may be an incentive for tenants or owners to find other places to park their cars to avoid the parking charge, potentially resulting in spillover effects.

6.6 Visitor Parking

Currently, visitor parking within the Midland Activity Centre is predominantly free and provided by on-street and off-street retail parking facilities. As proposed in the *Car Parking Action Plan Update* (Cardno, 2011), it is recommended for all inner-city off-street parking to gradually transition to uncapped paid parking (PTA Park 'n' Ride excepted) with the long-term goal of providing multi-deck car parking facilities for visitors.

Location

Retail parking is proposed to be located adjacent to, but outside of, areas with high levels of activation. Parking would be primarily provided in public or private multi-deck parking adjacent to these areas. Midland Gate will likely remain the primary site for retail parking, with the remainder distributed throughout the Activity Centre.

The on-street parking supply should be reserved for visitor parking, through the use of parking pricing and timing restrictions. On-street parking within the Activity Centre is encouraged in the majority of locations, with the exception of Great Eastern Highway, Morrison Road and Keane Street north of The Crescent. Embayed on-street parking is preferred, to minimise pedestrian crossing distances and allow street trees to be planted closer to the traffic lanes.

Quantum

It is anticipated that there is an unrestrained demand for approximately 12,000 visitor parking bays, of which 6,000 bays represent reciprocal demands from other land uses (hospital, office, education, residential, etc) or mode shift away from private vehicles.

Given that 4,000 bays will continue to be located at Midland Gate Shopping Centre, and there are approximately 600 bays on-street, this leaves between 1,500 and 2,500 visitor parking bays to be allocated to the remainder of the Activity Centre. On-site retail parking would therefore need to be minimised so as to maintain a satisfactory level of operation. As a result of the general lack of private retail parking in the Activity Centre, Midland Gate is likely to become a de-facto public parking station, necessitating introduction of paid parking at a level consistent with the rest of the Activity Centre.

6.7 Park ‘n’ Ride

Location

The location of the existing Midland Station, at the western boundary of the Activity Centre, is relatively distant from the local residential and business catchments. This reduces its effectiveness as a transport node and tends to promote a high reliance on park ‘n’ ride adjacent to the station, even for residents living nearby. To alleviate this issue, the Midland Station is proposed to be relocated approximately 1km to the east, towards the City Centre core. This will increase the catchment of residents and businesses within 800m and help promote alternative transport modes.

Quantum

The PTA has also proposed to locate a significant quantum of parking, tied to public transport use, immediately adjacent to the new station. This parking will attract a significant quantity of private vehicle trips into the Activity Centre, with no associated benefit to the community. The proposed park ‘n’ ride is therefore supported only as a solution prior to the extension of the rail line. However, the location of the proposed park ‘n’ ride, adjacent to the Midland Health Campus and at the heart of the City provides an opportunity for a potential transition to retail and hospital visitor parking in the longer-term, similar to the function of parking stations adjacent to the Perth Train Station.

Price

The proposed parking management structure for park ‘n’ ride would restrict parking availability to legitimate Transperth transport users through use of the SmartRider system. This will assist to limit the dilution effect of a large number of low-price parking bays in the centre of the Activity Centre.

6.8 Parking Quantum Summary

Collating the parking demand assessment data suggests the following approximate split for parking supply across the Midland Activity Centre:

- Long-Stay Private - 4,000 bays, including:
  - Midland Oval - 600 bays
  - Hospital - 900 bays
- Long-Stay Public - 2,000 bays
- Park ‘n’ Ride - 1,000 bays (transitioning to short-stay public in the long-term)
- Short-Stay Private - 5,000 bays, including
  - Midland Gate - 4,000 bays (de-facto public)
- Short-Stay Public - 1,000 bays, including:
  - On-Street - 500 bays.

Note that public car parking may be provided as a mixture of short-stay and long-stay parking, determined by establishing reasonable parking costs for hourly and daily parking at a single location.

6.9 Maximum Parking Rates

The constraints associated with road capacity and commercial sustainability for public parking support the modification of the existing standard parking minimum rates, as set out in Local Government Policy, to a simplified set of parking maximums. It is envisioned that land uses would be categorised according to simple criteria: Retail, Office, Showroom, Residential. Any other non-standard uses would be assessed with respect to the goals of the City and Department of Planning.

Nominal (example) maximum parking rates are proposed in the DoT *Activity Centres Parking Discussion Paper* and provide a benchmark for development as follows:

- Retail: 3-4 bays per 100sq.m
- Office: 1-2 bays per 100sq.m
- Showroom: 2 bays per 100sq.m
- Residential: 1 bay per unit

Calculations show that at the lower end of these rates, the ultimate development would result in approximately the desired parking quantum. However, a transitional plan which allows additional interim parking on a mandated schedule may be necessary to reflect the commercial realities of development.

Public car parking allows a more efficient and equitable allocation of parking resources across multiple land uses. Therefore, a proportion of public car parking is beneficial to the operation of the Activity Centre and should be supported by legislation. A public parking quantum of between 2,000 and 3,000 bays across the Centre (including on-street provisions) would likely be sufficient to provide the necessary flexibility.

6.10 Parking Pricing

Parking infrastructure is expensive to construct and maintain. Where unrestrained parking demand rates significantly exceed the supply rate, the market price for hourly or daily parking can support the construction of public car parking on commercial grounds. However, market pricing of parking will have a significant impact on demand, with effects felt at relatively low rates. While there may be localised hotspots where parking is in sufficient demand to justify cost recovery pricing, it is likely that the majority of public parking will be unable to pay for itself through fees. This suggests that alternative funding methodologies will be necessary.

It should also be noted that parking compliance is essential to the successful implementation of the parking management regime.

6.11 Cash-in-Lieu of Parking

Cash-in-lieu of parking is a mechanism by which developers contribute towards public parking and/or sustainable transport initiatives. This mechanism would allow public infrastructure to be funded by development, without the requirements for a Development Contributions Scheme.

A model cash-in-lieu scheme is recommended for consideration which combines parking maximums with mandatory cash-in-lieu to ensure that sufficient public parking can be supplied, while maintaining a limit on parking to prevent adverse impacts to the road network.

Mandatory cash-in-lieu would require developers to fund a proportion of their maximum parking requirement in off-site parking to be constructed by the City, and to fund additional sustainable transport initiatives such as cycling infrastructure and public transport improvements. Additional parking could be funded cash-in-lieu to reduce the development's on-site requirements. Demonstrated synergies within a development which would reduce their parking demand could also be supported to reduce on-site supplies.

By this mechanism, public parking rates need only fund maintenance of infrastructure, rather than recover the costs of capital works.

Record-Keeping

To maximise developer buy-in and ensure a streamlined process, it is important to ensure that there is an effective record-keeping process to manage cash-in-lieu contributions. This system would track payments by developers, current land and construction costs, infrastructure works and planning. Maintaining a transparent process of cash-in-lieu through which developers can see direct value will assist in achieving both mandatory and voluntary contributions.

6.12 Use of On-Street Parking

Residential Parking

On-street parking for residential uses is not supported except for visitor parking. It is expected that residential development will provide sufficient parking on-site, within the maximum parking rates recommended. This will minimise conflicts over on-street supply and retain it for valuable short-stay parking.

Visitor / Retail Parking

The primary use of on-street parking will be for short-stay visitor parking, particularly in and around activated streets. This parking should be time-restricted to avoid illegitimate commuter parking or priced on a demand-sensitive basis to promote vacancies.

Loading Zones and Service/Delivery Docks

Deliveries will be enabled through an increase in on-road loading zone areas, particularly in ‘main street’ precincts and where smaller office/retail development is located. Larger office/commercial buildings will be serviced via on-site docks connected to basement or undercroft parking structures. Access to dock areas through a laneway network is supported to minimise the impact of service/delivery vehicles on pedestrian, cycling and bus modes.

ACROD Parking

In the Car Parking Action Plan Update (Cardno, 2011), it is recommended in the short term to continue to promote ACROD parking rates above the stipulated rate given in the Building Code Australia (BCA). This reflects the growing mobility of people with disabilities and is consistent with the increasing uptake in ACROD permits in the Perth metropolitan region. Notwithstanding any provision in the BCA or AS2890, it is recommended that parking spaces for people with disabilities are to comprise 2-3% of the total number of parking spaces in non-residential development, with a higher provision rate required for car parks serving health facilities or which provide specific services for aged persons and people with disabilities.

Bus Stops and Layover

The location of bus stops will be dictated primarily by the associated road environment. On major regional roads such as Lloyd Street and Morrison Road, bus stops should be embayed to minimise disruption to traffic during peak operation. Bus lanes along Great Eastern Highway are proposed which would allow buses to stop within the lane.

Along all other roads, buses should stop within the travelling lane. This will have an impact on traffic, but will not disadvantage buses travelling through the City Centre. The impact of buses on the operation of these streets will ideally encourage cars to utilise other corridors for City Centre access.

Bicycle Parking

In activated streets, or any streets with on-road cycling facilities, cycle parking would ideally be located in on-street corrals, as shown in **Figure 11**. This has the advantage of keeping cyclists away from pedestrian conflict and is a very effective way of creating cycle parking.

Figure 11 Bike Corral

Other Critical Short-Stay Parking

Consideration for other specialty uses should be undertaken, depending on the requirements of adjacent land uses. As on-street parking is expected to be in high demand, dedicated parking for emergency and postal vehicles may be necessary. Dedicated taxi stands will also be desirable in entertainment precincts and other high-demand areas. Specific land uses such as banks may require very short-stay parking (15 minutes) to facilitate customer needs.

6.13 Paid Parking

The Car Parking Action Plan Update (Cardno, 2011) contains an outline for the gradual transition to paid parking over through to 2015. This involves reduction of free parking duration outside the City Centre and gradual introduction of pay and display meters in the City Centre.

The introduction of paid parking allows for fine-grained control of parking demand on a precinct or road-specific basis. Ideally, parking rates would vary as required and set to a level which generates a vacancy on each block. A good example of this mechanism is provided by the SF Park system currently being trialled in San Fransisco.

6.14 Enforcement

Due to the increased attractiveness of parking within the activity centre, the enforcement of parking restrictions both within the Midland Activity Centre and in the periphery is essential to a successful outcome of the parking strategy.

7 Traffic Analysis

A desktop model of the Midland Activity Centre was developed in order to determine the impact of the planned developments on intersection performances and road capacities. SCATS data for the signalised intersections sourced from MRWA and supplementary traffic count data was used to determine the turning movements proportions at critical intersections in and around the Activity Centre.

7.1 Trip Generation

The 2031 trip generation was based on the land use and dwelling yields as defined in the Midland Activity Centre Structure Plan prepared by Hassell along with AM peak, PM peak and daily trip generation rates derived from the ITE *Trip Generation Manual (7th Edition)*, as well as detailed observation and calculations from previous assessments. See **Table 5** for a summary of the land use areas and dwelling yields as defined in the Midland Activity Centre Structure Plan.

The traffic generation for the AM and PM peak periods is shown in **Table 9** and **Table 10** respectively, while the daily traffic generation is shown in **Table 11**.

Table 9 Traffic Generation per Precinct for 2031 AM Peak Hour (two-way)

Precinct	Retail	Office	Food	Residential	Education Culture	Health	Police	Bulky Goods
Old Town/Pedestrian Centre	324	951	1689	342	49			
Midland Oval	135	580	872	356				
Midland Gate	499							
Morrison Road East				155	20			
Brockman/Railway Core	116	1485	280	1044				
Police & Health Precinct						1389	294	60
Railway Workshops Precinct	3	432	164	290	1818			
Woodbridge Lakes				43				
Entry Streets		148						38
Morrison Road West				402	128			

Table 10 Traffic Generation per Precinct for 2031 PM Peak Hour (two-way)

Precinct	Retail	Office	Food	Residential	Education Culture	Health	Police	Bulky Goods
Old Town/Pedestrian Centre	1179	914	2347	416	34			
Midland Oval	493	557	1211	434				
Midland Gate	1816							
Morrison Road East								
Brockman/Railway Core	423	1428	389	1272				
Police & Health Precinct						1522	283	79
Railway Workshops Precinct	11	415	228	354	1259			
Woodbridge Lakes				53				
Entry Streets		142						51
Morrison Road West				490	89			

Table 11 2031 Daily Traffic Generation per Precinct (two-way)

Precinct	Retail	Office	Food	Residential	Education Culture	Health	Police	Bulky Goods
Old Town/Pedestrian Centre	13504	6752	15875	4173	208			
Midland Oval	5648	4119	8191	4355				
Midland Gate	20797							
Morrison Road East				1888	83			
Brockman/Railway Core	4839	10550	2634	12755				
Police & Health Precinct						16608	2090	754
Railway Workshops Precinct	125	3069	1540	3548	7656			
Woodbridge Lakes								
Entry Streets		1049						482

In order to ensure consistency between the parking demand calculations and the trip generation calculations, a correction was made in order to account for the reciprocal parking. The trip generation reduction factors for the AM peak, PM peak and daily is shown in **Table 12**.

Table 12 Traffic Generation Reciprocal Factors

	Retail	Office	Residential	Restaurant Cafe
AM peak reduction factor	14.5%	38.1%	1.5%	57.7%
PM peak reduction factor	24.8%	20.2%	10.3%	53.5%
Daily reduction factor	29.1%	36.8%	6.3%	50.5%

Additional data was sourced from the MRWA Regional Operations Model (ROM) and the Strategic Transport Evaluation Model (STEM) from the Department of Planning in order to determine the “background” traffic (i.e. regional traffic that would flow through the activity centre if the development had not been there). The AM peak, PM peak and daily traffic volumes were then added to this background traffic to assess the likely future traffic demand.

7.2 Trip Distribution and Assignment

The nature of the traffic entering and exiting the network was disaggregated to assess whether the traffic was purely regional, purely local or a mix of the two, in which case a proportion of local traffic was determined. Trips were then distributed to the boundary road network proportional to the results of the Main Roads 2031 volumes. The results of this simple model are shown in **Figure 12** and **Figure 13**, for the ultimate development scenario.

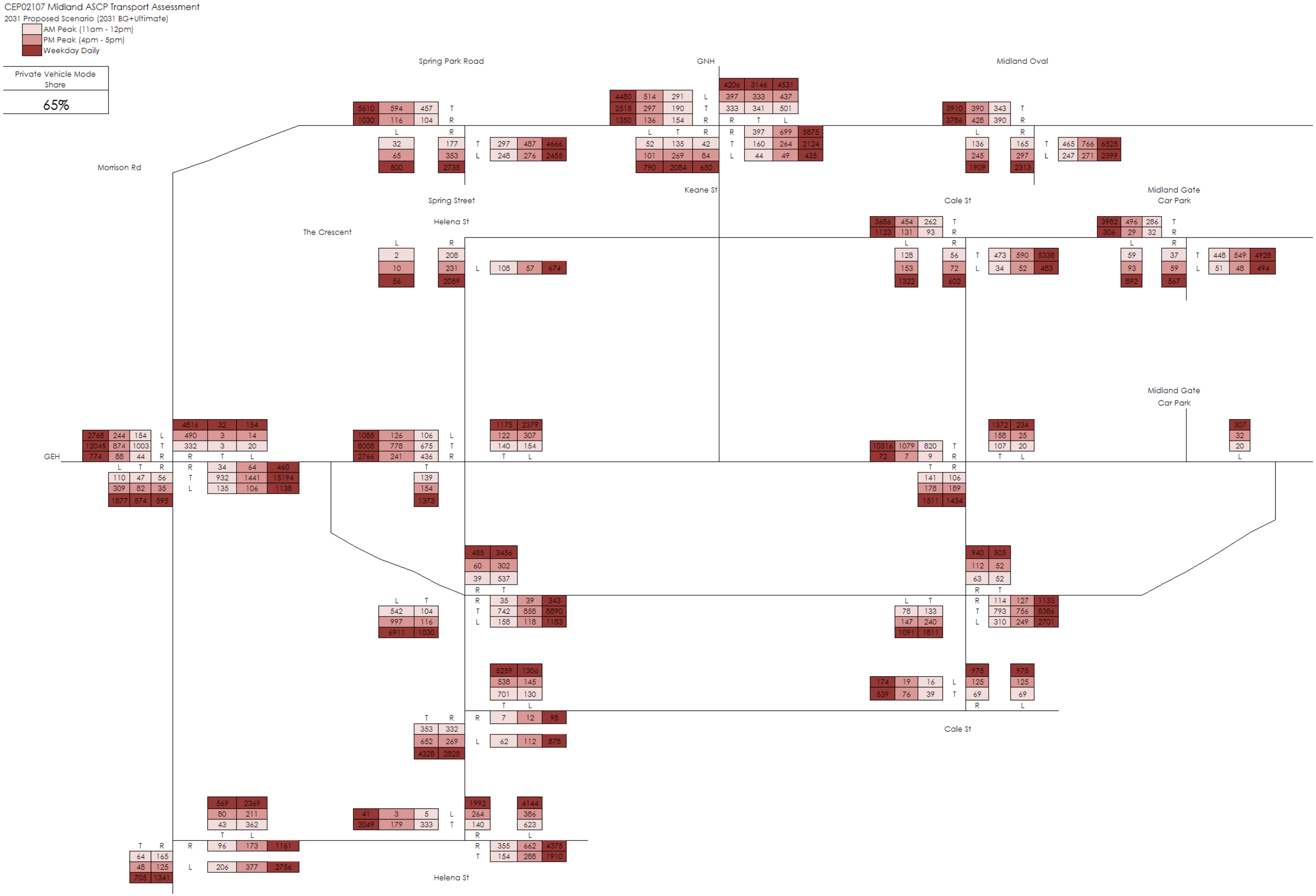


Figure 12 Turning Movement Model - West (2031 Background + Ultimate Development)

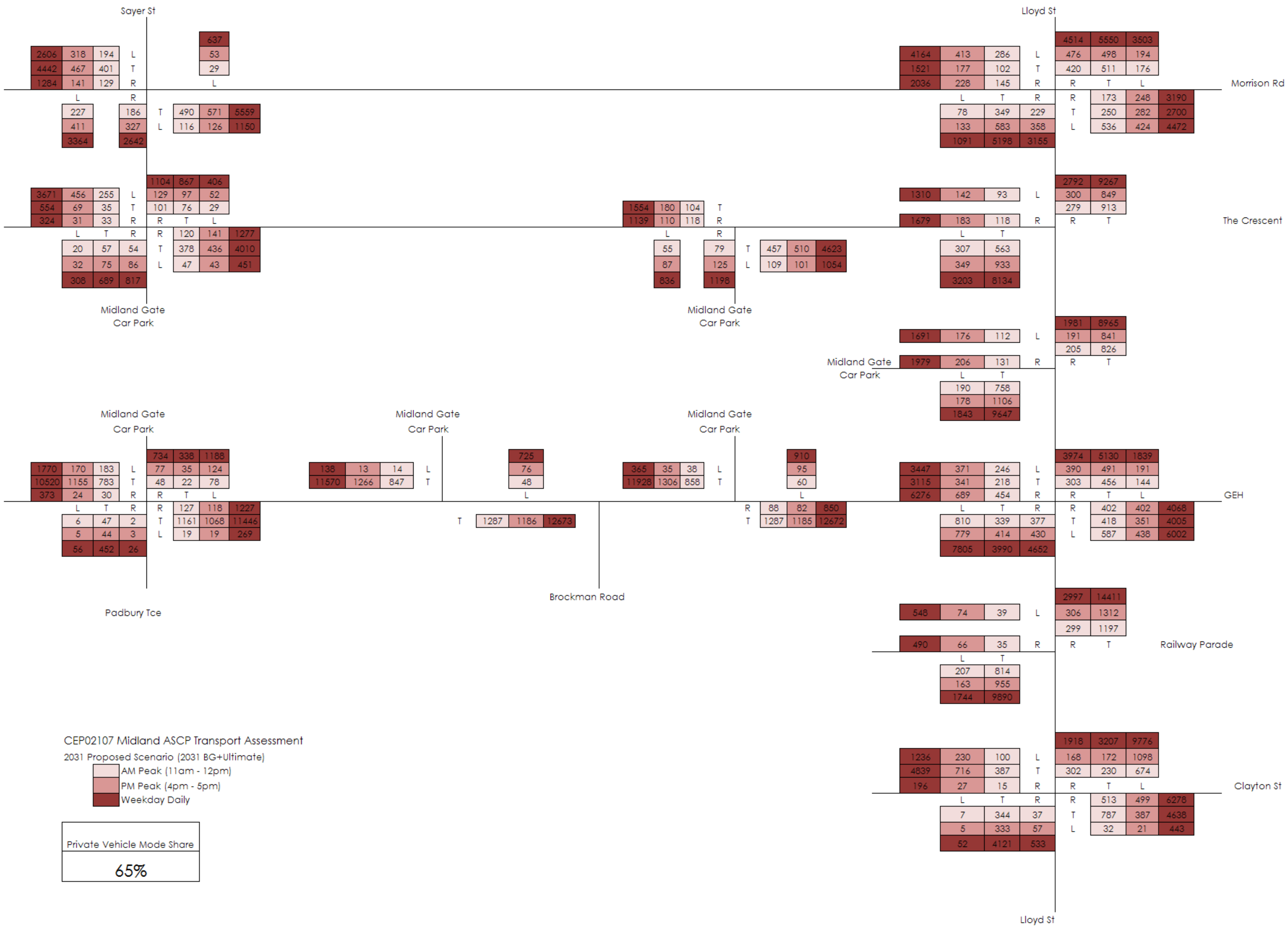


Figure 13 Turning Movement Model - East (2031 Background + Ultimate Development)

7.3 Impact of Regional Traffic

The existing road use shows a high volume of regional trips currently using Great Eastern Highway. This traffic is expected to increase in the future as additional regional connections are made to the east of Midland. Given that Great Eastern Highway bisects the Midland Activity Centre, this additional traffic represents a significant barrier to all forms of transport and impedes the operation of the Activity Centre as an integrated development. Therefore, alternatives to the existing arrangement were sought and a proposed redistribution of local traffic away from Great Eastern Highway is recommended to mitigate the increase in regional traffic not associated with the Activity Centre.

Potential Bypass Route - Morrison Road

Morrison Road was determined to be the best opportunity to redistribute local traffic around the Activity Centre core, rather than along Great Eastern Highway. Morrison Road is generally constructed as a 4-lane dual carriageway with right-turning pockets and is suitable for the high local traffic volumes anticipated.

Eastbound traffic from Great Eastern Highway can be redirected to Morrison Road via a minor reconfiguration of the road to include a left-turn continuous slip lane. SIDRA assessment suggests that this level of mitigation is not required to improve operational performance, but it would tend to promote this route for use by local traffic accessing parking facilities along Morrison Road.

Westbound traffic east of the Centre can be directed along the Clayton Street and Morrison Road corridors, via Lloyd Street as applicable. Of the existing approach routes from the west, only traffic travelling along Great Eastern Highway from Greenmount Hill is likely to prefer to stay on Great Eastern Highway through Midland. Operational analysis suggests only minor upgrades to the Great Eastern Highway / Lloyd Street intersection, which would include a new signal phasing regime, would be required to ensure satisfactory operation.

7.4 Traffic Operations Assessment

To evaluate the impact of the increased volumes anticipated for the ultimate design scenario (including background), SIDRA outputs for each approach are presented in the form of Degree of Saturation (DOS), Average Delay, Level of Service (LOS) and 95th Percentile Queue. These characteristics are defined as follows:

> Degree of Saturation (DOS): is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for varied traffic flow up to one for saturated flow or capacity. The theoretical intersection capacity is exceeded for an un-signalised intersection where DOS > 0.80;

> Average Delay: is the average of all travel time delays for vehicles through the intersection. An un-signalised intersection can be considered to be operated at capacity where the average delay exceeds 40 seconds for any movement;

> Level of Service (LOS): is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. The different levels of service can generally be described as follows:

LOS	Description	Signalised Intersection	Unsignalised Intersection
A	Free-flow operations (best condition)	≤10 sec	≤10 sec
B	Reasonable free-flow operations	10-20 sec	10-15 sec
C	At or near free-flow operations	20-35 sec	15-25 sec
D	Decreasing free-flow levels	35-55 sec	5-35 sec
E	Operations at capacity	55-80 sec	35-50 sec
F	A breakdown in vehicular flow (worst condition)	≥80 sec	≥50 sec

> 95% Queue: is the statistical estimate of the queue length below which 95% of all observed queues would be expected.

For the purpose of assessment, vehicle Level of Service is deemed acceptable if the intersection operates at a Level of Service E or better and the delays/queues generated by individual turning movements are not deemed to negatively impact adjacent intersections. These criteria are consistent with the intended operation of Midland as a City Centre with a focus on pedestrian connectivity and sustainable transport modes.

7.5 Impact of Future Volumes using Existing Intersection Geometry

SIDRA intersection operation analysis was undertaken for a series of critical intersections with peak hour traffic volumes determined through the desktop modelling process described above. Intersections were assessed for the ultimate demand scenario including redistribution of local traffic. Restrictions on parking quantum were translated into peak demand reductions on a 1:1 proportional basis. For the purpose of this assessment, therefore, private vehicle generation was reduced to reflect the target mode share of 65%. The locations assessed included the following signalised intersections:

> Great Eastern Highway / Morrison Road
> Morrison Road / Keane Street / Great Northern Highway
> Morrison Road / Lloyd Street
> Lloyd Street / The Crescent
> Lloyd Street / Great Eastern Highway
> Lloyd Street / Clayton Street

The following sections present the anticipated intersection operations for existing geometry.

Great Eastern Highway / Morrison Road

The Great Eastern Highway / Morrison Road intersection represents the entry point to Midland from the west. The intention is that local traffic will tend to use Morrison Road in preference to Great Eastern Highway, encouraged through the use of signage, intersection modifications and the location and access to public parking. If successful, a significant volume of local traffic would divert to Morrison Road.

The existing intersection geometry is shown in **Figure 14**.

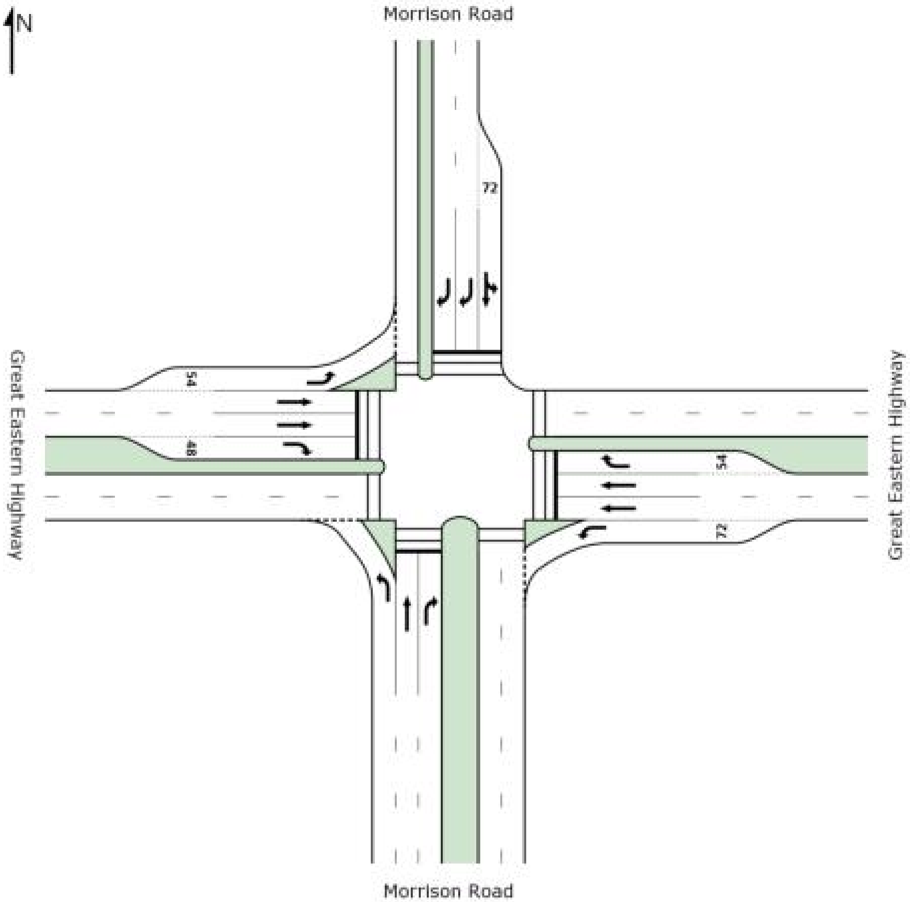


Figure 14 Great Eastern Highway / Morrison Road – Existing Geometry

Table 13 and **Table 14** show the results of SIDRA analysis for the existing intersection geometry under the 2031 background plus full development scenario, for the AM and PM Peak respectively.

Table 13 SIDRA Analysis for Great Eastern Highway / Morrison Road - Existing Geometry (2031 Background + Ultimate Development) AM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Morrison Road											
1	L	110	0.0	0.129	15.0	LOS B	2.4	14.2	0.41	0.69	42.6
2	T	47	0.0	0.149	50.7	LOS D	2.6	15.4	0.90	0.68	24.2
3	R	56	0.0	0.187	59.0	LOS E	3.1	18.6	0.90	0.75	23.0
Approach		213	0.0	0.187	34.4	LOS C	3.1	18.6	0.65	0.71	30.6
East: Great Eastern Highway											
4	L	135	0.0	0.109	8.1	LOS A	0.6	3.9	0.13	0.63	49.1
5	T	932	5.0	0.553	28.1	LOS C	21.5	135.2	0.79	0.70	32.4
6	R	34	5.0	0.411	77.8	LOS E	2.3	14.2	1.00	0.73	19.2
Approach		1101	4.4	0.553	27.2	LOS C	21.5	135.2	0.72	0.69	33.1
North: Morrison Road											
7	L	20	5.0	0.079	58.3	LOS E	1.2	7.8	0.88	0.72	23.2
8	T	3	0.0	0.079	50.0	LOS D	1.2	7.8	0.88	0.64	23.5
9	R	332	5.0	0.573	63.3	LOS E	9.9	62.5	0.97	0.81	22.0
Approach		355	5.0	0.573	62.9	LOS E	9.9	62.5	0.97	0.81	22.1
West: Great Eastern Highway											
10	L	154	5.0	0.143	8.3	LOS A	0.8	5.1	0.14	0.63	49.0
11	T	1003	5.0	0.595	28.9	LOS C	23.7	149.3	0.81	0.72	32.0
12	R	44	0.0	0.513	78.0	LOS E	2.9	17.6	1.00	0.74	19.1
Approach		1201	4.8	0.595	28.0	LOS C	23.7	149.3	0.73	0.71	32.7
All Vehicles		2870	4.3	0.595	32.5	LOS C	23.7	149.3	0.75	0.72	30.8

Table 14 SIDRA Analysis for Great Eastern Highway / Morrison Road - Existing Geometry (2031 Background + Ultimate Development) AM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Morrison Road											
1	L	309	0.0	0.461	32.9	LOS C	14.1	84.5	0.76	0.81	31.7
2	T	82	0.0	0.280	57.4	LOS E	5.0	30.1	0.93	0.73	22.5
3	R	35	0.0	0.126	63.6	LOS E	2.1	12.5	0.90	0.73	21.9
Approach		426	0.0	0.461	40.1	LOS D	14.1	84.5	0.80	0.79	28.4
East: Great Eastern Highway											
4	L	106	0.0	0.092	8.2	LOS A	0.6	3.6	0.14	0.63	49.0
5	T	1441	5.0	0.835	37.4	LOS D	43.9	276.9	0.95	0.88	28.3
6	R	66	5.0	0.644	82.7	LOS F	4.7	29.8	1.00	0.79	18.4
Approach		1613	4.7	0.835	37.3	LOS D	43.9	276.9	0.90	0.86	28.5
North: Morrison Road											
7	L	14	5.0	0.061	61.3	LOS E	1.0	6.1	0.87	0.71	22.5
8	T	3	0.0	0.061	53.0	LOS D	1.0	6.1	0.87	0.62	22.8
9	R	490	5.0	0.832	76.2	LOS E	17.7	111.2	1.00	0.92	19.5
Approach		507	5.0	0.832	75.6	LOS E	17.7	111.2	1.00	0.91	19.6
West: Great Eastern Highway											
10	L	244	5.0	0.275	9.0	LOS A	2.2	13.8	0.19	0.65	48.3
11	T	874	5.0	0.506	28.4	LOS C	20.8	130.8	0.76	0.67	32.3
12	R	88	0.0	0.829	87.2	LOS F	6.6	39.5	1.00	0.91	17.7
Approach		1206	4.6	0.829	28.8	LOS C	20.8	130.8	0.66	0.68	32.6
All Vehicles		3752	4.2	0.835	40.1	LOS D	43.9	276.9	0.82	0.80	27.9

The above results show that the intersection will operate acceptably under the proposed performance criteria, for the ultimate development. To facilitate redirection of local traffic, an alternative geometric arrangement may be warranted, equivalent in intent to the existing Great Eastern Highway Bypass intersection depicted in **Figure 15**, but at a smaller scale**.**

Figure 15 Great Eastern Highway Bypass Intersection

Morrison Road / Keane Street / Great Northern Highway

The Morrison Road / Keane Street / Great Northern Highway intersection will be a major entry point to Midland from the north, particularly with the increased strategic importance of Great Northern Highway into the future (see **Appendix A - ROM Data**), as a result of the extensive residential development along this corridor. Keane Street provides convenient access to the City Centre and will likely be the primary north-south corridor for access the entertainment / retail precincts. The high volumes of traffic anticipated along Keane Street have been mitigated by providing access to two large-scale multi-deck car parks via Morrison Road, rather than Keane Street. This is intended to improve the pedestrian environment of Keane Street as well as reduce the requirements for road widening and land acquisition.

The existing intersection geometry is shown in **Figure 16**.

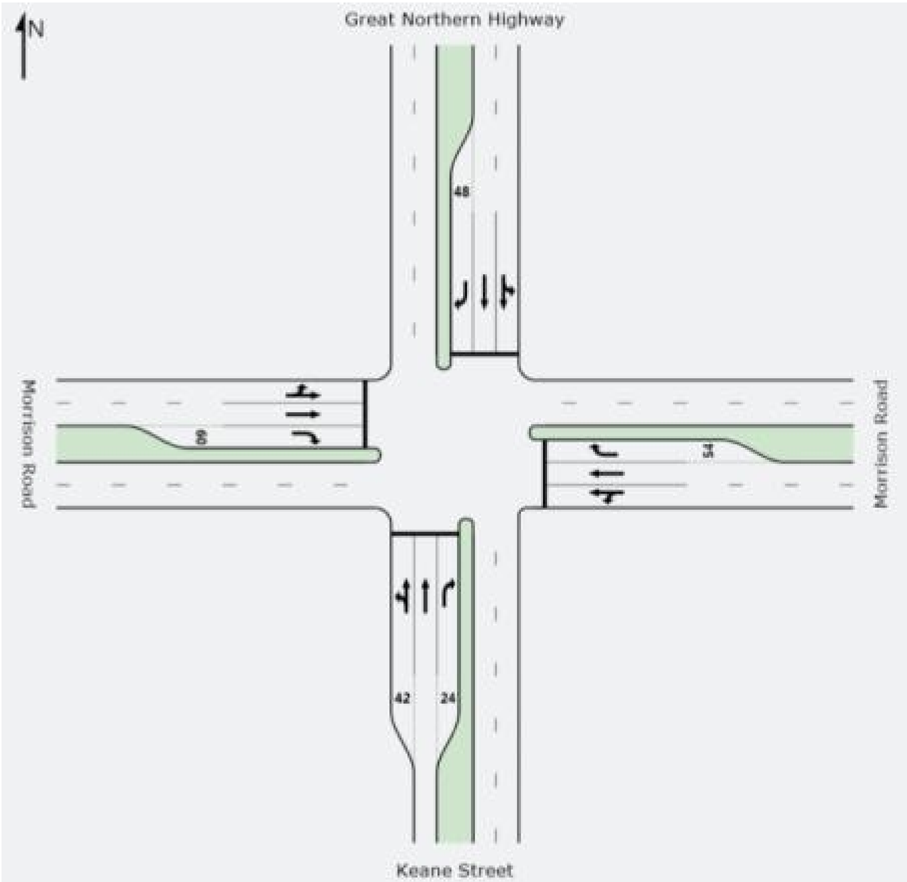


Figure 16 Morrison Road / Keane Street / Great Northern Highway – Existing Geometry

Table 15 and **Table 16** show the results of SIDRA analysis for the existing intersection geometry under the 2031 background plus full development scenario, for the AM and PM Peak respectively.

Table 15 SIDRA Analysis for Morrison Road / Keane Street / Great Northern Highway - Existing Geometry (2031 Background + Ultimate Development) AM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Keane Street											
1	L	52	0.0	0.399	38.5	LOS D	4.2	25.0	0.81	0.78	27.2
2	T	269	0.0	0.399	33.0	LOS C	9.0	54.0	0.85	0.70	27.3
3	R	84	0.0	0.682	60.4	LOS E	4.4	26.6	1.00	0.83	21.2
Approach		405	0.0	0.682	39.4	LOS D	9.0	54.0	0.88	0.74	25.8
East: Morrison Road											
4	L	44	0.0	0.480	49.0	LOS D	7.9	49.0	0.94	0.83	25.6
5	T	283	5.0	0.480	42.1	LOS D	7.9	49.0	0.94	0.77	26.0
6	R	274	5.0	1.000	[3] 54.2	LOS D	14.0	88.1	1.00	0.84	24.2
Approach		601	4.6	1.000	48.1	LOS D	14.0	88.1	0.97	0.80	25.1
North: Great Northern Highway											
7	L	501	5.0	1.012	131.2	LOS F	47.8	300.9	1.00	1.30	13.0
8	T	384	0.0	0.485	25.7	LOS C	14.4	86.9	0.79	0.71	33.2
9	R	290	5.0	1.000	[3] 59.3	LOS E	12.4	78.3	1.00	1.01	22.9
Approach		1175	3.5	1.012	79.0	LOS E	47.8	300.9	0.93	1.04	18.6
West: Morrison Road											
10	L	291	5.0	0.986	88.5	LOS F	19.0	119.4	1.00	1.25	17.5
11	T	190	5.0	0.986	94.3	LOS F	19.0	119.4	1.00	1.29	16.2
12	R	154	0.0	0.871	68.0	LOS E	9.0	53.9	1.00	1.00	20.2
Approach		635	3.8	0.986	85.2	LOS F	19.0	119.4	1.00	1.20	17.6
All Vehicles		2816	3.3	1.012	68.1	LOS E	47.8	300.9	0.95	0.98	20.3

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

Table 16 SIDRA Analysis for Morrison Road / Keane Street / Great Northern Highway - Existing Geometry (2031 Background + Ultimate Development) PM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Keane Street											
1	L	101	0.0	0.564	53.8	LOS D	6.1	36.8	0.86	0.77	22.6
2	T	269	0.0	0.564	50.7	LOS D	15.6	93.7	0.93	0.79	22.3
3	R	84	0.0	0.861	83.8	LOS F	6.2	37.0	0.99	0.98	17.3
Approach		454	0.0	0.861	57.5	LOS E	15.6	93.7	0.93	0.82	21.2
East: Morrison Road											
4	L	49	0.0	0.524	48.9	LOS D	17.3	108.4	0.87	0.88	25.7
5	T	733	5.0	0.832	48.7	LOS D	17.3	108.4	0.95	0.27	26.7
6	R	230	5.0	1.000	[3] 62.1	LOS E	14.0	88.1	0.98	0.83	22.2
Approach		1012	4.8	1.000	51.8	LOS D	31.7	199.4	0.95	0.43	24.5
North: Great Northern Highway											
7	L	437	5.0	1.034	177.8	LOS F	54.6	343.9	1.00	1.29	10.2
8	T	474	0.0	0.776	48.0	LOS D	29.5	179.6	0.97	0.87	24.1
9	R	256	5.0	1.000	[3] 50.8	LOS D	12.8	80.6	1.00	0.85	25.1
Approach		1167	3.6	1.034	97.2	LOS F	54.6	343.9	0.99	1.02	15.9
West: Morrison Road											
10	L	514	5.0	1.029	143.7	LOS F	49.1	309.5	1.00	1.25	12.1
11	T	297	5.0	0.881	71.9	LOS E	22.4	141.3	1.00	1.02	19.5
12	R	136	0.0	0.789	80.0	LOS F	9.8	58.8	1.00	0.89	18.1
Approach		947	4.3	1.029	112.0	LOS F	49.1	309.5	1.00	1.13	14.5
All Vehicles		3580	3.6	1.034	83.3	LOS F	54.6	343.9	0.97	0.86	17.1

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

These results show that the existing intersection form is generally insufficient to accommodate the changes in trip movements will therefore require upgrade. This intersection has been identified as a *Critical Intersection* with proposed mitigation and upgrade measures discussed further in **Section** 8**.**

Morrison Road / Lloyd Street

The Morrison Road / Lloyd Street intersection has been identified as a *Critical Intersection* due to the large increase in regional traffic volumes along both of these corridors as a result of strategic road linkages to the north and south. Lloyd Street will serve a large and growing residential population, operates as a parallel route to Roe Highway and provides efficient connection to the Midland Health Campus across the rail line.

The Main Roads modelling for the 2031 background scenario with the addition of traffic growth associated with the Midland Activity Centre suggests that intersection volumes will increase from approximately 28,000vpd under the existing scenario to 48,000vpd for the ultimate scenario. This will require some significant changes to the road environment, which are currently being planned and implemented by Main Roads WA. For the purpose of this Transport Assessment, recommendations for intersection improvements are included in **Section** 8.

It should be noted that modifications to the intersection of Roe Highway and Morrison Road (including removing this connection altogether) would have a significant and unknown impact on traffic volumes and flow directions.

The existing intersection geometry is shown in **Figure 17**.

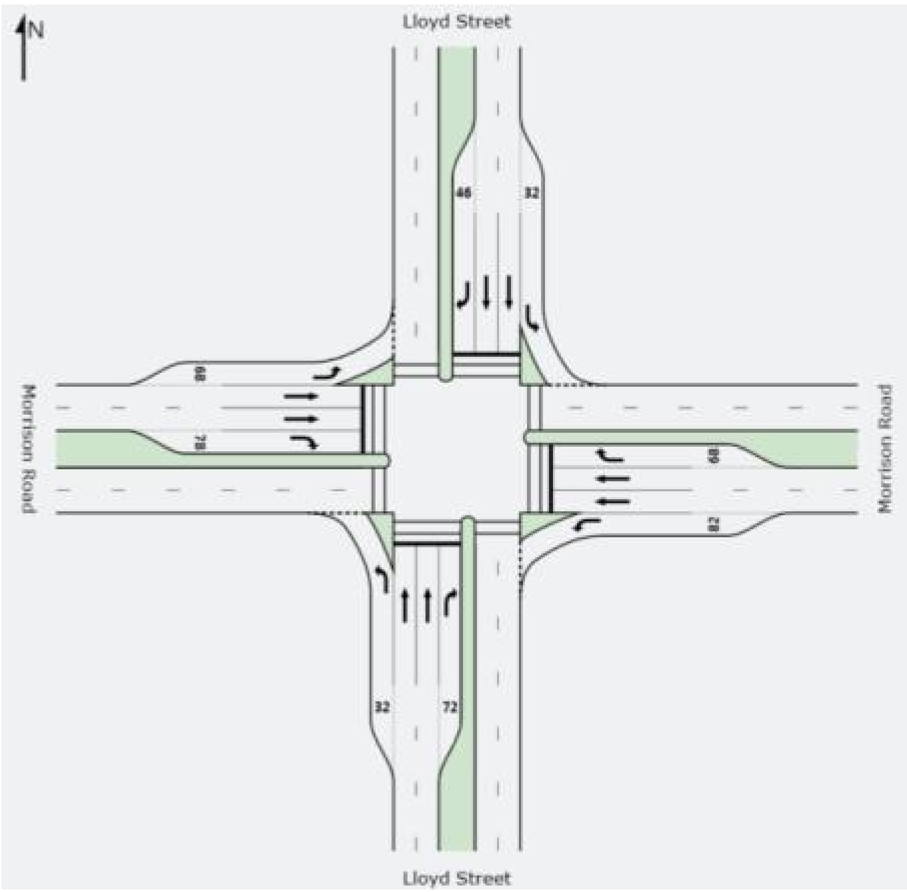


Figure 17 Morrison Road / Lloyd Street – Existing Geometry

Table 17 and **Table 18** show the results of SIDRA analysis for the existing intersection geometry under the 2031 background plus full development scenario, for the AM and PM Peak respectively.

Table 17 SIDRA Analysis for Morrison Road / Lloyd Street - Existing Geometry (2031 Background + Ultimate Development) AM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Lloyd Street											
1	L	78	5.0	0.159	11.1	LOS B	1.0	6.0	0.33	0.66	46.1
2	T	349	5.0	0.440	37.6	LOS D	7.5	47.5	0.92	0.75	28.2
3	R	229	5.0	0.608	47.4	LOS D	10.3	65.2	0.96	0.83	26.2
Approach		656	5.0	0.608	37.9	LOS D	10.3	65.2	0.86	0.77	28.8
East: Morrison Road											
4	L	536	5.0	0.580	15.2	LOS B	12.1	75.9	0.56	0.75	42.5
5	T	250	5.0	0.315	36.5	LOS D	5.2	33.0	0.89	0.71	28.7
6	R	173	5.0	0.965	87.9	LOS F	11.7	73.8	1.00	1.23	17.7
Approach		959	5.0	0.965	33.8	LOS C	12.1	75.9	0.73	0.83	30.9
North: Lloyd Street											
7	L	176	5.0	0.304	10.1	LOS B	1.8	11.4	0.30	0.67	47.1
8	T	663	5.0	0.740	40.0	LOS D	15.8	99.7	0.98	0.88	27.0
9	R	268	5.0	1.000	[3] 46.0	LOS D	11.9	75.1	0.97	0.83	26.6
Approach		1107	5.0	1.000	36.7	LOS D	15.8	99.7	0.87	0.83	28.9
West: Morrison Road											
10	L	286	5.0	0.360	11.4	LOS B	3.9	24.5	0.37	0.70	45.8
11	T	102	5.0	0.129	34.8	LOS C	2.0	12.8	0.85	0.64	29.4
12	R	145	5.0	0.809	62.1	LOS E	7.7	48.8	1.00	0.93	22.3
Approach		533	5.0	0.809	29.7	LOS C	7.7	48.8	0.64	0.75	32.9
All Vehicles		3255	5.0	1.000	35.0	LOS C	15.8	99.7	0.79	0.80	30.0

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

Table 18 SIDRA Analysis for Morrison Road / Lloyd Street - Existing Geometry (2031 Background + Ultimate Development) PM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Lloyd Street											
1	L	133	5.0	0.287	11.3	LOS B	1.8	11.5	0.32	0.67	45.9
2	T	611	5.0	0.810	52.5	LOS D	17.8	111.9	1.00	0.94	23.6
3	R	331	5.0	1.000	[3] 57.6	LOS E	18.7	117.5	1.00	0.85	23.3
Approach		1075	5.0	1.000	49.0	LOS D	18.7	117.5	0.92	0.88	25.0
East: Morrison Road											
4	L	424	5.0	0.534	18.3	LOS B	11.7	74.0	0.58	0.76	40.1
5	T	282	5.0	0.409	45.4	LOS D	7.1	44.7	0.93	0.75	25.7
6	R	248	5.0	0.994	87.1	LOS F	17.6	111.0	1.00	1.04	17.8
Approach		954	5.0	0.994	44.2	LOS D	17.6	111.0	0.79	0.83	26.9
North: Lloyd Street											
7	L	194	5.0	0.456	12.6	LOS B	3.2	20.1	0.38	0.69	44.7
8	T	725	5.0	0.724	42.0	LOS D	19.1	120.4	0.97	0.85	26.3
9	R	249	5.0	1.000	[3] 50.0	LOS D	11.9	75.1	0.98	0.83	25.4
Approach		1168	5.0	1.000	38.8	LOS D	19.1	120.4	0.87	0.82	28.0
West: Morrison Road											
10	L	405	5.0	0.678	17.3	LOS B	10.1	63.9	0.55	0.75	40.9
11	T	173	5.0	0.251	43.8	LOS D	4.2	26.5	0.90	0.70	26.2
12	R	220	5.0	0.882	72.4	LOS E	14.1	88.9	1.00	1.01	20.2
Approach		798	5.0	0.882	38.3	LOS D	14.1	88.9	0.75	0.81	29.1
All Vehicles		3995	5.0	1.000	42.7	LOS D	19.1	120.4	0.84	0.83	27.1

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

These results show that the existing intersection form requires some minor improvements to improve individual turning movements, but is largely suitable for the anticipated traffic volumes. Proposed mitigation and upgrade measures discussed further in **Section** 8**.**

Lloyd Street / The Crescent

The Lloyd Street / The Crescent intersection provides secondary access to the Activity Centre but, while it will experience a significant increase in demand along the Lloyd Street corridor, this is not expected to result in a significant change to operation.

The existing intersection geometry is shown in **Figure 18**.

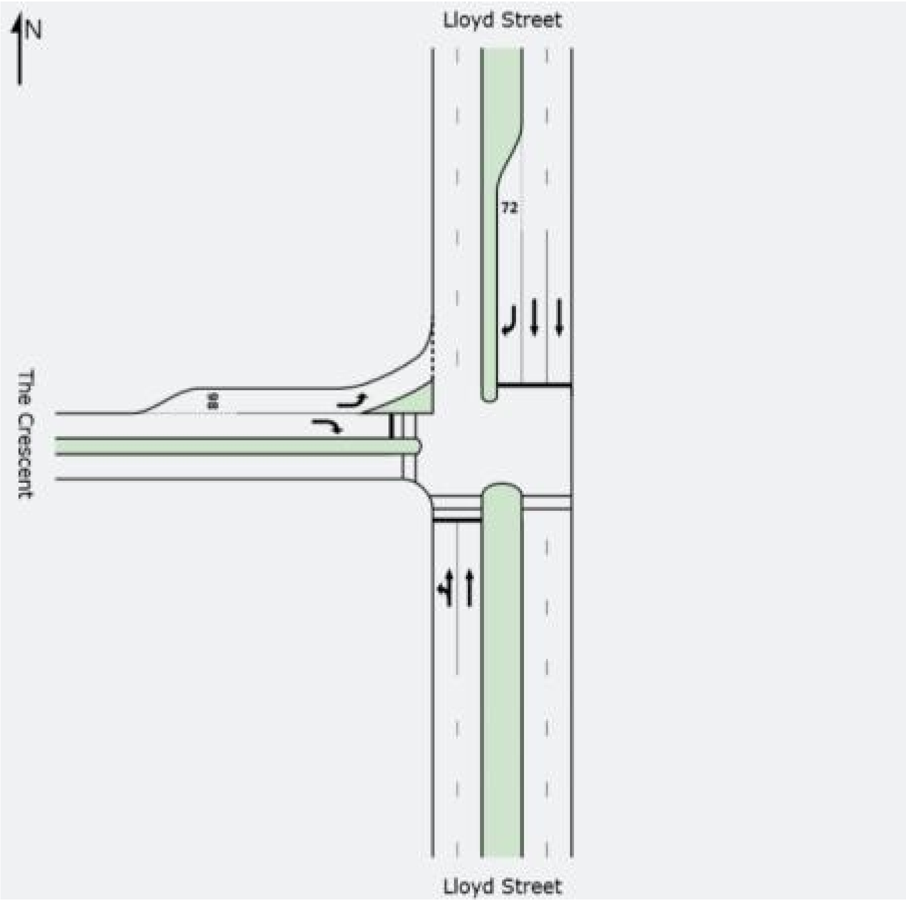


Figure 18 Lloyd Street / The Crescent – Existing Geometry

Table 19 and **Table 20** show the results of SIDRA analysis for the existing intersection geometry under the 2031 background plus full development scenario, for the AM and PM Peak respectively.

Table 19 SIDRA Analysis for Lloyd Street / The Crescent - Existing Geometry (2031 Background + Ultimate Development) AM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Lloyd Street											
1	L	307	5.0	0.751	37.4	LOS D	16.0	116.6	0.96	0.90	30.1
2	T	563	5.0	0.751	28.9	LOS C	16.5	120.5	0.96	0.88	31.5
Approach		870	5.0	0.751	31.9	LOS C	16.5	120.5	0.96	0.89	31.0
North: Lloyd Street											
8	T	913	5.0	0.523	16.4	LOS B	12.7	92.4	0.76	0.67	39.3
9	R	279	5.0	0.519	24.7	LOS C	6.5	47.3	0.88	0.83	35.9
Approach		1192	5.0	0.523	18.4	LOS B	12.7	92.4	0.79	0.70	38.5
West: The Crescent											
10	L	93	0.0	0.086	11.4	LOS B	1.1	7.6	0.39	0.68	45.7
12	R	118	0.0	0.726	50.9	LOS D	5.0	34.8	1.00	0.87	25.0
Approach		211	0.0	0.726	33.5	LOS C	5.0	34.8	0.73	0.78	31.3
All Vehicles		2273	4.5	0.751	24.9	LOS C	16.5	120.5	0.85	0.78	34.5

Table 20 SIDRA Analysis for Lloyd Street / The Crescent - Existing Geometry (2031 Background + Ultimate Development) PM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Lloyd Street											
1	L	349	5.0	0.861	46.1	LOS D	32.4	236.8	0.99	0.98	27.1
2	T	933	5.0	0.861	37.5	LOS D	33.2	242.4	0.99	0.99	28.0
Approach		1282	5.0	0.861	39.8	LOS D	33.2	242.4	0.99	0.99	27.7
North: Lloyd Street											
8	T	842	5.0	0.429	15.8	LOS B	12.6	91.7	0.66	0.58	40.0
9	R	300	5.0	0.697	39.2	LOS D	9.6	70.1	0.97	0.93	29.0
Approach		1142	5.0	0.697	21.9	LOS C	12.6	91.7	0.74	0.67	36.4
West: The Crescent											
10	L	142	0.0	0.163	16.2	LOS B	2.9	20.5	0.50	0.71	41.6
12	R	183	0.0	0.821	61.2	LOS E	9.7	68.2	1.00	0.93	22.3
Approach		325	0.0	0.821	41.6	LOS D	9.7	68.2	0.78	0.83	28.1
All Vehicles		2749	4.4	0.861	32.6	LOS C	33.2	242.4	0.86	0.84	30.8

The above results show that the intersection will operate acceptably under the proposed performance criteria, for the ultimate development.

Lloyd Street / Great Eastern Highway

The Lloyd Street / Great Eastern Highway intersection has been identified as a *Critical Intersection* due to the large increase in regional traffic volumes along both of these corridors as a result of strategic road linkages to the north and south. Lloyd Street will serve a large and growing residential population, operates as a parallel route to Roe Highway and provides efficient connection to the Midland Health Campus across the rail line.

Great Eastern Highway is the primary access into the City Centre for commuter / visitor trips from the east. Under the Main Roads WA 2031 ROM analysis, Great Eastern Highway volumes are predicted to increase by approximately 80%, compared to 2011 demands.

To achieve the desired function for Great Eastern Highway, local traffic will need to be encouraged to use Clayton Street or Morrison Road, via Lloyd Street or Roe Highway, rather than Great Eastern Highway. This is considered achievable due to the relatively low demands for through traffic travelling from the east, but will require improvements at the Lloyd Street / Great Eastern Highway intersection to promote turning traffic from Great Eastern Highway east, as well as replacement signage to reinforce the desired use. Recommendations for intersection improvements are included in **Section** 8.

The existing intersection geometry is shown in **Figure 19**.

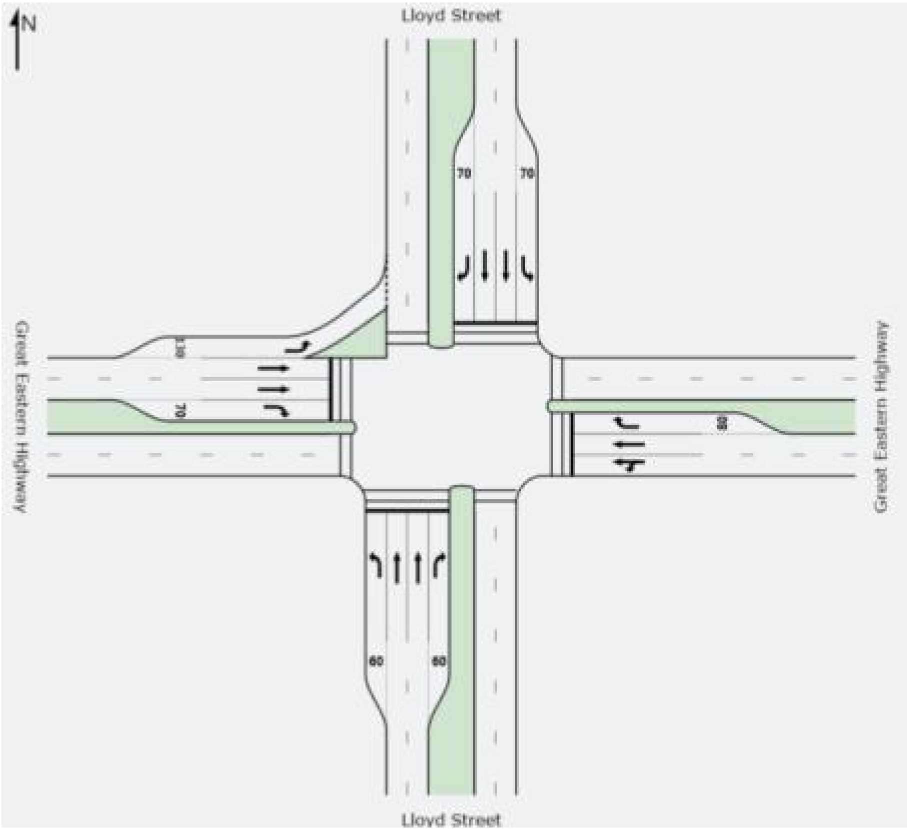


Figure 19 Lloyd Street / Great Eastern Highway – Existing Geometry

Table 21 and **Table 22** show the results of SIDRA analysis for the existing intersection geometry under the 2031 background plus full development scenario, for the AM and PM Peak respectively.

Table 21 SIDRA Analysis for Lloyd Street / Great Eastern Highway - Existing Geometry (2031 Background + Ultimate Development) AM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Lloyd Street											
1	L	305	5.0	1.000	[3]52.4	LOS D	15.5	97.9	1.00	0.85	24.6
2	T	989	5.0	1.056	157.5	LOS F	49.9	314.2	1.00	0.61	14.7
3	R	232	5.0	1.000	[3]67.6	LOS E	15.5	97.9	0.98	0.83	21.1
Approach		1526	5.0	1.056	122.8	LOS F	72.5	456.6	1.00	0.69	18.1
East: Great Eastern Highway											
4	L	587	5.0	1.067	228.8	LOS F	88.6	558.1	1.00	1.37	8.2
5	T	486	5.0	0.845	57.7	LOS E	35.4	223.2	1.00	0.95	22.2
6	R	334	5.0	1.000	[3]59.9	LOS E	20.7	130.6	1.00	0.86	22.8
Approach		1407	5.0	1.067	129.6	LOS F	88.6	558.1	1.00	1.10	13.1
North: Lloyd Street											
7	L	144	5.0	0.479	50.1	LOS D	7.9	49.5	0.80	0.78	25.2
8	T	580	5.0	0.970	108.7	LOS F	28.8	181.3	1.00	1.23	14.6
9	R	179	5.0	1.000	[3]131.1	LOS F	18.1	114.2	1.00	1.16	13.1
Approach		903	5.0	1.000	103.8	LOS F	28.8	181.3	0.97	1.15	15.3
West: Great Eastern Highway											
10	L	246	5.0	0.363	20.8	LOS C	7.9	49.5	0.52	0.73	38.4
11	T	420	5.0	0.685	64.4	LOS E	15.1	94.9	1.00	0.83	20.6
12	R	252	5.0	1.000	[3]74.1	LOS E	18.1	114.2	1.00	0.84	19.9
Approach		918	5.0	1.000	55.4	LOS E	18.1	114.2	0.87	0.81	23.3
All Vehicles		4754	5.0	1.067	108.2	LOS F	88.6	558.1	0.97	0.92	16.2

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

Table 22 SIDRA Analysis for Lloyd Street / Great Eastern Highway - Existing Geometry (2031 Background + Ultimate Development) PM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Lloyd Street											
1	L	387	5.0	1.000	[3] 40.9	LOS D	15.5	97.9	1.00	0.86	28.3
2	T	941	5.0	1.092	246.3	LOS F	68.9	434.0	1.00	1.91	7.6
3	R	296	5.0	1.000	[3] 61.3	LOS E	17.1	107.9	1.00	0.84	22.5
Approach		1624	5.0	1.092	163.6	LOS F	68.9	434.0	1.00	1.46	10.7
East: Great Eastern Highway											
4	L	438	5.0	1.080	235.8	LOS F	60.2	379.0	1.00	1.56	8.0
5	T	381	5.0	0.896	60.6	LOS E	24.8	156.1	1.00	1.07	21.6
6	R	372	5.0	1.000	[3] 55.5	LOS E	20.7	130.6	1.00	0.86	23.9
Approach		1191	5.0	1.080	123.4	LOS F	60.2	379.0	1.00	1.18	13.6
North: Lloyd Street											
7	L	189	5.0	0.563	50.3	LOS D	9.3	58.5	0.91	0.81	25.2
8	T	671	5.0	0.987	103.6	LOS F	29.5	185.6	1.00	1.37	15.1
9	R	203	5.0	1.000	[3] 123.5	LOS F	18.0	113.7	1.00	1.34	13.7
Approach		1063	5.0	1.000	97.9	LOS F	29.5	185.6	0.98	1.26	15.9
West: Great Eastern Highway											
10	L	371	5.0	0.412	23.4	LOS C	11.7	74.0	0.67	0.78	36.7
11	T	699	5.0	0.919	60.0	LOS E	20.1	126.5	1.00	0.47	23.6
12	R	331	5.0	1.000	[3] 55.2	LOS E	18.1	114.2	1.00	0.85	24.0
Approach		1401	5.0	1.000	49.2	LOS D	24.7	155.5	0.91	0.64	27.2
All Vehicles		5279	5.0	1.092	111.0	LOS F	68.9	434.0	0.97	1.14	14.3

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

As expected, these results show that the existing intersection form is insufficient to accommodate the increase in regional background and local trips and will therefore require upgrade. This intersection has been identified as a *Critical Intersection* with proposed mitigation and upgrade measures discussed further in **Section** 8**.**

Lloyd Street / Clayton Street

Clayton Street is currently a primary access to the commercial/industrial precinct to the south-east of Midland, largely due to the direct access provided from Roe Highway. Future development of the MRA area, including the Midland Health Campus and Midland Workshops is likely to increase demand for traffic along this corridor.

Currently, Clayton Street near Midland is not constructed to a level consistent with the anticipated traffic volume. Upgrade of both the Clayton Street intersection and the general cross-section will be necessary to accommodate this demand. This will require some significant changes to the road environment, which are currently being planned and implemented by the MRA. For the purpose of this Transport Assessment, recommendations for intersection improvements are included in **Section** 8.

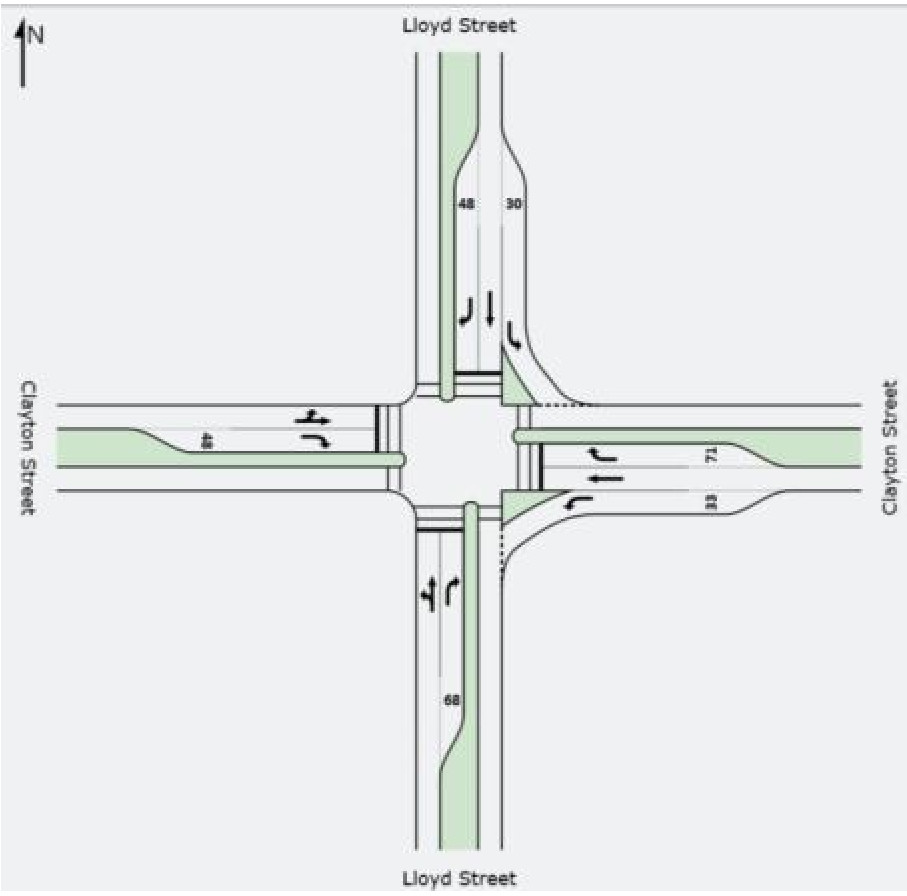


Figure 20 Lloyd Street / Clayton Street – Existing Geometry

Table 23 and **Table 24** show the results of SIDRA analysis for the existing intersection geometry under the 2031 background plus full development scenario, for the AM and PM Peak respectively.

Table 23 SIDRA Analysis for Lloyd Street / Clayton Street - Existing Geometry (2031 Background + Ultimate Development) AM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Lloyd Street											
1	L	7	5.0	0.664	59.6	LOS E	22.6	142.6	0.94	0.88	23.8
2	T	344	5.0	0.664	51.2	LOS D	22.6	142.6	0.94	0.82	24.0
3	R	37	5.0	0.516	89.9	LOS F	2.9	18.0	1.00	0.73	17.3
Approach		388	5.0	0.664	55.0	LOS E	22.6	142.6	0.95	0.81	23.1
East: Clayton Street											
4	L	32	0.0	0.055	9.1	LOS A	0.3	1.9	0.18	0.63	48.0
5	T	965	0.0	1.441	872.8	LOS F	324.1	1944.6	1.00	3.71	2.4
6	R	335	0.0	1.000	[3] 57.0	LOS E	19.3	115.9	1.00	0.86	23.4
Approach		1332	0.0	1.441	647.1	LOS F	324.1	1944.6	0.98	2.92	3.2
North: Lloyd Street											
7	L	423	5.0	1.000	[3] 15.3	LOS B	7.8	49.1	0.61	0.76	42.4
8	T	705	5.0	1.380	766.5	LOS F	218.6	1377.1	1.00	2.91	2.7
9	R	79	5.0	1.095	280.0	LOS F	12.4	78.2	1.00	1.37	6.9
Approach		1206	5.0	1.380	471.3	LOS F	218.6	1377.1	0.86	2.06	4.3
West: Clayton Street											
10	L	100	0.0	1.456	913.9	LOS F	164.5	986.9	1.00	3.45	2.3
11	T	387	0.0	1.456	905.7	LOS F	164.5	986.9	1.00	3.45	2.3
12	R	15	0.0	0.077	63.3	LOS E	0.9	5.4	0.86	0.70	21.9
Approach		502	0.0	1.456	882.2	LOS F	164.5	986.9	1.00	3.36	2.4
All Vehicles		3428	2.3	1.456	552.7	LOS F	324.1	1944.6	0.94	2.44	3.7

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

Table 24 SIDRA Analysis for Lloyd Street / Clayton Street - Existing Geometry (2031 Background + Ultimate Development) PM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Lloyd Street											
1	L	5	5.0	0.537	51.6	LOS D	19.9	125.3	0.87	0.90	25.9
2	T	333	5.0	0.537	43.3	LOS D	19.9	125.3	0.87	0.75	26.4
3	R	57	5.0	0.795	94.2	LOS F	4.6	28.9	1.00	0.86	16.8
Approach		395	5.0	0.795	50.7	LOS D	19.9	125.3	0.89	0.77	24.3
East: Clayton Street											
4	L	21	0.0	0.030	8.4	LOS A	0.1	0.8	0.14	0.62	48.8
5	T	612	0.0	1.713	1368.0	LOS F	257.7	1546.1	1.00	4.32	1.5
6	R	274	0.0	1.000	[3] 71.3	LOS E	19.3	115.9	1.00	0.84	20.3
Approach		907	0.0	1.713	945.0	LOS F	257.7	1546.1	0.98	3.18	2.2
North: Lloyd Street											
7	L	308	5.0	1.000	[3] 18.5	LOS B	7.8	49.1	0.57	0.74	40.0
8	T	1050	5.0	1.741	1415.9	LOS F	453.2	2855.5	1.00	3.80	1.5
9	R	79	5.0	1.095	280.0	LOS F	12.4	78.3	1.00	1.37	6.9
Approach		1436	5.0	1.741	1054.2	LOS F	453.2	2855.5	0.91	3.01	2.0
West: Clayton Street											
10	L	232	0.0	1.765	1467.4	LOS F	415.7	2494.0	1.00	4.67	1.4
11	T	720	0.0	1.765	1459.2	LOS F	415.7	2494.0	1.00	4.67	1.5
12	R	27	0.0	0.121	49.8	LOS D	1.4	8.5	0.76	0.71	25.3
Approach		979	0.0	1.765	1422.3	LOS F	415.7	2494.0	0.99	4.56	1.5
All Vehicles		3717	2.5	1.765	1017.9	LOS F	453.2	2855.5	0.95	3.22	2.1

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

These results show that the existing intersection form is insufficient to accommodate the increase in regional background and local trips and will therefore require upgrade. This intersection has been identified as a *Critical Intersection* with proposed mitigation and upgrade measures discussed further in **Section** 8**.**

8 Critical Intersections

8.1 Mitigation Measures

Mitigation measures are proposed for each *Critical Intersection* to reduce the operational delays to a sustainable level. Note that peak demands below practical capacity were assumed to be acceptable for the majority of turning movements.

Generally, mitigation measures were limited to turning pocket extensions, minor signal timing changes and the introduction of pedestrian filters. The high volume of right-turning movements was addressed by allowing right-turning traffic to share the adjacent through lane in some locations. This scenario is generally consistent with the scale of these intersections, but restricts the flexibility of signal phasing outside of peak periods.

Intersection upgrades were shown to be necessary at Morrison Road / Lloyd Street and Morrison Road / Keane Street as a result of the significant additional regional traffic utilising the Morrison Road route and local traffic accessing car parking via Morrison Road.

Changes to the Lloyd Street / Clayton Street intersection reflect the impact of MRA development and the generally low level of existing infrastructure.

Morrison Road / Keane Street / Great Northern Highway

Changes to this intersection have been reduced as a result of relocating direct access to the Midland Oval Car Park to Morrison Road. This splits the traffic between two parallel streets and reduces the anticipated demand to a sustainable level. As a result, Keane Street can be retained as a two-lane boulevard with an intersection form as shown in **Figure 21**. This requires the following:

> Installation of left-turning pockets and slip lanes at all approaches;
> Extension of the Morrison Road east right-turning pocket and modification of through lane to a combined through/right-turn lane;
> Extension of the Great Northern Highway right-turning pocket;
> Provision of protected pedestrian facilities across the west, south and east approaches; and
> Modification of signal phasing including pedestrian phasing.

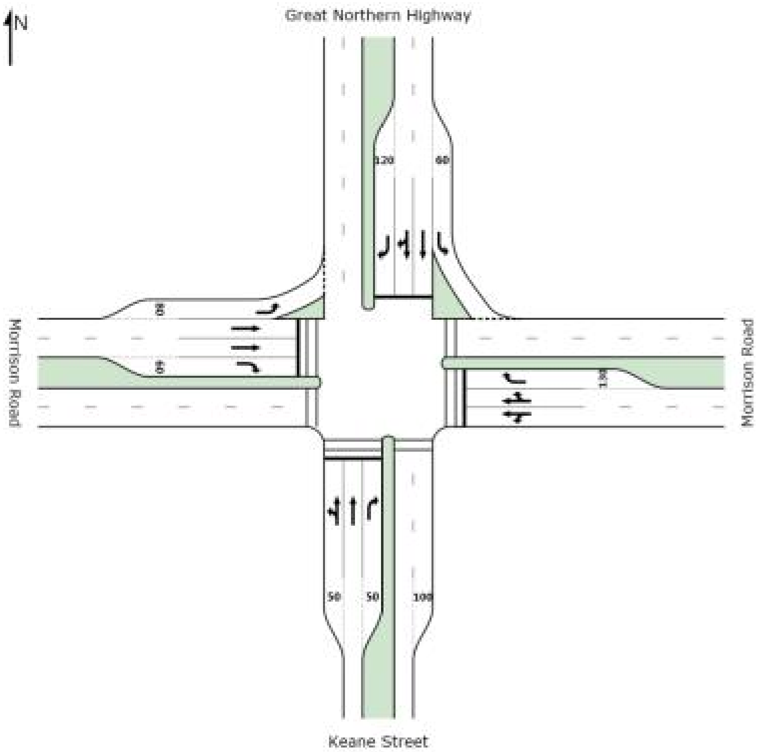


Figure 21 Morrison Road / Keane Street Great Northern Highway – Mitigated Geometry

Table 25 and **Table 26** show the results of SIDRA analysis for the existing intersection geometry under the 2031 background plus full development scenario, for the AM and PM Peak respectively.

Table 25 SIDRA Analysis for Morrison Road / Keane Street / Great Northern Highway - Mitigated Geometry (2031 Background + Ultimate Development) AM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Keane Street											
1	L	52	0.0	0.433	41.0	LOS D	5.3	31.8	0.88	0.80	26.5
2	T	269	0.0	0.433	34.5	LOS C	7.6	45.4	0.90	0.73	26.7
3	R	84	0.0	0.274	40.8	LOS D	3.3	19.6	0.87	0.76	26.2
Approach		405	0.0	0.433	36.7	LOS D	7.6	45.4	0.89	0.75	26.6
East: Morrison Road											
4	L	44	0.0	0.478	42.0	LOS D	8.3	51.9	0.91	0.84	28.1
5	T	160	5.0	0.478	34.6	LOS C	8.3	51.9	0.91	0.76	29.0
6	R	397	5.0	0.526	44.7	LOS D	8.4	52.7	0.94	0.81	27.1
Approach		601	4.6	0.526	41.8	LOS D	8.4	52.7	0.93	0.80	27.6
North: Great Northern Highway											
7	L	501	5.0	0.502	9.4	LOS A	4.5	28.4	0.30	0.69	47.8
8	T	341	0.0	0.495	36.0	LOS D	8.8	52.8	0.91	0.75	28.6
9	R	333	5.0	0.882	59.2	LOS E	18.0	113.3	1.00	1.02	23.0
Approach		1175	3.5	0.882	31.2	LOS C	18.0	113.3	0.68	0.80	31.9
West: Morrison Road											
10	L	291	5.0	0.334	11.3	LOS B	3.8	23.9	0.38	0.70	45.9
11	T	190	5.0	0.478	45.2	LOS D	4.4	27.4	0.98	0.77	25.7
12	R	154	0.0	0.875	63.3	LOS E	8.3	49.5	1.00	1.01	21.1
Approach		635	3.8	0.875	34.1	LOS C	8.3	49.5	0.71	0.79	30.4
All Vehicles		2816	3.3	0.882	34.9	LOS C	18.0	113.3	0.77	0.79	29.7

Table 26 SIDRA Analysis for Morrison Road / Keane Street / Great Northern Highway - Mitigated Geometry (2031 Background + Ultimate Development) PM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Keane Street											
1	L	101	0.0	0.462	41.0	LOS D	5.7	34.2	0.85	0.79	26.3
2	T	269	0.0	0.462	35.4	LOS D	10.1	60.5	0.89	0.74	26.5
3	R	84	0.0	0.294	43.3	LOS D	3.5	21.3	0.86	0.76	25.5
Approach		454	0.0	0.462	38.1	LOS D	10.1	60.5	0.87	0.75	26.2
East: Morrison Road											
4	L	49	0.0	0.780	52.9	LOS D	16.2	101.4	1.00	0.92	24.7
5	T	264	5.0	0.780	45.5	LOS D	16.2	101.4	1.00	0.92	25.3
6	R	699	5.0	0.930	74.5	LOS E	23.0	144.9	1.00	1.10	19.8
Approach		1012	4.8	0.930	65.9	LOS E	23.0	144.9	1.00	1.04	21.2
North: Great Northern Highway											
7	L	437	5.0	0.489	9.9	LOS A	4.8	30.5	0.31	0.69	47.2
8	T	333	0.0	0.942	43.9	LOS D	12.7	76.2	0.93	0.83	25.7
9	R	397	5.0	0.942	78.7	LOS E	25.3	159.4	1.00	1.12	19.1
Approach		1167	3.6	0.942	43.0	LOS D	25.3	159.4	0.72	0.88	27.2
West: Morrison Road											
10	L	514	5.0	0.745	18.3	LOS B	13.4	84.4	0.62	0.78	40.2
11	T	297	5.0	0.917	67.2	LOS E	9.2	57.8	1.00	1.08	20.4
12	R	136	0.0	0.854	67.3	LOS E	7.8	47.1	1.00	0.97	20.3
Approach		947	4.3	0.917	40.7	LOS D	13.4	84.4	0.79	0.90	27.9
All Vehicles		3580	3.6	0.942	48.2	LOS D	25.3	159.4	0.84	0.92	25.2

The results of assessment for this revised geometry show that the intersection will operate acceptably during the weekday peak periods. Queue lengths along Keane Street are maintained at a sustainable level that should minimise impact on nearby access locations and the heavy right turn from Morrison Road east towards Great Northern Highway is accommodated by modifying both the signal phasing and turning geometry.

Lloyd Street / Morrison Road

Changes to this intersection are generally fairly minimal due to the high capacity intersection form already constructed in this location. The mitigation measures recommended for this intersection are shown **Figure 22**. This requires the following:

> Extension of left- and right-turning pockets at all approaches;
> Modification of through lane on north, south and west approaches to a combined through/right-turn lane; and
> Modification of signal phasing

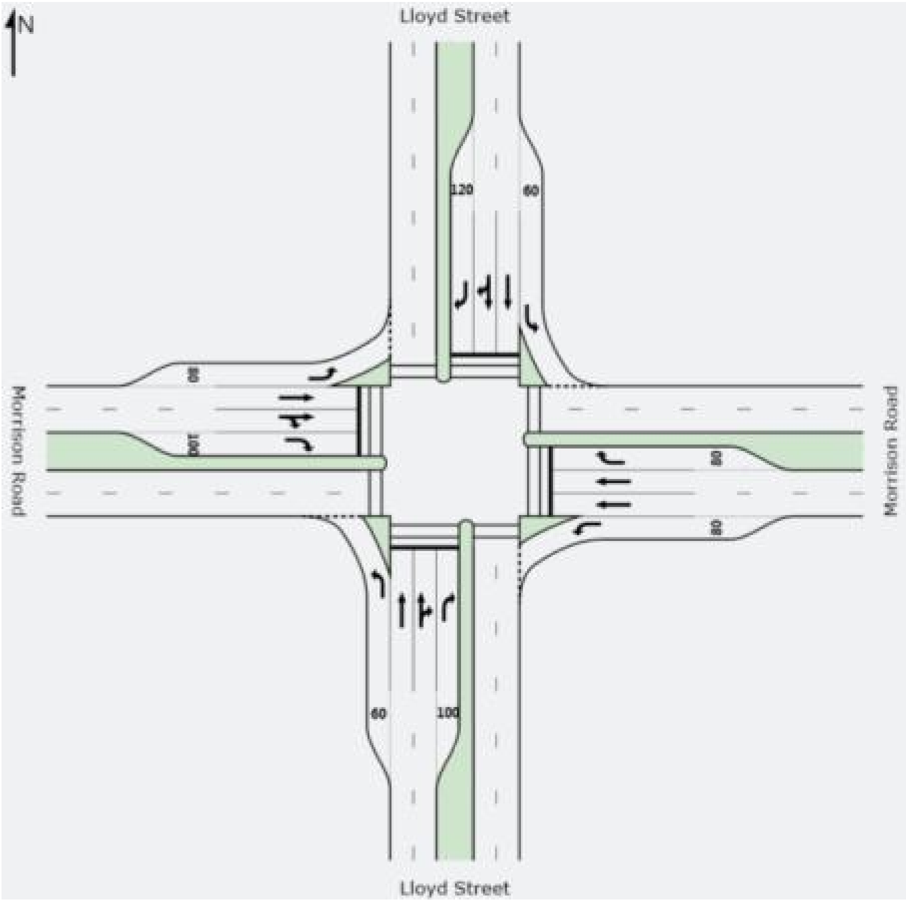


Figure 22 Lloyd Street / Morrison Road – Mitigated Geometry

Table 27 and **Table 28** show the results of SIDRA analysis for the existing intersection geometry under the 2031 background plus full development scenario, for the AM and PM Peak respectively.

Table 27 SIDRA Analysis for Lloyd Street / Morrison Road - Mitigated Geometry (2031 Background + Ultimate Development) AM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Lloyd Street											
1	L	78	5.0	0.113	11.7	LOS B	1.0	6.5	0.35	0.67	45.6
2	T	349	5.0	0.496	38.2	LOS D	8.6	54.3	0.93	0.77	27.9
3	R	229	5.0	0.496	46.2	LOS D	8.5	53.7	0.93	0.81	26.7
Approach		656	5.0	0.496	37.9	LOS D	8.6	54.3	0.86	0.77	28.8
East: Morrison Road											
4	L	536	5.0	0.540	13.0	LOS B	10.2	64.4	0.49	0.74	44.3
5	T	250	5.0	0.315	36.5	LOS D	5.2	33.0	0.89	0.71	28.7
6	R	173	5.0	0.804	60.4	LOS E	9.1	57.5	1.00	0.93	22.7
Approach		959	5.0	0.804	27.7	LOS C	10.2	64.4	0.69	0.77	33.8
North: Lloyd Street											
7	L	176	5.0	0.213	10.1	LOS B	1.8	11.4	0.30	0.67	47.1
8	T	511	5.0	0.765	42.6	LOS D	15.5	97.6	1.00	0.91	26.3
9	R	420	5.0	0.765	50.8	LOS D	15.2	95.8	1.00	0.90	25.4
Approach		1107	5.0	0.765	40.5	LOS D	15.5	97.6	0.89	0.87	27.9
West: Morrison Road											
10	L	286	5.0	0.341	11.7	LOS B	4.1	25.6	0.39	0.70	45.5
11	T	102	5.0	0.257	36.0	LOS D	4.2	26.5	0.88	0.69	28.9
12	R	145	5.0	0.337	53.1	LOS D	3.4	21.2	0.96	0.76	24.5
Approach		533	5.0	0.341	27.6	LOS C	4.2	26.5	0.64	0.72	34.0
All Vehicles		3255	5.0	0.804	34.1	LOS C	15.5	97.6	0.78	0.79	30.5

Table 28 SIDRA Analysis for Lloyd Street / Morrison Road - Mitigated Geometry (2031 Background + Ultimate Development) PM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Lloyd Street											
1	L	133	5.0	0.210	13.0	LOS B	2.2	13.7	0.39	0.68	44.4
2	T	583	5.0	0.811	49.9	LOS D	17.8	112.3	1.00	0.94	24.2
3	R	359	5.0	0.811	58.1	LOS E	17.7	111.4	1.00	0.93	23.3
Approach		1075	5.0	0.811	48.1	LOS D	17.8	112.3	0.92	0.91	25.3
East: Morrison Road											
4	L	424	5.0	0.504	17.1	LOS B	10.8	67.8	0.56	0.75	41.0
5	T	282	5.0	0.391	42.5	LOS D	6.7	42.3	0.92	0.74	26.6
6	R	248	5.0	0.801	60.4	LOS E	13.9	87.9	1.00	0.92	22.7
Approach		954	5.0	0.801	35.9	LOS D	13.9	87.9	0.78	0.79	29.9
North: Lloyd Street											
7	L	194	5.0	0.281	11.9	LOS B	2.9	18.1	0.36	0.68	45.4
8	T	498	5.0	0.808	49.0	LOS D	18.4	116.0	1.00	0.94	24.4
9	R	476	5.0	0.808	57.2	LOS E	18.0	113.3	1.00	0.93	23.6
Approach		1168	5.0	0.808	46.2	LOS D	18.4	116.0	0.89	0.89	26.1
West: Morrison Road											
10	L	405	5.0	0.600	17.2	LOS B	9.8	62.0	0.56	0.75	40.9
11	T	173	5.0	0.252	42.1	LOS D	4.0	25.4	0.90	0.70	26.7
12	R	220	5.0	0.750	58.8	LOS E	12.0	75.6	1.00	0.88	23.1
Approach		798	5.0	0.750	34.1	LOS C	12.0	75.6	0.76	0.78	30.8
All Vehicles		3995	5.0	0.811	41.8	LOS D	18.4	116.0	0.85	0.85	27.6

The results of assessment for this revised geometry show that the intersection will operate acceptably during the weekday peak periods. Queue lengths for all turning movements are maintained at a sustainable level that should minimise impact on nearby access locations and the heavy right turns from Lloyd Street north and Morrison Road west are accommodated by modifying both the signal phasing and turning geometry.

Great Eastern Highway / Lloyd Street

Due to the reallocation of local traffic to Morrison Road, resulting in the reduction of traffic at this location, changes to this intersection are generally fairly minimal. The mitigation measures recommended for this intersection are shown **Figure 23**. This requires the following:

> Construction of a left-turning pocket on the Great Eastern Highway east approach;
> Installation of left-turning slip lanes at the north, east and south approaches;
> Extension of the Great Eastern Highway east right-turning pocket and modification of one through lane to a combined through/right-turn lane for each approach;
> Extension of Lloyd Street turning pockets; and
> Modification of signal phasing.

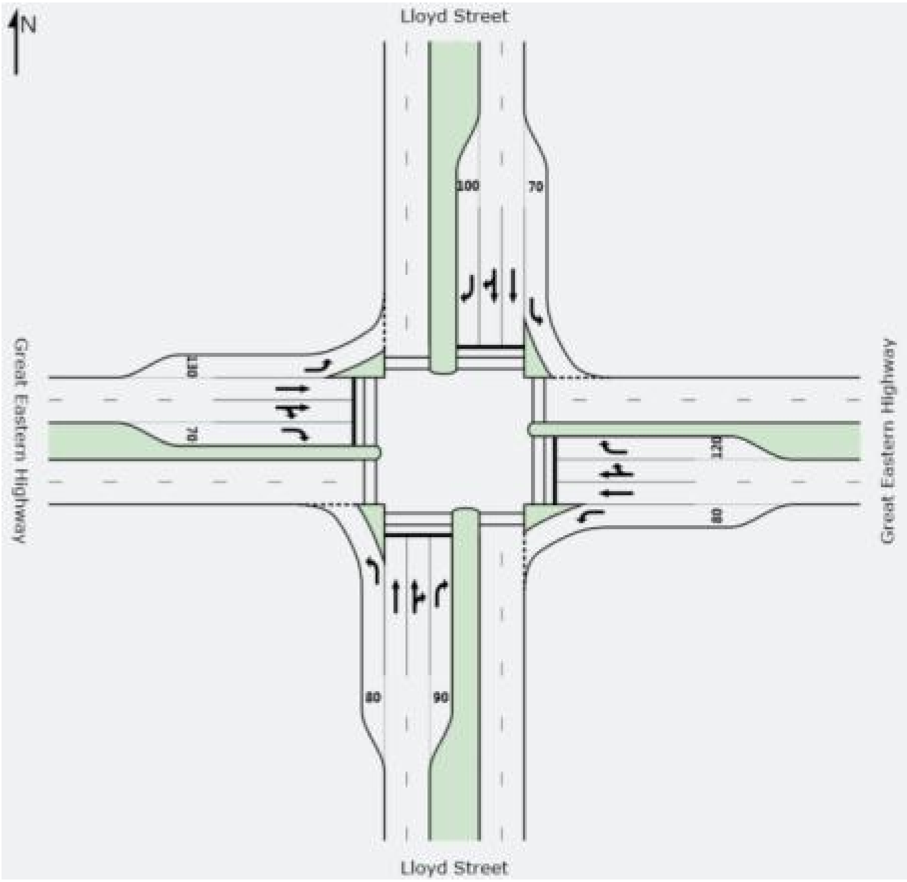


Figure 23 Great Eastern Highway / Lloyd Street – Mitigated Geometry

Table 29 and **Table 30** show the results of SIDRA analysis for the existing intersection geometry under the 2031 background plus full development scenario, for the AM and PM Peak respectively.

Table 29 SIDRA Analysis for Great Eastern Highway / Lloyd Street - Mitigated Geometry (2031 Background + Ultimate Development) AM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Lloyd Street											
1	L	810	5.0	0.894	22.6	LOS C	20.7	130.6	0.77	0.92	37.3
2	T	339	5.0	0.812	43.2	LOS D	16.5	103.8	1.00	0.95	26.3
3	R	377	5.0	0.832	59.1	LOS E	9.7	61.0	1.00	0.97	23.0
Approach		1526	5.0	0.894	36.2	LOS D	20.7	130.6	0.88	0.94	29.9
East: Great Eastern Highway											
4	L	587	5.0	0.804	22.3	LOS C	17.0	107.2	0.67	0.83	37.5
5	T	418	5.0	0.771	40.9	LOS D	15.7	98.7	1.00	0.91	26.8
6	R	402	5.0	0.771	52.5	LOS D	12.0	75.5	1.00	0.91	24.8
Approach		1407	5.0	0.804	36.5	LOS D	17.0	107.2	0.86	0.88	29.7
North: Lloyd Street											
7	L	144	5.0	0.188	11.8	LOS B	1.9	12.1	0.38	0.68	45.4
8	T	456	5.0	0.833	45.9	LOS D	17.3	109.1	1.00	0.98	25.3
9	R	303	5.0	0.833	58.6	LOS E	11.4	71.5	1.00	0.97	23.3
Approach		903	5.0	0.833	44.8	LOS D	17.3	109.1	0.90	0.93	26.4
West: Great Eastern Highway											
10	L	246	5.0	0.239	15.2	LOS B	4.6	29.3	0.51	0.73	42.5
11	T	218	5.0	0.498	34.7	LOS C	8.9	56.3	0.92	0.76	29.4
12	R	454	5.0	0.752	52.2	LOS D	10.8	68.1	1.00	0.89	24.8
Approach		918	5.0	0.752	38.1	LOS D	10.8	68.1	0.85	0.82	29.2
All Vehicles		4754	5.0	0.894	38.3	LOS D	20.7	130.6	0.87	0.90	29.0

Table 30 SIDRA Analysis for Great Eastern Highway / Lloyd Street - Mitigated Geometry (2031 Background + Ultimate Development) PM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Lloyd Street											
1	L	780	5.0	0.889	22.1	LOS C	20.7	130.6	0.74	0.90	37.6
2	T	414	5.0	0.896	58.4	LOS E	20.4	128.3	1.00	1.07	22.1
3	R	430	5.0	0.896	68.8	LOS E	15.8	99.3	1.00	1.06	21.0
Approach		1624	5.0	0.896	43.7	LOS D	20.7	130.6	0.88	0.99	27.1
East: Great Eastern Highway											
4	L	438	5.0	0.688	20.5	LOS C	12.2	76.8	0.66	0.78	38.5
5	T	351	5.0	0.734	44.5	LOS D	14.6	91.7	0.99	0.88	25.7
6	R	402	5.0	0.734	55.1	LOS E	12.1	76.5	1.00	0.88	24.1
Approach		1191	5.0	0.734	39.3	LOS D	14.6	91.7	0.87	0.84	28.6
North: Lloyd Street											
7	L	189	5.0	0.309	15.9	LOS B	3.9	24.5	0.49	0.71	41.9
8	T	488	5.0	0.909	61.1	LOS E	21.2	133.8	1.00	1.11	21.5
9	R	386	5.0	0.909	71.1	LOS E	17.5	110.3	1.00	1.08	20.6
Approach		1063	5.0	0.909	56.7	LOS E	21.2	133.8	0.91	1.03	23.1
West: Great Eastern Highway											
10	L	371	5.0	0.349	16.4	LOS B	8.3	52.3	0.54	0.74	41.5
11	T	341	5.0	0.729	40.7	LOS D	16.6	104.6	0.98	0.86	27.1
12	R	689	5.0	0.917	62.5	LOS E	21.9	137.7	1.00	0.98	22.2
Approach		1401	5.0	0.917	45.0	LOS D	21.9	137.7	0.87	0.89	26.7
All Vehicles		5279	5.0	0.917	45.7	LOS D	21.9	137.7	0.88	0.94	26.4

The results of assessment for this revised geometry show that the intersection will operate acceptably during the weekday peak periods. Queue lengths for all turning movements are maintained at a sustainable level that should minimise impact on nearby access locations. The advantage of this modification is that the propose mitigation measures require little resumption of adjacent land (predominantly on the eastern side of Lloyd Street), to achieve significant improvement over the existing (2011) performance.

Lloyd Street / Clayton Street

The strategic importance of Clayton Street east of Lloyd Street, as well as Lloyd Street itself results a requirement for significant modifications to the associated intersection. The geometric form of the proposed intersection has been tested using SIDRA, with a suitable solution shown **Figure 24**. Of particular importance is the disproportionately high movement from Lloyd Street north to Clayton Street east, resulting from the use of Clayton Street as a regional link to Roe Highway. As a result of this, a continuous slip lane is proposed for left-turning traffic into Clayton Street east, mirroring a dual right-turn into Lloyd Street.

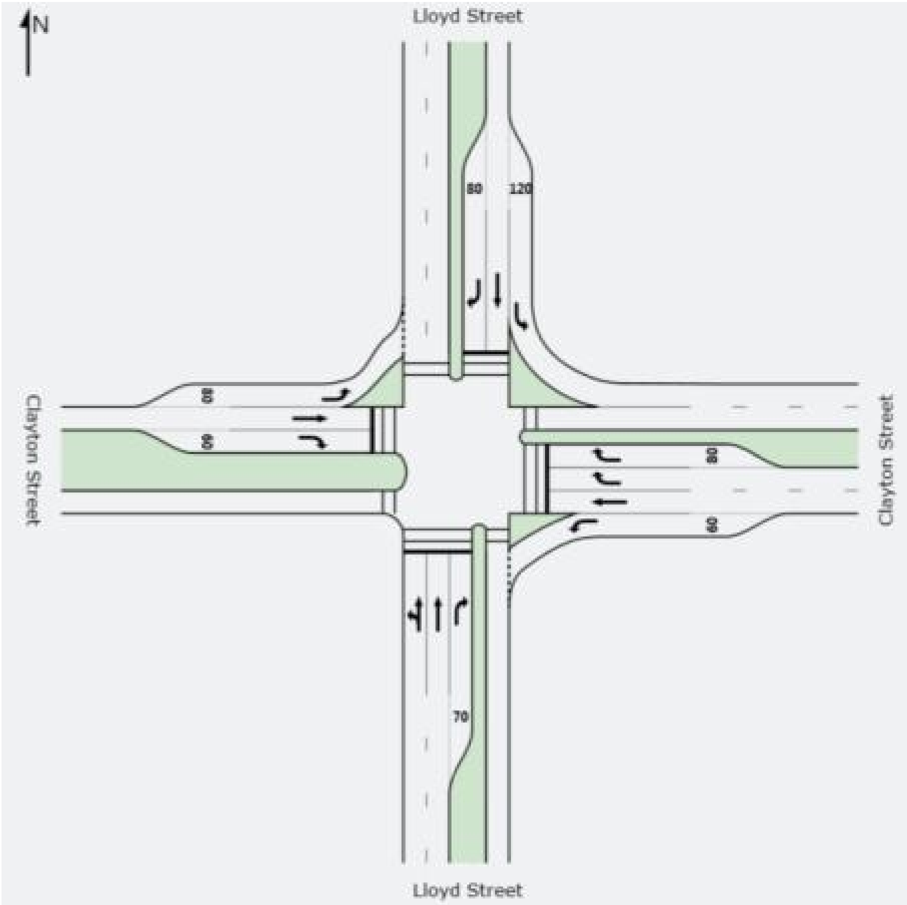


Figure 24 Lloyd Street / Clayton Street – Mitigated Geometry

Table 31 SIDRA Analysis for Lloyd Street / Clayton Street - Mitigated Geometry (2031 Background + Ultimate Development) AM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Lloyd Street											
1	L	7	5.0	0.606	78.9	LOS E	12.1	76.1	0.99	0.84	19.6
2	T	344	5.0	0.606	67.5	LOS E	12.1	76.5	0.99	0.82	20.3
3	R	37	5.0	0.146	66.2	LOS E	2.3	14.7	0.89	0.73	21.4
Approach		388	5.0	0.606	67.6	LOS E	12.1	76.5	0.98	0.81	20.4
East: Clayton Street											
4	L	32	0.0	0.041	9.6	LOS A	0.4	2.1	0.21	0.63	47.5
5	T	787	0.0	1.030	140.3	LOS F	84.3	505.7	0.96	1.39	12.1
6	R	513	0.0	0.454	30.1	LOS C	11.6	69.9	0.79	0.80	32.9
Approach		1332	0.0	1.030	94.7	LOS F	84.3	505.7	0.88	1.15	16.4
North: Lloyd Street											
7	L	674	5.0	0.376	7.8	X	X	X	X	0.60	49.7
8	T	245	5.0	0.558	54.5	LOS D	15.8	99.6	0.94	0.79	23.1
9	R	287	5.0	1.000	[3] 77.1	LOS E	21.4	134.7	1.00	0.85	19.4
Approach		1206	5.0	1.000	33.8	LOS C	21.4	134.7	0.43	0.70	31.0
West: Clayton Street											
10	L	100	0.0	0.151	12.9	LOS B	1.9	11.4	0.33	0.67	44.4
11	T	387	0.0	0.827	76.2	LOS E	14.9	89.6	1.00	0.93	18.8
12	R	15	0.0	0.067	71.3	LOS E	1.0	5.9	0.92	0.70	20.3
Approach		502	0.0	0.827	63.4	LOS E	14.9	89.6	0.86	0.87	21.3
All Vehicles		3428	2.3	1.030	65.6	LOS E	84.3	505.7	0.73	0.91	21.1

X: Not applicable for Continuous movement.

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

Table 32 SIDRA Analysis for Lloyd Street / Clayton Street - Mitigated Geometry (2031 Background + Ultimate Development) PM Peak

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Lloyd Street											
1	L	5	5.0	0.467	59.8	LOS E	8.8	55.7	0.94	0.85	23.7
2	T	333	5.0	0.467	49.1	LOS D	8.9	56.0	0.94	0.77	24.6
3	R	57	5.0	0.293	62.7	LOS E	3.2	20.0	0.96	0.75	22.2
Approach		395	5.0	0.467	51.2	LOS D	8.9	56.0	0.94	0.77	24.2
East: Clayton Street											
4	L	21	0.0	0.022	8.7	LOS A	0.2	0.9	0.18	0.63	48.4
5	T	387	0.0	0.863	57.0	LOS E	20.6	123.6	0.98	0.94	22.5
6	R	499	0.0	0.556	31.5	LOS C	8.0	48.1	0.93	0.82	32.2
Approach		907	0.0	0.863	41.8	LOS D	20.6	123.6	0.93	0.87	27.4
North: Lloyd Street											
7	L	1096	5.0	0.611	7.8	X	X	X	X	0.60	49.6
8	T	172	5.0	0.312	35.6	LOS D	7.8	49.3	0.82	0.68	29.2
9	R	168	5.0	0.865	75.0	LOS E	11.0	69.4	1.00	0.98	19.7
Approach		1436	5.0	0.865	19.0	LOS B	11.0	69.4	0.22	0.65	39.4
West: Clayton Street											
10	L	232	0.0	0.303	12.2	LOS B	3.8	23.1	0.37	0.69	45.0
11	T	720	0.0	0.886	61.6	LOS E	23.8	142.5	1.00	1.04	21.5
12	R	27	0.0	0.091	49.0	LOS D	1.3	7.6	0.83	0.72	25.6
Approach		979	0.0	0.886	49.5	LOS D	23.8	142.5	0.84	0.95	24.7
All Vehicles		3717	2.5	0.886	36.0	LOS D	23.8	142.5	0.63	0.80	29.6

X: Not applicable for Continuous movement.

The results of assessment for this revised geometry show that the intersection will operate acceptably during the weekday peak periods.

9 Pedestrians and Cyclists

9.1 Pedestrian Focus

Pedestrian activity and connections are critical factors in the effectiveness and vitality of an Activity Centre. For this reason, the pedestrian environment must be carefully considered, particularly along primary pedestrian desirelines. This includes construction of high quality paths, shade trees and street furniture to provide amenity. By allocating suitable resources to the pedestrian environment, the use of pedestrian modes will grow, reducing the demand for other modes as well as the requirement for parking.

Parking location is key to determining both traffic and pedestrian movement. The location of car parking towards the periphery limits the impact of parking on trip volumes and land consumption, but requires parkers to travel an additional distance to their destination. The demand for peripheral car parking will be significantly improved where attractive pedestrian facilities are provided.

A Level of Service approach has been considered, which considers the quality of the pedestrian experience across the length of the trip. Therefore, higher-traffic areas with a high concentration of pedestrians require good quality, legible, covered and shaded paths, but so do paths which connect areas of high demand across relatively long distances, approaching or exceeding the nominal 400m or 800m walkable catchment.

9.2 Activated Core

A desire line analysis has been undertaken for the proposed Activity Centre. This primarily consists of pedestrian routes from major transport nodes (i.e. Midland Station and large-scale public/private car parking) to commercial and retail activity in the Activated Core. **Figure 25** shows the results of this analysis.

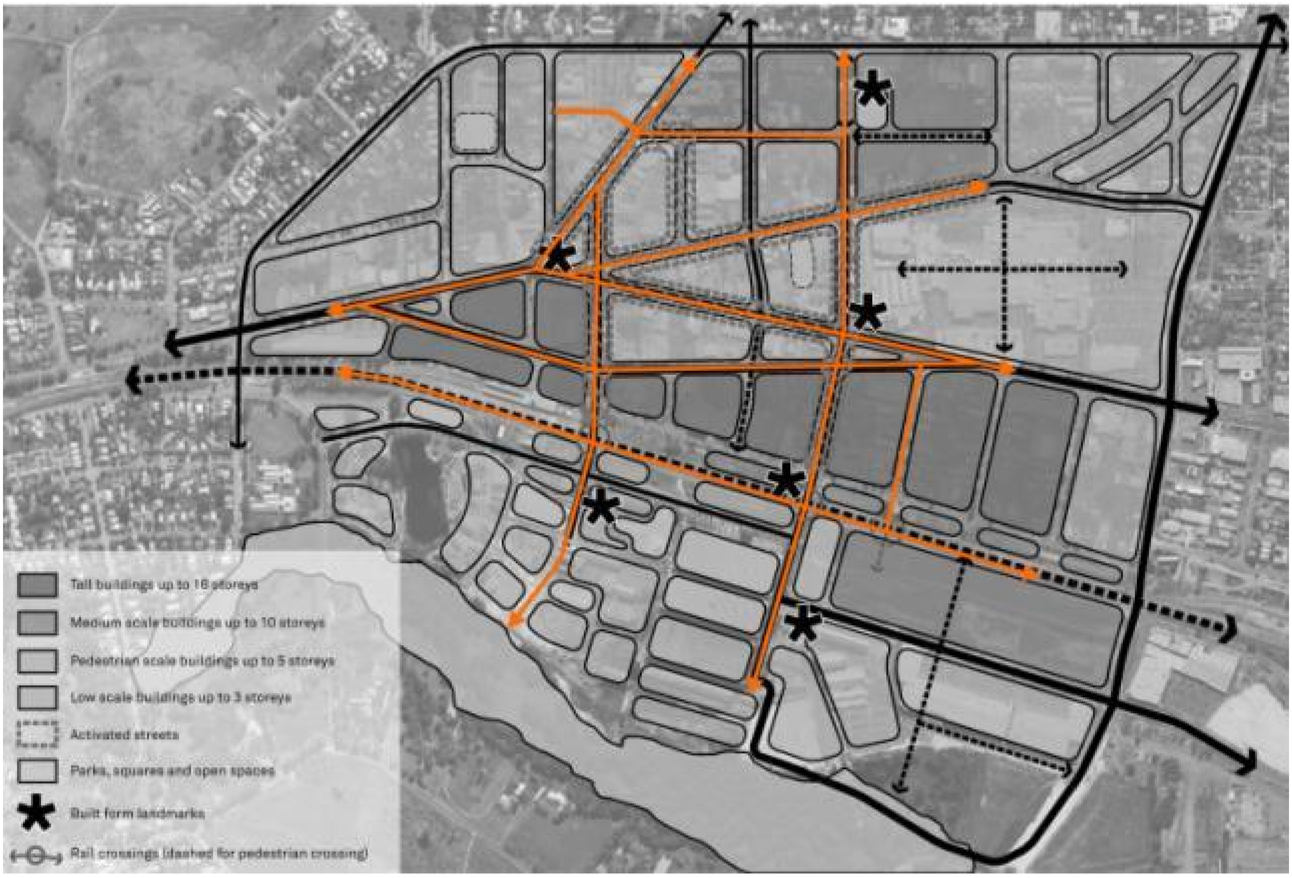


Figure 25 Pedestrian Desire Lines

9.3 Cycle Network

The Midland Activity Centre's location along strategically important regional transport routes creates opportunities for cycling along these road corridors. This is particularly relevant for commuter cycling trips from locations along the Midland PSP, or from the north and south which can be accessed via the sealed shoulders along Clayton Street and Lloyd Street. Midland has a good internal on-road cycling network that is being expanded through the MRA precincts.

9.4 Cycling Improvements

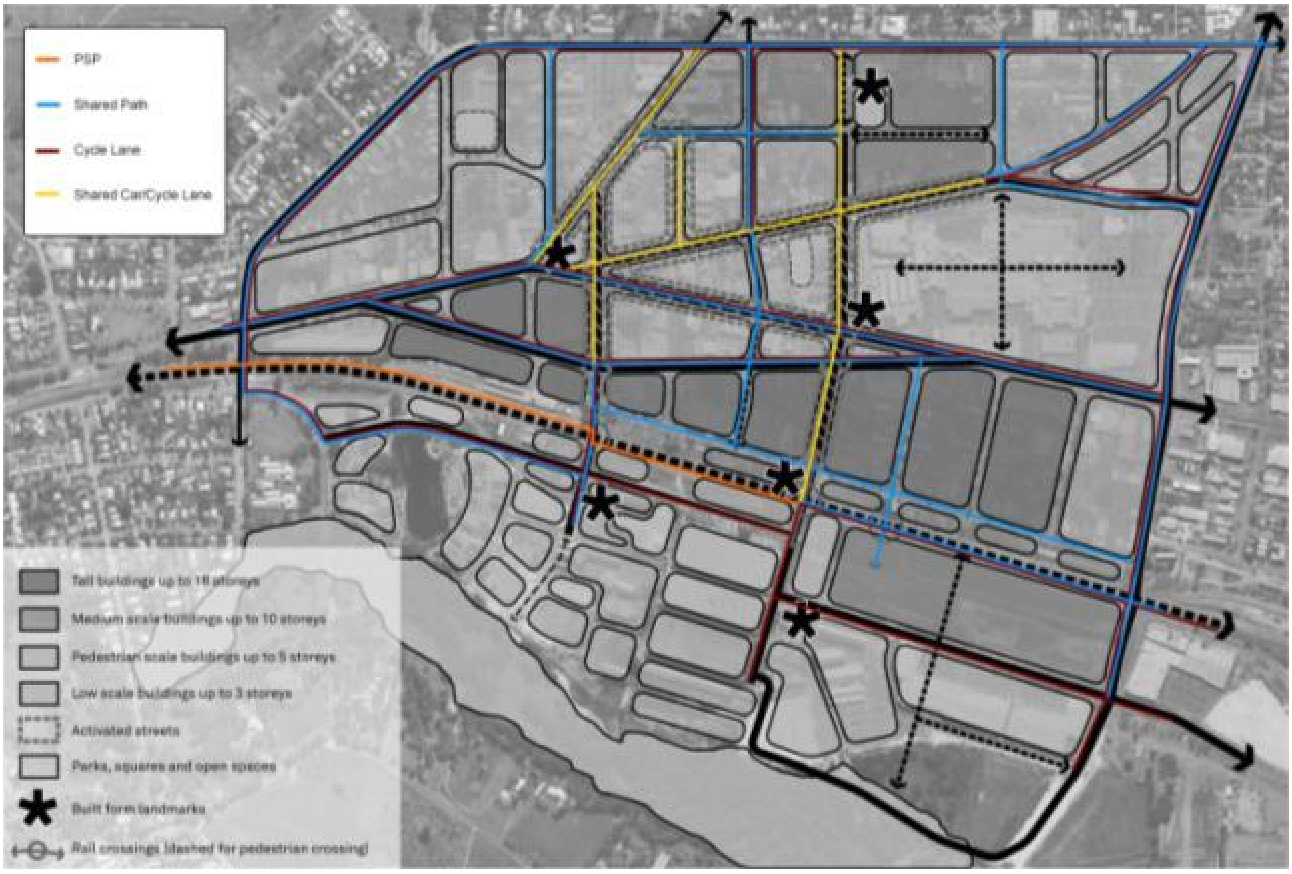
On-street paths are preferred along regional corridors to facilitate commuter travel, and through activated spaces to minimise conflicts with pedestrians. For these reasons, the cycling provision in Midland is focused primarily on-street, either through dedicated cycle lanes on strategic roads, or in shared bus/cycle or car/cycle lanes in the City Centre.

For on-street facilities, particularly those along major regional roads, headstart boxes should be installed to improve cycling safety and intersection operation. Headstart boxes are most beneficial in the prevailing flow direction on high speed streets and where left-turning pockets are not provided.

A network of off-street paths is also represented between Midland Station, retail nodes, education and residential areas and designed to promote casual cycling as well as for school children. As these facilities are constructed for less confident riders, safe crossing facilities are of primary concern.

A core cycling network of on-street facilities, supplemented by off-street dual use paths is shown in **Figure 26**.

Figure 26 Indicative Future Cycling Network



9.5 End of Trip Facilities

End of trip facilities consist of secure bicycle parking, showers, lockers and other ancillary infrastructure designed to support cycling as a comfortable, practical mode choice. The level of end of trip facility provided depends on the target demographic and the available infrastructure funding sources.

For large-scale multi-level buildings with some proportion of undercroft or basement parking, commuter bicycle parking should be provided in secure areas adjacent to vehicular parking, along with shower and locker facilities sufficient to cater for the projected demand.

Precincts which constitute smaller office and retail, such as high-street environments, generally do not have the private infrastructure to enable businesses to provide secure commuter parking, let alone showers. In this instance, public facilities will be of greatest benefit. It is recommended that a large-scale cycle parking facility be investigated in the Activity Centre, ideally located near the core. A similar facility could be provided in the Workshops Precinct to provide public cycle parking for commuters.

Visitor parking can be of a lower scale, consisting of small clusters of bike racks near retail, office and civic buildings. Consideration should be given to utilising on-street parking areas for bike parking, where pedestrian activity, and therefore the risk of conflict, is high.

9.6 Requirements

The requirements for cycling infrastructure should be mandated through Design Guidelines and a Town Planning Scheme for both public facilities and private development. Austroads recommendations and Green Star ratings provide reasonable industry benchmarks for cycling provision and could be used as target provision rates. Experience suggests that Austroads rates are suitable for smaller developments, while Green Star ratings requirements set appropriate benchmarks for large-scale retail and office facilities.

10 Public Transport

10.1 Service Improvements

The existing bus provision is relatively good from some areas and extremely sporadic from others. An increase in bus service along regional routes to minimum 60 minute headway (20 minutes during the peak) would allow outlying regional residential areas to utilise public transport in a way that is currently infeasible. This is important from both a mobility and equity standpoint, as those areas on the urban fringe are most sensitive to fluctuations in transport and housing costs. In particular, these areas are often occupied by those on fixed incomes, including retirees, and who may not have regular access to private transport.

Effective bus service is contingent on high frequency and direct access. Existing coverage routes are important to provide alternative access, but may never generate sufficient patronage to warrant significant expansion. However, areas within a 5-10km radius of Midland are easily accessible by buses. An increase in service provision in these areas would induce demand for bus connection into Midland, and beyond. This would reduce the existing reliance on expensive park 'n' ride at the Midland Station and better support the existing rail network.

All expansion services will all be designed to interchange at the central Midland Station and will operate from high quality stops adjacent to significant demand nodes. Local services (short loop or link services within 3-5km of the Activity Centre) and shuttle services would operate on a high-frequency basis to minimise both travel and wait times, ideally with a maximum 10 minute headway at all times, decreasing to 5 minutes during peak travel periods.

Bus priority along Cale Street will ensure that services can access the primary road network with a minimum of disruption.

10.2 Midland Station Relocation

The location of the existing Midland Station, at the western boundary of the Activity Centre, is relatively distant from the local residential and business catchments. This reduces its effectiveness as a transport node and tends to promote a high reliance on park 'n' ride adjacent to the station, even for residents living nearby. To alleviate this issue, the Midland Station is proposed to be relocated approximately 1km to the east, towards the City Centre core. This will increase the catchment of residents and businesses within 800m and help promote alternative transport modes.

The relocation of Midland Station and additional inner-city public transport services will improve accessibility for commuters into Midland, and residents within and surrounding the Activity Centre. By reducing the reliance on private vehicle transport, parking rates in the Activity Centre can be reduced, freeing up land for more productive uses. The expansions of local public transport services also improves equity in the region, by supporting households to transition away from private vehicle ownership and thereby reduce their vulnerability to external economic impacts.

The PTA has also proposed to locate a significant quantum of parking, tied to public transport use, immediately adjacent to the new station. This parking will attract a significant quantity of private vehicle trips into the Activity Centre, with no associated benefit to the community. The proposed park 'n' ride is therefore supported only as a solution prior to the extension of the rail line. However, the location of the proposed park 'n' ride, adjacent to the Midland Health Campus and at the heart of the City provides an opportunity for transition to retail and hospital visitor parking in the longer-term, similar to the function of parking stations adjacent to the Perth Train Station.

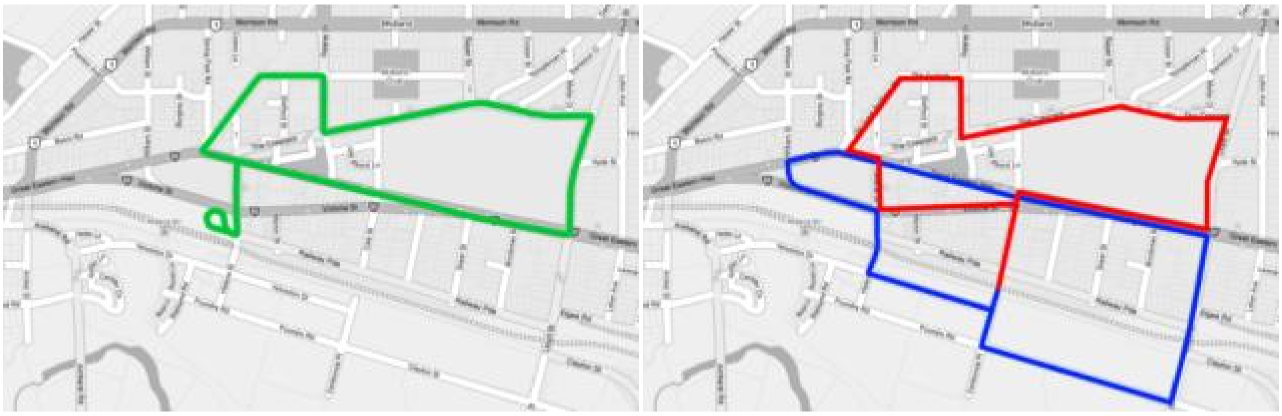
10.3 Bellevue Rail Extension

The City of Swan supports the construction of a train station at Bellevue, east of Midland, which would provide a number of significant benefits to the public transport network. In particular, this station would facilitate regional commuter transport from residential areas to the east, without park 'n' ride trips adversely impacting the operation of the roads and intersections within the Activity Centre.

10.4 Midland Shuttle

The Midland Shuttle is a local bus service which provides local-area connections between the Midland Station and Midland Gate Shopping Centre. The existing and potential extension alignment for this service is shown in **Figure 27** below.

Figure 27 Existing (left) and Proposed (right) Midland Shuttle Service



Frequency of the Midland Shuttle should be increased to a bus every 10-15 minutes throughout the day, and more often if demand increases sufficiently to warrant improved capacity.

10.5 Local Bus Routes

Analysis of the PTA park 'n' ride license plate survey (2011 data) shows a significant proportion of cars parked at Midland Station have their origin within a 5km radius, primarily to the east and north. While this distance is considered perfect for cycling to the Station, another opportunity is the modification of existing local bus services (such as exist the 314/315, 321/322, 323 and 324/325) to form high frequency two-way circular or paired routes between Midland Station and the surrounding commercial and residential catchments.

One of these local routes could provide high frequency connection between the City Centre and peripheral commuter car parking located outside of the Activity Centre, possibly at the location of the potential Bellevue Station.

Examples of modified local routes are shown in **Figure 28**, which are similar in concept to existing high-frequency services operated by PTA (see **Table 2** and **Figure 29**).

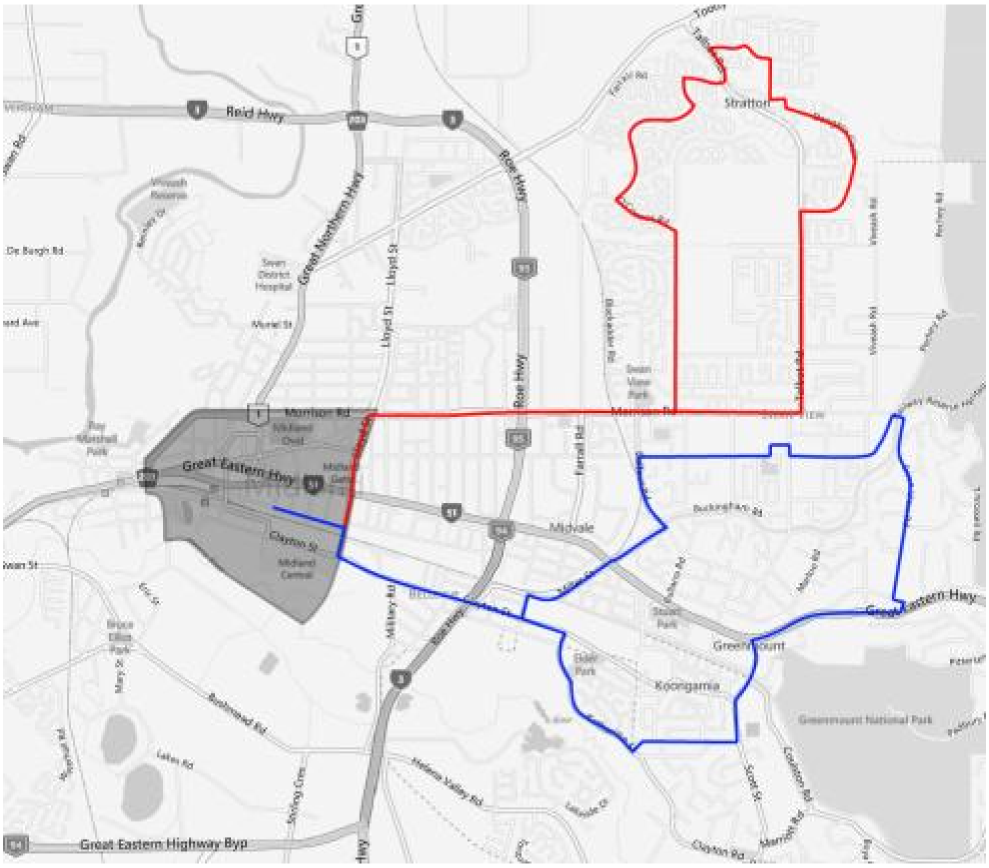


Figure 28 Examples of Local Route Modifications

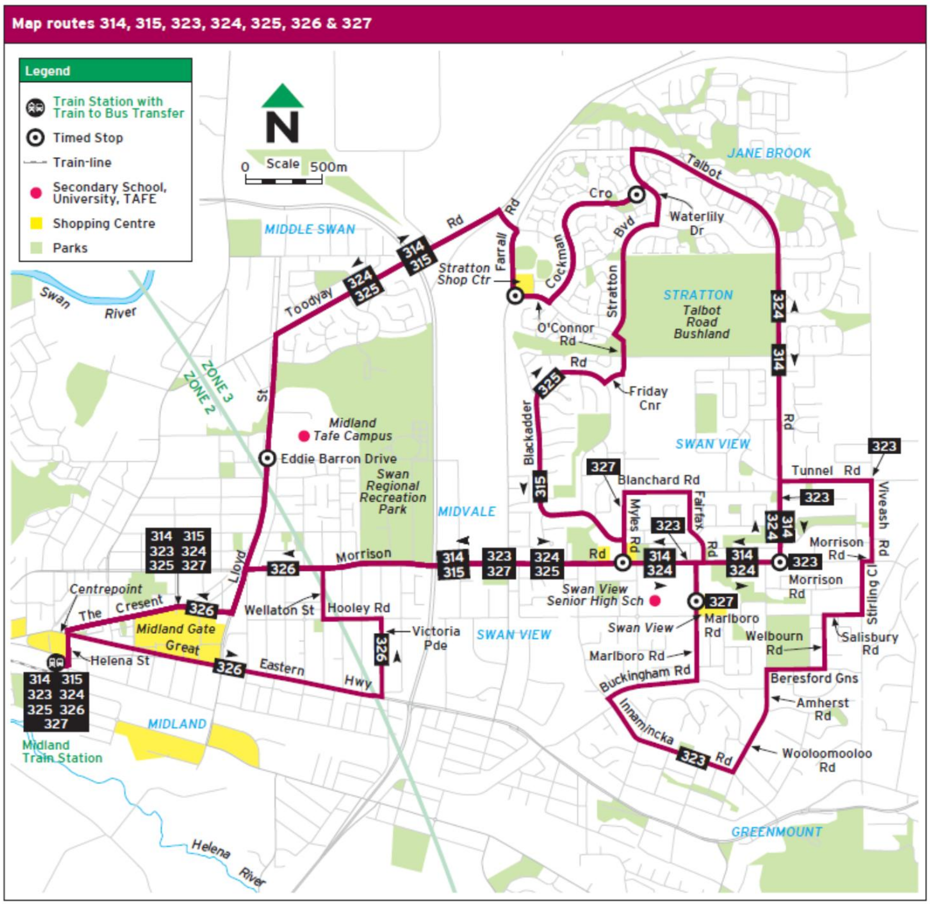


Figure 29 Existing PTA High Frequency Local Routes

11 Service/Loading

11.1 Service / Delivery

Freight and deliveries destined for Midland have the advantage of the high capacity regional road network within the area, including current and future roads such as Great Northern Highway, Great Eastern Highway, Lloyd Street and Roe Highway. Access to the Midland Activity Centre will be supported along these major road links, and restricted through the activated core of the Centre.

Deliveries will be enabled through an increase in on-road loading zone areas, particularly in ‘main street’ precincts and where smaller office/retail development is located. Larger office/commercial buildings will be serviced via on-site docks connected to basement or undercroft parking structures. Access to dock areas through a laneway network is supported to minimise the impact of service/delivery vehicles on pedestrian, cycling and bus modes.

11.2 Regional Road and Rail Freight

Midland’s location along the Great Eastern Highway, as well as its proximity to the Hazelmere industrial area and freight rail terminal, results in a high frequency of bypass freight trips. This is intended to be addressed through relocation of regional freight services away from the City Centre along the existing Roe Highway/Reid Highway and Tonkin Highway corridors and along the Great Eastern Highway Bypass. Long-term investigation of a freight rail bypass to the south of Midland is also supported as this will assist not only in improving road conditions in the area, but also reducing the disruption caused to local traffic as a result of interstate freight trains.

12 Conclusion

The Midland Activity Centre Structure Plan is an ambitious and long-term project that will transform the City Centre. To achieve the high quality transport environment envisaged in this Structure Plan, we propose an integrated network of transport modes encompassing private vehicles, public transport cycling and walking modes.

To accommodate the competing demands for these different forms of movement, the Department of Transport's *"Moving People"* framework has been used to allocated individual road segments to desired users. This enabled the determination of road cross-sections and network provision to ensure that the desired modes have safe, attractive, effective corridors within their activity zones, and without needing to support all users on every road.

The hierarchy chosen consists of the following general elements:

> Local access traffic supported along Morrison Road in preference to Great Eastern Highway
> Local traffic will be encouraged at slow speeds within the Activity Centre, through active and passive traffic management; to minimise the impact on other modes
> Pedestrian movement promoted within the Activated Core through attractive streetscapes, safe and convenient crossings and high quality pedestrian provision
> Bus priority along the Cale Street approach to the relocated Midland Station
> Cycling is proposed on-street throughout Midland, predominantly in separated sealed shoulders, but in mixed traffic within the Activated Core and in low-volume streets. Off-street cycling is proposed along critical routes or where traffic volumes or speeds are high
> Regional freight traffic is not supported within the Activity Centre, particularly along Great Eastern Highway

Parking has been chosen as the focus for mode shift, with quantum and location determined through analysis. This has resulted in a maximum parking provision of 13,000 bays (assuming approximately 85% efficiency). These would be roughly split into 6,000 long-stay (commuter) and 6,000 short-stay (visitor) bays, plus an additional 1,000 park 'n' ride bays associated with Midland Station. All parking within the City Centre is proposed to be restricted to a maximum rate determined for general land uses, and partly offset through public provision via application of a mandatory cash-in-lieu policy.

This parking provision is sufficient to support a 65% private vehicle mode share, a significant reduction from the 95% mode share currently evidenced by commuters to Midland. The remainder of all non-residential trips (140,000 daily) have been allocated among public transport, walking and cycling modes, for an external target mode split as follows:

> Private Vehicles: 65% (60,000 trips)
> Bus: 18% (16,000 trips)
> Train: 10% (9,200 trips)
> Cycling: 5% (4,600 trips)
> Pedestrian: 2% (1,800 trips)

For the purpose of this assessment, all internal trips between land uses within the Activity Centre (48,000 daily), are assumed to be taken by non-car modes. A general split for internal trips has been assumed for the purpose of infrastructure provision:

> Pedestrian: 70% (34,000 trips)
> Cycling: 10% (4,800 trips)
> Shuttle Bus: 20% (9,600 trips)
> Cycling: 4,600 trips (plus 4,800 internal)
> Pedestrian: 1,800 trips (plus 34,000 internal)

By establishing these benchmarks at this early stage of planning, the progress of transport provision and mode shift can be evaluated over time in an effort to create a sustainable, equitable and effective transport system.

Midland Activity Centre Structure Plan Transport Assessment

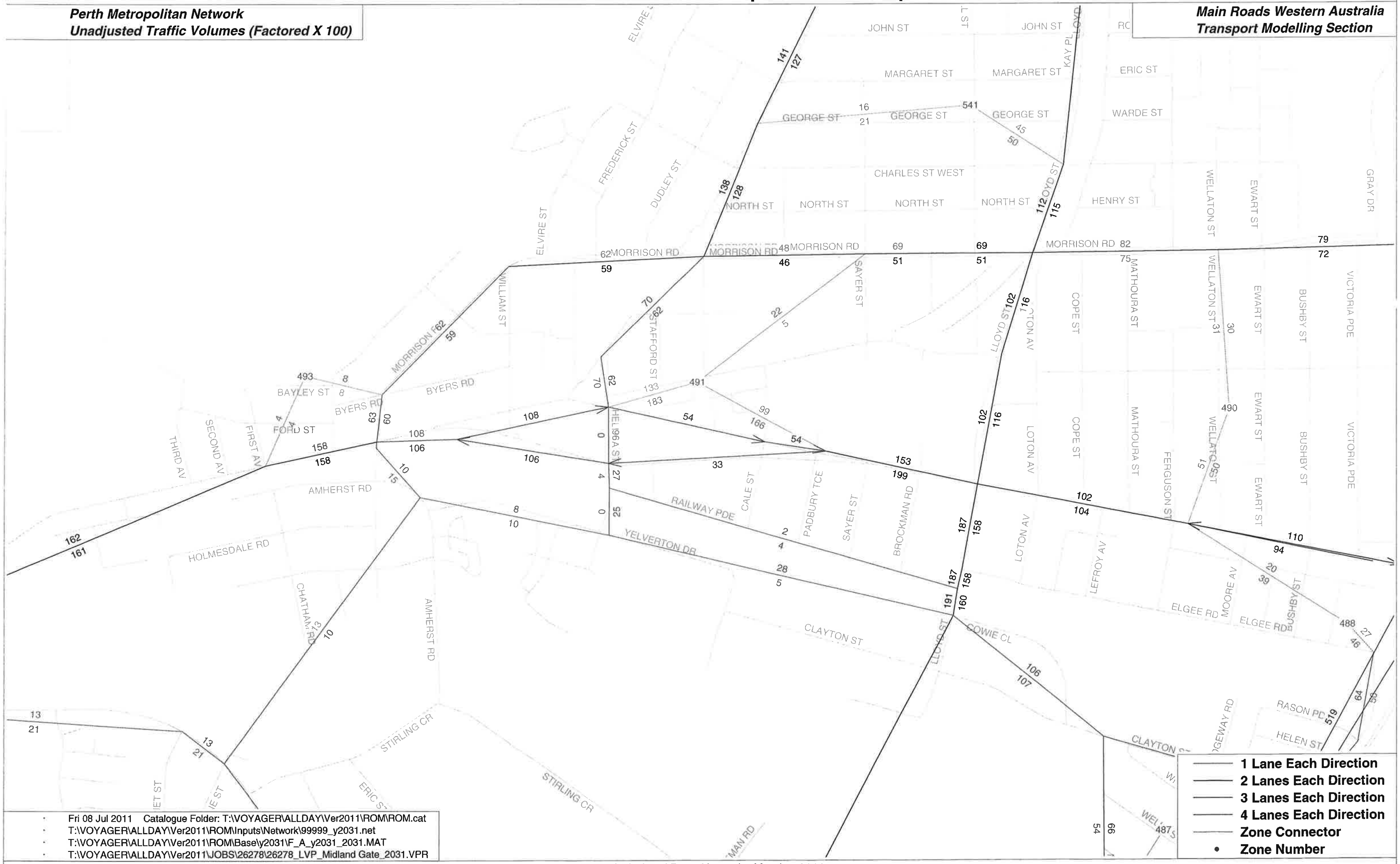
APPENDIX

A

ROM DATA

Cardno
Shaping the Future

2031 Base Model
Link Volume Plot for Midland Gate Redevelopment Traffic Impact Assessment



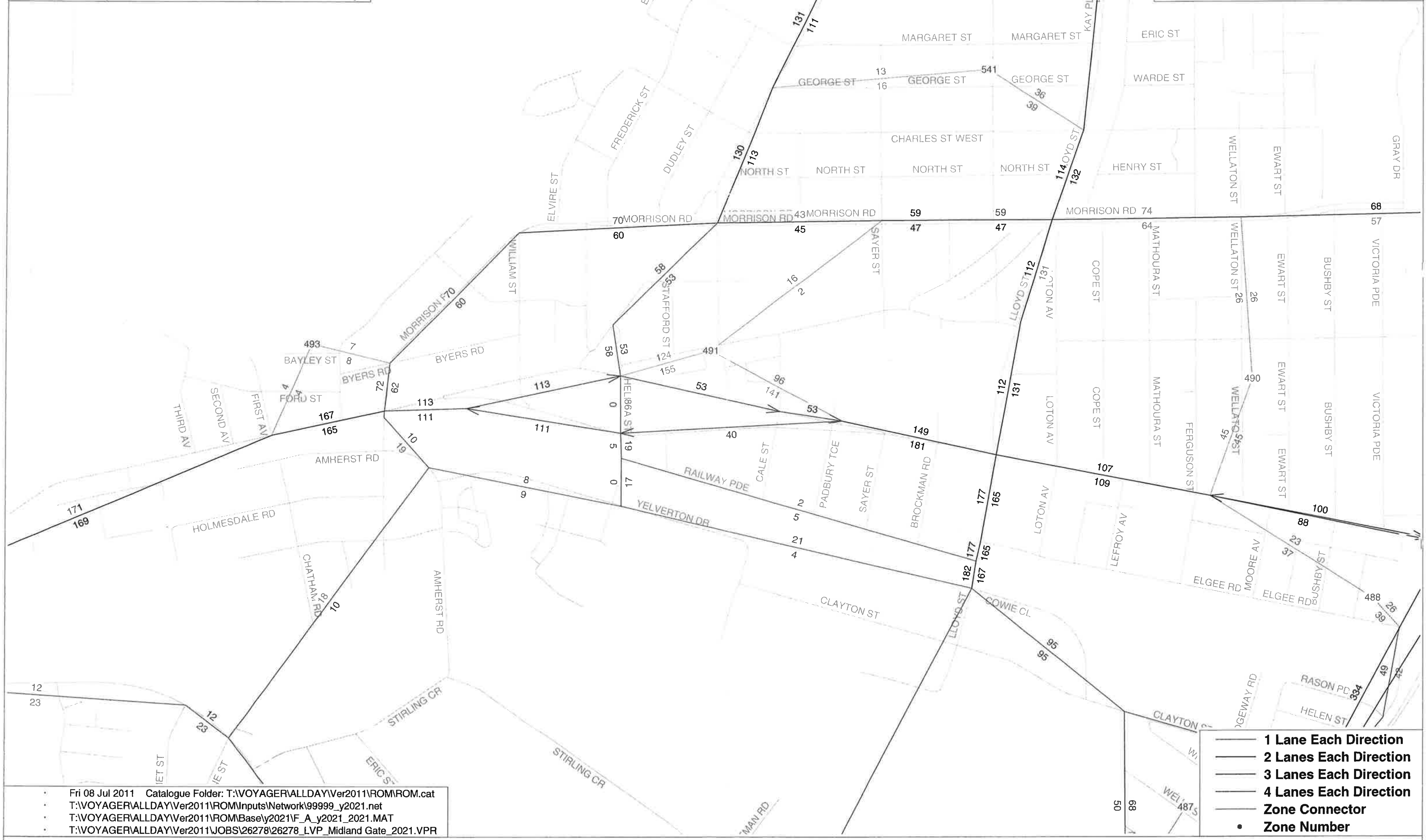
MRWA Updated Base Network - Version 2011

MRWA Transport Modelling Data as supplied to approved clients is confidential and is not to be made available to unauthorised persons or organisations

2021 Base Model
Link Volume Plot for Midland Gate Redevelopment Traffic Impact Assessment

Perth Metropolitan Network
Unadjusted Traffic Volumes (Factored X 100)

Main Roads Western Australia
Transport Modelling Section

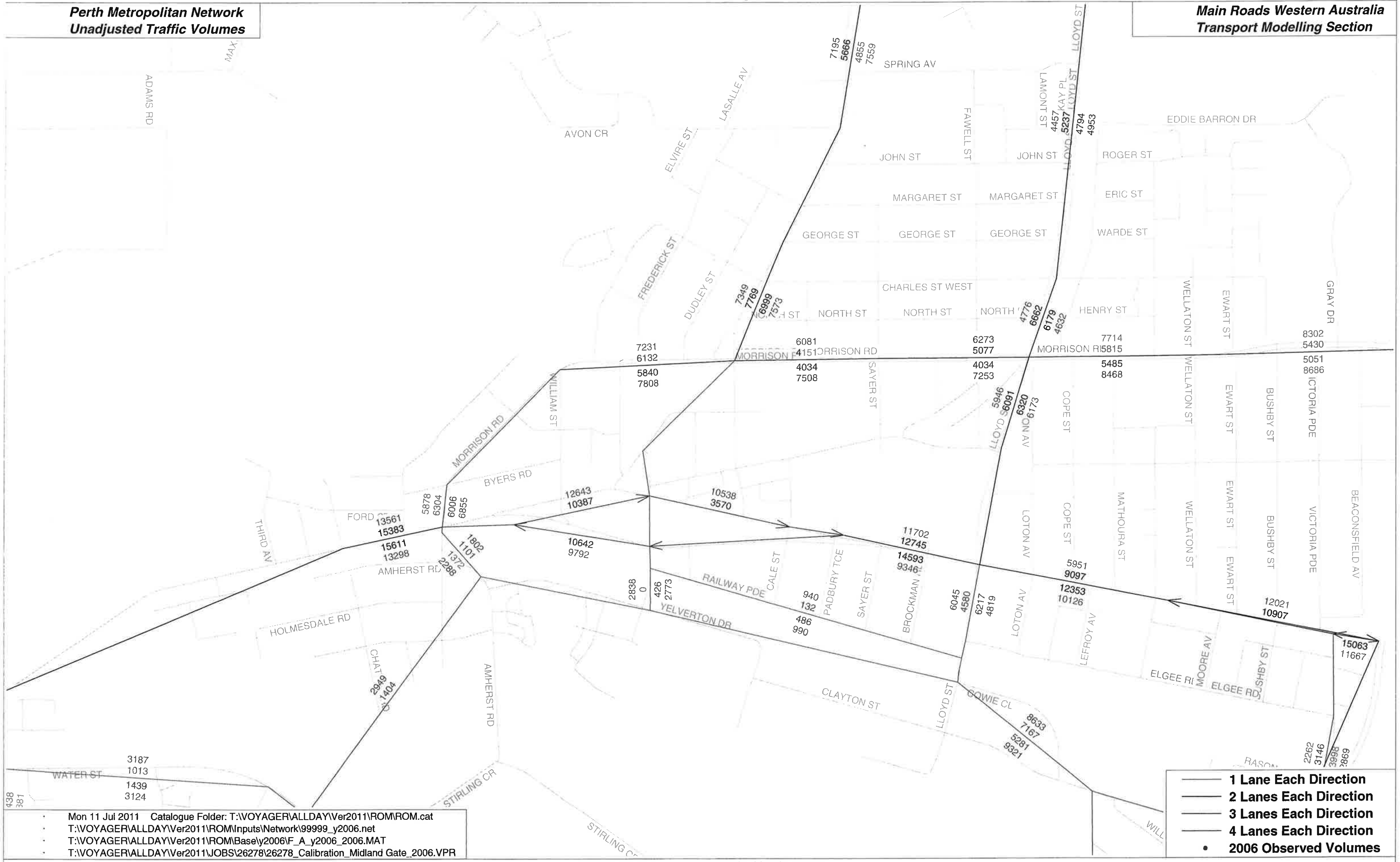


MRWA Updated Base Network - Version 2011
MRWA Transport Modelling Data as supplied to approved clients is confidential and is not to be made available to unauthorised persons or organisations

2006 Base Model
Calibration Plot for Midland Gate Redevelopment Traffic Impact Assessment

Perth Metropolitan Network
Unadjusted Traffic Volumes

Main Roads Western Australia
Transport Modelling Section



- Mon 11 Jul 2011 Catalogue Folder: T:\VOYAGER\ALLDAY\Ver2011\ROM\ROM.cat
- T:\VOYAGER\ALLDAY\Ver2011\ROM\Inputs\Network\99999_y2006.net
- T:\VOYAGER\ALLDAY\Ver2011\ROM\Base\y2006\F_A_y2006_2006.MAT
- T:\VOYAGER\ALLDAY\Ver2011\JOBS\26278\26278_Calibration_Midland Gate_2006.VPR

MRWA Updated Base Network - Version 2011
MRWA Transport Modelling Data as supplied to approved clients is confidential and is not to be made available to unauthorised persons or organisations

Research Report

Economic Advice
Midland Activity Centre Structure Plan
WESTERN AUSTRALIA

Hassell and the City of Swan

June 2012 Ref: RS510238

Contents

1 INTRODUCTION

This report has been prepared by Colliers International in response to a request by Hassell for economic advice on the Midland Activity Centre Structure Plan. The analysis is not intended as a comprehensive retail needs assessment for the Midland town centre but rather as a high level assessment of the impact that redevelopment projects within the town centre might have on the generation of employment and growth and redistribution of Midlands' population over the medium to longer term.

This report acknowledges two previous studies into retail needs and sustainability, notably:

- Midland Gate Shopping Centre Retail Sustainability Assessment produced for Colonial First State Global Asset Management by Urbis (August 2011), and
- The City of Swan Retail Needs Assessment produced by Essential Economics for the City (August 2011)

While the status of these documents is unclear at this stage, Colliers acknowledges these analyses. This report does not intended to duplicate these studies and their respective methodologies, but is more concerned with the preferred configuration of space required to activate the town centre rather than assuming that any developer or operator specific retail sustainability analysis (which supports the case for site specific development) is necessarily in the best interest for the activation of the city centre.

The underlying premise of this analysis is that the Midland Activity Centre Structure Plan will be profoundly influenced by a range of development initiatives which will fundamentally change (and invigorate) the nature and function of the Midland town centre over time. These development initiatives are a mix of strategic, driver projects, capability upgrades and spatial and amenity planning projects that include both private and public sector investment.

This report is comprised of three main sections:

- An analysis of the growth trajectory and drivers of growth for Midland;
- A high level analysis of the supply of and demand for retail space in the town centre;
- An overview of the spatial planning implications of economic factors and commentary on development staging.

This analysis draws on a range of published and confidential reports and information. Where possible the information source is cited but where the information is drawn from sources not in the public domain or not for publication, the information will be referred to only in a general sense.

1.1 WHAT IS AN ACTIVITY CENTRE?

An activity centre, in an urban development context, is a place that features a diversity and concentration of different activities that generate economic and social vitality. Typically, such places may include residential, retail and commercial activity and the presence of employment options. It is important to acknowledge that activity centres are about more than just retail employment and may include specialist activities such as health and education precincts and agglomerations of commercial and industrial activity. Midland, in the context of the Activity Centre Hierarchy[1], is designated as a Strategic Metropolitan Centre which in effect identifies the whole of the Midland town centre as an activity centre. What is important to note however, is that within the Midland centre there are identifiable precincts each of which will have a different function and role within the fabric of the town centre.

It can be argued that as an activity centre, the Midland town centre is dominated by the retail and entertainment offerings available at Midland Gate Shopping Centre and its surrounds, the Great Eastern Hwy retail and commercial strip, the civic and government employment precinct bordered by Old Great Northern Hwy, Morrison Rd and Spring Park Rd, the train station/ Centrepoint precinct and the area bounded by The Crescent, Keane St and The Avenue.

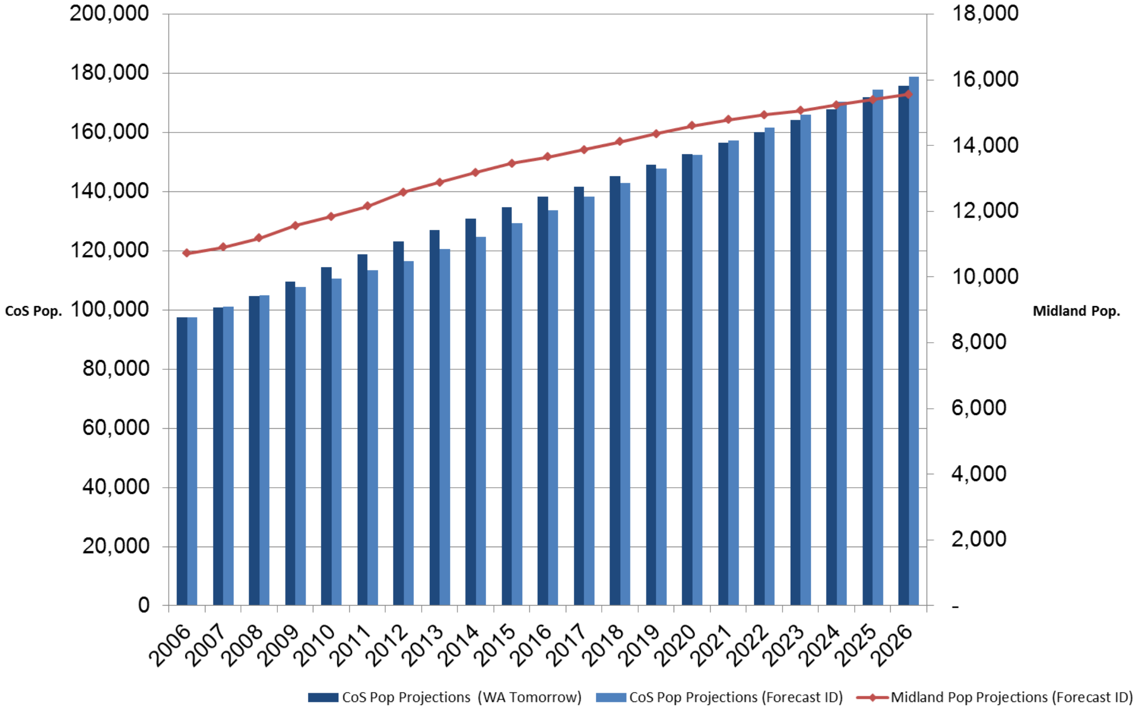
Looking forward, the development of the Midland Health Campus (including the proposed GP super clinic and private hospital), the railyards area, and the relocation of the train station and the potential development of a TOD precinct located in and around the intersection of Cale St and Railway Pde, will change the concentration and balance of activity that occurs in the town centre. The health campus in particular is a prime example of a specialised activity centre which will service substantial catchment. In addition, the current train station site, which will be freed up by the station relocation and suggested development clustered around the Midland Oval will also contribute to a significant reconfiguration of the Midland as an activity centre.

[1] State Planning Policy 4.2 Activity Centres for Perth and Peel, WAPC Aug.2010

2 POPULATION GROWTH

Population estimates by Forecast ID for the City of Swan and those contained in the Department of Planning's Western Australia Tomorrow forecasts, suggest that the City's population is expected to increase by more around 80% to approximately 177,000 between 2006 and 2026. In the same period, the population of Midland is expected to grow approximately 45% to around 15,500.

Figure 1 – City of Swan and Midland Population Projections



Source: WA Tomorrow, Forecast ID and Colliers Research

Anecdotal advice suggests that the rate of population growth for the City of Swan may be conservative and this may be the case depending on the extent of State Government and private sector investment in employment generating initiatives for the area over time.

3 DRIVERS OF GROWTH

Stable residential population growth in metropolitan centres is essentially driven by the perception of amenity that a place offers, which is in turn a function of the intersection of a range of influences including:

- Demographic changes over time
- The availability and accessibility of employment options;
- The availability, range and affordability of accommodation and housing options;
- Real estate return on investment;
- Access to and availability of retail, and population driven services such as health, education, community services, as well as entertainment and recreation offerings;
- The natural environment and physical appeal of a place;
- The degree of connectivity between places provided by road networks and transport options;
- The relative value of substitutes and alternatives (i.e. how does the place in question compare with alternative places open to current or potential residents, and how well does the place address the requirements and expectations of residents?);
- The strength and extent of social networks and cultural connections;
- The extent to which a place exhibits vitality and a cultural heart;
- A sense of safety, personal security and well-being.

There is undoubtedly a socio-cultural component to the choices that people make about where and how they live. That is, notwithstanding the economic considerations of choices of place of residence, people by and large will tend to live in places that address to varying degrees the list of factors above. Understanding the interaction of these influences is at the heart of effective, performance based, place creation and place management.

Arguably, the two biggest determinants of residential take-up are the affordability of accommodation offerings and the availability of jobs and specifically the generation of net new employment in an area.

3.1 ACCOMMODATION AFFORDABILITY

From an affordability perspective, housing stress occurs when housing costs (rental or mortgage payments) exceed approximately 30% of the household income. From an extrapolation of 2006 Census data, Colliers concludes that approximately half of the Midland population would experience housing stress where rental rates exceed around $425 per week and housing / accommodation prices exceed approximately $374,000. For household incomes below the median, particularly those in the first and second quintile income brackets, housing stress becomes critical and such households are increasingly pushed to the margins of population centres.

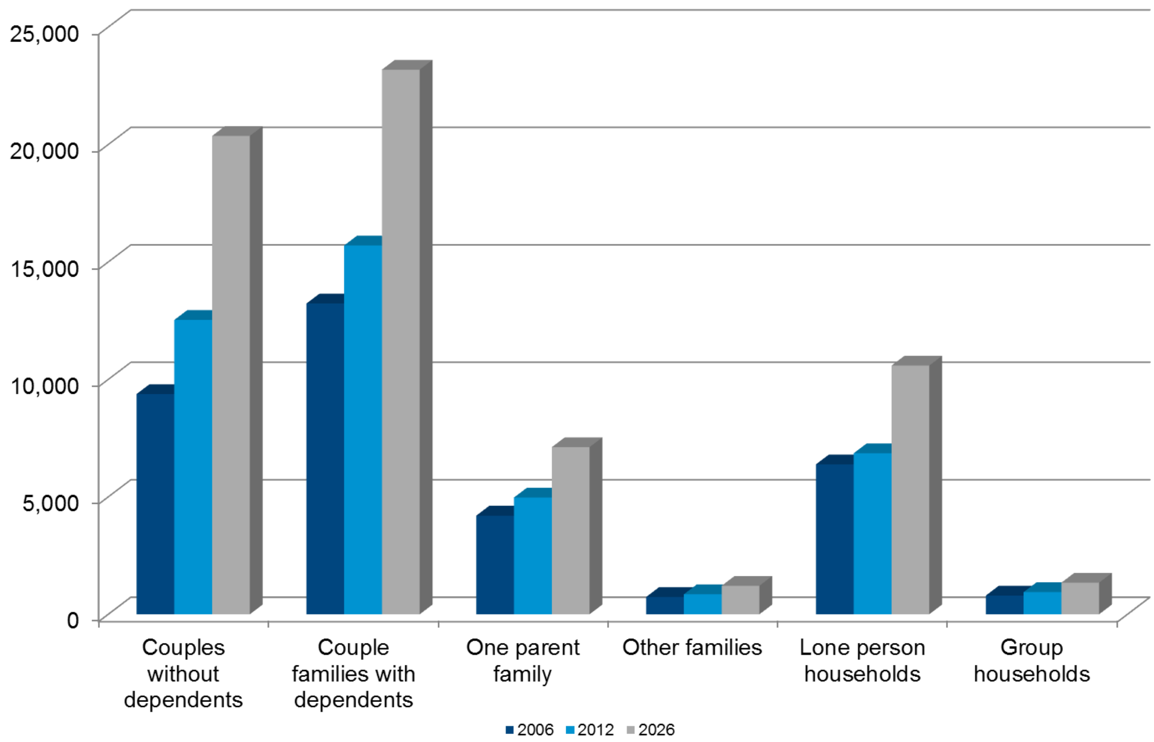
Where accommodation costs rise (rental or purchase), it follows that higher household incomes are required to take up options that both meet amenity requirements and enable households to avoid housing stress. Moreover, household composition, household income and accommodation preference are closely aligned. What is notable from the household number forecasts in the figures below is that between 2006 and 2026 there is expected to be a 117% growth in couples without dependants and a 66% increase in the number of lone person households in the City of Swan. These categories alone account for an anticipated growth of 11,500 households in the study area, many of which may be expected to gravitate to alternative density accommodation types.

This has implications for the provision of accommodation types as disposable income levels change and the capacity for these two groupings in particular to opt for accommodation that suits their financial capability. This, coupled with an emerging trend towards accommodation downsizing in households without dependents may serve to underscore the need for a greater range of density accommodation in the Midland town centre.

				20 Year Increase	
	2006	2012	2026	No.	%
Couples without dependents	9,378	12,532	20,365	10,987	117%
Couple families with dependents	13,230	15,703	23,187	9,957	75%
One parent family	4,201	4,973	7,114	2,913	69%
Other families	738	854	1,214	476	64%
Lone person households	6,385	6,857	10,586	4,201	66%
Group households	798	943	1,346	548	69%

Source: Forecast ID and Colliers Research

Figure 1



Source: Forecast ID and Colliers Research

Chart 1

From a planning perspective, if the intention is to have demographic diversity in the town centre residential base, then it implies the need to integrate affordable accommodation and social housing options into any urban development plan. The issue of affordability will have significant implications for any development feasibility because the concept of what is affordable varies according to the household income which is, in turn, a reflection of the quality of employment and income earning capacity that households display.

3.2 EMPLOYMENT GENERATION

The 2006 census data suggests that the City of Swan estimated total employment as a ratio of the resident population is around 50% (Approximately 34% of the workforce in Swan is derived from the Swan residential base). If a linear relationship between labour force and population growth was assumed (this is in effect a statistical convenience) and the ratio of labour force to resident population remained constant, then, on current population projections, this implies a growth in the Swan labour force of 80% to approximately 87,850 by 2026.

The relationship between labour force and resident population is, however, not as straightforward as this. Labour force growth will be influenced by the availability of employment in an area which is in turn affected by a range of factors not the least of which is the level of private sector and government investment in employment generating projects and ventures, and the changing profile of industry sectors over time. It is suggested that a comprehensive and multi-sector economic development strategy for the City of Swan is required if employment approaching these numbers is to be achieved.

An analysis of 2006 employment data for the City of Swan suggests around 38% of the workforce is employed in white collar areas with just over 14% in retail trade and nearly 15% in manufacturing. Without specifying exact percentages, it is reasonable to assume that a significant volume of employment growth will occur in the town centre, particularly as the health precinct develops and demand for retail and commercial space increases over time. The key issue for planners is to identify the optimal distribution location and configuration of activity nodes within the town centre to facilitate the evolution of a vibrant Midland Strategic Activity Centre.

Section 4 proposes demand scenarios for retail and commercial / office floorspace for the Midland town centre out to 2026. Based on an assumed average per square meterage per employee of around 32 m^2 for retail and approximately 20 m^2 for commercial / office, the demand for floorspace suggests that net new employment in Midland by 2026 could grow by 2,000 to 2,500 in the retail sector and by approximately 1,800 in commercial / office space for the same period.

4 RETAIL AND COMMERCIAL SUPPLY AND DEMAND ANALYSIS

The optimal location, quantum and configuration of retail and commercial floorspace in Midland are central to the establishment of a vibrant and viable city centre. Activity centres are more than just locations for retail activity and depend on a diverse mix of residents, workers and visitors to the area to engender a vital sense of place.

Estimating the likely demand, that is quantum and timing, for retail and commercial floorspace in Midland is a function of the interaction between a numbers of variables including:

- Determination of the trade area catchment
- Projections of population and household growth
- Estimates of the pool of available expenditure in the retail catchment derived from households and inbound people movements
- Estimates of the extent of escaped expenditure or leakage (which will vary between the primary and secondary catchments of the main trade area)
- Estimates of the per square metre productivity for different retail types
- The comparative positioning of the retail precinct relative to alternatives within the area.

The trade area catchment for Midland as defined by Colliers is represented in Appendices A - F

Colliers definition of the main trade area catchment and estimation of the residential population base approximates Urbis's current estimates but adopts a less aggressive growth trajectory of 266,362 residents to Urbis' 295,184 by 2026. While this represents an approximate 11% difference, the key element is the extent to which residential expenditure is retained within the trade area catchment and captured by local retail offerings.

Figure 2 proposes population growth rates in five year increments to 2026 for the primary and secondary catchments of the Midland main trade area.

Figure 2 – Midland Strategic Town Centre Main Trade Area Population Estimates

	2012	2016	2021	2026
Primary Trade Area	74,840	82,480	91,534	101,155
Secondary Trade Area - North	27,496	30,868	34,948	39,291
Secondary Trade Area - East	19,751	20,538	21,286	22,063
Secondary Trade Area - South	36,637	37,868	38,945	40,047
Secondary Trade Area - West	59,389	60,942	62,404	63,805
Total Catchment Population	**218,113**	**232,695**	**249,117**	**266,362**

Source: WA Tomorrow, Forecast ID and Colliers Research

Figure 2

4.1 CURRENT SUPPLY

Essential Economics reports the current level of retail supply in the Midland Strategic Metropolitan Centre is 134,500 m^2 across four precincts: Midland Gate, Midland Activities Area, Great Eastern Hwy and the Midland Railyards.

Of the this supply, Midland Gate accounts for approximately 52,500 m^2 and Centrepoint shopping centre 8,380 m^2. Then primarily bulky goods area at the south eastern end of the Midland railyards precinct is believed to account for about 35,500 m^2 of retail floorspace.

4.2 DEMAND MODELLING

Notwithstanding estimates of retail supply, the more relevant analysis relates to the level of supportable floorspace into the future, particularly the requirement for net new floorspace within the town centre. Calculating demand for floorspace demand is not an exact science and is contingent on various assumptions (as referred to previously) that underline demand models.

In addition to changes in population growth and variations in floorspace turnover, estimates of retail floorspace are most directly influenced by the extent of household expenditure on retail categories within the trade area, and the extent to which some of that expenditure escapes from the catchment. Added to this will be an allowance for expenditure that comes into Midland Strategic Town Centre from outside the main trade area and from the worker population.

Retail Floorspace turnover can vary considerably between centres and within precincts of centres. Figure 3 proposes indicative retail turnovers for a range of different categories escalated to 2026. The escalation rates are in a sense a statistical convenience to inform the demand for floorspace over time and should be considered as indicative measures only.

Figure 3 – Indicative Sales Turnover /m^2 for Different Retail Types 2012 – 2026

Sales Productivity (Retail Turnover Density $/$m^2$)	2012	2016	2021	2026
Supermarket	$ 7,651	$ 7,961	$ 8,368	$ 8,794
Food	$ 7,651	$ 7,961	$ 8,368	$ 8,794
Non food grocery	$ 7,651	$ 7,961	$ 8,368	$ 8,794
Catering	$ 5,611	$ 5,838	$ 6,136	$ 6,449
Clothing & Accessories	$ 5,101	$ 5,308	$ 5,578	$ 5,863
Furniture & Whitegoods	$ 3,060	$ 3,185	$ 3,347	$ 3,518
Electrical	$ 7,651	$ 7,961	$ 8,368	$ 8,794
Houseware & Softgoods	$ 3,060	$ 3,185	$ 3,347	$ 3,518
Hardware	$ 4,590	$ 4,777	$ 5,021	$ 5,277
Sports & Hobbies	$ 4,590	$ 4,777	$ 5,021	$ 5,277
Services	$ 5,611	$ 5,838	$ 6,136	$ 6,449
Newsagent & Chemist	$ 7,651	$ 7,961	$ 8,368	$ 8,794
Bottleshop	$ 10,201	$ 10,615	$ 11,157	$ 11,726
Retail Turonover Density	$ 5,300	$ 5,519	$ 5,805	$ 6,105

Source: Colliers Research

Figure 3

Figure 4 shows an estimate of aggregate retained spend in the Midland main trade area across primary and secondary catchments, based on estimated population growth and percentage of expenditure capture for the area. the main trade area aggregate pool of residential expenditure, assuming is projected to grow from $608 million in 2011 to $960 million in 2026. It is this pool of available expenditure, and estimates of floorspace productivity that inform the estimates of supportable net new floorspace requirements for the city.

Figure 4 – Main Trade Area Market Potential – Retained Residential Expenditure 2011-2026

Market Potential (Retained Resident Expenditure)	**2012**	**2016**	**2021**	**2026**
Main Trade Area	$ 631,125,602	$ 718,039,281	$ 831,238,515	$ 959,909,571
Supermarket	$ 180,228,945	$ 206,057,268	$ 239,844,025	$ 278,344,892
Food	$ 132,969,820	$ 152,008,687	$ 176,910,522	$ 205,285,540
Non food grocery	$ 47,259,125	$ 54,048,581	$ 62,933,503	$ 73,059,353
Catering	$ 40,242,366	$ 46,170,136	$ 53,945,626	$ 62,820,923
Clothing & Accessories	$ 106,459,831	$ 120,528,835	$ 138,791,383	$ 159,487,892
Furniture & Whitegoods	$ 76,441,632	$ 86,806,157	$ 100,278,407	$ 115,577,227
Electrical	$ 57,099,780	$ 64,831,954	$ 74,882,684	$ 86,294,772
Houseware & Softgoods	$ 29,700,918	$ 33,708,641	$ 38,914,378	$ 44,824,228
Hardware	$ 41,585,146	$ 47,215,486	$ 54,532,066	$ 62,840,042
Sports & Hobbies	$ 31,908,707	$ 36,228,247	$ 41,842,057	$ 48,216,301
Services	$ 23,987,923	$ 27,182,381	$ 31,322,387	$ 36,018,881
Newsagent & Chemist	$ 23,910,187	$ 27,078,406	$ 31,181,476	$ 35,834,658
Bottleshop	$ 19,560,167	$ 22,231,770	$ 25,704,026	$ 29,649,754

Source Colliers Research

Figure 4

Figure 5 proposes three scenarios for the demand for retail floorspace in the Midland Town Centre main trade area that are based on variations in the extent of retained expenditure in different retail categories. The base line parameters that define the expected scenario are detailed in Appendix A. Scenarios 1 and 2 outline changes in net new floorspace requirements arising from an increase of 3% and 5% respectively in retained household expenditure in the primary trade catchment of the Midland Town Centre main trade area. On current model settings, it is suggested that the Midland Strategic Town Centre currently has a shortfall of between 13,000 m^2 and approximately 23,000 m^2 of retail floorspace. This is predicted to rise to between 66,600 and 80,600 m^2 by 2026.

Figure 5 – Midland Strategic Town Centre Main Trade Area Supportable Floorspace Estimates

		2012	2016	2021	2026
Expected Scenario	Total Supportable Floorspace (SQM)	151,561	166,678	183,283	201,094
	Net New Supportable Floorspace (SQM)	17,061	32,178	48,783	66,594
Scenario 1	Total Supportable Floorspace (SQM)	157,625	173,408	190,827	209,513
	Net New Supportable Floorspace (SQM)	23,125	38,908	56,327	75,013
Scenario 2	Total Supportable Floorspace (SQM)	161,668	177,896	195,857	215,127
	Net New Supportable Floorspace (SQM)	27,168	43,396	61,357	80,627

Source: Colliers Research

Figure 5

4.3 COMMERCIAL / OFFICE FLOORSPACE DEMAND

Determination of the demand for demand for commercial / office space in the city centre is not necessarily directly predictable as a ratio of average floorspace to resident population growth. This is, in effect a proxy indicator for demand and does not consider the strategic investment decisions by governments and the private sector as to the establishment of new, long term employment generating projects and strategic infrastructure. While projects such as the establishment of the new Midland health campus, which will be an activity centre in its own right, are set to be realised in the near future, private sector investment, particularly larger scale employment generators, are inherently less predictable.

The Department of Planning's WASLUC data (2008) identifies the (then) supply of floorspace by type. Figure 6 presents an extract from this database along with an estimate of the ratio of per square metre floorspace by category per City of Swan population at the same period.

Figure 6 – Midland Floorspace Provision (2008)

Floorspace Type	m^2	m^2 / Population
Manufacturing / Process / Fabrication	1,552	0.01
Storage / Distribution	1,516	0.01
Services	4,088	0.04
Shop / Retail	68,385	0.65
Other Retail	14,245	0.13
Office / Business	56,552	0.53
Health / Welfare / Community	10,749	0.10
Entertainment	15,389	0.15
Utilities / Communication	1,624	0.02
Total	**174,100**	**1.65**

Source: Department of Planning and Colliers Research

Figure 6

Figure 7 outlines an indicative demand profile for commercial / office floorspace applying the same ratio to projected population growth for the City of Stirling. In theory, Midland town centre presently has a shortfall of around 7,100 m^2 of commercial / office floorspace which is expected to rise (using this methodology) to a requirement for approximately 35,500 m^2 of net new commercial / office floorspace by 2026.

Figure 7 – Midland Supportable Commercial Floorspace Demand (Indicative)

	2012	2016	2021	2026
Supportable Floorpsace (m^2)	63,703	72,144	81,827	92,130
Net New Required (m^2)	7,151	15,592	25,275	35,578

Source: Colliers Research

Figure 7

5 SPATIAL PLANNING IMPLICATIONS

The relationship between amenity provision, development staging and population growth is an iterative one. A certain level of shopping, entertainment and lifestyle amenity is expected of urban development projects but this in turn needs to grow and evolve with the sense of place and the levels of activity over time.

Section 4 of this report proposes a quantum of net new retail and commercial /office floorspace that the Midland Strategic Town Centre could reasonably expect over time but it is the optimal configuration and location of this floorspace that is most important.

A key challenge for Midland will be to generate sufficient levels of activity intensity and diversity over time. While the development and ultimate take-up of medium density accommodation over time will generate an 'in-close' residential population that may be expected to engender a degree of activity in the town centre, this needs to be augmented by a strategy that seeks to attract and concentrate a stable employment base in the town centre. A resident employment base that incorporates knowledge intensive jobs aimed at servicing the needs of the population over and above the primarily retail and commercial services employment that currently exists is important in extending the nature and size of the user groups that interact with the city centre.

A central plank in the development of the Midland Strategic Town Centre and of precincts within the centre is the establishment of the Midland Health Campus. The campus will feature a workforce of approximately 3,000 to 4,000 when fully operational and service potentially 200,000 to 300,000 patient events (inpatients, outpatients and emergency department) annually. In addition to this, the individual patient events are also likely to attract supporting visits from friends and relatives, suggesting that the total throughput of people in the precinct may well exceed 500,000 annually.

Of further key importance to the development of the Midland Town Centre is the prospect of the establishment of a transit oriented development notionally around the Cale St / Railway Pde Junction. This development, in close proximity to the health precinct site, can be expected to fundamentally change the nature of the Midland town centre and how users (i.e. residents, workers and visitors) interact with it. It should be noted that any such development in this area is not in competition per se with the established retail centres anchored by Midland Gate and Centrepoint but is rather, expected to be complementary to the established precincts and the way in which user groups interact (and their reasons for doing so) will differ to varying degrees from user behaviours in other precincts.

5.1 FLOORSPACE ALLOCATION AND PLACE PURPOSE

A conventional approach to the planning of the Midland town centre would concentrate on the allocation of retail and commercial / office floorspace in and around the Midland Gate complex and effectively work out from there. The development of the railyards, the establishment of the health precinct and the potential relocation of the Midland train station to a Cale St transit oriented development will mean a substantial reconfiguration of the Midland town centre. The development of key employment nodes south of Railway Pde and the emergence of density housing in these areas mean that careful consideration needs to be given to the allocation of net new retail and commercial space in these areas over time.

It is apparent that not all of the Midland town centre can be activated and revitalised at the same time. Vitality is about the concentration and frequency of economic and social transactions that occur within a given area and consideration must be given to the areas that most require and will be most suited to activation over the period to 2026. Moreover, the allocation of net new floorspace, or indeed the relocation of existing floorspace, for town centre is neither formulaic nor prescriptive. Colliers suggests that retail and commercial development should focus in the short to medium term on a relatively small number of nodes within the town centre including

- The Cale St / Railway Pde TOD location
- The Cale St and Padbury Tce corridors between the ostensible TOD site and Midland Gate
- The existing train station site and area adjacent to Midland Centrepoint
- The Crescent and Keane St borders of Midland Oval (assuming residential development of that precinct)
- The Railyards
- Midland Gate

The extent of these sites is graphically presented in Appendix G.

This analysis is not intended as a site specific feasibility investigation and therefore makes no recommendation on the exact quantum of space in each location. The intention is, rather, to present the case for balanced and effective development of the town centre in the context of what it is intended to become and considering the likely quantum of floorspace required for the town centre as a whole.

Vibrancy of place, or economic vitality, is about maximising the incidence and concentration of transactions, both economic and social, that occur within a place or precinct. This is an iterative and self-reinforcing process that, if done effectively, will bolster the property performance of a place and make it a desirable place for residents and for commercial and retail tenancies. The planning of the Midland Strategic City Centre should consider a number of place creation and activation principles that may guide the development of the city’s precincts. These principles include:

- Purpose of place – that is; understanding the reason why the place exists in the first instance and how, why and how often different users will engage with the place. Is the precinct primarily a residential place or an employment node, or is it primarily a place of retail and entertainment amenity? And to what extent might the place incorporate a measure of all these functions? What times of the day and week is the place intended to operate and is there a significant seasonality component to the nature of interactions that occur there.

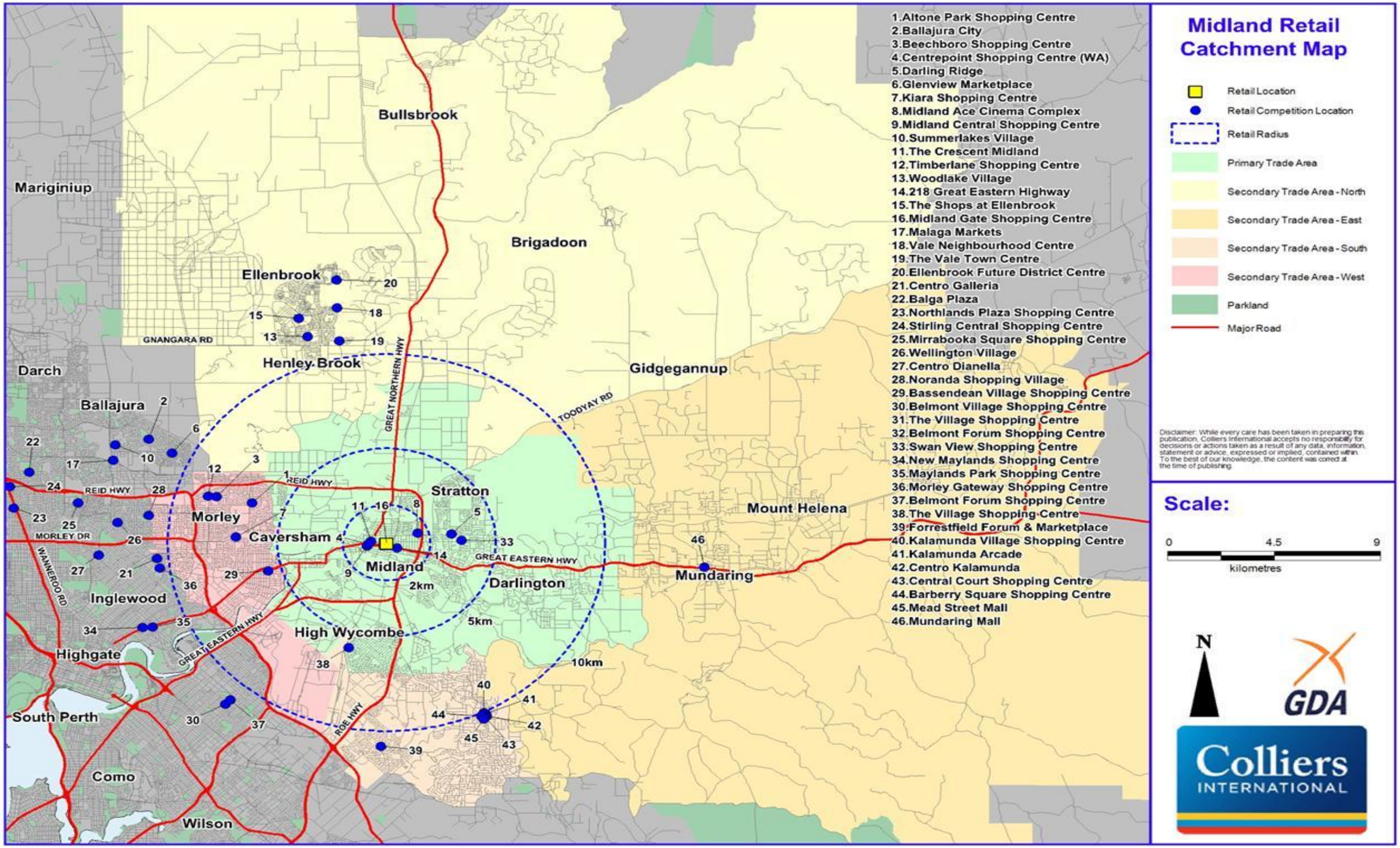
- Place focal point – what is the core focus of the place and how is this expressed in a design sense and in a functional sense? How do users know when they've arrived at the focal point or core of the precinct, what will they find there and how does what they find there determine the nature of their interactions?

- Accessibility, connectivity and legibility – how and where do users arrive at the place? How easy is the place to access by car or public transport, or by pedestrian and cycle traffic? How easy is the place to navigate internally and how well connected is it with other places in the city centre? How well is it supported by parking?

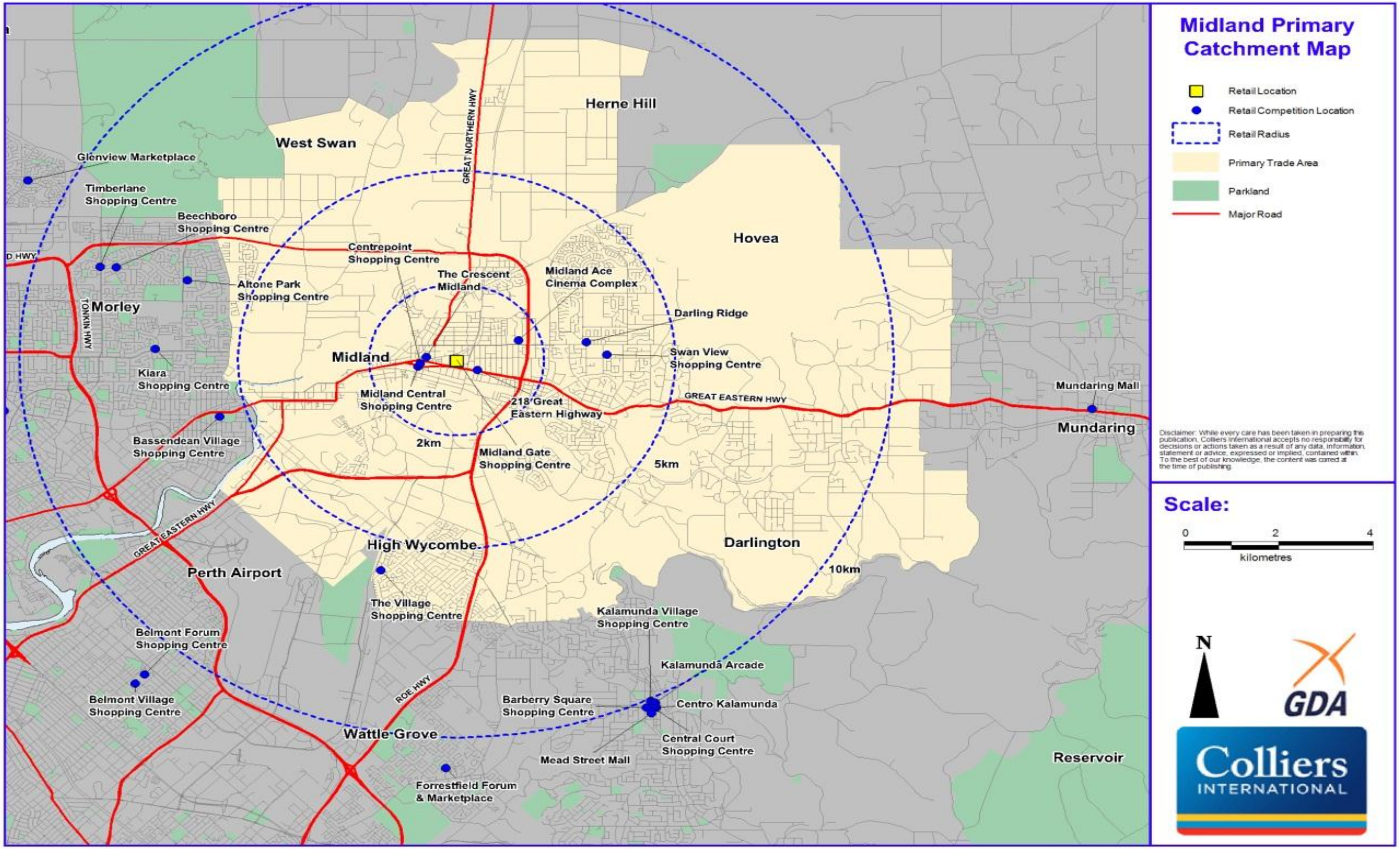
- Attraction and amenity provision – what are the elements additional to the functional purpose of the place that will attract users, that is, what are the major destinations within the place and how might they be augmented / expanded to provide the level of amenity and infrastructure that users seek?

- Governance, priority sites usage and control – what are the priority sites within the place or precinct and to what extent can a place activation and management strategy control both the nature of development on the sites and the type of tenancies that that might be attracted to the location? What governance model is required to ensure that the development and management of strategic sites is consonant with the City's development and planning objectives? What is the preferred development model for the place? (Appendix H outlines suggested strategic sites within the Cale St TOD precinct and adjoining activity corridors)

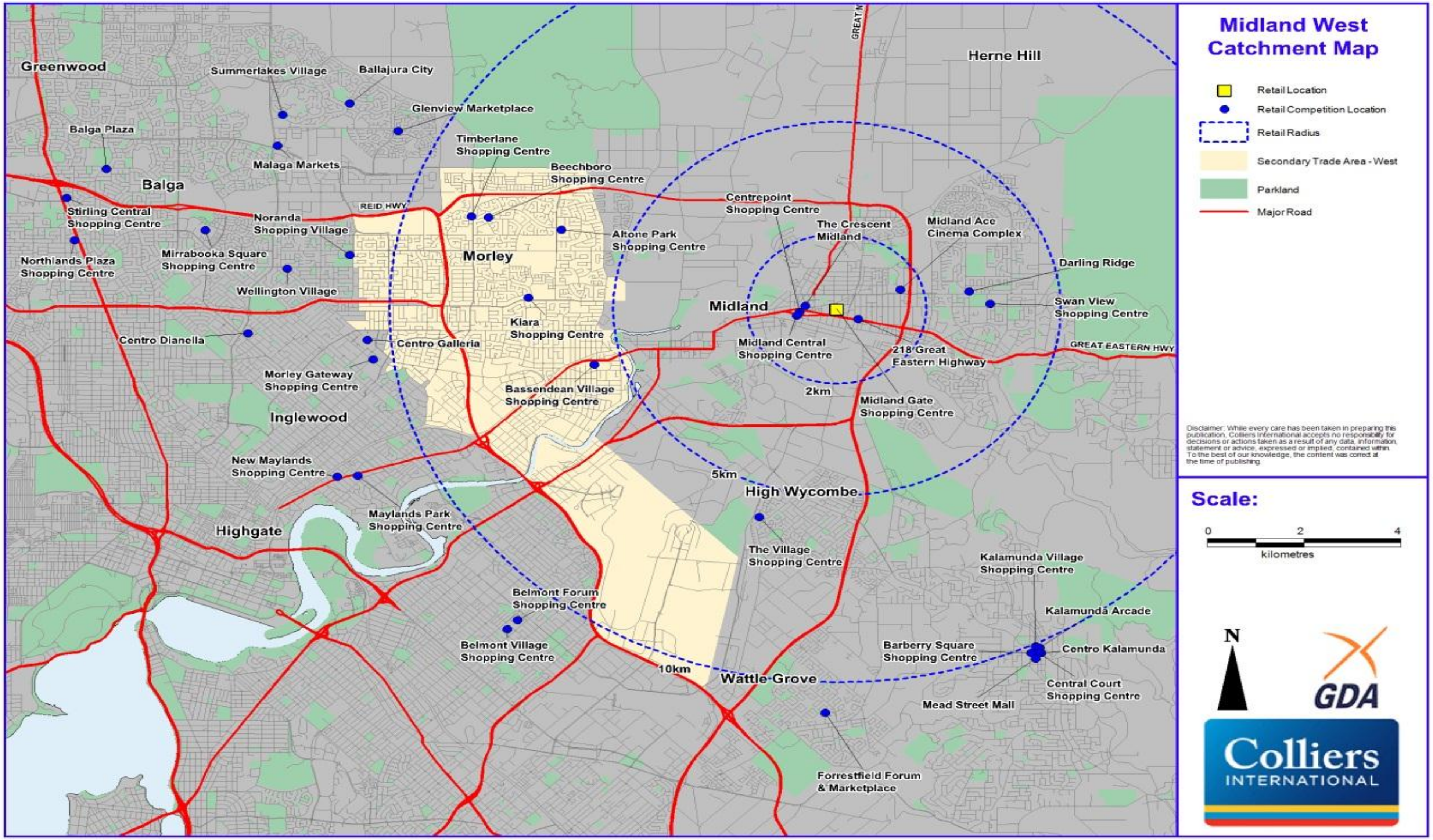
Appendix A – Midland Strategic Centre Main Trade Area Catchment



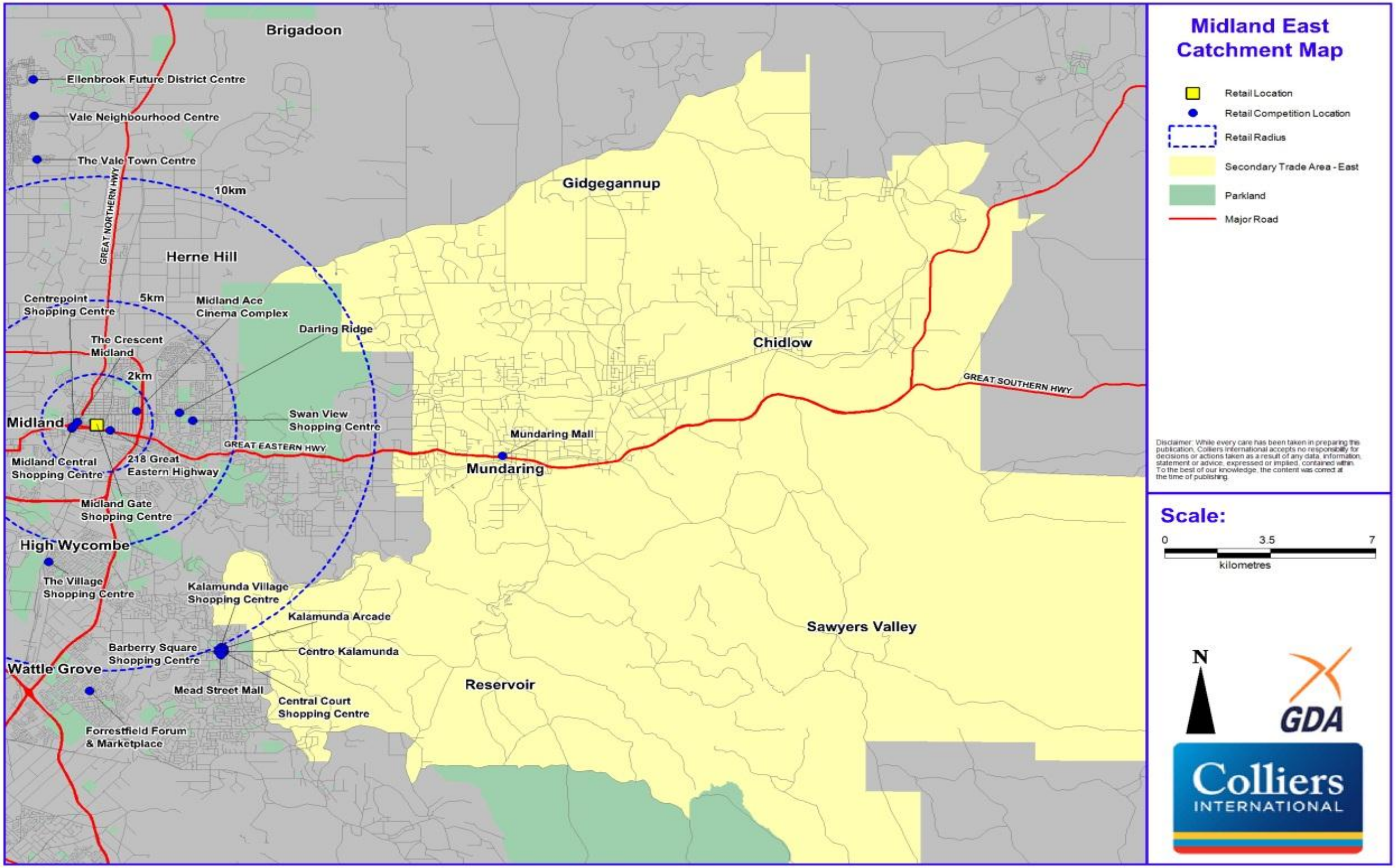
Appendix B – Midland Strategic Centre Primary Catchment



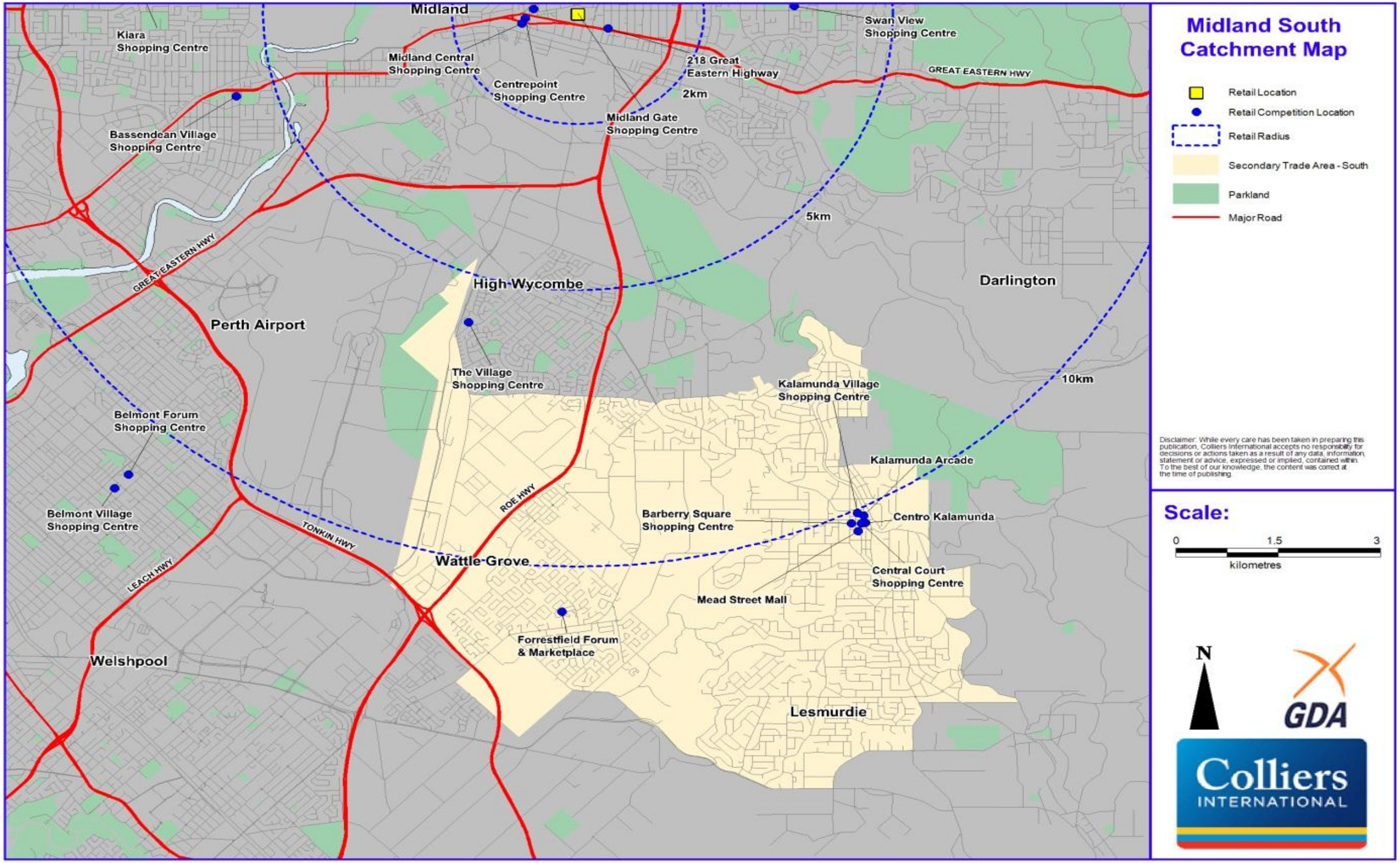
Appendix C – Midland West Catchment Map



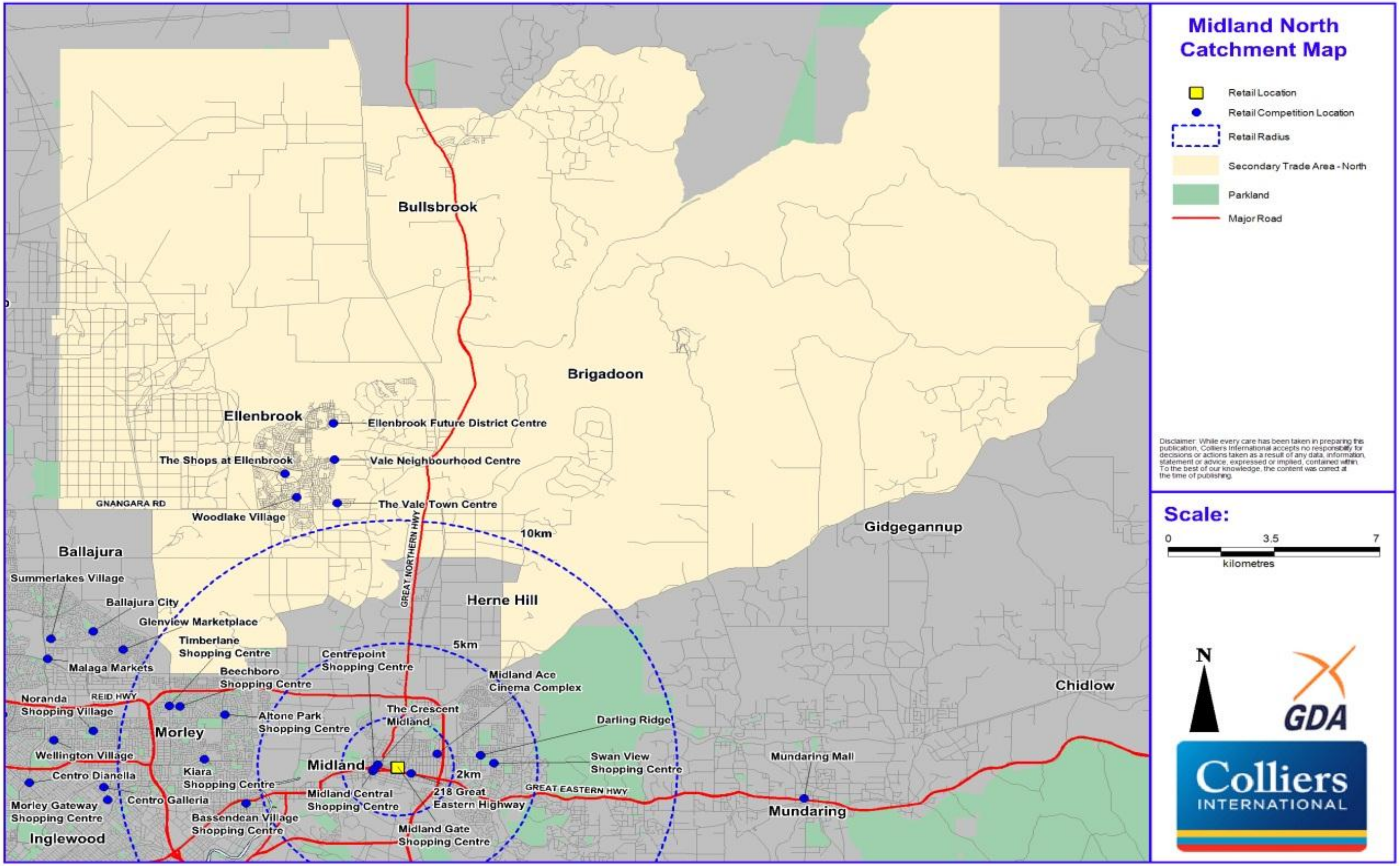
Appendix D – Midland East Catchment Map



Appendix E – Midland South Catchment Map



Appendix F – Midland North Catchment Map



Appendix G – Midland Strategic Town Centre Key Development Zones

Appendix H – Cale St TOD Area