Traffic Impact Assessment

Mixed-Use Development – Planning Proposal
143 – 149 Boundary Road & 689 Forest Road, Peakhurst

Ref: P1039r01
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Document Control

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Project: 143 – 149 Boundary Road & 689 Forest Road, Peakhurst

Client: Mr. John Rider

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Revision History

Revision	Date	Details	Author	Approved by
-	19/07/2019	DRAFT	A. Rasouli M. Tangonan	A. Rasouli
1	19/07/2019	Issue I	M. Tangonan	A. Rasouli

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1 Introduction

1.1 Overview

Ason Group has been engaged by Mr. John Rider to prepare a Traffic Impact Assessment (TIA) to support a mixed-use development at 143 – 149 Boundary Road and 689 Forest Road, Peakhurst (the Site). The proposal generally relates to development of a mix of commercial and residential units which is proposed to be accessed via a single vehicular crossover on Boundary Road. The Site is located within the Georges River Council (LGA) and is therefore subject to that's Council's control.

This TIA provides an assessment of the relevant traffic, transport and parking implications of the Proposal. In preparing this TIA, Ason Group has referenced key planning documents, these include:

- Hurstville Development Control Plan No.1 (Attachment No. 7) – (Effective 10 October 2018)
- Hurstville Local Area Development Plan 2012 – (LEP 2012)

This TIA also references general access, traffic and parking guidelines, including:

- Roads and Maritime Services, *Guide to Traffic Generating Developments* (RMS Guide),
- Roads and Maritime Services, *Guide to Traffic Generating Developments, Updated Traffic Surveys (*Technical Direction*)*

1.2 Report Structure

The report is structured as follows:

- Section 2 provides a summary of the Planning Proposal,
- Section 3 describes the existing site conditions and land use,
- Section 4 describes the future traffic conditions (without the proposal),
- Section 5 describes the existing public transport, pedestrian and cycling links,
- Section 6 outlines the parking requirements applicable to the Planning Proposal,
- Section 7 assesses the traffic impacts of the indicative development yield including the Site's projected trip generation and forecasted network performance,
- Section 8 discusses the site access and general internal parking design requirements, and
- Section 9 provides a summary of the key conclusions.

2 Overview of Proposal

2.1 Summary of the Planning Proposal

This Planning Proposal seeks to:

- Increase the current permissible Floor-Space-Ratio of 0.5:1 on the Site to a proposed FSR of 2:1.
- Change the current zoning of the Site from R2 (Low Rise Medium Density) to B1 (Neighbourhood Centre Zone).

The resultant impact on future development potential of the site is outlined below.

2.2 Indicative Yield

To inform assessment of this Planning Proposal, including this traffic assessment, the Project Team has undertaken an urban design exercise and provided an indicative development yield which sets out what the Proposal could potentially achieve, subject to the Planning Proposal changes outlined above.

The indicative Concept Plan envisages demolition of all existing residential dwellings and construction of a new mixed-use development comprising:

- 29 residential units on levels 1 to 4, comprising of:
  - 1 studio unit,
  - 10 one-bedroom units,
  - 15 two-bedroom units,
  - 3 three-bedroom units.
- Provision of 1,445 m^2 Gross Floor Area (GFA) of commercial development (likely to be medical centre, pharmacy and a small cafe) on ground floor with the following indicative breakdown:
  - 900 m^2 of medical centre,
  - 300 m^2 of pharmacy, and
  - 245 m^2 of café.
- Provision of parking spaces within the ground floor and basement level.
- Vehicular access from Boundary Road.

Reference should be made to the draft Concept Plans prepared by Conybeare Morrison which is presented at a reduced scale for context in **Figure 1**.

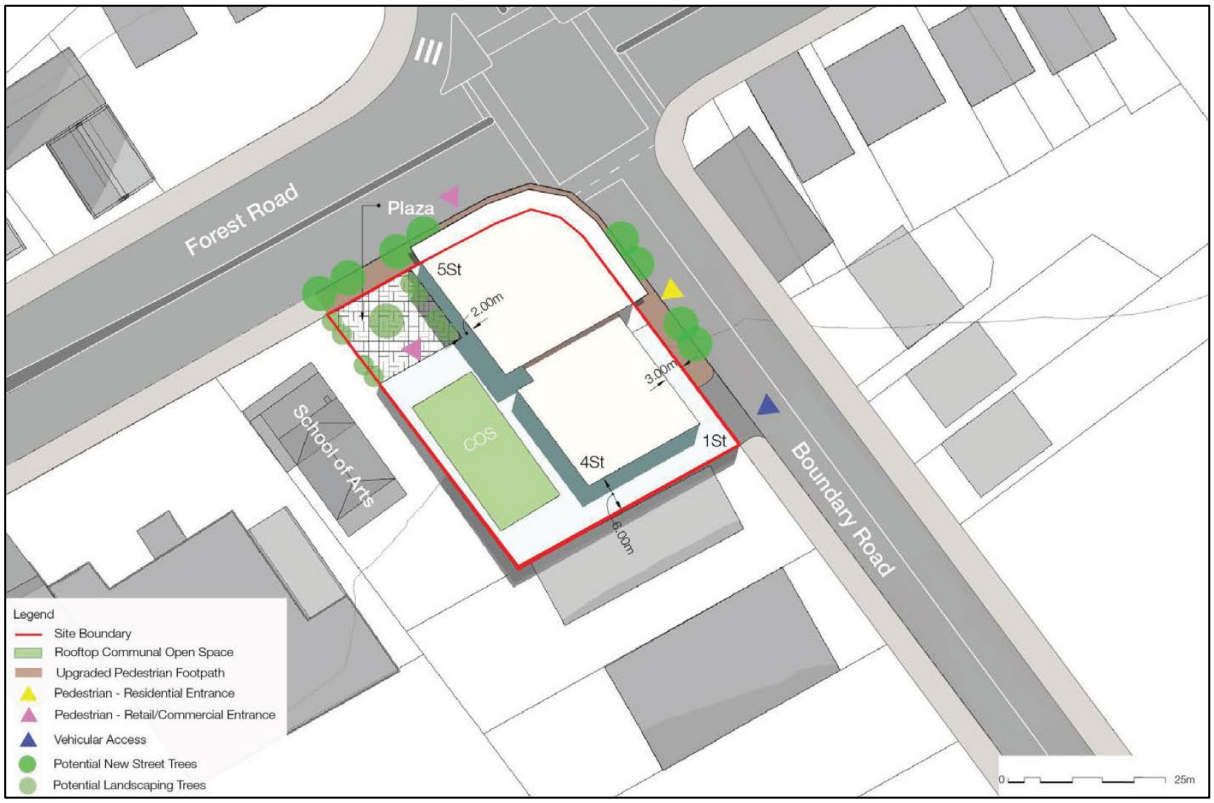

Figure 1: Draft Development Plan

3 Existing Conditions

3.1 Site & Location

The Site is located in Peakhurst – within Georges River Council LGA – and includes a total of 5 residential properties, as follows:

- 143 Boundary Road: Lot D in DP389507,
- 145 Boundary Road: Lot 12 in DP572452,
- 147 Boundary Road: Lot 11 in DP572452,
- 149 Boundary Road: Lot A in DP 389507, and
- 689 Forest Road: Lot 1 in DP 11501.

The site encompasses an area of 1,983m^2 and is bound by Forest Road to the north, Boundary Street to the east, and other existing developments to the immediate west and south. It is situated on the southwestern corner of the existing signalised intersection of Boundary Road and Forest Road. A location plan is presented in **Figure 2** which provides an appreciation of the site and the existing conditions.

Figure 2: Location Plan

3.1.1 Existing Land Use

The Site is currently zoned R2 low rise medium density housing under Hurstville Local Environment Plan (LEP) 2012 and it is currently under a permissible Floor-Space-Ratio of 0.5:1 (FSR 0.5:1).

Furthermore, the Site currently consists of 3 residential dwellings.

3.1.2 Existing Site Access

The existing residential dwellings are accessed via 3 direct and separate access driveways on Boundary Road and 2 access driveway on Forest Road.

3.2 Existing Site Generation

The existing residential dwellings on Site are anticipated to generate a total of 3 vehicles per hours on the surrounding road network during the road network peak periods.

However, for robust traffic assessment the existing traffic generation of the Site has not been considered in estimation of the net traffic increase of the proposal onto the road network.

3.3 Road Network

3.3.1 Road Hierarchy

The key roads providing in the vicinity of the site are summarised below:

Table 1: Road Network Critical Features

Road Name	Road Classification	Available Traffic Volumes[1] (vpd)[2]	Posted Speed Limit[3] (km/hr)	Notes
Forest Road	Classified Road Primary / Arterial	AM = 2,992 vph PM = 3,281 vph Daily ~ 30,000 vpd	60	"Clearway Zone from 6.00am-10:00am MON-FRI" applies on Forest Road fronting the Site.
Boundary Road	Unclassified Road Collector	AM = 1,240 vph PM = 1,356 vph Daily ~10,000 vpd	50	"No Stopping" sign applies on the northbound direction fronting the Site from closer to the signalised intersection of Boundary Road / Forest Road. "No Stopping from 7:00-9:00am and 3:00-7:00pm MON-FRI" sign applies on northbound direction fronting the Site.

Notes: 1) Source: Estimated from Ason Group peak period traffic surveys in June 2019.
2) vpd = two-way vehicles per day
3) Signposted speed limit. Actual speeds may vary.

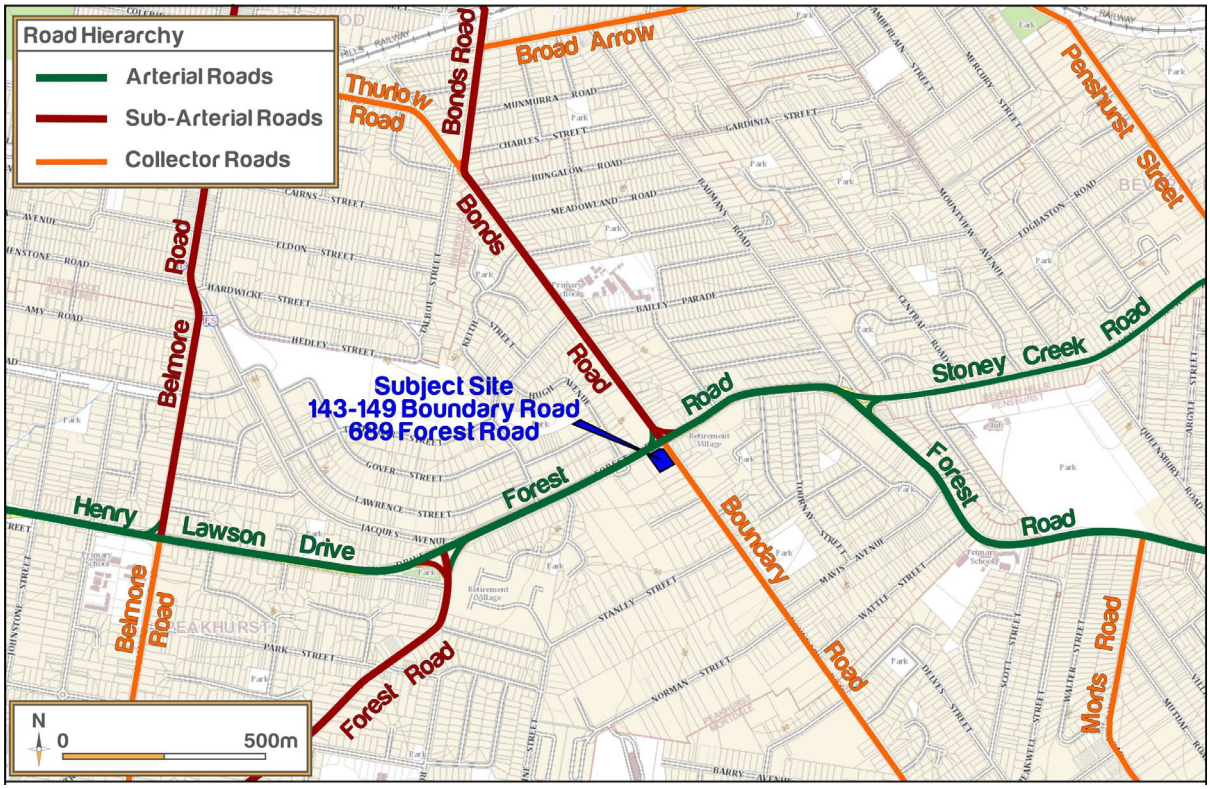

Figure 3: Road Hierarchy Plan

3.3.2 Existing Traffic Profile

The existing traffic on the surrounding road network was surveyed during the road network AM and PM peak hours on Thursday, 27th June 2019.

Accordingly, the resultant traffic profile of the surrounding road network is provided in **Figure 4**.

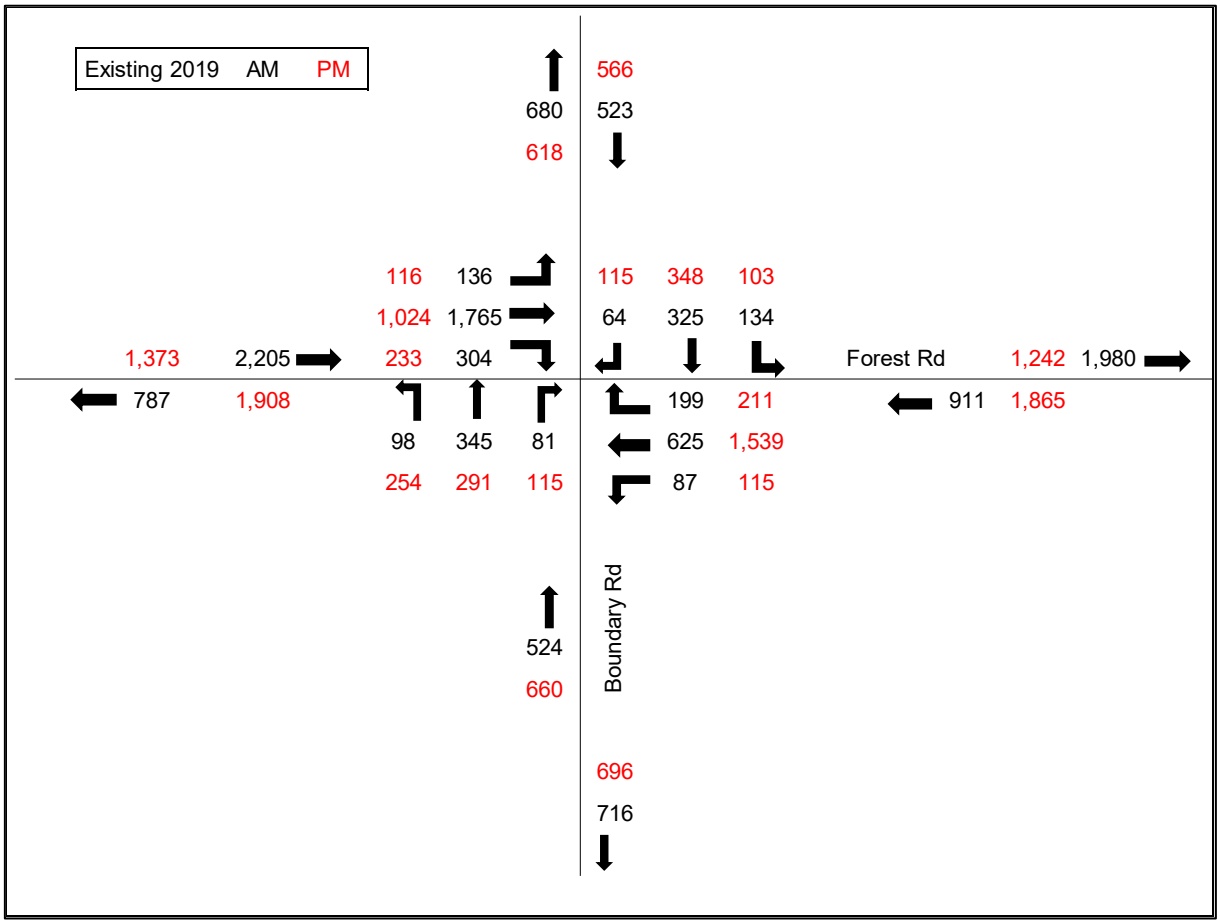

Figure 4 : Existing (2019) Traffic Profile

3.3.3 Existing Intersection Performance

Forest Road / Boundary Road / Bonds Road signal is the primary key intersection in this vicinity. This intersection is an existing signalised intersection located in the immediate vicinity of the Site. The intersection includes dedicated right turn bays on Forest Road with all approaches being signal controlled except the left turn from Forest Road northbound into Bonds Road. Pedestrian crossing facilities are present at this signal.

The operation of the intersection observed during morning and afternoon site inspections indicate that:

- The four approaches contain varying degrees of queueing exceeding 100 metres, particularly on the northern (Bonds Road) and southern (Boundary Road) approaches.
- Forest Road approaches (east and west) exhibit high traffic volumes across the four-lane operation at the intersection.

3.3.4 Baseline SIDRA Performance Testing

The performance of the above key intersection has been analysed using the SIDRA Intersection computer program. SIDRA modelling outputs a range of performance measures, in particular:

- *Average Vehicle Delay (AVD)* – The AVD (or average delay per vehicle in seconds) for intersections also provides a measure of the operational performance of an intersection and is used to determine an intersection's Level of Service (see below). For signalised intersections, the AVD reported relates to the average of all vehicle movements through the intersection. For priority (Give Way, Stop & Roundabout controlled) intersections, the AVD reported is that for the movement with the highest AVD.
- *Level of Service (LOS)* – This is a comparative measure that provides an indication of the operating performance, based on AVD.

The following table provides a recommended baseline for assessment as per the RMS Guide:

Table 2: RMS Level of Service Summary

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & 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	More than 70	Unsatisfactory and requires additional capacity.	Unsatisfactory and requires other control mode or major treatment.

The intersection configuration and local network performance is provided in **Table 3** which presents the SIDRA intersection modelling results of the intersection of Forest Road / Boundary Road under the existing "baseline" scenario.

Relevant SIDRA files can be provided to Council / RMS, upon request.

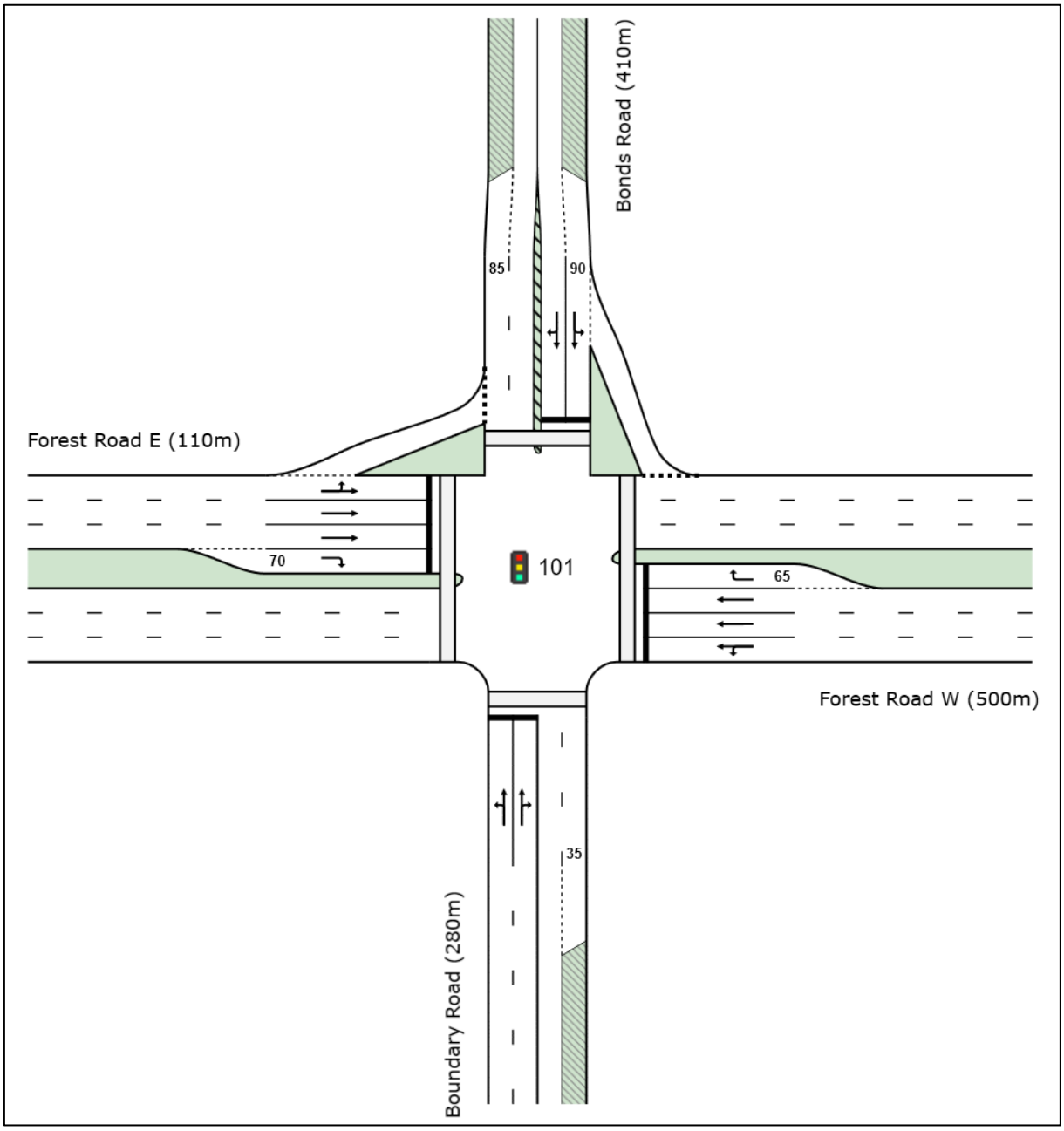

Figure 5: Forest Road / Boundary Road SIDRA Configuration

Table 3: Intersection Performance – Existing Base Case

Intersection	Control Type	Period	Intersection Delay	Level of Service
Forest Road / Boundary Road	Signal	AM	153.5	F
		PM	211	F

The analysis indicates that the key intersection adjacent to the Site's north-western boundary currently performs at Level of Service "F" during weekday AM and PM peaks; results corresponding with queue length observations made on site during these periods. This existing poor performance – with a LoS "F" – is a result of high traffic volumes and lane capacity issues on Boundary Road and Bonds Road. Nevertheless, it is emphasised that this is an existing issue.

3.4 Public Transport

The Site is serviced by local public transport infrastructure. Key rail and bus services in proximity of the Site are presented in **Figure 6** and summarised below.

3.4.1 Railway Services

The Integrated Public Transport Service Planning Guidelines, Sydney Metropolitan Area (Transport for NSW, December 2013) state that rail services influence the travel mode choices of areas within 800 metres walk (approximately 10 minutes) of a railway station.

Whilst the Site is not located within 800m walking distance to any train stations in the area, it is important to note that bus services on Boundary Road, Bonds Road and Forest Road provide connections to the surrounding train stations, including the T4 (via Penshurst station to the south of the Site) and T8 (via Riverwood train station to the north of the Site) train lines and thus connectivity to the broader Metropolitan area.

3.4.2 Bus Services

Having regard to the standard bus travel, the Integrated Public Transport Service Planning Guidelines state that bus services influence the travel mode choices of sites within 400 metres (approximately 5 minutes) of a bus stop. The Site is well serviced by a number of bus stops within 400 walking distance of the Site as shown in Figure 6; these include:

- Bus service 943 running along Forest Road provides connections to Hurstville and Mortdale Stations hence providing connection to T4 Illawarra and Eastern suburb line.

  This bus service runs 6 and 9 times during 6:00am to 9:00am and 3:00pm to 6:00pm respectively which translate into 1 service every 30 minutes in the AM peak period and 1 service every 20 minutes during the PM peak period.

- Bus Service 945 running along Boundary Road and Bonds Road provides connection to Riverwood train station and hence connection to T8 airport and south line services.

  This bus service runs 12 times during 6:00am to 9:00am and 3:00pm to 6:00pm respectively which translate into 1 service every 15 minutes in the AM and PM peak periods.

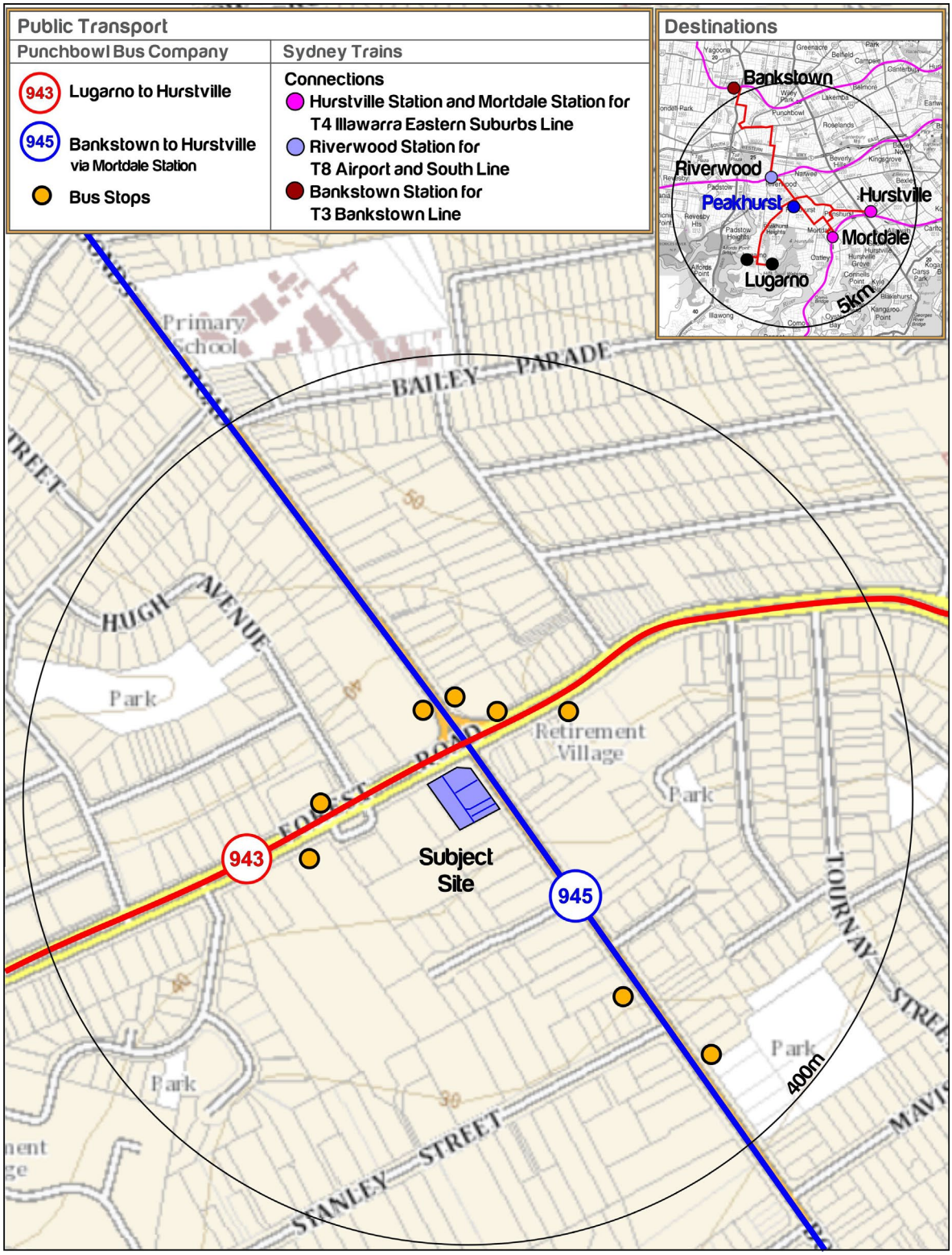

Figure 6: Public and Active Transport Network

3.5 Active Transport

3.5.1 Existing Pedestrian Accessibility

Pedestrian access is provided by footpaths along Boundary Road and Forest Road fronting the Site, providing convenient access to the footpath network in the area for residents, employees and visitors.

Full pedestrian crossing facilities exist through the Boundary Road / Forest Road intersection, and an additional staged crossing to the Site's west provide for favourable access to the local centre facilities adjacent to Forest Road - including churches, grocery stores and restaurants – all within 200 metres of the Site, as observed in **Figure 7**.

Figure 7: Local Facilities within 200m walking Radius

3.5.2 Existing Cycle Routes

There are currently limited cycling facilities and routes provided within the proximity of the development.

4 Future Context (Without Proposal)

4.1 Background Growth

Background traffic growth rates on the surrounding road network - extracted from RMS's Strategic Traffic Forecasting Model (STFM) - have been provided by the Roads and Maritime Services (RMS). For the purposes of this study, relevant future base year assumed to be the year 2036.

4.2 Future Intersection Performance

To assess the future performance of the critical intersections for the 2036 future baseline, extracted EMME growth factors have been applied to the 2019 surveyed volumes and a future base traffic profile has been developed which is shown in **Figure 8**.

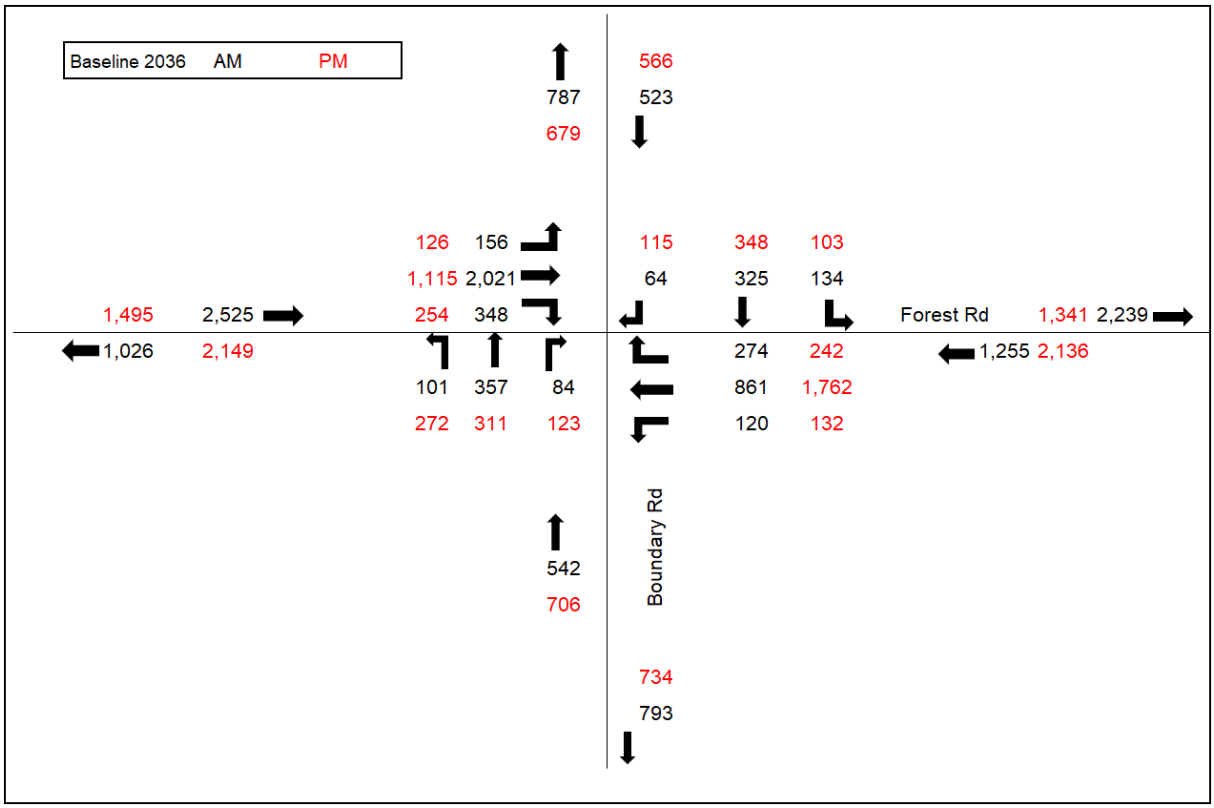

Figure 8: 2036 Baseline Traffic Profile

Accordingly, the 2036 baseline intersection performance has been analysed in SIDRA Network and the results are provided in below table.

Table 4 : Local Network Performance – Future (2036) Base Case (without Project)

Intersection	Scenario	Period	Intersection Delay	Level of Service
Forest Road / Boundary Road	2036 Baseline	AM	181.2	F
		PM	290.7	F

As outlined above, the 2036 Baseline scenario continues to perform at a Level of Service “F” from the existing base scenario. Applied network growth over the time period has resulted in a net increase of 87 and 58 seconds to intersection delay in the respective AM and PM Peak periods when compared to the Existing Base Case.

Ason Group is not aware of any planned road upgrades to this intersection, despite the apparent capacity constraints under both existing and future base case scenarios.

5 Parking Provisions

5.1 Car Parking

It is noted that the detailed parking demand / supply assessment is anticipated to be undertaken as part of future DA assessment when the development yield and the development site plans are finalised. However, the following general guidance in relation to the applicable DCP parking rates and potential parking requirements is provided.

5.1.1 General Provisions (DCP Requirement)

Since the Site is located in Peakhurst area, the parking for the Proposal is to be provided in accordance with the Hurstville DCP No. 1, Section *3.1 Vehicle Access Parking and Manoeuvring*. Furthermore, according to the location of the Site *Table 2 Carparking Rates –land located Outside a Business or Industrial zone* of the DCP has been sourced for adoption of the applicable parking rates.

Accordingly, the following parking rates would be applicable to the permissible land uses on this Site:

Table 5: Council Parking Rates

Land Use	Minimum Parking Rate
Medical Centre / Pharmacy	3 spaces per consulting room
Office	1 space per 40 m^2 GLFA
Retail Premises (Bulky Goods Retail Store)	1 space per 50 m^2 GLFA
Restaurant or Café	15 space per 100 m^2 GFA or 1 space per 3 seats (whichever is greater)
Residential (Refer Section 4.1 as requested by Table 2)	1 space for every studio, 1 or 2 bedroom dwelling 2 spaces for every 3 or more bedroom dwelling For developments of 4 dwelling or more, one visitor space per 4 dwellings or part thereof

Application of Council's rates to the indicative yield results in a parking requirement ranging – depending on type of ground floor commercial use – from 94 spaces (assumed for Bulky Goods) to 256 (assumed for medical centre use).

As discussed previously, the current concept plans do not detail the number of car parking. However, it is anticipated that as part of the DA submission, a sufficient amount of car parking spaces should be provided on the ground and basement levels to fully accommodate the proposed development demand.

Once again, the final resolution of the parking supply is a matter that can be addressed as part of the DA submission.

5.1.2 Accessible Parking

The DCP requires the following number of accessible parking spaces for different uses on Site:

Table 6: Accessible Parking Requirements

Land Use	Minimum Parking Rate
Medical Centre / Pharmacy OR Office	2 % of all parking spaces are to be set aside for accessible parking where 50 or more parking spaces are provided, to be designed in accordance with AS 2890.
Café	One space per 20 spaces or part thereof, where parking areas have more than 20 spaces but less than 50 spaces.
Residential	One adaptable unit for every ten dwelling or part thereof. Furthermore, one space per every adaptable unit is required.
Total	**na**

5.2 Bicycle Parking

Provision of bicycle parking and end-of-trip facility is also a matter for the DA stage. However, the following general requirements are deemed noteworthy to assist future design development.

Council's DCP does not specify any bicycle parking rates. However, bicycle parking bays and end-of-trip facilities may be provided having regard for the Planning Guidelines for Walking and Cycling (NSW Government 2004) document. In this instance the suggested bicycle rates for the residential and medical centre as follows:

Table 7: Bicycle Parking Requirements

Land Use	Employees / Residents	Visitors
Medical Centre	5-10% practitioners	5-10% practitioners
Office and Retail Shop	3-5% staff	5-10% staff
Residential	20-30% units	5-10% units

Furthermore, pending number of employees for the proposed commercial use of the Site which will be determined at later stages of the project, the following suggested showers, lockers and change room rates may be provided:

Staff	Lockers	Showers	Change rooms
0–12	1 per 3 racks	1	–
13–49	1 per 3 racks	2 (1 male and 1 female)	2 (1 male and 1 female)
50–149	1 per 3 racks	4 (2 male and 2 female)	2 (1 male and 1 female)
150–299	1 per 3 racks	6 (3 male and 3 female)	2 (1 male and 1 female)
300–500	1 per 3 racks	8 (4 male and 4 female)	2 (1 male and 1 female)
Additional shower facilities will be required at a rate of 1 female and 1 male shower for every 250 staff (adapted from WA Government Ref 7.16)			

Figure 9: Minimum Locker, Shower and Change Room

5.3 Service Vehicles

RMS Guides provide the following minimum requirements for delivery and service vehicles for different land-uses on Site:

- 1 space per 4,000 m^2 of GFA for commercial premises < 20,000 m^2 GFA,
- 1 space per 400 m^2 of GFA for restaurant premises < 20,000 m^2 GFA; and
- 1 space per 50 flats or home units for residential flat buildings < 200 units.

Subject to a loading management plan, there may be opportunity to reduce the total number of bays to reflect the shared use of bays between uses. Nevertheless, adequate provision of service bays is a detailed matter for DA.

6 Traffic Assessment

6.1 Traffic Generation Rates

The traffic impacts of the Planning Proposal have been assessed having regard for the RMS Guide and RMS Technical Direction documents. In this regard, the Planning Proposal application seeks development of 29 residential dwellings and 1,445 m^2 of commercial development.

A review of land-uses historically associated with developments with similar characteristics to that of the site, including bulky goods retail and commercial office has also been undertaken.

Accordingly, the following generation rates were adopted for the relevant land uses, including the two abovementioned:

Table 8: Traffic Generation Rates

Land Use	Traffic Generation Rate	
	AM	PM
Medical Centre / Pharmacy	1.1 trips per 100 m^2 of GLFA	2.2 trips per 100 m^2 of GLFA
Café	2.3 trips per 100 m^2 of GLFA	4.6 trips per 100 m^2 of GLFA
Residential	0.5 trips per units	0.5 trips per unit
Commercial Office	1.6 trips per 100 m^2 of GFA	1.2 trips per 100 m^2 of GFA
Commercial (Bulky Goods)	0.27 trips per 100 m^2 of GLFA[1]	2.7 trips per 100 m^2 of GLFA

Notes: 1. Commercial Bulky Goods retail generates minimal traffic during AM Peak as traditionally the store is not open for business. AM Generation has been considered to be 10% of the PM peak hour generation.

For conservative estimation, as required of a highest and best use analysis, the office use with higher traffic generation rate has been adopted for the AM peak period and the Medical Centre / Pharmacy rates have been adopted for PM peak hour traffic generation analysis (refer **Table 9**).

6.2 Traffic Generation

The resultant peak hour traffic generation for the Proposal is as follows:

Table 9: Peak Hour Traffic Generation

Land Use	Yield	Traffic Generation Estimation (veh/hr)	
		AM	PM
Medical Centre / Pharmacy	1,200 m^2 GFA (900 m^2 GLFA)	10	20
Office	1,200 m^2 GFA	19	14
Café	245 m^2 GFA (183.75 m^2 GLFA)	4	8
Residential	29 Units	15	15
Total		**29 – 38**	**37 – 43**

As discussed above, the following higher traffic generation has been adopted for the modelling purposes:

- AM Peak 38 veh/hr, and
- PM Peak 43 veh/hr.

6.3 Traffic Distribution

The distribution of the Planning Proposal traffic considers the traditional 80% / 20% inbound and outbound distribution for residential and office uses and 50% / 50% for medical centre and the café as per the following:

Table 10: Traffic Distribution

Land Use	AM (veh/hr)		PM (veh/hr)	
	Inbound	Outbound	Inbound	Outbound
Medical Centre / Pharmacy	-	-	10	10
Office	15	4	-	-
Café	2	2	4	4
Residential	3	12	12	3
Total	**20**	**18**	**26**	**17**

6.4 Traffic Assignment

The above additional traffic volumes have been assigned through the surrounding road network having regard for the catchment of the area, likely traffic routes, minimum travel time and more importantly the existing traffic pattern at the signalised intersection of Boundary Road / Forest Road. Accordingly, the likely traffic of the Planning Proposal is graphically shown in **Figure 10**.

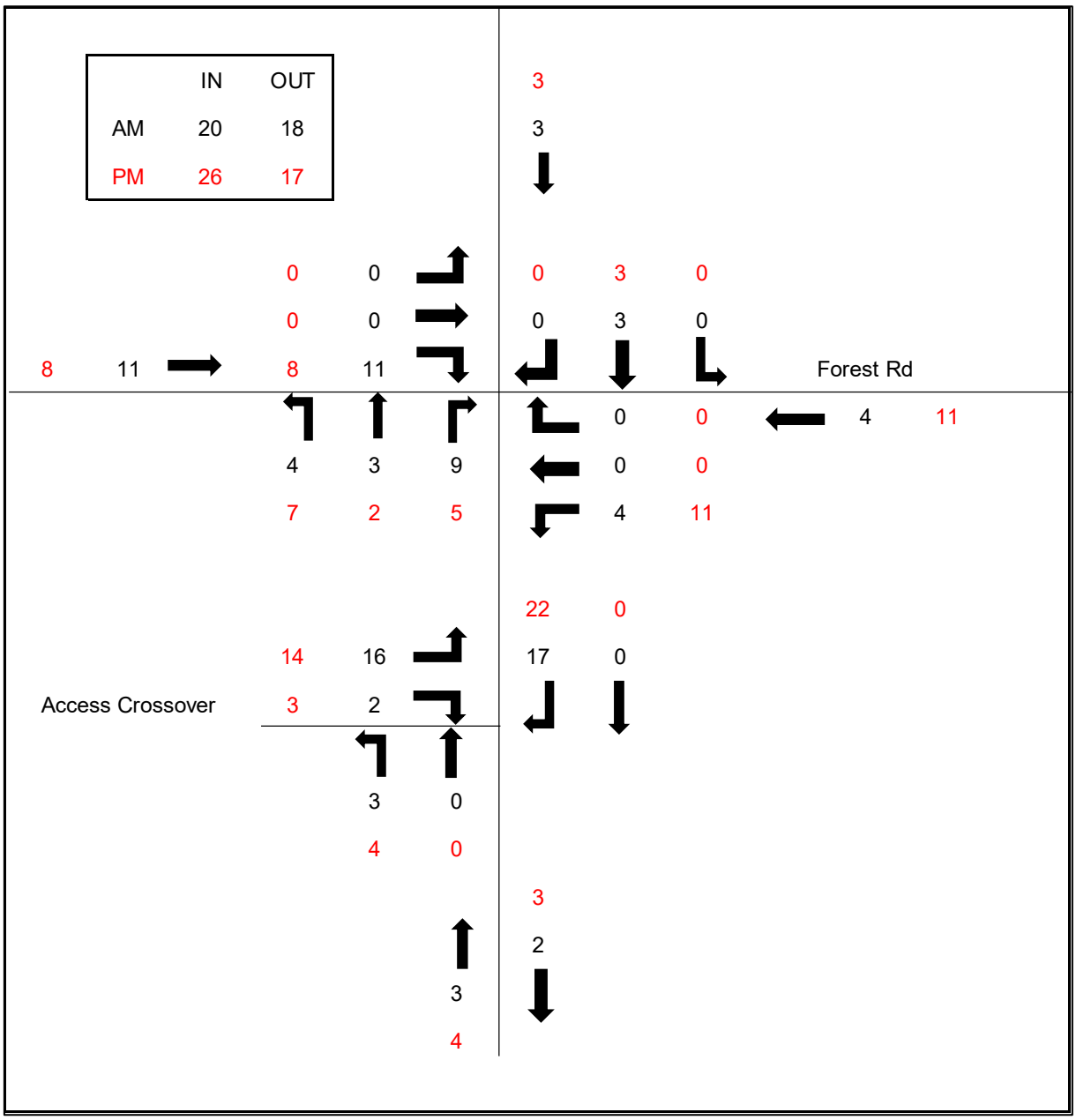

Figure 10: Proposed Traffic Profile

6.5 Traffic Impact Analysis

To assess the impact of the Planning Proposal the estimated traffic volumes in the above section has been added to the future baseline traffic volumes (shown in Figure 8). The resultant Project Future Case traffic volumes on the surrounding road network are shown in **Figure 11**.

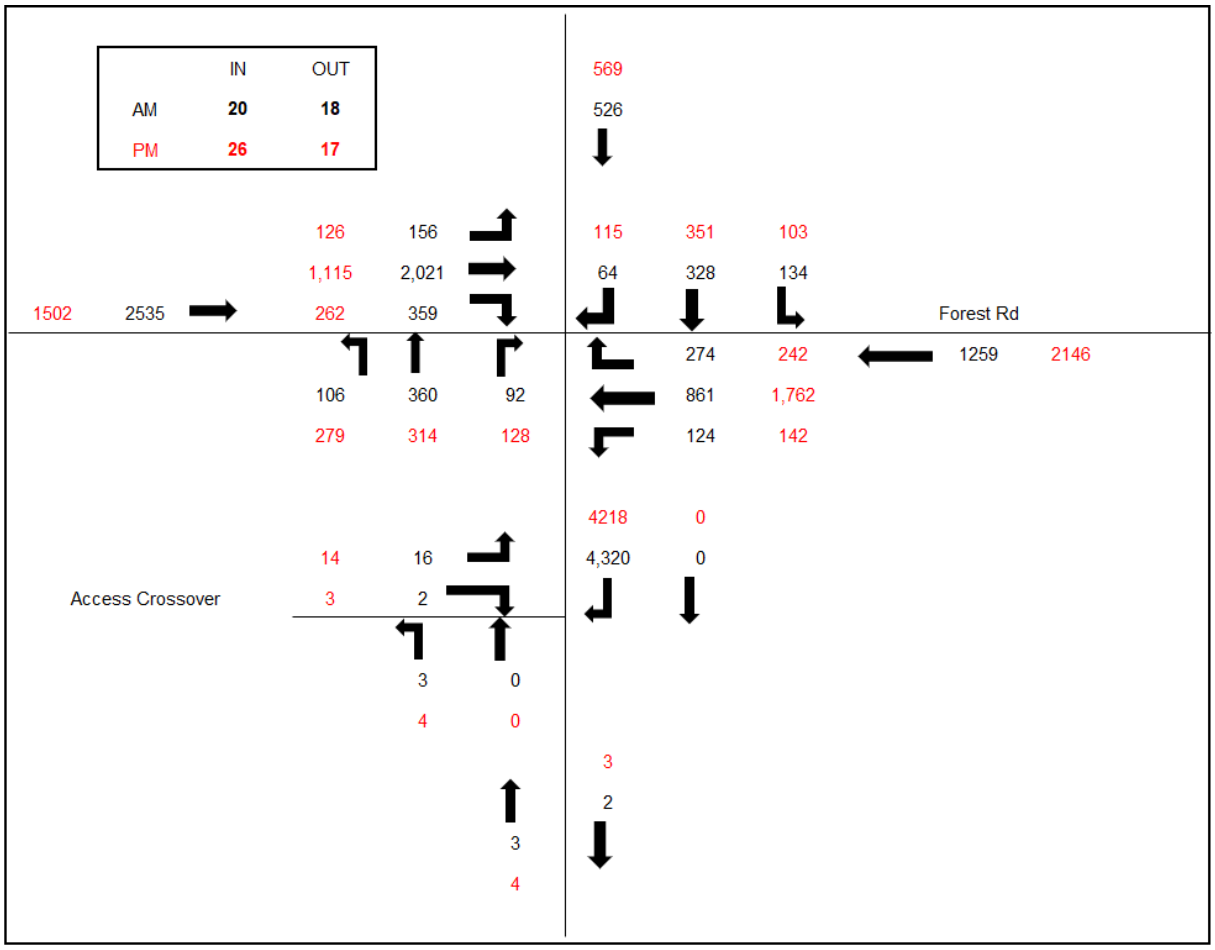

Figure 11: Project Case 2036 Traffic Profile

Accordingly, the increase of traffic at the signalised intersection of Forest Road / Boundary Road as a result of the Planning Proposal is outlined in below

Table 11: Traffic Comparison at the Signal – Forest Road / Boundary Road

Period	Future Baseline Traffic	Project Case Traffic	Increase of Traffic (%)
AM Peak Hour	4,845	4,883	38 (0.8%)
PM Peak Hour	4,903	4,946	43 (0.9%)

As outlined in above table the Proposal would only increase the traffic by less than 1% during the road network AM and PM peak hours. This is considered a negligible increase in traffic which is not anticipated to have any material impact on the operation of the surrounding road network. Notwithstanding – noting that the nearby signals are already at or over capacity under existing conditions – any increase will have a disproportionate impact on modelled delays. As such, these increased traffic volumes have also been assessed in SIDRA , with the Future Base Case and Project Future Case results summarised in **Table 12**.

Table 12: Intersection Performance Comparison – Base Case vs. Project Case

Intersection	Scenario	Period	Intersection Delay	Level of Service
Forest Road / Boundary Road	Future Baseline	AM	181.2	F
		PM	290.7	F
	Project Case	AM	189.6	F
		PM	299.2	F

The SIDRA analysis indicates that the 'net' traffic volumes arising from the proposal would result in moderate increases in AVD during the road network AM and PM peak hours and – importantly – LoS would remain unchanged. As discussed above, this impact to delays is disproportionate to the increased traffic volumes.

Nevertheless, to offset the impact from the introduced Planning Proposal traffic, it is noted that the intersection will require minor changes to improve lane capacity in the northern and southern approaches. A potential modification involves increasing effective length of exit lanes on the northern and southern approaches by extending parking lanes.

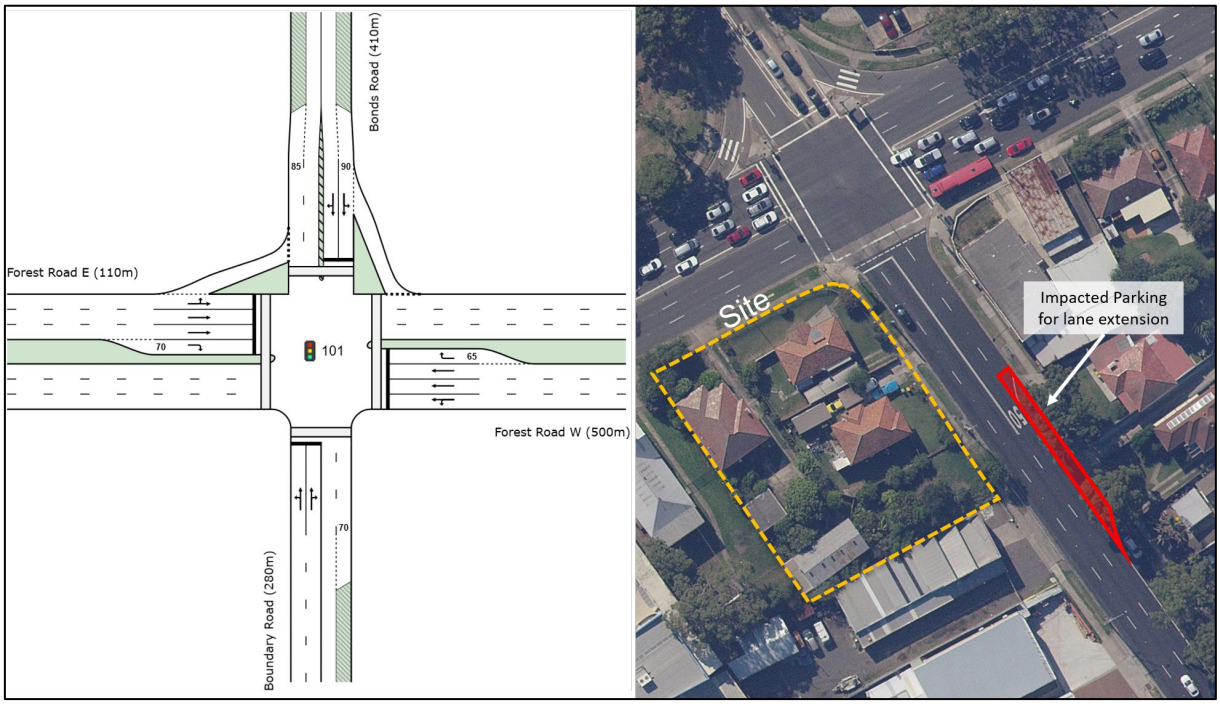

Figure 12: Forest Road / Boundary Road Intersection Modification Option

The intersection configuration above involves increasing the departure lane from 35 metres to 70 metres on Boundary Road. Noting that a section of this kerb space is actually designated No Parking, this will likely result in the loss of only 2 on-street car parking spaces. This is considered as a minor change to the existing on-street parking control which does not have a material impact on the parking provision of the surrounding area.

The resultant SIDRA performance is summarised below.

Table 13: Intersection Performance Comparison – Base Case vs. Project Case vs. Modified IS

Intersection	Scenario	Period	Intersection Delay	Level of Service
Forest Road / Boundary Road	Future Baseline	AM	181.2	F
		PM	290.7	F
	Project Case	AM	189.6	F
		PM	299.2	F
	Modified Intersection	AM	182.7	F
		PM	288.7	F

It is evident from above that minor changes to on-street parking can offset the impact of the Proposal.

7 Design Commentary

As mentioned previously, detailed design of the development site plans is anticipated to occur at later stages of the project; during the DA phase. Notwithstanding, this Section provides general guidance on the access crossover location and internal parking design to guide future detailed design development.

7.1 Relevant Design Standards

The Site access, car park and loading shall be designed to comply with the following relevant Australian Standards:

- AS2890.1 for car parking areas;
- AS2890.2 for commercial vehicle loading areas; and
- AS2890.6 for accessible (disabled) parking.

It is expected that any detailed drawings – to be assessed in at a subsequent DA and again as part of Construction Certificate documentation – would comply with these Standards.

7.2 Car Parking User Classes

It is anticipated that the following user classes of car parking area (outlined in AS2890.1) would be considered for different uses on this site:

- Residential and office User Class 1A, and
- Medical centre User Class 3.

7.3 Access Location

The Planning Proposal is anticipated to rationalise all existing 5 access crossovers on Forest Road and Boundary Road and provide only a single access crossover to be located at the southern end of the Site on Boundary Road (as far as practically possible from the signalised intersection). This arrangement is indicatively shown in **Figure 13**.

Figure 13: Indicative Vehicular Access Location

7.4 Access Design

Since the Proposal will provide access for commercial vehicles – likely to cater for Heavy Vehicle Rigid (HRVs) – therefore, AS2890.2 standard applies for the access design. In this instance, it is recommended that the access should be designed in accordance with Figure 3.1 of the AS2890.2:2018 (Part 2: Off-street Commercial Vehicle Facilities). A copy of this figure is presented in below:

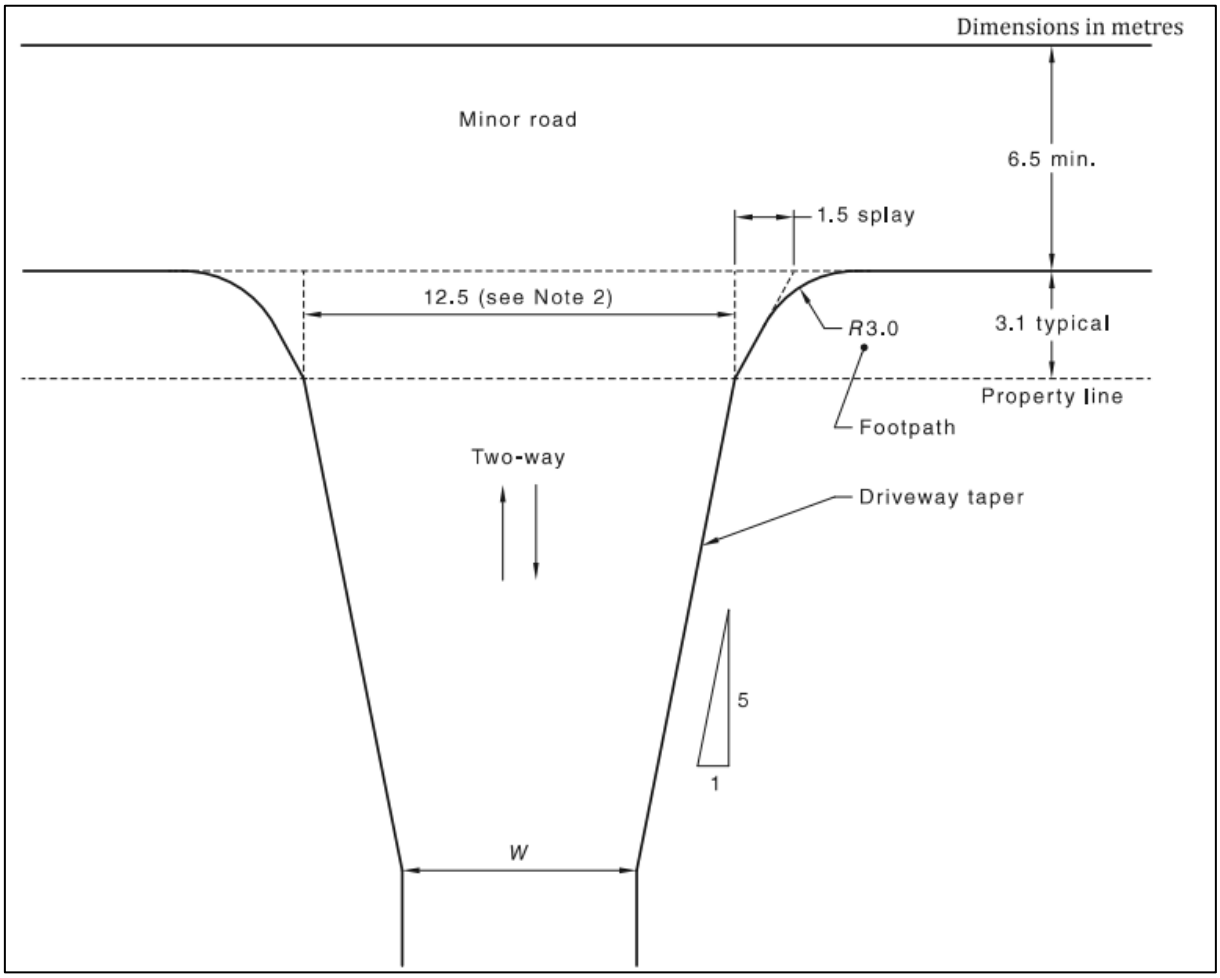

Figure 14: Minimum design for an access driveway on a minor road catering for HRVs and AVs

It is noteworthy that the final resolution of the access design will be determined by swept path analysis of the design vehicle and at the DA stage.

8 Conclusions

The key findings of this Traffic Impact Assessment are:

- The Concept Proposal relates to a planning proposal seeking to increase the current permissible Floor-Space-Ratio of 0.5:1 to 2:1. Additionally, the proposal seeks to change the current zoning of the Site from R2 (Low Rise Medium Density) to B1 (Neighbourhood Centre Zone).
- In turn, these changes would allow for an indicative development yield of:
  - 29 residential units,
  - 1,445 m^2 Gross Floor Area for commercial development (anticipated to be a medical centre, a pharmacy and small café)
  - Ancillary car parking spaces.
- The Site is located in close proximity of number of bus routes, which will encourage new residents to use alternative transport modes (other than private vehicles) to travel to and from the Site. The Forest Road / Boundary Road intersection facilitates full pedestrian movement and connectivity to available bus stops in the locality.
- It is expected that the on-site parking provision will be assessed as part of the Development Application (DA) stage of the project. However, it is anticipated that the proposal will provide sufficient off-street parking bays in accordance with the Georges River Council DCP requirements.
- Preliminary parking assessments suggest future development will require an on-site parking provision in the order of 94 to 256 parking spaces to comply with the Council DCP. It is expected that these parking bays would be provided within the proposed ground floor and basement levels.
- The traffic generation of the proposed indicative development yield results in potential addition of 38 and 43 vehicles to the network in the AM and PM Peaks, respectively. This represents an increase of less than 1% in traffic at the signalised intersection of Forest Road / Boundary Road when compared to the future 2036 baseline scenario. Accordingly, it is suggested that the increase of traffic as a result of the Proposal is negligible.
- SIDRA analysis of the Forest Road / Boundary Road signalised intersection indicates that the additional trips generated by the Site would result in moderate increases to DoS and AVD of the intersection; however – importantly – the Level of Service remains unchanged.
- The analysis demonstrates that the traffic generation volume is of a sufficiently low order that once distributed to the surrounding road network, the impacts of the Site at the intersection would be in the order of less than 10 seconds average delay during the AM and PM peak periods.

- To offset the development traffic impacts on the intersection, it is recommended that the exit lane on the Boundary Road approach be adjusted to provide for an additional 35 metres for through traffic. This in turn will improve lane capacity for the north and south approaches.
- Regarding the proposed access, it is expected that the Planning Proposal will rationalise all existing 5 access crossovers on Forest Road and Boundary Road into a single access crossover to be located at the southern end of Boundary Road. This location represents the furthest allowable distance from the existing signalised intersection.
- The access and basement car parking areas are anticipated to be designed having regard for relevant Australian Standards (AS2890 series). Detailed design of the access and car parking layouts is considered to be a matter that can be resolved as part of the DA stage of the project.

In summary, the Proposal is supportable on traffic planning grounds with the impacts of the Proposal able to be satisfactorily offset by minor changes to on-street parking.

Appendix A

Draft Development Plans

8.0 Design Proposal

8.2 Design Concept

A mixed use development is proposed including ground level retail/ commercial uses with shop top housing up to five storeys along the Boundary Road frontage. Car parking and service access is provided in basement levels.

A neighbourhood plaza is proposed on the Forest Road frontage, with an area of approximately 200 sqm. A Communal Open Space (COS) is proposed at podium level for residents. Shadow testing of the COS (and the proposed plaza) has shown compliance with the ADG requirement for 50% of the COS to receive a minimum of two hours of sunlight between 9am and 3pm at Winter Solstice.

Table 1: Development Parameters

Site Area* (sqm)			**1,983**
	GBA (sqm)	Efficiency	GFA (sqm)**
GF	1,700	85%	1,445
L1-3	2,769	75%	2,077
L4	493	75%	370
Total	**4,962**	_	3,892
FSR	**2.0**		
HOB	**18m**		

* Survey plans are not available at this stage. The site area is estimated from Six Maps data.
** No internal layout has been developed at this stage.
The GFA nominated is an estimation only.

Table 2: Proposed Unit Yield

Residential GFA			**2,447**
Dwelling Types	Percentage	Unit Size (sqm)	No. of Units
Studio	2%	44	1
1 Bedroom	28%	67	10
2 Bedroom	55%	89	15
3 Bedroom	15%	118	3
Total Units			**29**

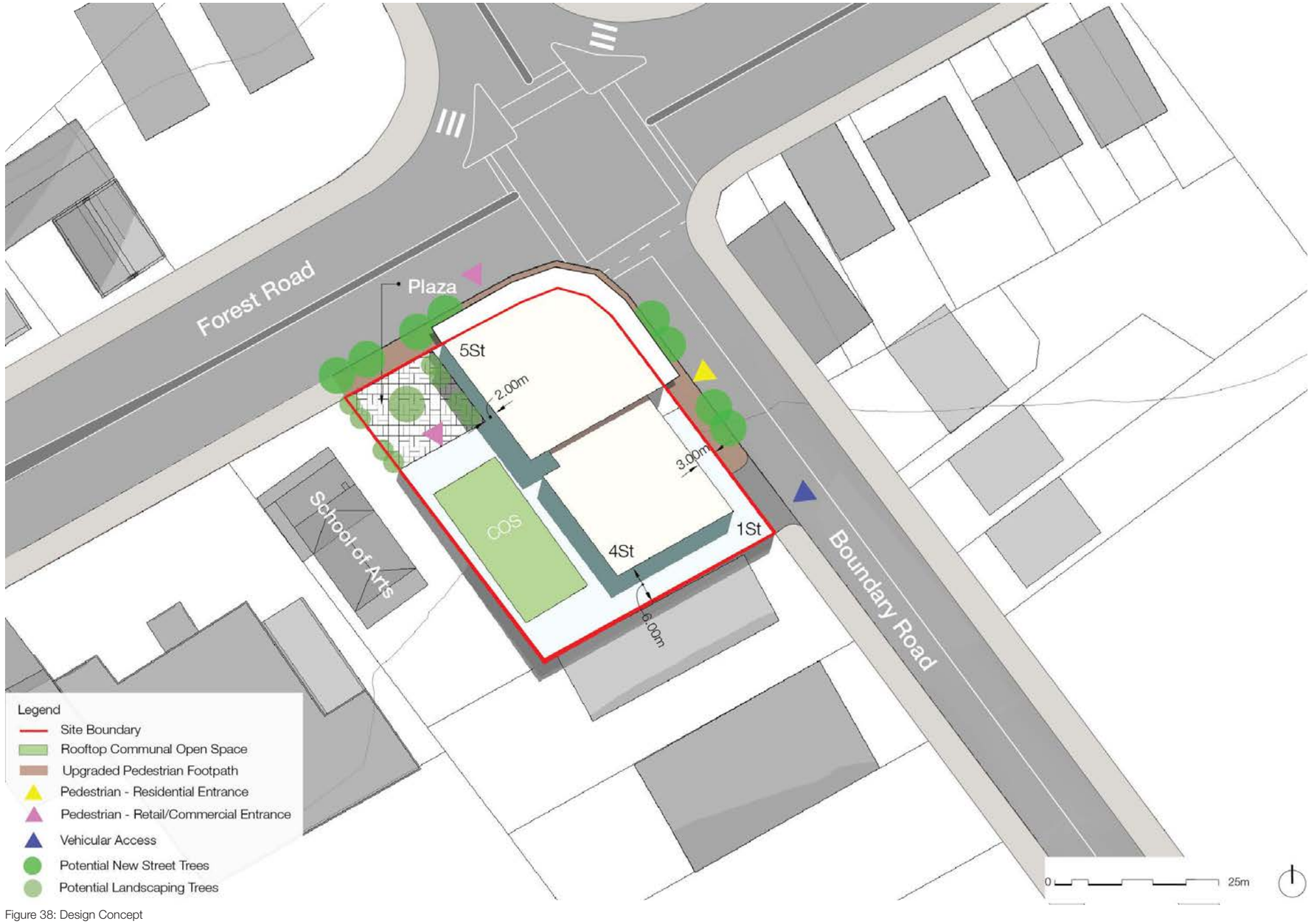

Figure 38: Design Concept

8.0 Design Proposal

Figure 39: View 1 - Looking southwest

Figure 40: View 2 - Looking south

Figure 41: View 3 - Looking southeast

Figure 42: View 4 - Looking northwest