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12 July 2019

P1357 Mavid Medowie Mixed Use Development

Medowie Retail Unit Trust

Attn: Peter Childs

Dear Peter,

Re: Traffic Impact Assessment for the proposed mixed use development, Medowie, NSW

Further to our site work and a review of the provided documentation for the proposed mixed use development located between Medowie Road, Muir Street and Peppertree Road, Medowie, we provide the following traffic impact assessment. This assessment has been prepared in accordance with the Austroads Guidelines and Section 2.3 of the RMS Guide to Traffic Generating Developments, which provides the structure for the reporting of key issues to be addressed when determining the impacts of traffic associated with a development. This guide indicates that the use of this format and checklist ensures that the most significant matters are considered by the relevant road authority.

The report has also taken into consideration the planning requirements outlined in the Port Stephens Council Development Control Plan 2014 and the relevant requirements of the Australian Standard for off-street parking, AS2890.1.Reference has also been made to the Medowie Traffic and Transport Study (URaP 2017), as well as the Medowie Planning Strategy (2016). The location of the proposed development is shown in Figure 1 below.

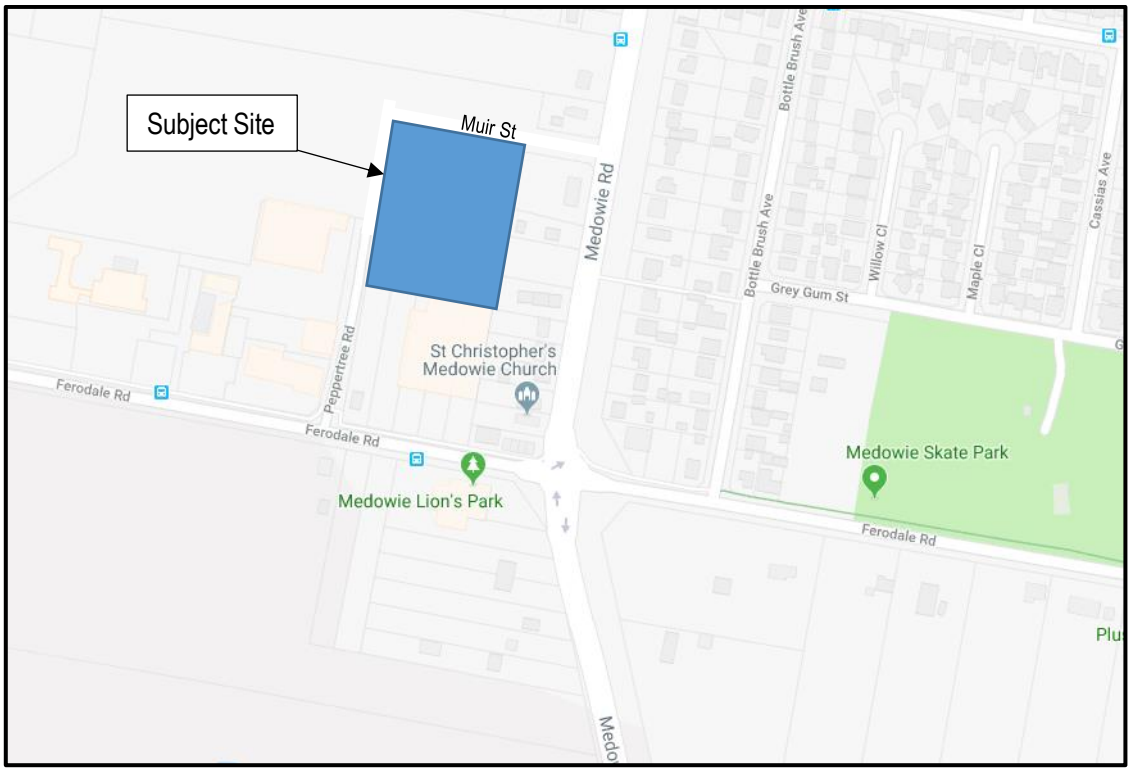
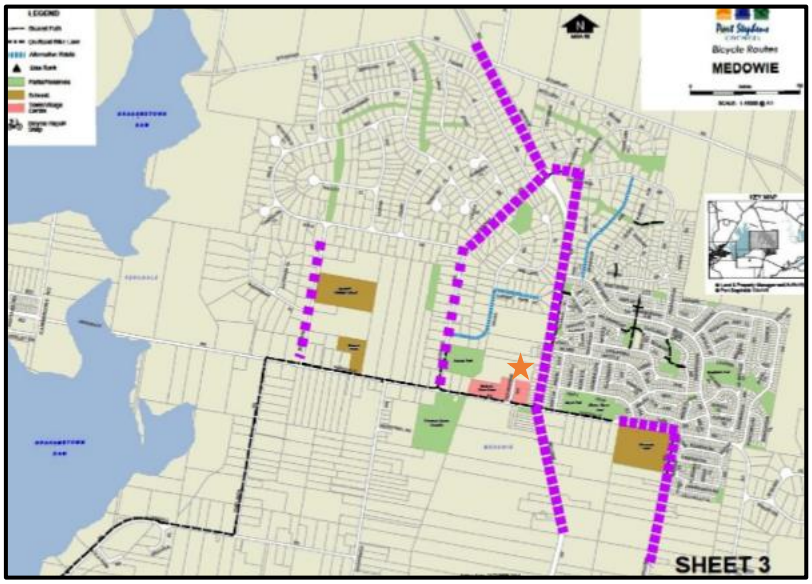


Figure 1 – Subject site in the context of the local road network

A summary of the key issues and their comments are provided below:

Item	Comment
Existing Situation	
2.1 Site Location and Access	The proposed development relates to vacant land in Medowie, NSW, with frontage to Muir Street (northern boundary) and Peppertree Road (western boundary). There is no existing vehicle access to the site. The site is located within the Medowie town centre between Medowie Road and Peppertree Road. To the immediate south of the site is the Woolworths Medowie supermarket, with further retail and commercial uses to the west of the site including Coles Medowie supermarket.
2.2.1 Road Hierarchy	The main road through the locality is **Medowie Road**, which is a regional road (MR518) that runs in a north / south orientation to the east of the subject site. It provides the primary connection between Medowie and the external road network including the Pacific Highway (to the north), Richardson Road (to the south), and Nelson Bay Road (to the south) for connection to Newcastle Airport. In the vicinity of the subject site it provides one lane of travel in each direction, with kerb and guttering along the western roadside and guttering only present along the eastern roadside. It has a pavement width in the order of 11 metres, allowing vehicles to pull over on both sides of the road with a 2.5 metre shoulder marked on the eastern side of the road. There is a footpath along the western roadside from Ferodale Road to Silver Wattle Drive, which ends prior to Silver Wattle Drive with a new footpath continuing north along the opposite (eastern) roadside. The posted speed limit in the locality of the subject site is 50km/hr. Street lighting is provided at the roundabout intersection of Medowie Road and Ferodale Road, with further lighting along the western side of Medowie Road to the north. There is one lane of travel in each direction, on both the northbound and southbound approaches to the roundabout intersection with Ferodale Road. **Ferodale Road** is a major collector road through Medowie, providing connection to the town centre, as well as two primary schools. There is a footpath provided along its length on the northern roadside, with street lighting in the proximity of the Medowie Town Centre. At the intersection with Medowie Road it provides one lane of travel in each direction on both the eastbound and westbound approaches to the roundabout. To the west of this roundabout, Ferodale Road provides access to a number of commercial/retail developments and has a pavement width in the order of 11 metres, with no stopping permitted along both sides of the road. There is a sheltered right turn lane into the Medowie Community Centre (eastbound), as well as a sheltered right turn lane at the connection with Peppertree Road (westbound). This intersection operates as a priority controlled T-intersection, with Ferodale Road having priority. **Peppertree Road** is a local road which provides a sealed surface with kerb and guttering and a pavement width in the order of 12 metres. There are footpaths along both sides of the road, with street lighting also provided. The road was upgraded as part of the recent development along this road and

Item	Comment
	extended to provide access to land earmarked for future development to the north. This includes a connection to Muir Street. **Muir Street** has an east-west orientation, linking Peppertree Road to Medowie Road. This road was constructed in 2016 and allows vehicles travelling from areas in the north to enter the commercial/retail area off Peppertree Road, bypassing the intersection of Medowie Road and Ferodale Road. It provides a single lane of travel in each direction with a sealed pavement in the order of 12 meters wide allowing sufficient space for kerbside parking, with kerb and guttering on both sides of the road. Street lighting is provided, as well as a pedestrian path along the southern side of the road. Muir Street connects with Medowie Road via a priority controlled T-intersection allowing all turning movements, with Medowie Road the priority road. There are two lanes provided at this intersection, with one designated for left turns and the other for right turns onto Medowie Road. There are no turn lanes on Medowie Road.
2.2.2 Current and Proposed Roadworks, Traffic Management Works and Bikeways	A review of the Port Stephens Council and RMS websites shows there are currently no road works occurring in the immediate vicinity of the subject site. The extension of Peppertree Road and construction of Muir Street providing a link through to Medowie Road has provided additional collector streets in the area. There are additional works proposed in response to ongoing development. The proposed works are identified on the Master Plan for the Medowie Town Centre (**Attachment D**), this includes the future road extension of Peppertree Road, as well as a new road running parallel to the west with access off Ferodale Road. Council's Contributions Plan includes funding to upgrade the intersection of Ferodale Road and Peppertree Road to a roundabout. A map of the existing shared paths has been provided in **Attachment C**. Proposed bike paths have also been identified in the Medowie Traffic and Transport Study, with an excerpt from this report shown in Figure 2 below.  *Figure 2 – Proposed bike paths in Medowie surrounding the subject site★ (Source: URaP 2017 Figure 4.3)*

Item	Comment
2.3 Traffic Flows	Seca Solution collected traffic data at the following intersections to determine the current road operation and peak flows along these roads: • Medowie Road and Ferodale Road • Ferodale Road and Peppertree Road These surveys were completed during the morning and afternoon on Tuesday 26th March 2019. The AM peak hour was determined as 8:15am to 9:15am, whilst the PM peak was 4:30pm to 5:30pm. The survey data is provided in **Attachment E**. A summary of the current distribution of traffic during the peak hour is provided below in Table 1.

Table 1 –Peak traffic flows in the vicinity of the subject site

Location	Distribution	AM Peak	PM Peak
Medowie Road (North of Ferodale Road)	Northbound	179	419
	Southbound	301	234
Medowie Road (South of Ferodale Road)	Northbound	352	720
	Southbound	500	395
Ferodale Road (West of Medowie Road)[1]	Eastbound	337	482
	Westbound	403	513
Ferodale Road (West of Peppertree Road)	Eastbound	347	391
	Westbound	340	370
Peppertree Road	Northbound	197	366
	Southbound	71	150

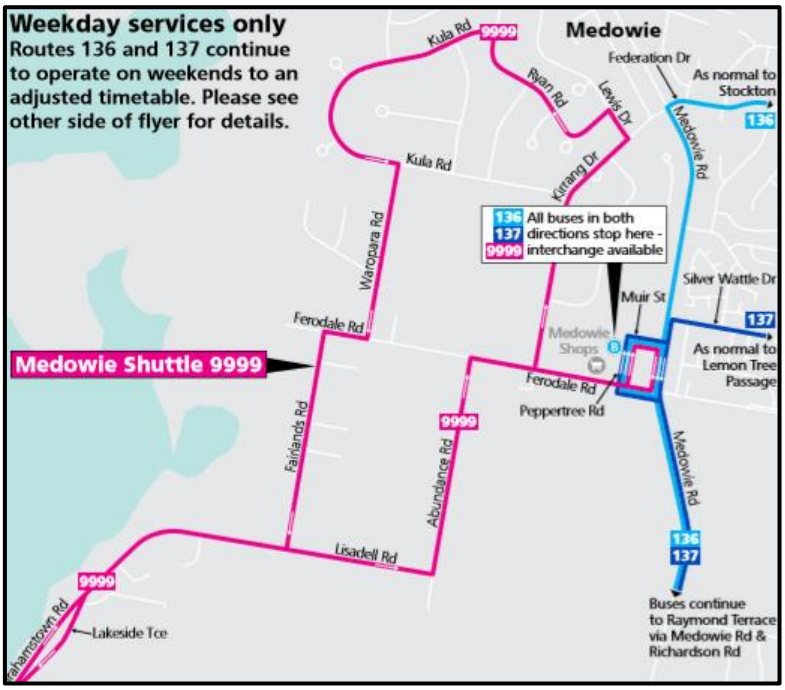
Notes: [1] Flows taken as higher value recorded from the two surveys, with flow differences relating to driveways between Peppertree Road and Medowie Road.

Medowie Road operates as a sub-arterial road through Medowie. The RMS Guide to Traffic Generating Development provides typical mid-block capacities for urban roads, with a capacity of 900 vehicles per hour per direction. The traffic flows along Medowie Road to the north of Ferodale Road are well within this capacity with critical flows of 419 vehicles northbound and 301 vehicles southbound. These flows represent a Level of Service C per the RMS Guide for urban road peak hour flows per direction.

Ferodale Road is a major collector road for the area, providing the main access to Medowie Town Centre. Given this classification Ferodale Road has been assessed as per the RMS Guide rate for urban roads above. Traffic flows on Ferodale Road to the west of Medowie Road, toward Peppertree Road, are within the mid-block capacity for Level of Service C with 482 vehicles eastbound and 513 vehicles westbound in the critical PM peak.

Item	Comment
	Traffic flows along Peppertree Road to the north of Ferodale Road are 366 vehicles northbound and 150 vehicles southbound, giving Level of Service B (northbound in the PM) per the RMS Guide.
2.3.1 Daily Traffic Flows	Peak hour flows typically represent around 10% of the daily traffic flows. This would indicate daily traffic flows in the locality in the order of: • 5,650 vehicles per day (vpd) along Medowie Road (north of Ferodale Road). • 9,850 vpd along Medowie Road (south of Ferodale Road) • 8,700 vpd along Ferodale Road (west of Medowie Road) • 7,250 vpd along Ferodale Road (west of Peppertree Road) • 3,900 vpd along Peppertree Road
2.3.2 AADT	There is no AADT data available in the locality.
2.3.3 Daily Traffic Flow Distribution	It can be seen from Section 2.3.1 above that there is a high demand for travel to the south along Medowie Road in the AM, representing commuters travelling to employment opportunities including Williamtown RAAF base, airport and the City of Newcastle. These flows are tidal with the reverse occurring during the PM. There is also significant demand for vehicles to the west of the roundabout along Ferodale Road, with Medowie Public School, as well as the various retail outlets in this location generating local demands. The demand for such trips would continue throughout the day given the range of commercial and retail developments.
2.3.4 Vehicle Speeds	No speed surveys were completed as part of the study work, however the volume of traffic in the peak periods along Ferodale Road and Medowie Road, to the south of the roundabout does not encourage drivers to speed. The interaction between driveways and accesses to developments in the locality also sees drivers lowering their speed.
2.3.5 Existing Site Flows	The site is currently vacant land and as such generates no traffic demands.
2.3.6 Heavy Vehicle Flows	Data recorded during the traffic survey found higher proportion of heavy vehicles in the AM peak, with 28 heavy vehicle movements at the intersection of Medowie Road and Ferodale Road representing 2.3% of the total traffic flows. At the intersection of Ferodale Road and Peppertree Road there were 15 heavy vehicles recorded representing 1.8% of the total traffic. From observation a number of these related to public and school buses in the locality.
2.3.7 Current Road Network Operation	Observations on site during the peak periods found that the roundabout intersection of Medowie Road and Ferodale Road operates well with minimal delays and congestion. The intersection of Ferodale Road and Peppertree Road currently operates to an acceptable standard during the morning and afternoon peak periods, however some delays and congestion were noted on Peppertree Road

Item	Comment
	associated with demands for vehicles turning right onto Ferodale Road. Outside of the peak periods this intersection operates well with minimal delays or queueing.
2.4 Traffic Safety and Accident History	A review of accident data provided by the RMS **(Attachment B)** during the period October 2013 to September 2018 indicates that 6 accidents have been recorded within the vicinity of the subject site. Of these: • Two accidents were recorded at the intersection of Muir Street and Medowie Road since its opening in 2016. • Two accidents were recorded at the intersection of Medowie Road and Ferodale Road. • One accident was recorded at the intersection of Ferodale Road and Peppertree Road. • One accident occurred along Medowie Road There are no repeat causes for accidents in the area, with a low number of accidents recorded relative to the traffic volumes. Given the good road alignment it is considered that Medowie Road in the vicinity of the subject site operates in a safe and appropriate manner. The two accidents recorded at Muir Street were indicative of driver error, rather than a poor intersection layout. One of these accidents related to a vehicle travelling eastbound in Muir Street colliding with a signpost near the intersection with Medowie Road. The other accident involved a vehicle in Muir Street holding at the intersection with Medowie Road, being struck by a southbound vehicle on Medowie Road, travelling along the footpath.
2.5 Parking Supply and Demand	
2.5.1 On-street Parking Provision	Kerbside parking is available along Muir Street, with no stopping restrictions in the proximity of intersections. The southern end of Peppertree Road, near the intersection with Ferodale Road, has no stopping, to provide capacity for turning movements. Further north kerbside parking is available, with the exception of the designated bus zone on the western side prior to the intersection with Muir Street.
2.5.2 Off-street Parking Provision	There is off-street parking available in the commercial/retail precinct, to the immediate south of the subject site.
2.5.3 Current Parking Demand and Utilisation	There was no demand observed for on-street parking along Muir Street, given the existing lack of development in this area. On-street parking at the southern end of Peppertree Road was heavily utilised, associated with the commercial developments in this location. At its northern end passing the subject site there was no demand for parking observed.
2.5.4 Short term set down or pick up areas	There are no set down or pick up areas in the vicinity of the site.
2.6 Modal Split	Given the proximity of the subject site to residential developments in the area, it is considered there is good walkability for local residents to access

Item	Comment
	the site. Given the semi-rural nature of the area it is considered the majority of trips in Medowie are undertaken by private vehicle.
2.7 Public Transport	
2.7.1 Rail Station Locations	There are no train services in the locality, with the nearest rail station located in Hexham, 20 kilometres to the south of the site.
2.7.2 Bus Stops and Associated Facilities	There is a bus stop located on the western side of Peppertree Road opposite the subject site. There are no seating or shelter facilities provided at this bus stop. There is a bus stop with seating and shelter located on Ferodale Road less than 200 metres south of the subject site.
2.7.3 Transport Services	Bus services in the locality are provided by Hunter Valley Buses. There are three routes that run through Medowie Road in the vicinity of the subject site. • 136 – Raymond Terrace to Stockton: Operates 7 days a week with frequent trips throughout the day. • 137 – Raymond Terrace to Lemon Tree Passage: Operates daily, with frequent trips Monday-Friday and limited trips on weekends and public holidays. • 9999 – Medowie Shuttle: Operates Monday to Friday at regular intervals. These bus routes are shown to follow in Figure 3.  *Figure 3 – Bus services through Medowie* The Medowie Traffic and Transport Study (2017) states there are 5 school buses which currently service the area.
2.8 Pedestrian Network	There is a pedestrian path along Medowie Road, as well as Muir Street and Peppertree Road providing connection from the subject site through the Medowie Town Centre and bus stops. These paths connect with footpaths extending along Ferodale Road in both directions, as well as the footpath

Item	Comment
	extending along Medowie Road to the north of Muir Street allowing for connection to residential areas.
2.9 Other Proposed Developments	A review of the Port Stephens Council DA Tracker has determined the following developments currently approved/proposed in the vicinity of the subject site: Approved multi-dwelling housing (eight dwellings) at 791 Medowie Rd, (LOT: 2 DP: 260883) Proposed 50 lot residential subdivision located to the north of the Medowie Town Centre at 799 Medowie Rd (LOT: A DP: 404939) and 813 Medowie Rd (LOT: 32 DP: 1045148). Proposed torrens title subdivision (213 lots) at Lots 7-9 DP: 855814 and Lots 1-2 DP: 567481 Approved multi-dwelling housing (comprising 238 moveable dwellings) at 717 Medowie Rd (LOT: 200 DP: 19739) and 733 Medowie Rd (LOT: 199 DP: 17437).
The Development	
3.1.1 Nature of Development	The subject site has frontage along Peppertree Road at its western boundary, and Muir Street along its northern boundary. The project site will allow for a mixed-use development which includes: • Childcare centre (126 spaces), • Medical Centre (Floor Area = 206m^2), • Pharmacy (Floor Area = 295m^2), • Commercial components (Floor area = 1,485m^2). Further development is to occur directly adjacent to these uses. This shall be the subject of a separate Development Application, with the cumulative impacts of this uses allowed for in this traffic assessment as "other development". Access is proposed from Peppertree Road and Muir Street.
3.1.2 Access and Circulation Requirements	The layout of the development will require circulation in accordance with the requirements of Council and AS2890. All vehicles shall be able to enter and exit the site in a forward direction.
3.2 Access	
3.2.1 Driveway Location	There are two driveway access points proposed for the subject site, with an access on Muir Street approximately 60 metres east of Peppertree Road and a further access off Peppertree Road, approximately 70 metres south off Muir Street. These driveways will allow for all turning movements into and out of the site.

Item	Comment
3.2.2 Sight Distances	Sight distance for the proposed driveways is to be provided in accordance with AS2890. For the speed limit of 50km/hr along Peppertree Road and Muir Street AS2890 states a desirable sight distance of 69 metres, with a minimum of 45 metres. Both Peppertree Road and Muir Street provide straight horizontal alignment along their lengths. Sight distance at the Peppertree Road site access allows for clear visibility along the length of this road, with 170 metres to the left (south) and 90 metres to the right (north) thereby satisfying AS2890. Sight distance at the Muir Street site access allows for clear visibility along the length of this road, with 60 metres to the left (west) and 100 metres to the right (east) thereby satisfying the minimum requirements of AS2890.
3.2.3 Service Vehicle Access	There will be occasional demands for delivery vehicles within the site. The detailed design of the internal roads will be in accordance with the Council DCP which will cater for the swept path requirements for the largest design vehicle.
3.2.4 Queuing at entrance to site	Given the low flows passing the site access points there are minimal vehicle queues expected for vehicles entering the site, with these driveways to operate in the same manner as the Woolworths and Coles access driveways off Peppertree Road. The internal road layout has been designed to allow for unimpeded flow into the subject site. For the Peppertree Road access there is at least 30 metres available along the internal road prior to a potential hold point, allowing storage for 6 vehicles. For the Muir Street access there is at least 54 metres available along the internal road prior to a potential hold point, allowing storage for 9 vehicles. Allowing for two exit points traffic flows associated with outbound traffic disburse reducing the impact of any queues. Any queues relating to exiting traffic would be contained within the subject site and not impact on the road network. The mix of uses on the site also promotes a spread of traffic and parking demands.
3.2.5 Comparison with existing site access	There is no existing access to the subject site.
3.2.6 Access to Public Transport	The development is well located in regard to public bus services through the locality. Internal pathways will provide for connection to existing footpaths along Peppertree Road to access the bus stop in this location.
3.3 Circulation	
3.3.1 Pattern of circulation	All vehicles will be able to enter and exit the site in a forward direction and travel along the internal roadways to access the various site uses, with the internal road layout allowing for two-way movements.
3.3.2 Internal Road width	All internal roads will be designed in accordance with the requirements of AS2890.1, which nominates a minimum width of 5.5 metres to allow for two-way movements. Additional width is required for parking aisles to be discussed further below.

Item	Comment
3.3.3 Internal Bus Movements	There are no internal bus movements anticipated for the development.
3.3.4 Service Area Layout	The detailed design of the site will provide for suitable service areas to allow for the management of deliveries and removal of waste. A designated loading area has been provided adjacent to the largest commercial tenancy on site.
3.4 Parking	
3.4.1 Proposed Supply	The subject site will include a parking supply of 106 spaces to cater for the whole of development.
3.4.2 Authority Parking	Port Stephens Council DCP provides the following parking rates relevant to the development: • Child care centre = 1 space per 4 childcare places (1 space to be accessible) • Medical Centre = 1 space per 25m^2 floor area (1 per 10 to be accessible) • Pharmacy (shop) = 1 space per 20m^2 floor area (1 per 30 to be accessible • Commercial = 1 space per 40m^2 floor area (1 per 30 to be accessible) The above rates are also consistent with those outlined for these uses (where nominated) in the RMS Guide to Traffic Generating Developments.
3.4.3 Parking Layout	Parking will be designed in accordance with AS2890.1 for a User Class 3 facility (short term parking). For 90^o angle parking this requires the following: • Minimum 2.6 x 5.4 metre parking spaces. • Minimum 5.8 metre aisle widths (for both one-way and two-way movements). Where parking is on one side of an aisle only and the other side is confined by a wall or high vertical obstruction, the aisle width shall be increased by 300mm. • At blind aisles (dead end), the aisle shall be extended a minimum of 1 metre beyond the last parking space. • In car parks open to the public, the maximum length of a blind aisle shall be equal to the width of 6 spaces (plus 1 metre), unless provision is made for cars to turn around at the end and drive out forwards.
3.4.4 Parking Demand	**Child care centre** The DCP parking requirement outlined above makes no allowance for absenteeism or shared trips for siblings. Similarly, the above parking rates do not allow for the type of childcare facility nor its operating hours. The longer hours of operation for the centre, compared to a traditional day care or preschool, allows for children to be dropped off / picked up over an extended period, seeing a spread in arrivals and departures thus reducing the peak parking requirements. This is consistent with advice provided by the RMS Guide to Traffic Generating Development and observations of similar childcare developments completed by Seca Solution Pty Ltd. Surveys of a similar 67 place childcare centre located in Lake Macquarie indicated that the peak parking demands represented less than 20% of the number of

<table>
<tr><th>Item</th><th>Comment</th></tr>
<tr><td></td><td>children enrolled or 1 space for each 5 enrolments. Applying this rate would give a peak parking demand of 26 spaces.

Allowing for the maximum capacity being 126 children attending the centre at any given time, equates to a total car parking requirement of 32 spaces, with the child care parking demand therefore in the range of 26-32 spaces.

Medical Centre

Based on a GFA of 206m^2 the medical centre will generate a demand for 9 parking spaces.

Pharmacy

Based on a GFA of 295m^2 the pharmacy will generate a demand for 15 parking spaces.

Commercial

The overall GFA of 1,485m^2 for the sum of the commercial uses will generate demand for 38 spaces.

Combined

The various uses proposed for the site shall see typical peak parking demands across a range of times with some not occurring simultaneously. The child care centre shall be before 9am but in the afternoon between 4-6pm, the medical centre will see demand throughout the day in a manner similar to the commercial uses, 9am-5 or 6pm. As such, there is the opportunity for some shared use of parking across the development to cater for the peak demands of each use and cater for any potential overflow parking as required. The overall parking demands are outlined in Table 2.

Table 2 – Overall site parking demand
<table>
<tr><th>Use</th><th>Peak Parking Demands</th><th>Parking Demand</th></tr>
<tr><td>Child care centre</td><td>Before 9am, 4-6pm</td><td>26-32</td></tr>
<tr><td>Medical centre</td><td>9am – 6pm</td><td>9</td></tr>
<tr><td>Pharmacy</td><td>9am – 6pm</td><td>15</td></tr>
<tr><td>Commercial</td><td>9am – 6pm</td><td>38</td></tr>
<tr><td colspan="2">Total</td><td>88 - 94</td></tr>
</table>

This gives a total parking demand of up to 94 spaces, with 5 to be designated accessible. As such, the proposed supply of 104 spaces (6 accessible) is sufficient to cater for the parking demands for the development.</td></tr>
<tr><td>3.4.5 Service Vehicle Parking</td><td>Servicing relating to the childcare centre, medical centre and shop would typically be completed by a light commercial / utility vehicle e.g. Toyota HiAce. These vehicles would be able to park within the standard parking spaces provided on site. A holding area has been nominated to cater for servicing of the largest commercial tenancy.</td></tr>
</table>

Item	Comment
	Waste collection shall be managed to occur at times to reduce potential conflicts within the site.
3.4.6 Pedestrian and Bicycle Facilities	Internal footpaths shall be provided connecting to the external pedestrian pathways. Consideration of bicycle facilities shall be incorporated as part of the detailed design.
Traffic Assessment	
4.1 Traffic Generation	Traffic generation for the proposed uses has been determined using rates provided in the RMS Guide, as well as the updated technical direction published by the RMS (TDT2013/04a August 2013). **Child care centres - long day care centre** • 0.8 peak hour trips per child during the morning peak (7:00am to 9:00am) • 0.7 peak hour trips per child during the afternoon / evening peak (4:00pm to 6:00pm) For the capacity of 126 children, the childcare centre could generate up to 101 peak hour trips during the morning peak hour and 89 trips during the afternoon / evening peak. Note that these rates do not allow for reduced demand associated with absenteeism, holidays/leave and shared trips with siblings and therefore the peak traffic generation for the proposed childcare centre could be less than that calculated. It is considered that during the AM peak, 60% of vehicle movements will be inbound (allowing for additional inbound trips for staff) with 40% outbound. The reverse shall apply in the PM. This gives the following split of traffic for the child care centre: • AM peak = 101 trips (61 inbound / 40 outbound) • PM peak = 89 trips (36 inbound / 53 outbound) For daily trips, allowing 2 vehicle movements per child during the morning drop-off and afternoon pickup periods, would see a maximum of 504 vehicles per day relating to attendees. The exact staffing arrangement is unknown however, based on similar developments the staff to child ratio is approximately 1 to 5.5, giving 23 staff for the development. Allowing 2 trips per staff member (arrival and departure), would see a further 46 trips, with total daily traffic flows for this element of the development thereby in the order of 550 vehicles. The majority of traffic associated with long day care centres such as this tend to be existing traffic diverted from a journey to work/study etc. These vehicles would already be travelling in the locality of the site as part of their journey to work and so will have a negligible impact upon the broader road network.

Item	Comment
	Medical Centre / Pharmacy There are no traffic generation rates provided in the RMS Guide that are relevant to the proposed pharmacy use. The inclusion of the medical centre and pharmacy adjacent to each other will result in these uses operating in tandem, with a crossover of demands. Given this it is considered that the standard traffic generation rates provided by the RMS Guide for medical centres are the most appropriate to assess the impact of the medical/pharmacy uses on site. The following trip rates are provided: • AM Peak = 10.4 vehicles per hour per 100m^2 GFA. • PM Peak = 8.8 vehicles per hour for every 100m^2 GFA. Allowing for a 60/40 split inbound and outbound in the AM, with the reverse in the PM gives the following split of traffic for the medical centre and pharmacy based on a combined GFA of 501m^2: • AM peak = 52 trips (31 inbound / 21 outbound) • PM peak = 44 trips (18 inbound / 26 outbound) For daily trips, allowing for an indicative 9 hour operation (at an average of 48 vehicle trips per hour) gives 432 trips per day. **Commercial** The traffic generation rates for commercial premises have been applied to assess the commercial components, as below. • Peak hour vehicle trips = 10 vehicles per hour per 100m^2 GFA • Daily vehicle trips = 2 vehicles per hour per 100m^2 GFA Again, allowing for a 60/40 split inbound and outbound in the AM, with the reverse in the PM gives the following split of traffic for the commercial component based on a GFA of 1,485m^2: • AM peak = 30 trips (18 inbound / 12 outbound) • PM peak = 30 trips (12 inbound / 18 outbound) For daily trips the RMS Guide gives 149 trips per day. **Combined Development** **Use** | **AM Peak (Inbound/Outbound)** | **PM Peak (Inbound/Outbound)** | **Daily** **Child care centre** | 101 trips (61 / 40) | 89 trips (36 / 53) | 550 **Medical / Pharmacy** | 52 trips (31 / 21) | 44 trips (18 / 26) | 432 **Commercial** | 30 trips (18 / 12) | 30 trips (12 / 18) | 149 | 183 trips (143 / 95) | 163 trips (104 / 134) | 1,131

<table>
<tr><th>Item</th><th>Comment</th></tr>
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Combined Development (Discounted rates)

A large percentage of the traffic generated by the child care centre is expected to be passing trade associated with parents who currently work in the surrounding area and drop off their children as part of their commute. These are therefore diverted trips and will have a negligible impact upon the broader road network. A discount of 25% has therefore been applied to allow for this.

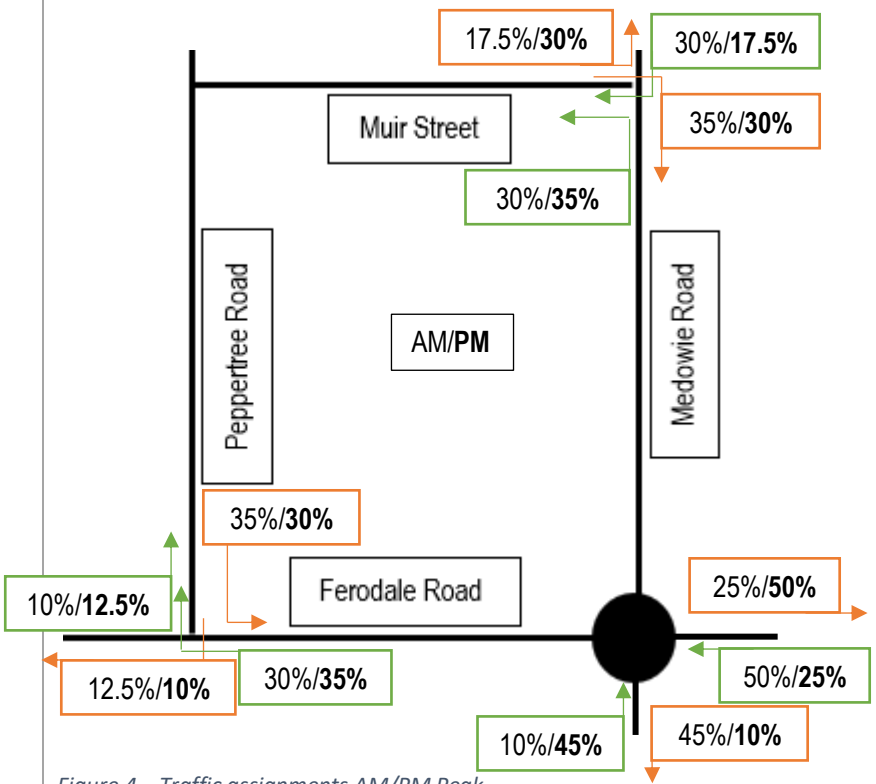
Traffic associated with the commercial use and medical centre are expected to include a number of multipurpose trips for patrons already within the Medowie Town Centre, thereby not generating additional traffic on the external road network. As these uses may be the main purpose of these trips, no discount has been applied to the traffic generation for these components.

The above gives the following traffic generation for the development:
<table>
<tr><th>Use</th><th>AM Peak (Inbound/Outbound)</th><th>PM Peak (Inbound/Outbound)</th><th>Daily</th></tr>
<tr><td>Child care Centre (-25%)</td><td>76 trips (46 / 30)</td><td>67 trips (27 / 40)</td><td>413</td></tr>
<tr><td>Medical / Pharmacy</td><td>52 trips (31 / 21)</td><td>44 trips (18 / 26)</td><td>432</td></tr>
<tr><td>Commercial</td><td>30 trips (18 / 12)</td><td>30 trips (12 / 18)</td><td>149</td></tr>
<tr><td></td><td>158 trips (95 / 63)</td><td>141 trips (57 / 84)</td><td>994</td></tr>
</table>
</td></tr>
<tr><td>4.1.1 Daily and Seasonal Factors</td><td>Limited daily and seasonal variation in traffic movements associated with the development, with the exception of the child care centre which shall see variation in flows during holiday periods when the centre may be closed or attendance is reduced.</td></tr>
<tr><td>4.1.2 Pedestrian Movements</td><td>The site is located within easy walking distance of the Medowie Town Centre, as such it is considered there will be considerable demand for pedestrian movements to the south/west of the subject site. There are footpaths provided along Peppertree Road to cater for these movements.</td></tr>
<tr><td>4.2 Hourly distribution of trips</td><td></td></tr>
<tr><td>4.2.1 Origin / destinations assignment</td><td>
The range of uses for the proposed development shall service demands within the local community, contributing to the existing commercial and retail developments within the surrounding Medowie Town Centre and supporting containment of trips within Medowie.

For the purpose of this assessment inbound vehicle movements in the AM have been assigned based on the surrounding residential development, with:

50% from the east along Ferodale Road
30% from the north along Medowie Road
10% from the west along Ferodale Road
10% from the south along Medowie Road

</td></tr>
</table>

Item	Comment
	For outbound movements in the AM, 50% shall return in the direction outlined above, with the other 50% to continue on their journey to work and assigned based on the traffic distribution outlined in the Medowie Traffic and Transport Study. These distributions were based upon the Journey to Work data for the area, with the following distribution along Medowie Road near the Town Centre: • 80% south via Medowie Road • 15% west via Ferodale Road / Abundance Road • 5% north via Medowie Road and Ferodale Road The internal road layout for the site has been allowed for in the trip distribution, with the breakdown of movements out of each site access based on the most efficient route for each lot. As such: • All movements to/from the west have been assigned to the Peppertree Road access. • All movements to/from the north have been assigned to the Muir Street access. • For movements to/from the south and east 50% have been assigned to the Muir Street access, with the remaining 50% assigned to the Peppertree Road access. Allowing for the above distribution of these vehicles on the local road network during the peak periods sees the following vehicle movements.  *Figure 4 – Traffic assignments AM/PM Peak*

Item	Comment
	Applying the assignments in Figure 4 to the traffic generation outlined in Section 4.1 gives the distribution of traffic shown in Figure 5 for the development.

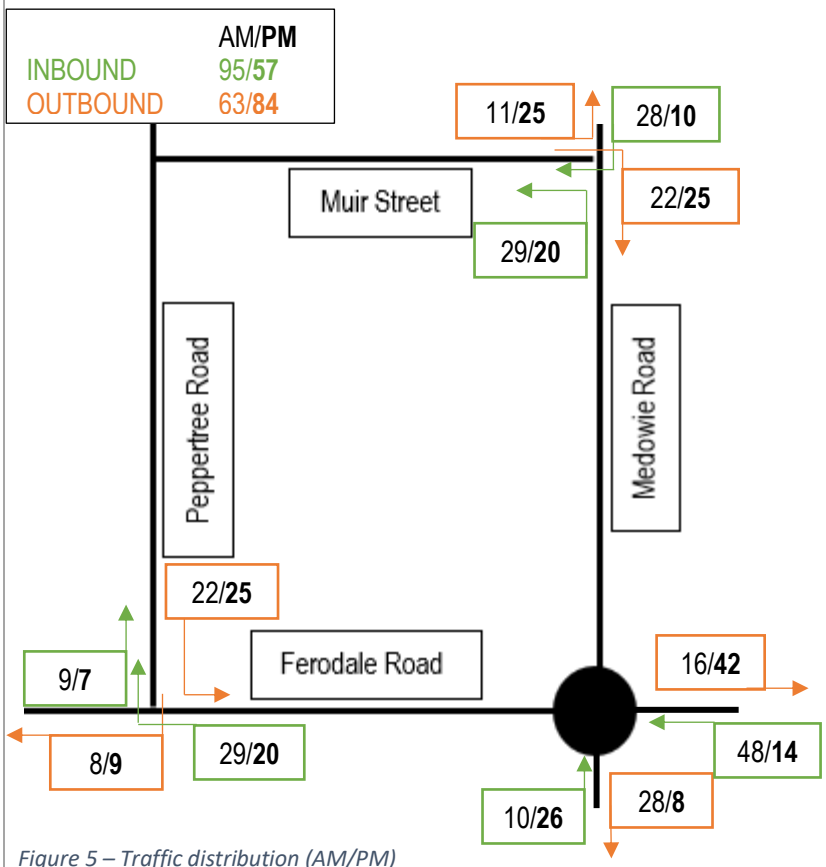


Figure 5 – Traffic distribution (AM/PM)

Allowing for the trips through the Medowie Road / Ferodale Road roundabout to be distributed evenly to/from each access gives the below demands at this intersection.

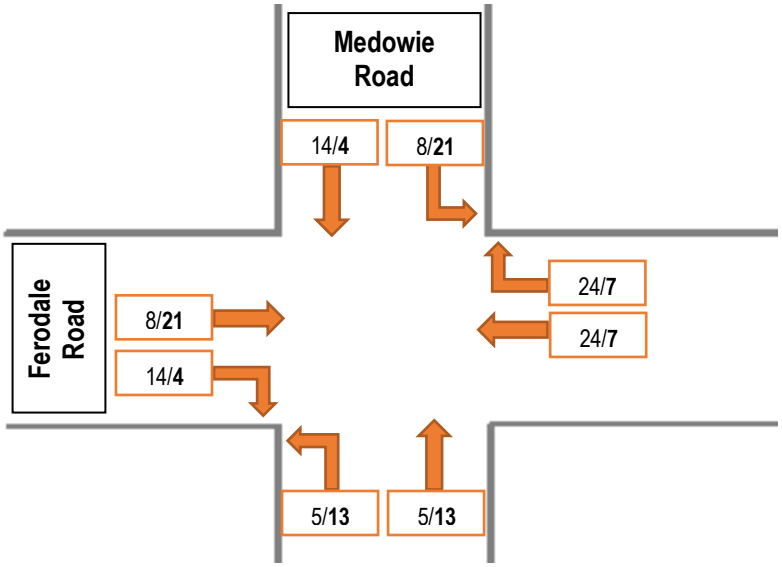


Figure 6 – Traffic distribution at Medowie Road / Ferodale Road (AM/PM)

Item	Comment
4.3 Impact on Road Safety	Sight distances at the access driveways are consistent with the requirements of AS2890 allowing good visibility for drivers entering and exiting the site. The local roads operate in a safe and appropriate manner with good visibility and road alignment at the key intersections of Ferodale Road/Peppertree Road, Medowie Road/Muir Street and Medowie Road/Ferodale Road. A review of the accident data provided by the RMS found no repeating cause for crash types at the key intersections, indicating there are no identifiable safety concerns. The intersection of Ferodale Road and Peppertree Road has been identified in the Medowie Traffic and Transport Study for upgrade to a roundabout, to improve the efficiency and safety of turning movements at this intersection. The development will result in increased traffic flows along Muir Street to access the Medowie Town Centre, however the Medowie Traffic and Transport Study identifies that most traffic to the town centre uses Ferodale Road. Muir Street was recently constructed by Council with consideration to the future traffic volumes and has been designed to cater for all turning movements at the intersection with Medowie Road. The intersection of Medowie Road and Ferodale Road has been identified for potential future upgrade to a 2-lane roundabout or traffic signals to cater for overall growth in Medowie and resulting increases in vehicle and pedestrian volumes. Observations indicate the existing roundabout operates in a safe and efficient manner, with the traffic flows associated with the development to have minimal impact upon the existing operation as shown in the Sidra Assessment to follow.
4.4 Impact of Generated Traffic	
4.4.1 Impact on Daily Traffic Flows	The development could generate an additional 994 trips per day with vehicles split across the two main access points and the surrounding local roads. These trips would however have an origin/destination primarily from Medowie and provide for the local containment of trips as well as the diverting of commuter trips in the AM and PM peaks. The Medowie Traffic and Transport Study classified these roads as collector identifying their role in the distribution of significant future traffic flows within the town centre. Medowie Road and Ferodale Road are major collector roads in the area, with spare capacity (as outlined in Section 2.3.1) to cater for the movements generated by this development. Peppertree Road and Muir Street are collector roads that provide access to commercial and retail land in the Medowie Town Centre. The impact of this traffic can therefore be accommodated within the local road network.
4.4.2 Peak Hour Impacts on Intersections	The key intersection of Ferodale Road and Peppertree Road has been identified by Council for upgrade and included in the Contributions Plan. The Medowie Traffic and Transport Study states a one lane circulating roundabout would be appropriate at this intersection, with the modelling

Item	Comment
	allowing for future development in Medowie, including the proposed development site. As such, further assessment of this intersection is not required. The Transport Study also nominates the intersection of Medowie Road and Ferodale Road for potential future upgrade to a 2-lane roundabout or signals. Sidra Intersection 8 has been used to analyse the impact of the development on this intersection to assess the capacity of the existing layout. The results for this assessment detailed following this table, with the outputs provided in **Attachment F**. The scenarios modelled included: • 2019 Existing Situation • 2019 Existing + Development • 2029 Future Design Year with background growth • 2029 Future Design Year with background growth + Other Development As discussed previously the intersection of Muir Street and Medowie Road was recently constructed by Council with this being identified as an alternative route for vehicles to access the Medowie Town Centre. A Sidra assessment has been completed for this intersection, as per the above scenarios in order to confirm its capacity to accommodate the proposed development. The results for this assessment detailed following this table, with the outputs provided in **Attachment F**.
4.4.3 Impact of Construction Traffic	There will be a requirement for construction vehicles (light and heavy) to access the site with the majority of the construction work located on the site. Construction of the new site access shall require a Construction Traffic Management Plan outlining appropriate controls which shall be prepared by the contractor in conjunction with the CC for the project. The construction traffic will be less than the traffic associated with the completed development and as such is considered to have an acceptable impact upon the local road network.
4.4.4 Other Developments	Subject to a separate DA, there is development to be incorporated directly adjacent to the subject site (nominated as Food and Drink on the site plan in Attachment A), which shall make use of the Muir Street access. Based on the RMS Guide applying the highest traffic generation rate for this use gives the below: Evening peak hour vehicle trips: • assume 180 veh/hr for average development (mean of survey results). • for sensitivity test, assess effect of 230 veh/hr (maximum of survey results). The sidra modelling to follow has included a scenario allowing for the above traffic generation.

Item	Comment
4.5 Public Transport	
4.5.1 Options for improving services	No requirement to improve services.
4.5.2 Pedestrian Access to Bus Stops	Pedestrian movements for the development shall be accommodated by internal pathways that will provide connection to existing footpaths along Peppertree Road to access the bus stop in this location.
4.6 Recommended Works	
4.6.1 Improvements to Access and Circulation	Ensure access and internal roads / driveways are designed and constructed in accordance with Council requirements.
4.6.2 Improvements to External Road Network	None required in conjunction with the proposed development.
4.6.3 Improvements to Pedestrian Facilities	The site shall connect to pedestrian facilities in the area. The existing pedestrian facilities to the south of the site have recently been upgraded, with no further improvements required.
4.6.4 Effect of Recommended Works on Adjacent Developments	Nil.
4.6.5 Effect of Recommended Works on Public Transport Services	None.
4.6.6 Provision of LATM Measures	None Required.
4.6.7 Funding	All internal site work will be funded by the developer.

Sidra Modelling

Sidra modelling has been completed for the intersections of Medowie Road / Ferodale Road and Medowie Road / Muir Street to determine their capacity to support the additional traffic demands associated with the proposed development. The following scenarios were considered in the modelling:

- 2019 Existing Situation based on 2019 surveyed traffic flows,
- 2019 Existing + Allowance for the additional traffic associated with the proposed development,
- 2029 Future Design Year with background growth allowing for 2.4% annual growth along Medowie Road over 10 years (Consistent with the high growth rate URaP 2017).
- 2029 Future Design Year with background growth + Known Developments

The results of this modelling are provided to follow.

Medowie Road / Ferodale Road

Table 3 - Sidra Results - Existing Situation 2019 (AM/PM)

Approach	Movement	Level of Service	Average Delay (s)	95% Queue (m)
Medowie Road (Northbound)	Approach	A / A	5.0 / 5.8	13.9 / 39.0
Ferodale Road (Westbound)	Approach	A / A	6.1 / 5.6	11.2 / 8.2
Medowie Road (Southbound)	Approach	A / A	6.0 / 6.8	12.7 / 11.5
Ferodale Road (Eastbound)	Approach	A / A	6.4 / 8.4	11.9 / 30.8
Overall	Approach	A / A	5.9 / 6.7	13.9 / 39.0

The results in Table 3 indicate that the roundabout intersection currently operates well with very minimal delays and queuing on all approaches during the peak hours, consistent with observations on site. Each approach operates well within its capacity providing an overall level of service A.

Table 4 - Sidra Results - Existing Situation 2019 with full development (AM/PM)

Approach	Movement	Level of Service	Average Delay (s)	95% Queue (m)
Medowie Road (Northbound)	Approach	A / A	5.3 / 6.3	15.6 / 45.5
Ferodale Road (Westbound)	Approach	A / A	6.8 / 5.8	14.4 / 9.0
Medowie Road (Southbound)	Approach	A / A	6.1 / 6.9	14.3 / 13.7
Ferodale Road (Eastbound)	Approach	A / A	6.6 / 9.1	13.3 / 36.2
Overall	Approach	A / A	6.2 / 7.2	15.6 / 45.5

Allowing for the increase in traffic demands associated with the proposed development (Section 4.2.1), the roundabout intersection will continue to operate to its current standard with no change to the current level of service on any approach and minor increases in the average delays and queuing.

Table 5 - Sidra Results – 2029 design year with 24% growth (AM/PM)

Approach	Movement	Level of Service	Average Delay (s)	95% Queue (m)
Medowie Road (Northbound)	Approach	A / A	5.9 / 12.4	23.5 / 120.6
Ferodale Road (Westbound)	Approach	A / A	9.0 / 6.6	25.7 / 13.8
Medowie Road (Southbound)	Approach	A / A	7.1 / 9.0	22.5 / 25.2
Ferodale Road (Eastbound)	Approach	A / B	7.1 / 19.7	19.5 / 103.0
Overall	Approach	A / A	7.2 / 13.3	25.7 / 120.6

For the future design year, allowing for 24% growth over 10 years, the intersection will continue to operate within its capacity providing an overall level of service A. Background growth will see some approaches experience increases in the average delays and additional queuing however these remain within acceptable limits, with the Ferodale Road (Eastbound) approach seeing operation at LoS B.

Overall, the intersection of Medowie Road and Ferodale Road provides sufficient spare capacity to support the proposed development, with increased delays at the intersection associated with the high background growth applied.

This intersection has also been assessed allowing for the future development adjacent to the site, as discussed in Section 4.4.4. Allowing for the maximum of 230 trips in the PM peak (115 inbound/115 outbound) distributed as:

- 50% to/from the east along Ferodale Road,
- 30% to/from the north along Medowie Road,
- 10% to/from the west along Ferodale Road and
- 10% to/from the south along Medowie Road.

Applying the above gives the following split of other development traffic utilising the intersection of Medowie Road / Ferodale Road.

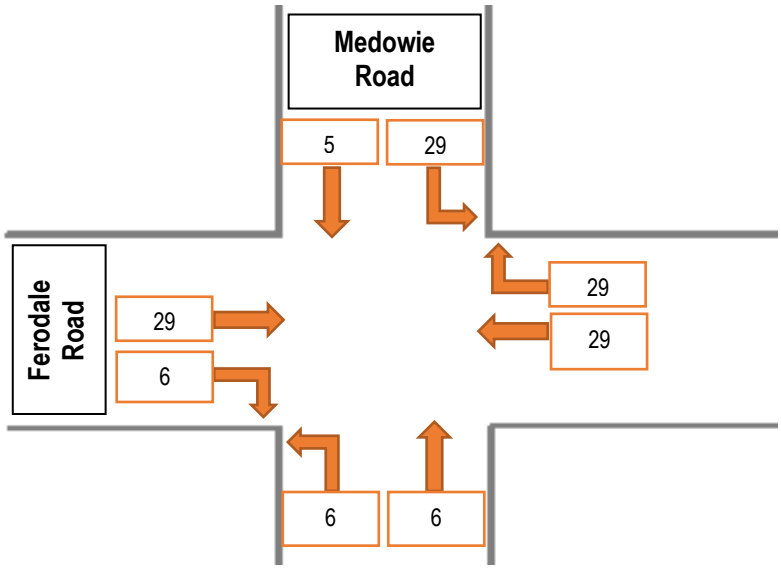


Figure 7 – Other development flows at Medowie Road / Ferodale Road

The Sidra results allowing for the above flows are provided below.

Table 6 - Sidra Results – 2029 design year with 24% growth and allowance for other development

Approach	Movement	Level of Service	Average Delay (s)	95% Queue (m)
Medowie Road (Northbound)	Approach	B	25.9	216.2
Ferodale Road (Westbound)	Approach	A	7.3	18.9
Medowie Road (Southbound)	Approach	A	10.8	34.6
Ferodale Road (Eastbound)	Approach	C	37.6	182.9
Overall	Approach	B	24.1	216.2

It can be seen the intersection of Medowie Road and Ferodale Road shall operate at an acceptable LoS B.

This assessment makes no allowance for multipurpose trips, nor vehicles already within the Medowie Town Centre using the other development and as such allows for the worst case per the RMS Guide rates.

Medowie Road / Muir Street

The recorded flows along Medowie Road to the north of Ferodale Road provide an accurate reflection of two-way flows passing Muir Street. Observations on site indicate that the turning movements in/out of Muir Street are low at this intersection. To be conservative an allowance for 100 vehicles per hour has been made in the peak periods, with this considered to overestimate the existing traffic at this intersection. This traffic has been applied with an 80/20 inbound/outbound split in the AM and the reverse in the PM, with vehicles split 50/50 to the north and south along Medowie Road. The Sidra results are provided below.

Table 7 - Sidra Results - Existing Situation 2019 (AM/PM)

Approach	Movement	Level of Service	Average Delay (s)	95% Queue (m)
Medowie Road (Northbound)	Left turn	A / A	4.6 / 4.6	0.0 / 0.0
Medowie Road (Southbound)	Right turn	A / A	5.5 / 6.5	2.5 / 0.8
Muir Street	Left turn	A / A	5.1 / 6.2	0.2 / 1.0
	Right turn	A / A	7.1 / 8.2	0.3 / 1.5

The results above indicate that the intersection operates at the highest LoS, with very minimal delays and queuing for critical movements during the peak hours.

Allowing for the traffic generated by the proposed development (Section 4.2.1) gives the following Sidra results.

Table 8 - Sidra Results - Existing Situation 2019 with full development (AM/PM)

Approach	Movement	Level of Service	Average Delay (s)	95% Queue (m)
Medowie Road (Northbound)	Left turn	A / A	4.6 / 4.6	0.0 / 0.0
Medowie Road (Southbound)	Right turn	A / A	5.7 / 6.7	4.3 / 1.6
Muir Street	Left turn	A / A	5.1 / 6.2	0.4 / 1.7
	Right turn	A / A	7.5 / 8.5	1.1 / 2.5

Allowing for the increase in traffic demands associated with the proposed development, the intersection will continue to operate to its current standard with no change to the current level of service on any approach and very minor increases in the average delays and queuing.

Allowing for background growth of 2.4% per annum along each leg gives the following Sidra results.

Table 9 - Sidra Results – 2029 design year with 24% growth (AM/PM)

Approach	Movement	Level of Service	Average Delay (s)	95% Queue (m)
Medowie Road (Northbound)	Left turn	A / A	4.6 / 4.6	0.0 / 0.0
Medowie Road (Southbound)	Right turn	A / A	6.1 / 7.6	6.1 / 2.4
Muir Street	Left turn	A / A	5.3 / 6.9	0.6 / 2.4
	Right turn	A / A	8.8 / 10.4	1.6 / 3.9

For the future design year, allowing for 24% growth over 10 years, the intersection will continue to operate within its capacity providing an overall level of service A. Increased traffic demands will see approaches experience minor increases in the average delays and additional queuing however these remain well within acceptable limits.

Allowing for the future development adjacent to the site, with the expected distribution through the Muir Street intersection as:

- 30% to/from the north along Medowie Road (35 inbound / 35 outbound) and
- 30% to/from the south along Medowie Road (35 inbound / 35 outbound),

The remaining 40% of traffic shall access via Peppertree Road.

The sidra results are provided below.

Table 10 - Sidra Results – 2029 design year with 24% growth and allowance for other development

Approach	Movement	Level of Service	Average Delay (s)	95% Queue (m)
Medowie Road (Northbound)	Left turn	A	4.6	0.0
Medowie Road (Southbound)	Right turn	A	8.2	8.0
Muir Street	Left turn	A	7.0	3.7
	Right turn	A	12.5	7.6

Again the existing LoS is maintained. Overall it can be seen, the intersection of Medowie Road and Muir Street provides sufficient capacity to support the proposed development and ongoing development in the area.

Site Photos

Photo 1 – Cross section of Peppertree Road looking north, subject site to the right

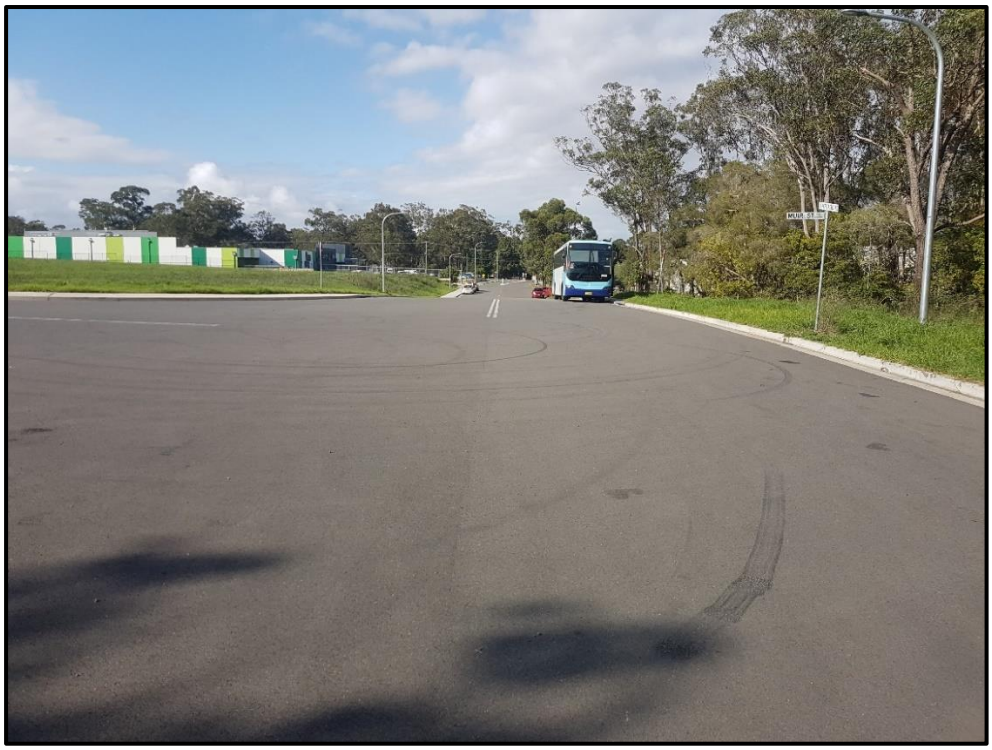


Photo 2 - Cross section of Peppertree Road looking south, with Muir Street to the left

Conclusion

From the above assessment and the review of the proposal and associated plans against the requirements of the RMS Guide to Traffic Generating Developments and Austroads Guide to Traffic Management, it is considered that the proposed development should have no objections raised on traffic and access grounds.

The potential for additional traffic movements generated by the development will have an acceptable impact on the surrounding road network. The SIDRA results show that the key intersection of Medowie Road and Ferodale Road will continue to operate at an acceptable Level of Service for the 2029 design horizon allowing for background growth and development traffic flows.

The intersection of Medowie Road and Muir Street, recently constructed by Council with consideration to the future traffic volumes, has been designed to cater for all turning movements at the intersection with Medowie Road. It has sufficient capacity to accommodate the proposed development and background growth.

The intersection of Ferodale Road and Peppertree Road has been identified as part of Council's Contributions Plan for upgrade to a roundabout in order to accommodate future development in Medowie, including the subject site. The layout of this intersection was determined as part of modelling completed as part of the Medowie Traffic and Transport Study, with this upgrade sufficient to cater for the proposed development and allowing for other development in the surrounding area.

It is considered the proposal can meet the requirements of the Development Control Plan in relation to traffic, parking and access as well as the overall planning for the subject site.

Please feel free to contact our office on 4032 7979, should you have any queries.

Yours sincerely

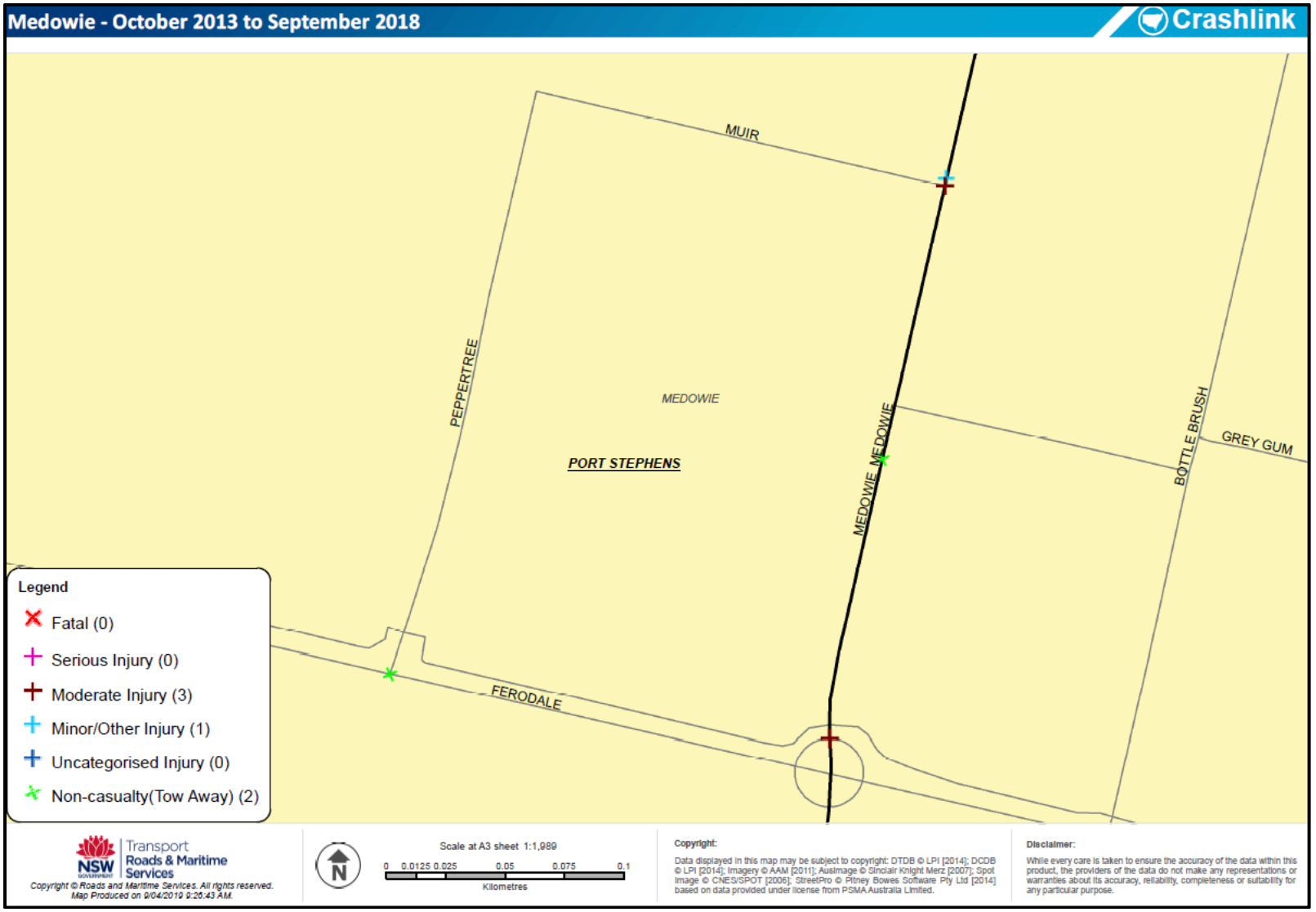
Tyler Neve
Traffic Engineer

Attached:
A – Site Plan
B – Accident Data
C – Shared Paths
D – Medowie Town Centre Master plan
E – Survey Data
F – Sidra Analysis

Attachment A Site Plan


PEPPERTREE ROAD
UNDER AWNING BLADE SIGNS
EXISTING FOOTPATH
EXISTING RETAINING WALL TO BE DEMOLISHED IN THIS AREA
LIGHT POLE
AWNING OVER
RL13,700
3,290
15,320
WASTE ENCLOSURE
COMMERCIAL 95 m²
COMMERCIAL 95 m²
COMMERCIAL 95 m²
COMMERCIAL 95 m²
COMMERCIAL 95 m²
COMMERCIAL 95 m²
ACC WC
ACC WC
ACC WC
GARBAGE STORE
ACC WC
ACC WC
ACC WC
3,490 400 6,313 220 6,314 220 6,313 220 3,500 220 6,313 220 6,314 220 6,313 400
1 Pharmacy/Commercial Lower
SCALE 1:200 @A3
Development Application
CKDS ARCHITECTURE
Mavid Medowie Development
project 19007
795 Medowie Rd, Medowie, 2318 NSW
Pharmacy Lower Floor Plan
drawing # DA-1101
issue 09
1:200@A3
5/7/19

Attachment B RMS Accident Data



Detailed Crash Report

Transport for NSW — Centre for Road Safety

Crash No.	Data Source	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash-Detailed	Killed	Seriously Inj.	Moderately Inj.	Minor/Other Inj.	Uncateg'd Inj.	Factors
						Natural Lighting																		S F
Hunter Region																								
Port Stephens LGA																								
Medowie																								
Ferodale Rd																								
1108346	S	16/07/2016	Sat	12:50	at	PEPPERTREE RD	TJN	STR	Fine	Dry	50	2	CAR	F46	S in PEPPERTREE RD	Unk	Turning right	NC	0	0	0	0	0	
E62766178						Daylight	RUM	13	Right near				4WD	F22	E in FERODALE RD	Unk	Proceeding in lane							
Medowie Rd																								
1083690	S	31/10/2015	Sat	15:05	at	NUMBER 785 HN	2WY	STR	Fine	Dry	50	2	CAR	M48	N in MEDOWIE RD	Unk	Proceeding in lane	NC	0	0	0	0	0	
E59470756						Daylight	RUM	30	Rear end				CAR	M69	N in MEDOWIE RD	Unk	Proceeding in lane							
1114461	P	28/07/2016	Thu	05:00	at	FERODALE RD	RDB	CRV	Fine	Dry	50	2	LOR	M38	S in MEDOWIE RD	30	Proceeding in lane	MC	0	0	1	0	0	
E62511229						Darkness	RUM	10	Cross traffic				CAR	M22	E in FERODALE RD	Unk	Proceeding in lane							
1119062	P	18/09/2016	Sun	10:40	at	FERODALE RD	RDB	STR	Overcast	Wet	50	1	M/C	M18	E in FERODALE RD	10	Proceeding in lane	MC	0	0	1	0	0	
E62674631						Daylight	RUM	74	On road-out of cont.															
1116547	S	25/09/2016	Sun	18:00	at	MUIR ST	TJN	STR	Fine	Wet	50	2	4WD	M26	S in MEDOWIE RD	Unk	Along footpath	OC	0	0	0	1	0	
E63215141						Dusk	RUM	49	Other manoeuvring				CAR	M U	E in MUIR ST	0	Stationary							
1154355	P	22/09/2017	Fri	14:00	at	MUIR ST	TJN	STR	Fine	Dry	50	1	CAR	F16	E in MUIR ST	5	Turning left	MC	0	0	1	0	0	S
E66034643						Daylight	RUM	87	Off lft/lft bnd=>obj				Signpost											

Report Totals: Crashes: 6 Fatal Crashes(FC): 0 Serious Injury Crashes(SC):0 Moderate Injury Crashes(MC): 3 Minor/Other Injury Crashes(OC): 1 Uncategorised Injury Crashes(UC): 0 Non-Casualty Crashes(NC): 2

Killed(K): 0 Seriously Injured(S): 0 Moderately Injured(M): 3 Minor/Other Injured(O): 1 Uncategorised Injured(U): 0

Crashid dataset Medowie - October 2013 to September 2018

Note: Ordered by: Crash Date.

Crash self reporting, including self reported injuries began Oct 2014. Trends from 2014 are expected to vary from previous yrs. More unknowns are expected in self reported data.
Reporting yrs 1996-2004 & 2018 Q4 onwards contain uncategorised inj crashes.

Summary Crash Report

Transport for NSW — Centre for Road Safety

# Crash Type		
Car Crash	5	83.3%
Light Truck Crash	0	0.0%
Rigid Truck Crash	1	16.7%
Articulated Truck Crash	0	0.0%
'Heavy Truck Crash	*(1)*	*(16.7%)*
Bus Crash	0	0.0%
"Heavy Vehicle Crash	*(1)*	*(16.7%)*
Emergency Vehicle Crash	0	0.0%
Motorcycle Crash	1	16.7%
Pedal Cycle Crash	0	0.0%
Pedestrian Crash	0	0.0%

' Rigid or Artic. Truck " Heavy Truck or Heavy Bus
These categories are NOT mutually exclusive

Location Type		
*Intersection	5	83.3%
Non intersection	1	16.7%

* Up to 10 metres from an intersection

Collision Type		
Single Vehicle	2	33.3%
Multi Vehicle	4	66.7%

Road Classification		
Freeway/Motorway	0	0.0%
State Highway	0	0.0%
Other Classified Road	5	83.3%
Unclassified Road	1	16.7%

Contributing Factors		
Speeding	1	16.7%
Fatigue	0	0.0%

Weather		
Fine	5	83.3%
Rain	0	0.0%
Overcast	1	16.7%
Fog or mist	0	0.0%
Other	0	0.0%

Road Surface Condition		
Wet	2	33.3%
Dry	4	66.7%
Snow or ice	0	0.0%

Natural Lighting		
Dawn	0	0.0%
Daylight	4	66.7%
Dusk	1	16.7%
Darkness	1	16.7%

Crash Movement		
Intersection, adjacent approaches	2	33.3%
Head-on (not overtaking)	0	0.0%
Opposing vehicles; turning	0	0.0%
U-turn	0	0.0%
Rear-end	1	16.7%
Lane change	0	0.0%
Parallel lanes; turning	0	0.0%
Vehicle leaving driveway	0	0.0%
Overtaking; same direction	0	0.0%
Hit parked vehicle	0	0.0%
Hit railway train	0	0.0%
Hit pedestrian	0	0.0%
Permanent obstruction on road	0	0.0%
Hit animal	0	0.0%
Off road, on straight	0	0.0%
Off road on straight, hit object	0	0.0%
Out of control on straight	1	16.7%
Off road, on curve	0	0.0%
Off road on curve, hit object	0	0.0%
Out of control on curve	0	0.0%
Other crash type	2	33.3%

Speed Limit				
40 km/h or less	0	0.0%	80 km/h zone	0	0.0%
50 km/h zone	6	100.0%	90 km/h zone	0	0.0%
60 km/h zone	0	0.0%	100 km/h zone	0	0.0%
70 km/h zone	0	0.0%	110 km/h zone	0	0.0%

~ 07:30-09:30 or 14:30-17:00 on school days | ~ 40km/h or less 0 0.0% | ~ School Travel Time Involvement 0 0.0%

Day of the Week												
Monday	0	0.0%	Wednesday	0	0.0%	Friday	1	16.7%	Sunday	2	33.3%	WEEKEND	4	66.7%
Tuesday	0	0.0%	Thursday	1	16.7%	Saturday	2	33.3%	WEEKDAY	2	33.3%			

CRASHES	6	
Fatal	0	0.0%
Serious inj.	0	0.0%
Moderate inj.	3	50.0%
Minor/Other inj.	1	16.7%
Uncategorised inj.	0	0.0%
Non-casualty	2	33.3%

Self Reported Crash	3	50%

Time Group		% of Day	
00:01 - 02:59	0	0.0%	12.5%
03:00 - 04:59	0	0.0%	8.3%
05:00 - 05:59	1	16.7%	4.2%
06:00 - 06:59	0	0.0%	4.2%
07:00 - 07:59	0	0.0%	4.2%
08:00 - 08:59	0	0.0%	4.2%
09:00 - 09:59	0	0.0%	4.2%
10:00 - 10:59	1	16.7%	4.2%
11:00 - 11:59	0	0.0%	4.2%
12:00 - 12:59	1	16.7%	4.2%
13:00 - 13:59	0	0.0%	4.2%
14:00 - 14:59	1	16.7%	4.2%
15:00 - 15:59	1	16.7%	4.2%
16:00 - 16:59	0	0.0%	4.2%
17:00 - 17:59	0	0.0%	4.2%
18:00 - 18:59	1	16.7%	4.2%
19:00 - 19:59	0	0.0%	4.2%
20:00 - 21:59	0	0.0%	8.3%
22:00 - 24:00	0	0.0%	8.3%

Street Lighting Off/Nil		% of Dark
0	of 1	in Dark 0.0%

CASUALTIES	4	
Killed	0	0.0%
Seriously inj.	0	0.0%
Moderately inj.	3	75.0%
Minor/Other inj.	1	25.0%
Uncategorised inj.	0	0.0%
^ Unrestrained	0	0.0%

^ Belt fitted but not worn, No restraint fitted to position OR No helmet worn

Crashes		Casualties
1	2017	1
4	2016	3
1	2015	0

McLean Periods		% Week
A	1	16.7% 17.9%
B	0	0.0% 7.1%
C	1	16.7% 17.9%
D	1	16.7% 3.5%
E	1	16.7% 3.6%
F	0	0.0% 10.7%
G	0	0.0% 7.1%
H	2	33.3% 7.1%
I	0	0.0% 12.5%
J	0	0.0% 10.7%

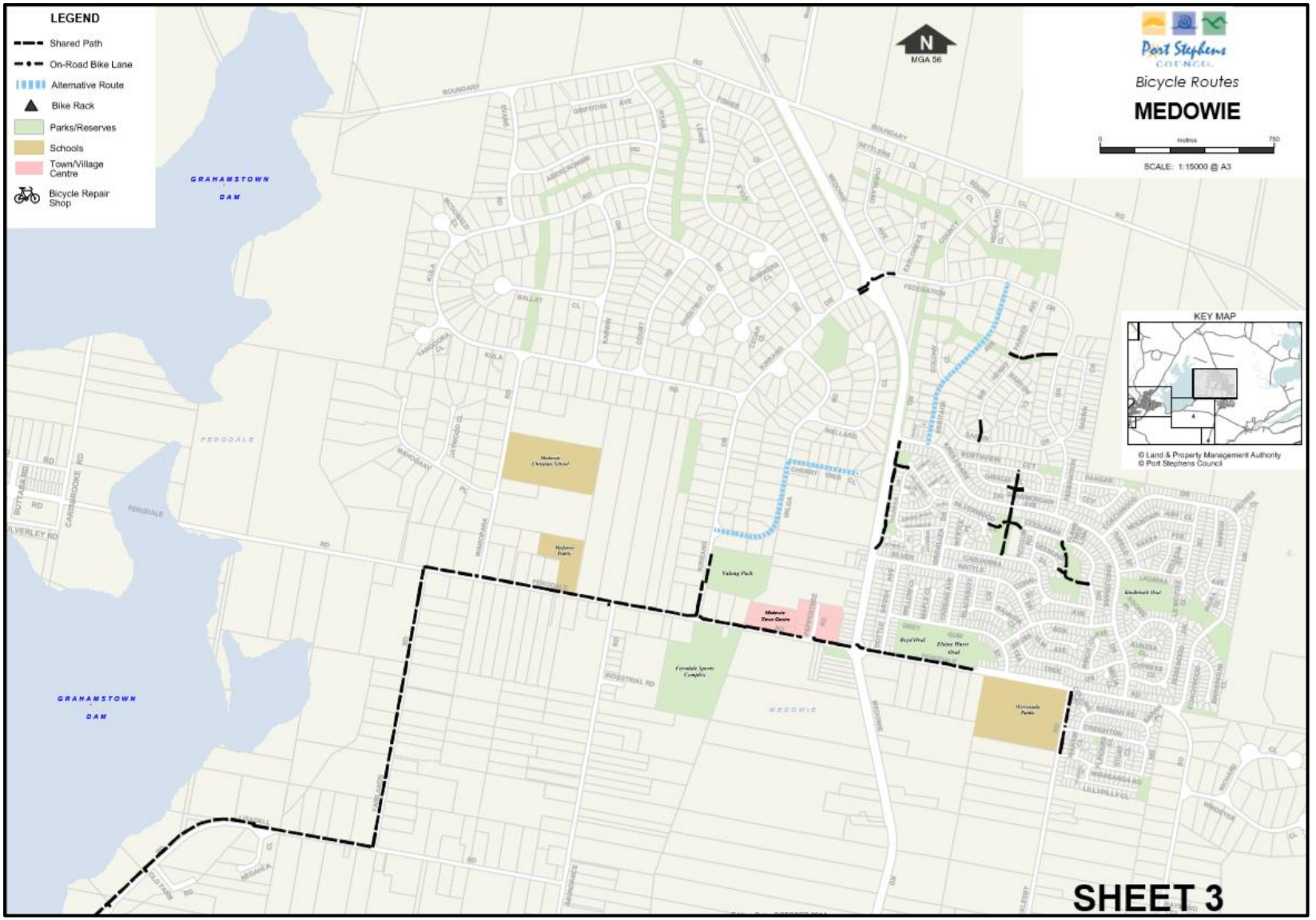
#Holiday Periods																		
New Year	0	0.0%	Easter	0	0.0%	Queen's BD	0	0.0%	Christmas	0	0.0%	Easter SH	0	0.0%	Sept./Oct. SH	1	16.7%	
Aust. Day	0	0.0%	Anzac Day	0	0.0%	Labour Day	0	0.0%	January SH	0	0.0%	June/July SH	1	16.7%	December SH	0	0.0%	

Crashid dataset Medowie - October 2013 to September 2018

Note: Crash self reporting, including self reported injuries began Oct 2014. Trends from 2014 are expected to vary from previous yrs. More unknowns are expected in self reported data. Reporting yrs 1996-2004 & 2018 Q4 onwards contain uncategorised inj crashes.

Percentages are percentages of all crashes. Unknown values for each category are not shown on this report.

Attachment C Shared Paths

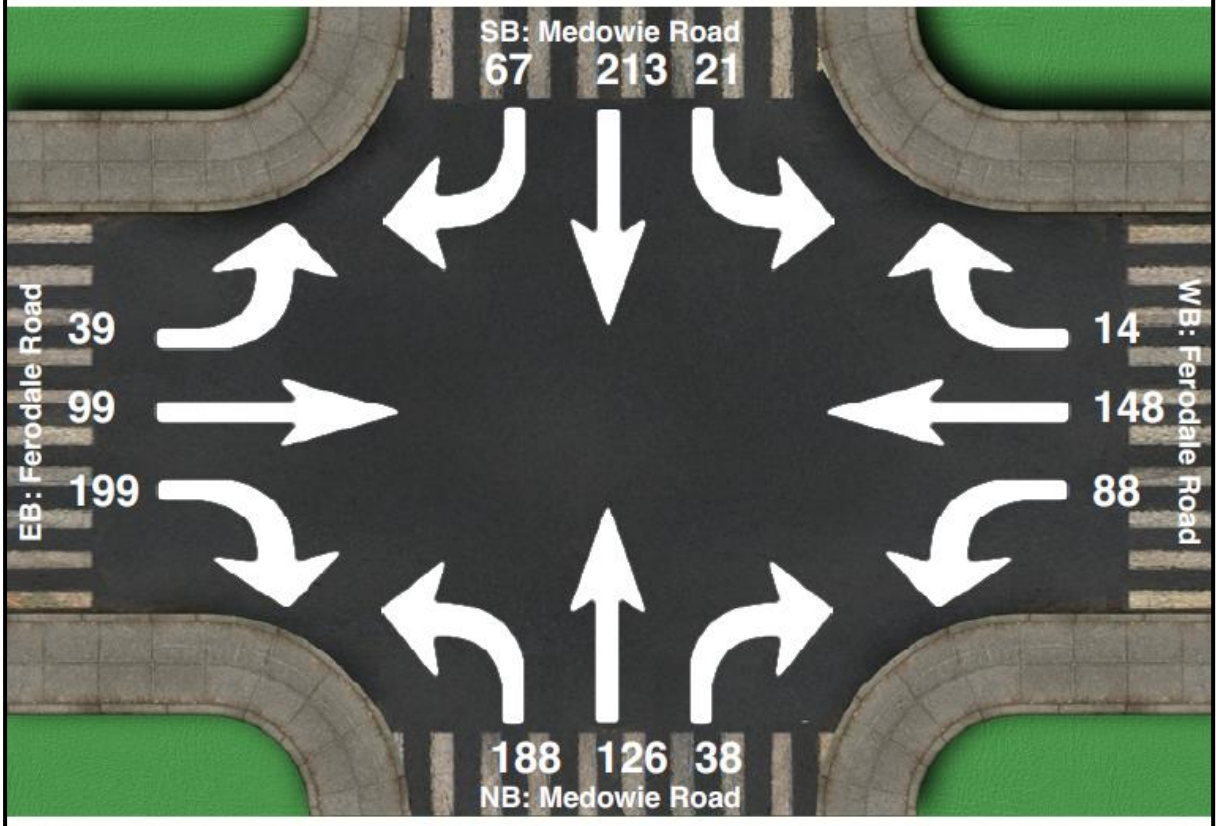


Attachment D Medowie Town Centre Masterplan

Attachment E Survey Data

Medowie Road / Ferodale Road

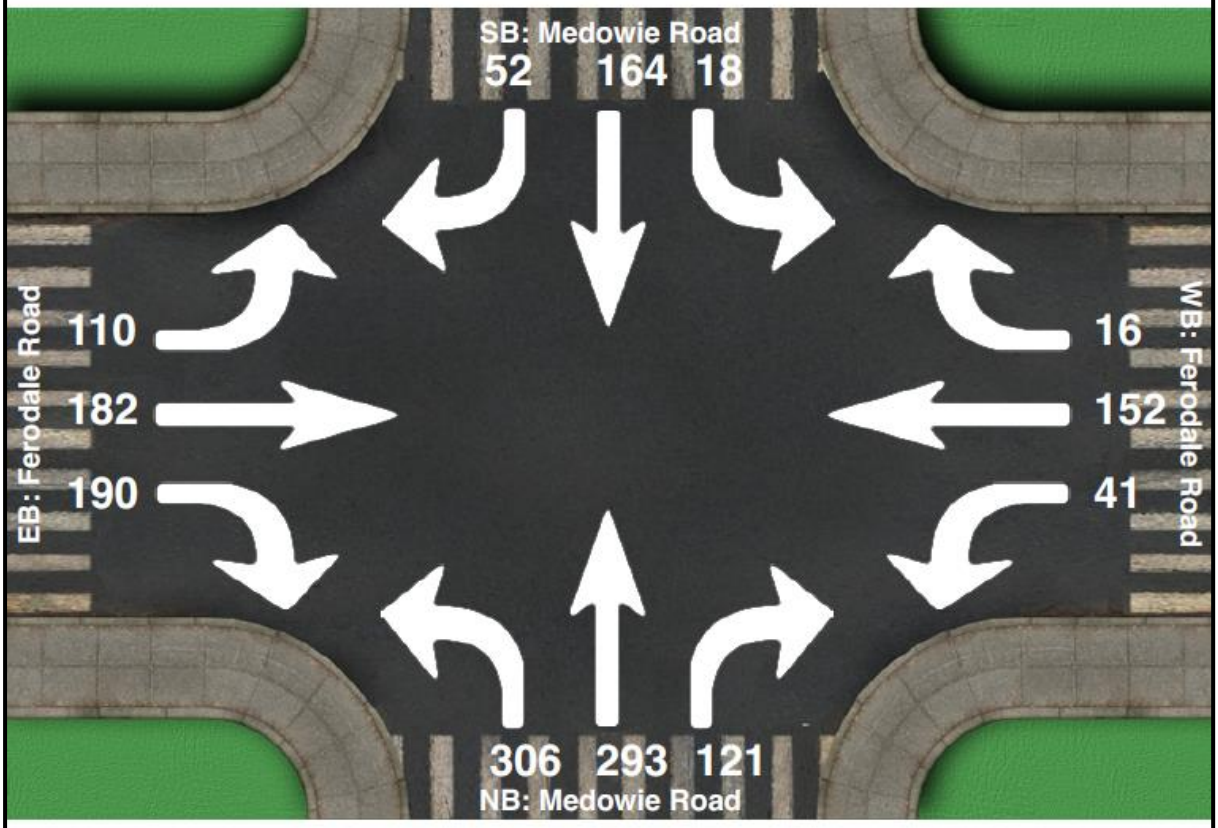
Location: Medowie Road at Ferodale Road, Medowie
GPS Coordinates:
Date: 2019-03-26
Day of week: Tuesday
Weather: Cloudy
Analyst: TN



Intersection Peak Hour

08:15 - 09:15

Location:	Medowie Road at Ferodale Road, Medowie
GPS Coordinates:	
Date:	2019-03-26
Day of week:	Tuesday
Weather:	Cloudy
Analyst:	TN

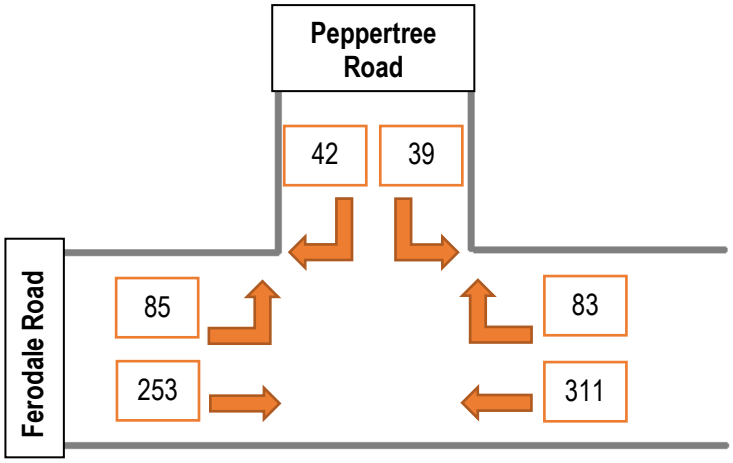


Intersection Peak Hour

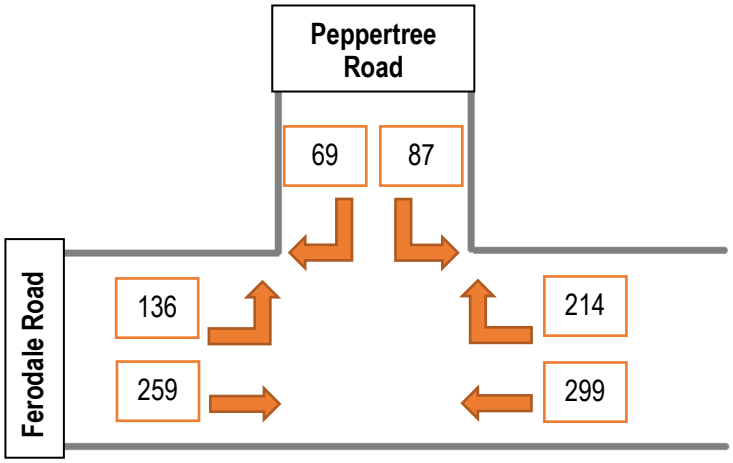
16:30 - 17:30

Ferodale Road / Peppertree Road

Intersection Peak Hour
8:15 – 9:15



Intersection Peak Hour
16:30 – 17:30



Attachment F Sidra Analysis

Criteria for Interpreting Results of Sidra

1-Level of Service (LoS)

LoS	Traffic Signals and Roundabouts	Give Way and Stop Signs
A	Good	Good
B	Good, with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	Satisfactory	Satisfactory, but requires accident study
D	Operating near capacity	Near capacity and requires accident study
E	At capacity, excessive delay: roundabout requires other control method	At capacity, requires other control mode
F	Unsatisfactory, requires other control mode or additional capacity	Unsatisfactory, requires other control mode

2-Average Vehicle Delay (AVD)

The AVD is a measure of operational performance of an intersection relating to its LoS. The average delay should be taken as a guide only for an average intersection. Longer delays may be tolerated at some intersections where delays are expected by motorists (e.g. those in inner city areas or major arterial roads).

LoS	Average Delay / Vehicle (secs)	Traffic Signals and Roundabouts	Give Way and Stop Signs
A	Less than 15	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	28 to 42	Satisfactory	Satisfactory but accident study required
D	42 to 56	Operating near capacity	Near capacity, accident study required
E	56 to 70	At capacity, excessive delays: roundabout requires other control mode	At capacity; requires other control mode
F	Exceeding 70	Unsatisfactory, requires additional capacity	Unsatisfactory, requires other control mode

3-Degree of Saturation (D/S)

The D/S of an intersection is usually taken as the highest ratio of traffic volumes on an approach to an intersection compared with the theoretical capacity, and is a measure of the utilisation of available green time. For intersections controlled by traffic signals, both queues and delays increase rapidly as DS approaches 1.0. An intersection operates satisfactorily when its D/S is kept below 0.75. When D/S exceeds 0.9, queues are expected.

MOVEMENT SUMMARY

Site: 101 [2019 AM Medowie Road / Ferodale Road]

Medowie Road / Ferodale Road
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Medowie Road												
1	L2	198	3.7	0.338	4.6	LOS A	1.9	13.9	0.45	0.57	0.45	46.0
2	T1	133	8.7	0.338	4.6	LOS A	1.9	13.9	0.45	0.57	0.45	46.9
3	R2	40	0.0	0.338	8.3	LOS A	1.9	13.9	0.45	0.57	0.45	47.0
Approach		371	5.1	0.338	5.0	LOS A	1.9	13.9	0.45	0.57	0.45	46.5
East: Ferodale Road												
4	L2	93	1.1	0.286	5.9	LOS A	1.6	11.2	0.60	0.68	0.60	45.6
5	T1	156	1.4	0.286	5.9	LOS A	1.6	11.2	0.60	0.68	0.60	46.5
6	R2	15	7.1	0.286	9.9	LOS A	1.6	11.2	0.60	0.68	0.60	46.4
Approach		263	1.6	0.286	6.1	LOS A	1.6	11.2	0.60	0.68	0.60	46.2
North: Medowie Road												
7	L2	22	0.0	0.317	5.1	LOS A	1.7	12.7	0.52	0.63	0.52	45.5
8	T1	224	7.0	0.317	5.2	LOS A	1.7	12.7	0.52	0.63	0.52	46.4
9	R2	71	3.0	0.317	8.9	LOS A	1.7	12.7	0.52	0.63	0.52	46.3
Approach		317	5.6	0.317	6.0	LOS A	1.7	12.7	0.52	0.63	0.52	46.3
West: Ferodale Road												
10	L2	41	10.3	0.303	4.4	LOS A	1.7	11.9	0.39	0.59	0.39	45.2
11	T1	104	0.0	0.303	4.2	LOS A	1.7	11.9	0.39	0.59	0.39	46.2
12	R2	209	1.5	0.303	8.0	LOS A	1.7	11.9	0.39	0.59	0.39	46.1
Approach		355	2.1	0.303	6.4	LOS A	1.7	11.9	0.39	0.59	0.39	46.0
All Vehicles		1305	3.7	0.338	5.9	LOS A	1.9	13.9	0.48	0.61	0.48	46.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2019 PM Medowie Road / Ferodale Road]

Medowie Road / Ferodale Road
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Medowie Road												
1	L2	322	0.7	0.643	5.2	LOS A	5.5	39.0	0.62	0.63	0.63	45.5
2	T1	308	2.4	0.643	5.2	LOS A	5.5	39.0	0.62	0.63	0.63	46.4
3	R2	127	2.5	0.643	9.0	LOS A	5.5	39.0	0.62	0.63	0.63	46.4
Approach		758	1.7	0.643	5.8	LOS A	5.5	39.0	0.62	0.63	0.63	46.0
East: Ferodale Road												
4	L2	43	0.0	0.225	5.3	LOS A	1.2	8.2	0.53	0.62	0.53	45.8
5	T1	160	0.0	0.225	5.3	LOS A	1.2	8.2	0.53	0.62	0.53	46.7
6	R2	17	0.0	0.225	9.1	LOS A	1.2	8.2	0.53	0.62	0.53	46.6
Approach		220	0.0	0.225	5.6	LOS A	1.2	8.2	0.53	0.62	0.53	46.5
North: Medowie Road												
7	L2	19	0.0	0.280	5.9	LOS A	1.6	11.5	0.63	0.71	0.63	45.2
8	T1	173	1.8	0.280	5.9	LOS A	1.6	11.5	0.63	0.71	0.63	46.0
9	R2	55	1.9	0.280	9.7	LOS A	1.6	11.5	0.63	0.71	0.63	46.0
Approach		246	1.7	0.280	6.8	LOS A	1.6	11.5	0.63	0.71	0.63	45.9
West: Ferodale Road												
10	L2	116	2.7	0.548	7.0	LOS A	4.3	30.8	0.73	0.82	0.81	44.5
11	T1	192	0.0	0.548	6.9	LOS A	4.3	30.8	0.73	0.82	0.81	45.4
12	R2	200	1.6	0.548	10.7	LOS A	4.3	30.8	0.73	0.82	0.81	45.3
Approach		507	1.2	0.548	8.4	LOS A	4.3	30.8	0.73	0.82	0.81	45.1
All Vehicles		1732	1.3	0.643	6.7	LOS A	5.5	39.0	0.64	0.70	0.67	45.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2019 AM Medowie Road / Ferodale Road + Development]

Medowie Road / Ferodale Road
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Medowie Road												
1	L2	203	3.6	0.364	4.9	LOS A	2.1	15.6	0.51	0.60	0.51	45.9
2	T1	138	8.4	0.364	4.9	LOS A	2.1	15.6	0.51	0.60	0.51	46.8
3	R2	40	0.0	0.364	8.6	LOS A	2.1	15.6	0.51	0.60	0.51	46.8
Approach		381	5.0	0.364	5.3	LOS A	2.1	15.6	0.51	0.60	0.51	46.3
East: Ferodale Road												
4	L2	93	1.1	0.349	6.3	LOS A	2.0	14.4	0.64	0.72	0.64	45.3
5	T1	181	1.2	0.349	6.3	LOS A	2.0	14.4	0.64	0.72	0.64	46.2
6	R2	40	2.6	0.349	10.1	LOS A	2.0	14.4	0.64	0.72	0.64	46.1
Approach		314	1.3	0.349	6.8	LOS A	2.0	14.4	0.64	0.72	0.64	45.9
North: Medowie Road												
7	L2	31	0.0	0.346	5.2	LOS A	2.0	14.3	0.55	0.64	0.55	45.5
8	T1	239	6.6	0.346	5.4	LOS A	2.0	14.3	0.55	0.64	0.55	46.3
9	R2	71	3.0	0.346	9.1	LOS A	2.0	14.3	0.55	0.64	0.55	46.3
Approach		340	5.3	0.346	6.1	LOS A	2.0	14.3	0.55	0.64	0.55	46.2
West: Ferodale Road												
10	L2	41	10.3	0.332	4.6	LOS A	1.9	13.3	0.43	0.61	0.43	45.1
11	T1	113	0.0	0.332	4.3	LOS A	1.9	13.3	0.43	0.61	0.43	46.1
12	R2	224	1.4	0.332	8.2	LOS A	1.9	13.3	0.43	0.61	0.43	46.0
Approach		378	1.9	0.332	6.6	LOS A	1.9	13.3	0.43	0.61	0.43	45.9
All Vehicles		1413	3.4	0.364	6.2	LOS A	2.1	15.6	0.53	0.64	0.53	46.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2019 PM Medowie Road / Ferodale Road + Development]

Medowie Road / Ferodale Road
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Medowie Road												
1	L2	336	0.6	0.675	5.7	LOS A	6.4	45.5	0.66	0.67	0.70	45.4
2	T1	322	2.3	0.675	5.7	LOS A	6.4	45.5	0.66	0.67	0.70	46.3
3	R2	127	2.5	0.675	9.5	LOS A	6.4	45.5	0.66	0.67	0.70	46.2
Approach		785	1.6	0.675	6.3	LOS A	6.4	45.5	0.66	0.67	0.70	45.9
East: Ferodale Road												
4	L2	43	0.0	0.243	5.4	LOS A	1.3	9.0	0.54	0.63	0.54	45.7
5	T1	167	0.0	0.243	5.3	LOS A	1.3	9.0	0.54	0.63	0.54	46.6
6	R2	25	0.0	0.243	9.1	LOS A	1.3	9.0	0.54	0.63	0.54	46.5
Approach		236	0.0	0.243	5.8	LOS A	1.3	9.0	0.54	0.63	0.54	46.4
North: Medowie Road												
7	L2	41	0.0	0.319	6.2	LOS A	1.9	13.7	0.67	0.73	0.67	45.1
8	T1	177	1.8	0.319	6.2	LOS A	1.9	13.7	0.67	0.73	0.67	46.0
9	R2	55	1.9	0.319	10.0	LOS A	1.9	13.7	0.67	0.73	0.67	45.9
Approach		273	1.5	0.319	6.9	LOS A	1.9	13.7	0.67	0.73	0.67	45.8
West: Ferodale Road												
10	L2	116	2.7	0.590	7.7	LOS A	5.1	36.2	0.78	0.87	0.90	44.2
11	T1	214	0.0	0.590	7.6	LOS A	5.1	36.2	0.78	0.87	0.90	45.1
12	R2	204	1.5	0.590	11.4	LOS A	5.1	36.2	0.78	0.87	0.90	45.0
Approach		534	1.2	0.590	9.1	LOS A	5.1	36.2	0.78	0.87	0.90	44.9
All Vehicles		1827	1.3	0.675	7.2	LOS A	6.4	45.5	0.68	0.74	0.73	45.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2029 AM Medowie Road / Ferodale Road + Development + Growth]

Medowie Road / Ferodale Road
Site Category: (None)
Roundabout
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Medowie Road												
1	L2	252	3.6	0.482	5.5	LOS A	3.2	23.5	0.64	0.68	0.64	45.6
2	T1	171	8.4	0.482	5.6	LOS A	3.2	23.5	0.64	0.68	0.64	46.4
3	R2	50	0.0	0.482	9.2	LOS A	3.2	23.5	0.64	0.68	0.64	46.5
Approach		473	5.0	0.482	5.9	LOS A	3.2	23.5	0.64	0.68	0.64	46.0
East: Ferodale Road												
4	L2	115	1.1	0.489	8.6	LOS A	3.6	25.7	0.79	0.89	0.89	44.2
5	T1	225	1.2	0.489	8.5	LOS A	3.6	25.7	0.79	0.89	0.89	45.1
6	R2	50	2.6	0.489	12.4	LOS A	3.6	25.7	0.79	0.89	0.89	45.0
Approach		389	1.3	0.489	9.0	LOS A	3.6	25.7	0.79	0.89	0.89	44.8
North: Medowie Road												
7	L2	38	0.0	0.465	6.2	LOS A	3.1	22.5	0.68	0.75	0.70	45.0
8	T1	296	6.6	0.465	6.4	LOS A	3.1	22.5	0.68	0.75	0.70	45.9
9	R2	87	3.0	0.465	10.1	LOS A	3.1	22.5	0.68	0.75	0.70	45.8
Approach		422	5.3	0.465	7.1	LOS A	3.1	22.5	0.68	0.75	0.70	45.8
West: Ferodale Road												
10	L2	51	10.3	0.431	5.0	LOS A	2.7	19.5	0.53	0.66	0.53	44.9
11	T1	140	0.0	0.431	4.8	LOS A	2.7	19.5	0.53	0.66	0.53	45.9
12	R2	278	1.4	0.431	8.6	LOS A	2.7	19.5	0.53	0.66	0.53	45.8
Approach		469	1.9	0.431	7.1	LOS A	2.7	19.5	0.53	0.66	0.53	45.7
All Vehicles		1752	3.4	0.489	7.2	LOS A	3.6	25.7	0.65	0.74	0.68	45.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2029 PM Medowie Road / Ferodale Road + Development + Growth]

Medowie Road / Ferodale Road
Site Category: (None)
Roundabout
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Medowie Road												
1	L2	416	0.6	0.881	11.8	LOS A	17.0	120.6	1.00	1.03	1.36	42.5
2	T1	399	2.3	0.881	11.8	LOS A	17.0	120.6	1.00	1.03	1.36	43.3
3	R2	158	2.5	0.881	15.6	LOS B	17.0	120.6	1.00	1.03	1.36	43.2
Approach		974	1.6	0.881	12.4	LOS A	17.0	120.6	1.00	1.03	1.36	42.9
East: Ferodale Road												
4	L2	54	0.0	0.332	6.2	LOS A	2.0	13.8	0.66	0.72	0.66	45.3
5	T1	208	0.0	0.332	6.2	LOS A	2.0	13.8	0.66	0.72	0.66	46.2
6	R2	31	0.0	0.332	10.0	LOS A	2.0	13.8	0.66	0.72	0.66	46.1
Approach		292	0.0	0.332	6.6	LOS A	2.0	13.8	0.66	0.72	0.66	46.0
North: Medowie Road												
7	L2	51	0.0	0.468	8.2	LOS A	3.5	25.2	0.84	0.91	0.91	44.3
8	T1	219	1.8	0.468	8.2	LOS A	3.5	25.2	0.84	0.91	0.91	45.1
9	R2	68	1.9	0.468	12.0	LOS A	3.5	25.2	0.84	0.91	0.91	45.1
Approach		338	1.5	0.468	9.0	LOS A	3.5	25.2	0.84	0.91	0.91	45.0
West: Ferodale Road												
10	L2	144	2.7	0.865	18.3	LOS B	14.6	103.0	1.00	1.33	1.73	39.2
11	T1	265	0.0	0.865	18.2	LOS B	14.6	103.0	1.00	1.33	1.73	39.9
12	R2	253	1.5	0.865	22.0	LOS B	14.6	103.0	1.00	1.33	1.73	39.9
Approach		662	1.2	0.865	19.7	LOS B	14.6	103.0	1.00	1.33	1.73	39.7
All Vehicles		2266	1.3	0.881	13.3	LOS A	17.0	120.6	0.93	1.06	1.31	42.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2029 PM Medowie Road / Ferodale Road + Development + Growth + Other Development]

Medowie Road / Ferodale Road
Site Category: (None)
Roundabout
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Medowie Road												
1	L2	424	0.6	0.965	25.3	LOS B	30.5	216.2	1.00	1.53	2.20	36.8
2	T1	407	2.2	0.965	25.3	LOS B	30.5	216.2	1.00	1.53	2.20	37.3
3	R2	158	2.5	0.965	29.1	LOS C	30.5	216.2	1.00	1.53	2.20	37.3
Approach		989	1.6	0.965	25.9	LOS B	30.5	216.2	1.00	1.53	2.20	37.1
East: Ferodale Road												
4	L2	54	0.0	0.423	6.6	LOS A	2.7	18.9	0.71	0.77	0.71	45.0
5	T1	245	0.0	0.423	6.5	LOS A	2.7	18.9	0.71	0.77	0.71	45.9
6	R2	69	0.0	0.423	10.3	LOS A	2.7	18.9	0.71	0.77	0.71	45.8
Approach		368	0.0	0.423	7.3	LOS A	2.7	18.9	0.71	0.77	0.71	45.7
North: Medowie Road												
7	L2	89	0.0	0.559	10.1	LOS A	4.9	34.6	0.90	1.01	1.08	43.3
8	T1	226	1.7	0.559	10.1	LOS A	4.9	34.6	0.90	1.01	1.08	44.1
9	R2	68	1.9	0.559	13.9	LOS A	4.9	34.6	0.90	1.01	1.08	44.1
Approach		382	1.4	0.559	10.8	LOS A	4.9	34.6	0.90	1.01	1.08	43.9
West: Ferodale Road												
10	L2	144	2.7	0.962	36.3	LOS C	25.9	182.9	1.00	1.82	2.74	33.0
11	T1	302	0.0	0.962	36.2	LOS C	25.9	182.9	1.00	1.82	2.74	33.4
12	R2	261	1.5	0.962	40.0	LOS C	25.9	182.9	1.00	1.82	2.74	33.4
Approach		706	1.1	0.962	37.6	LOS C	25.9	182.9	1.00	1.82	2.74	33.3
All Vehicles		2446	1.2	0.965	24.1	LOS B	30.5	216.2	0.94	1.42	1.96	37.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2019 AM Medowie Road / Muir Street + Development]

Medowie Road / Muir Street
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Medowie Road												
1	L2	73	0.0	0.141	4.6	LOS A	0.0	0.0	0.00	0.15	0.00	46.7
2	T1	188	8.9	0.141	0.0	LOS A	0.0	0.0	0.00	0.15	0.00	48.8
Approach		261	6.5	0.141	1.3	NA	0.0	0.0	0.00	0.15	0.00	48.4
North: Medowie Road												
8	T1	317	5.6	0.220	0.3	LOS A	0.6	4.3	0.17	0.11	0.17	48.5
9	R2	72	0.0	0.220	5.7	LOS A	0.6	4.3	0.17	0.11	0.17	47.4
Approach		388	4.6	0.220	1.3	NA	0.6	4.3	0.17	0.11	0.17	48.3
West: Muir Street												
10	L2	22	0.0	0.016	5.1	LOS A	0.1	0.4	0.28	0.51	0.28	44.2
12	R2	34	0.0	0.049	7.5	LOS A	0.2	1.1	0.49	0.72	0.49	38.2
Approach		56	0.0	0.049	6.6	LOS A	0.2	1.1	0.40	0.64	0.40	41.1
All Vehicles		705	4.9	0.220	1.7	NA	0.6	4.3	0.13	0.17	0.13	47.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2019 PM Medowie Road / Muir Street + Development]

Medowie Road / Muir Street
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Medowie Road												
1	L2	32	0.0	0.246	4.6	LOS A	0.0	0.0	0.00	0.04	0.00	48.3
2	T1	441	1.7	0.246	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	49.7
Approach		473	1.6	0.246	0.3	NA	0.0	0.0	0.00	0.04	0.00	49.6
North: Medowie Road												
8	T1	246	1.3	0.147	0.3	LOS A	0.2	1.6	0.11	0.05	0.11	49.2
9	R2	21	0.0	0.147	6.7	LOS A	0.2	1.6	0.11	0.05	0.11	48.1
Approach		267	1.2	0.147	0.8	NA	0.2	1.6	0.11	0.05	0.11	49.2
West: Muir Street												
10	L2	68	0.0	0.064	6.2	LOS A	0.2	1.7	0.45	0.63	0.45	43.6
12	R2	68	0.0	0.112	8.5	LOS A	0.4	2.5	0.55	0.80	0.55	37.3
Approach		137	0.0	0.112	7.4	LOS A	0.4	2.5	0.50	0.72	0.50	41.0
All Vehicles		877	1.2	0.246	1.6	NA	0.4	2.5	0.11	0.15	0.11	48.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2029 AM Medowie Road / Muir Street + Development + Growth]

Medowie Road / Muir Street
Site Category: (None)
Giveway / Yield (Two-Way)
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Medowie Road												
1	L2	90	0.0	0.175	4.6	LOS A	0.0	0.0	0.00	0.15	0.00	46.7
2	T1	234	8.9	0.175	0.0	LOS A	0.0	0.0	0.00	0.15	0.00	48.7
Approach		324	6.5	0.175	1.3	NA	0.0	0.0	0.00	0.15	0.00	48.4
North: Medowie Road												
8	T1	393	5.6	0.277	0.5	LOS A	0.8	6.1	0.21	0.11	0.21	48.4
9	R2	89	0.0	0.277	6.1	LOS A	0.8	6.1	0.21	0.11	0.21	47.2
Approach		482	4.6	0.277	1.5	NA	0.8	6.1	0.21	0.11	0.21	48.2
West: Muir Street												
10	L2	27	0.0	0.021	5.3	LOS A	0.1	0.6	0.31	0.53	0.31	44.1
12	R2	42	0.0	0.073	8.8	LOS A	0.2	1.6	0.57	0.81	0.57	37.0
Approach		69	0.0	0.073	7.4	LOS A	0.2	1.6	0.47	0.70	0.47	40.4
All Vehicles		875	4.9	0.277	1.9	NA	0.8	6.1	0.15	0.17	0.15	47.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2029 PM Medowie Road / Muir Street + Development + Growth]

Medowie Road / Muir Street
Site Category: (None)
Giveway / Yield (Two-Way)
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Medowie Road												
1	L2	39	0.0	0.305	4.6	LOS A	0.0	0.0	0.00	0.04	0.00	48.3
2	T1	547	1.7	0.305	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	49.7
Approach		586	1.6	0.305	0.3	NA	0.0	0.0	0.00	0.04	0.00	49.6
North: Medowie Road												
8	T1	305	1.3	0.186	0.4	LOS A	0.3	2.4	0.13	0.05	0.13	49.1
9	R2	26	0.0	0.186	7.6	LOS A	0.3	2.4	0.13	0.05	0.13	48.0
Approach		332	1.2	0.186	1.0	NA	0.3	2.4	0.13	0.05	0.13	49.0
West: Muir Street												
10	L2	85	0.0	0.091	6.9	LOS A	0.3	2.4	0.51	0.70	0.51	43.2
12	R2	85	0.0	0.175	10.4	LOS A	0.6	3.9	0.67	0.85	0.67	35.5
Approach		170	0.0	0.175	8.7	LOS A	0.6	3.9	0.59	0.77	0.59	40.0
All Vehicles		1087	1.2	0.305	1.8	NA	0.6	3.9	0.13	0.16	0.13	48.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽Site: 101 [2029 PM Medowie Road / Muir Street + Development + Growth + Other Development]

Medowie Road / Muir Street
Site Category: (None)
Giveway / Yield (Two-Way)
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Medowie Road												
1	L2	85	0.0	0.329	4.6	LOS A	0.0	0.0	0.00	0.07	0.00	47.8
2	T1	547	1.7	0.329	0.0	LOS A	0.0	0.0	0.00	0.07	0.00	49.4
Approach		632	1.4	0.329	0.6	NA	0.0	0.0	0.00	0.07	0.00	49.2
North: Medowie Road												
8	T1	305	1.3	0.253	1.5	LOS A	1.1	8.0	0.36	0.16	0.37	47.4
9	R2	85	0.0	0.253	8.2	LOS A	1.1	8.0	0.36	0.16	0.37	46.1
Approach		390	1.0	0.253	3.0	NA	1.1	8.0	0.36	0.16	0.37	47.1
West: Muir Street												
10	L2	129	0.0	0.138	7.0	LOS A	0.5	3.7	0.52	0.72	0.52	43.2
12	R2	129	0.0	0.298	12.5	LOS A	1.1	7.6	0.74	0.93	0.88	33.8
Approach		258	0.0	0.298	9.8	LOS A	1.1	7.6	0.63	0.82	0.70	39.1
All Vehicles		1280	1.0	0.329	3.2	NA	1.1	8.0	0.24	0.25	0.25	46.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.