BETTER TRANSPORT FUTURES
MARK WAUGH

Proposed Myall Quays Residential Development, Tea Gardens NSW

Crighton Property Group

Traffic Impact Assessment
November 2012

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Contents

1 Executive Summary

Crighton Property Group are preparing a Part 3A (Concept Plan) application for the proposed Riverside development at Tea Gardens, NSW. The concept plan development includes approximately 974 lots and associated works.

The traffic analysis task has involved the following considerations:

- whether the existing Myall Quays intersection can cater for the initial stages of development;
- timing of when additional access via a second intersection with Myall Street is required;
- impacts of the full concept plan development of 909 residential dwellings and 65 tourist lodges (giving 974 lots in total);
- likely further impact of the additional 1,300 lots to be developed at Myall River Downs; and
- the potential future impact of proposed industrial development to the west of Myall Street.

The study investigations have revealed the following outcomes in relation to traffic and access issues:

1. Operation of the existing intersection of Myall Street and Myall Quays Boulevard was assessed as having adequate capacity to cater for the flows associated with the initial stages of the development on the site (381 lots), for both the current 2012 and future 2022 design years.
2. The existing intersection has also been analysed to assess the impact of further residential development with access via Myall Quays Boulevard. This analysis indicates that some 400 residential lots could be developed off Myall Quays Boulevard using the existing intersection. Beyond 400 lots, the junction would need to be upgraded, or an additional access provided.
3. The existing intersection when combined with the proposed second access to the north on Myall Street is able to cater for the full 974 lots under the concept plan
4. The additional access available via Toonang Drive also contributes to a higher overall level of service at the proposed access junctions. Current traffic flows on the side road at this location are negligible and the intersection operates with minimal delays. However, with full development of Myall Quays and Myall Downs this intersection will need to be upgraded to a seagull type intersection. This upgrade will need to be implemented when the 974 lots are developed at Myall Quays and the connection is provided through to Toonang Drive.
5. The proposed Myall River Downs residential development can be accessed via a single 4-way signal controlled upgrade of the existing Myall Street / Myall Quays Boulevard intersection, having adequate capacity to cater for both the Myall Quays and Myall River Downs development.
6. The second Myall Street access with development of about 400 lots of Myall River Downs would require upgrade to signal control, because of the additional through traffic movements.
7. With the introduction of the industrial land to the west of Myall Street, access to this activity can be catered for via a 4th leg to the second Myall Street access controlled by traffic signals. This operates satisfactorily under signal for both the current 2012 and future 2017 design years.

From the study, it is concluded that the existing road system beyond the site is able to cater for the traffic demands of the proposed residential development of both Myall Quays and Myall River Downs. The existing intersection control at Myall Quays Boulevard and Myall Street, when combined with a 2nd intersection (of similar design) on Myall Street, and also with access to Toonang Drive can accommodate the entire Riverside Concept Plan area (974 lots.)

The two southern intersections of Myall Street will only require upgrading to signals at or before the development of either or both of Myall River Downs or the industrial land to the west of Myall Street. Prior to these developments, the existing T-intersection control at Myall Quays Boulevarde will have adequate capacity and with minimal pedestrian demand across Myall Street there is no requirement to upgrade to signal control.

It is recommended that the concept plan and initial stages reflect the following commitments:

1. The second access to Myall Street (as a priority controlled junction for stage i) is provided prior to the development of 500 lots within the concept plan. (i.e. before the 590 threshold.);
2. Access to be provided to Toonang Drive in line with the Concept plan staging, at say 700 lots. (i.e. before the 974 yield.);
3. The Riverside Concept plan, in isolation, be allowed to be developed in total (974 lots) based on the capacity of the proposed 4 intersections; and
4. The two southern intersections of Myall Street only to be upgraded at / before the requirement is reached for these to act as 4-way intersections. (i.e. access is triggered by either or both of Myall River Downs or the industrial land to the west of Myall Street). At this point, these intersections will need to be upgraded to 4-way signal control to allow for pedestrian movements as well as vehicle turn demands.

2 Introduction

2.1 Background

Better Transport Futures was commissioned by Crighton Property Group to prepare a Traffic Impact Assessment to support the Part 3A (Concept Plan) application for the proposed Riverside development at Tea Gardens, NSW. The scope of this report has also been extended to consider the cumulative impact of likely further development of the Myall River Downs site opposite.

The work presented in this report focuses on the traffic and transport elements of the proposal in the context of the existing situation and known development plans for the area.

2.2 Purpose of Investigations

The traffic investigations documented in this report have been prepared to support the Part 3A (Concept Plan) application for the proposed Riverside development at Tea Gardens, NSW. The report is required as part of the application to the Department of Planning NSW.

This report presents the findings of the traffic investigations and assessment of the proposal. It is structured as follows:

- Chapter 2 outlines the existing situation in the vicinity of the subject site, including discussion on the planned development growth within the vicinity and road network changes to support it.
- Chapter 3 describes the traffic and parking features of the proposal.
- Chapter 4 details the assessment of traffic operations related to the proposal.
- Chapter 5 summarises the findings of this investigation, outlining conclusions and recommendations for the traffic operations of the site to support the application for the proposal.

3 Existing Situation

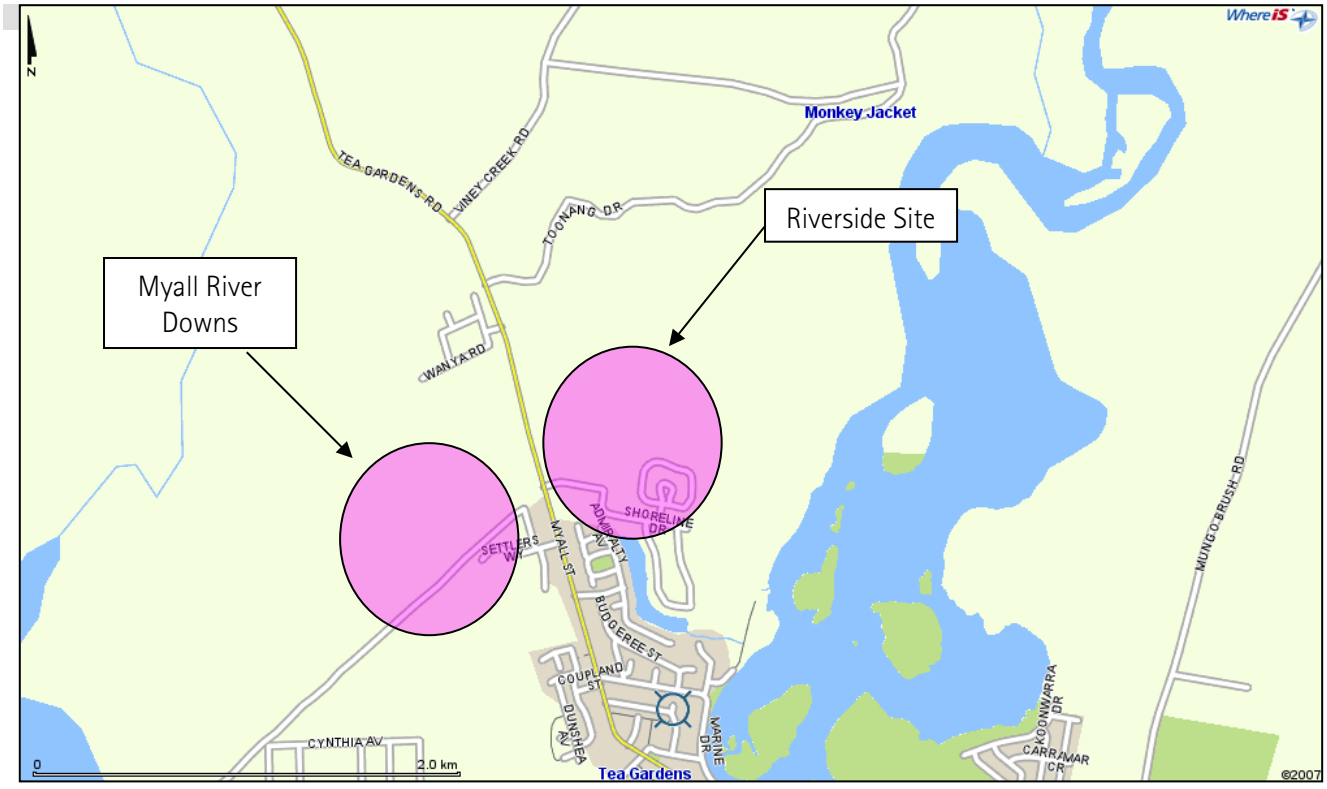
3.1 Background and Site Location

The subject site is located on a parcel of land off Myall Street, in the district of Tea Gardens. It is bounded to the south by existing residential development within Myall Quays and to the north by Toonang Drive and existing and proposed future residential development. To the west is Myall Street providing access to the greater road network. The land is currently vacant and predominantly cleared. The site is directly accessible from Myall Street, Toonang Drive and Myall Quays Boulevard.

Myall Quays and Myall River Downs are two developments located on opposite sides (east and west) of Myall Street, the main road access to the existing villages of Tea Gardens and Hawks Nest. Great Lakes Council has prepared a Development Control Plan No 30 Dated 1999 in addition to the Hawks Nest/ Tea Gardens Conservation and Development Strategy and a Local Environmental Plan. These planning documents covering the developments include potential for up to 2,500 – 3,000 residential dwellings, the shopping centre with supermarket, specialty retail and other services, service station, commercial centre, medical centre, restaurants and other employment lands.

Current proposals for the two sites provide for approximately 974 lots at Riverside with the Myall River Downs covering a further 1,300 dwellings (approximately).

The location of the site is shown below in Figure 3-1.



Source: Where Is.com

Figure 3-1 Site Location

3.2 Local Road System

3.2.1 Road Characteristics

Myall Street

Myall Street, (Main Road 506) is the main road link to and from the villages of Tea Gardens and Hawks Nest and the Pacific Highway (H10) to the west. As an arterial road, it currently has a two lane sealed carriageway of approximately 13 metres width in the vicinity of the site. The posted speed limit adjacent to the site is a 50 km/h local speed zone. Approximately ½ kilometre to the north of the site the speed limit changes to 80 km/h at the fringe of the Tea Gardens urban development. Site observations and previous investigations for Myall Quays have indicated the following in relation to traffic operations:

1. Council traffic survey data from December 2001/January 2002 shows Myall Street carries an Annual Average Daily traffic (AADT) flow of 3,927 vehicles per day.
2. AADT growth for Myall Street was around 5.5% between 1989 and 1998.
3. The growth rate for 1998-2002 slowed to 2.7%
4. Typical peak hour flows on Myall Street in October 2012 were observed as 463 vehicles per hour in the AM peak and 534 vehicles in the PM peak (to south of Myall Quays Boulevard). Based on peak hour flows representing approximately 10% of daily flows this would indicate the daily flows being in the order of 5,000 vehicles.
5. Sight distances exceed the requirements on all approaches to the subject site.
6. Existing traffic flows are relatively light with ample gaps to allow safe entering for vehicles entering the traffic stream from side roads.
7. The existing route operates at a satisfactory level of service as evidenced from the lack of traffic management devices installed.
8. Pedestrian facilities in the vicinity are limited to those being installed as part of the Myall Quays development.

Photo 1 View west along Myall Street showing typical cross section

Myall Quays Boulevard

This main access road will serve the shopping centre, proposed commercial development and surrounding residential development as well as the subject site. It has been designed as a dual carriageway boulevard and ultimately with signal control at the intersection with Myall Street.

Photo 2 View north along Myall Quays Boulevard showing typical cross section of southbound lanes

3.3 Traffic Volumes

3.3.1 Traffic Survey

As part of this project, traffic volume data has been collected during a survey of intersection traffic volumes at the intersection of Myall Street and Myalls Quay Boulevard. These surveys were completed on Tuesday 9th October 2012. The results of this survey are provided in Appendix A to this report.

The results from the traffic survey indicate that during the surveyed morning peak period (8.30 to 9.30 AM) the two-way traffic flow along Myall Street to the east of Myall Quay Boulevarde (Hawks Nest side of the intersection) was in the order of 463 vehicles whilst in the PM peak (4.00 to 5.00 PM) the flows were 534 vehicles per hour. The majority of vehicles were light vehicles, with limited heavy goods vehicles observed during the survey period. The survey showed that the westbound movement towards the Pacific Highway was the dominant flow with 270 vehicles in the AM with the reverse pattern occurring in the PM peak (331 vehicles).

The traffic flows along Myall Quays Boulevard were lower. During the morning peak period the two-way flow was 292 vehicles per hour and in the afternoon was 389, reflecting the demands associated with the shopping centre. Observations on site confirm the majority of these traffic movements were associated with the Myall Quays shopping centre.

The results of the traffic survey are summarised in Table 3-1 below.

Table 3-1 Traffic Volumes (2012)

Road	Peak Period	Peak flow	Mid-Block Road Capacity[1]	Volume / Capacity
Myall Street	AM peak	193 towards Hawks Nest 270 towards Pacific Highway	900 (one-way)	0.214 0.300
	PM peak	331 towards Hawks Nest 203 towards Pacific Highway	900 (one-way)	0.338 0.225
Myall Quays Boulevard	AM peak	159 towards Myall Quays Estate 133 from Myall Quays Estate	900 (one-way)	0.176 0.148
	PM peak	175 towards Myall Quays Estate 214 from Myall Quays Estate	900 (one-way)	0.194 0.238

Notes: 1.RTA 2002, Urban Road Conditions Level of Service C

Table 3-1 demonstrates that both Myall Street and Myall Quays Boulevard are operating well within their technical and functional capacity levels as an arterial road (Myall Street) and local collector road (Myall Quays Boulevard).

Using Table 3-2 from the RTA Guide to Traffic Generating Developments (reproduced below), it can be seen that the ultimate capacity for Myall Street in this location is around 1,400 vehicles per hour in one direction. For the current observed traffic flows along Myall Street it can be seen that the level of service for road users is A or B.

Table 3-2 RTA Guide - Urban Road Peak Hour Flows Per Direction

Levels of Service	One Lane (veh/hr)	Two Lanes (veh/hr)
A	200	900
B	380	1,400
C	600	1,800
D	900	2,200
E	1,400	2,800

Source: Table 4.4 RTA Guide to Traffic Generating Developments, version 2.2 dated October 2002.

3.4 Intersection Control and Operation

As discussed above, there are a number of intersections and driveways in the general vicinity of the subject site. These intersections are in the main, simple give way controlled intersections. There are also a number of driveways to individual residential lots.

The intersection of Myall Street and Myall Quays Boulevard is the major intersection in the vicinity of the site. It provides a give way control with a central right turn lane, so that westbound through movements are not impeded by traffic waiting to turn right into the side road. There is also a left turn deceleration lane for traffic turning left into the side road off Myall Street. For traffic exiting Myall Quays Boulevard there is a left turn acceleration lane to reduce the delays for these vehicles. The layout of intersection has been reviewed on site and provides good visibility in all directions, due to the straight alignment of both of the roads.

From the RTA Road Design Guide, the intersection provides a Type AUR intersection control, with the additional benefit of the left turn deceleration and acceleration lane.

Table 3-3 Existing Operation – Myall Road and Myall Quays Boulevarde

MOVEMENT	DEGREE OF SATURATION	AVERAGE DELAY (SEC/VEH)	LEVEL OF SERVICE	95th PERCENTILE BACK OF QUEUE (metres)
Right turn in to Myall Quays Boulevard	0.106 / 0.100	8.9 / 9.3	A / A	2.9 / 2.9
Right turn out Myall Quays Boulevard	0.092 / 0.097	13.2 / 13.3	A / A	2.4 / 2.6
Through towards Pacific Hwy	0.084 / 0.052	0.0 / 0.0	A / A	0.0 / 0.0
Through towards Hawks Nest	0.057 / 0.090	0.0 / 0.0	A / A	0.0 / 0.0

Table 3-4 Existing Operation – Myall Road and Toonang Drive

MOVEMENT	DEGREE OF SATURATION	AVERAGE DELAY (SEC/VEH)	LEVEL OF SERVICE	95th PERCENTILE BACK OF QUEUE (metres)
Right turn in to Toonang Drive	0.091 / 0.079	9.0 / 9.3	A / A	4.0 / 3.5
Right turn out Toonang Drive	0.024 / 0.013	10.3 / 9.5	A / A	0.6 / 0.3
Through towards Pacific Highway	0.091 / 0.079	0.6 / 0.8	A / A	4.0 / 3.5
Through towards Hawks Nest	0.075 / 0.100	0.1 / 0.0	A / A	0.0 / 0.0

The above Sidra analysis demonstrates that both of these intersections currently work very well with minimal delays and congestion.

3.5 Road Network Improvements

The only known road improvements in the vicinity are those associated with the proposed access to the Riverside, Myall River Downs and adjacent industrial estate projects. The long term access arrangements for these projects make provision for upgrading intersection controls to signals, and potentially also for the duplication of the road carriageway between the two nominated access points on Myall Street. These potential upgrades are discussed in later sections of this report.

It is understood there are no major road network improvements planned in the vicinity of the subject site, apart from normal road maintenance performed by Council and the RMS.

3.6 Public Transport, Pedestrians and Cyclists

Public transport in the vicinity of the site is limited. School buses provide access for school children between this area and Raymond Terrace. However, these services do not provide a high standard of service suitable for regular commuters.

Pedestrians and cyclists are able to use the public roads in the vicinity of the site. During the survey there was limited cyclist and pedestrian movements observed. Council has recently updated their Bike Plan for this locality and there are a number of routes in this locality that are at various stages of construction. These routes will be completed as development in the locality occurs.

4 Proposed Development

4.1 Development and Access Arrangements

A concept plan application is to be made to the NSW Department of Planning (DoP) for approval to subdivide the subject site into around 909 residential lots, 65 tourist lodges and associated works. The development will be constructed in a number of stages. The initial stages will provide approximately 381 lots.

The plans for the residential development show that access to the subject site will initially be provided via one intersection on Myall Street which currently exists. Further intersections to Myall Street and Toonang Drive are proposed in subsequent Stages.

The intersection of Myall Street and Myall Quays Boulevard is currently constructed as a give way control. This control will remain for the initial stage of the development but will be upgraded to signal control with ultimately a 4-way signal controlled intersection to allow for future development of the land opposite Myall Quays Boulevarde. It is proposed to construct the second access on Myall Street as a give way control in the early stage of the development. Under full development and with the development of industrial land opposite the subject site which appears likely to proceed at some future date this intersection will be upgraded then to provide a 4-way signal controlled intersection.

This assessment is for the full concept plan of 974 lots, with consideration of the first stages of 381 lots (via a single access on Myall Quays Boulevarde). It also considers the longer term effects of the potential continuation of the industrial estate on the western side of Myall Street, and also the development potential of Myall River Downs, assumed as a maximum potential of 1,300 lots. The timing of both of these potential developments is not currently known but there effects have been taken into account in terms of determining the appropriate ultimate level of road infrastructure requirements.

Details of the concept plan and project plan are included in Appendix B.

4.2 Traffic Generation

The level of traffic generation from the development proposal has been assessed using the rates available from the standard RTA guidelines for Traffic Generating Developments. These Guidelines indicate a range of traffic generation rates depending on the type land use activity, including residential subdivisions.

The RTA guidelines indicate the critical movement periods for residential are during the morning and afternoon peak periods. These movements are associated with work and school trips. Morning peak flows are generally more critical, as the afternoon peak flows often occur over a longer time frame with less of a peak. For the purposes of this assessment, it has been assumed that the morning and afternoon traffic flows are similar.

The RTA Guide to Traffic Generating developments indicates that typical traffic generation rates for residential subdivisions such as the subject site are 0.85 trips per dwelling during the peaks and 9 trips per dwelling per day.

For the initial stages of 381 residential lots the peak hour flows would be in the order of 324 vehicle movements per hour and 3,429 vehicle movements per day. It is considered that these rates provide the upper limit for traffic flows and that actual traffic flows could be considerably lower. A review of the current development in the locality of the site indicates that a significant portion of the current residents are retired, and therefore, do not have school related trips or work related trips. Assuming the subject development also accommodates a large number of retired people, and then the traffic flows would be much lower.

For retirement units, the RTA Guide indicates that the level of generation is 0.1 to 0.2 per dwelling in the evening with no advice for the morning peak. Assuming the higher rate and applying this to the AM peak as well, it can be seen that this rate is some 25% of the rate for normal residential development. If 25% of

the future lots were occupied by retired people, the composite generation rate would reduce to some 0.69 trips per lot, a reduction of 20%. As the number of lots occupied by retired people increases as a proportion, it can be seen that the composite lot rate per lot increases accordingly. With half the lots for example occupied by retied people for example, the composite generation rate would be 0.525 trips per lot.

In addition, it is important to note that a significant portion of the traffic will be contained traffic, associated with trips to the shops, schools, etc. Advice from the RTA Guide to Traffic Generating Developments indicates that typically some 25% of traffic is localised traffic, contained within the area of a development such as this and that this traffic does not use the external road network. It can be seen that the future residential development to the east of the existing commercial centre will not have to use the external road network to access the commercial centre. Whilst a trip will be generated by the dwellings, its impact on the greater road network will be zero.

Traffic demands will also be reduced due to the layout of the site, providing a positive encouragement for pedestrians and cyclists for the short trips required to the adjacent facilities and developments. It can also be seen that the home office facilities will encourage a significant portion of the future residents to work from home, using the internet and phone as part of the communication package. The location of the development discourages daily commuting to the major centre such as Newcastle, thereby attracting people who can work from home.

It is considered that with the containment of trips from the design of the site as well as a high proportion of retired people living in the area, together home based work, the normal traffic generation rate of 0.85 can be reduced by some 35%, giving an external trip generation rate of 0.55 trips per dwelling during the peak periods. Daily rates would also be reduced by a similar rate. Using these rates, the Stage One of the development (381 lots) would generate some 209 vehicles per hour two-way and the full development of 974 would generate 536 vehicle movements per hour.

4.3 Site Access

For the purposes for the concept plan vehicle access to the site will be provided via two access points. The existing intersection of Myall Street and Myall Quays Boulevard will provide one access point initially whilst a second access point will be provided to the north of this existing intersection. For stage one of the development, the existing intersection can be retained. The timing of the second intersection is discussed in Section 6 of this report. The access roads to the subject site will need to be designed in accordance with the RMS and Council requirements. There will be no direct individual property access to Myall Street, with all access provided via the internal road network.

4.4 Traffic Distribution

It is considered that the traffic distribution would be similar to the existing observed distribution. Whilst a large number of work related trips could be west towards the Pacific Highway (Raymond Terrace, Newcastle etc.) it can be seen that leisure associated trips for retired people would be east towards Hawks Nest e.g. golf course, shops and the beach. This is reflected in the current distribution at the intersection of Myall Street and Myall Quays Boulevard, where in the morning peak 30% of the traffic is west bound towards the Pacific Highway. A similar pattern is noted in the afternoon peak with 30% of the turn movements in and out of Myall Quay Boulevard being east towards Hawks Nest.

For the purposes of this assessment, the traffic has been distributed in a similar manner to the existing observed splits.

4.5 Pedestrian Access

Pedestrian access to the site would be via existing facilities along Myall Street augmented by the development as proposed by the proponent. It is considered that the augmented existing facilities in the local area will be more than adequate for the proposed development. In addition, there will be an extensive network of

pedestrian and cyclist (dual use) paths within the site. These paths will connect with the existing residential development adjacent to the site as well as connections to waterways and the existing shops at the entry to the subject site.

These dual use paths will tie in with the Bike Plan for the Hawks Nest / Tea Gardens area recently updated by Council.

4.6 Public Transport Facilities

The location of the site means that school children in particular will require a bus run to service the site. There is an existing school bus run that operates from this area. The demands on this existing service may require additional or improved runs to service this development. It is noted that a bus route throughout the development is proposed. The school bus run could be extended through the development if required, as the layout allows for through traffic movements. In the early stages of the development, it would be beneficial to provide a bus stop and shelter adjacent to the site entry point on Myall Street in the location allowed for adjacent to the shopping centre, to provide a pick-up/drop off point for school children.

The provision of school and regular bus routes to the subject site will be encouraged through discussions with the local bus company, with a view to extending and improving the existing service. This discussion will occur at the detailed design stage with the local bus company (s) as well as Council.

4.7 Site Operations and Access Arrangements

The indicative site plans for the proposed concept and initial stages are presented in Appendix B to this report. Overall access geometry would need to meet the requisite Council standards for residential subdivision. The internal road layout will need to be designed in accordance with Council residential subdivision code taking into account intersection controls, pedestrian requirements as well as existing road geometry requirements such as carriageway width etc.

The internal road network has been planned with careful consideration of the needs of the new community, both at the concept and project plan phase of the project. These plans will be upgraded and refined through the detailed design stage of the development in consultation with Council.

The longer term planning for the area surrounding the subject site includes development of industrial and other residential land, on both sides of Myall Street. It is envisaged that the two intersections along Myall Street that would provide the main points of access to the new areas.

It is understood that the longer term planning for the area surrounding the subject site includes the development of approximately 15,000 m^2 industrial uses and other residential land, on both sides of Myall Street. It is envisaged that the two intersections along Myall Street that would provide the main points of access to these new areas would be controlled ultimately by signals.

The technical analysis for the development of the site in relation to the form of intersection control required to provide satisfactory access for the residential site is discussed further in Section 6.

4.8 Parking Requirements

It can be seen that the new development will require parking for the residents but that it can be contained within the site. As per Council design requirements, there will be garage requirements for the future development as well as driveway requirements etc.

It is considered that all future parking for the development can be contained on site and that there is no further requirement to review parking for the development.

4.9 Other developments

There are a number of other key developments proposed in the general vicinity of the site. These include:

- Myall River Downs incorporating an additional approximately 1,300 lot residential lots; and
- Industrial floor space of approximately 15,000 m^2.

Timing of implementation of these two developments is expected to be beyond the timeframe planned for development of the Riverside project. Both of the developments will impact upon access to Myall Street in the long term, with access to these sites proposed at 4 way intersections as upgrades of the two Riverside access points, to minimise the number of access points to the main road Myall Street. The industrial development which is at the preliminary stages of planning is proposed to have access via two access points on Myall Street, the access to the existing industrial land, and via a fourth leg to the proposed second access into the Riverside site.

The preliminary plans for the Riverside development indicate that access in the long term would be provided via two 4-way signal controlled intersections that would provide access to the subject residential development as well as Myall River Downs, and the future industrial development.

It is important to note, nevertheless, that both the Myall River Downs and the future industrial development have not yet been approved. However, when assessing the access options for the subject residential development the impact of this industrial land should be taken into account, to ensure robustness of intersection design.

The assessment of intersection controls and staging of access considered in Section 6 of this report has taken the above planning timeframe into consideration.

5 Urban Design Principles

5.1 Urban Design Principles

The Riverside development provides an opportunity to contribute to the integration of land use and transport integration, through the adoption of urban design principles that encourage the full range of transport alternatives for visitors and residents of the site. The transport goals for the development are outlined below.

5.1.1 Riverside Transport Objectives

The following transport objectives have been put forward as part of the concept master plan for the Riverside site:

Pedestrians:

- Improve the Pedestrian Environment;
- Promote walking as principle local transport through and to the site;
- Give pedestrians priority over vehicles within the site;
- Enhance walking linkages - provide direct links within the site and to neighbouring attractions to encourage walking as key local transport. Provide signage with travel times to local attractions;
- Provide pedestrian links through proposed green/ open spaces;
- Provide pedestrian linkages back to Myall Street and the local shopping centre; and
- Provide a high standard of pedestrian accessibility / mobility within and to the site with continuity, consistency of materials, signposting, and lighting.

Vehicle Access and Movement:

- Primary vehicle access (including service vehicles) from Myall Street and Myall Quay Boulevard;
- In line with promoting pedestrian priority for the site minimise vehicle crossing points of footpath areas;
- Promote traffic calming within the local road system to enhance pedestrian safety; and
- Consider reducing road widths to improve pedestrian environment in areas of high pedestrian activity, low vehicle usage and high residential amenity (but still allowing for essential vehicle access and movement).

Public Transport:

- Promote access to public transport from the site using local shops as focal point for access to bus services, with a high degree of permeability for local service access to the site; and
- Provide high quality bus facilities at Myall Street and Myall Quay Boulevard.

Cycling:

- Consider nominating a route for cyclists around (rather than through) the site to protect and enhance the environment in high pedestrian activity areas.

Parking:

- Provide requisite parking on site to match development needs;
- Recognize parking requirement for storage of vehicles; and
- Manage on street parking adjacent to site for maximum benefit of site activities (Cafes etc.).

These objectives were taken into account in the development of the site concept Master plan.

6 Assessment of Transport Operations

6.1 Staging Assumptions

For the purposes of considering the impacts of the proposed development including the assumed staging of implementation, the relationship to other potential development in the area has been assumed as summarised in Table 6-1 below. The process of analysis has involved the following:

1. Assess the ability of the existing Myall Quays intersection to cater for the initial stages of 381 lots;
2. If spare capacity is still available, assess the ability of the existing Myall Quays intersection to cater for a portion of the concept plan development threshold up to the level of 974 lots;
3. When capacity of the existing Myall Quays intersection is reached, assess the capacity of the proposed second access under priority control to cater for the remainder of the concept plan development threshold up to the level of 974 lots;
4. Consider the impacts of the additional access points onto Toonang Drive also available to access Myall Street to the north;
5. Add a portion of the Myall River Downs Project to the existing Myall Quays intersection, upgrading to signal control if necessary;
6. Add additional development from the Myall River Downs Project. Assess the capacity of the 2nd Riverside access, upgrading to signal control if necessary; and
7. Add the industrial development via a 4th leg to the 2nd Riverside access, upgrading to signal control if necessary.

This process of analysis of the development staging is iterative, and assumes the timing of the Riverside Downs and Industrial development post-dates the Subject Riverside development.

Table 6-1 Site Access and staging Assumptions

Development Staging	Myall Quays intersection	Proposed 2nd access
Riverside - 381 lots	Existing	-
Riverside - 590 lots	Existing	-
Riverside - 974 lots	Existing	T intersection
Riverside - 974 lots + 500 Myall River Downs	4-way signals	T intersection
Riverside - 974 lots + 1,300 Myall River Downs	4-way signals	3-way signals
Riverside - 974 lots + 1,300 Myall Down + Industrial	4-way signals	4-way signals

The results of this process in terms of intersection performance and recommendations for staged implementation of the proposed junctions on Myall Street

6.2 Site Access Operations

It is proposed to provide all vehicle access to the site via two access points on Myall Street and two on Toonang Drive. One of these access points is already constructed (Myall Quays Boulevard) whilst the second access to the west will be built as part of a later stage of the development. It has been identified that during the initial stages of the development both of these intersections will be give way controlled, but that improved access control, i.e. signal control, will be required to facilitate full development of this site and the industrial land on the opposite side of Myall Street. The timing of the development of the signal controls will be tied to the various development staging, ensuring that adequate levels of service are maintained. The analysis here assesses the immediate needs of the subject residential development.

6.3 Road Network Performance and Capacity

From Table 3-1, the current peak one-way hourly traffic flows along Myall Street is in the order of 270 vehicles westbound in the AM peak and 331 vehicles per hour eastbound in the PM peak. From Table 3-2 (Table 4.4 of the RTA Guide to Traffic Generating Developments) it can be seen that the level of service for the current flows is B. This assumes the heavy good vehicles content is in the order of 5% and that the road is relatively flat in this location.

Upon completion of the initial stages of the development with 381 residential lots on the subject site, there could be up to 209 vehicles per hour generated by the development during the critical morning and afternoon peak periods. Assuming 70% of this traffic has an origin/destination to the east towards Hawks Nest, it can be seen that traffic flows along Myall Street could increase by nearly 150 vehicles per hour one-way in the critical direction. This would increase the total hourly flows from the current critical peak westbound flow, towards the Pacific Highway, of 270 vehicles per hour in the AM peak to 300 vehicles per hour. In the afternoon peak the critical eastbound flow, towards Hawks Nest, on Myall Street would increase from 173 vehicles hour to 323 vehicles per hour.

This would mean that there would no change to the existing level of service of B for road users along Myall Street to the west of the development access points. Level of service B is defined as "*This level is in the zone of stable flow and drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience is less than that of the level of Service A*". It is considered that the additional traffic generated by the development will have an acceptable impact upon the existing operation of Myall Street.

Typically, as traffic flows increase along a length of road drivers habits alter. The main change is that people alter their time of travel where possible to avoid travelling during the peak periods. This effectively increases the duration of the peak hour along the key routes whilst reducing the absolute peak demand along a road during the critical peak periods. This is particularly relevant for retired people, as they will choose to avoid driving in the peak hours where possible to avoid delays and congestion.

The key issue will therefore be the operation of the intersection of Myall Street and the two access points.

6.4 Traffic Distribution

For the initial stages of the development, it is proposed to utilise the existing intersection only (at Myall Quays Boulevard), as all of the additional traffic associated with the development of 381 residential lots can be accommodated by the existing intersection. As the development proceeds beyond this initial stage, it can be seen that traffic can be distributed from the development via four separate access points with three connections to Myall Street.

It is considered that 70% of the traffic will wish to head south from the site towards Hawks Nest as per the existing observations during both the AM and PM peak periods. The layout of the site allows ease of choice for drivers to use any of the four entry/exit points to gain access to the greater road network. It is considered that 35% of the traffic will use the southern intersection (existing give way controlled intersection at Myall Quays Boulevard) whilst the remaining 65% of the traffic will use the future access points to the north.

Using the above assumptions, the future traffic flows associated with the initial development of 381 lots are presented below.

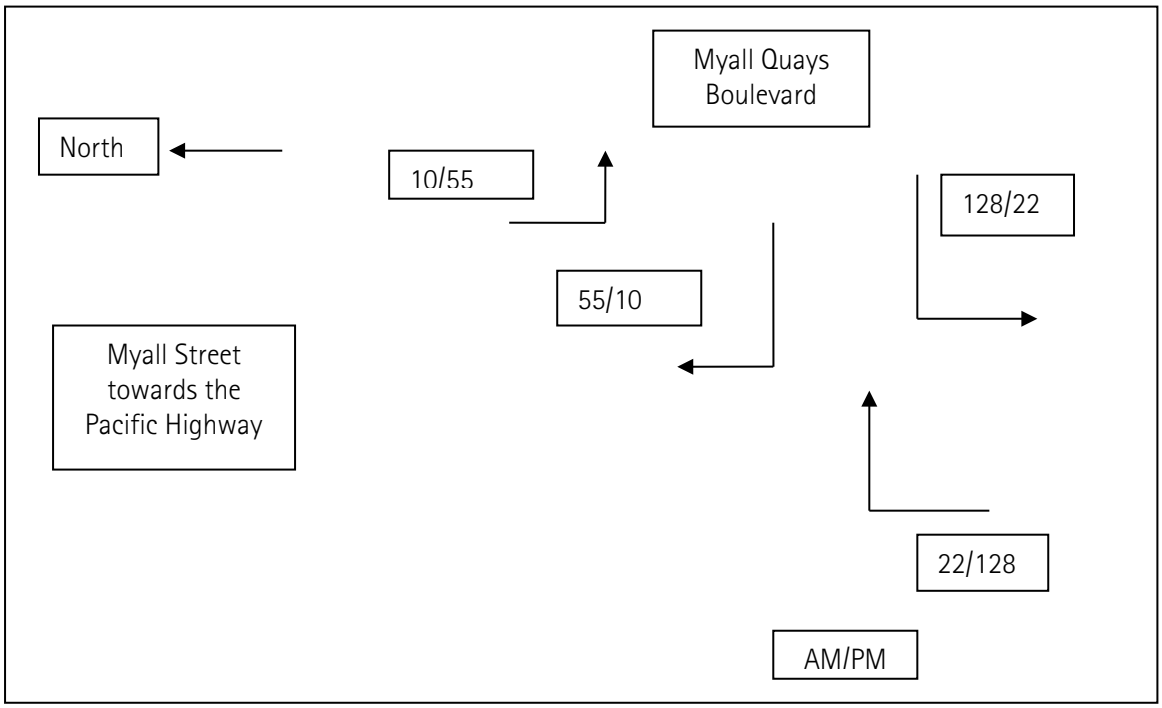


Figure 6-1 Future Traffic Flows, Stage One (381 lots)

The above traffic flows have been used for the analysis of the impact of the subject site at the intersection of Myall Street and Myall Quays Boulevard.

6.5 Intersection Operation

6.5.1 Initial Stages (381 lots)

The additional traffic associated with the initial stages of the development has been determined using the future flows associated with the development shown above. The intersections have been assessed using the standard computer package Sidra. Sidra is a traffic analysis tool developed originally by the Australian Road Research Board. It calculates the amount of delay to vehicles using an intersection, and gives a level of service rating which indicates the relative performance of the nominated intersection treatment. Levels of service of A to C are considered to be satisfactory, a level of service of D is acceptable, and levels of E and F are considered unsatisfactory. Sidra also calculates the degree of saturation, which indicates the amount of **spare capacity** available.

See Appendix D for full definition of SIDRA results.

The proposed development will be constructed over a number of stages, as required by market demand for the residential lots. As a worst case scenario, it has been assumed that the initial development (381 lots) is constructed entirely in 2013. The additional development flows shown above have been added to the current observed traffic flows to assess the performance of the intersection with the additional flows.

The results of the analysis for the existing intersection control with the additional traffic generated by 381 lots are shown overleaf in Table 6-2.

Table 6-2 Intersection of Myall Street and Myall Quays Boulevard, current intersection layout, 2012 traffic flows plus 381 lots (AM/PM)

MOVEMENT	DEGREE OF SATURATION	AVERAGE DELAY (SEC/VEH)	LEVEL OF SERVICE	95th PERCENTILE BACK OF QUEUE (metres)
Right turn in to Myall Quays Blvd	0.120 / 0.174	9.0 / 10.2	A / A	3.3 / 5.2
Right turn out Myall Quays Blvd	0.386 / 0.164	16.0 / 15.9	B / B	14.5 / 4.3
Through towards Pacific Highway	0.084 / 0.52	0.0 / 0.0	A / A	0 / 0
Through towards Hawks Nest	0.057 / 0.090	0.0 / 0.0	A / A	0 / 0

NB: Average delay, degree of saturation and level of service for the most delayed movement

The above analysis shows that with the full stage one of the development (381 of the residential lots) the existing intersection control at Myall Street and Myall Quays Boulevard are adequate. The level of service and associated delays will be similar to the existing situation and existing road users will notice minimal increases in delays and congestion at this intersection.

The intersections have also been assessed for the future design year of 2022. The through traffic movements on Myall Street have been increased by 25%, representing an annual increase of 2.5% in background traffic flows. The results of this analysis are presented in Table 6-3 below.

Table 6.3 – Intersection of Myall Street and Myall Quays Boulevard, current intersection layout, 2022 traffic flows plus 381 lots (AM/PM)

MOVEMENT	DEGREE OF SATURATION	AVERAGE DELAY (SEC/VEH)	LEVEL OF SERVICE	95th PERCENTILE BACK OF QUEUE (metres)
Right turn in to Myall Quays Blvd	0.121 / 0.182	9.2 / 10.4	A / A	3.4 / 5.4
Right turn out Myall Quays Blvd	0.432 / 0.184	18.3 / 17.4	B / B	16.7 / 4.8
Through towards Pacific Highway	0.105 / 0.066	0.0 / 0.0	A / A	0.0 / 0.0
Through towards Hawks Nest	0.071 / 0.111	0.0 / 0.0	A / A	0.0 / 0.0

NB: Average delay, degree of saturation and level of service for the most delayed movement

The above results indicate that the existing priority controlled intersections will continue to provide a high level of control for all road users over a 10 year design timeframe for the initial stages of the development (381 lots). The approach road capacity on Myall Street is also satisfactory as a two lane road configuration, and does not require upgrading to cater for the initial stages of the development.

6.5.2 Concept Plan and Development Staging

The relationship of the development staging to the overall concept plan and surrounding development has been tested as follow:

1. Introduction of the 2nd Myall Street access at or before completion of 381 lots;
2. Increase the level of lots developed from the concept plan, up to a maximum of 974 lots;
3. Continue to increase level of lots developed from the concept plan, up to a maximum of 974 lot;
4. Determine the point at which the intersection of Myall Quays Boulevard and Myall Street needs to be upgraded to signal control;
5. Increase the development in Myall River downs (opposite the site and access onto Myall Street / Myall Quays Boulevard intersection (Max 1,300 lots overall);
6. Assess the level of traffic on Myall Street, between the intersection at Myall Quays Boulevard and the future second access and determine road geometry i.e. 1 or 2 lanes in each direction; and
7. Assess the level of traffic on Myall Street, north and south of the signals and determine at what point the road needs to be upgraded to 4 lanes.

6.5.3 Project Development – Stage One and Two (974 lots)

The full development at Myall Quays will provide 974 residential lots. During the first stage, access will be via the existing single access point at the priority controlled intersection of Myall Quays Boulevard and Myall Street. During the development of the Riverside site a second access will be provided to the north of the existing intersection, providing a priority controlled intersection similar to the intersection of Myall Quays Boulevard and Myall Street. The development will also ultimately provide connections to Toonang Drive.

Once the second access is to Myall Street is constructed, it can be seen that traffic from Myall Quays will be distributed between these two access points. The total flows associated with the development of 974 lots, including the current traffic flows using Myall Quays Boulevard are shown below:

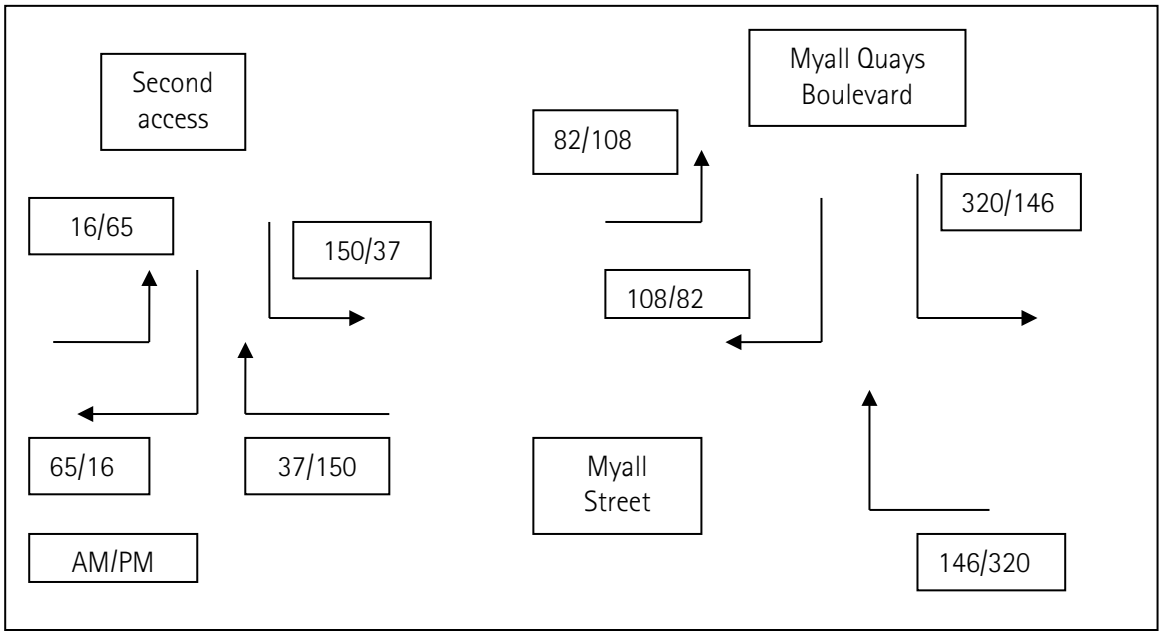


Figure 6-2 Myall Quays Boulevard Current Traffic Flows

The second access has been assessed to review the capacity of this intersection with the additional traffic associated with the full development of 974 residential lots. (This is a conservative approach as there will be some traffic that could make use of the connections to Toonang Drive.) The analysis has allowed for the additional through movements associated with the flows at the existing intersection as well as background traffic growth to the future design year of 2012. The results of the analysis for the second intersection are shown below in Table 6-3.

Table 6-3 Intersection of Myall Street and 2nd Access, Priority Control intersection layout, 2012 traffic flows plus 974 lots (AM/PM)

MOVEMENT	DEGREE OF SATURATION	AVERAGE DELAY (SEC/VEH)	LEVEL OF SERVICE	95th PERCENTILE BACK OF QUEUE (metres)
Right turn in to Second Access	0.034 / 0.148	9.0 / 9.7	A / A	0.9 / 4.4
Right turn out Second Access	0.141 / 0.046	13.3 / 15.9	A / B	3.8 / 1.2
Through towards Pacific Highway	0.109 / 0.077	0.0 / 0.0	A / A	0.0 / 0.0
Through towards Hawks Nest	0.081 / 0.127	0.0 / 0.0	A / A	0.0 / 0.0

NB: Average delay, degree of saturation and level of service for the most delayed movement

The above analysis shows that with the proposed second access point, the full development of 974 lots can be developed at Myall Quays through the combination of the existing priority controlled intersection of Myall Street and Myall Boulevard together with the second priority controlled intersection. The additional connections to the north via Toonang Drive will also be available and will actually result in a better overall level of service in the area.

Table 6-4 Intersection of Myall Street and Myall Quays Boulevard, existing layout, 2012 plus 974 lots (AM/PM)

MOVEMENT	DEGREE OF SATURATION	AVERAGE DELAY (SEC/VEH)	LEVEL OF SERVICE	95th PERCENTILE BACK OF QUEUE (metres)
Right turn in to Myall Quays Blvd	0.134 / 0.308	9.2 / 9.9	A / A	3.8 / 10.4
Right turn out Myall Quays Blvd	0.257 / 0.276	15.0 / 20.0	A / B	7.7 / 8.0
Through towards w-bound	0.084 / 0.052	0.0 / 0.0	A / A	0.0 / 0.0
Through e-bound	0.057 / 0.090	3.7 / 3.3	A / A	0.0 / 0.0

The above analysis confirms that the existing intersection controls at Myall Street and Myall Quays Boulevard will continue to provide adequate capacity for the full development of 974 lots, assuming the second access is provided to the north.

To ensure these intersections continue to have adequate capacity, an assessment has been completed at these two intersections allowing for 10 years background growth along Myall Street (a growth rate of 2.5% has been applied per annum). The results of this analysis are presented below:

Table 6-5 Intersection of Myall Street and 2nd Access, Priority Control intersection layout, 2022 traffic flows plus 974 lots (AM/PM)

MOVEMENT	DEGREE OF SATURATION	AVERAGE DELAY (SEC/VEH)	LEVEL OF SERVICE	95th PERCENTILE BACK OF QUEUE (metres)
Right turn in to Second Access	0.034 / 0.158	9.1 / 10.1	A / A	0.9 / 0.7
Right turn out Second Access	0.164 / 0.055	15.0 / 18.1	B / B	4.4 / 1.3
Through w-bound	0.137 / 0.096	0.0 / 0.0	A / A	0.0 / 0.0
Through e-bound	0.101 / 0.158	0.7 / 1.5	A / A	0.0 / 0.0

NB: Average delay, degree of saturation and level of service for the most delayed movement

Table 6-6 Intersection of Myall Street and Myall Quays Boulevard, existing layout, 2022 plus 974 lots (AM/PM)

MOVEMENT	DEGREE OF SATURATION	AVERAGE DELAY (SEC/VEH)	LEVEL OF SERVICE	95th PERCENTILE BACK OF QUEUE (metres)
Right turn in to Myall Quays Blvd	0.132 / 0.322	9.3 / 10.1	A / A	3.9 / 10.8
Right turn out Myall Quays Blvd	0.288 / 0.312	16.9 / 22.7	B / B	8.9 / 9.1
Through w-bound	0.105 / 0.066	0.0 / 0.0	A / A	0.0 / 10.8
Through e-bound	0.071 / 0.112	0.0 / 0.0	A / A	0.0 / 0.0

The above results confirm that the two intersections have adequate capacity to cater for the 974 lots plus background growth of 25% along Myall Street.

With the development of Myall River Downs on the western side of Myall Street from Myall Quays, the intersection of Myall Quays Boulevard and Myall Street will need to be upgraded to a signal control, to allow for a 4-way intersection. The Myall River Downs development could potentially yield an additional 1,300 residential lots (maximum) when fully development. It is considered that the traffic generation rates for this residential development will be similar to the Myall Quays development, with 0.55 trips per lot during the peak periods. Using this rate, the impact of the traffic associated with this development has been assessed on the 4-way signal controlled intersection of Myall Quays Boulevard and Myall Street.

It has been assumed as a worst case scenario that this development could occur within a 5 year design frame. Therefore, the background traffic flows on Myall Street have been increased by 2.5% per annum for the future design year of 2017. The Myall River Downs development flows have then been added to this base flow. The results of the Sidra analysis are presented in Table 6-7 overleaf:

Table 6-7 Intersection of Myall Street and Myall Quays Boulevard, signal controlled intersection layout, 2017 traffic flows plus 974 lots (Myall Quays) plus 1,300 lots (Myall River Downs) AM/PM

APPROACH	DEGREE OF SATURATION	AVERAGE DELAY (SEC/VEH)	LEVEL OF SERVICE	95th PERCENTILE BACK OF QUEUE (metres)
Myall Downs	0.553 / 0.241	15.7 / 21.0	B / C	46.6 / 15.3
Myall St towards Pacific Highway	0.391 / 0.513	25.7 / 21.3	C / C	24.7 / 49.2
Myall Quays Blvd	0.330 / 0.433	15.2 / 27.8	B / C	37.6 / 53.5
Myall St towards Hawks Nest	0.553 / 0.662	19.3 / 20.9	C / C	16.7 / 64.6

The above analysis for the 4-way signal controlled intersection shows that the proposed signals have adequate capacity to cater for the residential development at Myall Quays (974 lots) plus the Myall River Downs residential development (1,300 lots maximum).

A further analysis test has been completed at the intersection of Myall Street and the second access to Myall Quays. Whilst the Sidra analysis indicates that the signals at the intersection of Myall Quays has adequate capacity, the additional traffic from Myall River Downs will impact upon the operation of the intersection of the second access point to Myall Quays and Myall Street. As the through movements increase on the main road, the delays for the turning traffic increase.

To assess the impact of the Myall River Downs development at this intersection, a series of tests were completed to determine the cut-off point for the satisfactory operation of this intersection. By a series of iterative tests, it was determined that approximately 400 lots could be developed on Myall River Downs without providing unacceptable delays at the intersection of Myall Street and the second access to Myall Quays. Beyond this level of development at Myall River Downs, the turning movements at the intersection of Myall Quays and the second access became unacceptable. At this point the intersection will need to provide a signal control, with an interim three-way signal control provided with provision for the future 4 leg to the industrial area provided in the design. The results for the analysis of this 3-way signal control are provided in Table 6-8 below:

Table 6-8 Intersection of Myall Street and 2nd Access, Signal Control intersection layout, 2017 traffic flows plus 974 lots and 1300 lots Myall River Downs(AM/PM)

MOVEMENT	DEGREE OF SATURATION	AVERAGE DELAY (SEC/VEH)	LEVEL OF SERVICE	95th PERCENTILE BACK OF QUEUE
Myall St towards Pacific Highway	0.500 / 0.500	10.1 / 12.6	B / B	91.8 / 30.5
Second Access	0.486 / 0.122	32.0 / 32.1	C / C	35.7 / 8.4
Myall St towards Hawks Nest	0.206 / 0.467	8.4 / 8.9	A / A	30.3 / 83.0

The above analysis shows that with the provision of a 3-way signal control at the second access point for Myall Quays, the full development at Myall River Downs of 1,300 lots (maximum) can be developed as well as the 974 lots at Myall Quays.

The final consideration of future proposed development involves the construction of an industrial area to the west of Myall Street. The plans for this development indicate that access would be provided opposite the proposed second access to Myall Quays, via a 4-way signal controlled intersection as well as via the

existing industrial access to the north on Myall Street. This new access would involve the introduction of a 4th leg at this intersection.

The impact of the proposed industrial development has been assessed for the future design year of 2017. This has allowed for the full development of the Myall Quays residential development (974 lots), full development at Myall River Downs residential site (1,300 lots) and provision of 15,000 m^2 of general industrial area. The RTA Guide to Traffic Generating Developments has been used to determine the volume of traffic associated with this development, with a rate of 1 trip per 100 m^2 used to assess the impact.

It has been assumed (conservatively) that all of the industrial traffic will access Myall Street via a single access with 4-way signals proposed. The analysis has been completed for the future design of 2017, with 2.5% growth allowed for through traffic flows along Myall Street. The results of the analysis for the 4-way signals are presented in Table 6-9 overleaf:

Table 6-9 Intersection of Myall Street and 2nd Access, 4-way signals, 2017 traffic flows plus 974 lots (Myall Quays) plus 1300 lots (Myall River Downs) plus 15,000 m2 Industrial AM/PM

APPROACH	DEGREE OF SATURATION	AVERAGE DELAY (SEC/VEH)	LEVEL OF SERVICE	95th PERCENTILE BACK OF QUEUE (metres)
Industrial Access	0.054 / 0.205	23.2 / 24.5	C / C	4.4 / 17.7
Myall St towards Pacific Hwy	0.585 / 0.463	21.2 / 19.4	C / B	79.1 / 24.4
Second access	0.299 / 0.080	24.9 / 20.5	C / C	27.1 / 4.9
Myall St towards Hawks Nest	0.393 / 0.651	19.0 / 21.0	B / C	48.8 / 90.6

The above analysis confirms that with the full development of Myall Quays (974 lots), Myall River Downs (1,300 lots maximum) and the Industrial development (15,000 m^2) the 4-way signals at the second access point to Myall Quays will have adequate capacity to cater for the predicted traffic flows.

6.5.4 Toonang Drive Access

The traffic analysis completed here has conservatively assumed that all access from the development will use the proposed new access points on Myall Street. It should be noted that the development also proposes access at two points onto Toonang Drive to the north of the subject site, and so it can be expected that some traffic will use this route. Base traffic flows on Toonang Drive were surveyed in October 2012 and the Sidra analysis for this (refer Table 6-9 above) shows that the intersection is currently working very well with limited delays and congestion.

The volume of traffic use of Toonang Drive will be influenced by the design form of the internal road network of the proposed estate, where it is not intended to encourage this as a major access route for the estate. It is likely that some of the traffic assigned in the previous analysis to use the second Myall Street access would in fact use the Toonang Drive access. If this were as high as 50% (which is considered unlikely) this would be in the order of 75 vehicles per hour at peak times. This would place the traffic flows within the environmental capacity limits of a local road, and with an existing built form observed as a sealed bitumen road with a pavement width of approximately 6 metres and shoulders of about 1.2 meters, it is considered that the road is capable of accommodating this level of traffic. It is likely in fact that because of the internal design proposed for the estate more traffic will use the Myall Street access.

With regard to the intersection of Myall Street and Toonang Drive, it is recognised that while the existing intersection is adequate for the existing flows, as development occurs the intersection will need to be upgraded, mainly to ensure the delays for the westbound through traffic remain acceptable. To allow for the background growth, this intersection will need to be upgraded to provide a widened shoulder with a sheltered right turn lane for traffic movements into Toonang Drive together with a right turn out lane to provide a seagull type intersection control.

It is recommended that this intersection is upgraded when Riverside is fully developed to 974 lots and the access options are connected through to Toonang Drive. The results of the Sidra analysis for this intersection for the future development scenario, with full development of Riverside and Myall Downs together with the industrial development are provided below in Table 6-10.

Table 6-10 Intersection of Toonang Drive and Myall Street, 2017 with full development flows

APPROACH	DEGREE OF SATURATION	AVERAGE DELAY (SEC/VEH)	LEVEL OF SERVICE	95th PERCENTILE BACK OF QUEUE (metres)
Myall St towards Pacific Hwy	0.477 / 0.181	0.3 / 2.1	A / A	0.8 / 2.9
Toonang Drive	0.141 / 0.153	13.4 / 21.3	A / B	3.8 / 3.6
Myall Street towards Hawks Nest	0.237 / 0.433	0.5 / 0.4	A / A	0.0 / 0.0

None of the above intersections have been analysed beyond 2017 with full development, as it is considered that the subject site will be the major driver in any increases to background traffic flows. The surveys completed in 2012 show that there has been limited background growth along Myall Road and this trend is expected to continue. Thus, the 2017 results variously presented above will also be reflective of traffic movements and operations in 2022.

6.6 Road Safety

The intersection of Myall Street and Myall Quays Boulevard is a RTA Type AUR intersection, with shoulder widening to allow for westbound through movements on Myall Street to continue without being impeded by traffic turning right into Myall Quays Boulevard. There are also left turn deceleration and acceleration lanes provided. The intersection is located on a straight section of road and as such offers good visibility on all approaches. The available visibility exceeds the requirements of the RTA Road Design Guide and as such it is considered that the intersection provides a safe and acceptable layout. The layout is clearly laid out and offers a high level of access.

It is considered that this intersection provides a safe and appropriate location and layout for the proposed residential development.

With the future upgrade of this intersection to a signal control (when the industrial land is developed opposite the site) the safety will be increased further, as the hazards associated with the right turn movements will be significantly reduced with a signal control. It is considered that a signal at this location will provide a safe and appropriate level of control at this intersection and will allow for safe movement of pedestrians and cyclists.

It is considered that the proposed second access can also operate in a safe and appropriate manner, initially also as a RTA Type AUR intersection. This second access will have a similar layout to the intersection of Myall Street and Myall Quays Boulevard and will provide good visibility on all approaches that exceed the requirements. This intersection will be designed in accordance with the RTA Road Design Guide, Austroads Guidelines and Council requirements.

The levels of traffic generated by this concept plan proposal are able to be accommodated through the two priority controlled intersections. The timing of the provision of signal control will, therefore, be determined by the rate of development, particularly the proposed industrial land, on the opposite side of Myall Street and the future development of the Riverside site under the concept plan. Once the development allows for the Industrial Development a 4-way signal control is required.

For the intersection of Myall Street and Toonang Drive, this will need to be upgraded to allow for a sheltered right turn lane in and out of the side road to ensure road safety is maintained and reduce delays for the through traffic movements.

6.7 Pedestrian and Cyclist Facilities

Encouraging pedestrian movement through an improved overall environment for walking is a key principle of the Riverside concept plan. The concept allows for promotion of walking as principle local transport through and to the site. Where ever possible pedestrians would be given priority over vehicles within the site, with walking linkages enhanced to provide direct links within the site and to neighbouring attractions to encourage walking. Signage with travel times to local attractions would also be considered. Pedestrian links would be provided through proposed green/ open spaces with linkages back to Myall Street and the local shopping centre

Overall, it is proposed to provide a high standard of pedestrian accessibility / mobility within and to the site with continuity, consistency of materials, signposting, lighting and so on.

Cyclists can use the roads within the development and pedestrians will be provided with footpaths along the side of the roads within the development. There will also be a number of off road combined footway/cycle ways that will provide a high level of convenience and comfort for pedestrians and cyclists.

It is considered that the site has been well designed for pedestrian and cyclist access and permeability. The future design will be discussed with Council to ensure the aims of the Bike Plan prepared by Council can be achieved through this development site.

6.8 Public Transport

It is proposed to promote access to public transport from the site using the local shops as focal point for access to bus services, with a high degree of permeability for local service access to the site. The concept plan has considered the provision of a number of roads within the internal structure that are capable of accommodating bus operations. The proposal focuses on the provision of high quality bus facilities at Myall Street and Myall Quay Boulevard as a recognised transport node for the area.

It is considered that there will be an increase in demand for the school bus runs that currently operate along Myall Street. The additional demand can be accommodated by augmenting the existing bus service in this location. A new bus stop should be considered adjacent to the site on Myall Street to service the development. Provision has already been made in Myall Street here for the inclusion of a bus stop. A future route through the development should also be considered for the school bus run.

6.9 Road Capacity - Myall Street

In order to determine the proportion of existing road space used by forecast traffic flows, the nominal capacity of each road segment needs to be determined. The Volume to Capacity Ratio (V/C Ratio) is an accepted measure for evaluating operating condition of roads and the potential breakdown in traffic flow, which results in delay or reductions in travel speed along a link in urban environment.

As traffic volumes on a road link grow towards the capacity value, travel speeds deteriorate from the free flow speed. When the volume on a link is at capacity (i.e. the V/C ratio reaches 100% or 1.0), the average free flow travel speed is not constant and can reduce significantly under certain conditions.

The peak movement along a traffic lane has been used for the analysis of mid-block performance with each traffic lane assumed to be capable of accommodating 1,400 vehicles per hour before traffic speed is significantly impacted. The V/C Ratio at capacity for the mid-block performance assessment has been assumed 1,400 vehicles per hour as 100% or 1.0. This is consistent with performance measures presented in the RTA's Guide to Traffic Generating Development (SEPP 11).

The above mid-block operating criterion has been applied here to evaluate road link operations in the forecast with development of Riverside scenarios.

The increased development levels will substantially increase the traffic volumes on Myall Street. Current traffic flows are relatively low but with the increased residential (and future industrial development) flows

this will increase. The total traffic flows associated with the residential development at both Myall Quays and Myall River Downs have been used. The two-way traffic flows on Myall Street to the west of Myall Quays Boulevard will be in the order of 1,200 vehicles per hour in the peak hours. The peak directional flow will be in the order of 900 vehicles per hour.

Based on the above criteria for mid-block capacity it can be seen that Myall Street will continue to operate at satisfactory levels as a 2 lane road.

6.10 Internal Road Network

The project plan and concept plan illustrating the proposed general layout of the site are included in Appendix B to this report. The overall layout and access arrangements have been designed to meet the nominated transport objectives and to provide an environment that favours the pedestrian whilst still allowing vehicular access where required. Some movement corridors are exclusively pedestrian only. Others have been designed with sufficient width for cars and where required to allow for service vehicle access. The overall alignment of on-site roads has been developed to provide an environment that encourages low speed vehicle movement, improving overall safety and enhancing the pedestrian friendly environment. This is reinforced through a consistent hierarchy of road forms that reinforces the principles of movement in all forms in appropriate local environments that promote and enhance the overall safety and amenity of the area. Access geometry would meet the requisite standards for vehicle movement, with the basic principles of urban design guidelines such as AMCORD applied to reinforce the desired vehicle environment.

The designated speed of roads within the estate would be that of a normal residential area. That is the normal 50 kph speed limit would apply.

The planning that has been undertaken as part of the development of the concept plan and initial stages for the Riverside development has considered a wide range of factors in terms of the function of the various local roads within the development. This has included a combination of road typologies that have been chosen to suit specific road environments, from quiet local streets where it is intended that the motor car does not dominate, to allowing sufficient space on collector routes for alternate transport (bus) services.

Of particular concern in this regard is the tendency for nearly all local authorities to err on the conservative side and insist on road carriageway widths that are excessive and that encourage vehicle speeds that are too high. This not only impinges on the overall safety of neighbourhoods, it also results in a higher maintenance burden for the councils who inherit the wider roads (more pavement to maintain) and also then have to maintain the various speed control devices also. Narrower carriageway pavements suited to the road function can avoid this in the first place.

It is intended that by applying appropriate widths and road alignments in the first instance it is not then necessary to implement other forms of traffic calming that have become widely accepted as they are retrofitted into older road networks where the basic design has not considered the mix of road safety amenity and environmental issues that are a part of current planning techniques.

The full range of design features will not be evident until detail design is completed, but can include features such as threshold treatments, intersection priority controls (stop and give way signs) as measures of speed control within the estate. It is also possible to offset parking at some locations so that the overall perception of width of carriageway is lessened and hence speeds are influenced positively (reduced) without the need to introduce draconian measures such as speed humps into a new estate.

The road design elements have been chosen to incorporate open swale drains, etc. to integrate the design with the open space and other elements of the overall concept plan.

Extensive discussions have been held with Great Lakes Council Officers regarding the road design standards. All issues have been resolved, and design principles have been adopted that will achieve appropriate Council pavement standards.

7 Summary, Conclusions and Recommendations

7.1 Summary

From the study work, the following summary is provided:

1. The subject site is located on a parcel of land within Tea Gardens. The initial stages of the development will provide some 381 residential dwellings with associated road network and off street parking from a potential 909 residential lots (maximum) and 65 tourist lodges (giving 974 lots in total) in the overall concept plan.
2. All vehicle access to the initial stages will be provided off Myall Street. Access will be provided via the existing intersection of Myall Street and Myall Quays Boulevard and a future new access to the north of this intersection is to be subsequently commissioned.
3. Existing traffic flows have been surveyed at the intersection of Myall Street with Myall Quays Boulevard as well as Myall Street with Toonang Drive and the overall traffic flows are low and well within the existing road capacity.
4. The traffic flows associated with the initial stages of 381 lots have been determined using the RTA Guide to Traffic Generating Developments together with a reduction for internal traffic movements, a high proportion of retired residents (as per the existing situation) and an allowance for home based business. Taking these reductions into account, this guide indicates there could be some 209 vehicles per hour associated with the proposed development during the peak periods. The traffic has been assigned to the road network in a similar manner to the existing surveyed flows at the intersection of Myall Street and Myall Quays Boulevard.
5. The operation of the existing intersection of Myall Street and Myall Quays Boulevard has been assessed using the standard computer program Sidra. The Sidra analysis indicates that the existing intersection control will have adequate capacity to cater for the flows associated with the initial stages of the development on the site, for both the current 2012 and future 2022 design years.
6. The intersection has then been analysed further to assess the impact of further residential development with access via Myall Quays Boulevard. This Sidra analysis indicates that a further 400 residential lots could be developed off Myall Quays Boulevard using the existing intersection control. Beyond 400 lots, this intersection on its own would need to be upgraded to a signal control.
7. The existing intersection when combined with the proposed second access to the north on Myall Street is able to cater for the full 974 lots under the concept plan.
8. The additional access available via Toonang Drive also contributes to a higher overall level of service at the proposed access junctions, and along Myall Street by allowing greater dispersal of traffic flows.
9. The assessment has then taken into account the proposed Myall River Downs residential development. Plans for this development indicate some 1,300 residential lots could be developed on this land. Traffic generation rates are again expected to be lower than normal, due to home based business as well as retired residential reducing peak hour demands. Access to these lots will be provided via the future signal controlled intersection at Myall Street and Myall Quays Boulevard, with a fourth leg providing access to these lots.
10. The Sidra analysis indicates that a single 4-way signal controlled intersection will have adequate capacity to cater for both the Myall Quays and Myall River Downs development. Delays and congestion for all road users would be acceptable. Again, this analysis has been completed for the future design year of 2017.

11. Additional testing of the second Myall Street access with development of Myall River Downs indicates that this junction would require upgrade to signal control as a 3 leg intersection, because of the additional through traffic movements. Analysis indicates this would occur at a development level of approximately 400 lots.
12. With the introduction of the industrial land to the west of Myall Street, access to this activity can be catered for via a 4th leg to the second Myall Street access. This operates satisfactorily under signal control for both the current 2012 and future 2017 design years.
13. If the industrial land were to commence development prior to Myall River Downs, then the need for the 4th leg and signal control at the 2nd Myall Street access is triggered by this activity.
14. The existing layout of the intersections on Myall Street provides a clear and easily understood layout. Sight visibility lines on all approaches are good and it is considered that existing intersection of Myall Street and Myall Quays Boulevard can provide a safe and appropriate layout to cater for the predicted flows associated with the development.
15. The future need to upgrade intersections on Myall Street to signal control will be determined by the rate of development of the proposed Myall River Downs residential development and the industrial land on the opposite side of Myall Street to Myall Quays and not by the Riverside concept plan development based on the known timing of developments.
16. The existing two lane configuration of Myall Street will provide adequate capacity for all road users including this proposed residential development.
17. The internal road layout will be designed in accordance with the Council requirements.
18. Pedestrians and cyclists will be catered for with a combination of off-road and on-road facilities and will tie in with Councils Bike Plan for the locality. The provision of signal controlled intersections on Myall Street will allow for safe movements across Myall Street.
19. The development will require access for children to the existing school bus runs to Raymond Terrace. As part of the development a bus stop and shelter are to be provided adjacent to the entry points on Myall Street.
20. A bus route is proposed to be implemented in consultation with the local bus company through the development.
21. Extensive discussions have been held with Great Lakes Council Officers regarding the road design standards. All issues have been resolved, and design principles have been adopted that will achieve appropriate Council pavement standards.

7.2 Conclusion

From the study, it is concluded that the existing road system beyond the site is able to cater for the traffic demands of the proposed residential development of both Myall Quays and Myall River Downs. The existing intersection control at Myall Quays Boulevard and Myall Street when combined with a 2nd intersection (of similar design) on Myall Street, together with access to Toonang Drive can accommodate the entire Riverside Concept Plan area (974 lots.)

The two southern intersections of Myall Street will only require upgrading at or before the development of either or both of Myall River Downs or the industrial land to the west of Myall Street.

7.3 Recommendations

In consideration of the staging of the Concept Plan it is recommended that the concept plan reflect the following commitments:

1. The second access to Myall Street (as a priority controlled junction) be provided prior to the development of 500 lots within the concept plan.
2. Access to be provided to Toonang Drive in line with the Concept plan staging, at say 700 lots. (i.e. before the 974 yield.)
3. The Riverside Concept plan in isolation be allowed to be developed in total (974 lots maximum) based on the capacity of the proposed 4 intersections
4. The two southern intersections of Myall Street only to be upgraded at / before the requirement arises for these to act as 4-way intersections. (i.e. access is triggered by either or both of Myall River Downs or the industrial land to the west of Myall Street.).

Appendix A Traffic Survey Results

Turn Count Summary

Location: Tea Gardens Rd (Myall St) at Toonang Dr, Tea Gardens
GPS Coordinates: N = -32.643638, W= 152.146367
Date: 2012-10-09
Day of week: Tuesday
Weather:
Analyst: EBM

Total vehicle traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:29	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30	0	28	0	2	0	1	0	29	2	0	0	0	62
07:45	0	38	0	2	0	6	0	35	3	0	0	0	84
08:00	0	32	0	1	0	0	0	39	0	0	0	0	72
08:15	0	32	0	4	0	1	0	51	1	0	0	0	89
08:30	1	31	0	2	0	1	0	30	1	0	0	0	66
08:45	0	30	0	9	0	0	0	36	3	0	0	0	78
09:00	0	21	0	4	0	2	0	39	3	0	0	0	69
09:15	0	28	0	3	0	3	0	46	2	0	0	0	82
09:30	0	5	0	0	0	0	0	0	0	0	0	0	5

Car traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:29	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30	0	26	0	2	0	1	0	28	2	0	0	0	59
07:45	0	36	0	2	0	6	0	35	3	0	0	0	82
08:00	0	29	0	1	0	0	0	39	0	0	0	0	69
08:15	0	28	0	4	0	1	0	48	1	0	0	0	82
08:30	1	31	0	2	0	1	0	27	1	0	0	0	63
08:45	0	29	0	9	0	0	0	36	3	0	0	0	77
09:00	0	21	0	4	0	2	0	38	3	0	0	0	68
09:15	0	28	0	3	0	3	0	43	2	0	0	0	79
09:30	0	5	0	0	0	0	0	0	0	0	0	0	5

Truck traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:29	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30	0	2	0	0	0	0	0	1	0	0	0	0	3
07:45	0	2	0	0	0	0	0	0	0	0	0	0	2
08:00	0	3	0	0	0	0	0	0	0	0	0	0	3
08:15	0	4	0	0	0	0	0	3	0	0	0	0	7
08:30	0	0	0	0	0	0	0	3	0	0	0	0	3
08:45	0	1	0	0	0	0	0	0	0	0	0	0	1
09:00	0	0	0	0	0	0	0	1	0	0	0	0	1
09:15	0	0	0	0	0	0	0	3	0	0	0	0	3
09:30	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

07:45 - 08:45

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	1	133	0	9	0	8	0	155	5	0	0	0	311
Factor	0.25	0.88	0.00	0.56	0.00	0.33	0.00	0.76	0.42	0.00	0.00	0.00	0.87
Approach factor	0.88			0.53			0.77			0.00			

Peak Hour Vehicle Summary

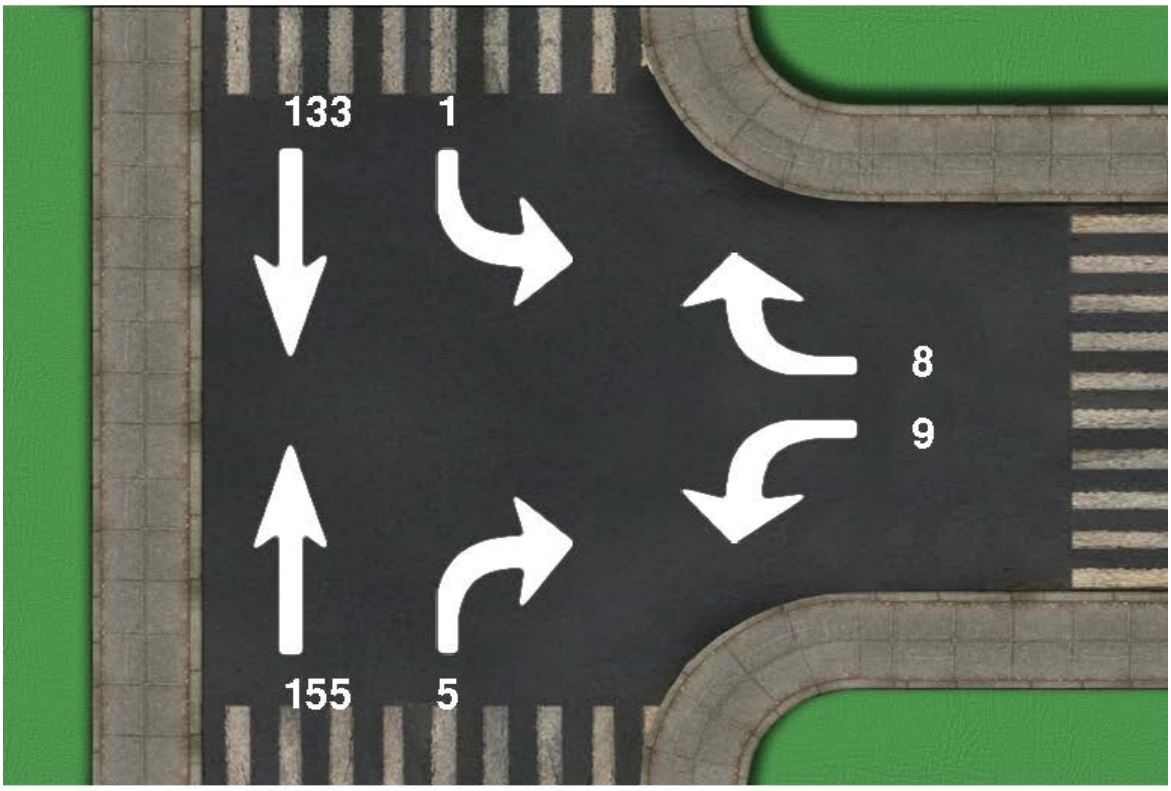
Vehicle	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Car	1	124	0	9	0	8	0	149	5	0	0	0	296
Truck	0	9	0	0	0	0	0	6	0	0	0	0	15

Peak Hour Pedestrians

	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

Location: Tea Gardens Rd (Myall St) at Toonang Dr, Tea Gardens
GPS Coordinates: N = -32.643638, W= 152.146367
Date: 2012-10-09
Day of week: Tuesday
Weather:
Analyst: EBM



Intersection Peak Hour

07:45 - 08:45

	South Bound			Westbound			North bound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	1	133	0	9	0	8	0	155	5	0	0	0	311
Factor	0.25	0.88	0.00	0.56	0.00	0.33	0.00	0.76	0.42	0.00	0.00	0.00	0.87
Approach factor	0.88			0.53			0.77			0.00			

Turn Count Summary

Location: Tea Garden Road(Myall Street) at Myall Quey Blvd, Tea Gardens
GPS Coordinates: N = -32.651857, W= 152.149112
Date: 2012-10-09
Day of week: Tuesday
Weather: Fine
Analyst: KB

Total vehicle traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:30	5	24	0	9	0	3	0	35	8	0	0	0	84
07:45	11	27	0	8	0	15	0	38	24	0	0	0	123
08:00	15	32	0	14	0	10	0	46	19	0	0	0	136
08:15	7	28	0	17	0	18	0	40	24	0	0	0	134
08:30	12	23	0	23	0	3	0	40	25	0	0	0	126
08:45	9	38	0	21	0	12	0	32	31	0	0	0	143
09:00	7	20	0	21	0	11	0	40	29	0	0	0	128
09:15	15	21	0	26	0	16	0	42	31	0	0	0	151
09:30	0	2	0	3	0	0	0	0	2	0	0	0	7

Car traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:30	5	23	0	9	0	3	0	35	8	0	0	0	83
07:45	11	26	0	8	0	15	0	38	24	0	0	0	122
08:00	15	28	0	14	0	10	0	45	19	0	0	0	131
08:15	7	25	0	17	0	18	0	38	24	0	0	0	129
08:30	12	22	0	23	0	3	0	37	25	0	0	0	122
08:45	9	35	0	21	0	12	0	32	31	0	0	0	140
09:00	7	20	0	21	0	11	0	38	29	0	0	0	126
09:15	15	20	0	26	0	16	0	39	31	0	0	0	147
09:30	0	2	0	3	0	0	0	0	2	0	0	0	7

Truck traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:30	0	1	0	0	0	0	0	0	0	0	0	0	1
07:45	0	1	0	0	0	0	0	0	0	0	0	0	1
08:00	0	4	0	0	0	0	0	1	0	0	0	0	5
08:15	0	3	0	0	0	0	0	2	0	0	0	0	5
08:30	0	1	0	0	0	0	0	3	0	0	0	0	4
08:45	0	3	0	0	0	0	0	0	0	0	0	0	3
09:00	0	0	0	0	0	0	0	2	0	0	0	0	2
09:15	0	1	0	0	0	0	0	3	0	0	0	0	4
09:30	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

08:30 - 09:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	43	102	0	91	0	42	0	154	116	0	0	0	548
Factor	0.72	0.67	0.00	0.88	0.00	0.66	0.00	0.92	0.94	0.00	0.00	0.00	0.91
Approach factor	0.77			0.79			0.92			0.00			

Peak Hour Vehicle Summary

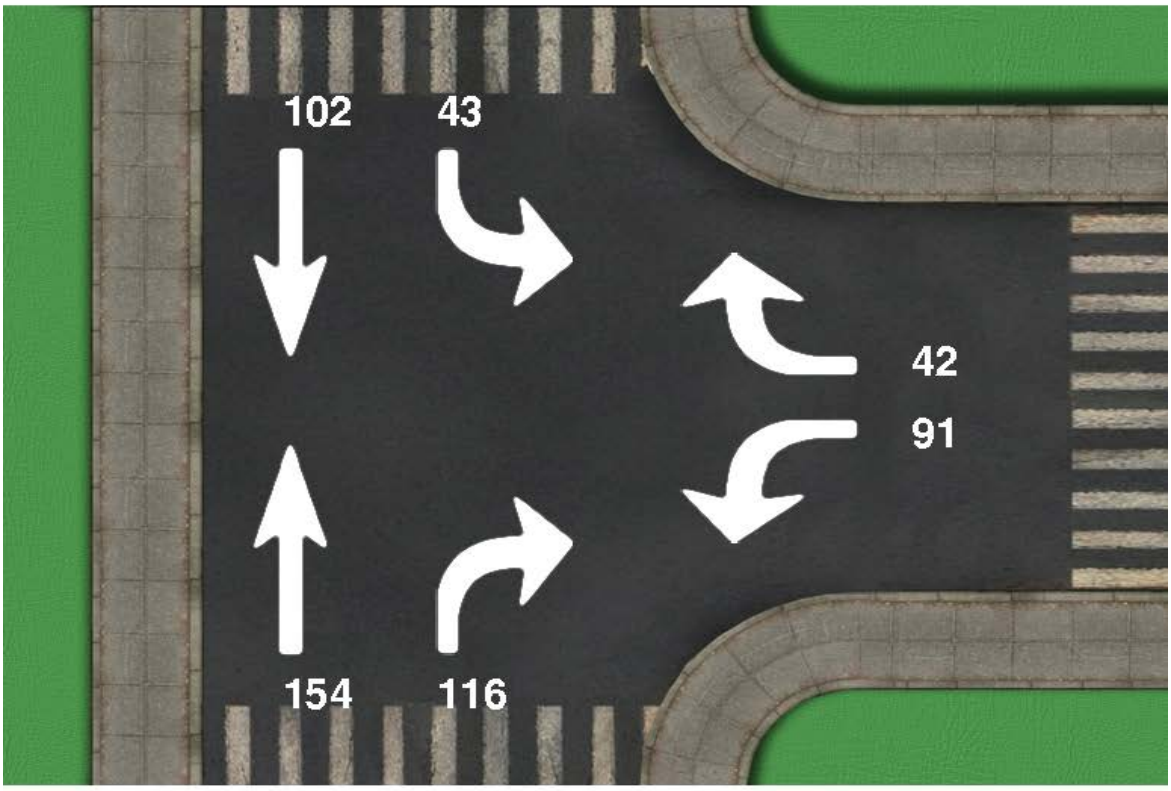
Vehicle	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Car	43	97	0	91	0	42	0	146	116	0	0	0	535
Truck	0	5	0	0	0	0	0	8	0	0	0	0	13

Peak Hour Pedestrians

	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

Location: Tea Garden Road(Myall Street) at Myall Quey Blvd, Tea Gardens
GPS Coordinates: N = -32.651857, W= 152.149112
Date: 2012-10-09
Day of week: Tuesday
Weather: Fine
Analyst: KB



Intersection Peak Hour

08:30 - 09:30

	South Bound			Westbound			North bound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	43	102	0	91	0	42	0	154	116	0	0	0	548
Factor	0.72	0.67	0.00	0.88	0.00	0.66	0.00	0.92	0.94	0.00	0.00	0.00	0.91
Approach factor	0.77			0.79			0.92			0.00			

Turn Count Summary

Location: Tea Gardens Rd (Myall St) at Toonang Dr, Tea Gardens
GPS Coordinates: N = -32.643576, W= 152.146441
Date: 2012-10-09
Day of week: Tuesday
Weather:
Analyst: EBM

Total vehicle traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
15:57	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00	0	43	0	1	0	0	0	41	4	0	0	0	89
16:15	2	45	0	3	0	0	0	32	3	0	0	0	85
16:30	0	41	0	2	0	0	0	27	3	0	0	0	73
16:45	1	48	0	4	0	1	0	19	4	0	0	0	77
17:00	1	28	0	4	0	2	0	23	1	0	0	0	59
17:15	1	37	0	0	0	0	0	22	3	0	0	0	63
17:30	0	32	0	0	0	4	0	18	1	0	0	0	55
17:45	1	37	0	2	0	0	0	19	6	0	0	0	65
18:00	0	21	0	2	0	2	0	14	1	0	0	0	40
18:15	3	25	0	3	0	0	0	13	1	0	0	0	45
18:30	0	3	0	0	0	0	0	0	0	0	0	0	3

Car traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
15:57	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00	0	42	0	1	0	0	0	41	4	0	0	0	88
16:15	2	45	0	3	0	0	0	31	3	0	0	0	84
16:30	0	41	0	2	0	0	0	27	3	0	0	0	73
16:45	1	48	0	4	0	1	0	19	4	0	0	0	77
17:00	1	28	0	4	0	2	0	22	1	0	0	0	58
17:15	1	37	0	0	0	0	0	22	3	0	0	0	63
17:30	0	31	0	0	0	4	0	18	1	0	0	0	54
17:45	1	35	0	2	0	0	0	19	6	0	0	0	63
18:00	0	21	0	2	0	2	0	14	1	0	0	0	40
18:15	3	25	0	3	0	0	0	12	1	0	0	0	44
18:30	0	3	0	0	0	0	0	0	0	0	0	0	3

Truck traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
15:57	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00	0	1	0	0	0	0	0	0	0	0	0	0	1
16:15	0	0	0	0	0	0	0	1	0	0	0	0	1
16:30	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00	0	0	0	0	0	0	0	1	0	0	0	0	1
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	0	1	0	0	0	0	0	0	0	0	0	0	1
17:45	0	2	0	0	0	0	0	0	0	0	0	0	2
18:00	0	0	0	0	0	0	0	0	0	0	0	0	0
18:15	0	0	0	0	0	0	0	1	0	0	0	0	1
18:30	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

16:00 - 17:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	3	177	0	10	0	1	0	119	14	0	0	0	324
Factor	0.38	0.92	0.00	0.62	0.00	0.25	0.00	0.73	0.88	0.00	0.00	0.00	0.91
Approach factor	0.92			0.55			0.74			0.00			

Peak Hour Vehicle Summary

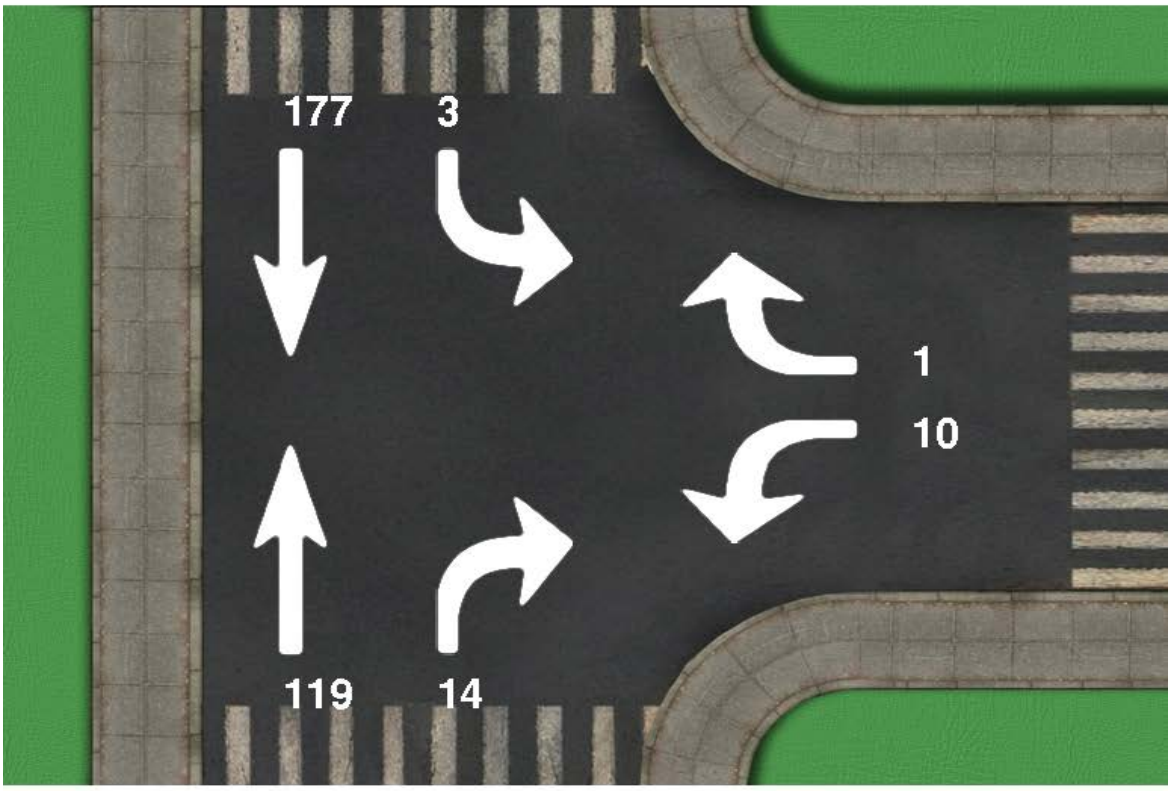
Vehicle	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Car	3	176	0	10	0	1	0	118	14	0	0	0	322
Truck	0	1	0	0	0	0	0	1	0	0	0	0	2

Peak Hour Pedestrians

	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

Location: Tea Gardens Rd (Myall St) at Toonang Dr, Tea Gardens
GPS Coordinates: N = -32.643576, W= 152.146441
Date: 2012-10-09
Day of week: Tuesday
Weather:
Analyst: EBM



Intersection Peak Hour

16:00 - 17:00

	South Bound			Westbound			North bound			East bound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	3	177	0	10	0	1	0	119	14	0	0	0	324
Factor	0.38	0.92	0.00	0.62	0.00	0.25	0.00	0.73	0.88	0.00	0.00	0.00	0.91
Approach factor	0.92			0.55			0.74			0.00			

Turn Count Summary

Location: Tea Gardens Road at Myall Quey Blvd, Tea Gardens
GPS Coordinates: N = -32.651642, W= 152.149522
Date: 2012-10-09
Day of week: Tuesday
Weather: Fine
Analyst: KB

Total vehicle traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	14	44	0	42	0	11	0	25	36	0	0	0	172
16:15	17	35	0	54	0	13	0	31	20	0	0	0	170
16:30	17	37	0	38	0	8	0	23	29	0	0	0	152
16:45	18	45	0	36	0	12	0	15	24	0	0	0	150
17:00	16	20	0	35	0	9	0	19	35	0	0	0	134
17:15	13	22	0	36	0	10	0	20	23	0	0	0	124
17:30	6	32	0	28	0	9	0	16	26	0	0	0	117
17:45	13	30	0	26	0	9	0	17	26	0	0	0	121
18:00	6	23	0	22	0	9	0	6	25	0	0	0	91
18:15	8	25	0	25	0	8	0	9	12	0	0	0	87
18:30	0	1	0	1	0	0	0	0	0	0	0	0	2

Car traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	14	43	0	42	0	11	0	25	36	0	0	0	171
16:15	16	35	0	54	0	13	0	30	20	0	0	0	168
16:30	17	37	0	38	0	8	0	22	29	0	0	0	151
16:45	18	45	0	36	0	12	0	15	24	0	0	0	150
17:00	16	20	0	35	0	9	0	19	35	0	0	0	134
17:15	13	22	0	36	0	10	0	20	23	0	0	0	124
17:30	5	32	0	28	0	9	0	16	26	0	0	0	116
17:45	12	29	0	26	0	9	0	17	26	0	0	0	119
18:00	6	23	0	22	0	9	0	6	25	0	0	0	91
18:15	8	25	0	25	0	6	0	9	12	0	0	0	85
18:30	0	1	0	1	0	0	0	0	0	0	0	0	2

Truck traffic

Interval starts	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
16:00	0	1	0	0	0	0	0	0	0	0	0	0	1
16:15	1	0	0	0	0	0	0	1	0	0	0	0	2
16:30	0	0	0	0	0	0	0	1	0	0	0	0	1
16:45	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	1	0	0	0	0	0	0	0	0	0	0	0	1
17:45	1	1	0	0	0	0	0	0	0	0	0	0	2
18:00	0	0	0	0	0	0	0	0	0	0	0	0	0
18:15	0	0	0	0	0	2	0	0	0	0	0	0	2
18:30	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

16:00 - 17:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	66	161	0	170	0	44	0	94	109	0	0	0	644
Factor	0.92	0.89	0.00	0.79	0.00	0.85	0.00	0.76	0.76	0.00	0.00	0.00	0.94
Approach factor	0.90			0.80			0.83			0.00			

Peak Hour Vehicle Summary

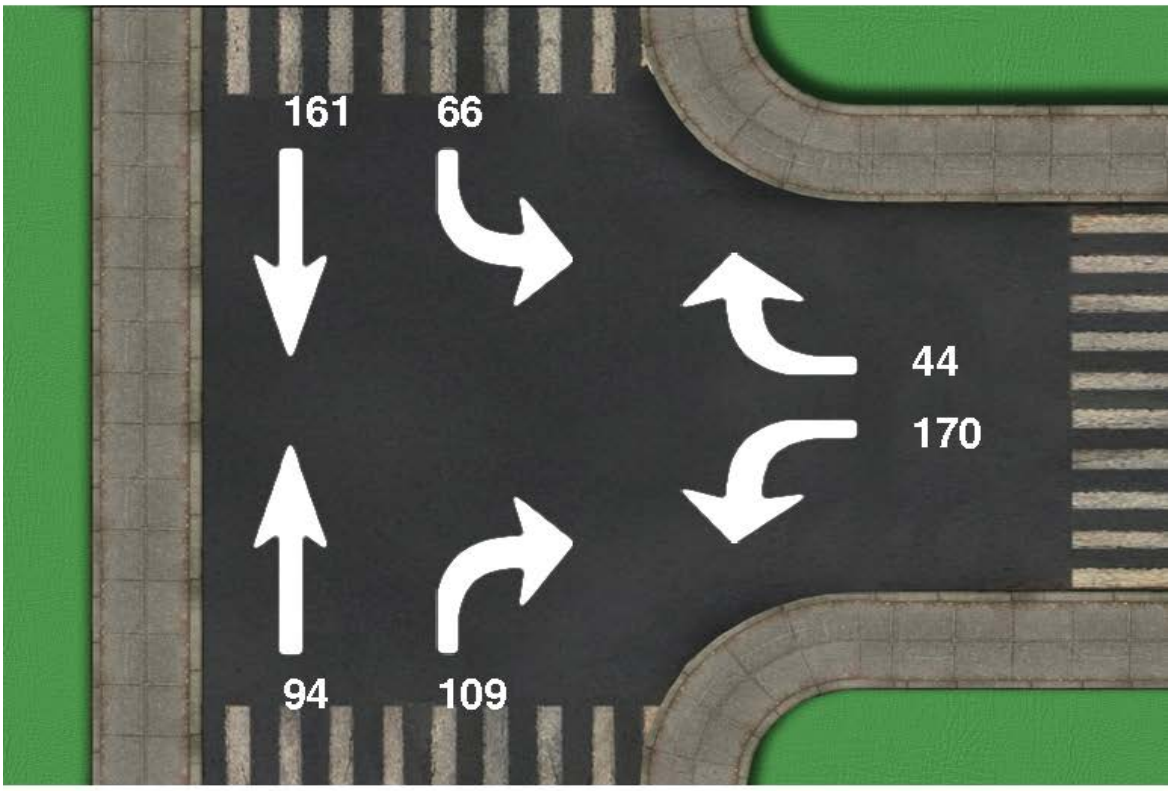
Vehicle	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Car	65	160	0	170	0	44	0	92	109	0	0	0	640
Truck	1	1	0	0	0	0	0	2	0	0	0	0	4

Peak Hour Pedestrians

	NE			NW			SW			SE			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

Location: Tea Gardens Road at Myall Quey Blvd, Tea Gardens
GPS Coordinates: N = -32.651642, W= 152.149522
Date: 2012-10-09
Day of week: Tuesday
Weather: Fine
Analyst: KB



Intersection Peak Hour

16:00 - 17:00

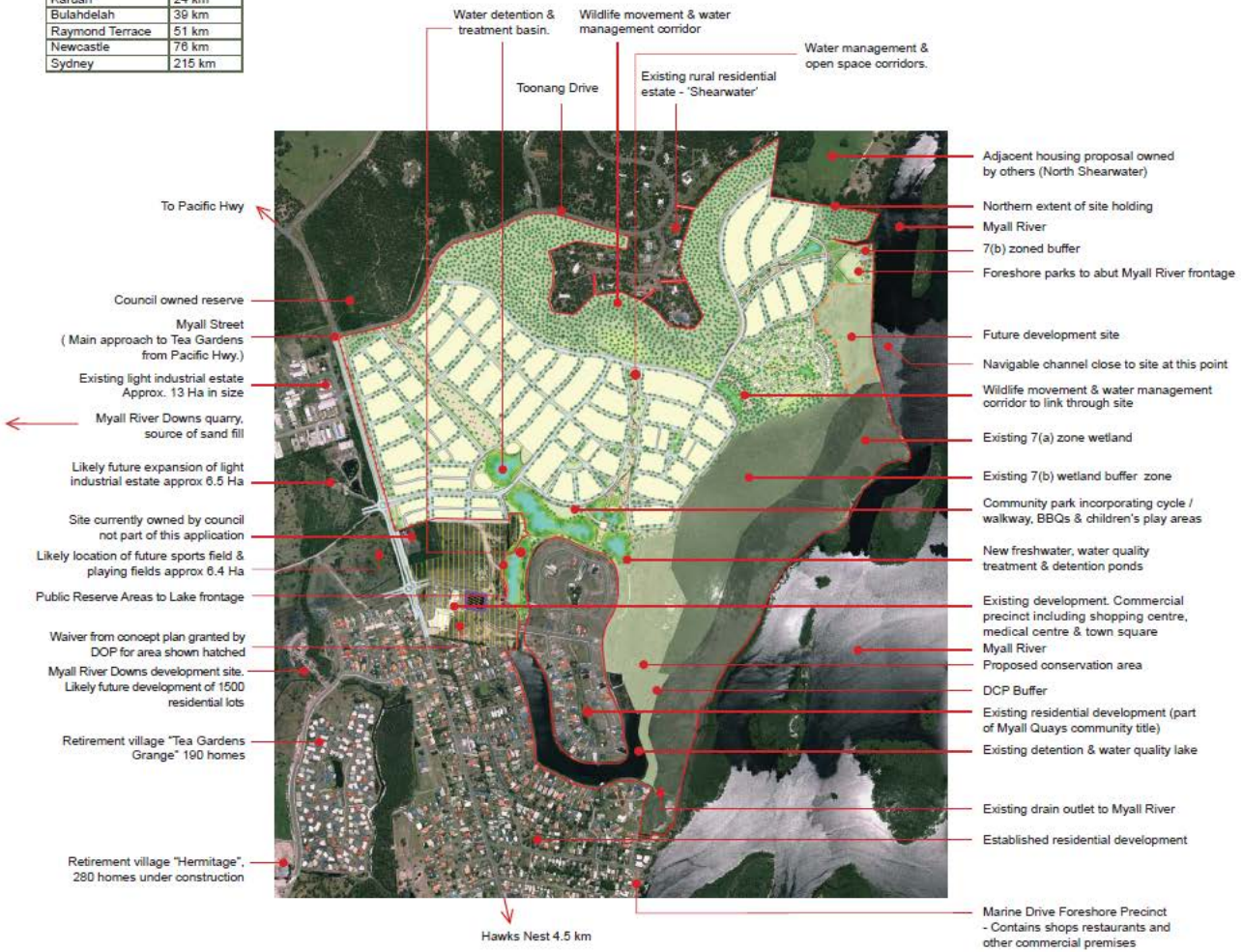
	South Bound			Westbound			North bound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	66	161	0	170	0	44	0	94	109	0	0	0	644
Factor	0.92	0.89	0.00	0.79	0.00	0.85	0.00	0.76	0.76	0.00	0.00	0.00	0.94
Approach factor	0.90			0.80			0.83			0.00			

Appendix B Site Concept Plans

Item	Description
1	Extent of concept plan area 'Riverside' at Tea Gardens.
2	Existing 7(a) wetland zone.
3	Existing 7(b) buffer zone.
4	Wildlife movement corridor.
5	Water management & open space corridors.
6	Community parks incorporating walking/cycle ways, BBQs, children's play area equipment.
7	Community pocket parks.
8	Myall foreshore park including structured and unstructured open space.
9	New fresh water, water quality management & detention ponds.
10	Existing detention and water quality lake.
11	New fresh water, water quality management & detention ponds.
12	Existing residential development.
13	Precinct community facilities.
14	Future precinct community facilities.
15	Site area currently owned by Great Lakes Council.
16	Separate medium density/commercial precint (not part of this application-current waver is-sued by DoP.)
17	Tourist lodgings precinct.
18	Additional land proposed for conservation
19	Proposed residential lot development to be developed under community title.
20	Future development site.
21	Existing house.
22	DCP buffer.
23	Location of known midden & buffer.
24	Existing drain outlet to Myall River.
25	Existing drainage swale
26	Existing shopping centre/medium density approvals
27	Future connecting road

Land Use Legend		
Total Site	**Ha**	**%**
Open Space		
- Wetlands (zoned 7a)	28.4	12.8
- Buffer Zones (zoned 7b)	20.6	9.2
- Additional Conservation Buffer	12.3	5.5
- Wildlife Corridors	32.8	14.8
- Myall Foreshore Park	5.6	2.5
- Drainage Corridors, Ponds & Large Parks	23.1	10.4
- Pocket Parks	2.6	1.2
- Existing detention & water quality lake	6.7	3.0
Total	**132.1 Ha**	**59.4%**
Built Upon Area		
- Residential (including roads & community facilities)	77.2	34.7
- Tourist/Residential (Lodgings)	8.2	3.7
- Future Development Site	5.0	2.2
Total	**90.4 Ha**	**40.6%**
Total	**222.5 Ha**	**100%**

Distance to:	
Pacific Hwy	12 km
Karuah	24 km
Bulahdelah	39 km
Raymond Terrace	51 km
Newcastle	76 km
Sydney	215 km



Riverside
Tea Gardens Australia

DRAWING TITLE
CONTEXT PLAN

0m 500m

APPLICATION			
Part 3a Submission to N.S.W. D.O.P.			
DATE	SCALE	DRAWING No.	REVISION
October 2010	1:7000 @ A1	R.C. -01	L

CRIGHTON PROPERTIES

BETTER TRANSPORT FUTURES

ROAD TYPES	DETAILS
Arterial #1	Road 18m, 5m median, green space & development
Arterial #2	Road 14m, 5m median, green space & development
Connector	Road 17m, 5m median, development both sides
Secondary Arterial #1	Road 13m, 1.5m centre bay, development both sides
Secondary Arterial #2	Road 13m, 1.5m centre bay, green space & development
Secondary Arterial #3	Road 13m, 1.5m centre bay, green space & development
Linkroad #1	Road 11m, development both sides
Link Road #2	Road 11m, green space & development
Street #1	Road 7.5m, development both sides
Street #2	Road 7.5m, green space & development
One Way	Road 5m, development both sides
Access Way	Lane 7.5m reserve, 3.5m road
Lane Way	Lane 8m reserve, 5.5m road
Bush Fire Trail	4m wide access (no permanent vehicular access)
Existing Roads	Existing NA
Intersection 1	Intersection to be upgraded to roundabout as required by development of Myall River Downs
Intersection 2	Roundabout to be provided at intersection as required by development of Myall River Downs

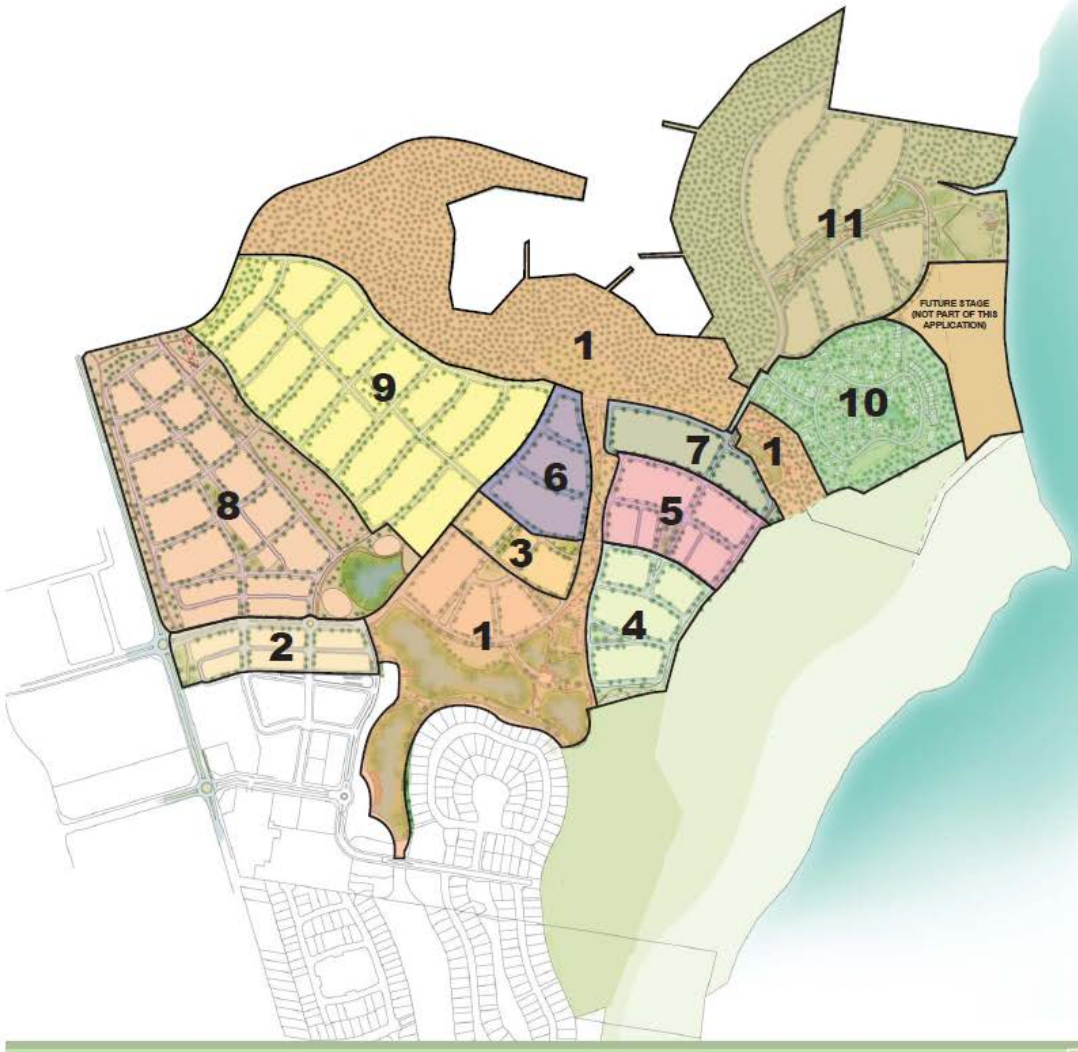
Riverside
Tea Gardens Australia

DRAWING TITLE
STREET HIERARCHY PLAN

0m 500m

APPLICATION			
Part 3a Submission to N.S.W. D.O.P.			
DATE	SCALE	DRAWING No.	REVISION
October 2010	1:4000 @ A1	R.C. -05	L

CRIGHTON PROPERTIES



STAGING DETAILS (INDICATIVE)

Stage	No. of Dwellings	Details other Inclusions	Approx. Registration Date (Year)
1	46	Stage 1 to include establishment & partial embellishment of primary water management corridors.	2011
2	37	Includes second connection to Myall Street.	2012
3	28		2012
4	53		2012
5	58		2013
6	48		2013
7	40		2014
8	184 (Approx)		2014
9	255 (Approx)	Includes completion of embellishment of community park, wildlife movement corridor. Includes provision of second community facility. Second access to Riverside.	2015
10	65 (Approx)	Includes new access to Toonang Drive & 4th community facility.	2016
11	160 (Approx)	Includes final access to Toonang Drive & finalisation of water management structures.	2018
Total	974		

Note: Plan illustrates staging of land release areas only. For detailed construction sequencing refer to engineering drawings for further detail.

Riverside
Tea Gardens Australia

DRAWING TITLE
STAGING PLAN

0m 500m

APPLICATION: Part 3a Submission to N.S.W. D.O.P.

DATE	SCALE	DRAWING No.	REVISION
October 2010	1:4000 @ A1	R.C. -08	L

CRIGHTON PROPERTIES

Appendix C 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.

Appendix D Sidra Intersection Modelling Results

Appendix E INTERSECTION SUMMARY

Site: AM 2012 base flows

Myall St and Myall Quays Boulevarde
2012 AM flows base
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	Vehicles		Persons	
Demand Flows (Total)	573	veh/h	859	pers/h
Percent Heavy Vehicles	2.9	%		
Degree of Saturation	0.106			
Practical Spare Capacity	655.4	%		
Effective Intersection Capacity	5407	veh/h		
Control Delay (Total)	0.79	veh-h/h	1.18	pers-h/h
Control Delay (Average)	5.0	sec	5.0	sec
Control Delay (Worst Lane)	13.2	sec		
Control Delay (Worst Movement)	13.2	sec	13.2	sec
Geometric Delay (Average)	4.3	sec		
Stop-Line Delay (Average)	0.6	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	0.4	veh		
95% Back of Queue - Distance (Worst Lane)	2.9	m		
Total Effective Stops	199	veh/h	299	pers/h
Effective Stop Rate	0.35	per veh	0.35	per pers
Proportion Queued	0.14		0.14	
Performance Index	8.1		8.1	
Travel Distance (Total)	347.4	veh-km/h	521.0	pers-km/h
Travel Distance (Average)	607	m	607	m
Travel Time (Total)	6.6	veh-h/h	9.9	pers-h/h
Travel Time (Average)	41.5	sec	41.5	sec
Travel Speed	52.6	km/h	52.6	km/h
Cost (Total)	228.34	$/h	228.34	$/h
Fuel Consumption (Total)	34.0	L/h		
Carbon Dioxide (Total)	85.2	kg/h		
Hydrocarbons (Total)	0.131	kg/h		
Carbon Monoxide (Total)	5.20	kg/h		
NOx (Total)	0.181	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: AM 2012 base flows

Myall St and Myall Quays Boulevarde
2012 AM flows base
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	158	5.0	0.084	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	122	1.0	0.106	8.9	LOS A	0.4	2.9	0.27	0.64	47.7
Approach		280	3.3	0.106	3.9	NA	0.4	2.9	0.12	0.28	53.9
North: Myall Quays Boulevarde											
7	L	96	1.0	0.091	8.2	LOS A	0.3	2.4	0.24	0.58	48.5
9	R	44	1.0	0.092	13.2	LOS A	0.3	2.4	0.53	0.79	44.0
Approach		140	1.0	0.092	9.8	LOS A	0.3	2.4	0.33	0.65	47.0
West: Myall St towards Hawks Nest											
10	L	45	1.0	0.025	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
11	T	107	5.0	0.057	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		153	3.8	0.057	2.4	NA	0.0	0.0	0.00	0.20	56.2
All Vehicles		573	2.9	0.106	5.0	NA	0.4	2.9	0.14	0.35	52.6

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

Project: M:\MW Pty Ltd\Active Projects\P0355 Crighton Riverside\Sidra Nov 2012.sip
8000290, MARK WAUGH PTY LTD, SINGLE

INTERSECTION SUMMARY

Site: PM 2012 base flows

Myall St and Myall Quays Boulevarde
2007 PM flows base
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	678	veh/h	1017	pers/h
Percent Heavy Vehicles	2.6	%		
Degree of Saturation	0.184			
Practical Spare Capacity	334.7	%		
Effective Intersection Capacity	3684	veh/h		
Control Delay (Total)	1.06	veh-h/h	1.59	pers-h/h
Control Delay (Average)	5.6	sec	5.6	sec
Control Delay (Worst Lane)	13.3	sec		
Control Delay (Worst Movement)	13.3	sec	13.3	sec
Geometric Delay (Average)	4.8	sec		
Stop-Line Delay (Average)	0.8	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	0.7	veh		
95% Back of Queue - Distance (Worst Lane)	5.2	m		
Total Effective Stops	272	veh/h	408	pers/h
Effective Stop Rate	0.40	per veh	0.40	per pers
Proportion Queued	0.18		0.18	
Performance Index	10.0		10.0	
Travel Distance (Total)	411.9	veh-km/h	617.8	pers-km/h
Travel Distance (Average)	608	m	608	m
Travel Time (Total)	8.0	veh-h/h	11.9	pers-h/h
Travel Time (Average)	42.3	sec	42.3	sec
Travel Speed	51.7	km/h	51.7	km/h
Cost (Total)	275.58	$/h	275.58	$/h
Fuel Consumption (Total)	41.3	L/h		
Carbon Dioxide (Total)	103.2	kg/h		
Hydrocarbons (Total)	0.161	kg/h		
Carbon Monoxide (Total)	6.63	kg/h		
NOx (Total)	0.224	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: PM 2012 base flows

Myall St and Myall Quays Boulevarde
2007 PM flows base
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	99	5.0	0.052	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	115	1.0	0.100	9.3	LOS A	0.4	2.9	0.34	0.66	47.4
Approach		214	2.9	0.100	5.0	NA	0.4	2.9	0.18	0.36	52.5
North: Myall Quays Boulevarde											
7	L	179	1.0	0.184	8.8	LOS A	0.7	5.2	0.34	0.63	48.0
9	R	46	1.0	0.097	13.3	LOS A	0.4	2.6	0.54	0.80	43.9
Approach		225	1.0	0.184	9.7	LOS A	0.7	5.2	0.38	0.66	47.1
West: Myall St towards Hawks Nest											
10	L	69	1.0	0.038	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
11	T	169	5.0	0.090	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		239	3.8	0.090	2.4	NA	0.0	0.0	0.00	0.19	56.3
All Vehicles		678	2.6	0.184	5.6	NA	0.7	5.2	0.18	0.40	51.7

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

Project: M:\MW Pty Ltd\Active Projects\P0355 Crighton Riverside\Sidra Nov 2012.sip
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INTERSECTION SUMMARY

Site: AM 2012 base+dev flows

Myall St and Myall Quays Boulevarde
2012 AM flows base+390 lots
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	774	veh/h	1161	pers/h
Percent Heavy Vehicles	2.8	%		
Degree of Saturation	0.282			
Practical Spare Capacity	183.4	%		
Effective Intersection Capacity	2741	veh/h		
Control Delay (Total)	1.29	veh-h/h	1.94	pers-h/h
Control Delay (Average)	6.0	sec	6.0	sec
Control Delay (Worst Lane)	16.2	sec		
Control Delay (Worst Movement)	16.2	sec	16.2	sec
Geometric Delay (Average)	4.5	sec		
Stop-Line Delay (Average)	1.5	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	1.2	veh		
95% Back of Queue - Distance (Worst Lane)	8.7	m		
Total Effective Stops	307	veh/h	461	pers/h
Effective Stop Rate	0.40	per veh	0.40	per pers
Proportion Queued	0.20		0.20	
Performance Index	11.7		11.7	
Travel Distance (Total)	469.2	veh-km/h	703.8	pers-km/h
Travel Distance (Average)	606	m	606	m
Travel Time (Total)	9.1	veh-h/h	13.7	pers-h/h
Travel Time (Average)	42.5	sec	42.5	sec
Travel Speed	51.3	km/h	51.3	km/h
Cost (Total)	315.24	$/h	315.24	$/h
Fuel Consumption (Total)	46.7	L/h		
Carbon Dioxide (Total)	116.8	kg/h		
Hydrocarbons (Total)	0.181	kg/h		
Carbon Monoxide (Total)	7.26	kg/h		
NOx (Total)	0.249	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: AM 2012 base+dev flows

Myall St and Myall Quays Boulevarde
2012 AM flows base+390 lots
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	179	5.0	0.095	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	131	1.0	0.112	9.3	LOS A	0.5	3.3	0.33	0.66	47.4
Approach		309	3.3	0.112	3.9	NA	0.5	3.3	0.14	0.28	54.0
North: Myall Quays Boulevarde											
7	L	127	1.0	0.129	8.6	LOS A	0.5	3.5	0.31	0.61	48.1
9	R	117	1.0	0.282	16.2	LOS B	1.2	8.7	0.63	0.91	41.5
Approach		244	1.0	0.282	12.2	LOS A	1.2	8.7	0.46	0.75	44.7
West: Myall St towards Hawks Nest											
10	L	55	1.0	0.030	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
11	T	165	5.0	0.088	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		220	4.0	0.088	2.0	NA	0.0	0.0	0.00	0.17	56.8
All Vehicles		774	2.8	0.282	6.0	NA	1.2	8.7	0.20	0.40	51.3

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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INTERSECTION SUMMARY

Site: PM 2012 base+dev flows

Myall St and Myall Quays Boulevarde
2012 PM flows +390 lots
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	876	veh/h	1314	pers/h
Percent Heavy Vehicles	2.6	%		
Degree of Saturation	0.205			
Practical Spare Capacity	289.4	%		
Effective Intersection Capacity	4263	veh/h		
Control Delay (Total)	1.45	veh-h/h	2.18	pers-h/h
Control Delay (Average)	6.0	sec	6.0	sec
Control Delay (Worst Lane)	16.1	sec		
Control Delay (Worst Movement)	16.1	sec	16.1	sec
Geometric Delay (Average)	4.9	sec		
Stop-Line Delay (Average)	1.1	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	0.8	veh		
95% Back of Queue - Distance (Worst Lane)	5.8	m		
Total Effective Stops	371	veh/h	556	pers/h
Effective Stop Rate	0.42	per veh	0.42	per pers
Proportion Queued	0.19		0.19	
Performance Index	13.2		13.2	
Travel Distance (Total)	531.7	veh-km/h	797.5	pers-km/h
Travel Distance (Average)	607	m	607	m
Travel Time (Total)	10.3	veh-h/h	15.5	pers-h/h
Travel Time (Average)	42.5	sec	42.5	sec
Travel Speed	51.4	km/h	51.4	km/h
Cost (Total)	357.70	$/h	357.70	$/h
Fuel Consumption (Total)	53.5	L/h		
Carbon Dioxide (Total)	133.9	kg/h		
Hydrocarbons (Total)	0.210	kg/h		
Carbon Monoxide (Total)	8.66	kg/h		
NOx (Total)	0.291	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: PM 2012 base+dev flows

Myall St and Myall Quays Boulevarde
2012 PM flows +390 lots
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	157	5.0	0.083	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	146	1.0	0.140	9.8	LOS A	0.6	4.1	0.42	0.70	47.1
Approach		303	3.1	0.140	4.8	NA	0.6	4.1	0.20	0.34	53.0
North: Myall Quays Boulevarde											
7	L	188	1.0	0.205	9.1	LOS A	0.8	5.8	0.39	0.66	47.7
9	R	56	1.0	0.149	16.1	LOS B	0.6	3.9	0.62	0.88	41.5
Approach		244	1.0	0.205	10.7	LOS A	0.8	5.8	0.44	0.71	46.2
West: Myall St towards Hawks Nest											
10	L	142	1.0	0.077	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
11	T	186	5.0	0.099	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		328	3.3	0.099	3.6	NA	0.0	0.0	0.00	0.29	54.7
All Vehicles		876	2.6	0.205	6.0	NA	0.8	5.8	0.19	0.42	51.4

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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INTERSECTION SUMMARY

Site: AM 2022 base+390 1 access

Myall St and Myall Quays Boulevarde
2022 AM flows base plus 390 lots One access
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	865	veh/h	1298	pers/h
Percent Heavy Vehicles	2.5	%		
Degree of Saturation	0.432			
Practical Spare Capacity	85.2	%		
Effective Intersection Capacity	2003	veh/h		
Control Delay (Total)	1.76	veh-h/h	2.64	pers-h/h
Control Delay (Average)	7.3	sec	7.3	sec
Control Delay (Worst Lane)	18.3	sec		
Control Delay (Worst Movement)	18.3	sec	18.3	sec
Geometric Delay (Average)	5.0	sec		
Stop-Line Delay (Average)	2.3	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	2.4	veh		
95% Back of Queue - Distance (Worst Lane)	16.7	m		
Total Effective Stops	401	veh/h	602	pers/h
Effective Stop Rate	0.46	per veh	0.46	per pers
Proportion Queued	0.24		0.24	
Performance Index	14.1		14.1	
Travel Distance (Total)	524.7	veh-km/h	787.1	pers-km/h
Travel Distance (Average)	606	m	606	m
Travel Time (Total)	10.5	veh-h/h	15.8	pers-h/h
Travel Time (Average)	43.9	sec	43.9	sec
Travel Speed	49.8	km/h	49.8	km/h
Cost (Total)	363.34	$/h	363.34	$/h
Fuel Consumption (Total)	53.7	L/h		
Carbon Dioxide (Total)	134.3	kg/h		
Hydrocarbons (Total)	0.212	kg/h		
Carbon Monoxide (Total)	8.77	kg/h		
NOx (Total)	0.292	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: AM 2022 base+390 1 access

Myall St and Myall Quays Boulevarde
2022 AM flows base plus 390 lots One access
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	198	5.0	0.105	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	138	1.0	0.121	9.2	LOS A	0.5	3.4	0.31	0.65	47.5
Approach		336	3.4	0.121	3.8	NA	0.5	3.4	0.13	0.27	54.2
North: Myall Quays Boulevarde											
7	L	154	1.0	0.152	8.5	LOS A	0.6	4.2	0.29	0.61	48.2
9	R	179	1.0	0.432	18.3	LOS B	2.4	16.7	0.68	0.99	39.9
Approach		333	1.0	0.432	13.7	LOS A	2.4	16.7	0.50	0.81	43.4
West: Myall St Hawks Nest											
10	L	62	1.0	0.034	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
11	T	135	5.0	0.071	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		197	3.7	0.071	2.6	NA	0.0	0.0	0.00	0.21	56.0
All Vehicles		865	2.5	0.432	7.3	NA	2.4	16.7	0.24	0.46	49.8

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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INTERSECTION SUMMARY

Site: PM 2022 base+390 1 access

Myall St and Myall Quays Boulevarde
2022 PM flows base+390 lots one access
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	972	veh/h	1457	pers/h
Percent Heavy Vehicles	2.4	%		
Degree of Saturation	0.228			
Practical Spare Capacity	251.6	%		
Effective Intersection Capacity	4270	veh/h		
Control Delay (Total)	1.79	veh-h/h	2.69	pers-h/h
Control Delay (Average)	6.6	sec	6.6	sec
Control Delay (Worst Lane)	17.4	sec		
Control Delay (Worst Movement)	17.4	sec	17.4	sec
Geometric Delay (Average)	5.3	sec		
Stop-Line Delay (Average)	1.4	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	0.9	veh		
95% Back of Queue - Distance (Worst Lane)	6.5	m		
Total Effective Stops	458	veh/h	687	pers/h
Effective Stop Rate	0.47	per veh	0.47	per pers
Proportion Queued	0.22		0.22	
Performance Index	15.1		15.1	
Travel Distance (Total)	589.5	veh-km/h	884.3	pers-km/h
Travel Distance (Average)	607	m	607	m
Travel Time (Total)	11.6	veh-h/h	17.4	pers-h/h
Travel Time (Average)	43.1	sec	43.1	sec
Travel Speed	50.7	km/h	50.7	km/h
Cost (Total)	402.72	$/h	402.72	$/h
Fuel Consumption (Total)	60.5	L/h		
Carbon Dioxide (Total)	151.3	kg/h		
Hydrocarbons (Total)	0.240	kg/h		
Carbon Monoxide (Total)	10.15	kg/h		
NOx (Total)	0.334	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: PM 2022 base+390 1 access

Myall St and Myall Quays Boulevarde
2022 PM flows base+390 lots one access
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	124	5.0	0.066	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	173	1.0	0.182	10.4	LOS A	0.8	5.4	0.48	0.75	46.6
Approach		297	2.7	0.182	6.1	NA	0.8	5.4	0.28	0.44	51.4
North: Myall Quays Boulevarde											
7	L	196	1.0	0.228	9.6	LOS A	0.9	6.5	0.44	0.69	47.5
9	R	63	1.0	0.184	17.4	LOS B	0.7	4.8	0.67	0.89	40.5
Approach		259	1.0	0.228	11.5	LOS A	0.9	6.5	0.49	0.74	45.6
West: Myall St towards Hawks Nest											
10	L	204	1.0	0.111	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
11	T	212	5.0	0.112	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		416	3.0	0.112	4.0	NA	0.0	0.0	0.00	0.33	54.0
All Vehicles		972	2.4	0.228	6.6	NA	0.9	6.5	0.22	0.47	50.7

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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INTERSECTION SUMMARY

Site: AM 2012 base flows - Toonang

Myall St and Toonang Road
2012 AM flows base
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	327	veh/h	491	pers/h
Percent Heavy Vehicles	4.7	%		
Degree of Saturation	0.091			
Practical Spare Capacity	783.3	%		
Effective Intersection Capacity	3614	veh/h		
Control Delay (Total)	0.09	veh-h/h	0.14	pers-h/h
Control Delay (Average)	1.0	sec	1.0	sec
Control Delay (Worst Lane)	10.2	sec		
Control Delay (Worst Movement)	10.3	sec	10.3	sec
Geometric Delay (Average)	0.6	sec		
Stop-Line Delay (Average)	0.4	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	0.6	veh		
95% Back of Queue - Distance (Worst Lane)	4.0	m		
Total Effective Stops	18	veh/h	27	pers/h
Effective Stop Rate	0.06	per veh	0.06	per pers
Proportion Queued	0.16		0.16	
Performance Index	3.8		3.8	
Travel Distance (Total)	198.4	veh-km/h	297.6	pers-km/h
Travel Distance (Average)	606	m	606	m
Travel Time (Total)	3.5	veh-h/h	5.3	pers-h/h
Travel Time (Average)	38.8	sec	38.8	sec
Travel Speed	56.2	km/h	56.2	km/h
Cost (Total)	120.67	$/h	120.67	$/h
Fuel Consumption (Total)	17.7	L/h		
Carbon Dioxide (Total)	44.3	kg/h		
Hydrocarbons (Total)	0.060	kg/h		
Carbon Monoxide (Total)	1.91	kg/h		
NOx (Total)	0.083	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: AM 2012 base flows - Toonang

Myall St and Toonang Road
2012 AM flows base
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	163	5.0	0.091	0.6	LOS A	0.6	4.0	0.29	0.00	54.7
6	R	5	1.0	0.091	9.0	LOS A	0.6	4.0	0.29	0.99	49.0
Approach		168	4.9	0.091	0.8	NA	0.6	4.0	0.29	0.03	54.5
North: Toonang Drive											
7	L	9	1.0	0.024	10.0	LOS A	0.1	0.6	0.33	0.60	46.9
9	R	8	1.0	0.024	10.3	LOS A	0.1	0.6	0.33	0.72	46.7
Approach		18	1.0	0.024	10.2	LOS A	0.1	0.6	0.33	0.65	46.8
West: Myall St towards Hawks Nest											
10	L	1	1.0	0.075	8.2	LOS A	0.0	0.0	0.00	1.09	49.0
11	T	140	5.0	0.075	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		141	5.0	0.075	0.1	NA	0.0	0.0	0.00	0.01	59.9
All Vehicles		327	4.7	0.091	1.0	NA	0.6	4.0	0.16	0.06	56.2

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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INTERSECTION SUMMARY

Site: PM 2012 base flows - Toonang

Myall St and Toonang Road
2012 PM flows base
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	341	veh/h	512	pers/h
Percent Heavy Vehicles	4.7	%		
Degree of Saturation	0.100			
Practical Spare Capacity	697.1	%		
Effective Intersection Capacity	3398	veh/h		
Control Delay (Total)	0.10	veh-h/h	0.15	pers-h/h
Control Delay (Average)	1.1	sec	1.1	sec
Control Delay (Worst Lane)	9.3	sec		
Control Delay (Worst Movement)	9.5	sec	9.5	sec
Geometric Delay (Average)	0.7	sec		
Stop-Line Delay (Average)	0.4	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	0.5	veh		
95% Back of Queue - Distance (Worst Lane)	3.5	m		
Total Effective Stops	24	veh/h	37	pers/h
Effective Stop Rate	0.07	per veh	0.07	per pers
Proportion Queued	0.14		0.14	
Performance Index	3.9		3.9	
Travel Distance (Total)	206.7	veh-km/h	310.1	pers-km/h
Travel Distance (Average)	606	m	606	m
Travel Time (Total)	3.7	veh-h/h	5.5	pers-h/h
Travel Time (Average)	38.6	sec	38.6	sec
Travel Speed	56.5	km/h	56.5	km/h
Cost (Total)	125.20	$/h	125.20	$/h
Fuel Consumption (Total)	18.3	L/h		
Carbon Dioxide (Total)	45.9	kg/h		
Hydrocarbons (Total)	0.062	kg/h		
Carbon Monoxide (Total)	1.95	kg/h		
NOx (Total)	0.086	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: PM 2012 base flows - Toonang

Myall St and Toonang Road
2012 PM flows base
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	125	5.0	0.079	0.8	LOS A	0.5	3.5	0.33	0.00	53.8
6	R	15	1.0	0.079	9.3	LOS A	0.5	3.5	0.33	0.94	48.9
Approach		140	4.6	0.079	1.7	NA	0.5	3.5	0.33	0.10	53.3
North: Toonang Drive											
7	L	11	1.0	0.013	9.3	LOS A	0.0	0.3	0.30	0.62	47.6
9	R	1	1.0	0.013	9.5	LOS A	0.0	0.3	0.30	0.71	47.6
Approach		12	1.0	0.013	9.3	LOS A	0.0	0.3	0.30	0.63	47.6
West: Myall St towards Hawks Nest											
10	L	3	1.0	0.100	8.2	LOS A	0.0	0.0	0.00	1.08	49.0
11	T	186	5.0	0.100	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		189	4.9	0.100	0.1	NA	0.0	0.0	0.00	0.02	59.8
All Vehicles		341	4.7	0.100	1.1	NA	0.5	3.5	0.14	0.07	56.5

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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INTERSECTION SUMMARY

Site: AM 2012 base flows +974 2 access points

Myall St and Myall Quays Boulevarde
2012 AM flows base plus 974 lots and 2 access points
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	956	veh/h	1434	pers/h
Percent Heavy Vehicles	2.1	%		
Degree of Saturation	0.327			
Practical Spare Capacity	144.7	%		
Effective Intersection Capacity	2923	veh/h		
Control Delay (Total)	1.87	veh-h/h	2.80	pers-h/h
Control Delay (Average)	7.0	sec	7.0	sec
Control Delay (Worst Lane)	15.0	sec		
Control Delay (Worst Movement)	15.0	sec	15.0	sec
Geometric Delay (Average)	5.8	sec		
Stop-Line Delay (Average)	1.3	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	1.5	veh		
95% Back of Queue - Distance (Worst Lane)	10.8	m		
Total Effective Stops	466	veh/h	699	pers/h
Effective Stop Rate	0.49	per veh	0.49	per pers
Proportion Queued	0.24		0.24	
Performance Index	15.4		15.4	
Travel Distance (Total)	581.3	veh-km/h	872.0	pers-km/h
Travel Distance (Average)	608	m	608	m
Travel Time (Total)	11.6	veh-h/h	17.4	pers-h/h
Travel Time (Average)	43.8	sec	43.8	sec
Travel Speed	50.0	km/h	50.0	km/h
Cost (Total)	403.10	$/h	403.10	$/h
Fuel Consumption (Total)	60.7	L/h		
Carbon Dioxide (Total)	151.8	kg/h		
Hydrocarbons (Total)	0.244	kg/h		
Carbon Monoxide (Total)	10.57	kg/h		
NOx (Total)	0.341	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: AM 2012 base flows +974 2 access points

Myall St and Myall Quays Boulevarde
2012 AM flows base plus 974 lots and 2 access points
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	158	5.0	0.084	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	154	1.0	0.134	9.2	LOS A	0.5	3.8	0.31	0.65	47.5
Approach		312	3.0	0.134	4.5	NA	0.5	3.8	0.15	0.32	53.1
North: Myall Quays Boulevarde											
7	L	337	1.0	0.327	8.6	LOS A	1.5	10.8	0.33	0.61	48.0
9	R	114	1.0	0.257	15.0	LOS B	1.1	7.7	0.61	0.89	42.4
Approach		451	1.0	0.327	10.2	LOS A	1.5	10.8	0.40	0.68	46.5
West: Myall St towards Hawks Nest											
10	L	86	1.0	0.047	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
11	T	107	5.0	0.057	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		194	3.2	0.057	3.7	NA	0.0	0.0	0.00	0.30	54.5
All Vehicles		956	2.1	0.327	7.0	NA	1.5	10.8	0.24	0.49	50.0

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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INTERSECTION SUMMARY

Site: PM 2012 base flows+974
2 access points

Myall St and Myall Quays Boulevarde
2012 PM flows base + 974 lots 2 access points
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	Vehicles		Persons	
Demand Flows (Total)	959	veh/h	1438	pers/h
Percent Heavy Vehicles	2.1	%		
Degree of Saturation	0.308			
Practical Spare Capacity	159.9	%		
Effective Intersection Capacity	3115	veh/h		
Control Delay (Total)	2.04	veh-h/h	3.06	pers-h/h
Control Delay (Average)	7.7	sec	7.7	sec
Control Delay (Worst Lane)	20.0	sec		
Control Delay (Worst Movement)	20.0	sec	20.0	sec
Geometric Delay (Average)	5.9	sec		
Stop-Line Delay (Average)	1.8	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	1.5	veh		
95% Back of Queue - Distance (Worst Lane)	10.4	m		
Total Effective Stops	495	veh/h	742	pers/h
Effective Stop Rate	0.52	per veh	0.52	per pers
Proportion Queued	0.28		0.28	
Performance Index	15.8		15.8	
Travel Distance (Total)	581.0	veh-km/h	871.5	pers-km/h
Travel Distance (Average)	606	m	606	m
Travel Time (Total)	11.8	veh-h/h	17.6	pers-h/h
Travel Time (Average)	44.1	sec	44.1	sec
Travel Speed	49.4	km/h	49.4	km/h
Cost (Total)	407.69	$/h	407.69	$/h
Fuel Consumption (Total)	61.4	L/h		
Carbon Dioxide (Total)	153.6	kg/h		
Hydrocarbons (Total)	0.248	kg/h		
Carbon Monoxide (Total)	10.85	kg/h		
NOx (Total)	0.346	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: PM 2012 base flows+974
2 access points

Myall St and Myall Quays Boulevarde
2012 PM flows base + 974 lots 2 access points
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	99	5.0	0.052	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	337	1.0	0.308	9.9	LOS A	1.5	10.4	0.44	0.71	47.0
Approach		436	1.9	0.308	7.6	NA	1.5	10.4	0.34	0.55	49.4
North: Myall Quays Boulevarde											
7	L	154	1.0	0.162	8.9	LOS A	0.6	4.5	0.35	0.63	47.9
9	R	86	1.0	0.276	20.0	LOS B	1.1	8.0	0.72	0.94	38.6
Approach		240	1.0	0.276	12.9	LOS A	1.1	8.0	0.48	0.75	44.1
West: Myall St towards Hawks Nest											
10	L	114	1.0	0.062	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
11	T	169	5.0	0.090	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		283	3.4	0.090	3.3	NA	0.0	0.0	0.00	0.27	55.0
All Vehicles		959	2.1	0.308	7.7	NA	1.5	10.4	0.28	0.52	49.4

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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INTERSECTION SUMMARY

Site: AM 2022 base flows +974 2 access points

Myall St and Myall Quays Boulevarde
2022 AM flows base plus 974 lots and 2 access points
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1023	veh/h	1535	pers/h
Percent Heavy Vehicles	2.3	%		
Degree of Saturation	0.337			
Practical Spare Capacity	137.6	%		
Effective Intersection Capacity	3039	veh/h		
Control Delay (Total)	1.95	veh-h/h	2.92	pers-h/h
Control Delay (Average)	6.9	sec	6.9	sec
Control Delay (Worst Lane)	16.9	sec		
Control Delay (Worst Movement)	16.9	sec	16.9	sec
Geometric Delay (Average)	5.4	sec		
Stop-Line Delay (Average)	1.5	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	1.6	veh		
95% Back of Queue - Distance (Worst Lane)	11.1	m		
Total Effective Stops	476	veh/h	714	pers/h
Effective Stop Rate	0.47	per veh	0.47	per pers
Proportion Queued	0.24		0.24	
Performance Index	16.3		16.3	
Travel Distance (Total)	622.2	veh-km/h	933.2	pers-km/h
Travel Distance (Average)	608	m	608	m
Travel Time (Total)	12.4	veh-h/h	18.6	pers-h/h
Travel Time (Average)	43.6	sec	43.6	sec
Travel Speed	50.2	km/h	50.2	km/h
Cost (Total)	428.51	$/h	428.51	$/h
Fuel Consumption (Total)	64.1	L/h		
Carbon Dioxide (Total)	160.4	kg/h		
Hydrocarbons (Total)	0.255	kg/h		
Carbon Monoxide (Total)	10.83	kg/h		
NOx (Total)	0.355	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: AM 2022 base flows +974 2 access points

Myall St and Myall Quays Boulevarde
2022 AM flows base plus 974 lots and 2 access points
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	198	5.0	0.105	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	154	1.0	0.132	9.3	LOS A	0.6	3.9	0.34	0.66	47.4
Approach		352	3.3	0.132	4.1	NA	0.6	3.9	0.15	0.29	53.8
North: Myall Quays Boulevarde											
7	L	337	1.0	0.337	8.8	LOS A	1.6	11.1	0.36	0.63	47.8
9	R	114	1.0	0.288	16.9	LOS B	1.3	8.9	0.64	0.92	41.0
Approach		451	1.0	0.337	10.8	LOS A	1.6	11.1	0.43	0.70	45.9
West: Myall St towards Hawks Nest											
10	L	86	1.0	0.047	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
11	T	135	5.0	0.071	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		221	3.4	0.071	3.2	NA	0.0	0.0	0.00	0.26	55.1
All Vehicles		1023	2.3	0.337	6.9	NA	1.6	11.1	0.24	0.47	50.2

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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INTERSECTION SUMMARY

Site: PM 2022 base flows+974
2 access points

Myall St and Myall Quays Boulevarde
2022 PM flows base + 974 lots 2 access points
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	Vehicles		Persons	
Demand Flows (Total)	1026	veh/h	1539	pers/h
Percent Heavy Vehicles	2.3	%		
Degree of Saturation	0.322			
Practical Spare Capacity	148.6	%		
Effective Intersection Capacity	3189	veh/h		
Control Delay (Total)	2.14	veh-h/h	3.21	pers-h/h
Control Delay (Average)	7.5	sec	7.5	sec
Control Delay (Worst Lane)	22.7	sec		
Control Delay (Worst Movement)	22.7	sec	22.7	sec
Geometric Delay (Average)	5.5	sec		
Stop-Line Delay (Average)	2.0	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	1.5	veh		
95% Back of Queue - Distance (Worst Lane)	10.8	m		
Total Effective Stops	509	veh/h	763	pers/h
Effective Stop Rate	0.50	per veh	0.50	per pers
Proportion Queued	0.28		0.28	
Performance Index	16.7		16.7	
Travel Distance (Total)	621.9	veh-km/h	932.8	pers-km/h
Travel Distance (Average)	606	m	606	m
Travel Time (Total)	12.5	veh-h/h	18.8	pers-h/h
Travel Time (Average)	43.9	sec	43.9	sec
Travel Speed	49.7	km/h	49.7	km/h
Cost (Total)	433.22	$/h	433.22	$/h
Fuel Consumption (Total)	64.8	L/h		
Carbon Dioxide (Total)	162.2	kg/h		
Hydrocarbons (Total)	0.260	kg/h		
Carbon Monoxide (Total)	11.09	kg/h		
NOx (Total)	0.360	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: PM 2022 base flows+974
2 access points

Myall St and Myall Quays Boulevarde
2022 PM flows base + 974 lots 2 access points
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	124	5.0	0.066	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	337	1.0	0.322	10.1	LOS A	1.5	10.8	0.47	0.74	46.9
Approach		461	2.1	0.322	7.4	NA	1.5	10.8	0.35	0.54	49.8
North: Myall Quays Boulevarde											
7	L	154	1.0	0.170	9.1	LOS A	0.7	4.7	0.39	0.66	47.7
9	R	86	1.0	0.312	22.7	LOS B	1.3	9.1	0.77	0.97	36.9
Approach		240	1.0	0.312	14.0	LOS A	1.3	9.1	0.52	0.77	43.2
West: Myall St towards Hawks Nest											
10	L	114	1.0	0.062	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
11	T	212	5.0	0.112	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		325	3.6	0.112	2.9	NA	0.0	0.0	0.00	0.23	55.6
All Vehicles		1026	2.3	0.322	7.5	NA	1.5	10.8	0.28	0.50	49.7

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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INTERSECTION SUMMARY

Site: 2nd access AM 2012 base+974 lots

2nd access and Myall St
2012 AM flows base+974 lots
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	641	veh/h	962	pers/h
Percent Heavy Vehicles	3.2	%		
Degree of Saturation	0.155			
Practical Spare Capacity	416.0	%		
Effective Intersection Capacity	4135	veh/h		
Control Delay (Total)	0.76	veh-h/h	1.14	pers-h/h
Control Delay (Average)	4.3	sec	4.3	sec
Control Delay (Worst Lane)	13.3	sec		
Control Delay (Worst Movement)	13.3	sec	13.3	sec
Geometric Delay (Average)	3.5	sec		
Stop-Line Delay (Average)	0.8	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	0.6	veh		
95% Back of Queue - Distance (Worst Lane)	4.3	m		
Total Effective Stops	187	veh/h	280	pers/h
Effective Stop Rate	0.29	per veh	0.29	per pers
Proportion Queued	0.15		0.15	
Performance Index	8.8		8.8	
Travel Distance (Total)	389.7	veh-km/h	584.5	pers-km/h
Travel Distance (Average)	608	m	608	m
Travel Time (Total)	7.3	veh-h/h	10.9	pers-h/h
Travel Time (Average)	40.9	sec	40.9	sec
Travel Speed	53.5	km/h	53.5	km/h
Cost (Total)	250.51	$/h	250.51	$/h
Fuel Consumption (Total)	36.8	L/h		
Carbon Dioxide (Total)	92.1	kg/h		
Hydrocarbons (Total)	0.137	kg/h		
Carbon Monoxide (Total)	5.08	kg/h		
NOx (Total)	0.188	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: 2nd access AM 2012 base+974 lots

2nd access and Myall St
2012 AM flows base+974 lots
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	206	5.0	0.109	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	39	1.0	0.034	9.0	LOS A	0.1	0.9	0.27	0.63	47.7
Approach		245	4.4	0.109	1.4	NA	0.1	0.9	0.04	0.10	57.6
North: second access											
7	L	158	1.0	0.155	8.5	LOS A	0.6	4.3	0.29	0.60	48.2
9	R	68	1.0	0.141	13.3	LOS A	0.5	3.8	0.54	0.81	43.9
Approach		226	1.0	0.155	9.9	LOS A	0.6	4.3	0.37	0.67	46.8
West: Myall St towards Hawks Nest											
10	L	17	1.0	0.009	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
11	T	153	5.0	0.081	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		169	4.6	0.081	0.8	NA	0.0	0.0	0.00	0.07	58.7
All Vehicles		641	3.2	0.155	4.3	NA	0.6	4.3	0.15	0.29	53.5

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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INTERSECTION SUMMARY

Site: 2nd access PM 2012 base+974 lots

2nd access and Myall St
2012 PM flows base+974 lots
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	666	veh/h	999	pers/h
Percent Heavy Vehicles	3.3	%		
Degree of Saturation	0.148			
Practical Spare Capacity	440.4	%		
Effective Intersection Capacity	4501	veh/h		
Control Delay (Total)	0.76	veh-h/h	1.13	pers-h/h
Control Delay (Average)	4.1	sec	4.1	sec
Control Delay (Worst Lane)	15.9	sec		
Control Delay (Worst Movement)	15.9	sec	15.9	sec
Geometric Delay (Average)	3.5	sec		
Stop-Line Delay (Average)	0.6	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	0.6	veh		
95% Back of Queue - Distance (Worst Lane)	4.4	m		
Total Effective Stops	194	veh/h	291	pers/h
Effective Stop Rate	0.29	per veh	0.29	per pers
Proportion Queued	0.13		0.13	
Performance Index	8.9		8.9	
Travel Distance (Total)	403.6	veh-km/h	605.4	pers-km/h
Travel Distance (Average)	606	m	606	m
Travel Time (Total)	7.5	veh-h/h	11.2	pers-h/h
Travel Time (Average)	40.5	sec	40.5	sec
Travel Speed	53.9	km/h	53.9	km/h
Cost (Total)	258.27	$/h	258.27	$/h
Fuel Consumption (Total)	38.1	L/h		
Carbon Dioxide (Total)	95.5	kg/h		
Hydrocarbons (Total)	0.142	kg/h		
Carbon Monoxide (Total)	5.29	kg/h		
NOx (Total)	0.195	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: 2nd access PM 2012 base+974 lots

2nd access and Myall St
2012 PM flows base+974 lots
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	145	5.0	0.077	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	158	1.0	0.148	9.7	LOS A	0.6	4.4	0.41	0.70	47.1
Approach		303	2.9	0.148	5.1	NA	0.6	4.4	0.21	0.36	52.6
North: second access											
7	L	39	1.0	0.043	9.0	LOS A	0.2	1.1	0.36	0.62	47.9
9	R	17	1.0	0.046	15.9	LOS B	0.2	1.2	0.61	0.83	41.7
Approach		56	1.0	0.046	11.1	LOS A	0.2	1.2	0.43	0.68	45.9
West: Myall St towards Hawks Nest											
10	L	68	1.0	0.037	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
11	T	239	5.0	0.127	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		307	4.1	0.127	1.8	NA	0.0	0.0	0.00	0.15	57.1
All Vehicles		666	3.3	0.148	4.1	NA	0.6	4.4	0.13	0.29	53.9

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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8000290, MARK WAUGH PTY LTD, SINGLE

INTERSECTION SUMMARY

Site: 2nd access AM 2017 base+dev flows

2nd access and Myall St
2017 AM flows base+65% full development
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	719	veh/h	1078	pers/h
Percent Heavy Vehicles	3.7	%		
Degree of Saturation	0.335			
Practical Spare Capacity	138.8	%		
Effective Intersection Capacity	2146	veh/h		
Control Delay (Total)	0.87	veh-h/h	1.30	pers-h/h
Control Delay (Average)	4.3	sec	4.3	sec
Control Delay (Worst Lane)	17.3	sec		
Control Delay (Worst Movement)	17.3	sec	17.3	sec
Geometric Delay (Average)	2.6	sec		
Stop-Line Delay (Average)	1.8	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	1.6	veh		
95% Back of Queue - Distance (Worst Lane)	11.2	m		
Total Effective Stops	183	veh/h	275	pers/h
Effective Stop Rate	0.25	per veh	0.25	per pers
Proportion Queued	0.15		0.15	
Performance Index	9.9		9.9	
Travel Distance (Total)	435.9	veh-km/h	653.8	pers-km/h
Travel Distance (Average)	606	m	606	m
Travel Time (Total)	8.1	veh-h/h	12.2	pers-h/h
Travel Time (Average)	40.8	sec	40.8	sec
Travel Speed	53.6	km/h	53.6	km/h
Cost (Total)	277.98	$/h	277.98	$/h
Fuel Consumption (Total)	39.9	L/h		
Carbon Dioxide (Total)	99.9	kg/h		
Hydrocarbons (Total)	0.144	kg/h		
Carbon Monoxide (Total)	4.87	kg/h		
NOx (Total)	0.194	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: 2nd access AM 2017 base+dev flows

2nd access and Myall St
2017 AM flows base+65% full development
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	291	5.0	0.154	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	17	1.0	0.014	9.1	LOS A	0.1	0.4	0.31	0.63	47.5
Approach		307	4.8	0.154	0.5	NA	0.1	0.4	0.02	0.03	59.2
North: second access											
7	L	58	1.0	0.060	8.6	LOS A	0.2	1.5	0.31	0.61	48.1
9	R	135	1.0	0.335	17.3	LOS B	1.6	11.2	0.65	0.94	40.6
Approach		193	1.0	0.335	14.7	LOS B	1.6	11.2	0.55	0.84	42.7
West: Myall St towards Hawks Nest											
10	L	17	1.0	0.009	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
11	T	202	5.0	0.107	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		219	4.7	0.107	0.6	NA	0.0	0.0	0.00	0.05	59.0
All Vehicles		719	3.7	0.335	4.3	NA	1.6	11.2	0.15	0.25	53.6

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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INTERSECTION SUMMARY

Site: 2nd access PM 2017 base+dev flows

2nd access and Myall St
2017 PM flows base+65% full development
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	719	veh/h	1078	pers/h
Percent Heavy Vehicles	3.7	%		
Degree of Saturation	0.168			
Practical Spare Capacity	375.3	%		
Effective Intersection Capacity	4271	veh/h		
Control Delay (Total)	0.60	veh-h/h	0.90	pers-h/h
Control Delay (Average)	3.0	sec	3.0	sec
Control Delay (Worst Lane)	16.8	sec		
Control Delay (Worst Movement)	16.8	sec	16.8	sec
Geometric Delay (Average)	2.6	sec		
Stop-Line Delay (Average)	0.4	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	0.2	veh		
95% Back of Queue - Distance (Worst Lane)	1.7	m		
Total Effective Stops	157	veh/h	235	pers/h
Effective Stop Rate	0.22	per veh	0.22	per pers
Proportion Queued	0.06		0.06	
Performance Index	8.9		8.9	
Travel Distance (Total)	435.6	veh-km/h	653.4	pers-km/h
Travel Distance (Average)	606	m	606	m
Travel Time (Total)	7.9	veh-h/h	11.8	pers-h/h
Travel Time (Average)	39.3	sec	39.3	sec
Travel Speed	55.4	km/h	55.4	km/h
Cost (Total)	269.85	$/h	269.85	$/h
Fuel Consumption (Total)	39.4	L/h		
Carbon Dioxide (Total)	98.6	kg/h		
Hydrocarbons (Total)	0.141	kg/h		
Carbon Monoxide (Total)	4.80	kg/h		
NOx (Total)	0.192	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: 2nd access PM 2017 base+dev flows

2nd access and Myall St
2017 PM flows base+65% full development
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	175	5.0	0.093	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	58	1.0	0.064	10.4	LOS A	0.2	1.7	0.47	0.72	46.6
Approach		233	4.0	0.093	2.6	NA	0.2	1.7	0.12	0.18	56.0
North: Myall Quays Boulevarde											
7	L	17	1.0	0.021	9.6	LOS A	0.1	0.5	0.42	0.64	47.5
9	R	17	1.0	0.050	16.8	LOS B	0.2	1.2	0.64	0.86	41.0
Approach		34	1.0	0.050	13.2	LOS A	0.2	1.2	0.53	0.75	44.1
West: Myall St towards Hawks Nest											
10	L	135	1.0	0.073	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
11	T	318	5.0	0.168	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		453	3.8	0.168	2.4	NA	0.0	0.0	0.00	0.20	56.2
All Vehicles		719	3.7	0.168	3.0	NA	0.2	1.7	0.06	0.22	55.4

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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INTERSECTION SUMMARY

Site: 2nd access AM 2022 base+974 lots

2nd access and Myall St
2022 AM flows base+974 lots
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	731	veh/h	1096	pers/h
Percent Heavy Vehicles	3.5	%		
Degree of Saturation	0.164			
Practical Spare Capacity	388.7	%		
Effective Intersection Capacity	4462	veh/h		
Control Delay (Total)	0.80	veh-h/h	1.20	pers-h/h
Control Delay (Average)	4.0	sec	4.0	sec
Control Delay (Worst Lane)	15.0	sec		
Control Delay (Worst Movement)	15.0	sec	15.0	sec
Geometric Delay (Average)	3.1	sec		
Stop-Line Delay (Average)	0.9	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	0.6	veh		
95% Back of Queue - Distance (Worst Lane)	4.5	m		
Total Effective Stops	194	veh/h	291	pers/h
Effective Stop Rate	0.27	per veh	0.27	per pers
Proportion Queued	0.14		0.14	
Performance Index	9.8		9.8	
Travel Distance (Total)	443.9	veh-km/h	665.9	pers-km/h
Travel Distance (Average)	608	m	608	m
Travel Time (Total)	8.2	veh-h/h	12.3	pers-h/h
Travel Time (Average)	40.5	sec	40.5	sec
Travel Speed	54.0	km/h	54.0	km/h
Cost (Total)	282.38	$/h	282.38	$/h
Fuel Consumption (Total)	41.2	L/h		
Carbon Dioxide (Total)	103.1	kg/h		
Hydrocarbons (Total)	0.151	kg/h		
Carbon Monoxide (Total)	5.38	kg/h		
NOx (Total)	0.206	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: 2nd access AM 2022 base+974 lots

2nd access and Myall St
2022 AM flows base+974 lots
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	258	5.0	0.137	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	39	1.0	0.034	9.1	LOS A	0.1	0.9	0.30	0.64	47.5
Approach		297	4.5	0.137	1.2	NA	0.1	0.9	0.04	0.08	58.0
North: second access											
7	L	158	1.0	0.161	8.7	LOS A	0.6	4.5	0.33	0.62	48.0
9	R	68	1.0	0.164	15.0	LOS B	0.6	4.4	0.59	0.87	42.5
Approach		226	1.0	0.164	10.6	LOS A	0.6	4.5	0.41	0.70	46.2
West: Myall St towards Hawks Nest											
10	L	17	1.0	0.009	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
11	T	191	5.0	0.101	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		207	4.7	0.101	0.7	NA	0.0	0.0	0.00	0.05	58.9
All Vehicles		731	3.5	0.164	4.0	NA	0.6	4.5	0.14	0.27	54.0

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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INTERSECTION SUMMARY

Site: 2nd access PM 2022 base+974 lots

2nd access and Myall St
2022 PM flows base+974 lots
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	762	veh/h	1143	pers/h
Percent Heavy Vehicles	3.5	%		
Degree of Saturation	0.158			
Practical Spare Capacity	405.4	%		
Effective Intersection Capacity	4815	veh/h		
Control Delay (Total)	0.78	veh-h/h	1.18	pers-h/h
Control Delay (Average)	3.7	sec	3.7	sec
Control Delay (Worst Lane)	18.1	sec		
Control Delay (Worst Movement)	18.1	sec	18.1	sec
Geometric Delay (Average)	3.0	sec		
Stop-Line Delay (Average)	0.7	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	0.7	veh		
95% Back of Queue - Distance (Worst Lane)	4.6	m		
Total Effective Stops	200	veh/h	300	pers/h
Effective Stop Rate	0.26	per veh	0.26	per pers
Proportion Queued	0.13		0.13	
Performance Index	10.0		10.0	
Travel Distance (Total)	461.7	veh-km/h	692.5	pers-km/h
Travel Distance (Average)	606	m	606	m
Travel Time (Total)	8.5	veh-h/h	12.7	pers-h/h
Travel Time (Average)	40.1	sec	40.1	sec
Travel Speed	54.5	km/h	54.5	km/h
Cost (Total)	291.73	$/h	291.73	$/h
Fuel Consumption (Total)	42.8	L/h		
Carbon Dioxide (Total)	107.1	kg/h		
Hydrocarbons (Total)	0.157	kg/h		
Carbon Monoxide (Total)	5.61	kg/h		
NOx (Total)	0.214	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: 2nd access PM 2022 base+974 lots

2nd access and Myall St
2022 PM flows base+974 lots
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	181	5.0	0.096	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	158	1.0	0.158	10.1	LOS A	0.7	4.6	0.45	0.72	46.9
Approach		339	3.1	0.158	4.7	NA	0.7	4.6	0.21	0.34	53.1
North: second access											
7	L	39	1.0	0.046	9.3	LOS A	0.2	1.2	0.40	0.64	47.7
9	R	17	1.0	0.055	18.1	LOS B	0.2	1.3	0.67	0.89	40.0
Approach		56	1.0	0.055	12.0	LOS A	0.2	1.3	0.48	0.72	45.1
West: Myall St towards Hawks Nest											
10	L	68	1.0	0.037	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
11	T	299	5.0	0.158	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		367	4.3	0.158	1.5	NA	0.0	0.0	0.00	0.12	57.6
All Vehicles		762	3.5	0.158	3.7	NA	0.7	4.6	0.13	0.26	54.5

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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INTERSECTION SUMMARY

Site: AM 2017 base+974+1300
4-way signals

Myall St and Myall Quays Boulevarde
2017 AM flows base+974+1500 lots
Signals - Actuated Cycle Time = 61 seconds

Intersection Performance - Hourly Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Demand Flows (Total)	1828	veh/h	85	ped/h	2828	pers/h
Percent Heavy Vehicles	1.1	%				
Degree of Saturation	0.553		0.027			
Practical Spare Capacity	62.7	%				
Effective Intersection Capacity	3305	veh/h				
Control Delay (Total)	9.81	veh-h/h	0.61	ped-h/h	15.32	pers-h/h
Control Delay (Average)	19.3	sec	25.9	sec	19.5	sec
Control Delay (Worst Lane)	32.5	sec				
Control Delay (Worst Movement)	32.5	sec	27.3	sec	32.5	sec
Geometric Delay (Average)	5.0	sec				
Stop-Line Delay (Average)	14.3	sec				
Intersection Level of Service (LOS)	LOS B		LOS C			
95% Back of Queue - Vehicles (Worst Lane)	6.7	veh				
95% Back of Queue - Distance (Worst Lane)	46.6	m				
Total Effective Stops	1348	veh/h	77	ped/h	2099	pers/h
Effective Stop Rate	0.74	per veh	0.91	per ped	0.74	per pers
Proportion Queued	0.70		0.91		0.70	
Performance Index	61.0		1.7		62.8	
Travel Distance (Total)	1053.2	veh-km/h	3.2	ped-km/h	1583.0	pers-km/h
Travel Distance (Average)	576	m	38	m	560	m
Travel Time (Total)	31.1	veh-h/h	1.3	ped-h/h	48.0	pers-h/h
Travel Time (Average)	61.3	sec	54.8	sec	61.1	sec
Travel Speed	33.8	km/h	2.5	km/h	33.0	km/h
Cost (Total)	994.44	$/h	21.75	$/h	1016.19	$/h
Fuel Consumption (Total)	118.4	L/h				
Carbon Dioxide (Total)	296.1	kg/h				
Hydrocarbons (Total)	0.505	kg/h				
Carbon Monoxide (Total)	20.26	kg/h				
NOx (Total)	0.601	kg/h				

Level of Service (LOS) Method: Delay (HCM 2000).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: AM 2017 base+974+1300
4-way signals

Myall St and Myall Quays Boulevarde
2017 AM flows base+974+1500 lots
Signals - Actuated Cycle Time = 61 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Myall Downs (1500 lots)											
1	L	421	0.0	0.461	12.1	LOS B	5.8	40.5	0.48	0.73	38.7
2	T	105	0.0	0.553	17.4	LOS B	6.7	46.6	0.82	0.70	33.0
3	R	168	0.0	0.553	23.5	LOS C	6.7	46.6	0.82	0.82	32.4
Approach		695	0.0	0.553	15.7	LOS B	6.7	46.6	0.61	0.75	36.1
East: Myall St towards Pac Hwy											
4	L	42	0.0	0.138	31.6	LOS C	1.1	7.8	0.87	0.72	28.4
5	T	162	5.0	0.366	26.1	LOS C	3.2	23.0	0.90	0.69	29.5
6	R	154	1.0	0.391	23.6	LOS C	3.5	24.7	0.86	0.77	31.9
Approach		358	2.7	0.391	25.7	LOS C	3.5	24.7	0.88	0.73	30.3
North: Myall Quays Boulevarde											
7	L	337	1.0	0.330	13.1	LOS B	5.3	37.6	0.51	0.75	38.1
8	T	26	0.0	0.330	6.6	LOS A	5.3	37.6	0.51	0.44	40.5
9	R	114	1.0	0.315	23.4	LOS C	2.6	18.4	0.76	0.76	32.0
Approach		477	0.9	0.330	15.2	LOS B	5.3	37.6	0.57	0.74	36.6
West: Myall St towards Hawks Nest											
10	L	86	1.0	0.286	32.5	LOS C	2.4	16.7	0.89	0.76	28.0
11	T	107	5.0	0.242	25.5	LOS C	2.0	14.9	0.88	0.66	29.7
12	R	105	0.0	0.278	23.1	LOS C	2.3	16.2	0.85	0.75	32.2
Approach		299	2.1	0.286	26.7	LOS C	2.4	16.7	0.87	0.72	30.0
All Vehicles		1828	1.1	0.553	19.3	LOS B	6.7	46.6	0.70	0.74	33.8

Level of Service (LOS) Method: Delay (HCM 2000).
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.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	Across S approach	32	27.3	LOS C	0.1	0.1	0.91	0.91
P3	Across E approach	21	24.8	LOS C	0.0	0.0	0.90	0.90
P5	Across N approach	11	26.3	LOS C	0.0	0.0	0.91	0.91
P7	Across W approach	21	24.8	LOS C	0.0	0.0	0.90	0.90
All Pedestrians		85	25.9	LOS C			0.91	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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INTERSECTION SUMMARY

Site: PM 2017 base+974+1300
4-way signals

Myall St and Myall Quays Boulevarde
2017 PM flows base+974+1500 lots
Signals - Actuated Cycle Time = 75 seconds

Intersection Performance - Hourly Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Demand Flows (Total)	1827	veh/h	85	ped/h	2826	pers/h
Percent Heavy Vehicles	1.1	%				
Degree of Saturation	0.662		0.033			
Practical Spare Capacity	36.0	%				
Effective Intersection Capacity	2761	veh/h				
Control Delay (Total)	11.35	veh-h/h	0.76	ped-h/h	17.78	pers-h/h
Control Delay (Average)	22.4	sec	32.0	sec	22.6	sec
Control Delay (Worst Lane)	33.0	sec				
Control Delay (Worst Movement)	35.4	sec	32.2	sec	35.4	sec
Geometric Delay (Average)	5.0	sec				
Stop-Line Delay (Average)	17.4	sec				
Intersection Level of Service (LOS)	LOS C		LOS D			
95% Back of Queue - Vehicles (Worst Lane)	9.2	veh				
95% Back of Queue - Distance (Worst Lane)	64.6	m				
Total Effective Stops	1359	veh/h	78	ped/h	2116	pers/h
Effective Stop Rate	0.74	per veh	0.92	per ped	0.75	per pers
Proportion Queued	0.75		0.92		0.76	
Performance Index	67.4		1.9		69.3	
Travel Distance (Total)	1052.5	veh-km/h	3.3	ped-km/h	1582.0	pers-km/h
Travel Distance (Average)	576	m	39	m	560	m
Travel Time (Total)	32.7	veh-h/h	1.5	ped-h/h	50.4	pers-h/h
Travel Time (Average)	64.3	sec	61.7	sec	64.2	sec
Travel Speed	32.2	km/h	2.3	km/h	31.4	km/h
Cost (Total)	1035.73	$/h	24.49	$/h	1060.22	$/h
Fuel Consumption (Total)	120.1	L/h				
Carbon Dioxide (Total)	300.3	kg/h				
Hydrocarbons (Total)	0.516	kg/h				
Carbon Monoxide (Total)	20.19	kg/h				
NOx (Total)	0.601	kg/h				

Level of Service (LOS) Method: Delay (HCM 2000).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: PM 2017 base+974+1300
4-way signals

Myall St and Myall Quays Boulevarde
2017 PM flows base+974+1500 lots
Signals - Actuated Cycle Time = 75 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Myall Downs (1500 lots)											
1	L	105	0.0	0.115	13.2	LOS B	1.2	8.3	0.32	0.67	37.9
2	T	26	0.0	0.241	29.2	LOS C	2.2	15.3	0.86	0.67	27.7
3	R	42	0.0	0.241	35.4	LOS D	2.2	15.3	0.86	0.76	27.4
Approach		174	0.0	0.241	21.0	LOS C	2.2	15.3	0.53	0.69	33.0
East: Myall St towards Pac Hwy											
4	L	168	0.0	0.462	28.9	LOS C	4.8	33.4	0.78	0.77	29.5
5	T	99	5.0	0.119	20.8	LOS C	1.8	13.4	0.73	0.56	32.1
6	R	337	1.0	0.513	17.7	LOS B	7.0	49.2	0.73	0.78	35.0
Approach		604	1.4	0.513	21.3	LOS C	7.0	49.2	0.74	0.74	32.8
North: Myall Quays Boulevarde											
7	L	154	1.0	0.433	29.3	LOS C	7.6	53.5	0.82	0.82	29.7
8	T	105	0.0	0.433	22.9	LOS C	7.6	53.5	0.82	0.69	30.3
9	R	86	1.0	0.241	31.0	LOS C	2.6	18.0	0.80	0.75	28.7
Approach		345	0.7	0.433	27.8	LOS C	7.6	53.5	0.81	0.76	29.6
West: Myall St towards Hawks Nest											
10	L	114	1.0	0.314	28.1	LOS C	3.1	21.9	0.76	0.75	29.8
11	T	169	5.0	0.205	21.4	LOS C	3.2	23.6	0.75	0.59	31.8
12	R	421	0.0	0.662	18.8	LOS B	9.2	64.6	0.82	0.81	34.4
Approach		704	1.4	0.662	20.9	LOS C	9.2	64.6	0.79	0.75	33.0
All Vehicles		1827	1.1	0.662	22.4	LOS C	9.2	64.6	0.75	0.74	32.2

Level of Service (LOS) Method: Delay (HCM 2000).
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.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	Across S approach	21	31.7	LOS D	0.0	0.0	0.92	0.92
P3	Across E approach	32	32.2	LOS D	0.1	0.1	0.92	0.92
P5	Across N approach	11	31.7	LOS D	0.0	0.0	0.92	0.92
P7	Across W approach	21	32.2	LOS D	0.0	0.0	0.92	0.92
All Pedestrians		85	32.0	LOS D			0.92	0.92

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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INTERSECTION SUMMARY

Site: 2nd access AM 2017 base+974+1300 Downs 3-way signals

2nd access and Myall St
2017 AM flows base+974+1300 lots signals
Signals - Fixed Time Cycle Time = 80 seconds (User-Given Cycle Time)

Intersection Performance - Hourly Values						
Performance Measure	Vehicles		Pedestrians		Persons	
Demand Flows (Total)	1278	veh/h	33	ped/h	1950	pers/h
Percent Heavy Vehicles	4.1	%				
Degree of Saturation	0.500		0.009			
Practical Spare Capacity	80.1	%				
Effective Intersection Capacity	2557	veh/h				
Control Delay (Total)	4.82	veh-h/h	0.23	ped-h/h	7.46	pers-h/h
Control Delay (Average)	13.6	sec	24.9	sec	13.8	sec
Control Delay (Worst Lane)	32.5	sec				
Control Delay (Worst Movement)	32.5	sec	32.4	sec	32.5	sec
Geometric Delay (Average)	1.4	sec				
Stop-Line Delay (Average)	12.2	sec				
Intersection Level of Service (LOS)	LOS B		LOS C			
95% Back of Queue - Vehicles (Worst Lane)	12.6	veh				
95% Back of Queue - Distance (Worst Lane)	91.8	m				
Total Effective Stops	698	veh/h	25	ped/h	1072	pers/h
Effective Stop Rate	0.55	per veh	0.77	per ped	0.55	per pers
Proportion Queued	0.61		0.77		0.61	
Performance Index	40.8		0.6		41.4	
Travel Distance (Total)	733.6	veh-km/h	1.2	ped-km/h	1101.6	pers-km/h
Travel Distance (Average)	574	m	36	m	565	m
Travel Time (Total)	20.0	veh-h/h	0.5	ped-h/h	30.4	pers-h/h
Travel Time (Average)	56.2	sec	52.9	sec	56.2	sec
Travel Speed	36.8	km/h	2.5	km/h	36.2	km/h
Cost (Total)	639.99	$/h	8.14	$/h	648.13	$/h
Fuel Consumption (Total)	79.2	L/h				
Carbon Dioxide (Total)	198.4	kg/h				
Hydrocarbons (Total)	0.312	kg/h				
Carbon Monoxide (Total)	11.99	kg/h				
NOx (Total)	0.382	kg/h				

Level of Service (LOS) Method: Delay (HCM 2000).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: 2nd access AM 2017 base+974+1300 Downs 3-way signals

2nd access and Myall St
2017 AM flows base+974+1300 lots signals
Signals - Fixed Time Cycle Time = 80 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	697	5.0	0.500	9.8	LOS A	12.6	91.8	0.60	0.52	39.1
6	R	39	1.0	0.095	16.0	LOS B	0.7	5.1	0.50	0.69	36.1
Approach		736	4.8	0.500	10.1	LOS B	12.6	91.8	0.59	0.53	38.9
North: second access											
7	L	158	1.0	0.486	32.5	LOS C	5.1	35.7	0.85	0.78	28.0
9	R	68	1.0	0.141	31.0	LOS C	2.1	14.6	0.80	0.74	28.6
Approach		226	1.0	0.486	32.0	LOS C	5.1	35.7	0.84	0.77	28.2
West: Myall St towards Hawks Nest											
10	L	17	1.0	0.027	13.7	LOS B	0.3	1.9	0.43	0.66	37.6
11	T	299	5.0	0.206	8.1	LOS A	4.1	30.3	0.49	0.41	40.6
Approach		316	4.8	0.206	8.4	LOS A	4.1	30.3	0.48	0.42	40.5
All Vehicles		1278	4.1	0.500	13.6	LOS B	12.6	91.8	0.61	0.55	36.8

Level of Service (LOS) Method: Delay (HCM 2000).
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.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue		Prop. Queued	Effective Stop Rate
					Pedestrian	Distance		
		ped/h	sec		ped	m		per ped
P3	Across E approach	11	32.4	LOS D	0.0	0.0	0.90	0.90
P5	Across N approach	11	10.0	LOS A	0.0	0.0	0.50	0.50
P7	Across W approach	11	32.4	LOS D	0.0	0.0	0.90	0.90
All Pedestrians		33	24.9	LOS C			0.77	0.77

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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INTERSECTION SUMMARY

Site: 2nd access PM 2017 base+974+1300 Downs 3-way signals

2nd access and Myall St
2017 PM flows base+974+1300 lots signals
Signals - Fixed Time Cycle Time = 80 seconds (User-Given Cycle Time)

Intersection Performance - Hourly Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Demand Flows (Total)	1277	veh/h	33	ped/h	1948	pers/h
Percent Heavy Vehicles	4.1	%				
Degree of Saturation	0.500		0.012			
Practical Spare Capacity	80.0	%				
Effective Intersection Capacity	2554	veh/h				
Control Delay (Total)	3.98	veh-h/h	0.24	ped-h/h	6.21	pers-h/h
Control Delay (Average)	11.2	sec	25.8	sec	11.5	sec
Control Delay (Worst Lane)	32.3	sec				
Control Delay (Worst Movement)	32.3	sec	34.2	sec	34.2	sec
Geometric Delay (Average)	1.4	sec				
Stop-Line Delay (Average)	9.8	sec				
Intersection Level of Service (LOS)	LOS B		LOS C			
95% Back of Queue - Vehicles (Worst Lane)	11.4	veh				
95% Back of Queue - Distance (Worst Lane)	83.0	m				
Total Effective Stops	662	veh/h	26	ped/h	1019	pers/h
Effective Stop Rate	0.52	per veh	0.78	per ped	0.52	per pers
Proportion Queued	0.56		0.78		0.56	
Performance Index	38.2		0.6		38.9	
Travel Distance (Total)	733.0	veh-km/h	1.2	ped-km/h	1100.6	pers-km/h
Travel Distance (Average)	574	m	36	m	565	m
Travel Time (Total)	19.1	veh-h/h	0.5	ped-h/h	29.1	pers-h/h
Travel Time (Average)	53.8	sec	53.7	sec	53.8	sec
Travel Speed	38.4	km/h	2.4	km/h	37.8	km/h
Cost (Total)	614.58	$/h	8.28	$/h	622.85	$/h
Fuel Consumption (Total)	77.2	L/h				
Carbon Dioxide (Total)	193.3	kg/h				
Hydrocarbons (Total)	0.301	kg/h				
Carbon Monoxide (Total)	11.56	kg/h				
NOx (Total)	0.371	kg/h				

Level of Service (LOS) Method: Delay (HCM 2000).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: 2nd access PM 2017 base+974+1300 Downs 3-way signals

2nd access and Myall St
2017 PM flows base+974+1300 lots signals
Signals - Fixed Time Cycle Time = 80 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Highway											
5	T	291	5.0	0.200	7.1	LOS A	3.9	28.7	0.46	0.38	41.5
6	R	158	1.0	0.500	22.7	LOS C	4.3	30.5	0.72	0.78	32.3
Approach		448	3.6	0.500	12.6	LOS B	4.3	30.5	0.55	0.52	37.7
North: second access											
7	L	39	1.0	0.122	32.3	LOS C	1.2	8.4	0.81	0.72	28.1
9	R	17	1.0	0.038	31.8	LOS C	0.5	3.6	0.80	0.69	28.3
Approach		56	1.0	0.122	32.1	LOS C	1.2	8.4	0.81	0.71	28.2
West: Myall St towards Hawks Nest											
10	L	68	1.0	0.105	13.0	LOS B	1.1	7.5	0.42	0.68	38.1
11	T	704	5.0	0.467	8.5	LOS A	11.4	83.0	0.55	0.49	40.1
Approach		773	4.6	0.467	8.9	LOS A	11.4	83.0	0.54	0.50	39.9
All Vehicles		1277	4.1	0.500	11.2	LOS B	11.4	83.0	0.56	0.52	38.4

Level of Service (LOS) Method: Delay (HCM 2000).
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.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue		Prop. Queued	Effective Stop Rate
					Pedestrian	Distance		
		ped/h	sec		ped	m		per ped
P3	Across E approach	11	34.2	LOS D	0.0	0.0	0.93	0.93
P5	Across N approach	11	9.0	LOS A	0.0	0.0	0.48	0.48
P7	Across W approach	11	34.2	LOS D	0.0	0.0	0.93	0.93
All Pedestrians		33	25.8	LOS C			0.78	0.78

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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INTERSECTION SUMMARY

Site: 2nd access AM 2017 base+974+1300+Industrial 4-way signals

2nd access and Myall St
2017 AM flows base+974+1300+Industrial signals
Signals - Fixed Time Cycle Time = 70 seconds (Practical Cycle Time)

Intersection Performance - Hourly Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Demand Flows (Total)	1511	veh/h	85	ped/h	2351	pers/h
Percent Heavy Vehicles	4.8	%				
Degree of Saturation	0.585		0.031			
Practical Spare Capacity	53.8	%				
Effective Intersection Capacity	2581	veh/h				
Control Delay (Total)	8.86	veh-h/h	0.63	ped-h/h	13.92	pers-h/h
Control Delay (Average)	21.1	sec	26.8	sec	21.3	sec
Control Delay (Worst Lane)	27.5	sec				
Control Delay (Worst Movement)	28.1	sec	29.3	sec	29.3	sec
Geometric Delay (Average)	2.0	sec				
Stop-Line Delay (Average)	19.1	sec				
Intersection Level of Service (LOS)	LOS C		LOS C			
95% Back of Queue - Vehicles (Worst Lane)	10.8	veh				
95% Back of Queue - Distance (Worst Lane)	79.1	m				
Total Effective Stops	1095	veh/h	74	ped/h	1717	pers/h
Effective Stop Rate	0.72	per veh	0.87	per ped	0.73	per pers
Proportion Queued	0.81		0.87		0.82	
Performance Index	54.7		1.8		56.4	
Travel Distance (Total)	915.8	veh-km/h	3.4	ped-km/h	1377.0	pers-km/h
Travel Distance (Average)	606	m	40	m	586	m
Travel Time (Total)	25.1	veh-h/h	1.4	ped-h/h	38.9	pers-h/h
Travel Time (Average)	59.7	sec	57.2	sec	59.6	sec
Travel Speed	36.5	km/h	2.5	km/h	35.4	km/h
Cost (Total)	839.51	$/h	22.70	$/h	862.21	$/h
Fuel Consumption (Total)	121.5	L/h				
Carbon Dioxide (Total)	304.2	kg/h				
Hydrocarbons (Total)	0.492	kg/h				
Carbon Monoxide (Total)	22.61	kg/h				
NOx (Total)	0.705	kg/h				

Level of Service (LOS) Method: Delay (HCM 2000).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: 2nd access AM 2017 base+974+1300+Industrial 4-way signals

2nd access and Myall St
2017 AM flows base+974+1300+Industrial signals
Signals - Fixed Time Cycle Time = 70 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Industrial Access											
1	L	7	10.0	0.016	18.4	LOS B	0.1	1.0	0.53	0.67	40.1
2	T	5	0.0	0.054	18.2	LOS B	0.6	4.4	0.72	0.53	36.7
3	R	19	10.0	0.054	26.5	LOS C	0.6	4.4	0.72	0.72	35.3
Approach		32	8.3	0.054	23.2	LOS C	0.6	4.4	0.68	0.68	36.5
East: Myall St towards Pac Hwy											
4	L	81	10.0	0.161	25.8	LOS C	1.9	14.6	0.72	0.75	35.3
5	T	758	5.0	0.585	20.7	LOS C	10.8	79.1	0.88	0.75	36.3
6	R	17	1.0	0.037	19.1	LOS B	0.3	2.1	0.70	0.69	39.3
Approach		856	5.4	0.585	21.2	LOS C	10.8	79.1	0.86	0.75	36.2
North: second access											
7	L	58	1.0	0.119	18.4	LOS B	1.0	7.4	0.56	0.72	39.8
8	T	11	0.0	0.299	20.0	LOS C	3.8	27.1	0.80	0.65	35.0
9	R	135	1.0	0.299	28.1	LOS C	3.8	27.1	0.80	0.79	34.0
Approach		203	0.9	0.299	24.9	LOS C	3.8	27.1	0.73	0.76	35.5
West: Myall St towards Hawks Nest											
10	L	17	1.0	0.034	24.6	LOS C	0.4	2.7	0.69	0.70	35.8
11	T	368	5.0	0.393	18.6	LOS B	6.7	48.8	0.78	0.65	37.8
12	R	35	10.0	0.106	20.7	LOS C	0.6	4.8	0.78	0.72	38.5
Approach		420	5.3	0.393	19.0	LOS B	6.7	48.8	0.78	0.66	37.8
All Vehicles		1511	4.8	0.585	21.1	LOS C	10.8	79.1	0.81	0.72	36.5

Level of Service (LOS) Method: Delay (HCM 2000).
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.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue		Prop. Queued	Effective Stop Rate
					Pedestrian	Distance		
		ped/h	sec		ped	m		per ped
P1	Across S approach	21	24.0	LOS C	0.0	0.0	0.83	0.83
P3	Across E approach	32	29.3	LOS C	0.1	0.1	0.91	0.91
P5	Across N approach	11	20.1	LOS C	0.0	0.0	0.76	0.76
P7	Across W approach	21	29.3	LOS C	0.0	0.0	0.91	0.91
All Pedestrians		85	26.8	LOS C			0.87	0.87

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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INTERSECTION SUMMARY

Site: 2nd access PM 2017 base+974+1300+Industrial 4-way signals

2nd access and Myall St
2017 AM flows base+974+1300+Industrial signals
Signals - Fixed Time Cycle Time = 70 seconds (Practical Cycle Time)

Intersection Performance - Hourly Values						
Performance Measure	**Vehicles**		**Pedestrians**		**Persons**	
Demand Flows (Total)	1421	veh/h	85	ped/h	2217	pers/h
Percent Heavy Vehicles	4.6	%				
Degree of Saturation	0.651		0.031			
Practical Spare Capacity	38.3	%				
Effective Intersection Capacity	2183	veh/h				
Control Delay (Total)	8.19	veh-h/h	0.63	ped-h/h	12.91	pers-h/h
Control Delay (Average)	20.7	sec	26.8	sec	21.0	sec
Control Delay (Worst Lane)	26.7	sec				
Control Delay (Worst Movement)	27.6	sec	29.3	sec	29.3	sec
Geometric Delay (Average)	2.4	sec				
Stop-Line Delay (Average)	18.4	sec				
Intersection Level of Service (LOS)	LOS C		LOS C			
95% Back of Queue - Vehicles (Worst Lane)	12.4	veh				
95% Back of Queue - Distance (Worst Lane)	90.6	m				
Total Effective Stops	1019	veh/h	74	ped/h	1602	pers/h
Effective Stop Rate	0.72	per veh	0.87	per ped	0.72	per pers
Proportion Queued	0.81		0.87		0.81	
Performance Index	50.4		1.8		52.2	
Travel Distance (Total)	861.3	veh-km/h	3.4	ped-km/h	1295.4	pers-km/h
Travel Distance (Average)	606	m	40	m	584	m
Travel Time (Total)	23.4	veh-h/h	1.4	ped-h/h	36.4	pers-h/h
Travel Time (Average)	59.2	sec	57.2	sec	59.1	sec
Travel Speed	36.9	km/h	2.5	km/h	35.6	km/h
Cost (Total)	783.50	$/h	22.70	$/h	806.20	$/h
Fuel Consumption (Total)	113.3	L/h				
Carbon Dioxide (Total)	283.8	kg/h				
Hydrocarbons (Total)	0.460	kg/h				
Carbon Monoxide (Total)	21.12	kg/h				
NOx (Total)	0.657	kg/h				

Level of Service (LOS) Method: Delay (HCM 2000).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: 2nd access PM 2017 base+974+1300+Industrial 4-way signals

2nd access and Myall St
2017 AM flows base+974+1300+Industrial signals
Signals - Fixed Time Cycle Time = 70 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Industrial Access											
1	L	35	10.0	0.076	18.6	LOS B	0.6	4.7	0.55	0.71	39.9
2	T	11	0.0	0.205	19.4	LOS B	2.3	17.7	0.77	0.61	35.7
3	R	81	10.0	0.205	27.6	LOS C	2.3	17.7	0.77	0.77	34.5
Approach		126	9.2	0.205	24.5	LOS C	2.3	17.7	0.71	0.74	35.9
East: Myall St towards Pac Hwy											
4	L	5	10.0	0.042	25.0	LOS C	0.5	3.7	0.69	0.80	37.1
5	T	291	5.0	0.211	17.6	LOS B	3.3	24.4	0.74	0.60	38.5
6	R	158	1.0	0.463	22.4	LOS C	3.1	22.1	0.89	0.79	37.1
Approach		454	3.7	0.463	19.4	LOS B	3.3	24.4	0.79	0.67	38.0
North: second access											
7	L	39	1.0	0.080	18.3	LOS B	0.7	4.9	0.55	0.71	39.9
8	T	5	0.0	0.046	18.1	LOS B	0.5	3.7	0.72	0.53	36.7
9	R	17	1.0	0.046	26.2	LOS C	0.5	3.7	0.72	0.72	35.3
Approach		61	0.9	0.080	20.5	LOS C	0.7	4.9	0.61	0.70	38.2
West: Myall St towards Hawks Nest											
10	L	68	1.0	0.140	25.2	LOS C	1.6	11.3	0.71	0.74	35.4
11	T	704	5.0	0.651	20.6	LOS C	12.4	90.6	0.87	0.75	36.4
12	R	7	10.0	0.015	18.5	LOS B	0.1	1.0	0.63	0.67	40.0
Approach		780	4.7	0.651	21.0	LOS C	12.4	90.6	0.85	0.74	36.3
All Vehicles		1421	4.6	0.651	20.7	LOS C	12.4	90.6	0.81	0.72	36.9

Level of Service (LOS) Method: Delay (HCM 2000).
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.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue		Prop. Queued	Effective Stop Rate
					Pedestrian	Distance		
		ped/h	sec		ped	m		per ped
P1	Across S approach	21	24.0	LOS C	0.0	0.0	0.83	0.83
P3	Across E approach	32	29.3	LOS C	0.1	0.1	0.91	0.91
P5	Across N approach	11	20.1	LOS C	0.0	0.0	0.76	0.76
P7	Across W approach	21	29.3	LOS C	0.0	0.0	0.91	0.91
All Pedestrians		85	26.8	LOS C			0.87	0.87

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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INTERSECTION SUMMARY

Site: AM 2017 base flows - Toonang + dev

Myall St and Toonang Road
2017 AM flows base plus full development
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1463	veh/h	2195	pers/h
Percent Heavy Vehicles	4.6	%		
Degree of Saturation	0.477			
Practical Spare Capacity	67.9	%		
Effective Intersection Capacity	3070	veh/h		
Control Delay (Total)	0.47	veh-h/h	0.71	pers-h/h
Control Delay (Average)	1.2	sec	1.2	sec
Control Delay (Worst Lane)	14.6	sec		
Control Delay (Worst Movement)	14.6	sec	14.6	sec
Geometric Delay (Average)	0.8	sec		
Stop-Line Delay (Average)	0.3	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	0.5	veh		
95% Back of Queue - Distance (Worst Lane)	3.8	m		
Total Effective Stops	120	veh/h	180	pers/h
Effective Stop Rate	0.08	per veh	0.08	per pers
Proportion Queued	0.04		0.04	
Performance Index	16.2		16.2	
Travel Distance (Total)	886.7	veh-km/h	1330.1	pers-km/h
Travel Distance (Average)	606	m	606	m
Travel Time (Total)	15.3	veh-h/h	22.9	pers-h/h
Travel Time (Average)	37.5	sec	37.5	sec
Travel Speed	58.1	km/h	58.1	km/h
Cost (Total)	519.19	$/h	519.19	$/h
Fuel Consumption (Total)	73.6	L/h		
Carbon Dioxide (Total)	184.4	kg/h		
Hydrocarbons (Total)	0.243	kg/h		
Carbon Monoxide (Total)	6.29	kg/h		
NOx (Total)	0.320	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: AM 2017 base flows - Toonang + dev

Myall St and Toonang Road
2017 AM flows base plus full development
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	900	5.0	0.477	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	26	1.0	0.030	10.4	LOS A	0.1	0.8	0.47	0.71	46.6
Approach		926	4.9	0.477	0.3	NA	0.1	0.8	0.01	0.02	59.5
North: Toonang Drive											
7	L	29	1.0	0.041	10.8	LOS A	0.1	1.0	0.46	0.73	46.2
9	R	61	1.0	0.141	14.6	LOS B	0.5	3.8	0.58	0.86	42.7
Approach		91	1.0	0.141	13.4	LOS A	0.5	3.8	0.54	0.82	43.8
West: Myall St towards Hawks Nest											
10	L	26	1.0	0.237	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
11	T	420	5.0	0.237	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		446	4.8	0.237	0.5	NA	0.0	0.0	0.00	0.06	59.2
All Vehicles		1463	4.6	0.477	1.2	NA	0.5	3.8	0.04	0.08	58.1

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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INTERSECTION SUMMARY

Site: PM 2017 base flows - Toonang + dev

Myall St and Toonang Road
2017 PM flows base plus full development
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1276	veh/h	1914	pers/h
Percent Heavy Vehicles	4.5	%		
Degree of Saturation	0.433			
Practical Spare Capacity	84.8	%		
Effective Intersection Capacity	2947	veh/h		
Control Delay (Total)	0.67	veh-h/h	1.00	pers-h/h
Control Delay (Average)	1.9	sec	1.9	sec
Control Delay (Worst Lane)	26.6	sec		
Control Delay (Worst Movement)	26.6	sec	26.6	sec
Geometric Delay (Average)	1.0	sec		
Stop-Line Delay (Average)	0.9	sec		
Intersection Level of Service (LOS)	NA			
95% Back of Queue - Vehicles (Worst Lane)	0.5	veh		
95% Back of Queue - Distance (Worst Lane)	3.6	m		
Total Effective Stops	146	veh/h	219	pers/h
Effective Stop Rate	0.11	per veh	0.11	per pers
Proportion Queued	0.07		0.07	
Performance Index	14.8		14.8	
Travel Distance (Total)	773.2	veh-km/h	1159.7	pers-km/h
Travel Distance (Average)	606	m	606	m
Travel Time (Total)	13.6	veh-h/h	20.3	pers-h/h
Travel Time (Average)	38.2	sec	38.2	sec
Travel Speed	57.0	km/h	57.0	km/h
Cost (Total)	460.75	$/h	460.75	$/h
Fuel Consumption (Total)	65.1	L/h		
Carbon Dioxide (Total)	163.0	kg/h		
Hydrocarbons (Total)	0.218	kg/h		
Carbon Monoxide (Total)	5.84	kg/h		
NOx (Total)	0.286	kg/h		

Level of Service (LOS) Method: Delay (RTA NSW).
NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: PM 2017 base flows - Toonang + dev

Myall St and Toonang Road
2017 PM flows base plus full development
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Myall St towards Pac Hwy											
5	T	342	5.0	0.181	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	58	1.0	0.119	14.7	LOS B	0.4	2.9	0.69	0.90	42.7
Approach		400	4.4	0.181	2.1	NA	0.4	2.9	0.10	0.13	56.7
North: Toonang Drive											
7	L	29	1.0	0.078	16.1	LOS B	0.2	1.8	0.70	0.90	41.6
9	R	29	1.0	0.153	26.6	LOS B	0.5	3.6	0.81	0.94	34.6
Approach		59	1.0	0.153	21.3	LOS B	0.5	3.6	0.76	0.92	37.8
West: Myall St towards Hawks Nest											
10	L	37	1.0	0.433	8.2	LOS A	0.0	0.0	0.00	1.06	49.0
11	T	780	5.0	0.433	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		817	4.8	0.433	0.4	NA	0.0	0.0	0.00	0.05	59.4
All Vehicles		1276	4.5	0.433	1.9	NA	0.5	3.6	0.07	0.11	57.0

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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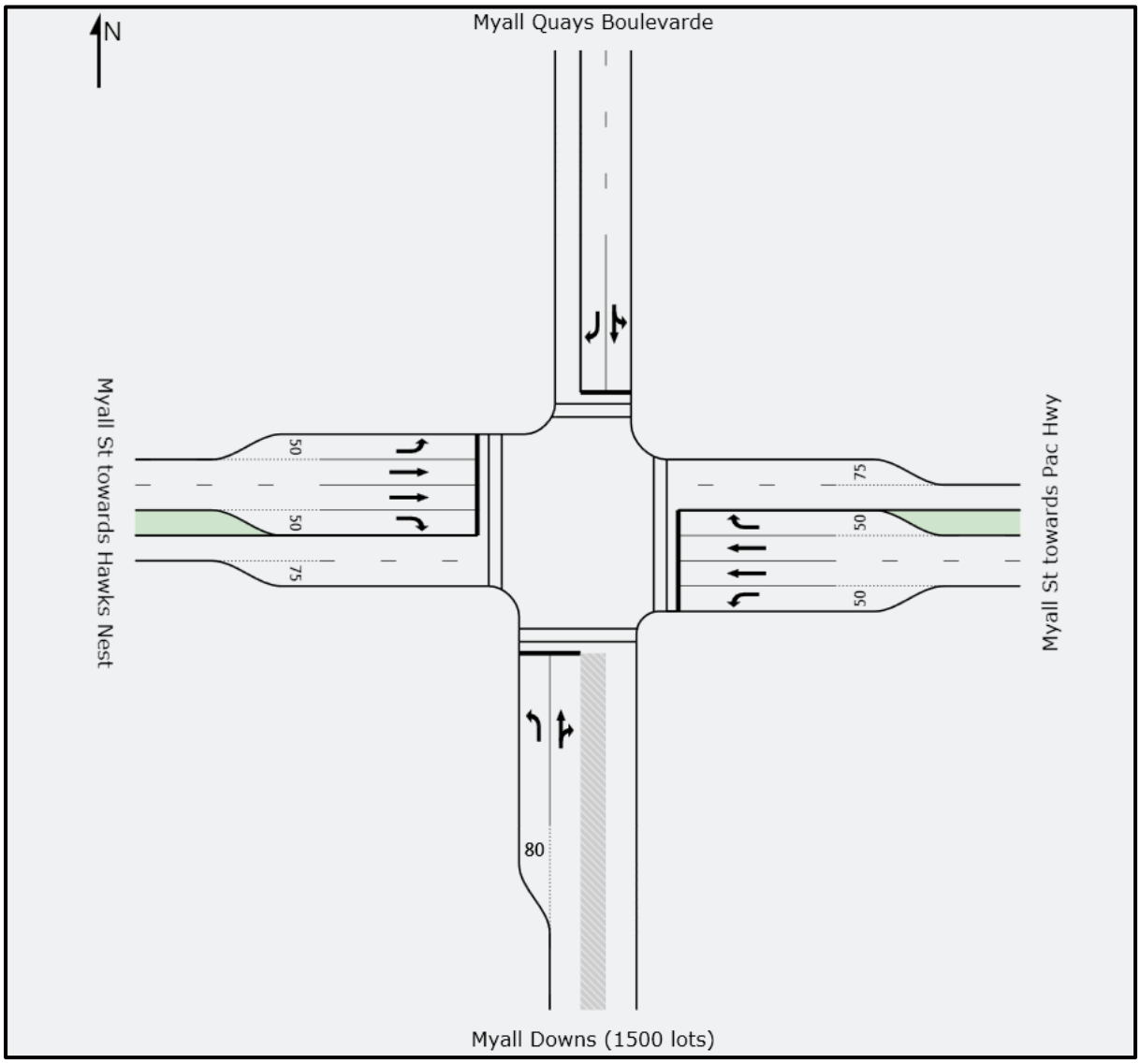
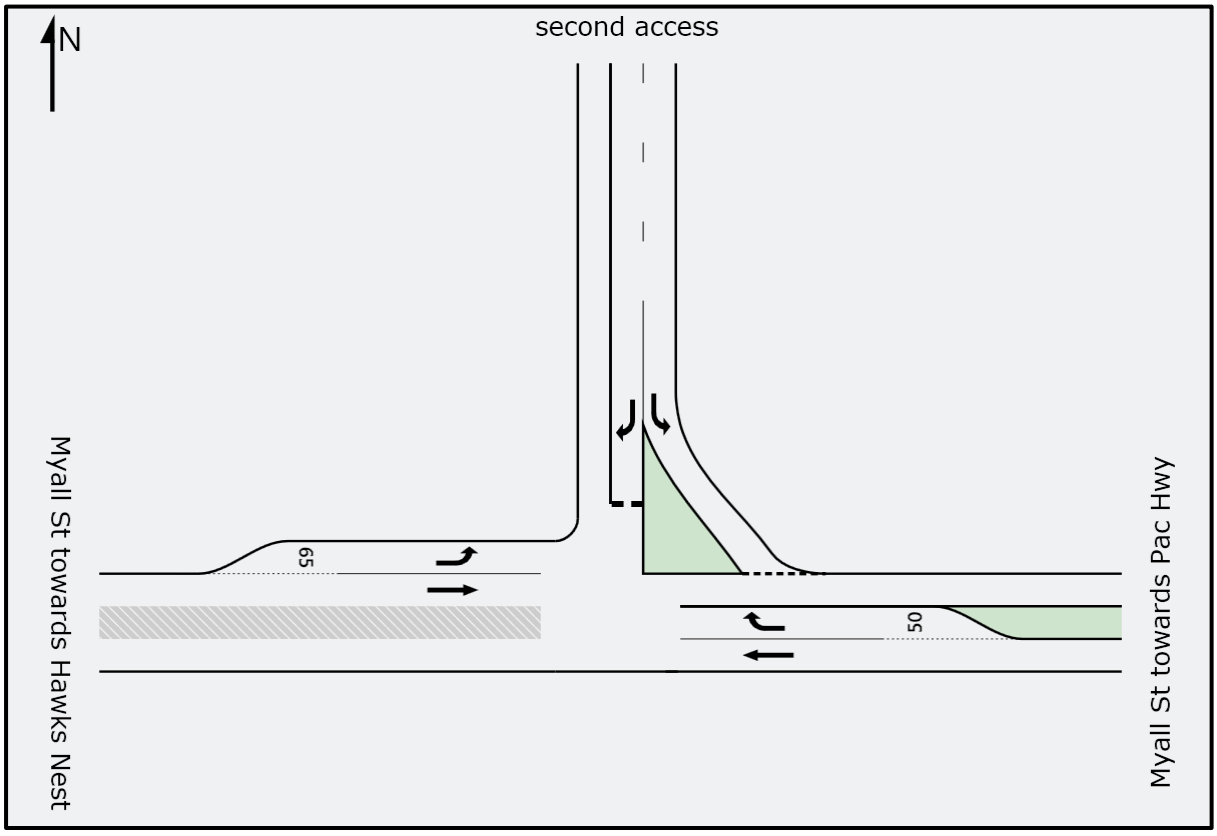
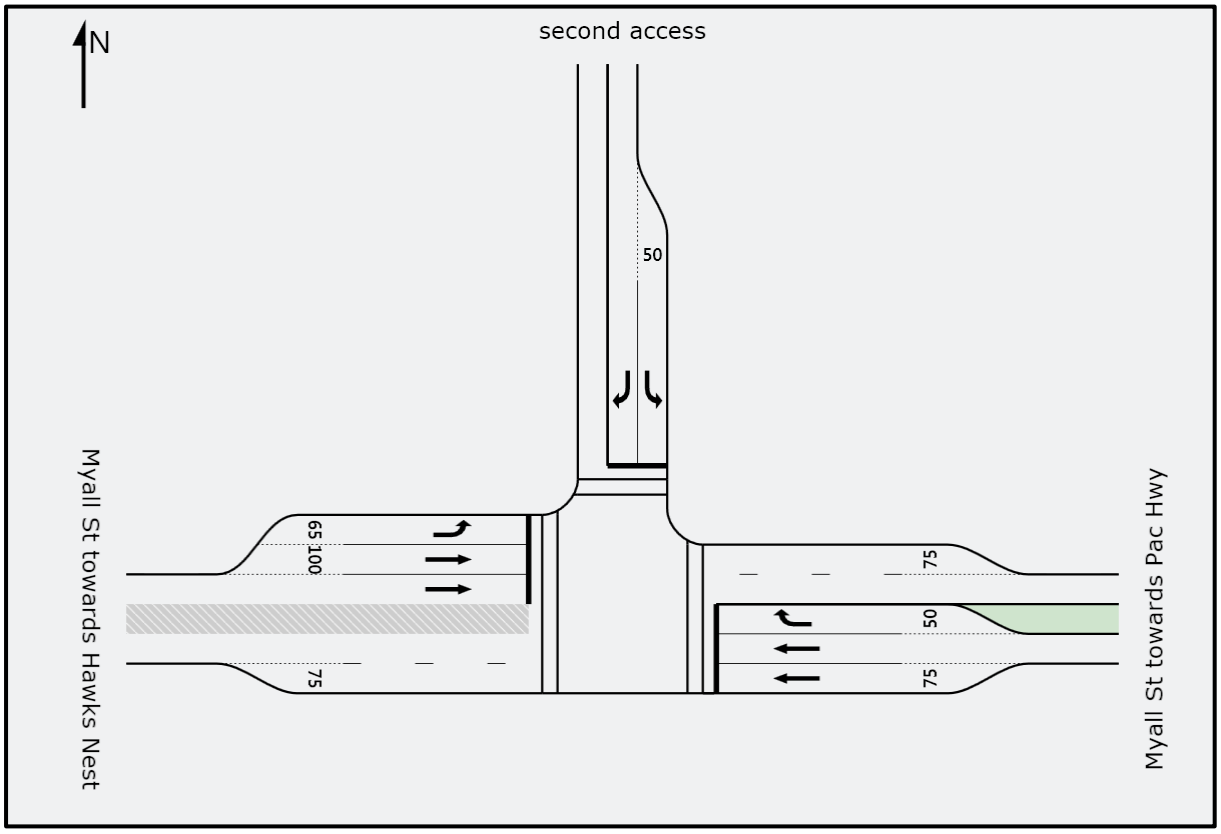
Appendix F Indicative Intersection Upgrades (Sidra outputs)



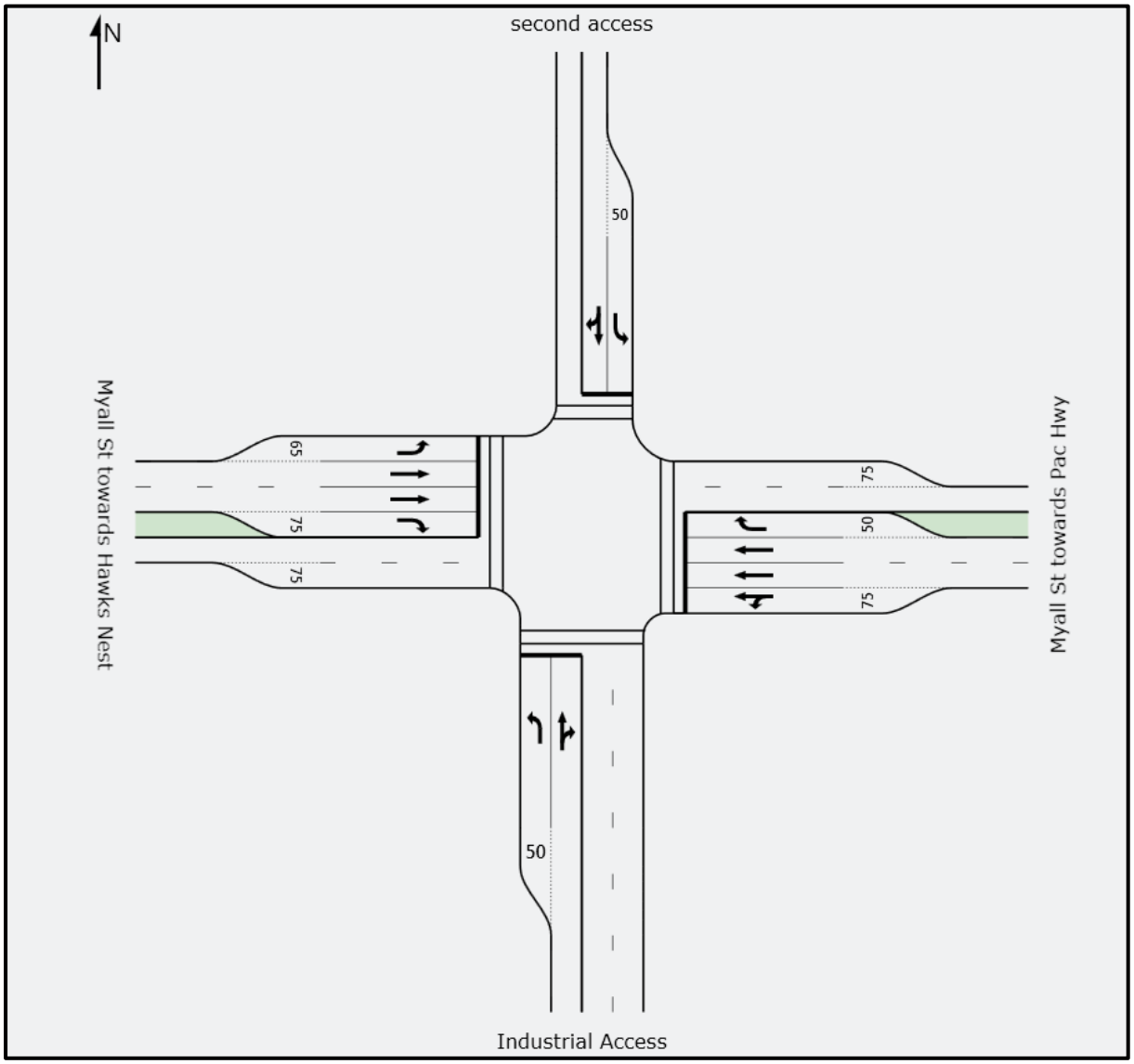
Upgrade of Myall Street and Myall Quays Boulevarde including 4th leg to access Myall Downs



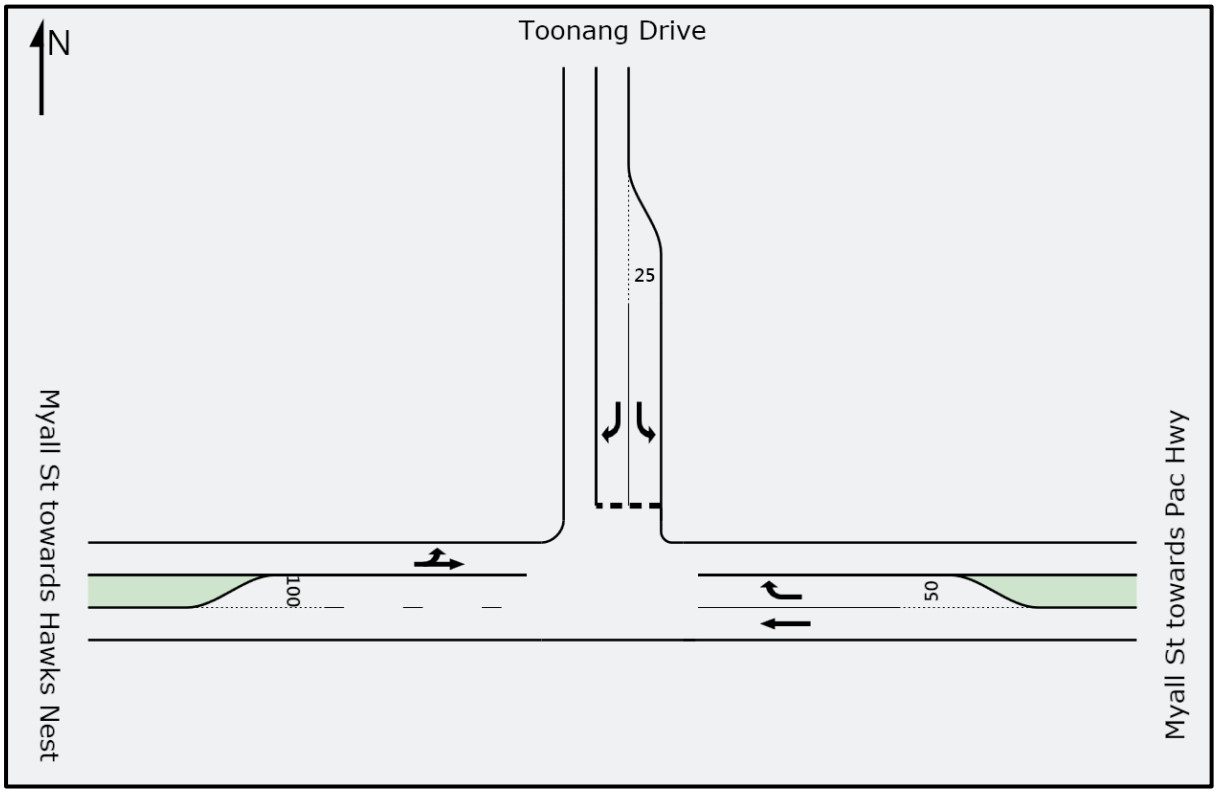
Second Access- Prior to development of Myall Downs



Interim Signal Control for 2nd Access on Myall Street (prior to development of Industrial Area)



4-way Signal Controlled Intersection of Myall Street, Second Access and Industrial Area Access



Upgrade of Toonang Drive to Seagull Type Intersection