Georges Cove Marina Residential Planning Proposal

Transport Planning Assessment Report

Prepared for Mirvac | 10 April 2018

Ground Floor, Suite 01, 20 Chandos Street
St Leonards, NSW, 2065

T +61 2 9493 9500
F +61 2 9493 9599
E info@emmconsulting.com.au

www.emmconsulting.com.au

Georges Cove Marina Residential Planning Proposal

Final

Report J16077 RPT2 | Prepared for Mirvac | 10 April 2018

Prepared by	**Dr Tim Brooker**	Approved by	**Allan Young**
Position	Associate – Transport Planner	Position	Planning Service Leader
Signature		Signature	
Date	10 April 2018	Date	10 April 2018

Document Control

Version	Date	Prepared by	Reviewed by
v1	30 January 2018	Tim Brooker	Allan Young
V2	13 February 2018	Tim Brooker	Allan Young
V3	10 April 2018	Tim Brooker	Allan Young

T +61 (0)2 9493 9500 | F +61 (0)2 9493 9599

Ground Floor | Suite 01 | 20 Chandos Street | St Leonards | New South Wales | 2065 | Australia

www.emmconsulting.com.au

Table of contents

Table of contents *(Cont'd)*

Appendices

Tables

Figures

1 Introduction

1.1 Overview

This transport planning assessment report has been prepared by EMM Consulting Pty Limited (EMM) for Mirvac Homes (NSW) Pty Ltd to review the transport and access impacts of a planning proposal to include 374 dwellings within the Georges Cove Marina development (353 apartments and 21 terraces) as an additional permitted use on this site. The new residential development will primarily be constructed in lieu of sections of the previously proposed marina commercial premises (with reductions in the floor areas for the marina commercial uses) at part of the subject land which is Lot 7 DP 1065574, 146 Newbridge Road, Moorebank (the site).

This Transport Planning Assessment Report considers the impacts of the additional future traffic generated by the additional permitted use, the subject of the planning proposal, in comparison to the future marina commercial and recreational development and incorporates consideration of the future traffic changes from the other known proposed or approved developments in the Moorebank East locality which are shown in Figure 1.1.

This report also responds to the traffic related submissions from the NSW Government Transport Agencies (letter from RMS dated 14 June 2017 and letter from Transport for NSW dated 9 May 2017), although it should be noted that these submissions relate to an earlier planning proposal for 108 apartments and 17 terraces at the marina site (125 dwellings in total).

The following known proposed, approved or completed developments are included in the future adjusted baseline traffic volumes for the two intersections on Brickmakers Drive at Newbridge Road and the proposed Link Road, on which the planning proposal traffic analysis in this report is based:

- The completion in October 2016 of the Georges Fair residential estate with over 1,000 dwellings;
- The future completion of the approved Brighton Lakes residential estate (310 dwellings) and clubhouse redevelopment;
- The commencement of traffic operations for the approved Moorebank Recyclers development
- The future Georges Cove Marina (as assessed by the EMM transport planning report in July 2015);
- The proposed Moorebank Cove Residential Estate (179 dwellings), and
- The proposed new mixed use commercial (7,310 sq m GFA) and residential (171 dwellings) development on the Benedict-owned B6 Enterprise Corridor zoned land fronting Newbridge Road.

The future adjusted baseline traffic volumes in this report do not included the future potential traffic from any higher density residential developments proposal on the Plant Nursery B6 land (Figure 1.1), as that land can potentially utilise other vehicle access routes via Davy Robinson Drive or Newbridge Road.

In this transport planning assessment report, the updated traffic impact analysis for the potential marina residential development is based on the most recent 2016 locality traffic volume surveys and the Benedict B6 land development traffic volumes documented in the Ason traffic impact assessment report (Ason, 2017), which was prepared in October 2017. The Benedict B6 land (Figure 1.1) is also part of the same subject land, Lot 7 DP 1065574, 146 Newbridge Road, Moorebank as the future Georges Cove Marina and Moorebank Cove residential estate.

\\emmsvr1\EMM\Jobs\2017\J17045 - Georges Cove Marina advice\GIS\02_Maps\T002_Developments_20171116_01.mxd 16/11/2017

Source: EMM (2017); DFSI (2017); MFA (2015); DPE (2015)

0 250 500 m

GDA 1994 MGA Zone 56

KEY

Proposed and approved developments

- Future residential
- Benedict B6 land
- Plant nursery B6 land
- Marina site (investigation site boundary)

Existing environment

- Cadastral boundary
- Motorway
- Arterial road (RMS)
- Regional road (RMS)
- Other road

Proposed and approved developments in the locality

Morebank Cove residential estate and proposed marina residential uses

Addendum traffic report

Figure 1.1

EMM

This transport planning assessment report and its access recommendations for the subject land should be read in conjunction with the related traffic study analysis and future access recommendations which are contained in the Ason traffic report (Ason, 2017) for the Benedict B6 Enterprise Corridor land.

1.2 Assessment scope for RMS and TfNSW requirements

The traffic impacts analysis in this transport planning report responds to the requests for further information in the letter from RMS dated 14 June 2017 and the letter from Transport for NSW (TfNSW) dated 9 May 2017, as follows. The letters are included in Appendix A.

The key items of additional traffic information which have been requested by RMS and TfNSW in these submissions are as follows:

Traffic volume considerations

- TfNSW recommends that this traffic study should take into consideration the cumulative traffic impact from the adjoining properties including but not limited to the Mirvac residential estate (Moorebank Cove), potential redevelopment of the plant nursery site and the proposed recycling facilities.

- TfNSW recommends the use of updated survey data (as opposed to 2013 data used in previous traffic reports) on the traffic volumes of Brickmakers Drive to account for the largely completed Georges Fair development.

Intersection modelling

- The proposed traffic signals at Brickmakers Drive/Link Road intersection should be modelled in conjunction with Newbridge Road/Governor Macquarie Drive/Brickmakers Drive intersection by using SIDRA 7.

- A 140 seconds cycle time should be used in these models.

- An updated electronic copy of the SIDRA models should be provided to the Council.

Intersection layout design

- Council prefers two through traffic lanes with a right turn lane provided on the southern approach of the proposed signalised intersection. A design plan with the associated turning path should be provided to Council.

- If the preferred design is not provided, the developer should submit justifications to Council, demonstrating why the preferred design is not achievable.

Public Transport Access

- TfNSW recommends that a 3.0 metre wide pedestrian and cycle path between Brickmakers Drive and Newbridge Road be provided to connect the development enabled by the planning proposal to public transport on Newbridge Road.

1.3 Liverpool City Council requirements

The proposed local road network within the 146 Newbridge Road site is specified in general terms by the Liverpool City Council *Moorebank East Development Control Plan* 2008 (Clause 2.10) which is shown in Figure 1.2. An updated traffic signal warrant assessment report has also been requested by Liverpool City Council for the proposed Brickmakers Drive/Link Road intersection traffic signals using the standard RMS template.

The previous traffic signal warrant report which was prepared by EMM for the proposed traffic signals at this location in June 2016 identified that due to the current high imbalance between the peak hour northbound and southbound traffic flows at this location on Brickmakers Drive (which is expected to continue with the additional traffic from future developments in the Moorebank East DCP area) it will be very difficult for the future traffic volumes using Brickmakers Drive in both directions to meet the formal RMS warrant requirement for installing traffic signals at the Brickmakers Drive/Link Road intersection.

However, the future traffic volumes using Brickmakers Drive would meet the RMS traffic signal warrant requirement if the averages of the peak hourly northbound and southbound traffic flows were considered instead of the actual peak directional traffic flows.

In practice the gaps in the peak hour two-way traffic flow on a major local "distributor" road such as Brickmakers Drive will determine the traffic capacity for unsignalised right turn access from other collector roads such as the proposed Link Road. These gaps are independent of the actual direction in which the Brickmakers Drive traffic flow is occurring, so the need for the traffic signals is really determined by the total two way traffic flow on Brickmakers Drive, regardless of the directions in which traffic is actually travelling.

It was also identified in the EMM traffic reports for both the future Georges Cove Marina (EMM, 2015) and the proposed Moorebank Cove residential estate (EMM, 2016) that the proposed future traffic signals at the Brickmakers Drive/Link Road intersection were generally necessary for the following reasons, independently of the RMS traffic signal warrant analysis:

- Initial SIDRA intersection analysis showed either Level of Service E or F for the future intersection operations with an unsignalised intersection using either give way or stop signs;
- The adjoining land ownership constraints prevent any alternative roundabout design being constructed at this location, which could accommodate the required large trucks travelling from the Moorebank Recyclers site, and
- There is no continuous footpath along the eastern side of Brickmakers Drive, so pedestrians cannot safely walk along the eastern side of Brickmakers Drive to reach another safer location to cross the road, so the traffic signals are required at the Link Road intersection to provide a minimum safe pedestrian crossing facility for pedestrians from the Link Road, which is a primary pedestrian access route for the future residential and other developments in the Moorebank East DCP area.

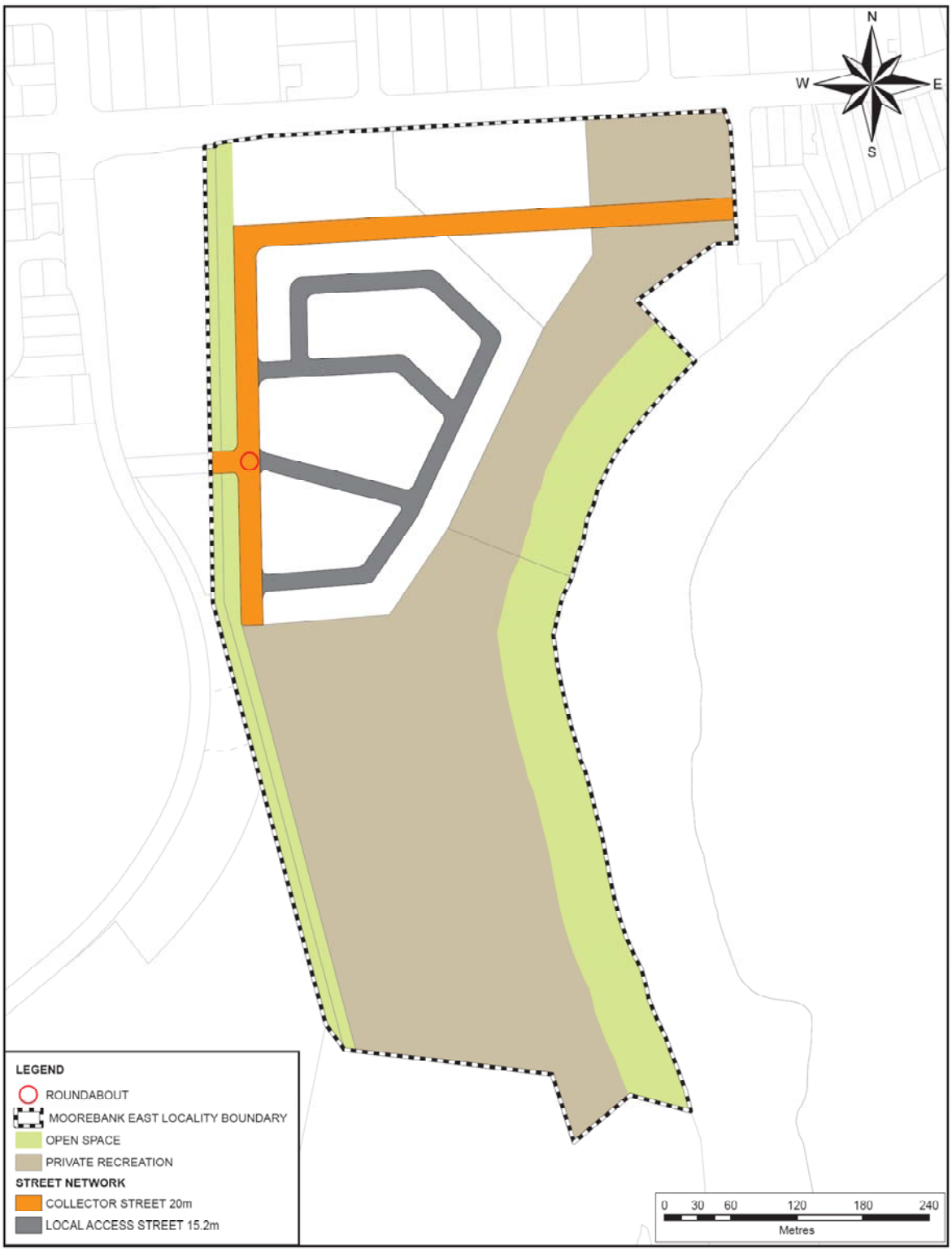


Figure 1.2 Liverpool Moorebank East DCP extract showing the future local road network

1.4 Details of the development traffic impact scenarios considered

This transport planning report reviews the future effect of the development which would be enabled by the planning proposal on the locality traffic during weekdays for the main morning and afternoon commuter peak traffic hours on Brickmakers Drive and Newbridge Road, in combination with the traffic from other known or approved developments in the locality in the following future cumulative development traffic impact scenarios:

- The future baseline development traffic (from Ason, 2017) which includes:
    - existing (2016) base traffic volumes using Brickmakers Drive and Newbridge Road;
    - future locality traffic growth from the completion of the Georges Fair and Brighton Lakes developments;
    - The future Georges Cove Marina (as assessed by the EMM transport planning report in July 2015);
    - traffic growth from the approved Moorebank Recyclers Development;
    - traffic growth from the low density Moorebank Cove Residential Estate (conservatively assumed by Ason to be 190 rather than 179 dwellings), and
    - Benedict B6 development traffic volumes (as identified by Ason, 2017) for traffic generated by proposed seniors housing and other residential development totalling 171 dwellings, and commercial and retail development totalling 7,310 sq m GLFA.
- These future baseline traffic volumes are then assessed with the marina residential planning proposal traffic including corresponding reductions in the future commercial floor areas at the marina as follows:
    - 374 residential dwellings comprising 353 apartments and 21 terraces;
    - a reduction in the marina commercial floor areas from 4,938 sq m to 1,243 sq m; and
    - the removal of the boat sales showrooms and boat repair workshops.

This report also reviews the future pedestrian, cycleway and public transport access requirements for the new marina planning proposal residential units and 179 dwelling residential estate including the potential daytime visitor access requirements to public parkland and the Georges River foreshore by considering:

- The requirements for through-site pedestrian and cycleway access;
- The use of the M90 bus route as the primary public transport route serving the area; and
- The influence of public transport accessibility on vehicle traffic generation rates for residential and other traffic.

2 Existing traffic conditions

2.1 Location

The planning proposal sites and the related development sites which are also considered by this transport planning report are shown on Figure 1.1. These sites will all primarily utilise vehicle access via Brickmakers Drive and the new Link Road but will also potentially utilise Newbridge Road for some stages of their development, primarily for some construction stage access, via the existing driveway on Newbridge Road.

The location of the new Link Road traffic signal controlled intersection with Brickmakers Drive is approximately 300 m south of Newbridge Road, which provides approximately 300 m future separation distance for traffic queuing on Brickmakers Drive, between the two traffic signal controlled intersections.

2.2 Site access

The former Benedict industrial operations on the subject land have historically been accessed by vehicle traffic directly from Newbridge Road. The continuing use of this vehicular access will generally only be required for the construction stage access for the Moorebank Cove residential estate (179 dwellings), the future Georges Cove Marina development, and the potential additional 374 dwellings which are the subject of this report.

The future operational stage access for all these developments would use the new vehicular access which has been approved to be constructed: via Brickmakers Drive and the new Link Road. However in the traffic report for the current planning proposal for the Benedict B6 land development (Ason, 2017) some continuing future use of the Newbridge Road access is also proposed for the longer term operational access.

2.3 Road network

The major roads and the planned local roads which provide access to the subject land are shown in Figure 1.1 and Figure 1.2. The wider local area network includes a number of other major roads such as the M5 Motorway, Governor Macquarie Drive, Nuwarra Road, Heathcote Road and Henry Lawson Drive.

This transport planning report primarily assesses the effects of the additional Moorebank East locality development traffic on the main access route via the two intersections at Brickmakers Drive/Link Road and Newbridge Road/Governor Macquarie Drive/Brickmakers Drive.

The M5 West Motorway between Heathcote Road and King Georges Road now has significantly improved traffic carrying capacity, since the Motorway widening was completed in December 2014. There have been some corresponding traffic reductions since 2015 on Newbridge Road and the other parallel east-west traffic routes through the Moorebank East locality.

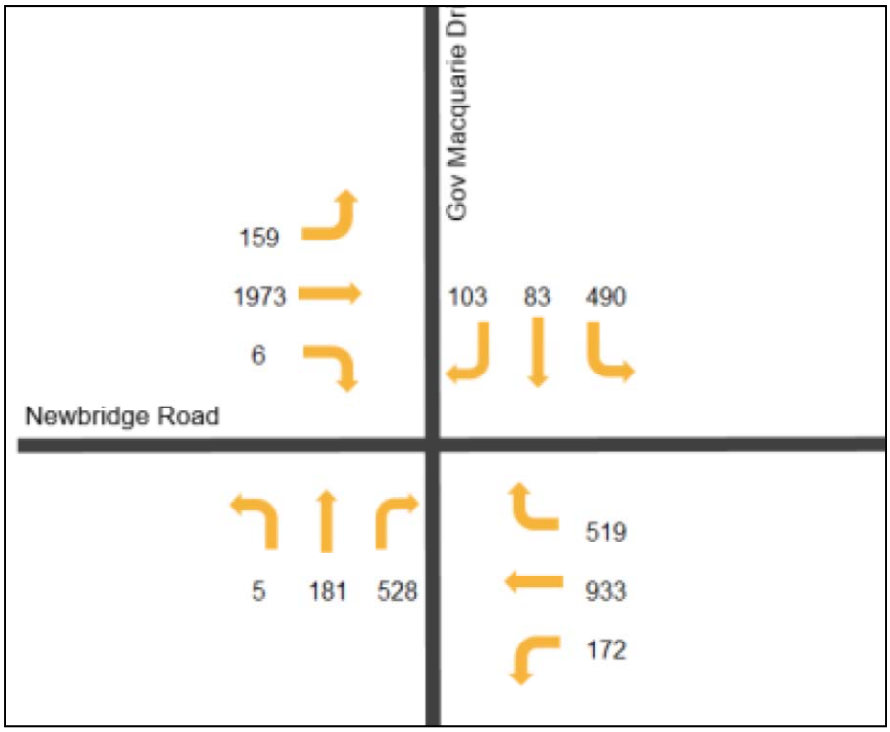
Newbridge Road is generally at least six lanes wide with a minimum of three traffic lanes in each direction and has additional turning traffic lanes at the major intersections. Brickmakers Drive has four traffic lanes at the intersection with Newbridge Road, but this reduces to three lanes potentially near the proposed Link Road intersection (where the two marked lanes with wide sealed shoulders can provide one additional traffic lane if required). Further to the south, Brickmakers Drive has a series of traffic management devices and roundabouts which have been installed to control traffic speeds and physically restrict the use of the route by larger trucks or articulated semi-trailers.

2.4 Traffic volumes

The existing peak hourly traffic volumes for Newbridge Road and Brickmakers Drive were determined by the peak hourly intersection counts undertaken for the Ason traffic report in 2016.

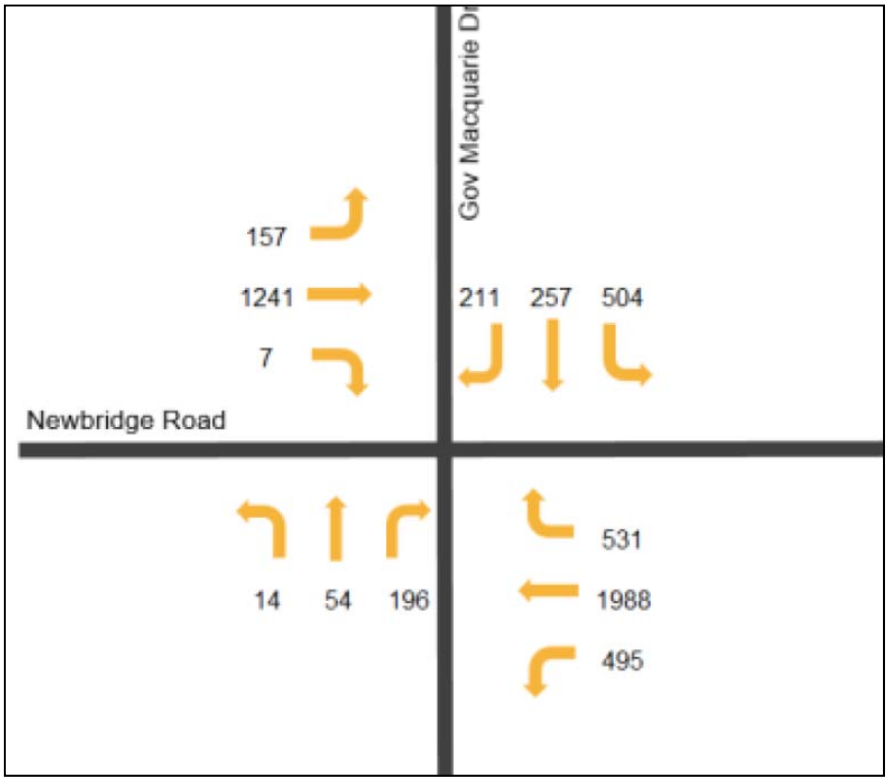
These morning and afternoon peak hour traffic counts are shown in Figure 2.1 and Figure 2.2 below. The corresponding peak hourly two way traffic flows for Brickmakers Drive at the northern end near Newbridge Road are as follows:

- Morning peak hour volumes using Brickmakers Drive
    - 714 vehicles per hour northbound, and
    - 261 vehicles per hour southbound.
- Afternoon peak hour volumes using Brickmakers Drive
    - 264 vehicles per hour northbound, and
    - 759 vehicles per hour southbound.



Source: Ason (2017)

Figure 2.1 Existing morning peak hour volumes using Newbridge Road at Brickmakers Drive



Source: Ason (2017)

Figure 2.2 Existing afternoon peak hour volumes using Newbridge Road at Brickmakers Drive

2.5 Existing Intersection Performance

From the other recent development traffic studies for the Moorebank East area which were prepared during 2011 and 2014 for the Mirvac Brighton Lakes developments (GHD, 2011 and GHD, 2014) it was concluded that the Newbridge Road/Governor Macquarie Drive/Brickmakers Drive intersection was operating with congested peak hour traffic conditions which were recorded or predicted to be either peak hour Level of Service E or F during both the morning and afternoon traffic peak hours.

However more recently, as a result of the M5 West Motorway widening which was completed in December 2014, the most recent existing situation SIDRA intersection analysis which has been undertaken by the Benedict B6 Traffic Report (Ason, 2017), indicates there has been some recent improvement in the peak hour operating traffic conditions at the intersection, to Level of Service C or D.

The existing situation SIDRA intersection analysis results from the Ason report are included in Appendix B of this report for the intersection operating as a "stand alone" isolated intersection, which is a reasonable operating assumption for the existing traffic situation analysis, as the maximum intersection traffic queue lengths were less than 400 m and would not generally have affected the operations of any other nearby traffic signal controlled intersection.

The RMS SIDRA intersection Level of Service (LOS) vs delay standards for traffic signal controlled intersections which are specified in the RTA-RMS Guide to Traffic Generating Developments (RTA 2002) are summarised in Table 2.1. In addition to LOS, the existing operation of the intersection is also described in terms of the following factors:

- Degree of Saturation (DOS) which is the ratio of the traffic volume to the capacity of the intersection;
- the Average Vehicle Delay (AVD) in seconds per vehicle for all traffic movements at the intersection; and
- the length of the maximum traffic queue (95th percentile traffic queue) for any traffic movement at the intersection.

Table 2.1 Intersection Level of Service definitions (RTA/RMS)

Description	LOS (RMS definition)	Average Vehicle Delay (s)
Very Good	A	<14.5
Good	B	14.5 to ≤28.5
Satisfactory	C	28.5 to ≤42.5
Near Capacity	D	42.5 to ≤56.5
At Capacity	E	56.5 to ≤70.5
Over Capacity	F	≥70.5

The SIDRA intersection results for the existing traffic situation at the Newbridge Road/Governor Macquarie Drive/ Brickmakers Drive intersection which were determined by the Ason traffic report (Ason 2017) are summarised in Table 2.2. The existing intersection is operating in the near capacity (LOS D) or satisfactory (LOS C) congestion ranges during the morning and afternoon peak traffic hours. This shows the intersection has some spare traffic capacity to accommodate additional peak hour traffic growth from new residential and other developments in the Moorebank East locality as is assessed in this report.

Table 2.2 Existing Newbridge Road and Brickmakers Drive intersection performance

Peak hour and traffic scenario analysed	Operation	Intersection performance
Existing surveyed traffic	DOS	0.904
	LOS	D
Weekday am peak hour	Average delay	52.5 s
(8.00 to 9.00 am)	Maximum queue length (approach)	383 m (Newbridge Road west)
Existing surveyed traffic	DOS	0.900
	LOS	C
Weekday pm peak hour	Average delay	36.3 s
(4.00 to 5.00 pm)	Maximum queue length (approach)	284 m (Newbridge Road east)

No existing situation intersection capacity analysis has been undertaken for the Brickmakers Drive and Link Road intersection as there are no existing turning traffic volumes to consider in an intersection capacity analysis.

2.6 Car parking

On-street car parking is generally not permitted on most of the major roads in the locality such as Newbridge Road, Nuwarra Road or on Brickmakers Drive due to the peak hour traffic capacity requirements for these roads. However, some on-street parking is permitted along a short 100 m length

on the western side of Brickmakers Drive, between approximately 150 to 250 m south of the Newbridge Road intersection. From direct observations, this on-street parking is rarely used.

2.7 Pedestrian and cycling access

Brickmakers Drive only has continuous pedestrian footpaths along the western side, north of the proposed Link Road intersection. On the eastern side, pedestrian and cycling access is only generally feasible to the Georges River foreshore in the Moorebank East locality from Davy Robinson Drive currently.

2.8 Public transport access and services

The East Moorebank area near Newbridge Road is currently well serviced by public transport, in particular by the M90 high frequency bus route. This route provides the main connection by public transport from the Newbridge Road area to other connecting bus services and train services at the Liverpool, Bankstown and Burwood rail stations.

The most accessible eastbound and westbound bus stops to the site are located on Newbridge Road, about 100 m west of the Brickmakers Drive intersection. There are also other eastbound and westbound bus stops located on Newbridge Road near the Plant Nursery, approximately 400 m east of the Brickmakers Drive intersection, but there are no facilities for pedestrians to cross Newbridge Road there.

As the walking distances from future residential development on the Georges Cove Marina site will be generally further than the optimum (up to 400 metres) walking distance for easy and convenient access to bus services, this accessibility constraint should be reflected in the assumed future traffic generation rates for residential development on the site which will be more consistent with the traditional RTA/RMS Guide (2002) traffic generation rates for medium density residential development, than other more recently published RMS (2013) rates for higher density residential development, which would not be generally applicable in this locality.

2.9 Other developments in the locality

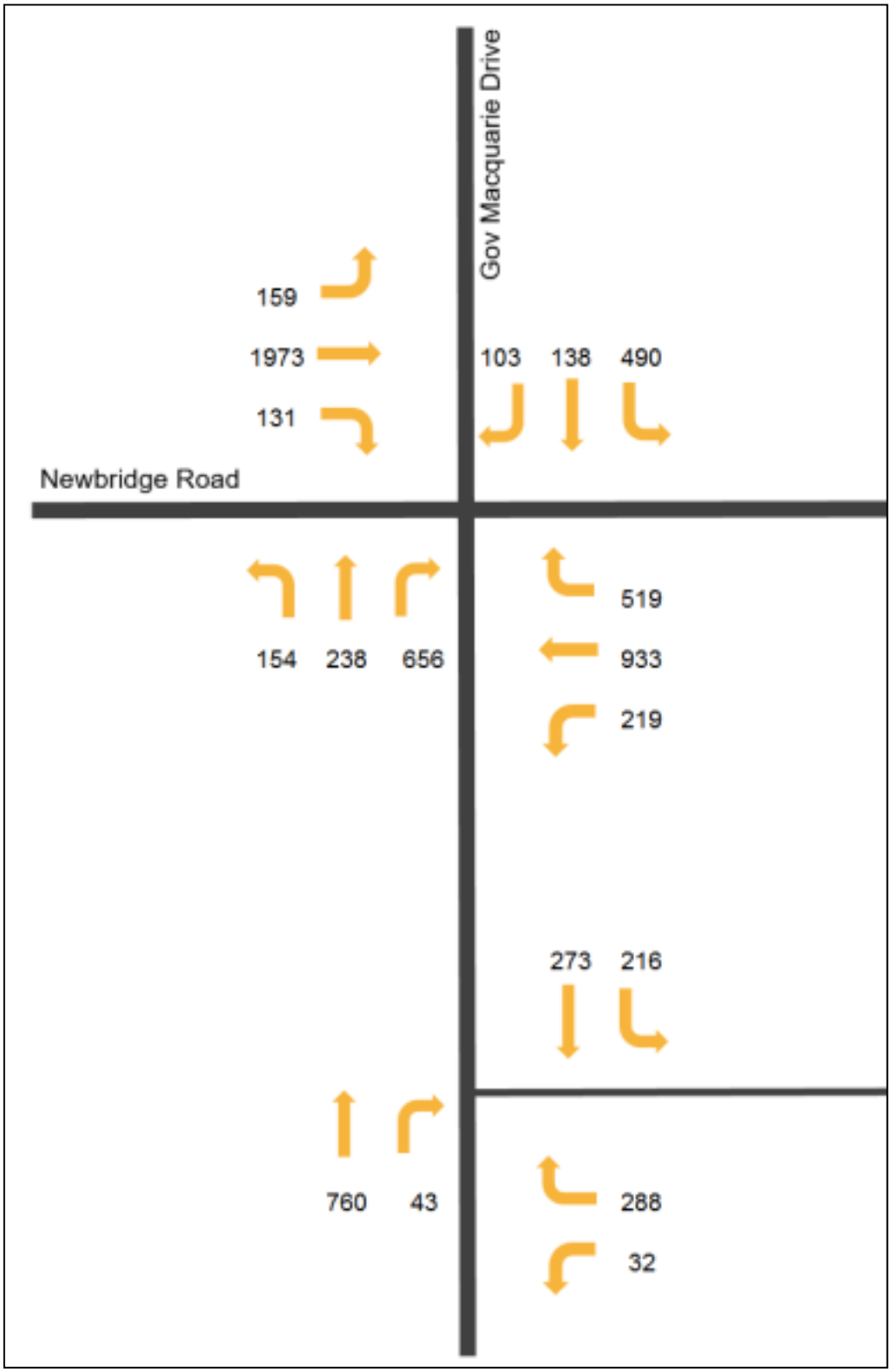
As has been noted in the introduction (Section 1.1), in addition to the Georges Cove marina planning proposal for residential development, a number of other known and approved developments in the Moorebank East locality are considered in this transport planning assessment report. These developments are:

- The completion in October 2016 of the Georges Fair residential estate with over 1,000 dwellings;
- The future completion of the approved Brighton Lakes residential estate (310 dwellings) and clubhouse redevelopment;
- The future Georges Cove Marina Development (as assessed by the EMM transport planning report in July 2015);
- The commencement of traffic operations for the approved Moorebank Recyclers development south of the proposed Georges Cove Marina (which generates mainly truck traffic);
- The proposed new mixed use commercial (7,310 sqm GFA) and residential (171 dwellings) developments on the B6 Enterprise Corridor zoned land which is owned by Benedict and has frontage to Newbridge Road, and.

- The proposed Moorebank Cove Residential Estate (179 dwellings).

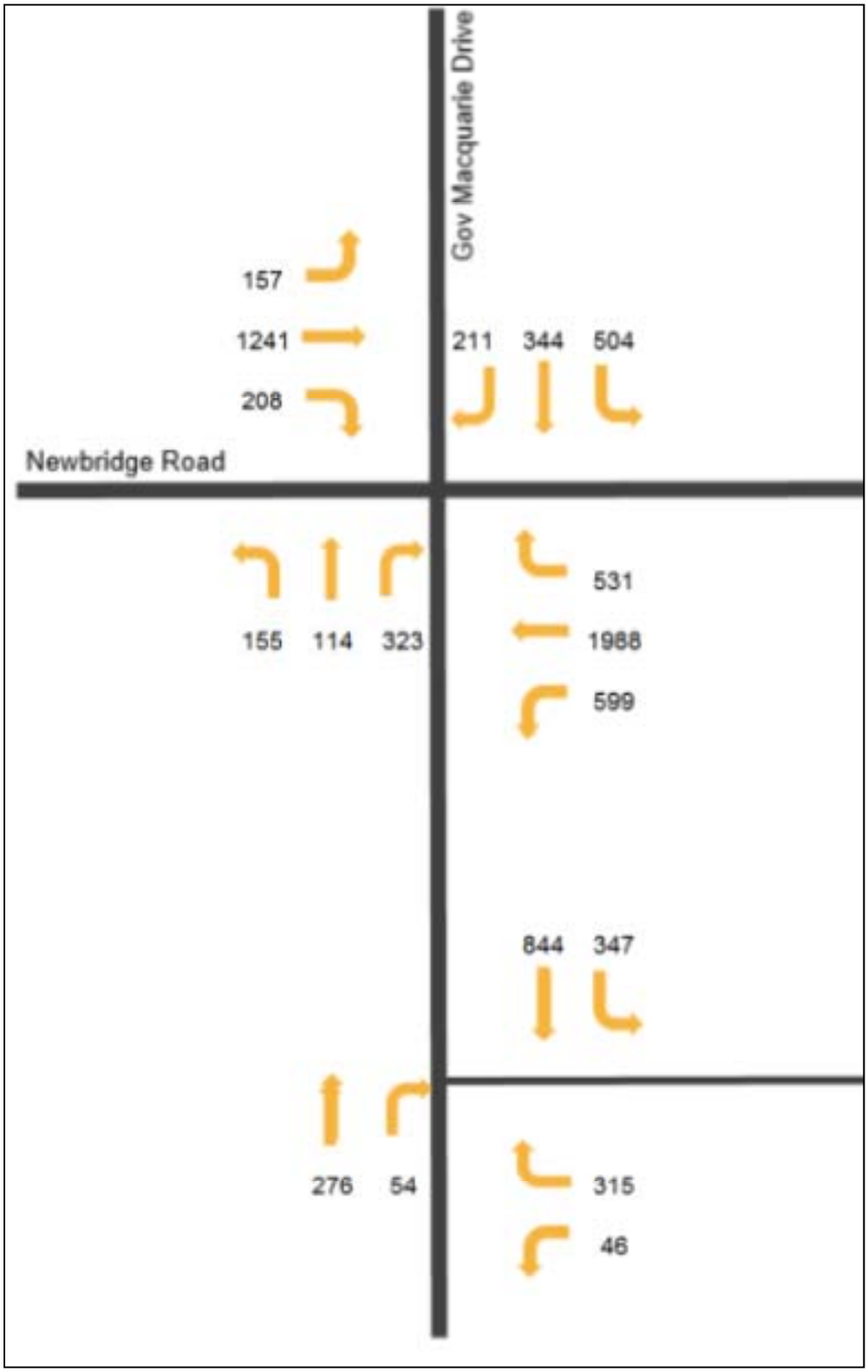
The estimated future peak hourly baseline traffic movements from all these developments (*except for the future Marina residential apartments with reduced commercial uses which is the subject of this planning proposal*) have been determined by (Ason, 2017) from the respective development application and planning proposal traffic reports for each development.

The future baseline traffic flows within the locality including these developments (but *excluding the future Marina residential traffic associated with this planning proposal*) are summarised in Figures 2.3 and 2.4.



Source: Ason (2017)

Figure 2.3 Future adjusted baseline morning peak hour traffic flows



Source: Ason (2017)

Figure 2.4 Future adjusted baseline afternoon peak hour traffic flows

3 Planning proposal

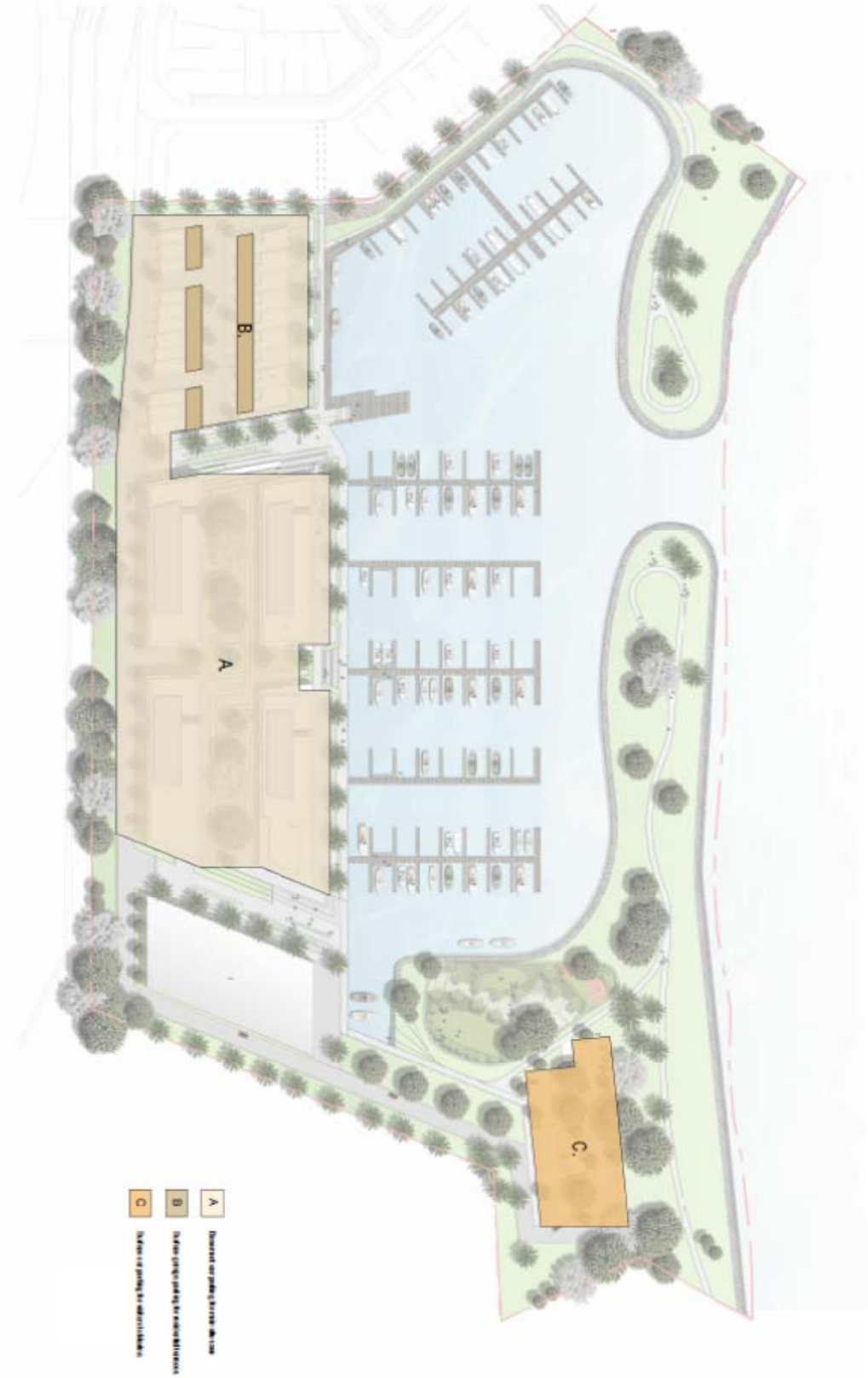
3.1 Site layout and DCP road network

The local road and footpath/cycleway network within and through the future Georges Cove Marina site are shown in Figure 3.1. The vehicle access to the main basement car parking area will be via driveways on the western and southern sides of the building. The proposed site car parking areas are shown in Figure 3.2.

The proposed local road layout for the future Georges Cove Marina continues on from the recommended DCP road layout, extending the 'collector street' south from the alignment which is shown in Figure 1.2. Minor changes to the other DCP recommended local road layout in Figure 1.2 are also proposed as part of the adjacent Moorebank Cove residential estate.

Source: Mirvac

Figure 3.1 Proposed site building layout plan



Source: Mirvac

Figure 3.2 Proposed location of car parking areas

The proposed changes to the DCP recommended local road layout are addressed in more detail in the Moorebank Cove Residential Estate Addendum Traffic Report (November 2017), as these are more closely related to that proposal. However, the principal changes relevant to the marina development are as follows:

- A three-way intersection is proposed by Mirvac at the eastern end of the Link Road Bridge instead of a four-way intersection.

- The main site 'collector road' along the western site boundary is proposed to be modified to accommodate a 3 metre wide service road along the drainage easement at the lower level and the angled face of the retaining wall between the two levels. This additional requirement changes the standard 20 metre wide DCP corridor road cross section to the following configuration:

    - 3.0 m wide service road easement at the lower level;
    - 1.0 m wide angled face and top of retaining wall including guardrail;
    - 2.5 m wide parking lane along the western side of the roadway;
    - 3.5 m wide travel lane in the northbound direction;
    - 3.5 m wide travel lane in the southbound direction;
    - 2.5 m wide parking lane along the eastern side of the roadway; and
    - 4.0 m wide verge including cycleway/footpath along the eastern side of the roadway.

3.2 Link road and access intersection to Brickmakers Drive

The proposed intersection design for the Link Road intersection on Brickmakers Drive includes provision for traffic signals. The locations of the traffic signal posts, the intersection signage and line markings will be determined as part of detailed design of the intersection.

The future performance of the intersection including traffic signals has been assessed in this report for both the future locality baseline traffic and the future predicted total traffic (*including the marina residential planning proposal*) traffic scenarios, as defined in Section 1.4. For both these traffic scenarios, the combined future peak hourly traffic movements which would be generated at the Brickmakers Drive/Link Road intersection and the Newbridge Road/Governor Macquarie Drive/Brickmakers Drive intersection have been assessed using the SIDRA 7 linked intersection model with a 140 second cycle time for both intersections, as has been requested by the RMS submission in Section 1.2. The full submission is included in Appendix A.

3.3 Collector road intersection

The main new 'collector road' intersection, via which all the future Georges Cove Marina site traffic will access the new Link Road and Brickmakers Drive is now proposed to be a three way T-intersection instead of the four way roundabout which is shown in the DCP road network, Figure 1.2.

The future operating performance for this intersection has been assessed in more detail in the Moorebank Cove Residential Estate Addendum Traffic Report (November 2017), for both roundabout and T-Intersection operations, using the SIDRA 7 intersection model. The analysis has shown the proposed intersection operating as either a roundabout or a T-intersection has adequate traffic capacity for the

future total traffic generated by all the assessed locality developments (*including the future residential apartments and terraces in the Georges Cove marina which would be enabled by this planning proposal*).

3.4 Pedestrian and cycling access

The proposed future pedestrian and cycleway routes for access through and within the future Georges Cove Marina development (including proposed residential sections) are shown on Figure 3.1.

To the north of the Marina site, a combined pedestrian and cycle access path will be constructed along the northern side of the proposed Link Road bridge for access to and from Brickmakers Drive. This route will be the primary pedestrian and cycle access route connecting between the residential estate, Brickmakers Drive and Newbridge Road.

The proposed traffic signals at the Brickmakers Drive/Link Road intersection will also assist pedestrians to safely and easily cross Brickmakers Drive at this location to reach Newbridge Road by walking along the footpath which is on the western side of Brickmakers Drive, between the future Link Road intersection and Newbridge Road.

Additionally, a future foreshore pedestrian and cycleway path will extend south from Davy Robinson Drive along the Georges River foreshore, linking with the Moorebank Cove residential estate, the Georges Cove Marina and other areas along the foreshore further to the south. The future proposed network of pedestrian and cycle paths will connect the marina (and residential estate) with Newbridge Road at multiple locations, which will provide good pedestrian and cycle access connections for access to public transport at Newbridge Road and for local pedestrian access to the Georges River foreshore, where this access is currently not available.

3.5 Access to public transport

Depending on the walking route used, most parts of the Georges Cove Marina site will be approximately 700 to 900 m walking distance from the nearest existing M90 bus route stops on the southern side of Newbridge Road. The route up Brickmakers Drive is a relatively easy walk – it is flat and is provided with a good footpath on the western side and road barriers on the eastern side.

The M90 route provides high frequency bus services for the Moorebank area with a weekday service frequency of about 10 minutes during peak hours and about 20 minutes during daytime off-peak hours on weekdays, Saturdays, Sundays and public holidays. The M90 bus route also provides connections to other bus routes and train services via the Liverpool, Bankstown and Burwood railway stations, which connect to other destinations throughout the Sydney metropolitan area, including the Sydney central business district.

The M90 bus route will provide adequate public transport accessibility for the Georges Cove Marina site and there will be no additional requirement for any existing bus services or new bus route to be extended to connect directly to the site to serve future residential apartments and terraces there.

Another bus route in the locality also connects to the Liverpool CBD and railway station (route 902) passes through other areas of East Moorebank (through the Georges Fair and adjacent to the Brighton Lakes residential estates). However, the nearest bus stops on this route are at least 1 km walking distance from the Georges Cove Marina site so this bus route will not generally be usable for the future residents of the potential Marina residential apartments and terraces.

4 Traffic assessment at intersections

4.1 Traffic generation and distribution

The adjacent Moorebank Cove residential estate traffic volumes and the traffic volumes for the other proposed and approved developments which are included in the future baseline traffic analysis for this report have been determined from a combination of previous EMM and Ason Group traffic report calculations (EMM, 2015) (EMM, 2016) (Ason, 2017) and are summarised in Table 4.1.

Table 4.1 Daily and peak hourly traffic generation for related baseline developments

Land use	Time Period	Traffic generation rate	Proposed development land use units and floor areas	Daily vehicle movements
Georges Cove Marina commercial uses	Daily	EMM Estimate	As per report	1,289
As proposed (EMM 2015)	Morning Peak Hour	Varies	As per report	98
	Afternoon Peak Hour	Varies	As per report	197
Moorebank Recyclers Development	Daily	EMM Estimate	As per report	360
	Morning Peak Hour	Varies	As per report	43
	Afternoon Peak Hour	Varies	As per report	29
Moorebank Cove residential estate	Daily	9.0 per dwelling	179 dwellings	1,610
	Morning Peak Hour	0.85 per dwelling	179 dwellings	152
	Afternoon Peak Hour	0.85 per dwelling	179 dwellings	152
Benedict B6 Land mixed use development	Daily	EMM Estimate	As per report	3,410
(for traffic access via Brickmakers Drive)	Morning Peak Hour	Varies	As per report	296
	Afternoon Peak Hour	Varies	As per report	386

Source: EMM (2015); Ason (2017).

For the daily traffic volumes and the weekday peak hour traffic volumes for the future Georges Cove marina residential planning proposal and the corresponding reductions in the previously proposed marina commercial land uses, the future traffic volumes have been calculated using NSW standard traffic generation rates for the relevant residential densities (RTA, 2002).

The corresponding net additional daily and peak hourly traffic volumes are listed in Table 4.2.

Table 4.2 Daily and peak hourly traffic generation for the planning proposal changes

Land use	Time Period	Traffic generation rate	Proposed development land use units and floor areas	Daily vehicle movements
Reduction in the Georges Cove Marina commercial uses	Daily	EMM Estimate	As per report	-734
	Morning Peak Hour	Varies	As per report	-61
	Afternoon Peak Hour	Varies	As per report	-86
Potential additional Georges Cove Marina residential uses	Daily	4.83 per dwelling	374 dwellings	1,810
	Morning Peak Hour	0.483 per dwelling	374 dwellings	181
	Afternoon Peak Hour	0.483 per dwelling	374 dwellings	181

Source: EMM (2015); EMM (2016); RTA (2002).

This transport planning assessment report specifically provides additional traffic analysis in response to the RMS and Transport for NSW requirements (Appendix A) which have requested more detailed "linked" intersection analysis for the future operation of the two Brickmakers Drive intersections.

Also, the combined additional daily traffic volumes from all the potential and approved developments which are listed in Table 4.1 and Table 4.2 provides a useful basis for the future apportionment of the construction costs for the installation of traffic signals at the Brickmakers Drive/Link Road intersection, whereby each development could contribute financially in the future based on their respective daily traffic movements using this access route.

The future baseline developments in Table 4.1 are all included in the Ason traffic report (Ason, 2017) from which the traffic flow plots are shown in Figures 2.3 and 2.4 of this report. These plots include all the future development traffic from:

- the future Georges Cove Marina Development (as assessed by the EMM transport planning report in July 2015);
- the approved Moorebank Recyclers Development, and
- the proposed low density Moorebank Cove Residential Estate (which was conservatively assumed by Ason to be 190 rather than 179 dwellings), and
- the Benedict B6 land developments which were the primary focus of the Ason report.

The net future additional traffic volumes from the Georges Cove Marina planning proposal for 374 dwellings (which is the subject of this report) and the corresponding reduction in the future marina commercial land uses, are shown on Figure 4.1 and Figure 4.2. The actual additional morning and afternoon peak hourly residential traffic movements which are shown on Figure 4.1 and Figure 4.2 are based on 376 rather than 374 new dwellings, but there is a difference of only one vehicle between the peak hourly generated traffic volumes for both situations, which is minimal.

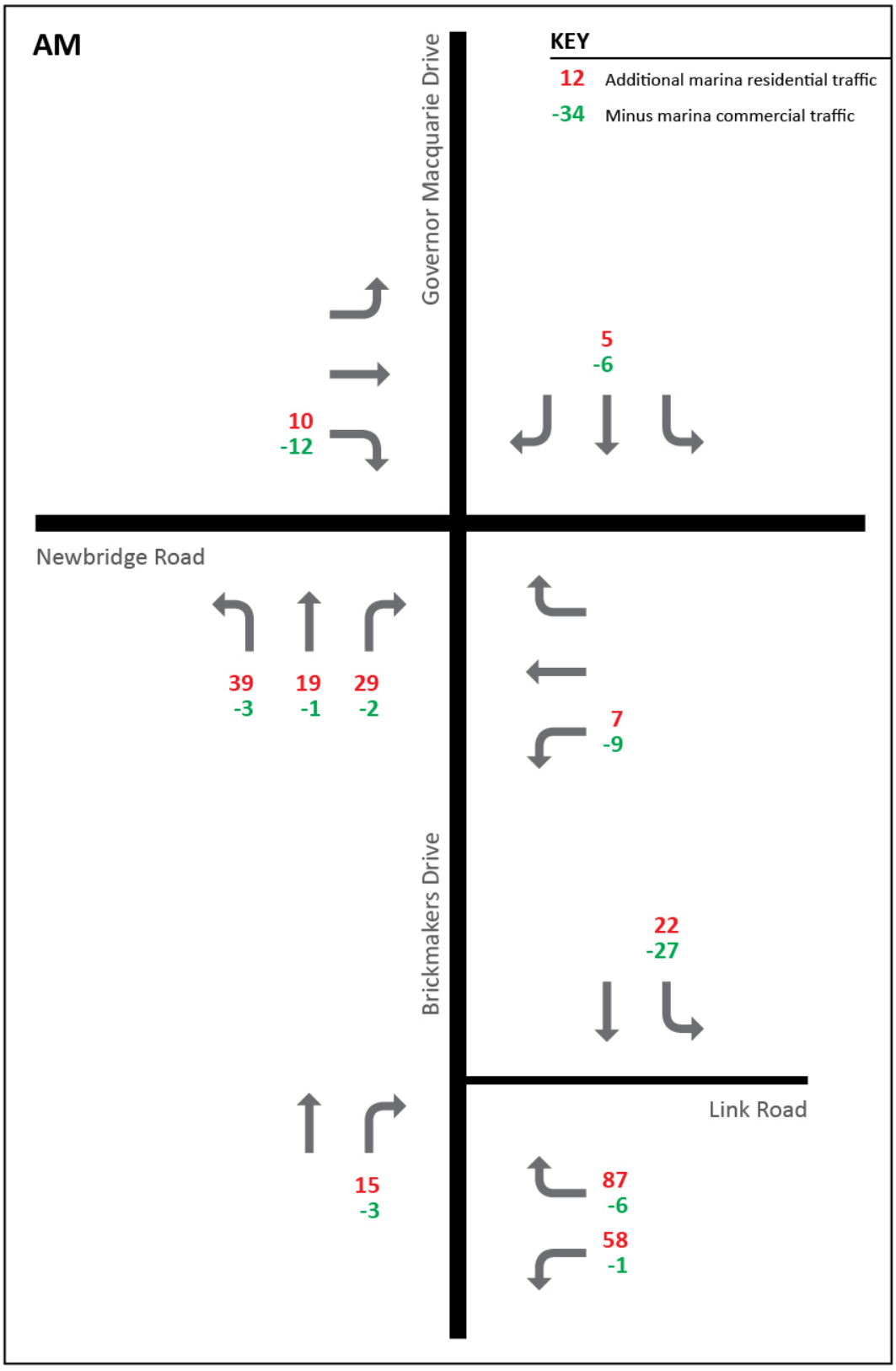


Figure 4.1 **Proposed future marina residential traffic and reduced commercial traffic (am peak hr)**

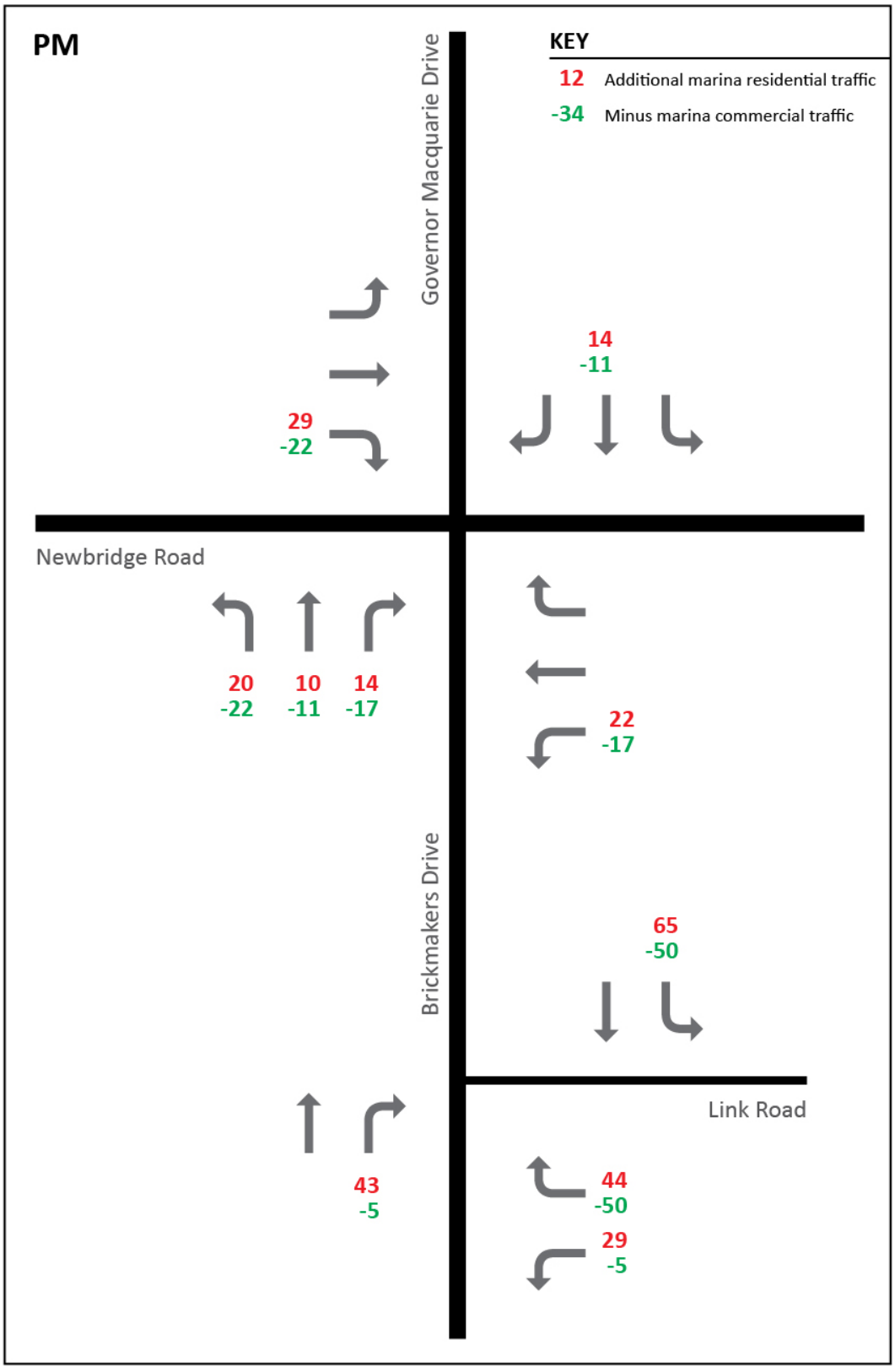


Figure 4.2 **Proposed future marina residential traffic and reduced commercial traffic (pm peak hr)**

4.2 Impacts at intersections

The future linked intersection operating performance of the two intersections at Brickmakers Drive/Link Road and Newbridge Road/Governor Macquarie Drive/Brickmakers Drive has been assessed using the SIDRA 7 model with a 140 second cycle time for both intersections.

The primary modified feature of the new linked intersection design, which is shown in Figure 4.3, is that two continuous traffic lanes are required in the future on Brickmakers Drive northbound, between the two intersections, which are 300 m apart. Provisionally, it is considered that this change to the road configuration could be achieved by re-line-marking the existing road carriageway.

The two future traffic generation scenarios for the locality which have been assessed are described in Section 1.4. The first scenario (future baseline traffic) assesses the future additional baseline traffic volumes for the locality incorporating the range of other developments for which the traffic details are summarised in Table 4.1. The second scenario (future total traffic) represents a cumulative analysis of the surrounding developments' traffic generation with the future Georges Cove Marina residential planning proposal traffic which is calculated in Table 4.2.

The existing SIDRA 'unlinked' intersection results for the existing intersection operation for the Newbridge Road/Governor Macquarie Drive/Brickmakers Drive intersection are shown in Appendix B. The full future SIDRA 'linked' intersection output results for the two future traffic generation scenarios considered are shown for the two linked Brickmakers Drive intersections in Appendices C and D.

4.3 Brickmakers Drive and Link Road intersection

The intersection analysis results for the Brickmakers Drive and Link Road intersection for the two future traffic generation scenarios are presented in Table 4.3.

Table 4.3 Brickmakers Drive/Link Road intersection performance

Peak hour	Operation	(Future base traffic) Intersection performance	(Future total traffic) Intersection performance
Weekday am peak hour	DOS	0.891	0.888
(8.00 to 9.00 am)	LOS	C	C
	Average delay	31.4 s	35.0 s
	Maximum queue length (approach)	159 m (Link Road east)	196 m (Link Road east)
Weekday pm peak hour	DOS	1.036	1.144
(4.00 to 5.00 pm)	LOS	D	D
	Average delay	42.7 s	55.5 s
	Maximum queue length (approach)	343 m (Brickmakers Drive north)	349 m (Brickmakers Drive north)

The results in Table 4.3 show the future Link Road traffic signal controlled intersection operation will be at the same Level of Service (either C or D) for both future traffic scenarios. The proposed future Link Road intersection design is considered to be suitable for both these future locality traffic generation scenarios.

With the highest future peak hour traffic generation scenario, which includes the Marina residential planning proposal traffic, the future intersection operation will be at Level of Service C during the morning traffic peak hour, but will deteriorate to Level of Service D (average traffic delay 55.5 seconds per vehicle) during the afternoon traffic peak hour.

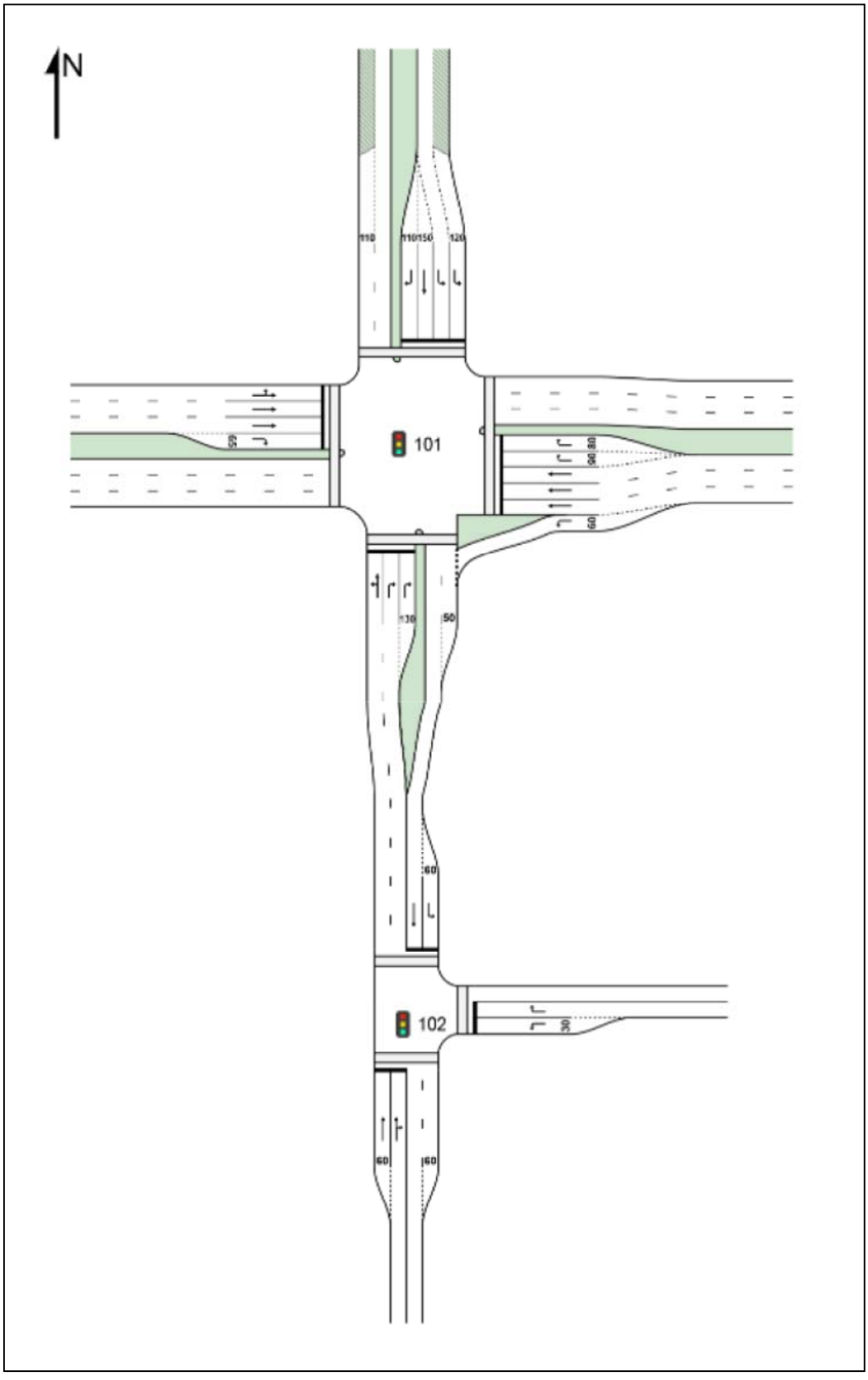


Figure 4.3 Proposed Link Road and Newbridge Road connections at Brickmakers Drive

The maximum future intersection traffic queue lengths which are shown in Table 4.3 will typically occur on either the Brickmakers Drive (north) or the Link Road (east) intersection approaches. During the future morning peak traffic periods, the maximum intersection traffic queue will typically occur on the Link Road (east) intersection approach and may reach 200 m. During the future afternoon peak traffic periods, the maximum intersection traffic queue will typically occur on the Brickmakers Drive (north) intersection approach and may exceed 340 m.

Further details of the predicted intersection maximum (95 percentile) traffic queue lengths for all the intersection approaches for all the morning and afternoon peak hour traffic scenarios considered are included in the detailed SIDRA intersection analysis results for each scenario in Appendices C and D.

4.4 Newbridge Road, Governor Macquarie and Brickmakers Drives intersection

The intersection analysis results for the Newbridge Road/Governor Macquarie Drive/Brickmakers Drive intersection for the two traffic generation scenarios considered are presented in Table 4.4.

Table 4.4 Newbridge Road/Governor Macquarie/Brickmakers Drive intersection performance

Peak hour	Operation	(Future base traffic) Intersection performance	(Future total traffic) Intersection performance
Weekday am peak hour	DOS	1.125	1.168
(8.00 to 9.00 am)	LOS	F	F
	Average delay	124.2 s	137.8 s
	Maximum queue length (approach)	707 m (Newbridge Road west)	772 m (Newbridge Road west)
Weekday pm peak hour	DOS	1.042	1.043
(4.00 to 5.00 pm)	LOS	F	F
	Average delay	84.9 s	85.8 s
	Maximum queue length (approach)	647 m (Newbridge Road east)	648 m (Newbridge Road east)

The results in Table 4.4 show that this intersection will be operating at relatively congested traffic conditions, with a consistent future Level of Service F for the intersection operations during both the morning and afternoon peak hour traffic conditions for the two traffic scenarios considered.

With the highest future peak hour traffic generation scenario, which includes the Marina residential planning proposal traffic, the future intersection operation will be at Level of Service F during both the morning and the afternoon traffic peak hour traffic conditions, and the average traffic delays will be 138 and 86 seconds per vehicle respectively during the morning and afternoon traffic peak hour periods,

These high predicted future intersection delays, when all the predicted future development traffic is included in the analysis, are not exceptionally high when compared with other high traffic queuing delays which can occur at many other large four way traffic signal controlled intersections on the major arterial road routes through the Sydney Region, during both the morning and afternoon traffic peak hours.

At the Newbridge Road/Brickmakers Drive intersection the predicted future intersection traffic delays in Table 4.4, although high, are still considered to be acceptable as within a short term future period, additional vehicle access routes are likely to be established to Newbridge Road in the Moorebank East locality (either via the adjoining B6 development land or via Davy Robinson Drive) which will then reduce these high predicted average intersection delays and generally improve the future peak hour levels of service at Newbridge Road/Brickmakers Drive intersection.

In the interim period the predicted future intersection traffic queue lengths which are shown in Table 4.4, will typically occur on either the Newbridge Road (west) or the Newbridge Road (east) intersection approaches. During the future morning peak hour the maximum traffic queue will occur on the Newbridge Road (west) intersection approach and may exceed 770 m. During the future afternoon peak hour the maximum intersection traffic queue will occur on the Newbridge Road (east) intersection approach and may exceed 640 m.

Further details of the predicted future maximum (95 percentile) intersection traffic queue lengths for each intersection approach, for all the morning and afternoon peak hour traffic scenarios considered, are provided in the detailed SIDRA intersection analysis results for each scenario in Appendices C and D.

4.5 Car parking

The future layout of proposed car parking areas on the site will provide a total of 624 car parking spaces in three separate areas of the site as follows (these areas are shown on the map in Figure 3.2):

- 532 car parking spaces in the main basement car parking areas (Area A)
- 30 car parking spaces provided in surface car parking for the residential terraces (Area B)
- 62 car parking spaces in the southern surface car parking area (Area C)

Taken collectively, these areas will potentially provide adequate car parking capacity for all the predicted future residential, marina and commercial employee and visitor car parking for the overall marina site, which has been calculated by EMM as summarised in Table 4.4 below. The calculation is based on the various car parking rates for the various development components which are contained in the RTA/RMS Guide to Traffic Generating Developments, 2002.

Table 4.3 Analysis of overall Marina site recommended parking requirements and provisions

Function	Description	Requirement [1,2,3,4,5]	Spaces Required
353 apartment dwellings	96 x 1 bedroom	0.5 space per apartment [1]	48
	189 x 2 bedroom	1.0 spaces per apartment [2]	189
	68 x 3 bedroom	1.3 spaces per apartment [1]	88
Residential visitor parking	353 dwellings	0.2 spaces per dwelling [3]	71
21 terrace dwellings	Combination of Types	Either 1 or 2 spaces per terrace [3]	30
Marina wet berths	186 boats	0.6 spaces per berth [4]	111
Marina dry Berths	250 boats	0.2 spaces per berth [4]	50
Commercial development	1,243 m^2	1 space per 40 m^2 [5]	32
Total	All areas	Various	620

Notes: *1. Based on RMS Guide rate for higher density residential developments.*

2. Based on RMS Guide rate between medium and higher density for medium density residential developments.

3. Based on RMS Guide rate for medium density residential development

4. Based on RMS Guide rates for marina wet berths and dry boat storage

5. Based on RMS Guide rate for commercial development

4.6 Pedestrian and cycling access

The combined pedestrian and cycle access path which is proposed along the northern side of the Link Road overbridge connection to Brickmakers Drive will be 2.5 m wide, which will meet the Liverpool DCP 2008 (Part 2.10) pedestrian and cycle path design requirements.

The future local street footpath widths within the marina development will be adequate for the anticipated future levels of pedestrian movement and circulation within the residential area, including cycling access through the marina development, between the Brickmakers Drive Link Road connection and the Georges River foreshore.

Future bicycle parking, where this is required in the streets of the marina development will be designed in accordance with the applicable Council, RMS, Austroads and Australian Standard design requirements.

4.7 Public transport services

The future site dwellings will typically be 700 to 900 m walking distance from the nearest existing bus stops on Newbridge Road for the M90 bus route, which will also provide connections to rail services and other bus services at a number of major metropolitan railway stations, such as Liverpool, Bankstown and Burwood.

The M90 bus route provides adequate public transport accessibility for the future planning proposal residential uses. This is reflected by the use of the historic RTA/RMS Guide traffic generating rates from 2002 for medium density residential development, in assessing the future development traffic generation and car parking rates for the future Marina site residential uses, in preference to the other more recent (but lower) traffic generation rates which were recommended by RMS in 2013 for use with proposed higher density residential developments in the more urbanised areas of Sydney, which have more direct access to existing rail services.

5 Summary and conclusions

5.1 Site access and traffic circulation

The proposed vehicle access route for the assessed Georges Cove Marina residential additions (374 dwellings with reductions to the future Georges Cove Marina commercial uses) will be the same as for the approved Georges Cove Marina development, which is via the DCP Link Road and bridge from Brickmakers Drive.

This transport planning assessment report has analysed the future planning proposal for residential development in conjunction with the surrounding proposed, approved and completed projects in the locality, which are:

- The Georges Fair residential estate with over 1,000 dwellings (completed in October 2016);
- The future completion of the approved Brighton Lakes residential estate (310 dwellings) and clubhouse redevelopment;
- The future Georges Cove Marina (as assessed by the EMM transport planning report in July 2015):
- The commencement of traffic operations for the approved Moorebank Recyclers development south of the Marina site (which will generate mainly truck traffic);
- The proposed Moorebank Cove Residential Estate (179 dwellings).
- The proposed new mixed use commercial (7,310 sq m GFA) and residential (171 dwellings) developments on the Benedict-owned B6 Enterprise Corridor zoned land fronting Newbridge Road; and

The proposed DCP Link Road will cross over a drainage channel and access easement to the Moorebank Recyclers site, which are at lower levels to the surrounding land, and will intersect with Brickmakers Drive at a location approximately 300 m south of the Newbridge Road/Governor Macquarie Drive/Brickmakers Drive intersection. During construction, the Marina site developments may also utilise temporary vehicle access via the existing Benedict site Newbridge Road access driveway, but all the longer term operations stage access is proposed to utilise the DCP Link Road route.

The primary purpose of this transport planning assessment report has been to undertake a cumulative traffic impacts assessment of the future potential additional Marina site apartments and terrace houses from this planning proposal, with consideration of the other relevant surrounding developments.

Further, the report specifically addresses the traffic impact assessment requirements which have been requested by the NSW Government transport agencies, which primarily require:

- A detailed linked intersection traffic analysis of the proposed traffic signals at Brickmakers Drive/Link Road intersection in conjunction with Newbridge Road/Governor Macquarie Drive/Brickmakers Drive intersection using the SIDRA 7 intersection model and a 140 seconds intersection cycle time for both these intersections;
- A detailed cumulative traffic impacts analysis of the proposed Georges Cove residential component in conjunction with the latest information which is known in relation to other proposed and approved developments in the Moorebank East DCP area; and

- An assessment of the proposed locality public transport and pedestrian/ cycleway access routes, in conjunction with the assumed future traffic generation rates and the availability of public transport access utilising the M90 bus route services for the future residents of new residential developments in the Moorebank East DCP area.

5.2 Assessment of traffic impacts on intersections

There have been significant recent traffic changes in the Moorebank East locality since the M5 West Motorway Widening which was completed in December 2014, which have reduced the previously higher regionally based east-west traffic flows which were using Newbridge Road in this locality.

In this transport planning assessment report, the adjusted future baseline traffic volumes from the surrounding traffic generating developments have been assessed, and the effects of the Georges Cove Marina planning proposal for additional residential development (374 dwellings with reductions in the future Marina Commercial uses) have been assessed in a cumulative traffic impact assessment scenario for the planning proposal.

At the Brickmakers Drive/Link Road intersection, which has been assumed to have traffic signal controlled operations for all the future development traffic scenarios considered, the future intersection operations will remain at or below Level of Service C during the morning peak hour, but will increase to Level of Service D during the afternoon traffic peak hour, under the highest (cumulative) future traffic generation scenario.

The existing Newbridge Road/Governor Macquarie Drive/Brickmakers Drive intersection operations have been determined by Ason (2017). The intersection is currently operating in the near capacity (LOS D) or satisfactory (LOS C) traffic congestion ranges during the morning and afternoon peak traffic hours. This shows the intersection has some spare traffic capacity to accommodate additional peak hour traffic growth from new residential and other developments in the Moorebank East locality as is assessed in this report.

Under both these future traffic scenarios, the future Newbridge Road/Governor Macquarie Drive/ Brickmakers Drive intersection operations will be a consistent Level of Service F during both the morning and afternoon peak hour traffic periods. However, these future intersection delays would be no worse than the delays which previously occurred prior to 2015, when there were higher traffic volumes using Newbridge Road prior to the recent M5 West motorway widening.

Also, the predicted future Level of Service F intersection delays, when all the predicted future development traffic is included in the analysis, are not exceptionally high when compared with the other high traffic queuing delays which can also occur at many other large four way traffic signal controlled intersections on the major arterial road routes through the Sydney Region, during both the morning and afternoon traffic peak hours on most weekdays.

Within a short term future period, additional vehicle access routes are likely to be established to Newbridge Road in the Moorebank East locality (either via the adjoining B6 development land or via Davy Robinson Drive) which will then reduce these high predicted average intersection delays and generally improve the future peak hour levels of service at Newbridge Road/Brickmakers Drive intersection.

It is not recommended that any further intersection widening be undertaken on the Brickmakers Drive route as the required future additional traffic capacity within the local Moorebank East DCP area should preferably be provided via the additional future DCP road connection to Davy Robinson Drive, which can then provide additional access to Newbridge Road for the developments east of Brickmakers Drive.

This future additional access to Newbridge Road requirement utilising Davy Robinson Drive has always been foreshadowed since the original 2008 Moorebank East DCP road network was proposed and has also now been identified by the Benedict owned B6 land planning proposal traffic report (Ason, 2017) which has identified that the additional vehicle access via Davy Robinson Drive will need to be provided to fully accommodate the predicted future generated traffic volumes from that site.

5.3 Assessment of car parking

There will be sufficient car parking area available for the maximum future Marina site combined car parking demand with the proposed combination of one basement level and two surface car parking areas which would provide the required total number of car parking spaces (at least 620) for the future potential combined residential, commercial and marina recreational uses at the site, in accordance with the standard RTA/RMS guideline car parking rates for the identified development components.

The residential visitor car parking capacity will generally also be provided in the underground parking area and the other marina and general commercial visitor car parking demand will mainly utilise the additional surface car park which is proposed in the southern portion of the site.

5.4 Assessment of pedestrian and cycling access needs

The proposed local street footpath widths within the marina development and the waterside paths will be adequate for the anticipated future levels of pedestrian movement and circulation within the marina area, and on the Georges River foreshore on the eastern boundary.

For the external pedestrian and cycleway route connections, appropriate connections will be provided to the marina development, including access to Brickmakers Drive west of the site.

5.5 Assessment of public transport access

The majority of the future Georges Cove marina residential dwellings lots will be within 700 to 900 m level walking distance from the nearest existing bus stops on Newbridge Road for the M90 bus route.

There is appropriate existing public transport access currently available via the M90 bus route, for the future site residents and other visitors.

References

Ason (2017) Traffic Impact Assessment; Planning Proposal; Benedict Sands, 146 Newbridge Road, Moorebank. 9 October 2017.

EMM (2015) Georges Cove Marina, Transport Planning Assessment, report prepared for Benedict Industries Pty Ltd, 28 July 2015.

EMM (2016) Moorebank Cove Residential Estate, Traffic Assessment Version 3, report prepared for Mirvac Pty Ltd, 14 December 2016.

GHD (2011), *New Brighton Golf Club, Transport Assessment*, report prepared for New Brighton Golf Club, June 2011.

GHD (2014), *New Brighton Golf Club, Proposed Clubhouse, Traffic Impact Assessment*, report prepared for Mirvac Homes (NSW) Pty Ltd, March 2014.

Roads and Traffic Authority (2002), *Guide to Traffic Generating Developments.*

Appendix A

NSW Transport Agency Submissions

Transport
Roads & Maritime
Services

14 March 2017

Our Reference: SYD17/00257/01 (A16540016)
Council Ref: DA-24/2017

The General Manager
Liverpool City Council
Locked Bag 7064
LIVERPOOL BC NSW 1871

Attention: **Marcus Jennejohn**

STAGE 1 SUPERLOT SUBDIVISION, STAGE 2 RESIDENTIAL SUBDIVISION AND INFRASTRUCTURE WORKS
146 NEWBRIDGE ROAD, MOOREBANK

Dear Sir/Madam,

Reference is made to Council's letter dated 16 February 2017, regarding the abovementioned application which was referred to Roads and Maritime Services (Roads and Maritime) for comment

Roads and Maritime has reviewed the development application and the following issues are to be addressed prior to the determination of the application:

1. The submitted Environmental Impact Statement indicates that the construction stage is likely to have heavy vehicle movements for deliveries associated with import of road base, asphalting, and concrete kerb work, as well as heavy vehicle movements for the importation of fill. The heavy vehicle movements will therefore be more than 13 truck movements per hour.

   The submitted traffic report should address the expected light and heavy vehicle movements for all construction activities at this site, and not just for the importation of fill.

2. Roads and Maritime requests a copy of the traffic volume survey for 1 March 2016.

3. The proponent should carry out traffic modelling to determine the likely traffic impacts on the Newbridge Road/ Brickmakers Drive/Governor Macquarie Drive intersection.

4. Further information is requested from the applicant regarding the proposed 3m wide concrete service vehicle maintenance path arrangement and movements. It is not clear what access arrangements are being provided at the existing Newbridge Road access for service vehicles and pedestrians. It is also not clear whether the proposed service vehicle maintenance path will still be located underneath the elevated road bridge.

It is understood that all future vehicular access will be via Brickmakers Drive as per previous Roads and Maritime comments dated 18 February 2012 (see attached).

The applicant is advised that the above information is requested to allow Roads and Maritime to complete the assessment of this application. Roads and Maritime may also request further information once the assessment is carried out.

Any inquiries in relation to this Application can be directed to Malgy Coman on 8849 2413 or development.sydney@rms.nsw.gov.au.

Yours sincerely

RJCumming

Rachel Cumming
Senior Land Use Assessment Coordinator
Network and Safety Section

Transport
Roads & Maritime
Services

14 June 2017

Roads and Maritime Reference: SYD17/00547/01 (A17867832)
Council Ref: RZ-2/2015

The General Manager
Liverpool City Council
Locked Bag 7064
LIVERPOOL BC, NSW 1871

Attention: Peter Pham

Dear Sir/Madam,

PLANNING PROPOSAL TO AMEND LIVERPOOL LOCAL ENVIRONMENTAL PLAN 2008 (AMENDMENT NO. 66)

I refer to Council's correspondence dated 19 April 2017 regarding the planning proposal to amend Liverpool LEP 2008 (Amendment No. 66) which was referred to Roads and Maritime Services (Roads and Maritime) for comment in accordance with Section 56 (2) (d) of the *Environmental Planning and Assessment Act 1979*. Roads and Maritime appreciates the opportunity to provide comment and apologise for the delay in providing a response.

Roads and Maritime has reviewed the information provided and notes that this planning proposal seeks to amend Liverpool LEP 2008 (Draft Amendment No. 66) at 146 Newbridge Road, Moorebank to allow the following:

a. An additional permitted residential use within land zoned RE2 Private Recreation; and

b. A zone boundary adjustment to R3 Medium Density Residential from RE2 Private Recreation for a portion of the land. .

This planning proposal is to include a residential component of 108 apartments and 17 terraced townhouses in addition to the currently approved development mix of marina wet and dry storage berths, clubhouse and bar, function centre with café/kiosk/restaurant uses, boat sales showroom and workshop area. There will be total of 851 car parking at the Marine development site and access would be provided via a link road connecting with Brickmakers Drive with a traffic signal.

Roads and Maritime supports the comments received from the Transport for NSW (TfNSW) in their letter dated 9 May 2017 (copy attached). Roads and Maritime provides the following comments in addition to the issues raised by the TfNSW for Council's consideration:

1. From the submitted traffic impact report it was noticed that only New Link Road & Brickmakers Drive intersection has been analysed. However, due to the proposed development and other adjoining developments there would be a potential impact at Newbridge Road & Brickmakers Drive signalised intersection. Therefore, it is requested to analyse this intersection with cumulative impact from other adjoining developments. The traffic report should identify road infrastructure improvements required (if any) and funding mechanism (such as; VPA).

2. New signalised intersection: the new signalised intersection at New Link Road/Brickmakers Drive should be linked/ connected with existing Newbridge Road/Brickmakers Drive signalised intersection. The new intersection at New Link Road/Brickmakers Drive would need to be modelled at 140 seconds during peak hours.

Thank you for the opportunity to comment on the subject proposal. If you require clarification on the above matter, please contact Ahsanul Amin, A/Senior Strategic Land Use Planner on 8849 2762 or e-mail at development.sydney@rms.nsw.gov.au.

Yours sincerely

Greg Flynn
Program Manager – Land Use

NSW GOVERNMENT | Transport for NSW

Mr Peter Pham
Strategic Planner
Liverpool City Council
Locked Bag 7064
Liverpool BC
NSW 1871

Dear Mr Pham

Draft Liverpool Local Environment Plan 2008 (Amendment No. 66)

Thank you for your letter dated 19 April 2017 inviting Transport for NSW (TfNSW) to review and comment on the above. Roads and Maritime Services (RMS) may provide a separate response.

Transport for NSW has reviewed the documentation submitted in support of the subject proposal and provides the following comments. Detailed comments on the traffic study in support of the proposal are provided in the attached annexure.

- TfNSW notes that the proposal's access to public transport is outside the 400m catchment. The only public transport available to service the site is route M90, which operates at approximately 650m to 800m from the site via Newbridge Road. It is recommended that appropriate pedestrian and cycle links be provided between Brickmakers Drive and Newbridge Road and to be integrated with the public transport network. Any such link should be at a width of 3.0m.

- The Council's Development Control Plan (Part 2.10) has proposed a road network in conjunction with the land uses listed in the Local Environment Plan. The proposal seeks to permit residential use of 108 apartments and 17 terraced townhouse in addition to the approved Marina site development (land zoned RE2). The traffic study in support of this proposal indicates the traffic generation of these added residential components shall not pose significant traffic impact. TfNSW recommends that the traffic study should take into consideration of the cumulative traffic impact from the adjoining properties including but not limited to the Mirvac residential estate, potential redevelopment of the plant nursery site and the proposed concrete recycling facilities.

If you require further clarification regarding this matter, please contact Billy Yung, Senior Transport Planner on 8202 3291 or via email at Billy.Yung@transport.nsw.gov.au.

Yours sincerely

9/5/17

Mark Ozinga
Principal Manager, Land Use Planning and Development
Freight, Strategy and Planning

Objective Reference CD17/04662

Transport for NSW
18 Lee Street, Chippendale NSW 2008 | PO Box K659, Haymarket NSW 1240
T 02 8202 2200 | **F** 02 8202 2209 | **W** transport.nsw.gov.au | ABN 18 804 239 602

Annexure – Detailed Comments on Transport Planning Assessment Report

Background traffic data

The traffic study is based on traffic survey data obtained in 2013 with an adjustment to account for approximated additional residential traffic movements using Brickmakers Drive from the completion of the George Fair residential estate development. It is recommended to obtain updated traffic survey data to more realistically reflect the current traffic condition with the largely completed George Fair development. It is essential to understand the current traffic condition at the intersection of Newbridge Road with Governor Macquarie Drive and Brickmakers Drive which is the primary access to the Marina site.

Cumulative traffic impact from adjoining properties

The traffic study had identified the adjoining properties including the Mirvac residential estate, potential redevelopment of the plant nursery site and the proposed concrete recycling facilities which would potentially share their vehicular access with the Marina site via the link road intersection. It is recommended that the traffic impact assessment should take into consideration the cumulative traffic impact from these adjoining properties to understand the overall traffic implication to the link road intersection and Brickmakers Drive. It is noted that the intersection performance indicates a maximum traffic peak hour queue length of 199m in the southbound direction on Brickmakers Drive with consideration of traffic generated by the Marina site. A longer queue length might occur with the inclusion of traffic generated by the adjoining properties and affect the traffic operation at the intersection of Newbridge Road with Governor Macquarie Drive and Brickmakers Drive. Similarly a longer queue might occur on the link road and affect the traffic operation of the proposed roundabout located approximately 110m to the east of the link road intersection.

Appendix B

Existing Intersection SIDRA Analysis Results

LANE SUMMARY

Site: 101 [GMD/Newbridge AM Existing]

Newbridge Road / Gov Macquarie Drive / Brickmakers Drive
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Brickmakers Drive													
Lane 1	186	5.0	302	0.615	100	63.4	LOS E	12.8	93.4	Short	120	0.0	NA
Lane 2	264	5.0	299	0.883	100	82.9	LOS F	21.4	156.4	Short	140	0.0	NA
Lane 3	264	5.0	299	0.883	100	82.9	LOS F	21.4	156.4	Full	500	0.0	0.0
Approach	714	5.0		0.883		77.8	LOS F	21.4	156.4				
East: Newbridge Road													
Lane 1	172	5.0	1570	0.110	100	7.4	LOS A	1.1	8.4	Short	70	0.0	NA
Lane 2	311	5.0	1032	0.301	100	19.4	LOS B	12.1	88.0	Full	500	0.0	0.0
Lane 3	311	5.0	1032	0.301	100	19.4	LOS B	12.1	88.0	Full	500	0.0	0.0
Lane 4	311	5.0	1032	0.301	100	19.4	LOS B	12.1	88.0	Full	500	0.0	0.0
Lane 5	260	5.0	287	0.904	100	89.7	LOS F	21.8	158.9	Short	95	0.0	NA
Lane 6	260	5.0	287	0.904	100	89.7	LOS F	21.8	158.9	Short	80	0.0	NA
Approach	1624	5.0		0.904		40.6	LOS C	21.8	158.9				
North: Gov Macquarie Drive													
Lane 1	245	5.0	514	0.477	100	52.9	LOS D	14.7	107.6	Short	125	0.0	NA
Lane 2	245	5.0	514	0.477	100	52.9	LOS D	14.7	107.6	Full	500	0.0	0.0
Lane 3	83	5.0	164	0.507	100	74.1	LOS F	6.0	43.8	Short	145	0.0	NA
Lane 4	103	5.0	167	0.615	100	78.7	LOS F	7.5	54.9	Short	75	0.0	NA
Approach	676	5.0		0.615		59.5	LOS E	14.7	107.6				
West: Newbridge Road													
Lane 1	711	5.0	803	0.885	100	51.5	LOS D	52.3	382.0	Full	500	0.0	0.0
Lane 2	713	5.0	806	0.885	100	50.4	LOS D	52.5	383.1	Full	500	0.0	0.0
Lane 3	708	5.0	800 [1]	0.885	100	50.4	LOS D	52.0	379.6	Full	500	0.0	0.0
Lane 4	6	5.0	72	0.084	100	85.0	LOS F	0.4	3.2	Short	60	0.0	NA
Approach	2138	5.0		0.885		50.8	LOS D	52.5	383.1				
Intersection	5152	5.0		0.904		52.5	LOS D	52.5	383.1				

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

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

LANE SUMMARY

Site: 101 [GMD/Newbridge PM Existing]

Newbridge Road / Gov Macquarie Drive / Brickmakers Drive
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Brickmakers Drive													
Lane 1	68	5.0	156	0.437	100	45.5	LOS D	3.0	22.0	Short	120	0.0	NA
Lane 2	98	5.0	120	0.820	100	56.8	LOS E	4.9	35.5	Short	140	0.0	NA
Lane 3	98	5.0	120	0.820	100	56.8	LOS E	4.9	35.5	Full	500	0.0	0.0
Approach	264	5.0		0.820		53.9	LOS D	4.9	35.5				
East: Newbridge Road													
Lane 1	495	5.0	1326	0.373	100	9.7	LOS A	6.2	45.4	Short	70	0.0	NA
Lane 2	562	5.0	624 [1]	0.900	100	39.9	LOS C	27.2	198.4	Full	500	0.0	0.0
Lane 3	755	5.0	839	0.900	100	39.1	LOS C	39.0	284.4	Full	500	0.0	0.0
Lane 4	671	5.0	746 [1]	0.900	100	39.1	LOS C	33.4	244.2	Full	500	0.0	0.0
Lane 5	266	5.0	339	0.784	100	48.7	LOS D	12.2	89.0	Short	95	0.0	NA
Lane 6	266	5.0	339	0.784	100	48.7	LOS D	12.2	89.0	Short	80	0.0	NA
Approach	3014	5.0		0.900		36.1	LOS C	39.0	284.4				
North: Gov Macquarie Drive													
Lane 1	252	5.0	737	0.342	100	25.1	LOS B	7.6	55.4	Short	125	0.0	NA
Lane 2	252	5.0	737	0.342	100	25.1	LOS B	7.6	55.4	Full	500	0.0	0.0
Lane 3	257	5.0	294	0.875	100	51.8	LOS D	13.0	95.2	Short	145	0.0	NA
Lane 4	211	5.0	259	0.815	100	52.3	LOS D	10.1	73.8	Short	75	0.0	NA
Approach	972	5.0		0.875		38.1	LOS C	13.0	95.2				
West: Newbridge Road													
Lane 1	472	5.0	618	0.764	100	32.7	LOS C	19.5	142.3	Full	500	0.0	0.0
Lane 2	465	5.0	609	0.764	100	31.8	LOS C	19.4	141.4	Full	500	0.0	0.0
Lane 3	461	5.0	604 [1]	0.764	100	31.7	LOS C	19.2	140.1	Full	500	0.0	0.0
Lane 4	7	5.0	120	0.059	100	51.2	LOS D	0.3	2.2	Short	60	0.0	NA
Approach	1405	5.0		0.764		32.2	LOS C	19.5	142.3				
Intersection	5655	5.0		0.900		36.3	LOS C	39.0	284.4				

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

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

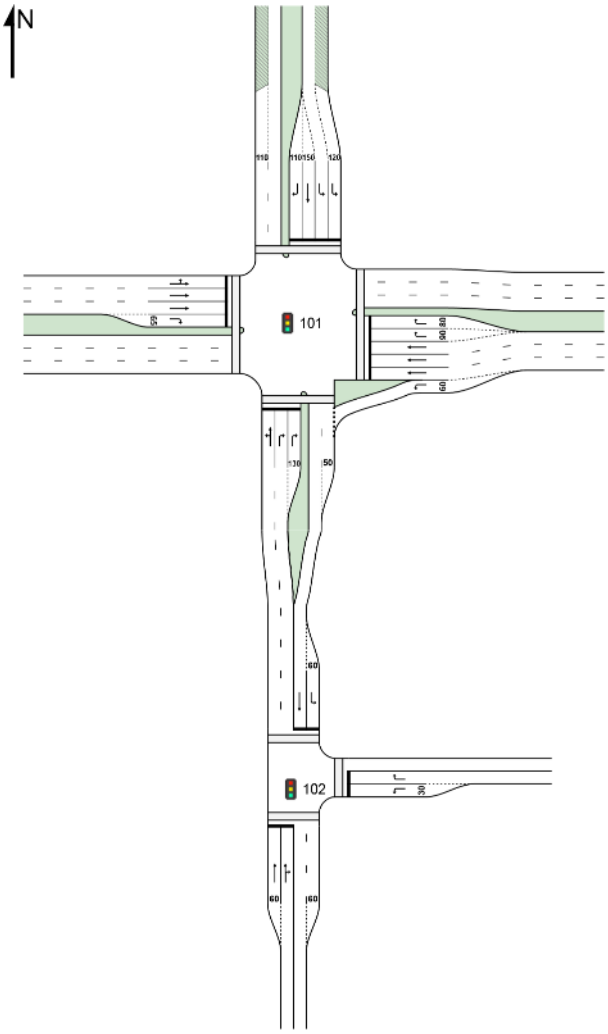
Appendix C

SIDRA Analysis results for Adjusted Future Baseline

NETWORK LAYOUT

Network: N101 [Network1]

AM Peak Network

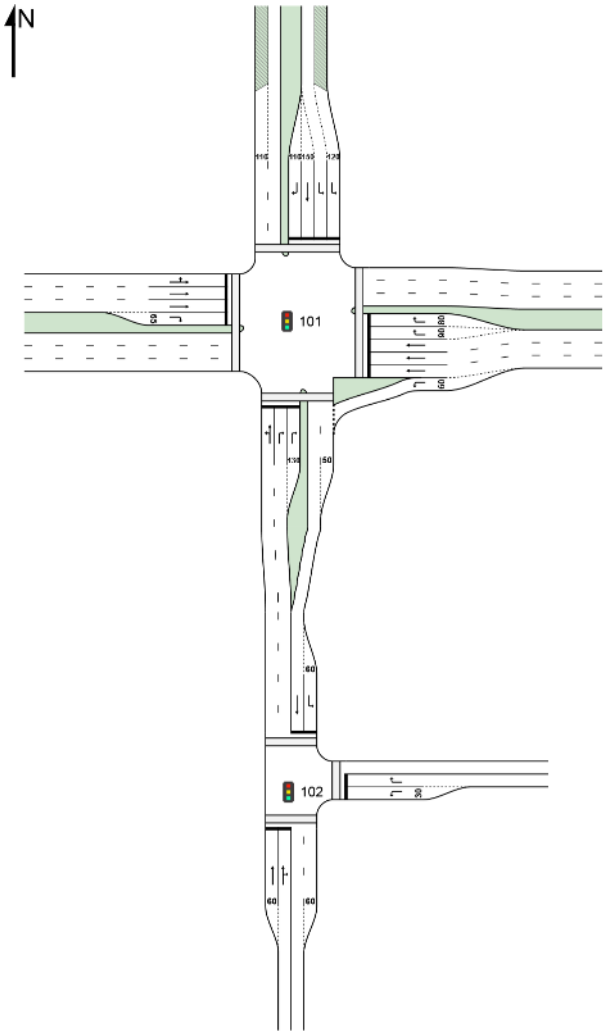


SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	Newbridge Road & Brickmakers intersection B6 Baseline AM Peak
102	NA	Brickmakers Drive & Link Road B6 Baseline Am Peak

NETWORK LAYOUT

Network: N102 [Network2]

Pm Peak Network



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	Newbridge Road & Brickmakers intersection B6 Baseline PM Peak
102	NA	Brickmakers Drive & Link Road B6 Baseline Pm Peak

MOVEMENT SUMMARY

Site: 101 [Newbridge Road & Brickmakers intersection B6 Baseline AM Peak]

Network: N101 [Network1]

Existing Four Way Intersection
Signals - Fixed Time Coordinated Cycle Time = 140 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive													
1	L2	154	5.0	154	5.0	0.824	62.2	LOS E	26.8	196.0	1.00	0.93	26.4
2	T1	238	5.0	238	5.0	0.824	57.6	LOS E	26.8	196.0	1.00	0.93	26.8
3	R2	656	5.0	656	5.0	0.915	81.0	LOS F	24.6	179.4	1.00	0.96	22.4
Approach		1048	5.0	1048	5.0	0.915	72.9	LOS F	26.8	196.0	1.00	0.95	23.8
East: Newbridge Road													
4	L2	219	5.0	219	5.0	0.161	9.4	LOS A	3.0	22.2	0.26	0.65	51.8
5	T1	933	5.0	933	5.0	0.483	37.8	LOS C	16.9	123.4	0.83	0.72	40.8
6	R2	519	5.0	519	5.0	1.122	148.1	LOS F	40.3	294.0	1.00	1.12	17.5
Approach		1671	5.0	1671	5.0	1.122	68.3	LOS E	40.3	294.0	0.81	0.83	28.6
North: Governor Macquarie Drive													
7	L2	490	5.0	490	5.0	1.125	200.2	LOS F	31.1	227.4	1.00	1.29	13.6
8	T1	138	5.0	138	5.0	0.602	65.7	LOS E	9.2	66.8	1.00	0.80	19.7
9	R2	103	5.0	103	5.0	0.893	89.1	LOS F	8.0	58.4	1.00	0.98	24.6
Approach		731	5.0	731	5.0	1.125	159.2	LOS F	31.1	227.4	1.00	1.15	15.2
West: Newbridge Road													
10	L2	159	5.0	159	5.0	1.122	190.4	LOS F	95.8	699.2	1.00	1.59	14.7
11	T1	1973	5.0	1973	5.0	1.122	184.5	LOS F	96.8	706.6	1.00	1.64	15.2
12	R2	131	5.0	131	5.0	0.465	65.2	LOS E	8.3	60.3	0.96	0.80	20.4
Approach		2263	5.0	2263	5.0	1.122	178.0	LOS F	96.8	706.6	1.00	1.59	15.3
All Vehicles		5713	5.0	5713	5.0	1.125	124.2	LOS F	96.8	706.6	0.94	1.19	19.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.1 %
Number of Iterations: 5 (maximum specified: 10)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	21	40.2	LOS E	0.1	0.1	0.76	0.76
P2	East Full Crossing	11	64.2	LOS F	0.0	0.0	0.96	0.96
P3	North Full Crossing	21	41.7	LOS E	0.1	0.1	0.77	0.77
P4	West Full Crossing	53	55.0	LOS E	0.2	0.2	0.89	0.89
All Pedestrians		105	50.3	LOS E			0.85	0.85

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.

MOVEMENT SUMMARY

Site: 101 [Newbridge Road & Brickmakers intersection B6 Baseline PM Peak]

Network: N102 [Network2]

Existing Four Way Intersection
Signals - Fixed Time Coordinated Cycle Time = 140 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive													
1	L2	155	5.0	152	5.0	0.917	84.5	LOS F	21.0	153.1	1.00	1.05	21.8
2	T1	114	5.0	112	5.0	0.917	79.9	LOS F	21.0	153.1	1.00	1.05	22.1
3	R2	323	5.0	317	5.0	0.884	85.3	LOS F	11.8	85.9	1.00	0.92	21.7
Approach		592	5.0	581 N1	5.0	0.917	84.1	LOS F	21.0	153.1	1.00	0.98	21.8
East: Newbridge Road													
4	L2	599	5.0	599	5.0	0.544	23.5	LOS B	17.9	130.4	0.62	0.86	37.4
5	T1	1988	5.0	1988	5.0	1.042	124.6	LOS F	88.6	646.7	1.00	1.38	20.6
6	R2	531	5.0	531	5.0	0.902	72.0	LOS F	24.3	177.6	0.98	0.91	28.4
Approach		3118	5.0	3118	5.0	1.042	96.2	LOS F	88.6	646.7	0.92	1.20	22.9
North: Governor Macquarie Drive													
7	L2	504	5.0	504	5.0	0.787	69.0	LOS E	17.4	127.1	1.00	0.88	28.2
8	T1	344	5.0	344	5.0	1.020	121.0	LOS F	34.3	250.3	1.00	1.30	12.4
9	R2	211	5.0	211	5.0	0.969	103.3	LOS F	18.4	134.4	1.00	1.07	22.5
Approach		1059	5.0	1059	5.0	1.020	92.7	LOS F	34.3	250.3	1.00	1.06	21.4
West: Newbridge Road													
10	L2	157	5.0	157	5.0	0.794	52.5	LOS D	31.8	232.0	0.97	0.88	34.4
11	T1	1241	5.0	1241	5.0	0.794	45.4	LOS D	32.2	235.3	0.94	0.86	37.4
12	R2	208	5.0	208	5.0	1.031	138.0	LOS F	21.5	157.0	1.00	1.14	11.2
Approach		1606	5.0	1606	5.0	1.031	58.1	LOS E	32.2	235.3	0.95	0.90	31.9
All Vehicles		6375	5.0	6364 N1	5.0	1.042	84.9	LOS F	88.6	646.7	0.95	1.08	24.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 2.4 %
Number of Iterations: 10 (maximum specified: 10)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	21	33.6	LOS D	0.1	0.1	0.69	0.69
P2	East Full Crossing	11	64.2	LOS F	0.0	0.0	0.96	0.96
P3	North Full Crossing	21	42.5	LOS E	0.1	0.1	0.78	0.78
P4	West Full Crossing	53	64.3	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		105	53.8	LOS E			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.

MOVEMENT SUMMARY

Site: 102 [Brickmakers Drive & Link Road B6 Baseline Am Peak]

Network: N101 [Network1]

New Intersection with Traffic Signals
Signals - Fixed Time Coordinated Cycle Time = 140 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive													
2	T1	760	5.0	760	5.0	0.314	8.5	LOS A	10.7	77.8	0.42	0.38	40.4
3	R2	43	5.0	43	5.0	0.314	14.7	LOS B	10.7	77.8	0.45	0.42	43.2
Approach		803	5.0	803	5.0	0.314	8.9	LOS A	10.7	77.8	0.42	0.38	40.7
East: Link Road													
4	L2	32	5.0	32	5.0	0.030	16.5	LOS B	0.9	6.3	0.43	0.63	40.4
6	R2	288	5.0	288	5.0	0.891	76.8	LOS F	21.8	159.3	1.00	0.97	16.2
Approach		320	5.0	320	5.0	0.891	70.8	LOS F	21.8	159.3	0.94	0.93	18.2
North: Brickmakers Drive													
7	L2	216	5.0	216	5.0	0.383	44.6	LOS D	11.6	84.9	0.84	0.79	28.2
8	T1	273	5.0	273	5.0	0.482	41.1	LOS C	15.1	110.1	0.87	0.74	29.4
Approach		489	5.0	489	5.0	0.482	42.7	LOS D	15.1	110.1	0.86	0.76	28.8
All Vehicles		1612	5.0	1612	5.0	0.891	31.4	LOS C	21.8	159.3	0.66	0.61	29.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.1 %
Number of Iterations: 5 (maximum specified: 10)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	11	54.1	LOS E	0.0	0.0	0.88	0.88
P2	East Full Crossing	21	37.9	LOS D	0.1	0.1	0.74	0.74
P3	North Full Crossing	53	54.2	LOS E	0.2	0.2	0.88	0.88
All Pedestrians		84	50.1	LOS E			0.84	0.84

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.

MOVEMENT SUMMARY

Site: 102 [Brickmakers Drive & Link Road B6 Baseline Pm Peak]

Network: N102 [Network2]

New Intersection with Traffic Signals
Signals - Fixed Time Coordinated Cycle Time = 140 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive													
2	T1	276	5.0	276	5.0	0.201	6.3	LOS A	5.8	42.5	0.34	0.30	42.7
3	R2	54	5.0	54	5.0	0.254	35.0	LOS C	2.6	18.9	0.74	0.75	33.5
Approach		330	5.0	330	5.0	0.254	11.0	LOS A	5.8	42.5	0.41	0.37	39.7
East: Link Road													
4	L2	46	5.0	46	5.0	0.095	45.2	LOS D	2.3	17.0	0.78	0.71	30.7
6	R2	315	5.0	315	5.0	1.036	135.7	LOS F	33.0	241.2	1.00	1.18	10.6
Approach		361	5.0	361	5.0	1.036	124.2	LOS F	33.0	241.2	0.97	1.12	12.4
North: Brickmakers Drive													
7	L2	347	5.0	344	5.0	0.298	16.9	LOS B	11.3	82.5	0.53	0.71	38.4
8	T1	844	5.0	836	5.0	0.900	30.7	LOS C	47.0	343.0	0.75	0.77	32.8
Approach		1191	5.0	1179 N1	5.0	0.900	26.6	LOS B	47.0	343.0	0.68	0.75	34.3
All Vehicles		1882	5.0	1870 N1	5.0	1.036	42.7	LOS D	47.0	343.0	0.69	0.75	27.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 2.4 %
Number of Iterations: 10 (maximum specified: 10)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	11	54.9	LOS E	0.0	0.0	0.89	0.89
P2	East Full Crossing	21	11.6	LOS B	0.0	0.0	0.41	0.41
P3	North Full Crossing	53	55.0	LOS E	0.2	0.2	0.89	0.89
All Pedestrians		84	44.2	LOS E			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.

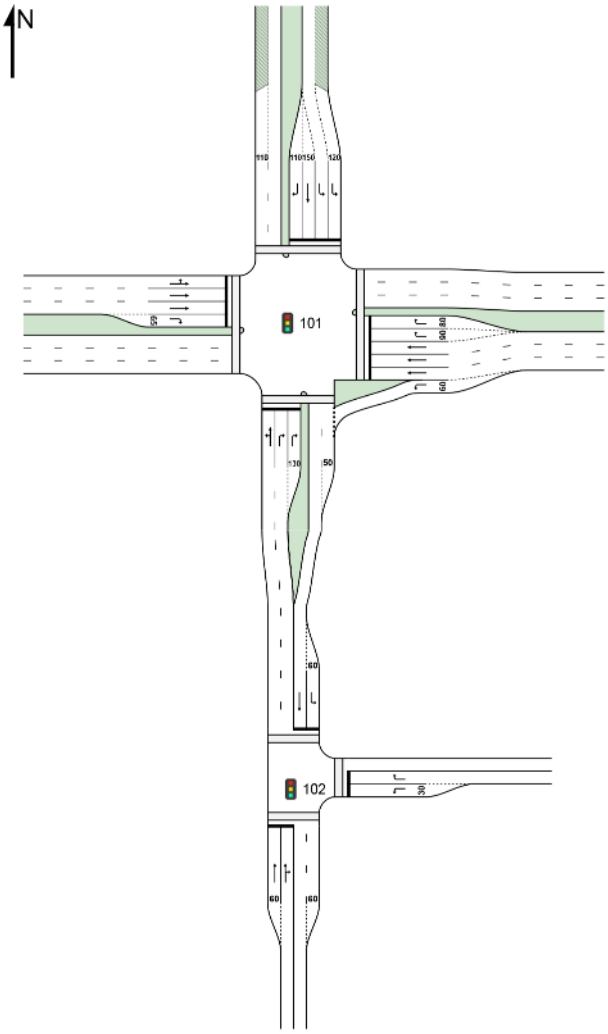
Appendix D

SIDRA Analysis results with Marina Residential Planning Proposal

NETWORK LAYOUT

Network: N101 [Network1]

AM Peak Network

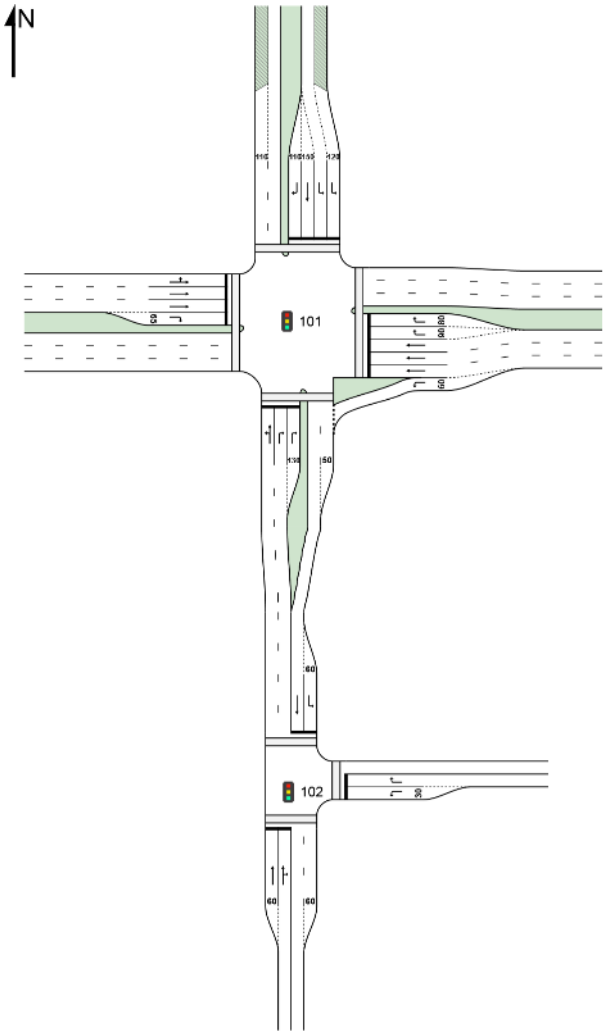


SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	Newbridge Road & Brickmakers with extra Marina Residences AM Peak
102	NA	Brickmakers Drive & Link Road with extra Marina Residences Am Peak

NETWORK LAYOUT

Network: N102 [Network2]

Pm Peak Network



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	Newbridge Road & Brickmakers with extra Marina Residences PM Peak
102	NA	Brickmakers Drive & Link Road with extra Marina Residences Pm Peak

MOVEMENT SUMMARY

Site: 101 [Newbridge Road & Brickmakers with extra Marina Residences AM Peak] Network: N101 [Network1]

Existing Four Way Intersection
Signals - Fixed Time Coordinated Cycle Time = 140 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive													
1	L2	190	5.0	190	5.0	0.890	69.3	LOS E	33.3	243.3	1.00	1.00	24.8
2	T1	256	5.0	256	5.0	0.890	64.7	LOS E	33.3	243.3	1.00	1.00	25.1
3	R2	683	5.0	683	5.0	0.889	77.8	LOS F	24.9	181.9	1.00	0.93	22.9
Approach		1129	5.0	1129	5.0	0.890	73.4	LOS F	33.3	243.3	1.00	0.96	23.7
East: Newbridge Road													
4	L2	217	5.0	217	5.0	0.159	9.4	LOS A	3.0	22.0	0.26	0.65	51.9
5	T1	933	5.0	933	5.0	0.505	39.5	LOS C	17.4	126.7	0.85	0.73	40.0
6	R2	519	5.0	519	5.0	1.122	148.1	LOS F	40.3	294.0	1.00	1.12	17.5
Approach		1669	5.0	1669	5.0	1.122	69.3	LOS E	40.3	294.0	0.82	0.84	28.4
North: Governor Macquarie Drive													
7	L2	490	5.0	490	5.0	1.125	200.2	LOS F	31.1	227.4	1.00	1.29	13.6
8	T1	137	5.0	137	5.0	0.597	65.6	LOS E	9.1	66.3	1.00	0.80	19.7
9	R2	103	5.0	103	5.0	0.893	89.1	LOS F	8.0	58.4	1.00	0.98	24.6
Approach		730	5.0	730	5.0	1.125	159.3	LOS F	31.1	227.4	1.00	1.15	15.2
West: Newbridge Road													
10	L2	159	5.0	159	5.0	1.168	228.2	LOS F	104.7	764.0	1.00	1.73	12.7
11	T1	1973	5.0	1973	5.0	1.168	222.2	LOS F	105.8	772.3	1.00	1.78	13.0
12	R2	129	5.0	129	5.0	0.458	65.1	LOS E	8.1	59.3	0.96	0.80	20.4
Approach		2261	5.0	2261	5.0	1.168	213.6	LOS F	105.8	772.3	1.00	1.72	13.2
All Vehicles		5789	5.0	5789	5.0	1.168	137.8	LOS F	105.8	772.3	0.95	1.25	17.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.1 %
Number of Iterations: 5 (maximum specified: 10)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	21	41.7	LOS E	0.1	0.1	0.77	0.77
P2	East Full Crossing	11	64.2	LOS F	0.0	0.0	0.96	0.96
P3	North Full Crossing	21	43.3	LOS E	0.1	0.1	0.79	0.79
P4	West Full Crossing	53	53.3	LOS E	0.2	0.2	0.87	0.87
All Pedestrians		105	50.0	LOS E			0.84	0.84

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.

MOVEMENT SUMMARY

Site: 101 [Newbridge Road & Brickmakers with extra Marina Residences PM Peak] Network: N102 [Network2]

Existing Four Way Intersection
Signals - Fixed Time Coordinated Cycle Time = 140 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive													
1	L2	153	5.0	143	5.0	0.862	76.1	LOS F	18.4	134.3	1.00	0.98	23.3
2	T1	113	5.0	106	5.0	0.862	71.5	LOS F	18.4	134.3	1.00	0.98	23.6
3	R2	320	5.0	299	5.0	0.897	86.5	LOS F	11.2	81.7	1.00	0.93	21.5
Approach		586	5.0	547[N1]	5.0	0.897	80.9	LOS F	18.4	134.3	1.00	0.95	22.3
East: Newbridge Road													
4	L2	604	5.0	604	5.0	0.555	24.3	LOS B	18.3	133.9	0.64	0.87	36.8
5	T1	1988	5.0	1988	5.0	1.043	125.1	LOS F	88.8	648.5	1.00	1.39	20.5
6	R2	531	5.0	531	5.0	0.902	72.0	LOS F	24.3	177.6	0.98	0.91	28.4
Approach		3123	5.0	3123	5.0	1.043	96.6	LOS F	88.8	648.5	0.93	1.21	22.8
North: Governor Macquarie Drive													
7	L2	504	5.0	504	5.0	0.787	69.0	LOS E	17.4	127.1	1.00	0.88	28.2
8	T1	347	5.0	347	5.0	1.029	126.2	LOS F	35.4	258.2	1.00	1.32	12.0
9	R2	211	5.0	211	5.0	1.030	133.3	LOS F	21.2	155.0	1.00	1.17	18.8
Approach		1062	5.0	1062	5.0	1.030	100.5	LOS F	35.4	258.2	1.00	1.08	20.3
West: Newbridge Road													
10	L2	157	5.0	157	5.0	0.782	50.8	LOS D	31.3	228.5	0.96	0.87	35.0
11	T1	1241	5.0	1241	5.0	0.782	43.7	LOS D	31.7	231.7	0.93	0.84	38.0
12	R2	215	5.0	215	5.0	1.032	138.8	LOS F	22.4	163.3	1.00	1.15	11.2
Approach		1613	5.0	1613	5.0	1.032	57.1	LOS E	31.7	231.7	0.94	0.89	32.1
All Vehicles		6384	5.0	6345[N1]	5.0	1.043	85.8	LOS F	88.8	648.5	0.95	1.08	24.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 8.3 %
Number of Iterations: 10 (maximum specified: 10)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	21	33.6	LOS D	0.1	0.1	0.69	0.69
P2	East Full Crossing	11	64.2	LOS F	0.0	0.0	0.96	0.96
P3	North Full Crossing	21	41.7	LOS E	0.1	0.1	0.77	0.77
P4	West Full Crossing	53	64.3	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		105	53.6	LOS E			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.

MOVEMENT SUMMARY

Site: 102 [Brickmakers Drive & Link Road with extra Marina Residences Am Peak]

Network: N101 [Network1]

New Intersection with Traffic Signals
Signals - Fixed Time Coordinated Cycle Time = 140 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive													
2	T1	760	5.0	760	5.0	0.365	14.2	LOS A	13.8	100.5	0.54	0.48	35.9
3	R2	55	5.0	55	5.0	0.365	21.5	LOS B	13.8	100.5	0.59	0.53	39.9
Approach		815	5.0	815	5.0	0.365	14.7	LOS B	13.8	100.5	0.54	0.49	36.4
East: Link Road													
4	L2	89	5.0	89	5.0	0.078	14.8	LOS B	2.3	16.5	0.40	0.64	41.2
6	R2	369	5.0	369	5.0	0.888	68.9	LOS E	26.9	196.5	0.98	0.96	17.5
Approach		458	5.0	458	5.0	0.888	58.4	LOS E	26.9	196.5	0.87	0.90	21.5
North: Brickmakers Drive													
7	L2	211	5.0	211	5.0	0.422	48.9	LOS D	11.7	85.7	0.87	0.80	27.1
8	T1	273	5.0	273	5.0	0.558	45.6	LOS D	15.7	114.4	0.90	0.76	28.1
Approach		484	5.0	484	5.0	0.558	47.0	LOS D	15.7	114.4	0.88	0.78	27.7
All Vehicles		1757	5.0	1757	5.0	0.888	35.0	LOS C	26.9	196.5	0.72	0.67	28.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.1 %
Number of Iterations: 5 (maximum specified: 10)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	11	44.8	LOS E	0.0	0.0	0.80	0.80
P2	East Full Crossing	21	41.7	LOS E	0.1	0.1	0.77	0.77
P3	North Full Crossing	53	44.9	LOS E	0.2	0.2	0.80	0.80
All Pedestrians		84	44.1	LOS E			0.79	0.79

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.

MOVEMENT SUMMARY

Site: 102 [Brickmakers Drive & Link Road with extra Marina Residences Pm Peak] Network: N102 [Network2]

New Intersection with Traffic Signals
Signals - Fixed Time Coordinated Cycle Time = 140 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive													
2	T1	276	5.0	276	5.0	0.197	5.7	LOS A	5.5	40.2	0.32	0.28	43.4
3	R2	92	5.0	92	5.0	0.388	37.4	LOS C	4.9	35.7	0.82	0.79	32.8
Approach		368	5.0	368	5.0	0.388	13.6	LOS A	5.5	40.2	0.45	0.41	38.4
East: Link Road													
4	L2	70	5.0	70	5.0	0.144	45.8	LOS D	3.6	26.2	0.80	0.73	30.5
6	R2	309	5.0	309	5.0	1.144	214.3	LOS F	41.4	302.3	1.00	1.37	7.1
Approach		379	5.0	379	5.0	1.144	183.2	LOS F	41.4	302.3	0.96	1.25	9.3
North: Brickmakers Drive													
7	L2	362	5.0	357	5.0	0.310	17.0	LOS B	11.8	86.3	0.53	0.72	38.4
8	T1	844	5.0	833	5.0	0.906	32.5	LOS C	47.8	349.0	0.74	0.78	32.1
Approach		1206	5.0	1190 N1	5.0	0.906	27.9	LOS B	47.8	349.0	0.68	0.76	33.8
All Vehicles		1953	5.0	1937 N1	5.0	1.144	55.5	LOS D	47.8	349.0	0.69	0.79	24.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 8.3 %
Number of Iterations: 10 (maximum specified: 10)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	11	56.7	LOS E	0.0	0.0	0.90	0.90
P2	East Full Crossing	21	11.6	LOS B	0.0	0.0	0.41	0.41
P3	North Full Crossing	53	56.8	LOS E	0.2	0.2	0.90	0.90
All Pedestrians		84	45.5	LOS E			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.