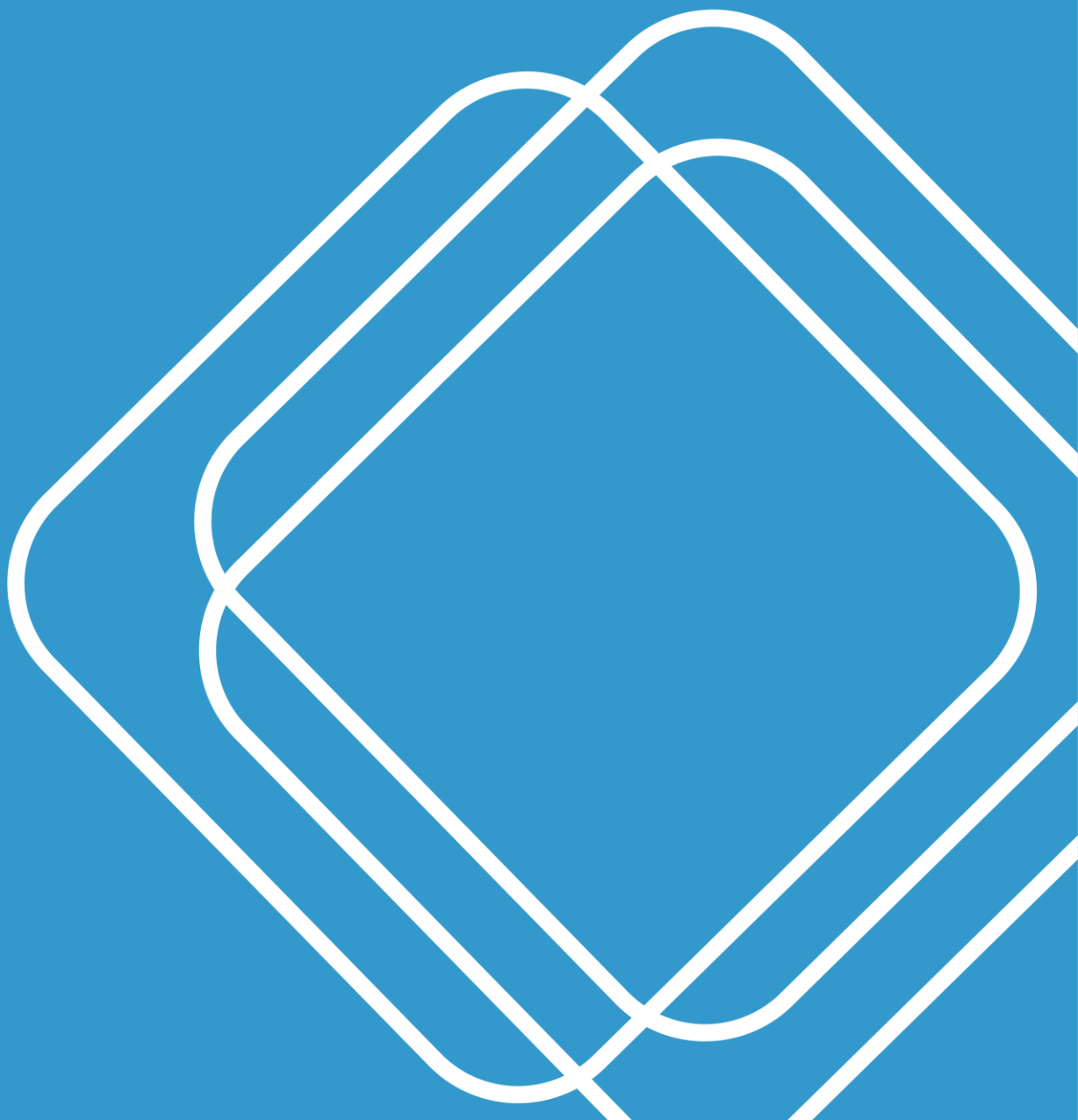
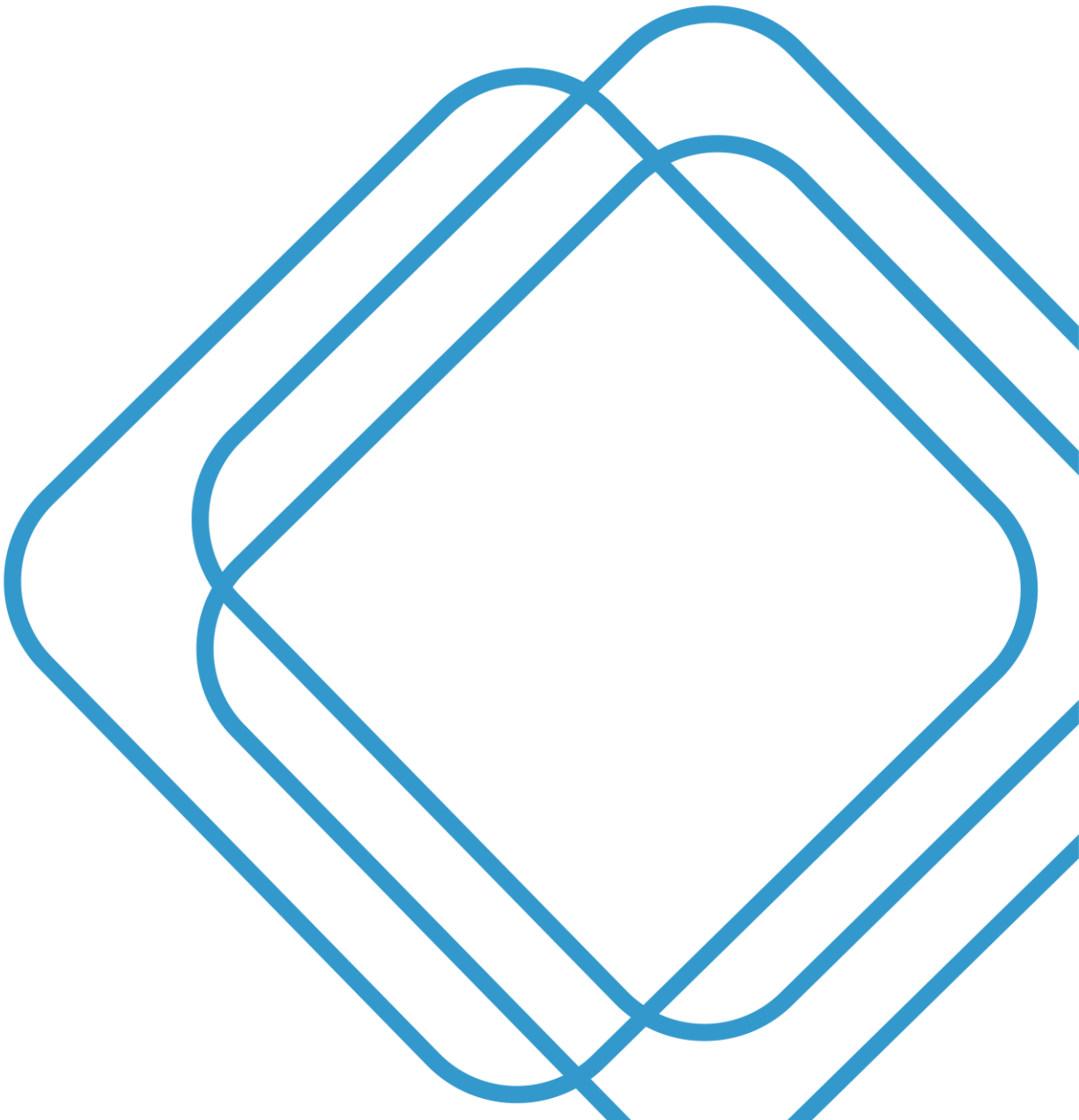
SCT Consulting

HILLS SHOWGROUND STATION PRECINCT

Traffic and Transport Assessment

30 OCTOBER 2019





Quality Assurance

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Contents

Executive Summary

Background and introduction

The NSW Government has recently opened the Sydney Metro North West (SMNW) in May 2019. The SMNW is Stage One of the Sydney Metro project from Tallawong to Bankstown that involved the construction of eight new Metro stations and supporting infrastructure between Tallawong and Epping Stations, as well as upgraded five existing stations between Epping and Chatswood. Stage Two will deliver a new Metro rail line from Chatswood through Sydney's CBD to Bankstown (Sydney Metro City and Southwest).

Landcom and Sydney Metro are working in collaboration to develop walkable, attractive, mixed use places around the SMNW stations. This includes using government owned land located adjacent to the Hills Showground Station. The subject site, the Hills Showground Station Precinct is bounded by De Clambe Drive to the north and west, Carrington Road to the south and Showground Road to the east.

The proposal

SCT Consulting was engaged to carry out a Traffic and Transport Assessment to support a State Significant Development Application (SSDA) for the subject site. The Illustrative Concept Proposal is a transit-oriented mixed-use development that could comprise up to 1,900 dwellings and up to a maximum of 13,600 m^2 of non-residential space.

It should be highlighted that the Concept Proposals seek approval for a range of non-residential Gross Floor Areas (between 6,700 m^2 and 13,600 m^2 of GFA), hence there is a range of residential dwelling yield between 1,802 and 1,879 dwellings including a minimum of five percent for affordable housing. The higher and lower non-residential schemes both yield a total GFA 175,796 m^2. In order to understand the implications of both scenarios and to undertake a worst-case assessment, the parking assessment has considered the more onerous condition with the upper limit of both non-residential and residential Gross Floor Areas.

On the other hand, the trip generation and traffic modelling exercise have considered the more onerous condition with the upper limit of both non-residential and the lower limit residential Gross Floor Areas, which would generate the highest vehicular trips. Hence the impacts highlighted in this report would be overstated if the lower limit of the non-residential is delivered with the upper limit of residential component.

Up to 2,273 car parking spaces and 799 bicycle parking spaces are also proposed, based on the yield and land use mix of the proposed development and the recommended maximum car parking rates and minimum bicycle parking rates for each type of uses respectively.

The SSDA would facilitate development which supports best practice transit-oriented development principles, by providing increased residential and employment density in proximity to existing and planned transport infrastructure upgrades that provides employees with greater access to public transport and employment options, while promoting the use of sustainable travel options.

The Illustrative Concept Proposal responds to the opportunity to create a transit-oriented centre by reducing the amount of car parking, reflecting the higher level of public transport services and providing walking and cycling facilities to enhance seamless connections with the regional facilities. The best approach to facilitate / influence reduced car use and to minimise additional congestion to the surrounding road network is to restrain parking provision (while offering attractive public transport alternative in this case Sydney Metro and its connecting bus network). Hence the need to predict and provide parking provision based on historical data / trends does not align with the principle of the Hills Showground Station Precinct.

The recommended parking rates is part of the proposal to discourage private vehicle use and minimise traffic impacts, as shown below:

Land use		Car parking rates range	Bicycle parking rates
Residential	1 Bed	0.6 - 1.0 space per dwelling	One space per three apartments for resident and one visitor space per 12 apartments
	2 Bed	0.9 - 1.0 space per dwelling	
	3 Bed	1.4 - 1.5 spaces per dwelling	
	Visitor	0.1 spaces per dwelling	

Land use	Car parking rates range	Bicycle parking rates
Retail	1 space per 130 m^2 – 60 m^2 GFA	One space per 450 m^2 GFA for staff
Office / commercial	1 space per 145 m^2 – 100 m^2 GFA	One space per 600 m^2 GFA for staff
Car share spaces	One space per 150 car spaces for residential and one space per 80 car parking spaces for commercial	-

Source: SCT Consulting, 2019

Trip generation and traffic impacts

The Illustrative Concept Proposal would generate 710 and 927 peak hour vehicular trips during the AM and PM peak hours respectively. The proposed cap on vehicular parking spaces below the requirements of the rates suggested in The Hills Development Control Plan and the Showground Precinct Development Control Plan is one of the tools used to reduce the traffic impacts of this proposal.

Key roads servicing the development are Showground Road and Carrington Road. The intersections modelled in SIDRA Network were:

– Showground Road / De Clambe Drive;

– Showground Road / Carrington Road;

– Carrington Road / Andalusian Way / Middleton Avenue;

– Carrington Road / Doran Drive;

– Carrington Road / De Clambe Drive; and

– Carrington Road / Victoria Avenue.

The modelled road network currently operates with a performance of Level of Service D or better. A few intersections operate over capacity without any infrastructure improvement in 2031, as a result of background traffic growth. However, the performance can be maintained at Level of Service D or better provided the following infrastructure at each development scenario:

– **2031 without development (background traffic growth only)**, which includes:

  - Intersection widening for Showground Road as per scheme proposed by Roads and Maritime;
  - Carrington Road as per scheme proposed by Roads and Maritime to Middleton Avenue; and
  - Signalisation of Carrington Road / Victoria Avenue within road footprint, as per scheme proposed by Roads and Maritime.

– **2031 with development**, which requires: same as above with no additional upgrades.

Roads and Maritime Services provided the current scheme for the Showground Road and Carrington Road upgrades, which were used to identify infrastructure requirements as above.

Traffic modelling indicates that the traffic network requires the full Showground Road and Carrington Road upgrade scheme including the signalisation of Carrington Road / Victoria Avenue in order to achieve acceptable performance to cater for background traffic growth and development traffic. It should be noted that no additional infrastructure upgrades are required to cater for the proposed development, once the full Showground Road and Carrington Road upgrade scheme including the signalisation of Carrington Road / Victoria Avenue is delivered.

According to the Showground Station Precinct Contributions Plan No. 19, the signalisation of Carrington Road and Victoria Avenue and the upgrade of Carrington Road and Middleton Avenue have already been included to meet the future demand, whilst ensuring an acceptable level of access, safety and convenience for all street and road users within the Showground Precinct. Hence, the upgrade of this intersection, as confirmed by the traffic modelling to cater for background traffic growth and development traffic, should be paid off by all relevant Section 7.11 contributions. On the other hand, as also stated in the Contributions Plan No. 19, the upgrade of Showground Road / Carrington Road will be provided by parties other than Council (including Transport for NSW and future individual developers within the Precincts) as development occurs.

It is also estimated the development would generate approximately 670 and 542 person-trips during the weekday AM and PM peak hours respectively – i.e. trips across all modes of transport. Given the site is located adjacent to the Hills Showground Station, most of the walking trips are expected to be using surrounding public transport services

and a small proportion would be walking / cycling to / from local origins. Given the high frequency of train services, the pedestrian demand between the proposed development and the station would be very well-spread across the peak hours, hence reducing the likely crowding levels and additional upgrade of current footpaths and shared paths which are delivered for significantly higher demand and are currently observed to have significant spare capacities.

The additional public transport trips generated during the peak hours can be accommodated through the high frequency Metro services (4-minute frequency during the peak hours) and up to 19 bus services per hour across seven bus routes in the peak travel demand direction during AM and PM peak hour periods.

Conclusion

This Traffic and Transport Assessment concludes that:

– The location of the site directly adjacent to Hills Showground Station will provide future residents and employees with improved access to high frequency public transport services, which will provide an alternative to private vehicle use especially for commuter trips;

– Footpath and pedestrian crossing facilities are well provided around the site to support safe and convenient walk to / from Hills Showground Station;

– Dedicated cycle routes around the site connecting to the regional routes will cater for more short trips by cycling to nearby activities and destinations;

– Parking rates are proposed for the Illustrative Concept Proposal to create a transit-oriented centre in line with metro's vision, reflecting the higher level of public transport services and to minimise additional congestion to the surrounding road network; and

– The total number of parking spaces is appropriate for this transit oriented development and in line with Roads and Maritime Service Guide to traffic generating developments and will naturally limit the traffic impacts of this proposal. The additional vehicle trips will not have any significant adverse traffic implications on the public road network.

1.0 Introduction

1.1 Context

SCT Consulting was engaged to carry out a Traffic and Transport Assessment to support the concept State Significant Development Application (SSDA) for the Hills Showground Station Precinct site (The site) located in The Hills Local Government Area (LGA). This SSDA is for a concept plan and seeks consent for building envelopes and Gross Floor Area (GFA) for residential and non-residential development on the three development lots located at the newly opened Hills Showground Metro Station. The site is bounded by Carrington Road to the south, Showground Road to the east, De Clambe Drive to the north and west, as shown in **Figure 1–1**.

The Illustrative Concept Proposal is a transit-oriented mixed-use development that could comprise up to 1,900 dwellings and up to a maximum of 13,600 m^2 of non-residential space.

Figure 1–1 Location of the subject site

Source: Cox, June 2019

1.2 Planning background

In 2012, the NSW Government announced a plan to deliver Sydney Metro, a rapid transit service to transform and modernise Sydney's rail network to support Sydney's growing population. Sydney Metro planned to deliver 31 Metro stations and more than 65 kilometres of new Metro rail before 2024 including:

– Stage One - Sydney Metro Northwest (SMNW) – from Tallawong to Chatswood, opened in 2019;

– Stage Two - Sydney Metro City & Southwest – from Chatswood to Bankstown via city stations is due for completion in 2024.

A third stage, Sydney Metro West, is under development and is currently in the public consultation phase. This stage involves an extension of the Metro from Sydney to Parramatta via the Bays Precinct and Sydney Olympic Park.

SMNW is the first stage of the overall project. It involves eight new stations and commuter car parking as well as upgrades to the existing railway line between Epping and Chatswood to meet Metro rail standards. Sydney Metro acquired large sections of land to support construction and delivery of SMNW. Land which was not required for either

station development or the ongoing operation of the Metro is now available to be developed for other uses, including new homes and spaces for businesses and community uses. These sites are referred to within this report as Developable Government Land (DGL).

Landcom and Sydney Metro are planning for creating diverse, well-designed places for current and future communities. This program is known as Sydney Metro Northwest Places.

Landcom is the master planner for Sydney Metro-owned land next to SMNW stations and in this role will support planning for places that maximise the benefits of SMNW.

The Showground Station Precinct is one of eight urban transformation projects under the SMNW Urban Transformation Program, with the other seven sites around new Metro stations being Cherrybrook, Castle Hill, Hills Showground, Bella Vista, Kellyville and Tallawong, as well as around the existing Epping Station. The context of the Showground Station Precinct site is shown in **Figure 1–2**.

Figure 1–2 Sydney Metro Northwest Places map

Source: Landcom, 2018

The site forms part of the wider Showground Station Precinct that was rezoned in 2017 by the Department of Planning, Industry and Environment (DPIE) as part of the Planned Precincts Program (formerly known as a priority precinct). The precinct covers 271 hectares and is bounded by Showground Road and Kathleen Avenue to the north, and Windsor Road to the west and south. The eastern boundary runs along a number of local residential streets including Fishburn Crescent, Anthony Road and Parsonage Road.

The rezoning of the wider Showground Station Precinct, along with changes to height, density, and lot size controls, as well as other supporting controls will:

– Transform the area around the new Showground Station into a vibrant urban centre;

– Provide for a maximum of 5,000 new dwellings and 2,300 new jobs over the next 20 years;

– Deliver nearly two hectares of parks and new open space; and

– Provide community facilities, recreation areas and a mix of housing choice for people at all life stages.

The Hills Showground Station Precinct site is currently envisaged as a transit-oriented mixed-use development that links with the station and may include residential, retail, community and commercial office land uses. Car parking provision will recognise the transit-oriented development nature of the development.

Once the SSDA is approved, the successful purchasers of the development lots from Sydney Metro, will be responsible for submitting subsequent development applications (DAs) for the design and construction of the buildings in accordance with the concept approval.

A literature review of other relevant planning documents and their implications on the development of the Illustrative Concept Proposal as well as the Traffic and Transport Assessment is included in Section 2 of the report.

1.3 Purpose of report

The purpose of this Traffic and Transport Assessment is to support the SSDA for a proposed mixed-use development at the Hills Showground Station Precinct site.

This report has addressed the Secretary's Environmental Assessment Requirements for the concept proposal for a mixed-use development at Hills Showground Station Precinct site, issued on 26 October 2018, for transport, traffic, parking and access, particularly it will address/provide:

- The projected additional yields and traffic volumes for the Precinct and assess the cumulative impacts of the proposal in its developing context;
- Accurate details of the current daily and peak hour vehicle, public transport, point to point transport services, pedestrian and bicycle movements from existing or former buildings/uses on the site using the adjacent and surrounding road network;
- Forecast total daily and peak hour trips likely to be generated by the proposed development including vehicle, public transport, point to point transport services, pedestrian and bicycle trips, together with cumulative impacts of existing, proposed and approved developments in the area and any transport/traffic changes anticipated for the road network;
- Detailed assessment of the existing and future performance of key intersections providing access to the site, supported by appropriate modelling and analysis to the satisfaction of the relevant road authorities and TfNSW;
- Measures to mitigate impacts of the proposed development on the operation of existing and future traffic, public transport, pedestrian and bicycle networks including any required upgrades;
- Measures to be implemented to encourage users of the development to make sustainable travel choices, including walking, cycling, public transport and car sharing, such as the integration with rail and bus infrastructure and provision of adequate bicycle parking and end of trip facilities;
- Proposed car and bicycle parking provision for residents, workers and visitors, including consideration of the availability of public transport and the requirements of the relevant parking codes and Australian Standards;
- Proposed provision of any bus service infrastructure and pedestrian connections to support the bus/rail interchange function of the metro station, including an assessment of the public domain surrounding the site to accommodate the future pedestrian demands safely and adequately and mitigation measures identified;
- Proposed vehicle access arrangements, including for service and loading activities and measures to mitigate impacts to bus services and passengers interchanging between bus and rail; and
- Describe preliminary construction traffic arrangements and management measures, including consideration of the cumulative construction traffic impacts from infrastructure works in the surrounding road / transport network.

1.4 Report structure

This report has been structured into the following sections:

- **Section 2** considers the transport planning context;
- **Section 3** describes the existing transport conditions for all modes of transport;
- **Section 4** describes the proposed development and its access strategy as well as the likely trip generation as a result of the proposed development;
- **Section 5** describes the likely cumulative impacts for all transport modes and parking impacts as a result of the proposed development; and
- **Section 6** summarises the report content and presents the final conclusions.

2.0 Transport planning context

2.1 The NSW Government Future Transport 2056 Strategy

The Future Transport Strategy 2056 (The NSW Government, 2018) is an update of NSW's Long-Term Transport Master Plan. It is a vision for how transport can support growth and the economy of New South Wales over the next 40 years. The strategy is underpinned by the Regional Services and Infrastructure Plan and the Greater Sydney Services and Infrastructure Plan, as well as a number of supporting plans including Road Safety and Tourism.

The Future Transport Strategy 2056 sets the long-term vision for mobility and transport provision in NSW, explains how the customer experience of transport will change and what this means for NSW. The Future Transport Strategy 2056 identifies that Sydney will grow as a global metropolis with benefits distributed more evenly across the City. It sets out a vision of three cities to guide many of the planning, investment and customer outcomes including faster, convenient and reliable travel times to major centres, as shown in **Figure 2–1**.

Existing and potential transit connections, together with new technology and innovation, will make the network surrounding the Site more responsive to demand and better able to manage congestion in the future.

For the three cities identified, more specific outcomes listed as part of the Strategy which will benefit the Site's transport context, include:

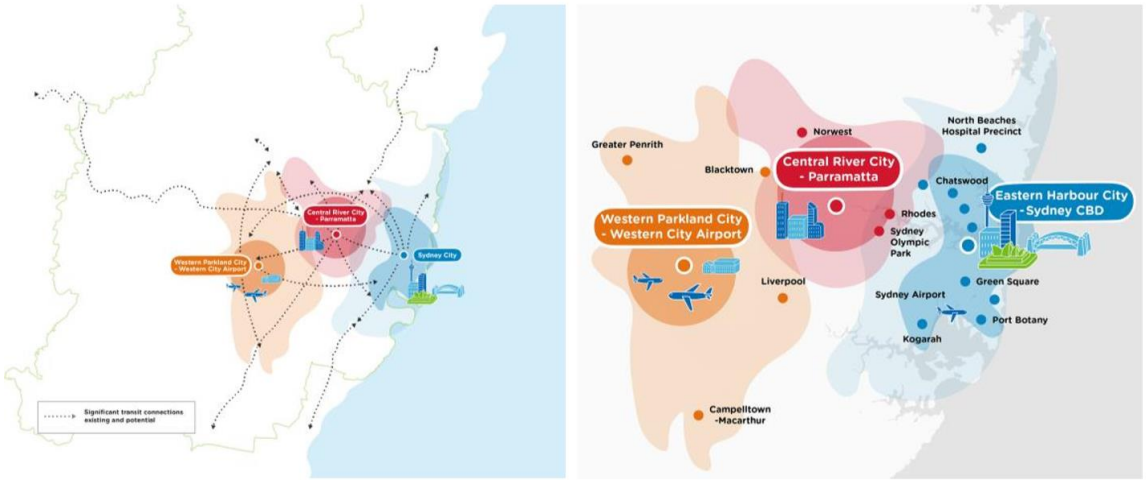
– A 30-minute access for customers to their nearest Centre by public transport 7-days a week;

– Fast and convenient interchanging with walking times no longer than 5 minutes between services;

– Walking or cycling is the most convenient option for short trips around centres and local areas, supported by a safe road environment and attractive paths; and

– Fully accessible transport for all customers.

Figure 2–1 A future metropolis of three cities



Source: The NSW Government Future Transport 2056 Strategy, 2018

The following historic transport strategies were superseded by Future Transport 2056, so no longer have any relevant requirements for this site:

– Sydney's Walking Future;

– Sydney's Cycling Future; and

– Sydney's Bus Future.

2.2 State Infrastructure Strategy

The Future Transport Strategy 2056 was released in coordination with the State Infrastructure Strategy. One of the strategic directions of the strategy was integrating land use and infrastructure planning. The strategy notes that "Further action needs to be taken to identify and protect major infrastructure corridors and supporting and

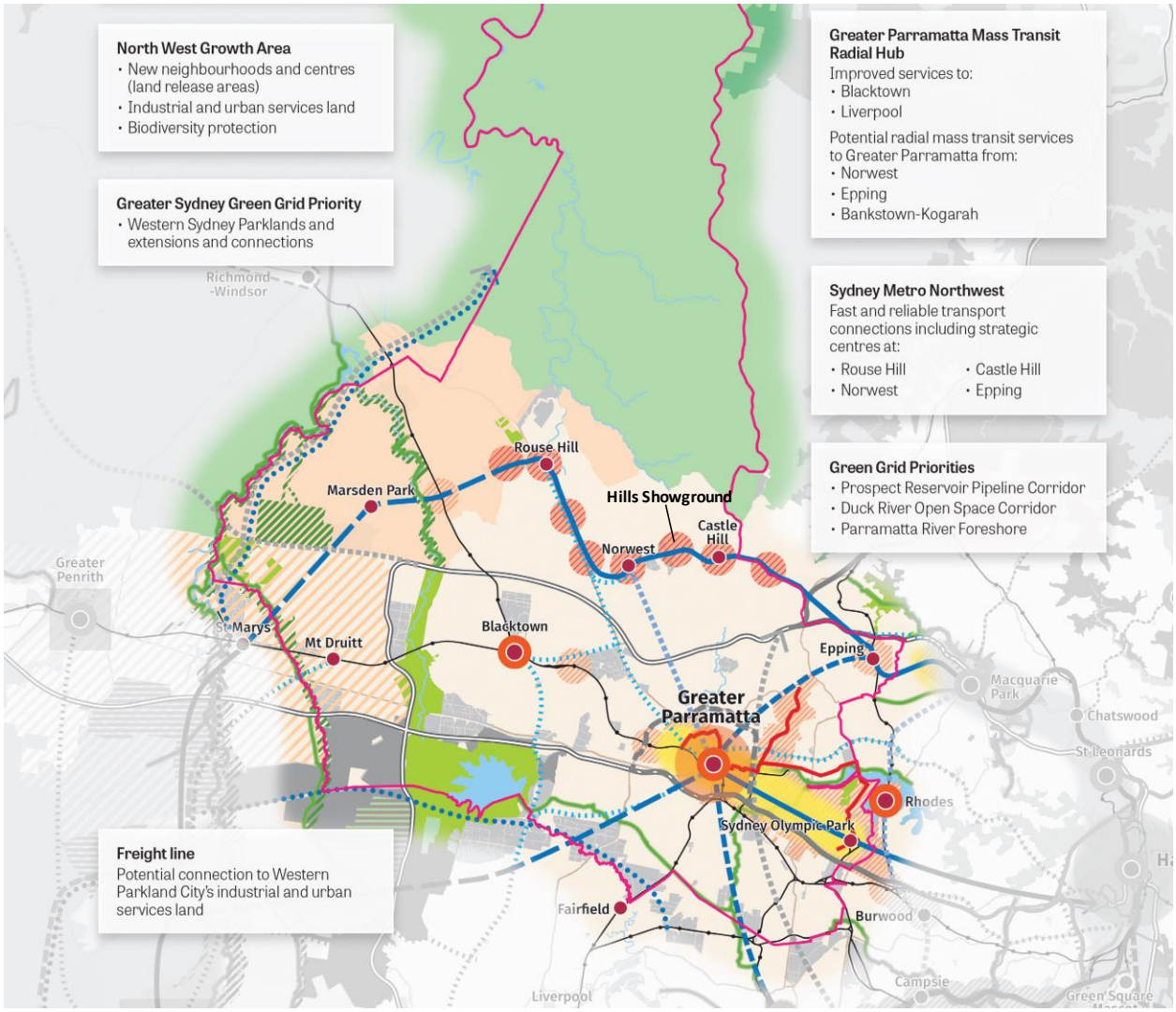
coordinating housing supply plans that align with Regional Plans." (INSW, 2018). One of the key challenges and opportunities is that "the State's growing population and tightening fiscal position make it imperative that we get the most from our current infrastructure stock and that investment in new infrastructure is targeted effectively to meet and shape demand."

Implications for Hills Showground Station Precinct site: Managing the impacts of the development while maximising the use of current infrastructure is critical at this location. With major new investment into the Sydney Metro, Showground and Carrington road upgrades, the site is well placed to benefit from current capacity without the need for significant additional expenditure.

2.3 Central City District Plan

The vision for the Central City District is to help residents have quicker and easier access to a wider range of jobs, housing types and activities as part of the transformation of their District. The vision will improve the District's lifestyle and environmental assets as shown in **Figure 2–2**.

Figure 2–2 Future of the Central City District



Source: https://www.greater.sydney/central-city-district-plan/future-of-central-city%C2%A0district, 2018

The Central City District covers Blacktown, Cumberland, Parramatta and The Hills local government areas. The Central City District Plan is a 20-year plan to manage growth in the context of economic, social and environmental matters to achieve the 40-year version of Greater Sydney.

The District Plan informs local strategic planning statements and local environmental plans, the assessment of planning proposals as well as community strategic plans and policies. The District Plan also assists councils to plan

for and support growth and change and align their local planning strategies to place-based outcomes. It guides the decisions of State agencies and informs the private sector and the wider community of approaches to manage for growth and change. Community engagement on the District Plan has contributed to a plan for growth that reflects local values and aspirations, in a way that balances regional and local considerations.

The Hills Showground Station Precinct site is identified as a Transit Oriented Development area that has direct access to fast and reliable transport connections to the SMNW network. SMNW and new station at Hills Showground will provide the opportunity to transform the existing area into a transit-oriented, more vibrant and diversified centre with a mix of residential uses and supporting services. SMNW will also enable faster and more reliable business-to-business connections to other centres such as Macquarie Park and Chatswood.

The vision for Greater Sydney is one where people can access jobs and services in their nearest metropolitan and strategic centre. The 30-minute city is a long-term aspiration that will guide decision-making on locations for new transport, housing, jobs, tertiary education, hospitals and other amenities. It means that they will be planned for metropolitan and strategic centres and more people will have public transport access to their closest metropolitan or strategic centre within 30 minutes. This will enable more efficient access to workplaces, services and community facilities.

As the population of the Central City District grows, land use, transport and infrastructure planning will be integrated. Initiatives to support integration in line with population and economic growth include:

- City-shaping transport providing faster services for a larger number of commuters to better connect people to centres and services – committed and proposed links to the Harbour CBD and the Western Sydney Airport and Badgerys Creek Aerotropolis;
- Capacity and reliability improvements on existing transport corridors serving Greater Parramatta and surrounding centres;
- Improved city-serving and centre-serving transport links between strategic centres, and as feeders into city-shaping corridors including bus priority infrastructure to support new services;
- Improvements to the strategic road network which may include both new roads and road space reallocation to prioritise the efficient movement of people and goods on transport corridors and key intersections to improve movement through the District and access to strategic centres;
- Strategic freight network improvements including the Northern Sydney Freight Line and the Southern Sydney Freight Line;
- Travel behaviour change programs to help manage demand on the transport network;
- On-demand bus services on selected local bus routes, currently being trialled in Greystanes, to provide more convenience and choice for customers, and improving the efficiency of the transport network and providing more choice for first and last mile access to the train network; and
- Investment in Smart Roads, which will support the financial sustainability of the transport system by better using existing road infrastructure and enable future forms of mobility such as connected and automated vehicles.

Implications for Hills Showground Station Precinct site: Given the excellent access to SMNW, Hills Showground can play an important role as a transit-oriented development. Transit-oriented developments must aim to adopt car parking rates that provide a balance between meeting car parking demand whilst encouraging sustainable and active transport use. New developments are encouraged to minimise car parking provision and demonstrate the inclusion of supportive mix of land uses and transport alternatives or strategies to reduce trip generation and discourage private motor vehicle use. The Illustrative Concept Proposal will support future residents who choose to live in a transit-oriented centre with low parking provision and excellent access to public and active transport.

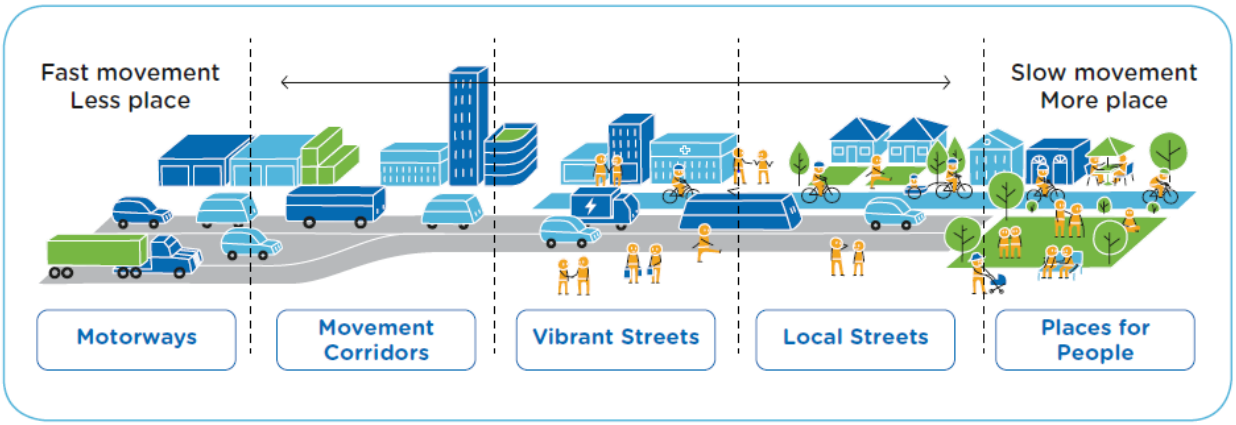
2.4 Greater Sydney Services Infrastructure Plan

The Greater Sydney Services and Infrastructure Plan is a 40-year plan for transport in Sydney. It is designed to support the land use vision for Sydney. Building on the state-wide transport outcomes identified in the Future Transport Strategy 2056, the Plan establishes the specific outcomes transport customers in Greater Sydney can expect and identifies the policy, service and infrastructure initiatives to achieve these.

To support the liveability, productivity and sustainability of places for the transport network, a Movement and Place Framework was developed. The Framework acknowledges that transport networks have different functions and roles and serve as both a destination and as a means to move people and goods. The Movement and Place Framework

will enable us to plan, design and operate the transport network to meet these different needs by providing greater transparency, supporting collaboration between those responsible for land use, transport and roads while also encouraging input from the community. Through the framework we will be able to design a future network that is better used and supports the safe, efficient and reliable movement of goods and the need for liveability of places along it.

Figure 2–3 Different movement environments under the Movement and Place Framework



Source: https://future.transport.nsw.gov.au/sites/default/files/media/documents/2018/Future_Transport_2056_Strategy.pdf, 2018

Implication for Hills Showground Station Precinct site: De Clambe Drive, Andalusian Way, Doran Drive would be classified as local street as they are part of the fabric of the suburban neighbourhood where customers live their lives. The streets will also facilitate local community access to the station.

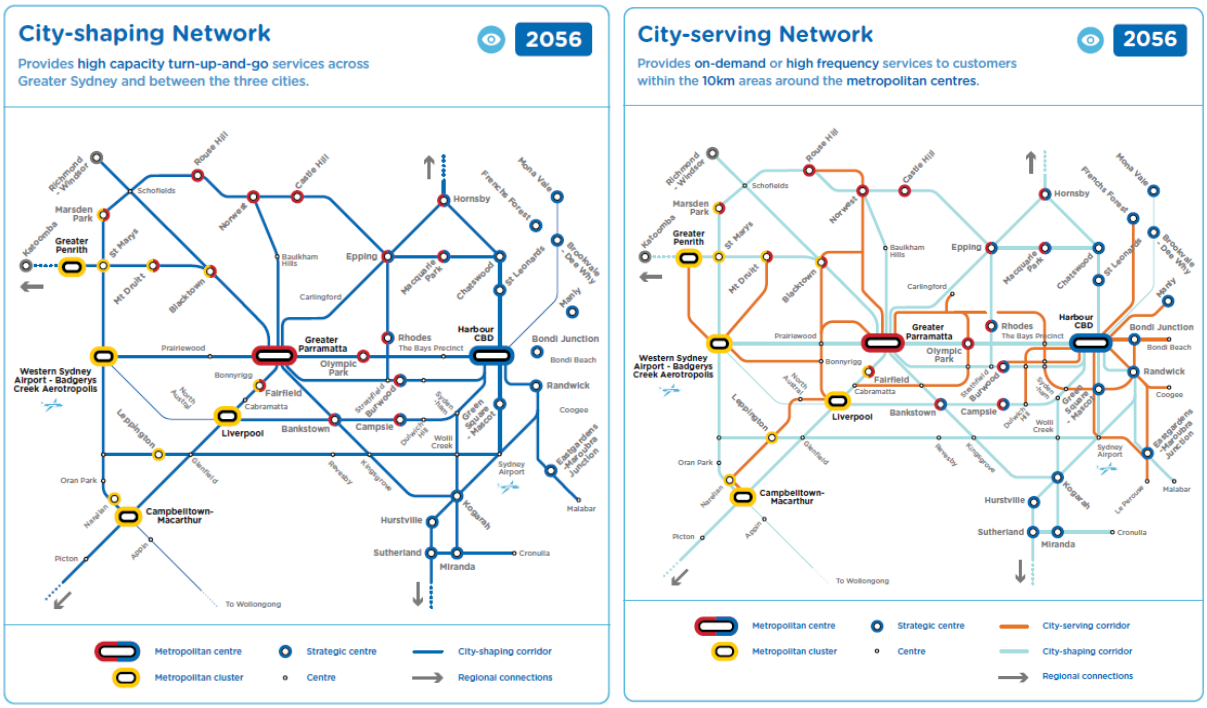
2.4.1 Future Transport Network

2.4.1.1 City-shaping network

The city-shaping network includes higher speed and volume linkages between our cities and centres (**Figure 2–4**). The function of this network is to enable people living in any of the three cities to access their nearest metropolitan centre within 30 minutes and to be able to travel efficiently between these metropolitan centres.

As Greater Sydney transitions to a metropolis of three cities, the city-shaping network will need to expand to provide improved access to and between each metropolitan city/centre, particularly Greater Parramatta and centres in the Metropolitan cluster in the Western Parkland City.

Figure 2–4 City-shaping and City Serving networks - 2056



Source: https://future.transport.nsw.gov.au/wp-content/uploads/2018/plans/Greater_Sydney_Services_Infrastructure_Plan.pdf (April, 2018)

2.4.1.2 City-serving network

The city-serving network will provide high-frequency services within a ~10km radii of the three metropolitan cities/centres (**Figure 2–4**). This will support access within some of the densest land use in Greater Sydney where demand for travel is most concentrated. As these urban areas in each of the three cities develop and become denser, the Government will investigate the prioritisation of on-street public transport services and invest in higher frequency services, providing more travel options for employees and visitors to Hills Showground Station Precinct and the site.

Implication for Hills Showground Station Precinct site : Hills Showground is part of both city-shaping and city-serving networks that would connect Hills Showground to Campbelltown via Western Sydney airport, Parramatta as well as the Harbour CBD. This would bring Hills showground into reach of all three cities by high frequency and high capacity public transport links.

2.4.1.3 Bicycle Network

Building on the existing network, the immediate focus for State Government is working with local councils to deliver committed Priority Cycleway projects to address key missing links around the Harbour CBD, Greater Parramatta, Greater Penrith, Blacktown and Liverpool, such as the Nepean River Green Bridge and Inner West Greenway. Council partnership programs are delivering local bicycle infrastructure. Bicycle parking is also being rolled out at interchanges.

By 2056:

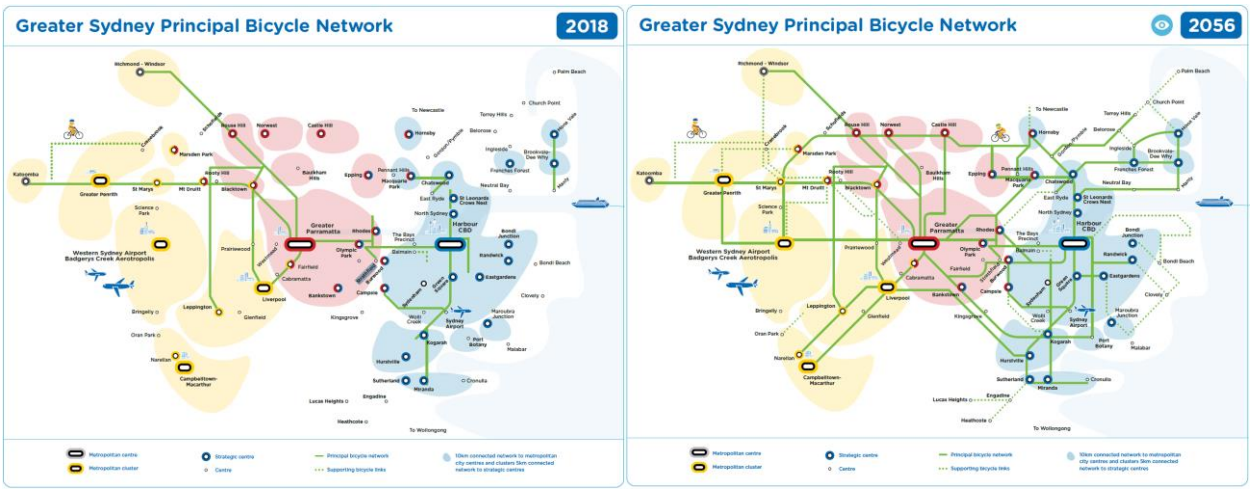
– Walking and cycling network coverage will be improved by using state held corridors for public transport, pipelines, waterways, crown land and service easements for bicycle network infrastructure;

– That all strategic centres have connected walking and cycling networks, including strategic centres across the Western Parkland City; and

– Further investment in connections to strategic centres and in the Principal Bicycle Network will support walking or cycling being the most convenient option for short trips, improving health outcomes, safety and convenience for customers as well as boosting the productivity, liveability and sustainability of Greater Sydney.

Figure 2–5 shows the current/committed Greater Sydney Bicycle Network alongside the envisioned 2056 Bicycle Network.

Figure 2–5 Current / committed and 2056 Greater Sydney Principal Bicycle Network



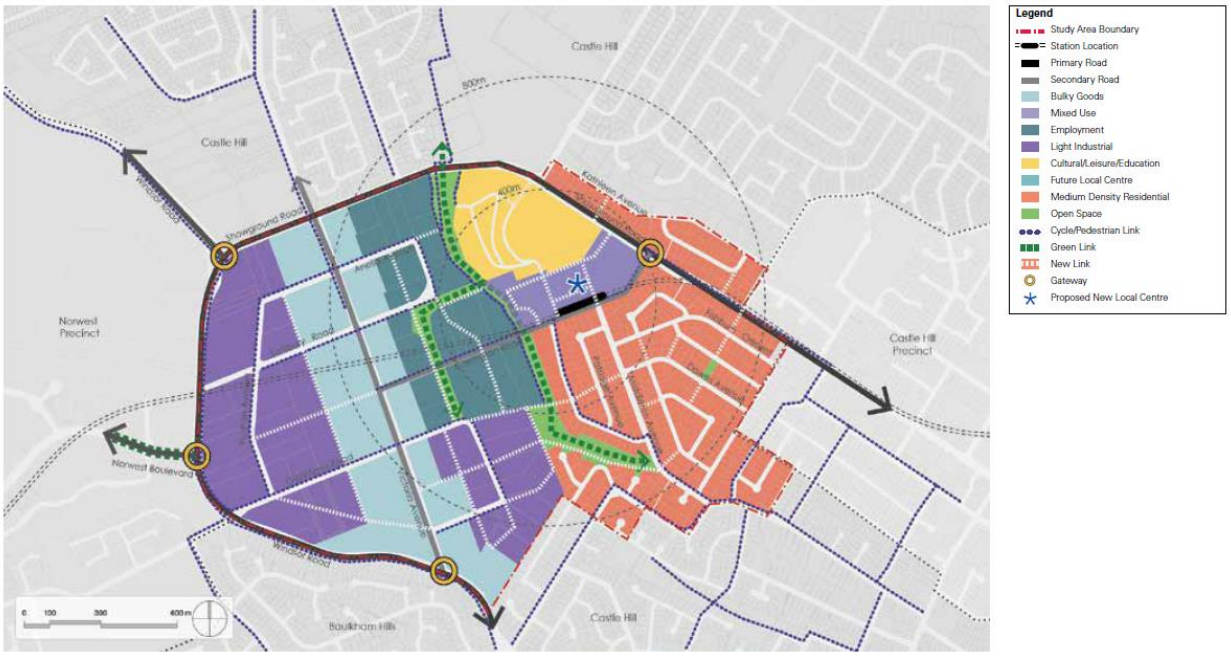
Source: https://future.transport.nsw.gov.au/wp-content/uploads/2018/plans/Greater_Sydney_Services_Infrastructure_Plan.pdf (April, 2018)

Implication for Hills Showground Station Precinct site: Transport for NSW and Council will work together to investigate the delivery of Principle Bicycle Network that connects Hills Showground with surrounding centres including Rouse Hill, Castle Hill and also Greater Parramatta.

2.5 North West Rail Link Corridor Strategy

The North West Rail Link (NWRL – now SMNW) Corridor Strategy was prepared in 2013 to identify future visions for precincts surrounding NWRL stations and establish frameworks for managing future land use change. This strategy enables infrastructure agencies to identify, prioritise and co-ordinate the delivery of infrastructure upgrades in accordance with each precinct's long-term growth potential, providing increased transparency about the area's growth infrastructure pipeline.

Figure 2–6 Hills Showground Station Structure Plan



Source: North West Rail Link Corridor Strategy (NSW Department of Planning and Transport for NSW, 2013)

The Strategy highlights the role of transit-oriented development in maximising the benefits of the rail investment in delivering dwelling and employment growth for the area. It identifies objectives to grow patronage, increase access to

public transport, help communities access jobs and services closer to home, build liveable centres and improve housing affordability.

The document states that SMNW supports positive changes in travel behaviour arising from mode shift to rail. The project facilitates reduced private vehicle movements, in turn addressing capacity constraints on the road network and reducing traffic congestion, including reduced bus congestion in the CBD in the longer term. The SMNW also provides increased opportunities for sustainable transport alternatives, through the provision of cycling and walking networks to the SMNW stations.

The introduction of SMNW and a station at Hills Showground has the potential to further reinforce Hills Showground Station Precinct as a mixed-use centre for Sydney's North West. The expected residential dwellings and jobs will be 4,350 and 15,200 in 2036 within the study area. A new station will provide further impetus for Hills Showground to evolve as a vibrant and active centre of business and residence for the region, comprising offices, retail, community facilities, recreation, cultural, education and housing to serve the 650,000 people of the North West by 2036.

2.6 The Hills Corridor Strategy

The Hills Corridor Strategy identifies SMNW as a significant transport project that enhances the liveability of the Hills Shire. It is transformational in that it provides a fast and efficient connection to the global arc but importantly within The Hills Shire itself. It is important that the land used around the station support each station's role, achieve housing and jobs targets and create vibrant and safe places.

A key consideration is the capacity of roads and intersections to take more growth whilst accounting for mode shift. As a result of SMNW, there could be a shift from private vehicles to public transport modes. This is based upon a review of other key transit centres within the Sydney Metropolitan Region such as Chatswood, Hurstville and Meadowbank-West Ryde and indicates there is likely to be an increase in the proportion of employed residents catching public transportation to work in the areas closest to the station.

The strategy notes that such a mode shift will take time and a careful response will be needed to ensure the additional yield does not compromise residents' ability to get where they need to go in a reasonable time.

2.7 Hills Future 2036 – Local Strategic Planning Statement (LSPS)

The Hills Future 2036 - Local Strategic Planning Statement (LSPS) provides details upon which to base planning decisions and drive future land use planning and the management of growth in the Shire based on our economic, social and environmental needs over the next 20 years. The LSPS sets out planning priorities and corresponding actions to be delivered over the next 5 years that will provide for more housing, jobs, parks and services for our growing population.

The LSPS recognises The Hills Shire's place in the Greater Sydney Region and its mix of urban and rural environments that provide a number of challenges and opportunities in the delivery of housing, jobs and services to allow Sydney to grow as a metropolis. It builds on previous local strategies as well as key strategic planning documents such as Council's Community Strategic Plan, The Hills Corridor Strategy and various detailed Precinct Plans. It will be used to inform future changes to Council's Local Environmental Plan (LEP), Development Control Plan (DCP) and Contributions Plans.

The Hills Shire will be a significant contributor to achieving outcomes identified under the Central City District Plan, 18 percent of additional dwellings in Central City (38,000 of 207,500) and up to 30 percent of additional jobs (32, 200) in 2036.

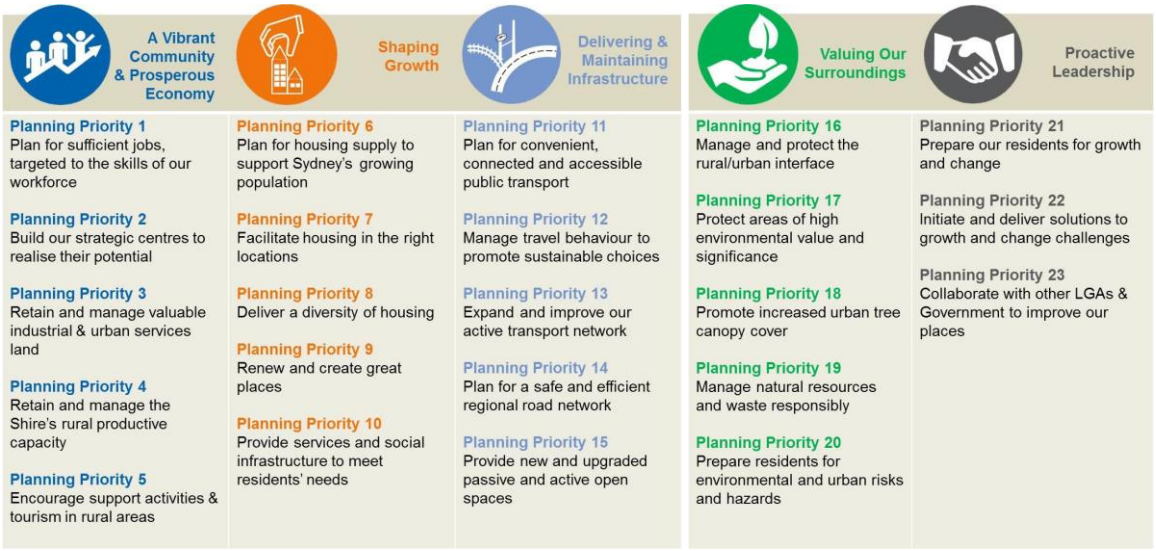
The Hills Future 2036 Vision is:

> *"To shape exceptional living, working and leisure places where expected growth brings vibrancy, diversity, liveability and prosperity for the Hills."*

In conjunction with the SMNW, careful planning for new dwellings and employment opportunities close to transport nodes and bus links will contribute to the 30-minute city vision for Greater Sydney.

Five related themes form the basis for our community's vision of The Hills: a vibrant community and prosperous economy, shaping growth, delivering and maintaining infrastructure, valuing our surroundings and proactive leadership. These themes will be monitored against identified measures and implemented through 23 planning priorities.

Figure 2–7 Hills Future 2036 Planning Priorities



Source: Hills Future 2036 – Local Strategic Planning Statement, June 2019

2.7.1 Hills Future 2036 – Integrated Transport and Land Use Strategy

The Integrated Transport and Land Use Strategy provides an overall strategic context for planning for growth and movement in The Hills.

The completion of SMNW is a catalyst for a considerable portion of the Shire's population growth. The master planning process for station precincts is identifying the amount and locations of key supporting infrastructure including traffic and transport infrastructure.

The Integrated Transport and Land Use Strategy provides an overall strategic context for planning for growth and movement in The Hills:

– Renew and create great places;

– Plan for convenient, connected and accessible public transport;

– Manage travel behaviour to promote sustainable choices;

– Expand and improve our active transport network; and

– Plan for a safe and efficient regional road network.

2.7.1.1 Renew and Create Great Places

Whilst there is capacity across the urban area of the Shire for 62,400 extra dwellings, The Hills is expecting to deliver an additional 38,000 dwellings between 2016 and 2036. Remaining capacity will service growth beyond 2036.

The majority of housing growth to 2036 is expected to occur within SMNW station precincts (69 percent) and new release areas within the North West Growth Area (29 percent). The majority of new dwellings will be in high density areas, with good access to public transport options.

The integration of transport, infrastructure and land-use planning is critical to achieving the vision of the 30-minute city. The way that we move to and through a place influences our interactions, perceptions, choices and general enjoyment of the places we live and work.

2.7.1.2 Managing Travel Behaviour to Promote Sustainable Choices

Car ownership levels in The Hills are typically high at approximately 2.1 vehicles per household and nearly 80 percent of trips are made by private vehicle. The majority of people travel as either driver or passenger in a private vehicle, whether out of necessity or preference. Compared to Greater Sydney, The Hills has fewer people who do not own a car, and more people who own 2 or more cars.

As population increases, so too will the numbers of cars that will be using the existing road network, as well as the demand for car parking. Based on existing levels of car ownership, it could reasonably be expected that an additional 72,000 vehicles could be located in The Hills by 2030. Future Transport 2056 does not identify any major new road

connections to or through The Hills within the next 20 years. As a result, any additional vehicles will be added to the existing road network, increasing the need to address issues of congestion and mode share to ensure that Hills residents can get to where they need to go safely and efficiently.

Managing travel behaviour through control of parking cost and availability is one key way in which Council can influence peoples travel choices and effect meaningful mode shift. This doesn't mean that car users are penalised for their travel choices, rather that the environment is managed in such a way that encourages more alternative travel choices by making them convenient and attractive while still ensuring that private vehicle travel is accommodated and supported appropriately.

Opportunities exist for reconsideration of existing car parking rates for residential and commercial developments in close proximity to public transport, where car ownership levels are typically lower. Reducing parking opportunities at both origin and destination will influence travel choices.

Car sharing is a convenient, affordable and sustainable transport option for residents and businesses located in close proximity to public transport. Car sharing enables more sustainable travel habits and helps keep businesses and residents connected. It is an efficient use of parking space, allowing a single vehicle to be used by a large number of people. This reduces congestion and the competition for parking spaces, which ultimately benefits all road users.

Encouraging car sharing in high density residential and commercial areas within close proximity to transport hubs may be supported through targeted development controls. These could include:

– Reduced car parking rates for developments incorporating shared parking facilities in station precincts;

– Requirements for dedicated car sharing spaces for new developments; or

– Provision of dedicated on-street parking for shared vehicles.

2.7.1.3 Expand and improve our active transport network

Walking is an important travel mode in journeys and is often associated with trips which also involve travel by bus, rail or car. Communities and town centres with walking and cycling at the forefront of design provide attractive, liveable areas with high levels of street activity, improved safety and a high quality public environment. Walkable and cycle friendly environments contribute to greater public transport use and contribute to healthier communities by encouraging physical activity.

As part of the development of the SMNW, a pedestrian and cycle strategy was developed which identified preliminary options for improvements to on and off-road cycle and pedestrian networks. Some of these improvements were to be provided by SMNW, with others to be provided by other bodies including Council. Development of fine grain public domain plans around new station precincts will give further detailed consideration to any new on and off-road cycle and pedestrian links and these will be incorporated into Council's Bike Plan review.

2.8 The Showground Station Precinct Plan

2.8.1 The Showground Station Precinct Plan – Finalisation Report

The Showground Station Precinct, along with the Bella Vista and Kellyville Station Precincts, were announced as Priority Precincts by the NSW Government in August 2014, following a unanimous decision to nominate these precincts by The Hills Shire Council.

The SMNW has become the catalyst for urban transformation in Sydney's northwest, opening up new connections and economic benefits for the region, and providing opportunities for new attractive and vibrant town centres around the stations. A focus on place-making has underpinned the planning for the precinct for the creation of a healthy, safe and sustainable community.

The Showground Station Precinct will see a new town centre focused around the station, the Castle Hill Showground site continue its role as an important cultural and recreation facility, provide for more homes and more housing choice close to the station, and provide for a range of business uses, with better connections to transport. It will provide additional open space and facilitate the rehabilitation of and improve access to Cattai Creek.

The rezoning investigations has involved an incredibly comprehensive body of evidence based strategic planning, underpinned by extensive community and stakeholder consultation that will establish a long term and holistic land use and infrastructure plan for the area.

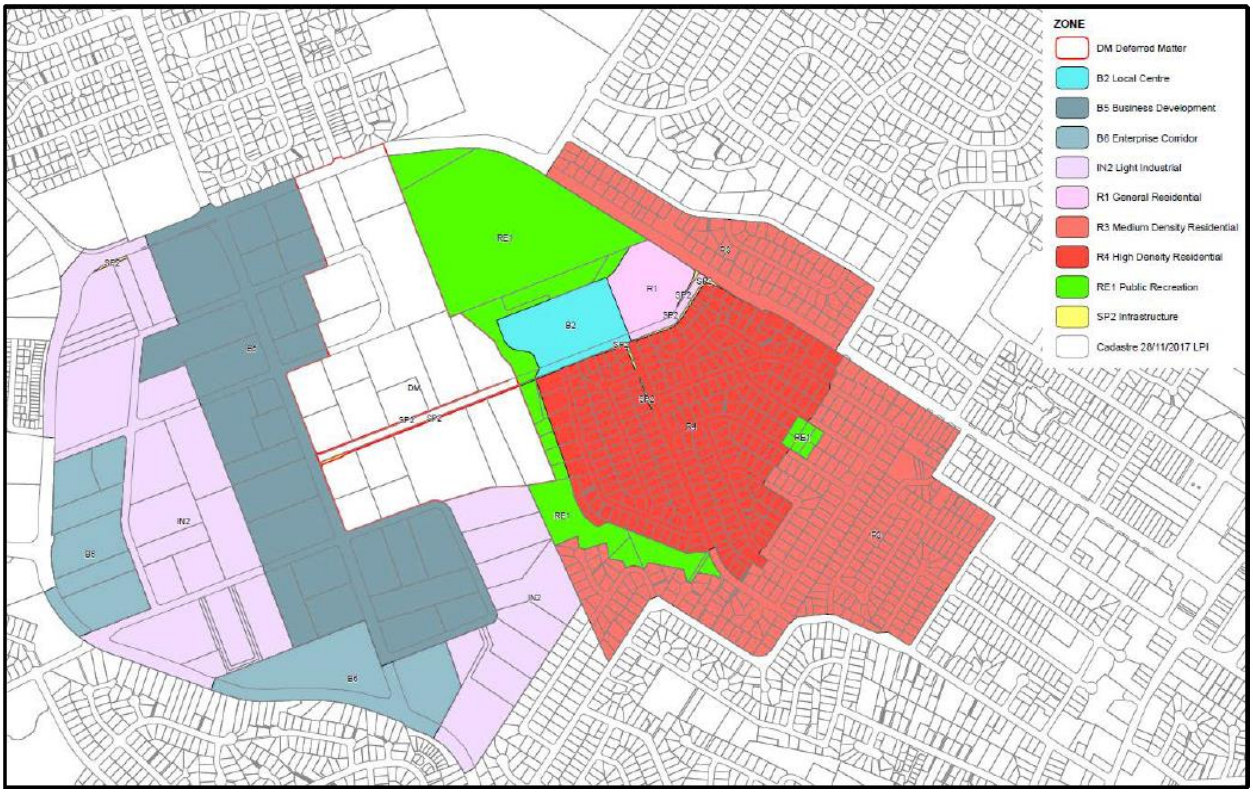
This Finalisation Report provides an overview of the Showground Station Precinct and details the planning amendments that are proposed by State Environmental Planning Policy Amendment (Showground Station Precinct)

2017. The finalisation Report summarises the public consultation undertaken and responds to issues raised in the submissions.

Figure 2–8 provides the updated zones including post exhibition amendments. The rezoning plan is forecast to deliver approximately 5,000 new homes and 2,300 jobs over the next 20 years, transforming the area around Showground Station Precinct into a vibrant local centre.

This dwelling number is capped through a clause in the SEPP to align with the local and state infrastructure that has been planned to support the precinct's growth and is consistent with the level of growth forecast during public exhibition of the draft plans.

Figure 2–8 Showground Station Precinct proposed zoning



Source: The Showground Precinct Plan Finalisation Report (December 2017)

2.8.2 The Showground Station Precinct Plan – Transport Plan

The proposed land use of the precinct comprises a local centre, commercial and light industrial areas, an employment spine along Carrington Road as well as town houses and detached dwellings. The 2036 yields of residential, employment and retail will be 5,000 dwellings, 8,640 jobs and 10,000 m^2 GFA respectively.

The newly opened SMNW transforms the Precinct and enable an activated transit-oriented precinct, resulting in a diversity of activities that create and shape the travel demand for residents, workers and visitors. It is suggested that mode share of 53 percent for public and active transport for trips made both to and from the Precinct, higher than many well-established station precincts across Sydney. Private car will share the rest 47 percent consequently.

This shift to public transport will happen over time, and will need to be reinforced with the proposed integrated future network, including:

– Delivery of SMNW;

– Focused investment in the road network to manage movement and place functions;

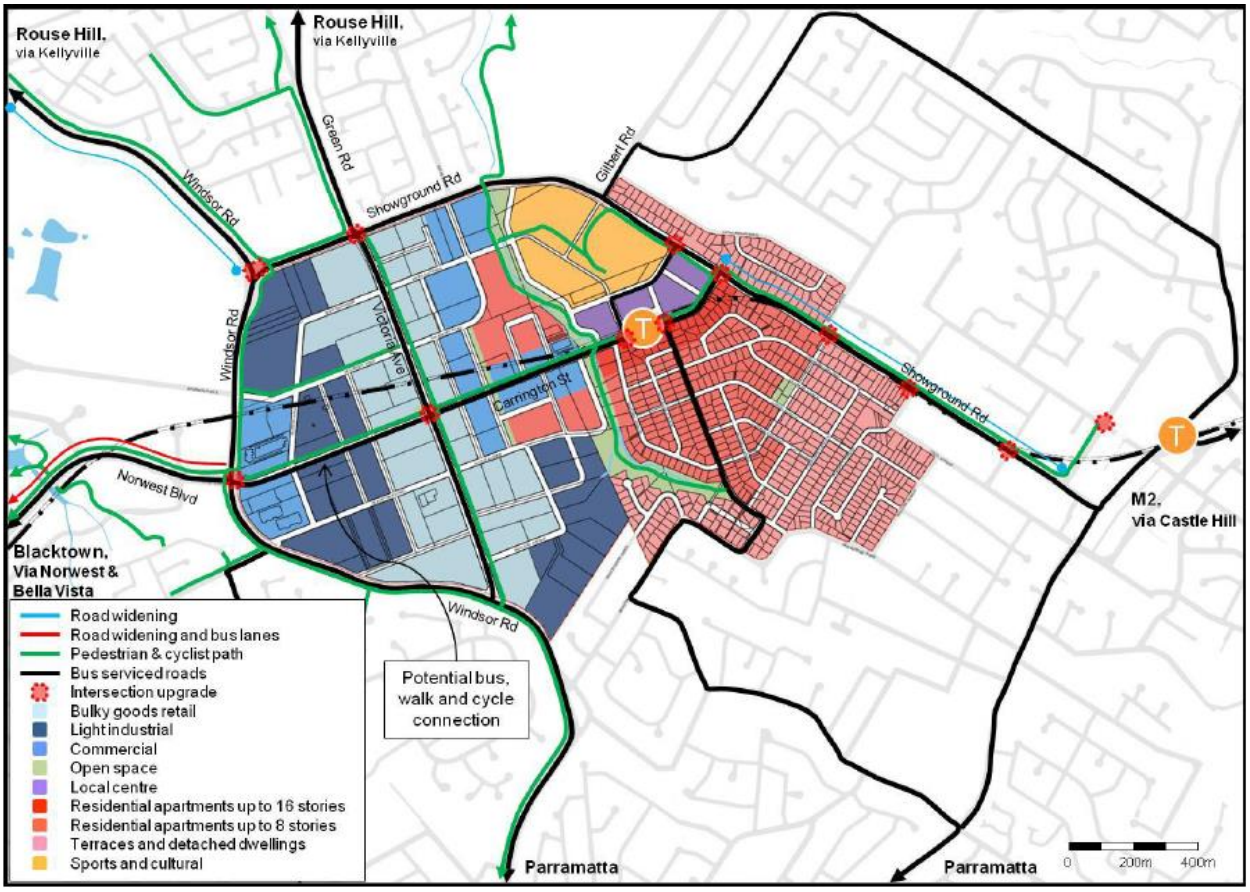
– Significantly improving walking connectivity and amenity;

– Providing cycling links and facilities;

– Facilitating a network of bus corridors that connect the Precinct to surrounding centres outside the rail corridor; and

– Longer distance private vehicle travel and key road freight movements will be prioritised on primary roads, and access provided for local freight, including deliveries, on local roads.

Figure 2–9 Infrastructure improvement plan



Source: The Showground Station Precinct Plan – Transport Plan (December 2015)

2.8.2.1 Street function

The future road network has been defined in the context of the movement and place functions that it will serve, consistent with desired urban renewal and transport outcomes. The future street functions are illustrated in **Figure 2–10** and illustrate the planned movement and place function of each of the roads in the precinct.

Key road functions as a result of the SMNW and the land use proposal will be:

– Windsor Road will remain as a primary movement corridor connecting areas northwest of the Precinct to Parramatta;

– Showground Road will remain as a primary movement corridor and will accommodate regional trips away from the streets interfacing with the station precinct;

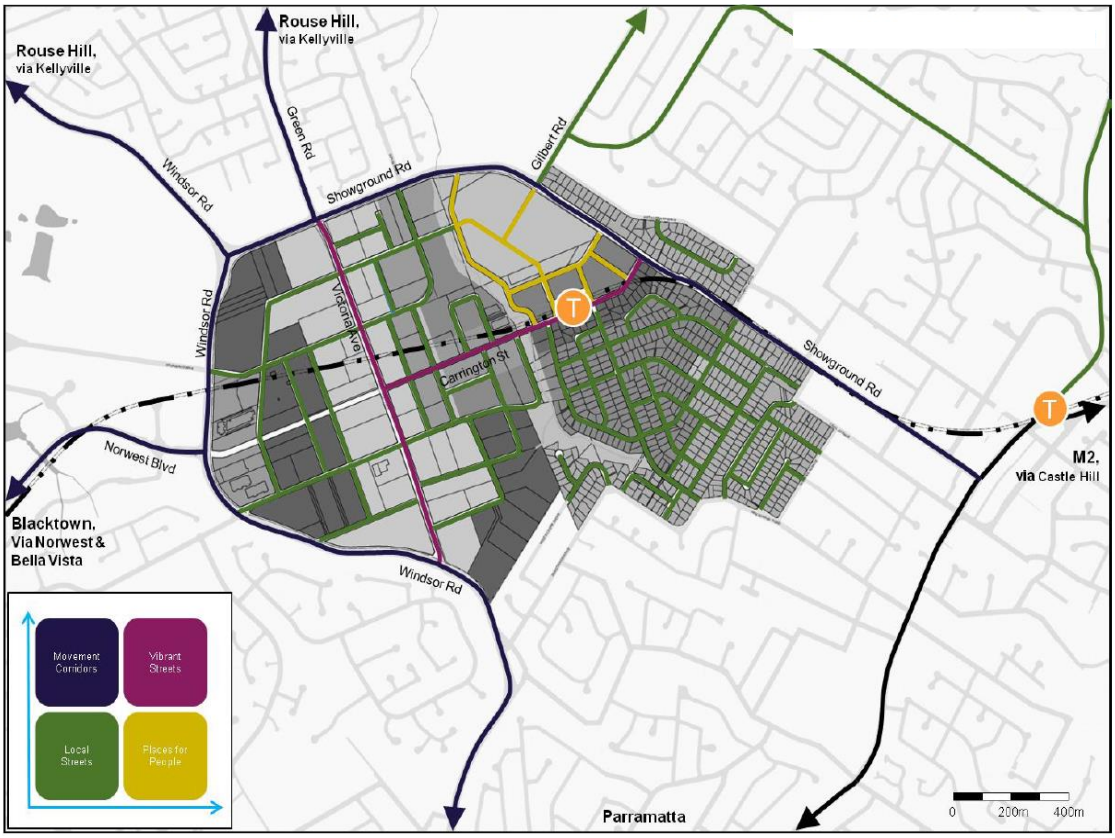
– Carrington Road and Victoria Avenue will have a greater place function as urban renewal occurs within the precinct, and operate as a vibrant street;

– This planning proposal proposes to retain bulky goods uses within the Precinct, as well as provide an increase in commercial land uses. This will require continued access by light freight to, from and within the Precinct;

– The primary access points for freight will be via Victoria Road from Showground Road and Windsor Road which have a high movement function. Access for heavy freight via Carrington Road will be discouraged through design and urban form outcomes; and

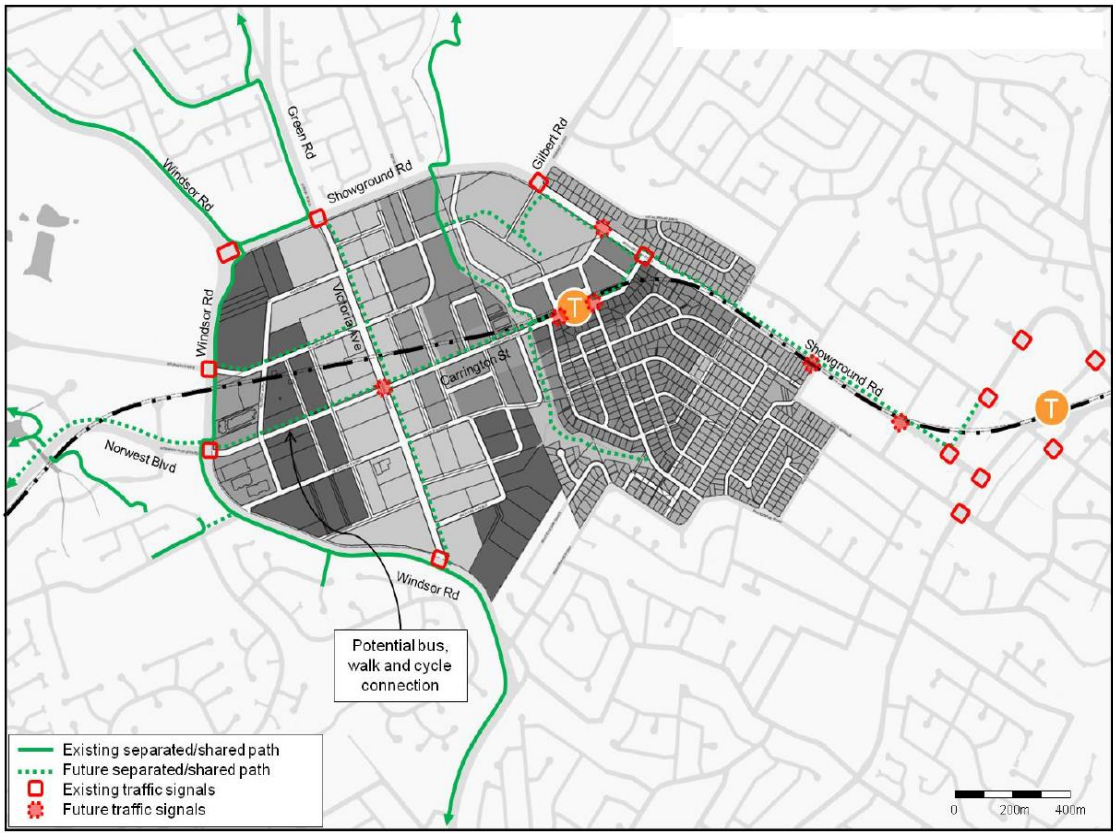
– Local roads including new links will provide local permeable access for vehicles, walking and cycling, and accommodate the local freight task.

Figure 2–10 Street function



Source: The Showground Station Precinct Plan – Transport Plan (December 2015)

Figure 2–11 Proposed walking and cycling facilities



Source: The Showground Station Precinct Plan – Transport Plan (December 2015)

2.8.2.2 Walking and cycling

The future proposed urban renewal will facilitate improved pedestrian connectivity through a finer grained street network that provides greater permeability.

Carrington Road and Victoria Avenue will have greater place function as a result of the proposed future land use changes. This will create a demand for improved walking amenity within the precinct, accessing the mix of land uses and the rail station. To support the demand for improved amenity traffic signals will be required along Carrington Road, Victoria Avenue and Showground Road to provide safe locations for pedestrians to move across high movement corridors.

Increased cycling trips will also result from the future proposed urban renewal with a greater population of residents and workers requiring a mix of cycling facilities for commuting and recreational purposes.

Future cycling facilities would cater for both local and subregional travel demand. Existing facilities currently serve demand between the Precinct and the residential areas to the north and south. Increased off-road facilities will be required to improve accessibility between the adjacent centres as Castle Hill and Norwest, as well as the residential areas to the northwest.

The proposed walking and cycling network improvements are outlined in **Figure 2–11**. These proposed improvements provide the main network structure that will be further integrated with the fine grain road network that will be developed to support residential, commercial, retail and other business land uses.

2.8.2.3 Bus

Improved service routing and frequencies are required to increase the catchment for bus accessibility to the Precinct and the rail station for residents and workers in the region. The proposed rapid and suburban bus services will complement the future rail services and service travel demand to locations away from the rail corridor. The local bus routes will also need to cater for local access to, from and within the area.

Utilising Sydney's Bus Future, a proposed future bus network is illustrated in **Figure 2–12**. The bus network will require comprehensive review to take advantage of new precinct streets, additional bus priority measures, servicing improvements across North West Sydney, local precinct development and the interchange capabilities of SMNW.

The main considerations for the proposed bus network include:

– Bus stops located every 800 metres on rapid bus routes;

– Bus priority measures along rapid bus routes;

– Provision of bus services within 400 metres of at least 90 percent of homes;

– Peak service frequencies of four to six services per hour per route; and

– Off-peak service frequencies of at least two services per hour per route.

2.8.2.4 Road

The road network is the main artery of the transport system in the region which provides access to, from and within the Precinct for pedestrians, cyclists, buses and private vehicles. The road network will mainly serve subregional and regional travel demand for a range of trip purposes.

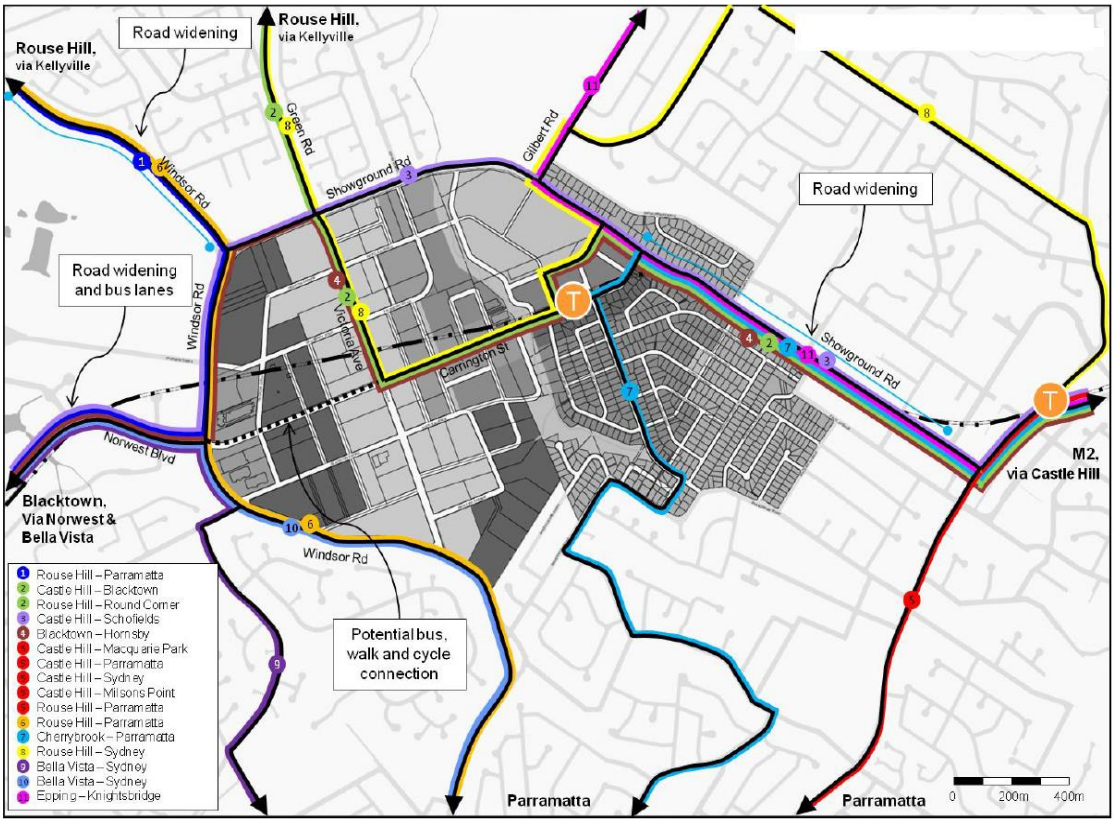
To support customers living outside the walking, cycling and bus catchments, some parking will be provided at the Showground Station. Currently 600 spaces are provided for these customers to provide equitable access for potential metro customers.

Showground Road will continue to be a primary link between the precinct, Castle Towers and M7 Motorways. The planned widening of the road between Carrington Road and Castle Hill will help to accommodate future demand and potentially provide bus priority measures to support the objectives of the bus network.

A finer grain street network in the Precinct will have an important role in improving accessibility for pedestrian and cyclists to move within the Precinct, as well as for motorists to access the arterial road network. Proposed intersection improvements would facilitate access to the Precinct and provide safe crossing points for pedestrians and cyclists, as well as bus priority measures where required.

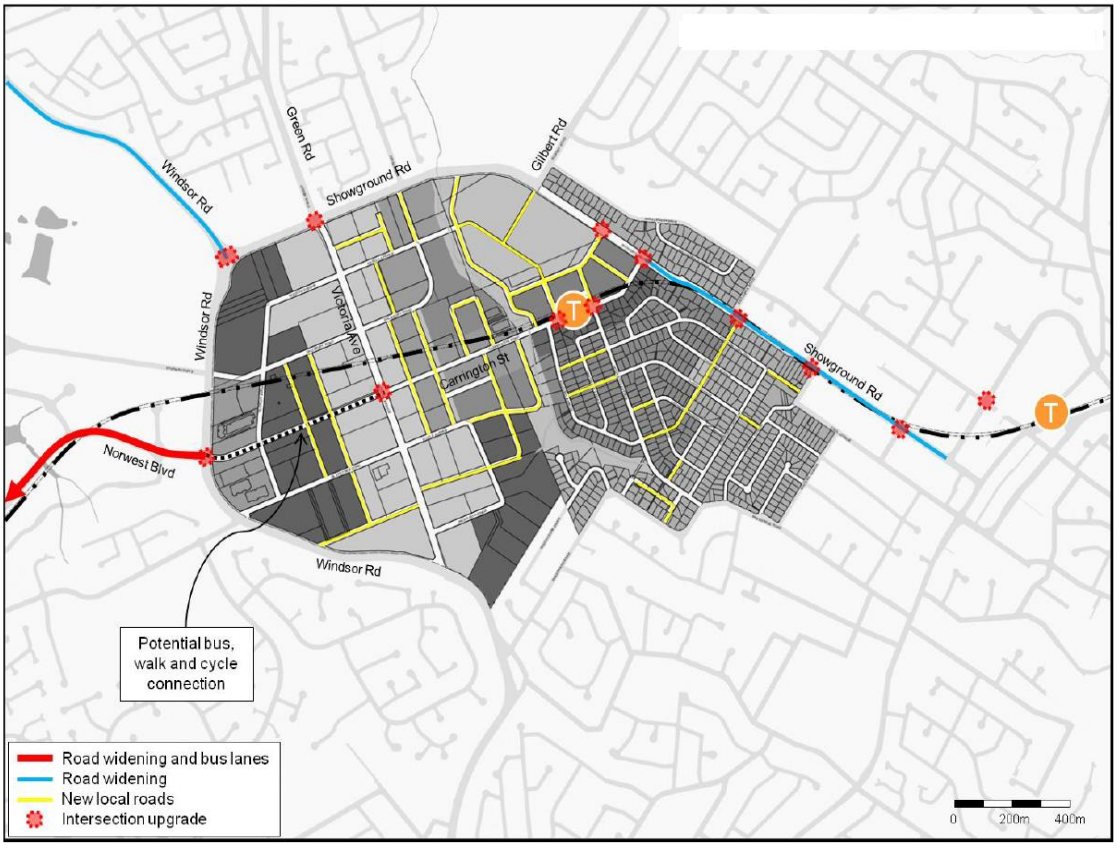
The proposed road improvements are illustrated in **Figure 2–13**.

Figure 2–12 Proposed bus network



Source: The Showground Station Precinct Plan – Transport Plan (December 2015)

Figure 2–13 Proposed road network improvements



Source: The Showground Station Precinct Plan – Transport Plan (December 2015)

2.9 Apartment Design Guide

The Apartment Design Guide (Department of Planning, Industry and Environment) provides design criteria and general guidance about how development proposals can achieve the nine design quality principles identified in SEPP 65 (State Environmental Planning Policy No 65 - Design Quality of Residential Apartment Development). The SEPP 65 legislation states:

> *(1) If an application for the modification of a development consent or a development application for the carrying out of development to which this Policy applies satisfies the following design criteria, the consent authority must not refuse the application because of those matters:*
>
> > *(a) if the car parking for the building will be equal to, or greater than, the recommended minimum amount of car parking specified in Part 3J of the Apartment Design Guide*

The specific term of the Apartment Design Guide that captures parking provision is repeated below:

Objective 3J-1

Car parking is provided based on proximity to public transport in metropolitan Sydney and centres in regional areas

Design criteria

1. For development in the following locations:
   - on sites that are within 800 metres of a railway station or light rail stop in the Sydney Metropolitan Area; or
   - on land zoned, and sites within 400 metres of land zoned, B3 Commercial Core, B4 Mixed Use or equivalent in a nominated regional centre

   the minimum car parking requirement for residents and visitors is set out in the Guide to Traffic Generating Developments, or the car parking requirement prescribed by the relevant council, whichever is less

   The car parking needs for a development must be provided off street

Source: Department of Planning, Environment and Industry (2015)

The rates provided in the Guide to Traffic Generating Developments are shown in **Table 2.1**.

Table 2.1 Roads and Maritime Services Guide to Traffic Generating Developments (2002) parking rates

Dwelling type	Number of parking spaces required	
	Metro Regional CBD Centres	Metro Sub-Regional CBD Centres
1 Bed	0.4 spaces	0.6 spaces
2 Bed	0.7 spaces	0.9 spaces
3 Bed	1.2 spaces	1.4 spaces
Visitor	0.14 spaces	0.2 spaces

Source: Roads and Maritime Service, 2002

As per SEPP 65, the parking rates that comply with the above rates cannot be used as grounds to refuse consent of this SSDA. The Apartment Design Guide does not stipulate which of the regional or sub-regional centres applies in each context. The centre definitions of “regional” and “sub-regional” are not defined in the Guide to Traffic Generating Developments either.

2.10 Showground Station Precinct DCP

The Showground Station Precinct DCP (Part D Section 19) in force from 11 September 2018, identifies that the Showground Station Precinct will become an attractive and well-connected neighbourhood that achieves housing targets, creates vibrant, safe and desirable places, reinforces the garden shire character and lifestyle, and is supported by necessary infrastructure. It is anticipated the Precinct will provide up to 9,000 additional dwellings (with a 5,000 dwelling cap for planned and funded infrastructure) and 2,300 additional jobs by 2036 (excluding potential growth within the deferred area on the western side of Cattai Creek).

To achieve the vision, future development within the Precinct must address the following key principles and strategic priorities of Council:

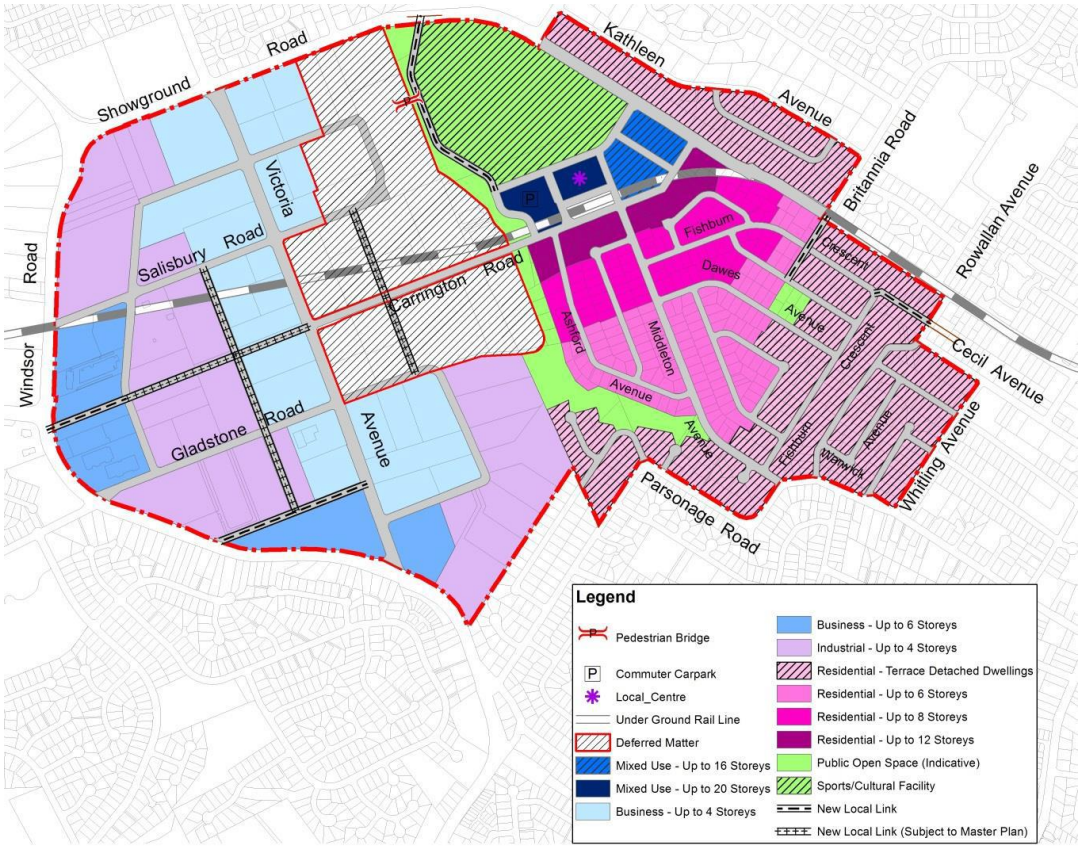
– Transit oriented development involves the creation of compact, walkable, mixed-use communities around public transport nodes. A key goal of TODs is to increase the number of people who walk, cycle or use public transport as their main form of transport. TODs have densities that result in increased patronage of public transport and provide more opportunities for people to live near the station and reduce their reliance on vehicles;

– The need to locate high density housing in centres with good access to services, community facilities and transport is well recognised and will support the on-going operation of the SMNW. Density at the core allows for a scale and character suitable for pedestrian connectivity. Centres should provide a mixture of residential, retail and commercial activities that are centred around transport and create an environment where services, recreation, entertainment, jobs and housing provide a lifestyle alternative to the traditional suburban context, consistent with the principles of TODs; and

– This DCP Section supports the provision of TODs by helping to deliver the highest densities in key strategic locations close to centres and existing and proposed transport infrastructure. This will ensure a sensible balance can be achieved between delivering on housing targets whilst ensuring an appropriate transition in residential densities and maintaining residential character.

The DCP highlights some of the key elements of the Precinct for land use and transport. A Showground Station Precinct Structure Plan is shown in **Figure 2–14**.

Figure 2–14 Showground Precinct Structure Plan



Source: Showground Station Precinct DCP (11 September 2018)

2.10.1 Land use

– A mixed use local centre immediately surrounding the station with shops, cafes, restaurants, plazas, local services and some commercial premises and apartments at upper levels;

– Employment areas on the western side of the precinct to generally retain existing bulky goods spine along Victoria Avenue and light industrial areas;

– New commercial office development on Windsor Road adjacent to Norwest Business Park;

– Residential areas on the eastern side of the precinct to comprise highest density apartment buildings immediately surrounding the station and south of Carrington Road;

– Buildings to transition to lower scale apartments further south of Carrington Road; and

– Medium density housing forms such as townhouses and terraces on the edges of the precinct to Whitling Avenue and Kathleen Avenue.

2.10.2 Transport

– Precinct is generally bound by arterial roads including Windsor Road to the west and Showground Road to the north and east;

– Two sub-arterial roads traverse the precinct including Carrington Road (east-west) and Victoria Avenue (north-south);

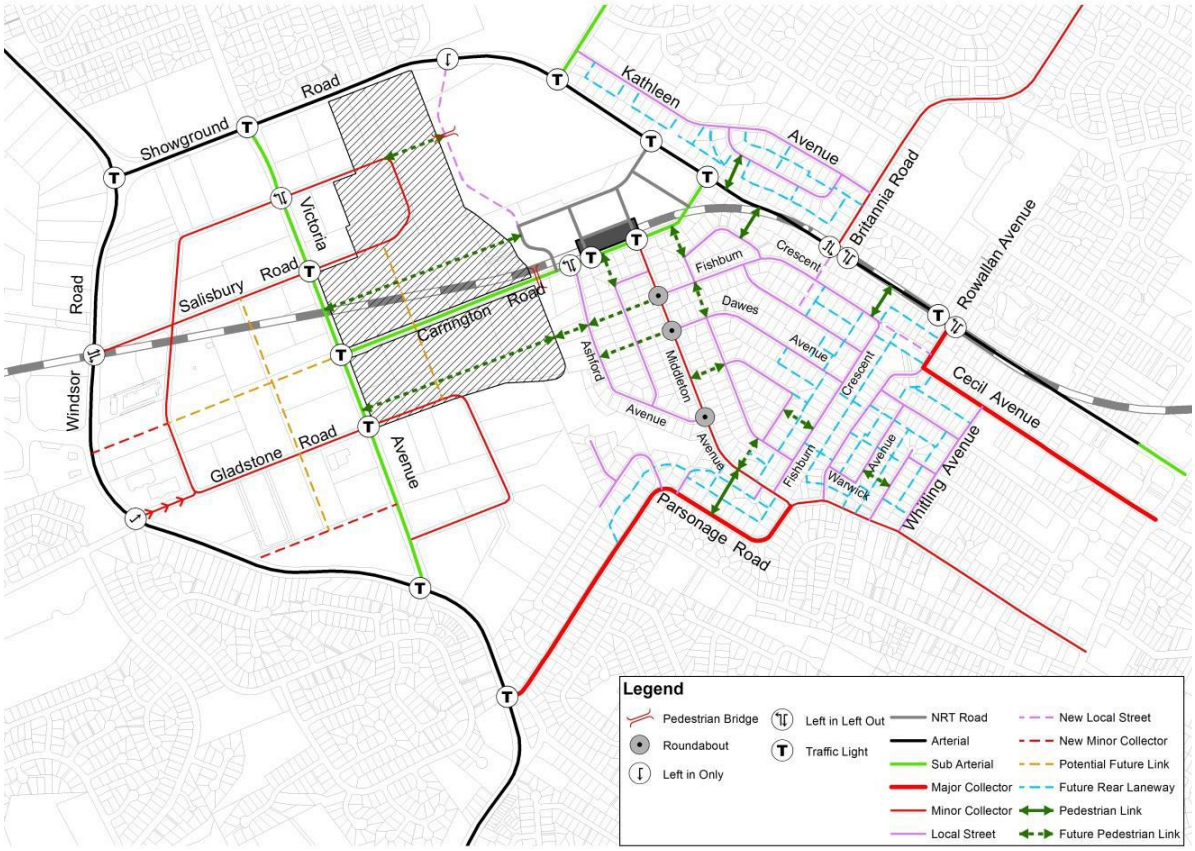
– Existing roads to be generally retained with new connections to enhance access and permeability including:

  - New connections surrounding the station;
  - New road between Carrington Road and Showground Road;
  - New roads throughout employment areas including connections between Salisbury and Gladstone Roads and a long term potential connection from Victoria Avenue to Windsor Road; and
  - New roads within residential areas including extension of Fishburn Crescent to Cecil Avenue and new road between Chapman Avenue and Showground Road.

– New and upgraded shared paths along key routes and new cycleways associated with Cattai Creek and connecting open spaces.

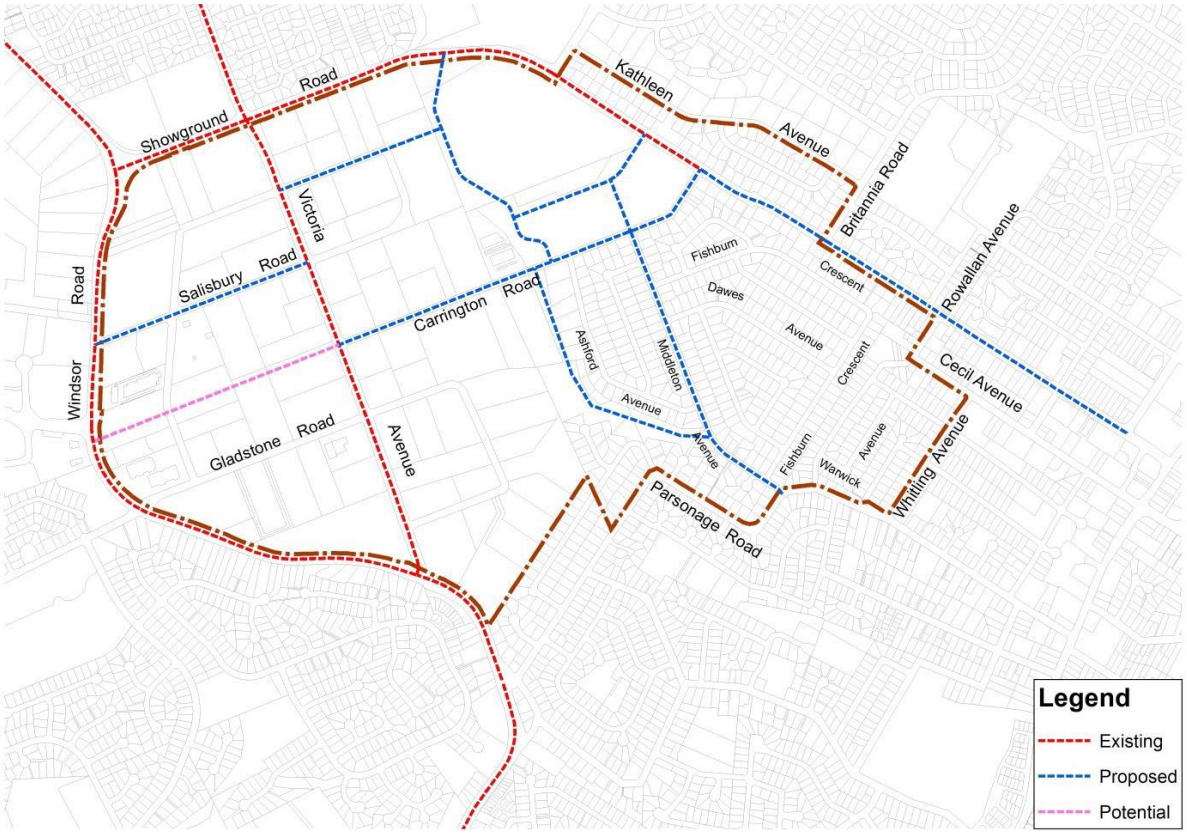
The street network is to be consistent with the indicative street network and hierarchy in **Figure 2–15**. The cycleway network is to be generally consistent with the existing and proposed cycleway network in **Figure 2–16**. Street profiles of Carrington Road and Victoria Avenue are to be consistent with the street profiles in **Figure 2–17**.

Figure 2–15 Indicative street network and hierarchy



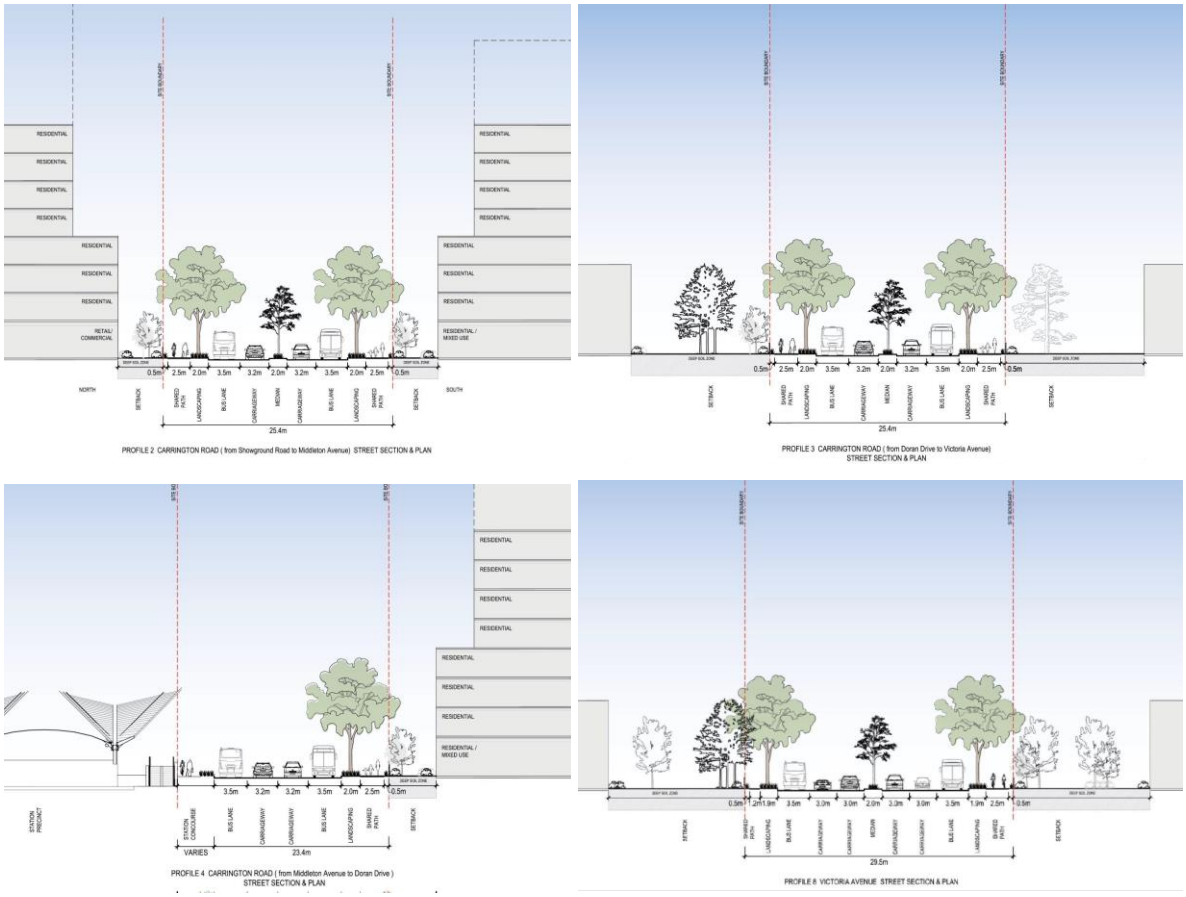
Source: Showground Station Precinct DCP (11 September 2018)

Figure 2–16 Existing and proposed cycleway network



Source: Showground Station Precinct DCP (11 September 2018)

Figure 2–17 Street profile for Carrington Road and Victoria Avenue

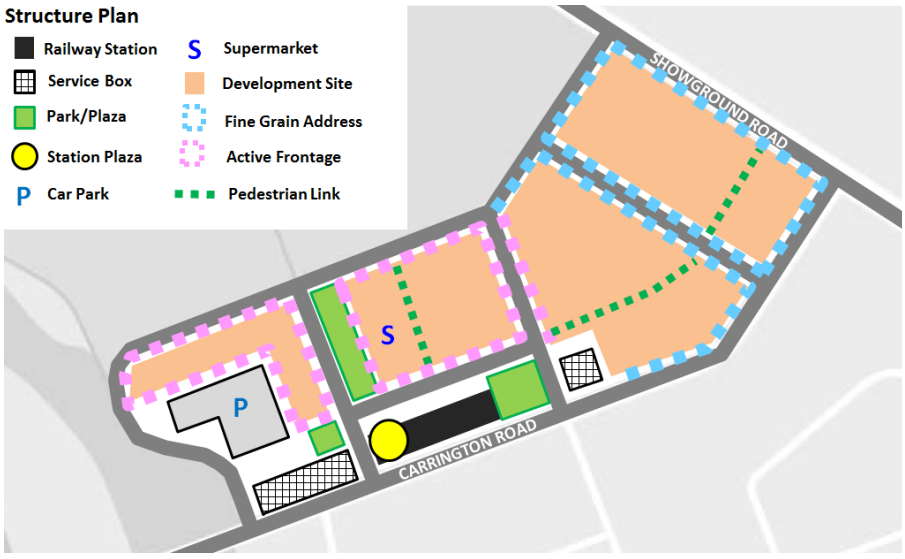


Source: Showground Station Precinct DCP (11 September 2018)

A range of employment and services are expected at the local centre, close to transport connections and high quality open space. The local centre is expected to be attractive, pedestrian focused, convenient and walkable, providing shops, cafes, restaurants, community facilities and jobs.

The development of the local centre at Hills Showground Station Precinct is expected to be consistent with the layout plan in **Figure 2–18**.

Figure 2–18 Indicative Layout Plan – Local Centre



Source: Showground Station Precinct DCP (11 September 2018)

The DCP further specifies the car and bicycle parking rates for different land uses in **Table 2.2**.

Table 2.2 Car and bicycle parking rates

Mode	Land Use	Rate
Car	Residential flat buildings and dwellings in shop top housing	1 resident space per unit. 1 visitor space per 5 units.
	Retail and commercial use in B2 Local Centre zone	To be determined by a merit based assessment. Development applications are to be accompanied by a traffic and parking study which demonstrates that the parking provision is sufficient to meet the forecast demand.
	All other uses	To comply with the rates in The Hills DCP 2012 Part C Section 1 – Parking.
Bicycle	Residential flat buildings	1 resident space per three apartments. 1 visitor space per 12 apartments.
	Commercial use	1 space per 600 m^2 GFA for staff.
	Retail use	1 space per 450 m^2 for staff.

Source: Showground Station Precinct DCP (11 September 2018)

It is noted that the residential parking rates are not binding as minimums due to SEPP 65.

It is also required that loading areas and vehicular access points for development in the B2 Local Centre zone must avoid conflicts with pedestrian activity areas including waiting zones for bus, taxi and kiss and ride activities.

Car share spaces are encouraged within residential flat buildings and shop top housing developments. Car share spaces are to be for the exclusive use of car share scheme vehicles and included in the number of car parking spaces permitted on a site. The car share parking spaces are to be:

– Exclusive of visitor car parking;

– Retained as common property by the Owners Corporation of the site, and not sold or leased to an individual owner/occupier at any time;

– Made available for use by operators of car share schemes without a fee or charge;

– Grouped together in the most convenient locations relative to car parking entrances and pedestrian lifts or access points;

– Located in well-lit spaces that allow for casual surveillance;

– Signposted for use only by car share vehicles; and

– Made known to building occupants and car share members through appropriate signage which indicates the availability of the scheme and promotes its use as an alternative mode of transport.

2.11 The Hills Development Control Plan (DCP) 2012

In Part C of the DCP, the required minimum car parking provision and disabled parking proportion of the relevant land uses of the site are specified as shown in **Table 2.3** and **Table 2.4** respectively.

Table 2.3 Required minimum car parking provisions

Land Use Class	Land Use	Required Minimum Provision
Residential	Residential Flat Buildings	1 space per 1 bedroom unit 2 spaces per 2 bedroom unit 2 spaces per 3 bedroom unit 2 visitor spaces per 5 units
Commercial	Centre Commercial	1 space per 40 m^2 GFA

Land Use Class	Land Use	Required Minimum Provision
Retail	Shops *# (including shopping centres and general business retail)	1 space per 18.5 m^2 GLFA

Source: The Hills DCP 2012
* Bicycle parking is also required.
# Set down areas are to be provided for these land uses.

Table 2.4 Disabled persons parking provisions

Land Use	Required Provision
Retail/Commercial A shopping centre with or without commercial premises (banks, credit union, restaurants or cafes, offices etc), or an office area. Includes strip shopping centres or CBD areas, shopping complexes, supermarkets, and variety stores. May include post office, entertainment, community, recreation venues and the like.	2% of total car parking
Community Civic centres, town halls, community centres, senior citizen's clubs, and health care. Recreation Leisure centres, gymnasiums, swimming pools, parks, gardens, foreshore, and sporting venue.	3% of total car parking

Source: The Hills Development Control Plan (DCP) 2012

Motorcycle parking is to be provided for all developments with on-site parking of more than 50 car parking spaces, at a rate of 1 motorcycle parking space for every 50 car parking spaces or part thereof.

For loading and delivery, the Hills Shire Parking DCP (Part C -Parking) requirements include:

– Supermarket at two for the first 930sqm of GLFA, two for the next 930sqm, one for each extra 930sqm;

– Mixed small shops at two for the first 4,645sqm of GLFA, two for the next 4,645sqm, one for each extra 4,645sqm; and

– Offices at one for the first 1,860sqm of GFA, one for the next 3,720sqm, one for the next 3,720sqm, one for each extra 9,250sqm.

Other requirements related to loading include:

– All loading and delivery areas are to be provided on-site;

– The use of loading and delivery areas must not conflict with the safe efficient circulation of pedestrians and other vehicles on-site; and

– In larger developments loading and delivery areas should operate independently of other parking areas.

2.12 State Environmental Planning Policy (Affordable Rental Housing) 2009

The *State Environmental Planning Policy (Affordable Rental Housing) 2009* has different parking requirements depending on the nature of delivery of the new affordable rental housing.

Table 2.5 SEPP (Affordable Rental Housing) parking requirements

Context	Div 1: In-fill affordable housing	Div 5: Residential flat buildings—social housing providers, public authorities and joint ventures	Div 6: Residential development - Land and Housing Corporation
Type of development	If development is permitted by an environmental planning instrument and there is no heritage	Not if residential flat building development is permissible under an environmental planning instrument	Residential development, if any building will have a height of 8.5 metres or less and the development will result in 20 dwellings or less on a single site

Context	Div 1: In-fill affordable housing	Div 5: Residential flat buildings—social housing providers, public authorities and joint ventures	Div 6: Residential development - Land and Housing Corporation
Parking spaces required for land in accessible areas	– ≥0.4 space for each 1 bedroom dwelling; – ≥0.5 spaces are for each 2 bedroom dwelling; and – ≥1 space for each 3 or more bedroom dwelling.	"Car parking is not required to be provided"	– ≥0.4 space for each 1 bedroom dwelling; – ≥0.5 spaces are for each 2 bedroom dwelling; and – ≥1 space for each 3 or more bedroom dwelling.
Parking spaces required in any other case	– ≥0.5 spaces for each 1 bedroom dwelling; – ≥1 space for each 2 bedroom dwelling; and – ≥1.5 spaces are for each 3 or more bedroom dwelling.		– ≥0.5 spaces for each 1 bedroom dwelling; – ≥1 space for each 2 bedroom dwelling; and – ≥1.5 spaces are for each 3 or more bedroom dwelling.
Relevant	✓	× residential flat building development is permissible	× height and number of dwellings

Source: State Environmental Planning Policy (Affordable Rental Housing) 2009

Due to the proximity with the Hills Showground Station, it is concluded that the area is in an accessible area, so the lower minimum rates apply.

These parking requirements are listed as "Standards that cannot be used to refuse consent", meaning that it is possible to provide less parking than specified, but it would be a matter requiring consent.

However, it should be noted that this SSDA is not seeking consent for affordable housing, these rates have been adopted for consistency for the affordable dwellings in the design work for Hills Showground Station Precinct East.

2.13 Guide to Traffic Generating Developments

The RMS Guide to Traffic Generating Developments (2002) (RTA Guide) sets out traffic generation rates based on survey data collected in New South Wales for a range of land uses. This guide is referred to in the Austroads Guide which is used by Roads and Maritime Services and is generally regarded as the standard for metropolitan development characteristics.

The RMS Guide to Traffic Generating Development, in particular Section 2 should be used as a guide to the detail required in the Transport Assessment Study.

In relation to trip generation by vehicles, reference should be made to the 'RMS Guide to Traffic Generating Developments' which provides a summary of basic vehicular trip generating rates for both daily and peak hour vehicle trips. Surveys of existing developments similar to the proposal, can also be taken and comparisons drawn.

Over the past few years a number of surveys have been undertaken to update trip generation and parking information as part of the Guide. The Technical Direction: TDT 2013/04a provides a summary of the updated information. Of particular relevance to this Traffic and Transport Assessment are the reference trip rates for high density residential flat dwellings where traffic surveys were undertaken for developments that are close to public transport and greater than six storeys.

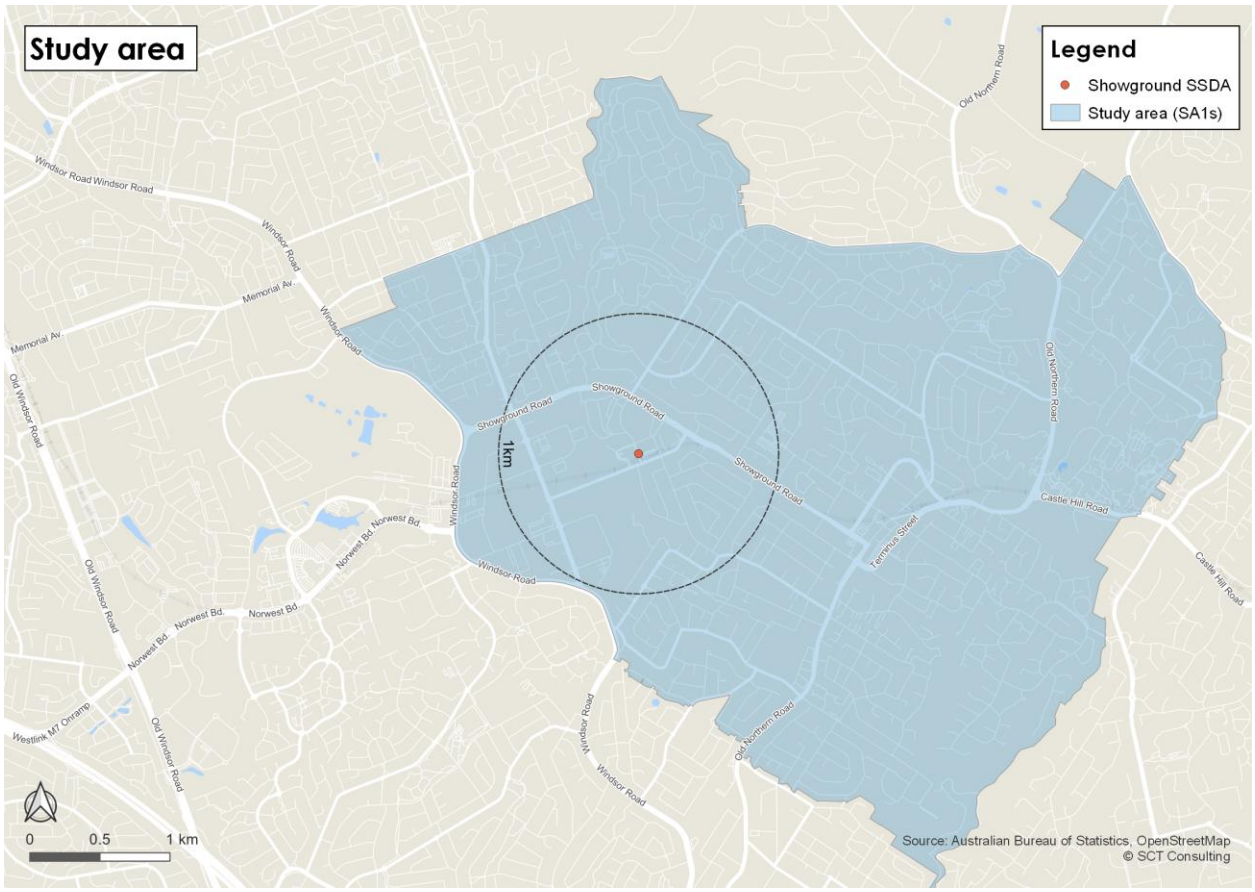
3.0 Existing conditions

3.1 Travel behaviour

3.1.1 Method of travel to work data

2016 Method of travel to work data from Castle Hill was analysed to determine travel behaviour of the existing residents in the vicinity of the site as shown in **Figure 3–1**.

Figure 3–1 Study area for method of travel to work analysis



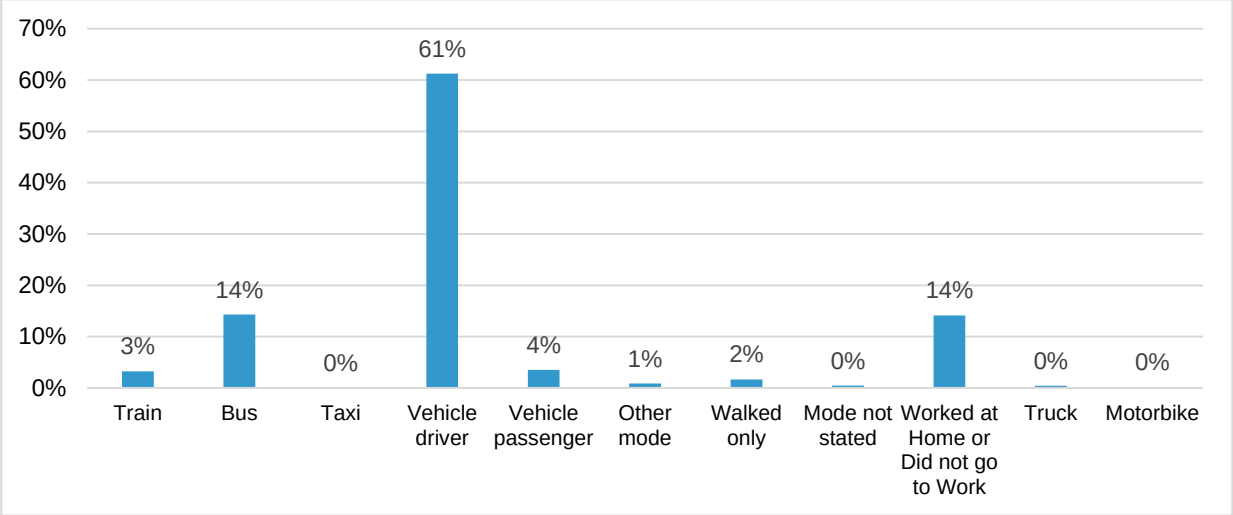
Source: Australian Bureau of Statistics, OpenStreetMap Contributors, SCT Consulting, 2019

At the time of the journey-to-work (JTW) data being collected in 2016, approximately 17,000 trip samples were included in the survey for Castle Hill. According to the Australian Bureau of Statistics, a person in employment are those of working age who, during a short reference period, were engaged in any activity to produce goods or provide services for pay or profit.

The travel mode split is shown in **Figure 3–2**, where vehicle driver travel mode is the dominant travel mode being greater than 60 percent, followed by a dramatic reduction to 15 percent of bus usage, implying a less developed public transport infrastructure back in 2016 in the local area.

The low public transport mode share at Castle Hill area is expected to change significantly with the introduction of SMNW – as larger catchment of residential areas along the Sydney Metro / Rail network would now have direct and frequent access to employment areas via improved public transport.

Figure 3–2 Travel modes for journey to work in Castle Hill



Source: https://profile.id.com.au/the-hills/travel-to-work?WebID=150

The demand for point to point (i.e. including taxi services) is indicatively 0.02 percent of total journey to work mode share. It is therefore concluded that point to point demand is unlikely to be significant and does not require additional surveys beyond that of the Method of Travel to Work survey. This is also true for the existing conditions for cycling demands. Cycling demands are included in the mode not stated category for the mode11 response. With a total proportion of 0.46 percent of trips via 'mode not stated', cycling demand is considered a small part of the overall demand and does not require additional surveys beyond that of the method of travel to work survey.

Table 3.1 lists the Journey to Work 2016 destinations for departures from Castle Hill by LGA. Local destinations in The Hills Shire attract the highest percentage of commuters at 31 percent, followed by Sydney (12.4 percent) and Parramatta (11.7 percent). The remainder of departures from Castle Hill are very fragmented throughout the NSW LGAs, which reflects the vehicle driver travel modes shown in **Figure 3–2**.

Table 3.1 Departures LGA Destination

LGA	Number of Trips	Percentage
The Hills Shire (A)	24,870	31.0%
Sydney (C)	9,927	12.4%
Parramatta (C)	9,357	11.7%
Blacktown (C)	6,589	8.2%
Ryde (C)	4,259	5.3%
Hornsby (A)	4,014	5.0%
No Fixed Address (NSW)	2,969	3.7%
Cumberland (A)	2,450	3.1%
North Sydney (A)	1,896	2.4%
Willoughby (C)	1,587	2.0%
Total	**67,918**	**84.8%**

Source: https://profile.id.com.au/the-hills/workers?WebID=150

Table 3.2 shows the Journey to Work 2016 origins of arrivals at Castle Hill by LGA. The arrivals into Castle Hill are extremely dominated from The Hills Shire (39 percent), followed by around 20 percent of people from Blacktown. There are around 7 percent and 6 percent of the workers coming from Parramatta and Hornsby respectively whereas the remaining origins are fragmented similar to the employment destinations.

Table 3.2 Arrivals LGA Origin

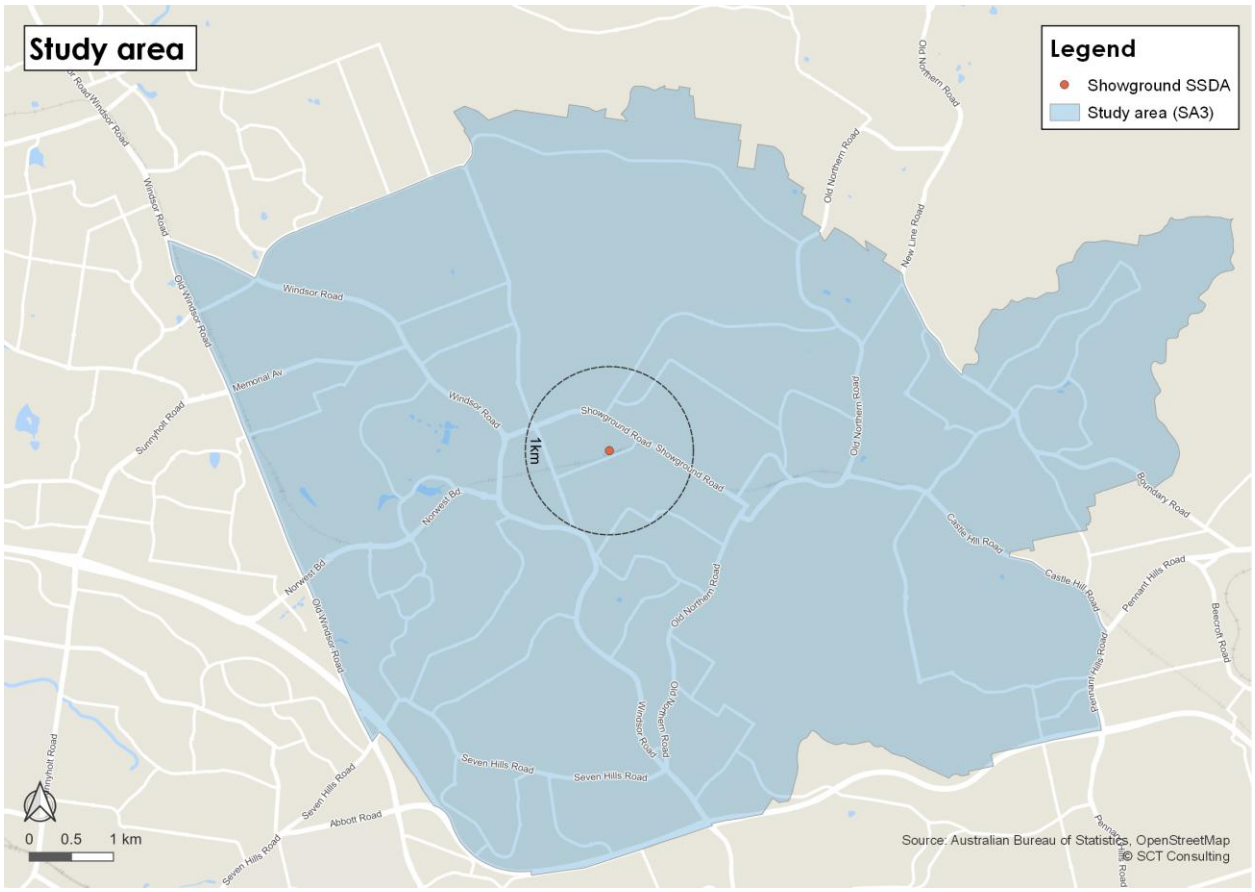
LGA	Number of Trips	Percentage
The Hills Shire (A)	24,870	39.0%
Blacktown (C)	12,179	19.1%
Parramatta (C)	4,601	7.2%
Hornsby (A)	3,962	6.2%
Hawkesbury (C)	2,452	3.8%
Penrith (C)	2,113	3.3%
Cumberland (A)	1,959	3.1%
Total	**52,136**	**81.7%**

Source: https://profile.id.com.au/the-hills/workers?WebID=150

3.1.2 Household Travel Survey

The proposed Hills Showground Station Precinct site sits within the statistical area "Baulkham Hills"[1] as defined by the Australian Bureau of Statistics, 2017/2018 Household Travel Survey (HTS).

Figure 3–3 Study area for household travel survey analysis



Source: Australian Bureau of Statistics, OpenStreetMap Contributors, SCT Consulting, 2019

[1] Baulkham Hills is a "Statistical Area 3".

For the purpose of analysis, it has been assumed that JTW data provides a suitable reflection of the travel characteristics during AM and PM peak hour periods, due to the high proportion of trips during this timeframe associated with journey to work trips.

Analysis of the 2017/2018 Household Travel Survey (HTS), which is reflective of travel characteristics of residents throughout an average weekday, indicates that the majority (approximately 22, 21, 15 and 14 percent respectively) of daily trips made by residents of statistical area "Baulkham Hills" are likely to be associated with Serve Passenger, Social/recreation, shopping and commuting.

The majority (83 percent) of all daily trips are undertaken by car, either as driver or passenger. Train and bus trips account for approximately two and five per cent of daily trips respectively. Walk only trips account for nine per cent of all daily trips.

Table 3.3 and **Table 3.4** provide a summary of the purpose of travel and overall mode choice by residents of Baulkham Hills associated with these trip purposes.

Table 3.3 Household Travel Survey – residents within Baulkham Hills, trip purpose

Mode of Travel	Number of Trips	Proportion of Total
Serve passenger	144,691	22%
Social/recreation	136,159	21%
Shopping	96,331	15%
Commute	91,574	14%
Education/childcare	62,248	9%
Change mode of travel	62,187	9%
Personal business	25,808	4%
Work related business	19,991	3%
Other	17,882	3%

Source: https://www.transport.nsw.gov.au/performance-and-analytics/passenger-travel/surveys/household-travel-survey, 2019

Table 3.4 Household Travel Survey – residents within Baulkham Hills, mode choice

Mode of Travel	Number of Trips	Proportion of Total
Vehicle Driver	362,447	55%
Vehicle Passenger	183,355	28%
Train	12,967	2%
Bus	35,619	5%
Walk Only	59,577	9%
Other	2,906	0%

Source: https://www.transport.nsw.gov.au/performance-and-analytics/passenger-travel/surveys/household-travel-survey

3.2 Hills Showground Station

Hills Showground Station is a new underground metro station on Doran Drive, north of Carrington Road between Showground Road and Cattai Creek. It is an interchange and park-and-ride station with 600 park-and-ride spaces that provides access to surrounding employment, recreational and residential areas. The entrance to the station is from a plaza on Doran Drive.

Hills Showground Station is the catalyst for the evolution of the Showground Station Precinct into a village centre. A metro station at Hills Showground supports the Castle Hill Showground, and provides access to current and future employment, as well as existing and future residential development in the area. Major station strategy includes:

– Provide easy, safe and intuitive transfer to and from the metro station within the existing network and road environment;

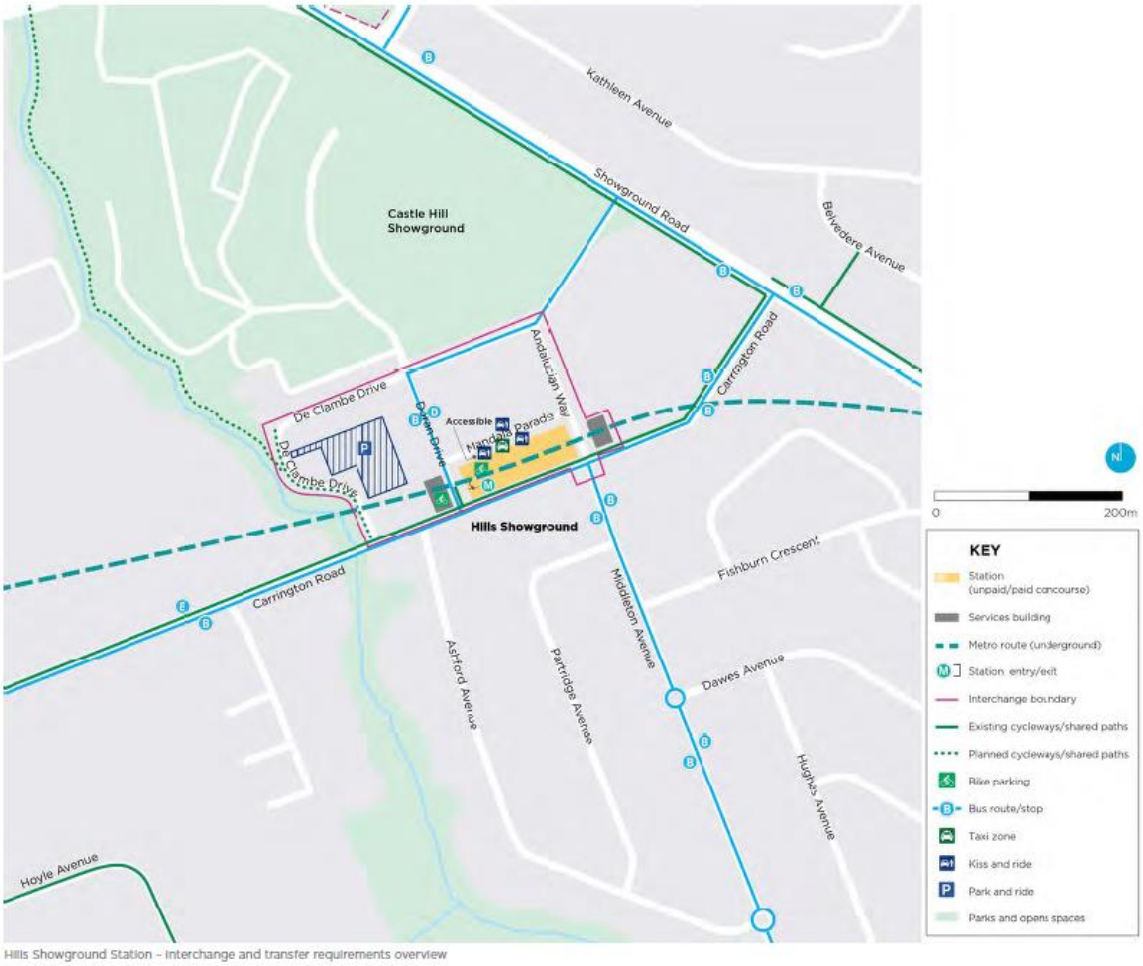
– Increase public transport access to the surrounding existing and future employment, recreational and residential areas;

– Maximise legibility and connectivity with the local urban structure; and

– Integrate the station with local improvement plans and make a positive contribution to the sense of place.

As shown in **Figure 3–4**, the station has a bus interchange on Doran Drive, a bicycle storage facility as well as bike racks located close to the entrance plaza as well as kiss and ride spaces and taxi ranks along Mandala Parade.

Figure 3–4 Hills Showground Station interchange and transfer requirement overview



Hills Showground Station – interchange and transfer requirements overview

Source: Sydney Metro Interchange Access Plan, October 2018

Hills Showground Station has the following urban design opportunity:

– Integrate the metro station with the existing road network to facilitate safe transfers to and from the station and customers' destinations;

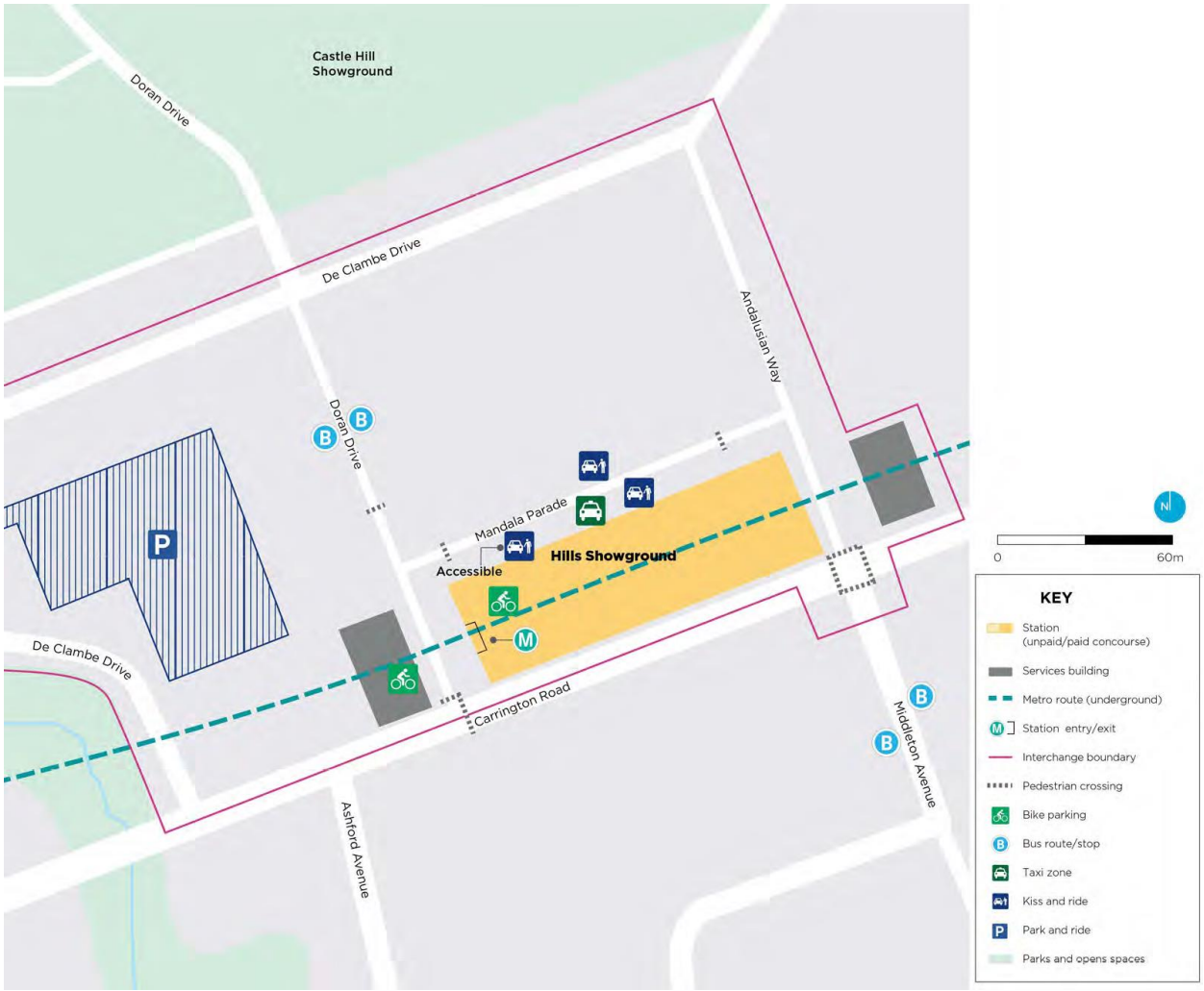
- Recognise the cultural setting of the Showground facilities and curtilage as initiating the potential for “place-making”;
- Improve access to the precinct with a new street network that accommodates high-quality pedestrian and cycle access;
- Create a clear sense of place at the station entry that responds to its context as a gateway to the Showground Station Precinct;
- Integrate future development sites into an efficient and connected precinct plan;
- Modify existing topography to help integrate the station to the precinct and natural ground levels; and
- Minimise any adverse impacts on Castle Hill Showground facilities and maintain existing Showground Station Precinct circulation patterns and uses.

3.3 Walking

Hills Showground Station is an origin station, meaning that in the morning peak, majority of trips are from Hills Showground Station to other stations on the metro due to the predominately residential nature of land uses around the station. Pedestrian activity clusters around station entry points and dissipates further afield from entrance points. Adequate pedestrian facilities are provided to connect to the surrounding land uses in a safe and convenient manner.

The Hills Showground Interchange Access Plan describes walking access requirements for the station precinct as shown in **Figure 3–5**.

Figure 3–5 Walking access arrangements and facilities at Hills Showground Station



Source: Sydney Metro Interchange Access Plan, October 2018

Pedestrian infrastructure includes a footpath network that provides safe and accessible access for pedestrians to station entry points, including:

– Footpaths exist on both sides of new streets created surrounding the Metro Station including Doran Drive, Andalusian Way and Mandala Parade;

– A shared path (off road), linking Carrington Road to Cattai Creek in the west;

– A shared 2.5-metre-wide pathway from Carrington Road at De Clambe Drive to existing pathway at northern boundary of site;

– Multiple crossings on Doran Drive and Mandala Parade; and

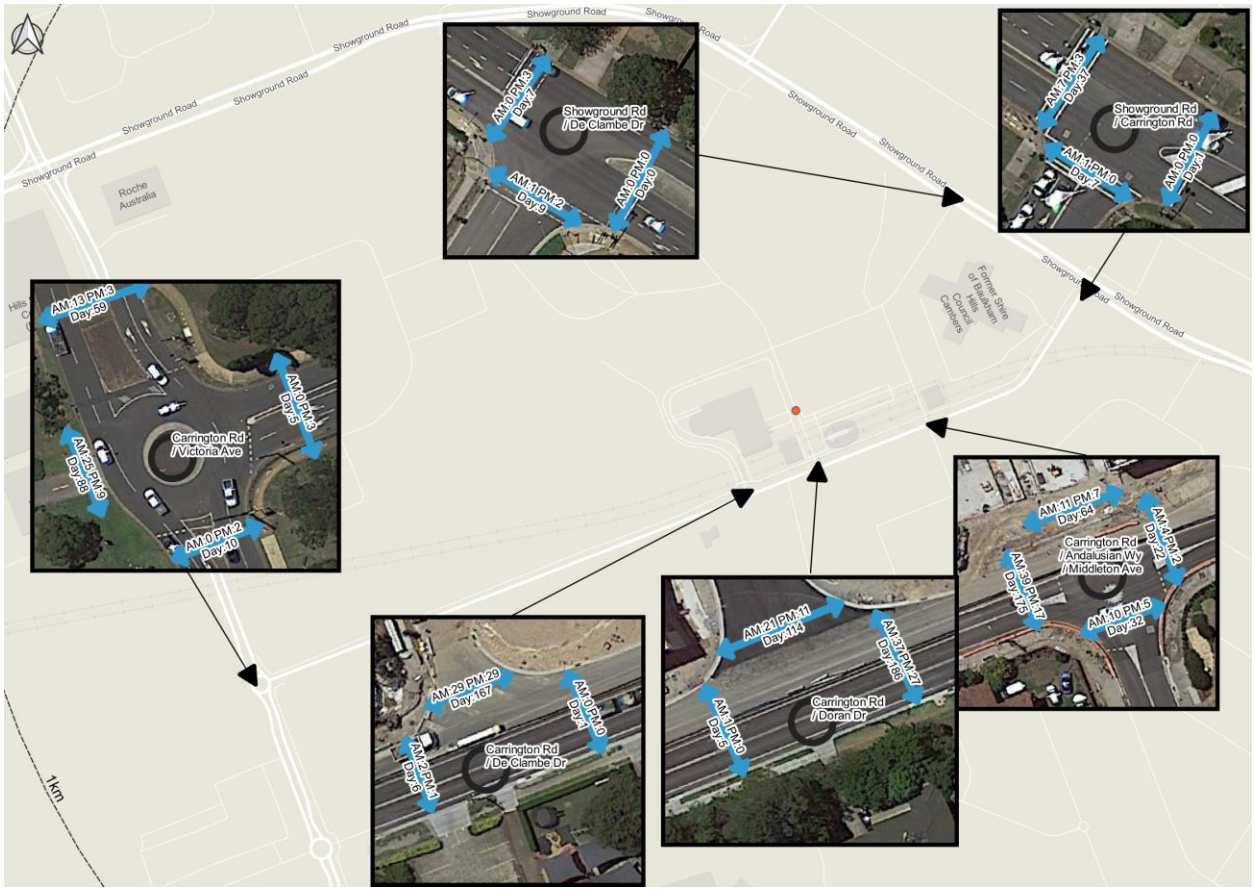
– Signalised pedestrian crossings at the intersection of Showground Road / De Clambe Drive, Showground Road / Carrington Road, Doran Drive / Carrington Road, Andalusian Way / Carrington Road, connecting residents from surrounding areas to the station via these crossing points along Showground Road and Carrington Road.

Pedestrian surveys undertaken recently in June 2019 (as shown in **Figure 3–6**) after the opening of the Hills Showground Station indicate that the majority of pedestrian demands use Carrington Road for accessing the Station. Crossing movements are very limited on Showground Road and more significant on Carrington Road. The largest crossing demand occurs at:

– Carrington Road / Andalusian Way, with a crossing demand of 43 in the AM peak and 197 over the day; and

– Carrington Road / Doran Drive, with a crossing demand of 38 in the AM peak and 191 over the day.

Figure 3–6 Pedestrian count data



Source: SCT Consulting, Datacorp Traffic, OpenStreetMap Contributors, 2019

3.4 Cycling

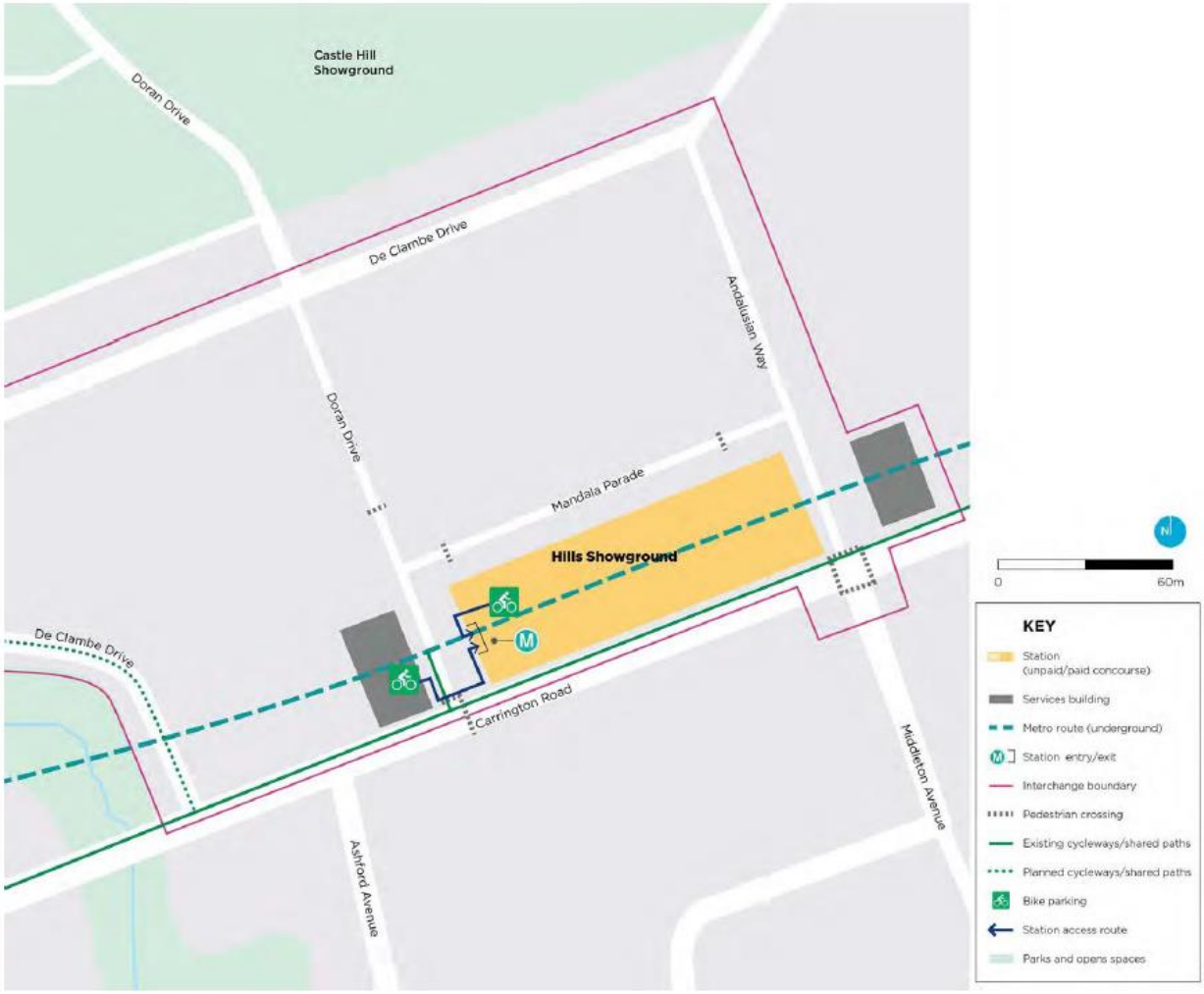
The Hills Showground Interchange Access Plan describes cycling access for the station precinct as shown in **Figure 3–7**. An off-road cycle path exists on Carrington Road and main cycling routes connecting to the station are along Cattai Creek to the west of the site. New cycle routes include a shared 2.5-metre path from Carrington Road at De Clambe Drive to the existing pathway at the northern boundary of the site.

Ultimately, the number of bike parking spaces surrounding the station should include, where possible:

– Bike shed for 50 bicycles, with electronic access facility; and

– Bike racks for 20 bicycles.

Figure 3–7 Proposed cycling access arrangements and facilities at Hills Showground Station



Source: Sydney Metro Interchange Access Plan, October 2018

Within the vicinity of the site there are a number of shared paths provided, offering connectivity of the connections between the metro station and a wide variety of local and regional facilities. Carrington Road, De Clambe Drive (along Cattai Creek) and Showground Road in the vicinity of the site all have off-road shared paths.

The existing cycle network in proximity of the site is presented in **Figure 3–8**.

Figure 3–8 Existing cycle paths in proximity of the site

Source: Transport for NSW, OpenStreetMap Contributors, SCT Consulting, 2019

3.5 Public transport

The SMNW was opened in May 2019 and the site has direct access to the Hills Showground Station. The station entry is accessed via Doran Drive as shown in **Figure 3–9**.

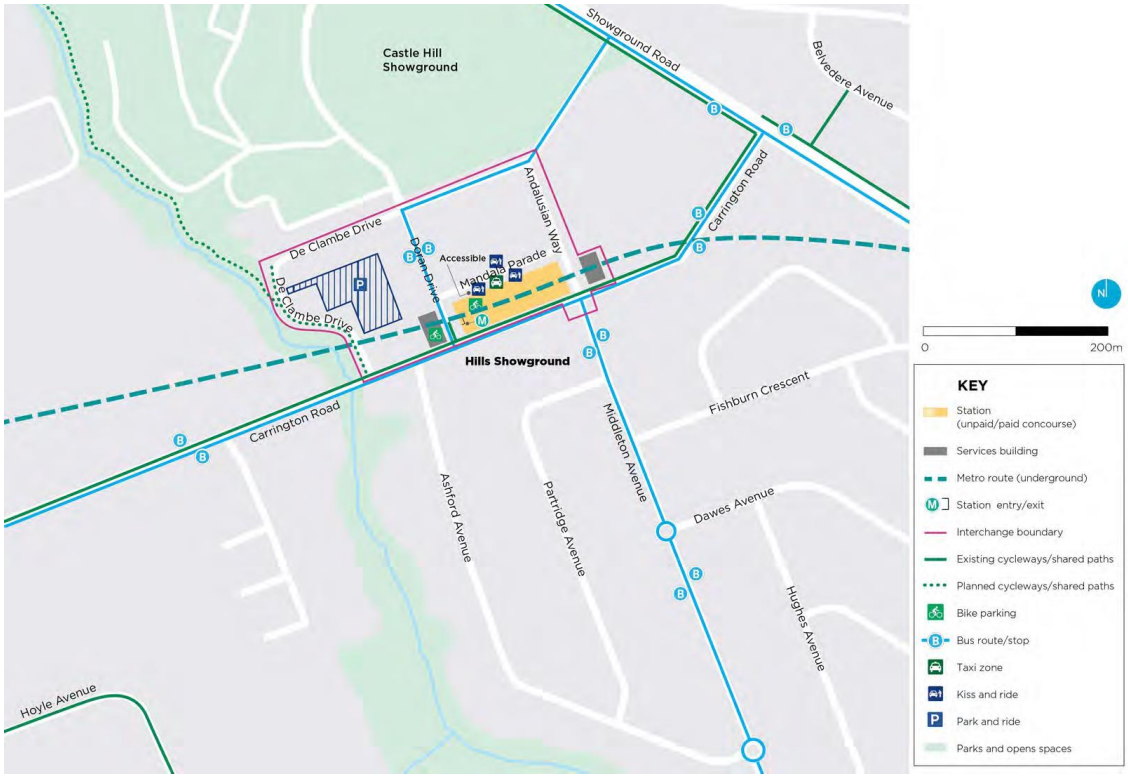
SMNW delivers fast travel time to major destinations. For example, it only takes two minutes to access Castle Hill station, 11 minutes to Epping station, 17 minutes to Macquarie Park station, 26 minutes to Chatswood station, and 46 minutes to Wynyard station.

The increased network coverage, train frequency, journey-time reliability and improved customer offering of Sydney Metro, has been shown to encourage rail network usage and increase journey to work trips by non-car modes. The Metro patronage published by Transport for New South Wales has risen to a total monthly trip of 2,085,000[2] in August 2019, indicated a typical weekday patronage over 70,000.

Hills Showground Station is a bus-rail interchange station serving the local residents and multi storey park-and-ride facility, that will reduce vehicle kilometres travelled and promote switching to sustainable transport.

[2] https://www.transport.nsw.gov.au/data-and-research/passenger-travel/metro-patronage/metro-patronage-top-level-chart

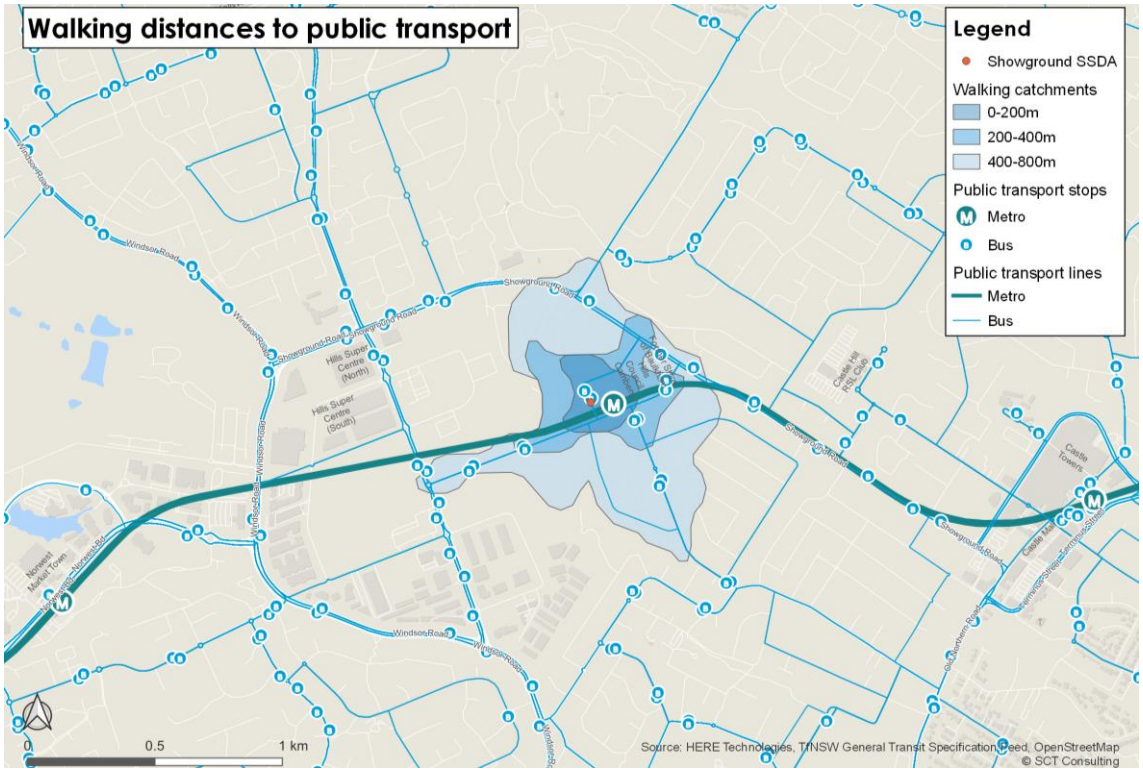
Figure 3–9 Hills Showground Station of Sydney Metro



Source: Sydney Metro North West Interchange Access Plan

Bus stops are generally within short walking distance on Doran Drive and Showground Road as shown in **Figure 3–10**.

Figure 3–10 Bus services in proximity of the site



Source: HERE Technologies, TfNSW GTFS feed, OpenStreetMap Contributors, SCT Consulting, 2019

The bus routes that operate around Hills Showground Station typically run between a variety of places such as Dural, Rouse Hill, Castle Hill, Pennant Hills, Kellyville, Epping, Castlewood, Blacktown and Parramatta, via Castle Hill, Cherrybrook, Kellyville, Norwest, Glenwood, Baulkham Hills, and other adjacent suburbs providing a wide array of local accessibility. The frequency of seven bus services available in proximity of the site, being routes 601, 604, 626, 633, 651, 660 and 730, are shown in **Table 3.5**. There are up to an average of 19 bus services that is currently serving the Hills Showground Station during the weekday AM and PM peak hour.

Table 3.5 Existing bus routes and service frequencies in proximity of the site

Route	Corridor	To	From	Total number of services		
				Weekday		Weekend
				6am-10am	3am-7pm	10am-2pm
601	Showground Rd	Parramatta	Rouse Hill	8	8	4
604	Showground Rd	Dural	Parramatta	13	13	2
626	Showground Rd	Pennant Hills	Kellyville	12	13	6
633	Carrington Rd	Rouse Hill	Pennant Hills	4	4	4
651	Showground Rd	Epping	Rouse Hill	5	4	2
660	Showground Rd	Castlewood	Parramatta	5	5	2
730	Showground Rd	Castle Hill	Blacktown	7	6	4
			Total	**52**	**52**	**24**

Source: TfNSW GTFS, August 2019

3.6 Street network

The site is bounded by Carrington Road to the south, Showground Road to the east, De Clambe Drive to the north and west. New internal roads within the precinct were constructed as part of the SMNW named Doran Drive, De Clambe Drive, Andalusian Way and Mandala Parade.

The characteristics of the key road network, as shown in **Figure 3–11**, surrounding the subject site are:

– Carrington Road is a 4-lane sub-arterial road which provides connection between Showground Road and Victoria Avenue. Carrington Road between Victoria Avenue and De Clambe Drive has a bus lane in each direction improving access to Hills Showground Station;

– Victoria Avenue is 4-lane sub-arterial between Showground Road and Windsor Road. A shoulder lane is provided on each side of the road which caters for on-street parking and bus stops. It provides access to substantial number of access roads, industrial retail stores and recreational facilities;

– Showground Road is 4-lane arterial road which runs from Windsor Road to Old Northern Road. Showground Road provides regional connections to Windsor Road in the west, Old Northern Road to the east and to Gilbert Road to the north. The site can be accessed from Showground Road via the signalised intersections at De Clambe Drive and Carrington Road;

– Windsor Road is a 4-lane arterial road in the vicinity of the site. Windsor Road provides a direct north-south connection to the wider road network such as Parramatta to the south, A2 the north and to suburbs such as Baulkham Hills, Kellyville and Beaumont Hills;

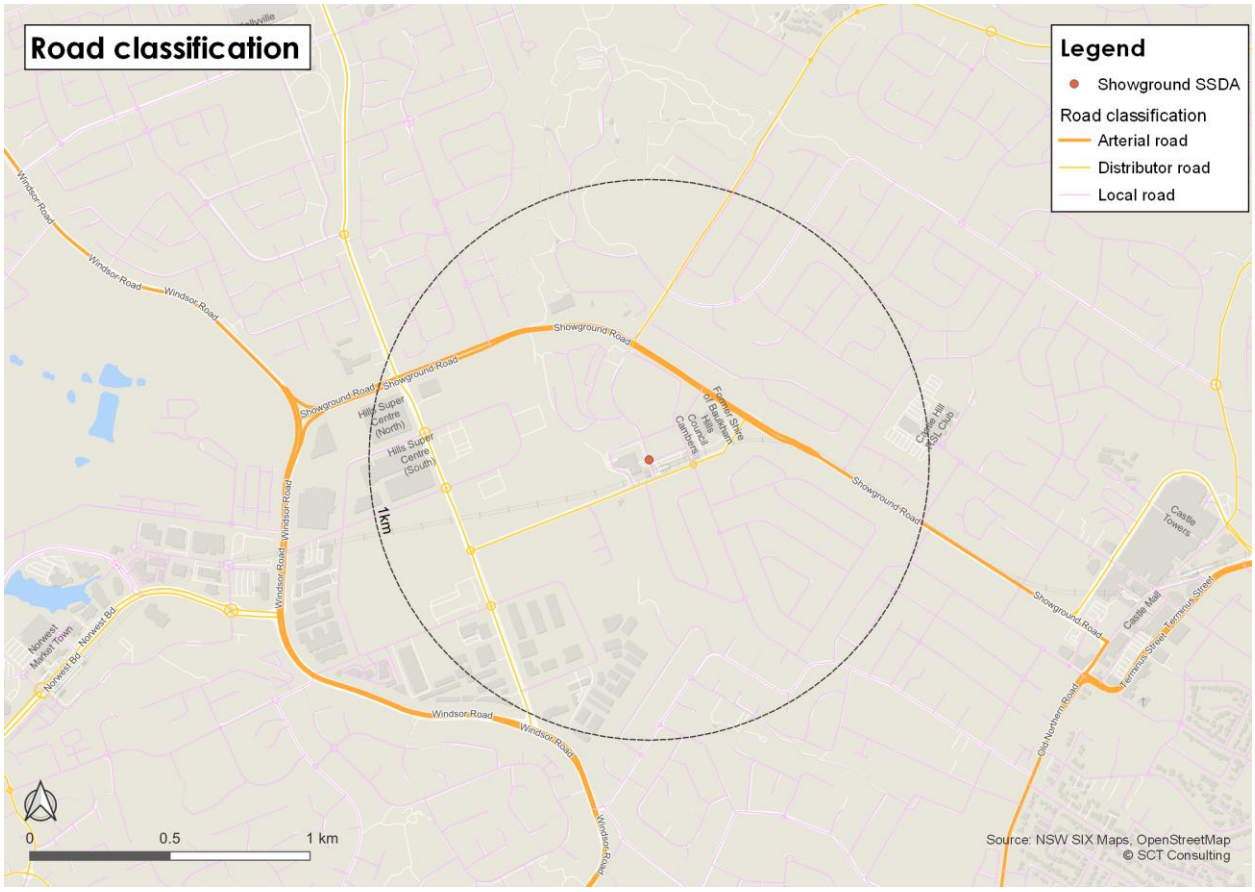
– Gilbert Road is 2-lane sub-arterial road connecting Showground Road to Old Northern Road providing access to suburbs such as Glenhaven and Dural;

– De Clambe Drive is a local street with one lane in each direction that connects Carrington Road with Showground Road, while providing access to the commuter car park as well as accesses to future development within the precinct. It connects with Carrington Road as a left-in left-out priority intersection, intersects with Doran Drive and Andalusian Way as priority intersections and with a signalised intersection at Showground Road. The section of De Clambe Drive between Doran Drive and Showground Road services all bus route access to Hills Showground Station;

– Doran Drive and Mandala Parade are local streets that provide interchange function to support access to Hills Showground Station by buses and vehicular pick-up drop-off respectively. Disabled parking spaces are also located on Mandala Parade. Both streets are designated as high pedestrian zones with 40km/hr speed limit; and

– Andalusian Way is also a local street that connects between De Clambe Drive and Carrington Road, with one traffic lane and one parking lane in each direction.

Figure 3–11 Road network surrounding the site



Source: NSW SIX Maps, OpenStreetMap Contributors, SCT Consulting, 2019

3.7 Existing traffic conditions

A SIDRA Network model was prepared for the key intersections in the study area to understand the existing network performance and to test the impacts of the development.

The intersections covered by the traffic modelling cover those stipulated in the Secretary's Environmental Assessment Requirements including:

– Showground Road / De Clambe Drive;

– Showground Road / Carrington Road;

– Carrington Road / Andalusian Way / Middleton Avenue;

– Carrington Road / Doran Drive;

– Carrington Road / De Clambe Drive; and

– Carrington Road / Victoria Avenue.

Figure 3–12 shows the intersections included in the SIDRA Network modelling.

Figure 3–12 Intersections included in SIDRA Network model

Source: OpenStreetMap Contributors, SCT Consulting, 2019

Intersections were modelled using a single 'network' within SIDRA due to the close spacing of junctions.

3.7.1 Input data

Traffic and pedestrian surveys were obtained from Sydney Metro undertaken between 17 and 23 June 2019. Thursday 20 June was selected as the date for modelling purposes as the development includes a component of retail uses, for which the Thursday evening peak is typically the most constrained.

Intersection layouts were derived from a combination of site visits, Sixmaps imagery and traffic signal design drawings. In the case of many of the intersections, the satellite imagery did not reflect the latest intersection layouts, so the drawings were required to supplement.

Traffic signal data was obtained from Transport for NSW for all of the signalised intersections for 18, 19, 20 and 22 June 2019. Data provided included 15-minute summary signal timing data, detector counts, LX files and SCATS summary images.

3.7.2 Model calibration

Models were calibrated using the input data to reflect observations of traffic behaviours on site. One of the key goals is to calibrate the models such that the degree of saturation[3] of all movements was 1.0 or below. This is a standard procedure to ensure that the models aren't over-predicting congestion. Key assumptions made were:

– Use of a roundabout calibration factor for Carrington Road (east approach) to Carrington Road / Victoria Avenue as this approach was recorded as a degree of saturation of greater than 1.0;

– Use of a standard six seconds for pedestrian start loss for all intersections on Carrington Road based on the pedestrian surveys. While the traffic signa data did not record calling of pedestrian crossings, the pedestrian count surveys indicated that pedestrian crossings were used; and

[3] Degree of saturation refers to the volume of a turning movement divided by its capacity. A degree of saturation of 1.0 is when a turning movement is 'at capacity' so that no more traffic could do this turn.

– The network timing was set to capture coordination on Showground Road but not Carrington Road. A review of the cycle times for the signals indicated highly similar cycle times for both junctions on Showground Road. The LX file also specified an offset for both intersections on Showground Road, which was adopted. By contrast, the intersections on Carrington Road had very different cycle times and an offset of zero seconds. The network timing option was set so that the Showground Road junctions were modelled using their pre-specified phase times plus a cycle time that was the average of both junctions. The Carrington Road junctions were specified as uncoordinated sites, so that they ran at their typical cycle time.

3.7.3 Network performance

Operational performance is typically measured through an assessment of the throughput of vehicles across a traffic network, with average delay per vehicle used to assess the performance of an individual intersection. The average delay per vehicle measure is linked to a Level of Service (LoS) index which characterises the intersection's operational performance. **Table 3.6** provides a summary of the LoS performance bands.

Table 3.6 Level of Service index

Level of Service	Average Delay per Vehicles (sec/h)	Performance explanation
A	Less than 14.5	Good operation
B	14.5 to 28.4	Good with acceptable delays and spare capacity
C	28.5 to 42.4	Satisfactory
D	42.5 to 56.4	Operating near capacity
E	56.5 to 70.4	At capacity, at signals incidents will cause excessive delays. Roundabouts require other control method.
F	70.5 or greater	At capacity, at signals incidents will cause excessive delays. Roundabouts require other control method.

Source: Guide to Traffic Generating Developments; RMS; 2002

In addition, intersection performance is measured using degree of saturation, which is a measure of the spare capacity of each intersection. These measures enable clearer target setting, with future performance of degree of saturation greater than one being unacceptable. The intersection performance per the SIDRA Network results is shown in **Table 3.7**.

Table 3.7 Network performance for existing conditions (2019)

Intersection	AM Peak			PM Peak		
	Delay	LoS	DoS	Delay	LoS	DoS
Carrington Road/ Showground Road	21.8s	B	0.67	45.4s	D	0.92
Showground Road / De Clambe Drive	3.5s	A	0.50	5.5s	A	0.50
Carrington Road / Victoria Avenue	17.4s	B	0.76	27.6s	B	0.88
Carrington Road / Middleton Avenue / Andalusian Way	17.6s	B	0.81	29.2s	C	0.96
Carrington Road / Doran Drive	6.4s	A	0.63	7.0s	A	0.51
Carrington Road / De Clambe Drive	4.7s	A	0.26	4.7s	A	0.45

Source: SCT Consulting, 2019
Delay = worst movement for priority and roundabout controlled intersections and DoS = degree of saturation of worst movement

The SIDRA results show that while majority of intersections operate at a typically deemed acceptable level of service, the degree of saturation of Carrington Road / Showground Road, Carrington Road / Victoria Avenue and Carrington Road / Middleton Avenue / Andalusian Way indicates that the intersections are approaching capacity, with 12 percent or less spare capacity.

4.0 The Proposal

4.1 Proposed development

The Illustrative Concept Proposal is a transit-oriented mixed-use development that could comprise up to 1,900 dwellings and up to a maximum of 13,600 m^2 of non-residential space. Up to 2,273 car parking spaces and 813 bicycle parking spaces are also proposed, based on the yield and land use mix of the proposed development and the recommended range of parking rates for each type of uses.

The SSDA would facilitate development which supports best practice transit-oriented development principles, by providing increased employment density in proximity to existing and planned transport infrastructure upgrades that provides employees with greater access to public transport and employment options, while promoting the use of sustainable travel options.

It should be highlighted that the Concept Proposals seek approval for a range of non-residential Gross Floor Areas (between 6,700 m^2 and 13,600 m^2 of GFA), hence there is a range of residential dwelling yield between 1,802 and 1,879 dwellings including a minimum of five percent for affordable housing. The higher and lower non-residential schemes are shown in ***Table 4.1*** *and the total GFA for both scenarios is 175,796 m^2. In order to understand the implications of both scenarios and to undertake a worst-case assessment, this assessment has considered the more onerous condition with the upper limit of both non-residential and residential Gross Floor Areas. Hence the impacts highlighted in this report would be overstated if the lower end of the non-residential is delivered with the upper limit of residential component.*

Table 4.1 Range of development yield

Type of use	Higher Non-Residential Scheme	Lower Non-Residential Scheme
Non-residential	13,600 m^2 GFA	6,700 m^2 GFA
Residential	1,802 dwellings	1,879 dwellings
Total	**175,796 m^2 GFA**	**175,796 m^2 GFA**

Source: Cox, October 2019

4.2 Proposed access arrangements

4.2.1 Vehicular access

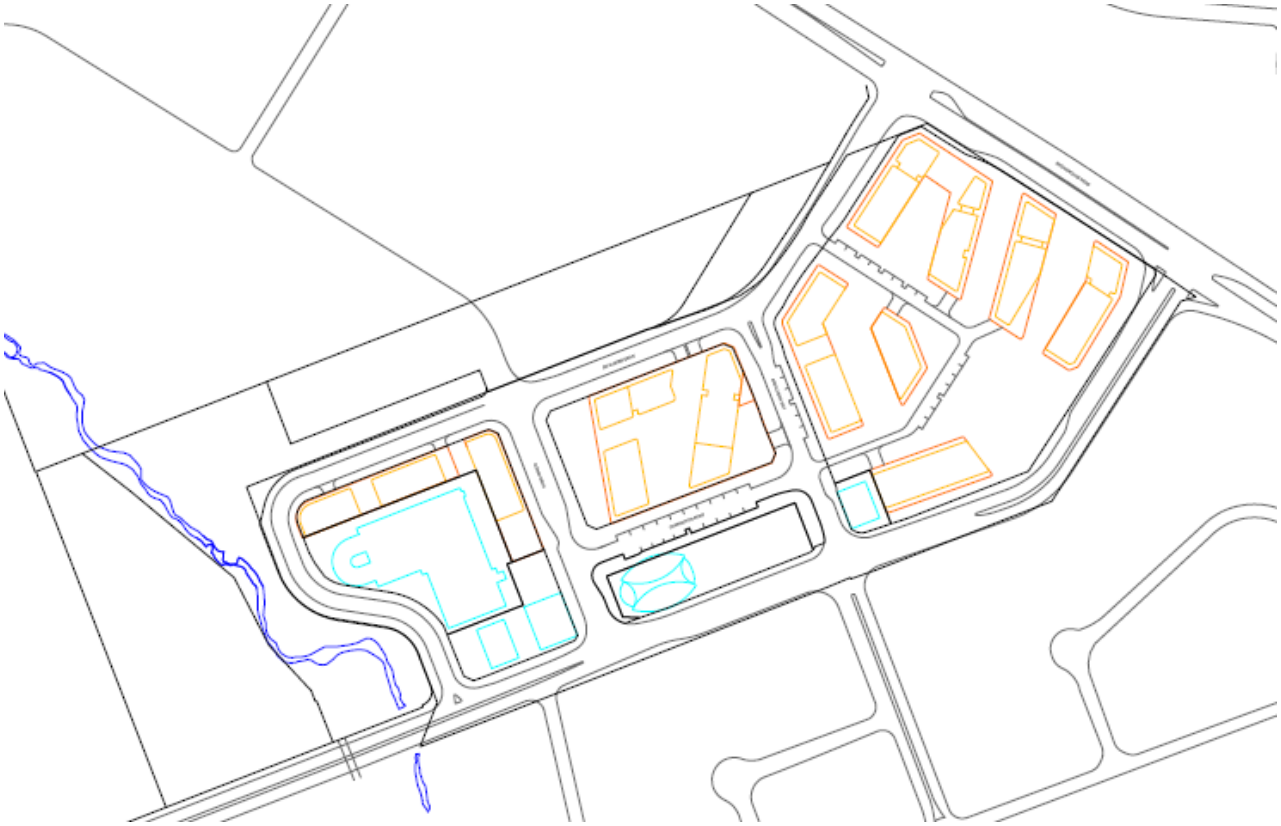
As shown in **Figure 4–1**, the Illustrative Concept Proposal is divided to the three precincts from the west to the east namely:

– Hills Showground Station Precinct West;

– Doran Drive Precinct; and

– Hills Showground Station Precinct East.

Figure 4–1 Potential arrangements to cater for driveway accesses



Source: COX, 2019

Each precinct will have individual accesses:

– **Hills Showground Station Precinct West** has two accesses on the northern edge of De Clambe Drive. The eastern access connects to an internal loading area and a car park at lower ground level; The western access ramps down to basement parking;

– **Doran Drive Precinct** has a shared access on De Clambe Drive. The eastern half of the access connects to a loading area equipped with turntable and the western half ramps down to basement parking for the non-residential component; another access is located on Andalusian Way which has a direct ramp to the basement parking for the residential component; and

– **Hills Showground Station Precinct East** proposes an internal street that connects between Andalusian Way to the west and De Clambe Drive to the north. Multiple car park accesses are proposed to access individual building blocks with separated basement car parks.

The location of the car park and loading dock accesses have been designed to minimise interface with high pedestrian areas such as Doran Drive and Mandala Parade, while providing the most direct access to the surrounding street network.

4.2.2 Public transport access

Sydney Metro provides existing and future residents and employees with high quality access to public transport and employment options and promotes sustainable travel options. The Hills Showground Station of the SMNW project is shown in **Figure 4–2**, which provides direct access to Chatswood to the south east and Rouse Hill and Tallawong Station to the north west, with fifteen services in an hour during the peak. SMNW has opened in May 2019, and customers will also have a new direct Metro service to Crows Nest, Barangaroo and Martin Place when Sydney Metro City and Southwest opens in 2024. Access to a wide range of employment locations within 30 minutes will attract more people to live at Hills Showground.

Figure 4–2 Sydney Metro Line

Source: Sydney Metro, 2019

The bus interchange located on both sides of Doran Drive and will continue to service bus routes that operate along Carrington Road and Showground Road connecting residents and employees between the station and other surrounding centres.

Other bus stops in the vicinity of the site are located in pair on Middleton Avenue (around 50 metres south of the Carrington Road / Middleton Avenue intersection), Carrington Road (around 75 metres southwest of the Carrington Road / Showground Road intersection) and Showground Road (around 70 metres upstream/ downstream of the Carrington Road/ Showground Road intersection).

The proximity to bus stops to the station allows efficient access of future residents and patrons to the Hills Showground Station site. The Illustrative Concept Proposal has been developed to facilitate efficient access by bus and Metro passengers through the station plaza and surrounding road network.

4.2.3 Active transport access

The vast majority of trips to, through and within the site will be taken on foot and the experience of the pedestrian is a critical consideration. Pedestrian footpath, through site link and mid-block connections has been proposed to ensure permeability and activity within all precincts of the site.

Footpaths within the proposed development are proposed according to the DCP requirements to ensure capacity to cater for a high number of walking trips and all major circulation spaces will be provided with shelter from the weather.

On-site bicycle parking will be provided for residents and employees, which will have accesses to the existing pedestrian and cycle path network.

4.3 Travel Demand Management

Sustainable transport and Travel Demand Management (TDM) strategies involve the application of policies, objectives, measures and targets to influence travel behaviour, to encourage uptake of sustainable forms of transport, i.e. non-car modes, wherever possible. TDM measures have proven to reduce congestion created by growth within urban areas and unlock urban renewal opportunities. They result in travel behaviour that uses less road space than a single occupant vehicle commute and takes advantage of spare transport capacity outside the morning and afternoon peaks.

TDM strategies generally guide all relevant customers (residents, employees and visitors) in changing the travel behaviour in the following ways:

– Reduce travel;

– Re-mode (consideration of travel via alternative modes);

– Re-time (consideration of travel at alternative times); and

– Re-route.

Landcom and Sydney Metro set up a framework for a more sustainable travel, which has been used as a key principle of planning for the development. A Travel Plan should be developed by future developers and monitored by strata management for the Hills Showground Station Precinct community to deliver best practice travel programs and initiatives to manage travel demand for a transit-oriented development. Key initiatives and measures of Travel Demand Management Strategies should be further developed into a Travel Plan to:

– Reduce the need to travel
  - Planning of wider Showground Station Precinct as a mixed-use community to maximise trip containment within the precinct and encourage use of active transport (walking and cycling) for short trips.

– Re-think the mode of travel
  - Walking and cycling:
    - A highly permeable and safe pedestrian network throughout the development;
    - Dedicated cycle routes that connect to the regional routes and major transport hubs;
    - Key design principles to integrate walking and cycling network and facilities into the planning and delivery of the development;
    - High quality, safe and accessible end-of-trip facilities (centralised cycle hubs that are integrated within development at convenient locations, on-street secure bicycle storage located conveniently at end of cycle destinations, parking hubs for shared bikes, lockers and showers);
    - Promotion of bicycle initiatives – NSW bicycle week, cycle to work day, free bike check-up events;
    - Establishment of a Bicycle User / Consultation Group.
  - Public transport:
    - Provision of frequent public transport services to establish a non-car travel behaviour;
    - Good quality public transport stops in the vicinity of the development;
    - Tailored information with clear mapping and walking catchments at public transport stops;
    - Provision of public transport information from home via television channel or community app.
  - Parking measures to encourage alternative modes of travel:
    - Reduced parking rates with flexibility in parking arrangements such as shared parking between non-conflicting uses, shared vehicles parking and / or carpooling to accommodate parking needs of all employees;
    - Parking spaces dedicated to electric vehicles, with charging stations; The design to consider the future ability of spaces to link to electrical systems / power supply within the structure;
    - Parking spaces dedicated to car share scheme and community car-share vehicles, both on-street and incorporated in easily-accessed public car parks.
  - Development and use of carpooling app for the wider precinct and community.

– Re-time and Re-route journeys:
  - Development of specific community app / community engagement program to enable changing travel behaviour which includes:
    - Active and public transport maps;
    - Personalised journey planner;

    - Notifications to latest travel information;
    - Shared vehicles information;
    - Car-pooling opportunities;
    - Other precinct-related information.
- Real-time information embedded into development and public transport stops.
- Employers to promote and encourage flexible working hours and arrangements.

While it is important to develop a Travel Plan that is aimed at managing travel demand and reducing reliance on car travel, it is more important to monitor and evaluate the effectiveness of individual measures and the need to adjust the measures. The planning and implementation of a targeted Travel Plan with the above green travel initiatives / principles could support the delivery of a transit-oriented development at Hills Showground Station that provides significant opportunities for alternative travel options and reduces the need for car travel.

At the SSDA stage, there is no means to enforce the delivery of Green Travel Plan actions. It is recommended that subsequent development applications be given the requirement to develop green travel plans to realise the benefits of access to SWNW.

4.4 Parking requirements and provision

4.4.1 Parking guidelines and DCP requirements

4.4.1.1 Car parking facilities

Guidance on parking rates in a number of relevant state and local planning frameworks as well as RMS Guide to Traffic Generating Developments could be applied to estimate likely parking provision for the site.

Transit-oriented developments aim to adopt car parking rates that provide a balance between meeting car parking demand whilst encouraging sustainable and active transport by residents. New developments are encouraged to reduce car parking provision and demonstrate the inclusion of transport alternatives or strategies to discourage private motor vehicle use.

The guidelines considered appropriate for review, for the residential and non-residential components of the proposed development, are the Roads and Maritime Service Guidelines, The Hills Shire / Showground Precinct DCP rates and SCT Consulting previous work for SSDA of Bella Vista and Kellyville DGL sites – refer to **Appendix A**.

A comparison of the relevant parking rates applicable to the residential component of the proposed development is presented in **Table 4.2**.

It should be highlighted that the Concept Proposals seek approval for a range of non-residential Gross Floor Areas (between 6,700 m^2 and 13,600 m^2 of GFA), hence there is a range of residential dwelling yield between 1,802 and 1,879 dwellings including a minimum of five percent for affordable housing. The higher and lower non-residential schemes both yield a total GFA 175,796 m^2. In order to understand the implications of both scenarios and to undertake a worst-case assessment, this assessment has considered the more onerous condition with the upper limit of both non-residential and residential Gross Floor Areas.

Table 4.2 Car parking requirements for residential developments

Dwelling type		Proposed no. of units	Number of parking spaces required			
			Showground Precinct DCP	The Hills Shire DCP	Recommended for Bella Vista and Kellyville and Hills Showground DGL sites	
					Min	Max
Market housing	1 Bed	631 – 658 units	1.0	1.0	0.6	1.0
	2 Bed	991 – 1,033 units	1.0	2.0	0.9	1.0
	3 Bed	181 – 188 units	1.0	2.0	1.4	1.5
	Visitor	1,802 – 1,879 units	0.2	0.4	0.1	0.1
Total spaces		**-**	**2,163 – 2,255**	**3,694 – 3,852**	**1,703 – 1,776**	**2,076 – 2,165**

Source: SCT Consulting, 2019

Note: A 35 percent, 55 percent and 10 percent ratio was applied for the proportion of one bed, two bed and three bed dwellings for all dwelling types.

Based on a review of all relevant parking guidelines to the site, the estimated number of parking spaces to be provided should be 1,703 to 2,165 spaces for the residential development, which is based on the range for similar TOD sites and are still lower rates than The Hills Shire DCP and Showground Station Precinct DCP.

Reduced car parking provision would encourage a balance between meeting car parking demand whilst encouraging sustainable and active transport by residents. The car parking needs of future residents can still be met through a number of flexible and sustainable parking management measures / options such as:

– Decoupled parking, shared vehicles parking to accommodate parking needs of all residents.

– Car travel needs can be addressed via carpooling and / or using shared vehicles.

– Parking spaces dedicated to electric vehicles, with charging stations.

– Parking spaces dedicated to car share scheme and community car-share vehicles, both on-street and incorporated in easily-accessed public car parks.

A comparison of the relevant parking rates applicable to the non-residential component of the proposed development is presented in **Table 4.3**.

Table 4.3 Car parking requirements for non-residential developments

Type of use	GFA	Number of bicycle parking spaces required			
		Guide to Traffic Generating Developments	The Hills Shire DCP 2012	Recommended for Bella Vista and Kellyville and Hills Showground DGL sites	
				Min	Max
Retail	5,160 – 9,093 m^2	1 space per 16.4m^2 GLFA ^	1 space per 18.5m^2 GLFA ^	1 space per 130m^2 GFA	1 space per 60m^2 GFA
Commercial	1,540 – 4,507 m^2	1 space per 40m^2 GFA	1 space per 40m^2 GFA	1 space per 145m^2 GFA	1 space per 100m^2 GFA
Total	**6,700 – 13,600 m^2**	**274 – 529 spaces**	**248 – 481 spaces**	**50 – 101 spaces**	**101 – 197 spaces**

Source: SCT Consulting, 2019

^Assuming GLFA: GFA=0.75:1 (refer to Section 5.7 Guide to Generating Traffic Development).

As described for the residential car parking component, it is considered acceptable to adopt the lower rates given the transit-oriented nature of the development and retail's main target customer group, i.e. local walk-up catchment. It is recommended that for the retail and commercial component that the car parking rate be set at the range that SCT previous works for similar TOD projects, i.e. 50 - 197 spaces in total.

The car parking spaces for the higher and lower non-residential schemes are shown in **Table 4.4**.

Table 4.4 Range of car parking spaces for different yield scenarios

Type of use	Higher Non-Residential Scheme	Lower Non-Residential Scheme
Non-residential	101 – 197 spaces	50 – 101 spaces
Residential	1,703 – 2,076 spaces	1,776 – 2,165 spaces
Total	**1,804 – 2,273 spaces**	**1,826 – 2,266 spaces**

Source: Cox, October 2019

Hence, it is recommended that **1,804 – 2,273** parking spaces be provided for the residential and non-residential components of the development.

4.4.1.2 Shared vehicle parking

Further opportunities are considered to minimise parking provision by introducing shared vehicle parking spaces within the development that fully leverage the opportunities offered by SMNW and the principles of a transit-oriented development. Car share is a recent parking management option that is being increasingly considered for developments in Sydney as part of a travel demand management plan to reduce the number of parking spaces required to be provided in new developments.

Development applications are to demonstrate how the car share parking space(s) is to be accessed, including where access is through a security gate. A covenant is to be registered with the strata plan advising of any car share parking space. The covenant is to include provisions that the car share parking space(s) cannot be revoked or modified without prior approval of Council.

These requirements support the notion of using car share schemes, such as Go Get, to achieve reductions in private vehicle ownership. They also allow for action to be taken regarding parking provision and a review of existing parking controls.

SCT was engaged by Landcom in a study to review DCPs and guidelines from other locations in Sydney to identify reasonable number of car share spaces (see technical note attached in **Appendix A**). Given the increase in density and quantity of development surrounding the station and limited provision of car share locations around the site, a ratio of one per 150 car spaces for residential and one per 80 car parking spaces for commercial developments for the site is proposed, in lieu of 3 car parking spaces per car share parking space as suggested by some Councils. This results in 13 – 16 car share spaces which could further reduce 26 – 32 spaces from the total parking provision. It

would capitalise on the precincts' excellent public transport access through the new Sydney Metro, but also reflect the area's more suburban character compared to the City of Sydney, North Sydney and Parramatta.

4.4.1.3 Bicycle parking facilities

Based on the Showground Precinct DCP, the required bicycle parking is calculated in **Table 4.5**. A total of 781-799 bicycle parking spaces is required for the site according to Higher Non-Residential Scheme and Lower Non-Residential Scheme.

Table 4.5 Bicycle parking for the site

Type of use	Yield	Showground Precinct DCP requirements	Number of parking spaces required
Market housing	1,802 – 1,879 dwellings	One space per three apartments for resident and one visitor space per 12 apartments	752 – 784
Retail	5,160 – 9,093 m^2	One space per 450 m^2 GFA for staff	12 – 21
Commercial	1,540 – 4,507 m^2	One space per 600 m^2 GFA for staff	3 – 8
Total			**781 – 799 spaces^**

Source: SCT Consulting, 2019

^Note that lower end of the bicycle parking spaces is composed of 752 + 21 + 8 = 781 spaces based on combination of lower end yield of residential and higher end yield of non-residential whilst higher end of the bicycle parking spaces is composed of 784 + 12 + 3 = 799 spaces based on combination of higher end yield of residential and lower end yield of non-residential.

4.4.1.4 Other parking requirements

Based on the development scale described in the preferred option and the requirements from The Hills Shire DCP, parking provision for service parking, motorcycle parking and accessible parking are summarised in **Table 4.6**.

Table 4.6 Other parking requirements for the site

Type of parking	The Hills Shire DCP 2012 requirement		Total spaces
	Residential	Non-residential	
Service parking	Not specified	**Supermarket**: Two for the first 930m^2 of GLFA^, two for the next 930m^2, one for each extra 930m2;	5
		Mixed small shops: Two for the first 4,645m^2 of GLFA^, two for the next 4,645m^2, and one for each extra 4,645m^2; and	2
		Office: One for the first 1,860m^2, one for next 3,720m^2, one for the next 3,720m^2, one for each extra 9,250m^2.	1
Motorcycle parking	Provided for all developments with on-site parking of more than 50 car parking spaces, at a rate of one motorcycle parking space for every 50 car parking spaces or part thereof		37 – 46
Accessible parking	Two percent of the total car parking		37 – 46

Source: SCT Consulting, 2019
^Assuming GLFA: GFA=0.75:1 (refer to Section 5.7 Guide to Generating Traffic Development).

4.4.2 Parking summary

According to The Hills Shire Council DCP, the Illustrative Concept Proposal would require providing over 4,333 spaces which does not reflect its strategic location adjacent to a Metro station.

Additional mode share analysis suggests that there could be a significant shift to public transport use, from currently less than 10 percent to between 24 percent and 61 percent depending on the types of transport and built form policies implemented for this development given its location and density, which then complements a proposed

reduction in parking supply. The increase in public transport services at the Hills Showground Station Precinct site enables reduction of car parking provision as there is significantly less reliance on private vehicles.

Restrained parking is proposed for the Illustrative Concept Proposal to create a transit-oriented centre, reflecting the higher level of public transport services and to minimise additional congestion to the surrounding road network. Based on a parking review of other relevant DCPs and similar development examples that are located close to train station, it is proposed that the following car parking rates be adopted and applied to the Illustrative Concept Proposal of the Hills Showground Station Precinct site as shown in **Table 4.7**.

Table 4.7 Recommended parking rates for Hills Showground Station Precinct site

Land use		Car parking rates range	Bicycle parking rates
Residential	1 Bed	0.6 - 1.0 space per dwelling	One space per three apartments for resident and one visitor space per 12 apartments
	2 Bed	0.9 - 1.0 space per dwelling	
	3 Bed	1.4 - 1.5 spaces per dwelling	
	Visitor	0.1 spaces per dwelling	
Retail		1 space per 130 m^2 – 60 m^2 GFA	One space per 450 m^2 GFA for staff
Office / commercial / facility		1 space per 145 m^2 – 100 m^2 GFA	One space per 600 m^2 GFA for staff
Car share spaces		One space per 150 car spaces for residential and one space per 80 car parking spaces for commercial	-

Source: SCT Consulting, 2019 Car parking facilities

These parking controls could be achieved by a site-specific DCP or other planning tool to enforce the recommendations. The general parking spaces rate would need to be detailed as a maximum (not minimum) to achieve the proposed outcome.

Based on the yield and land use mix and the recommended maximum parking rates for each type of uses, the Illustrative Concept Proposal would supply up to 2,273 car parking spaces. This represents around 47 percent reduction in car parking space to maximise the full potential of its strategic location adjacent to the Metro station and to reduce trip generation and discourage private motor vehicle use.

4.5 AS 2890 car park review

A car park review and related swept path assessment has been conducted based on the current concept drawings. The review confirmed that all the car park and loading dock accesses are generally appropriately designed given the potential for further refinements in subsequent Development Application stages. Further refinements may be required as the design of the buildings evolve.

4.6 Trip generation

The site at Hills Showground Station Precinct is characterised by a mix of residential, retail and commercial uses within immediate proximity of the Hills Showground Station as well as low parking rates. Research indicates that these types of built environment variables lead to higher public transport mode share. Work by Matthew McKibbin (McKibbin, 2011) indicates that there are several factors that influence travel behaviour and that the strongest relationships are associated with demographics, car ownership and public transport access. A summary of the findings is provided in **Table 4.8**.

Table 4.8 Findings of built environment variables and their influence on public transport mode share

Category	Built environment variables	Model coefficient	Elasticity
Density	Residential density (pop/ha) Employment density (jobs/ha)	0.0004 0.0003	0.05 0.02
Diversity	Jobs/housing diversity (0 = single use, 1 = mixed use)	0.0247	0.03
Design	Street density (m/ha) *Not statistically significant*	-	-
Destination accessibility	% of jobs accessible by public transport in 30 mins % of jobs accessible by car in 30 mins	0.4019 -0.1044	0.11 -0.05
Distance to transit	Distance to the nearest CityRail station (log km)	-0.0537	-002
Control variables	Weekly income per person ($ per week) Cars per household % workers travelling to Sydney CBD	0.0001 -0.2216 0.5415	0.17 -0.98 0.24

Note: The model intercept coefficient was 0.4313. The number of locations (Travel Zones) analysed was 1553
Source: McKibbin, 2011

McKibbin's work also provides a relationship between the level of car ownership and the non-car mode share / car trip generation. The relationship between these variables is an elasticity of -0.98, indicating that a 100 percent decrease in car ownership would result in a 98 percent increase in non-car mode share or vice-versa (all else being equal). As the original data does not include parking supply at place of work, it's not possible to estimate the exact response to this policy. When viewed together with research that indicates that low parking supply for households results in less car ownership, it can be concluded that parking supply can be used to influence travel behaviour.

Given the site's access to frequent transit services, lower proposed parking and mixed-use nature, trip generation rates have been tailored to the proposal as per the following sections.

4.6.1 Residential vehicle trip generation

The average trip rate for high density residential flat dwellings that have good access to public transport services within Sydney urban areas, as published by the Roads and Maritime Services[4], is identified as 0.19 and 0.15 trips per dwelling within the AM and PM peak hour periods respectively and 1.52 daily trips per dwelling.

Given the site's proximity to good public transport services, implementation of travel demand management measures as included in **Section 4.4**, including the reduced parking provision for a transit-oriented development, the above peak hour vehicular trip rates are considered the most appropriate. These trip generation rates are also consistent with the rates used for a number of nearby residential developments.

4.6.2 Commercial vehicle trip generation

The RMS Technical Direction[5] also described vehicular trip rates for commercial developments where traffic surveys were undertaken for developments that are close to public transport. Included in this Technical Direction were surveys at North Sydney, Chatswood, Macquarie Park and Parramatta, which are similar in terms of scale of development and proximity to the train stations. As such, the standard trip generation for office blocks was adopted:

[4] Technical Direction TDT 2013/04a, Guide to Traffic Generating Developments – Updated traffic surveys (Roads and Maritime Services, 2013)
[5] Technical Direction TDT 2013/04a, Guide to Traffic Generating Developments – Updated traffic surveys (Roads and Maritime Services, 2013)

– 1.6 vehicles per hour per 100m^2 GFA in the AM peak;
– 1.2 vehicles per hour per 100m^2 GFA in the PM peak; and
– 11 vehicles per day per 100m^2 GFA.

4.6.3 Retail vehicle trip generation

Roads and Maritime Service's Technical Direction[4] specified vehicle trip generation for the evening or midday peak of Thursday through to Sunday, however, does not specify the morning trip generation rate. Analysis was undertaken of the raw survey information to estimate the typical Thursday AM peak generation, all of which is shown in **Table 4.9**.

Table 4.9 Retail trip generation rates

Range in floor area (m^2 GLFA)	Trip generation rate per 100m^2 GLFA				
	Thursday PM peak	Friday PM peak	Saturday midday	Sunday midday	Thursday AM peak
0-10,000	**12.3**	12.5	16.3	-	**5.9**
10,000 – 20,000	7.6	6.2	7.5	6.6	Not estimated
20,000 – 30,000	5.9	5.6	7.5	6.3	Not estimated
30,000 – 40,000	4.6	3.7	6.1	-	Not estimated

Source: Roads and Maritime Service, analysis by SCT Consulting (Thursday AM peak), 2019

With the total quantity of retail floor space being under 10,000m^2 GLFA, the relevant band is the 0 – 10,000m^2 GLFA band.

4.6.4 Total vehicle trip generation

The likely estimated peak hour vehicle trip generation of the Hills Showground Station Precinct site is shown in **Table 4.10**.

It should be highlighted that the Concept Proposals seek approval for a range of non-residential Gross Floor Areas (between 6,700 m^2 and 13,600 m^2 of GFA), hence there is a range of residential dwelling yield between 1,802 and 1,879 dwellings including a minimum of five percent for affordable housing. The higher and lower non-residential schemes both yield a total GFA 175,796 m^2. In order to understand the implications of both scenarios and to undertake a worst-case assessment, the trip generation and traffic modelling exercise have considered the more onerous condition with the upper limit of both non-residential and the lower limit residential Gross Floor Areas, which would generate the highest vehicular trips. Hence the impacts highlighted in this report would be overstated if the lower limit of the non-residential is delivered with the upper limit of residential component.

Table 4.10 Peak hour vehicle trip generation of Hills Showground Station Precinct site

Land Use	Indicative Yield	Proposed AM Peak trip rates	AM Peak trips	Proposed PM Peak trip rates	PM Peak trips
Apartment	1,802 units	0.19 per unit	342 veh/h	0.15 per unit	270 veh/h
Commercial	5,150 m^2	1.6 / 100m^2 GFA	82 veh/h	1.2 / 100m^2 GFA	62 veh/h
Retail	8,450 m^2 ^	5.9 / 100m^2 GLFA *	285 veh/h	12.3 / 100m^2 GLFA *	595 veh/h
Total			**710 veh/h**		**927 veh/h**

Source: SCT Consulting, 2018

^Assuming GLFA: GFA=0.75:1 (refer to Section 5.7 Guide to Generating Traffic Development).

*An 25% reduction factor has also been applied to these retail vehicular trip rates to account for high passing trade expected given the location of these retail next to metro station.

Based on the adopted trip generation rates of the respective land uses, it is estimated the Illustrative Concept Proposal would generate 710 and 927 peak hour vehicular trips during the AM and PM peak respectively. Total point to point trip generation is considered negligible given the low journey to work mode share in the area for point to point.

4.6.5 Person trip generation

Surveys at several locations were chosen from the Roads and Maritime Service Technical Direction, for person trip generation estimation. Person trip generation for apartments is an average of 0.66 and 0.56 trips per unit in the AM and PM peak, respectively per the average of the Technical Direction.

The average peak hour person trip rates were estimated to be 1.45 and 1.14 trips per 100m^2 during the AM and PM network peak hour respectively for similar office areas. Average peak hour trip rates were 3.05 and 6.94 person-trips per 100m^2 during the AM and PM network peak hour respectively for retail sites. The surveyed data for these sites is highlighted in **Table 4.11** and **Table 4.12**.

Table 4.11 Peak hour person trip generation of similar office sites (commercial)

Surveyed location	North Sydney	Chatswood	Macquarie Park	Parramatta	Average
AM peak hour trips	391	111	142	266	-
PM peak hour trips	338	90	86	298	-
GFA (m^2)	31,400	10,214	5,748	27,000	-
AM trip rate / 100 m^2	**1.25**	**1.09**	**2.47**	**0.99**	**1.45**
PM trip rate / 100 m^2	**1.08**	**0.88**	**1.50**	**1.10**	**1.14**

Source: Roads and Maritime Service, Technical Direction 2013/14

Table 4.12 Peak hour person trip generation of similar retail sites

Surveyed location	Burwood	Liverpool	Rouse Hill	Warriewood	Average
GFA (m^2)	63,404	91,115	69,000	22,143	-
AM trip rate / 100 m^2	**3.27**	**3.68**	**2.08**	**3.18**	**3.05**
PM trip rate / 100 m^2	**8.00**	**6.65**	**6.30**	**6.80**	**6.94**

Source: Roads and Maritime Service, Technical Direction 2013/14

It should be noted that these retail areas are significantly larger than the retail component of the illustrative development concept, but this approach provides an estimation of likely person trip generation by the retail component.

Person trip generation for the site was estimated as shown in the **Table 4.13** below with the peak hour trip generation rates estimated in the previous tables.

Table 4.13 Peak hour person trip generation of Hills Showground Station Precinct site

Land Use	Indicative Yield	Proposed AM Peak trip rates	AM Peak trip generation	Proposed PM Peak trip rates	PM Peak trip generation
Apartment	1,802 units	0.66 per unit	1,189	0.56 per unit	1,009
Commercial Community uses	5,150 m^2	1.45 per 100m^2 GFA	75	1.14 per 100m^2 GFA	59
Retail	8,450 m^2	3.05 per 100m^2 GFA	258	6.94 per 100m^2 GFA	586
Total		**-**	**1,522**	**-**	**1,654**
Less persons in vehicle trips	**1,964**	**-**	**-852^**	**-**	**-1,112^**
Total person trips	**1,212**	**-**	**670**	**-**	**542**

Source: SCT Consulting, 2018
^Assuming the car occupancy for the vehicle trip generation is 1.2 person / vehicles. AM Peak trip generation = 710*1.2 = 852 persons and PM Peak trip generation = 927*1.2 = 1,112 persons.

Given its location directly adjacent to Hills Showground Station and peak hour travel purposes, most of these person-trips associated with the Hills Showground Station Precinct site will be using surrounding public transport services, some will be to other businesses and some would be walking / cycling from trip origins. Hence, it is estimated the Illustrative Concept Proposal is forecast to could generate approximately **670** and **542** person-trips during the AM and PM peak hours respectively, of which the majority of them will be associated with Metro and bus customers. A small proportion would be walking / cycling to or from the origins of their trips.

It is not possible to estimate cycling demand accurately given the changing nature of the precinct. The site is currently characterised by construction, bulky goods and detached dwellings. With the introduction of high-density mixed use and street activation, this is expected to change significantly. Cycling demand could be up to 2 percent of the total person demand, indicatively 33 trips per hour.

5.0 Traffic and transport impact assessment

5.1 Public and active transport

5.1.1 Public transport impacts

The site is located immediately adjacent to Hills Showground Station, which provides direct access to Chatswood, Rouse Hill, Macquarie Park and other employment centres via connecting rail services. The wide network coverage, train frequency, journey-time reliability and improved customer offering of Sydney Metro, will encourage public transport usage and increase journey to work trips by non-car modes.

The delivery of this site would support best practice transit-oriented development principles, by providing increased mixed-use density in proximity to high frequency and capacity public transport services. Sydney Metro will provide employees with greater access to public transport and employment options, while promoting the use of sustainable travel options.

On this basis, **Section 0** estimated the majority of an additional 670 person-trips during the peak hour that generated by the Illustrative Concept Proposal will be using public transport or active transport to access the development. These additional trips during the peak hours can be accommodated through the high frequency Metro services and frequent bus services.

Impacts on the metro system are expected to be limited, with the subject site intended to capitalise on benefits of the new metro service, increasing patronage. With a total of up to 19 bus services in each of the AM and PM one-hour peak, respectively, the impact on individual routes is expected to be limited. Bus trips are expected to be demanded only for locations not covered by the metro, such as Parramatta or Blacktown. Based on the breakdown of current destinations from **Table 3.1**, indicatively 27 percent of destinations would be more easily accessible by bus than metro. Assuming no destination shift towards more accessible locations (a conservative assumption), buses are forecast to experience an increase in demand by 446 trips per hour, predominately to Parramatta and Blacktown. Bus services may need to increase in frequency if this demand can't be catered for with the current services.

With bus stops interchanging directly with Hills Showground Station, no changes to bus service patterns are considered necessary to service the development.

5.1.2 Active transport impacts

Pedestrian and cyclist access to the site has been identified in the Interchange Access Plan via the cycle and pedestrian paths on De Clambe Drive, Andalusian Way and Doran Drive. These routes will connect cyclists and pedestrians to station, Showground Road and Carrington Road.

As discussed in **Section 0**, the increased yield of the Illustrative Concept Proposal could generate approximately 670 person-trips per peak hour, of which only a small proportion would be walking / cycling to / from the origins of their trips.

The station layout and interface with the Illustrative Concept Proposal has several features to support the expected large amount of pedestrian volumes. There are multiple access points to the station, reducing pressure on each of the access points. There is also spacious public domain with multiple plazas, which provides waiting or meet and greet space for customers, which reduces queue build-up near station gates. Lastly, with the large frequency of train services, the peak factor for pedestrian demands is more balanced compared with a conventional heavy rail station.

Given the high frequency of train services, the pedestrian demand between the proposed development and the station would be very well-spread across the peak hours, hence reducing the likely crowding levels and additional upgrade of current footpaths and shared paths which are delivered for significantly higher demand and are currently observed to have significant spare capacities.

The vast majority of trips to, through and within the site will be taken on foot and the experience of the pedestrian is a critical consideration in the development of the concept master plan. Within the network of streets, a finer grain of mid-block connections has been proposed to ensure permeability and activity within all blocks of the Showground Station Precinct.

Street wall heights and primary setbacks have been incorporated into the concept master plan to ensure the scale of buildings is an appropriate experience for pedestrians at the street level. Upper level setbacks to towers provide a sense of space and openness to the sky and the podiums shield pedestrians from down-drafts. Footpaths throughout

the site are designed according to DCP requirements to ensure capacity to cater for a high number of walking trips and all major circulation spaces will be provided with shelter from the weather.

Crossing locations on Showground Road are considered appropriate, being spaced at 180m distance from each other. It would not be safe to introduce an additional signalised crossing on Showground Road between De Clambe Drive and Carrington Road, as the close spacing of intersections could lead to rear-end crashes due to “look through” effects, where drivers confuse which traffic lights they are looking at.

5.2 Road network

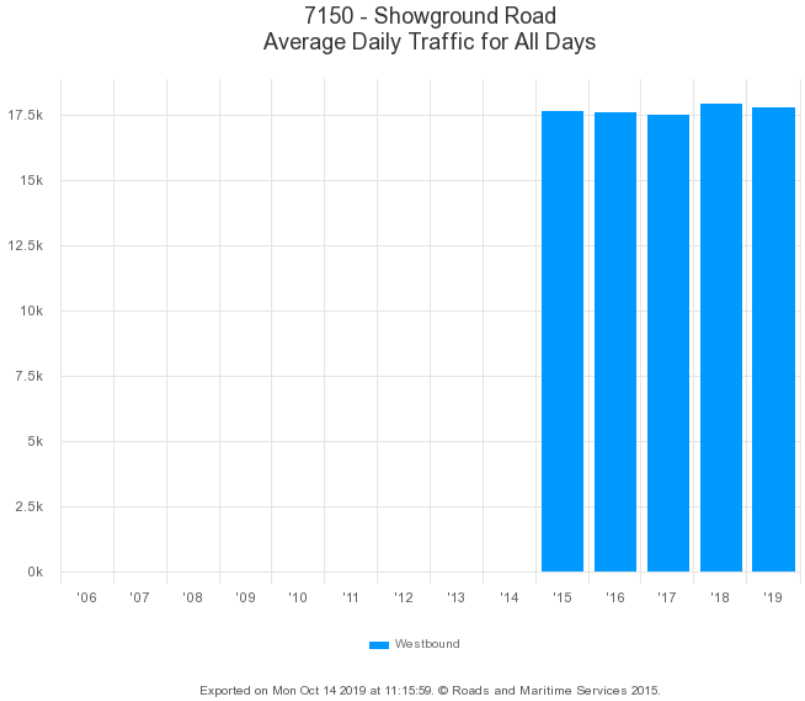
As discussed in **Section 4.6.4**, the Illustrative Concept Proposal would generate between 710 and 927 peak hour vehicular trips during the AM and PM peak hours respectively.

5.2.1 Background growth

Roads and Maritime provided a copy of the Showground Road concept design including the supporting traffic memo. This memo identified growth rates of the surrounding road network assumed in the development of the road upgrade. These growth rates were extracted from the STFM in 2017, after the time of the exhibition of the Showground Station Precinct rezoning and the North West Rail Link Corridor Strategy, both of which provided forecast growth precinct-by-precinct.

Historical traffic volumes are shown in **Figure 5–1** for the count station of Showground Road, east of Victoria Road.

Figure 5–1 Showground Road average daily traffic



Source: Roads and Maritime Service, https://www.rms.nsw.gov.au/about/corporate-publications/statistics/traffic-volumes/aadt-map/index.html#/?z=13&f=0&yr=2018&lat=-33.76007830827463&lon=151.01082843200197&id=7150&tb=1, 2019

The historical growth on the corridor is flat, with17,680 average vehicles per day in 2015 and 17,831 vehicles per day in 2019, a compound growth rate of 0.2 percent per annum.

The rates identified in the STFM modelling is significantly above these rates, so is concluded as including regional growth – a cumulative impact assessment.

The adopted background traffic growth are shown in **Table 5.1**.

Table 5.1 Adopted growth rates by location

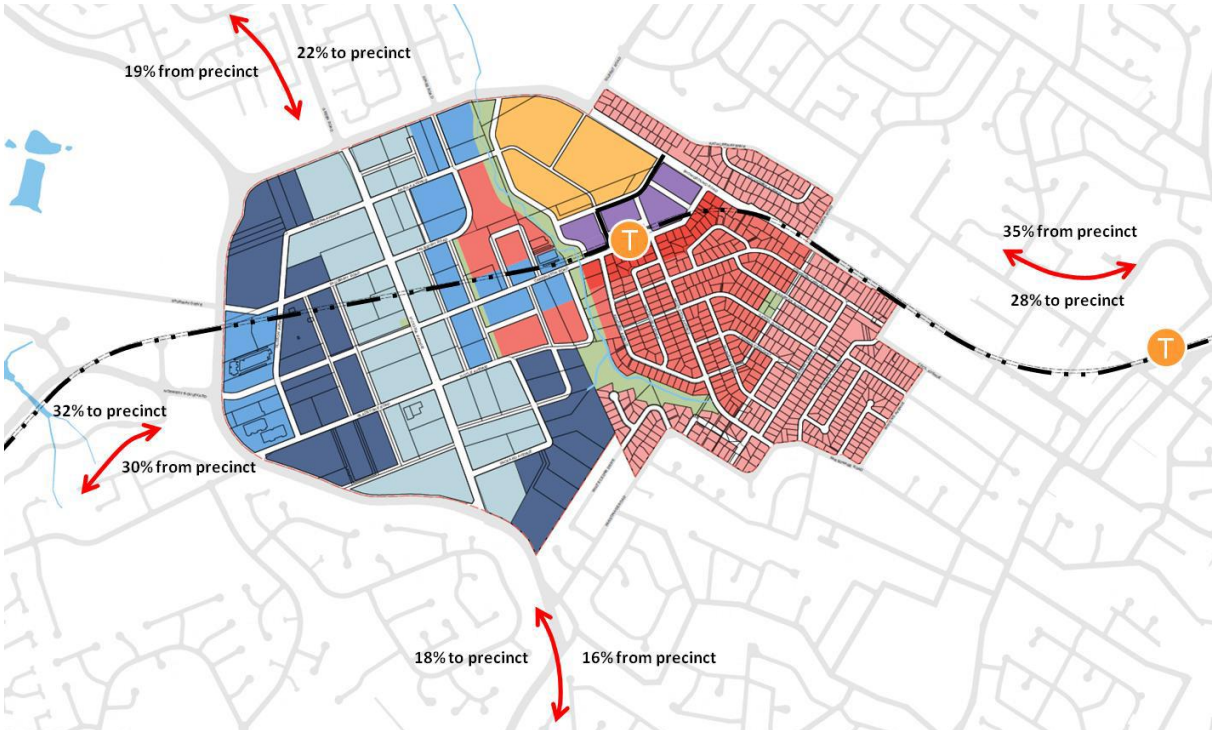
Road	Direction	AM peak growth p.a.	PM peak growth p.a.
Carrington Road	EB	2.4%	1.0%
	WB	1.0%	2.4%
Showground Road	SB	2.9%	2.4%
	NB	2.9%	3.0%
Victoria avenue	SB	2.0%	1.4%
	NB	3.3%	1.9%

Source: SCT Consulting based on Easing Sydney's Congestion, AECOM, 2019

5.2.2 Traffic distribution

The traffic distribution was adopted from the Transport for NSW transport plan, which has the best distribution information available in the area as it accounts for the benefits of Sydney Metro. This is shown in **Figure 5–2**.

Figure 5–2 Showground Station Precinct Transport Plan trip distribution



Source: Transport for NSW, 2019

5.2.3 Future year traffic forecast

The development trip generation as estimated in Section 4.6.4 as well as background traffic growth derived from Section 5.2.1 have been applied to the 2019 traffic volumes. The resultant 2031 peak hour traffic volumes on Showground Road and Carrington Road are summarised in **Table 5.2**.

Table 5.2 2031 forecast traffic volumes on Showground Road and Carrington Road

Location	2019 AM	2019 PM	2031 AM Base (with background traffic)	2031 PM Base (with background traffic)	2031 AM With development traffic	2031 PM With development traffic
Showground Road between Carrington Road and De Clambe Drive	2,200 (106)	2,330 (64)	3,050 (141)	3,220 (85)	3,060 (141)	3,260 (85)
Carrington Road between Showground Road and Andalusian Way	1,140 (22)	1,270 (4)	1,550 (30)	1,600 (8)	1,740 (30)	1,810 (8)
Carrington Road between Doran Drive and De Clambe Drive	1,250 (34)	1,530 (26)	1,460 (41)	1,840 (34)	1,770 (41)	2,220 (34)

Source: SCT Consulting, 2019

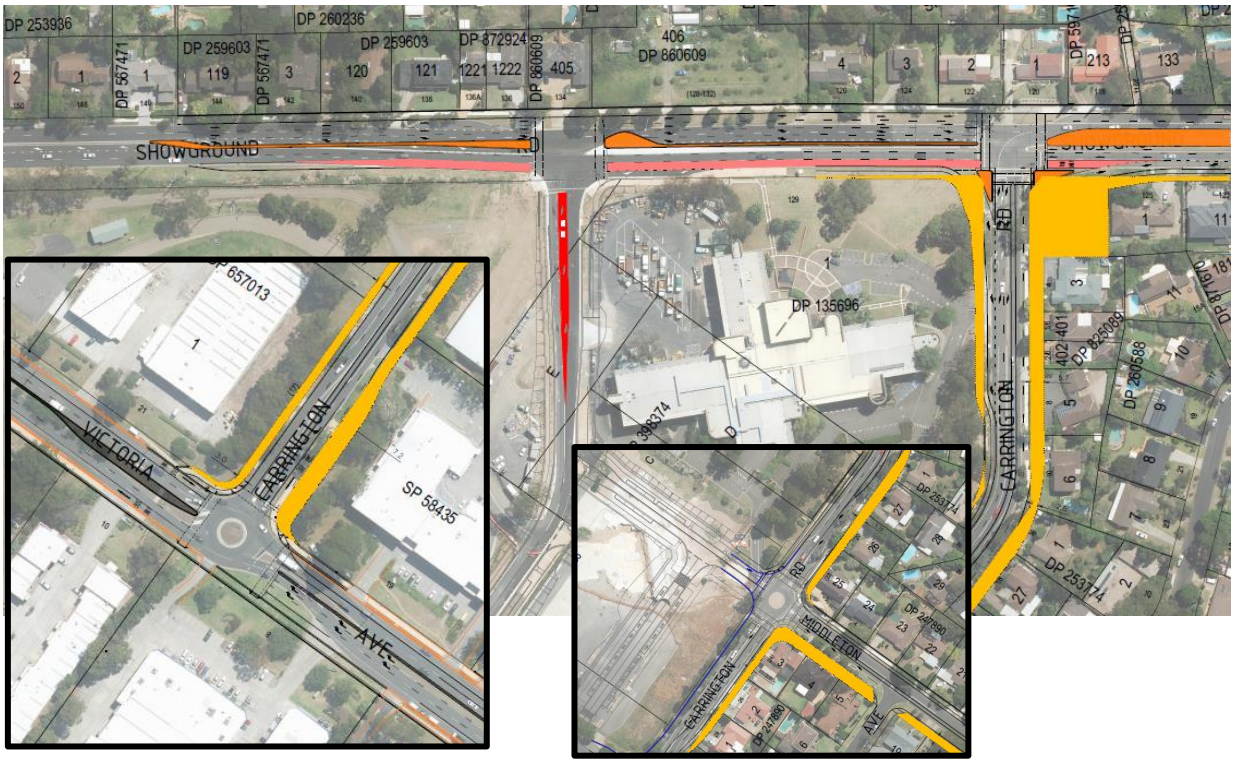
Note: Total peak (1-hour) traffic volumes are shown in table with forecast heavy vehicles shown in brackets.

5.2.4 Showground Road and Carrington Road upgrade scheme

In consultation with Roads and Maritime, it is understood that the Showground Road and Carrington Road upgrade scheme is proposed as part of the Bus Priority Infrastructure Program (BPIP), which is designed around improving reliability and efficiency of bus services. Roads and Maritime provided details of the current scheme, which is summarised in **Figure 5–3**.

Not all of the Showground Road and Carrington Road scheme would be delivered at once, so sensitivity tests were undertaken to understand the performance of the network if the upgrades were introduced incrementally in response to increasing traffic demands. The proposed works associated with Showground Road widening and Carrington Road widening to Middleton Avenue, are planned to be delivered first, whereas the signalisation of Carrington Road / Victoria Avenue could be delivered at a later stage.

Figure 5–3 Showground Road and Carrington Road upgrade scheme



Source: Roads and Maritime Services, 2019

The key trigger point that was used for identifying that further upgrade was required was the use of degree of saturation. It was assumed that if degree of saturation exceeded 1.0, then the state of being over capacity necessitated a further infrastructure investment.

The staging of upgrades is shown in **Table 5.3**.

Table 5.3 Summary of incremental upgrades tested to identify staging

Scenario		Worst intersection delay (LoS)	Worst Degree of Saturation	Upgrades assumed/required
1	2031 without development, no upgrades	310.6s (F) (Carrington Rd / Victoria Ave)	1.92 (Carrington Rd/ Showground Rd)	Existing network – no upgrades
2	2031 without development, partial upgrades only	310.6s (F) (Carrington Rd / Victoria Ave)	1.32 (Carrington Rd / Victoria Ave)	– Showground Road widening – Carrington Road widening to Middleton Ave
3	2031 without development, full upgrades	38.9 (C) (Carrington Rd / Victoria Ave)	0.91 (Carrington Rd / Victoria Ave)	Above, plus: – Signalisation of Carrington Road / Victoria Ave within road footprint.
4	2031 with development, no upgrades	434.1s (F) (Carrington Rd / Victoria Ave)	2.01 (Carrington Rd/ Showground Rd)	Existing network – no upgrades
5	2031 with development, full upgrades	50.7 (D) (Carrington Rd / Victoria Ave)	0.94 (Carrington Rd / Victoria Ave)	Same as Scenario #3

Source: SCT Consulting, 2019

The results show that the full Carrington Road and Showground Road upgrades provide sufficient capacity for the cumulative impacts of the precinct up to 2031, and that the SSDA does not trigger any additional infrastructure by itself.

According to the Showground Station Precinct Contributions Plan No. 19, the signalisation of Carrington Road and Victoria Avenue and the upgrade of Carrington Road and Middleton Avenue have already been included to meet the future demand, whilst ensuring an acceptable level of access, safety and convenience for all street and road users within the Showground Precinct. Hence, the upgrade of this intersection, as confirmed by the traffic modelling to cater for background traffic growth and development traffic, should be paid off by all relevant Section 7.11 contributions.

On the other hand, as also stated in the Contributions Plan No. 19, the upgrade of Showground Road / Carrington Road will be provided by parties other than Council (including Transport for NSW and future individual developers within the Precincts) as development occurs.

5.2.5 Future year network performance

The performance of the traffic network under the various scenarios in 2031 is shown in **Table 5.4**. The scenarios tested for 2031 AM and PM peak include:

– Existing road network with background growth;

– Existing road network with background growth and development traffic;

– Partial road network upgrade of Showground Road and Carrington Road with background growth;

– Partial road network upgrade of Showground Road and Carrington Road + signalisation of Carrington Road / Victoria Avenue with background growth; and

– Partial road network upgrade of Showground Road and Carrington Road + signalisation of Carrington Road / Victoria Avenue with background growth and development traffic.

Table 5.4 Network performance in 2031 under modelled scenarios

Intersection performance in 2031	Background growth No upgrades			With development No upgrades			Background growth partial upgrades only			Background growth full upgrades			With development full upgrades		
	Delay	LoS	DoS	Delay	LoS	DoS	Delay	LoS	DoS	Delay	LoS	DoS	Delay	LoS	DoS
2031 AM Peak															
Carrington Rd/ Showground Rd	120.1	F	1.92	135.1	F	2.01	22.5	B	0.63	22.5	B	0.63	25.1	B	0.72
Showground Rd / De Clambe Dr	4.8	A	0.68	5.7	A	0.68	6.9	A	0.69	6.9	A	0.69	7.7	A	0.69
Carrington Rd / Middleton Ave / Andalusian Wy	33.1	C	0.86	114.3	F	1.12	27.4	B	0.80	27.4	B	0.80	29.7	C	0.82
Carrington Rd / Victoria Ave	100.6	F	1.08	264.7	F	1.27	100.6	F	1.08	32.5	C	0.84	38.2	C	0.93
Carrington Rd / Doran Dr	6.1	A	0.66	10.0	A	0.81	6.7	A	0.71	6.7	A	0.71	9.0	A	0.77
Carrington Rd / De Clambe Dr	4.7	A	0.29	4.7	A	0.33	4.7	A	0.29	4.7	A	0.29	4.7	A	0.33
2031 PM Peak															
Carrington Rd/ Showground Rd	132.4	F	1.25	200.2	F	1.47	27.8	B	0.89	28.9	C	0.86	39.7	C	0.93
Showground Rd / De Clambe Dr	8.8	A	0.73	10.5	A	0.74	8.5	A	0.69	8.5	A	0.70	10.2	A	0.71
Carrington Rd / Middleton Ave / Andalusian Wy	30.0	C	0.89	125.1	F	1.30	24.7	B	0.69	24.7	B	0.69	23.2	B	0.81
Carrington Rd / Victoria Ave	310.6	F	1.32	434.1	F	1.46	310.6	F	1.32	38.9	C	0.91	50.7	D	0.94
Carrington Rd / Doran Dr	7.6	A	0.57	16.6	B	0.73	6.5	A	0.56	6.5	A	0.56	16.6	B	0.73
Carrington Rd / De Clambe Dr	4.7	A	0.51	4.7	A	0.61	4.7	A	0.51	4.7	A	0.51	4.7	A	0.61

Source: SCT Consulting, 2019
Delay = worst movement for priority and roundabout controlled intersections and DoS = degree of saturation of worst movement..

The traffic modelling indicates that the traffic network requires the full Showground Road and Carrington Road upgrade scheme including the signalisation of Carrington Road / Victoria Avenue in order to achieve acceptable performance to cater for background traffic growth and development traffic.

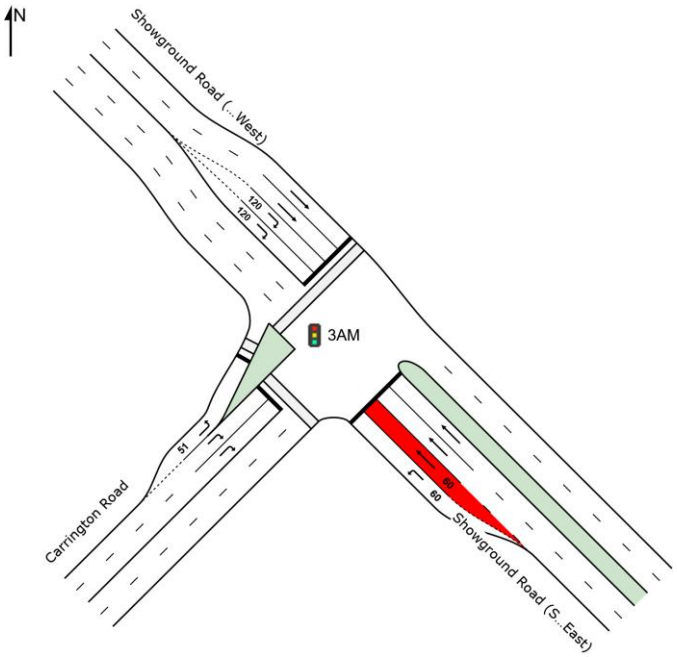
However, the modelling confirmed that no additional infrastructure upgrades are required to cater for the proposed development, once the full Showground Road and Carrington Road upgrade scheme including the signalisation of Carrington Road / Victoria Avenue is delivered.

5.2.5.1 Sensitivity for increased crossing movements at Showground Road

Roads and Maritime Service requested a sensitivity test for additional pedestrian crossing movements of Showground Road given the expected continual growth for pedestrian access to Hills Showground Station over time.

The primary access for pedestrians would likely be Carrington Road, due to its proximity to the Metro station. The primary crossing facility for pedestrians wishing to cross Showground Road is located on the north-western side of the intersection, as shown in **Figure 5–4**.

Figure 5–4 Showground Road planned upgrade layout



Source: SCT Consulting, 2019

This pedestrian crossing does not have any conflicting vehicle turning movements. The pedestrian crossing runs at the same time as the right turn out of Carrington Road (Phase C), which requires a significant amount of green time due to the scale of the movement. As there are no vehicle conflicts with any turning movements, there were no changes to the model under the situation that the pedestrian crossing is called more frequently. The model assumes that the crossing is called every cycle.

A similar case occurs with the pedestrian crossing of the left turn slip on Carrington Road. The left turn slip pedestrian crossing is given a green light during the phase where both sides of Showground Road are given a green light (Phase A). As this phase is called every cycle, this pedestrian crossing is called every cycle. With no conflicting movements there were no changes required to be made in the models to align with greater pedestrian crossing demands.

In short, the infrastructure is well placed as an at grade signalised crossing in that conflicting movements are limited with pedestrians, promoting safety and running every cycle. No testing of any changes to the infrastructure is required in SIDRA Network.

5.3 Parking

The number of car parking spaces provided as part of the proposal is complemented by the excellent level of access to frequent public transport (rail / Metro and buses) within short walking distance to the site and good access to alternative cycle parking and facilities provided within the development.

As a result of the opening of Hills Showground Station, on-street parking surrounding the station has been converted to short-term parking such that they will not be available for long-term users or commuters. Hence the reduced parking rates of the Illustrated Concept Proposal, combined with the limited availability of long-term on-street parking, will further encourage the uptake of public transport use and assist in reducing the traffic generating impacts of the proposal.

813 secure bicycle parking spaces with end-of-trip facilities are required in this development to provide an alternative to driving for shorter distance trips and to encourage residents and employees to adopt sustainable transport modes.

5.4 Service vehicle access

According to SEARS, “Proposed vehicle access arrangements, including for service and loading activities and measures to mitigate impacts to bus services and passengers interchanging between bus and rail”. The current servicing accesses for Precinct West and Precinct Doran Drive are located on De Clambe Drive in the northern boundary of the site, which are kept away from the major activity of bus and metro users on Doran Drive and Mandala Parade.

5.5 Preliminary construction approach

Due to the preliminary nature of the development concept, the construction task has not been fully defined. Further engineering design work is required before this could be completed. A construction traffic management plan will be prepared in the development application stage in accordance with the Traffic control at work sites manual (Roads and Maritime Service, 2010).

Construction haulage routes would likely have to be limited to access via the north of the precinct via De Clambe Drive, directly from Showground Road. Road access points on Carrington Road should be via Andalusian Way to minimise impacts to pedestrians and bus operations on Doran Drive. While the primary station interchange function is on Mandala Parade, there could be a conflict between heavy vehicles and passengers accessing the station.

This construction route will still interact with bus movements exiting the station via De Clambe Drive. This is unavoidable as there are no alternative construction routes.

Cumulative construction impacts would therefore be limited to overlapping demands for Showground Road, with construction vehicles using Showground Road and Carrington Road to access development sites south of Carrington Road. Use of De Clambe Drive directly onto Showground Road minimises overlap and reduces impacts.

6.0 Summary and conclusions

6.1 Summary

This report has been prepared by SCT Consulting, to support a SSDA for the Hills Showground Station Precinct site located in The Hills Shire. The Illustrative Concept Proposal is a transit-oriented mixed-use development that comprise approximately 175,796 sqm of GFA. This may include up to 13,600 sqm of non-residential space and up to 1,900 apartments. Underground car park area comprising circa 2,273 car parking spaces are also proposed.

It should be highlighted that the Concept Proposals seek approval for a range of non-residential Gross Floor Areas (between 6,700 m^2 and 13,600 m^2 of GFA), hence there is a range of residential dwelling yield between 1,802 and 1,879 dwellings including a minimum of five percent for affordable housing. The higher and lower non-residential schemes both yield a total GFA 175,796 m^2. In order to understand the implications of both scenarios and to undertake a worst-case assessment, the parking assessment has considered the more onerous condition with the upper limit of both non-residential and residential Gross Floor Areas.

On the other hand, the trip generation and traffic modelling exercise have considered the more onerous condition with the upper limit of both non-residential and the lower limit residential Gross Floor Areas, which would generate the highest vehicular trips. Hence the impacts highlighted in this report would be overstated if the lower limit of the non-residential is delivered with the upper limit of residential component.

In summary:

– The proposal is supported by TDM strategies with a number of green travel initiatives / principles developed specifically for a transit-oriented development at this location that provide significant opportunities for alternative travel options and reduce the need of car travel. A Travel Plan will be developed by the future developers to deliver best practice travel programs and initiatives to manage travel demand for a transit-oriented development;

– The Illustrative Concept Proposal will have excellent access to the public transport system, with the Hills Showground Station located directly adjacent to the site. The increased network coverage, journey-time reliability and improved customer offering of Sydney Metro services together with nearby frequent bus services, will encourage public transport patronage and increase all trips to be made by non-car modes;

– The Illustrative Concept Proposal promotes pedestrian and cyclist movements that could provide good connection to the surrounding cycling and walking network, and to public transport;

– A total of six vehicular access to the site are proposed to service three individual precincts; They are located on De Clambe Drive, Andalusian Way, which minimise the impact on major pedestrian activity around the Metro station and interchange (at Doran Drive and Mandala Parade).

– The SSDA would facilitate development which responds to the opportunity to create a transit-oriented centre by reducing the amount of employee parking, reflecting the higher level of public transport services. The best approach to facilitate / influence reduced car use and to minimise additional congestion to the surrounding road network is to restrain parking provision (while offering attractive public transport alternative in this case Sydney Metro and its connecting bus network). Hence the need to predict and provide parking provision based on historical data / trends does not align with the principle of the Hills Showground Station site. The recommended range of car parking spaces is determined based on 1 space per 145m^2 - 100m^2 GFA of office space, 1 space per 130m^2 - 60m^2 GFA of retail space as well as a set of lower rate for residential parking, i.e. 0.6 – 1.0 space for one bed, 0.9 – 1.0 spaces for two bed and 1.4 – 1.5 spaces for three bed, as part of the proposal to discourage private vehicle use and minimise traffic impacts;

– The Illustrative Concept Proposal would generate between 710 and 927 peak hour vehicular trips during the AM and PM peak hours respectively. The traffic modelling indicates that the traffic network requires the full Showground Road and Carrington Road upgrade scheme including the signalisation of Carrington Road / Victoria Avenue in order to achieve acceptable performance to cater for background traffic growth and development traffic. It should be noted that no additional infrastructure upgrades are required to cater for the proposed development, once the full Showground Road and Carrington Road upgrade scheme including the signalisation of Carrington Road / Victoria Avenue is delivered;

– According to the Showground Station Precinct Contributions Plan No. 19, the signalisation of Carrington Road and Victoria Avenue and the upgrade of Carrington Road and Middleton Avenue have already been included to meet the future demand, whilst ensuring an acceptable level of access, safety and convenience for all street and road users within the Showground Precinct. Hence, the upgrade of this intersection, as confirmed by the traffic modelling to cater for background traffic growth and development traffic, should be paid off by all relevant

Section 7.11 contributions. On the other hand, as also stated in the Contributions Plan No. 19, the upgrade of Showground Road / Carrington Road will be provided by parties other than Council (including Transport for NSW and future individual developers within the Precincts) as development occurs.

6.2 Conclusions

– This The location of the site directly adjacent to Hills Showground Station will provide future residents and employees with improved access to high frequency public transport services, which will provide an alternative to private vehicle use especially for commuter trips;

– Footpath and pedestrian crossing facilities are well provided around the site to support safe and convenient walk to / from Hills Showground Station;

– Dedicated cycle routes around the site connecting to the regional routes will cater for more short trips by cycling to nearby activities and destinations;

– Parking rates are proposed for the Illustrative Concept Proposal to create a transit-oriented centre in line with metro's vision, reflecting the higher level of public transport services and to minimise additional congestion to the surrounding road network; and

– The total number of parking spaces is appropriate for this transit oriented development and in line with Roads and Maritime Service Guide to traffic generating developments and will naturally limit the traffic impacts of this proposal. The additional vehicle trips will not have any significant adverse traffic implications on the public road network.

7.0 Bibliography

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APPENDIX A

Car Parking Rates Review

Technical Memorandum

Quality Information	
Project:	Kellyville & Bella Vista Car Parking Strategic Assessment
Project Number:	SCT_00111
Document Name:	Kellyville & Bella Vista Parking Rates Review
Date:	31st May 2019
Prepared:	Florian Langstraat, Senior Consultant
Reviewed:	Andy Yung, Director
Authorised:	Andy Yung, Director

Background

The Kellyville and Bella Vista station precincts are two of eight station precincts along the recently opened Sydney Metro Northwest line. The Bella Vista and Kellyville precincts will provide for around 10,400 new jobs and 8,400 new homes over the next 20 years. Both precincts have been rezoned, although further work is still needed to finalise development control plans, including parking controls.

To take forward the planned transit-oriented growth in the Bella Vista and Kellyville precincts, Landcom are preparing State Significant Development Applications (SSDA) for the part of the rezoned areas directly adjacent to the new Sydney Metro stations and owned by the Government, known as Direct Government Lands (DGLs). The SSDAs for the DGLs will seek development consent for approximately:

– **Kellyville:** 1,800 dwellings and 10,000m^2 of retail Gross Floor Area (GFA); and

– **Bella Vista:** 3,800 dwellings, 14,000m^2 of retail GFA and 151,000m^2 of commercial GFA.

Sydney Metro's function includes integrated station development, which will realise the benefits of the Sydney Metro investment and transform local places to a new international standard of place. One of the opportunities in the station precincts therefore is to plan and deliver places that are transit-oriented in every aspect – including parking.

This memo provides recommendations for appropriate car parking rates and other strategies to reduce car dependence and encourage sustainable travel behaviour for the Kellyville and Bella Vista DGL sites, given the transit-oriented nature of the development directly adjacent to the new Sydney Metro.

Principles for parking provision in transit-oriented developments adjacent to Sydney Metro

The Kellyville and Bella Vista precincts will be exemplar transit-oriented developments with direct access to the metro network and a mix of land uses that serve local residents predominantly within a walking catchment. The precincts will support future residents and employees who choose to live and work in a transit-oriented centre without being reliant on a car to get around.

One of the benefits of living or working near rail or metro stations, especially those that also have mixed-use town centres, is that residents / employees are not as reliant on cars to get to work, do the shopping, drop children at child care, visit a park, or go out for coffee or dinner. It also makes not owning a car a viable and attractive option. Owning fewer cars per household, or even foregoing a car altogether can save households many thousands of dollars per year. Further, in light of the cost of underground parking spaces (in the order of $50,000-60,000 per space) the potential benefits to the affordability of the development and the purchase price of apartments will be enhanced significantly with reduced car parking provision.

In support of the proposed reduced car parking rates for residential development, additional technical research was undertaken and suggested the following changes in travel behaviour with the influence of proximity to public transport:

- *"the closer a person lives to a train station the more likely they are to use the train for their travel (Cervero, 1994)"*, quoted in Ellis and Parolin 2010.
- *"Residents who prefer to walk and use public transport are more likely to choose to live in a denser neighbourhood where many services, such as retail shops, are within walking distance and public transport is frequent and easily accessible (Krizek, 2003)"*, quoted in Ellis and Parolin 2010.
- Car ownership reduces within higher density accommodation close to stations due to the travel behaviour which favours public transport and active transport (research across Brisbane by Kelly & Pekol, 2013).
- Recent data from Roads and Maritime Services indicates that + 25% of people aged 20-34 do not have a driver's license, also supporting a reduction in parking demand.
- *"… Distance to transit has a significant effect on residential car parking demand. This effect was found to be strongest when residential development was within 1,500 metres of a major public transport node, with the most significant effect evident for developments situated within 400 metres* (research across Brisbane by Kelly & Pekol, 2013).

A review of public transport mode share across key employment centres shows the combination of high density mixed use development, good access to public transport services as well as low parking supply contribute to high public transport mode shares in Sydney CBD and North Sydney. For example in Macquarie Park, increasing public transport services enabled Council to reduce parking provision rates for developments within walking distance to train stations and frequent bus services. The increase of public transport services at the Kellyville and Bella Vista Station DGL sites will enable reduction of car parking provision as there is significantly less reliance on use of private vehicles.

On this basis, it is suggested the following features of the proposed retail / commercial uses in proximity to public transport should reduce parking needs:

- The large offer of commercial floorspace could attract larger corporate tenants that do not need to provide parking spaces to the employees, given good public transport access.
- The retail uses proposed in the Kellyville and Bella Vista precincts will serve the local community (workers and residents), which is expected to have a limited travel catchment, with reduced parking demand. The retail is not designed to serve a wider car access market, which have access to alternatives at Rouse Hill Regional Centre, The Ponds and other centres.
- The other major customer market for the proposed retail at Kellyville and Bella Vista is Metro station users, who have been provided with car parking, kiss-and-ride spaces and bus access, thus obviating the need to off-street parking.
- The retail tenancies will generally be small, with lower expected traffic generation rates, and parking demand.
- The local nature of the non-residential uses, located at the station, will serve the local population, where the ability to use active transport instead of private cars will be higher.
- While the commuter car parking at Kellyville and Bella Vista Stations is proposed principally for weekday commuters who will park and ride from there, off-peak use by people visiting the non-residential uses outside of commuter peaks is also possible.

Transit-oriented developments must aim to adopt car parking rates that provide a balance between meeting car parking demand whilst encouraging sustainable and active transport by residents. New developments are encouraged to minimise car parking provision and demonstrate the inclusion of supportive mix of land uses and transport alternatives or strategies to reduce trip generation and discourage private car use.

Landcom and Sydney Metro are therefore proposing reduced car parking provision for the Kellyville and Bella Vista station precincts to facilitate:

- An exemplar transit-oriented development, which maximises the benefits of fast frequent metro connections with services every 4 minutes in the peak and 10 minutes in off-peak;
- A town centre not dominated by cars;
- Activation and life on the street; and
- A reduction in the congestion of precinct roads.

The Hills Shire Development Control Plan (DCP) 2012 specifies the following minimum car parking provisions across the Shire:

Table 1 General required minimum car parking provisions in The Hills Shire

Land use class	Land use	Required minimum provision
Residential	Flats	– 1 space per 1 bedroom unit – 2 spaces per 2 or 3 bedroom unit – 2 visitor spaces per 5 units
	Flats in centres*	– 1 space per 1 bedroom unit – 1.5 spaces per 2 bedroom unit – 2 spaces per 3 bedroom unit – 2 visitor spaces per 5 units
Commercial	Commercial	1 space per 25m^2 GFA
	Commercial in centres*	1 space per 40m^2 GFA
Retail	Shops	1 space per 18.5m^2 Gross Leasable Floor Area (GLFA)

Source: The Hills Shire Development Control Plan 2012 Part C Section 1: Parking
*Note: Centre parking rates apply to Castle Hill Major Centre, Baulkham Hills Town Centre and Rouse Hill Major Centre.

However, the above minimum parking rates apply generally across the Hills Shire LGA, and do not take account of the excellent rapid transit access provided by the Sydney Metro stations. These general parking rates are therefore not considered appropriate for the planned transit-oriented developments at Kellyville and Bella Vista.

Benchmark review of relevant parking rates in Sydney

To help determine more appropriate parking provision rates for the Kellyville and Bella Vista station precincts, a benchmark review of other relevant parking rates in Sydney was undertaken, focusing on:

– Other Sydney Metro station precincts (consented or in planning);
– Other centres in Sydney with comparable excellent rapid transit access;
– Other DCPs; and
– RMS guidelines.

Residential parking rates

Table 2 shows a summary of relevant residential parking rates.

Table 2 Benchmark review of relevant residential parking rates

Precinct / Area	Benchmark type	Benchmark status	1 Bed Flat rate (spaces / unit)	2 Bed Flat rate (spaces / unit)	3 Bed Flat rate (spaces / unit)	Flat visitor rate (spaces / unit)
Hills Shire (outside Centres)	General DCP	Adopted	1.0	2.0	2.0	0.4
Rouse Hill Regional Centre	Centre-specific	Adopted	1.0	2.0	2.0	0.2
Wolli Creek	Centre-specific	Adopted	1.0	2.0	2.0	0.1
Hills Shire (Centres)	Centre-specific	Adopted	1.0	1.5	2.0	0.4
Parramatta	General DCP	Adopted	1.0	1.2	2.0	0.2
Blacktown Growth Centre Precincts	Centre-specific	Adopted	1.0	1.0	1.5	0.2
Bella Vista Precinct (2015 Planning Report)	Sydney Metro precinct	Draft	1.0	1.0	1.5	0.2
Kellyville Precinct (2015 Planning Report)	Sydney Metro precinct	Draft	1.0	1.0	1.5	0.2

Precinct / Area	Benchmark type	Benchmark status	1 Bed Flat rate (spaces / unit)	2 Bed Flat rate (spaces / unit)	3 Bed Flat rate (spaces / unit)	Flat visitor rate (spaces / unit)
Liverpool City Centre	Centre-specific	Adopted	1.0	1.0	1.5	0.1
Willoughby (railway precincts)	Centre-specific	Adopted	1.0	1.0	1.2	0.3
Hills Showground Precinct	Sydney Metro precinct	Adopted	1.0	1.0	1.0	0.2
Hornsby (<800m of station)	Centre-specific	Adopted	0.8	1.0	1.5	0.1
Epping Town Centre	Centre-specific	Adopted	0.8	1.0	1.5	0.1
RMS Guidelines for Metro Sub-Regional CBD Centres	General guidelines	Adopted	0.6	0.9	1.4	0.2
North Ryde Station Precinct	Sydney Metro precinct	Adopted	0.6	0.9	1.4	0.1
Macquarie Park Corridor Precincts	Sydney Metro precinct	Adopted	0.6	0.9	1.4	0.1
Tallawong Station Precinct	**Sydney Metro precinct**	**Adopted**	**0.6**	**0.9**	**1.4**	**0.1**
RMS Guidelines for Metro Regional CBD Centres	General guidelines	Adopted	0.4	0.7	1.2	0.1

Source: SCT Consulting
Note: figures above contain a mix of minimum and maximum parking rates.

Although there is significant variation between these parking rates in Table 2, a trend is clearly apparent with parking rates near rail and Metro stations much lower than general DCP guidelines.

The benchmark examples that are closest to the Kellyville and Bella Vista station precincts are North Ryde, Macquarie Park and Tallawong, which are also served by Sydney Metro Northwest and these rates also aligned with the RMS Guidelines for Metro Sub-Regional CBD Centres. Out of these, Tallawong is located further from Epping, Chatswood and Sydney CBD than Kellyville and Bella Vista.

Based on the adopted parking rates for these Sydney Metro station precincts, it would be reasonable to adopt similar residential and retail parking rates for Kellyville and Bella Vista as the recently consented Tallawong station precinct SSDA (0.6, 0.9 and 1.4 parking spaces per 1, 2 and 3-bedroom flat respectively, plus 0.1 visitor spaces per flat).

Retail parking rates

Table 3 shows a summary of relevant retail parking rates.

Table 3 Benchmark review of relevant retail parking rates

Precinct / Area	Benchmark type	Benchmark status	Retail rate (m^2 GFA per space)
RMS Guidelines for Metro Sub-Regional CBD Centres	General guidelines	Adopted	16
RMS Guidelines for Metro Regional CBD Centres	General guidelines	Adopted	16
Hills Shire (outside Centres)	General DCP	Adopted	19
Rouse Hill Regional Centre	Centre-specific	Adopted	19
Hills Shire (Centres)	Centre-specific	Adopted	19
Blacktown Growth Centre Precincts	Centre-specific	Adopted	22
Macquarie Park Corridor Precincts	Sydney Metro precinct	Adopted	25
Willoughby (railway precincts)	Centre-specific	Adopted	25
Hornsby (<800m of station)	Centre-specific	Adopted	29

Precinct / Area	Benchmark type	Benchmark status	Retail rate (m^2 GFA per space)
Parramatta	General DCP	Adopted	30
Bella Vista Precinct	Sydney Metro precinct	Draft	50
Kellyville Precinct	Sydney Metro precinct	Draft	50
Epping Town Centre	Centre-specific	Adopted	60
Tallawong Station Precinct	**Sydney Metro precinct**	**Adopted**	**60**
North Ryde Station Precinct	Sydney Metro precinct	Adopted	100
Liverpool City Centre	Centre-specific	Adopted	100
North Sydney	Centre-specific	Adopted	100
Norwest Station Precinct	**Sydney Metro precinct**	**Draft**	**130**

Source: SCT Consulting
Note: figures above contain a mix of minimum and maximum parking rates.

For the retail component of the Kellyville and Bella Vista SSDAs, a conservative approach would be to adopt the consented rate for the Tallawong station precinct (1 space per 60m^2).

A more ambitious approach would be to adopt the significant lower rate proposed for the Norwest station precinct (1 space per 130m^2). For Norwest, a significantly lower retail parking rate is proposed for the following reasons:

– Given Norwest Station is surrounded mainly by businesses, the retail uses proposed would serve passing trade to/from the station by employees working within the local walk-up catchment, and convenience shopping for residents leaving the station to travel home to surrounding residential suburbs. The parking demand for the retail component during the day (between 6AM to 6PM) would be minimal;

– With the proximity to other existing retail areas that have ample parking provisions (the nearest at Norwest Marketown), local residents would be attracted to surrounding centres if car access is needed for weekly (large trolley) shopping;

– A complementary approach to parking is proposed at the Norwest Station precinct, with the proposed small-scale convenience supermarket and other retail sharing spaces to increase the efficiency of the parking provided.

If some, or all, of these conditions can be replicated at Kellyville and Bella Vista, a reduced parking rate similar to the proposed Norwest station precinct could be considered. Otherwise, a cautious approach would be to adopt a similar rate to the consented Tallawong station precinct. The range proposed for retail parking rates (between 1 space per 60m^2 and 1 space per 130m^2) could be refined as the masterplans develop and the specific uses and scale of the retail areas are more defined.

Commercial parking rates

Table 4 shows a summary of relevant commercial (office) parking rates.

Table 4 Benchmark review of relevant commercial (office) parking rates

Precinct / Area	Benchmark type	Benchmark status	Office rate (m^2 GFA per space)
Hills Shire (outside Centres)	General DCP	Adopted	25
Rouse Hill Regional Centre	Centre-specific	Adopted	25
RMS Guidelines for Metro Sub-Regional CBD Centres	General guidelines	Adopted	40
RMS Guidelines for Metro Regional CBD Centres	General guidelines	Adopted	40
Hills Shire (Centres)	Centre-specific	Adopted	40
Blacktown Growth Centre Precincts	Centre-specific	Adopted	40
Hornsby (<800m of station)	Centre-specific	Adopted	48

Precinct / Area	Benchmark type	Benchmark status	Office rate (m^2 GFA per space)
Parramatta	General DCP	Adopted	50
Epping Town Centre	Centre-specific	Adopted	70
Tallawong Station Precinct	Sydney Metro precinct	Adopted	70
Bella Vista Precinct	Sydney Metro precinct	Draft	80
Kellyville Precinct	Sydney Metro precinct	Draft	80
Norwest Station Precinct (Council suggested)	**Sydney Metro precinct**	**Draft**	**80**
North Ryde Station Precinct	Sydney Metro precinct	Adopted	90
Macquarie Park Corridor Precincts	**Sydney Metro precinct**	**Adopted**	**100**
Liverpool City Centre	Centre-specific	Adopted	100
Westmead	Centre-specific	Adopted	100
Willoughby (railway precincts)	Centre-specific	Adopted	110
Green Square	Centre-specific	Adopted	125
Norwest Station Precinct (Landcom proposed)	**Sydney Metro precinct**	**Recommendation**	**145**
Rhodes East	Centre-specific	Draft	150
North Sydney	Centre-specific	Adopted	400

Source: SCT Consulting
Note: figures above contain a mix of minimum and maximum parking rates.

For the commercial parking rate at Bella Vista, an ambitious approach would be to adopt a similar rate to that proposed in the Traffic and Transport Study for the Norwest station precinct[1] (1 space per 145m^2). This rate was considered appropriate as the site is located directly adjacent to a Metro station with access to bus services. This reduced parking provision would make the site similar to parking rates in North Sydney and recently delivered developments in Parramatta with similar reduced parking provision. The recommended rate is also very similar to the one proposed for Rhodes East Precinct Plan.

It should be noted however that the final commercial parking rate for the Norwest station precinct is still subject to further refinement, in close consultation with The Hills Shire Council. In its recent Local Planning Panel Report (15 May 2019), The Hills Shire Council recommended an alternative commercial parking rate of 1 space per 80m^2, based on analysis of 2011 Census Journey to Work data. However, it was specifically noted in the meeting minutes that a lower rate of car parking could be applied if justified by the traffic and transport modelling. Ultimately, whether a low rate similar to the recommended rate for Norwest could be recommended at Bella Vista and Kellyville would depend on the scale and type of commercial space delivered, and the areas' wider connectivity and forecast traffic conditions.

A more cautious approach at this stage would be to adopt a rate of 1 space per 100m^2. This is slightly more ambitious than originally proposed in the 2015 Kellyville and Bella Vista Precinct Planning Reports, and similar to rates for Macquarie Park, North Ryde, and other rail-connected centres across Sydney.

Applying the recommended parking rates to the proposed developments

Table 5 applies the recommended parking rates shown above to the estimated yields for the Kellyville and Bella Vista DGL sites. The table distinguishes between a low and a high rate for retail and commercial parking, as reviewed above. The same residential parking rate is applied in both scenarios.

In summary, based on recommendations from the benchmark review, the total number of parking spaces across the Kellyville and Bella Vista SSDAs would be in the region of 6,700 to 7,400 spaces.

[1] Source: SCT Consulting (2019), Norwest Station Planning Proposal: Traffic and Transport Study, 10 May 2019.

Table 5 Indicative parking requirements for the Kellyville and Bella Vista developments

		Estimated yield (residential units / m² GFA)	Parking spaces (lower rates)	Parking spaces (higher rates)
Kellyville	Residential	1,804	1,759	1,759
	Retail	9,775	75	163
	Total	**-**	**1,834**	**1,922**
Bella Vista	Residential	3,823	3,727	3,727
	Retail	13,900	107	232
	Commercial	151,000	1,041	1,510
	Total	**-**	**4.875**	**5,468**
TOTAL		**-**	**6,709**	**7,390**

Source: SCT Consulting, based on estimated yield data provided by Landcom
Note: Excludes private landholdings

Further opportunities to reduce car dependence and encourage sustainable travel behaviours

The car parking provision rates reviewed in the previous section all assume traditional models of car ownership. However, consumer preferences are changing, and this should be considered to ensure that the Kellyville and Bella Vista precincts do not deliver an over-supply of parking for future residents.

Strategies to improve the efficiency of parking

The following opportunities could be considered as part of the Kellyville and Bella Vista precinct developments to further reduce requirements or to support lower requirements of parking provision, presented in order of their level of ambition and level of impact[2]:

– **Unbundled parking:** Unbundled parking is parking that is separated from the cost of the flat, with residents having the choice to purchase or lease parking rather than it being bundled in the cost of housing. This strategy better matches supply with demand and gives residents the choice of more affordable homes.

– **Decoupled parking:** Decoupled parking is parking that is spatially separated from the building to which the parking services. It is also generally unbundled from the sale or rental of an apartment or building. In addition to the benefits of unbundled parking, it provides potential for parking to transition to other uses if car ownership decreases over time.

– **Shared parking:** Shared parking reduces the requirement for parking spaces by efficiently using spaces across different users and land uses. For example, visitor parking for apartments could be shared with visitor parking for commercial and retail purposes to limit the total amount of visitor parking provided.

– **Car sharing:** Car share allows residents or businesses to use a shared vehicle fleet. Car share relies on the restriction of parking in areas of high public transport access and mobility choice.

Car share parking: examples elsewhere in Sydney

Car sharing has become a major mainstream option for residents in Sydney. The choice not to buy a second car (or even not to own a car at all) but rent one on an hourly basis as required can deliver major savings to consumers, as well as making much more efficient use of scarce parking space. According to the City of Sydney, a single car share vehicle can replace up to 12 private vehicles that would otherwise compete for local parking[3].

At the Central Park development in Chippendale, about 700 residents, or one in 10, are car-share members using about 50 car sharing spaces at the One Central Park and Duo building[4]. The Chippendale development delivered 0.6 car spaces per apartment, having been constructed during 2012-2013. Since then, the number of car share members

[2] Source: adapted from Kinesis (2019), Cherrybrook Precinct Parking Strategy, February 2019.
[3] Source: City of Sydney (2019), Car Sharing. Available from: https://www.cityofsydney.nsw.gov.au/live/residents/car-sharing
[4] Source: Financial Review (2019), How the rise of car sharing could slash property prices. Available from: https://www.afr.com/real-estate/residential/how-the-rise-of-car-sharing-could-slash-property-prices-20190524-p51qog

in the City of Sydney has more than doubled[3], suggesting an even lower rate could be achieved if a similar development was delivered now.

There are currently no requirements or guidance for providing car share parking spaces in The Hills Shire Parking DCP. However, other DCPs from elsewhere in Greater Sydney provide an indication:

– The City of Sydney DCP specifies a minimum rate of car share parking to be provided in residential developments, ranging from 1 per 50 car spaces provided to 1 per 90 car spaces provided, depending on the development's location. For office, business or retail premises, the minimum rate specified ranges from 1 per 30 car spaces to 1 per 50 car spaces, depending on the location.

– North Sydney Council does not provide a minimum rate of car share parking; however the DCP allows developers to substitute residential or commercial parking spaces with car share spaces at the rate of 3 or 4 to 1.

– The City of Parramatta Council DCP prescribes 1 car share parking space is to be provided for any business development with a floor space of 5,000 square metres or above and is within an 800m radial catchment of a railway station. 1 car share space can be provided in lieu of 3 car parking spaces.

Car share parking: potential application at the Kellyville and Bella Vista DGL sites

For residential car share parking, a reasonable approach based on the above examples could be to provide car share parking spaces at a ratio of **1 per 150 car parking spaces provided**, in lieu of **3 car parking spaces per car share parking space**. This would capitalise on the precincts' excellent public transport access through the new Sydney Metro, but also reflect the area's more suburban character compared to the City of Sydney, North Sydney and Parramatta.

Table 6 summarises the savings that could be made by introducing residential car share parking at both precincts.

Table 6 Potential impact of car sharing (residential)

Precinct	Residential parking (without car sharing) – see Table 5	Car sharing spaces	Car parking spaces saved
Kellyville	1,759	12	24
Bella Vista	3,727	25	50
Total	**5,485**	**37**	**74**

For commercial car share parking, a conservative estimate could be to provide car share parking spaces at a ratio of **1 per 80 car parking spaces provided**, in lieu of **3 car parking spaces per car share parking space**. Similar to car share parking at the residential element of the development, this would capitalise on the Sydney Metro, but also reflect the area's more suburban character compared to the examples above.

Table 7 summarises the savings that could be made by introducing commercial car share parking.

Table 7 Potential impact of car sharing (commercial)

Precinct	Commercial parking (without car sharing) – see Table 5	Car sharing spaces	Car parking spaces saved
Kellyville	0	0	0
Bella Vista (lower rates)	1,041	13	26
Bella Vista (higher rates)	1,510	19	38

In total, car sharing could save up to 24 parking spaces at Kellyville, and up to 88 parking spaces at Bella Vista.

Conclusions

This note has provided indicative recommendations for parking requirements at the Kellyville and Bella Vista station DGL sites. Because of the excellent public transport access provided by the new Sydney Metro, there is a major opportunity to deliver reduced parking provision, and create exemplar transit-oriented developments. This will not only encourage sustainable travel, but also make the developments more affordable.

Based on a benchmark review of similar precincts in Sydney, the following parking rates are recommended:

– **Residential:** 0.6 spaces per 1-bedroom flat, 0.9 spaces per 2-bedroom flat, 1.4 spaces per 3-bedroom flat, and 0.1 spaces for visitor parking for all flats; and

– **Retail:** 1 space per 60-130 m^2 GFA;

– **Commercial:** 1 space per 100-145 m^2 GFA.

To ensure the developments at the DGL sites are delivered as exemplar transit-oriented developments and do not deliver an unintended over-supply of parking, it is recommended that the above rates are set as maximum rates.

It is also recommended to further explore opportunities for unbundled, decoupled and shared parking arrangements, and car sharing. Using conservative assumptions, car sharing could save up to 24 residential parking spaces at Kellyville, and up to 88 spaces at Bella Vista.

References

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