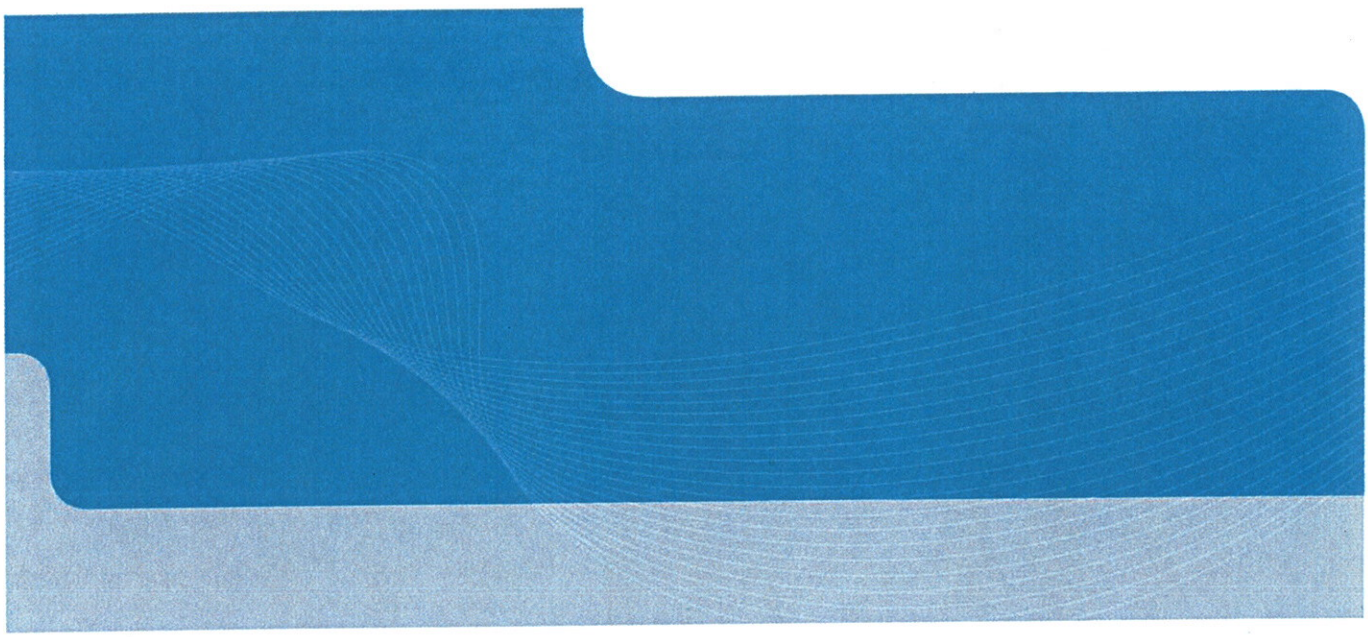
CLIENTS | PEOPLE | PERFORMANCE

New Brighton Golf Club

Report for New Brighton Golf Club Rezoning Specialist Studies

Transport Assessment

June 2011



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4. Traffic Generation

4.1 Proposed Development

Based on proposed Concept Plan, as shown in Figure 26, the residential development will comprise of 313 residential lots notionally consisting of the following:

- 40% or 125 dwellings will be 3-bedroom attached dwellings;
- 35% or 110 dwelling will be 3-bedroom single detached dwellings; and
- 25% or 78 dwellings will 4-bedroom single detached dwellings.

In addition to the residential development, the Concept Plan includes a redevelopment of the existing holes and construction of a new clubhouse.

Figure 26 Concept Plan

4.2 Traffic Generation

Traffic generation for the Site was estimated on the basis of the RTA's *Guide to Traffic Generating Developments*.[2] The Guide provides trip generation rates to estimate peak hour vehicle traffic to and from specific land use developments. The traffic generation for residential uses is further differentiated by type of dwelling. The Guide specifies a range of traffic generation rates for private housing depending on dwelling size and offers some discount depending on the sites proximity to public transport, local and regional centres and community facilities and schools.

The RTA Guide suggests that single detached dwelling houses have a corresponding peak hour traffic generation rate of 0.85 vehicle trips per dwelling and a daily traffic generation rate of 9.0 vehicle trips per dwelling. The rates for single detached dwellings do not differentiate by the number of bedrooms. The rates are based on surveys in areas where new subdivisions were being built and where public transport accessibility is limited. It is also noted that high car ownership rates in an LGA counter balance good public transport access and result in the above traditionally high traffic generation rates.

Traffic generation rates for medium density dwelling units are potentially lower than that applied for single detached dwellings. Unlike single detached dwellings, the traffic generation rates for townhouses or attached units depends on the number of bedrooms which are traditionally lower in number per dwelling. The weekday peak hour traffic generation rate for larger townhouses or units with three or more bedrooms is estimated to be 0.5-0.65 vehicle trips per dwelling and have a corresponding daily traffic generation of 5-6.5 vehicle trips per day per dwelling. This generation rate has been used to determine the potential traffic generation from the proposed development of the site.

With the proposed development mix, the 313 dwellings are expected to generate a total of 240 vehicle trips during the peak hour. New traffic generation associated with the redesign of the holes and the clubhouse is expected to be marginal and already counted in the growth of existing traffic generation of the area observed though the traffic volume counts undertaken at the key access intersections.

Although the Guide further suggests that up to 25% of trips may be considered 'internal' to the subdivision involving local shopping, schools and local social visits, it has been assumed that all trips for this development will be external since the location of major shops, schools and facilities are all external to the Site. Therefore, this assessment can be assumed to be conservative and a worst case scenario.

It is also noted that the peak hour volume for residential traffic tends to be representative of the morning peak hour while in the evening peak, the residential traffic generation can be more spread over a wider time period.

4.3 Distribution of Traffic

4.3.1 Directional Split

In terms of directional split of residential traffic generation, outbound traffic is expected to be higher than inbound traffic in the morning peak period while in the evening peak period, inbound traffic will be higher than outbound traffic. The RTA Guide suggests that 80% of the traffic generated by residential developments account for outbound traffic in the morning peak while 20% account for inbound traffic. For the evening peak, it is expected to be the opposite.

[2] *Guide to Traffic Generating Developments*, NSW-RTA, 2002.

Table 11 Directional Split of Peak Hour trips

	AM Peak		PM Peak	
	Inbound	Outbound	Inbound	Outbound
Percent of trips	20%	80%	80%	20%
Vehicle trips per hour:	46	183	183	46

4.3.2 Modal Split

The overall modal splits based on the 2006 Journey-to-Work data from the TDC[3] indicate a modal share for private car of 77% for the Liverpool LGA. The modal share for public transport will likely depend on the proximity and availability of public transport. Based on current trends, it is assumed that the Site is likely to initially generate more car trips than public transport trips. However, it is noted that there are current plans to improve bus services in the local area and this may encourage a future mode share shift to public transport in line with State Government objectives. For a worst case scenario assessment it is assumed all trips generated by the proposed development would be by private car.

4.4 Distribution of Traffic

The JTW data presented in Section 3 suggests that the JTW trips tend to be localised and within the LGAs of Liverpool, Bankstown and Fairfield. A proportion of around 9 percent was calculated to be trips made to the Sydney CBD area.

Hence, the distribution of traffic from the development is likely to follow current directional flows at the key access routes to and from the development. For the purpose of this assessment, it was assumed that the volume of inbound and outbound traffic to and from the Site would be approximately evenly balanced between the key access routes, as follows:

To/from the proposed development -

- 50% from the west via Nuwarra Road route access; and
- 50% from the north via Brickmakers Drive/Newbridge Road access route.

Directional flow along Nuwarra Road corridor and the Newbridge Road corridor are further based on current directional distribution of traffic flows observed at the intersection of Nuwarra Road with Heathcote Road to the south and Newbridge Road to the north and at the intersection of Newbridge Road and Governor Macquarie Road.

4.5 Future Traffic

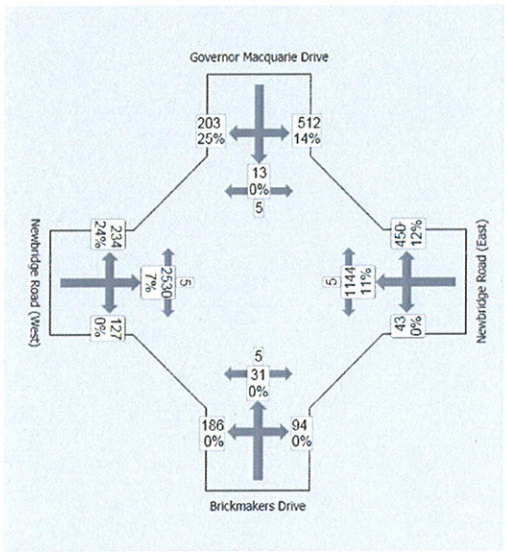
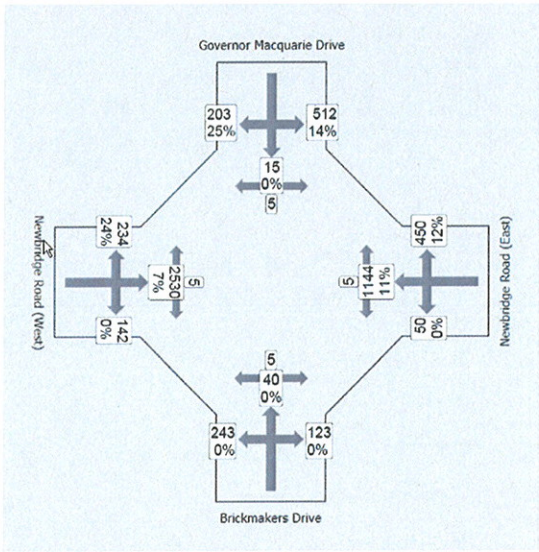
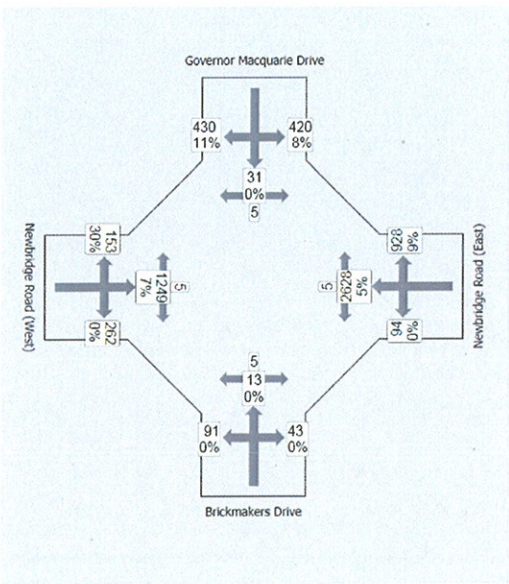
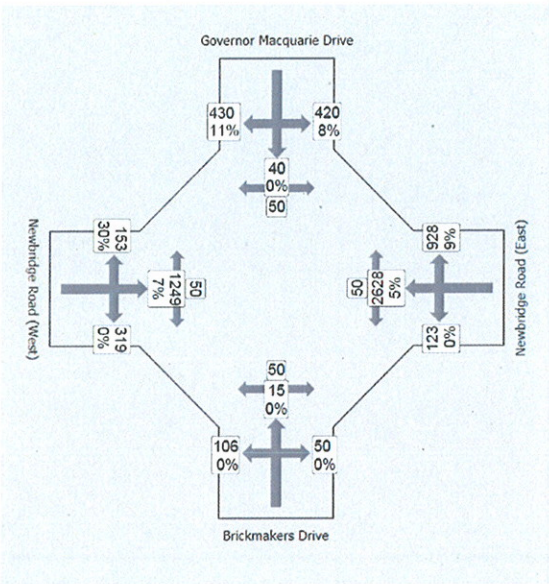
As outlined in Section 2.4, for the purpose of assessing future traffic, it was assumed that traffic growth along the main access routes will be static beyond 2011.

[3] Transport Data Centre, NDS Department of Transport Infrastructure.

4.5.1 Nuwarra Road and Governor Macquarie Drive Intersection

A summary of the projected traffic volumes has been produced for the 2 development scenarios for the Nuwarra Road and Newbridge Road intersection. Refer to Table 12 for further details.

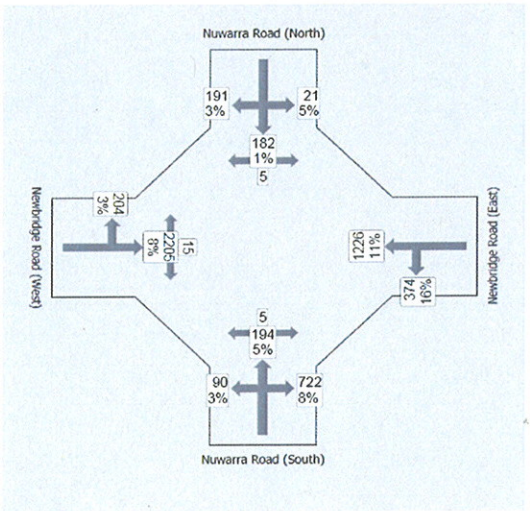
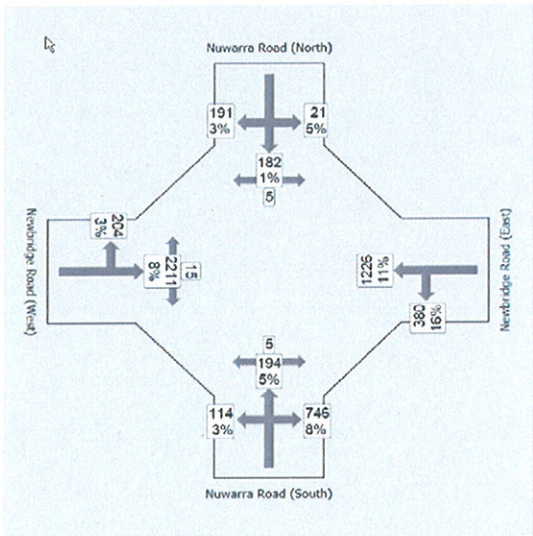
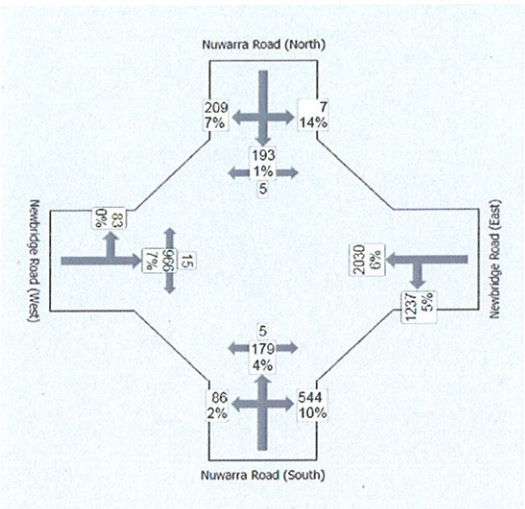
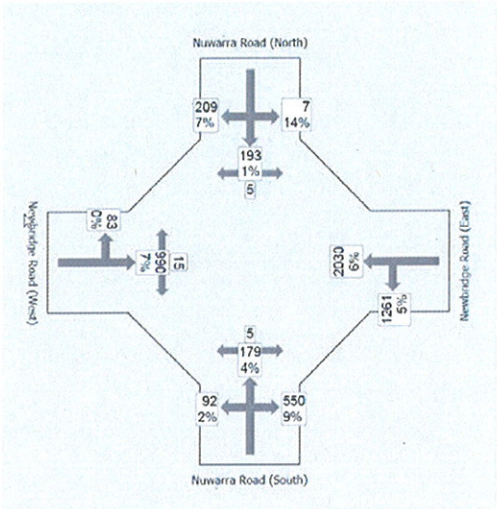
Table 12 Intersection Traffic Volumes at Newbridge Road – Governor Macquarie Drive

Scenario 1 – 2016 Boral Moorebank development (AM Peak)	Scenario 2 – 2016 New Brighton and Boral Moorebank development (AM Peak)
	
Boral Moorebank development (PM Peak)	**New Brighton and Boral Moorebank development (PM Peak)**
	

4.5.2 Nuwarra Road and Newbridge Road Intersection

A summary of the projected traffic volumes has been produced for the 2 development scenarios for the Nuwarra Road and Newbridge Road intersection. Refer to Table 13 for further details.

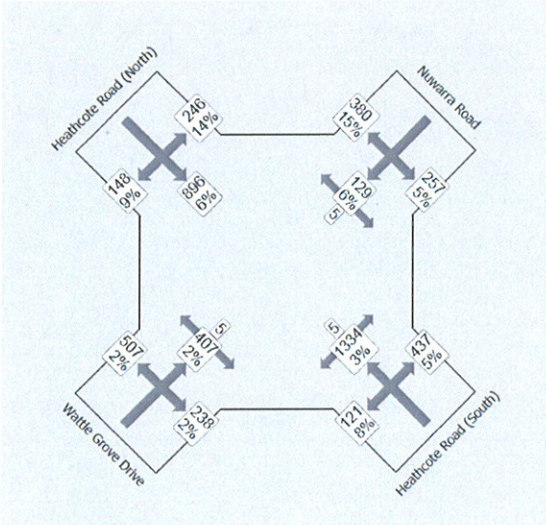
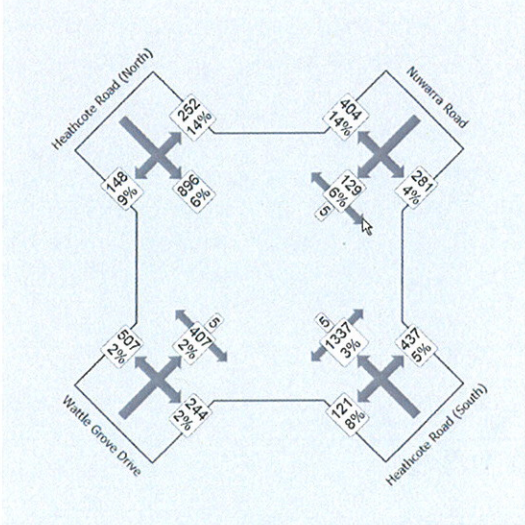
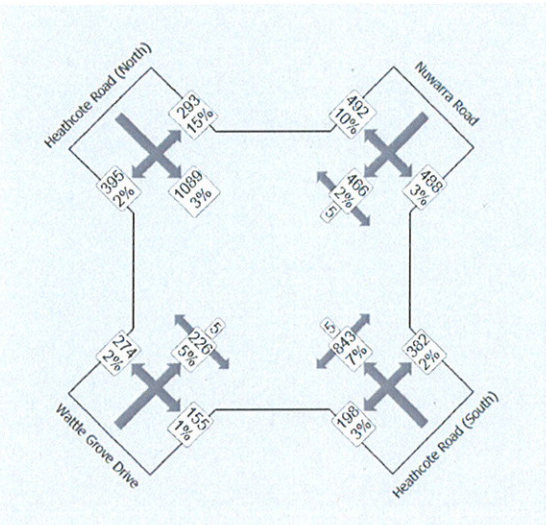
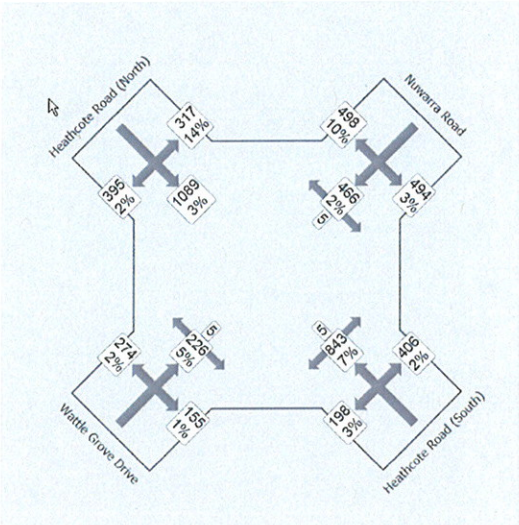
Table 13 Intersection Traffic Volumes at Nuwarra Road – Newbridge Road

Boral Moorebank development (AM Peak)	New Brighton and Boral Moorebank development (AM Peak)
	
Boral Moorebank development (PM Peak)	New Brighton and Boral Moorebank development (PM Peak)
	

4.5.3 Nuwarra Road and Heathcote Road Intersection

A summary of the projected traffic volumes has been produced for the 2 development scenarios for the Nuwarra Road and Heathcote Road intersection. Refer to Table 14 for details.

Table 14 Intersection Traffic Volumes at Nuwarra Road – Heathcote Road

2016 Boral Moorebank development (AM Peak)	New Brighton and Boral Moorebank development (AM Peak)
	
Boral Moorebank development (PM Peak)	New Brighton and Boral Moorebank development (PM Peak)
	

5. Impact Assessment

5.1 Site Access Arrangements

As noted in Section 2.3 and Figure 8, entry to the Site will be provided via two locations. One access will be from Nuwarra Road and the other access will be from Newbridge Road. Table 7 is further refined to indicate the distribution of inbound and outbound traffic on the two access intersections. The expected additional volumes are shown in Table 15.

Table 15 Inbound and Outbound Traffic Generated by the Development

	AM Peak		PM Peak	
	Inbound	Outbound	Inbound	Outbound
Percent of trips	20%	80%	80%	20%
Total Trips (Table 11)	**46**	**183**	**183**	**46**
Additional Vehicle trips per hour at Nuwarra Road access driveway	**23**	**92**	**92**	**23**
◗ Nuwarra Rd South Approach	12	46	46	12
◗ Nuwarra Rd North Approach	11	46	46	11
Additional Vehicle trips per hour at Newbridge Road/ Brickmakers Drive	**23**	**91**	**91**	**23**
◗ Newbridge Rd East Approach	7	27	27	7
◗ Newbridge Rd West Approach	14	55	55	14
◗ Gov Macquarie Approach	2	9	9	2

Table 15 provides the distribution of generated traffic attributed to the development. Note that this is a very conservative appraisal with no reduction applied. Hence, the assessments carried out would denote the worst-case scenario

5.2 Surrounding Traffic Generation

This section of the assessment presents the potential traffic generation that may be attributed to the future development of surrounding land adjacent to the Site.

5.2.1 Boral Moorebank Land

The Boral Moorebank Land is 102 ha in area and is located just north of the Site. It is currently accessible from Nuwarra Road at the signalised intersection with Maddecks Avenue. The development is proposed to incorporate around 950 to 990 residential dwellings (standard residential lots with a 40% medium density component) and including 10,000 sqm of commercial floorspace.

Traffic modelling using NETANAL was undertaken by Sims Varley Traffic Systems Pty Ltd in 2002 to test the maximum level of development sustainable by the proposed access arrangements. The modelling

indicated that the road network in the vicinity of the site is capable of sustaining a residential release of 950-990 lots with the construction of a link road between Newbridge Road at Governor Macquarie Drive and Nuwarra Road. This link road, subsequently named Brickmakers Drive, is anticipated to reduce the volume of traffic in both directions along Nuwarra Road and as a result, improve the operation and provide additional increased capacity at the intersection of Nuwarra Road and Newbridge Road. As part of the link road option, a number of works were recommended, including the installation of traffic signals at the intersection of Nuwarra Road with Brickmakers Drive at the current golf club entrance. The modelling also indicated that the residential development could even be further extended to 1250 lots with minor modifications to proposed link road and the recommended infrastructure works. The findings of the modelling report served as one of the resource documents employed by the Liverpool City Council during the preparation of the Development Control Plan (DCP) No, 50 in September 2003.

Further traffic modelling was undertaken in October 2005 to test the effect of limiting vehicle speed on Brickmakers Drive to 50 km/h thereby to reduce the potential for intrusion by through traffic. The modelling indicates that traffic volumes on Newbridge Road and Nuwarra Road would increase within manageable limits given the infrastructure changes prescribed by the previous modelling report. The DCP 50 was modified in July 2006 to reflect these findings.

5.2.2 Moorebank Recyclers Pty Ltd Land

Moorebank Recyclers Pty Ltd land is located northeast of the Site and is being developed into a Resource Recovery Centre or Materials Recycling Yard to cater for building and construction waste. This will be processed on site and recycled for use in the building and civil engineering industries. The property covers an area of approximately 21.4 ha in area and lies on the west bank of Georges River. The land forms part of the Boral Moorebank Structure Plan which was adopted by Liverpool City Council for the redevelopment of the land.

The Preliminary Assessment Report prepared by Nexus Environmental Planning Pty Ltd dated January 2006 makes reference to a traffic report prepared by Lyle Marshall and Associates Pty Ltd for the rezoning application of the site for the expected traffic generation of the facility. It is reported that the estimated number of daily truck movements would be 324 truck movements a day with 19 trucks inbound and 19 trucks outbound during the AM peak of 8:00-9:00 a.m. and 5 trucks inbound and 5 trucks outbound during the PM peak of 4:00-5:00 p.m. Since access to the yard is being provided via an existing access situated on Newbridge Road that leads directly into the yard, the associated traffic is not expected to use Brickmakers Drive.

5.3 Future Intersection Operation

As indicated in Section 4.2, the Site is expected to generate a maximum of 240 vehicle trips during the peak hour. In Section 2.7.2 of this report, the operational performance of the key intersections was assessed for existing volumes and current signal phasing plans. The following sections provides an assessment of the future operational performance of intersections taking into account changes in background traffic trends and additional future traffic volumes attributed to known future developments in the local area (i.e. Boral Brickworks land).

Two future scenarios have been tested to determine potential impact of the rezoning on the operational performance of the impacted intersections. These scenarios are as follows:

- Boral Moorebank development; and
- Boral Moorebank development and the rezoning of the site for residential use in the New Brighton Golf Club.

The results of the assessments are summarised in the sections that follow.

Table 16 Post Development Intersection Performances (with growth rate)

Intersection Name	Scenario	Peak Period	Average Delay (Seconds) (a)	Level of Service (LOS) (b)	Degree of Saturation (DS) (c)	Comments
Heathcote and Nuwarra	Existing Conditions	AM	51.9	D	1.038	The intersection operation is at a satisfactory level for the AM peak, with critical movements along Heathcote Road (north) and Nuwarra Road. The intersection operation is at near capacity for the PM peak, with Nuwarra Road (east) and Heathcote Road (north) operating at full capacity
		PM	76.8	F	1.117	
	With Boral Moorebank Lands only	AM	50.5	D	1.016	The overall intersection for the AM peak is operating at a satisfactory level, with Heathcote Road (south) operating at near capacity. The overall intersection for the PM peak is operating at a satisfactory level, with Nuwarra Road operating at near capacity.
		PM	49.4	D	1.000	
	With Boral Moorebank Lands and proposed development	AM	50.6	D	1.068	The overall intersection for the AM peak is performing near to capacity. The overall intersection is performing near capacity for the PM Peak, with critical movements along Heathcote Road and Nuwarra Road.
		PM	54.1	D	1.086	
Newbridge and Nuwarra	Existing Conditions	AM	63.9	E	1.041	The intersection operation is close to capacity for the AM peak, with critical movements along Nuwarra Road and Newbridge Road (east) The overall intersection for the PM peak is at full capacity,
		PM	80.9	F	1.014	
	With Boral Moorebank Lands only	AM	67.7	E	1.031	The overall intersection is operating at near capacity for the AM peak, with Nuwarra Road (south) and Newbridge (east) performing at full capacity.
		PM	34.8	C	1.081	

						The overall intersection is operating at a satisfactory level for the PM peak, with critical movements along Nuwarra Road.
	With Boral Moorebank Lands and proposed development	AM PM	69.7 36.6	E C	1.044 1.210	The intersection operation is close to full capacity for the AM peak, with critical movements along Nuwarra Road (south) and Newbridge Road (west). The overall intersection is performing at a satisfactory level for the PM Peak, with critical movements along Nuwarra Road.
Newbridge and Governor Macquarie	Existing Conditions (t-intersection)	AM PM	56 41.2	D C	0.957 1.00	The overall intersection for the AM peak is performing near to capacity. The intersection operation is at a satisfactory level for the PM peak with critical movements along Newbridge Road (west)
	With Boral Moorebank Lands only (4 way intersection)	AM PM	63.0 50.9	E D	0.986 1.029	During the AM peak Brickmakers Drive, Governor Macquarie Drive and Newbridge Road (west) are operating at full capacity. The overall intersection is operating at a satisfactory level in the PM peak with Brickmakers Drive and Governor Macquarie Drive operating at full capacity.
	With Boral Moorebank Lands and proposed development (4 way intersection)	AM PM	63.4 53.6	E D	0.986 1.054	The overall intersection is running close to capacity for the AM peak, with critical movements along Brickmakers Drive, Governor Macquarie Drive and Newbridge Road (west). The intersection operation is functioning at a satisfactory level for the PM peak, with critical movements along Governor Macquarie Drive and Brickmakers Drive

The results of the SIDRA analysis indicate that the subject intersections operate near or at capacity under all scenarios. These being under existing conditions and with minor modifications to intersection arrangements similar to typical treatments introduced under the Pinch Point Program under projected development traffic demand with Boral Moorebank Lands and with both Boral Moorebank Lands plus the proposed development. Refer to the above table for further details on the performance of the intersections under the three different scenarios.

It should be noted that the proposed modification to intersections have been introduced to demonstrate that the intersection are able to accommodate worst case scenario traffic levels for the proposed development and their performance will not change if the proposed development is approved and

delivered in addition to Boral Moorebank Lands. Other sections of this report indicate that the proposed development has the potential to support travel containment based on existing uses that are available alone. It is also noted in the Sub Regional Strategy that new planned infrastructure, the location of new jobs and a citywide parking policy is likely to encourage increases in walking and cycling and use of public transport for peak hour Journey to Work based trips. The locality of the site also offers the opportunity to use these mode choices for retail, recreation and education trip purposes.

It is assumed that the actual intersection improvements will be determined and delivered as part of a holistic plan for the respected corridors. These improvements will be aimed at delivering the objectives of the South West Subregional Strategy and improving the efficient operation of the existing transport network combined with planned growth. Refer to section 3.4 for details of improvements and committed projects aimed at addressing capacity issues along the road network and more balanced travel patterns in the region.

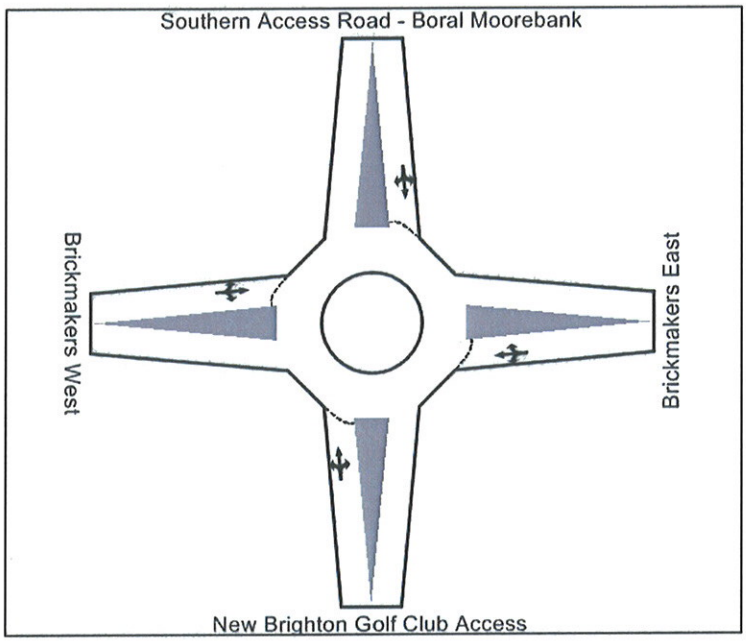
A preliminary level review of regional modelling undertaken to date has indicated that traffic patterns are likely to change as a result of upgrades to strategic corridors and the location of new major centres, urban development and employment centres. This may mean that existing arterial roads in close proximity to the site become less attractive as alternative routes for regional traffic movements. As a result of this and the review of recent historical daily traffic trends, the growth factors applied to background traffic under the with development modelling scenarios have been minimal and reflect the existing congested conditions and the attractiveness of these routes in comparison to the more attractive upgraded alternatives.

5.4 Configuration of the Proposed Roundabout at Brickmakers Drive

As shown in Table 11, the proposed development of the New Brighton Golf Club is likely to generate a total of 229 vehicle trips (46 IN and 183 OUT in the AM peak and 183 IN and 46 OUT in the PM peak). Access to and from the Site would be via the roundabout situated at Brickmakers Drive.

The proposed layout of the roundabout intersection is shown in Figure 27. In the future, this roundabout is expected to cater for traffic generated by the Boral Moorebank Land (located north to the roundabout) and other future neighbouring developments. Council has previously expressed concern that the proposed layout of the roundabout may not be able to accommodate the future traffic flows brought about by the developments in the area other than the New Brighton Golf Club.

Figure 27 Brickmakers Drive Roundabout Configuration

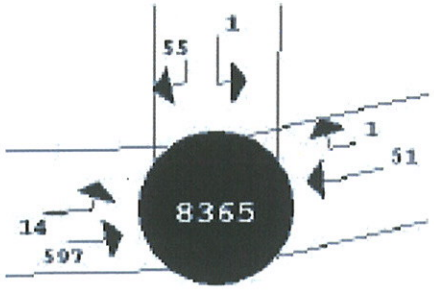
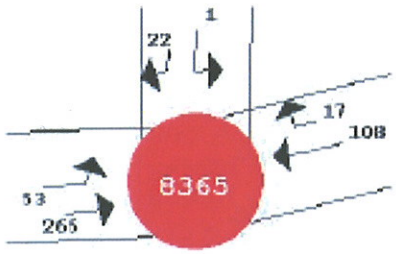


Intersection analysis was undertaken to verify the likely operational performance of the roundabout with proposed 2016 New Brighton Gold Club traffic, Boral Moorebank land traffic and other known developments.

The microsimulation modelling report[4] undertaken for the Boral Moorebank Land also provides an indication of projected vehicle volumes at the roundabout with the full development of the Moorebank Land. The projected turn movements reported by the NETANAL model for the AM peak and evening peak periods adopted a heavy vehicle composition of 8.5%. These turning volumes were projected for 2006 conditions (assumed full development of the site) as shown in Table 17.

[4] Boral Moorebank Land Redevelopment Traffic and Transport Supplementary Report, Addendum – Acoustics and Civil Design Data, Sims Varley Pty Ltd, October 2005.

Table 17 Expected Turning Volumes, Southern Access Road, Boral Moorebank Land, 2006

AM Peak	PM Peak
	

As the full development potential of the Boral Moorebank Land has not yet been reached, these expected volumes are still consistent with the development of the Boral Moorebank Land. The results of the intersection analyses are given in Table 18.

Table 18 Future 2016 Intersection Operation, Brickmakers Drive Roundabout

AM Peak				PM Peak			
LoS	Degree of Saturation	Average Delay (secs)	95% Back of Queue (m)	LoS	Degree of Saturation	Average Delay (secs)	95% Back of Queue (m)
A	0.476	7.06	34	A	0.281	7.5	16

It can be seen that the proposed layout of the roundabout would be able to accommodate future traffic aside from traffic generated by the residential development proposed on the New Brighton Golf Club.

5.5 Public Transport Requirements

The site is served by buses and will potentially attract patronage from the new residents of the proposed development and surrounding areas. Although no reduction has been applied in the calculation of traffic generation, it is acknowledged that with the existing and planned bus services through the area, a target mode split of at least 10% is identified in the State Government Plan as being feasible. New bus stops should be located within 400m walking distance from the residential core to encourage the new residents who have the opportunity to use public transport in lieu of the private car.

5.6 Pedestrians and Cyclists

The site is within easy walk and cycle distance from the surrounding residential areas. There is significant opportunity to encourage cycling for short trips between the residential area and the planned commercial area in the Boral Moorebank land development. In support of the proposed Liverpool Bike Plan, the provision of pedestrian and cycle facilities from the Site to link up with the proposed route along Brickmakers Drive will encourage and offer the opportunity for residents to cycle or walk for local based trips.

5.7 Parking Provision

Minimum parking requirements for the proposed development are identified based on Liverpool City Council's DCP 2008 (Part 1.2, Section 2). The RTA's *Guide to Traffic Generating Developments* also provides minimum standards.

Table 19 Guidelines for Minimum Parking Requirements

Land Use	Liverpool City Council DCP 2008 (Part 1.2, Section 2)	RTA Guide to Traffic Generating Developments
Dwelling houses	2 spaces / dwelling	1-2 spaces / dwelling
Medium Density Residential	1 space for each unit plus additional 1 space per 5 x 2 bedroom unit and additional 1 space per each 2 x 3 bedroom unit 1 space per 5 units (for visitor parking)	1 space per unit + 1 space for every 5 x 2 bedroom unit + 1 space for every 2 x 3 bedroom unit 1 space for every 5 units (for visitor parking)

6. Summary and Conclusions

The proposed development is mainly expected to impact on the key intersections of Nuwarra Road/Heathcote Road, Nuwarra Road/Newbridge Road, and Newbridge/Governor Macquarie Road. The analysis undertaken as part of this study indicates that the existing operational performance of these intersections borders around the 'near capacity' or 'at capacity'. The analysis of existing intersection performance indicated that the intersection of Nuwarra Road with Heathcote Road is operating near capacity while the intersection of Nuwarra Road with Newbridge Road is already operating at a LoS "F" where significant vehicle delays are already evident.

The proposed development will alter the operation of the intersection of Newbridge Road with Governor Macquarie from currently operating as a T-intersection to a signalised four way intersection. This new intersection arrangement was tested as part of this study to determine impact on the road network.

The Boral Moorebank land development is expected to generate a total of 742 vehicle trips during the peak hour. The New Brighton Golf Club will generate 229 vehicle trips during the peak hour. This assessment represents the worst case scenario and no reduction has been applied for internal trips, linked trips or public transport trips as would be expected in the planning of Boral Moorebank, Moorebank town centre, surrounding employment areas and Liverpool as a River City. It is anticipated that improvements to cycling and public transport services and infrastructure will occur in the near future as part of committed projects and objectives that form part of the Metropolitan Transport Plan and South West Subregional Strategy.

The future operating conditions of intersections was tested with the increased traffic volumes attributed to the Boral Moorebank land development and the New Brighton Golf Club development. The analysis indicates that key intersections along Newbridge Road will require further enhancement.

With the already anticipated increase in traffic volumes brought about by Boral Moorebank development, it is expected that the impacts brought about by the New Brighton Golf Club development would be marginal and would not worsen the operational performance of the network beyond what it will already be experiencing. In addition, the existing conditions indicate that the intersections already have limited spare capacity (or no capacity in the case of Nuwarra Road – Newbridge intersection) but can still accommodate the anticipated traffic from the proposed development with minor modifications to key intersections.

Improvements or mitigation measures associated with these are best identified based on an assessment of the road corridor rather than the intersection in isolation should be addressed as part of the planning of Boral Moorebank and RTA's Pinch Point program. Previous modelling undertaken for the area has identified intersection treatments required to accommodate the anticipated traffic generation from the proposed Boral Moorebank development site and expected changes in background traffic patterns.

The completion of Brickmakers Drive has been deemed to be essential for improving traffic flow and decrease pressure on the intersection of Nuwarra Road and Newbridge Road for Boral Moorebank Lands and does provide access and benefits for the proposed development. As a result of its construction, it is anticipated that Brickmakers Drive will absorb a proportion of the traffic volume on Nuwarra Road and improve traffic flow at the intersection.

Opportunities exist to achieve mode shift from private car to public transport in line with NSW Government policy for Metropolitan Sydney and the South West Subregion. The availability of public transport in the form of bus services is an added advantage for the Site. It is assumed that with the existing and proposed modifications to Bus Route M90 along Brickmakers Drive will attract potential users from the new residents and hence, it can be expected that a reduction in vehicle trips by private car may be achieved. In addition, suitable bus stops and shelters and amenities should be provided to further encourage modal shift to public transport

The current initiatives to expand the pedestrian and cycling network in the vicinity of the Site will promote transport sustainability and will further enhance the potential for mode shift.

Finally, it is noted that the planned development improvements to the strategic road network, changes in land uses and the level of planned development within the Moorebank precinct will impact on the key intersections and may require further assessment in order to maximise existing transport infrastructure and change travel trends in line with NSW Government policy.

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	K.Martinez	S.Manahan	*S. Manahan*	G.Hughes	*G. Hughes*	03/03/11
Final	K.Martinez	S.Manahan	*S. Manahan*	G.Hughes	*G. Hughes*	07/06/11