ARUP

Subject	John Hunter Hospital - Traffic Review		
Date	13 December 2016	Job No/Ref	239008-01

1 Introduction

1.1 Background

Arup was engaged by Health Infrastructure (HI) to review the operation of the local traffic network surrounding the John Hunter Hospital (JHH) campus, in the context of the information contained in the Environmental Impact Assessment (EIS) for the Newcastle Inner City Bypass –Rankin Park to Jesmond, released in November 2016.

In June 2014 the NSW Government announced it would complete the $280 million Rankin Park to Jesmond section of the Newcastle Inner City Bypass, the final stage of the project. The project could potentially serve John Hunter Hospital by providing a dedicated access point to the north west of the campus. The current alignment as presented in the EIS indicates a half interchange to provide a connection serving the rear of John Hunter Hospital as shown in Figure 1, facilitating access to and from the north.

No access to JHH would be provided for vehicles travelling northbound on the new bypass.

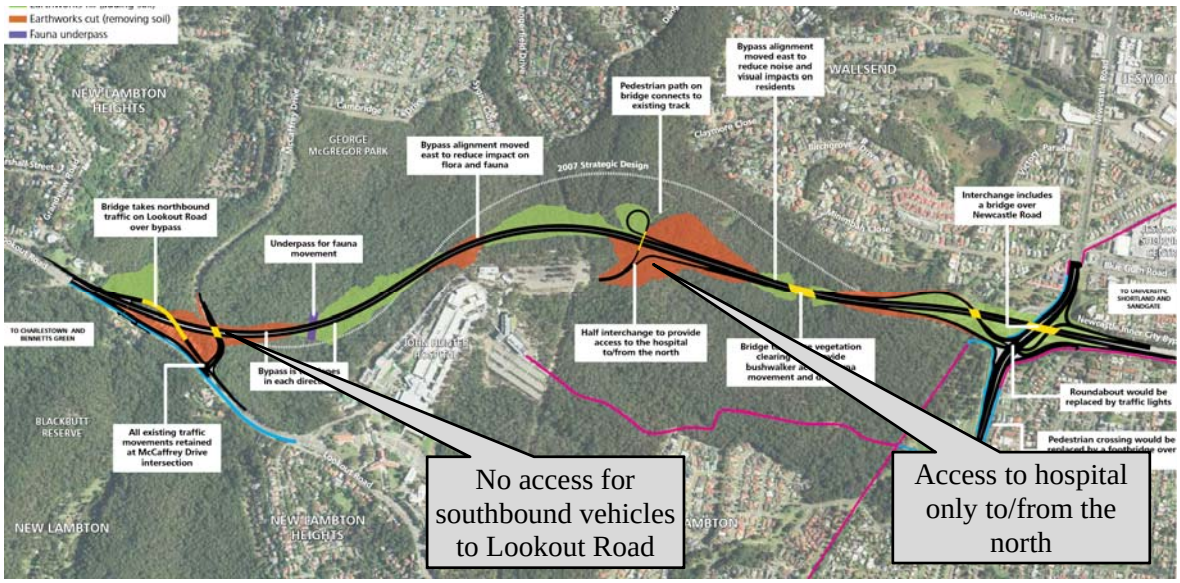


Figure 1 Current Rankin Park to Jesmond Alignment

Source: RMS, 2016

The following documents have been considered in this review:

- Newcastle Inner City Bypass –Rankin Park to Jesmond Environmental impact statement (RMS, 2016)
- Newcastle Inner City Bypass – Rankin Park to Jesmond, Technical Paper 2 – Traffic and Transport Assessment (RMS, 2016)

1.2 Report purpose

This report considers the following items:

- Existing access issues and constraints to John Hunter Hospital, including the operation of intersections along Lookout Road and the internal campus road layout;
- Understand the directional distribution of staff and visitors accessing the hospital to provide an indication of the likely usage of the bypass from different directions;
- Summary of the current bypass proposal and implications for hospital access, including forecasts of the potential usage at each of the site entry points
- The forecast level of traffic generated by the hospital campus due to the likely growth of the site in coming years
- Based on this future level of traffic, consider the implications for the site access and egress. This will include forecasts for traffic movements accessing the campus under two road network scenarios, those being:
  - RMS proposal
  - Full interchange (all movements) from bypass into the campus;
- Implications for the operation of the traffic signals on Lookout Road based on each option considered.

2 Existing Conditions

2.1 Site access

John Hunter Hospital is a large site and accommodates a wide range of transport movements, including:

- pedestrians
- ambulances
- helicopters
- patient transport vehicles
- visitor and staff vehicles
- delivery and contractor vehicles
- construction vehicles
- public buses & taxis
- courtesy bus and off-site shuttle bus
- bicycles and motorcycles

A map of the hospital campus, showing key roads, car parks, pedestrian links and public transport facilities is presented as Figure 2.

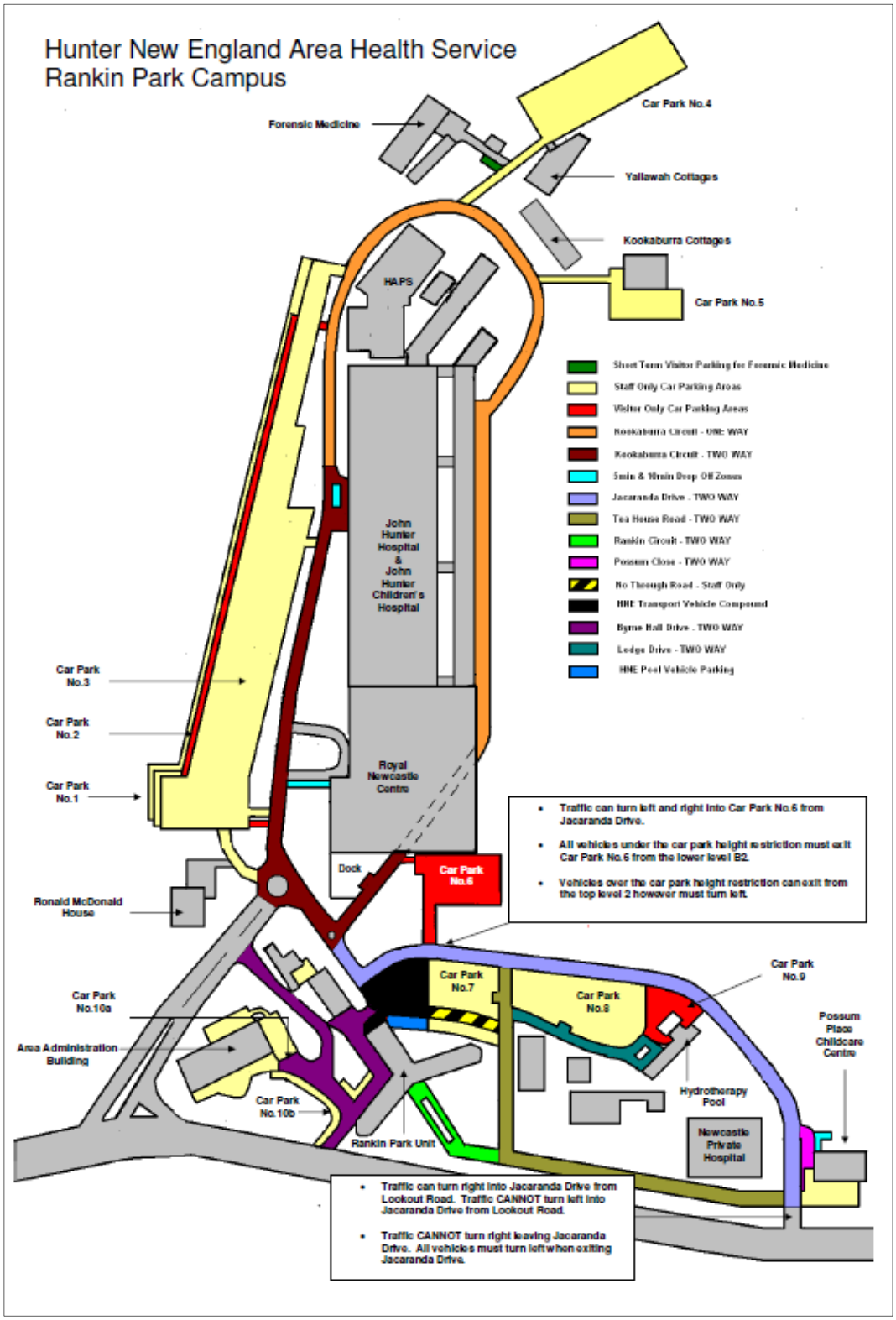


Figure 2 Existing transport network

2.2 Road network

There are two roads providing access to the campus, both from Lookout Road:

- The primary access is known as Kookaburra Circuit and connects to the external road network via a major signalised intersection on Lookout Road. This intersection was upgraded in 2006 to increase capacity and to improve safety.
- The secondary access, opened in November 2007, is known as Jacaranda Drive and connects to the external road network via a signalised intersection on Lookout Road. This intersection does not provide for all movements. Traffic can turn right from Lookout Road into Jacaranda Drive but cannot turn left into Jacaranda Drive from Lookout Road. Similarly, traffic can turn left from Jacaranda Drive into Lookout Road but cannot turn right into Lookout Road from Jacaranda Drive.

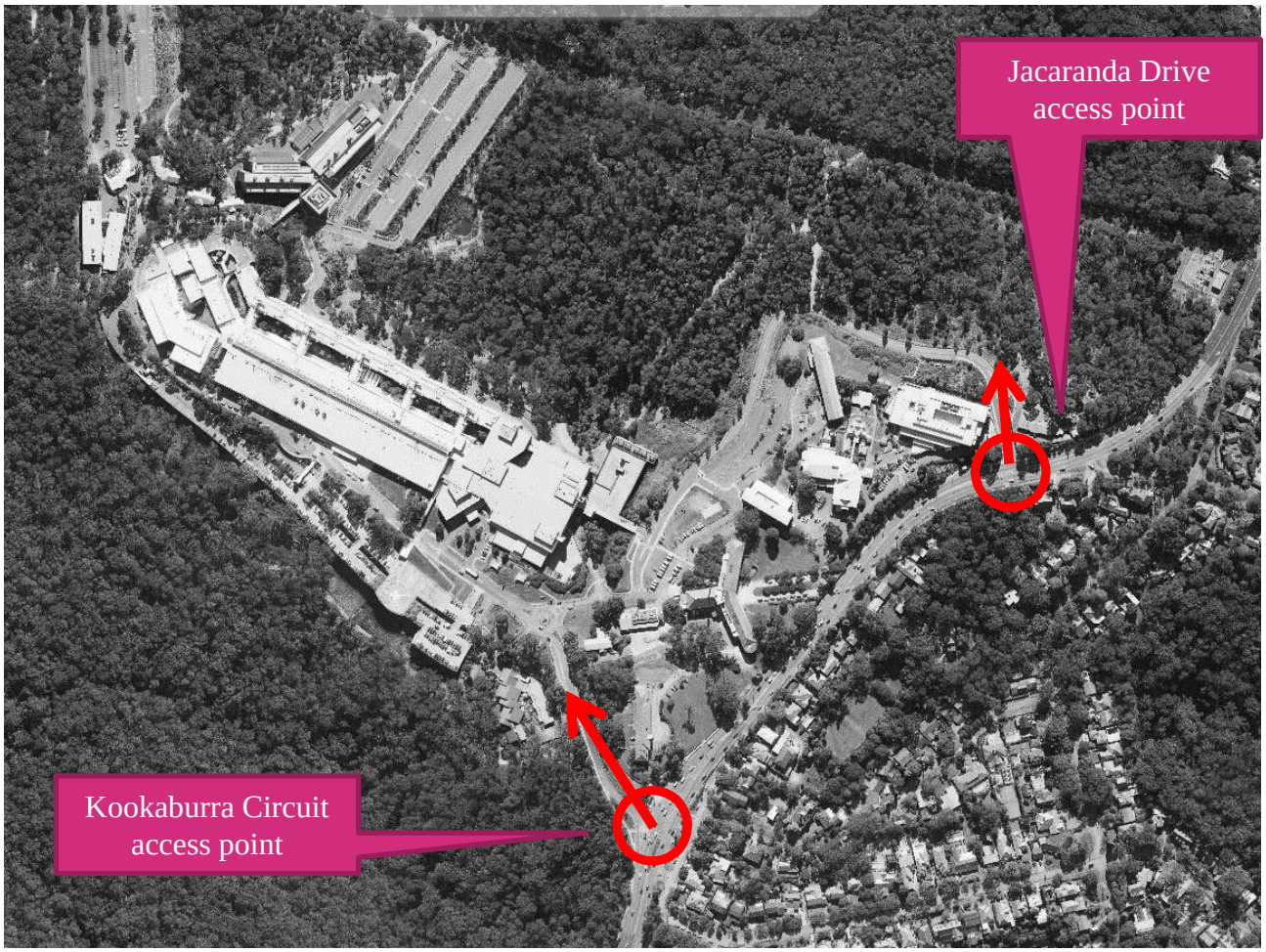


Figure 3 Site access options

2.3 Traffic conditions

As shown in Figure 1 below, traffic flows into and out of JHH are significant in both the AM and PM peak hours – with over 1,600 vehicle movements currently in the afternoon peak.

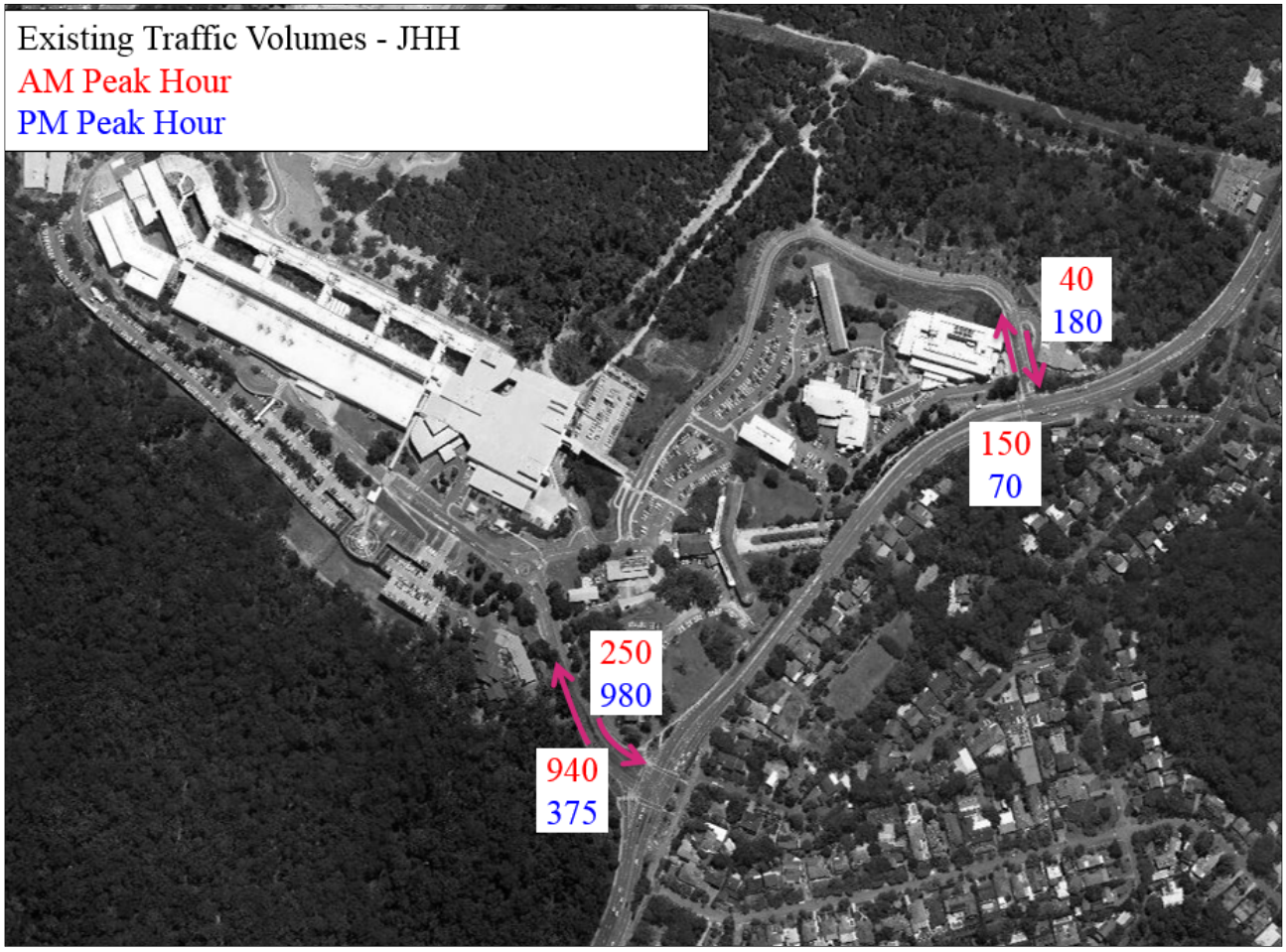


Figure 4 Existing traffic volumes

Due to the volume of traffic currently accessing the JHH campus, vehicle queues can be extensive in peak hours. This is particularly prevalent in the PM peak hour when the primary direction of travel is out of the campus. Long vehicle queues and delays typically occur within the campus, with the extent of these illustrated in Figure 5 below.

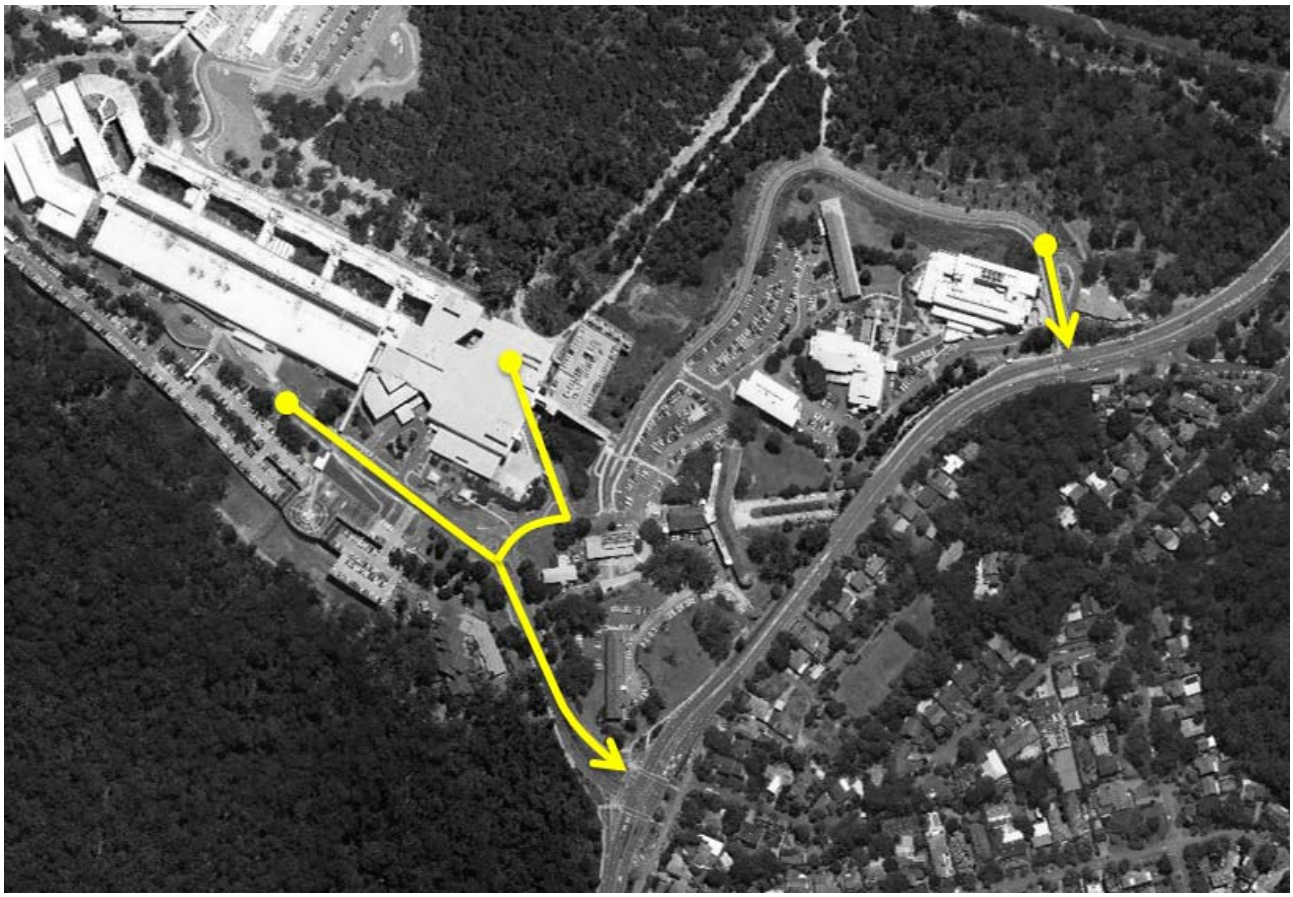


Figure 5 Existing vehicle queues – PM peak hour

3 Future Conditions

3.1 Proposed Road Upgrade

The proposal involves the construction of 3.4 kilometres of new four lane divided road between Lookout Road, New Lambton Heights and Newcastle Road, Jesmond. A half interchange is proposed at John Hunter Hospital, which would provide access for users travelling to and from the north only. Those arriving from other directions would continue to utilise Lookout Road.

It should also be noted that no access will be provided for users travelling southbound on the bypass to Lookout Road.

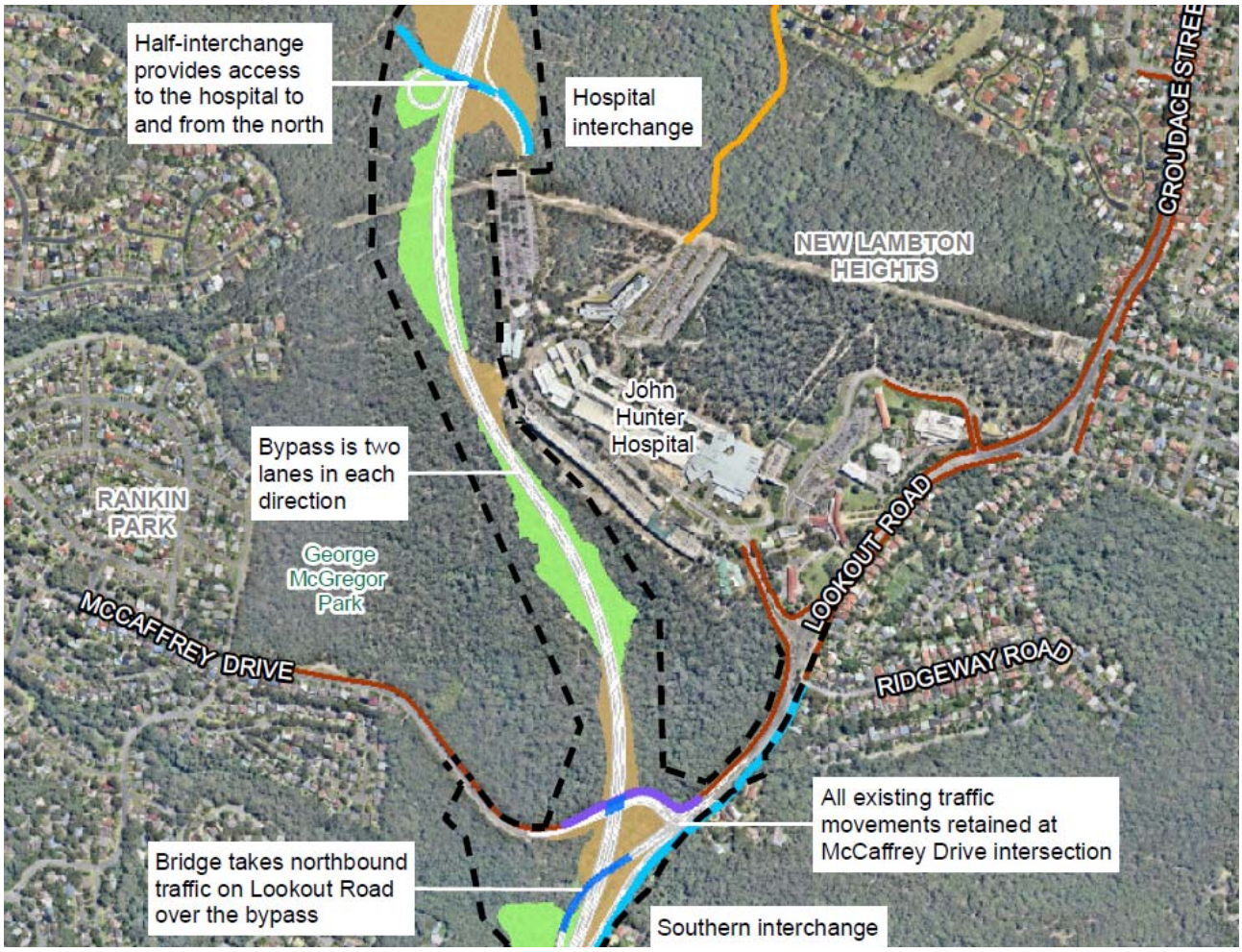


Figure 6 Project overview

Source: Rankin Park to Jesmond Environmental Impact Assessment (RMS, 2016)

3.2 Campus Master Plan

BVN Donovan Hill prepared a campus wide master plan for the JHH site in 2015, which considered the future development of the campus beyond its current uses. A number of expansion options were considered which contemplated development options to the north, east, south and west. The location of the future Newcastle Inner City Bypass link into the campus was considered in the master planning.

Based on the work undertaken, the future bed capacity for the campus could be projected (presented in Table 1 below). At this master planning stage, these projections provide a basis for forecasting future traffic flows and car parking requirements associated with the expansion of the hospital campus.

Table 1 Future bed capacity

Service	**Current beds**	**Planned Capacity**		**Proposal**
		2022	**2027**	**2026 Target**
Medical	151	226	302	466
Surgical	204	298	404	92
Maternity	56	62	72	96
Paediatrics	67	67	67	67
Neonatal Nursery	42	52	52	53
ICU / HDU	24	28	30	70
Rehabilitation	49	66	82	32
Maintenance	23	30	38	32
Total Overnight Beds	**616**	**829**	**1047**	**908**
Day Surgical	36	43	50	91
Day Maternity	8	10	12	17
Day Medical	38	51	66	52
Day Paediatrics	21	21	21	20
Total Day Beds	**103**	**125**	**149**	**180**
Total	**719**	**954**	**1196**	**1088**
% Increase		***33%***	***66%***	***51%***

Source: BVN Donovan Hill (2015)

The master plan exercise undertaken by BVN considered a number of options to accommodate future development within the JHH campus. Due to a number of factors, including the availability of land to construct new buildings and maintain the operation of existing health facilities, as well as topographic constraints, it was determined that development would only be feasible towards the northern and western ends of the campus.

With these potential changes to the campus as envisaged in the master plan, there is now a long term strategy to reorientate the campus so that the new bypass acts as the ‘front door’ or primary point of access into the site. This would replace the role of the Lookout Road / Kookaburra Circuit intersection which currently functions as the primary access for vehicular traffic. Directional signage in the precinct would be modified to direct people to use the bypass to access the campus.

This long term strategy has been considering in forecasting the likely usage of the bypass under a number of scenarios, as detailed in Section 4 of this report.

4 Future Traffic Volumes

4.1 Trip assignment

The Local Health District (via Health Infrastructure) provided Arup with postcode data for all staff and visitors of the JHH campus. These were mapped in ArcGIS to understand the current distribution of campus users, which will ultimately inform their likely direction of travel to the JHH campus.

The origin location of JHH staff and visitors is illusrated in Figure 7 below.

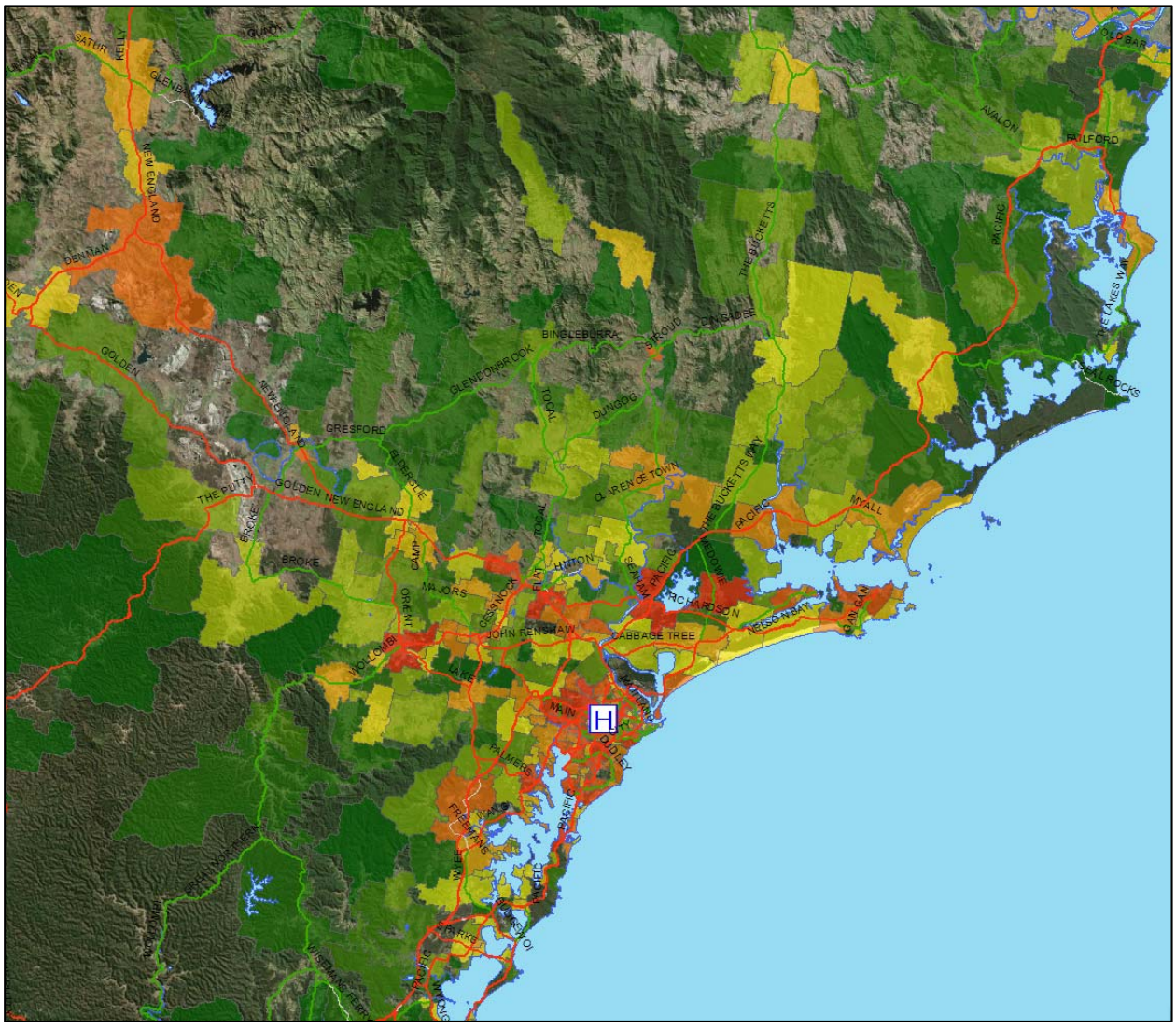


Figure 7 Location of JHH staff and visitors by postcode

The likely arrival route from JHH staff and visitors was determined in ArcGIS network analyst by overlaying the origin postcode information with the key road links serving the campus, as illustrated in Figure 8 below. This analysis assigned users to the campus by different routes based on the shortest and most convenient path of travel.

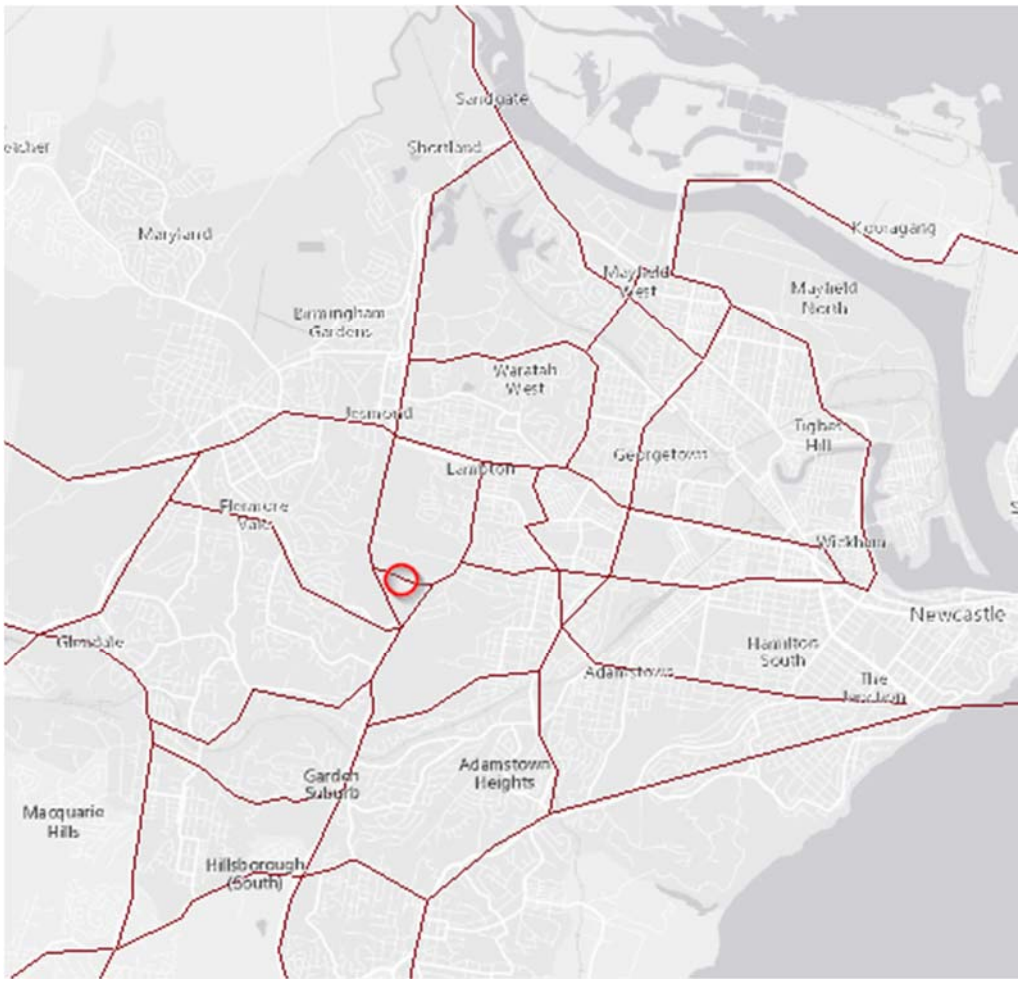


Figure 8 Modelled road network

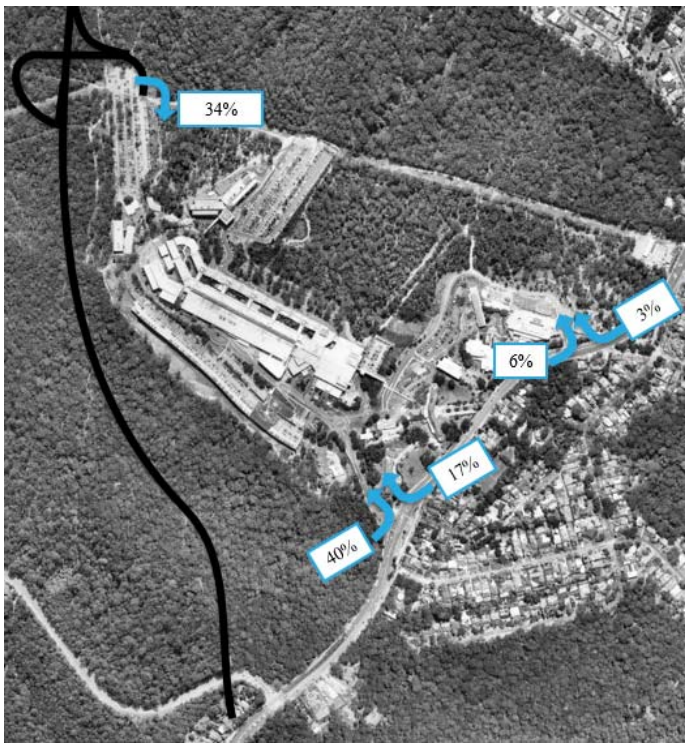
4.2 Trip distribution

Based on the assignment methodology as described in section 4.1, the proportion of staff and visitors utilising the various entry points into JHH campus could be estimated. This is shown in Figure 9 for the following scenarios:

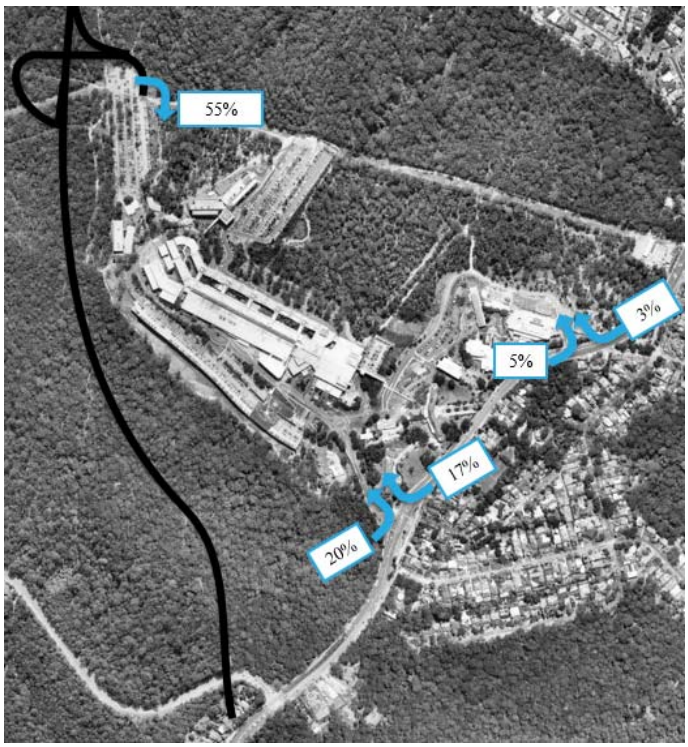
1. As per the current RMS proposal with a half interchange (access to/from north only) at JHH
2. Alternative design with a full interchange at JHH, facilitating access for users coming from both the north and the south

Traffic modelling previously undertaken by RMS considered the likely usage of south facing ramps serving JHH. It was determined that despite the requirement for motorists to pass through an extra two sets of traffic lights, 63% of all traffic approaching from the south would continue to use the existing eastern main hospital access off Lookout Road. With the viable development opportunities however occurring to the north and east of the campus, the long term strategy will be to reorientate the site so that the new bypass acts as the primary point of access. This will include modification of directional signage to direct people to use the bypass to access the campus.

Although travel distance for those arriving from the south is longer via the bypass compared to Lookout Road, travel time would be comparable as two sets of traffic signals are avoided on the bypass route. Given this, it is more likely traffic from the south will be distributed evenly between the new bypass and Lookout Road.



Trip distribution by access point – half interchange



Trip distribution by access point – full interchange at JHH

Figure 9 Forecast trip distribution

The analysis above indicates that under the current proposal, only 34% of staff and visitors to JHH would utilise the new entry point into the campus in future years. This is less than the 41% forecast as noted in the traffic report supporting the EIS.

Should a full interchange be provided, 55% of all users would benefit from improved access into the campus.

4.3 Future traffic volumes

Based on the existing traffic volumes as noted in Section 2.3, as well as the anticipated level of growth at the JHH campus in future years (51% increase in bed numbers up to 2027), the future level of traffic accessing the campus can be determined. This is summarised in Figure 10 (for the AM peak hour) and Figure 11 (for the PM peak hour).

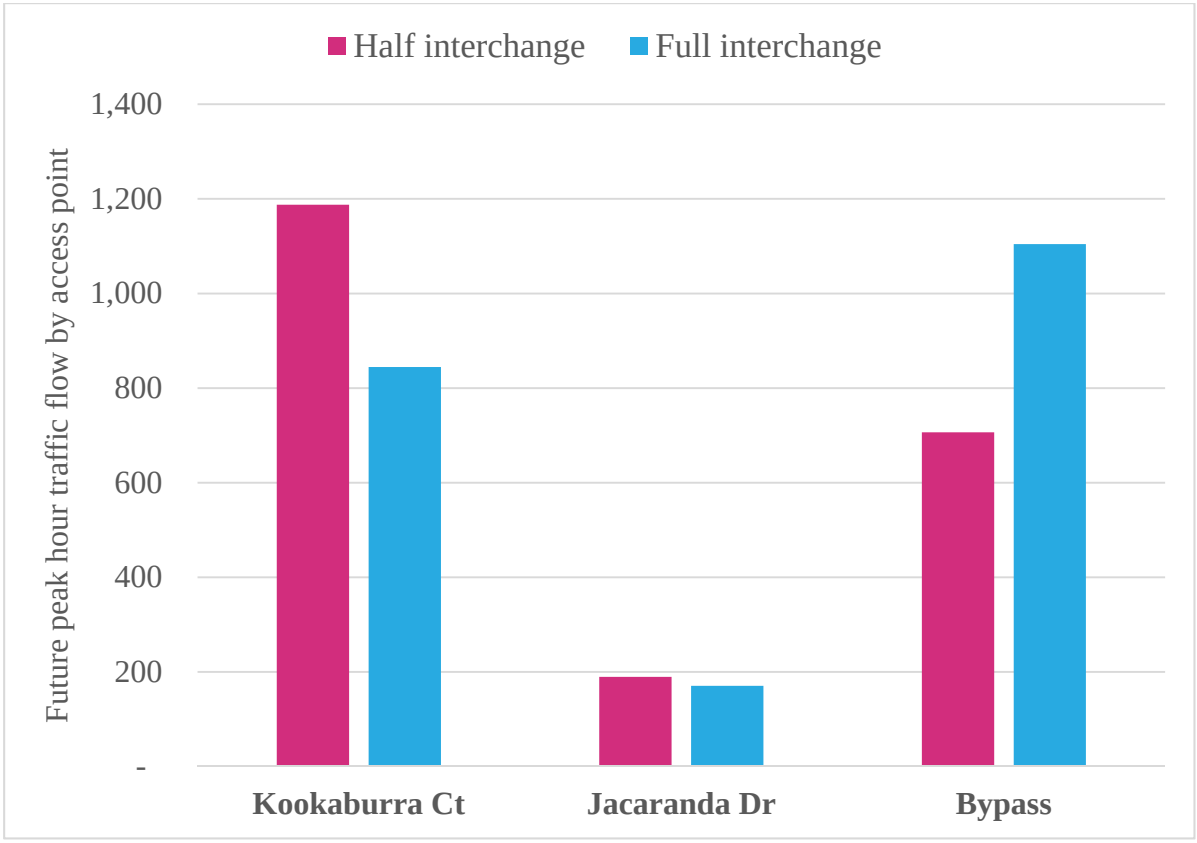


Figure 10 Forecast peak hour traffic flow by access point – AM peak hour

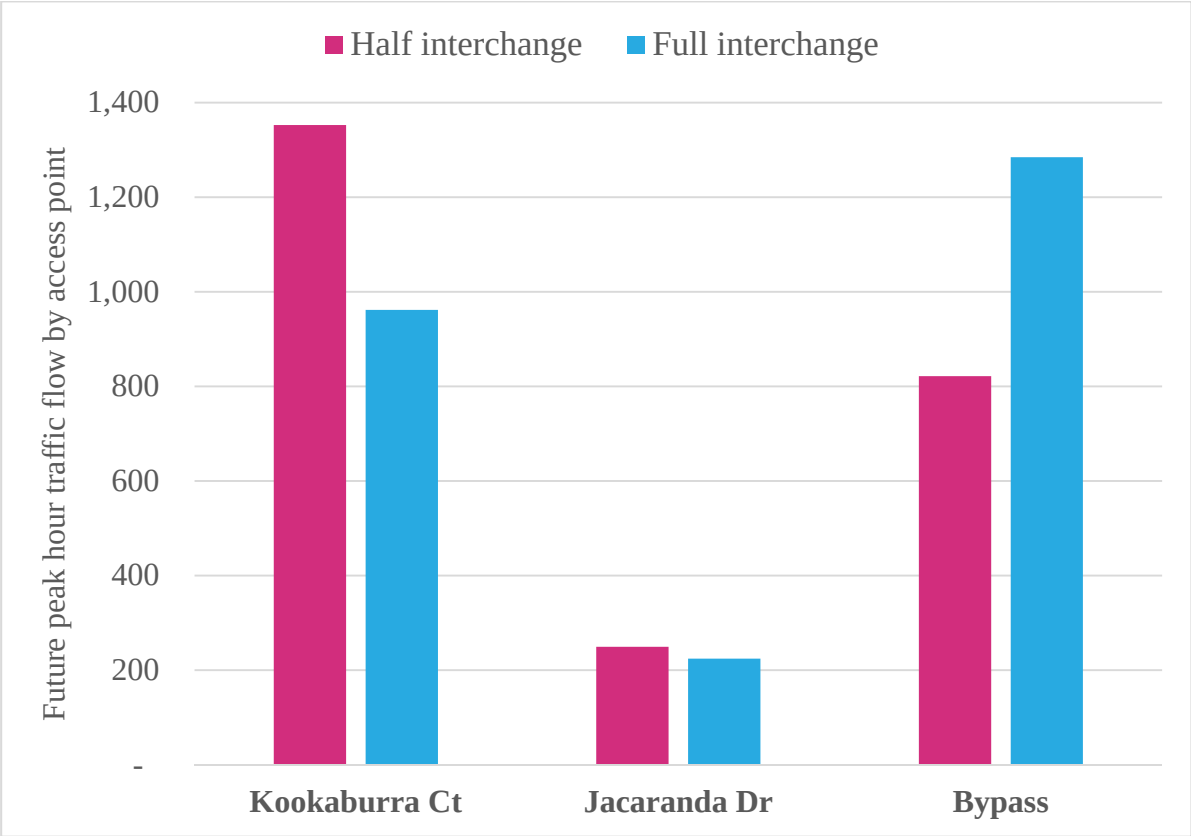


Figure 11 Forecast peak hour traffic flow by access point – PM peak hour

These graphs indicate the significant benefit that would be achieved from provided a full interchange into the JHH campus. Under the current proposal, only 34% of people travelling to JHH would utilise the new bypass as a means of accessing the campus, with nearly two thirds of users continuing to access the campus via Lookout Road.

Should a full interchange be constructed, 55% of people would travel along the bypass – significantly reducing pressure on the signalised intersections on Lookout Road.

4.4 Road network impacts

Arup has modelled the future operation of the road network serving JHH in future years following the construction of the proposed bypass. The modelling has considered:

- The future growth of the JHH campus as previously outlined in section 3.2
- The forecast reduction in traffic flows on Lookout Road following the construction of the bypass (as noted in the traffic report supporting the EIS for the project)
- The distribution of vehicle trips into and out of the JHH campus as noted as previously outlined in section 4.2

SIDRA modelling was undertaken to understand the future operation of the Lookout Road / Kookaburra Circuit intersection, which provides the primary point of access into JHH. In particular, the extent of vehicle queuing in the PM peak hour was considered.

The modelling again demonstrates the significant benefits that would arise from the construction of a full interchange serving the JHH campus. Under the current RMS proposal, vehicle queues are forecast to extend back well within the site for more than 225m, resulting in lengthy delays for vehicles. Queues on Lookout Road are forecast to extend for 380m under the half interchange scenario. Under the full interchange scenario the extent of queuing is significantly reduced, with the maximum queue length forecast to be no more than 130m within the hospital and 180m on Lookout Road. This is summarised in Table 2 below.

Table 2 Traffic modelling results (PM peak hour)

Scenario	Approach	Level of Service	Degree of Saturation	Max Queue (m)
Half interchange	Lookout Road (N)	D	0.93	380
	Kookaburra Circuit	C	0.72	226
	Lookout Road (S)	C	0.76	180
Full interchange	Lookout Road (N)	B	0.71	180
	Kookaburra Circuit	D	0.57	130
	Lookout Road (S)	B	0.53	120

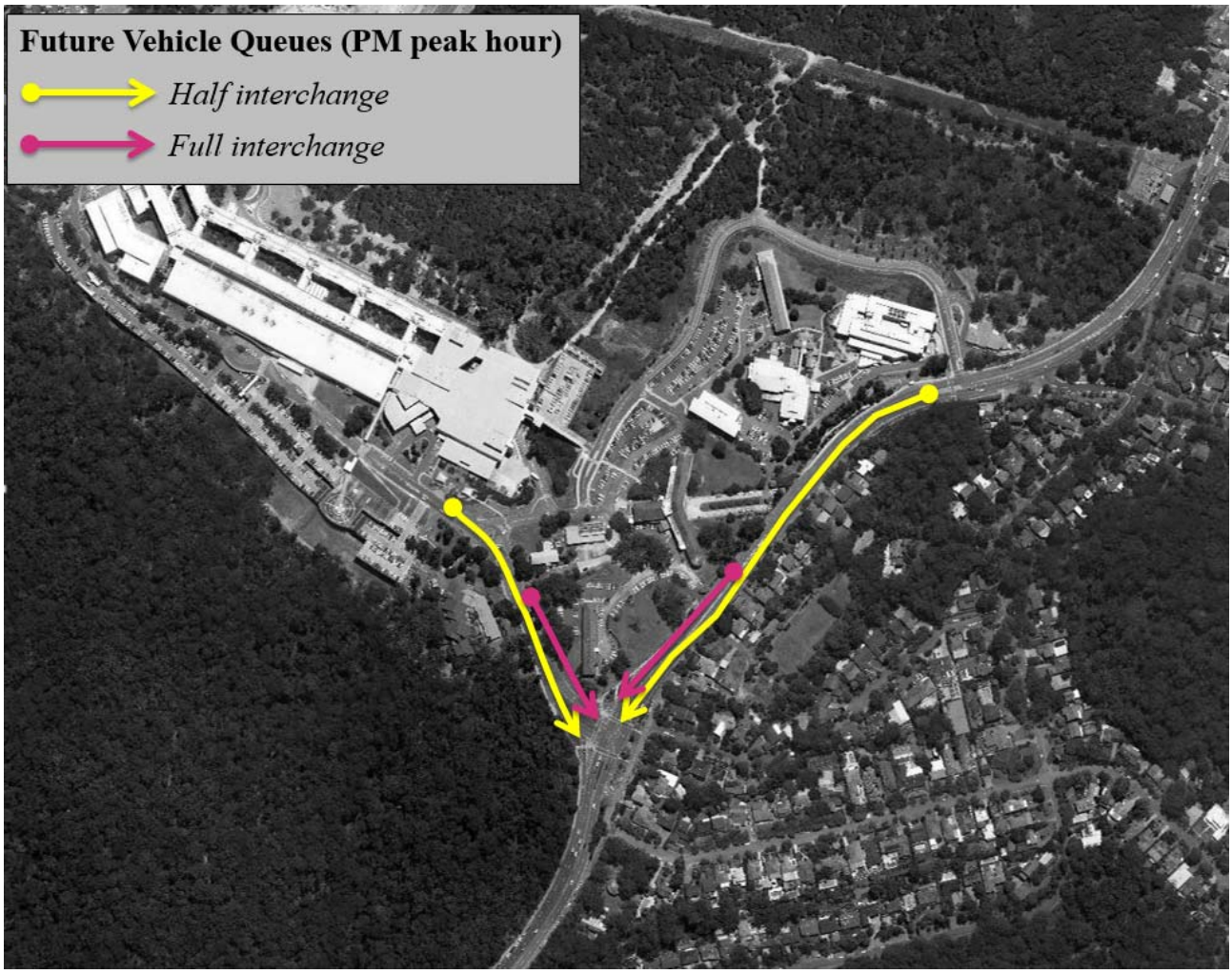


Figure 12 Lookout Road future intersection operation (max queue lengths)

5 Summary

Arup was engaged by Health Infrastructure (HI) to review the operation of the local traffic network surrounding the John Hunter Hospital (JHH) campus, in the context of the information contained in the Environmental Impact Assessment (EIS) for the Newcastle Inner City Bypass –Rankin Park to Jesmond, released in November 2016. Key findings of the review are as follows:

- Due to the volume of traffic currently accessing the JHH campus, vehicle queues can be extensive in peak hours.
- The campus master plan developed by BVN Donovan Hill envisages an increase in the bed capacity for the campus of approximately 50% over the next 15 years, which is equivalent to the predicted increase in traffic movements over the same time period.
- Under the current RMS proposal to provide a half interchange serving JHH (north facing ramps), only 34% of staff and visitors would utilise the new entry point into the campus.
- The EIS forecasts approximately 41% of staff and visitors entering JHH will use the hospital interchange on the new bypass to access the site. This is higher than the figure forecast in this study, and therefore the operational benefits to the road network as a result of the project noted in the EIS may be overstated and are not likely to be representative of actual conditions.
- Should a full interchange be provided, with turning movements permitted from both the north and south, 55% of all users would benefit from improved access into the campus.
- Traffic modelling indicates that under the current (half interchange) proposal, vehicle queues would extend back well within the JHH campus.
- Under the full interchange scenario the extent of queuing is significantly reduced, with the maximum queue length forecast to be no more than 130m. This has flow on benefits to the operation of the Lookout Road corridor.

In summary, construction of a full interchange directly serving the JHH campus would have significant benefits for people travelling to the site, as well as users of the wider road network.