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SHOPPING CENTRE DEVELOPMENT

The Glen Shopping Centre, Glen Waverley

Traffic Engineering Assessment

Prepared for

FEDERATION CENTRES

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The Glen Shopping Centre, Glen Waverley

Traffic Engineering Assessment

Study To

Nath Chewta

B.E. (Civil), V.P.E.L.A.

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1. INTRODUCTION

Traffix Group has been engaged by Federation Centres to prepare a traffic engineering report for the proposed re-development of The Glen Shopping Centre. This report provides a detailed review of car parking and traffic matters.

2. EXISTING CONDITIONS

2.1. Subject Land

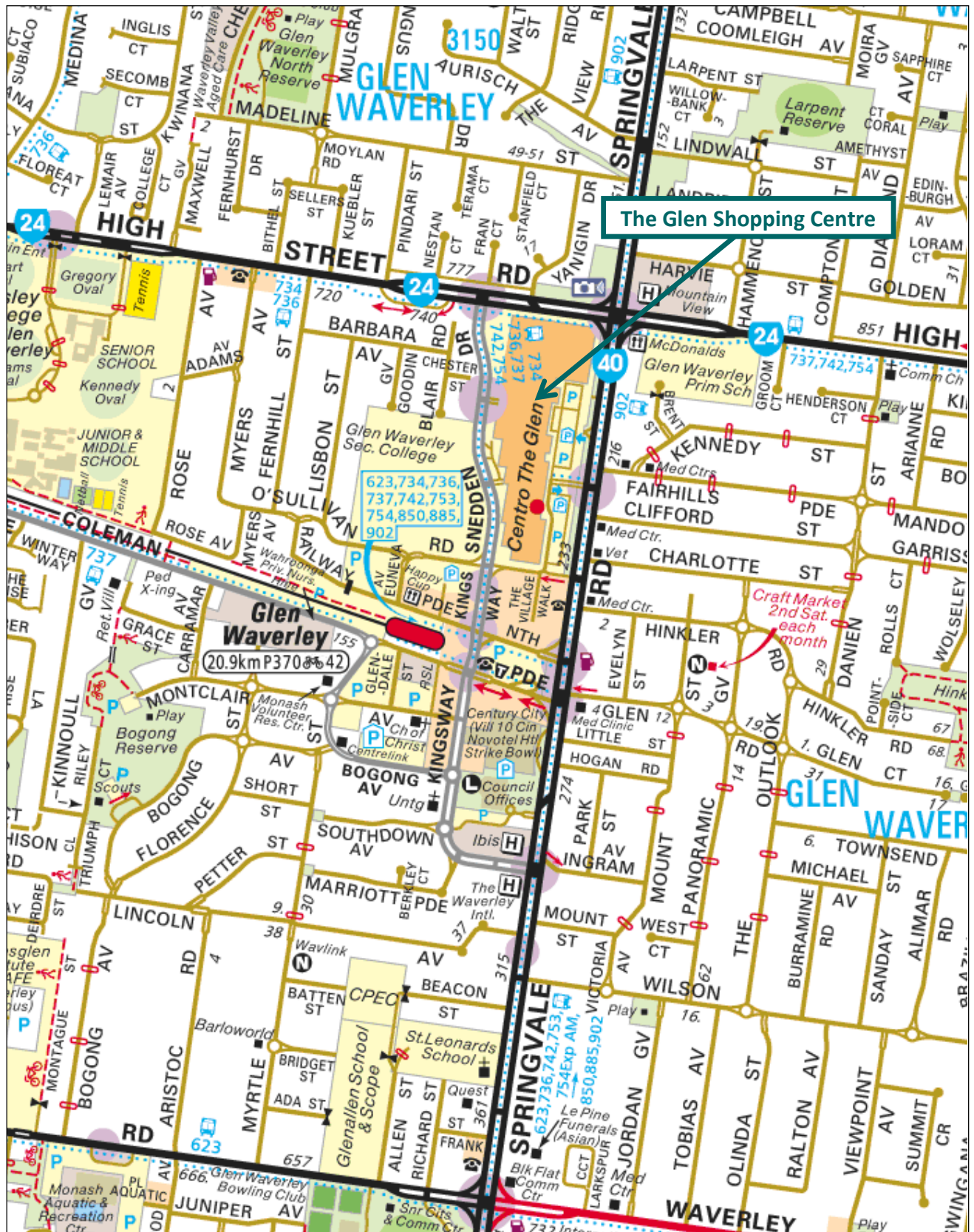
The development site is The Glen Shopping Centre in Glen Waverley, which is bound by Springvale Road to the east, High Street Road to the north, Snedden Drive to the west, and O'Sullivan Road to the south, as shown in Figure 1. An aerial photo of the site is presented in Figure 2.

The Glen Shopping Centre includes a total of 58,930 square metres of net leasable floor area over two (2) levels, inclusive of 7,618 square metres of supermarkets (Coles and Woolworths) and 4,899 square metres of office.

The Glen is serviced by approximately 3,000 parking spaces provided over six (6) levels. Given the slope of the site (a falling grade from south to north), various parking levels are accessed directly from each of the site's frontages from a total of nine (9) separate access / egress points.

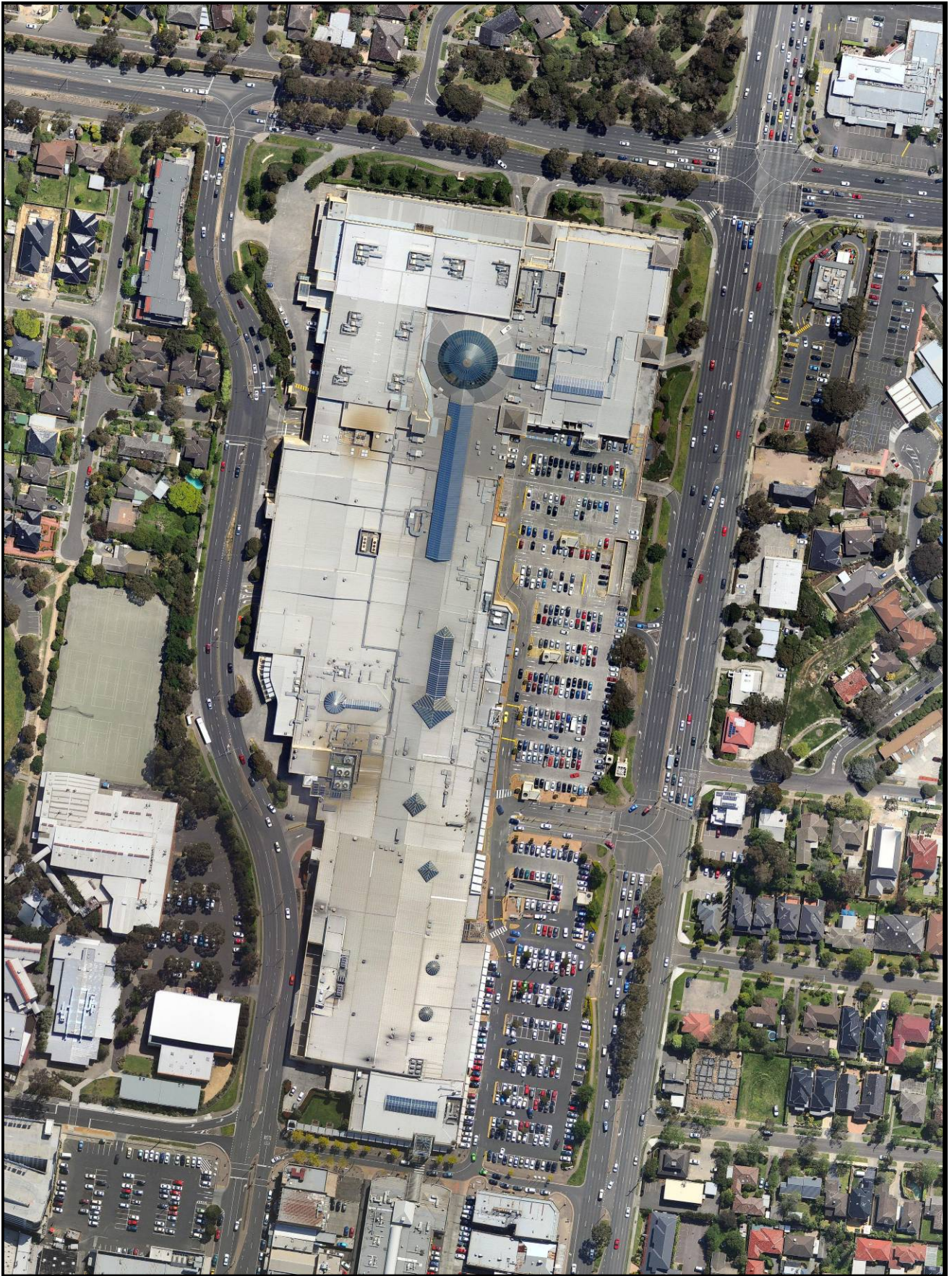
The Glen Shopping Centre is located within a Business 1 Zone under the Monash Planning Scheme, and is identified as part of the 'Glen Waverley Principal Activity Centre'. Existing significant land uses in the nearby area include:

- Glen Waverley Train Station, located approximately 150 metres to the south-west of the subject site.
- Glen Waverley Secondary College located opposite the subject site on the west side of Snedden Drive; and
- Glen Waverley entertainment precinct, located along Kingsway, approximately 200 metres to the south of the subject site, including Century City (Village Cinemas, Novotel Hotel and Strike Bowling Bar) and numerous restaurants / cafes.



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Figure 1: The Glen Shopping Centre Locality Plan



Source: www.nearmap.com

Figure 2: Aerial Photo

2.2. Road Network

Springvale Road is a primary arterial road and is under the control of VicRoads. Springvale Road extends from the Mornington Peninsula Freeway in the south to Reynolds Road, Donvale in the north. In the vicinity of the subject site, Springvale Road is constructed with a divided carriageway providing three (3) lanes of traffic in each direction, with separate turn lanes. A speed limit of 70km/h applies in Springvale Road in the vicinity of the site.

Springvale Road is shown in Figure 3 and Figure 4.



Figure 3: Springvale Rd View South adjacent Subject Site



Figure 4: Springvale Rd View South towards Hinkler St

High Street Road is a Primary Arterial Road managed by VicRoads and located within a Category 1 Road Zone under the Planning Scheme. High Street Road is aligned in an east-west direction between Warrigal Road in the west (where it continues as High Street) and Burwood Highway in the east.

For the frontage of The Glen, High Street Road operates as a divided carriageway providing for at least two traffic lanes in each direction. On-street parking is prohibited. A 60 km/h speed limit applies to High Street Road, with a School Zone 40km/h limit to the applying west of Rose Avenue.

Figure 5 and 6 illustrate the typical cross section for High Street Road.



Figure 5: High Street Rd - View East adjacent Subject Site



Figure 6: High Street Rd - View West adjacent Subject Site

The intersection of High Street Road and Springvale Road is signalised, with flaring at the intersection to accommodate additional lanes on all legs.

Snedden Drive is a local collector road. It extends from High Street Road in the north to O'Sullivan Road in the south, where it continues as Kingsway connecting through to Springvale Road. Snedden Drive / Kingsway essentially provides a ring road connection for the Glen Waverley Activity Centre.

Snedden Drive operates as a divided carriageway providing two (2) lanes of traffic in each direction. There is no parking available on Snedden Drive, and a speed limit of 40km/h applies.

Figure 7 and Figure 8 illustrate Snedden Drive.



Figure 7: Snedden Dr - View North adjacent Subject Site



Figure 8: Snedden Dr - View South adjacent Subject Site

The intersection of Snedden Drive and High Street Road is arranged as a signalised T-intersection. The western leg of the intersection (High Street Road) is constructed in cut with retaining walls on both the northern and southern verges.

2.3. Public Transport

The subject site has excellent public transport accessibility, with Glen Waverley train station situated approximately 250 metres to the west and a bus interchange located on Railway Parade, adjacent to the station. The available public transport services within walking distance are:

Bus Routes

- **Bus Route 623** is provided with a bus terminus at the Railway Parade interchange, and provides a service between Glen Waverley and St Kilda via Mount Waverley, Chadstone, and Carnegie.
- **Bus Route 734** is provided with a bus terminus at the Railway Parade interchange, and provides a service between Glen Iris and Glen Waverley via Ashburton, Ashwood and Mount Waverley.
- **Bus Route 736** is provided with a bus terminus at the Railway Parade interchange, and provides a service between Mitcham and Blackburn via Vermont South, Glen Waverley, and Forest Hill.
- **Bus Route 737** is provided with a bus terminus at the Railway Parade interchange, and provides a service between Croydon and Monash University via Boronia, Knox City Shopping Centre and Glen Waverley.
- **Bus Route 742** is provided with a bus terminus at the Railway Parade interchange, and provides a service between Eastland and Chadstone via Vermont South, Glen Waverley and Oakleigh.
- **Bus Route 753** is provided with a bus terminus at the Railway Parade interchange, and provides a service between Glen Waverley and Bayswater via Wheelers Hill, Knoxfield and Boronia.

3. THE GLEN SHOPPING CENTRE

3.1. General

The Glen Shopping Centre includes a total of 58,930 square metres of net leasable floor area over two (2) levels, inclusive of 7,618 square metres of supermarkets (Coles and Woolworths) and 4,899 square metres of office.

Over 3,000 parking spaces are provided at The Glen, across six (6) levels. The parking levels for The Glen are colour coded. Figure 10 has been prepared to illustrate the existing access arrangements to The Glen, the permitted movements at each access, and which parking level the access services.

The parking levels from lowest to ground level at Springvale Road are:

Purple Level; Red Level; Yellow Level; Green Level; Blue Level; White Level.

The Green Level provides direct access to level 1 of the Centre, containing Coles, whilst the White level is the at-grade (Springvale Road) parking directly interfacing with Level 2 of the Centre, containing Woolworths. To this end, the existing at-grade parking (White Level) and Green Level parking are the most popular with customers.

Presently, the connectivity between different parking levels is poor as none of the access ramps between parking levels are 'stacked'. This means visitors cannot circulate between more than two levels of parking without also negotiating parking aisles of at least one level of parking. This system can be confusing for new visitors to The Glen, and existing customers are likely to always return to the same parking area, as navigation to other levels can be difficult.

3.2. Traffic Generation

It is typical for Shopping Centres to experience peak traffic generation on Saturdays, with secondary peaks on Friday afternoons. To this end, Traffix sourced SCATS data for the signalised The Glen access to Springvale Road for a Friday and Saturday in November 2013. The surveys showed a peak hour of 1,115 movements (arrivals and departures) at this access on the Friday compared to 1,104 movements on the Saturday. For these periods, Springvale Road was marginally busier on the Friday afternoon than the Saturday.

In view of the above, the critical time for The Glen is a Friday afternoon.

To establish existing traffic movements at The Glen at the critical time, Traffix commissioned traffic count surveys at each of the nine (9) access / egress points (excludes dedicated Loading Areas) between 2pm and 7pm on Friday 6th December, 2013. It is noted that this time was a relatively busy for The Glen, being two (2) weeks prior to Xmas.

Overall, The Glen peak traffic period occurred 2:30pm - 3:30pm, with a total of 3,270 vehicles entering and exiting during that period. For the existing 58,930 square metres of floor area, this equates to a traffic generation of 5.55 movements per 100 square metres.

The recorded traffic generation rate is in the range, albeit at the high end, of what one would expect for a shopping centre of this size. This is likely to be a result of the timing of the survey being in December, a couple of weeks prior to Xmas.

A summary of the peak hour traffic movements at each access is summarised in Table 1.



Figure 10: The Glen Shopping Centre – Access / Egress Points

Table 1: The Glen Peak Traffic Movements – Friday, 6th December 2013 (2:30 – 3:30pm)

	Access/Egress Point	Peak Hour Volume	% of Overall Volumes across the 5 hour survey
1	Springvale Rd - Access to White Level (Signalised)	1,108 veh	34%
2	Springvale Rd - Access to Blue Level	245 veh	7%
3	Springvale Rd - Access to Yellow Level	39 veh	1%
4	Springvale Rd - Egress from Red Level	44 veh	1%
5	High Street Rd - Access to Purple/Red Levels	215veh	7%
6	Snedden Dr - North Access to Yellow Level (Signalised)	541 veh	17%
7	Snedden Dr - Central Access to Yellow Level	178 veh	5%
8	Snedden Dr – South Access to Green Level	452 veh	14%
9	O’Sullivan Rd - Access to White Level	448 veh	14%
	TOTAL	3,270 veh (2:30-3:30pm)	100%

4. THE PROPOSAL

4.1. General

The application proposes to extend and refurbish the existing shopping centre. Specifically, it is proposed to extend the centre to the east across the at-grade parking (White Level), extend the existing Level 1 supermarket, construct a new 2 level department store at the southern end of the site, construct a new larger supermarket on Level 1 at the northern end of the centre to replace the existing Level 2 supermarket, and construct a new discount supermarket.

The expansion will allow the development of a 'racetrack' mall on Level 2 providing a more modern arrangement and customer friendly environment.

The amendments to the shopping centre will result in an overall floor area of 76,009 square metres comprising:

- 60,940 square metres of retail.
- 10,170 square metres of supermarkets.
- 4,899 square metres of office

The development results in a net increase of 17,079 square metres of retail floor area (inclusive of supermarkets).

The application also proposes the construction of residential towers above the mid to southern end of the centre. In total, the development will include 515 dwellings, comprising 275 x 1-bedroom apartments and 240 x 2-bedroom apartments.

4.2. Car Parking

The application plans illustrate an overall retail / commercial parking provision of 3,295 spaces, and 515 spaces for the residential component.

The retail parking spaces will also be available for residential visitors.

The existing at-grade parking (White Level) is deleted, but replaced by two levels of above ground parking providing for in the order of 1,000 car spaces. Minor amendments are proposed to the existing Blue, Green, Yellow and Red Levels to introduce a 'stacked' ramping system that will provide a more logical and navigable parking arrangement.

The improved parking is supplemented by the inclusion of a new 'stacked' travelator system from 'Yellow' level parking providing direct access to the new supermarket at the northern end of the centre, and then extending up all levels of the development.

The residential car park will operate as a secure car park, and only be accessible to residents. It is provided as podium parking (3 levels) above David Jones, and below the residential towers.

It is intended to provide each apartment with a single car space.

4.3. Access

Retail

The retail access arrangements essentially remain as is, with the exception of the following changes:

- Deletion of the access to O'Sullivan Road.
- Conversion of the existing signalised access to Springvale Road to incorporate the 'Blue Level' access. The existing 'White Level' signalised access will be reconstructed to ramp directly down to 'Blue Level' and will provide for ingress only, retaining two right turns lane from Springvale Road. The existing 'Blue Level' access will be included as part of the signals and allow egress movements only, comprising four (4) exit lanes (two left turn and two right turn lanes).
- Inclusion of an internal speed ramp from 'Blue Level' to the 1st level of above grade parking (labelled as Level 3). Then a 'stacked' ramp arrangement to service the 2nd above grade car parking level (Level 3M).
- Inclusion of a corkscrew ramp providing access to the 1st level of above grade parking (Level 3), accessed directly from the southern Snedden Drive access (Green Level parking access).
- Signalisation of the southern Snedden Drive access (Green Level access).

Residential

The residential car park is proposed to be accessed via construction of a new access to O'Sullivan Road.

4.4. Loading Arrangements

Retail

The application plans illustrate the provision of four (4) primary loading areas comprising:

- An existing loading area in the north east portion of the site. The area is accessed from the High Street Road access and is situated on the 'Purple Level' of parking. Goods are transported by lift, and the area will service speciality retail in the north east portion of the centre, including the food court, on both retail levels. There are no changes proposed to this loading area.
- The existing loading area in the north west portion of the site is proposed to be reconfigured to service the new tenants at this end of the centre. The loading area interfaces with Level 1 retail, and is accessed either directly from High Street Road or from Snedden Drive. The loading area will service the new supermarket, the new discount supermarket, and speciality retail (northern shops) on Level 1, and the northern portion of the centre on Level 2, including the majors.
- The existing loading area on the western side of the centre, accessed from Snedden Drive, is proposed to be retained. This loading area interfaces with Level 1 retail, and will service the extended supermarket and speciality retail on Level 1, and the central western retail tenancies, including majors, on Level 2.
- Introduction of a new loading area at the southern end of the centre. The loading area is situated on Level 1 retail (Green Level), and is accessed via the new signalised access to Snedden Drive. The area will service the new department store, and the speciality retail tenancies on Level 2 at the southern end of the Centre.

Residential

The residential apartments are proposed to have a dedicated area for loading and waste collection in the new retail loading dock proposed in the southern portion of the centre.

4.5. Bicycle Facilities

The applicant is proposing to provide bicycle parking at the statutory rates, including showers and changerooms, for the retail expansion area and the residential component.

However, the plans have yet to fully resolve the design of bicycle facilities and just designate areas. The identified areas are:

- The southern end of Level 1 (Green Level).
- Spread throughout the 'Blue' Level parking.
- Spread throughout the residential car park.

5. CAR PARKING CONSIDERATIONS

5.1. Planning Scheme Requirements

The car parking requirements for the proposed use are outlined in Clause 52.06 of the Monash Planning Scheme. Their application to the proposed scheme is summarised in Table 2.

Table 2: Statutory Car Parking Requirements

<i>Use</i>	<i>Floor Area / No.</i>	<i>Rate</i>	<i>Requirement</i>
Retail	60,940 sqm	4 spaces / 100sqm	2,437 spaces ¹
Supermarket	10,170 sqm	5 spaces / 100sqm	508 spaces ¹
Office	4,899 sqm	3.5 spaces / 100sqm	171 spaces
Commercial Total			3,116 spaces
Residential	515 apartments	1 space / apartment	515 spaces
Residential Visitors		0.2 spaces / apartment	103 spaces
Residential Total			618 spaces

The development has a statutory requirement to provide 3,116 spaces for the commercial / retail component, and 618 spaces for the residential component.

The application plans illustrate the provision of 3,295 car spaces, which will be shared between the retail, office and residential visitors. This provision exceeds the combined statutory requirement (3,219 spaces) for these uses.

The residential car park has provision for 515 car spaces satisfying the residential tenant statutory requirement.

In view of the above, the proposed parking provision exceeds the statutory requirements and therefore does not seek a permit for a waiver of car parking.

5.2. Car Parking Layout

Car parking has been designed in accordance with the Planning Scheme. Specifically, car spaces are typically designed with a depth of 4.9 metres, width of 2.6 metres with access from aisles 6.6 metres wide.

The intent with the retail car parking is to provide a car park that is conveniently accessible and logically navigable. To this end, dead end aisles have been avoided and internal ramps have been 'stacked', where possible, to allow direct navigation between parking levels.

Overall there is opportunity to access parking from a variety of frontages and access points, and the design has provided for good circulation that will allow customers to conveniently access parking and navigate through the site.

The residential parking has been designed to maximise the parking provision, as circulation is less important for allocated parking.

¹ Clause 52.06-5 specifies that where a car parking calculation results in a requirement that is not a whole number, the number of spaces should be rounded down to the nearest whole number.

6. TRAFFIC CONSIDERATIONS

6.1. Existing Conditions

To establish existing traffic volumes for the intersections surrounding the site, Traffix Group sourced data (SCATS and IDM) from VicRoads for the intersections of:

- Springvale Road and The Glen Shopping Centre access (white level) for Friday 6th December 2013.
- High Street Road and Snedden Drive for Friday 6th December 2013.
- Springvale Road and High Street Road for Friday 7th February 2014.

As detailed earlier, Traffix Survey also commissioned turning movement counts (TMCs) at The Glen unsignalised access points to Snedden Drive, High Street Road, Springvale Road and O'Sullivan Road. TMCs were also undertaken at the signalised intersection of Snedden Drive and The Glen Shopping Centre access to due to the unavailability of SCATS data at this intersection in December 2013.

The TMCs were conducted 1.45pm-7pm on Friday 6th December 2013.

The Glen experienced the highest level of shopping centre traffic at 2.30pm-3.30pm, whilst the commuter peak on the adjacent road network was established to be 5pm-6pm.

Supplementing the traffic counts, observations of phase and cycle times, and queue lengths were undertaken on Thursday 11 and Friday 12 September, 2014 during the PM commuter peak period. Additionally, where a single lane accommodated two (2) movements (i.e. left and through from the same lane) sample surveys were undertaken to determine the typical split of traffic.

Figure 11 has been prepared to show the existing traffic volumes for the surrounding critical intersections and accesses to the site. It is noted that the 'base' case is a conservative assessment as it adopts the commuter peak hour volumes for Springvale Road and High Street Road, but the peak (2:30 – 3:30pm) movements for INs and OUTs for The Glen.

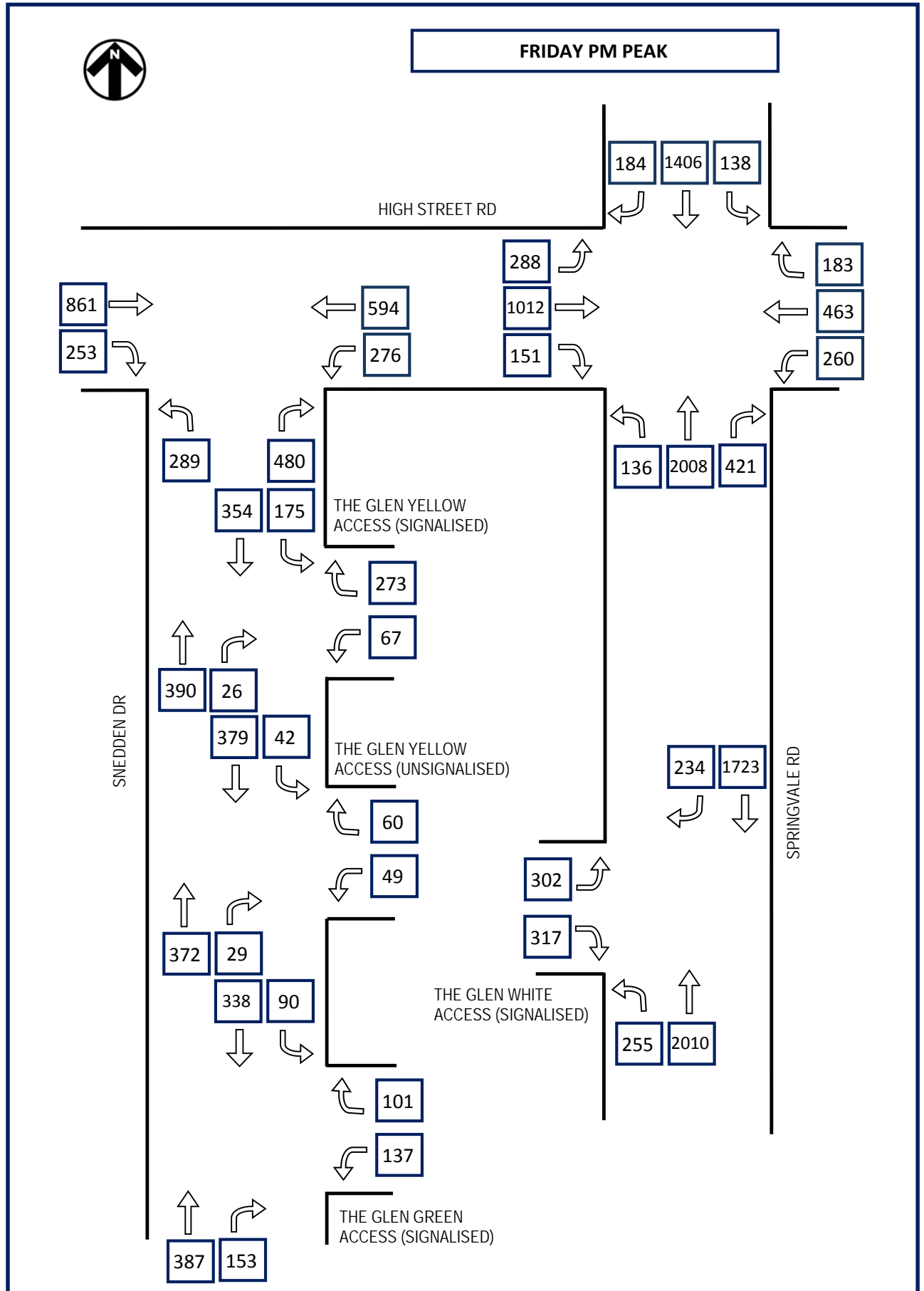


Figure 11: Critical Intersections - Existing Peak Hour Traffic Volumes

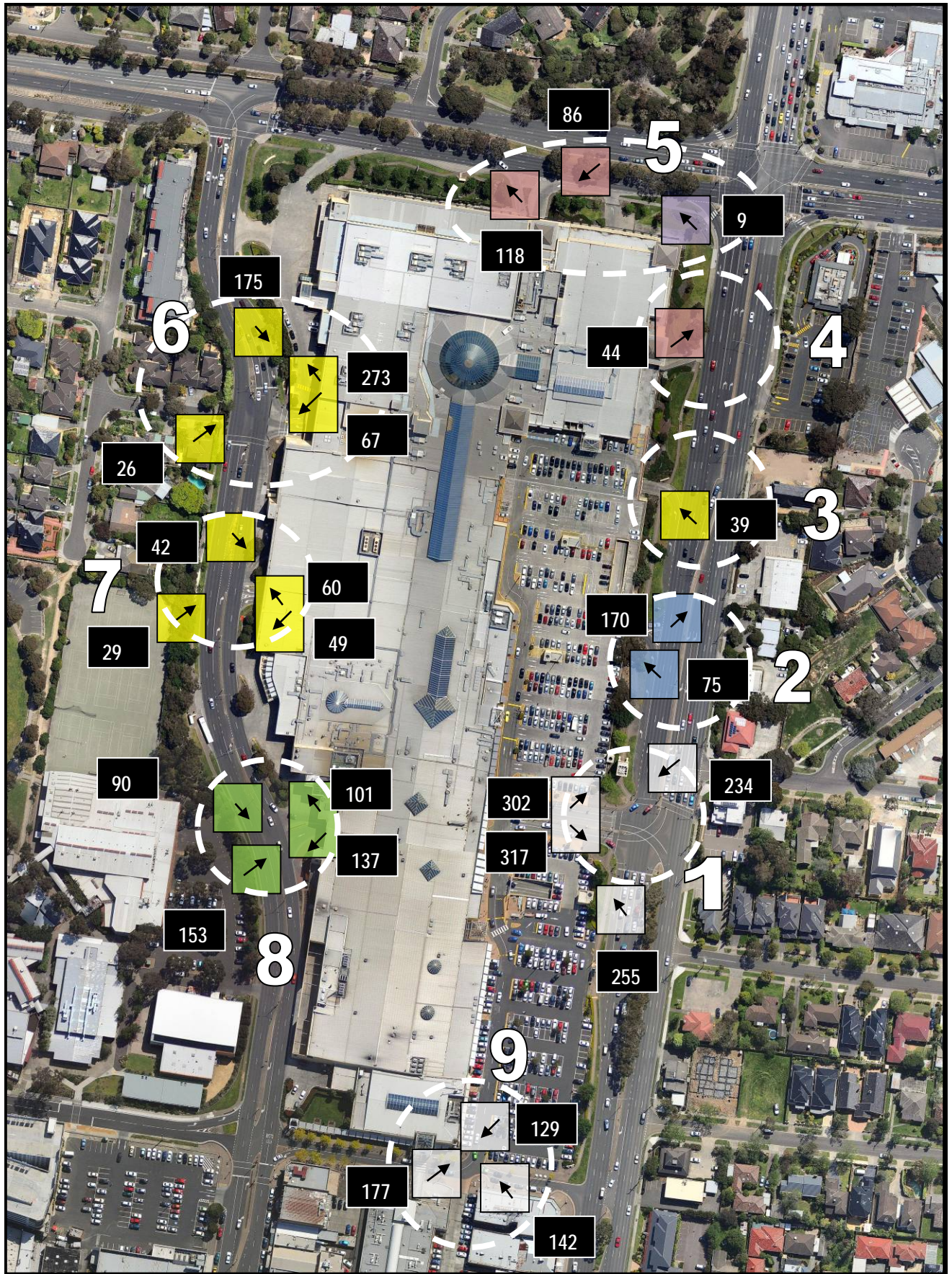


Figure 12: The Glen Shopping Centre – Access/Egress Points

To understand the existing performance of surrounding intersections, SIDRA analysis has been conducted.

SIDRA is a computer program originally developed by the Australian Road Research Board, which can be used to analyse the operation of intersections. SIDRA provides information about the capacity of an intersection in terms of a range of parameters, described as follows:

Degree of Saturation (D.O.S.) is the ratio of the volume of traffic observed making a particular movement compared to the maximum capacity for that movement. Various values of degree of saturation and their rating are shown below.

Level of Service		Intersection Degree of Saturation	
		Unsignalised Intersection	Signalised Intersection
A	Excellent	≤ 0.60	≤ 0.60
B	Very Good	0.60 – 0.70	0.60 – 0.70
C	Good	0.70 – 0.80	0.70 – 0.90
D	Acceptable	0.80 – 0.90	0.90 – 0.95
E	Poor	0.90 – 1.00	0.95 – 1.00
F	Very Poor	≥ 1.0	≥ 1.0

The **95th Percentile Queue** represents the maximum queue length, in metres, that can be expected in 95% of observed queue lengths in the peak hour.

Average Delay (seconds) is the average delay time that can be expected for all vehicles making a particular movement in the peak hour.

The key assumptions for the SIDRA modelling are:

- Adoption of the traffic signal IDM data (Intersection Diagnostic Monitor) obtained from VicRoads for 2.30pm-6.30pm on Friday 14th February.
- Where nearby signals are within proximity, the signal co-ordination of through movements has been upgraded to favourable where appropriate.
- For simplicity of the model, pedestrian movements have been deleted to allow adoption of the IDM data. This is considered acceptable given that pedestrian movements are not activated in all cycles and SIDRA's modelling of average phase times.
- Extra bunching has been applied where appropriate.

The results of the SIDRA analysis for the critical intersections surrounding the site are summarised and discussed as follows. The detailed SIDRA results are provided at Appendix A.

Springvale Road / High Street Road Intersection

A summary of the Friday peak SIDRA results for the Springvale Road / High Street Road intersection is provided in Table 3.

The analysis suggests the intersection is, as expected, experiencing a level of congestion during commuter peak periods, with lengthening queues and delays in peak directions. This level of congestion is not unusual for intersecting arterial roads within inner suburban areas during peak times.

It is noted that the left turn and right turn movements on the High Street Road east approach extend beyond the available storage during the commuter peak times.

All other movements at this intersection operate within capacity and existing geometry of the intersection.

Table 3: Springvale Rd / High Street Rd – Existing Peak Intersection Performance

Leg	Movement	Existing Friday Peak		
		DoS	Av. Delay (s)	95 th ile Queue (m)
Springvale Rd (S)	Left	0.19	11	3
	Through	0.90	19	255
	Right	0.79	72	103
High Street Rd (E)	Left	1.00	25	33
	Through	0.43	48	65
	Right	1.00	73	82
Springvale Rd (N)	Left	0.92	66	151
	Through	0.92	41	289
	Right	0.49	71	43
High Street Rd (W)	Left	0.65	13	14
	Through	0.86	47	158
	Right	0.75	75	74

High Street Road / Snedden Drive Intersection

Table 4 provides a summary of the SIDRA peak hour analysis for the intersection of High Street Road and Snedden Drive. The analysis reveals that the intersection operates in the 'good' category.

The right turn movements on the High Street Road approach can encounter some level of delay and queue beyond the available storage.

On site observations reveal that the central shared left and right turn lane is predominantly used by right turning vehicles. It is noted that existing queues on the Snedden Drive approach can extend beyond The Glen traffic signals on Snedden Drive.

Table 4: High Street Rd / Snedden Dr – Existing Peak Intersection Performance

Leg	Movement	Existing Friday Peak		
		DoS	Av. Delay (s)	95 th ile Queue (m)
Snedden Dr (S)	Left	0.88	51	144
	Right	0.88	75	144
High Street Rd (E)	Left	0.27	9	5
	Through	0.39	14	56
High Street Rd (W)	Through	0.32	6	68
	Right	0.84	54	86

Springvale Road / The Glen Intersection

Table 5 provides a summary of the SIDRA peak hour analysis for the intersection of Springvale Road and The Glen Shopping Centre. The analysis reveals that the intersection operates in the 'good' category and indicates an availability in capacity on each approach to the intersection.

Traffix Group commissioned queue length surveys of the Springvale Road north leg right turn lane in February, 2014 to understand the prevailing queues associated with this movement. In turn, the SIDRA modelling has been calibrated to accurately reflect these queues.

Table 5: Springvale Rd / The Glen Signalised Access – Existing Peak Intersection Performance

Leg	Movement	Existing Friday Peak		
		DoS	Av. Delay (s)	95 th ile Queue (m)
Springvale Rd (S)	Left	0.20	11	7
	Through	0.65	3	49
	Right	0.51	16	3
Springvale Rd (N)	Through	0.45	2	23
	Right	0.44	11	3
The Glen Access (W)	Left	0.46	44	99
	Right	0.46	55	69

Snedden Drive / The Glen Intersection – Signalised (Yellow Level)

Table 6 provides a summary of the SIDRA peak hour analyses for the intersection of Snedden Drive and the signalised northern access to The Glen. The analysis reveals that the intersection largely operates well within capacity however, operates in the 'good' category due to the volume of right turning vehicles exiting The Glen.

Table 6: Snedden Dr / The Glen Signalised Access – Existing Peak Intersection Performance

Leg	Movement	Existing Friday Peak		
		DoS	Av. Delay (s)	95 th ile Queue (m)
Snedden Dr (S)	Through	0.22	9	22
	Right	0.09	15	3
The Glen Northern Access (E)	Left	0.13	20	10
	Right	0.76	25	52
Snedden Dr (N)	Left	0.13	6	1
	Through	0.20	7	14

Snedden Drive / The Glen Intersection – Unsignalised (Yellow Level)

Table 7 provides a summary of the SIDRA peak hour analysis for the intersection of Snedden Drive and the unsignalised access to the Yellow Level. The analysis reveals that the intersection operates in the ‘acceptable’ category.

Table 7: Snedden Dr / The Glen Unsignalised Access (Yellow Level) – Existing Peak Intersection Performance

Leg	Movement	Existing Friday PM Peak			Projected PM Peak		
		DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)
Snedden Dr (S)	Through	0.09	-	-	0.12	-	-
	Right	0.03	7	1	0.05	7	1
The Glen Central Access (E)	Left	0.06	9	2	0.09	10	2
	Right	0.22	20	6	0.37	27	11
Snedden Dr (N)	Left	0.12	6	-	0.13	6	-
	Through	0.12	-	-	0.13	-	-

Snedden Drive / The Glen Intersection – Unsignalised (Green Level)

Table 8 provides a summary of the SIDRA peak hour analysis for the intersection of Snedden Drive and the unsignalised southern access to The Glen (Green Level). The analysis reveals that the intersection operates in the ‘excellent’ category and has spare capacity on all approaches.

Table 8: Snedden Dr / The Glen Unsignalised Access (Green Level) – Existing Peak Intersection Performance

Leg	Movement	Existing Friday Peak		
		DoS	Av. Delay (s)	95 th ile Queue (m)
Snedden Dr (S)	Through	0.10	-	-
	Right	0.16	7	5
The Glen Southern Access (E)	Left	0.17	10	5
	Right	0.54	35	18
Snedden Dr (N)	Left	0.12	6	-
	Through	0.12	-	-

6.2. Traffic Generation

Retail

The traffic surveys of the existing centre established a peak traffic generation rate of 5.55 movements per 100 square metres.

It is well documented that as shopping centres increase in size the overall traffic generation rate reduces. This results from a combination of less customers per square metre of floor area and customers staying for longer periods as the centre grows.

To this end, traffic generated by the extension is not a direct translation of the existing generation.

It is typical within the traffic engineering profession to adopt 60% of the existing traffic generation rate as appropriate to apply for the extension area, which in this case equates to a traffic generation of 3.33 movements per 100 square metres. Application of this rate to the proposed extension of 17,079 square metres results in a projected additional peak hour traffic generation of 569 movements.

It is therefore projected that the extended retail centre, as a whole, would generate 3,839 movements at its peak. For the new centre with a floor area of 76,009 square metres this is equivalent to a traffic generation of 5.05 movements per 100 square metres.

In the absence of a Victorian Guide, traffic engineers and authorities often reference the Road Traffic Authority (RTA) of New South Wales Guide to Traffic Generating Developments to qualify shopping centre traffic generation rates.

We note that the resultant overall rate of 5.05 movements per 100 square metres is significantly higher than the rate of 4 movements per 100 square metres specified within the RTA Updated Traffic Surveys (May 2013), for shopping centres with a total floor area exceeding 70,000 square metres.

Consequently, it is considered the adopted traffic generation will result in a conservative assessment.

Residential

The site has good accessibility to public transport within convenient walking distance and is provided with several services at the Railway Parade North interchange. The site will also be located above The Glen Shopping Centre, reducing the travel needs by car for everyday amenities.

In consideration of the foregoing, a residential daily traffic generation rate of 4 movements per apartment, inclusive of 0.4 movements per apartment during peak hours is considered representative for assessment purposes.

Application of this rate to the proposed 515 apartments results in a projected daily traffic generation of 2,060 movements, inclusive of 206 movements in peak hours.

6.3. Traffic Distribution

The Glen Shopping Centre is located within the City of Monash approximately 24 kilometres east of the Melbourne CBD and centrally located between Burwood Highway and the Monash Freeway on Springvale Road.

Shopping Centre

The application proposes to modify the existing access arrangements to Springvale Road and Snedden Drive. In this regard, some of the existing retail traffic will be redistributed and diverted to alternate access points. However for simplicity, the following assumptions have been adopted.

- Existing access points that are to remain will retain the existing traffic movements.
- The existing retail access to 'O'Sullivan Road is to be deleted, and consequently existing traffic will be redistributed as; existing arrivals from the east (i.e. right turns from O'Sullivan Road) – will enter from the south at the signalised Springvale Road access; existing arrivals from the west (i.e. left turns from O'Sullivan Road) – will enter from the south at the southern most Snedden Drive access; and departures to the west – will exit to the south via the southern most Snedden Drive access.
- The additional traffic (569 movements) related to the expansion will be equally split between arrivals and departures.

- The additional movements will be split amongst the existing access points largely proportional to existing movements, however with a greater emphasis on the southern most Snedden Drive access as it is proposed to be signalised and it provides direct access to the speed ramp to access the above grade parking.
- The proposed split for the additional traffic is:

Site Access Description	Distribution	Distributed Traffic Volume
Springvale Rd Signals	20%	114
Springvale Rd Yellow Level	12%	68
High Street Rd	12%	68
Snedden Dr Signalised North Access	20%	114
Snedden Dr Unsignalised Central Access	12%	68
Snedden Dr Unsignalised South Access	24%	137

- At the access points and external intersections, the expansion traffic will be proportionally distributed to existing turning movements.

Residential

For the critical afternoon peak hour, residential traffic will be split as 60% arrivals and 40% departures.

The residential access is located in a section of O'Sullivan Road that operates one-way west bound. This will result in arrivals from Springvale Road, and departures to Snedden Drive. Egress from O'Sullivan Road is restricted to left-out, so all departures must travel initially to the south.

For broader movements, the following assumptions have been adopted.

Arrivals

- 67% from the south, and 33% from the north.
- Traffic arriving from the north will be proportionally split between existing movements at the intersection of Springvale Road and High Street Road.

Departures

- All departures are initially to the south, with a broader distribution of 75% to the west and south; and 25% to the north and east.
- Movements wishing to ultimately head north or east will travel south to Railway Parade North and turn left onto Springvale Road, and then be split proportionally between the existing through and right turn movements on the south approach to the intersection of High Street Road.
- Movements destined to the west or south will use Coleman Parade and Railway Parade North / Springvale Road respectively.

In consideration of the above, Figure 13 has been prepared to illustrate the expansion traffic, including the redistributed traffic from deletion of the O'Sullivan Road retail access.

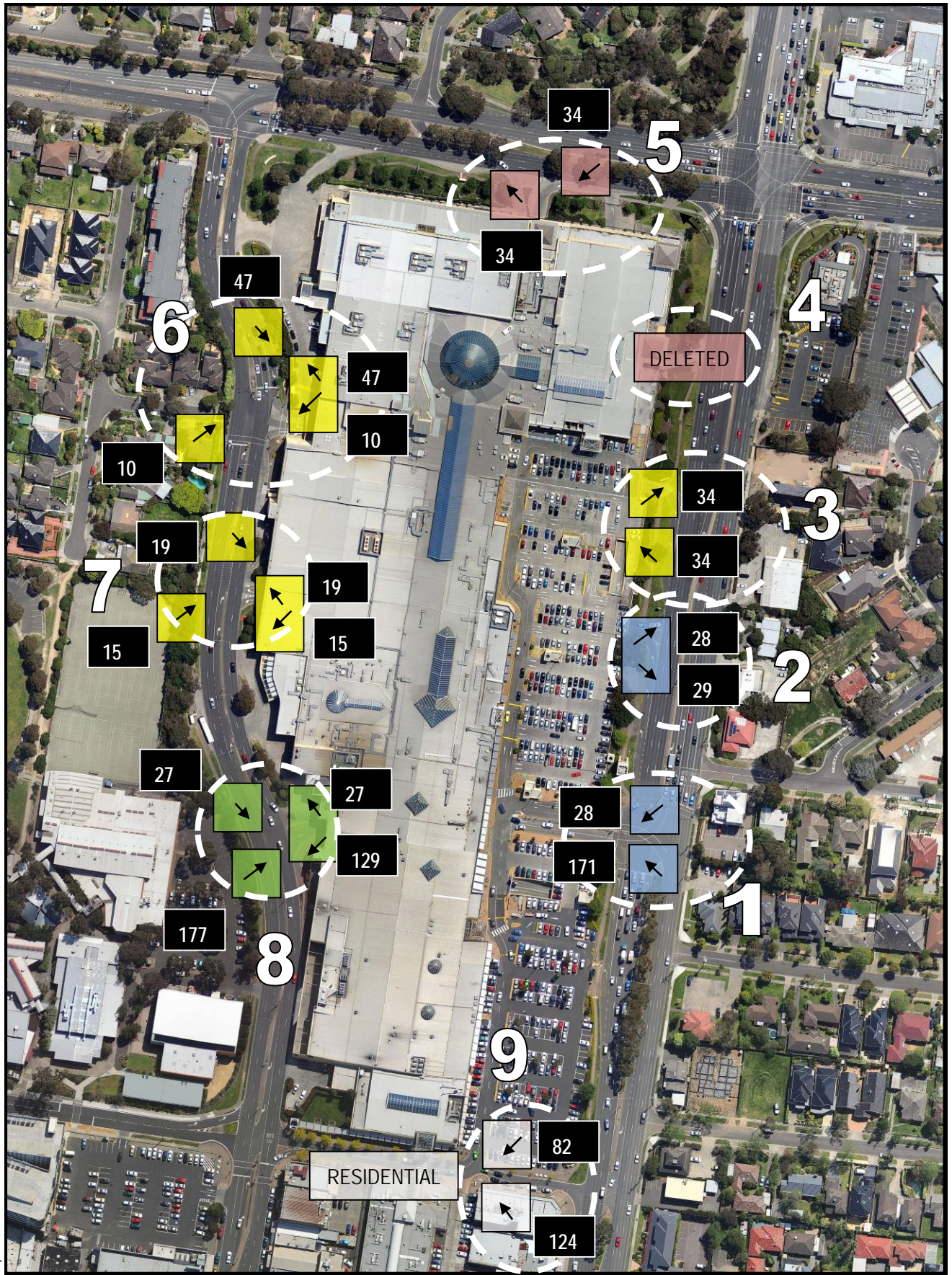


Figure 13: The Glen Shopping Centre Expansion Traffic

6.4. Traffic Impacts

Figure 14 illustrates the projected post development traffic volumes for the critical accesses to the site and surrounding intersections.

These volumes and the proposed traffic conditions have been input to SIDRA and reanalysed. The results of the SIDRA assessment, and where appropriate, a comparison to existing conditions is summarised in the following tables.

High Street Road / Snedden Drive Signalised Access

There are no physical changes proposed to this intersection, however the analysis identified that the additional traffic generated to this intersection could be accommodated by minor alterations to existing phase times. Specifically, six (6) seconds has been reallocated from the High Street Road through phase equally to the leading right turn phase from High Street Road, and the Snedden Drive phase.

Table 9 summarises a comparison of the existing conditions and post development conditions for the intersection of High Street Road and Snedden Drive, acknowledging the minor alteration to the phase times.

Table 9: High Street Rd / Snedden Dr Intersection- Peak Hour SIDRA Comparison

Leg	Movement	Existing Friday PM Peak			Projected PM Peak		
		DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)
Snedden Dr (S)	Left	0.88	51	144	0.84	44	73
	Right	0.88	75	144	0.86	72	137
High Street Rd (E)	Left	0.27	9	5	0.32	9	6
	Through	0.39	14	56	0.44	18	71
High Street Rd (W)	Through	0.32	6	68	0.32	7	70
	Right	0.84	54	86	0.84	42	90

The table shows that the additional traffic can be accommodated without material change to the operation of the intersection.

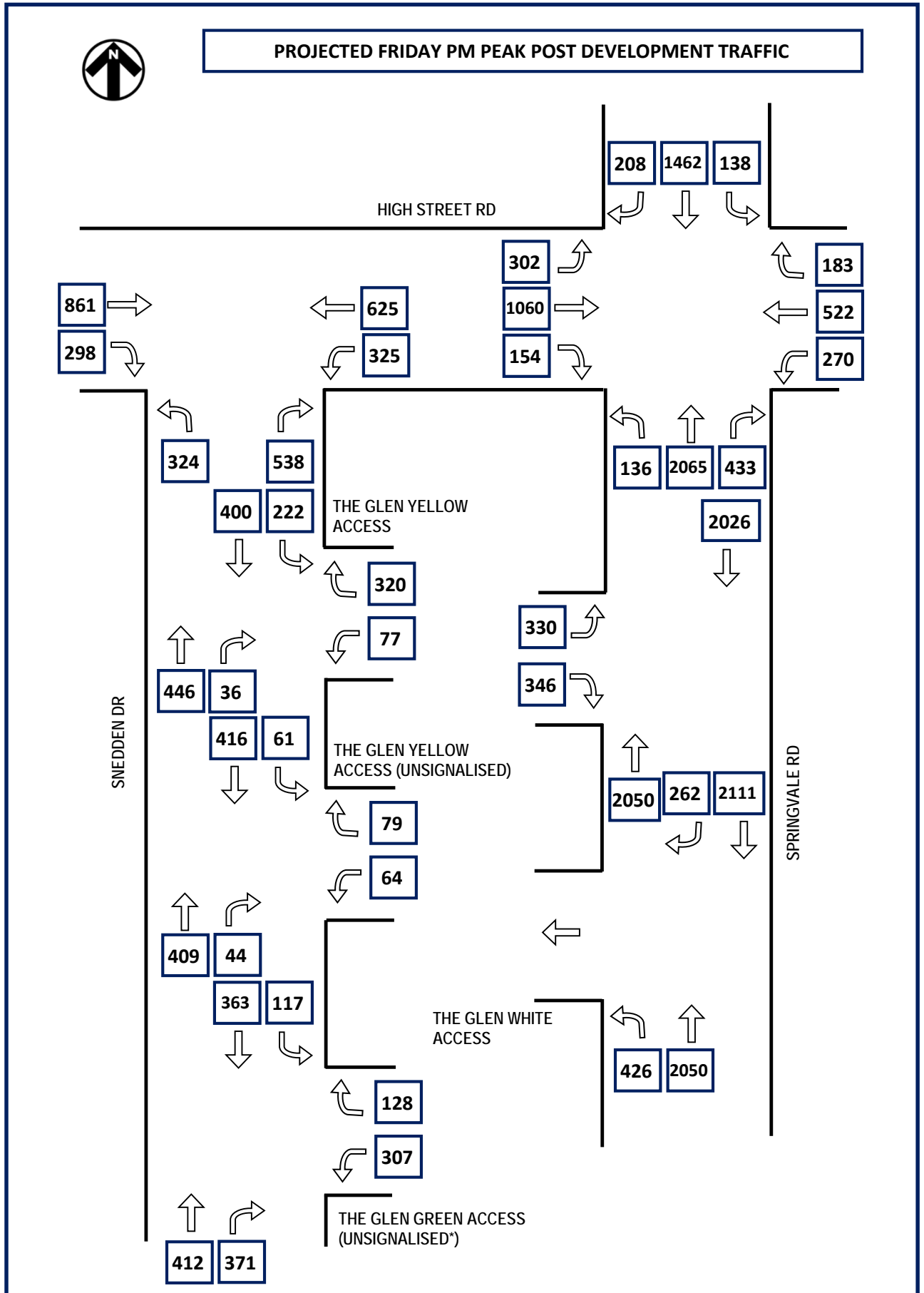


Figure 14: Projected Peak Hour Post Development Traffic

Springvale Road / High Street Road Signalised Intersection

In the order of 6,600 vehicles travel through the intersection of High Street Road and Springvale Road in the afternoon peak hour.

The proposed development is expected to generate 283 vehicle movements to the intersection in the afternoon peak, which is equivalent to approximately a 4% increase. This is a relatively small overall increase. Nonetheless the through movement on the west approach of High Street Road and the right turn from the north approach of Springvale Road are projected to increase by marginally more than 10%, triggering a VicRoads requirement to assess the intersection.

The post development model has adopted the existing phasing and cycle times sourced from VicRoads.

A comparison of the existing and post development conditions for this intersection is summarised in Table 10.

Table 10: Springvale Rd / High Street Rd Intersection – Peak Hour SIDRA Comparison

Leg	Movement	Existing Friday Peak			Projected Friday Peak		
		DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)
Springvale Rd (S)	Left	0.19	11	3	0.20	11	3
	Through	0.90	19	255	0.93	21	285
	Right	0.79	72	103	0.81	73	107
High Street Rd (E)	Left	1.00	25	33	1.00	26	33
	Through	0.43	48	65	0.50	49	78
	Right	1.00	73	82	0.100	73	82
Springvale Rd (N)	Left	0.92	66	151	0.95	72	166
	Through	0.92	41	289	0.95	47	320
	Right	0.49	71	43	0.56	72	49
High Street Rd (W)	Left	0.65	13	14	0.68	15	26
	Through	0.86	47	156	0.90	51	174
	Right	0.75	75	74	0.77	75	76

Review of the results reveals that the additional traffic will make no material change to the operation of the intersection, as would be expected for the modest increase in traffic volumes.

Springvale Road / The Glen Signalised Access

The existing signalised access to The Glen at Springvale Road is to be modified to incorporate the 'Blue Level' access. Specifically, the existing 'White Level' access will be narrowed, ramp directly to 'Blue Level', and provide for entry only via two (2) lanes. The existing 'Blue Level' access will be widened and provide for egress only through the provision of four (4) lanes (two left turn and two right turn lanes).

The design has incorporated this traffic signal arrangement to allow development of a ‘race track’ mall on Level 2 of the Centre, whilst minimising impacts to the operation of Springvale Road.

In effect, the entry and egress will be separated but operate as a single set of traffic signals.

The works will include signalisation of both access points and minor works would be required to Springvale Road to facilitate the proposed access arrangements.

The intersection arrangement is expected to include:

- Configuration of traffic signalling to include, bonus left turns on the Springvale Road south approach and egress movements from The Glen.
- The right turn out will operate under a split phase arrangement.
- The analysis has adopted the existing cycle time and ‘green’ time for Springvale Road through movements that was sourced from VicRoads for the existing Glen traffic signals at Springvale Road.

Table 11 and Table 12 summarise the results for Egress and Entry signals respectively.

Table 11: Springvale Rd / The Glen Signalised Intersection (Exit Access) - Peak Hour SIDRA Comparison

Leg	Movement	Projected PM Peak		
		DoS	Av. Delay (s)	95 th ile Queue (m)
Springvale Rd (S)	Through	0.65	3	50
Springvale Rd (N)	Through	0.46	2	24
The Glen Access (W)	Left	0.27	40	54
	Right	0.46	56	70

Table 12: Springvale Rd / The Glen Signalised Intersection (Entry Access) - Peak Hour SIDRA Comparison

Leg	Movement	Projected PM Peak		
		DoS	Av. Delay (s)	95 th ile Queue (m)
Springvale Rd (S)	Left	0.33	12	14
	Through	0.66	3	52
	Right	0.16	49	13
Springvale Rd (N)	Through	0.55	2	34
	Right	0.87	75	66

The analysis demonstrates the intersection arrangement will operate in the ‘acceptable’ category, with the right turn in from Springvale Road being the critical movement. Importantly, the inclusion of a 4th departure lane is expected to improve the efficiency of egress from the centre.

Snedden Drive / The Glen Southern Access – Green Level (Signalised)

The development proposes to signalise the existing southern site access to Snedden Drive. The intersection will be upgraded to formalise two (2) departure lanes from the site.

The intersection arrangement will include; signal hardware to allow bonus left turns on the north and east approaches; and pedestrians crossing on the south and east approaches.

The analysis has adopted the existing cycle time at the existing signalised access to the 'Yellow Level' at Snedden Drive, but includes a leading right turn phase on Snedden Drive. The results of the analysis and comparison to the unsignalised access is summarised in Table 13.

Table 13: Snedden Dr / The Glen Intersection - Green Level Access: Peak Hour SIDRA Comparison

Leg	Movement	Existing Friday PM Peak (Unsignalised)			Projected PM Peak (Signalised)		
		DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)
Snedden Dr (S)	Through	0.10	-	-	0.23	9	24
	Right	0.16	7	5	0.88	33	69
The Glen Southern Access (E)	Left	0.17	10	5	0.44	14	39
	Right	0.54	35	18	0.25	20	20
Snedden Dr (N)	Left	0.12	6	-	0.41	21	39
	Through	0.12	-	-	0.41	16	39

The results show that the proposed signals will operate in the 'very good' category and suitably provide for the projected movements to and from the car park.

Snedden Drive / The Glen Central Access – Yellow Level (Unsignalised)

No changes are proposed to the existing unsignalised access to the 'Yellow' Level at Snedden Drive. Table 14 shows a comparison of existing and post development conditions.

Table 14: Snedden Dr / The Glen Unsignalised Central Access (Yellow Level) - Peak Hour SIDRA Comparison

Leg	Movement	Existing Friday PM Peak			Projected PM Peak		
		DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)
Snedden Dr (S)	Through	0.09	-	-	0.12	-	-
	Right	0.03	7	1	0.05	7	1
The Glen Central Access (E)	Left	0.06	9	2	0.09	10	2
	Right	0.22	20	6	0.37	27	11
Snedden Dr (N)	Left	0.12	6	-	0.13	6	-
	Through	0.12	-	-	0.13	-	-

The analysis reveals that there is sufficient capacity in the existing intersection to accommodate the projected expansion traffic, and queues will be contained with the designated storage.

Snedden Drive / The Glen Northern Access – Yellow Level (Signalised)

No changes are proposed to the existing signalised access to the ‘Yellow’ Level at Snedden Drive. Table 15 shows a comparison of existing and post development conditions.

Table 15: Snedden Dr / The Glen Signalised Northern Access (Yellow Level) - Peak Hour SIDRA Comparison

Leg	Movement	Existing Friday PM Peak			Projected PM Peak		
		DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)
Snedden Dr (S)	Through	0.22	9	22	0.24	9	25
	Right	0.09	15	3	0.13	15	4
The Glen Northern Access (E)	Left	0.13	20	10	0.15	20	12
	Right	0.76	25	52	0.90	28	65
Snedden Dr (N)	Left	0.13	6	1	0.16	6	1
	Through	0.20	7	14	0.22	7	16

The analysis highlights that the projected additional traffic can be accommodated, albeit the right turn out is starting to approach capacity. In this regard, motorists departing to the south have the ability to utilise the unsignalised access to the same level, which has ample capacity. In fact, it is likely that over time the use of these accesses will find an equilibrium such that motorists choose the access where they experience the least delay.

Conclusion

In our view, the variety of access opportunities from Springvale Road, High Street Road and Snedden Drive, and the proposed improvements to internal connectivity between parking levels will offer customers a convenient and navigable car park.

The foregoing analysis demonstrates that, with the proposed access improvements, the access arrangements can suitably accommodate the projected levels of traffic, and there is no requirement for remedial works on the surrounding network.

7. BICYCLE CONSIDERATIONS

Clause 52.34 of the Planning Scheme sets out the relevant statutory bicycle parking requirements for the proposed development.

Specifically, the Scheme states:

Where the floor area occupied by an existing use is increased, the requirement for bicycle facilities only applies to the increased floor area of the use.

In this regard, the bicycle parking requirements only apply to the expansion. That is the 17,079 square metres of retail floor area (shop), and the 515 residential apartments.

The required number of bicycle parking spaces for the proposed development is summarised in Table 16.

Table 16: Statutory Bicycle Parking Requirement

Component	No. / Area	Statutory Bicycle Parking Rate	No. of Spaces Required
Residential Apartments			
Dwellings – Residents	515 dwellings	1 to each 5 dwellings	103 spaces
Dwellings – Visitors		1 to each 10 dwellings	52 spaces
Residential Apartments Sub Total			103 resident spaces 52 visitor spaces
Shop			
Shop – Staff	17,079m ²	1 to each 600m ² of leasable floor area	28 spaces
Shop – Customers		1 to each 500m ² of leasable floor area	34 spaces
Shop Sub Total			28 staff spaces 34 customer spaces

Based on the above assessment, the application is required to provide a total of 155 bicycle spaces for the residential use, and 62 spaces for the retail expansion.

The application also has a statutory requirement to provide 1 shower for the first five (5) employee bicycle spaces, plus 1 to each 10 employee bicycle spaces thereafter. In addition, each shower must be provided access to a change room.

Application of these rates to the proposed development (28 staff spaces) equates to a requirement to provide for three (3) showers with access to a communal changeroom.

The application plans illustrate bicycle parking but do not quantify numbers.

The proposed location of bicycle parking is acceptable, however should a permit issue a condition should be imposed requiring provision of the statutory bicycle parking requirements and design to the satisfaction of the Responsible Authority.

Bicycle parking dimensions should be designed in accordance with the design principles outlined in Clause 52.34-4 and / or the relevant manufacture's specifications.

8. LOADING CONSIDERATIONS

The statutory loading requirements for the application are outlined in Clause 52.07 of the Planning Scheme.

The Scheme requires the provision of loading for the sales, manufacturing or storage of goods. To this end, the development has a requirement to provide for loading for the retail expansion but not the residential component.

In relation to the retail expansion of 17,079 square metres, the Scheme requires a loading area of 189.4 square metres to be designated for loading, with a clearance of 4 metres.

The new loading area in the southern portion of the site has been designed with an area far exceeding the statutory spatial provision, and has a head clearance that exceeds 4 metres.

The loading area has been designed to accommodate 19 metre semi-trailers and in our view will adequately service the retail expansion.

Whilst there is no statutory loading requirement for the residential component, the application proposes a loading area for residents, shared with a waste collection area. This area has been adequately designed for a Medium Rigid Vehicle (MRV).

9. CONCLUSIONS

Having visited the site, collected traffic volume data, and undertaken an assessment of the car parking and traffic impacts for the proposed development, we are of the opinion that:

- a) The development has a statutory car parking requirements to provide for 3,734 car spaces comprising 3,219 car spaces for retail, office and residential visitors and 515 spaces for residential visitors.
- b) The development proposes the provision of 3,295 car spaces shared by retail, office and residential visitors, and 515 spaces for residential tenants. To this end, the proposed car parking provision exceeds the statutory requirement, and accordingly no car parking waiver is sought by the application.
- c) The proposed development is conservatively projected to generate an additional 775 peak hour traffic movements, comprising 569 retail traffic movements and 206 residential traffic movements.
- d) The site can be suitably accessed via the proposed access strategy incorporating:
 - Deletion of the O'Sullivan Road 'White' level retail access, and inclusion of a residential access to O'Sullivan Road and circulatory ramping to residential parking levels.
 - Deletion of the Springvale Road 'Red' level retail access.
 - Conversion of the Snedden Drive and southern retail car park access to a signalised intersection to facilitate additional traffic movements expected to be generated to this access.
 - Separation of the Springvale Road signalised 'White' level retail access to form separate ingress and egress access points. The separation will include works to convert the 'White' level retail access to ingress only and connect directly to the 'Blue' level, and widen the existing 'Blue' level access to provide for 4 departure lanes.
 - New circulation ramps between the 'Red' level car park and the 'Blue' level car park on the north-east corner of the site.
 - A new corkscrew ramp near to the entrance of the Snedden Drive southern access to provide access to the rooftop car parking levels.
- e) The SIDRA analysis of the critical intersections reveals that:
 - The High Street Road / Snedden Drive intersection requires reallocation of the current phasing times to afford more green time to the right turn movements from the west and south approaches.
 - The Snedden Drive / Southern Green Level Access intersection requires signalisation to facilitate the additional right turn in movements from the Snedden Drive south approach.
 - All other critical intersections and access points will operate in an acceptable manner and provide for reasonable and convenient access to and from the centre.
- f) The development has a statutory requirement to provide 217 bicycle spaces, comprising 155 residential bicycle spaces and 62 spaces for the retail expansion. Should a permit issue, a condition should be imposed requiring provision of the statutory bicycle parking requirements and design to the satisfaction of the Responsible Authority.
- g) The application proposes a new loading area to the southern portion of the site that will appropriately cater for service and delivery vehicles up to 19 metres long as required by the development. There is no statutory requirement to provide a loading area for the residents however, a loading area accommodating MRVs is proposed.

- h) There are no traffic engineering reasons why a planning permit for the proposed mixed use development should be refused, subject to the inclusion of appropriate conditions.

