in association with:
Gennaoui Consulting

Hillsong

Greater West Development

Transport Study

November 2017

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Hillsong

Greater West Development

Transport Study

Quality Assurance Statement

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1. Introduction

1.1 Background

Hillsong Church is proposing the development of a Place of Public Worship at 1 Water Street, Werrington formally known as Lot 1 Deposited Plan (DP) 1176624. The site has an area of approximately 3.093 hectares (ha) and an aerial image of the site is provided below.

Figure 1: Aerial Image of Proposed Site

The proposed complex will consist of a Main Auditorium, a Youth and Children facilities and a Child Care Centre. The development to be provided in three stages will also include approximately 385 car parking spaces and facilities for coaches.

Vehicular access to and from the proposed site will be through the intersection of Water Street with Great Western Highway.

TDG in association with *Gennaoui Consulting Pty Ltd* has been commissioned to investigate and report on the parking requirements and traffic impact of the proposed development.

1.2 Scope of Report

The report includes the findings and conclusions in respect to the parking requirements and traffic impact of the proposed development on Water Street and the Great Western Highway and on their intersection.

2. The Proposal Parking and Access Evaluation

2.1 The Proposal

The proposed development off Water Street, Werrington, will consist of the following traffic generating activities provided in three stages as illustrated in **Appendix A**:

- Stage 1:
  - Youth ministry (400 persons) converted to Auditorium on Sundays
  - Temporary Child ministry (135 children)
  - Office (12 persons)
  - Parking for 125 spaces
- Stage 2:
  - Main auditorium (1,350 seats)
  - Child ministry (400 children)
  - Youth ministry (increased to 500 persons)
  - City care (15 persons per day)
  - Parking for additional 260 spaces
- Stage 3:
  - Child care centre for 89 children and 19 staff

The activities and maximum patronage at peak times for each Stage 1 and at ultimate development of the proposed facility are summarised in **Table 1**.

	MAXIMUM NO. OF PERSONS AT END OF EACH STAGE			
Activity	**Stage 1**	**Stage 2**	**Stage 3**	**Peak Time of Operation**
Office	12 persons	12 persons	12 persons	Weekdays 8.0 to 5.0pm
Main Auditorium	400 persons	1,350 persons	1,350 persons	Busiest on Sundays
Child Ministry	135 children	400 children	400 children	Busiest on Sundays
City Care		15 persons per day	15 persons per day	Monday - Friday 9.30am - 4.00pm
Youth Ministry	400 persons	500 persons	500 persons	Busiest on Friday 6pm - 10.30pm
Child Care Centre			89 Children + 19 staff	Monday - Friday 7.00am - 6.00pm

Table 1: Activities and Attendance at Proposed Facility

The Place of Worship will operate seven days a week. On occasion, the auditorium will be used for smaller gatherings and some meetings after business hours in the evenings.

2.2 Parking Requirement

2.2.1 Council's DCP Requirements

Council's DCP (2014) stipulates the following parking provisions for the different components of the development:

- Office
  - 1 space per 40m^2 GFA; thus 3 spaces would be required for 92m^2 GFA.
- Place of Worship:
  - 1 space per 4 seats or 1 space per 6 m^2 GFA whichever is the greatest

Thus during Stage 1, with a maximum capacity of 400 seats, some 100 spaces would be required to meet Council's requirement. At completion of Stage 2, about 340 spaces would be required to comply with Council's DCP. This activity is at its busiest on Sundays; children attending the ministry would not generate additional parking.

- Child Care Centre:
  - 1 space per 10 children; and
  - 1 space per staff

From Monday to Friday the Child Care Centre will require some 10 spaces for visitors and 19 spaces for staff. These spaces would be required at completion of Stage 3.

2.2.2 Other Uses

The DCP does not stipulate a requirement for the other proposed activities on site. Peak parking has been based on similar facilities currently operated by Hillsong Church.

2.2.2.1 City Care

Up to 15 persons per day are expected to attend the premises for a few hours during the day mostly for counselling. Assuming a maximum of 10 persons at any one time, then up to 10 car spaces would be required assuming all drive to the site.

2.2.2.2 Youth Ministry

On Friday evenings, a Youth ministry will take place from 6.00 pm to 10.30 pm. It is anticipated that during Stage 1 up to 400 persons would attend, increasing to 500 at the completion of Stage 2.

The Youth Ministry currently take place at the University of Western Sydney. A survey of attendees was carried out on a Friday evening to establish their mode of travel. The result of this survey is summarised in **Table 2**.

Hillsong runs buses to and from the facility at UWS; these are used by 36% of attendees; the remaining youth travel by car with a car occupancy of 3.5 persons/car. Hillsong proposes to increase the number of buses to meet the demand in Stages 2 and 3.

Mode of Travel Youth	Number	Percentage	Stages 1	Stage 2 & 3
Cars	34	19%	37	93
Cars as passengers	84	46%	92	230
Hillsong buses	65	36%	71	178
Total	**183**	**100%**	**200**	**500**

Table 2: Mode of Travel to Youth Ministry

The services at the University will be relocated to the Water Street site. It has therefore been assumed that similar mode of travel would prevail; thus about 75 and 93 car spaces would be required at completion of Stages 1 and 2 respectively as noted in **Table 2**.

2.3 Adequacy of Parking Provisions

Some 385 spaces will be provided as follows:

- Stage 1 - 125 spaces
- Stage 2 – 260 spaces

Bus bays will also be provided as well as a drop off area for buses as illustrated in **Appendix B.** Five (5) drop off spaces will also be provided adjacent to the Child Care Centre.

The proposed provision of 125 spaces in conjunction with stage 1 and the 385 spaces at completion of 2 & 3 respectively exceeds the parking demand of the proposed development as noted in **Table 3**.

FACILITY	STAGE 1			STAGE 3		
	Monday to Friday	**Friday Evening**	**Sundays**	**Monday to Friday**	**Friday Evening**	**Sundays**
Office	12					
Main Auditorium			100			338
Child Care Centre				28		
Youth Ministry		75			93	
City Care				10		
Total	**12**	**75**	**100**	**38**	**93**	**338**
Parking Provision	**125 spaces**			**385 spaces**		

Table 3: Parking Requirements

2.4 Evaluation of Parking Layout

An evaluation of the proposed parking layout prepared by NBRS Architecture and included as **Appendix B** was carried out.

Council's DCP (Penrith, 2014) stipulates the dimensions for the parking layout and spaces should be in accordance with the appropriate Australian Standards (2004). The physical dimensions of the proposed parking layout were compared with the requirements of the Australian Standard (2004) as noted in **Table 4.**

Area	AS 2890.1 – 2004*	Proposal
Car Spaces 90^0 Short Term		
To wall or high kerb	2.5 x 5.4 m	2.5 x 5.5 m
Disabled Parking		
Number	2-3% of spaces	8 spaces
Dimensions	2.4m + 2.4m empty space	2.4m + 2.4m empty space
Aisles		
Two Way Aisle	5.8m	min 6.0m

Table 4: Comparison of Parking Requirements with Proposal

The parking layout and dimensions satisfy all the requirements of the Australian Standards (2004).

The Australian Standards (2004) requires the designation of two (2) to three (3) percent of available spaces as "parking for the disabled". Eight (8) spaces have been designated as such and designed accordingly. If necessary additional such spaces could be provided.

2.5 Vehicular Access to the Site

During Stage 1, access to the site will be provided access to the site will be off Water Street via an 11.0m wide driveway. The driveway would accommodate large rigid trucks and coaches. Access to the Stage 1 parking area will be via a temporary driveway as shown in **Appendix B**.

In conjunction with Stage 2 of the development, a secondary access, 6.0m in width will be also provided off Lander Street (not yet constructed) along the eastern boundary. A third access will also be provided off Lander Street via a combined 8.0m wide driveway which will then be used by trucks and coaches.

The three driveways will comply with the AS 2890.1 (2004).

All vehicles would enter and exit the site in a forward direction.

3. Assessment of Traffic Conditions

3.1 Approach Roads

The proposed development will be situated at 1 Water Street, Werrington to the north of the Great Western Highway. All vehicular access to and from the proposed development will be via the Great Western Highway and Water Street.

East of Water Street, the Great Western Highway has a six-lane divided carriageway, which reduces to a four lane carriageway west of Water Street. An exclusive right turn bay is also provided at Water Street. Water Street has a four (4) lane carriageway with parking permitted on both sides.

The intersection of Water Street with the Great Western Highway is controlled by the T-junction rule.

Bus services provide the major public transport option to the site with bus stops at the Great Western Highway in vicinity of Water Street. The proposed development is situated about 1.7km walking distance to the Werrington Railway Station.

It is understood that Council plans to construct Lander Street, adjacent to the site, as a Collector road to provide access from the Great Western Highway to the area bounded by Werrington Road, the railway line and the Cobham Juvenile Justice Centre. It will provide a T junction at Great Western Highway some 85m east of Water Street. Whilst not confirmed with Council or RMS it has been assumed that traffic signals would control this new intersection.

3.2 Trip Generation

The RTA Guide to Traffic Generating Developments (2002) does not include peak hour rates for this type of development, except for Child Care centres. Therefore, in order to assess the worst case traffic impact scenario, the following approach was used to estimate the appropriate trip generation of each facility.

3.2.1 Child Care Centre

The Child Care Centre would cater for 89 children and operate on weekdays from 7.00am to 6.00pm. The guidelines for traffic generation development published by the RTA (2002), included in **Table 5**, were used to estimate the number of trips likely to be generated by the proposed long day Childcare centre.

Time Period	Peak Hourly Generation Rates *	During Peak Hour
7.00 to 9.00 am	0.8 vehicle trips/child	71
2.30 to 4.00 pm	0.3 vehicle trips/child	27
4.00 to 6.00 pm	0.7 vehicle trips/child	62

Table 5: RTA Trip Generation of Proposed Childcare Centre
* source: RTA (2002)

The proposed development is thus expected to generate some 71, 27 and 62 vehicle trips during the morning, afternoon school and afternoon peak hours respectively as noted in **Table 4.**

3.2.2 City Care

Some 15 persons are anticipated to attend the development on weekdays (Monday to Friday) for a few hours between 9.30am and 4.00pm. No more than 10 persons are expected to be on site at any one time. Assuming that all drive than no more than 10 trips per hour are expected at different time of the day.

3.2.3 Youth Ministry

Youth ministry services are expected to take place every Friday evenings from 6.00 pm to 10.30 pm; a maximum of 400 and 500 persons could be in attendance at completion of Stages 1 and 2 respectively.

Travel to the development is anticipated to be by car (~64%) and coaches (~36%). A car occupancy of 3.5 persons per car established in section 2.2.2.2. would result in about 75 and 93 cars arriving at the commencement of the service and departing at its conclusion during Stages 1 and stages 2 and 3 respectively. Three to five buses would also access the site at Stage 1 and S2.

3.2.4 Auditorium

At completion of Stage 1, the Auditorium would require on Sundays the provision of about 100 spaces; it has been assumed that 100 cars would arrive at the commencement of a service and depart at the end of a service.

Similarly, at full capacity the main Auditorium would require the provision of about 340 spaces. Thus, it has been assumed that 340 cars would arrive at the commencement of each service and depart at the end of the service.

3.2.5 Overall Trip Generation

The likely trip generation of the proposed development on different days is summarised in **Table 6.**

On this basis, at full completion, the proposed Development would generate from Mondays to Fridays a peak of about 90 trips during the morning and afternoon periods.

ACTIVITY	ARR	DEP	ARR	DEP
Monday To Friday	**AM 8.00 TO 9.00AM**		**PM 4.45 TO 5.45PM**	
Office (Stages 1 to 3)	10	0	0	10
City Care (Stages 2 & 3)	10	6	5	6
Child care Centre (Stage 3)	45	26	22	40
Friday Evening (6.00 to 7.00pm)	**Before Service**		**After Service**	
Youth Ministry (Stage 1)	75	10	10	75
Youth Ministry (Stage 2)	93	12	12	93
Sunday	**Before First Service**		**After First Service**	
Auditorium (Stage 1)	100	10	100*	100
Auditorium (Stage 2)	338	34	338*	338

Table 6: Vehicular Generation of Proposed Activities
**Arrival for subsequent service*

On Friday evenings, a peak of 85 trips would be generated by the Youth Service during the period from 6.00 to 7.00pm and at the completion of the service about 10.30pm. This generation would increase following Stage 2 to about 105 trips.

On Sundays, a number of services of approximately 90 minutes duration will take place. Prior to the commencement of the first service up to 100 cars would be arriving during Stage 1, increasing to 340 cars at completion of Stage 2. The highest trip generation is likely to occur between services, noting there is a 30mn period between services, when cars depart the previous service and cars arrive for the subsequent service.

3.3 Trip Distribution of Proposed Development

An analysis of the postcode of existing members of the congregation likely to patronise the new facility indicated that 76% of households are in postcodes to the East of Water Street and 24% of households are in postcodes to the West of Water St. This distribution was adopted to assign the future traffic to the road network as summarised in **Table 7**.

DIRECTION					
		Arr	**Dep**	**Arr**	**Dep**
Monday-Friday	**Stages 1 & 2**				
From east	76%	15	4	4	4
From west	24%	5	2	1	2
Total	**100%**	**20**	**6**	**5**	**6**
Monday-Friday	**Stage 3**				
From east	76%	49	24	21	42
From west	24%	16	8	6	13
Total	**100%**	**65**	**32**	**27**	**55**

DIRECTION					
		STAGE 1		STAGES 2 & 3	
Friday Evening	**6.00 - 7.00pm**	**Arr**	**Dep**	**Arr**	**Dep**
From east	76%	57	8	71	9
From west	24%	18	2	22	3
Total	**100%**	**75**	**10**	**93**	**12**
Sundays First Service	**9.00 – 10.00am**	**Arr**	**Dep**	**Arr**	**Dep**
From east	76%	76	8	257	26
From west	24%	24	2	81	8
Total	**100%**	**100**	**10**	**338**	**34**
Sundays Second Service	**10.30 – 11.30am**	**Arr**	**Dep**	**Arr**	**Dep**
From east	76%	76	76	257	257
From west	24%	24	24	81	81
Total	**100%**	**100**	**100**	**338**	**338**

Table 7: Approach Routes Trips Distribution

3.4 Traffic Impact of Proposed Development

3.4.1 Existing Traffic Counts

The facility will be operating Monday to Sunday. As discussed above, the highest trip generation of the proposed development will occur on Sunday morning between consecutive services. From Monday to Friday, traffic generation would be much lower peaking on Friday evening when the Youth Ministry would take place.

Traffic counts were carried out at the intersection of Great Western Road with Water Street at Werrington. These counts were carried out on Sunday 27 November 2016 between 9.00 and 1.00pm to coincide with the hours preceding (arriving) and following (departing) a main service. Counts were also carried out on Thursday 1st December 2016, from 7.00 to 9.00am and between 4.00 and 6.00pm. The results of these counts are included in **Appendix C.** A further count was undertaken on a Friday evening in March 2017 from 6.00pm to 7.00pm.

Traffic volumes for the morning and afternoon peak hours on weekdays is summarised in **Table 8**.

Adjacent to the site, traffic volumes along Great Western Highway varied during these periods from about 2800 vph during the afternoon weekday peak to a peak of about 1,630 vph on Sunday.

In the vicinity of the site, Walter Street carried less than 70 vph at all time. Most of this traffic is associated with the Cobham Juvenile Justice Centre.

3.5 Impact on Carriageway Capacity

The traffic generated by the proposed development on weekdays and Sundays was assigned to the road network in accordance with the distribution in **Table 6**. The existing and projected traffic volumes including the trips generated by the proposed development along the approach roads are included in **Table 8** to **10** together with their corresponding levels of service. The concepts of carriageway capacity and Level of Service (LoS) are discussed in **Appendix D** together with the criteria for their assessment.

STREET	LANES	EXISTING						FUTURE STAGE 3					
		AM Peak			PM Peak			AM Peak			PM Peak		
		N/E	S/W	LoS	N/E	S/W	Los	N/E	S/W	LoS	N/E	S/W	LoS
Great Western Highway													
East of Water	4DC	969	1456	A	1422	1436	A	993	1498	A	1460	1457	A
West of Water	4DC	979	1415	A	1399	1435	A	992	1422	A	1405	1447	A
Water Street	4U	57	6	A	6	28	A	112	37	A	33	78	A

Table 8: Carriageway Volumes and Levels of Service on Weekdays

The volume of traffic generated by the proposed development on weekdays will have little effect on the current levels of service of the approach roads. The current very good Level of Service "A" along all roads will continue to prevail on all weekdays.

The existing and future traffic volumes during the evening period, prior to the Youth Service (6.00 to 7.00pm) are summarised in **Table 9.**

STREET	LANES	EXISTING EVENING			STAGE 1			STAGES 2 & 3		
		N/E	S/W	LoS	N/E	S/W	LoS	N/E	S/W	LoS
Great Western Highway										
East of Water	4DC	795	1087	A	799	1114	A	803	1144	A
West of Water	4DC	798	1087	A	806	1088	A	816	1089	A
Water Street	4U	8	5	A	43	10	A	83	15	A

Table 9: Carriageway Volumes and Levels of Service on Friday Evening

The volume of traffic generated by the proposed development on Friday evenings will also have little effect on the current levels of service of the approach roads. The current very good Level of Service "A" along all roads will continue to prevail.

The existing traffic volumes on a Sunday coinciding with period prior to commencement of the service (9.00 to 10.00am) and the period between the first and second service (10.30 to 11.30am) are summarised in **Table 10**.

STREET	LANES	EXISTING 9.00 – 10.00am			STAGE 1			STAGES 2 & 3		
		N/E	S/W	LoS	N/E	S/W	LoS	N/E	S/W	LoS

Great Western Highway										
East of Water	4DC	439	786	A	452	910	A	465	1043	A
West of Water	4DC	439	780	A	478	784	A	520	788	A
Water Street	4U	10	4	A	173	21	A	348	38	A
STREET	**LANES**	**EXISTING 10.30 – 11.30am**			**STAGE 1**			**STAGES 2 & 3**		
		N/E	**S/W**	**LoS**	**N/E**	**S/W**	**LoS**	**N/E**	**S/W**	**LoS**
Great Western Highway										
East of Water	4DC	744	890	A	868	1014	A	1001	1147	A
West of Water	4DC	741	882	A	780	921	A	822	963	A
Water Street	4U	12	7	A	175	170	A	350	345	A

Table 10: Carriageway Volumes and Levels of Service on Sundays

Uninterrupted Flows (Refer to Table C2 in Appendix C)
N/E = Northbound / Eastbound S/W = Southbound / Westbound

The volume of traffic generated by the proposed development on Sundays will not impact the current levels of service of all approach roads. The current very good Level of Service "A" along all roads will continue to prevail. This analysis assumes that the section of Lander Street adjacent to the development is constructed as would be the unmade section of Water Street.

3.6 Impact on Intersection Operation

The critical movement for the assessment of the level of service of a sign (or T-junction) or a roundabout controlled intersection is the one with the highest average delay. The assessment of the level of service of traffic signals is based on the evaluation of the average delay (secs/veh) of vehicles on all approaches. The concepts of intersection capacity and level of service are discussed in **Appendix E** together with criteria for their assessment.

The operation of the intersection of Great Western Highway with Water Street was analysed using the SIDRA computer-modelling program, to assess the effects of the proposed developments on its operation. The results of this analysis are summarised in **Table 11**.

3.6.1 Existing Operation

The analysis of the intersection of Water Street with the Great Western Highway, controlled subject to the T-junction rule, indicates that it currently operates during the morning and afternoon peak hours at a very poor level of service "F"; this is largely due to the very high delays experienced by a very small number of right turning vehicles (no more than 5) out of Water Street. Therefore, in view of this very small number of cars making this manoeuvre no further action is required at this stage.

The right turning movement into Water Street currently operates at a satisfactory level of service "C" or better. All other movements have very good levels of service "A".

TIME PERIOD	RIGHT TURN FROM WATER			RIGHT TURN INTO WATER			RIGHT TURN FROM WATER			RIGHT TURN INTO WATER		
	Vol	Delay	LoS	Vol	Delay	LoS	Vol	Delay	LoS	Vol	Delay	LoS
Weekday	**AM Peak 8.00 to 9.0am**						**PM Peak 4.45 to 5.45 pm**					
Existing	1	>70	F	42	22.4	B	5	>70	F	3	41.7	C
Stage 3	8	>70	F	84	27.4	B	27	>70	F	24	49.7	D
Friday Evening							**Friday Evening 6.00 to 7.00pm**					
Existing							4	>70	F	4	15.2	B
Stage 3							6	>70	F	61	17.9	B
Sundays	**Sunday 9.00 to 10.00am**						**Sunday 10.30 to 11.30 am**					
Existing	1	>70	F	8	14.2	A	1	>70	F	8	12.3	A
Stage 3	9	>71	F	265	>70	F	81	>71	F	265	35.5	C

Table 11. Operational Characteristic of Great Western Hwy/Water St Intersection

3.6.2 Future Operation of Intersection

3.6.2.1 Weekdays Monday to Friday

At the completion of Stage 3, the proposed development will have minimal impact on the operation of the intersection during the morning peak. During the afternoon peak hour, the small number (24 cars) of right turning movement into Water Street would experience higher delays. Nevertheless, the queue generated by these delays is well within the length of the exclusive right turn bay of 140m.

Vehicles with a westbound destination would find it difficult to turn right. These vehicles would most likely turn left into the Great Western Highway, then use Gipps Street and Water Street to access Werrington Road, where they would either right turn to access the signals at Great Western Highway or turn left if their destination is north of the railway line.

3.6.2.2 Friday Evening

The Youth Ministry service on Friday evening would have minimal impact on the intersection, both at completion of Stages 1 and Stages 2 and 3.

3.6.2.3 Sundays

The proposed development would considerably exacerbate the difficulty of right turning out of Water Street, particularly during the period between services. At the end of Stage 1, the number of cars with a westbound direction would increase to about 40 per hour and off course would experience very high delays, and difficulty in making this manoeuvre. These vehicles would most likely turn left into the Great Western Highway, then use Gipps Street and Water Street to access Werrington Road, where they would either right turn to access the signals at Great Western Highway or turn left if their destination is north of the railway line.

At the end of Stage 2, the number of cars with a westbound direction would further increase. At that stage, the installation of traffic signals at the intersection of Water Street with Great Western Highway should be given serious consideration.

3.7 Lander Street Extension

As discussed above, Lander Street is planned by Council to provide access from the Great Western Highway. The construction and extension of Lander Street to the Great Western Highway would necessitate the provision of traffic signals at their junction. However, the extension of Lander Street to the Great Western Highway is not scheduled for a number of years. It would therefore make good sense to install the traffic signals, when required, at Water Street for the following reasons:

- The layout of the existing intersection would easily adapt without further roadworks for the installation of traffic signals; thus reduced costs.
- Water Street is further away from the traffic signals controlling the major intersection of Gipps Street with Great Western Highway.
- It would provide safe and efficient access to all developments north of the Highway earlier than anticipated.

4. Summary and Conclusions

4.1 Summary

Hillsong is proposing the development of a public Place of Worship at 1 Water Street, Werrington. The proposed development will be carried out in three stages and will consists of a main auditorium (1,350 seats), a Child Care Centre (89 children) and a hall for Youth Ministry (500 seats).

The parking demand for the proposed development would vary from about 40 spaces during the week to about 340 spaces on Sundays. The provision of 385 spaces would satisfy the parking demand of the proposed development at all times. The parking layout and dimensions satisfy all the requirements of the Australian Standards (2004).

On weekdays, the proposed development is expected to generate on Friday evenings a peak of 105 trips increasing to about 680 trips on Sundays between services, half of which would be exiting at the completion of the service with the remaining arriving prior to the next service. The volume of traffic generated by the proposed development will have little effect on the current very good Levels of Service "A" along the Great Western Highway and Water Street.

The intersection of Water Street with the Great Western Highway currently operates at a level of service "F". However, this very poor level of service is caused by the very large delays experienced by a very small number (~5) of right turning vehicles out of Water Street. Therefore, in view of this very small number of cars making this manoeuvre no further action is required at this stage.

At completion of Stage 1, the small number of cars with a westbound destination would find it difficult to turn right. These vehicles would most likely turn left into the Great Western Highway, then use Gipps Street and Water Street to access Werrington Road, where they would either right turn to access the signals at Great Western Highway or turn left if their destination is north of the railway line.

At completion of Stage 2, the number of cars with a westbound direction would further increase. At that stage, the installation of traffic signals at the intersection of Water Street with Great Western Highway should be given serious consideration.

4.2 Conclusions

The proposed development satisfies Council's parking requirements. The parking layout is in accordance with the requirements of the Australian Standards. The current very good Levels of Service "A" along the Great Western Highway and Water Street are not likely to be unduly impacted.

The use of Gips Street to access Werrington Road then Great Western Highway to travel west may delay the necessity to provide traffic signals at the junction of Water Street with the Highway.

5. References

Penrith City Council (2014). "*Part C10 Development Control Plan"*. December.

Roads and Traffic Authority of NSW (2002) "*Guide to Traffic Generating Developments*". Issue 2.2. October.

Standards Australia (2004). "AS 2890.1-2004 Parking Facilities Part 1 Off Street car parking."

Appendix A

Proposed Development

NBRSARCHITECTURE.

136864

5000 SETBACK | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 3000 | 3000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000 | 6000

4 / 400 — 27000 — 1 / 400 — 39000

SITE BOUNDARY

5000 SETBACK

SITE BOUNDARY

CUBBY HOUSE - 5 ROOMS - TOTAL 301SQM

RL 26.800

RL 27.250

CHILD CARE

ROOM 5
30KIDS

ROOM 4
20 KIDS

ROOM 3
15 KIDS
60 m²

CLOTHES HANGING

LAUNDRY
10 m²

AWC
SHW
MWC

KITCHEN
22 m²

STAFF OUTDOOR DECK

STAFF ROOM
20 STAFF
38 m²

FWC
3 m²

RACK
3 m²

PRINCIPAL / MEETING / ADMIN

FOYER
65 m²

ROOM 2
12 TODDLERS
61 m²

COT RM
21 m²

COT RM
21 m²

ROOM 1
12 BABIES
60 m²

1:30 GRADIENT

DROP OFF

TREASURE CHEST 3
38 m²

TREASURE CHEST ROOM 4
34 m²

TREASURE CHEST 1
34 m²

TREASURE CHEST FOYER
38 m²

TREASURE CHEST 1
33 m²

STORE

STR

ST
5 m²

K
7 m²

UNISEX WC
23 m²

CHILDRENS MINISTRY

STORAGE BENCH SEAT

ARK HOME ROOM

OP. WALL

PLAYLAND

KIDS WELCOME
145 m²

EGRESS
17 m²

STORE
20 m²

BACK OF HOUSE/LOADING/ STORE
111 m²

LOADING PLATFORM

5mW x 3mH LED SCREEN OVER

STAGE
115 m²

PLATFORM LIFT

1760 | 10 SEATS | 1600 | 16 SEATS | 1605 | 16 SEATS | 1605 | 16 SEATS | 1605 | 10 SEATS | 1780

AUDITORIUM
1350 SEATS

STORE
96 m²

MWC
40 m²

ACC WC
6 m²

PARENTS
57 m²

RESOURCE CENTRE
11 m²

FWC
62 m²

FOYER

CAFE
11 m²

RL 26.500

FORECOURT

STREET TEAM + GARAGE

CAMPAIGN

STORE HOUSE

OFFICE 4

OFFICE 3

OFFICE 2

OFFICE 1

CITYCARE

LUNCH ROOM

STORE

COLD

DRY

FWC

MWC

DWC

C3

C4

C2

C1

RECEPTION

LIFT
8 m²

WASTE AREA

SPRINKLER ROOM
27 m²

RACK ROOM
23 m²

YOUTH MINISTRY
565 m²

YOUTH MINISTRY
500 SEATS

STAGE

CHAIR STORE

STORE

KITCHEN
16 m²

FWC

AWC
6 m²

MWC
21 m²

SLN
1.8²

STAIR

5 / 400

STAGE 3 — STAGE 2 — STAGE 1
WITH STAGE 2 INTERNAL ALTERATIONS

Issue

No.	Date	Description	Chkd
1	03/05/2017	Draft Development Application	AD
2	22/09/2017	For Client Reveiw	AD
4	31/10/2017	Development Application	AD

① METAL ROOF	⑧ PAVING 02		
② FC PAINTED	⑨ POWDER COAT FENCE		
③ ALPOLIC 01	⑩ STAINLESS STEEL FINISH		
④ ALPOLIC 02	⑪ TIMBER FINISH	2100 mm HIGH FENCE	
⑤ GLASS	⑫ SOFTFALL		
⑥ POWDERCOAT	⑬ SYNTHETIC GRASS	EXISTING GROUND LEVEL / MAXIMUM HEIGHT LIMIT	
⑦ PAVING 01	⑭ PRECAST CONCRETE		

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Development Application

Building

Drawing Title
GF ALL STAGES PLAN

Project & Client
Hillsong Greater West Development
at
1 WATER STREET, WERRINGTON, 2747
for
HILLSONG CHURCH

Architect
NBRSARCHITECTURE.
Sydney
61 2 9922 2344 nbrsarchitecture.com

Date 31/10/2017 5:38:27 PM
Scale: 200@A1 or 400@A3
0 2m 4m 6m 8m 10m 12m

Drawing Reference
15467 - 102.3

Revision
4

Appendix B

Parking Layout

NBRSARCHITECTURE.

Cobham Remand Centre

TOTAL: 385 PARKING

GREAT WESTERN HIGHWAY

Water Street
ROAD UPGRADE BY OTHERS

EXISTING ROAD
CONNECT TO EXISTING ROAD

STAGE 1 ROAD UPGRADE

ENTRY
EXIT

Claremont Creek

Sewer Access

SITE BOUNDARY

SERVICE VEHICLE PARKING BAY
STAGE 1A SERVICE AREA
TRUCK REVERSE MANOEUVRE
WASTE BINS
STAGE 1A TEMPORARY DRIVEWAY

CHILD CARE OUTDOOR PLAY
COVERED OUTDOOR PLAY
2 STOREY KIDS MINISTRY
2 STOREY AUDITORIUM
2 STOREY CITY CARE /ADMIN
YOUTH MINISTRY
SINGLE STOREY CHILDCARE
COVERED WALKWAY
CHILDCARE DROP-OFF BAY
BICYCLE PARKING
MAIN ENTRY
BUS DROP-OFF BAY
STAGE 1 TEMPORARY DRIVEWAY

STAGE 2: 157 PARKING
STAGE 2: 103 PARKING
STAGE 1: 125 PARKING

TYPICAL AISLE & BAY DIMENSIONS
2500
6000
5500

BUS PARKING

STAGE 1 TEMPORARY TURNING HEAD - TO BE REMOVED IN STAGE 2
R 17.50
19.6 m

10m SETBACK LINE FROM STREET

STAGE 2 ROAD UPGRADE

ROAD BY OTHERS BEYOND SITE BOUNDARY

STAGE 2 ROAD UPGRADE
Proposed Road (Lander Street Extension)

Wollemi School

Issue

No.	Date	Description	Chkd
1	03/05/2017	Draft Development Application	AD
2	22/09/2017	For Client Reveiw	AD
3	27/10/2017	Site Plan Consultant issue	AD
4	31/10/2017	Development Application	AD

Vehicle Access
Pedestrian Access
Site Boundary
Site Setback
Extent of Carpark & Road Stages

Stage 1 Road & Parking
Stage 1 temporary vehicular access

Development Application

Building

Drawing Title
Proposed Site Plan

Project & Client
Hillsong Greater West Development
at
1 WATER STREET, WERRINGTON, 2747

for
HILLSONG CHURCH

Architect
NBRSARCHITECTURE.
Sydney
61 2 9922 2344
nbrsarchitecture.com

ABN 16 002 247 565 © 2016
Nominated Architects: Geoffery Deane 3766; Andrew Duffin 5602; Garry Hoddinett 5286

Date 31/10/2017 5:38:05 PM
Scale: 500@A1 or 1000@A3
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Drawing Reference
15467 - 101

Revision
4

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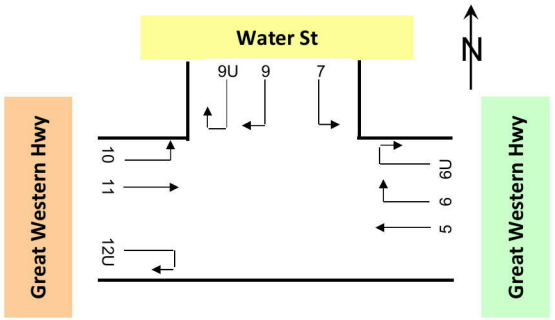
Appendix C

Traffic Volumes Counts

Job No. : N2870
Client : TDG
Suburb : Werrington
Location : Great Western Hwy / Water St

Day/Date : Thu, 1st Dec 2016
Weather : Fine
Description : Classified Intersection Count
: Peak Hour Summary



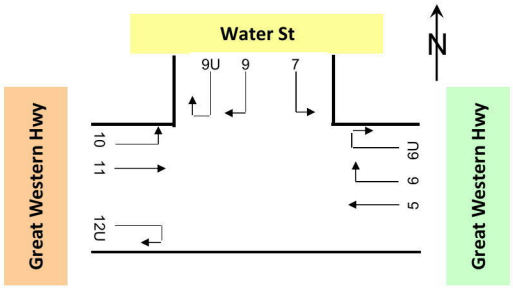
MATRJ Traffic and Trar

Approach		Great Western Hwy				Water St				Great Western Hwy				Grand Total
Time Period		Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total	
8:00	to 9:00	1,408	37	11	**1,456**	6	0	0	**6**	923	47	9	**979**	**2,441**
16:45	to 17:45	1,404	20	12	**1,436**	28	0	0	**28**	1,367	22	10	**1,399**	**2,863**

Approach		Great Western Hwy				Water St				Great Western Hwy				Grand Total
Time Period		Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total	
7:00	to 8:00	868	49	11	**928**	6	3	0	**9**	816	49	18	**883**	**1,820**
7:15	to 8:15	1,023	38	9	**1,070**	5	3	0	**8**	865	43	18	**926**	**2,004**
7:30	to 8:30	1,199	41	12	**1,252**	6	3	0	**9**	917	43	13	**973**	**2,234**
7:45	to 8:45	1,339	38	12	**1,389**	6	2	0	**8**	918	50	11	**979**	**2,376**
8:00	to 9:00	1,408	37	11	**1,456**	6	0	0	**6**	923	47	9	**979**	**2,441**
AM Totals		**2,276**	**86**	**22**	**2,384**	**12**	**3**	**0**	**15**	**1,739**	**96**	**27**	**1,862**	**4,261**
16:00	to 17:00	1,356	25	14	**1,395**	34	0	0	**34**	1,274	26	12	**1,312**	**2,741**
16:15	to 17:15	1,349	22	14	**1,385**	32	0	0	**32**	1,370	21	12	**1,403**	**2,820**
16:30	to 17:30	1,366	20	14	**1,400**	31	0	0	**31**	1,358	20	10	**1,388**	**2,819**
16:45	to 17:45	1,404	20	12	**1,436**	28	0	0	**28**	1,367	22	10	**1,399**	**2,863**
17:00	to 18:00	1,425	21	11	**1,457**	19	0	0	**19**	1,317	20	8	**1,345**	**2,821**
PM Totals		**2,781**	**46**	**25**	**2,852**	**53**	**0**	**0**	**53**	**2,591**	**46**	**20**	**2,657**	**5,562**

Job No. : N2870
Client : TDG
Suburb : Werrington
Location : Great Western Hwy / Water St

Day/Date : Sun, 27th Nov 2016
Weather : Fine
Description : Classified Intersection Count
: Peak Hour Summary



MATR
Traffic and Tr

Approach		Great Western Hwy				Water St				Great Western Hwy				Grand Total
Time Period		Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total	
11:45 to 12:45		880	6	4	**890**	7	0	0	**7**	734	2	5	**741**	1,638

Approach		Great Western Hwy				Water St				Great Western Hwy				Grand Total
Time Period		Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total	Cars	Trucks	Buses	Total	
9:00 to 10:00		693	1	5	**699**	2	0	0	**2**	406	4	4	**414**	1,115
9:15 to 10:15		756	2	5	**763**	3	0	0	**3**	407	4	3	**414**	1,180
9:30 to 10:30		781	2	3	**786**	4	0	0	**4**	431	4	5	**440**	1,230
9:45 to 10:45		776	6	3	**785**	3	0	0	**3**	483	3	5	**491**	1,279
10:00 to 11:00		800	5	3	**808**	2	0	0	**2**	530	3	4	**537**	1,347
10:15 to 11:15		855	6	3	**864**	1	0	0	**1**	581	4	5	**590**	1,455
10:30 to 11:30		881	9	4	**894**	2	0	0	**2**	629	4	5	**638**	1,534
10:45 to 11:45		921	7	4	**932**	3	0	0	**3**	640	2	5	**647**	1,582
11:00 to 12:00		937	8	4	**949**	4	0	0	**4**	649	3	6	**658**	1,611
11:15 to 12:15		882	6	4	**892**	6	0	0	**6**	668	2	7	**677**	1,575
11:30 to 12:30		872	6	4	**882**	5	0	0	**5**	698	1	5	**704**	1,591
11:45 to 12:45		880	6	4	**890**	7	0	0	**7**	734	2	5	**741**	1,638
12:00 to 13:00		862	9	4	**875**	6	0	0	**6**	714	1	4	**719**	1,600
Total		**3,292**	**23**	**16**	**3,331**	**14**	**0**	**0**	**14**	**2,299**	**11**	**18**	**2,328**	**5,673**

Appendix D

Concept of Carriageway Capacity and Level of Service

The capacity of major streets within an urban area can be based on an assessment of their operating Level of Service

Level of service is defined by Austroads as a "qualitative measure of the effects of a number of features, which include speed and travel time, traffic interruptions, freedom to manoeuvre, safety, driving comfort and convenience, and operating costs. Levels of service are designated from A to F from best (free flow conditions) to worst (forced flow with stop start operation, long queues and delays) as follows:

***LEVELS OF SERVICE**

A - Free flow (almost no delays);

B - Stable flow (slight delays);

C - Stable flow (acceptable delays);

D - Approaching unstable flow (tolerable delays);

E - Unstable flow (congestion; intolerable delays); and

F - Forced flow (jammed).

A service volume, as defined by Austroads, is the maximum number of vehicles that can pass over a given section of roadway in one direction during one hour while operating conditions are maintained at a specified level of service. It is suggested that ideally arterial and sub-arterial roads should not exceed service volumes at level of service C. At this level, whilst most drivers are restricted in their freedom to manoeuvre, operating speeds are still reasonable and acceptable delays experienced. However, in urban situations, arterial and sub-arterial roads operating at Level of Service D are still considered adequate. Traffic Volumes along urban roads with interrupted and uninterrupted flow conditions are included in Table D1 and D2 respectively.

	DESCRIPTION	LEVEL OF SERVICE					
		A	B	C	D	E	F
2U	2 Lane Undivided	540	630	720	810	900	F
4UP	4 Lane Undivided with Two Parking Lanes	540	630	720	810	900	F
4U	4 Lane Undivided with Some Parking	900	1050	1200	1350	1500	O
4UC	4 Lane Undivided with Clearways	1080	1260	1440	1620	1800	R
4D	4 Lane Divided with Clearways	1140	1330	1520	1710	1900	C
6U	6 Lane Undivided	1440	1680	1920	2160	2400	E
6D	6 Lane Divided with Clearway	1740	2030	2320	2610	2900	D

Table D1: Level of Service Interrupted Flow Conditions along Urban Roads (One Way Hourly Volumes)

	DESCRIPTION	LEVEL OF SERVICE					
		A	B	C	D	E	F
2U	2 Lane Undivided	760	880	1000	1130	1260	F
4U	4 Lane Undivided with Some Parking	1260	1470	1680	1890	2100	O
4UC	4 Lane Undivided with Clearways	1510	1760	2010	2270	2520	R
4DC	4 Lane Divided with Clearways	1600	1860	2130	2400	2660	C
4DCL	6 Lane Undivided with Clearways	2250	2620	3000	3380	3740	E
6DC	6 Lane Divided with Clearway	2440	2840	3250	3660	4060	D

* 40% higher than base volumes in Table F1

Table D2: Level of Service Uninterrupted Flow Conditions along Urban Roads (One Way Hourly Volumes)

Appendix E

Guidelines for Evaluation of Intersection Operation

The RTA has included in the "Guide to Traffic Generating Developments" (Issue 2) a section on the assessment of intersections. The assessment of the level of service of an intersection is based on the evaluation of the following Measures of Effectiveness:

(a) Average delay (seconds/veh) (all forms of control)
(b) Delay to critical movement (seconds/veh) (all forms of control)
(c) Degree of saturation (traffic signals and roundabouts)
(d) Cycle length (traffic signals)

INTANAL was used to calculate the relevant intersection parameters. INTANAL is a software which allows comparisons between different forms of intersection control and different forms of intersection configurations to be readily evaluated. That is at each intersection the priority control, roundabout and signal control options will be examined to determine the most efficient form of control.

The best indicator of the level of service at an intersection is the average delay experienced by vehicles at that intersection. For traffic signals, the average delay over all movements should be taken. For roundabouts and priority control intersections (with Stop and Give Way signs or operating under the T-junction rule) the critical movement for level of service assessment should be that with the highest average delay.

With traffic signals, delays per approach tend to be equalised, subject to any over-riding requirements of signal co-ordination as well as to variations within individual movements. With roundabouts and priority - control intersections, the critical criterion for assessment is the movement with the highest delay per vehicle. With this type of control the volume balance might be such that some movements suffer high levels of delay while other movements have minimal delay. An overall average delay for the intersection of 25 seconds might not be satisfactory if the average delay on one movement is 60 seconds.

The average delay for level of service E should be no more than 70 seconds. The accepted maximum practical cycle length for traffic signals under saturated conditions is 120 - 140 seconds. Under these conditions 120 seconds is near maximum for two and three phase intersections and 140 seconds near maximum for more complex phase designs. Drivers and pedestrians expect cycle lengths of these magnitudes and their inherent delays in peak hours. A cycle length of 140 seconds for an intersection which is almost saturated has an average vehicle delay of about 70 seconds, although this can vary. If the average vehicle delay is more than 70 seconds, the intersection is assumed to be at Level of Service F.

Table E1 sets out average delays for different levels of service. There is no consistent correlation between definitions of levels of service for road links as defined elsewhere in this section, and the ranges set out in Table G1. In assigning a level of service, the average delay to the motoring public needs to be considered, keeping in mind the location of the intersection. For example, drivers in inner-urban areas of Sydney have a higher tolerance of delay than drivers in country areas. Table G1 provides a recommended baseline for assessment.

Level of Service	Average Delay per Vehicle (seconds/veh)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 - 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, required other control mode

Table E1: Level of Service Criteria for Intersections

The figures in Table G1 are intended as a guide only. Any particular assessment should take into account site-specific factors including maximum queue lengths (and their effect on lane blocking), the influence of nearby intersections and the sensitivity of the location to delays. In many situations, a comparison of the current and future average delay provides a better appreciation of the impact of a proposal, and not simply the change in the level of service.

The intersection degree of saturation (DS) can also be used to measure the performance of isolated intersections. At intersections controlled by traffic signals, both queue length and delays increase rapidly as DS approaches 1.0. An upper limit of 0.9 is appropriate. When DS exceeds 0.8 - 0.85, overflow queues start to become a problem. Satisfactory intersection operation is generally achieved with a DS of about 0.7 - 0.8. (Note that these figures are based on isolated signalised intersections with cycle lengths of 120 seconds. In co-ordinated signal systems DS might be actively maximised at key intersections). Although in some situations additional traffic does not alter the level of service, particularly where the level of service is E or F, additional capacity may still be required. This is particularly appropriate for service level F, where small increases in flow can cause disproportionately greater increases in delay. In this situation, it is advisable to consider means of control to maintain the existing level of absolute delay. Suggested criteria for the evaluation of the capacity of signalised intersections based on the Degree of Saturation are summarised in Table E2.

Level Of Service	Optimum Cycle Length (Seconds) (Co)	Volume/Saturation Y	Intersection Degree Of Saturation X
A/B - Very good operation	< 90	< 0.70	< 0.80
C - Satisfactory	90-120	0.70-0.80	0.80-0.85
D - Poor but manageable	120-140	0.80-0.85	0.85-0.90
E/F - Bad, extra capacity required	>140	>0.85	> 0.90

Table E2: Criteria for Evaluating Capacity Of Signalised Intersections*

** Source: Roads & Traffic Authority (2002)*