# Planning Proposal for Mixed Use Development
# 27 Victoria Avenue, Castle Hill

**Traffic and Parking Assessment Report**

Prepared for: Martis Investments Pty Ltd

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Report No: PT200093r01_V11

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## 1. Introduction

This report has been prepared on behalf of Martis Investments Pty Ltd to present findings of a traffic and parking assessment of a planning proposal for the redevelopment of the site at No.27 Victoria Avenue, Castle Hill to provide a multi storey mixed use development.

The study has assessed existing traffic conditions, parking demands, access arrangements, future traffic conditions and design compliance.

The remainder of the report is set out as follows:

- Section 2 describes the existing traffic and parking conditions;
- Section 3 presents a summary of relevant background studies;
- Section 4 summarises the proposed development;
- Section 5 reviews the potential traffic impacts of the proposal;
- Section 6 reviews the design for compliance with relevant standards; and
- Section 7 presents the conclusions

## 2. Existing Development / Conditions

The following presents a summary of existing site and traffic conditions.

### 2.1 Site Location

The site subject to the planning proposal includes an existing multi retail / commercial development located on the south-western corner of the intersection of Victoria Avenue / Anella Avenue and within the Castle Hill employment zone, which is bounded by Showground Road in the north, Cattai Creek in the east, Windsor Road in the south and Windsor Road in the west.

The location of the development site is shown in **Figure 1**.

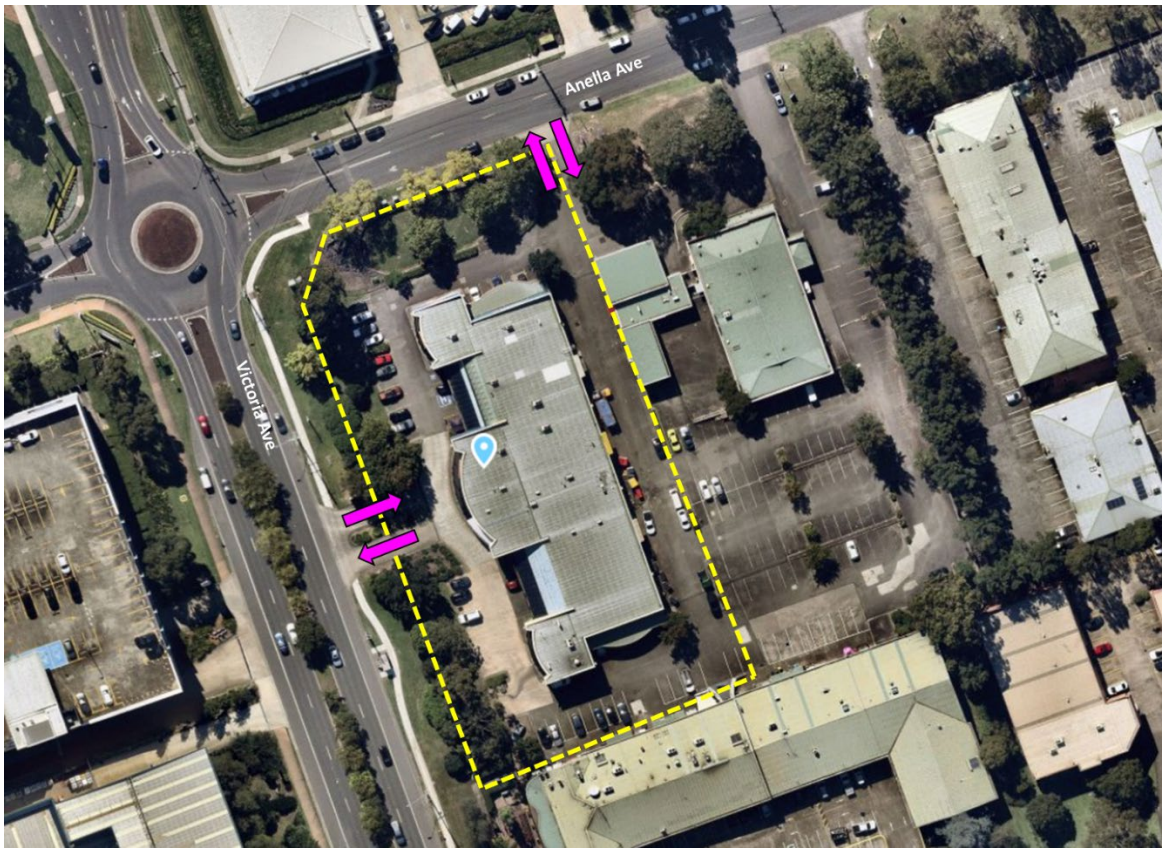
**Figure 1 - Site Location**


*Source: Nearmap*

As stated above the existing site includes a number of retail / commercial businesses with vehicle driveway access entry / exit driveways from both Victoria Avenue and Anella Avenue. The driveway which serves the site from Anella Avenue is a shared vehicle access with the adjacent site at No.3-3A Anella Avenue which includes a BWS Liquor Store.

The site includes approximately 2,000m$^2$ Gross Floor Area (GFA) of mixed retail floorspace within the existing buildings served by a combined open air car park with a total parking provision of **46** spaces. The finer grain details of the existing buildings, parking areas and access arrangements are shown below in **Figure 2**.

**Figure 2 – Existing Site Access / Parking / Building Areas**




The existing site in terms of business operations all of which were operational at the time of preparing this report include:

1. BCF – Boating Camping Fishing Store
2. Ultra-Tune Vehicle Servicing Store
3. LM Home Interiors
4. Pizza Hut Take Away Restaurant
5. Roof Rack Superstore
6. Fishtank Aquarium Store

## 2.2 Existing Site Traffic Generation

Having regard to the existing traffic demands of the precinct (discussed further below) and the high traffic demands exhibited in the immediate road network on weekends, the recommended rates for 'retail' uses are considered more appropriate to ascertain the existing traffic generation of the site.

**Shopping Centres**

Extensive surveys of shopping centres were conducted in 1978, 1990 and again in 2011. The latter survey involved ten larger shopping centres, seven in the Sydney metropolitan area and one each at Mittagong, Shellharbour and Tuggerah. Peak hour trip generation rates are as follows:

| Range in Total Floor Area (GLFA – $m^2$) | Peak Hour Generation Rate (vehicles per $100m^2$ GLFA) | | | |
|---|---|---|---|---|
| | Thursday (V(P)/A) | Friday (V(P)/A) | Saturday PVT (A) | Sunday |
| 0 – 10,000 | 12.3 | 12.5 | 16.3 | |
| 10,000 – 20,000 | 7.6 (6.2) | 6.2 (6.7) | 7.5 (7.5) | (6.6) |
| 20,000 – 30,000 | 5.9 (6.0) | 5.6 (5.9) | 7.5 (7.0) | (6.3) |
| 30,000 – 40,000 | 4.6 | 3.7 | 6.1 | |
| 40,000 – 70,000 | (4.4) | (4.4) | (5.5) | (4.6) |
| 70,000+ | (3.1) | (4.0) | (3.6) | (3.2) |

* Figures in brackets refer to 2011 surveys. Other figures are as per 1978 and 1990 surveys. Caution should be used in comparing the data in that they reflect changes in shopping behaviours. Seasonally adjusted rates appear to be in the order of 3-5% higher than the quoted 2011 rates.

Given the retail of the precinct forms part of the greater retail available within the precinct the 40,000 – 70,000 rate has been adopted. That is, a rate of 4.4 trips per $100m^2$ GLFA for the Thursday PM peak and 5.5 trips per $100m^2$ GLFA for the Saturday AM peak is considered an appropriate indictor of existing site traffic generation.

Therefore, for some $2,000m^2$ of mixed retail floorspace (assuming GFA represents GLFA), the existing site is estimated to generate some **88** peak hour trips in the Thursday PM peak and **110** peak hour trips in the Saturday AM peak.

## 2.3 Classification Criteria

It is usual to classify roads according to a road hierarchy in order to determine their functional role within the road network. Changes to traffic flows on the roads can then be assessed within the context of the road hierarchy. Roads are classified according to the role they fulfil and the volume of traffic they should appropriately carry. The RTA has set down the following guidelines for the functional classification of roads.

- Arterial Road – typically a main road carrying over 15,000 vehicles per day and fulfilling a role as a major inter-regional link (over 1,500 vehicles per hour)
- Sub-arterial Road – defined as secondary inter-regional links, typically carrying volumes between 5,000 and 20,000 vehicles per day (500 to 2,000 vehicles per hour)
- Collector Road – provides a link between local roads and regional roads, typically carrying between 2,000 and 10,000 vehicles per day (250 to 1,000 vehicles per hour). At volumes greater than 5,000 vehicles per day, residential amenity begins to decline noticeably.
- Local Road – provides access to individual allotments, carrying low volumes, typically less than 2,000 vehicles per day (250 vehicles per hour).

## 2.4 Existing Road Network

Victoria Avenue – is a key collector road serving the precinct linking Windsor Road in the south with Showground Road in the north. As the main road artery within the precinct it is subject to high traffic demands during business hours, AM / PM road network peak periods and weekends. All major intersections are controlled by single or dual lane roundabouts.

Across the frontage of the site, Victoria Avenue consists of a dual travel lanes in each direction with unrestricted parallel parking on both sides of the street. Travel lanes are separated by a wide landscaped median. The intersection of Victoria Avenue / Anella Avenue / Hudson Avenue is controlled by a dual lane roundabout whereas the Showground Road intersection is controlled by traffic signals.

Anella Avenue – is a local street which forms a loop (becoming Salisbury Road in the south providing access between Victoria Avenue and adjacent retail / commercial / industrial properties which front it. As is the case for the precinct to provide truck access, Anella Avenue includes a wide pavement of some 12.0m, a single travel lane in each direction and unrestricted parallel parking on both sides of the street. The street includes a speed limit of 50km/hr.

Windsor Road – functions as one of the main arterial roads through the area linking the M2 Motorway in the south (and the Parramatta Central Business District further south) with key arterial roads / motorways such as the M2 Motorway and Old Windsor Road in the north. Major intersections are typically controlled by traffic signals with minor intersections constrained to left in / left out movements. The road also provides a key bus corridor through the area.

Showground Road – could be considered a high functioning collector road or sub arterial linking Windsor Road in the west with the Old Northern Road in the east. The road also provides a key public transport corridor through the area linking to the recently constructed North West Metro rail stations within the Showground and Castle Hill Precincts.

## 2.5 Existing Traffic Flows

Traffic demands on the surrounding road network are summarised below in Section **3**.

## 2.6 Public Transport

### *2.6.1 Rail Services*

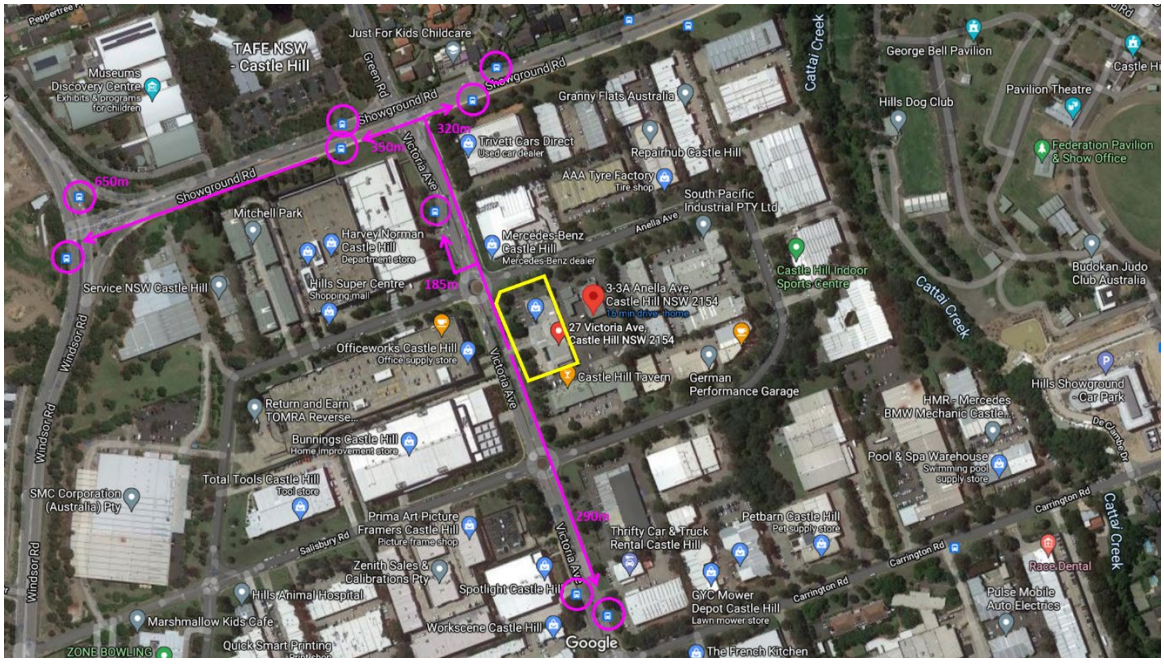
The proposed development site (prior to new connections in the future to the Showground Precinct Redevelopment) is currently some 1.1km walking distance to the Showground Metro Rail Station located off Carrington Road which provides high frequency peak hour rail services to major employment / retail centres including the Sydney CBD, North Sydney, Chatswood, Castle Hill and Rouse Hill. This is shown below.

**Figure 3 – Walking Distance to Showground Rail Station**


### *2.6.2 Bus Services*

The site is located within a short walking distance to an extensive bus network which is proposed to further expand in the future following redevelopment of both the Castle Hill Precinct and Showground Precinct. The walking distances to each available bus stop are shown below in **Figure 4**.

**Figure 4 - Site Walking Distances to Existing Bus Stops**

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These large number of bus stops within a convenient walking distance to the development site provide access to the following services:

**Table 1 – Existing Bus Services**

| Route No. | Origin | Destination | Via |
|---|---|---|---|
| 615X | North Kellyville | Sydney CBD | Baulkham Hills |
| 664 | Rouse Hill | Parramatta | Kellyville |
| 632 | Rouse Hill | Pennant Hills | Norwest |
| 660 | Castle Hill | Parramatta | Winston Hills |
| 662 | Castle Hill | Parramatta | Bella Vista |
| 715 | Rouse Hill | Seven Hills | Kellyville |
| 601 | Rouse Hill | Parramatta | Kellyville |
| 610X | Kellyville | Sydney CBD | Baulkham Hills |
| 626 | Kellyville | Pennant Hills | Castle Hill |
| 633 | Rouse Hill | Pennant Hills | Kellyville |
| 651 | Rouse Hill | Epping | Castle Hill |

From **Table 1** it is clearly evident that the development site is located within a convenient walking distance to a *significant number* of local and regional bus services providing access to a range of local / regional employment / retail centres.

## 3. Background Report / Studies Review

The following presents both a summary of relevant traffic impact assessment reports conducted within the Castle Hill industrial precinct / in immediate surrounding areas and proposals for improvements in the precinct across all transport modes to provide a context to the expected traffic and transport environment in the future.

### 3.1 Showground Station Precinct Redevelopment Transport Plan – Transport for NSW

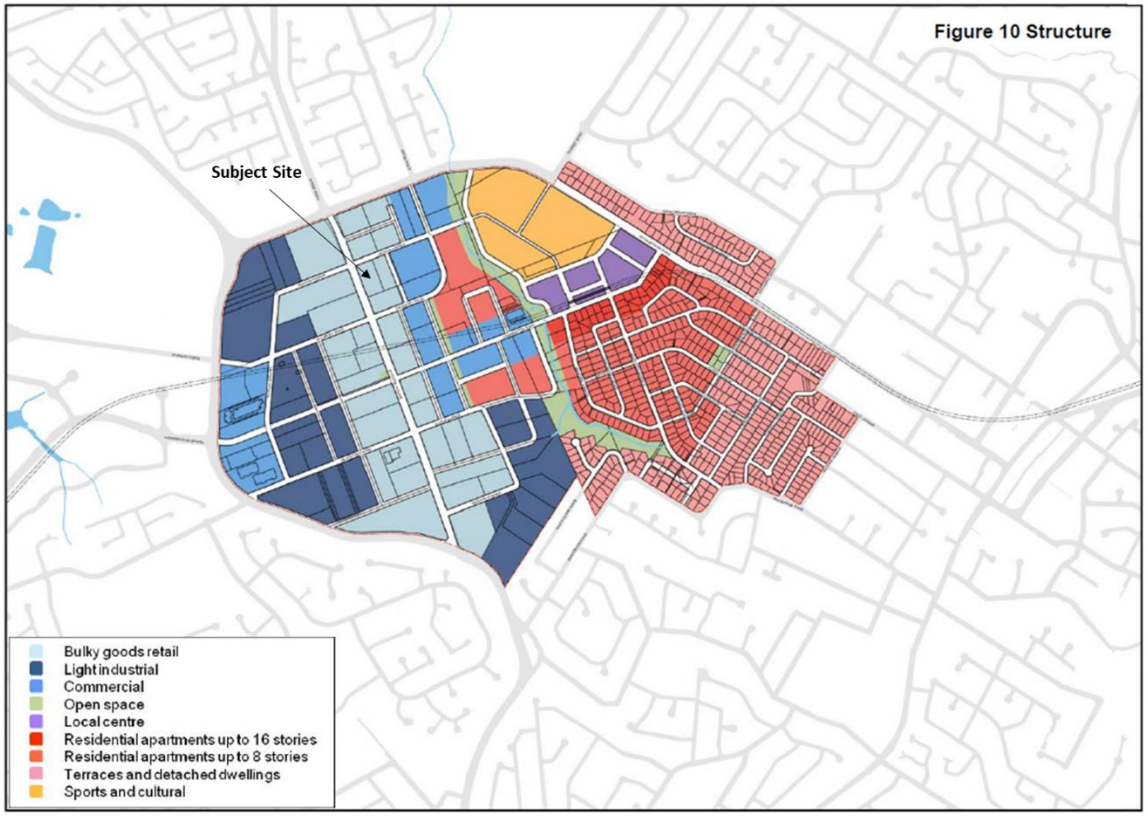
This key transport planning document underpins the necessary infrastructure planning in and around the Showground Station Precinct (including the Castle Hill Industrial Precinct) to support significant growth in development in both areas.

The redevelopment of the Showground Station Precinct seeks to provide additional housing / employment within a convenient walking distance to the Showground Metro Station. This would deliver a further 10,000m$^2$ of commercial floorspace along with 5,000 dwellings and 8,640 jobs by the year 2036.

The development of the Transport Plan has been based on extensive traffic assessments of the traffic generated by the redeveloped Showground Station Precinct along with increased background traffic demands generated by additional growth in surrounding areas including the Castle Hill Industrial Precinct which includes the subject site.

The area included in the assessment of additional traffic / transport demands on the network in the Transport Plan is shown below in **Figure 5**.

**Figure 5 - Showground Station Precinct Transport Plan Land Development Boundary**




The Transport Plan developed future traffic generated trips of *redevelopment of all land holdings in the precinct* which are shown below:

*A summary of the quantum of peak hour travel demand in the Precinct is provided in Table 8. This is based on the assumed take up of development within the Precinct. The planning controls proposed in this planning proposal allows for greater yields to be developed and so any additional take up will need to be further assessed to understand the impact on the transport network.*

**Table 8 Travel demand**

| Land use | Peak hour trips |
|---|---|
| Total peak hour trips | 7,900 trips |
| Trips from precinct | 2,600 trips |
| Trips to precinct | 4,950 trips |
| Trips within precinct | 350 trips |

It is noted that the Transport Plan developed traffic generation forecasts generated by the redevelopment of the precinct and acknowledged that even greater yield than that which is currently zoned is permitted in the plan with investigations necessary to gauge the impacts of the additional yield.

On matters relating to traffic and transport network improvements the following is noted:

### *3.1.1 Intersection Upgrades*

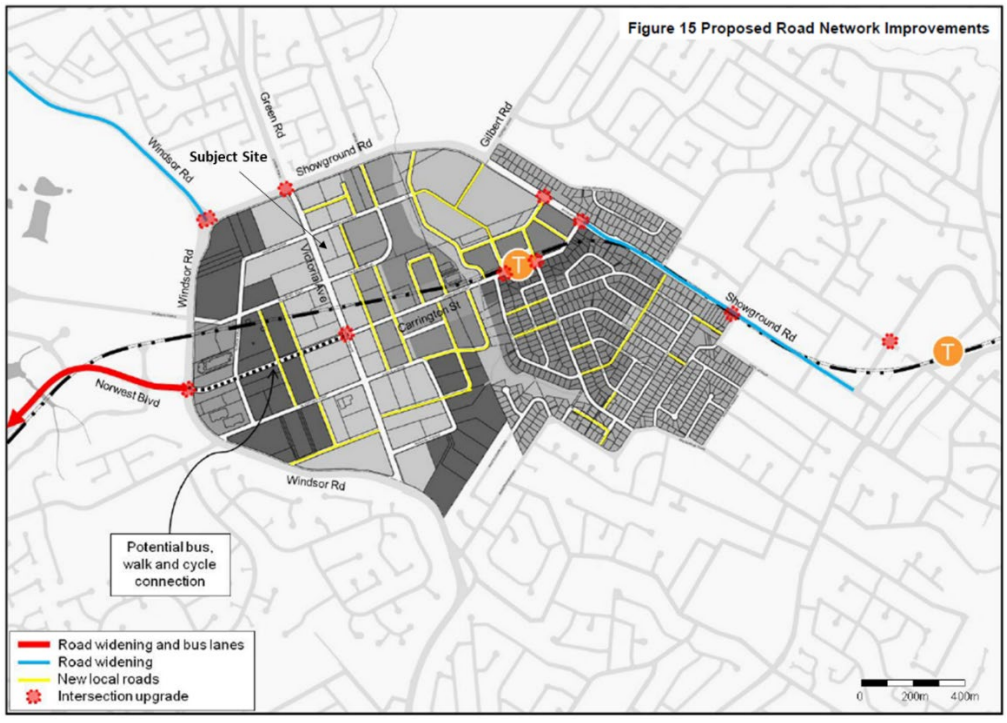
The Transport Plan included the following recommendations:

*To support the Precinct planning proposal, the following steps are recommended:*

- *Adoption of the future transport framework outlined in this transport plan and illustrated in the figure on the following page;*
- *Staged delivery of transport initiatives consistent with the staging of development and subregional growth, evolving travel patterns and further informed by detailed technical studies supporting future development applications;*
- *Monitoring transport system performance over time as detailed development applications are prepared and development proceeds; and*
- *Ongoing collaboration with Council to ensure urban renewal objectives are achieved and transport needs are accommodated.*

To accommodate the identified redevelopment of the Showground Station Precinct (and redevelopment of the subject site) the Transport Plan identified the following road / intersection improvement strategy as shown in **Figure 6**.

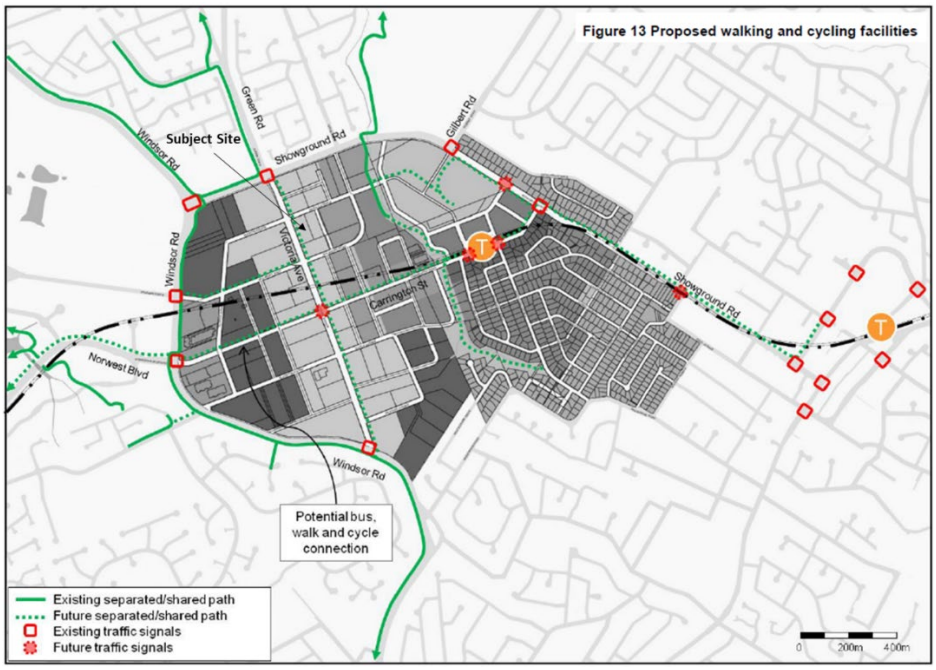
**Figure 6 – Transport Plan Recommended Road / Intersection Improvements**



### 3.1.2 Improved Pedestrian / Cycling Facilities

The emphasis of creating a network of pedestrian / cycling facilities to provide a permeable safe and functional precinct for alternative modes is evident in the extensive improvement in pedestrian / cycling networks recommended below from the Transport Plan as shown in **Figure 7**.

**Figure 7 – Transport Plan Recommended Pedestrian / Cycling Network Improvements**




Of note the Transport Plan would deliver an off-road shared pedestrian / cycling path along the frontage of the development site within Victoria Avenue.

The report made the following conclusion:

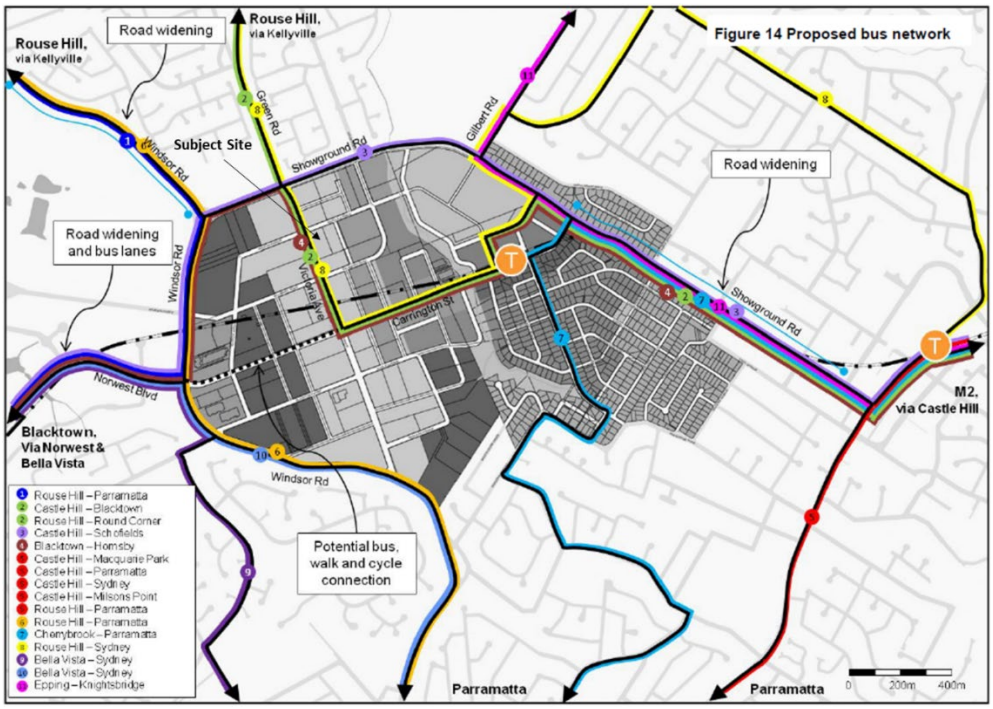
*The proposed cycle network will:*
*Facilitate local and subregional trips within and surrounding the Precinct through a complete network of separated/shared paths and local streets.*
*Provides the main cycle network structure that will be further developed and integrated with fine grain road network that supports residential, commercial, retail and other business land uses.*
*Capitalise on the investment for the Metro Northwest by providing safe cycling links to the station and the provision of end of trip facilities at the station.*
*Provide an alternate to vehicle travel in the local area to reduce the pressure on the local, sub arterial and arterial roads surrounding the precinct.*
*Help deliver the cycle network that connects to major centres as outlined in Sydney's Cycle Future*

### 3.1.3 Improved Bus Networks

Despite the already convenient access the subject site would enjoy to existing bus services in and around the precinct, the Transport Plan would seek to deliver even greater levels of bus service accessibility with Victoria Avenue / Carrington Road identified as the key road corridors to provide enhanced bus services.

The markedly enhanced bus service / infrastructure plan which would be delivered by the Transport Plan is shown below in **Figure 8**.

**Figure 8 – Transport Plan Recommended Bus Network Improvements**




These improvements include a new transit corridor along Victoria Avenue / Carrington Street providing direct high frequency bus services past the subject site.

The report made the following conclusion:

*The proposed bus network will:*
*Provide greater land use and transport integration for the Precinct. It will facilitate subregional and regional connections to other transport modes and to areas not serviced by rail.*
*Maximise investment in the Metro Northwest through providing public transport integration and facilitation/encouragement of multi-modal trips.*
*Provide a good level of bus service and coverage for residents, businesses and visitors of the Precinct. This means the area will have an equitable transport system for all customers.*
*Provide **22 buses per hour on Carrington Road and Victoria Avenue** during peak periods servicing Showground Station.*

### *3.1.4 Car Parking Provision*

The Transport Plan acknowledged the role parking provision plays as a travel demand management tool and highlighted the existing parking rates for non-residential (commercial / retail) and residential uses within the Hills Shire LGA were markedly higher than other regional centres of a comparable scale (once Showground Station Precinct was completed).

The Transport Plan noted the following:

*In Council's preparation of relevant development controls for the Precinct, it is recommended that car parking controls be reviewed to reflect the significant increase in public transport accessibility.*

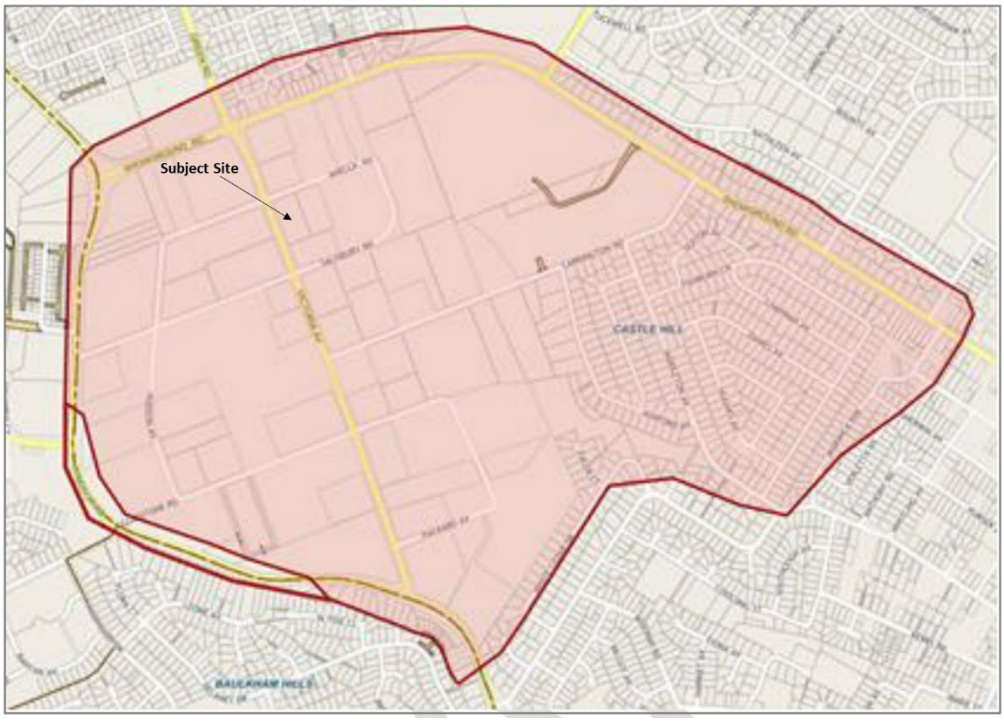
## 3.2 Castle Hill Precinct Modelling Study – Hills Shire Council / Transport for NSW

In partnership with Transport for NSW (formally Roads and Maritime Services) the Hills Shire Council commissioned in 2019 area wide modelling studies of key precincts within the Hills Local Government Area (LGA) including the Norwest Precinct / Showground Station Precinct and Castle Hill Town Centre.

The purpose of the modelling assessment study was to ascertain initially the existing traffic and transport conditions within the precinct and then scenario test three (3) development yield scenarios within the precinct to gauge the future infrastructure requirements across the transport networks to accommodate forecast demands of such development increases.

The area to be included in the area wide modelling assessment of additional development yield within the Showground Station Precinct and surrounds is shown below in **Figure 9**.

**Figure 9 – Showground Station Precinct Area Wide Modelling Assessment Boundary**



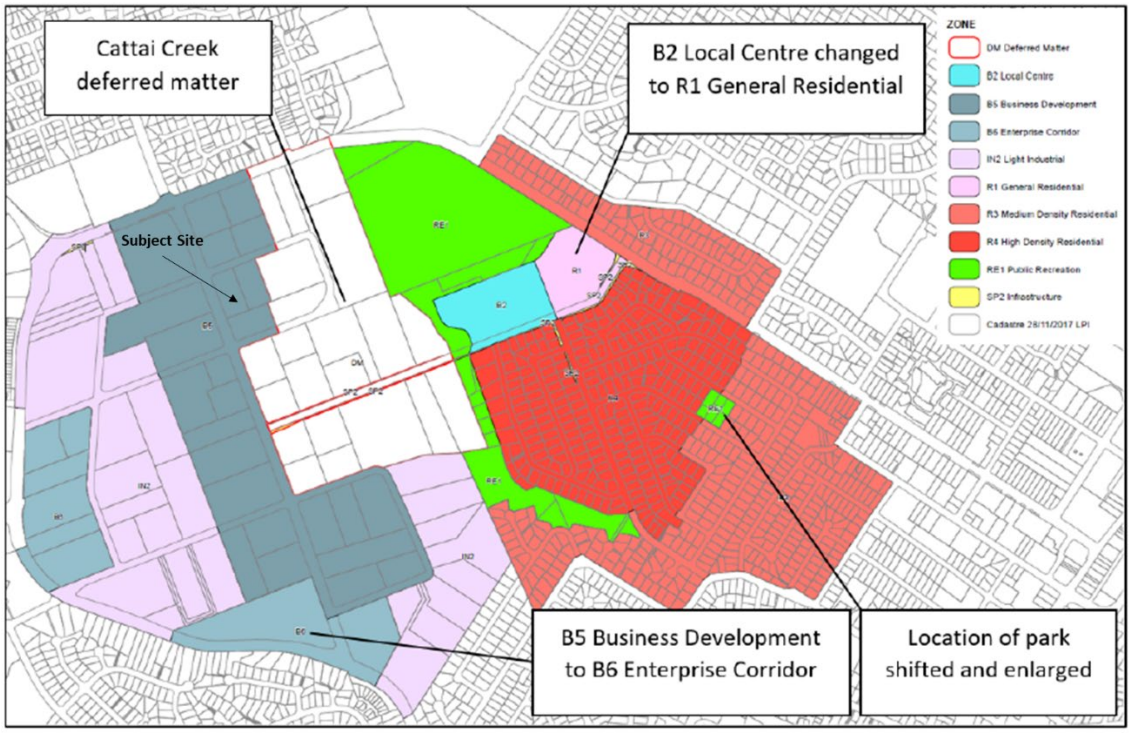
The above confirms that redevelopment of the subject site (and three development yield scenarios on an area wide basis) is currently being assessed by both Hills Shire Council / Transport NSW to develop a holistic transport infrastructure improvement program for developments within the precinct to contribute to in the future.

At the time of preparing this report the final findings of the area wide modelling study were not available to the public. Consultation with Council representatives confirmed that this study is still ongoing and no additional information on the recommendations of the study are available for referral in this report.

### 3.3 Showground Station Precinct Finalisation Report – NSW Planning & Environment December 2017

The purpose of this report was to provide a summary / recommendations for the final zoning arrangements of the Showground Station Precinct which includes the subject site. The draft rezoning of the precinct was subject to extensive community / stakeholder consultation following which minor changes were made to the exhibited plan which in turn resulted in the following zoning arrangements for the precinct as shown below in **Figure 10**.

**Figure 10 – Showground Station Precinct Final Zoning Plan**




On matters regarding parking provision and in response to concerns raised during the consultation period, the report recommended that a parking strategy for the precinct be considered to reduce the reliance on private vehicles for travelling to, from and within the precinct.

### 3.4 Victoria Avenue Corridor Castle Hill – Intersection Upgrade Traffic Impact Assessment Report – Thompson Stanbury & Associates June 2017

This corridor traffic impact assessment study commissioned by Hills Shire Council investigated and prepared recommendations for future intersection improvements along the Victoria Avenue corridor including:

- Alterations to the signalised traffic control at the intersection of Showground Road and Victoria Avenue;
- Signalisation of the intersection of Victoria Avenue and Hudson Avenue/Anella Avenue;
- Signalisation of the intersection of Victoria Avenue and Salisbury Road; and
- Signalisation of the intersection of Victoria Avenue and Carrington Road.

The traffic report included morning / afternoon weekday intersection counts at all intersections noted above to ascertain existing intersection performance conditions. A comparison of the existing intersection operating conditions versus the future conditions following implementation of the improvements detailed above is provided below from the report.

**Existing Intersection Performance**

TABLE 2
SIDRA NETWORK MODELLING ANALYSIS
EXISTING CONDITIONS FOR EXISTING INTERSECTION TRAFFIC CONTROL

| Intersection | AM Peak | PM Peak |
|---|---|---|
| **Showground Rd & Green Rd/Victoria Av** | | |
| Average Vehicle Delay | 46.0 | 60.2 |
| Degree of Saturation | 0.84 | 0.90 |
| Level of Service | D | E |
| **Victoria Av & Anella Av /Hudson Av** | | |
| Average Vehicle Delay | 6.1 | 7.9 |
| Degree of Saturation | 0.41 | 0.63 |
| Level of Service | A | A |
| **Victoria Av & Salisbury Rd** | | |
| Average Vehicle Delay | 6.3 | 9.5 |
| Degree of Saturation | 0.38 | 0.85 |
| Level of Service | A | A |
| **Victoria Av & Carrington Rd** | | |
| Average Vehicle Delay | 8.8 | 10.7 |
| Degree of Saturation | 0.71 | 0.69 |
| Level of Service | A | A |

**Future Intersection Performance**

TABLE 3
SIDRA NETWORK MODELLING ANALYSIS
PROJECTED TRAFFIC CONDITIONS FOR SIGNALISED INTERSECTIONS

| Intersection | AM Peak | PM Peak |
|---|---|---|
| **Showground Rd & Green Rd/Victoria Av** | | |
| Average Vehicle Delay | 59.0 | 78.3 |
| Degree of Saturation | 1.05 | 1.12 |
| Level of Service | E | F |
| **Victoria Av & Anella Av /Hudson Av** | | |
| Average Vehicle Delay | 32.4 | 36.7 |
| Degree of Saturation | 0.52 | 0.71 |
| Level of Service | C | D |
| **Victoria Av & Salisbury Rd** | | |
| Average Vehicle Delay | 27.3 | 38.6 |
| Degree of Saturation | 0.58 | 0.91 |
| Level of Service | B | C |
| **Victoria Av & Carrington Rd** | | |
| Average Vehicle Delay | 34.8 | 37.9 |
| Degree of Saturation | 0.90 | 0.92 |
| Level of Service | C | C |

From the tables above it is noted that signalisation of intersections in the precinct, to achieve an overall improvement of conditions for non-private vehicle modes, did result in diminished intersection operating conditions at *all* intersections modelled. However, all internal intersections along the Victoria Avenue corridor continued to function at a satisfactory level of service in the future. In addition, the provision of traffic signals at the intersections would significantly improve pedestrian connectivity across Victoria Avenue.

### 3.5 Norwest Strategic Plan (Council Endorsed Nov 2022)

The area encompassed by this Council endorsed plan is shown below in **Figure 11**.

**Figure 11 – Norwest Strategic Plan Boundaries**

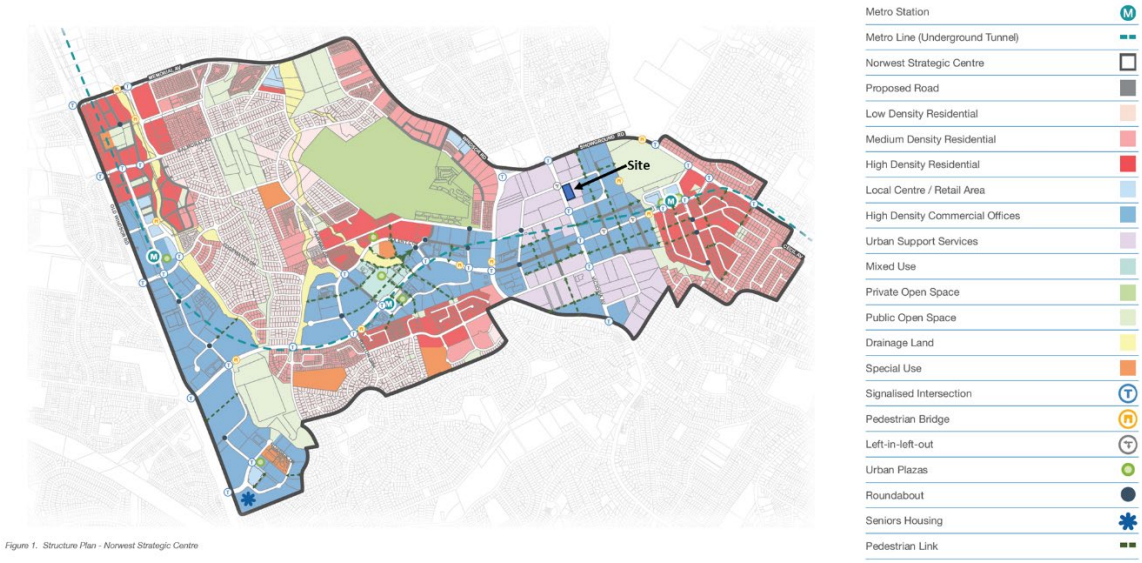



Figure 1. Structure Plan - Norwest Strategic Centre

The purpose of this plan was to

- *Address the principles and actions identified for Strategic Centres within the Greater Sydney Region Plan and Central City District Plan and strengthen each of the Strategic Centres.*
- *Engage and discuss with the community and stakeholders about how the Strategic Centre will grow and evolve into the future.*
- *Establish a clear vision and parameters to guide medium to longer term growth for key strategic locations.*
- *Create a structure for urban development that is place based, resolves competing issues and gives certainty and confidence to Council, the local community, developers and businesses.*
- *Inform changes to planning controls to facilitate implementation of planned outcomes in the short term.*
- *Identify the need for any new or additional infrastructure to support the anticipated growth and inform associated discussions with the NSW Government.*[1]

As summarised in Section **3.2** above, the Castle Hill Precinct Modelling Study is included in the area wide modelling of the boundaries of the plan as a whole. The assessment is expected to be finalised in 2023 and will inform infrastructure planning and future reviews of relevant development controls.

The subject site is located within Focus Area 9 of the strategic plan which has been identified as an area for Protecting and Encouraging Urban Services. This is shown in **Figure 12**.

[1] The Hills Shire Council Draft Precinct Plan Norwest Strategic Centre

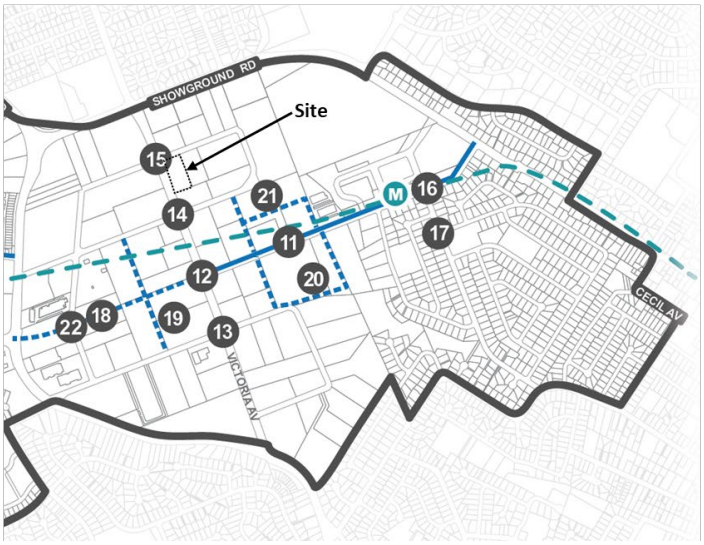
**Figure 12 – Norwest Strategic Plan Focus Areas**

A number of "Focus Areas" have been identified for the Precinct. These build on the planning work completed to date and guide the achievement of the vision for the Precinct. These outcomes are reflected in the vision and structure plan in **Section 6.4** of this Precinct Plan.


The plan reaffirms the background report summaries provided above where in the vicinity of the site the intersection of Victoria Avenue / Anella Avenue will be converted from a dual lane roundabout to a left in / left out intersection with Victoria Avenue / Salisbury Road intersection signalised as shown below in **Figure 13**.

**Figure 13 – Recommended Intersection Changes Adjacent to Development Site**

| | | |
|---|---|---|
| 14 | Signalisation of Victoria Avenue and Salisbury Road intersection | Council |
| 15 | Victoria Avenue / Hudson Avenue (left-in and left-out) | Council |



### 3.6 Commentary on Historical Reporting

As confirmed above, the publicly available historical traffic, planning and policy reports undertaken for the Showground Station Precinct to underpin future infrastructure provision in the vicinity of the subject site, all have included the potential redevelopment of the subject site. Further, the area wide planning for the future of the precinct as sought to ensure that the redevelopment of the precinct with increased development would allow provision of high-quality networks for all non-private vehicle modes guided by an appropriate contributions plan.

This plan would seek to deliver holistic improvements over time as sites development moving away from single site fragmentary infrastructure improvements which provide both little initial benefits and which do not consider the holistic preferred outcomes for the precinct.

This is discussed further below in **Section 5** of this report.

## 4. The Proposed Development

The key components of the planning proposal are to seek the following development outcome subject to a future development application:

- Redevelopment of the subject site to provide the following mixed-use elements:
  - Bulky Goods Showrooms (Specialised retail premises) – 2 levels (3,962m$^2$).
  - Café (Food and Drink premises) - 1 level (693m$^2$).
  - Car Showroom (Vehicles Sales or Hire premises) – 3 levels (3,287m$^2$).
  - Car Servicing/Repairs (Vehicle Repair Station) Ground level (431m$^2$).
  - Childcare Centre (Centre-based childcare facility) - 1 (upper) level (1,838m$^2$) with 1,596m$^2$ of outdoor space.
  - Gymnasium (Recreation Facility(Indoor)) – 1 level (2,271m$^2$).
  - Medical Centre (Health Services facility) – 1 level (1,260m$^2$).
  - Carparking for **339** vehicles. Including 20 bicycles, 12 motorbikes, and 19 accessible spaces.
  - 23 spaces for childcare centre parents / visitors
  - 19 spaces for childcare staff
  - 29 spaces for medical centre visitors
  - 19 spaces for medical centre staff
  - 121 spaces for retail areas
  - 25 spaces for vehicle showroom
  - 13 spaces for vehicle servicing
  - 90 spaces for indoor recreational areas
- An interconnected carpark which allows for dual use of on-site parking spaces for different components of the development during their respective peak operating periods.
- Single entry / exit driveway access from Victoria Avenue which has been located as far south as possible from the intersection with Anella Avenue.
- Single entry / exit driveway in Anella Avenue which also provides access to the on-site loading dock.
- Single entry / exit driveway to existing right of way of the adjacent site which also includes existing entry / exit driveway access in Anella Avenue.
- Overall increase in FSR to 1.98:1 versus current zoning of 1:1.

Plans of the potential development which would be achieved with the planning proposal can be found in **Appendix A** of this report.

# 5. Potential Traffic Impacts

## 5.1 Introduction

The following presents an assessment of the potential traffic impacts of the proposal using the Roads and Traffic Authority Guide to Traffic Generating Developments standard approach.

## 5.2 Planning Proposal Potential Traffic Generation

The following traffic generation rates have been applied to the elements of the planning proposal:

**Bulky Goods Retail**

The RMS Technical Direction 2013-04a recommends the following traffic generation rates for bulky goods retail:

- 2.7 vehicles per 100m$^2$ of GFA on a weekday peak hour (noting morning site peak hour traffic generation does not generally coincide with the network peak hour
- 3.9 vehicles per 100m$^2$ of GFA on a weekend peak hour

Applying the above traffic generation rates to the bulky goods retail component would equate to **107** weekday peak hour trips and **144** weekend peak hour trips two way.

**Cafe**

The nature of the development is such that it is not expected that the onsite café would be a major traffic generator in its own right but a use which is accessed via linked trips to major uses at the site including the bulky goods retail, medical centre and to a lesser extent the motor showroom.

The RTA Guide to Traffic Generating Developments indicates that a 'restaurant' use in terms of traffic generation as:

*Restaurant: a refreshment room where food is served to customers. It can either be licensed or unlicensed and can include **cafes**, tea rooms, eating houses or the like.*

The guide suggests the following traffic generation rates:

- Evening peak hour vehicle trips = 5 per 100 m$^2$ gross floor area.
- Daily vehicle trips = 60 per 100m$^2$ gross floor area.

Therefore, the proposed café of 693m$^2$ could be expected to generate **35** evening vehicle trips.

However, to account for this use having similar demands as the retail during Thursday evening and Saturday morning periods, another method of calculating the potential traffic generation would be to apply the 'speciality shop' rate of the disaggregated RTA Guide for retail uses which for a Thursday evening and Saturday morning are presented below:

*Thursday:*
*V(P) = 20 A(S) + 51 A(F) + 155 A(SM) + 46 A(SS) + 22 A(OM)*
*(vehicle trips per 1000m²).*

*Saturday:*
*PVT= 38 A(S) + 13 A(F) + 147 A(SM) + 107 A(SS)*
*(vehicle trips per 1000m²).*

where:

- A(S): Slow Trade gross leasable floor area (Gross Leasable Floor Area in square metres) includes major department stores such as David Jones and Grace Bros., furniture, electrical and whitegoods
- stores.
- A(F): Faster Trade GLFA - includes discount department stores such as K-Mart and Target, together with larger specialist stores such as Fosseys.
- A(SM): Supermarket GLFA - includes stores such as Franklins and large fruit markets.
- A(SS): Specialty shops, secondary retail GLFA - includes specialty shops and take-away stores such as McDonalds. These stores are grouped as they tend to not be primary attractors to the centre.
- A(OM): Office, medical GLFA: includes medical centres and general business offices.

Applying the above rates would equate to **32 trips** in the Thursday evening and **74 trips** during a Saturday morning. To provide a conservative estimate of traffic generation these rates have been adopted.

**Car Showroom + Car Servicing/Repairs**

The RTA Guide provides the following definition for a 'motor showroom':

*A motor showroom is a building or place used for the display and sale of motor vehicles, caravans or boats, and where accessories for these items are sold or displayed. Vehicle servicing facilities may be included as part of the development.*

For the motor showroom, the RTA Guide suggests the following traffic generation rate:

- Evening peak hour vehicle trips = 0.7 per 100m² site area.

In this instance the 'site area' has been assumed to be area of this component of the development which would result in an evening peak hour traffic generation of **26 trips**.

**Child Care Centre**

At this early stage of planning for the site, the number of children which may occupy the proposed childcare centre is unknown. The RTA Guide suggests the following rates:

| Centre Type | Peak Vehicle Trips / Child | | |
|---|---|---|---|
| | 7.00-9.00am | 2.30-4.00pm | 4.00-6.00pm |
| Pre-school | 1.4 | 0.8 | - |
| Long-day care | 0.8 | 0.3 | 0.7 |
| Before/after care | 0.5 | 0.2 | 0.7 |

Further, the planning proposal includes a total of **42 spaces** for the childcare centre (19 spaces for staff and 23 spaces for parents / visitors). Applying Council's DCP parking rate for a childcare centre of 1 space per employee plus 1 space per 6 children enrolled for visitors and/or parent parking would equate to **19** staff and **138** children.

The resulting traffic generation rate of the long day care centre would be:

- 7:00am – 9:00am: **110 trips**
- 2:30pm – 4:00pm: **42 trips**
- 4:00pm – 6:00pm: **97 trips**

**Indoor Recreation Facility**

At this stage of planning for the site, the type of recreational use which may occur is not strictly known and would be known as part of any future development application. Further, the type of recreational use which may be housed within the areas identified for such uses has a marked impact on the potential peak hour traffic generation of these areas and when such traffic generation occurs.

As an example, a gymnasium typically generates traffic prior to the AM peak but also during the PM road network peak with much smaller demands occurring during the early hours of a Saturday. In comparison, an indoor facility such as a play centre or trampoline centre generates little traffic during both the AM and PM road network peaks with the majority of traffic generated through day on weekends or later Friday evenings.

The 90 spaces allocated to these areas can provide an indication of potential traffic generation assuming a range of uses within the spaces. Allowing for say 20% of the spaces occupied by staff, a conservative estimate of peak hour traffic generation during the weekday afternoon peak and Saturday would be 80% turnover of the remaining 70 spaces or 56 trips inbound and outbound (112 trips two way). This traffic generation has been adopted for this preliminary assessment of potential impacts.

**Medical Centre**

On the basis that the medical centre operated as an 'extended hours' medical centre, the RTA Guide to Traffic Generating Developments does not explicitly provide peak hour traffic generation rates. However, from the survey data of existing medical centres to inform the guide, the following is stated:

During the Monday evening peak period the mean peak vehicle trip generation rate was 8.8 veh/hr/100 m$^2$ gross floor area. In the morning period of 9.00 am to 12.00 pm the mean peak vehicle trip generation rate was 10.4 veh/hr/100 m$^2$ gross floor area.

Of note, the medical centre would likely areas / rooms which house medical machinery and would not generate large volumes of visitors. Further, the parking allocation for the medical centre as per the DCP is 48 spaces (29 spaces for visitors / 19 spaces for staff).

If the average rate of the guide was applied to the medical centre as a whole, this would equate to **111** trips in the morning period and **131** trips in the evening period which considering the available parking provision would be unlikely.

A more realistic estimate of traffic generation would be the assumption that all visitor spaces turned over twice per hour in the AM and PM peak hours. This would equate to 58 trips in both peak periods. Having regard to the disaggregated formula for a shopping centre which includes a medical centre, the guide suggests a rate of 22 trips per 1,000m$^2$ GFA during the evening peak or in the case of the proposed medical centre **28 trips**.

Overall, 58 trips in both the weekday AM and PM peak periods has been adopted for the medical centre component.

**Total Traffic Generation**

In summary, the potential traffic generation of the planning proposal is summarised below in **Table 2**.

**Table 2 - Planning Proposal Total Potential Traffic Generation**

| Use | Weekday AM Peak | Weekday PM Peak | Weekend AM Peak | Weekend PM Peak |
|---|---|---|---|---|
| Bulky Goods | 11* | 107 | 144 | 15** |
| Cafe | 4*** | 32 | 74 | ***8 |
| Car Showroom + Car Servicing/Repairs | 6**** | 26 | 6**** | 0 |
| Child Care Centre | 110 | 97 | 0 | 0 |
| Indoor Recreation | 21***** | 112 | 112***** | 21***** |
| Medical Centre | 58 | 58 | 12****** | 12****** |
| **Potential Total** | **214** | **432** | **348** | **56** |

*Assumed 10% of weekday PM peak hour generation to account for staff travel
**Assumed 10% of weekend AM peak hour generation to account for staff travel
***Assumed 10% of peak hour traffic generation to account for staff travel
****Assumed 20% of peak hour traffic generation to account for staff travel
*****Assumed 10% of peak hour traffic generation
******Assumed 20% of peak hour traffic generation

Therefore, accounting for the existing site traffic generation detailed above in Section **2.2**, the following presents a summary of the potential *net* traffic generation of the site on the basis the planning proposal is delivered. Therefore, for some 2,000m$^2$ of mixed retail floorspace (assuming GFA represents GLFA), the existing site is estimated to generate some **88** peak hour trips in the

Thursday PM peak and **110** peak hour trips in the Saturday AM peak. Further, 20% of these trips would occur during the opposite peak each day to account for staff travel.

**Table 3 - Planning Proposal Total *Net* Potential Traffic Generation**

| Use | Weekday AM Peak | Weekday PM Peak | Weekend AM Peak | Weekend PM Peak |
|---|---|---|---|---|
| **Potential Total** | **196*** | **344** | **238** | **34*** |

*Assumed 20% of existing weekday AM / PM peak hour traffic generation is staff travel

## 5.3 Comparison with Existing Zoning Potential Traffic Generation

As stated above the planning proposal is seeking an overall FSR 1.98:1 compared to the current zoning of 1:1. That is, the FSR of the existing zoning equates to some 51% of the FSR which would be achieved by the planning proposal.

Comparing the proportion reduction in yield of the proposal to account for the existing zoning to in turn calculate the traffic generation of the site, the following presents the resulting yield:

**Table 4 - Comparison of Potential Development of Planning Proposal FSR vs Current Zoning FSR**

| Use | Planning Proposal FSR 1.98:1 | Current Zoning FSR 1:1 | |
|---|---|---|---|
| | Size / No. | Size / No. | Difference |
| Bulky Goods | 3,962m$^2$ | 2,021m$^2$ | +1,941m$^2$ |
| Cafe | 693m$^2$ | 353m$^2$ | +340m$^2$ |
| Car Showroom + Car Servicing/Repairs | 3,718m$^2$ | 1,897m$^2$ | +1,821m$^2$ |
| Child Care Centre | 138 children | 71 children | + 67 children |
| Indoor Recreation | 2,271m$^2$ | 1,519m$^2$ | +680m$^2$ |
| Medical Centre | 1,260m$^2$ | 643m$^2$ | +617m$^2$ |

Applying the *same* traffic generation rates to the current zoning potential yield by use would equate to the following weekday / weekend day site traffic generation.

**Table 5 – Current Zoning Potential Development Estimated Site Potential Traffic Generation**

| Use | Weekday AM Peak | Weekday PM Peak | Weekend AM Peak | Weekend PM Peak |
|---|---|---|---|---|
| Bulky Goods | 6* | 53 | 71 | 8** |
| Cafe | 2*** | 16 | 37 | 4*** |
| Car Showroom + Car Servicing/Repairs | 3*** | 13 | 3*** | 0 |
| Child Care Centre | 54 | 48 | 0 | 0 |
| Indoor Recreation | 11 | 55 | 55 | 11 |
| Medical Centre | 29**** | 29 | 6***** | 6***** |
| **Potential Total** | **105** | **214** | **172** | **29** |

*Assumed 20% of weekday PM peak hour generation to account for staff travel
**Assumed 20% of weekend AM peak hour generation to account for staff travel
***Assumed 10% of peak hour traffic generation to account for staff travel
**** % difference in floorspace applied to 58 trips per peak
***** Assumed 20% of weekday peak hour traffic generation

Using the same approach described above, accounting for the *existing* site traffic generation, the following presents the estimated *net* site traffic generation increase on the basis the site was developed under its *current zoning* (FSR of 1:1) and assuming the same uses.

**Table 6 – Current Zoning Total *Net* Potential Traffic Generation**

| Use | Weekday AM Peak | Weekday PM Peak | Weekend AM Peak | Weekend PM Peak |
|---|---|---|---|---|
| **Potential Total** | **88*** | **126** | **62** | **7*** |

*Assumed 20% of existing weekday AM / PM peak hour traffic generation is staff travel

Thus, the potential *net* difference in site traffic generation of the *planning proposal* compared to a similar development under the *current zoning* is shown below in **Table 7**.

**Table 7 - Planning Proposal Total Additional *Net* Potential Traffic Generation Compared to Existing Zoning**

| Use | Weekday AM Peak | Weekday PM Peak | Weekend AM Peak | Weekend PM Peak |
|---|---|---|---|---|
| **Potential Total** | **108*** | **218** | **176** | **27*** |

*Assumed 10% of existing weekday AM / PM peak hour traffic generation is staff travel

## 5.4 Commentary on Potential Traffic Impacts of the Planning Proposal

Given the extensive traffic / planning reporting undertaken for the precinct along with the impending Norwest Precinct / Showground Station Precinct Council commissioned area wide traffic studies undertaking single intersection site specific assessment/s of the potential impacts of the change in potential yield the proposal would achieve is not considered a strictly necessary requirement for an informed decision to be made on the planning proposal on traffic grounds alone.

Ultimately the planning for the Showground Station Precinct seeks to provide an interconnected non-private vehicle network throughout the precinct complimented by markedly improved higher frequency public transport options directly accessible by those wishing to travel to / from the development site.

On the matter of potential impacts the 2036 forecast traffic volumes for Victoria Road / Carrington Road roundabout were provided for refence. These are shown below in **Figure 14** to **Figure 15**:

**Figure 14 – Showground Road / Victoria Avenue 2036 PM Peak Forecast Volumes**

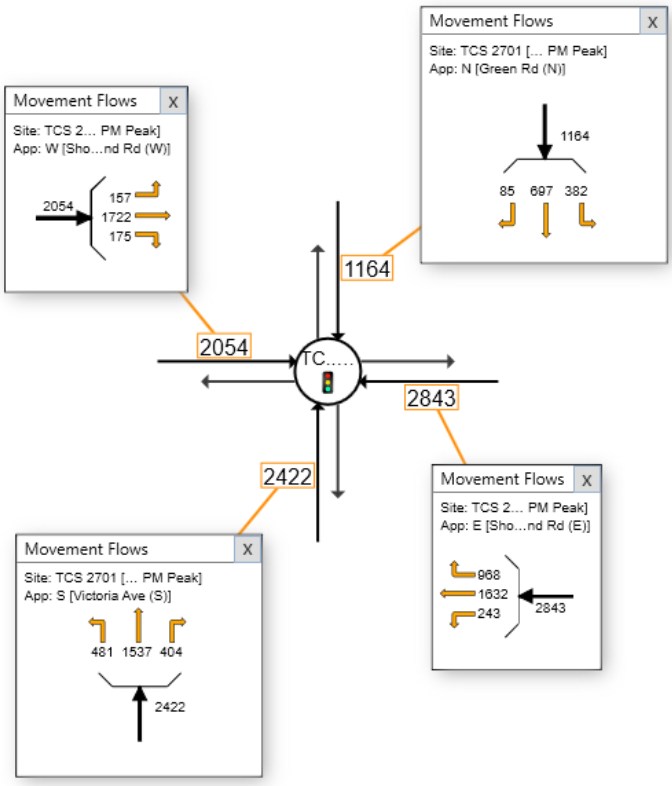
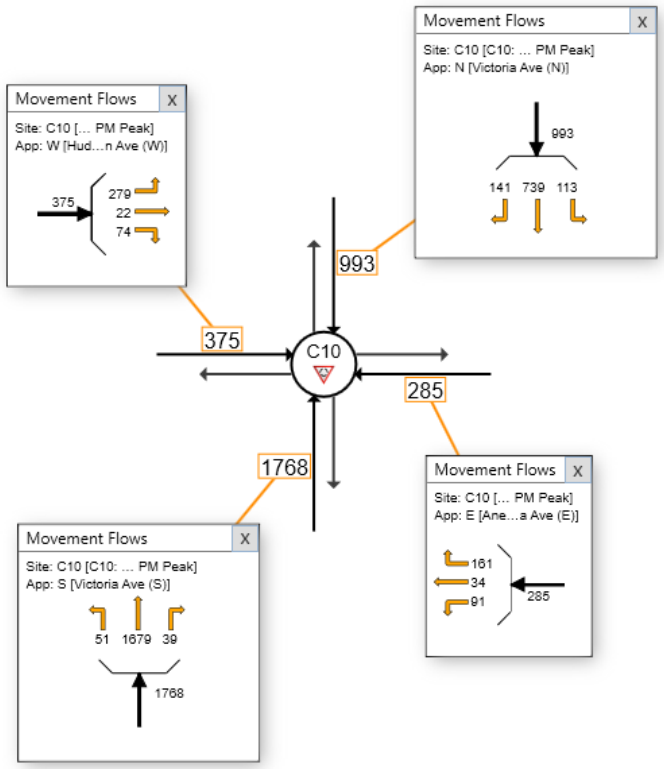
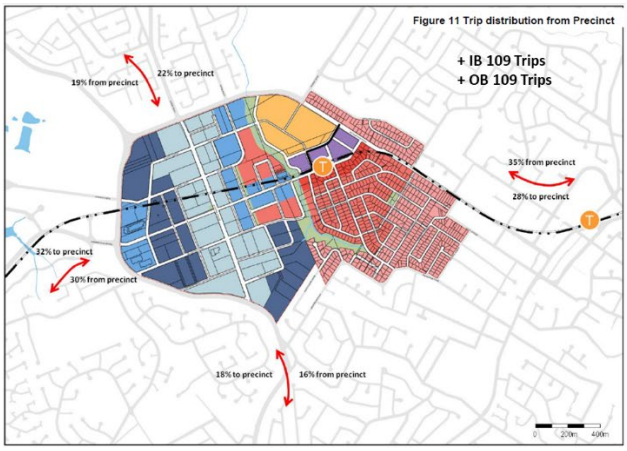


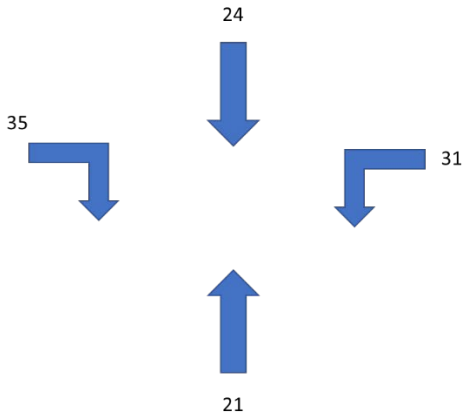

**Figure 15 –Victoria Avenue / Anella Avenue 2036 PM Peak Forecast Volumes**



As confirmed above the traffic volumes in Victoria Avenue near the site in are some **3,586** two way in the PM Peak in 2036 (on a weekday). This has been adopted for a Thursday evening peak

SIDRA assessment of the intersections of Showground Road / Victoria Avenue and Victoria Avenue / Anella Avenue (converted from roundabout to traffic signals in 2036) for 2036 PM peak conditions *with* and *without* the traffic generated by the planning proposal is presented below. The distribution of the net generated trips through these intersections has *mirrored* the identified distribution of trips in the Transport for NSW report[2] which is shown below for ease of reference.




Net traffic generated by the planning proposal travelling *south* to Windsor Road would *not pass* through the above intersections and would utilise the left in / left out driveways in Victoria Avenue to exit the site. Traffic generated would utilise other routes of travel including Carrington Road, Victoria Avenue south and Windsor Road.

**Table 8 – 2036 Intersection Operating Conditions with and without Planning Proposal**

| Intersection | 2036 Without PP | | 2036 With PP | |
|---|---|---|---|---|
| | LOS | Delay | LOS | Delay |
| Showground Rd / Victoria Ave | F | 456.4 | F | 450.9 |
| Victoria Ave / Anella Ave | A* | 4.6 | A | 4.6 |

*Hudson Ave / Anella Avenue left in / left out only at Victoria Ave in the future

From **Table 8** above it is noted that with some increased traffic generated by the planning proposal and a slight change to the balance of approach volumes at the intersection of Showground Road / Victoria Avenue, there is a slight improvement to average delay although it would remain at LOS F. Therefore, the impacts of the additional traffic on intersection performance conditions in the future would be negligible and would not result in significant different conditions to that which was anticipated to occur in 2036. Overall, the increase in traffic demands during a Thursday evening peak would be considered acceptable.

[2] Showground Station Precinct Redevelopment Transport Plan – Transport for NSW

Copies of all SIDRA outputs are provided in **Appendix C** of this report.

# 6. Parking and Access Review

## 6.1 Council DCP Parking Provision

The following presents an assessment of Council DCP parking requirements for the site.

**Bulky Goods Retail Component**

Hills Shire Council DCP includes a parking rate of 1 space per 40m$^2$ for bulky goods retail which would equate to a need for **99** parking spaces for this component of the planning proposal. The potential design plans provided in **Appendix A** of this report propose a parking provision of **121** spaces for retail parking including bulky goods retail or an excess of **22 spaces** over and above the DCP requirements.

**Cafe**

The DCP requires the following for a café use located within a retail complex as would be the case for the subject planning proposal:

- 1 space per 18.5m$^2$ of GLFA.

The proposed food and beverage areas of the development would not be significant generators in their own right and rely on passing trade generated by other uses. In this instance and on the basis that *no dual use* of parking was adopted, the remaining 23 spaces for this component of the retail parking allocation would equate some 425.5m$^2$ GLFA. Taking into account kitchen areas, walls, stairwells, hallways and amenities it would be expected that this would reflect the potential GLFA of the food and beverage uses with a total combined area 693m$^2$ across two separate premises.

Of note, as is often the case for complimentary uses such as the bulky goods retail / food and beverage areas linked trips occur which in turn reduce parking provision when considering each use separately as has been undertaken above. That is, dual use parking occurs where two trips generate only one vehicle parked.

The parking allocation for the food and beverage uses presents as appropriate at this stage of the planning for the development site and refinement of these areas which accounts for both separate and dual use of parking provision should be included in any future development applications.

**Car Showroom + Car Servicing/Repairs**

Council's DCP does not provide any parking rates for a vehicle showroom. For a separate vehicle repair premises, the DCP suggests a rate of 1 space per 2 employees, plus 6 spaces per work bay which is not considered applicable in this instance as vehicle servicing forms part of the overall car showroom proposal. Further, the number of work bays is not known at this early stage of a planning proposal.

The RTA Guide to Traffic Generating Developments recommends a rate of customer / visitor car parking the rate of 0.75 spaces per 100m$^2$ of site area. Assuming site area in this mixed use development is GFA, this would equate to **28 spaces**.

With a total parking allocation for the vehicle showroom / servicing of **38 spaces**, the parking provision would allow for two (2) service bays with the remainder set aside for showroom customer parking.

**Child Care Centre**

As stated above, the childcare centre capacity is not known as this early stage planning proposal but has been assumed to have 19 staff and 138 children. Applying the DCP rate of 1 space per employee plus 1 space per 6 children enrolled for visitors and/or parent parking, this would require **42 spaces** which has been allocated in the preliminary design for the site and would be considered satisfactory.

**Indoor Recreational Facility**

As stated above, the indoor recreational spaces can accommodate a variety of recreational uses of which would have a range of parking demands at different times. That is, parking demands which may coincide with say bulky good retail demands on a Saturday (indoor play centre) or parking demands after peak operation of the vehicle showroom, vehicle repair centre.

As an example, applying Councils DCP space per GFA rate of 1 space per 25m$^2$ GFA to the areas proposed assuming a 'gymnasium' would require **90 spaces** which would be catered for in the allocated 90 spaces for this component of the site.

**Medical Centre**

Council's DCP parking rates are based on both the number of consulting rooms present and the number of staff. These rates are:

- 3 spaces per consulting room plus 1 space per support employee

The medical centre component has been allocated **29 spaces** within the planning proposal design of the site. Allowing for say two (2) administrative staff, the medical centre could accommodate 9 consulting rooms plus other non-parking generating areas such as scanning machines, storerooms etc.

Overall, at this stage of planning for the site the allocated parking provision of the proposal is considered appropriate to accommodate the peak demands of the site without concern for overflow parking to occur.

## 6.2 Preliminary Design Compliance Assessment

As per the requirements of the Australian Standard for Off Street Car Parking Facilities AS2890.1, turning path assessments of an 85$^{th}$ and 99$^{th}$ percentile vehicles using access driveways and internal ramps are provided in **Appendix C** of this report.

These turn path assessments of the preliminary design confirm the proposed design of the car park and ramps comply with the minimum requirements of AS2890.1 and are considered satisfactory.

### 6.3 Service Vehicle Access

The site includes service vehicle access to / from Anella Avenue to a loading dock area which can accommodate a Medium Rigid Truck entering and exiting the site in a forward direction.

A turn path assessment of the arrangements is provided in **Appendix D** of this report confirming the above.

It is expected that the final service vehicle arrangements would be confirmed as part of a future development application.

## 7. Conclusions

This report has reviewed the potential traffic impacts of the planning proposal of No.27 Victoria Avenue, Castle Hill to provide a mixed-use development. The findings of this assessment are presented below:

1. The net traffic generation of the planning proposal versus that which would be approved in the current zoning would be minor in the context of existing / future traffic volumes in roads immediately surrounding the subject site.
2. The infrastructure planning for all modes of transport to be delivered throughout the Showground Station Precinct is expected to more than cater for the potential net traffic generation of the planning proposal compared to that which would be generated under the current zoning.
3. The site is located within a convenient walking distance to a number of existing bus stops which provide access to a range of local and regional employment and retail centres.
4. The proposed expansion of public transport operations within the Showground Station Precinct and immediately adjacent to the development site will significantly increase public transport accessibility for those wishing to travel to / from the site.
5. The proposed parking provision of the site having regard to the potential uses which could be occupied would fully comply with the requirements of Council's DCP. Further, the parking provision would more than cater for the expected peak demands of each component at all times.
6. The preliminary design of the proposal complies with the requirements of both AS2890.1, AS2890.2 and AS2890.6 and are considered satisfactory as a basis for the design of the site moving forward to a development application in the future.

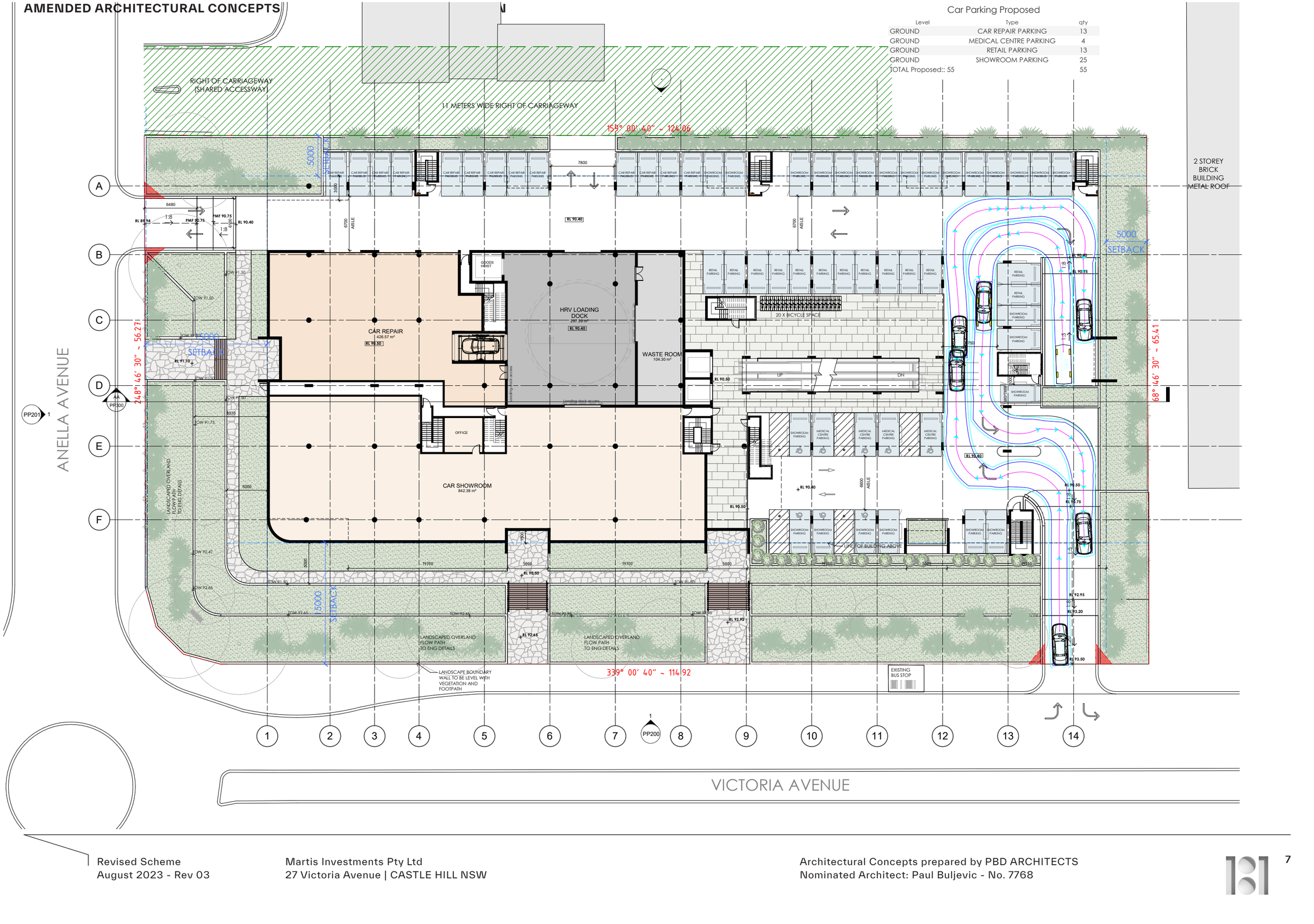
Overall, the traffic impacts of the proposal are considered acceptable.

## 8. Appendix A – Planning Proposal Preliminary Design Plans


VICTORIA AVENUE STREETSCAPE VIEW

## Car Parking Proposed

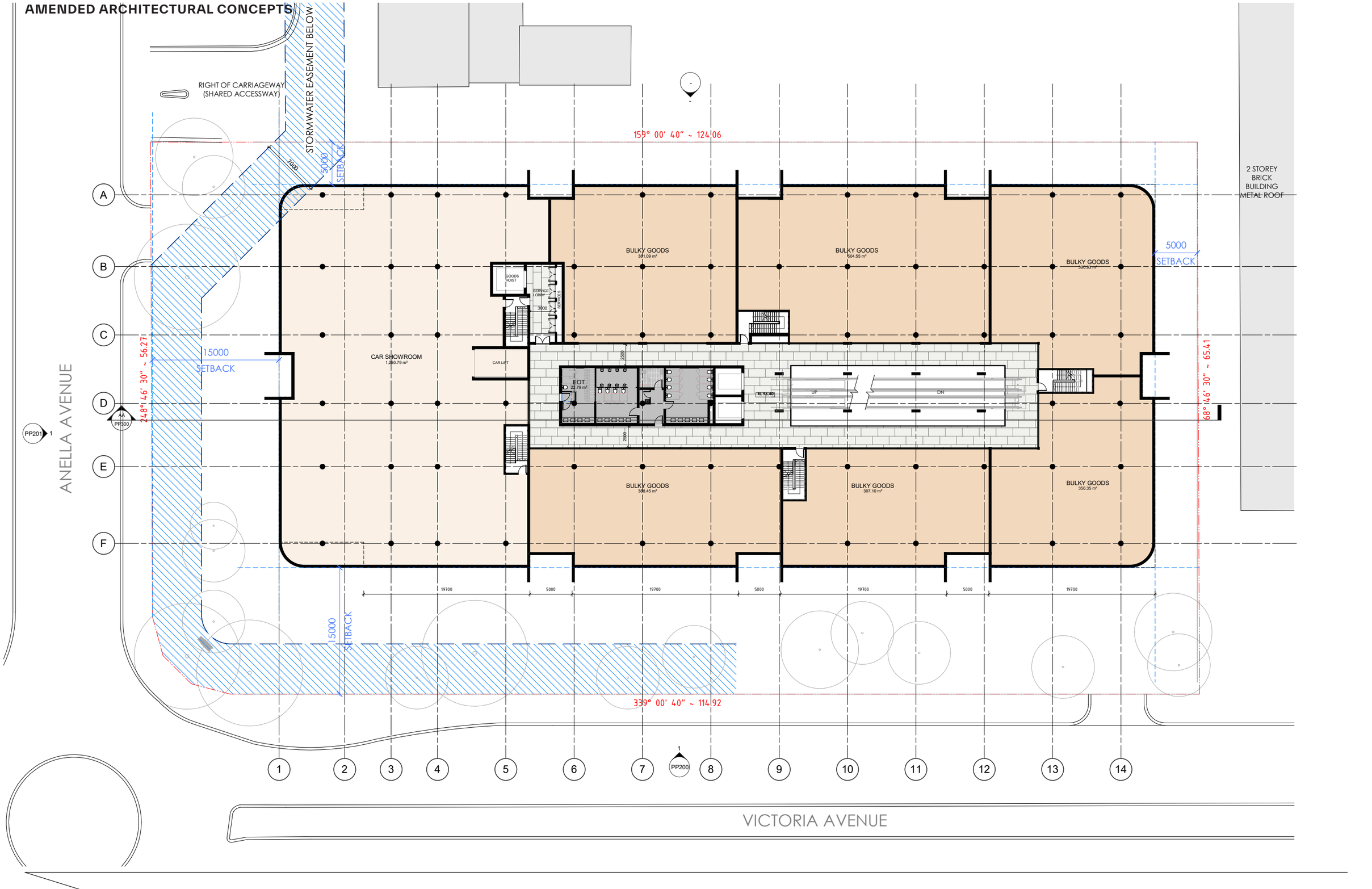
| Level | Type | qty |
|---|---|---|
| GROUND | CAR REPAIR PARKING | 13 |
| GROUND | MEDICAL CENTRE PARKING | 4 |
| GROUND | RETAIL PARKING | 13 |
| GROUND | SHOWROOM PARKING | 25 |
| TOTAL Proposed:: 55 | | 55 |




Revised Scheme
August 2023 - Rev 03

Martis Investments Pty Ltd
27 Victoria Avenue | CASTLE HILL NSW

Architectural Concepts prepared by PBD ARCHITECTS
Nominated Architect: Paul Buljevic - No. 7768




Revised Scheme
August 2023 - Rev 03

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27 Victoria Avenue | CASTLE HILL NSW

Architectural Concepts prepared by PBD ARCHITECTS
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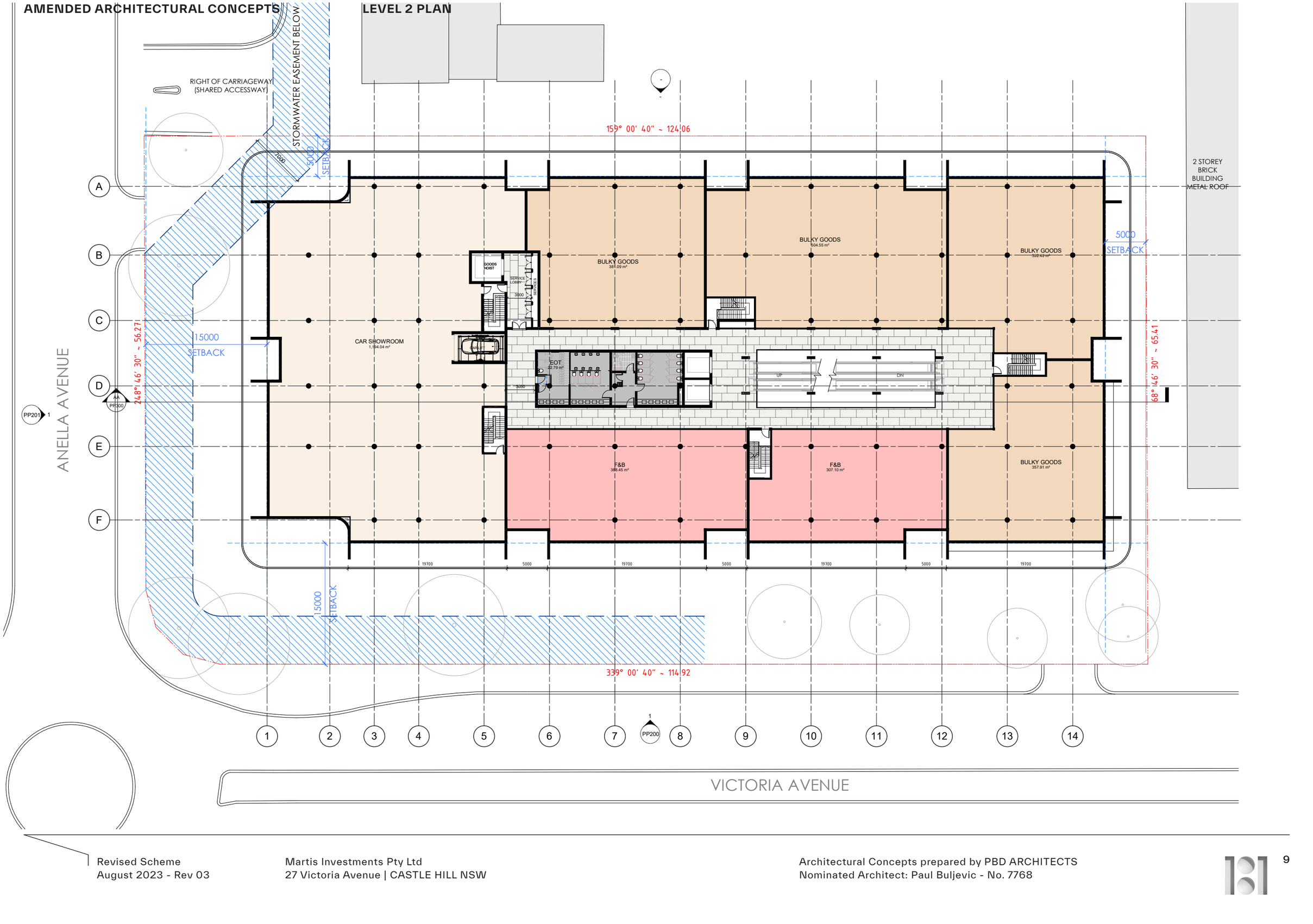
# LEVEL 2 PLAN



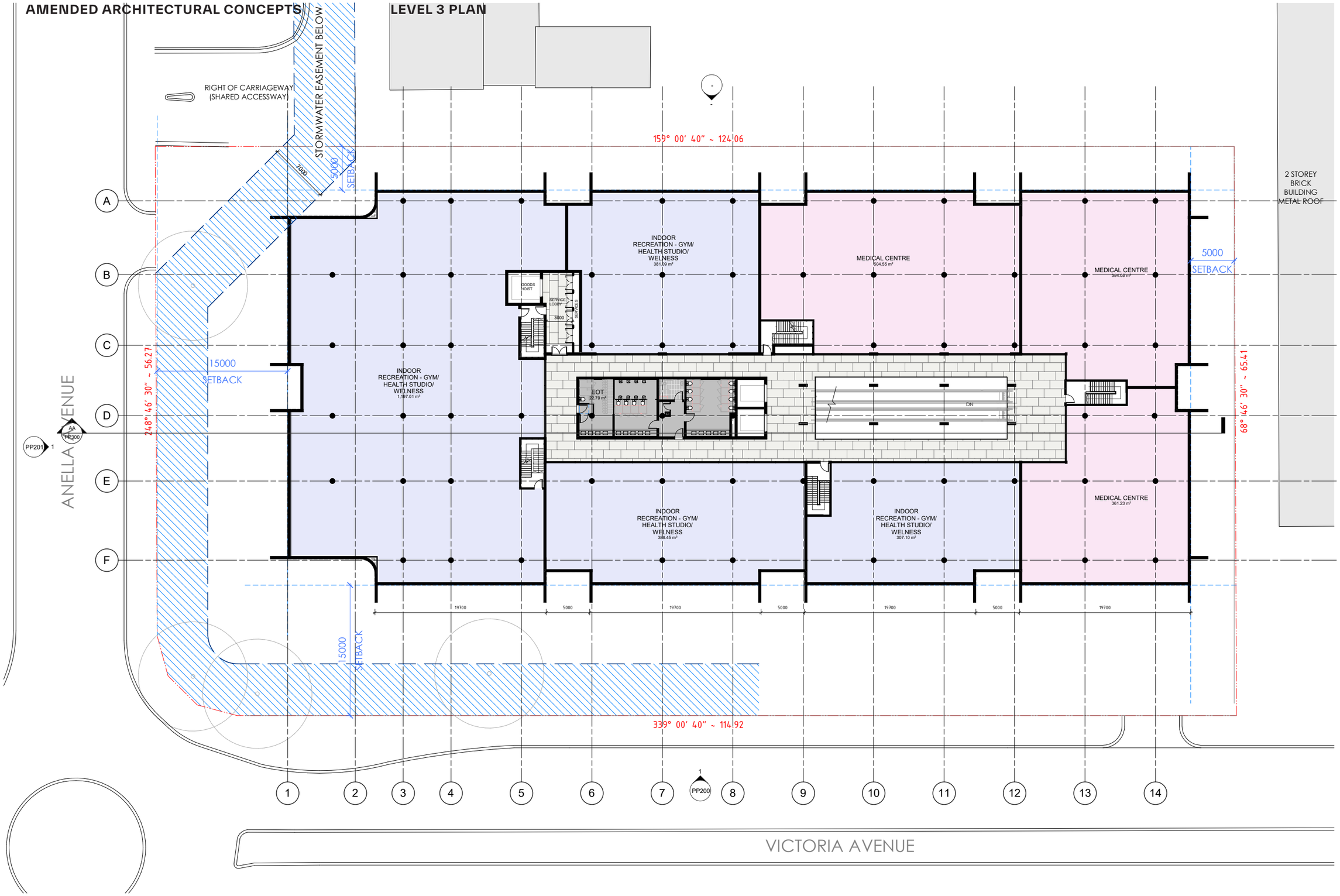

Revised Scheme
August 2023 - Rev 03

Martis Investments Pty Ltd
27 Victoria Avenue | CASTLE HILL NSW

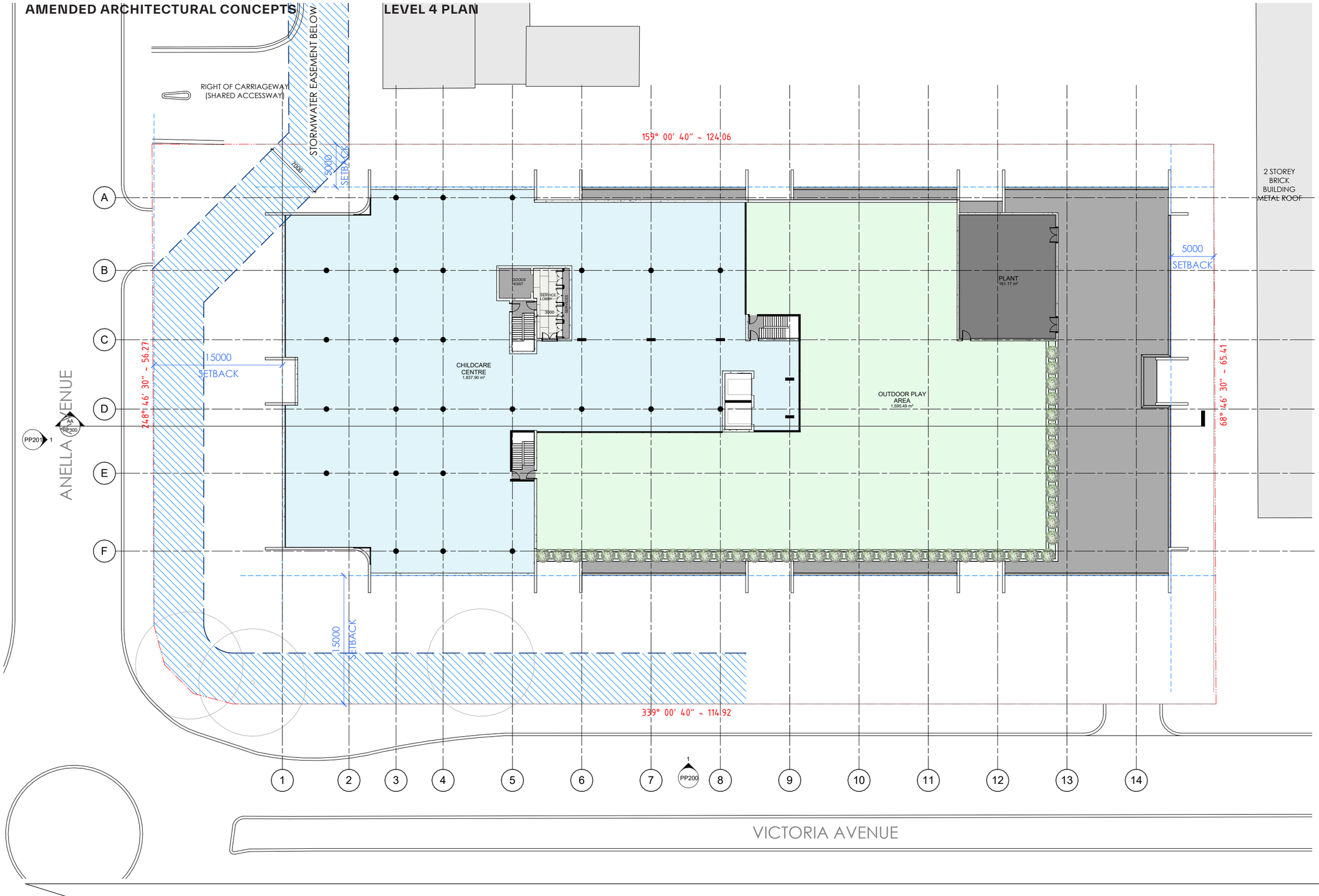
Architectural Concepts prepared by PBD ARCHITECTS
Nominated Architect: Paul Buljevic - No. 7768

# AMENDED ARCHITECTURAL CONCEPTS

## LEVEL 3 PLAN



# LEVEL 4 PLAN




Revised Scheme
August 2023 - Rev 03

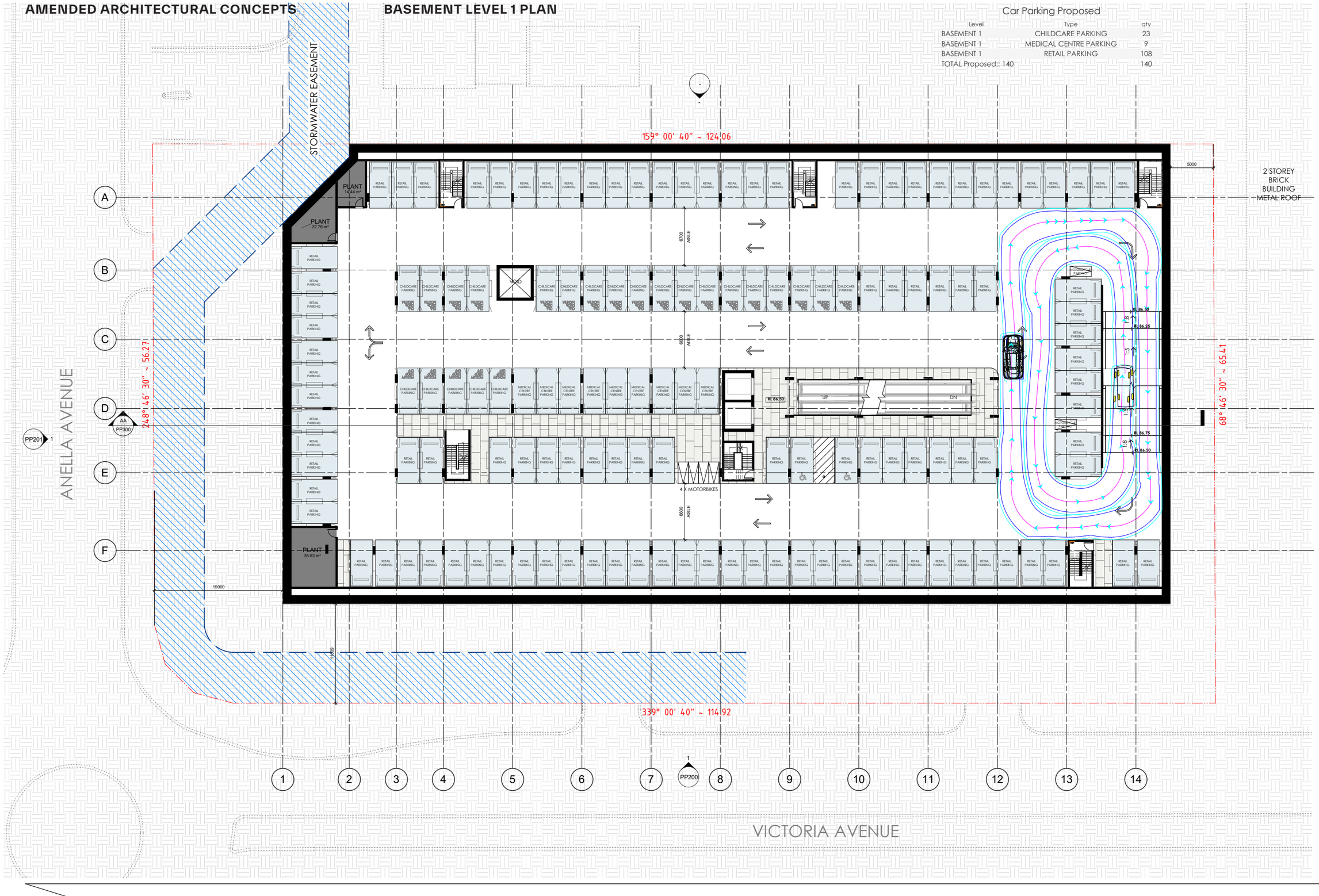
Martis Investments Pty Ltd
27 Victoria Avenue | CASTLE HILL NSW

Architectural Concepts prepared by PBD ARCHITECTS
Nominated Architect: Paul Buljevic - No. 7768

# BASEMENT LEVEL 1 PLAN

Car Parking Proposed

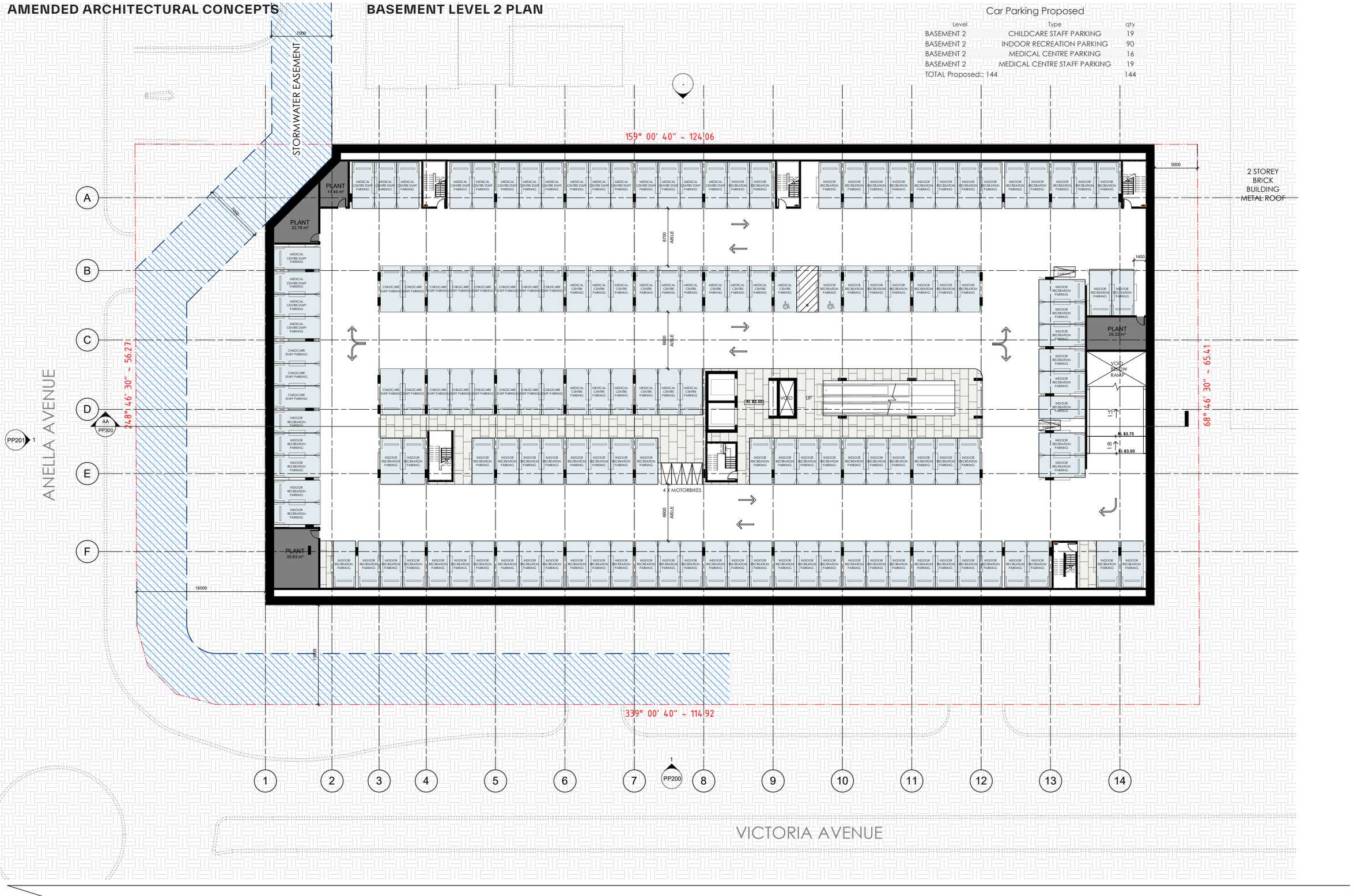
| Level | Type | qty |
|---|---|---|
| BASEMENT 1 | CHILDCARE PARKING | 23 |
| BASEMENT 1 | MEDICAL CENTRE PARKING | 9 |
| BASEMENT 1 | RETAIL PARKING | 108 |
| TOTAL Proposed:: 140 | | 140 |



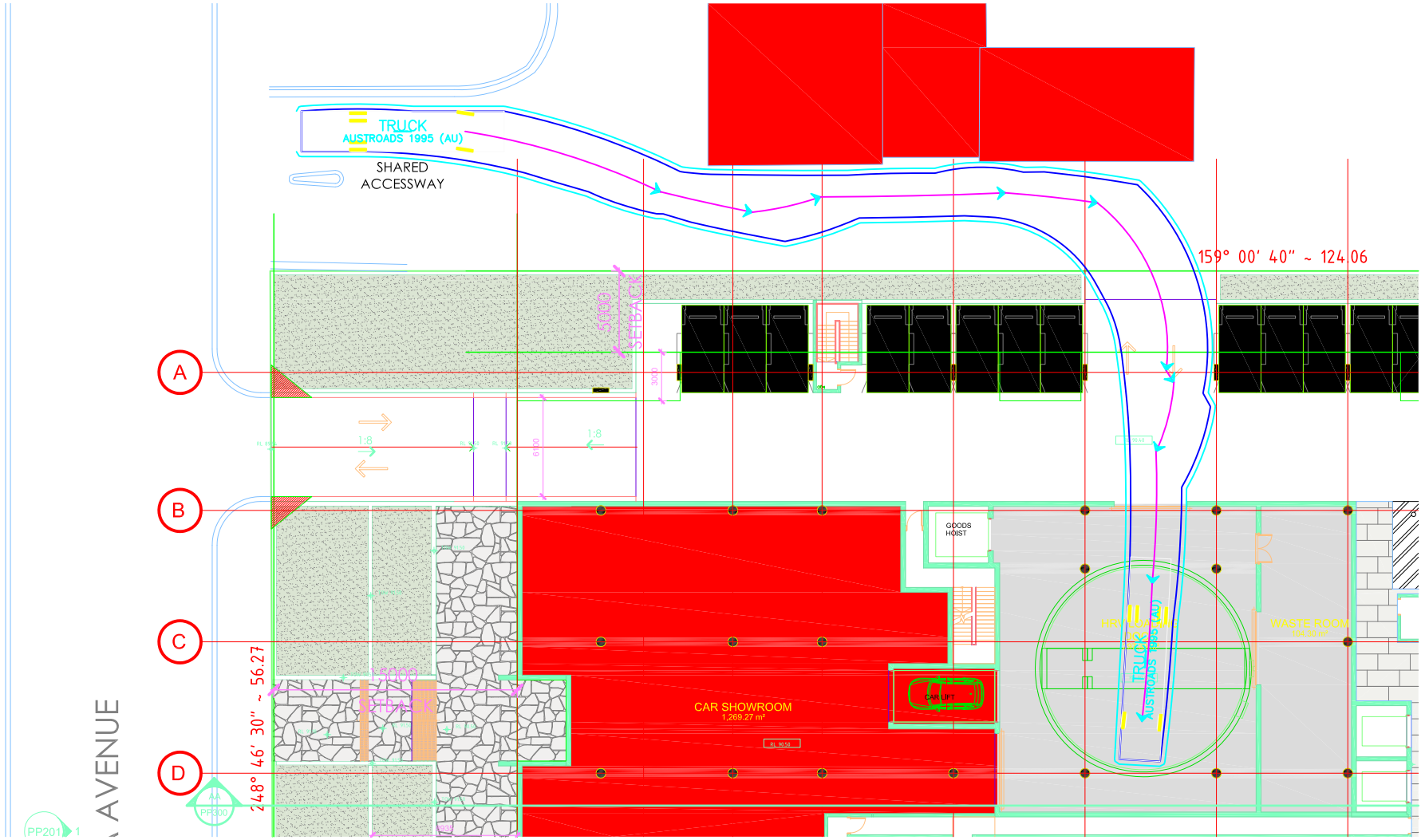
# BASEMENT LEVEL 2 PLAN

## Car Parking Proposed

| Level | Type | qty |
|---|---|---|
| BASEMENT 2 | CHILDCARE STAFF PARKING | 19 |
| BASEMENT 2 | INDOOR RECREATION PARKING | 90 |
| BASEMENT 2 | MEDICAL CENTRE PARKING | 16 |
| BASEMENT 2 | MEDICAL CENTRE STAFF PARKING | 19 |
| TOTAL Proposed:: 144 | | 144 |



# 9. Appendix B – Service Vehicle Turning Path Assessment


TRUCK
AUSTROADS 1995 (AU)
SHARED
ACCESSWAY
159° 00' 40" ~ 124.06
5000
SETBACK
A
B
C
D
1:8
1:8
GOODS
HOIST
CAR SHOWROOM
1,269.27 m²
CAR LIFT
WASTE ROOM
TRUCK
AUSTROADS 1995 (AU)
248° 46' 30" ~ 56.27
5000
SETBACK
AVENUE

# 10. Appendix C – SIDRA Assessment Outputs

# MOVEMENT SUMMARY

## Site: C10v [C10: Victoria Ave / Anella Ave / Hudson Ave - PM Peak (2) (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.3.210**

2036 Do Minimum Model - PM Peak
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | Mov Class | Demand Flows [ Total veh/h | HV ] % | Arrival Flows [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% Back Of Queue [ Veh. veh | Dist ] m | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Victoria Ave (S) | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 60 | 0.0 | 60 | 0.0 | 0.032 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.53 | 0.00 | 44.3 |
| | | LV | 60 | | 60 | | 0.032 | 4.6 | LOS A | 0.0 | 0.0 | NA | NA | NA | 44.3 |
| | | HV | 0 | | 0 | | - | - | - | - | - | NA | NA | NA | - |
| 2 | T1 | All MCs | 1968 | 2.5 | 1968 | 2.5 | 0.513 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 49.7 |
| | | LV | 1919 | | 1919 | | 0.513 | 0.1 | LOS A | 0.0 | 0.0 | NA | NA | NA | 49.7 |
| | | HV | 49 | | 49 | | 0.513 | 0.1 | LOS A | 0.0 | 0.0 | NA | NA | NA | 49.7 |
| Approach | | | 2028 | 2.4 | 2028 | 2.4 | 0.513 | 0.2 | NA | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.3 |
| East: Anella Ave (E) | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 95 | 0.0 | 95 | 0.0 | 0.071 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.53 | 0.00 | 44.3 |
| | | LV | 95 | | 95 | | 0.071 | 4.6 | LOS A | 0.0 | 0.0 | NA | NA | NA | 44.3 |
| | | HV | 0 | | 0 | | - | - | - | - | - | NA | NA | NA | - |
| Approach | | | 95 | 0.0 | 95 | 0.0 | 0.071 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.53 | 0.00 | 44.3 |
| North: Victoria Ave (N) | | | | | | | | | | | | | | | |
| 7 | L2 | All MCs | 122 | 0.0 | 122 | 0.0 | 0.066 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.53 | 0.00 | 44.3 |
| | | LV | 122 | | 122 | | 0.066 | 4.6 | LOS A | 0.0 | 0.0 | NA | NA | NA | 44.3 |
| | | HV | 0 | | 0 | | - | - | - | - | - | NA | NA | NA | - |
| 8 | T1 | All MCs | 839 | 3.5 | 839 | 3.5 | 0.220 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 49.9 |
| | | LV | 809 | | 809 | | 0.220 | 0.0 | LOS A | 0.0 | 0.0 | NA | NA | NA | 49.9 |
| | | HV | 29 | | 29 | | 0.220 | 0.0 | LOS A | 0.0 | 0.0 | NA | NA | NA | 49.9 |
| Approach | | | 961 | 3.1 | 961 | 3.1 | 0.220 | 0.6 | NA | 0.0 | 0.0 | 0.00 | 0.07 | 0.00 | 48.6 |
| West: Hudson Ave (W) | | | | | | | | | | | | | | | |
| 10 | L2 | All MCs | 297 | 0.4 | 297 | 0.4 | 0.223 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.53 | 0.00 | 44.3 |
| | | LV | 296 | | 296 | | 0.223 | 4.6 | LOS A | 0.0 | 0.0 | NA | NA | NA | 44.3 |
| | | HV | 1 | | 1 | | 0.223 | 4.6 | LOS A | 0.0 | 0.0 | NA | NA | NA | 44.3 |
| Approach | | | 297 | 0.4 | 297 | 0.4 | 0.223 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.53 | 0.00 | 44.3 |
| All Vehicles | | | 3381 | 2.4 | 3381 | 2.4 | 0.513 | 0.8 | NA | 0.0 | 0.0 | 0.00 | 0.09 | 0.00 | 48.1 |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# INTERSECTION SUMMARY

## Site: TCS 2701 [C2: Showground Rd / Victoria Ave - PM Peak + PP 2023 V2 (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.3.210**

2036 Do Minimum Model - PM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 130 seconds (Site User-Given Cycle Time)

**Intersection Performance - Hourly Values**

| Performance Measure | Vehicles: | All MCs | Pedestrians | Persons |
|---|---|---|---|---|
| Travel Speed (Average) | km/h | 7.4 | 1.2 km/h | 7.4 km/h |
| Travel Distance (Total) | veh-km/h | 8983.9 | 4.2 ped-km/h | 10784.9 pers-km/h |
| Travel Time (Total) | veh-h/h | 1206.2 | 3.7 ped-h/h | 1451.1 pers-h/h |
| Desired Speed | km/h | 60.0 | | |
| Speed Efficiency | | 0.12 | | |
| Travel Time Index | | 0.27 | | |
| Congestion Coefficient | | 8.06 | | |
| | | | | |
| Demand Flows (Total) | veh/h | 8589 | 211 ped/h | 10518 pers/h |
| Arrival Flows (Total) | veh/h | 8589 | | |
| Percent Heavy Vehicles (Demand) | % | 2.4 | | |
| Percent Heavy Vehicles (Arrivals) | % | 2.4 | | |
| Degree of Saturation | | 1.594 | 0.071 | |
| Practical Spare Capacity | % | -43.5 | | |
| Effective Intersection Capacity | veh/h | 5390 | | |
| | | | | |
| Control Delay (Total) | veh-h/h | 1075.75 | 2.75 ped-h/h | 1293.66 pers-h/h |
| Control Delay (Average) | sec | 450.9 | 47.1 sec | 442.8 sec |
| Control Delay (Worst Lane by MC) | sec | 655.9 | | |
| Control Delay (Worst Movement by MC) | sec | 655.9 | 57.4 sec | 655.9 sec |
| Geometric Delay (Average) | sec | 1.9 | | |
| Stop-Line Delay (Average) | sec | 448.9 | | |
| Idling Time (Average) | sec | 421.8 | | |
| Intersection Level of Service (LOS) | | LOS F | LOS E | |
| | | | | |
| 95% Back of Queue - Veh (Worst Lane) | veh | 169.7 | | |
| 95% Back of Queue - Dist (Worst Lane) | m | 1210.6 | | |
| Ave. Que Storage Ratio (Worst Lane) | | 3.56 | | |
| Effective Stops (Total) | veh/h | 18803 | 189 ped/h | 22752 pers/h |
| Effective Stop Rate | | 2.19 | 0.90 | 2.16 |
| Proportion Queued | | 1.00 | 0.90 | 1.00 |
| Performance Index | | 2631.9 | 4.7 | 2636.6 |
| | | | | |
| Cost (Total) | $/h | 40827.69 | 92.03 $/h | 40919.73 $/h |
| Fuel Consumption (Total) | L/h | 2232.0 | | |
| Carbon Dioxide (Total) | kg/h | 5266.1 | | |
| Hydrocarbons (Total) | kg/h | 0.613 | | |
| Carbon Monoxide (Total) | kg/h | 4.60 | | |
| NOx (Total) | kg/h | 4.565 | | |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.
In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %

Number of Iterations: 2 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Main (Timing-Capacity) Iterations: 0.0%  114.2%  0.0%

**Intersection Performance - Annual Values**

| Performance Measure | Vehicles: | All MCs | Pedestrians | Persons |
|---|---|---|---|---|
| Demand Flows (Total) | veh/y | 4,122,948 | 101,053 ped/y | 5,048,590 pers/y |
| Delay (Total) | veh-h/y | 516,362 | 1,321 ped-h/y | 620,955 pers-h/y |

| | | | | | | |
|---|---|---|---|---|---|---|
| Effective Stops (Total) | veh/y | 9,025,331 | 90,758 | ped/y | 10,921,160 | pers/y |
| Travel Distance (Total) | veh-km/y | 4,312,277 | 2,021 | ped-km/y | 5,176,753 | pers-km/y |
| Travel Time (Total) | veh-h/y | 578,975 | 1,753 | ped-h/y | 696,522 | pers-h/y |
| | | | | | | |
| Cost (Total) | $/y | 19,597,290 | 44,176 | $/y | 19,641,470 | $/y |
| Fuel Consumption (Total) | L/y | 1,071,337 | | | | |
| Carbon Dioxide (Total) | kg/y | 2,527,723 | | | | |
| Hydrocarbons (Total) | kg/y | 294 | | | | |
| Carbon Monoxide (Total) | kg/y | 2,209 | | | | |
| NOx (Total) | kg/y | 2,191 | | | | |

1 Hours per Year: 480 (Site)

# MOVEMENT SUMMARY

## Site: TCS 2701 [C2: Showground Rd / Victoria Ave - PM Peak + PP 2023 V2 (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.3.210**

2036 Do Minimum Model - PM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 130 seconds (Site User-Given Cycle Time)

**Vehicle Movement Performance**

| Mov ID | Turn | Mov Class | Demand Flows [ Total veh/h | HV ] % | Arrival Flows [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% Back Of Queue [ Veh. veh | Dist ] m | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Victoria Ave (S) | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 481 | 3.3 | 481 | 3.3 | 1.149 | 229.3 | LOS F | 18.7 | 134.3 | 1.00 | 1.43 | 2.10 | 7.9 |
| | | LV | 465 | | 465 | | 1.149 | 229.3 | LOS F | 18.7 | 134.3 | NA | NA | NA | 7.9 |
| | | HV | 16 | | 16 | | 1.149 | 229.3 | LOS F | 18.7 | 134.3 | NA | NA | NA | 7.9 |
| 2 | T1 | All MCs | 1559 | 1.9 | 1559 | 1.9 | *1.547 | 572.1 | LOS F | 147.0 | 1045.8 | 1.00 | 2.90 | 3.50 | 4.4 |
| | | LV | 1529 | | 1529 | | *1.547 | 572.1 | LOS F | 147.0 | 1045.8 | NA | NA | NA | 4.4 |
| | | HV | 29 | | 29 | | 1.547 | 572.1 | LOS F | 147.0 | 1045.8 | NA | NA | NA | 4.4 |
| 3 | R2 | All MCs | 404 | 1.3 | 404 | 1.3 | *1.544 | 579.8 | LOS F | 72.2 | 510.7 | 1.00 | 2.02 | 3.51 | 6.1 |
| | | LV | 399 | | 399 | | *1.544 | 579.8 | LOS F | 72.2 | 510.7 | NA | NA | NA | 6.1 |
| | | HV | 5 | | 5 | | 1.544 | 579.8 | LOS F | 72.2 | 510.7 | NA | NA | NA | 6.1 |
| Approach | | | 2444 | 2.1 | 2444 | 2.1 | 1.547 | 505.9 | LOS F | 147.0 | 1045.8 | 1.00 | 2.46 | 3.23 | 5.0 |
| East: Showground Rd (E) | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 276 | 2.3 | 276 | 2.3 | 1.489 | 454.1 | LOS F | 155.3 | 1111.2 | 1.00 | 2.52 | 3.32 | 6.8 |
| | | LV | 269 | | 269 | | 1.489 | 454.1 | LOS F | 155.3 | 1111.2 | NA | NA | NA | 6.8 |
| | | HV | 6 | | 6 | | 1.489 | 454.1 | LOS F | 155.3 | 1111.2 | NA | NA | NA | 6.8 |
| 5 | T1 | All MCs | 1632 | 2.7 | 1632 | 2.7 | 1.489 | 491.0 | LOS F | 155.3 | 1111.2 | 1.00 | 2.51 | 3.32 | 7.8 |
| | | LV | 1587 | | 1587 | | 1.489 | 491.0 | LOS F | 155.3 | 1111.2 | NA | NA | NA | 7.8 |
| | | HV | 44 | | 44 | | 1.489 | 491.0 | LOS F | 155.3 | 1111.2 | NA | NA | NA | 7.8 |
| 6 | R2 | All MCs | 968 | 2.2 | 968 | 2.2 | *1.594 | 655.9 | LOS F | 94.2 | 672.0 | 1.00 | 2.08 | 3.64 | 7.3 |
| | | LV | 947 | | 947 | | *1.594 | 655.9 | LOS F | 94.2 | 672.0 | NA | NA | NA | 7.3 |
| | | HV | 21 | | 21 | | 1.594 | 655.9 | LOS F | 94.2 | 672.0 | NA | NA | NA | 7.3 |
| Approach | | | 2876 | 2.5 | 2876 | 2.5 | 1.594 | 543.0 | LOS F | 155.3 | 1111.2 | 1.00 | 2.36 | 3.43 | 7.5 |
| North: Green Rd (N) | | | | | | | | | | | | | | | |
| 7 | L2 | All MCs | 382 | 3.3 | 382 | 3.3 | 0.890 | 45.9 | LOS D | 29.4 | 211.5 | 1.00 | 1.03 | 1.15 | 35.2 |
| | | LV | 369 | | 369 | | 0.890 | 45.9 | LOS D | 29.4 | 211.5 | NA | NA | NA | 35.2 |
| | | HV | 13 | | 13 | | 0.890 | 45.9 | LOS D | 29.4 | 211.5 | NA | NA | NA | 35.2 |
| 8 | T1 | All MCs | 722 | 3.1 | 722 | 3.1 | 0.890 | 80.7 | LOS F | 38.8 | 278.4 | 1.00 | 1.02 | 1.14 | 25.9 |
| | | LV | 700 | | 700 | | 0.890 | 80.7 | LOS F | 38.8 | 278.4 | NA | NA | NA | 25.9 |
| | | HV | 22 | | 22 | | 0.890 | 80.7 | LOS F | 38.8 | 278.4 | NA | NA | NA | 25.9 |
| 9 | R2 | All MCs | 85 | 6.2 | 85 | 6.2 | 0.242 | 81.9 | LOS F | 3.3 | 24.2 | 0.93 | 0.74 | 0.93 | 34.7 |
| | | LV | 80 | | 80 | | 0.242 | 81.9 | LOS F | 3.3 | 24.2 | NA | NA | NA | 34.7 |
| | | HV | 5 | | 5 | | 0.242 | 81.9 | LOS F | 3.3 | 24.2 | NA | NA | NA | 34.7 |
| Approach | | | 1189 | 3.4 | 1189 | 3.4 | 0.890 | 69.6 | LOS E | 38.8 | 278.4 | 1.00 | 1.00 | 1.13 | 30.2 |
| West: Showground Rd (W) | | | | | | | | | | | | | | | |
| 10 | L2 | All MCs | 157 | 2.7 | 157 | 2.7 | 1.496 | 466.9 | LOS F | 169.7 | 1210.6 | 1.00 | 2.01 | 3.34 | 5.6 |
| | | LV | 153 | | 153 | | 1.496 | 466.9 | LOS F | 169.7 | 1210.6 | NA | NA | NA | 5.6 |
| | | HV | 4 | | 4 | | 1.496 | 466.9 | LOS F | 169.7 | 1210.6 | NA | NA | NA | 5.6 |
| 11 | T1 | All MCs | 1722 | 2.1 | 1722 | 2.1 | *1.496 | 503.3 | LOS F | 169.7 | 1210.6 | 1.00 | 2.45 | 3.34 | 7.6 |
| | | LV | 1685 | | 1685 | | *1.496 | 503.3 | LOS F | 169.7 | 1210.6 | NA | NA | NA | 7.6 |
| | | HV | 37 | | 37 | | 1.496 | 503.3 | LOS F | 169.7 | 1210.6 | NA | NA | NA | 7.6 |
| 12 | R2 | All MCs | 201 | 0.5 | 201 | 0.5 | 1.177 | 257.7 | LOS F | 12.4 | 87.2 | 1.00 | 1.31 | 2.38 | 7.1 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LV | 200 | | 200 | | 1.177 | 257.7 | LOS F | 12.4 | 87.2 | NA | NA | NA | 7.1 |
| | HV | 1 | | 1 | | 1.177 | 257.7 | LOS F | 12.4 | 87.2 | NA | NA | NA | 7.1 |
| Approach | | 2080 | 2.0 | 2080 | 2.0 | 1.496 | 476.8 | LOS F | 169.7 | 1210.6 | 1.00 | 2.30 | 3.25 | 7.4 |
| All Vehicles | | 8589 | 2.4 | 8589 | 2.4 | 1.594 | 450.9 | LOS F | 169.7 | 1210.6 | 1.00 | 2.19 | 3.01 | 7.4 |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

**Pedestrian Movement Performance**

| Mov ID | Crossing | Input Vol. ped/h | Dem. Flow ped/h | Aver. Delay sec | Level of Service | AVERAGE BACK OF QUEUE [ Ped ped | Dist ] m | Prop. Que | Eff. Stop Rate | Travel Time sec | Travel Dist. m | Aver. Speed m/sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Victoria Ave (S) | | | | | | | | | | | | |
| P1 | Full | 50 | 53 | 32.5 | LOS D | 0.1 | 0.1 | 0.91 | 0.91 | 47.8 | 20.0 | 0.42 |
| East: Showground Rd (E) | | | | | | | | | | | | |
| P2 | Full | 50 | 53 | 49.2 | LOS E | 0.2 | 0.2 | 0.87 | 0.87 | 64.6 | 20.0 | 0.31 |
| North: Green Rd (N) | | | | | | | | | | | | |
| P3 | Full | 50 | 53 | 57.4 | LOS E | 0.2 | 0.2 | 0.94 | 0.94 | 72.8 | 20.0 | 0.27 |
| West: Showground Rd (W) | | | | | | | | | | | | |
| P4 | Full | 50 | 53 | 49.2 | LOS E | 0.2 | 0.2 | 0.87 | 0.87 | 64.6 | 20.0 | 0.31 |
| All Pedestrians | | 200 | 211 | 47.1 | LOS E | 0.2 | 0.2 | 0.90 | 0.90 | 62.5 | 20.0 | 0.32 |

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

# INTERSECTION SUMMARY

## Site: C10v [C10: Victoria Ave / Anella Ave / Hudson Ave - PM Peak (2) + PP 2023 V2 (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.3.210**

2036 Do Minimum Model - PM Peak
Site Category: (None)
Give-Way (Two-Way)

| Intersection Performance - Hourly Values | | | |
|---|---|---|---|
| **Performance Measure** | **Vehicles:** | **All MCs** | **Persons** |
| Travel Speed (Average) | km/h | 47.9 | 47.9 km/h |
| Travel Distance (Total) | veh-km/h | 1511.4 | 1813.7 pers-km/h |
| Travel Time (Total) | veh-h/h | 31.5 | 37.8 pers-h/h |
| Desired Speed | km/h | 50.0 | |
| Speed Efficiency | | 0.96 | |
| Travel Time Index | | 9.54 | |
| Congestion Coefficient | | 1.04 | |
| | | | |
| Demand Flows (Total) | veh/h | 3523 | 4228 pers/h |
| Arrival Flows (Total) | veh/h | 3523 | |
| Percent Heavy Vehicles (Demand) | % | 2.3 | |
| Percent Heavy Vehicles (Arrivals) | % | 2.3 | |
| Degree of Saturation | | 0.513 | |
| Practical Spare Capacity | % | 91.0 | |
| Effective Intersection Capacity | veh/h | 6868 | |
| | | | |
| Control Delay (Total) | veh-h/h | 0.91 | 1.09 pers-h/h |
| Control Delay (Average) | sec | 0.9 | 0.9 sec |
| Control Delay (Worst Lane by MC) | sec | 4.6 | |
| Control Delay (Worst Movement by MC) | sec | 4.6 | 4.6 sec |
| Geometric Delay (Average) | sec | 0.9 | |
| Stop-Line Delay (Average) | sec | 0.1 | |
| Idling Time (Average) | sec | 0.0 | |
| Intersection Level of Service (LOS) | | NA | |
| | | | |
| 95% Back of Queue - Veh (Worst Lane) | veh | 0.0 | |
| 95% Back of Queue - Dist (Worst Lane) | m | 0.0 | |
| Ave. Que Storage Ratio (Worst Lane) | | 0.00 | |
| Effective Stops (Total) | veh/h | 353 | 423 pers/h |
| Effective Stop Rate | | 0.10 | 0.10 |
| Proportion Queued | | 0.00 | 0.00 |
| Performance Index | | 33.1 | 33.1 |
| | | | |
| Cost (Total) | $/h | 1204.26 | 1204.26 $/h |
| Fuel Consumption (Total) | L/h | 105.2 | |
| Carbon Dioxide (Total) | kg/h | 248.8 | |
| Hydrocarbons (Total) | kg/h | 0.016 | |
| Carbon Monoxide (Total) | kg/h | 0.19 | |
| NOx (Total) | kg/h | 0.198 | |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.
In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %

Number of Iterations: 3 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 28.2% 0.0% 0.0%

| Intersection Performance - Annual Values | | | |
|---|---|---|---|
| **Performance Measure** | **Vehicles:** | **All MCs** | **Persons** |
| Demand Flows (Total) | veh/y | 1,691,116 | 2,029,339 pers/y |

| | | | | |
|---|---|---|---|---|
| Delay (Total) | veh-h/y | 435 | 522 | pers-h/y |
| Effective Stops (Total) | veh/y | 169,328 | 203,194 | pers/y |
| Travel Distance (Total) | veh-km/y | 725,481 | 870,577 | pers-km/y |
| Travel Time (Total) | veh-h/y | 15,137 | 18,164 | pers-h/y |
| | | | | |
| Cost (Total) | $/y | 578,046 | 578,046 | $/y |
| Fuel Consumption (Total) | L/y | 50,517 | | |
| Carbon Dioxide (Total) | kg/y | 119,433 | | |
| Hydrocarbons (Total) | kg/y | 8 | | |
| Carbon Monoxide (Total) | kg/y | 94 | | |
| NOx (Total) | kg/y | 95 | | |

1 Hours per Year: 480 (Site)

# MOVEMENT SUMMARY

## Site: C10v [C10: Victoria Ave / Anella Ave / Hudson Ave - PM Peak (2) + PP 2023 V2 (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.3.210**

2036 Do Minimum Model - PM Peak
Site Category: (None)
Give-Way (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | Mov Class | Demand Flows [ Total veh/h | HV ] % | Arrival Flows [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% Back Of Queue [ Veh. veh | Dist ] m | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Victoria Ave (S) | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 60 | 0.0 | 60 | 0.0 | 0.032 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.53 | 0.00 | 44.3 |
| | | LV | 60 | | 60 | | 0.032 | 4.6 | LOS A | 0.0 | 0.0 | NA | NA | NA | 44.3 |
| | | HV | 0 | | 0 | | - | - | - | - | - | NA | NA | NA | - |
| 2 | T1 | All MCs | 1968 | 2.5 | 1968 | 2.5 | 0.513 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 49.7 |
| | | LV | 1919 | | 1919 | | 0.513 | 0.1 | LOS A | 0.0 | 0.0 | NA | NA | NA | 49.7 |
| | | HV | 49 | | 49 | | 0.513 | 0.1 | LOS A | 0.0 | 0.0 | NA | NA | NA | 49.7 |
| Approach | | | 2028 | 2.4 | 2028 | 2.4 | 0.513 | 0.2 | NA | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.3 |
| East: Anella Ave (E) | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 142 | 0.0 | 142 | 0.0 | 0.107 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.53 | 0.00 | 44.3 |
| | | LV | 142 | | 142 | | 0.107 | 4.6 | LOS A | 0.0 | 0.0 | NA | NA | NA | 44.3 |
| | | HV | 0 | | 0 | | - | - | - | - | - | NA | NA | NA | - |
| Approach | | | 142 | 0.0 | 142 | 0.0 | 0.107 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.53 | 0.00 | 44.3 |
| North: Victoria Ave (N) | | | | | | | | | | | | | | | |
| 7 | L2 | All MCs | 169 | 0.0 | 169 | 0.0 | 0.091 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.53 | 0.00 | 44.3 |
| | | LV | 169 | | 169 | | 0.091 | 4.6 | LOS A | 0.0 | 0.0 | NA | NA | NA | 44.3 |
| | | HV | 0 | | 0 | | - | - | - | - | - | NA | NA | NA | - |
| 8 | T1 | All MCs | 886 | 3.3 | 886 | 3.3 | 0.232 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 49.9 |
| | | LV | 857 | | 857 | | 0.232 | 0.0 | LOS A | 0.0 | 0.0 | NA | NA | NA | 49.9 |
| | | HV | 29 | | 29 | | 0.232 | 0.0 | LOS A | 0.0 | 0.0 | NA | NA | NA | 49.9 |
| Approach | | | 1056 | 2.8 | 1056 | 2.8 | 0.232 | 0.8 | NA | 0.0 | 0.0 | 0.00 | 0.08 | 0.00 | 48.3 |
| West: Hudson Ave (W) | | | | | | | | | | | | | | | |
| 10 | L2 | All MCs | 297 | 0.4 | 297 | 0.4 | 0.223 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.53 | 0.00 | 44.3 |
| | | LV | 296 | | 296 | | 0.223 | 4.6 | LOS A | 0.0 | 0.0 | NA | NA | NA | 44.3 |
| | | HV | 1 | | 1 | | 0.223 | 4.6 | LOS A | 0.0 | 0.0 | NA | NA | NA | 44.3 |
| Approach | | | 297 | 0.4 | 297 | 0.4 | 0.223 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.53 | 0.00 | 44.3 |
| All Vehicles | | | 3523 | 2.3 | 3523 | 2.3 | 0.513 | 0.9 | NA | 0.0 | 0.0 | 0.00 | 0.10 | 0.00 | 47.9 |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

# INTERSECTION SUMMARY

## Site: TCS 2701 [C2: Showground Rd / Victoria Ave - PM Peak (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.3.210**

2036 Do Minimum Model - PM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 130 seconds (Site User-Given Cycle Time)

**Intersection Performance - Hourly Values**

| Performance Measure | Vehicles: | All MCs | Pedestrians | Persons |
|---|---|---|---|---|
| Travel Speed (Average) | km/h | 7.4 | 1.1 km/h | 7.4 km/h |
| Travel Distance (Total) | veh-km/h | 8900.2 | 4.2 ped-km/h | 10684.5 pers-km/h |
| Travel Time (Total) | veh-h/h | 1204.1 | 3.7 ped-h/h | 1448.6 pers-h/h |
| Desired Speed | km/h | 60.0 | | |
| Speed Efficiency | | 0.12 | | |
| Travel Time Index | | 0.26 | | |
| Congestion Coefficient | | 8.12 | | |
| | | | | |
| Demand Flows (Total) | veh/h | 8483 | 211 ped/h | 10390 pers/h |
| Arrival Flows (Total) | veh/h | 8483 | | |
| Percent Heavy Vehicles (Demand) | % | 2.4 | | |
| Percent Heavy Vehicles (Arrivals) | % | 2.4 | | |
| Degree of Saturation | | 1.621 | 0.071 | |
| Practical Spare Capacity | % | -44.5 | | |
| Effective Intersection Capacity | veh/h | 5234 | | |
| | | | | |
| Control Delay (Total) | veh-h/h | 1075.58 | 2.80 ped-h/h | 1293.50 pers-h/h |
| Control Delay (Average) | sec | 456.4 | 47.9 sec | 448.2 sec |
| Control Delay (Worst Lane by MC) | sec | 655.9 | | |
| Control Delay (Worst Movement by MC) | sec | 655.9 | 57.4 sec | 655.9 sec |
| Geometric Delay (Average) | sec | 1.9 | | |
| Stop-Line Delay (Average) | sec | 454.5 | | |
| Idling Time (Average) | sec | 426.9 | | |
| Intersection Level of Service (LOS) | | LOS F | LOS E | |
| | | | | |
| 95% Back of Queue - Veh (Worst Lane) | veh | 169.3 | | |
| 95% Back of Queue - Dist (Worst Lane) | m | 1207.5 | | |
| Ave. Que Storage Ratio (Worst Lane) | | 3.69 | | |
| Effective Stops (Total) | veh/h | 18669 | 191 ped/h | 22593 pers/h |
| Effective Stop Rate | | 2.20 | 0.91 | 2.17 |
| Proportion Queued | | 1.00 | 0.91 | 1.00 |
| Performance Index | | 2607.9 | 4.8 | 2612.6 |
| | | | | |
| Cost (Total) | $/h | 40747.32 | 93.33 $/h | 40840.65 $/h |
| Fuel Consumption (Total) | L/h | 2223.6 | | |
| Carbon Dioxide (Total) | kg/h | 5246.6 | | |
| Hydrocarbons (Total) | kg/h | 0.612 | | |
| Carbon Monoxide (Total) | kg/h | 4.59 | | |
| NOx (Total) | kg/h | 4.577 | | |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.
In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 22.8 %

Number of Iterations: 5 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Main (Timing-Capacity) Iterations: 15.9%  43.2%  9.4%

**Intersection Performance - Annual Values**

| Performance Measure | Vehicles: | All MCs | Pedestrians | Persons |
|---|---|---|---|---|
| Demand Flows (Total) | veh/y | 4,071,916 | 101,053 ped/y | 4,987,353 pers/y |
| Delay (Total) | veh-h/y | 516,280 | 1,346 ped-h/y | 620,881 pers-h/y |

| | | | | | | |
|---|---|---|---|---|---|---|
| Effective Stops (Total) | veh/y | 8,961,036 | 91,537 | ped/y | 10,844,780 | pers/y |
| Travel Distance (Total) | veh-km/y | 4,272,105 | 2,021 | ped-km/y | 5,128,548 | pers-km/y |
| Travel Time (Total) | veh-h/y | 577,958 | 1,778 | ped-h/y | 695,327 | pers-h/y |
| | | | | | | |
| Cost (Total) | $/y | 19,558,710 | 44,798 | $/y | 19,603,510 | $/y |
| Fuel Consumption (Total) | L/y | 1,067,315 | | | | |
| Carbon Dioxide (Total) | kg/y | 2,518,347 | | | | |
| Hydrocarbons (Total) | kg/y | 294 | | | | |
| Carbon Monoxide (Total) | kg/y | 2,202 | | | | |
| NOx (Total) | kg/y | 2,197 | | | | |

1 Hours per Year: 480 (Site)

# MOVEMENT SUMMARY

## Site: TCS 2701 [C2: Showground Rd / Victoria Ave - PM Peak (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.3.210**

2036 Do Minimum Model - PM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 130 seconds (Site User-Given Cycle Time)

**Vehicle Movement Performance**

| Mov ID | Turn | Mov Class | Demand Flows [ Total veh/h | HV ] % | Arrival Flows [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% Back Of Queue [ Veh. veh | Dist ] m | Prop. Que | Eff. Stop Rate | Aver. No. of Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Victoria Ave (S) | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 481 | 3.3 | 481 | 3.3 | 1.231 | 300.1 | LOS F | 18.7 | 134.3 | 1.00 | 1.56 | 2.45 | 6.2 |
| | | LV | 465 | | 465 | | 1.231 | 300.1 | LOS F | 18.7 | 134.3 | NA | NA | NA | 6.2 |
| | | HV | 16 | | 16 | | 1.231 | 300.1 | LOS F | 18.7 | 134.3 | NA | NA | NA | 6.2 |
| 2 | T1 | All MCs | 1537 | 1.9 | 1537 | 1.9 | *1.621 | 639.4 | LOS F | 152.4 | 1084.6 | 1.00 | 2.99 | 3.70 | 3.9 |
| | | LV | 1507 | | 1507 | | *1.621 | 639.4 | LOS F | 152.4 | 1084.6 | NA | NA | NA | 3.9 |
| | | HV | 29 | | 29 | | 1.621 | 639.4 | LOS F | 152.4 | 1084.6 | NA | NA | NA | 3.9 |
| 3 | R2 | All MCs | 404 | 1.3 | 404 | 1.3 | *1.412 | 463.7 | LOS F | 64.3 | 454.9 | 1.00 | 1.85 | 3.12 | 7.5 |
| | | LV | 399 | | 399 | | *1.412 | 463.7 | LOS F | 64.3 | 454.9 | NA | NA | NA | 7.5 |
| | | HV | 5 | | 5 | | 1.412 | 463.7 | LOS F | 64.3 | 454.9 | NA | NA | NA | 7.5 |
| Approach | | | 2422 | 2.1 | 2422 | 2.1 | 1.621 | 542.7 | LOS F | 152.4 | 1084.6 | 1.00 | 2.52 | 3.35 | 4.7 |
| East: Showground Rd (E) | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 243 | 2.6 | 243 | 2.6 | 1.466 | 434.0 | LOS F | 149.0 | 1066.7 | 1.00 | 2.47 | 3.25 | 7.1 |
| | | LV | 237 | | 237 | | 1.466 | 434.0 | LOS F | 149.0 | 1066.7 | NA | NA | NA | 7.1 |
| | | HV | 6 | | 6 | | 1.466 | 434.0 | LOS F | 149.0 | 1066.7 | NA | NA | NA | 7.1 |
| 5 | T1 | All MCs | 1632 | 2.7 | 1632 | 2.7 | 1.466 | 470.0 | LOS F | 149.0 | 1066.7 | 1.00 | 2.46 | 3.25 | 8.1 |
| | | LV | 1587 | | 1587 | | 1.466 | 470.0 | LOS F | 149.0 | 1066.7 | NA | NA | NA | 8.1 |
| | | HV | 44 | | 44 | | 1.466 | 470.0 | LOS F | 149.0 | 1066.7 | NA | NA | NA | 8.1 |
| 6 | R2 | All MCs | 968 | 2.2 | 968 | 2.2 | *1.594 | 655.9 | LOS F | 94.2 | 672.0 | 1.00 | 2.08 | 3.64 | 7.3 |
| | | LV | 947 | | 947 | | *1.594 | 655.9 | LOS F | 94.2 | 672.0 | NA | NA | NA | 7.3 |
| | | HV | 21 | | 21 | | 1.594 | 655.9 | LOS F | 94.2 | 672.0 | NA | NA | NA | 7.3 |
| Approach | | | 2843 | 2.5 | 2843 | 2.5 | 1.594 | 530.2 | LOS F | 149.0 | 1066.7 | 1.00 | 2.33 | 3.38 | 7.7 |
| North: Green Rd (N) | | | | | | | | | | | | | | | |
| 7 | L2 | All MCs | 382 | 3.3 | 382 | 3.3 | 0.925 | 51.8 | LOS D | 30.3 | 217.8 | 1.00 | 1.06 | 1.22 | 33.9 |
| | | LV | 369 | | 369 | | 0.925 | 51.8 | LOS D | 30.3 | 217.8 | NA | NA | NA | 33.9 |
| | | HV | 13 | | 13 | | 0.925 | 51.8 | LOS D | 30.3 | 217.8 | NA | NA | NA | 33.9 |
| 8 | T1 | All MCs | 697 | 3.2 | 697 | 3.2 | 0.925 | 88.2 | LOS F | 40.3 | 289.6 | 1.00 | 1.08 | 1.21 | 24.2 |
| | | LV | 675 | | 675 | | 0.925 | 88.2 | LOS F | 40.3 | 289.6 | NA | NA | NA | 24.2 |
| | | HV | 22 | | 22 | | 0.925 | 88.2 | LOS F | 40.3 | 289.6 | NA | NA | NA | 24.2 |
| 9 | R2 | All MCs | 85 | 6.2 | 85 | 6.2 | 0.219 | 81.6 | LOS F | 3.3 | 24.0 | 0.92 | 0.74 | 0.92 | 35.0 |
| | | LV | 80 | | 80 | | 0.219 | 81.6 | LOS F | 3.3 | 24.0 | NA | NA | NA | 35.0 |
| | | HV | 5 | | 5 | | 0.219 | 81.6 | LOS F | 3.3 | 24.0 | NA | NA | NA | 35.0 |
| Approach | | | 1164 | 3.4 | 1164 | 3.4 | 0.925 | 75.7 | LOS F | 40.3 | 289.6 | 0.99 | 1.05 | 1.19 | 28.7 |
| West: Showground Rd (W) | | | | | | | | | | | | | | | |
| 10 | L2 | All MCs | 157 | 2.7 | 157 | 2.7 | 1.494 | 465.4 | LOS F | 169.3 | 1207.5 | 1.00 | 2.01 | 3.34 | 5.7 |
| | | LV | 153 | | 153 | | 1.494 | 465.4 | LOS F | 169.3 | 1207.5 | NA | NA | NA | 5.7 |
| | | HV | 4 | | 4 | | 1.494 | 465.4 | LOS F | 169.3 | 1207.5 | NA | NA | NA | 5.7 |
| 11 | T1 | All MCs | 1722 | 2.1 | 1722 | 2.1 | *1.494 | 502.4 | LOS F | 169.3 | 1207.2 | 1.00 | 2.44 | 3.34 | 7.6 |
| | | LV | 1685 | | 1685 | | *1.494 | 502.4 | LOS F | 169.3 | 1207.5 | NA | NA | NA | 7.6 |
| | | HV | 37 | | 37 | | 1.494 | 502.4 | LOS F | 169.3 | 1207.5 | NA | NA | NA | 7.6 |
| 12 | R2 | All MCs | 175 | 0.6 | 175 | 0.6 | 1.024 | 135.8 | LOS F | 7.7 | 54.4 | 1.00 | 1.10 | 1.83 | 12.6 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LV | 174 | | 174 | | 1.024 | 135.8 | LOS F | 7.7 | 54.4 | NA | NA | NA | 12.6 |
| | HV | 1 | | 1 | | 1.024 | 135.8 | LOS F | 7.7 | 54.4 | NA | NA | NA | 12.6 |
| Approach | | 2054 | 2.1 | 2054 | 2.1 | 1.494 | 468.4 | LOS F | 169.3 | 1207.5 | 1.00 | 2.30 | 3.21 | 7.6 |
| All Vehicles | | 8483 | 2.4 | 8483 | 2.4 | 1.621 | 456.4 | LOS F | 169.3 | 1207.5 | 1.00 | 2.20 | 3.03 | 7.4 |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

**Pedestrian Movement Performance**

| Mov ID | Crossing | Input Vol. | Dem. Flow | Aver. Delay | Level of Service | AVERAGE BACK OF QUEUE [ Ped | Dist ] | Prop. Que | Eff. Stop Rate | Travel Time | Travel Dist. | Aver. Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ped/h | ped/h | sec | | ped | m | | | sec | m | m/sec |
| South: Victoria Ave (S) | | | | | | | | | | | | |
| P1 | Full | 50 | 53 | 32.5 | LOS D | 0.1 | 0.1 | 0.91 | 0.91 | 47.8 | 20.0 | 0.42 |
| East: Showground Rd (E) | | | | | | | | | | | | |
| P2 | Full | 50 | 53 | 51.0 | LOS E | 0.2 | 0.2 | 0.89 | 0.89 | 66.4 | 20.0 | 0.30 |
| North: Green Rd (N) | | | | | | | | | | | | |
| P3 | Full | 50 | 53 | 57.4 | LOS E | 0.2 | 0.2 | 0.94 | 0.94 | 72.8 | 20.0 | 0.27 |
| West: Showground Rd (W) | | | | | | | | | | | | |
| P4 | Full | 50 | 53 | 51.0 | LOS E | 0.2 | 0.2 | 0.89 | 0.89 | 66.4 | 20.0 | 0.30 |
| All Pedestrians | | 200 | 211 | 47.9 | LOS E | 0.2 | 0.2 | 0.91 | 0.91 | 63.3 | 20.0 | 0.32 |

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

# INTERSECTION SUMMARY

## Site: C10v [C10: Victoria Ave / Anella Ave / Hudson Ave - PM Peak (2) (Site Folder: General)]

**Output produced by SIDRA INTERSECTION Version: 9.1.3.210**

2036 Do Minimum Model - PM Peak
Site Category: (None)
Give-Way (Two-Way)

| Intersection Performance - Hourly Values | | | |
|---|---|---|---|
| **Performance Measure** | **Vehicles:** | **All MCs** | **Persons** |
| Travel Speed (Average) | km/h | 48.1 | 48.1 km/h |
| Travel Distance (Total) | veh-km/h | 1428.4 | 1714.0 pers-km/h |
| Travel Time (Total) | veh-h/h | 29.7 | 35.6 pers-h/h |
| Desired Speed | km/h | 50.0 | |
| Speed Efficiency | | 0.96 | |
| Travel Time Index | | 9.58 | |
| Congestion Coefficient | | 1.04 | |
| | | | |
| Demand Flows (Total) | veh/h | 3381 | 4057 pers/h |
| Arrival Flows (Total) | veh/h | 3381 | |
| Percent Heavy Vehicles (Demand) | % | 2.4 | |
| Percent Heavy Vehicles (Arrivals) | % | 2.4 | |
| Degree of Saturation | | 0.513 | |
| Practical Spare Capacity | % | 91.0 | |
| Effective Intersection Capacity | veh/h | 6591 | |
| | | | |
| Control Delay (Total) | veh-h/h | 0.78 | 0.94 pers-h/h |
| Control Delay (Average) | sec | 0.8 | 0.8 sec |
| Control Delay (Worst Lane by MC) | sec | 4.6 | |
| Control Delay (Worst Movement by MC) | sec | 4.6 | 4.6 sec |
| Geometric Delay (Average) | sec | 0.8 | |
| Stop-Line Delay (Average) | sec | 0.1 | |
| Idling Time (Average) | sec | 0.0 | |
| Intersection Level of Service (LOS) | | NA | |
| | | | |
| 95% Back of Queue - Veh (Worst Lane) | veh | 0.0 | |
| 95% Back of Queue - Dist (Worst Lane) | m | 0.0 | |
| Ave. Que Storage Ratio (Worst Lane) | | 0.00 | |
| Effective Stops (Total) | veh/h | 303 | 363 pers/h |
| Effective Stop Rate | | 0.09 | 0.09 |
| Proportion Queued | | 0.00 | 0.00 |
| Performance Index | | 31.0 | 31.0 |
| | | | |
| Cost (Total) | $/h | 1133.91 | 1133.91 $/h |
| Fuel Consumption (Total) | L/h | 98.9 | |
| Carbon Dioxide (Total) | kg/h | 234.0 | |
| Hydrocarbons (Total) | kg/h | 0.015 | |
| Carbon Monoxide (Total) | kg/h | 0.18 | |
| NOx (Total) | kg/h | 0.194 | |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.
In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %

Number of Iterations: 3 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 28.2% 0.0% 0.0%

| Intersection Performance - Annual Values | | | |
|---|---|---|---|
| **Performance Measure** | **Vehicles:** | **All MCs** | **Persons** |
| Demand Flows (Total) | veh/y | 1,622,905 | 1,947,487 pers/y |

| | | | | |
|---|---|---|---|---|
| Delay (Total) | veh-h/y | 377 | 452 | pers-h/y |
| Effective Stops (Total) | veh/y | 145,333 | 174,400 | pers/y |
| Travel Distance (Total) | veh-km/y | 685,616 | 822,739 | pers-km/y |
| Travel Time (Total) | veh-h/y | 14,258 | 17,109 | pers-h/y |
| | | | | |
| Cost (Total) | $/y | 544,275 | 544,275 | $/y |
| Fuel Consumption (Total) | L/y | 47,485 | | |
| Carbon Dioxide (Total) | kg/y | 112,307 | | |
| Hydrocarbons (Total) | kg/y | 7 | | |
| Carbon Monoxide (Total) | kg/y | 88 | | |
| NOx (Total) | kg/y | 93 | | |

1 Hours per Year: 480 (Site)