TRAFFIC AND PARKING IMPACT ASSESSMENT OF A PROPOSED EXPANSION OF PRESIDENT AVENUE PRIVATE HOSPITAL

369-381 President Avenue in Kirrawee

Traffic and Parking Impact Assessment Report

Prepared for: Imagescape Design Studios

N1815947N (Version 3a)

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Suite 195, 79-83 Longueville Road, Lane Cove North NSW 2066

Telephone: 0418 256 674 ***Facsimile: 1300 739 523***
sydney@mltraffic.com.au *www.mltraffic.com.au*

ABN 69 981 485 197

1. INTRODUCTION

ML Traffic Engineers was commissioned by Imagescape Design Studio to prepare a traffic and parking impact assessment of the proposed hospital expansion of President Private Hospital located at 369-381 President Avenue in Kirrawee. Currently, the private hospital is operating.

The entrance and exit to the site are via the President Avenue and Hotham Road.

In the course of preparing this assessment, the subject site and its environs have been inspected, plans of the development examined, and all relevant traffic and parking data collected and analysed.

2. BACKGROUND AND EXISTING CONDITIONS

2.1 Location and Land Use

The development is located east of Gymea Train Stations and west of Kirrawee Train Station. The adjacent land uses are predominantly residential areas. Most traffic that enters and exits the proposed development site will pass through President Avenue or Hotham Road.

Figure 1 presents an aerial view of the development site.

Figure 2 presents the location of the development using street directory and assessed intersection.

Figure 3a and 3b present photographs of the development site.

Figure 1: Location of the development site from an aerial view

Figure 2: Street Map of the Location of the Development Site

Figure 3a: Photograph of President Private Hospital from President Avenue

Figure 3b: Photograph of President Private Hospital from Hotham Road including driveway

Figure 3c: Photograph of Hospital President Avenue driveway

2.2 Road Network

The development is located on and has frontage to both President Avenue and Hotham Road.

President Avenue is an arterial road with two lanes each way with a sign posted speed limit of 60km/hr. The road is divided by a median island adjacent to the Hospital. On-street parking is restricted on the both sides of President Avenue. Figure 4 presents a photograph of President Avenue.

Hotham Road is a local road with one lane each way with a default speed limit of 50km/hr. On-street parking is permitted on both sides of the Hotham Road and is not time restricted. Figure 5 presents a photograph of Hotham Road.

Figure 4: President Avenue Facing West

Figure 5: Hotham Road Facing North

2.3 Intersection Description

As part of the traffic impact assessment, the performance of one nearby intersection were surveyed and assessed:

- Signalised intersection of President Avenue with Hotham Road and North West Arm Road.

This intersection is adjacent to the Hospital.

External traffic travelling to and from the development will have to travel through the above intersection.

The signalised intersection of President Avenue with Hotham Road is a four-leg intersection. All turn movements are permitted. Pedestrian crossings are provided on all approaches. A median island is located on President Avenue. Figure 6 shows the layout of the intersection using SIDRA 9 – an industry standard intersection software. The number on the lane represent the length of a short lane in metres.

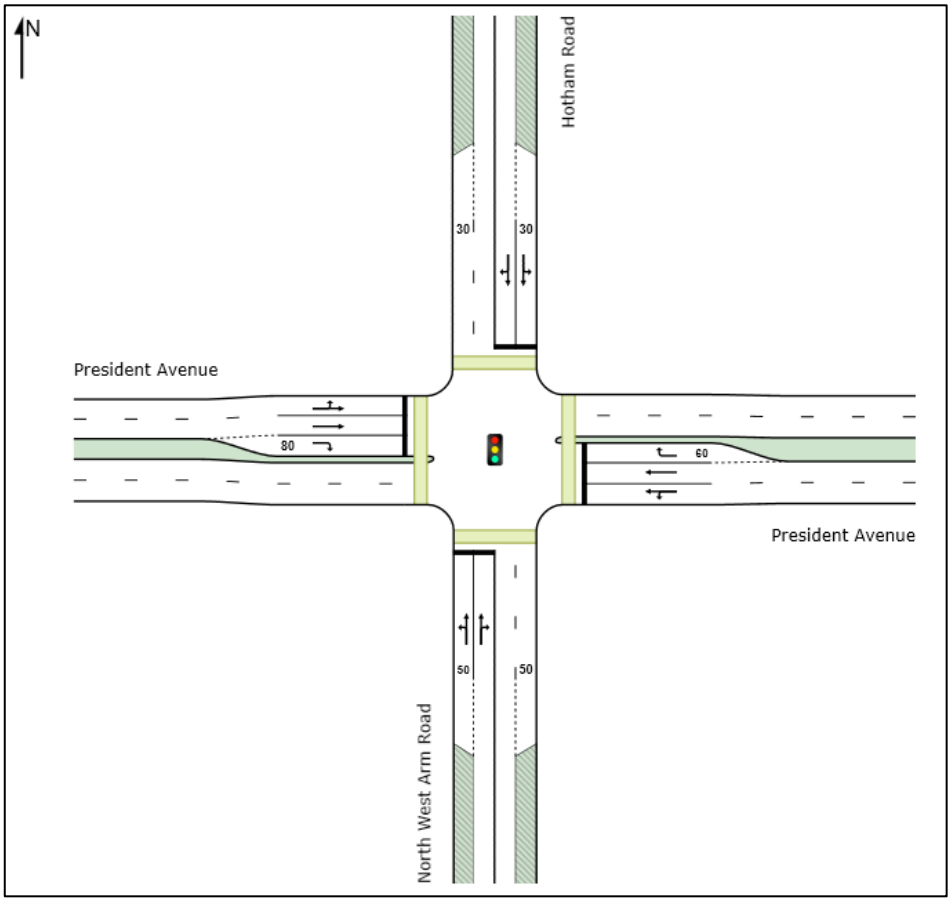

Figure 6: Signalised Intersection of President Avenue with Hotham Road and North West Arm Road

2.4 Existing Traffic Volumes

Traffic volumes were collected as part of this project for the weekday AM and PM peak hours in February 2020 for the surveyed intersection presented. The peak hours are from 8am to 9am and 5pm to 6pm.

Figures 7 and 8 present the existing weekday AM and PM peak hour traffic volumes in vehicle numbers.

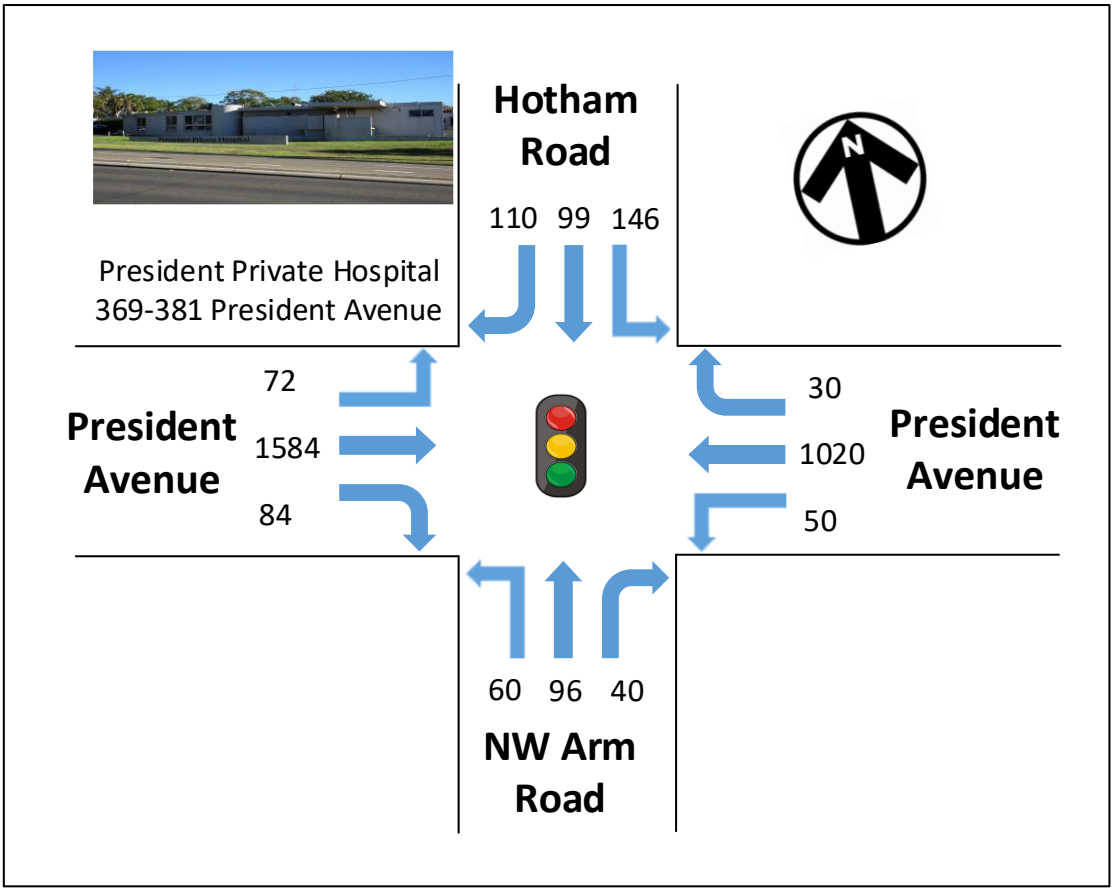

Figure 7: Weekday Existing AM Peak Hour Traffic Volumes

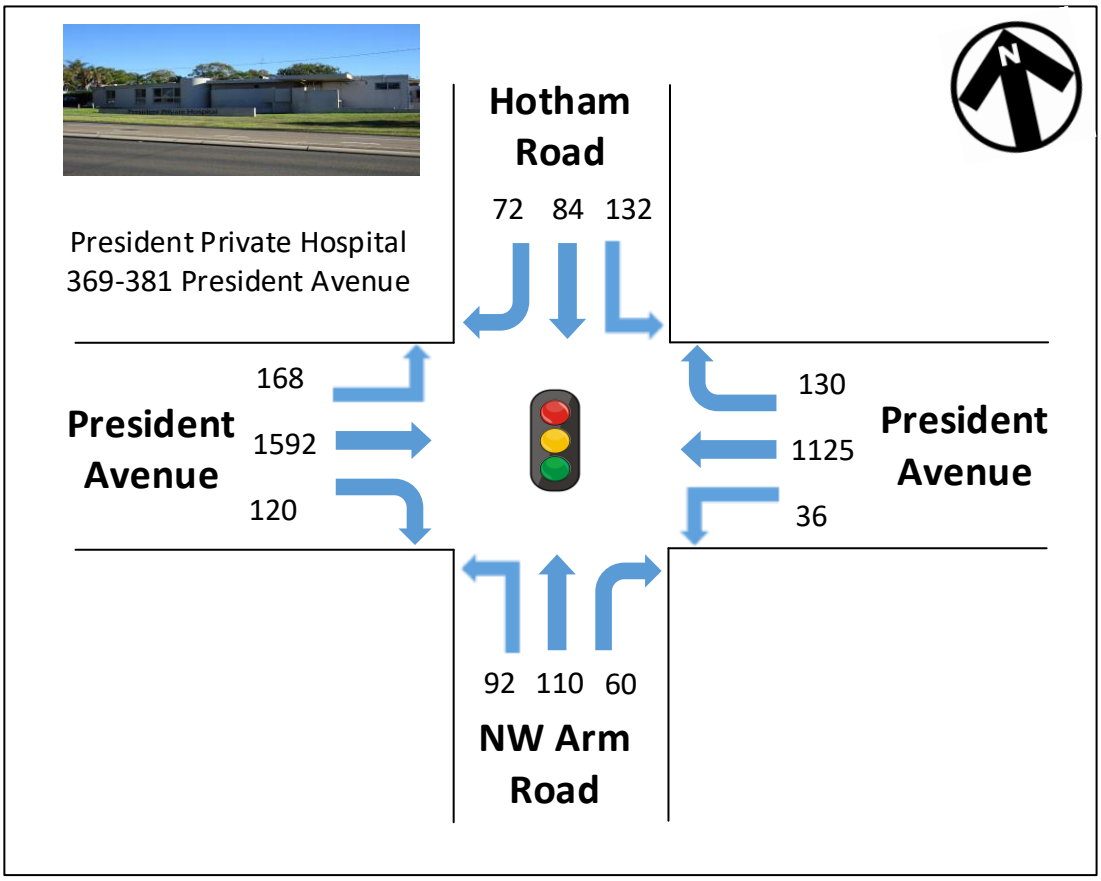

Figure 8: Weekday Existing PM Peak Hour Traffic Volumes

2.5 Intersection Assessment

An intersection assessment and survey has been undertaken for the weekday AM and PM peak hours for the intersection.

The existing intersection operating performance was assessed using the SIDRA 9.0 software package to determine the Degree of Saturation (DS), Average Delay (AVD in seconds) and Level of Service (LoS) at each intersection. The SIDRA program provides Level of Service Criteria Tables for various intersection types. The key indicator of intersection performance is Level of Service, where results are placed on a continuum from 'A' to 'F', as shown in Table 1.

LoS	Traffic Signal / Roundabout	Give Way / Stop Sign / T-Junction control
A	Good operation	Good operation
B	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	Satisfactory	Satisfactory, but accident study required
D	Operating near capacity	Near capacity & accident study required
E	At capacity, at signals incidents will cause excessive delays.	At capacity, requires other control mode
F	Unsatisfactory and requires additional capacity, Roundabouts require other control mode	At capacity, requires other control mode

Table 1: Intersection Level of Service

The Average Vehicle Delay (AVD) provides a measure of the operational performance of an intersection as indicated below, which relates AVD to LOS. The AVD's should be taken as a guide only as longer delays could be tolerated in some locations (i.e. inner-city conditions) and on some roads (i.e. minor side street intersecting with a major arterial route). For traffic signals, the average delay over all movements should be taken. For roundabouts and priority control intersections (sign control) the critical movement for level of service assessment should be that movement with the highest average delay.

LoS	Average Delay per Vehicles (seconds/vehicle)
A	Less than 14
B	15 to 28
C	29 to 42
D	43 to 56
E	57 to 70
F	>70

Table 2: Intersection Average Delay (AVD)

The degree of saturation (DS) is another measure of the operational performance of individual intersections. For intersections controlled by traffic signals both queue length and delay increase rapidly as DS approaches 1. It is usual to attempt to keep

DS to less than 0.9. Degrees of Saturation in the order of 0.7 generally represent satisfactory intersection operation. When DS exceed 0.9 queues can be anticipated.

The results of the intersection assessment are as follows:

Signalised Intersection of President Avenue with Hotham Road and North West Arm Road

- The intersection has an overall LoS B and C for the weekday AM and PM peak hours respectively
- There is existing queues on the right turn movements out of North west Arm Road and Hotham Road

The full SIDRA results are presented in Appendix A for the existing conditions.

2.6 Public Transport

President Private Hospital is located less than 750 metres from both Kirrawee Train Station and Gymea Train Station. The nearest bus stop is approximately 100 metres on President Avenue from the proposed development site. The bus stop is being serviced by 976 and 993 bus routes. These routes provide transport mainly to the local suburbs including Sutherland, Kirrawee, Grays Point, Miranda and Engadine. The development has excellent connections to public transport. Figure 9 shows public transport network map.

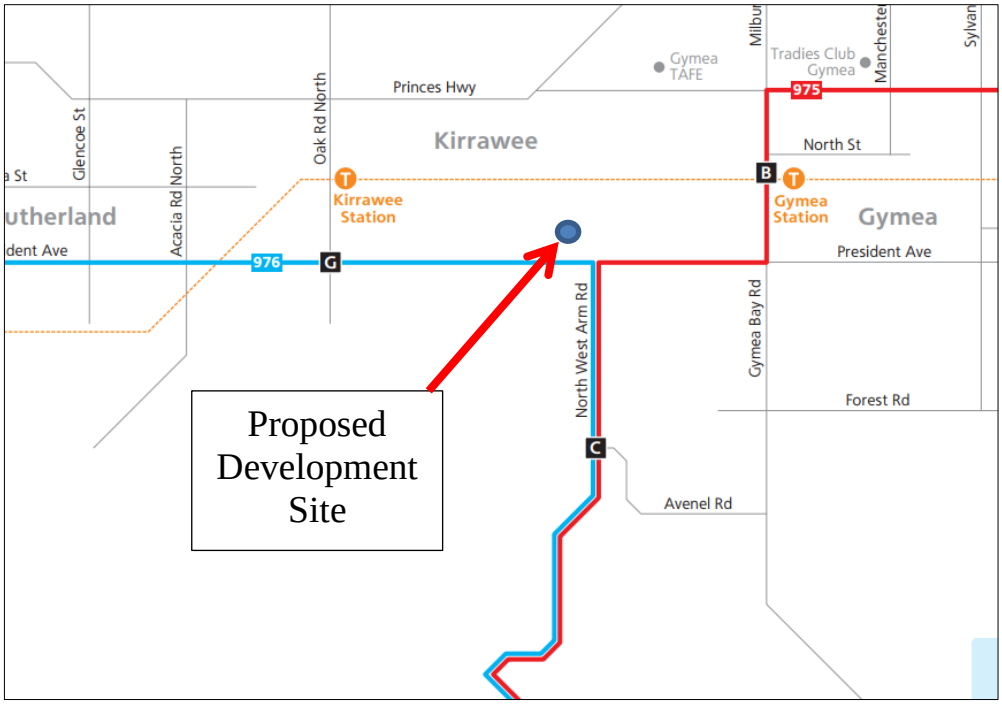

Figure 9: Public Transport Network Map

2.7 On Site Hospital Parking

Vehicle parking is currently available in three separate locations within the existing hospital site at the ground level:

- The northern most car park on Hotham Road has 20 car spaces and is available for staff parking only (vehicle access and egress via Hotham Road)
- The southern car park on Hotham Road has 25 car spaces is available for both staff and visitors, with five spaces marked for doctors and surgeons. An ambulance bay is also located within this car park (vehicle access and egress via Hotham Road)
- The parking area on President Avenue has 20 car spaces is used for patients seeking occupational therapy and injury recovery.
- *The majority of car spaces are not individually allocated but the parking areas are as mentioned above*
- A total of 65 car spaces are provided

An existing truck loading bay is provided in the parking adjacent to President Avenue.

The hospital does not accept emergency operations and hence parking demand is relatively stable. Occasional unexpected consultations occur, but in insignificant occurrences. The majority of patients have booked appointments.

Car parking demand is higher on the weekday than on the weekend:

- Significantly lower administrative staff
- Significantly lower number of surgeries and hence lower medical staff

Peak parking demand is on the weekday with no variance between days. Peak parking demand is during the day. There is lower parking demand in the evening (weekday and evening) since there are fewer administrative staff and no occurrences of surgeries (the hospital does not perform emergency procedures).

A weekday parking survey was undertaken in February 2020 and is presented in Table 3. The results showed that there at least twelve car spaces vacant.

		Weekday Occupancy				
Parking Area	**Car spaces**	9am	11am	1pm	3pm	5pm
Hotham Road Staff	20	18	18	16	16	6
Hotham Road General	25	20	20	19	16	11
President Avenue	17	15	15	15	16	1
Total	62	53	53	50	48	18
Vacant car spaces		9	9	12	14	44

Table 3: On Site Hospital Parking Survey

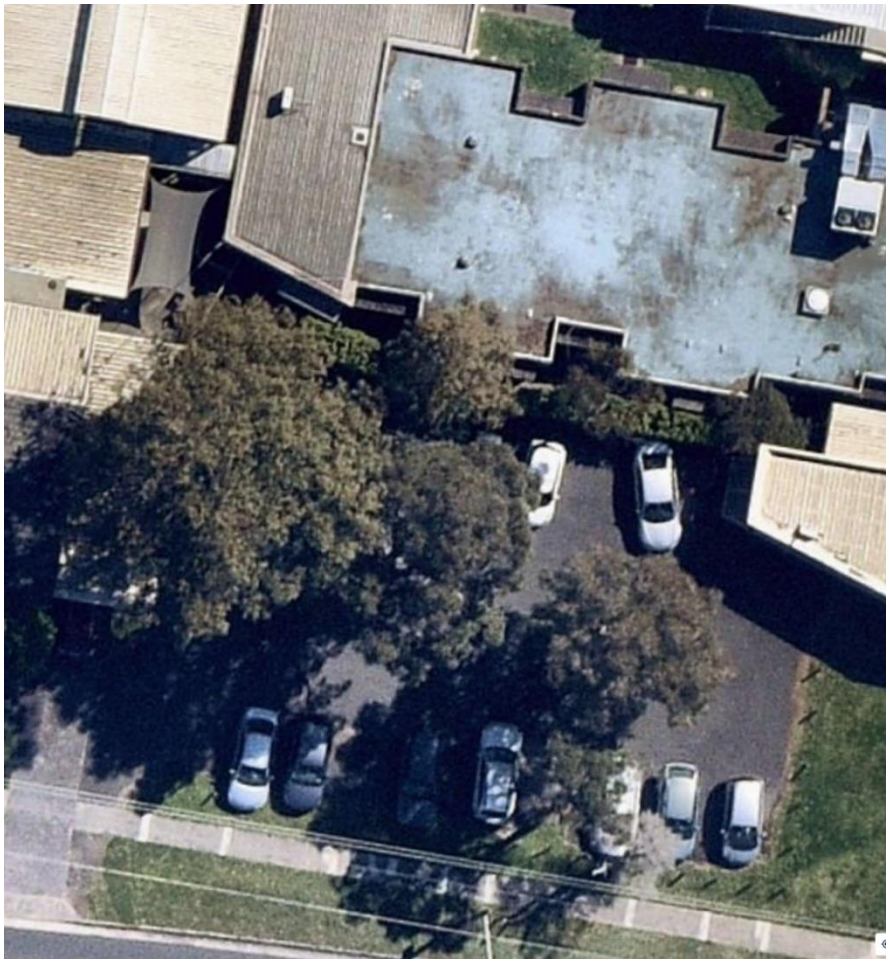

Figure A: Aerial Photograph (October 2021) of President Avenue Showing M (foliage partly covering car spaces)

Figure B: Aerial Photograph (October 2021) of President Avenue Showing Maximum Capacity of 20 car spaces (foliage partly covering car spaces)

2.8 On Street Parking

Site visits also show that there are a small number of vacant car spaces on Hotham Road and more vacant car spaces on Bidurgal Lane. The nearby on street parking is not time restricted.

2.9 Conclusions on the Existing Conditions

Overall, there is spare capacity in the nearby road network.

The on-site parking at the Hospital showed that not all car spaces are occupied with at least twelve vacant car spaces.

Site visit shows that there are small vacant car spaces on Hotham Road for extra number of car trips generated by the proposed development site.

The local area has excellent connections to public transport with staff using the nearby train service and walking to and from the train station.

The adjacent signalised intersection of President Avenue with Hotham Road and NW Arm Road performs well overall with spare capacity

3. PROPOSED HOSPITAL EXPANSION

The anticipated details of the proposed private hospital upon alterations and additions completion are as follows:

Level	Location	Number of Beds
Ground	Surgical	30
First	Rehabilitation	49
	Mental Health	36
Second	Surgical and Medical	31
	Mental Health	36
Total		**182**

Table 4: Number of Beds and Distribution Upon Expansion Completion

Once finalised, the proposed hospital will cater for a maximum of 182 beds.

These staff numbers represent the maximum number of employed by the hospital. The shifts are staggered throughout the day on morning, evening and night shifts. The starting and finalising times for each shift vary according to each staff

- AM shifts: Starting from 6:30AM-8:30AM and finalising at 1:30PM-6:00PM
- PM shifts: Starting 1:30PM and finalising at 9:00PM
- Night shifts: Starting at 9:00PM and finalising at 7:00AM

The estimated staff shift allocation for weekdays and weekends is presented in tables 5a and 5b respectively.

Monday to Friday		Number of Staff		
Location	**Staff Type**	**AM Shift**	**PM Shift**	**Night Shift**
Ground Floor	Nurse	4	3	**2**
	Support	2	2	2
	Clinical	1		
	Doctor	1		
	NUM	1		
	Administration	8	4	
	Kitchen	6	2	
	Café	2	2	
	Pharmacy	2		
First Floor	Nurse	8	6	5
	Support	5	5	5
	Clinical	6	2	
	Doctor	3		
	NUM	2		
Second Floor	Nurse	7	5	4
	Support	4	4	4
	Clinical	4	1	
	Doctor	2		
	NUM	2		
Wellness Centre	Allied Health	6	3	
	Administration	2		
GP Clinic	Doctor	2	2	
	Nurse	1	1	
	Administration	1		
Theatres		16	8	
Radiology		2	2	
Maintenance and Stores		2	1	0
Total		**102**	**53**	**22**

Table 5a: Number of Staff per Shift Upon Expansion Completion During Weekdays

Weekends		Number of Staff		
Location	**Staff Type**	**AM Shift**	**PM Shift**	**Night Shift**
Ground Floor	Nurse	4	2	**1**
	Support	2	2	2
	Administration			
	Kitchen	3	2	
	Café	2	2	
	Pharmacy	2		
First Floor	Nurse	9	5	3
	Support	6	4	4
Second Floor	Nurse	8	4	2
	Support	4	4	4
GP Clinic	Doctor	2	2	
	Nurse	2	2	
	Administration	1	1	
Total		**45**	**30**	**16**

Table 5b: Number of Staff per Shift Upon Expansion Completion During Weekends

It should be noted that the staff allocation shown above is based on the average staff numbers for a normal working day, there will be variations of extremes.

Parking is provided on the ground, basement levels 1,2,3 and 4. Table 6 presents the details of the car parking area, the proposed expansion will provide 168 car spaces.

PROPOSED PARKING

	Standard	Accessible	Drop off	Ambulance	Truck
Basement 3&4	51				
Basement 1&2	77	5		1	
Ground Floor	29	3	3		1
Total Parking	157	8	3	1	1
Total			168		

Table 6: Number of Parking Spaces

Additionally, there is provision of three drop-off bays on the ground level and two ambulances and truck parking bays within the basement levels.

The ground floor parking area can be accessed and egressed from President Avenue and Hotham Road, this will allow for better circulation to find a vacant car space and reduce the need to enter and leave the adjacent public road.

An enter only driveway is also proposed on Hotham Road for patient drop off, exit is via the two-way driveway running off Hotham Road to the north.

Twenty bicycle spaces are provided as well as trip end facilities.

A full scaled plan of the proposed development is provided as part of the Development Application.

4. CAR PARKING CONSIDERATIONS

4.1 Car Parking Requirements

Sutherland Shire Council Development Control Plan 2015 does not provide the minimum car parking rates for a private hospital; however, the *RTA Guide to Traffic Generating Developments 2002* presents the parking requirements for private hospitals, the details are as follows:

Private Hospitals:
The peak parking accumulation (PPA) may be estimated by:

$$PPA = -19.56 + 0.85B + 0.27\ ASDS$$

Where:

- (B) = the number of beds
- (ASDS) = the average number of staff per weekday day shift

Based on a total number of 182 beds and average of 102 staff during the daytime shifts, the estimated parking demand will be 163 car spaces without including short term parking (drop off and pick up bays).

A total of 168 car spaces are provided and the proposed hospital expansion complies with the car parking requirements as set out in the *RTA Guide to Traffic Generating Developments 2002*.

As discussed previously, a Green Travel Plan is prepared and will be implemented. The implementation of the Green Travel Plan for staff will assist in reducing staff private car travel and car parking demand. The hospital will provide for bicycle storage and end of journey facilities on the basement level 2, encouraging staff to use sustainable travel modes. The use of higher more sustainable modes will need to take into account the three work shifts (AM, PM and Overnight) and the staff respective circumstances. Night shift workers are less likely to use public transport when there are sufficient number of car spaces and frequency of bus and train services is low.

Additionally, Gymea Train Station is within walking distance of the Hospital and staff are using public transport as shown by the parking survey undertaken on the hospital's exiting car parking areas (See Section 2.7).

Social and financial incentives may be required in implementing a Green Travel Plan. A Green Travel Plan conditioned as part of a Development Consent. The

existing transport modes used would be surveyed and a target would then nr determined.

4.2 Bicycle Parking Requirements

The hospital provides twenty bicycle car spaces and trip end facilities. Council's Development Control Plan requirements is seventeen and no trip end facility .

5. VEHICLE TRAFFIC IMPACT CONSIDERATIONS

5.1 Traffic Generation

The *NSW RTA Guide to Traffic Generating Development 2002* publishes a model which can be to estimate the trip generation during the morning (MVT) and evening (EVT) commuter peak hours. The details of model are as follows:

Private Hospitals:

$$MVT = -10.21 + 0.47B + 0.06\ ASDS$$
$$EVT = -2.84 + 0.25B + 0.4\ ASDS$$

Where:

- (B) = the number of beds
- (ASDS) = the average number of staff per weekday day shift

Table 7 presents the estimated total net peak period trips generated by the proposed expansion of President Private Hospital during the AM and PM peak period. The existing trips are calculated based on a supply of 50 beds with a maximum of 55 staff during the weekday day shift.

Table 8 presents the distribution of the generated trips during the AM and PM peak period.

	Number of Beds	Number of Weekday Staff	MVT	EVT
Existing	50	55	17	32
Proposed	182	102	81	83
Net trips			**65**	**52**

Table 7: Net Trips Generated by the Proposed Hospital Expansion in the Weekday AM and PM Peak Hours

Peak Hour	Origin	Destination	Total
AM	13	52	65
PM	41	11	52

Table 8: Distribution of Generated Trips by the Proposed Hospital Expansion in the Weekday AM and PM Peak Hours

5.2 Existing with Additional Hospital Traffic

The following presents the existing and with development traffic volumes for the AM and PM peak hours distributed onto the two intersections with the development traffic. The additional traffic is in red for origin trips and blue for destination trips.

The private hospital site is located to a "Peninsular" to the east where Cronulla is located. The trip distribution takes into account that a large proportion of traffic comes from the west and that there will a reasonable proportion of existing staff living east of Princes Highway (south of Georges River). Moreover, there has been recent and proposed residential apartment developments on President Avenue and on The Boulevarde that would "encourage" staff to live locally.

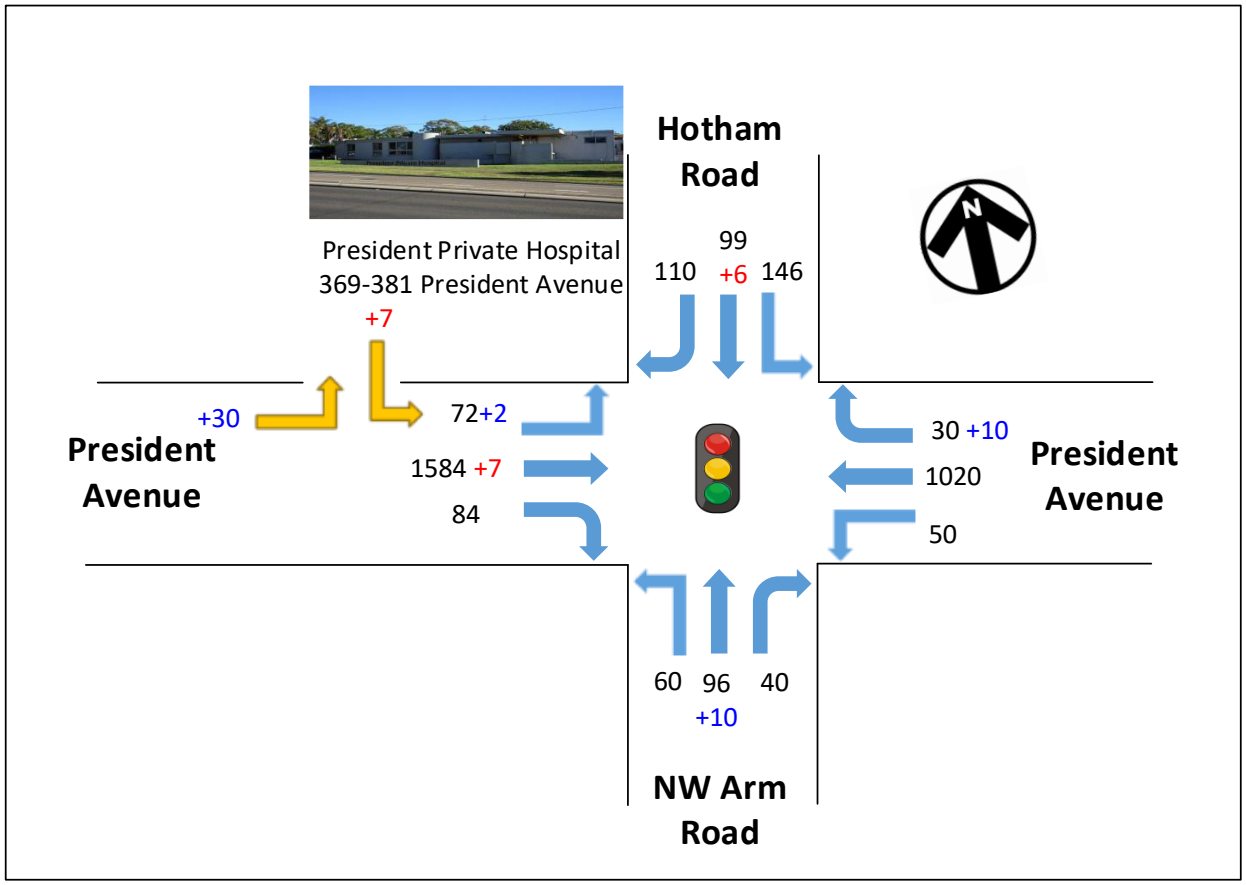

Figure 10: Weekday AM Peak Hour with additional development Traffic in Red for Origin Trips and Blue for Destination Trips

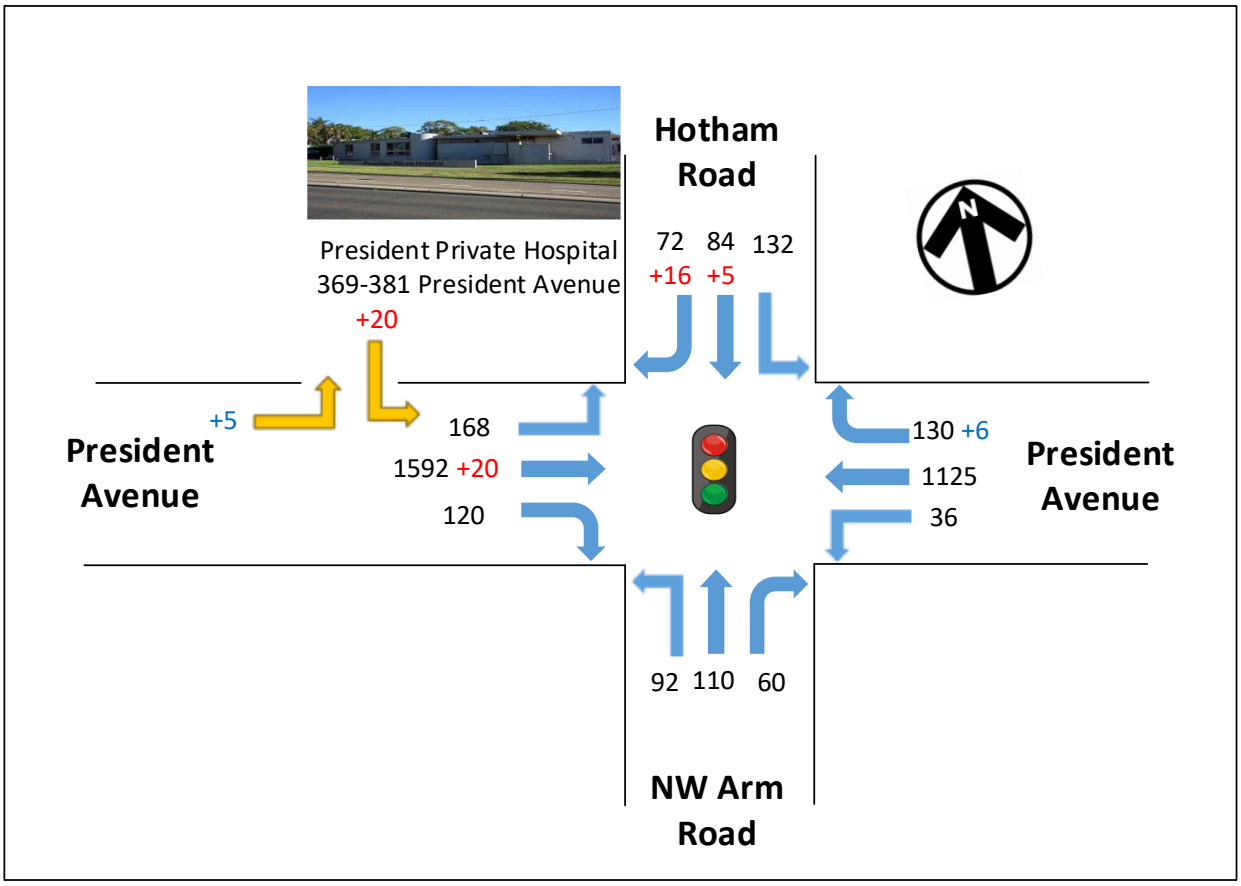

Figure 11: Weekday PM Peak Hour with additional development Traffic in Red for Origin Trips and Blue for Destination Trips

5.3 Intersection Assessment Using Existing Intersection Layout for Existing and Additional Hospital Traffic

This section assesses the following intersections for the existing traffic with the development traffic. The intersection results are as follows:

Signalised Intersection of President Avenue with Hotham Road and North West Arm Road

- The intersection has an overall LoS B and C for the weekday AM and PM peak hours respectively.
- The additional development trips do not change the LoS of the overall intersection.

The full SIDRA results are presented in Appendix B for the existing conditions with the development traffic. The full SIDRA results are presented in Appendix A for the existing conditions.

5.4 Existing with Hospital Traffic and a Ten year Forecast

A ten year forecast has been undertaken of the President Avenue through traffic with a growth rate of one per annum (linear). The private hospital site is located to a "Peninsular" to the east where Cronulla is located. And increase in traffic on President Avenue would not be "through" traffic that occurs occur on Princes Highway.

Figures 12 and 13 show the increase in traffic on President Avenue with the existing and additional hospital traffic.

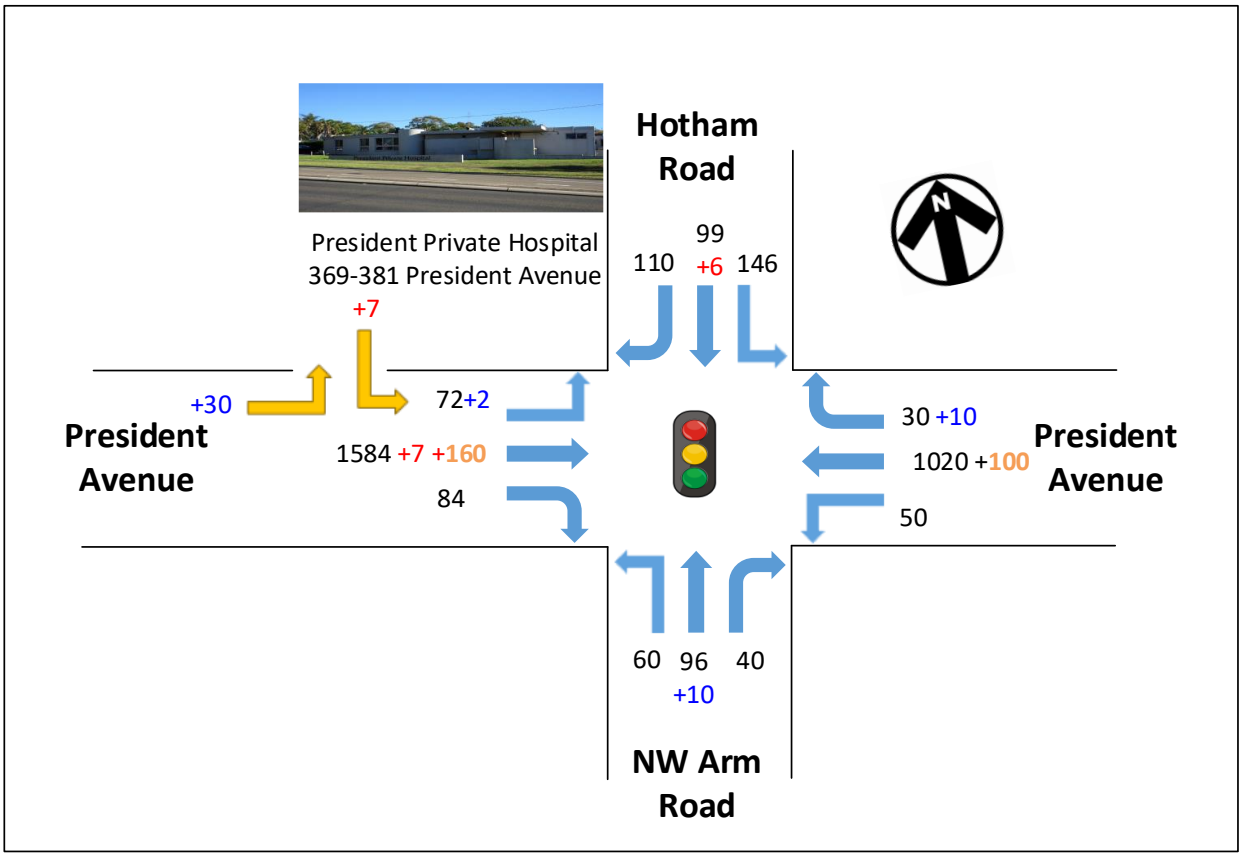

Figure 12: Weekday AM Peak Hour with additional development Traffic in Red for Origin Trips and Blue for Destination Trips with ten year forecast traffic (in orange)

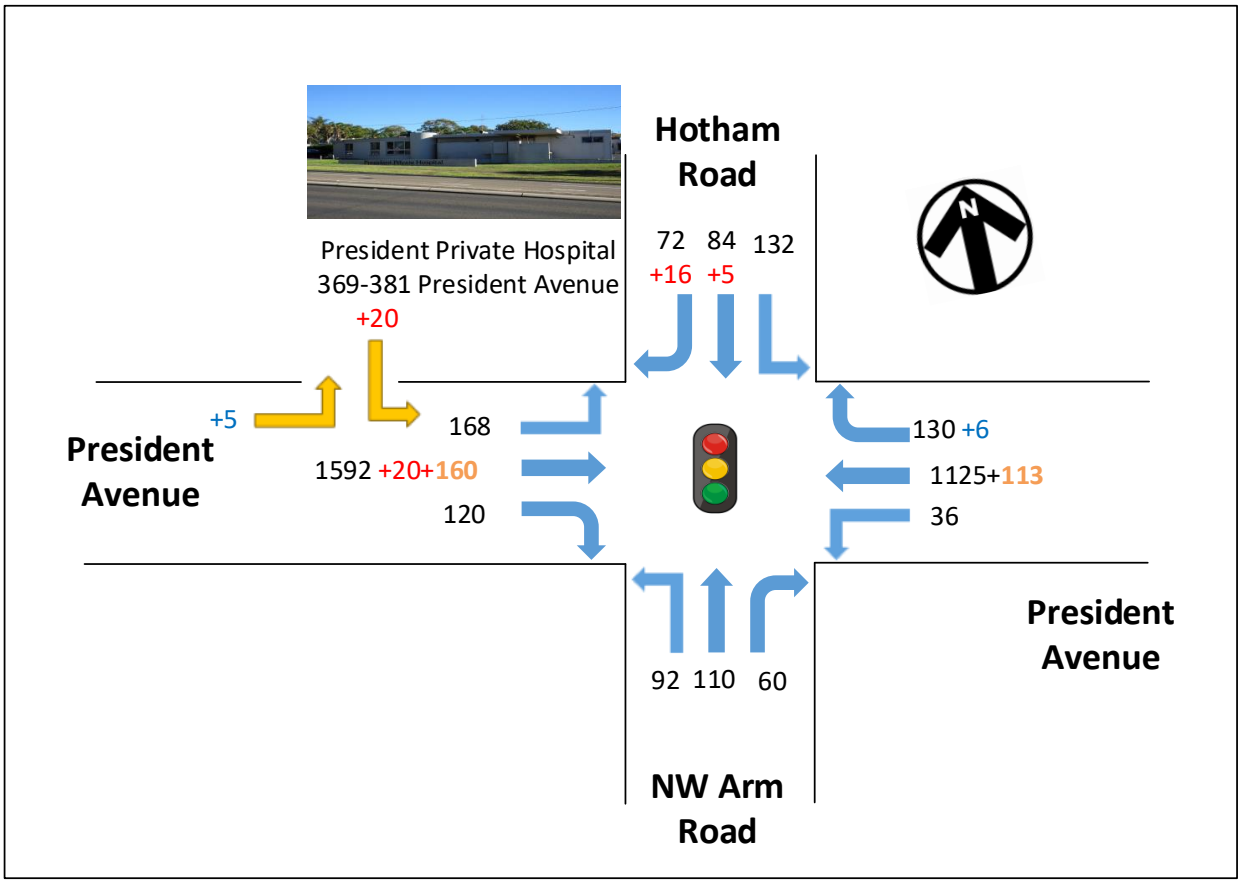

Figure 13: Weekday PM Peak Hour with additional development Traffic in Red for Origin Trips and Blue for Destination Trips with ten year forecast traffic (in orange)

5.5 Intersection Assessment Using Existing Intersection Layout for Existing with Additional Hospital Traffic and Ten Year Background Traffic Growth

This section assesses the following intersections for the existing traffic with the development traffic. The intersection results are as follows:

Signalised Intersection of President Avenue with Hotham Road and North West Arm Road

- The intersection has an overall LoS C and D for the weekday AM and PM peak hours respectively.

The intersection LoS is considered overall acceptable.

The full SIDRA results are presented in Appendix C.

6. CONCLUSIONS

Based on the considerations presented in this report, it is considered that:

Parking

- Overall, the proposed hospital expansion complies with the parking demand as per the *RTA Guide to Traffic Generating Developments.*
- There is provision of three patient drop off bays on the ground floor and four service bays for the use of ambulance and trucks
- The implementation of a Green Travel Plan will assist in reducing staff car parking demand

Traffic

- The proposed expansion is a low trip generator in the AM and PM peak hours.
- The additional development trips can be accommodated in the nearby intersection without significantly affecting the performance or creating any additional delays or queues.
- There are no traffic engineering reasons why a development consent for the proposed expansion of President Private Hospital at 369-381 President Avenue in Kirrawee should be refused.

APPENDIX A - SIDRA INTERSECTION EXISTING TRAFFIC CONDITIONS

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: North West Arm Road														
1	L2	60	0	60	0.0	0.373	44.2	LOS D	2.4	16.5	0.98	0.75	0.98	23.1
2	T1	96	0	96	0.0	* 0.809	44.9	LOS D	5.9	41.5	1.00	0.96	1.36	23.5
3	R2	40	0	40	0.0	0.809	49.4	LOS D	5.9	41.5	1.00	0.96	1.36	25.6
Approach		196	0	196	0.0	0.809	45.6	LOS D	5.9	41.5	0.99	0.89	1.25	23.9
East: President Avenue														
4	L2	50	0	50	0.0	0.500	17.8	LOS B	12.9	90.2	0.67	0.61	0.67	40.9
5	T1	1020	0	1020	0.0	0.500	12.0	LOS A	12.9	90.6	0.67	0.60	0.67	36.9
6	R2	30	0	30	0.0	0.259	38.4	LOS C	1.1	7.7	0.89	0.74	0.89	20.3
Approach		1100	0	1100	0.0	0.500	13.0	LOS A	12.9	90.6	0.67	0.60	0.67	36.4
North: Hotham Road														
7	L2	146	0	146	0.0	0.572	41.1	LOS C	5.6	39.2	0.98	0.80	0.99	19.1
8	T1	99	0	99	0.0	* 0.830	42.9	LOS D	9.1	63.4	1.00	1.00	1.34	23.7
9	R2	110	0	110	0.0	0.830	47.4	LOS D	9.1	63.4	1.00	1.00	1.34	9.1
Approach		355	0	355	0.0	0.830	43.6	LOS D	9.1	63.4	0.99	0.92	1.20	16.8
West: President Avenue														
10	L2	72	0	72	0.0	0.825	25.4	LOS B	30.9	216.3	0.89	0.88	0.96	23.3
11	T1	1584	0	1584	0.0	* 0.825	19.5	LOS B	30.9	216.3	0.86	0.85	0.94	29.9
12	R2	84	0	84	0.0	0.363	25.5	LOS B	2.5	17.4	0.75	0.76	0.75	30.6
Approach		1740	0	1740	0.0	0.825	20.1	LOS B	30.9	216.3	0.85	0.84	0.93	29.7
All Vehicles		3391	0	3391	0.0	0.830	21.7	LOS B	30.9	216.3	0.82	0.78	0.89	28.3

Table A1: Signalised Intersection of President Avenue with Hotham Road and North West Arm Roam During the Weekday AM Peak Hour

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: North West Arm Road														
1	L2	92	0	92	0.0	0.584	40.9	LOS C	3.3	23.2	1.00	0.80	1.07	24.1
2	T1	110	0	110	0.0	* 1.035	126.5	LOS F	13.3	93.4	1.00	1.76	3.21	12.0
3	R2	60	0	60	0.0	1.035	131.0	LOS F	13.3	93.4	1.00	1.76	3.21	13.5
Approach		262	0	262	0.0	1.035	97.5	LOS F	13.3	93.4	1.00	1.42	2.46	14.9
East: President Avenue														
4	L2	36	0	36	0.0	0.522	15.7	LOS B	12.1	84.6	0.66	0.60	0.66	42.6
5	T1	1125	0	1125	0.0	0.522	9.9	LOS A	12.1	84.9	0.66	0.59	0.66	39.7
6	R2	130	0	130	0.0	* 1.043	161.8	LOS F	12.2	85.4	1.00	1.69	3.59	6.7
Approach		1291	0	1291	0.0	1.043	25.3	LOS B	12.2	85.4	0.69	0.70	0.95	26.4
North: Hotham Road														
7	L2	132	0	132	0.0	0.829	45.5	LOS D	5.2	36.2	1.00	0.99	1.48	17.9
8	T1	84	0	84	0.0	* 0.955	56.5	LOS E	7.4	52.0	1.00	1.32	2.20	20.6
9	R2	72	0	72	0.0	0.955	61.1	LOS E	7.4	52.0	1.00	1.32	2.20	8.0
Approach		288	0	288	0.0	0.955	52.6	LOS D	7.4	52.0	1.00	1.17	1.87	15.7
West: President Avenue														
10	L2	168	0	168	0.0	0.851	26.0	LOS B	31.6	221.4	0.90	0.93	1.04	22.8
11	T1	1592	0	1592	0.0	0.851	19.9	LOS B	31.6	221.4	0.86	0.90	1.00	29.4
12	R2	120	0	120	0.0	0.524	24.1	LOS B	3.4	23.5	0.80	0.79	0.80	31.3
Approach		1880	0	1880	0.0	0.851	20.7	LOS B	31.6	221.4	0.86	0.89	0.99	29.0
All Vehicles		3721	0	3721	0.0	1.043	30.2	LOS C	31.6	221.4	0.82	0.89	1.15	23.9

Table A2: Signalised Intersection of President Avenue with Hotham Road and North West Arm Road During the weekday PM Peak Hour

APPENDIX B – SIDRA INTERSECTION EXISTING TRAFFIC WITH ADDITIONAL HOSPITAL TRAFFIC

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: North West Arm Road														
1	L2	60	0	60	0.0	0.373	44.2	LOS D	2.4	16.5	0.98	0.75	0.98	23.1
2	T1	106	0	106	0.0	* 0.867	47.9	LOS D	6.6	46.4	1.00	1.05	1.55	22.7
3	R2	40	0	40	0.0	0.867	52.5	LOS D	6.6	46.4	1.00	1.05	1.55	24.8
Approach		206	0	206	0.0	0.867	47.7	LOS D	6.6	46.4	0.99	0.96	1.38	23.3
East: President Avenue														
4	L2	50	0	50	0.0	0.512	18.5	LOS B	13.2	92.7	0.69	0.63	0.69	40.4
5	T1	1020	0	1020	0.0	0.512	12.7	LOS A	13.3	93.2	0.69	0.62	0.69	36.2
6	R2	40	0	40	0.0	0.359	41.9	LOS C	1.6	10.9	0.94	0.76	0.94	19.2
Approach		1110	0	1110	0.0	0.512	14.0	LOS A	13.3	93.2	0.69	0.62	0.69	35.4
North: Hotham Road														
7	L2	146	0	146	0.0	0.524	39.8	LOS C	5.5	38.5	0.97	0.79	0.97	19.5
8	T1	105	0	105	0.0	* 0.790	40.2	LOS C	9.0	62.8	1.00	0.96	1.24	24.5
9	R2	110	0	110	0.0	0.790	44.7	LOS D	9.0	62.8	1.00	0.96	1.24	9.3
Approach		361	0	361	0.0	0.790	41.4	LOS C	9.0	62.8	0.99	0.89	1.13	17.4
West: President Avenue														
10	L2	74	0	74	0.0	0.857	29.7	LOS C	34.7	242.9	0.93	0.95	1.05	20.9
11	T1	1593	0	1593	0.0	* 0.857	23.8	LOS B	34.7	242.9	0.88	0.92	1.02	26.9
12	R2	84	0	84	0.0	0.374	27.1	LOS B	2.6	18.0	0.78	0.77	0.78	29.9
Approach		1751	0	1751	0.0	0.857	24.2	LOS B	34.7	242.9	0.88	0.91	1.01	26.9
All Vehicles		3428	0	3428	0.0	0.867	24.1	LOS B	34.7	242.9	0.84	0.82	0.94	26.9

Table B1: Signalised Intersection of President Avenue with Hotham Road and North West Are Road during the Weekday AM Peak Hour with Additional Hospital Traffic

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: North West Arm Road														
1	L2	92	0	92	0.0	0.584	40.9	LOS C	3.3	23.2	1.00	0.80	1.07	24.1
2	T1	110	0	110	0.0	* 1.035	126.5	LOS F	13.3	93.4	1.00	1.76	3.21	12.0
3	R2	60	0	60	0.0	1.035	131.0	LOS F	13.3	93.4	1.00	1.76	3.21	13.5
Approach		262	0	262	0.0	1.035	97.5	LOS F	13.3	93.4	1.00	1.42	2.46	14.9
East: President Avenue														
4	L2	36	0	36	0.0	0.522	15.7	LOS B	12.1	84.6	0.66	0.60	0.66	42.6
5	T1	1125	0	1125	0.0	0.522	9.9	LOS A	12.1	84.9	0.66	0.59	0.66	39.7
6	R2	136	0	136	0.0	* 1.108	259.9	LOS F	17.8	124.5	1.00	2.02	4.60	4.3
Approach		1297	0	1297	0.0	1.108	36.2	LOS C	17.8	124.5	0.69	0.74	1.07	21.2
North: Hotham Road														
7	L2	132	0	132	0.0	0.829	45.5	LOS D	5.2	36.2	1.00	0.99	1.48	17.9
8	T1	89	0	89	0.0	* 1.085	204.7	LOS F	19.4	135.7	1.00	2.10	4.01	8.2
9	R2	88	0	88	0.0	1.085	209.3	LOS F	19.4	135.7	1.00	2.10	4.01	3.3
Approach		309	0	309	0.0	1.085	138.0	LOS F	19.4	135.7	1.00	1.63	2.93	7.8
West: President Avenue														
10	L2	168	0	168	0.0	0.865	27.9	LOS B	33.8	236.5	0.92	0.97	1.08	21.7
11	T1	1612	0	1612	0.0	0.865	21.8	LOS B	33.8	236.5	0.86	0.93	1.04	28.0
12	R2	120	0	120	0.0	0.524	24.1	LOS B	3.4	23.5	0.80	0.79	0.80	31.3
Approach		1900	0	1900	0.0	0.865	22.5	LOS B	33.8	236.5	0.87	0.92	1.03	27.8
All Vehicles		3768	0	3768	0.0	1.108	41.9	LOS C	33.8	236.5	0.83	0.95	1.30	19.5

Table B2: Signalised Intersection of President Avenue with Hotham Road and North West Arm Road during the Weekday PM Peak Hour with Additional Hospital Traffic

APPENDIX C – SIDRA INTERSECTION EXISTING WITH ADDITIONAL HOSPITAL TRAFFIC AND TEN BACKGROUND GROWTH TRAFFIC

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: North West Arm Road														
1	L2	60	0	60	0.0	0.388	51.5	LOS D	2.8	19.5	0.99	0.75	0.99	21.3
2	T1	106	0	106	0.0	* 0.901	59.3	LOS E	8.0	56.3	1.00	1.11	1.63	20.2
3	R2	40	0	40	0.0	0.901	63.8	LOS E	8.0	56.3	1.00	1.11	1.63	22.2
Approach		206	0	206	0.0	0.901	57.9	LOS E	8.0	56.3	1.00	1.00	1.44	20.9
East: President Avenue														
4	L2	50	0	50	0.0	0.546	19.0	LOS B	17.3	121.4	0.66	0.61	0.66	40.2
5	T1	1120	0	1120	0.0	0.546	12.8	LOS A	17.3	121.4	0.65	0.59	0.65	36.0
6	R2	40	0	40	0.0	0.441	51.4	LOS D	1.9	13.3	0.96	0.76	0.96	16.7
Approach		1210	0	1210	0.0	0.546	14.4	LOS A	17.3	121.4	0.66	0.60	0.66	34.9
North: Hotham Road														
7	L2	146	0	146	0.0	0.533	46.4	LOS D	6.5	45.4	0.97	0.80	0.97	17.7
8	T1	105	0	105	0.0	* 0.890	55.1	LOS D	11.6	81.2	1.00	1.11	1.50	20.8
9	R2	110	0	110	0.0	0.890	59.6	LOS E	11.6	81.2	1.00	1.11	1.50	8.0
Approach		361	0	361	0.0	0.890	52.9	LOS D	11.6	81.2	0.99	0.98	1.29	15.2
West: President Avenue														
10	L2	74	0	74	0.0	* 0.895	35.7	LOS C	49.2	344.2	0.95	0.99	1.10	18.2
11	T1	1751	0	1751	0.0	0.895	30.2	LOS C	49.2	344.2	0.88	0.94	1.05	23.5
12	R2	84	0	84	0.0	0.422	29.8	LOS C	3.0	21.2	0.77	0.78	0.77	28.7
Approach		1909	0	1909	0.0	0.895	30.4	LOS C	49.2	344.2	0.88	0.94	1.04	23.6
All Vehicles		3686	0	3686	0.0	0.901	28.9	LOS C	49.2	344.2	0.82	0.83	0.96	24.4

Table B1: Signalised Intersection of President Avenue with Hotham Road and North West Are Road during the Weekday AM Peak Hour with Additional Hospital Traffic and Ten Year Background Traffic

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: North West Arm Road														
1	L2	92	0	92	0.0	0.584	40.9	LOS C	3.3	23.2	1.00	0.80	1.07	24.1
2	T1	110	0	110	0.0	* 1.035	126.5	LOS F	13.3	93.4	1.00	1.76	3.21	12.0
3	R2	60	0	60	0.0	1.035	131.0	LOS F	13.3	93.4	1.00	1.76	3.21	13.5
Approach		262	0	262	0.0	1.035	97.5	LOS F	13.3	93.4	1.00	1.42	2.46	14.9
East: President Avenue														
4	L2	36	0	36	0.0	0.520	15.7	LOS B	13.2	92.5	0.66	0.60	0.66	42.7
5	T1	1238	0	1238	0.0	0.520	9.8	LOS A	13.2	92.7	0.66	0.59	0.66	39.8
6	R2	136	0	136	0.0	* 1.151	329.8	LOS F	21.1	147.5	1.00	2.22	5.29	3.5
Approach		1410	0	1410	0.0	1.151	40.8	LOS C	21.1	147.5	0.69	0.75	1.10	19.6
North: Hotham Road														
7	L2	132	0	132	0.0	0.829	45.5	LOS D	5.2	36.2	1.00	0.99	1.48	17.9
8	T1	89	0	89	0.0	* 1.085	204.7	LOS F	19.4	135.7	1.00	2.10	4.01	8.2
9	R2	88	0	88	0.0	1.085	209.3	LOS F	19.4	135.7	1.00	2.10	4.01	3.3
Approach		309	0	309	0.0	1.085	138.0	LOS F	19.4	135.7	1.00	1.63	2.93	7.8
West: President Avenue														
10	L2	168	0	168	0.0	0.880	28.9	LOS C	38.9	272.3	0.93	0.99	1.11	21.2
11	T1	1772	0	1772	0.0	0.880	23.0	LOS B	38.9	272.3	0.86	0.94	1.06	27.3
12	R2	120	0	120	0.0	0.574	25.4	LOS B	3.6	24.9	0.83	0.82	0.87	30.7
Approach		2060	0	2060	0.0	0.880	23.6	LOS B	38.9	272.3	0.87	0.94	1.05	27.1
All Vehicles		4041	0	4041	0.0	1.151	43.2	LOS D	38.9	272.3	0.82	0.96	1.30	19.1

Table B2: Signalised Intersection of President Avenue with Hotham Road and North West Are Road during the Weekday PM Peak Hour with Additional Hospital Traffic and Ten Year Background Traffic