

Broome North

TRAFFIC AND ACCESS REPORT



- V2
- 22 January 2010



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1. Introduction

Sinclair Knight Merz (SKM) was engaged by LandCorp to prepare a Transport Assessment to accompany the structure plan for the proposed Broome North development.

This Transport Assessment has been prepared in consultation with the multi-disciplinary design team, the Shire of Broome, Main Roads Western Australia (MRWA) and Department of Planning (DoP). The report expands on the document ‘*Broome North Development – Engineering Report Final, Revision 4, 13 October 2009*’ prepared by SKM.

The current report covers all main modes of transport and has been prepared in parallel to the structure plan (Development Plan) prepared by Roberts Day. The assessment has been prepared in accordance with the Western Australian Planning Commission draft *Guidelines for Developments, Volume 2 – Structure Plans*, August 2006 (WAPC Guidelines).

1.1 Transport Assessment Objectives

The key objectives of a Transport Assessment for a Structure Plan for an area of this size are:

- to assess the proposed internal transport networks with respect to accessibility and safety for all modes: vehicles, public transport, pedestrians and cyclists;
- to assess the level of transport integration between the Structure Plan area and the surrounding land uses;
- to determine the impacts of the traffic generated by the Structure Plan area on the surrounding land uses; and
- to determine the impacts of the traffic generated by the Structure Plan on the surrounding transport networks.

A number of specific objectives and principles were agreed by a number of key stakeholders at the Planning Design Forum (PDF) for Broome North held in Broome from 19-22 August 2009. The transport objectives included:

Topic	Key objective
Overall	<ul style="list-style-type: none"> ■ To design and deliver safe, convenient movement system for all people (residents, visitors and business) that contributes to a clean environment, healthy lifestyle and vibrant economy
Transport/ land use integration	<ul style="list-style-type: none"> ■ Integrate transport and land use to minimise car use and encourage safe walking and cycling
Safety	<ul style="list-style-type: none"> ■ Safe and secure movement network in Broome North: <ul style="list-style-type: none"> ■ Provide a safe network of streets (local connectors and local streets) within Broome North for walking, cycling and relevant traffic



Topic	Key objective
	<ul style="list-style-type: none"> ■ Provide safe and secure network of footpaths and shared paths on the internal network of streets ■ Provide a safe off-street network for pedestrians and cyclists within integrated open space areas and ECC's
Public Transport	<ul style="list-style-type: none"> ■ Plan and promote two bus services in Broome North – one linking to Cable Beach and the other to Chinatown and Broome Town Centre ■ Plan bus services to be carefully positioned and to serve both neighbourhood centres
Street design	<ul style="list-style-type: none"> ■ Legible and permeable internal street network in Broome North ■ Design all local and neighbourhood connector streets in Broome North as low speed streets to discourage through traffic movement and to improve safety for all users ■ Design all streets to make a contribution to the above ground drainage system ■ Provide intersection traffic management control where neighbourhood connectors or important local streets intersect to improve safety and reduce speed ■ Provide a comprehensive, integrated and safe footpath network ■ Provide a network of linked, safe bicycle routes using a combination of shared paths and on-street facilities within road reserves
Connectivity and legibility	<ul style="list-style-type: none"> ■ Ensure connectivity and legibility to existing Broome: <ul style="list-style-type: none"> ■ Provide a high degree of accessibility to Broome North from the surrounding road network and developed areas ■ Provide a clear regional structure with legible and direct connections to and between activity centres

1.2 Background

The purpose of the four-day PDF was to:

- Identify what matters to the local community and other key stakeholders in the development of the land;
- Detail the issues, opportunities and values of the site;
- Establish the overarching design principles for future development and how these can be incorporated into a Masterplan;
- Establish principles for a movement network including site access and routes for pedestrians, cyclists and public transport;
- Agree on the best urban design and built form outcomes that celebrate the land's values; and
- Prepare a final design concept that has the support of forum participants.

The traffic and transport environment in Broome is unique due to climate, remoteness and the transient population. Therefore, the application of standard transport and access approaches as outlined in the Western Australian Planning Commissions (WAPC's) Liveable Neighbourhoods design code is not always appropriate or relevant. The key factors taken into account in the planning of the movement network for Broome North include:



- The high cost of housing in Broome means that household sizes tend to be higher than in Metropolitan Perth. This has implications with respect to dwelling size, the number of parking spaces required and the trip generation rates per dwelling.
- Due to the isolated location of Broome, many trips are local in nature, with the most popular destinations being the centre of Broome (Chinatown), Cable Beach, the Port and Airport.
- The mix of residents in Broome North is expected to include retirees, families and people employed on a 'fly-in, fly-out' basis.
- The road network in Broome forms an integral part of the drainage system. The Q100 event is stored fully within the road reservation. A width of 7.4m is generally required for the road pavement to fulfill this function, which has implications for designing streets for low traffic speeds
- The types of pavement treatments available in Broome are limited, due to availability and cost of materials, and the prevalence of pindan. The use of coloured asphalt is cost prohibitive and where differentiations are necessary on the road, line marking and pavers are typically used.
- Medians within the road reserve are typically kerbed in order to prevent infiltration of storm water to the road sub-base at the centre of the road.
- Larger vehicles such as four wheel drives are commonplace, which contribute to faster wear of road surfaces.
- Walking in Broome is not popular for some residents but is an important mode for tourists.
- Cycling as a mode of travel is growing in popularity. The topography in Broome is flat and conducive to cycling. In addition, most travel distances within the township are manageable for cyclists of all abilities.
- There is only a limited public transport service in Broome, but this is likely to expand as the town grows in size.

1.3 Consultation

A collaborative approach to the preparation of this report has been adopted with the Shire of Broome, DoP and MRWA. In particular, trip generation rates (and balance of internal to external trips), trip distribution, geographical area of assessment, site access treatments and methods to assess/ quantify impacts have been pre-agreed with relevant authorities.



1.4 Report Structure

- Section 1 Introduction and background (this section)
- Section 2 Structure Plan outline
- Section 3 Existing transport and access
- Section 4 Future Conditions
- Section 5 Traffic generation
- Section 6 Traffic distribution
- Section 7 Traffic analysis
- Section 8 Planned internal transport network
- Section 9 Public transport
- Section 10 Pedestrians and cyclists
- Section 11 Summary



2. Structure Plan Outline

2.1 Location

The development site is approximately 735Ha in area. It is located north of Broome Airport and bordered by Gubinge Road to the south, Broome Highway to the east, Fairway Drive and Lullfitz Drive to the west, and the Broome Shire refuse area to the north. The area is presently not developed with the exception of the Blue Haze Light Industrial Area at the southeast corner of the site.

Strategic planning by the DoP has identified areas within the site as the next major land supply area for Broome. It is estimated that on average, 100 new residential lots per annum are released in Broome.

2.2 Broome North Structure Plan

The Development Plan for Broome North is shown in Figure 2-1. This is a long term plan and it is expected that it will be at least a 50 year time frame to reach full build-out.

2.3 Proposed Land Uses

The proposed development yield at Broome North, for the purposes of this Transport Assessment, is summarised in Table 2-1.

■ **Table 2-1 Structure Plan proposed land uses**

Use	Yield	Unit
Residential	4,833	Lots
	286.18	Hectares
Education	34.15	Hectares
Retail	7.09	Hectares
Tourism	20.43	Hectares
Industrial ¹	72	Lots

The development is planned to be self-sustaining in relation to education and local shopping needs. Two public primary schools, one public high school and an Anglican school are planned on the site. The town centres are proposed to have a local neighbourhood function and be located so that most of the Broome North catchment is within 800m to 1000m of the centre. The higher density living (R40 zoning), will be principally around the town centres. The bush living and larger lifestyle blocks will be located mostly at the northern fringe of the site.

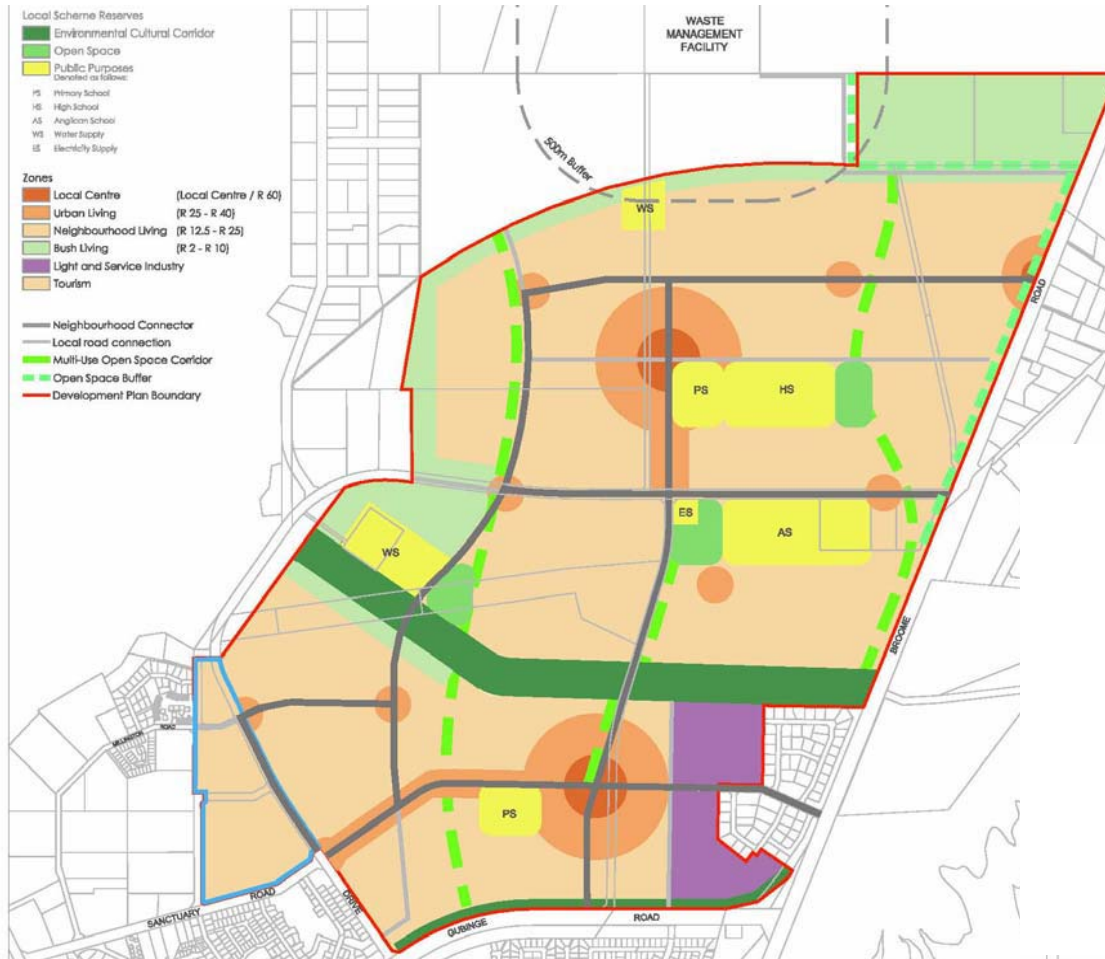
¹ These are new lots. Total Light Industrial Area is 27 Hectares.



The tourism-related uses will be located on the western side of Fairway Drive, as an extension to the Cable Beach tourism precinct. It is proposed to extend the Blue Haze Light Industrial Area to the west.

Planning for the site has responded to the natural features and a strong desire to retain vegetation belts, which will contribute to the character of the site and serve as green corridors, forming an integral part of the site's drainage system.

■ **Figure 2-1 Proposed Broome North Structure Plan (source Roberts Day)**



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PLANNING CONDITIONS

1. This District Development Plan (Plan) applies to the land contained within the inner edge of the red line.
2. The purpose of this Plan is to describe the broad land uses (expressed as transect zones), the location of major service infrastructure, main movement systems and major conservation and recreation areas to guide the preparation of Local Development Plans within the Plan area.
3. Residential density throughout the Plan area is expressed as a range for each of the relevant transect zones depicted on the Plan. The extent of the transect zones is indicative and not intended to describe the spatial boundaries of the each zone. Specific residential density codes and land use within each of the transect zones will be applied by a Local Development Plan prepared in accordance with Clause 3 of Part One of the Broome North District Development Plan report.
4. The design of lots and local streets depicted on the Plan is indicative and will be subject to further refinement and modification at the Local Development Plan and subdivision stages respectively.
5. The location and design of Public Open Space (POS) depicted on the Plan is indicative and will be subject to further refinement and modification at the Local Development Plan and subdivision stages respectively. POS will be provided generally in accordance with the requirements of Liveable Neighbourhoods.

3. Existing Transport and Access

3.1 Existing Land Uses

The site is largely undeveloped natural scrub/ bush land incorporating some conservation areas, located at the northern periphery of Broome.

Broome contains a number of key trip attractors and destinations including:

- Broome Town Centre and Chinatown are located approximately 4km south of Gubinge Road. This is the main retailing, administrative and service centre for the town. It is also host to a number of tourism-related land uses.
- The Cable Beach tourism precinct is located to the west of Broome North and accessed via one of three routes - Cable Beach Road West, Fairway Drive/ Sanctuary Road or Murray Road/ Cable Beach Road. There are over 1,300 tourist accommodation units within this precinct.
- Broome International Airport encompasses – an extensive land area located between Broome North and the balance of the Broome Township. Vehicle access to the main terminal buildings is via Frederick Street/ Coghlan Street/ Macpherson Street.

- Broome Port is located at the southern end of the peninsula, 10km south of the township and is accessed via Gubinge Road/ Port Drive.

3.2 Existing Road Network and Traffic Volumes

The Broome Township road network is shown in Figure 3-1. Given that much of Broome North is undeveloped, there is only a limited network of streets throughout the site. Broome Road/ Highway (route H42), to the east of the site, is the only road in and out of the Broome township. It is a declared two lane undivided rural road under the care and control of MRWA. In July 2009, during the peak tourist season, traffic counts were undertaken by the Shire of Broome. The average daily traffic volumes on the road network surrounding Broome North are shown in Figure 3-2. The five-day average 24-hour traffic count on Broome Highway south of Gubinge Road was approximately 5,000 vehicles.

Gubinge Road was developed as a bypass route between Broome Road/ Highway and the Broome Port, reducing the throughput of heavy vehicles in the Broome Town Centre. Heavy vehicles comprise approximately 21% of the typical daily traffic flows on Gubinge Road. At present, Gubinge Road carries an average 2,650vpd east of Fairway Drive.



To the south of the Broome North development site, Gubinge Road is a two lane divided road with a 70km/h speed limit. The road reservation width is 70m and would allow a four lane duplicated cross section in the long term when traffic demands necessitate upgrade.

North-South Link Road, also known as Jigal Drive, is the southerly extension of Fairway Drive. It is ultimately planned to connect through the area now occupied by Broome Airport to Frederick Street. The timing of the Airport's relocation is not yet known. Until the Airport is relocated, Jigal Drive provides access to the Broome Town Centre via Sandpiper Avenue and Broome Road.

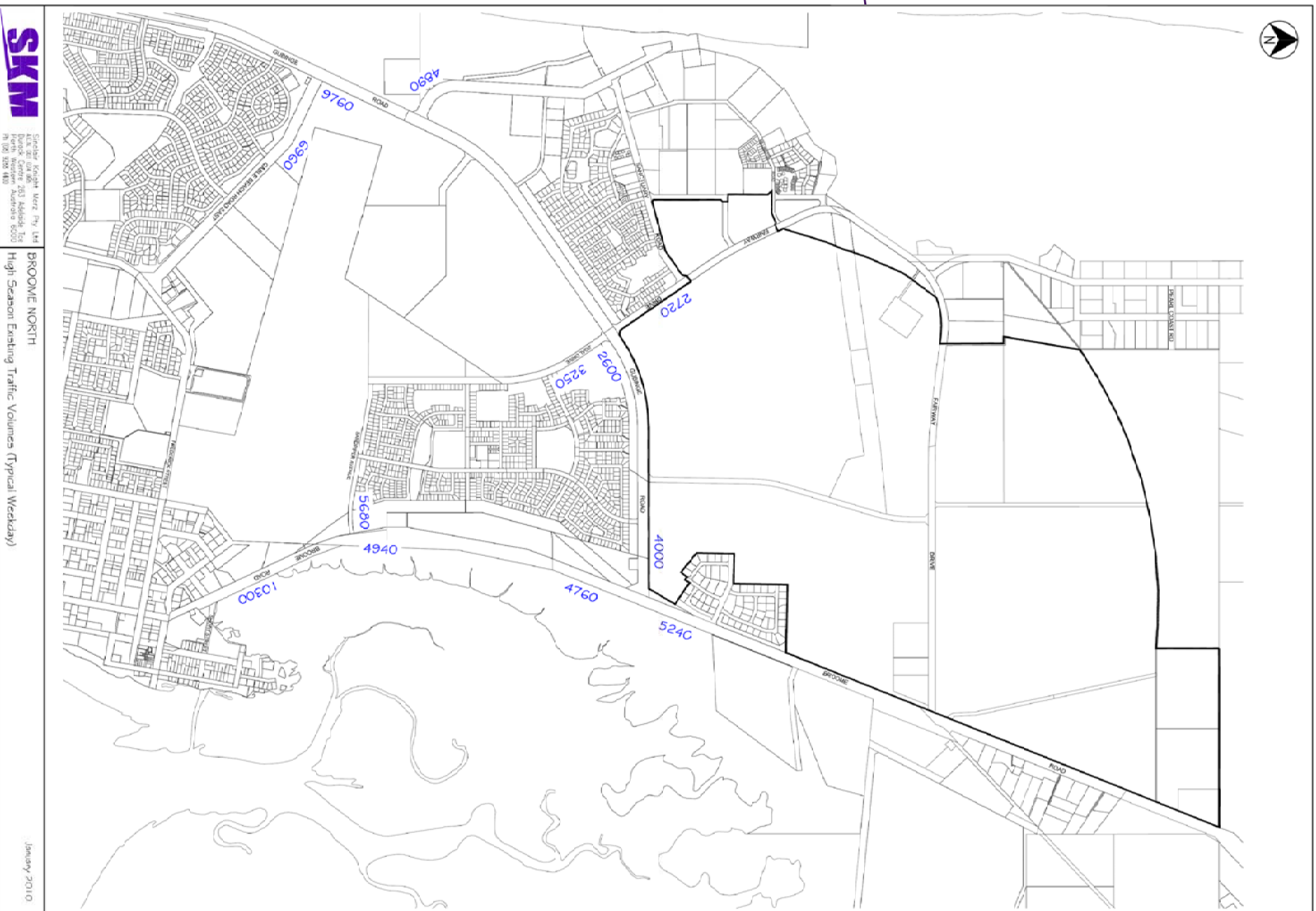
Magabala Road is presently an informal, unsealed road and carries only light traffic volumes (less than 1,000 vpd). Fairway Drive is also an unsealed road. The surface is well maintained but subject to flooding during the wet season. It connects Broome Road and Gubinge Road but carries low levels of traffic north of Sanctuary Road.

■ Figure 3-1 Broome Township map (Source: Broome Tourist Information Centre)



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■ Figure 3-2 Existing High Season Traffic Volumes



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BROOME NORTH
High Season Existing Traffic Volumes (Typical Weekday)

January 2010

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3.3 Existing Walking and Cycling Networks

There is presently no formalised walking and cycling access through the development site. Throughout Broome, most residential streets have footpaths on at least one side of the road. All major roads have footpaths on both sides. Footpaths are most commonly located adjacent to the road kerb, rather than adjacent to the property boundary.

Council has received ongoing funding under the Country Pathways programme to extend and upgrade cycling/ shared use paths. Most shared use paths are 2.0 metres wide.

Gubinge Road has recently been constructed with a shared path on one side. There is also a shared path along the western side of Fairway Drive in the vicinity of Cable Beach.

Currently, traffic volumes are low on Gubinge Road but in view of forecast increases, well located crossing points will be essential, especially to link the Broome North and Roebuck Bay residential areas.

3.4 Existing Public Transport

The current bus service in Broome is a privately operated franchise service geared towards the tourist market. The service operates from Chinatown to Cable Beach and intermittently to the Broome Port. Bus patronage is relatively low in the residential areas serviced such as Roebuck Estate.



4. Future Conditions

4.1 Road Network

The *Broome Highway Planning Study – Route Definition Report* (Western Infrastructure, May 2002) outlines the ultimate access arrangements on to Gubinge Road and Broome Highway in the vicinity of Broome North. These include:

- 40m radius roundabout at the intersection of Gubinge Road/ Fairway Drive/ North-South Link Road (Jigal Drive)
- 3-leg, priority controlled intersection at Gubinge Road/ Magabala Road. Full directional access permitted.
- 3-leg priority controlled intersection at Gubinge Road/ Sanderling Drive. Access to and from Sanderling Drive restricted to left-in/ left-out
- 3-leg, priority controlled intersection at Gubinge Road/ Broome Road/ Broome Highway. Full directional access permitted.
- 3-leg, priority controlled intersection at Broome Highway/ Tanami Drive. Full directional access permitted into and out from the Blue Haze Industrial estate.
- 3-leg priority controlled intersection at Broome Highway/ Fairway Drive. Full directional access permitted.

The plans from the *Broome Highway Planning Study – Route Definition Report* (Western Infrastructure, May 2002) are presented in Appendix A of this report.

All street intersections with Gubinge Road are designed to cater for the turning movement of a 19m semi-trailer.

Gubinge Road is ultimately planned to be duplicated with timing reviewed periodically.

4.2 Traffic Projections

Traffic volume projections for the Broome road network have been made by a number of sources. These include:

- Broome International Airport Group (prepared by ULOTH and Associates) – to understand the impacts of planned development within land owned by the airport group which includes Roebuck Estate. Projections have been developed for the years 2011 and 2031.
- Department of Planning - (formerly Department for Planning and Infrastructure, DPI) – forecasts for the years 2011 and 2031
- Western Infrastructure through the preparation of the Broome Highway Planning Study Route definition report for the year 2031 (March 2003).

The year 2031 projections for key roads around Broome North are presented in Figure 4-1.

It is noted that these forecasts are not directly comparable as there are inconsistencies in the allowances for residential lot development in Broome (especially Broome North, Roebuck Estate and Cable Beach) and road networks. However there is a large degree of consistency between the DPI (DoP) and ULOTH and Associates projections.

The most recent traffic forecasts are those prepared by ULOTH and Associates. Figure 4-2 shows year 2031 traffic projections prepared by ULOTH which exclude development in Broome North however with some modifications. SKM considers that a more even balance in traffic growth on Sanctuary Road and Gubinge Road west of Fairway Drive will occur. These volumes will be used as the baseline volumes for the 'interim' year assessment for Broome North.

Traffic projections do not extend beyond the year 2031, which is the typical planning horizon.

5. Traffic Generation

5.1 Methodology and Assumptions

The full build-out of Broome North is expected to occur significantly later than the typical planning horizon for transport assessments which is the year 2031. It has been agreed with the DoP that two development scenarios will be considered to assess the impacts of Broome North:

- **Interim:** year 2031 with 2,000 residential lots, one primary school, one high school, extension to the Blue Haze industrial estate and partial development of one retail centre. This development area is expected to be bounded by Fairway Drive, Broome Highway and Gubinge Road.
- **Ultimate:** notionally year 2051 with full development extending to the existing waste transfer station.

Based on the trends in lots released in Broome North – approximately 100 per annum - the interim scenario is considered a high growth scenario with a medium growth scenario more likely to be around 1,500 lots.

5.2 Assumptions

The assumptions made in undertaking this analysis are presented in Table 5-1.

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■ **Table 5-1 Assumed yield for analysis**

Use	Interim	Ultimate
Residential lots	2,000	4,800
Education enrolments	500	2,000
Retail (net floor area, sqm)	2,500	6,000
Industrial (gross floor area, sqm) ²	60,750	60,750

5.3 Trip Generation Rates

Detailed calculations of the trip generation for Broome North are presented in Appendix E and the trip rates are summarised below.

² Industrial area is 27ha, 75% net yield, 0.3GFA



■ **Table 5-2 Ultimate Trip Generation**

Use	Car driver trip rate
Residential ³	7.17 trips per dwelling
Education	2 trips per enrolment
Retail ⁴	80 per 100 sqm NLA
Industrial	6.5 per 100 sqm GFA

The total trip generation is not calculated by addition of the above trip rates for each use as this would lead to double counting. For example a trip generated from a dwelling to the local shopping centre would be counted twice.

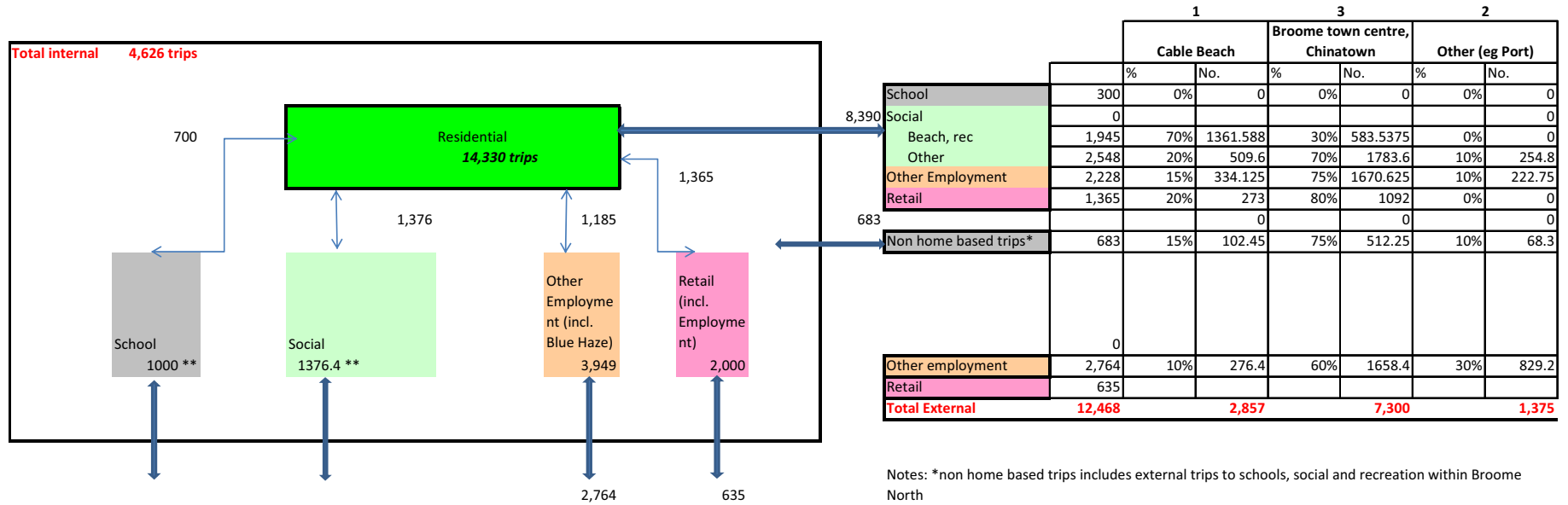
Broome North is expected to have a high degree of self sufficiency which will increase as the development grows and becomes more mixed use. The mix of internal and external trip is shown in Figure 5-1 and Figure 5-2.

³ Includes 5% non home based trips

⁴ Includes employment trips

■ **Figure 5-1 Internal and External Trips Generated at Broome North (Interim development)**

Daily internal and external trips



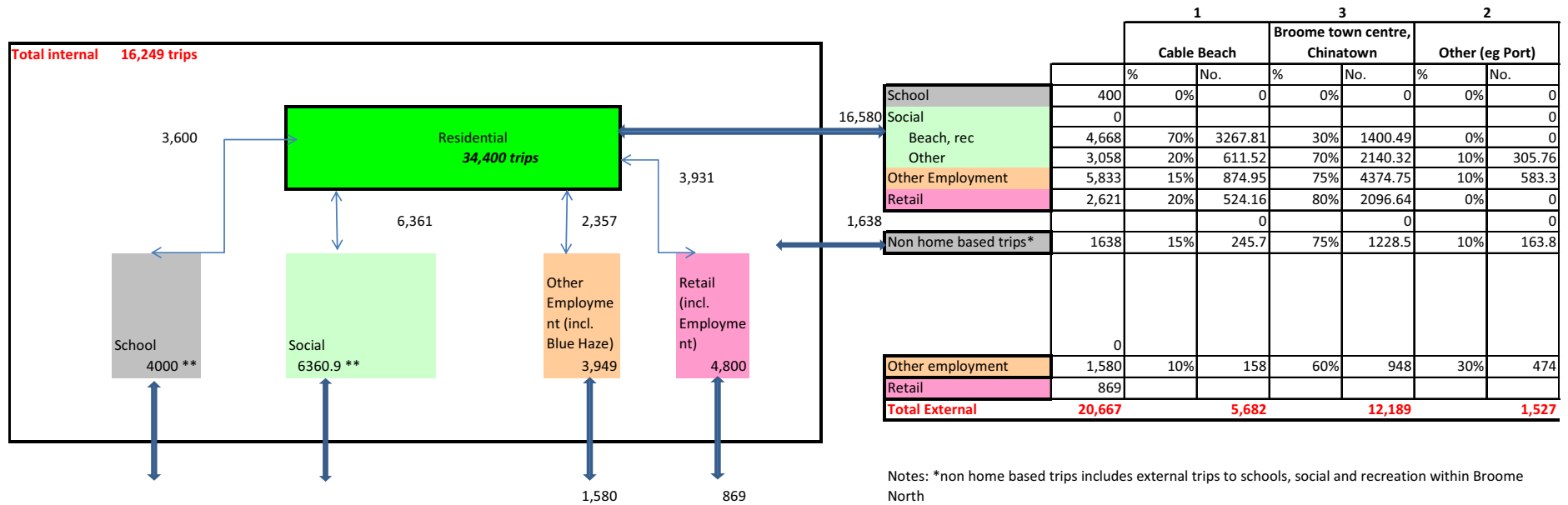
**External trips Included in non home based trips

Notes: *non home based trips includes external trips to schools, social and recreation within Broome North



■ **Figure 5-2 Internal and External Trips Generated at Broome North (Ultimate development)**

Daily internal and external trips

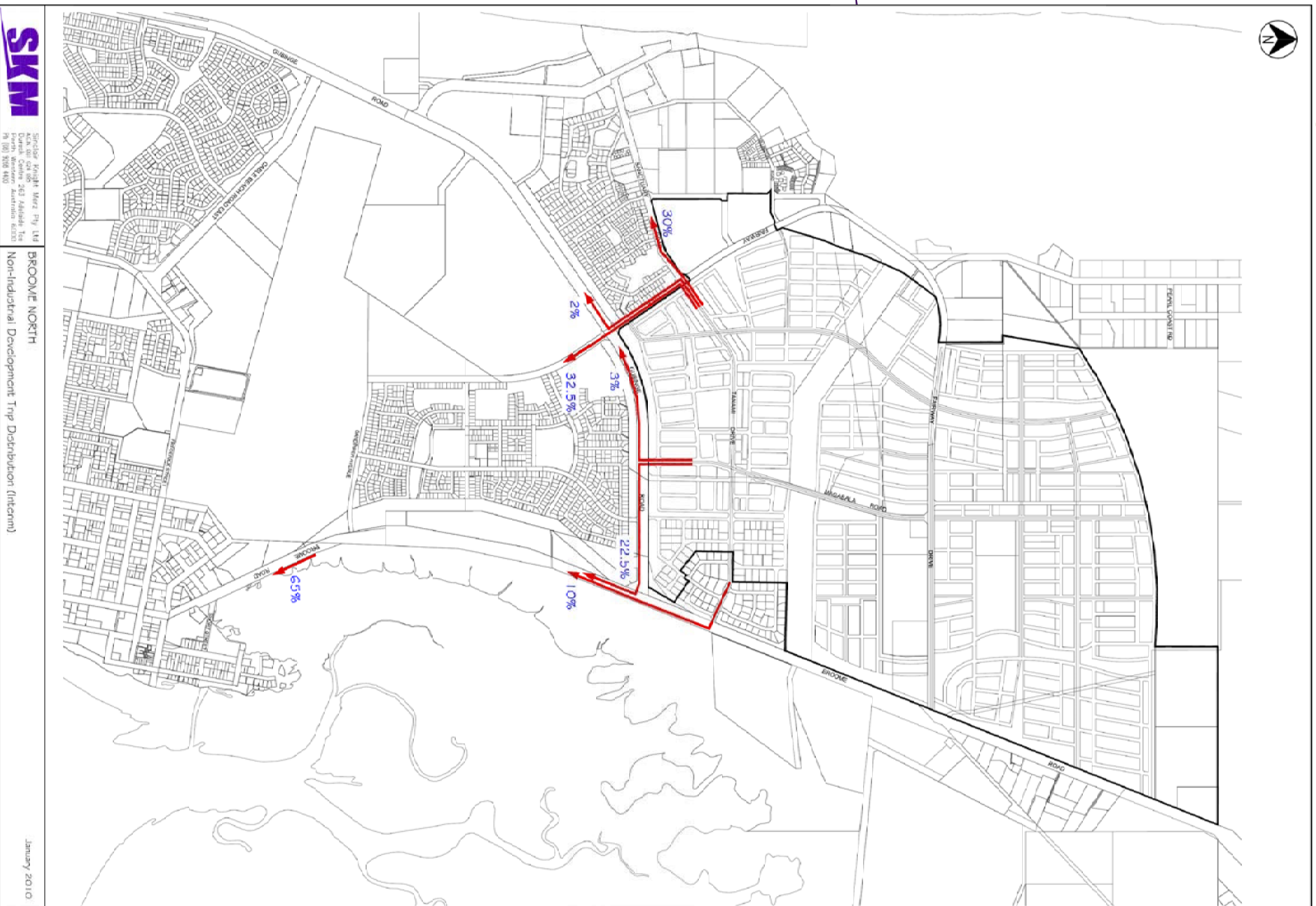


**External trips Included in non home based trips

6. Traffic Distribution

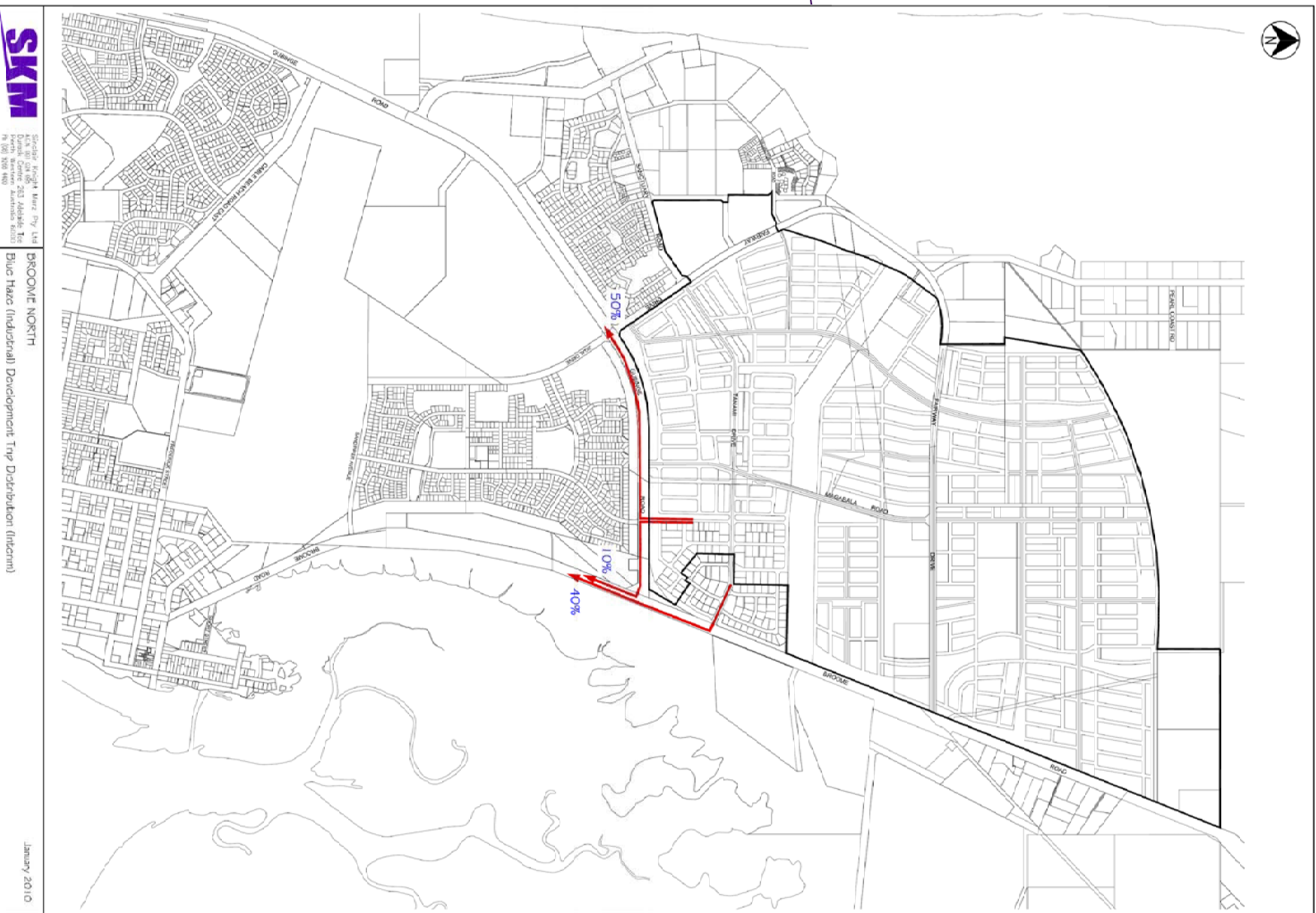
The assumed external trip distribution for trips to Blue Haze and all other trips at interim and ultimate development are shown in Figure 6-1 to Figure 6-4.

Figure 6-1 Non-industrial Trip Distribution – Interim



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■ **Figure 6-2 Industrial (Blue Haze) Trip Distribution – Interim**



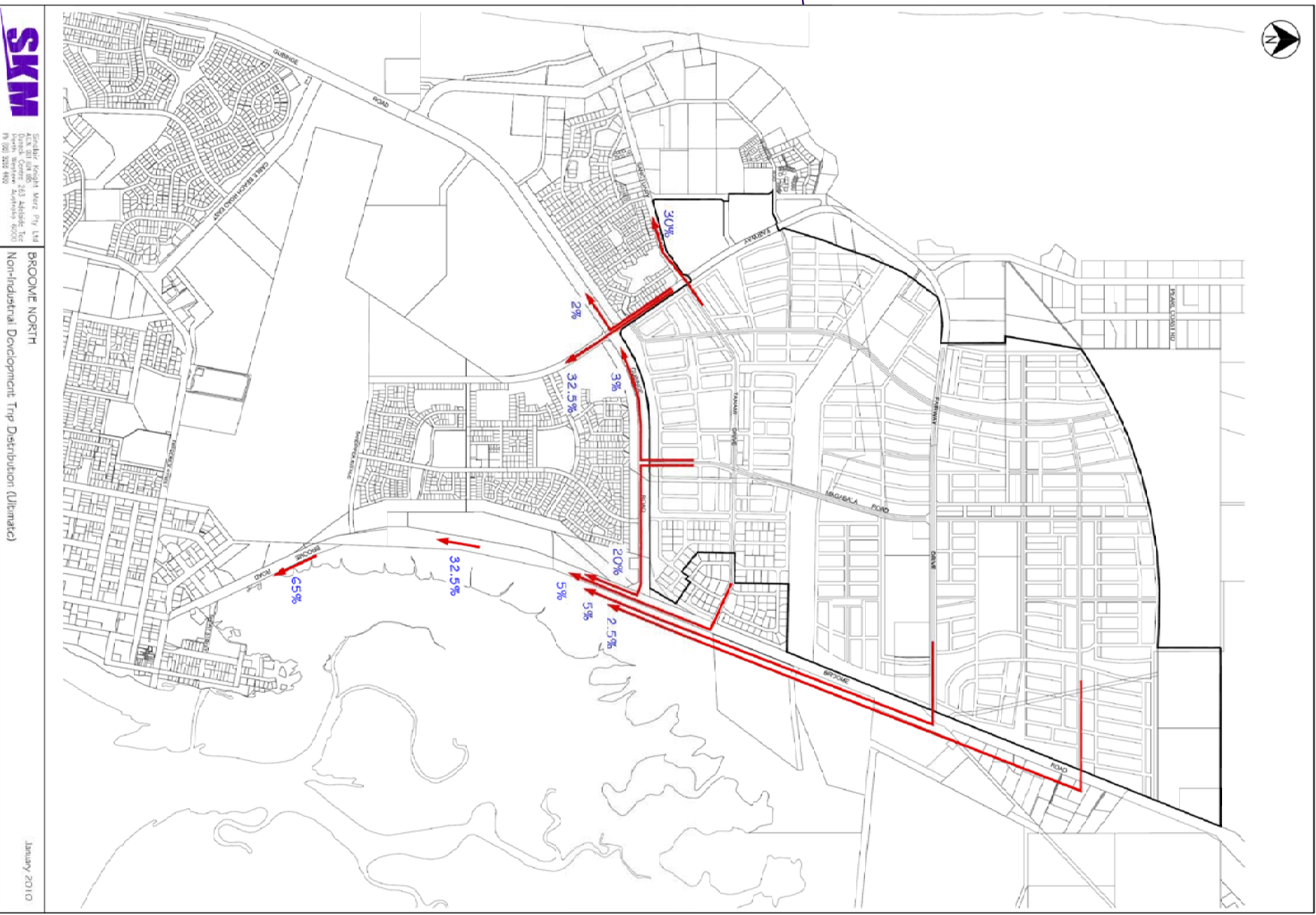
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Blue Haze (Industrial) Development Trip Distribution (Interim)

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■ **Figure 6-3 Non-industrial Trip Distribution – Ultimate**



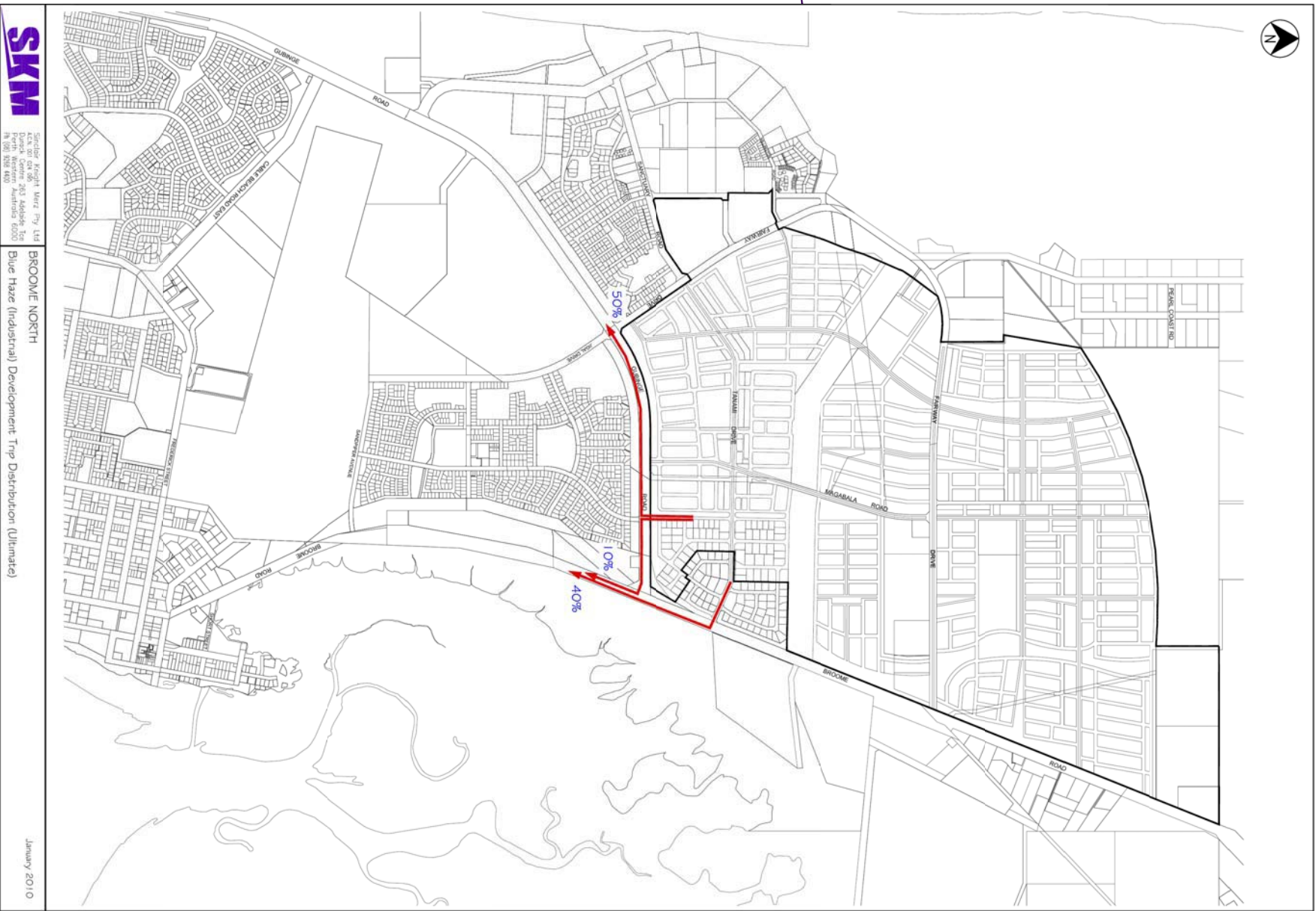
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Non-Industrial Development: Trip Distribution (Ultimate)

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■ **Figure 6-4 Industrial (Blue Haze) Trip Distribution – Ultimate**



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BROOMIE NORTH
 Blue Haze (Industrial) Development - Trip Distribution (Ultimate)

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7. Transport Analysis

7.1 Methodology

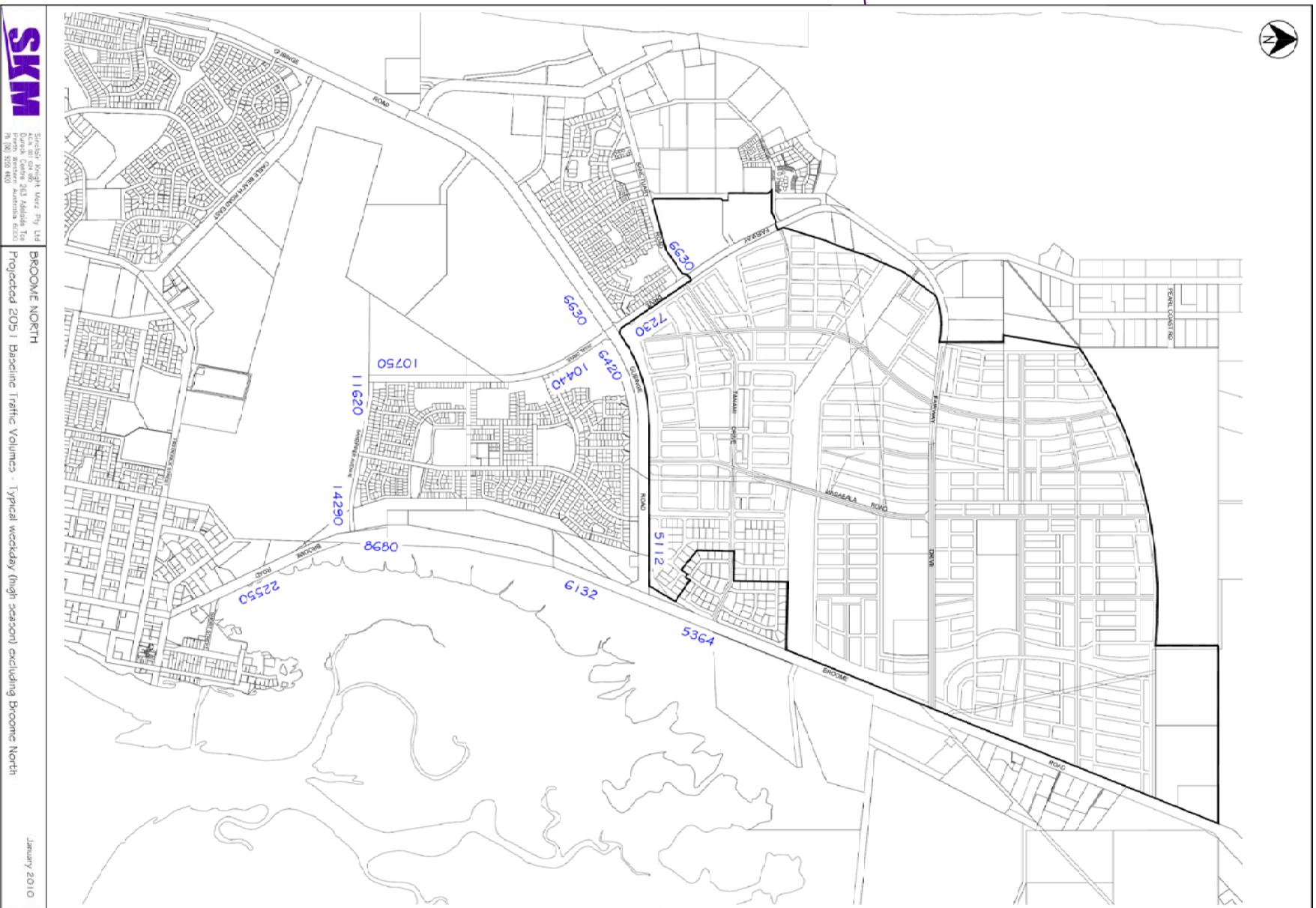
As discussed in Section 13, year 2031 traffic projections prepared on behalf of the Broome International Airport Group by ULOTH and Associates have been used as the baseline of the interim assessment. For the ultimate development, notionally year 2051, the 2031 volumes have been increased by 20% to allow for continued growth external to Broome North. However, it is recognised that most growth within Broome will take place in Broome North during the period 2031 to 2051.

The projected 2051 baseline traffic volumes (excluding the Broome North development) are presented in Figure 7-1.

7.2 Forecast Traffic Volumes

The interim and ultimate forecast traffic volumes on the road network surrounding Broome North, including the projected traffic associated with the Broome North development are presented in Figure 7-2 and Figure 7-3.

■ Figure 7-1 Year 2051 volumes – without Broome North



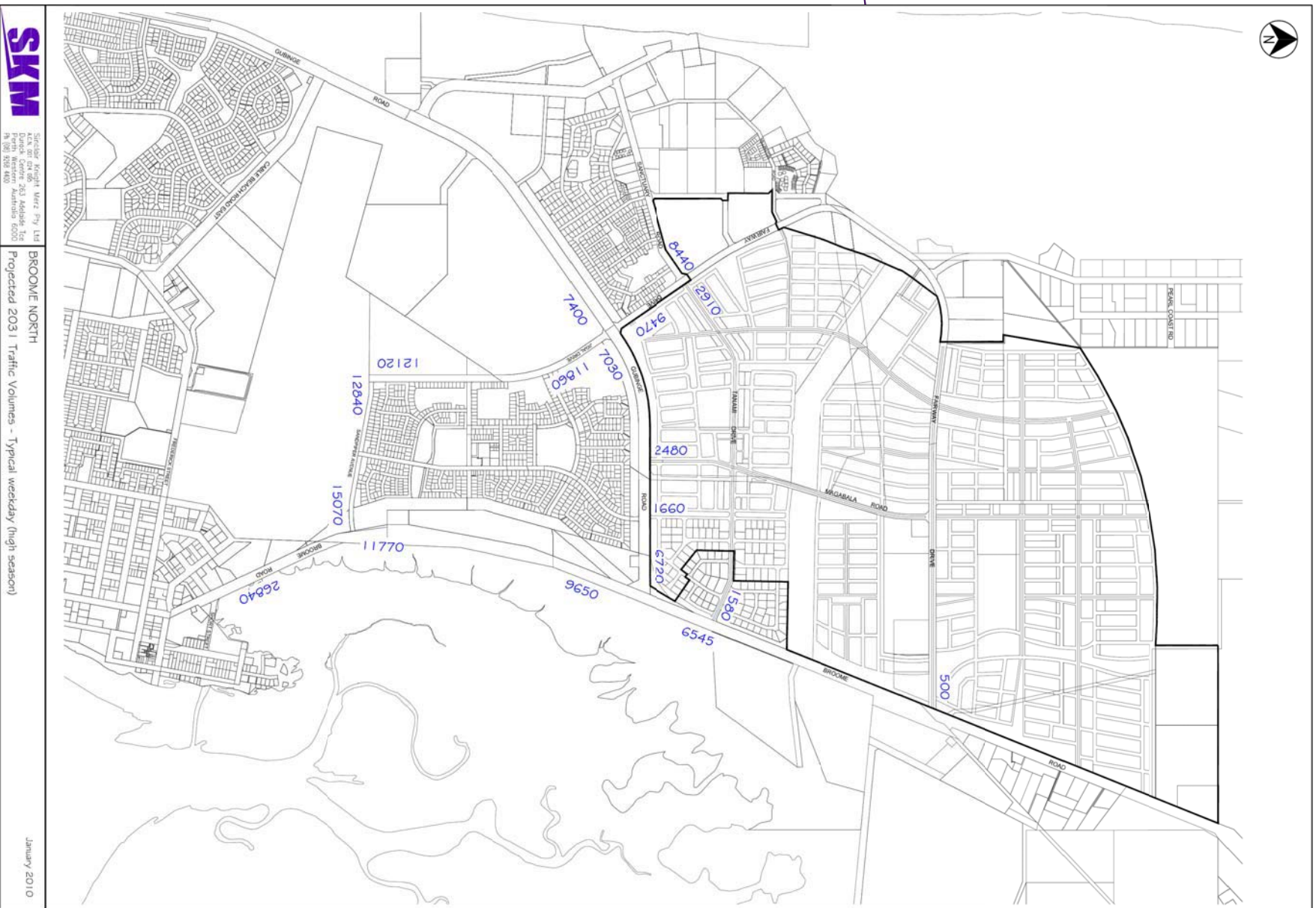
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BROOME NORTH
Projected 2051 Baseline Traffic Volumes - Typical weekday (high season) excluding Broome North

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■ Figure 7-2 2031 Forecast Traffic Volumes at Interim Development



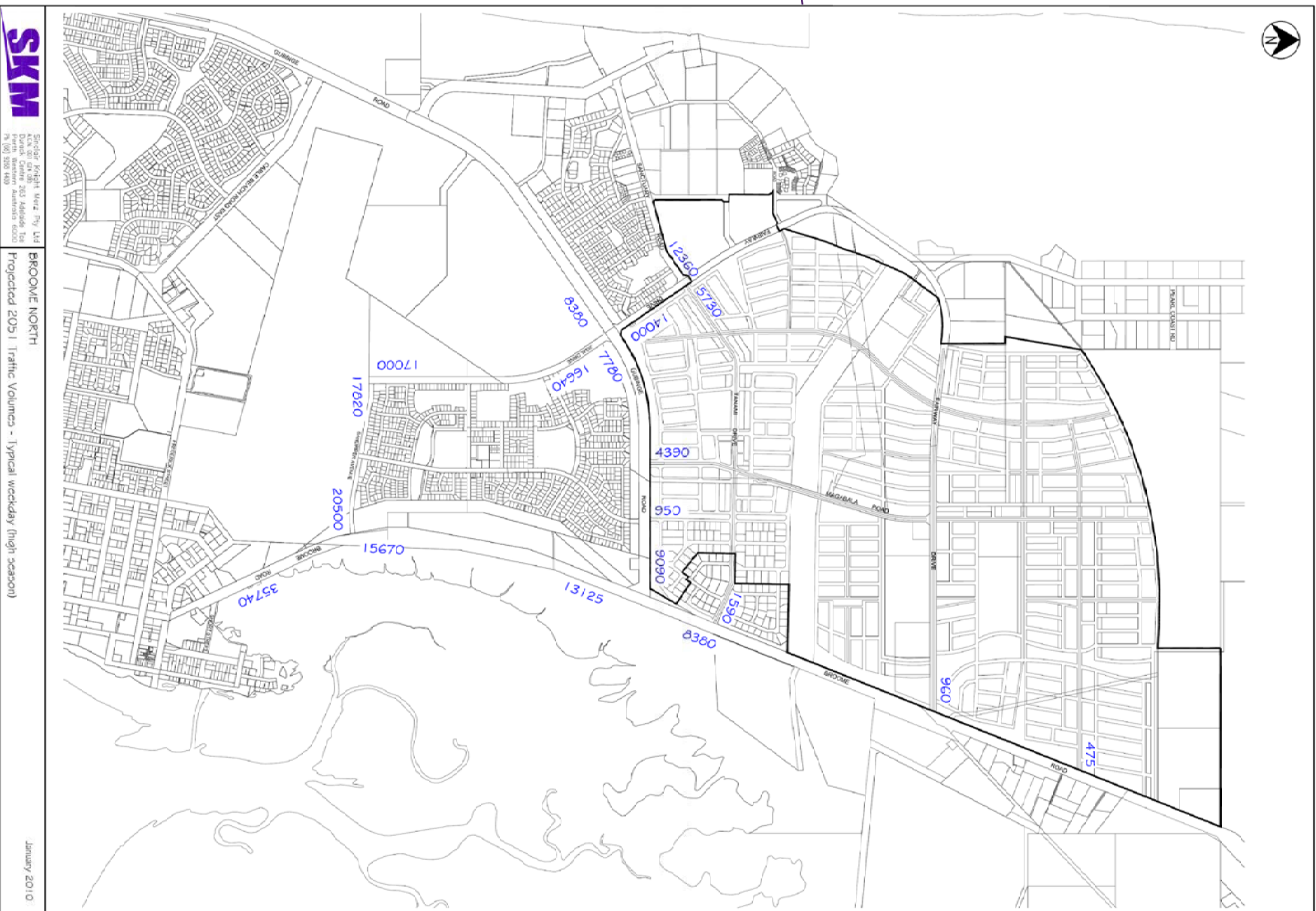
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Projected 2031 Traffic Volumes - Typical weekday (high season)

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■ Figure 7-3 2051 Forecast Traffic Volumes at Ultimate Development



7.3 Proposed Access Arrangements

Refer to plans attached as Appendix C.

The proposed external access points to the arterial road network from Broome North and their respective treatments are as follows:

Broome Highway

- Existing entrance to Blue Haze
- Existing Fairway Drive
- One new entrance towards the north of the development.

The existing intersection of Tanami Drive and Broome Highway, which provides access to Blue Haze, will need to be upgraded to include slip lanes as per the *Broome Highway Planning Study – Route Definition Report* (Western Infrastructure, May 2002).

In the long term it is also planned that a new separate entrance is provided to the waste transfer station (for amenity and safety reasons). All intersections will be priority-controlled.

The spacing between these entrances is approximately:

- Blue Haze to Fairway Drive – 1,200 metres
- Fairway Drive to northern entrance – 900 metres
- Northern entrance to access to transfer station – 500 metres.

Gubinge Road

Access to Gubinge Road has been agreed in principle with MRWA as follows:

- Magabala Road, full access
- Blue Haze Light Industrial Area, just west of Sanderling Drive

Copies of correspondence with MRWA are attached as Appendix D.

The intersection of Magabala Road/ Gubinge Road is planned as a full movement T-intersection. It will be priority controlled (GIVEWAY or STOP) until such time that the demand for pedestrian crossing warrants signalisation. The traffic analysis undertaken suggests that it is the demand for pedestrian crossing rather than traffic capacity grounds, which will prompt signalisation of this intersection. Main Roads WA supports this position.



To separate general traffic and heavy vehicles accessing the Blue Haze Light Industrial Area, a second access point from Broome North to Gubinge Road is proposed. This is for both amenity and safety reasons. This access was not considered under the *Broome Highway Planning Study – Route Definition Report*. However, at that time the development potential of Broome North was considered to be significantly less than now proposed.

Most heavy vehicles accessing Blue Haze will be destined for or originate at Broome Port (accessed via Gubinge Road). To discourage heavy vehicle traffic from travelling through the planned town centre on Magabala Road, a secondary access permitting left and right turns out from Blue Haze to Gubinge Road and left turns in from Gubinge Road, is proposed. No right turn in is considered necessary at this location as this would be a low demand movement and can be facilitated at the intersection of Broome Road/ Tanami Drive.

This new access is to be located just west of Sanderling Drive and approximately 300m from Magabala Road, which will be realigned west of its current location. This access arrangement assumes that Sanderling Drive will be limited to left-in/ left-out at Gubinge Road as per the *Broome Highway Planning Study – Route Definition Report*. The conceptual layout of the proposed secondary access Gubinge Road Blue Haze is shown in Appendix C.

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The intersection of Gubinge Road and Fairway Drive is roundabout-controlled. The geometry of this intersection (40m radius) caters for triple road trains. This intersection will provide sufficient capacity well into the future. However, to facilitate safe pedestrian crossing of Gubinge Road, it is recommended that this intersection be signalised in the longer term when pedestrian demands necessitate.

The treatment at the intersection of Tanami Drive/ Fairway Drive/ Sanctuary Road is discussed below.

Fairway Drive

The projected traffic volumes at the intersection of Tanami Drive and Fairway Drive require that it is roundabout-controlled at or prior to ultimate development in order to provide satisfactory levels of service.

7.4 Intersection Analysis

The software package SIDRA has been used to assess the interim and long term performance of the following intersections where development of Broome North is expected to have the greatest impact:-



- Gubinge Road/ Fairway Drive/ Jigal Drive
- Broome Road/ Tanami Drive
- Broome Road/ Gubinge Road
- Broome Road/ Sandpiper Avenue
- Broome Road/ Short Street

The intersection controls proposed and analysed for interim and ultimate development are presented in Table 7-1.

■ **Table 7-1 Analysed intersection controls**

Intersection	Interim	Ultimate⁵
Gubinge Road/ Magabala Road	Priority	Signals
Gubinge Road/ Blue Haze access	Priority	Priority
Gubinge Road/ Fairway Drive/ Jigal Drive	Roundabout	Signals
Broome Road/ Tanami Drive	Priority	Priority

⁵ Further traffic planning/ assessment will be required in the future to confirm intersection arrangements beyond 2031 prior to decisions being made on infrastructure upgrades. The analysed intersection performance is notional.

Intersection	Interim	Ultimate⁵
Broome Road/ Gubinge Road	Priority	Priority
Broome Road/ Sandpiper Avenue	Roundabout	Roundabout
Broome Road/ Short Street	Roundabout	Roundabout

Full details of the intersection analysis results are presented in Appendix E.

7.5 Road Network Improvements

The road network external to the Broome North site is expected to undergo major changes beyond the year 2031. The possible relocation of the Broome International Airport is a significant factor. It is for this reason, combined with the difficulties in projecting traffic growth beyond the year 2031 that it cannot be determined with any certainty at this stage of planning the required infrastructure upgrades beyond 2031.

Consequently the focus of this discussion on recommended road infrastructure upgrades is up to and including the year 2031 (ie interim development scenario).



The practical capacity of a two and four lane divided road (with median) is typically 15,000 – 20,000vpd and 35,000-40,000vpd respectively, depending on intersection treatments. Review of the projected traffic volumes at interim development, the following conclusions can be made, assuming that the airport has not relocated:

- Gubinge Road is unlikely to need duplication prior to 2031. Although the forecast volumes in the area investigated are expected to remain less than 15,000vpd the need for a four lane divided road is likely to be brought forward by the high proportion of heavy vehicles.
- Jigal Drive is likely to require to be upgraded to a two lane divided carriageway. Right turn movements should be protected via a median.
- Sandpiper Avenue should be upgraded to a four lane divided carriageway
- Broome Road is expected to require duplication (four lane divided road) south of Sandpiper Avenue by interim development.

At a stage between interim and ultimate development stages there will be a requirement for some of the site access points to be upgraded, this is in part due to the duplication of Gubinge Road and Broome Road (north of Gubinge Road). It is envisaged that this duplication (as outlined in the

Broome Road Planning Study prepared by Western Infrastructure) will take place at some stage between 2031 and 2051.

Upgrading the intersections of Gubinge Road/ Magabala Road and Gubinge Road/ Fairway Drive/ Jigal Drive to traffic signals is likely to be triggered by the need to provide for safe pedestrian crossing of Gubinge Road, rather than on traffic capacity grounds.

In addition to the site access points, the development of Broome North is projected to notably impact the intersections of Broome Road/ Gubinge Road and Broome Road/ Sandpiper Avenue. It is forecast that the Broome Road/ Gubinge Road intersection can remain a priority controlled intersection well into the future. It is expected that the current configuration will remain suitable until such time as Gubinge Road and Broome Road north of Gubinge Road are duplicated to a four lane divided carriageway.

The intersection of Broome Road/ Sandpiper Avenue is forecast to require upgrading to a single lane roundabout control by interim development. Extending Jigal Drive south of Sandpiper Avenue through the airport would reduce the traffic volume through the Broome Road/ Sandpiper Avenue intersection and would determine the need to upgrade this intersection to a dual-circulatory lane roundabout beyond 2031.



The SIDRA analysis shows that the intersection of Sandpiper Avenue/ Broome Road is expected to operate with a degree of saturation of 0.85 (Broome North right turn) in the interim for the right turn into Sandpiper Avenue. This is a low demand movement and it is noted that our analysis is based on a worst case scenario of high growth at Broome North. The operation of this movement is therefore not expected to be problematic.

The intersection of Broome Road/ Frederick Street has been recently upgraded to roundabout control. It is expected that this intersection would be upgraded to a two-lane roundabout if/ when Broome Road (south of Gubinge Road) is duplicated.

7.6 Summary

The recommended intersection treatments at interim and ultimate development stages are presented in Figure 7-4 and Figure 7-5 respectively. The treatments at ultimate development are notional and would require further investigation in the future to determine the need for upgrade.

It is noted that forecasting traffic volumes at the time of full build out of Broome North is difficult to do with a great deal of certainty due to the very long time horizon which will see a significant transformation of Broome. There are many local and global factors which will influence

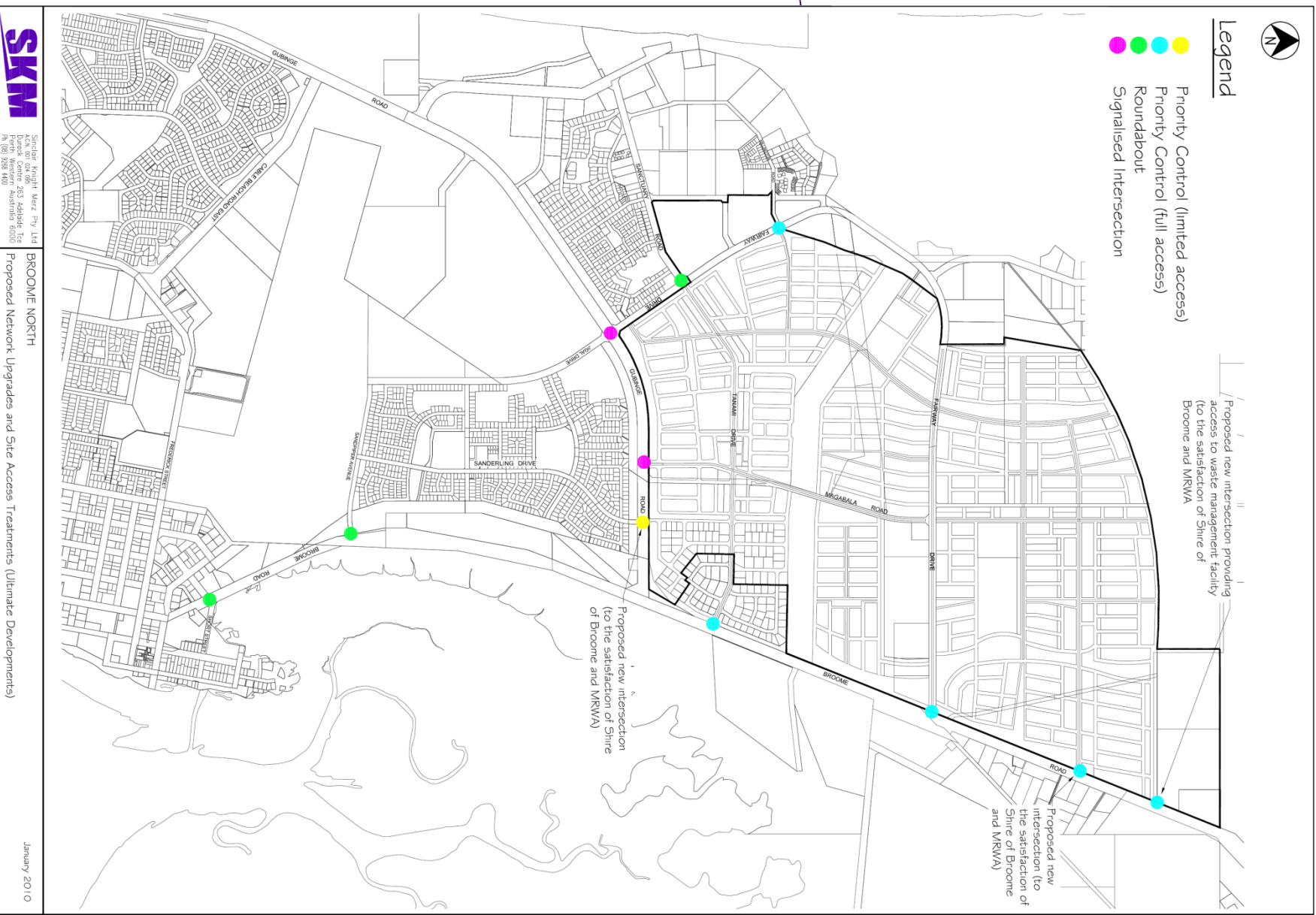
travel patterns over this period such as housing affordability, technology and peak oil. In Broome there is uncertainty around the timing of the airport relocation and the nature of the development which would take place on the site it now occupies. Spatial planning for road network improvements and associated developer contributions to fund road upgrades post 2031 should be undertaken with caution. It is recommended that a developer contributions plan for Broome North be developed to include road network upgrades to the year 2031.

■ **Figure 7-4 Recommended intersection treatments – interim (2031)**



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■ **Figure 7-5 Recommended intersection treatments – ultimate (2051)**



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8. Planned Internal Transport Network

8.1 Objectives

Legible and permeable internal street network in Broome North

Design all local and neighbourhood connector streets in Broome North as low speed streets to discourage through traffic movement and to improve safety for all users

Design all streets to make a contribution to the above ground drainage system

Provide intersection traffic management control where neighbourhood connectors or important local streets intersect to improve safety and reduce speed

Provide a comprehensive, integrated and safe footpath network

Provide a network of linked, safe bicycle routes using a combination of shared paths and on-street facilities within road reserves

At the PDF it was agreed that to implement these objectives a minimum 7.4 metre pavement should be provided between kerbs (and can include traffic lanes, parking and cycle lanes) in order for streets to fulfil a surface drainage function. This requires that a number of the standard Neighbourhood Connector and Local Access Street typologies in Liveable Neighbourhoods need to be adapted for Broome conditions.

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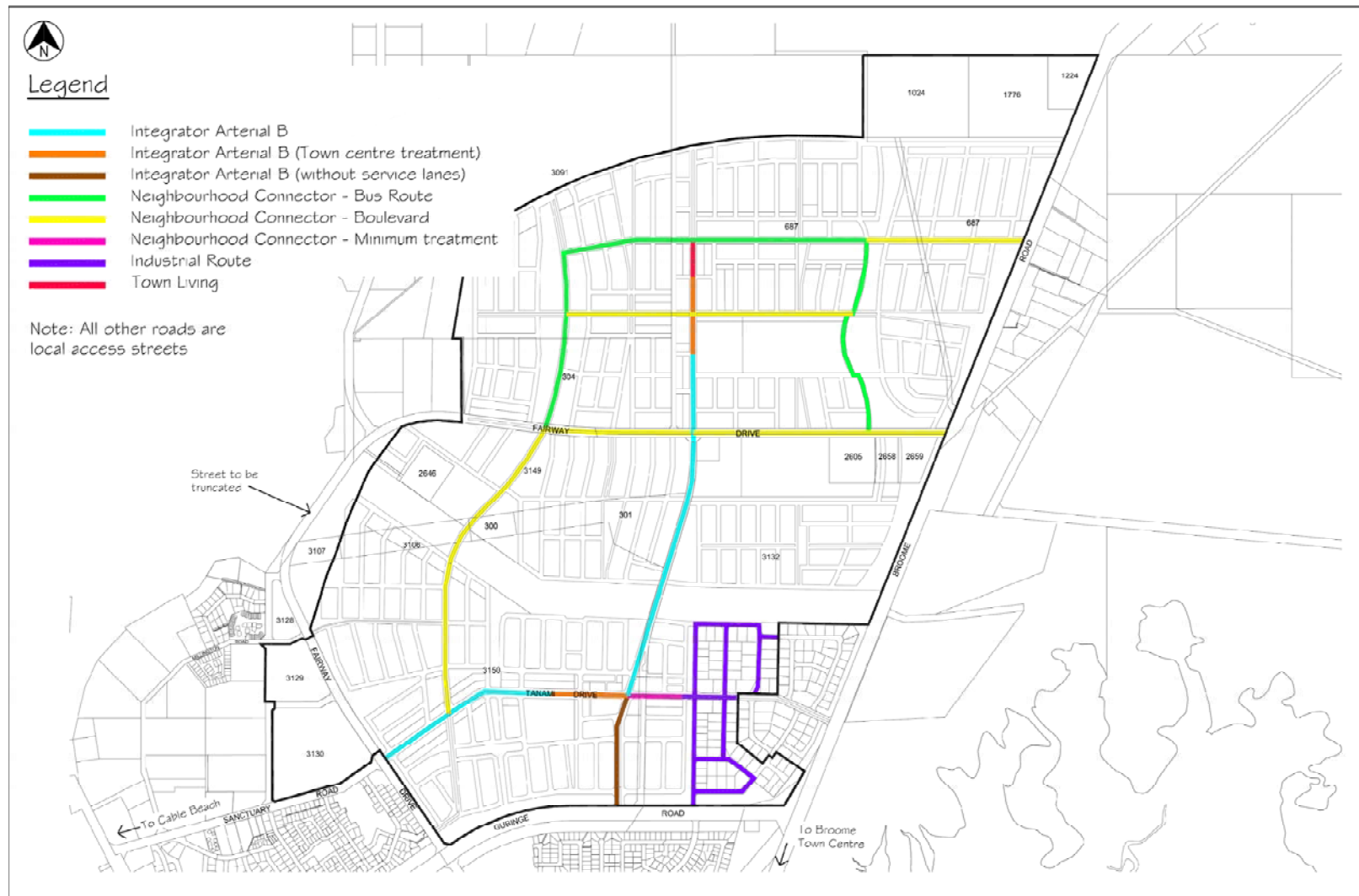
8.2 Hierarchy of Streets

The following principles have been applied:

- All roads have a minimum pavement width of 7.4 metres to satisfy drainage requirements
- Where estimated traffic volumes are greater than 7,000 vehicles per day, property access is provided via service roads
- On street parking provision is maximised around town centres
- Schools are accessed via a network of shared paths
- Footpaths are provided on at least one side of all locals streets and both sides of all other streets
- Shared paths are at least 2.5m wide and all footpaths are at least 1.5m wide.

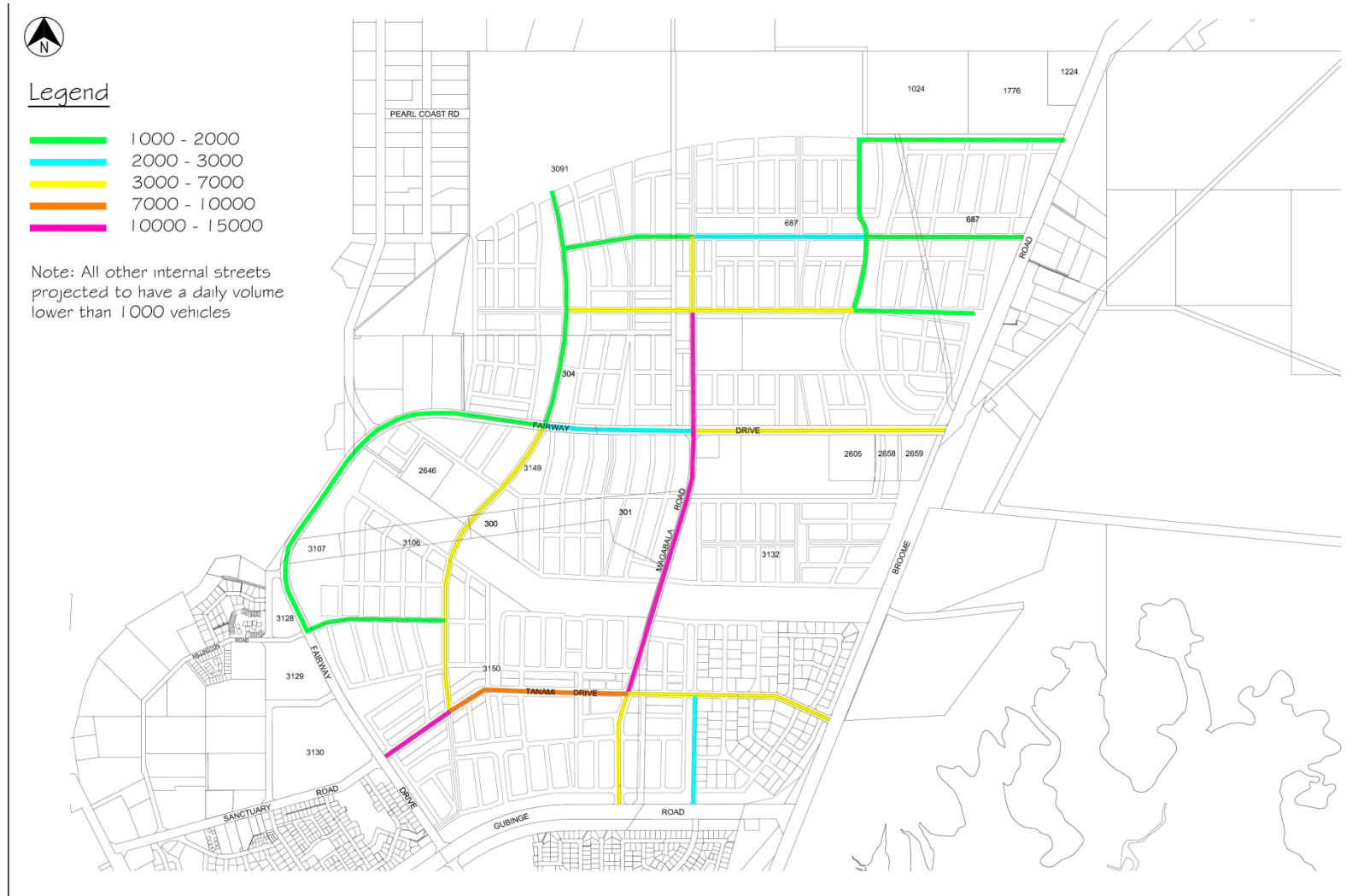
The road hierarchy for Broome North is shown in Figure 8-1. This comprises a network of local access streets, Neighbourhood Connectors and Integrator Arterial B Roads (Magabala Road and Tanami Drive west of Magabala Road). The maximum forecast traffic volume in the development is 14,000vpd on a section of Magabala Road (refer to Figure 8-2).

■ **Figure 8-1 Proposed Street Hierarchy**



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■ **Figure 8-2 Internal Network Volumes – ultimate development**



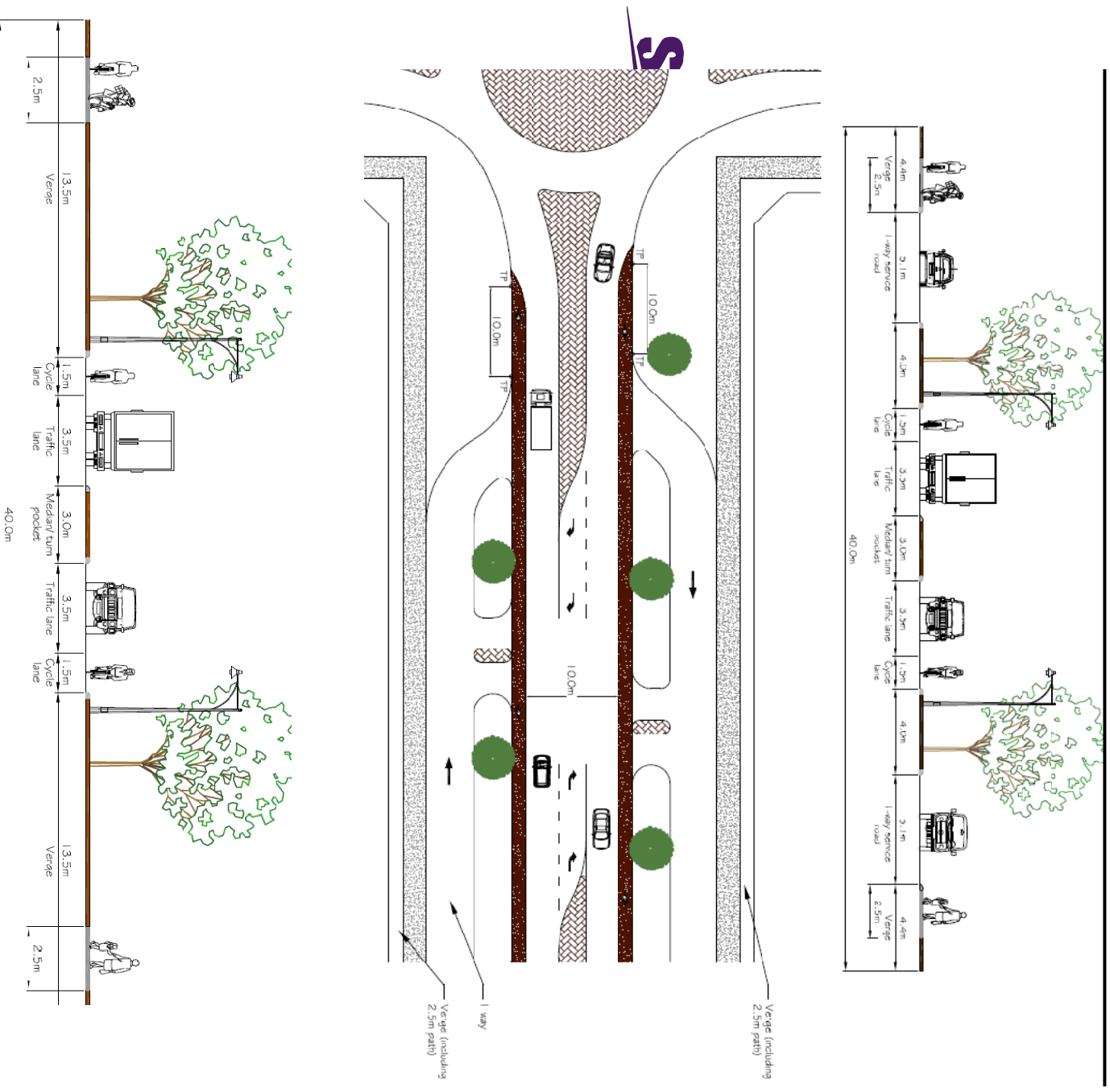
8.3 Street Typologies

Specific cross sections have been created for the town centre to maximise on-street parking provision and for the Blue Haze Light Industrial Estate to provide 19.0m semi trailer access to lots.

The typical designs for all road types are shown in Figure 8-3 to Figure 8-10.

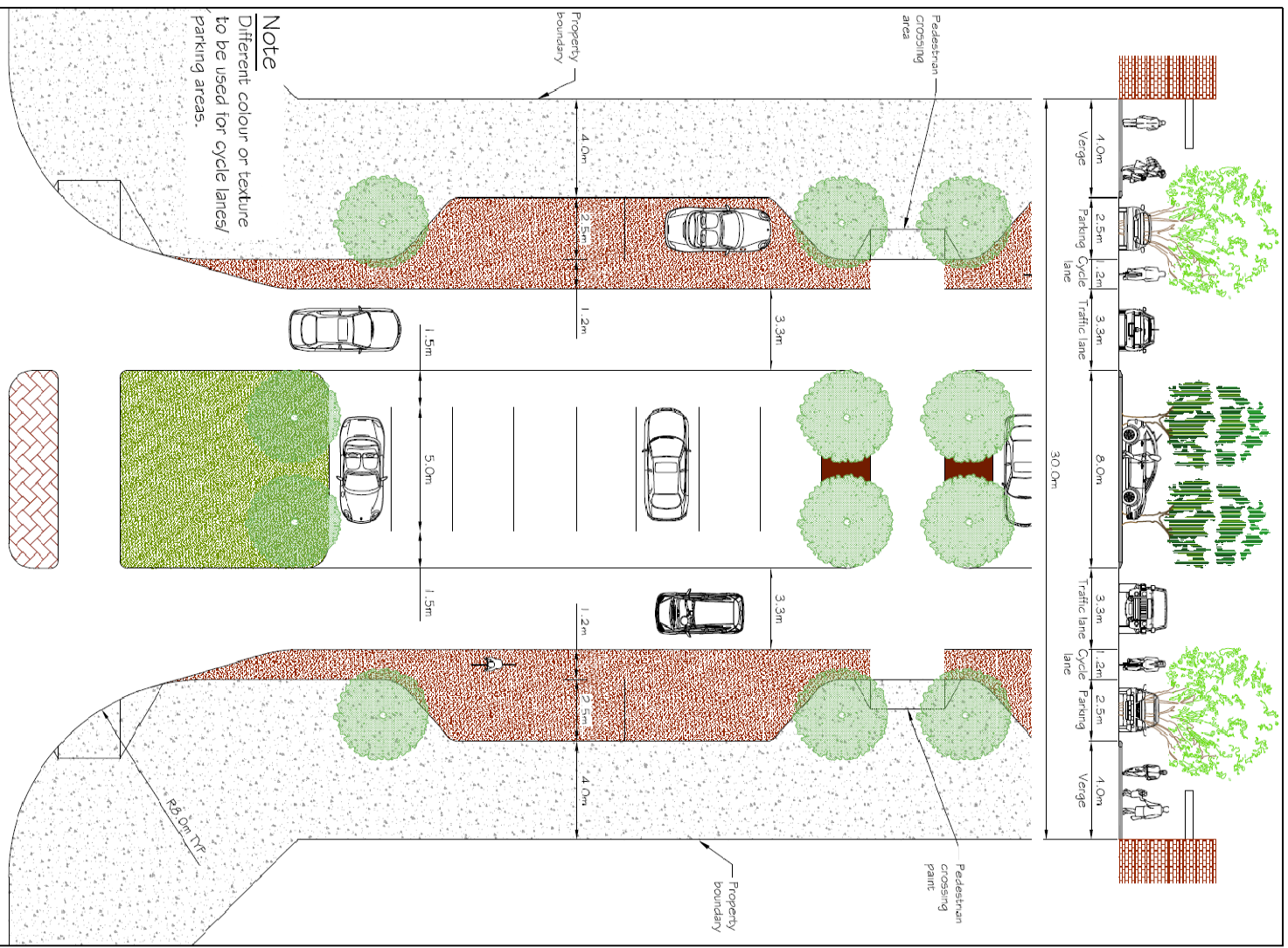
In accordance with the Liveable Neighbourhoods guidelines the verge width is reduced to 1.0m adjacent to public open space.

■ **Figure 8-3 Integrator Arterial B – with and without service lanes**

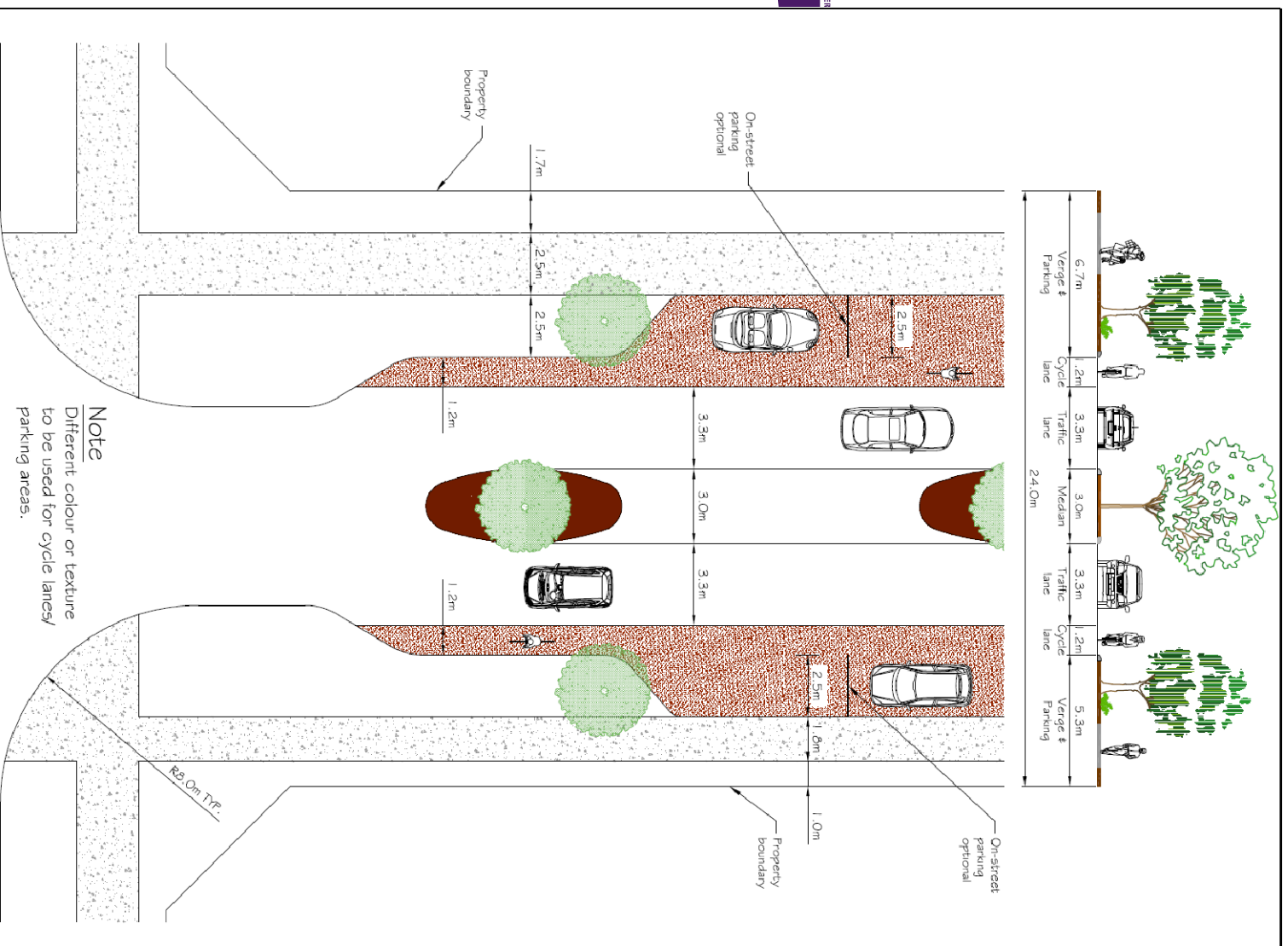


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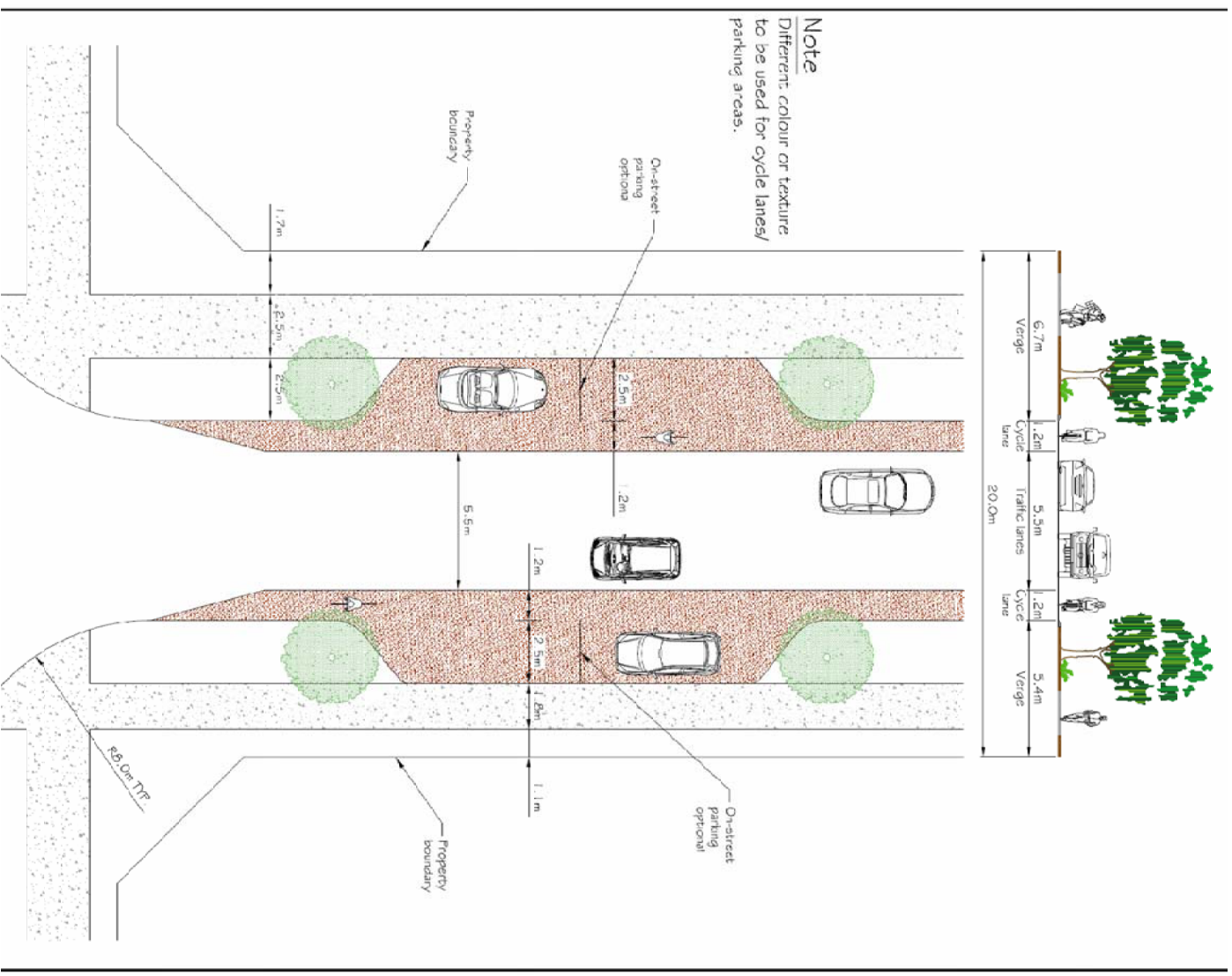
■ **Figure 8-4 Integrator Arterial B – town centre treatment**



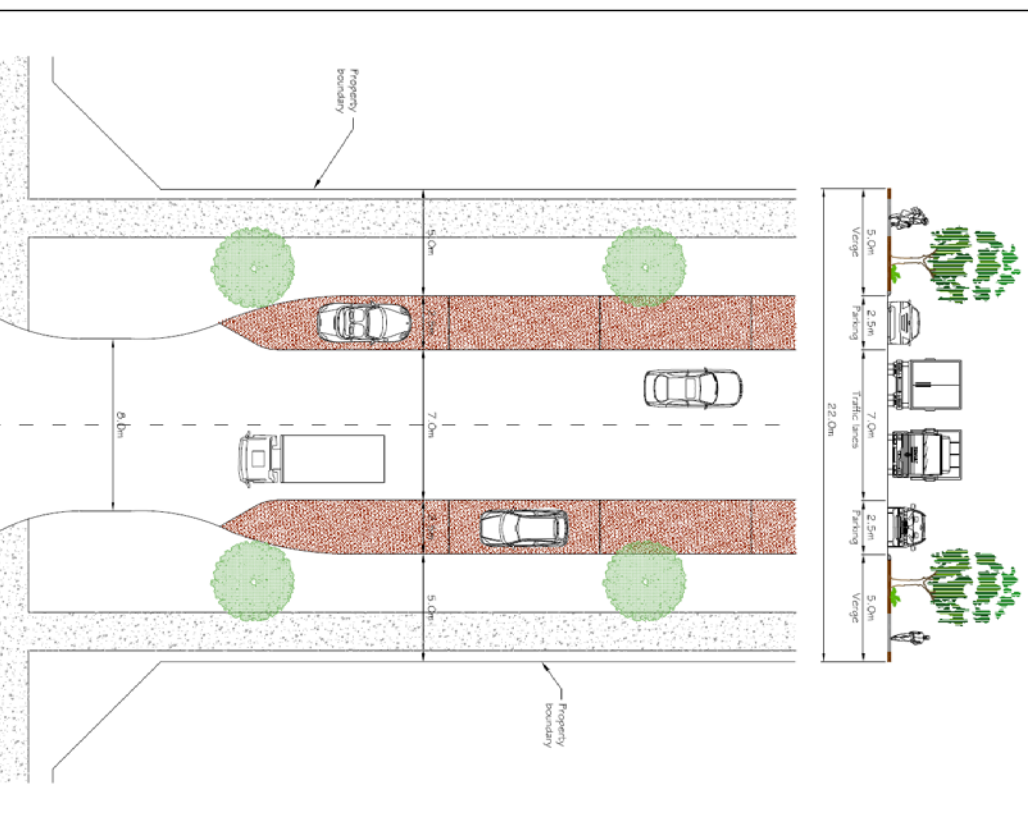
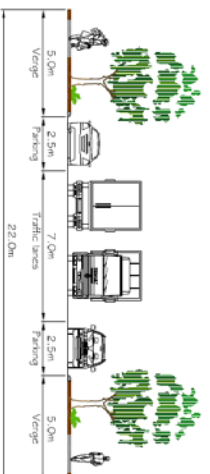
■ **Figure 8-5 Neighbourhood connector boulevard**



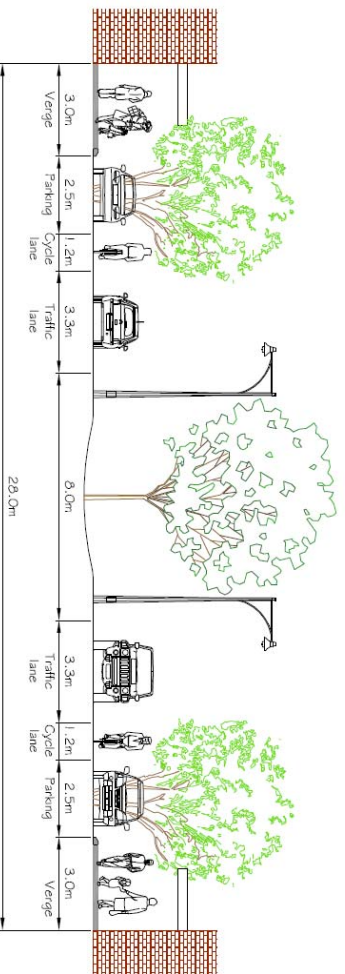
■ **Figure 8-6 Neighbourhood Connector – Minimum Treatment**



■ **Figure 8-7 Industrial Route**

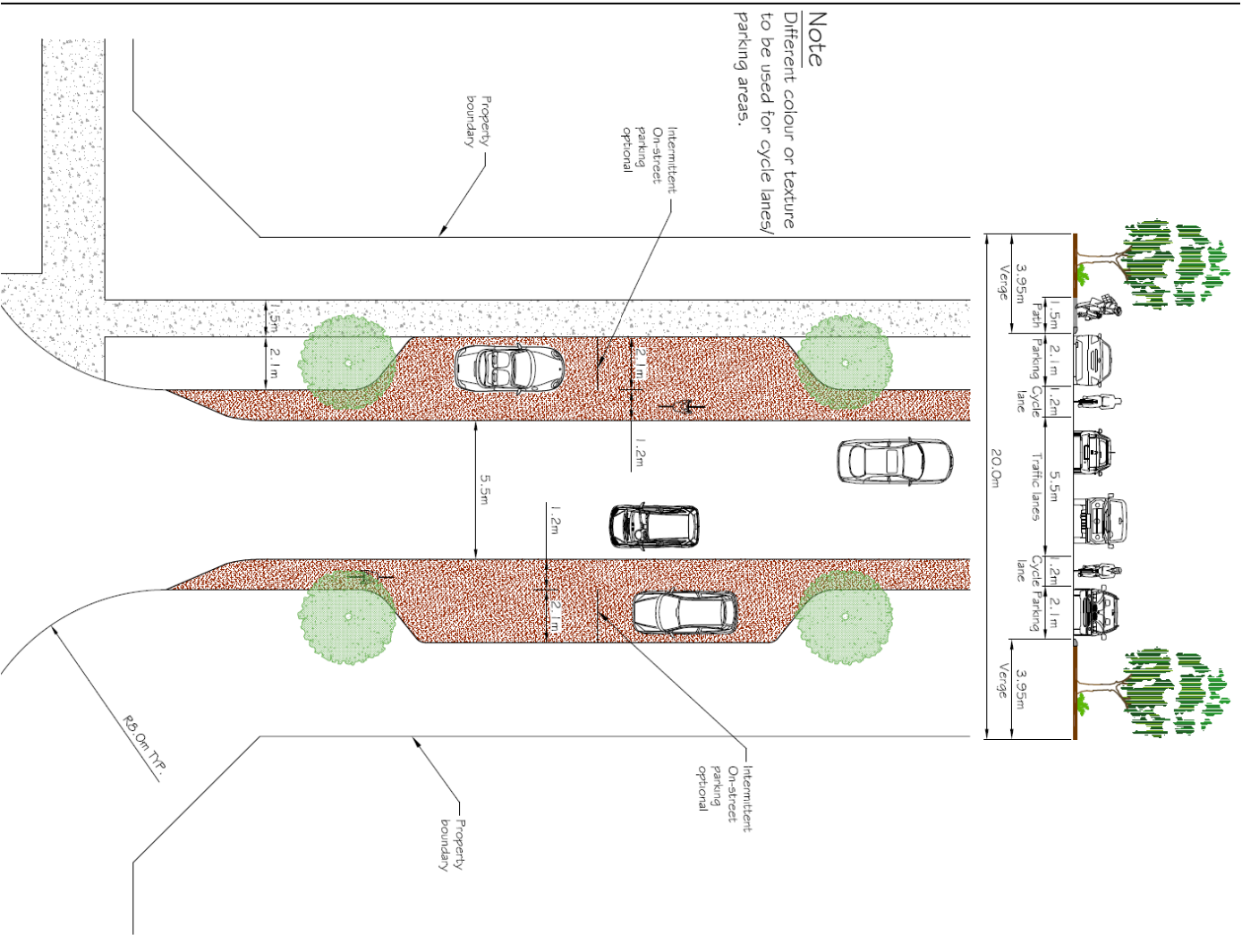


■ **Figure 8-8 Town living**

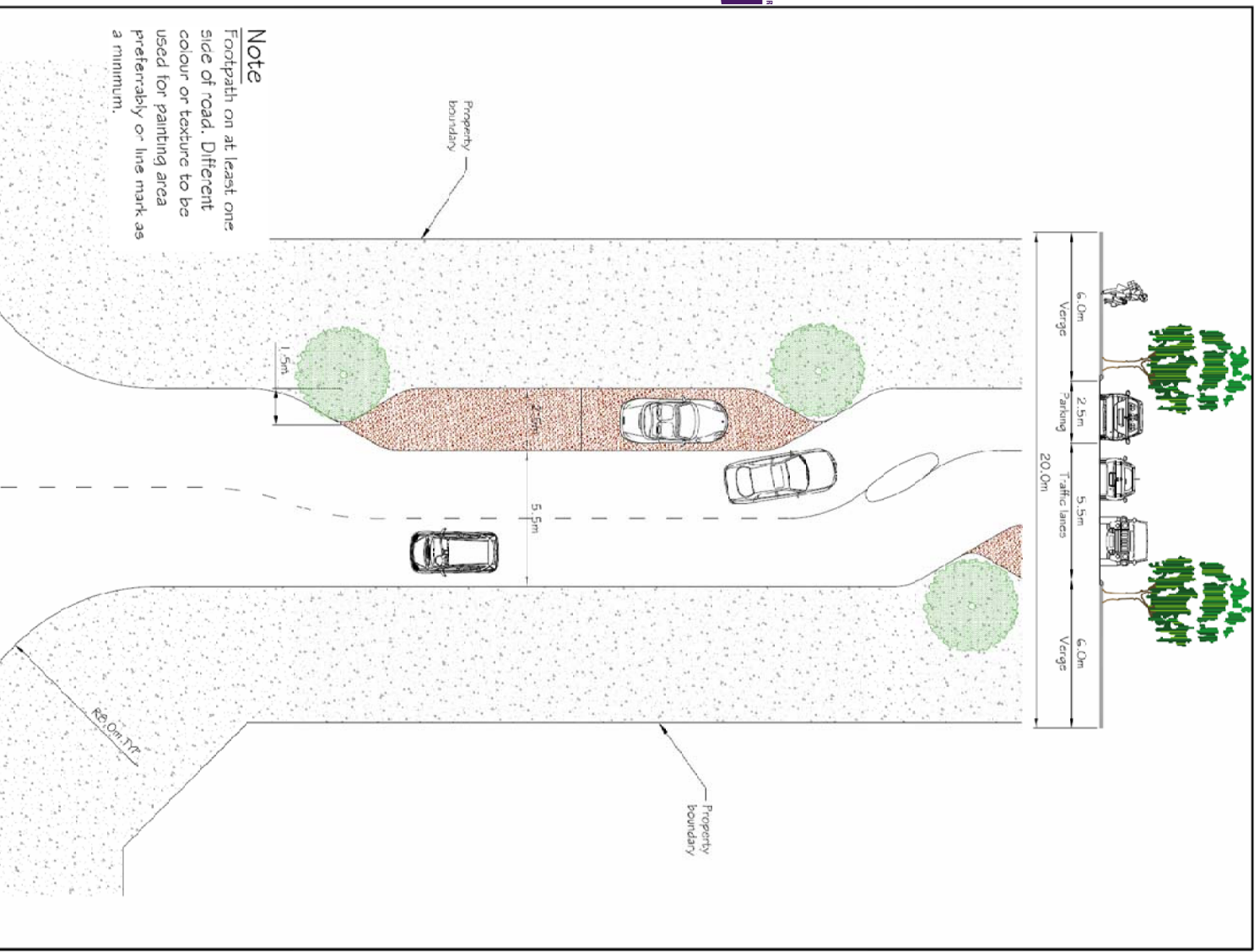


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■ **Figure 8-9 Local Access Street**



■ **Figure 8-10 Local Access Street – Minimum treatment**



9. Public Transport

9.1 Objectives

Plan and promote two bus services in Broome North – one linking Cable Beach and the other to Chinatown and Broome Town Centre

Plan bus services to be carefully positioned and to serve both neighbourhood centres

9.2 Planned Services

Figure 8.3 shows the planned public transport services through the site as agreed at the PDF. Two local bus routes are proposed: one to link Broome North with the Broome Town Centre and Chinatown and the second with Cable Beach. The service plan through the site aims to maximise the public transport catchment while not creating unnecessarily long or circuitous routes. The majority of the lots will be within 400m of a bus route. The indicative location of stops is shown in Figure 9-1, although these will need to be reviewed as part of detailed design to ensure that stops are located close to trip attractors such as recreation and community centres, shops and schools.

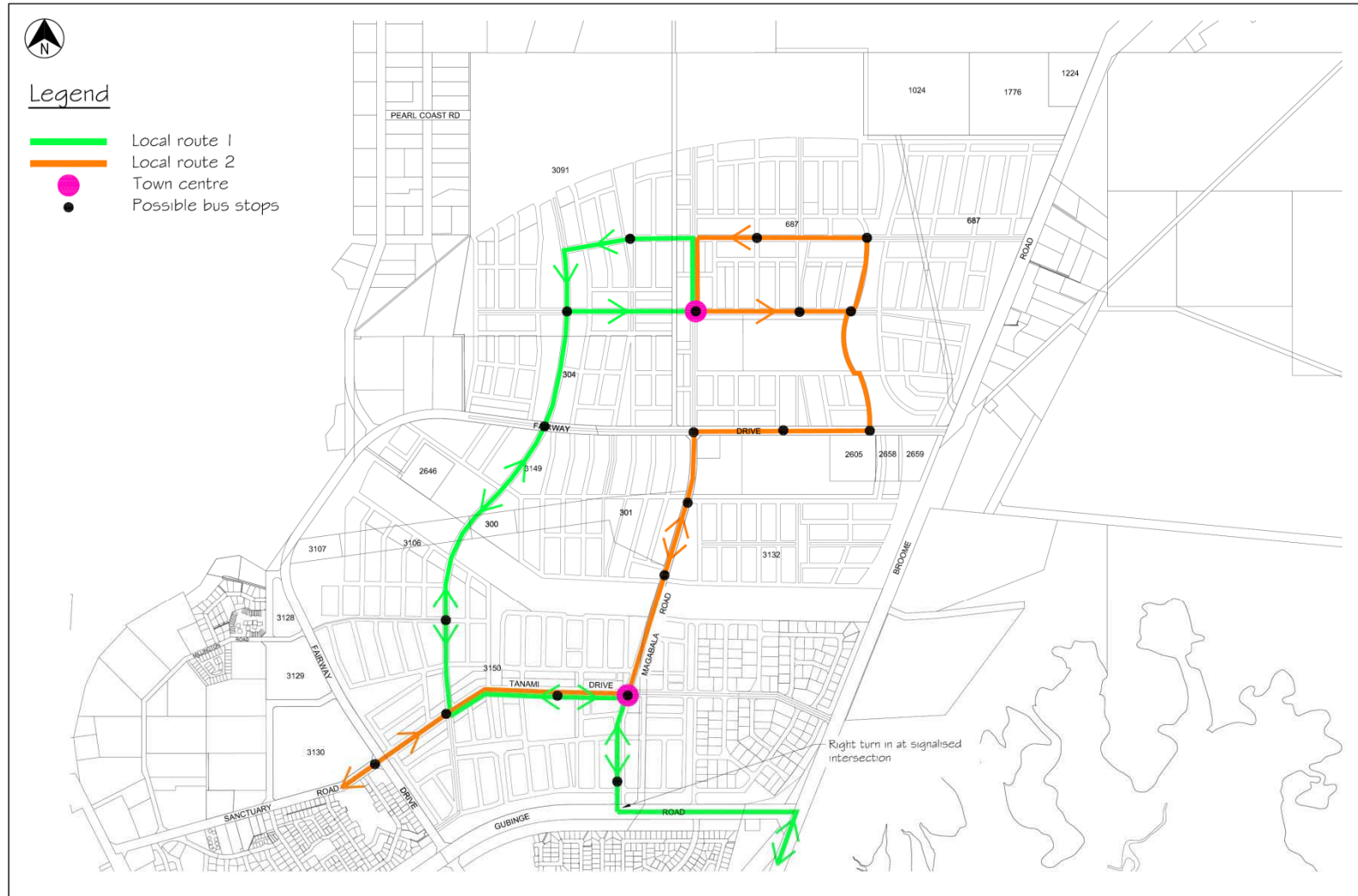
Bus services will operate along the Integrator Arterial B (Magabala Road) and Neighbourhood Connectors. It is proposed that on all Neighbourhood Connectors, stops are not embayed in order to reduce the delays to buses re-entering the traffic stream. On Magabala Road and

Tanami Drive (west of Magabala Road) it may become necessary to embay stops in order to maintain traffic flows and reduce queuing on the main traffic spine through the site. This arrangement is to be agreed with the service operator and the Shire of Broome. The divider between the service lane and through traffic lane on the Integrator Arterial Road is 4.0m wide, requiring the bus shelter to be located longitudinal to the bus bay, rather than alongside.

It is projected that on average 3% of trips to/ from within Broome North will be undertaken by public transport. This equates to approximately 1,500 trips per day. Although it could be higher in the long term when as peak oil and affordability become a constraining factor to car use.

As a minimum, the services should operate at 30 minute intervals during peak periods and hourly outside peak hours on a typical weekday. The Cable Beach service should operate at more frequent intervals during the peak holiday season. Bus services should operate seven days a week.

■ **Figure 9-1 Proposed Bus Service Routes in Broome North**



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10. Pedestrians and Cyclists

10.1 Objectives

Provide a comprehensive, integrated and safe footpath network

Provide a network of linked, safe bicycle routes using a combination of shared paths and on-street facilities within road reserves

Safe and secure movement network in Broome North

Provide a safe network of streets (local connectors and local streets) within Broome North for walking, cycling and relevant traffic

Provide safe and secure network of footpaths and shared paths on the internal network of streets

Provide a safe off-street network for pedestrians and cyclists within integrated open space areas and ECC's

10.2 Planned Pedestrian and Cyclist Provision

The aim is for 12% of trips from Broome North to be made by walking and cycling. The location of schools and the two town centres within Broome North make it viable to walk to local schools and shops from most locations within the site. A walking distance of 800m to 1,000m is equivalent to approximately a 10 to 15 minute journey time. The proposed key cycling and shared path routes throughout Broome North are shown in Figure 10-1.

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The following guidelines will be important in encouraging walking and cycling as modes of transport:

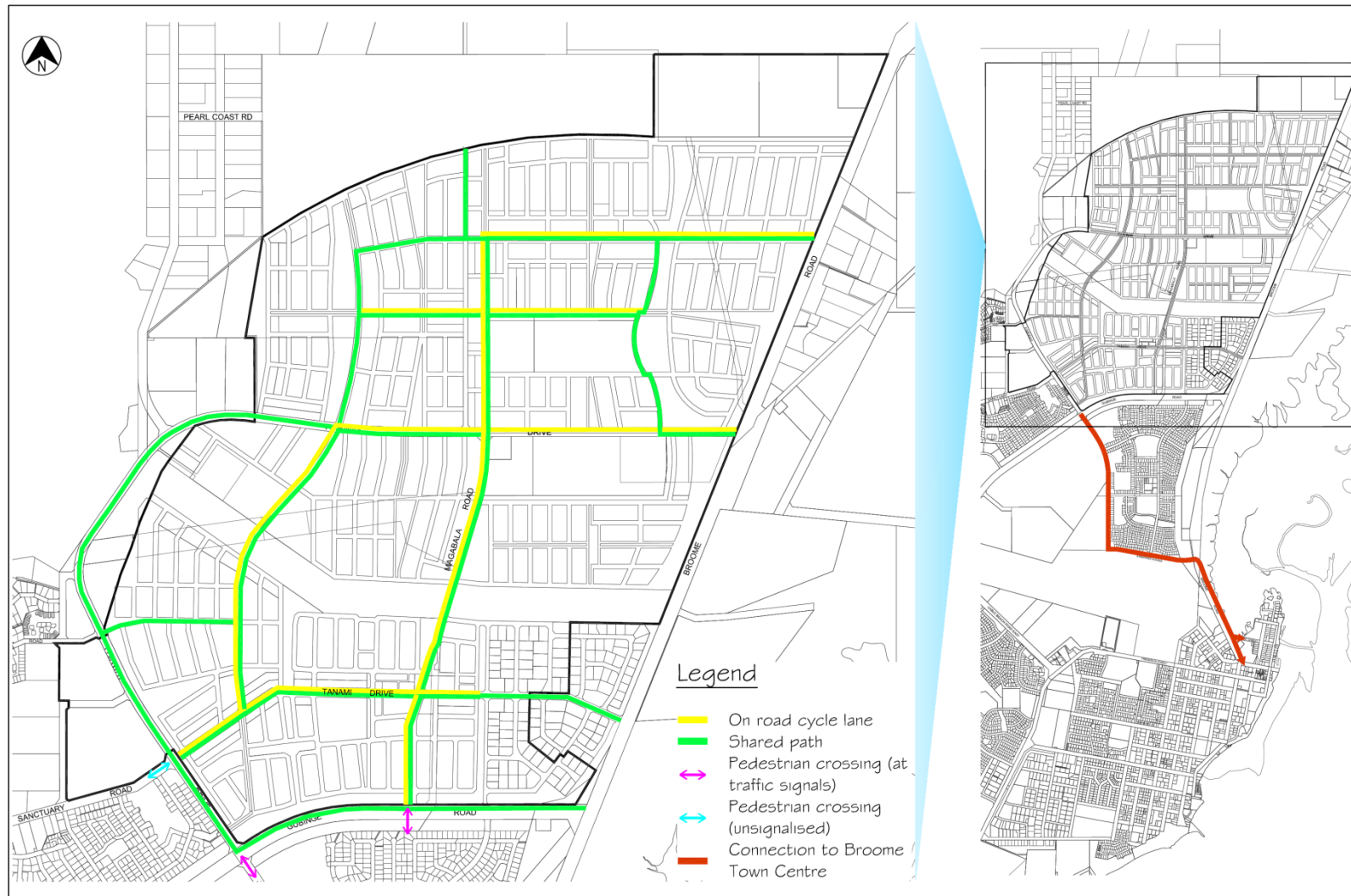
- Provide footpaths on both sides of major roads and on at least one side of local access streets
- Footpaths should be a minimum of 1.5m wide and shared paths a minimum of 2.5m wide
- Widen footpaths to 2-3 metres in locations with high demand such as town centres and around schools
- Use vegetation and awnings in town centres to shade paths where possible
- Adopt crime prevention through environmental design (CPTED) approaches to path design, landscaping and building orientation to maximise passive surveillance and sight distances
- Provide shared paths around and along key routes to schools
- Integrate off road paths with open space
- Locate convenient, safe and clearly marked crossing points with appropriate treatments (such as tactile paving and hand rails) to support universal access.

These guidelines should be applied throughout more detailed planning phases.



While the Broome town centre and Chinatown are not within a reasonable walking distance from the site, they are within a reasonable distance cycling and this should be encouraged through the provision of suitable north-south linkages such as a shared path along Broome Highway and Jigal Drive.

■ **Figure 10-1 Planned Walking and Cycling Network in Broome North**



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10.3 Pedestrian Crossings

A key objective is to integrate Broome North with surrounding areas. There is presently no network for cyclists and pedestrians adjacent to Broome North. It is envisaged that as Broome North develops the key pedestrian desire lines will be to/ from external destinations including the Cable Beach tourism precinct and Roebuck Estate, creating crossing demands on Fairway Drive and Gubinge Road. The greatest demand will come from school, retail and recreation related trips.

The draft WAPC Transport Assessment Guidelines require an analysis of the operation and safety of the pedestrian/ cycle networks including identification of which roads could potentially be difficult for pedestrians and cyclists to cross, where safe crossing should be provided, and where safe crossings are proposed. Traffic volumes which adversely impact on the ability of pedestrians to cross safely are:

- 2-lane undivided road – 1,000 vehicles in the peak hour (two-way), equivalent to 10,000 vpd
- 4-lane divided road – 1,500 vehicles in the peak hour (two-way), equivalent to 15,000 vpd

Traffic volumes on Gubinge Road, Broome Road or Fairway Drive are not forecast to meet these thresholds along the Broome North frontage. However, Gubinge Road is an arterial road carrying a significant

proportion of heavy vehicles. It is also a wide road reservation, which has the potential to create a barrier to pedestrian movements. For these reasons, it has been agreed with MRWA that strategically placed crossings are required as follows:

- Pedestrian crossing at traffic signals at the intersection of Gubinge Road/ Magabala Road
- Pedestrian crossing at traffic signals at the intersection of Gubinge Road/ Fairway Drive

The installation of traffic signals at these locations will be primarily driven by pedestrian crossing demands rather than traffic capacity grounds. This need should be continually monitored over the course of development of Broome North.

There is a need to provide for safe pedestrian crossings to schools. The primary school in Broome North is planned as part of stage 1. This means that there may be demand for students residing outside Broome North to access the primary schools. The converse may also be true. Safe pedestrian crossing should be provided, as necessary, via a traffic warden controlled children's crossing located just to the east of the Magabala Road/ Gubinge Road intersection. A mini bus service could also operate although is not expected to be needed in light of the warden-controlled crossing.



In the longer term it is expected that the school catchment boundaries for Roebuck Estate and Broome North and will be bordered by Gubinge Road and therefore not overlap.

Within the site, Magabala Road (two-lane cross-section) is forecast to carry more than 10,000 vehicles per day in some locations. Some primary schools are shown in the Structure Plan to be located adjacent to this Integrator Arterial road. This infers that pedestrian crossings will be required across sections of Magabala Road, along pedestrian desire lines. It is recommended that warden crossings should be located on Magabala Road at each of the proposed retail centres. The treatment near schools is discussed below.

10.4 Safe Routes to Schools

The draft WAPC Guidelines require an assessment of safe routes to school by identifying the catchment of each school, identifying the most likely walk and cycle routes, determining any potential deficiencies and proposing measures to address these. However, it is often more relevant for much of this detail to be planned at local Structure Plan or subdivision design phases. The following information addresses access to schools at the District Structure Planning level.

One primary school will have frontage to Tanami Drive where volumes may exceed 7,000 vehicles per day. In this location Tanami Drive has been designed with a wide median, which will enable staged crossing. It is recommended that the main point of access should be via one of the alternative site frontages to preferably a neighbourhood connector. Nevertheless it is recommended that at least one guarded pedestrian crossing be provide adjacent to the school on Tanami Drive. Kerbside parking should not be located where it has the potential to obstruct sight lines to pedestrians.



11. Summary

Sinclair Knight Merz has prepared a Transport Assessment on behalf of LandCorp for the proposed Broome North development. Due to the scale of the site (735Ha) and long development timeline, the assessment has considered two scenarios:

- **Interim:** year 2031 with 2,000 residential lots, one primary school, one high school, extension to the Blue Haze industrial estate and partial development of one retail centre. This development area is expected to be bounded by Fairway Drive, Broome Highway and Gubinge Road.
- **Ultimate:** notionally year 2051 with full development extending northward to the existing waste transfer station. Full development will comprise 4,800 residential lots, two public primary schools, one public high school, an Anglican school, Blue Haze Light Industrial Estate and two town centres.

The development is planned to be self-contained in relation to education and local shopping needs in the medium to long term. The site's planning has been underpinned by a series of transport objectives agreed with a number of community groups and government agencies at a four-day Planning Design Forum.

Traffic generation forecasts for a typical weekday for the interim and ultimate development scenarios are as follows:

- Interim: 4,626 internal, 12,468 external vehicle trips per day
- Ultimate: 16,249 internal, 20,667 external vehicle trips per day.

The site will be accessed in the interim via the following intersections:

- Broome Road/ Fairway Drive – priority controlled
- Broome Road/ Tanami Drive - priority controlled
- Gubinge Road/ Blue Haze access: priority controlled (right turn-in banned)
- Broome Road/ Magabala Road: priority controlled

The site will also be accessed via an easterly extension of Sanctuary Road.

Ultimately as the development extends north, a new access will be created on Broome Road approximately 900m north of the Fairway Drive and a separate access off Broome Highway for the waste management facility installed. At a stage between interim and ultimate development stages there will be a requirement for some of the site access points to be upgraded, this is in part due to the duplication of Gubinge Road and Broome Road (north of Gubinge Road). It is envisaged that this duplication (as outlined in the Broome Road Planning Study prepared by



Western Infrastructure) will take place at some stage between 2031 and 2051.

Upgrading the intersections of Gubinge Road/ Magabala Road and Gubinge Road/ Fairway Drive/ Jigal Drive to traffic signals is likely to be triggered by the need to provide for safe pedestrian crossing of Gubinge Road, rather than on traffic capacity grounds.

In addition to the site access points, the development of Broome North is projected to notably impact the intersections of Broome Road/ Gubinge Road and Broome Road/ Sandpiper Avenue. It is forecast that the Broome Road/ Gubinge Road intersection can remain a priority controlled intersection well into the future. It is expected that the current configuration will remain suitable until such time as Gubinge Road and Broome Road north of Gubinge Road are duplicated to a four lane divided carriageway.

The intersection of Broome Road/ Sandpiper Avenue is forecast to require upgrading to a single lane roundabout control by interim development. Extending Jigal Drive south of Sandpiper Avenue through the airport would reduce the traffic volume through the Broome Road/ Sandpiper Avenue intersection and in this event further upgrade to this intersection may no longer be warranted.

The relocation of the airport and creation of a new arterial north-south route between Broome Road and Gubinge Road will greatly influence

travel patterns. The timing of any such development is not yet known. However, if a new north-south road link through the airport is not created by 2051, it is apparent that Broome Road between Gubinge Road and Sandpiper Avenue will need to be duplicated (four lane divided road). The intersection of Broome Road/ Frederick Street has been recently upgraded to roundabout control. It is expected that this intersection would be upgraded to a two-lane roundabout if/ when Broome Road (south of Gubinge Road) is duplicated.

In terms of sustainable transport, it is recommended that two bus services operate through Broome North – providing connections to cable Beach and Broome Town Centre.

A network of footpaths and cycling routes are planned throughout the Broome North development and integrating with existing infrastructure outside of the development site. A shared path linking Broome North to the Broome Town Centre, preferably along Broome Road, is recommended to encourage cycling as a travel mode.



Appendix A Broome Highway Planning Study Extract



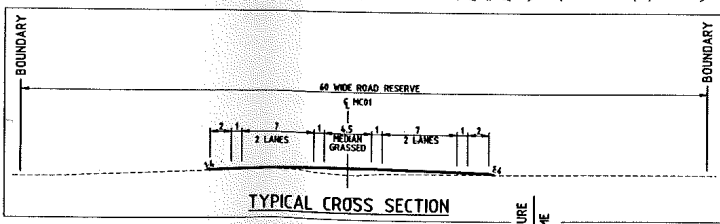
LEGEND:

- DENOTES EXISTING CARRIAGEWAY
- - - PROPOSED TPS BOUNDARY
- SHARED USE PATH
- UNDERGROUND ELECTRICITY
- OVERHEAD ELECTRICITY
- SEWER
- WATER MAIN
- TELSTRA

NOTE :

1. FOR LAND PROTECTION PLAN SEE DRG No. 200221-229.
2. DRAINAGE INVESTIGATION SUBJECT TO DETAIL DESIGN
3. DATE OF PHOTOGRAPHY NOVEMBER, 1998.
4. SERVICES SHOWN ON THIS PLAN ARE APPROXIMATE ONLY.
5. FOR CONCEPT PLAN SEE DRG. No. 200221-227 & 200221-228.
6. FOR '4D' DIRECTORY SEE R:\DGN_AGD084\MOSS_4D\BROOME
7. FOR MICROSTATION DIRECTORY SEE R:\DGN_AGD084\MSTATION\RURAL\BROOME

DETAILS SHOWN ON THIS PLAN ARE PRELIMINARY ONLY. STAGE-CONSTRUCTION AND ULTIMATE DEVELOPMENT MAY DIFFER FROM DETAILS SHOWN.



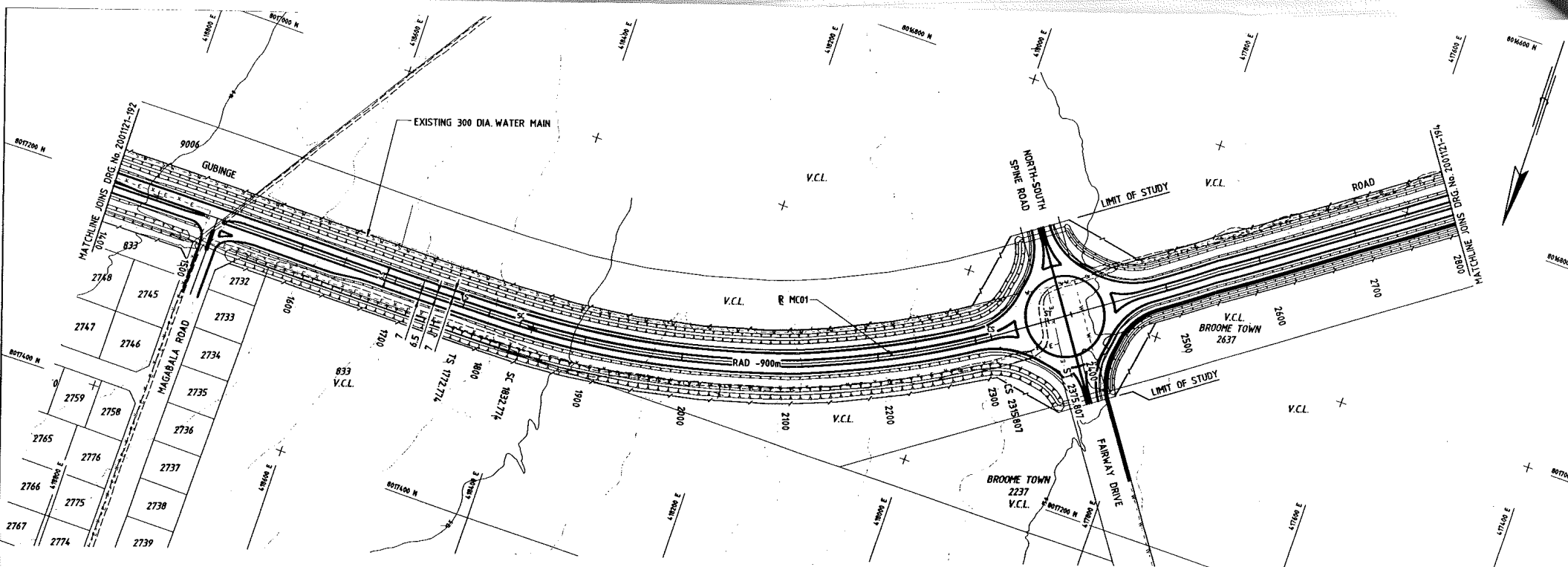
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EXISTING LEVEL ON R MC01	6800	6816	6748	6920	6980	7040	7100	7160	7220	7280	7340	7400	7460	7516	7556	7584	7603	7609	7602	7584
CHAINAGE ON R MC01	0+00	20+00	40+00	60+00	80+00	100+00	120+00	140+00	160+00	180+00	200+00	220+00	240+00	260+00	280+00	300+00	320+00	340+00	360+00	380+00
HORIZONTAL	0.300%																			
VERTICAL	200 L.V.C. VPI ELEV 7.160																			
	-0.305%										200 L.V.C. VPI ELEV 6.350									
	TRANS 100										CURVE RAD 350									
	TRANS 100										TRANS 100									
	0.644%																			

BROOME HIGHWAY CARRIAGEWAY PATTERN AND PROFILE
CHA. 0 TO CHA. 1400

ROAD NETWORK PERFORMANCE BRANCH
WATERLOO CROSS EAST PERTH ROAD
TEL: 938 8221 FAX: 938 8247
DRAWING NO: 04.03
DRAWING TYPE: 200121 102

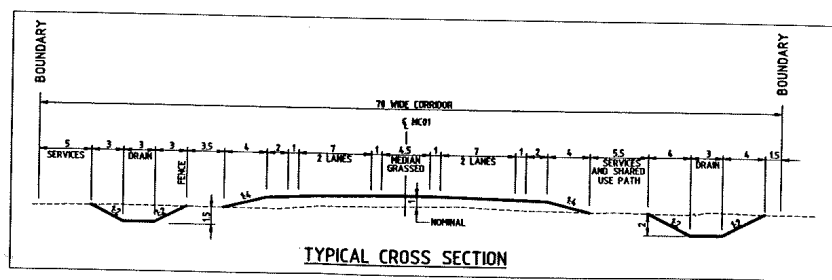
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DATE: 04.03	DESIGNED: K. MOODS
DRAWN: D. PLSHEWIS	CHECKED: J. BURTON
FILE NO: 90-577-15	DATE: 20/10/03





- LEGEND:**
- DENOTES EXISTING CARRIAGEWAY
 - - - PROPOSED TPS BOUNDARY
 - SHARED USE PATH
 - - - UNDERGROUND ELECTRICITY
 - - - OVERHEAD ELECTRICITY
 - - - SEWER
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 6. FOR '4D' DIRECTORY SEE R:\DGN_AGDB4\MOSS_4D\BROOME
 7. FOR MICROSTATION DIRECTORY SEE R:\DGN_AGDB4\MSTATION\RURAL\BROOME



DETAILS SHOWN ON THIS PLAN ARE PRELIMINARY ONLY. STAGE CONSTRUCTION AND ULTIMATE DEVELOPMENT MAY DIFFER FROM DETAILS SHOWN.

	E MACABALLA RD		R MC01		EXISTING GROUND ON R MC01		NTH-STH SPINE RD		FAIRWAY DR	
DATUM 9.0	14200.00	14200.00	14200.00	14200.00	14200.00	14200.00	14200.00	14200.00	14200.00	14200.00
PROPOSED LEVEL ON R MC01	9.457	9.644	10.454	9.954	10.583	10.712	10.840	10.969	11.098	11.227
EXISTING LEVEL ON R MC01	9.457	9.644	10.454	9.954	10.583	10.712	10.840	10.969	11.098	11.227
CHAINAGE ON R MC01	14200.00	14200.00	14400.00	14400.00	14600.00	14600.00	14800.00	14800.00	15000.00	15000.00
HORIZONTAL	0.644%									
VERTICAL	200 L.V.C. VPI ELEV 12.000									
	200 L.V.C. VPI ELEV 14.000									
	0.623%									

THIS DRAWING IS AN AMENDMENT OF THE APPROVED DRAWING

ORIGINAL DRAWING SIZE A1		IN THE ABSENCE OF THE APPROVED SIGNATURE THIS DRAWING SHALL BE TREATED AS PRELIMINARY	
DATE	A.H.D.	DESIGNED	DRAWN
		K. WOODS	D. PILSNERIKS

BROOME HIGHWAY
CARRIAGEWAY PATTERN AND PROFILE
 CHA. 1400 TO CHA. 2800

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 SMC AUSTRALIA PTY LTD
 LEVEL 5, 100 WILSON STREET
 PORTA VICTORIA
 VIC 3207
 TEL: 03 5222 0221 FAX: 03 5222 0221

ROAD NETWORK PERFORMANCE BRANCH
 WATERLOO CREEK EAST PERTH WA
 TEL: 08 9223 0221 FAX: 08 9223 0247



Appendix B Traffic Generation – Interim and Ultimate

Interim Broome North Trip generation

Revision: 3
Date: 20/11/2009

Development Yield

Residential 2,000 lots
Industrial 27 Ha
Retail 2500 sqm
School enrolments 500.00

Assumptions
No through traffic through the site
Industrial 27ha, 75% net yield, 0.3 GFA

Education Trip Generation

School enrolments	500.00	Primary school within site
Trip rate per enrolment	2	
School trips	1,000 trips	
% internal trips	70%	
% external trips	30%	
No. Internal trips	700 trips	
No. External trips	300 trips	

Industrial trip generation

Gross floor area	60750 sqm
Car driver trips per 100sqm GFA	6.5
Total Industrial trips	3,949 trips
% internal trips	30%
% external trips	70%
No. of internal trips	1,185 trips
No. of external trips	2,764 trips

Retail Trip Generation

Net floor area	2500 sqm
Car driver trips per 100sqm NLA (incl.10% workers)	80.0
Total retail trips	2,000 trips
Shopping trips	
% internal trips	68%
% external trips	32%
No. of internal trips	1,365 trips
No. of external trips	635 trips

Includes 10% workers trips (ie 393)

Residential trip generation

Occupants per household	3
Trips per person (all modes)	3.5
Total generated trips (all modes)	21,000 trips
Estimated % car driver trips	65%
Estimated No. car driver trips (home based)	13,650 trips
Non-home based trips %	5%
Estimated No. non-home based trips (into BN)	683 trips
Total No. car driver trips from/ to/ within Broome North	14,330 trips
Resultant trip generation rate (residential)	7.17

Residential trip percentages by purpose -

	Total	Internal	External
Retail	20%	50%	50%
Employment	25%	35%	65%
Education	12%	70%	30%
<i>social and recreation</i>			
beach and recreation, restaurants, etc	15%	5%	95%
other	28%	33%	67%
Total	100%		

Includes internal trips to Blue Haze

Residential trips by purpose -

	Total	Internal	External
Retail (incl employment)	2,730	1,365	1,365
Other employment (incl Blue Haze)	3,413	1,185	2,228
Education	1,000	700	300
<i>social and recreation</i>			
beach and recreation, restaurants, etc	2,048	102	1,945
other	3,822	1,274	2,548
Total	13,012.00	4,630.00	8,390.00

Total External originated trips

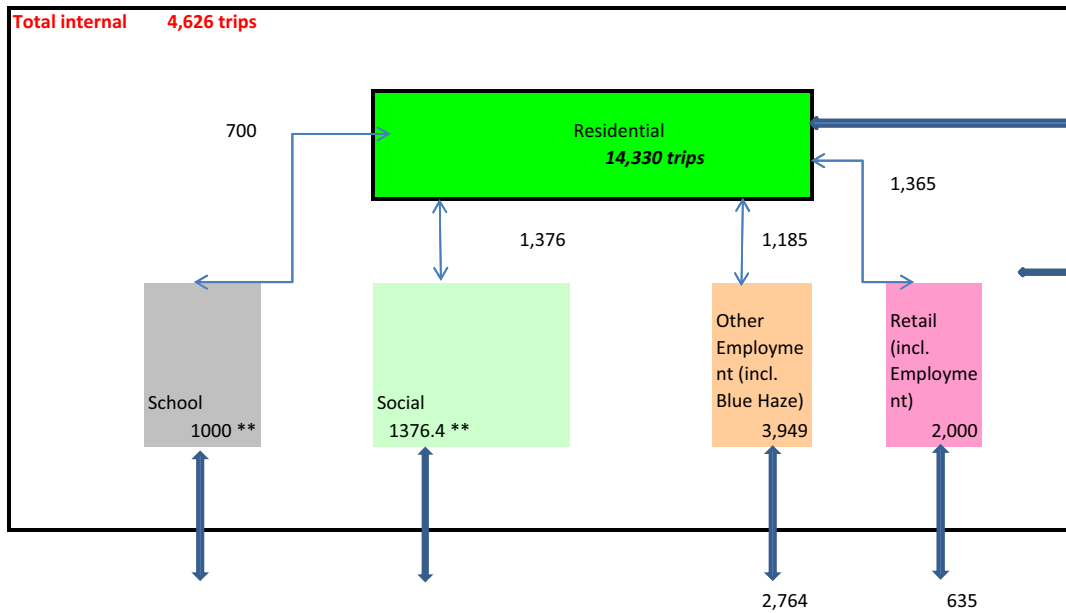
Home based trips to external 8,390 trips
Non home based trips (5%) 683 trips
Trips to Blue Haze Industrial Estate 2,764 trips
Trips to retail (incl employment) 635 trips
Total External originated trips 12,472 trips

Total generated trips

Internal	4,630 trips	27%	16640
External	12,472 trips	73%	19408
Total	17,102 trips		

Total trip generation rate 8.6

Daily internal and external trips

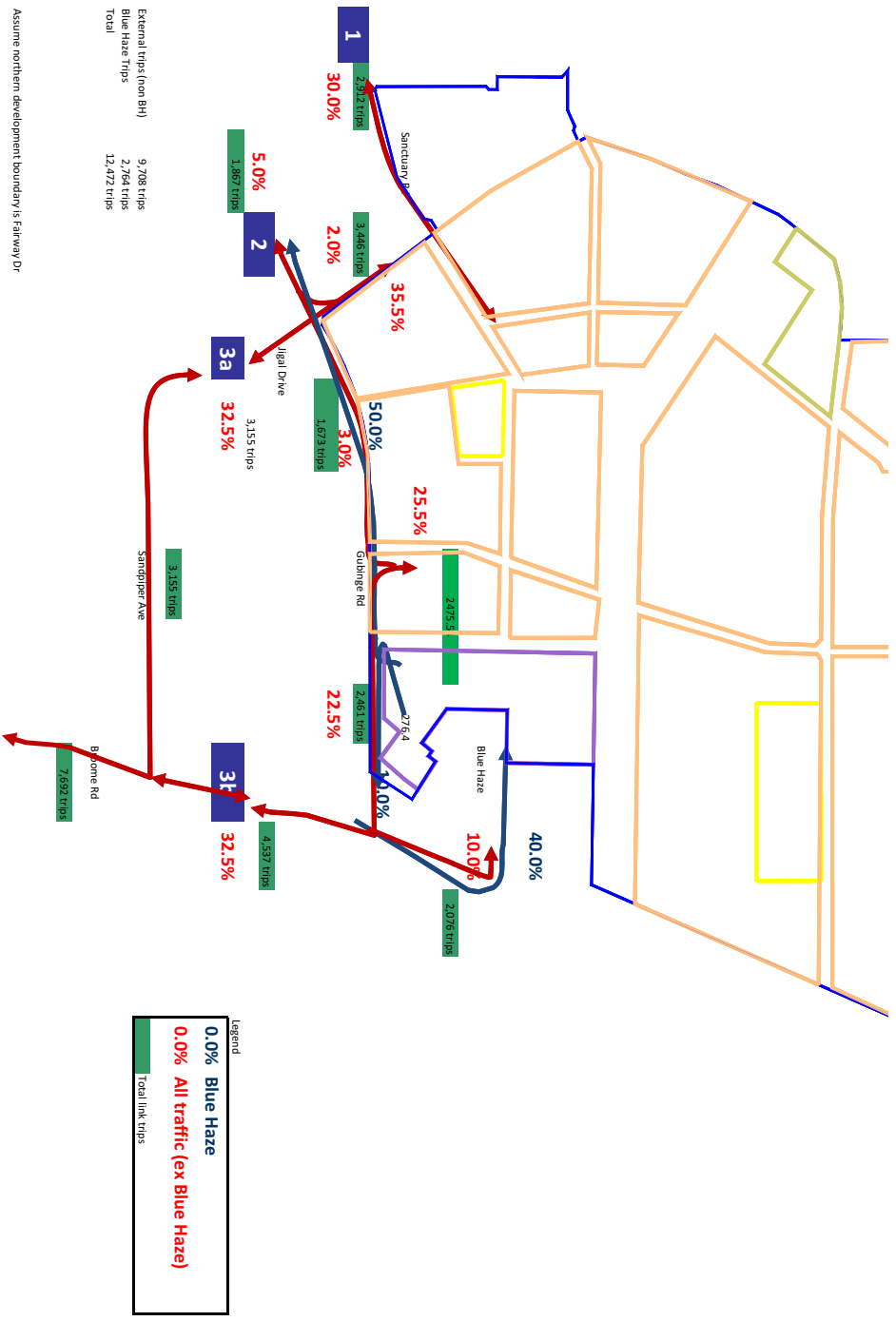


**External trips Included in non home based trips

	1		3		2	
	%	No.	%	No.	%	No.
School	300	0%	0	0%	0	0%
Social	0					
Beach, rec	1,945	70%	1361.588	30%	583.5375	0%
Other	2,548	20%	509.6	70%	1783.6	10%
Other Employment	2,228	15%	334.125	75%	1670.625	10%
Retail	1,365	20%	273	80%	1092	0%
Non home based trips*	683	15%	102.45	75%	512.25	10%
Other employment	2,764	10%	276.4	60%	1658.4	30%
Retail	635					
Total External	12,468		2,857		7,300	1,375

Notes: *non home based trips includes external trips to schools, social and recreation within Broome North

Interim Broome North generated vehicle trips



Ultimate Broome North Trip generation

Revision: 3
Date: 20/11/2009

Development Yield

Residential 4,800 lots
Industrial 27 Ha
Retail 6000 sqm
School enrolls 2000.00

Assumptions

No through traffic through the site
Industrial 27ha, 75% net yield, 0.3 GFA

Education Trip Generation

School enrolls 2000.00
Trip rate per enrolment 2
School trips 4,000 trips
% internal trips 90%
% external trips 10%
No. Internal trips 3,600 trips
No. External trips 400 trips

Industrial trip generation

Gross floor area 60750 sqm
Car driver trips per 100sqm GFA 6.5
Total Industrial trips 3,949 trips
% internal trips 60%
% external trips 40%
No. of internal trips 2,357 trips
No. of external trips 1,580 trips

Retail Trip Generation

Net floor area 6000 sqm
Car driver trips per 100sqm NLA (incl.10% workers) 80.0
Total retail trips 4,800 trips
Shopping trips
% internal trips 82%
% external trips 18%
No. of internal trips 3,931 trips
No. of external trips 869 trips

Includes 10% workers trips (ie 393)

Residential trip generation

Occupants per household 3
Trips per person (all modes) 3.5
Total generated trips (all modes) 50,400 trips
Estimated % car driver trips 65%
Estimated No. car driver trips (home based) 32,760 trips
Non-home based trips % 5%
Estimated No. non-home based trips (into BN) 1,638 trips
Total No. car driver trips from/ to/ within Broome North 34,400 trips
Resultant trip generation rate (residential) 7.17

7.16625

Residential trip percentages by purpose -

	Total	Internal	External
Retail	20%	60%	40%
Employment	25%	29%	71%
Education	12%	90%	10%
<i>social and recreation</i>			
beach and recreation, restaurants, etc	15%	5%	95%
other	28%	67%	33%
Total	100%		

Includes internal trips to Blue Haze

Residential trips by purpose -

	Total	Internal	External
Retail (incl employment)	6,552	3,931	2,621
Other employment (incl Blue Haze)	8,190	2,357	5,833
Education	4,000	3,600	400
<i>social and recreation</i>			
beach and recreation, restaurants, etc	4,914	246	4,668
other	9,173	6,115	3,058
Total	32,828.80	16,250.00	16,580.00

Total External originated trips

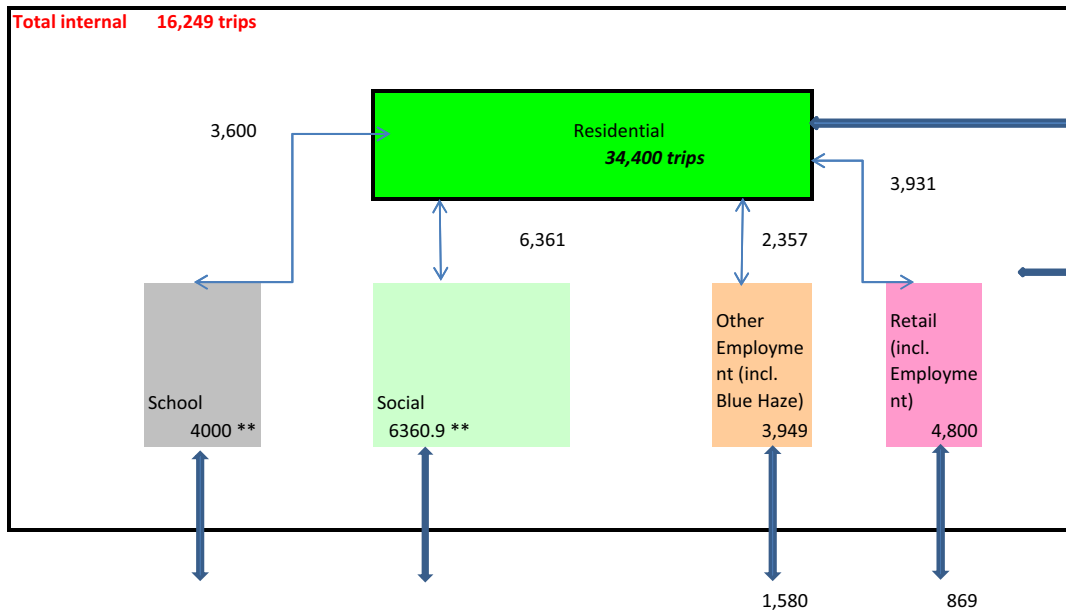
Home based trips to external 16,580 trips
Non home based trips (5%) 1,638 trips
Trips to Blue Haze Industrial Estate 1,580 trips
Trips to retail (incl employment) 869 trips
Total External originated trips 20,667 trips

Total generated trips

Internal 16,250 trips
External 20,667 trips
Total 36,917 trips
Total trip generation rate 7.7

16640
19408

Ultimate Development
Daily internal and external trips

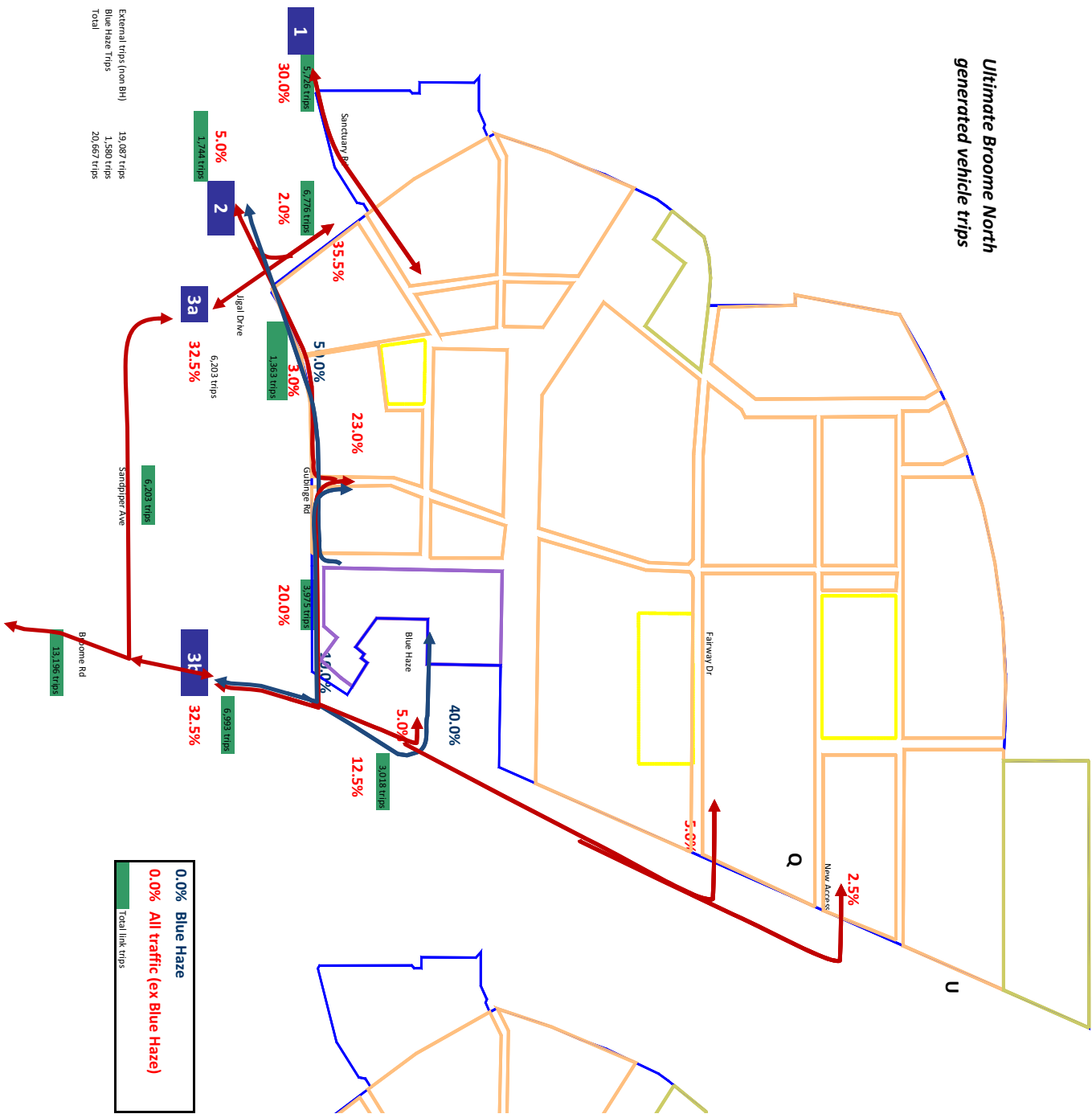


**External trips Included in non home based trips

	1		3		2	
	%	No.	%	No.	%	No.
School	400	0%	0	0%	0	0%
Social	0					
Beach, rec	4,668	70%	3267.81	30%	1400.49	0%
Other	3,058	20%	611.52	70%	2140.32	10%
Other Employment	5,833	15%	874.95	75%	4374.75	10%
Retail	2,621	20%	524.16	80%	2096.64	0%
Non home based trips*	1,638		0		0	
			1638	15%	245.7	75%
					1228.5	10%
Other employment	1,580	10%	158	60%	948	30%
Retail	869					
Total External	20,667		5,682		12,189	1,527

Notes: *non home based trips includes external trips to schools, social and recreation within Broome North

Ultimate Broome North generated vehicle trips



External trips (non BH)
Blue haze trips
Total

19,087 trips
1,580 trips
20,667 trips

0.0% Blue Haze
32.5% All traffic (ex Blue Haze)
Total link trips



Appendix C Gubinge Road proposed access – Interim and Ultimate

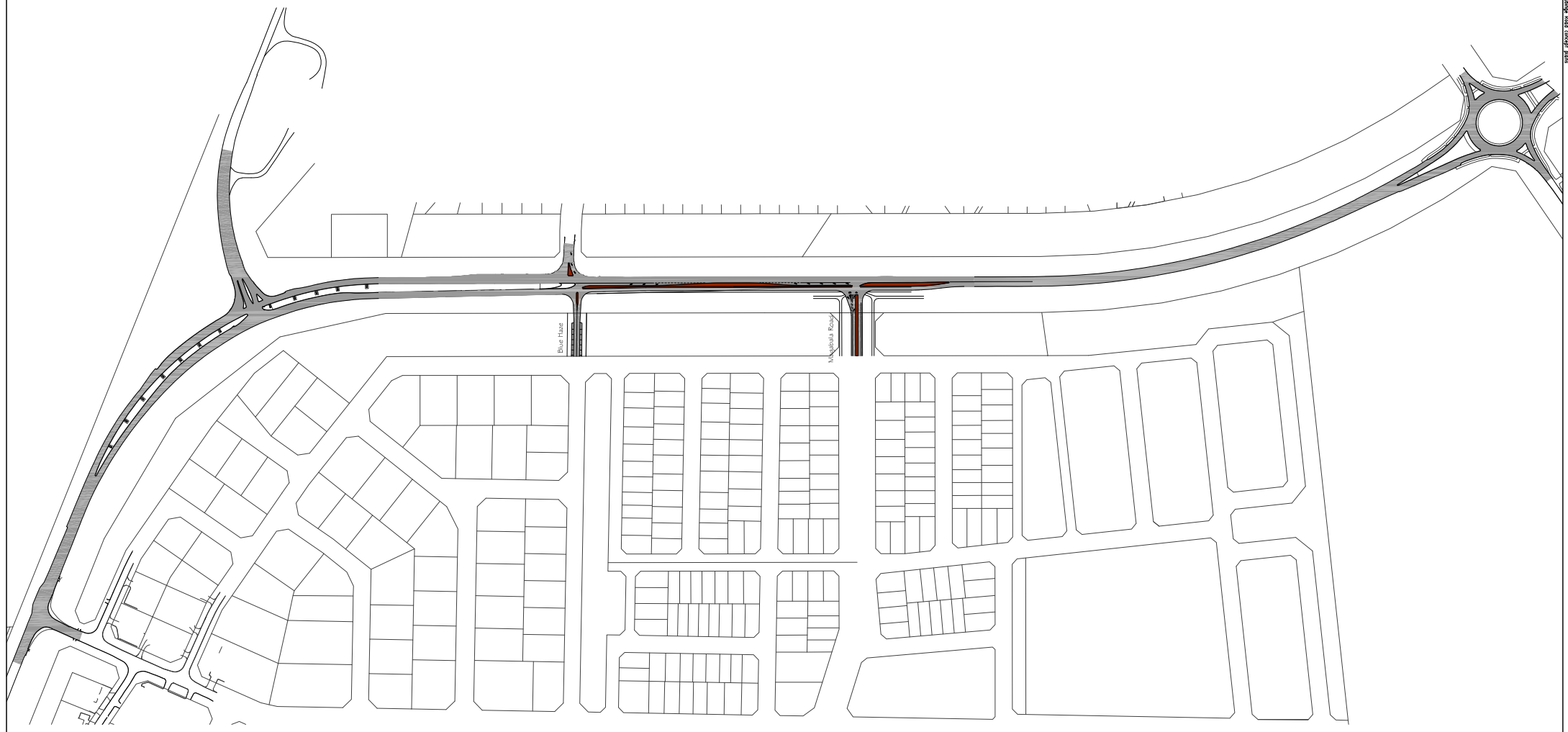


Skidder Knight Merz Pty Ltd
A/CN 01 06
Dunck Centre 263 Adelaide Tce
Perth Western Australia 6000
Ph (08) 9282 4000

BROOME NORTH

Gubinge Road Interim concept

Nov 2009



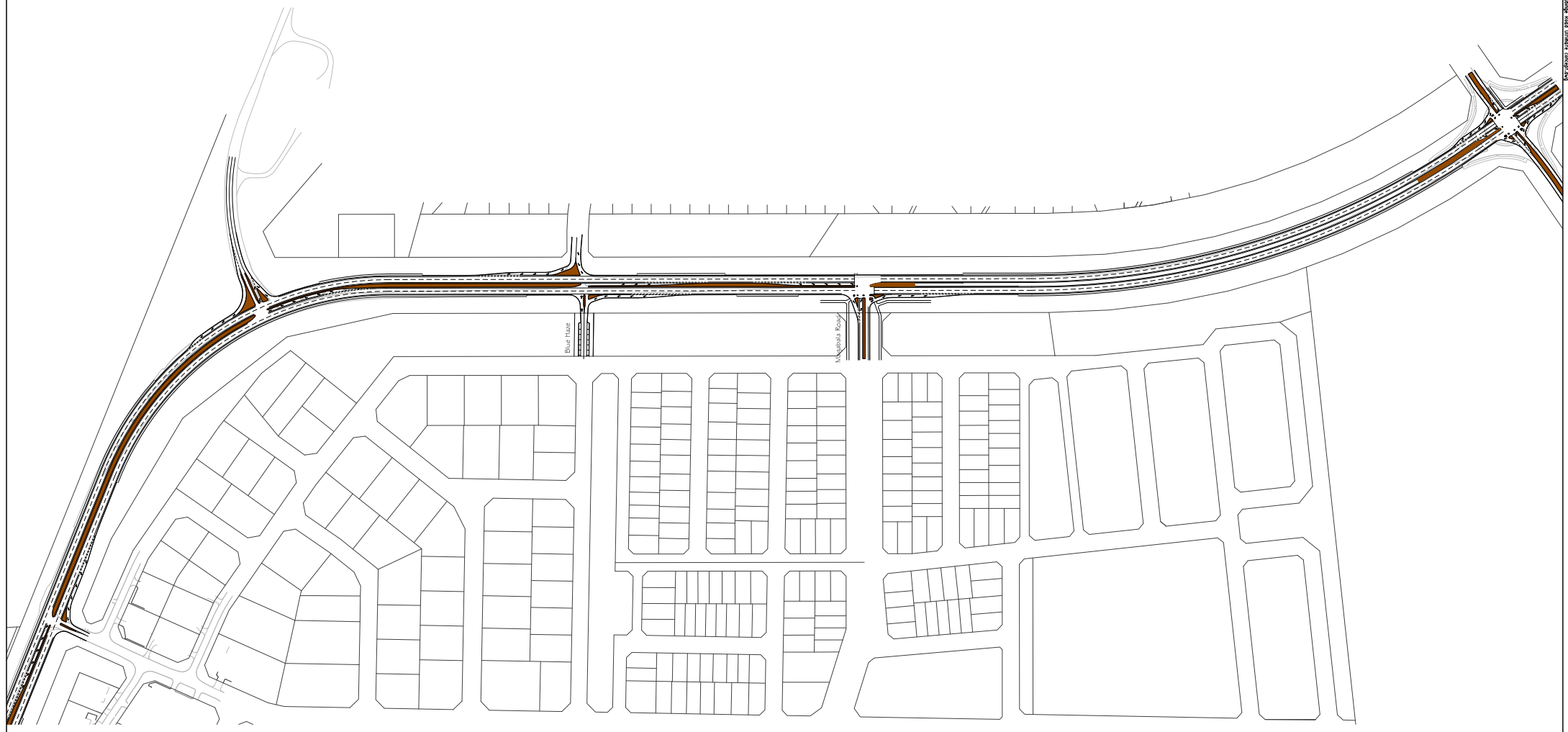


Skidmore Knight Merz Pty Ltd
A/CN 02 06
Perth Centre 263 Adelaide Ter
Perth Western Australia 6000
Ph (08) 5282 4000

BROOME NORTH

Gubinge Road ultimate concept

Nov 2009





Appendix D Correspondence with MRWA – Gubinge Road conceptual intersection plan

Sinc air Kni ht Mer
11th Floor, Durack Centre
263 Adelaide Terrace
PO Box H615
Perth WA 6001 Australia

Tel: +61 8 9469 4400
Fax: +61 8 9469 4488
Web: www.skmoonconsulting.com

Gary Bradshaw
Network Manager
Main Roads Western Australia

30 November 2009

091127 concept plans note.docx
PB50119

Dear Gary

Broome North - Conceptual Intersection Treatment Plans

Dear Gary,

Following the meeting on 20 November 2009 between SKM, Main Roads WA, Department of Planning (DoP) and LandCorp to discuss the interim and ultimate intersection treatments on Broome Road/ Gubinge Road between Tanami Drive and Fairway Drive, intersection concept plans have been developed for your review.

The interim development comprises 2,000 lots, expansion of the Blue Haze industrial estate, retail land use at one centre and at least one primary school. The exact timing (year) when the 2,000 lots would be built is not clear however assuming the current release rate for Broome continues and that majority of the lots are released in Broome North, the time frame is expected to be post year 2031.

At ultimate development a total of approximately 4,800 lots, two shopping centres, further expansion of the Blue Haze light industrial area, a private school, a high school and two primary schools will be developed.

The intersection treatments on Broome Road and Gubinge Road are summarised in **Table 1**.

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Table 1 Proposed Intersection Treatments

Intersection	Interim	Ultimate
Gubinge Rd / Fairway Dr	No change to existing	Signals (if/ when required to facilitate pedestrian crossing)
Gubinge Rd/ Magabala Rd	Priority-controlled (full access)	Signals (if/ when required to facilitate pedestrian crossing)
Gubinge Road / new Blue Haze Industrial access	Priority-controlled (no right turn in)	Priority-controlled (no right turn in)
Gubinge Rd/ Sanderling Dr	Priority-controlled (left in/ out)	Priority-controlled (left in/ out)
Gubinge Rd/ Old Broome Rd	No change to existing	Priority-controlled full access (Gubinge Rd duplicated)
Broome Rd/ Tanami Dr	No change to existing	Priority-controlled full access (Gubinge Rd duplicated)

It is assumed by 'ultimate' development that Gubinge Road/ Broome Road will be a four-lane divided carriageway as per the *Broome Highway Planning Study – Route Definition Report* (Western Infrastructure, March 2003).

Conceptual plans of the proposed intersection treatments are attached for comment. It would be appreciated if we could receive your comments by 7 December 2009 in order to progress planning in line with LandCorp's schedule as agreed with the Shire of Broome and WAPC.

If you have any queries please do not hesitate to contact me on 9469 4577.

Yours sincerely

Danya Alexander
Senior Transport Planner

Phone: 94694577
 Fax: 94694488
 E-mail: DAlexander@skm.com.au

Encl.

Gubinge Road Interim Concept Plan

Gubinge Road Ultimate Concept Plan



ABN: 50 860 676 021

Enquiries: Gary Bradshaw on 91584 325
Our Ref: 05/7129
Your Ref:

Danya Alexander
Senior Transport Planner (SKM)
Durack Centre
263 Adelaide Terrace
PO Box H615
Perth WA 6001

Dear Danya,

BROOME NORTH – CONCEPTUAL INTERSECTION TREATMENT PLAN


I refer to your correspondence of 30 November 2009 seeking comments on access requirements and conceptual intersection treatments to Broome Highway (Gubinge Road) in relation to the Broome North development.

Main Roads has reconsidered the proposed access from the Blue Haze estate and based on discussions and information supplied Main Roads now supports the proposed access location. The support of this additional access is on the assumption that the need for traffic signals at Gubinge/Magabala intersection would not be required in the short to medium term.

Main Roads supports the interim treatment proposed for the intersections and acknowledges that there may be a need for traffic signals in the longer term. However, to delay the installation of traffic signals an access plan for pedestrian movements across Gubinge Road will be required, especially in the short term where there will be a need for school children to access schools in the Roebuck Estate area.

If you require any further information please contact Gary Bradshaw on 91584 325. In reply please quote file reference 05/7129.

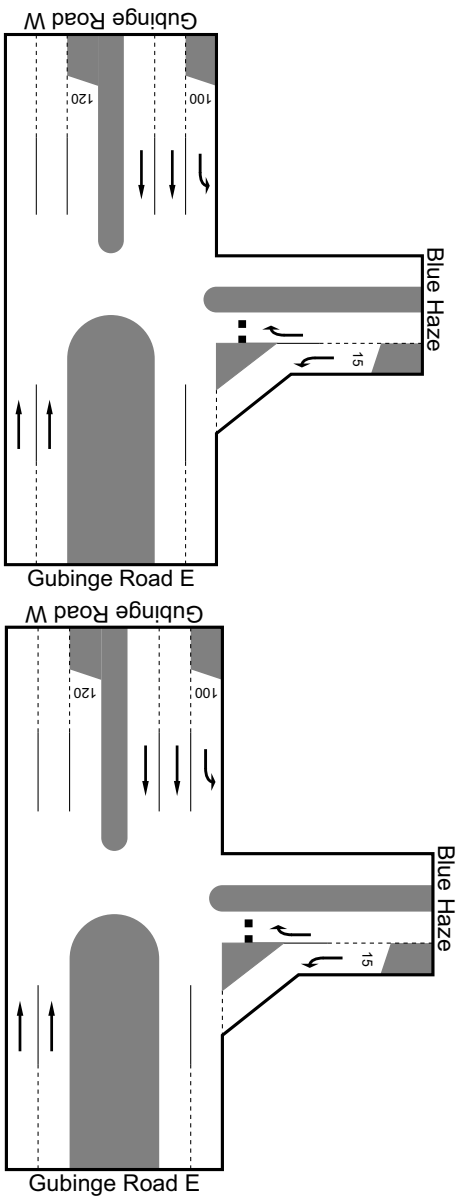
Yours sincerely


Gary Bradshaw
Network Manager
07 December 2009

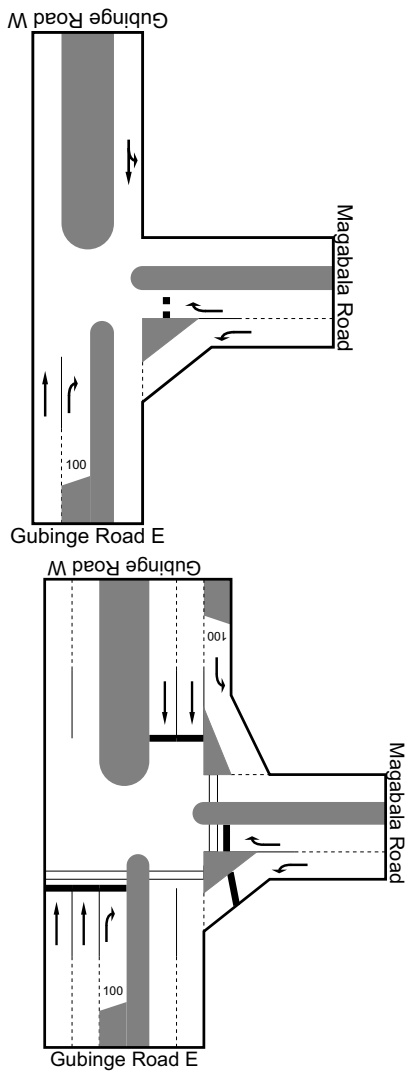


Appendix E Intersection Analysis Results (SIDRA)

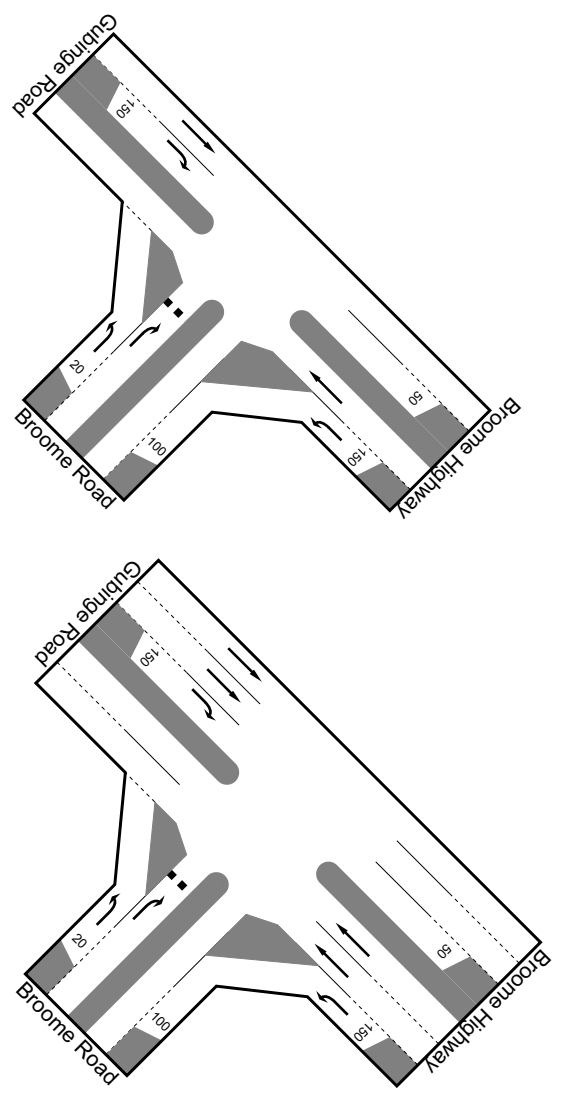
1 Interim & Ultimate



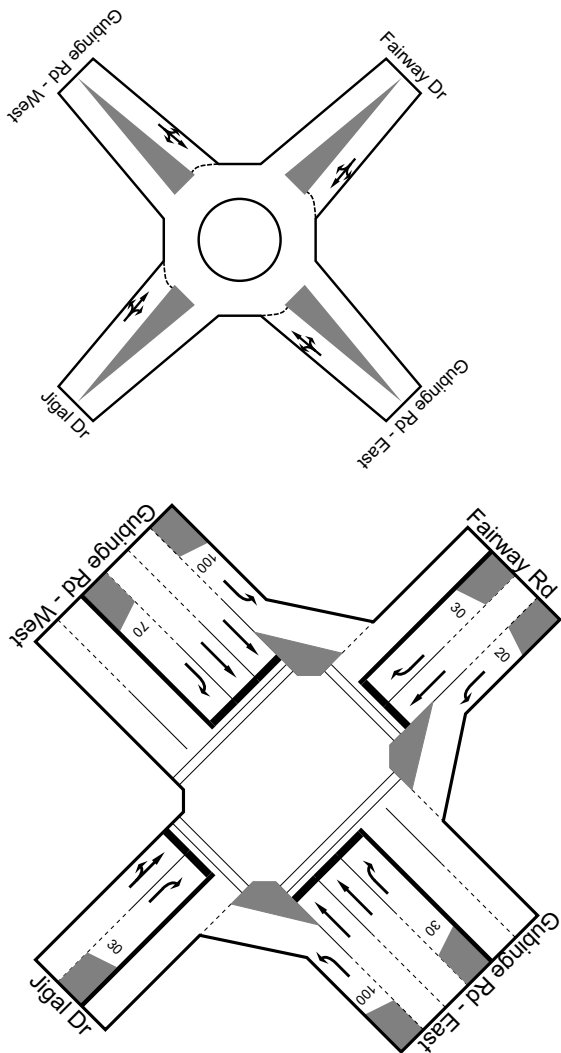
2 Interim & Ultimate



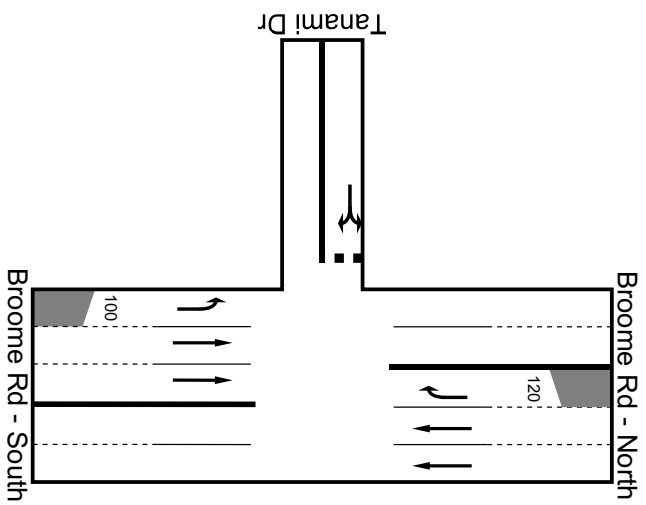
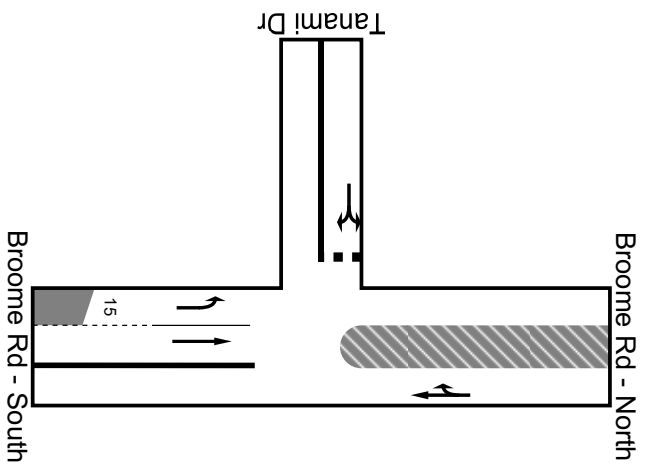
3 Interim & Ultimate



4 Interim & Ultimate



5 Interim & Ultimate



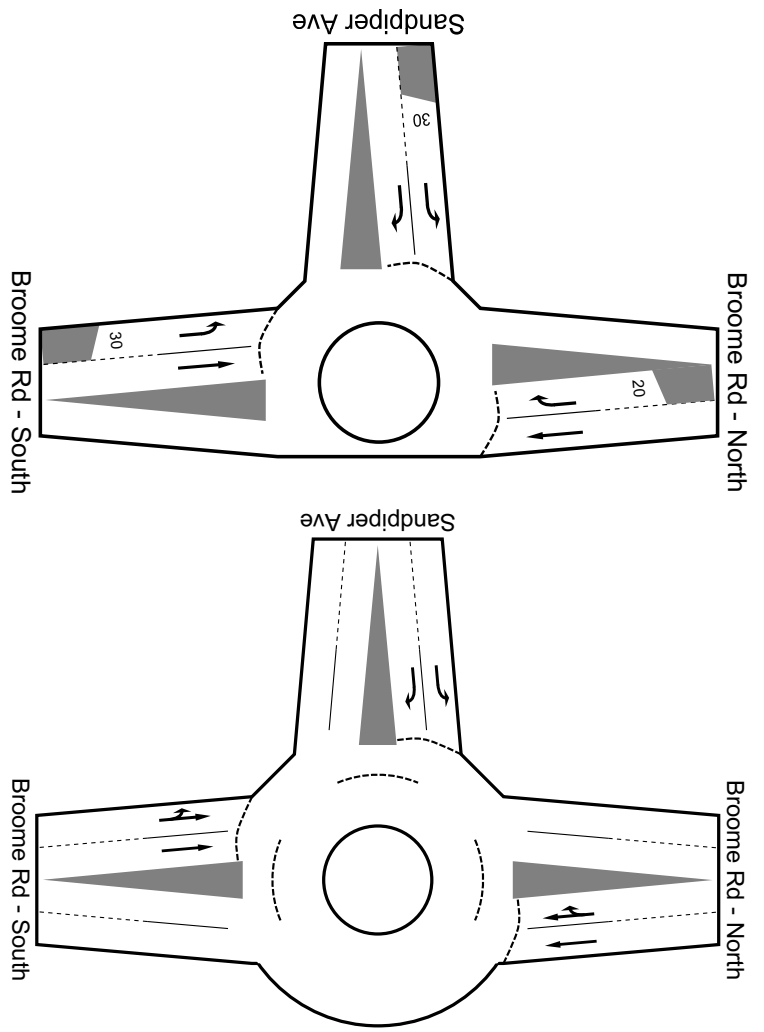
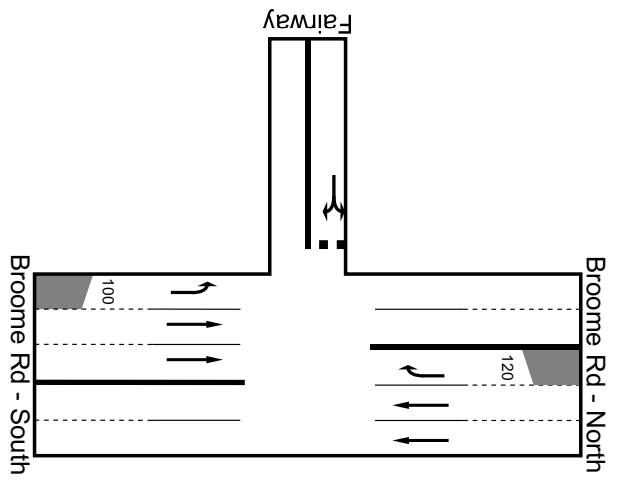


Figure 7 Ultimate





Movement Summary

Gubinge / Fairway / Jigal

Interim - AM Peak

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Jigal Dr										
21	L	112	2.7	0.283	5.5	LOS A	17	0.45	0.45	56.6
22	T	239	2.9	0.283	5.8	LOS A	17	0.45	0.46	56.5
23	R	74	2.7	0.283	14.7	LOS B	17	0.45	0.65	49.5
Approach		423	2.8	0.283	7.2	LOS A	17	0.45	0.49	55.0
Gubinge Rd - East										
24	L	32	9.7	0.203	7.1	LOS A	13	0.65	0.57	54.6
25	T	187	10.1	0.203	7.4	LOS A	13	0.65	0.57	54.5
26	R	11	10.0	0.204	16.3	LOS B	13	0.65	0.71	48.4
Approach		229	10.0	0.203	7.7	LOS A	13	0.65	0.58	54.2
Fairway Dr										
27	L	53	3.8	0.363	6.4	LOS A	24	0.62	0.53	54.9
28	T	412	2.9	0.363	6.8	LOS A	24	0.62	0.54	54.8
29	R	18	5.6	0.360	15.6	LOS B	24	0.62	0.71	48.6
Approach		482	3.1	0.363	7.1	LOS A	24	0.62	0.54	54.5
Gubinge Rd - West										
30	L	13	8.3	0.255	6.1	LOS A	16	0.51	0.49	56.0
31	T	221	10.0	0.255	6.4	LOS A	16	0.51	0.50	55.8
32	R	105	10.4	0.255	15.3	LOS B	16	0.51	0.67	49.2
Approach		339	10.0	0.255	9.2	LOS A	16	0.51	0.55	53.4
All Vehicles		1473	5.7	0.363	7.7	LOS A	24	0.55	0.53	54.3

Symbols which may appear in this table:

Following Degree of Saturation

X = 1.00 for Short Lane with resulting Excess Flow

* X = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



Site: Gubinge_Fairway_Jigal_AM_Interim
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Movement Summary

Gubinge / Fairway / Jigal

Interim - PM Peak

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Jigal Dr										
21	L	105	2.9	0.385	5.9	LOS A	25	0.55	0.49	55.6
22	T	412	2.9	0.384	6.2	LOS A	25	0.55	0.50	55.5
23	R	32	3.1	0.386	15.1	LOS B	25	0.55	0.67	49.0
Approach		548	2.9	0.384	6.7	LOS A	25	0.55	0.50	55.0
Gubinge Rd - East										
24	L	74	9.6	0.266	6.3	LOS A	16	0.54	0.50	55.7
25	T	221	10.0	0.266	6.6	LOS A	16	0.54	0.51	55.6
26	R	53	9.6	0.267	15.5	LOS B	16	0.54	0.68	49.0
Approach		346	9.8	0.266	7.9	LOS A	16	0.54	0.54	54.4
Fairway Dr										
27	L	11	9.1	0.193	5.9	LOS A	11	0.52	0.48	55.9
28	T	239	2.9	0.193	6.2	LOS A	11	0.52	0.49	55.8
29	R	13	7.7	0.194	15.0	LOS B	11	0.52	0.67	49.1
Approach		263	3.4	0.193	6.6	LOS A	11	0.52	0.50	55.4
Gubinge Rd - West										
30	L	18	11.1	0.273	7.0	LOS A	18	0.65	0.56	54.6
31	T	187	10.1	0.272	7.3	LOS A	18	0.65	0.57	54.5
32	R	112	9.9	0.272	16.2	LOS B	18	0.65	0.71	48.4
Approach		317	10.1	0.272	10.4	LOS B	18	0.65	0.62	52.0
All Vehicles		1474	6.2	0.386	7.8	LOS A	25	0.56	0.54	54.2

Symbols which may appear in this table:

Following Degree of Saturation

X = 1.00 for Short Lane with resulting Excess Flow

* X = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



Site: Gubinge_Fairway_Jigal_PM_Interim
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Phasing Summary

Gubinge Rd/ Fairway Dr/ Jigal Dr

Ultimate - AM

C = 80 seconds
 Cycle Time Option: **Optimum cycle time (Minimum Delay)**
Phase times determined by the program.

Phase B	Phase D	Phase E
<p>Green Time = 16 seconds Phase Time = 22 seconds Phase Split = 28 %</p>	<p>Green Time = 34 seconds Phase Time = 40 seconds Phase Split = 50 %</p>	<p>Green Time = 12 seconds Phase Time = 18 seconds Phase Split = 23 %</p>

- Normal Movement
- Slip-Lane
- Stopped Movement
- Turn On Red
- Permitted/Opposed
- Opposed Slip-Lane
- Continuous



Site: Gubinge Rd, Fairway Dr, Jigal Dr_ AM_ Ultimate
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Movement Summary

Gubinge Rd/ Fairway Dr/ Jigal Dr

Ultimate - AM

Signalised - Fixed time

Cycle Time = 80 seconds

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (V/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Jigal Dr										
21	L	179	2.8	0.590	26.1	LOS C	111	0.80	0.84	34.9
22	T	307	2.9	0.590	17.8	LOS B	111	0.80	0.71	40.3
23	R	73	2.8	0.427	41.5	LOS D	27	0.92	0.77	28.1
Approach		558	2.9	0.589	23.5	LOS C	111	0.82	0.76	36.4
Gubinge Rd - East										
24	L	32	3.1	0.038	13.7	LOS B	5	0.47	0.67	43.7
25	T	396	10.1	0.541	31.9	LOS C	67	0.95	0.78	32.0
26	R	16	6.2	0.090	36.9	LOS D	6	0.84	0.70	29.8
Approach		444	9.5	0.541	30.8	LOS C	67	0.91	0.77	32.5
Fairway Rd										
27	L	66	3.0	0.115	8.6	LOS A	3	0.22	0.64	48.6
28	T	584	3.1	0.720	20.8	LOS C	143	0.89	0.79	38.2
29	R	34	2.9	0.186	35.0	LOS D	12	0.82	0.73	30.6
Approach		685	3.1	0.720	20.3	LOS C	143	0.82	0.78	38.5
Gubinge Rd - West										
30	L	20	5.0	0.018	9.5	LOS A	2	0.28	0.64	47.7
31	T	288	10.0	0.186	15.4	LOS B	37	0.66	0.54	42.1
32	R	136	2.9	0.315	25.8	LOS C	34	0.84	0.78	35.1
Approach		445	7.6	0.315	18.3	LOS B	37	0.70	0.62	39.9
All Vehicles		2132	5.3	0.720	22.9	LOS C	143	0.81	0.74	36.8

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P9	53	31.5	LOS D	0	0.89	0.89
P11	53	19.6	LOS B	0	0.70	0.70
P13	53	34.2	LOS D	0	0.93	0.93
P15	53	19.6	LOS B	0	0.70	0.70
All Ped	212	26.2	LOS C	0	0.80	0.80

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



Site: Gubinge Rd, Fairway Dr, Jigal Dr, AM, Ultimate
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Phasing Summary

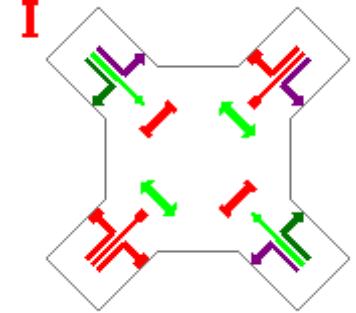
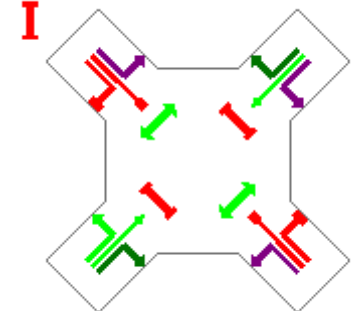
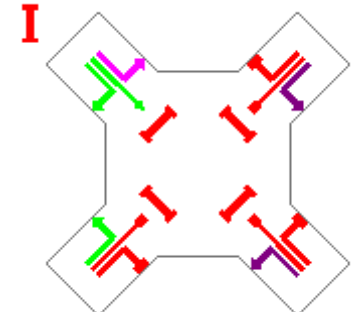
Gubinge Rd / Fairway Dr / Jigal Dr

Ultimate - PM

C = 90 seconds

Cycle Time Option: **Optimum cycle time (Minimum Delay)**

Phase times determined by the program.

Phase B	Phase D	Phase E
 <p data-bbox="1025 162 1106 446">Green Time = 16 seconds Phase Time = 22 seconds Phase Split = 24 %</p>	 <p data-bbox="1025 590 1106 874">Green Time = 44 seconds Phase Time = 50 seconds Phase Split = 56 %</p>	 <p data-bbox="1025 1018 1106 1302">Green Time = 12 seconds Phase Time = 18 seconds Phase Split = 20 %</p>

- | | |
|------------------|-------------------|
| Normal Movement | Permitted/Opposed |
| Slip-Lane | Opposed Slip-Lane |
| Stopped Movement | Continuous |
| Turn On Red | |



Site: Gubinge Rd / Fairway Dr / Jigal Dr _PM _Ultimate2
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Movement Summary

Gubinge Rd/ Fairway Dr/ Jigal Dr

Ultimate - PM

Signalised - Fixed time

Cycle Time = 90 seconds

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (V/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Jigal Dr										
21	L	136	2.9	0.771	28.7	LOS C	189	0.88	0.89	33.5
22	T	584	3.1	0.771	20.4	LOS C	189	0.88	0.81	38.4
23	R	32	3.1	0.153	26.2	LOS C	10	0.64	0.71	35.0
Approach		753	3.1	0.771	22.2	LOS C	189	0.87	0.82	37.3
Gubinge Rd - East										
24	L	73	2.8	0.085	10.4	LOS B	8	0.32	0.66	46.8
25	T	288	10.0	0.444	36.6	LOS D	57	0.94	0.76	29.9
26	R	66	3.0	0.419	44.4	LOS D	27	0.91	0.76	27.1
Approach		427	7.7	0.444	33.4	LOS C	57	0.83	0.74	31.3
Fairway Rd										
27	L	16	6.2	0.035	8.8	LOS A	1	0.21	0.63	48.4
28	T	307	2.9	0.328	15.0	LOS B	71	0.65	0.56	42.5
29	R	20	5.0	0.135	43.3	LOS D	9	0.87	0.72	27.4
Approach		343	3.2	0.328	16.3	LOS B	71	0.64	0.57	41.4
Gubinge Rd - West										
30	L	34	2.9	0.040	12.9	LOS B	6	0.42	0.67	44.4
31	T	396	10.1	0.286	21.0	LOS C	59	0.74	0.62	38.0
32	R	179	2.8	0.440	31.2	LOS C	52	0.89	0.80	32.3
Approach		609	7.6	0.440	23.6	LOS C	59	0.76	0.67	36.4
All Vehicles		2132	5.3	0.771	23.9	LOS C	189	0.79	0.72	36.2

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P9	53	36.5	LOS D	0	0.90	0.90
P11	53	17.4	LOS B	0	0.62	0.62
P13	53	39.2	LOS D	0	0.93	0.93
P15	53	17.4	LOS B	0	0.62	0.62
All Ped	212	27.6	LOS C	0	0.77	0.77

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



Site: Gubinge Rd, Fairway Dr, Jigal Dr, PM, Ultimate2
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Movement Summary

Gubinge Rd/ Magabala Rd

Interim - AM Peak

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gubinge Road E										
5	T	207	10.1	0.114	0.0	LOS A	0	0.00	0.00	70.0
6	R	42	2.4	0.052	11.9	LOS B	2	0.41	0.72	51.6
Approach		250	8.8	0.114	2.0	LOS A	2	0.07	0.12	66.1
Magabala Road										
7	L	165	3.0	0.142	11.6	LOS B	7	0.55	0.69	51.3
9	R	22	4.5	0.036	13.5	LOS B	1	0.52	0.77	49.7
Approach		187	3.2	0.142	11.8	LOS B	7	0.54	0.70	51.1
Gubinge Road W										
10	L	5	16.7	0.182	9.9	LOS A	0	0.00	0.71	53.9
11	T	324	9.9	0.180	0.0	LOS A	0	0.00	0.00	70.0
Approach		330	10.0	0.180	0.2	LOS A		0.00	0.01	69.6
All Vehicles		767	8.0	0.182	3.6	Not Applicable	7	0.16	0.21	63.0

Symbols which may appear in this table:

Following Degree of Saturation

* X = 1.00 for Short Lane with resulting Excess Flow

* X = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



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Movement Summary

Gubinge Rd/ Magabala Rd

Interim - PM Peak

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gubinge Road E										
5	T	324	9.9	0.177	0.0	LOS A	0	0.00	0.00	70.0
6	R	165	3.0	0.151	11.3	LOS B	7	0.41	0.69	51.8
Approach		489	7.6	0.177	3.8	LOS A	7	0.14	0.23	62.7
Magabala Road										
7	L	42	2.4	0.045	10.7	LOS B	1	0.33	0.64	52.6
9	R	5	16.7	0.014	16.0	LOS C	0	0.61	0.79	47.2
Approach		48	4.2	0.045	11.3	LOS B	1	0.36	0.66	51.9
Gubinge Road W										
10	L	22	4.5	0.126	9.9	LOS A	0	0.00	0.71	53.9
11	T	207	10.1	0.126	0.0	LOS A	0	0.00	0.00	70.0
Approach		230	9.6	0.126	0.9	LOS A	0	0.00	0.07	68.1
All Vehicles		767	8.0	0.177	3.4	Not Applicable	7	0.11	0.21	63.4

Symbols which may appear in this table:

Following Degree of Saturation

* X = 1.00 for Short Lane with resulting Excess Flow

* X = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



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Phasing Summary

Gubinge Rd / Magabala Rd

Ultimate - AM Peak

C = 60 seconds

Cycle Time Option: Program calculated cycle time

Phase times determined by the program.

Phase A	Phase B	Phase C
<p>Green Time = 12 seconds Phase Time = 13 seconds Phase Split = 22 %</p>	<p>Green Time = 12 seconds Phase Time = 18 seconds Phase Split = 30 %</p>	<p>Green Time = 23 seconds Phase Time = 29 seconds Phase Split = 48 %</p>

- | | |
|------------------|-------------------|
| Normal Movement | Permitted/Opposed |
| Slip-Lane | Opposed Slip-Lane |
| Stopped Movement | Continuous |
| Turn On Red | |



Site: Gubinge_Magabala_AM_Ultimate
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Movement Summary

Gubinge Rd/ Magabala Rd

Ultimate - AM Peak

Signalised - Fixed time

Cycle Time = 60 seconds

Vehicle Movements

Mov ID	Turn	Dem Flow (Veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gubinge Road E										
5	T	257	10.1	0.169	11.9	LOS B	26	0.66	0.53	51.5
6	R	73	2.8	0.205	32.3	LOS C	19	0.87	0.76	35.4
Approach		329	8.5	0.205	16.4	LOS B	26	0.71	0.58	46.9
Magabala Road										
7	L	289	3.1	0.532	28.9	LOS C	65	0.88	0.82	37.5
9	R	126	3.1	0.182	23.1	LOS C	26	0.70	0.77	41.2
Approach		417	3.1	0.532	27.2	LOS C	65	0.83	0.80	38.6
Gubinge Road W										
10	L	61	3.3	0.040	9.9	LOS A	2	0.14	0.67	53.7
11	T	227	10.1	0.150	11.8	LOS B	23	0.65	0.52	51.6
Approach		289	8.7	0.150	11.4	LOS B	23	0.55	0.55	52.1
All Vehicles		1035	6.4	0.532	19.3	LOS B	65	0.71	0.66	44.3

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P3	53	17.6	LOS B	0	0.77	0.77
P5	53	24.3	LOS C	0	0.90	0.90
All Peds	106	21.0	LOS C	0	0.83	0.83

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



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Phasing Summary

Gubinge Rd / Magabala Rd

Ultimate - PM Peak

C = 60 seconds

Cycle Time Option: Program calculated cycle time

Phase times determined by the program.

Phase A	Phase B	Phase C
<p>Green Time = 12 seconds Phase Time = 13 seconds Phase Split = 22 %</p>	<p>Green Time = 20 seconds Phase Time = 26 seconds Phase Split = 43 %</p>	<p>Green Time = 15 seconds Phase Time = 21 seconds Phase Split = 35 %</p>

- Normal Movement Permitted/Opposed
- Slip-Lane Opposed Slip-Lane
- Stopped Movement Continuous
- Turn On Red



Site: Gubinge_Magabala_PM_Ultimate
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Movement Summary

Gubinge Rd/ Magabala Rd

Ultimate - PM Peak

Signalised - Fixed time

Cycle Time = 60 seconds

Vehicle Movements

Mov ID	Turn	Dem Flow (Veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gubinge Road E										
5	T	227	10.1	0.113	7.0	LOS A	18	0.51	0.41	57.9
6	R	289	3.1	0.544	28.0	LOS C	63	0.86	0.83	37.9
Approach		518	6.2	0.544	18.7	LOS B	63	0.71	0.64	44.7
Magabala Road										
7	L	73	2.8	0.158	28.9	LOS C	18	0.82	0.75	37.5
9	R	61	3.3	0.134	29.0	LOS C	15	0.81	0.75	37.3
Approach		133	3.0	0.158	29.0	LOS C	18	0.81	0.75	37.4
Gubinge Road W										
10	L	126	3.1	0.093	10.1	LOS B	5	0.21	0.68	53.3
11	T	257	10.1	0.128	7.0	LOS A	20	0.51	0.41	57.8
Approach		384	7.8	0.128	8.0	LOS A	20	0.41	0.50	56.2
All Vehicles		1035	6.4	0.544	16.1	LOS B	63	0.61	0.60	47.1

Pedestrian Movements

Mov ID	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P3	53	24.3	LOS C	0	0.90	0.90
P5	53	24.3	LOS C	0	0.90	0.90
All Peds	106	24.3	LOS C	0	0.90	0.90

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



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Movement Summary

Broome Rd/ Gubinge Rd/ Broome Hwy

Interim - AM Peak

Two-way stop

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Broome Road										
21	L	126	4.8	0.145	10.8	LOS B	5	0.44	0.62	51.9
23	R	232	5.2	0.241	13.3	LOS B	13	0.66	0.79	50.1
Approach		358	5.0	0.241	12.4	LOS B	13	0.58	0.73	50.7
Broome Highway										
24	L	267	4.9	0.149	9.6	LOS A #	4#	0.00	0.65	54.6
25	T	101	9.9	0.055	0.0	LOS A	0	0.00	0.00	70.0
Approach		368	6.2	0.149	7.0	LOS A		0.00	0.47	58.1
Gubinge Road										
31	T	134	9.8	0.073	0.0	LOS A	0	0.00	0.00	70.0
32	R	275	5.1	0.178	10.6	LOS B	8	0.30	0.65	52.4
Approach		408	6.6	0.178	7.1	LOS A	8	0.20	0.44	57.1
All Vehicles		1134	6.0	0.241	8.7	Not Applicable	13	0.26	0.54	55.2

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



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Movement Summary

Broome Rd/ Gubinge Rd/ Broome Hwy

Interim - PM Peak

Two-way stop

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Broome Road										
21	L	274	5.1	0.317	11.1	LOS B	12	0.49	0.65	51.7
23	R	268	4.9	0.210	11.3	LOS B	10	0.47	0.71	51.6
Approach		542	5.0	0.317	11.2	LOS B	12	0.48	0.68	51.6
Broome Highway										
24	L	228	4.8	0.127	9.6	LOS A #	3#	0.00	0.65	54.6
25	T	134	9.8	0.073	0.0	LOS A	0	0.00	0.00	70.0
Approach		361	6.6	0.127	6.1	LOS A		0.00	0.41	59.4
Gubinge Road										
31	T	101	9.9	0.055	0.0	LOS A	0	0.00	0.00	70.0
32	R	129	4.7	0.092	10.9	LOS B	4	0.37	0.66	52.0
Approach		230	7.0	0.092	6.1	LOS A	4	0.21	0.37	58.7
All Vehicles		1133	5.9	0.317	8.5	Not Applicable	12	0.27	0.53	55.3

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



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Movement Summary

Broome Rd/ Gubinge Rd/ Broome Hwy

Ultimate - AM Peak

Two-way stop

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Broome Road										
21	L	165	4.8	0.191	10.9	LOS B	7	0.46	0.63	51.8
23	R	312	5.1	0.554	18.2	LOS C	31	0.72	1.04	45.3
Approach		477	5.0	0.554	15.7	LOS C	31	0.63	0.90	47.4
Broome Highway										
24	L	334	5.1	0.186	9.6	LOS A#	5#	0.00	0.65	54.6
25	T	81	9.9	0.022	0.0	LOS A	0	0.00	0.00	70.0
Approach		415	6.0	0.186	7.7	LOS A		0.00	0.52	57.0
Gubinge Road										
31	T	160	10.0	0.044	0.0	LOS A	0	0.00	0.00	70.0
32	R	422	5.0	0.418	11.1	LOS B	20	0.38	0.68	52.0
Approach		582	6.4	0.418	8.1	LOS A	20	0.28	0.49	56.0
All Vehicles		1474	5.8	0.554	10.4	Not Applicable	31	0.31	0.63	53.2

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



Site: Broome_Gubinge_AM_Ultimate
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Movement Summary

Broome Rd/ Gubinge Rd/ Broome Hwy

Ultimate - PM Peak

Two-way stop

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Broome Road										
21	L	420	5.0	0.498	12.9	LOS B	30	0.59	0.76	50.6
23	R	336	5.1	0.479	15.1	LOS C	27	0.62	0.96	48.3
Approach		756	5.0	0.498	13.9	LOS B	30	0.61	0.85	49.6
Broome Highway										
24	L	305	4.9	0.170	9.6	LOS A#	5#	0.00	0.65	54.6
25	T	160	10.0	0.044	0.0	LOS A	0	0.00	0.00	70.0
Approach		465	6.7	0.170	6.3	LOS A		0.00	0.43	59.1
Gubinge Road										
31	T	81	9.9	0.022	0.0	LOS A	0	0.00	0.00	70.0
32	R	175	5.1	0.218	12.2	LOS B	8	0.47	0.77	51.3
Approach		256	6.6	0.218	8.4	LOS A	8	0.32	0.52	56.0
All Vehicles		1477	5.8	0.498	10.5	Not Applicable	30	0.37	0.66	53.3

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



Site: Broome_Gubinge_PM_Ultimate
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Movement Summary

Gubinge Rd/ Blue Haze

Interim - AM peak

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gubinge Road E										
5	T	203	9.9	0.111	0.0	LOS A	0	0.00	0.00	70.0
Approach		203	9.9	0.111	0.0	LOS A		0.00	0.00	70.0
Blue Haze										
7	L	1	50.0	0.006	14.6	LOS B	0	0.61	0.60	49.4
9	R	4	25.0	0.004	12.4	LOS B	0	0.46	0.62	51.6
Approach		6	33.3	0.006	13.1	LOS B	0	0.51	0.62	50.8
Gubinge Road W										
10	L	18	22.2	0.011	10.7	LOS B	0	0.00	0.71	53.9
11	T	361	10.0	0.197	0.0	LOS A	0	0.00	0.00	70.0
Approach		379	10.6	0.197	0.5	LOS A		0.00	0.03	69.0
All Vehicles		588	10.5	0.197	0.5	Not Applicable	0	0.01	0.03	69.1

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



Site: Gubinge_Blue Haze_Interim AM
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Movement Summary

Gubinge Rd/ Blue Haze

Interim - PM peak

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gubinge Road E										
5	T	361	10.0	0.197	0.0	LOS A	0	0.00	0.00	70.0
Approach		361	10.0	0.197	0.0	LOS A		0.00	0.00	70.0
Blue Haze										
7	L	3	25.0	0.007	11.5	LOS B	0	0.43	0.55	52.0
9	R	18	22.2	0.015	11.5	LOS B	1	0.33	0.62	52.2
Approach		22	22.7	0.015	11.5	LOS B	1	0.35	0.61	52.2
Gubinge Road W										
10	L	4	25.0	0.003	10.7	LOS B	0	0.00	0.71	53.9
11	T	203	9.9	0.111	0.0	LOS A	0	0.00	0.00	70.0
Approach		207	10.1	0.111	0.2	LOS A		0.00	0.01	69.6
All Vehicles		590	10.5	0.197	0.5	Not Applicable	1	0.01	0.03	69.0

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



Site: Gubinge_Blue Haze_Interim_PM

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Movement Summary

Gubinge Rd/ Blue Haze

Ultimate - AM peak

Give-way :

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gubinge Road E										
5	T	266	10.1	0.073	0.0	LOS A	0	0.00	0.00	70.0
Approach		267	10.1	0.073	0.0	LOS A		0.00	0.00	70.0
Blue Haze										
7	L	2	33.3	0.009	16.9	LOS C	0	0.69	0.67	47.2
9	R	13	23.1	0.030	16.2	LOS C	1	0.57	0.80	47.8
Approach		16	25.0	0.030	16.3	LOS C	1	0.60	0.77	47.6
Gubinge Road W										
10	L	51	20.0	0.031	10.7	LOS B	0	0.00	0.71	53.9
11	T	580	10.0	0.158	0.0	LOS A	0	0.00	0.00	70.0
Approach		630	10.8	0.158	0.9	LOS A		0.00	0.06	68.4
All Vehicles		913	10.8	0.158	0.9	Not Applicable	1	0.01	0.05	68.3

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



Site: Gubinge_Blue Haze_Ultimate AM
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Movement Summary

Gubinge Rd/ Blue Haze

Ultimate - PM peak

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Gubinge Road E										
5	T	580	10.0	0.158	0.0	LOS A	0	0.00	0.00	70.0
Approach		580	10.0	0.158	0.0	LOS A		0.00	0.00	70.0
Blue Haze										
7	L	9	20.0	0.018	11.9	LOS B	1	0.49	0.58	51.7
9	R	51	20.0	0.068	12.5	LOS B	3	0.40	0.70	51.8
Approach		60	20.0	0.068	12.4	LOS B	3	0.41	0.68	51.8
Gubinge Road W										
10	L	13	23.1	0.008	10.7	LOS B	0	0.00	0.71	53.9
11	T	266	10.1	0.073	0.0	LOS A	0	0.00	0.00	70.0
Approach		280	10.7	0.073	0.5	LOS A		0.00	0.03	69.1
All Vehicles		920	10.9	0.158	1.0	Not Applicable	3	0.03	0.05	68.2

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



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Movement Summary

Broome Rd/ Tanami Dr

Interim - AM peak

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Broome Rd - South										
1	L	166	10.2	0.096	10.3	LOS B	0	0.00	0.71	53.9
2	T	169	10.0	0.093	0.0	LOS A	0	0.00	0.00	70.0
Approach		337	10.1	0.096	5.1	LOS A		0.00	0.35	61.0
Broome Rd - North										
8	T	254	9.9	0.146	1.5	LOS A	10	0.47	0.00	61.8
9	R	11	10.0	0.147	11.8	LOS B	10	0.47	0.73	51.8
Approach		263	9.9	0.146	1.9	LOS A	10	0.47	0.03	61.4
Tanami Dr										
10	L	11	10.0	0.189	14.0	LOS B	7	0.53	0.68	49.5
12	R	113	9.8	0.190	14.0	LOS B	7	0.53	0.85	49.5
Approach		122	9.8	0.189	14.0	LOS B	7	0.53	0.84	49.5
All Vehicles		722	10.0	0.190	5.4	Not Applicable	10	0.26	0.31	58.9

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



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Movement Summary

Broome Rd/ Tanami Dr

Interim - PM peak

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Broome Rd - South										
1	L	114	9.7	0.065	10.3	LOS B	0	0.00	0.71	53.9
2	T	254	9.9	0.138	0.0	LOS A	0	0.00	0.00	70.0
Approach		366	9.8	0.138	3.2	LOS A		0.00	0.22	64.1
Broome Rd - North										
8	T	169	10.0	0.101	1.6	LOS A	7	0.47	0.00	61.9
9	R	11	10.0	0.101	11.9	LOS B	7	0.47	0.72	51.8
Approach		180	10.0	0.101	2.1	LOS A	7	0.47	0.04	61.2
Tanami Dr										
10	L	11	10.0	0.263	14.2	LOS B	11	0.55	0.73	49.3
12	R	163	9.8	0.263	14.2	LOS B	11	0.55	0.87	49.3
Approach		173	9.8	0.263	14.2	LOS B	11	0.55	0.86	49.3
All Vehicles		719	9.9	0.263	5.6	Not Applicable	11	0.25	0.33	59.2

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



SIDRA SOLUTIONS

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Movement Summary

Broome Rd/ Tanami Dr

Ultimate - AM peak

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Broome Rd - South										
1	L	144	9.7	0.083	10.3	LOS B	0	0.00	0.71	53.9
2	T	333	9.9	0.091	0.0	LOS A	0	0.00	0.00	70.0
Approach		476	9.9	0.091	3.1	LOS A		0.00	0.21	64.2
Broome Rd - North										
8	T	312	10.0	0.085	0.0	LOS A	0	0.00	0.00	70.0
9	R	11	10.0	0.015	13.3	LOS B	1	0.48	0.73	50.3
Approach		321	10.0	0.085	0.4	LOS A	1	0.01	0.02	69.2
Tanami Dr										
10	L	11	10.0	0.667	45.8	LOS E	32	0.89	1.15	29.4
12	R	103	9.7	0.660	45.7	LOS E	32	0.89	1.14	29.4
Approach		113	9.7	0.659	45.7	LOS E	32	0.89	1.14	29.4
All Vehicles		910	9.9	0.667	7.4	Not Applicable	32	0.12	0.26	57.3

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



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Movement Summary

Broome Rd/ Tanami Dr

Ultimate - PM peak

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Broome Rd - South										
1	L	105	10.4	0.061	10.3	LOS B	0	0.00	0.71	53.9
2	T	312	10.0	0.085	0.0	LOS A	0	0.00	0.00	70.0
Approach		417	10.1	0.085	2.6	LOS A		0.00	0.18	65.1
Broome Rd - North										
8	T	333	9.9	0.091	0.0	LOS A	0	0.00	0.00	70.0
9	R	11	10.0	0.014	12.8	LOS B	0	0.45	0.71	50.8
Approach		342	9.9	0.091	0.4	LOS A	0	0.01	0.02	69.2
Tanami Dr										
10	L	11	10.0	0.833	64.1	LOS F	58	0.94	1.53	23.8
12	R	138	10.1	0.852	64.0	LOS F	58	0.94	1.37	23.8
Approach		148	10.1	0.851	64.0	LOS F	58	0.94	1.38	23.8
All Vehicles		907	10.0	0.852	11.8	Not Applicable	58	0.16	0.32	51.8

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



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Movement Summary

Broome Rd / Fairway

Ultimate - AM peak

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Broome Rd - South										
1	L	18	11.1	0.010	10.3	LOS B	0	0.00	0.71	53.9
2	T	343	9.9	0.094	0.0	LOS A	0	0.00	0.00	70.0
Approach		361	10.0	0.094	0.5	LOS A		0.00	0.04	69.0
Broome Rd - North										
8	T	322	9.9	0.088	0.0	LOS A	0	0.00	0.00	70.0
9	R	5	16.7	0.009	12.7	LOS B	0	0.43	0.69	51.0
Approach		328	10.1	0.088	0.2	LOS A	0	0.01	0.01	69.5
Fairway										
10	L	11	10.0	0.417	32.6	LOS D	17	0.80	0.90	35.3
12	R	73	9.7	0.419	32.6	LOS D	17	0.80	1.01	35.4
Approach		82	9.8	0.418	32.6	LOS D	17	0.80	1.00	35.4
All Vehicles		771	10.0	0.419	3.8	Not Applicable	17	0.09	0.13	62.9

Symbols which may appear in this table:

Following Degree of Saturation

* X = 1.00 for Short Lane with resulting Excess Flow

* X = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



Site: Broome Rd/ Fairway - Ultimate AM
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Movement Summary

Broome Rd / Fairway

Ultimate - PM peak

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Broome Rd - South										
1	L	73	9.7	0.041	10.3	LOS B	0	0.00	0.71	53.9
2	T	322	9.9	0.088	0.0	LOS A	0	0.00	0.00	70.0
Approach		394	9.9	0.088	1.9	LOS A		0.00	0.13	66.4
Broome Rd - North										
8	T	343	9.9	0.094	0.0	LOS A	0	0.00	0.00	70.0
9	R	11	10.0	0.014	12.6	LOS B	0	0.44	0.70	51.0
Approach		353	9.9	0.094	0.4	LOS A	0	0.01	0.02	69.3
Fairway										
10	L	5	16.7	0.120	26.3	LOS D	4	0.73	0.72	39.1
12	R	18	11.1	0.120	26.2	LOS D	4	0.73	0.92	39.2
Approach		24	12.5	0.120	26.2	LOS D	4	0.73	0.87	39.2
All Vehicles		771	10.0	0.120	1.9	Not Applicable	4	0.03	0.10	66.3

Symbols which may appear in this table:

Following Degree of Saturation

* X = 1.00 for Short Lane with resulting Excess Flow

* X = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



Site: Broome Rd/ Fairway - Ultimate PM
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Movement Summary

Sandpiper Ave/ Broome Rd

Interim - AM peak

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Broome Rd - South										
1	L	485	3.1	0.422	8.6	LOS A	20	0.99	0.21	49.9
2	T	403	9.9	0.279	7.1	LOS A	21	0.12	0.48	57.3
Approach		889	6.2	0.422	7.9	LOS A	21	0.59	0.33	53.0
Broome Rd - North										
8	T	677	10.0	0.733	15.0	LOS B	84	0.97	1.06	48.6
9	R	13	7.7	0.026	16.6	LOS B	1	0.65	0.73	47.5
Approach		690	10.0	0.733	15.0	LOS B	84	0.97	1.05	48.6
Sandpiper Ave										
10	L	18	5.6	0.027	11.3	LOS B	1	0.57	0.63	52.3
12	R	677	3.0	0.571	16.9	LOS B	47	0.76	0.81	47.2
Approach		695	3.0	0.571	16.8	LOS B	47	0.75	0.81	47.3
All Vehicles		2274	6.4	0.733	12.8	LOS B	84	0.75	0.70	49.7

Symbols which may appear in this table:

Following Degree of Saturation

* x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



Site: Sandpiper Ave/ Broome Rd - Interim AM roundabout
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Movement Summary

Sandpiper Ave/ Broome Rd

Interim - PM peak

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Broome Rd - South										
1	L	677	3.0	0.577	8.9	LOS A	30	1.00	0.24	49.8
2	T	677	10.0	0.464	7.1	LOS A	43	0.18	0.47	56.8
Approach		1354	6.5	0.577	8.0	LOS A	43	0.59	0.36	53.1
Broome Rd - North										
8	T	403	9.9	0.371	8.9	LOS A	24	0.67	0.66	52.7
9	R	18	5.6	0.031	15.4	LOS B	1	0.55	0.71	48.3
Approach		421	9.7	0.371	9.2	LOS A	24	0.66	0.66	52.5
Sandpiper Ave										
10	L	13	7.7	0.023	14.0	LOS B	1	0.71	0.69	49.3
12	R	485	3.1	0.513	19.6	LOS B	42	0.87	0.92	44.8
Approach		499	3.2	0.513	19.5	LOS B	42	0.87	0.92	44.9
All Vehicles		2274	6.4	0.577	10.8	LOS B	43	0.66	0.54	50.9

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



Site: Sandpiper Ave/ Broome Rd - Interim PM roundabout
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Movement Summary

Sandpiper Ave/ Broome Rd

Ultimate - AM peak

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Broome Rd - South										
1	L	619	3.1	0.375	6.1	LOS A	25	0.11	0.49	50.8
2	T	547	10.0	0.375	5.2	LOS A	25	0.12	0.41	52.1
Approach		1167	6.3	0.375	5.7	LOS A	25	0.11	0.45	51.4
Broome Rd - North										
8	T	980	10.0	0.781	14.6	LOS B	63	0.91	1.12	43.2
9	R	15	6.7	0.789	22.0	LOS C	57	0.90	1.15	38.4
Approach		995	9.9	0.781	14.7	LOS B	63	0.91	1.12	43.1
Sandpiper Ave										
10	L	28	3.4	0.592	10.2	LOS B	42	0.70	0.85	47.0
12	R	1179	3.0	0.593	15.6	LOS B	42	0.71	0.92	42.9
Approach		1208	3.0	0.593	15.5	LOS B	42	0.71	0.92	43.0
All Vehicles		3370	6.2	0.789	11.9	LOS B	63	0.56	0.82	45.5

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



Site: Sandpiper Ave/ Broome Rd - Ultimate AM
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Movement Summary

Sandpiper Ave/ Broome Rd

Ultimate - PM peak

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Broome Rd - South										
1	L	1179	3.0	0.702	6.3	LOS A	72	0.24	0.47	49.9
2	T	980	10.0	0.702	5.4	LOS A	72	0.28	0.41	50.8
Approach		2159	6.2	0.702	5.9	LOS A	76	0.26	0.44	50.3
Broome Rd - North										
8	T	547	10.0	0.333	7.2	LOS A	17	0.64	0.62	48.3
9	R	28	3.4	0.333	13.6	LOS B	16	0.64	0.85	44.0
Approach		577	9.7	0.333	7.5	LOS A	17	0.64	0.63	48.1
Sandpiper Ave										
10	L	15	6.7	0.469	14.4	LOS B	33	0.87	1.00	43.0
12	R	619	3.1	0.470	20.3	LOS C	33	0.87	1.02	39.5
Approach		634	3.2	0.470	20.1	LOS C	33	0.87	1.02	39.6
All Vehicles		3370	6.2	0.702	8.8	LOS A	72	0.44	0.58	47.4

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue

- Density for continuous movement



Site: Sandpiper Ave/ Broome Rd - Ultimate PM
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