



27 May, 2022

Department of Planning and Environment
4 Parramatta Square
12 Darcy Street
Parramatta NSW 2150

Attention: Amy Watson

Dear Madam,

REQUEST FOR ADDITIONAL INFORMATION
161 – 179 PRINCES HIGHWAY & 26 – 42 EDEN STREET, ARNCLIFFE

Reference is made to your email correspondence addressed to Dean Stojanovski of Billbergia indicating your request for additional information with respect to the State Significant Development Application situated at the above address (SSDA-11429726).

Additional information was requested with respect to traffic, flooding and plan related matters. This correspondence is to address the items relating to Traffic as follows:

“Princes Highway / Brodie Spark Drive intersection performance

- 1. The intersection performance tables contained within Appendix 6 of the revised Transport Impact Assessment show vehicle movements turning right from Princes Highway to Brodie Spark Drive are unchanged by the proposed development, despite an increase in trips being noted in the remained of the report.*

Please have the traffic engineer review the tables to include accurate trip details and provide an updated detailed analysis of the specific impact on the Level of Service (LOS) on the right turn from Princes Highway to Brodie Spark Drive, including existing and projected:

- *Vehicle trips*
- *Delays*
- *Saturation levels*
- *Overall LOS*

The wider analysis of intersection performance should be updated as necessary to take account of any new / revised information.”

STANBURY TRAFFIC PLANNING RESPONSE

February 2022 Updated Transport Impact Assessment Results

Figures 1 below and Figure 2 overleaf provide excerpts of **Appendix 5** and **Appendix 6** from the Updated Transport Impact Assessment prepared by Stanbury Traffic Planning dated February 2022 (STP Report) which show the modelled existing and projected post development operation of the intersection of Princes Highway and Brodie Spark Drive during the weekday morning peak hour, specifically highlighting the southbound right turn movement mentioned within your email correspondence.

FIGURE 1
APPENDIX 5 EXCERPT
AM PEAK EXISTING – INTERSECTION OF PRINCES HIGHWAY AND BRODIE SPARK DRIVE

MOVEMENT SUMMARY

Site: 101 [Princes Hwy and Brodie Sparks Dr (Site Folder: AM Existing)]

Network: N101 [AM Existing North (Network Folder: Existing)]

AM Peak Existing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total	HV]	[Total	HV]				[Veh.	Dist]				
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Princes Hghwy South														
1	L2	129	5.0	129	5.0	0.120	17.8	LOS B	3.6	27.1	0.45	0.69	0.45	27.2
2	T1	2884	5.0	2884	5.0	* 0.844	10.6	LOS A	36.9	273.9	0.57	0.53	0.57	48.7
Approach		3014	5.0	3014	5.0	0.844	10.9	LOS A	36.9	273.9	0.56	0.54	0.56	48.2
North: Princes Hghwy North														
8	T1	1060	5.0	1060	5.0	0.264	7.4	LOS A	8.3	61.3	0.38	0.33	0.38	51.7
9	R2	206	5.0	206	5.0	0.338	58.7	LOS E	6.3	46.5	0.92	0.77	0.92	18.1
Approach		1266	5.0	1266	5.0	0.338	15.7	LOS B	8.3	61.3	0.47	0.40	0.47	42.3
West: Brodie Sparks Dr														
10	L2	407	5.0	407	5.0	0.432	46.8	LOS D	12.2	90.5	0.86	0.78	0.86	21.7
12	R2	212	5.0	212	5.0	* 0.837	81.4	LOS F	7.9	58.7	1.00	0.98	1.31	10.8
Approach		619	5.0	619	5.0	0.837	58.6	LOS E	12.2	90.5	0.91	0.85	1.01	17.7
All Vehicles		4899	5.0	4899	5.0	0.844	18.2	LOS B	36.9	273.9	0.58	0.54	0.59	40.4

FIGURE 2
APPENDIX 6 EXCERPT
AM PEAK PROJECTED – INTERSECTION OF PRINCES HIGHWAY AND BRODIE SPARK DRIVE

MOVEMENT SUMMARY

Site: 101 [Princes Hwy and Brodie Sparks Dr (Site Folder: AM Projected Scenario North)]

Network: N101 [AM Projected Scenario North (Network Folder: Projected Scenario)]

AM Projected - 1

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total	HV]	[Total	HV]				[Veh.	Dist]				
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Princes Hghwy South														
1	L2	129	5.0	129	5.0	0.120	17.8	LOS B	3.6	27.1	0.45	0.69	0.45	27.2
2	T1	2907	5.0	2907	5.0	* 0.851	10.9	LOS A	38.0	281.7	0.58	0.54	0.58	48.5
Approach		3037	5.0	3037	5.0	0.851	11.2	LOS A	38.0	281.7	0.57	0.55	0.57	48.0
North: Princes Hghwy North														
8	T1	1082	5.0	1082	5.0	0.270	7.4	LOS A	8.5	62.9	0.38	0.34	0.38	51.7
9	R2	212	5.0	212	5.0	0.347	58.8	LOS E	6.4	47.7	0.93	0.77	0.93	18.0
Approach		1294	5.0	1294	5.0	0.347	15.8	LOS B	8.5	62.9	0.47	0.41	0.47	42.2
West: Brodie Sparks Dr														
10	L2	416	5.0	416	5.0	0.444	46.9	LOS D	12.6	93.3	0.86	0.78	0.86	21.6
12	R2	212	5.0	212	5.0	* 0.837	81.4	LOS F	7.9	58.7	1.00	0.98	1.31	10.8
Approach		627	5.0	627	5.0	0.837	58.5	LOS E	12.6	93.3	0.91	0.85	1.01	17.8
All Vehicles		4958	5.0	4958	5.0	0.851	18.4	LOS B	38.0	281.7	0.59	0.55	0.60	40.2

Figures 1 and 2 indicate that an additional six vehicle movements have been added to the right turn movement from Princes Highway onto Brodie Spark Drive during the morning peak hour and the development is expected to result in minimal impact on the average delay and the 95% queue length with no change to the modelled Level of Service.

Figures 3 and 4 overleaf are excerpts from Appendix 5 and Appendix 6 from the STP Report which show the modelled existing and projected post development operation of the intersection of Princes Highway and Brodie Spark Drive during the weekday afternoon peak hour, specifically highlighting the southbound right turn movement.

FIGURE 3
APPENDIX 5 EXCERPT
PM PEAK EXISTING – INTERSECTION OF PRINCES HIGHWAY AND BRODIE SPARK DRIVE

MOVEMENT SUMMARY

Site: 101 [Princes Hwy and Brodie Sparks Dr
(Site Folder: PM Existing)]

Network: N101 [PM Existing North
(Network Folder: Existing)]

PM Peak Existing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total HV]		[Total HV]					[Veh.]	[Dist]				
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Princes Hghwy South														
1	L2	316	5.0	316	5.0	0.553	30.1	LOS C	13.5	99.8	0.68	0.77	0.68	19.8
2	T1	1645	5.0	1645	5.0	0.652	26.6	LOS B	30.5	226.0	0.77	0.69	0.77	38.0
Approach		1961	5.0	1961	5.0	0.652	27.1	LOS B	30.5	226.0	0.76	0.71	0.76	36.1
North: Princes Hghwy North														
8	T1	2617	5.0	2617	5.0	* 0.694	5.5	LOS A	16.1	119.7	0.30	0.28	0.30	53.6
9	R2	591	5.0	591	5.0	0.646	55.7	LOS D	18.0	133.7	0.95	0.84	0.95	22.0
Approach		3207	5.0	3207	5.0	0.694	14.7	LOS B	18.0	133.7	0.42	0.38	0.42	44.8
West: Brodie Sparks Dr														
10	L2	288	5.0	288	5.0	0.196	31.1	LOS C	6.2	45.8	0.68	0.71	0.68	30.2
12	R2	249	5.0	249	5.0	* 0.696	70.1	LOS E	8.5	63.1	1.00	0.85	1.08	12.6
Approach		538	5.0	538	5.0	0.696	49.2	LOS D	8.5	63.1	0.83	0.77	0.86	20.9
All Vehicles		5706	5.0	5706	5.0	0.696	22.2	LOS B	30.5	226.0	0.57	0.53	0.58	38.7

FIGURE 4
APPENDIX 6 EXCERPT
PM PEAK PROJECTED – INTERSECTION OF PRINCES HIGHWAY AND BRODIE SPARK DRIVE

MOVEMENT SUMMARY

Site: 101 [Princes Hwy and Brodie Sparks Dr (Site Folder: PM Projected Scenario North)]

Network: N101 [PM Projected Scenario North (Network Folder: Projected Scenario)]

PM Projected - 1
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total HV]	[Total HV]	[Total HV]	[Total HV]				[Veh.]	[Dist]				
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Princes Hghwy South														
1	L2	316	5.0	316	5.0	0.558	30.1	LOS C	13.5	99.8	0.68	0.77	0.68	19.8
2	T1	1682	5.0	1682	5.0	0.667	26.8	LOS B	31.5	233.7	0.78	0.70	0.78	37.9
Approach		1998	5.0	1998	5.0	0.667	27.4	LOS B	31.5	233.7	0.77	0.71	0.77	36.0
North: Princes Hghwy North														
8	T1	2676	5.0	2676	5.0	* 0.709	5.6	LOS A	17.1	127.1	0.31	0.29	0.31	53.5
9	R2	606	5.0	606	5.0	0.663	55.9	LOS D	18.6	138.0	0.95	0.84	0.95	21.9
Approach		3282	5.0	3282	5.0	0.709	14.9	LOS B	18.6	138.0	0.43	0.39	0.43	44.7
West: Brodie Sparks Dr														
10	L2	293	5.0	293	5.0	0.199	31.2	LOS C	6.3	46.5	0.68	0.71	0.68	30.2
12	R2	249	5.0	249	5.0	* 0.696	70.1	LOS E	8.5	63.1	1.00	0.85	1.08	12.6
Approach		542	5.0	542	5.0	0.696	49.1	LOS D	8.5	63.1	0.83	0.77	0.86	20.9
All Vehicles		5822	5.0	5822	5.0	0.709	22.4	LOS B	31.5	233.7	0.58	0.54	0.59	38.6

Figures 3 and 4 indicate that an additional 15 vehicle movements have been added to the right turn movement from Princes Highway onto Brodie Spark Drive during the afternoon peak hour and the development is expected to result in minimal impact on the average delay and the 95% queue length with no change to the modelled Level of Service.

Figures 5 below and **Figure 6** overleaf are excerpts from **Appendix 5** and **Appendix 6** from the STP Report which show the modelled existing and projected post development operation of the intersection of Princes Highway and Brodie Spark Drive during the Saturday midday peak hour, specifically highlighting the southbound right turn movement

FIGURE 5
APPENDIX 5 EXCERPT
SAT PEAK EXISTING – INTERSECTION OF PRINCES HIGHWAY AND BRODIE SPARK DRIVE

MOVEMENT SUMMARY

Site: 101 [Princes Hwy and Brodie Sparks Dr
(Site Folder: SAT Existing)]

Network: N101 [SAT Existing North
(Network Folder: Existing)]

SAT Peak Existing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total	HV]	[Total	HV]				[Veh.	Dist]				
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Princes Hghwy South														
1	L2	271	5.0	271	5.0	0.266	21.6	LOS B	9.1	67.8	0.54	0.73	0.54	24.4
2	T1	2083	5.0	2083	5.0	* 0.681	19.7	LOS B	34.6	256.4	0.71	0.65	0.71	42.0
Approach		2354	5.0	2354	5.0	0.681	19.9	LOS B	34.6	256.4	0.69	0.66	0.69	40.8
North: Princes Hghwy North														
8	T1	1744	5.0	1744	5.0	0.457	11.0	LOS A	18.1	134.1	0.50	0.46	0.50	48.4
9	R2	417	5.0	417	5.0	* 0.684	65.6	LOS E	13.7	101.4	0.99	0.84	1.01	19.8
Approach		2161	5.0	2161	5.0	0.684	21.6	LOS B	18.1	134.1	0.60	0.53	0.60	40.1
West: Brodie Sparks Dr														
10	L2	346	5.0	346	5.0	0.303	41.6	LOS C	8.8	65.4	0.80	0.76	0.80	26.4
12	R2	242	5.0	242	5.0	* 0.706	71.4	LOS F	8.3	61.9	1.00	0.85	1.09	12.4
Approach		588	5.0	588	5.0	0.706	53.8	LOS D	8.8	65.4	0.88	0.80	0.92	20.1
All Vehicles		5103	5.0	5103	5.0	0.706	24.5	LOS B	34.6	256.4	0.67	0.62	0.68	37.3

FIGURE 6
APPENDIX 6 EXCERPT
SAT PEAK PROJECTED – INTERSECTION OF PRINCES HIGHWAY AND BRODIE SPARK DRIVE

MOVEMENT SUMMARY

Site: 101 [Princes Hwy and Brodie Sparks Dr (Site Folder: SAT Projected Scenario North)]

Network: N101 [SAT Projected Scenario North (Network Folder: Projected Scenario)]

SAT Projected - 1

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Req. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total	HV %	[Total	HV %	v/c	sec		[Veh.	Dist]				km/h
		veh/h		veh/h					veh	m				
South: Princes Hwy South														
1	L2	271	5.0	271	5.0	0.266	21.6	LOS B	9.1	67.8	0.54	0.73	0.54	24.4
2	T1	2111	5.0	2111	5.0	* 0.689	19.9	LOS B	35.3	262.1	0.72	0.66	0.72	41.9
Approach		2381	5.0	2381	5.0	0.689	20.1	LOS B	35.3	262.1	0.70	0.66	0.70	40.7
North: Princes Hwy North														
8	T1	1772	5.0	1772	5.0	0.465	11.1	LOS A	18.5	137.2	0.51	0.46	0.51	48.3
9	R2	422	5.0	422	5.0	* 0.692	65.9	LOS E	13.9	103.1	1.00	0.84	1.02	19.7
Approach		2194	5.0	2194	5.0	0.692	21.6	LOS B	18.5	137.2	0.60	0.53	0.61	40.0
West: Brodie Sparks Dr														
10	L2	356	5.0	356	5.0	0.311	41.7	LOS C	9.1	67.4	0.80	0.76	0.80	26.4
12	R2	242	5.0	242	5.0	* 0.706	71.4	LOS F	8.3	61.9	1.00	0.85	1.09	12.4
Approach		598	5.0	598	5.0	0.706	53.7	LOS D	9.1	67.4	0.88	0.80	0.92	20.2
All Vehicles		5173	5.0	5173	5.0	0.706	24.6	LOS B	35.3	262.1	0.68	0.62	0.68	37.3

Figures 5 and 6 indicate that an additional five vehicle movements have been added to the right turn movement from Princes Highway onto Brodie Spark Drive during the Saturday peak hour and the development is expected to result in minimal impact on the average delay and the 95% queue length with no change to the modelled Level of Service.

STP Report Traffic Assignment

The following was provided in Section 8.2 of the STP Report with respect to the trip assignment of the traffic generated by the proposed development which will utilise the southbound right turn movement from Princes Highway onto Brodie Spark Drive to access the development:

The morning and Saturday peak hour trips have been assigned as follows:

- 3% of trips travel **from** the north via Brodie Spark Drive and thence Arncliffe Street;

The afternoon peak hour trips have been assigned as follows:

- 8% of trips travel **from** the north via Brodie Spark Drive and thence Arncliffe Street;

The above trip assignment which was the same as AECOM's *Arncliffe and Banksia Priority Precincts, Strategic Transport Plan*, for the weekday specified that 3% of vehicles are anticipated to utilise the specified route during the weekday AM peak hour with 8% during the weekday PM peak hour, involving a right turn onto Brodie Spark Drive from Princes Highway. STP estimated the Saturday trip assignment based on the AECOM trip assignment.

The modelling results in Figure 1 to 6, utilising the above assignment percentages, show that the intersection can support the projected amount of additional right turn movements onto Brodie Spark Drive for each peak hour being 6, 15 and 5 additional movements (taking into account application of the peak flow factor) during the morning, afternoon and Saturday peak hour, respectively.

Sensitivity Test

Notwithstanding the above, in order to provide an assessment of the potential impacts on the right turn movements and the total intersection operation of Princes Highway and Brodie Spark Drive if additional vehicles were to utilise the right turn movement during the modelled peak hours, a sensitivity test has been undertaken.

Table 1 overleaf provides a summary of the results of the morning peak hour assessment for the following three scenarios:

- Existing;
- Projected (Scenario presented in Transport Impact Assessment); and
- Projected (Alternate scenario with additional right turn traffic).

The alternate scenario provided triples the percentage of the vehicles generated from the subject site which will utilise the right turn movement therefore the morning and Saturday peak hour trips have therefore been assigned as follows:

- 9% of trips travel **from** the north via Brodie Spark Drive and thence Arncliffe Street.

The afternoon peak hour trips have been assigned as follows:

- 24% of trips travel **from** the north via Brodie Spark Drive and thence Arncliffe Street.

A summary of the total inbound development traffic volumes and the sensitivity traffic volumes is provided in **Table 1**.

TABLE 1 TOTAL DEVELOPMENT INBOUND TRAFFIC VOLUMES AND SENSITIVITY TRAFFIC VOLUMES TURNING RIGHT FROM PRINCES HIGHWAY TO BRODIE SPARK DRIVE		
PEAK HOUR	TOTAL INBOUND DEVELOPMENT TRIPS	SOUTHBOUND RIGHT TURN VOLUME FROM PRINCES HIGHWAY TO BRODIE SPARK DRIVE [1]
Weekday AM	153	14
Weekday PM	185	44
Saturday Middy	183	16

[1]: These additional volumes input into the Sidra model. These values are affected by the application of the Peak Flow Factor and the demand output traffic volumes may differ accordingly.

In order to provide a worst-case scenario and for the purposes of the sensitivity test, movements have only been added to the model and not taken from the volumes that have been added to the southbound or northbound Princes Highway through volumes.

Table 2 overleaf provides a summary of the results of the weekday morning peak hour assessment and highlights the northern approach and total intersection results for comparison between each scenario. The total movement summaries for each scenario are attached to this correspondence as **Attachment 1**.

TABLE 2 AM PEAK HOUR – ASSESSMENT OF EFFECTS WITH ADDITIONAL RIGHT TURN MOVEMENTS INTERSECTION OF PRINCES HIGHWAY AND BRODIE SPARK DRIVE					
	Demand Flow	Average Delay	Degree of Saturation	95 th Percentile Queue (m)	Level of Service
Existing					
Princes Highway North					
Through	1060	7.4	0.26	61.3	A
Right	206	58.7	0.34	46.5	E
Total Intersection	4899	18.2	0.84	273.9	B
Projected (Scenario presented in Transport Impact Assessment)					
Princes Highway North					
Through	1082	7.4	0.27	62.9	A
Right (+6 movements with PFF)	212	58.8	0.35	47.7	E
Total Intersection	4958	18.4	0.85	281.7	B
Projected (Alternate scenario with additional right turn traffic)					
Princes Highway North					
Through	1082	7.4	0.27	62.9	A
Right (+15 movements with PFF)	221	58.9	0.36	50.0	E
Total Intersection	4967	18.5	0.85	281.7	B

The additional 14 right turn movements equate to 9% of inbound movements (which becomes a demand flow of 15 with the PFF). **Table 2** above indicates that when triple the previously assessed trips are applied to the right turn movement from Princes Highway to Brodie Spark Drive during the morning peak hour, the average delay and degree of saturation for the right turn movement and the total intersection remain comparable to the previous assessment.

When 14 additional right turn movements are applied, the level of service remains an 'E' for the right turn movement and the overall level of service a 'B' for the intersection.

Additionally, **Table 2** indicates that the application of 14 additional right turn movements results in a 95th percentile queue that reaches 50m, an increase that is less than one vehicle. This queue length is expected to remain within the dedicated 165m right turn lanes on approach to the intersection and is therefore not projected to impact the operation of the southbound through lanes.

Table 3 overleaf provides a summary of the results of the weekday afternoon peak hour assessment and highlights the northern approach and total intersection results for comparison between each scenario. The total movement summaries for each scenario are attached to this correspondence as **Attachment 1**.

TABLE 3 PM PEAK HOUR – ASSESSMENT OF EFFECTS WITH ADDITIONAL RIGHT TURN MOVEMENTS INTERSECTION OF PRINCES HIGHWAY AND BRODIE SPARK DRIVE					
	Demand Flow	Average Delay	Degree of Saturation	95 th Percentile Queue (m)	Level of Service
Existing					
Princes Highway North					
Through	2617	5.5	0.69	119.7	A
Right	591	55.7	0.65	133.7	D
Total Intersection	5706	22.2	0.70	226.0	B
Projected (Scenario presented in Transport Impact Assessment)					
Princes Highway North					
Through	2676	5.6	0.71	127.1	A
Right (+15 movements with PFF)	606	55.9	0.68	138.0	D
Total Intersection	5822	22.4	0.71	233.7	B
Projected (Alternate scenario with additional right turn traffic)					
Princes Highway North					
Through	2676	5.6	0.71	127.1	A
Right (+46 movements with PFF)	637	55.5	0.68	145.0	D
Total Intersection	5853	22.7	0.71	237.4	B

The additional 44 right turn movements equate to 9% of inbound movements (which becomes a demand flow of 46 with the PFF). **Table 3** above indicates that when triple the previously assessed trips are applied to the right turn movement from Princes Highway to Brodie Spark Drive during the afternoon peak hour, the average delay and degree of saturation for the right turn movement and the total intersection remain comparable to the previous assessment.

The level of service when 44 additional right turn movements are applied, the level of service remains a 'D' for the right turn movement and the overall level of service a 'B' for the intersection.

Additionally, **Table 3** indicates that the application of 44 additional right turn movements results in a 95th percentile queue that reaches 145m, an increase of approximately 2 vehicles. This queue length is expected to remain within the dedicated 165m right turn lanes on approach to the intersection and is therefore not projected to impact the operation of the southbound through lanes.

Table 4 overleaf provides a summary of the results of the Saturday peak hour assessment and highlights the northern approach and total intersection results for comparison between each scenario. The total movement summaries for each scenario are attached to this correspondence as **Attachment 1**.

TABLE 4 SAT PEAK HOUR - ASSESSMENT OF EFFECTS WITH ADDITIONAL RIGHT TURN MOVEMENTS INTERSECTION OF PRINCES HIGHWAY AND BRODIE SPARK DRIVE					
	Demand Flow	Average Delay	Degree of Saturation	95 th Percentile Queue (m)	Level of Service
Existing					
Princes Highway North					
Through	1744	11.0	0.46	134.1	A
Right	417	65.6	0.68	101.4	E
Total Intersection	5103	24.5	0.71	256.4	B
Projected (Scenario presented in Transport Impact Assessment)					
Princes Highway North					
Through	1772	11.1	0.47	137.2	A
Right (+5 movements)	422	65.9	0.69	104.9	E
Total Intersection	5173	24.6	0.71	262.1	B
Projected (Alternate scenario with additional right turn traffic)					
Princes Highway North					
Through	1772	11.1	0.47	137.2	A
Right (+16 movements with PFF)	434	64.8	0.68	112.0	E
Total Intersection	5185	24.9	0.71	267.1	B

The additional 16 right turn movements equate to 9% of inbound movements (which becomes a demand flow of 17 with the PFF). **Table 4** above indicates that when triple the previously assessed trips are applied to the right turn movement from Princes Highway to Brodie Spark Drive during the Saturday peak hour, the average delay and degree of saturation for the right turn movement and the total intersection remain comparable to the previous assessment.

When 16 additional right turn movements are applied, the level of service remains an 'E' for the right turn movement and the overall level of service a 'B' for the intersection.

Additionally, **Table 3** indicates that the application of 16 additional right turn movements results in a 95th percentile queue that reaches 112m, an increase of approximately 2 vehicles. This queue length is expected to remain within the dedicated 165m right turn lanes on approach to the intersection and is therefore not projected to impact the operation of the southbound through lanes.

CONCLUDING STATEMENT

While the comment provided stated that the turning movements from Princes Highway to Brodie Spark Drive were "unchanged", the results in the STP Report as highlighted in this letter, had modelled additional right turn movements correctly and the results showed differences. The results projected minimal impact on the intersection operation, specifically the right turn movement between Princes Highway and Brodie Spark Drive.

The assignment of traffic as provided within the STP Report was the same as AECOM's *Arncliffe and Banksia Priority Precincts, Strategic Transport Plan*, for the weekday AM which projected 3% of inbound vehicles generated by the development will perform a right turn onto Brodie Spark Drive in the morning peak hour and 8% during the afternoon peak hour. STP estimated the Saturday peak hour based on the AECOM trip assignment.

A sensitivity test was performed as summarised in this letter in which the percentage of vehicles generated by the subject site that will utilise a right turn at Brodie Spark Drive was tripled during the morning, afternoon and Saturday peak hours. This resulted in 9% of inbound vehicles generated by the development performing a right turn onto Brodie Spark Drive in the morning and Saturday peak hours and 24% during the afternoon peak hour.

The sensitivity test results indicated that even with tripling the percentage of vehicles utilising the southbound right turn from Princes Highway to Brodie Spark Drive, the intersection is projected to continue to operate with comparable average delays and degree of saturation, the same level of service with minimal impact on queues within the dedicated right turn lanes.

Submitted for your consideration.

Yours sincerely,



Morgan Stanbury
Director
Traffic Engineer

Enclosed: Attachment 1 – SIDRA Movement Summaries – Assessment of Effects with Additional Right Turn Movements

APPENDIX 1

MOVEMENT SUMMARY

 **Site: 101 [Princes Hwy and Brodie Sparks Dr (Site Folder: AM Projected Scenario North)]**  **Network: N101 [AM Projected Scenario North (Network Folder: Projected Scenario)]**

AM Projected - 1

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Princes Hghwy South														
1	L2	129	5.0	129	5.0	0.120	17.8	LOS B	3.6	27.1	0.45	0.69	0.45	27.2
2	T1	2907	5.0	2907	5.0	* 0.851	10.9	LOS A	38.0	281.7	0.58	0.54	0.58	48.5
Approach		3037	5.0	3037	5.0	0.851	11.2	LOS A	38.0	281.7	0.57	0.55	0.57	48.0
North: Princes Hghwy North														
8	T1	1082	5.0	1082	5.0	0.270	7.4	LOS A	8.5	62.9	0.38	0.34	0.38	51.7
9	R2	221	5.0	221	5.0	0.363	58.9	LOS E	6.7	50.0	0.93	0.77	0.93	18.0
Approach		1303	5.0	1303	5.0	0.363	16.2	LOS B	8.5	62.9	0.47	0.41	0.47	41.9
West: Brodie Sparks Dr														
10	L2	416	5.0	416	5.0	0.444	46.9	LOS D	12.6	93.3	0.86	0.78	0.86	21.6
12	R2	212	5.0	212	5.0	* 0.837	81.4	LOS F	7.9	58.7	1.00	0.98	1.31	10.8
Approach		627	5.0	627	5.0	0.837	58.5	LOS E	12.6	93.3	0.91	0.85	1.01	17.8
All Vehicles		4967	5.0	4967	5.0	0.851	18.5	LOS B	38.0	281.7	0.59	0.55	0.60	40.2

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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Princes Hghwy South											
P11	Stage 1	145	64.5	LOS F	0.6	0.6	0.96	0.96	228.0	212.5	0.93
P12	Stage 2	145	64.5	LOS F	0.6	0.6	0.96	0.96	226.3	210.3	0.93
West: Brodie Sparks Dr											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	235.7	222.8	0.95
All Pedestrians		343	64.5	LOS F	0.6	0.6	0.96	0.96	228.4	213.1	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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MOVEMENT SUMMARY

Site: 101 [Princes Hwy and Brodie Sparks Dr (Site Folder: PM Projected Scenario North)]

Network: N101 [PM Projected Scenario North (Network Folder: Projected Scenario)]

PM Projected - 1

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %	[Veh. veh			Dist] m	v/c				
South: Princes Hghwy South														
1	L2	316	5.0	316	5.0	0.571	30.8	LOS C	13.6	101.2	0.69	0.77	0.69	19.5
2	T1	1682	5.0	1682	5.0	0.677	27.6	LOS B	32.0	237.4	0.79	0.71	0.79	37.5
Approach		1998	5.0	1998	5.0	0.677	28.1	LOS B	32.0	237.4	0.78	0.72	0.78	35.6
North: Princes Hghwy North														
8	T1	2676	5.0	2676	5.0	* 0.709	5.6	LOS A	17.1	127.1	0.31	0.29	0.31	53.5
9	R2	637	5.0	637	5.0	0.678	55.5	LOS D	19.5	145.0	0.96	0.85	0.96	22.1
Approach		3313	5.0	3313	5.0	0.709	15.2	LOS B	19.5	145.0	0.44	0.40	0.44	44.4
West: Brodie Sparks Dr														
10	L2	293	5.0	293	5.0	0.195	30.5	LOS C	6.2	45.9	0.67	0.70	0.67	30.5
12	R2	249	5.0	249	5.0	* 0.696	70.1	LOS E	8.5	63.1	1.00	0.85	1.08	12.6
Approach		542	5.0	542	5.0	0.696	48.7	LOS D	8.5	63.1	0.82	0.77	0.86	21.0
All Vehicles		5853	5.0	5853	5.0	0.709	22.7	LOS B	32.0	237.4	0.59	0.54	0.59	38.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

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

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

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Princes Hghwy South											
P11	Stage 1	155	64.5	LOS F	0.6	0.6	0.96	0.96	228.0	212.5	0.93
P12	Stage 2	155	64.5	LOS F	0.6	0.6	0.96	0.96	226.3	210.3	0.93
West: Brodie Sparks Dr											
P4	Full	66	64.3	LOS F	0.3	0.3	0.96	0.96	235.5	222.6	0.95
All Pedestrians		376	64.5	LOS F	0.6	0.6	0.96	0.96	228.6	213.4	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.


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MOVEMENT SUMMARY

 Site: 101 [Princes Hwy and Brodie Sparks Dr (Site Folder: SAT Projected Scenario North)]

 Network: N101 [SAT Projected Scenario North (Network Folder: Projected Scenario)]

SAT Projected - 1

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Princes Hghwy South														
1	L2	271	5.0	271	5.0	0.272	22.1	LOS B	9.3	68.9	0.55	0.73	0.55	24.0
2	T1	2111	5.0	2111	5.0	*0.698	20.6	LOS B	36.0	267.1	0.73	0.67	0.73	41.4
Approach		2381	5.0	2381	5.0	0.698	20.8	LOS B	36.0	267.1	0.71	0.67	0.71	40.3
North: Princes Hghwy North														
8	T1	1772	5.0	1772	5.0	0.465	11.1	LOS A	18.5	137.2	0.51	0.46	0.51	48.3
9	R2	434	5.0	434	5.0	*0.683	64.8	LOS E	14.1	104.9	0.99	0.84	1.01	19.9
Approach		2205	5.0	2205	5.0	0.683	21.7	LOS B	18.5	137.2	0.60	0.54	0.61	40.0
West: Brodie Sparks Dr														
10	L2	356	5.0	356	5.0	0.304	40.9	LOS C	9.0	66.7	0.79	0.75	0.79	26.6
12	R2	242	5.0	242	5.0	*0.706	71.4	LOS F	8.3	61.9	1.00	0.85	1.09	12.4
Approach		598	5.0	598	5.0	0.706	53.2	LOS D	9.0	66.7	0.88	0.80	0.91	20.3
All Vehicles		5184	5.0	5184	5.0	0.706	24.9	LOS B	36.0	267.1	0.68	0.63	0.69	37.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

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

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

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Princes Hghwy South											
P11	Stage 1	168	64.6	LOS F	0.6	0.6	0.96	0.96	228.0	212.5	0.93
P12	Stage 2	168	64.6	LOS F	0.6	0.6	0.96	0.96	226.4	210.3	0.93
West: Brodie Sparks Dr											
P4	Full	68	64.3	LOS F	0.3	0.3	0.96	0.96	235.5	222.6	0.95
All Pedestrians		405	64.5	LOS F	0.6	0.6	0.96	0.96	228.6	213.3	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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