

A photograph of a university campus scene. In the foreground, a young man with a black backpack and a leopard-print pouch is walking away from the camera. The ground is paved with large grey stones. In the background, there are several people walking, some trees, and a building. The sky is clear and blue.

University of Sydney Campus Improvement Program (2014 - 2020) Access Strategy

ARUP

Issue | 5 December 2013

University of Sydney

Campus Improvement Program (2014-2020)

Access Strategy

Issue | 5 December 2013

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Executive Summary

The Access Strategy develops a holistic strategy on movements to and through The University of Sydney (the University) Camperdown-Darlington campus, to meet the objectives of the Campus Improvement Program (CIP), and addresses:

- Vehicle access.
- Parking.
- Servicing.
- Pedestrian.
- Cycling.
- Travel Demand.
- Accessibility.

By considering each of the movement streams, the University of Sydney (the University) will be in the best position to:

- Create streets and movement networks for people and their various forms of transport.
- Embed the provision of convenient public transport within the structure of the University.
- Ensure the University includes a clear and interconnected set of movement networks that accentuate gateways and fit with broader transport connections.

An Access Strategy that prioritises active travel modes and demonstrates an integrated approach is the preferred and recommended document by Transport for NSW to support the transport and access objectives of the CIP. The Access Strategy provides guidance on general vehicle and service vehicle access, accessibility, parking rationalisation and management, sustainable transport objectives and initiatives, and pedestrian and bicycle opportunities both to and through the Camperdown-Darlington campus.

Travel Demand Strategy

Current mode share of public transport (53%) and active modes (26%) are higher than private vehicle usage (21%) for the University according to 2012 Travel Surveys conducted by the University of Sydney. There is potential to further increase mode share, especially for staff that have a higher percentage (approx. 35%) of private vehicle usage compared to students (approx. 15%). Current train usage is approximately 30%, with up to 60% of staff and students living near a train line.

Measures to reduce demand for private vehicle travel are the most difficult to achieve. The most effective way to reduce demand is to target a 10% change (or more) to other modes.

The movement and parking strategies aim to increase the use of active transport modes, by improving general access and discouraging private vehicle trips. Ways in which this is achieved include:

- Pricing mechanisms to reduce demand for parking and reducing vehicle trips.
- Prioritising pedestrian and cyclist movement by providing shared zones and paths.
- Addressing connectivity barriers at gateways and along key pedestrian routes.

The CIP recommends encouraging further train usage by subsidised public transport tickets, to be competitive with parking permit benefits. Bicycle usage would also be encouraged by further provision for bicycle parking and end of trip facilities within the new developments of the CIP.

The University lends itself well to this type of measure for the following reasons:

- There are several large trip generators within the University that have a direct influence on how people travel to and from the University.
- The University is in the unique situation where it can strategically align all current and future precincts.
- Often the most enthusiastic take up of alternative modes of travel come from student populations.
- There are high quality and high frequency public transport corridors within a walking distance of all parts of the University including bus services along City Road / Parramatta Road and train services at Redfern.



Picture 1: Active Transport

General Vehicle Strategy (Figure 1)

The General Vehicle Strategy considers car, motorcycle and truck access to the University. Parking areas will be relocated to peripheral locations as basements to new CIP buildings, to reduce the many surface car parks that exist across the heart of each campus, and thereby reduce unnecessary vehicle movements across University. The existing major access points will provide gateways to each of the precincts on the University.

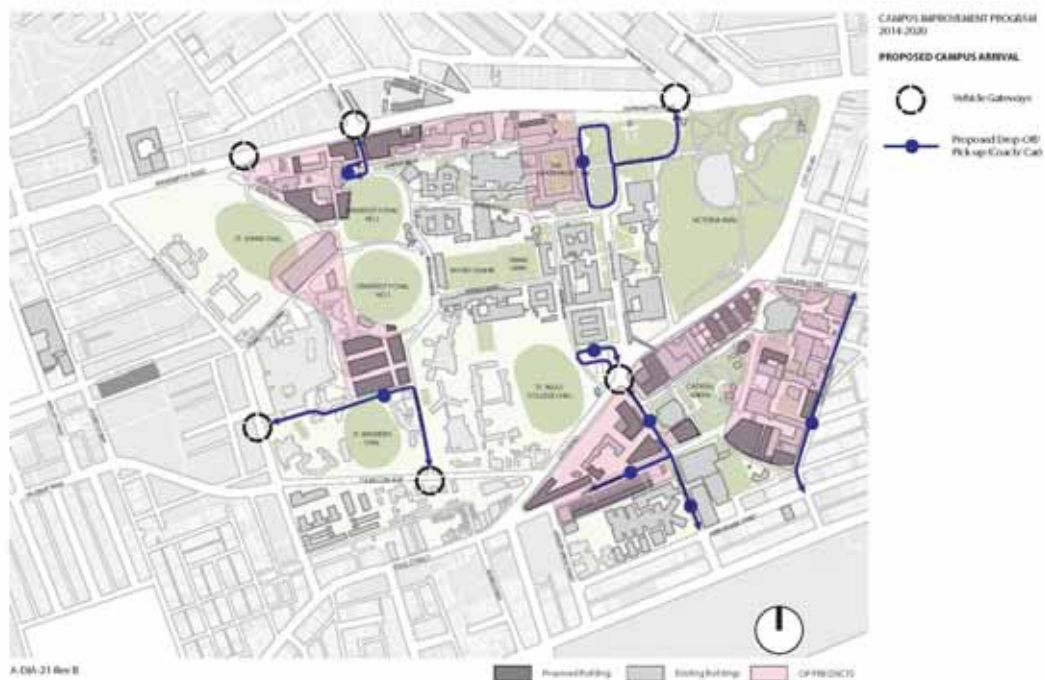


Figure 1: The University Gateways

The CIP proposes a number of gateways to provide drop-off and pick-up points to facilitate access to each of the precincts for taxis, buses and private vehicles. These locations include:

- Parramatta Road / Ross Street.
- Western Avenue and Cadigal Lane.
- Parramatta Road / University Avenue.
- Butlin Avenue.
- Codrington Street.
- Darlington Road.

A key element of the strategy is to restrict access for general traffic to peripheral parking stations once this parking becomes available. As the precinct developments are completed, additional parking will allow the gradual removal of internal parking.

The CIP proposes ‘Shared Zones’ to be implemented along the remaining internal University roads (much like Eastern Avenue). The shared zones will provide priority for pedestrians and allow access by cyclists and will be implemented according to criteria in Roads and Maritime Services guidelines in order to provide safe and effective movement for people at the heart of the University.

Emergency and authorised University vehicles will be able to use the internal shared zones to navigate the campus cores. Guidelines for use will provide clear direction for authorised vehicle users.

Restricted vehicular access and parking area relocation will have a minor impact of redirecting traffic around the entries to the University. A reassignment of traffic has revealed that the majority of entries are unaffected with the exception of Western Avenue and Butlin Avenue. The impact of the redistribution of traffic due to the revised internal road system has been assessed and all access intersections will continue to operate at acceptable levels of service.

The cumulative impact of the surrounding developments will be minimal due to the nature of the land uses with many of them being complimentary to the University. The majority of trips will be focused onto the arterial routes such as City Road and Parramatta Road. Individual developments will generate vehicle movements at different times of the day with peaks not coinciding, and hence cumulative impacts are reduced.

Parking Strategy (Figure 2)

The CIP provides an opportunity to rationalise car parking within the currently planned footprints of the future projects. Achieving the new car and motorcycle parking within CIP developments allows at-grade car parking in the central precincts of each campus to be removed to create 'parking free zones'. The benefits of rationalising parking include:

- Centralised car parking provision integrated within precincts enhances walkability and ensures priority is maintained for cyclists and pedestrians.
- Discouraging car parking access from central activity areas and encouraging traffic to assign to perimeter streets, removing through and circulating traffic.
- The parking strategy will support the prioritisation of active transport modes (including pedestrians and cyclists) within the heart of the University.

As well as managing parking supply, the University will, as part of the CIP:

- Look to increase the possibility of sharing parking assets.
- Improve way-finding to address University traffic associated with trying to find a car park.
- Facilitate mode switch through increased public transport servicing, enhancements of the local walking and cycling environment and growth of local accommodation choices.
- Achieve a strong mix of non-residential land use on-campus, including the promotion of weekday, evening and weekend activities, to spread peak demand for parking.

A parking audit in 2010 showed a total of 2,357 car parking spaces and approximately 100 motorcycle parking spaces on-campus (prior to Transformational project construction activities). At the completion of the three Transformational developments, there will be an additional 30 car parking spaces and 12 motorcycle parking spaces.

The car parking strategy has sought to minimise additional car parking facilities in line with the objectives of increasing the use of public transport. Therefore a total future parking provision of 2,800 car parking spaces could be achieved under full realisation of the CIP up to year 2020. This represents a 19% increase above the

year 2010 car parking provision. This aligns with the expected 21% increase in University population, however is considerably lower than the proposed 31% increase in building GFA. The Transformational projects (Charles Perkins Centre, Australian Institute of Nanoscience, Abercrombie Precinct Redevelopment) as the first stage of development have a building GFA of 117,100m² and will increase the total site building GFA from 555,600m² to 672,100m². The Transformational projects are approved and not the subject of this CIP application. The CIP precincts are the second stage of development and add building GFA of 211,900m² taking the total University building GFA to 884,600m². The increase in GFA from 2010 to 2020 proposed by the Transformational and CIP developments together represents a 67% increase. Based on this building GFA increase, the overall rate of parking provision is significantly reduced.

This level of parking growth is appropriate given the prioritisation of active modes and sustainable transport initiatives that will be implemented as part of the CIP to facilitate the growth in non-car mode required to meet student and staff travel demands.

The Access Strategy has explored travel demand measures including pricing mechanisms to ensure that the use of private vehicles for access to the University is equitable and targets a more sustainable travel outcome for the CIP. Some of the travel demand measures being considered include:

- Increase the parking permit cost in line with other Sydney universities.
- Differentiating user groups to ensure equitable access.
- Increasing motorcycle parking provision within CIP developments.
- Provisions for different vehicle types and occupancy levels to achieve car-pooling.
- Encouraging public transport through ticketing incentives in discussion with Transport for NSW.

Standard parking pricing should increase to align with other universities in Sydney such as the University of NSW or Macquarie University, where parking permit charges are approximately \$800 per annum. The CIP recommends a program of gradually increasing parking pricing to a similar level, utilising mechanisms of varying pricing scales that provide equity for the various user groups based on:

- Salary dependence.
- Public transport accessibility.
- Car-pooling.
- Parental/Carer duties.
- Short term discounted parking rates 1 – 2 hours for public usage for University facilities.
- Salary sacrifice for public transport tickets and bicycle purchase. (already provided by the University to full-time staff)



Figure 2: Parking Strategy

Servicing Strategy - Service & Waste Distribution Centres (Figure 3)

A Servicing Strategy has been devised to manage access for loading and waste services throughout the University. Four peripheral Transfer Stations will be constructed to manage all of the loading and unloading, recycling and waste. This centralisation should lead to efficiencies in both ordering and delivery across the wider University. Transfer Station access will be via general vehicle access routes. The transfer stations will be located at:

- Darlington Road
- Shepherd Street
- Orphan School Creek Lane
- Cadigal Lane (from Western Avenue)



Picture 2 –Electric Vehicle

The distribution to internal loading areas will primarily be via the existing University road network. Suitable low emission-campus style vehicles will be considered for the distribution task. These vehicles will move around in the nominated shared zones as authorised vehicles and will be able to move goods and waste between the internal loading areas and the Transfer Stations.



Figure 3: Servicing Strategy

A typical delivery and distribution centre can include the following facilities:

- Loading dock for four large rigid vehicles.
- Space provision for transfer vehicles.
- Courier parking spaces.
- Centralised courier and postal store and distribution offices.
- Space for a fork lift.
- Furniture, Finishes and Equipment stores.
- Stationery and administration stores.
- Flammable goods store.
- Delivery of dangerous goods.
- Minus 80 degree freezer storage.
- Delivery of medical units.
- Garbage storage - bins for general waste and recyclables and science waste including dangerous and contaminated goods.

Similarly, these centres can provide centralised Waste Transfer Stations that serve as waste deposit and pick up centres across the University. Waste facilities will accommodate for:

- General waste storage, comprising dry and wet (refrigerated) storage areas.
- Recycling storage.

- Redistribution facility – furniture co-op where furniture no longer required can be sold to staff and students.
- Chemical/hazardous storage.

These centres will be accessible by the University's waste contractor services and will assist in rationalising and reducing waste service vehicles across the University.

From the Service Distribution Centres, the University will take responsibility of service deliveries throughout the University. This can be achieved through:

- University service electric vehicles specially designed for accommodating loads and deliveries.
- Pedestrian delivery couriers (e.g. engagement of student services).

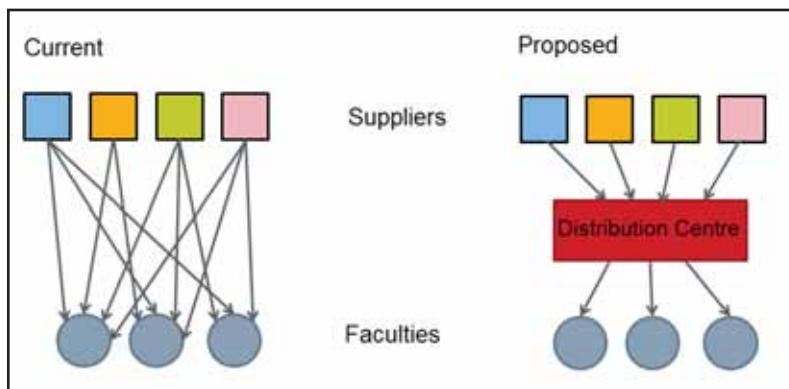


Figure 4: Rationalisation of Distribution Centres

Certain types of external service delivery vehicles will need to be given access to and through the University, including:

- Delivery of sensitive materials/items that require specially configured or climate control vehicles.
- Contractor vehicles carrying out construction works.
- Emergency vehicles (police, ambulance, fire engines).

Contractor facilities will be designed and located adjacent to the distribution centre. The facilities will include a contractor's central store and general amenities to provide ongoing space and facilities for contractors working on other buildings and precincts on multiple projects. Contractor facilities will be designed to assume occupation by 30 staff members at any one time and will include:

- Showers, WC and lockers.
- Meeting rooms.
- Offices.
- General storage.

The rationalisation of service delivery centres and contractor compounds/facilities brings a significant number of advantages:

- The University controlling service and contractor vehicle movements throughout the University, through advanced notification of vehicle arrivals and times;
- Preventing unnecessary large vehicle access on-campus;
- Reducing traffic movements across the University;
- Improving pedestrian and cyclist safety across the University;
- Improving security across the University; and
- Avoiding the duplication of service deliveries and contractor vehicles to multiple faculty/school/administrative destinations

Pedestrian Strategy (Figure 5)

A key characteristic of high quality universities is a comfortable and safe walking environment both within and surrounding the University. It is not only the staff and students who will make a lively University but also the interaction with surrounding community. Permeability must therefore be considered.

Walking is of high importance to universal access especially as most staff and students already walk to the University. Accessibility also needs to take into account the needs of people with disabilities. Significant numbers of people walk to and from Redfern Station daily (approximately 10,000-11,000 each way) and cross City Road (approximately 8,000 people on the footbridge and 8,000-10,000 people at Butlin Avenue). With these large numbers of pedestrians, the Pedestrian Strategy considers further enhancement of pedestrian facilities including internal connectivity, access to public transport nodes and access to surrounding areas.

The CIP will provide an opportunity to increase pedestrian priority within the University. Shared zones are proposed on many of the internal roadways where pedestrians and cyclists will have equal priority with authorised vehicles, excluding general vehicles. In other areas pedestrian footpaths and shared cycling facilities will complete the connected movement network.

Opportunities to improve pedestrian linkages to the surrounding pedestrian network exist around the University. Key areas of investigation include:

- Parramatta Road (bus stops) and Arundel Road (overpass) from Science Road.
- Barff Road to Victoria Park.
- Cleveland Street to Maze Crescent.
- City Road Overpass.

Other areas that will require further consultation outside of the University include:

- Lawson Street (owned by the City of Sydney) to Redfern Station (owned by Railcorp).
- Grose Street (to Queen Mary Building) – which is owned by NSW Health.



Picture 3: Shared Zone



Figure 5: Pedestrian Strategy

Cycling Strategy (Figure 6)

The Cycling Strategy considers improvements that will result in a mode shift to cycling. The University is linked with the City of Sydney's comprehensive bicycle network and access will be greatly improved with the completion of the Broadway Cycle Link, providing further connectivity to surrounding areas.

To continue this high level of connectivity, the CIP proposes shared paths and zones across the University which will provide an environment where all mode access is equally shared, as opposed to faster segregated cycleways. Cyclist behaviour on-campus will be regulated through the design of shared zones that necessitates lower speed travel and heightened awareness. This arrangement is currently implemented along Eastern Avenue, as well as parts of Darling Harbour and creates a safe, pleasant environment for all modes.

Bicycle parking provision in the form of racks currently caters for approximately 1,300 bicycles spread throughout the University. These bicycle racks are currently heavily utilised during semester and account for a 5% mode share for students and 8% mode share for staff. As precincts are developed, additional secure bicycle parking will be provided in key locations and bicycle racks will be installed at-grade adjacent to the shared path and access roadways. To encourage cyclists not to lock their bikes to street furniture, plants or buildings, it is important that bicycle parking facilities be located as close to the entrances of buildings and retail/hospitality facilities as possible.

It should be recognised that bicycle trips associated with university campuses include both short and long term stays – which require a mix of different types of parking facilities. A steady increase in bicycle parking provisions for both staff and students will be achieved. End of trip facilities in the form of showers and lockers will be incorporated into the new precinct developments.



Figure 6: Cycle Strategy

1 Introduction

1.1 Background

The University of Sydney (the University) is currently preparing a Campus Improvement Program (CIP) which will outline development and infrastructure for the main Camperdown-Darlington campus over the next seven years. The CIP will include initiatives and opportunities for accessibility to and through the Camperdown-Darlington campus, including access to all buildings, public domains and recreational facilities.

The University commissioned Arup to prepare an Access Strategy, collating all issues and recommendations in support of the Concept Plan application of the CIP. This Access Strategy will support the University's vision through a major upgrade of University facilities to create a healthy, sustainable and vibrant campus environment with seamless and equitable access to and through the University. This Access Strategy would consider all modes of transport and strategies to improve access throughout the CIP.

1.2 Why an Access Strategy?

An Access Strategy is the preferred document to support the CIP Concept Plan, providing a holistic document, prioritising active travel modes. The Access Strategy provides guidance on general vehicle and service vehicle access, parking rationalisation and management, sustainable transport objectives and initiatives, and pedestrian & cycle opportunities to and through the Camperdown-Darlington campus. The requirement for an Access Strategy has been confirmed by Transport for NSW and Roads and Maritime Services (RMS).

1.3 Director General Requirements (DGRs)

This Access Strategy addresses the Director General's Requirements (DGRs) for the State Significant Development (SSD) 13_6123 throughout this report, specifically Section 6: Transport and Accessibility and Section 2: Policies in the DGR Key Issues.

This strategy will provide an assessment of the traffic and transport impact of the concept proposal to be undertaken, considering all approved and planned developments located within and adjacent to the University, with particular regard to the DGRs issued by Department of Planning and Infrastructure (DP&I) listed in Table 1.

Table 1: Director General's Requirements

DGR	Report Section
Consideration of potential cumulative impacts due to other development in the vicinity	3.3.2
the existing and future traffic and transport situation, including - parking demand and parking provision for each multi-purpose building - maximum car parking rates for student housing and minimum bicycle parking rates - daily/peak hour traffic generation - mode of travel used by staff and students, including a review of the existing modal split and identification of a target modal split to the site and the measures to achieve this - public transport demand and services to the University - staged breakdown of traffic and transport infrastructure requirements	5.1 (existing parking) & 5.3 (provisions) 3.1.3 (parking rates) & 5.3.2 (student parking) 6.3.5 4.2 - 4.3 (mode split) & 8.3 (mode split measures) 6.1.4 (services) & 4.3 (demand) 6.3.4 (externally) & 6.1.7 (pedestrians) & 6.3.5 (RPA access)
existing road capacity, traffic conditions, expected impacts, including the existing safety issues on the road network located adjacent to the University	6.1.1 (capacity) & 6.3.4 (impact) & 3.4 (safety issues)
road and intersection upgrade requirements, including options to offset the impact of the future development and operations of the University on the road network	6.3.4 (access upgrade)
the adequacy of the public transport services, including unplanned or additional public transport connections, to meet the demands of the future development, growth and movement of students and provision of new infrastructure	6.1.4 (existing) & 3.2 (strategies) & 4.3-4.4 (demand) & 8.3 (travel measures) & 4.1 (student growth)
access arrangements to and within the site, including the appropriateness, location and access to parking stations	5.3 (parking access) & 6.3.4 (external access)
delivery, servicing and loading arrangements	6.3.6
details of emergency vehicle access arrangements	6.3.3
pedestrian and bicycle linkages to and within the site.	6.1.6 (cycling) & 6.1.7 (pedestrian) & 6.3.1-2 (future provisions)

Reference is made to the following relevant *Policies and Guidelines* in this document:

- *Guide to Traffic Generating Developments (RTA)*
- *EIS Guidelines – Road and Related Facilities (DP&I)*
- *NSW Planning Guidelines for Walking and Cycling*
- *Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development.*

1.4 Study Area

The study area (Figure 7) contains the main Camperdown-Darlington campus, and the connections to immediate surrounding areas such as Newtown, Broadway, Chippendale and Camperdown centres, Central and Redfern Railway Stations, and bus corridors along Parramatta Road and City Road.



Figure 7: Study Area

The Mallett Street campus and the Queen Mary Building have also been included as part of this strategy.

1.5 Scope and Format of Report

The Access Strategy supports the CIP Concept Plan application and will outline the following:

- **The University Background and Context** (section 2) describing the context surrounding the University and the CIP's objectives
- **Planning Context** (section 3) describing statutory/strategic planning and surrounding development
- **Demographics and Travel Patterns** (section 4) describing student and staff numbers and travel patterns
- **Parking Strategy** (section 5) describing existing, Transformational and long term impacts on parking for bicycles, cars and motorcycles
- **Access and Circulation** (section 6) describing existing, Transformational and long term circulation for pedestrians, cyclists and vehicles
- **Disability Discrimination Act (DDA)** (section 7) describing requirements and provisions for access of DDA compliance
- **Travel Demand Strategy** (section 8) describing existing and potential travel demand measures for the University
- **Wayfinding** (section 9) describing existing and potential signage and technology

2 The University Background and Context

2.1 The University

In the early days of establishment, the University was well connected to City Road, Parramatta Road and Central Railway Station. However as the volume of through general traffic along its frontages increased, the local access function and the ease of crossing these roads decreased. The lack of connectedness was suited to academic isolation and residential college communities that did not integrate with adjacent housing or businesses.

The lack of natural barriers of water or topography provided little direction to the layout or transport to the site. The University was served by good tram services connected to rail, but when the trams were removed and replaced by buses in the middle of the last century, public transport visibility was reduced. As an older-style of inner city campus, this was not replaced by a fully car-dominated plan of the type available to UNSW or Macquarie University or University of Western Sydney, universities formed in the mass automobile age. The Camperdown-Darlington campus is a wide spread area disrupted by major road and rail reserves.

Recent transport studies have identified legacy issues of how to grow, integrate and connect with the rest of Sydney, both for everyday and major event modes. The draft Campus 2020 Masterplan involved a wide range of stakeholders to form a plan for land uses and access.

2.2 Transformational Developments

2.2.1 Development Staging

A number of 'transformational' developments are currently underway to cater for the University's natural growth. These developments were sparked by previous Master Plans and now form the Transformational phase projects listed below:

- Charles Perkins Centre (CPC)
- Australian Institute of Nanoscience (AIN)
- The University of Sydney Business School (USBS)
- Abercrombie Student Housing
- Queen Mary Building (QMB) Student Housing

2.2.2 Charles Perkins Centre

The Charles Perkins Centre (CPC) is the University's Centre for Obesity, Diabetes & Cardiovascular Disease (CODCD) and The Sydney ARC. The CPC is due for completion by the beginning of 2014, and is located in close proximity of the Royal Prince Alfred Hospital. The building covers a GFA of 46,700 m²¹ and will support students and staff in the obesity, diabetes and cardiovascular diseases in the health precinct.

The site is located in the northwest of Camperdown, adjacent to the St Johns Oval and the University Ovals No 1 and 2. The development is situated on a site that previously had a mixture of vacant land and a group of smaller buildings and structures, which were demolished for the purposes of this development

The site's main access will be provided by an upgraded Orphan School Creek Lane access road, utilising an existing gate from Parramatta Road, with limited egress from Regimental Drive via the Ross Street gate. Pedestrian and cycling access will be available Grose Farm Lane, Blackburn Circuit and John Hopkins Drive.

2.2.3 Australian Institute of Nanoscience

The Australian Institute of Nanoscience (AIN) is a 12,000m² GFA development located within Camperdown, south of the physics building on Physics Road. The development site is bounded by the Physics Building to the north, St Pauls Wesley College to the west, St Pauls Oval to the south and Fisher Road to the east.

The site will be accessed by vehicles on Physics Road, with pedestrian/cyclist access available from St Pauls College, Fisher Road and Western Avenue.

Construction for the building commenced in November 2012, and should be complete by the beginning of 2015.

2.2.4 The University of Sydney Business School, Abercrombie

The University of Sydney Business School (USBS) will form a new precinct of 34,500m² GFA on the Darlington campus which will consist of four lecture theatres, eight case study rooms, 40 seminar rooms and a learning hub. This construction is programmed to be complete by early 2015 and will teach approximately 4,500 students and grow to 4,800 students by 2018.

The development is situated in the Darlington campus bounded by Darlington Public School, Codrington Street, Abercrombie Street and Darlington Lane. Primary vehicular access is provided from Darlington Lane which is currently two-way. However upon completion of the project the University may investigate changing the lane to one-way east bound from Golden Grove Street as this will be the operation of the lane during construction. The building will provide 82 car parking spaces and 247 bicycle parking spaces.

¹ http://sydney.edu.au/perkins/building_project/background.shtml

2.2.5 Abercrombie Student Accommodation Building

Student Accommodation will form part of the Abercrombie Precinct redevelopment consisting of the construction of a new three to five storey student accommodation building providing 200 beds with a GFA of 3,700m². Car parking will not be provided as part of this development however provision has been made for 50 bicycle parking spaces.

Student housing will be expanded behind existing terrace housing along Darlington Road. This project utilises the existing footprint of the site to increase the student accommodation in the precinct.

2.2.6 Queen Mary Building Student Accommodation

The Queen Mary Building (QMB) will be restored to house up to 800 students for the University. This site is currently located on Grose Street, off campus. No student car parking will be provided. The GFA is some 21,900m². Provision has been made for a total of 200 bicycle parking spaces.

2.3 Campus Improvement Program (the CIP)

The next stages of the University development between 2014 to 2020 are dictated by the University Campus Improvement Program (the CIP), which is a seven year plan for development and infrastructure of the University. The CIP will be essential in the University's vision of being a vibrant and sustainable university. This program will be put in place to respond to the City of Sydney and NSW Government initiatives for delivering objectives set in local and state strategies.

There are a number of objectives envisaged through the CIP including:

- Upgrade quality of University facilities;
- World research excellence;
- Vibrant and affordable student campus life; and
- Healthy and sustainable campus environment.

The main aspects of the CIP in relation to transport access include an area wide strategy for:

- rationalised car parking;
- improved access to public transport;
- precinct consolidation;
- increased on-site student accommodation; and
- improved pedestrian and cycling environment.

2.3.1 Gross Floor Areas

The existing GFA is approximately 366,000m² for Camperdown and 190,000m² for Darlington. It is expected that the Transformational developments will increase this GFA by approximately 117,100m². Future potential GFA is expected to be approximately 211,900m² for the CIP developments over the seven year period. The CIP GFA Projections are based on maximum building envelopes and are anticipated to be reduced by 15-20% at Stage 2 DA, to accommodate for site articulation setbacks, through site links and circulation etc.

It is expected that total GFA at the University will total approximately 884,600m² by 2020, (inclusive of transformational projects with GFA 117,100m²). A summary of additional potential GFA for the CIP projects is provided by precinct below:

- Engineering Precinct, Darlington: 26,300m².
- Merewether Precinct, Darlington: 63,400m².
- City Road Precinct, Darlington: 62,800m²
- Blackburn-Bosch Health Precinct, Camperdown: 56,700m².
- Life Sciences Precinct, Camperdown: 77,300m².
- Cultural Precinct, Camperdown (Macleay-Edgeworth David Exhibition): 450m².

2.4 A Unique Identity for the University of Sydney

A high quality urban environment accommodating goods, services, entertainment, recreation and accessibility aids the attraction and retention of a diversity of user groups. In a competitive economic environment, the University will look to consolidate numbers of students, researchers and businesses seeking research partnerships by establishing a unique identity and offering. Increasingly, the University will be required to interlink and create networks between physical and digital components as users seamlessly switch from one mode or platform to another.

It is widely acknowledged that contemporary universities such as the University are places of innovation and can be viewed as contributors to a nation's global competitiveness. Across the world, new mixed-use forms of settlement are being designed around universities, to support a culture of innovation. In the current age, it is the cities who harness most effectively the energy, talent and creativity of the people who live there or who might be attracted there that will be the most innovative, will secure the most investment and will attract the most talented.

The way people interact and move around the University is linked to their ability to collaborate and produce. The point of difference that the University, being this inner city land locked site, requires to be increasingly competitive in the market place, and consequently this will be achieved through the strategic alignment of CIP streams.

2.5 Core Principles

It is important to address the conventional requirements of the traffic network and work with stakeholders to start to create a movement network that will stand the test of time. Early engagement and strategic decision making will allow the University to take full advantage of the potential opportunities associated with broader transit planning.

While the growth of cities brings the advantages of proximity, diversity and competition, it also generates issues around congestion, pollution and social conflict. The most innovative cities are combining their collaborative capacity and their networks – virtual and real.

Predictions of empty universities have propagated in recent times. In the 1990s, the same was said about central business districts. With teleworkers working from home and communicating using a digital network, the CBD was to become redundant. It would seem that both of these predictions are gross exaggerations and that in fact, as the University has recognised, the shift is toward truly integrated mixed land use campuses.

In the coming years, the University will undergo a transformation to highly urbanised and sustainable campuses to meet the requirements of the growing and changing population in Sydney. The vision will be derived from the University CIP, which is currently underway. Transformation will require careful consideration of the interplay between the key land use categories on-campus

- Primarily:
 - Academic: teaching, learning and research
 - Infrastructure: movement, environmental, utility, digital and organisational
 - Student accommodation
- Ancillary:
 - Commercial/Retail
 - Sport, recreational and open space

A focus on movement infrastructure within the University will enable the CIP intent. This Access Strategy aims to provide technical transport planning advice and a systemic view of the urban environment to provide strategically aligned and achievable solutions situated within the broader vision for the University.

The establishment of an integrated movement network both to and within the University will amplify the productivity benefits associated with the CIP. High quality transit will strengthen and broaden business and research networks. Greater connectivity to the CBD will improve the University of Sydney's attractiveness to commercial enterprise and the associated research and commercialisation opportunities.

The University will need to provide movement networks for people. The CIP should establish an integrated movement network that provides access to convenient, efficient and attractive transport and streets that are safe and walkable. The transformation to highly urbanised campuses will be facilitated by connecting the University community to its neighbourhood, industry and the broader region.

2.6 Key Access Strategy Objectives

2.6.1 Rationalising Car Parking

One of the key CIP objectives is to relocate on-street parking (on internal streets within the University) to peripheral parking stations. In addition to this plan, there will be redevelopment and refurbishing of several buildings and greenfield sites across the University, which currently contain surface car parking.

The CIP proposes that a number of new buildings will contain new basement car parking stations, which will rationalise the parking from these locations. This supersedes the need to provide additional multi-storey standalone parking stations. Some ideas of how to achieve this include:

- Provide peripheral car parking provision integrated within precincts, enhancing walkability and ensuring priority is maintained for cyclists and pedestrians
- Designate kerb-side parking for the University authorised servicing or accessible use
- Discourage car parking access from central activity areas and encourage traffic to assign to perimeter parking stations
- A parking strategy that supports the prioritisation of active transport within the heart of the University

2.6.2 Encouraging Integration and Active Transport Modes

The CIP will prioritise active modes by removing general traffic and through movements across the University from the internal access roads. This will open up opportunities for pedestrian and cyclist movement throughout the University, enhancing access to key public transport facilities. This plan will also re-direct any through general traffic to the surrounding arterial roads. Some key considerations include:

- A strong urban street structure with a legible hierarchy;
- A connected pedestrian and cycle network;
- High quality end-of-trip facilities;
- Accommodate cycle routes in shared use paths (shared with pedestrians) to make efficient use of infrastructure and generate concentrated active movement areas for safety and security;
- Ensure equitable access for all walking and cycling ability levels;
- Make sure early catalyst projects anticipate future opportunities for the delivery of effective transport solutions; and
- A multi-modal public transport network that connects the University to its region.

2.6.3 Precinct Consolidation and Development

The CIP proposes to cluster faculties within set precincts to centralise activities and minimise the need for walking across the University for students and staff. The CIP proposes the formation of five new precincts and two development sites, in addition to existing University arrangements shown in Figure 8. The CIP has proposed six key development precincts known as:

1. Merewether Precinct
2. City Road Precinct
3. Engineering Precinct
4. Health Precinct (Blackburn Bosch)
5. Life Sciences Precinct
6. Cultural Precinct (Macleay and Edgeworth David)

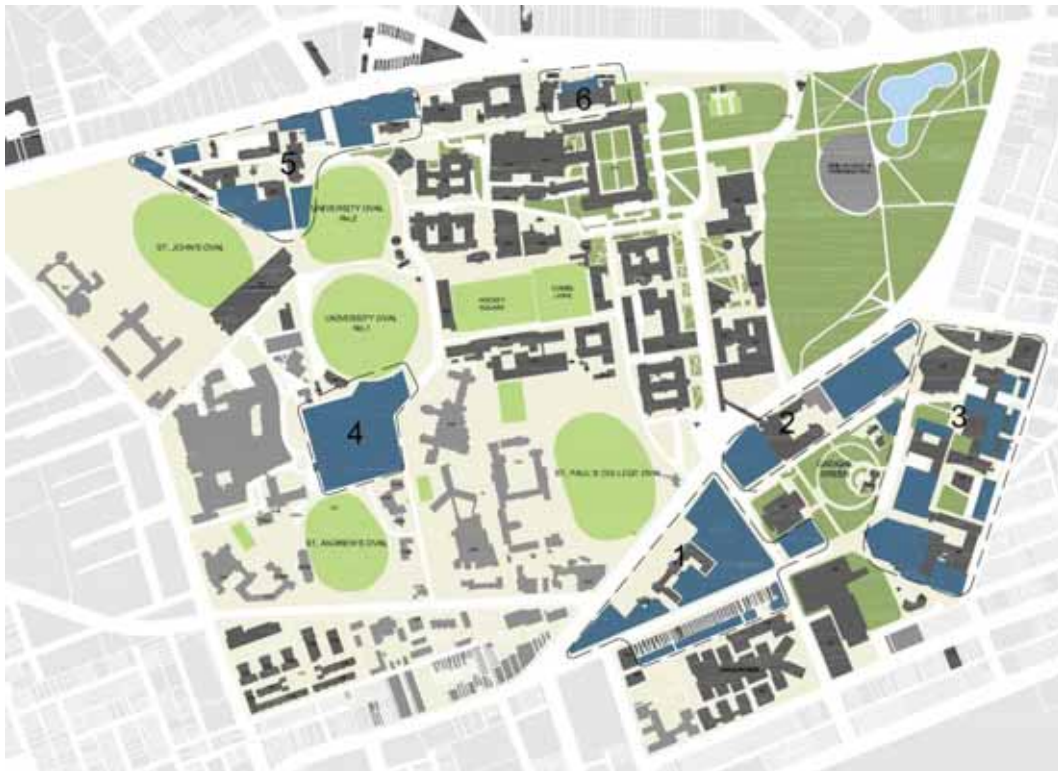


Figure 8: CIP Site Footprints 2014-2020

2.6.4 Increased On-site Student Accommodation

The CIP also proposes to increase on-site student accommodation in the order of 4000 additional beds. It is envisaged that the additional accommodation will increase activity on-campus and reduce the commute for these students. The majority of the additional accommodation will be located on the Darlington campus, with additional college accommodation provided at the western end of Camperdown. Figure 9 indicates the locations of existing and proposed accommodation locations.



Figure 9: Affordable Student Accommodation

The impacts of the additional student accommodation on-campus, supporting the University retail and professional services will result in increased campus activity, especially after nominal university hours. This will increase internal pedestrian movements, increasing security and amenity due to high levels of pedestrian traffic at night and during weekends.

A diversity of accommodation options is a core component of successful urbanisation economies. By providing study/live/work opportunities and robust movement networks, car dependence and therefore congestion is reduced. Less travel time for resident workers means higher productivity and efficiency. The diversity of user groups on-campus at different times contributes to greater economic activation, retail success and safety.

3 Planning Context

3.1 Statutory Planning Context

3.1.1 Consultation with Authorities

A key stakeholder meeting was held at Transport for NSW on Monday 30 September. Attendance included key representatives from the City of Sydney, Roads and Maritime Services and Transport for NSW. Discussion identified key issues to be addressed by the Access Strategy:

- The quantum of parking at the University should not exceed an agreed amount of car parking for the full CIP development
- Appropriate facilities are required for the VIPs and taxi/coach drop-off
- Traffic reassignment to be reviewed on the basis of the adjusted distribution of car parking across the Camperdown-Darlington campus
- Impact of the new public bus timetables to be incorporated in the Access Strategy
- Access to bus stops on Parramatta Road to be reviewed as part of the Access Strategy
- Retail Strategy role is to complement and not to compete with surrounding centres (such as proposed small general produce store in Merewether Precinct)

3.1.2 State Significant Development (NSW Government)

The State Significant Development (SSD) application process was introduced in 2011 for projects that are not only significant to local councils, but significant on a regional and state strategic level. An SSD will be assessed by the Department of Planning and Infrastructure, followed by the Minister, Planning Assessment Commission or senior departmental staff.

The assessment must involve consultation with Councils and state government agencies, with public access to all documentation. Projects in the development classes must be worth at least \$30 million. A development is state significant if it falls under the following categories:

- Large scale industrial, resource and other proposals in 24 different development classes or
- Development in precincts identified as important for the state by the NSW Government.

The University is an educational establishment with health research facilities, which align with the state strategy in the area. Therefore this Concept Plan and all Transformation buildings are SSDs. The Concept Plan proposes a pathway to develop buildings as an SSD application. The proposed developments in the CIP are similar in scale to the existing Transformational construction projects and will form a major contribution to the application.

Table 1 in the Introduction outlines the Director General's Requirements for the SSD Concept Plan application.

3.1.3 Local Government Plans

The University lies within the City of Sydney Local Government Area (LGA). As such, the City of Sydney Local Environmental Plan (LEP) 2012 and The City of Sydney Development Control Plan (DCP) 2012 currently apply to the University. Relevant planning guidelines including parking rates are given below:

The City of Sydney Development Control Plan 2012 Draft Amendment 2

The 2012 draft amendment was on public exhibition until late August 2013, seeking to achieve the following outcomes across the City of Sydney relevant to the University:

- Improve pedestrian safety
- Access for mobility impaired
- End of trip facilities such as showers and lockers for cyclists need to be provided in new developments
- Identification of major pedestrian routes
- Improving access to public transport, quality of access to public transport and provide bus shelters
- 1 motorcycle space for every 12 car parking spaces²

The key minimum bicycle parking provisions in the LEP are shown in Table 2.

Table 2: LEP Minimum Bicycle Parking Rates

Land Use	Residents/Employees	Customer/Visitors
Residential	1 per dwelling	1 per 10 dwellings
Tourist/Visitor Accommodation	1 per 4 staff	1 per 10 beds / 1 per 20 rooms
Office/Business Premises	1 per 150m2 GFA	1 per 400m2 GFA
Shop; Restaurant or café	1 per 250m2 GFA	2 plus 1 per 1 per 100m2 GFA over 100m2 GFA
Shopping centre	1 per 200m2 GFA	1 per 300m2 sales GFA
Pub	1 per 100m2 GFA	1 per 100m2 GFA
Child care centre	1 per 10 staff	2 per centre
Medical centre / health consulting rooms	1 per 10 staff	1 per 200m2 GFA
Tertiary educational institution	1 per 10 staff and 1 per 10 students	-
Library	1 per 10 staff	2 plus 1 per 200m2 GFA

For non-residential uses, facilities for bike parking are to be provided at the following rates:

1. 1 personal locker for each bike parking space
2. 1 shower and change cubicle for up to 10 bike parking spaces
3. 2 shower and change cubicles for 11 to 20 or more bike parking space are provided

² <http://sydneycycleways.net/programs/workplace-program/cycle-friendly-workplaces>

4. 2 additional showers and cubicles for each additional 20 bike parking space or part thereof
5. Showers and change facilities may be provided in the form of shower and change cubicles in a unisex area in both female and male change rooms
6. Locker, change room and shower facilities are to be located close to the bike parking area, entry and exit points and within an area of security camera surveillance where there are such building security systems.

The following minimum requirements for service vehicle parking apply to new developments (with no guidance for educational use) for:

- Residential buildings and serviced apartments
 1. 1 space for the first 50 dwellings or serviced apartments plus;
 2. 0.5 spaces for every 50 dwellings/ serviced apartments or part thereafter
- Shops, shopping centres
 1. 1 space per 350m² GFA, or part thereof, up to 2,000m²; then
 2. 1 space per 800m² GFA thereafter

For accessible car parking space provision:

1. One accessible car parking space is to be provided for every adaptable residential unit.
2. One space for every 20 car parking spaces or part thereof is to be allocated as accessible visitor parking.
3. Accessible parking is not required in a car parking areas where a parking service is provided and direct access to any of the car parking spaces is not available to the general public or occupants.
4. For residential development, accessible car parking spaces are to be allocated to adaptable units, or as visitor parking. Accessible car parking spaces allocated to adaptable dwelling units are to be a part lot to an adaptable unit in the strata plan.
5. Accessible parking is to be designed in accordance with the requirements of relevant Australian Standards.

The City of Sydney Local Environmental Plan 2012

The LEP outlines the land use and character of the Sydney LGA. The key maximum car parking provisions in the LEP are:

- 0.2 car parking spaces for each studio dwelling / 0.4 spaces for each 1 bedroom dwelling for residential flat building or multi dwelling houses
- 1 car space for every 4 bedrooms up to 100 bedrooms, then 1 car space for every 5 bedrooms over 100 bedrooms for hotel / motel accommodation and serviced apartments.
- 1 car parking space for every 200m² of GFA for information and education facilities
- 2 car parking spaces for every consulting room at medical or health consultants

Currently, the Camperdown-Darlington campus contains an approximate combined GFA of 550,000m², which allows for a maximum provision of 2,750 car spaces under the City of Sydney LEP (educational land use alone). As there is

no guidance on student accommodation parking provision, DCP guidelines state where no guidance on parking guidelines for specific land use is provided, the car parking provision is required to be justified. While the University proposes no additional parking for student accommodation, the LEP residential parking rates for studio apartments would be considered appropriate for student accommodation parking provision.

As a whole, the CIP objectives align with the City of Sydney's DCP and LEP. The University has a strong desire to improve access for all modes, especially active modes including objectives for improved pedestrian/cyclist access and a comprehensive Disability Action Plan. With a total proposed CIP GFA of 884,600m², a total of 2,800 car parking spaces are proposed, which satisfy the requirements of the Sydney LEP 2012 parking controls.

The University is also discussing the projects of on-campus bicycle stations with the City of Sydney Council

3.2 Strategic Planning Context

3.2.1 State Government Strategies

Current state policies provide a framework to support local strategies to improve the level of accessibility and sustainable transport in the City of Sydney LGA. The following documentation is summarised in reference to the University and The City of Sydney LGA.

The Draft Metropolitan Strategy for Sydney to 2031

The draft metropolitan strategy to 2031, which is to be finalised later in 2013, replaces the Metropolitan Plan for Sydney 2036. This draft strategy will better align with the Long Term Transport Master Plan and the State Infrastructure Strategy released in 2012. It will form a key link to the various plans that have been developed including the short term Regional Action Plans and NSW 2021 Plan. The metropolitan draft strategy focuses on driving sustainable growth of Sydney to 2031, with focus on the following five outcomes:

- Balanced growth;
- A liveable city;
- Productivity and prosperity;
- Healthy and resilient environment; and
- Accessibility and connectivity.

For surrounding areas to the University, the following were discussed:

- Major redevelopment of Redfern which should demonstrate sustainability
- Improved and integrated transport system
- Renewal of the Redfern area precinct with commercial activities around the station, and performing arts around the Eveleigh precinct.

The State Government has commenced the urban renewal of the Redfern area which will include a variety of housing options.

Long Term Transport Master Plan, 2012

The Long Term Transport Master Plan was released in December 2012. It is the key framework for improving and delivering better transport throughout NSW. Sydney is identified as the major international centre in the plan with the University identified as a key specialised centre of health and education. Key points relating to the University transport are as follows:

- Better planning of public transport services around “demand generators” such as universities
- Upgrade and improvements of surrounding precincts of Redfern Railway Station
- Sydney Airport to CBD road link
- Development of jobs in urban renewal areas such as Redfern

Key public transport links identified in the master plan are located adjacent to the University. The completion of the Redfern Railway Station upgrades and recognition of strategic bus corridors will provide better access for students and staff to the University.

In addition to the above points relating to universities, the master plan discusses methods in which to provide a Bus Rapid Transit or Light Rail along Parramatta Road. This investigation will also look at the urban renewal aspects along Parramatta Road due to the WestConnex motorway project. These projects should improve the public transport network for Sydney’s inner west areas by providing reliable and frequent services.

New South Wales Bike Plan

The NSW Bike Plan focuses on what will be done in the future to encourage cyclist usage. The plan looks at how LGAs may implement strategies including lowering speed limits on certain roads and installing new signage for cyclists at major locations (such as universities and public transport hubs).

Key aspects in which the University could benefit from what the authorities provide in surrounding areas include:

- Additional way finding signage, including distances to and from major hubs close to the University
- Development and testing of narrow bus shelter structure to reduce obstacles for cyclists on major bus corridors, which could apply to Parramatta Road or City Road in the future
- Investigate feasibility of introducing bicycle excepted signs along one-way roads such as the Little Eveleigh Street.
- Increased mode share of cyclists if a greater number of end of trip facilities are provided, such as showers and lockers

Eastern Sydney and Inner West Regional Action Plan

The vision of this regional action plan included:

- A well-connected efficient public transport system
- Providing more housing options
- Globally competitive
- More liveable and safer

In regards to the University, the main issues relating to transport and traffic are:

- Planning for cycling networks close to employment centres
- Upgrade of railway stations
- Upgrade roads to improve traffic flow

Once the cycling and public transport network upgrades have been completed, it is expected that these modes will become more attractive, further shifting mode shares.

Healthy Urban Development Checklist, NSW Health

The purpose of the Healthy Urban Development Checklist is to ensure that urban design accounts for health effects of a certain policy and plan, and how to provide better health outcomes. This report looks at healthy eating, physical activity, transport and physical connectivity, public open space, environment and health. These points are relevant to the University and are discussed below:

- Physical activity discusses how pedestrians are more likely to walk longer distances if the pavement is pedestrian oriented and of a high quality. On average pedestrians usually walk to a destination within 400-500m or 5 minutes walking distance.
- Pedestrian routes should be well defined and clear which will increase pedestrian security.
- If pedestrians and cyclists are required to spend long periods of time to cross roads, it was found that they are more inclined to ignore the road rules and risk serious injury. To ensure pedestrians and cyclists follows the road rules, intersection design must be analysed properly before implementation.
- Features that encourage these modes of transport are good street surfaces, wide street widths, separated pedestrian and bicycle paths and good quality streetscapes.

Environmental Impact Statement (EIS) Guidelines: Roads and Related Facilities

The EIS guideline was prepared to ensure projects address environmental impacts. Key issues in the guideline investigate strategic planning context, traffic issues, community issues and air and water quality issues. An EIS is required for a project which may significantly affect the environment. It is required as part of the Major Project application process.

When completing an EIS, all environmental issues must be identified and prioritised. Key stakeholders must be consulted before the final route and site selection. The University may need to follow these steps depending on the projects undertaken and should refer to this document when completing an EIS.

NSW Planning Guidelines for Walking and Cycling

The planning guidelines for walking and cycling were developed by the NSW Government to recognise the importance of walking and cycling in NSW cities. This report looks at how to increase mode share of walking and cycling, by improving security and public amenities.

In relation to the University, passive surveillance is encouraged in design of pedestrian and bicycle facilities, to increase safety. This generally applies to major walkways where pedestrian flows are higher.

- Narrow pedestrian overpasses and underpasses should be avoided for security and connectivity reasons.
- Appropriate lighting should be provided (which cannot be vandalised) along major pedestrian and cycling routes, especially for routes to and from major transport nodes or hubs
- Laneways should be provided to link any cul-de-sacs or road ends to minimise the distances pedestrian need to walk.

Creating Places for People: An Urban Design Protocol for Australian Cities

The urban design protocol looks at urban design from a national level to a site level. It discusses best practise of urban design from various points of view including productivity, sustainability, liveability and governance. Key points from the protocol include:

- Productivity and sustainability: the University must look at being well connected with a range of public transport options, well connected to the surrounding area and connected to jobs, shops, facilities and services.
- Liveable Communities: the University must be comfortable, vibrant, safe and walkable by increasing lighting, prioritising walking and cycling, places to meet people and accessible to all people.
- Governance: These aspects can only occur if key stakeholders are included to plan, design and maintain these facilities.

WestConnex

The WestConnex is a 33km motorway project, which will involve the widening of the M4 motorway between Parramatta and Concord to four lanes, duplication of the M5 East motorway tunnel, and the extension of the M4 to connect to Sydney Airport and M5 motorway. This project, costing \$11.5 billion, will provide a 40 minute travel time saving for drivers travelling from Parramatta to the Sydney Airport. It will also enable urban renewal along Parramatta Road to improve public transport links for Sydney's Inner West.

The motorway project will reduce traffic on Parramatta Road and City Road, and open up opportunities for development along these corridors. As a result, Parramatta Road will have less traffic lanes and improved public transport reliability along Parramatta Road. The road link is expected to be completed by 2023.

Impacts on the University may include a decrease in traffic, and better connectivity to the airport and Western Suburbs by road.

3.2.2 Local Government Strategies

Sustainable Sydney 2030 The Vision

The Vision for The City of Sydney is to be a green, global and connected city, leading the world in all three of these fields. To achieve these goals, the city is required to encourage active modes of transport and improve its public transport system. The University also has key issues to achieve this vision:

- “Activity hubs as a focus for the city’s village communities and transport” along King Street
- Metro-rail along the Parramatta Road corridor
- 70% reduction of greenhouse gases by 2030 from 1990 levels
- Reduce existing parking
- Encourage carpooling
- Establish pricing schemes for car parking to fund public transport

The Vision has objectives similar to that of the University’s, including achievement of the 5 star green rating for new buildings. The University is also looking to further reduce the reliance of vehicle drivers by shifting the mode share to public transport or active modes.

City of Sydney Cycle Strategy and Action Plan 2007 - 2017

The City of Sydney Cycle Strategy and Action Plan 2007- 2017 will provide a safer and bike friendly environment, which will promote the use of bicycles throughout the City of Sydney. Introduction of additional infrastructure and facilities will increase cycling mode share from 1% in 2007 to a predicted 10% by 2016. Key features of this strategy include:

- Construction of separate bicycle lanes
- Improvement of bicycle parking and end of trip facilities
- Connect gaps in bicycle network

Sydney City Centre Access Strategy

The Sydney City Centre Access Strategy was released for further consultation in September 2013 documenting how the City of Sydney Council is planning to reduce congestion in the Sydney centre. Strategies relevant to the University are:

- Completion of the Sydney cycle network to provide an integrated safer environment for cyclists both locally and regionally
- Improved bus routes and simpler timetables
- Increased real time information for increased public transport use
- Reduction of on-street parking throughout the CBD including 40km/h speed limits in some areas

The changes and improvements to the public transport and cycle networks will improve the mode share of both these modes. The reduced focus of car parking will also deter further general traffic entering the CBD in peak periods. These will further increase the accessibility for all travel to the University.

Broadway Cycle Link

This Broadway Cycle Link was approved by the City of Sydney in September 2013. The link forms a part of the cycling strategy for the City, connecting the Leichhardt to City South/Central, and Newtown to Bondi Junction cycleways. This cycle link will connect Notre Dame University, University of Technology, the University of Sydney, TAFE and the Broadway shops. This link will increase the connectivity of the University to other major hubs in the region.

The majority of the link will be mixed traffic cycleway, with sections devoted to shared paths. This cycle link will create streetscape improvements, encouraging pedestrian movements and traffic calming. Safety for pedestrians and cyclists will be improved through better street lighting, wider footpaths, 40km/h speed limit and shared pedestrian/ cyclists paths.

It is envisaged that this link will complement access to the University, with the proposed role being more of a bypass route alongside the University.

3.3 Surrounding Development and Centres

3.3.1 Surrounding Retail/Business Centres

The surrounding centres have been assessed for access to the Camperdown-Darlington campus. These are shown below in Figure 10.



Figure 10: Effective connectivity of Camperdown-Darlington campus to surrounding precincts

Newtown

The Newtown centre is a strip of retail along both sides of King Street, southwest of the University. The strip ranges from the south-west corner of the Darlington campus (Regiment site) to approximately 2.5km south-west along King Street.

Newtown is a key attractor for students, and is known for its vibrant nightlife. The area has a number of licenced venues including both restaurants and pubs. To access this area, students are able to walk along City Road / King Street.

These arterial roads generally have high volumes of vehicular traffic and pedestrians, allowing for adequate surveillance and access. Alternatively, students and staff are able to take one of the regular bus services on City Road or an Inner West train service from Redfern Railway Station to access this area.

Broadway

Broadway includes a large shopping centre and associated food and beverage and retail outlets, located opposite Victoria Park on the north side of Parramatta Road.

The shopping centre has over 100 specialty stores and cinemas, and is open till after 6pm on all days of the week. Students are also eligible to receive all day parking at a relatively inexpensive rate of \$12³. Broadway also has apartments and hotels which may be used by some students and staff.

To access this centre from the University, students are able to walk or take a bus service along either City Road or Parramatta Road and cross at the traffic signals on the northeast corner of Victoria Park.

Chippendale

In Chippendale, the main retail centre is located along the eastern end of Abercrombie Street. This centre has a small number of cafes and take-away restaurants which students and staff may access during their breaks. This strip is located less than 200 metres from the Darlington campus boardwalk entry, allowing excellent access for students and staff.

Camperdown

The Camperdown area along Missenden Road includes the connection between the Mallett Street campus and the Camperdown-Darlington campus. Currently there are deficiencies in this access, with RPA providing a major barrier with a lack of pedestrian access at back of house. Students also have to walk through narrow walkway on Grose Street, with limited artificial lighting at night, which may pose a security risk for students and staff in the night times. Students may enter the University via John Hopkins Drive or Cadigal Lane. This connection requires activation to encourage use of these access routes.

There are limited retail outlets along Missenden Road in the vicinity of the University. There is a relatively activated space due to the RPA, creating an increase in pedestrian and car movements. This area is also serviced by bus route 412 from Campsie to Earlwood.

³ <http://www.broadway.com.au/centre-info>

3.3.2 Surrounding Development

Sydney Employment Lands

Employment Lands is a scheme of rezoning existing employment locations for housing and mixed uses to maximise use of previous abandoned warehousing and factories, ensuring that Sydney has adequate level of housing⁴.

This project is relevant as some of the employment lands considered includes a pocket of land between Parramatta Road and Arundel Street, north of Camperdown. This increase of housing may provide benefit and connectivity to the University.

Royal Prince Alfred Master Plan

The Royal Prince Alfred Hospital is located on Missenden Road, directly next to the University, is currently being redeveloped to provide additional capacity to Mental Health Services which is due for completion in 2016. An additional 53 new beds will be added as part of the \$67 million project which sees some of the older buildings being demolished for the new Mental Health Unit⁵.

Redfern Station Upgrade

The Built Environment Plan (Stage 1) was released to encourage future economic growth throughout Redfern and Waterloo, and is planned to take place in the areas surrounding Redfern train station. There are plans to increase employment through renewal in this location as well as commercial activities. There are also plans to upgrade the train station in the Transport Master Plan which will provide disabled access to this train station and increase security. These plans are proposed to go ahead once the future of Sydney's train system is finalised.

Central to Eveleigh Corridor

The Central to Eveleigh Corridor is a 3 kilometre distance from Goulburn Street car park in the CBD to Macdonaldtown train station. This corridor is proposed by the NSW government to be redeveloped to include additional residential and commercial capacity for Sydney. This proposal will see the potential upgrade of Central and Redfern Stations, Australian Technology Park, Eveleigh Rail Yards and the airspace above the railway lines. This project is still at concept stage.

North Eveleigh

The North Eveleigh Concept Plan is located between Abercrombie Street and the major Western Sydney railway corridor. The development relates to a potential development area of 10.7 hectares for commercial, residential and park land use. The area is proposed to create approximately 3,200 new jobs and 1,250 new dwellings over the next 5-15 years. This project will consist of development up to 16 storeys high and cost approximately \$550 million. However certain parts of the site are unable to be developed until the future of rail planning is finalised. As part of this project, there is also a potential for Redfern Train Station to be upgraded⁶.

⁴ <http://www.planning.nsw.gov.au/employment-lands>

⁵ <http://www.slhd.nsw.gov.au/rpa/redevelop/faq.html>

⁶ <http://www.smda.nsw.gov.au/north-eveleigh-concept-plan>

St Pauls Graduate House

St Pauls Graduate House in The University is proposed to house 392 units for men and women. This number is provided separate to the proposed student accommodation in the CIP. Its location is most likely going to be on the northern edge of college land. This house will be for undergraduate and postgraduate students, with most of the units to be leased. However there will also be certain units for short term accommodation⁷.

St Andrews Master Plan

The St Andrew's College is located on the south-western corner of the University, Camperdown. The college currently houses 285 male and female students. This number is provided separate to the proposed student accommodation in the CIP.

The 2011 Master Plan for St Andrew's College involved the construction of 3 new residential buildings to house an additional 400 residents and upgrade of car and bike parking facilities. The master plan also looks at improving access to and from the University and aligning with the ambitions of the University⁸.

Sancta Sophia College

Sancta Sophia College is located northwest of the University on the corner of Missenden Road and Parramatta Road. The college currently houses undergraduate women, and postgraduate men and women studying at The University. Construction began in 2012 for a new postgraduate building. The Graduate House will open in January 2014 with approximately 128 ensuite rooms. This number is provided separate to the proposed student accommodation in the CIP.

Moore College

Moore Theological College is located on the corner of King Street and Carillon Avenue on the southern extent of the University, Camperdown. Since the late 1950's the college has expanded with the addition of a library, administration and dining room facilities. There is further development and expansion planned for the college from late 2014⁹.

⁷ http://development.cityofsydney.nsw.gov.au/Datasource/DANotifications/1101407_067.pdf

⁸ <http://www.standrewscollege.edu.au/docs/2011%20Content/St%20Andrews%20College%20Master%20Planning%20Stakeholder%20Workshop%20May%202011%20Draft%20Report.pdf>

⁹ <http://www.moore.edu.au/history>

3.4 Previous Relevant Studies

Campus Wide Transport and Traffic Study for Master Plan (Arup)

The Campus Wide Transport and Traffic Study for The University of Sydney was prepared by Arup in 2011, in light of Stage 1 of the Draft Campus Master Plan 2020. The report commented on the existing status of the University and a possible parking pricing mechanism. It focused on key issues in pedestrian, cycling and vehicular flows throughout the University and understanding the current and future plans of the University. This report also presents a series of actions which may be implemented to enhance the University environment.

Keys issues discussed in this report were:

- Availability of parking;
- Access and security of walking around the University;
- footpath capacities;
- conflicts with circulating and parking / unparking vehicles produce unsafe and inconvenient delays for pedestrians and vehicles;
- access and security of walking to Redfern;
- Abercrombie Street crossing delays / safety.
- Difficulty of external vehicular access routes;
- Internal access and circulation;
- service vehicles, visitors, deliveries, couriers etc. conflict with pedestrians and are delayed crossing City Road;

Some of the key findings from this report were:

- All streets and lanes should be walkable
- Most staff (52%) and students (79%) walk to the site from Redfern Station or from accommodation
- Every new development site should have greater number of biking parking than car parking spaces
- Approximately 40% of staff and 6% of students travel by car
- Travelling to the University by car is largely influenced by availability and affordability of parking.

Sustainable Transport and Mobility Plan 2014-2017 (The University of Sydney)

The draft Sustainable Transport and Mobility Plan (STAMP) May 2013 is currently being written by the University. The report reviews and provides travel demand measures for the University. The report provides a number of statistics and analyses the current barriers in active modes of transport and current features of each mode of transport. Recommendations were put forward to increase active modes and public transport, while attempting to reduce single occupancy vehicles.

Key Issues are:

- Access to end of trip facilities
- Excessive car parking facilities
- Dedicated cycling lanes along City and Parramatta Roads
- Not enough bike racks
- Cheap parking permits
- Percentage of parking permits given to staff within 10 kilometres of the University is 37%

Upgrade Options include:

- Upgrade of cycling facilities
- Subsidise bicycles
- Improved bike lockers
- All future parking to be built away from the University centre
- Subsidised parking for car pooling

This report's statistics feed into this strategy and the STAMP report will be expanded further upon release of this Access Strategy.

Darlington Precinct Pedestrian and Bicycle Access Strategy (Parking and Traffic Consultants [PTC])

Parking and Traffic Consultants (PTC) was commissioned in 2013 by the University to develop a pedestrian and bicycle strategy for the Darlington precinct as a Project Approval condition of USBS development. The report identified current key issues being experienced by pedestrians and cyclist and identified measures to improve and encourage these modes of transport throughout the University.

Upgrade proposals together with cost estimates were outlined in the report, and was submitted to the Department of Planning and Infrastructure for approval. The University is required to spend a minimum of \$2 million on these capital works improvements.

Key Issues include:

- Codrington Street and Butlin Avenue have poor alignments of roads
- Lawson Street has high pedestrian volumes and operates beyond capacity
- Lander Street, Abercrombie and Raglan Street have poor pedestrian safety

The report concludes that the University, in agreement with the City of Sydney provide the following upgrade works:

1. Contribution to the City of Sydney's Abercrombie Street upgrade works.
2. Shepherd Street upgrade between Abercrombie Street and the University boardwalk.
3. Relocated pedestrian crossing, footpath upgrade, and kerb extensions at the intersection of Darlington Road and Codrington Street (near the Aquatic Centre).

Barff Road Traffic Control Assessment (PTC)

PTC was commissioned in 2012 to undertake an options assessment on the Barff Road access. Barff Road currently provides two separate two-way accesses to the Law Building car park from Parramatta Road (via University Avenue) and City Road. Five options were presented including:

- Road closures (one access as car park access is required)
- Traffic calming (slowing vehicles to 40km/h by speed humps)
- One-way (reduce carriageway width and widen footpath)
- Shared zone (10km/h speed limit with pedestrian priority)
- Footpath widening

The report recommended a combination of the restricted one-way southbound option and traffic calming option to provide a widened eastern footpath.

Physical Activity and Travel Mode Report (The University of Sydney)

The University Physical Activity and Travel Mode Report for 2013 prepared by C Rissel, C Mulley, D Ding and T Gill surveyed and analysed the current modal share of students and staff for all the University campuses. These results were gathered from a sufficient sample of 3,737 staff and students who completed a travel mode survey.

Key findings from the study include:

- Out of all staff and students, 21% drove, 53% took public transport and 26% took active modes.
- Staff were twice as likely to drive to the University than students
- Staff were slightly more likely to take active modes than students to arrive at the University
- 89% of staff and students that drove, had no passengers
- The most common permit type over all campuses was yellow with 72% followed by 12% using purple permit which are described as follows:
 - Yellow Permits are available to senior full-time academics and general staff (HEO 10 or above), and any permanent full-time staff with more than two years continuous service. This permit allows parking on the Camperdown-Darlington campus.
 - Purple permits are available to any full-time, part-time, or casual staff member. This permit allows parking on-campus at Darlington (including the Shepherd Street car park) at any time, and at Camperdown after 3pm and on weekends.

The results gathered give an indication of travel behaviour for students and staff. The report also discusses reducing barriers for active modes and recommends a number of initiatives which have been set out in the CIP.

4 Demographics and Travel Patterns

4.1 Students and Staff

Currently the Camperdown-Darlington campus accommodates approximately 43,300 students¹⁰. (At August 2012, the University Student/Staff ratio was 17.6:1.) It is anticipated that there will be increased student numbers onto the Camperdown-Darlington campus as a result of the CIP. The forecast student population growth over the course of the CIP is shown in Table 3.

Table 3: Forecast Student Enrolments

Year	2013	2014	2015	2016	2017	2018	2019	2020
Students	43,300	44,400	45,700	47,100	50,900	51,500	52,500	53,500
Growth (no. p.a.)	-	1,100	1,300	1,400	3,800	600	1,000	1,000
Growth (% p.a.)	-	2.5%	2.9%	3.1%	8.1%	1.2%	1.9%	1.9%

This represents a 21% population increase over the 7 year period, or an average growth of 3% per annum. These increases assume the transfer of Sydney College of Arts students in 2016 and residual Health Sciences and Nursing students in 2017. However, it should be noted that a proportion of students from all of these satellite locations already visit the Camperdown-Darlington campus for courses, lectures and access to University facilities (libraries, sports, administration, and events).

Consequently, the relocation of these satellite campuses onto the Camperdown-Darlington campus allows the CIP to realise significant sustainable benefits including land use and financial efficiencies. Student postcodes were mapped on Figure 11 to inform the study.

The number of staff (full-time and part-time) based at the Camperdown-Darlington campus was approximately 6,200 in 2013¹⁰. The staff levels have remained relatively stable since 2009. Staff numbers are expected to grow slightly (by approximately 400 over a 7 year period or 1% per annum as shown below in Table 4) to cater for the natural increase of student numbers.

Table 4: Indicative Staff Increases

Year	2013	2014	2015	2016	2017	2018	2019	2020
Staff	6,200	6,200	6,270	6,340	6,400	6,470	6,540	6,610
Growth (no. p.a.)	-	0	70	70	60	70	70	70
Growth (% p.a.)	-	0%	1.1%	1.1%	0.9%	1.1%	1.1%	1.1%

The majority of staff employed at the Camperdown-Darlington campus live within the wider Sydney metropolitan area, with few living in the Central Coast, Blue Mountains and Wollongong areas. Staff postcodes were mapped on Figure 12 and Figure 13 to inform the study.

¹⁰ Student and staff numbers provided by The University of Sydney and assume ongoing efficiencies in proportion of students to staff

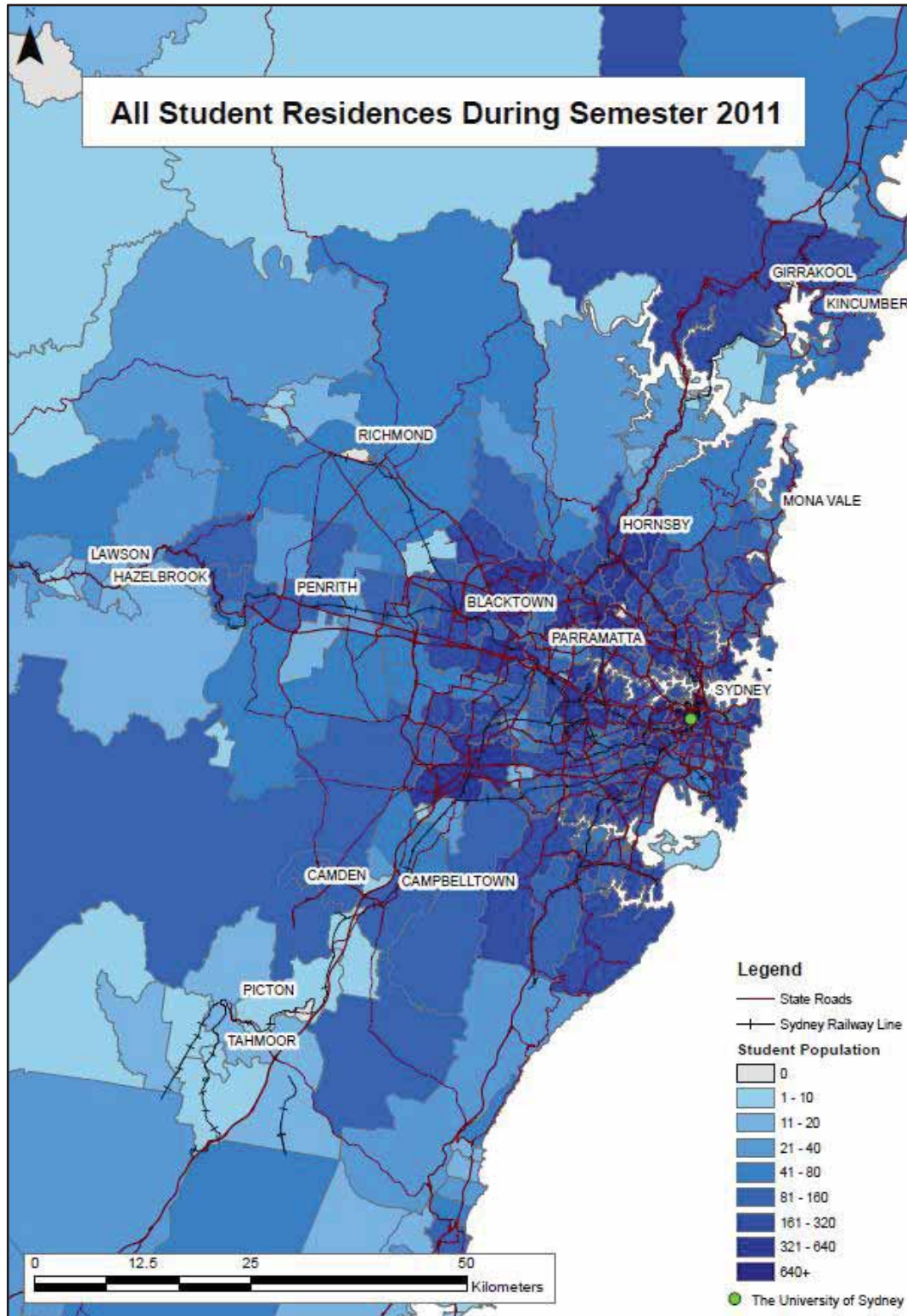


Figure 11: Student Origins for Greater Sydney

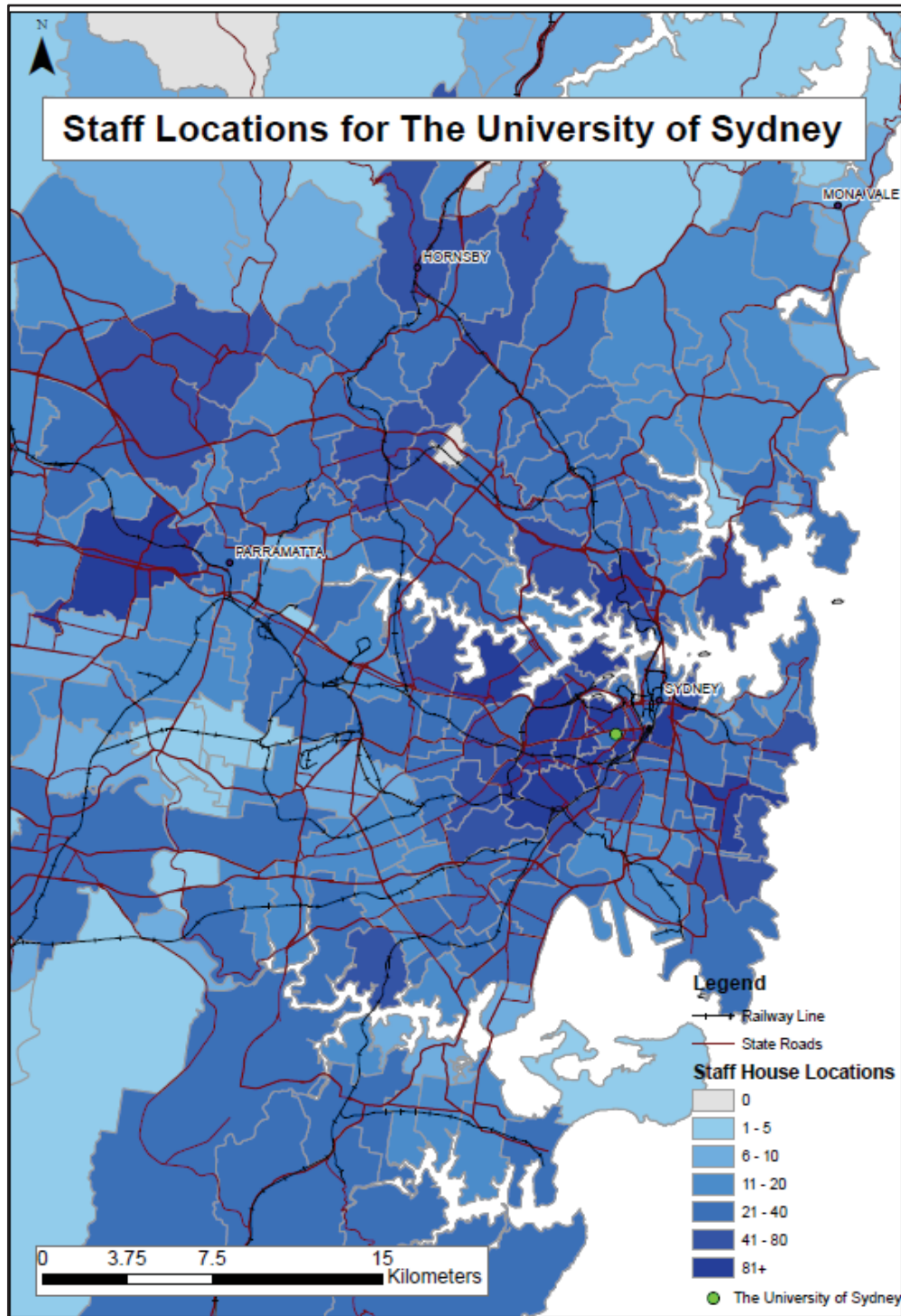


Figure 12: Staff Origin for Inner Sydney (1:200,000)

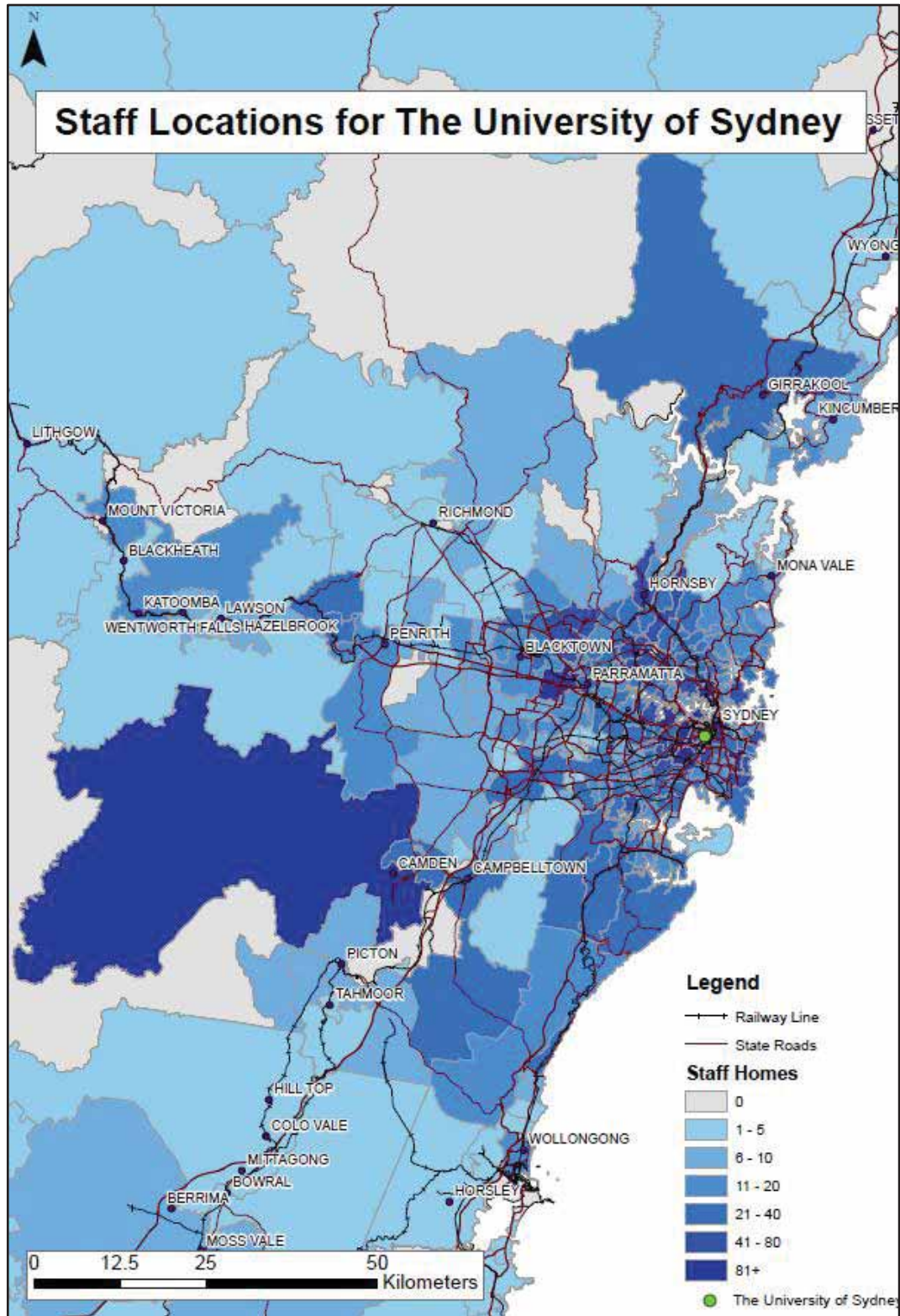


Figure 13: Staff Origin for Greater Sydney (1:1,500,000)

4.2 Trip Analysis

4.2.1 Journey to Work

Staff trips were analysed using 2011 Journey to Work (JTW) Census data from the Bureau of Transport Statistics. The JTW data for travel zone 236 (Camperdown) and 239 (Darlington) were used for the basis of this analysis.

Darlington and Camperdown as separate campuses were compared by mode share of staff and is presented in Table 5.

Table 5: 2011 JTW Mode Split

Mode	Camperdown	Darlington	Combined
Train	26%	28%	26%
Bus	15%	12%	15%
Car	37%	40%	38%
Walked	16%	16%	16%
Other	6%	4%	5%

The data shows similarities between the two campuses, with a higher train mode share (+2%) for Darlington and a higher bus mode share (+3%) for Camperdown due to the close proximity to these modes. Car share remains the highest mode for staff at approximately 38% for both campuses, with competitive public transport mode share of 41%.

The combined data has been presented over three separate figures by mode for staff arriving at the University including:

- Bus JTW Trips Figure 14
- Train JTW Trips Figure 15
- Car JTW Trips Figure 16

Key findings from this analysis indicate:

- Bus mode share accounted for approximately 15% of journeys to the University and were used for the shorter trips to the University, (i.e. within a 10 kilometre radius). Bus journeys were also used where train modes were unavailable such as the Hills area, Eastern Suburbs and Northern Beaches.
- Train mode share accounted for approximately 26% of journeys to the University. A spatial analysis showed that origins were reasonably spread over areas the where the train lines spanned in metropolitan Sydney, with greater numbers arriving from the Inner West and North Shore areas of Sydney.
- Car mode share was highest single mode share, with travel greatest by those staff living in the Eastern Suburbs and within 10km of the University.
- Spatial data for car use indicates a large number of car related trips to the University originated within 10km, which is supported by data from the draft STAMP showing a high number of permits issued within a 10 kilometre of the University.

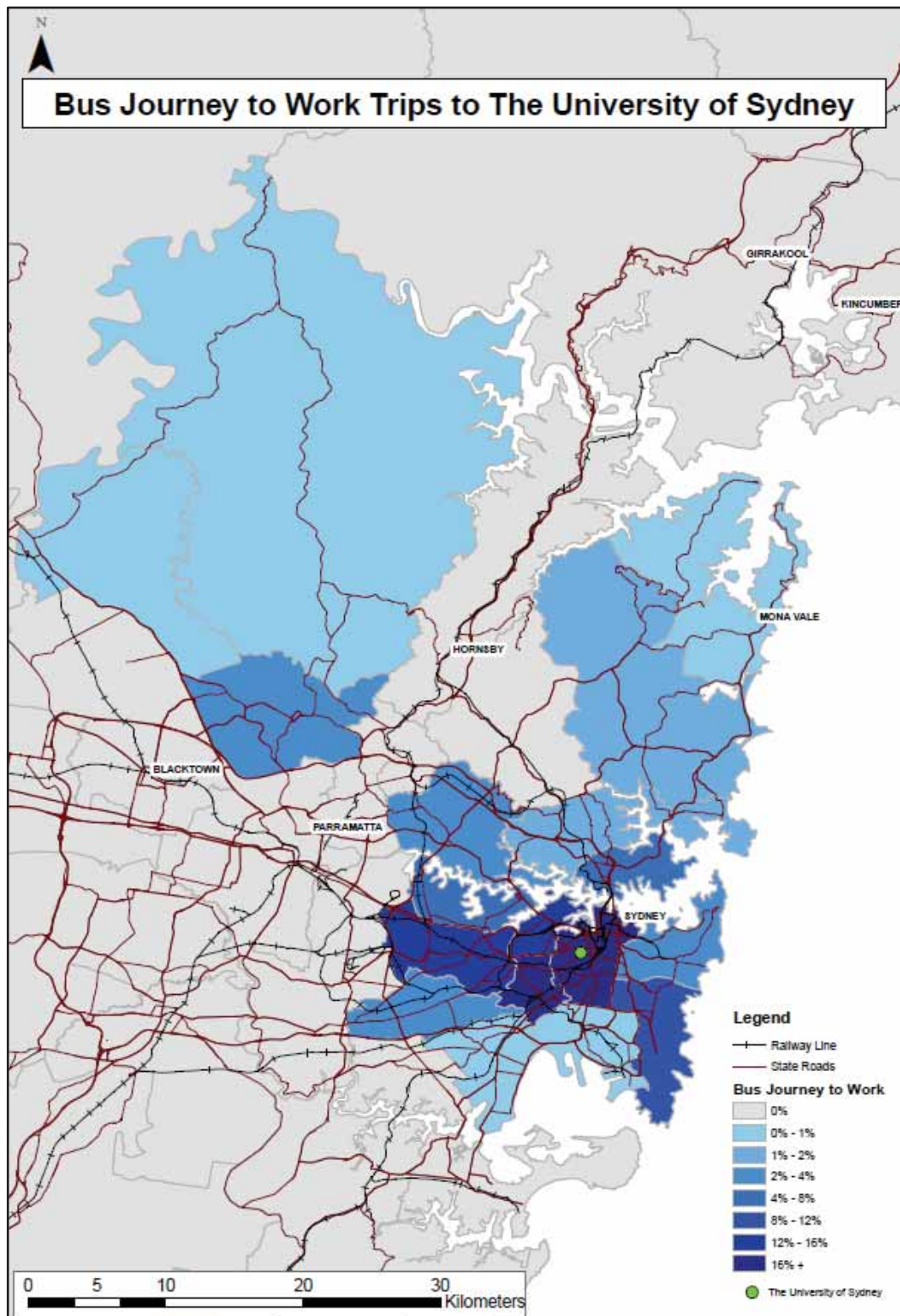


Figure 14: Bus travel to the University

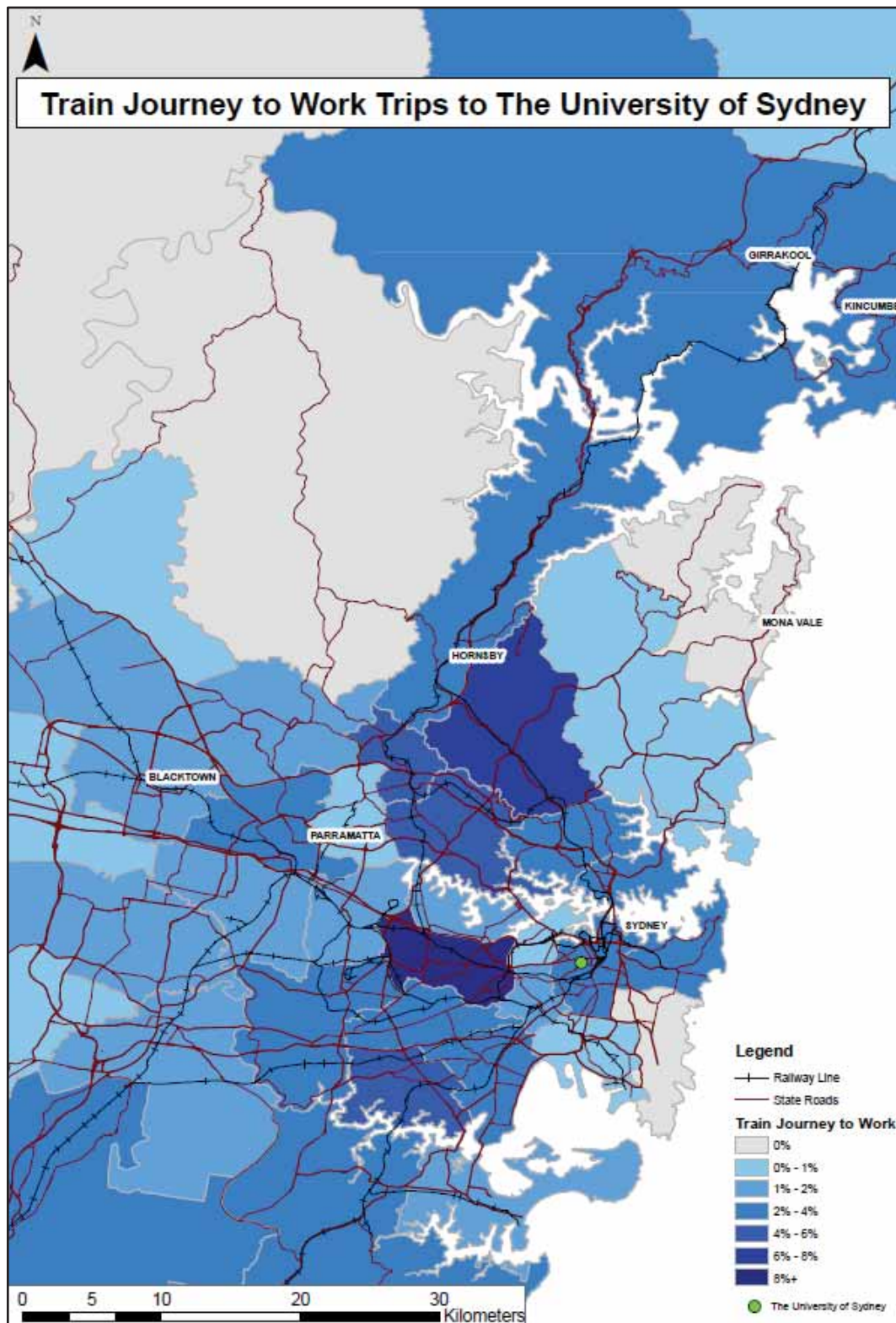


Figure 15: Train travel to the University

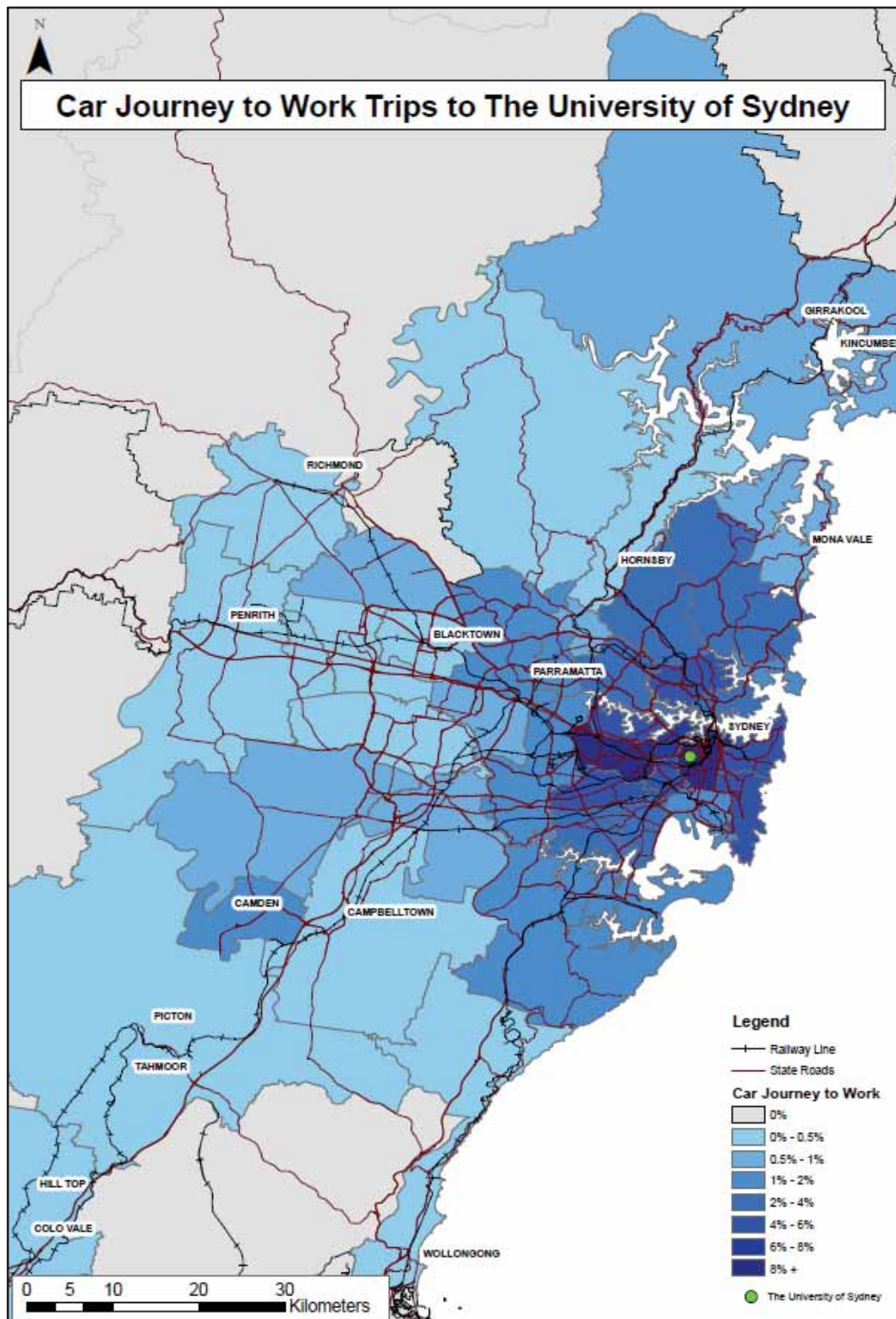


Figure 16: Car mode share to the University

4.2.2 Train Catchments

Postcode data obtained from the University shows the resident location of staff and students. This data was mapped against key transport corridors to determine possible catchments for staff and students as shown in Figure 17 and Figure 18 respectively. It was found that approximately 60% of staff and students live within 1.5km (within walking distance) of a railway station leading to potentially double the existing patronage from the Travel Mode Survey and JTW data.

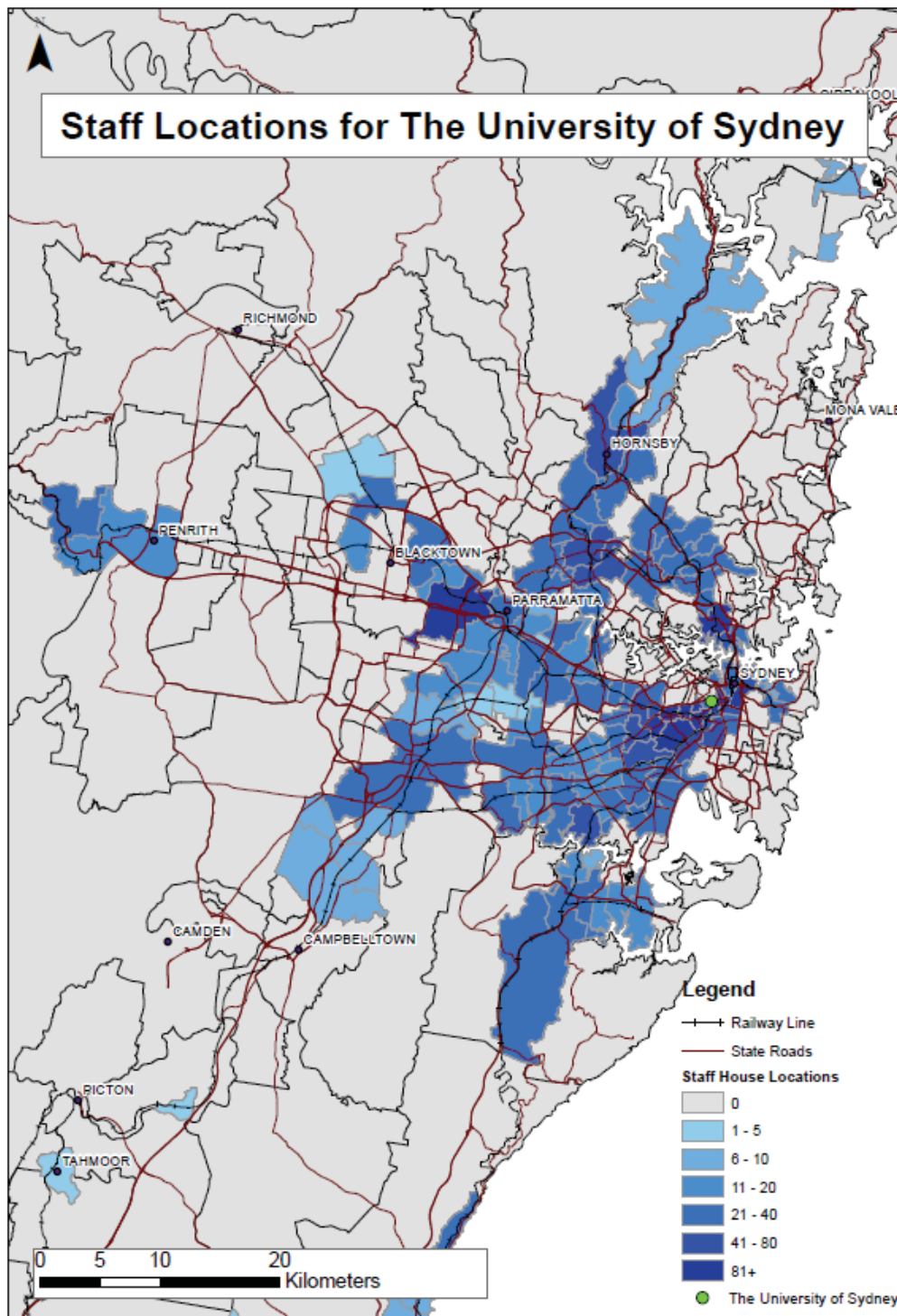


Figure 17 Staff catchment for Railway

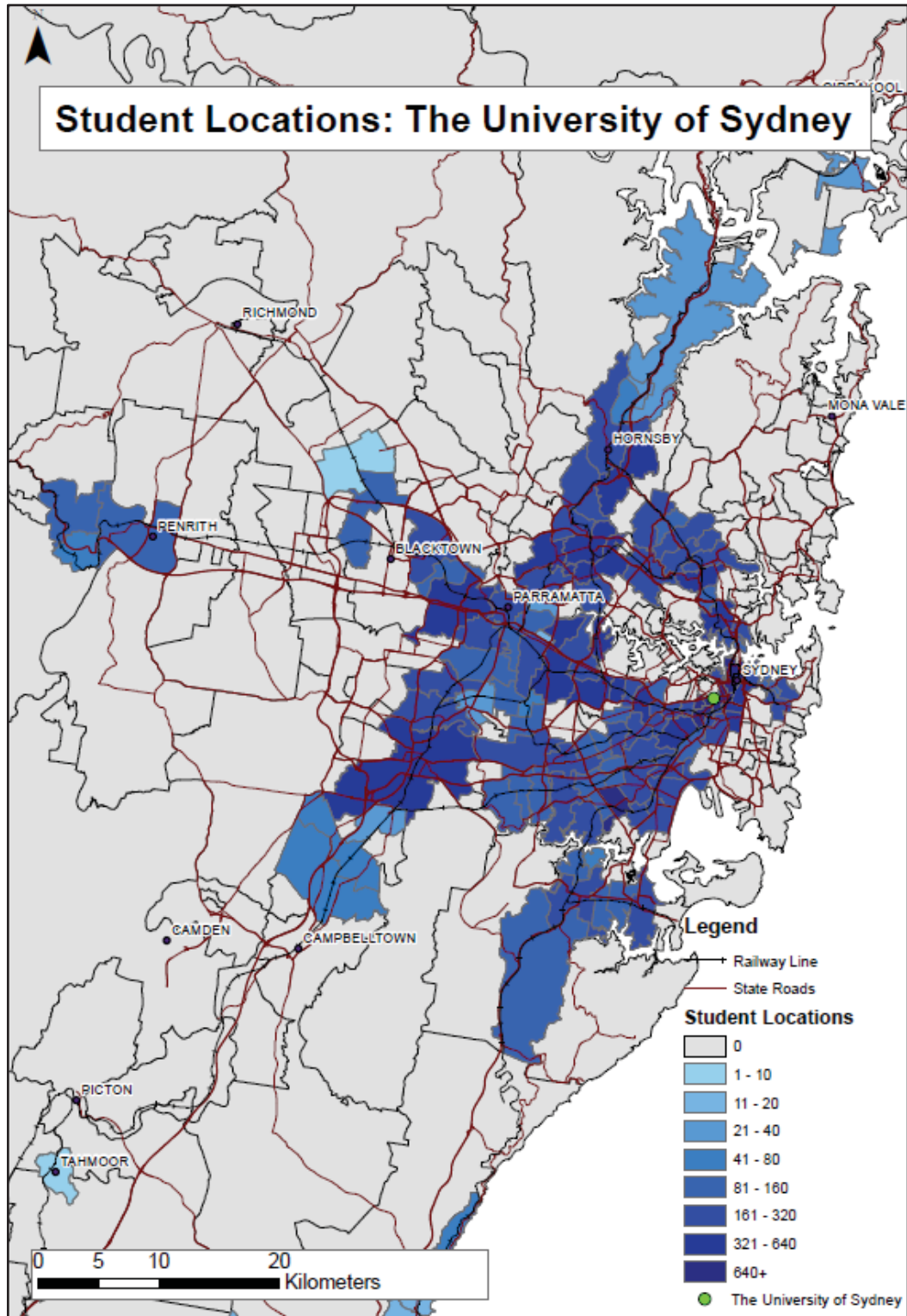


Figure 18: Student Catchment for Railways

4.2.3 Bus Catchments

The suburbs that should attract the most patronage from buses are the Inner West and Eastern Suburbs areas, which are serviced by 21 bus routes. The furthest extent of suburbs that are serviced by these bus routes are Mortlake, Abbotsford, Chiswick, Rozelle, Burwood, Strathfield, Campsie, Belmore and Rockdale. Suburbs between these suburbs mentioned above and the University are all within this catchment zone and should attract bus patronage. This is supported by the Journey to Work Data presented in the previous section, which show greatest use in buses align with the catchment below in Figure 19.

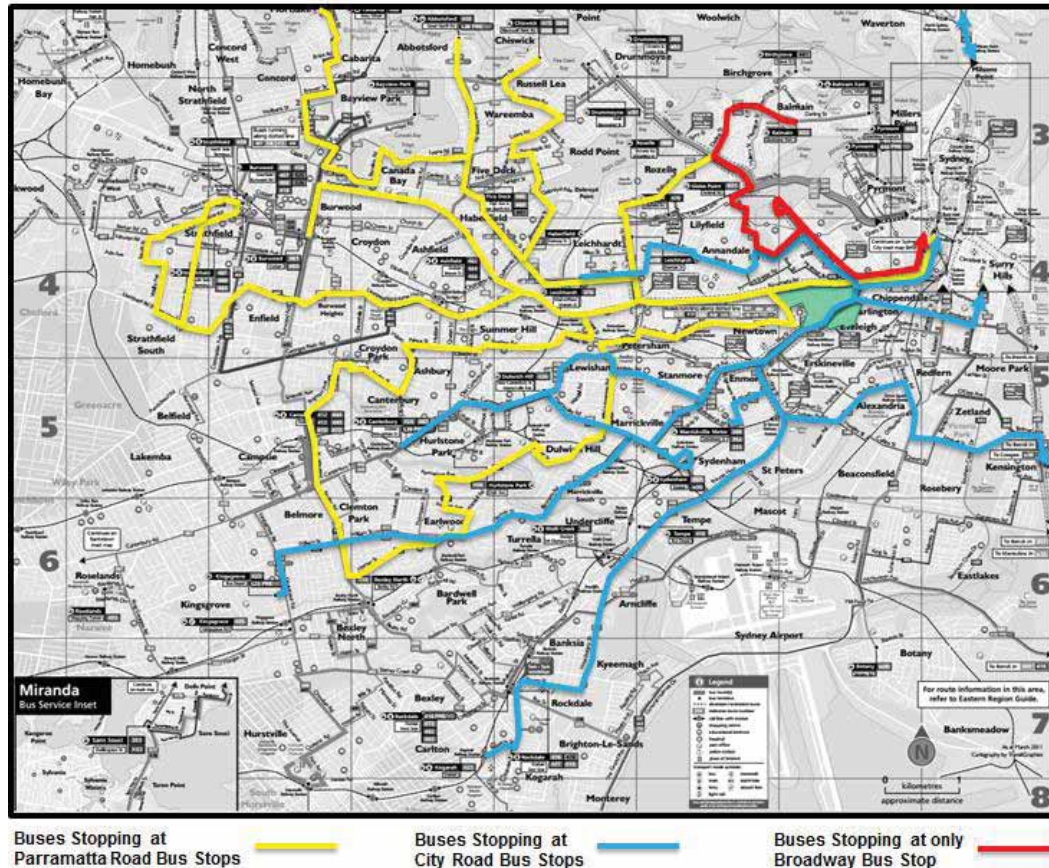


Figure 19: Bus Catchment for the University

4.3 Travel Surveys

In August 2013, a research article, “Travel Mode and Physical Activity at The University” was presented, which reported on the travel behaviour of students and staff at all campuses of the University. The information gathered related to mode choice of commuters based on age, gender, degree, location and physical activity.

The current mode share of students and staff arriving at the Camperdown-Darlington campus are shown in the Figure 20 below. This data shows a clear skew towards public transport use with over half staff and students using this mode. Active travel, which includes cycling and walking accounts for approximately 26% of staff and students.

Mode Share of Sydney University Staff and Students Camperdown/ Darlington Campus

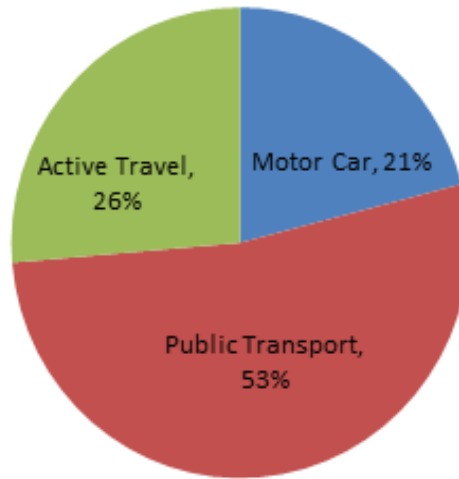


Figure 20: Modal share of staff and students to Camperdown-Darlington campus

This data however does not account for the difference in travel behaviour between staff and students. Data gained from the University Physical Activity and Travel Mode Report in 2012 showed that staff were twice as likely to drive to the University, most likely due to the ability of acquire a parking permit.

Data from the Travel Mode Report also showed a relationship between distance and permits issued (shown in Figure 21). Surprisingly, a large number of staff and students within 10km drive to the University which is within active mode catchment.

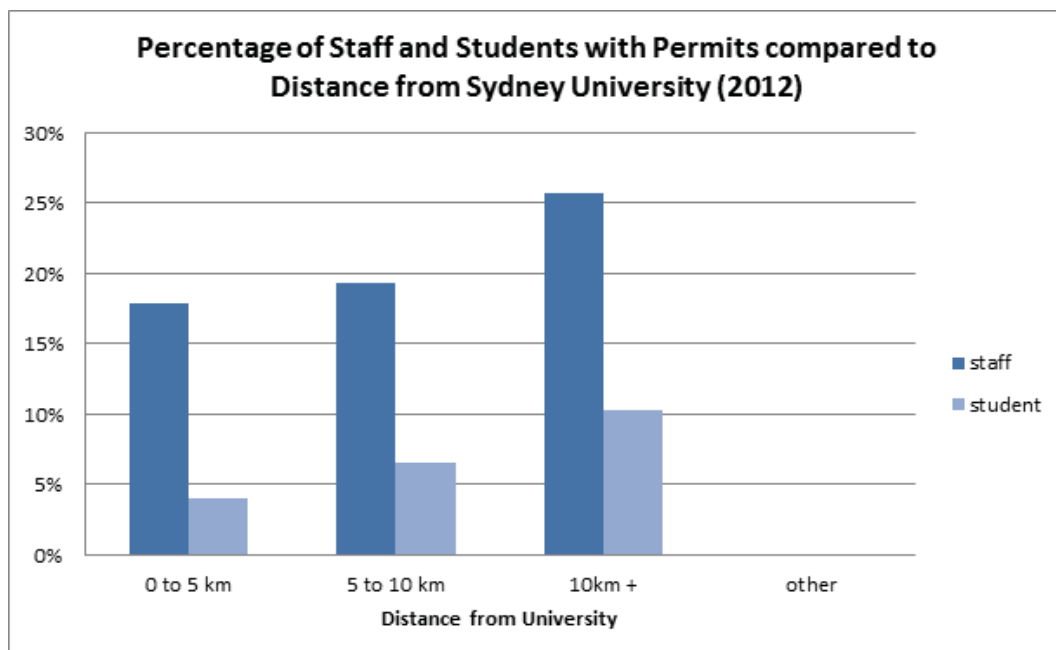


Figure 21: Percentage of staff and students with parking permits related to distance from the University

The mode share of all the University campuses is shown in Figure 22 for staff and students separately. This graph clearly shows the greater use of public transport in students with 61%, compared to 36% in staff.

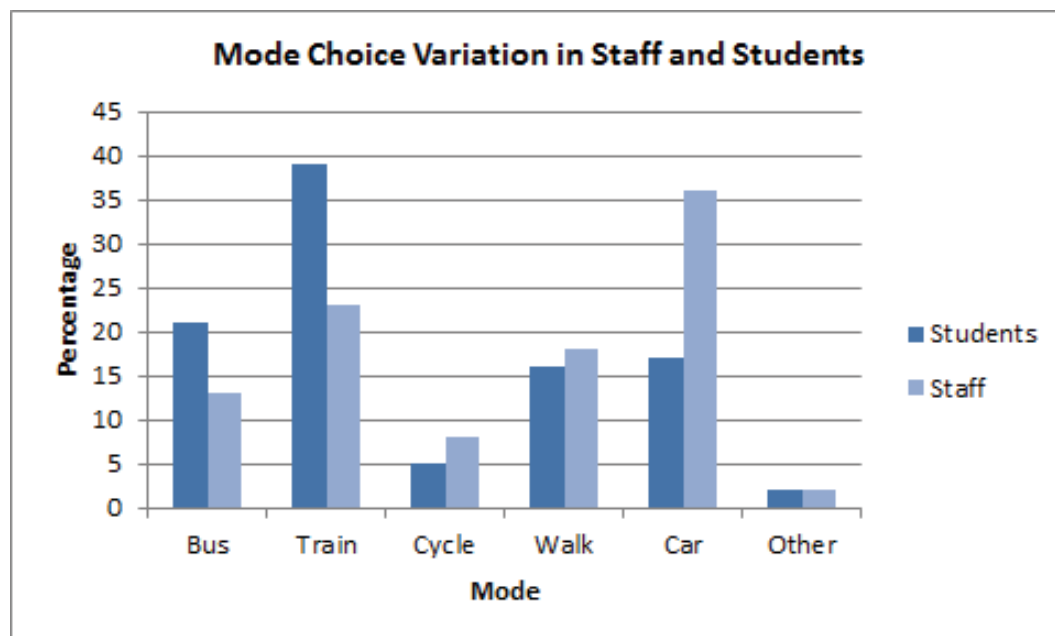


Figure 22: Staff and Students travel to the University mode share¹¹

From car users, 89% drive themselves, while the remainder carpool or are dropped off. Public transport usage to the Camperdown-Darlington campus is higher than that of the other campuses, due to the improved accessibility of the University.

These travel surveys conducted by the University show the predominant use of public transport in both students and staff. The CIP will investigate methods in which to further increase the number of staff and students using public transport and active modes to encourage sustainable modes of travel to the University.

¹¹ Travel Mode Report 2012

5 Parking Strategy

5.1 Existing University Parking

5.1.1 Car Parking

Currently, parking availability on the Camperdown-Darlington campus is wide spread, with relatively short walking distances required to the drivers' final destination. Figure 23 and Figure 24 shows where parking is available at Darlington and Camperdown as follows:

- Car Parking Stations (Blue) and
- Motorcycle Parking Stations (Red)



Figure 23: Camperdown Parking Locations

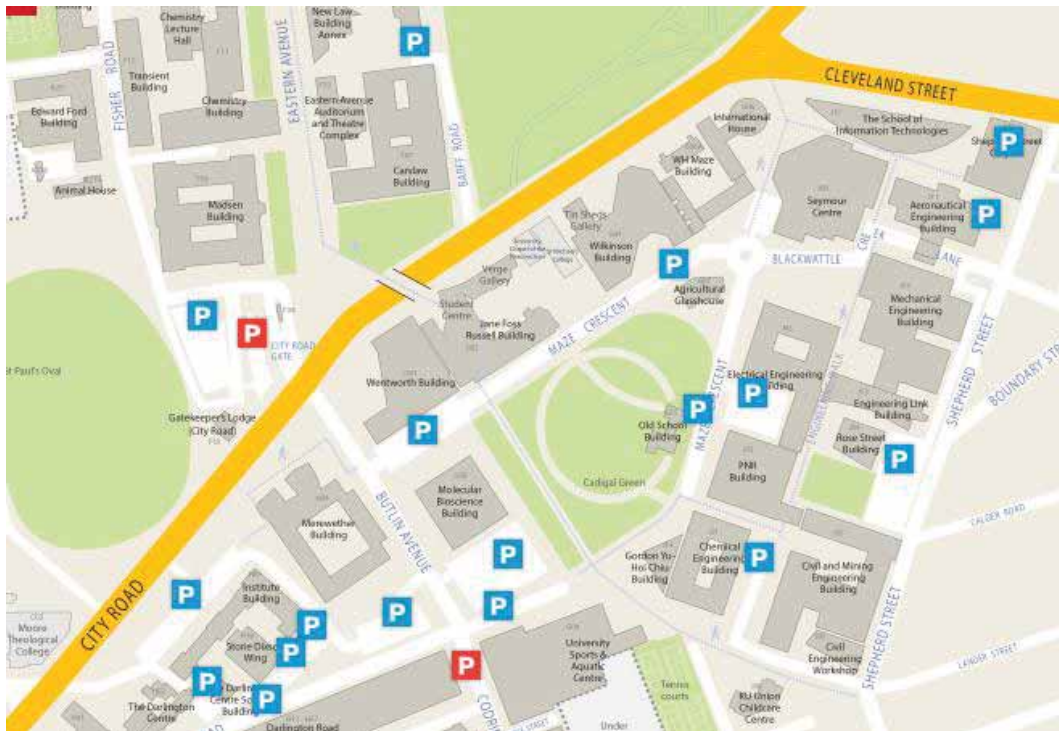


Figure 24: Darlington Parking Locations¹²

An audit of parking spaces on-campus in 2010 showed that the total number of parking spaces on the Camperdown-Darlington campus was 2,357 in 2010 (prior to Transformational developments). This number has decreased in the most recent audit undertaken in 2013, with a total of 2,227 parking spaces due construction over previous surface parking sites. There are approximately an additional 200 parking spaces being constructed in these Transformational developments.

The total spaces listed currently contain a mixture of parking including:

- permit and ticket holder spaces,
- accessible parking spaces,
- Service type spaces,
- Union type vehicle spaces
- University operated type vehicle spaces
- Clinic Visitor type vehicle spaces

The demand for parking is dictated on-campus by a pricing mechanism and permit system. Currently, visitors are only able to park for a flat rate of \$24 (between 6am-3pm weekdays) at the University, except Shepherd Street car park which allows a \$4 hourly rate up to the maximum \$24. Outside of 6am-3pm weekdays, \$2 per hour available other times up to a maximum of \$6. Vehicles parked without correct ticketing or permits are fined at the current infringement rate of \$99.

¹² <http://sydney.edu.au/maps/campuses/?area=CAMDAR>

Parking permits are available to staff, with special regular visitor and VIP permits available. The permits cost as little as \$285.05 per annum and are offered with salary sacrificing. In 2012, the University issued 2293 parking permits to staff (63%), students (21%), commercial representatives (1%), departments (3%), and service contractors (13%). In 2012, of approximately 7000 staff, 65% had parking permits.

5.1.2 Motorcycle Parking

Motorcycle parking is currently provided informally at four peripheral locations at the University as shown on Figure 23 and Figure 24 in the previous section:

- West side of Ross Street (Gate from Parramatta Road) with space for approximately 20 motorcycles
- City Road car park at Eastern Avenue (Gate from City Road) with space for approximately 40 motorcycles
- West side of Western Avenue south of Cadigal Lane with space for approximately 20 motorcycles
- West side of Codrington Street, between Darlington Road and Darlington Lane with space for approximately 15 motorcycles

While the University caters for approximately 100 motorcycles; any car parking space on-campus provides for motorcycles also (for the cost rates of cars.)

5.1.3 Bicycle Facilities

The University currently provides approximately 1,300 bicycle spaces on the Camperdown-Darlington campus. Most of the bicycle infrastructure provided includes bicycle racks, with only three secure bicycle cages currently on-campus, located at biochemistry, Margaret Telfer and the New Law building. The location of bicycle parking at Camperdown and Darlington is shown in Figure 25 and Figure 26.

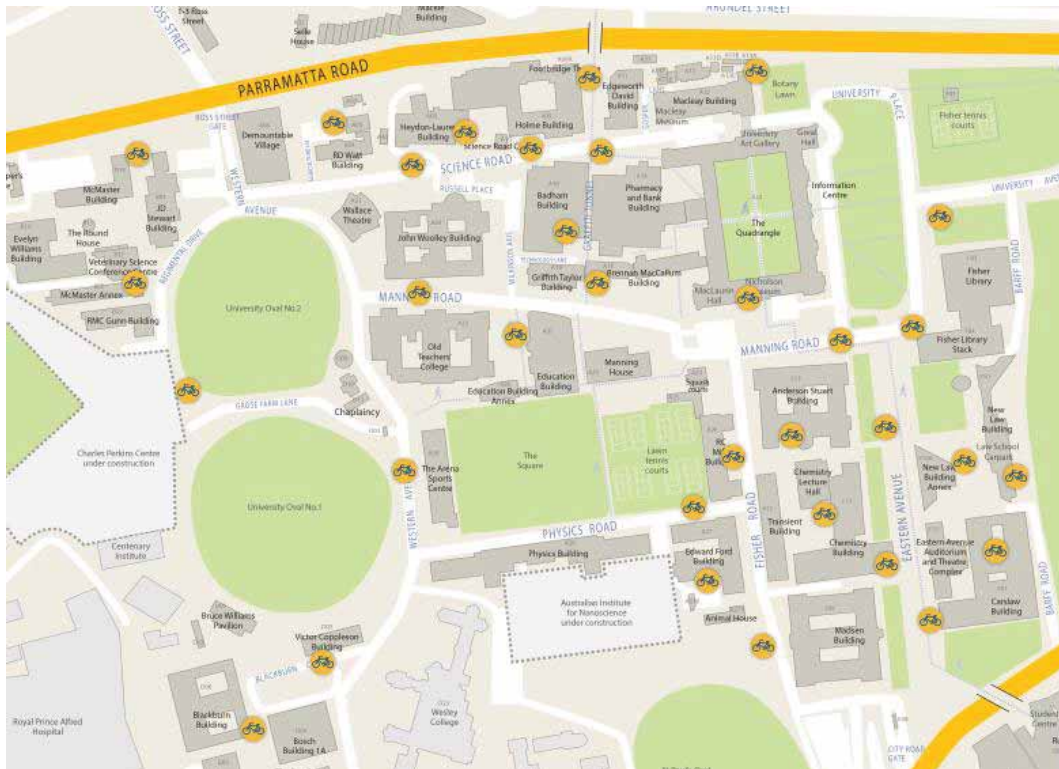


Figure 25: Bicycle Parking Camperdown

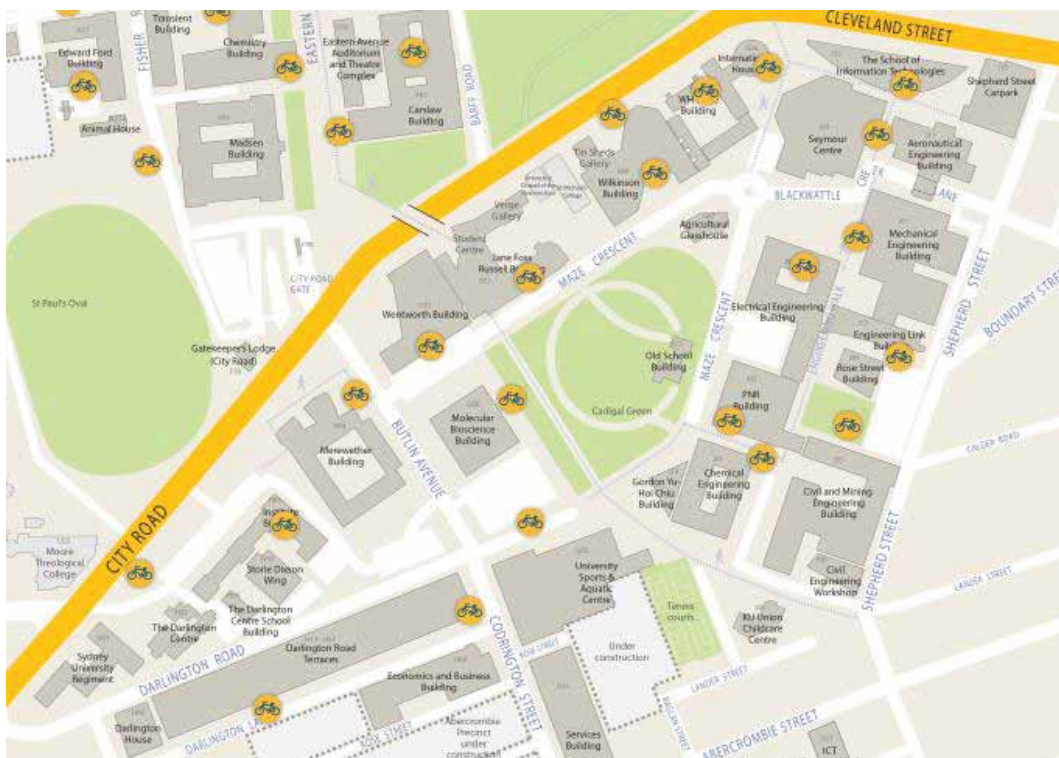


Figure 26: Bicycle Parking Darlington

The bicycle racks are widespread across the University and highly utilised as shown below in Figure 27.



Law Building lockers



Highly utilised bike rack, Camperdown



Bike Doctor



Fisher Road bike racks

Figure 27: Photographs of Bike Racks

The only location observed with low usage was Fisher Road, however this was expected to increase due to the current construction activity at the AIN. There is also a bicycle repair shop located on-campus in the Manning Building.

Using the City of Sydney DCP rates of 1 bicycle per 10 students and 1 bicycle per 10 staff, there is a requirement of approximately 700 bicycle spaces for staff alone, with an additional 5000 racks required for students (given current enrolment figures). However, the LEP rate is quite high and it should be assumed that bicycle parking be provided at the expected peak occupancy of 50%, this is approximately 2,800 bicycle spaces, which is over half of what is provided. Improvements could be made to increase the number of bicycle spaces on-campus.

5.2 Transformational Stage Developments

5.2.1 Car Parking Provision

Some parking spaces from the University were removed upon commencement of construction of the three main Transformational developments. It is understood that these parking numbers were not temporally relocated and will be provided upon completion of the developments.

The parking spaces lost from the 2010 audit totalled approximately 38 parking spaces. These are separated by type of parking space for each Transformational development below:

- CPC: 1 disabled and 1 service parking spaces.
- AIN: 5 permit, 4 service, 2 University and 2 disabled parking spaces.
- USBS: 19 union, 2 service, 1 disabled and 1 University parking spaces.

The QMB and Abercrombie accommodation are not proposing any increase of parking. Additionally, no parking was lost from these developments. The total parking spaces to be provided upon completion total 203 and include the following:

- CPC: 97 car parking spaces (including five disabled spaces) and 1 loading space (formerly revised from a provision of 200 general spaces and 15 visitor spaces)
- AIN: 12 car parking spaces (including 2 disabled spaces) and 4 service vehicle spaces
- USBS: 94 car parking spaces

The increase of parking spaces for these developments are justified based on the increase of GFA expected by the CIP. These developments were built on previously unoccupied land of the University, and have also been included as part of the development staging analysis of parking on the University in the long term.

5.2.2 Motorcycle Parking Provision

Motorcycle parking provision has only been included as part of the USBS Transformational development. Approximately 14 motorcycle spaces will be included in the basement car park. For the remainder of the developments, it is envisaged that motorcyclists will continue to use the four existing parking areas devoted to motorcycles.

5.2.3 Bicycle Parking Provision

The main developments are proposing additional bicycle storage either in the form of bike racks or secure lockers. The total bicycle storage provisions for each development are as follows:

- CPC: 125 bicycles
- AIN: 16 bicycles
- USBS: 277 bicycles

The USBS will provide 216 lockers as part of the 277 bicycle provision, with 22 showers for staff and students.

5.3 The CIP 2014- 2020 Plan

The Parking Strategy for the CIP will address the following:

- Inclusion of a series of consolidated parking stations, strategically located at the edges of user 'catchments', reducing the extent of internal traffic movements and encouraging walking and use of the local active transport network
- Basement parking in selected commercial and/or community use buildings, in support of the parking stations
- Maintaining on-street parking in some areas to assist in maintaining a slow moving traffic environment and contributing to effective levels of passive surveillance on the streets
- Improving access to publicly accessible parking areas by providing short stay parking options
- Ensuring there is no unreasonable impact on existing residents as a result of the University parking strategy
- Ensuring that public access to the University facilities is provided through short-term parking measures
- Ensuring at grade parking for emergency vehicles, service vehicles and persons with a disability

Therefore this parking strategy will provide car parking requirements for the University over the course of the CIP, rather than rates and provision for each multi-purpose building, addressing parking demand and provisions DGR.

Figure 28 shows the locations of the park free zones and car parks for the CIP.

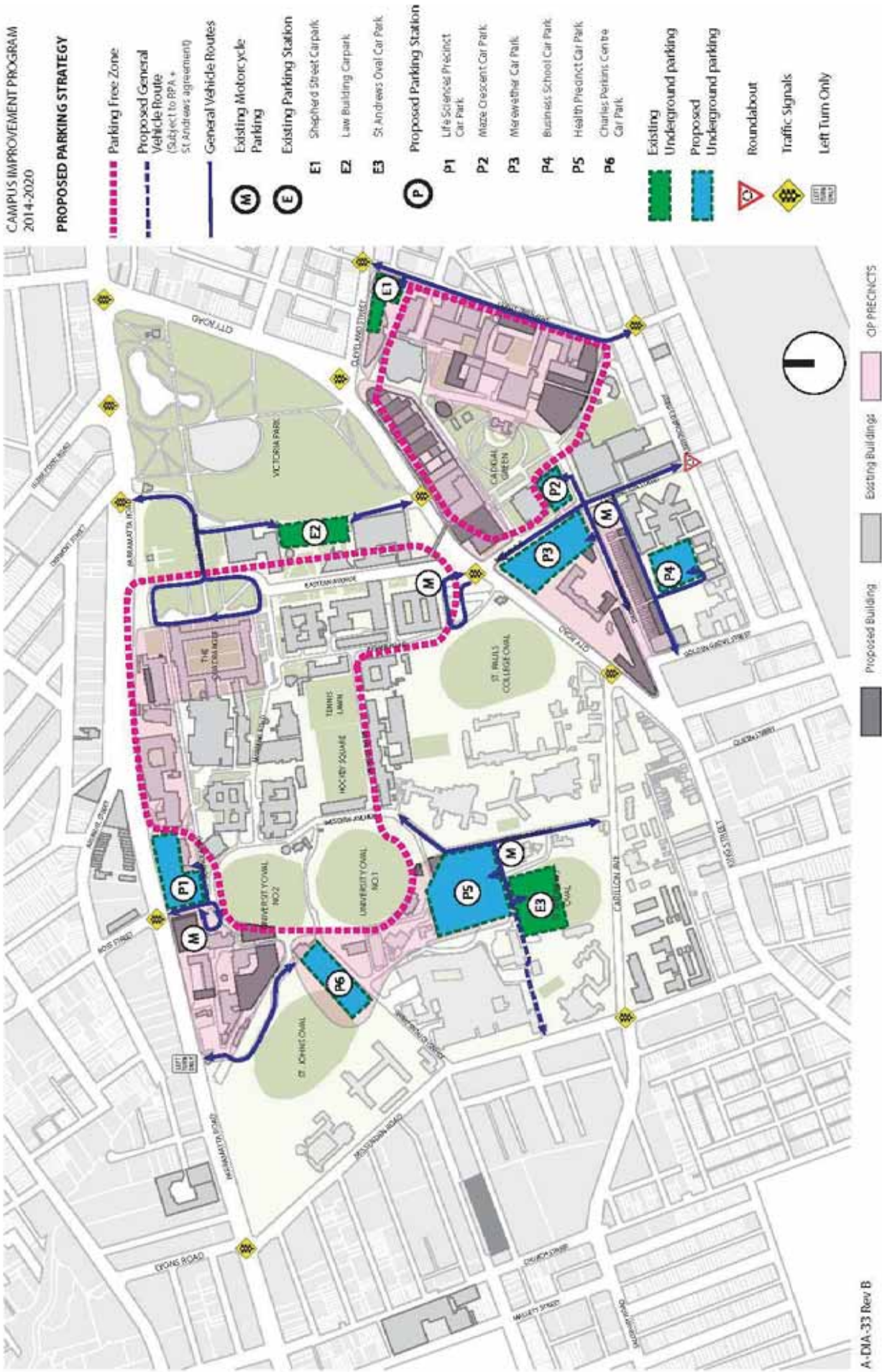


Figure 28: Parking Strategy

5.3.1 Development Staging

Over the course of the CIP, a number of developments will remove and increase parking. Car parking spaces will be lost due to the development of sites where current parking resides. These parking locations will be replaced by basement car parking upon completion of the new developments. A summary of the change each year in parking number from 2010 is shown in Figure 29.



Figure 29: Change of Parking Number from 2010 Base Year

Total parking provision declines by 5% from 2010 parking numbers between 2014 and 2017. The parking reduction during 2014-2017 is minimal and would not require any relocation or temporary parking provision.

After 2018, there is a sharp increase of parking available on-campus with the completion of the Merewether Precinct and the Health Precinct. It would be advisable to begin removing surface parking around the University after 2018 to coincide with the increases expected from the various developments. Parking could be removed from the areas closest to the new developments upon completion to minimise access disadvantages. A suggested closure method is presented below:

- Once the and City Road Precinct is completed, the University can then remove street and surface parking completely from the Darlington campus and possibly southern areas of Camperdown (including the City Road car park).
- Once the Health and Life Sciences Precincts are completed, the University can then remove the remainder of surface parking in Camperdown

By the end of 2020, it is expected that total parking provision would be in the order of 2,800 parking spaces. This represents a 19% increase above 2010 car parking provision. However given that the increase in building GFA is 70%, the overall rate of parking provision is reducing.

5.3.2 Rationalising Car Parking

Car parking provision around the University will change with the implementation of the CIP. The development of five new precincts and two buildings will consolidate car parking under these newly built structures, allowing for rationalisation compared to current arrangements. Each new multi-purpose building will provide additional spaces to remove parking elsewhere on-campus.

Parking provision based on GFA is commonly applied to commercial or residential uses, however may also be relevant to university applications. The University of Sunshine Coast has developed a policy to reduce its current parking provision rate of one space per 45m² GFA to one space per 200m² GFA over a period of time as development occurs within the University. Details of this policy published on the University's website identify that this rate is typical of high density mixed use centres such as CBD's or other mixed use urban villages such as Fortitude Valley, Carlton, St Kilda and Paddington. As a whole, the CIP objectives align with the City of Sydney's DCP and LEP.

With a total proposed CIP GFA of 884,600m², a total of 2,800 car parking spaces are proposed, which satisfy the requirements of the Sydney LEP 2012 parking controls. The GFA parking ratio throughout the course of the CIP compared with the City of Sydney's rate of 1 per 200m² is shown below in Figure 30.

The potential parking using the Council LEP rate of 1 per 200m² GFA is much higher than the parking currently provided on the Camperdown-Darlington campus. A combined GFA of approximately 550,000m² is currently provided on-site, which allows for a maximum provision of 2,750 car spaces under the City of Sydney LEP (using the educational land use alone). While the CIP is proposing to increase GFA to the order of nearly 1 million square metres GFA, there is no proposal to increase parking to this upper limit of potential parking, with the rate of parking decreasing to 1 per 350m².

No additional car parking is being provided for student accommodation.

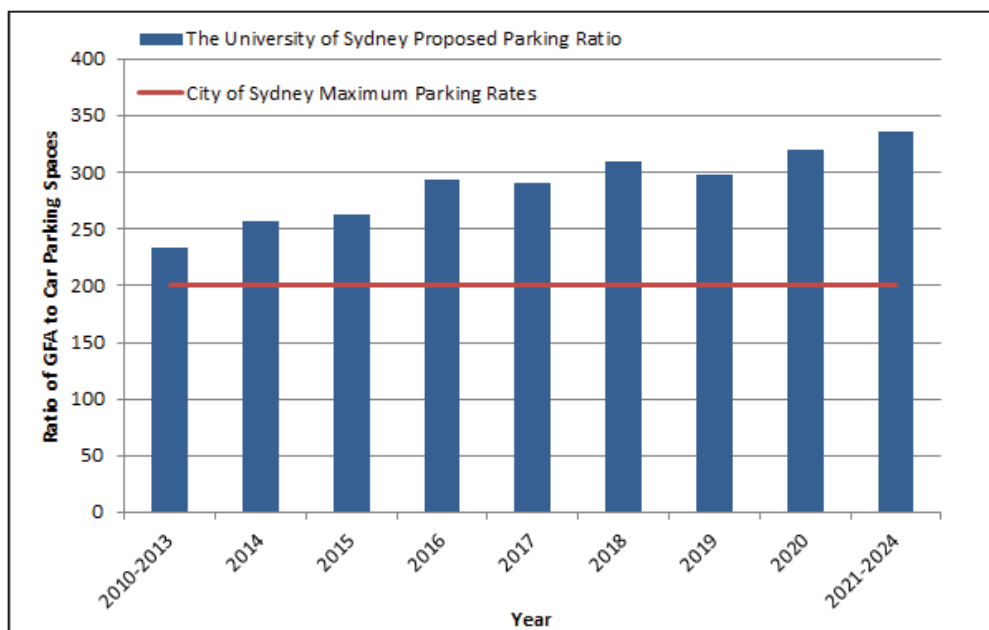


Figure 30: Ratio of GFA to Car Parking

The University is proposing to have limited parking on the internal streets in the centres of the University, (excluding disabled, service and emergency vehicle spaces) defining these as “park free zones”. With the potential closure of these internal access roads to general traffic, a number of small internal at-grade car parking areas will also lose access and become part of the “park free zones”. While it is noted that parking may become in surplus during opening of parking stations, surface parking will be removed progressively as the staged development occurs. The exact timing of the removal of parking spaces will be addressed through policy such as the following:

- Providing consent conditions upon completion of each development (i.e. to remove parking once a development opens)
- Opening of car parks to the public including surrounding residents or short term parking users for public facilities

5.3.3 Motorcycle Parking Provision

There are currently four motorcycle parking areas on the periphery of the Camperdown-Darlington campus, with a fifth area planned in the basement of USBS. The existing parking areas are unmarked for maximum storage. To comply with AS2890.1-2004, these areas should be linemarked correctly (2.5m x 1.2m bays) and formalised. While this will give less storage than the current arrangement, it will provide a measurable supply and demand for the usage of these areas. It will also lead to less potential damage to property when not clustered together in an unorganised fashion.

As new car parking stations are built, it is advisable to provide motorcycle parking as well. The City of Sydney DCP 2012 rates currently indicate 1 motorcycle space for every 12 car parking spaces. The space required for motorcycle is relatively low compared to car parking spaces, with the ability to fit them in areas where cars are unable to be parked. Demand for motorcycle parking should be monitored as buildings are opened to determine if more spaces are required.

5.3.4 Bicycle Facilities

New bicycle parking facilities should be located adjacent to buildings or precincts where there is already high demand for such facilities. Bicycle facilities should also be located in a visible, well lit area for maximum passive security. They should also be well signposted and positioned to provide ease of access. Where the University provides covered and secure bicycle storage (e.g. through swipe card access), the University may be able to charge users in order to recover the cost of new installations.

Currently, the University does not have adequate dedicated end of trip facilities. End of trip facilities are an important incentive in the promotion of active transport modes especially for staff who want to use these modes to travel to work. The University should consider developing a ratio in line with the Council LEP when planning for end of trip facilities in new buildings.

Appendix A refers to case studies discussing the use of a possible bike share scheme for the University. These schemes have been implemented successfully in other universities around the world. Case studies have also been presented on the implementation of shared paths and shared zones on universities campuses.

5.4 Managing Demand for Car Parking

A number of measures that the University could introduce, as part of the CIP include the following:

- Share parking assets
- Improve way-finding
- Facilitate mode switch through increased public transport servicing, enhancements of the local walking and cycling environment and growth of local accommodation choices
- Introduce market-oriented 'pay per use' parking
- Achieve a strong mix of non-residential land use on-campus, including weekday, evening and weekend activities to spread peak demand for parking

The University should look to manage car parking supply and demand into the future. Some options include:

- Ramping up all day car parking costs, with these to at least reflect the cost of a return public transport fare
- Facilitating a high degree of shared parking to avoid redundancies in supply. This may be abetted by provision of real-time information on-campus – via signage and mobile applications – to direct staff, students and visitors to vacant parking
- Trending towards 'pay per use' for all categories of users of parking assets
- Introducing a coherent, real-time way-finding system to mitigate congestion that may occur when car drivers circulate looking for free parking bays
- Current public transport servicing has potential to facilitate mode switch – greater investment in public transport is required for this to be a realistic substitute for staff
- Increase accessibility to public transport
- Introduce time/distance mechanisms
- Short-term reduced parking price for staff and students attending the University for 1 to 2 hours to prevent parking on residential streets

5.4.1 Pricing Demand Mechanism

The ability to travel by car is largely influenced by the availability of car parking at an affordable price. The provision of car parking is a balance between ample car parking with resultant congestion, safety, noise and sustainability concerns, and scarce car parking with resultant deterrence of some users and visitors, and overspill into streets outside the University.

Parking and transport policy are influenced by the areas external to the University. The University should continue to engage with its neighbours and authorities such as the City of Sydney, Transport for NSW, Roads and Maritime Services and others to develop complementary walk route, bike route, and resident parking policies.

Annual parking permits for the University are purchased on the basis that they do not guarantee a parking bay. Parking availability is on a 'first come, first served' basis. Most permits are restricted to staff and postgraduate students. Part-time academic positions/general staff positions and staff with less than two years' service cannot park on campus until after 3pm, Monday to Friday, unless they purchase a ticket from a pay & display machine.

This arrangement of fees discourages 'one-off' car trips but allows regular car commuters (permit holders) to park at the University for a relatively low price. The annual car parking permit price for the University is in fact at a substantial discount to average public transport travel fares, which strongly discourages public transport use.

It is recommended that the parking policy is reviewed to decrease the rate of parking available in the first instance. Currently, the demand for parking permits is higher than the actual parking supply, as shown in 2012 where approximately 2,300 permits were purchased compared to 2,227 parking spaces. As parking supply becomes scarcer, pricing may be increased to counter the demand on-campus as has been done with UNSW. Currently the price for a parking permit at UNSW is based on different user groups. For example, annual earnings above or below \$35,000 are approximately \$850 and \$470 for an annual permit respectively¹³.

Care should be taken not to discriminate against certain user groups. Parking should only be reduced if there are sufficient services to offset the needs for everyone. For example: a user group that may be discriminated is mobility impaired persons who are unable to find a sufficient mode alternative that is both price and time competitive with driving.

A permit pricing system based on distance and/or public transport availability may also be beneficial to reduce the overall demand for parking. As previously determined, there is a large number of staff that lives within 10km of the University who drive. Active modes and travel demand measures should be considered to discourage single occupancy car usage.

Currently parking permits and public transport travel passes are available through salary sacrifice (i.e. tax-free). Another common incentive is to offer interest free loans for the annual public transport ticket or a bike loan (which include purchase and maintenance costs of a bicycle).

5.4.2 External Effects

Parking on-campus is quite constrained due to the high demand. The natural effect of this demand is spilling onto neighbouring streets. Parking in the local surrounding streets is competitive with residents from nearby densely populated suburbs.

The majority of the immediate areas surrounding the University are restricted by resident parking schemes. Resident parking schemes are not available to everyone and pricing is dependent on the type of vehicle applied for. This generally restricts parking to metered, time restricted parking unless a permit is bought within a certain area.

¹³ <http://www.facilities.unsw.edu.au/getting-uni/driving-parking/parking-rates>

These areas include:

- Area Glebe: North of Camperdown campus
- Area 22 – Newtown: South of Camperdown / West of Darlington campus
- Area 24 – Chippendale: Northeast of Camperdown campus
- Area 30 – Camperdown: West of Camperdown campus
- Area 32 – Darlington: South of Darlington campus
- Area 36 – MacDonalddtown: West of Darlington campus

These separate areas are provided so that residents from an area are unable to park in other areas with their permit. However, residents are able to park in a separate street within their area – for example, Area Glebe consists of Parramatta Road to Blackwattle Bay which spans over 2km, therefore allowing short distance trips from residents in the north of the area to streets near Parramatta Road.

Given the restricted nature of car parking in the surrounding streets, additional effects of parking from the University would be minimal, provided that Council continue to enforce these restrictions.

5.4.3 Car Parking Management

Currently staff and students can generate a substantial number of on-street car parking during semester. It is impractical and undesirable to cater for this parking demand on-campus (on the contrary, the best use of space on-campus is not car parking). The University could act to reduce over-spill of parking through a combination of policies including:

- encouragement of walking and cycling;
- reducing the transport task – by providing more student accommodation within or near the University;
- encouraging public transport use – through provision of better services, ease of access, facilities and information; and,
- encouragement of carpooling.

Currently with on-street and localised parking spread throughout the Camperdown-Darlington campus, structured parking stations at Shepherd Street and Western Avenue are not always fully utilised during the day, as drivers seek to find a parking space close to their destination. The progressive relocation of general staff/student parking away from the heart of the University to peripheral parking stations will lead to greater acceptance and usage of parking stations.

Where there is a significantly greater chance of finding a parking space in peripheral station locations rather than very close to an individual's destination, then drivers will be more likely to drive directly into a station rather than circulate and search for a space closer to their destination. This would also help reduce vehicular-pedestrian conflict. This switch in attitudes would be reinforced by reductions in campus vehicle speeds (by introduction of shared zones and other measures). Provision of structured parking should be accompanied by reductions in general on-street parking availability.

It is impractical/expensive however to transport students/staff by bus from a remote location. This implies that any off-site location would need to be within convenient walking distance of the University.

The current price for annual parking permits is considered low for the benefits received. There have been increases in casual day parking rates (from \$3 in 1992 to \$24 now) but not corresponding increases in annual permit rates (from \$120-\$240 per year in 1992 to \$285 currently). It has been noted in a previous study that gradual real increases in price are warranted to help reduce car use and pay for alternative parking.

However, unless managed carefully there is a potential danger of transferring parking demand to local residential streets. Increased parking charges may thus need to be accompanied by increased enforcement and policing of local parking controls to produce overall effective discouragement of car use. This would require cooperation with City of Sydney Council.

6 Access and Circulation

6.1 Existing Conditions

6.1.1 Surrounding Road Network

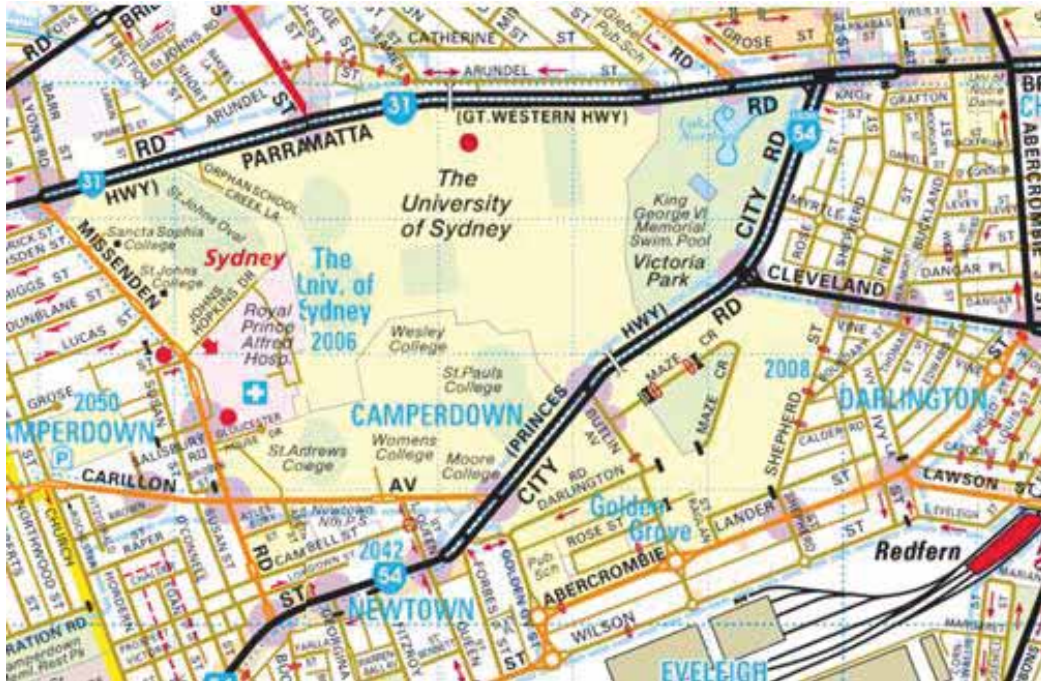


Figure 31: Road network surrounding the University¹⁴

The state road network (shown in black in Figure 31) is governed by RMS and includes Parramatta Road / Broadway, City Road / King Street, Cleveland Street and Abercrombie Road (north of Cleveland Street). These roads are major bus corridors and carry in the order of approximately 40,000-50,000 vehicles per day. Parramatta Road borders the north of Camperdown, and City Road divides the University between the Camperdown-Darlington campus. Cleveland Street also borders a small section of Darlinghurst (at the Seymour Centre / Shepherd Street car park).

The regional roads within close proximity of the University consist of Glebe Point Road, Carillon Avenue, Mallett Street and Missenden Road (south of Carillon Avenue). The regional road network provides connections and increased capacity between state roads, and is shared responsibility between RMS and Council.

The local road network surrounding the site is governed by the City of Sydney Council and provides for local access. Roads are generally characterised by posted speed limits of 50km/h with parking either side. The main local roads surrounding the University include the following:

¹⁴ Sydways

- Abercrombie Street is a local two-way road between Cleveland Street and Golden Grove Street and currently carries around 6,300vpd near Codrington Street. Access to Cleveland Street is limited to left-in/left-out. West of Lawson Street, it carries large numbers of pedestrians.
- Shepherd Street is a local two-way road between Wilson Street and Cleveland Street. Shepherd Street provides unrestricted access to Cleveland Street and carries a large number of pedestrians between Lander Street and Abercrombie Street.
- Golden Grove Street is a local two-way road connecting King Street with Wilson Street, and carries traffic flows at the sub-arterial level along that section between Abercrombie Street and Wilson Street.
- Codrington Street is a local two way road between Butlin Avenue (University Avenue) and Wilson Street. Codrington Street serves as a major connector to City Road for local traffic and provides a pedestrian/cyclist route for access to through Darlington.
- Darlington Road is a wide one-way local road with parking perpendicular to the traffic on the northern side. West of Golden Grove Street, the road is two-way and provides unrestricted movement to King Street.

6.1.2 Internal Road Network and Circulation

The current internal road network of the Camperdown-Darlington campus consists of a number of general traffic roads, owned by the University. While owned by the University, these roads are public roads which are governed by the NSW Roads Act 1999, which means speed limits, parking restrictions and road signs must be followed by law. The speed limit on all University roads is currently 25km/h.

The University is serviced by a number of vehicular entrances via the following external roads:

- Parramatta Road (four gates)
- Shepherd Street (three gates)
- City Road (three gates and Butlin Avenue)
- Codrington Street (two gates and Butlin Avenue)
- Carillion Avenue
- Abercrombie Street

Currently, the internal road network allows through traffic to drive from one side of the campus to the other (e.g. a driver is able to drive from Parramatta Road to City Road via Western Avenue or Fisher Road). However, there are a number of existing barriers in place which stop through traffic, including:

- Forced one-way eastbound direction on Physics Road
- Bollards between University Avenue Loop and Science Road
- Complete pedestrianisation of Eastern Avenue between the main gate and University Avenue
- Pedestrianisation between Darlington Road and Maze Crescent
- Forced one-way eastbound exit from Maze Crescent onto Shepherd Street
- Forced entry of Barff Road into the Law Building car park, which has boom gate control

The main routes and barriers throughout the University are shown in Figure 32.

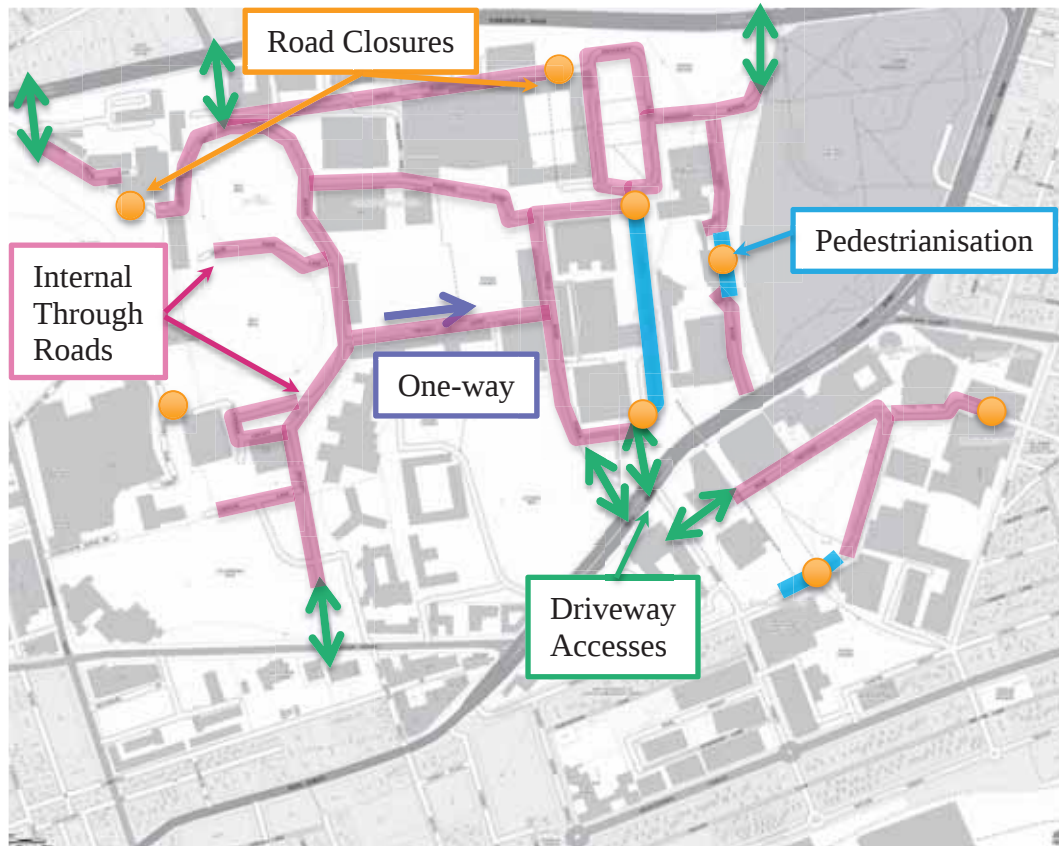


Figure 32: Vehicular Access

6.1.3 Servicing Arrangements

Most buildings currently have their own loading zones, requiring service vehicles to drive on the internal road network to service each building. In 2010, the Camperdown-Darlington campus had a combined total of 84 service vehicle spaces throughout the University. The main loading docks are located on Shepherd Street (next to the boardwalk), Regiment Drive (north of CPC), and Physics Building (north of AIN).

Waste is currently collected throughout the University by a private contractor who is able to access a number of compactors located around the University. Currently waste is separated by recycling and general waste, except hazardous waste from science areas.

6.1.4 Existing Public Transport

Public transport to the University consists of primarily bus and train services with very little current light rail use, with an overall mode share of 53% for public transport¹⁵. The main public transport routes to the University are shown in Figure 33.

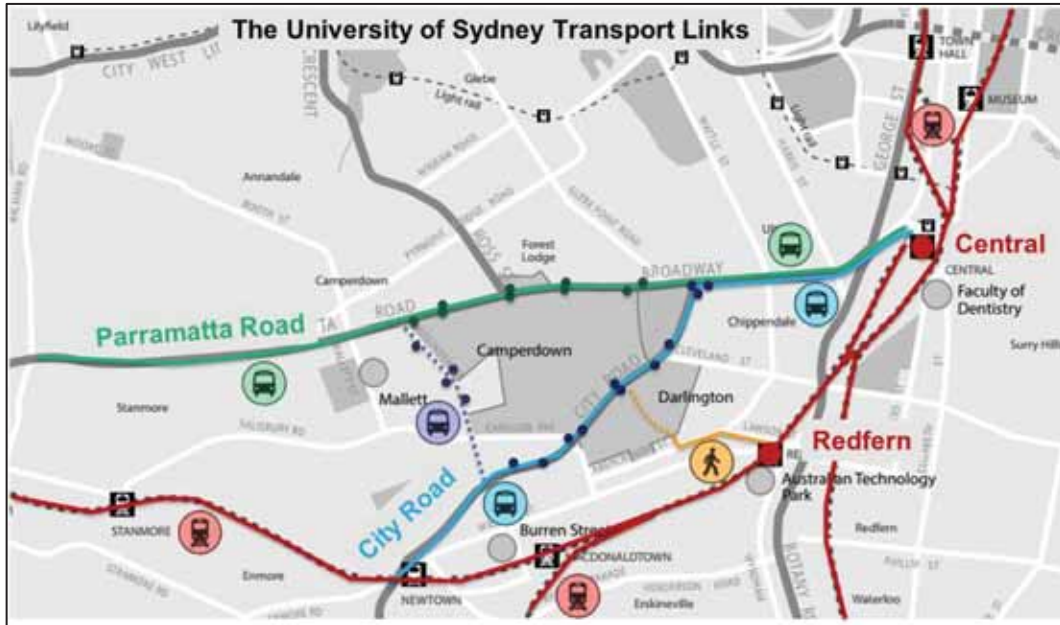


Figure 33 Transport Links

6.1.4.1 Buses

From all campuses of the University, 17% of students and staff take buses to access the University. This number is likely to be greater for Camperdown-Darlington campus due to the greater use of public transport for the city campus.

The Camperdown-Darlington campus is serviced by buses on the Parramatta Road and City Road corridors with 11 bus routes servicing Parramatta Road, and 10 buses servicing City Road. A service map is given in Figure 34 showing all bus routes passing the University campus. The Physical Activity and Travel Mode Survey, states the most regularly used bus routes are:

- 440- Rozelle to City via Leichhardt- 10%
- 422- Kogarah to City via Tempe and St Peters – 8.7%
- M30- Spit Junction to Sydenham via City and the University- 8%
- 423- Kingsgrove to City via Earlwood- 6.4%

¹⁵ Physical travel mode 2012

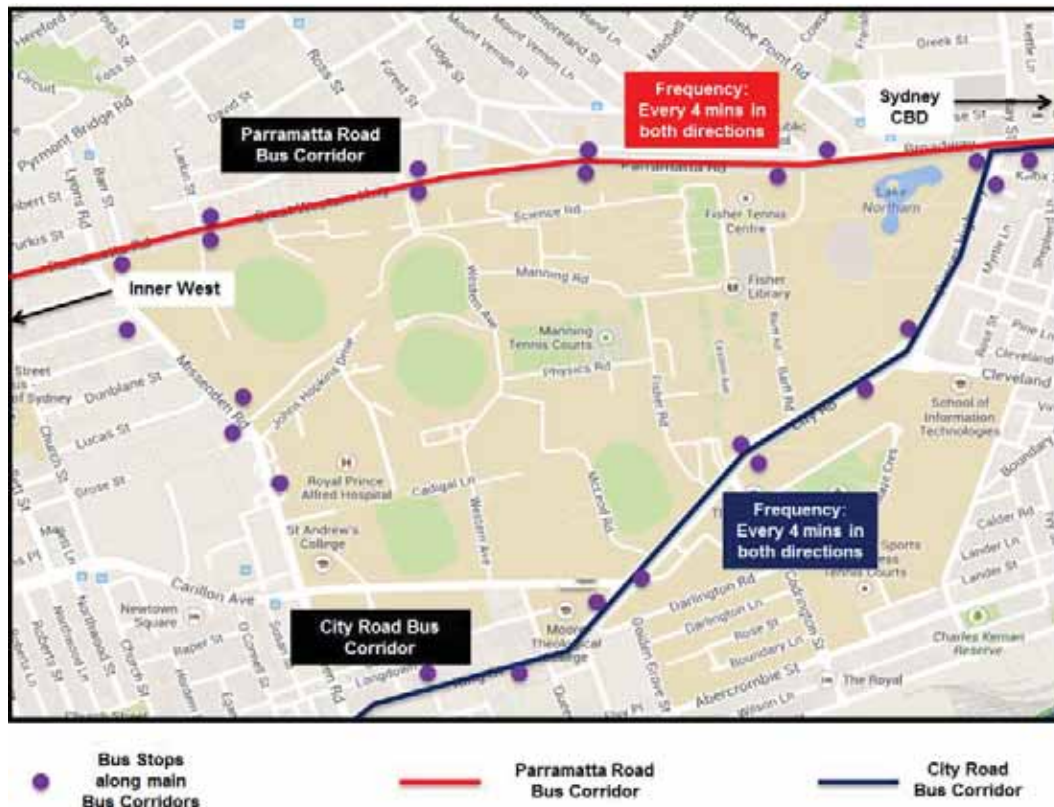


Figure 34: The University Bus Service Map

Buses running along Parramatta and City Road towards the Sydney CBD arrive at a frequency of every 4 minutes while buses in the opposite direction are of similar frequency.

There are currently bus lanes installed on both sides of Parramatta Road, and on the westbound lane of City Road which generally assist in on time running of buses along these corridors.

The bus stops servicing the University are located approximately every 400 metres around the perimeter of Camperdown, along the Parramatta Road and City Road. Buses are generally full in the peak direction (i.e. a bus approaching the city would be full in morning peak and the reverse is true for evening peak).

6.1.4.2 Trains

Train usage is the dominant public transport mode for the University, with approximately 30% of students and staff using it to get to all University campuses. The Camperdown-Darlington campus is located near three railway stations (shown in Figure 35) which are:

- Redfern Station
- Macdonaldtown Station
- Central Station

Central Station is serviced by all train lines (including intercity and interstate services) except the Carlingford Line and Cumberland Line of Sydney Trains.

Redfern Station is similarly serviced by all train lines except certain NSW Trainlink services and Airport/ East Hills Line. Macdonaldtown is serviced only by the Inner West Line.

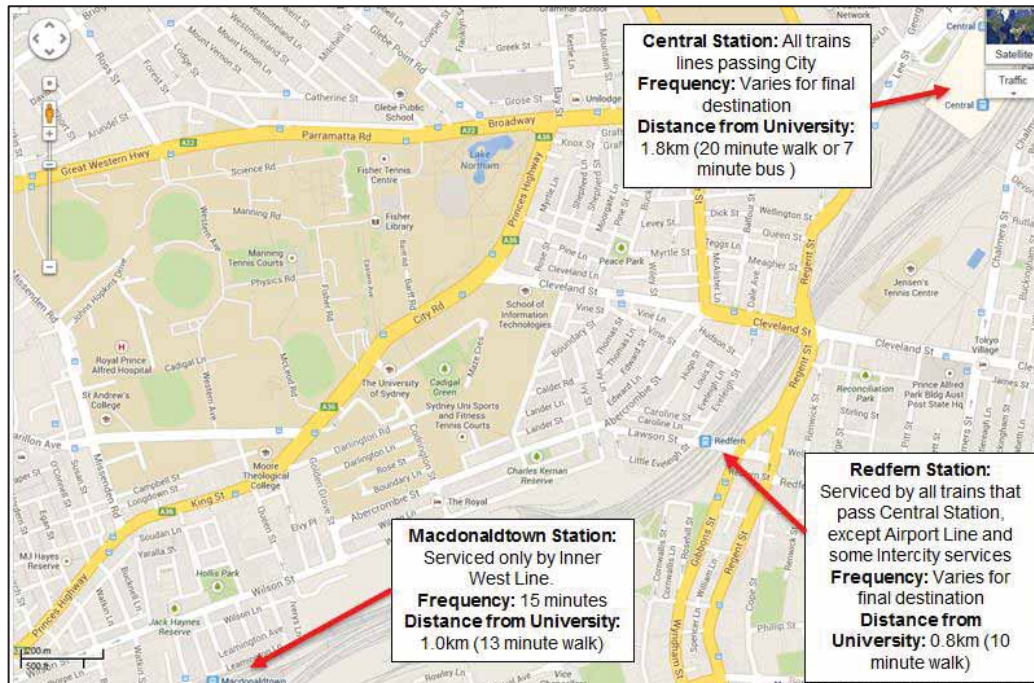


Figure 35: Train Station locations close to the University

Redfern Station is the closest railway station to the Camperdown-Darlington campus and has the highest patronage for the University. Redfern Station patronage is five times higher than Central Station, with very little patronage recorded at MacDonalddtown Station¹⁶.

Access to the University from Central station is likely accessed via Parramatta Road or City Road bus services, which take approximately 7 minutes (depending on the location on-campus). This mode choice is more likely to occur during adverse weather events or dark hours, when the walk between Redfern Station and the University is undesirable.

The walk from Redfern Station to the University is approximately 10 minutes (boardwalk entry at Shepherd Street), with an additional 5 minutes walking time to Camperdown (Eastern Avenue entry). During the later hours, safety (and perceived safety) is an identified issue for the walk between Redfern Station and the University. This issue is especially prevalent on Lawson Street, which becomes quite a dark and narrow footpath.

Redfern Station currently does not have lift access to the station platforms, limiting access for parents with prams, and the mobility impaired persons. However in August 2013, Transport for NSW announced the construction of lift access to at least one platform to help alleviate this issue¹⁷.

¹⁶ Travel mode survey

¹⁷ <http://www.transport.nsw.gov.au/media-releases/accessibility-upgrade-redfern-station>

The City of Sydney, with the University contribution is implementing an upgrade to the Abercrombie Street footpath with Lawson Street and Codrington Street.

6.1.5 Shuttle Bus Services

The University owns three minibuses which are operated as free shuttle services. The University operates these minibuses from the University to Redfern Station and satellite campuses. One of the minibuses is an eight seat bus with full hydraulic wheel lift for mobility impaired access, operated on demand.

A security shuttle operates on a loop between the University and Redfern Station. Security services run from the Fisher Library to Redfern Train Station at 15-20 minute frequencies at the following times between 4:30pm-10:15pm during semester, and 4:30pm-8:15pm outside of semester.

Additionally, the shuttle services are operated between the Camperdown-Darlington campus (corner of Manning Road / Fisher Road), the Mallett Street campus and the Sydney College of Arts (Rozelle) campus. Services are operated during the day from 8.30am-8.30pm at half hour frequencies. The estimated travel time between campuses is approximately 20 minutes.

All of these bus services do not run on weekends, public holiday or Christmas shut down period¹⁸

The security bus route is shown in red in Figure 36 below.



Figure 36: The University Security Bus Route¹⁹

¹⁸ http://sydney.edu.au/current_students/transport_safety/campus-bus.shtml

6.1.6 Cycling Network and Connections

Cycling conditions on-campus have improved in recent years, with more shared plaza areas such as Eastern Avenue, and an increased supply of bike parking. The University promotes cycling as a way of keeping fit and healthy and has a bicycle map that shows bike parking areas on-campus. There is also reference to the Council map of cycleways surrounding the University. The Council map shows bike-friendly streets within a five-kilometre radius of the University and encourages the use of sustainable transport.

Excerpts from the Council bicycle map, showing cycle paths in and around the immediate vicinity and cycle parking stations within the University are shown in Figure 37.

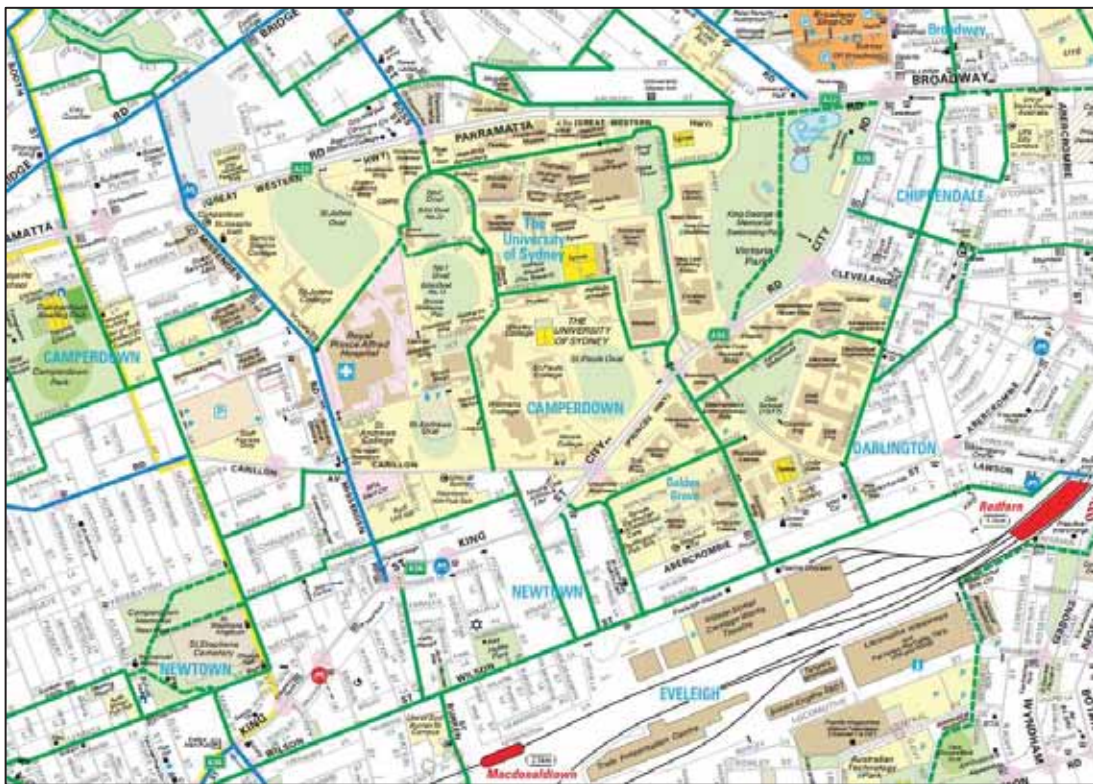


Figure 37: Bicycle Map

As identified in Section 5.1.3, the University currently has limited number of showers and changes rooms available to cyclists. The University website also has limited information of the locations of these sites. This is an area of identified deficiency that would be beneficial to address to encourage bicycle use by staff.

¹⁹ http://sydney.edu.au/current_students/transport_safety/campus-bus.shtml

6.1.7 Pedestrian Paths and Routes

There remain some concerns about personal security of students and staff on-campus and in surrounding areas, particularly after hours. The University has published information and maps of security services including security bus services.

There are currently various issues concerning pedestrians and cyclists movements into and around the University. A summary of the key issues is as follows:

- Footpath capacities
- Conflicts with circulating and parking/ unparking vehicles produce unsafe and inconvenient delays for pedestrians and vehicles
- Access and security of walking to Redfern
- Abercrombie Street crossing delays/safety
- The principal pedestrian challenges are the safe access of students to and from Redfern railway station, via Abercrombie Street and Shepherd Streets, as well as travel between the Camperdown, Darlington and North Eveleigh sites. In many cases, principal pedestrian and bicycle routes coexist.

Pedestrian conflicts have been identified as being significant at the following locations:

- at the Shepherd Street / Lander Street intersection;
- at the pedestrian crossings of the traffic signals at Butlin Avenue / City Road;
- QMB access along Grose Street and crossing Missenden Road; and
- along the Abercrombie Street / Lawson Street footpaths.

For cyclists keys issues are as follows:

- The NSW Helmet Law requires helmets to be worn by all riders on roads and road-related areas which may be a barrier for students or staff having to carry additional items.
- Insufficient bicycle parking is provided on-campus leading to bicycles chained to other infrastructure and trees where insufficient bicycle spaces are provided.

6.1.8 Pedestrian Access to Transit Stops

The access to transit stops varies depending on-campus and building the student and staff member is located at the beginning or end of the day.

From the Travel Mode Survey 2012 conducted by the University, it was found the four most popular initial destinations of students and staff as being:

- Eastern Avenue (Red) - 22%
- Maze, Shepherd, Lander Area (Blue) - 17%
- Veterinary Science, Science Road Area (Green) – 12%
- Manning, Hockey Square Area (Yellow) - 11%

These points were plotted on a map and the locations are shown below in Figure 38:

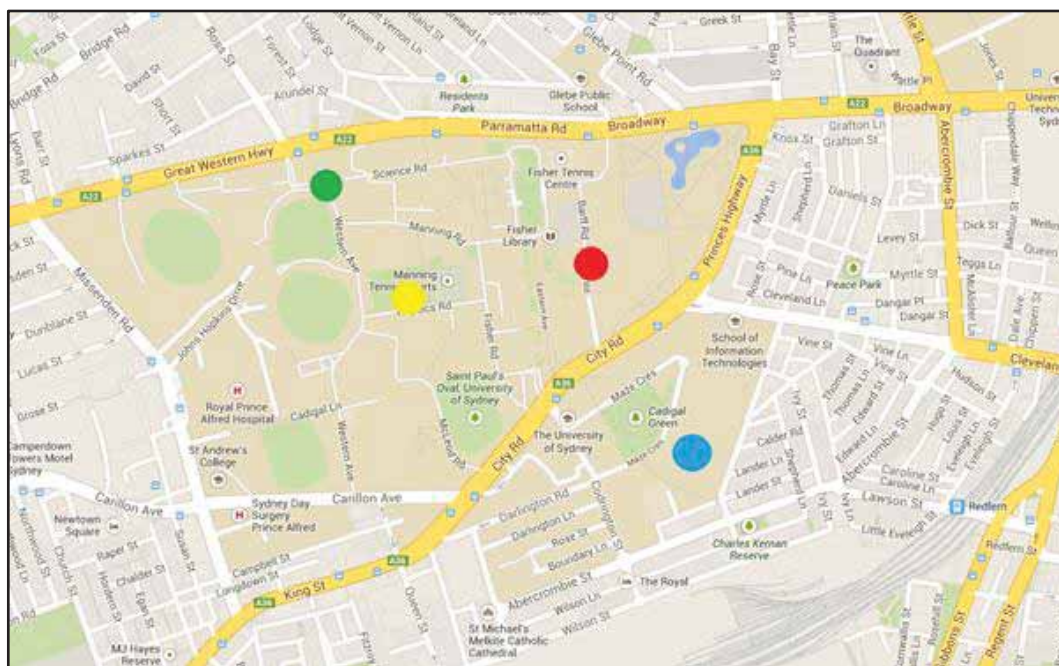


Figure 38: Most popular initial destination at the University

Using Google Maps, the distances and approximately walking time to these locations was calculated from the closest bus and train station. The results are shown in Table 6.

Table 6: Time to Transit Stop

Area	City Road Bus Stops	Parramatta Road Bus Stops	Central Station	Redfern Station	Macdonaldtown Station
Eastern Avenue	300m/ 4 mins	290m/ 4 mins	1.5km/ 11 mins	1.3km/ 16 mins	1.4km/ 18 mins
Maze, Shepherd, Lander Area	350 m / 4 mins	1.1km/ 14 mins	1.9km/ 14 mins	750 m/ 9 mins	1.2km/ 15 mins
Veterinary Science, Science Road Area	1.0km/ 12 mins	160m/ 2 mins	1.9km/ 11 mins	1.9km/ 24 mins	2.0km/ 25 mins
Manning, Hockey Square Area	500m/ 6 mins	500m/ 6 mins	2.2km/ 14 mins	1.4km/ 18 mins	1.3km/ 16 mins

Assumptions for Table 6 include:

- Students and staff from Central Station boarded a bus to reach the University
- For the City and Parramatta Road bus stops, students and staff alighted at the bus stop nearest to their final destination
- For all other transit stops, it was assumed that walking was the main mode used.

The current barrier to accessing transit stops includes Parramatta Road (bus stops) and Arundel Road (overpass) from Science Road. The safety of staff and students accessing Redfern Station at night time, especially along Lawson Street

6.2 Transformational Stage

6.2.1 The University of Sydney Business School

For vehicle access to the USBS, the driveway entry and exit will be located on Darlington Lane. Darlington Lane is a narrow four metre wide carriage way, which does not give vehicles the ability to pass²⁰. As such it is likely that Darlington Lane will be converted to a one-way road east bound.

For pedestrian access, the primary frontage is proposed on Codrington Street. Pedestrian crossings in the area will provide safe and consistent access to the USBS and include:

- An existing pedestrian crossing located on the northern leg of the roundabout at the Abercrombie Street / Codrington Street intersection.
- An existing pedestrian crossing on Golden Grove Street (opposite Darlington Public School).
- An existing pedestrian crossing on Abercrombie Street (opposite Darlington Public School)
- A proposed pedestrian crossing on the southern leg of the Codrington Street / Darlington Road intersection.

6.2.2 Australian Institute of Nanoscience

Primary vehicle access for the AIN will be provided from Physics Road, a one-way eastbound road allowing movements from west to east. The development will require deliveries to facilitate operations connected with the development. These include waste collection, chlorine and liquid nitrogen. Deliveries are expected to be infrequent less than one delivery per day.

Ambulance vehicles can access the development via the main vehicle access to the site which is adjacent to the pedestrian access. In the event of an emergency fire trucks currently access the fire hydrant booster on Physics Road adjacent to the access to the development. This operation is proposed to remain as existing for the proposed development.

As part of the development plans, it is proposed to provide approximately 12 car parking spaces including two spaces for drivers with mobility impairments. The spaces are to be restricted allowing permitted cars to park in the area similar to existing parking spaces within the University. The low provision of parking spaces is to encourage sustainable transport to the proposed development.

Also as part of the development plans it is proposed to provide approximately 16 bicycle parking spaces located in a convenient position adjacent to the access to the development.

The main access to the building for pedestrians will be through a foyer on the eastern side of the new building. The foyer will also be linked to the Physics Building entrance on Physics Road.

²⁰ TTW Report 2013

6.2.3 Charles Perkins Centre

The Charles Perkins Centre will be primarily accessed from Parramatta Road via Orphan School Creek Lane and will consist of 97 staff parking spaces located in the basement car park.

The primary cycling routes are accessed from either Parramatta Road, via Orphan School Creek lane, or via Ross Street or Missenden Road via John Hopkins Drive. The Charles Perkins Centre is also located along the proposed University cycle route which will give improved connectivity to University cyclists. This development will include 125 bicycle parking facilities, and other end of trip facilities.

Main pedestrian access to the building is from the main plaza located on the southern-eastern side of the Charles Perkins Centre. The main pedestrian connections with the rest of the University are via Grose Farm Lane or Regimental Drive.

6.3 CIP Future Transport Access

6.3.1 Shared Zones

A key characteristic of high quality Universities is a comfortable and safe walking environment to and within the University. Most staff and students already walk to the site, so walking already has a high importance to universal access by all including people with disabilities. Significant numbers of people walk to and from Redfern daily. Some 4% of staff and 15% of students cycle, warranting calm streets and substantial provision of bike parking.

Currently, pedestrian access is limited to narrow footpaths throughout the University's internal roads. The large pedestrian volumes spill from existing footpaths onto the carriageway and may present a dangerous situation, even with the posted speed limit of 25km/h, as the general environment still indicates priority for vehicles.

As part of the CIP, it is recommended to convert the internal road network to shared zones initially. The criteria for shared zones are:

- Less than 100 vehicles per hour and less than 1000 vehicles per day
- Length of proposed shared zone must be less than 400 metres
- Carriageway width must have minimum trafficable width of 2.8m
- Current speed limit must be less than 50km/h
- Current speed limit of adjoining roads must be less than 50km/h
- Route access must not be located along bus routes or heavy vehicles routes except delivery and garbage trucks
- Kerbs must be removed unless accepted by the RMS or unless they constitute heritage items/ significance

The 'shared zones' proposed as part of the CIP will be implemented along the remaining internal University roads (much like Eastern Avenue). The shared zones will provide priority for pedestrians and allow access by cyclists and will be implemented according to criteria in Roads and Maritime Services guidelines in order to provide safe and effective movement for people at the heart of campus.

New paved shared zones will enhance the urban design character of the University, increasing safety for all users. Case studies in the Appendices indicate that a number of universities (both locally and internationally) have implemented shared zones in their universities. The successful implementation of these shared zones allows for service vehicle movements and creates an equitable environment for all types of pedestrians and cyclists of all abilities.

While these zones do not effectively stop through vehicle access, they do slow traffic to an undesirable level that discourages high volumes and rat-runners. The shared zones will also maintain access for parking and loading areas, and may even keep parking marked within the zones (i.e. maintain on-street parking levels). This measure is a desirable first choice for the University, while the future desirable outcome is to discourage car access completely. This will be addressed through gateway principles, the parking free zones and internal road closures.

6.3.2 Shared Path Principles

Where internal roads are not being completely converted to Shared Zones, it is recommended that shared paths are provided. A shared path is defined as a combined path for both cyclists and pedestrians, which provide priority to pedestrians (i.e. cyclists give way to pedestrians and overtake). Conventional footpaths are restrictive and legally do not allow cyclists to ride on them unless the cyclist is under 12 years old. The nominal width of a shared path is also wider than a conventional footpath, which offers a minimum width of 2.4m.

The University proposes increased pedestrian and cyclist priority within the University. Shared zones are a first step in bringing priority to an even level for all users. Currently, cyclists use the internal roads and footpaths attempting to share with either vehicles or pedestrians. Eastern Avenue is an exception, using shared path principles.

Universities around Australia have implemented shared zones and paths around campus to provide a comfortable and safe walking environment; case studies have been provided in Appendix A. The University cycle network connects directly with the surrounding City of Sydney bicycle network. The diagrams below in Figure 39 and Figure 40 shows the Sydney Cycle network green, with the proposed University cycle network in purple, shared pedestrian and cycle routes in light blue and pedestrian priority zones in red.

CAMPUS IMPROVEMENT PROGRAM
2014-2020

PROPOSED CYCLE STRATEGY

Shared Zones
Definition: authorised university
vehicles/ service vehicles/ emergency
vehicles and pedestrians/ cyclists only

Off Road Campus
Cycle Route

On-Road Campus
Cycle Route

Pending Future RPA
On-Road Cycle Access

City of Sydney
Cycle Network

Secure Bicycle
Cage Parking

Bicycle Repair Shop

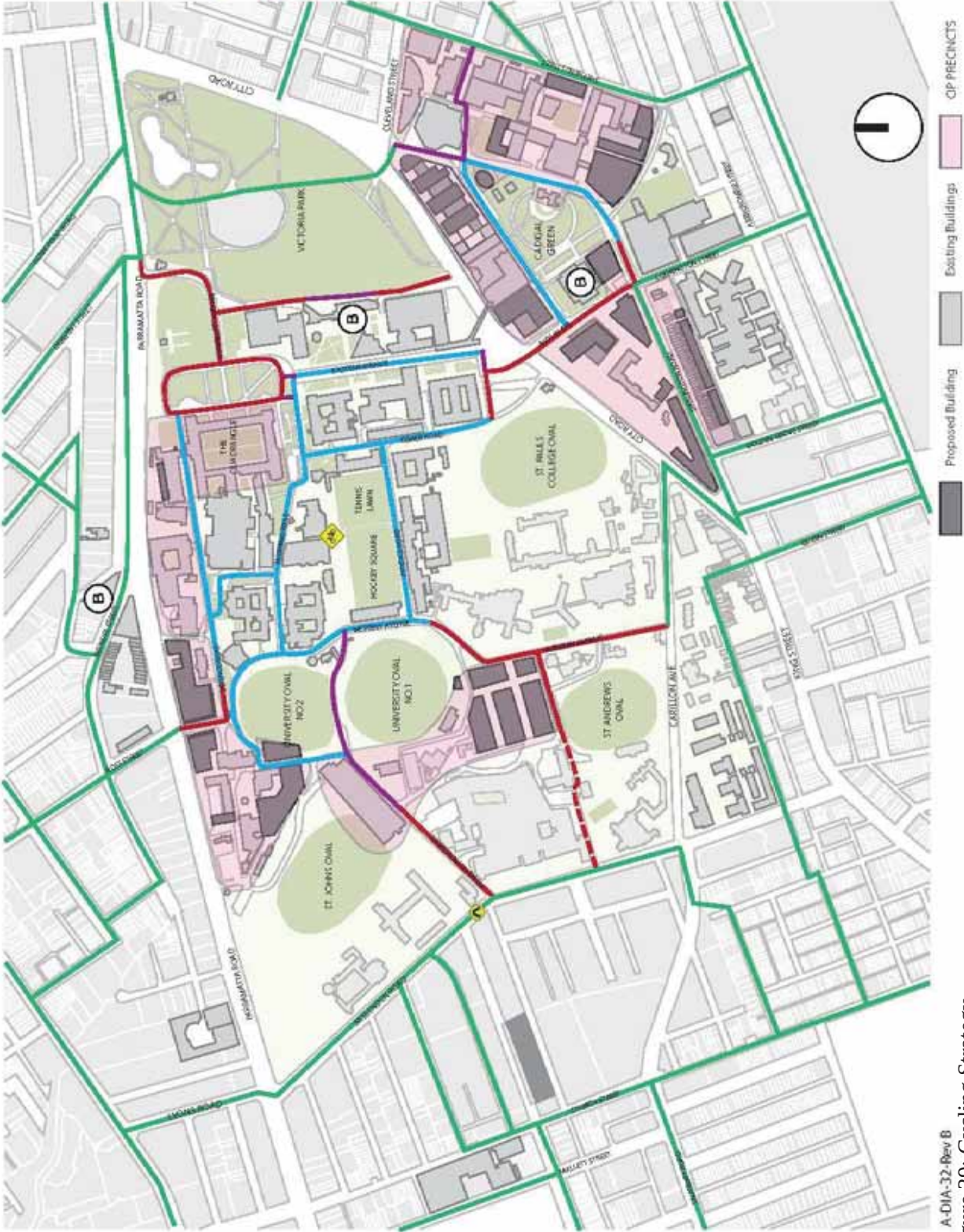
Zebra Crossing

(B)

Noteracks provided throughout campus

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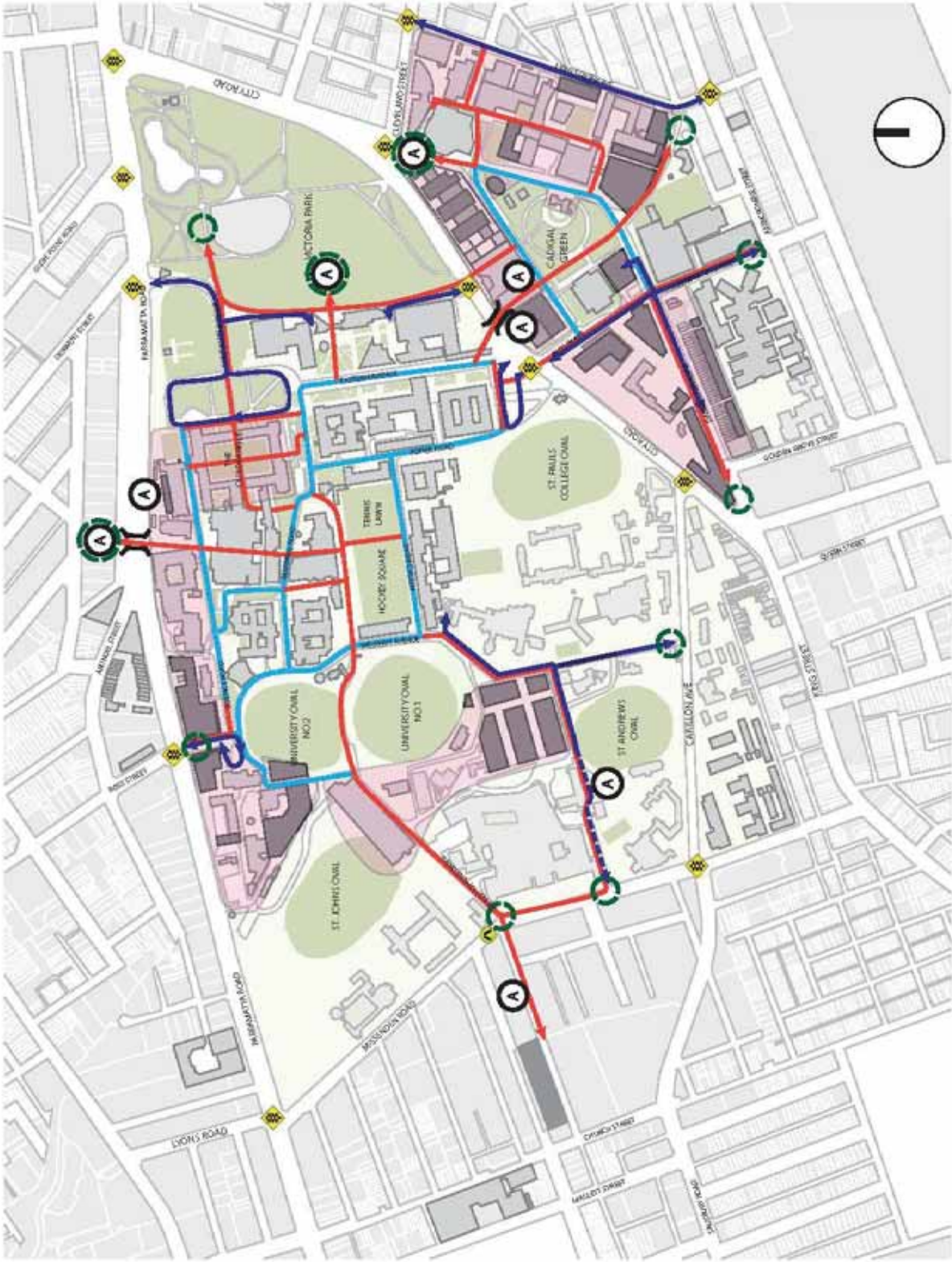
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Figure 39: Cycling Strategy

CAMPUS IMPROVEMENT PROGRAM
2014-2020

PROPOSED PEDESTRIAN STRATEGY

- Shared Zones
Definition: authorised university
vehicles/ service vehicles/ emergency
vehicles and pedestrian/ cyclists only
- Pedestrian Footpath
- General Traffic Routes
- Proposed Future
Access Road
(Subject to RPA +
St Andrews agreement)
- Pedestrian Gateways
- Access Resolution
- Zebra Crossing
- Traffic Signals
- Pedestrian Overbridge



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Figure 40: Pedestrian Strategy

6.3.3 Barriers to Cycling On-campus

As internal roads are currently governed under NSW Roads Act 1999, the NSW Helmet Law (1991) applies which requires that helmets must be worn by all riders on roads and road-related areas. This may present a barrier to travelling by bicycle for staff and students as it is an additional carry item. Public transport is also limiting with no bicycles permitted on buses and bicycles charged as child on trains/trams during peak periods.

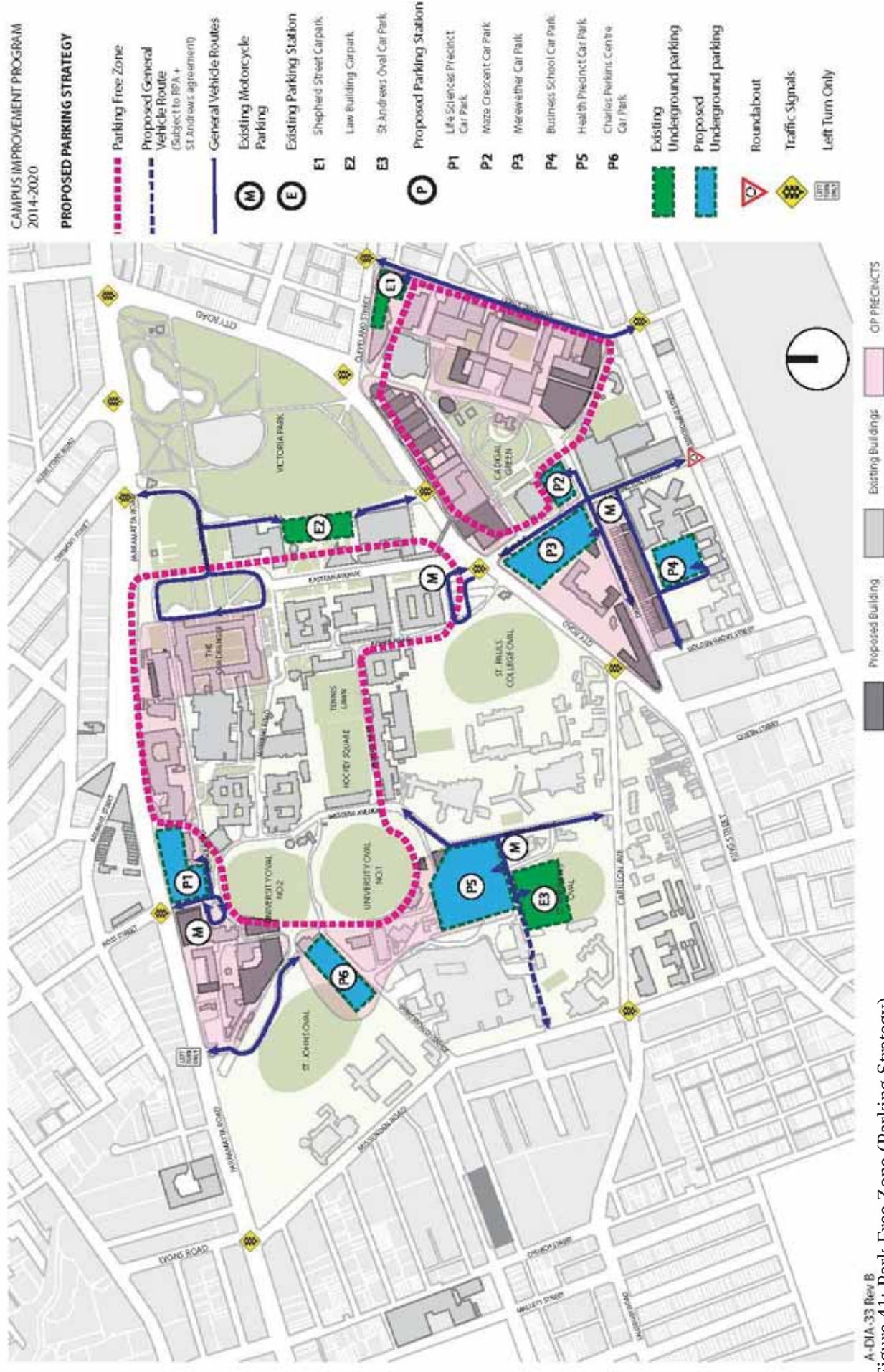
One barrier related to walking and perhaps cycling to the University is access to public transport connection points. There can be safety concerns with regards to walking to nearby stations (such as Redfern and Central) particularly after hours. One issue raised through responses to the Physical Activity Survey was the bottleneck of pedestrian traffic flow to Redfern. There is also a concern for safe passage for cyclists on the corner of Abercrombie Street and Codrington Street. Signage that clearly indicates cycle ways, pedestrian passage and shared pathways is one measure to increase the awareness of the public, staff and students. Increased connectivity with surrounding suburbs through signage will also encourage cyclists travelling to neighbouring suburbs and stations.

The provision of facilities such as showers, lockers and a change room is required to support active modes of transport to the University. This issue is often raised by staff with the Engineering and Sustainability unit and it was also commented on in response to the Physical Activity Survey. To encourage staff to take up active transport, the University could improve the provision of such facilities. There are currently predominantly bicycle racks installed outside building facilities, requiring a lock for security. In 2013, 8 bicycle thefts have been reported to date, the same amount reported this time last year. This is a concern for cyclists and bicycle parking facilities could be provided under cover or in secure locations. Currently, all bicycle storage facilities external to buildings are not covered or weather protected. The plan will propose an upgrade of end of trip facilities which will include a combination of secure or covered cycling facilities, change rooms and locker storage. The upgrade of end of trip facilities will mitigate the concerns of current and potential cyclists and make it more convenient for staff to use active modes of transportation.

6.3.4 Internal Road Closures to General Traffic

The CIP proposes to close a number of roads to general traffic throughout the Camperdown-Darlington campus to minimise through traffic. While this concept is generally encouraged, measures to close roads usually include bollards or psychically blocking entries and exits with kerbs etc. This may not be a desired outcome for the University as it creates issues such as emergency vehicle access or the shuttle bus that currently circulates throughout the University.

Pedestrianisation of the University internal roads is encouraged, which will have an impact on the internal routes cars and service vehicles will take. Formal roads should be provided on the periphery, so that service vehicles and cars may access the peripheral parking stations located at the extents of the University. The diagram in Figure 41 below show which areas are proposed to be park free.



Authorised buildings will be able to access all parts of the University via shared zones and service routes. Signs will be erected stating vehicle access is only for authorised and service vehicles only. Gateway Principles

A number of gateways are proposed surrounding the Camperdown-Darlington campus. In order for the CIP to address the objectives, a hierarchical approach was undertaken so that pedestrian and vehicular gateways are defined. It is envisaged that vehicular gateways will provide an enhanced character for pedestrians, cyclists and vehicles to enter the University as shown further below in Figure 42. The additional pedestrian gateways are secondary and will provide improved pedestrian only accesses.

Vehicular gateways include:

- Parramatta Road
 - Orphan School Creek Lane
 - Ross Street
 - University Avenue
- City Road
 - Barff Road
 - Butlin Avenue
 - Eastern Avenue
- Cleveland Street / Shepherd Street
- Darlington Road / Butlin Avenue
- Codrington Street / Abercrombie Street

While there are other interfaces to the external road network, these will not form the iconic gateways as listed above (e.g. Darlington Road will form back of house entries to Merewether). These vehicle gateways connect the internal roads to the external road network and are expected to require no additional infrastructure changes to the external network for access.

The identified secondary pedestrian gateways are generally proposed at corners of the Camperdown-Darlington campus. The identified pedestrian gateways are as follows:

- Victoria Park (Law building stairs and University Avenue)
- City Road / Cleveland Street intersection
- Shepherd Street / Lander Street intersection
- City Road / Darlington Road intersection
- Missenden Road (at John Hopkins Road)

6.3.5 Transport Assessment

A key element of the strategy is to restrict access for general traffic to peripheral parking stations once this parking becomes available. As the precinct developments are completed, additional parking in these stations will allow the gradual removal of parking in the campus cores. It is assumed that these initiatives will have an impact of redirecting traffic around the entries to the University due to the current wide-spread on-campus parking and the proximity to each gate.

Emergency and authorised University vehicles will be able to use the internal shared zones to navigate the campus cores. Guidelines for use will provide clear direction for authorised vehicle users.

Traffic Redistribution

A reassignment of traffic of the AM and PM peak has been performed from the 2010 base year to the full realisation of the CIP by 2020. The critical AM peak entries into the site (in Table 7) show an overall increase of 159 trips (which is a 13% increase on 2010 traffic levels).

The assessment of the AM peak hour does not take the gate exit traffic into consideration as it has been assumed as through traffic (i.e. rat-run through the University). Therefore, this assessment is conservative as this traffic will no longer occur when restricted shared zones are in operation for the 2020 scenario, and would be significantly higher in the 2010 base case (adding further trips) than the 2020 case. PM peak trips have a similar proportion of trip changes for egress, where the entries were assumed as through traffic.

Table 7: Reassignment of Traffic – AM Peak (entries into University)

	Gate	Base 2010 AM Trips	Forecast 2020 AM Trips	Difference in Trips
Parramatta Road	Orphan School Creek Lane	78	134	+56
	Ross Street	227	160	-67
	University Avenue	96	89	-7
City Road	Barff Road	58	58	no change
	Eastern Avenue / Fisher Road	153	41	-112
	Butlin Avenue	88	188	+100
	Darlington Road	45	63	+18
Carillon Avenue	Western Avenue	181	353	+172
Cleveland Street	Shepherd Street	298	298	no change
Total		1,226	1,385	+159

Orphan School Creek Lane traffic flows estimated from Halcrow CPC letter 2008

Ross Street, Butlin Avenue, Western Avenue based on 2008 Austraffic counts

University Avenue traffic flows adapted from 2012 Barff Road PTC report and 2008 Austraffic counts

Barff Road traffic flows extracted from 2012 Barff Road PTC report

Darlington Road and Shepherd Street flows adapted from Halcrow 2008 generation rates used for University (0.61 vehicle trips / AM peak hour / parking space)

Overall, there is an expected 13% increase in traffic levels due to the 19% increase of parking levels. There will be a shift of traffic flows towards Butlin Avenue and Western Avenue to the location of the new parking stations. However, the change of traffic flows is minimal in the context of surrounding flows.

Flows into Butlin Avenue to the south are assumed to be redistributed from the main access gate at Eastern Avenue/Fisher Road from the north (there may also be a smaller amount of additional traffic at Darlington Road for USBS access). This is effectively a redistribution of movements at this City Road intersection and will have minimal impact on its operation. Intersection analysis using SIDRA indicates that the Level of Service remains at B, which is a good level of operation

The largest change of traffic flows occurs at the Western Avenue gate, where the number of vehicles movements increases from 181 to 353 vehicles in the AM peak. However, as part of the Health Precinct development, it is envisaged that a new access will be created along the southern side of the Royal Prince Alfred Hospital, which will spread the traffic load between the Missenden Road and Carillion Avenue / Western Avenue gateways. The operation of the Western Avenue gate driveway has been assessed using SIDRA. The analysis indicates that the Level of Service (LoS) is currently B and under future traffic flows changes to LoS C. This remains at an acceptable level of operation.

There is also a small increase of traffic expected at the Orphan School Creek Lane gate when the CPC opens, which will cause minimal impact on Parramatta Road due to the left-in / left-out access provision.

Cumulative Impact

The surrounding developments described in Section 3.3.2 are outlined in Table 8 with their associated traffic impacts included.

Table 8: Surrounding Developments

Development	Description	Traffic impact
Sydney Employment Lands	upgraded to mixed land use	minor traffic increase potential
Royal Prince Alfred Master Plan	consolidation and upgrade projects	no traffic increase assumed
Redfern Station Upgrade	short term easy access program	no traffic increase assumed
North Eveleigh	Stage 1 200 residential dwellings	48 peak car trips
St Pauls Graduate House	Student accommodation and associated facilities	66 PM peak car trips for functions
St Andrews Master Plan	Student accommodation and associated facilities	minor traffic increase potential
Sancta Sophia College	Student accommodation and associated facilities	minor traffic increase potential
Moore College	Student accommodation and associated facilities	minor traffic increase potential
Chris O'Brien Lifehouse	Opened in Nov 2013 on Missenden Rd	40 peak car trips

The majority of the developments are associated with College upgrades which are focused on increasing student accommodation and associated facilities. This will result in increased student accommodation in the immediate surrounds of the University which will increase active travel mode share. There is the potential for some traffic increase however this would be spread throughout the day with minimal impact on peak periods.

A number of recent and planned developments at Royal Prince Alfred Hospital are predominantly associated with consolidation and upgrade of facilities with limited additional peak hour trips expected. The Chris O'Brien Lifehouse which opened in November 2013 has only 100 car spaces at basement level which generate up to 40 car trips in the peak hour.

These surrounding developments will have minimal traffic related impacts on the operation of the University.

The North Eveleigh Stage 1 development is expected to generate 48 car trips in the peak periods. These will distribute across a number of routes with negligible impact.

Redfern Station upgrade will improve transport accessibility for the University and surrounding areas. Any increase of traffic from the University is envisaged away from these developments.

The cumulative impact of the surrounding developments will be minimal due to the nature of the land uses with many of them being complimentary to the University. The majority of trips will be focused onto the arterial routes such as City Road and Parramatta Road. Individual developments will generate vehicle movements at different times of the day with peaks not coinciding, and hence cumulative impacts are reduced.

6.3.6 Arrival Address: Drop-off / Pick-up Strategy

A number of pick-up and drop-off areas are proposed to surround the University at five locations. The arrival address is required for those who are dropping off and picking people up from the University. These facilities are accessed via the vehicle gateways mentioned in the previous section. The pick-up and drop-off locations are as follows:

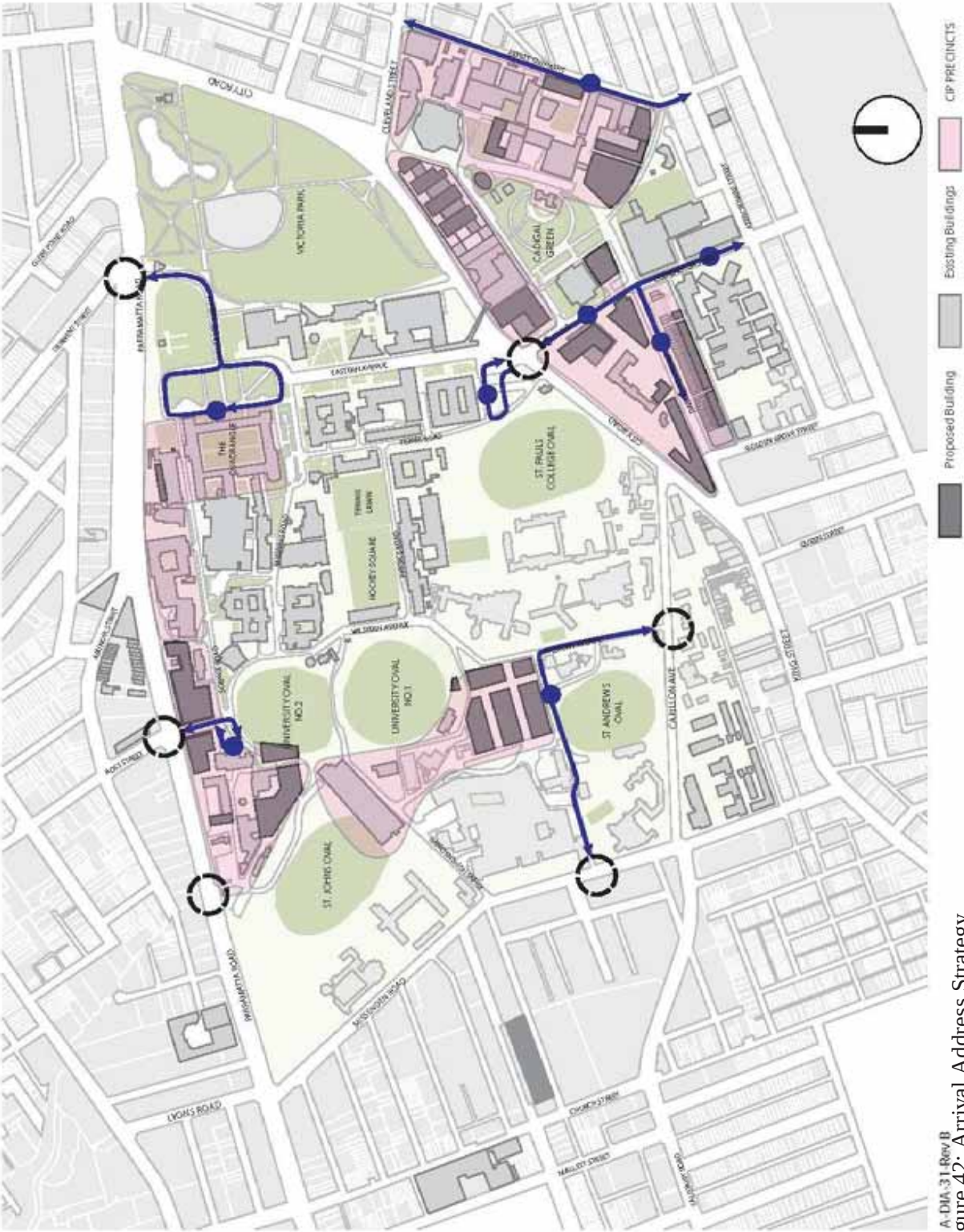
- University Avenue (outside the Great Hall)
- Shepherd Street (outside Mechanical Engineering Building)
- Codrington Street (next to The University of Sydney Business School)
- Darlington Place (next to Darlington Centre)
- Cadigal Lane (Close to Bosch Building)
- Butlin Avenue (close to Merewether Building)
- Opposite Butlin Avenue (close to Madsen Building)
- Ross Street (close to Ross Street Building)

Figure 42 below shows the routes and locations of the pick-up and drop-off locations mentioned above.

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PROPOSED CAMPUS ARRIVAL

- Vehicle Gateways
- Proposed Drop-Off/
Pick-up (Coach/Car)



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Figure 42: Arrival Address Strategy

6.3.7 Servicing and Waste Transfer Stations

Service & Waste Distribution Centres

The CIP intends to rationalise and reduce the access of service, waste and contractor vehicles to and through the Camperdown-Darlington campus through a limited number of nominated Service Distribution Centres and associated Contractor compounds. These centres will be located close to the external road network surrounding the University, in order to facilitate easy service vehicle access and egress. A typical delivery and distribution centre will include the following facilities:

- Loading dock for four large rigid vehicles
- 2 courier parking spaces
- Centralised courier and postal store and distribution offices
- Space for a fork lift
- Furniture, Finishes and Equipment stores
- Stationery and administration stores
- Flammable goods store
- Delivery of dangerous goods
- Minus 80 degree freezer storage
- Delivery of medical units
- Garbage storage - bins for general waste and recyclables and science waste including dangerous and contaminated goods

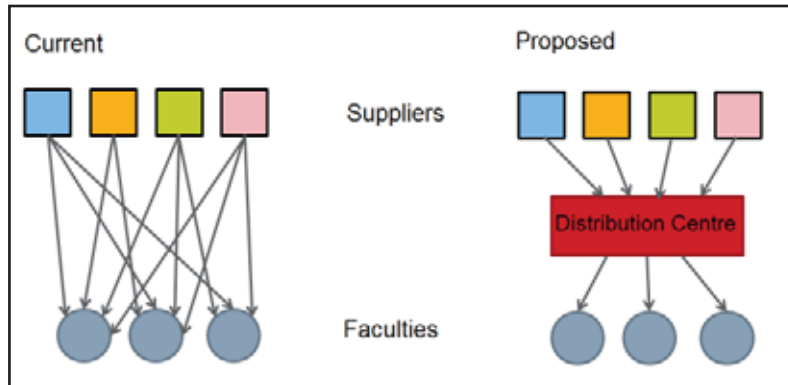
Similarly, these centres can provide centralised Waste Transfer Stations that serve as waste deposit and pick up centres across the University. Waste facilities will accommodate for:

- General waste storage, comprising dry and wet (refrigerated) storage areas;
- Recycling storage;
- Redistribution facility – furniture co-op where furniture no longer required can be sold to staff and students;
- Chemical/hazardous storage

These centres will be accessible by the University's waste contractor services and will assist in rationalising and reducing waste service vehicles across the University.

From the Service Distribution Centres, the University will take responsibility of service deliveries throughout the University. This can be achieved through:

- University service electric vehicles specially designed for accommodating loads and deliveries
- Pedestrian delivery couriers (e.g. engagement of student services).



Certain types of external service delivery vehicles will need to be given access to and through the University, including:

- Delivery of sensitive materials/items that require specially configured or climate control vehicles;
- Contractor vehicles carrying out construction works; and
- Emergency vehicles (police, ambulance, fire engines)

Contractor Facilities

Contractor facilities will be designed and located adjacent to the distribution centre. The facilities will include a contractor's central store and general amenities to provide ongoing space and facilities for contractors working on other buildings and precincts on multiple projects. Contractor facilities will be designed to assume occupation by 30 staff members at any one time and will include:

- Showers, WC and lockers
- Meeting rooms
- Offices
- General storage

CIP Location of Service Distribution Centres & Contractor Facilities

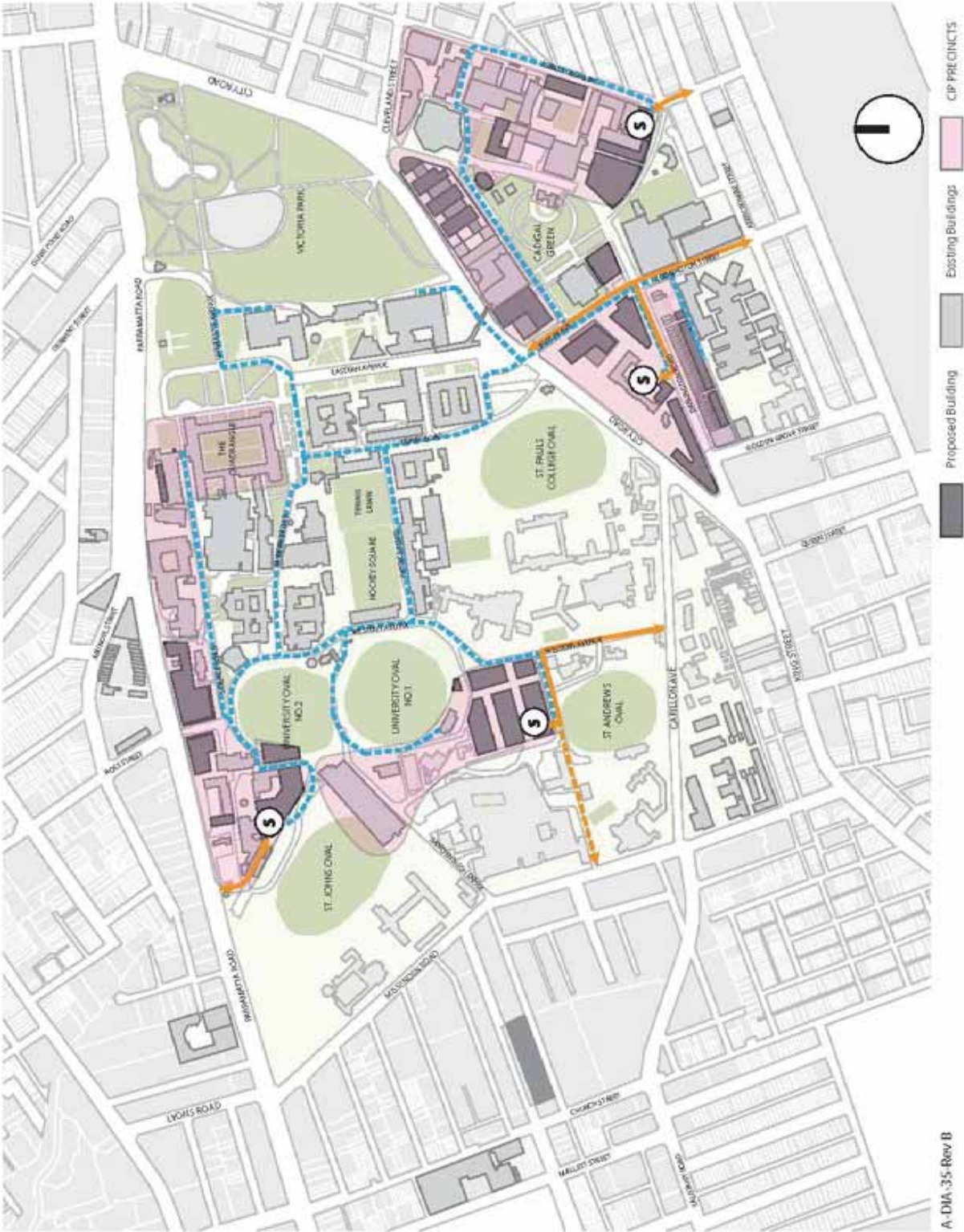
The CIP will provide for four (4) service delivery stations and contractor facilities for the Camperdown-Darlington campus:

- Life Sciences precinct (Camperdown) with access from Parramatta Road via the Orphan Creek School Lane entrance)
- The Health precinct (Blackburn-Bosch, Camperdown) with vehicular access from Western Avenue
- The Merewether precinct (Darlington) with vehicle access via Codrington Street and Butlin Avenue; and
- The Engineering/Business (southern end, Darlington) with vehicle access via Abercrombie Street and Shepherd Streets.
- The servicing strategy showing the service distribution centres and service routes are shown in Figure 43.

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VEHICLE SERVICING STRATEGY

- Campus Service Route
- Truck Access
- Proposed Future Service access road (Subject to RPA + St Andrews agreement)
- Transfer Station



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Figure 43: Servicing Strategy

The rationalisation of service delivery centres and contractor compounds/facilities brings a significant number of advantages:

- The University controlling service and contractor vehicle movements throughout the University, through advanced notification of vehicle arrivals and times
- Preventing unnecessary large vehicle access onto the University
- Reducing traffic movements across the University
- Improving pedestrian safety across the University
- Improving security across the University
- Avoiding the duplication of service deliveries and contractor vehicles to multiple faculty/school/administrative destinations

7 Disability Discrimination Act (DDA)

7.1 Existing Barriers for Access

The University generally has a highly accessible environment for both cyclists and pedestrians. However, there are some deficiencies and barriers for people with disabilities to access the University. Some examples include:

- Access to Parramatta Road bus stops and Arundel Street from Camperdown is separated by grade differences, which only provide stairs (no lifts/ramps).
- Poor design for the footbridge across City Road, whereby people with disabilities need to take two lifts to reach the footbridge on the Darlington side of the University
- Narrow footpaths with high pedestrian traffic along most internal roads of Camperdown

7.2 Disability Action Plan 2013

The DAP 2013 provides an action plan from 2013-2018 outlining a number of objectives for people with disabilities. These objectives include:

- Incorporating the rights and opportunities of people with disability in all policies and planning.
- To be a tertiary education provider of choice for all students
- To be an employer of choice for people with disabilities
- Communication and digital environment is accessible to people with disabilities
- Providing an accessible built environment to everyone
- Providing leadership to the community in developing an inclusive Australian society.

As a result of the DAP, the University proposes to increase spending on the DAP objectives each year to over \$6 million by the final year; spending over \$32.5 million in 2013-2018. This initiative is a key driver to continuing improvements for access throughout the University. While one of the key items to be addressed includes an upgrade to Parramatta Road Footbridge as Priority 1 (Camperdown – Public Domain action), City Road footbridge access will not be addressed in the DAP. The plan also outlines a number of upgrades for access to buildings and around the University including lecture theatres and roadway kerb ramps etc.

7.3 CIP Provisions for Access

The Campus Improvement Program (CIP) will create a welcoming and accessible built environment for students, staff and visitors. This will be achieved by providing facilities which comply with access regulations in the Building Code of Australia and with fitouts which are adapted or adaptable to meet the current or future needs of a welcoming campus environment.

The CIP will meet the requirements of Strategy 4 of the University Strategic Plan 2011 – 2015 and Strategy 5 of the University Disability Action Plan 2013 - 2018.

The objective of a welcoming and accessible campus has following specific requirements that should part of the brief for every project.

Wayfinding and signage and accessible paths of travel from the east side of Camperdown to the west side and north including the pedestrian bridge to Glebe over Parramatta Road. New and refurbished buildings designed and built to present day standard.

The Priority 1 and 1A Works are outlined in Table 9.

Table 9: Priority 1 and 1A Projects. Accessible Environments Plan

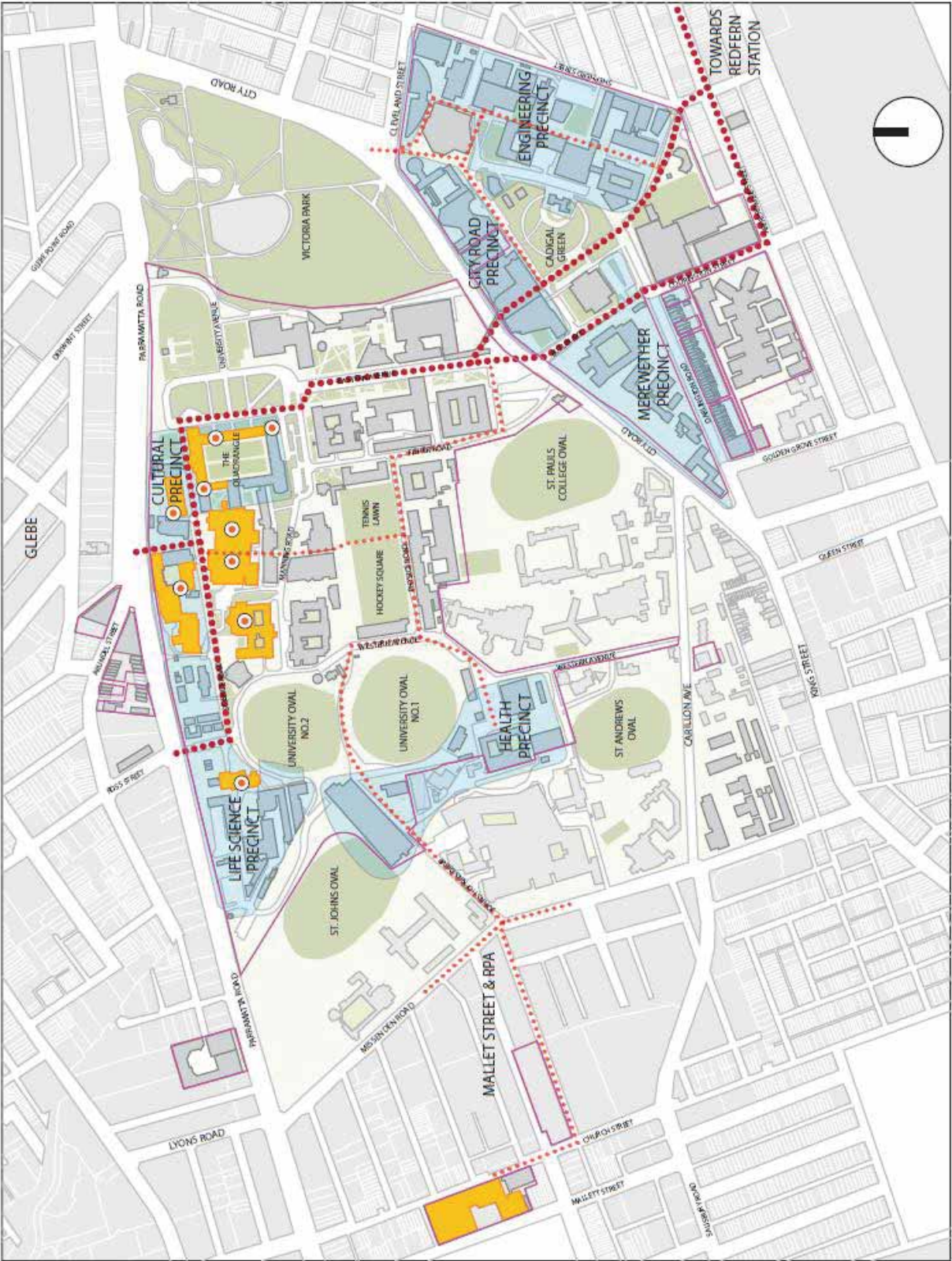
Building	Location
Marker signs with direction arrows, precinct maps and security information. Building names. Entry signs.	The University entrances, paths of travel and building entries.
Entry, lift, accessible toilets, accessible and adaptable teaching spaces.	A09 Holme Building, A12 Macleay Building, A14 Quadrangle, A15 Pharmacy and Bank Building, A16 Badham Building, A20 John Woolley Building and B01 JD Stewart Building,

Access requirements for all new buildings (shown in Figure 44) and refurbishments within the CIP Merewether, City Road, Health, Life Sciences, and Engineering precincts:

- On grade access to all buildings and lift access between all floors.
- Parking and drop off zones for persons with disabilities.
- Pedestrian links between precincts and remainder of campus and outer campus. Provide rest points at maximum 60 metres.
- Residential: 15% adaptable units/rooms.
- General teaching spaces including labs and tutorial rooms: 100% accessible and 15% of FFE to be adaptable.
- Research spaces: 100% accessible and adaptable to individuals' requirement.
- Staff spaces: 100% accessible and adaptable.

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ACCESSABILITY



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Figure 44: Plan of Camperdown-Darlington campus showing the access strategy

Definitions

Accessible Environments Plan (AEP): The AEP is the University's access masterplan and was developed in 2011 following a review of all the buildings and campuses in the Sydney region by the access consultants, Access Australia. In the AEP a list of priority projects were identified as Priority 1 and 1A Projects.

BCA Access to Premises Standard: This standard is the AS 1428 Part 1 which is designed to cater for 90% of persons with a disability.

Best practice: The term 'best practice' describes a technique or methodology that has been demonstrated through evidence-based research to produce results superior to those achieved by other means. Best practice is evolving, benchmarked and often qualitative. As best practice is evolving, the term refers to the best practice for the current year in which the particular action within this plan is carried out.

Disability Action Plan 2013 - 2018: This is the University's Third Disability Action plan, and it aims to further the human rights and inherent dignity of all students, staff and visitors to the University.

It is a key principle accepted and adopted by the University that people with disabilities have the same human rights and inherent dignity as everyone else. The University is committed to working proactively together to ensure people with disabilities have the opportunity to realise their full potential and capabilities.

The DAP outlines the aspiration of the University that within the timeframe of the next 5 years will take a coordinated approach to ensure equitable access for all students, staff and visitors.

Reasonable adjustment: The term 'reasonable adjustment' defines a workplace arrangement such as alterations to a workplace fitout or working or studying arrangement which effectively removes identified barriers for a person with a disability so that they may enjoy the same access and benefit enjoyed by all other persons (ie equitable access).

What is considered 'reasonable' will depend on the facts and circumstances and context of a site/place. As part of the University's DAP 2013-2018 all faculties/schools/business units will be tasked with preparing their own local disability action plans. This is being done to ensure that the designing of reasonable adjustments is done at a local level and informed by best practice appropriate to the particular faculty/school/business unit.

Standards

The current best practice standards for access to the built environment are the Disability Access to Premises – buildings, Standards 2010, which build on AS1742.10 Pedestrian Access standards. Therefore the University's built environment should comply with these standards. Building works from the CIP will be implemented by the Accessible Environment Plan, which was completed to complement the policy directives set out in the DAP.

These improvements and recommendations will be incorporated in the CIP.

8 Travel Demand Strategy

8.1 The University Demand Management

Demand management is any measure that reduces or eliminates the need for travel or encourages increased use of modes of travel that are an alternative to private single occupant car use, thus reducing traffic impact.

Measures to reduce demand for travel are often the most difficult to achieve but can be the most effective often achieving over 10% change or more.²¹ This is particularly the case in study areas where there is little that can be done to improve the physical infrastructure due to constraints from surrounding housing, heritage areas, topography etc.

The University lends itself well to this type of measure for the following reasons:

- There are several large trip generators in the study area that have a direct influence over those accessing their sites;
- Often the most enthusiastic take up of alternative modes of travel come from student populations; and
- There is high quality and high frequency public transport within a 10 minute walking distance of the study area.

There are a number of measures and associated actions that are appropriate for the University. These are not necessarily direct actions to reduce car use but rather set a framework within which the University can develop a long term strategy to work with the various faculties. It is expected that individual faculties within the University should have or be encouraged to develop their own travel plans with their own targets and actions. Actions identified in Table 10 (Section 8.3) are developed as University actions to coordinate, enable, encourage, monitor and improve the implementation of individual travel plans to maximise the University wide benefits. The Premiers Council for Active Living cites excellent examples of global and Australian guidance that can be used to develop quality travel plans²².

Table 10 identifies each of these actions in order of priority, determined by likely impact. Examples of previous global and Australian precedents are also identified alongside likely cost to the University, responsibility and actions.

It should be noted that a vital element of the success of these proposals is the identification of a nominated person or persons within the University to be responsible for implementing each action. This person or group would be ideal to include the below actions within their remit with a focus on understanding the issues, finding a champion within each organisation involved, taking action and monitoring successes and failures to refine and develop results.

²¹ Report by Cairns S, Sloman L, Newson C, Anable J, Kirkbride A & Goodwin P (2004) '*Smarter Choices – Changing the Way We Travel*' **Workplace. travel plans**

²² http://www.pcal.nsw.gov.au/workplace_travel_plan

8.2 Existing Travel Demand

The CIP has already included a number of transport demand measures through land use planning that will increase affordable student accommodation on site. In addition, there are proposals to improve the connectivity to existing public transport along appropriate pedestrian and cyclist routes, enhancing gateways. Parking is proposed to be rationalised to the perimeter of the Camperdown-Darlington campus to enhance the public realm within the centre of the campus areas. Prioritisation of the development staging program has also been prepared to ensure that the transition from existing to future can be made without undue impact on the operation of the University.

Arup has conducted a review of previous studies and considered the following to be some of the key transport issues:

- Availability of parking:
 - overparking / informal parking in some areas;
 - vehicles circulating while searching for a space;
 - impact of removal of cars from the centre of the campus; and
 - ‘fairness’ of the permit system.
- Access and security of walking around campus:
 - footpath capacities;
 - conflicts with circulating and parking vehicles produce unsafe and inconvenient delays for pedestrians and vehicles;
 - access and security of walking to Redfern;
 - routes for the mobility impaired are not always intuitive or easy; and
 - Abercrombie Street crossing delays / safety.
- Difficulty of external vehicular access routes:
 - Butlin Avenue / City Road intersection congestion; and
 - lack of eastbound right turns from Parramatta Road.
- Internal access and circulation:
 - service vehicles, visitors, deliveries, couriers etc. conflict with pedestrians who are delayed crossing City Road;
 - physical separation of Camperdown and Darlington by major arterial road (City Road); and
 - through traffic between City Road and Abercrombie Street via Butlin Avenue and Codrington Street.

The ability to travel by car is largely influenced by the availability of car parking at an affordable price. The provision of car parking is a balance between ample car parking with resultant congestion, safety, noise and sustainability concerns and scarce car parking with resultant deterrence of some users and visitors, and overspill into streets outside the Camperdown-Darlington campus to the detriment of the University’s relationship with the surrounding community.

A parking provision rate of one bay per 200m² Gross Floor Area (GFA) is recognised as a sustainable trade-off between these extremes by recent City of Sydney and NSW Government policy, and is in accordance with world best practice for inner city sites. This rate accords with a total University parking supply of 2,800 bays, a number and rate that might be reduced over future years as opportunities to reduce car use arise and the green travel plan measures are successfully implemented.

Parking and transport policy are also influenced by the areas external to the University. The University should engage with its neighbours, City of Sydney, Urban Growth Development Corporation, Transport for NSW, RMS and others to develop complementary walk route, bike route, and resident parking policies.

Significant actions arising from this strategy would not be limited to, but might include:

- All routes to be safely walkable, with adequate lighting and active paths
- Development of a truly accessible campus environment;
- Enforce shared zones campus-wide, with maximum vehicle speed limits of 10km/h;
- Minimise through traffic within the University by implementing peripheral car parking and considering a quality servicing strategy to address service vehicle movement;
- Iconic bold bike parking station(s) as a highly visible demonstration of best practice;
- Car Pooling, Car Share and Bike Hire operators be established; and,
- Review and implementation of a workplace Green Travel Plan that is genuinely achievable, measurable and successful.

8.3 Potential Demand Management Measures

Table 10: Demand management measures for the University

Measure	Global/Australian precedents	Cost implications	Stakeholders/ responsibility	Actions for implementation	Priority (based on likely impact)
Identify a representative who can be responsible for monitoring and coordinating activity	Global precedent indicates that Travel Plans only work where someone is responsible for implementation. This person should develop a University Travel Plan as an example.	CIS Officer time	University	Develop specific guidance or refer to appropriate other guidance for the production of Travel Plans to promote quality of plans.	Vital
Lobby government	Universities can successfully lobby government for changes to parking policies, planning regulations and procedures etc to promote sustainable modes of travel	CIS Officer time	University	Meet with surrounding authorities to discuss issues Agree a collective voice and write to Government departments	
Promote initiatives to improve the environment and raise awareness of environmental issues and indirectly transportation issues	The Green Building Council Australia encourages 'green star' ratings for communities and education facilities Other global events include: Global Day of Action on Climate Change – occurs at different times throughout the year to coincide with the UN talks on climate change ²³ Climate Week – March ²⁴ Earth Day/International Mother Earth Day – 22 April ²⁵ World Environment Day – 5 June ²⁶	CIS Officer time	University	Identify key target dates Develop a core calendar of events Work with trip generators in the area to promote these events Monitor impact on area to understand most important events	High

²³ www.globalclimatecampaign.org

²⁴ www.climateweek.com

²⁵ www.un.org/en/events/motherearthday/

²⁶ www.unep.org/wed

Measure	Global/Australian precedents	Cost implications	Stakeholders/ responsibility	Actions for implementation	Priority (based on likely impact)
Promotion of local and global events	There are many global events that can be accessed and promoted in Australia. There are many local events, one of these are listed below: Bupa walk to work day (This year this will be held in Australia on 5th September 2013)²⁷ Other initiatives that happen elsewhere in the world include: Car Free Day/In Town Without My Car – a UK initiative to discourage driving to the city European Mobility Week – 16-22 September²⁸ One World Week – October²⁹ National Tree Week – 26 November to 4 December³⁰ Green Transport Week (Environmental Transport Association) – June³¹ TfL's London Cycle Challenge – June/July³²	Marketing material costs Monitoring costs	University marketing / community engagement officer	Identify key target dates Develop a core calendar of events Work with trip generators in the area to promote these events Monitor impact on area to understand most important events	High
Focus on staff travel	Students and staff create and have very different travel patterns and travel requirements and preferences. These should be identified and distinguished from each other. Often this can use parking policies as a stick to discourage staff single occupant vehicles. A number of Australian universities have implemented parking policies that restrict parking availability	CIS officer time	Travel Planning Group	Travel Planning Group should consider separate actions for staff	High

²⁷ <http://www.walk.com.au/wtw/page.asp>

²⁸ www.mobilityweek.eu

²⁹ www.oneworldweek.org

³⁰ www.treecouncil.org.uk

³¹ www.etc.co.uk/green_transport_week

³² www.tfl.gov.uk

Measure	Global/Australian precedents	Cost implications	Stakeholders/ responsibility	Actions for implementation	Priority (based on likely impact)
Promotion of walking for those who can	Persuading people to walk is a very successful way to reduce car use. However, precedent suggests that understanding the problem is key to success. ³³ Often a poorly thought out solution can be generated from a perceived problem or a well-meaning travel planning coordinator and can be detrimental to the longer term effort.	Time of CIS Officers Monitoring costs	The University	Work faculties to determine the proportions of students and staff who could walk and target these groups Monitor events to determine success for refinement of approach	High
Engage train and bus operators for special deals	University of NSW worked with Sydney Buses to reduce waiting times for students at the Central Interchange Station.	CIS officer time	Travel Planning Group with support from Council	Discuss with faculties Arrange meetings as appropriate to discuss PT facilities	Medium
Promotion of travel planning activity throughout the University	Advertising successes can be a powerful way to engage more people in activities. Most businesses and Councils who have successful travel plans will promote this. Optus is a local example of a Travel Planning success story that shouts about its achievements ³⁴ .	Marketing material costs Monitoring costs	University marketing/communications engagement officer	Include monitoring results and success of events on the University website Develop a newsletter for issue to businesses and schools	Medium
Promotion of car share	A growing concept in many new developments, there may not be the residential density or demand in surrounding areas, however, staff at the University may be able to share their own cars with colleagues.	Time of CIS Officers	Car share companies The University	Introduce to Travel Planning Group if appropriate Work with faculties to develop car sharing as an option for staff	Medium
Use of travel plan coordination software	Common in UK. An example is iontravel which is used by Luton, Somerset, Central Bedfordshire and Cornwall Councils. ³⁵ Only really useful when there are many travel plans to monitor.	\$10,000-\$15,000 for software, annual maintenance charges of around \$4,000 per year	The University	Purchase software Employ a travel plan coordinator	Low – future requirement if many TPs to monitor

³³ Curtis, Carey and Holling, Carlindi. 2004. : Travel Demand Management at Australian Universities:

³⁴ http://www.pcal.nsw.gov.au/case_studies/optus

³⁵ <http://www.iontravel.co.uk/>

8.4 Monitoring of Demand Management Impacts

There are two appropriate methods of possible University monitoring that can be employed at the University. The first is to **monitor specific traffic movements and behaviour** throughout the University. If traffic flows continue to grow and staff and new students attempt to drive to the University to park, this will result in several impacts that can be measured:

- There will be increasing circulating traffic, double parking, ‘waiting for parking spaces’ occurring on the internal streets of the University and surrounding areas. This will increase the perception of congestion – MEASURE: Complaints from residents in the surrounding areas citing safety and congestion; and
- An increase in circulating traffic will be likely to result in an increased risk of crashes and consequential injuries within the area – MEASURE: Road safety statistics may worsen within the area.

The above measures are simple methods of monitoring that the University can employ that will indicate whether the University impacts are greater than those indicated in their previous reports.

In addition to the above, the University could initiate a **partnership approach** with the surrounding Colleges and local businesses to explain the benefits that can be achieved from the successful implementation of a travel plan for everyone in the surrounding area. This approach would encourage self-monitoring and sharing of results and is the easiest way for the University to monitor future growth through student numbers and actual mode split.

9 Wayfinding

9.1 Why is wayfinding important

Wayfinding is more than static signage – it is all the design elements and spatial tools that help you to know where you are and where you want to go on-campus and in a broader sense in the city itself. A new comprehensive wayfinding program will facilitate a University that feels less ‘busy’ and help to achieve a better visitor experience by providing the information that students, residents and visitors need to navigate the University. Allowing users to be in control of their experience and their journey through the University is important in engaging both the students and other members of the public. The proposed strong hierarchy of the movement network (made clearly visible through differentiated urban design) will deliver the optimum outcomes for wayfinding and legibility. Intuitive navigation through hints in the built form and public realm along with clear, consistent and purposeful signage can give users confidence to explore – a critical element of any learning environment. The balance between removing as many barriers to exploration and discovery as possible and providing the right level of help and assistance in a public space will be important for the feel of the future the University.

“The University of Sydney has an especially effective wayfinding and informational signage strategy, with a keen eye for design and aesthetic harmony. Nevertheless, it may be within their best interests to use the existing digital signage the way it is intended, and therefore effectively manage the student and visiting population.” – blueprint’s Wayfinding Signage: Sydney Universities 2012

9.2 Wayfinding at the University

The proposed gateways will show clear points of entry and physical wayfinding interventions can be focused at these points. The concept of the wayfinding system for the University of Sydney should be permanent, yet flexible with event-based capability. We can clearly see that this is already underway with the implementation of some digital signage and the development of a Sydney University app. Ideally a combination of intuitive layout, fixed signage, digital signage, viral marketing, planting and light projections. In addition, it should have hybrid features that tie into the digital environment. One of the clear benefits of improved and flexible wayfinding, particularly as it relates to car parking, will be reduced traffic circulation associated with searching for available parking bays.

Bicycle users should be able to navigate the shared space network using ground based and built form cues. One of the primary principles of shared space design is the elimination of signage. Elimination of the signage that we have become overly dependent on in our road environments forces the need for intuitive and navigable public places.

Pedestrians are equally important. The University of Sydney has developed an app that provides access to campus maps. This is widely used, however, the University should explore and possibly support other digital tools developed by third parties. This strategy has been employed effectively by Transport for NSW – you will now see a host of third party apps being advertised at train stations in Sydney.³⁶

There is a third party smart phone app already broadly used by the student population for navigating the University. ‘Lost on-campus’³⁷ is a brilliant digital wayfinding device that provides, as well as accurate trip navigation, communication and rating mechanisms like the ability to comment on every location, chat with your faculty in the building forum and chat with the whole University. The University should consider supporting the increased functionality of this app by engaging with the developers.

Wayfinding on-campus should not be limited to the internal places – achieving permeability will require a broader influence. Amongst other tools, the University could consider the implementation of ‘pervasive wayfinding’ – a network of smart information displays that do more than digital signs and are capable of showing relevant, up to date and useful information for people in the area. Wayfinding displays provide important information amenity to users who don’t have access to smart-phone technologies, or who would benefit from more ‘glance-able’ information. A pervasive wayfinding strategy would help the University to blend seamlessly with surrounding activity centres such as Newtown, Redfern and Glebe and to draw people to the University from those areas.

³⁶ <http://www.131500.com.au/plan-your-trip/Info-on-the-go/apps>

³⁷ <http://lostoncampus.com.au/>

10 Conclusions and Recommendations

10.1 Project Objectives

The University of Sydney commissioned Arup to prepare an Access Strategy, collating all issues and recommendations in support of the Concept Plan application of the Campus Improvement Program. This Access Strategy will support the University's vision through a major upgrade of campus facilities to create a healthy, sustainable and vibrant campus environment with seamless and equitable access to and through the campus. This Access Strategy would consider all modes of transport and strategies to improve access throughout the CIP.

10.2 Project Tasks and Conclusions

The Access Strategy provides guidance on general vehicle and service vehicle access, parking rationalisation and management, sustainable transport objectives and initiatives, and pedestrian & cycle opportunities to and through the Camperdown-Darlington campus.

10.3 Recommendations

The recommendations from this report are outlined below:

- **Vehicle Access:** It is recommended that six gateways will provide drop-off and pick-up points to facilitate access to each of the precincts for taxis, buses and private vehicles. Shared zones will be implemented along the remaining internal University roads (much like Eastern Avenue). The impact of the redistribution of traffic due to the revised internal road system has been assessed and all access intersections will continue to operate at acceptable levels of service. The cumulative impact of the surrounding developments have been considered and will be minimal due to the nature of the land uses with many of them being complimentary to the University.
- **Parking Strategy:** The car parking strategy has sought to minimise additional car parking facilities in line with the objectives of increasing the use of public transport. Standard parking pricing should increase to align with other universities in Sydney such as the University of NSW where parking permit charges are approximately \$800 per annum. It would be advisable to gradually increase pricing to a similar level
- **Servicing Strategy:** Four peripheral Transfer Stations will be constructed to manage all of the loading and unloading, recycling and waste. This centralisation should lead to efficiencies in both ordering and delivery across the wider campus.
- **Cycling Strategy:** Shared zones will provide an environment where all mode access is equally shared, as opposed to faster segregated cycleways. Cyclist behaviour on-campus will be regulated through the design of shared spaces that necessitates lower speed travel and heightened awareness. As precincts are developed, additional secure bicycle parking will be provided in key locations and bicycle racks will be installed at grade adjacent to the shared path and access roadways. End of trip

facilities in the form of showers and lockers will be incorporated into the new precinct developments.

- **Pedestrian Strategy:** Shared zones are proposed on many of the internal roadways where pedestrians and cyclists will have equal priority with authorised vehicles, excluding general vehicles. In other areas pedestrian footpaths and shared cycling facilities will complete the connected movement network.
- **Travel Demand Strategy:** It is recommended to investigate further initiatives for increased public transport usage by staff such as subsidised public transport tickets, to be competitive with parking permit benefits. Bicycle usage would also be encouraged by further provision for bicycle parking and end of trip facilities within the new developments of the CIP.

Appendix A

Case Studies

Case Study: How universities in Australia have reduced their reliance on the private car

The University of Sydney Travel Survey Results

In 2012, the University students and staff at the Camperdown and Darlington campuses had a mode share of 53% public transport use, 26% either walking or cycling and 21% using a private car.

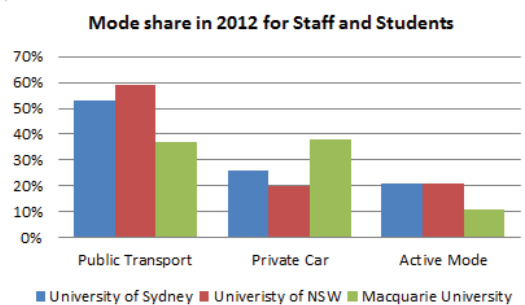
The cost of a parking permit is a maximum of \$285 (in 2013), restricted to only staff and post graduate students. 37% of staff permit holders also lived within 10 km of the University. Staff are also able to salary sacrifice their car parking permit.

This case study looks at how other universities in Sydney have reduced their car mode share by implementing higher parking permit costs since 2007.



Due to increasing congestion on Australia's road network and need for sustainable options, universities are becoming increasingly aware of the need to encourage alternate modes to the private car.

The travel mode surveys of three universities were analysed to see current mode shares and how this mode share has been improved in the past. The current mode share of The University of Sydney, University of NSW and Macquarie University is shown in the below figure.



From these travel survey's it was also found that staff were more inclined to drive than students with 44% staff at the University of NSW driving, compared to 65% at Macquarie University and 36% at the University of Sydney.

Both the University of NSW and Macquarie University have reduced their staff and student car mode share dramatically since 2007.

The University of NSW reduced car mode share of staff from 59% to 44%, and students from 30% to 14% by 2012. Similarly, Macquarie University reduced car mode share of staff from 73% to 65%, and students from 44% to 38% between 2007 - 2010.

How to reduce private vehicle drivers to the University?

The University of NSW have far higher parking permit fees of a maximum of \$850 annually respectively. This can be compared to the University of Sydney parking permit fee of \$285 annually.

The University of NSW also provides staff salary sacrifice of public transport tickets as an incentive to use public transport.

These incentives have worked to reduce the number of car drivers to the University of NSW.

Case Study: How universities around the world have reduced their reliance on the private car

The University of Sydney

In 2012, Sydney University students and staff at the Camperdown and Darlington Campuses had a mode share of 53% public transport use, 26% either walking or cycling and 21% using a private motor car.

Of these results, over all University of Sydney campuses, 61% of students take public transport compared to 36% of staff. The use of the private car was 36% of staff and 17% for students.

This case study looks at how other universities around the world have reduced their reliance in the private vehicle since 2007.



Universities in America and Canada have a history of high reliance of the private car, however recently there has been a trend towards sustainable modes of transport such as active modes and public transport. This case study looks at how two universities from America and Canada have reduced their reliance on the private car.

Portland State University (Oregon, America)

Portland State University currently has 30,000 students enrolled. In a bid to reduce private vehicle use, the university implemented a Flexipass and an all zone monthly pass for a bus operator at a rate of 30% of retail value. The Flexipass allows multiple mode trips on public transport in Oregon, encouraging transfers and integrated transport initiatives. The all zone monthly pass allows unlimited trips for a certain bus operator, encouraging public transport usage.

The ticket discount resulted in a decline of car usage from 40% to 29% and an increase in public transport use from 32% to 38% the year following this scheme indicating a mode shift towards more sustainable modes of travel.

University of British Columbia (Vancouver, Canada)

The University of British Columbia is located approximately 20 minutes west of Vancouver, and has approximately 47,000 students and 9,000 staff at the university, with approximately 15,000 living on campus.

In an attempt to reduce car reliance, the university introduced three schemes:

- U-Pass: which is a universal transport pass giving students unlimited public transport use for a fee of \$35.00 per month (usually \$81/month).
- Staggering of class start times
- Reducing 25% of total car parking spaces

The implementation of these schemes saw students and staff arriving to the university by car fall from 77% to 48% from 1997 to 2010, and the number choosing public transport rise from 18% in 1997 to 49% in 2010.

When the U-Pass was implemented in 2002, approximately 15,000 extra students and staff began using public transport. By reducing travel costs this promoted a mode shift from cars to public transport.

Case Study: How universities around the world have implemented bike share schemes

The University of Sydney

The University of Sydney is considering ways to promote active modes of transport to the university. Currently, cycling mode share for active modes to the University campus is 26% of students and staff. Of this 26%, approximately 6% cycle to the campus.

This case study looks at how universities around the world have implemented a cost effective bike share scheme.



There are a number of cities and universities both locally and around the world that have implemented bike share schemes to promote cycling. These include:

New York University (America)

The New York University currently runs a bike share program, which users must register and attend a seminar on how to use and lock up bicycles. Bicycles may then be rented from various locations around the University. Helmets must be worn and can be rented for a small fee from the bicycle station. Users must return the bikes by the end of the day or may receive a suspension.

Aristotle University of Thessaloniki (Greece)

The Aristotle University of Thessaloniki has implemented an hourly based charging scheme. The charging scheme starts at approximately \$1.50 AUD (1 Euro) plus \$0.50 AUD (0.3 Euro) for every extra hour. These bikes can also be rented for 24 hours for approximately \$6.00 (4 Euros). This system is run by volunteers and revenue generated is used to upgrade and extend the bike scheme.

University at Buffalo (America)

The University of Buffalo has implemented a bike share scheme for a membership fee of \$10. Bikes are left at 5 hub locations around the University campus. Students are also able to track bike availability online. Once the student arrives at the bike station, they type a code onto the bike keypad and a bike is unlocked for use. Students need to return the bike to a hub or they will receive a fine.

La Trobe University (Melbourne)

La Trobe University has implemented a free on-campus bike share program. Users of this program register for free for the bike share program. They receive a bike share key, bike helmet, front and rear lights, cycling information and an invitation to a cycling confidence training session. Users are then able to unlock any of the 120 bikes around campus at 11 docking stations. At the end of semester, users must de-register and return the helmet, bike key, and front and rear lights in good condition, or receive a fine for each item lost or damaged.

Case Study: How universities around the world have used electric vehicles for service distribution

The University of Sydney

The University of Sydney is proposing to implement a car free zone in the central areas of the Camperdown and Darlington campuses to restrict parking and general vehicle usages. However, the roads will still be required for servicing to the various building loading and waste facilities.

To make the university campus safer and more sustainable, the university is proposing peripheral transfer distribution centres, where all deliveries and waste will be gathered and redistributed to/from each facility via electric vehicles within the university grounds.

This case study looks at how other universities around the world have implemented this strategy successfully.



There are a number of universities around the world that have converted their service vehicle fleets from diesel/petrol vehicles to sustainable electric vehicles. This case study focuses on how the University of Nebraska-Lincoln and The University of North Carolina began using electric vehicles for servicing needs.

University of Nebraska- Lincoln

In October 2012, the University of Nebraska- Lincoln purchased two green vehicles manufactured by Mitsubishi called i-MiEV. These vehicles were used by the University Courier Services to make on- campus deliveries.

These vehicles are capable of travelling a range of 120km before requiring a recharge, which is higher than the average daily distance travelled by the university service vehicles. Even during winter months, when the vehicles ranges were found to be less than the 120km range, they were still more than adequate for daily use.

These vehicles performed the job well, with enough horsepower and torque to complete the vehicles tasks efficiently. The vehicle also came with a seven year warranty for the motor and battery.

The complete life-cycle assessment cost analysis is not currently available as this is a relatively new technology, thus don't know how long the parts last on average.

The University of North Carolina

In 2010, the facilities services of The University of North Carolina took up a grant from the Clean Fuel Advanced Technology grant awarded by the NC Solar Centre.

The university has successfully replaced four combustion power vehicles with two electric vehicles. These electric vehicles have been responsible for delivering mail all over campus.

These vehicles are able to travel at a top speed of 40km/h and are street legal in America, however are limited to roads with speed limits under 60km/h.

For more information:

<http://newsroom.unl.edu/announce/todayatunl/1690/9517>

<http://www.sustainability.unc.edu/Initiatives/CampusOperations/CampusFleet/ElectricVehiclesatUNC/tabid/1228/Default.aspx>

Case Study: How universities in Australia have introduced shared zones

The University of Sydney

The University of Sydney is proposing to implement a car free zone in the heart of the Camperdown and Darlington Campuses to increase the safety and accessibility of pedestrians and cyclists within university grounds.

Certain roads will however still remain assessable for service vehicle access. Shared pedestrian, cyclist and vehicle roads will have to be implemented to provide a safe environment for all modes.

This case study will look at how other universities around Australia have implemented this measure and the guidelines in which this shared zone can be built.



Universities in Australia have been implementing shared zones to increase pedestrian and cyclist safety. Shared zones in Australia must have a 10km/h speed limit, and vehicles must always give way to pedestrians.

Universities that have shared roads as part of their internal road network include:

- The University of the Sunshine Coast
- University of New England (planned)

Shared zones have been implemented in these universities to give pedestrian priority but to ensure practical access to buildings is kept.

Criteria of Shared Zones

Criteria that should be followed in accordance with transport for NSW guidelines are as follows:

- Current traffic flows must be below 100 vehicles per hour and below 1000 vehicles per day
- Current speed limit must be less than 50km/h
- Length of proposed shared zone must be less than 400 metres
- Current speed limit of adjoining roads must be less than 50km/h
- Current carriageway width must have minimum trafficable width of 2.8m
- Route access must not be located along bus routes or heavy vehicles routes except delivery and garbage trucks
- Kerbs must be removed unless accepted by the RMS

Most of Sydney University roads comply with these criteria of shared zones.

Case Study: How Universities in Australia have introduced pedestrian and cyclist shared paths



The University of Sydney

The University of Sydney is proposing to implement a car free zone in the heart of the Camperdown and Darlington Campuses to increase the safety and accessibility of pedestrians and cyclists within university grounds.

This case study will look at how Macquarie University and the University of New South Wales have implemented pedestrian and cyclists shared paths. The RMS have prepared a study on the impacts of pedestrian and cyclists conflicts within these shared paths, and the results have been shown.

Criteria for these shared zones are also given with relation to RMS guidelines.

There are many universities around Australia that have implemented pedestrian and cyclist shared paths to provide a safer environment for pedestrians and cyclists. Cyclists are not allowed to use pedestrian footpaths unless signs state otherwise. Universities in Sydney that have included a pedestrian and cyclists shared zones include the Macquarie University.

Macquarie University

All pathways on the Macquarie University campus are shared-use zones meaning pedestrians and cyclists are allowed to use the pathways. The RMS has also funded a shared path from Macquarie Park train station to Macquarie University.

Study on Bicyclists and Pedestrians Safety on Shared Paths (RMS 2009)

The RMS completed a report in 2009 into pedestrian and cycle shared zones looking at the number of incidents between the two modes.

The study looked at shared paths in Sydney, Newcastle and Wollongong areas. It was found that only 5 near misses occurred during the 672 hours of observation in all sites between pedestrians and cyclists.

19% of the shared paths users were cyclists with the remainder being pedestrians.

Criteria of pedestrian and cyclist shared path

A shared zone may be appropriate where:

- Demand exists for both a pedestrian path and bicycle path, but not enough use for separated facilities.
- An existing footpath has low use, and may be converted into a shared pedestrian and cycle path
- There is an existing road for faster cyclists to limit conflict for pedestrians and cyclists

Shared paths may use an existing footpath if:

- Suitable for speeds of lower than 15km/h due to driveway crossing, and should cater for the young and inexperienced cyclists

The width of a shared path differs with use:

- Local access path – 2.5 metres
- Commuter path- 3 metres
- Recreational Path- 3.5 metres