

JBA Urban Planning
Consultants Pty Ltd

**Sydney Adventist
Hospital - Hornsby Day
Surgery
Redevelopment**

Traffic and Accessibility
Impact Assessment

FINAL ISSUE

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Impact Assessment

July 2010

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Executive Summary

This report addresses the traffic related aspects of a proposed redevelopment of a day surgery medical facility, on the Northcote Road in Hornsby, Sydney.

The report uses the New South Wales Road and Traffic Authority (RTA) Guide to Traffic Generating Developments and the Hornsby Development Control Plan (Car Parking) in the assessment of the traffic impact resulting from the proposed development.

The development proposal consists of demolishing the existing SAN day surgery medical facility and the adjacent health clinics on Northcote Road in Hornsby, New South Wales and constructing a larger day surgery in place of the existing development.

The existing medical facility currently provides onsite car parking for 11 standard vehicles. During operational hours the day surgery car park has some spare capacity. However, many staff currently utilise available on street parking in the surrounding area.

The proposed development will provide a total of 139 car parking spaces. These spaces are broken down into 106 standard car parking spaces, 27 small car parking spaces and 6 dedicated spaces for mobility impaired users. There are also three service vehicle spaces. The service vehicle spaces consist of an ambulance parking drive through, a courier delivery vehicle parking space and a loading dock parking space, suitable for a 6.5 metre long rigid truck.

The proposed development is to be constructed in two stages. Both Stage 1 and Stage 2 will satisfy all the minimum requirements for on-site car parking, given the stipulations in the Hornsby Development Control Plan.

Vehicular access to the development is proposed to be via a two level basement car park. With access to the upper level via Northcote Road and separate access and egress ramps to the lower level on Balmoral Road.

Potential users of the proposed development will have several modes of transport available for accessing the site. Each mode provides access to a wider area given the available modes of public transport. The proposed development does not hinder the existing use of public transport in the area and may increase the demand for public transport in the area in future years.

Included within this report is a detailed capacity and delay analysis for the Sherbrook Road / Northcote Road roundabout junction, the Edgeworth David Avenue/ Palmerston Road traffic signal control junction and the Edgeworth David Avenue / Myra Street traffic signal control junction. All three of the analysed junctions are predicted to operate within optimum capacity limits with the expected traffic generated by the proposed site and the existing traffic flows on the junctions.

The proposed SAN development is predicted to have negligible effect on the operation of the surrounding network during the year of opening.

From this analysis, it is concluded that the proposed medical facility development will have no adverse impact on the surrounding road network in terms of traffic capacity, traffic safety and car parking issues. It is however recommended that future consideration be given to the installation of an additional marked pedestrian crossing or pedestrian refuge crossing in the vicinity of the route 575 bus stops on Palmerston Road, approximately 40 metres north of the site, to improve the convenience and safety of pedestrian access to public transport in the local area, for the benefit of all existing and potential future public transport users in the area.

1 Introduction

1.1 Project Background

This Traffic and Accessibility Impact Assessment (TAIA) has been carried out by Arup on behalf of JBA Urban Planners Pty Ltd. in support of a planning application for a proposed SAN medical facility located on Northcote Road in Hornsby, Sydney.

The fundamental purpose of this TAIA is to assess the transport impact arising from a proposed 3-4 storey medical facility of approximately 6,237m² Gross Floor Area (GFA), apply it to the surrounding road network and analyse the impact that the development traffic will have on the surrounding junctions.

The TAIA report is based on the following sources of information and industry accepted practices:

- Roads Traffic Authority (RTA) “Environmental Planning and Assessment Act (1979)”;
- “The Director General’s Requirements as according to Section 75F of the Environmental Planning and Assessment Act (1979)”;
- The “NSW Planning Guidelines for Walking and Cycling”;
- “Hornsby Shire Development Control Plans (Car Parking)”;
- New South Wales State Environmental Planning Policies (SEPP);
- Discussions with Roads Officials in the Roads Traffic Authority (RTA);
- Traffic Surveys undertaken in June 2010; and
- Observations obtained during site visits.

1.2 Scope

The aim of this study is to address the following:

- Introduction;
- Existing Environment;
- Development Proposals;
- Traffic Impact Assessment;
- Sustainable Transport; and
- Conclusions.

1.3 Project DGRs

The NSW Government’s Department of Planning issued a list of DGRs for the SAN Medical Facility Project (Application Number MP 09_0199) on 11 December 2009. Section 6 of the document has addressed the Transport, Access and Parking impacts as follows:

A Transport & Accessibility Impact Assessment prepared in accordance with the *RTA’s Guide to Traffic Generating Developments* and making reference to the *Metropolitan Transport Plan - Connecting the City of Cities*, *NSW Planning Guidelines for Walking and Cycling* and the *Integrating Land Use and Transport policy package*, considering the issues outlined in Table 1 below;

Table 1 DGR Requirements

DGR No.	Description	Relevant Section of Report
DGR 6.1	Traffic Generation including daily and peak traffic movements likely to be generated by the project; the impact on the safety and capacity of the surrounding road network and nearby intersections; and the need and provision of upgrade, road improvement works, or funding (if required).	Section 4.5
DGR 6.2	Car Parking and access arrangements, including number of spaces and compliance with the relevant parking codes and how this will minimise on-street parking (note: the Department supports reduced parking provision, if adequate public transport is available to access the site).	Section 4.1
DGR 6.3	Measures to promote sustainable means of transport including public transport usage and pedestrian and bicycle linkages in addition to addressing the potential for implementing a location specific sustainable travel plan;	Section 5
DGR 6.4	Demonstrate how users of the development will be able to make travel choices that support the achievement of relevant State Plan targets;	Section 5
DGR 6.5	Detail the 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 5.2
DGR 6.6	Identify measures to mitigate potential impacts for pedestrians and cyclists during the construction stage of the project; and	Section 5.4
DGR 6.7	Provide an assessment of the implications of the proposed development for non-car travel modes (including public transport, walking and cycling).	Section 5

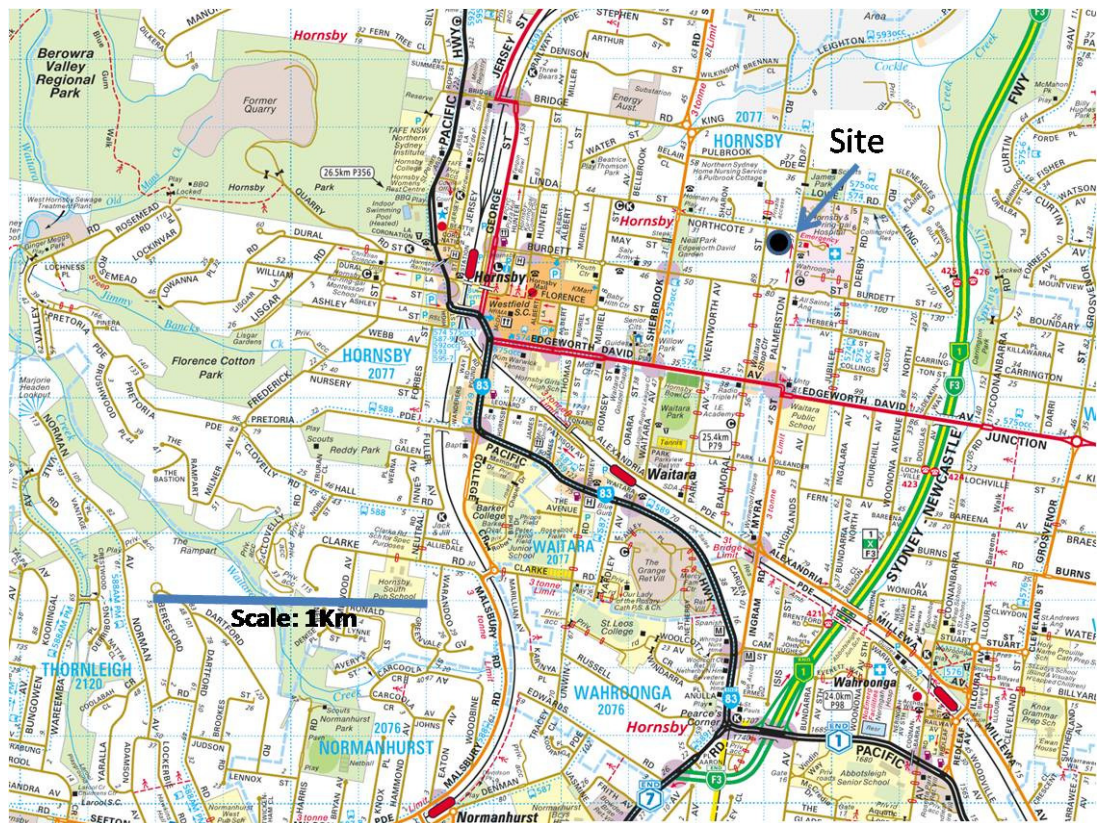
2 Existing Environment

2.1 Location

Hornsby is a suburb located on the upper north shore of west Sydney. It is 25km North West of the Sydney Central Business District (CBD). The F3 Freeway bypasses the town of Hornsby and is the major connector route for the east coast of Australia connecting Melbourne to Brisbane via Sydney. The Old Pacific Highway begins in Hornsby and continues north east from Hornsby to Newcastle.

The existing site consists of the SAN day surgery medical facility, two health clinics and a single residential house. The site is located along Northcote Road between Balmoral Road and Palmerston Road. The site is located in a predominantly residential area bordered by Northcote Road to the north, Palmerston Road to the east, Balmoral Street to the west and residential dwellings and a clinic to the south. The location of the proposed development site is shown on Figure 1 below;

Figure 1 Site Location



The site frontage to Northcote Road is a wide, two way single carriageway road with on street parking available on both sides of the road. The existing road infrastructure is in a good condition, with dedicated footpaths and pedestrian links. The speed limit is 50km/hr along the site frontage. There is street lighting on both sides of the road in front of the proposed site.

The adjacent Palmerston Road, to the east of the site is a one-way street from the Burdett Street junction to Northcote Road allowing only south to north traffic movements. The road has several kerb blisters along the length of the road slowing the average traffic speed. There is an existing pedestrian crossing adjacent to the proposed site on Palmerston Road.

Balmoral Road is to the west of the site. It is a wide two way single lane carriageway, with segregated pedestrian footpaths and dropped kerbs and intermittent street lighting. On street parking is permitted along the entire length of the road.

2.2 Local Road Network and Traffic Capacity

The area surrounding the site is primarily residential in nature with several medical facilities including the Hornsby Hospital in the local area. Northcote Road, Palmerston Road and Balmoral Street are key local access roads which currently provide access to the site, the nearby Hornsby Hospital and the adjoining medical precinct.

Peak hour traffic volumes along Northcote Road are approximately 406 and 631 vehicles per hour respectively which occur during the weekday AM peak (07.00 – 08.00) and PM peak (16:15-17:15) periods.

On Palmerston Road, the corresponding AM and PM peak hour volumes are 439 and 503 vehicles per hour respectively.

On sections of Balmoral Street, traffic calming devices, ie Speed Humps have previously been installed which significantly reduce the existing traffic usage of this street, in comparison to Northcote and Palmerston Roads

There is currently significant spare capacity along both Palmerston Road and Northcote Road given that an average two way single carriageway road in an urban area has a capacity of approximately 900 vehicles per lane per hour (Level of Service) according to Table 4.4 of the RTA Guide to Traffic Generating Developments .

2.3 Existing Site Traffic and Parking Surveys

2.3.1.1 On Site Parking

The existing SAN day surgery medical facility and the existing clinical offices on the site at 1A Northcote Road, Hornsby provide 11 onsite parking spaces and 8 onsite parking spaces respectively. Both the sites provide the parking free of charge with no time restrictions for both staff and visitors.

Vehicular access to the SAN day surgery medical facility parking is currently provided from Northcote Road and the adjacent clinics have access from both Northcote Road and Palmerston Road. Informal parking surveys carried out on the SAN day surgery and the adjacent clinical office sites show that the car parks reached a maximum of 80% capacity during the AM peak hour period. The car parks operated below maximum capacity at both AM and PM road network peaks.

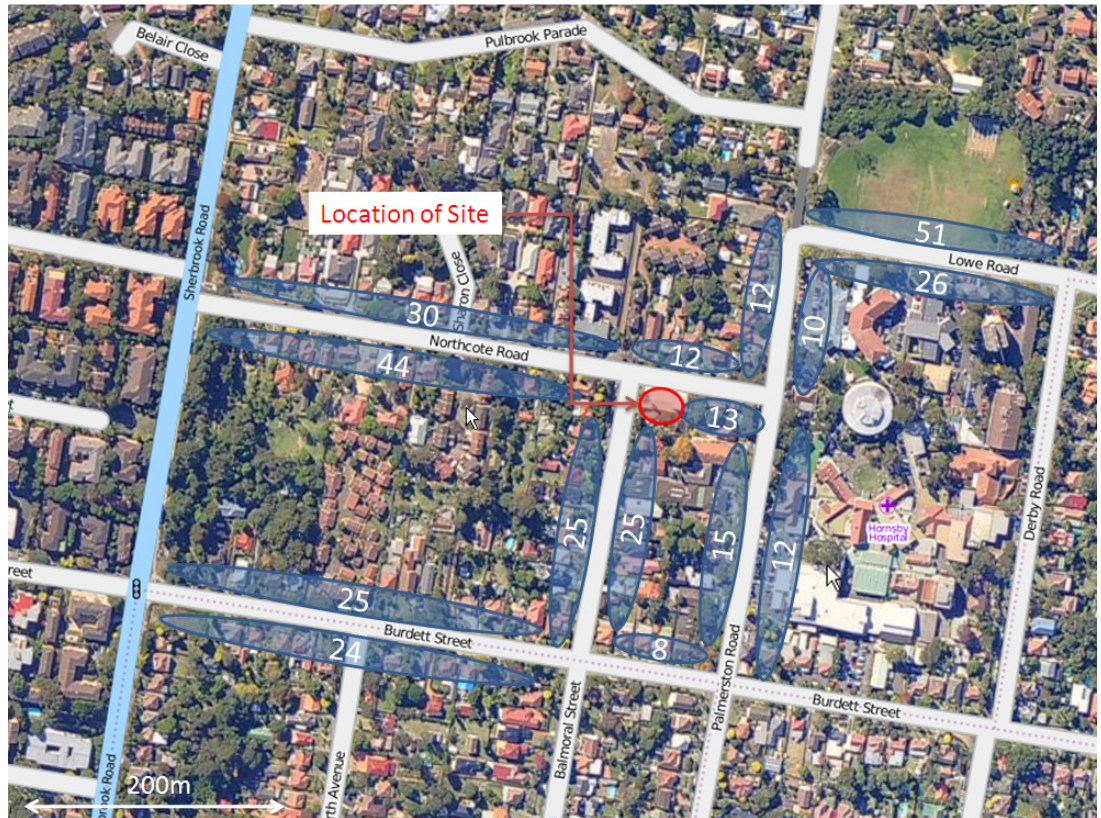
2.3.1.2 On Street Parking

The area surrounding the existing SAN day surgery site has a large amount of unrestricted on street parking which currently supplements the parking facilities of the existing medical facilities in the precinct generally and the nearby Hornsby Hospital.

The majority of residents in the area have private garages and carports, and thus local on street parking within walking distance of the medical facilities is mostly available for staff and visitor parking. Figure 2 below details the existing observed levels of on street parking supply on the nearby streets within approximately 200 metres (2–3 minutes walk) of the Hornsby Hospital and other medical precinct areas. The totals are based on parking surveys observed by Arup were carried out in May- June 2010.

The existing SAN day surgery hospital site traffic generation movements were recorded by Arup visual surveys on 27 May 2010 and 10 June 2010 as 7 and 21 vehicle movements respectively in the AM (07.00 – 08.00) and PM (16.15 – 17.15) peak periods. These surveys recorded all persons entering and leaving the building utilising either on site parking or on street parking in the surrounding streets

Figure 2 Existing Locality On Street Parking Capacity Survey



2.4 Public Transport

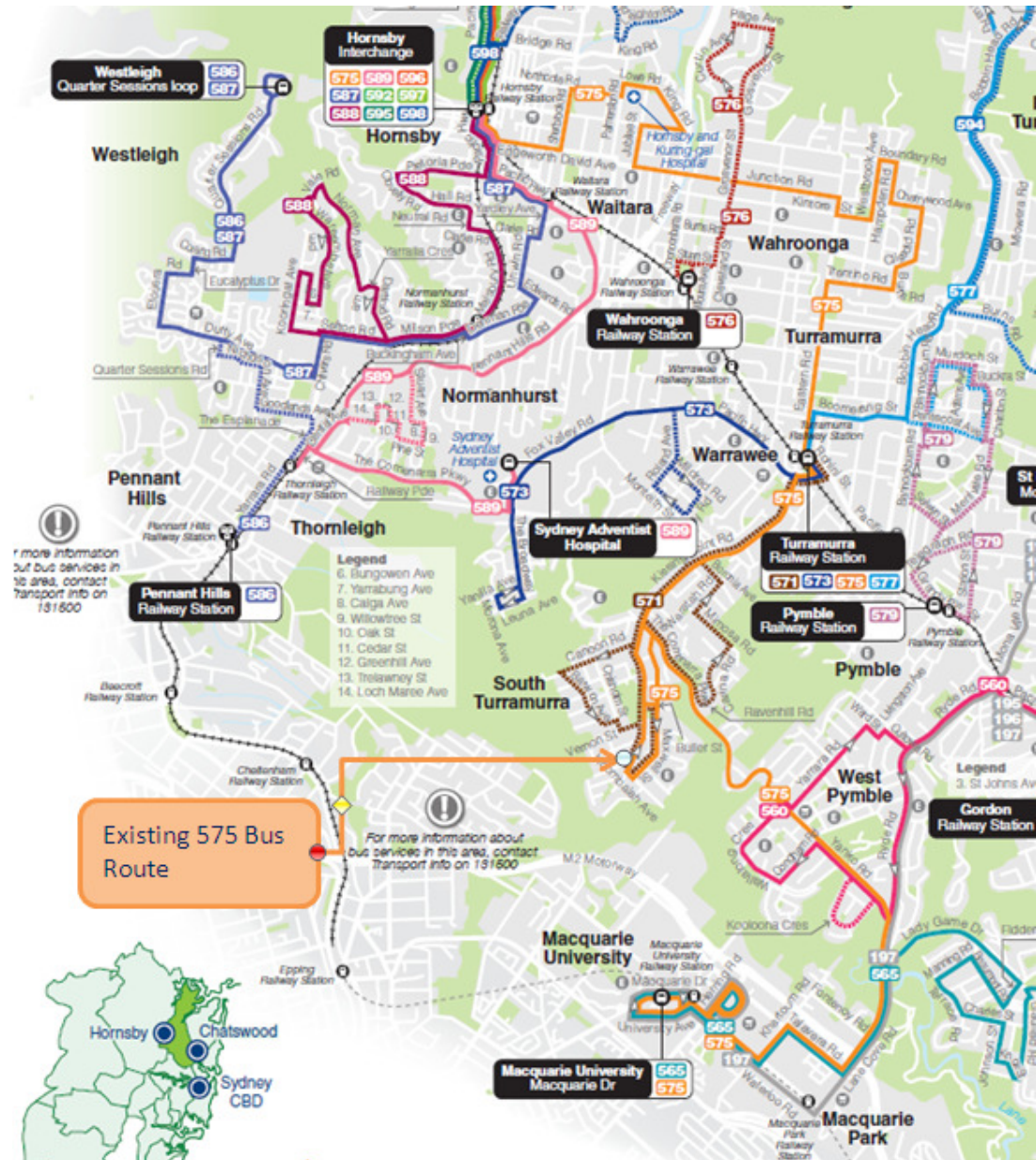
The existing SAN day surgery site is within 50 metres of the nearest bus stops on Palmerston Road, facilitating pedestrian access to buses operating on either side of the road. The Transdev TSL number 575 bus (see photographs below) operates along this route incorporating links to nearby railway stations. (see Figure 3).

The Transdev TSL number 575 bus operates from Hornsby Railway Station to Macquarie University via Hornsby Hospital, Turramurra Railway Station and the Macquarie Centre. The 575 bus provides approximately 37 buses from Macquarie University to Hornsby Hospital and 35 buses on the return route daily from Monday to Friday.

There are 10 buses provided in both directions on a Saturday, 9 bus journeys on a Sunday from Macquarie University to Hornsby Hospital and 8 buses operate on the Sunday return journey.



Figure 3 Transdev TSL Bus Number 575 Route Map



2.5 Travel Modes

2.5.1 Mode Split

The existing 2006 Journey to Work data for the travel zone which takes in the existing site has been analysed, with the mode split indicated Table 2.

The data shows that approximately 80% of staff currently drive themselves to work in the Hornsby hospital/medical precinct. The other major travel modes are by train, walking and as a passenger in a car which all of which range from 5% to 7% of the total modal split.

Table 2 Modal Split Summary

Mode Description	Total Trips	Proportion of Total Trips
Car as Driver	1641	79.9%
Train	134	6.5%
Walked Only	125	6.1%
Car as Passenger	109	5.4%
Bus	13	0.6%
Motorbike	12	0.6%
Bicycle	6	0.3%
Other mode	6	0.3%
Tram	3	0.1%
Taxi	3	0.1%
Truck	3	0.1%
Ferry	0	0%
Total	2055	100.00%

From the above information, it is estimated that while the vast majority of staff arrive at work by car and the vehicle occupancy of vehicles accessing the site is approximately 1.07 persons per vehicle.

2.5.2 Arrival Location

The origin location of all workers arriving to the travel zone incorporating the site is presented in Table 3 below;

Table 3 Origin Location of Workers

SLA Name	Total Trips to SLA	Proportion of Total Trips
Hornsby - South	636	30.9%
Hornsby - North	522	25.4%
Ku-ring-gai	249	12.1%
Gosford - West	167	8.1%
Gosford - East	69	3.4%
Warringah	65	3.2%
Baulkham Hills - Central	58	2.8%
Wyong - South and West	53	2.6%
Wyong - North-East	51	2.5%
Ryde	51	2.5%
Other	134	6.5%
TOTAL	2055	100.00%

The analysis shows that the majority of workers live in the local area (either Hornsby or Ku-ring-gai), however a significant proportion travel from areas in the Central Coast such as Gosford and Wyong.

3 Development Proposals

3.1 Description

The proposal involves the demolition of the existing SAN day surgery medical facility, two health clinics and the residential development and the construction of a replacement medical facility development. The proposed development is a 3 -4 storey building of approximately 6,237m² gross floor area (GFA), with a two level underground car park and associated landscaping. The proposed development incorporates approximately 79 beds within the development and is expected to employ approximately 100 staff members at any one time.

3.2 Parking and Service Entrances

The proposed development is to include a two story underground car park, providing a total of 139 car parking spaces. These spaces are broken down into:

- 106 standard car parking spaces
- 27 small car parking spaces
- 6 dedicated spaces for mobility impaired users

There are also three service vehicle parking spaces provided. The three service vehicle spaces consist of an ambulance parking drive through, a courier delivery vehicle parking space and a loading dock parking space, suitable for a 6.5 metre long rigid truck.

The proposed upper car parking level (Lower Ground Floor) is to have a total of 52 car parking spaces. There will be a shared entry /exit driveway ramp on the north side of the building providing access mid – block onto Northcote Road. This level will provide 39 standard parking spaces, 6 small car parking spaces, 6 spaces for mobility impaired drivers and an ambulance parking drive through space, a courier drop off space and a loading vehicle dock for deliveries.

The lower car park (Basement Level) is to have a total of 87 car parking spaces. It will include individual access and egress ramps from the western side of the development onto Balmoral Street. The lower basement will consist of approximately 66 standard parking spaces and 21 small car parking spaces.

The proposed layout of the upper and lower level car parks is attached in **Appendix A**. For clarity Table 4 below, details the car parking breakdown;

Table 4 Car Parking Breakdown

Car Parking	Number of Spaces
Standard Spaces	106
Accessible Parking Spaces	6
Small Vehicle Spaces	27
Total	139

4 Transport Assessment

4.1 Parking Provision Standards

Parking requirements for medical centres as set out in the Hornsby Shire Development Control Plan (DCP) are as follows:

- 3 standard car parking spaces per surgery;
- 1 standard car parking space for every doctor; and
- 1 standard car parking space for every employee.

Further to these parking requirements, the DCP also states that a medical centre must be dedicate a minimum of 3% to 4% of available parking spaces for mobility impaired drivers.

According to the DCP, commercial premises must have a minimum of one parking space per 4,000m² GFA for delivery and service vehicles. This translates to a provision of 2 service vehicle spaces for the proposed 6,237m² GFA development.

The Australian/New Zealand Standard AS/NZS 2890.1:2004 states that approximately 35% of cars on the road are classified as small cars. For this reason approximately 20% of the onsite parking is classified for small cars. This increases the efficiency of the car park and allows for increased parking facilities onsite.

4.2 Parking Provision for Full Development

The total parking provision on site for the proposed development is 139 car parking spaces broken down into 106 standard vehicle bays, 27 small car parking spaces and 6 vehicle bays for mobility impaired. The development will also be equipped with an ambulance parking drive through, one courier delivery space and one loading vehicle dock. The spaces dedicated to mobility impaired driver parking equates to approximately 3.5% of the total parking provision. The car parking areas have been designed as to minimize conflict within the car park and to allow ease of vehicular and pedestrian movement throughout the site.

An ambulance parking drive through space is provided on the upper car park section. The parking drive through is designed as to allow the ambulance ease of access and egress from the car park in a one way movement. The stopping area for the ambulance is marked with yellow hatching to prevent other vehicles stopping in the area.

The upper level car park is equipped with two service vehicle parking spaces, one for heavy vehicles (small rigid truck) and one courier drop off space. These service vehicle parking spaces are located so as to minimize conflict with pedestrians within the car park. Given these parking spaces, the proposed development provides 3 service vehicle parking spaces for the development.

4.3 Parking for Staged Development

The proposed development is to be built in two stages. The first stage is to include 75 staff and no surgeries. As a result the minimum requirement for parking will be 75 parking spaces including 3 spaces for mobility impaired users. The completed development is predicted to include a maximum of 100 staff, including doctors to be on call at any one time. As a result the minimum requirement for parking is 100 parking spaces including 4 parking spaces for people with disabilities. Both stages will be equipped with 3 service vehicle spaces as outlined in Section 4.2.

For clarification purposes the car parking requirements and provisions are outlined in Table 5 below;

Table 5 Car Parking Requirements

Stage	Stage 1		Stage 2	
	DCP Requirement	On-Site Provision	DCP Requirement	On-Site Provision
Total Parking Spaces	75	91	100	139
Spaces for Mobility Impaired	3	4	4	6

Based on the information detailed above, the proposed development provides adequate parking facilities given the requirements in the Hornsby DCP.

4.4 Parking Accumulation

The Roads and Traffic Authority (RTA) Guide to Traffic Generating Developments (2002) provide a formulaic method for calculating the Peak Parking Accumulation (PPA) for a private hospital. The peak parking accumulation is given by;

$$PPA = -19.56 + 0.85B^* + 0.27ASDS^\dagger$$

Given that the proposed medical facility is to be equipped with 79 beds and a maximum of 100 staff at any time, the peak parking accumulation within the car park is predicted to be approximately 75 vehicles during peak periods. As the proposed development provides a total of 139 car parking spaces, it is forecast that the proposed car park will provide ample parking during peak times.

4.5 Traffic Generation and Distribution

4.5.1 Methodology

The RTA "Guide to Traffic Generating Developments (2002)" has been used to assess the traffic impact resulting from the proposed mixed-use development.

The RTA provide a formulaic method for calculating trip rates for calculating the vehicle trips during peak hours for a private hospital. These formulae are shown on Table 6 below;

Table 6 Peak Period Traffic Generation

Peak Period Trip Generation	Formulae	Trip Generation
Morning Vehicle Trips (MVT)	$=-10.21+0.47B+0.06ASDS$	32.92
Evening Vehicle Trips (EVT)	$=-2.84+0.25B+0.40ASDS$	56.91

The proposed development is to have an average number of daily staff totalling approximately 100 people and the development is proposed to provide approximately 79 beds. As a result the morning and evening vehicle trips are predicted to be 33 and 57 vehicles per hour during the AM and PM peak hours respectively.

* Where B is the number of beds provided in the hospital.

† Where ASDS is the average number of staff per weekday shift.

4.5.2 Distribution

The proposed medical facility is planned to replace the existing SAN day surgery, and other health clinics which currently are in operation on the site. As a result, the existing vehicle trips to and from the existing day surgery and other building on the site (7 and 21 vehicle trips in the AM and PM peaks respectively) have been replaced by the forecast traffic flows expected for the new development. The additional traffic flows are then distributed onto the road network based on the existing local precinct geographic journey to work patterns. Further details of the site trip generation and distribution calculations in relation to the nearby affected intersections on the major traffic approach and departure routes (via Northcote and Palmerstone Roads) are attached in **Appendix B**.

4.6 Impacts on the Road Network and Intersections

4.6.1 Traffic Volumes

Traffic counts were undertaken at three key intersections surrounding the site on Thursday 10th June 2010. Counts were conducted during the AM (7am – 9am) and PM (4pm – 6pm) commuter peak periods. The full intersection traffic count results are included in **Appendix B**. These counts are representative of traffic conditions during busy times of the year when the local schools are operating. The surveyed intersections were:

- Sherbrook Road / Northcote Road (roundabout)
- Edgeworth David Avenue / Palmerston Road (traffic signals)
- Edgeworth David Avenue / Myra Street (traffic signals)

4.6.2 Sidra Analysis

The above intersections have been assessed using RTA approved software SIDRA (Signalised Intersection Design and Research Aid). SIDRA Intersection 4.0 is a computer software package used for the assessment and design of traffic signal junctions and roundabouts. It enables the user to predict the capacity, queues and delays at a variety of types of traffic intersections.

In urban areas, the performance of the major road network is generally a function of the performance of key intersections. This performance is quantified in terms of Level of Service (LOS), which is an index of the operational performance of traffic at an intersection and is based on the average delay per vehicle. LOS ranges from A = very good to F = highly congested travel conditions, as shown below in Table 7.

Table 7 Level of Service Definitions

Description	Level of Service (RTA Definition)	Average Delay per Vehicle (s)
Very Good	A	< 14.5
Good	B	14.5 ≤ 28.5
Satisfactory	C	28.5 ≤ 42.5
Near Capacity	D	42.5 ≤ 56.5
At Capacity	E	56.5 ≤ 70.5
Over Capacity	F	≥ 70.5

Generally it is desirable to aim at achieving a Level of Service of C or better at all major road intersections. However, in practice, it is reasonable for some intersections to operate at Level of Service D at peak times. Another common measure of intersection performance is the degree of saturation (DOS), which provides an overall measure of the capability of the intersection to accommodate additional traffic. A DOS of 1.0 indicates that an intersection is

operating at capacity. The desirable maximum degree of saturation for an intersection with traffic signals is 0.9.

4.6.3 Intersection Results with Additional Development Traffic

A summary of the intersection modelling during the PM peak is provided in the sections below. The PM peak has been analysed as the all the existing traffic surveys indicated higher levels of traffic during this time as compared to the AM peak. Further detailed results including all the existing intersection traffic flows and capacity analysis and the AM peak hour intersection results are attached in **Appendix C**.

Sherbrook Road – Northcote Road Roundabout Junction

The Sherbrook Road – Northcote Road roundabout junction is a three arm roundabout junction to the west of the site with a single circulatory carriageway. All approaches are single lane with pinch points to prevent road users entering the roundabout at excessive speeds. The northern arm has an extended central median to prevent right turners from the nearby Linda Street to the north of the junction.

The SIDRA analysis results of Sherbrook Road – Northcote Road roundabout junction during the weekday PM Peak Hour (16:15-17:15) are shown in Table 8 below;

Table 8 Sherbrook Road – Northcote Road Roundabout Junction Results; PM Peak

Turning Movement	Degree of Saturation (Percentage)	Delay (seconds)	Level Of Service
Sherbrook Road North; Straight Through	0.51	4.7	A
Sherbrook Road North; Turning Left	0.51	5.7	A
Northcote Road; Turning Right	0.58	18.3	B
Northcote Road; Turning Left	0.58	12.5	B
Sherbrook Road South; Turning Right	0.69	16.0	B
Sherbrook Road South; Straight Through	0.69	9.0	A

Palmerston Road – Edgeworth David Avenue Traffic Signal Controlled Junction

The Palmerston Road – Edgeworth David Avenue traffic signal controlled junction is a three arm signalled junction. Palmerston Road is the minor arm of the junction. It has a single lane approach with a large hatched central median. Right turns are banned for traffic exiting from Palmerston Road. There is a signalised pedestrian crossing across the Palmerston Road arm of the junction. The Edgeworth David Avenue is the major arm of the junction; it has a two lane approach in both directions and an extended kerbed central median on the western arm.

The SIDRA analysis results for the Palmerston Road – Edgeworth David Avenue signal junction during the weekday PM Peak Hour (16:15-17:15) are shown in Table 9 below;

Table 9 Palmerston Road – Edgeworth David Avenue Junction Results; PM Peak[‡]

Turning Movement	Degree of Saturation (Percentage)	Delay (seconds)	Level Of Service
West Edgeworth David Ave; Straight Through	0.63	15.2	B
West Edgeworth David Ave; Turning Left	0.63	23.3	C
Palmerston Road; Turning Left	0.31	22.4	C
East Edgeworth David Ave; Turning Right	0.62	20.7	C
East Edgeworth David Ave; Straight Through	0.62	3.3	A

Myra Street – Edgeworth David Avenue Signal Controlled Junction

The existing Myra Street – Edgeworth David Avenue is a three arm signal controlled junction. The Edgeworth David Avenue is the major arm and has a dual carriageway in both directions. The major arm at the junction is on an approximately 90 degree bend with guidelines marking the major route through the junction. Myra Street is the minor arm and is also a dual carriageway in both directions. Pedestrian crossings exist on the Eastern major arm and on the southern arm of the junction.

The SIDRA analysis results of the Palmerston Road – Edgeworth David Avenue signal junction during the Weekday PM Peak Hour (16:15-17:15) are shown in Table 10 below;

Table 10 Myra Street – Edgeworth David Avenue Junction Results; PM Peak

Turning Movement	Degree of Saturation (Percentage)	Delay (seconds)	Level Of Service
North Edgeworth David Ave; Straight On	0.66	17.6	B
North Edgeworth David Ave; Turning Right	0.54	9.6	A
East Edgeworth David Ave; Turning Right	0.65	19.7	B
East Edgeworth David Ave; Turning Left	0.65	19.7	B
Myra Street; Turning Right	0.47	24.1	C
Myra Street; Straight Through	0.47	15.9	B

4.6.4 Conclusions

Based on the above analysis, it is concluded that the proposed medical facility will have no adverse impact on the surrounding road network at either of the three intersections considered, in terms of either traffic capacity, Level of Service or road safety.

There will be no need for road or intersection upgrades / improvements as a result of the additional traffic movements from the proposed SAN day hospital redevelopment.

[‡] Note that Right Turn movements are banned for traffic exiting from Palmerston Road

5 Sustainable Transport Measures

5.1 Public Transport

5.1.1 Bus

The proposed development is within 50 metres of bus stops facilitating buses operating on either side of the road. The Transdev TSL number 575 bus operates along this route incorporating links to railway mass transit stations.

The 575 bus provides approximately 37 buses from Macquaire University to Hornsby Railway Station and 35 buses on the return route daily from Monday to Friday. There are 10 buses provided in both directions on a Saturday, and 9 bus journeys on a Sunday from Macquaire University to Hornsby Railway Station and 8 buses operate on the Sunday return journey.

5.1.2 Train

The 575 bus provides bus users with a link to the Hornsby Railway Station approximately 1.5km away. Hornsby Railway Station is a major junction between the North Shore Line and the Northern Railway Line and links Hornsby to the greater Sydney area. The North Shore Line operates from Sydney Central Station to Hornsby with on average 182 trains leaving Hornsby to Central Station daily. The Northern Railway Line serves the northern suburbs of Sydney along parts of the Inner West and the Hills districts. The Line operates from Hornsby to Chatswood with approximately 122 trains leaving Hornsby Railway Station daily.

5.2 Pedestrians and Cyclists

5.2.1.1 Pedestrians

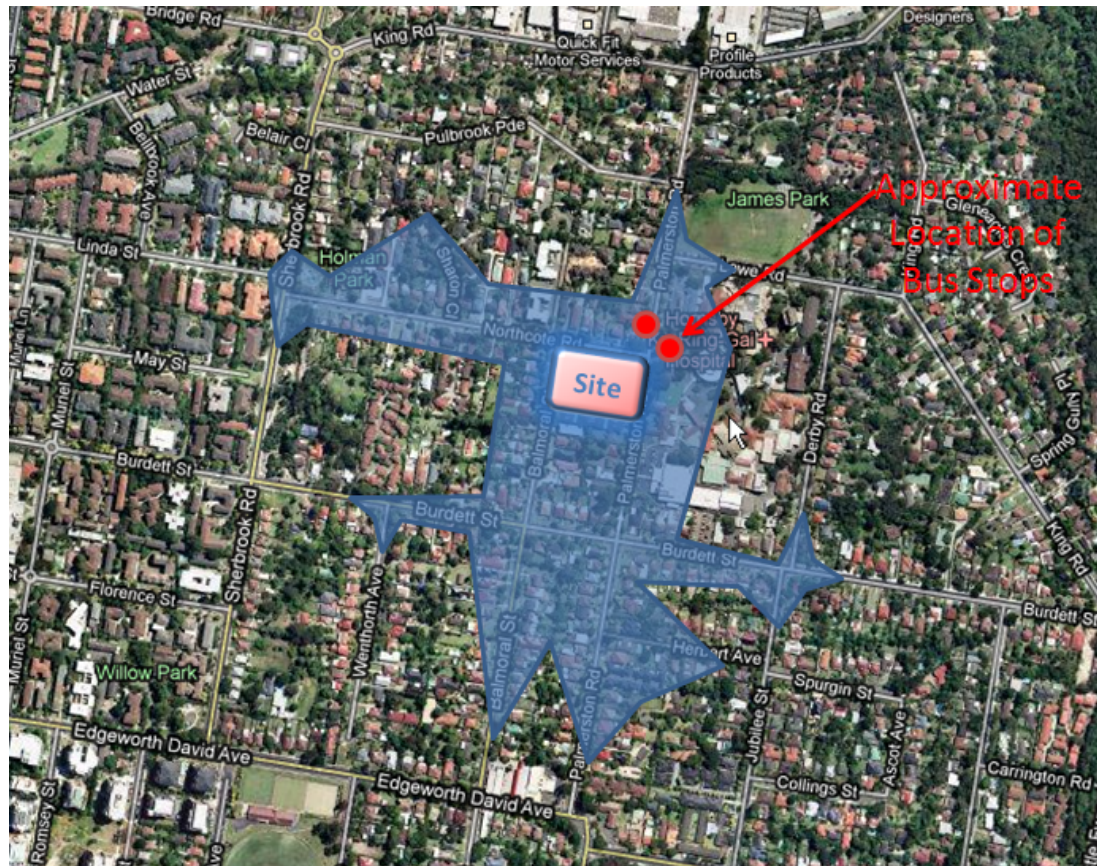
The site is well connected through local pedestrian footpath networks. A zebra crossing exists along the one-way Palmerston Road adjacent to the proposed site. This provides a safe link for pedestrians crossing to or from the bus stop.

The "NSW Planning Guidelines for Walking and Cycling" state that "Actual walkability is defined by drawing a line along all streets up to 400m or 800m distance and by identifying all sites accessible to that line".

From this definition, it is possible to demonstrate that the proposed development has within its core walkability catchment two bus stops which connect the site to the greater Sydney area. Figure 4 below illustrates the catchment given by the core walkability catchment of 400 metres.

Given the nature of the land uses in the area, leading to a high proportion of vulnerable, impaired and elderly road users and the need to maximise pedestrian accessibility to the Route 575 bus stops, it is recommended to investigate the future provision of either a marked pedestrian crossing or a pedestrian refuge crossing on Palmerston Road directly between the northbound and southbound the Route 575 bus stops. This may be dependent on the crossing meeting relevant warrants relating to pedestrian and vehicle activity.

This additional pedestrian crossing in the area should be strategically placed within the visibility requirements defined by the local 50km/h speed limit and located as to facilitate the future access to the Route 575 bus stops for all bus users. The crossing should provide for mobility impaired users with appropriate dropped kerbs and tactile paving. It will provide improved pedestrian links to and from the proposed SAN Hornsby day surgery development as well as the other surrounding medical and residential developments and allowing staff and visitors to arrive and depart from the proposed development in a safer environment.

Figure 4 5 Minute Walk Time Isochrone

5.2.2 Cycling

The existing area is well suited for cycling activity, with a relatively slow (50 km/hr) local traffic speed limit in the area which facilitates cycle safety. The wide roads allow ample space for shared use of the roadway between cyclists and vehicular traffic.

According to the “NSW Planning Guidelines for Walking and Cycling” the bicycle catchment for a five minute ride is around 1.5km. Figure 5 below illustrates the area that may be considered within five minutes travel from the site by bicycle. This area includes the Hornsby Railway Station which offers links from the development to and from the Greater Sydney area by rail.

5.3 Worksite Travel Demand Management – Green Travel Plan

From the information above, it can be demonstrated that future users will have several modes of transport available for accessing the site. Each mode provides access to a wider area given the available modes of car, public transport walking and cycling.

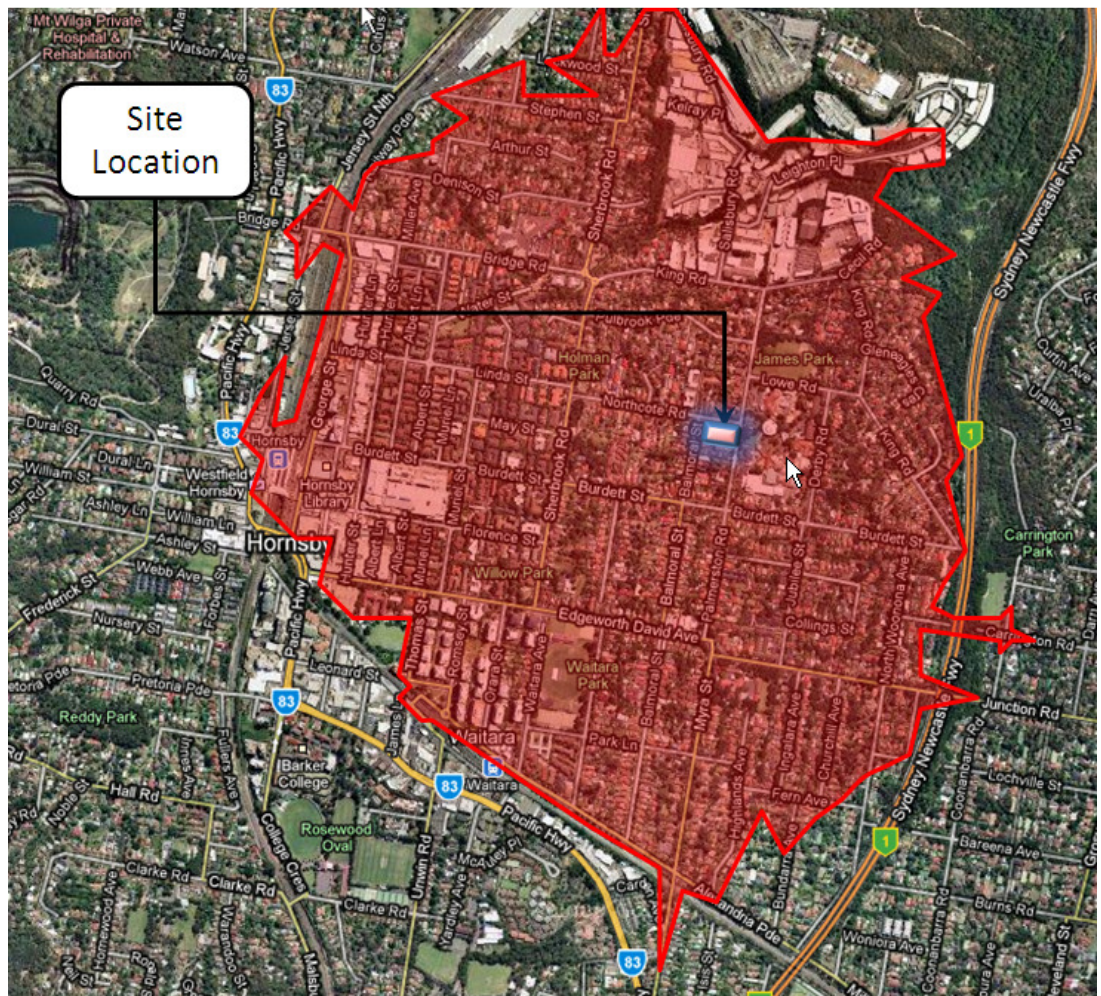
With the numerous transport options available to staff and visitors to access the site, it is recommended that a green travel plan be developed for the site. A green travel plan is a package of measures introduced to promote the use of public transport, walking and cycling by patrons and employees for travel to and from work and for business related trips. Some specific measures that could be incorporated in this travel plan include:

- Public transport timetables and maps
- Key local walking and cycling routes
- Possibly subsidising/salary sacrificing cost of public transport tickets for staff

- Improvement of current SAN Hospital website detailing transport options for both staff and patients
- Establishment of transport information packs to new staff explaining the various ways (other than motor vehicle) of travelling to the site
- Development of a travel plan booklet for staff and visitors
- Liaising with hospital staff, either face to face or via email/telephone, providing them with advice where needed about travelling to work

Provision of these measures would reduce the reliance on private vehicle for hospital staff and patients, and lead to an increase in non-car modes of travel to the site.

Figure 5 5 Minute Cycle Time Isochrone



5.4 Construction Traffic and Parking Management

A detailed construction traffic management plan would be prepared at the construction stage of the project. A summary of measures to mitigate potential impacts for pedestrians and cyclists during the construction stage of the project is given below. The measures recognise the high volumes of pedestrians in the vicinity of the site.

Provisions will be made for pedestrians and cyclists to pass the worksite safely. A minimum footpath width of 2.0m on Northcote Road and Balmoral Street would be maintained at all times. Suitable pedestrian road crossing points would be maintained.

At times it may be necessary to direct pedestrians and cyclists onto the road carriageway and adequate warning signs and barricades would be provided. Traffic controllers or other traffic devices to direct traffic would be provided in accordance with AS 1742.3: 1996.

The construction schedule for the development will also aim to minimise:

- Loss of on site parking capacity for staff and visitors due to construction work areas
- disruption to traffic movements particularly at peak periods
- interference with public transport services

Adequate fencing will be installed around the perimeter of the construction site to restrict unauthorised public access.

All demolition and construction related vehicles would comply with relevant Hornsby traffic and parking regulations. Vehicular access points to the construction site will be selected to avoid conflict with high volume pedestrian desire lines.

6 Conclusions

This Traffic and Accessibility Impact Assessment (TAIA) has been carried out by Arup on behalf of JBA Urban Planners Pty Ltd. in support of a planning application for a proposed medical facility located on Northcote Road in Hornsby, Sydney.

The purpose of this TAIA is to assess the transport impact arising from a proposed 3 -4 storey medical facility of approximately 6,237m² GFA, with a total of approximately 100 future staff and doctors, 79 beds and medical operating theatres.

The proposed development has a two story underground car park with access to the upper level car park on the Northcote Road, to the north of the site. Access to the lower car park is provided by access and egress ramps to the Balmoral Road, to the west of the site. Approximately 20% of the onsite parking is allocated for small cars, increasing the efficiency of the car park and allowing for increased parking facilities onsite.

The Hornsby DCP for car parking requires a medical centre/day surgery hospital of this size to provide a minimum of 100 standard car parking spaces, 3% to 4% of which should be dedicated to mobility impaired users and a minimum of 2 service vehicle parking spaces.

The proposed development goes over and above this provision, providing 139 car parking spaces. These spaces are broken down into 106 standard car parking spaces, 27 small car parking spaces, 6 dedicated spaces for mobility impaired users and three service vehicle spaces. The proposed development provides adequate parking facilities given the requirements outlined in the DCP, and will assist in reducing the existing locality parking impact of the medical precinct developments on local residential streets.

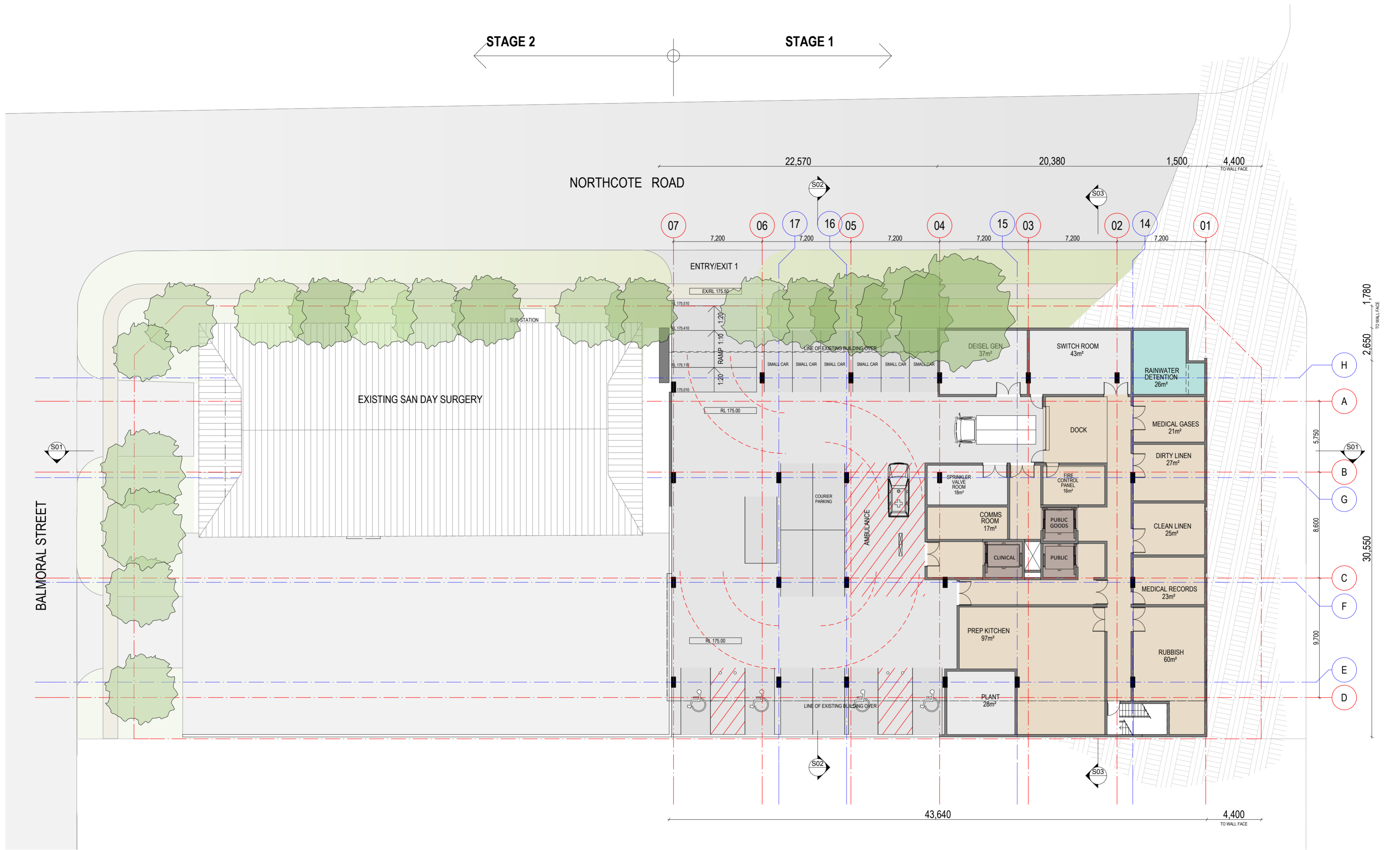
The proposed development is forecast not have any adverse effect on the operation of the local road network, which will continue to operate within reasonable capacity limits (PM peak hour Level of Service C) with the estimated additional development flows distributed onto the major development access routes via Northcote Road and Palmerston Road. Balmoral Street will be used by a lesser proportion of the future site development traffic as it already has speed humps installed to discourage non - local traffic flows.

Potential users of the proposed development will have several modes of transport available for accessing the site. Each mode provides access to a wider area given the extent of modes of public transport offered, such as rail and bus. The proposed development in no way hinders the existing use of public transport and may ultimately increase the demand for public transport services in the area in future years.

The provision of a future Green Travel Plan for the site would potentially reduce the current high reliance on private vehicle usage for hospital staff and patients, and lead to an increase in the use of non-car based modes of travel.

Appendix A

**Proposed Car Park
Layout**



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No.	Initial	DATE	REVISION / ISSUE DETAILS	Check	PROJECT
B	ST	13.07.10	Approval		
A	ST	28.06.10	Information		

SAH Day Surgery Hornsby Redevelopment
Northcote Road / Palmerston Road
Hornsby

SYDNEY ADVENTIST HOSPITAL

186 Fox Valley Road
 Wairoonga NSW
 phone : +61 2 9487 9111
 fax : +61 2 9487 9266



morrisbrayarchitects

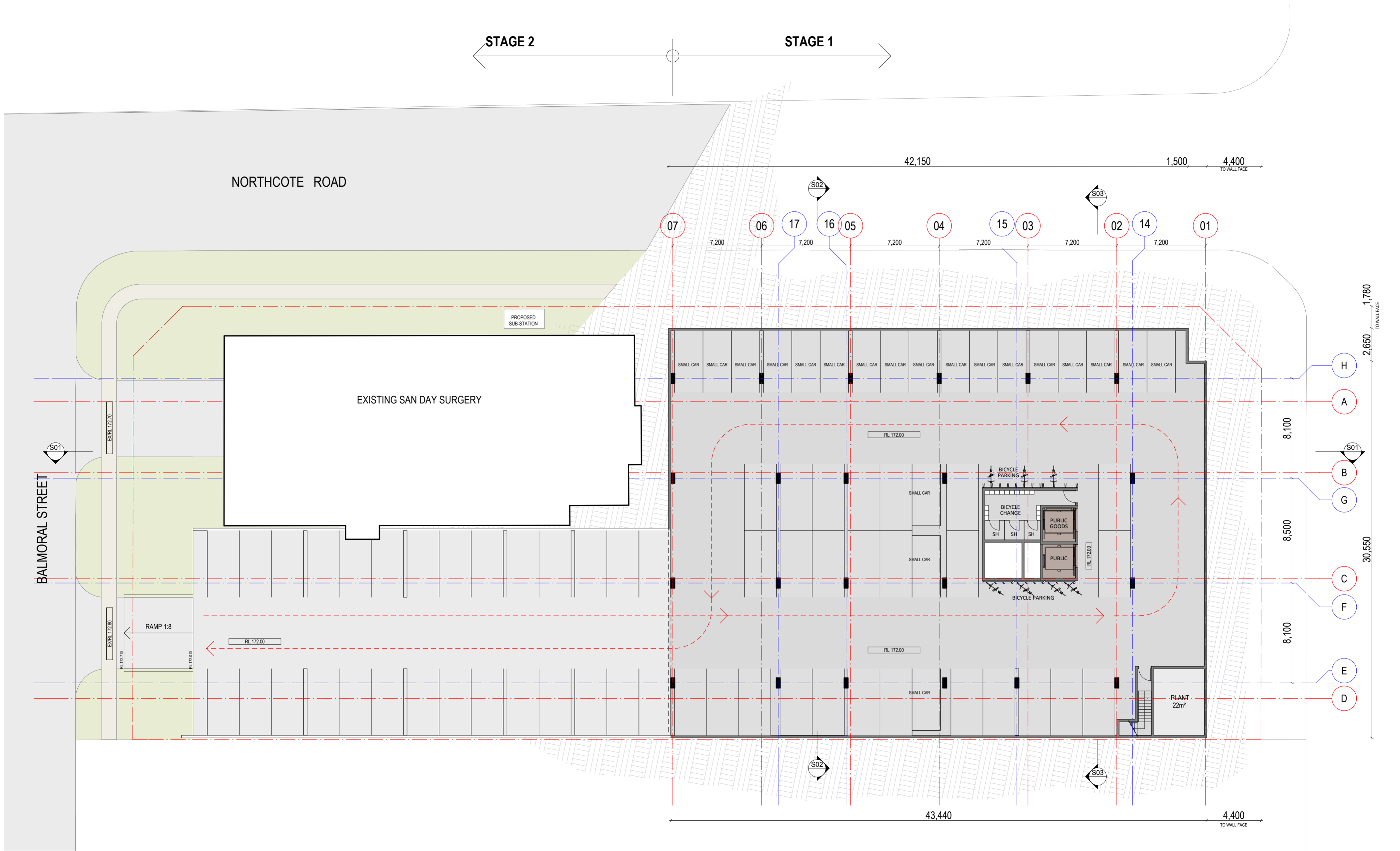
Morris Bray Architects
 186-188 Willoughby Rd
 Crows Nest NSW 2067 Australia
 ABN 16 001 268 211
 NSW Architects Registration Board Nominated
 Architects: Terry Morris 3354 Garry Bray 3555

[P] +612 9438 6622
 [F] + 612 9438 4873
 [E] info@morrisbray.com.au
 [W] www.morrisbray.com.au

DRAWING TITLE:
STAGE 1
LOWER GROUND FLOOR

SCALE: 1:200 @A2

PLOT DATE: 14/07/2010



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DRAWING TITLE:
STAGE 1
BASEMENT

SCALE:
 1:200 @A2

09009

A/EA-101

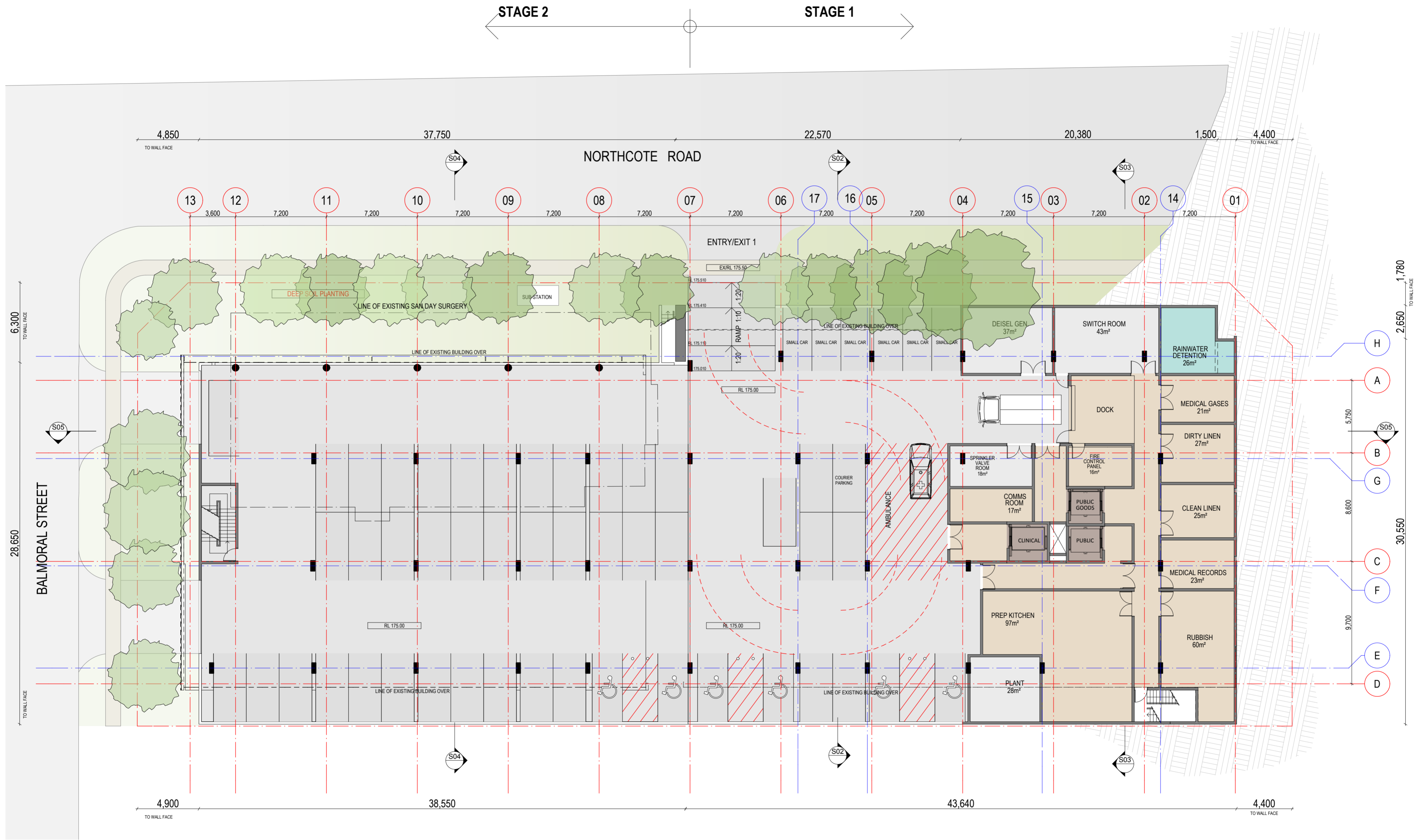
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 14/07/2010

JOB NO.

DRAWING NUMBER:

ISSUE:

101



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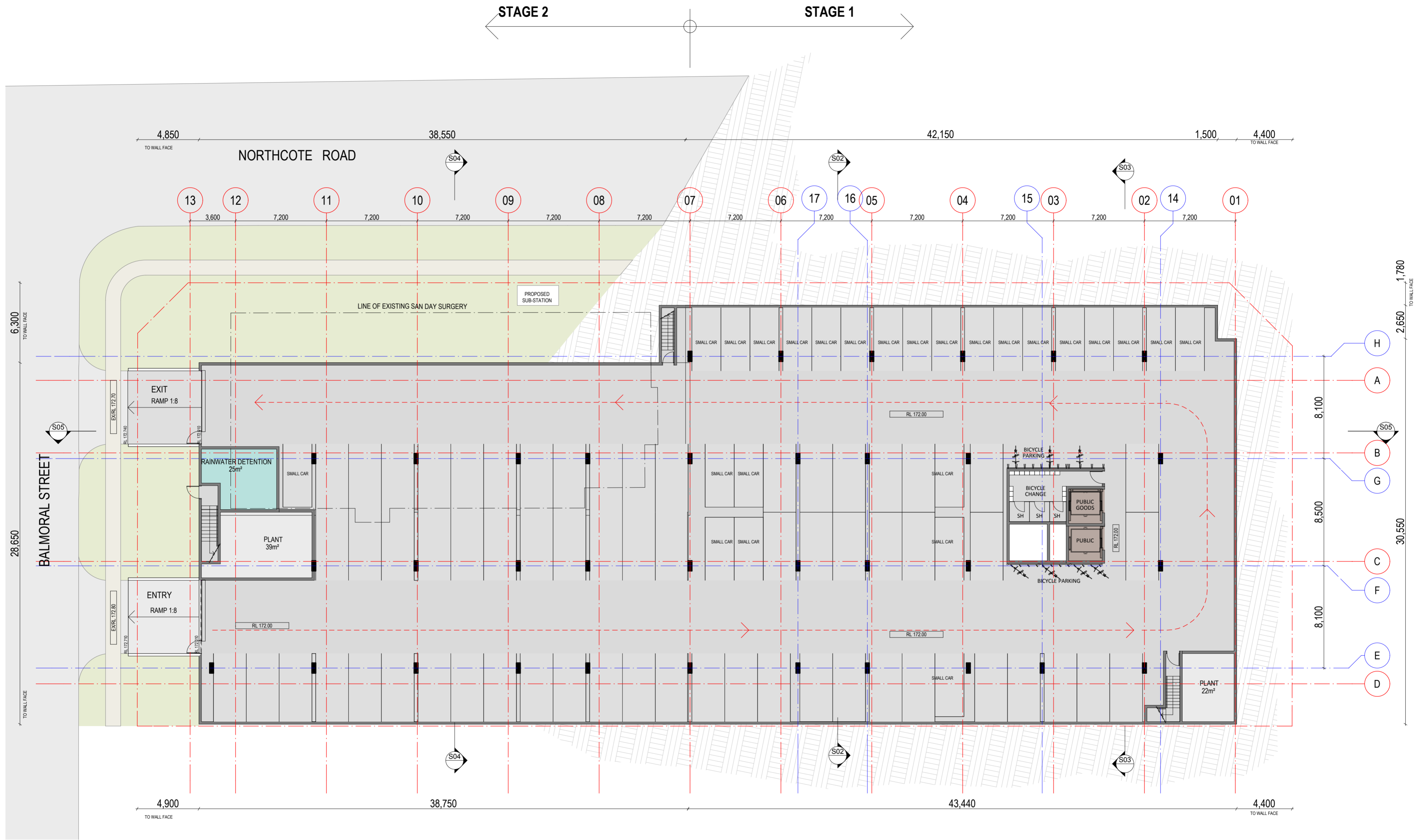
STAGE 2
LOWER GROUND FLOOR

SCALE: 1:200 @A2

JOB NO. 09009
 DRAWING NUMBER: A/E-A-202

PLOT DATE: 14/07/2010

202



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B	ST	13.07.10	Approval		
A	ST	28.06.10	Information		

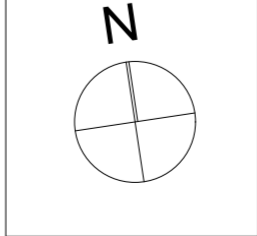
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ARCHITECTS

DRAWING TITLE:
STAGE 2
BASEMENT

SCALE:
 1:200 @A2

PLOT DATE:
 14/07/2010

JOB NO. **09009** A/E/A-201
 DRAWING NUMBER: **B**

201

Trip Generation:

AM Peak: 07:00-08:00

Element	GFA		
Medical Centre	9,000 m ²	<i>per 100m²</i>	90

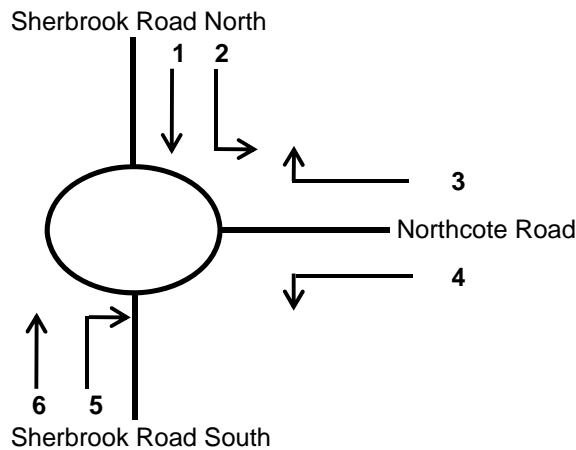
Number of beds in hospital (B):	79
Number of staff during weekday day shift (ASDS)	100
Morning Vehicle Trips (MVT) = -10.21+0.47B+0.06ASDS	

Element	Predicted Trips
Proposed Medical Centre	33
Existing Medical Centre	7
Total	26

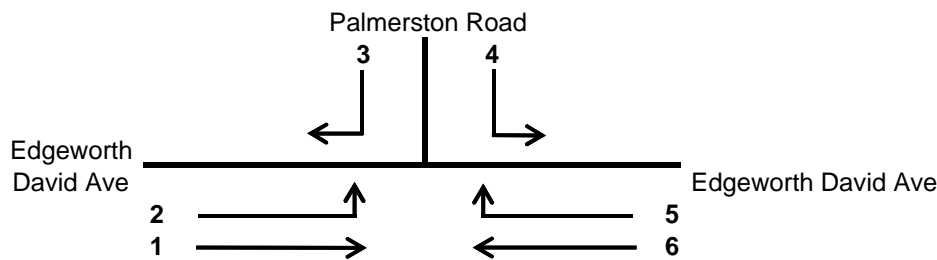
Arriving to Site From;	East	North	West	South	Total
Proportions*	17%	44%	3%	36%	100%
Vehicle Trips	4	11	1	9	26

*based on 2006 Census Data

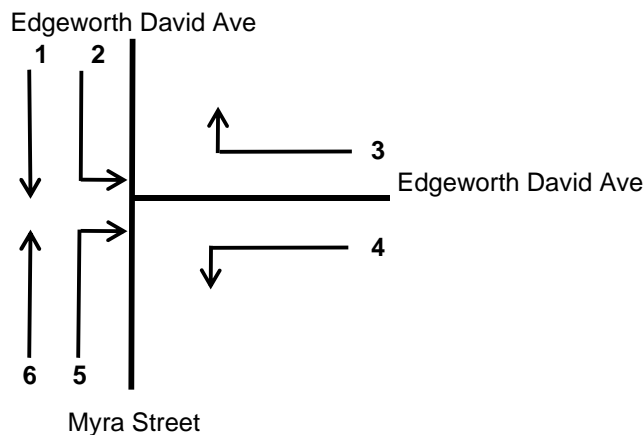
AM Peak: 07:00-08:00					
Sherbrook Road - Northcote Road Roundabout					
Traffic Movement	Vehicle Movements		Medical Centre	Total Predicted Flow	
	Lights	HGVs		Lights	Heavies
1	637	7	0	637	7
2	192	1	11	203	1
3	124	1	0	124	1
4	49	3	0	49	3
5	33	3	1	34	3
6	536	7	0	536	7
Total	1571	22	12	1583	22



AM Peak: 07:00-08:00					
Palmerston Road - Edgeworth David Ave Signal Controlled Junction					
Traffic Movement	Vehicle Movements		Medical Centre	Total Predicted Flow	
	Lights	HGVs		Lights	Heavies
1	844	8	0	844	8
2	29	0	0	29	0
3	0	0	0	0	0
4	150	3	0	150	3
5	257	0	14	271	0
6	939	6	0	939	6
Total	2219	17	14	2233	17



AM Peak: 07:00-08:00					
Palmerston Road - Edgeworth David Ave Signal Controlled Junction					
Traffic Movement	Vehicle Movements		Medical Centre	Total Predicted Flow	
	Lights	HGVs		Lights	Heavies
1	305	2	0	305	2
2	638	8	0	638	8
3	768	7	4	772	7
4	95	0	0	95	0
5	86	1	0	86	1
6	412	0	9	421	0
Total	2304	18	14	2318	18



Trip Generation:

PM Peak: 16:15 - 17:15

Element	GFA		
Medical Centre	9,000 m ²	<i>per 100m²</i>	90

Number of beds in hospital (B):	79
Number of staff during weekday day shift (ASDS)	100
Evening Vehicle Trips (EVT) = -2.84+0.25B+0.4ASDS	

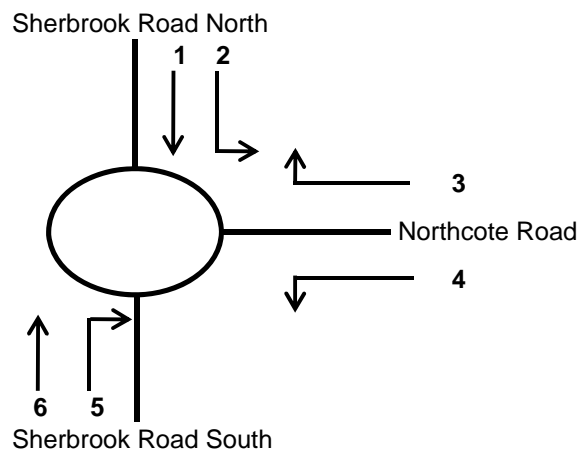
Element	Predicted Trips
Proposed Medical Centre	57
Existing Medical Centre	21
Total	36

Arriving to Site From;	East	North	West	South	Total
Proportions*	17%	44%	3%	36%	100%
Vehicle Trips	6	16	1	13	36

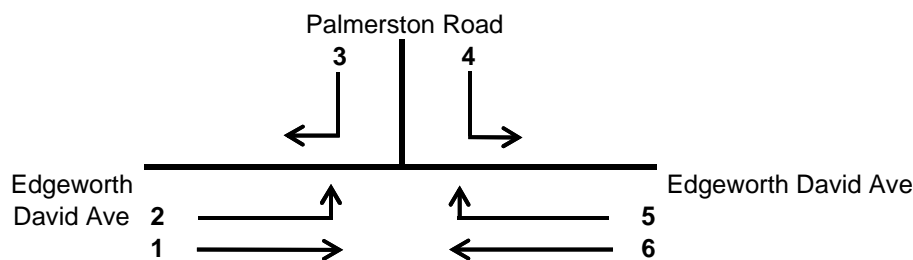
**based on 2006 Census Data*

PM Peak: 16:15 - 17:15

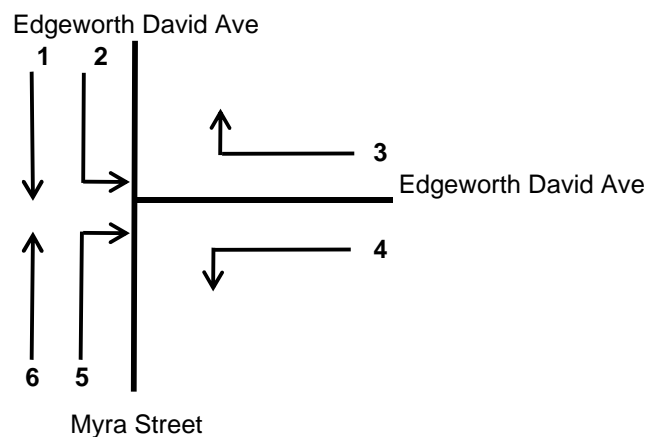
Sherbrook Road - Northcote Road Roundabout					
Traffic Movement	Vehicle Movements		Medical Centre	Total Predicted Flow	
	Lights	HGVs		Lights	Heavies
1	659	0	0	659	0
2	99	0	0	99	0
3	352	0	16	368	0
4	114	2	1	115	2
5	61	3	0	61	3
6	642	2	0	642	2
Total	1927	7	17	1944	7



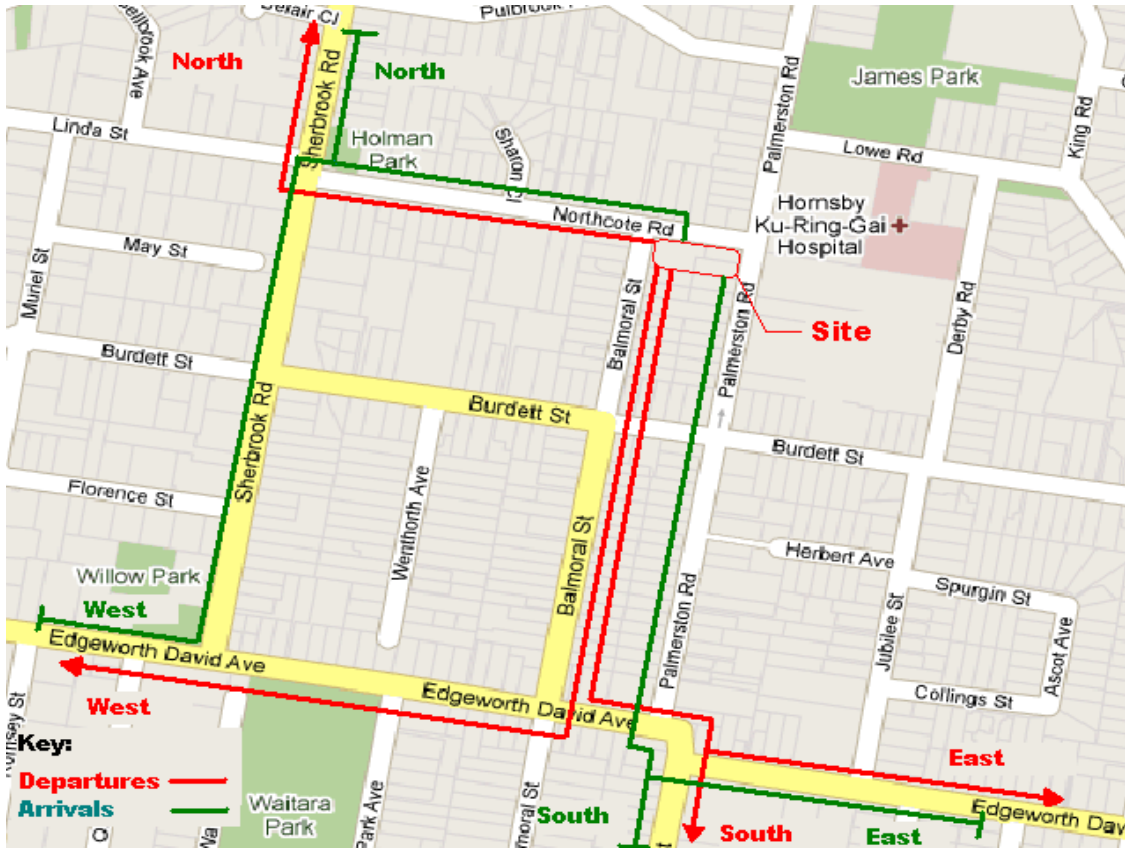
PM Peak: 16:15 - 17:15					
Palmerston Road - Edgeworth David Ave Signal Controlled Junction					
Traffic Movement	Vehicle Movements		Medical Centre	Total Predicted Flow	
	Lights	HGVs		Lights	Heavies
1	913	1	19	932	1
2	35	0	0	35	0
3	0	0	0	0	0
4	213	0	0	213	0
5	255	0	0	255	0
6	1107	9	0	1107	9
Total	2523	10	19	2542	10



PM Peak: 16:15 - 17:15					
Palmerston Road - Edgeworth David Ave Signal Controlled Junction					
Traffic Movement	Vehicle Movements		Medical Centre	Total Predicted Flow	
	Lights	HGVs		Lights	Heavies
1	354	0	13	367	0
2	719	1	6	725	1
3	967	9	0	967	9
4	78	0	0	78	0
5	95	0	0	95	0
6	424	0	0	424	0
Total	2637	10	19	2656	10



Predicted Traffic Routes:



Appendix C

**Junction Assessment
Results**

Morning Peak Flow (AM): 07:00 - 08:00**Sherbrook Road - Northcote Road Roundabout Junction**

AM Peak Flow Without Proposed Medical Facility			
Arm	Degree of Saturation	Delay	Level Of Service
Sherbrook Road North Straight Through	0.54	4.6	A
Sherbrook Road North Turning Left	0.54	5.6	A
Northcote Road Turning Right	0.21	14.9	B
Northcote Road Turning Left	0.21	9.0	A
Sherbrook Road South Turning Right	0.43	12.2	B
Sherbrook Road South Straight Through	0.43	5.1	A

AM Peak Flow With Proposed Medical Facility			
Arm	Degree of Saturation	Delay	Level Of Service
North Sherbrook Road; Straight Through	0.54	4.6	A
North Sherbrook Road; Turning Left	0.54	5.6	A
Northcote Road; Turning Right	0.21	15	B
Northcote Road; Turning Left	0.21	9.2	A
South Sherbrook Road; Turning Right	0.29	12.1	B
South Sherbrook Road; Straight Through	0.29	5	A

Evening Peak Flow (PM): 16:15 -17:15**Sherbrook Road - Northcote Road Roundabout Junction**

PM Peak Flow Without Proposed Medical Facility			
Arm	Degree of Saturation	Delay	Level Of Service
Sherbrook Road North Straight Through	0.51	4.7	A
Sherbrook Road North Turning Left	0.51	5.7	A
Northcote Road Turning Right	0.56	18	B
Northcote Road Turning Left	0.56	12.1	B
Sherbrook Road South Turning Right	0.68	15.6	B
Sherbrook Road South Straight Through	0.68	8.6	A

PM Peak Flow With Proposed Medical Facility			
Arm	Degree of Saturation	Delay	Level Of Service
North Sherbrook Road; Straight Through	0.51	4.7	A
North Sherbrook Road; Turning Left	0.51	5.7	A
Northcote Road; Turning Right	0.58	18.3	B
Northcote Road; Turning Left	0.58	12.5	B
South Sherbrook Road; Turning Right	0.69	16.0	B
South Sherbrook Road; Straight Through	0.69	9.0	A

Morning Peak Flow (AM): 07:00 - 08:00**Palmerston Road - Edgeworth David Avenue Signal Controlled Junction**

AM Peak Flow Without Proposed Medical Facility			
Arm	Degree of Saturation	Delay	Level Of Service
West Edgeworth David Ave; Straight Through	0.55	13.8	B
West Edgeworth David Ave; Turning Left	0.55	22	C
Palmerston Road; Turning Left	0.24	22.7	C
East Edgeworth David Ave; Turning Right	0.56	22	C
East Edgeworth Ave; Straight Through	0.56	2.8	A

Palmerston Road - Edgeworth David Avenue Signal Controlled Junction

AM Peak Flow With Proposed Medical Facility			
Arm	Degree of Saturation	Delay	Level Of Service
West Edgeworth David Ave; Straight Through	0.58	14.7	B
West Edgeworth David Ave; Turning Left	0.58	22.9	C
Palmerston Road; Turning Left	0.23	21.9	C
East Edgeworth David Ave; Turning Right	0.56	21.6	C
East Edgeworth Ave; Straight Through	0.56	2.8	A

Evening Peak Flow (PM): 16:15 -17:15**Palmerston Road - Edgeworth David Avenue Signal Controlled Junction**

PM Peak Flow Without Proposed Medical Facility			
Arm	Degree of Saturation	Delay	Level Of Service
West Edgeworth David Ave; Straight Through	0.62	15	B
West Edgeworth David Ave; Turning Left	0.62	23.2	C
Palmerston Road; Turning Left	0.31	22.4	C
East Edgeworth David Ave; Turning Right	0.62	20.8	C
East Edgeworth Ave; Straight Through	0.62	3.3	A

Palmerston Road - Edgeworth David Avenue Signal Controlled Junction

PM Peak Flow With Proposed Medical Facility			
Arm	Degree of Saturation	Delay	Level Of Service
West Edgeworth David Ave; Straight Through	0.63	15.2	B
West Edgeworth David Ave; Turning Left	0.63	23.3	C
Palmerston Road; Turning Left	0.31	22.4	C
East Edgeworth David Ave; Turning Right	0.62	20.7	C
East Edgeworth Ave; Straight Through	0.62	3.3	A

Morning Peak Flow (AM): 07:00 - 08:00**Myra Street - Edgeworth David Avenue Signal Controlled Junction**

AM Peak Flow Without Proposed Medical Facility			
Arm	Degree of Saturation	Delay	Level Of Service
Edgeworth David Avenue North; Straight Through	0.53	18.6	B
Edgeworth David Avenue North; Turning Left	0.46	9.3	A
Edgeworth David Avenue East; Turning Right	0.61	19.8	B
Edgeworth David Avenue East; Turning Left	0.61	19.8	B
Myra Street; Turning Right	0.43	26.1	C
Myra Street; Straight Through	0.43	17.9	B

AM Peak Flow With Proposed Medical Facility			
Arm	Degree of Saturation	Delay	Level Of Service
Edgeworth David Avenue North; Straight Through	0.55	16.4	B
Edgeworth David Avenue North; Turning Left	0.49	9.5	A
Edgeworth David Avenue East; Turning Right	0.54	18.9	B
Edgeworth David Avenue East; Turning Left	0.54	18.9	B
Myra Street; Turning Right	0.46	24.1	C
Myra Street; Straight Through	0.46	15.9	B

Evening Peak Flow (PM): 16:15 -17:15**Myra Street - Edgeworth David Avenue Signal Controlled Junction**

PM Peak Flow Without Proposed Medical Facility			
Arm	Degree of Saturation	Delay	Level Of Service
Edgeworth David Avenue North; Straight Through	0.64	17.2	B
Edgeworth David Avenue North; Turning Left	0.54	9.6	A
Edgeworth David Avenue East; Turning Right	0.65	19.7	B
Edgeworth David Avenue East; Turning Left	0.65	19.6	B
Myra Street; Turning Right	0.47	24.1	C
Myra Street; Straight Through	0.47	15.9	B

PM Peak Flow With Proposed Medical Facility			
Arm	Degree of Saturation	Delay	Level Of Service
Edgeworth David Avenue North; Straight Through	0.66	17.6	B
Edgeworth David Avenue North; Turning Left	0.54	9.6	A
Edgeworth David Avenue East; Turning Right	0.65	19.7	B
Edgeworth David Avenue East; Turning Left	0.65	19.7	B
Myra Street; Turning Right	0.47	24.1	C
Myra Street; Straight Through	0.47	15.9	B