



TRAFFIC AND INFRASTRUCTURE REVIEW

TORQUAY NORTH TRAFFIC AND INFRASTRUCTURE REVIEW

25 OCTOBER 2021

TORQUAY NORTH TRAFFIC AND INFRASTRUCTURE REVIEW

CLIENT: Surf Coast Shire Council

OBT JOB NUMBER: 21376



Suite 2.03, 789 Toorak Road
Hawthorn East, Victoria 3123

T: 61 3 9804 3610
W: obrientraffic.com
ABN 55 007 006 037

STUDY TEAM

Jemima Macaulay
Derek Lee
Kevin Ho

EXECUTIVE SUMMARY

O'Brien Traffic has been engaged by Surf Coast Shire Council to undertake a traffic and infrastructure review of the Torquay North Urban Growth Area and directly surrounding road network.

The original Torquay North Outline Development Plan (ODP) was adopted in 2008 and revised in 2012. Since adoption of the 2012 ODP, much of the precinct has undergone development, with further development planned over the next 5-10 years. There have been significant changes to land use and realisation of other factors that have, and will continue to, impact traffic within the precinct, such as:

- More extensive community facilities within the precinct (pool, stadium, secondary school, kindergartens and childcare, two primary schools of greater size than anticipated);
- Additional areas of higher density residential development;
- Higher traffic generation uses within the activity centre;
- Introduction of a community hospital into the precinct;
- Higher proportion of permanent residents than in the rest of Torquay; and
- Growth in adjacent precincts (such as Armstrong Creek) have a greater influence on traffic volumes than originally predicted.

Therefore, Council has commissioned this traffic and infrastructure review to ensure that the infrastructure being delivered will be sufficient to safely cater for traffic volumes when the precinct is fully developed.

The review has included:

- An independent analysis of the traffic generation of the Torquay North Urban Growth Area at full development, considering changes to land use since the original development plan and in response to community concerns;
- Impact of the above traffic generation and assessment of the existing/proposed infrastructure within Torquay North;
- Impact of the above traffic generation on the surrounding road network; and
- Identification of traffic mitigation measures within Torquay North to support efficient and safe operation of the road network.

Traffic projections

Traffic projections for the road network have been developed based on:

- Existing traffic volumes (typically 2019 pre-Covid traffic volumes);
- Full build out of the subdivisions within the study area;
- Completion of the road network as per the approved development plans;
- 10 years growth; and
- Peak and off-peak season variation.

The traffic projections, based on a range of conservative assumptions (i.e. worst case scenario) are shown within the report.

Sensitivity analysis was also undertaken to understand the potential variability of the final traffic volumes, which will depend on a range of factors including dwelling occupancy, changes in traffic patterns and access behaviour over time, and external traffic growth.

Infrastructure recommendations

An assessment of the existing and proposed infrastructure was undertaken based on the traffic projections for the precinct at full build. Recommendations have been made for the provision of appropriate infrastructure to safely accommodate the future traffic demands of the precinct. Recommendations include:

- Roundabout at the South Beach Road/Fischer Street intersection;
- Roundabout at the Fischer Street/Stretton Drive intersection;
- Consideration of pedestrian operated signals on Fischer Street at the Dunes Shopping Centre at full build out if required;
- Safety improvements at the South Beach Road/Horseshoe Bend Road roundabout;
- Various intersection treatments, including on Rosser Boulevard at Inshore Drive and Marine Drive;
- Local area traffic management treatments, including along Stretton Drive, Marine Drive and Anchor Lane;
- Investigation to improve cyclist provision on Fischer Street; and
- Improvements to bicycle routes/facilities within the precinct.

CONTENTS

1	INTRODUCTION	1
2	STUDY AREA	2
3	BACKGROUND	4
4	EXISTING CONDITIONS	9
5	TRAFFIC PROJECTIONS	15
6	INFRASTRUCTURE ASSESSMENT	24
7	RECOMMENDATIONS, TIMING AND PRIORITIES	37
	APPENDIX A	41
	APPENDIX B	47
	APPENDIX C	49
	APPENDIX D	51
	APPENDIX E	53
	APPENDIX F	56
	APPENDIX G	61

1 INTRODUCTION

O'Brien Traffic has been engaged by Surf Coast Shire Council to undertake a traffic and infrastructure review of the Torquay North Urban Growth Area and directly surrounding road network.

The original Torquay North Outline Development Plan (ODP) was adopted in 2008, then revised in 2012 following a number of local and regional studies and several land use changes. Since adoption of the 2012 ODP, much of the precinct has undergone development, with further development planned over the next 5-10 years. There have been further, significant changes to land use and realisation of other factors that have, and will continue to, impact traffic within the precinct, such as:

- More extensive community facilities within the precinct (pool, stadium, secondary school, kindergartens and childcare, two primary schools of greater size than anticipated);
- Additional areas of higher density residential development;
- Higher traffic generation uses within the activity centre;
- Introduction of a community hospital into the precinct;
- Higher proportion of permanent residents than in the rest of Torquay; and
- Growth in adjacent precincts (such as Armstrong Creek) have a greater influence on traffic volumes than originally predicted.

Between 2018 and 2021, Council undertook extensive traffic surveys on the constructed portion of the road network in Torquay North. Based on these surveys, it is apparent that the traffic projections in the 2012 ODP do not provide a realistic representation of the likely traffic volumes within the precinct at full build out, with actual traffic volumes on key collector routes already exceeding projected traffic volumes.

Therefore, Council has commissioned this traffic and infrastructure review to ensure that the infrastructure being delivered will be sufficient to safely cater for traffic volumes when the precinct is fully developed.

The review has included:

- An independent analysis of the traffic generation of the Torquay North Urban Growth Area at full development, considering changes to land use since the original development plan and in response to community concerns;
- Impact of the above traffic generation and assessment of the existing/proposed infrastructure within Torquay North;
- Impact of the above traffic generation on the surrounding road network; and
- Identification of traffic mitigation measures within Torquay North to support effective and safe operation of the road network.

2 STUDY AREA

2.1 LOCATION

The subject area is the Torquay North Urban Growth Area, as per the Torquay North Outline Development Plan adopted in 2008. The area is bounded by South Beach Road to the north, Surf Coast Highway to the west, and existing residential development to the east and south. The study specifically considers growth within the development area but also analyses external traffic and growth expected to travel through the precinct.

The study area and external traffic routes that will contribute through traffic are shown in **Figure 1**.



COPYRIGHT MELWAY PUBLISHING PTY. LTD. REPRODUCED WITH PERMISSION

FIGURE 1: LOCATION OF STUDY AREA

2.2 CURRENT / FUTURE DEVELOPMENT

An aerial photograph of the study area is shown in **Figure 2** and shows the extent of development within the study area as of April 2020. Note, the 'starting point' for the analysis is January 2020. The April 2020 aerial photograph is the available aerial closest to this starting point.



COPYRIGHT NEARMAP.COM.AU REPRODUCED WITH PERMISSION

FIGURE 2: AERIAL PHOTO OF SUBJECT SITE – APRIL 2020

The study area comprises several subdivisions. Current development plans are indicated in **Figure 3** and are provided in **Appendix A**. As can be seen from the aerial in Figure 2, the level of completion of each subdivision varies from not started to partially developed or completed.

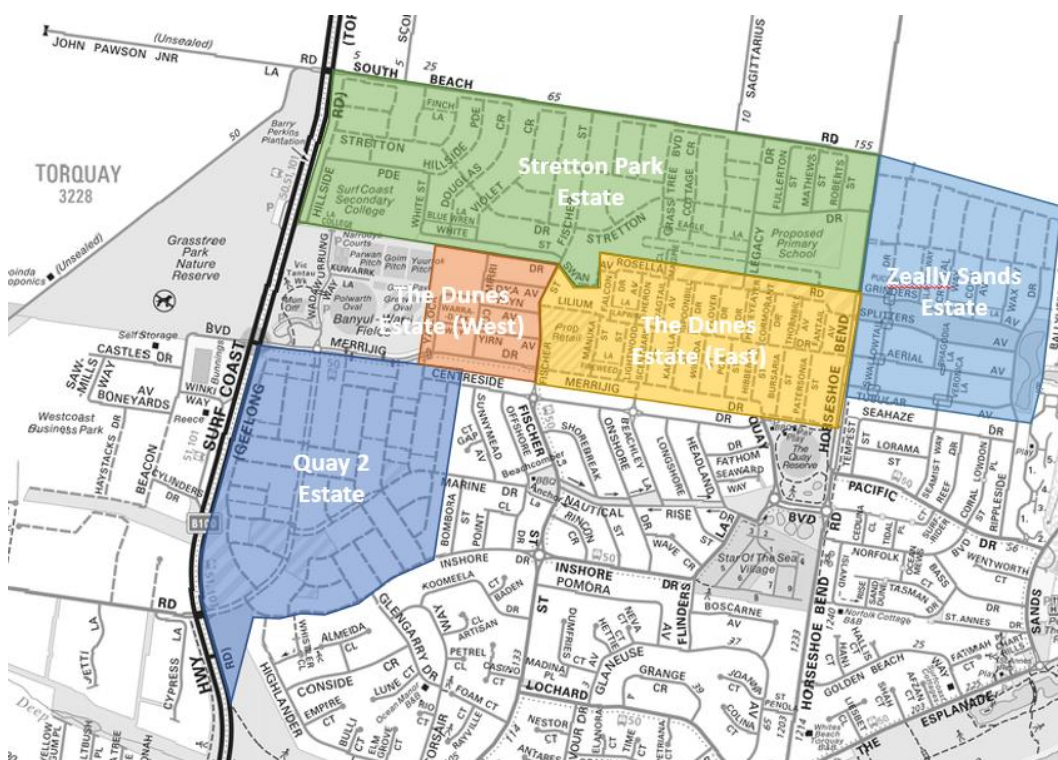


FIGURE 3: CURRENT DEVELOPMENT PLANS IN STUDY AREA

3 BACKGROUND

3.1 PREVIOUS STUDIES

3.1.1 Torquay/Jan Juc Transport Infrastructure Strategy Review, Traffix Group 2007

The 2007 Torquay/Jan Juc Infrastructure Strategy Review (Traffix Group, 2007) made recommendations for infrastructure upgrades to support and cater for projected traffic volumes up to 2021. The review was based on a number of key assumptions including:

- Peak and off peak traffic volumes
- Traffic generation rate of 10 trips per dwelling per day
- Additional trips to account for beach/ tourist traffic
- 45% of trips assumed to/from external destinations
- internal trips assumed to/from activity centres
- Bristol Rd access to highway closed (this did not eventuate and the intersection is to be signalised)
- Coombes Rd cross road intersection constructed

Recommendations from the review included the following:

- Installation of traffic signals at the intersection of Coombes Road and Surf Coast Highway (scheduled for delivery within the next year)
- Connection of Fischer Street to South Beach Road and installation of roundabout at resulting intersection

- Widening of Fischer Street at high volume locations – i.e. between Bristol and Beach Road.
- Roundabout at South Beach Road and Horseshoe Bend Road intersection (completed)
- Traffic signals at South Beach Rd and Surf Coast Highway intersection (dual lane roundabout has been provided).

3.1.2 Torquay/Jan Juc Retail Strategy, Tim Nott 2011

The Torquay/Jan Juc Retail Strategy anticipated the Torquay North Neighbourhood centre, including a full line supermarket (3,500m²), specialty shops (2,000m²) and commercial offices (500-1,500m²), would take 26% of the retail spend of the Torquay North catchment by 2015.

3.1.3 Torquay North Outline Development Plan, Revised 2012

The Torquay North Outline Development Plan (ODP) was revised in 2012 to align with current land use, approved development plans and best practice sustainable design.

The 2012 ODP includes the following key community facilities:

- Community and Civic Precinct – Shire offices and recreation facilities
- Primary and secondary schools
- Neighbourhood Activity Centre
- Opportunities for medium density housing
- Open spaces linkages, local parks, conservations areas and drainage reserves
- Urban arterial and collector street network
- Bus routes
- Cycle paths.

Design principles and responses provide context for the layout of the ODP and guidance for detailed Development Plans and includes the following:

Subdivision design is to give priority to walking, cycling and public transport, focusing on community and shared spaces.

The road network is to be designed to reduce traffic speeds and promote community interaction and pedestrian priority use of the road reserve. It shall comprise a predominantly grid based layout modified as appropriate for topographical and other conditions. It shall facilitate the provision / extension of an efficient local bus service.

In terms of the street network, the ODP contemplates the following connector streets:

- Horseshoe Bend Road and South Beach Road
- Merrijig Drive connection between Surf Coast Highway and Horseshoe Bend Road
- the extension of Fischer Street to South Beach Road
- a connection from Merrijig Drive to a new signalised intersection at Surf Coast Highway/Coombes Road.

The 2012 ODP is reproduced in **Figure 4** and the cross sections for Access Street (Level 2) and Connector Street (Level 1) are shown in **Figure 5** and **Figure 6**. The street hierarchy and design were informed by a traffic review undertaken TTM Consulting (2012).

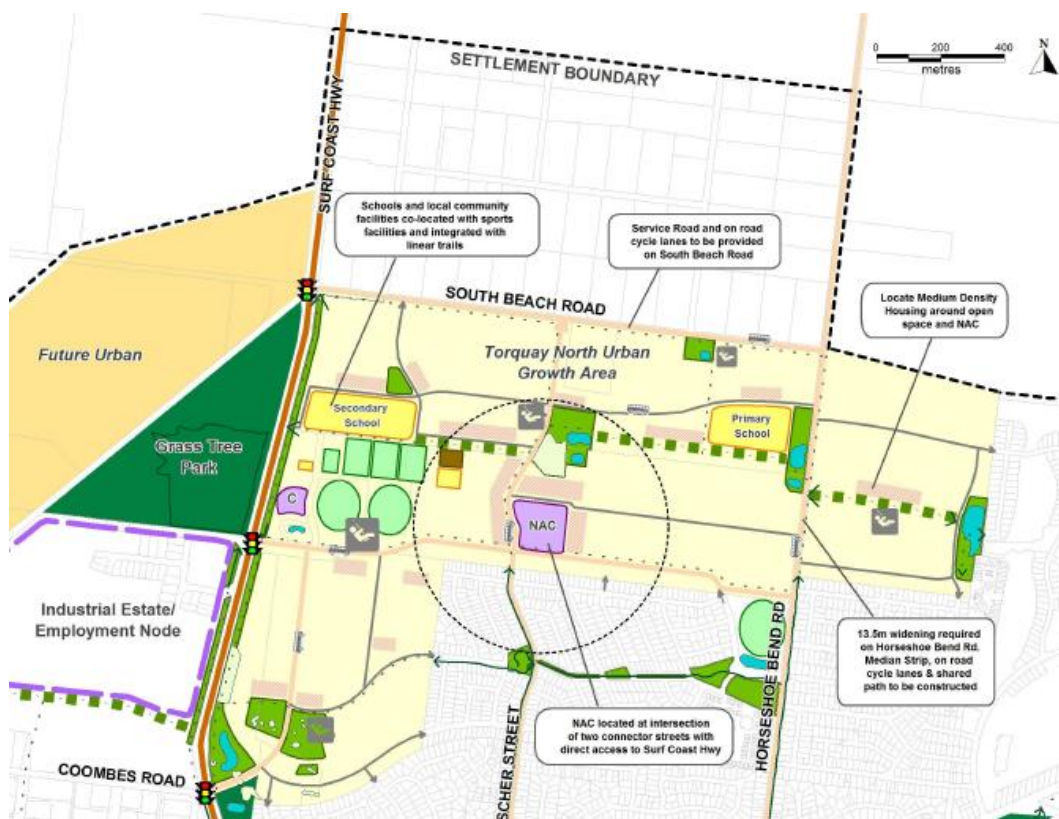


FIGURE 4: 2012 TORQUAY NORTH OUTLINE DEVELOPMENT PLAN

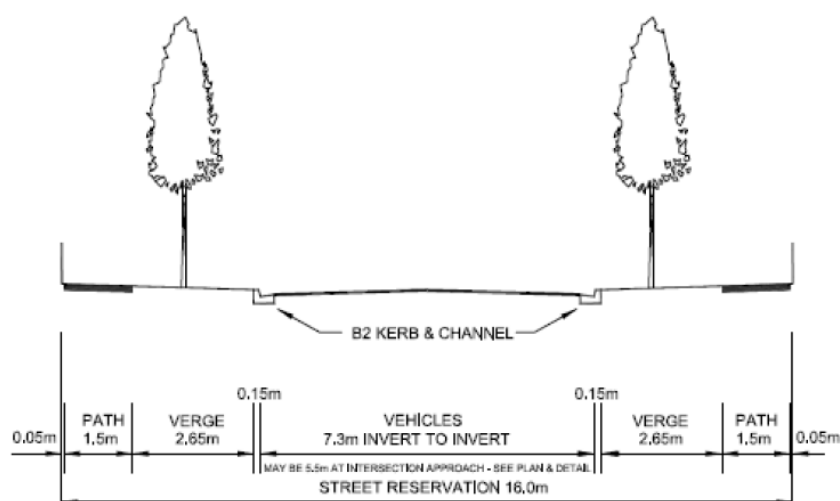


FIGURE 5: ACCESS STREET LEVEL 2 CROSS SECTION, TORQUAY NORTH ODP (2012)

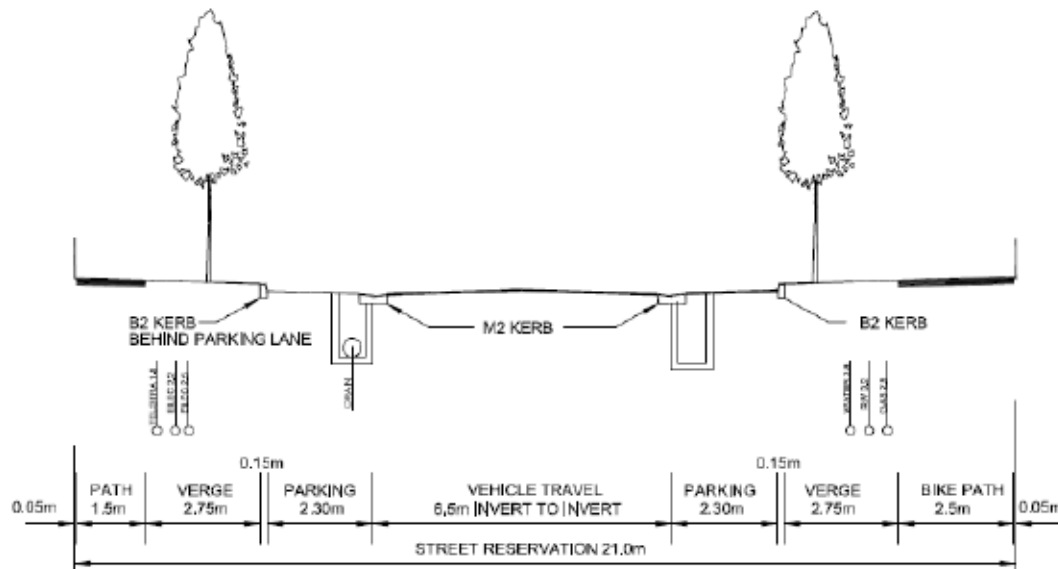


FIGURE 6: CONNECTOR STREET LEVEL 1 CROSS SECTION, TORQUAY NORTH ODP (2012)

It is noted that the projected traffic volumes shown in the ODP (prepared by TTM Consulting) have already been exceeded on key collector routes, with significant development still to occur.

3.1.4 Torquay Jan Juc Development Contributions Plan – Revised July 2017

The Torquay Jan Jun Development Contributions Plan (DCP) lists infrastructure items required to service Torquay and Jan Juc over time, and the calculated development contribution charges for all types of development based on anticipated share of usage.

Of relevance to this study, are the following road projects listed in the DCP:

- Upgrade and signalise the intersection of Surf Coast Highway and Coombes Road – this is scheduled for delivery within the next 12 months;
- Widen Fischer Street to 15m (parallel parking & bike lanes both sides between Beach Road and Zeally Bay Road & construct left turning lane at Fischer Street/Bristol Road intersection;
- Upgrade South Beach Road to connector road standard (urban south side/rural north side) (completed) and incorporate turning lanes at the Fischer Street T intersection.

Other projects listed in the DCP relevant to the study area have been constructed, for example, a roundabout at Horseshoed Bend Road/South Beach Road.

3.1.5 Sustainable Futures Plan Torquay – Jan Jun 2040, June 2014

The Torquay-Jan Juc 2040 Sustainable Futures Plan (SFP) is a high level strategic document that provides policy direction for the township's growth for 30 years. The SFP:

- sets a population target of 25,000-30,000 people by 2040;
- establishes most of the township's growth will be located in Torquay North; and
- provides overall guidance for all growth areas.

3.2 REFERENCE DOCUMENTS

3.2.1 Surf Coast Shire Road Management Plan 2017-21

The *Road Management Plan 2017-2021* sets out a hierarchy for the Municipal Road Network, based on functionality, traffic volumes, traffic type and accessibility. The road and pathway hierarchy classifications are reproduced in **Figure 7**.

Asset type	Road Hierarchy Classification	Road Hierarchy Description
Roads	Primary Collector	Provides a strategic link between arterial roads, suburbs, commercial areas, major housing areas or a defined destination. Access to tourist facilities or industrial centres and may include regional links. These roads carry the heaviest volumes of traffic.
	Secondary Collector	Provides connection into residential areas. These roads carry heavy volumes of traffic.
	Primary Access	Provides access to local residents or secondary access to commercial areas.
	Secondary Access	Provides secondary access to residential properties, or provides access to property (non-residential) only.
Asset type	Road Hierarchy Classification	Road Hierarchy Description
Pathways	Tracks	These tracks have little or no imported pavement material but are not closed to the public. They are infrequently used or dry weather or fire access only. These tracks are not maintained to a standard suitable for general public access and are excluded from the inspection and response requirements of the Road Management Plan. Council may undertake maintenance on nominated fire access tracks to allow access for fire fighting vehicles. This is done through specific agreement rather than under the Road Management Plan.
	Primary Pathway	Pathways, including shared pathways, providing direct access or adjoining to significant facilities such as Shopping Precincts / Aged Care Units / Schools / Kindergartens / Hospitals
	Secondary Pathway	Remainder of constructed pathway network

FIGURE 7: HIERARCHY CLASSIFICATIONS – REPRODUCED FROM SURF COAST SHIRE ROAD MANAGEMENT PLAN 2017-21

3.2.2 Infrastructure Design Manual

Surf Coast Shire utilises the Infrastructure Design Manual (IDM) to provide guidance for the design and development of infrastructure within the Shire. The IDM provides guidance on road/street characteristics and road reserve widths for urban developments including street type, indicative volume, carriageway width, road reserve width, parking provision and pedestrian/cyclist provision.

Of particular note, is the following street characteristics:

- Access street: Indicative volume 0-2,500 vpd, footpath both sides, no separate cycle provision
- Collector Street Level 1: Indicative volume 2,500-6,000 vpd, shared path both sides
- Collector Street Level 2: Indicative volume 6,000-12,000 vpd, shared path both sides

4 EXISTING CONDITIONS

4.1 LAND USE

The study area is primarily residential, although there are a number of other land uses that are significant activity generators, as follows:

- Surf Coast Shire Council offices
- Banyul Warri Fields and Wurdi Baierr Stadium, including ovals, soccer pitches, skate park and playground
- The Dunes Shopping Centre, including Woolworths and petrol station
- The Quay Reserve
- Lisieux Catholic Primary School
- Torquay Coast Primary School
- Surf Coast Secondary College
- 2 early learning centres

4.2 ROAD NETWORK

4.2.1 External road network

Surf Coast Highway

Surf Coast Highway provides access to Geelong and Melbourne from Torquay and surrounds and is a gateway to the Great Ocean Road. It is a primary arterial road under the management of the Department of Transport (DoT).

Surf Coast Highway provides two lanes in each direction separated by a central median. A signalised intersection at Merrijig Drive provides access to the study area.

As noted above, traffic signals will be installed at the intersection of Coombes Road in the next year. The eastern leg of the intersection, Rosser Boulevard, will also provide access to the study area.

A roundabout has recently been constructed at the intersection of South Beach Road.

Horseshoe Bend Road

Horseshoe Bend Rd runs parallel to Surf Coast Highway, connects to Armstrong Creek and provides an alternate route to South Geelong. It is a primary collector road (south of Blackgate Road) under the management of Council.

Horseshoe Bend Road, adjacent to the study area, provides one traffic lane and a

bicycle lane in each direction, separated by a central median. Median openings and turn lanes are provided at several intersections. Roundabouts are provided at Quay Boulevard and South Beach Road.

South Beach Road

South Beach Road connects Horseshoe Bend Road and Surf Coast Highway. It is a secondary collector road under the management of Council.

South Beach Road provides one traffic lane plus sealed shoulder in each direction. A 2.5m path is provided on the southern side of the road which may be appropriate for shared use.

Fischer Street

Fischer Street runs parallel to Surf Coast Highway and provides a connection from the study area to Torquay Central. Ultimately, Fischer Street will connect to South Beach Road at the northern end of the study area.

Fischer Street is a secondary collector road under the management of Council. South of the study area, it typically provides one traffic lane and a shared bicycle/parking lane in each direction.

4.2.2 Internal road network

The road network shown in Melway (refer Figure 1) reflects the existing constructed road network and proposed road network as per the approved Development Plans.

Most streets are classified as primary access or secondary access streets in Council's Register of Public Roads. Other street classifications are indicated in **Table 1**.

ROAD	CLASSIFICATION
Merrijig Drive, Surf Coast Highway to Quay Boulevard	Primary Collector
Merrijig Drive, Quay Boulevard to Horseshoe Bend Road	Secondary Access
Fischer Street, south of White Street	Secondary Collector
Quay Boulevard, Horseshoe Bend Road to Headland Drive roundabout	Secondary Collector
Quay Boulevard, Headland Drive roundabout to Sports Ground car park	Primary Access
Inshore Drive, Flinders Lane to Rosser Boulevard	Secondary Collector
Flinders Lane, Inshore Drive to Headland Drive	Secondary Collector
Stretton Drive, Horseshoe Bend Road to end	Secondary Collector
Rosser Street	Secondary Collector
Marine Drive, west of Scott Avenue	Primary Access
Marine Drive west of Offshore Drive	Secondary Access

TABLE 1: STREET CLASSIFICATIONS AS PER COUNCIL'S ROAD REGISTER

It is noted that the above road hierarchy classifications are not consistent with those represented in the current Melway. In particular, Melway indicates the following are local streets:

- Merrijig Drive
- Fischer Street, north of Centreside Drive
- Stretton Drive
- Inshore Drive, west of Fischer Street
- Rosser Boulevard

It is recommended that Council request Melway to update their street classifications to be consistent with Council's classifications. Otherwise, community expectations of road functionality and traffic volumes may be misinformed.

4.2.3 Merrijig Drive

Merrijig Drive currently provides the main access to the study area from Surf Coast Highway via a signalised intersection. It provides access to the Shire Offices, Banyul Warri Fields, Kurrambee Myaring Community Centre and The Dunes Village Shopping Centre.

Between Surf Coast Highway and Yallock Crescent, Merrijig Drive provides one traffic lane and a bicycle lane in each direction, separated by a central median. Angle parking is provided on the northern side adjacent to Banyul Warri Fields, and on the southern side adjacent to the Kurrambee Myaring Community Centre.

Between Yallock Crescent and Fischer Street, Merrijig Drive provides one traffic lane and a bicycle lane in each direction, with intermittent indented parking bays on each side of the street. It has a carriageway width of approximately 9.8m.

Between Fischer Street and Horseshoe Bend Road, Merrijig Drive provides one traffic lane in each direction with intermittent indented parking bays on each side of the street. It has a carriageway width of approximately 6.4m.

A roundabout is provided at the intersection of Merrijig Drive and Fischer Street.

4.2.4 Fischer Street

As noted above Fischer Street provides a connection from the study area to Torquay Central and will ultimately connect to South Beach Road.

North of Merrijig Drive, Fischer Street provides one traffic lane and a bicycle lane in each direction, with intermittent indented parking bays on each side of the street. It has a carriageway width of approximately 9.8m.

Between Merrijig Drive and Inshore Street, Fischer Street provides one traffic lane and a bicycle lane in each direction, with a carriageway width of approximately 11.4m.

Roundabouts are provided on Fischer Street at Merrijig Drive, Centreside Drive and Inshore Drive.

4.4 CASUALTY CRASH HISTORY

DoT casualty crash data for the five year period from July 2015 to June 2020 has been reviewed. The location and number of crashes is shown in **Figure 9**.



FIGURE 9: LOCATION OF CASUALTY CRASHES IN STUDY AREA, JULY 2015 TO JUNE 2020

It is noted that:

- 3 crashes have occurred at Horseshoe Bend Road/South Beach Road, all of which have occurred since the construction of a roundabout at the intersection in 2017. Two of the crashes involved a vehicle entering the roundabout from South Beach Road colliding with a northbound cyclist;
- 2 crashes occurred at Fischer Street/Merrijig Drive, both involving vehicles from adjacent directions. Both crashes occurred prior to the construction of a roundabout at the intersection in 2019; and
- 4 crashes occurred at South Beach Road/Surf Coast Highway, of which 3 involved vehicles from adjacent directions. All crashes occurred prior to the construction of a roundabout at the intersection in late 2019.

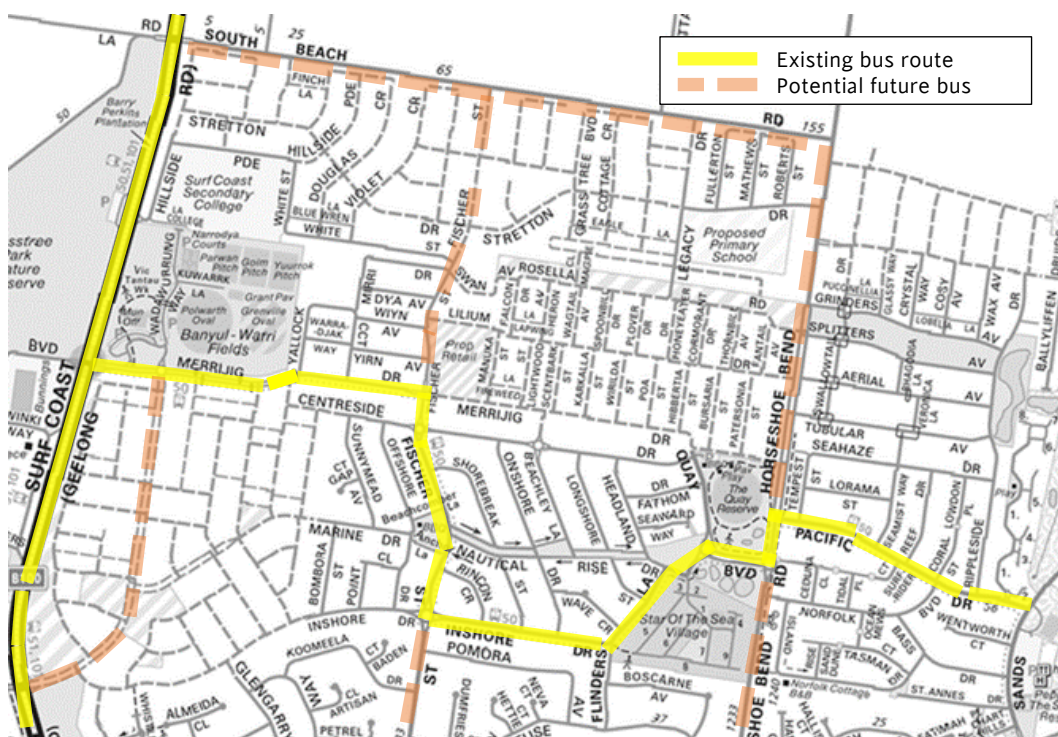
Crash details are provided in **Appendix B**.

4.5 BUS ROUTES

Local bus services operate within the study area along Route 50 between Surf Coast Highway and Sands Boulevard/The Esplanade, via Merrijig Drive, Fischer Street,

Inshore Drive, Horseshoe Bend Road and Pacific Drive. The existing bus route through the study area is shown in **Figure 10**.

DoT has indicated that future bus routes would like include Rosser Boulevard and potentially continue on Fischer Street to South Beach Road (also shown in **Figure 10**).



COPYRIGHT MELWAY PUBLISHING PTY. LTD. REPRODUCED WITH PERMISSION

FIGURE 10: EXISTING AND POTENTIAL FUTURE BUS ROUTES

4.6 PEDESTRIAN AND BICYCLE NETWORK

4.6.1 Principal Bicycle Network

Fischer Street and Merrijig Drive (between Surf Coast Highway and Fischer Street) are on the Principal Bicycle Network.

Merrijig Drive provides on-road bicycle lanes between Surf Coast Highway and Fischer Street.

Fischer Street provides:

- on-road bicycle lanes north of Merrijig Drive;
- marked kerbside lane between Beach Road and Riverside Drive which appears to be used as a shared parking/bicycle lane although, in most part, is not signed;
- marked kerbside lane between Zeally Bay Road and Beach Road, but not signed as a bicycle lane.

4.6.2 Path network

Paths within the study area comprise:

- 1.5m wide footpaths typically provided on each side of the streets within the study area, as per the street cross sections provided in the Torquay North ODP;

- 2.5m wide paths along Merrijig Drive (northern side), Marine Drive (southern side) and Stretton Drive (southern side);
- Paths (typically 2.5m wide) in/adjacent to park reserves, including:
 - Along the southern side of Banyul Warri Fields
 - Along the northern side of Banyul Warri Fields to Fischer Street
 - Through the reserve north of Splitters Avenue and Fantail Avenue
 - Around Quay Reserve, through Nautical Rise median reserve and around Pirate Park (north of Anchor Lane).

Paths are also provided along the eastern side of Surf Coast Highway, the southern side of South Beach Road and the eastern side of Horseshoe Bend Road.

Where 2.5m paths are provided within the study area, there is ambiguity with regard to their function. It is recommended that where paths are appropriately designed to function as shared paths, they should be signed for shared use to provide clarity to users. To be signed as shared paths, paths should be generally designed in accordance with the AustRoads *Guide to Road Design Part 6A: Paths for Walking and Cycling*. In particular, paths should have a minimum width of 2.5m, minimum clearance to adjacent obstacles of 0.5m (0.3m clearance to obstacles with a smooth surface), and adequate sight lines.

The 2.5m paths along Merrijig Drive (northern side), Marine Drive (southern side) and Stretton Drive (southern side) could be upgraded to shared paths by increasing the width to 3.0m to provide clearance to property boundaries and improve sight lines.

5 TRAFFIC PROJECTIONS

5.1 DEVELOPMENT OF TRAFFIC PROJECTIONS

Traffic projections for the road network have been developed based on:

- Full build out of the subdivisions within the study area;
- Completion of the road network as per the approved development plans;
- 10 years growth; and
- Peak and off-peak season variation.

The 'base' traffic volumes are the existing counts provided in Figure 8. These traffic counts are from 2019 tube counts where available to reflect, as closely as possible, traffic volumes in the study area as at January 2020 (i.e. pre-Covid conditions).

5.2 FUTURE DEVELOPMENT WITHIN THE STUDY AREA

5.2.1 Future development traffic generation

The likely traffic generated by future development within the study area has been determined based on the approved development plans and assumptions outlined below.

The analysis is based on the level of development at January 2020. Nearmap aerial photographs dated 19 September 2019 and 28 April 2020 have been used to determine the level of development in the study area. Houses constructed during that period were assumed to have been 50% occupied at January 2020.

The traffic generation assumptions are as follows:

- Standard residential dwellings generate 10 vehicle trips per household per day;
- Medium density dwellings generate 6 vehicle trips per household day;
- Residential dwelling occupancy is 90% (based on ABS data for Belmont which is considered to have similar characteristics); and
- An additional 10% of vehicle trips occur during the peak (summer/holiday) season.

Further assumptions have been made in relation to particular land uses within each development area. These are outlined in **Appendix C**.

5.2.2 Future development traffic distribution

It is apparent from the existing traffic counts on Merrijig Drive (at Surf Coast Highway) and Fischer Street (south of Inshore Drive) that the majority of existing traffic within the study area exits the area.

The majority of significant attractors within the study area are already established (e.g. The Dunes Shopping Centre, schools, sporting fields, Council offices etc.) and future development will be predominantly residential. Therefore, there is not expected to be significant shift in trip destinations. That is, the majority of trips for employment, retail and entertainment purposes will continue to be to/from destinations outside of the study area.

Given the above, the traffic distribution assumes that 70% of trips generated by future development within the study area will have an origin/destination external to the study area. The remaining 30% of trips will occur within the study area.

Internal trips

Internal vehicle trips are assumed to be distributed to the major attractors within the study area as follows:

- 50% of trips to/from The Dunes Shopping Centre and adjacent uses
- 15% of trips to/from the north-east, i.e. Torquay Coast Primary School/ childcare
- 25% of trips to/from the Civic Centre/Banyul Wari/secondary school
- 5% of trips to/from Lisieax Catholic Primary School
- 5% of trips to/from Quay Reserve

External trips

Existing traffic volume data (SCATS data) at Merrijig Drive/Surf Coast Highway indicates approximately 55% of traffic is to/from the north and 45% of traffic is to/from the south or west. Trips to/from the south and west also occur via Fischer Street.

With consideration to the above, external trips are assumed to be distributed to the surrounding road network as followings.

From study area north of Merrijig Drive:

- 45% of trips are to/from the north (eg. Melbourne/Geelong)
- 40% of trips are to/from Torquay Central
- 15% of trips are to/from Torquay west (eg. Grossmans Road/schools/surf shops)

From study area south of Merrijig Drive:

- 30% of trips are to/from the north
- 40% of trips are to/from Torquay Central
- 30% of trips are to/from Torquay west (including trips to/from Melbourne via Coombes Road)

Trips are assumed to be distributed to the surrounding road network as follows:

- Trips to/from the north (eg. Melbourne/Geelong) via Surf Coast Highway or Horseshoe Bend Road
- Trips to/from Torquay Central via Surf Coast Highway, Fischer Street or Horseshoe Bend Road
- Trips to/from the west via Coombes Road or Surf Coast Highway (i.e. to Coombes Road or Grossmans Road)

The overall distribution of external trips to/from each development area are shown in **Figure 11**.



FIGURE 11: DISTRIBUTION OF EXTERNAL TRIPS GENERATED FROM FUTURE DEVELOPMENT TO THE SURROUNDING ROAD NETWORK

The anticipated traffic generated by the additional development within the study area, for peak and off-peak season, distributed onto the road network is provided in Appendix D.

5.3 EXISTING TRAFFIC REDISTRIBUTION TO NEW ROAD NETWORK

Completion of the road network in North Torquay will realise the connection of Fisher Street to South Beach Road and Rosser Boulevard to Surf Coast Highway/Coombes Road. Significant redistribution of traffic to both roads are anticipated as Fischer Street will provide an alternative route for traffic from Torquay Central to Geelong (and

vice versa) and Rosser Boulevard will provide a connection to/from Coombes Road and the Geelong Ring Road.

The redistribution of existing traffic will comprise:

- internally generated traffic - within the study area and accessing the surrounding road network
- externally generated traffic - travelling through the study area.

A re-assignment of existing traffic to the proposed street network has been undertaken as follows:

- *Fischer Street* - a portion of traffic currently using Surf Coast Highway or Horseshoe Bend Road diverts to Fischer Street;
- *Rosser Boulevard / Coombes Road* - a portion of traffic currently using Darian Road or Merrijig Drive to/from the west diverts to Rosser Boulevard;
- *Stretton Drive (east of Fischer Street)* – a portion of traffic from the catchment east of Horseshoe Bend Road diverts from Merrijig Drive (western section) to Stretton Drive (western section).

The detailed traffic redistribution assumptions are provided in **Appendix E**.

5.4 TRAFFIC DISTRIBUTION IF INSHORE DRIVE NOT CONNECTED TO ROSSER BOULEVARD

It is understood that the connection of Inshore Drive to Rosser Boulevard may not be realised, or may be delayed for a number of years. If this is the case, traffic will utilise alternate routes, specifically:

- Marine Drive and Anchor Lane/Beachcomber Lane to Fischer Street;
- Marine Drive and Cook Avenue/Powell Street to Inshore Drive. It is likely that Cook Avenue will become the preferred route, being the last option for cars on Inshore Drive to access Marine Drive. It also has a straighter alignment than Powell Street and only one side street (i.e. less friction along route).

Traffic management treatments should be implemented to manage traffic on the above streets.

5.5 TRAFFIC GROWTH AND SEASONAL VARIATION

5.5.1 Background traffic growth

In addition to traffic generated by future development in Torquay North, there will be traffic growth associated with future development of neighbouring precincts (e.g. Armstrong Creek) and growth in visitation to Torquay.

To determine the likely background traffic growth in the precinct, traffic counts and current growth rates for Surf Coast Highway and Horseshoe Bend Road have been examined. The following growth factors for the next 10 years are assumed:

- *Surf Coast Highway* – 2% per annum. This is based on existing growth factors for Surf Coast Highway provided in the DoT open source data (1.7% northbound, 1.9% southbound).

- *Horseshoe Bend Road* –3.5% p.a. for Years 1 to 5, 3% pa for Years 5 to 10. This is based on very high traffic growth (10-15% p.a.) over the past 5 years but recognising that the rate of growth is slowing.
- *Fischer Street* – 1.7% p.a. This assumes a slightly lower growth rate than Surf Coast Highway.
- *South Beach Road* – 1.5% growth. This assumes a slightly lower growth rate than Fischer Street.

The above background growth factors have been applied to the road network for a period of 10 years.

5.5.2 Seasonal variation in traffic volumes

There is a significant increase in traffic volumes in Torquay generally during peak summer and holiday periods due to the influx of holiday makers and visitors. SCATS traffic volume data for Surf Coast Highway indicates peak holiday traffic volumes are 20% higher than typical (off peak) traffic volumes (based on August 2019 and January 2020 traffic volume data). The increase in traffic volumes during holiday periods on other roads is likely to be lower, around half or 10%.

As such, the following factors have been applied to the typical (off-peak) traffic volume projections to derive peak season traffic volume projections.

- *Surf Coast Highway* – 20%
- *Horseshoe Bend Road, Fischer Street, South Beach Road, Merrijig Drive* - 10%

5.6 PROJECTED TRAFFIC VOLUMES

The projected 2030 traffic volumes on the existing and proposed road network within and surrounding the study area have been determined based on the assumptions above. The projected traffic volumes are provided as follows:

Figure 12 - Full build out of Torquay North based on the approved development plans for the peak season

Figure 13 - Full build out of Torquay North based on the approved development plans for the off-peak season

Figure 14 - Full build out of Torquay North based on the approved development plans, but with no connection of Inshore Drive to Rosser Boulevard, for the peak season

Figure 15 - Full build out of Torquay North based on the approved development plans but with no connection of Inshore Drive to Rosser Boulevard, for the off-peak season

As detailed in Appendix C, the traffic generation of the proposed Torquay Community Hospital is assumed to be 2,000 vehicle trips per day, with vehicular access via Stretton Drive and South Beach Road. However, there is currently little detail available with regard to the size of the hospital or vehicular access arrangements. Therefore, there is likely to be some variability in traffic volumes on the road network in the vicinity of the hospital site.

[illegible]

21



FIGURE 14: 2030 PROJECTED TRAFFIC VOLUMES AT FULL BUILD OUT OF TORQUAY NORTH WITH NO CONNECTION OF INSHORE DRIVE – PEAK SEASON



FIGURE 15: 2030 PROJECTED TRAFFIC VOLUMES AT FULL BUILD OUT OF TORQUAY NORTH WITH NO CONNECTION OF INSHORE DRIVE – OFF-PEAK SEASON

5.7 SENSITIVITY ANALYSIS

A sensitivity analysis of the traffic projections has been undertaken to understand the potential variability of traffic volumes due to the assumptions in relation to traffic growth, dwelling occupancy, traffic patterns (within the study area and to external destinations), and redistribution of existing traffic to the new road network.

The projected traffic volumes above are based on conservative assumptions (i.e. worst case scenario). Additional analyses have been undertaken to understand the sensitivity of the traffic projections to the assumptions outlined below.

- Background traffic growth rate – lower growth rate of 0.8% assumed for Fischer Street
- Internal/external traffic split – fewer external trips, specifically 60% of trips generated by future development within the study area have an origin/destination external to the study area and the remaining 40% of trips occur within the study area;
- Distribution of internal trips – fewer trips to the activity centre, more trips to the civic/sports precinct and hospital;
- Residential dwelling occupancy – lower occupancy of 80% assumed (similar to ABS data for Torquay);
- Redistribution of existing traffic onto new road network - significantly reduced portion of existing traffic diverting from existing routes to Fischer Street assumed.

Projected traffic volumes (for peak season) based on the above assumptions are shown in **Figure 16**. This indicates the potential variability in traffic volumes that could be realised across the road network. Of particular note is the lower traffic volume projection for Fischer Street (approximately 3,000vpd lower north of Merrijig Drive) and the higher traffic projection for Merrijig Drive (approximately 1,400 vpd higher east of Surf Coast Highway).

The sensitivity analysis indicates the assumptions regarding the redistribution of existing traffic to the new road network has the greatest impact on the traffic projections. In reality, the redistribution of existing traffic to the new road network, and the distribution of new trips on the road network, will be reactive to the level of service offered by the various routes, i.e. Fischer Street, Merrijig Drive, Surf Coast Highway and Horseshoe Bend Road.

6 INFRASTRUCTURE ASSESSMENT

6.1.1 Surf Coast Highway / Merrijig Drive

6.1.2 Surf Coast Highway / Rosser Boulevard

6.1.3 Surf Coast Highway / South Beach Road

6.1.4 South Beach Road / Fischer Street

O'BRIEN TRAFFIC 21376 REP V5.DOCX: TOROUAY NORTH TRAFFIC AND INFRASTRUCTURE REVIEW : 25 OCTOBER 2021

The projected traffic volumes at this intersection would meet warrants for traffic signals (as per Table 3.11 of the *Austrroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management*).

However, based on Safe System alignment, a roundabout is the preferred intersection type. Roundabouts consistently perform closer to Safe System than conventional signalised and unsignalised intersections¹ and are considered a primary Safe System treatment. That is, a roundabout would practically eliminate the potential for fatal and serious injury occurring as a result of right-angle crashes.

It is noted that the 2007 Torquay/Jan Juc Transport Infrastructure Assessment recommended construction of a roundabout at the Fischer Street/South Beach Road intersection when traffic volumes on Fischer Street exceed 3,000 vpd. The traffic projections outlined above indicate that traffic volumes will significantly exceed this trigger point.

Provision of a roundabout at South Beach Road/Fischer Street would assist traffic entering/exiting Fischer Street, making Fischer Street a more attractive route, thereby discouraging the use of Stretton Street as an alternative route (i.e. rat-run).

6.1.5 South Beach Road / Stretton Drive

Anticipated turning movements would warrant provision of a channelised right turn lane (CHR) and an auxiliary left turn lane (AUL) on South Beach Road at Stretton Drive, in accordance with *AustRoads Guide to Traffic Management Part 6 Intersections, Interchanges and Crossings Management* (Figure 3.25). A right turn lane length of 100m (including 25m taper) is recommended in accordance with the *AustRoads Guide* for an 80 km/h speed zone (SIDRA analysis does not indicate additional right turn storage would be required).

Anticipated traffic volumes at this intersection should be reviewed as part of a traffic impact assessment of the proposed Community Hospital development. Additional traffic using Stretton Drive to access the hospital would likely require a longer turn lane on South Beach Road or more significant treatment of the intersection, eg. roundabout.

6.1.6 South Beach Road/Legacy Drive

Similarly, anticipated traffic volumes would warrant provision of a channelised right turn lane (CHR) and an auxiliary left turn lane (AUL) on South Beach Road at Legacy Drive, in accordance with *AustRoads Guide to Traffic Management Part 6 Intersections, Interchanges and Crossings Management* (Figure 3.25).

6.1.7 South Beach Road / Horseshoe Bend Road

The existing roundabout at South Beach Road/Horseshoe Bend Road will cater for the projected traffic volumes following full development of the study area.

However, the review of crash data identified an issue with cyclist safety at the new roundabout. In particular, two crashes involved northbound cyclists being struck by

¹ *Austrroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management*

vehicles entering the roundabout from South Beach Road. To improve safety for cyclists at the roundabout it is recommended that:

- A raised platform be provided on the South Beach Road approach to the roundabout to further reduce vehicle speeds prior to entering the roundabout.
- The shoulder on the South Beach Road western approach be marked as a bicycle lane, with green pavement, to highlight potential presence of cyclists; and
- A semi-mountable annulus be provided around the central island to reduce the circulating carriageway width and vehicle speeds through the roundabout, without impacting turning movements for larger vehicles.

6.1.8 Horseshoe Bend Road intersections

Existing right turn lanes on Horseshoe Bend Road are anticipated to accommodate right turn movements into side streets. No changes to existing intersection layouts are proposed.

The review of crash data indicated a number of crashes have occurred involving cyclists on Horseshoe Bend Road being struck by a vehicle exiting the side road. It is noted the southbound bicycle lane that at Pacific Drive has a green pavement. Similar treatment could be provided at other side streets along Horseshoe Bend Road to highlight the bicycle lane and potential presence of cyclists.

6.2 EXTERNAL ROAD CROSS SECTIONS

6.2.1 South Beach Road

South Beach Road has been recently upgraded and its cross section will continue to cater for projected traffic volumes. Intersection treatments will be required at intersections along South Beach Road as discussed above.

Minimum 0.3m (and desirably 0.5m) clearance should be provided between the shared path along the southern side of the road and property fences. Consideration should be given to design of shared path crossings at intersections. These could be provided as raised crossings with priority for shared path users.

6.2.2 Horseshoe Bend Road

The cross section of Horseshoe Bend Road will continue to cater for projected traffic volumes. It is noted that the lack of parking opportunities in some sections may result in parking occurring on-road in the bicycle lane. This would significantly impact operation of the bicycle lane and safety for cyclists. This should be monitored and if parking is observed in the bicycle lane *No Stopping* signs should be erected and/or alternate parking opportunities provided, such as indented parking bays (as provided elsewhere along Horseshoe Bend Road).

6.2.3 Fischer Street

The Fischer Street cross section between Inshore Drive and Beach Road varies between approximately 10.3m and 11.5m and provides a separate traffic lane and parking/bike lane in each direction. While the cross section will accommodate projected vehicle flows satisfactorily, the level of service for cyclists is poor. Desirably bicycle lanes would be provided separate to the parking lane. It is recommended

opportunities for cyclist provision be investigated.

Between Beach Road and Zeally Bay Road, there are works currently underway to widen the eastern side of the street and formalise 90° parking adjacent to the park. The plans (dated 11 Nov 2020) show 5.6m indented 90° parking plus 1.6m clearance on the eastern side, 2 x 3.0m through lanes, and a 2.1m parking lane on the western side. The proposed works will improve traffic flow, as the northbound through lane will no longer be impacted by parked cars, however there is no specific provision for cyclists. (The 1.6m clearance on the eastern side would likely function as a bicycle lane, although would not be signed as a bike lane according to the plans).

South of Zeally Bay Road, the carriageway reduces further and there is no specific provision for cyclists, although the 40 km/h speed limit makes it more palatable for cyclists to share the road space. Parking could be banned except where provided in indented bays.

6.3 KEY INTERNAL INTERSECTIONS

6.3.1 Merrijig Drive / Fischer Street

SIDRA analysis has been undertaken for the existing roundabout at the Merrijig Drive/Fischer Street intersection. The results are provided in **Appendix F**.

Based on the projected traffic volumes for the off-peak season, the SIDRA analysis for the critical PM peak hour indicates:

- The roundabout would operate with a DoS of 0.86;
- Fischer Street northern leg would have a 95th percentile queue length of 120m (approximately 17 vehicles) and average delay of 12 seconds;
- Fischer Street southern leg would have a 95th percentile queue length of 52m and average delay of 9 seconds;
- Merrijig Drive eastern leg would have a 95th percentile queue length of 52m and average delay of 26 seconds; and
- Minimal queuing and delay on Merrijig Drive western leg.

Based on the projected traffic volumes for the peak season, the SIDRA analysis for the critical PM peak hour indicates:

- The roundabout would operate with a DoS of 0.95;
- Fischer Street northern leg would have a 95th percentile queue length of 217m (approximately 30 vehicles) and average delay of 19 seconds;
- Fischer Street southern leg would have a 95th percentile queue length of 73m and average delay of 11 seconds;
- Merrijig Drive eastern leg would have a 95th percentile queue length of 106m and average delay of 66 seconds; and
- Merrijig Drive western leg would have a 95th percentile queue length of 24m and average delay of 12 seconds.

While long queues could be expected on Fischer Street north, particularly during peak holiday season, constraints at the site preclude any significant improvement to the existing roundabout design. Based on the SIDRA analysis, the anticipated operation of the roundabout is considered satisfactory and would not warrant upgrade to signals. (In any case, a signalised intersection would not provide improved operation given the intersection layout achievable within the site constraints).

Based on the SIDRA analysis above, queuing and delays on the northern, eastern and, to lesser extent, southern legs of the roundabout during peak periods could encourage rat-running in nearby streets, in particular Yallock Circuit, Falcon Drive-Manuka Street and Centreside Drive. This should be monitored and traffic calming measures provided in affected streets if required. For example, speed humps could be provided to slow and deter through traffic in Centreside Drive, Falcon Drive, and Manuka Street. A road closure could be considered for Yallock Circuit near its eastern intersection with Merrijig Drive, although this would require further assessment of the traffic implications.

It is likely that as queuing and delays on Fischer Street increase, some traffic that has redistributed to Fischer Street from other roads (eg. from Surf Coast Highway) would return to their previous routes. Other traffic may re-route to Surf Coast Highway or Horseshoe Bend Road. That is, there will be a natural 'balancing' of traffic amongst the various routes, particularly during peak periods. Therefore, it is likely that the Merrijig Drive/Fischer Street roundabout would perform better than suggested above.

Pedestrian crossing movements at the roundabout, in particular Fischer Street, will become more difficult as traffic volumes increase. Provision of priority crossings for pedestrians at the roundabout would likely result in unacceptable queuing and delays for vehicles. Given the likely pedestrian crossing demand on Fischer Street near the shopping centre, provision of pedestrian operated signals (POS) near the entrance to the shopping centre (i.e. north of Merrijig Drive) could be considered.

SIDRA analysis indicates POS on Fischer Street near the entrance to the shopping centre would operate satisfactorily in the PM peak during the off-peak season, although the queue length on the northern approach would be approximately 150m, with an average delay of 34 seconds. The operation of the roundabout would improve slightly, particularly for vehicles on the eastern and southern approaches.

However, during peak season, queue lengths on the northern approach to the POS would blow out to more than 400m, if the projected traffic volumes in Section 5.6 are realised. In reality, this is unlikely to eventuate as some traffic would avoid Fischer Street and re-route to Surf Coast Highway or Horseshoe Bend Road. If there was a redistribution of 150vph from the northern approach, the queue length on the northern approach would be approximately 160m.

Nonetheless, it is recommended that further analysis be undertaken prior to implementing POS, based on actual traffic volumes as development occurs and the road network is completed.

6.3.2 Fischer Street / Stretton Drive

The development plan shows a cross intersection at Fischer Street/Stretton Drive. Untreated cross intersections have a poor history of cross intersection type crashes.

Given the anticipated traffic volumes at this location, it is highly likely that cross intersection type crashes would result if the intersection was untreated.

A roundabout is recommended at the intersection to control traffic movements. A roundabout is a primary Safe System treatment and would provide speed control for Fischer Street. A roundabout would also be consistent with other intersection treatments along Fischer Street.

It is noted that the projected traffic volumes at this intersection meet the warrants for traffic signals (as per Table 3.11 of the *Austrroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management*).

6.3.3 Fischer Street / Centreside Drive

The existing roundabout at Fischer Street / Centreside Drive will accommodate projected traffic volumes, although increased queueing and delays on Fischer Street are anticipated.

6.3.4 Fischer Street / Inshore Drive

The existing roundabout at Fischer Street / Inshore Drive is also anticipated to accommodate project traffic volumes.

6.3.5 Rosser Boulevard / Marine Drive

Marine Drive and McFarlane Street intersect with Rosser Boulevard at an offset cross intersection. The layout of the intersection, with a wide median opening, results in a large area within the intersection with little delineation and turning/cross movement paths not well defined.

Significant turning movements are anticipated between the southern and eastern legs, particularly up until Inshore Drive is connected to Rosser Boulevard. Turning movements at the intersection could be better defined and conflict points reduced to reduce the risk of intersection crashes. This could be achieved by extending the northern median on Rosser Boulevard and restricting movements to/from McFarlane Street to left in/left out only, as shown in **Figure 17**.

If the connection between Inshore Drive and Rosser Boulevard is not constructed before full build out, the median could be modified to provide a right turn lane to better accommodate right turn movements into Marine Parade (also shown in Figure 17). A 14m right turn lane (plus taper) would allow two vehicles to store clear of the northbound lane.

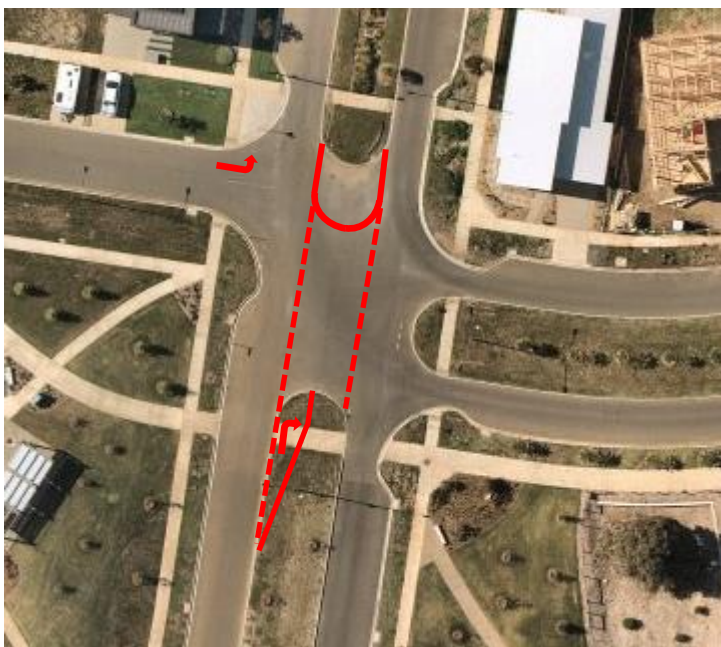


FIGURE 17: PROPOSED MEDIAN EXTENSION AND RIGHT TURN LANE ON ROSSER BOULEVARD AT MARINE PARADE AND LEFT IN/LEFT OUT AT MCFARLANE STREET

6.3.6 Rosser Boulevard / Inshore Drive

When Inshore Drive is connected to Rosser Boulevard, there will be significant turning movements to/from Rosser Boulevard (west). The current intersection layout allows 1-2 cars to store in the median to turn right into Inshore Drive. Any additional right turning vehicles will block the northbound through lane of Rosser Boulevard. This is undesirable given the proximity to the proposed signalised intersection at Surf Cost Highway and may increase the risk of rear end crashes.

The median on Rosser Boulevard could be modified to provide a right turn lane into Inshore Drive. A 14m right turn lane (plus taper) would allow two vehicles to store clear of the northbound lane. This would require the path across Rosser Boulevard (west of intersection) to be relocated.



FIGURE 18: PROPOSED RIGHT TURN LANE ON ROSSER BOULEVARD AT INSHORE DRIVE

6.4 TRAFFIC MANAGEMENT TREATMENTS

6.4.1 *Stretton Drive*

Stretton Drive will provide an attractive traffic route to/from South Beach Road and Horseshoe Bend Road and may provide access to the proposed Torquay Community Hospital. Stretton Drive may also be a future bus route.

Long sections of relatively straight alignment will be conducive to speeding. There are also several existing/proposed cross intersections along Stretton Drive that are undesirable. Typically, cross intersections have a higher risk of right-angled crashes than T-intersections due to line of sight issues and the number of conflict points.

It is recommended traffic management treatments be provided on Stretton Drive to improve safety, discourage through traffic and reduce vehicle speeds. Suggested treatments are as follows:

- Raised intersection at Cottage Crescent (see example in **Figure 19**);
- Blister island west of Grass Tree Boulevard (approximately midway between bends) (see example in **Figure 20**);
- Blister island between Fischer Street and Violet Crescent;
- Intersection treatment at Violet Crescent (e.g. mini roundabout, raised intersection);
- Re-align Douglas Crescent to avoid a cross intersection with Stretton Drive; and
- Intersection treatment at Hillside Parade (e.g. mini roundabout, raised intersection).



FIGURE 19: EXAMPLE OF
RAISED INTERSECTION



FIGURE 20: EXAMPLE OF BLISTER ISLAND

Where raised intersection platforms are provided, it is desirable to provide platform ramps at 1:15 to achieve the desired speed reduction.

If staggered T-intersections are provided, as per the North Torquay ODP (2012), the distance between streets should be at least 15m. Otherwise, cross traffic is likely to cut diagonally across the intersection and safety issues may eventuate.

6.4.2 Anchor Lane and Beachcomber Lane

Anchor Lane and Beachcomber Lane provide a direct route between Fischer Street and Marine Drive and have potential to carry significant volumes of traffic, particularly if Inshore Drive is not connected to Rosser Boulevard (or until such connection is constructed). This is particularly undesirable given the adjacent parkland and play spaces.

It is noted that a 'serious injury' pedestrian crash occurred at the intersection of Marine Drive and Offshore Drive, near the pedestrian access to the park, in 2015.

To reduce vehicle speeds, improve pedestrian safety and discourage traffic using this route the following traffic management treatments are recommended (also shown in **Figure 21**):

- a raised intersection treatment at Marine Drive/Offshore Drive/Anchor Lane; and
- a mid-block speed hump Anchor Lane and Beachcomber Lane.



FIGURE 21: PROPOSED RAISED INTERSECTION AT MARINE DRIVE/OFFSHORE DRIVE/ANCHORE LANE AND SPEED HUMPS ON ANCHOR LANE AND BEACHCOMBER LANE

6.4.3 Merrijig Drive

With increasing traffic volumes at the eastern end of Merrijig Drive, provision of a median island around the 90° bend north of Quay Boulevard would be desirable to control traffic movements and discourage vehicles cutting across the centreline, as shown in **Figure 22**. A median island would likely need to be mountable to accommodate larger vehicles.

Consideration could also be given to changing priority so that Merrijig Drive east - west vehicle movements have priority over vehicle movements to/from Quay Boulevard, consistent with the majority of traffic movement through this intersection. It is recommended that priority of the intersection be assessed at completion of the Dunes East Estate.



FIGURE 22: PROPOSED MEDIAN ISLAND ON MERRIJIG DRIVE NORTH OF QUAY BOULEVARD AND POTENTIAL CHANGE OF PRIORITY AT QUAY BOULEVARD

6.4.4 Cook Avenue and Powell Street

Until such time as Inshore Drive is connected to Rosser Boulevard (or if no connection eventuates), the majority of traffic between Fischer Street and Rosser Boulevard/Surf Coast Highway is expected to use Cook Avenue and/or Powell Street between Inshore Drive and Marine Drive. A strategy should be developed to manage through traffic on these streets.

It is likely that Cook Avenue would become the default through route. Traffic at the Cook Avenue/Inshore Drive intersection could be managed by providing priority to traffic movements between Cook Avenue and Inshore Drive east, as shown in **Figure 23**. A kerb outstand could be constructed using temporary spike down kerb, and then removed and priority reversed if/when Inshore Drive is connected.



FIGURE 23: PROPOSED TEMPORARY INTERSECTION TREATMENT AT INSHORE DRIVE/COOK AVENUE

With significant turning movements at the Cook Avenue/Marine Drive intersection, it is recommended that the northern median on Marine Drive be extended and movements to/from Dupree Street restricted to left in/left out, as shown in **Figure 24**.

This would reduce potential conflict points at the intersection and reduce the risk of intersection crashes. (Note the turn volume at Marine Drive/Cook Avenue will be approximately half of the turn volume at Rosser Blvd/Marine Drive. Given the speed environment and available storage within median opening, a right turn lane is not considered to be necessary at this location).



FIGURE 24: PROPOSED MEDIAN EXTENSION ON MARINE PARADE AT COOK AVENUE AND LEFT IN/LEFT OUT AT DUPREE STREET

To discourage traffic using Powell Street, speed humps are recommended. Speed humps could also be provided in Cook Street to control vehicle speeds.

6.4.5 Speed management

There are numerous streets within the precinct with long, straight sections which may be conducive to vehicle speeds that are higher than desirable for local streets. It is recommended that vehicle speeds be monitored and implementation of traffic management treatments be considered where 85th percentile speeds exceed 55km/h.

6.5 BICYCLE ROUTES

6.5.1 General

As noted in Section 4.6, bicycle facilities within the study area are limited to:

- on-road bicycle lanes on Merrijig Drive between Surf Coast Highway and Fischer Street;
- on-road bicycle lanes on Fischer Street, north of Merrijig Drive;
- on-road bicycle lanes on Horseshoe Bend Road;
- several sections of shared path through/adjacent to park reserves;
- shared paths along the eastern side of Surf Coast Highway, the southern side of South Beach Road and the eastern side of Horseshoe Bend Road.

The Dunes East and Quay 2 Outline Development Plans show shared paths through each subdivision as follows:

- Dunes Estate - Merrijig Drive and Bursaria Avenue

- Quay 2 Estate – McFarlane Street, Marine Parade and Scott Avenue

These paths have been constructed as 2.5m paths adjacent to property boundaries, with negligible offset. A 2.5m path is also provided along the southern section of the constructed portion of Stretton Drive.

While the above paths are provided in line with the cross sections given in the Torquay North ODP, there are risks when they function as shared paths, due to:

- negligible offset to property boundaries - fences, vegetation etc. located on the boundary results in inadequate clearance to the path;
- landscaping/fencing on private property blocking sightlines between cyclists and motorists exiting driveways; and
- the number/frequency of crossovers which increases risk.

6.5.2 Fischer Street

Desirably, Fischer Street would provide a continuous on-road bicycle facility between Torquay Central and South Beach Road.

As Fischer Street north is constructed, the cross section should provide on-road bicycle lanes, separated from on-street parking.

Opportunities should be investigated for provision of a bicycle facility south of Merrijig Drive. This would likely involve removal and/or indentation of on-street parking on one side of the street and should be done in consultation with the community. It is noted that the infrastructure projects listed in the Torquay-Jan Juc DCP includes widening of Fischer Street between Beach Rd and Zeally Bay Rd to 15m including bike lanes.

In the short term, sharrows could be provided at roundabouts and at the slow point at Highlander Street to remind motorists of the potential presence of cyclists.

6.5.3 Stretton Park Estate

A shared path could be provided through the linear open space in the southern portion of the Stretton Park Estate between Surf Coast Secondary College and Horseshoe Bend Road, and would connect with the existing path north of Splitters Avenue (on the eastern side of Horseshoe Bend Road). There is an existing crossing point on Horseshoe Bend Road at this location which could be widened and bicycle rails provided to cater for cyclists.

6.5.4 McFarlane Street - Marine Drive – Scott Avenue

As discussed above the 2.5m paths provided along McFarlane Street, Marine Parade and Scott Avenue present risks if used by cyclists. There are few opportunities to provide a safe, bicycle route through Quay 2 estate.

McFarlane Street and Scott Avenue will have low traffic volumes and could be on-road bicycle routes, with cyclists sharing the road space, if traffic speeds can be controlled to 30 km/h (i.e. to align with Safe System risk levels). Bicycle stencils could be provided on the road to support the bicycle route.

Marine Drive, however, is not appropriate for on-road cycling, given anticipated traffic volumes (particularly if Inshore Drive is not connected) and the carriageway width. That is, the available carriageway width between the median and parked cars/kerb outstands is approximately 3.5m which does not allow a car to safely pass a cyclist.

To provide a cycling link along Marine Drive, the following options could be considered:

- Relocate the path on the southern side of the street to 1.0m behind the back of kerb. This would provide adequate clearance to fences etc. on private property, improve sightlines between cyclists and motorists exiting driveways, and provide a buffer to cars parked on-street. This would impact existing trees.
- Ban on-street parking, remove kerb outstands and provide on-road bicycle lanes. Indented parking bays could be provided to cater for some parking.
- Re-configure the median to provide a shared path (similar to the shared path in the Nautical Rise median). Again, this would impact existing trees. The median openings are problematic and further consideration is required to provide a suitable solution. At least one median opening could be closed (e.g. at Hosick Avenue).

6.5.5 Nautical Rise

A 2.4m path is provided in the Nautical Rise median. Although slightly narrower than the desirable width of 2.5m, the path is considered appropriate for shared use. Raised shared path crossings could be provided at Onshore Drive and Headland Drive to slow vehicles and provide priority for shared path users.

6.5.6 Surf Coast Highway shared path

It is understood the shared path along the southern side of South Beach Road will be connected to the shared path on the eastern side of Surf Coast Highway.

Similarly, the shared path on the eastern side of Surf Coast Highway/western side of Bright Street will be continued through the Quay 2 estate to facilitate a connection with the shared path further south.

6.6 CHANGES TO ROAD HIERARCHY

Based on the projected traffic volumes and street function, changes to the road hierarchy for the study area are recommended, as outlined in **Table 2**.

ROAD	EXISTING CLASSIFICATION	RECOMMENDED CLASSIFICATION
Merrijig Drive, Quay Boulevard to Horseshoe Bend Road	Secondary Access	Secondary Collector
Fischer Street, north of Stretton Drive	N/A	Secondary Collector
Fischer Street, south of Stretton Drive	Secondary Collector	Primary Collector
Stretton Drive, east of Fischer Street	N/A	Secondary Collector
<i>When Inshore Drive connects to Rosser Boulevard</i>		
Inshore Drive, Flinders Lane to Rosser Boulevard	Secondary Collector	Secondary Collector
<i>If Inshore Drive not connected to Rosser Boulevard before full build out of precinct</i>		
Inshore Drive, west of Cook Avenue	Secondary Collector	Secondary Access
Cook Avenue	Secondary Access	Secondary Collector
Marine Drive, west of Cook Avenue	Primary Access	Secondary Collector

TABLE 2: RECOMMENDED CHANGES TO ROAD HIERARCHY

As noted in Section 4.2.2, it is recommended that Council request Melway to update their street classifications to be consistent with Council's classifications. Otherwise, community expectations of road functionality and traffic volumes may be misinformed.

7 RECOMMENDATIONS, TIMING AND PRIORITIES

A plan of the recommended treatments is provided in **Appendix G**.

Table 3 provides a summary of the recommended treatments, along with the recommended timing of implementation and priorities.

Table 4 lists the additional treatments recommended if Inshore Drive is not connected to Rosser Boulevard before full build out of the precinct, the recommended timing and priorities.

#	LOCATION	TREATMENT	TIMING	PRIORITY
1	South Beach Rd/Fischer St	Roundabout	By completion of Stretton Park Stage 12	High
2	South Beach Rd at Stretton Dr	Right turn (CHR) and left turn (AUL) lane treatments	By completion of Stretton Park Stage 17	High
3	South Beach Rd at Legacy Dr	Right turn (CHR) and left turn (AUL) lane treatments	By completion of Stretton Park Stage 8	Medium
4	South Beach Rd/Horseshoe Bend Rd	Bicycle lane and raised platform on west approach, mountable annulus	1-2 years	High
5	Fischer St/Stretton Dr	Roundabout	When intersection constructed	High
6	Stretton Dr LATM treatments Cottage Cr intersection West of Grass Tree Rd East of Violet Cr Violet Cr Hillside Pde	Raised intersection Mid-block blister island Mid-block blister island Intersection treatment Intersection treatment	Stretton Park Stage 10 Stretton Park Stage 10 As Stretton Drive constructed As Stretton Drive constructed As Stretton Drive constructed	
7	Fisher St, north of Merrijig Dr	Pedestrian operated signals subject to further analysis	Post connection of Fischer Street to South Beach Road	Medium
8	Rosser Bd/Inshore Dr	Right turn lane	When Inshore Drive connected	Medium
9	Rosser Bd/Marine Dr	Extend median	When Rosser Blvd/Surf Coast Hwy intersection constructed	Medium
10	Anchor Lane, Beachcomber Lane	Speed humps (one per street)	When Rosser Blvd/Surf Coast Hwy intersection constructed	Medium
11	Marine Drive/Offshore Drive /Anchor Lane	Raised intersection	When Rosser Blvd/Surf Coast Hwy intersection constructed	Medium

12	Merrijig Drive at Quay Blvd	Median island on bend Review intersection priority and alter if required	At completion of the Dunes East Estate	Medium
13	Onshore Dr at Nautical Rise Headland Dr at Nautical Rise	Raised shared path crossings	1-2 years	Low
14	Fischer St	Ensure separate bicycle lanes continued north of Mirri Drive Investigate options for bicycle facility south of Merrijig Drive	As Fischer St constructed 1-2 years	High High
15	Stretton Park linear parkland	Shared path	By completion of Stretton Park	Medium
16	Quay 2 Estate	Reconsider bicycle route	By completion of Quay 2	Medium
17	General	Update road classifications in Council's Register of Public Roads and inform Melway	Yearly	Medium

TABLE 3: SUMMARY OF RECOMMENDED TREATMENTS, TIMING AND PRIORITIES

#	LOCATION	RECOMMENDATION	TIMING	PRIORITY
18	Rosser Bd/Marine Dr	Modify median and provide right turn lane into Marine Dr	When Rosser Blvd/Surf Coast Hwy intersection constructed	Medium
19	Marine Dr/Cook Ave	Extend median, left in/left out at Dupree St	When Rosser Blvd/Surf Coast Hwy intersection constructed	Medium
20	Inshore Dr/Cook Ave	Intersection priority treatment (could be implemented as a temporary treatment until Inshore Drive is connected, e.g. using temporary kerb)	When Rosser Blvd/Surf Coast Hwy intersection constructed	High
21	Powell St and Cook Street	2 speed humps per street	When Rosser Blvd/Surf Coast Hwy intersection constructed	High

TABLE 4: ADDITIONAL TREATMENTS RECOMMENDED IF INSHORE DRIVE NOT CONNECTED BEFORE FULL BUILD OUT OF PRECINCT, TIMING AND PRIORITIES

APPENDIX A

CURRENT DEVELOPMENT PLANS

**STRETTON PARK
ZEALLY SANDS ESTATE
THE DUNES EAST
THE DUNES WEST
QUAY 2 ESTATE**

Signed [Signature]
for and on behalf of the Council of the Surf Coast Shire
Date: 7/3/2017 Sheet No. 1 of 4 sheets.



PLANNING
DEPARTMENT

willana
associates
urban planning and project management



OPEN SPACE				
DESCRIPTION	AREA (ha.)	APPORTIONED CREDIT	EQUIVALENT AREA (ha.)	% OF SITE AREA
TOTAL SITE AREA	37.94	—	—	
OPEN SPACE ①	0.483	100%	0.483	1.27%
OPEN SPACE ②	0.367	100%	0.367	0.97%
OPEN SPACE ③	1.918	100%	1.918	5.06%
OPEN SPACE ④	0.312	100%	0.312	0.82%
ENCUMBERED SPACE ⑤	0.965	50%	0.483	1.27%
TOTAL OPEN SPACE (INCL. DRAINAGE)	4.045	-	3.563	9.39%

* Areas based on TGM drawing No. 003134-202B (CIVIL) WETLAND PUBLIC OPEN SPACE REV03.

LEGEND

ROADS

- ACCESS STREET LEVEL 2
- ACCESS PLACE / PARK EDGE
- REAR ACCESS LANE
- ST GEORGES WAY

PROPOSED SUBDIVISION

- RESIDENTIAL DENSITY
- MEDIUM DENSITY
- POTENTIAL FUTURE CONNECTION
- LOTS REQUIRING FENCING & SITING CONTROLS VIA RESTRICTION ON THE PLAN OF SUBDIVISION

FEATURES

- RESERVE / PUBLIC OPEN SPACE
- BIKE TRAIL & FOOTPATH
- WATER SENSITIVE URBAN DESIGN
- 400m PEDESTRIAN CATCHMENT TO OPEN SPACE
- GARBAGE COLLECTION POINT
- TELECOMMUNICATION COMPOUND
- ELECTRICITY KIOSK

LOT TABLE

< 400m ²	25 LOTS
400m ² - 499m ²	102 LOTS
500m ² - 599m ²	201 LOTS
600m ² - 699m ²	94 LOTS
700m ² - 799m ²	8 LOTS
800m ² +	5 LOTS
3612m ²	1 LOT
TOTAL	436 LOTS

DENSITY

DESCRIPTION	RESIDENTIAL DENSITY	MEDIUM DENSITY
TOTAL LOTS	410	25
DEVELOPABLE AREA	30.94 ha.	0.64 ha.
DENSITY	13.40 LOTS/ha.	33 LOTS/ha.

Project Name **HORSESHOE BEND ROAD TORQUAY**

Drawing Title **PROPOSED DEVELOPMENT PLAN**

Level Datum -
Contour Interval -
Date of Survey -
Surveyed By -
Drawn By AD
Date Drawn 10/05/2016
Scale 1:2500 @ A2

SCALE 0 25 50 75 100 125 LENGTHS ARE IN METRES

Licensed Surveyor Approved

Project Ref. 14425 Sheet No. 1 of 1 Rev. 01



NOTATIONS

This plan was prepared as a proposed subdivision to accompany a permit application to the Surfcoast Shire and should not be used for any other purpose. The total number of lot's shown hereon are subject to field survey and also to the requirements of Council and any other authority which may have requirements under any relevant legislation. In particular, no reliance should be placed on the information on this plan for any financial dealings involving the land. This note is an integral part of this plan.

COPYRIGHT These drawings, plans and specifications and the copyright therein are the property of the St. Quentin consulting and must not be used, reproduced or copied wholly or in part without the written permission of St. Quentin consulting.

Rev	Description	Date
01	Plan based on existing records	10/05/2016

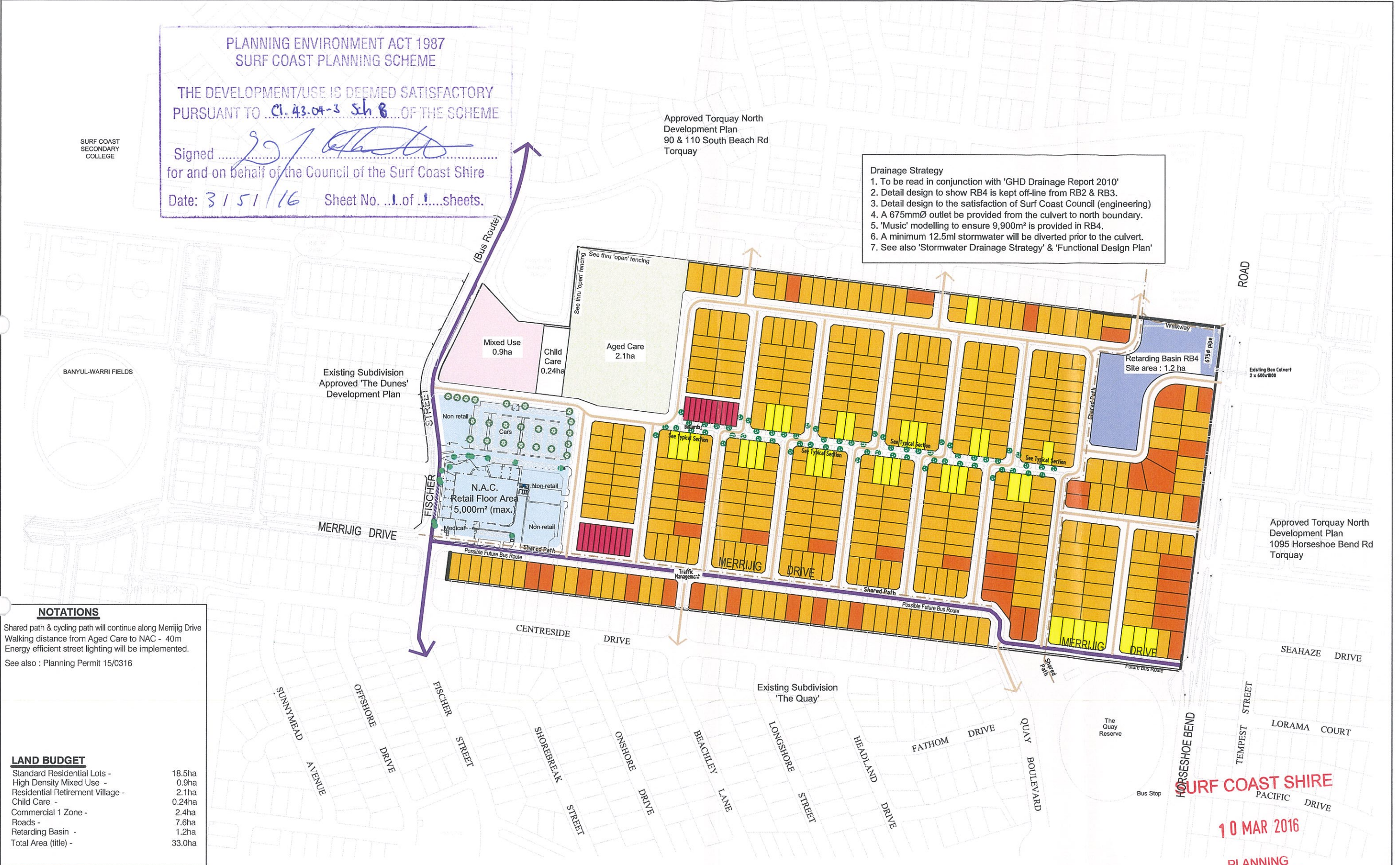
PLANNING ENVIRONMENT ACT 1987
SURF COAST PLANNING SCHEME

THE DEVELOPMENT/USE IS DEEMED SATISFACTORY
PURSUANT TO CL 43.04-3 Sch B OF THE SCHEME

Signed [Signature]
for and on behalf of the Council of the Surf Coast Shire
Date: 31/5/16 Sheet No. 1 of 1 sheets.

Approved Torquay North
Development Plan
90 & 110 South Beach Rd
Torquay

- Drainage Strategy
1. To be read in conjunction with 'GHD Drainage Report 2010'
 2. Detail design to show RB4 is kept off-line from RB2 & RB3.
 3. Detail design to the satisfaction of Surf Coast Council (engineering)
 4. A 675mmØ outlet be provided from the culvert to north boundary.
 5. 'Music' modelling to ensure 9,900m³ is provided in RB4.
 6. A minimum 12.5ml stormwater will be diverted prior to the culvert.
 7. See also 'Stormwater Drainage Strategy' & 'Functional Design Plan'



NOTATIONS

Shared path & cycling path will continue along Merrijig Drive
Walking distance from Aged Care to NAC - 40m
Energy efficient street lighting will be implemented.
See also : Planning Permit 15/0316

LAND BUDGET

Standard Residential Lots -	18.5ha
High Density Mixed Use -	0.9ha
Residential Retirement Village -	2.1ha
Child Care -	0.24ha
Commercial 1 Zone -	2.4ha
Roads -	7.6ha
Retarding Basin -	1.2ha
Total Area (title) -	33.0ha

No	Date	Description
A	08.11.11	Development Plan Application
B	08.12.11	Lot A (old school site) removed, replaced by lots; Retarding basins added.
C	03.02.12	Retail area removed from Plan
D	20.08.12	Retail area added to Plan
E	06.06.14	Retirement Village added to Plan
F	26.07.14	Additional notes in response to Council's RFI
G	26.07.14	Further additional notes in response to Council's further requests
H	19.02.15	Minor refinements for Council
I	06.03.15	Re-locate Aged Care near NAC
J	08.04.15	Re-orientate retarding basin; fit road access to existing HSB construction.
K	02.11.15	Response to Council's RFI letter dated 14 August 2015.
L	02.03.16	Response to further discussions with Council. Move Child Care

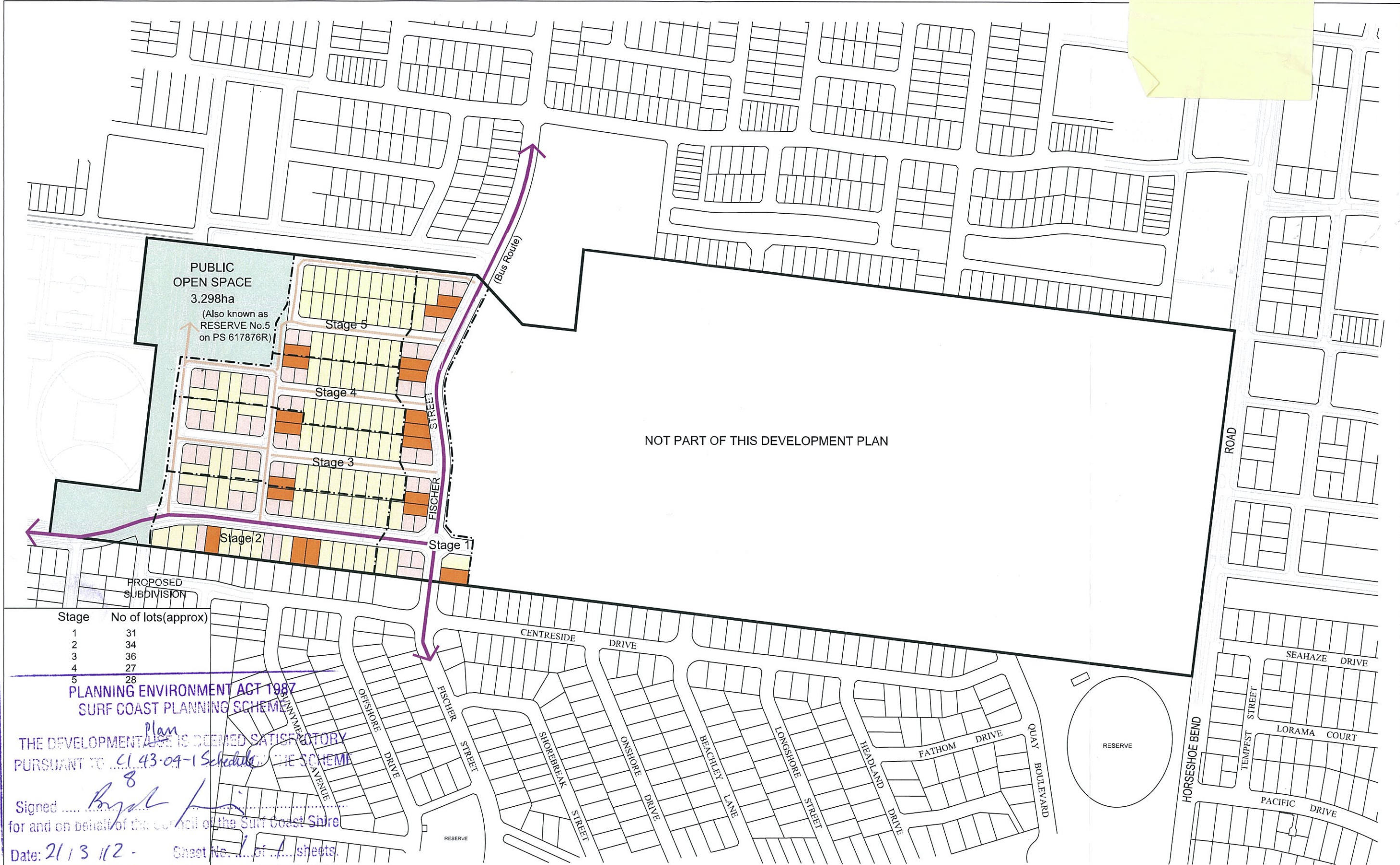
Legend

Terrace Lots (less than 300m²) -	20 lots	Retail - 5,000m² Floorspace
Compact Lots (301-500m² & frontage < 12m -	37 lots	High Density Multi-Level Apartments Subject to further Council Approval
Standard Lots (301-500m² & frontage > 12m -	336 lots	Local Access Street Level 1
Large Lots (over 500m²) -	43 lots	Local Access Street Level 2
Total: 436 lots (16 lots per hectare - indicative)		



Client	The Dunes, Torquay Pty. Ltd.		Address	1160 Horseshoe Bend Road TORQUAY 3228		Drawing Title	Development Plan [East]		
	Suite 20, The Clocktower, 255 Drummond Street, Carlton, 3063 Phone 9347 5655 e-mail: ldc@landevco.net.au						Planning Permit No. : 15/0316		
Project	The Dunes, Torquay		Drawn	Scale	Date	Project No.	DWG No.	Issue No.	
			mct	1:2000 @ A1	02.03.16	2782		N	

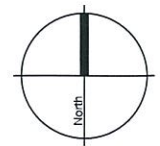
SURF COAST SHIRE
10 MAR 2016
PLANNING DEPARTMENT



Stage	No of lots(approx)
1	31
2	34
3	36
4	27
5	28

PLANNING ENVIRONMENT ACT 1987
SURF COAST PLANNING SCHEME
THE DEVELOPMENT IS DEEMED SATISFACTORY
PURSUANT TO 43-04-1 Schedule 8
Signed *[Signature]*
for and on behalf of the Council of the Surf Coast Shire
Date: 21/3/12 - Sheet No. 1 of 1 sheets.

Issued			Legend	
No	Date	Description		
A	08.11.11	Development Plan Application	Terrace Lots (less than 260m²) - 22 lots	Retail - 6300m² Floorspace
B	06.12.11	Lot A (old school site) removed & replaced by lots; Retarding basins added.	Compact Lots (260m² - 359m²) - 114 lots	High Density Multi-Level Apartments STCA: 110 Units (Approx)
C	03.02.12	Retail area removed from Plan	Standard Lots (360m² - 499m²) - 376 lots	Local Access Street Level 1
D	23.02.12	Area between Fischer Street & Horseshoe Bend Road removed from Plan	Large Lots (over 500m²) - 112 lots	Local Access Street Level 2
			Total: 624 lots	



Client The Dunes, Torquay Pty. Ltd. Suite 20, The Clocktower, 255 Drummond Street, Carlton, 3053 Phone 9347 5655 Fax 9347 5054 e-mail: ldc@cyberspace.net.au		Address 1160 Horseshoe Bend Road TORQUAY 3228		Drawing Title Development Plan		
Project The Dunes, Torquay	Drawn cd	Scale 1:4000 @ A3	Date 13.02.12	Project No. 2782	DWG No. 2	Issue No. D



This plan has been prepared for review and comment only and should not be used for any other purpose without the written consent of Reeds Consulting Pty Ltd. The plan is subject to survey, site and easement verification, engineering design, recommendations / and all other relevant authorities. All landscape and paving details shown herein are indicative only. No reliance should be placed on the information on this plan for detailed design or for any financial dealings involving the land.

For Numbered Trees Refer to Gallop & Associates Report of 17 June 2011 for additional information relating to trees proposed for retention.

Landscaping and kerbs shown herein are indicative only. The location of landscaping is indicative only and will be confirmed once the staging of the subdivision has been determined.

The locations of bicycle lanes, shared paths, footpaths, driveway @s and bus stops are indicative only and subject to engineering design and relevant authority approval.

Stage numbers are indicative only and may not indicate the sequence of the subdivision. Stage 1 is in separate ownership to Stages 2-16, so the timing of the stages is dependent upon the adjoining land owner.

Turning areas provided at on-through roads will be designed to meet the CMA Engineering Construction and Design Manual (or Substitutions).

The Subject Site is comprised of two Certificates of Title, being Lots A and B on PS1234567. This plan has been prepared in support of planning permit applications for subdivision and development.

Stages 8, 9, 10, 11 and 12 will be subject to future planning permit applications for subdivision and development.

The locations of the potential remaining areas of contamination shown are based on aerial photography from the Geospatial Associates reports.

OVERALL STATISTICS (STAGES 1-17)		
Site Area:	48.52	Ha
Tree Reserves:	1.540	Ha
Unencumbered Open Space (Drainage):	3.291	Ha
Private Open Space:	2.192	Ha
Medium Density (200):	2.554	Ha
Net Developable Area:	38.80	Ha
Area of Subdivision Road:	14.00	Ha
Area of Residential Land:	28.80	Ha
Net Yield (Conventional):	568	No.
Net Yield of Medium Density:	784	No.
Total Lot Yield:	1352	No.
Weighted Lot Area (Conventional):	485.12	m ²
Weighted Lot Area (Conventional):	34.0	No.
Units per hectare (Conventional):	14.5	No.

INTRAPARC ONLY STATISTICS (STAGES 1-16)		
Site Area:	45.52	Ha
Tree Reserves:	1.540	Ha
Unencumbered Open Space (Drainage):	3.291	Ha
Private Open Space:	2.192	Ha
Medium Density (200):	2.554	Ha
Net Developable Area:	38.80	Ha
Area of Subdivision Road:	14.00	Ha
Area of Residential Land:	28.80	Ha
Net Yield (Conventional):	568	No.
Net Yield of Medium Density:	784	No.
Total Lot Yield:	1352	No.
Weighted Lot Area (Conventional):	485.12	m ²
Weighted Lot Area (Conventional):	34.0	No.
Units per hectare (Conventional):	14.5	No.

NOTATIONS

- SUBJECT SITE
- SIGNALISED INTERSECTION
- CONVENTIONAL LOTS (STAGES 1-16)
- CONVENTIONAL LOTS (STAGE 17)
- FUTURE MEDIUM DENSITY LOTS
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
- UNENCUMBERED OPEN SPACE
-

APPENDIX B

CASUALTY CRASH DATA

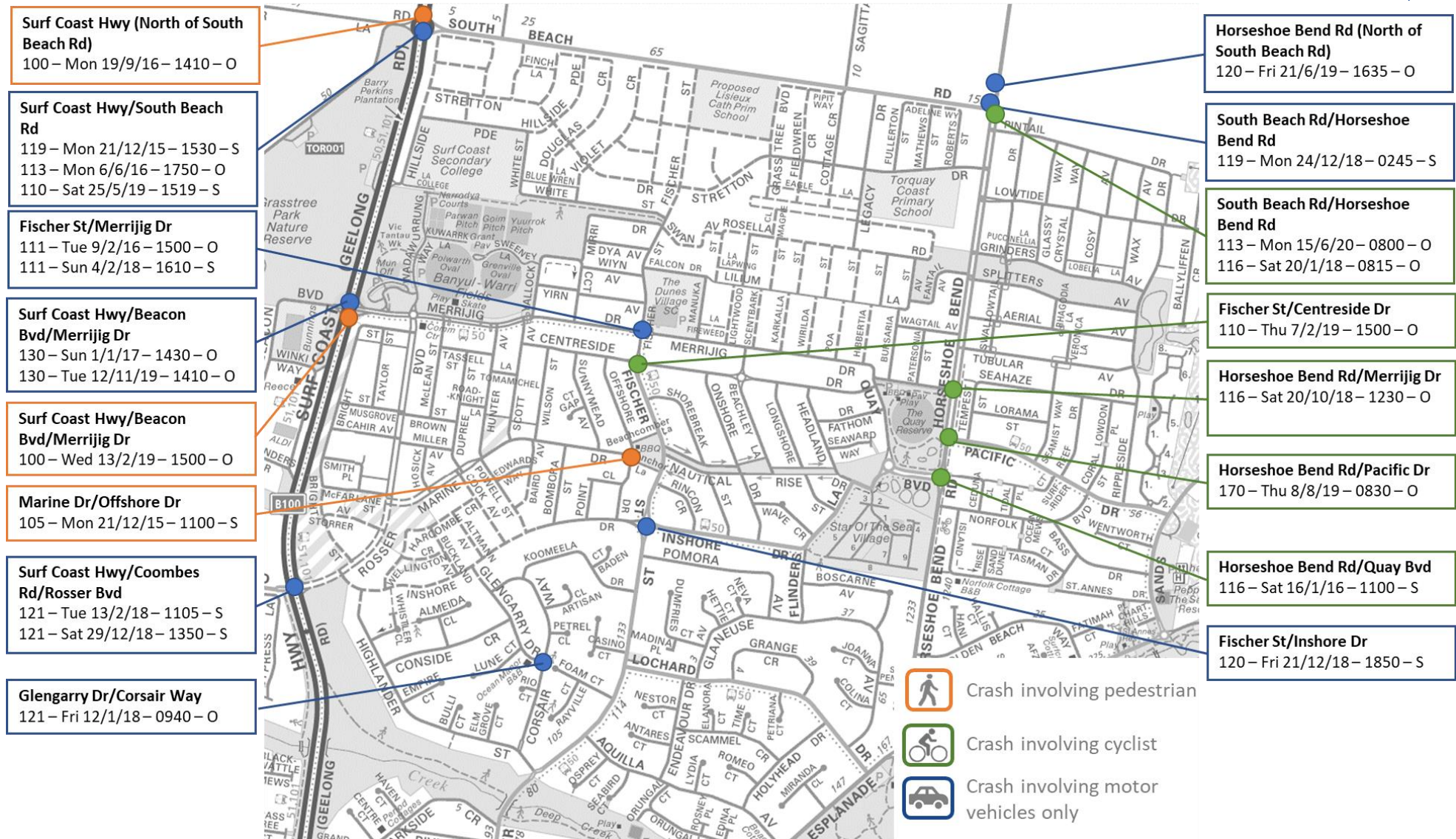


FIGURE C1: CASUALTY CRASH DATA – JULY 2015 TO JUNE 2020

TRAFFIC GENERATION ASSUMPTIONS FOR SPECIFIC LAND USES

Traffic Generation Assumptions for Specific Land Uses

The Dunes Estate

- Elements Childcare is operating close to capacity, no allowance for additional traffic generation;
- Future Aged Care (2.1 ha site) will generate 100 trips/day, of which 20% are assumed to be internal trips;
- Future Mixed Use (0.9 ha site) allowance for 10 external trips/day
- Proposed swimming pool and gym as follows:
 - 550m² gym + 2 program rooms - assuming 500 patrons and 90% drive equates to 500 x 2 trips (in + out) x 0.9 = 900 vehicle trips/day
 - Pool (summer) - assuming 1000 patrons/day, 0.78 trips/patron (based on survey data) equates to 780 vehicle trips/day
 - Pool (winter) - assuming 650 patrons/day, 0.78 trips/patron (based on survey data) equates to 507 vehicle trips per day
 - 90% of trips are external to study area
- Stadium – no specific information was available in relation to the proposed stadium development, assumed 300 vehicle trips/day, 60% of trips external to study area
- Quay Reserve – additional 50 trips per day

Stretton Park

- Surf Coast Secondary College – allowance for additional 100 students, 0.8 trips/student in AM and 0.6 trips/student in PM
- Torquay Coast Primary School – allowance for additional 400 students, 0.9 trips in AM, 0.7 trips in PM, 40% of trips internal to study area
- Liseaux Catholic – allowance for additional 200 students, 0.9 trips in AM, 0.7 trips in PM, 40% of trips internal to study area
- Torquay YMCA Early Learning Centre – allowance for additional 55 children, 100 trips/day, 50 % of trips internal to study area
- Medium Density Apartments – 50 apartments assumed based on site area
- Torquay Community Hospital to be developed on the corner of South Beach Road and Surf Coast Highway. Access to be provided via South Beach Road Highway and Fischer Street/Stretton Drive, 25 consulting rooms assumed. Based on 8 trips/room per hour for 10 hours/day, equates to 2,000 vehicle trips/day.

Quay 2

- Medium Density Lots – 116 dwellings assumed in total based on advice from Council
- For standard dwelling lots constructed at January 2020, 50% occupancy assumed

**ANTICIPATED TRAFFIC GENERATED BY ADDITIONAL DEVELOPMENT
WITHIN STUDY AREA**



FIGURE D1: ANTICIPATED DAILY TRAFFIC GENERATION OF ADDITIONAL DEVELOPMENT WITHIN THE STUDY AREA- PEAK SEASON



FIGURE D2: ANTICIPATED DAILY TRAFFIC GENERATION OF ADDITIONAL DEVELOPMENT WITHIN THE STUDY AREA- OFF-PEAK SEASON

TRAFFIC REDISTRIBUTION ASSUMPTIONS FOLLOWING COMPLETION OF PROPOSED ROAD NETWORK IN NORTH TORQUAY

E1 Redistribution to Fischer Street to/from South Beach Road / Surf Coast Highway

The following assumptions have been made with regard to redistribution of traffic to Fischer Street, to/from South Beach Road/Surf Coast Highway:

- 20% of existing vehicles turning right from Beach Road to Surf Coast Highway divert to Fischer Street and South Beach Road (west), and vice versa;
- 20% of vehicles turning right from Darian Rd to Surf Coast Highway divert to Fischer Street and South Beach Road (west), and vice versa;
- 80% of traffic generated by the existing development north of Merrijig Drive travelling to/from the north via Merrijig Drive divert to Fischer Street and South Beach Rd (west);
- 10% of vehicles travelling via Fischer Street to/from South Beach Road (west) travel via Stretton Drive (west).

E2 Redistribution to Fischer Street to/from South Beach Road / Horseshoe Bend Road

The following assumptions have been made with regard to redistribution of traffic to Fischer Street, to/from Horseshoe Bend Road:

- 80% of traffic generated by the existing development north of Merrijig Drive travelling to/from the north via Merrijig Drive (east) divert to Fischer Street and South Beach Road (east);
- 15% of traffic generated by the existing development south of Merrijig Drive travelling to/from the north via Merrijig Drive (east) divert to Fischer Street and South Beach Rd (east);
- 10% of vehicles travelling via Fischer Street to/from South Beach Road (east) travel via Stretton Drive (east).

E3 Redistribution to Fischer Street to/from Torquay Central

The following assumption has been made with regard to redistribution of traffic to Fischer Street, to/from Torquay Central:

- Traffic generated by the existing development in the north-eastern corner of the subdivision (i.e. near Torquay Coast Primary School) diverts to Fischer Street to/from the south.

E4 Redistribution to Rosser Boulevard / Coombes Road

The following assumptions have been made with regard to redistribution of traffic to Rosser Boulevard / Coombes Road intersection:

- Of traffic generated by existing development west of Horseshoe Bend Road currently using Merrijig Drive to/from Surf Coast Highway, 80% divert to Inshore Drive/Marine Drive and Rosser Boulevard;
- Of traffic generated by existing development west of Horseshoe Bend Road currently using Darian Road to/from Surf Coast Highway, 70% divert to Inshore Drive/Marine Drive and Rosser Boulevard;

- Of traffic generated by existing development east of Horseshoe Bend Road currently using Merrijig Drive to/from Surf Coast Highway, 70% divert to Inshore Drive/Marine Drive and Rosser Boulevard.

E5 Redistribution to Stretton Drive (east)

The following assumption has been made with regard to redistribution of traffic to Stretton Drive (west):

- Of traffic from Pintail Drive/Lowtide Drive (east of Horseshoe Bend Road) currently using Merrijig Drive (eastern section), 90% divert to Stretton Drive (eastern section) and Fischer Street (north).

APPENDIX F

SIDRA RESULTS FISCHER STREET/MERRIJIG DRIVE

MOVEMENT SUMMARY

Site: 101 [Merrijig Drive/Fischer Street PM peak, off-peak season (Site Folder: General)]

New Site

Site Category: (None)

Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total	HV]	[Total	HV]				[Veh.	Dist]				
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Fischer St														
1	L2	70	0.0	74	0.0	0.650	7.5	LOS A	6.9	48.1	0.78	0.76	0.86	51.7
2	T1	524	0.0	552	0.0	0.650	7.8	LOS A	6.9	48.1	0.78	0.76	0.86	53.0
3	R2	70	0.0	74	0.0	0.650	12.4	LOS B	6.9	48.1	0.78	0.76	0.86	52.9
Approach		664	0.0	699	0.0	0.650	8.2	LOS A	6.9	48.1	0.78	0.76	0.86	52.8
East: Merrijig Dr														
4	L2	70	0.0	74	0.0	0.623	21.0	LOS C	6.5	45.3	1.00	1.14	1.38	43.6
5	T1	115	0.0	121	0.0	0.623	21.2	LOS C	6.5	45.3	1.00	1.14	1.38	44.5
6	R2	70	0.0	74	0.0	0.623	25.8	LOS C	6.5	45.3	1.00	1.14	1.38	44.4
Approach		255	0.0	268	0.0	0.623	22.4	LOS C	6.5	45.3	1.00	1.14	1.38	44.2
North: Fischer St														
7	L2	60	0.0	63	0.0	0.838	9.7	LOS A	15.2	106.1	0.95	0.82	1.12	50.7
8	T1	776	0.0	817	0.0	0.838	9.9	LOS A	15.2	106.1	0.95	0.82	1.12	51.9
9	R2	120	0.0	126	0.0	0.838	14.5	LOS B	15.2	106.1	0.95	0.82	1.12	51.9
Approach		956	0.0	1006	0.0	0.838	10.5	LOS B	15.2	106.1	0.95	0.82	1.12	51.8
West: Merrijig Dr														
10	L2	30	0.0	32	0.0	0.274	8.3	LOS A	1.9	13.3	0.81	0.82	0.81	50.9
11	T1	95	0.0	100	0.0	0.274	8.5	LOS A	1.9	13.3	0.81	0.82	0.81	52.1
12	R2	60	0.0	63	0.0	0.274	13.2	LOS B	1.9	13.3	0.81	0.82	0.81	52.1
Approach		185	0.0	195	0.0	0.274	10.0	LOS A	1.9	13.3	0.81	0.82	0.81	51.9
All Vehicles		2060	0.0	2168	0.0	0.838	11.2	LOS B	15.2	106.1	0.89	0.84	1.04	51.1

MOVEMENT SUMMARY

Site: 101 [Merrijig Drive/Fischer Street PM peak, peak season (Site Folder: General)]

New Site

Site Category: (None)

Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total	HV]	[Total	HV]				[Veh.	Dist]				
		veh/h	%	veh/h	%				veh	m				
South: Fischer St														
1	L2	70	0.0	74	0.0	0.729	9.4	LOS A	9.5	66.2	0.88	0.86	1.06	51.1
2	T1	583	0.0	614	0.0	0.729	9.6	LOS A	9.5	66.2	0.88	0.86	1.06	52.2
3	R2	70	0.0	74	0.0	0.729	14.2	LOS B	9.5	66.2	0.88	0.86	1.06	52.2
Approach		723	0.0	761	0.0	0.729	10.0	LOS B	9.5	66.2	0.88	0.86	1.06	52.1
East: Merrijig Dr														
4	L2	70	0.0	74	0.0	0.843	50.0	LOS E	12.5	87.2	1.00	1.41	2.09	32.4
5	T1	90	0.0	95	0.0	0.843	50.2	LOS E	12.5	87.2	1.00	1.41	2.09	32.8
6	R2	123	0.0	129	0.0	0.843	54.9	LOS E	12.5	87.2	1.00	1.41	2.09	32.8
Approach		283	0.0	298	0.0	0.843	52.2	LOS E	12.5	87.2	1.00	1.41	2.09	32.7
North: Fischer St														
7	L2	80	0.0	84	0.0	0.927	15.2	LOS B	26.1	182.7	1.00	0.98	1.43	47.2
8	T1	858	0.0	903	0.0	0.927	15.4	LOS B	26.1	182.7	1.00	0.98	1.43	48.2
9	R2	120	0.0	126	0.0	0.927	20.0	LOS C	26.1	182.7	1.00	0.98	1.43	48.2
Approach		1058	0.0	1114	0.0	0.927	15.9	LOS B	26.1	182.7	1.00	0.98	1.43	48.2
West: Merrijig Dr														
10	L2	80	0.0	84	0.0	0.408	10.3	LOS B	3.2	22.1	0.92	0.93	0.95	49.8
11	T1	85	0.0	89	0.0	0.408	10.5	LOS B	3.2	22.1	0.92	0.93	0.95	50.9
12	R2	70	0.0	74	0.0	0.408	15.1	LOS B	3.2	22.1	0.92	0.93	0.95	50.9
Approach		235	0.0	247	0.0	0.408	11.8	LOS B	3.2	22.1	0.92	0.93	0.95	50.5
All Vehicles		2299	0.0	2420	0.0	0.927	18.1	LOS B	26.1	182.7	0.95	0.99	1.35	46.8

MOVEMENT SUMMARY

 **Site: 101 [Merrijig Drive/Fischer Street PM peak, off peak season with POS (Site Folder: General)]**

 **Network: N101 [Network1 - off peak, PM peak (Network Folder: General)]**

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total	HV]	[Total	HV]				[	Dist]				
		veh/h	%	veh/h	%				v/c	sec				
South: Fischer St														
1	L2	74	3.0	74	3.0	0.718	8.9	LOS A	3.7	26.3	0.85	0.81	0.99	51.3
2	T1	604	3.0	604	3.0	0.718	9.1	LOS A	3.7	26.3	0.85	0.81	0.99	46.2
3	R2	74	3.0	74	3.0	0.718	13.7	LOS B	3.7	26.3	0.85	0.81	0.99	52.4
Approach		752	3.0	752	3.0	0.718	9.5	LOS A	3.7	26.3	0.85	0.81	0.99	47.8
East: Merrijig Dr														
4	L2	74	3.0	74	3.0	0.498	17.2	LOS B	2.3	16.5	1.00	0.93	1.12	45.6
5	T1	121	3.0	121	3.0	0.498	17.4	LOS B	2.3	16.5	1.00	0.93	1.12	46.6
6	R2	74	3.0	74	3.0	0.498	22.0	LOS C	2.3	16.5	1.00	0.93	1.12	38.0
Approach		268	3.0	268	3.0	0.498	18.6	LOS B	2.3	16.5	1.00	0.93	1.12	44.6
North: Fischer St														
7	L2	63	3.0	63	3.0	0.815	7.0	LOS A	4.8	34.8	0.63	0.69	0.74	47.8
8	T1	764	3.0	764	3.0	0.815	7.4	LOS A	4.8	34.8	0.63	0.69	0.74	49.7
9	R2	126	3.0	126	3.0	0.815	11.7	LOS B	4.8	34.8	0.63	0.69	0.74	49.5
Approach		954	3.0	954	3.0	0.815	8.0	LOS A	4.8	34.8	0.63	0.69	0.74	49.5
West: Merrijig Dr														
10	L2	32	3.0	32	3.0	0.309	9.1	LOS A	0.9	6.4	0.86	0.87	0.86	44.9
11	T1	100	3.0	100	3.0	0.309	9.3	LOS A	0.9	6.4	0.86	0.87	0.86	51.6
12	R2	63	3.0	63	3.0	0.309	14.0	LOS B	0.9	6.4	0.86	0.87	0.86	51.5
Approach		195	3.0	195	3.0	0.309	10.8	LOS B	0.9	6.4	0.86	0.87	0.86	50.9
All Vehicles		2168	3.0	2168	3.0	0.815	10.1	LOS B	4.8	34.8	0.78	0.78	0.89	48.3

 **Site: 101 [Fischer St proposed POS off peak season (Site Folder: General)]**

 **Network: N101 [Network1 - off peak, PM peak (Network Folder: General)]**

Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 40 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total	HV]	[Total	HV]				[Veh.	Dist]				
		veh/h	%	veh/h	%				veh	m				
South: Fischer St														
2	T1	709	3.0	709	3.0	0.530	3.1	LOS A	4.1	29.5	0.51	0.46	0.51	54.9
Approach		709	3.0	709	3.0	0.530	3.1	LOS A	4.1	29.5	0.51	0.46	0.51	54.9
North: Fischer St														
8	T1	954	3.0	954	3.0	0.947*	34.2	LOS C	20.7	148.9	0.96	1.39	1.74	28.3
Approach		954	3.0	954	3.0	0.947	34.2	LOS C	20.7	148.9	0.96	1.39	1.74	28.3
All Vehicles		1663	3.0	1663	3.0	0.947	20.9	LOS C	20.7	148.9	0.77	0.99	1.22	36.2

MOVEMENT SUMMARY

 **Site: 101 [Merrijig Drive/Fischer Street PM peak, peak season with POS(Site Folder: General)]**

 **Network: N101 [Network1 - peak season, PM peak (Network Folder: General)]**

Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total	HV]	[Total	HV]				[Veh.	Dist]				
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Fischer St														
1	L2	74	3.0	74	3.0	0.930	21.7	LOS C	7.4	53.3	0.89	1.20	1.71	43.6
2	T1	614	3.0	614	3.0	0.930	21.9	LOS C	7.4	53.3	0.89	1.20	1.71	35.4
3	R2	74	3.0	74	3.0	0.930	26.5	LOS C	7.4	53.3	0.89	1.20	1.71	44.4
Approach		761	3.0	761	3.0	0.930	22.3	LOS C	7.4	53.3	0.89	1.20	1.71	37.7
East: Merrijig Dr														
4	L2	74	3.0	74	3.0	0.652	30.8	LOS C	3.9	27.8	1.00	1.08	1.48	38.8
5	T1	95	3.0	95	3.0	0.652	31.0	LOS C	3.9	27.8	1.00	1.08	1.48	39.5
6	R2	129	3.0	129	3.0	0.652	35.7	LOS D	3.9	27.8	1.00	1.08	1.48	29.7
Approach		298	3.0	298	3.0	0.652	33.0	LOS C	3.9	27.8	1.00	1.08	1.48	35.9
North: Fischer St														
7	L2	84	3.0	74	3.0	0.841	7.4	LOS A	5.4	38.5	0.65	0.70	0.77	47.5
8	T1	903	3.0	798	3.0	0.841	7.8	LOS A	5.4	38.5	0.65	0.70	0.77	49.4
9	R2	126	3.0	112	3.0	0.841	12.1	LOS B	5.4	38.5	0.65	0.70	0.77	49.2
Approach		1114	3.0	983 N1	3.0	0.841	8.2	LOS A	5.4	38.5	0.65	0.70	0.77	49.2
West: Merrijig Dr														
10	L2	84	3.0	84	3.0	0.473	11.8	LOS B	1.4	10.1	0.93	0.99	1.06	42.3
11	T1	89	3.0	89	3.0	0.473	12.0	LOS B	1.4	10.1	0.93	0.99	1.06	49.8
12	R2	74	3.0	74	3.0	0.473	16.7	LOS B	1.4	10.1	0.93	0.99	1.06	49.8
Approach		247	3.0	247	3.0	0.473	13.3	LOS B	1.4	10.1	0.93	0.99	1.06	48.0
All Vehicles		2420	3.0	2290 N1	3.2	0.930	16.7	LOS B	7.4	53.3	0.81	0.95	1.21	42.4

 **Site: 101 [Fischer St proposed POS peak season (Site Folder: General)]**

 **Network: N101 [Network1 - peak season, PM peak (Network Folder: General)]**

Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 40 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total	HV]	[Total	HV]				[Veh.	Dist]				
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Fischer St														
2	T1	827	3.0	827	3.0	0.618	3.5	LOS A	5.3	38.2	0.57	0.51	0.57	54.4
Approach		827	3.0	827	3.0	0.618	3.5	LOS A	5.3	38.2	0.57	0.51	0.57	54.4
North: Fischer St														
8	T1	1114	3.0	1114	3.0	*	1.187	199.5	66.8	479.6	1.00	3.45	5.03	7.9
Approach		1114	3.0	1114	3.0		1.187	199.5	66.8	479.6	1.00	3.45	5.03	7.9
All Vehicles		1941	3.0	1941	3.0		1.187	116.0	66.8	479.6	0.82	2.20	3.13	12.9

RECOMMENDED INFRASTRUCTURE TREATMENTS



1. Roundabout

2. Turn lane treatment

3. Turn lane treatment

4. Roundabout improvements

5. Roundabout

6. Stretton Drive LATM treatments:

- Intersection treatment
- Blister island
- Raised intersection

7. Pedestrian operated signals – subject to further analysis

15 Shared path through linear open space

19. Median extension (left out only from Dupree St) if Inshore Drive not connected

9. Median extension (left out only from McFarlane St)
18. Right turn lane if Inshore Drive not connected

11. Raised intersection

10. Speed humps

12. Median island on bend, review intersection priority at Quay Blvd

21. Speed humps on Powell Street and Cook Street if Inshore Drive not connected

13. Shared path crossings

20. Intersection priority treatment if Inshore Drive not connected

8. Right turn lane



FIGURE G1: TREATMENT 2 - PROPOSED RIGHT TURN LANE (CHR) AND LEFT TURN (AUL) TREATMENT ON SOUTH BEACH ROAD AT STRETTON DRIVE (FUTURE ROAD)

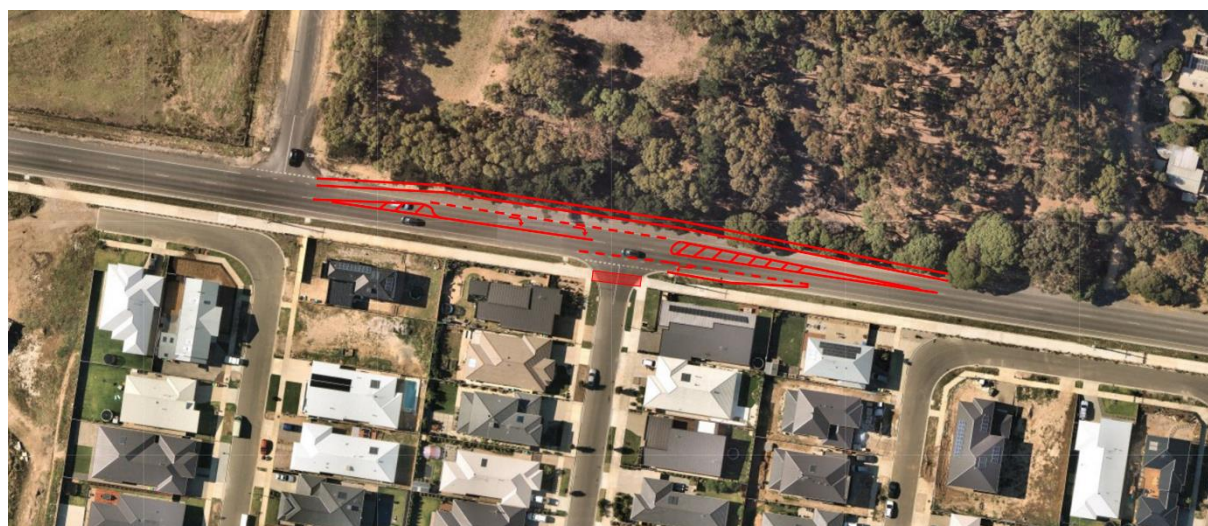


FIGURE G2: TREATMENT 3 - PROPOSED RIGHT TURN LANE (CHR) AND LEFT TURN (AUL) TREATMENT ON SOUTH BEACH ROAD AT LEGACY DRIVE



FIGURE G3: TREATMENT 4 - PROPOSED RAISED PLATFORM AND BICYCLE LANE ON WESTERN APPROACH, SEMI-MOUNTABLE ANNULUS ON CIRCULATING ISLAND



FIGURE G4: TREATMENT 8 - PROPOSED RIGHT TURN LANE ON ROSSER BOULEVARD AT INSHORE DRIVE

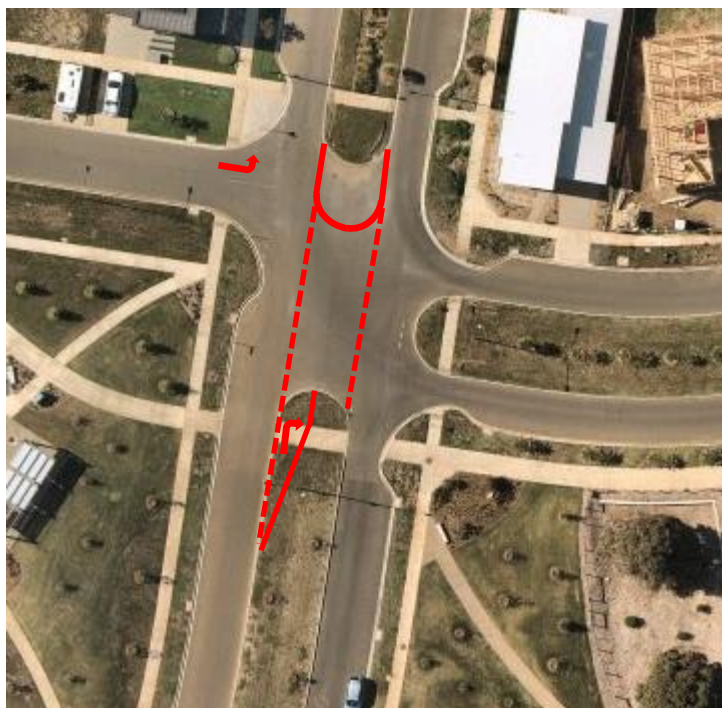


FIGURE G5: TREATMENT 9 & 18 - PROPOSED MEDIAN EXTENSION ON ROSSER BOULEVARD AND LEFT IN/LEFT OUT AT MCFARLANE STREET, PROPOSED RIGHT TURN LANE ON ROSSER BOULEVARD AT MARINE PARADE IF INSHORE DRIVE NOT CONNECTED



FIGURE G6: TREATMENT 10 & 11 - PROPOSED RAISED INTERSECTION AT MARINE DRIVE/OFFSHORE DRIVE/ANCHORE LANE AND SPEED HUMPS ON ANCHOR LANE AND BEACHCOMBER LANE



FIGURE G7: TREATMENT 12 - PROPOSED MEDIAN ISLAND ON MERRIJIG DRIVE NORTH OF QUAY BOULEVARD AND CHANGE OF PRIORITY AT MERRIJIG DRIVE/QUAY BOULEVARD INTERSECTION



FIGURE G8: TREATMENT 19 - PROPOSED MEDIAN EXTENSION ON MARINE PARADE AT COOK AVENUE AND LEFT IN/LET OUT AT DUPREE STREET – IF INSHORE DRIVE NOT CONNECTED



FIGURE G9: TREATMENT 20 - PROPOSED INTERSECTION TREATMENT AT INSHORE DRIVE/COOK AVENUE IF INSHORE DRIVE NOT CONNECTED (COULD BE IMPLEMENTED AS SHORT TERM TEMPORARY TREATMENT)