Traffic

TaylorThomsonWhitting

STATE SIGNIFICANT DEVELOPMENT APPLICATION FOR

Byron Shire Central Hospital

54 Ewingsdale Road, Ewingsdale

Transport and Accessibility

for Health Infrastructure

13 August 2014

141233

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Revision Register

Rev	Date	Prepared By	Approved By	Remarks
1	25/7/14	KT	PY	Draft
2	13/8/14	KT	PY	Inclusion of nearby Intersection analysis
3	13/8/14	KT	PY	For Submission

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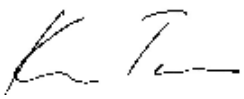

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EXECUTIVE SUMMARY

This report addresses the Transport and Accessibility requirements of the Secretary's Environmental Assessment Requirements (SEARs) Section 78A(8A) of the Environmental Planning and Assessment Act, application number SSD 6573, dated 9 July 2014.

As part of the proposed Byron Shire Central Hospital, Taylor Thomson Whitting (NSW) Pty Ltd has been engaged by Health Infrastructure to provide advice on Traffic, Parking and Transport aspects for the project.

The Development Application seeks approval for 3 clinical buildings up to two floors in height accommodating an emergency department, acute medical beds, maternity services and surgical wards. To support the building there will be roads, carparking, truck loading areas and plant. The works are proposed by NSW Health Infrastructure.

This report will assess the relevant SEAR's and review Transport and Accessibility issues such as: traffic generation, public transport review, transport management strategy, parking provisions, alternative transport (pedestrians, cyclists), and service vehicle requirements

1.0 INTRODUCTION

1.1 Background

This study has been commissioned to evaluate the traffic and parking needs for the new Byron Shire Central Hospital at 54 Ewingsdale Road, Ewingsdale.

The new concept plan permits staged development of the site consisting of a number of buildings. The concept plan includes the relocation of the Mullumbimby and Byron Bay District Hospitals from their current locations to the new site.

The main concerns of this study relate to the provision of adequate and appropriate parking facilities and vehicle access (at a strategic level) to and from the proposed Hospital site.

1.2 The Study Area

The reference site is located about 7km west of Byron Bay. The site is currently accessible by Ewingsdale Road.

The Study Area and the proposed site is shown in **Figure 1.**

The area north of Ewingsdale Road is mainly rural while the land south of the proposed site has residential uses.

1.3 The Study Approach

The purpose of this report is to provide information in terms of access, traffic and parking for New Byron Shire Central Hospital proposal. An overall plan for the proposal is shown as part of the architectural drawings.

The study has been carried out on the basis of relevant guidelines and standards such as the RMS's Guide to Traffic Generating Developments, AUSTROADS and state, regional and Byron Shire Council's planning documents.

Further, documents from reports related to the study area and similar studies (based on our previous assessment of some 20 Hospitals in NSW and ACT) have also been utilised.

1.4 Scope of the Report

The report is divided into eight sections:

- Section 1 includes introduction and summary of related studies
- Section 2 covers the existing conditions.
- Section 3 covers the proposed Hospital parking review

- Section 4 covers vehicle access arrangements
- Section 5 covers Traffic impacts from the proposed Hospital development
- Section 6 covers preliminary comments on construction activity
- Section 7 provides a transport strategy for the Hospital.
- Section 8 provides a summary and conclusions.

1.5 Literature Review

Summaries of reports related to this study are presented in **Appendix A** to establish some of the assumptions that have been used as part of this report. These studies include:

- Byron Shire Health Service Redevelopment, Traffic Assessment; AECOM (2013)
- Byron Shire Central Hospital; Traffic and Parking Study; TEF (April 2007)
- West Byron Development Transport Study (March 2011)
- Tintenbar to Ewingsdale Pacific Highway Upgrade; Working Paper 06 - Traffic and Transport Assessment (RTA 2008)
- MR545 Strategic Study (Opus 2009)

1.6 Response to Secretary's Environmental Assessment Requirements

No	SEARs KEY ISSUES – Transport and Accessibility	Comments and References
	General Requirements	The study has been carried out on the basis of relevant guidelines and standards such as the RMS's Guide to Traffic Generating Developments, AUSTROADS and state, regional and Byron Shire Council's Development control Plan (DCP) and other planning documents including the current 2010 DCP, Draft 2014 DCP. Additionally reference documentation was reviewed for inclusion in the development of the report (Refer to **Section 2.5** and **Appendix A**.
6	The existing and proposed pedestrian and cycle movements within the vicinity of the site	There is no existing pedestrian and cycle paths adjacent to the site. There is an existing cycle path east of McGettingans Lane (330m east) of the site. The development is given consideration to incorporate the provision of a shared pedestrian cycle path along the frontage of the site. Refer to **Section 2.4 and 4.4**)

No	SEARs KEY ISSUES – Transport and Accessibility	Comments and References
6	An estimate of the total daily and peak hour trips generated by the proposal, including vehicle, public transport, pedestrian and cycle trips	It is estimated that the majority of traffic associated with the proposed development will be as a result of visitor/patient and staff movements. These will be primarily with the use of private vehicles due to the location of the site. It is anticipated that the site could generate some 120 peak hour vehicle trips. Refer to **Section 5**)
6	The adequacy of public transport to meet the likely future demand of the proposed development	The current public transport options are outlines in Section 2.4 and consist of three bus routes connecting Byron Bay, Mullumbimby, Bangalo and Ballina. The development is to consider the provision of a Bus stop within the proximity of the site (eg along Ewingsdale Road) refer **Section 2.4 and 4.1**)
6	Measure to promote travel choices that support the achievement of State targets, such as location-specific sustainable transport plan	A Transport Management Strategy has been outlined in **Section 7** to promote sustainable transport options and planning including public transport, active transport options (walking/cycle) and safer travel means.
6	The daily and peak movements impact on Ewingsdale Road and nearby intersections, with consideration of the cumulative impacts from other approved developments in the vicinity, and the need/associated funding for upgrading or road improvement works (if required)	It is estimated that the majority of traffic associated with the proposed development will be as a result of visitor/patient and staff movements. These will be primarily with the use of private vehicles due to the location of the site. It is anticipated that the site could generate some 120 peak hour vehicle trips. Refer to **Section 5**. Intersection analysis was completed for the two proposed access/egress points along Ewingsdale Road. These analyses was based on current traffic data with traffic volumes increased based on predicted traffic growth as outlined in previous networks and strategic studies such as West Byron Development Transport Study. The intersection analysis was completed for estimated volume in 2018 and 2028. (Refer to **Section 5**) and indicate the intersections will perform at a good level of service. Intersection analysis was completed for nearby intersections on Ewingsdale Road of the future Pacific Highway Interchange and McGettingans Lane. The intersection analysis was developed for future (2028) traffic volumes based on the TEF 2007 report for McGettingans Lane. For the Pacific Highway interchange future (2028) were outlined in the RMS report Titenbar to Ewingsdale Pacific Highway Upgrade Working Paper 06 – Traffic and Transport Assessment 2008. The analysis indicate the intersections will perform at a similar level of service post development. (Refer to **Section 5**)

No	SEARs KEY ISSUES – Transport and Accessibility	Comments and References
6	The proposed access arrangements and measures to mitigate any associated traffic impacts and impacts on public transport, pedestrian and cycle networks	Access arrangements are outlined in **Section 4** of the report. The section describes the site will have two access points (main western roundabout access and minor left in/left out eastern access), implementation of pedestrian cycle and public transport facilities and the reduction of the speed limit to 60km/h along Ewingsdale Road.
6	Proposed car park provision, including consideration of the availability of public transport and the requirements of the relevant parking codes and Australian Standards	The parking provisions for the hospital are outlined in **Section 3.2** of the report. The minimum parking provision was based on estimated staff and visitor numbers for the hospital and referenced to Council's DCP minimum parking requirements. The site proposes to provide some 194 car parking spaces for visitors and staff including 7 accessible spaces.
6	Estimated service vehicle movements (including vehicle type and the likely arrival departure times	Estimated Service vehicle access and movements are outlined in **Section 4.2** of the report. Access for deliveries is proposed to be via the main western entry roundabout. The maximum size vehicle is anticipated to be the 19.0m articulated vehicle for gas and oxygen deliveries. Smaller general delivery vehicles are anticipated to occur on average up to 15 vehicles per day
6	Access and car parking arrangements at all stages of construction and measure to mitigate any associated pedestrian, cycleway, public transport or traffic impacts	Preliminary Statement of construction activity is outlined in **Section 6** of the report. The current site is a greenfield area which allows for greater opportunity to provide parking for construction vehicles within the site. Access and egress to the site will be designated access points with vehicles entering and exiting in a forward direction. Minimising access points where possible and with the significant portion of works being within the site minimises impacts to traffic , pedestrians, cyclists and public transport. Roadwork will be staged to maintain vehicular access along Ewingsdale Road. Cycle and Pedestrian activity is currently low but access for this mode of transport will be considered during the staging of road construction works.

2.0 EXISTING CONDITIONS

2.1 The Site

The proposed site is located south of Ewingsdale Road and west of McGettigans Lane while Parkway Drive forms its southern part. Refer to **Figure 1**.

The site will be accessed by Ewingsdale Road. This road is a dual carriageway accommodating eastbound and westbound traffic and providing access to Pacific Highway at its western end. The eastern section of the road is a link to Byron Bay Town Centre and its environs. The land is undulating to hilly rural property.

2.2 Major Approach Routes

The major approach routes to the Study Area are from Pacific Highway and Ewingsdale Road. The main access to the site is from Ewingsdale Road. Refer to **Figure 1**.

Pacific Highway is a two lane undivided carriageway with a daily traffic volume of 15,000 – 27,000 vehicles per day along its section north and south of Ewingsdale Road, respectively (West Byron Transport Study 2008).

Ewingsdale Road forms the northern boundary of the study area and has two travel lanes with an average daily traffic volume of about 15,000 vehicles per day with peak hourly traffic volumes of approximately 1,450 vph (AECOM, 2011).

As stated earlier Ewingsdale Road currently is a two lane road with line marking and various speed limits of 60 to 100 km/hr.

Figure 1: Site Locality
(Source: www.nearmap.com.au)

2.3 Intersections

The major intersections along approach routes to the site include:

- Pacific Highway exit and Ewingsdale Road (including the old Pacific Highway(also known as Woodford Lane))
- Ewingsdale Road and McGettigans Lane

The intersection of the Pacific Highway and Ewingsdale Road (west of the site) is treated with an external roundabout allowing a safe turning movements at the intersection. The Old Pacific Highway (Woodford Lane) is a cross road with William Flick Lane and Ewingsdale Road. Right turn lanes are provide along Ewingsdale Road to provide access to these roadways.

The intersection of Ewingsdale and McGettings Lane is controlled by a seagull type T-junction.

Currently, any upgrade to the road system has not been envisaged by the Roads and Maritime Services (RMS). However, any upgrade of the road system should also be incorporated as part of the overall strategic planning of the area.

In 2009, Byron Shire Council engaged Opus International Consultants (Opus) to undertake a Strategic Study for Regional Road, MR545. The report recommended the following measures due to the increased traffic from the developments entering Ewingsdale Road:

- Single lane roundabout at the McGettigans Lane / Ewingsdale Road intersection;
- Dual lane roundabout at Sunrise Boulevard / Ewingsdale Road with access to the proposed West Byron Residential prior to the completion of the proposed West Byron Residential;
- Four lane roundabout at Sport fields, Sunnybrand and Island Quarry / Ewingsdale Road Intersection;
- Dual lane roundabout at the Bayshore Drive / Ewingsdale Road intersection prior to the completion of the proposed Bayshore Village; and
- Widening of the carriageway to four traffic lanes along Ewingsdale Road between the proposed sports field roundabout and the Sunrise Boulevard / Ewingsdale Road roundabout.

2.4 Active and Public Transport

The existing bicycle routes for the Byron Bay are shown in **Figure 2**. It should be noted that currently due to the location of the site, bicycle access to the site is limited. The existing bike route path from the Byron Bay town centre along Ewingsdale road ceases at the intersection with McGettingans Lane (some 330m east of the site).

Figure 2: Bicycle Routes
(Source: www.byron.nsw.gove.au/bikeways)

Regional bus routes 640, 641 and 645 provide services to the site with connection to Byron Bay, Mullumbimby, Bangalow and Ballina. The bus routes and their time tables are shown in **Appendix B.**

In order to encourage public transport and provide amenities for bus users, the following measures are suggested:

- Provision of a bus stop and turning area within or adjacent to the new hospital facility.
- Consideration of bus manoeuvring requirements as part of the design stage e.g. to cater for 14.5m length buses, shelters or awnings not placed too closely to the kerb lines, avoid any dips or humps along the road systems.
- Provision of indented bus bays and bus shelters along new bus routes (in consultation with bus companies during the planning and implementation phase)

3.0 HOSPITAL CONCEPT MASTERPLAN

3.1 Proposed Hospital Redevelopment

The planned development for the new Byron Health Facility will combine both facilities that currently are available at Byron Bay District and Mullumbimby Hospitals. The new site will also provide additional services and consulting rooms as part of the concept plan.

The key characteristics of the new facility will comprise:

- Accommodation for 65 inpatient beds.
- Daily outpatients of 120 (currently the outpatient numbers for both Byron Bay and Mullumbimby are recorded at 88 to 111 per day with a peak of 133 based on information by the study management).
- Provision of a number of consulting rooms.

- Limited expansion of mental health unit and other health related services.

Table 1 outlines the expected Staff FTE (i.e. about 95 per peak shift) up to 2021 when the hospital is to be fully operational.

Table 1: Staff FTE

	2013/14 (current year)	2014/15	2015/16	2016/17 (Project Completion)	2021/22 (Fully Operational)
FTE	143.1	143.1	143.1	172.6	184.2

3.2 Parking

From the information supplied for the existing Hospitals situation, estimates were made on the arrival and departure times, the mode of transport and the vehicle occupancy. These estimates assisted in determining the likely accumulation of parked vehicles at the proposed Hospital throughout a normal day.

The estimates are based on characteristics of the Byron Shire Central Hospital with comparison to similar regional hospitals such as Bega, Belmont, Lismore and Wallsend hospitals and the information provided.

Travel mode surveys of staff, outpatients and visitors for Byron and Mullumbimby Hospitals (TEF Report 2006) indicated that most staff over 90% use car as their mode of transport.

3.2.1 Car Parking

Initially the estimated parking requirements were developed based on the Byron Shire Development Control Plan (DCP) (2010 and Draft 2014). It was then was compared to the assumed anticipated staff, visitor and patent numbers as provided to better ascertain expected parking demand specifically for the Byron Shire Central Hospital development. Byron Shire DCP compliances include the following:

Hospital (DCP 2010)

- Minimum 1 space per 2 employees
- Minimum 1 space per 10 beds
- Minimum 1 ambulance space
- Minimum 1 bike space per 10 bed = 9 spaces
- Accessible Parking: 3%-4%

Consultancy Rooms (Draft DCP 2014)

- 3 spaces per consulting room plus 1 space per 2 employee
- 1 bike space per consulting room = 10 spaces

Table 2 below compares the DCP minimum parking requirements with the estimated parking demand for the assumed staff, visitor and patent numbers anticipated to be incorporated for the development.

Table 2: Parking Demand Comparison

Category	Number	Estimated Parking Demand	Council DCP Parking Requirements
Total FTE *Staff/shift	184 Total FTE 129 Shift	- 115	92 -
Outpatient ^Daily	30,000 Annually 120 Daily	20	7
Beds ^^Visitors/day	65 Beds 130 Visitors/day	13	
Consulting ** rooms	10 rooms operating	20	35
# Fleet cars	27	27	27
## Mental Health	20 bed	Included within the above parking provisions	2
Accessible Parking	-	~ 6 (included within total)	~~5
Total		195	163

Assumptions

*staff shift @ about 70% of FTE based on other hospitals and 90% car use

^ 1.5hr length of stay during a day and assuming 95% car use

** 10 rooms active during a day or activity shared with hospital

^^ 80% occupied bed with 2.5 visitors/bed over 10-12 hrs

27 Fleet cars has been specified for this development (based on info from hospital)

Medical Health Facilities is considerate to have low parking demand requirements, parking provision for staff will be accommodated as part of the staff parking hospital provision and fleet cars.

~ Building Code Australia requirement 2%

~~ Council DCP 2010 requirement 3-4%

From the above assumptions it is estimated that there is a parking demand of some **195** spaces during the peak period as part of the Byron Shire Central Hospital development. Based upon this a minimum of some 5 spaces should be allocated for accessible uses as outlined in AS2890.6.

NOTE: considering the low parking requirements for mental health facilities, parking provision for staff will be accommodated as part of the staff parking hospital provision and fleet cars.

The above estimates are based on characteristics of the Hospital with comparison to similar regional hospitals such as Bega, Belmont, Lismore and Wallsend hospitals.

The architectural drawings outline the parking provision the following parking allocation for the proposed hospital as outlined in **Table 3**.

Table 3: Proposed Car Parking Provision

Location	Use	Car Parking Provided
Main Entry	Visitor/Outpatient Accessible	37 2
Southern Area	Staff Short Stay (15mins) Accessible	44 8 1
Eastern Area	Staff Fleet Accessible	73 27 3
TOTAL	General Visitor/Outpatient Staff Fleet Accessible	45 117 27 6
	TOTAL	**195**

Note: There is a potential overflow parking area on the eastern side of the site that could accommodate an additional of some 40 vehicles. Furthermore, there are two drop off locations provided within the site. One facility in front of the Main Hospital Building (3 spaces), the other outside the Mental Health Building (3 spaces).

3.2.2 Bike Parking

To encourage alternative transport options both the 2010 and draft 2014 Council DCP's require the provision of bicycle parking

- Minimum 1 bike space per 10 bed = 9 spaces
- Minimum 1 bike space per consulting room = 19 spaces

A total of some **28 bike spaces** should be provided with appropriate and safe bicycle routes being established.

Consideration should be given that the existing shared path located east of the site along Ewingsdale Road to be extended to connect with the new hospital facility.

3.2.3 Motorcycle Parking

As outline in the TEF Report 2007, staff within the support services utilise motorbikes to travel to the hospital. The Draft 2014 DCP outlines that the minimum provision of for 2% of the car spaces provide be conversed to motorcycle parking (the equivalent of 4 motorcycle spaces).

For the proposed Byron Shire Central Hospital the implementation of 4 car spaces be transferred to motorcycle parking (the equivalent of **16 motorcycle spaces**).

4.0 ACCESS

4.1 General Vehicle

The proposed site will be accommodated with two entry points off Ewingsdale Road. It is envisaged that the main entry point to the site (western side) will be treated by a single lane roundabout, while the eastern entry point will be a T – junction with restriction left in/left out only. Ambulances will be exempted from this restriction to allow right turn movements to and from the access road. "Keep Clear" linemarking across the access road entrance is proposed to keep the intersection clear for emergency vehicles.

Along with the two access points, it is proposed to implement a 60km/hr speed limit along a section of Ewingsdale Road adjacent to the Hospital's site subject to RMS and Council approval. The access points and speed limit implementation has been discussed with RMS and Council representative at a meeting on 3 June 2014 (and subsequence discussions), where these concepts were generally accepted.

The access arrangements has been tested with consideration to the existing condition of Ewingsdale Road and the implementation of the proposed intersections (refer **Section 5.2**).

The site development should be designed on the basis of best practice and current guidelines, catering for disabled access and parents with prams.

The proposed access arrangements should meet the required vehicular and pedestrian access situation to the new Hospital and serve the Hospital's needs adequately.

Bus stops in vicinity of the site (eg. along Ewingsdale Road) should provide public transport facilities to and from the site.

4.2 Service Vehicle

All service vehicles including trucks will enter and exit the site in a forward direction. All vehicular turning paths to and from the loading areas will be developed to provide a review of the accessibility around the site. The maximum proposed vehicle is to be a 19.0m articulated vehicle for the delivery of gas and oxygen supply for the hospital.

The architectural drawings for the site demonstrate the loading areas and associated improvements. A total of some 5 truck movements could occur within a day (about 2 during the morning period and 3 in the afternoon). Approximately 10 other deliveries also occur throughout the day using vans, smaller trucks for couriers and other services.

There will be a primary service vehicle access route utilising the western roundabout to access the loading zone and LPG tank area. This access will allow for access and egress to/from both the east and west directions. A secondary access route could be utilised at the eastern access. This will allow access the loading zone for vehicles travel along Ewingsdale Road from the west and then continuing to travel to the west. Alternatively access to the LPG tank could be via the secondary access with exit utilising the roundabout

Vehicular access to and from the site is shown in **Figure 3**.

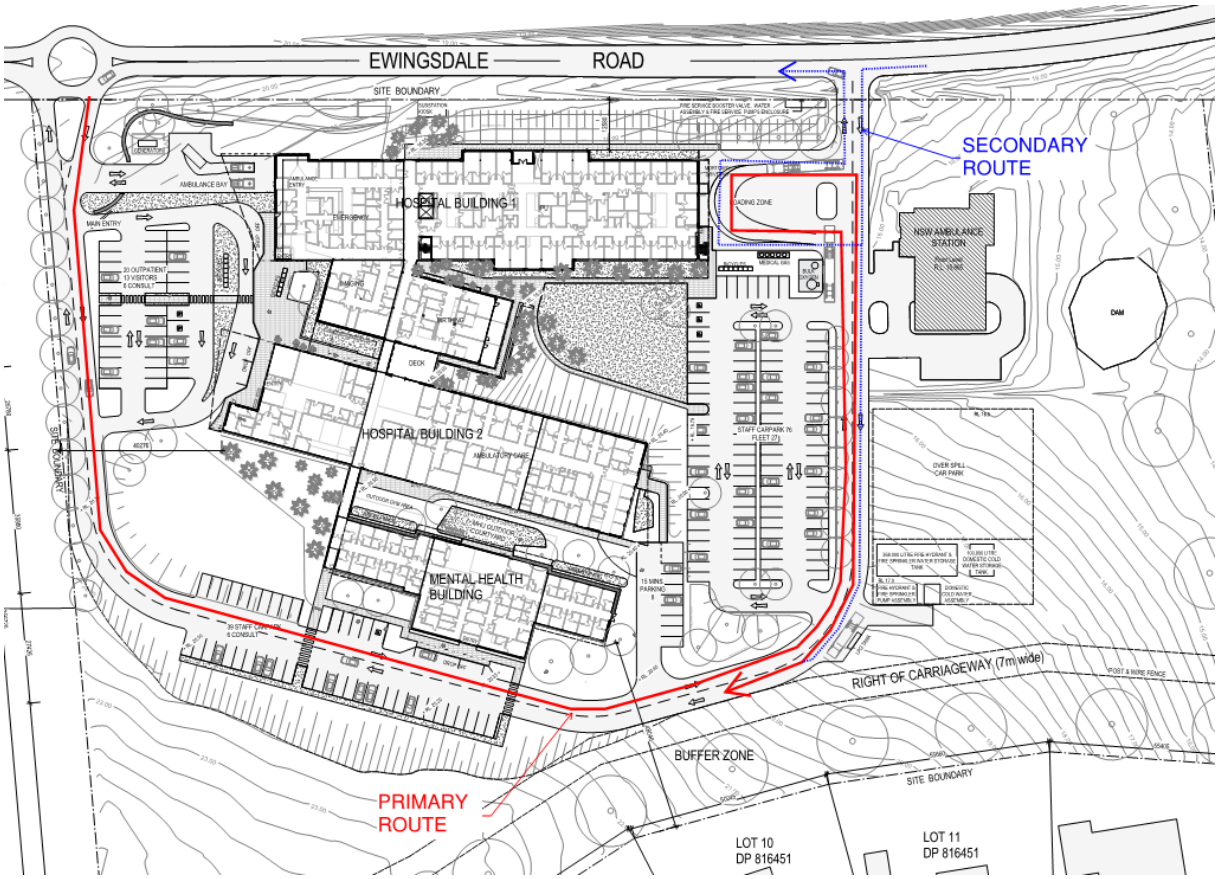

Figure 3: Service Vehicle Route

4.3 Ambulance Access

The hospital has the main emergency ambulance area located off the main entrance roundabout at the west of the site. The facility has the ability to cater for up to 2 ambulance vehicles at any one time. The ambulances will be able to manoeuvre within the area in order to enter and exit the site in a forward direction.

To the east of the site is the Ambulance Station. Access and egress to the station will via the eastern access of Ewingsdale Road to/from both the east and west direction. It is proposed to install “Keep Clear” linemarking opposite the entrance to maintain emergency vehicle access. The proposed “No Right Turn” into the site access road will be exempt for emergency vehicles. This has been discussed with Ambulance Services representatives and no objections have been raised.

4.4 Pedestrian and Cyclist Access

Pedestrian facilities and links will be provided as part of the Hospital development plan. This should include internal pedestrian links within the hospital grounds and a shared pedestrian/cycle path along the site frontage of Ewingsdale Road.

Introduction of bicycle parking at various locations within the Hospital Campus will also provide additional amenities for the users of the Hospital and would promote active transport particularly among the Hospital’s staff. This however will be in line with Council’s future bicycle plan for the area.

5.0 TRAFFIC IMPACT OF THE DEVELOPMENT

A traffic generation of 120 vehicles per hour (during peak periods) has been estimated for the future Hospital activities – considering that not all staff arrive or depart at the same time. Assuming 80% of all cars arriving or departing the site during a peak hour plus 12 vehicle trips associated with fleet and service vehicles.

Considering this level of vehicular traffic (i.e. about 2 car per minute), the road system will continue to operate at a good level of service.

The introduction of parking management measures will provide an appropriate parking condition for the new facility.

The development proposals will ensure the accessibility of the Hospital in terms of vehicular and pedestrian movements. As part of the concept plan proposal, appropriate walkways should be provided within the Hospital site. Vehicular access and pick-up and set-down facilities should also be included to provide amenity for the Hospital's users.

Directional signs should be placed as part of the concept master plan to improve the accessibility for the Hospital and to encourage a higher use of the Hospital's Entrance at designated locations.

5.1 Road Network

*The term "level of service" for **road capacity** has been defined by AUSTROADS as: A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and or passengers. A level of service definition generally describes these conditions in terms of factors such as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort, convenience and safety. In general there are six levels of service designated from A to F, with level of service A representing the best operating conditions (i.e. free flow) and level of service F the worst (i.e. forced or breakdown flow).*

One-way hourly volumes for urban roads during peak hours and recommended level of service are shown in **Table 4.**

Table 4: Urban Road Peak Hour Flows per Direction

Level of Service	One Lane (veh/hr)	Two Lanes (veh/hr)
A	200	900
B	380	1400
C	600	1800
D	900	2200
E	1400	2800

Source: RTA (now RMS) Guidelines 2002

The major approach route to the development site is Ewingsdale Road which provides connection to the site from both Byron Bay and Mullumbimby. The average daily traffic (ADT) volume along Ewingsdale Road was recorded at 16,480 vehicles per day (vpd) dated 2012. The ADT for September 2010 recorded 16,159 vpd with 5.6% accounting for heavy vehicles and peak hour traffic volumes of:

- 8am-9am: 1110 veh (bidirectional) with 688 veh eastbound
- 11am-Midday: 1330 veh (bidirectional) with 671 veh eastbound

- 4pm-5pm: 1289 veh (bidirectional) with 516 vech eastbound

However considering West Byron Development Transport Study (WBTS) the following traffic volumes are anticipated:

2018 predicted ADT : 18,820 vpd (WBTS)

Based on 2010 distribution a peak would be:

- AM Peak: 1317vph (62% eastbound); Peak traffic/lane/hr: 817 vph
- PM Peak: 1505vph (40% eastbound) Peak traffic/lane/hr: 903 vph

2028 predicted ADT: 21,000 vpd

- AM Peak: 1,470vph say 1,500 (62% eastbound); Peak traffic/lane: 816 vph
- PM Peak: 1680vph say 1700 (40% eastbound); Peak traffic/lane: 1020 vph

The above analysis indicate that currently Ewingsdale Road is operating at a satisfactory level of service with some capacity while by the year 2028, it could require an additional lane (in each direction) to support the major developments with the Byron Bay area.

5.2 Intersection Operation

The adequacy of the capacity of an intersection is judged by whether it can physically and operationally cater for the traffic using it. The performances of the intersections have been assessed using SIDRA intersection modelling software. The model provides parameters of the performance of an intersection including the degree of saturation (DoS) and the average delay per vehicle.

Satisfactory operation of an intersection would normally continue up to 42 seconds as Average Delay/Vehicle. At this Level of Service (LoS) operating speeds are still reasonable and acceptable delays are experienced. The recommended criteria for evaluating capacity of intersections are shown in **Table 5.**

Table 5: Criteria for Evaluating Capacity of Intersection

Level of Service	Degree of Saturation (DoS)	Ave. Delay/ Veh. (Secs)
A/B: good operation	less than 0.80	Less than 28
C: satisfactory	0.80 to 0.85	29-42
D: poor but manageable	0.85 to 0.90	43-56
E: at capacity	0.90 to 1.0	57-70
F: unsatisfactory, extra capacity required	Over 1.0	Over 70

Accordingly, an assessment of intersections performances were carried out using SIDRA traffic modelling software and proposed intersections layouts to the proposed site with consideration to the morning and afternoon commuter peak hour traffic volumes.

The results of the assessment revealed (see **Table 6**) that the all proposed access points and intersections relevant to the site will operate at a good level of service during the morning and afternoon commuter peak hours on a weekday. The average delay for all vehicles at these intersections is well below the 28 seconds per vehicle (i.e. very good level

of service), indicating an ample capacity at these intersections. Since the allowable maximum average delay for vehicles is about 70 seconds per vehicle.

Table 6: Performance of Intersections – AM & PM Peak Hour - Weekday

Intersection	Traffic Controls	Degree of Saturation DoS	Level of Service LoS	Intersection Average Delay (Seconds)
2018 Traffic Volumes				
AM PEAK HOUR				
Eastern Access	T- Junction	0.465	A	0.1
Western Access	Roundabout	0.550	A	4.9
PM PEAK HOUR				
Eastern Access	T- Junction	0.514	A	0.1
Western Access	Roundabout	0.588	A	6.6
2028 Traffic Volumes				
AM PEAK HOUR				
Eastern Access	T- Junction	0.520	A	0.1
Western Access	Roundabout	0.625	A	5.0
PM PEAK HOUR				
Eastern Access	T- Junction	0.584	A	0.1
Western Access	Roundabout	0.668	A	5.3

Appendix C provides detailed lane summary assessment of the intersections.

An assessment of intersections performances was also carried out using SIDRA traffic modelling software for nearby intersections post construction of the hospital. The intersections included Ewingsdale Road/McGettings Lane and Ewingsdale Road/upgraded Pacific Highway interchange.

The base volumes for the Ewingsdale Road/McGettings Lane model was developed with reference to TEF Consulting 2007 Traffic and Parking Study. These volumes were increased based on projected growths of the RMS report Titenbar to Ewingsdale Pacific Highway Upgrade Working Paper 06 – Traffic and Transport Assessment 2008 to obtain estimated volumes for 2028.

The base volumes for the Ewingsdale Road/Pacific Highway model was developed with reference to 2028 traffic volumes outlined in the RMS report Titenbar to Ewingsdale Pacific Highway Upgrade Working Paper 06 – Traffic and Transport Assessment 2008. These were future holiday period peak flows.

The results of the assessment revealed (see **Table 7** and **Table 8**) that the all nearby intersections will operate a similar level of service post the construction of the hospital facility when compared to pre construction intersection performance. It is noted that the by 2028 Ewingsdale Road/ McGettingans Lane intersection will be operating at a poor level of service even prior to any potential traffic generation of the hospital development. This was outlined in the MR545 Strategic Study by Opus International Consultants which highlighted the requirement of the intersection to be upgraded as part of the strategic road network.

Table 7: Nearby Intersection Performance Pre Construction of Hospital

Intersection	Traffic Controls	Degree of Saturation DoS	Level of Service LoS	Intersection Average Delay (Seconds)
2028 Traffic Volumes Ewinsdale Road / McGettingans Lane	T- Junction	1.888	A: East and West Approach F: North approach	71.5
2032 Traffic Volumes Pacific Highway Interchange	Roundabout	0.705	A	7.9

Table 8: Nearby Intersection Performance Post Construction of Hospital

Intersection	Traffic Controls	Degree of Saturation DoS	Level of Service LoS	Intersection Average Delay (Seconds)
2028 Traffic Volumes Ewinsdale Road / McGettingans Lane	T- Junction	2.157	A: East and West Approach F: North approach	68.8
2032 Traffic Volumes Pacific Highway Interchange	Roundabout	0.734	A	8.1

Appendix C provides lane summary assessment of the intersections.

6.0 CONSTRUCTION ACCESS

A Construction Traffic Management Plan (CTMP) will be prepared prior to commencement of works. Provision for pedestrian and cyclist access will be made as part of the CTMP.

The designated heavy vehicle routes would be via major approach roads such as the Pacific Highway and Ewingsdale Road.

It is anticipated that some 30 vehicular trips associated with construction staff would occur during each AM and PM peak periods. Parking for construction staff should be provided on site as part of the Early Works on formalisation of carparking areas. As part of the car parking provision strategy for construction workers the following measures are therefore proposed:

- Endeavour should be made to provide maximum parking on site for construction workers during the construction period.
- High level incentive among construction workers to utilise car pooling – this could be included as part of the contract to selected builder.

7.0 TRANSPORT MANAGEMENT STRATEGY

In line with Transport Management Strategies a number of strategies are included as part of the project and/or recommended in order to achieve such goals to improve the liveability, quality of life and sustainable transport for the region and its community.

For example, the higher use of public and active transport will not only create a healthier environment but will also improve the road safety and character of the built environment.

Further, decreased use of the car, particularly by the Hospital's staff, will reduce the need for construction of carparks and their associated costs. This means freeing funds for other activities and needs.

It should however be noted that some major initiatives have already been taken by the Area Health Services as these measures emphasize on better accessibility to a health facility while encouraging active and public transport.

Further, as part of the proposed redevelopment plan for the Hospital, bicycle racks are be placed at appropriate locations within the Campus. The current and proposed pedestrian footpaths/walkways and facilities for cyclist together with *Health Promotions* will provide better amenity and information for the users of the Hospital and hence reduce car dependency.

It is vital to take into account the future level of population increase within the region and to provide solutions that are complementary to State, regional and local transport plans.

Therefore, following measures are put forward for consideration and implementation in order to achieve the desired goals and targets as outlined above and detailed in relevant planning documents:

- Preparation of Go 2 Work Travel Plan for the Hospital
- Preparation of Transport Access Guide for the Hospital
- Provision of incentive schemes among staff
- Negotiation with bus agencies for provision of frequent bus services with faster and more direct destinations e.g. shuttle bus between city centre/shopping areas and the Hospital.
- Provision of better, safer (in terms of route alignment as well as security) bicycle and pedestrian routes. This measure should be devised in consultation with Council and other authorities.
- Promotion of the merits of walking and bicycle riding in order to encourage staff living near the Hospital to leave their cars at home.
- Provision of bicycle parking within the campus.

8.0 CONCLUSION

The proposed development should provide a total of some 195 parking spaces, with introduction of parking management measures.

It has been estimated that about 120 vehicles during a peak hour could be generated by the proposed Hospital. This level of vehicular traffic would have a minimal impact on the road system.

The access routes to the site are Pacific Highway and Ewingsdale Road. These roads have a satisfactory level of service and will continue to have a similar level of service once the development is completed.

The level of vehicular traffic will be low and the road network will continue to have a satisfactory operational characteristics.

The access layout should be in accordance with the RMS's Guidelines, the Australian Standard and Council's Code.

The proposed concept master plan should aim to improve the safety and efficiency for vehicular traffic and pedestrian movements within the Study Area.

APPENDIX A: SUMMARY OF AVAILABLE TRAFFIC STUDIES

Byron Shire Health Service Redevelopment, Traffic Assessment; AECOM (2013)

- Low use of public transport (limited services) and cycle (no cycle paths to site)
- Estimated staff:140 EFT
- With shift pattern at peak change over allowance for 150 spaces + 1 ambulance + 4 accessible (including 20 fleet cars)
- Estimated traffic generation base on predicted staff and rates provided by TEF report . (RMS guidelines were also reviewed but produced a lower rate, therefore not adopted)
- AM Peak Traffic generation: 52 trips; PM Peak Traffic : 63 trip
- Existing traffic was assessed on Revised 2028 flows based on MR545 Strategic Study 2009
- Priority intersection (right turn) was not model as it was deemed too have very poor performance and has safety concerns.
    - Seagull crossing for western access (Primary): 94m deceleration and 125m acceleration provide a good level of service
    - (LoS A: AM peak and Los B in PM peak) base on predicted traffic flows for 2028 strategic model. Preferred solution based on predicted lower cost
- Roundabout: 24m dia provide good level of service
    - (LoS A: AM peak and Los B in PM peak) base on predicted traffic flows for 2028 strategic model.
    - Longer queues due to all road uses to give way
- Noted within report that 60km/h should be provided along Ewingsdale Road

Byron Shire Central Hospital; Traffic and Parking Study; TEF (April 2007)

- Based on 56 Bed hospital; 90 staff
- Staff:54 morning shift; 46 afternoon shit and 12 night shift
- Woodford Lane/McGettigans/Ewingsdale intersection current operate at LoS “A”
- Estimated parking min 88 (excluding fleet)
- Staff travel modes reviewed: predominately Car. Low use of public transport (limited services) and cycle (no cycle paths to site)
- Comparison drawn based on similar institutions for traffic generation: Peak hour: 0.5 per patient: 0.6 per visitor
- Development has low impact on key intersections Woodford

Lane/McGettigans/Ewingsdale (LoS A existing and post development)

- Recommended main hospital entry to be CH based on RMS guidelines: (LoS A: AM peak and Los B in PM peak)

- Noted within report that 60km/h should be provided along Ewingsdale Road

- Traffic counts in 2006 indicate traffic volumes along Ewingsdale road approximately 1200 in peak hour (bi direction)

West Byron Development Transport Study (March 2011)

The West Byron Development, as proposed, will contain 856 residential dwellings housing a population of 2,182. It will also accommodate business and light industry with an estimated employment of about 379.

The Development, at this scale, is predicted to generate about 6,000 vehicle trips each weekday that will either enter or leave the site via Ewingsdale Road.

This scale of traffic interaction with Ewingsdale Road is best accommodated by providing two site entry/exits. The West Byron Development will increase traffic on Ewingsdale Road. In the vicinity of the site the impact is estimated to be about a 7-8% increase in traffic in 2018 and 2028.

The report recommends the following Road Infrastructure Requirements 2010-2018:

- Construct Mini-Bypass on the Butler Street alignment with a connection across the railway line to Jonson Street at Marvel Street.

- Construct dual lane roundabouts at the intersections of Ewingsdale Road with McGettigans Lane and Bayshore Drive, and at the SAE Institute. These works will be required for traffic safety reasons as traffic volumes on Ewingsdale Road continue to grow and entering from side roads becomes more hazardous (particularly right turns entering Ewingsdale Road).

- Complete pedestrian/cycleway along the south side of Ewingsdale Road.

- Provide two accesses to the West Byron Development - at Bayshore Drive and the SAE Institute.

Road Infrastructure Requirements Post 2018:

- Maintain the option to construct a 4-lane divided carriageway along Ewingsdale Road. The 2028 modelling suggests that this initiative may be necessary within the next 20-30 years whether the West Byron Bay Development proceeds or not. The project can be staged, and the need for the works (in terms of timing) will depend on whether the Development proceeds.

- Progressively introduce parking restrictions in Shirley Street on the western approach to, and exit from, the Butler Street Bypass to provide 4 moving traffic lanes during peak traffic periods.

- Maintain the option to implement the Full Bypass (two lanes - one in each direction) while retaining the intermediate connection to Marvel Street. The extended Bypass can be connected across the railway line to Browning Street via a single lane

roundabout. It is unlikely that the Full Bypass can be justified on purely traffic efficiency grounds. One of the major benefits of the project is improved amenity in the southern portion of the Byron Bay Township east of the railway line resulting from the diversion of through traffic to the Bypass.

Other Studies:

- Tintenbar to Ewingsdale Pacific Highway Upgrade; Working Paper 06 - Traffic and Transport Assessment (RTA 2008)

- MR545 Strategic Study (Opus 2009)

APPENDIX B: BUS ROUTES

Regional Services

Blanch's Bus Company

640 Ballina - Lennox Head - Suffolk Park - Byron Bay - Mullumbimby

Monday to Friday	BVC								BVC		Saturday						Sunday		
map ref Route Number	640	640	645	640	640	640	640	640	645	640	640	640	640	640	640	640	640	640	640
	am	am	am	am	am	pm	pm	pm	pm	pm	am	am	am	pm	pm	pm	am	am	pm
	♿	♿		♿	♿	♿	♿	♿		♿	♿	♿	♿	♿	♿	♿	♿	♿	♿
A **Ballina** - Byron Gateway Airport	6.50	7.30	....	9.05	10.25	12.05	1.45	3.15	....	5.15	7.50	9.00	11.10	1.00	2.45	4.40	7.50	11.10	2.45
B **Ballina** - Kerr St (Hungry Jacks)	6.55	7.35	....	9.10	10.30	12.10	1.50	3.20	....	5.20	7.55	9.05	11.15	1.05	2.50	4.45	7.55	11.15	2.50
C **Ballina** - Tamar St	7.00	7.40	....	9.15	10.35	12.15	1.55	3.30	....	5.25	8.00	9.10	11.20	1.10	2.55	4.50	8.00	11.20	2.55
D **Bayview Drive Estate** - Old Coast Rd	7.05	7.45	....	9.20	10.40	12.20	2.00	3.38	....	5.30	8.05	9.15	11.25	1.15	3.00	4.55	8.05	11.25	3.00
E Headlands Dr	7.10	7.50	....	9.25	10.45	12.25	2.05	3.45	....	5.35	8.10	9.20	11.30	1.20	3.05	5.00	8.10	11.30	3.05
F **Lennox Head** - Ballina St (Prof Centre)	7.15	7.55	....	9.30	10.50	12.30	2.10	3.55	....	5.40	8.15	9.25	11.35	1.25	3.10	5.05	8.15	11.35	3.10
G **Suffolk Park** - Clifford St	7.40	8.20	....	9.55	11.15	12.55	2.35	4.20	....	6.05	8.40	9.50	12.00	1.50	3.35	5.30	8.40	12.00	3.35
H **Byron Hills** - Beech Dr	....	....	....	....	....	....	....	....	....	....	8.42	9.52	12.02	1.52	3.37	5.32	8.42	12.02	3.37
I **Baywood Chase Estate** - Teak Cct	....	....	....	....	....	....	....	....	....	....	8.45	9.55	12.05	1.55	3.40	5.35	8.45	12.05	3.40
J Opp. Beaches of Byron - Broken Head Rd	7.43	8.23	....	9.58	11.18	12.58	2.38	4.23	....	6.08	8.47	9.57	12.07	1.57	3.42	5.37	8.47	12.07	3.42
K **Byron Bay** - Jonson St (Tourist Info)	7.55	8.40Y	9.05	10.05	11.25	1.05	2.45	4.30	5.10	6.15	8.55	10.05	12.15	2.05	3.50	5.45	8.55	12.15	3.50
L **Sunrise Beach Estate** - Julian Rocks Dr	....		....	....	....		....	....	....		8.58	10.08	12.18	2.08	3.53	5.48	8.58	12.18	3.53
M Former Byron Bay Beach Resort	....		....	....	....		....	....	....		....	10.15	....	2.15	....		....		....
N **McGettigans Lane** - Parkway Dr Loop	....		....	....	....		....	4.35	....		....		....		....		....		....
O **Ewingsdale** - cnr Pacific Hwy & Ewingsdale Rd	8.00		9.10	10.10	11.30		3.03	4.40	5.15		9.05		12.25		4.00		9.05		4.00
P **Tyagarah** - cnr Pacific Hwy & Grays Lane	8.08		9.13	10.13	11.33		3.08	4.43	5.18		9.08		12.28		4.03		9.08		4.03
Q **Mullumbimby** - (River Tce Bus Zone)	8.25c		9.30	10.30c	11.50c		3.18	5.00	5.30		9.20c		12.40c		4.15c		9.20		4.15

640 Mullumbimby - Byron Bay - Suffolk Park - Lennox Head - Ballina

Monday to Friday							BVC			Saturday						Sunday		
map ref Route Number	640	640	640	640	640	640	645	640	640	640	640	640	640	640	640	640	640	640
	am	am	am	am	pm	pm	pm	pm	pm	am	am	am	pm	pm	pm	am	pm	pm
	♿	♿	♿	♿	♿	♿		♿	♿	♿	♿	♿	♿	♿	♿	♿	♿	♿
Q **Mullumbimby** - (River Ter B/ Zone)	....	....	8.35c	10.40c	12.00c	....	2.53	3.25	5.10	....	9.30c	....	1.00c	....	4.25c	9.30	....	4.25
P **Tyagarah** - cnr Pacific Hwy & Grays Lane	....	....	8.45	10.50	12.10	....	3.03	3.35	5.20	....	9.40	....	1.10	....	4.35	9.40	....	4.35
O **Ewingsdale** - cnr Pacific Hwy & Ewingsdale Rd	....	....	8.50	10.53	12.13	....	3.06	3.38	5.23	....	9.43	....	1.13	....	4.38	9.43	....	4.38
N **McGettigans Lane** - Parkway Dr Loop	....	....	9.00	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
M Former Byron Bay Beach Resort	....	....	....	....	....	....	....	....	....	7.35	....	11.30	....	....	....	....	....	....
L **Sunrise Beach Estate** - Julian Rocks Dr	....	....	....	....	....	....	....	....	....	7.36	9.45	11.31	1.15	3.10	4.40	9.45	1.15	4.40
R **Byron Bay** - Jonson St (opp. Woolworths)	7.40	7.40	9.10	11.10	12.30	1.45	3.15	3.55	5.40	7.50	10.05	11.50	1.35	3.30	5.00	10.05	1.35	5.00
J Beaches of Byron - Broken Head Rd	7.43	7.43	9.13	11.13	12.33	1.48		3.58	5.43	7.53	10.08	11.53	1.38	3.33	5.03	10.08	1.38	5.03
I **Baywood Chase** - Teak Cct	....	....	....	....	....	....		....	....	7.55	10.10	11.55	1.40	3.35	5.05	10.10	1.40	5.05
H **Byron Hills** - Beech Dr	....	....	....	....	....	....		....	....	7.58	10.13	11.58	1.43	3.38	5.08	10.13	1.43	5.08
G **Suffolk Park** - Clifford St Bus Zone	7.50	7.50	9.20	11.20	12.40	1.55		4.10	5.50	8.05	10.20	12.05	1.50	3.45	5.15	10.20	1.50	5.15
S **Lennox Head** - (Beachfront Bus Zone)	8.10	8.10	9.40	11.40	1.00	2.15		4.30	6.10	8.25	10.40	12.25	2.10	4.05	5.35	10.40	2.10	5.35
E Headlands Dr	8.15v	8.15T	9.45	11.45	1.05	2.20		4.35	6.15	8.30	10.45	12.30	2.15	4.10	5.40	10.45	2.15	5.40
D **Bayview Dr Estate** - Old Coast Rd	8.20v	8.30s	9.50	11.50	1.10	2.25		4.40	6.20	8.35	10.50	12.35	2.20	4.15	5.45	10.50	2.20	5.45
C **Ballina** - Tamar St Bus Zone	8.25v	8.40s	10.00	12.00	1.20	2.35		4.50	6.25	8.40	10.55	12.40	2.25	4.20	5.50	10.55	2.25	5.50
T **Ballina** - Kerr St (KFC)	8.30v	8.45s	10.05	12.05	1.25	2.40		4.55	6.30	8.45	11.00	12.45	2.30	4.25	5.55	11.00	2.30	5.55
A **Ballina** - Byron Gateway Airport	8.40v	8.50s	10.10	12.10	1.30	2.45		5.00	6.35	8.50	11.05	12.50	2.35	4.30	6.00	11.05	2.35	6.00

Timetable Info Line
24 hours 7 days
6686 2144
www.blanchs.com.au

Blanch's Bus Company

♿ Wheelchair Accessible Services

Route usually serviced by a low floor wheelchair accessible vehicle.

Periodic maintenance may affect availability. Please check prior to journey.

Explanations

- **C** - Connects at Mullumbimby with BVC 645 Service travelling to and from Ocean Shores.
- **Q** - Bus travels via Hayters Hill to Byron Bay school days. Departs from Bangalow Hotel
- **S** - Journey operates NSW school days only.
- **T** - School days diverts via Catholic schools.
- **V** - Journey operates NSW school holidays only.
- **X** - Bus sets down at Swift St school days only.
- **Y** - Arrival time at Jonson St is 8.30am during school vacation.
- *** - Enter on request
- .... - Journey does not operate past this timing point.

A Timing Points

For your assistance, the symbols located in the timetables refer to corresponding locations on the route map.

* Weekends & Public Holidays

Route 637 and 641 operates weekdays. Routes 664 and 665 operate weekdays and Saturdays excluding Easter Saturday. Route 640 operates on weekdays, Saturdays and Sundays. On public holidays the Route 640 Sunday timetable operates, except on Christmas Day (no service).

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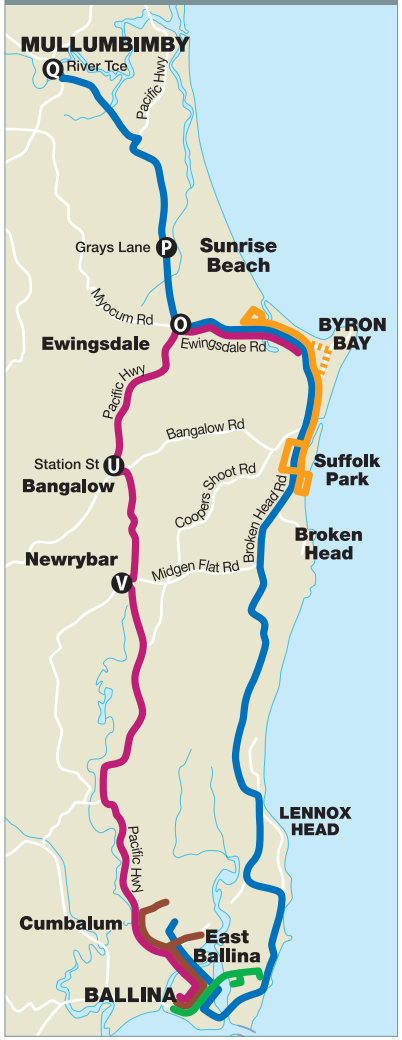
- **Route 641** Ballina - Bangalow - Byron Bay
- **Route 664** Ballina - Northlakes - Ballina Heights
- **Route 665** Ballina - Angels Beach - Prospect Estate & Return

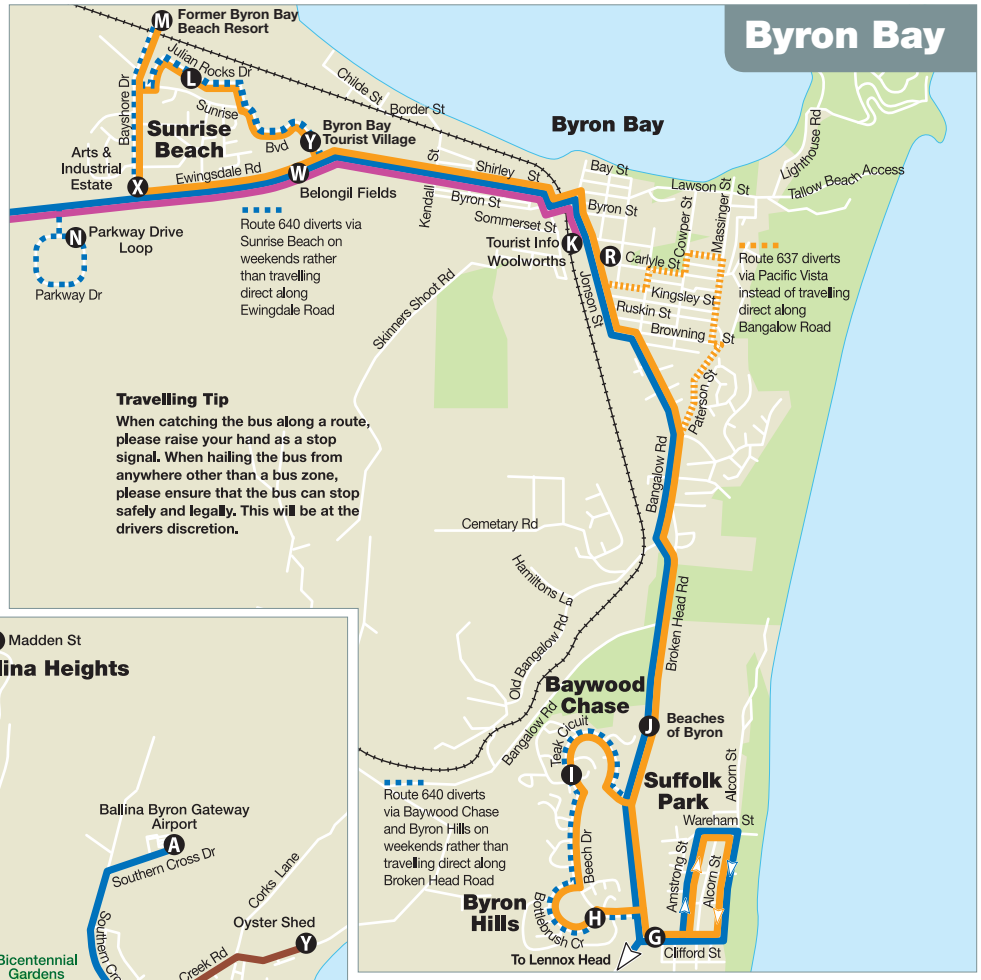
Key

- Shopping Centre
- TAFE
- Hospital
- School

Regional Services



Byron Bay



Ballina

Lennox Head

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641 Byron Bay - Bangalow - Ballina

Monday to Friday - School days							School holidays			
map ref / Route Number	641	641	641	641	641	641	641	641	641	641
	am	am	am	am	pm	pm	am	am	pm	pm
	♿	♿	♿	♿		♿	♿	♿	♿	♿
K **Byron Bay** - Jonson St (Tourist info)	7.35s	....	8.40s	10.20s	2.45s	5.00s	9.10v	11.35v	1.15v	5.00v
U **Bangalow** - Station St	7.55s	7.45s	9.13s	10.40s	3.10s	5.20s	9.30v	11.55v	1.35v	5.20v
V **Newrybar** - Shop	|	7.55s	9.20s	|	|	5.30s	9.40v	|	|	5.30v
B **Ballina** - Kerr St (Hungry Jacks)	|	8.25s	9.35s	|	|	5.45s	9.55v	|	|	5.45v
C **Ballina** - Tamar St	|	8.30sx	9.40s	|	|	5.50s	10.00v	|	|	5.50v

641 Ballina - Bangalow - Byron Bay

Monday to Friday - School days							School holidays			
map ref / Route Number	641	641	641	641	641	641	641	641	641	641
	am	am	am	am	pm	pm	am	pm	pm	pm
	♿			♿	♿	♿	♿	♿	♿	♿
C **Ballina** - Tamar St	7.10s	....	....	....	2.35s	3.40s	8.30v	....	....	4.00v
T **Ballina** - Kerr St (KFC)	7.15s	....	....	....	2.40s	3.45s	8.35v	....	....	4.05v
V **Newrybar** - Opposite Shop	7.30s	....	....	....	2.53s	4.20s	8.50v	....	....	4.20v
U **Bangalow** - Station St	7.40s	8.15sq	9.10s	10.45s	3.05s	4.30s	9.00v	12.00v	1.40v	4.30v
R **Byron Bay** - Opposite Woolworths	....	8.40s	9.30s	11.05s	3.25s	4.50s	9.20v	12.20v	2.00v	4.50v

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Key

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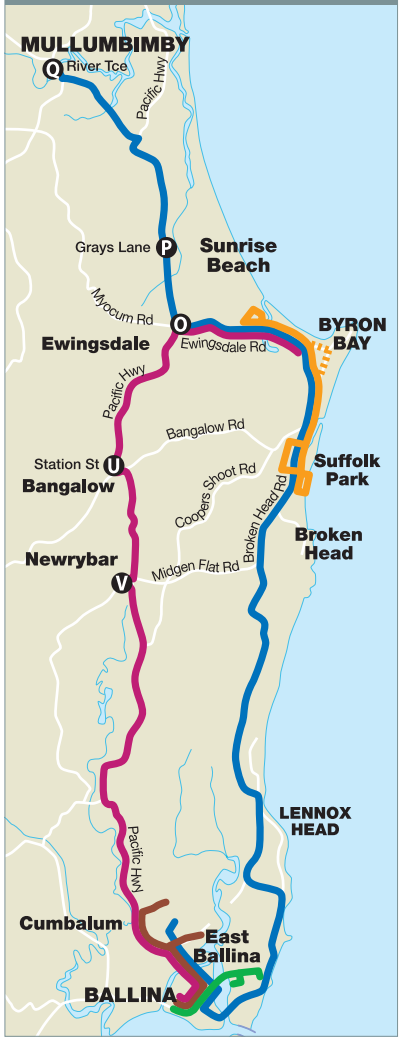
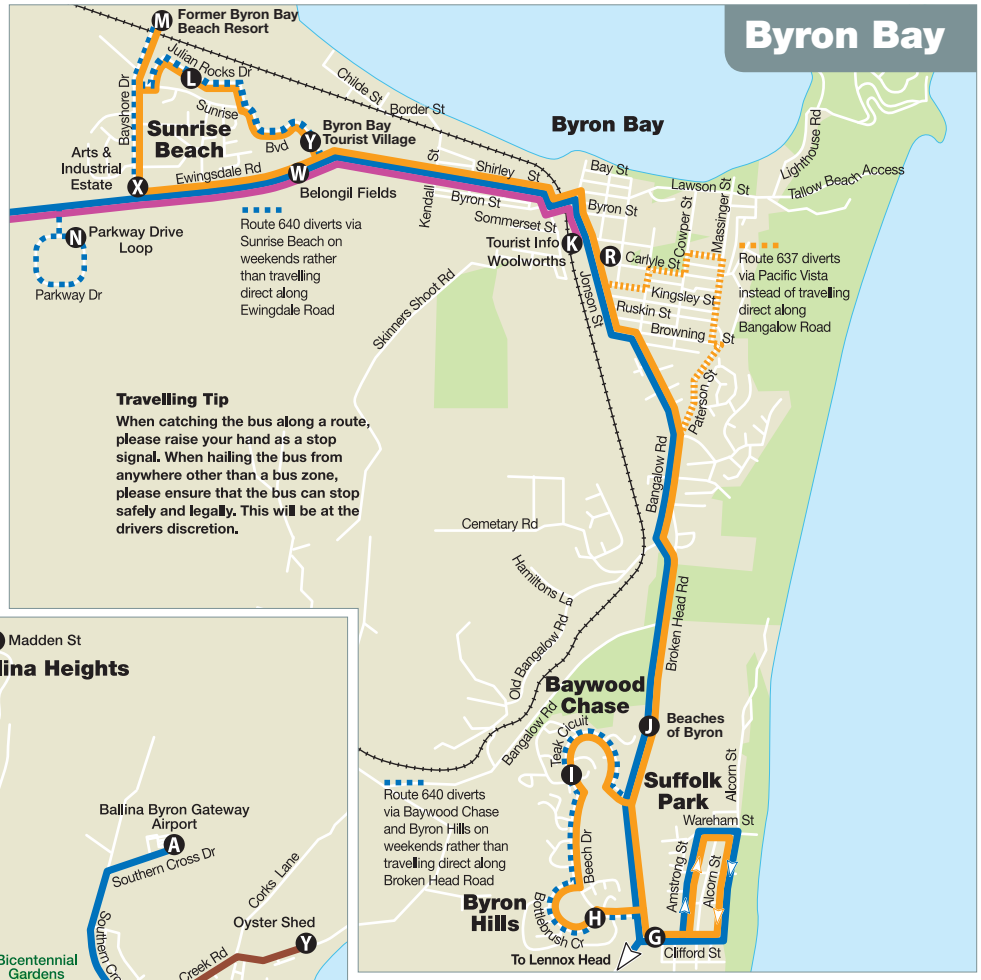


Byron Bay



Ballina

Lennox Head

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B·V·C

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District Bus Services

Serving:
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Brunswick Heads
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Commencing 3 February 2014

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Email: info@brunswickvalleycoaches.com.au
www.brunswickvalleycoaches.com.au

B&E Blanch Pty. Ltd. ABN 75001202455

645

Ocean Shores
Brunswick Heads
Mullumbimby

Key

- Bus Route 645
- Occasional Journeys
- 645 Bus Route Terminus
- Police Station
- Shopping Centre
- School

Concession fare

A Concession fare certificate must be shown with payment of fare or full fare will be charged.

645 Ocean Shores - Brunswick Heads - Mullumbimby - Byron Bay

Monday to Friday								Saturday			
map ref Route Number	645	645	645	645	645	645	645	645	645	645	645
	am ♿	am	am ♿	am ♿	pm ♿	pm	pm	am ♿	am ♿	am/pm ♿	pm ♿
K **Billinudgel** - Mogo Place Humble Pies	....	7.40	9.51					8.36	....	....	3.26
J Balemo Drive - Ocean Shores	7.30	7.44N	9.55	11.08	12.21	2.08	3.49	8.40	9.54	11.59	3.30
L Shara Blvd (SDA Church)	7.37	....	10.02	11.15	12.28	2.15	3.56	8.47	10.01	12.06	3.37
M Golden Beach (Bus zone adjacent Golden Beach Shop)	7.41	....	10.06	11.19	12.32	2.19	4.00	8.51	10.05	12.10	3.41
N New Brighton Shop	7.45	....	10.10	11.23	12.36	2.23	4.04	8.55	10.09	12.14	3.45
O Orana Road (east of Wahlooga Way)	7.48	....	10.13	11.26	12.39	2.26	4.07	8.58	10.12	12.17	3.48
I Yamble Drive Ocean Shores	7.52	....	....	....	....	....	....	....	....	....	....
H Wahlooga Way Ocean Shores	....	7.50	10.17	11.30	12.43	2.30	4.11	9.02	10.16	12.21	3.52
G Coomburra Crescent Ocean Shores	7.54	7.54	10.19	11.32	12.45	2.32	4.13	9.04	10.18	12.23	3.54
F Goondooloo Drive Ocean Shores	7.56	7.56	10.21	11.34	12.47	2.34	4.15	9.06	10.20	12.25	3.56
E **Ocean Shores** Shopping Centre	7.58	7.58	10.23	11.36	12.49	2.36	4.17	9.08	10.22	12.27	3.58
D **Brunswick Heads** Info Centre (Park St)	8.03	8.03	10.28	11.41	12.54	2.41	4.22	9.13	10.27	12.32	4.03
● Bayside (Tweed Street)	8.06	8.06	10.31	11.44	12.57	2.44	4.25	9.16	10.30	12.35	4.06
● Uncle Toms	8.09	8.10	10.34	11.47	1.00	2.47	4.28	9.19	10.33	12.38	4.09
A **Mullumbimby** (River Terrace B/Zone)	8.20BC	....	10.40C	11.53C	1.06	2.53	4.34	9.25C	10.39	12.44C	4.15C
U Byron Bay opp Woolies	....	8.45	....	....	....	3.15	4.54	....	....	....	....

645 Byron Bay - Mullumbimby - Brunswick Heads - Ocean Shores

Monday to Friday									Saturday			
map ref Route Number	645	645	645	645	645	645	645	645	645	645	645	645
	am ♿	am	am ♿	am/pm ♿	pm ♿	pm	pm	pm	am ♿	am ♿	pm ♿	pm ♿
U **Byron Bay** Tourist Info	....	9.05	....	....	....	....	3.35	5.10	....	....	....	.....
A **Mullumbimby** (River Terrace B/Zone)	8.25BC	9.30	10.44C	11.57C	1.44	3.25	....	5.30	9.30C	11.35	12.50C	4.20C
● Opposite Uncle Toms	8.30	9.35	10.49	12.02	1.49	3.30	3.55	5.35	9.35	11.40	12.55	4.25
● Opposite Bayside (Tweed Street)	8.33	9.38	10.52	12.05	1.52	3.33	3.58	5.38	9.38	11.43	12.58	4.28
D **Brunswick Heads** Info Centre (Park St)	8.40	9.41	10.55	12.08	1.55	3.36	4.01	5.41	9.41	11.46	1.01	4.31
E Opp **Ocean Shores** Shopping Centre	8.48	9.48	11.02	12.15	2.02	3.43	4.08	5.48	9.48	11.53	1.08	4.38
F Goondooloo Drive Ocean Shores	8.49	9.49	11.03	12.16	2.03	3.44	4.09	5.49	9.49	11.54	1.09	4.39
G Coomburra Crescent Ocean Shores	8.51	9.51	11.05	12.18	2.05	3.46	4.11	5.51	9.51	11.56	1.11	4.41
H Wahlooga Way Ocean Shores	....	9.52	11.06	12.19	2.06	....	4.12	5.52	9.52	11.57	1.12	4.42
I Yamble Drive Ocean Shores	8.54	....	....	....	....	3.48	....	....	....	....	....	....
J Balemo Drive Ocean Shores	8.56	9.55	11.08	12.21	2.08	3.49	4.17	5.54	9.54	11.59	1.14	4.44
K **Billinudgel** - Mogo Place Humble Pies	....	....	....	....	....	....	4.25	....	....	....	....	....
L Shara Blvd (SDA Church)	....	10.02	11.15	12.28	2.15	3.56	....	6.00	10.01	12.06	1.21	4.51
M Golden Beach (Bus zone adjacent Golden Beach Shop)	....	10.06	11.19	12.32	2.19	4.00	....	6.04	10.05	12.10	1.25	4.55
N New Brighton Shop	....	10.10	11.23	12.36	2.23	4.04	....	6.07	10.09	12.14	1.29	4.59
O Orana Road (east of Wahlooga Way)	....	10.13	11.26	12.39	2.26	4.07	....	6.10	10.12	12.17	1.32	5.02
K **Billinudgel** - Mogo Place Humble Pies	....	....	....	....	....	....	....	6.15	....	....	1.38	5.08

Explanations

B - Uses Stuart Street Bus Zone at Newsagency

C - Connects at Mullumbimby with Blanchs 640 Service travelling to and from Byron Bay.

N - Enters Balemo Drive from the northern end at intersection of Balemo Drive & Tweed Valley Way.

♿ - Route usually serviced by a low floor wheelchair accessible vehicle.
Periodic maintenance may affect availability. Please check prior to journey.

.... - Journey does not operate past this timing point.

Ⓐ Timing Points

For your assistance, the symbols located in the timetables refer to corresponding locations on the route map.

Sundays & Public Holidays

Route 645 DOES NOT OPERATE ON Sundays, Public Holidays or Easter Saturday.

Fares

Passes must be produced for concession discounts each time a ticket is purchased. Unreadable passes are invalid. Passengers 16 years and over are required to pay full fare unless travelling to and from school, or upon presenting a valid school pass or other valid ID. Note health care cards do not entitle travellers to concession fares.

Lost Property

Please take all items with you before you leave the bus. If you find an item left on the bus, please hand it to the driver. Lost property enquiries for this service can be made at our depot, on 6680 1566. Please keep your bus ticket to help identify the bus involved.

APPENDIX C: SIDRA INTERSECTION ANALYSIS

Byron Shire Central Hospital Access SIDRA Analysis

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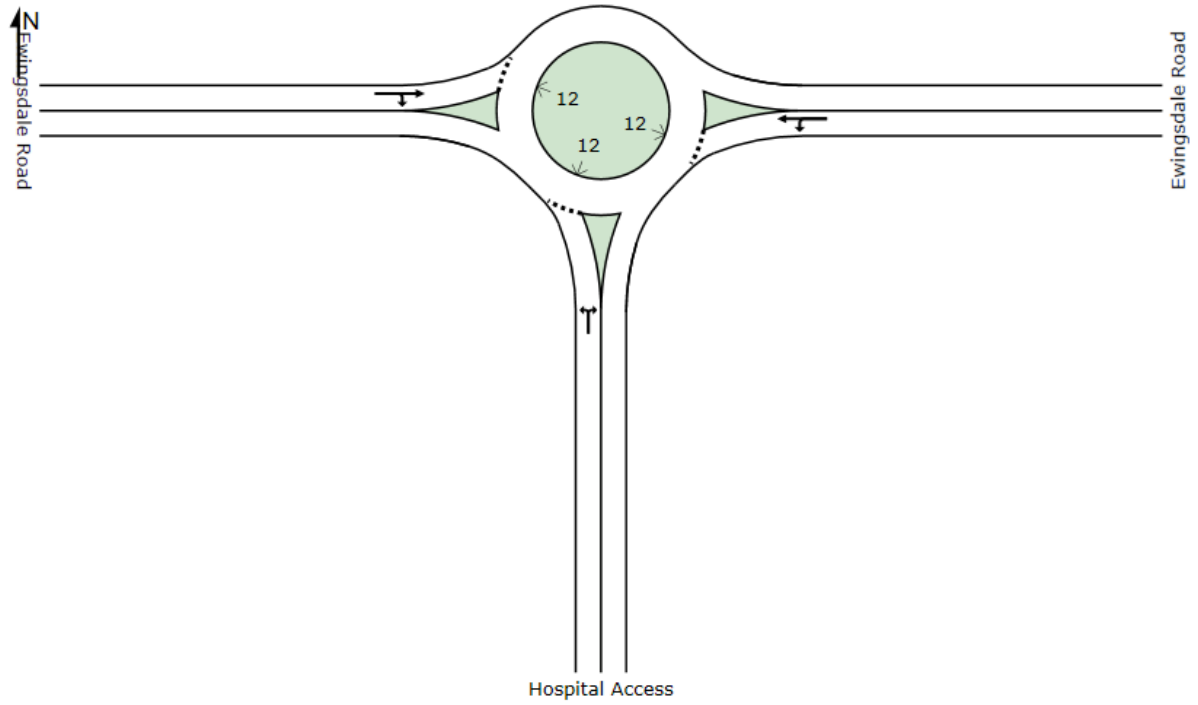
Revision Register

Rev	Date	Prepared By	Remarks
1	16/7/14	STC	
1	13/8/14	STC	Addition of nearby intersection analysis

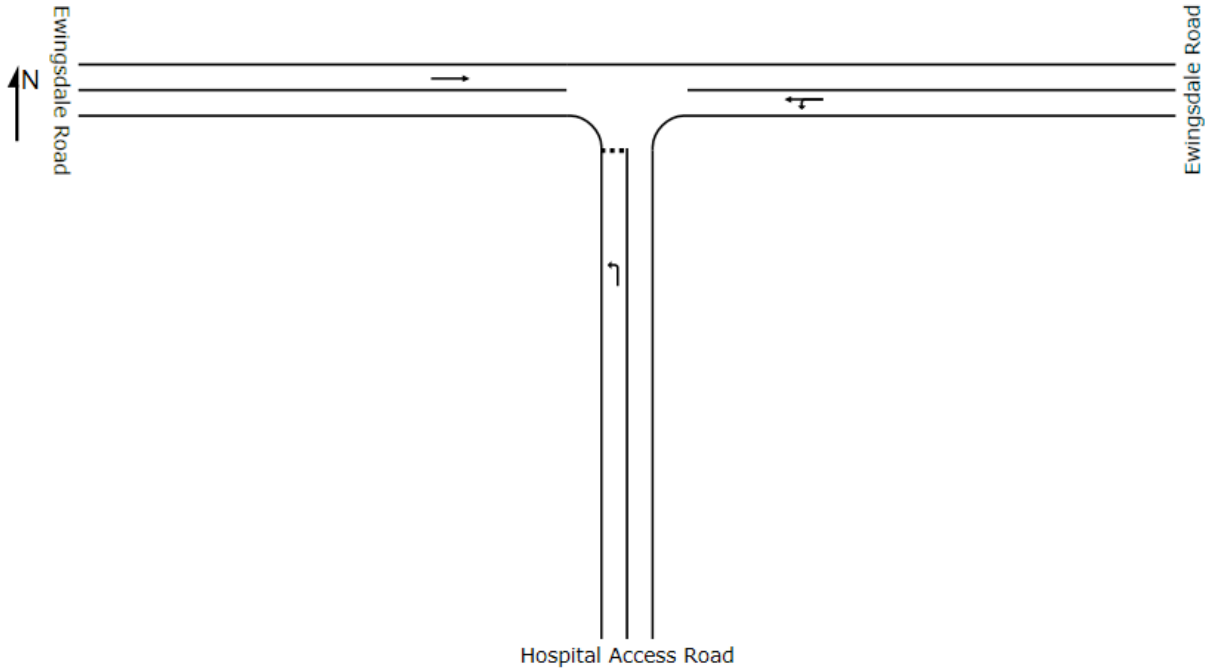
P:\2014\1412\141233\Reports\TTW\Traffic\140813_SIDRA Analysis Summary - Hospital Access and Nearby Intersection (Rev 2).doc

1.0 SIRDRA LAYOUT PROFILE

1.1 Western Access – 1 Lane Roundabout



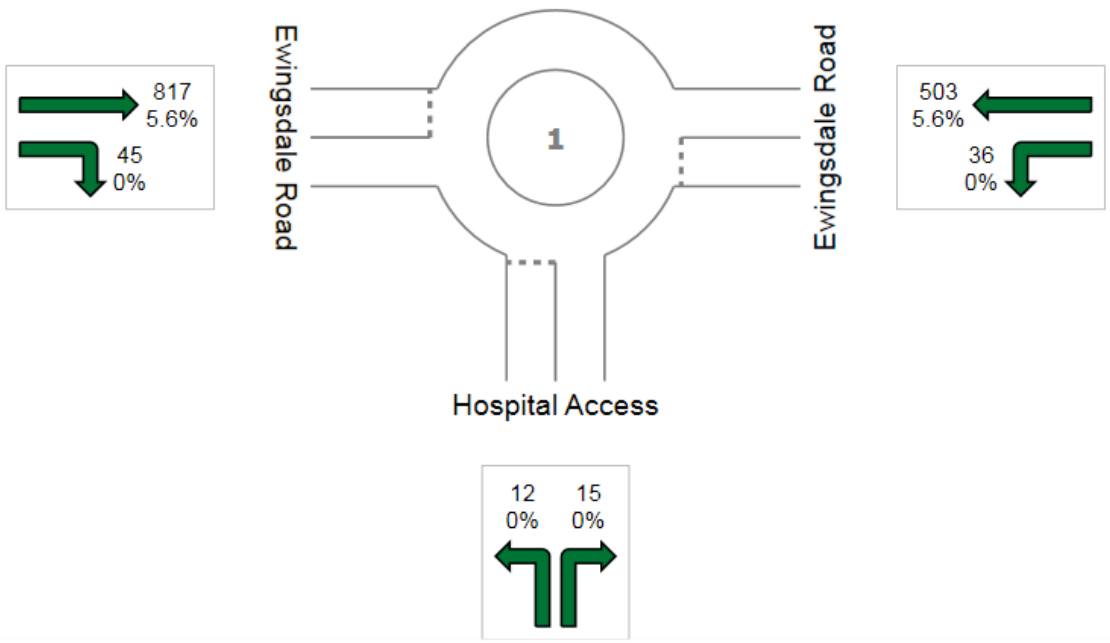
1.2 Eastern Access – Left In/Left Out



2.0 2018 TRAFFIC VOLUMES POST DEVELOPMENT

2.1 Western Access – 1 Lane Roundabout: AM Peak

Traffic volumes



LANE SUMMARY

Site: Western Access - Roundabout 1 lane (2018 Traffic Volume - AM Peak)

Ewingsdale Road Roundabout (1 Lane)
Roundabout

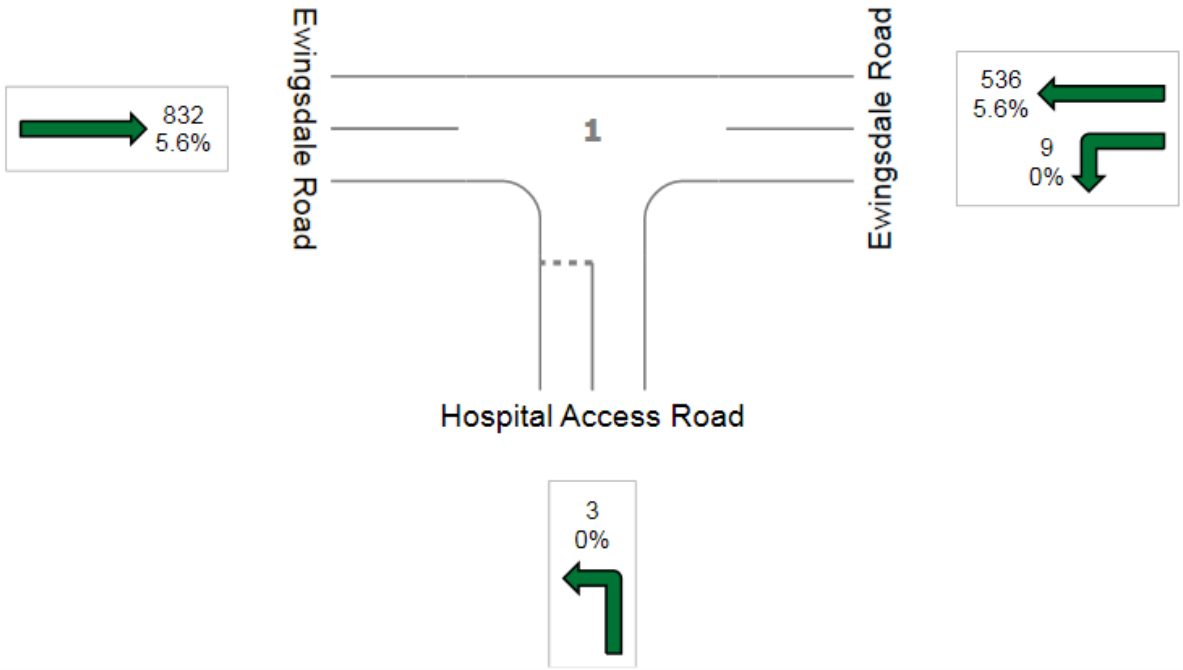
Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV						Veh	Dist				
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Hospital Access													
Lane 1d	27	0.0	800	0.034	100	5.6	LOS A	0.2	1.3	Full	40	0.0	0.0
Approach	27	0.0		0.034		5.6	LOS A	0.2	1.3				
East: Ewingsdale Road													
Lane 1d	539	5.2	1403	0.384	100	4.9	LOS A	2.9	21.5	Full	170	0.0	0.0
Approach	539	5.2		0.384		4.9	LOS A	2.9	21.5				
West: Ewingsdale Road													
Lane 1d	862	5.3	1567	0.550	100	4.9	LOS A	6.3	46.3	Full	270	0.0	0.0
Approach	862	5.3		0.550		4.9	LOS A	6.3	46.3				
Intersection	1428	5.2		0.550		4.9	LOS A	6.3	46.3				

d Dominant lane on roundabout approach

2.2 Eastern Access – Left In/Left Out: AM Peak

Traffic volumes



LANE SUMMARY

Site: Eastern Access/Egress Point (2018 Traffic Volume - AM Peak)

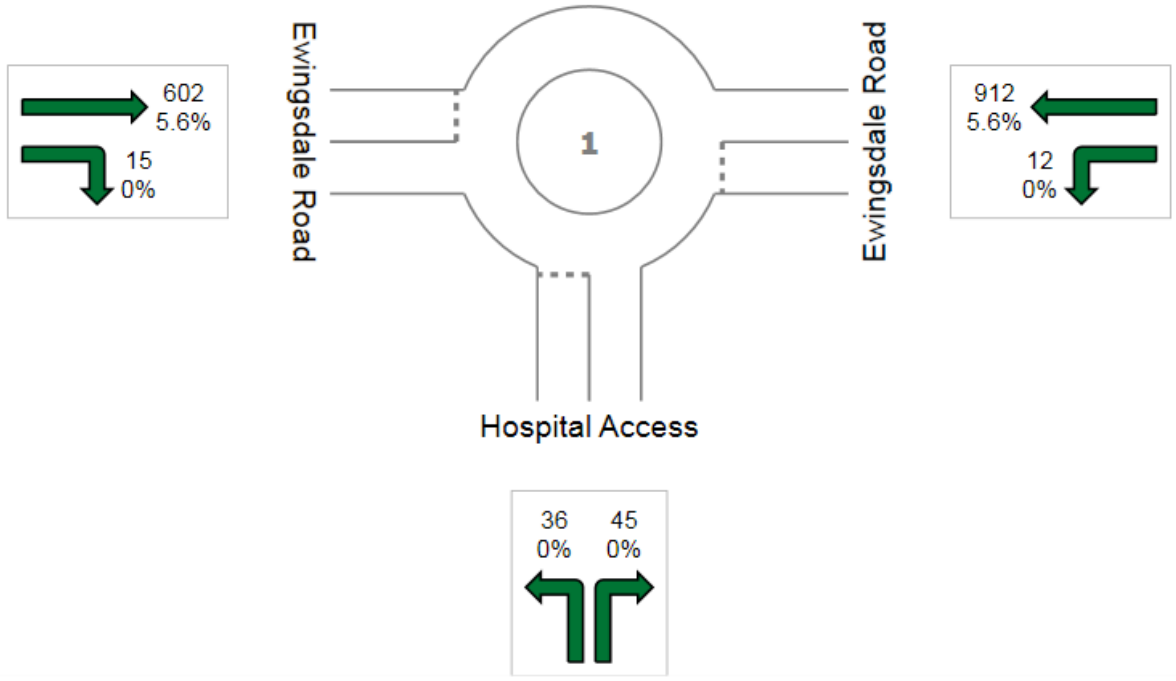
Edingsdale Road Eastern Access/Egress Point
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV						Veh	Dist				
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Hospital Access Road													
Lane 1	3	0.0	901	0.004	100	4.9	LOS A	0.0	0.1	Full	20	0.0	0.0
Approach	3	0.0		0.004		4.9	LOS A	0.0	0.1				
East: Edingsdale Road													
Lane 1	574	5.5	1881	0.305	100	0.1	LOS A	0.0	0.0	Full	320	0.0	0.0
Approach	574	5.5		0.305		0.1	NA	0.0	0.0				
West: Edingsdale Road													
Lane 1	876	5.6	1882	0.465	100	0.0	LOS A	0.0	0.0	Full	170	0.0	0.0
Approach	876	5.6		0.465		0.0	NA	0.0	0.0				
Intersection	1453	5.6		0.465		0.1	NA	0.0	0.1				

2.3 Western Access – 1 Lane Roundabout: PM Peak

Traffic volumes



LANE SUMMARY

Site: Western Access - Roundabout 1 lane (2018 Traffic Volume - PM Peak)

Ewingsdale Road Roundabout (1 Lane)
Roundabout

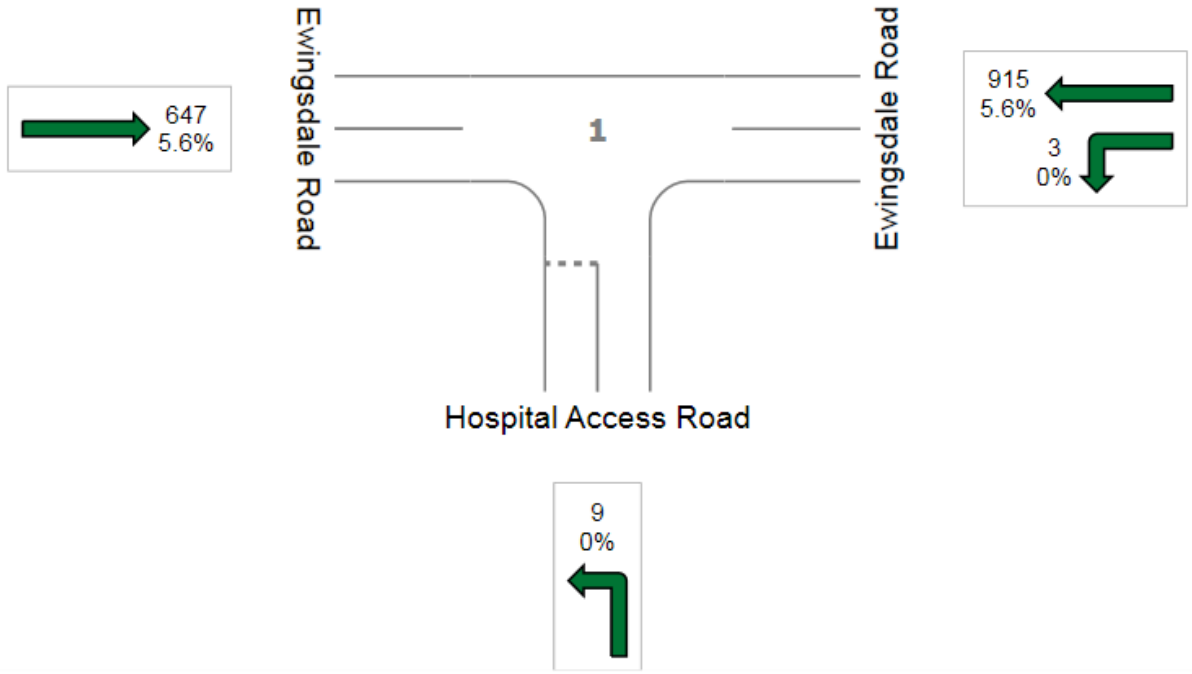
Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV						Veh	Dist				
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Hospital Access													
Lane 1[d]	81	0.0	544	0.149	100	10.9	LOS A	0.9	6.5	Full	40	0.0	0.0
Approach	81	0.0		0.149		10.9	LOS A	0.9	6.5				
East: Ewingsdale Road													
Lane 1[d]	924	5.5	1572	0.588	100	4.7	LOS A	6.6	48.5	Full	170	0.0	0.0
Approach	924	5.5		0.588		4.7	LOS A	6.6	48.5				
West: Ewingsdale Road													
Lane 1[d]	617	5.5	1399	0.441	100	5.0	LOS A	4.3	31.5	Full	270	0.0	0.0
Approach	617	5.5		0.441		5.0	LOS A	4.3	31.5				
Intersection	1622	5.2		0.588		5.2	LOS A	6.6	48.5				

d Dominant lane on roundabout approach

2.4 Eastern Access – Left In/Left Out: PM Peak

Traffic volumes



LANE SUMMARY

Site: Eastern Access/Egress Point (2018 Traffic Volume - PM Peak)

Ewingsdale Road Eastern Access/Egress Point
Giveway / Yield (Two-Way)

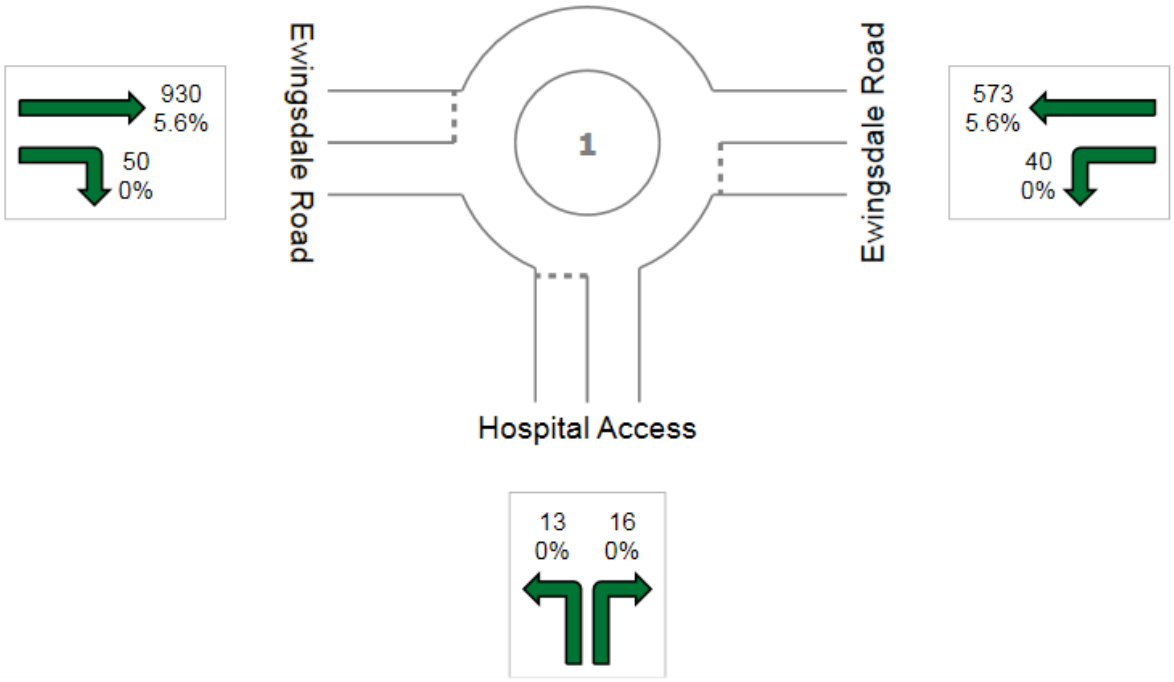
Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV						Veh	Dist				
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Hospital Access Road													
Lane 1	9	0.0	455	0.021	100	9.3	LOS A	0.1	0.5	Full	20	0.0	0.0
Approach	9	0.0		0.021		9.3	LOS A	0.1	0.5				
East: Ewingsdale Road													
Lane 1	966	5.6	1881	0.514	100	0.1	LOS A	0.0	0.0	Full	320	0.0	0.0
Approach	966	5.6		0.514		0.1	NA	0.0	0.0				
West: Ewingsdale Road													
Lane 1	681	5.6	1882	0.362	100	0.0	LOS A	0.0	0.0	Full	170	0.0	0.0
Approach	681	5.6		0.362		0.0	NA	0.0	0.0				
Intersection	1657	5.6		0.514		0.1	NA	0.1	0.5				

3.0 2028 TRAFFIC VOLUMES POST DEVELOPMENT

3.1 Western Access – 1 Lane Roundabout: AM Peak

Traffic volumes



LANE SUMMARY

Site: Western Access Roundabout 1 lane (2028 Traffic Volume - AM Peak)

Ewingsdale Road Roundabout (1 Lane)
Roundabout

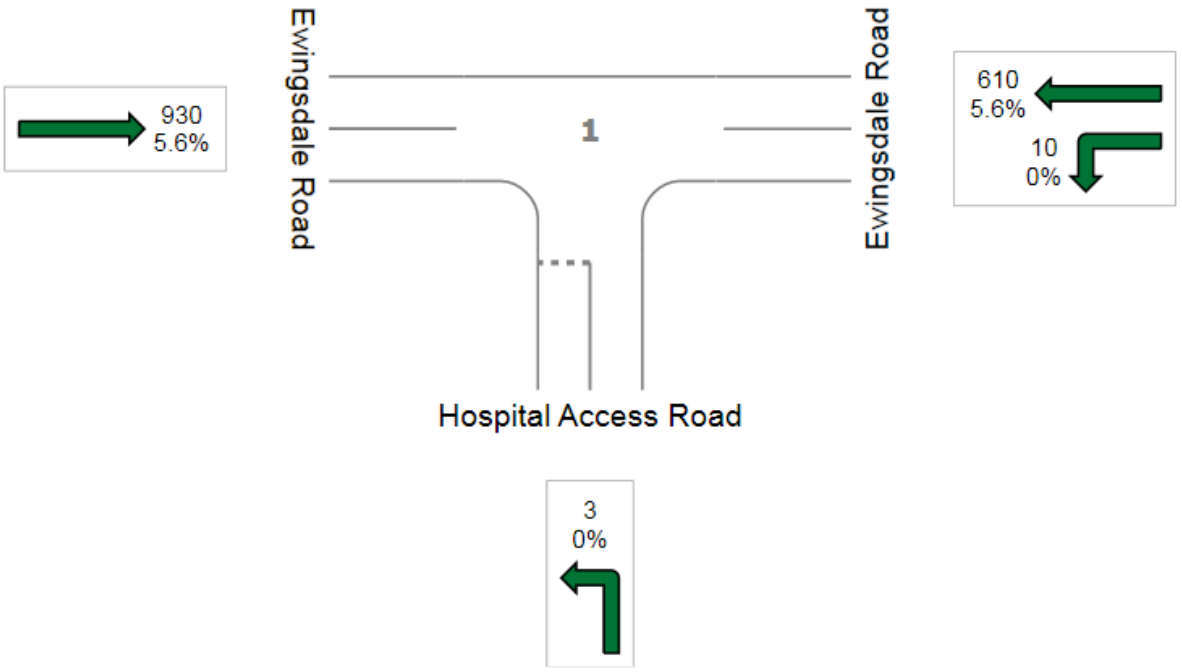
Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV						Veh	Dist				
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Hospital Access													
Lane 1d	29	0.0	746	0.039	100	6.2	LOS A	0.2	1.5	Full	40	0.0	0.0
Approach	29	0.0		0.039		6.2	LOS A	0.2	1.5				
East: Ewingsdale Road													
Lane 1d	613	5.2	1396	0.439	100	5.0	LOS A	3.6	26.6	Full	170	0.0	0.0
Approach	613	5.2		0.439		5.0	LOS A	3.6	26.6				
West: Ewingsdale Road													
Lane 1d	980	5.3	1569	0.625	100	4.9	LOS A	8.4	61.5	Full	270	0.0	0.0
Approach	980	5.3		0.625		4.9	LOS A	8.4	61.5				
Intersection	1622	5.2		0.625		5.0	LOS A	8.4	61.5				

d Dominant lane on roundabout approach

3.2 Eastern Access – Left In/Left Out: AM Peak

Traffic volumes



LANE SUMMARY

Site: Eastern Access/Egress Point (2028 Traffic Volume - AM Peak)

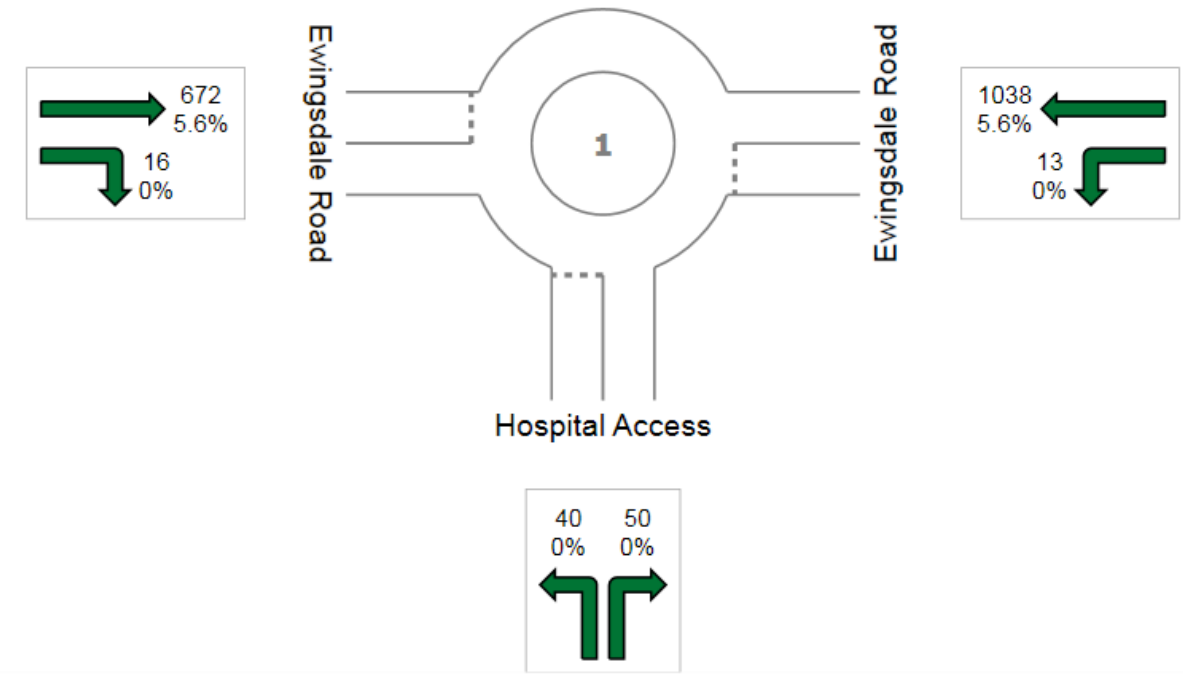
Ewingsdale Road Eastern Access/Egress Point
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV						Veh	Dist				
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Hospital Access Road													
Lane 1	3	0.0	807	0.004	100	5.4	LOS A	0.0	0.1	Full	20	0.0	0.0
Approach	3	0.0		0.004		5.4	LOS A	0.0	0.1				
East: Ewingsdale Road													
Lane 1	653	5.5	1881	0.347	100	0.1	LOS A	0.0	0.0	Full	320	0.0	0.0
Approach	653	5.5		0.347		0.1	NA	0.0	0.0				
West: Ewingsdale Road													
Lane 1	979	5.6	1882	0.520	100	0.0	LOS A	0.0	0.0	Full	170	0.0	0.0
Approach	979	5.6		0.520		0.0	NA	0.0	0.0				
Intersection	1635	5.6		0.520		0.1	NA	0.0	0.1				

3.3 Western Access – 1 Lane Roundabout: PM Peak

Traffic volumes



LANE SUMMARY

Site: Western Access Roundabout 1 lane (2028 Traffic Volume - PM Peak)

Ewingsdale Road Roundabout (1 Lane)
Roundabout

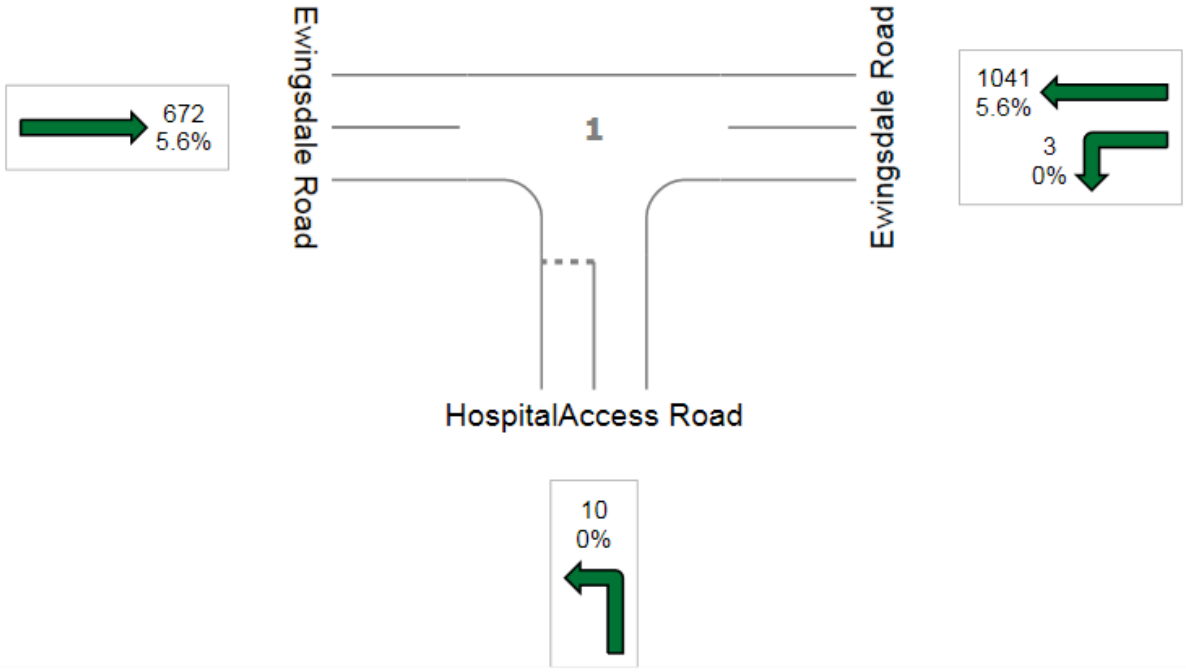
Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV						Veh	Dist				
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Hospital Access													
Lane 1[d]	90	0.0	460	0.196	100	13.7	LOS A	1.3	8.9	Full	40	0.0	0.0
Approach	90	0.0		0.196		13.7	LOS A	1.3	8.9				
East: Ewingsdale Road													
Lane 1[d]	1051	5.5	1574	0.668	100	4.8	LOS A	9.0	66.3	Full	170	0.0	0.0
Approach	1051	5.5		0.668		4.8	LOS A	9.0	66.3				
West: Ewingsdale Road													
Lane 1[d]	688	5.5	1389	0.495	100	5.1	LOS A	5.3	38.6	Full	270	0.0	0.0
Approach	688	5.5		0.495		5.1	LOS A	5.3	38.6				
Intersection	1829	5.2		0.668		5.3	LOS A	9.0	66.3				

d Dominant lane on roundabout approach

3.4 Eastern Access – Left In/Left Out: PM Peak

Traffic volumes



LANE SUMMARY

Site: Eastern Access/Egress Point (2028 Traffic Volume - PM Peak)

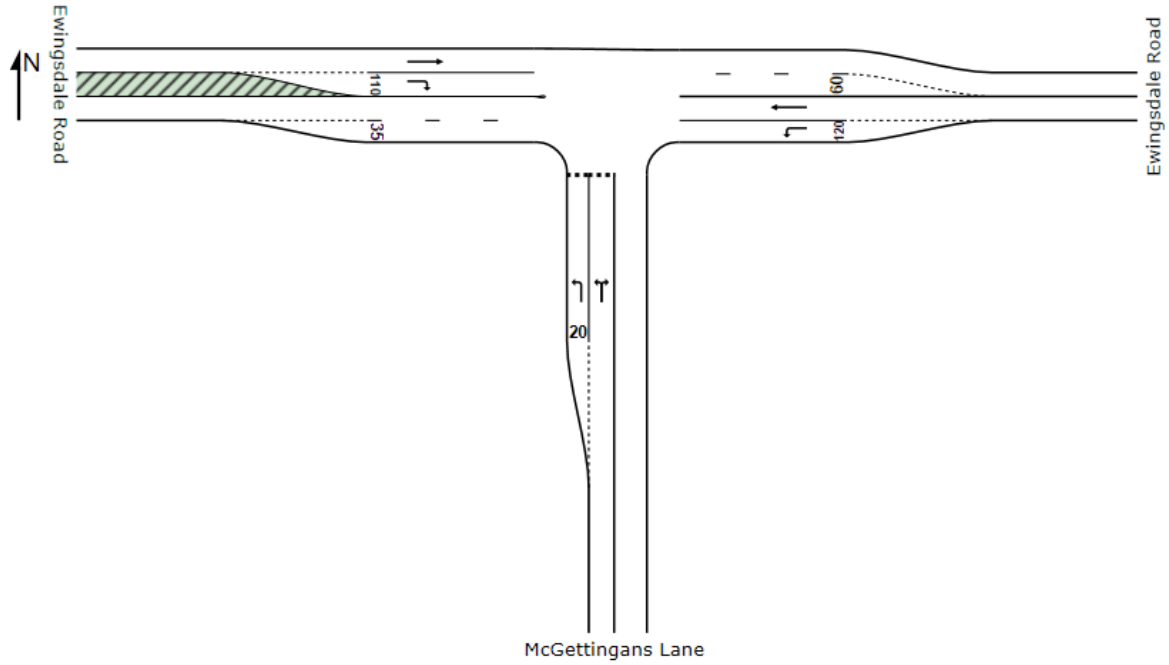
Ewingsdale Road Eastern Access/Egress Point
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV						Veh	Dist				
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Hospital Access Road													
Lane 1	11	0.0	332	0.032	100	12.3	LOS A	0.1	0.7	Full	20	0.0	0.0
Approach	11	0.0		0.032		12.3	LOS A	0.1	0.7				
East: Ewingsdale Road													
Lane 1	1099	5.6	1881	0.584	100	0.1	LOS A	0.0	0.0	Full	320	0.0	0.0
Approach	1099	5.6		0.584		0.1	NA	0.0	0.0				
West: Ewingsdale Road													
Lane 1	707	5.6	1882	0.376	100	0.0	LOS A	0.0	0.0	Full	170	0.0	0.0
Approach	707	5.6		0.376		0.0	NA	0.0	0.0				
Intersection	1817	5.6		0.584		0.1	NA	0.1	0.7				

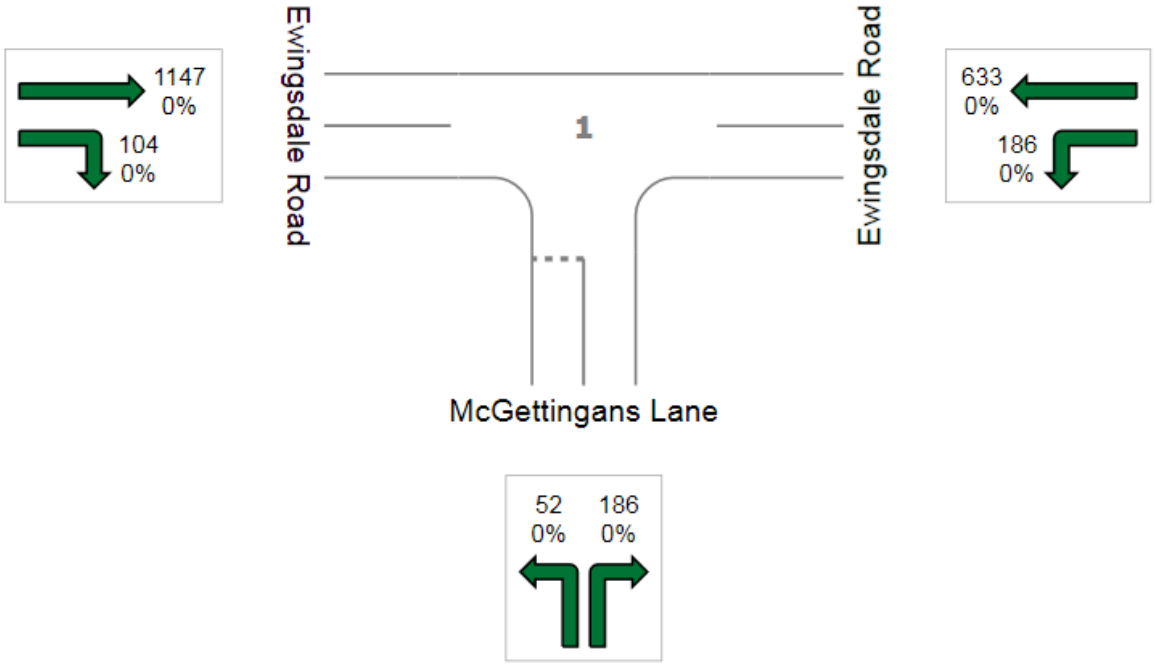
4.0 MCGETTINGANS LANE/ EWINGSDALE ROAD ANALYSIS (2028)

SIDRA Layout



2028 Traffic Volumes Pre Development

Traffic volumes



LANE SUMMARY

Site: Ewingsdale Road / McGettingans Lane (TEF 2007 Base Traffic Volumes (AM Peak) + Growth Factor (2028)

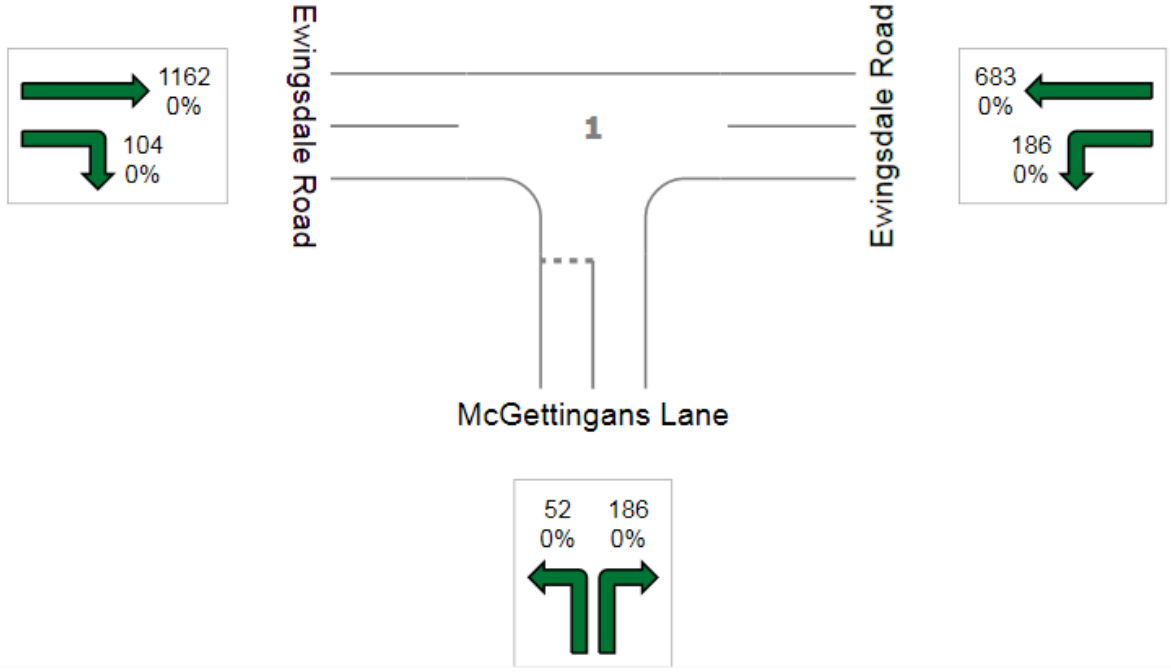
Ewingsdale Road / McGettingans Lane: (2018 Traffic Volumes - AM Peak)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV						Veh	Dist				
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: McGettingans Lane													
Lane 1	52	0.0	636	0.082	100	9.3	LOS A	0.3	1.9	Short	20	0.0	0.0
Lane 2	186	0.0	99	1.888	100	866.2	LOS F	60.6	424.3	Full	425	0.0	5.0
Approach	238	0.0		1.888		679.0	LOS F	60.6	424.3				
East: Ewingsdale Road													
Lane 1	186	0.0	1828	0.102	100	8.0	LOS A	0.0	0.0	Short	120	0.0	0.0
Lane 2	633	0.0	1950	0.325	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	819	0.0		0.325		1.8	NA	0.0	0.0				
West: Ewingsdale Road													
Lane 1	1147	0.0	1950	0.588	100	0.1	LOS A	0.0	0.0	Full	320	0.0	0.0
Lane 2	104	0.0	354	0.294	100	16.7	LOS B	1.2	8.5	Short	110	0.0	0.0
Approach	1251	0.0		0.588		1.5	NA	1.2	8.5				
Intersection	2308	0.0		1.888		71.5	NA	60.6	424.3				

2028 Traffic Volumes Post Development

Traffic volumes



LANE SUMMARY

Site: Ewingsdale Road / McGettingans Lane (TEF 2007 Base Traffic Volumes (AM Peak) + Growth Factor (2028)

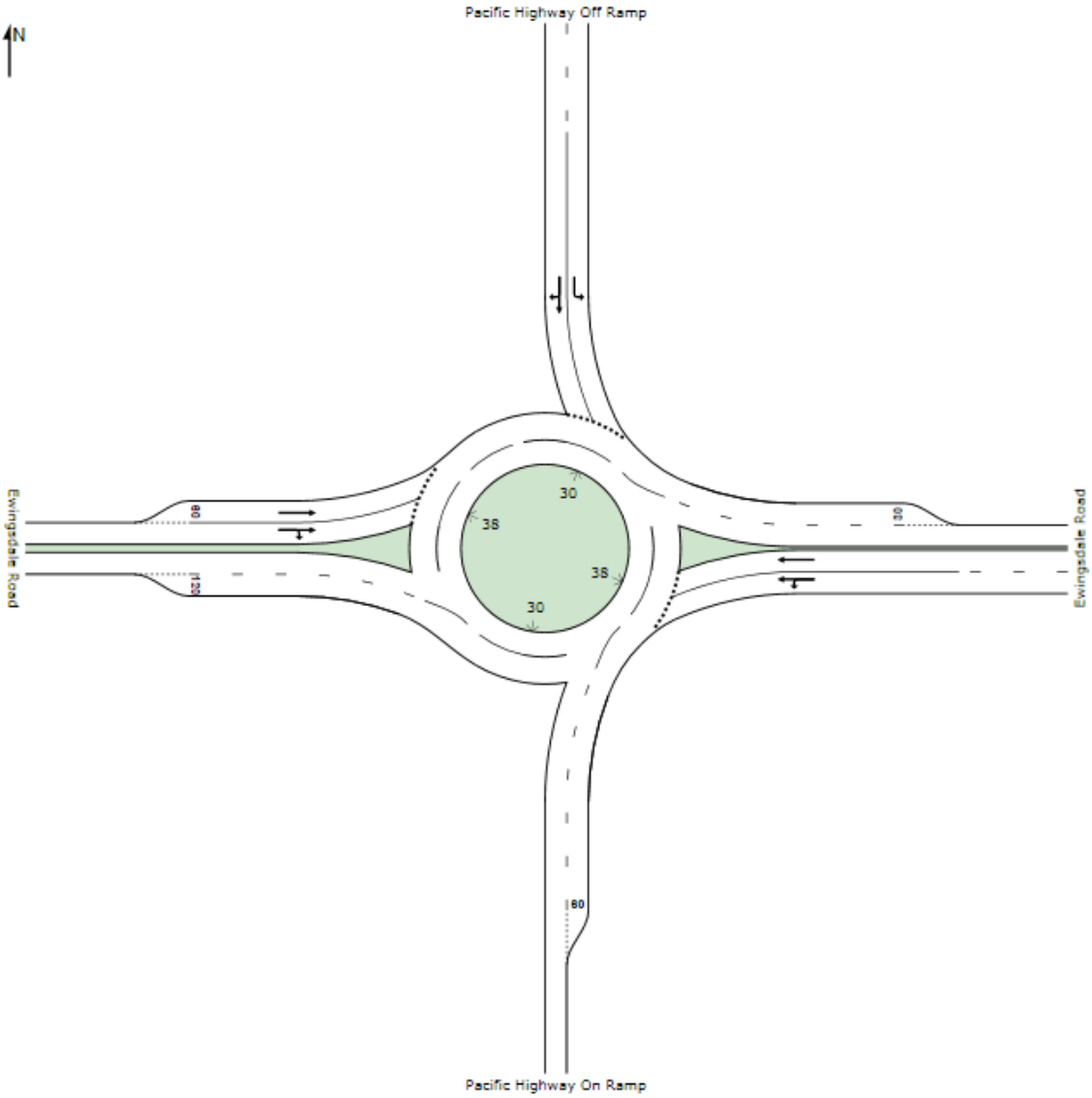
Ewingsdale Road / McGettingans Lane: (2018 Traffic Volumes - AM Peak)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV						Veh	Dist				
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: McGettingans Lane													
Lane 1	52	0.0	587	0.089	100	9.9	LOS A	0.3	2.1	Short	20	0.0	0.0
Lane 2	186	0.0	86	2.157	100	1113.1	LOS F	68.8	481.7	Full	425	0.0	8.8
Approach	238	0.0		2.157		872.1	LOS F	68.8	481.7				
East: Ewingsdale Road													
Lane 1	186	0.0	1828	0.102	100	8.0	LOS A	0.0	0.0	Short	120	0.0	0.0
Lane 2	683	0.0	1950	0.350	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	869	0.0		0.350		1.7	NA	0.0	0.0				
West: Ewingsdale Road													
Lane 1	1162	0.0	1950	0.596	100	0.1	LOS A	0.0	0.0	Full	320	0.0	0.0
Lane 2	104	0.0	319	0.326	100	18.7	LOS B	1.3	9.4	Short	110	0.0	0.0
Approach	1266	0.0		0.596		1.6	NA	1.3	9.4				
Intersection	2373	0.0		2.157		89.0	NA	68.8	481.7				

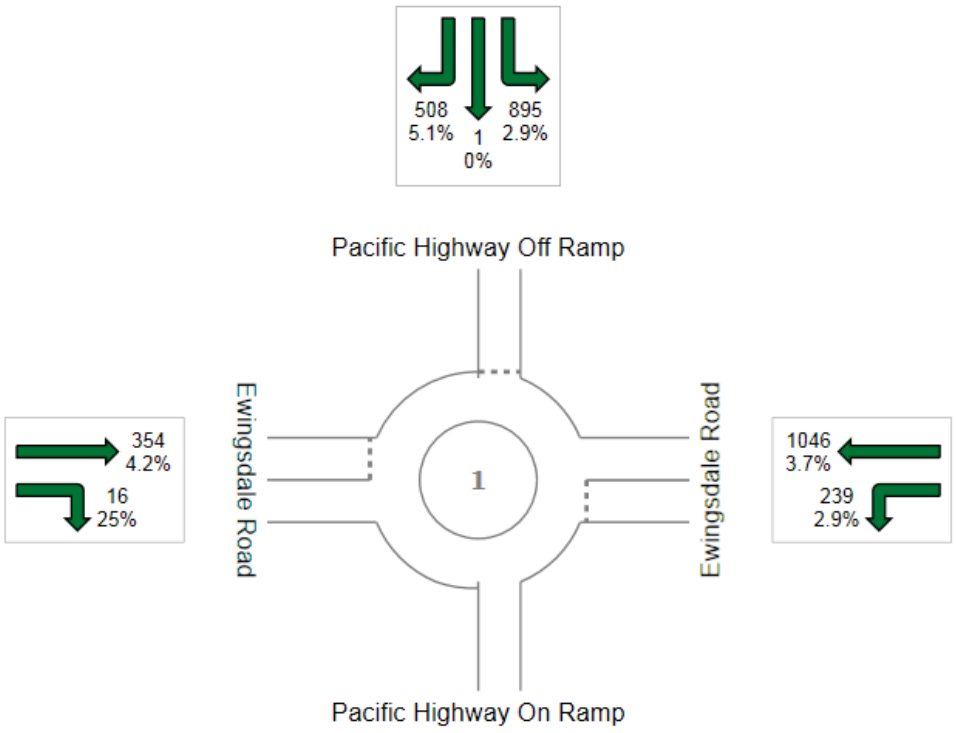
5.0 PACIFIC HIGHWAY INTERCHANGE/ EWINGSDALE ROAD ANALYSIS (2032)

SIDRA Layout



2032 Traffic Volumes Pre Development

Traffic volumes



LANE SUMMARY

Site: Ewingsdale Road/Pacific Highway Roundabout (RMS 2032 Peak Volumes)

Ewingsdale Road/Pacific Highway Roundabout - 2 lane Roundabout

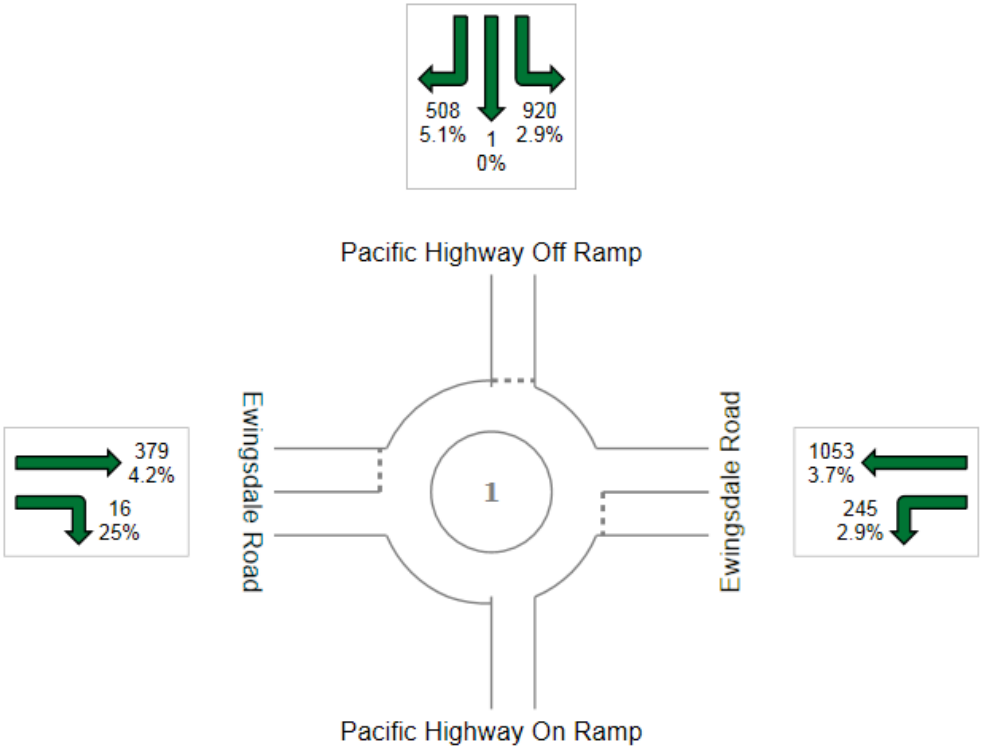
Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV						Veh	Dist				
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Ewingsdale Road													
Lane 1	523	3.3	899	0.581	84[6]	8.0	LOS A	5.0	35.8	Full	100	0.0	0.0
Lane 2[d]	762	3.7	1106	0.689	100	8.5	LOS A	7.8	56.3	Full	100	0.0	0.0
Approach	1285	3.6		0.689		8.3	LOS A	7.8	56.3				
North: Pacific Highway Off Ramp													
Lane 1[d]	895	2.9	1269	0.705	100	6.9	LOS A	6.4	45.8	Full	380	0.0	0.0
Lane 2	509	5.1	1000	0.509	100	11.8	LOS A	2.9	21.4	Full	380	0.0	0.0
Approach	1404	3.7		0.705		8.6	LOS A	6.4	45.8				
West: Ewingsdale Road													
Lane 1	85	4.2	1372	0.062	39[6]	3.3	LOS A	0.0	0.0	Short	60	0.0	0.0
Lane 2[d]	285	5.4	1800	0.158	100	3.7	LOS A	0.0	0.0	Full	240	0.0	0.0
Approach	370	5.1		0.158		3.6	LOS A	0.0	0.0				
Intersection	3059	3.8		0.705		7.9	LOS A	7.8	56.3				

6 Lane underutilisation due to downstream effects
d Dominant lane on roundabout approach

2032 Traffic Volumes Post Development

Traffic volumes



LANE SUMMARY

Site: Ewingsdale Road/Pacific Highway Roundabout (RMS 2032 Peak Volumes + AM Hospital Peak)

Ewingsdale Road/Pacific Highway Roundabout - 2 lane Roundabout

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total	HV						Veh	Dist				
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Ewingsdale Road													
Lane 1	528	3.3	897	0.589	84[6]	8.1	LOS A	5.1	36.9	Full	100	0.0	0.0
Lane 2[d]	770	3.7	1103	0.698	100	8.6	LOS A	8.1	58.3	Full	100	0.0	0.0
Approach	1298	3.5		0.698		8.4	LOS A	8.1	58.3				
North: Pacific Highway Off Ramp													
Lane 1[d]	920	2.9	1254	0.734	100	7.4	LOS A	7.2	51.5	Full	380	0.0	0.0
Lane 2	509	5.1	979	0.520	100	12.1	LOS A	3.1	22.5	Full	380	0.0	0.0
Approach	1429	3.7		0.734		9.1	LOS A	7.2	51.5				
West: Ewingsdale Road													
Lane 1	91	4.2	1371	0.066	39[6]	3.3	LOS A	0.0	0.0	Short	60	0.0	0.0
Lane 2[d]	304	5.3	1800	0.169	100	3.6	LOS A	0.0	0.0	Full	240	0.0	0.0
Approach	395	5.0		0.169		3.6	LOS A	0.0	0.0				
Intersection	3122	3.8		0.734		8.1	LOS A	8.1	58.3				

6 Lane underutilisation due to downstream effects
d Dominant lane on roundabout approach