

Appendix 4

Traffic and Parking Assessment

CONCRETE RECYCLERS GROUP PTY LTD

**TRAFFIC REPORT FOR CONSTRUCTION AND
OPERATION OF A MATERIALS RECYCLING FACILITY
ON LOT 6, D.P. 1065574,
NEWBRIDGE ROAD, MOOREBANK**

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CONTENTS

EXECUTIVE SUMMARY

1.0 INTRODUCTION

- 1.1 Background**
- 1.2 Scope of Report**

2.0 EXISTING TRAFFIC CONDITIONS

- 2.1 Existing Road Network**
- 2.2 Existing Traffic Volumes**
- 2.3 Vehicle Access to Site**
- 2.4 Traffic Generation by Georges Fair Moorebank Residential Development**

3.0 TRANSPORT ISSUES TO BE ADDRESSED

- 3.1 Director General's Requirements**

4.0 PROCESSING OPERATIONS OF PROPOSED MATERIALS RECYCLING FACILITY

- 4.1 Part 3A Application**
- 4.2 Processing Operation**
- 4.3 Estimated Daily Truck Movements**
- 4.4 Directional Distribution of Trucks to Main Road System**
- 4.5 Estimated Peak Hour Movements**
- 4.6 Future Traffic Volumes in Brickmakers Drive**
- 4.7 Estimated Equivalent Standard Axle Loadings on Road Network**
- 4.8 Total Hourly Heavy Vehicle Movements in Nuwarra road and Brickmakers Drive**
- 4.9 Truck Parking On Site**

5.0 DESIGN OF ACCESS ROAD

- 5.1 Site Access**
- 5.2 Design Vehicles**
- 5.3 Flooding Characteristics and Site Constraints**
- 5.4 Existing Access Road**
- 5.5 Horizontal and Vertical Alignment**
- 5.6 Stormwater Drainage**
- 5.7 Pavement Width and Road Cross Sections**
- 5.8 Pavement Design and Materials**
- 5.9 Compensation For Reduced Stormwater Storage**
- 5.10 Signposted Speed Limit**
- 5.11 Construction Staging**

6.0 TRAFFIC IMPACTS OF PROPOSED MATERIALS RECYCLING FACILITY

- 6.1 Easement for Link Road**
- 6.2 Increase in Heavy Vehicle Movements On Road Network**
- 6.3 Performance of Link Road / Brickmakers Drive Intersection**
- 6.4 Noise Abatement Measures on Access Road.**
- 6.5 in Equivalent Standard Axle Loading (E.A's) on External Road Pavements**

APPENDICES:

- Appendix B** **Link Road and Access Road Design Drawings**
Sheets 1D, 2B, 3E, 4C, 5A, 6B, 7 and 8 of Drawing 8318/7/09 and Supp 1B.
- Appendix C** **Georges Fair Masterplan Concept 23/06/2010 prepared by Proust and Gardner.**
- Appendix D •** **Table B Governor Macquarie Drive north of Balanada Avenue Bidirectional Weekday Average Hourly Volumes and Vehicle Classifications.**
- **Table A Nuwarra Road South of Junction Road. Bidirectional Weekday Average Hourly Volumes and Vehicle Classifications February 2011.**
 - **Table C Brickmakers Drive at Ch.300 (North of Lot 309) Bidirectional Distribution of Average Hourly (5 day) Weekday Volumes and Vehicle Classifications October 2012.**
- Appendix E** **SIDRA Analysis Link Road / Brickmakers Drive under 2021 AM and PM Peak Hour Traffic Volumes.**

EXECUTIVE SUMMARY

1.0 INTRODUCTION

- 1.1 This report has been commissioned by Concrete Recyclers Group Pty Ltd to assess the traffic impacts arising from development of part of the Site, Lot 6, DP106554 Newbridge Road, Moorebank for construction and operation of a materials recycling facility.
- 1.2 This report addresses the traffic and transport arising from construction and operation of the proposed facility as stated in the Director General's Requirements (DGR's) and Liverpool Council's requirements.
- 1.3 The RTA has stated that direct access to Lot 6 from Newbridge Road would not be supported. The alternative access is via Brickmakers Drive to Newbridge Road, a link road to Brickmakers Drive and an access road on Lot 6 to the recycling facility.
- 1.4 Brickmakers Drive is described as a Link Road in *Figure 1* in the *Liverpool DCP 2008 for Georges Fair Moorebank* and is a higher status road than the Collector Roads Christiansen Boulevard, Maddecks Avenue and Conlon Avenue.
- 1.5 Full development of the Boral land (Georges Fair Moorebank) is planned to be completed in 2016. Stages **1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D, 2E, 3A, 3B** and **4A** were almost complete on 05/11/12 and there were **318** occupied dwellings. The status of development is shown in the *Near Map aerial photo* in **Figure 1**. Brickmakers Drive has been opened to traffic and is dedicated as a public road.

2.0 EXISTING TRAFFIC CONDITIONS

- 2.1 The existing arterial and regional road network surrounding the site comprises Newbridge Road (MR167) to the north, Governor Macquarie Drive (RR7268) to the north, Henry Lawson Drive (MR508) to the east, the M5 Motorway to the south, Nuwarra Road (RR7269) to the west and Heathcote Road (MR512) to the south west.
- 2.2 Automatic tube counts were made in Nuwarra Road south of Junction Road and Governor Macquarie drive north of Balanada Avenue in February 2011 and in Brickmakers Drive north of Maddecks Avenue in October 2012. The average **weekday** bidirectional (2 way) hourly traffic volumes and percentages of heavy vehicles are shown in Tables **A**, **B** and **C** respectively in **Appendix D** and are summarised in the table following:-

Road	ADT	% Heavy Veh.	% Heavy Veh. 7am – 10pm	% Heavy Veh. 10pm-7am
Nuwarra Road	24295	8.6	8.5	9.0
Governor Macquarie Drive	19950	16.75	17.2	13.6
Brickmakers Drive	7561	5.35	5.32	5.59

3.0 TRANSPORT ISSUES TO BE ADDRESSED

- 3.1 The Director General's Requirements were stated in a letter from the Department of Planning dated 7th July 2008.

4.0 PROCESSING OPERATIONS OF PROPOSED MATERIALS RECYCLING FACILITY

- 4.1 An application under Part 3A of the E P and A Act, 1979 was lodged with the Department of Planning for a Materials Recycling Facility on Lot 6 with an annual production capacity of 500,000 tonnes.
- 4.2 Raw materials comprising bricks, concrete, asphalt, sandstone and sand are to be transported by truck, stockpiled, fed into the crushing plant by excavators, crushed, screened into appropriate products, stockpiled, loaded and transported out by trucks that are weighed. No domestic loads of waste will be delivered to the site.
- 4.3 The estimated number of truck movements per day is 324 and the average load is 21.2 tonnes. The plant will be available to operate 292 days per annum. Trucks delivering raw materials will come in loaded and go out empty. Trucks carrying processed materials will come in empty and go out loaded. Operating hours will be **7.00am to 6.00pm Monday to Saturday**.
- 4.4 The origins of trucks bringing raw materials to the site for processing and the destinations of trucks taking processed material from the site will vary. However all trucks will travel via the Link Road and Brickmakers Drive to Newbridge Road.
- 4.5 There will be daily variations in the number of truck movements per day and per hour. The estimated truck movements expected to be generated in the **8.00-9.00am** and **4.00-5.00pm peak** hours on a typical day are **38** and **21** respectively.
- 4.6 The intersection of the link road and Brickmakers Drive has been analysed under *Give Way Sign Control* and *traffic signal control* under future 2021 projected traffic volumes. The delays to vehicles turning right into Brickmakers Drive from the link road equate to Level of Service **A** in the *am peak hour* and Level of Service **B** in the *pm peak hour under give way and sign control* and are satisfactory..
- 4.7 All trucks are to be garaged off site.

5.0 DESIGN OF ACCESS ROAD (LOT 6) AND LINK ROAD (LOT 309)

- 5.1 Future access is proposed via Brickmakers Drive (Lot 308), a Link Road in Lot 309 between Brickmakers Drive and the access handle in Lot 6.
- 5.2 The design vehicles are a 15 metre long tri-axle semi trailer, and a bogey truck and dog trailer 18.29 metres long. The gross mass is 42.5 tonnes.
- 5.3 The 100 year, 50 year and 20 year flood levels downstream of the Milperra Bridge over the Georges River were referenced from the Report prepared by Evans & Peck.
- 5.4 The existing access road is passable by laden trucks having a gross mass of 42.5 tonnes.
- 5.5 Because of the extremely flat terrain the proposed upgraded access road has been designed with a series of crests and low points with an absolute minimum longitudinal gradient of 0.25 percent and a cross fall of 3 percent. The finished surface levels are at or above the 1 in 4.2 year flood level except at the lowest point where a concrete causeway is to be constructed.
- 5.6 The stormwater drainage system has been designed for a 1 in 2 year ARI. The access road has a one way cross fall draining to a table drain that discharges into grated inlet pits and a pipeline that discharges into a pump well. The estimated peak discharge from a 1 in 2 year storm is 81 litres/sec. A submersible pump is to be used to pump runoff into above ground storage tanks.
- 5.7 The proposed access road is to carry a maximum AADT estimated to be 350. The access handle is 10.06 metres wide. The proposed pavement width is 7.6 metres and provides 2/3.5 metre wide traffic lanes and 2/0.3 metre wide shoulders. The pavement has been widened at the Brickmakers Drive / Link road and the Link road / access road intersections to accommodate the swept paths of 2/15 metre long semi-trailers to pass concurrently. The road design drawings are included in **Appendix B**.
- 5.8 The road pavement is based upon a design life of 20 years and a lane loading of 1.987×10^6 ESA's. The pavement design thickness is 660mm for a CBR of 2 and includes a 300 mm compacted thickness permeable drainage layer.
- 5.9 The embankment in the link road and the raised pavement level in the access road will reduce flood storage by 3500 cu.m. The compensation for this reduction in flood storage has been addressed by Evans and Peck.

5.0 (Continued)

- 5.10 A speed limit of 25 km/hr is to be signposted along the access road.
- 5.11 Fill material for the Link road embankment is to be transported along the existing access road on Lot 6 as Stage 1 in the construction stage of the recycling facility. When the Link road is completed construction traffic will be able to access the facility site from Brickmakers Drive.

6.0 TRAFFIC IMPACTS OF PROPOSED MATERIALS RECYCLING FACILITY

- 6.1 Trucks will not be able to turn left into Brickmakers Drive from the Link road. All trucks will travel to and from Newbridge Road.
- 6.2 The SIDRA analysis of the Link Road / Brickmakers Drive intersection shows that it will require traffic signal control to provide a satisfactory Level of Service under estimated 2021 peak hour traffic conditions.
- 6.3 Details of effective noise abatement measures for the access road are contained in the Acoustic Report by Wilkinson and Murray.
- 6.4 The estimated hourly truck volumes generated by the materials recycling facility are very low and will have minimal impact on the level of service and performance of the road pavement in the arterial road network comprising Nuwarra Road and Newbridge Road.

1.0 INTRODUCTION

1.1 Background

This report has been commissioned by Concrete Recyclers Group Pty Ltd to assess the traffic impacts arising from development of part of the site, Lot 6, D.P. 1065574 Newbridge Road, Moorebank for construction and operation of a *materials recycling facility*. This report is to be annexed to an *Environmental Assessment* prepared by *Nexus Environmental Planning Pty Ltd* in a **Part 3A** Application. The site is shown in **Figure 1, Locality Map**.

1.2 Scope of Report

This report addresses the traffic and transport issues arising from construction and operation of the proposed facility as stated in the Director General's Requirements (**DGRs**) dated 7 July 2008.

The road carriageway in Brickmakers Drive is constructed as an undivided carriageway **11.6 metres** wide and provides **2 lanes** for moving traffic. It was opened to traffic in 2012 and has been dedicated as a public road.



scale 1:5000 Image date 1st Nov 2012

FIGURE 1 LOCALITY MAP

2.0 EXISTING TRAFFIC CONDITIONS

2.1 Existing Road Network

The site is in the Liverpool LGA and the major road network surrounding the site comprises Newbridge Road (MR 167) to the north, Governor Macquarie Drive (RR 7268) to the north, Henry Lawson Drive (MR 508) to the east, the M5 Motorway to the south, Nuwarra Road (RR 7269) to the west and Heathcote Road (MR 512) to the south west. The road network is shown in **Figure 2**.

2.2 Existing Traffic Volumes

Automatic Tube Counts over a period of 7 days were made in Nuwarra Road south of Junction Road and in Governor Macquarie Drive north of Balanada Avenue in February 2011 and in Brickmakers Drive north of Maddecks Avenue in October 2012.. The average weekday ADT volumes are shown on **Figure 2**. The bidirectional weekday average hourly volumes of light and heavy vehicles in Nuwarra Road, Governor Macquarie Drive and Brickmakers Drive are contained in **Tables A, B and C** respectively in **Appendix D**.

Analysis of the data indicates an annual average compound reduction of **0.1%** in Newbridge Road between 2002 and 2011. The *24/7 ADT Count* in Nuwarra Road south of Junction Road in February 2011, indicates *zero growth* in Nuwarra Road between 2002 and 2011.

Intersection traffic volume counts were made from **7:00am – 9:00am, 12 noon to 2:00pm** and **4:00 to 6:00pm** at Nuwarra Road / Maddecks Avenue and Brickmakers Drive / Christiansen Boulevarde intersections on Monday 05/11/2012. The turning volumes at these intersections are shown in **Figures 3A and 3B** for the am and pm peak hours respectively.

2.3 Vehicular Access to Site

The existing access to the facility site is via a gravel road from Newbridge Road. The access crossing is on the southern side of Newbridge Road some **120** metres east of Governor Macquarie Drive. The access road is located in an access handle Lot 6, **10.064** metres wide. The pavement width varies but is approximately **5** metres wide. The access handle from Newbridge Road to the facility site is approximately **876** metres in length. The entrance, is shown in Photo **P1**. Photo **P2** and is typical of the road construction.

NORTH

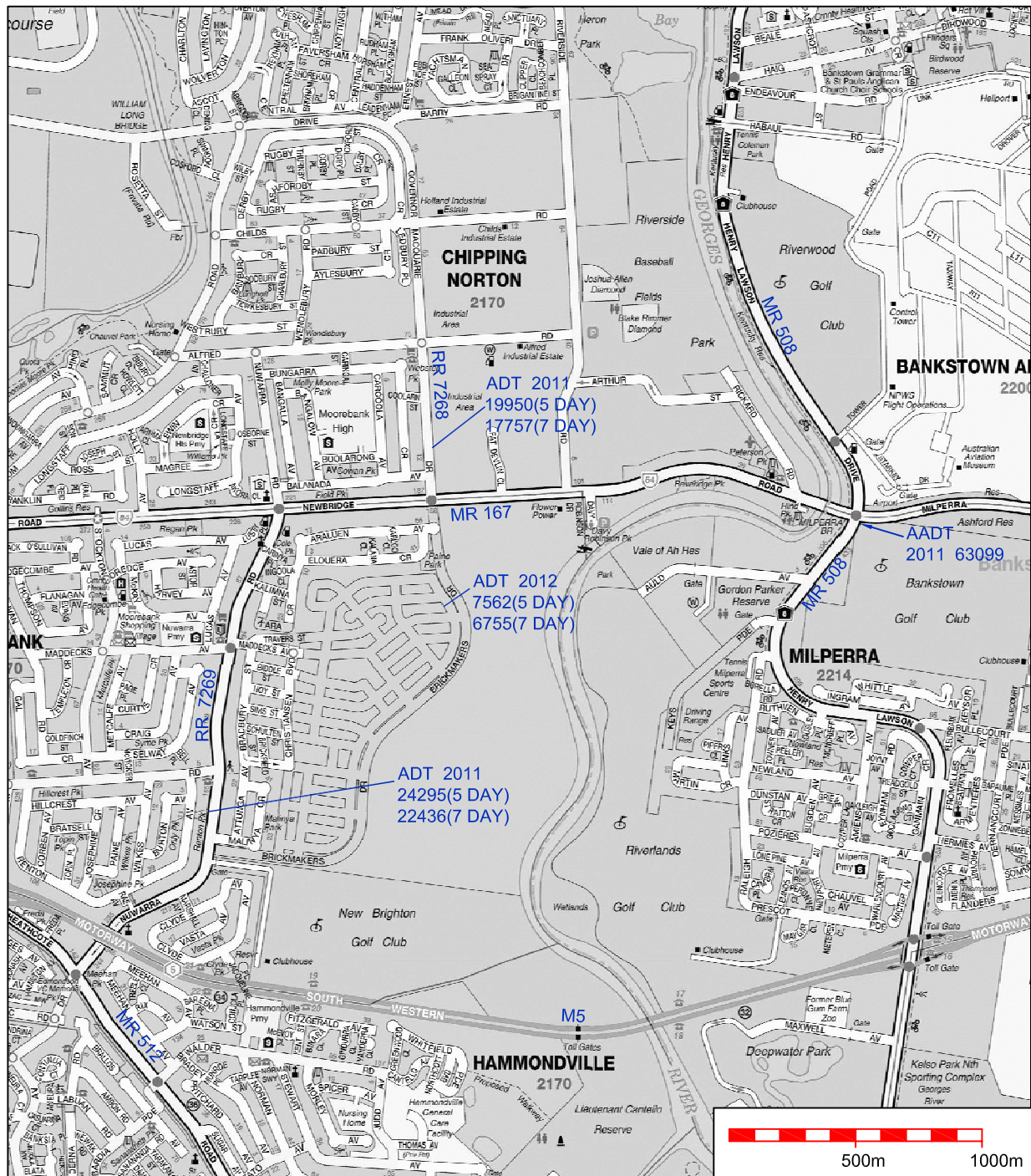
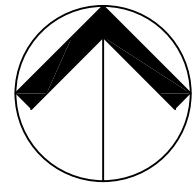
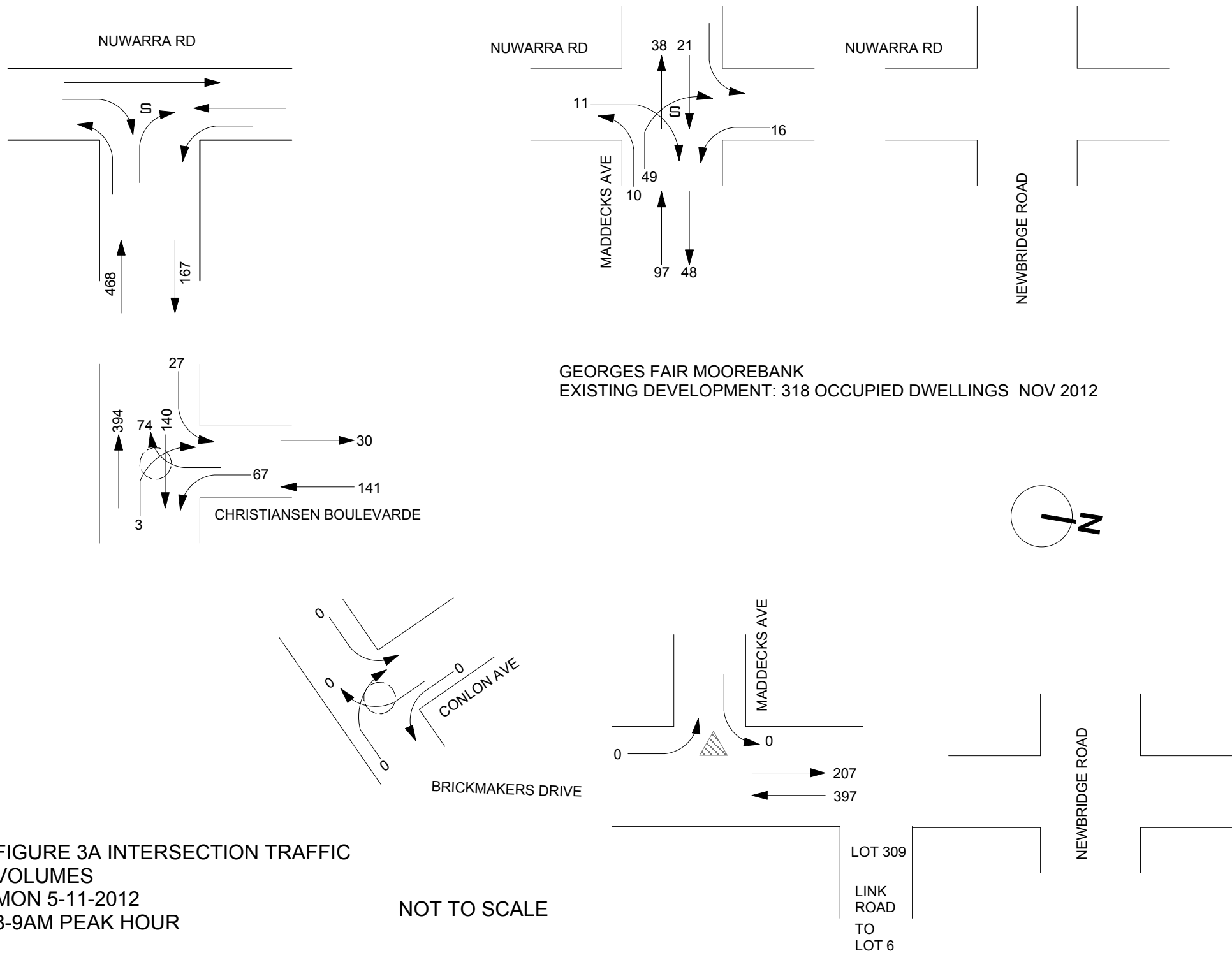


FIGURE 2: ROAD NETWORK



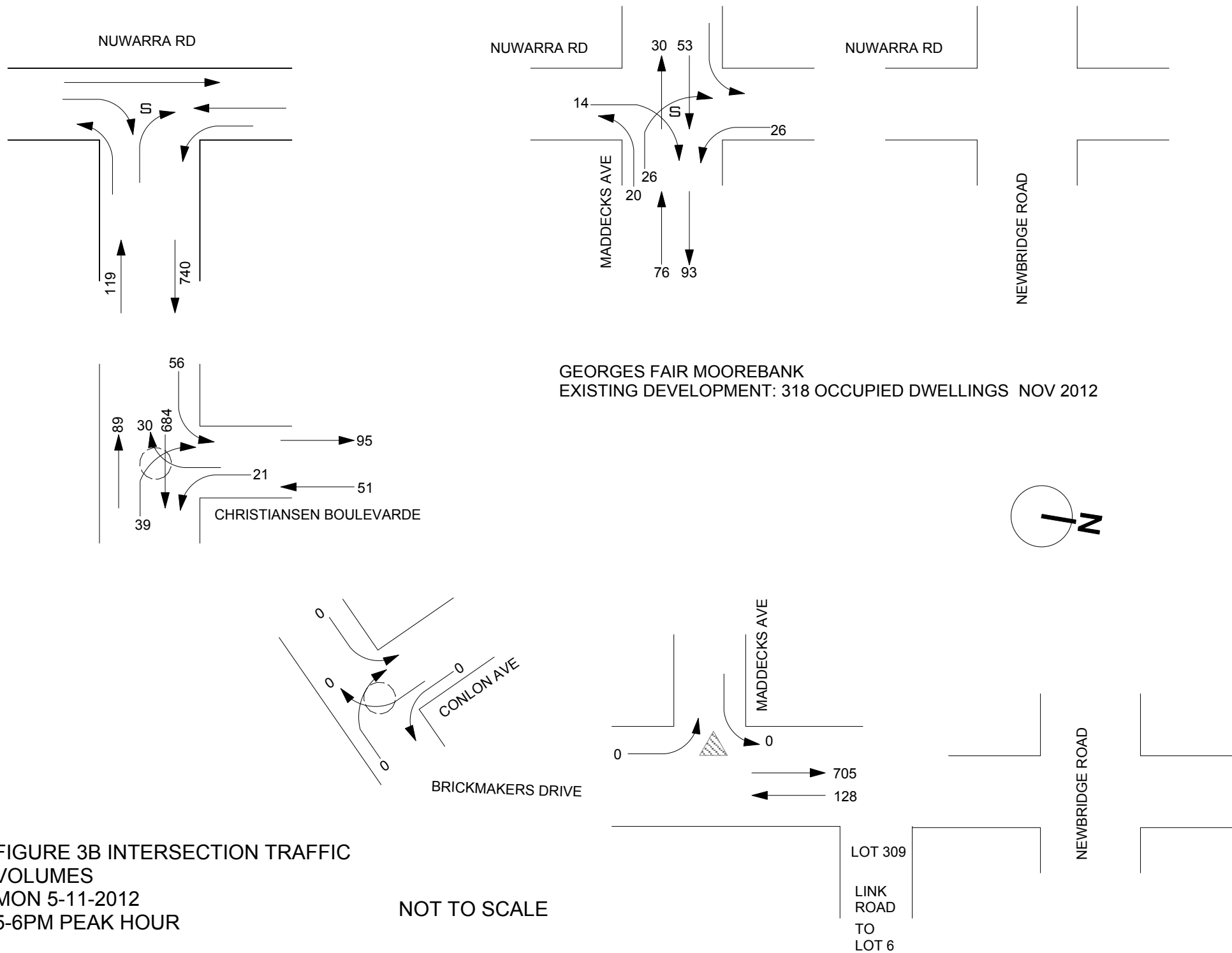


FIGURE 3B INTERSECTION TRAFFIC
VOLUMES
MON 5-11-2012
5-6PM PEAK HOUR

NOT TO SCALE



PHOTO P1 **ENTRANCE TO ACCESS ROAD AT NEWBRIDGE ROAD.**



PHOTO P2 **VIEW SOUTH ALONG ACCESS ROAD ABOUT 200 METRES SOUTH OF NEWBRIDGE ROAD.**

2.0 (Continued)**2.4 Traffic Generation by Georges Fair/Moorebank Residential Subdivision**

A survey was made of vacant lots, dwellings under construction, completed unoccupied dwellings and occupied dwellings on **05/11/2012**. The survey findings are summarised in **Table 2.4A**

Table 2.4A Status of Residential Development November 2012

Vacant Lots	Dwellings Under Construction	Dwellings Completed Unoccupied	Occupied Dwellings
19	67	36	318

Dwellings with access to Nuwarra Road are not included.

The *only vehicular access* to the existing development was to Brickmakers Drive at Christiansen Boulevard and to Nuwarra Road at Maddecks Avenue. The access from Conlons Avenue to Brickmakers Drive was not open to traffic and the Maddecks Avenue road connection to Brickmakers Drive was not constructed.

The estimated traffic generation by the existing 318 occupied dwellings from the intersection traffic movements was as follows:-

2.4B Peak Hour Traffic Generation Residential Development

Peak Hour	Traffic Volume		Total	Trips/Dwelling	
	In	Out			
8:00-9:00am	78	238	316	0.994	
5:00-6:00pm	188	127	315	0.991	
Directional Distribution Trips / Dwelling			In	Out	Total
AM Peak			.245	.748	.994
PM Peak			.591	0.399	.991

3.0 TRANSPORT ISSUES TO ADDRESSED.

3.1 Director General's Requirements

The key issues relating to traffic and transport were stated in a letter from the Department of Planning to Moorebank Recyclers Pty Ltd dated 7 July 2008 and are as follows:-

Site access – demonstrate that suitable arrangements have been made to secure access to the site, including written evidence of the relevant landowner's consent for the proposed site access works

“Traffic and Transport – *including details of the traffic volumes that are likely to be generated during construction and operation and an assessment of the impact of this traffic on the safety and efficiency of the surrounding road network.”*

State Government Technical and Policy Guidelines – For reference.

Traffic and Transport:

Guide to Traffic Generating Developments (RTA)

Road Design Guide (RTA)

4.0 PROCESSING OPERATIONS OF PROPOSED MATERIALS RECYCLING FACILITY

4.1 PART 3A APPLICATION

In 2011, an application under *Part 3A* of the *Environmental Planning and Assessment Act, 1979* was lodged with the Department of Planning for a *Materials Recycling Facility* on Lot 6, D.P. 1065574 with an *annual production capacity of 500,000 tonnes*.

4.2 Processing Operations

Raw materials will be transported to the site by tip truck, tip truck and trailer and semi-trailer. There will not be any domestic loads delivered.

Incoming loads will be inspected visually on the truck to determine whether the material is acceptable before passing over the weighbridge where the truck is weighed and a ticket issued.

The driver is then directed to a waste material stockpile where the load is tipped and inspected. Once the load is passed the truck can leave and exit the site via the wheel wash.

The raw materials are fed into the crushing plant by excavators that sit on the top of the stockpiles which are segregated. The raw materials may comprise bricks, concrete, asphalt, sandstone and sand. The materials are crushed and screened into appropriate products and stockpiled.

The processed material is transported out by trucks that enter the site without passing over the weighbridge. The trucks are then loaded from the product pile they require. The trucks then pass through the wheel wash and onto the weighbridge where the driver receives a dispatch docket.

4.3 Estimated Daily Truck Movements

The estimated number of truck movements per day is **324** based upon an average load of **21.2** tonnes and **292** working days per annum.

Raw Materials	IN	: 81 Loaded Trucks
	OUT	: 81 Empty Trucks
Processed Materials	IN	: 81 Empty Trucks
	OUT	: 81 Loaded Trucks

The hours of operation will be 7:00am to 6:00pm Monday to Saturday.

4.0 (Continued)

4.4 Directional Distribution of Trucks to Main Road System

Concrete Recyclers has advised, that the origins of trucks bringing raw material to the site for processing and the destinations of trucks taking processed material from the site will vary. Based upon their current knowledge it is estimated that:

- 55% of trucks are expected to approach the site from the east along Milperra Road / Newbridge Road with raw materials and depart to the east with processed material.
- 25% of trucks are expected to approach the site from the north and north west along Newbridge Road with raw material and depart with processed material along the same route.
- 20% of trucks from the south are expected to travel on the M5 Motorway and Nuwarra Road / Newbridge Road to the site with raw material and depart with processed material along the same route.
- All trucks will turn left from Brickmakers Drive onto the link road when approaching the site. When departing from the site all trucks will turn right from the link road onto Brickmakers Drive. The intersection design will prevent the Moorebank Recyclers trucks from turning left into Brickmakers Drive. The estimated directional distribution is illustrated in **Figure 4**.

4.5 Estimated Peak Hour Movements

Traffic data over a 2 month period in 2003 for a previous recycling facility on the Benedict Sand and Gravel site operated by Concrete Recyclers has been used to estimate the hourly distribution of truck movements for the proposed facility on Lot 6. There will be daily variations in the number of *truck movements per day and per hour*.

The estimated number of truck movements per hour on a typical day when the proposed facility is generating **324** truck movements is as shown in **Table 4.5a** following:

Table 4.5a Estimated Hourly and Daily Truck Movements

TIME	NUMBER OF TRUCK MOVEMENTS IN & OUT	PER CENT OF TOTAL
7:00 – 7:30AM	9.7	3.0
7:30 – 9:00	56.4	17.4
9:00 – 12:00	115.3	35.6
12:00 – 3:00 PM	100.8	31.1
3:00 – 5:00PM	41.8	12.9
TOTAL	324	100.0

NORTH

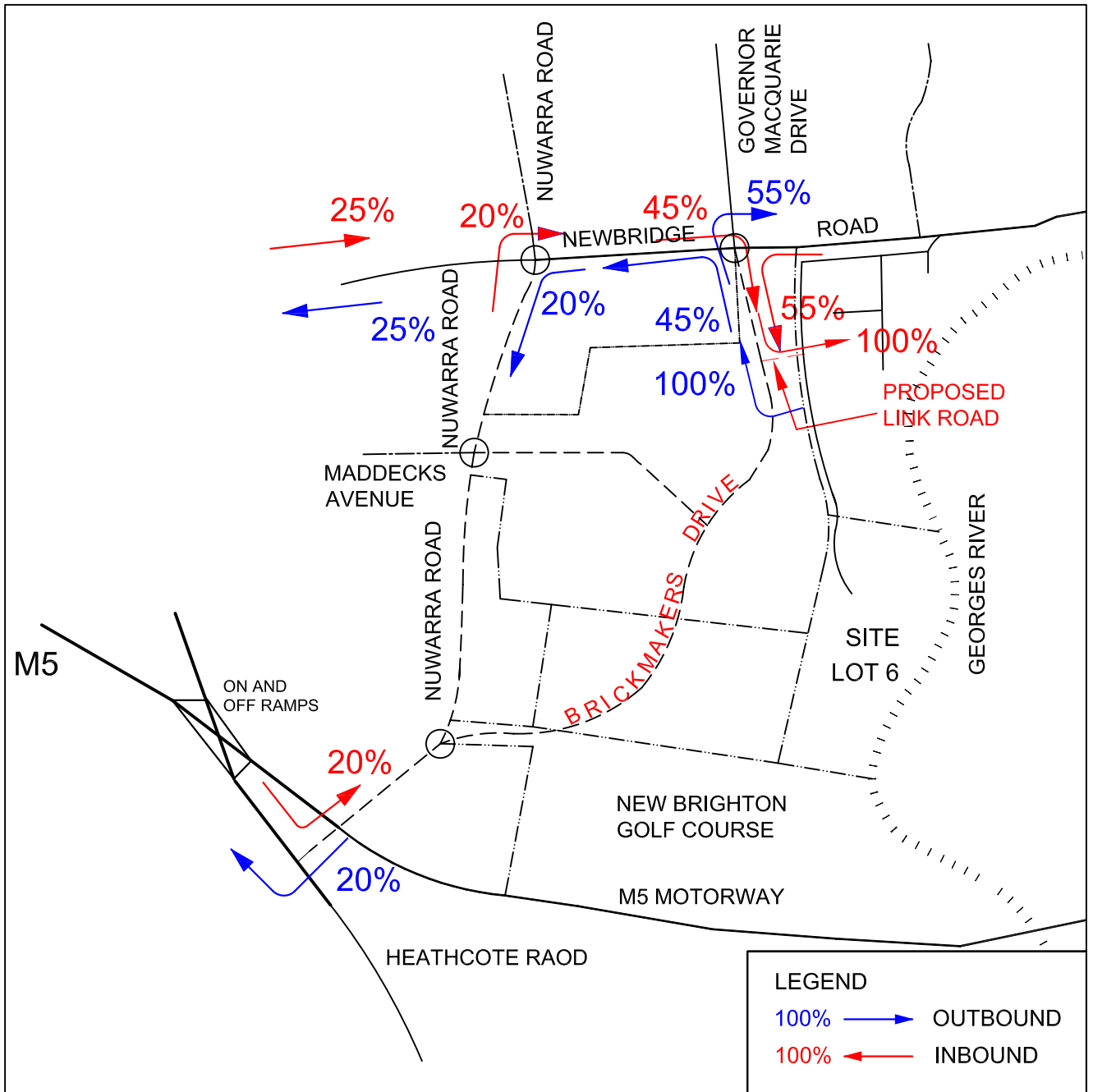
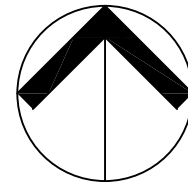


FIGURE 4: FUTURE TRAFFIC DISTRIBUTION

4.5 (Continued)

The existing peak hours in Nuwarra Road are **8:00 – 9:00am** and **5:00 – 6:00pm** based upon the *RTA published 2002 Traffic Counts* and subsequent *7 day counts* in February 2011. The peak hours in Brickmakers Drive in **October 2012** were **7:00 – 8:00am** and **5:00 – 6:00pm**.

The estimated truck volumes generated by Concrete Recyclers in the **8:00 – 9:00am** and **4:00 – 5:00pm** peak hours on a typical day based upon the traffic pattern in **Figure 4** are as follows:-

TIME	TRAFFIC GENERATION		TOTAL
	IN	OUT	
8:00 – 9:00 AM	19	19	38
4:00 – 5:00 PM	10	11	21

Peak hour volumes in the am and pm peak hours have been assigned to the road network using the percentage distribution in **Figure 4**. The truck volumes are shown in **Figures 5A** and **5B** respectively.

4.6 Future Traffic Volumes in Brickmakers Drive in 2021

In 2021 the road network in Georges Fair Moorebank will have been completed and the Conlon Avenue and Maddecks Avenue links to Brickmakers Drive will be in operation. As shown in **Figure 1**, there will be a *single lane roundabout* at the Conlon Avenue/Brickmakers Drive intersection and channelization at the Maddecks Avenue/Brickmakers Drive intersection to *restrict traffic movements to left in and left out*.

4.6.1 Full Development of Georges Fair Moorebank

The traffic generation in the **am** and **pm peak hours** at full development of the **967** residential lots having driveways to the internal subdivision roads has been estimated based upon the traffic generated by the **318** occupied dwellings in November 2012.

The estimated traffic generation at full development in 2021 is as shown in **Table 4.6**.

4.6 (Continued)**Table 4.6 Peak Hour Traffic Generation at Full Development**

Peak Hour	Use	No. Dwellings	Commercial Floor Space GFA m ²	Year 2021 Traffic Movements	
				IN	OUT
8.00 – 9.00am	Residential	967	-	237	723
5.00 – 6.00pm	Residential	967	-	571	386

4.6.2. Distribution of Traffic to Road Network

The peak hour traffic volumes have been distributed to the road network based upon the intersection turning movements in the 2012 traffic counts shown in Figures 3A and 3B with adjustments to reflect the shortest path with the completion of Conlon Avenue and Maddecks Avenue links to Brickmakers Drive.

Future Growth in Traffic Due to Proposed Development in the South West Growth Centre

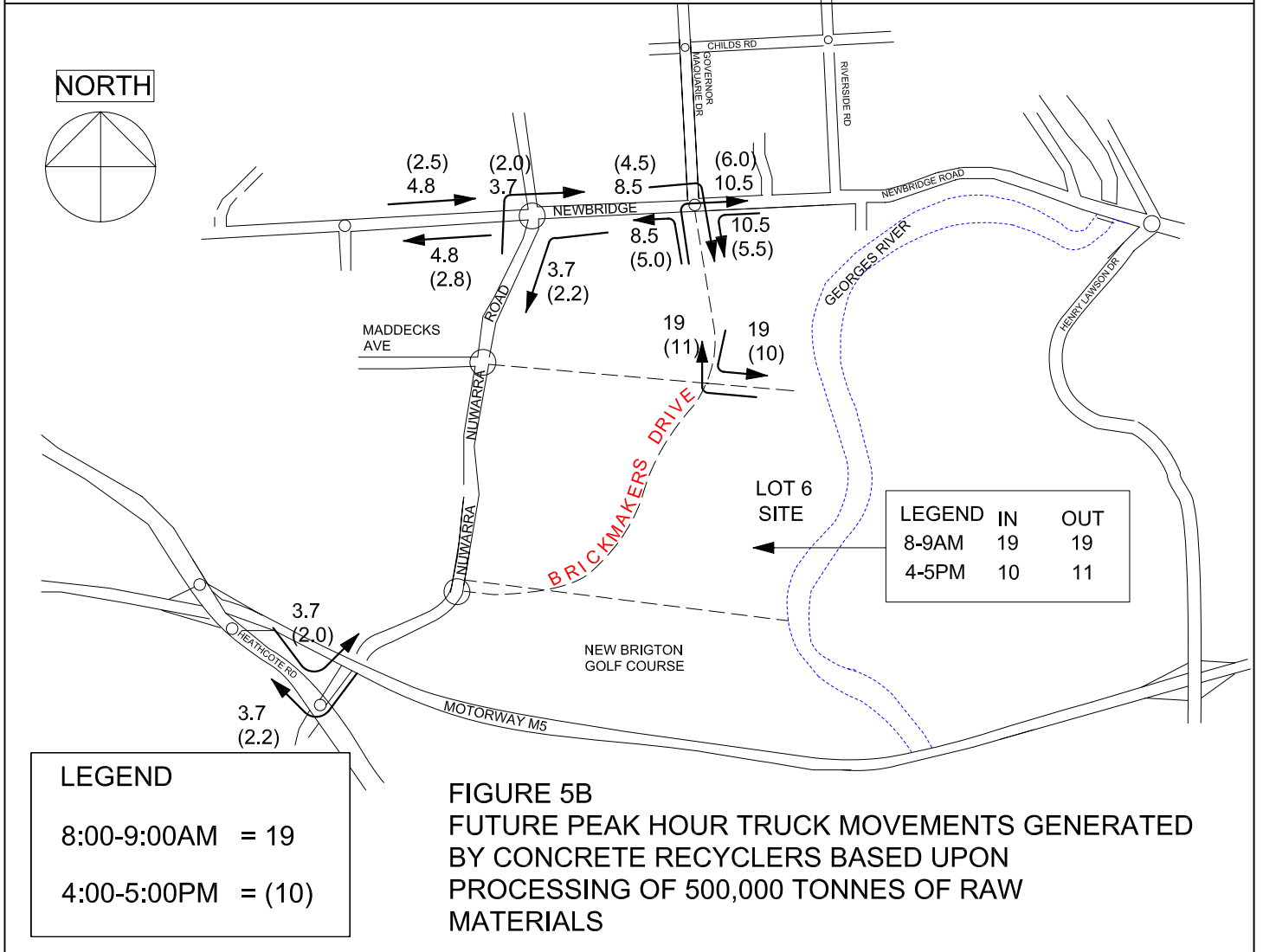
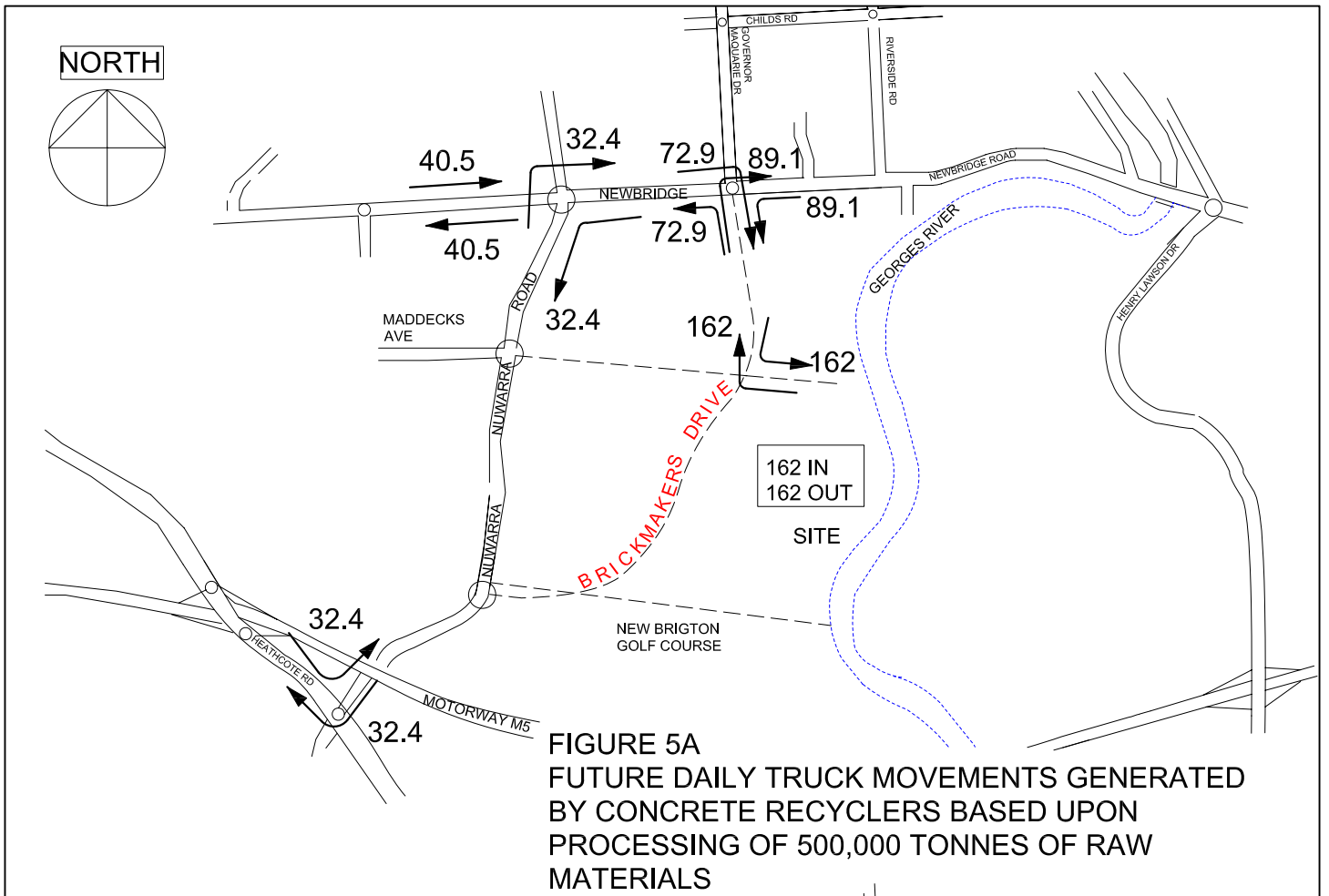
The forecast of employee growth in the Campbelltown, Liverpool and Bankstown LGA between 2011 and 2021 by the *Bureau of Transport Statistics* is an annual compound rate of about **0.75** per cent. Although the actual growth in population and employees has fallen well below the BTS forecasts it is reasonable to expect that growth will increase as economic conditions improve. An annual average growth rate of **1** per cent has been assumed for the period *2013 to 2021* and the *2012 peak hour volumes* in Brickmakers Drive have been expanded accordingly.

The future 2021 estimated peak hour volumes in Brickmakers Drive are as shown in **Figures 6A and 6B**.

4.6.3 Intersection Analysis

The intersection at the link road to Concrete Recyclers and Brickmakers Drive has been analysed under *Give Way* sign control in Brickmakers Drive for future 2021 peak hour volumes in the **am** and **pm** peak hours and volumes (pcu^s) as shown in **Figure 7**.

The network performance is determined by the Level of Service (**LoS**) Average Vehicle Delay (**AVD**), Degree of Saturation (**DoS**) and maximum delay on the critical movement during peak hours. The Level of Service criteria for intersections are explained in **Table 4.2** taken from the *RTA Guide to Traffic Engineering Developments*.



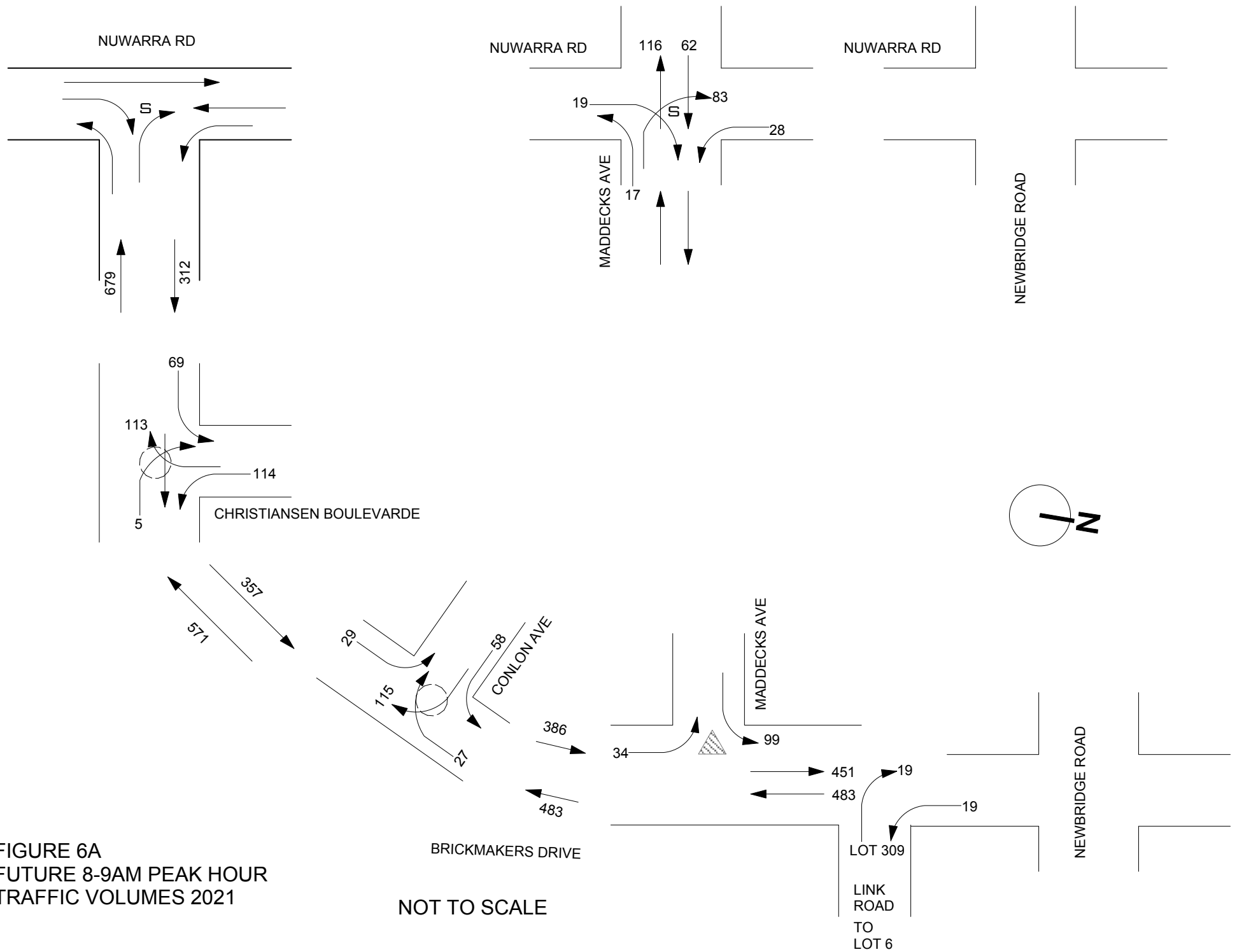


FIGURE 6A
FUTURE 8-9AM PEAK HOUR
TRAFFIC VOLUMES 2021

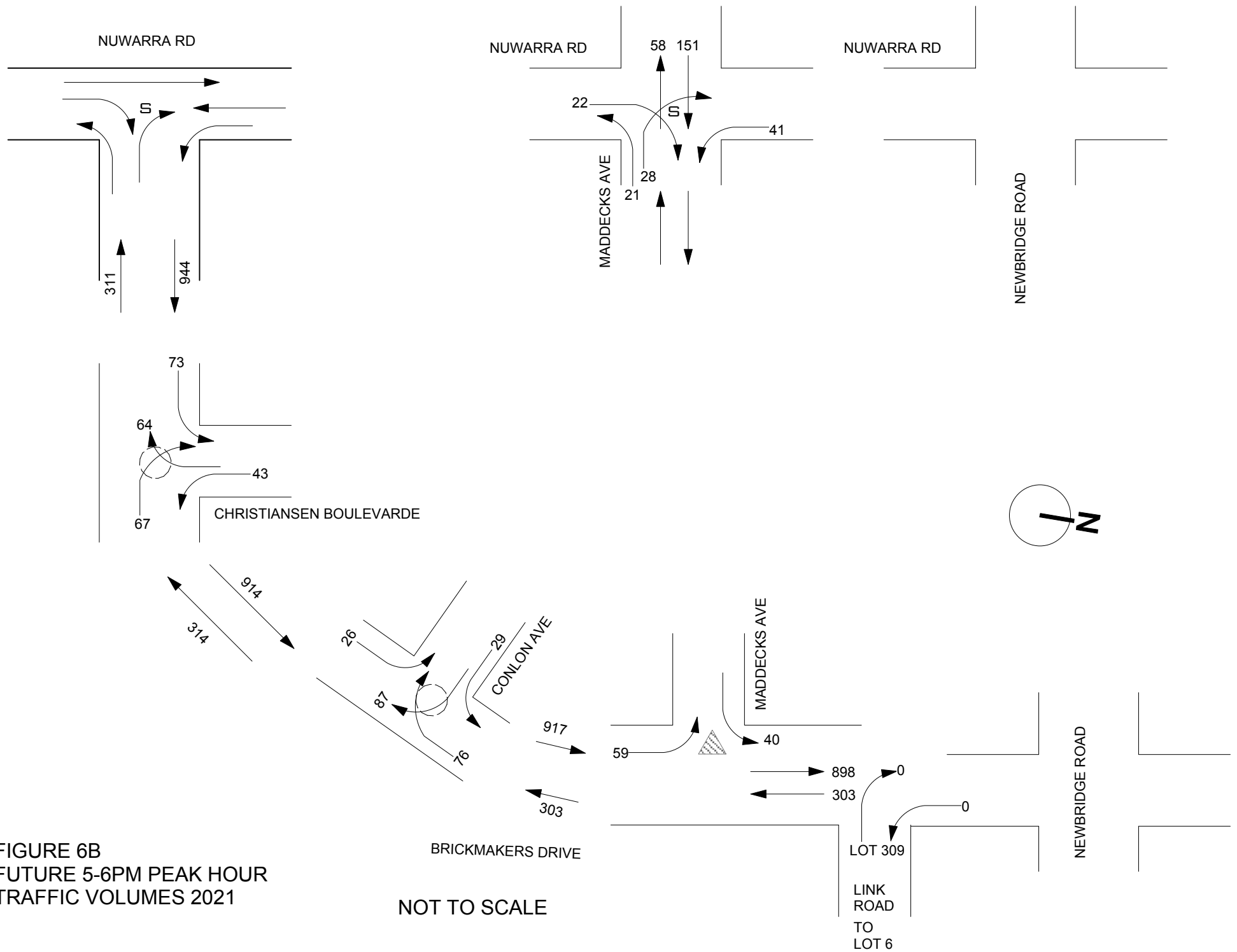


FIGURE 6B
FUTURE 5-6PM PEAK HOUR
TRAFFIC VOLUMES 2021

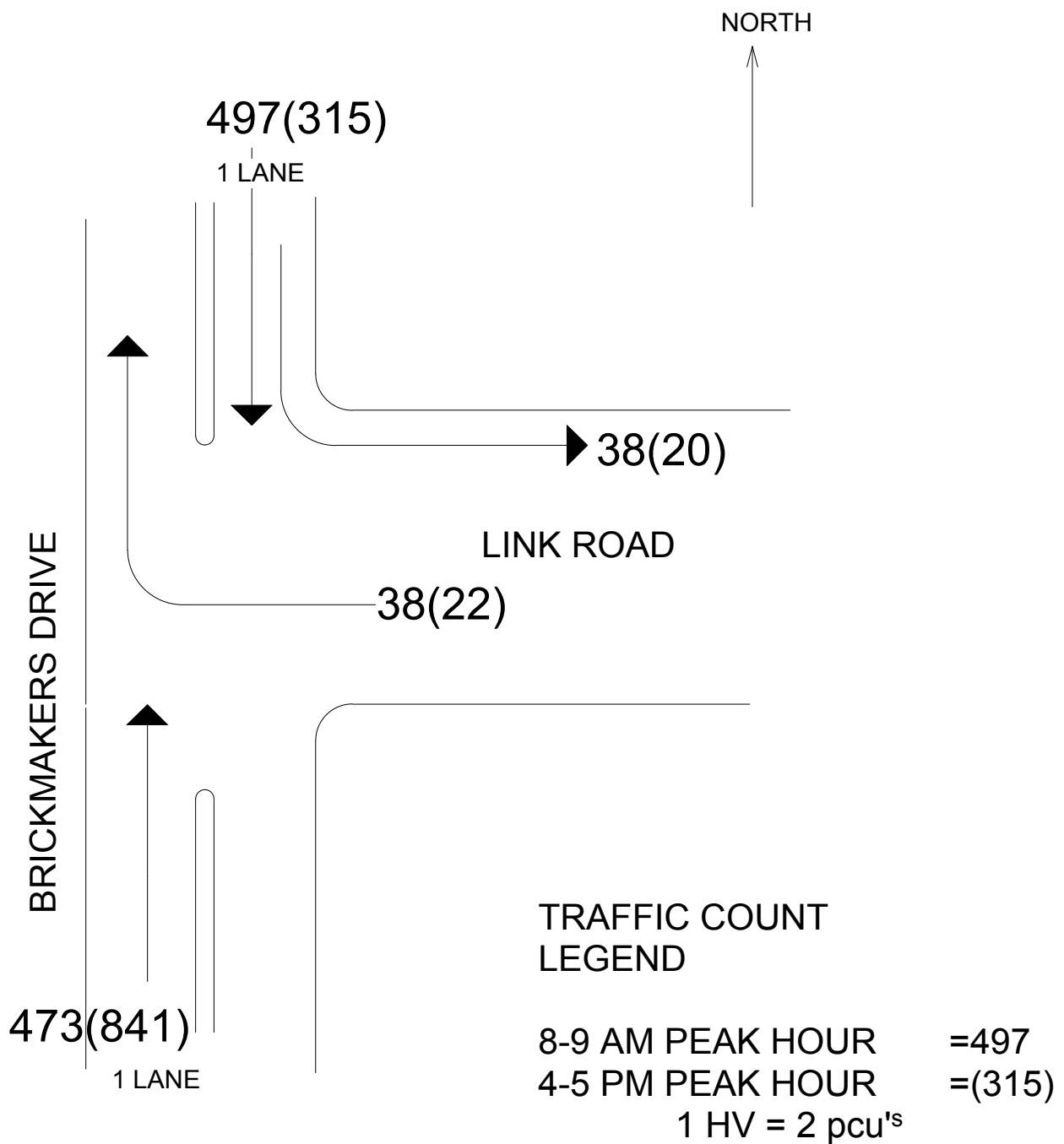


FIGURE 7
ESTIMATED PEAK HOUR (PCU'S) VOLUMES AT
BRICKMAKERS DRIVE/LINK ROAD INTERSECTION

4.6.3 (Continued)

The **SIDRA** analysis shows that the *right turn* from the Link Road to Brickmakers Drive will operate under *Level of Service A* in the *am* peak hour and *Level of Service B* in the *pm* peak hour with satisfactory performance under giveaway and stop sign control. The Levels of Service are similar in both peak hours for signal control. The results are shown in **Figures 7** Option 1 *Give Way signs* and **Figure 7** Option 2 *Traffic Signals* in **Appendix E**.

Table 4.2
Level of Service criteria for intersections.

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	< 14	Good operation	Good operation
B	15 TO 28	Good with acceptable delays spare capacity	Acceptable delays & spare capacity
C	29 TO 42	Satisfactory	Satisfactory, but accident study required
D	43 TO 56	Operating near capacity	Near capacity & accident study required
E	57 TO 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, requires other control mode
F		Forced Flow Conditions	Flow breakdown occurs queueing and delays results.

4.7 Estimated Equivalent Standard Axles Loadings on Road Network

The traffic loading for pavements is expressed as the number of standard axle load repetitions in a traffic lane which is equal to the sum total of the various axles passing over the lane during the design period which is normally 20 years for a flexible pavement. In order to assess the damaging effect of differently loaded axles on a pavement, all axles are converted to **ESA**'^s.

The traffic load is referred to as the number of *Equivalent Standard Axles* (**ESA**'^s). The standard axle is dual tyred and loaded to a total mass of **8.2** tonnes.

The damaging effect of light vehicles Classes **1** and **2** is negligible. Therefore the design traffic only includes *heavy vehicles Truck Classes 3 to 12*.

Procedure FT2 described in MR Form 76 has been used to estimate the total number of ESA's repetitions on each lane in Nuwarra Road and Brickmakers Drive using the 2011 and 2012 vehicle classification counts in each direction of travel. A design life of 20 years has been assumed and an annual compound growth factor of 1%. Road Function **Urban Class 7** has been adopted for Nuwarra Road and **Urban Class 6** for Newbridge Road. The pavement design for Brickmakers Drive shown on Drawing No. CS 0143-1-C40 prepared by BMD Consulting for Urban states that the pavement has

4.7 (Continued)

been designed as a Collector Road for 8.57×10^6 ESA's (Equivalent Standard Axle Loadings).

In *Annexure 3051/A to RTA Specification 3051* in *Table 3051/A1*, the heaviest loading is **Category A, Very Heavy**, where the design traffic loading exceeds **10^7 ESA's**. It is reasonable to assume that Newbridge Road (**MR 167**) and Nuwarra Road (**RR7269**) have been designed for the 'Very Heavy' traffic loading. The estimated ESA's over a 20 year period from 2012 are listed in **Table 4.7** with and without Moorebank.

Table 4.7 Estimated 20 Year Traffic Loading ESA's

Road	Section	Direction	Estimated ESA's		TOTAL
			Without Moorebank Recyclers Trucks	Moorebank Recyclers Trucks	
Access Road (Link Road)	Brickmakers Drive to Moorebank Recyclers Site	North	-	1.987×10^6	1.987×10^6
		South	-	1.987×10^6	1.987×10^6
Brickmakers Drive	Link Road to Newbridge Road	North	1.468×10^6	1.987×10^6	3.455×10^6
		South	0.839×10^6	1.987×10^6	2.826×10^6
	Link Road to Nuwarra Road	North	1.468×10^6	0	1.468×10^6
		South	0.839×10^6	0	0.839×10^6
Newbridge Road	East of Brickmakers Drive	East		1.091×10^6	
		West		1.091×10^6	
Newbridge Road	Brickmakers Drive to Nuwarra Road	East		0.895×10^6	
		West		0.895×10^6	
Newbridge Rd	West of Nuwarra Road	East		0.503×10^6	
		West		0.503×10^6	
Nuwarra Rd	Newbridge Road to Brickmakers Drive	North	5.810×10^6	0.392×10^6	6.202×10^6
		South	6.010×10^6	0.392×10^6	6.402×10^6

Note: The Moorebank Recyclers Trucks would be distributed over 3 lanes in both directions in Newbridge Road.

4.8 Total Hourly Heavy Vehicle Movements in Nuwarra Road and Brickmakers Drive.

The truck movements to and from the proposed Moorebank Recyclers site will be from **7:00am to 5:00pm**, Monday to Friday.

Based upon **Drawing No. 21843/MP10** prepared by *Proust and Gardner* for Georges Fair, there are a total of **8** existing lots and **1** new lot on the western side of Brickmakers Drive between Lot 309 and Newbridge Road. The first **3** lots are between Araluen Avenue and Newbridge Road and back onto Brickmakers Drive at the busy intersection. None of the lots have vehicular access to Brickmakers Drive.

4.8 (Continued)

The hourly heavy vehicle movements in Brickmakers drive and Nuwarra Road derived from the *Classification Counts in 2012 and 2011* respectively, together with the *estimated heavy vehicle movements* generated by Moorebank Recyclers are listed in **Table 4.8**:

Table 4.8 Total Heavy Vehicles Including Moorebank Recyclers (MR)

ROAD	HOUR	Heavy Vehicle Movements Excluding Moorebank Recyclers		Heavy Vehicles Movements Generated by MR	Total Heavy Vehicles	
		Monday to Friday	Saturday	Monday to Saturday	Monday to Friday.	Saturday
		Both Directions		Both Directions	Both Directions	Both Directions
Brickmakers Drive	7 – 8.00am	34.4	7	28.5	62.9	35.5
	8 – 9.00am	32.6	15	37.6	70.2	52.6
	9 – 10.00am	27.8	16	38.4	66.2	54.4
	10 – 11.00am	24.2	14	38.4	62.6	52.4
	11 – 12.00pm	27.4	15	38.5	65.9	53.4
	12 – 1.00pm	27.2	8	33.6	60.8	41.6
	1 – 2.00pm	27.8	4	33.6	61.4	37.6
	2 – 3.00pm	38.8	7	33.6	72.4	40.6
	3 – 4.00pm	35.6	3	20.9	56.5	23.9
	4 – 5.00pm	28.0	5	20.9	48.9	25.9
Nuwarra Road	7 – 8.00am	134.6	54	5.7	140.3	59.7
	8 – 9.00am	163.4	48	7.52	170.92	55.52
	9 – 10.00am	155.6	67	7.68	163.28	74.68
	10 – 11.00am	160.2	51	7.68	167.88	58.68
	11 – 12.00	179.0	70	7.68	186.68	77.68
	12 – 1.00pm	174.4	70	6.72	181.12	76.72
	1 – 2.00pm	164.4	85	6.72	171.12	91.72
	2 – 3.00pm	163.4	84	6.72	170.12	90.72
	3 – 4.00pm	146	50	4.18	150.18	54.18
	4 – 5.00pm	102.8	40	4.18	106.98	44.18

4.9 Truck Parking on Site

Concrete Recyclers have advised that vehicles parked on site would include service vehicles, water trucks and a fuel truck. Trucks delivering raw materials to the site and delivering processed materials from the site would be garaged off site.

5.0 DESIGN OF ACCESS ROAD (LOT 6) AND LINK ROAD (LOT 309)

5.1 Site Access

Future access is proposed via Brickmakers Drive (Lot 308), a link road in Lot 309 between Brickmakers Drive and the access handle in Lot 6. Liverpool Council is now the owner of Lot 308 and Lot 309.

5.2 Design Vehicles

The design vehicles are:

- i) A **15 metre** long tri-axle semi trailer with a Gross Mass of **42.5 Tonnes**.
- ii) A truck and dog trailer **18.29 metres** long with a Gross Mass of **42.5 Tonnes**.

Both trucks are about **4 metres** high. The **15 metre** long semi trailer has a *wider swept turning path* than the truck and dog trailer and has been adopted as the design vehicle.

5.3 Flooding Characteristics and Site Constraints

Annexure A, The Warning System and Site Emergency Response in the Flood Evacuation Plan Report prepared by Evans and Peck 27th November 2012, contains **100 year**, **50 year** and **20 year** *flood levels* downstream of the Milperra Bridge over the Georges River from the 1991 Georges River Flood Study. The hydraulic gradient from Milperra Bridge to the Link Road is **0.18 metres**.

Figure 3 in the Water Management and Pollution Control Assessment Report by Evans and Peck, November 2012, shows the flood frequency curve at Milperra Bridge. The flood levels shown in Figure 3 have been taken into account during the design of the access road between Brickmakers Drive and the site.

Advice from Evans and Peck is that the flood storage characteristics of the Boral Land should not be altered by the link road and access road.

The width of the access handle is **10.064 metres**. This requires the width of the road shoulders to be minimal whilst allowing for an adequate road pavement width, table drain and batters.

5.0 (Continued)

5.4 Existing Access Road

The spot levels on the existing access road are shown on **Sheet 3E**. The longitudinal gradients and crossfalls are extremely flat. The gravel pavement is well compacted and is passable by laden trucks having a gross mass of **42.5 tonnes**. The site constraints require crests and low points with minimum longitudinal gradients between. The access road has been overtopped by flooding in the Georges River at average intervals of **1 in 3** years but is passable by trucks. The existing pavement is **5 metres** wide and varies and is sufficient for one traffic lane.

5.5 Horizontal and Vertical Alignment

Because of the narrow width of the access handle and the extremely flat terrain, the road has been designed with a series of crests and low points with an absolute minimum longitudinal gradient of **0.25%**. Similar gradients have had to be adopted in residential subdivisions in areas such as Griffith in NSW where the terrain is very flat. A crossfall of **3%** has been adopted to shed stormwater from the road pavement. The road longitudinal section is shown in **Sheet 4C**. Typical road cross sections are shown on **Sheet 5A**. The finished surface levels on the access road pavement are at or above the **1 in 4.2** year flood level except at the lowest point, **Chainage 619** where a concrete causeway is to be constructed.

5.6 Stormwater Drainage

The stormwater drainage has been designed using the Rational Method in accordance with Australian Rainfall and Run off for a **1 in 2** year ARI. The rainfall intensity, frequency, duration data used is for Georges River at Liverpool in the Liverpool City Council Handbook for drainage design criteria. The time of concentration at **Pit 1** in **Line 1** is **7.5 minutes**.

The drainage system comprises kerb inlet pits in the link road and a **375mm** diameter RCP Class 2 pipeline to grated inlet pit $\frac{1}{4}$. From pit $\frac{1}{4}$ to the pump well at the end of **Line 1** in the access road, the pipe is a **375mm** diameter U PVC Class SEH.

The access road has a one-way crossfall draining to a table drain that flows into D20 grated inlet pits and thence in the underground pipeline. The drainage pit layout and table drain are shown on **Sheet 3E**. The longitudinal section of drainage line 1 is shown on **Sheet 8**. Line 1 discharges into a pump well near the creek where a submersible 3 phase pump is to be installed to pump into above ground storage tanks for re-use on site. The estimated 1 in 2 year peak discharge is **81 litres/sec**.

5.0 (Continued)

In order to maintain the existing flood storage characteristics on the Boral land, a **4 cell box culvert** is provided in the link road embankment to maintain water balance from north to south. The existing pipe culvert at chainage **636.7** in the access road will be retained to maintain the water balance in the southern storage basin on Boral land. To permit Boral land to drain across the access road at the low point **RL1.76** at chainage **619**, a concrete causeway will be constructed.

5.7 Pavement Width and Road Cross Sections

The access road to the materials recycling facility is essentially a *rural road* on private property south of Chainage **94.735** on the southern boundary of the link road from Brickmakers Drive. The estimated maximum **AADT** including staff vehicles is **350**. Based upon **Table 3.2.4 Lane Widths two lane Rural Roads in the RTA Road Design Guide**, the lane width required on the **straight** for a **2** lane rural road carrying **150-500** vehicles per day is **2/3.0 metre** wide lanes. The pavement width is **7.6 metres** wide and thus provides **2/3.5 metre** wide lanes and **2/0.3 metre** wide shoulders.

On the western end of the link road where the trucks are turning *from* and *to* Brickmakers Drive and on the eastern end where trucks are turning *to* and *from* the access road, the pavement width on the link road has been modelled using Autoturn to allow for **2/15 metre long semi-trailers** to pass concurrently. The geometric layout for the pavement in the link road is shown on **Sheet 2B**. Typical pavement cross sections on the link road and on the access road, are shown on **Sheet 5A**.

The *swept path diagrams* for the **15** metre semi-trailer travelling in both directions and turning between Brickmakers Drive and the access road are shown in **Sheet 1D**.

5.8 Pavement Design and Materials

The number of equivalent standard axles for a tri axle semi-trailer and truck and dog trailer for the maximum legal load is **3.2 ESA's**. Based upon a design life of **20 years**, **81** loaded trucks per day, per lane, **81** empty trucks per day per lane and **292** working days per year the estimated loading per lane is **1.987 x 10⁶ ESA's**.

Advice from Jeffery and Katauskas is that the subgrade CBR in this locality is about **2**. Hence, for thin bituminous surfacing, *Design Chart Figure 8.4 in Austroads Pavement Design 2004* requires a pavement thickness of **660mm** for a CBR of **2** and a traffic loading of **1.987 x 10⁶ ESA's**.

Prior to construction, the subgrade will be sampled and *soaked tests* carried out to determine the CBR for final design.

5.0 (Continued)

The access road is essentially straight. Because of the high water table and periodic flooding, a **300mm** compacted thickness permeable drainage layer comprising **Class D75** recycled material will be placed over the compacted sub-base layer of granular material. A *Bidem A34 geotextile* is to be placed over the permeable drainage layer to separate this layer from the basecourse layer. A basecourse comprising **200mm** compacted thickness of **Class R1** recycled material will be placed over the geotextile. The pavement will be sealed with a **2** coat hot flush bitumen seal incorporating pre-coated aggregate.

The pavement within the link road will be a **200mm** thick reinforced concrete pavement over a granular sub-base layer on compacted select fill material in the embankment. The concrete pavement design is based upon the *Cement and Concrete Association of Australia Guidelines for Design and Construction of Industrial Pavements*. A concrete pavement has been selected in this area to withstand the forces imposed by the turning manoeuvres. The typical pavement cross sections, are shown on **Sheet 5A**.

5.9 Compensation for Reduced Stormwater Storage

The embankment in the link road and raising the finished pavement level in the access road will *reduce flood storage* by **3500 cu.m**. The compensation for this reduction in flood storage is addressed in Section 3.3.2 Access Road of the Water Management and Pollution Control Assessment report November 2012, by Evans and Peck.

5.10 Signposted Speed Limit

A speed limit of **25 km/hr** is to be signposted along the access road for traffic safety reasons, to reduce traffic noise generated by truck engines and tyres and also to reduce wear and tear on the sealed pavement.

5.11 Construction Staging

Brickmakers Drive is about **1.8 metres** above the existing ground level at the intersection of the link road and the embankment fill is retained by a split block gravity retaining wall, as shown in **Photo P3**.

Fill material for the link road embankment is to be transported along the existing access road from cut and fill operations on the recycling facility site or from Newbridge Road as **Stage 1** in the construction stage of the facility. Concrete, steel reinforcement and box culverts for the link road will have to be brought in from Newbridge Road to complete construction of the link road.

Once the link road is completed construction traffic will be able to access the facility site from Brickmakers Drive.



PHOTO P3 Retaining wall on eastern side of Brickmakers Drive at Intersection.

6.0 TRAFFIC IMPACTS OF PROPOSED MATERIALS RECYCLING FACILITY

6.1 Easement for Link Road

As shown on **Sheet 2B**, the **18** metre wide **Lot 309** between Brickmakers Drive and the access handle to the Moorebank recycling facility is wide enough to permit *two 15 metre long tri-axle semi trailers* to pass each other on the **90** degree bends.

The **6 metre kerb return** will prevent trucks from turning left into Brickmakers Drive to exit to Nuwarra Road. In addition a “**No Left Turn**” **R2-6A Regulatory sign** will be erected to ban this movement. It is an offence to disregard a regulatory sign.

6.2 Increase in Heavy Vehicle Movements on Road Network.

The *existing light and heavy vehicle volumes* counted in February 2011 are shown in **Table A** for Nuwarra Road. The *existing light and heavy vehicle volumes* counted in October 2012 are shown in **Table C** for Brickmakers Drive. These Tables are in **Appendix D**.

6.2.1 Brickmakers Drive

The increase in heavy vehicle movements due to trucks travelling to and from the Moorebank Recyclers site will be from **7:00am to 5:00pm Monday to Saturday** and be *restricted* to **300 metres** of road south of Newbridge Road. In this section there are **8** existing dwellings and this will increase by **1** when Stage 5E of Georges Fair is developed.

The existing 2-way light and heavy vehicles from the count in October 2012 are shown together with the estimate of heavy vehicles generated by Moorebank Recyclers for each hour from **7:00am to 5:00pm** in **Table 6.2**.

6.0 (Continued)**Table 6.2.1 Brickmakers Drive Bi-Directional Traffic Volumes**

HOUR	Weekday Monday to Friday				SATURDAY			
	Existing		MR		Existing		MR	
	Light Vehs.	Heavy Vehs	Heavy Vehs	TOTAL Heavy Vehs	Light Vehs	Heavy Vehs	Heavy Vehs	TOTAL Heavy Vehs.
7 – 8.00am	585.6	34.4	28.5	62.9	207	7	28.5	35.5
8 – 9.00am	571.4	32.6	37.6	70.2	252	15	37.6	52.6
9 – 10.00am	280.2	27.8	38.4	66.2	302	16	38.4	54.4
10 – 11.00am	195.2	24.2	38.4	62.6	378	14	38.4	52.4
11 – 12.00pm	203.6	27.4	38.5	65.9	419	15	38.5	53.4
12 – 1.00pm	245.2	27.2	33.6	60.8	393	8	33.6	41.6
1 – 2.00pm	276.8	27.8	33.6	61.4	372	4	33.6	37.6
2 – 3.00pm	433	38.8	33.6	72.4	411	7	33.6	40.6
3 – 4.00pm	700.4	35.6	20.9	56.5	362	3	20.9	23.9
4 – 5.00pm	735.2	28.0	20.9	48.9	399	5	20.9	25.9

Note: MR - Moorebank Recyclers

The general conclusions are:-

1. The additional heavy vehicles generated by Moorebank Recyclers do not reduce the Level of Service in any hour.
2. On week days, the addition of Moorebank Recyclers trucks increases the number of heavy vehicle from about *1 in 2 minutes* to *1 per minute*.
3. On week days, the percentage of total heavy vehicles to total vehicles ranges from a *minimum* of **6.2%** from **4:00 – 5:00pm** to a *maximum* of **24.3%** from **10:00 – 11:00am**.
4. The total number of heavy vehicles during each hour on Saturday is lower than week days. The percentage of heavy vehicles to total vehicles ranges from a minimum of **6.1%** from **4:00 – 5:00pm** to a *maximum* of **17.3%** from **8:00 – 9:00am**.

6.2.2 Nuwarra Road

The *existing 2-way light and heavy vehicles* from the count in February 2011 are shown together with estimate of *heavy vehicles* generated by Moorebank Recyclers (MR) for each hour from **7:00am** to **5:00pm** Monday to Saturday in **Table 6.2.2**

6.0 (Continued)**Table 6.2.2 NUWARRA ROAD NORTH OF BRICKMAKERS DRIVE**

HOUR	Weekday Monday to Friday				SATURDAY			
	Existing		MR		Existing		MR	
	Light Vehs.	Heavy Vehs	Heavy Vehs	TOTAL Heavy Vehs	Light Vehs	Heavy Vehs	Heavy Vehs	TOTAL Heavy Vehs.
7 – 8.00am	1428	134.6	5.7	140.3	603	54	5.7	59.7
8 – 9.00am	1357.8	163.4	7.52	170.92	937	48	7.52	55.52
9 – 10.00am	1166.6	155.6	7.68	163.28	1169	67	7.68	74.68
10 – 11.00am	947	160.2	7.68	167.88	1304	51	7.68	58.68
11 – 12.00pm	993	179	7.68	186.68	1415	70	7.68	77.68
12 – 1.00pm	1020.6	174.4	6.72	181.12	1490	70	6.72	76.72
1 – 2.00pm	1058	164.4	6.72	171.12	1322	85	6.72	91.72
2 – 3.00pm	1323	163.4	6.72	170.12	1296	84	6.72	90.72
3 – 4.00pm	1701	146	4.18	150.18	1328	50	4.18	54.18
4 – 5.00pm	1858	102.8	4.18	106.98	1252	40	4.18	44.18

Note: MR – Moorebank Recyclers

- The percentage of heavy vehicles per hour in 2011 between **7:00am** and **5:00pm** on weekdays ranged from a minimum of **5.2%** between **4:00** and **5:00pm** to a maximum of **15.3%** between **11:00am – 12:00pm**.
- The additional heavy vehicles generated by Moorebank Recyclers and distributed to Nuwarra Road will increase the percentage of heavy vehicles to the *total traffic on weekdays* from **5.2%** to **5.4%** between **4:00 – 5:00pm** and from **15.3%** to **15.8%** between **11:00am – 12:00pm**.

The increases are too small to change the Level of Service in Nuwarra Road.

- The percentage of heavy vehicles on Saturday in 2011 between **7:00am** and **5:00pm** ranged from a minimum of **3.1%** between **4:00 – 5:00pm** to a maximum of **8.2%** between **7:00 – 8:00am**.
- The additional heavy vehicles generated by Moorebank Recyclers and distributed to Nuwarra Road on Saturday will increase the percentage of heavy vehicles from **3.1%** to **3.4%** between **4:00 – 5:00pm** and from **8.2%** to **9.0%** between **7:00 – 8:00am**. There will be no change to the Level of Service in Nuwarra Road.

6.0 (Continued)

6.2.3 Newbridge Road

In 2012 the eastbound **AADT** was **38055** and the westbound **AADT** was **25044**. The **AADT** in both directions was **63099** vpd and **2.8** times the **ADT** of **22436** in Nuwarra Road.

Based upon the directional distribution of **55%** of heavy vehicles generated by Moorebank Recyclers to Newbridge Road east of Brickmakers Drive, the additional heavy vehicles between **7:00am – 5:00pm** are estimated to be **89.1** in both directions. If the existing percentage of heavy vehicles during this period is **12%** of total traffic and total traffic is **59%** of the **AADT** then the existing number of heavy vehicle movements (both directions) is in the order of **4467**. The Moorebank Recyclers trucks amount to about a **4%** increase in heavy vehicle movements.

6.3 Performance of Link Road / Brickmakers Drive Intersection

This intersection has been modelled as a tee intersection for 2021 **am** and **pm** peak hour traffic volumes under *Give Way* sign control and traffic signal control. The tee intersection kerb return design does not allow access to the residential area to the west and south to prevent trucks from passing these residential areas. The *Level of Service and Degree of Saturation* shows that this intersection will provide satisfactory performance under traffic signal control.

6.4 Noise Abatement Measures on Access Road

The access road to Moorebank Recyclers site from Brickmakers Drive to the site is to be signposted for **25km/hr** for safety reasons and to reduce tyre and engine noise. The proposed site *hours of operation* are **7:00am to 6:00pm** Monday to Saturday but *truck movements* will be from **7:00am to 5:00pm**. The access road is on flat terrain in a low lying area some **3** metres below the level of Brickmakers Drive. For complete details of noise abatement measures refer to the *acoustic report by Wilkinson and Murray*.

6.0 (Continued)

6.5 Increase in Equivalent Standard Axle Loading (ESA's) on External Road Pavements

The estimated (ESA's) due to the passage of Moorebank Recyclers trucks over a 20 year design period has been included in **Table 4.7** in Brickmakers Drive between the Link Road and Newbridge Road (300 metres), Nuwarra Road and three sections of Newbridge Road.

The pavement in Brickmakers Drive has been designed for **8.57×10^6 ESA's**. The pavement in Nuwarra Road and Newbridge Road would have been designed for very heavy traffic loading exceeding **10^7 ESA's**.

6.5.1 Brickmakers Drive:

The estimated traffic loading in Brickmakers Drive including Moorebank Recyclers trucks over 20 years is **3.455×10^6 ESA's** compared with the pavement design of **8.57×10^6 ESA's**. The risk of poor structural performance is therefore low.

The life of a dense graded asphalt wearing surface is in the range of 8 to 20 years.

6.5.2 Nuwarra Road:

The increase in ESA's due to the Moorebank Recyclers trucks is **6.7%** in the *northbound* direction and **6.5%** in the *southbound* direction.

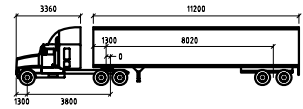
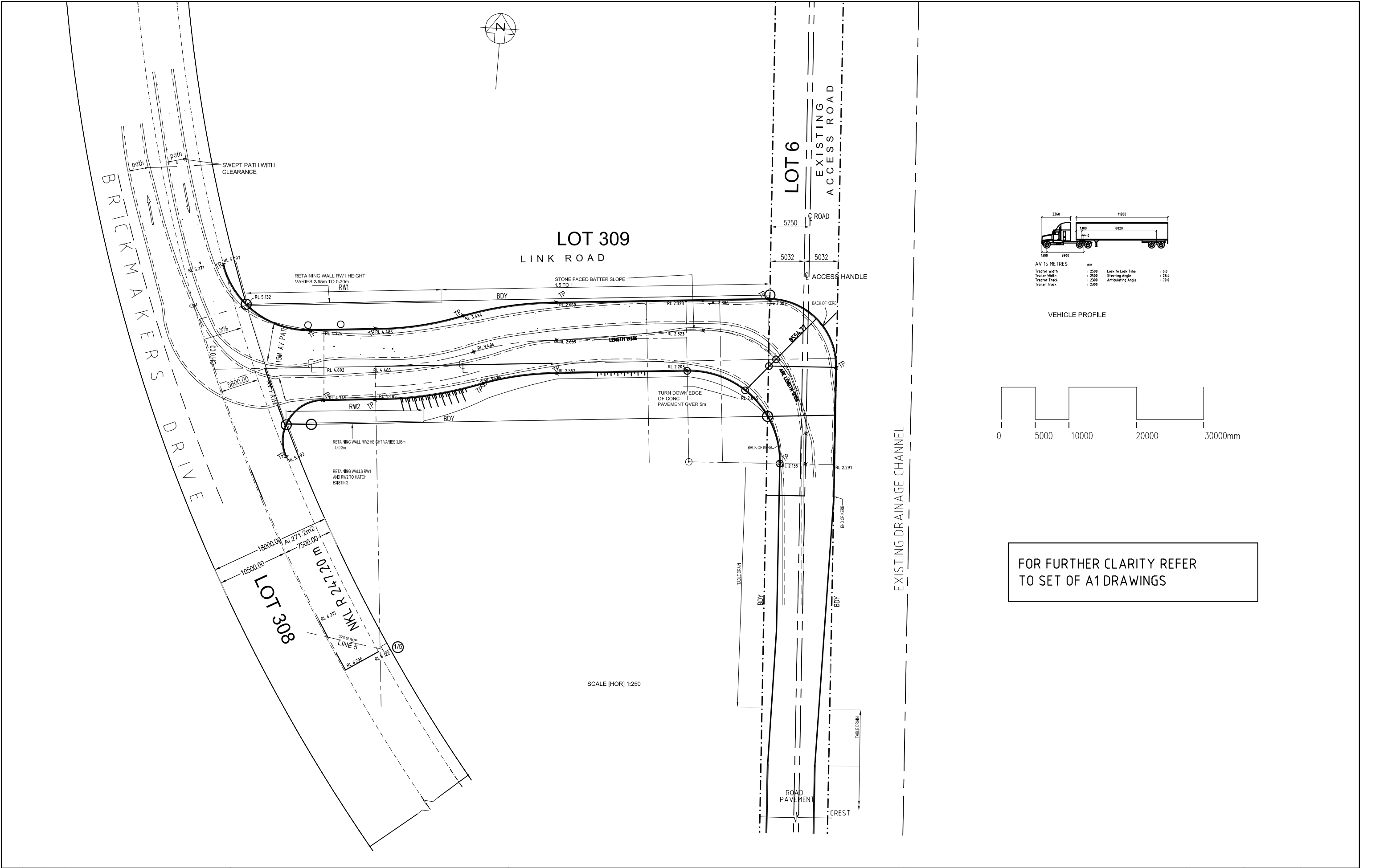
The impact of the additional heavy vehicles on the structural life of the road pavement and the asphalt wearing surface is *low* enough to be ignored.

6.5.3 Newbridge Road:

There is insufficient data to estimate the current and future traffic loading on the most heavily trafficked lane of this *busy 6 lane arterial main road*. It is considered that the impacts of the *additional heavy vehicles* would be *lower* than Nuwarra Road because the vehicles have **3 lanes** to travel on, compared with a *single lane in Nuwarra Road*.

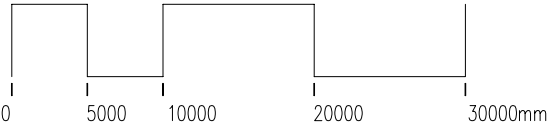
APPENDICES

APPENDIX B



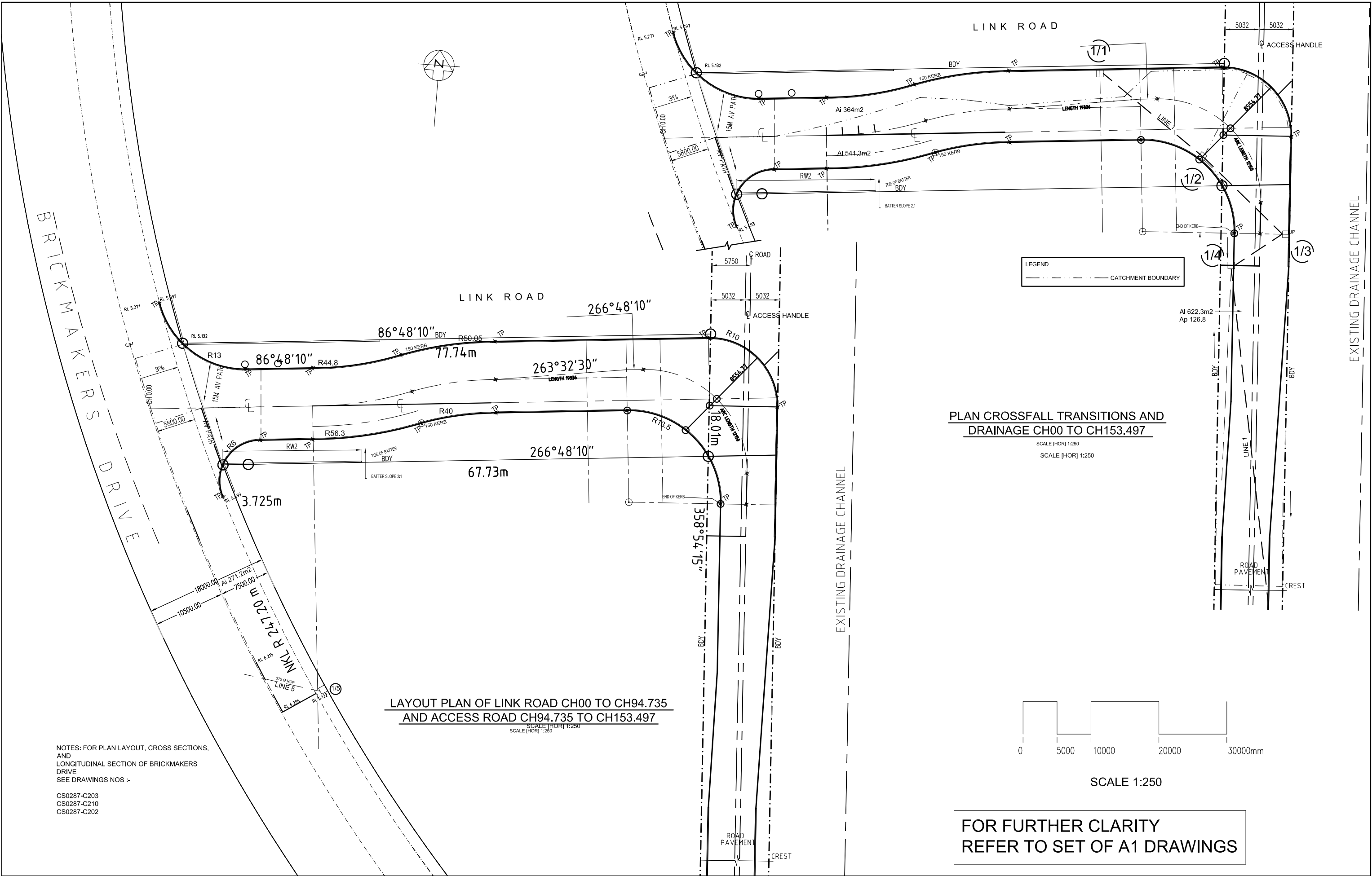
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VEHICLE PROFILE



FOR FURTHER CLARITY REFER
TO SET OF A1 DRAWINGS

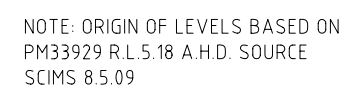
No.				DATE		APPD		SURVEY BY:		ASHER CONSULTING PTY LTD PO BOX 1455 PARRAMATTA NSW PHONE:(02) 9635 5411 FACSIMILE: (02) 9635 5237		<div><p>LYLE MARSHALL AND ASSOCIATES PTY. LTD. CONSULTING ENGINEERS, TRANSPORTATION AND ENVIRONMENTAL PLANNERS</p><p>SUITE 8, 871 PACIFIC HIGHWAY, CHATSWOOD N.S.W 2067 PH:(02) 9419 8191 FAX:(02) 9419 8107 EMAIL: lylemarshall@ozemail.com.au</p></div>		CLIENT:		MOOREBANK RECYCLERS PTY LTD PO BOX 238 RYDALMERE NSW 1701 PHONE: (02) 9684 6811 FACSIMILE:(02) 9684 6535		SCALE		PASSED		DATE FIRST ISSUED			
A				4.2.10		GLM		GEOMETRIC DESIGN LAYOUT AMENDED																	
B				3.5.10		GLM		NOTE ADDED																	
C				16.6.10		GLM		LOT NUMBER ADDED																	
D				21.11.12		GLM		DELETE WHEEL PATHS																	
										A.H.D.		COPYRIGHT THIS DRAWING IS THE PROPERTY OF LYLE MARSHALL AND ASSOCIATES P/L AND MAY ONLY BE USED FOR THE PURPOSE FOR WHICH IT WAS COMMISSIONED & IN ACCORDANCE WITH THE TERMS OF ENGAGEMENT FOR THAT COMMISSION. UNAUTHORISED USE OF THIS DRAWING IS PROHIBITED.													
														SWEPT PATH DIAGRAM FOR 15M A.V TURNING TO AND FROM BRICKMAKERS DR		DESIGN		LMA		SHEET No.		DRAWING No.			
																FROM THE ACCESS ROAD TO MOOREBANK RECYCLERS VIA THE LINK ROAD		DRAWN		EMMC		1D		8318/7/09	
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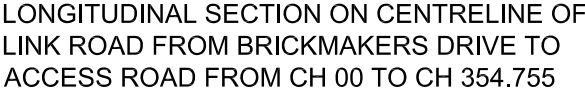
NOTES: FOR PLAN LAYOUT, CROSS SECTIONS, AND LONGITUDINAL SECTION OF BRICKMAKERS DRIVE SEE DRAWINGS NOS :-

CS0287-C203
CS0287-C210
CS0287-C202

				SURVEY BY:		ASHER CONSULTING PTY LTD PO BOX 1455 PARRAMATTA NSW PHONE (02) 9635 5411 FACSIMILE: (02) 9635 5237		 LYLE MARSHALL AND ASSOCIATES PTY. LTD. CONSULTING ENGINEERS, TRANSPORTATION AND ENVIRONMENTAL PLANNERS	CLIENT:		MOOREBANK RECYCLERS PTY LTD PO BOX 238 RYDALMERE NSW 1701 PHONE: (02) 9684 6811 FACSIMILE: (02) 9684 6535		SCALE		PASSED		DATE FIRST ISSUED	
No.		DATE		APPD									1:250				MAY 2009	
A		4.2.10		GLM		GEOMTRIC DESIGN LAYOUT AMENDED												
B		21.11.12				BASE ALIGNMENT AMENDED												



SCALE		PASSED		DATE FIRST ISSUED	
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DESIGN	LMA	SHEET No. 3E OF 8	DRAWING No. 8318/7/09		
DRAWN	EMMC				
CHECKED	GLM				



The profile view shows the proposed road elevation (solid line) and existing surface (dashed line) against chainage. Key features include a match line at chainage 452.752, a low point at 452.752 (elevation 2.148), a crest at 537.73 (elevation 2.360), another low point at 640.583 (elevation 1.96), and existing culverts at 679.323 (elevation 3.38) and 690.183 (elevation 5.467). The road ends at chainage 710.303 (elevation 5.866). The design level is shown as a horizontal line at elevation 5.075.

CHAINAGE	EXISTING SURFACE	DESIGN LEVEL
452.752	1.88	2.148
537.73	1.96	2.360
640.583	1.76	1.96
679.323	3.38	5.075
690.183	5.467	5.467
710.303	4.25	5.866

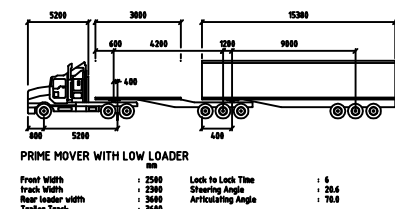
LONGITUDINAL SECTION ON CENTRELINE OF
ACCESS ROAD FROM CH 354.755 TO CH 710.303

FOR FURTHER CLARITY
REFER TO SET OF A1 DRAWINGS

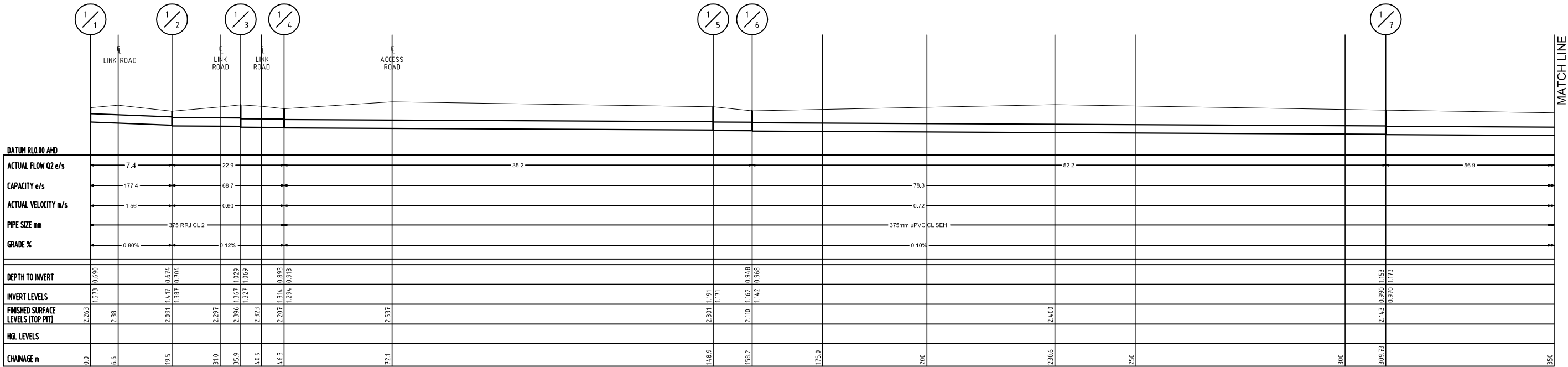
No.	DATE	APPD	SURVEY BY: ASHER CONSULTING PTY LTD P.O. BOX 1655 PARRAMATTA N.S.W PHONE (02) 9635 5411 FAX (02) 9635 5237	 LYLE MARSHALL AND ASSOCIATES PTY. LTD. CONSULTING ENGINEERS, TRANSPORTATION AND ENVIRONMENTAL PLANNERS	CLIENT: MOOREBANK RECYCLERS P.O. BOX 238 RYDALMERE NSW 1701 PHONE (02) 9684 6811 FAX (02) 9684 6535	SCALE		PASSED	DATE FIRST ISSUED	
A	1-2-10	Finished Surface Levels Revised				1500 @ A1		SEPTEMBER 2009		
B	30-3-10	Levels raised at Weighbridges								
C	21-11-12	Delete intermediate data								
			DATUM: A.H.D.	COPYRIGHT THIS DRAWING IS THE PROPERTY OF LYLE MARSHALL AND ASSOCIATES P/L AND MAY ONLY BE USED FOR THE PURPOSE FOR WHICH IT WAS COMMISSIONED & IN ACCORDANCE WITH THE TERMS OF ENGAGEMENT FOR THAT COMMISSION. UNAUTHORISED USE OF THIS DRAWING IS PROHIBITED.	SUITE 8, 871 PACIFIC HIGHWAY, CHATSWOOD N.S.W 2067 PH: (02) 9419 8191 FAX: (02) 9419 8107 EMAIL: lylemarshall@ozemail.com.au	DESIGN		LMA	SHEET No. 4C OF 8	DRAWING No. 8318/7/09
						DRAWN	EMMC			
						CHECKED	GLM			

No.	DATE	APPD		SURVEY BY: ASHER CONSULTING PTY LTD P.O. BOX 1655 PARRAMATTA NSW PHONE (02) 9635 5411 FAX (02) 9635 5237	 LYLE MARSHALL AND ASSOCIATES PTY. LTD. CONSULTING ENGINEERS, TRANSPORTATION AND ENVIRONMENTAL PLANNERS	CLIENT: MOOREBANK RECYCLERS P.O. BOX 238 RYDALMERE NSW 1781 PHONE (02) 9684 6811 FAX (02) 9684 6535	SCALE		PASSED	DATE FIRST ISSUED
A	--2-201		CROSS SECTIONS				1:50		SEPTEMBER 2009	
				DATUM: A.H.D.	COPYRIGHT THIS DRAWING IS THE PROPERTY OF LYLE MARSHALL AND ASSOCIATES P/L AND MAY ONLY BE USED FOR THE PURPOSE FOR WHICH IT WAS COMMISSIONED & IN ACCORDANCE WITH THE TERMS OF ENGAGEMENT FOR THAT COMMISSION. UNAUTHORISED USE OF THIS DRAWING IS PROHIBITED.	SUITE 8, 871 PACIFIC HIGHWAY, CHATSWOOD N.S.W 2067 PH:(02) 9419 8191 FAX:(02) 9419 8107 EMAIL: lylemarshall@ozemail.com.au	DESIGN	LMA	SHEET No. 5A OF 8	DRAWING No. 8318/7/09
				CROSS SECTIONS ALONG LINK RD FROM BRICKMAKERS DR AND ACCESS RD TO MOOREBANK RECYCLING SITE	DRAWN		EMMC			
					CHECKED		GLM			

GENERAL NOTES				DRAINAGE NOTES				CONCRETE KERB & GUTTER			
G1.	THE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE LIVERPOOL CITY COUNCIL DESIGN AND CONSTRUCTION SPECIFICATIONS.			D1.	THE STORMWATER SYSTEM HAS BEEN DESIGNED USING THE RATIONAL METHOD IN ACCORDANCE WITH THE AUSTRALIAN RAINFALL AND RUNOFF FOR A 1 IN 2 YEAR ARI IN THE ACCESS ROAD AND LINK ROAD.			C17.	THE STANDARD KERB AND GUTTER PROFILES SHALL COMPLY WITH STANDARD DRAWING R2.		
G2.	LEVELS ARE TO AHD. LOCATION OF BENCH MARK IS NOTED ON SHEET 3.			D2.	THE RAINFALL INTENSITY FREQUENCY, DURATION DATA USED IS FOR GEORGES RIVER AT LIVERPOOL IN THE LIVERPOOL CITY COUNCL HANDBOOK FOR DRAINAGE DESIGN CRITERIA.			ACCESS ROAD PAVEMENT NOTES			
G3.	EROSION CONTROL MEASURES ARE TO BE IMPLEMENTED PRIOR TO THE COMMENCEMENT OF WORKS.			D3.	THE TIME OF CONCENTRATION PIT 1/4 USED IN CALCULATIONS IS 7.5 MINUTES AT PIT 1 IN LINE 1 AND 20 MINS AT THE PUMP WELL. THE ESTIMATED PEAK DISCHARGE IS 81.0 LITRES/SEC.			AP1.	THE EXISTING GRAVEL ACCESS ROAD WAS IN USE FOR 3½ TO 4 YEARS WHEN 60,000 TONNES WAS TRANSPORTED IN BY BOGY TRUCK FOR SITE REMEDIATION WORKS.		
G4.	THE LOCATIONS OF EXISTING SERVICES ON THESE PLANS ARE INDICATIVE ONLY.			D4.	ALL DRAINAGE WORKS SHALL COMPLY WITH LIVERPOOL CITY COUNCIL DESIGN SPECIFICATIONS – 2003.			AP2.	THE ACCESS ROAD IS INUNDATED PERIODICALLY BY FLOODWATERS FROM THE GEORGES RIVER AND THE WATER TABLE IS HIGH AND FLUCTUATES. IN ORDER TO DISSIPATE HIGH PORE PRESSURES AND PUMPING PRESSURES CAUSED BY HEAVY TRUCK MOVEMENTS, A FREE DRAINING PERMEABLE LAYER SHALL BE CONSTRUCTED UNDER THE BASECOURSE.		
G5.	THE CONTRACTOR SHALL EXERCISE THE GREATEST CARE DURING THE PROGRESS OF THE WORKS TO AVOID DAMAGE TO ANY UTILITY SERVICE AND SHALL BE RESPONSIBLE FOR ANY DAMAGE CAUSED BY THEM OR THEIR AGENTS DIRECTLY OR INDIRECTLY.			D5.	ALL PIPELINES TO BE LAID IN TRENCH CONDITIONS. (TYPE H1 BEDDING).			AP3.	WHERE THE ROAD IS TO BE WIDENED THE TOPSOIL SHALL BE STRIPPED ON EACH SIDE OF THE EXISTING PAVEMENT AND THE EXPOSED EARTH EXCAVATED TO THE DEPTH OF 350mm BELOW THE EXISTING PAVEMENT SURFACE. THE EXPOSED SUBGRADE SHALL BE COMPACTED TO 95 PERCENT OF STANDARD MAXIMUM DRY DENSITY. THE TOP 200mm OF THE EXISTING PAVEMENT IS TO BE REMOVED AND PLACED AND COMPACTED TO A DEPTH OF 150mm AS A SUB BASE WHERE THE PAVEMENT IS WIDENED. THE SUB-BASE AND BASECOURSE SHALL BE COMPACTED IN LAYERS OF 100mm COMPACTED THICKNESS TO 95 PERCENT MODIFIED MAXIMUM DRY DENSITY.		
G6.	ALL EXISTING SERVICES TO BE LOCATED BY AN APPROVED CABLE LOCATING CONTRACTOR DEPTHS CONFIRMED BY HAND EXCAVATION AND LEVELLED BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF WORK.			D6.	ALL LONGITUDINAL PIPELINES IN PAVEMENTS SHALL BE BACKFILLED WITH APPROVED GRANULAR MATERIAL.			AP4.	A PERMEABLE DRAINAGE LAYER 300mm COMPACTED THICKNESS OF CLASS D75 RECYCLED MATERIAL COMPLYING WITH RESOURCE NSW SPECIFICATION FOR SUPPLY OF RECYCLED MATERIAL FOR PAVEMENTS SHALL BE SPREAD OVER THE COMPACTED SUB-BASE IN THE WIDENED ACCESS ROAD PAVEMENT AND COMPACTED TO 95 PER CENT MODIFIED MAXIMUM DRY DENSITY.		
G7.	TOPSOIL SHALL BE STRIPPED TO A MINIMUM DEPTH OF 100mm FROM WITHIN THE PAVEMENT AND BATTER FORMATION AREAS AND IS TO BE CONSERVED FOR THE TOP DRESSING.			D7.	ALL PITS SHALL BE BENCHED AND STREAMLINED. PROVIDE STEP IRONS FOR ALL PITS OVER 1.2m DEEP.			THE SURFACE SHALL BE COMPACTED USING A SMOOTH DRUM ROLLER TO MINIMIZE THE SURFACE ROUGHNESS. A BIDIM A34 GEOTEXTILE SHALL BE PLACED OVER THE PERMEABLE SUB-BASE LAYER TO SEPARATE THIS LAYER FROM THE BASECOURSE LAYER.			
G8.	WHILE WORKING ON COUNCIL S ROADS OR ROADS RESERVES, CONTRACTOR SHALL MAKE PROVISION FOR TRAFFIC AS SET OUT IN AS 1742 PART 3 (2002) – TRAFFIC CONTROL DEVICES FOR WORKS ON ROADS.			D8.	ALL AREAS DISTURBED BY CONSTRUCTION ARE TO BE FULLY REINSTATED TO THE SATISFACTION OF THE CERTIFYING AUTHORITY.			A BASECOURSE COMPRISING 200mm COMPACTED OF CLASS R1 RECYCLED MATERIAL COMPLYING WITH RESOURCE NSW SPECIFICATION SHALL BE SPREAD OVER THE GEOTEXTILE AND COMPACTED TO 95 PER CENT MODIFIED MAXIMUM DRY DENSITY.			
G9.	ANY ROAD RESTORATION REQUIRED SHALL BE IN 300mm LAYERS OF SAND FROM THE BOTTOM OF TRENCH OR TOP OF SAND OVERLAY OVER ANY PIPES COMPACTED TO A MINIMUM OF 100% STANDARD COMPACTION, WITH THE FINAL LAYERS OF SUB-BASE COMPACTED TO MINIMUM OF 95% MODIFIED COMPACTION AND FINISHED LEVEL WITH EXISTING ROAD SURFACE.			D9.	EROSION AND SEDIMENTATION CONTROLS ARE TO BE ESTABLISHED AS SHOWN ON THE EROSION AND SEDIMENT CONTROL PLAN AND TO THE REQUIREMENTS OF THE CERTIFYING AUTHORITY AND MAINTAINED DURING AND AFTER CONSTRUCTION.			AP5.	A TWO COAT HOT FLUSH BITUMEN SEAL SPRAYED BITUMINOUS SURFACING COMPRISING THE SPRAYING OF HOT BITUMEN AND THE APPLICATION OF PRECOATED AGGREGATE SHALL BE CONSTRUCTED ON THE PREPARED BASECOURSE IN ACCORDANCE WITH LIVERPOOL CITY COUNCIL SPECIFICATION C244- SPRAYED BITUMINOUS SURFACING.		
G10.	ALL CONSTRUCTION SHALL MAKE SMOOTH CONNECTION TO ALL EXISTING WORK.			D10.	ALL UNDERGROUND DRAINAGE PIPES IN THE ACCESS ROAD SHALL BE uPVC CLASS SEH COMPLYING WITH AS/NZS 1260-1999 PIPES AND FITTINGS FOR SEWERAGE APPLICATIONS. UNO. ALL DRAINAGE PIPES IN THE LINK ROAD SHALL BE REINFORCED CONCRETE PIPES CLASS 2 RRJ AND COMPLY WITH AS/NZS 4058 : 2007.						
G11.	THE CONTRACTOR SHALL CONTACT COUNCIL IN WRITING A MINIMUM OF SEVEN (7) DAYS PRIOR TO COMMENCING WORK AND APPLY FOR A ROAD OPENING PERMIT (SECTION 138 OF THE ROADS ACT) FOR APPROVAL TO WORK ON A PUBLIC ROAD AND INCLUDE COPIES OF CURRENT PUBLIC LIABILITY INSURANCE TO THE VALUE OF \$20 MILLION AND THE PAYMENT OF THE CURRENT FEE.			D11.	PRECASE KERB INLET LINTELS SHALL BE USED ON GULLY PITS TYPE SA TO MD. R11. B02. A.1.						
G12.	ALL SERVICES REQUIRED TO BE ADJUSTED OR RELOCATED BY NEW WORK, SHALL BE ADJUSTED TO THE SATISFACTION OF THE RELEVANT SERVICE AUTHORITY.			D12.	TABLE DRAINS SHALL BE CONSTRUCTED WHERE INDICATED ON THE GENERAL PLAN.						
				D13.	A SUBMERSIBLE 3 PHASE PUMP KRS-150 OR EQUIVALENT IS TO BE INSTALLED IN THE PUMP WELL.						

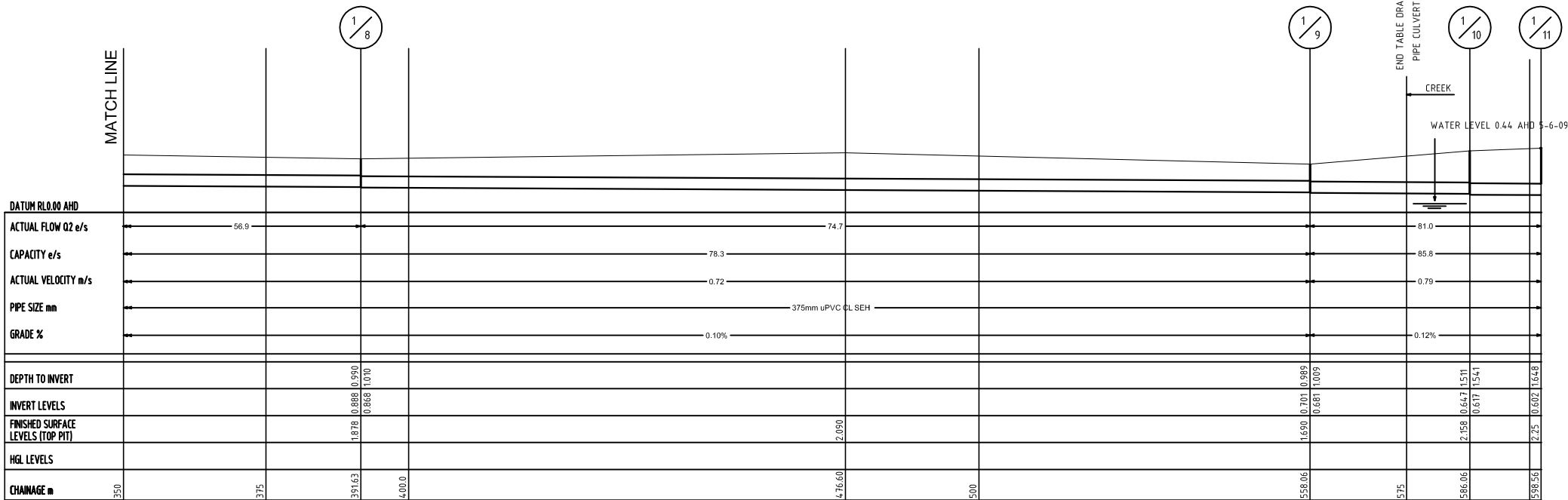


No.	DATE	APPD	<div>SURVEY BY: ASHER CONSULTING PTY LTD PO BOX 1455 PARRAMATTA NSW PHONE:(02) 9635 5411 FACSIMILE: (02) 9635 5237</div>	<div><div>LYLE MARSHALL AND ASSOCIATES PTY. LTD.</div><div>CONSULTING ENGINEERS, TRANSPORTATION AND ENVIRONMENTAL PLANNERS</div></div>	<div>CLIENT: MOOREBANK RECYCLERS PTY LTD PO BOX 238 RYDALMERE NSW 1701 PHONE: (02) 9684 6811 FACSIMILE:(02) 9684 6535</div>	SCALE		PASSED	DATE FIRST ISSUED
						1:250		MAY 2009	
						DESIGN	LMA	SHEET No. 7 OF 8	DRAWING No. 8318/7/09
						DRAWN	EMMC		
						CHECKED	GLM		
			DATUM: A.H.D.	COPYRIGHT THIS DRAWING IS THE PROPERTY OF LYLE MARSHALL AND ASSOCIATES P/L AND MAY ONLY BE USED FOR THE PURPOSE FOR WHICH IT WAS COMMISSIONED & IN ACCORDANCE WITH THE TERMS OF ENGAGEMENT FOR THAT COMMISSION. UNAUTHORISED USE OF THIS DRAWING IS PROHIBITED.		SUITE 8, 871 PACIFIC HIGHWAY, CHATSWOOD N.S.W 2067 PH:(02) 9419 8191 FAX:(02) 9419 8107 EMAIL: lylemarshall@ozemail.com.au			
						SWEPT PATH DIAGRAM FOR PRIME MOVER AND LOW LOADER TURNING TO AND FROM BRICKMAKERS DRIVE FROM THE ACCESS ROAD TO MOOREBANK RECYCLERS VIA THE LINK ROAD			



LONGITUDINAL SECTION DRAINAGE LINE 1
FROM CH 00 TO CH 350.00

SCALE [HOR] 1:500
SCALE [VERT] 1:100

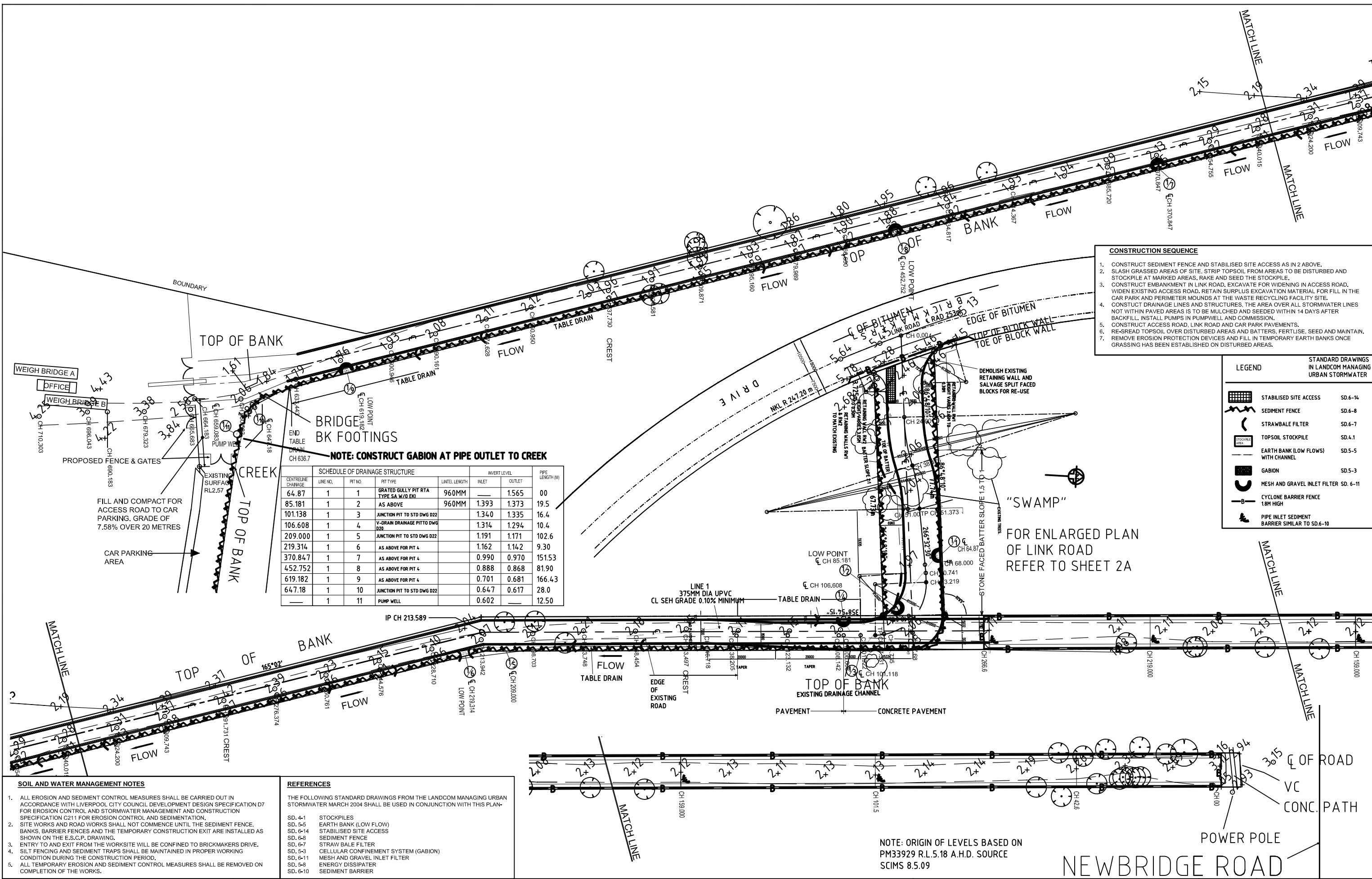


LONGITUDINAL SECTION DRAINAGE LINE 1
FROM CH 350 TO CH 598.56

SCALE [HOR] 1:500
SCALE [VERT] 1:100

LINE NO.	PIT NO.	STRUCTURE TYPE	LINTEL
1	1/1	KERB INLET PIT TO RTA DWG MD.R11.B02.A.1	960 mm
	1/2	As for 1/1	
	1/3	JUNCTION PIT TO D22 914x610	
	1/4	V DRAIN DRAINAGE PIT TO D20 900x600	
	1/5	JUNCTION PIT TO D22 914x610	
	1/6	V DRAIN DRAINAGE PIT TO D20 900x600	
	1/7	AS FOR 1/6	
	1/8	AS FOR 1/6	
	1/9	AS FOR 1/6	
	1/10	JUNCTION PIT TO D22 914x610	
	1/11	PUMPWELL	

No.	DATE	APPD	SURVEY BY: ASHER CONSULTING PTY LTD PO BOX 1455 PARRAMATTA NSW PHONE:(02) 9635 5411 FACSIMILE: (02) 9635 5237		 The Australian Consulting Engineers Association	LYLE MARSHALL AND ASSOCIATES PTY. LTD. CONSULTING ENGINEERS, TRANSPORTATION AND ENVIRONMENTAL PLANNERS	CLIENT: MOOREBANK RECYCLERS PTY LTD PO BOX 238 RYDALMERE NSW 1701 PHONE: (02) 9684 6811 FACSIMILE:(02) 9684 6535	SCALE		PASSED	DATE FIRST ISSUED		
									1:500			FEBRUARY 2010	
			DATUM:	COPYRIGHT THIS DRAWING IS THE PROPERTY OF LYLE MARSHALL AND ASSOCIATES P/L AND MAY ONLY BE USED FOR THE PURPOSE FOR WHICH IT WAS COMMISSIONED & IN ACCORDANCE WITH THE TERMS OF ENGAGEMENT FOR THAT COMMISSION. UNAUTHORISED USE OF THIS DRAWING IS PROHIBITED.				SUITE 8, 871 PACIFIC HIGHWAY, CHATSWOOD N.S.W 2067 PH:(02) 9419 8191 FAX:(02) 9419 8107 EMAIL: lylemarshall@ozemail.com.au	LONGITUDINAL SECTION DRAINAGE LINE 1	DESIGN	LMA	SHEET No. 8 OF 8	DRAWING No. 8318/7/09
			A.H.D.							DRAWN	EMMC		
					CHECKED	GLM							



SOIL AND WATER MANAGEMENT NOTES			
1. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE CARRIED OUT IN ACCORDANCE WITH LIVERPOOL CITY COUNCIL DEVELOPMENT DESIGN SPECIFICATION D7 FOR EROSION CONTROL AND STORMWATER MANAGEMENT AND CONSTRUCTION SPECIFICATION C211 FOR EROSION CONTROL AND SEDIMENTATION.			
2. SITE WORKS AND ROAD WORKS SHALL NOT COMMENCE UNTIL THE SEDIMENT FENCE, BANKS, BARRIER FENCES AND THE TEMPORARY CONSTRUCTION EXIT ARE INSTALLED AS SHOWN ON THE E.S.C.P. DRAWING.			
3. ENTRY TO AND EXIT FROM THE WORKSITE WILL BE CONFINED TO BRICKMAKERS DRIVE.			
4. SILT FENCING AND SEDIMENT TRAPS SHALL BE MAINTAINED IN PROPER WORKING CONDITION DURING THE CONSTRUCTION PERIOD.			
5. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED ON COMPLETION OF THE WORKS.			

REFERENCES			
THE FOLLOWING STANDARD DRAWINGS FROM THE LANDCOM MANAGING URBAN STORMWATER MARCH 2004 SHALL BE USED IN CONJUNCTION WITH THIS PLAN-			
SD, 4-1	STOCKPILES		
SD, 5-6	EARTH BANK (LOW FLOW)		
SD, 6-14	STABILISED SITE ACCESS		
SD, 6-8	SEDIMENT FENCE		
SD, 6-7	STRAW BALE FILTER		
SD, 5-3	CELLULAR CONFINEMENT SYSTEM (GABION)		
SD, 6-11	MESH AND GRAVEL INLET FILTER		
SD, 5-8	ENERGY DISSIPATER		
SD, 6-10	SEDIMENT BARRIER		

No.	DATE	APPD	SURVEY BY:
A	4-2-10		ASHER CONSULTING PTY LTD
B	7-12-10		P.O. BOX 1435 PARRAMATTA N.S.W
			PHONE (02) 9635 5411 FAX (02) 9635 5237
			DATUM:
			A.H.D.
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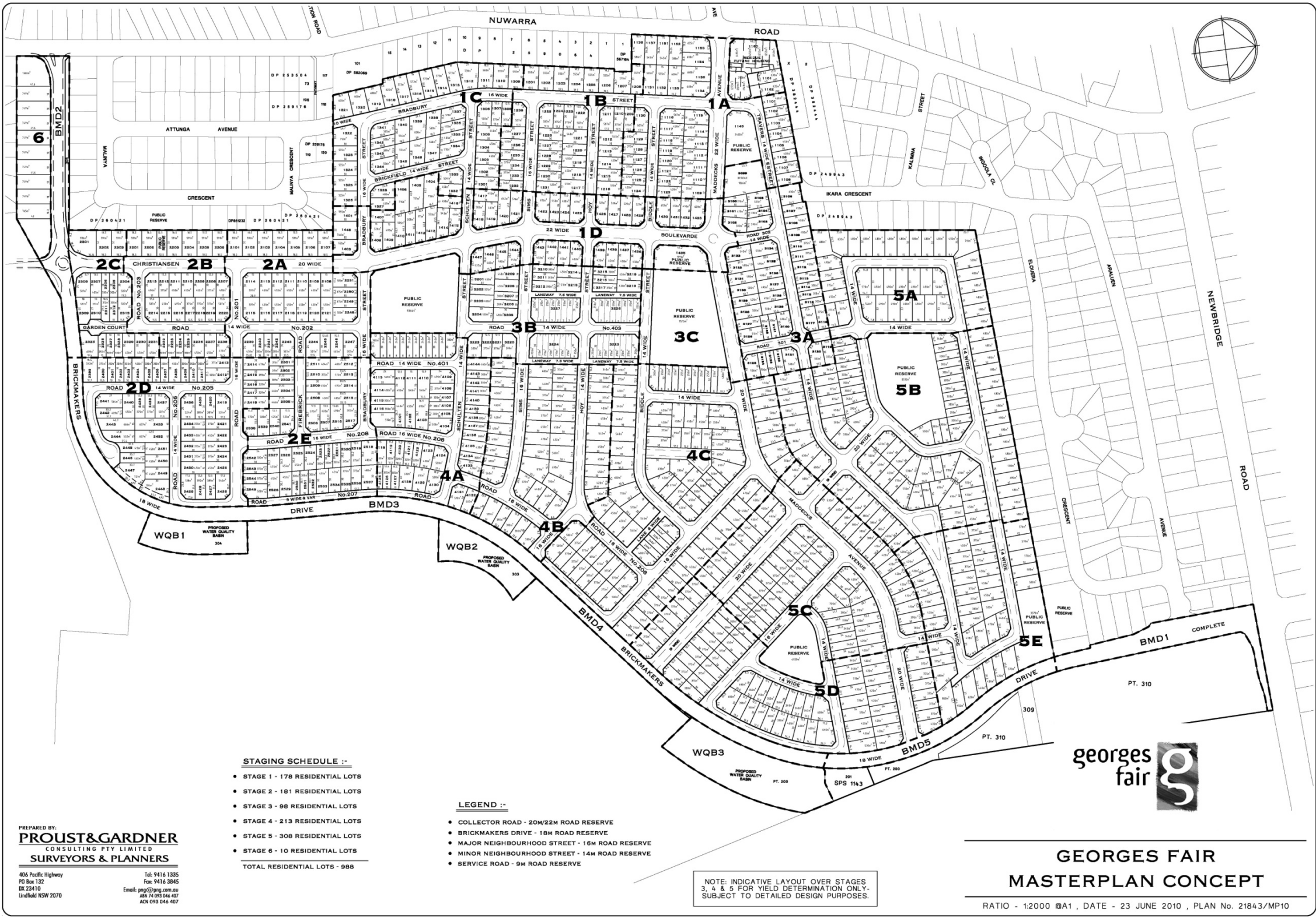
LYLE MARSHALL AND ASSOCIATES PTY. LTD.
CONSULTING ENGINEERS, TRANSPORTATION AND ENVIRONMENTAL PLANNERS

SUITE 8, 871 PACIFIC HIGHWAY, CHATSWOOD N.S.W 2067 PH:(02) 9419 8191 FAX:(02) 9419 8107
EMAIL: lylemarshall@ozemail.com.au

CLIENT:		SCALE	PASSED	DATE FIRST ISSUED
MOOREBANK RECYCLERS		1:500 (A1)		APRIL 2010
P.O. BOX 238 RYDALMERE NSW 1701				
PHONE (02) 9684 6811 FAX (02) 9684 6535				
EROSION AND SEDIMENT CONTROL PLAN		DESIGN	LMA	SUPP SHEET No.
PLAN OF LINK ROAD FROM BRICKMAKERS DRIVE TO ACCESS ROAD CH00 TO CH94.735		DRAWN	JW	1B
AND ACCESS ROAD TO MOOREBANK RECYCLING SITE CH94.735 TO CH 710.303		CHECKED	GLM	
				DRAWING No.
				8318/7/09

APPENDIX C

Figure 17: Georges Fair Master Plan



APPENDIX D

APPENDIX D

TABLE B
GOVERNOR MACQUARIE DRIVE NORTH OF BALANADA AVENUE
BI-DIRECTIONAL 5 DAY (WEEKDAY) AVERAGE HOURLY VOLUMES
AND VEHICLE CLASSIFICATIONS FEB 2011

Hour of Day	Light Vehicle Classes 0, 1, 2		Heavy Vehicle Classes 3 to 10		Total Vehicles	
	Number	%	Number	%	Number	% of Total
Midnight – 1.00am	137.8	92.7	10.8	7.3	148.6	0.75
1.00 – 2.00am	56.4	80.1	14.0	19.9	70.4	0.35
2.00-3.00am	60.6	75.4	19.8	24.6	80.4	0.40
3.00-4.00am	76.8	79.3	20	20.7	96.8	0.49
4.00-5.00am	157.6	78.1	44.2	21.9	201.8	1.01
5.00-6.00am	368.8	84.9	65.4	15.1	434.2	2.18
6.00-7.00am	753.8	85.2	131	14.8	884.8	4.44
7.00-8.00am	1037.8	84.8	186	15.2	1223.8	6.14
8.00-9.00am	1156.2	82.3	248.8	17.7	1405.0	7.04
9.00-10.00am	1011	78.5	277.4	21.5	1288.4	6.46
10.00-11.00am	879.2	73.7	314.2	26.3	1193.4	5.98
11.00-12 Midday	860.8	73.1	316.6	26.9	1177.4	5.90
Midday – 1.00pm	930.8	75.6	300.6	24.4	1231.4	6.17
1.00-2.00pm	975.4	77.2	288.2	22.8	1263.6	6.34
2.00-3.00pm	1084.4	78.4	298.2	21.6	1382.6	6.93
3.00-4.00pm	1319.2	83.6	258.2	16.4	1577.4	7.90
4.00-5.00pm	1332.2	86.9	200	13.1	1532.2	7.68
5.00-6.00pm	1309.6	91.4	123.6	8.6	1433.2	7.18
6.00-7.00pm	974.8	92.6	77.8	7.4	1052.6	5.28
7.00-8.00pm	636.2	92.8	49.6	7.2	685.8	3.44
8.00-9.00pm	487.4	93.5	34	6.5	521.4	2.61
9.00-10.00pm	429.6	94.3	26.2	5.7	455.8	2.29
10.00-11.00pm	339.2	94.4	20.2	5.6	359.4	1.80
11.00-Midnight	232.8	93.2	17	6.8	249.8	1.25
TOTAL	16608.4	83.25	3341.8	16.75	19950	100.0
7.00am-10.00pm	14424.6	82.8	2999.4	17.2	17424.0	
10.00pm-10.00pm	2183.8	86.4	342.4	13.6	2526.2	

APPENDIX D

TABLE A
NUWARRA ROAD SOUTH OF JUNCTION ROAD
BI-DIRECTIONAL 5 DAY (MON TO FRI) AVERAGE HOURLY VOLUMES
AND VEHICLE CLASSIFICATIONS FEB 2011

Hour of Day	Light Vehicle Classes 0, 1, 2		Heavy Vehicle Classes 3 to 10		Total Vehicles	
	Number	%	Number	%	Number	% of Total
Midnight – 1.00am	124	92.5	10	7.5	134	0.55
1.00 – 2.00am	68	89.5	8	10.5	76	0.31
2.00-3.00am	49	84.5	9	15.5	58	0.24
3.00-4.00am	61	83.6	12	16.4	73	0.30
4.00-5.00am	137	76.5	42	23.5	179	0.74
5.00-6.00am	564	88.0	77	12.0	641	2.64
6.00-7.00am	1249.8	92.2	105.2	7.8	1355	5.58
7.00-8.00am	1428	91.4	135	8.6	1563	6.43
8.00-9.00am	1357.8	82.3	163.4	17.7	1521	6.26
9.00-10.00am	1166.6	88.2	155.6	11.8	1322	5.44
10.00-11.00am	947	85.5	160	14.5	1107	4.56
11.00-12 Midday	993	84.7	179	15.3	1172	4.82
Midday – 1.00pm	1020.6	85.4	174.4	14.6	1195	4.92
1.00-2.00pm	1058	86.6	164	13.4	1222	5.03
2.00-3.00pm	1323	89.0	163	11.0	1486	6.12
3.00-4.00pm	1701	92.1	146	7.9	1847	7.60
4.00-5.00pm	1858	94.7	103	5.3	1961	8.07
5.00-6.00pm	1951	96.2	78	3.8	2028	8.35
6.00-7.00pm	1762	96.9	57	3.1	1819	7.49
7.00-8.00pm	1187	95.7	53	4.3	1240	5.10
8.00-9.00pm	844.4	96.8	28.2	3.2	873	3.59
9.00-10.00pm	639.4	95.8	28.4	4.2	668	2.75
10.00-11.00pm	446.6	96.8	16.0	3.2	463	1.91
11.00-Midnight	277.0	95.5	13.8	4.5	291	1.20
TOTAL	22213.2	91.4	2081	8.6	24295	100.0
7.00am-10.00pm	19236.8	91.5	1788.0	8.5	21024	86.54
10.00pm-10.00pm	2976.4	91.0	293.0	9.0	3270	13.46

TABLE C

BRICKMAKERS DRIVE AT CH300m NORTH OF
MADDOCKS AVENUE INTERSECTION
BI-DIRECTIONAL 5 DAY (WEEKDAY) AVERAGE HOURLY VOLUMES
AND VEHICLE CLASSIFICATIONS OCTOBER 2012.

Hour of Day	Light Vehicle Classes		Heavy Vehicle Classes		Total Vehicles	
	Number	%	Number	%	Number	% of Total
Midnight-1am	26.6	99.25	0.2	0.75	26.8	0.35
1-2am	17.6	98.9	0.2	1.10	17.8	0.25
2-3am	10.2	100.0	0	0	10.2	0.13
3-4am	16.0	97.6	0.4	2.4	16.4	0.22
4-5am	39.6	91.2	3.8	8.8	43.4	0.57
5-6am	158.2	91.7	14.4	8.7	172.6	2.28
6-7am	429.4	93.1	31.8	6.9	461.2	6.10
7-8am	585.6	94.5	34.4	5.5	620.0	8.20
8-9am	571.4	94.6	32.6	5.6	604.0	8.00
9-10am	280.2	91.0	27.8	9.0	308.0	4.07
10-11am	195.2	89.0	24.2	11.0	219.4	2.90
11-12 Midday	203.6	88.1	27.4	11.9	231.0	3.06
12-1pm	245.2	90.0	27.2	10.0	272.4	3.60
1-2pm	276.8	90.9	27.8	9.1	304.6	4.03
2-3pm	433.0	91.8	38.8	8.2	471.8	6.24
3-4pm	700.4	95.2	35.6	4.8	736.0	9.73
4-5pm	735.2	96.3	28.0	3.7	763.2	10.09
5-6pm	811.8	97.5	21.0	2.5	832.8	11.01
6-7pm	564.8	98.1	11.0	1.9	575.8	7.62
7-8pm	296.4	96.9	9.6	3.1	306.0	4.05
8-9pm	199.4	97.7	4.6	2.3	204.0	2.70
9-10pm	171.8	98.7	2.2	1.3	174.0	2.30
10-11pm	122.0	99.3	0.8	0.7	122.8	1.62
11-Midnight	66.0	98.8	0.8	1.2	66.8	0.88
Total	7156.4	94.65	404.6	5.35	7561	100.0

APPENDIX E

FIGURE 7, OPTION 1: GIVEWAY AM

MOVEMENT SUMMARY

Site: Figure 7 Option 1 - BR/LI - AM Peak

Figure 7 Brickmakers Drive/Link Road
Option 1 Give Way
AM Peak 8-9am
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow 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: Brickmaker's Drive (S)											
2	T	498	0.0	0.255	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		498	0.0	0.255	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
East: Link Road (E)											
6	R	40	0.0	0.101	14.5	LOS A	0.4	2.9	0.73	0.90	37.0
Approach		40	0.0	0.101	14.5	LOS A	0.4	2.9	0.73	0.90	37.0
North: Brickmaker's Drive (N)											
7	L	40	0.0	0.290	6.0	LOS A	0.0	0.0	0.00	0.77	43.7
8	T	523	0.0	0.290	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		563	0.0	0.290	0.4	LOS A	0.0	0.0	0.00	0.05	49.5
All Vehicles		1101	0.0	0.290	0.7	NA	0.4	2.9	0.03	0.06	49.1

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

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

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

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

SIDRA Standard Delay Model used.

FIGURE 7, OPTION 1: GIVEWAY PM

MOVEMENT SUMMARY

Site: Figure 7 Option 1 - BR/LI - PM Peak

Figure 7 Brickmakers Drive/Link Road
Option 1 Give Way
PM Peak 4-5pm
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow 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: Brickmaker's Drive (S)											
2	T	885	0.0	0.454	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		885	0.0	0.454	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
East: Link Road (E)											
6	R	23	0.0	0.079	17.7	LOS B	0.3	2.2	0.79	0.93	35.0
Approach		23	0.0	0.079	17.7	LOS B	0.3	2.2	0.79	0.93	35.0
North: Brickmaker's Drive (N)											
7	L	21	0.0	0.181	6.0	LOS A	0.0	0.0	0.00	0.78	43.7
8	T	332	0.0	0.181	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		353	0.0	0.181	0.4	LOS A	0.0	0.0	0.00	0.05	49.6
All Vehicles		1261	0.0	0.454	0.4	NA	0.3	2.2	0.01	0.03	49.5

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

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

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

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

SIDRA Standard Delay Model used.

FIGURE 7, OPTION 1: SIGNALS AM

MOVEMENT SUMMARY

Figure 7 Brickmakers Drive/Link Road

Option 2 Signals

AM Peak 8-9am

Signals - Fixed Time Cycle Time = 30 seconds (Practical Cycle Time)

Site: Figure 7 Option 2 - BR/LI - AM Peak

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow 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: Brickmaker's Drive (S)											
2	T	498	0.0	0.638	8.7	LOS A	8.1	56.5	0.86	0.77	39.3
Approach		498	0.0	0.638	8.7	LOS A	8.1	56.5	0.86	0.77	39.3
East: Link Road											
6	R	40	0.0	0.108	18.0	LOS B	0.8	5.6	0.85	0.72	34.8
Approach		40	0.0	0.108	18.0	LOS B	0.8	5.6	0.85	0.72	34.8
North: Brickmaker's Drive (N)											
7	L	40	0.0	0.725	16.6	LOS B	9.8	68.6	0.90	0.96	37.4
8	T	523	0.0	0.725	10.2	LOS A	9.8	68.6	0.90	0.87	38.0
Approach		563	0.0	0.725	10.7	LOS A	9.8	68.6	0.90	0.88	37.9
All Vehicles		1101	0.0	0.725	10.0	LOS A	9.8	68.6	0.88	0.82	38.4

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

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

FIGURE 7, OPTION 1: SIGNALS PM

MOVEMENT SUMMARY

Figure 7 Brickmakers Drive/L

Option 2 Signals

PM Peak 4-5pm

Signals - Fixed Time Cycle Time = 40 seconds (Practical Cycle Time)

A floating User Guide viewer will open with bookmarks to the left of the User Guide text area.

Site: Figure 7 Option 2 - BR/LI - PM Peak

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Brickmaker's Drive (S)											
2	T	885	0.0	0.825	13.2	LOS A	19.2	134.3	0.89	0.96	36.1
Approach		885	0.0	0.825	13.2	LOS A	19.2	134.3	0.89	0.96	36.1
East: Link Road											
6	R	23	0.0	0.083	23.4	LOS B	0.7	4.6	0.89	0.70	31.9
Approach		23	0.0	0.083	23.4	LOS B	0.7	4.6	0.89	0.70	31.9
North: Brickmaker's Drive (N)											
7	L	21	0.0	0.330	11.8	LOS A	5.3	36.9	0.58	0.87	40.2
8	T	332	0.0	0.330	5.4	LOS A	5.3	36.9	0.58	0.50	42.5
Approach		353	0.0	0.330	5.8	LOS A	5.3	36.9	0.58	0.52	42.4
All Vehicles		1261	0.0	0.825	11.4	LOS A	19.2	134.3	0.80	0.83	37.6

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

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.