# CBD & South-East Light Rail Project

## Project SSI 6042

## Submission on CBD & South-East Light Rail Project

Submitted to NSW Department of Planning & Infrastructure
On Behalf of University of NSW

Volume 1 of 1

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# Executive Summary

The proposed CBD and South East Light Rail (CSELR) project provides a once-in-a-generation opportunity to provide central and south-eastern Sydney with a world class light rail system.

The stated objectives of the CSELR project are to:

- Improve reliability and efficiency of travel to, from and within the CBD and suburbs to the south east;
- Improve access to major destinations in the south east including Moore Park, UNSW , Royal Randwick Racecourse and Randwick health precinct;
- Improve the overall amenity of public spaces in the CBD and suburbs to the south east;
- Increase the use of sustainable transport modes in the CBD and suburbs to the south east;
- Satisfy long-term travel demand between the CBD and suburbs to the south east; and
- Facilitate the continued, orderly and efficient growth of urban development and economic activity within the CBD and suburbs to the south east.

Overall, the likely public benefits are:

- Improved:
  - Accessibility/connectivity;
  - Capacity;
  - Efficiency;
  - Quality;
  - Reliability;
  - Pedestrian amenity;
  - Integration with other services; and
  - Sustainability (via mode shift and urban densification).
- Reduced:
  - Traffic congestion;
  - Travel times;
  - Public transport operating costs (over time); and
  - Noise and emissions (in some areas).

In general, the CSELR provides a significant opportunity to enhance and grow a number of key locations along its route, including a number of locations and places of international standing and reputation. This includes the Randwick Education & Health Specialised Centre (the Centre), and in particular UNSW. The likely benefits to the Specialised Centre are increased business confidence and investment in the Centre, enhanced standing, increased productivity, research, economic growth, employment and change. Above all, successful delivery of the CSELR project will cement the Centre as a hub for education, medical, research, and supporting activities excellence.

As a key partner in the Centre and the CSELR delivery process, UNSW strongly supports the project and the public benefits it will bring to the community, the Centre and to the University.

UNSW shares the same objectives and stated likely public benefits as Transport for NSW (TfNSW). UNSW has also identified its own key project objectives since its involvement as a lead partner and key stakeholder in the process. These key objectives are:

- Staff and student safety;
- Improved urban amenity;
- A fully integrated transport solution; and
- Environmental sustainability.

Whilst these objectives are broadly met by the exhibited scheme presented in the exhibited Environmental Impact Statement (EIS), UNSW has focussed its attention on its fundamental concern, staff and student safety, to ensure a consistent, but superior outcome may result, not only for its community, but also the wider community.

To that end, UNSW, with the assistance of a specialist consultant team, has prepared a suggested design for each of its stops (UNSW Anzac Parade and UNSW High Street) to ensure shared TfNSW and University objectives and public benefits can be best achieved. These suggested designs form part of this submission.

UNSW acknowledges the early stage of design reflected in the EIS Documentation and the constructive role of the TfNSW project team in supporting and guiding the suggested designs in this submission.

This submission also addresses a number of construction-related and operational concerns remaining for UNSW in this phase of the process. These concerns relate principally in ensuring UNSW's typical daily operations can continue as unaffected as possible in recognition of the importance the University plays in the Centre and to the economy in general. Any significant detrimental effects have the potential to introduce wider-ranging and longer-term impacts upon the Centre's and University's viability, amenity, character and reputation.

In continuing to work and collaborate with TfNSW (and the contractor) on a range of design and construction-related matters, shared objectives of the project that benefit the wider community as well as the Centre and the University will be able to be successfully met.

# 1.0 UNSW supports the project

As a key partner in this once-in-a-generation project, UNSW strongly supports the CBD and South East Light Rail (CSELR) proposal and its broader objectives and wide-ranging benefits it will bring to the CBD and the south-eastern suburbs, for the following reasons:

- The opportunity to improve pedestrian and passenger safety, in particular for UNSW students and staff within the network;
- Improved reliability, efficiency, amenity, capacity and quality of the public transport network;
- The provision of a fully integrated transport solution with access to major destinations in the south east including Moore Park, UNSW, Royal Randwick Racecourse and Randwick health precinct;
- Opportunities to improve the overall amenity of public spaces and the public domain;
- The increased use of sustainable transport modes and improved environmental sustainability;
- Meeting long-term travel demand between the CBD and suburbs to the south east and leaving a lasting legacy; and
- Facilitating orderly and efficient growth of urban development and economic activity along the corridors and particularly within the Randwick Education & Health Specialised Precinct.

Reflecting this support and partnership approach UNSW has committed to provide land and other resources to the project.

# 2.0 The importance of the UNSW campus

## 2.1 An institutional place of significance

UNSW is an education and research institution of state, national and international significance. The UNSW Kensington campus (together with the Randwick Hospitals campus) is an important place which is reflected in State planning policy in its key role within in the Randwick Education & Health Specialised Precinct.

The Precinct is also a significant place as an economic driver, cultural and education meeting place, hub of technological advancement and a range of co-located land uses, including residential and key worker accommodation.

As an educational institution, UNSW is a significant contributor to the national, state and local economies with an estimated $1.5 bn direct fee revenue from fee-paying overseas students over the life of the CSELR project. Additionally, it contributes to the economy through investment in its' built infrastructure, estimated to be $1.2bn over the life of the project, and through its' research and collaboration with industry partners. UNSW is the locality's largest employer with about 6,000 staff, in the order of 37,000 full time equivalent students as part of a total student cohort of more than 50,000 students and has many visitors for specific events such as graduations. These students, staff and visitors inject about $150 million into the local economy annually.

Just as importantly, the campus is a cultural centre being a publicly accessible place of local history with significant landscape, urban design and architecture. It serves as a significant amenity within the Randwick Municipality and beyond.

Furthermore, the CSELR project seeks to service, link and complement all important land uses (of national and international standing) along its routes, such as the Sydney Opera House and the Circular Quay Precinct, the Sydney Cricket Ground, Allianz (Sydney Football) Stadium, Fox Studios, Randwick Racecourse, UNSW campus, and the Randwick Hospitals campus. These important land uses along the corridors are identified in **Figure 1** below. See also Drawing 1 in **Appendix A**.

These important places also provide a high level of cultural significance in terms of landscape. The parkland and fig tree character of the corridors is highlighted in **Figure 2**. (See also Drawing 2 in **Appendix A**). This includes landscapes along Anzac Parade at the Sydney Cricket Ground, Centennial Parklands, Alison Road and Wansey Road at the Randwick Racecourse and UNSW campus with arrival at the Chancellery Forecourt, and at Anzac Parade at the UNSW campus where this character re-emerges along the corridor for the extent of the campus frontage forming an important arrival statement.

The key UNSW campus gateways and malls in Anzac Parade and High Street provide the defining symbols and character for the campus as a place. Indeed, the main entries to the Kensington campus off Anzac Parade and High Street are University Mall and the Clancy Forecourt (at Gate 9) which each provide the gateway and identity to the Randwick Education & Health Specialised Precinct and define places of state and national significance. This is programmed to be further enhanced by the completion of the College Walk connection to Anzac Parade.

Each stop proposed at UNSW (UNSW Anzac Parade and UNSW High Street) will transform the address of the University and provide the opportunity for positive change and improvement of the streets that contain the line as well as the surrounding public places. Accordingly, the prominence of the UNSW Anzac Parade and UNSW High Street light rail stops require careful consideration and

demand a high quality design in any design resolution to ensure appropriate treatment

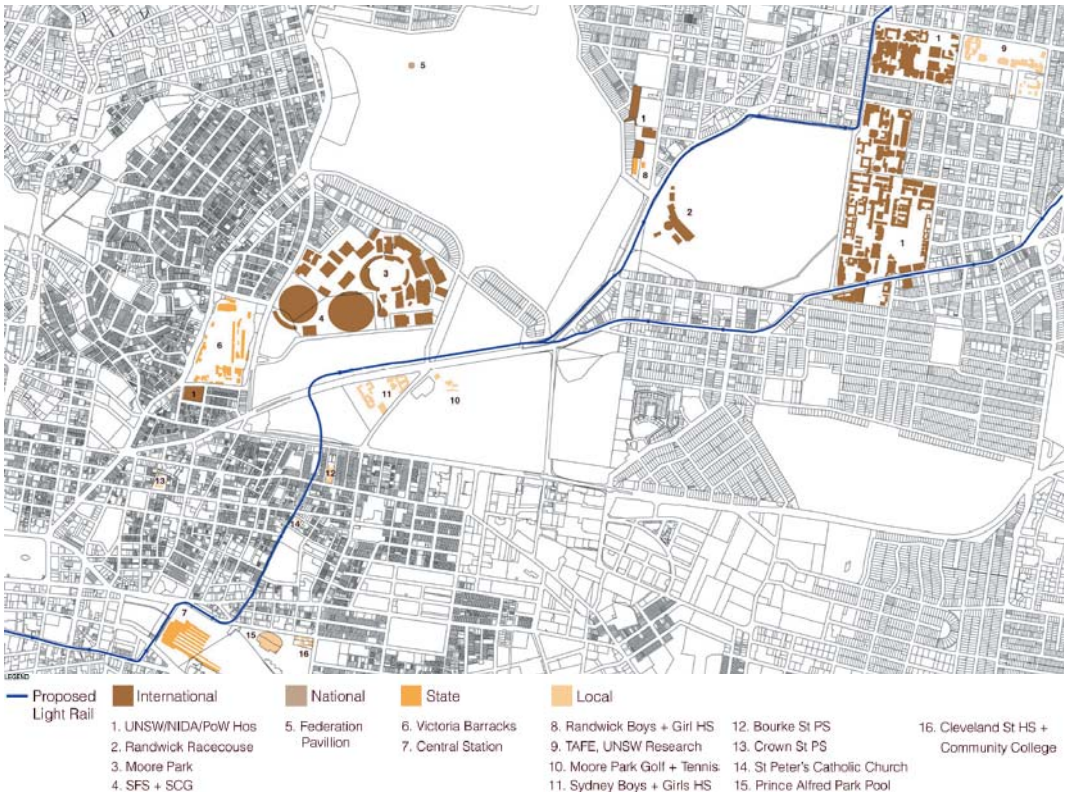


**Figure 1** – Places of national and international standing (south-eastern arms of the CSELR corridors)

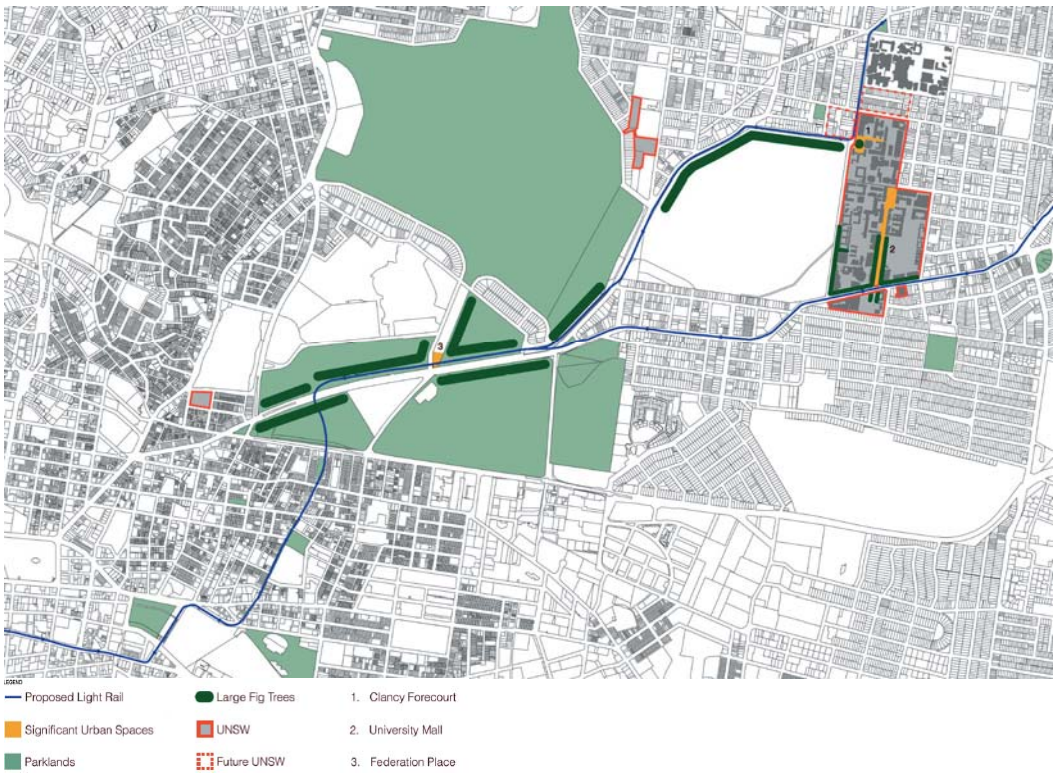


**Figure 2** – Significant parklands, landscaping and significance of the UNSW location

## 2.2 UNSW public transport patronage

### 2.2.1 Existing patronage

UNSW's daily staff and student population exceeds 43,000 which is greater than the populations of many larger inland NSW towns, such Orange or Bathurst.

UNSW is a significant contributor to the ongoing success of the Sydney public transport network and the success of the CSELR, bringing some 25,000 passengers to the campus weekdays (see **Figure 3** below). Some 65% of all arrivals and departures by bus alone are via the UNSW Express routes to and from Central Station (see **Figure 4**). The total number of users of these services is 17,000 (out the 25,000 public transport passengers). The wider bus network is shown at **Figure 5**. Figure 5 is also included in **Appendix A** as Drawing 3.

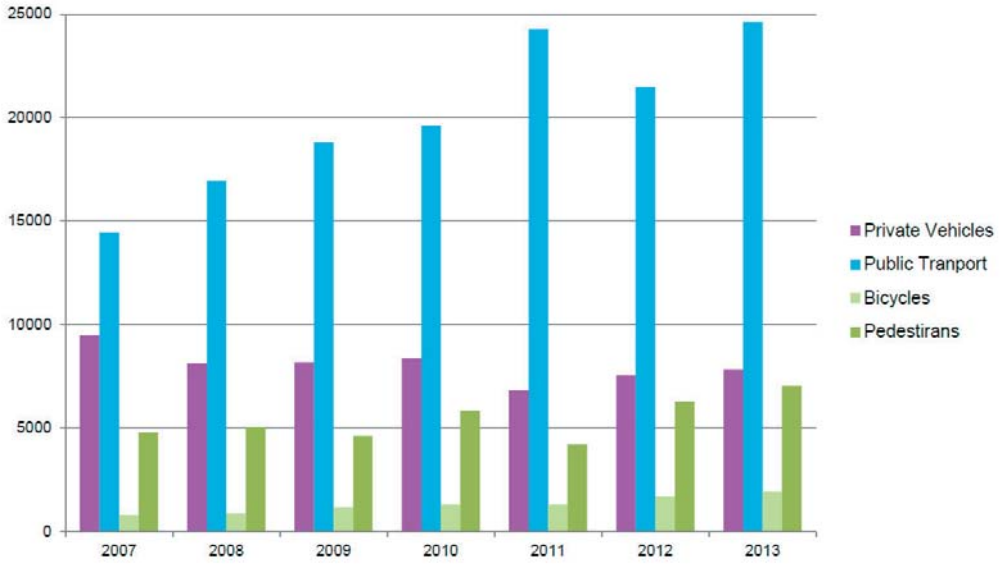


**Figure 3** – Modal split trends 2007-2013 (staff & students)

*(source: UNSW 2013 Travel Survey and Campus Counts Analysis Summary)*

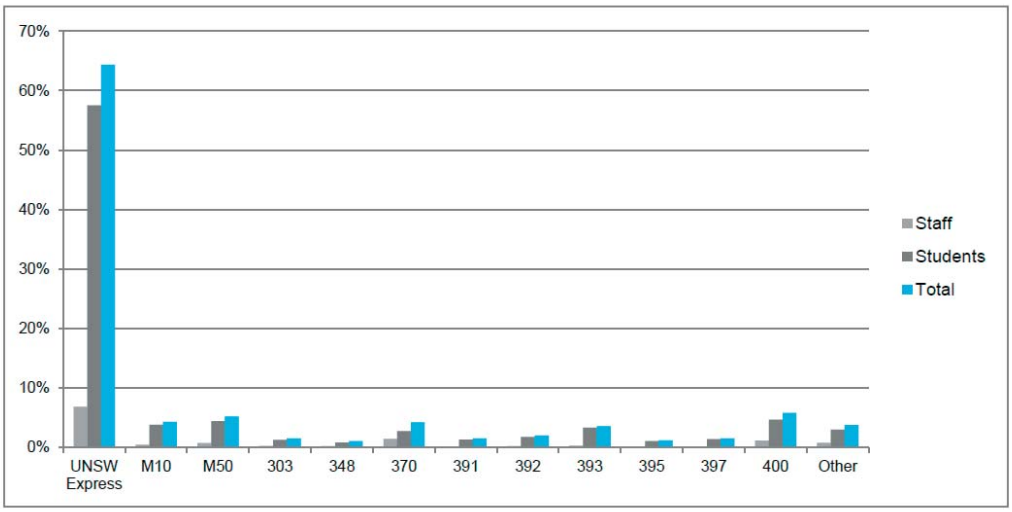


**Figure 4** – Arrival and Departure by Bus Route

*(source: UNSW 2013 Travel Survey and Campus Counts Analysis Summary)*

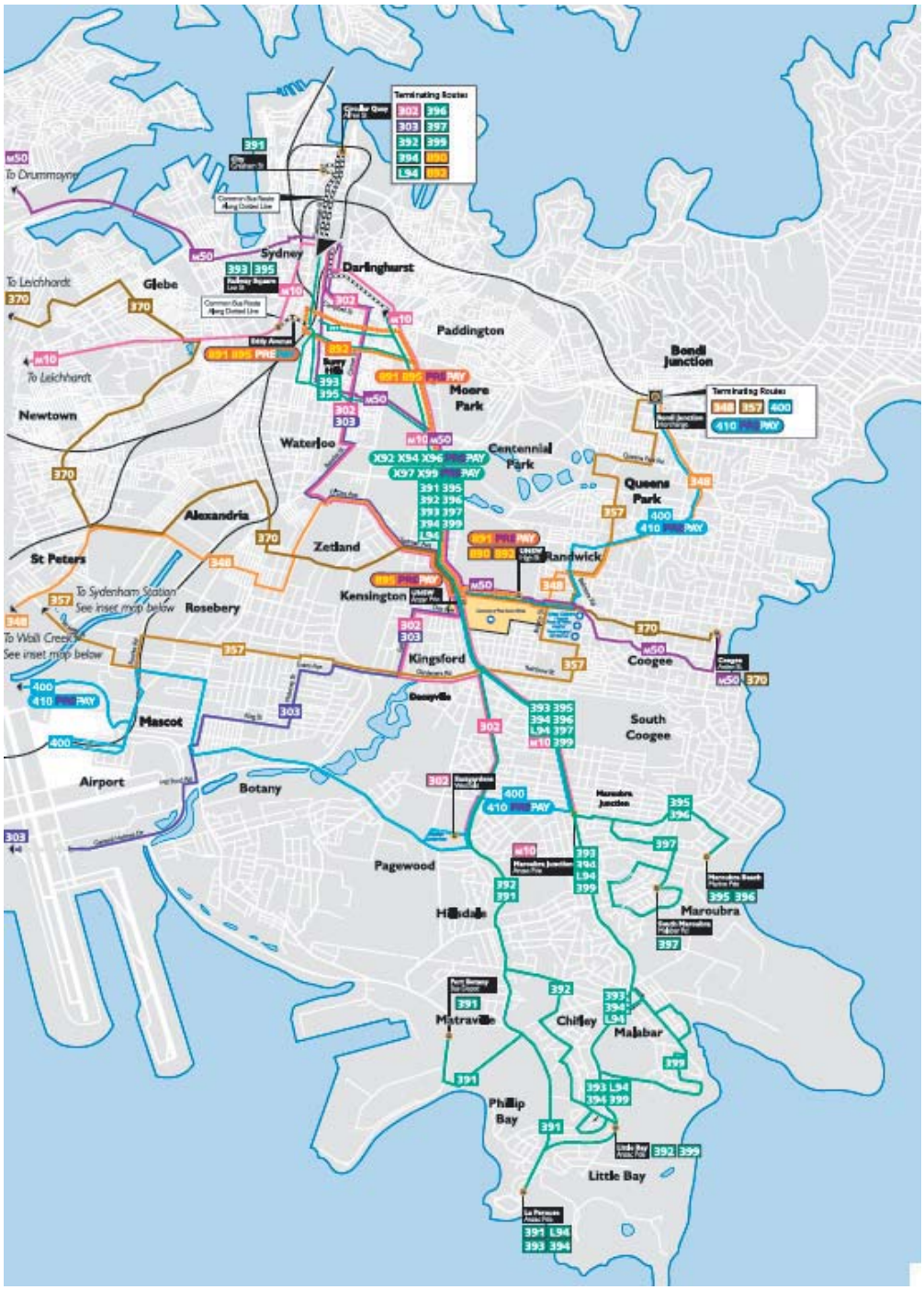


**Figure 5** – Existing Bus services to UNSW

To that end, the UNSW Kensington Campus is presently Sydney Buses biggest single customer destination. This level of patronage is expected to continue to grow as UNSW itself grows. Indeed, UNSW provides "special event" status to the public transport system twice on a daily basis. The EIS has noted this in nominating the two proposed UNSW stops as the 4th and 5th busiest in the CSELR project, and the two busiest in the south-east corridor.

**Figures 6** and **7** below, developed from the UNSW annual Travel Survey, highlight the distribution of arrivals to, and departures from, the campus.These demonstrate the dominance of the pedestrian entries off Anzac Parade at University Mall and at Gate 2 in High Street in the lower campus, and Gate 9 in the upper campus at the High Street and Wansey Road intersection. The volume of pedestrian traffic

through the campus to get to these arrival and departure points shows strong desire lines or travel paths.

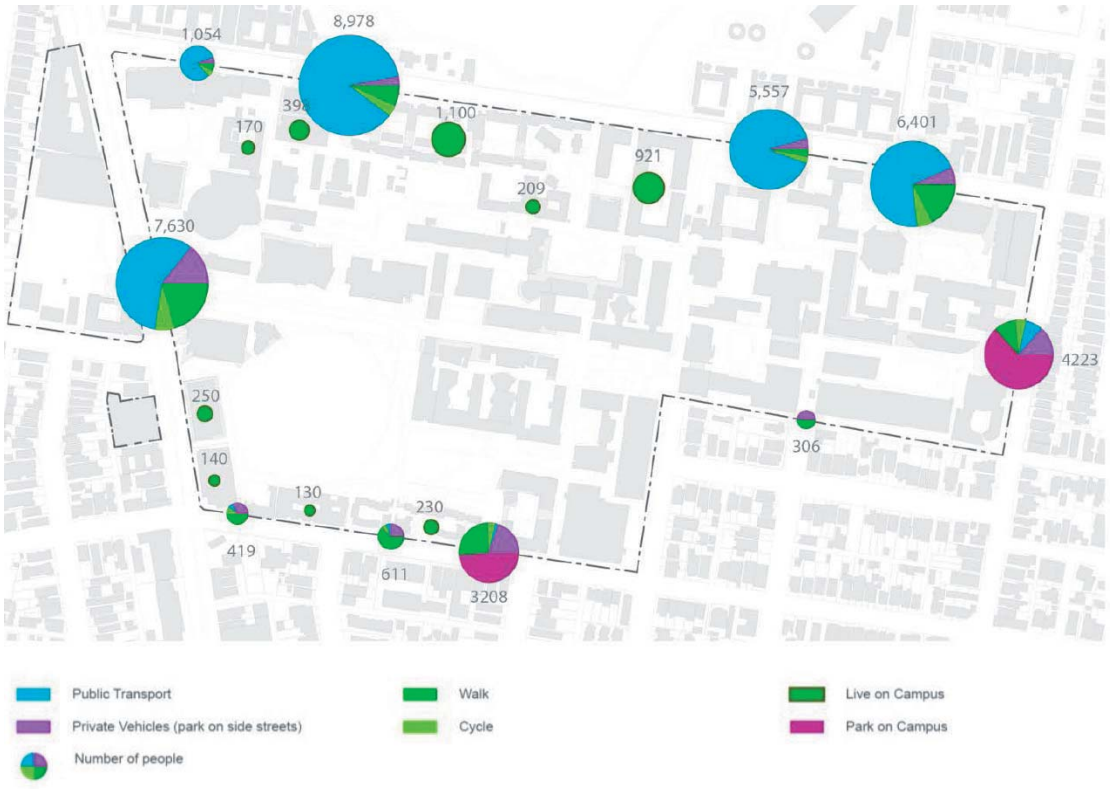


**Figure 6** – Arrival Points to the Campus and Volumes (2013)

*(source: UNSW 2013 Travel Survey and Campus Counts Analysis Summary)*


**Figure 7** – Departure Points from the Campus and Volumes (2013)

*(source: UNSW 2013 Travel Survey and Campus Counts Analysis Summary)*

## 2.2.2 Projected patronage

Projected UNSW patronage of both the CSELR and buses in AM arrivals and PM departures in 2020, as developed from the UNSW annual Travel Survey, is shown below at **Figures 8** and **9**. See Drawings 5, 6 and 7 in **Appendix A** for further detail around these projections.

As seen above, UNSW has projected public transport patronage growth to 2020. Projections beyond 2020 to 2036 (as used by TfNSW in the EIS) may be extrapolated from this data and be part of ongoing collaboration and discussion around the CSELR project. Note: the data for 2036 would need to consider not only UNSW growth, but also any other growth resulting from rezonings and new development into the future.


**Figure 8** – UNSW projected public transport AM arrivals in 2020


**Figure 9** – UNSW projected public transport PM departures in 2020

### 2.2.3 Peak periods

Review of the data contained in the EIS with respect to the daily and peak public transport loads to and from campus appears to be understating the level of existing (and likely future) UNSW public transport patronage.

**Table 1** below sets out the daily public transport arrivals and departures at the main gateways into and out of the campus based on the UNSW 2013 Travel Survey and Campus Counts Analysis Summary (see **Appendix B**). The table demonstrates that by 2020 and with growth at the campus and with the benefit of light rail that these volumes will grow substantially.

**Table 1** – Daily Arrivals and Departures by public transport at main gateways (2013 & 2020)

| | 2013 by bus (rounded) | 2020 projection by CSELR & Bus (rounded) |
|---|---|---|
| Arrivals | | |
| Anzac Parade Main Entrance / Gate 2 | 11,000 | 15,700 (+43% growth) |
| Gate 8 / 9 | 9,000 | 12,400 (+38% growth) |
| Departures | | |
| Anzac Parade Main Entrance / Gate 2 | 14,400 | 18,900 (+31% growth) |
| Gate 8 / 9 | 6,900 | 9,500 (+38% growth) |

The peak arrival and departure times (and peak volumes) at UNSW are represented in **Figure 10** below. This demonstrates a unique peak period from 8:45am to 9:00am when some 2,250 staff and students arrive within this 15 minute interval. Across the period 8:30am to 9:15am the total arrival volume is some 5,650 staff and students. As can be seen by the graph, departures times are generally distributed more widely across the afternoon peak period but also have distinctive spikes in activity.

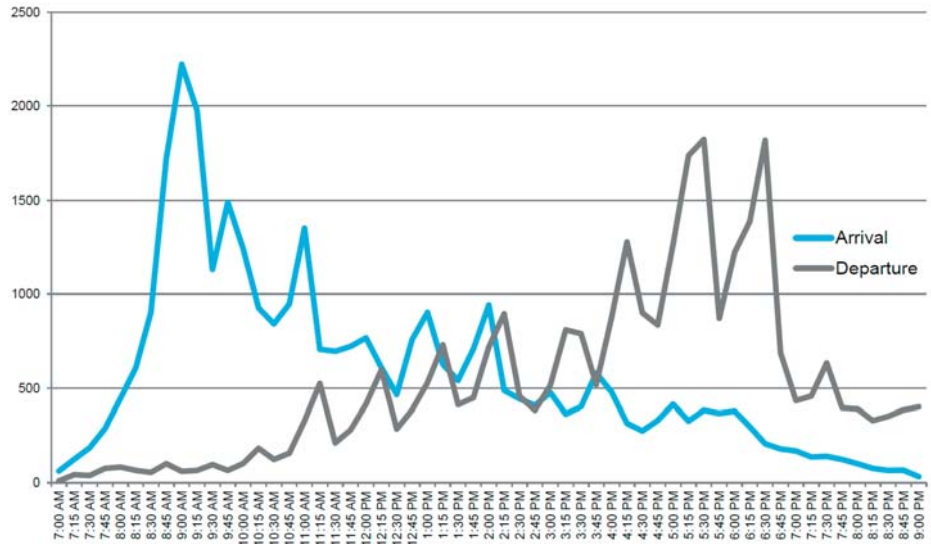


**Figure 10** – Arrival and Departure Times at UNSW (2013)

*(source: UNSW 2013 Travel Survey and Campus Counts Analysis Summary)*

As is clear in the figure and table above, UNSW has unique peak arrival and departure times with some significant volumes. The sheer volume of visitation to the campus reinforces this as a "special event" twice daily, and especially in the AM peak.

Traffix Group (traffic and transport consultants) has concluded that the EIS's data related to stop design underestimates:

- existing levels of public transport patronage to and from the campus;
- 2020 projected levels of public transport (including the CSELR) patronage to and from the campus; and
- 2036 projected levels of public transport (including the CSELR) patronage to and from the campus.

Based on UNSW's own data, calculations and projections reveal that UNSW's likely light rail patronage in 2020 appear to exceed the EIS's projected patronage for 2036 at the relevant stops.

Generally, assumptions made in the EIS around UNSW's likely patronage of the CSELR will mean demand will outweigh capacity during peak periods on the platforms of the two UNSW stop locations. The implications of this are described further below, along with suggested refinements to cater for demand, improved safety and efficiency at the UNSW stops, and address a number of co-related issues in terms of design and environmental impacts. The Traffix Group "Technical Review – Traffic Engineering & Road Safety" is included in this submission at **Appendix C**. This review considers, amongst other things, the pedestrian level of service and stops, passenger boarding and alighting volumes, and detailed consideration of the two UNSW stops design, function and safety.

# 3.0 Urban Design and Safety

Given the significance of the campus as a place, the high volumes of public transport patronage, UNSW's urban design objectives and the safety of its students and staff (and visitors), a review of the design and function of the two EIS proposed UNSW stops is required. Additionally, the ability to achieve improved amenity and accessibility at the campus and its surrounds is a key objective of UNSW.

Because large numbers of people arrive and depart daily by public transport, safety is UNSW's primary concern. This is especially the case for overseas students who may not yet be attuned to traffic flows on the opposite side of the roadway. This will only be heightened for both local and overseas students initially not attuned to light rail vehicles on Sydney's roadways.

In achieving improved urban design outcomes, safety, amenity and accessibility, UNSW's consultants have considered the following:

- Design refinements to the UNSW Anzac Parade and UNSW High Street stops which will improve safety and accessibility;
- Improved urban design outcomes for the stops and their integration with the campus and the public domain and movement hierarchy;
- Improvements to traffic flow and performance of adjacent intersections;
- Traffic speed review at the stop locations; and
- Safety audits of the EIS proposed locations and designs for the UNSW Anzac Parade and UNSW High Street stops.

To ensure the public benefit is maximised, the design of these stops has been carefully examined and improvements recommended through this submission. These improvements are founded on an evidence-based examination of the design conditions of each stop location with the collaborative contribution of an experienced diverse knowledge base, including traffic planning, landscape architecture and urban design.

## 3.1 Urban Design Framework

The desire lines for movement and circulation through the campus are predominantly via University Mall (the dominant central spine) and College Walk, running parallel to University Mall. Access to and from Gate 9 in a north-south direction from the hub of the upper campus forms a strong secondary, but important, link. See **Figure 11** below as also included in **Appendix A** as Drawing 8.

Part of the University's consideration of the EIS for the CSELR project has focussed on its own growth plans within the existing campus and areas outside of the campus. **Figures 12**,**13,** and **14** highlight future development and construction sites, the ongoing development of the key east-west linkages through the campus, and the Urban Design Framework for the Lower and Western Campus which has driven this renewal and change, respectively.

These figures reinforce the key pedestrian linkages, both existing and proposed and new developments planned to frame these malls and walkways, particularly University Mall and College Walk. College Walk and plans for the Lower and Western Campus in particular have been activated and realised through recent approvals, such as for the new Materials Sciences & Engineering Building and Alumni Park.

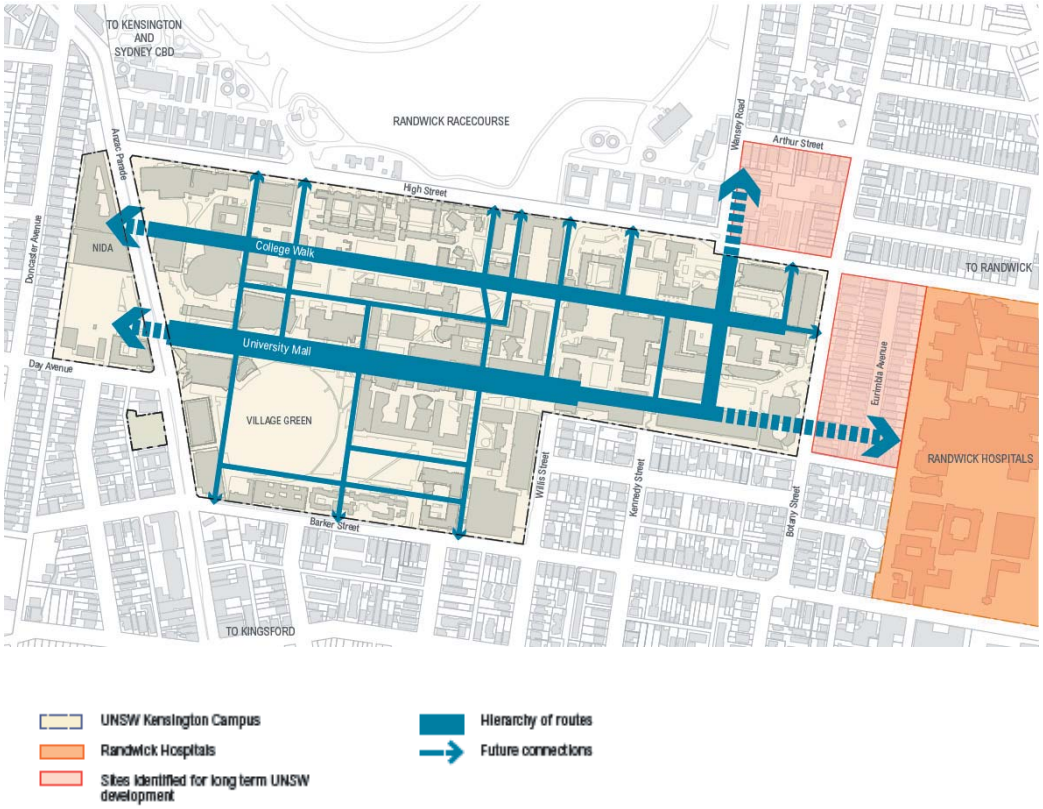


**Figure 11** – UNSW Campus Pedestrian Movement and Circulation

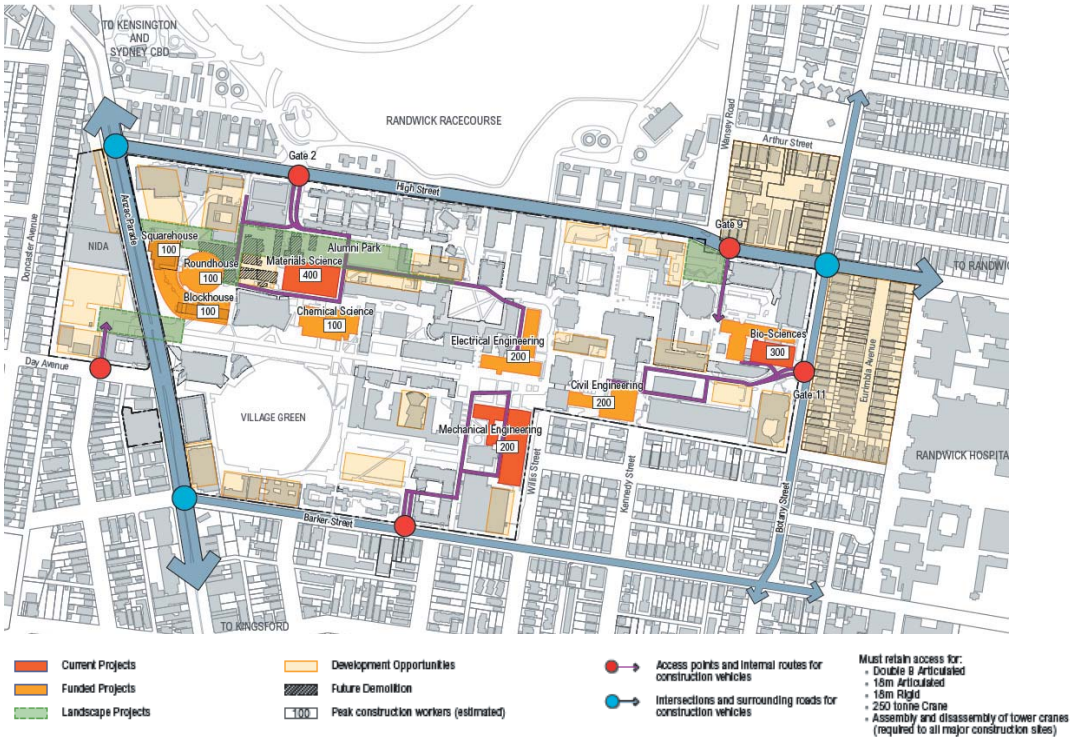


**Figure 12** – UNSW Future Development Sites and Environs

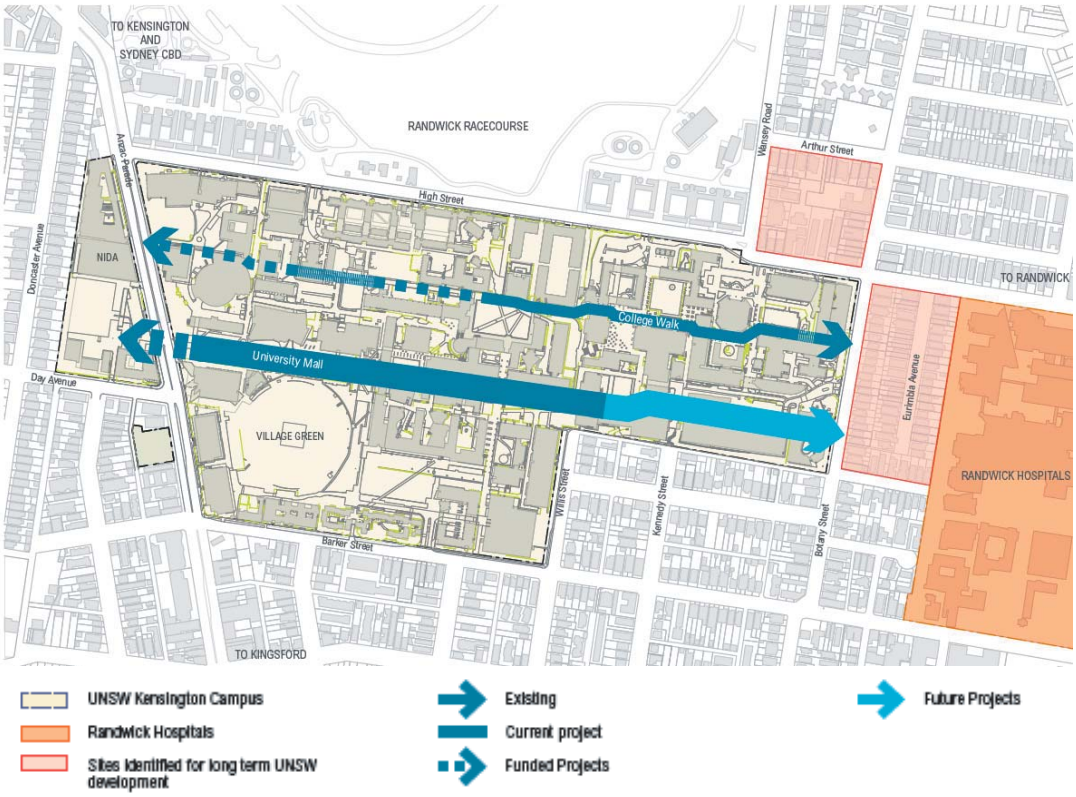


**Figure 13** – University Mall and College Walk Implementation

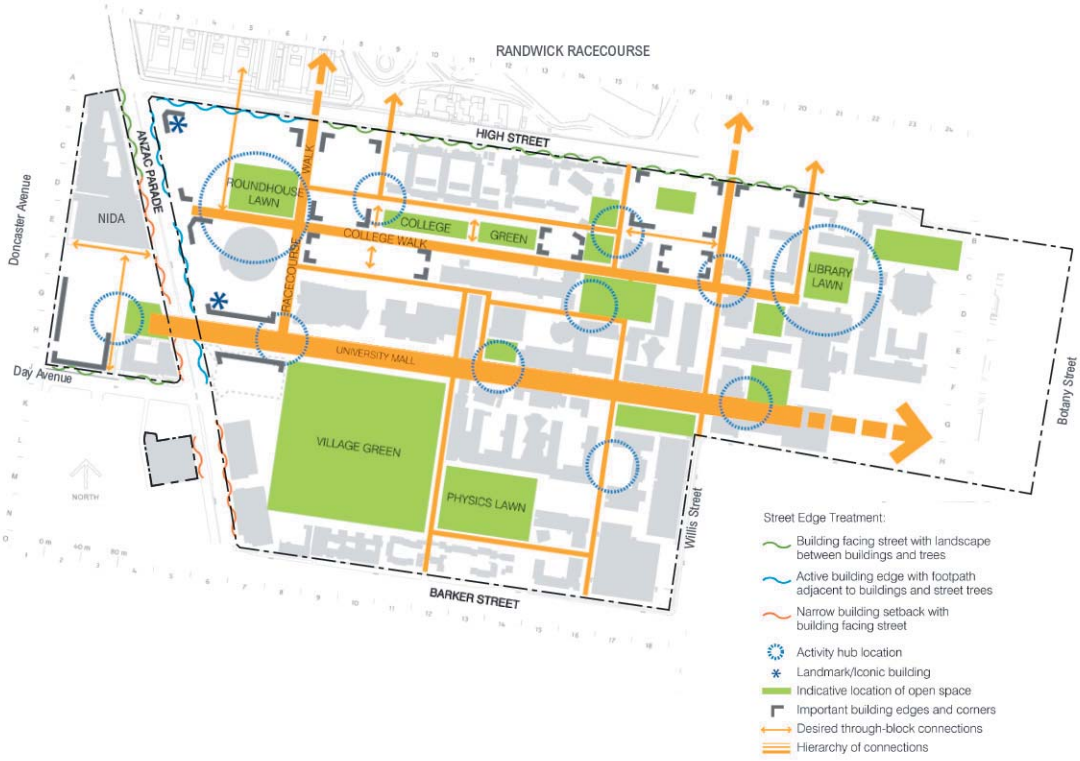


**Figure 14** – Urban Design Framework for Lower and Western Campus

**Figures 12, 13** and **14** above are also included at **Appendix A** as Drawings 9, 10 and 11.

## 3.2 Design Principles for CSELR Stops

TfNSW's Design Principles for the CSELR stops are understood to include the following:

- Stops must be legible;
- Stops must promote and enhance access to public transport; and
- Stops must create a lasting legacy.

To achieve these Design Principles, the design features of the stops include:

- A modular kit of parts;
- Maximum accessibility and permeability;
- A protected comfortable and safe waiting area;
- Minimum clutter and consolidated infrastructure; and
- A consistent and identifiable suite of elements.

UNSW broadly shares the attainment of these key Design Principles and design features, particularly those in relation to safety.

As stated previously, the assumptions made around the capacity and design requirements for the UNSW stops appear to underestimate the peak volumes and capacity needs, therefore design refinements are put forth for consideration for both UNSW stops to ensure both UNSW's and TfNSW's project objectives and design principles can be suitably met.

## 3.3 Safety Audits

UNSW engaged an independent consultant audit team (Transafe) to undertake Road Safety Audits for the EIS proposed light rail stop options at UNSW Anzac Parade and UNSW High Street in accordance with the Guidelines for Road Safety Audit Practices. The main objective of the audits was to better understand the road safety risks of each stop for all road users based on the general designs of the CSELR stops in the EIS and based on other information.

Transafe's Safety Audits are included at **Appendix D** to this submission. A number platform and track alignment options were considered for each UNSW stop, including the exhibited EIS schemes.

The Road Safety Audit reports were prepared to assist in gauging and addressing any relevant safety issues arising from the EIS design of the stops and review and assessment of a range of possible alternative designs. The audits were used as a key input to the process for alternative design for the UNSW Anzac Parade and UNSW High Street stops.

In undertaking its audits, a number of general issues were identified by Transafe in its audits. These included:

- UNSW is characterised by an existing (and projected – based on existing data) very large volume of passenger arrivals and departures in peak periods, including 15 minute interval spikes within the peak periods;
- Narrowed trafficable lanes increase the chances of collision with parked or fixed objects in the kerbside lanes;
- Given the very high volume of pedestrian traffic, reduction in vehicular traffic speeds from 60km/h to 40km/h should be considered. This would further assist in lessening severity of possible light rail, vehicle, cyclist and pedestrian

conflicts in this environment (refer also to **Appendix E** Speed Zones Reports by Traffix Group); and

- Suitable / appropriate pedestrian crossing widths (and times) are required to eliminate bunching and bottlenecking at crossings and prevent unsafe alternatives in shortcuts by pedestrians being undertaken.

Broadly, Transafe considered a wide range of technical and performance based criteria to determine the optimal design and arrangement of the two UNSW stops. Generally, it was concluded from a safety perspective (and based on levels of service of the stops, platforms and ramps) that alternative designs to both stops were warranted to achieve the highest possible safety and efficiency outcomes. The predicted levels of service (LOS) of the platforms and ramps at the stops are set out as part of Traffix Group's review at **Appendix C** to this submission.

The adopted and accepted method of measuring crowd and pedestrian movement through space is the Fruin Level of Service approach. In general terms pedestrian comfort and manoeuvrability is measured from a LOS of "A" to "F". The table below sets out the LOS and general characteristics of pedestrian movement.

**Table 2** – Fruin Level of Service description

| LOS | Characteristics |
|---|---|
| A | Relatively free movement with walking at normal speeds and with restrictions or conflict unlikely |
| B | Normal walking speed, by passing slower moving pedestrians with a minimum of restrictions or conflict |
| C | Restricted flow, minor conflicts and slightly lower than average walking speed or flow |
| D | High probability of conflict, speed restricted and difficultly in passing |
| E | Speed severely restricted, frequent adjustment of gait and approaching limit of capacity |
| F | Progress made only by shuffling and bunching, and extreme restriction in speed and breakdown of flow. |

The results of the individual stop audits are set out in Sections 4.0 and 5.0, as well as in **Appendices C** and **D**.

## 3.4 Alternative Designs for the UNSW Stops

Multiple criteria have been applied and tested in relation to the location and configuration of the two stops with the safety of the light rail customers given the highest priority. Safety has been combined with consideration of both the network's landscape character and urban design and the specific character of Anzac Parade, High Street, Wansey Road, and the campus.

The resultant alternative designs conform to the Design Principles of the CSELR (as highlighted earlier) and achieve:

- A safer pedestrian and light rail user environment due to improved platform capacity, improved accessibility, and reduced adjacent traffic speeds UNSW's fundamental concern);
- Improved amenity in terms of design, heritage, landscape, and tree retention;
- Improved campus amenity for learning, teaching, research and accommodation and reinforcement of UNSW character and identity;
- Less interruption to underground services and utilities;
- Improved traffic and intersection performance adjacent to and in the environs of the campus;
- Less land acquisition required;
- A better integrated transport solution;
- Sustainability improvements;

- Future proofing for growth with the campus and the Randwick Education & Health Specialised Precinct; and
- The creation of a lasting legacy for future generations.

Importantly, these alternative designs enhance the overall amenity of the local environment and reflect the national, state and local significance of these light rail stop locations.

# 4.0 UNSW Anzac Parade Stop – proposed alternative design

## 4.1 Background

The location of this stop is distinctive along Anzac Parade as its eastern side supports a row of large significant trees of various species set just within the campus. Along the frontage between High and Barker Streets are several large institutional buildings of acknowledged design excellence, social significance and memorable form including the NIDA Parade Theatre, Squarehouse, Blockhouse, Tyree and the Foundation Studies building.

Currently the pedestrian circulation within the lower campus and its connection to Anzac Parade is concentrated on the University Mall, a wide, long, formally planted, straight, symbolic path that is the most distinctive and impressive pedestrian place along the Light Rail line, comparable to Martin Place. The Mall intersects Anzac Parade obliquely maintaining its axis with an eight metre wide pedestrian crossing. The crossing connects the campus on both sides of the Parade.

The lower and western campus at UNSW has been identified for redevelopment since the adoption of the Urban Design Framework in 2011. Various development sites have similarly been identified since 2011. The concept of a double pedestrian crossing between NIDA and UNSW over Anzac Parade is older having been considered by UNSW in the 1990s as a more effective and efficient way of moving large numbers of people and maintaining and reinforcing existing desire lines into and out of the campus. UNSW Council adopted the double-crossing concept in 1997.

The existing Squarehouse and Blockhouse buildings have been identified for development to in part provide an appropriate context for the planned Anzac parade light rail stop. These projects have been in UNSW's capital planning process for several years and have been brought forward by UNSW in response to the CSELR project. They are funded in the UNSW Capital Plan in alignment with the project for completion in 2019. The detailed planning and design is pending resolution of the CESLR project and confirmation of the public domain and access interface and linkages.

With delivery of this redevelopment, the University Mall will be paralleled by College Walk approximately one hundred and forty metres to its north. It will serve the majority of the student accommodation on campus while providing an alternative weather protected route through the campus. It will also accommodate between 30 - 40% of the pedestrian trips to and from the UNSW Anzac Parade stop.

## 4.2 Safety audit results

In balancing all relevant factors including site constraints, Transafe found that the preferred platform and track alignment option from a safety perspective would include:

- Avoiding/limiting potential conflict for all road users, and where this cannot be avoided, ensuring that consequences of potential conflict are minimised. Other important considerations include providing a road environment that:
  - Is simple, obvious, expected and predictable;
  - Is free of physical obstructions and is forgiving;
  - Provides logical connectivity;

– Provides direct pedestrian access; and,
– Caters for all expected user groups including cyclists and vulnerable/disabled pedestrians.

From this audit Transafe recommended a centre platform design as the preferred platform arrangement, mainly due to the lowest likely conflict points and because it is by the far the safest option from a road safety perspective. It also provides a platform arrangement that is simple and consistent with the likely arrangement of much of the abutting light rail network (running within the median). Each of the other three options are considered less safe in these terms and are similar in relation to likely points of conflict.

The advantages of a centre platform arrangement identified in the Safety Audit are that it:

- is logical and simple. It does not require multiple deviations of the light rail tracks and therefore limits potential interaction and therefore conflict between the light rail vehicles and other road users;
- is separate from the roadway and provides the most offset between opposing directions of traffic;
- avoids the need for low radius horizontal curves along the traffic lanes and light rail reserve (i.e. is a mostly straight alignment and the need to deviate around curves does not complicate the driving task);
- avoids the need for road users, in particular two-wheeled vehicles to cross the tracks;
- reduces delays to both the light rail and road users due to no crossing of the light rail and traffic lanes;
- enables complete segregation between the light rail reserve and likely pedestrian areas. The use of fencing along the light rail reserve will physically corral pedestrians to designated crossing points, which are fully controlled (and avoid ambiguous right-of-way confusion between the light rail and pedestrians often associated with uncontrolled crossings);
- enables staged crossing movements to be performed by pedestrians that choose to cross against a red man (which can reasonably be expected to occur at any signalised crossing), a safer alternative to the other options that either have no central median, or a narrow median;
- enables the installation of a single row of catenary power poles between the two light rail tracks, outside the clear zone of adjacent traffic, and therefore limits the risk associated with this necessary light rail infrastructure;
- has the option of expanding the platform waiting area within the central median as demand grows;
- enables close connectivity of adjacent bus stops;
- allows a straight alignment and therefore good visibility for egressing bus drivers is expected;
- provides the possibility of facilitating kerbside parking (with a single through lane of adjacent traffic) during off-peak periods;
- is particularly suited to locations where patronage tends to peak in one direction (such as at the university); and
- can be implemented in conjunction with a reduced speed limit of 40km/h to further reduce risk and consequences of conflict.

Additionally, Traffix Group's review of the UNSW Anzac Parade stop Passenger Area Assessment, **Appendix C**, reveals that the platform and ramp widths provided appear to be inadequate in their level of service considering the

number of patrons who will be present at peak times. However, the wider (and longer) the platform will enable improved dispersal of light rail users alighting, and an appropriate the level of service to be provided.

## 4.3 Design Features


**Figure 15** – UNSW Anzac Parade Stop – Landscape and Groundplane Plan

The proposed alternative design includes the following:

- Centrally aligned tracks and platform;
- 103.4m long, 6.6 to 7.7m wide platform, double loaded from either end providing a ~730m$^2$ platform (refer **Appendix A**, Drawing 22);
- Double pedestrian crossing points (8m wide and 6m wide) leading directly into UNSW at University Mall and College Walk, respectively, and NIDA on western edge of Anzac Parade (refer **Appendix A**, Drawing 18);
- Canopy or shelter over 100% of the platform (refer **Appendix A**, Drawing 24;
- CCTV, ticketing and information;
- Retains and increases existing width of trafficable lanes on Anzac Parade at/to 3.2m for kerbside lanes and 3.5m for centre lanes (refer **Appendix A**, Drawing 23;
- Reduced traffic speeds to that of School Zones at 40km/h to improve safety (refer **Appendix C**);
- Generous planting zones at each end of the platform;
- Materials and finishes palette derived from the agreed palette with City of Sydney and commensurate with a significant interchange stop;
- Removal or reduction in clutter through undergrounding of cables or use of joint-use poles (refer **Appendix A**, Drawing 19);

- Use of the "Boulevard character" to reflect the nature of Anzac Parade, the significant mall entry and gateway to UNSW and the wider Education & Health Specialised Centre; and
- Adjacent improvements to cater for bus stops both south and north-bound and new taxi stands (refer **Appendix A**, Drawing 20).

**Figure 16** – UNSW Anzac Parade Stop – All Aspects

The design concept is included at **Figures 15, 16 (above), 17, 18, 19, 20** and **21.** These figures are also included at **Appendix A** as Drawings 13, 25, 12, 15, 14, 16 and 17, respectively.

A central platform provides a safer, more familiar and easy to use stop typology in Anzac Parade.

In the afternoon peak period in several fifteen minute periods this stop will need to accommodate customers whose numbers will exceed the capacity of the system as proposed. It is anticipated that the contractor may adjust the frequency of service to meet this demand. However, in order to ensure safe and easy use of the stop and operational flexibility a double platform, more than 90 metres in length is required.

Given the expected level of use of College Walk and its location at an appropriate distance between University Mall and High Street, a signalised pedestrian crossing of Anzac Parade where College Walk intersects is essential to provide safe and easy access to the Anzac Parade stop. The crossing is planned to be 6 metres wide providing an appropriately proportionate width in relation to the University Mall crossing.

This arrangement provides dual entry/exit to the platform easing circulation and ensuring that the pedestrian paths more closely follow the natural pedestrian desire lines. This will increase the safe and easy use of the stop.

The platform width of an approximate average of 7 metres will flare from the wider crossing at University Mall to the narrower crossing at College Walk. This will ensure the platform shape accommodates the predicted level of use lessening congestion on the approach ramps and from the crossing points.

Given the expected patronage it is envisioned that the whole platform will be covered with a canopy design of the standard proposed for other interchanges like Rawson Place. This will also assist with the recognition of the stop given the scale and quality of existing and future buildings. The University campus contains a number of buildings with impressive projecting awnings and soffits including the NIDA Parade Theatre, Tyree and Scientia. The stop architecture will strike accord with these buildings that are all within its visual catchment.

Either side of the platform are two traffic lanes in each direction and beyond these footpaths are provided. The traffic lanes are 3.2 metres wide, wider then some existing lanes in this location. On the western footpath between the crossings an indented bus bay is provided for northbound bus routes. The bus bay will have a shelter sympathetic and diminutive to the light rail stop shelter. On the eastern footpath south of University Mall is an indented bus bay for southbound buses and beyond this is a small taxi and drop off bay. This arrangement allows the conservation and continued health of the significant trees and some additional tree planting.

On the eastern side the existing wall and hedge will be removed to allow the footpath to extend into the campus in places narrowed by the conservation requirements of the trees. On the western side the kerb will be moved slightly out narrowing the existing footpath. As a consequence these footpaths will be suitable for pedestrian only use, not suitable to sharing with bicycles.

New high quality public space finishes equal to those proposed in George Street in the city will ensure the significance and high level of use of the place are appropriately provided for. Existing overhead communications and power lines will be undergrounded and shared use poles will support the light rail catenary system, street and pedestrian lighting, traffic controls, signs and banners. As a consequence of this arrangement the level of service of the High Street intersection with Anzac Parade will be an improvement to the level predicted in the Environmental Impact Statement.

In order to ensure the overall safety of the roadway a reduced speed zone of 40 km/h between High Street and Barker Street is an essential accompaniment to the stop design. Traffix Group's Speed Zone Report at **Appendix E** supports the implementation of a reduced speed zone in this area.

## 4.4 Merits of the Design

The merits of this design can be summarised as follows:

- A central island platform of the recommended size provides the safest option from a pedestrian safety and passenger loading and unloading perspective at peak periods;
- Removal of crowding and improved dispersal of large volumes of people / pedestrians;
- The length of the platform provides for suitable capacity / demand increases and therefore future proofing and ensuring 'lasting legacy' achievement;
- The length also caters for a double Light Rail Vehicle from the commencement of operations;
- The double pedestrian crossing from and to the platform substantially improves distribution of pedestrians directly into and along established desire lines and UNSW malls and walkways. People are delivered exactly to the places they want to be;
- Lane widths are maintained in this part of Anzac Parade, with a neutral impact upon traffic, but importantly a positive impact upon trees and their retention;

- The design aligns with UNSW campus planning already underway and being realised for the campus via the lower and western campus urban design framework (College Walk and University Mall). This is progressively being added to with each new development in the lower and western campus (e.g. Materials Sciences & Engineering Building now under construction) and will from part of the lower campus redevelopment projects due for completion in 2019;
- The main gateway to the campus and the Randwick Education & Health Specialised Precinct will be substantially enhanced and reinforced with a design of suitable recognition of the standing and importance of the place from a cultural, aesthetic, and architectural viewpoint;
- Reduced traffic speeds and a safer environment will result without reduction of lane widths;
- Removal of visual clutter and improved integration of design features to provide for a holistic, consistent and identifiable suite of elements;
- Potential minimisation of impacts into campus and along the campus perimeter as they relate to noise, vibration and electro-magnetic interference (in terms of optimal outcome to reduce stray currents near Tyree Energy Technologies Building);
- Reduces land needed to be acquired from UNSW and therefore an improved public benefit outcome;
- Significantly more trees are saved with this alignment and design noting the trees provide a substantial amenity, heritage links to the development of the campus, and character and identity to the place;
- Improved configuration at the High Street and Anzac intersection for traffic movements;
- Drainage to address localised flooding and overland flow issues in this part of the campus and Anzac Parade are better able to be resolved.

**Figure 17** – UNSW Anzac Parade Stop – Design Concept Rendering

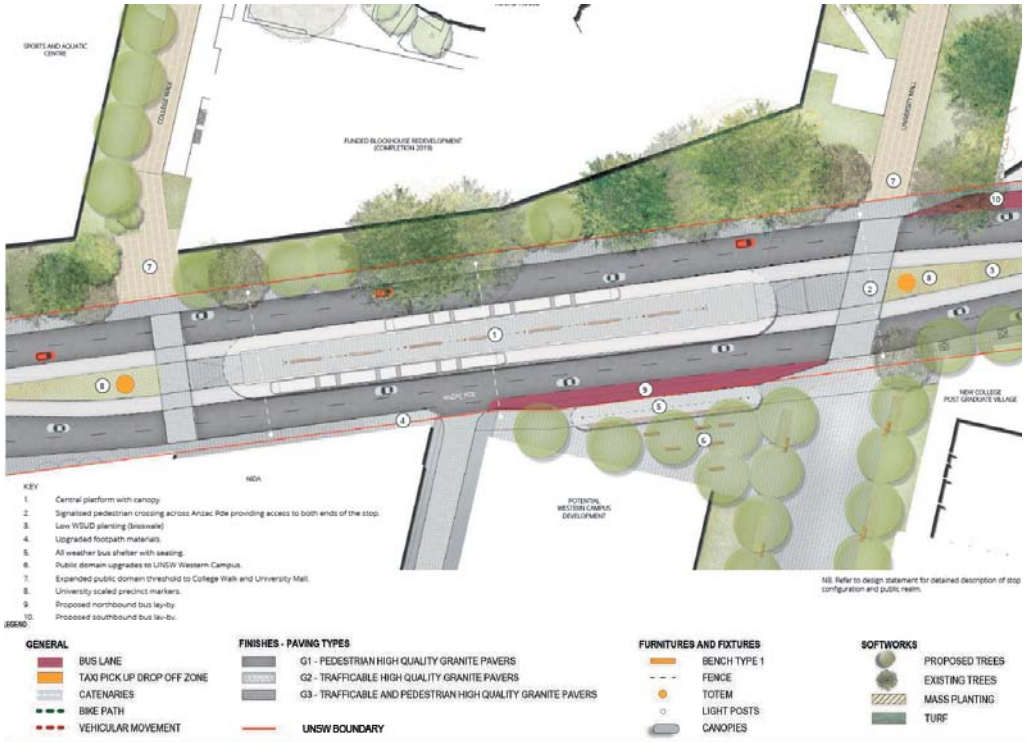


**Figure 18** – UNSW Anzac Parade Stop – Landscape and Groundplane Plan

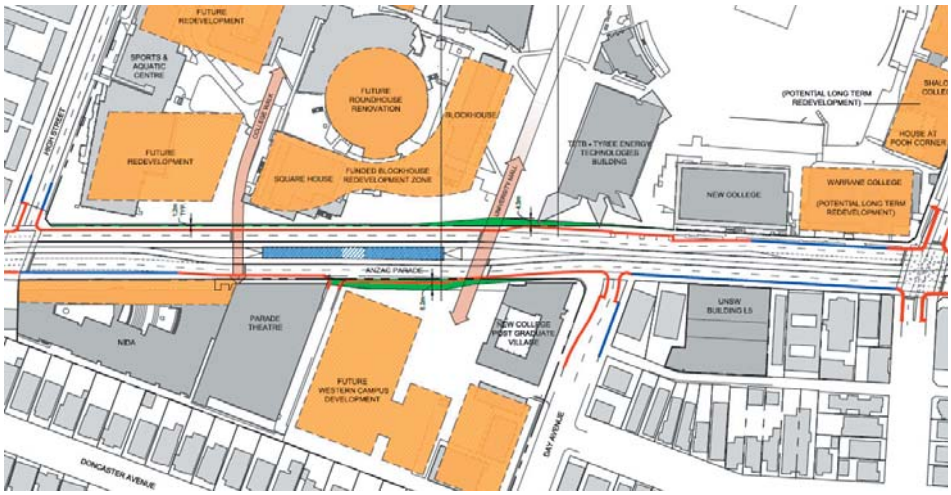


**Figure 19** – UNSW Anzac Parade Stop

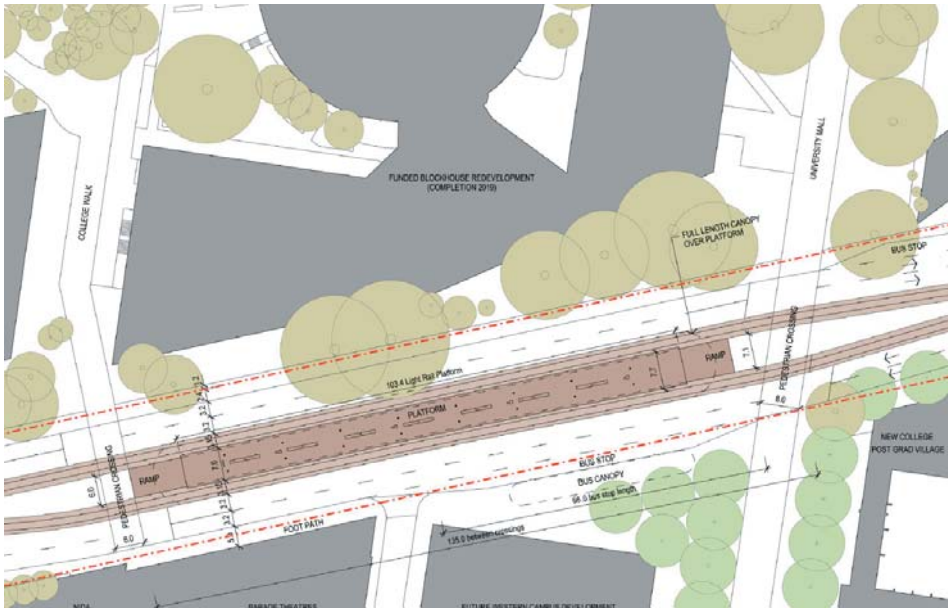


**Figure 20**– UNSW Anzac Parade Stop – Plan

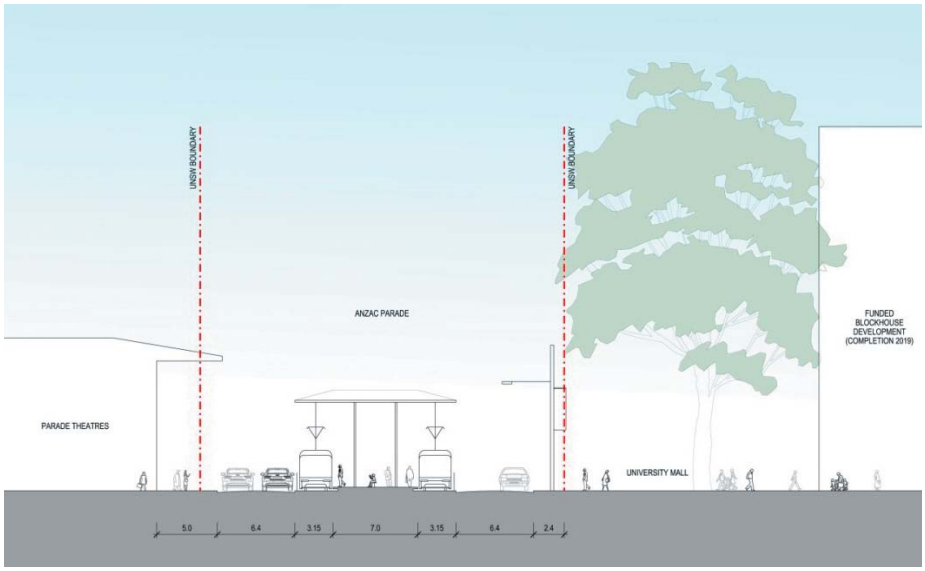


**Figure 21** – UNSW Anzac Parade Stop – Section

The following table sets out TfNSW's key objectives and the stated public benefits of the CSELR project and how the UNSW suggested changes to the UNSW Anzac Parade stop meets and further enhances the ability to satisfy both the objectives and the public benefits.

**Table 3** – Shared Objectives Summary – UNSW Anzac Parade Stop

| EIS Objectives & Public Benefits | UNSW Option |
|---|---|
| – Improve reliability and efficiency of travel to, from and within the CBD and suburbs to the south east | Yes |
| – Improve access to major destinations in the south east including Moore Park, UNSW , Royal Randwick Racecourse and Randwick health precinct | Neutral |
| – Improve the overall amenity of public spaces in the CBD and suburbs to the south east | Yes |
| – Increase the use of sustainable transport modes in the CBD and suburbs to the south east | Neutral |
| – Satisfy long-term travel demand between the CBD and suburbs to the south east | Yes |
| – Facilitate the continued, orderly and efficient growth of urban development and economic activity within the CBD and suburbs to the south east | Yes |
| – Improved accessibility/connectivity | Yes |
| – Improved capacity | Yes |
| – Improved efficiency | Yes |
| – Improved quality | Yes |
| – Improved reliability | Neutral |
| – Improved pedestrian amenity | Yes |
| – Improved integration with other services | Neutral |
| – Improved sustainability (via mode shift and urban densification) | Neutral |
| – Reduced traffic congestion | Yes |
| – Reduced travel times | Yes |
| – Reduced public transport operating costs (over time) | Neutral |
| – Reduced noise and emissions (in some areas) | Yes |
| **TfNSW Design Principles for Stops** | **UNSW Option** |
| – Legibility | Yes |
| – Promotion and enhancement of access to public transport | Yes |
| – Creation of a lasting legacy | Yes |
| – Modular kit of parts | Neutral |
| – Maximum accessibility and permeability | Yes |
| – Protected comfortable and safe waiting environment | Yes |
| – Minimum clutter and consolidated infrastructure | Yes |
| – Consistent and identifiable suite of elements | Yes |

# 5.0 UNSW High Street Stop – proposed alternative design

## 5.1 Background

This stop will serve the upper campus of UNSW and is adjacent to its largest public performance venue (the 1,000 seat Clancy Auditorium), its administrative heart (the Chancellery) and the internationally recognised Lowy Cancer Research Centre. These are set around a generous landscaped area that will be renewed in response to the light rail stop. High Street forms the north side of this forecourt and Wansey Road meets it on axis forming a T-intersection.

Under UNSW's development program and master planning review of the campus, potential improvements to the Clancy Forecourt as well as a Chancellery redevelopment or expansion are proposed. The CSELR project provides an opportunity to refine and enhance this gateway into the upper campus.

## 5.2 Safety audit results

As for the UNSW Anzac Parade stop, in balancing all relevant factors including site constraints, Transafe found that the preferred platform and track alignment option from a safety perspective would include:

- Avoiding/limiting potential conflict for all road users, and where this cannot be avoided, ensuring that consequences of potential conflict are minimised. Other important considerations include providing a road environment that:
  - Is simple, obvious, expected and predictable;
  - Is free of physical obstructions and is forgiving;
  - Provides logical connectivity;
  - Provides direct pedestrian access; and,
  - Caters for all expected user groups including cyclists and vulnerable/disabled pedestrians.

From this audit Transafe recommended a centre platform arrangement as the preferred platform arrangement mainly due to less potential conflict points compared with other options explored. Again, as for the UNSW Anzac Parade stop, the Centre Platform design is simple and consistent with the likely arrangement of much of the abutting light rail network (running within the median).

The advantages of a centre platform arrangement identified in the Safety Audit are that it:

- provides an offset buffer (i.e. the width of the southbound light rail reserve) between the platform and adjacent traffic, providing improved level of safety for both motorists and pedestrians / light rail users.

- creates separation of the two opposing light rail tracks and requires less space for the provision of the 90degree curve through the intersection. Compared to other options this enables a larger central refuge island at the southern end of the platform, and reduces the required north-south crossing distance from the stop into UNSW at Gate 9.

- enables complete segregation between the light rail reserve and Wansey Road. The use of fencing along the light rail reserve will physically corral pedestrians to designated crossing points (not mid-block between parked cars or between platforms), of which the southern end is fully controlled (and will avoid ambiguous right-of-way confusion between trams and pedestrians often associated with uncontrolled crossings and sometimes zebra crossings.
- allows for the provision of a scramble crossing at the intersection of Wansey Road and High Street. While such a crossing could also be adopted in other options, the shorter crossing distances under the UNSW option makes it better suited to a scramble crossing (i.e. less crossing time required and therefore reduced overall delay at the intersection).
- is particularly suited to locations where patronage tends to peak in one direction (such as at the university).

Additionally, Traffix Group's review of the UNSW High Street stop Passenger Area Assessment, **Appendix C** reveals that the platform and ramp widths provided appear to be inadequate in their level of service considering the number of patrons who will be present at peak times. Again, the wider the platform will enable an appropriate level of service.

The suggested designs for the stops to address these concerns and other issues are set out in detail below.

## 5.3 Design Features


**Figure 22** – UNSW High Street Stop – Landscape and Groundplane Plan

The proposed alternative design includes the following:

- Centrally aligned tracks and platform;
- 45m long, up to 8.4m wide platform providing a 360m$^2$ platform (refer **Appendix A**, Drawing 36);

- A scramble crossing at High Street / Wansey Road intersection, with unique paving treatment to reflect nature of crossing (refer **Appendix A**, Drawing 32);
- Canopy or shelter over 100% of the platform (refer **Appendix A**, Drawing 38);
- CCTV, ticketing and information;
- Removal or reduction in clutter through undergrounding of cables or use of joint-use poles (refer **Appendix A**, Drawing 33);
- No right turn into Wansey from High Street in westerly direction. Left in and left out of Wansey Road, which is retained as a two-way carriageway of 3.4m wide southbound lane and 3.2m wide northbound lane (refer **Appendix A**, Drawing 37);
- Left in and Left out traffic at Gate 9;
- Relocated bus stops to outside Gate 8 on High Street for both east and westbound routes arriving and departing UNSW (refer **Appendix A**, Drawing 34);
- "Park character" to reflect the nature of the Wansey Road area;
- New street trees on eastern side of Wansey Road, between High and Arthur Streets (refer **Appendix A**, Drawing 35);
- Parking and taxi zone along eastern edge of Wansey Road at 2.5m wide with spaced street tree blister plantings;
- A bus and taxi zone along the northern side of High Street (refer **Appendix A**, Drawing 34);
- Reduced traffic speeds to that of School Zones at 40km/h to improve safety;
- Landscaped buffer between the light rail tracks and the bike path (refer **Appendix A**, Drawing 35);
- Enlarged footpath and protected bikepath, arranged and spaced to allow for development opportunity on Randwick Racecourse site with frontage and access to Wansey Road; and
- Capacity of an Arthur Street extension into Randwick Racecourse site.

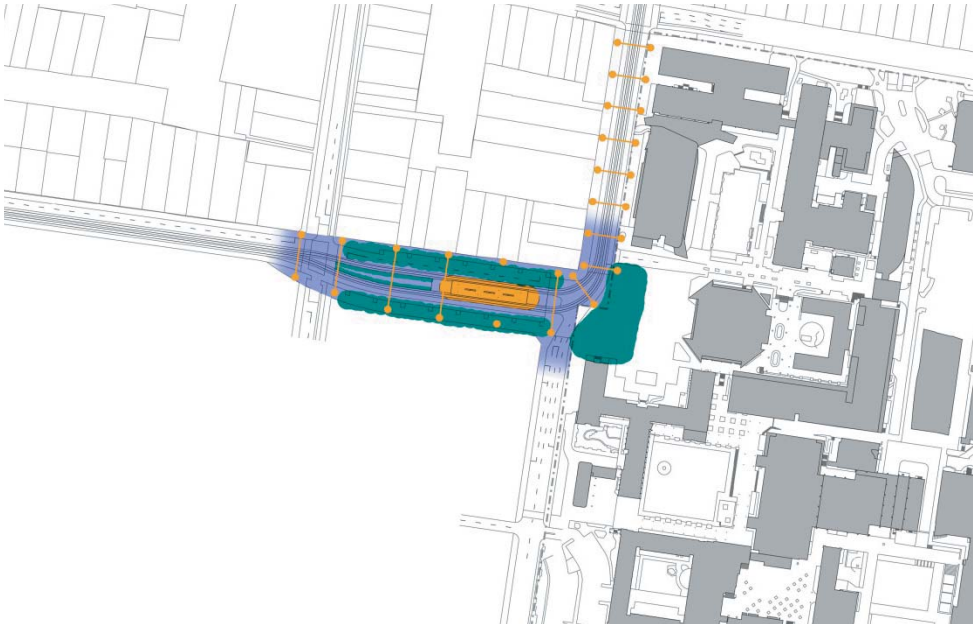

**Figure 20** – UNSW High Street Stop – All Aspects

At this corner the light rail corridor turns from Wansey Road (north leg) to High Street (east leg). In the eastern part of High Street the existing pavement will contain in its centre the tracks in two directions and one traffic lane in each direction on each edge. This arrangement requires the bus stops currently located there to be moved to the west of the Wansey Road intersection and consolidated either side of High Street. The northern bus bays will be spaced to allow access to the Randwick Racecourse site.

Wansey Road is widened to the west to accommodate the stop.

As in Anzac Parade a centre platform is the safer typology. The expected patronage of the stop is high and will require a 45 m long and 8.4m wide platform with full canopy cover high and wide to match the Anzac Parade stop. To the east of the platform is one traffic lane in each direction and a south bound parking lane that contains new tree planting and beyond this an upgraded footpath.

The northbound lane of Wansey Road provides the possibility of a 'G" turn from eastbound High Street to southbound Botany Street. This involves additional right hand turns, increases the traffic at the intersection and will be difficult to sign post. The left hand turn movement from High Street to Wansey Street has an unusual geometry which may be difficult for unfamiliar users. In addition, the north bound lane places trams and cars in adjoining lanes in opposing directions. It would be preferable to eliminate this lane and allow access to Botany Street via Barker Street to improve safety around this stop. It is suggested this be further reviewed with the University following the finalisation and review of traffic modelling to ensure that traffic flows within the area are fully understood and appropriate strategies developed.

To the west of the stop are a landscaped strip, a bicycle path, tree planting and a pedestrian path.

The longitudinal axis of the stop is perpendicular to the edge of the new created Clancy Forecourt south of High Street that is the arrival and departure point of the majority of customers. This arrangement is unusual as the desire line for customers is on this axis. This is further complicated by the light rail line turning sharply immediately beyond the platform and that the T-intersection that is less familiar to users then a normal intersection.

For this reason a 'scramble' or 'Barnes' pedestrian crossing is proposed where there is one traffic signal phase when all pedestrian movements are available and all vehicle movements are stopped. Special provisions for visually and physically impaired people will be provided via 'traditional' types of crossings. These crossings will enable them to cross each road separately rather than the longer diagonal crossings available to other pedestrians.

There will be no right hand turn vehicle movement from High Street to Wansey Road. This helps simplify the intersection, reduce the number of conflict points and reduce delays at the intersection, in particular for light rail vehicles.

The north end of the platform is connected to a new controlled intersection at Wansey Road and Arthur Street for use by surrounding residents and other users and eliminating the need for less safe mid-block pedestrian crossings. This intersection may also provide access to the Randwick Racecourse site.

New tree plantings on both sides of Wansey Road will frame the stop architecture. On High Street the existing bus stops will be removed and the landscaping setting of the Lowy Centre will be enhanced. New high quality public space finishes equal to those proposed in George Street in the city will ensure the significance and high level of use of the place are appropriately provided for. Existing overhead communications and power lines will be undergrounded and shared use poles will

support the catenary system, street and pedestrian lighting, traffic controls, signs and banners.

Taxi and drop off bays are located on the eastern side of Wansey Road close to High Street and on the north side of High Street at the head of the bus bay close to Wansey Road.

In order to ensure the overall safety of the roadway a reduced speed zone of 40 km/h on High Street and Wansey Road south of Arthur Street accompanies the stop design.

The design concept is included at **Figures 22, 23 (above)** and **24, 25, 26, 27 and 28 (over)**. These figures are also included at **Appendix A** as Drawings 27, 39, 26, 27, 28, 30 and 31 respectively.

In order to ensure the overall safety of the roadway a reduced speed zone of 40 km/h is an essential accompaniment to the stop design. Traffix Group's Speed Zone Report at **Appendix E** supports the implementation of a reduced speed zone in this area.

## 5.4 Merits of the Design

The merits of this design can be summarised as follows:

- A centre platform of the recommended size provides the safest solution from a pedestrian safety and passenger loading and unloading perspective at peak periods;
- Removal of crowding and improved dispersal of large volumes of pedestrians;
- The length of the platform provides for suitable capacity / demand increases and therefore future proofing and ensuring 'lasting legacy' achievement;
- The proposed scramble crossing at the High Street intersection allows for improved distribution and dispersal of pedestrians to desire lines;
- Conversion of the temporary bus stop location to a permanent bus stop – this saves trees at the Lowy Centre edge and reduces the potential land take;
- Design aligns with the current master planning review of  campus;
- An Entry / Arrival statement is able to be coordinated with the Clancy Forecourt;
- Creation of a safer pedestrian environment generally;
- Removal of visual clutter and improved integration of design features to provide for a holistic, consistent and identifiable suite of elements;
- Potential minimisation of impacts into campus and along the campus perimeter as they relate to noise, vibration and electro-magnetic interference (in terms of optimal outcome to reduce stray currents near the Lowy Centre and other nearby sensitive uses); and
- More trees are saved with this alignment and design noting the trees provide a substantial amenity, heritage links to the development of the campus, and character and identity to the place.

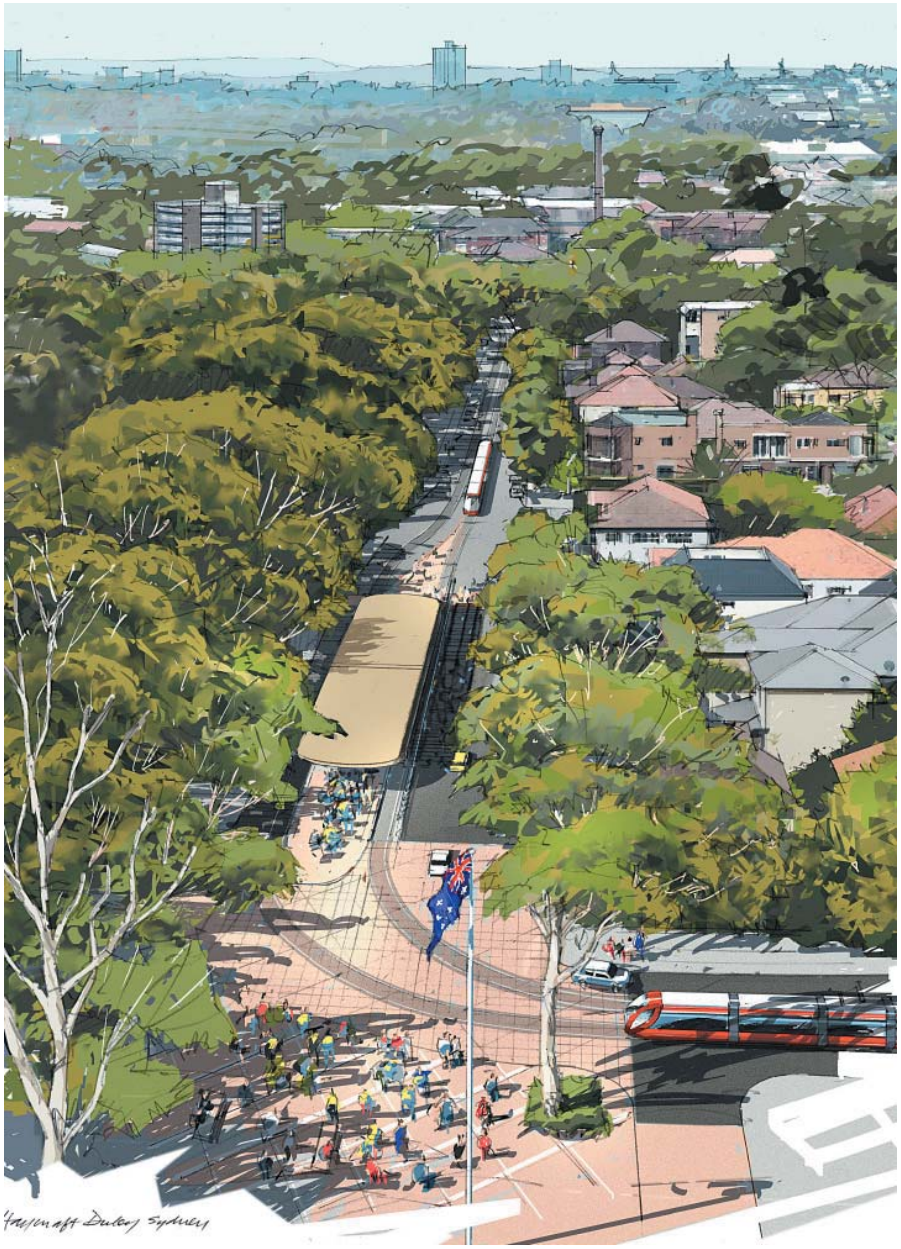

**Figure 24** – UNSW High Street Stop – Design Concept Rendering

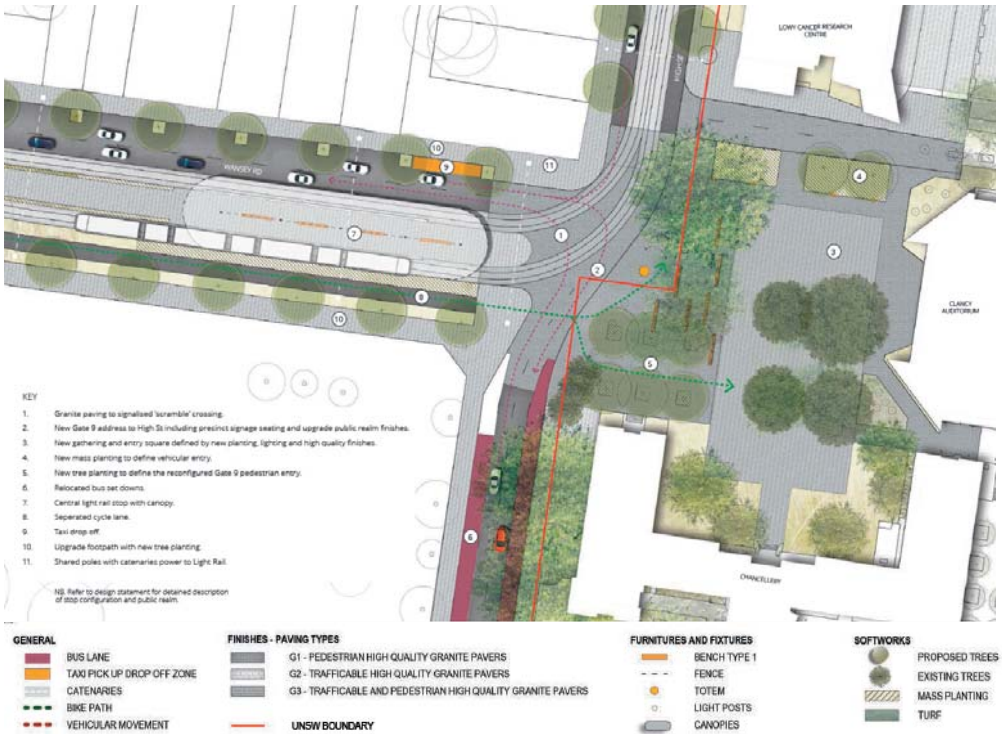


**Figure 25** – UNSW High Street Stop - Landscape and Groundplane Plan

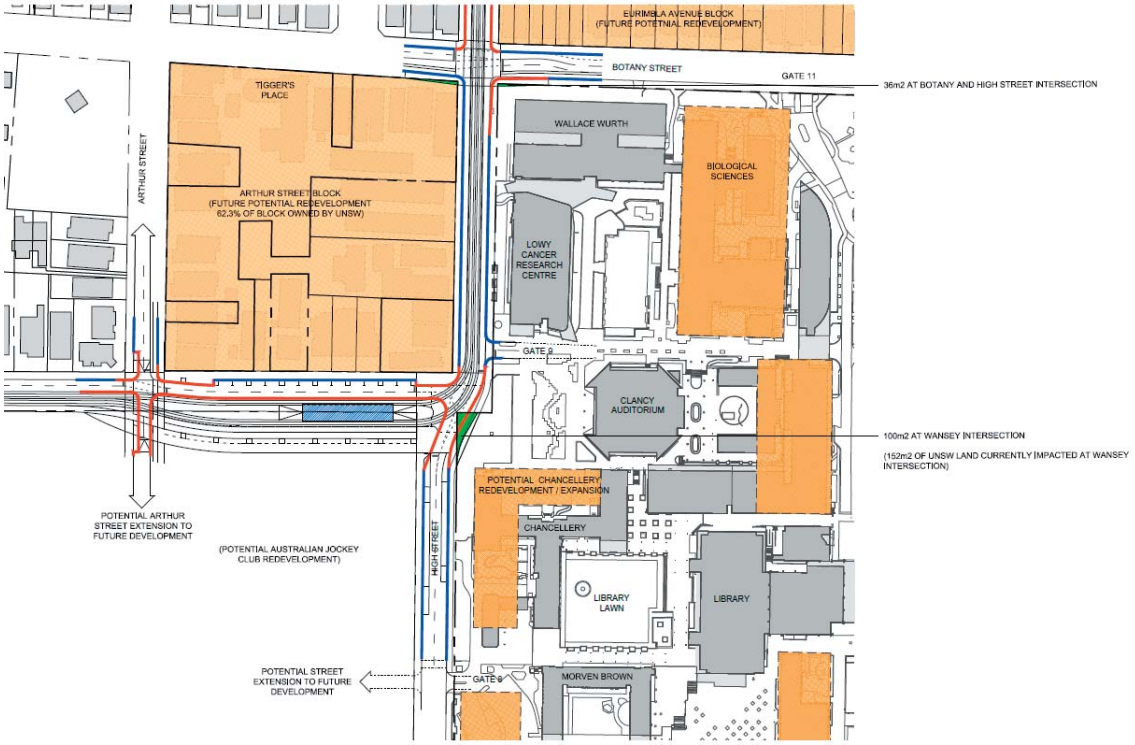


**Figure 26** – UNSW High Street Stop


**Figure 27** – UNSW High Street Stop - Plan

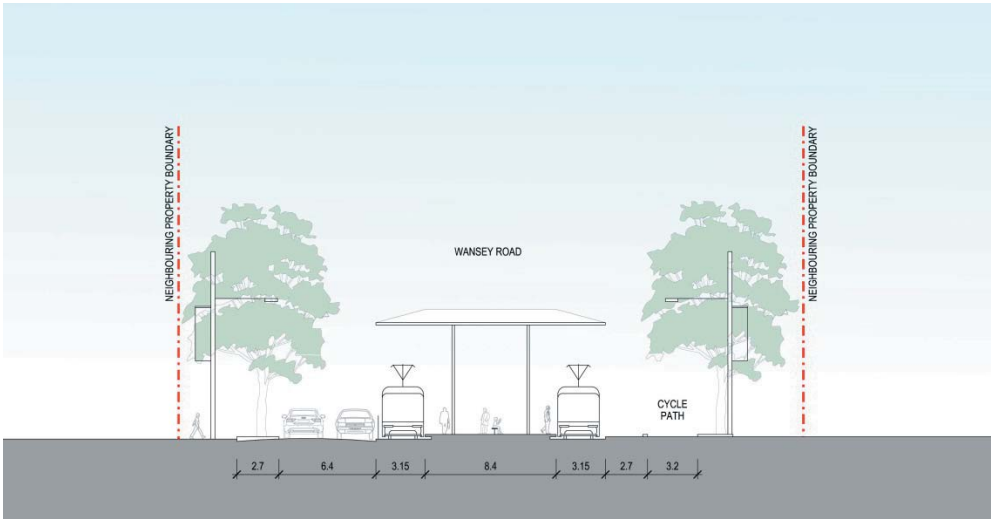


**Figure 28** – UNSW High Street Stop - Section

The following table sets out TfNSW's key objectives and the stated public benefits of the CSELR project and how the UNSW suggested changes to the UNSW High Street stop meets and further enhances the ability to satisfy both the objectives and the public benefits.

**Table 4** – Shared Objectives Summary – UNSW High Street Stop

| EIS Objectives & Public Benefits | UNSW Option |
|---|---|
| – Improve reliability and efficiency of travel to, from and within the CBD and suburbs to the south east | Yes |
| – Improve access to major destinations in the south east including Moore Park, UNSW , Royal Randwick Racecourse and Randwick health precinct | Neutral |
| – Improve the overall amenity of public spaces in the CBD and suburbs to the south east | Yes |
| – Increase the use of sustainable transport modes in the CBD and suburbs to the south east | Neutral |
| – Satisfy long-term travel demand between the CBD and suburbs to the south east | Yes |

| | |
|---|---|
| – Facilitate the continued, orderly and efficient growth of urban development and economic activity within the CBD and suburbs to the south east | Yes |
| – Improved accessibility/connectivity | Yes |
| – Improved capacity | Yes |
| – Improved efficiency | Yes |
| – Improved quality | Yes |
| – Improved reliability | Neutral |
| – Improved pedestrian amenity | Yes |
| – Improved integration with other services | Neutral |
| – Improved sustainability (via mode shift and urban densification) | Neutral |
| – Reduced traffic congestion | Yes |
| – Reduced travel times | Yes |
| – Reduced public transport operating costs (over time) | Neutral |
| – Reduced noise and emissions (in some areas) | Yes |
| **TfNSW Design Principles for Stops** | **UNSW Option** |
| – Legibility | Yes |
| – Promotion and enhancement of access to public transport | Yes |
| – Creation of a lasting legacy | Yes |
| – Modular kit of parts | Neutral |
| – Maximum accessibility and permeability | Yes |
| – Protected comfortable and safe waiting environment | Yes |
| – Minimum clutter and consolidated infrastructure | Yes |
| – Consistent and identifiable suite of elements | Yes |

# 6.0 Other relevant issues

A range of matters in relation to construction and operation of the light rail require clarification and confirmation as part of the project's assessment and determination. These are set out below.

Recommendations have been provided, where appropriate and relevant.

## 6.1 Construction impacts upon trees and landscape character

### 6.1.1 Significant trees

The interfaces to both the Anzac Parade and High Street stops as proposed in TfNSW's EIS is strongly characterised by its significant tree cover.

Mature Fig plantings, particularly to Anzac Parade, High Street and Wansey Road create a distinct gateway character to the Health and Education Precinct of UNSW and the Randwick Hospitals Campus. The UNSW Significant Tree Plan (see **Figure 29** below and Drawing 40 in **Appendix A**) identifies that the majority of the significant trees that interface with the proposed light rail stops along the boundaries of High Street and Anzac Parade have long life expectancies.


**Figure 29** – UNSW Significant Tree Plan

These character defining mature trees are also recognised in the Randwick City Council (RCC) Significant Tree Register.

The RCC Street Tree Master Plan (RCC STMP) locates the UNSW Kensington Campus within the Plateau, Northern Leeward Slopes and Northern Swamp Valley Floor Precincts. The Randwick Hospital Campus is located on the Plateau. The RCC STMP proposes diverse tree plantings to express each of these Precincts.

### 6.1.2 Tree Removal

It is noted in the Tree and Landscaping Report prepared by Aspect Studios for UNSW, **Appendix F**, that the proposed TfNSW light rail stops at UNSW High Street and UNSW Anzac Parade require the removal of several historic and significant trees. It also notes that the landscape impact assessment (Hassell and ARUP) has deemed that the construction and operation of the CSELR will have high adverse landscape impacts on Wansey Road at the proposed High Street Stop.

Anzac Parade in the area adjacent to the UNSW Kensington Campus is deemed to be of regional sensitivity, due to its visual prominence in the locality of Randwick. Due to the required vegetation offset, if the trees in this area are unable to be retained, (as per the Vegetation Offset Guide by TfNSW in the EIS), the character of UNSW's Anzac Parade frontage will change drastically. This impact is significantly reduced with the adoption of UNSW's stop design proposal.

As proposed, the construction and operation of the CSELR will have a high and moderate adverse landscape impact on both the Anzac Parade street trees and the UNSW Pool Lawn and University Mall.

Accordingly, it is relevant that the proposal be reviewed to minimise the adverse effect that the CSELR may have on its immediate surrounds during construction and operation.

TfNSW has committed to replacing every tree lost with eight replacement trees in the local area. There is strong support for this commitment; however, consideration must be made with regard to the replacement tree species, pot sizes and location so an appropriate outcome can be achieved given the significance of the University and its existing streetscape.

Where the landscape and public domain character has been disturbed as a result of the CSELR and tree removal, mature trees should be installed in the immediate vicinity and species selected which are reflective of the surrounding character and to uplift the public domain. There is support for the landscape strategy's recommendation of planting replacement trees as close as possible to their original locations to mitigate adverse effects.

Additionally, the landscape strategy in the EIS proposes several key principles for the extent of the CSELR to minimise adverse impacts on its surrounds by minimising and mitigating the loss of existing trees, promoting the use of native trees in accordance with local plans, providing improved streetscapes and enhanced public open space, and using the landscape elements as way finding elements.

This landscape strategy as compiled by Hassell lacks detail with regard to the stop character at UNSW High Street and UNSW Anzac Parade. For example, no trees have been proposed for the UNSW High Street stop, as the Park typology planting palette consists only of grasses/tufted plants, sedges and groundcovers.

Additionally, it is requested that TfNSW consider that the use of a Palm for the Boulevard typology is not an accurate reflection of the landscape in Anzac Parade, nor does it provide any amenity for pedestrians or cyclists. We support the potential use of Figs and Brush Box on the street verges, as these species would be reflective of the existing landscape character and provide amenity for both pedestrians and cyclists.

Additionally, the proposed UNSW High Street stop requires the removal of historic Fig tree plantings within the Racecourse to enable the circulation of pedestrians, cyclists and vehicular traffic with the proposed CSELR. The Fig trees along this boundary provide the majority of shade to the western footpath of Wansey Road,

and their removal will drastically change the streetscape as well as the quality of pedestrian and cyclist journey.

Therefore, the recommendation to protect the existing Figs at the Australian Turf Club (Randwick Racecourse) is also supported, and whilst the Fig species are not referenced in any Randwick City Council STMP, it is recommended by Aspect Studios any trees requiring removal should be replaced with trees of the same species.

The strategy references the Randwick City Council Street Tree Master Plan, which has developed planting palettes based on a series of precincts, defined by landscape topography. There is support for the proposed use of species such as *Angophora costata* and *Eucalyptus haemastoma* or *Lophostemon confertus* as street tree planting on Wansey Road. Whilst the use of *Agathis robusta* would certainly create a distinct avenue for the CSELR, its form and habit would not provide the amenity offered by the other species proposed.

## 6.2 Construction and post project noise, vibration and electro-magnetic interference

The construction and to a lesser extent, operation, of the CSELR has the potential to greatly impact upon a range of sensitive uses at UNSW. This includes impacts upon teaching, exam, research and accommodation environments and uses, by way of noise, vibration and potentially electro-magnetic interference (EMI).

### 6.2.1 Sensitive Uses at UNSW

A range of sensitive uses exist at UNSW. These include student accommodation premises within the campus, chiefly along the perimeter of the campus at High Street, Anzac Parade, and Barker Street. **Figure 30** below (Drawing 41 in **Appendix A**) indicates the locations of these premises, many in the vicinity of the works and the operational CSELR.

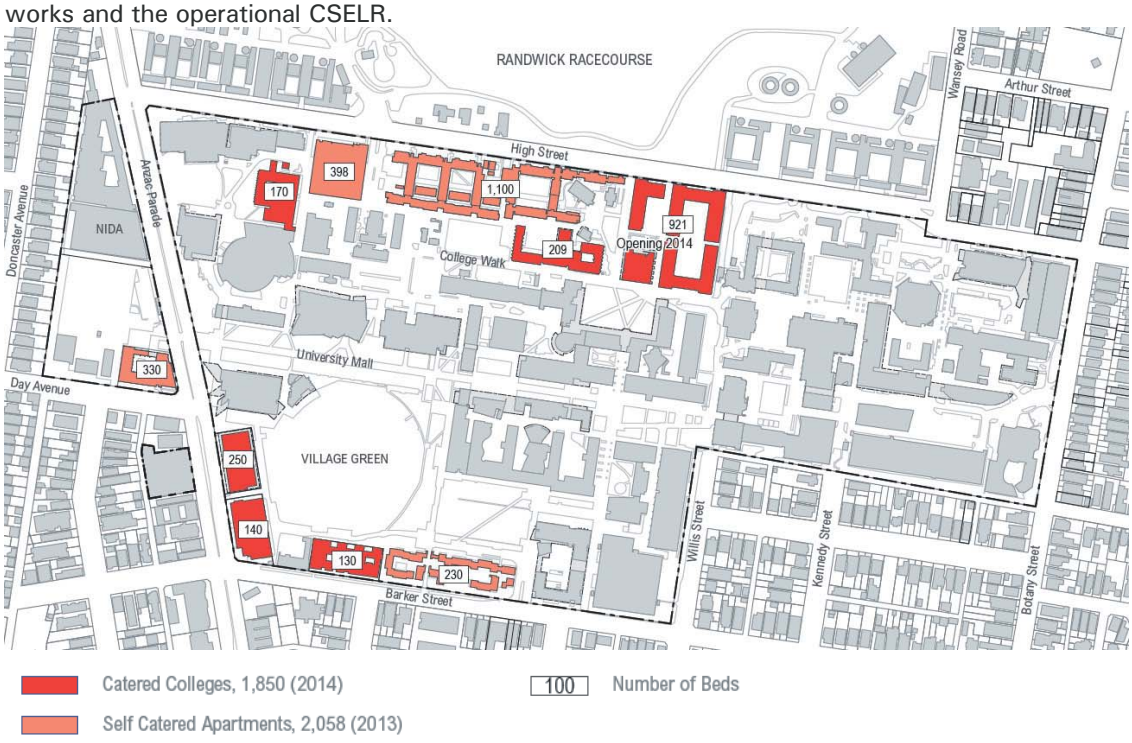


**Figure 30** – Sensitive Land Uses – Student Accommodation on campus

Additionally, and most critically, UNSW has a number Faculties and Schools that use sensitive equipment and carry out research that has the potential to be affected by both construction noise and vibration and operational noise, vibration and EMI. **Figure 31 (**Drawing 42 in **Appendix A**) below identifies these locations. This also includes the National Institute of Dramatic Art (NIDA) on Anzac Parade which includes both rehearsal and performance spaces. Notably, each arm of the light rail will have the potential to affect these sensitive uses and their locations.

At Anzac Parade, the potential impacts are likely to affect NIDA and the Parade Theatres, the Roundhouse, the Tyree Energy Technologies Building, Material Science and Engineering Building, the Mark Wainwright Analytical Centre and the Newton Building. At High Street and Wansey Road, the affected buildings are the Clancy Auditorium, Lowy Cancer Research Centre, the Wallace Wurth Building, and Biological Sciences Building.

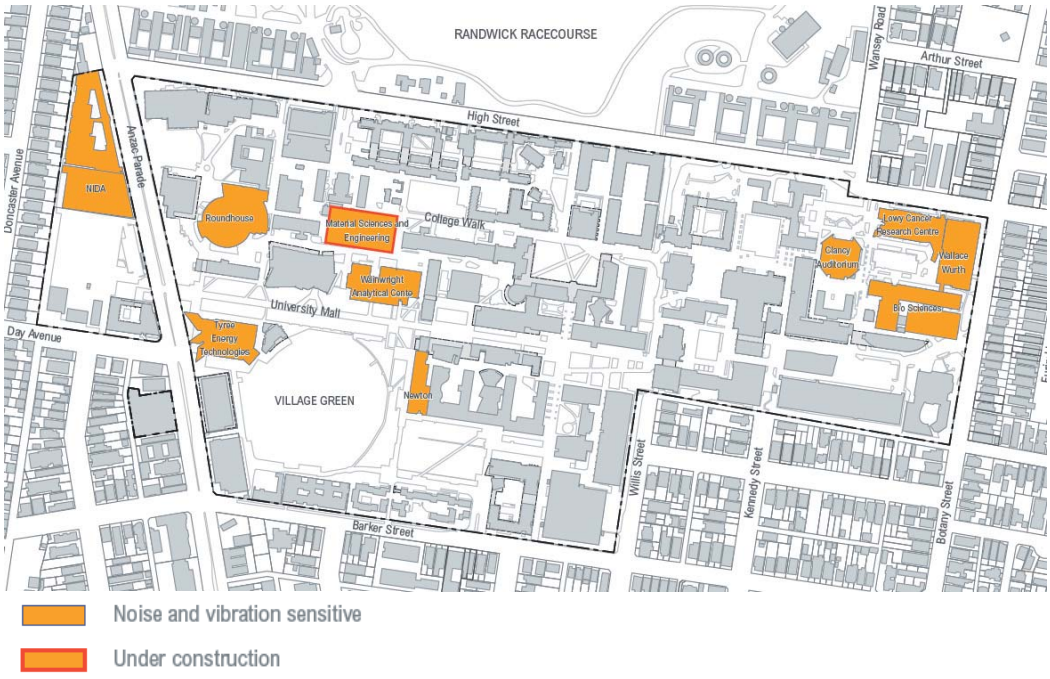


**Figure 31** – Sensitive Land Uses – Sensitive Equipment and Research Areas on campus

Further to these sensitive uses are critical timetable times and activities for UNSW, including exam periods and the locations where exams occur.

Exam periods typically occur three times annually (Term 1, Term 2, and Summer). Term 1 Exams run from mid-June to Late June or early July; Term 2 Exams run from Early November to late November, and Summer Exams run from early to mid-February. The timetable for exams is typically a 2-hour exam during the morning from 09:00 – 11:00 and a 2-hour exam in the afternoon from 14:00 to 16:00. Exams are typically held in two locations, on campus and at Randwick Racecourse. Due to additional space at the Racecourse, substantially more students are likely to sit individual exams at this location.

### 6.2.2 Noise and Vibration impacts

A review of the EIS reveals that no technical assessment specifically related to the impact of construction and operation ground borne vibration on the operation of vibration-sensitive equipment was undertaken in relation to the various UNSW buildings located near or adjacent the CSELR alignment.

It is our view that assurance should be provided to UNSW that the necessary mitigation measures required to avoid significant adverse impact on their

operations be demonstrated, as this currently cannot be ascertained from the EIS documentation.

Particular areas of concern with respect to the impact of the proposed light rail system on the UNSW laboratories are as follows:

- Vibration from light rail rolling stock operating on track systems in the vicinity of laboratory buildings affecting the performance of sensitive laboratory equipment, dependent upon the specifically proposed rail/track fixings and the vibration reduction they provide.
- Vibration during the construction of the light rail system affecting the performance of sensitive laboratory equipment, dependent upon the proposed construction methodology and equipment.
- Highly intrusive construction noise (Based on the EIS report, a 20dB exceedance over the proposed Noise Management Level is predicted).

### 6.2.3 Electro-magnetic interference

A review of the EIS reveals that no technical assessment specifically related to the impact of construction and operation EMI on the operation of sensitive equipment was undertaken in relation to the various UNSW buildings located near or adjacent the CSELR alignment.

It is our view that assurance should be provided to UNSW that the necessary mitigation measures required to avoid significant adverse impact on their operations be demonstrated, as this currently cannot be ascertained from the EIS documentation.

Particular areas of concern with respect to the impact of the proposed light rail system on the UNSW laboratories are as follows:

- EMI from light rail rolling stock operating on track systems in the vicinity of laboratory buildings affecting the performance of sensitive laboratory equipment; and
- EMI during the construction of the light rail system affecting the performance of sensitive laboratory equipment, dependent upon the proposed construction methodology and equipment.

Overall, UNSW seeks input into the timetabling of intrusive works in the period leading up to and during examination periods at both the Randwick Racecourse site and the UNSW Kensington Campus to ensure adverse impacts by way of noise and vibration can be suitably managed and mitigated against. UNSW proposes to continue to partner with the TfNSW project team and the contractor with respect to detailed timing and arrangements during the course of the construction period.

## 6.3 Construction and post project impacts upon UNSW utilities and infrastructure

A review of the EIS stop proposal indicates that a number of UNSW's privately-owned utilities and natural resources are likely to be significantly impacted by the construction works. This includes groundwater, borewater, overland flow paths in relation to stormwater, electricity, gas, water supply and sewer, and telecommunications.

The EIS's risk assessment fails to identify that UNSW is the service utility provider, owner and maintainer for the UNSW Kensington Campus and as a result has not been consulted on these issues.

In making this assessment without identification of the University as a service provider, the risk matrix details that several of the risks identified in the Utilities and Services category have a medium/low residual risk rating. UNSW does not agree with this assessment.

The risks include:

- Significant number of services and utilities requiring relocation or protection as part of the CSELR proposal, increasing the area of disturbance;
- Disruption to asset owner access to services and utilities;
- Damage to services and utilities during construction of the proposal (including associated safety risks, such as earth potential rise);
- Additional draw of electrical power (and thus additional power supply required in the local area) to run the light rail vehicles and electrical equipment at each of the stops, maintenance facility and stabling yard; and
- Buried cables and stray leakage currents from the running rails into surrounding earth causing cause electrolysis corrosion of nearby buried metalwork.

Additionally, the risk matrix details that several of the risks identified in the Hydrology, drainage and surface water quality category have a high/medium/low residual risk rating. UNSW does not agree with this assessment. The risks of concern to UNSW include;

- Potential stormwater ponding along the alignment affecting operation of the LRVs; and
- Potential for the proposal to result in exacerbation of existing localised stormwater flooding events during operation.

With regard to Groundwater, the risk matrix details that several of the identified risks have a medium/low residual risk rating. UNSW does not agree with this assessment. The risks include:

- Localised drawdown of the water table, resulting in a change in groundwater flow direction due to groundwater intersection and dewatering;
- Ground settlement risks to existing buildings and infrastructure due to groundwater drawdown during construction;
- Impacts to bores; and
- Contamination of groundwater aquifers due to accidental chemical spills or leakage from construction and maintenance plant, vehicles, equipment and storage areas.

**Figures 32** and **33** below show UNSW's utilities and services in relation to Anzac Parade and High Street. These are also located at Drawings 44 and 46 at **Appendix A**.

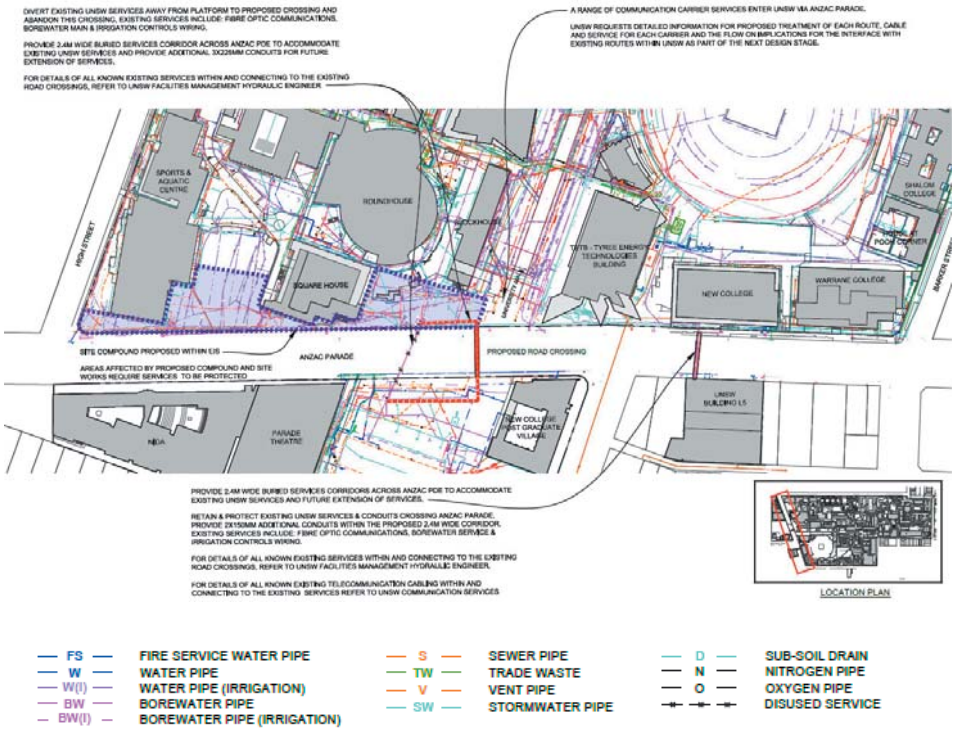


**Figure 32** – Current and Future Service Provisions – UNSW Anzac Parade Stop

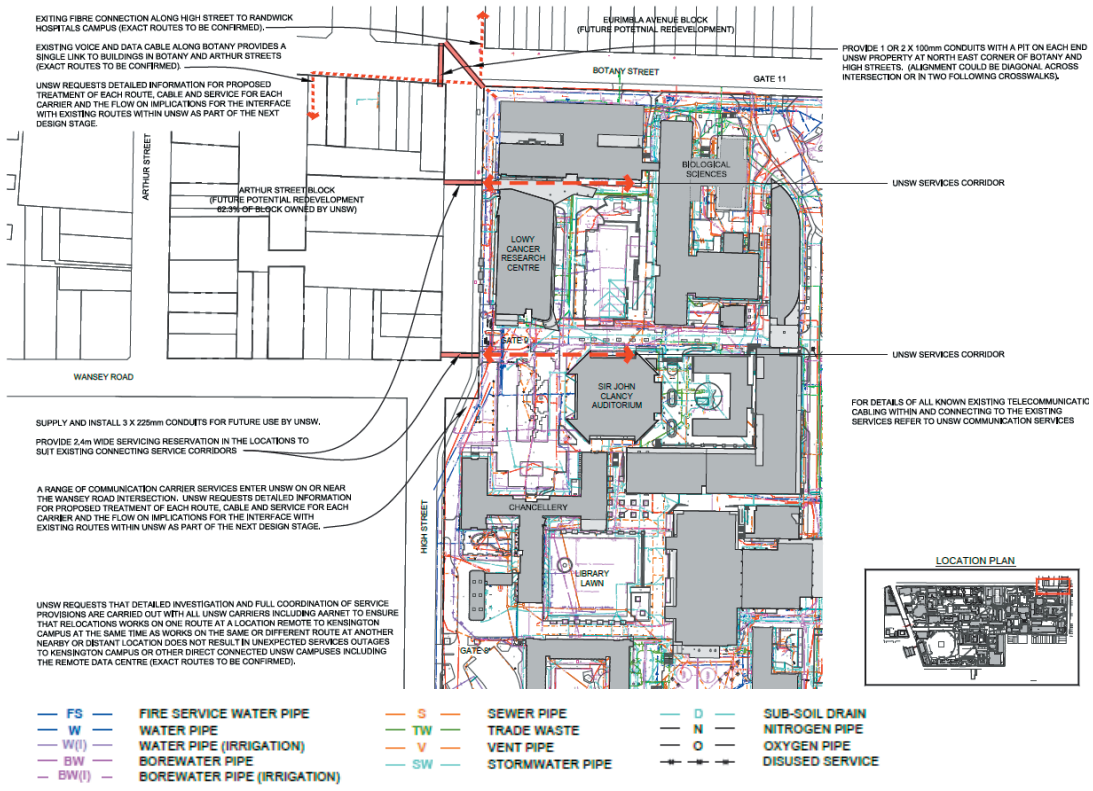


**Figure 33** – Current and Future Service Provisions – UNSW High Street Stop

### 6.3.1 Groundwater, borewater, and stormwater

UNSW trade waste, water supply bores and associated reticulation and stormwater will be affected by the EIS stop proposals for UNSW stops.

### Groundwater & Borewater

Existing underground groundwater and borewater services affected include:

- Location of two of the three large water production bores and associated services for the city of Kensington Campus which draws some 200kL / day of groundwater for 'commercial' uses,
- UNSW main stormwater pipeline runs within part of this strip of land,
- Bore water reticulation drain point lies immediately beneath the platform.
- Irrigation pipelines that run the length of the proposed land acquisition.
- Trade waste grease arrester and associated sewer drainage.
- Bore water mains exist across Anzac Parade to provide supply to Western Campus and to L5 site.

The University stop proposals to the greater degree limit impacts to its services, however, should the UNSW Production Bores No3 and 4 require relocation to available sites within UNSW campus that will provide a long term pumping rate for each bore of 18L/sec. This will require the bores to be located in the NW corner of the site to a depth to rock of about 30m (identical to the existing bores). Full hydraulic / mechanical design is required for the bore, casing, pump, controls, power supply, new 150mm bore water connecting mains and a new system drain to stormwater, relocation of associated buried pipeline and valves away from the site to be acquired. All designs need approval from UNSW. Lead time for this work is at least six months with design and construction costs estimated at some $1m.

### Stormwater

The existing local stormwater flooding along Anzac Parade from High Street to Day Street adjacent to UNSW is not addressed. The UNSW overland stormwater flood path drains onto Anzac Parade across the proposed construction compound and the UNSW Anzac Parade stop. (refer to **Appendix A**, Drawing 45). It is noted that Randwick City Council have prepared the Kensington – Centennial Park Flood Study, Draft for Public Exhibition November 2012 indicating stormwater flooding issues that exist. The implementation of the CSELR Project is to take these matters into consideration to ensure that no deterioration of performance is experienced.

## 6.3.2 Electricity

It is noted that the EIS assumes that AusGrid is the utility service owner and that any utilities relocation works associated with the light rail "will require careful planning and programming with the asset owner, AusGrid." This is not the case for UNSW land where UNSW is the utility service owner. Any relocation of services will require consultation with UNSW rather than AusGrid.

Additionally, it is understood that there is the intention for the CSELR project to source bulk electricity supplies from the existing from the AusGrid 11kV network from Central Station to Randwick terminus and Kingsford terminus. It is critically important that UNSW's share 11kV supply from the AusGrid network is not in any way compromised by the additional supply capacity and maximum demand required by the CSELR Substations as UNSW operations and future development rely on this supply.

It is stated that AusGrid will endeavour to connect to the closest available 11kV feeder. However, if the closest feeder has inadequate capacity, AusGrid will source other nearby, suitable 11kV feeders for connection. UNSW dedicated 11kV supply capacity must be retained for any future growth requirements, especially the recently installed 4th ring at the Barker Street supply. Accordingly, it cannot

be assumed that there is any available spare capacity in relation to power supply to the University.

### 6.3.3 Gas

The EIS assumes that Jemena is the utility service owner and that any utilities relocation works associated with the light rail "will require careful planning and programming with the asset owner, Jemena." This is not the case for UNSW land where UNSW is the utility service owner. Any relocation of services will require consultation with UNSW rather than Jemena.

### 6.3.4 Water supply and sewer

This section assumes that the local council and Sydney Water are the utility service owners and that any relocation works associated with the light rail will require careful planning and programming with them. As above, this is not the case for UNSW land where UNSW is the utility service owner. Any relocation of services will require consultation with UNSW rather than council or Sydney Water.

### 6.3.5 Telecommunications

A range of communications carrier services enter UNSW on both Anzac Parade and High Street near the Wansey Road intersection. Carrier services installed along both Anzac Parade and Wansey Road are likely to be affected, however it is not clear if the entry point to the campus on Anzac Parade or High Street will also be within the extent of permanent work boundary. As part of the next stage of design, UNSW requests the provision of detailed information on the proposed treatment of each service by each carrier along both Anzac Parade and Wansey Road and High Street and the flow on implications for the interface with existing routes within UNSW.

It is noted that an existing cable route running across High Street at Botany Street is not shown on the drawing. This conduit provides the route for voice and data cables to UNSW buildings in Botany Street and Arthur Streets. The route provides a single link to those premises. It is difficult to determine if another cable route running east along High Street providing fibre connection to various buildings within the POWH campus is included or not on the drawing.

UNSW requests that detailed information on all communications cable routes included in considerations and the proposed treatment of each service along those routes is provided to UNSW Communications Services and Facilities Management during the next stage of design.

The document states that "the number of both Early Works and PPP Works sites that can be worked at the same time are dependent on a number of factors, the main ones being the impact on the management of traffic and the availability of contractors." It is therefore requested that detailed investigation and full coordination of service provisions are carried out with all UNSW carriers including AARnet to ensure that relocations works on one route at a location remote to Kensington Campus at the same time as works on the same or different route at another nearby or distant location does not result in unexpected services outages to Kensington Campus or other direct connected UNSW campuses including the remote data centre at the UNSW Randwick Campus.

One of the key assumptions in the EIS indicates that "local connections and relocations outside the corridor have not yet been considered in the program." This is a critical consideration and it is requested that coordination of reconnection to existing cabling routes within UNSW property is considered along with street reconnections during the next stage of design and as part of construction considerations.

As part of this it is essential to provide adequate lead/response times for UNSW Communications Services in relation to any proposed outages or changes to existing telecommunications services. Network adjustments, changes to systems, long lead time user notification may be necessary to prepare for outages or changes to single or multiple segments of the service.

Further, the list of utility owners consulted to date does not include AARnet. As AARnet is a major service provider to UNSW it is suggested that they are included on all lists of affected utility providers and consulted throughout the project.

UNSW supports the following approach - " Investigations would be carried out during the detail design phase to ensure that all appropriate measures are in place to minimise potential risks to existing utilities and services prior to commencement of constructions works." "In addition to current investigations into the locations of buried utilities in the vicinity of the CSLER alignment, the construction contractor(s) would be required to check the locations of existing underground utilities and services prior to commencing construction works. This would include a revised and detailed DBYD investigation. This would be undertaken through pot-holing and/or hand digging and in accordance with guidelines provided by the relevant utility authority."

Currently, the EIS does not documentation does not include an existing conduit route across Anzac Parade to Western Campus on the relevant drawing. The conduit contains fibre and voice cables providing data & some voice services to National Institute of Dramatic Art and New College Postgraduate Village. It is the only route available and disruption will result in total loss of data service. it is therefore requested that the proposed treatment of this route is discussed in detail with UNSW Communications Services during the next stage of design.

Also, an area adjoining the south west corner of the UNSW Squarehouse building is included in the extent of the permanent works boundary. There are a communications services conduits running through the defined area. Routes included are the single lead-in voice and data route providing services to the Squarehouse as well as a cable route from Anzac Parade to the Blockhouse. It is requested that the proposed treatments in relation to these routes are discussed in detail with UNSW Communications Services and Facilities Management during the next stage of design.

Lastly, a range of communications carrier services enter UNSW via Anzac Parade. As part of the next stage of design, it is requested that detailed information is provided to UNSW on the proposed treatment of each route, cable and service for each carrier and the flow on implications for the interface with existing routes within UNSW.

### 6.3.6 Future proofing / Future expansion and servicing needs

UNSW plans to develop the Western side of Anzac Parade opposite UNSW Anzac Parade Station. UNSW Infrastructure and Utility services will be extended across Anzac Parade to further service that site. At least 6 x 300mm inside diameter PVC pipelines with at least 750mm cover to top of pipe are required.

There are planning proposals by UNSW to extend Kensington Upper Campus services north to service existing and new sites planned for purchase (Wansey, Arthur and Botany Streets). New conduits will be required to be installed N-S under High St to allow several water, borewater and gas mains to be installed. The

following conduits are required to be installed: 6 x 300mm inside diameter PVC pipelines with at least 750mm cover to top of pipe.

New conduits will be required to be installed under High St and under Anzac Parade to allow communications, several water, borewater and gas mains to be installed. The following conduits are required to be installed: 6 x 300mm inside diameter PVC pipelines at least 750mm cover to top of pipe.

There is no mention of the potential Risk of services interruptions to UNSW's infrastructure during construction or the impact on UNSW operations of the service interruption if this occurs. It is requested that adequate lead time is programmed to enable UNSW Communications Services to plan for and manage any outages or changes to existing telecommunications services. Network adjustments, changes to systems, long lead time user notification will be necessary to prepare for outages or changes to single or multiple segments of the service.

## 6.4 Construction and post project impacts upon UNSW operations

This response is driven predominantly by UNSW's desire to see a safe and accessible environment at the campus for its students and staff and one which achieves and maintains a high level of amenity within, and at the edges of, the campus. To that end, these key concerns remain those tied to broadly meeting the project's objectives from a public benefit standpoint, but also the ability for UNSW to continue to be able to provide a learning, teaching, and research environment commensurate with its place as one of Australia's and the Asia-Pacific Region's premier universities, during both construction and operation.

It is essential that UNSW be able to operate as normally as possible during the CSELR construction works period. Maintaining traffic and transport access to the campus is fundamental to ongoing operations not being detrimentally affected, and in turn affecting the University's reputation and standing, particularly with student intake and its ability to maintain a competitive business edge and attract not only students but the best staff and key supporters of education, research, technology, and innovation.

### 6.4.1 Traffic and access

Key to the above is the provision for the following:

#### Student and Staff Access

In addition to public transport, UNSW has approximately 8,000 staff and students arriving by private vehicle, 7,000 walking and more than 1,000 cycling to campus each day.

In order to continue operations, sufficient access points and capacity for each of these modes needs to be managed and maintained throughout construction and beyond in a safe and efficient manner.

Any changes to arrangements need to be coordinated and communicated in advance to avoid confusion and disruption to operations.

In order to ensure that the bicycle network extent and operations are supported by the CSELR project, UNSW engaged Arup to review and recommend how this would best be achieved. Their External Bicycle Network report is contained at Appendix G. The University supports their recommendations.

## Operations and Delivery Access

Daily campus delivery requirements and campus specific construction traffic must be considered and managed during construction and delivery phases of the CSELR project.

Ongoing access for deliveries is essential for normal operations to continue. Access to the University is limited to a number of entry/exit points. These are nominated on **Figure 34** (Drawing 43 in **Appendix A**) below. All access points are likely to be affected by the construction works in one way or another, and especially so, dependent upon the size of the delivery vehicle.

Certain access points presently cannot cater for oversized vehicles, whereas other access points can. Should any one Gate be affected for an extended duration (including the route to that Gate) severe impacts to supplies of materials and other important deliveries is likely to result. As can also be seen from **Figure 34** below, not all loading docks or parts of the campus are readily accessible from other parts of the campus.

Some research activities rely on specialised gas and other services to operate. Due to the infrastructure involved use of alternative gates and access points may not be possible. Regular access for these activities will need to be maintained throughout the construction process.

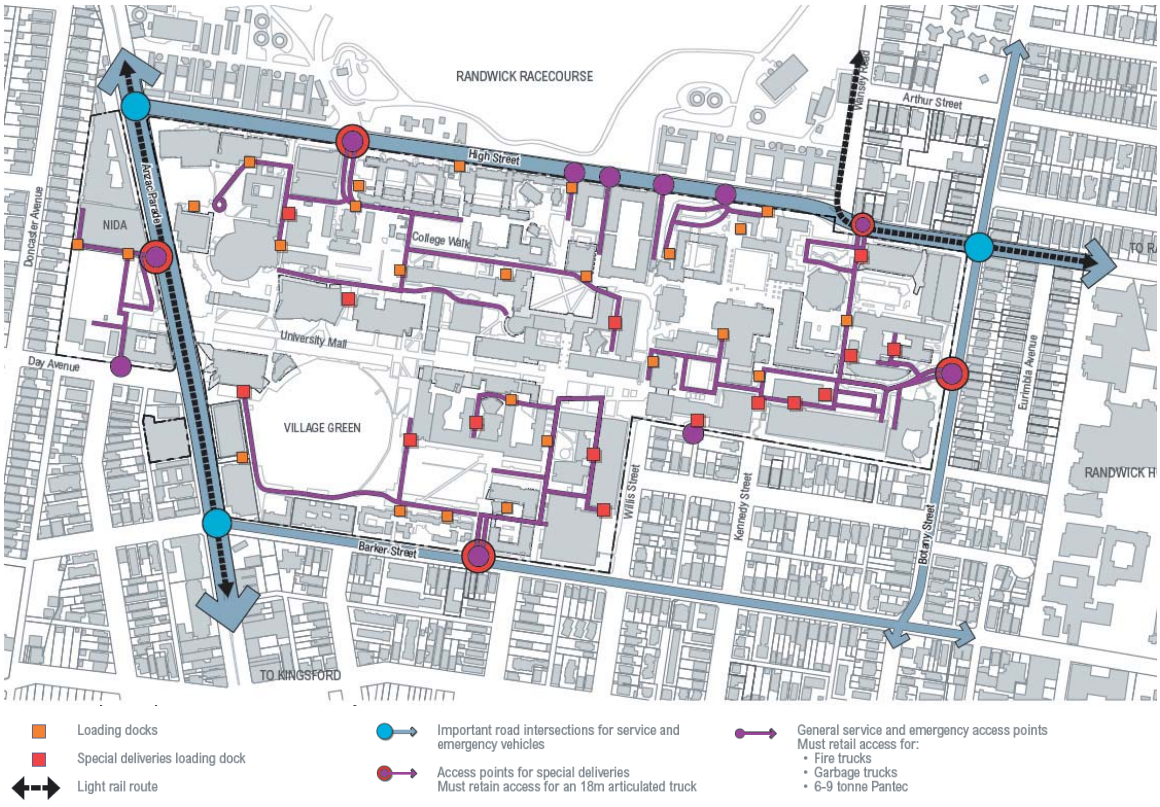


**Figure 34** – Campus Operations and Delivery Access

## UNSW Construction Program

The UNSW Kensington Campus has a building replacement cost value of approximately $2.5bn. With ageing built infrastructure the university currently spends in the order of $200m a year on facilities.

At present there are 4 major projects underway on the Kensington Campus:

- Wallace Wurth School of Medicine (completion May 2014) - $146m

- Kensington Colleges Redevelopment (completion January 2014) - $110m
- Materials Science Building (completion June 2015) - $145m
- Mechanical Engineering Refurbishment (completion March 2015) - $68m

In December 2013 the University Council approved a borrowing strategy and capital program that will see the University continue to undertake a similar level of activity throughout the period of the construction of the CSELR.

The projects in the following table are funded from University reserves and the borrowing strategy. They require no other external funding to proceed.

**Table 5** – UNSW Capital Development Program – Short term

| Project | Budget | Construction Period | Construction Access |
|---|---|---|---|
| Biosciences Phase 1 | $150m | 2014 - 2017 | Gate 11 Botany Street |
| Biosciences Phase 2 | $120m | 2017 - 2020 | Gate 11 Botany Street |
| Materials Science Lab Fit Out | $38m | 2015 | Gate 2 High Street |
| Chemical Sciences Refit | $63m | 2016 - 2017 | Gate 2 High Street |
| Electrical Engineering Refit | $100m | 2015 - 2016 | Gate 2 High Street |
| Civil Engineering Refit | $40m | 2016 - 2017 | Gate 11 Botany Street |
| Squarehouse / Blockhouse | $48m | 2017 - 2018 | Gate 2 High Street |

The University will also be reviewing its student accommodation demand following the opening of 950 new beds in 2014. If sufficient demand exists additional student accommodation could be developed. This will be self-funding from debt. The university has other projects in planning that are subject to external funding from Government and / or fundraising.

The construction program is broadly identified in the **Figure 35** below (Drawing 9 in **Appendix A**). As with routine deliveries, only certain access points and Gates will be able to directly serve individual construction sites. Some of these Gates are directly affected by the timing, duration and location of the CSELR project and its works.

To assist in resolving routine and construction access issues and likely impacts, UNSW seeks to work proactively with TfNSW to formulate a construction program that is mutually acceptable to both parties and considers the economic and business impacts of each project or entity.

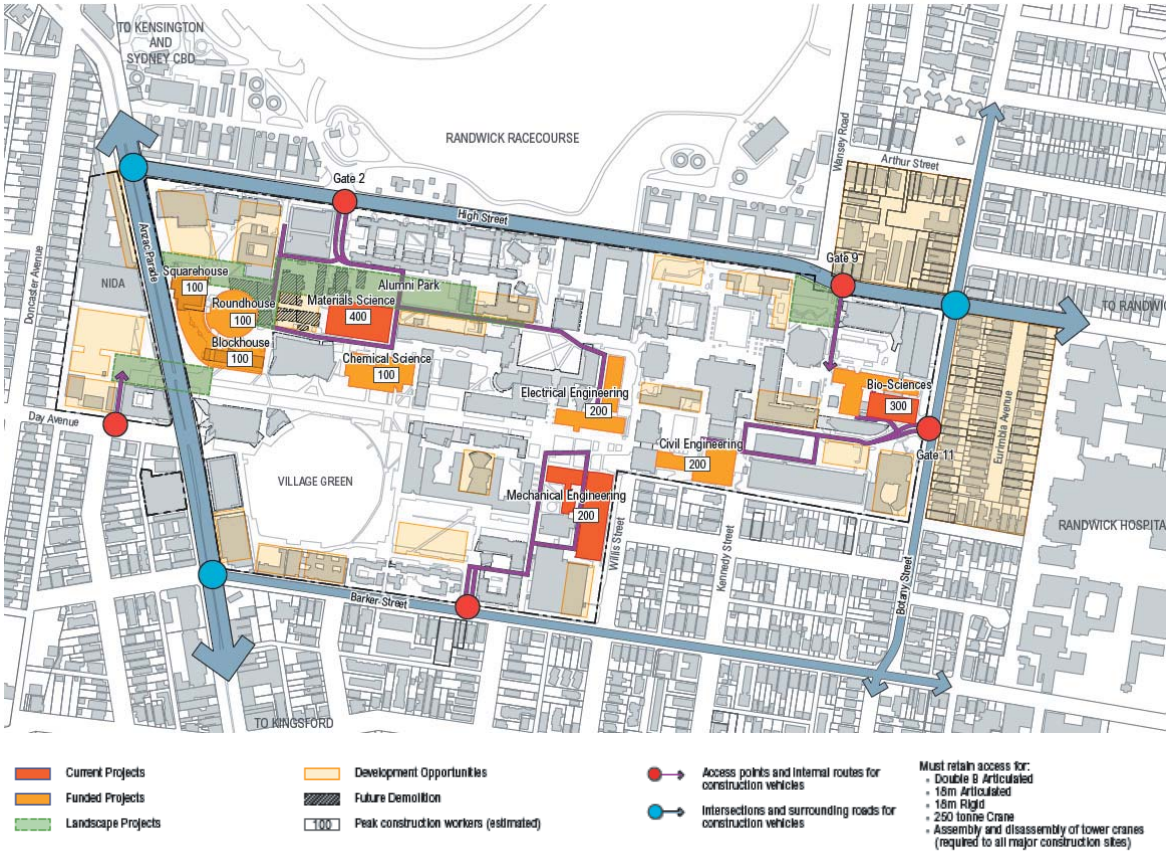


**Figure 35** – Campus construction projects and access requirements (2013-2018)

## Traffic Operations and Management

UNSW and its partners have had a key role throughout the project providing land and other resources as well as playing a critical role in design and development of the project on the Client Working Group and other forums.

It is noted that the UNSW community will be the largest single customer for the CSELR. Its staff and students will also travel counter to the commuter flow to the CBD using what would otherwise be surplus capacity.

This active role and the importance of the UNSW community has been reflected in the Memorandum of Understanding (MoU) signed with TfNSW and the Transport Minister's announcement in July 2013:

> *"The key to successful delivery lies in developing strong working relationships with our key partners,"*
>
> *"The agreements signed with Randwick City Council, Centennial Parklands and UNSW set out matters of importance to all parties and provide a foundation for an ongoing partnership that will support the efficient delivery of light rail."*

The Transport Operations Report recognises (Pg. 111):

> *"The University of New South Wales has more than 50,000 students including approximately 12,000 international students that generate*

*between $350m - $400m of export income for the State each year. UNSW is regularly ranked in the top 100 universities in the world."*

*"The continuation of reliable transport services throughout the construction process is vital to the operation of the University and the ability to attract and retain students. This includes not only connections to Central Station but also cross regional bus services that connect to the UNSW Kensington Campus."*

Despite the MoU, recognised operational impacts and the role of UNSW's staff and students in the viability of the CSELR project, this key role has often not been reflected in the language or focus in the EIS including the Construction Traffic and Transport Management Plan (CTTMP). For example UNSW is identified under "Other Stakeholders" and is excluded from membership of the Network Co-ordination Liaison Group. UNSW intends to continue to be actively involved as a key partner at both high and detailed levels to ensure shared objectives and public benefits can be achieved.

## Journey Time and Signal Priority

Chapter 5 of the EIS Proposal infrastructure and operations (Tables 5.6 and 5.7) indicate the following journey times for the light rail:

- UNSW Upper Campus to Central 13 minutes
- Central to UNSW Upper Campus 16 minutes
- UNSW Lower Campus to Central 14 minutes
- Central to UNSW Lower Campus 15 minutes

These times are broadly the same as the timetable for the existing UNSW express bus service of 15 minutes. UNSW notes signal priority will enable the light rail system to achieve 97% reliability and also notes the importance of coordinated signals in zones such as in Anzac Parade between High Street and Barker Street.

Additionally, it is noted that elements of delay have been factored into these journey times and that the final performance will be part of the detailed design phase of the proposal (5.4.3. LRV road network integration Pg. 5-82).

As the largest customer destination of the proposed light rail UNSW proposes a number of measures to reduce journey times between UNSW and Central Station:

1. As the mass transport mode, provide the light rail with higher priority under the Sydney Coordinated Adaptive Transport System at key intersections and during key periods;
2. Include technology used by other modern light rail systems including signal pre-emption at key intersections;
3. Increase the amount of separate running for the light rail to improve speed in key parts of the corridor;
4. Include coordination of signals in the Anzac Parade zone between High Street and Barker Street; and
5. Include journey time improvement as one of the criteria for procurement of the operator.

It is noted that the proposed UNSW lower campus stop will simplify the signal operations of the corner of Anzac Parade and High Street improve the journey time relative the forecasts above.

UNSW does not support any changes that would increase travel times between Central Station and the UNSW Kensington Campus e.g. additional stop(s) or pedestrian priority areas.

### UNSW Peak Load Prioritisation

UNSW's Upper and Lower campus stop designs and associated bus stops assume that the University is given priority for the Light Rail capacity during weekday peak periods (7am to 7pm) i.e. that normal services operate and that rail replacement buses will only by used during special events to serve the campus transport needs outside of these times, if required at all.

## 6.4.2 Bus Services

UNSW notes that the CTTMP executive summary (pg. xvi) identifies no mitigation strategies for the Randwick Precinct. It is also noted the express services remain in place with no mitigation measures identified (University Express Services 890, 891 and 892 4.6.6.5 Pg. 152).

This contrasts with the mitigations measures for class 1 and 2 special events, which the University express services qualify as, in terms of impact, but are not defined as.

UNSW accepts that there will be disruption during the construction of the CSELR. However the University does not accept that there are no mitigation measures to offset the disruption and maintain or improve the experience for its staff and students particularly those travelling on the Express Bus services from Central Station.

### Arrangements at Central Station / Express Services

UNSW is in a highly competitive environment to attract and retain top student. Many of the students who endure the construction activities will not benefit from the CSELR as they will have graduated.

The failure of the UNSW express bus services to be able to cope with UNSW staff and Students, including a bus every 75 seconds, is a key driver of the strategic need for the project.

Accordingly, UNSW requests the following changes and inclusions:

- Run express buses in the morning peak along Alison Road and Botany Street onto High Street.
- Provide shelter at Eddie Avenue.
- Investigate loading express buses on Chalmers street south of Devonshire Street per the major events.
- Guarantee Sydney buses staff are on site to load buses from rear doors and ensure ticket machines are operational.
- Allow the larger articulated buses to continue to provide express bus services.
- Dispense with tickets for the duration of construction.
- Provide supplementary services from Green Square, Redfern and/or Bondi Junction.

### NSW Long Term Transport Master Plan

The NSW Long Term Transport Master Plan includes an action for a pedestrian friendly CBD

4.9.3

Action Create new dedicated pedestrian links in the CBD

A Central Station east-west link (parallel and to the north of Devonshire Street tunnel and providing a link across Pitt and George Streets to the west).

*We will prioritise pedestrian access and mobility in and around busy CBD public transport*
*interchanges, contributing to the creation of attractive, safe pedestrian friendly urban precincts.*

4.9.1 – A transit Friendly CBD
Under the action of Upgrading Busy CBD Interchanges, we note *Central Station – A comprehensive and multi-modal upgrade would encompass and integrate trains, coaches, taxis, buses and light rail. The rail network efficiency program provides opportunity to streamline rail services to Central. The implementation of Sydney's Rail Future and construction of light rail will enhance the role of the Station and possibly require an upgrade to better integrate with surrounding transport infrastructure. The upgrade will alleviate overcrowding on some platforms and pedestrian congestion in the passenger terminal at peak times. Wayfinding will be improved within and outside the station.*

The Central Station East-West link is required to provide an integrated solution and seamless transfer between heavy rail and light rail for University staff and students as well as people attending special events.

UNSW notes that this is an agreed action of the NSW Long Term Transport Master Plan and recommends that it is delivered in time for 2019 when light rail services start.

## Arrangements at Randwick Racecourse (Exam Periods / Locations)

As a consequence of University operational requirements, including particularly key periods such as exam times and session commencement times it is requested that the works be timetabled to coincide with the major Christmas break between December and February.

This includes consideration of works in Alison Road as these will impact UNSW exams held at the Randwick Racecourse.

## Other Bus and Operations comments

It is noted that UNSW supports:

- the Anzac Parade Services (routes 391, 392, 394 and 399) continuing to Todman Avenue providing direction connections to UNSW;
- the continuation of cross regional bus services via High Street including routes 348, 370, 375, 400 and 410; and
- the Kingsford mitigations strategies of Tidal flow operation on Anzac Parade and staged construction activities in the Anzac Parade and Alison Road corridors.

It is also noted that the University Express bus services and Metrobus routes M10 and M50 will not operate as they will be replaced by CSELR.

## Future Routes / Services

UNSW strongly recommends that decisions regarding all future bus routes and the operation of the Light Rail Services are made on merit i.e. that neither place contractual limitations or restrictions on the other. Future routes are shown below in **Figures 36** and **37** – Drawings 3 and 4 in **Appendix A**.

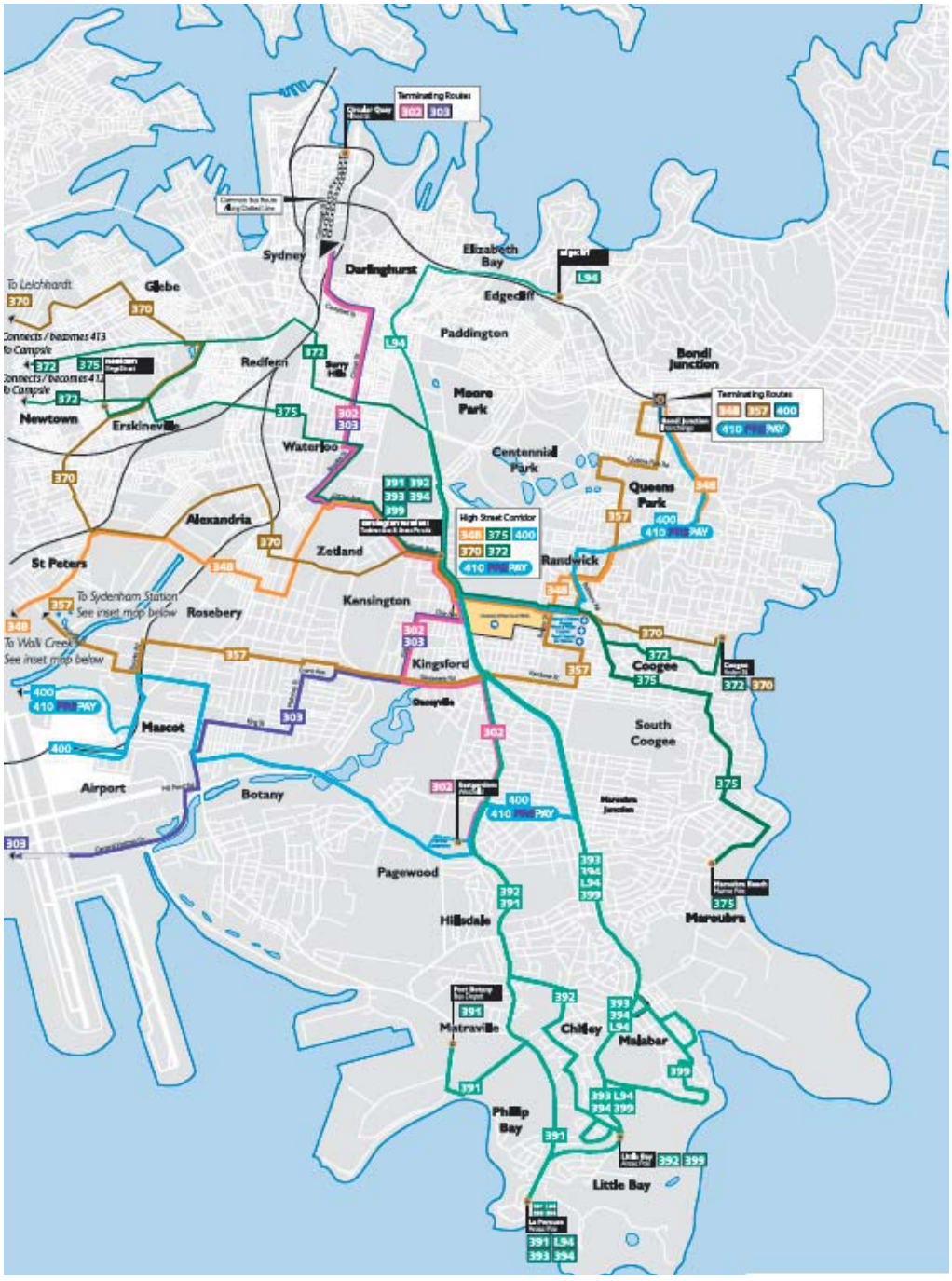


**Figure 36** – Future Bus Services and Routes

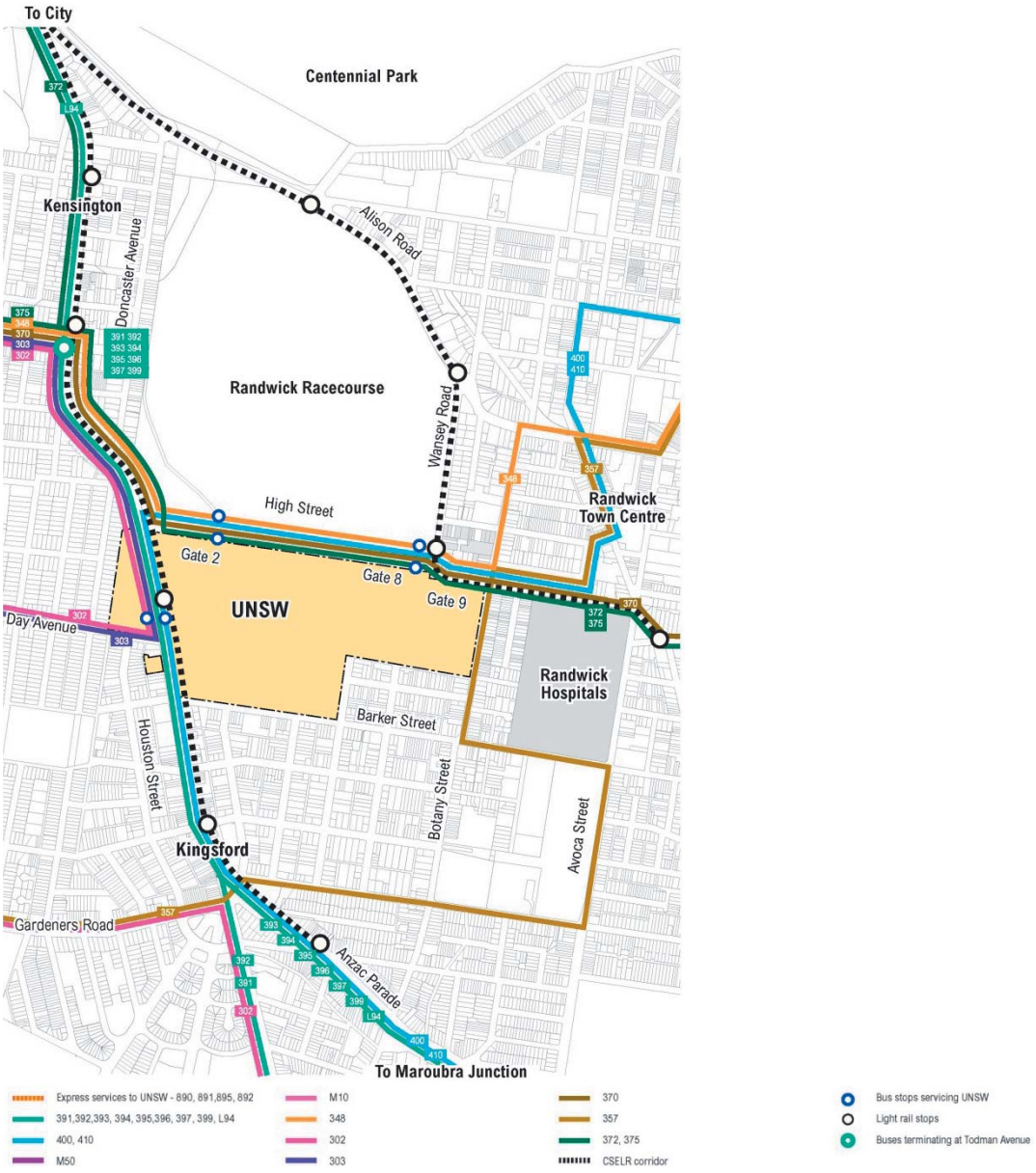


**Figure 37** – Future Public Transport to UNSW to UNSW

## 6.4.3 High Street Stop for Hospitals

The University of New South Wales notes the absence of a stop on high Street to serve the Health and Education precinct and particularly the Prince of Wales Hospital campus. Many UNSW staff and students have complementary positions and placements at the hospital campus in clinical and research roles. Additionally UNSW occupies space on the hospital campus including the Australian Advance Treatment Centre, currently under construction.

Accordingly UNSW strongly advocates the inclusion of a stop on High Street that serves the Prince of Wales Hospital Campus directly.

## 6.4.4 Social Impacts

UNSW strongly supports the positive social impacts of the CSELR.

UNSW notes the urban renewal and improved amenity provided by the CSELR (Pg. 2). The main fixed infrastructure component of the project that contributes directly to this are stops including their access points, platforms, seating, information

panels and canopies. Accordingly UNSW recommends adopting a number a number of social impacts (Pg. 3) in the design considerations for the stops:

- Safety and Security
- Local amenity, character and environment
  - Visual amenity
  - Changes in access and local traffic conditions
  - Access to public spaces and urban connectivity

By considering these factors in the design of each stop they will respond to the individual characteristics of the location and use that they support.
In response to the Light rail on High Street impacts (Pg. 5) UNSW requests inclusion of University activities in the considerations for mitigations to prevent negative impacts during construction and operation.

UNSW notes the assessment of a slightly negative safety and security impact (Pg. 83) of the CSELR on the upper campus area around the proposed High Street / Wansey Road Stop. As noted in the report UNSW recommends further detailed design work to mitigate these impacts.

UNSW notes the assessment of a slightly negative safety and security impact (Pg. 92) of the CSELR on the lower campus area around the proposed UNSW Anzac Parade Stop. As noted in the report UNSW recommends further detailed design work to mitigate these impacts.

### 6.4.5 Economic Impacts

UNSW notes the recommendation to implement a Business and Landowner Engagement and Management Plan as well as a Business Management and Assistance Strategy to proactively work with businesses. As the largest organisation (turnover $1.5bn, annual capital spend circa $200m, 6,000 staff) impacted by the light rail construction UNSW requests that it is defined as a business for the purposes of these plans and strategies.

## 6.5 Construction compound location

The location of the construction compound on the campus is not supported due to the range of likely impacts upon the campus and nearby sensitive uses within the campus. These impacts include loss of amenity and intrusion of noise, vibration, and light spill at night; loss of significant trees; potential damage and loss of access to infrastructure and services; impaired pedestrian accessibility, reduced safety, diversion of existing stormwater flow, noting that the proposed site of the compound is an area largely subject to inundation.

As a result of UNSW's recommended revised location for the UNSW Anzac Parade stop, the compound is no longer directly contiguous with where the works are proposed to be undertaken. There may be an opportunity for the compound to be located within the road reserve.

More details are required in order to better understand impacts upon UNSW. UNSW's preferred action is to continue to work with the TfNSW project team to find a solution.

## 6.6 Stabling options

The University supports the stabling option that best serves and supports the operation of the CSELR network.

# 7.0 Ongoing consultation with TfNSW

As a key partner in the CSELR Project, UNSW seeks to maintain positive and meaningful engagement on the project in ensuring its objectives can be achieved.

As stated in this submission package, UNSW will continue to partner with TfNSW and the contractor to find solutions to the recommendations raised in this submission package that enhance detailed design process and the facilitation and delivery of the light rail network.

UNSW has sought to work collaboratively in achieving optimal outcomes for the University and the wider community. Its strong desire is to assist in detailed design outcomes as put forward in this submission, particularly for light rail stops at its perimeter and those along the route that affect the daily operations of the campus.

To achieve suitable and meaningful input into the detailed design phase, UNSW seeks the preparation and implementation of a stakeholder liaison protocol and sign-off mechanism to address early works and main construction works to assist in input, feedback (and critically) notification of when certain works may be carried out. As noted, UNSW has numerous sensitive uses and functions for which significant disruptions (programmed or otherwise) may pose significant issues to those uses and the University in general. Accordingly, the potential staging of works will be an important consideration for and impact upon UNSW.

UNSW acknowledges that the detailed design process for the CSELR will continue after the EIS process has completed. UNSW proposes the following principles for the Upper and Lower campus stop designs and for the corridors on Anzac Parade (between High Street and Barker Street) and High Street (between Wansey Road and Botany Street) as well as any services, utilities, bus stop and other impacts on the Kensington campus;

- Notice period of 13 business days for comment on any design changes;
- A clear rationale for any design changes with reference to UNSW's priorities, the social impact objectives of the project and previous design drawings and concepts; and
- Engagement of an independent certifier should there be a dispute between TfNSW and UNSW on a design solution.

As noted previously, a Business and Landowner Engagement and Management Plan as well as a Business Management and Assistance Strategy are to be implemented by TfNSW to proactively work with businesses. UNSW requests that it is defined as a business for the purposes of these plans and strategies.

Lastly, UNSW will also be party to a Development Agreement as part of CSELR project and, as relevant, this will seek to address management and issues mitigation procedures and a range of development and construction matters in that agreement.

# 8.0 Conclusion

UNSW is a significant contributor to the ongoing success of the Sydney public transport network and the success of the CSELR, bringing some 25,000 passengers to the campus weekdays, including 17,000 alone on buses between Central and the Kensington Campus. Additional to this are the visitors to campus for special events both during the week and at weekends.

To that end alone it is Sydney Buses biggest single customer destination. This is expected to continue to grow as UNSW itself grows. Indeed, UNSW provides "special event" status to the network on a twice daily basis. The EIS has noted this in nominating the two proposed UNSW stops as the 4$^{th}$ and 5$^{th}$ busiest in the CSELR project, and the two busiest on the south-eastern corridors. This UNSW daily passenger load clearly provides the single greatest driver of the benefit case for the light rail.

As a key partner in the CSELR project UNSW will continue to partner with TfNSW (and the contractor) to clarify and resolve any issues raised in this submission package and to find appropriate outcomes that enhance the facilitation and delivery of the light rail network. UNSW has sought to work collaboratively with TfNSW in achieving optimal outcomes for the UNSW and the wider community.

We request that UNSW be notified when the proponent's Response to Submissions Report is made available for review to ensure a seamless and time effective process to ensure issues are resolved.

Whilst this submission is chiefly about suggested designs for the two UNSW stops, and other relevant issues at construction and operational phases of the project, UNSW confirms that its fundamental concern in responding to the EIS is the safety and security of its staff and students. It is noted for additional information that a list of comments regarding the EIS documentation itself is provided at **Appendix H**.