

APPENDIX F

Transport Accessibility Study





STAGE 2 NORTHERN BEACHES HOSPITAL

STATE SIGNIFICANT INFRASTRUCTURE APPLICATION SSI_6792
(STAGE 2)

Environmental Impact Statement Appendix F: Transport Accessibility Study

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STAGE 2 NORTHERN BEACHES HOSPITAL

State Significant Infrastructure Application SSI_6792 (Stage 2)

Environmental Impact Statement Appendix F: Transport Accessibility Study

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Date 13 November 2014

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APPENDICES

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EXECUTIVE SUMMARY

The proposed Northern Beaches Hospital Project (NBH Project) aims to establish a partnership between the NSW State Government and a health services provider for the provision of a new hospital facility to service the Northern Beaches community. The proposed NBH is located approximately 15 km north of the Sydney CBD within the suburb of Frenchs Forest.

This report documents a *Transport Accessibility Study* that is required by the Stage 2 Director Generals Requirements (DGRs) for the project. The Transport Accessibility Report has been developed to detail proposed access arrangements for the proposed Northern Beaches Hospital Project, including type and size of vehicles accessing the site, proposed parking provisions, pedestrian and cycle connectivity improvements and mitigations to address potential traffic impacts.

Since 2012, an Inter-agency Reference Group comprised of Health Infrastructure (HI), NSW Department of Planning and Environment (DoPE), Transport for NSW (TfNSW) and Roads and Maritime Services (RMS) have worked collaboratively to address road network planning issues in the vicinity of the hospital site primarily to support the delivery of the hospital. Significant upgrades are proposed to the surrounding road network under the RMS Northern Beaches Hospital Road Connectivity and Network Enhancement Project. The Stage 1 Hospital Connectivity Works aim to enhance the existing road network to facilitate the opening of Northern Beaches Hospital in 2018. The Stage 2 Network Enhancement Works are directed toward broader network capacity enhancement particularly on Warringah Road.

This assessment was undertaken to assess existing and future localised transport conditions within the hospital precinct. The peak hour traffic volume assessed for the hospital in this report for the Stage 2 NBH EIS was in the order of 809 vehicle trips (282 vehicles on Warringah Road and 527 on Frenchs Forest Road). Currently, Frenchs Forest Road carries approximately 8,000 vehicles per day in both directions with am peak traffic being approximately 1100 vehicles in both directions. Warringah Road carries approximately 80,000 vehicles per day in both directions with eastbound am peak traffic being approximately 3500 vehicles.

The assessment identifies under existing conditions, both Frenchs Forest Road and Warringah Road would have a combined absorption capacity^[1] of 1,320 vehicles/hour (Frenchs Forest Road: 550 vph eastbound and 500 vph westbound; Warringah Road: 270 vph eastbound). This combined absorption capacity exceeds the indicative vehicle generation anticipated for the hospital and as such there would be sufficient midblock capacity to accommodate the additional forecast peak hour traffic. However, there are major constraints in the surrounding road network with regards to the capacity deficiencies of the major intersections. Impacts from future development in the area, including the hospital will consequently reduce the performance of the intersections. These existing deficiencies have been recognised and acknowledged by the RMS.

As part of the EIS for the Stage 1 RMS works, RMS have prepared a Traffic and Transport Assessment that has considered impacts of the hospital and attributes changes to overall network performance as cumulative impacts brought about by the proposed roadworks, growth in background traffic and hospital traffic

The RMS modelling outcomes suggest that the proportion of hospital traffic on the entire network in the context of the wider area network is around 7-10%.

However, it should be noted that the proportion of hospital traffic is likely to be higher on the approach roads leading to the main access to the hospital particularly on Frenchs Forest Road and to a minor extent on Warringah Road. The background traffic volumes on Frenchs Forest Road in 2018 is estimated to be 1,260 veh/hour (617 veh/hour in the eastbound direction and

643 veh/hour in the westbound direction) and the background traffic on Warringah Road eastbound lane is estimated to be 1,290 veh/hour¹. With the additional traffic attributed to the hospital during the peak hour, the total traffic on Frenchs Forest road will be around 1,790 vehicles while the total traffic on the eastbound outer lane of Warringah Road will be around 1,572. Hence, hospital traffic will comprise 30% of the total traffic on Frenchs Forest Road and 18% of the total traffic on the eastbound lane of Warringah Road.

The RMS Report compares 2012 traffic performance with 2018 predicted performance and concludes that The Stage 1 Hospital Connectivity works will provide an improvement in 2018 with better performance generally than the 'do minimal' or 'do nothing' case scenario. The report also concludes that the Stage 1 Hospital Connectivity works generally provide sufficient road capacity for traffic generated within the immediate study area to access the road network.

Given that the proposed improvement of the external network is being addressed by the RMS, through the Northern Beaches Hospital Road Connectivity and Network Enhancement Project, a key focus of the design of the Northern Beaches Hospital in relation to Transport Accessibility will be directed toward measures to ensure access efficiency, circulation and sound traffic management, together with actions to reduce the car mode share.

The outcomes of the assessment note key features of the development that would support the overall efficiency of the transport network for the site. The key features include the following:

Internal connectivity and external linkages

- The design layout provides internal connectivity and improved amenity to ensure linkages to the external network.
- Circulation routes within the site ensure separation of vehicles and pedestrian traffic.
- Interactive wayfinding and signage facilitate access within the site and to the external network.

Improved linkages to Public Transport and Active Transport

- Public transport for the site is being provided by the existing bus routes already servicing the site and future planning for improved and additional bus services will be addressed by two separate studies now being undertaken by the RMS and TfNSW. The studies referred to relate to the strategic bus corridor program of the RMS and the pre-feasibility study on the Bus Rapid Transit for the Northern Beaches of the TfNSW.
- The pedestrian and cycle plans developed for implementation by Warringah Council are aimed at achieving modal shift from car based modes to active transport.
- The development design for the Northern Beaches Hospital considers these existing and future improvements to the public transport and active transport network and has incorporated enhanced pedestrian access and amenity to support and encourage public and active transport modes. Adequate and comprehensible signage and wayfinding mechanisms are recommended to create a streetscape conducive to walking and cycling. Information booths on the available options for public transport should be located at common areas easily accessible to the public.

Parking

- Provision of parking to cater to the expected accumulated peak hour demand. Parking provision for the NBH will consist of a total of 1,394 spaces broken down as follows:

¹ Stage 1 Northern Beaches Hospital EIS

Parking Type	Location	Number of spaces
Public parking	Multi deck Car Park	1034
Staff parking	Multi deck Car Park	312
	Eastern surface car park	41
Emergency Vehicle Parking	Ambulance	6
	Emergency vehicles	4
	MHU Emergency vehicle	1
Drop off spaces	Emergency	6
	Main Entry	5
	Main Entry Taxi drop off	3
	Main Entry Transit vehicles	4
	Main Entry Transit drop off	3
Commercial vehicle parking	Loading Dock	6
	Contractors and Couriers	4
	Mortuary Hearse	1
Overall Total Spaces		1430

- This level of parking provision is deemed adequate to service the expected peak parking demand for the site and at the same time will deliver the optimal car park solution for the anticipated total demand.
- Following a review of various approaches in estimating parking demand for a hospital site, this parking provision was determined based on a conservative approach and has been established based on a number of factors influencing the demand for parking.
- It is envisaged that this parking provision/strategy will be sufficient to fully accommodate the parking demand for the Northern Beaches Hospital and that there will be no requirement for on-street car parking in the local road network.
- It is recommended that after the opening of the hospital and actual parking demand can be validated, an assessment be undertaken to ensure the parking strategy conforms to the hospital functionality. Appropriate parking policies may be considered to further reduce car mode share in support of promoting more sustainable transport modes.

Preparation of the Travel Plan Framework

- The preparation of a Travel Plan Framework to effect travel behaviour change and reduce private car dependency to promote sustainable transport.

Provision of End-of Trip facilities

- The design has provision for 22 showers for staff as part of the overall staff change zone located in the Hospital.
- The design has provision for a total of 86 bicycle racks in the ground floor of the multi deck car park (48 staff bike parking and 38 visitor bike parking) to facilitate the use of active transport modes and promote cycle/walking.

2 REPORT STRUCTURE

This report is structured to provide an assessment of the transport and traffic issues relating to Stage 2 of the staged infrastructure application. This report is laid out in the following order:

- Section 1 provides an Executive Summary of the report;
- Section 2 sets out the report structure;
- Section 3 describes the planning pathway for the infrastructure application;
- Section 4 summarises the Director General's Requirements and outlines the responses and relevant sections of the report which address each of the requirements;
- Section 5 details the strategic context within which the assessment has taken place. This section provides a literature review of all relevant, state, regional, local and other documents;
- Section 6 establishes the existing transport context in the surrounding area. An assessment of the existing road network has been undertaken to establish road network characteristics, performance criteria and any existing road network deficiencies. The chapter also provides an overview of existing travel patterns in the locality as well as existing public transport, walk and cycle provisions;
- Section 7 provides an overview of the Connectivity Enhancement Works proposed by RMS for Stage 1;
- Section 8 details the pattern of development on the NBH site;
- Section 9 documents the likely traffic generation, distribution and impacts;
- Section 10 refers to the construction traffic management plan report;
- Section 11 discusses sustainable transport initiatives applicable to the hospital site;
- Section 12 summarises a package of measures to mitigate likely impacts on traffic from the development; and,
- Section 13 provides the conclusions for this study.

3 PLANNING PATHWAY

In October 2013, a Staged Infrastructure Application (SSI_5982) was lodged by Health Infrastructure (HI) for this project. The application was divided into two parts:

(i) Concept Proposal and Stage 1

- Concept Proposal for the site; and
- Stage 1 - Site clearance and preparatory works.

(ii) The proposed Stage 2 NBH development

- Bulk excavation works
- Construction of a nine storey Hospital building
- Staff, patient and visitor car parking, including construction of an eight storey multi-deck Car Park
- Site works including internal roads, pathways and landscaping
- Utility amplification works

The Director General's Requirements (DGRs) for environmental assessment were issued by Department of Planning and Infrastructure (DP&I) on 19 June 2013 for both parts of the application.

A State Significance Infrastructure Application (SSIA) and Environmental Impact Statement (EIS) was prepared to address the DGRs associated with the Concept Proposal and Stage 1 and submitted in October 2013.

Public exhibition of the SSIA and EIS closed on 28 November 2013 and a significant number of submissions were received.

A Submission Report / Preferred Infrastructure Report was subsequently prepared and lodged with DP&I in February 2014 in response to the submissions received and to seek approval for additional services diversion works.

The Stage 1 SSIA and EIS was approved by Department of Planning and Environment (DP&E) on 22 June 2014.

The DP&E advised on 10 November 2014 that the Stage 2 NBH SSIA and EIS should be lodged under project title reference 'SSI 6792'.

4 DIRECTOR GENERAL'S REQUIREMENTS

This Transport Accessibility Study was undertaken to fulfil the Environmental Assessment Requirements issued by the Director General for the preparation of the Environmental Impact Statement (EIS) for Stage 2 of the Northern Beaches Hospital staged infrastructure application (SSI 13_5982).

Section 6 of the general requirements relates to Transport and Accessibility (Construction and Operation) and requires reference to:

- Guide to Traffic Generating Developments (RTA)
- Planning Guidelines for Walking and Cycling
- EIS Guidelines – road and related facilities (DP&E)

The issues to be considered are outlined in Table 4-1.

Table 4-1 Director General Requirements

Issue Description	Relevant Section of Report	Response
Detail proposed access arrangements to the hospital, including: ➤ augmentation requirements and intersection upgrade treatments; ➤ the type and size of vehicles accessing the site; and, ➤ measures to mitigate any associated pedestrian, cycle and traffic impacts.	Section 7 Section 8, Section 12	Improvements to the external road network are being proposed as part of the RMS road enhancements and network connectivity project. The scope of this study is focused on localised traffic for the site. The proposed access arrangements include a main access on the western side of the site along Frenchs Forest Road. A secondary access is provided to the east of the main access for emergency vehicles and ambulances only. A third left-in left out access intersection is provided to the south of the site along Warringah Road. Vehicles likely to access the NBH site include: ▪ Light vehicles (staff, patients, tenants and visitors) ▪ Light commercial vehicles (for service deliveries and tenants) ▪ Bus (25-seater) ▪ Ambulance and emergency vehicles ▪ Firetrucks ▪ Heavy commercial vehicles (for major hospital deliveries of supplies and equipment). Measures identified to mitigate potential impacts include: ▪ The design of the NBH will ensure that direct connections and pedestrian linkages are in place to encourage and promote public transport use. ▪ Providing adequate on-site parking such that on-street parking is not required. ▪ Separating vehicle, emergency, service, pedestrian and cycle movements to minimise traffic conflict. ▪ Preparation of a Travel Plan Framework. ▪ Provision of end-of-trip facilities to promote sustainable transport.

Issue Description	Relevant Section of Report	Response
Prepare a Transport Accessibility Study that addresses the following: ➤ The proposed access and parking provisions, including: - an assessment of car parking supply; and - compliance with the relevant Australian standards and parking codes;	Section 8.2 and Section 8.3	The design of parking facilities for off- street, on street and accessibility parking conform to guidelines stipulated in the Australian Standards AS2890 for parking.
➤ Demonstrates how users (including workers) of the development will be able to make travel choices that support the achievement of State Plan targets;	Section 8	A Travel Plan Framework will be prepared for the site documenting alternative options for travel to and from the hospital. It will provide a framework for travel behavior change. Improving access to alternative modes of transport provides options for travelers to choose from.
➤ Details existing pedestrian and cycle movements within the vicinity of the site; and, ➤ Determine the adequacy of the proposal to meet the likely future demand for increased public transport and pedestrian and cycle access;	Section 6.3, 6.4 and 6.5	The mode share analysis indicates a high dependency on the private car as a mode of travel. The existing mode share for pedestrians and cyclists is approximately around 5-7%. Planning initiatives and future proposals for the Northern Beaches Hospital study area are cognisant of the likely future demand for increased public transport and pedestrian and cycle access. The provision of support facilities such as signage, wayfinding, dedicated pathways etc, address the requirements within the hospital site. Adequacy of the proposal to meet the future demand can be achieved in coordination with the agencies responsible to supply the services in the external area beyond the hospital site. Addressing future demand requirements will be a continuing effort for the hospital operator and the agencies. Both parties will have to work in tandem to achieve the best outcome for the issue.
➤ Describe measures to be implemented to promote sustainable means of transport including: - public transport usage and - pedestrian and bicycle linkages, including the provision for bicycle parking, end of trip facilities and - preparation of a workplace travel plan as part of a travel demand strategy; and;	Section 11	A Travel Plan Framework (TPF) is provided in the report illustrating measures and initiatives to promote sustainable travel and reduce the reliance on private vehicle use as a means to travel, particularly as single occupancy car trips.. Once the hospital is operational and travel patterns and demand have been established, the Workplace Travel Plan can be finalised, and measures implemented in a resource efficient manner.

Issue Description	Relevant Section of Report	Response
➤ Estimate the total daily and peak hour trips generated by the proposed development, including accurate details of the current and future daily vehicle movements and ; ➤ Assess the impacts of the traffic generated on the local network, including intersection capacity and any potential need for upgrading of road works (if required), having regards to local planning controls.	Section 5	Traffic generation is based on a review of the RTA's Guide to Traffic Generating Development. The majority of external road network and connectivity issues will be addressed by the RMS committed works. The works include widening of Frenchs Forest Road from the hospital site to Allambie Road, a new signalised intersection at the new access to the hospital, road widening along Alambie and Warringah Road and changes to the Frenchs Forest Road/Wakehurst Parkway intersection, among others. These improvements will provide additional capacity that is expected to sufficiently cater to the increase in traffic associated with the hospital development and allow for the effective management of traffic on the external network. The approval of the Concept Proposal has noted that the proposed road works and network improvements identified within the RMS committed works comprise a significant package of network improvements that will facilitate the operation of the Northern beaches Hospital and accommodate additional inbound and outbound trips during the AM and PM peak periods. Hence, once completed, the local traffic implications due to the development will be minor and provisions in the overall design of the hospital will mitigate the impacts, as necessary. Hence, the overall impact on traffic is not expected to be significant.

5 STRATEGIC CONTEXT

NSW Government Strategies and Policies have been continuously articulated in policy documents. Key themes in these policies have been the need to reduce car dependency, increase the attractiveness and usage of sustainable transport modes, reduce the growth in vehicle kilometres travelled and provide an urban form which supports public transport provision.

The following NSW Government policies, plans and strategies contain the strategic context relevant to the local planning and development of the Northern Beaches Hospital site. The following documents have been reviewed:

- NSW 2021
- Metropolitan Plan for Sydney 2036
- NSW Long Term Transport Master Plan
- North East Sub-Regional Strategy
- Planning Guidelines for Walking and Cycling
- NSW Bike Plan 2010
- Warringah Bike Plan
- Healthy Urban Development Checklist

A summary of the key priorities identified in these documents is provided below.

- NSW 2021 outlines that an integrated transport system is required to ensure different transport modes work together and that the interests of the travelling public are put first. NSW Plan 2021 includes travel mode share targets; these are principally directed to Sydney and its wider Metropolitan Region and include increasing the proportion of journeys to work by public transport to 28% by 2016.
- The Metropolitan Plan for Sydney 2036 highlights the importance of integrating transport and land use planning to overcome Sydney's challenges of managing congestion and reducing Sydney's energy-related greenhouse gas emissions. The Plan promotes actions to support sustainable travel, including the implementation of the NSW Bike Plan and Workplace Travel Plans.
- The intention of the NSW Guidelines for Walking and Cycling is to ultimately create further opportunities for people to live in places with easy walking and cycling access to urban services and public transport and reducing private vehicle usage.
- The NSW Bike Plan outlines strategies for increasing the share of short trips by bike in Greater Sydney to 5% for all purposes by 2016 and double to share of travel to work by bike across all of NSW between 2006 and 2016. In central Sydney, the NSW Bike Plan supports the implementation of an inner Sydney strategic cycle network to link with surrounding LGAs.
- The Warringah Bike Plan represents a planning framework for the provision of bike facilities in Warringah LGA

The planning policies and strategies outlined above relate to common themes for transport that are relevant to the development site and serve as the guiding principles for strategic directions of planning outcomes for the NBH, including:

- Improve public transport;

- Encourage sustainable transport through the provision of facilities;
- Integrating land use and transport; and
- Reduction of mode share to private motor vehicles.

6

EXISTING TRANSPORT CONDITIONS

The Northern Beaches Hospital will be situated in Frenchs Forest on the parcel of land bound by Frenchs Forest Road to the north, Wakehurst Parkway to the east, Warringah Road to the south, and the Forest High School to the west.

Land use to the north of the site across Frenchs Forest Road is predominantly residential. Adjoining the site to the west is the Forest High School and the area to the south of Warringah Road is predominantly comprised of low density commercial fronting the road with residential uses towards the back.

6.1 ROAD NETWORK

Transport and access facilities are key supporting infrastructure associated with the hospital site. The NBH project site is well connected to the surrounding road network. The key roads providing access to the site lie along major strategic road corridors that carry high volumes of traffic.

The key roads in the vicinity of the site include:

Warringah Road

Warringah Road is a major state arterial road under the care and maintenance of the Roads and Maritime Services (RMS) carrying approximately 80,000 vehicles per day in both directions. It is one of three strategic arterial routes providing access to the Northern Beaches Peninsula. Warringah Road is a divided road with three lanes per direction and indented turning lanes at key intersections. It has a posted speed limit of 70 km/h. In the vicinity of the site, it is an existing bus corridor with limited bus stops around the retail activity at Hilmer Street mainly to serve the residential area south of Warringah Road.



Figure 6-1 Warringah Road, view from the east at Wakehurst Parkway

Frenchs Forest Road

Frenchs Forest Road is a local road under the care of Warringah Council and fronted by residential development as well as the Forest High School. It has an undivided two lane / two

way configurations and provides the east-west connection between Wakehurst Parkway and Forest Way. Frenchs Forest Road carries approximately 8,000 vehicles per day in both directions.

At the approach to Wakehurst Parkway, the intersection is flared to provide additional lanes. The road corridor is narrow and characterised predominantly with buses and school related traffic in the morning peak. It has a posted speed limit of 50 km/h.



Figure 6-2 Frenchs Forest Road, view from the west

Wakehurst Parkway

Wakehurst Parkway is a state arterial road under the care and management of the RMS. It provides the link between Narrabeen and Seaforth. It has a divided road configuration with two through lanes, dual right turn lanes, and a left-turn slip lane in the northbound direction. In the southbound direction, it has a single through lane and a dedicated bus lane. The road carries approximately 21,000 vehicles per day in both directions. It has a posted speed limit of 70 km/h.



Figure 6-3 Wakehurst Parkway, view from north

Forest Way Road

Forest Way is not immediately adjacent to the site but provides access to Warringah Road and Naree Road/Frenchs Forest Road from the west.

Forest Way Road is the main access road to the suburbs of Belrose and Davidson. It is a local road under the care and management of Warringah Council. It provides the north-south link from Mona Vale Road to Warringah Road. It is an undivided road with three lanes per direction. At its intersection with Warringah Road, it has a left-turn slip lane with two right turn lanes to Warringah Road. It carries approximately 25,000 vehicles per day in both directions and has a posted speed limit of 50 km/h.

Key Intersections

Considering the network connectivity to the NBH site and traffic distribution from a wider network context, four key intersections lie along the main access routes to the NBH site:

- Wakehurst Parkway / Frenchs Forest Road signalised intersection
- Warringah Road / Wakehurst Parkway signalised intersection
- Warringah Road / Forest Way signalised intersection
- Naree Road / Forest Way give way/yield intersection

6.2 ROAD NETWORK PERFORMANCE

This section defines the existing transport network performance in the study area around the Northern Beaches Hospital. An assessment of existing network capacity has been undertaken to identify key issues related to network deficiencies at key roads and intersections.

This assessment was undertaken on the basis of data and information collected at the time of preparation of the report and supplemented by traffic data and information contained in the following reports:

- Access Strategy, Northern Beaches Hospital, Stage 1 EIS, Hyder Consulting, December 2013.
- Traffic and Transport Impact Assessment, Northern Beaches Hospital, Stage 1 EIS, Hyder Consulting, August 2013.
- Frenchs Forest Specialised Centre Local Transport Assessment, AECOM, November 2011.
- Frenchs Forest Specialised Centre – State Significant Site Study, Preliminary Transport Assessment, ARUP, December 2010

Existing Traffic Volumes and Mid Block Capacity

Daily traffic flows on key roads within the vicinity of the study area have been identified. The results are based on survey data reported in previous studies for the Northern Beaches Hospital.

Table 6-2 summarises AM and PM peak hour traffic volumes on key roads in the study area.

Table 6-2 Daily and Peak Direction Traffic Volumes at Key Roads

Road (Section)	AADT	AM Peak		PM Peak	
		Peak Direction Volume	VCR	Peak Direction Volume	VCR
Warringah Road (between Hilmer St and Forest Way)	80,000	3,250	1.1	3,600	1.2
Wakehurst Parkway (between Warringah Road and Frenchs Forest)	21,000	1,250	0.4	1,200	0.4
Frenchs Forest Road (between Allambie Road and Wakehurst Parkway)	8,000	830	0.8	1,016	1.1
Frenchs Forest Road (between Wakehurst Parkway and Naree Road)	7,000*	643	0.6	546	0.5
Forest Way (between Naree Road and Warringah Road)	25,000	2,230	0.7	1,939	0.7

*Approximate

A comparison of mid-block volumes against the available capacity (measured in terms of number of lanes multiplied by lane capacity) provides the road volume-to-capacity ratio (VCR). This measure demonstrates the level of spare capacity available at midblock. The mid-block capacity is estimated at 1,000 vehicles per hour per lane, as per Austroads Guide to Traffic Management.

Existing Intersection Capacity and Level of Service

The criteria for evaluating the operational performance of intersections are provided by the *RMS Guide to Traffic Generating Developments, Version 2.2, October 2002*. The criterion is based on a qualitative measure (i.e. Level of Service), which is applied to each average delay band.

The 'Level of Service' is the standard used to measure the performance of the intersection operation. This is defined as the qualitative assessment of the quantitative effect of factors such as speed, traffic volume, geometric features, delays and freedom of movement.

The Traffic Impact Assessment (Hyder, August 2013) prepared for Stage 1 EIS of this Staged Infrastructure Application assessed the existing operational performance using SIDRA Intersection Analysis. SIDRA Intersection calculates the amount of delay experienced by vehicles using an intersection, and gives a Level of Service rating. The 'Level of Service' (LOS) indicates the relative performance of that intersection with regard to the average delay (in seconds per vehicle) experienced by vehicles at the intersection.

The LoS value is determined by the overall average vehicle delay for all movements for signalised intersections, while with roundabout, "Stop" and "Give Way" sign control intersections, the LoS value is determined by the critical movement with the highest average delay.

Table 6-3 summarises intersection LoS criteria applied to assess the intersection performance.

Table 6-3 LOS Criteria

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

In general, SIDRA predicts intersection performance for the following key parameters:

- Degree of saturation (DoS);
- Average delays to intersection;
- Level of service (LoS) determined from LoS criteria from **Table 6-3**; and
- Queue length.

The key intersections adjacent to the Northern Beaches Hospital are:

- Frenchs Forest Road/Wakehurst Parkway;
- Wakehurst Parkway/Warringah Road;
- Warringah Road/Forest Way; and
- Forest Way/Naree Road.

Table 6-4 and Table 6-5 provide an indication of the existing intersection performance of the key intersections along the main access routes to the Northern Beaches Hospital at the AM and PM peak periods.

Table 6-4 Intersection Performance, AM Peak (2012)

Intersection	Intersection Control	Approach	Average Delay Approach (sec/veh)	Approach LoS	Overall Average Delay (sec/veh)	Overall LoS
Warringah Road / Wakehurst Parkway	Signalised	Wakehurst Parkway South	45.3	D	47.6	D
		Warringah Road East	56.7	E		
		Wakehurst Parkway North	53.4	D		
		Warringah Road West	40.6	C		

Intersection	Intersection Control	Approach	Average Delay Approach (sec/veh)	Approach LoS	Overall Average Delay (sec/veh)	Overall LoS
Wakehurst Parkway, Frenchs Forest Road	Signalised	Wakehurst Parkway South	34.5	C	42.9	D
		Frenchs Forest Road East	32.5	C		
		Wakehurst Parkway North	54.4	D		
		Frenchs Forest West	48.8	D		
Forest Way / Naree Road	Giveway / Yield	Forest Way South	>200	F	>200	F
		Naree Road East	>200	F		
		Forest Way North	8.8	A		
Warringah Road / Forest Way	Signalised	Warringah Road WB	151.6	F	113.4	F
		Forest Way North	111.5	F		
		Warringah Road EB	104.7	F		

Source: Traffic Impact Assessment, Stage 1 EIS, Hyder 2013

Table 6-5 Intersection Performance, PM Peak (2012)

Intersection	Intersection Control	Approach	Average Delay Approach (sec/veh)	Approach LoS	Overall Average Delay (sec/veh)	Overall LoS
Warringah Road / Wakehurst Parkway	Signalised	Wakehurst Parkway South	55.7	D	82.7	F
		Warringah Road East	123	F		
		Wakehurst Parkway North	118.1	F		
		Warringah Road West	57.9	E		
Wakehurst Parkway, Frenchs Forest Road	Signalised	Wakehurst Parkway South	41.4	C	42.0	C
		Frenchs Forest Road East	34.2	C		
		Wakehurst Parkway North	44.0	D		
		Frenchs Forest West	41.9	C		
Forest Way / Naree Road	Giveway / Yield	Forest Way South	>200	F	>200	F
		Naree Road East	170.5	F		
		Forest Way North	8.7	A		
Warringah Road / Forest Way	Signalised	Warringah Road WB	111.2	F	75.5	F
		Forest Way North	79.0	F		
		Warringah Road EB	62.9	E		

Source: Traffic Impact Assessment, Stage 1 EIS, Hyder 2013

Summary

A number of studies and assessments have investigated the current transport condition in the vicinity of the proposed NBH site. These studies and assessments all conclude that the transport network around the proposed Northern Beaches Hospital is already at capacity and requires significant infrastructure upgrades to accommodate background growth.

A recent strategic assessment undertaken in May 2011² concluded that:

- all major roads servicing the Warringah area (including Mona Vale Road, Military Road, Pittwater Road and Warringah Road) are carrying volumes of traffic above their designed capacity in the am peak;
- all key intersections are operating close to their design capacity particularly the Warringah Road/Wakehurst Parkway intersection;
- Warringah Road carries a high proportion (70%-90%) of car trips due to limited east-west public transport connection; and
- Approximately 60% of vehicle trips on Warringah Road through Frenchs Forest originate from Brookvale, Dee Why and Pittwater LGA.

The local transport assessment study³ concluded that the traffic volumes during both peak periods on the key roads surrounding the site have reached capacity limits with all intersections operating at maximum limits of their designed capacity as at-grade intersections. Further conclusions included:

- The need to signalise Naree Road/Wakehurst Parkway intersection;
- A need to increase capacity at the Frenchs Forest Road/Wakehurst Parkway along with the Warringah Road/Wakehurst Parkway and Warringah Road/Forest Way intersections.

As a general outcome of these assessments, it was concluded that significant investment in transport infrastructure and public transport improvements is needed to accommodate existing travel demand, background growth and any additional development. A number of recommendations were identified for road infrastructure upgrades to be investigated. As such, these recommendations are of relevance to any development proposal in the Frenchs Forest area, including the Northern Beaches Hospital development proposal.

Many of the identified issues will be addressed by the RMS Connectivity and Network Enhancements Project. Refer to Section 7.

6.3 PUBLIC TRANSPORT

Public transportation access to the NBH site is only via bus services on the adjacent roads bordering the Precinct. The bus services are operated by Sydney Buses and Forest Coach Line. Most bus services are concentrated along the main arterial network with destinations including Chatswood, Dee Why, Manly, Brookvale and the City. The intersections of Warringah Road / Forest Way and Warringah Road / Wakehurst Parkway have bus priority facilities.

There are existing bus stops along Frenchs Forest Road and Warringah Road in close proximity to the proposed access entry to the Northern Beaches Hospital.

² Strategic Transport Assessment for the Frenchs Forest Specialised Centre, AECOM, May 2011

³ Local transport Assessment for the Frenchs Forest Specialised Centre, AECOM, November 2011

Table 6-6 summarises the existing bus services.

Table 6-6 Existing Bus Services

Bus Route No	Route Description	SW Bound	NE Bound
270	Belrose-City: via Warringah Road and Forest Way.	25	7
279-284	Duffys Forest-Chatswood via Warringah Road and Forest Way.	17	10
280	Warringah Mall-Chatswood via Warringah Road and Forest Way.	4	6
L60	Mona Vale-Chatswood via Warringah Road.	3	0
136	Manly-Chatswood via Warringah Road, Forest Way, Frenchs Forest Road East.	9	5
137	Chatswood-Bantry Bay via Warringah Road.	0	1
169	Manly-City via Warringah Road, Forest Way, Frenchs Forest Road East, Wakehurst Parkway.	4	1
169 / E69	Manly-City via Warringah Road, Forest Way, Frenchs Forest Road East, Wakehurst Parkway.	17	0
173	Narraweena-Milsons Point via Warringah Road, Forest Way, Frenchs Forest Road East, Wakehurst Parkway.	3	0
142	Allambie Heights-Manly via Skyline shops, Allambie Road, Condamine Street, Manly	2	3
E66	Allambie Heights-City via Skyline shops, Allambie Road, Military Road, Wynyard Station	5	1

Figure 6-4 shows the existing bus routes servicing the site and the location of bus stops.



Figure 6-4 Existing Bus Services

Reliability and frequency of the bus transport service is a critical factor to improve access provisions to the Precinct. The Strategic Bus Corridor Program of the NSW Government commenced in 2004 as a result of the recommendation put forward by the Unsworth Review of NSW bus services. The program is aimed at improving bus priority on Strategic Bus Corridors, both by infrastructure and technological solutions with the intent to improve average bus speeds on strategic corridors. A number of bus priority projects have been completed since the start of the programme. The implementation of bus priority measures along the strategic corridors is a continuing effort by the RMS.

Strategic bus corridors that service the Northern Beaches Hospital site are:

- Strategic Bus Corridor 15A – Chatswood to Dee Why via Warringah Road and Frenchs Forest Road East/West Iris Street McIntosh Street and;
- Strategic Bus Corridor 15B – Chatswood to Allambie Heights via Warringah Road and Allambie Road.

A study for Strategic Bus Corridor 15A and 15B is currently underway to define a program of works for potential implementation over a ten-year period.⁴

A proposal for a bus rapid transitway (BRT)⁵ along Warringah Road is also being investigated and considered by the State. The BRT is likely to provide limited stop services given the high volume of traffic carried by Warringah Road and the limited access from the adjoining developments. More frequent stop services are likely to be provided along Frenchs Forest Road.

The improvement of the existing bus stop facilities and the provision of new bus stop facilities are deemed to be part of the State's connectivity and enhanced network improvements.

The design of the hospital site will include enhanced pedestrian linkages to facilitate access to the bus stop facilities through signage and wayfinding as well as the provision of designated pedestrian paths within the hospital precinct.

6.4 PEDESTRIAN AND CYCLE NETWORK

6.4.1 PEDESTRIAN NETWORK

There are existing pedestrian paths on the adjacent network surrounding the Precinct with crossing facilities mainly at the signalised intersections. Refer to **Figure 6-5**.

⁴ Strategic Bus Corridor 15, GTA Consultants, September 2012.

⁵ Northern Beaches Bus Rapid Transit (BRT) Pre-Feasibility Study, TfNSW, June 2012



Figure 6-5 Pedestrian Paths and Crossing Points

A shared pedestrian and cycle path on the western boundary of the site will be provided as part of the Stage 1 NBH works. This path will improve north-south linkages between Frenchs Forest Road and Warringah Road.

6.4.2 CYCLE NETWORK

The Warringah Council Bike Plan presents a planning framework for the implementation of cycle facilities in Warringah LGA. The Plan includes an off-road shared path along Warringah Road and an on-road cycle path on Wakehurst Parkway. See **Figure 6-6**.

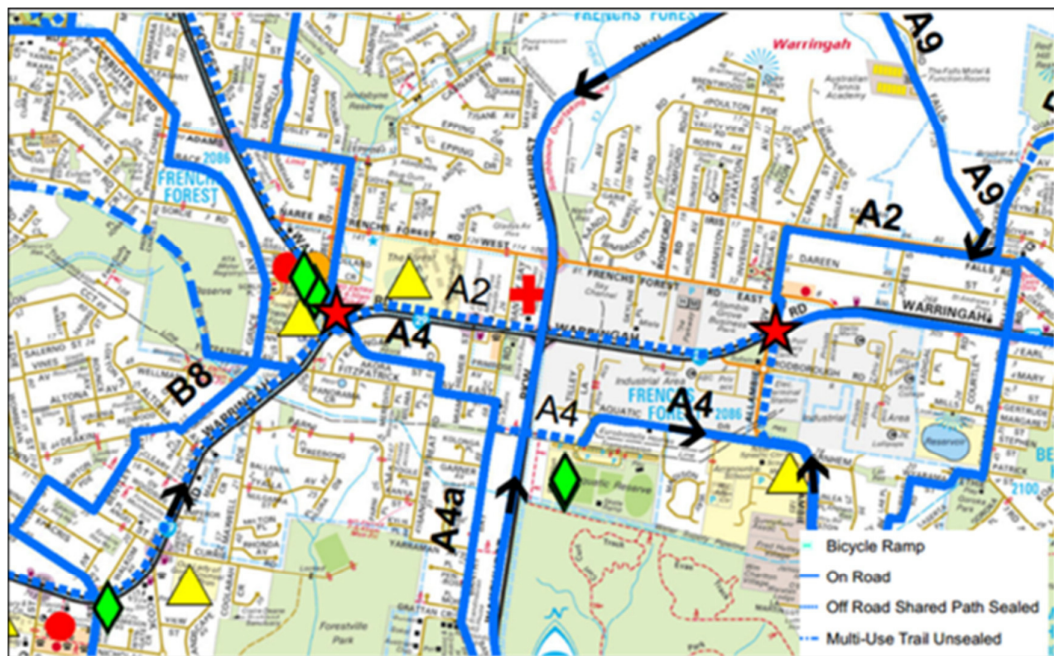


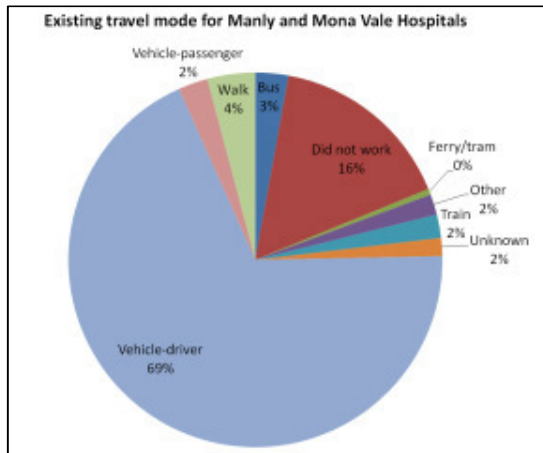
Figure 6-6 Warringah Council Bike Plan 2010

Under the Warringah Bike Plan, both paths are designated as Priority 1 paths for funding and implementation. The proposed shared path on the western boundary of the hospital precinct will connect to the external cycle network on the southern end at Warringah Road.

6.5 MODE SHARE

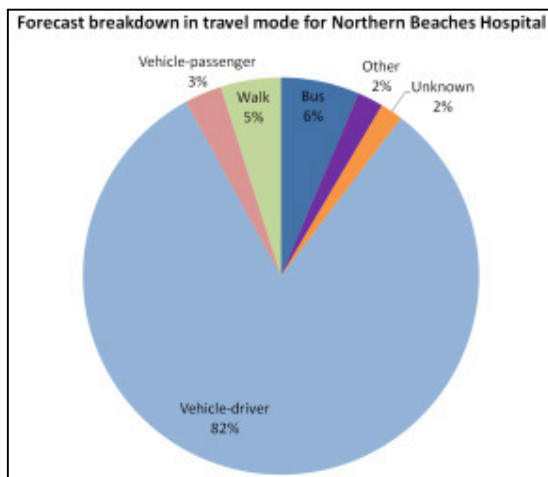
The likely transport mode choice for staff is based on Journey to Work data from the 2011 Census (Bureau of Transport Statistics). A key assumption is that the many of the staff currently serving at the Manly and Mona Vale Hospitals will be transferred to the Northern Beaches Hospital and hence, the likely transport mode split for NBH staff will be similar to the mode choices of the current staff at Manly and Mona Vale hospitals. An analysis of the existing mode split indicates 71% use private car (whether as driver or as passenger). This is shown in **Figure 6-7**.

Figure 6-7 Existing Travel Mode for Manly and Mona Vale Hospital



While the existing mode split includes staff who did not work and staff who travel on the train and ferry, it has been assumed that staff would continue to use public transport and would travel on bus. The forecast distribution for travel mode has been approximated by eliminating the data "did not work" category and the resulting breakdown in travel mode for the Northern Beaches Hospital is shown in **Figure 6-8**.

Figure 6-8 Forecast breakdown in travel mode for the NBH



The analysis provides an indicative assessment of the likely transport mode choices of future staff for travel to and from the hospital and forms the basis of setting targets for the reduction in reliance on the private car as the main travel mode.

6.6 CONSULTATION WITH KEY STAKEHOLDERS

Hyder requested for a consultation meeting to be held with the RMS and TfNSW to discuss existing concerns and future proposals relevant to the Northern Beaches Hospital Project. In lieu of a consultation meeting, Hyder was invited to attend a briefing conducted by the RMS on the Stage 1 connectivity works on the 21st February 2014] to present the overall strategy for the proposed road enhancements and connectivity for the Northern Beaches Hospital Stage 1 application. The briefing was focussed on providing a general overview of the strategy to deliver the proposed program of works.

A meeting with TfNSW is still to be confirmed.

7 CONNECTIVITY ENHANCEMENT WORKS

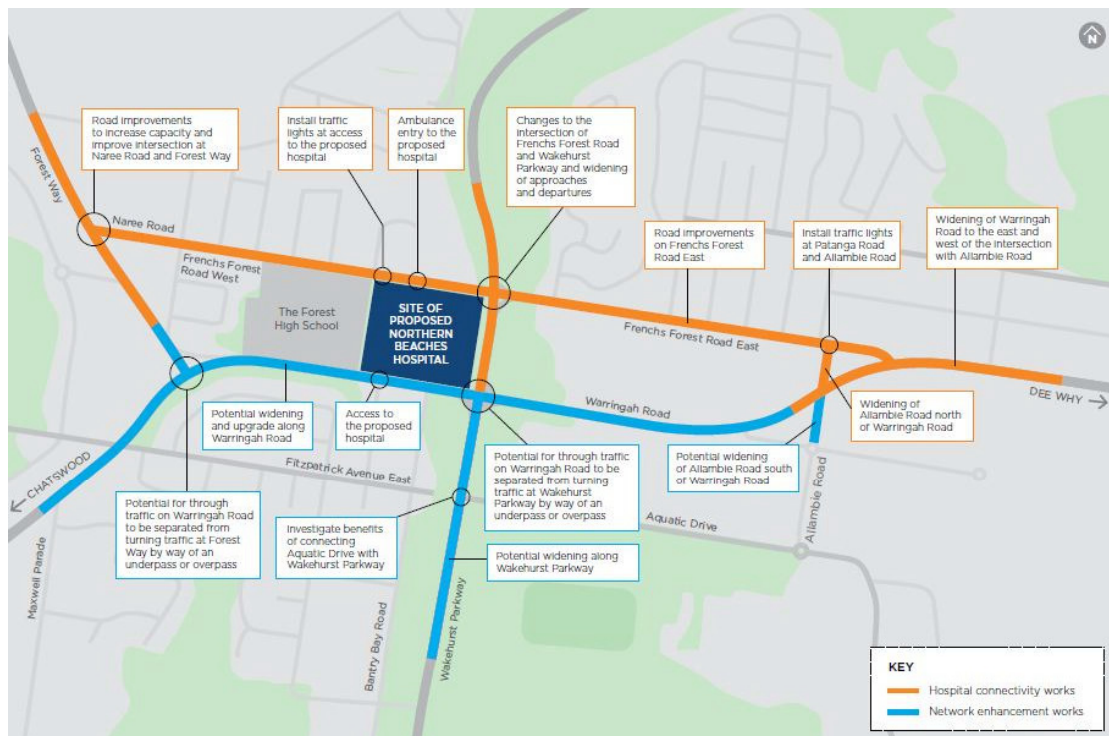
The RMS has committed to undertaking road upgrade works to facilitate efficient access to and from the new Northern Beaches Hospital through the Northern Beaches Hospital Road Connectivity and Network Enhancement Project. At the date of this document, Director General Requirements for RMS Stage 1 Hospital Connectivity Works have been issued and EIS prepared. Secretary's Environmental Assessment Requirements (SEARs) for RMS Stage 2 Network Enhancement Works have also been issued⁶. The Northern Beaches Hospital Connectivity and Network Enhancement Project is intended to support the activation of the Northern Beaches Hospital Precinct through road network and intersection upgrades to facilitate access connections and allow for improved public transport improvements through the network.

Stage 1 works involve the following upgrades:

- Widening of a section of Frenchs Forest Road West and East from the hospital site to Allambie Road.
- Provision of a new signalised intersection on Frenchs Forest Road West as a new access to the hospital and on Frenchs Forest Road East, Patanga Road and Allambie Road.
- Provision of dedicated kerb side bus lanes along Frenchs Forest Road West and East approaches and departures to the intersection with Wakehurst Parkway.
- Changes to the intersection of Frenchs Forest Road and Wakehurst Parkway.
- Widening of Allambie Road to the north of the intersection with Warringah Road.
- Widening of Warringah Road around 500 metres west of the intersection with Allambie Road to the vicinity of Courtley Street in the east.
- Widening and intersection upgrades along sections of Forest Way between Warringah Road and the vicinity of Adams Street.
- Widening and intersection upgrades along Naree Road and Frenchs Forest Road West.
- Reconfiguring of access between Forest Way and Naree Road.

Stage 2 works involves significant works to Warringah Road including grade separated intersections at Wakehurst Parkway, Hilmer Street and Forset Way.

⁶ Stage 1 Hospital Connectivity Works Program



Source: Northern Beaches Hospital – Connectivity and Network Enhancements Staged Infrastructure Application Report

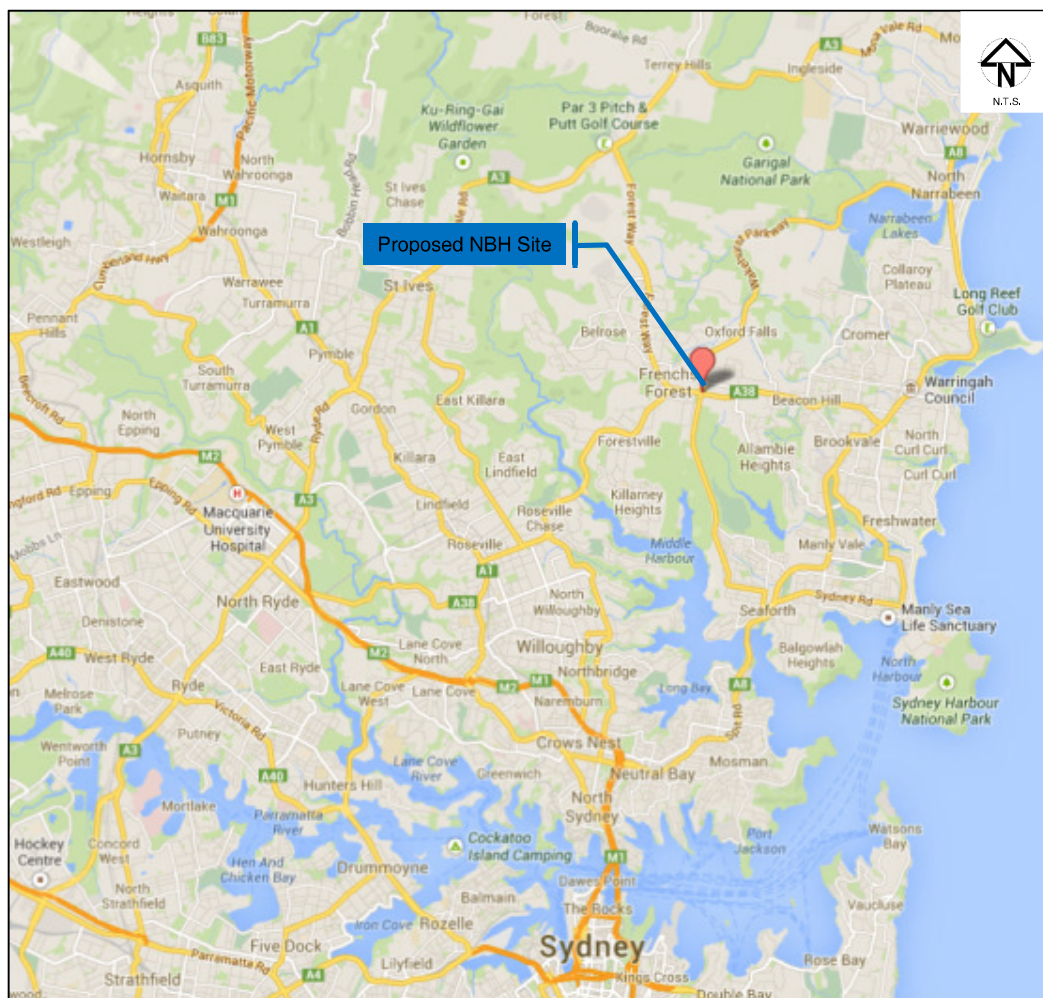
Figure 7-9: Key Features of the RMS Staged Infrastructure Application

8 THE NBH SITE

The proposed Stage 2 NBH includes:

- Bulk excavation works
- Construction of a nine storey Hospital building
- Staff, patient and visitor car parking, including construction of an eight storey multi-deck Car Park
- Site works including internal roads, pathways and landscaping
- Utility amplification works

The site for the proposed NBH is located approximately 15 km north of the Sydney CBD (refer to **Figure 8-10**) within the suburb of Frenchs Forest and Warringah Council Local Government Area (LGA).



(background image source: www.google.com/maps)

Figure 8-10: Locality Map

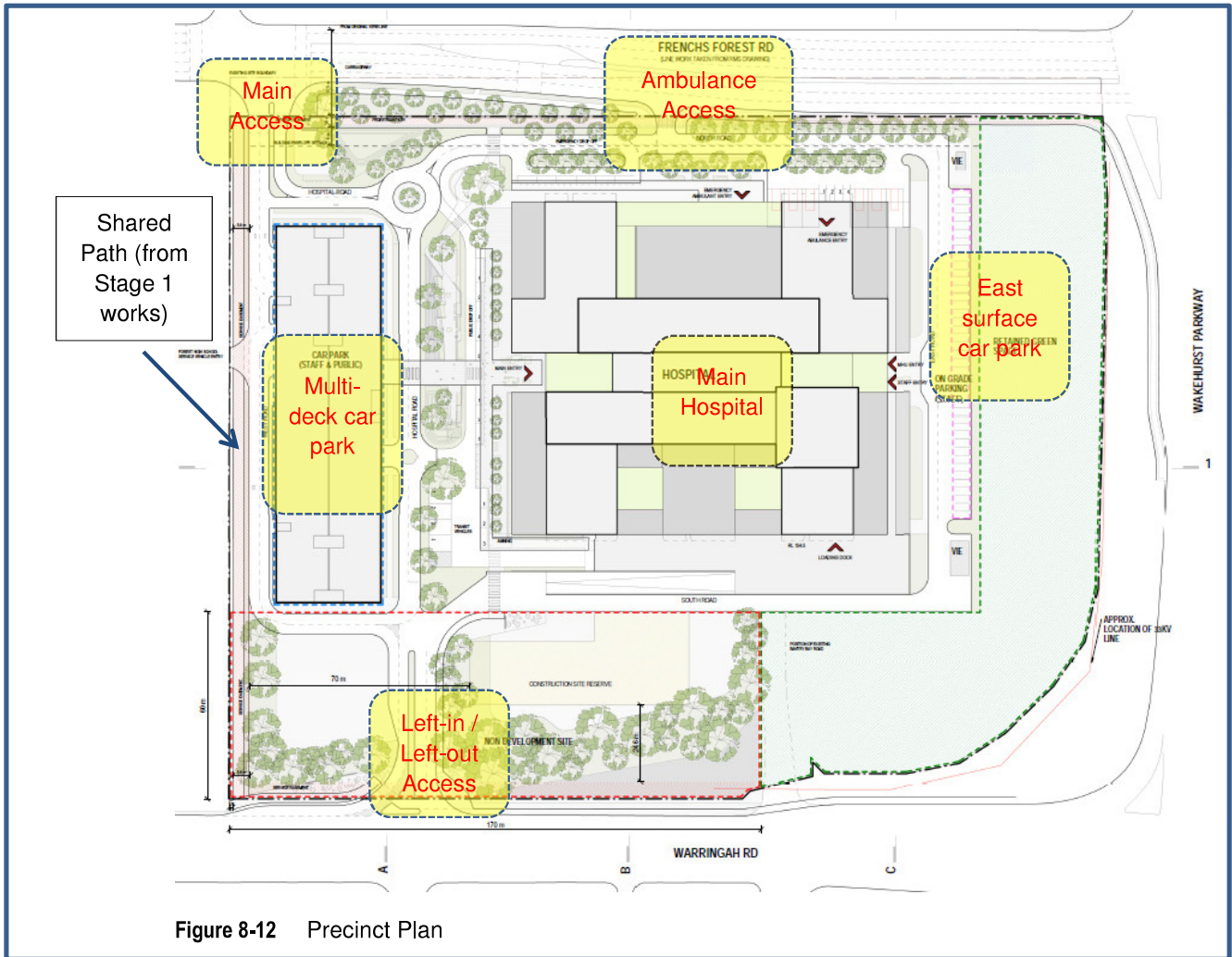
The site is bound by Frenchs Forest Road West, Warringah Road, Wakehurst Parkway and The Forest High School (refer **Figure 8-11**) and has a total area of approximately 6.285 ha.



(background image source: www.google.com/maps)

Figure 8-11: Site Plan

8.1 SITE DEVELOPMENT



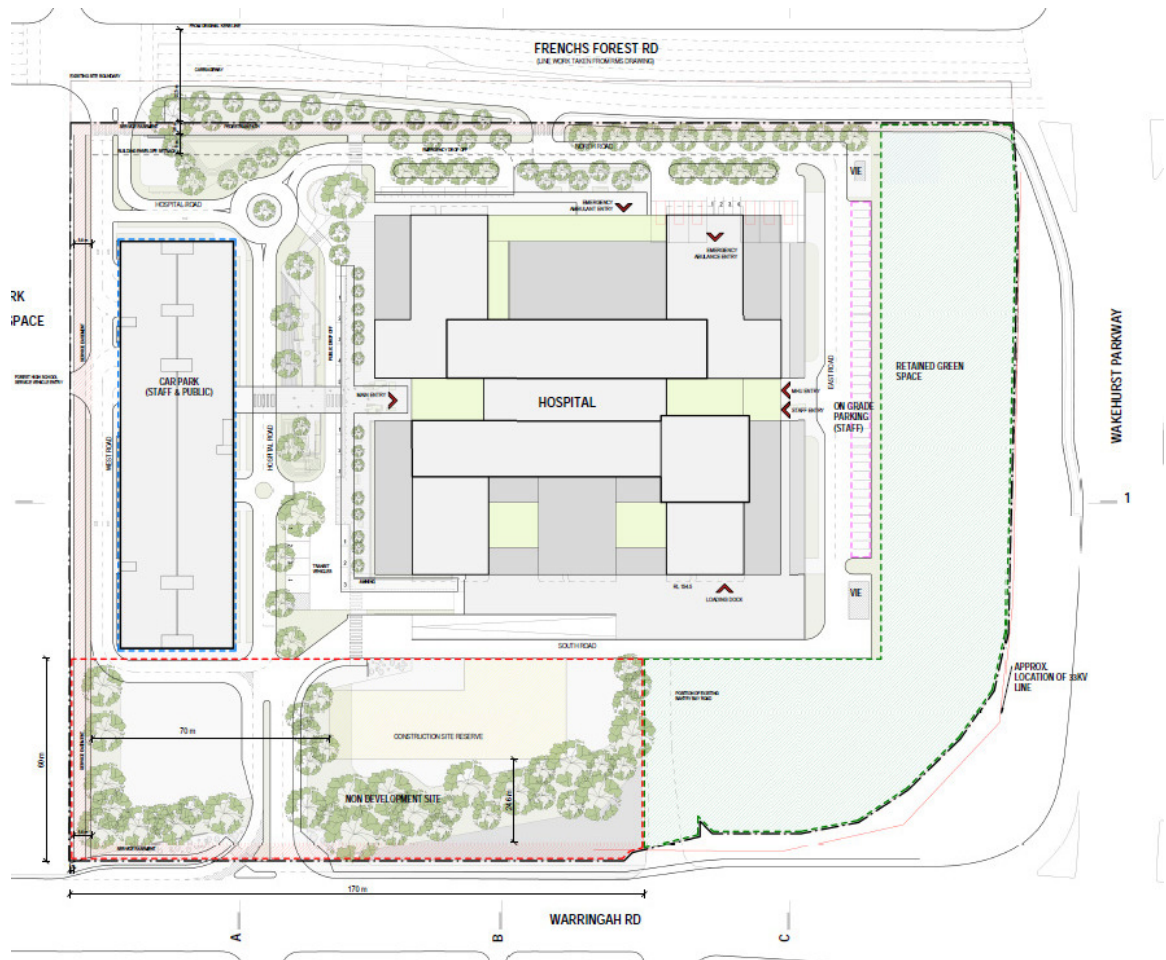


Figure 8-12 identifies the proposed pattern of development on the NBH site including the location of access points on Frenchs Forest Road and Warringah Road. The pattern of development includes a multi-storey car park building on the western boundary, open staff car park along the eastern boundary and the main 9 storey hospital building in the centre of the site.

8.2 SITE ACCESS

The main vehicular access to the site is via a new signalised intersection at Frenchs Forest Road near the north western corner of the site. The signalised intersection is part of the RMS Stage 1 works program. The primary access location was selected as the preferred option following an Access Strategy and Options Assessment review undertaken as part of the preparatory works for Stage 1.

The proposed location of the main access provides the following benefits:

- Improved safety – allows right turns in and out;
- Adjacent footpaths are channelled to signalised crossings;
- Provides safer pedestrian access to bus stops;
- Greater flexibility with arrivals and departures – caters for both directions;
- Land take is on hospital grounds – reduced cost and lead time for delivery;
- No impact to northern kerblines of Frenchs Forest Road; and

- Signals should be able to operate in tandem with coordination with signals at the Wakehurst Parkway/Frenchs Forest intersection and without excessive risk of queue spillage.

It is estimated that approximately 70% of the vehicles entering the hospital will use this main access intersection at Frenchs Forest Road with majority of the vehicles arriving from the east⁷.

Entry at the main entrance to the hospital site will require a turn lane from both directions of travel on Frenchs Forest Road. Preliminary modelling was undertaken to determine lane configuration and lane lengths to accommodate vehicle queuing. This entry access will cater to vehicles, pedestrians and cyclist. Separate entry paths will be provided for each. A designated bus stop will be located adjacent to the entry. Pedestrian crossing facilities will also be provided as part of the signalised intersection works by RMS. In addition, the shared (north-south) pedestrian and cycle path on the western side will link directly to the pedestrian entry.

A secondary access point on Frenchs Forest Road located approximately 120 metres to the east of the main entrance is proposed to provide dedicated emergency access for ambulances only.

Access will also be provided from Warringah Road with a left-in left-out only access provided for all vehicles. The left-in left-out access will be located opposite Hilmer Street and will cater to service vehicles, emergency vehicles and private vehicles. A deceleration lane for left turning vehicles from Warringah Road east into the site will be required. The Warringah Road access will accommodate truck vehicles accessing the loading dock.

The swept paths for access to the site and to the loading dock are shown in **Appendix A**.

Pedestrians and cyclists from Warringah Road can access the site via the internal pedestrian path systems linked to public transport stops. Access is to be provided by the Stage 1 shared path located against the western boundary of the site.

Vehicles likely to access the NBH site include:

- Light vehicles (staff, patients, tenants and visitors)
- Light commercial vehicles (for service deliveries and tenants)
- Bus (25-seater)
- Ambulance and emergency vehicles
- Firetrucks
- Heavy commercial vehicles (for major hospital deliveries of supplies and equipment).

⁷ Traffic distribution is further discussed in Section 9.

Internal Circulation

Within the site, a network of internal roads will provide for access and circulation. The system primarily consists of a north-south spine road linked to the Warringah Road access and an east-west link. An internal loop road to north, east and south faces of the hospital will link the north-south spine road to the at-grade staff car park at the eastern sector of the site and the discreet Mental health entry located along the eastern elevation of the hospital

Car and light commercial vehicles can enter and exit via Frenchs Forest Road or Warringah Road access entry.

Access and internal circulation within the site is shown in **Figure 8-13** to **Figure 8-13**.

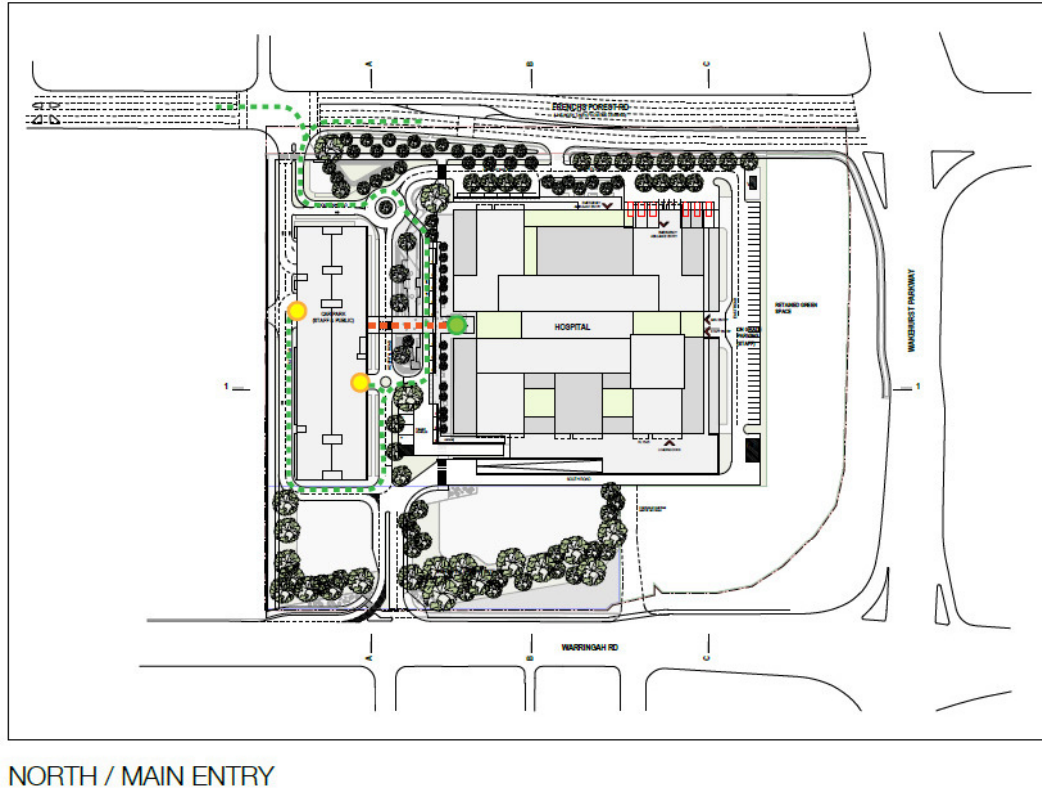
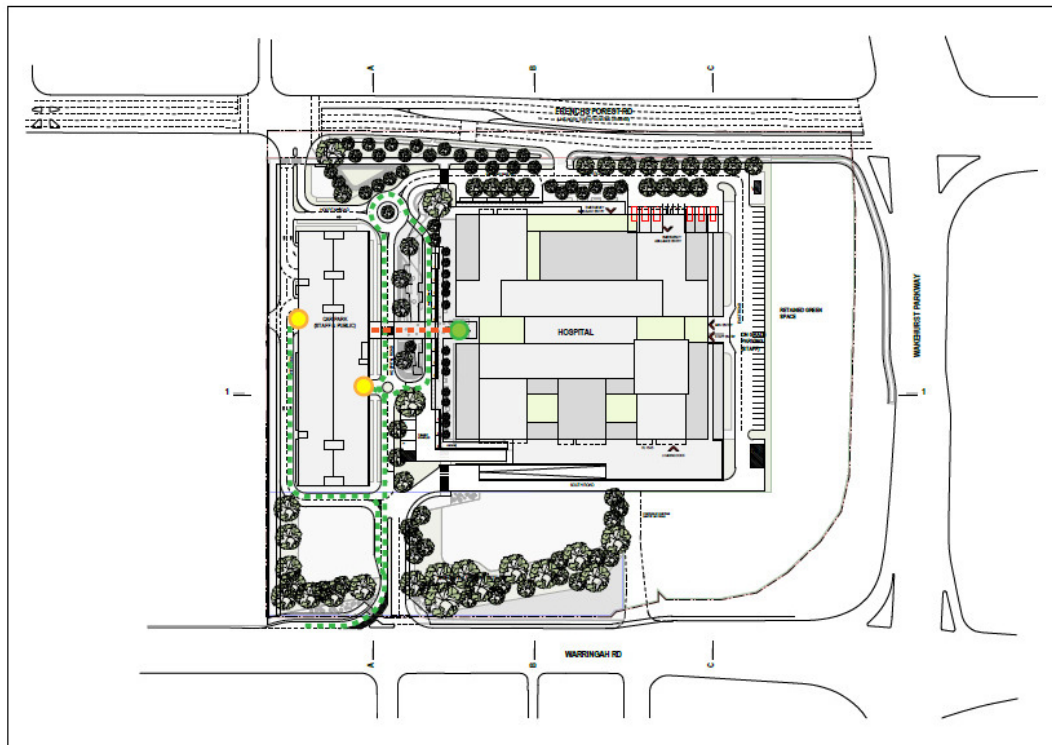
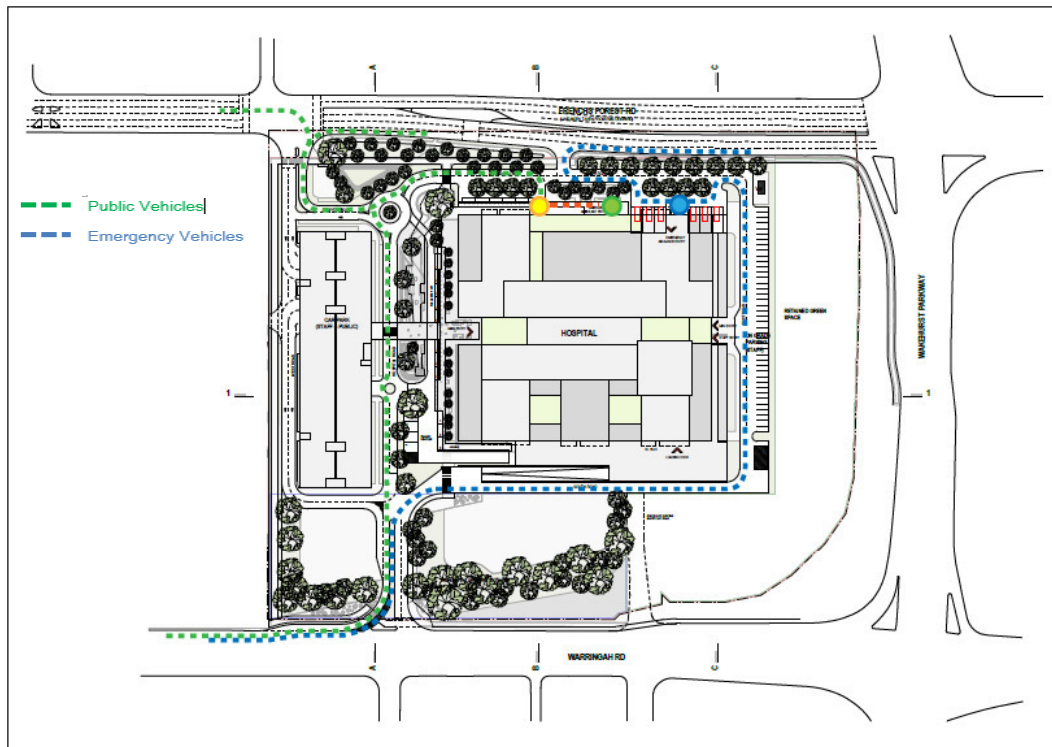


Figure 8-13 Traffic Flow Diagram Plan for entry from the North/main Entry to Hospital Main Entry then to Car Park (Public vehicles only)



SOUTH ENTRY

Figure 8-14 Traffic Flow Diagram Plan for entry from the South Entry to Hospital Main Entry then to Car Park (public vehicles only)

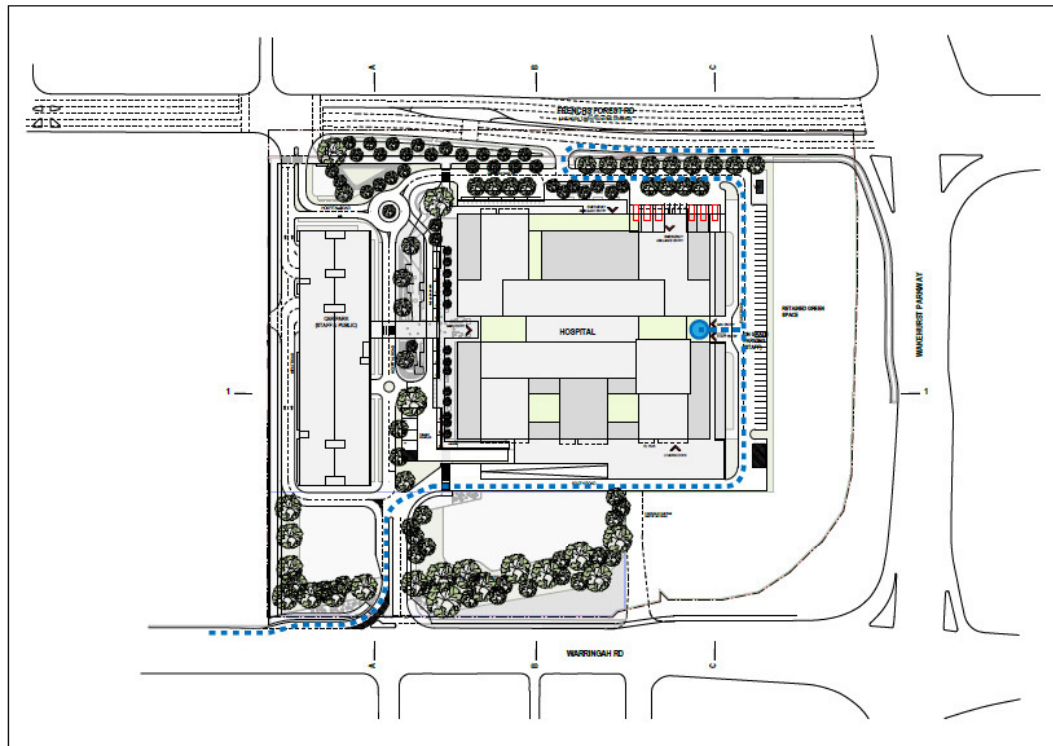


EMERGENCY ENTRY

Figure 8-15 Traffic Flow Diagram Plan for Public and Emergency Vehicles

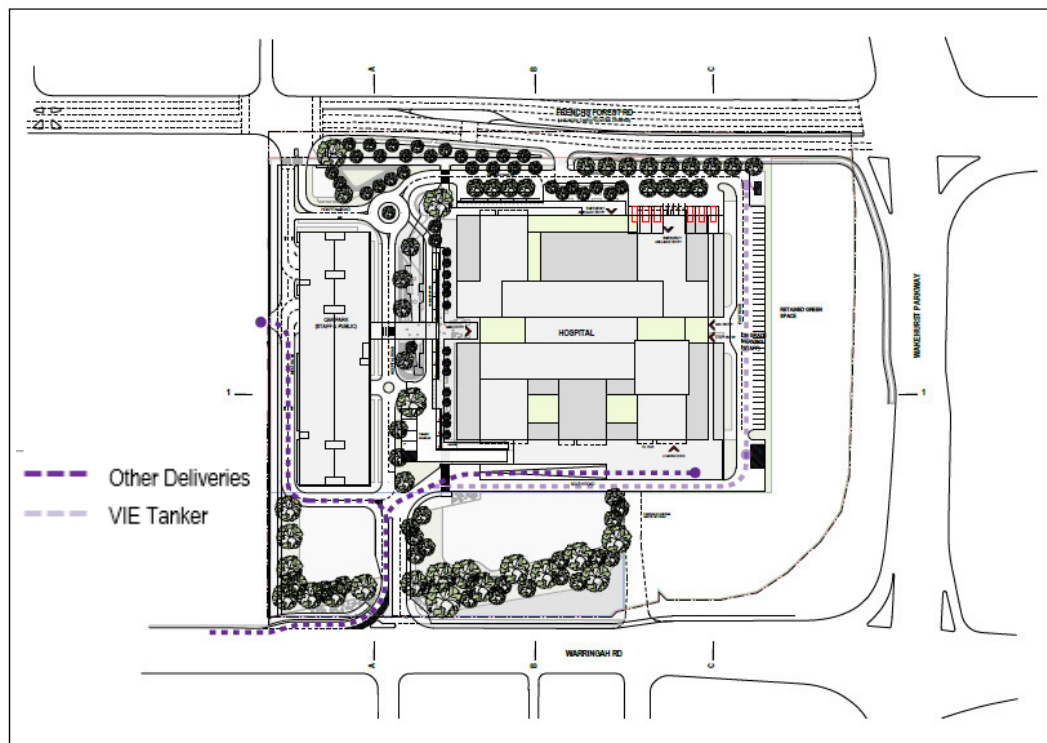
Figure 8-15 shows the secondary access to the east of the main entrance on Frenchs Forest Road. This entry is designated as ambulance and emergency vehicle access. However, ambulances can also enter and exit via Warringah Road.

Access to the Mental Health Unit is via the south entry on Warringah Road or via the secondary entry on Frenchs Forest Road. This is shown in **Figure 8-16**.



MENTAL HEALTH

Figure 8-16 Traffic Flow Diagram Plan for Access to the Mental Health Unit



SERVICE VEHICLE

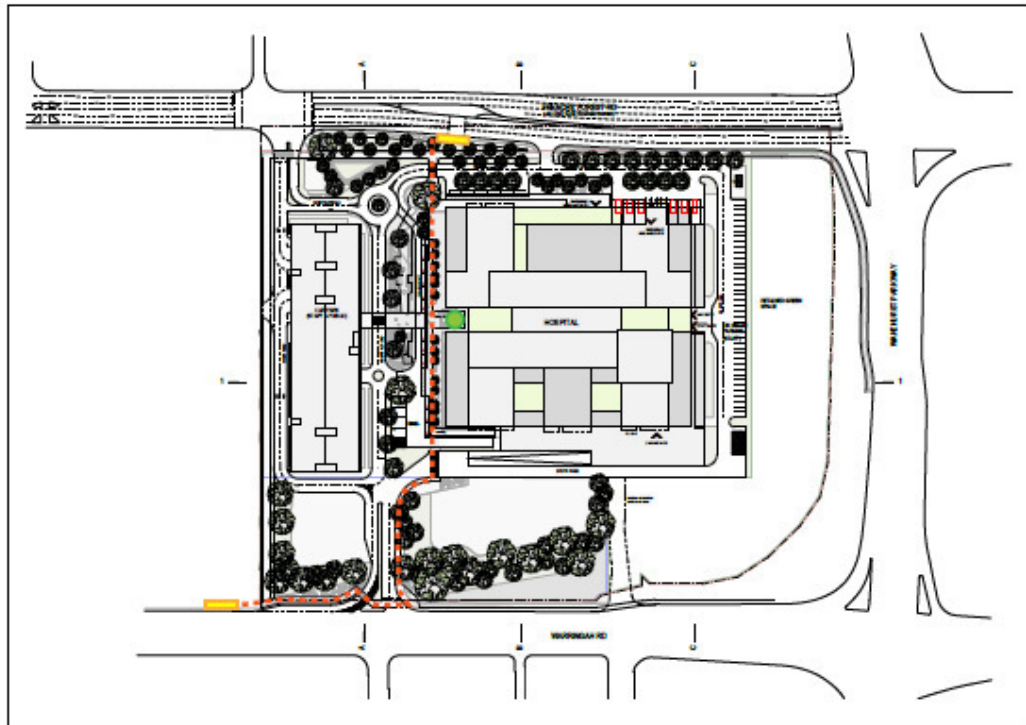
Figure 8-17 Traffic Flow Diagram Plan for Service Vehicles

As shown in **Figure 8-17**, service vehicles, trucks and large commercial vehicles will enter the site via the southern access at Warringah Road. Trucks entering the loading dock on the southern side of the Hospital building are provided with an access ramp to the east of the southern entry. Trucks can reverse into the loading dock facility and egress in a forward direction towards the access ramp.

Access to the adjacent High School for service vehicles is provided from Warringah Road to a designated school entry from the road to the west of the car park.

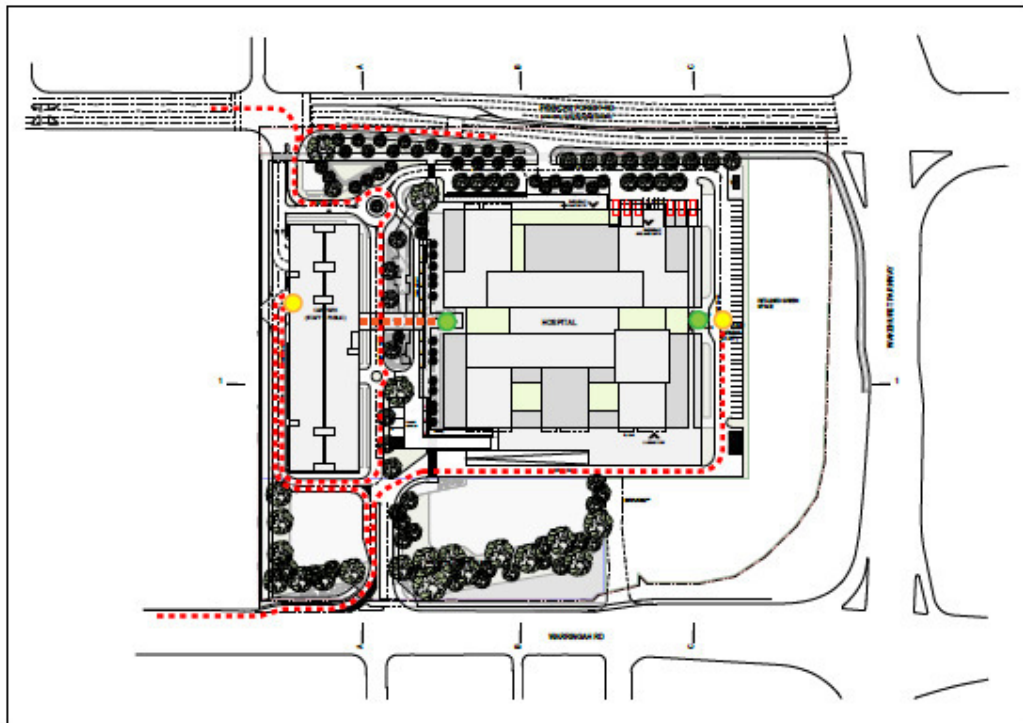
Designated pathway for pedestrians to access the bus stop has been identified to ensure separation of pedestrian and vehicle movements and to minimize potential conflicts. Traffic circulation within the site for pedestrians is shown in **Figure 8-18**.

Staff can enter the site via the north or south entry. This is shown in **Figure 8-19**. Traffic flow diagrams for transit vehicles and for access to the mortuary are shown in **Figure 8-20** and **Figure 8-21**.



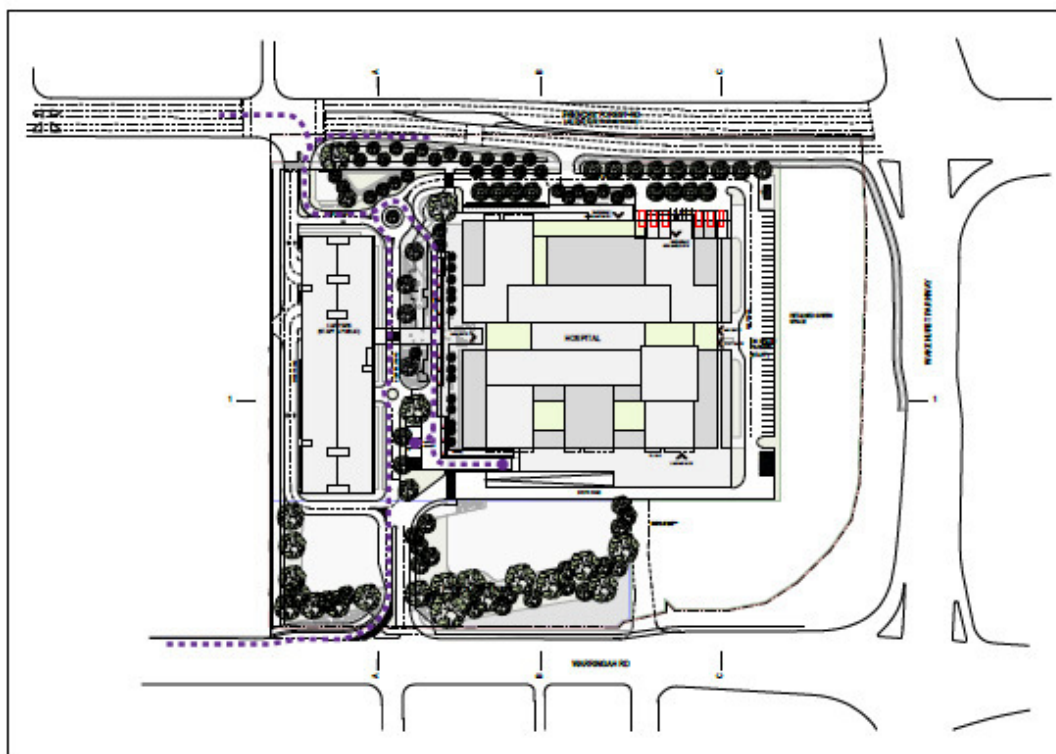
BUS STOP

Figure 8-18 Traffic Flow Diagram Plan for Pedestrians to Access the Bus Stop



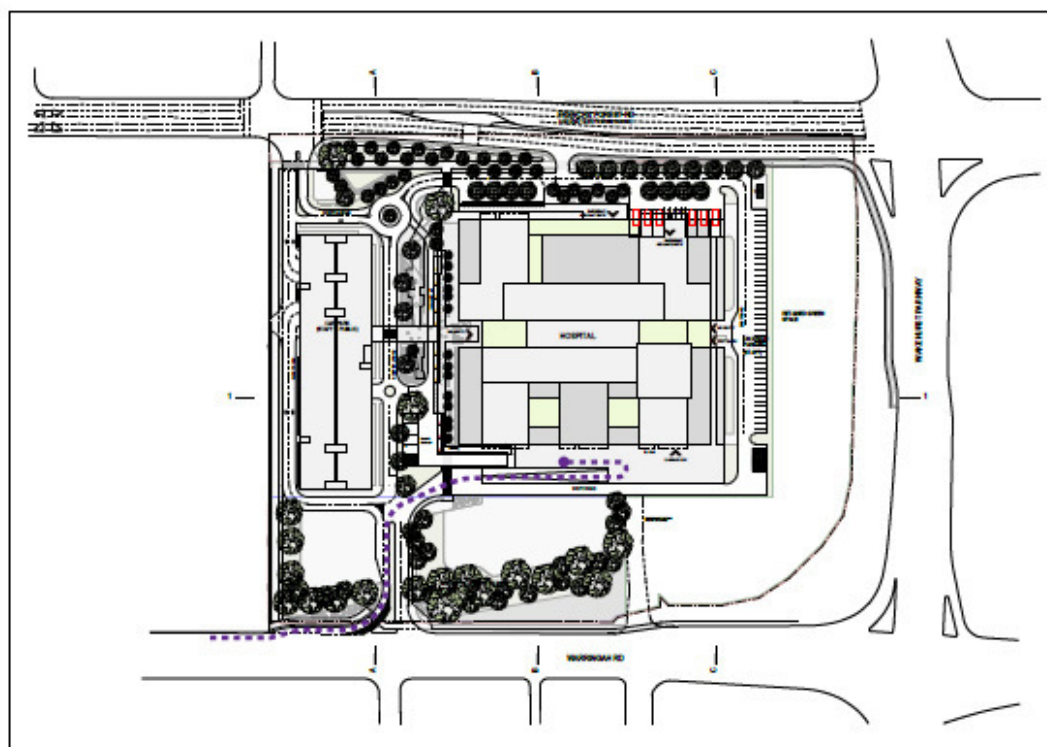
STAFF ENTRY

Figure 8-19 Traffic Flow Diagram Plan for Staff Vehicles



TRANSIT

Figure 8-20 Traffic Flow Diagram Plan for Transit Vehicles



MORTUARY

Figure 8-21 Traffic Flow Diagram Plan for Access to the Mortuary

8.3 PARKING PROVISION

The Stage 1 EIS identified a parking requirement for 900 spaces. The parking demand has been subject to a series of reviews. Data on which the reviews were conducted include the count of beds, hospital staff, doctors and tenants.

A study⁸ subsequently undertaken by Luxmoore Parking and Safety reviewed the various findings to validate the forecast demand for parking for the Northern Beaches Hospital. The specific intent was to determine an appropriate parking provision for the current hospital design. The review carried out a comparative analysis of the various approaches used in determining parking demand. The review recommended a total of 1,426 parking bays, primarily provided in the multi-deck car park.

The review further concluded that the forecast peak hour demand is a total of 1,295 parking bays. The proposed Northern Beaches Hospital now provides a total of 1,430 spaces broken down as follows:

Table 8-7 NBH Parking Provision

Parking Type	Location	Number of spaces
Public parking	Multi deck Car Park	1034
Staff parking	Multi deck Car Park	312
	Eastern surface car park	41
Emergency Vehicle Parking	Ambulance	6
	Emergency vehicles	4
	MHU Emergency vehicle	1
Drop off spaces	Emergency	6
	Main Entry	5
	Main Entry Taxi drop off	3
	Main Entry Transit vehicles	4
	Main Entry Transit drop off	3
Commercial vehicle parking	Loading Dock	6
	Contractors and Couriers	4
	Mortuary Hearse	1
Overall Total Spaces		1430

⁸ Northern Beaches Hospital Parking Review, Luxmoore Parking and Safety, February 2014 and Northern Beaches Forecast Parking Demand, 9 April 2014

Multi-deck Car Park

The multi deck car park is located to the west of the site parallel to the western boundary and east to shared pedestrian and cycle path. The west car park consists of 2 basement levels, a ground level and 7 upper level parking decks. The two basement levels will accommodate 141 vehicles each (141x2), the ground floor will have 58 spaces, Level 1 will have 142 spaces and each upper level deck from Level 2 to Level 7 will have the capacity to accommodate around 144 vehicles (144x6). In total, the multi-deck car park will have 1346 spaces. Entry to and exit from the car park is provided via a car park access road on the western side and an entry/exit on the eastern side along Hospital Road. Entry and exit to/from the car park will be controlled via boom gates and ticket issuing devices. The required queuing length for vehicles for the anticipated peak hourly inflow has been considered and reflects the requirements of AS2890.1.

The multi-deck car park includes a total of 20 accessible parking spaces with two (2) spaces located on each level (B2 to L7). These spaces will be located close to lift and main pedestrian access corridors connecting to the hospital buildings.

The car park design is in accordance with AS2890.1 (Off street Car parking) and AS2890.6 (Off-street parking for people with disabilities).

East Surface Car Park

The east surface car park is located on the east side of the Main Hospital Building and is an at-grade, open space car park with 41 spaces. The car park is intended to cater for nominated staff parking only.

The east surface car park can be accessed via the east-west link road on the south side connecting to the north-south spine and the south entrance on Warringah Road Forest Road west.

There are four (4) accessible parking spaces provided in the east surface car park.

The car park design is in accordance with AS2890.1 (Off street Car parking), and AS2890.6 (Off-street parking for people with disabilities).

Bicycle Parking

Within the multi-deck car park, a total of forty-eight (48) bicycle racks are provided for staff bicycle parking and thirty-eight (38) bicycle racks for visitor bicycle parking. End of trip facilities will also be provided for staff. A total of twenty-two (22) shower facilities will be installed for use of staff as part of the overall staff change zone to be located in the Hospital.

Ambulance Parking

The secondary access located to the east of the main entrance on Frenchs Forest Road is a dedicated entry intended for ambulance and emergency vehicles and adjacent to the Emergency Department. The design provides six (6) drive-in spaces for ambulances at the easternmost side of the Hospital building and four (4) car park spaces for emergency vehicles.

Main Entry Patient Drop Off and Pickup

The design provides five (5) spaces for patient drop off and emergency parking (accessed from the north-south spine road) adjacent to the main entrance to the main hospital building. In addition, three (3) taxi drop off spaces, three (3) spaces for transit vehicle drop off and four (4) spaces for transit vehicles parking are provided in the adjacent area.

Emergency Drop-Off/Parking

The emergency drop-off area is located adjacent to the emergency ambulant entry on the north side of the main hospital building. It can be accessed from the east via the secondary access entry on Frenchs Forest Road intended for ambulance and emergency vehicles. There is provision for six (6) vehicle drop-offs. From the west, the emergency drop off can be accessed via the east-west link road. The on-street vehicle spaces conform to AS2890.5 (On-street Parking).

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Loading Dock/Parking

The loading dock will have a total of six (6) spaces for commercial vehicles with additional provision of four (4) spaces for contractors and couriers and a single (1) space for the mortuary hearse. The loading dock can be accessed via south entry to the hospital at Warringah Road. The loading dock is designed in accordance with AS2890.2 (Commercial Vehicles).

9 TRAFFIC GENERATION

Traffic Generation Rates

The vehicle trip generation associated with the hospital has been estimated in accordance with the traffic generation rates prescribed in the RMS “Guide to Traffic Generating Developments”. The guide stipulates a traffic generation rate based on a combination of the number of beds (B)⁹ and the number of staff per weekday shift (ASDS)¹⁰. It is, however, noted that the models are based on surveys undertaken in 1994 of private hospitals. In the absence of any other guidelines, these models are used to establish indicators of potential traffic generation of the hospital site for the purpose of planning. It has also been assumed that all beds are private and the trip generation has been applied uniformly.

Peak Period Traffic Generation Models

The RMS Guide provides three models to calculate peak traffic activity, as shown below:

- a) PVT (Peak vehicle trips) $= -14.69 + 0.69 B + 0.31 \text{ ASDS}$ ($R^2 = 0.74$)
- b) MVT (Morning commuter peak hour) $= -10.21 + 0.47 B + 0.06 \text{ ASDS}$ ($R^2 = 0.64$)
- c) EVT (Evening commuter peak hour) $= -2.84 + 0.25 B + 0.40 \text{ ASDS}$ ($R^2 = 0.69$)

Estimated Traffic Generation

Applying the above RMS models yields the following estimates:

- a) Peak vehicle trips¹¹: PVT = 809 vehicle trips
- b) Morning commuter peak hour: MVT = 297 vehicle trips

The vehicle trip generation for the morning commuter peak hour is estimated to be for the time period between 8:00 AM to 9:00 AM. The morning staff shift change usually occurs outside the morning commuter peak and does not impact much on the traffic generation.

- c) Evening commuter peak hour: EVT = 779 vehicle trips

The vehicle trip generation for the afternoon or evening commuter peak hour usually falls within the time period between 5:00 PM to 6:00 PM. The peak traffic activity varies between hospitals but is observed to occur in the afternoon period and usually incorporates a staff shift change and the visiting hours period.

It is clear that the peak vehicle trip total is closely correlated to the calculated evening commuter peak hour vehicle trips.

Trip Distribution

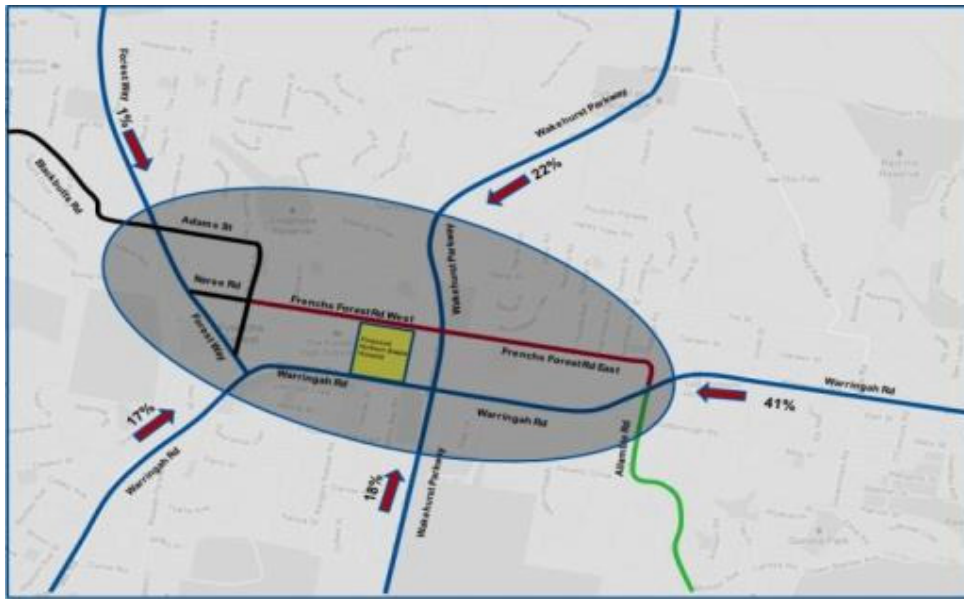
The Journey to Work data from the 2011 census was used to inform the spatial distribution of staff trips. The spatial distribution of trips is also likely to be similar to the spatial distribution of the Manly and Mona Vale hospitals considering that many of the clinical services will be transferred to the Northern Beaches Hospital,

⁹ The number of beds adopted is 439.

¹⁰ Based on the RFP, the value of 1,680 was adopted as the ASDS. This is a conservative estimate as subsequent reports have noted lower ASDS.

¹¹ Peak generation for a variable peak hour of the day.

Figure 9-22 provides an indicative summary of the trip distribution pattern for the Northern Beaches Hospital.



Source: Traffic Impact Assessment, Stage 1 EIS

Figure 9-22 Trip Distribution

The analysis suggests that 41% of the trips will be coming from the east direction via Warringah Road, 22% from the north-east via Wakehurst Parkway, 18% from the south via Wakehurst Parkway, 17% from the southwest via Warringah Road and 1% from the north-west via Forest Way.

Applying the trip distribution to the estimated peak hour traffic generation provides the likely distribution of vehicles on the access nodes to/from the hospital. For the evening peak hour, it is assumed that 20% of the trips are arriving at the hospital and 80% of the vehicle trips are departing.

Arrivals

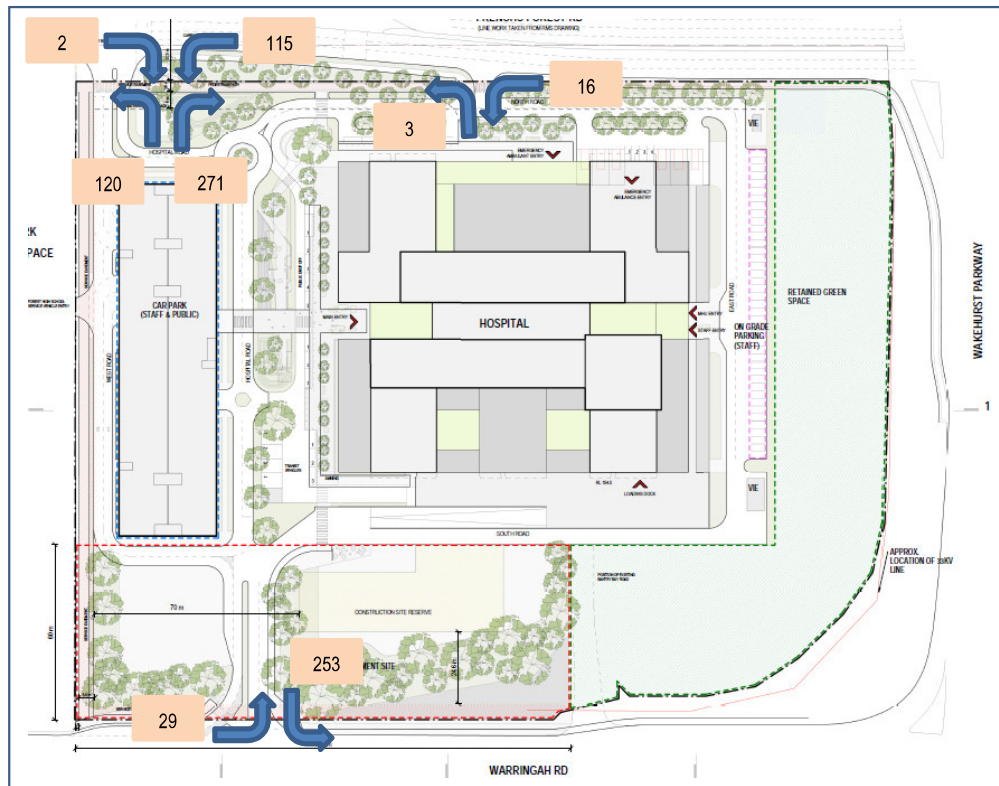
Majority of the arrivals to the hospital are expected to use the main entry at Frenchs Forest. With the left-in, left-out arrangement at Warringah Road access, vehicles travelling from the northeast, southeast and east will access from the direction of the Wakehurst Parkway/Frenchs Forest intersection. Vehicles from the southwest are likely to enter via the Warringah Road access.

Departures

Vehicles departing the hospital and travelling towards the southeast are likely to exit from the Warringah Road left out access. Vehicles travelling east may take either the Warringah Road or the Frenchs Forest exit. Vehicles to the northeast will exit from Frenchs Forest and vehicles to the southwest will exit at Frenchs Forest.

SUMMARY

In summary, the forecast evening peak hour vehicle trip distribution is estimated as shown in **Figure 9-23**.



The figure above shows an indicative distribution of the peak hour volume of 809 vehicles. The volumes shown have been rounded-up to the nearest whole number.

Figure 9-23 Forecast Peak Hour Vehicle Trip Distribution

Traffic Impact Assessment

It is anticipated that the hospital development will impact on the surrounding road network in terms of road capacity and intersection performance. The peak hour traffic volume assessed for the hospital in this report for the Stage 2 NBH EIS was in the order of 809 vehicle trips (282 vehicles on Warringah Road and 527 on Frenchs Forest Road). Currently, Frenchs Forest Road carries approximately 8,000 vehicles per day in both directions with am peak traffic being approximately 1100 vehicles in both directions. Warringah Road carries approximately 80,000 vehicles per day in both directions with eastbound am peak traffic being approximately 3500 vehicles.

The preliminary traffic impact assessment submitted in the Stage 1 Northern Beaches Hospital EIS established that under existing conditions, both Frenchs Forest Road and Warringah Road would have a combined absorption capacity^[1] of 1,320 vehicles/hour (Frenchs Forest Road: 550 vph eastbound and 500 vph westbound; Warringah Road: 270 vph eastbound). This combined absorption capacity exceeds the indicative vehicle generation anticipated for the hospital (shown in Figure 9-23) and as such there would be sufficient midblock capacity to accommodate the additional forecast peak hour traffic. The report concluded that although there will be an increase in the hourly volume, the available absorption capacity suggests that there would be potential capacity to absorb/receive this additional peak hour traffic from the proposed hospital in the existing road network.

Intersection performance is critical to the overall network performance. Table 6-4 and Table 6-5 provide a summary of intersection performance under existing road conditions and peak period

traffic demands. The tables clearly indicate that there is high levels of congestion at the intersections during the AM and PM peak periods and very little residual capacity for additional traffic during peak periods. There are major constraints in the surrounding road network with regards to the capacity deficiencies of the major intersections. Impacts from future development in the area, including the hospital will consequently reduce the performance of the intersections. These existing deficiencies have been recognised and acknowledged by the RMS.

As noted in Section 7, significant upgrades are proposed to the surrounding road network under the RMS Northern Beaches Hospital Road Connectivity and Network Enhancement Project and as such consideration of the hospital impacts on the proposed system require consideration.

The project is proposed in two stages being:

- Stage 1 Hospital Connectivity Works which aim to enhance the existing road network to facilitate the opening of Northern Beaches Hospital in 2018 and traffic growth up to 2028. Stage 1 works include:
 - widening and intersection upgrades along sections of Forest Way between Warringah Road and south of Adams Street,
 - Upgrade of the existing bus stop fronting the Forest Way shopping centre on Forest Way to accommodate two buses within the bay,
 - Widening of Naree Road, Frenchs Forest Road West and a section of Frenchs Forest Road East from Wakehurst Parkway intersection to about 50 metres west of Skyline Place,
 - Provision of new traffic signals with pedestrian crossings at Naree Road and Forest Way, at Naree Road , Frenchs Forest Road West and Rabbett Street, on Frenchs Forest Road East and Ramford Road, and at Frenchs Forest Road East, Patonga Road and Allambie Road,
 - Widening and upgrades to the intersection of Frenchs Forest Road and Wakehurst Parkway,
 - Provision of dedicated kerb side bus lanes along approaches and departures to the Frenchs Forest Road intersection with Wakehurst Parkway,
 - Widening of Wakehurst Parkway from about 330 metres north of the intersection with Frenchs Forest Road to the intersection with Warringah Road,
 - Provision of a sea-gull type traffic management arrangement at the intersection of Frenchs Forest Road East and Nandi Avenue to allow all point access,
 - Widening of Allambie Road to the north of the intersection with Warringah Road,
 - Widening and upgrade to the Warringah Road and Allambie Road (north) intersection,
 - Widening of Warringah Road from west of Allambie Road for about 700 metres to east of Courtley Road.

These improvements will provide additional capacity and is expected to cater to the increase in traffic associated with the hospital development and allow for the effective management of traffic on the external network.

- Stage 2 Network Enhancement Works directed toward broader network capacity enhancement particularly on Warringah Road and to cater to traffic growth up to 2036.

As part of the RMS Stage 1 (Hospital Connectivity Works) EIS, a Traffic and Transport Assessment has been carried out. This assessment considers the impacts of the proposed roadworks and includes allowance for the traffic generated by the hospital.

The report prepared by SMEC considers in their assessment the background traffic demands generated by other land uses in the precinct and the traffic expected to be generated by the Northern Beaches Hospital, together with the proposed access arrangements for the hospital. The assessment takes into account the new access intersections on French Forest Road and the hospital access on Warringah Road.

The predicted growth in traffic is attributable to background traffic growth brought about by the forecast of an increase in 18 percent in population and 43 percent in employment over the next 25 years. This forecast by the Bureau of Transport Statistic (BTS) does not specifically include the proposed Northern Beaches Hospital. Hence, the modelling undertaken for the RMS Stage 1 Hospital Connectivity Works has assessed traffic expected to be generated by the hospital in addition to background traffic.

In the RMS modelling, the peak hour traffic generation considered for the hospital was 900 vehicle trips in the AM and PM peak hour. The traffic generation components will consist of staff trips, patient trips, visitor trips and deliveries and supplies. The assumed trip distribution pattern for staff suggests 90% will be approaching the site from the east and 10% from the west. The assumed trip distribution for patients, visitors, and deliveries/supplies suggests 9% to/from the northwest, 6% to/from the southwest, 25% to/from northeast, 29% to/from east, 12% to/from east and 18% to/from the south. Hence, for the purpose of this assessment, it is estimated that of the 900 vehicles, around 630 vehicles will use Frenchs Forest and 270 vehicles will use Warringah Road.

In comparison, the peak hour volume assessed for the hospital in this report for the Stage 2 NBH EIS was in the order of 809 vehicle trips (282 vehicles on Warringah Road and 527 on Frenchs Forest Road).

The RMS modelling outcomes also suggest that the proportion of hospital traffic on the entire network in the context of the wider area network is around 7-10%.

However, it should be noted that the proportion of hospital traffic is likely to be higher on the approach roads leading to the main access to the hospital particularly on Frenchs Forest Road and to a minor extent on Warringah Road. The background traffic volumes on Frenchs Forest Road in 2018 is estimated to be 1,260 veh/hour (617 veh/hour in the eastbound direction and 643 veh/hour in the westbound direction) and the background traffic on Warringah Road eastbound lane is estimated to be 1,290 veh/hour ¹². With the additional traffic attributed to the hospital during the peak hour, the total traffic on Frenchs Forest road will be around 1,790 vehicles while the total traffic on the eastbound outer lane of Warringah Road will be around 1,572. Hence, hospital traffic will comprise 30% of the total traffic on Frenchs Forest Road and 18% of the total traffic on the eastbound lane of Warringah Road.

Furthermore, the RMS modelling considered an expanded three-hour AM and PM peak period to cover the start and end of daytime shift at the hospital (7am and 3:30 pm) and including the end of the school day at 3pm. This assessment period takes into consideration hospital staff shift changeover peak period and school peak dismissal period.

As such, the impacts identified in the RMS SMEC report has considered impacts of the hospital and attributes changes to overall network performance as cumulative impacts brought about by the proposed roadworks, growth in background traffic and hospital traffic. The traffic volumes associated with the Hospital are only one component of the overall traffic through the area.

¹² Stage 1 Northern Beaches Hospital EIS

The SMEC Report compares 2012 traffic performance with 2018 predicted performance and concludes:

1. The 2012 base scenario indicates that four key intersections adjacent to the Hospital site are already currently operating at LoS F during both the AM and PM peak periods.
2. The Stage 1 Hospital Connectivity works will provide an improvement in 2018 with better performance generally than the 'do minimal' or 'do nothing' case scenario. Some of the intersections are predicted to operate with lower average vehicle delays and thus may no longer be predicted to operate at LoS F during the AM and PM peak period without the proposed improvements.
3. The Stage 1 Hospital Connectivity works generally provides sufficient road capacity for traffic generated within the immediate study area to access the road network and key intersections within the study area will improve in performance. These intersections include:
 - Warringah Road/Hilmer Street
 - Warringah Road/Allambie Road
 - Warringah Road/Ellis Road/Government Road
 - Frenchs Forest Road West/Rabbett Street
 - Frenchs Forest Road/Rumford Road
4. The report further noted that the signalised intersection of the Northern Beaches Hospital entry on Frenchs Forest Road is expected to operate at an acceptable level of service due to the capacity provided by the widening of Frenchs Forest Road as part of the Stage 1 Connectivity Works.
5. . Intersection performance of two upstream intersections from Warringah Road along Forestway (Naree Road and Adams Street) will experience a reduction in intersection performance to LoS F compared to current of LoS D due to redistribution of background traffic as a consequence of the roadworks and the NBH traffic.

The reduction in the performance of the Forestway / Naree Road intersection may be attributed to the general increase in traffic in the north-south direction on Forestway, not necessarily related to the hospital. The 2012 peak traffic volumes showed heavy flows in the southbound direction for both the AM and PM peak (1,800-1600 vehicles per hour, respectively) and heavy flows in the northbound direction in the PM peak (1600 vehicles per hour). The distribution of hospital related traffic to this intersection is likely to be minimal (RMS report indicates around 7-9% of hospital traffic). The proportion of future hospital traffic to existing traffic is estimated to be only 2-3% of the overall traffic at the intersection. Any increase in existing traffic volumes due to background growth will result in a lower proportion of hospital traffic over the overall volume.

6. With the provision of Stage 1 Connectivity works, some key intersections are predicted to continue to operate at LoS F in 2028 in either the AM or PM peak periods (or both). These intersections include:

- Warringah Road/Forest Way
- Warringah Road/Wakehurst Parkway
- Forest Way / Adams Street
- Forest Way / Naree Road
- Frenchs Forest Road / Wakehurst Parkway

However, it is anticipated that further detailed modelling of the Stage 2 RMS works will indicate better performance at intersections and provide a better improvement in network statistics.

In summary, once the Stage 1 Connectivity and Stage 2 Network Enhancement Works are completed, the local traffic implications due to the hospital development will be minor. Hence, the overall impact on traffic is not expected to be significant.

10 CONSTRUCTION TRAFFIC MANAGEMENT

Refer to Appendix G Preliminary Construction Management Plan of the Stage 2 NBH Environmental Impact Statement.

11 SUSTAINABLE TRANSPORT INITIATIVES

A Travel Plan Framework (TPF) will be prepared prior to Hospital commencing operations to inform the preparation of a Workplace Travel Plan (WTP). The TPF may include the following initiatives to reduce private car dependency:

- Provision of up-to-date route and timetable information.
- Allocation of car spaces for small cars, carpooling, electric vehicles and hybrid cars together with preferential parking for car share operations.
- Priority on-site parking for 'car share' vehicles
- Incentives for public transport users and rewards for employees who use cycle, public transport, carpooling, hybrid, electric or alternate fuel vehicles;
- Wayfinding, signage and infrastructure to provide real time information on travel options;
- Provision of end-of-trip facilities such as storage rooms, lockers, showers and change rooms;
- Organise a 'BUS' – Bicycle Users Group to encourage group travel and 'buddy' system for safe travel
- Annual Travel Ticket Policy, where staff and employees of the hospital can be given the option to purchase annual travel passes for public transport travel through the 'salary sacrifice scheme'. This enables the staff member to purchase travel tickets at a reduced "wholesale" price with return payments through weekly or fortnightly deductions from salary payments due to the staff member. This includes buying integrated tickets that cover bus and train transport.
- Providing Shuttle Services to the nearest train station or major interchange, whichever is applicable. This would be managed in accordance with demand.
- Provide for GoGet car sharing service

The above list is not exhaustive but provides the foundation for the development of appropriate initiatives or package of measures suited for the site and the target beneficiaries of the WTP.

12 MITIGATION MEASURES

As noted in Section 7, the majority of external road network and connectivity issues will be addressed by the RMS.

On that basis, the proposed measures aimed at managing localised transport and accessibility issues associated with the Stage 2 Northern Beaches Hospital to ensure that there will be no adverse impacts on the surrounding transport network include:

- The design of the NBH will ensure that direct connections and pedestrian linkages are in place to encourage and promote public transport use.
- Providing adequate on-site parking such that on-street parking is not required.
- Separating vehicle, emergency, service, pedestrian and cycle movements to minimise traffic conflict.
- Preparation of a Travel Plan Framework.
- Provision of end-of-trip facilities to promote sustainable transport

13 CONCLUSIONS AND RECOMMENDATIONS

The key traffic and transport management objective for the Northern Beaches Hospital is to reduce potential traffic impacts and deliver a transport management plan to proactively address any potential impacts that can be mitigated so that operational efficiency of the network can be maintained.

The assessment was undertaken to assess existing and future localised transport conditions within the hospital precinct. Traffic and transport related issues and impacts to the external network are assumed to be addressed by a separate project being undertaken by the RMS.

The outcomes of the assessment note key features of the development that would support the overall efficiency of the transport network for the site include the following:

Internal connectivity and external linkages

- The design layout provides internal connectivity and improved amenity to ensure linkages to the external network.
- Circulation routes within the site ensure separation of vehicles and pedestrian traffic.
- Interactive wayfinding and signage facilitate access within the site and to the external network.

Improved linkages to Public Transport and Active Transport

- Public transport for the site is being provided by the existing bus routes already servicing the site and future planning for improved and additional bus services will be addressed by two separate studies now being undertaken by the RMS and TfNSW. The studies referred to relate to the strategic bus corridor program of the RMS and the pre-feasibility study on the Bus Rapid Transit for the Northern Beaches of the TfNSW.
- The pedestrian and cycle plans developed for implementation by Warringah Council are aimed at achieving modal shift from car based modes to active transport.
- The development design for the Northern Beaches Hospital considers these existing and future improvements to the public transport and active transport network and has incorporated enhanced pedestrian access and amenity to support and encourage public and active transport modes. Adequate and comprehensible signage and wayfinding mechanisms are recommended to create a streetscape conducive to walking and cycling. Information booths on the available options for public transport should be located at common areas easily accessible to the public.

Parking

- Provision of parking to cater to the expected accumulated peak hour demand. Parking provision for the NBH will consist of a total of 1,430 spaces broken down as follows:

Type of parking	Location	Number of spaces
Public parking	Multi deck carpark	1034
Staff parking	Multi deck carpark	312
	Eastern surface carpark	41
Emergency Vehicle Parking	Ambulance	6
	Emergency vehicles	4

Type of parking	Location	Number of spaces
	MHU Emergency vehicle	1
Drop off spaces	Emergency	6
	Main Entry	5
	Main Entry Taxi drop off	3
	Main Entry Transit vehicles	4
	Main Entry Transit drop off	3
Commercial vehicle parking	Loading Dock	6
	Contractors and couriers	4
	Mortuary Hearse	1
Overall Total Spaces		1430

- This level of parking provision is deemed adequate to service the expected peak parking demand for the site and at the same time will deliver the optimal car park solution for the anticipated total demand.
- Following a review of various approaches in estimating parking demand for a hospital site, this parking provision was determined based on a conservative approach and has been established based on a number of factors influencing the demand for parking.
- It is envisaged that this parking provision/strategy will be sufficient to fully accommodate the parking demand for the Northern Beaches Hospital and that there will be no requirement for on-street car parking in the local road network.

Preparation of the Travel Plan Framework

- The preparation of a Travel Plan Framework to effect travel behaviour change and reduce private car dependency to promote sustainable transport.

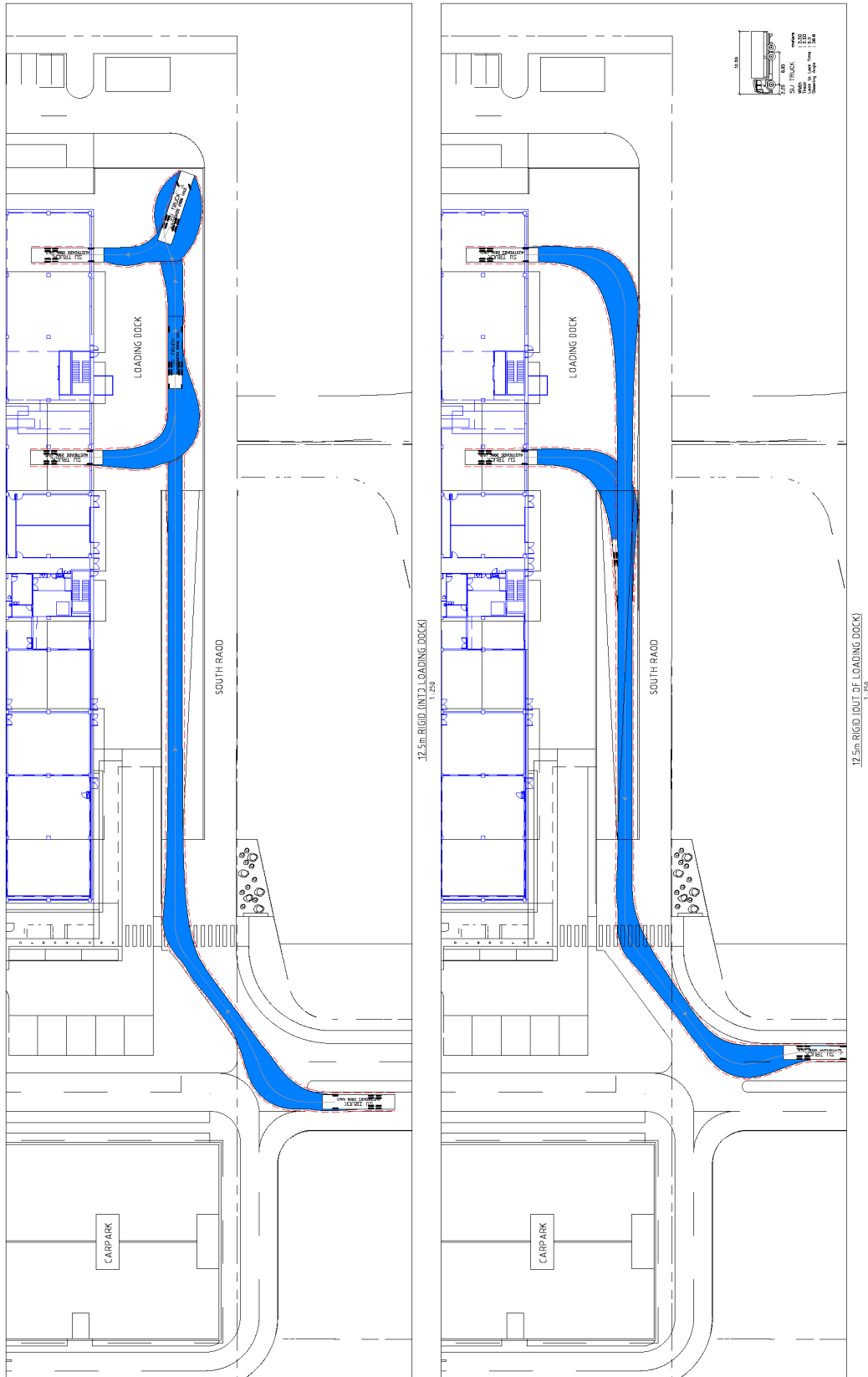
Provision of End-of Trip facilities

- The design has provision for 22 showers for use of staff as part of the overall change change zone to be located in the Hospital
- The design also has provision for 86 bicycle racks (48 staff bike parking and 36 visitor bike parking in the multi-deck carpark) to facilitate the use of active transport modes and promote cycle/walking.

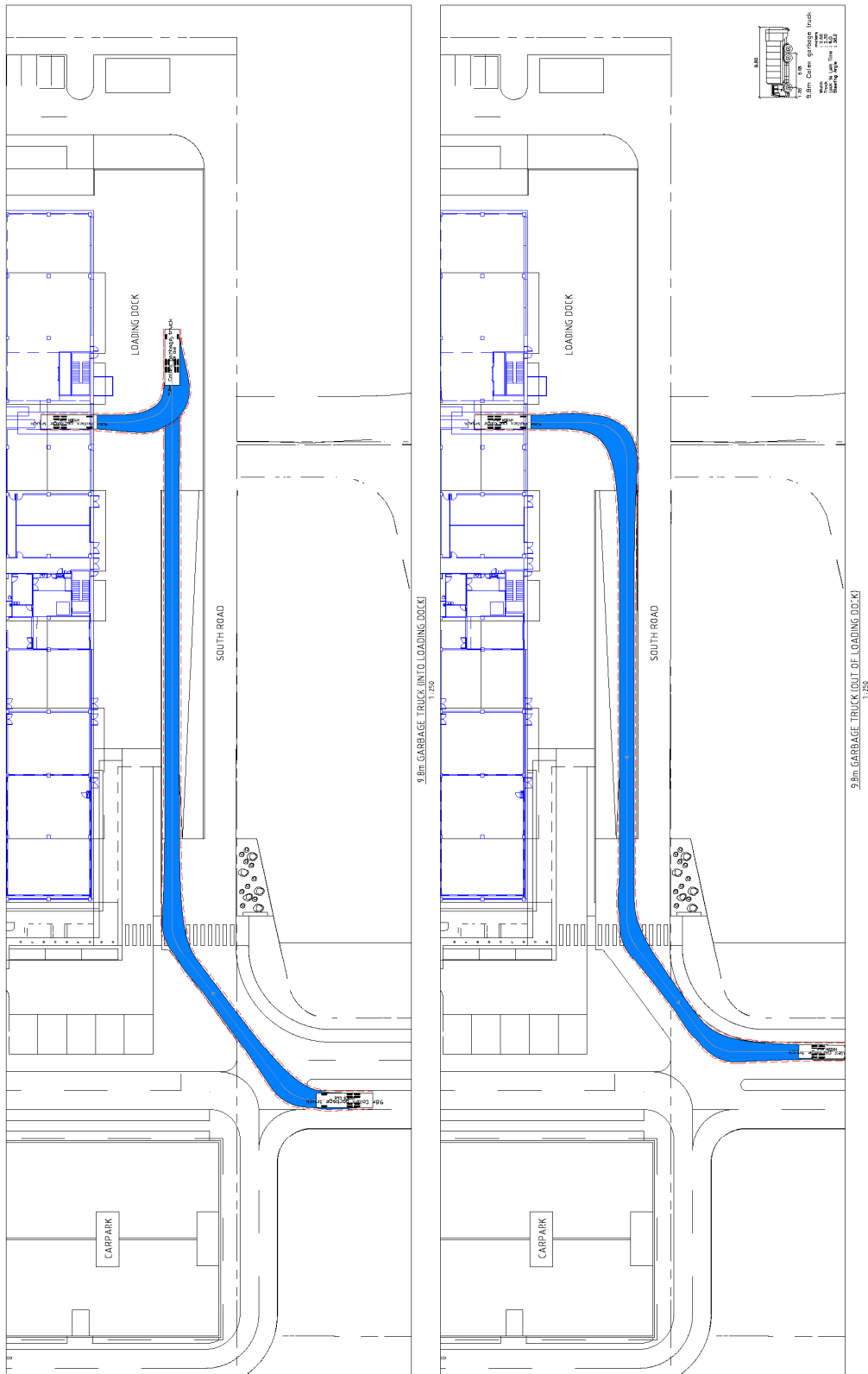
APPENDIX A

TURNING PATHS

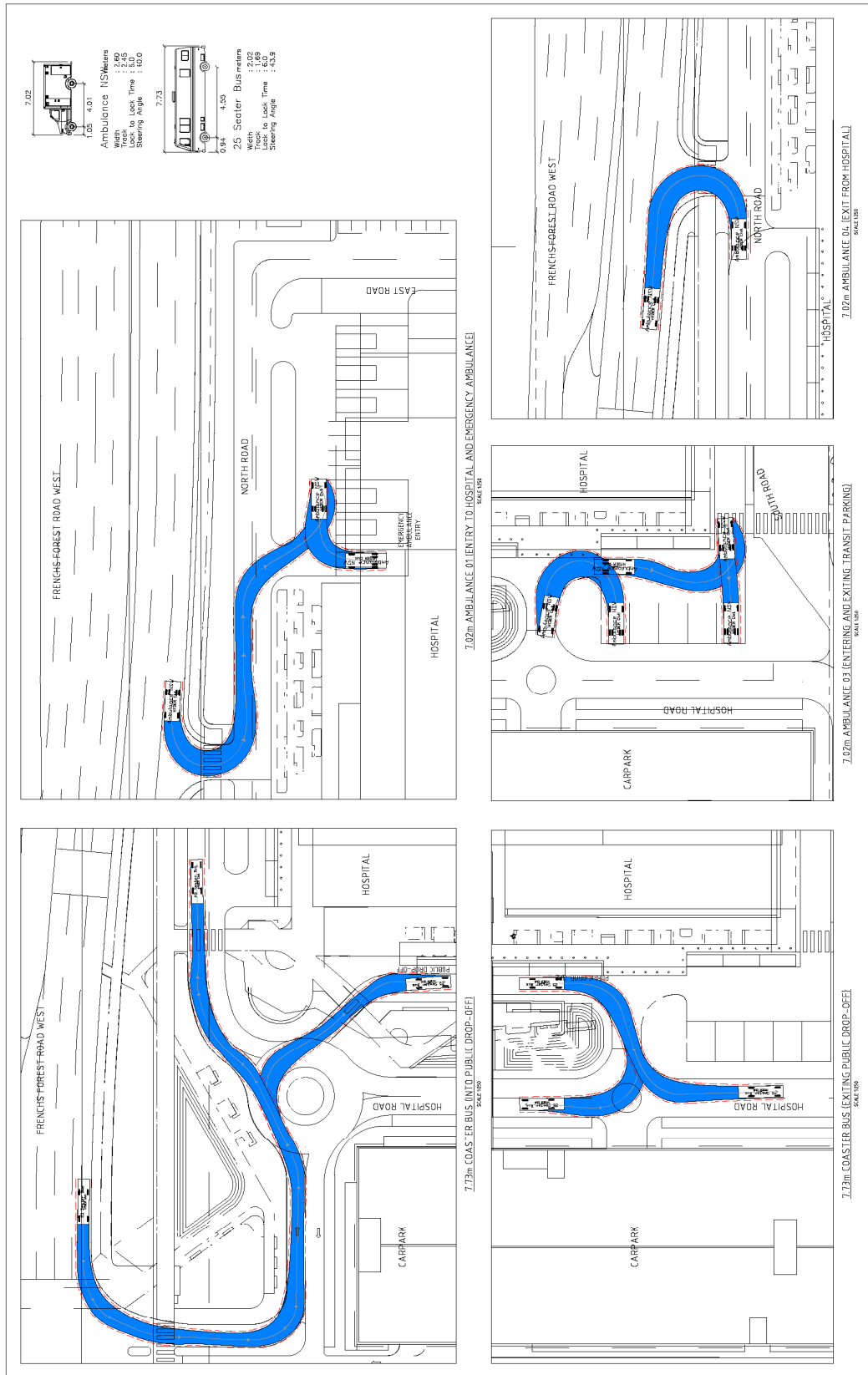




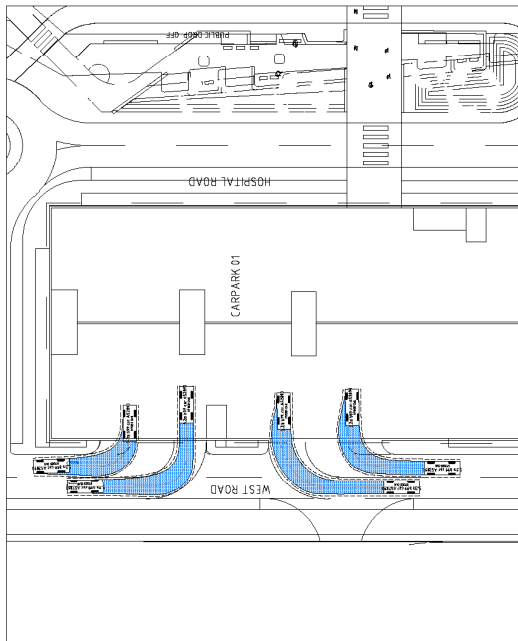
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TURNING PATHS - LOADING DOCK ENTRY / EXIT												
12.5m RIGID TRUCK												
RFP												
01/10/14												
DWG-PCT.TRA.RD.ALL.00.102 SN												



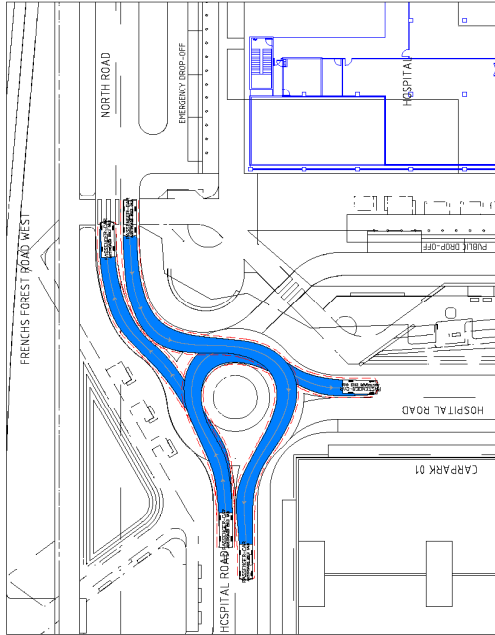
				Project THE NORTHERN BEACHES HOSPITAL	Graphic Scale 	Scale 1:250	Drawings TURNING PATHS - LOADING DOCK ENTRY / EXIT 9.8m GARBAGE TRUCK	Purpose RFP	Date 05/05/14	Drawings No DWG.PCT.TRA.D ALL.00.103 SN	Revision SN



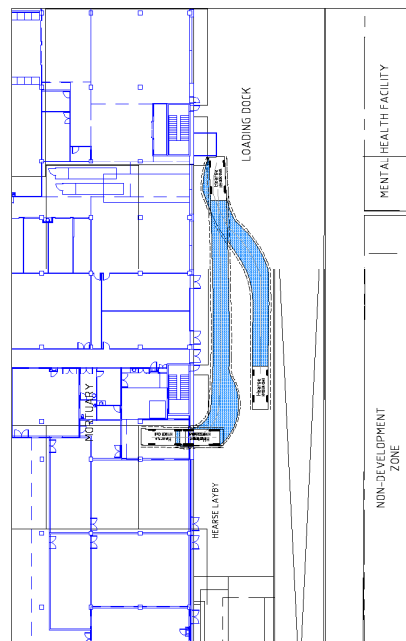
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											TURNING PATHS - GENERAL PRECINCT 1 ENTRY / EXIT	RFP	05/05/14	DWG.PCT.TRA.RD.ALL.00.105 SN	



5.2m LARGE CAR ENTRY/EXIT TO CARPARK 01
SCALE 1:500



5.2m LARGE CAR ACCESS INTO PUBLIC DROP-OFF
SCALE 1:500



6.4m HEARSE ENTRY TO MORTUARY
SCALE 1:500

