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25 May 2020

Malgy Coman
Senior Land Use Planner
Transport for NSW
Sent via email

Re: Georges Cove Marina at 146 Newbridge Road, Moorebank - Response to TfNSW matters

Dear Malgy,

This letter responds to the traffic related matters that have been raised by Transport for NSW (TfNSW) in their letter dated 30 March 2020 for the Georges Cove Marina (TfNSW Ref: SYD18/01728/04, Council Ref: DA-611/2018).

1.1 Newbridge Road/Government Macquarie Drive/Brickmakers Drive intersection

TfNSW Comment

The SIDRA modelling results indicate that the performance and capacity of the Newbridge Road / Government Macquarie Drive / Brickmakers Drive intersection will be significantly impacted by the traffic generated by the proposed development.

Measures should be proposed to mitigate these traffic impacts on the Newbridge Road / Government Macquarie Drive / Brickmakers Drive intersection. In particular, for all movements out of Brickmakers Drive, the right turn movements from Newbridge Road into Brickmakers Drive and through movements from Governor Macquarie Drive into Brickmakers Drive.

EMM Response

EMM has undertaken cumulative traffic impact assessment for all five developments within this precinct. A breakdown of traffic generation is provided in Table 1.

Table 1 Traffic generation from Georges Cove Marina developments (source: EMM letter response to RMS matters dated 20 March 2020)

	AM peak hour		PM peak hour	
	Traffic generation	**Percentage**	**Traffic generation**	**Percentage**
Moorebank Cove Residential	152	20.7%	152	18.2%
Moorebank Recycling Facility	43	5.9%	29	3.5%
Georges Cove Marina Commercial	**61**	**8.3%**	**86**	**10.3%**

Table 1 **Traffic generation from Georges Cove Marina developments (source: EMM letter response to RMS matters dated 20 March 2020)**

	AM peak hour		PM peak hour	
Georges Cove Marina Residential	181	24.7%	181	21.7%
Benedict B6 Corridor Mixed-use Development	296	40.4%	386	46.3%
Total	733	100%	834	100%

The data in the above table shows that the subject development (Georges Cove Marina Commercial) will generate 61 and 86 vehicles during the AM and PM peak hours which equates to about 8 to 10% of total development traffic. Of this development traffic, 55 and 78 vehicles will travel to/from the north during the AM and PM peak hours respectively.

Traffic volume data for the Newbridge Road/Government Macquarie Drive/Brickmakers Drive intersection show that the intersection will carry 5,535 vehicles during the AM peak hour and 6,013 vehicles during the PM peak hour respectively. The additional Georges Cove Marina commercial development traffic will account for between 1.0% to 1.3% of additional traffic at this intersection during the peak hours as shown in Table 2.

Table 2 **Development traffic volume percentage during peak hours**

Peak hour	Georges Cove Marina Commercial development traffic (to/from the north)	Newbridge Road/Governor Macquarie Drive/Brickmakers Drive intersection	Percentage
AM	55	5,535	1.0%
PM	78	6,013	1.3%

A detailed analysis of the SIDRA modelling results (refer to Appendix B and Appendix C) shows that some approaches of the this intersection currently operates at Level of Service (LOS) F, with significant delays. On no occasion, is this approach performing any better than LOS E during peak hours. For example, during both the AM and PM peak hours, the right turn movement from Brickmakers Drive is currently operating at LOS F. For the north approach of this intersection (Governor Macquarie Drive), the through movements are already operating at LOS E during the AM peak and LOS F during the PM peak hour. Similarly, on the eastbound approach of Newbridge Road, the right turn movement is already LOS F during the AM peak and LOS E during the PM peak hour. During both peak hours, the queuing of the right turn lanes is encroaching into the through movement. The intersection is already under considerable strain with over 5,000 vehicles during the peak hours.

The additional 55 vehicles during the AM peak and 78 vehicles during the PM peak travelling to/from the north due to the marina commercial development, equating 1.3% of total traffic, are unlikely to have any significant impact on the operation of this signalised intersection. Therefore, we believe it is unreasonable to require any mitigation measures for such a small increase of traffic at this intersection.

1.2 Brickmakers Drive and Link Road intersection - signalisation

TfNSW Comment

EMM predicted that by the time the development is constructed and operational around the year 2027-2028, the growth of the background traffic will likely meet the signal warrant for the Brickmakers Drive and Link Road intersection.

Data and information to support this statement should be provided. SIDRA modelling should be undertaken for the traffic signals at the Brickmakers Drive/Link Road intersection with updated traffic volumes. The SIDRA modelling results, proposed traffic signal phasing plan, and concept civil plan should be provided to TfNSW for review.

EMM Response

In accordance with the *Traffic Signal Design Guidelines*, the signal warrant requires the major road to have a flow exceeding 600 vehicles/hour in both directions, or a high speed limit/significant crash history and the minor road to have a flow exceeding 200 vehicles/hour in one direction.

By the time the development is constructed and operational, about 2026, there will be a 12% growth of background traffic (assuming 2% linear growth per annum). Hence, the signal warrant for Brickmakers Drive/ Link Road intersection has been assessed for 2026.

EMM has undertaken traffic counts for Brickmakers Drive for 7 am–9 am and 4 pm–6 pm where peak hour traffic was determined to be 7 am– 8 am and 4.30 pm–5.30 pm.

Council's Development Control Plan (DCP) stipulates using a one-hour peak-hour (ie one hour for the AM and one hour for the PM) traffic generation for developments, whereas the signal warrant assessment requires traffic movements for four peak hours of the day. For the purpose of this assessment, 7 am–9 am and 4 pm–6 pm are adopted as the four peak hours. It is assumed that the one-hour peak-hour traffic makes up 55% of the two-hour peak traffic in the respective AM and PM period. The traffic generation in the two-hour peak-periods would therefore be as presented in Table 3. As one of the actual hourly peaks (4.30 to 5.30 pm) straddles an hourly intervals, the analysis has to be split into half hourly periods to estimate the equivalent hourly volumes either side of the actual peak hour. This breakup only needed to be done for the pm peak period, however, to keep the table consistent it was done for both the am and pm peak periods. .

Table 3 Peak hour development traffic summary

AM and PM two-hour peak periods	Proportion of traffic generation over a two-hour (peak) period	Traffic generation half hourly totals (highlighted periods)		
		Brickmakers Drive northbound (318 AM / 316 PM)	Brickmakers Drive southbound (219 AM / 306 PM)	Link Road westbound (450 AM / 407 PM)
7 to 7.30 am	27.5%	**159**	**109.5**	**225**
7.30 to 8 am	27.5%	**159**	**109.5**	**225**
8 to 8.30 am	22.5%	130	89.6	184
8.30 to 9 am	22.5%	130	89.6	184
4 to 4.30 pm	22.5%	**129.3**	**125.2**	**166.5**
4.30 to 5 pm	27.5%	**158**	**153**	**203.5**
5 to 5.30 pm	27.5%	158	153	203.5
5.30 to 6 pm	22.5%	129.3	125.2	166.5

Based on this assumption, the forecast traffic volume in Brickmakers Drive and Link Road is estimated using:

Traffic volume (in 2026) = Traffic volume (2020 tube count) x traffic growth rate (1.12) + peak hour development traffic from the two half hourly totals in Table 3.

- Brickmakers Drive northbound traffic:
  - 7 am to 8 am: 656 x 1.12 + (159 + 159) = 1,053 vehicles

- 8 am to 9 am: 753 x 1.12 + (130 + 130) = 1,103 vehicles
- 4 pm to 5 pm: 321 x 1.12 + (129.3 + 158) = 647 vehicles
- 5 pm to 6 pm: 290 x 1.12+ (158 + 129.3) = 612 vehicles

• Brickmakers Drive southbound traffic:

- 7 am to 8 am: 340 x 1.12 + (109.5 + 109.5) = 600 vehicles
- 8 am to 9 am: 380 x 1.12 + (89.6 + 89.6) = 605 vehicles
- 4 pm to 5 pm: 882 x 1.12 + (125.2 + 153) = 1,266 vehicles
- 5 pm to 6 pm: 916 x 1.12 + (153 + 125.2) = 1,304 vehicles

• Link Road westbound traffic:

- 7 am to 8 am: (225 + 225) = 450 vehicles (peak hour development traffic)
- 8 am to 9 am: (184 + 184) = 368 vehicles
- 4 pm to 5 pm: (166.5 + 203.5) = 370 vehicles
- 5 pm to 6pm: (203.5 + 166.5) = 370 vehicles

Traffic flows on the major road, Brickmakers Drive, will reach or exceed 600 vehicles/hour (each way) for each of the four traffic peak hours. Traffic flows on the minor road, Link Road, will also exceed 200 vehicles/hour (one way) for each of the four traffic peak hours. These flows meet the traffic signal warrant as stipulated in Section 2.1(a) of the Traffic Signal Design Guidelines, refer Appendix D.

Hence based on the background traffic growth and the forecast development traffic, the signalisation of the intersection will be required from about 2026.

SIDRA modelling analyses the capacity of any particular intersection and does not provide any information on traffic signal warrant. Therefore, SIDRA analysis has not been undertaken for the signal warrant assessment.

Proposed traffic signal phasing plan and concept civil plan are attached in Appendix F.

1.3 Brickmakers Drive and Link Road intersection - lanes

TfNSW Comment

The signalized intersection layout shown on Figure 11 provides two right turn lanes on the Link Road, but only one through lane on the northern leg on Brickmakers Drive. It is not possible for vehicles to merge within the signalized intersection and this layout needs to be amended accordingly. Also it is not clear why there is a 60m long acceleration/merge lane on the southern leg for the single through lane on the northern leg on Brickmakers Drive.

EMM Response

The Liverpool traffic committee has approved the line marking plan for the Brickmakers Drive/Link Road intersection as a priority-controlled intersection, refer Appendix E and Appendix F.

The priority-controlled intersection has been designed so that minimal civil work will be required when the intersection is signalised. This has been discussed at the traffic committee.

The kerbside lane in Link Road could be converted to a combined left and right turn lane to increase the capacity of this intersection as most of the traffic will exit to the north from Georges Cove marina precinct. On the south approach, the 60 long merging lane is provided on the interim layout which could be adjusted as part of the signalisation process in due course. After the TfNSW's in principle approval of the traffic signal at this intersection, a traffic signal plan (TCS) will be prepared for TfNSW consideration. In the traffic signal design, this merge lane could be excluded if it is considered unnecessary. Hence, this merge lane could be retained in the interim giveway controlled intersection as it is already approved by the Liverpool traffic committee.

We trust this thoroughly addresses the TfNSW comments and seek TfNSW in principle approval of the traffic signals at Brickmakers Drive/ Link Road intersection. Should you require further clarification regarding this matter, please do not hesitate to contact the undersigned.

Yours sincerely

Abdullah Uddin
Associate Traffic Engineer

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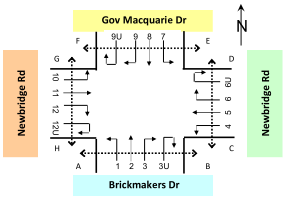
0425 478 650

Appendix A

Intersection and tube count data

Job No.	: N5560
Client	: EMM
Suburb	: Moorebank
Location	: 1. Newbridge Rd / Gov Macquarie Dr / Brickmakers Dr
Day/Date	: Thu, 30th January 2020
Weather	: Fine
Description	: Classified Intersection Count
	: 15 mins Data

Classifications	Class 1	Class 2
	Lights	Heavies

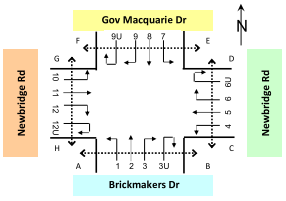


MATRIX Traffic and Transport Data

Approach	Brickmakers Dr												Newbridge Rd											
Direction	Direction 1 (Left Turn)			Direction 2 (Through)			Direction 3 (Right Turn)			Direction 3U (U Turn)			Direction 4 (Left Turn)			Direction 5 (Through)			Direction 6 (Right Turn)			Direction 6U (U Turn)		
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total
7:00 to 7:15	1	0	**1**	33	2	**35**	134	1	**135**	0	0	**0**	70	1	**71**	200	30	**230**	101	14	**115**	0	0	**0**
7:15 to 7:30	2	0	**2**	41	1	**42**	124	0	**124**	0	0	**0**	60	1	**61**	181	39	**220**	113	16	**129**	0	0	**0**
7:30 to 7:45	4	0	**4**	42	0	**42**	88	0	**88**	0	0	**0**	63	0	**63**	194	26	**220**	60	6	**66**	0	0	**0**
7:45 to 8:00	1	0	**1**	57	1	**58**	146	3	**149**	0	0	**0**	88	6	**94**	212	25	**237**	141	11	**152**	0	0	**0**
8:00 to 8:15	3	0	**3**	72	0	**72**	161	2	**163**	0	0	**0**	65	0	**65**	164	25	**189**	125	14	**139**	0	0	**0**
8:15 to 8:30	6	0	**6**	72	1	**73**	117	1	**118**	0	0	**0**	64	1	**65**	149	23	**172**	152	12	**164**	0	0	**0**
8:30 to 8:45	2	0	**2**	64	1	**65**	108	2	**110**	0	0	**0**	58	2	**60**	159	29	**188**	118	13	**131**	0	0	**0**
8:45 to 9:00	3	0	**3**	49	1	**50**	109	1	**110**	0	0	**0**	64	1	**65**	196	32	**228**	97	15	**112**	0	0	**0**
AM Totals	**22**	**0**	**22**	**430**	**7**	**437**	**987**	**10**	**997**	**0**	**0**	**0**	**532**	**12**	**544**	**1,455**	**229**	**1,684**	**907**	**101**	**1,008**	**0**	**0**	**0**
16:00 to 16:15	4	0	**4**	25	1	**26**	102	4	**106**	0	0	**0**	165	2	**167**	411	19	**430**	121	12	**133**	0	0	**0**
16:15 to 16:30	2	1	**3**	21	0	**21**	112	0	**112**	0	0	**0**	151	1	**152**	332	19	**351**	91	15	**106**	0	0	**0**
16:30 to 16:45	2	0	**2**	24	0	**24**	73	0	**73**	0	0	**0**	146	2	**148**	306	23	**329**	92	17	**109**	0	0	**0**
16:45 to 17:00	5	0	**5**	26	0	**26**	54	1	**55**	0	0	**0**	162	1	**163**	381	24	**405**	125	11	**136**	0	0	**0**
17:00 to 17:15	4	0	**4**	16	0	**16**	77	2	**79**	0	0	**0**	166	2	**168**	411	14	**425**	89	13	**102**	0	0	**0**
17:15 to 17:30	4	0	**4**	18	0	**18**	52	2	**54**	0	0	**0**	139	3	**142**	468	16	**484**	114	13	**127**	1	0	**1**
17:30 to 17:45	1	0	**1**	18	0	**18**	55	0	**55**	0	0	**0**	145	0	**145**	398	17	**415**	109	12	**121**	0	0	**0**
17:45 to 18:00	1	0	**1**	24	0	**24**	46	0	**46**	0	0	**0**	159	0	**159**	383	17	**400**	141	15	**156**	0	0	**0**
PM Totals	**23**	**1**	**24**	**172**	**1**	**173**	**571**	**9**	**580**	**0**	**0**	**0**	**1,233**	**11**	**1,244**	**3,090**	**149**	**3,239**	**882**	**108**	**990**	**1**	**0**	**1**

Approach	Gov Macquarie Dr												Newbridge Rd												Crossing Pedestrians								
Direction	Direction 7 (Left Turn)			Direction 8 (Through)			Direction 9 (Right Turn)			Direction 9U (U Turn)			Direction 10 (Left Turn)			Direction 11 (Through)			Direction 12 (Right Turn)			Direction 12U (U Turn)										
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	B to A	A to B	D to C	C to D	F to E	E to F	H to G	G to H	Total
7:00 to 7:15	113	14	**127**	24	0	**24**	10	14	**24**	0	0	**0**	16	10	**26**	389	23	**412**	0	0	**0**	0	0	**0**	0	0	0	0	0	0	3	1	**4**
7:15 to 7:30	98	11	**109**	21	1	**22**	11	8	**19**	0	0	**0**	26	8	**34**	506	43	**549**	1	0	**1**	0	0	**0**	0	0	0	0	0	0	1	0	**1**
7:30 to 7:45	130	14	**144**	19	0	**19**	9	14	**23**	0	0	**0**	24	6	**30**	435	33	**468**	0	0	**0**	0	0	**0**	0	0	0	0	0	0	1	1	**2**
7:45 to 8:00	117	9	**126**	28	1	**29**	11	12	**23**	0	0	**0**	31	11	**42**	375	32	**407**	0	0	**0**	0	0	**0**	0	0	0	0	0	0	3	1	**4**
8:00 to 8:15	133	16	**149**	26	5	**31**	8	10	**18**	0	0	**0**	26	17	**43**	294	32	**326**	0	1	**1**	1	0	**1**	1	0	0	0	1	0	6	1	**9**
8:15 to 8:30	142	16	**158**	19	0	**19**	14	13	**27**	0	0	**0**	38	11	**49**	316	36	**352**	1	0	**1**	0	0	**0**	0	1	0	1	0	0	8	2	**12**
8:30 to 8:45	135	22	**157**	45	1	**46**	19	15	**34**	0	0	**0**	51	10	**61**	295	44	**339**	0	1	**1**	0	0	**0**	0	0	0	0	0	0	4	0	**4**
8:45 to 9:00	72	26	**98**	26	2	**28**	25	11	**36**	0	0	**0**	49	10	**59**	316	49	**365**	5	0	**5**	0	0	**0**	0	0	0	1	0	0	2	1	**4**
AM Totals	**940**	**128**	**1,068**	**208**	**10**	**218**	**107**	**97**	**204**	**0**	**0**	**0**	**261**	**83**	**344**	**2,926**	**292**	**3,218**	**7**	**2**	**9**	**1**	**0**	**1**	**1**	**1**	**0**	**2**	**1**	**0**	**28**	**7**	**40**
16:00 to 16:15	194	24	**218**	64	0	**64**	41	11	**52**	0	0	**0**	2	0	**2**	1	0	**1**	0	0	**0**	0	0	**0**	1	0	1	0	0	0	0	6	**8**
16:15 to 16:30	197	14	**211**	59	0	**59**	35	10	**45**	0	0	**0**	6	3	**9**	178	14	**192**	1	0	**1**	1	0	**1**	1	0	4	0	3	2	0	0	**10**
16:30 to 16:45	140	3	**143**	63	0	**63**	31	6	**37**	0	0	**0**	23	12	**35**	351	15	**366**	0	0	**0**	0	0	**0**	0	0	0	0	0	1	1	1	**3**
16:45 to 17:00	105	8	**113**	51	2	**53**	20	9	**29**	0	0	**0**	25	6	**31**	209	11	**220**	1	0	**1**	0	0	**0**	1	0	1	1	0	3	1	1	**8**
17:00 to 17:15	153	9	**162**	79	1	**80**	42	5	**47**	0	0	**0**	27	7	**34**	276	11	**287**	3	0	**3**	0	0	**0**	0	0	0	0	0	1	0	0	**1**
17:15 to 17:30	109	3	**112**	67	0	**67**	46	7	**53**	0	0	**0**	25	8	**33**	308	12	**320**	2	0	**2**	0	0	**0**	0	0	0	0	0	0	0	1	**1**
17:30 to 17:45	109	4	**113**	53	0	**53**	29	5	**34**	0	0	**0**	14	8	**22**	311	15	**326**	2	0	**2**	0	0	**0**	0	0	0	0	0	0	0	0	**0**
17:45 to 18:00	80	3	**83**	37	0	**37**	26	8	**34**	0	0	**0**	24	6	**30**	234	12	**246**	2	0	**2**	0	0	**0**	0	0	1	0	0	0	0	0	**1**
PM Totals	**1,087**	**68**	**1,155**	**473**	**3**	**476**	**270**	**61**	**331**	**0**	**0**	**0**	**146**	**50**	**196**	**1,868**	**90**	**1,958**	**11**	**0**	**11**	**1**	**0**	**1**	**3**	**0**	**7**	**1**	**3**	**7**	**2**	**9**	**32**

Job No.	: N5560
Client	: EMM
Suburb	: Moorebank
Location	: 1. Newbridge Rd / Gov Macquarie Dr / Brickmakers Dr
Day/Date	: Thu, 30th January 2020
Weather	: Fine
Description	: Classified Intersection Count
	: Hourly Summary



MATRIX Traffic and Transport Data

Approach	Brickmakers Dr												Newbridge Rd											
Direction	Direction 1 (Left Turn)			Direction 2 (Through)			Direction 3 (Right Turn)			Direction 3U (U Turn)			Direction 4 (Left Turn)			Direction 5 (Through)			Direction 6 (Right Turn)			Direction 6U (U Turn)		
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total
7:00 to 8:00	8	0	**8**	173	4	**177**	492	4	**496**	0	0	**0**	281	8	**289**	787	120	**907**	415	47	**462**	0	0	**0**
7:15 to 8:15	10	0	**10**	212	2	**214**	519	5	**524**	0	0	**0**	276	7	**283**	751	115	**866**	439	47	**486**	0	0	**0**
7:30 to 8:30	14	0	**14**	243	2	**245**	512	6	**518**	0	0	**0**	280	7	**287**	719	99	**818**	478	43	**521**	0	0	**0**
7:45 to 8:45	12	0	**12**	265	3	**268**	532	8	**540**	0	0	**0**	275	9	**284**	684	102	**786**	536	50	**586**	0	0	**0**
8:00 to 9:00	14	0	**14**	257	3	**260**	495	6	**501**	0	0	**0**	251	4	**255**	668	109	**777**	492	54	**546**	0	0	**0**
AM Totals	**22**	**0**	**22**	**430**	**7**	**437**	**987**	**10**	**997**	**0**	**0**	**0**	**532**	**12**	**544**	**1,455**	**229**	**1,684**	**907**	**101**	**1,008**	**0**	**0**	**0**
16:00 to 17:00	13	1	**14**	96	1	**97**	341	5	**346**	0	0	**0**	624	6	**630**	1,430	85	**1,515**	429	55	**484**	0	0	**0**
16:15 to 17:15	13	1	**14**	87	0	**87**	316	3	**319**	0	0	**0**	625	6	**631**	1,430	80	**1,510**	397	56	**453**	0	0	**0**
16:30 to 17:30	15	0	**15**	84	0	**84**	256	5	**261**	0	0	**0**	613	8	**621**	1,566	77	**1,643**	420	54	**474**	1	0	**1**
16:45 to 17:45	14	0	**14**	78	0	**78**	238	5	**243**	0	0	**0**	612	6	**618**	1,658	71	**1,729**	437	49	**486**	1	0	**1**
17:00 to 18:00	10	0	**10**	76	0	**76**	230	4	**234**	0	0	**0**	609	5	**614**	1,660	64	**1,724**	453	53	**506**	1	0	**1**
PM Totals	**23**	**1**	**24**	**172**	**1**	**173**	**571**	**9**	**580**	**0**	**0**	**0**	**1,233**	**11**	**1,244**	**3,090**	**149**	**3,239**	**882**	**108**	**990**	**1**	**0**	**1**

Approach	Gov Macquarie Dr	Newbridge Rd	Crossing

Direction	Direction 7 (Left Turn)			Direction 8 (Through)			Direction 9 (Right Turn)			Direction 9U (U Turn)			Direction 10 (Left Turn)			Direction 11 (Through)			Direction 12 (Right Turn)			Direction 12U (U Turn)			Pedestrians								
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	B to A	A to B	D to C	C to D	F to E	E to F	H to G	G to H	Total
7:00 to 8:00	458	48	**506**	92	2	**94**	41	48	**89**	0	0	**0**	97	35	**132**	1,705	131	**1,836**	1	0	**1**	0	0	**0**	0	0	0	0	0	0	8	3	**11**
7:15 to 8:15	478	50	**528**	94	7	**101**	39	44	**83**	0	0	**0**	107	42	**149**	1,610	140	**1,750**	1	1	**2**	1	0	**1**	1	0	0	0	1	0	11	3	**16**
7:30 to 8:30	522	55	**577**	92	6	**98**	42	49	**91**	0	0	**0**	119	45	**164**	1,420	133	**1,553**	1	1	**2**	1	0	**1**	1	1	0	1	1	0	18	5	**27**
7:45 to 8:45	527	63	**590**	118	7	**125**	52	50	**102**	0	0	**0**	146	49	**195**	1,280	144	**1,424**	1	2	**3**	1	0	**1**	1	1	0	1	1	0	21	4	**29**
8:00 to 9:00	482	80	**562**	116	8	**124**	66	49	**115**	0	0	**0**	164	48	**212**	1,221	161	**1,382**	6	2	**8**	1	0	**1**	1	1	0	2	1	0	20	4	**29**
AM Totals	**940**	**128**	**1,068**	**208**	**10**	**218**	**107**	**97**	**204**	**0**	**0**	**0**	**261**	**83**	**344**	**2,926**	**292**	**3,218**	**7**	**2**	**9**	**1**	**0**	**1**	**1**	**1**	**0**	**2**	**1**	**0**	**28**	**7**	**40**
16:00 to 17:00	636	49	**685**	237	2	**239**	127	36	**163**	0	0	**0**	56	21	**77**	739	40	**779**	2	0	**2**	1	0	**1**	3	0	6	1	3	6	2	8	**29**
16:15 to 17:15	595	34	**629**	252	3	**255**	128	30	**158**	0	0	**0**	81	28	**109**	1,014	51	**1,065**	5	0	**5**	1	0	**1**	2	0	5	1	3	7	2	2	**22**
16:30 to 17:30	507	23	**530**	260	3	**263**	139	27	**166**	0	0	**0**	100	33	**133**	1,144	49	**1,193**	6	0	**6**	0	0	**0**	1	0	1	1	0	5	2	3	**13**
16:45 to 17:45	476	24	**500**	250	3	**253**	137	26	**163**	0	0	**0**	91	29	**120**	1,104	49	**1,153**	8	0	**8**	0	0	**0**	1	0	1	1	0	4	1	2	**10**
17:00 to 18:00	451	19	**470**	236	1	**237**	143	25	**168**	0	0	**0**	90	29	**119**	1,129	50	**1,179**	9	0	**9**	0	0	**0**	0	0	1	0	0	1	0	1	**3**
PM Totals	**1,087**	**68**	**1,155**	**473**	**3**	**476**	**270**	**61**	**331**	**0**	**0**	**0**	**146**	**50**	**196**	**1,868**	**90**	**1,958**	**11**	**0**	**11**	**1**	**0**	**1**	**3**	**0**	**7**	**1**	**3**	**7**	**2**	**9**	**32**

Job No	N5560
Client	Eric Lei
Site	Brickmakers Drive
Location	Mooorebank
Site No	1
Start Date	30-Jan-20
Description	Volume Summary
Direction	Combined

MATRIX Traffic and Transport Data

Hour Starting	Day of Week							W'Day Ave	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	3-Feb	4-Feb	5-Feb	30-Jan	31-Jan	1-Feb	2-Feb		
AM Peak	1152	1099	1092	1122	1200	882	710		
PM Peak	1217	1228	1259	1313	1203	919	772	**14929**	**13700**
0:00	81	83	79	82	98	167	196	85	112
1:00	42	51	52	34	31	95	103	42	58
2:00	30	25	29	38	37	70	77	32	44
3:00	35	43	46	56	53	72	59	47	52
4:00	141	139	136	148	141	86	60	141	122
5:00	460	454	443	448	432	188	100	447	361
6:00	800	853	850	828	806	357	161	827	665
7:00	1030	879	1086	996	994	433	255	997	810
8:00	1152	1099	1092	1122	1200	609	343	1133	945
9:00	778	811	942	785	795	772	513	822	771
10:00	579	598	624	631	669	882	653	620	662
11:00	551	634	593	674	670	838	710	624	667
12:00	600	700	671	616	722	919	772	662	714
13:00	657	712	727	735	782	795	736	723	735
14:00	970	983	963	1076	1012	724	651	1001	911
15:00	1217	1187	1189	1306	1203	646	674	1220	1060
16:00	1162	1228	1135	1313	1179	615	691	1203	1046
17:00	1211	1197	1259	1180	1182	651	642	1206	1046
18:00	969	1024	1039	975	931	655	593	988	884
19:00	666	666	662	661	701	541	420	671	617
20:00	497	520	553	568	536	451	400	535	504
21:00	343	445	478	446	486	444	325	440	424
22:00	231	289	278	292	363	399	253	291	301
23:00	152	128	168	136	280	317	143	173	189
Total	14354	14748	15094	15146	15303	11726	9530	14929	13700

7-19	10876	11052	11320	11409	11339	8539	7233	11199	10253
6-22	13182	13536	13863	13912	13868	10332	8539	13672	12462
6-24	13565	13953	14309	14340	14511	11048	8935	14136	12952
0-24	14354	14748	15094	15146	15303	11726	9530	14929	13700

Appendix B

SIDRA results (existing)

MOVEMENT SUMMARY

Site: 101 [Ex Newbridge Rd/Gov Macquarie Dr/Brickmakers Dr AM]

Existing Four Way Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 140 seconds (Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Brickmakers Drive												
1	L2	8	0.0	0.750	71.4	LOS F	12.8	91.2	1.00	0.88	1.09	25.1
2	T1	177	2.3	0.750	66.9	LOS E	12.8	91.2	1.00	0.88	1.09	25.1
3	R2	496	0.8	0.990	110.2	LOS F	22.7	160.1	1.00	1.17	1.58	18.5
Approach		681	1.2	0.990	98.5	LOS F	22.7	160.1	1.00	1.09	1.45	19.9
East: Newbridge Road												
4	L2	289	2.8	0.242	9.2	LOS A	3.4	24.4	0.30	0.67	0.30	51.6
5	T1	907	13.2	0.268	12.2	LOS A	9.0	70.2	0.48	0.42	0.48	56.8
6	R2	462	10.2	1.198	158.8	LOS F	33.1	252.1	1.00	1.18	1.89	15.2
Approach		1658	10.6	1.198	52.5	LOS D	33.1	252.1	0.59	0.67	0.84	31.5
North: Governor Macquarie Drive												
7	L2	506	9.5	0.497	37.1	LOS C	10.4	78.4	0.88	0.85	0.99	36.8
8	T1	94	2.1	0.380	62.6	LOS E	6.0	42.7	0.96	0.76	0.96	25.8
9	R2	89	53.9	0.366	47.9	LOS D	4.7	47.8	0.93	0.77	0.93	30.0
Approach		689	14.2	0.497	42.0	LOS C	10.4	78.4	0.89	0.83	0.98	34.1
West: Newbridge Road												
10	L2	132	26.5	0.873	55.7	LOS D	43.9	336.6	0.99	0.98	1.23	33.4
11	T1	1836	7.1	0.873	48.4	LOS D	45.4	337.3	0.99	0.97	1.12	36.3
12	R2	1	0.0	0.001	32.0	LOS C	0.0	0.3	0.61	0.61	0.61	36.7
Approach		1969	8.4	0.873	48.9	LOS D	45.4	337.3	0.99	0.97	1.13	36.1
All Vehicles		4997	8.9	1.198	55.9	LOS D	45.4	337.3	0.85	0.87	1.06	31.4

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	21	16.0	LOS B	0.0	0.0	0.48	0.48
P2	East Full Crossing	11	64.2	LOS F	0.0	0.0	0.96	0.96
P3	North Full Crossing	21	35.7	LOS D	0.1	0.1	0.71	0.71
P4	West Full Crossing	53	64.3	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		105	48.9	LOS E			0.81	0.81

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

MOVEMENT SUMMARY

Site: 101 [Ex Newbridge Rd/Gov Macquarie Dr/Brickmakers Dr PM]

Existing Four Way Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 140 seconds (Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Brickmakers Drive												
1	L2	15	0.0	0.326	61.5	LOS E	6.1	42.4	0.93	0.74	0.93	27.2
2	T1	84	0.0	0.326	56.9	LOS E	6.1	42.4	0.93	0.74	0.93	27.3
3	R2	261	1.9	0.712	73.9	LOS F	9.1	64.8	1.00	0.85	1.09	23.8
Approach		360	1.4	0.712	69.4	LOS E	9.1	64.8	0.98	0.82	1.05	24.7
East: Newbridge Road												
4	L2	621	1.3	0.628	19.7	LOS B	20.4	144.6	0.64	0.82	0.74	43.6
5	T1	1643	4.7	0.509	13.5	LOS A	21.9	159.6	0.55	0.50	0.55	55.7
6	R2	474	11.4	0.942	63.6	LOS E	18.4	141.5	0.99	0.98	1.39	30.3
Approach		2738	5.1	0.942	23.5	LOS B	21.9	159.6	0.65	0.65	0.74	46.2
North: Governor Macquarie Drive												
7	L2	530	4.3	0.404	34.2	LOS C	10.2	73.9	0.79	0.85	0.96	38.6
8	T1	263	1.1	0.865	72.5	LOS F	19.4	137.3	1.00	0.98	1.22	23.8
9	R2	166	16.3	0.511	49.3	LOS D	9.2	73.5	0.92	0.79	0.92	32.5
Approach		959	5.5	0.865	47.3	LOS D	19.4	137.3	0.87	0.88	1.03	32.7
West: Newbridge Road												
10	L2	133	24.8	0.625	42.6	LOS D	22.8	174.0	0.87	0.81	0.98	37.7
11	T1	1193	4.1	0.625	37.2	LOS C	24.7	179.2	0.87	0.78	0.90	40.8
12	R2	6	0.0	0.008	34.8	LOS C	0.2	1.7	0.64	0.65	0.64	35.5
Approach		1332	6.2	0.625	37.8	LOS C	24.7	179.2	0.87	0.78	0.91	40.4
All Vehicles		5389	5.2	0.942	34.4	LOS C	24.7	179.2	0.77	0.74	0.85	39.9

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	21	15.1	LOS B	0.0	0.0	0.46	0.46
P2	East Full Crossing	11	64.2	LOS F	0.0	0.0	0.96	0.96
P3	North Full Crossing	21	38.7	LOS D	0.1	0.1	0.74	0.74
P4	West Full Crossing	53	64.3	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		105	49.3	LOS E			0.82	0.82

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

Appendix C

SIDRA results (signalisation)

MOVEMENT SUMMARY

Site: 101 [Dev Newbridge Rd/Gov Macquarie Dr/Brickmakers Dr AM]

Network: N101 [Dev AM]

Dev Four Way Intersection
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 140 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Brickmakers Drive														
1	L2	144	6.3	144	6.3	0.689	51.7	LOS D	22.8	164.1	0.95	0.83	0.95	29.0
2	T1	233	1.7	233	1.7	0.689	47.1	LOS D	22.8	164.1	0.95	0.83	0.95	29.6
3	R2	622	2.3	622	2.3	1.254	303.2	LOS F	50.1	357.6	1.00	1.74	2.58	8.1
Approach		999	2.7	999	2.7	1.254	207.2	LOS F	50.1	357.6	0.98	1.40	1.96	11.1
East: Newbridge Road														
4	L2	336	5.7	336	5.7	0.334	11.7	LOS A	5.9	43.4	0.42	0.70	0.42	48.9
5	T1	907	13.2	907	13.2	0.268	12.2	LOS A	9.0	70.2	0.48	0.42	0.48	56.8
6	R2	462	10.2	462	10.2	1.198	158.8	LOS F	33.1	252.1	1.00	1.18	1.89	15.2
Approach		1705	10.9	1705	10.9	1.198	51.8	LOS D	33.1	252.1	0.61	0.68	0.85	31.0
North: Governor Macquarie Drive														
7	L2	506	9.5	506	9.5	0.497	37.1	LOS C	10.4	78.4	0.88	0.85	0.99	36.8
8	T1	143	1.4	143	1.4	0.647	67.2	LOS E	9.6	68.3	1.00	0.82	1.02	19.3
9	R2	89	53.9	89	53.9	0.818	83.5	LOS F	6.8	69.8	1.00	0.95	1.33	23.2
Approach		738	13.3	738	13.3	0.818	48.6	LOS D	10.4	78.4	0.91	0.86	1.04	31.2
West: Newbridge Road														
10	L2	132	26.5	132	26.5	0.910	63.5	LOS E	50.1	383.5	1.00	1.02	1.16	31.2
11	T1	1836	7.1	1836	7.1	0.910	56.1	LOS D	51.6	383.4	0.98	1.02	1.15	33.8
12	R2	125	8.0	125	8.0	0.170	34.6	LOS C	5.3	40.0	0.67	0.75	0.67	30.6
Approach		2093	8.4	2093	8.4	0.910	55.3	LOS D	51.6	383.5	0.97	1.00	1.12	33.5
All Vehicles		5535	8.8	5535	8.8	1.254	80.7	LOS F	51.6	383.5	0.85	0.96	1.18	24.7

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	1	16.0	LOS B	0.0	0.0	0.48	0.48
P2	East Full Crossing	1	53.2	LOS E	0.0	0.0	0.87	0.87
P3	North Full Crossing	1	35.7	LOS D	0.0	0.0	0.71	0.71
P4	West Full Crossing	12	50.6	LOS E	0.0	0.0	0.85	0.85
All Pedestrians		15	47.3	LOS E			0.82	0.82

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

MOVEMENT SUMMARY

Site: 102 [Dev Brickmakers Dr/Link Rd AM]

Network: N101 [Dev AM]

New Intersection with Traffic Signals
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 50 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Brickmakers Drive														
2	T1	656	1.8	656	1.8	0.661	14.8	LOS B	8.6	60.9	0.87	0.79	0.93	35.5
3	R2	66	3.0	66	3.0	0.661	20.1	LOS B	7.1	50.4	0.88	0.81	0.95	40.4
Approach		722	1.9	722	1.9	0.661	15.3	LOS B	8.6	60.9	0.87	0.80	0.93	36.2
East: Link Road														
4	L2	133	0.8	133	0.8	0.095	5.4	LOS A	0.4	3.0	0.27	0.60	0.27	46.0
6	R2	319	6.0	319	6.0	0.629	20.0	LOS B	6.9	50.6	0.88	0.83	0.91	32.5
Approach		452	4.4	452	4.4	0.629	15.7	LOS B	6.9	50.6	0.70	0.77	0.72	37.5
North: Brickmakers Drive														
7	L2	220	9.5	220	9.5	0.166	5.6	LOS A	0.8	5.8	0.29	0.61	0.29	44.9
8	T1	340	9.7	340	9.7	0.463	10.9	LOS A	5.3	40.1	0.66	0.56	0.66	42.1
Approach		560	9.6	560	9.6	0.463	8.8	LOS A	5.3	40.1	0.51	0.58	0.51	43.2
All Vehicles		1734	5.1	1734	5.1	0.661	13.3	LOS A	8.6	60.9	0.71	0.72	0.74	39.0

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	17.7	LOS B	0.1	0.1	0.84	0.84
P2	East Full Crossing	53	13.7	LOS B	0.1	0.1	0.74	0.74
P3	North Full Crossing	53	17.7	LOS B	0.1	0.1	0.84	0.84
All Pedestrians		158	16.4	LOS B			0.81	0.81

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

MOVEMENT SUMMARY

Site: 101 [Dev Newbridge Rd/Gov Macquarie Dr/Brickmakers Dr PM]

Network: N102 [Dev PM]

Dev Four Way Intersection
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 140 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Brickmakers Drive														
1	L2	153	4.6	153	4.6	0.554	50.1	LOS D	17.1	122.2	0.90	0.80	0.90	29.4
2	T1	143	0.0	143	0.0	0.554	45.5	LOS D	17.1	122.2	0.90	0.80	0.90	29.8
3	R2	382	3.1	382	3.1	1.051	145.6	LOS F	20.2	145.2	1.00	1.31	1.86	14.8
Approach		678	2.8	678	2.8	1.051	103.0	LOS F	20.2	145.2	0.96	1.09	1.44	19.0
East: Newbridge Road														
4	L2	693	2.0	693	2.0	1.080	146.5	LOS F	79.3	564.7	1.00	1.22	1.80	10.0
5	T1	1643	4.7	1643	4.7	0.505	13.4	LOS A	21.7	157.7	0.55	0.50	0.55	55.8
6	R2	474	11.4	474	11.4	0.942	63.6	LOS E	18.4	141.5	0.99	0.98	1.39	30.3
Approach		2810	5.2	2810	5.2	1.080	54.7	LOS D	79.3	564.7	0.74	0.76	1.00	30.6
North: Governor Macquarie Drive														
7	L2	530	4.3	530	4.3	0.404	34.2	LOS C	10.2	73.9	0.79	0.85	0.96	38.6
8	T1	333	0.9	333	0.9	1.202	256.7	LOS F	49.3	347.7	1.00	1.71	2.38	6.4
9	R2	166	16.3	166	16.3	1.002	125.4	LOS F	16.4	130.7	1.00	1.16	1.73	19.4
Approach		1029	5.2	1029	5.2	1.202	120.9	LOS F	49.3	347.7	0.89	1.18	1.54	17.6
West: Newbridge Road														
10	L2	133	24.8	133	24.8	0.653	45.1	LOS D	24.8	188.8	0.89	0.80	0.89	36.8
11	T1	1193	4.1	1193	4.1	0.653	37.8	LOS C	26.2	190.1	0.87	0.78	0.87	40.5
12	R2	170	3.5	170	3.5	0.242	38.1	LOS C	7.8	56.4	0.73	0.77	0.73	28.9
Approach		1496	5.9	1496	5.9	0.653	38.5	LOS C	26.2	190.1	0.86	0.78	0.86	39.2
All Vehicles		6013	5.1	6013	5.1	1.202	67.4	LOS E	79.3	564.7	0.82	0.87	1.11	27.2

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	1	15.1	LOS B	0.0	0.0	0.46	0.46
P2	East Full Crossing	2	54.0	LOS E	0.0	0.0	0.88	0.88
P3	North Full Crossing	5	38.6	LOS D	0.0	0.0	0.74	0.74
P4	West Full Crossing	5	51.4	LOS E	0.0	0.0	0.86	0.86
All Pedestrians		14	44.1	LOS E			0.79	0.79

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

MOVEMENT SUMMARY

Site: 102 [Dev Brickmakers Dr/Link Rd PM]

Network: N102 [Dev PM]

New Intersection with Traffic Signals
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 50 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Brickmakers Drive														
2	T1	396	2.0	396	2.0	0.367	6.6	LOS A	5.4	38.5	0.59	0.51	0.59	42.4
3	R2	122	0.8	122	0.8	0.484	19.2	LOS B	2.5	17.8	0.82	0.78	0.82	39.3
Approach		518	1.7	518	1.7	0.484	9.6	LOS A	5.4	38.5	0.64	0.57	0.64	41.2
East: Link Road														
4	L2	92	2.2	92	2.2	0.066	5.4	LOS A	0.3	2.1	0.26	0.60	0.26	46.0
6	R2	317	4.4	317	4.4	0.895	36.7	LOS C	10.0	72.5	1.00	1.12	1.63	25.1
Approach		409	3.9	409	3.9	0.895	29.7	LOS C	10.0	72.5	0.83	1.00	1.32	30.1
North: Brickmakers Drive														
7	L2	307	3.9	290	4.0	0.252	5.8	LOS A	1.4	10.3	0.33	0.60	0.33	45.2
8	T1	851	8.1	771	8.8	0.711	6.1	LOS A	10.2	76.6	0.57	0.54	0.59	45.2
Approach		1158	7.0	1060 N1	7.5	0.711	6.0	LOS A	10.2	76.6	0.50	0.56	0.52	45.2
All Vehicles		2085	5.1	1987 N1	5.3	0.895	11.8	LOS A	10.2	76.6	0.61	0.65	0.72	40.7

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

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
P2	East Full Crossing	53	8.4	LOS A	0.0	0.0	0.58	0.58
P3	North Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
All Pedestrians		158	15.7	LOS B			0.78	0.78

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

Appendix D

RMS Traffic Signal Warrant Guidelines

2.1 INTRODUCTION

This section describes the general warrants for the installation of traffic signals. It must be emphasised that these are only a guide. If a site satisfies the warrants, it does not necessarily mean that traffic signals are the best solution. All traffic data should be analysed and alternative treatments considered to determine the optimum solution (see Section 4 of the *Road Design Guide*). Traffic signals are sometimes installed due to public pressure or an administrative directive irrespective of the general warrants.

2.2 FACTORS INFLUENCING THE PROVISION OF TRAFFIC SIGNALS

Traffic signals are usually installed at an intersection:

- to provide traffic control at a site with a traffic capacity or road safety problem
- to control conflicting movements with high traffic flows
- to facilitate access to and from local areas in a major/minor road system, including pedestrian movements
- as part of an area wide system of traffic management

A side effect of signalisation is that the traffic flow on a major road is broken up into platoons. This assists nearby pedestrians to cross the major road and vehicles in nearby side streets to cross or enter the major road.

Factors influencing the provision of traffic signals include:

- traffic flows
- traffic conflicts
- traffic accident statistics
- pedestrian requirements
- access to major roads
- cost of installation
- availability of funds
- maintenance costs
- practicality
- feasibility
- the signposted speed limit is not more than 80km/h

General warrants are given in the following sub-sections. The figures stated should only be used as a guide and each intersection should be considered in more detail before being accepted for signal design.

2.3 SIGNALISED INTERSECTIONS

As a guide, a signalised intersection may be considered if one of the following warrants is met.

(a) Traffic demand:

For each of four one-hour periods of an average day:

(i) the major road flow exceeds 600 vehicles/hour in each direction; and

(ii) the minor road flow exceeds 200 vehicles/hour in one direction.

OR

(b) Continuous traffic:

For each of four one-hour periods of an average day:

(i) the major road flow exceeds 900 vehicles/hour in each direction; and

(ii) the minor road flow exceeds 100 vehicles/hour in one direction; and

(iii) the speed of traffic on the major road or limited sight distance from the minor road causes undue delay or hazard to the minor road vehicles; and

(iv) there is no other nearby traffic signal site easily accessible to the minor road vehicles.

OR

(c) Pedestrian safety:

For each of four one-hour periods of an average day:

(i) the pedestrian flow crossing the major road exceeds 150 persons/hour; and

(ii) the major road flow exceeds 600 vehicles/hour in each direction or, where there is a central median of at least 1.2 m wide, 1000 vehicles/hour in each direction.

OR

(d) Pedestrian safety – high speed road:

For each of four one-hour periods of an average day:

(i) the pedestrian flow crossing the major road exceeds 150 persons/hour; and

(ii) the major road flow exceeds 450 vehicles/hour in each direction or, where there is a central median of at least 1.2 m wide, 750 vehicles/hour in each direction; and

(iii) the 85th percentile speed on the major road exceeds 75 km/h.

OR

(e) Crashes:

(i) The intersection has been the site of an average of three or more reported tow-away or casualty traffic accidents per year over a three year period, where the traffic accidents could have been prevented by traffic signals; and

(ii) the traffic flows are at least 80% of the appropriate flow warrants.

2.4 SIGNALISED MARKED FOOT CROSSINGS AT INTERSECTIONS

A signalised marked foot crossing must be provided on each leg of a signalised intersection (including T Junctions), in a built-up area, except in the following circumstances:

(a) There are significant road safety implications:

(i) there is insufficient sight distance (see Section 4 of the *Road Design Guide*); or

(ii) there is adverse road geometry (see Section 4 of the *Road Design Guide*).

(b) There are significant adverse transport efficiency implications

(i) there is an unacceptable increase in delay and degree of saturation which must be substantiated by intersection modelling; or

Appendix E

Liverpool Traffic Committee Minutes

ITEM 10	146 NEWBRIDGE ROAD, MOOREBANK – PROPOSED LINEMARKING AND SIGNPOSTING SCHEME

INTRODUCTION

The developer of Georges Cove Marina at 146 Newbridge Road, Moorebank (legally known as Lot 7 in DP 1065574) has submitted a signs and linemarking scheme of a planned access road off Brickmakers Drive.

The Committee is requested to support the proposed signs and linemarking scheme as shown in Attachment 10.1 (in the attachment booklet).

ASSESSMENT

The proposed development of 146 Newbridge Road (Georges Cove Marina) will result in a daily average traffic movement of approximately 1300 vehicles. The development's only vehicular access is off Brickmakers Drive.

Access to Georges Cove Marina will be from the existing signalised intersection of Newbridge Road and Brickmakers Drive and via a proposed elevated road bridge which will connect to a road that connects to Brickmakers Drive, forming a 'T' intersection.

The new intersection off Brickmakers Drive will be approximately 300m south of Newbridge Road. This intersection would also provide access to other future developments in the south-eastern corner of Newbridge Road and Brickmakers Drive.

Traffic assessment carried out to date indicates that, in future, the intersection would meet the warrant for traffic signals and would need to be signalised to permit safe and efficient turning movements into and out of the development's access road.

The interim 'T' intersection will be a priority control intersection which would have dedicated right and left turn lanes out of the proposed access road, as well as dedicated left and right turn lanes along Brickmakers Drive.

The Committee is requested to support the interim channelised intersection treatment as shown in Attachment 10.1 (in the attachment booklet).

In addition, the developer of Georges Cove Marina will seek RMS' in-principal approval for the intersection to be signalised in order to accommodate the future traffic volumes.

RECOMMENDATION

That:

1. The Committee supports the proposed signs and linemarking scheme for an access road off Brickmakers Drive, as shown in Attachment 10.1.

COMMITTEE DISCUSSION

The Committee was advised that the proposed linemarking and signposting scheme at the intersection of Brickmakers Drive and the proposed east-west access road, to provide access to the development precinct east of Brickmakers Drive (including the marina and other urban developments) is an interim intersection treatment.

This intersection will be upgraded to traffic signals in future when it meets the RMS traffic signals warrant. As part of the interim intersection layout, the developer is to seek RMS in-principle approval of the traffic signals and include required conduits in the layout.

The Committee discussed and supported the signs and linemarking scheme as an interim treatment until it is upgraded to traffic signals in future.

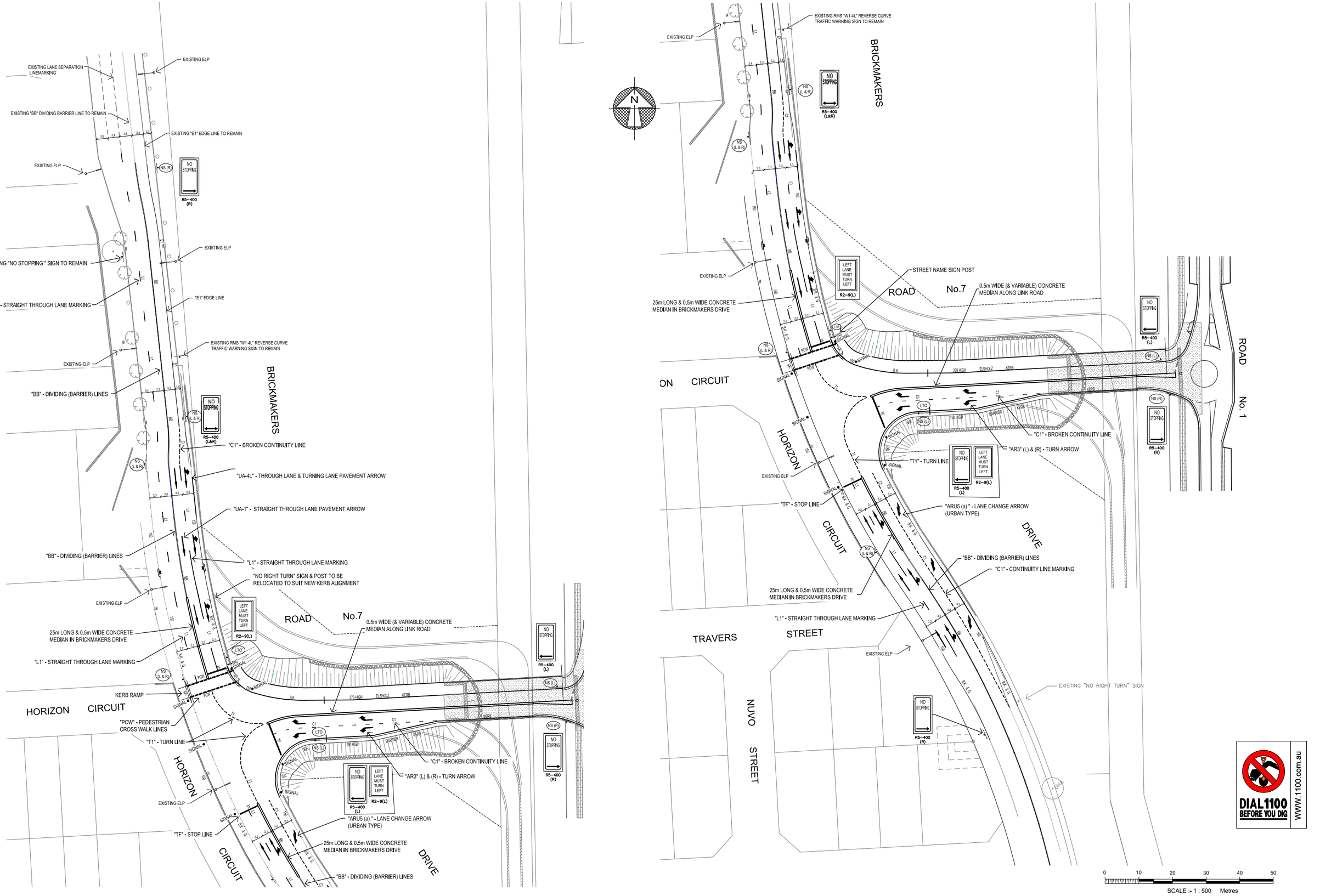
COMMITTEE RECOMMENDATION

That:

1. Council approves the linemarking and signposting scheme at the Brickmakers Drive and the new road providing access to the development precinct east of Brickmakers Drive (including the marina) as an interim intersection treatment.

Appendix F

Approved Line Marking Plans



DIAL 1100 BEFORE YOU DIG
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Issue	App	Date	Description
B	S.G.	30-05-2019	ISSUED FOR TRAFFIC COMMITTEE APPROVAL
A	S.G.	08-08-2018	ISSUED FOR DA APPROVAL

Client: MIRVAC HOMES (NSW) PTY LTD.
Designed by : S.G.
Date of Drawing : 08-08-2018
Ratio (A1) : 1:200

Datum : AHD
Origin of Levels :
Date of Survey : N/A

JMD Development Consultants

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Engineering
Project Management
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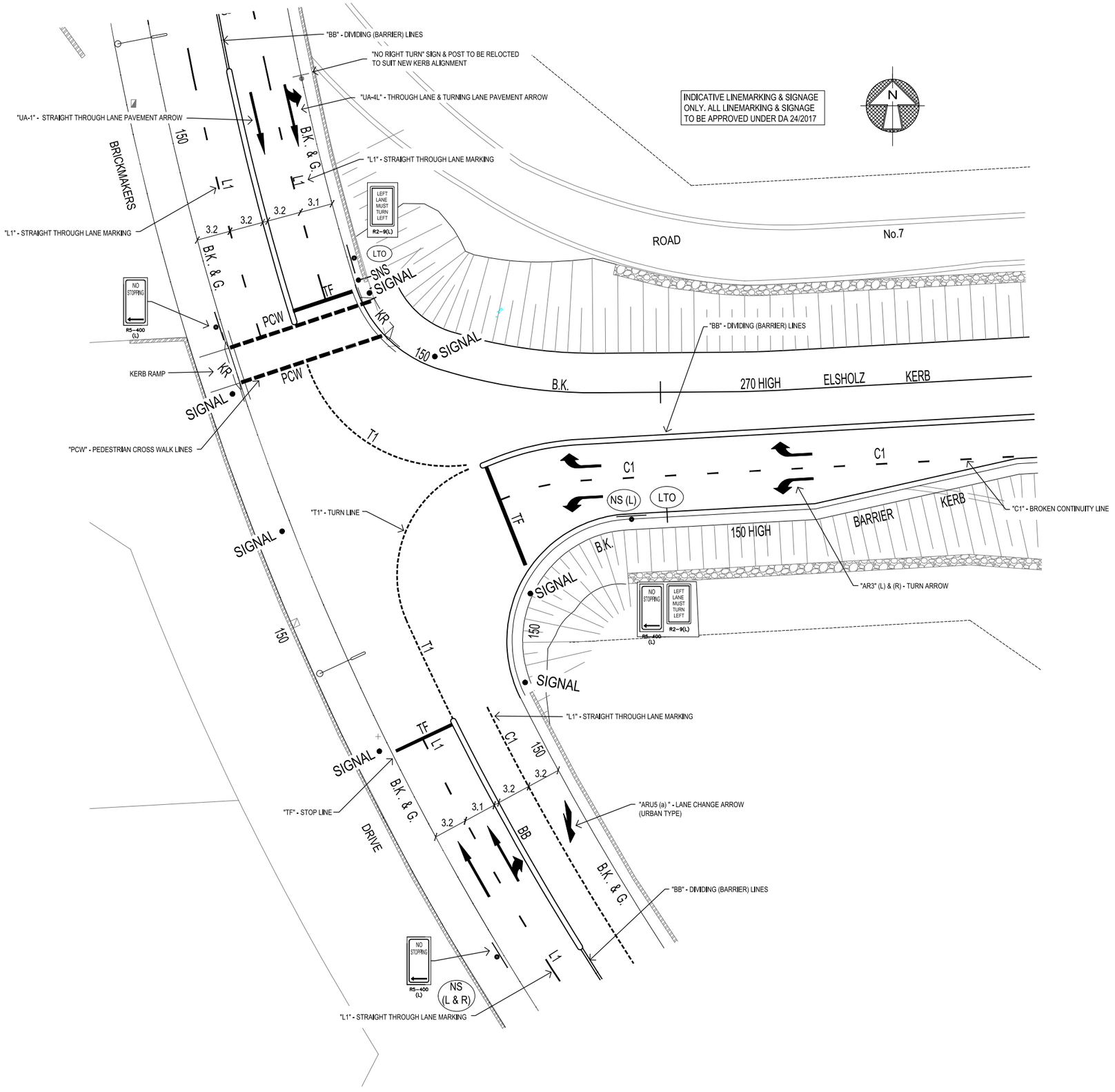
Project : MOOREBANK COVE
NEWBRIDGE ROAD, MOOREBANK

LINEMARKING PLAN FOR FUTURE TRAFFIC LIGHTS INSTALLATION
Sheet 1 of 2

Sheet 1 of 6 sheets
Ref: 14005E27

Locality : MOOREBANK
L.G.A. : LIVERPOOL
CAD Ref: S:\JOBS\14\14005\14005 EMW\ENG\CAD\E27 - BRICKMAKERS TRAFFIC\14005E27 LINEMARKING TRAFFIC LIGHTS



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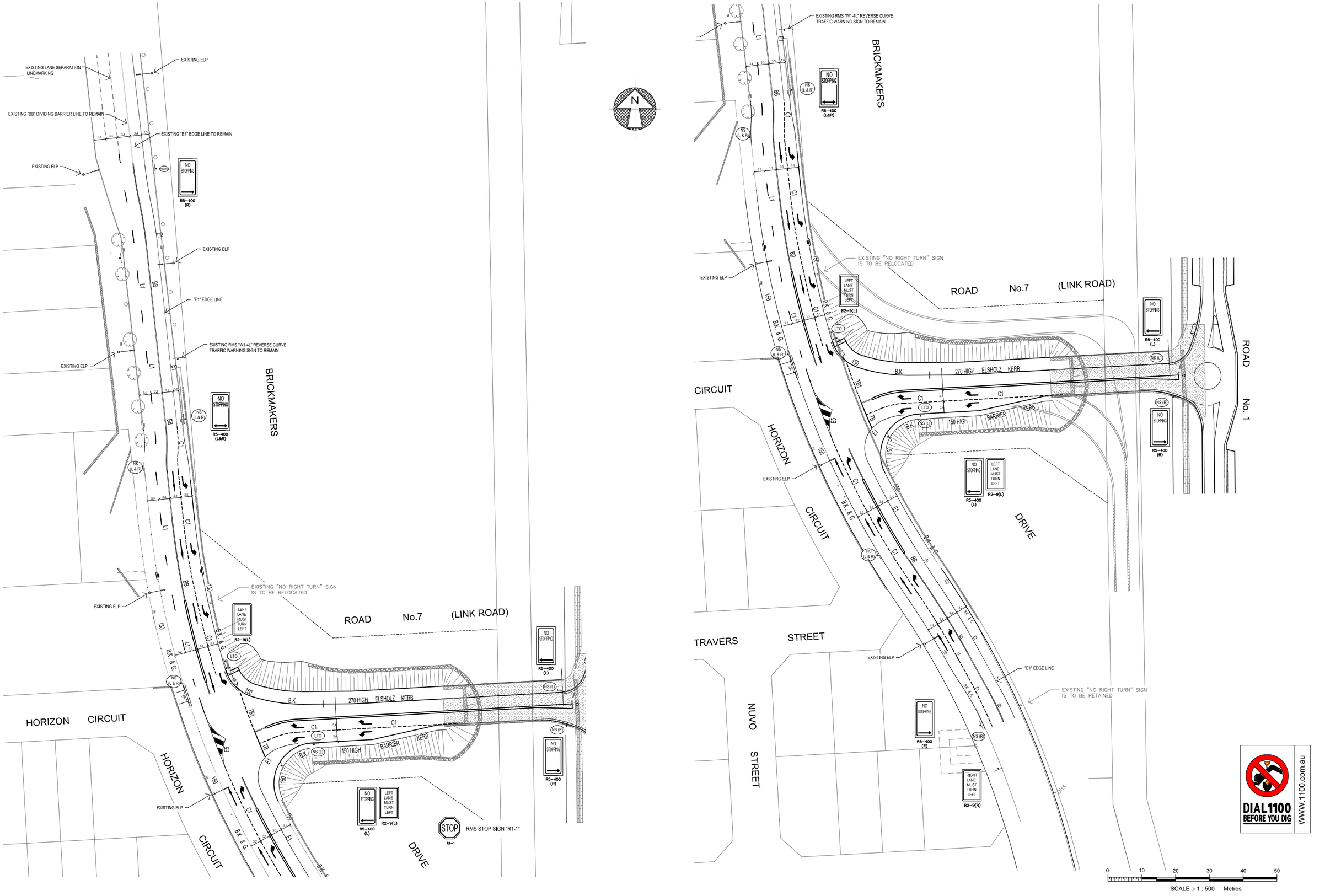
Project : MOOREBANK COVE
NEWBRIDGE ROAD, MOOREBANK

LINEMARKING PLAN FOR FUTURE TRAFFIC LIGHTS INSTALLATION
Sheet 2 of 2

Sheet 2 of 6 sheets
Ref: 14005E27

Locality : MOOREBANK
L.G.A. : LIVERPOOL
CAD Ref: S:\JOBS\14\14005\14005 EMW\ENG\CAD\E27 - BRICKMAKERS TRAFFIC\14005E27 LINEMARKING TRAFFIC LIGHTS



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Issue	App	Date	Description
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Project : MOOREBANK COVE
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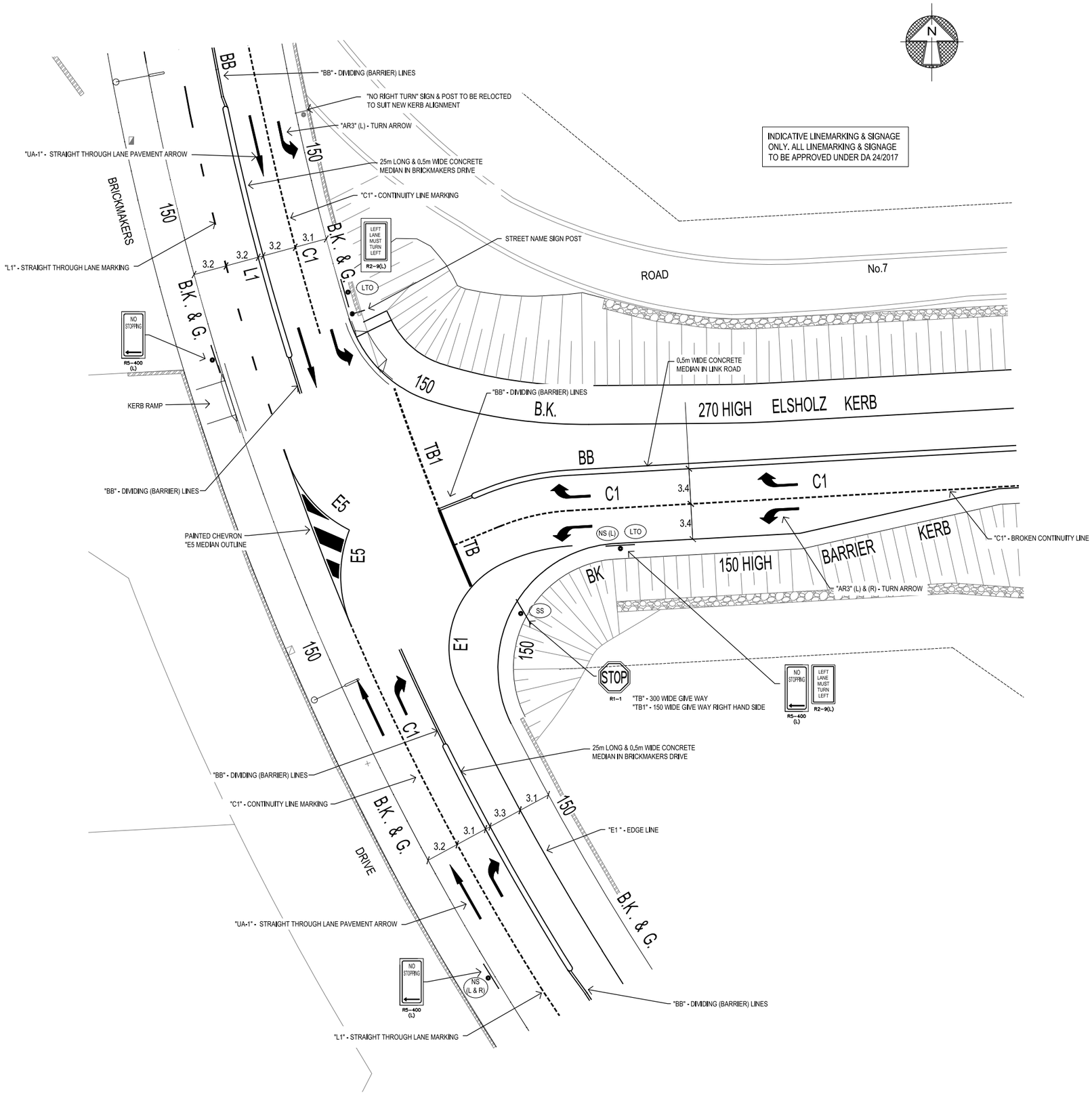
Sheet 3 of 6 sheets

LINEMARKING PLAN FOR INITIAL INTERSECTION TREATMENT - STOP SIGN
Sheet 1 of 2

Ref: 14005E27

Locality : MOOREBANK
L.G.A. : LIVERPOOL
CAD Ref: S:\JOBS\14\14005\14005 EMW\ENG\CAD\E27 - BRICKMAKERS TRAFFIC\14005E27 LINEMARKING STOP SIGN



DIAL 1100 BEFORE YOU DIG WWW.1100.com.au

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SCALE :- 1 : 200
Metres

Issue	App	Date	Description
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A	S.G.	08-08-2018	ISSUED FOR DA APPROVAL

Client: MIRVAC HOMES (NSW) PTY LTD.
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Date of Drawing : 08-08-2018
Ratio (A1) : 1:200

Datum : AHD
Origin of Levels :
Date of Survey : N/A

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Sheet 4 of 6 sheets

LINEMARKING PLAN FOR INITIAL INTERSECTION TREATMENT - STOP SIGN
Sheet 2 of 2

Ref: 14005E27

Locality : MOOREBANK
L.G.A. : LIVERPOOL
CAD Ref: S:\JOBS\14\14005\14005 EMW\ENG\CAD\E27 - BRICKMAKERS TRAFFIC\14005E27 LINEMARKING STOP SIGN

LEGEND

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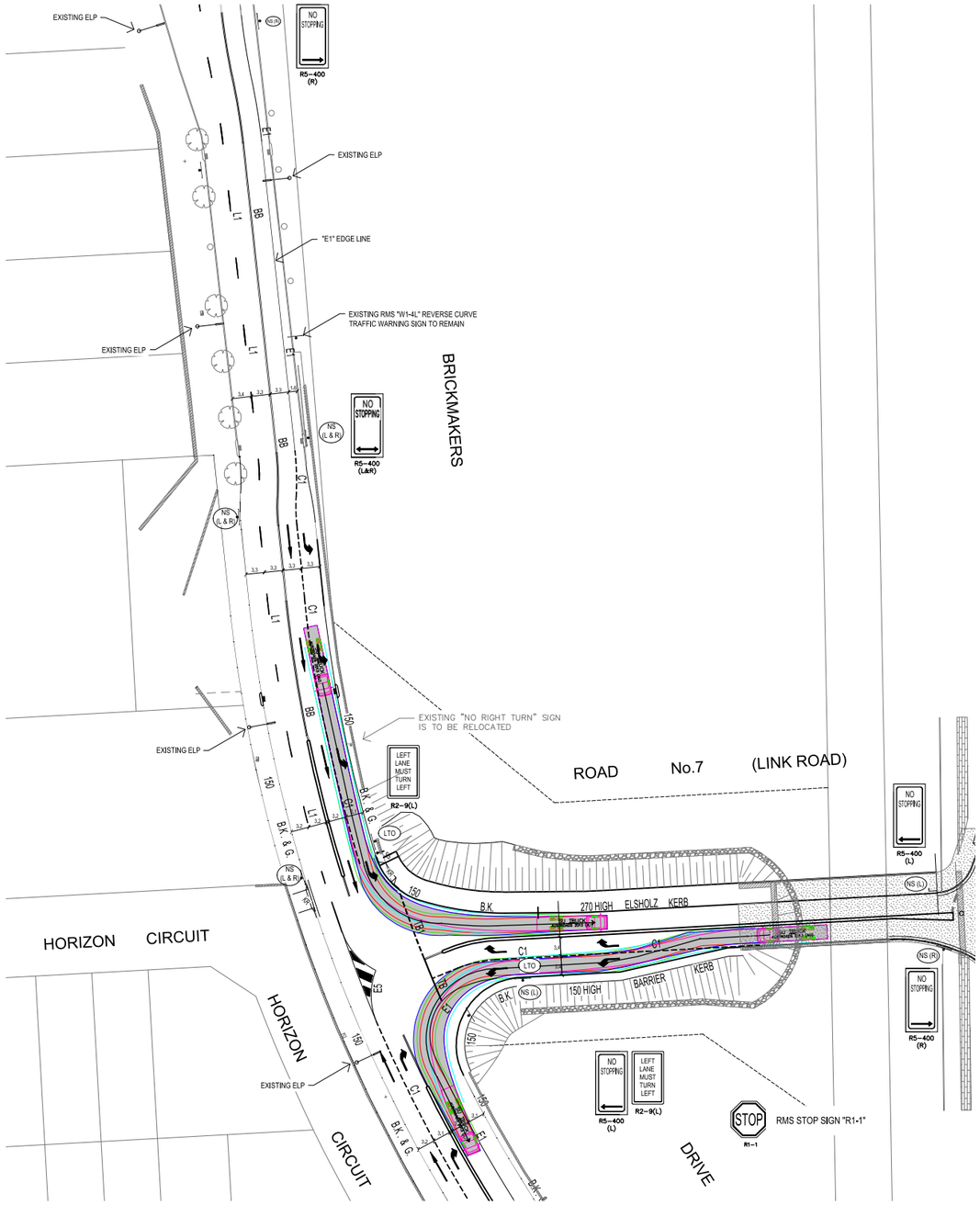
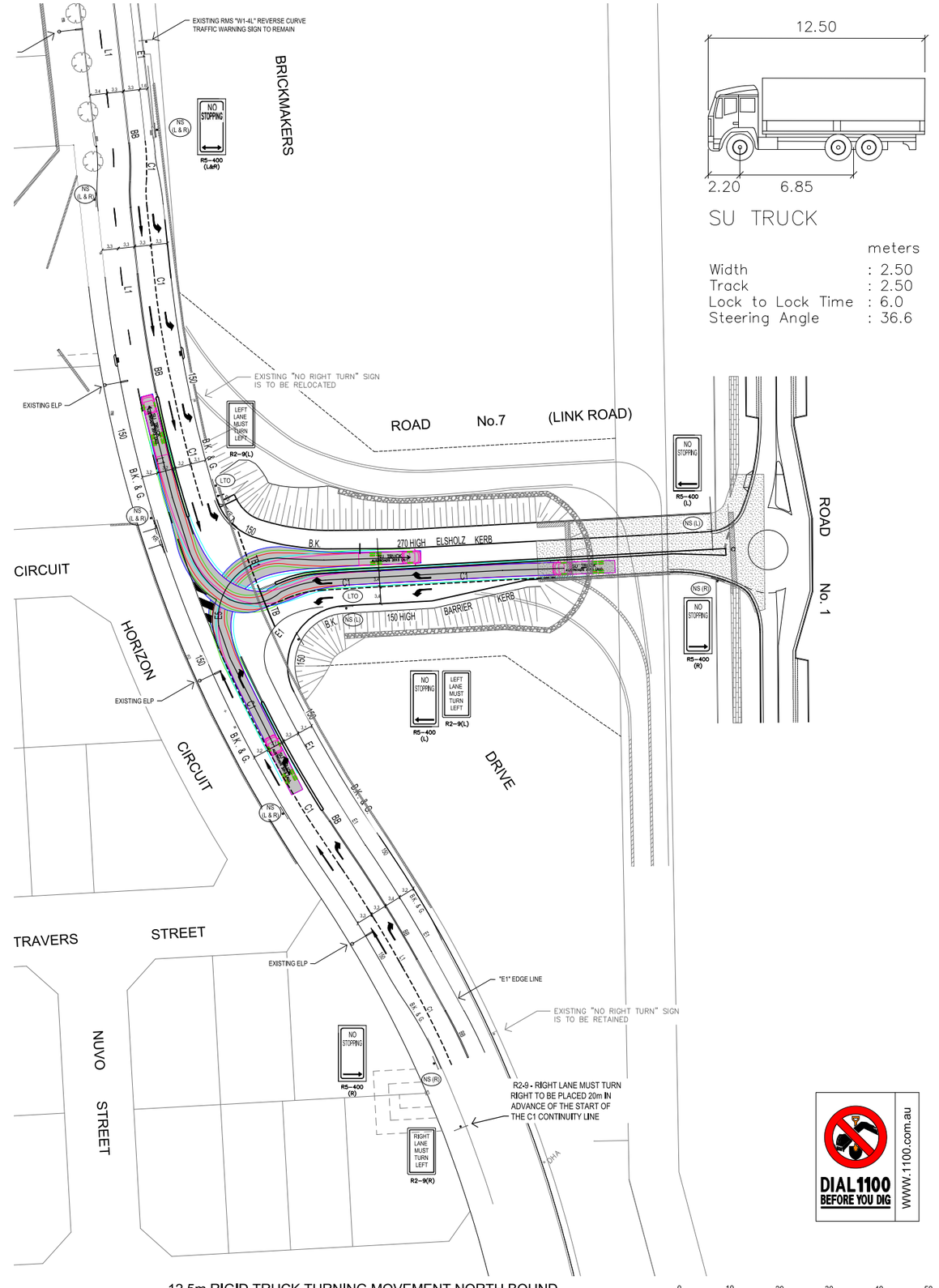
- REAR TIRES
- FRONT CLEARANCE
- REAR CLEARANCE
- VEHICLE BODY



12.5m RIGID TRUCK TURNING MOVEMENT SOUTH BOUND
SCALE 1:500



12.5m RIGID TRUCK TURNING MOVEMENT NORTH BOUND
SCALE 1:500

SU TRUCK

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 36.6

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SCALE :- 1 : 500 Metres

Issue	App	Date	Description
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A	S.G.	08-08-2018	ISSUED FOR DA APPROVAL

Client: MIRVAC HOMES (NSW) PTY LTD.
Designed by : S.G.
Date of Drawing : 08-08-2018
Ratio (A1) : 1:200

Datum : AHD
Origin of Levels :
Date of Survey : N/A

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Sheet 5 of 6 sheets

TURNING MOVEMENTS FOR INITIAL INTERSECTION TREATMENT - STOP SIGN

Ref: 14005E27

Locality : MOOREBANK
L.G.A. : LIVERPOOL

CAD Ref: S:\JOBS\14\14005\14005 EMW\ENG\CAD\E27 - BRICKMAKERS TRAFFIC\14005E27 LINEMARKING STOP SIGN

nearmap

DIAL 1100 BEFORE YOU DIG
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12.5m RIGID TRUCK TURNING MOVEMENT SOUTH BOUND
SCALE 1:500

12.5m RIGID TRUCK TURNING MOVEMENT NORTH BOUND
SCALE 1:500

0 10 20 30 40 50
SCALE :- 1 : 500 Metres

Issue	App	Date	Description
A	S.G.	30-05-2019	ISSUED FOR TRAFFIC COMMITTEE APPROVAL

Client: MIRVAC HOMES (NSW) PTY LTD.
Designed by : S.G.
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email: admin@jmd.com.au

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Sheet 6 of 6 sheets

LINEMARKING PLAN FOR INITIAL INTERSECTION TREATMENT - STOP SIGN OVERLAID ON NEARMAP IMAGE

Ref: 14005E27

Locality : MOOREBANK
L.G.A. : LIVERPOOL
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