Dalyellup District Centre

TRAFFIC AND TRANSPORT REPORT

- Final v4
- January 2011

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1. Introduction and background

1.1. Purpose of this transport assessment

This transport assessment has been prepared by Sinclair Knight Merz (SKM) on behalf of Satterley Property Group for the proposed District Centre in the Dalyellup Estate, in the Shire of Capel.

It has been prepared in accordance with the document *Transport Assessment Guidelines for Development, Volume 2 - Structure plans,* August 2006, Western Australian Planning Commission.

1.2. Transport assessment objectives

From the WAPC Guidelines, the key objectives of a transport assessment for a structure plan 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.

1.3. Consultation

Representatives from SKM met with the Department of Planning on 31 May 2010 to discuss inputs to this transport assessment. Some key issues raised at this meeting included:

- Estimated traffic volumes to/ from Bussell Highway and Norton Promenade are required to assess the performance of the intersection in 2031 with proposed Dalyellup District Centre development.
- Crossing facilities are required near key access points to the District Centre and public transport stops for the safety of pedestrian and cyclists.
- A breakdown of traffic volumes from the recent EMME model needs to be included in this report.

1.4. Layout of this transport assessment

This transport assessment is set out in ten sections as follows:

- Section 1 Introduction and background (this section)
- Section 2 Structure plan outline

- Section 3 Existing transport environment
- Section 4 Traffic generation and distribution
- Section 5 Internal transport network and analysis
- Section 6 Proposed pedestrian and cycle network
- Section 7 Proposed public transport routes
- Section 8 Integration with surrounding area
- Section 9 Parking
- Section 10 Conclusion

2. Structure Plan outline

2.1. Site location, regional context and surrounding land uses

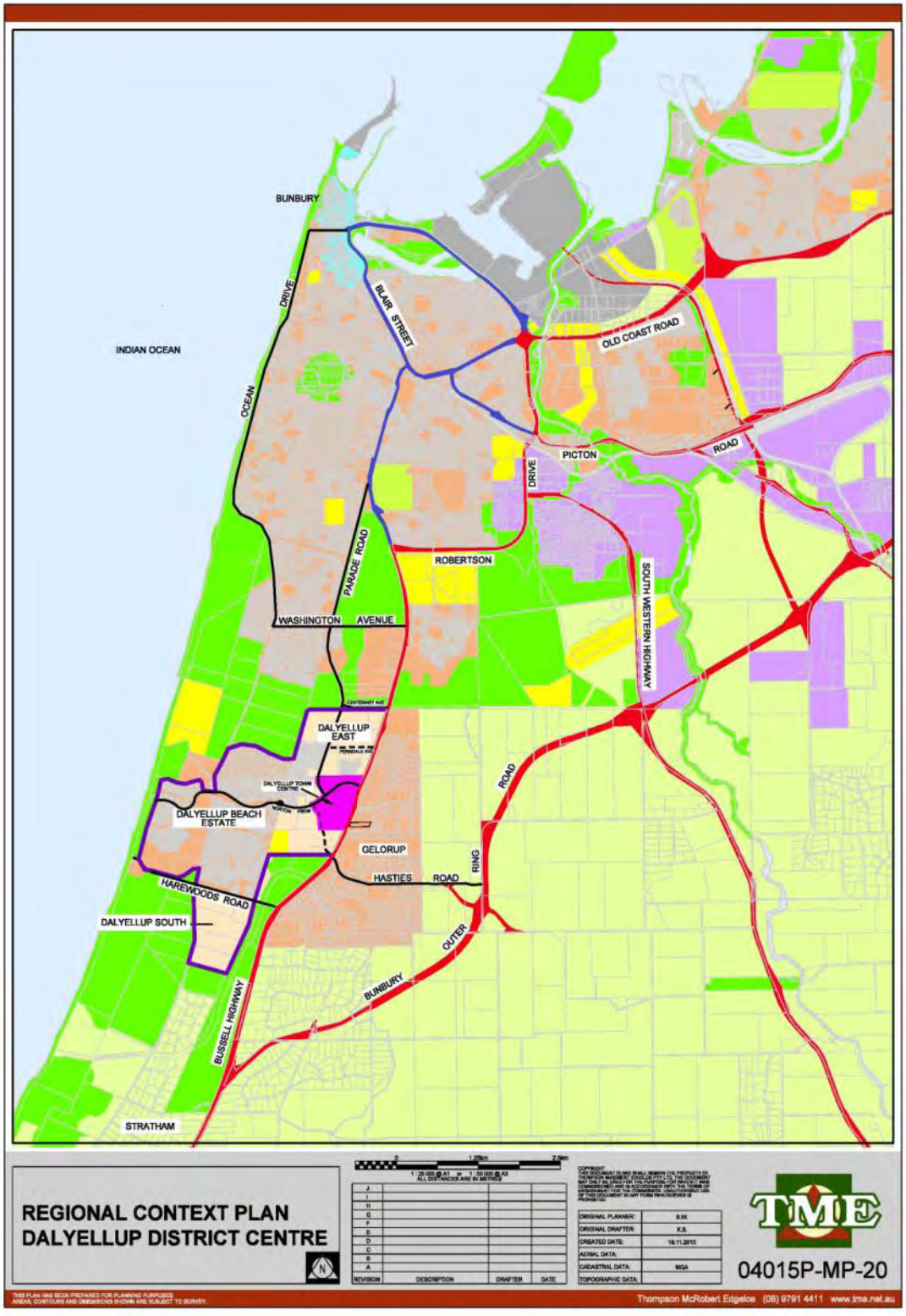
The District Centre is located within the Shire of Capel, approximately 10 kilometres south of Bunbury. The Bussell Highway provides the key regional connection for Dalyellup and serves as the eastern boundary to the Dalyellup East development.

The development is located on a greenfield site, within a broader structure plan for the Dalyellup East Estate. The surrounding Dalyellup East development is largely residential in use and includes densities ranging from R20 to R40. Other land uses include two primary schools, a high school site, public open space and conservation areas and aged persons accommodation. All uses directly abutting the District Centre will be residential in nature and public open space.

The adjacent Dalyellup Beach Estate (located directly to the west, between the Dalyellup East precinct and the coast) is also predominately residential, but includes a primary school, community centre and tourist precinct.

The site context for the Dalyellup Town Centre is shown in **Figure 2-1.** The proposed concept plan for Dalyellup District Centre is shown in **Figure 2-2** and the draft Centre Plan is provided in **Figure 2-3**.

Figure 2-1 Regional Context Plan Dalyellup District Centre



- **Figure 2-2 Dalyellup Town Centre Concept Plan**

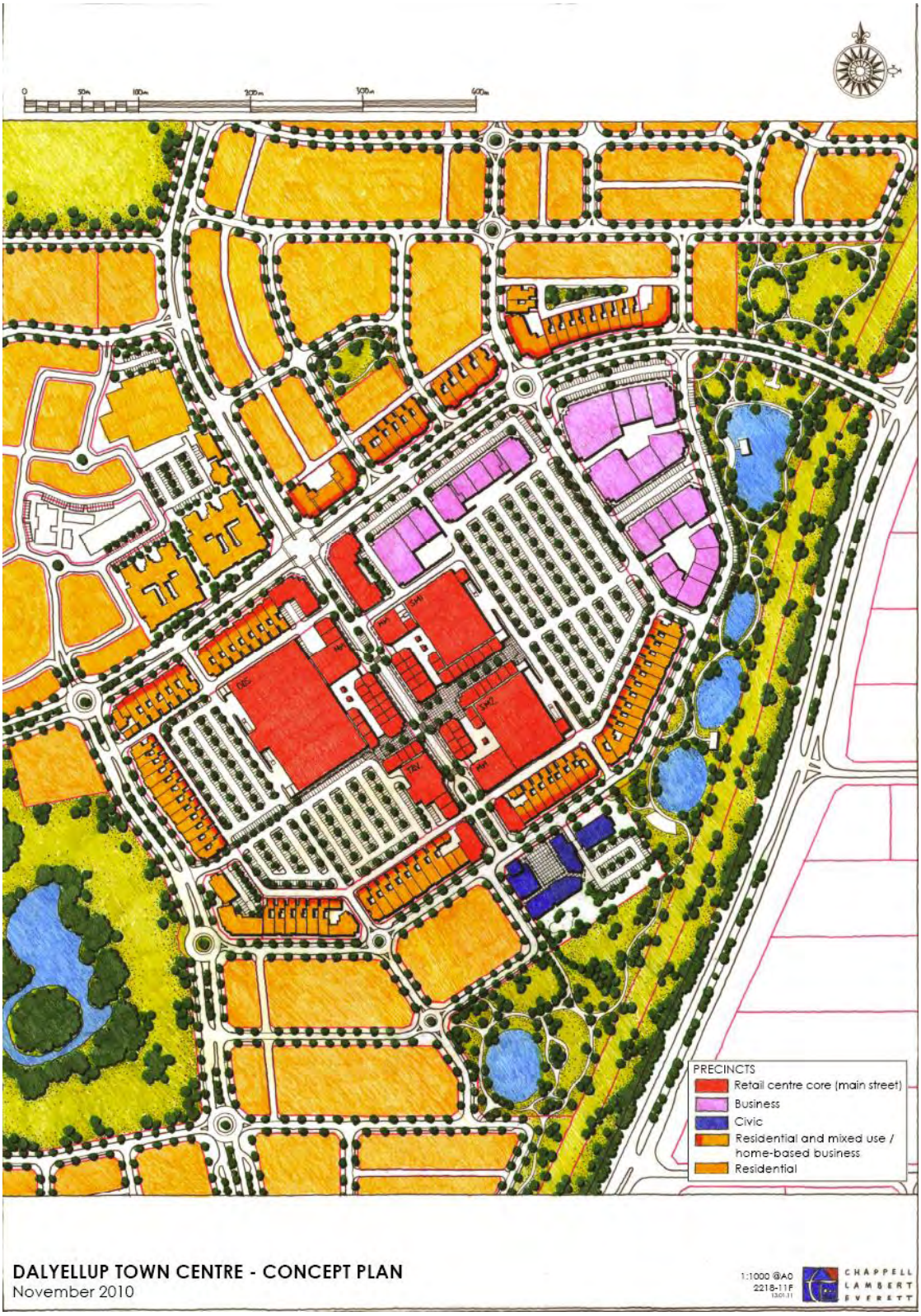
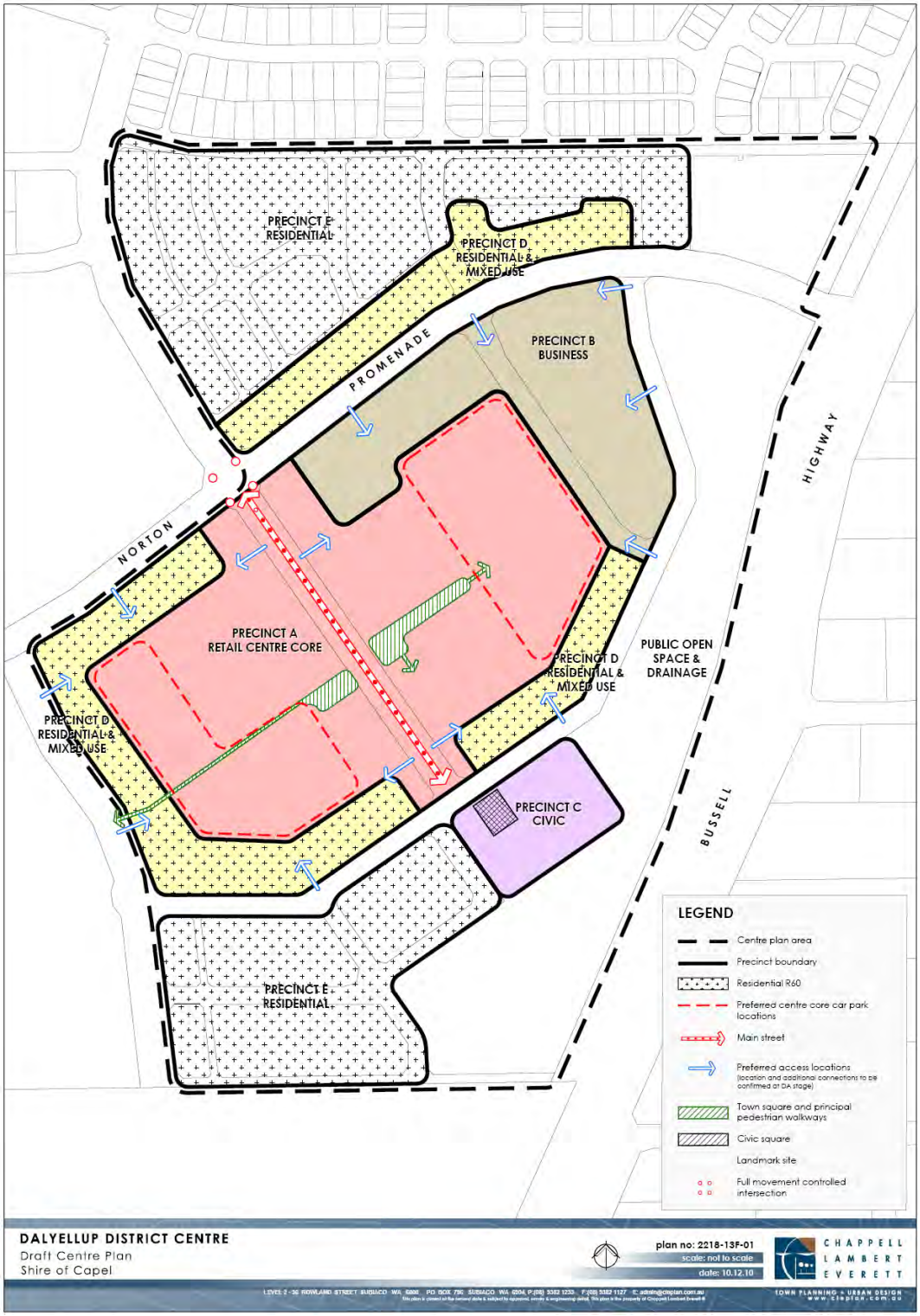


Figure 2-3 Draft Centre Plan



2.2. Proposed land uses

The proposed land uses for the District Centre are broken into four precincts and the individual and total preliminary land use yields are outlined in **Table 2-1.**

- **Table 2-1 Structure plan proposed land uses** (Note 1)

Land Use	Net Leasable Floor Space (m^2) or dwelling units
Residential	
Total Dwelling Units	**245**
Retail Floorspace NLA (m^2)	
Total Retail (m^2)	**20,000**
Other Uses	
Business [1]	**15,500**
Community Building	**3,000**
Mixed Use	**3,000**
Medical	**500**
Tavern	**750**
Total Other Uses	**22,750**

Source: Satterly, Preliminary Yield Estimates January 2011

Note 1: Floorspace estimates are indicative and subject to refinement as part of the development application process.

2.3. Major attractors/ generators

The District Centre will provide key retail and business uses servicing the Dalyellup East and Dalyellup Beach Estates, as well as surrounding residential areas. These uses will create demand for daily trips, for example for retail shopping, as well as employment commuter trips to local offices and business uses.

[1] Includes showrooms, local service use, private recreational and similar uses.

2.4. Key transport issues

The key transport issues for the town centre will be:

- Creation of a sufficiently integrated internal network to provide the most efficient access to and between individual uses within the District Centre, including car parks
- Integration with the surrounding residential street network
- Provision of safe and direct pedestrian and cycle access to the centre
- Provision of parking appropriate to a District Centre
- An integrated access strategy for location of access/ egress onto Norton Promenade

3. Existing transport environment

This section of the report outlines the existing transport infrastructure and conditions in and around the proposed District Centre site.

3.1. Existing road network

There are two key existing roads servicing the Dalyellup District Centre, these are Bussell Highway and Norton Promenade and these are discussed in more detail below. Parade Road North exists in part extending south from Centenary Road. However Parade Road South is not constructed within the vicinity of the town centre and currently does not connect to Norton Promenade.

3.1.1. Bussell Highway

Bussell Highway is constructed as a four lane dual carriageway, with a posted speed limit of 80km/ hr adjacent to Dalyellup East, which increases to 90km/ hr in the vicinity of Hastie Road and to 110km/ hr further south. The most recent traffic counts for Bussell Highway, collected to the south of Norton Promenade by Main Roads WA in May 2010, reveal volumes of approximately 16,100 vehicles per day (vpd). This volume increases during the busy holiday and long weekend periods.

The main access to the District Centre from Bussell Highway is via Norton Promenade, approximately 650m south of Sleaford Park Drive. Alternative accesses to the Dalyellup East development are planned at Sleaford Park Drive to the north and Hastie Road to the south.

The intersection of Norton Promenade and the Bussell Highway has been constructed as a signalised T-junction.

3.1.2. Norton Promenade

Norton Promenade is the main access road for the Dalyellup Beach Estate from Bussell Highway, with additional access from the north via Parade Road, which is now connected beyond Centenary Road. In the future it will form the main east-west link within Dalyellup East, providing direct access to (and through) the District Centre. Norton Promenade carried in the order of 7,300 vpd in 2010 (traffic count data provided by the Shire of Capel). It functions as an Integrator Arterial "B" adjacent to the centre

3.2. Existing pedestrian and cycle network

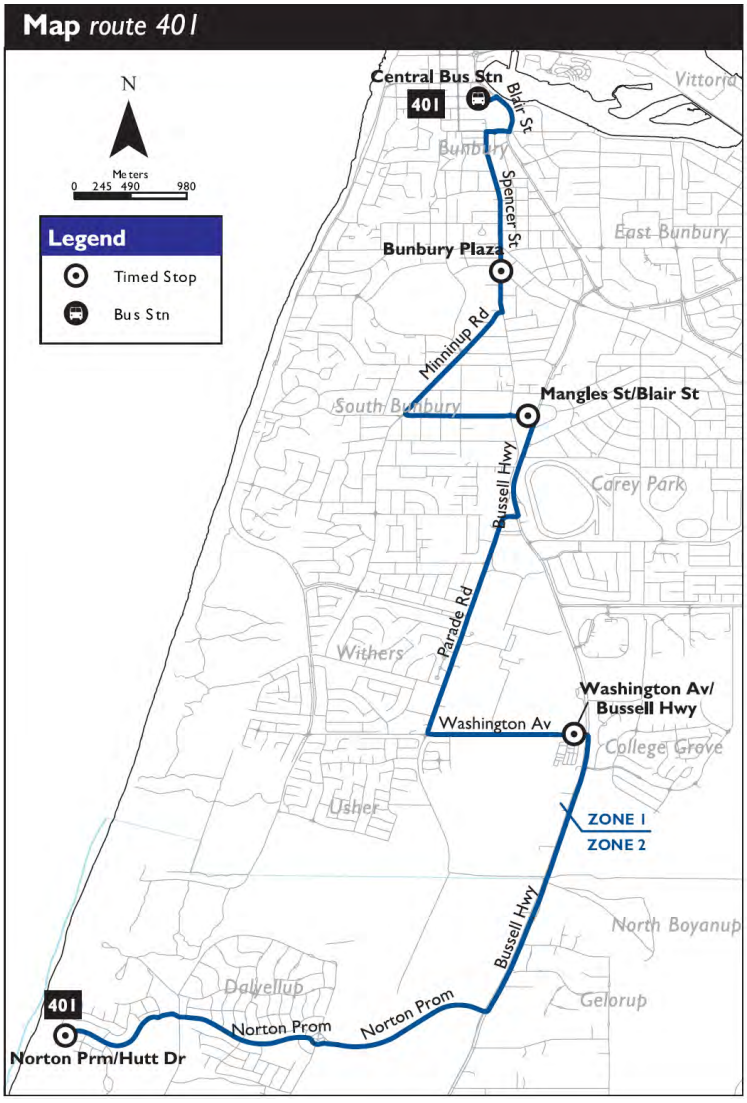
The existing path network surrounding the Dalyellup District Centre is limited and is planned to be expanded to form a comprehensive network for north-south and east-west travel. There are currently no paths along Norton Promenade; however these are planned to be constructed as part of the works for Dalyellup East and the District Centre.

3.3. Existing public transport services within and surrounding structure plan area

Dalyellup is served by the 401 bus route from Bunbury's central bus station, terminating at the coastal end of Norton Promenade with a journey time of approximately 35 minutes. The route is operated by Bunbury City Transit/ Veolia Transport. Route 401 is a peak period service (including weekends) to Dalyellup operating between College Grove, Dalyellup, Gelorup, South Bunbury, Usher, Withers.

Future bus services are planned for the Dalyellup area and are discussed further in section 7.

- **Figure 3-1 Bus route 401 Bunbury – Dalyellup (http://www.veoliatransportwa.com.au) Accessed 21 October 2010)**



4. Traffic generation and distribution

4.1. Traffic generation

SKM's EMME[2] model of the Dalyellup area was used to estimate the traffic volumes generated by the land use data supplied by LME (refer to **Table 2-1**).

In the SKM EMME model, only vehicle trips are generated. Effectively, this means that trip generation is done simultaneously with mode split. The model contains three trip purposes: home-based work, home-based education and home-based other/ non-home based.

Table 4-1 shows the assumed motorised trip production rates per person for the study area.

Table 4-1: Daily vehicle trip production rates by trip purpose

Trip Purpose	Average vehicular trips/ person per day
Work	0.65
Education	0.15
Other	1.48
Total	2.28

Trip Attraction equations for each zone are based on the following relationships:

Work Attractions: 1.298 X Total Employment

Education Attractions: 0.425 X (Primary & Secondary Enrolments) + 0.897 X (Tertiary)

Other Attractions: 1.138 X Dwellings + 0.78 X Retail Floor Area + .711 X (Primary/Secondary + Tertiary enrolments) + 1.006 X Total Employment + 0.15 X Civil Floor Area

Table 4-2 shows the total number of productions (trip origins) and attractions (trip destinations) in the Dalyellup model area based on the land use supplied.

[2] EMME provides a uniquely flexible approach to modelling that allows users the freedom to leverage established techniques or create new methods to address local needs. It offers a complete and comprehensive set of tools for demand modelling, multimodal network modelling and analysis and for the implementation of evaluation procedures.

- **Table 4-2 Dalyellup Vehicular Trip generation summary**

Trip Purpose	Productions	Attractions
Home-Based Work	10,959	1,892
Home-Based Education	2,529	1,190
Home-Based Other / Non-Home Based	24,953	35,226

Not all of the trips produced within the study area will have destinations in the study area and also, not all of the trips attracted to the study area would have origins in the study area. Therefore, it was necessary to make assumptions about the percentage of "internal-internal" (I-I) trips for each trip purpose. After subtracting the I-I trips from the figures in **Table 4-1**, it is possible to calculate the number of "internal-external" (I-E) and "external-internal" (E-I) trips for each trip purpose.

Table 4-3 shows the percentage of trips assumed to have internal origins and destinations for each trip purpose:

- **Table 4-3 Dalyellup trip distribution assumptions**

Trip Purpose	Percentage of attractions assumed to have internal productions
Home-Based Work	70%
Home-Based Education	85%
Home-Based Other/ Non-Home Based	80%

Table 4-4 shows the total number of I-I, I-E, and E-I trips for each purpose in the Dalyellup model.

- **Table 4-2: Breakdown of Internal and External Trips**

	Internal-Internal	Internal-External	External-Internal
Home-based work	1,288	9,634	552
Home-based Education	1,012	1,518	178
Home-based other/ Non-Home Based	19,939	4,991	15,246

4.2. Trip Distribution

The trip distribution model in the Dalyellup EMME model was broken down into three different components, reflecting the three different types of trips, namely:

- Internal-internal trips
- Internal-external and external-internal trips
- External-external trips.

For internal-internal trips, a gravity type model formulation was used whereby the closer the origin and the destination zones, the more trip making activity resulted between the two zones.

For internal-external and external-internal trips, the distribution was based on the assumed distribution in **Table 4-5** which was derived from matrices received from Main Roads WA when the EMME model was created.

- **Table 4-5: Assumed Distribution of Internal-External and External-Internal Trips**

Zone (Gateway)	Percentage
1 (Parade Rd)	33.5%
2 (Bussell Hwy N)	40.8%
3 (Centenary Rd E)	0.6%
4 (Sleaford Rd)	0.9%
5 (Loretta Ave)	1.5%
6 (Frances Rd)	1.5%
7 (Hasties Rd)	6.2%
8 (Gelorup Rise)	2.4%
9 (Bussell Hwy S)	6.0%
10 (Minninup Rd)	6.6%

Daily external-external trips were taken directly from a matrix of through trips provided by Main Roads WA.

4.3. Network Model Coverage

SKM's EMME model covers an area including the Dalyellup Beach and Dalyellup East estates and includes the Bussell Highway as the eastern boundary. Access points to the Bussell Highway are included at:

- Norton Promenade.
- Centenary Road.
- Hasties Road.
- Harewoods Road.
- Sleaford Drive (Ferndale Avenue).

Two separate network were tested for the wider Dalyellup area – the first assuming the completion of the Bunbury bypass and the second without. In the scenario with no bypass, Bussell Highway will carry approximately 34,500 vpd, but this volume will drop to around 21,500 vpd when the bypass is included. Within the Dalyellup District Centre, the volumes are forecast to be relatively constant with or without the bypass.

Traffic demand to/ from the area surrounding Dalyellup is based on the Main Roads regional model. Therefore, Dalyellup South has been included in the model. The timing of development and the proposed road network is highly uncertain which means that more detailed demand forecasting is not possible at this time.

A District Context map is provided in **Figure 2-1** to show the locations of all the urban areas and the local and district networks.

Table 4-6 shows the land use data assumed in the Dalyellup model. The model includes the yields for the district centre as shown in **Table 2-1**.

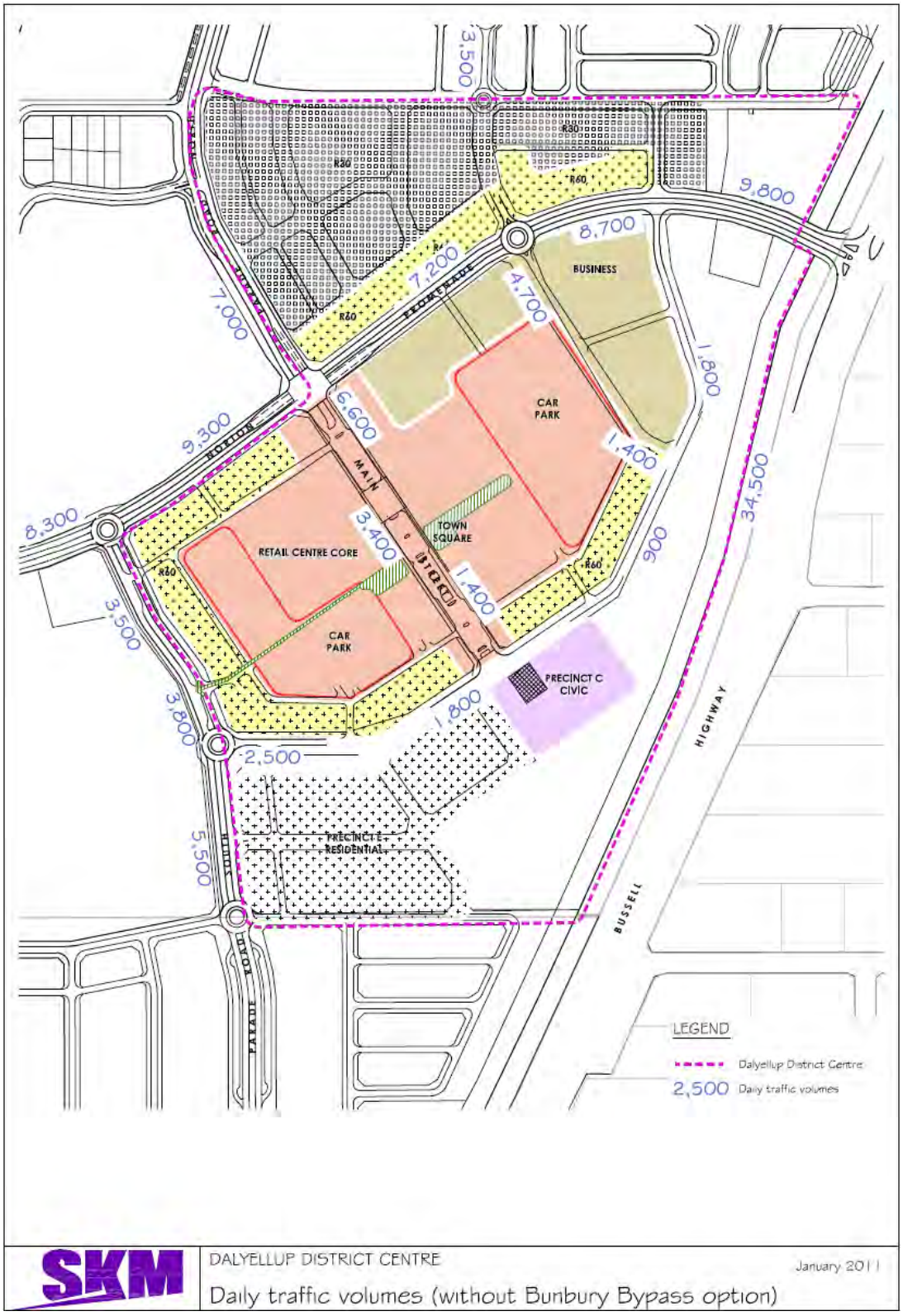
- **Table 4-6 Model assumed land uses for Dalyellup as a whole**

	Land Use Yields				
Development Area	**Dwellings (units)**	**Population (persons)**	**Primary and secondary enrolments**	**Retail (m2 gfa)**	**Employment (persons)**
Totals	5620	16860	2800	28519	1458

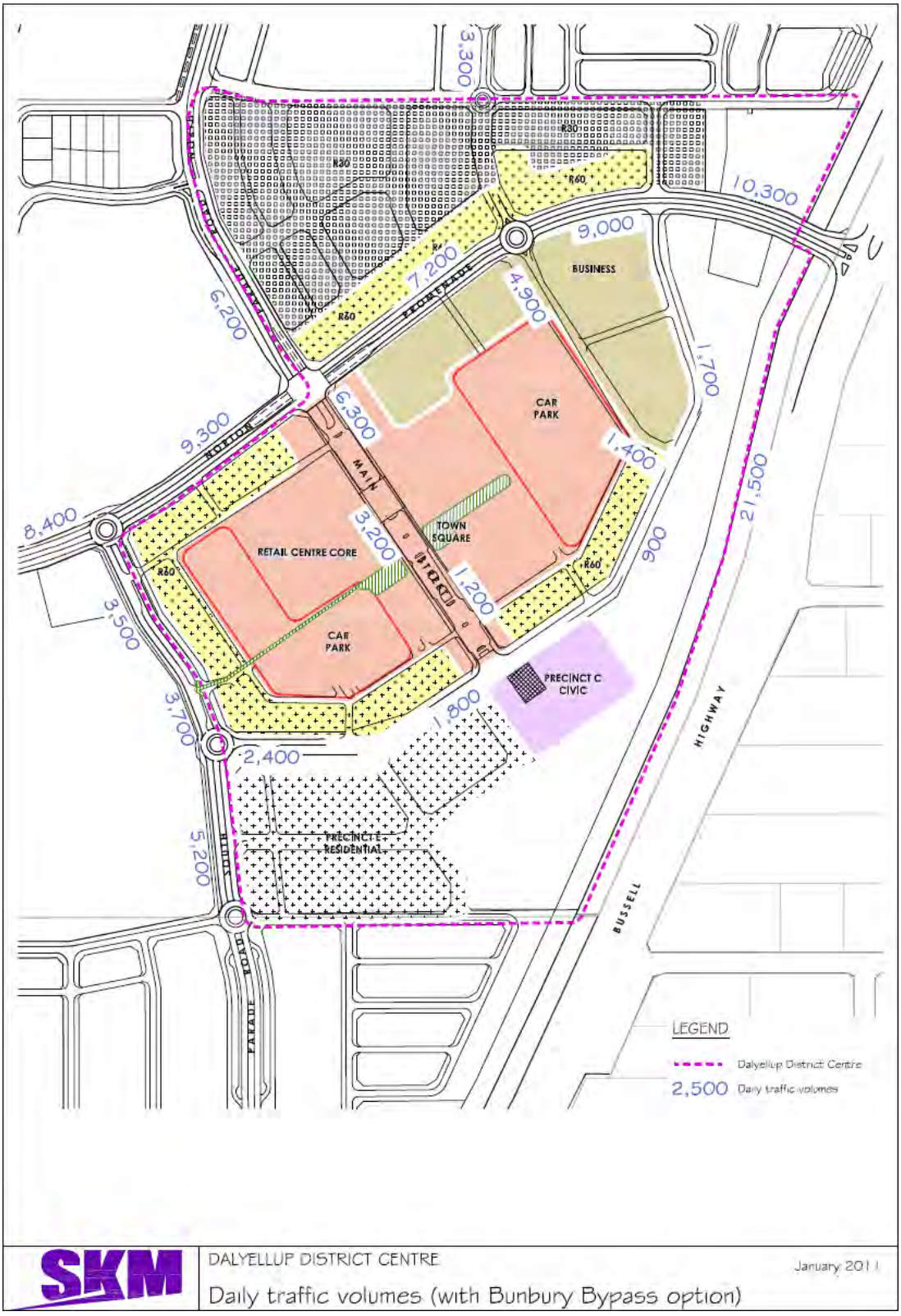
Some recent updates have been made to the Dalyellup model in the immediate vicinity of the District Centre to reflect the finer-grained access network now planned and car park locations and accesses in this area.

The estimated 24-hour traffic flows on the major roads in and around the centre are illustrated in **Figures 4-1 and 4-2.**

- **Figure 4-1 Estimated daily traffic volumes (without Bunbury Bypass option)**



- **Figure 4.2 Estimated daily traffic volumes (with Bunbury Bypass Option)**



5. Internal transport network and analysis

5.1. Proposed internal network

The proposed street network is intended to:

- Provide a variety of alternative travel routes
- Provide direct and legible access for pedestrians and cyclists
- Offer good access to car parks and loading bays
- Enable efficient distribution of traffic to discourage congestion at any one key intersection, car park or access street.
- Encourage passing trade through the centre

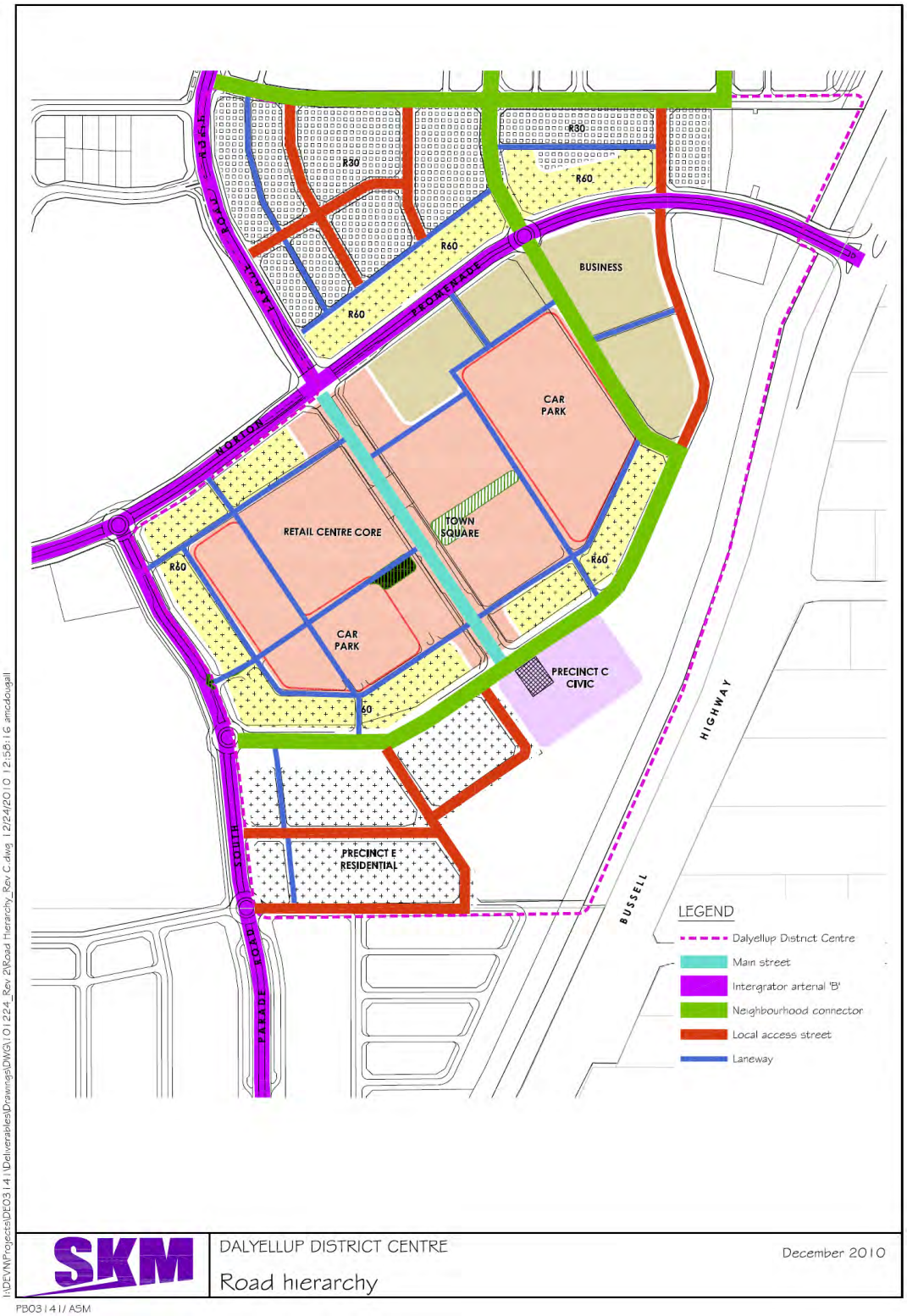
5.2. Proposed road hierarchy

There are four key street types within the District Centre, these are:

- Integrator Arterial B
- Main Street
- Neighbourhood connectors
- Access streets

The road hierarchy for streets within the centre is illustrated in **Figure 5-1.**

Figure 5-1 Road hierarchy



5.3. Road reservation widths and cross sections

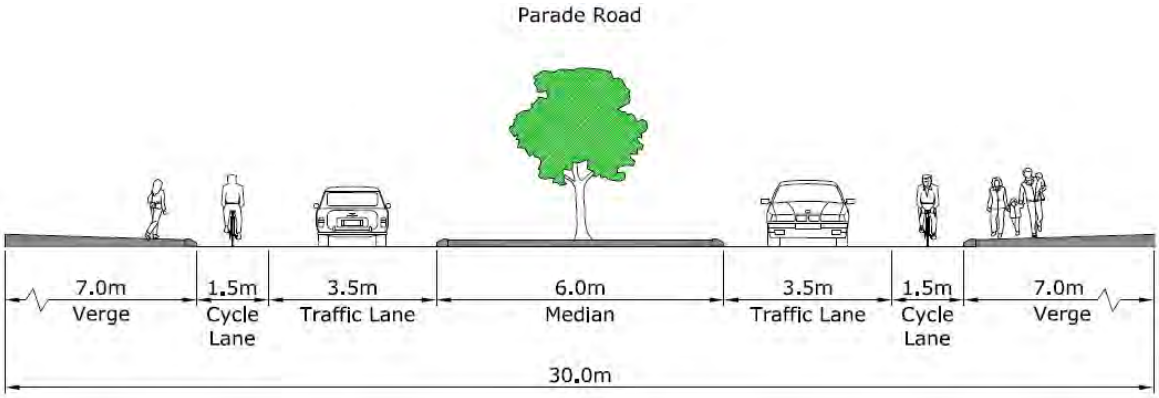
The reservation widths and indicative cross sections for key streets within the District Centre are discussed in the following sections. It should be noted that these provide guidance for appropriate cross section design, however flexibility remains to refine these at more detailed level of planning.

5.3.1. Integrator Arterial B

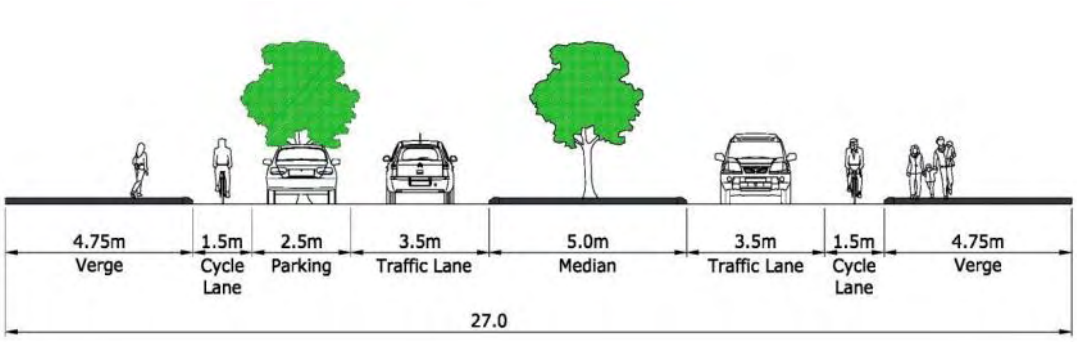
Norton Promenade, Parade Road North and Parade Road South will be classified as Integrator Arterial B roads with daily traffic volumes ranging from 4,000 vpd to 10,000 vpd. These roads carry the majority of through traffic and play an important role in regional traffic movement. The cross section makes provision for bus routes and on-street cycle lanes, as well as a median which will facilitate two staged pedestrian crossings, allow filtered right turns and will serve to narrow the visual width of the road. The posted traffic speed would be 60km/hr. Outside the District Centre, where less right turn movements onto Parade Road are expected, the median on Parade Road can be reduced to 5.0 metres and the verge width increased to 7.5 metres to maintain the 30m reservation.

The indicative cross-section for Parade Road, north and south of the District Centre is shown in **Figure 5-2**. The cross section of Norton Promenade is shown in **Figure 5-3**.

- **Figure 5-2 Indicative cross section for Parade Road adjacent to District Centre**



- **Figure 5-3 Cross section for Norton Promenade**



5.3.2. Main Street

The focus of the town centre will be Main Street which will have two cross section typologies. The cross sections and a conceptual long section are shown in **Figure 5-4**. Main Street is expected to carry between 1200 and 6600 vpd on a typical weekday, with the higher volumes at the Norton Promenade end.

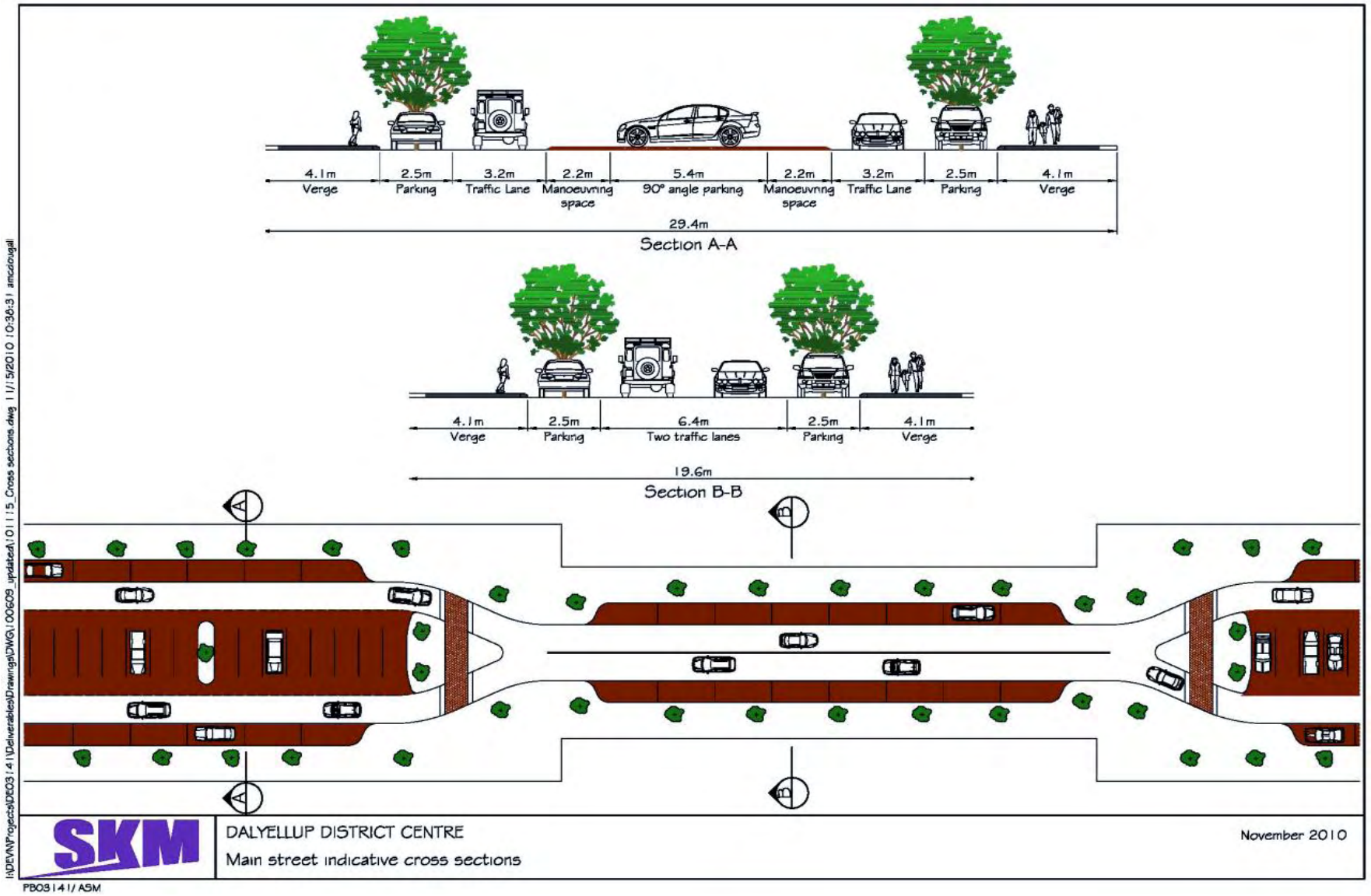
The road at each end of the Main Street is proposed to feature parallel parking on sides, two-way traffic flow and central 90 degree parking bays. A 2.2m wide manoeuvring strip is proposed on either side of the central 90 degree bays to facilitate safe movement to and from parking bays and will allow vehicles to reverse out from bays. It is considered that this cross section is appropriate for the forecast traffic volumes and reflects the importance of this road in creating a vibrant, pedestrian friendly, low speed traffic environment within the centre.

The road pavement width is to be significantly narrowed in the central section of the Main Street by the removal of the central parking bays in the vicinity of the east-west pedestrian mall. This narrowing; by creating a lateral shift of the traffic lanes, will serve to slow traffic. Other benefits will include wider footpaths/verges and shorter crossing distances for pedestrians. Zebra crossings are also proposed in this narrowed zone.

At key points (such as the covered mall), the pavement texture may be varied and raised in order to reinforce the low speed environment within the centre. The indicative posted traffic speed would be 30km/hr.

It is important to note that finalisation of the proposed cross sections will need to occur at a more detailed level of planning when urban design, user interface and street frontages are considered in more detail.

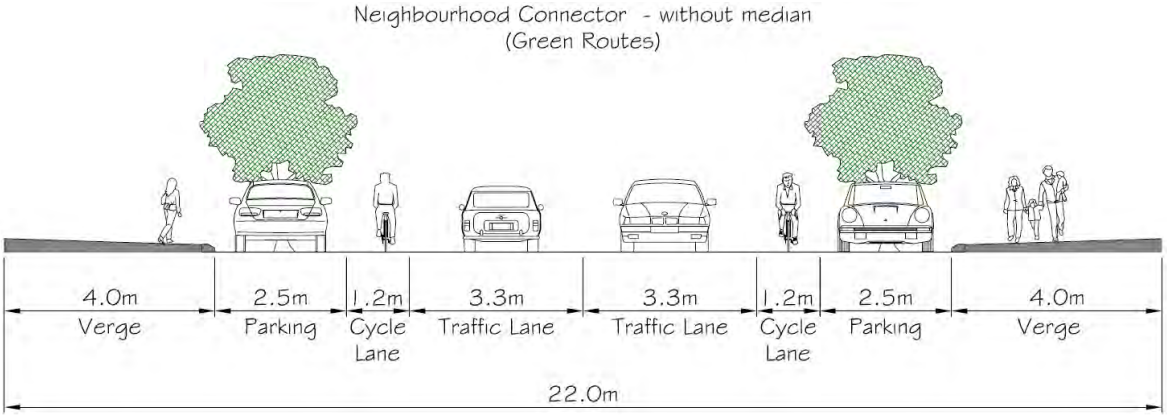
- **Figure 5-4 Proposed cross section for Main Street, District Centre**



5.3.3. Neighbourhood connectors

A neighbourhood connector will connect between Norton Promenade and Parade Road South to the south-east of the District Centre. An indicative typical cross-section is shown in **Figure 5-5**. It will be a key access route to car parks within the centre. This road is forecast to carry between 900vpd and 2,500vpd through the centre. The cross section features cycle lanes and on-street parking, though the specific locations where on-street parking is permitted will be considered further at detailed design phase. The indicative posted traffic speed would be 40 or 50km/ h.

- **Figure 5-5 Indicative cross section for a neighbourhood connector**



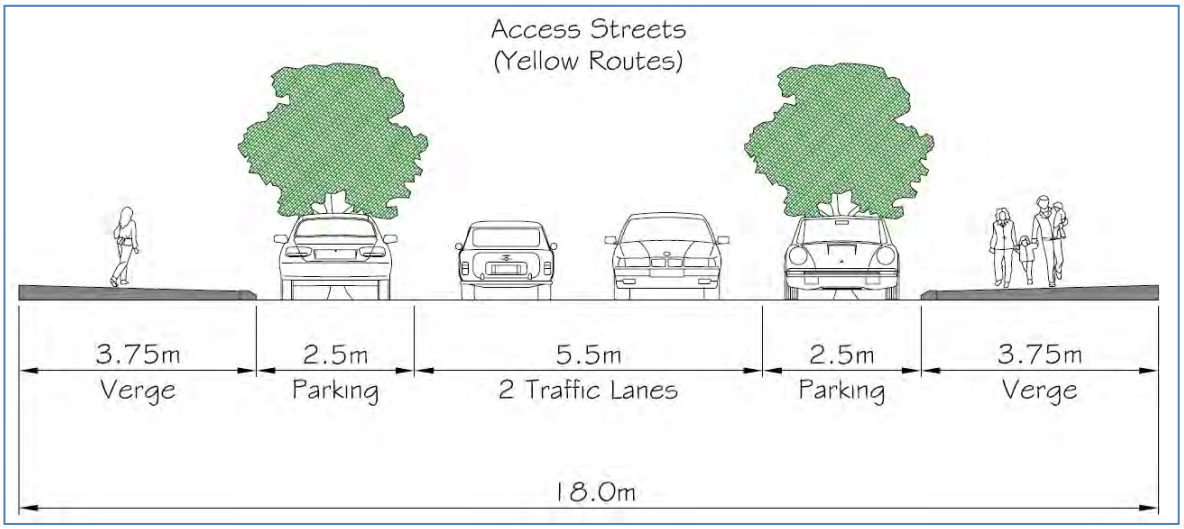
5.3.4. Access streets

The cross section for other minor streets within the centre largely depends on the provision of on-street parking and the abutting land uses. An indicative section is shown in **Figure 5-6**; however this cross section will vary depending on whether a particular section of street provides:

- Parking both sides
- Parking one side
- No parking

Specific street layouts can be designed within an 18m road reservation at a later stage of planning. The indicative posted traffic speed would be 40 to 50km/hr. Access roads will be designed to accommodate service vehicles and will provide sufficient radii for the service vehicle to undertake a turning manoeuvre in forward gear.

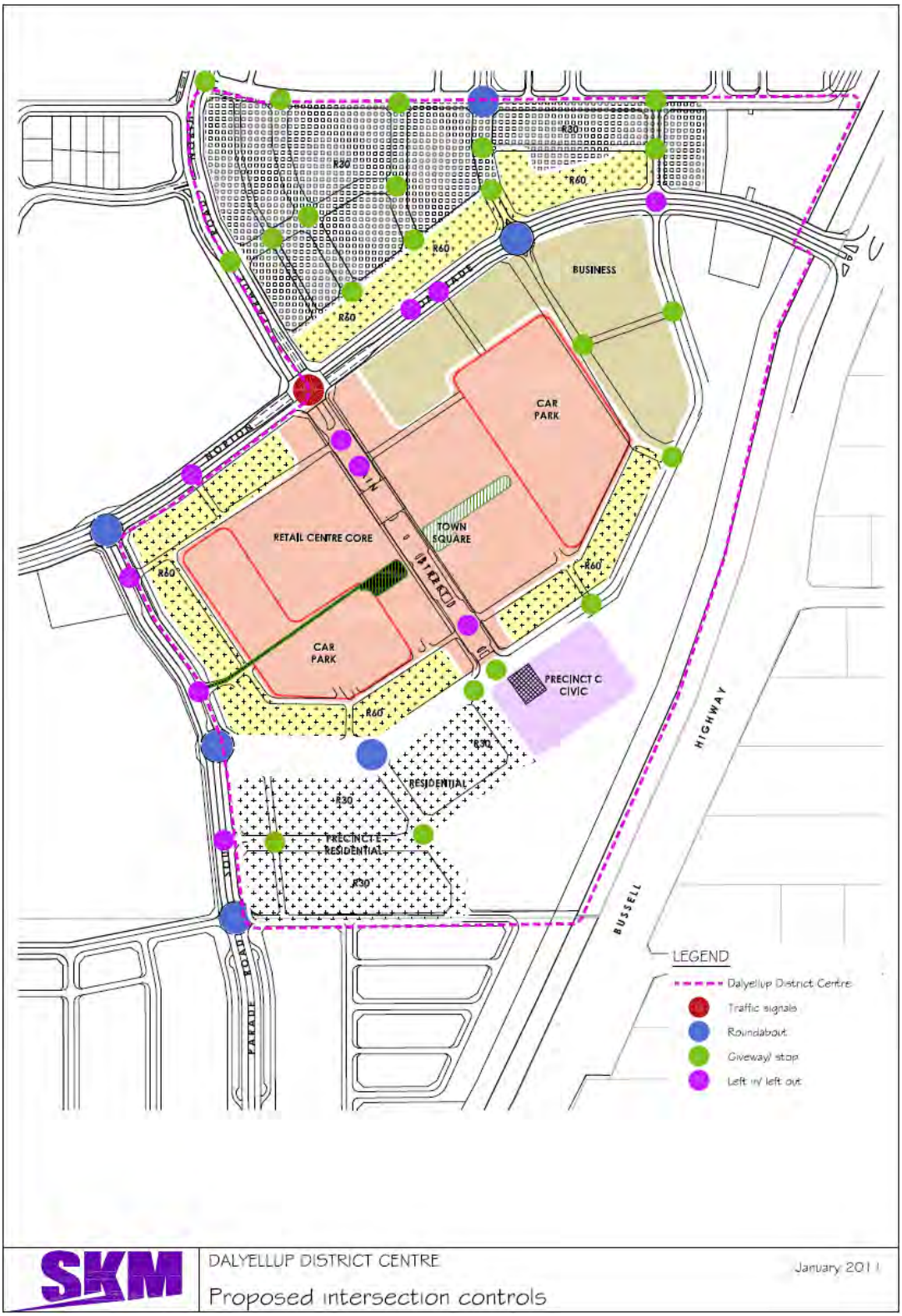
- **Figure 5-6 Indicative cross section for an access street**



5.4. Internal intersection control

The proposed treatments for intersections internal to the District Centre are illustrated in **Figure 5-7.**

Figure 5-7 Proposed intersection control



5.5. Analysis of intersections (level of service)

SIDRA analysis has been undertaken for key intersections within the District Centre to assess the performance of the intersections assuming full development of the centre. SIDRA was carried out for PM Peak volume as retail land uses generate lower levels of traffic in the AM compared to the PM peak and therefore the PM peak is expected to reflect highest peak volumes. Peak hour traffic volumes used in the SIDRA analysis have been assumed to be 10% of 24-hour daily traffic volume forecasts from the EMME model. The directional split has been assumed as follows:

- 40% in and 60% out of the District Centre on the main traffic network
- 45% in and 55% out for trips accessing the core retail area

The following five intersections have been assessed:

- Parade Road North/ Norton Promenade/ Main Street
- Parade Road South/ Norton Promenade
- Norton Promenade/ Neighbourhood Connector
- Parade Road South/ Neighbourhood Connector
- Bussell Highway/ Norton Promenade

A summary of volumes used in SIDRA and the movement results for key intersections are provided in the following sections. The full SIDRA outputs for the analysis are provided in the Technical Appendix A.

5.5.1. Parade Road North/ Norton Promenade/ Main Street

This intersection is planned to be signalised. For the 'with bypass' scenario this intersection shows an overall level of service of 'C' and a maximum degree of saturation for all vehicles of 0.76. In the 'without bypass scenario the intersection is forecast to operate at a level of service 'C' with a degree of saturation for all vehicles of 0.91.

The PM peak optimal cycle time with minimum delay is 70 seconds and an 18-second exclusive pedestrian phase is designed to provide for safe pedestrian crossing and minimise the conflicts between pedestrians and vehicles. This is the case for both the 'with' and 'without bypass' scenarios. In reality the pedestrian phase may not be activated every cycle and the average length of the phase may be shorter than 18 seconds. The assumptions within the model, including the approach volumes, are considered to provide a conservative estimate of operations and the intersection is expected to operate to a satisfactory level. In addition to this, there is a desire from a pedestrian safety and crossing perspective to keep the intersection compact in design and layout. Accordingly slip lanes have been adopted only on the left and right turns onto Parade Road, which

is considered appropriate for an intersection located within a District Centre where there is likely to be a high demand for pedestrian crossing and a desire to minimise slip lanes.

5.5.2. Parade Road South/ Norton Promenade

This intersection will effectively operate as a three way roundabout, with the northern arm proposed as the main entrance into the senior village. The roundabout is suitable for managing the capacity of a four arm highway intersection. The SIDRA outputs show an average level of service A with the highest degree of saturation a 0.36 during the PM peak in both the 'with' and 'without bypass' scenarios. This intersection is expected to operate well within capacity. Pedestrian volumes in this location are expected to be low and therefore a roundabout treatment is considered more appropriate than signals.

5.5.3. Residential Road/ Norton Promenade/ Neighbourhood Connector

This intersection is planned as a single lane four-way roundabout control. Entry and exit flows are forecasted to be less than 500veh/hr during the PM peak. A roundabout provides good access to/ from side sheets to Norton Promenade. Pedestrian volumes in this location are expected to be low and therefore a roundabout is considered as a suitable treatment. The average level of service for this intersection is A, and degree of saturation for all vehicles is 0.38 (ie 38% capacity), for both the 'with' and 'without bypass' scenarios.

5.5.4. Parade Road South and Neighbourhood Connector

This intersection is planned to be roundabout controlled and is forecast to operate with level of service A during peak periods. The average level of service for this intersection is A. The highest degree of saturation for all vehicles is 0.19 (ie 19% capacity) and 0.20 (ie 20% capacity), in the 'with' and 'without bypass' scenarios respectively.

5.5.5. Bussell Highway and Norton Promenade

SIDRA analysis was carried out for two options as follows:

- Option A without Bussell Highway Bypass shows the intersection will operate near capacity at full build out of the District Centre. The average queue length is expected to be about 12 vehicles per lane, or approximately 84m, however the 95% back of queue for the Bussell Highway south through movement may reach up to 300m at times, which will exceed the turning lane storage capacity. This demonstrates that the bypass will be needed prior to 2031. It is expected that other nearby intersections on Bussell Highway will similarly reach capacity without the Bypass in place.
- Option B with Bussell Highway Bypass shows an average level of service C and the highest degree of saturation is 0.59.

It is important to note that as the intersection analysis for Bussell Highway/ Norton Promenade shows constraints in future years, this will not be a situation specific to the Dalyellup development area and many intersections on Bussell Highway will be experiencing capacity issues in future years prior to construction of the bypass.

5.6. Local accesses/ neighbourhood connector

The intersection at the southern end of Main Street is proposed as a priority controlled T-junction. The distance between the Main Street intersection and the access to the west of the civic building is approximately 25m to 30m. Although this forms a staggered intersection, it will operate as a right/left stagger and the volumes of traffic are sufficiently low that this intersection will operate satisfactorily under a give-way control. The south-bound volume at the southern end of Main St is modelled at 100vpd and the two way traffic on the neighbourhood connector in the order of 200vpd.

The intersection on the neighbourhood connector half way between Main Street and Parade Road South has been shown as a roundabout on the concept plan. Whilst a roundabout would be satisfactory, so too would be an un-signalised intersection under give way control.

The street that extends between the eastern car park and the business uses intersects at its southern end with the neighbourhood connector. In terms of capacity and flow either a T-intersection of roundabout would be suitable treatment for this intersection. A T-intersection is currently proposed and will be sufficient to meet forecast traffic flows. However, a roundabout would cater better for the turning traffic and reduce speed along the through route.

5.6.1. Design and function of car park and service area access points

Referring to **Figure 5-7** there will be six access points into the west of Main Street car park. This car park will provide five left in/left out arrangements and one give way/stop arrangement. The east of Main Street car park will provide eight access points for users. There will be four left in/left out arrangements, three give way/stop arrangements and one roundabout arrangement for users of this car park.

It is envisaged that the main service vehicle access to the car parks will be from Norton Promenade, with egress onto the Neighbourhood Connector to the south. Access points to the car parks will be wide enough to accommodate service vehicles undertaking a turning manoeuvre in forward gear.

Pedestrian access to both car parks will be provided via a west-east pedestrian spine, which traverses Main Street, within the proximity of the Town Square. Pedestrian access to the west of Main Street car park will additionally provide a through route to Parade Road South and the residential areas further west. Access streets lying peripheral to the district centre will provide

verges approximately 3.75m in diameter. This will provide sufficient width to accommodate pedestrians and will serve to reduce any potential vehicle/pedestrian conflict.

6. Proposed pedestrian/ cycle network

6.1. Provision for pedestrians and cyclists

There are two main path types through the District Centre; these are footpaths and shared use paths. The network of paths is illustrated in **Figure 6-1** and is described in more detail below.

Shared use paths (minimum 2.5m wide) are provided on main connecting streets and reflect key desire lines for pedestrians and cyclists between major origins and destinations. Shared paths are also provided on higher function roads where some cyclists would not be comfortable sharing the road environment with vehicles. Shared paths are proposed for both sides of Norton Promenade, Parade Road North and Parade Road South. Shared paths are also proposed along one side of neighbourhood connectors with a footpath provided on the other side. These shared paths are in addition to the on-road cycle paths proposed on the integrator arterial and neighbourhood connector streets.

Footpaths (minimum 1.5m wide) are proposed for both sides of all other streets within the District Centre and provide pedestrians safe and efficient access to uses within the centre and surrounding residential areas.

In addition to these formal footpaths, wider paved verges can be provided adjacent to retail uses that may wish to have active frontage to the public realm (such as cafes and alfresco dining).

A significant east-west pedestrian link through the retail core will be provided for users wanting to access all areas of the District Centre. This will provide a safe thoroughfare and will reduce any potential vehicle/pedestrian conflict for pedestrians accessing the centre from the residential areas to the west through the car park.

6.2. Crossing facilities

The draft Western Australia Planning Commission (WAPC) 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 – 1,100 vehicles per hour (two-way), equivalent to 10,000 vpd
- 4-lane divided road – 1,600 vehicles per hour (two-way), equivalent to 15,000 vpd

All roads within the District Centre have estimated traffic volumes that are below these levels. Hence the network would not compromise the safety and efficiency of pedestrians crossing streets.

Nonetheless in addition to ensuring an efficient and safe pedestrian/ cycle network, it is also important to identify locations where special provision may be required to meet specific pedestrian needs along desire lines. In the Dalyellup District Centre, it is recommended that the intersection of Norton Promenade/ Parade Road North be signalised to assist pedestrians crossing in this town centre environment. It is also recommended that a zebra crossing be located centrally on Main Street to connect the retail uses on both sides and car parks. Zebra crossings are also recommended to be installed on Norton Promenade and Parade Road South. The locations of crossings are subject to agreement with Main Roads WA. **Figure 6-1** shows the proposed location of zebra crossings through the retail core and surrounding the District Centre.

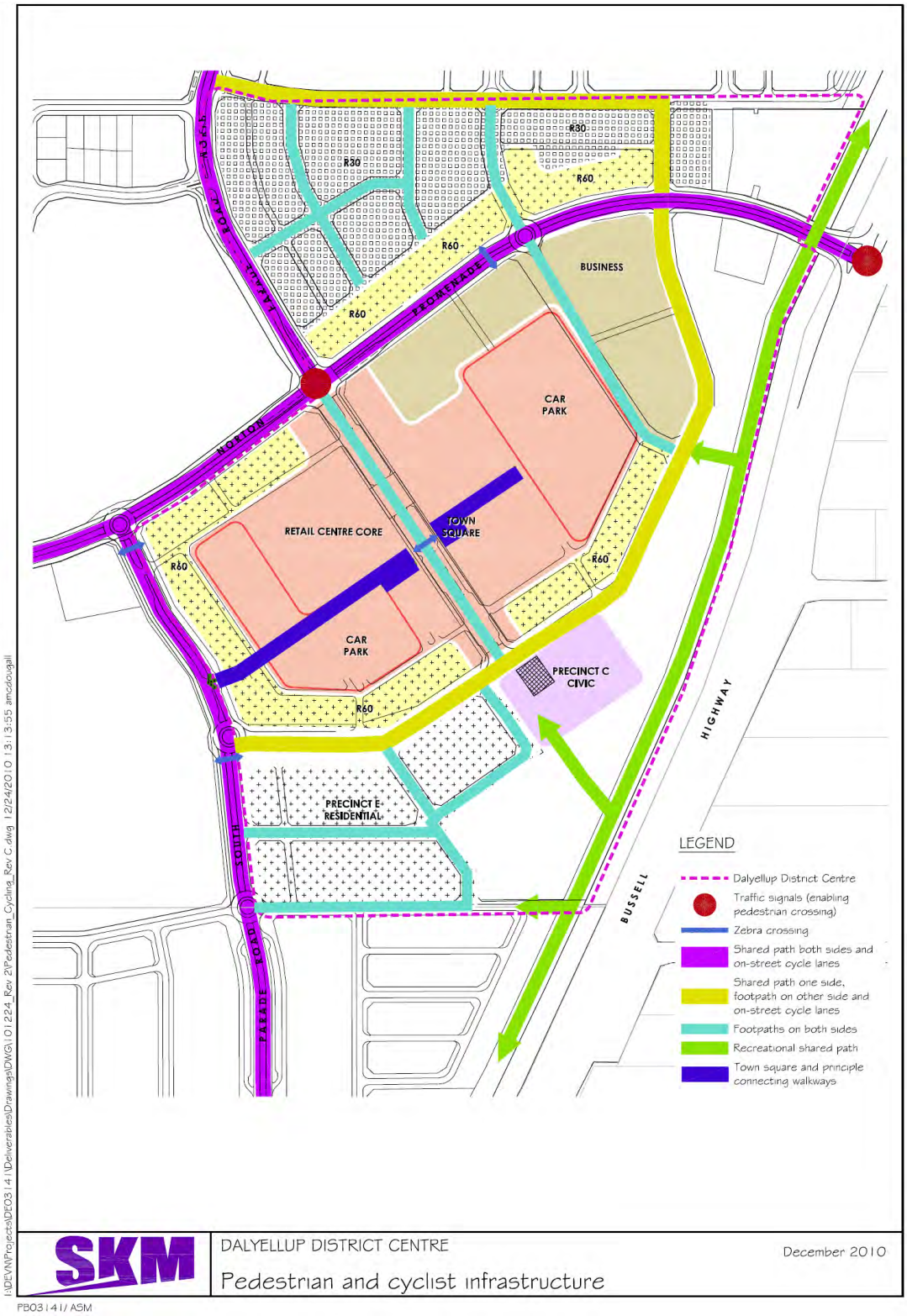
6.3. Bicycle parking

It is important to encourage people to cycle to new developments within the District Centre. The new residential community and retail/ business developments should provide end of trip facilities for cyclists. These facilities should include secure, well lit bicycle parking, showers and lockers.

Recommended parking provision rates for various uses are as follows:

- Residential-one cycle bay per apartment
- Commercial/Office tenant- one cycle bay/ 200m^2 GFA
- Commercial/Office visitor- one cycle bay/ 500m^2 GFA
- Retail – one cycle bay/ 200m^2 GFA

Figure 6-1 Proposed path network



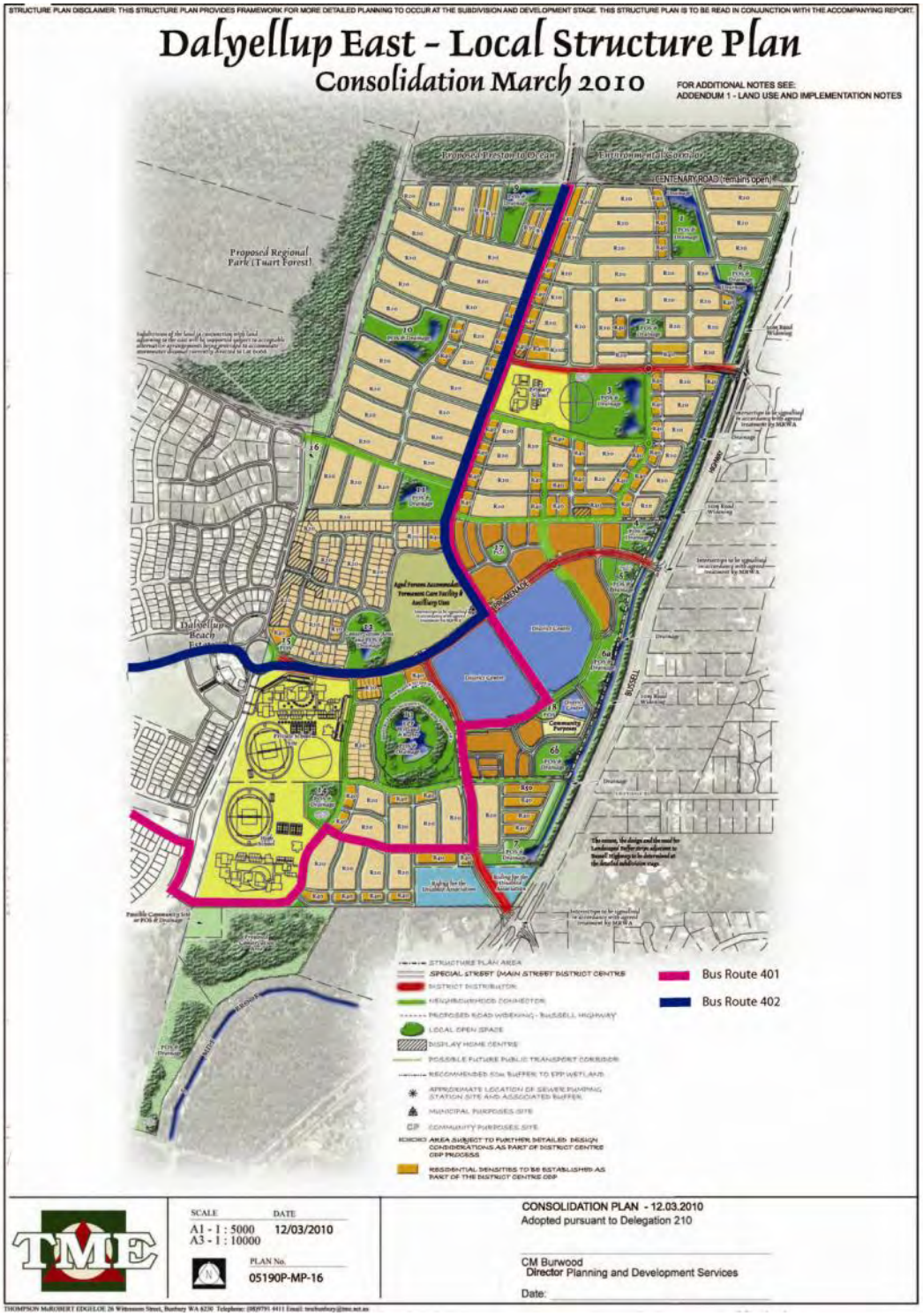
7. Proposed public transport routes

Discussions have been held with The Public Transport Authority (PTA) regarding the alignment of bus routes servicing the Dalyellup District Centre. **Figure 7-1** illustrates the proposed bus routes. Two bus routes are proposed; one route is based on the existing Route 401 and is proposed to run through the District Centre via Main Street and a second route will travel around the District Centre development (Bus Route 402 in **Figure 7-1**). The PTA has advised that the existing 401 route in Dalyellup is to be redirected to follow the proposed routing as shown in **Figure 7.1** (i.e. along Parade Street South, Main Street and Parade Road North). Detailed planning for the residential areas in Dalyellup will ensure the road design is adequate to accommodate bus movement along the proposed route alignment outside the district centre.

There is no set implementation date as yet for Bus Route 402. This service will be introduced when demand necessitates and will follow Norton Promenade and Parade Road North. Both bus routes will operate along Parade Road North located to the north of the District Centre. Regular services will cater for the local residential catchment areas and interchange between both services will be available.

It is recommended that bus stops be provided at a spacing of approximately 300 to 400 metres, to provide an accessible service to the whole district of Dalyellup, which comprises Dalyellup Beach Estate, Dalyellup East and Dalyellup South. Furthermore, the District Centre will provide services to cater for catchment areas beyond the locality of Dalyellup, such as south Bunbury, Gelorup and Stratham, which will effectively increase the footfall to the District Centre bus embayment and should be provided at locations which have high bus wait times.

- **Figure 7-1 Proposed public transport routes servicing the Dalyellup District Centre**



8. Integration with surrounding area

8.1. Desire lines between structure plan land uses and surrounding uses

The District Centre will provide the key destination within the Dalyellup area for retail and business uses and the majority of vehicular travel within the structure plan area will be from local residents. This is demonstrated by the minimal change in forecast volumes through the centre with and without the Bussell Highway Bypass. Trips will originate from surrounding residential precincts and will disperse onto the local street network with many trips accessing the centre via Norton Promenade.

Other key desire lines for vehicular traffic will be between residential areas, the District Centre and the local primary schools, community centre and the tourist precinct. Movement between residential areas, the District Centre, public open space and local beaches will represent the greatest desire lines for pedestrians and cyclists.

Because the District Centre is one component of broader structure planning for the wider Dalyellup area, the centre is planned to feature a high level of integration with surrounding development in terms of proposed layout, land uses and design aesthetics, whilst culturing a sense of place appropriate for a District Centre.

9. Parking

9.1. Preamble on reciprocal use

The Shire of Capel Town Planning Scheme No 7 generally sets minimum requirements for provision of parking to support individual developments of certain land use. In most cases it is a requirement that the parking is provided on-site by the developer. Where shared parking is allowed, it is a negotiated agreement approved at the discretion of the Council, as per section 7.9.6 below;

> *Council may approve an application for development where the number of car parking spaces proposed to be provided is less than the number required pursuant to the Scheme provided the applicant can demonstrate that other off street parking facilities are available to be shared with other land uses operating at different times and provided:*
>
> *a) The Council is satisfied that no conflict will occur in the operation of land uses for which the joint use of parking facilities is proposed; and*
>
> *b) Landowners who request sharing of parking facilities enter into a legal agreement for reciprocal rights to parking facilities.*

Where parking can be shared by different land uses and activities, the total amount of parking that needs to be provided can be reduced. This is because the peak times for different uses occur at different times and because the mix of land uses allows visitors to fulfil numerous trip purposes whilst utilising only one car parking space. An accumulation of land uses allows a less conservative approach to minimum parking requirements to be adopted.

The concept of shared parking is particularly applicable in town or mixed use centres. It works best when a large proportion of parking is made available as public parking, rather than for sole use of customers or visitors to a particular site.

9.2. Parking rates for land uses

Table 9-1 provides a summary of the parking ratios considered suitable for each land use within the District Centre. In addition to the Shire of Capel's Town Planning Scheme (TPS) guidance has been sought from the New South Wales Road Traffic Authority Guidelines on Traffic Generation Development (RTA Guide, 2002). Different Councils require different levels of parking in their town planning schemes. The State Administrative Tribunal, in seeking to mediate and determine development approvals, has generally relied upon the New South Wales Road Traffic Authority Guidelines. The RTA guide recommends a base level of parking for different uses. These levels of parking (referred to as the unrestrained situation) are meant to apply to parking provided on site to

single uses and take no account for shared use (similarly to the TPS rates). Reduction for shared used therefore needs to be applied to these base rates where applicable.

In recommending a level of parking supply for the district centre, SKM has taken account of the Shire of Capel's Town Planning Scheme parking requirements (attached as Appendix B). The recommended parking rates for the non-residential uses proposed in the centre are summarised in **Table 9-1.**

Table 9-1 Recommended Parking Rates by Land Use

Land Use	Recommended Parking	Comment
Retail	5 bays per 100m^2 GLA	As per TPS
Business[3]	2.5 bays per 100m^2 GLA	As per TPS for showrooms
Community Building	50 bays for a medium sized community centre	Maximum parking required in evenings when plenty spare parking available
Mixed Use / Ground Floor Commercial	2.5 bays per 100m^2 GLA	As per RTA guidelines for office development
Medical	5 bays per practitioner	As per TPS
Tavern	50 bays	Maximum parking required in the evenings when plenty of space available in the centre

9.3. Recommended Parking Provision

The Dalyellup District Centre at full development is likely to generate a demand for parking of up to 1613 bays. **Table 9-2** provides an indication of how this demand has been derived.

Table 9-2 Parking Demand by Land Use

Land Use	Arena (NLA) m^2	Parking Requirement (bays)	Comment
Retail	20,000 m^2	1000	Based on 5 bays/100 m^2
Business	15,500 m^2	388	Based on 2.5 bays/ 100m^2
Mixed Use / Ground Flow Commercial	3000 m^2	75	Based on 2.5 bays/ 100 m^2
Medical	500 m^2	50	Based on 10 practitioners and 5 bays/practitioner
Tavern	750 m^2	50	Based on mid-day demand
Community Centre	3000 m^2	50	Based on mid-day demand
Total	**42, 750 m^2**	**1613**	

[3] Includes showrooms, local service uses, private recreational and similar uses.

The overall parking demand has been based on the likely maximum demand for individual uses. It is unlikely that these maximum demands would occur at the same time. Therefore the overall level of parking is considered to be conservative.

There is provision in the design for up to 1990 parking bays to be provided:

- 1734 bays off street in main centre car parks
- 50 bays adjacent to community centre
- 206 on street bays within the district centre

Whilst this would appear to be an over provision of parking, it allows for design flexibility and provision for landscaping within the proposed parking areas.

In addition to the above, parking for the proposed 245 residences will be provided on site at a rate of between 1 and 2 bays per unit. Visitor parking for the residential units of about 25 bays can be accommodated by the supply of on-street parking.

Overall provisions have been made for sufficient parking to be constructed to meet the needs of Dalyellup District Centre.

10. Conclusion

Sinclair Knight Merz has undertaken an assessment of the transport and access arrangements for the proposed Dalyellup District Centre. This assessment has followed the Western Australian Planning Commission Guidelines for Transport Assessments. This report has been prepared in consultation with the Department of Planning to agree trip generation rates, trip distribution, provisions for pedestrians/ cyclists and traffic impact analysis.

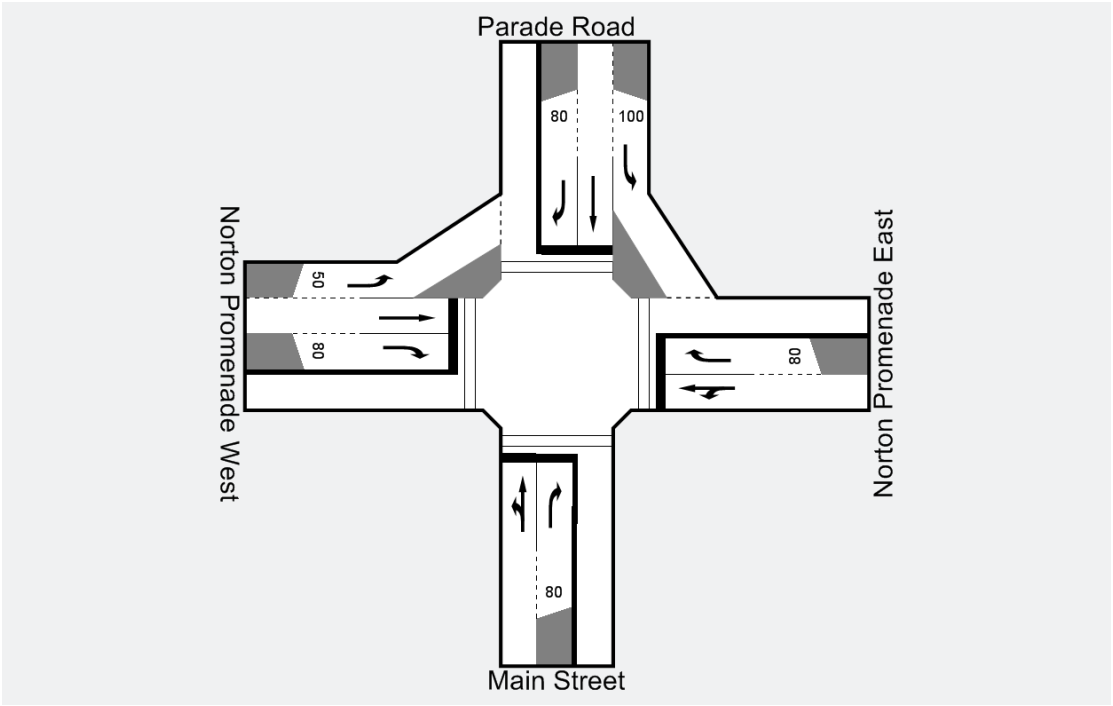
The key conclusions from the assessment are as follows:

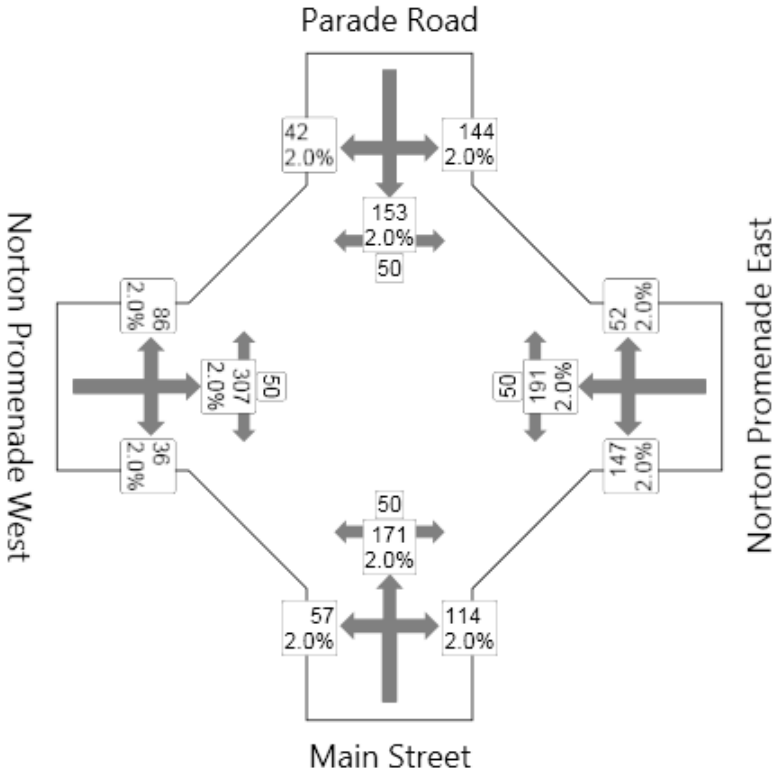
- The District Centre will be mixed use in nature including different types of housing, business, retail and community use
- The centre is projected to generate approximately 20,000 vehicular trips per day. This includes generation of around 8 vehicular trips per day per dwelling
- Retailing will be centred on Main Street which will be a traffic-calmed environment flanked with high quality pedestrian spaces and on-street car parking will be provided. This street is estimated to carry up to 6,600 vehicles per day
- The main access to the District Centre will be via Norton Promenade, a two lane divided road, which will carry in between 7,000 and 10,000 vehicles per day between Main Street and Bussell Highway. Access to this street will be limited to controlled intersections - signalised, roundabout controlled or left in/ left out
- The centre will be served by two planned bus routes, one passing along Main Street and the other passing along Norton Promenade (to the west of Main Street) to the north of the District Centre
- A range of route choices will be provided for pedestrian and cyclist travel to/ from and through the centre. A number of pedestrian crossings are proposed along key desire lines
- Analysis of key intersections through the centre has revealed that they are expected to operate well within capacity at full build out of the centre. The exception to this is the intersection of Norton Promenade/ Bussell Highway in the absence of the highway bypass being in place by full build out (or year 2031). This highlights the need for the bypass to be constructed prior to 2031 to cater for regional demand and to allow for localised access to Dalyellup and Dalyellup East
- Traffic volumes within the centre are expected to remain relatively constant at full build out with or without the bypass
- Provision of up to 2,000 parking bays (including 206 on street bays) within the centre is possible within the current plan for the District Centre which will more than meet the projected demand for parking and will satisfy the requirements of the TPS. This provision is subject to review as part of detailed design and the development application process.

Appendix A SIDRA outputs

SIDRA Analysis Results

Norton Promenade/ Parade Road with Bypass





PHASING SUMMARY

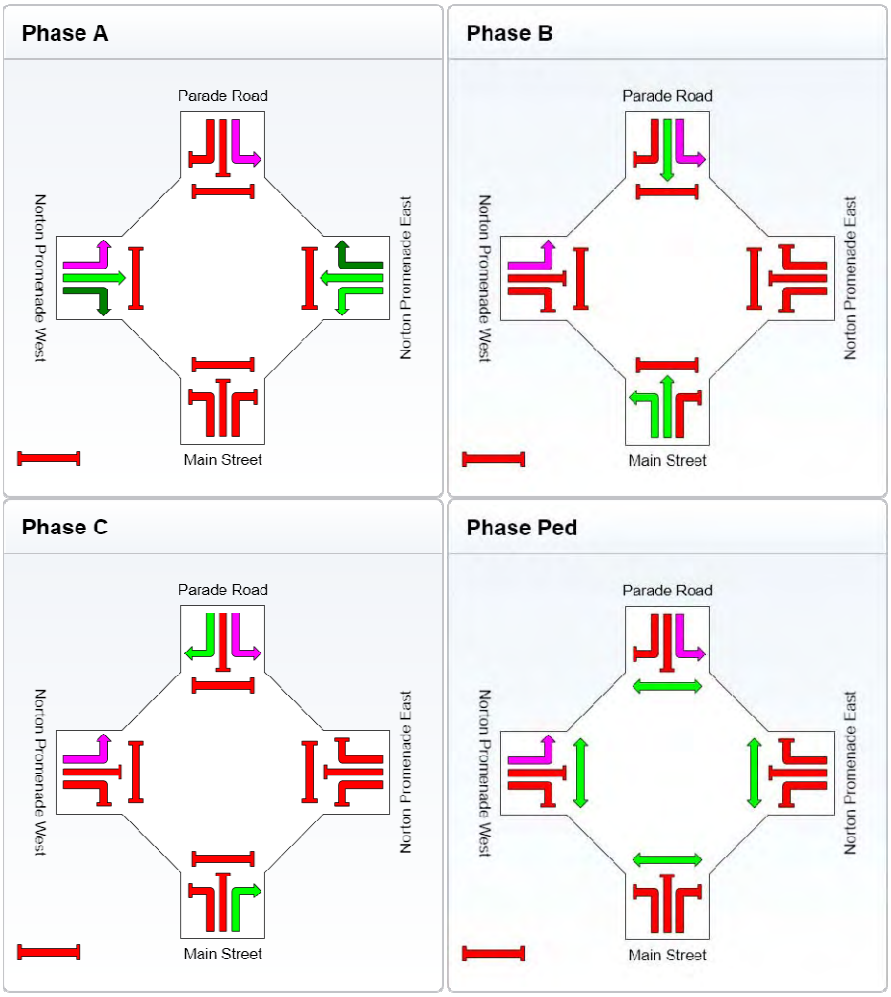
Site: Promenade/ Parade Rd with BB

Norton Promenade/ Parade Road with Bypass PM Peak Hour
Signals - Fixed Time Cycle Time = 70 seconds

Cycle Time Option: **Optimum Cycle Time (Minimum Delay)**
Phase times determined by the program
Sequence: Two-phase
Input Sequence: A, B, C, Ped
Output Sequence: A, B, C, Ped

Phase Timing Results

Phase	A	B	C	Ped
Green Time (sec)	17	11	6	12
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	23	17	12	18
Phase Split	33 %	24 %	17 %	26 %



MOVEMENT SUMMARY

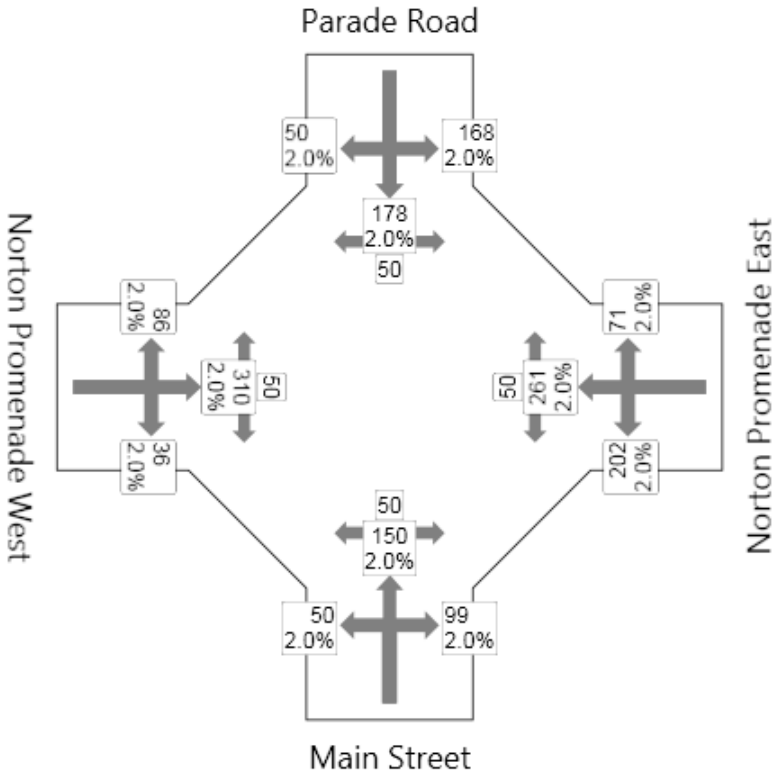
Site: Promenade/ Parade Rd with BB

Norton Promenade/ Parade Road with Bypass PM Peak Hour
Signals - Fixed Time Cycle Time = 70 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Main Street											
1	L	57	2.0	0.764	42.7	LOS D	10.0	71.1	1.00	0.92	28.7
2	T	171	2.0	0.764	34.5	LOS C	10.0	71.1	1.00	0.92	28.9
3	R	114	2.0	0.730	46.6	LOS D	5.8	41.0	1.00	0.87	26.2
Approach		342	2.0	0.763	39.9	LOS D	10.0	71.1	1.00	0.90	27.9
East: Norton Promenade East											
4	L	147	2.0	0.739	37.3	LOS D	13.1	93.2	0.98	0.91	30.6
5	T	191	2.0	0.739	29.0	LOS C	13.1	93.2	0.98	0.89	30.8
6	R	52	2.0	0.313	42.1	LOS D	2.6	18.7	0.97	0.75	27.8
Approach		390	2.0	0.739	33.9	LOS C	13.1	93.2	0.98	0.88	30.3
North: Parade Road											
7	L	144	2.0	0.104	8.2	LOS A	0.8	5.4	0.20	0.64	48.7
8	T	153	2.0	0.506	30.5	LOS C	6.6	46.9	0.96	0.77	31.1
9	R	42	2.0	0.268	42.9	LOS D	2.2	15.4	0.97	0.73	27.5
Approach		339	2.0	0.506	22.6	LOS C	6.6	46.9	0.64	0.71	36.1
West: Norton Promenade West											
10	L	86	2.0	0.069	8.2	LOS A	0.4	3.0	0.19	0.64	48.7
11	T	307	2.0	0.657	26.9	LOS C	11.5	81.9	0.96	0.82	32.8
12	R	36	2.0	0.245	43.1	LOS D	1.9	13.4	0.97	0.73	27.4
Approach		429	2.0	0.657	24.5	LOS C	11.5	81.9	0.80	0.78	34.5
All Vehicles		1500	2.0	0.764	30.0	LOS C	13.1	93.2	0.86	0.82	32.0

Norton Promenade/ Parade Road without Bypass



PHASING SUMMARY

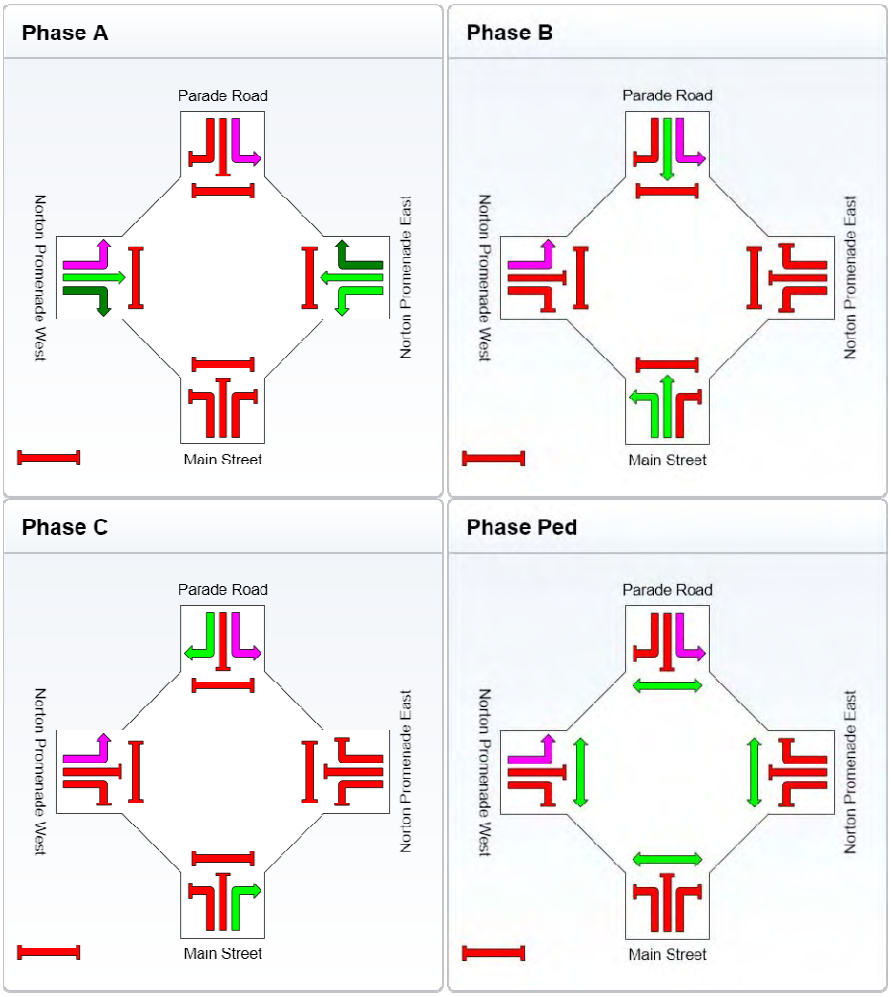
Site: Promenade/ Parade Rd no BB

Norton Promenade/ Parade Road no Bypass PM Peak Hour
Signals - Fixed Time Cycle Time = 70 seconds

Cycle Time Option: **Practical Cycle Time**
Phase times determined by the program
Sequence: Two-phase
Input Sequence: A, B, C, Ped
Output Sequence: A, B, C, Ped

Phase Timing Results

Phase	A	B	C	Ped
Green Time (sec)	19	9	6	12
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	25	15	12	18
Phase Split	36 %	21 %	17 %	26 %


Phase A
Parade Road
Norton Promenade West
Norton Promenade East
Main Street
Phase B
Parade Road
Norton Promenade West
Norton Promenade East
Main Street
Phase C
Parade Road
Norton Promenade West
Norton Promenade East
Main Street
Phase Ped
Parade Road
Norton Promenade West
Norton Promenade East
Main Street

MOVEMENT SUMMARY

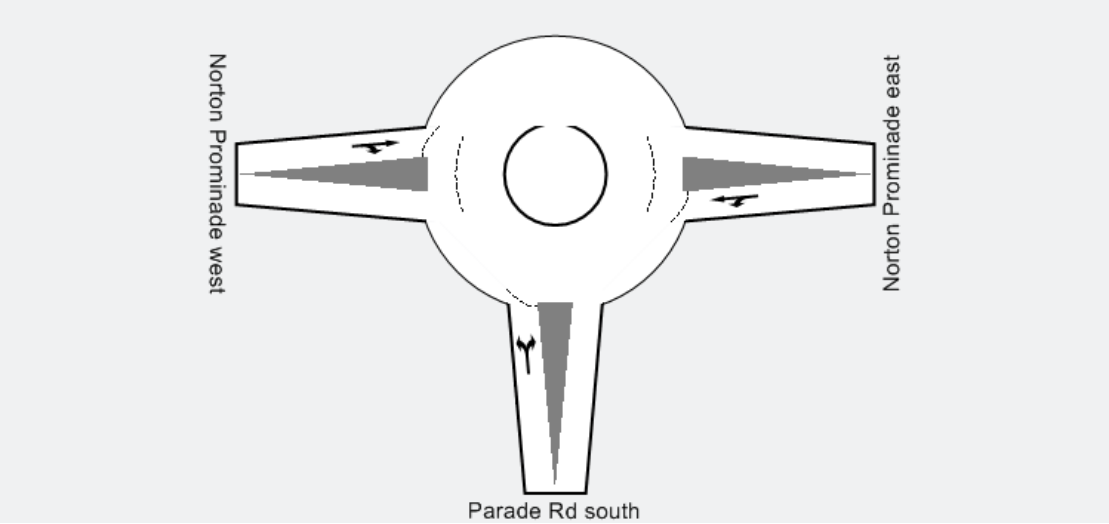
Site: Promenade/ Parade Rd no BB

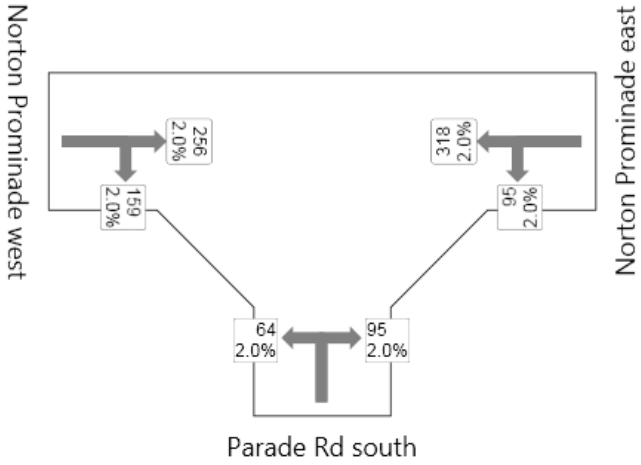
Norton Promenade/ Parade Road no Bypass PM Peak Hour
Signals - Fixed Time Cycle Time = 70 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Main Street											
1	L	50	2.0	0.819	46.3	LOS D	9.4	66.6	1.00	0.96	27.4
2	T	150	2.0	0.819	38.1	LOS D	9.4	66.6	1.00	0.96	27.6
3	R	99	2.0	0.645	45.4	LOS D	5.0	35.5	1.00	0.82	26.6
Approach		299	2.0	0.818	41.9	LOS D	9.4	66.6	1.00	0.92	27.2
East: Norton Promenade East											
4	L	202	2.0	0.906	49.0	LOS D	20.8	148.3	1.00	1.13	26.3
5	T	261	2.0	0.906	40.7	LOS D	20.8	148.3	1.00	1.13	26.4
6	R	71	2.0	0.362	39.5	LOS D	3.4	24.2	0.94	0.77	28.8
Approach		534	2.0	0.906	43.7	LOS D	20.8	148.3	0.99	1.08	26.6
North: Parade Road											
7	L	168	2.0	0.123	8.3	LOS A	0.9	6.4	0.20	0.65	48.7
8	T	178	2.0	0.719	35.0	LOS C	8.1	57.6	1.00	0.88	29.2
9	R	50	2.0	0.319	43.1	LOS D	2.6	18.3	0.98	0.74	27.4
Approach		396	2.0	0.719	24.7	LOS C	8.1	57.6	0.66	0.76	34.9
West: Norton Promenade West											
10	L	86	2.0	0.069	8.2	LOS A	0.4	3.0	0.19	0.64	48.7
11	T	310	2.0	0.593	24.5	LOS C	11.1	79.1	0.92	0.78	34.0
12	R	36	2.0	0.318	46.6	LOS D	2.0	14.0	1.00	0.71	26.2
Approach		432	2.0	0.593	23.1	LOS C	11.1	79.1	0.78	0.74	35.3
All Vehicles		1661	2.0	0.906	33.5	LOS C	20.8	148.3	0.86	0.89	30.4

Norton Promenade/ Parade Road South with Bypass





MOVEMENT SUMMARY

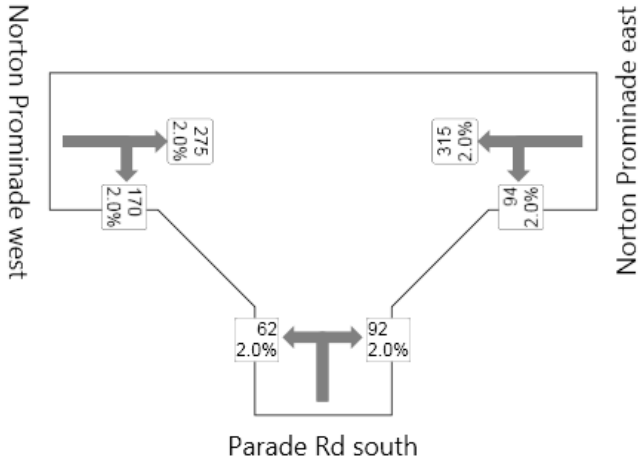
Site: Parade Rd south RB with BB

Parade Rd south/ Norton Prom PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Parade Rd south											
1	L	67	2.0	0.160	7.7	LOS A	1.1	7.9	0.50	0.60	48.1
3	R	100	2.0	0.160	13.0	LOS B	1.1	7.9	0.50	0.73	45.0
Approach		167	2.0	0.160	10.8	LOS B	1.1	7.9	0.50	0.68	46.1
East: Norton Promenade east											
4	L	100	2.0	0.358	6.2	LOS A	2.5	17.5	0.36	0.54	50.0
5	T	335	2.0	0.358	5.4	LOS A	2.5	17.5	0.36	0.48	50.4
Approach		435	2.0	0.358	5.6	LOS A	2.5	17.5	0.36	0.50	50.3
West: Norton Promenade west											
11	T	269	2.0	0.334	4.9	LOS A	2.4	17.0	0.29	0.41	51.0
12	R	167	2.0	0.334	11.7	LOS B	2.4	17.0	0.29	0.77	46.3
Approach		437	2.0	0.334	7.5	LOS B	2.4	17.0	0.29	0.54	49.0
All Vehicles		1039	2.0	0.358	7.2	LOS A	2.5	17.5	0.35	0.55	49.0

Norton Promenade/ Parade Road South without Bypass



MOVEMENT SUMMARY

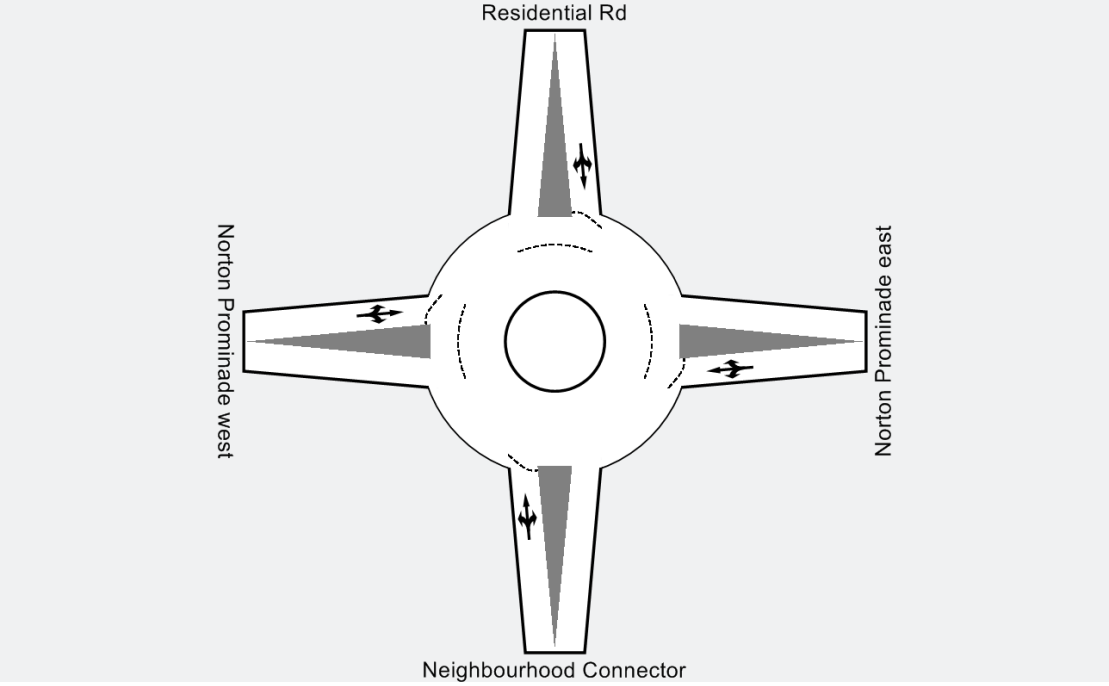
Site: Parade Rd south RB no BB

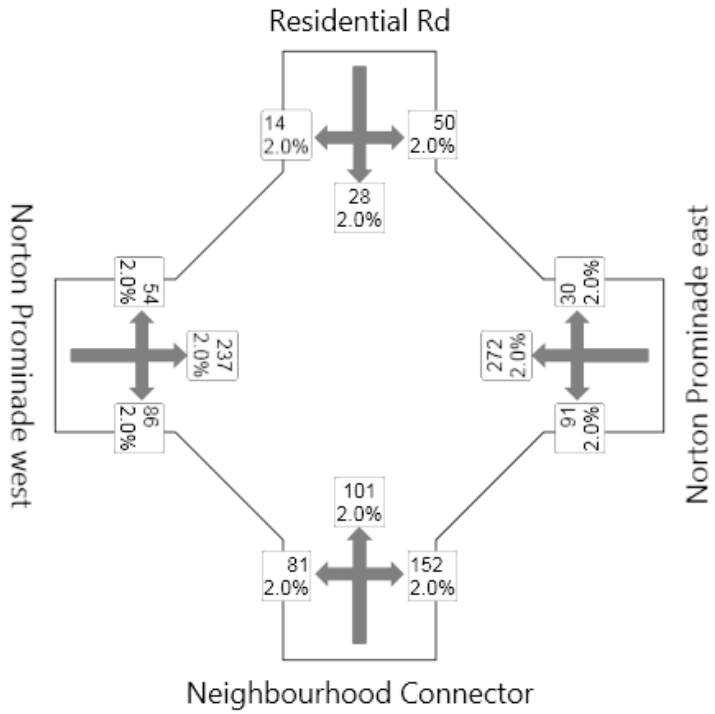
Parade Rd south/ Norton Prom PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Parade Rd south											
1	L	65	2.0	0.155	7.7	LOS A	1.1	7.7	0.50	0.60	48.1
3	R	97	2.0	0.155	12.9	LOS B	1.1	7.7	0.50	0.73	45.0
Approach		162	2.0	0.155	10.8	LOS B	1.1	7.7	0.50	0.67	46.1
East: Norton Promenade east											
4	L	99	2.0	0.360	6.3	LOS A	2.5	17.6	0.38	0.55	49.9
5	T	332	2.0	0.359	5.5	LOS A	2.5	17.6	0.38	0.49	50.3
Approach		431	2.0	0.359	5.7	LOS A	2.5	17.6	0.38	0.50	50.2
West: Norton Promenade west											
11	T	289	2.0	0.355	4.8	LOS A	2.6	18.5	0.29	0.40	51.0
12	R	179	2.0	0.355	11.7	LOS B	2.6	18.5	0.29	0.77	46.3
Approach		468	2.0	0.355	7.5	LOS B	2.6	18.5	0.29	0.54	49.0
All Vehicles		1061	2.0	0.360	7.2	LOS A	2.6	18.5	0.36	0.55	49.0

Norton Promenade/ Residential Road with Bypass





MOVEMENT SUMMARY

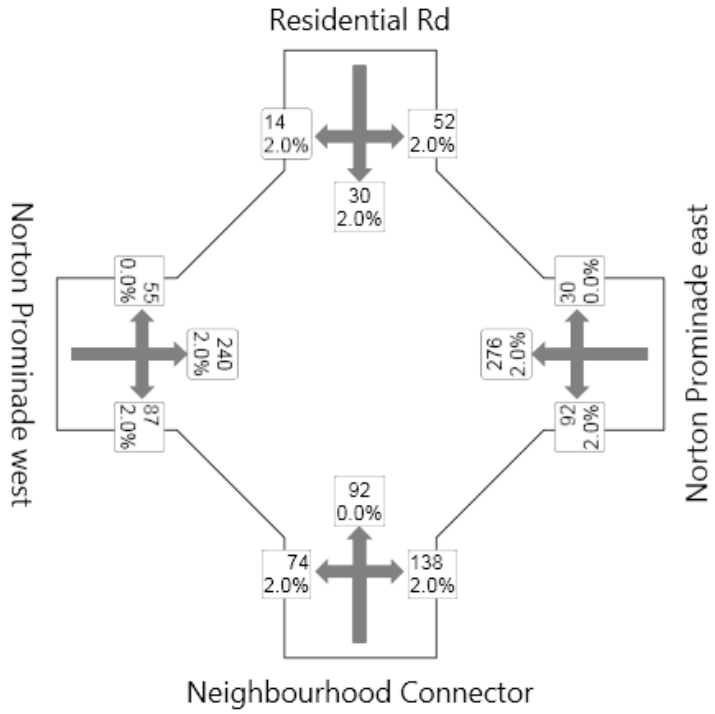
Site: Norton Promenade/Residential Rd with BB

Norton Prom/ Residential Road PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Neighbourhood Connector											
1	L	85	2.0	0.347	8.6	LOS A	2.7	19.3	0.57	0.68	47.7
2	T	106	2.0	0.347	7.0	LOS A	2.7	19.3	0.57	0.61	48.0
3	R	160	2.0	0.347	13.4	LOS B	2.7	19.3	0.57	0.78	45.1
Approach		352	2.0	0.347	10.3	LOS B	2.7	19.3	0.57	0.70	46.5
East: Norton Promenade east											
4	L	96	2.0	0.330	6.0	LOS A	2.2	16.0	0.32	0.51	50.1
5	T	286	2.0	0.330	5.5	LOS A	2.2	16.0	0.32	0.47	50.5
6	R	32	2.0	0.329	11.9	LOS B	2.2	16.0	0.32	0.81	46.4
Approach		414	2.0	0.330	6.1	LOS B	2.2	16.0	0.32	0.50	50.0
North: Residential Rd											
7	L	53	2.0	0.107	7.6	LOS A	0.6	4.6	0.53	0.63	48.7
8	T	29	2.0	0.107	6.6	LOS A	0.6	4.6	0.53	0.58	48.9
9	R	15	2.0	0.107	13.4	LOS B	0.6	4.6	0.53	0.83	45.4
Approach		97	2.0	0.107	8.2	LOS B	0.6	4.6	0.53	0.65	48.2
West: Norton Promenade west											
10	L	57	2.0	0.379	7.0	LOS A	2.8	19.7	0.52	0.61	48.9
11	T	249	2.0	0.380	6.0	LOS A	2.8	19.7	0.52	0.54	49.1
12	R	91	2.0	0.380	12.9	LOS B	2.8	19.7	0.52	0.83	46.1
Approach		397	2.0	0.380	7.7	LOS B	2.8	19.7	0.52	0.62	48.3
All Vehicles		1259	2.0	0.380	7.9	LOS A	2.8	19.7	0.47	0.61	48.3

Parade Road South/ Residential Road without Bypass



MOVEMENT SUMMARY

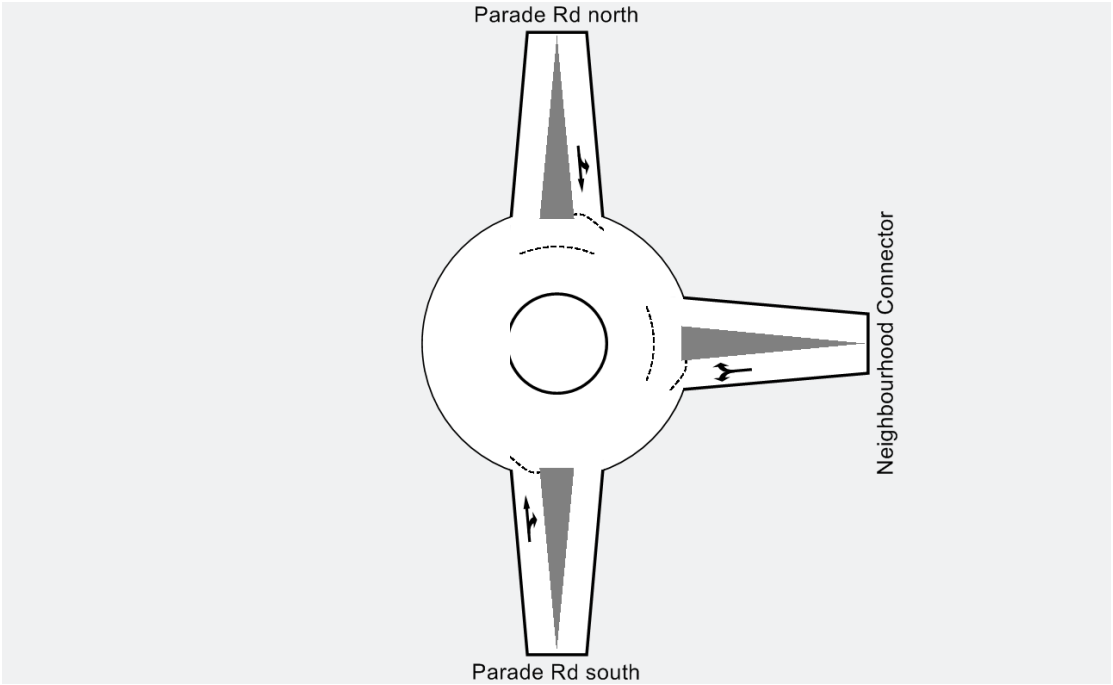
Site: Norton Promenade/Residential Rd no BB

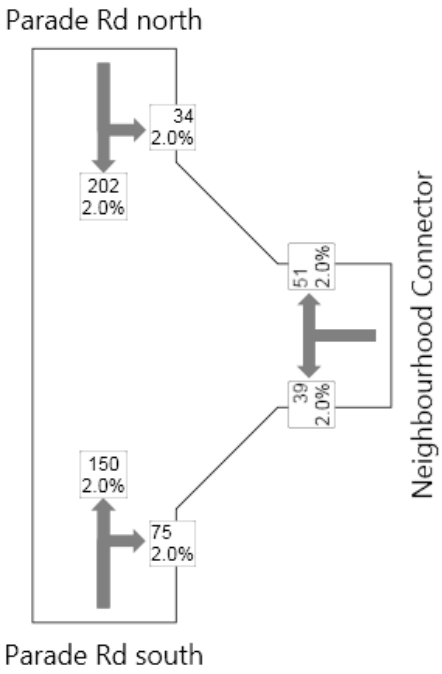
Norton Prom/ Residential RoadPM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Neighbourhood Connector											
1	L	78	2.0	0.317	8.6	LOS A	2.4	17.1	0.56	0.68	47.8
2	T	97	0.0	0.316	6.9	LOS A	2.4	17.1	0.56	0.60	48.0
3	R	145	2.0	0.317	13.4	LOS B	2.4	17.1	0.56	0.78	45.1
Approach		320	1.4	0.317	10.3	LOS B	2.4	17.1	0.56	0.70	46.6
East: Norton Promenade east											
4	L	97	2.0	0.335	6.0	LOS A	2.3	16.2	0.33	0.51	50.1
5	T	291	2.0	0.335	5.5	LOS A	2.3	16.2	0.33	0.47	50.4
6	R	32	0.0	0.336	11.8	LOS B	2.3	16.2	0.33	0.82	46.4
Approach		419	1.8	0.335	6.1	LOS B	2.3	16.2	0.33	0.51	50.0
North: Residential Rd											
7	L	55	2.0	0.111	7.5	LOS A	0.7	4.8	0.52	0.63	48.7
8	T	32	2.0	0.111	6.5	LOS A	0.7	4.8	0.52	0.58	48.9
9	R	15	2.0	0.111	13.4	LOS B	0.7	4.8	0.52	0.84	45.5
Approach		101	2.0	0.111	8.1	LOS B	0.7	4.8	0.52	0.64	48.3
West: Norton Promenade west											
10	L	58	0.0	0.376	6.8	LOS A	2.7	19.3	0.49	0.60	49.0
11	T	253	2.0	0.375	5.8	LOS A	2.7	19.3	0.49	0.53	49.3
12	R	92	2.0	0.375	12.7	LOS B	2.7	19.3	0.49	0.82	46.2
Approach		402	1.7	0.375	7.5	LOS B	2.7	19.3	0.49	0.60	48.5
All Vehicles		1242	1.7	0.376	7.8	LOS A	2.7	19.3	0.46	0.60	48.4

Parade Road South/ Neighbourhood Connector with Bypass





MOVEMENT SUMMARY

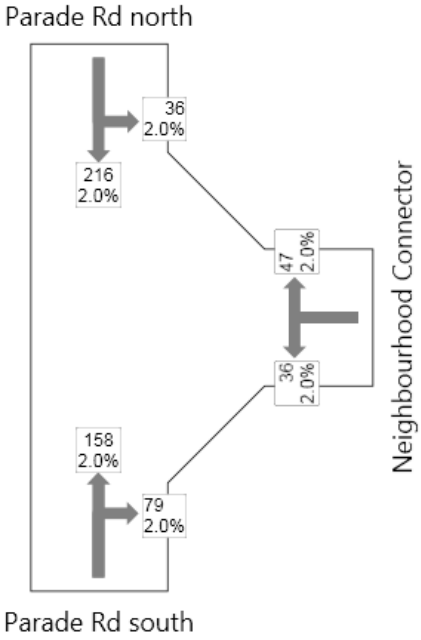
Site: Parade South/Neighbourhood Connector with BB

Parade Rd south/ Neighbourhood Connector PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Parade Rd south											
2	T	158	2.0	0.180	7.1	LOS A	1.3	9.0	0.20	0.53	49.4
3	R	79	2.0	0.180	11.4	LOS B	1.3	9.0	0.20	0.69	45.9
Approach		237	2.0	0.180	8.5	LOS B	1.3	9.0	0.20	0.58	48.1
East: Neighbourhood Connector											
4	L	41	2.0	0.084	6.2	LOS A	0.4	3.2	0.32	0.48	49.7
6	R	54	2.0	0.084	12.0	LOS B	0.4	3.2	0.32	0.74	45.8
Approach		95	2.0	0.084	9.5	LOS B	0.4	3.2	0.32	0.63	47.3
North: Parade Rd north											
7	L	36	2.0	0.189	5.7	LOS A	1.1	7.7	0.20	0.50	51.1
8	T	213	2.0	0.189	4.7	LOS A	1.1	7.7	0.20	0.40	51.9
Approach		248	2.0	0.189	4.8	LOS A	1.1	7.7	0.20	0.42	51.8
All Vehicles		580	2.0	0.189	7.1	LOS A	1.3	9.0	0.22	0.52	49.5

Parade Road South/ Neighbourhood Connector without Bypass



MOVEMENT SUMMARY

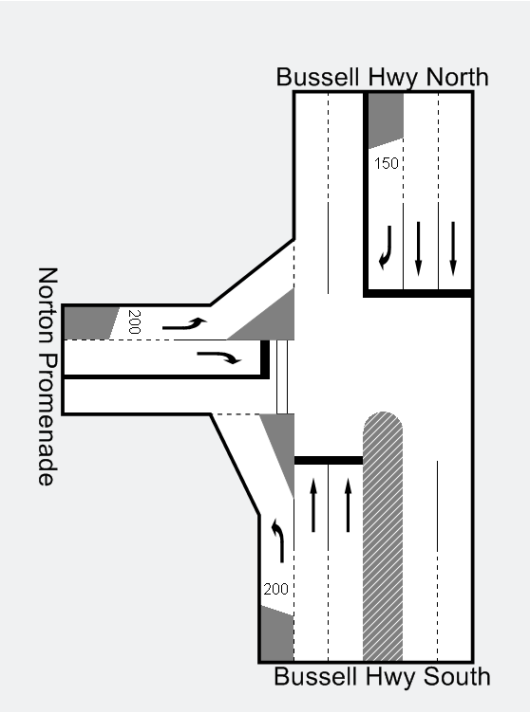
Site: Parade South/Neighbourhood Connector no BB

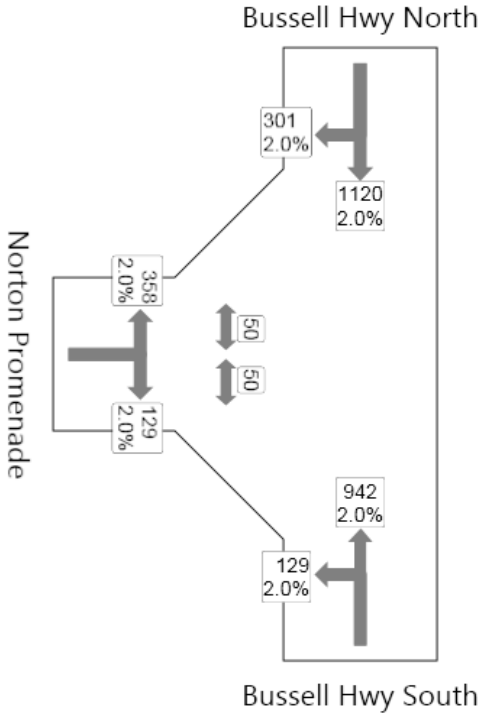
Parade Rd south/ Neighbourhood Connector PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Parade Rd south											
2	T	166	2.0	0.187	7.0	LOS A	1.3	9.4	0.19	0.53	49.5
3	R	83	2.0	0.187	11.4	LOS B	1.3	9.4	0.19	0.69	45.9
Approach		249	2.0	0.187	8.5	LOS B	1.3	9.4	0.19	0.58	48.2
East: Neighbourhood Connector											
4	L	38	2.0	0.079	6.2	LOS A	0.4	3.0	0.33	0.48	49.6
6	R	49	2.0	0.079	12.0	LOS B	0.4	3.0	0.33	0.74	45.7
Approach		87	2.0	0.079	9.5	LOS B	0.4	3.0	0.33	0.63	47.3
North: Parade Rd north											
7	L	38	2.0	0.203	5.7	LOS A	1.2	8.3	0.21	0.50	51.1
8	T	227	2.0	0.203	4.7	LOS A	1.2	8.3	0.21	0.41	51.9
Approach		265	2.0	0.203	4.9	LOS A	1.2	8.3	0.21	0.42	51.7
All Vehicles		602	2.0	0.203	7.0	LOS A	1.3	9.4	0.22	0.52	49.5

Bussell Hwy/Norton Promenade with Bypass





PHASING SUMMARY

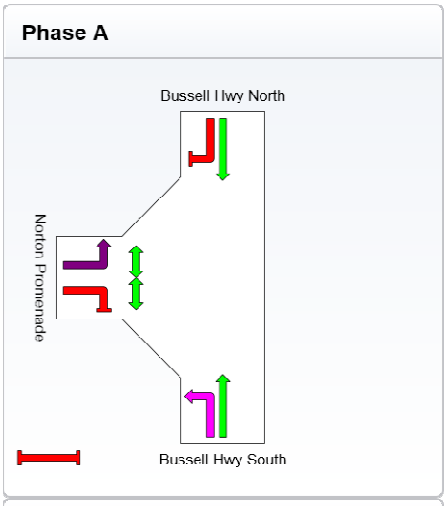
Site: With Bypass

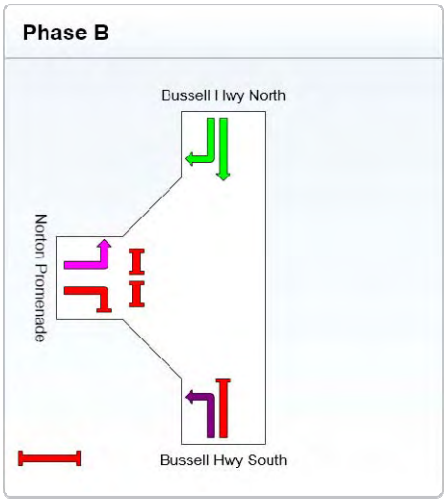
Bussell Hwy/Norton Promenade PM Peak
Signals - Fixed Time Cycle Time = 120 seconds

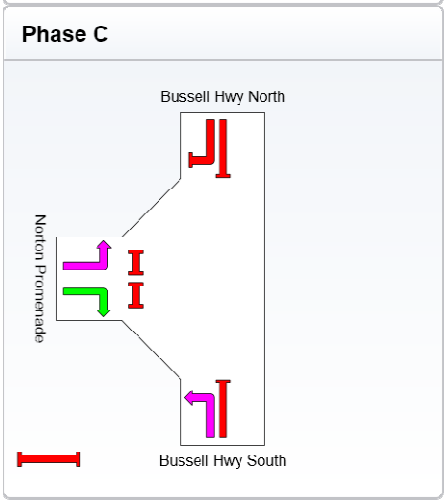
Cycle Time Option: **User-specified Cycle Time**
Phase times determined by the program
Sequence: Two-Phase
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	52	35	15
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	58	41	21
Phase Split	48 %	34 %	18 %







MOVEMENT SUMMARY

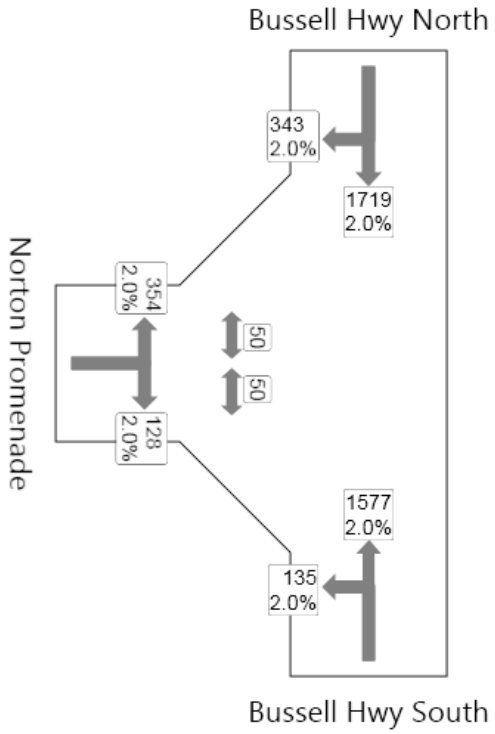
Site: With Bypass

Bussell Hwy/Norton Promenade PM Peak
Signals - Fixed Time Cycle Time = 120 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Bussell Hwy South											
1	L	136	2.0	0.104	10.4	LOS B	2.5	17.6	0.28	0.66	46.8
2	T	992	2.0	0.594	27.7	LOS C	22.7	161.7	0.82	0.73	32.6
Approach		1127	2.0	0.594	25.6	LOS C	22.7	161.7	0.75	0.72	33.9
North: Bussell Hwy North											
8	T	1179	2.0	0.395	4.6	LOS A	12.5	89.1	0.35	0.32	51.7
9	R	317	2.0	0.587	47.5	LOS D	17.1	121.8	0.91	0.84	26.0
Approach		1496	2.0	0.587	13.7	LOS B	17.1	121.8	0.47	0.43	42.8
West: Norton Promenade											
10	L	377	2.0	0.372	13.1	LOS B	9.1	64.5	0.43	0.72	44.3
12	R	136	2.0	0.593	63.4	LOS E	9.5	67.4	0.99	0.80	21.9
Approach		513	2.0	0.593	26.4	LOS C	9.5	67.4	0.58	0.74	34.9
All Vehicles		3136	2.0	0.594	20.0	LOS C	22.7	161.7	0.59	0.58	37.8

Bussell Hwy/Norton Promenade without Bypass



PHASING SUMMARY

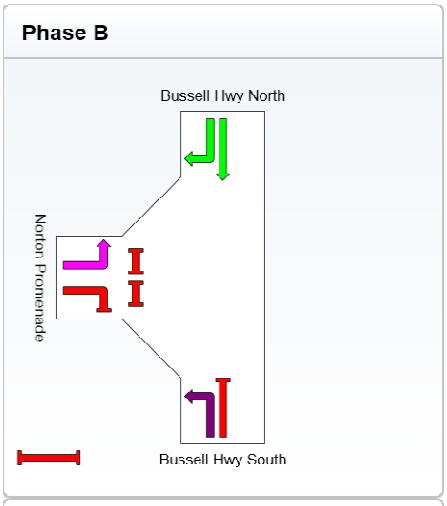
Site: Without Bypass

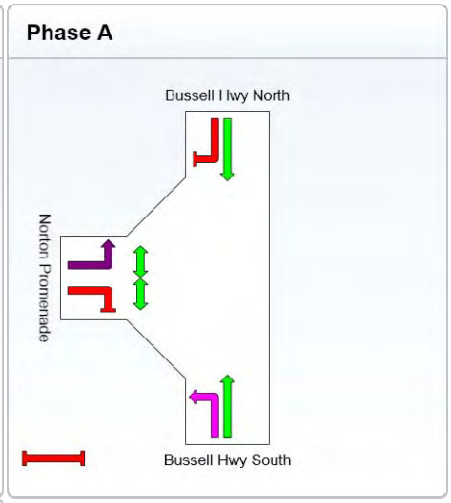
Bussell Hwy/Norton Promenade PM Peak
Signals - Fixed Time Cycle Time = 110 seconds

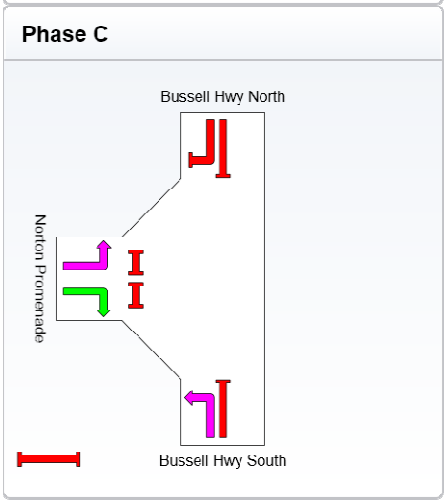
Cycle Time Option: **Optimum Cycle Time (Minimum Delay)**
Phase times determined by the program
Sequence: Two-Phase
Input Sequence: B, A, C
Output Sequence: B, A, C

Phase Timing Results

Phase	B	A	C
Green Time (sec)	26	56	10
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	32	62	16
Phase Split	29 %	56 %	15 %







MOVEMENT SUMMARY

Site: Without Bypass

Bussell Hwy/Norton Promenade PM Peak
Signals - Fixed Time Cycle Time = 110 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Bussell Hwy South											
1	L	142	2.0	0.119	11.7	LOS B	3.1	21.9	0.33	0.67	45.5
2	T	1660	2.0	0.847	28.9	LOS C	41.2	293.3	0.93	0.90	31.8
Approach		1802	2.0	0.847	27.6	LOS C	41.2	293.3	0.89	0.88	32.6
North: Bussell Hwy North											
8	T	1809	2.0	0.587	4.4	LOS A	19.0	135.2	0.41	0.38	51.7
9	R	361	2.0	0.826	57.1	LOS E	21.1	150.0	1.00	0.92	23.3
Approach		2171	2.0	0.826	13.1	LOS B	21.1	150.0	0.51	0.47	43.0
West: Norton Promenade											
10	L	373	2.0	0.453	28.3	LOS C	14.0	99.3	0.74	0.90	34.0
12	R	135	2.0	0.809	67.9	LOS E	9.6	68.2	1.00	0.91	20.9
Approach		507	2.0	0.809	38.8	LOS D	14.0	99.3	0.81	0.90	29.2
All Vehicles		4480	2.0	0.847	21.9	LOS C	41.2	293.3	0.69	0.69	36.4

Appendix B Car Parking Requirements (Shire of Capel TPS 7)

USE	NO. OF PARKING SPACES
Shop	1 for every 20m^2 gross leasable area
Office	1 for every 20m^2 gross leasable area
Hotel, motel, tavern, club, private hotel, lodging house, cafe/restaurant, night club, place of public assembly	Where applicable to the particular use: 1 for every 3m^2 of public drinking area other than lounge floor area 1 for every 4 seats which an eating area is designed to provide OR 1 for every 4m^2 of eating area or part thereof which ever produces the greater number of car parking spaces 1 for every bedroom 1 for every 6 seats provided or capable of being provided in assembly area OR 1 for every 4.5m^2 of assembly area whichever produces the greatest number of car parking spaces 1 for every 3m^2 of public lounge drinking area In addition to any of the above, Council may require parking space dedicated specifically for staff.
Place of worship	1 for every 5 seats in main auditorium
Hospital	1 for every 3 bed spaces provided
Health centre, clinic, consulting rooms	5 for every practitioner
Consulting room attached to a dwelling	4 for every practitioner and 2 for the dwelling
Funeral parlour	Not less than 6 car parking spaces
Motor repair station, service station	1 for each lubrication and maintenance bay plus 1 for each person working on the site
Open air display	1 for every 200m^2 of display area/or sales area
Squash court	3 for every court
Showrooms	1 for every 40m^2 of gross leasable area
Warehouse (not open to the general public)	1 for every 100m^2 of gross leasable area
Light industry	1 for every 50m^2 of gross leasable area
Veterinary clinic/hospital	6 for 1 practitioner, and 10 for 2 practitioners