MACQUARIE UNIVERSITY DESIGN EXCELLENCE STRATEGY AND URBAN DESIGN GUIDELINES

VOLUME 1

DATE: SEPTEMBER 2017



MACQUARIE University

Amendment	Date	Changes
1	**May 2010**	– Detailed design controls for lots in Precinct E, general site structure plans.
2	**August 2015**	– Submission of a comprehensive set of detailed design controls for each lot on the campus, excluding Precinct E and lots in Precinct D which were impacted by potential changes associated with finalisation of the Herring Road Priority Precinct.
3	**September 2017**	– Provide a consolidated set of detailed design controls for each lot, including Precincts E and D which were exclude. – Provide for increased heights and floorspace along Herring Road to align with the outcomes of the Priority Precinct process. – Translate the FSR controls under Ryde LEP 2014 to maximum GFA caps for key sites along Herring Road, to align with the terminology used in the approved MU CP and to provide greater clarity for the University. – Align the Guidelines to reflect recent changes to road layouts across the Campus, which have been undertaken as part of various applications under Part 5 of the EP&A Act. – Detailed design controls updated for lots in Precinct A.

MACQUARIE University

MACQUARIE UNIVERSITY PROPERTY

Macquarie University, NSW 2109
Telephone: +61 2 9850 7111

context

LANDSCAPE ARCHITECTS

Context Landscape Design
Level 2, 52 - 58 William Street
East Sydney, NSW 2001
Telephone: +61 2 8244 8900

JBA

STATUTORY PLANNERS

JBA Planning
173 Sussex Street
Sydney, NSW 2060
Telephone: +61 2 9956 6962

CONTENTS

VOLUME 1

1. INTRODUCTION 1

1.1 Macquarie University Location and Context 2
1.2 The Macquarie University Concept Plan 4
1.3 Position of Guidelines in the Planning Framework 5
1.4 The Macquarie University Campus Master Plan 2014 6
1.5 Herring Road Priority Precinct (PP) 7
1.6 Scope and Precinct Definition 8
1.7 Concept Plan Requirements 10
1.8 Current Projects 13

2. PRECINCT PLANNING FRAMEWORK 15

2.1 Plan Development 16
2.1.1 Structure Plan 16
2.1.2 Precincts 18
2.1.3 Development Parcels 22
2.1.4 Open Space Framework 24
2.2 Access and Movement 26
2.2.1 Access Corridors 28
2.2.2 Illustrative Accessway Sections 30
2.2.3 Pedestrian Network 32
2.2.4 Public Transport 34
2.2.5 Cycle 35
2.2.6 Lot Access 36
2.2.7 Parking 38
2.2.8 Accessibility 39
2.3 Rail Easement 40

3. PUBLIC DOMAIN 43

3.1 Landscape Structure 44
3.2 Primary Walkways and Thoroughfares 50
3.3 Primary Parks and Plazas 58
3.4 Secondary Parks and Plazas 66
3.5 Creek Corridors and Parklands 82
3.6 Sports Fields and Facilities 88
3.7 Campus Gateways 90
3.8 Primary Roads 98
3.9 Secondary Roads 106
3.10 Shared Ways 110
3.11 Secondary Pedestrian Connections 111
3.12 Planting Schedules 113
3.13 Water Management 120
3.14 Lighting, Safety and Security 122
3.15 Paving 123
3.16 Street Furniture 126
3.17 Public Art 127

4. BUILT FORM 129

4.1 Principles 130
4.2 Building Heights 132
4.3 Articulation 134
4.4 Activation 136
4.5 Materials 137
4.6 Building Lighting 138
4.7 Building Signage 139
4.8 Sustainability 140
4.9 Lot Landscaping 141

5. LOT CONTROLS 143

5.1 Legacy Building Lots 144
5.2 Individual Lots 146
5.2.1 Precinct A 147
5.2.2 Precinct B 173
5.2.3 Precinct C 182
5.2.4 Precinct D 185
5.2.5 Precinct E 191
5.2.6 Precinct F 201
5.2.7 Precinct G 206
5.2.8 Precinct H 212

VOLUME 2

6. SUPPORTING DOCUMENTS

6.1 Landscape Management Plan (incorporating Weed Management Plan)
6.2 Vegetation Management Plan (incorporating Threatened Species Plan)
6.3 Utilities Management Plan and Stormwater Management Plan
6.4 Transport and Accessibility Report
6.5 Consultation Report


MACQUARIE
UNIVERSITY
2014



1

INTRODUCTION

1. INTRODUCTION

1.1 MACQUARIE UNIVERSITY LOCATION AND CONTEXT

The Macquarie University campus is located 17km to the northwest of the Sydney CBD at the western end of the Macquarie Park Corridor - a major employment and research business precinct bounded by Culloden Road, Herring Road, the M2 Motorway and Epping Road.

The 126ha University campus is bounded by Epping, Herring, Talavera and Culloden Roads. The main components of the campus are:

- The Academic Core which contains the main University buildings ranging in height from 1 – 8 storeys.
- Macquarie University Research Park which is located in the eastern corner of the campus fronting Herring Road and Talavera Road. Commercial tenants are located in buildings typically four to eight storeys in height.
- University housing located west of Culloden Road.
- University housing along Herring Road.
- Playing fields and open space located in the northern quadrant of the campus and north of Culloden Road (accessible from the M2 Motorway).
- New commercial and research space on University Avenue: Cochlear and the Australian Hearing Hub.

Other land-uses on campus include:

- Macquarie Graduate School of Management (MGSM) accessed from Talavera Road.
- A Travelodge Hotel (off Talavera Road).
- A service station on the corner of Epping and Culloden Roads.
- An Aquatic and Sports Centre.
- Macquarie University Hospital off Talavera Road.
- Macquarie University Observatory.

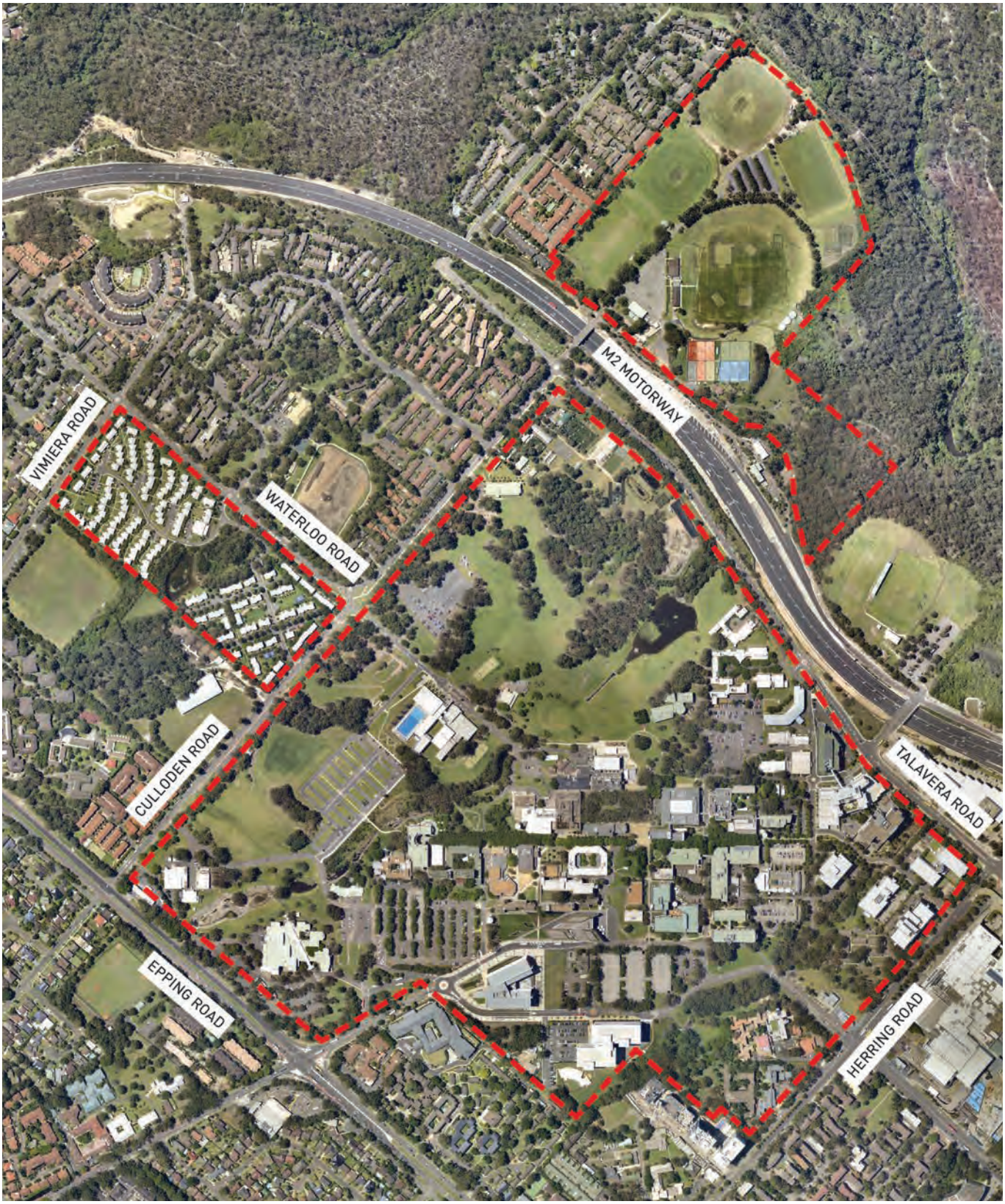


FIGURE 1: MACQUARIE UNIVERSITY SITE

1.2 THE MACQUARIE UNIVERSITY CONCEPT PLAN

The Concept Plan approval was granted to Macquarie University on 13 August 2009 for the carrying out of development across the campus.

The Concept Plan approval was activated in December 2010, with the approval of the Australian Hearing Hub. The Concept Plan approval is now retained in perpetuity.

The conditions of approval set out areas of detail where the originally exhibited version of the Concept Plan and development parameters (together with the subsequent Preferred Project Report and the Statement of Commitments) are to be modified.

Condition B4 of the Concept Plan approval requires the preparation of a Design Excellence Strategy and Urban Design Guidelines for the campus. These Guidelines have been prepared to satisfy this condition.

1.3 POSITION OF GUIDELINES IN THE PLANNING FRAMEWORK

The current statutory planning regime governing the planning for, and development of, the MQU campus is the approved Part 3A Macquarie University Campus Concept Plan and the gazetted State Significant Site (SSS) listing under the State Environmental Planning Policy (Major Development) 2005 (Major Development SEPP).

In accordance with the Major Development SEPP, the SSS listing prevails over Council's Local Environmental Plan and any other environmental planning instrument. Similarly, the approved Concept Plan continues to apply to the site, despite any provisions in any other environmental planning instrument – SEPP, LEP or a DCP. The Design Excellence Strategy and Urban Design Guidelines are required by, and form part of, the Concept Plan approval.

Given the existing planning regime applying to the University, the University campus has been excluded from Part 4.5 of the Ryde Development Control Plan 2014. These Urban Design Guidelines now provide the 'controls' and detailed design measures against which future development on the campus will be assessed, and are to be considered instead of Council's DCP controls.

The Design Excellence Strategy and Urban Design Guidelines will be managed and maintained by Macquarie University. When variations to the Guidelines are proposed, the Guidelines will be updated by the University and reviewed by the University Design Excellence Committee, University Executive and University Council for their endorsement. A copy of the revised Guidelines will be issued to Council for information.

Using These Guidelines

The Guidelines have been formulated to capture the overall principles and key requirements for sites across the campus.

The Guidelines are not prescriptive and variations are possible where appropriate justifications is provided. Any proposal that departs from the overall intent of the Guidelines, lot controls or overall planning principles should provide clear justification for any proposed changes. Supplementary reports or assessments (eg. Landscape, Urban Design etc) may need to be prepared.

1.4 THE MACQUARIE UNIVERSITY CAMPUS MASTER PLAN 2014

In 2014, Macquarie University revisited the campus vision to address the next 50 year phase of the University's growth. This is reflected in the recently completed Macquarie University Campus Master Plan 2014, which was approved and adopted by the Macquarie University Council in March 2014. The Master Plan does not seek to replace the approved Concept Plan, rather it represents an internal guiding document which will be implemented via the Concept Plan.

Importantly, the Master Plan does not represent a significant change to the development potential achieved by the approved Concept Plan. Whilst there are some changes proposed (for example, student housing is now considered within the Academic Core) the Master Plan reflects a duration longer than that of the Concept Plan, a vision for growth over the next 50 years to 2064, rather than proposing growth within the Concept Plan's timeframe of 2034.

Whilst it was originally requested that the Concept Plan guide development on the campus for a 40 year period, a 25 year timeframe was preferred by the then Department of Planning to ensure parity with Metropolitan Planning objectives and targets to 2031.

In effect, the Master Plan confirms the original long-term plan for capacity, spatial planning and development potential.

As noted above, the Master Plan will continue to be implemented via the Concept Plan, so there is no change proposed to the current planning regime applying to the site. These Urban Design Guidelines have been prepared in accordance with the Concept Plan approval, while being informed by the 2014 Master Plan.

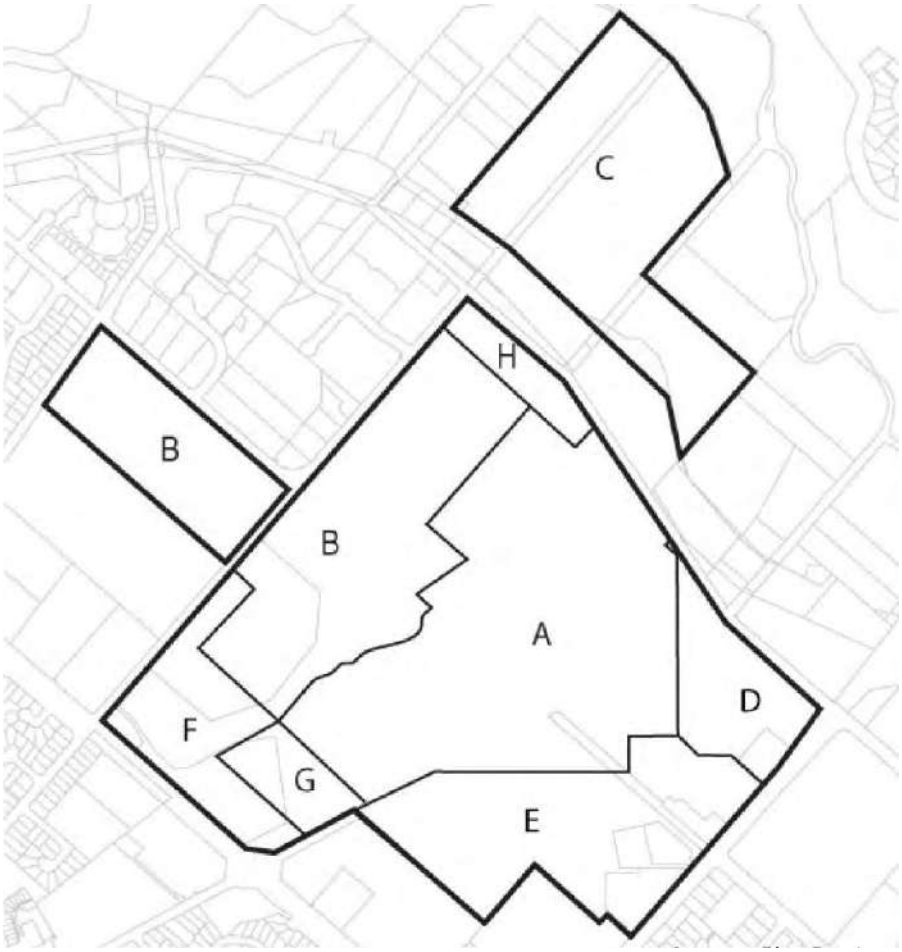


FIGURE 2: CONCEPT PLAN PRECINCTS

1.5 HERRING ROAD PRIORITY PRECINCT (PP)

The Priority Precinct (PP) program, announced in March 2013, is a State Government initiative aimed at delivering more homes and jobs in places with access to infrastructure, transport and services, together with increased amenities, services and improved public spaces. New land use and transport plans will be matched by the development of Growth Infrastructure Plans.

Part of Macquarie University is within the Herring Road PP. The Herring Road PP provides for the renewal and revitalisation of the Herring Road precinct, consistent with *A Plan for Growing Sydney*. The Herring Road precinct proposal comprises of the following:

- A mix of land uses to transform the precinct into an active place for living and working.
- A quality higher density urban community that utilises excellent transport infrastructure and access to job markets, educational facilities, retail, local services and recreational assets.
- Increased building heights and densities that can improve housing supply and choice.
- A transformation of Herring Road into an active street, with wider pavements, new landscaping and new places to meet.
- Better connected and finer-grained streets and pedestrian/ cycle and networks provide safer, more convenient and pleasant access.
- Opportunities for new and improved parks, spaces, playgrounds and community facilities.

The PP seeks to rezone the majority of the campus to B4 Mixed Use to provide greater flexibility in land use distribution across the campus. The PP also allows heights of up to 120m along the Herring Road frontage, and a maximum FSR of 6.0:1 at this important transport interface zone.

The Guidelines for Precinct E and the part of Precinct D which falls within the PP areas. While it is intended that a DCP will be prepared for the wider PP area, these Design Guidelines will form specific controls for the University's lands and would override any future DCP.



FIGURE 3: DRAFT PP PLAN 2013 (SOURCE: DEPARTMENT OF PLANNING AND ENVIRONMENT)

1.6 SCOPE AND PRECINCT DEFINITION

The conditions of approval of the Concept Plan require the preparation of Design Excellence Strategy and Urban Design Guidelines and Landscape Management Plan on a precinct by precinct basis.

As described in the Concept Plan, the campus is divided into several precincts. They are:

- **Precinct A**
  Academic Core
- **Precinct B**
  University Housing
- **Precinct C**
  University Open Space and Playing Fields
- **Precinct D**
  Macquarie University Research Park (MURP) and Private Hospital
- **Precinct E**
  Station South
- **Precinct F**
  Epping Road West
- **Precinct G**
  Epping Road Precinct Expansion
- **Precinct H**
  Talavera Road North

The precinct boundaries (see Figure 4) are based on broad land use areas, both existing and proposed, as well as natural and man-made boundaries.

This Design Excellence Strategy and Urban Design Guidelines document covers Precincts A, B, C, D, E, F, G and H.

The recently gazetted Precinct E and a part of Precinct D along Herring Road have been incorporated into this document with the guidelines of Precinct E updated.

The Design Excellence Strategy and Urban Design Guidelines for Precinct E have been previously submitted.

The Guidelines for Precinct E were endorsed by the then Department of Planning in 2010. Precinct E represents the main opportunity for growth under the Concept Plan, as it has an interface with the campus' key Herring Road boundary and at the time was likely to be developed by third parties. As a result, the Precinct E Guidelines were required to be clearly defined in terms of footprints, heights, massing, access and GFA distribution in order to manage the growth in this precinct, and reinforce and define development opportunities.

The remaining precincts within the campus serve a different purpose to Precinct E, and the approach to the campus-wide Guidelines reflects this. The Guidelines for the remaining precincts are more succinct than those prepared for Precinct E. This is based on the University's need for greater flexibility across the remainder of the campus, and the recognition that the remaining precincts do not require the same level of assessment or scrutiny due to their long standing land uses, location and spatial separation from the key interface with Herring Road.

This position was accepted by the Department during the preparation of the Concept Plan and is reflected in the way these precincts are addressed in the Concept Plan.

Minor changes to the precinct boundaries from the Concept Plan have occurred due to further refinement of the Master Plan. Adjustments following development of the Master Plan reflect new road alignments and further definition of lots. Following major upgrades, the Arts Building (the previous Australian Film,Television and Radio School) has been nominated for retention.

Key changes to the original precinct boundaries are:

- **Precinct G**
  Inclusion of the retention of building Y3A/Faculty of Arts and car park provision on Hadenfield Road.
- **Precinct F**
  Adjustment of the boundary due to Precinct G changes.
- **Precinct H**
  Minor adjustment of the boundary to Precinct B to regularise the precinct.
- **Precinct A**
  Adjustment of the boundary due to Precinct G changes.
- **Precinct B**
  Adjustment of the boundary adjacent to Precincts F, G and H.

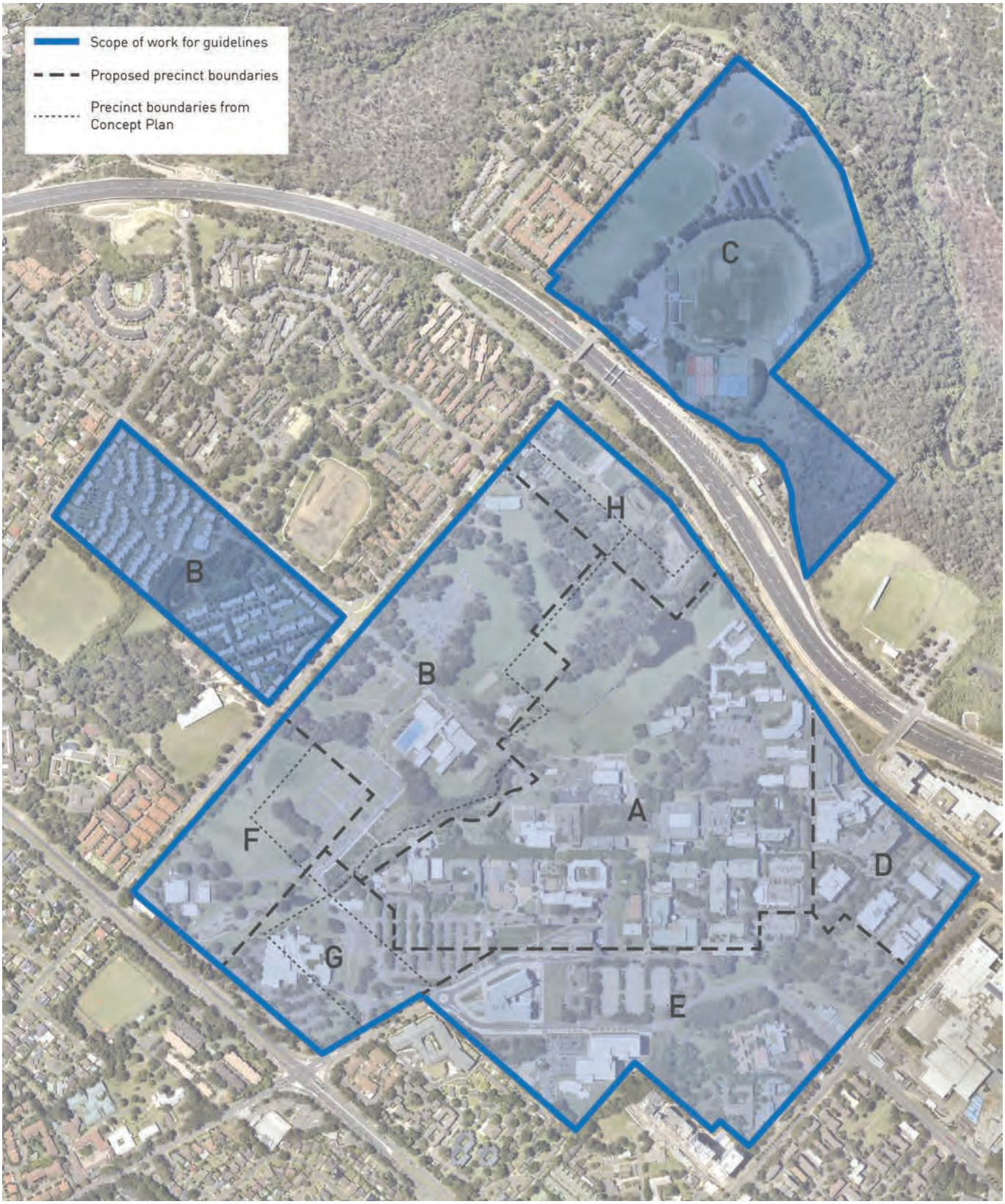


FIGURE 4: PRECINCTS

1.7 CONCEPT PLAN REQUIREMENTS

The Design Excellence Strategy and Urban Design Guidelines, together with specialist consultant reports, address the relevant conditions of the Concept Plan Approval.

These elements are contained either within the document or are appended as Supporting Documentation.

Separate submissions have now been made for:

- Micro simulation modelling (undertaken)
- Child Care Strategy (finalised)
- RMS Agreement (subject to agreement of micro-simulation modelling and VPA with RMS)
- Council Agreement (finalised).

Supporting Documentation includes the following plans and reports:

- Landscape Management Plan
- Vegetation Management Plan (incorporating Weed Management Plan, Threatened Species Plan)
- Stormwater Management Plan
- Utilities Management Plan
- Transport Accessibility Constraints and Design Solutions Report
- Consultation Report.

CONDITION	REQUIREMENT	RELEVANT CONSULTANT REPORT	COMMENT
B3 – Roadworks	Indicative timing or staging plans for nominated intersection upgrades and development triggers for those upgrades.	Micro-simulation modelling	The micro-simulation modelling was submitted to RMS for endorsement in July 2011 and the University is continuing to work with RMS to reach an agreement. The micro-simulation model has not yet been endorsed. However, some agreement has now been reached on the intersection upgrades, with RMS acknowledging that only the Epping/Herring and Epping/Balaclava Roads intersection upgrades remain outstanding. A VPA is being prepared between the University and Transport for New South Wales to finalise this agreement.
B4 – Design Excellence Strategy and Urban Design Guidelines	Preparation of Design Excellence Strategy and Urban Design Guidelines in consultation with Council and the RMS (as relevant) on a precinct basis.	Macquarie University Precinct E: – Precinct Plan – Design Excellence Strategy and Urban Design Guidelines Consultation Report Macquarie University Design Excellence Strategy and Urban Design Guidelines (Note that these Guidelines seek to satisfy this requirement for the remaining precincts)	Refer Section 3 - Design Excellence Strategy and Urban Design Guidelines

CONDITION	REQUIREMENT	RELEVANT CONSULTANT REPORT	COMMENT
B5 – Setbacks	Amendment to Concept Plan (for Precinct E only) for any setbacks that may be required along Balaclava and Waterloo Roads, in consultation with Council and the RMS, for additional capacity improvements.	Macquarie University Precinct E: – Precinct Plan – Design Excellence Strategy and Urban Design Guidelines Consultation Report	Based on the results of the micro-simulation modelling, the University is of the view that the setbacks to Waterloo Road are not required. This is still pending final agreement from the RMS as part of the micro-simulation modelling exercise. The University is separately proposing changes to the University's Balaclava Road Gateway to satisfy safety concerns and redesign of the Herring Road Gateway to improve pedestrian access.
C1 – Staging of Development	Adequate servicing and infrastructure and access for pedestrians and vehicles.	Macquarie University Design Excellence Strategy and Urban Design Guidelines (note that these Guidelines seek to satisfy this requirement for the remaining precincts) Macquarie University Precinct E: – Precinct Plan – Design Excellence Strategy and Urban Design Guidelines Transport Accessibility Constraints and Design Solutions Report Utilities Management Plan	Utilities Management Plan expanded to include the remainder of the campus.
C2(2) – Urban Design Details	Station North (parcel E11) 43m setback with elevations and sections.	Macquarie University Precinct E: – Precinct Plan – Design Excellence Strategy and Urban Design Guidelines	Elevations and sections to be updated with gazettal of the Priority Precinct (PP) and with individual development application for E11 site.
C3 – Landscaping	Preparation of a Landscape Management Plan incorporating (on a precinct basis) Vegetation Management Plan, Weed Management Plan, Threatened Species Plan, and Stormwater Management Plan.	Landscape Management Plan Landscape Rehabilitation Plan and Vegetation Management Plan Stormwater Management Plan Utilities Management Plan	Previous studies expanded to include the remainder of the campus.
C4 – Riparian Zone, Flooding and Stormwater	Preparation of a Stormwater Management Plan, incorporating a Vegetation and Threatened Species Plan (on a precinct basis as required via C3).	Landscape Rehabilitation Plan and Vegetation Management Plan Stormwater Management Plan Utilities Management Plan	Previous studies expanded to include the remainder of the campus.
C5 – Bushfire Protection	Bushfire Management Plan to be prepared for development in Precinct B, with each application for building works, as relevant.	Bushfire Management Plan	To be provided with future development applications in Precinct B, as relevant.

CONDITION	REQUIREMENT	RELEVANT CONSULTANT REPORT	COMMENT
C6 – Flora and Fauna	Vegetation Management Plan, Weed Management Plan, Threatened Species Plan to address responsibilities for each action under those plans.	Landscape Rehabilitation Plan and Vegetation Management Plan	Previous study expanded to include the remainder of the campus.
C9 – Heritage/ Archaeology	Aboriginal Archaeology Strategy to be prepared in liaison with the Metropolitan Local Aboriginal Land Council, and submitted for approval prior to or with the first application for new building works within each precinct.	Aboriginal Archaeology Strategy	A Due Diligence Aboriginal Heritage Assessment has been prepared for the entire campus by Mary Dallas Consulting Archaeologists. The study found no evidence of past Aboriginal use within the subject lands, however did identify areas of potential archaeological sensitivity. The areas identified as possibly retaining archaeological potential are those comprising relatively undisturbed land surfaces on the shale and sandstone formations. These areas generally coincide with areas that will be retained for other environmental values (significant remnant vegetation).
C10 – Access, Traffic, Transport and Parking	C10(1) Prepare a University Travel Plan prior to, or with the first application for building works in the Academic Core. C10(2) – Micro-simulation modelling in liaison with Council, the RMS and MoT. C10(3) – new M2 access exclusion from modelling.	Transport Accessibility Constraints and Design Solutions Report University Travel Plan (UTP)	As above, note that modelling has been undertaken, but still awaiting sign off from RMS. UTP prepared in 2012 (currently being updated to reflect Master Plan and changes to the transport network, eg. Opal Card).
C11 – Child Care Strategy	Child Care strategy to be submitted following consultation with Council.	Child Care Strategy	The child care strategy has now been finalised, and was submitted to the Department in November 2013.
C14 – Utilities	Preparation of: – A detailed water supply infrastructure analysis – Services masterplan – Water supply needs analysis. Prior to the submission of the first application for building works.	Utilities Management Plan	Previous study expanded to include the remainder of the main campus.
C15 – Agency and Council Agreements	Agreement with RMS and Council for roadworks and contributions, respectively.	VPA and RMS Agreement	The RMS agreement is yet to be finalised. Finalisation of the agreement is dependent on several matters being resolved, including the micro-simulation modelling. The VPA between Council and Macquarie University has now been executed, and is in operation.

1.8 CURRENT PROJECTS

Currently Macquarie University has a number of projects in various stages of development and under consideration (see Figure 5). Some of these projects will require a Development Application to either council or the Department of Planning and Environment and others would fall under a Review of Environmental Factors (REF) depending on the extent and type of development.

The list of projects as of June 2017 is as follows:

1 Gateway and Crossing
2 Arts Precinct
3 Interdisciplinary Science Building
4 Biological Research Centre
5 8-10 University Avenue
6 University Common and Cultural Centre
7 Central Courtyard
8 Central Courtyard Precinct
9 E4A
10 2 University Avenue
11 Law School
12 Science Precinct

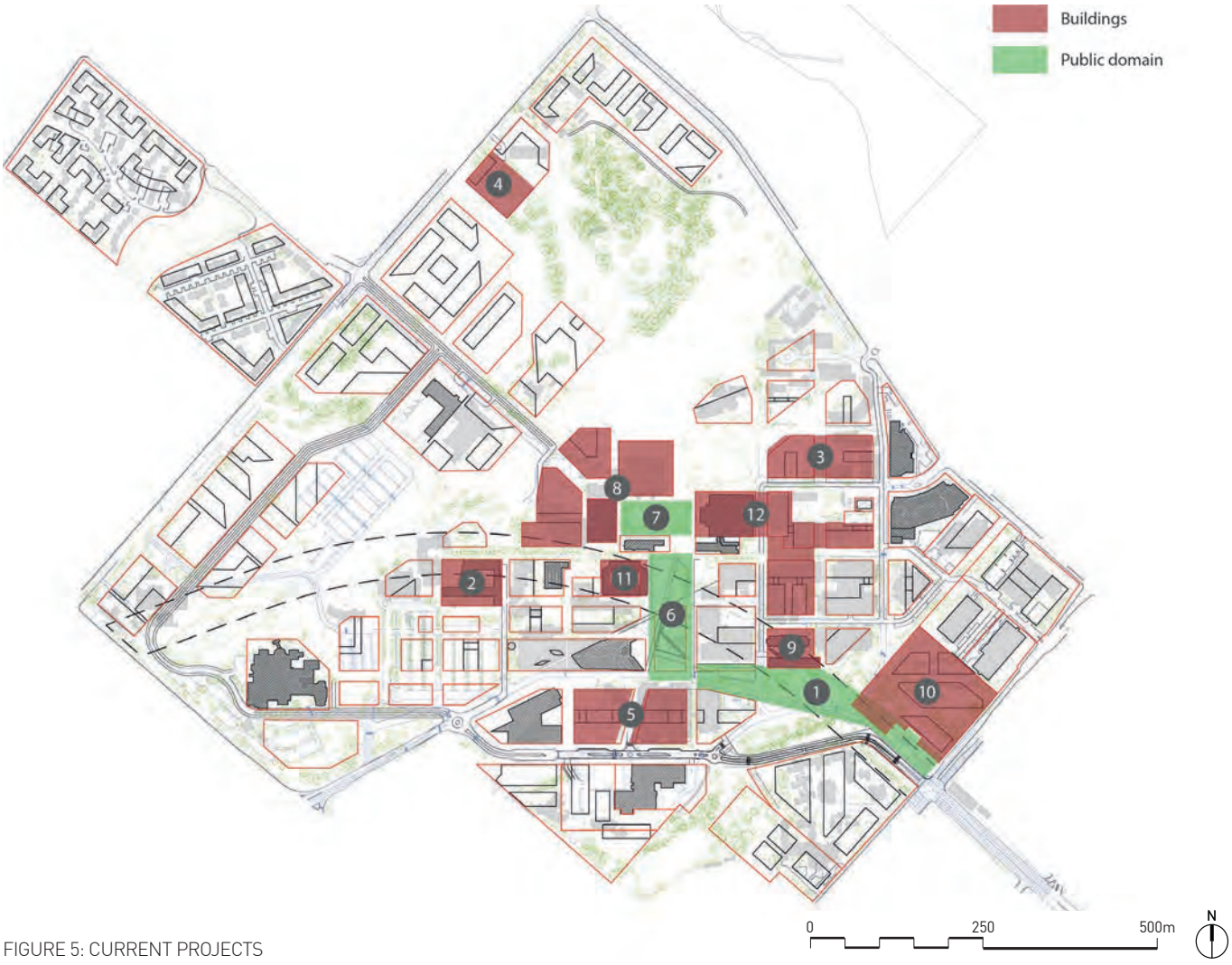


FIGURE 5: CURRENT PROJECTS


Welcome to
Graduation
E5A
Graduation



2

PRECINCT PLANNING FRAMEWORK

2. PRECINCT PLANNING FRAMEWORK

2.1 PLAN DEVELOPMENT

2.1.1 Structure Plan

The central campus is organised around the north-south grid of the Academic Core and a tight cluster of buildings. On the edges of the site, the predominately non-academic buildings follow the external street pattern.

The design principles set out in the Concept Plan are:

- Extension of the existing geometric layout
- Creation of clear orientation and efficient formation of streets
- Reinforcing the open space network
- Provision of pedestrian links that generate freedom of movement and a sense of place
- Defining major spaces and circulation spines by built form
- Reinforcing important vistas to help students, staff and visitors with orientation and to create a strong connection to the landscape environment
- Focusing the movement network on pedestrian amenity, landscape treatment with the control of traffic to reduce vehicular impact.

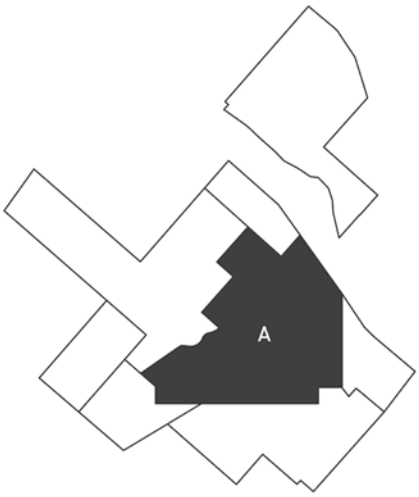
This guideline document aims to build upon the Concept Plan principles.



FIGURE 6: STRUCTURE PLAN

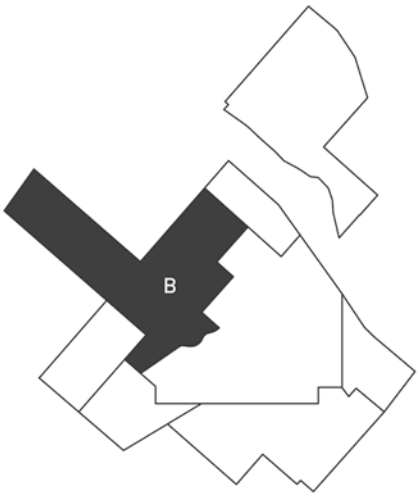
2.1.2 Precincts

Key elements from each precinct are derived from the Concept Plan.



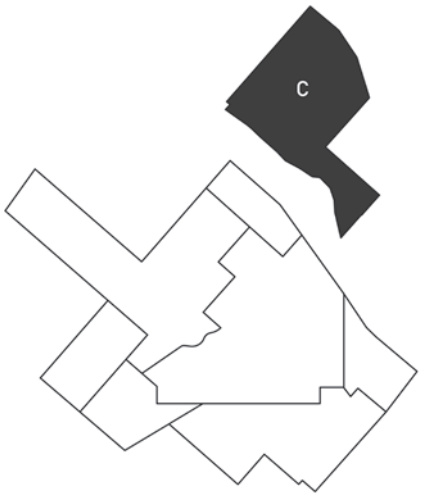
Precinct A
Academic Core

- Develop the new University Common on the new north-south spine as the main public open space in the Academic Core.
- Explore potential for student housing and commercial/ research uses.
- Establish a new north-south pedestrian corridor through the Academic Core adjoining the new University Common.
- Establish a predominant building height with taller buildings located at landmark locations.
- Consolidate existing low-rise multi-deck and on-grade parking into peripheral above and below ground multideck parking at the University's key entry points with no increase in car parking for academic uses.
- Upgrade and visually strengthen the arrival and entry points to the precinct with landscaping and signage.
- Improve legibility and permeability by maximising pedestrian links between buildings and introducing new cross-campus circulation and cycle routes.
- Continue to explore landscape themes that highlight and interpret the current and former uses and character of the campus.
- Adopt Crime Prevention though Environmental Design (CPTED) principles for new development.
- Activate pedestrian zones within the Academic Core with ground floor activities, cafes and shops where appropriate.
- Enhance the Mars Creek Valley area for use as passive open space whilst protecting the visual and environmental qualities of the woodlands and watercourse/ pond.
- Open up vistas from the Academic Core to the Mars Creek Valley area wherever possible.
- Retain significant native woodland areas in this precinct.



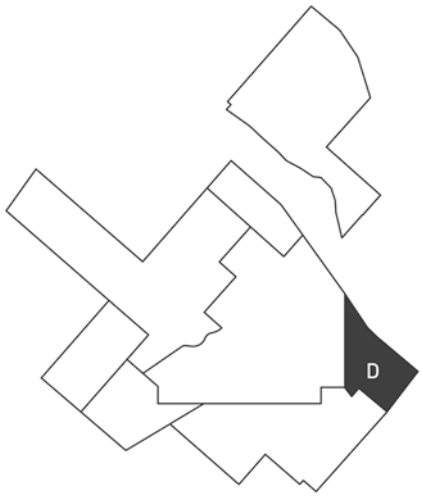
Precinct B
West Precinct

- Strengthen the activity axis along Gymnasium Road to provide a more distinguished entrance and avenue link to the Academic Core.
- Retain significant native woodland areas in this precinct.
- Protect and enhance the Mars Creek and Culloden Creek riparian corridors.
- Incorporate a new green space leading down to Mars Creek. This space is to address a new north-south road, the Gymnasium, and respond to views of the creek and Academic Core.
- New buildings should be screened with similar tree species so that they blend with the backdrop when viewed across from the Academic Core. The existing parkland character should remain as the primary focus of this view.
- New buildings setback from Culloden Road.
- Explore a mix of uses - student housing, commercial/research and academic uses.



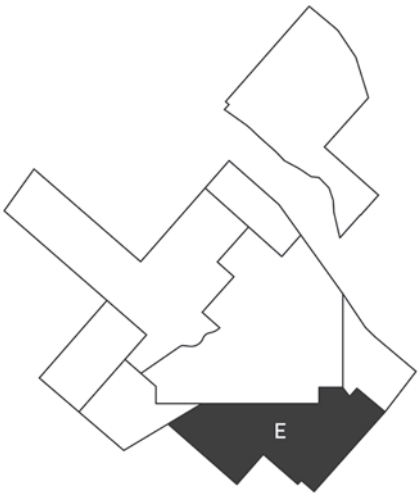
Precinct C
University Open Space and Playing Fields

- Retain and manage the natural landscape setting of the playing fields precinct.
- Extend the indigenous vegetation to the south to mitigate the impact of the M2 Motorway.
- Expand/improve support facilities as required.
- Allow replacement and development of low rise structures and development of new support facilities (ancillary to the playing fields and/or University uses).



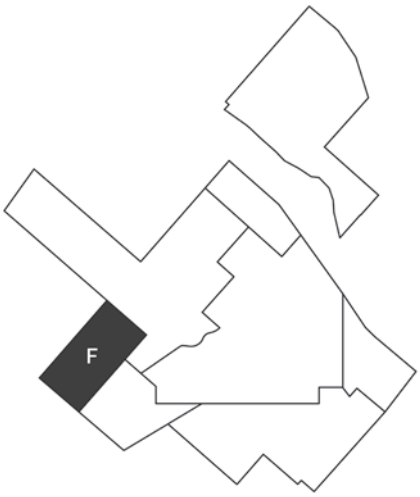
Precinct D
Macquarie University Research Park (MURP) and Private Hospital

- New development to provide an address to an internal or external road or significant open space area.
- Overshadowing impacts to be considered in the development of new buildings.
- Appropriate stormwater measures to be incorporated in the development of new buildings.



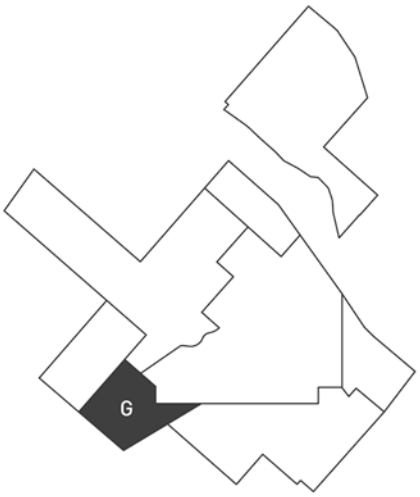
Precinct E
Station South

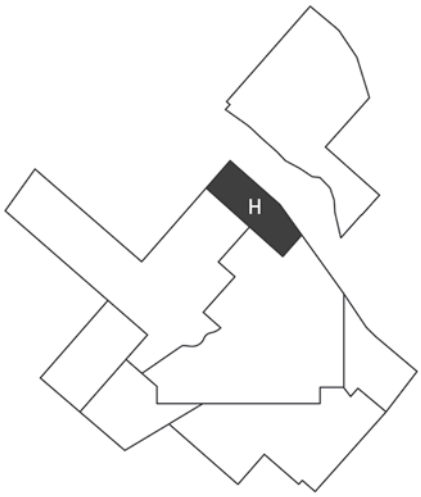
- Link new public spaces (eg. station forecourt and new University Common) with major pedestrian routes.
- Establish view corridors along primary pedestrian routes.
- Upgrade and visually strengthen the arrival and entry points to the precinct with landscaping and signage.
- Allow for the progressive demolition of parking structures.
- Locate two landmark buildings on Herring Road in close proximity to the train station.
- Minimise adverse overshadowing on adjoining properties.
- Provide a 'forecourt' to the two development parcels at the intersection of Waterloo and Herring Roads.
- Protect and enhance the University Creek riparian corridor.
- Incorporate Water Sensitive Urban Design (WSUD) principles within new development.
- Establish 'entry statements' at the Balaclava Road and Herring Road entrance to the campus.
- Create a sense of open space and allow a visual link towards the Academic Core through building setbacks on Herring Road and Waterloo Road.
- Locate active uses such as retail shops, cafes, and restaurants around the station portal area.
- Create an address to the Academic Core within the established grid pattern of the campus.
- Minimise vehicular impacts on the pedestrian network and the Academic Core.



Precinct F
Epping Road West

- Incorporate Water Sensitive Urban Design (WSUD) principles within new development.
- Create landscape buffer along Culloden and Epping Roads.
- Provide new formal public open space associated with new commercial development.
- Upgrade and visually strengthen the arrival and entry points to the precinct with landscaping and signage.
- Improve legibility and permeability by maximising pedestrian links between buildings and introducing new cross-campus circulation and cycle routes.
- Mark the University entrance at Epping and Balaclava Roads.
- Vehicular impacts on the pedestrian network and the Academic Core are to be minimised.





Precinct G
Epping Road Precinct Expansion

- Protect and enhance the Mars Creek riparian corridor with new native planting.
- Link new public space (Mars Creek Plaza) with major pedestrian routes.
- Protect and enhance the Mars Creek riparian corridor with new native planting.
- Incorporate Water Sensitive Urban Design (WSUD) principles within new development.
- Mark the University entrance at Epping and Balaclava Roads.

Precinct H
Talavera Road North

- Protect and enhance the Mars Creek riparian corridor with new native planting.
- Create landscape buffer along Culloden and Talavera Roads.
- Incorporate Water Sensitive Urban Design (WSUD) principles within new development.
- Improve legibility and permeability by maximising pedestrian links between buildings.

2.1.3 Development Lots

Although development lots were identified in the Concept Plan for Precincts E and F, they were not identified for the whole campus. Through the detailed plan development and refinement process an indicative Lot Plan showing illustrative development parcels has now been prepared for the whole campus.

The Concept Plan identifies principles for development across the campus and a structure for public domain and access elements. The Master Plan process formalised this framework and defined lot locations and outlines. The Lot Plan is a development of and is consistent with the principles established under the Concept Plan.

Lot definition has taken into account road and pedestrian corridors and the realignment of links through better integration with the open space and pedestrian network. A number of significant buildings are retained.

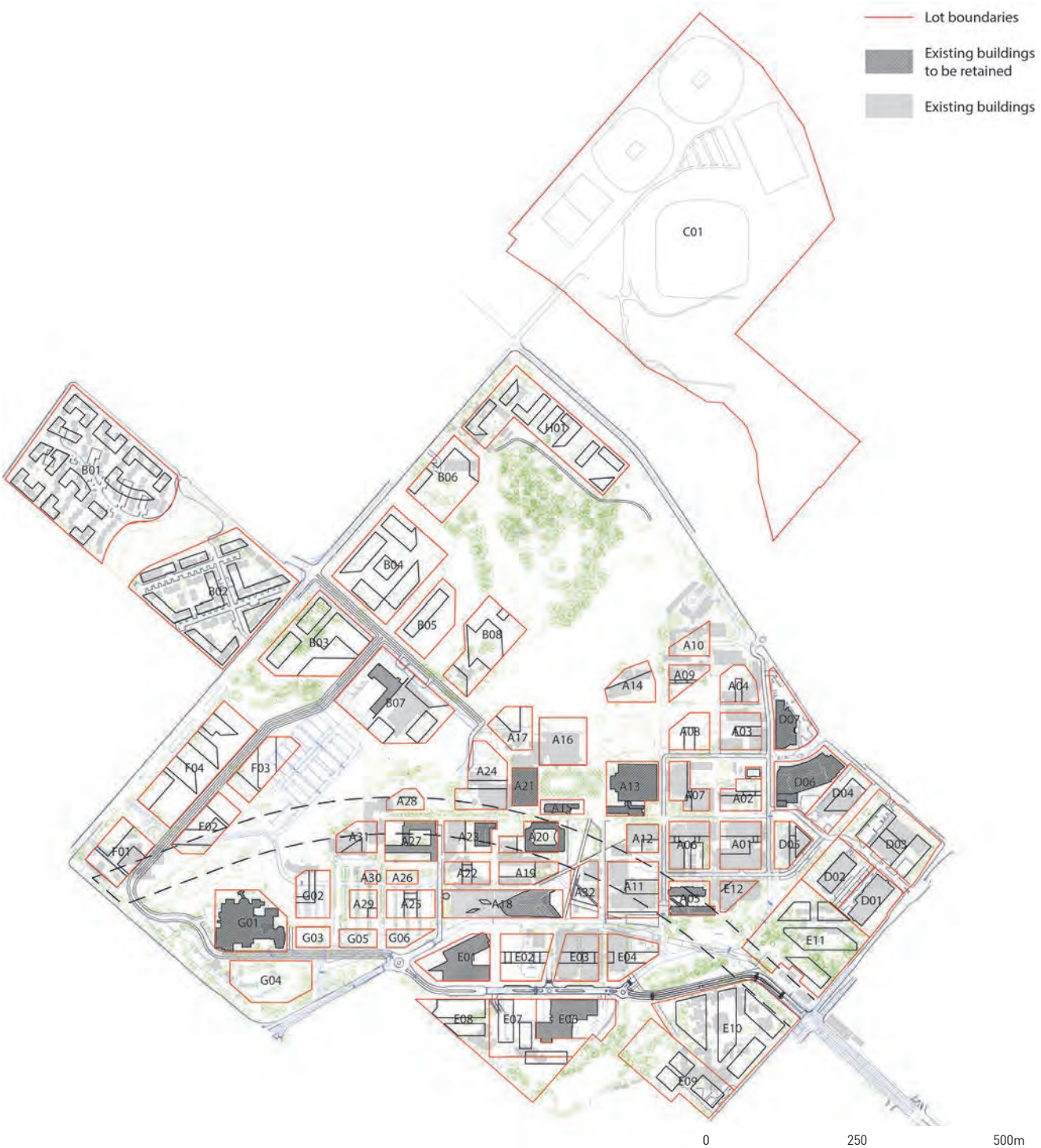


FIGURE 7: DEVELOPMENT PARCELS

2.1.4 Open Space Network

Macquarie University is recognised for its high quality landscape setting, with its academic buildings and colleges set amongst pocket parks, courtyards, natural creek lines and parkland corridors.

The structure of its open space network is fundamental in defining the experience of the campus. Integration of all of the Precincts into this network will ensure the quality of the campus landscape continues to thrive in the future.

As a development of the Concept Plan, the 2014 Campus Master Plan is structured around the public domain as the primary organising element of the campus. The Master Plan recognises the importance of the campus landscape through the following principles:

- Reinforce the concept of a 'campus in a park'
- Create green gateways to the campus
- Develop a distinctive formal landscape theme within the core
- Integrate landscape and public domain
- Enhance the landscape definition of streets
- Develop a strong maintenance and management policy

Key elements of the open space network will include:

- A comprehensive network of major open spaces, including the University Common, Central Courtyard, Arts Lawn and The Grove, together with numerous minor open spaces, courtyards and pocket parks.
- Strong green pedestrian links along major thoroughfares such as Wally's Walk, Macquarie Walk and Sir Christopher Ondaatje Avenue together with shared streets, vehicular thoroughfares and service roads to link key destinations.
- Major creek corridors of University Creek and Mars Creek and associated riparian and parkland areas.
- Green gateways punctuating areas of buffer planting along the boundary of the campus.

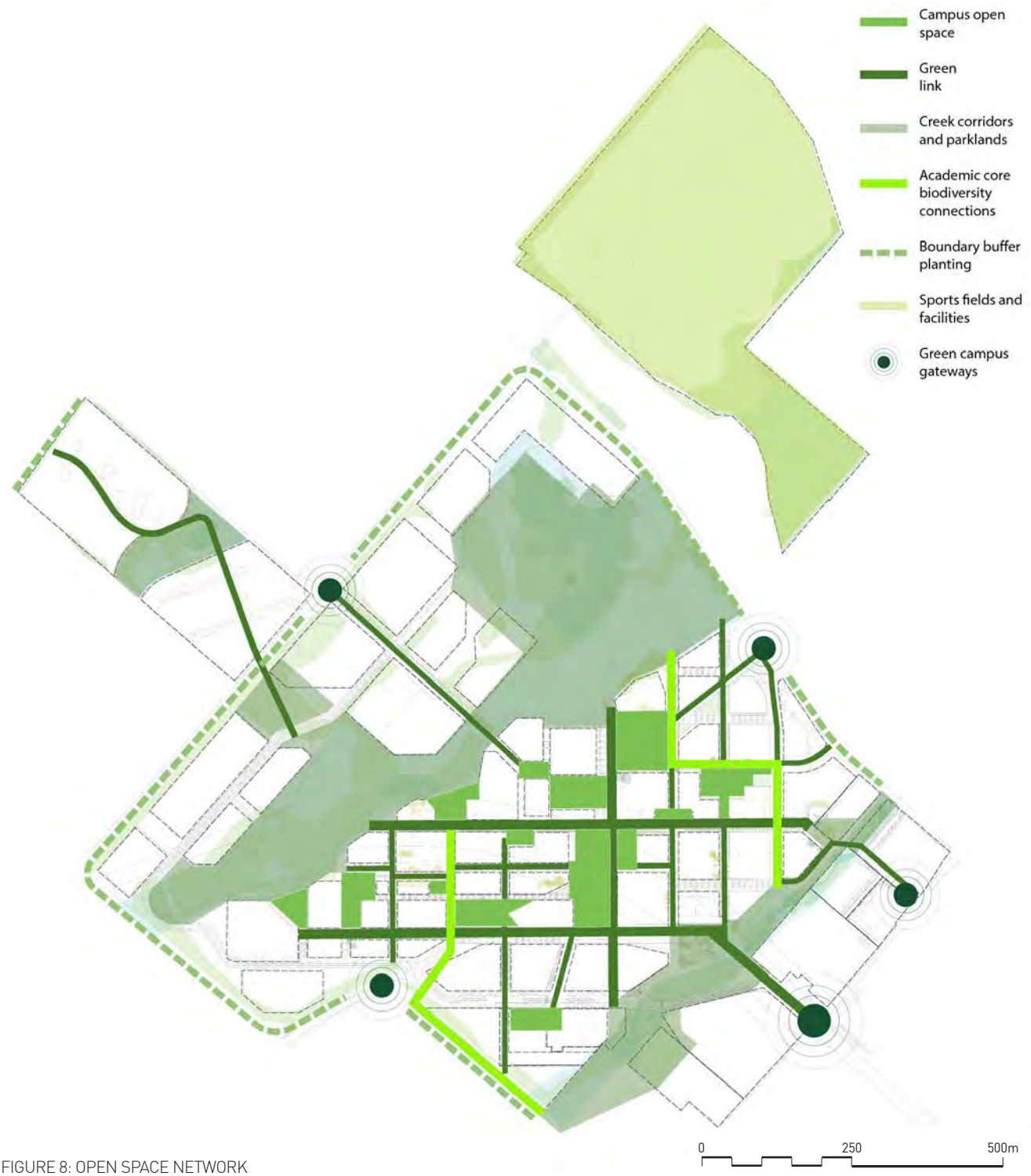


FIGURE 8: OPEN SPACE NETWORK

2.2 ACCESS AND MOVEMENT

The ability to efficiently access the campus and encourage pedestrian movement across the precinct is a fundamental driver of the plan.

The Concept Plan identifies a number of opportunities for direct access to and from the surrounding regional road network. These include:

- Existing access arrangements from the surrounding main roads into the University, (Epping and Herring Roads), are to be maintained and upgraded.
- The intersections on the regional road network including Epping/ Balaclava Roads and Herring/ Waterloo Roads could be upgraded to improve accessibility to the University, and provide for the future development within the surrounding Macquarie Park Corridor.

Upgraded access to and from the M2 Motorway (new east-facing on and off ramps at Herring and Christie Roads) has improved access to the Macquarie University site.

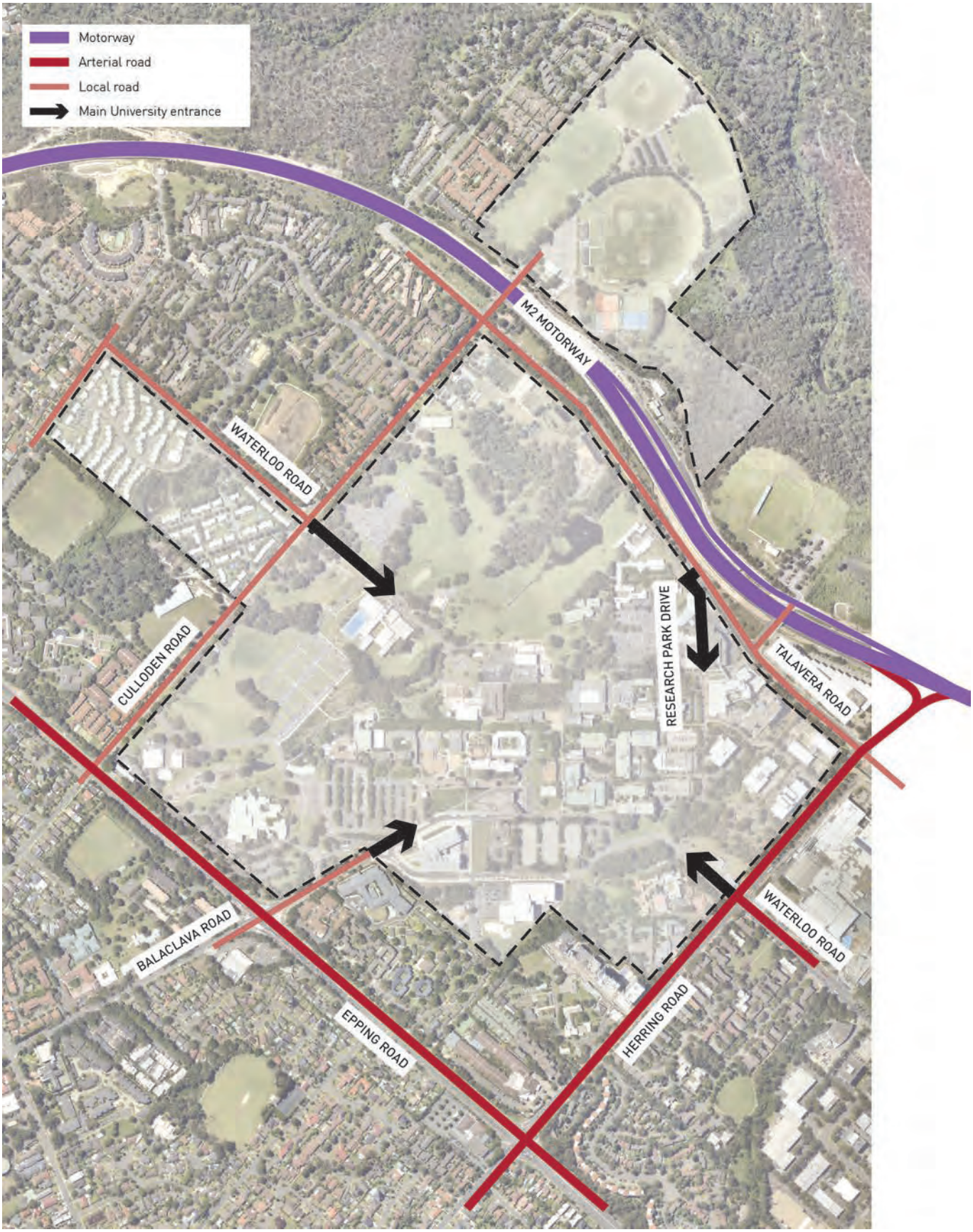


FIGURE 9: EXISTING ROAD NETWORK AND SITE ACCESS

2.2.1 Access Corridors

The precinct guidelines allow for access corridors with a range of widths that permit varying configuration of roads and pedestrian zones within them.

Roads have changed from the Concept Plan based on traffic studies. The primary roads are no longer 3 or 4 lanes as described in the Concept Plan, they are now 2 lanes. The secondary roads and shared ways are the same as the Concept Plan.

The final configuration that best meets the University's priorities and access requirements while preserving pedestrian amenity will be developed by Macquarie University over time.

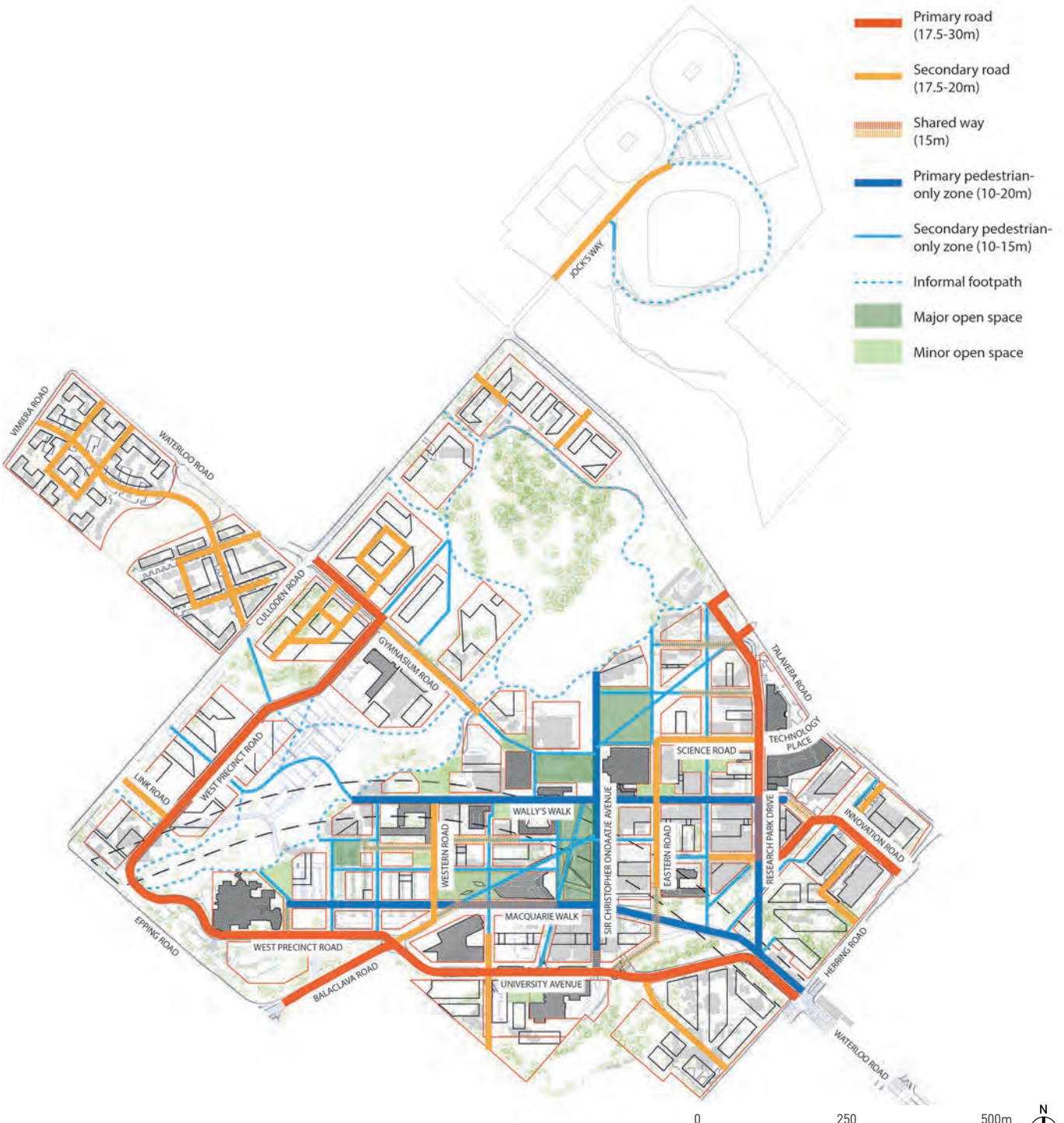


FIGURE 10: MOVEMENT HIERARCHY

2.2.2 Illustrative Accessway Sections

These typical sections illustrate the character of the different accessway typologies. As there is a range of possible widths for the accessway corridors, these sections are flexible to accommodate the variations, mainly within the pedestrian/ landscape zones.

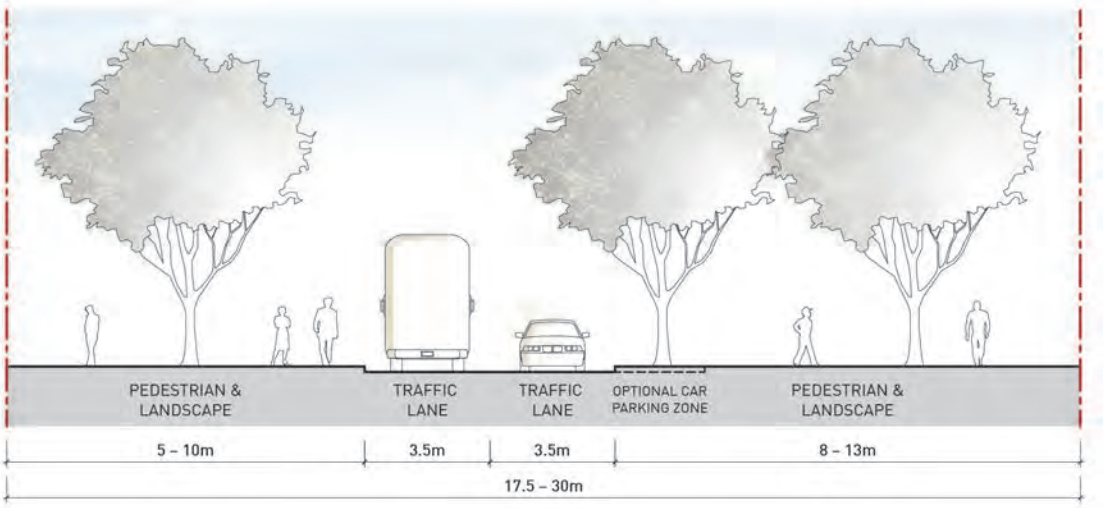


FIGURE 11: PRIMARY ROAD (17.5 – 30M)

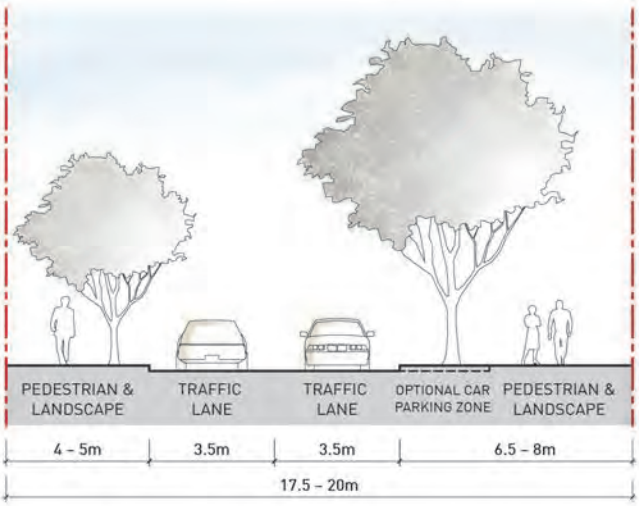


FIGURE 12: SECONDARY ROAD (17.5 – 20M)

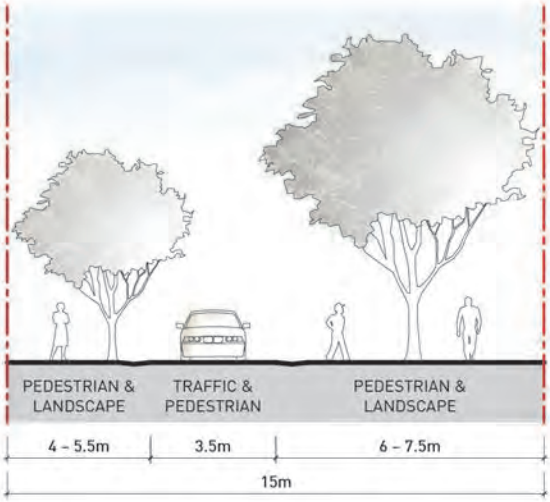


FIGURE 13: SHARED WAY (15M)

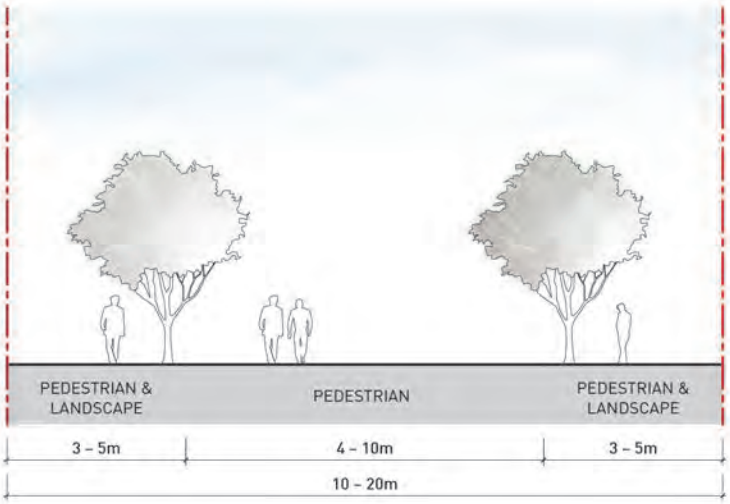


FIGURE 14: PRIMARY PEDESTRIAN (10 – 20M)

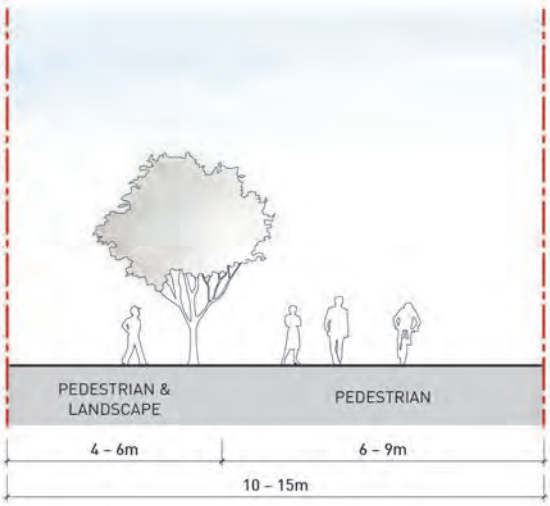


FIGURE 15: SECONDARY PEDESTRIAN (10 – 15M)

2.2.3 Pedestrian Network

Macquarie University is noted for its landscape environment and the quality of the pedestrian environment around the campus.

Fundamental to the planning of the University was the establishment of the Academic Core as a pedestrian precinct, with vehicular access north of Macquarie Walk generally limited to service and emergency vehicles.

A series of alternating north-south pedestrian and vehicle access ways are generated.

At the heart of this network, a new proposed central north-south green open space, University Common, creates a pedestrian zone that links the traditional heart of the campus with the new development zones to the south and the parklands to the north in the Mars Creek zone.

New buildings will be oriented to address and activate this pedestrian zone and open space.

Pedestrian access from the station to the Academic Core is along a planned pedestrian bridge crossing over University Creek.

LEGEND

1 Central Courtyard
2 University Common
3 The Grove (East Common)
4 Arts Lawn (West Common)
5 University Creek
6 Mars Creek
7 Culloden Creek

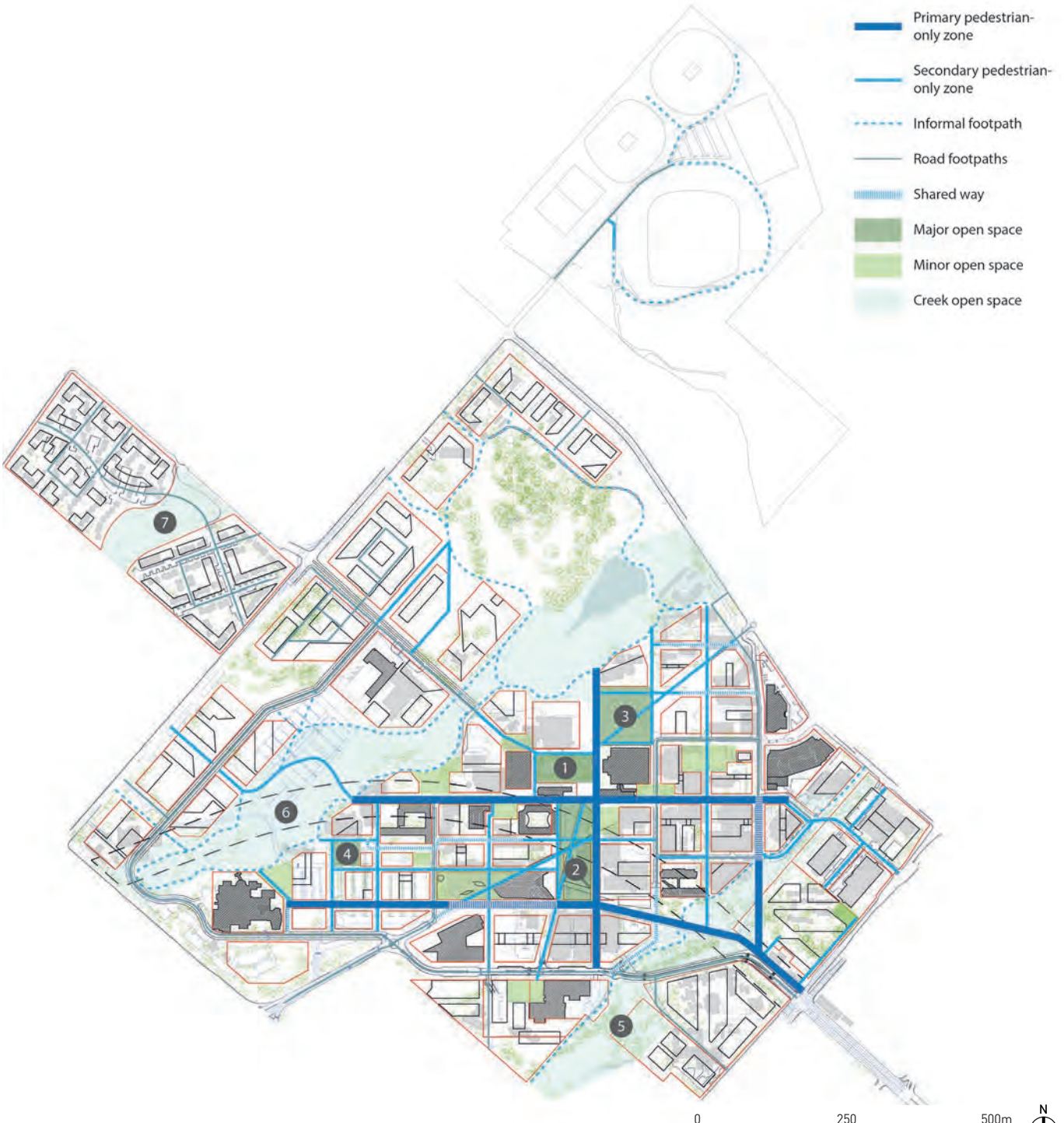


FIGURE 16: PEDESTRIAN ACCESS

2.2.4 Public Transport

The opening of the Epping to Chatswood Line on the Sydney Trains network, including the provision of a new station at Macquarie University, has seen a dramatic shift in access to the campus from private vehicle to public transport. While private cars were previously the primary transport option to the University, the new rail link has significantly improved access opportunities to the campus – with close to half of all students and staff now arriving via either bus or rail.

Note that the Macquarie University station is to be converted to a fully-automated rapid transit rail system as part of Sydney Metro Northwest, with train services arriving every 4 minutes. This will further enhance access to the campus.

The free internal University shuttle bus service is provided to students, staff and visitors. Shuttle bus access remains important and planning has identified adjusted routes and stops on the new road layout to maintain service to the Academic Core.

An upgrade to the public transport interchange at Macquarie Square on Herring Road adjacent to the Macquarie Centre is proposed to enhance access opportunities for those arriving by bus.

Pedestrian access to the train station will be improved by the construction of a pedestrian bridge from the new University Common across University Creek.

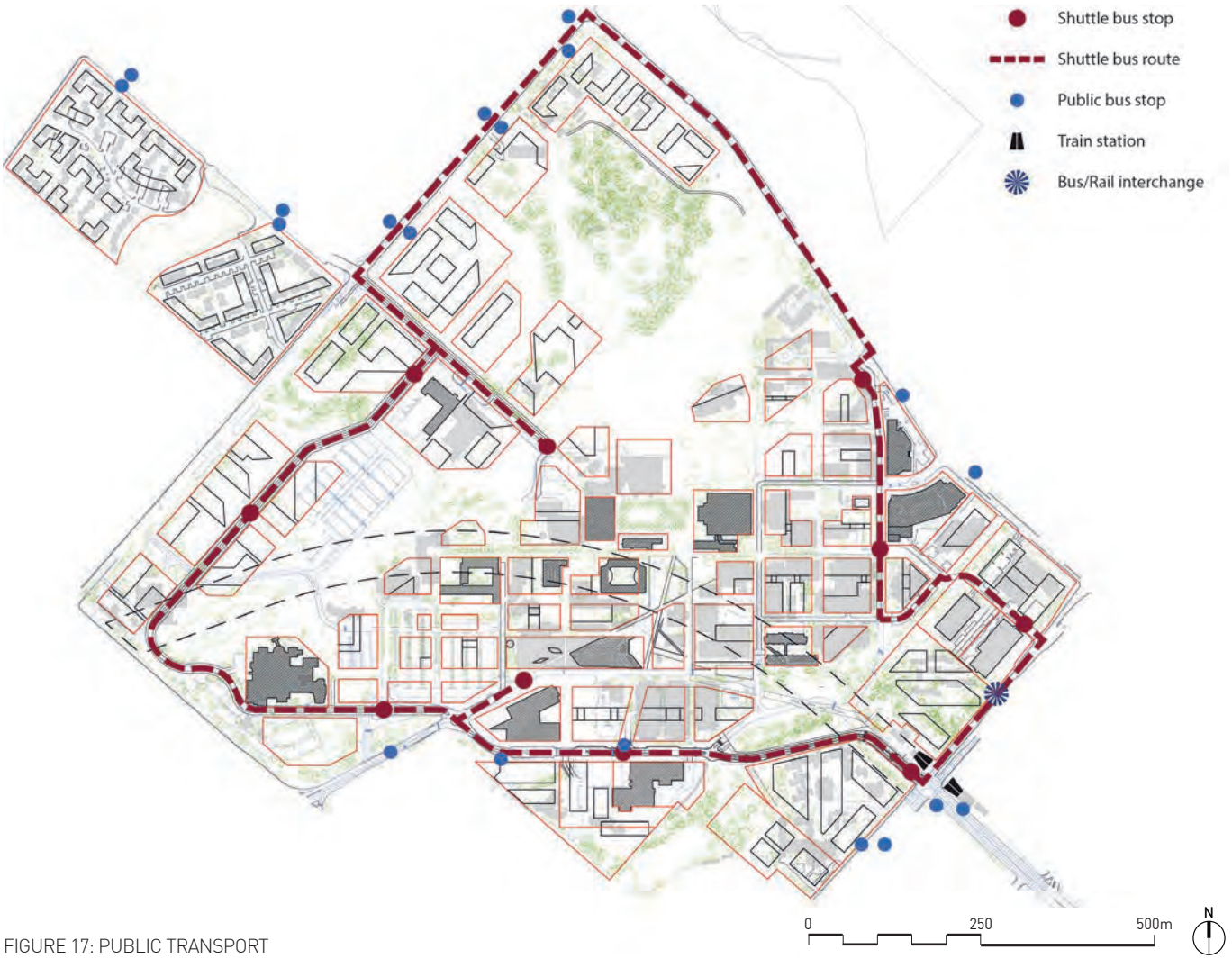


FIGURE 17: PUBLIC TRANSPORT

2.2.5 Cycle

Macquarie University has long promoted cycle access to and within the campus. The Master Plan formalises the main cycle corridors around the campus and provides links to regional and district networks.

Within the Academic Core area, cycling is discouraged as this is a high-pedestrian-use area. Bike hubs are located on the fringe of the Academic Core so that cyclists can conveniently park their bikes close to where they need to go.

This is in line with a fundamental driver of these Guidelines, promoting the ability to efficiently access the campus and encourage pedestrian movement across the precinct.



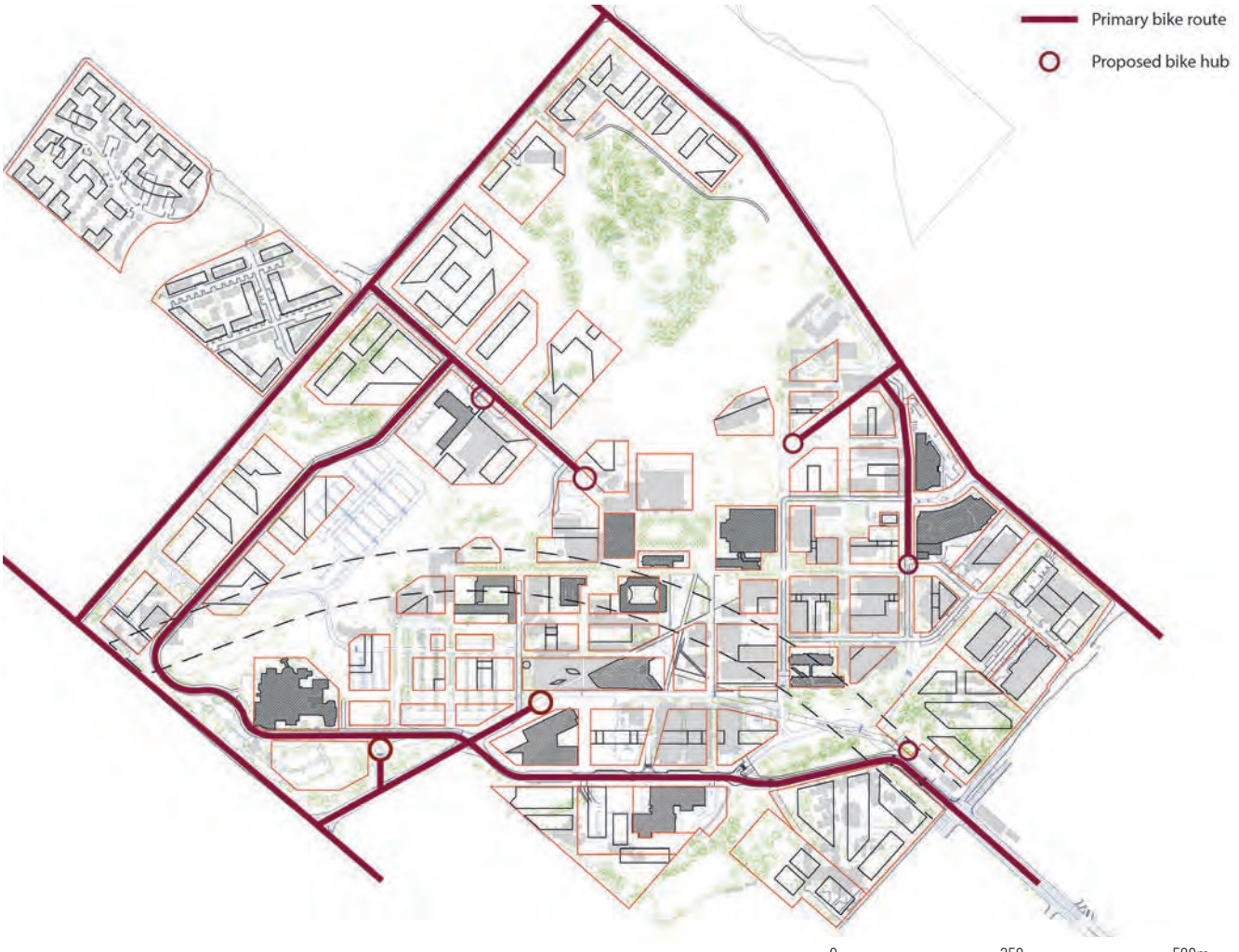


FIGURE 18: CYCLE NETWORK

2.2.6 Lot Access

Access to lots will be controlled to minimise impacts of garage and loading dock entries on major streets. Access off Macquarie Walk and University Avenue is minimised in the Master Plan.

The guidelines identify access zones off the minor road network where access to sites is permitted. These zones anticipate setbacks from street corners to ensure that service or carpark entries are located so that they are not visually apparent from the main streets.

The key principles are:

- Site entries are recommended to be a maximum of 6 metres wide.
- Ensure vehicular crossings create a safe footpath environment.
- Allow safe vehicular access to the property.
- Facilitate access for emergency vehicles.
- Exit and entry points should be rationalised and clearly articulated.
- The design of the vehicular access to each of the sites must be clear and not intrusive in order to minimise any potential conflicts between pedestrians and vehicular traffic.
- Conflicts between pedestrians and vehicles, at entrance points to parking areas, must be minimised.
- Entrance points to parking and loading areas have clear and unobstructed visibility of pedestrian zones.
- Pedestrians to have priority at crossing points.
- All transitions between levels outside and inside sites (both pedestrian and vehicular) must take place within lots.
- The service hubs are central stores where goods can be delivered and stored.



FIGURE 19: LOT ACCESS

2.2.7 Parking

Both the Concept Plan and the Master Plan propose to consolidate University car parking within parking structures on the periphery of the Academic Core. The parking structures will be linked directly to the pedestrian network, providing convenient and safe access to and from the Academic Core.

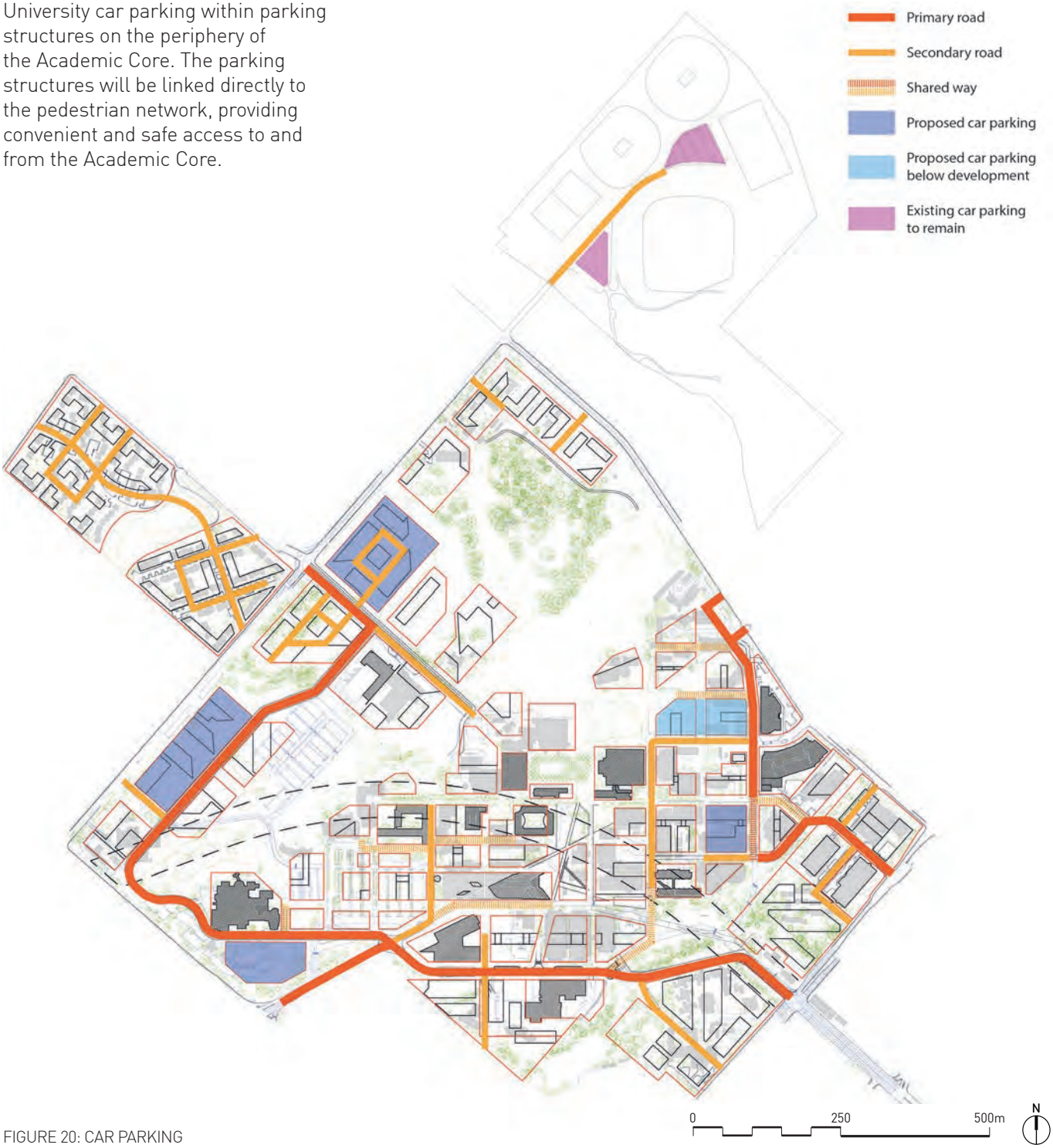


FIGURE 20: CAR PARKING

2.2.8 Accessibility

Macquarie University aims to achieve fully compliant disabled access across most of the campus. This includes accessibility from transport nodes to all buildings, accessibility within buildings and accessibility across the public domain.

The pedestrian network facilitates access through the extended grid. In areas of steep topography, initiatives are to be introduced to mitigate impediments with alternate routes to all destinations.

The key initiatives are:

- New buildings should achieve level access at major entries.
- Accessible gradients should be achieved wherever possible throughout the public domain.
- Major level changes on significant public paths should be negotiated by lifts or ramps in the same course of travel.
- Development should be considerate of the University's Disability Action Plan.

2.3 RAIL EASEMENT

The construction of the Epping to Chatswood Rail Line has had enormous benefits to the University. Macquarie University is the only major university in Australia with a train station on campus.

The planned construction of the North West Rail Link will extend the Epping to Chatswood Rail Link north-west to Castle Hill and Rouse Hill and dramatically increase patronage to and through the Macquarie University station.

Transport for NSW limits development within the zone of influence of the tunnels and any significant development above the tunnel reserves will need formal approval:

- No development of structural elements within the tunnel zone (First Reserve).
- Structural elements are permitted in the Second Reserve (and in the First Reserve outside the Support Zone) within 3m of grade.
- Structural elements are permitted in the Second Reserve (a zone struck at 45 degrees from the bottom and 20m to the side of the First Reserve).

	1st RESERVE WITHIN SUPPORT ZONE	1st RESERVE OUTSIDE SUPPORT ZONE	2nd RESERVE WITHIN ZONE OF INFLUENCE	2nd RESERVE OUTSIDE ZONE OF INFLUENCE
Excavations	Not permitted	Excavation less than 3m require no assessment Excavation more than 3m require assessment	Excavation less than 3m require no assessment Excavation more than 3m require assessment	Excavation less than 3m require no assessment Excavation more than 3m require assessment
Shallow Footings	Not permitted	Shallow footings require assessment	Shallow footings require no assessment	Shallow footings require no assessment
Deep Foundations	Not permitted	Deep foundations require assessment	Deep foundations require assessment	Deep foundations may not require assessment
Tunnels and Underground Excavations	Not permitted	Tunnels and underground excavations require assessment	Tunnels and underground excavations require assessment	Tunnels and underground excavations require assessment
Demolition of Existing Subsurface Structures	Not permitted	Demolition of existing subsurface structures require assessment	Demolition of existing subsurface structures require assessment	Demolition of existing subsurface structures require assessment

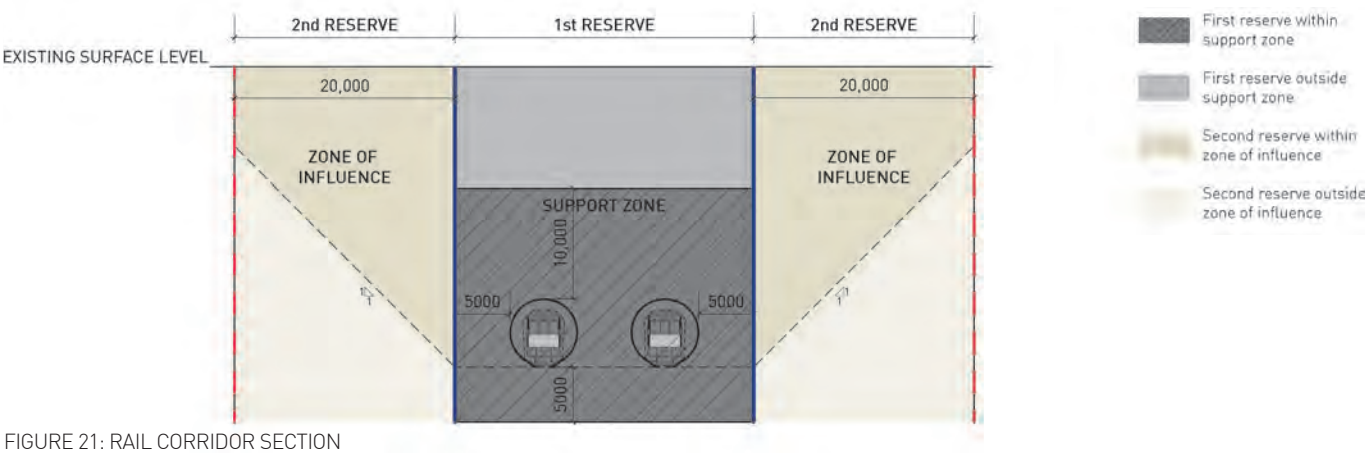


FIGURE 21: RAIL CORRIDOR SECTION

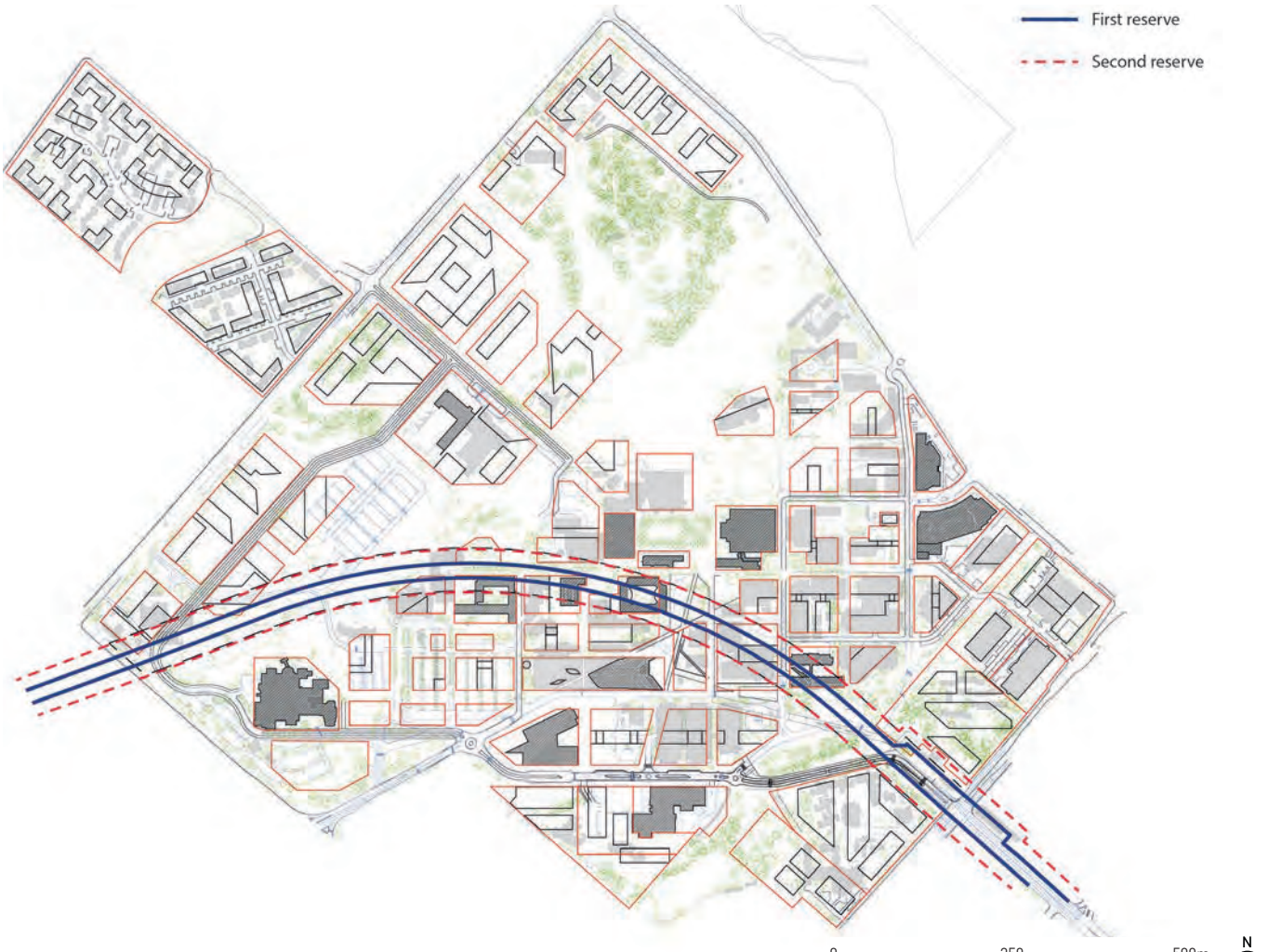


FIGURE 22: RAIL CORRIDOR IMPACT





3

PUBLIC DOMAIN

3. PUBLIC DOMAIN

3.1 LANDSCAPE STRUCTURE

Fundamental to the future landscape of Macquarie University will be the vision created for the overall public domain within the campus. The identity of the campus will be reinforced by a landscape structure of walkways and thoroughfares, parks and plazas, creek corridors, gateways and edges together with a strong palette of colours, textures and plants.

Sustainable landscape principles underpin all aspects of the public domain, in particular the consideration of climate and microclimate, soil and water regimes, recycling, endemic planting and provision of ecological and habitat areas.

In developing the open space response for the precincts, a series of landscape objectives have been identified:

- Establish a structured hierarchy of public domain and open space defined and reinforced by the urban form.
- Create a comprehensive landscape setting and distinctive visual identity.
- Create an environment that is in harmony with local environmental conditions.
- Ensure that climate and microclimate defines the landscape response.
- Plan for an evolving and gradually maturing natural and urban ecology.
- Ensure the efficient use of resources and natural systems in the creation of sustainable soils and irrigation methods.
- Instil user awareness of coexistence with natural systems and environments.
- Establish endemic ecologies where appropriate.
- Continued integration of significant areas of native and locally indigenous plant species within formal and informal landscaped areas.

LEGEND

Primary public domain spines
a. Wally's Walk
b. Macquarie Walk
c. Sir Christopher Ondaatje Avenue

Primary parks and plazas
d. University Common
e. Central Courtyard
f. The Grove (East Common)
g. Arts Lawn (West Common)

Secondary parks and plazas
h. Frank Mercer Biological Sciences Garden
i. Jim Rose Earth Sciences Garden
j. Mars Creek Plaza
k. Wally's Walk Park
l. Western Road Park
m. Macquarie Theatre Courtyard
n. Faculty of Science Garden
o. Cochlear Forecourt
p. Library Lawn

Creek corridors and parklands
q. University Creek
r. Mars Creek
s. Culloden Creek

Sports fields and facilities
t. Macquarie University Sports Fields

Campus gateways
u. Herring Road Gateway
v. Balaclava Road Gateway
w. Gymnasium Road Gateway
x. Talavera Road Gateway

Primary roads
aa. University Avenue
bb. Research Park Drive
bb. Innovation Road
cc. West Precinct Road
dd. Shared Ways

Secondary roads
y. Eastern Road and Science Road
z. Western Road



FIGURE 23: LANDSCAPE STRUCTURE PLAN

Connectivity

The new public domain will create a high level of connectivity throughout the campus, integrating open spaces with a network of footpaths, cycleways and shared paths. Buildings will address streets, footpaths and open spaces to help make places feel safer and improve legibility. Extension of the green network will be achieved through improved pedestrian and visual linkages with surrounding developments and open spaces.

Activity

Open spaces will have a degree of flexibility and versatility to allow for a variety of uses over time and enable people to enjoy different activities in the same space.

Legibility

Creating views and vistas will assist with legibility across the precinct and help integrate new development into the overall campus structure. The definition of these visual links with themed planting and materials palettes will help with wayfinding throughout the campus.

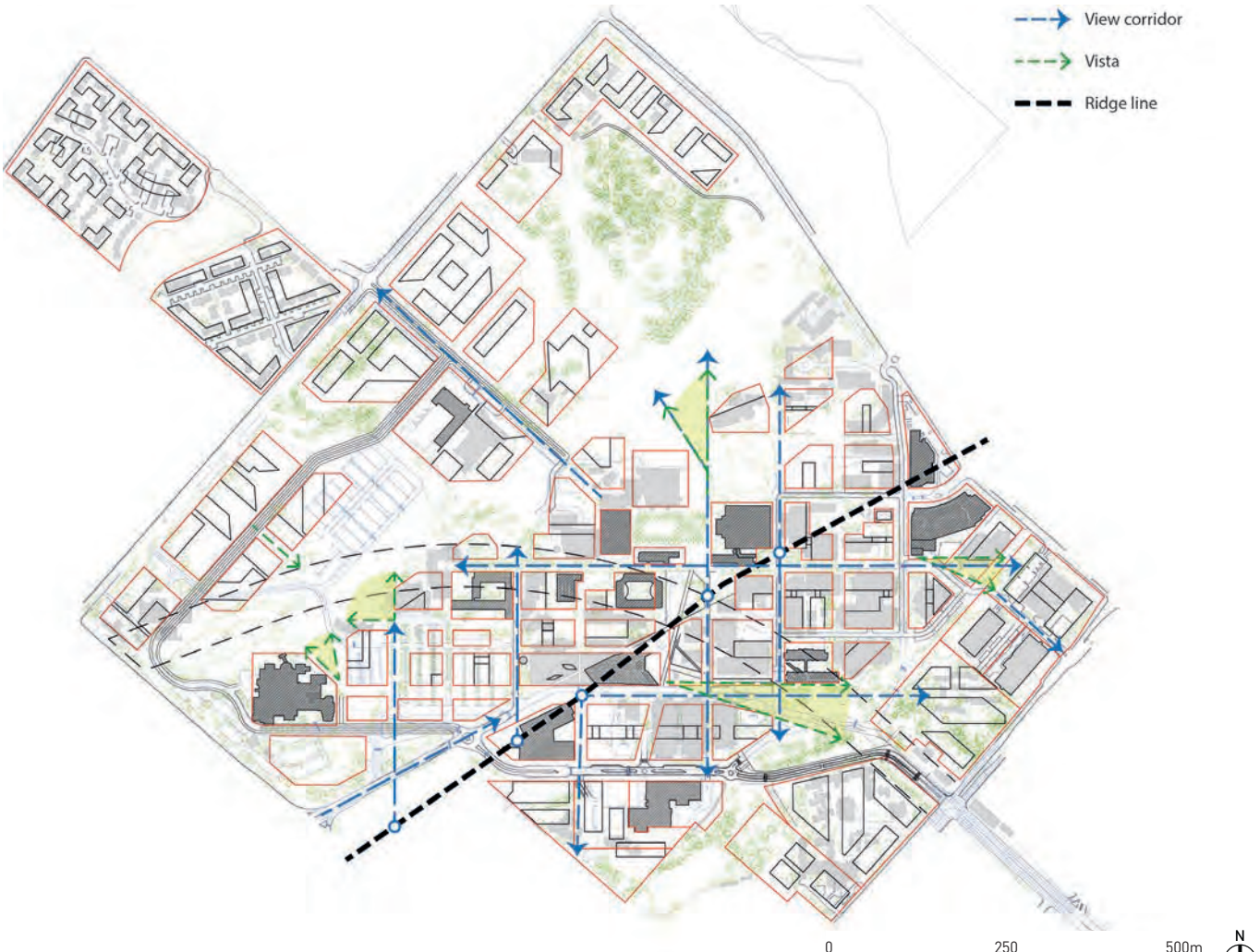


FIGURE 24: VIEW SHEDS

Environmental Sustainability

The public domain must showcase environmentally sustainable design through environmental initiatives such as water sensitive urban design, managing and controlling the runoff from construction sites and encouraging the return of aerial and terrestrial wildlife through improved landscape linkages.

Macquarie University Arboretum

The Macquarie University Arboretum comprises all the trees and plants on campus. These trees, growing in natural and planted habitats, provide a valuable resource for teaching and research and a pleasing and relaxing environment for the enjoyment of staff, students and visitors to the University. The arboretum also provides habitat for many native birds and animals.

Maintenance

The public domain will reinforce a robust landscape infrastructure that is easily managed to reduce maintenance requirements.

Significant Trees

The distinctive, predominantly native landscape at Macquarie University is the result of both the preservation of key areas of inheritated landscape and over 40 years of continuous planting, radically transforming the site of former market gardens and orchards into a 'Campus in a Park'. Where possible, existing trees are to be retained as the nucleus of the new public domain network.



FIGURE 25: SIGNIFICANT TREES

3.2 PRIMARY WALKWAYS AND THOROUGHFARES

3.2.1 Wally's Walk

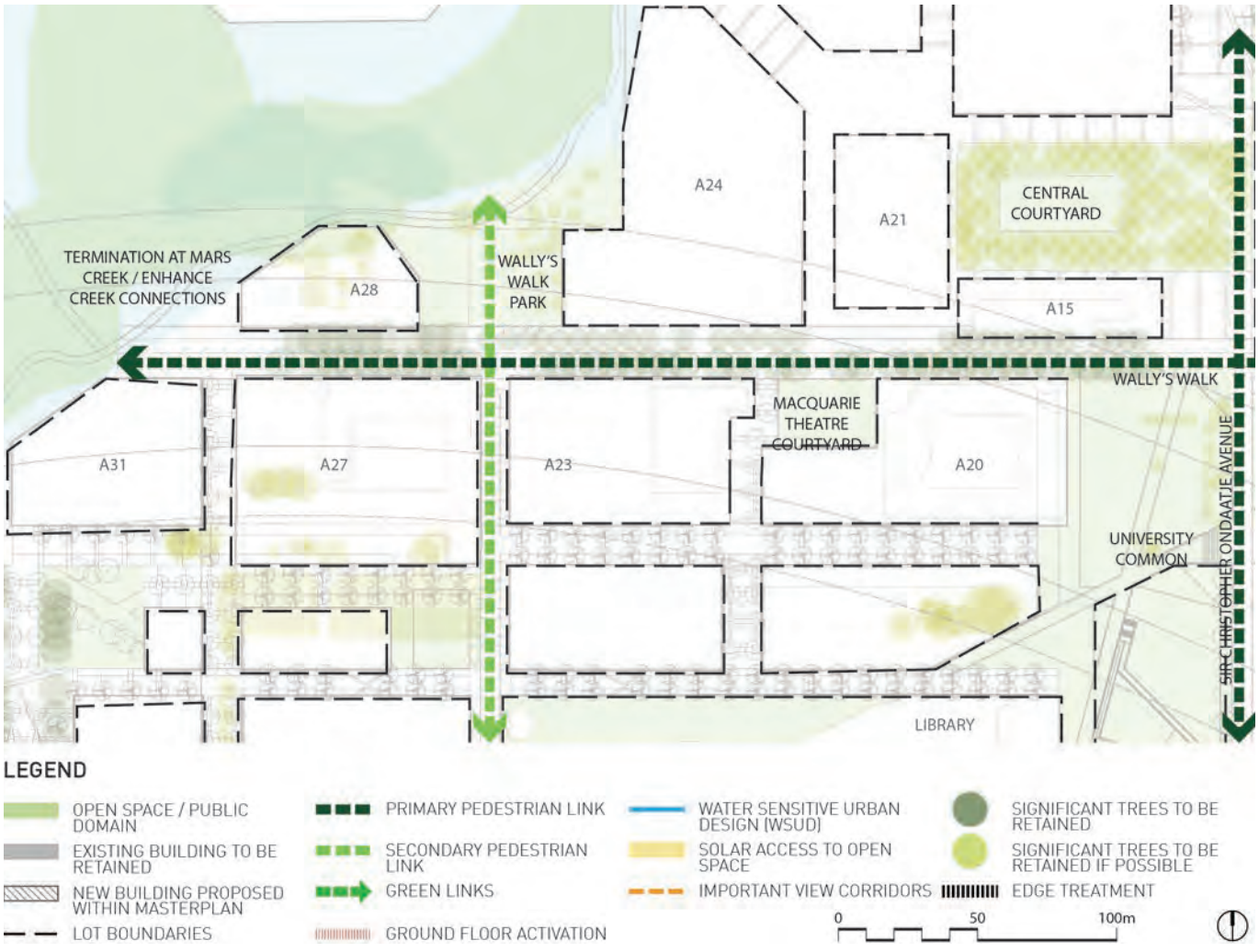
Wally's Walk is one of the campus' most enduring images, with its established canopy of London Plane Trees defining a memorable and unique space. Linking the east and western ends of the Academic Core, it should remain important as an address for many campus buildings and a connector to the open spaces at Mars Creek and University Creek.

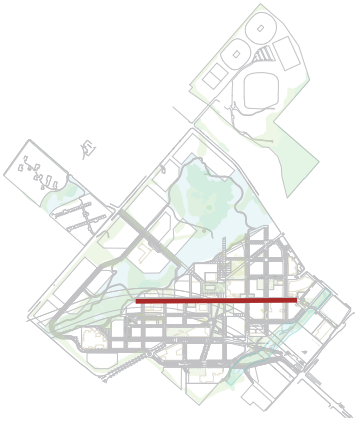
Wally's Walk is primarily a transitory space that ebbs and flows with activity as students travel between classes and to other destinations on campus. It is a place for short stays and waiting rather than socialising in large groups.

The Walk also serves as an infrastructure service network with its underground service tunnels. This role should be preserved in the future and extended through the Academic Core.

Principles

- Retain and build on the distinctive London Plane Tree planting along the Walk to reinforce its traditional boulevard character, distinguishing itself as a place that remains connected to the University's rich history.
- Complement the existing functional aspects of the pedestrian boulevard with new carefully located staying places along its edges to not obstruct the flow of people along its length.





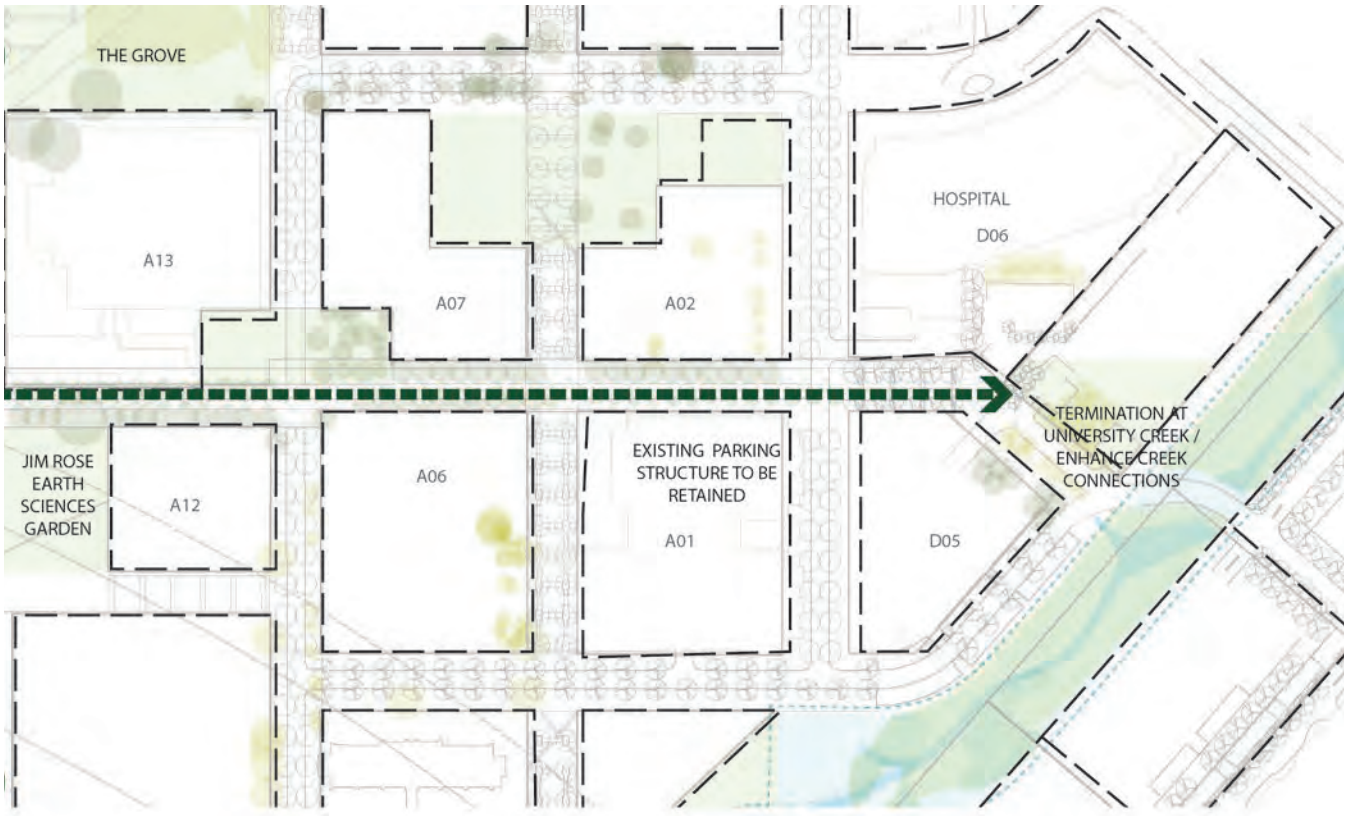
- Enhance the relationship with Mars Creek and University Creek at each end of the Walk.
- Reinforce active uses with high visibility into each building from the Walk by locating accessible entries and building address points along the Walk with discrete servicing points only on side roads and access ways.
- Retain and enhance understorey plantings and undertake maintenance of the existing London Plane Trees to ensure longevity.

Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Platanus x acerifolia	London Plane Tree	14 x 10 m







3.2.2 Macquarie Walk

The pedestrianisation of Macquarie Drive and its extension to the west will form the basis of a new high quality public domain space and walkway to compliment Wally's Walk.

Linking the east and west ends of the Academic Core, it will be important as an address for new campus buildings that are to form part of the arts and human sciences faculties.

Principles

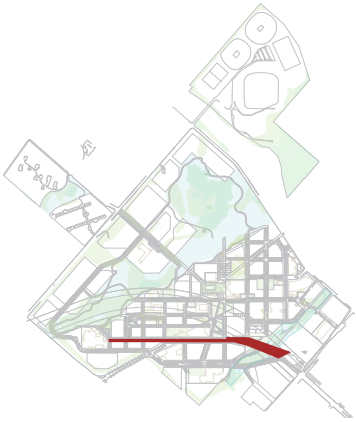
- Create a generous central walkway bordered by activated edges, water sensitive urban design (WSUD) rain gardens and canopy landscape.
- Develop a distinctive deciduous tree planting along the Walk, drawing on the character of the creek landscape with predominantly indigenous planting and trees, as well as colour and movement.
- Provide strong connections with Mars Creek and University Creek at each end of the Walk.
- Provide high visibility into each building from the Walk by locating accessible entries and building address points along the Walk with discrete servicing points only on side roads and access ways.
- Develop shelter elements along the Walk or at adjoining buildings.
- The Walk should offer easy and clear connections with all key nodes offering University-wide directional signage including campus maps and general information.



LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 50 100m



– Macquarie Walk, particularly between the Library and the station, should be well lit and monitored for safe movement between destinations.

The Terminus

The visual termination to the axis at the western end of Macquarie Walk will transition into the future Mars Creek Plaza. The landscape response is to feature strong avenue planting, feature paving design and a sophisticated planting palette.

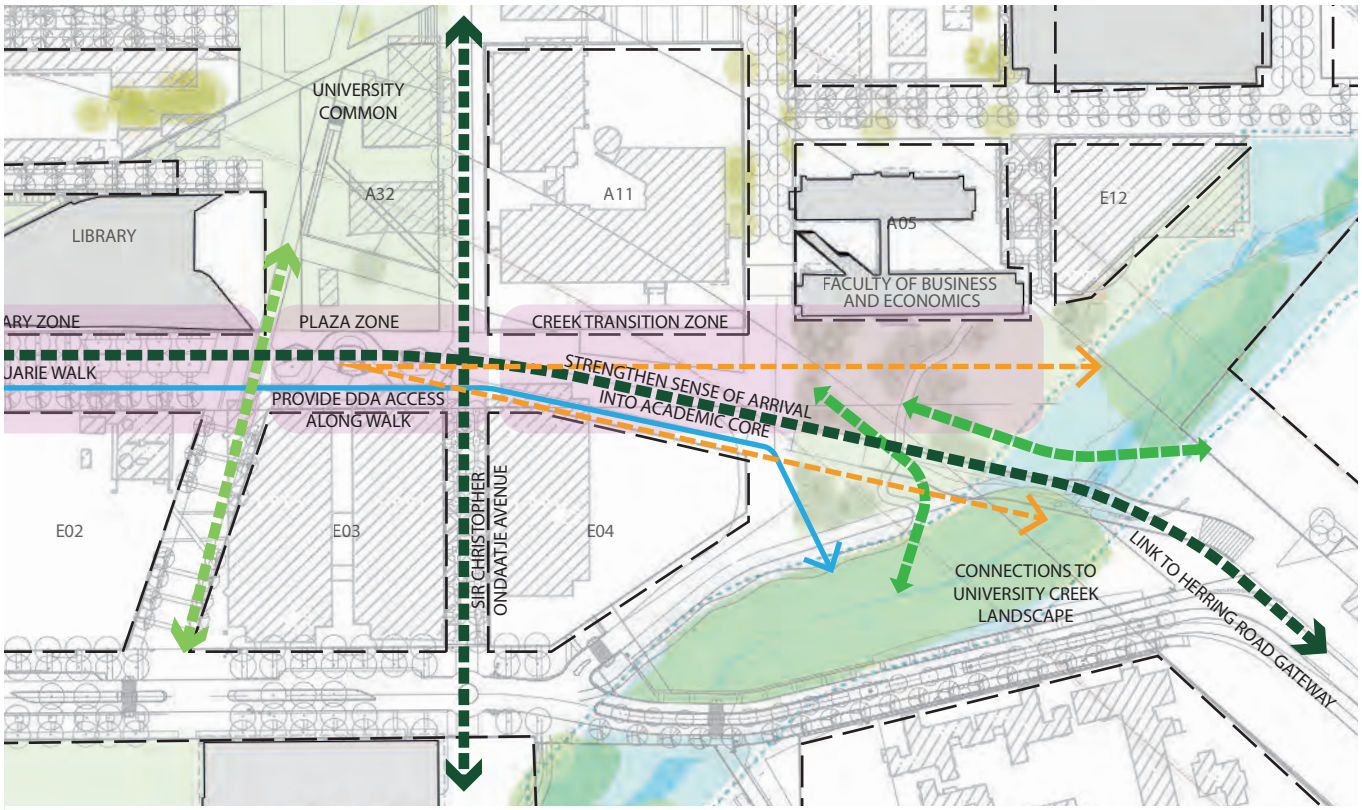
The Active Zone

The active zone will stretch through the flat area west of the library towards Mars Creek Plaza with a continuation of strong avenue planting. The ground floor should be activated by building entries and lobbies, cafes and communal spaces.

The northern edge should be characterised by seating nooks, raised turf beds, rain gardens and a contemporary indigenous and non-indigenous colourful planting palette. The southern edge should be enhanced by deciduous planting to control solar access.

The Library Zone

The library zone marks the point where Macquarie Walk begins to slope down towards University Creek in the east. The space should feature a continuation of strong avenue planting. A series of smaller spaces will mediate the level changes along building frontages and will create informal meeting places.



The landscape treatment should include an activated southern edge enhanced by deciduous planting to control solar access, a northern edge characterised by seating nooks, raised turf beds and rain gardens, and a contemporary planting palette with a large proportion of native species.

The Plaza

The plaza zone is the area adjacent to the new University Common. It should be a transition space between the east-west flow along Macquarie Walk and the strong north-south movement into the University Common and along Sir Christopher Ondaatje Avenue.

Landscape elements should include a plaza edge to the University Common forming a meeting node with the space to be characterised by complex paving, the creation of informal and formal seating areas and an activated southern edge to be enhanced by deciduous tree planting.

The Creek Transition

The area between University Creek and the new University Common, the Creek Transition zone, will be an active space that mediates between the formality of the Herring Road entry, the riparian zone and the new open spaces at the heart of the campus.

The landscape treatment should include strong avenue planting west of Eastern Road, the creation of seating nooks, raised turf beds





and rain gardens as the spaces step down from the University Common, informal rain garden planting feathered into pedestrian plazas, complex paving design to characterise plaza spaces, a sophisticated riparian planting palette including native grasses at the creek and opportunities to create terraced plaza spaces adjoining the cultural building.

Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Angophora costata	Smooth-Barked Apple	15 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Nyssa sylvatica	Black Gum	11 x 6 m
Pyrus ussuriensis	Manchurian Pear	9 x 7 m
Ulmus parvifolia	Chinese Elm	10 x 11 m







3.2.3 Sir Christopher Ondaatje Avenue

Sir Christopher Ondaatje Avenue forms the primary north-south corridor through the campus core between the Mars Creek and University Creek, connecting the Central Courtyard, the new University Common, Wally's Walk, Macquarie Walk and University Avenue and the parkland corridors associated with both creeks.

It will form a major address point for important campus destinations.

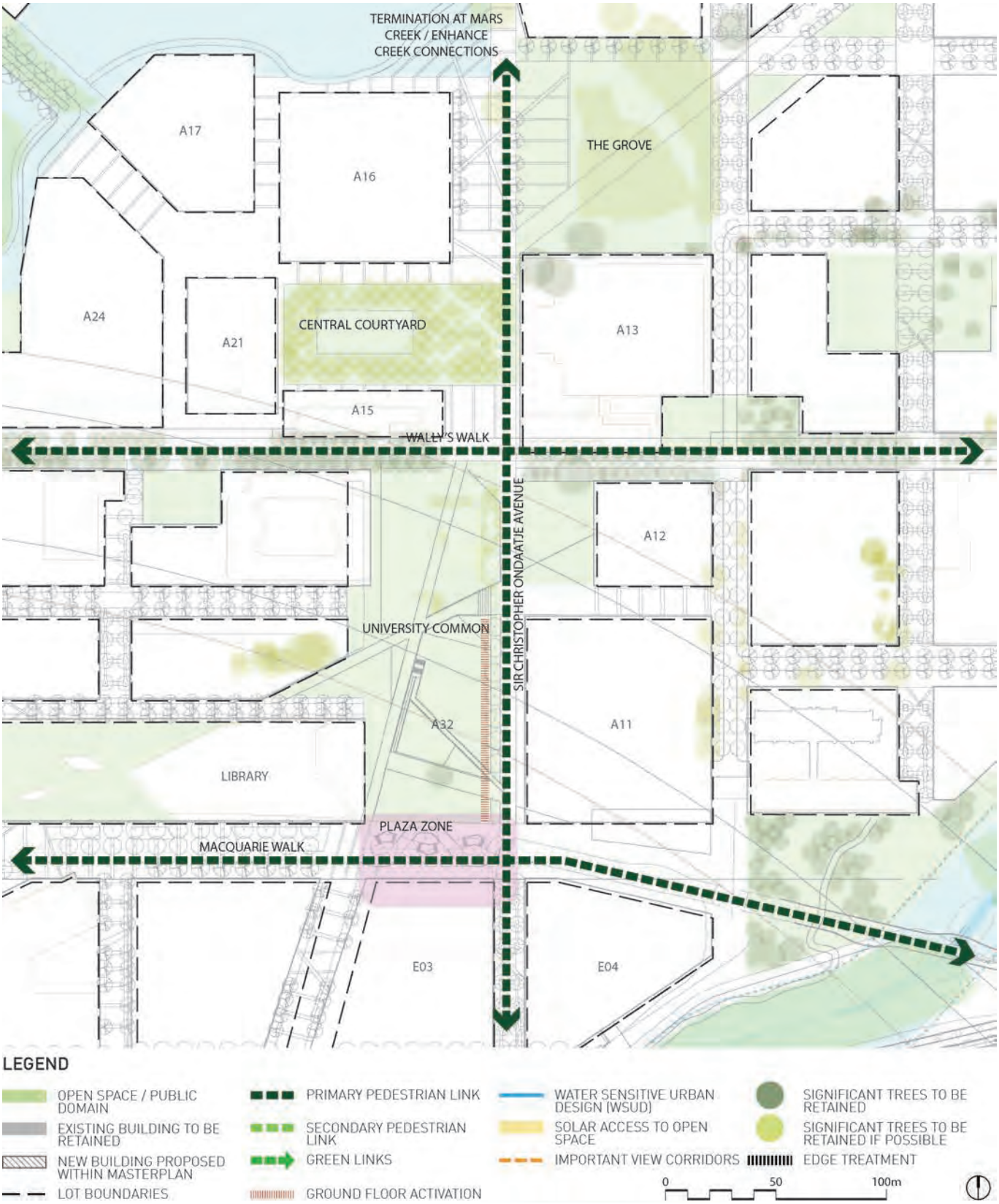
Principles

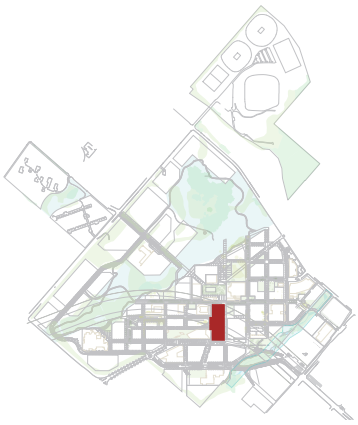
- Provide a variety of landscape experiences that reflect Asian sensibilities regarding edge and centre, introversion and extraversion, enclosure and openness providing a physical representation of the transformative culture of the University.
- The preferred location for history plaques or other memorials or markers, the Avenue is to be a highly managed and manicured space, retaining a certain distinction and respect.
- Provide a strong visual connection to Mars and University Creeks.
- Reinforce the clarity of the spine through a double row of feature trees.

Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Flindersia australis	Crows Ash	10 x 8 m
Syzygium smithii	Narrow-Leaved Lilly Pilly	10 x 6 m
Toona ciliata	Red Cedar	20 x 10 m
Waterhousia floribunda 'Green Avenue'	Green Avenue Lilly Pilly	15 x 9 m




TERMINATION AT MARS CREEK / ENHANCE CREEK CONNECTIONS
A17
A16
THE GROVE
A24
A21
CENTRAL COURTYARD
A13
A15
WALLY'S WALK
SIR CHRISTOPHER ONDAATJE AVENUE
A12
UNIVERSITY COMMON
A32
A11
LIBRARY
PLAZA ZONE
MACQUARIE WALK
E03
E04
LEGEND
OPEN SPACE / PUBLIC DOMAIN
EXISTING BUILDING TO BE RETAINED
NEW BUILDING PROPOSED WITHIN MASTERPLAN
LOT BOUNDARIES
PRIMARY PEDESTRIAN LINK
SECONDARY PEDESTRIAN LINK
GREEN LINKS
GROUND FLOOR ACTIVATION
WATER SENSITIVE URBAN DESIGN (WSUD)
SOLAR ACCESS TO OPEN SPACE
IMPORTANT VIEW CORRIDORS
SIGNIFICANT TREES TO BE RETAINED
SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
EDGE TREATMENT
0
50
100m



3.3 PRIMARY PARKS AND PLAZAS

3.3.1 University Common

The University Common will be a significant new space that will become a focal point for Macquarie University. It will have few parallels at other university campuses. With generous dimensions and addressed by major buildings such as the Library, it will unite Wally's Walk with Sir Christopher Ondaatje Avenue and create legibility within, and a focal point for the campus. It will receive good solar access throughout the year.

The Library will provide 18-hour a day activity. The Common and the locality of other major campus functions facing the Common will extend activity in this space.

Principles

- Create a clear space for the new University Common with the removal of buildings C4A and C4B.
- Develop a mix of lawn, planted and paved areas with multiple connected pathways across the space, demarcating the major pedestrian pathways with new tree planting.
- Accommodate pavilion buildings within the space that can serve as orientation centres or social meeting points.
- Develop the Common as part of a sequence of spaces from Mars Creek to University Creek.
- Create a place of assembly and celebration within the campus.
- Maximise connectivity and accessibility between the new Common and the existing Central Courtyard.
- Significant trees to be retained.

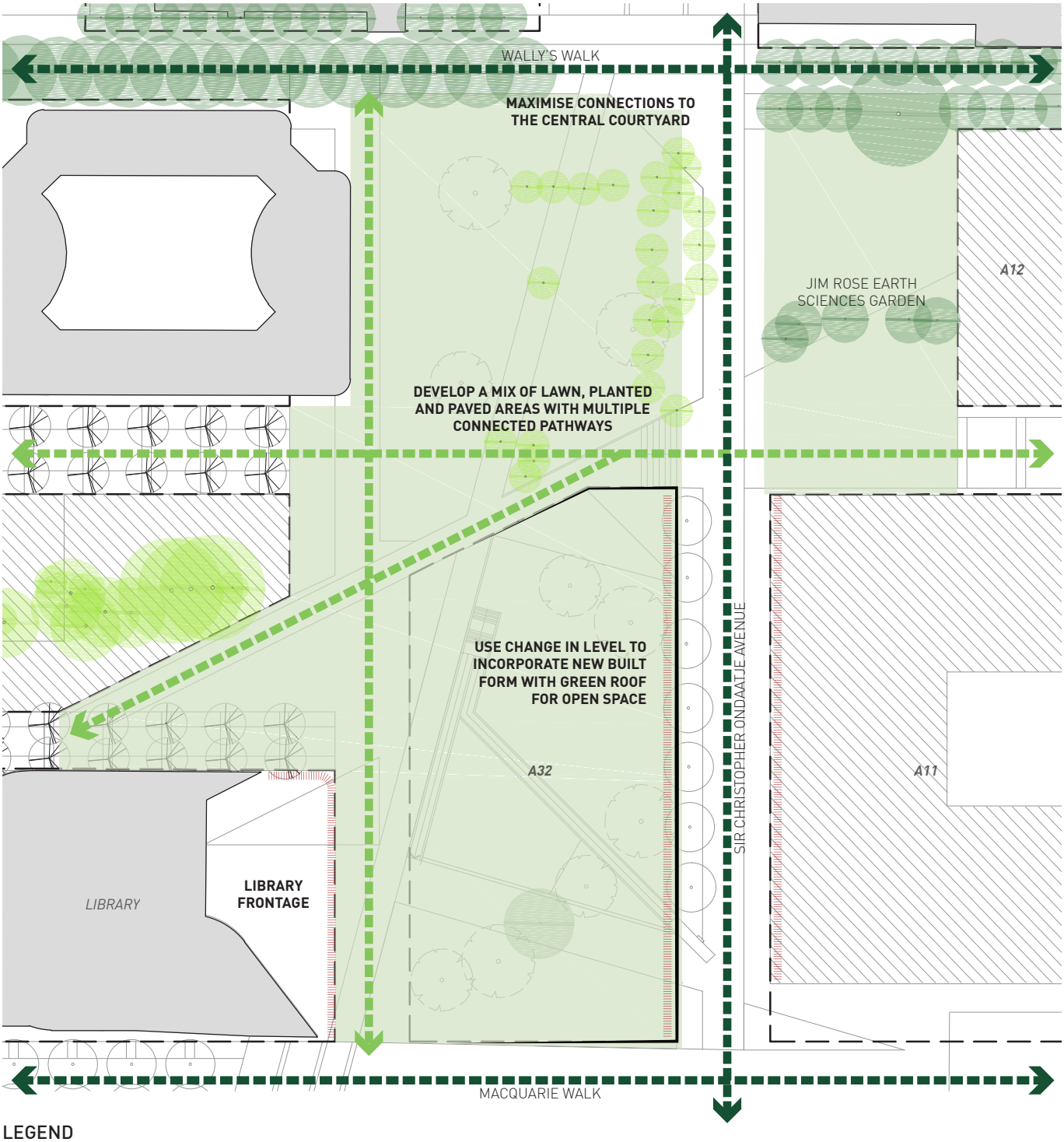
Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Angophora costata	Smooth-Barked Apple	15 x 10 m
Corymbia citriodora	Lemon Scented Gum	20 x 10 m
Pyrus ussuriensis	Manchurian Pear	9 x 7 m
Sapium sebiferum	Chinese Tallow	8 x 8 m





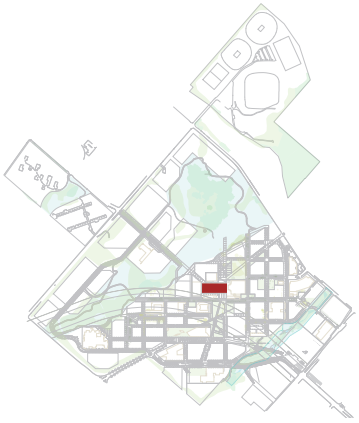




LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 25 50m



3.3.2 Central Courtyard

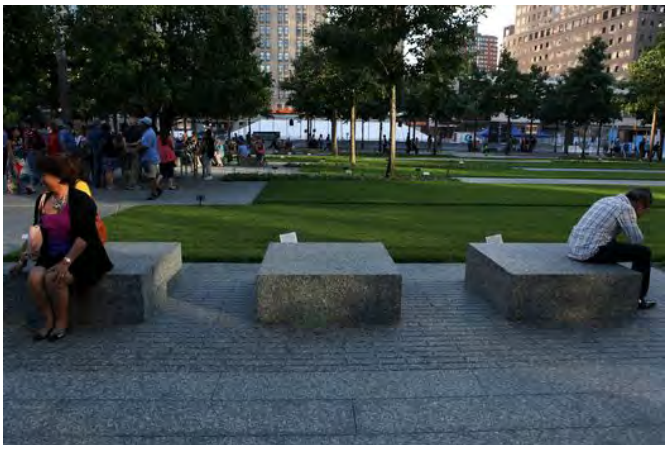
The Central Courtyard will remain an important space within the University. While some central functions of the Courtyard such as the Library have relocated, administrative and civic functions of the University should remain focused in this area. There are plans to activate the edges of the space with additional food and beverage uses.

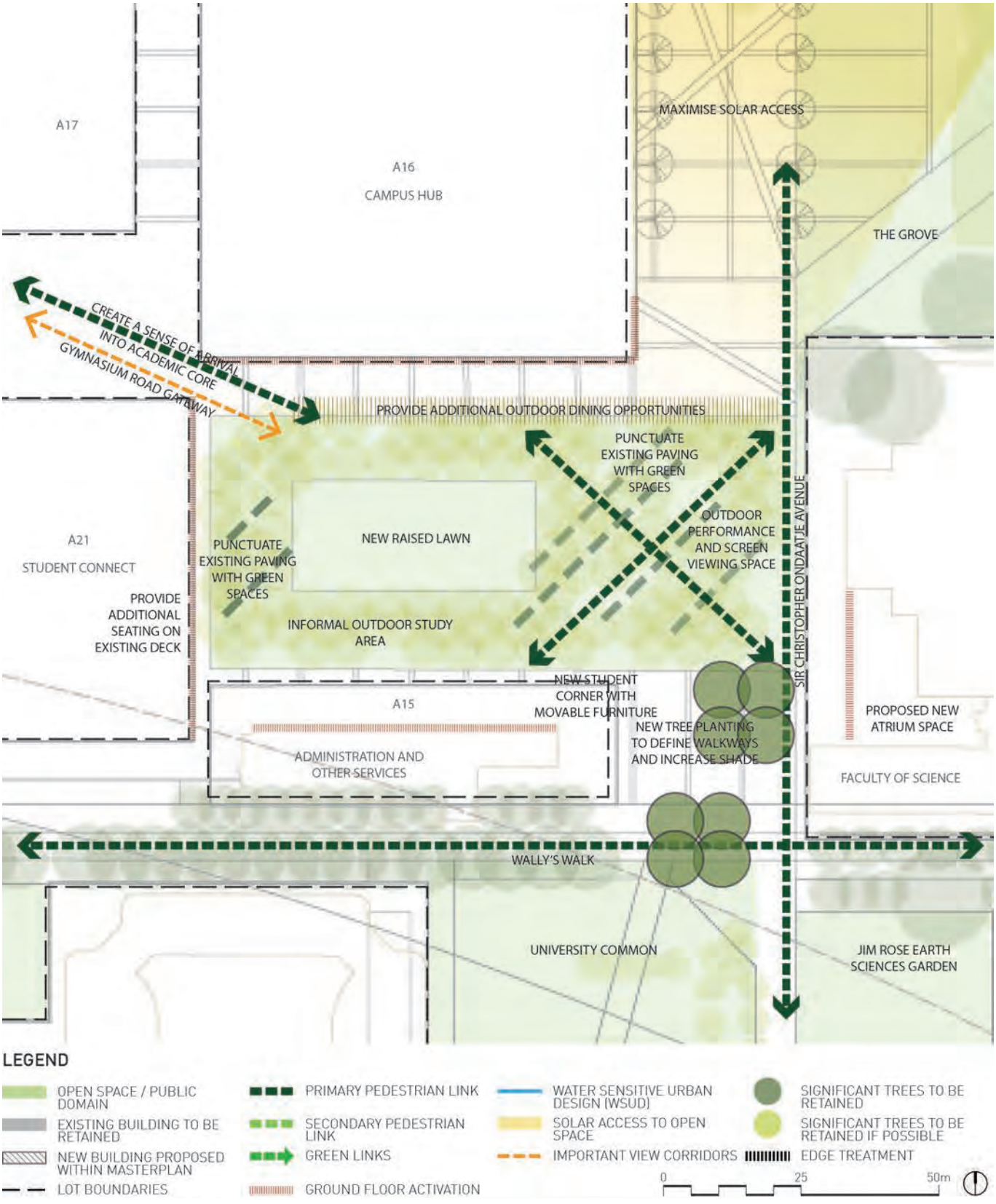
Renewal of the buildings framing this space will revitalise the Courtyard. Creation of a new direct link to Mars Creek towards Gymnasium Road in the north-west of the space will mean a much more accessible connection to the north and to the student housing areas.

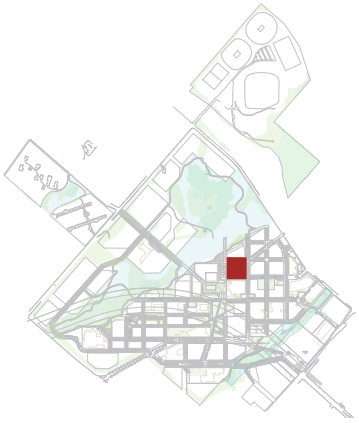
Principles

- Build on the existing informal and unstructured character to create a place that is bold and iconic but also comfortable, relaxed, fun and changeable.
- Co-locate food and services with a high quality experience of the public realm: north facing, sheltered, people watching, vista framing for indoor/outdoor dining, ensuring that the best outdoor playing/eating/relaxing spaces are free, i.e. not commercial.
- Support and encourage student activation of the place with appropriate services such as power, water, seating and shelter that can be used for a variety of event scales and types.
- Replace the existing *Corymbia citriodora* plantings.
- Celebrate the original 1960s and 1970s architecture as appropriate.
- Improve access to and functionality of the Lincoln Building and the former Library.
- Develop links to adjacent spaces and the northern campus entry points.
- Maximise visual and spatial links between the Central Courtyard and the four key campus entry points.
- Maximise northern solar access and visual link between the Central Courtyard and landscaped vista to the north (to the lake and beyond).
- If possible, retain existing trees within the Courtyard.






A17
A16
CAMPUS HUB
MAXIMISE SOLAR ACCESS
THE GROVE
CREATE A SENSE OF ARRIVAL INTO ACADEMIC CORE
GYMNASIUM ROAD GATEWAY
PROVIDE ADDITIONAL OUTDOOR DINING OPPORTUNITIES
PUNCTUATE EXISTING PAVING WITH GREEN SPACES
OUTDOOR PERFORMANCE AND SCREEN VIEWING SPACE
A21
STUDENT CONNECT
PUNCTUATE EXISTING PAVING WITH GREEN SPACES
NEW RAISED LAWN
PROVIDE ADDITIONAL SEATING ON EXISTING DECK
INFORMAL OUTDOOR STUDY AREA
SIR CHRISTOPHER ONDAATJE AVENUE
NEW STUDENT CORNER WITH MOVABLE FURNITURE
A15
NEW TREE PLANTING TO DEFINE WALKWAYS AND INCREASE SHADE
PROPOSED NEW ATRIUM SPACE
ADMINISTRATION AND OTHER SERVICES
FACULTY OF SCIENCE
WALLY'S WALK
UNIVERSITY COMMON
JIM ROSE EARTH SCIENCES GARDEN
LEGEND
OPEN SPACE / PUBLIC DOMAIN
EXISTING BUILDING TO BE RETAINED
NEW BUILDING PROPOSED WITHIN MASTERPLAN
LOT BOUNDARIES
PRIMARY PEDESTRIAN LINK
SECONDARY PEDESTRIAN LINK
GREEN LINKS
GROUND FLOOR ACTIVATION
WATER SENSITIVE URBAN DESIGN (WSUD)
SOLAR ACCESS TO OPEN SPACE
IMPORTANT VIEW CORRIDORS
SIGNIFICANT TREES TO BE RETAINED
SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
EDGE TREATMENT
0
25
50m



3.3.3 The Grove (East Common)

As the activity in the University increases around the Hospital and new science programs, there will be a need for a new open space in the north-east of the Academic Core. This large space has a framework of existing trees and forms an extension of the Mars Creek landscape. The space is located on generally level ground and will have good solar access.

The grove of mature trees creates a forest like atmosphere and a sense of mystery and discovery. It is a place of contemplation and enjoyment of the arts, through the careful placement of appropriate sculpture and nature through the arboretum planting.

Principles

- Develop the Grove as an extension of the Mars Creek open space, retaining and enhancing the existing vegetation and providing interesting areas of open space for passive recreation and cultural campus events.
- Provide an informal open space focus in the north of the Academic Core, enhancing the existing forest experience with soft and unstructured paths leading through and down to the creek, and more local species of vegetation.
- Key artworks from the University collection should be integrated into the detailed design of both the path ways and the tree plantings.
- Provide a walking track that connects to the creek and lake, vegetation pockets and cultural spaces.

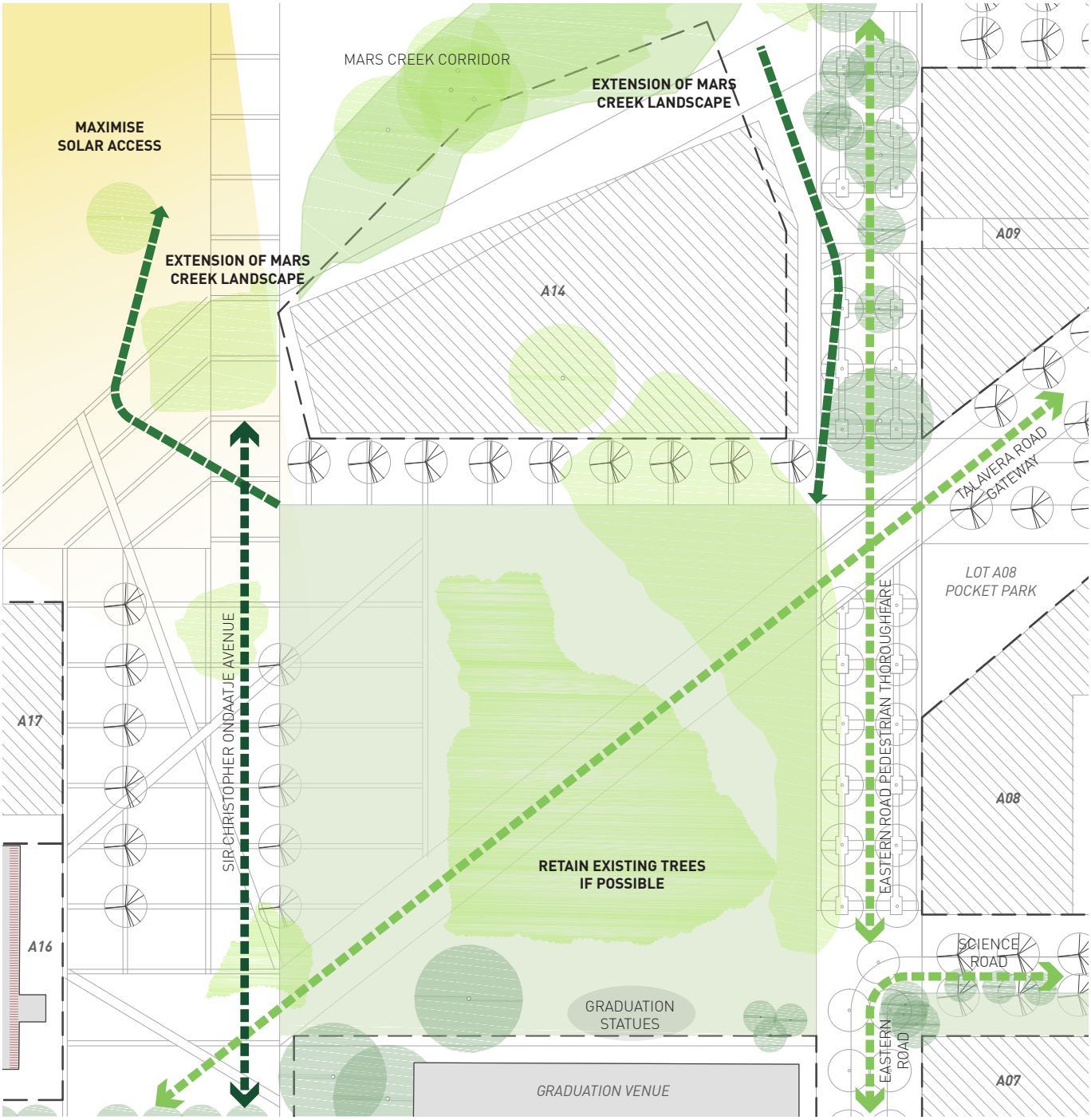
Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Angophora costata	Smooth-Barked Apple	15 x 10 m
Eucalyptus crebra	Narrow-Leaved Ironbark	20 x 10 m
Eucalyptus fibrosa	Red Ironbark	20 x 10 m
Eucalyptus notabilis	Mountain Mahogany	20 x 10 m
Eucalyptus paniculata	Grey Ironbark	20 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Syncarpia glomulifera	Turpentine	25 x 12 m









LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 25 50m

3.3.4 Arts Lawn (West Common)

The Arts Lawn lies in the Arts Precinct and is linked to the University Common along an east-west path past the new Library. Located largely on land currently used for parking, the Arts Lawn will form a link between Wally's Walk and the new Macquarie Walk. This more intimate space is close to the Mars Creek corridor and should form an extension of the Mars Creek landscape.

The Arts Lawn should provide both soft and hard areas suitable for flexible uses including outdoor art installations and other creative performances or endeavours. The base design should be quirky and flexible enough to be transformed with low cost and resources.

Principles

- Provide a defined open space focus in the west of the Academic Core, building on the close access to the informal landscape of Mars Creek.
- Link to the University Core along the new Macquarie Walk that also links to the train station.
- Deliver a place that can function on a day to day level as a local social activity hub but also has the built in infrastructure to allow for multiple flexible uses e.g. power, lighting, catenary structure etc.
- Focus amenities such as cafes, student or staff services etc. around the edge of the space, even mural walls.

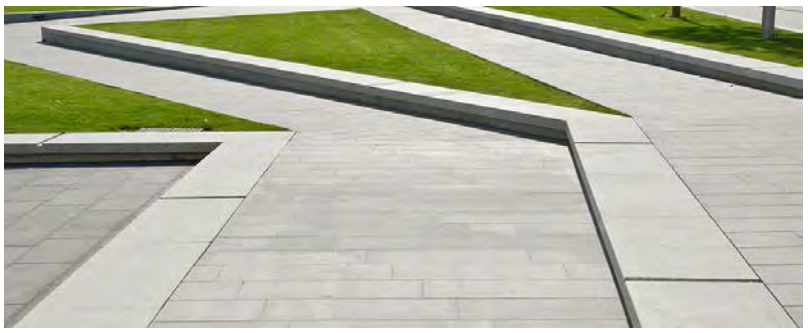
Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Brachychiton acerifolius	Illawarra Flame Tree	10 x 8 m
Jacaranda mimosifolia	Jacaranda	12 x 10 m
Pyrus ussuriensis	Manchurian Pear	9 x 7 m
Waterhousia floribunda 'Green Avenue'	Green Avenue Lilly Pilly	15 x 9 m



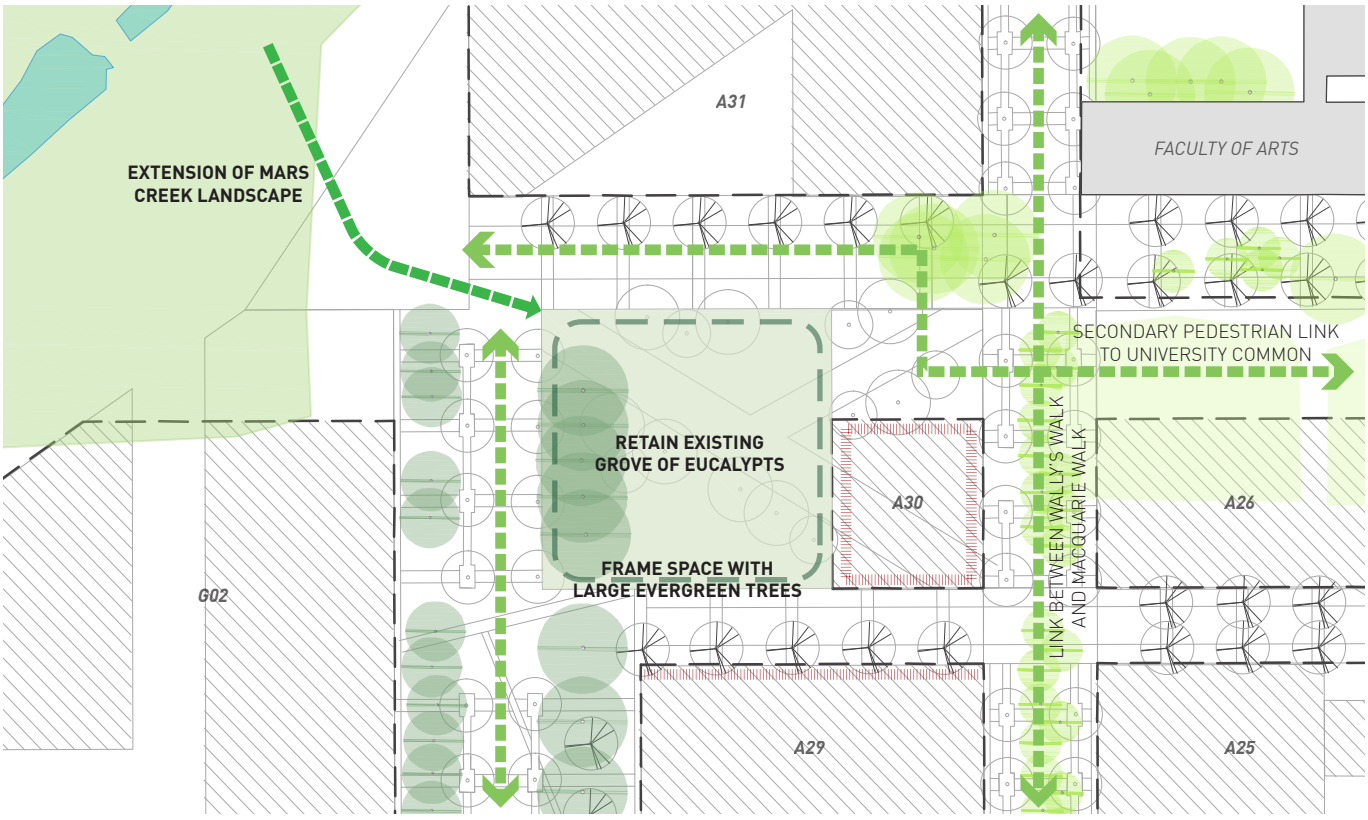








- Loosen management structures over the space and invite student ownership of the creative programming of the area.
- Mediate the landform through a series of stepped levels to the north.
- Create an important termination in the west of the Academic Core and Macquarie Walk.
- Provide large evergreen trees to frame the spaces while deciduous trees delineate plaza areas.



3.4 SECONDARY PARKS AND PLAZAS

3.4.1 Frank Mercer Biological Sciences Garden

The Biological Science Garden was developed by Professor Frank Mercer in collaboration with the Architect's Planner Office. Garden beds were designed to showcase particular plant biological characteristics; a fern bed, a pond for algae and mosses, a bed displaying monocotyledons, another for dicotyledons, a dry land bed with cacti and succulents, and yet another with plants from two closely related families, the Epacridaceae and the Ericacaeae.

Many of the species planted are either uncommon or sourced from unique locations and there is an opportunity to revive the scientific, educational and thematic display enriching the landscape experience of the University. The proximity to the Hospital means that the space has potential as an open space accessible by patients and staff.

Landscape Principles

- Retain and enhance existing garden form and function including arboretum signage.
- Provide additional paths through space taking into account new desire lines.
- Explore opportunities for the garden to contribute to the biodiversity corridor between University Creek and Mars Creek along Science Road.
- Retain existing trees.
- Provide informal seating.

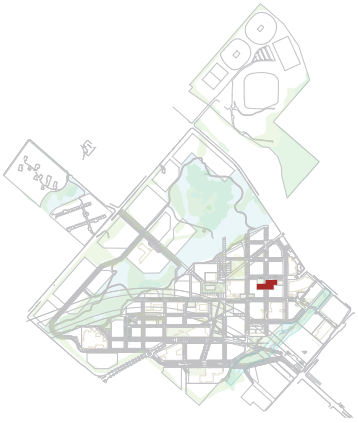
Tree Schedule

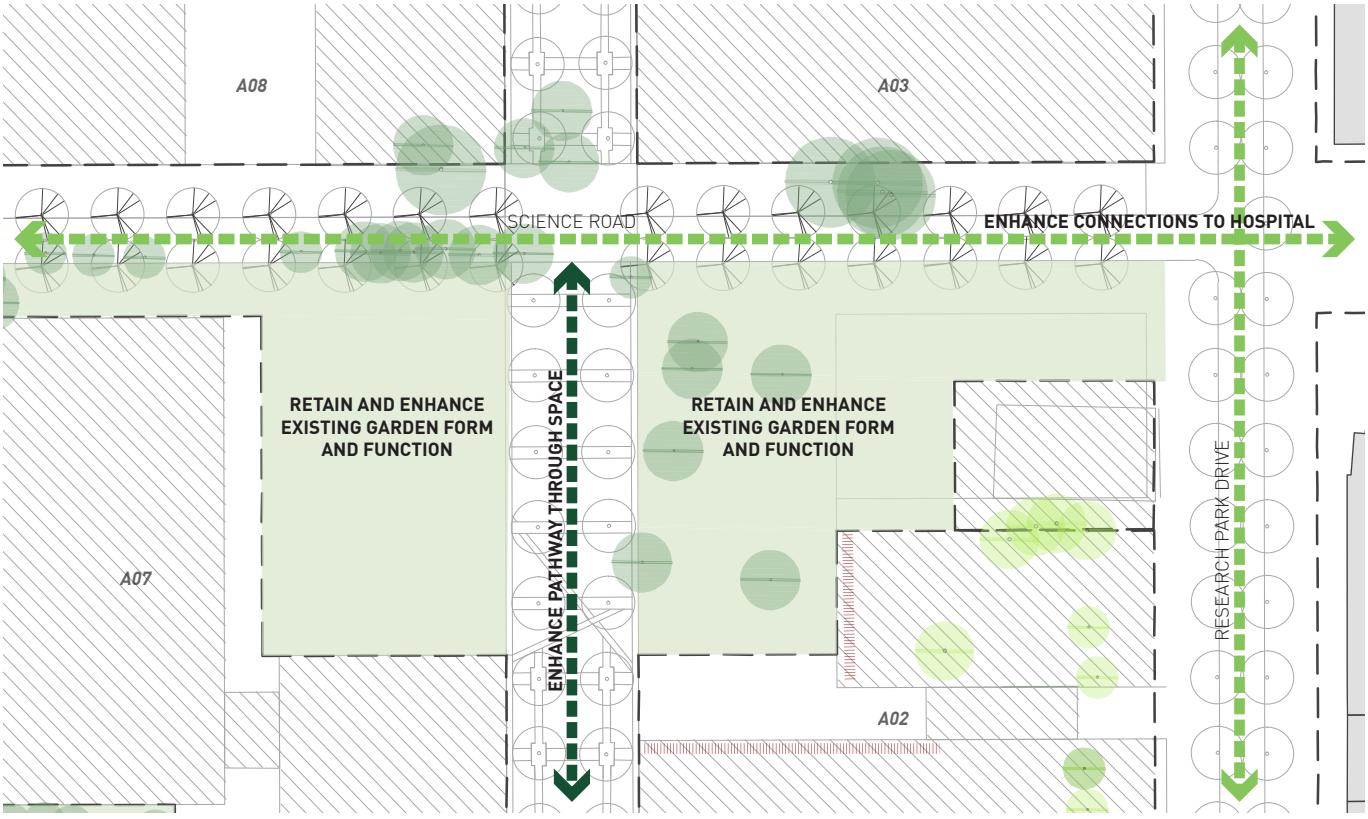
BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Angophora costata	Smooth-Barked Apple	15 x 10 m
Eucalyptus crebra	Narrow-Leaved Ironbark	20 x 10 m
Eucalyptus fibrosa	Red Ironbark	20 x 10 m
Eucalyptus notabilis	Mountain Mahogany	20 x 10 m
Eucalyptus paniculata	Grey Ironbark	20 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Syncarpia glomulifera	Turpentine	25 x 12 m











LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 25 50m

3.4.2 Jim Rose Earth Sciences Garden

The Jim Rose Earth Sciences Garden is an existing open space with an important role both as educational plantings and as a memorial to Jim Rose. The courtyard is divided into two sections, with the gardens on the north and west planted with Laurasian (predominantly) northern hemisphere species while the gardens on the eastern and southern sides are planted with Gondwanan (predominantly) southern hemisphere species.

The space lies at the junction of Wally's Walk and the upgraded Sir Christopher Ondaatje Avenue – one of the highest trafficked spaces in the campus' pedestrian network. Planned as a retreat, the landscape treatment is to upgrade the space while preserving the sense of relief from the main pedestrian network.

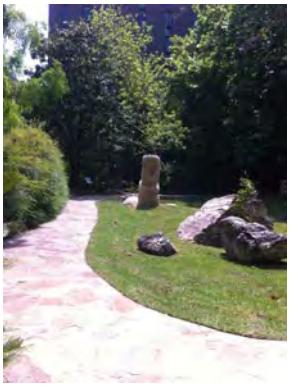
Landscape Principles

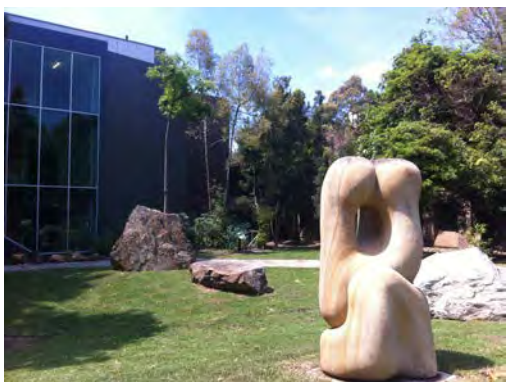
- Retain and enhance existing courtyard planting concept, form and function.
- Ensure expansion of the space to the south builds upon the existing Gondwanan planting already in the southern area of the courtyard.
- Maintain and enhance the connection to Wally's Walk.
- Provide additional paths through space taking into account new desire lines.
- Retain existing trees where possible and if trees are required to be removed, the same species should be replanted elsewhere in the courtyard to ensure the original design intent and integrity of the space is maintained.

Tree Schedule

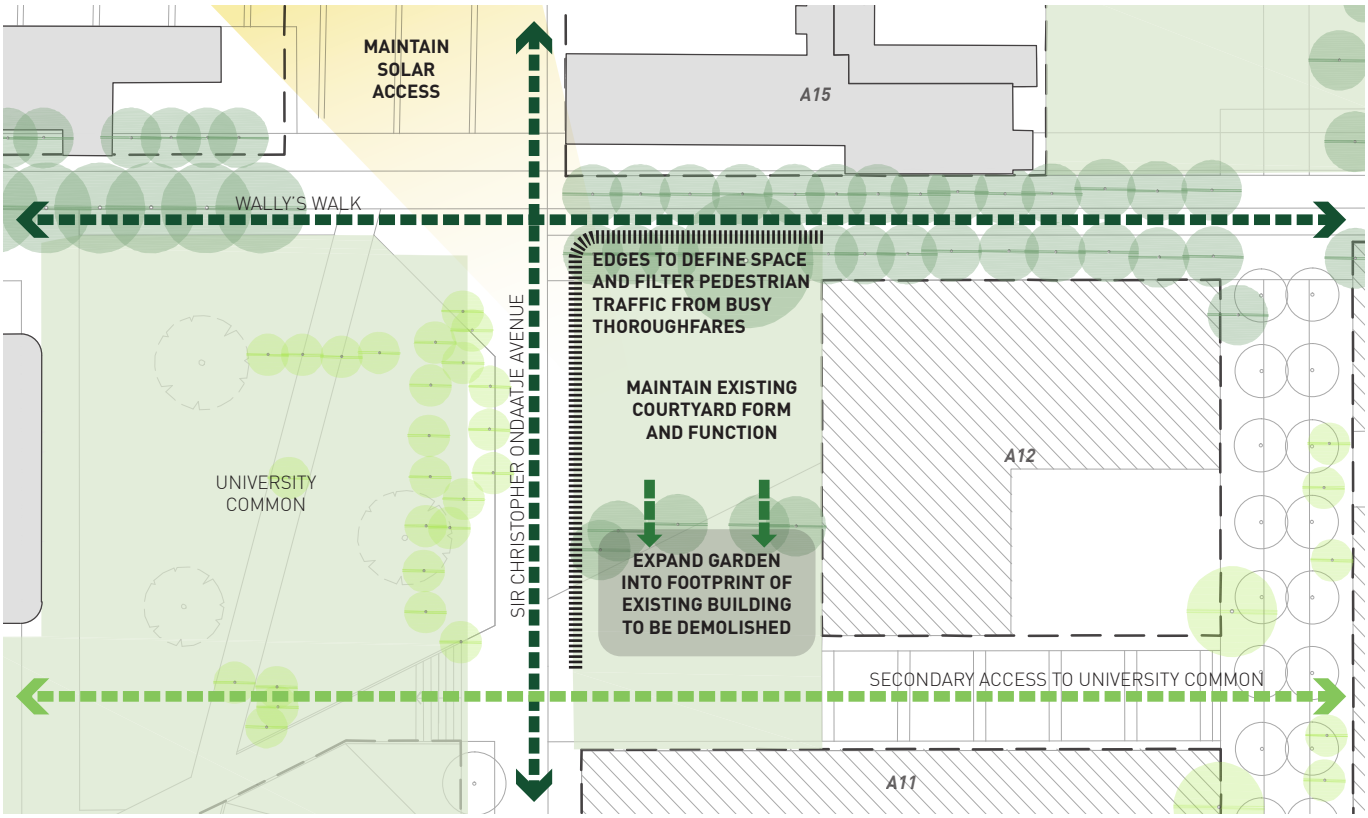
BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Araucaria cunninghamii	Hoop Pine	25 x 10 m
Araucaria heterophylla	Norfolk Island Pine	25 x 10 m
Buckinghamia celsissima	Ivory Curl Tree	8 x 6 m
Protea caffra	Common Sugar Bush	5 x 5 m











LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 25 50m

3.4.3 Mars Creek Plaza

Mars Creek Plaza is located at the western termination of Macquarie Walk, providing a transitional space from the urban aesthetic of the Walk to the parkland character of the Mars Creek corridor.

The space is to be integrated with the Mars Creek landscape while the orientation will provide opportunities for access to the winter afternoon sun.

Landscape Principles

- Enhance the relationship between Macquarie Walk and Mars Creek by providing an urban edge to the Academic Core that incorporates the landscape character of the creek riparian corridor.
- Develop a mix of lawn, planted and paved areas with multiple connected pathways across the space, allowing for the natural grade of the landform towards the creek by stepping the landscape to create a range of dwelling spaces and opportunities.
- Retain and enhance views through the plaza between Macquarie Walk and Mars Creek.
- Characterise space with accent paving forming engaging patterns, retaining existing trees where possible.
- Explore opportunities for public art and Water Sensitive Urban Design (WSUD) integrated within the space.

Tree Schedule

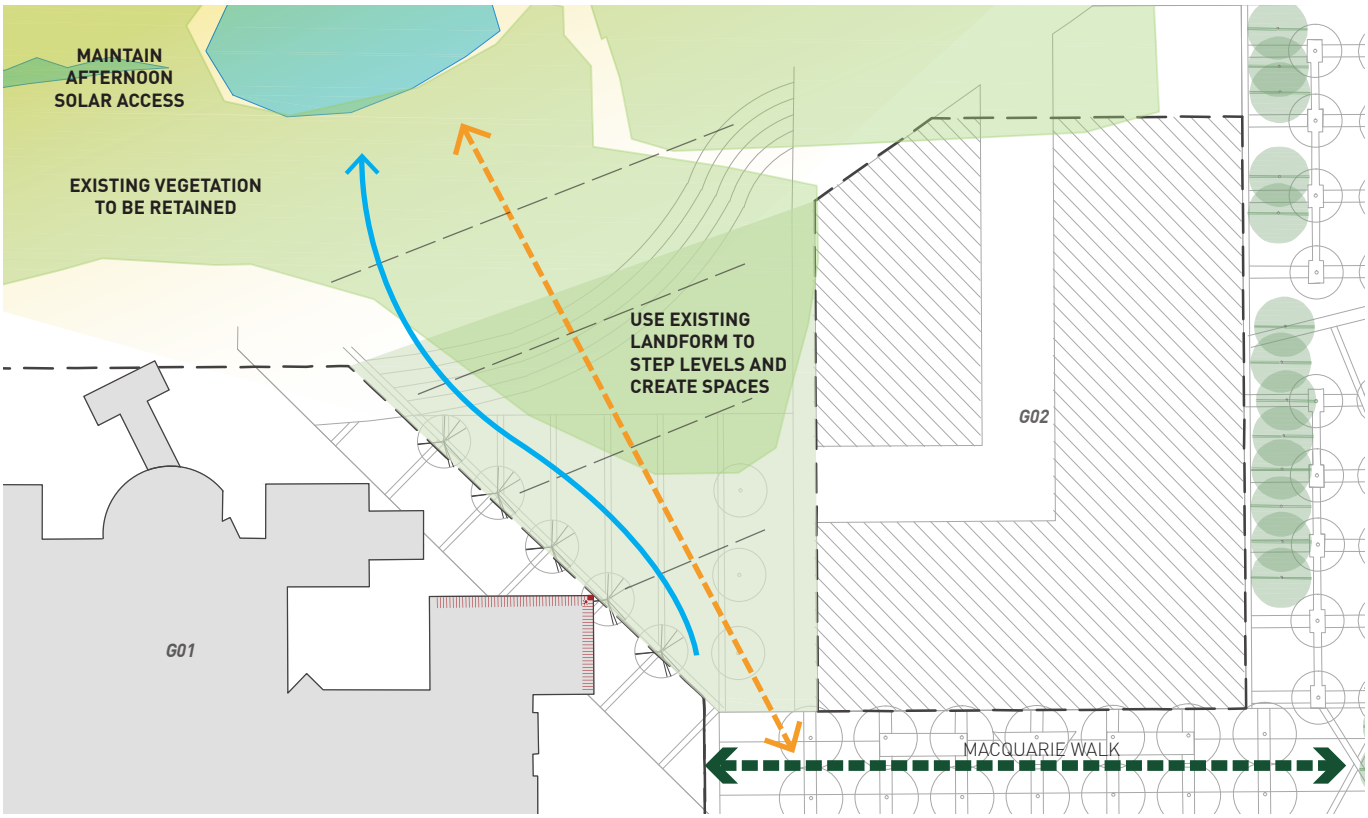
BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Angophora costata	Smooth-Barked Apple	15 x 10 m
Corymbia maculata	Spotted Gum	20 x 10 m
Pyrus ussuriensis	Manchurian Pear	9 x 7 m
Ulmus parvifolia	Chinese Elm	10 x 11 m











LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 25 50m

3.4.4 Wally's Walk Park

This existing north-facing open space provides excellent views into the parkland corridor of Mars Creek, while the existing lawns are popular with students and staff.

New development to the east and west of the park will frame the space and provide an opportunity to extend the space towards the creek with new seating and landscaped elements.

Landscape Principles

- Provide new paths that address existing and future pedestrian desire lines while providing opportunities for formal and informal seating.
- Retain and enhance views through the park between Wally's Walk and Mars Creek.
- Allow for any change in level toward the creek by stepping creating informal seating and gathering nooks.
- Explore opportunities for public art and Water Sensitive Urban Design (WSUD) integrated within the space.
- Retain existing trees where possible.

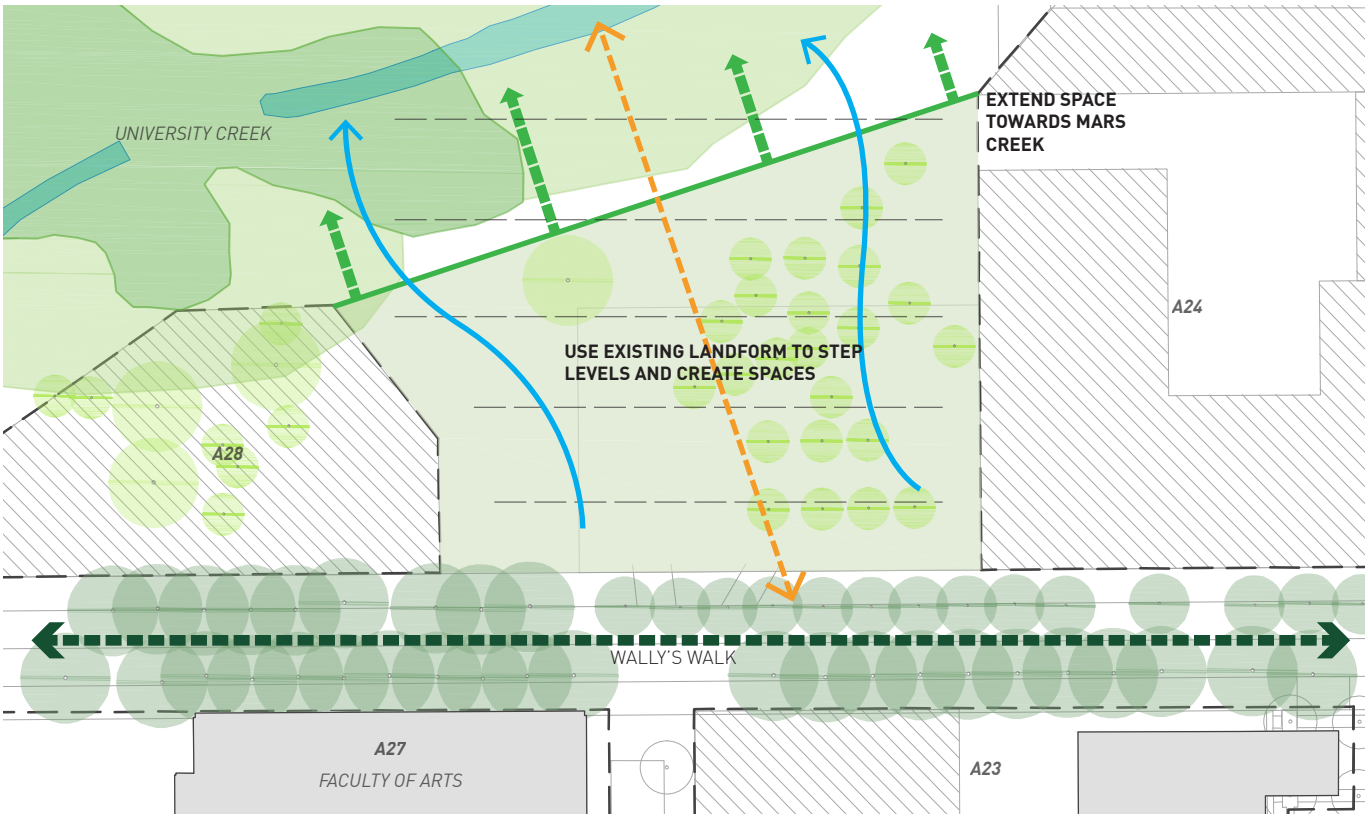
Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Angophora costata	Smooth-Barked Apple	15 x 10 m
Corymbia maculata	Spotted Gum	20 x 10 m
Pyrus ussuriensis	Manchurian Pear	9 x 7 m
Ulmus parvifolia	Chinese Elm	10 x 11 m









LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 25 50m

3.4.5 Western Road Park

Western Road Park will be a new public space along Western Road adjoining Lot A26 to the west. The park will need to allow for potential secondary pedestrian access to the Lot A26 building.

Landscape Principles

- Address potential secondary pedestrian access requirements to adjoining building.
- Explore opportunities for the Park to contribute to the biodiversity corridor between University Creek and Mars Creek along Western Road.
- Provide deciduous tree planting for summer shade and winter sun.
- Provide an appropriate frontage to Western Road.

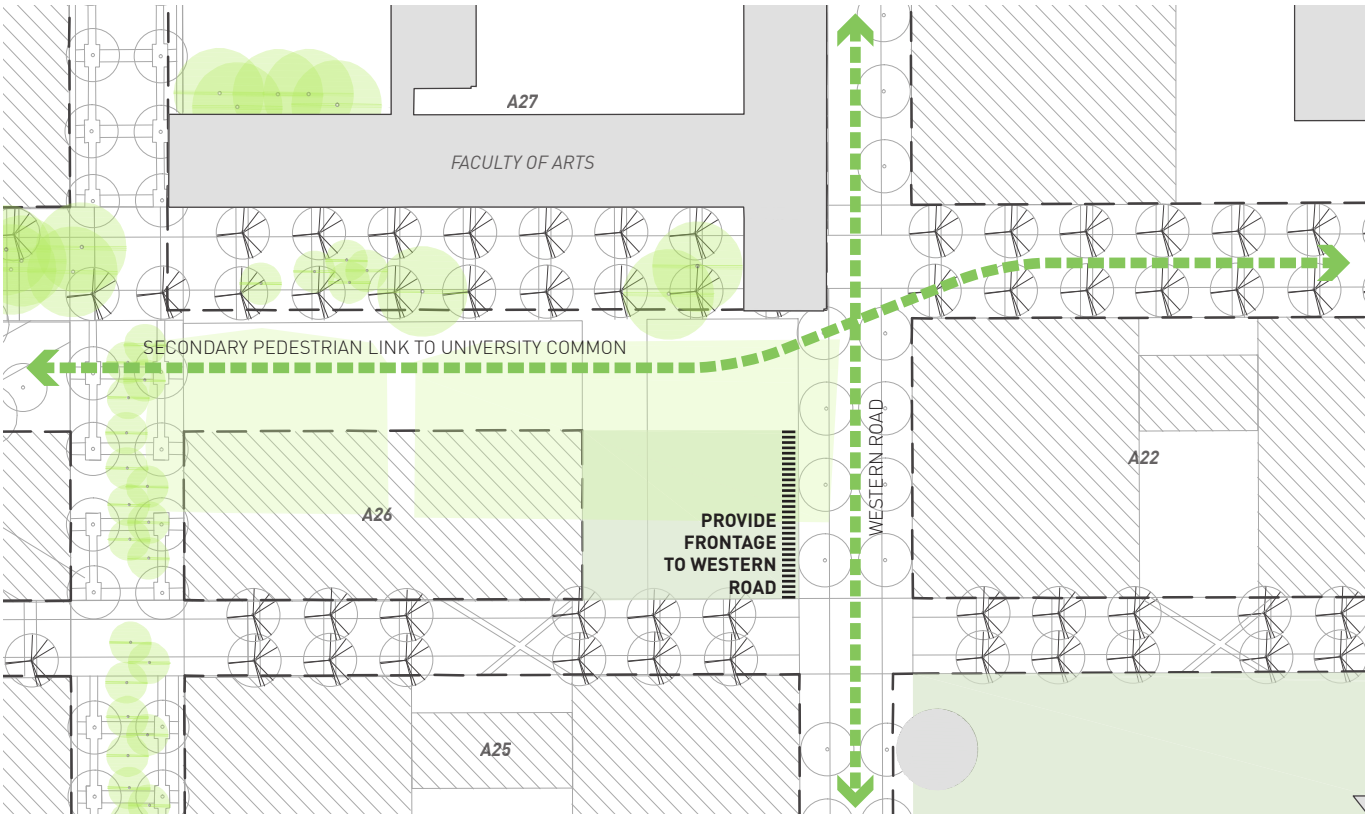
Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Angophora costata	Smooth-Barked Apple	15 x 10 m
Eucalyptus paniculata	Grey Ironbark	20 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Syncarpia glomulifera	Turpentine	25 x 12 m









LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 25 50m

3.4.6 Macquarie Theatre Courtyard

The recent upgrade of the Macquarie Theatre has seen upgrade work undertaken on the spaces around this focal point on the campus. The existing courtyard is used extensively through the day both as a leisure space and informal teaching. The plaza provides break out spaces from the theatre before and after performances and lectures.

Future development of the Theatre site and surrounding parcels may see new paths introduced and some reworking of the spaces.

Landscape Principles

- Retain and enhance existing courtyard form and function.
- Address popular/informal walking routes.
- Maintain and enhance the connection to Wally's Walk.
- Provide additional paths through space.
- Provide opportunities for public art to enhance space.

Tree Schedule

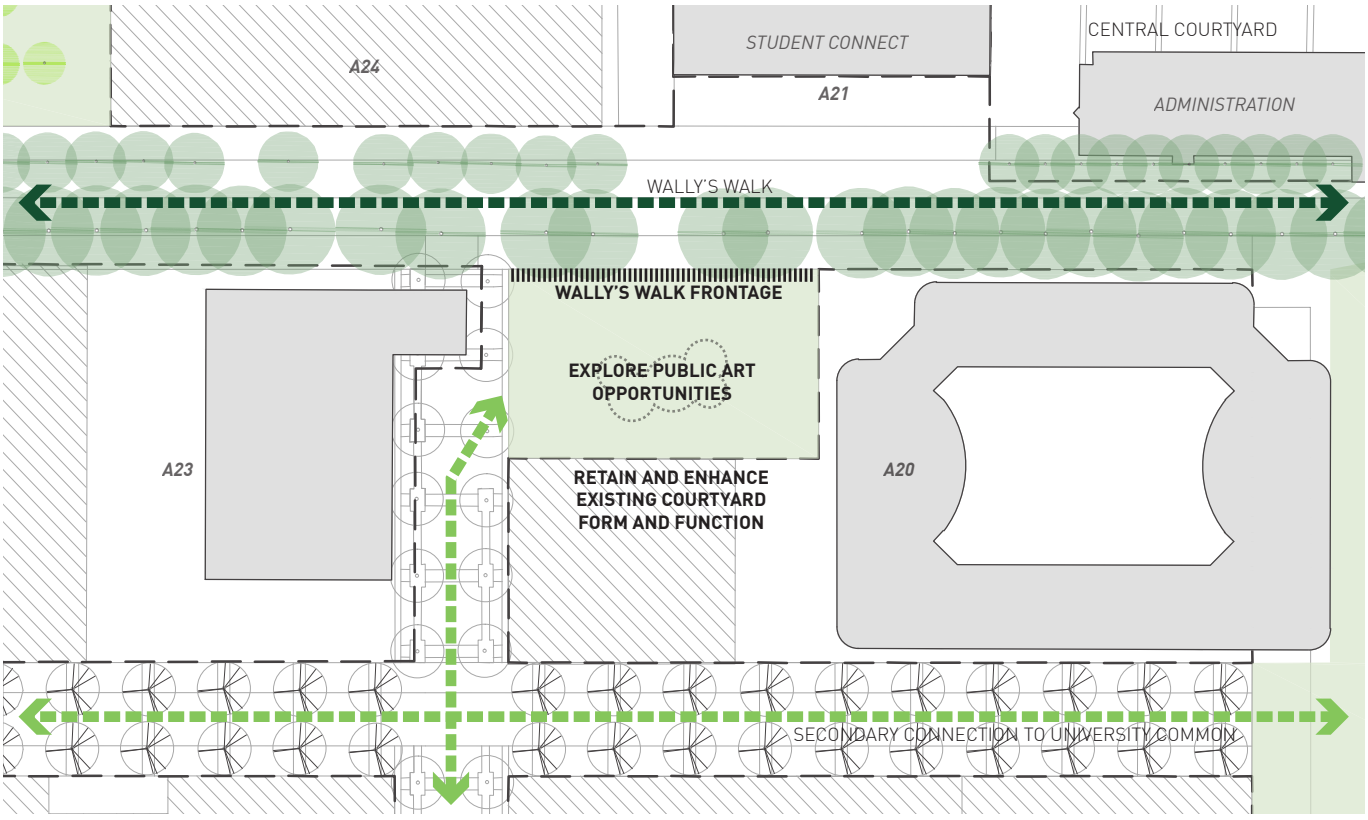
BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Brachychiton acerifolius	Illawarra Flame Tree	10 x 8 m
Jacaranda mimosifolia	Jacaranda	12 x 10 m
Pyrus ussuriensis	Manchurian Pear	9 x 7 m
Waterhousia floribunda 'Green Avenue'	Green Avenue Lilly Pilly	15 x 9 m











LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 25 50m

3.4.7 Faculty of Science Garden

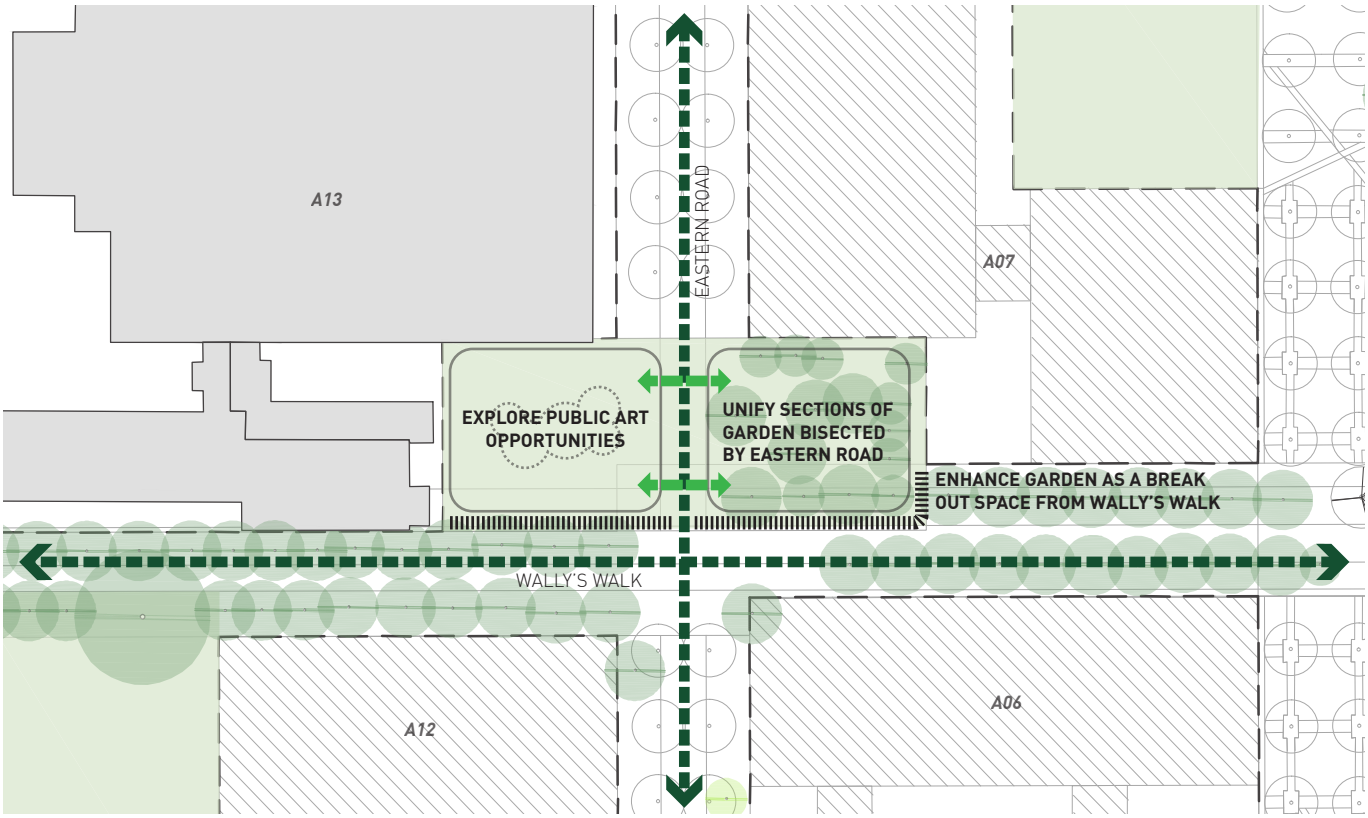
A new garden along Wally's Walk at the Faculty of Science will provide a new breakout space for both the Faculty building and a staying place along the edge of Wally's Walk.

Landscape Principles

- Use ground plane treatments and planting to unify sections of the garden that will be bisected by Eastern Road.
- Maintain and enhance the connection to Wally's Walk.
- Provide opportunities for public art to enhance space.
- Provide deciduous tree planting for summer shade and winter sun.

Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Brachychiton acerifolius	Illawarra Flame Tree	10 x 8 m
Jacaranda mimosifolia	Jacaranda	12 x 10 m
Pyrus ussuriensis	Manchurian Pear	9 x 7 m
Waterhousia floribunda 'Green Avenue'	Green Avenue Lilly Pilly	15 x 9 m



LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 25 50m



3.4.8 Cochlear Forecourt

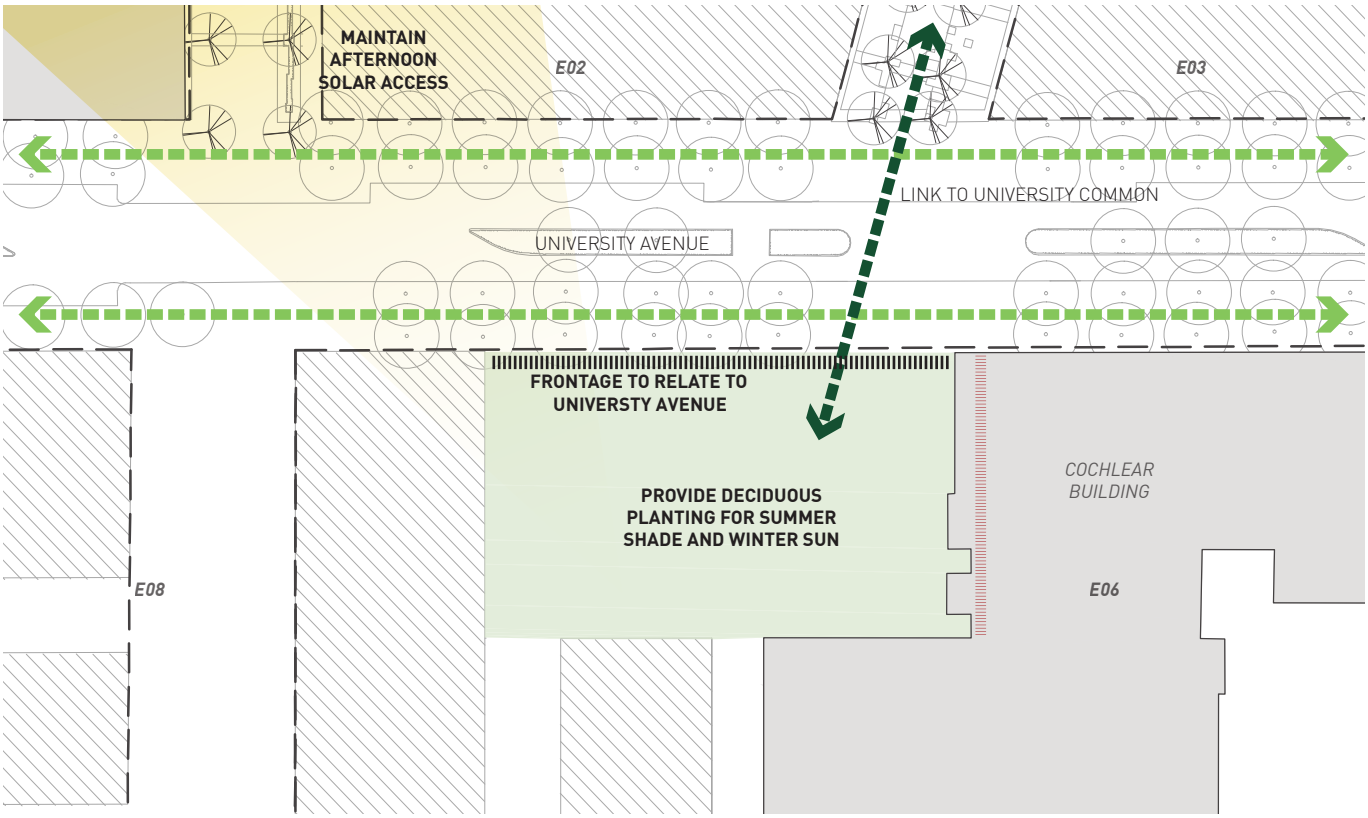
The Cochlear Forecourt will be a new major public open space adjoining the Cochlear Building at the end of the pedestrian link from the University Common.

Principles

- Provide a suitable break out space for the Cochlear Building and any adjoining future development.
- Provide a mix of both hard and soft landscape to allow for versatility.
- Raise areas to accommodate deep soil planting.
- Recognise the termination of the north south diagonal link.
- Allow for suitable pedestrian movement in and around the plaza.
- Relate plaza design to both University Avenue and the adjoining development.
- Ensure a comfortable space by providing shade from the afternoon sun.

Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Brachychiton acerifolius	Illawarra Flame Tree	10 x 8 m
Jacaranda mimosifolia	Jacaranda	12 x 10 m
Pyrus ussuriensis	Manchurian Pear	9 x 7 m
Waterhousia floribunda 'Green Avenue'	Green Avenue Lilly Pilly	15 x 9 m



3.4.9 Library Lawn

The new Macquarie University Library, opened in 2011, incorporates two floors below ground covered by a ground-level green roof. This area provides a substantial open space within the Academic Core of the campus.

The Lawn is predominantly open turf areas affording long distance views to the new library building, with areas of planting beds including Kangaroo Paw, Sawsedge, Blue Flax-Lily and Spiny-Headed Mat-Rush.

Principles

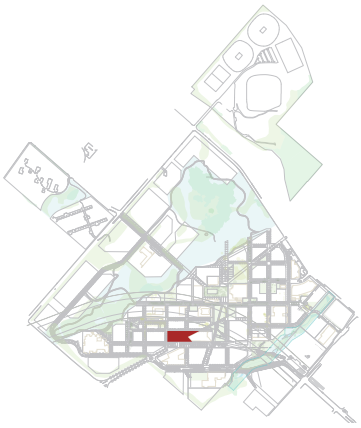
- Retain existing open character of the lawn.
- Explore opportunities for the western end of the Library Lawn to contribute to the biodiversity corridor between University Creek and Mars Creek along Western Road.

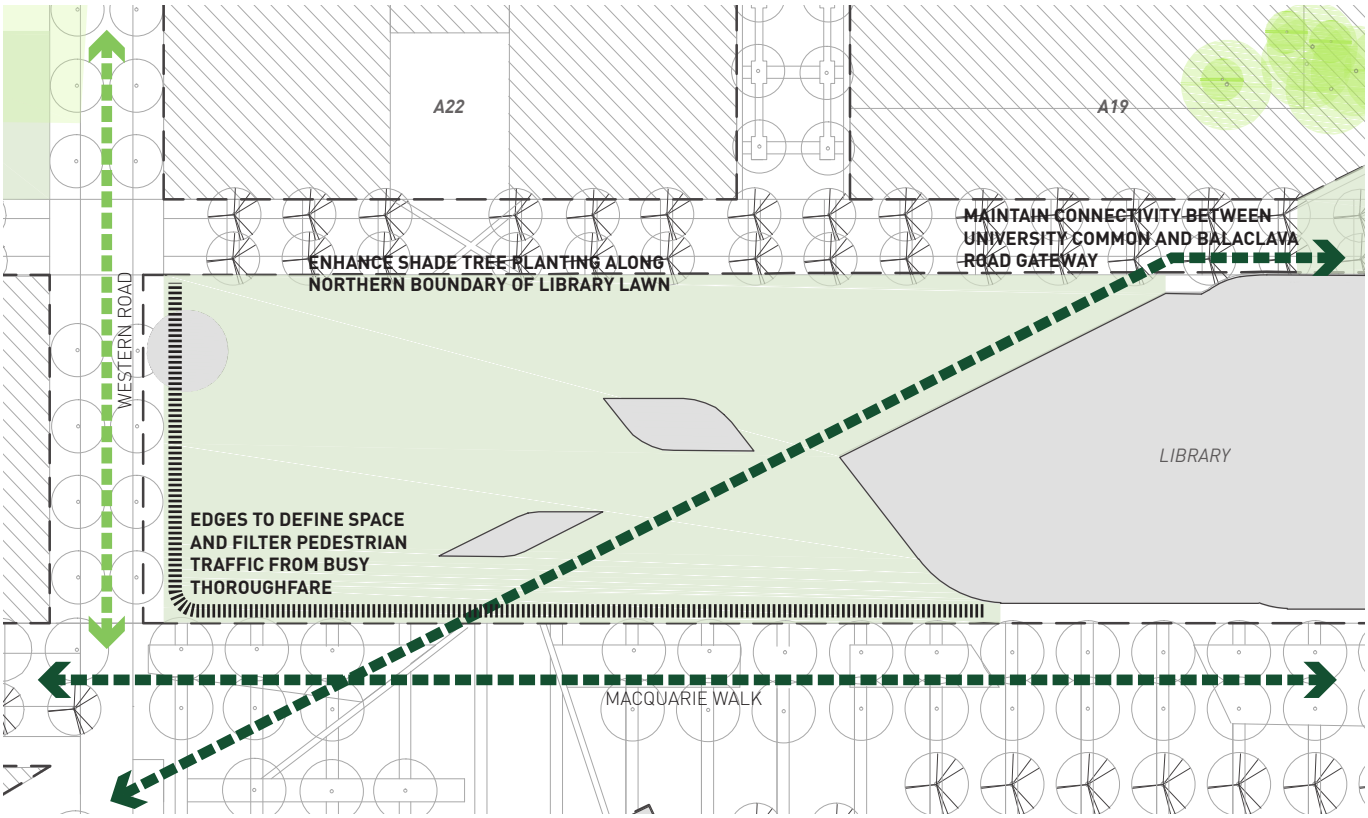
Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Eucalyptus haemastoma	Scribbly Gum	15 x 10 m
Eucalyptus microcorys	Tallowwood	20 x 10 m
Eucalyptus saligna	Sydney Blue Gum	20 x 10 m









LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 25 50m



3.5 CREEK CORRIDORS AND PARKLANDS

3.5.1 University Creek

University Creek is to be improved under existing plans to mitigate flood risk, ensure conservation and enhancement of the habitat in the creek corridor and contribute as an important element of the principal entry into the University. The creek landscape is seen as a defining edge of the Academic Core and as a landscape frame for the campus.

The redesigned University Avenue entry will improve gradients and ease of movement from the train station to the campus heart. The arrival walk along an elevated pathway through the creek habitat, within the shade of its tall tree canopy, will be a unique and memorable experience in a major university campus.

Landscape Principles

- Implement the landscape rehabilitation plan for University Creek.
- Adopt the full 20 metre riparian zone, with wider setbacks to buildings, throughout the creek corridor.
- Provide an urban plaza that emphasises the termination of Wally's Walk at the creek zone.
- Extend the Sir Christopher Ondaatje Avenue axis south from Macquarie Walk to engage the creek zone.
- Take advantage of progressive phases of the Master Plan to remove buildings such as car park F3A from the creek zone.
- Provide continuous accessible pedestrian paths along the edges of the creek zone.
- Review the 200ARI flood risk to existing buildings in the Research Park and plan for long-term improvements.
- Redesign storm water catchment and outflows to minimise catchment run-off from the developed campus core areas.
- Rehabilitate and naturalise creek lines in accordance with the NSW Office of Water requirements.
- Provide interesting areas of open space for passive recreation and campus events.
- Create a terraced urban plaza that integrates the creek landscape with the University Avenue campus gateway.
- Provide a walking track that relates to the creek, plazas and pedestrian nodes.
- Provide opportunities for and encourage art installations in and around the creek landscape.
- Provide interesting and sensitive creek crossings and elevated walkways.
- Consider the opportunity to create a water feature to enhance the campus entry experience.

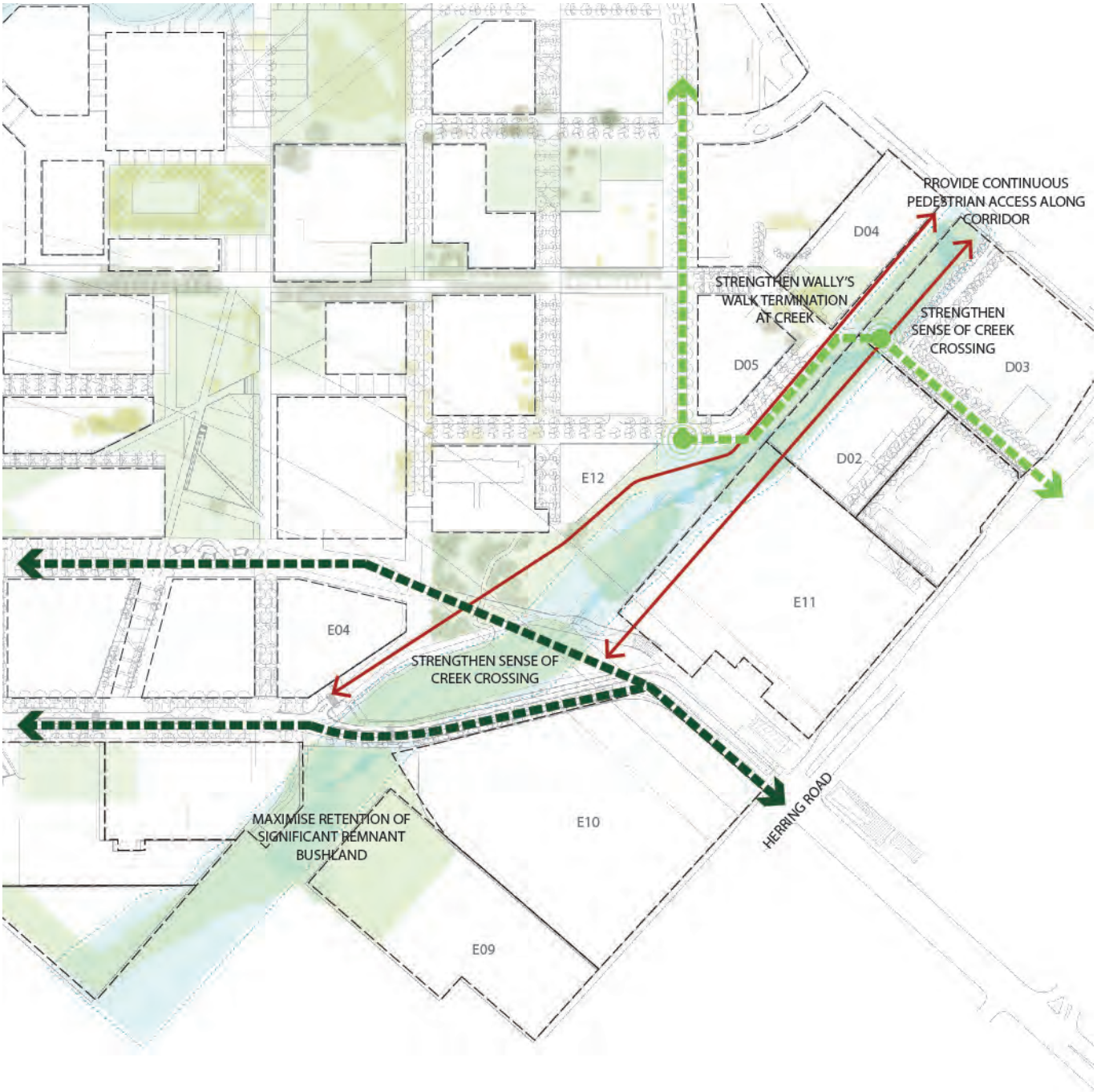
Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Angophora costata	Smooth-Barked Apple	15 x 10 m
Allocasuarina littoralis	Black She-Oak	8 x 4 m
Allocasuarina torulosa	Forest Oak	8 x 4 m
Ceratopetalum apetalum	Coachwood	12 x 8 m
Eucalyptus globoidea	White Stringybark	20 x 10 m
Eucalyptus paniculata	Grey Ironbark	20 x 10 m
Eucalyptus saligna	Sydney Blue Gum	20 x 10 m
Syncarpia glomulifera	Turpentine	25 x 12 m
Synoum glandulosum	Scentless Rosewood	8 x 4 m
Tristaniopsis laurina	Water Gum	7 x 5 m





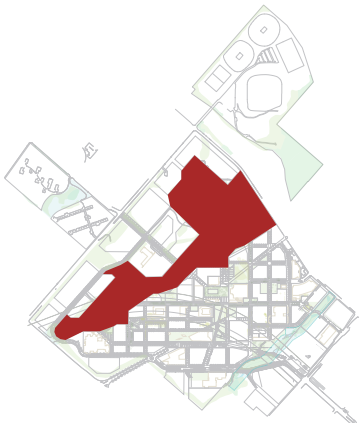




LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 100 200m



3.5.2 Mars Creek

Mars Creek is to be celebrated as a substantial natural resource within the campus. It is to be rehabilitated with a modified watercourse and new planting along the corridor boundary to enable important biodiversity regrowth, establishing a maturing habitat for the University population to enjoy.

Landscape Principles

- Retain the open character of the creek corridor, with planting focused along the corridor boundaries and existing long distance vistas retained.
- Create a defined riparian landscape adjoining the Academic Core and development parcels to the northern bank with perimeter pedestrian paths to the creek space.
- Rehabilitate and naturalise the creek line, retain and rehabilitate existing vegetation pockets and create a more natural sinuous creek alignment at the upper reaches.
- Ensure that buildings address the open space.
- Realign perimeter pathways to promote continuity of the watercourse with small crossings and pathways encouraging visitation.
- Create a variety of landscapes and water forms, ranging from smaller quieter spaces at the higher western reaches, down to the lake expanse and toward Lane Cove River across the M2 Motorway.
- Ensure that satisfactory pollution control measures are installed at appropriate locations.
- Complete flora and fauna studies for the habitat within the creek corridor.
- Redesign stormwater catchment and outflows to redirect surface catchment from the Academic Core away from the parkland.
- Provide interesting areas of open space for passive recreation and cultural campus events.
- Provide a walking track that relates to the creek, vegetation pockets and cultural spaces.
- Provide further opportunities for and encourage art and sculpture installations within the landscape that relate to the different precincts around Mars Creek.

.

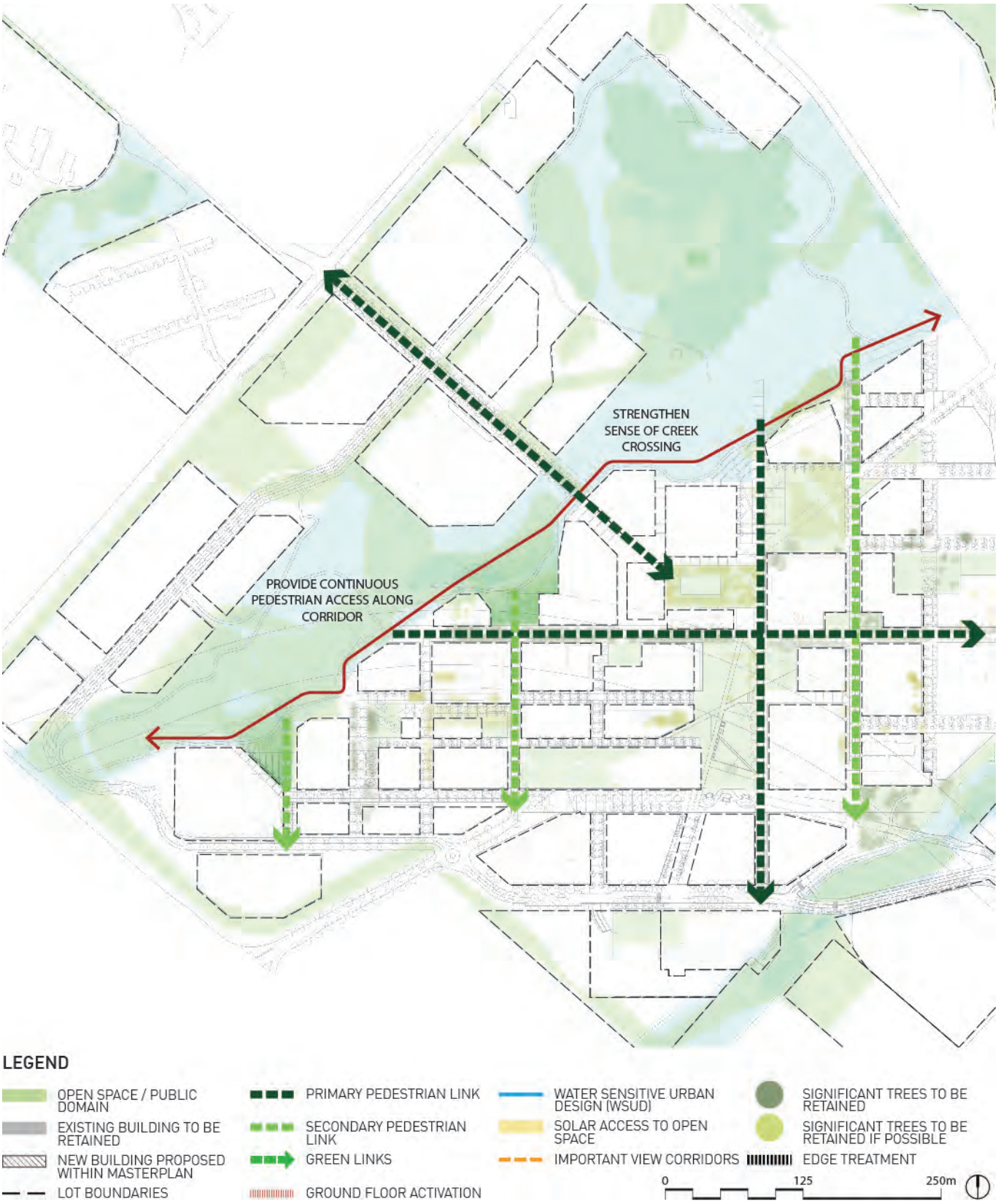
Tree Schedule

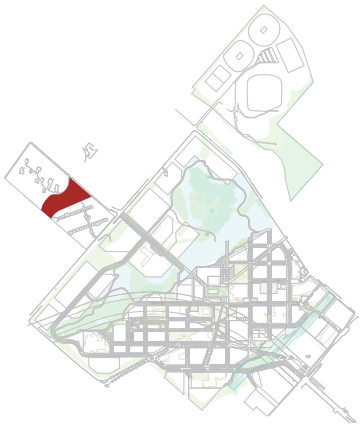
BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Angophora costata	Smooth-Barked Apple	15 x 10 m
Corymbia maculata	Spotted Gum	20 x 10 m
Eucalyptus crebra	Narrow-Leaved Ironbark	20 x 10 m
Eucalyptus eugenioides	Thin-Leaved Stringybark	20 x 10 m
Eucalyptus fibrosa	Red Ironbark	20 x 10 m
Eucalyptus globoidea	White Stringybark	20 x 10 m
Eucalyptus notabilis	Mountain Mahogany	15 x 10 m
Eucalyptus paniculata	Grey Ironbark	20 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Syncarpia glomulifera	Turpentine	25 x 12 m








STRENGTHEN SENSE OF CREEK CROSSING
PROVIDE CONTINUOUS PEDESTRIAN ACCESS ALONG CORRIDOR
LEGEND
OPEN SPACE / PUBLIC DOMAIN
EXISTING BUILDING TO BE RETAINED
NEW BUILDING PROPOSED WITHIN MASTERPLAN
LOT BOUNDARIES
PRIMARY PEDESTRIAN LINK
SECONDARY PEDESTRIAN LINK
GREEN LINKS
GROUND FLOOR ACTIVATION
WATER SENSITIVE URBAN DESIGN (WSUD)
SOLAR ACCESS TO OPEN SPACE
IMPORTANT VIEW CORRIDORS
SIGNIFICANT TREES TO BE RETAINED
SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
EDGE TREATMENT
0
125
250m



3.5.3 Culloden Creek

Culloden Creek is located in the central area of the Macquarie University Village. The creek corridor has the potential to build upon the existing Sydney Turpentine-Ironbark Forest located to the south-west of the Village, and will play an important role within the future increase in density of the Village.

Landscape Principles

- Ensure that the future development of the Macquarie University Village does not negatively impact the ecological health of the creek corridor.
- Consider the opportunity for future development to address the creek corridor with shared open space along its fringe.
- Enhance the future recreational amenity of the creek corridor to provide for the future needs of the Village.

Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Eucalyptus crebra	Narrow-Leaved Ironbark	20 x 10 m
Eucalyptus eugenioides	Thin-Leaved Stringybark	20 x 10 m
Eucalyptus fibrosa	Red Ironbark	20 x 10 m
Eucalyptus globoidea	White Stringybark	20 x 10 m
Eucalyptus paniculata	Grey Ironbark	20 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Eucalyptus resinifera	Red Mahogany	25 x 10 m
Syncarpia glomulifera	Turpentine	25 x 12 m









LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 50 100m

3.6 SPORTS FIELDS AND FACILITIES

3.6.1 Macquarie University Sports Fields

The Macquarie University Sports Fields are located on the corner of Talavera Road and Culloden Road. This sporting precinct provides approximately seven hectares of high quality specialist playing areas that can be configured to a variety of uses.

Landscape Principles

– Maintain, enhance and consider opportunities to expand the existing Hornsby Enriched Sandstone Exposed Woodland.

Tree Schedule

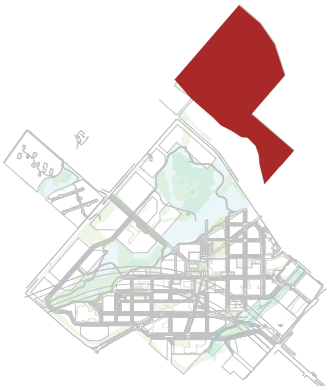
BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
*Angophora costata**	Smooth-Barked Apple	15 x 10 m
*Corymbia gummifera**	Red Bloodwood	25 x 10 m
*Eucalyptus haemastoma**	Broad-Leaved Scribbly Gum	15 x 10 m
*Eucalyptus piperita**	Sydney Peppermint	20 x 10 m
Eucalyptus racemosa	Scribbly / Snappy Gum	20 x 10 m
*Eucalyptus sclerophylla**	Hard-Leafed Scribbly Gum	20 x 10 m
*Eucalyptus squamosa**	Scaly Bark	12 x 7 m

* denotes species from the broader Sydney Sandstone Ridge-top Woodland community.











LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 125 250m

3.7 CAMPUS GATEWAYS

3.7.1 Herring Road Gateway

As the primary point of entry to the campus, the Herring Road Gateway has assumed an increased importance since the construction of the Macquarie University train station and is now the 'front door' to the University. The pedestrian environment remains challenging with high volumes of pedestrian flows and traffic converging around this intersection.

Responding to the potential of future growth in the Macquarie Park corridor, the Master Plan seeks to reinforce the entry and the quality of the arrival experience and accommodate increased flows of students from the station and bus interchange on Herring Road.

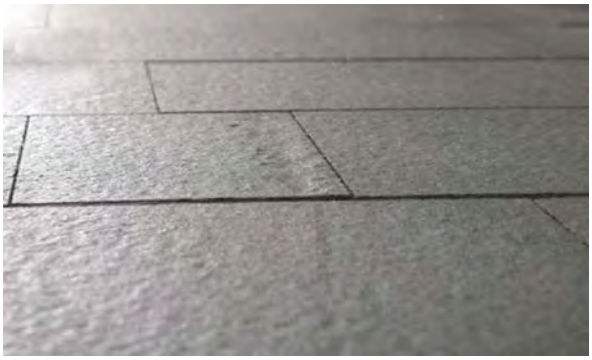
Landscape Principles

- Create a dramatic and iconic landscape entry to Macquarie University.
- Improve the pedestrian experience and flows into the campus.
- Provide a material palette consistent with the adjoining public domain of Macquarie Park.
- Maintain a clear vista into the campus from viewpoints along Waterloo Road to the south-east.

Tree Schedule

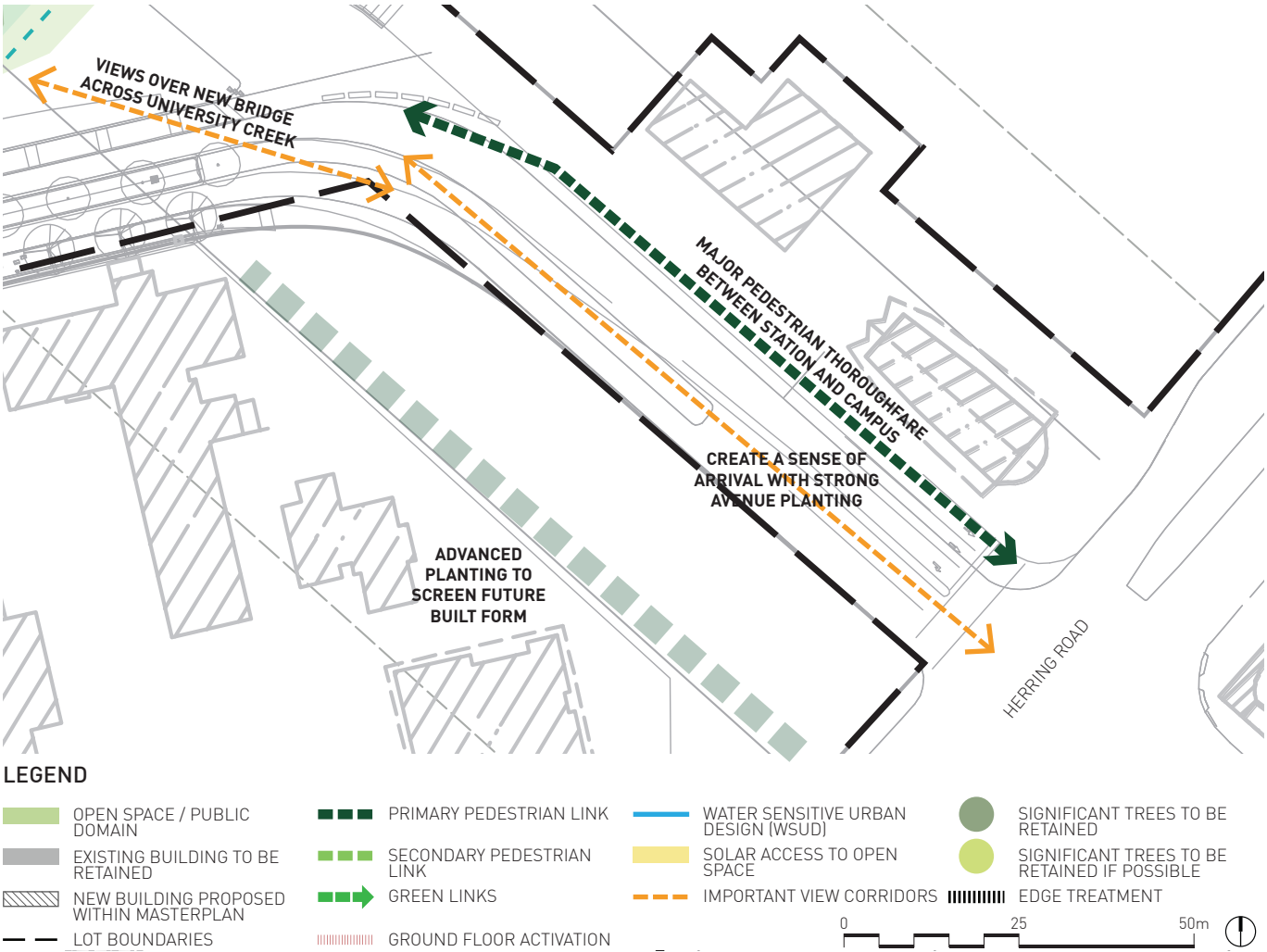
BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Agathis robusta	Queensland Kauri Pine	20 x 10 m
Malus ionensis 'Plena'	Bechtel's Crabapple	6 x 5 m
Pyrus calleryana	Chanticleer	8 x 5 m
Syzygium anisata	Ringwood	12 x 6 m
Tristaniopsis laurina	Water Gum	7 x 5 m







- Direct pedestrian flows into the new University Common.
- Manage student traffic across Herring Road to Macquarie Centre.
- Improve the awareness and relationship to University Creek.
- Develop the built form to reinforce the pedestrian entry experience.
- Entry to have a sense of arrival created by strong avenue planting of large evergreen trees.
- Formality and structure of the streetscape planting to contrast with the informality and deep green foliage of the vegetation around the water courses.
- Avenue planting to recognise and enhance the view corridor through to the campus heart
- The landscape setting is to be activated by the use of raised planting beds with informal and formal seating nodes



3.7.2 Balaclava Road Gateway

While pedestrian traffic on the original western entry at Balaclava Road entry is low, the gateway remains important for vehicular traffic including many bus routes. The entry from Epping Road is dominated by informal stands of indigenous vegetation at the intersection, which changes to formal street planting in toward the new Library. A new sculptural element may be located at the end of the entry axis.

Landscape Principles

- Provide a strong eucalyptus framed entry to the University.
- Retain and enhance the informal tall eucalypts planting at the Epping Road intersection to provide a distinctive character to the campus.
- Improve pedestrian access from Epping Road into the campus and extend past the Library into the University Common.
- Maintain appropriate setbacks to future development.
- Anticipate impacts from increased regional traffic growth and major upgrades to the Balaclava/ Epping.
- Road intersection is part of an RMS bus priority project.
- Ensure detailed design of the western car park is screened behind the existing vegetation facing Epping and Balaclava Roads.
- Entry to have an urban bushland aesthetic strengthened with a strong avenue of uniform eucalyptus plantings.

Tree Schedule

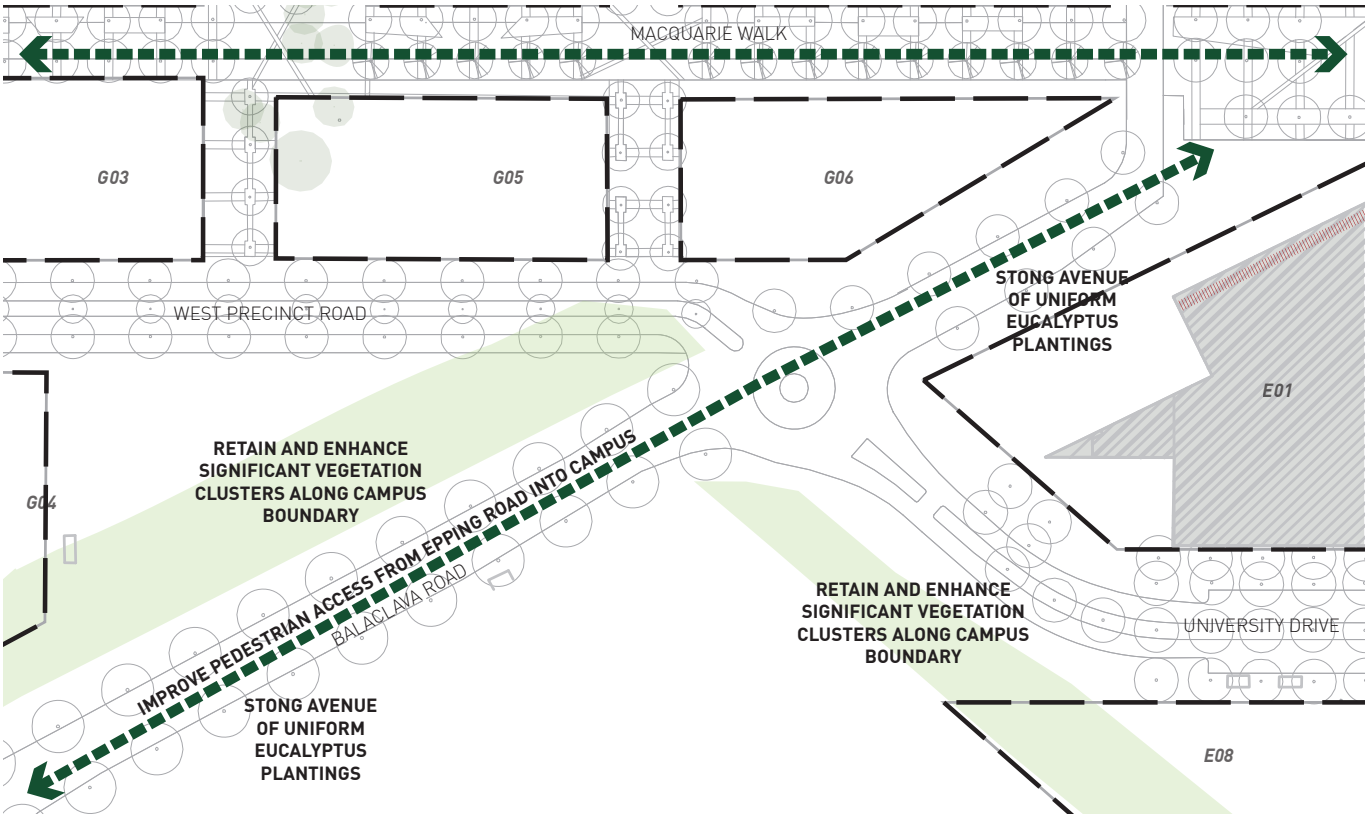
BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Corymbia maculata	Spotted Gum	20 x 10 m
Eucalyptus pilularis	Blackbutt	20 x 10 m
Eucalyptus saligna	Sydney Blue Gum	20 x 10 m







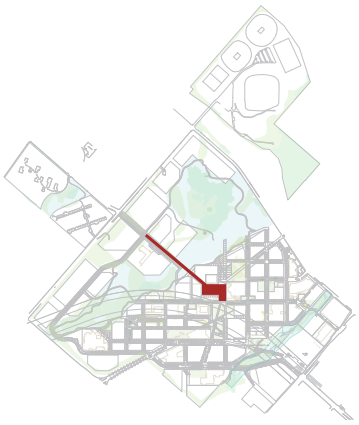




LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 25 50m



3.7.3 Gymnasium Road Gateway

Gymnasium Road off Culloden Road provides the main path of travel for students residing in on-campus accommodation in the north-west quadrant of the campus. As housing provision and academic uses increase in this precinct, the Master Plan seeks to reinforce this corridor as a major access point.

Landscape Principles

- Create a new pedestrian-friendly boulevard from Culloden Road to the Academic Core with wider pedestrian paths and formal tree planting.
- Extend the visual axis to the Central Courtyard.
- Create a transition space between Mars Creek and the Central Courtyard.
- Consider amending the north-west corner of existing Library building (C7A) to create a clear visual link between entry and Central Courtyard.
- Review the Master Plan for the Sport and Aquatic Centre to facilitate access to the facility and address on Gymnasium Road.
- Initiate works to the Hub and former Library building to present an improved arrival sequence into the Central Courtyard.
- Replace the existing open service yard for Central Courtyard facilities with access via a discrete loading entry at the lower end of Gymnasium Road.
- Entry to be punctuated by colourful plantings to juxtapose the existing bush land character.
- Planting style to complement the domestic garden setting of Culloden Road and beyond.

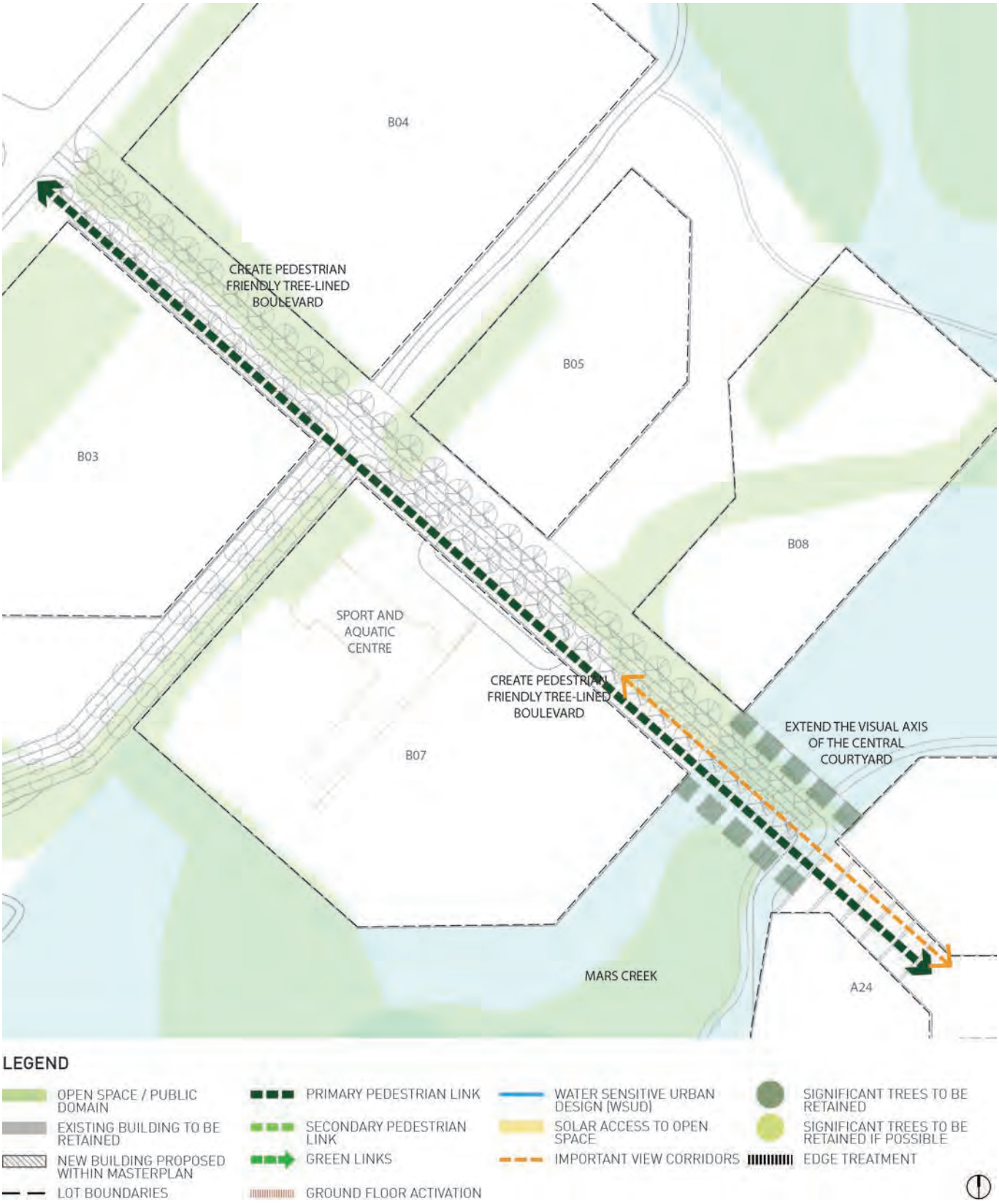
Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Brachychiton acerifolius	Illawarra Flame Tree	10 x 8 m
Jacaranda mimosifolia	Jacaranda	12 x 10 m








B04
CREATE PEDESTRIAN FRIENDLY TREE-LINED BOULEVARD
B05
B03
B08
SPORT AND AQUATIC CENTRE
CREATE PEDESTRIAN FRIENDLY TREE-LINED BOULEVARD
EXTEND THE VISUAL AXIS OF THE CENTRAL COURTYARD
B07
MARS CREEK
A24
LEGEND
OPEN SPACE / PUBLIC DOMAIN
EXISTING BUILDING TO BE RETAINED
NEW BUILDING PROPOSED WITHIN MASTERPLAN
LOT BOUNDARIES
PRIMARY PEDESTRIAN LINK
SECONDARY PEDESTRIAN LINK
GREEN LINKS
GROUND FLOOR ACTIVATION
WATER SENSITIVE URBAN DESIGN (WSUD)
SOLAR ACCESS TO OPEN SPACE
IMPORTANT VIEW CORRIDORS
SIGNIFICANT TREES TO BE RETAINED
SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
EDGE TREATMENT

3.7.4 Talavera Road Gateway

With widening and improved access to and from the M2 Motorway, traffic along Talavera Road is expected to increase. The Talavera Road Gateway will create a consolidated point of access for the Research Park precinct, the Private Hospital and the eastern parts of the Academic Core.

Landscape Principles

- Create vistas into the campus.
- Facilitate wayfinding through the north-east quadrant of the Academic Core.
- Facilitate pedestrians' access into the Central Courtyard.
- Create new address points to development parcels in the northeast.
- Separate pedestrian and vehicular movements.
- Widen the Talavera Road entry.
- Separate the new pedestrian avenue from vehicle traffic including hospital vehicles.
- Extend the landscape scheme for Research Park Drive to this entry.
- Contemporary urban plaza style landscape to provide a strong entry experience into the campus.

Tree Schedule

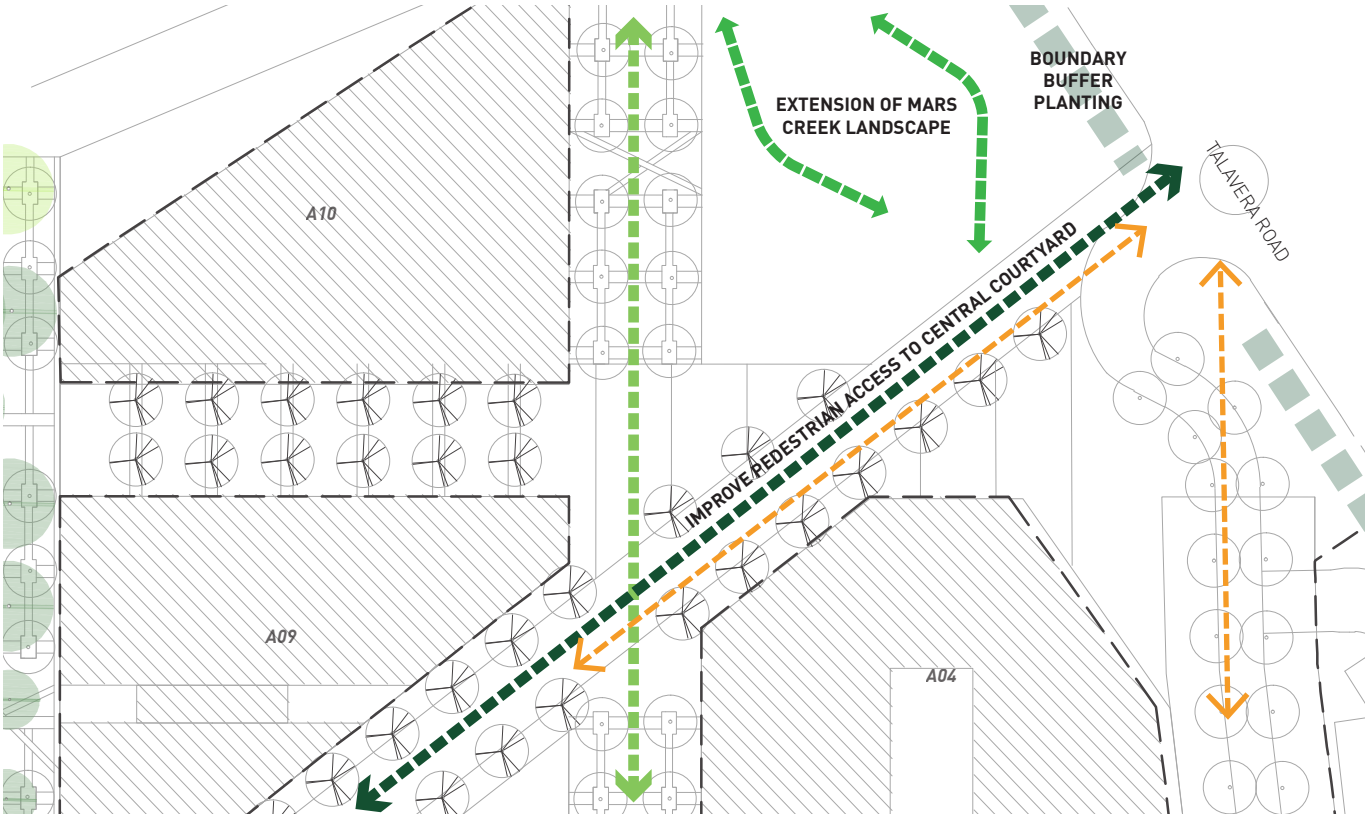
BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Trees within adjoining open space		
Angophora costata	Smooth-Barked Apple	15 x 10 m
Corymbia maculata	Spotted Gum	20 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Street trees		
Koelreuteria paniculata	Golden Rain Tree	7 x 7 m
Pyrus ussuriensis	Manchurian Pear	9 x 7 m











LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 25 50m

3.8 PRIMARY ROADS

3.8.1 University Avenue

The pedestrianisation of Macquarie Walk and the closure of Research Park Drive at the main campus entry will see a change in the role and focus of University Avenue.

University Avenue has long been a major route through Macquarie Park with buses and local traffic using the road as a route between Epping Road and the Macquarie Centre. The closure of Macquarie Walk to traffic will require the relocation of east bound buses and should assist in reducing the volume of local through traffic.

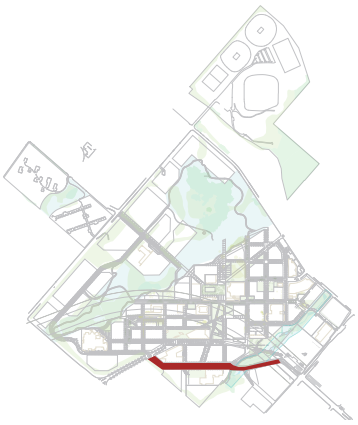
The most significant change will be the increase in development density along this corridor.

Previous plans identified the need to upgrade University Avenue. The new plan formalises the road treatment, develops new paving and planting, and introduces water sensitive urban design (WSUD) elements in the median. University Avenue is relocated to the east side of University Creek before sweeping around to Herring Road.

Tree Schedule

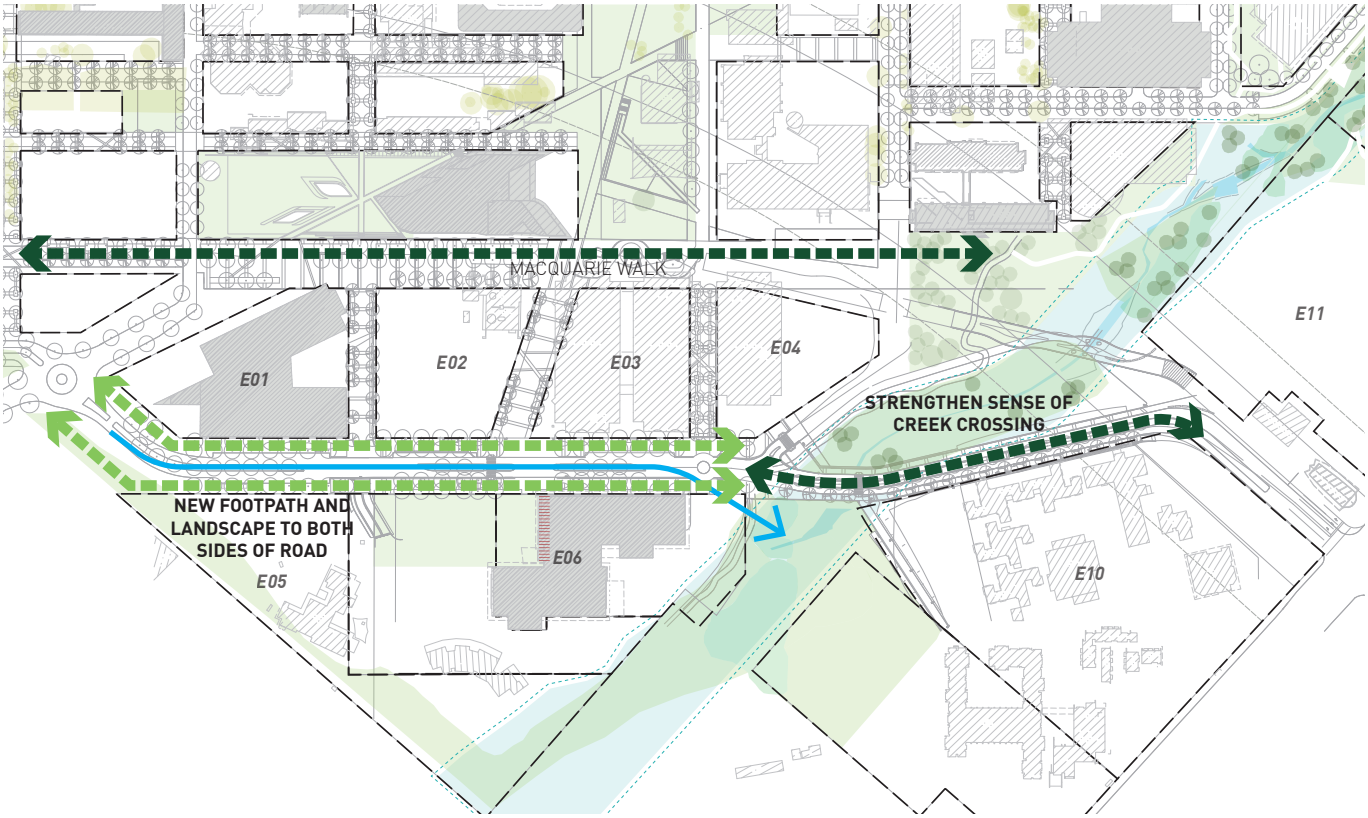
BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
University Creek riparian planting *Characteristics - Evergreen riparian planting to the median, complimentary to creek vegetation, no planting along creek frontage*		
Angophora costata	Smooth-Barked Apple	15 x 10 m
Allocasuarina littoralis	Black She-Oak	8 x 4 m
Ceratopetalum apetalum	Coachwood	12 x 8 m
Syncarpia glomulifera	Turpentine	25 x 12 m
Synoum glandulosum	Scentless Rosewood	8 x 4 m
Tristaniopsis laurina	Water Gum	10 x 8 m
Non-riparian planting *Characteristics - Strong double avenue of deciduous street tree planting*		
Agathis robusta	Queensland Kauri Pine	20 x 10 m
Flindersia australis	Crows Ash	15 x 7 m
Malus ionensis 'Plena'	Bechtel's Crabapple	6 x 5 m
Pyrus calleryana	Chanticleer	8 x 5 m
Tristaniopsis laurina	Water Gum	10 x 8 m





Principles

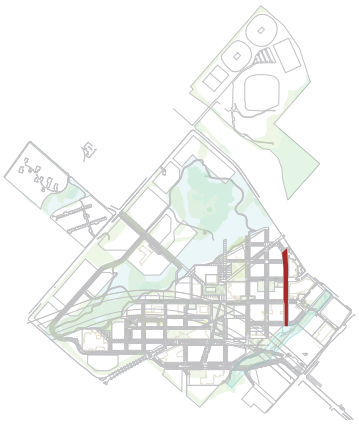
- University Avenue is relocated to the east side of University Creek.
- Widened road reserve.
- New footpaths and landscaping to both sides.
- Median planting and water treatment.
- New right turn lanes to access development sites.
- Upgraded lighting and signage elements.
- Three zones of distinct planting with common elements:
  1. Entry zone – Strong avenue of deciduous and evergreen tree planting.
  2. Creek zone – Evergreen riparian planting to the median and southern edge.
  3. Commercial zone – to extend the contemporary planting themes at Hearing Hub, street tree planting to continue as a strong avenue.



LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 25 50m



3.8.2 Research Park Drive

Research Park Drive marks the eastern edge of the Academic Core and the edge of major ancillary uses on the campus – Research Park, Macquarie University Hospital and the development of the new commercial buildings adjacent to the train station.

The closure of the road at its southern end will result in reduced traffic and will allow public domain upgrades.

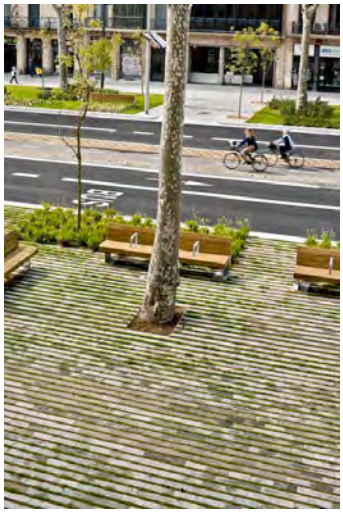
Principles

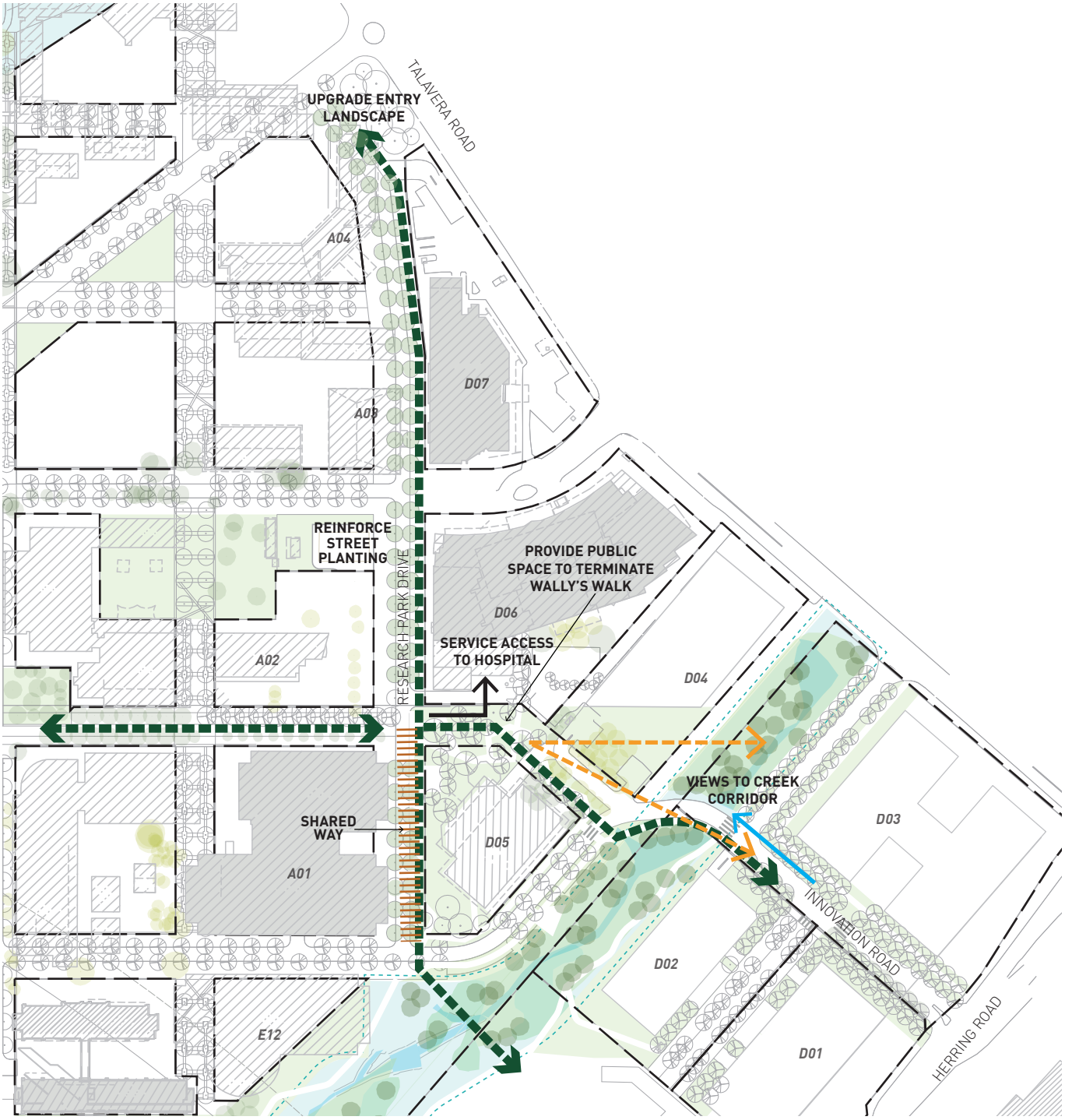
- Closure of the road at University Creek to improve amenity and safety for pedestrians walking to and from the train station.
- New footpaths and landscaping to both sides.
- Extensive planting.
- Redevelopment of carpark sites as new academic buildings with potential for parking below.
- Create a strong green corridor to frame the campus core and provide a visual boundary.
- Provision of a shared way environment in the southern section between A01 and D05.
- Street tree planting to be evergreen medium sized trees to visually link the Research Park Drive with the University Creek landscape.
- Where possible building setbacks to include buffer planting to strengthen green corridor concept.
- Upgrade landscape adjacent to the Talavera Road entry.

Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Characteristics - Dark green foliage, dense crown, complimentary to creek vegetation		
Flindersia australis	Crows Ash	10 x 8 m
Syncarpia glomulifera	Turpentine	25 x 12 m
Acmena smithii	Lilly Pilly	10 x 6 m
Toona ciliata	Red Cedar	20 x 10 m
Waterhousia floribunda 'Green Avenue'	Green Avenue Lilly Pilly	15 x 9 m



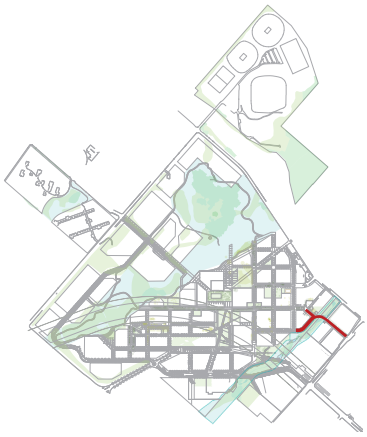




LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 25 50m



3.8.3 Innovation Road

As new development is delivered in Precinct D and the population increases, there will be increased demands on the public domain.

Four key initiatives have been identified:

- The realignment of Innovation Road along the creek edge south of Lot D05.
- The widening of the footpath zone at Lot D03 to improve pedestrian amenity and connections from the Hospital to Herring Road.
- Upgrade of Wally's Walk adjacent to the Hospital to better terminate this important axis with an outlook to the University Creek corridor and to improve accessible links down to Innovation Road.
- Provision of a secondary road between D01 and D02.

Principles

- Improve pedestrian access along Innovation Road and connection to Wally's Walk.
- Explore opportunities for the realigned road to contribute to the biodiversity in the University Creek corridor, for instance by using endemic creek species as street trees in proximity to the creek.
- Provide tall evergreen tree planting to reduce the visual impact of the building and strengthen the connection to University Creek.
- Upgrade creek pathway to the south of Innovation Road to create a continuous path.





Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Angophora costata	Smooth-Barked Apple	15 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Syncarpia glomulifera	Turpentine	25 x 12 m
Corymbia maculata	Spotted Gum	25 x 12 m
Waterhousia floribunda	Weeping Lilly Pilly	18 x 12 m

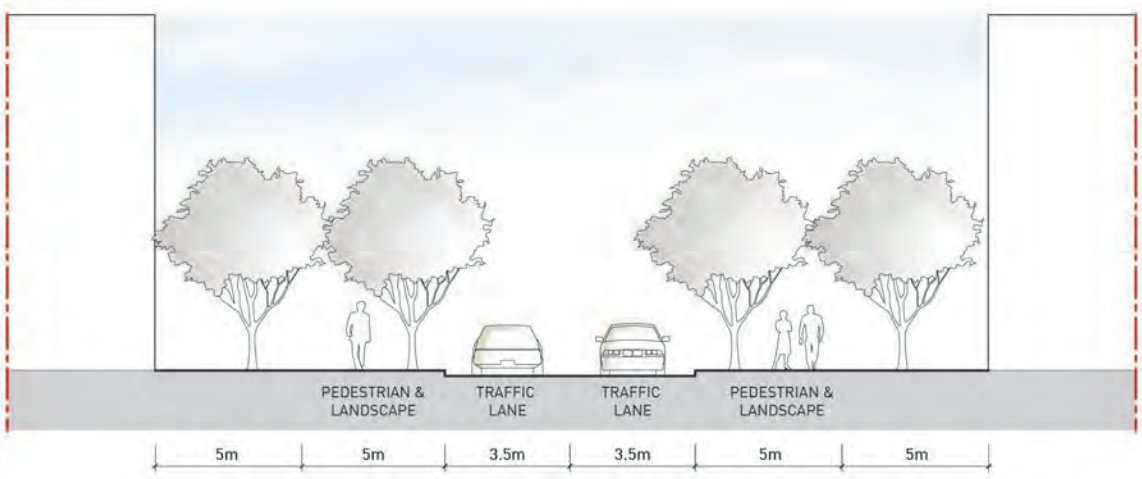
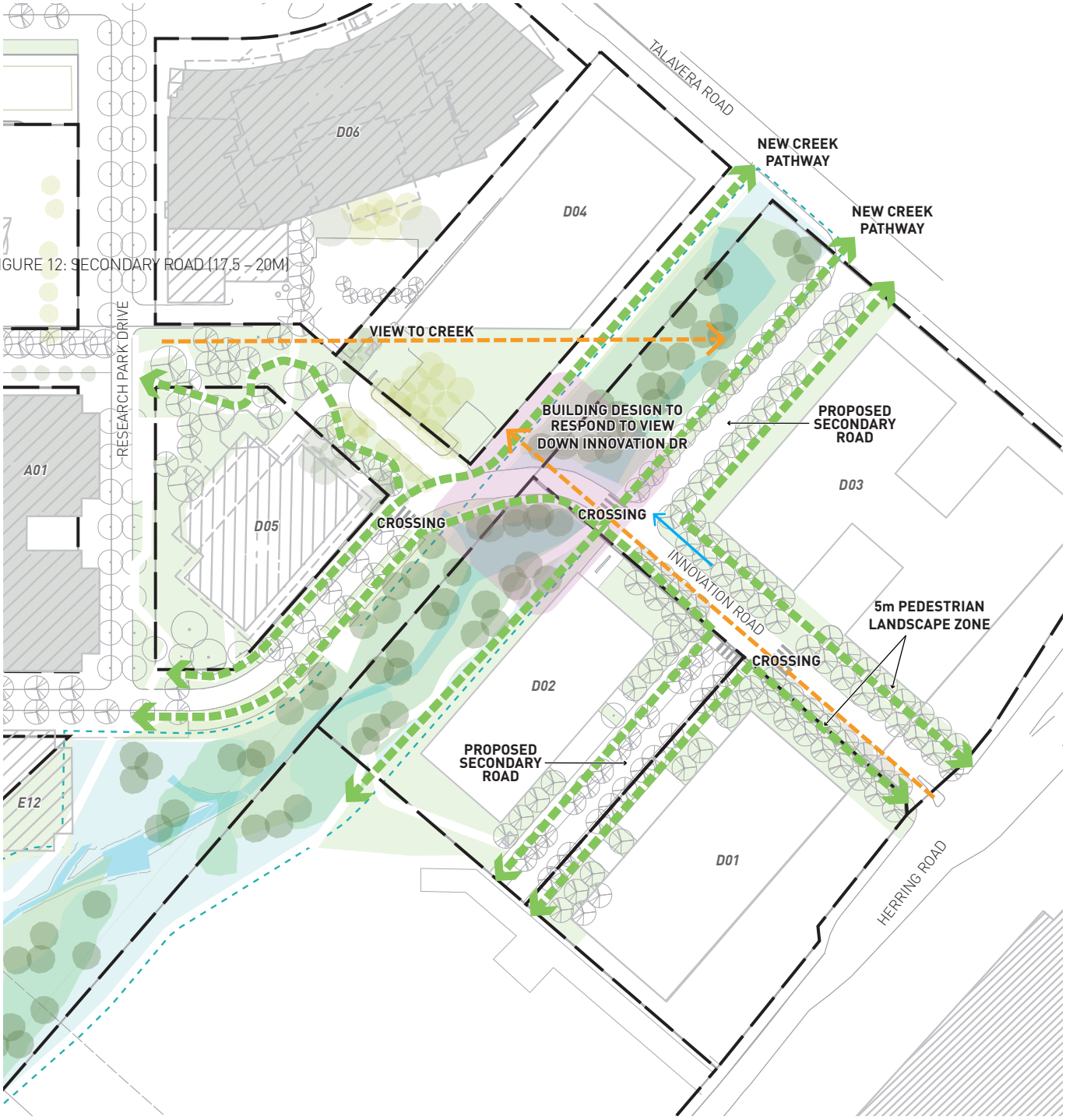


FIGURE 26: SECTION THROUGH INNOVATION ROAD

FIGURE 12: SECONDARY ROAD (17.5 – 20M)





3.8.4 West Precinct Road

A new road is to be constructed in the zone west of Mars Creek. Much of the car park traffic will be on Culloden Road allowing the new road to deal with campus traffic and providing access to new development in the west of the site. The street will be a simple two-lane street (one lane each way) with parking recessed into a landscape zone.

Principles

– Ensure the footprint of the road is kept to a minimum, particularly where it passes through the Mars Creek corridor.

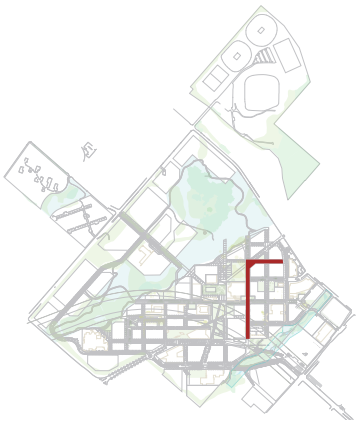
Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Characteristics - small, evergreen		
Backhousia myrtifolia	Grey Myrtle	6 x 4 m
Cupaniopsis anacardiodes	Tuckeroo	8 x 6 m
Tristaniopsis laurina 'Luscious'	Water Gum	10 x 8 m
Waterhousia floribunda 'Green Avenue'	Green Avenue Lilly Pilly	15 x 9 m






B03
B07
F04
F03
F02
F01
WEST PRECINCT ROAD
WESTERN ROAD
G01
G03
G05
G06
G04
LEGEND
OPEN SPACE / PUBLIC DOMAIN
EXISTING BUILDING TO BE RETAINED
NEW BUILDING PROPOSED WITHIN MASTERPLAN
LOT BOUNDARIES
PRIMARY PEDESTRIAN LINK
SECONDARY PEDESTRIAN LINK
GREEN LINKS
GROUND FLOOR ACTIVATION
WATER SENSITIVE URBAN DESIGN (WSUD)
SOLAR ACCESS TO OPEN SPACE
IMPORTANT VIEW CORRIDORS
SIGNIFICANT TREES TO BE RETAINED
SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
EDGE TREATMENT
0
25
50m



3.9 SECONDARY ROADS

3.9.1 Eastern Road

Eastern Road currently serves as a secondary service road that is also heavily used by pedestrian traffic. Future works should improve the quality of this street using unit paving to designate it as a shared access route, levelling undulating levels at the southern end, removing open parking areas and screening service yards.

Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Characteristics – strengthen biodiversity connection between University Creek and Mars Creek		
Angophora costata	Smooth-Barked Apple	15 x 10 m
Eucalyptus paniculata	Grey Ironbark	20 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Syncarpia glomulifera	Turpentine	25 x 12 m

3.9.2 Science Road

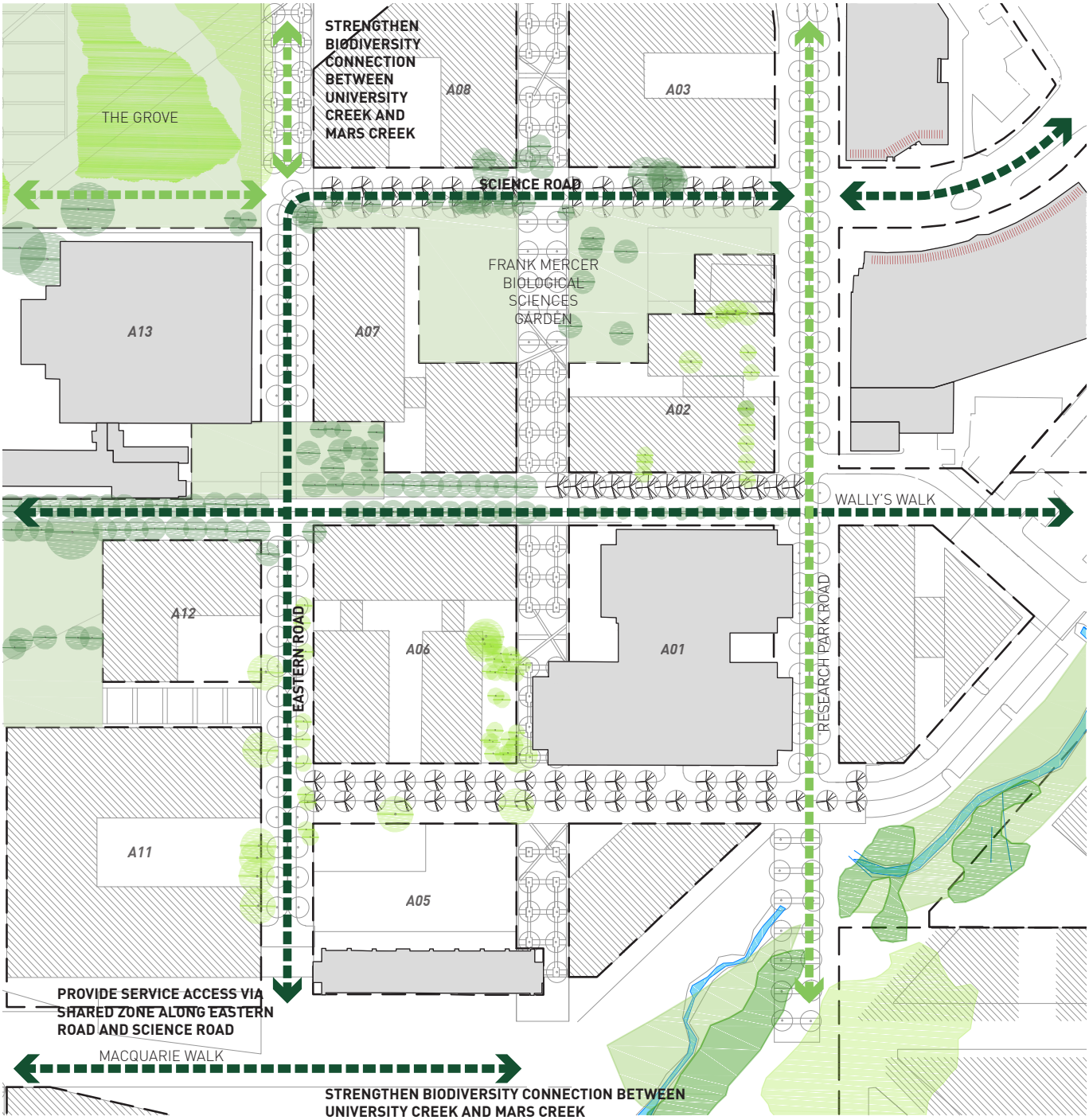
Science Road currently serves as a secondary service road, also used heavily by pedestrian traffic. Future works should improve the quality of this street by developing it as a paved shared access route, removing open parking areas and screening of service yards.

Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Characteristics – small, evergreen		
Backhousia myrtifolia	Grey Myrtle	6 x 4 m
Cupaniopsis anacardiodes	Tuckeroo	8 x 6 m
Tristaniopsis laurina 'Luscious'	Water Gum	10 x 8 m
Waterhousia floribunda 'Green Avenue'	Green Avenue Lilly Pilly	15 x 9 m



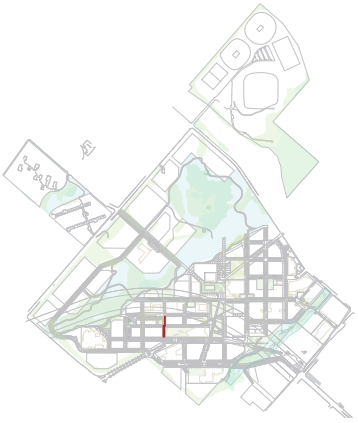




LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 25 50m



3.9.3 Western Road

Western Road will be widened, straightened and paved areas upgraded. It should be a shared way with access for service vehicles only, with open parking areas removed and service yards screened.

Western Road also provides an opportunity to form a biodiversity corridor together with the buffer vegetation along the south-western boundary of the campus to create a north-south ecological connection between University Creek and Mars Creek. The planting palette of Western Road should therefore reflect the ecological communities of the creek corridors.

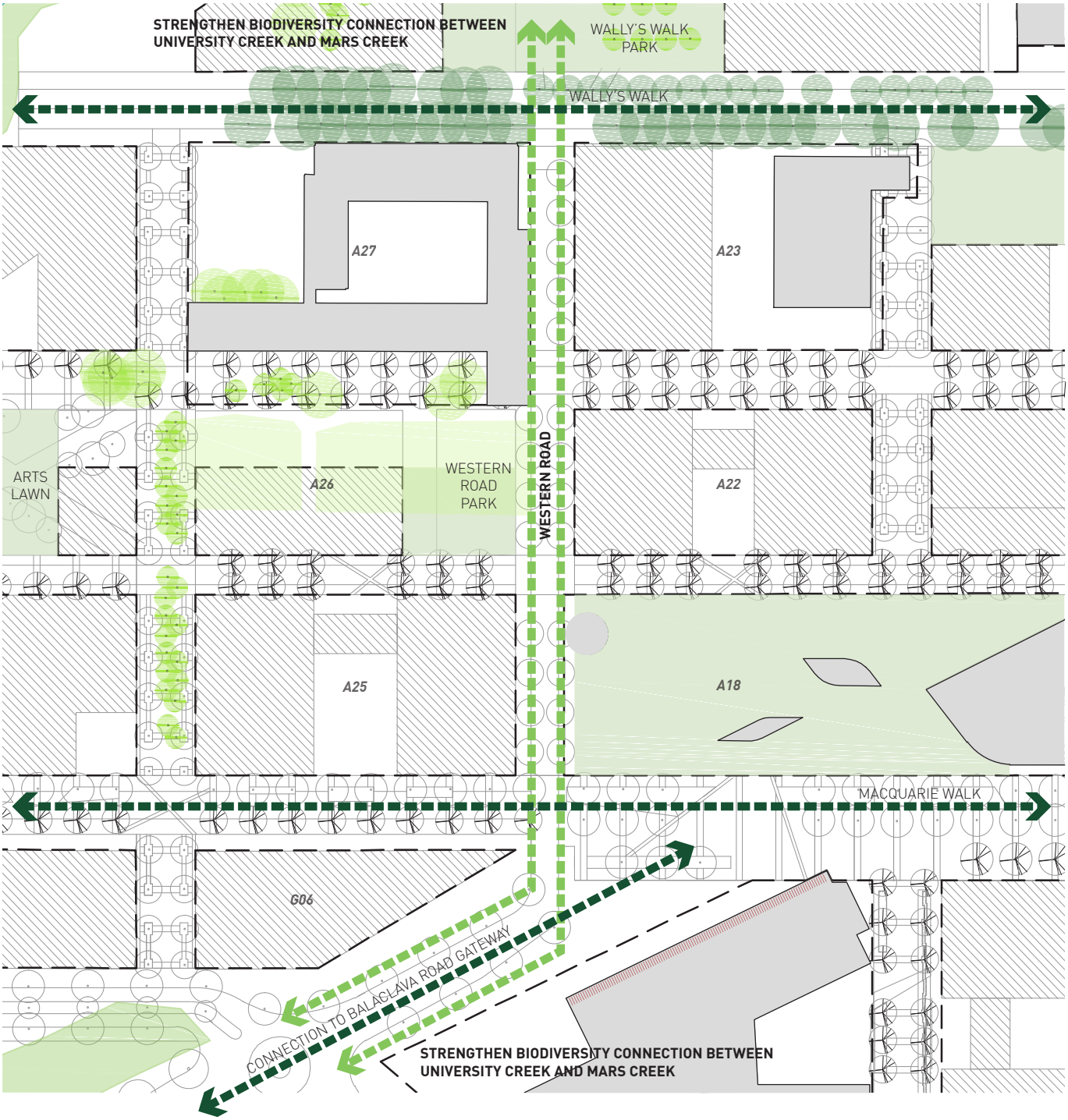
Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Characteristics – strengthen biodiversity connection between University Creek and Mars Creek		
Angophora costata	Smooth-Barked Apple	15 x 10 m
Eucalyptus paniculata	Grey Ironbark	20 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Syncarpia glomulifera	Turpentine	25 x 12 m









LEGEND

- OPEN SPACE / PUBLIC DOMAIN
- EXISTING BUILDING TO BE RETAINED
- NEW BUILDING PROPOSED WITHIN MASTERPLAN
- LOT BOUNDARIES
- PRIMARY PEDESTRIAN LINK
- SECONDARY PEDESTRIAN LINK
- GREEN LINKS
- GROUND FLOOR ACTIVATION
- WATER SENSITIVE URBAN DESIGN (WSUD)
- SOLAR ACCESS TO OPEN SPACE
- IMPORTANT VIEW CORRIDORS
- SIGNIFICANT TREES TO BE RETAINED
- SIGNIFICANT TREES TO BE RETAINED IF POSSIBLE
- EDGE TREATMENT

0 25 50m



3.10 SHARED WAYS

A Shared Way is a road where the road space is shared safely by vehicles and pedestrians. The maximum speed limit is always 10 km/h. and vehicles must give way to pedestrians. The minimum trafficable width is 2.8 metres. The minimum total width of the corridor is 15 metres (refer Section 2.2.2 Figure 13). There are no road lines and no kerb or gutter in a Shared Zone to show that pedestrians and vehicles are equal. Drivers must give way to pedestrians at all times.

The pavement surface shall be changed to highlight the difference in the street environment from the surrounding road network. It must be clearly distinguishable by colour, texture and materials.

At the entrance and exit points there is usually a raised threshold to bring the road surface and pedestrian surface levels together, and prominent features such as signs, architectural or landscape features must be provided to indicate a change in the street environment and highlight the start / end of the scheme.

Traffic calming or a suitable treatment must also be provided to reduce speeds within the zone. Other features such as architectural and landscaping may also be provided to enhance the scheme.

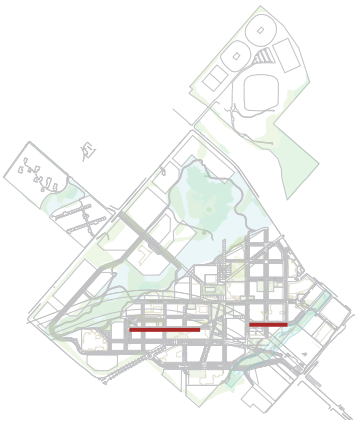
Provide deciduous trees for summer shade and winter sun. The size and species of all proposed trees should be selected to respect the scale of the surrounding buildings and the width of the shared way.

Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Pistacia chinensis	Chinese pistachio	8 x 6 m
Acer freemanii 'Jeffersred'	Autumn Blaze	13 x 10 m
Lagerstroemia 'Natchez'	Crepe Myrtle "White"	6 x 4 m
Malus ioensis	Bechtel's Crab Apple	5 x 3.5 m







3.11 SECONDARY PEDESTRIAN CONNECTIONS

3.11.1 Secondary East-West Pedestrian Connections

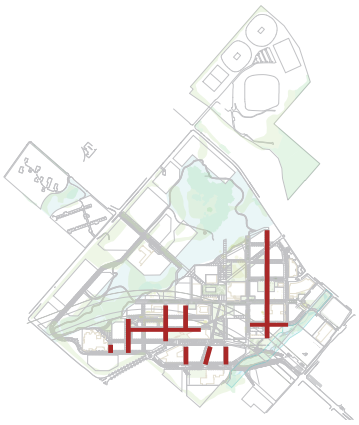
The existing network of minor links will be formalised and upgraded across the campus. These pedestrian spaces will have a simple central path with a zone for landscape buffers and open spaces on either side.

Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Characteristics - small, deciduous		
Pistacia chinensis	Chinese pistachio	8 x 6 m
Pyrus ussuriensis	Manchurian Pear	9 x 7 m
Ulmus parvifolia	Chinese Elm	10 x 11 m





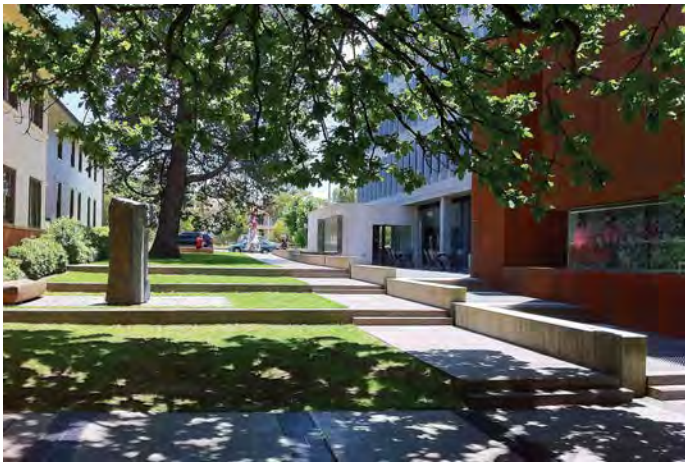


3.11.2 Secondary North-South Pedestrian Connections

Like the east-west links, the existing network of north-south pedestrian links will be formalised and upgraded across the campus. The links are planned to have a central path with areas for landscape and open spaces on either side.

Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Characteristics - small, evergreen		
Backhousia myrtifolia	Grey Myrtle	6 x 4 m
Cupaniopsis anacardiodes	Tuckeroo	8 x 6 m
Flindersia australis	Crows Ash	*10 x 8 m*
Tristaniopsis laurina 'Luscious'	Water Gum	*10 x 8 m*
Waterhousia floribunda 'Green Avenue'	Green Avenue Lilly Pilly	*15 x 9 m*





3.12 PLANTING SCHEDULES

The campus will be defined by open space planting and tree lined avenues that soften and scale the built areas of the public domain.

The proposed road reserves have been designed to prioritise pedestrians, then cyclists, public transport and lastly private vehicles. The landscape design of each streetscape has given way to this hierarchy

Primary Public Domain Spines Planting Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Wally's Walk		
Platanus x acerifolia	London Plane	14 x 10 m
Macquarie Walk		
Angophora costata	Smooth-Barked Apple	15 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Nyssa sylvatica	Black Gum	11 x 6 m
Pyrus ussuriensis	Manchurian Pear	9 x 7 m
Ulmus parvifolia	Chinese Elm	10 x 11 m
Sir Christopher Ondaatje Avenue		
Flindersia australis	Crows Ash	10 x 8 m
Syzygium smithii	Narrow-Leaved Lilly Pilly	10 x 6 m
Toona ciliata	Red Cedar	20 x 10 m
Waterhousia floribunda 'Green Avenue'	Green Avenue Lilly Pilly	15 x 9 m

Primary Parks and Plazas Planting Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
The University Common		
Angophora costata	Smooth-Barked Apple	15 x 10 m
Corymbia citriodora	Lemon Scented Gum	20 x 10 m
Pyrus ussuriensis	Manchurian Pear	9 x 7 m
Sapium sebiferum	Chinese Tallow	8 x 8 m
The Central Courtyard		
Corymbia citriodora	Lemon Scented Gum	20 x 10 m
The Grove (East Common)		
Angophora costata	Smooth-Barked Apple	15 x 10 m
Eucalyptus crebra	Narrow-Leaved Ironbark	20 x 10 m
Eucalyptus fibrosa	Red Ironbark	20 x 10 m
Eucalyptus notabilis	Mountain Mahogany	20 x 10 m
Eucalyptus paniculata	Grey Ironbark	20 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Syncarpia glomulifera	Turpentine	25 x 12 m
Arts Lawn (West Common)		
Brachychiton acerifolius	Illawarra Flame Tree	10 x 8 m
Jacaranda mimosifolia	Jacaranda	12 x 10 m
Pyrus ussuriensis	Manchurian Pear	9 x 7 m
Waterhousia floribunda 'Green Avenue'	Green Avenue Lilly Pilly	15 x 9 m

Secondary Parks and Plazas Planting Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Frank Mercer Biological Sciences Garden		
Angophora costata	Smooth-Barked Apple	15 x 10 m
Eucalyptus crebra	Narrow-Leaved Ironbark	20 x 10 m
Eucalyptus fibrosa	Red Ironbark	20 x 10 m
Eucalyptus notabilis	Mountain Mahogany	20 x 10 m
Eucalyptus paniculata	Grey Ironbark	20 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Syncarpia glomulifera	Turpentine	25 x 12 m
Jim Rose Earth Sciences Garden		
Araucaria cunninghamii	Hoop Pine	25 x 10 m
Araucaria heterophylla	Norfolk Island Pine	25 x 10 m
Buckinghamia celsissima	Ivory Curl Tree	8 x 6 m
Protea caffra	Common Sugar Bush	5 x 5 m
Mars Creek Plaza, Wally's Walk Park		
Angophora costata	Smooth-Barked Apple	15 x 10 m
Corymbia maculata	Spotted Gum	20 x 10 m
Pyrus ussuriensis	Manchurian Pear	9 x 7 m
Ulmus parvifolia	Chinese Elm	10 x 11 m
Western Road Park		
Angophora costata	Smooth-Barked Apple	15 x 10 m
Eucalyptus paniculata	Grey Ironbark	20 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Syncarpia glomulifera	Turpentine	25 x 12 m
Macquarie Theatre Courtyard, Faculty of Science Garden, Cochlear Forecourt		
Brachychiton acerifolius	Illawarra Flame Tree	10 x 8 m
Jacaranda mimosifolia	Jacaranda	12 x 10 m
Pyrus ussuriensis	Manchurian Pear	9 x 7 m
Waterhousia floribunda 'Green Avenue'	Green Avenue Lilly Pilly	15 x 9 m
Library Lawn		
Eucalyptus haemastoma	Scribbly Gum	15 x 10 m
Eucalyptus microcorys	Tallowwood	20 x 10 m
Eucalyptus saligna	Sydney Blue Gum	20 x 10 m

Creek Corridors and Parklands Planting Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
University Creek		
Angophora costata	Smooth-Barked Apple	15 x 10 m
Allocasuarina littoralis	Black She-Oak	8 x 4 m
Allocasuarina torulosa	Forest Oak	8 x 4 m
Ceratopetalum apetalum	Coachwood	12 x 8 m
Eucalyptus globoidea	White Stringybark	20 x 10 m
Eucalyptus paniculata	Grey Ironbark	20 x 10 m
Eucalyptus saligna	Sydney Blue Gum	20 x 10 m
Syncarpia glomulifera	Turpentine	25 x 12 m
Synoum glandulosum	Scentless Rosewood	8 x 4 m
Tristaniopsis laurina	Water Gum	7 x 5 m
Mars Creek		
Angophora costata	Smooth-Barked Apple	15 x 10 m
Corymbia maculata	Spotted Gum	20 x 10 m
Eucalyptus crebra	Narrow-Leaved Ironbark	20 x 10 m
Eucalyptus eugenioides	Thin-Leaved Stringybark	20 x 10 m
Eucalyptus fibrosa	Red Ironbark	20 x 10 m
Eucalyptus globoidea	White Stringybark	20 x 10 m
Eucalyptus notabilis	Mountain Mahogany	15 x 10 m
Eucalyptus paniculata	Grey Ironbark	20 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Syncarpia glomulifera	Turpentine	25 x 12 m
Culloden Creek		
Eucalyptus crebra	Narrow-Leaved Ironbark	20 x 10 m
Eucalyptus eugenioides	Thin-Leaved Stringybark	20 x 10 m
Eucalyptus fibrosa	Red Ironbark	20 x 10 m
Eucalyptus globoidea	White Stringybark	20 x 10 m
Eucalyptus paniculata	Grey Ironbark	20 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Eucalyptus resinifera	Red Mahogany	25 x 10 m
Syncarpia glomulifera	Turpentine	25 x 12 m

Sports Fields Planting Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Macquarie University Sports Fields		
*Angophora costata**	Smooth-Barked Apple	15 x 10 m
*Corymbia gummifera**	Red Bloodwood	25 x 10 m
*Eucalyptus haemastoma**	Broad-Leaved Scribbly Gum	15 x 10 m
*Eucalyptus piperita**	Sydney Peppermint	20 x 10 m
Eucalyptus racemosa	Scribbly / Snappy Gum	20 x 10 m
*Eucalyptus sclerophylla**	Hard-Leafed Scribbly Gum	20 x 10 m
*Eucalyptus squamosa**	Scaly Bark	12 x 7 m

* denotes species from the broader Sydney Sandstone Ridge-top Woodland community.

Campus Gateways Planting Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Herring Road Gateway		
Agathis robusta	Queensland Kauri Pine	20 x 10 m
Malus ionensis 'Plena'	Bechtel's Crabapple	6 x 5 m
Pyrus calleryana	Chanticleer	8 x 5 m
Syzygium anisata	Ringwood	12 x 6 m
Tristaniopsis laurina	Water Gum	7 x 5 m
Balaclava Road Gateway		
Corymbia maculata	Spotted Gum	20 x 10 m
Eucalyptus pilularis	Blackbutt	20 x 10 m
Eucalyptus saligna	Sydney Blue Gum	20 x 10 m
Gymnasium Road Gateway		
Brachychiton acerifolius	Illawarra Flame Tree	10 x 8 m
Jacaranda mimosifolia	Jacaranda	12 x 10 m
Talavera Road Gateway – adjoining open space		
Angophora costata	Smooth-Barked Apple	15 x 10 m
Corymbia maculata	Spotted Gum	20 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Talavera Road Gateway – street trees		
Koelreuteria paniculata	Golden Rain Tree	7 x 7 m
Pyrus ussuriensis	Manchurian Pear	9 x 7 m

Shared Services Roads Planting Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Eastern Road *Characteristics – Strengthen biodiversity connection between University Creek and Mars Creek*		
Angophora costata	Smooth-Barked Apple	15 x 10 m
Eucalyptus paniculata	Grey Ironbark	20 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Syncarpia glomulifera	Turpentine	25 x 12 m
Science Road *Characteristics – Small, evergreen*		
Backhousia myrtifolia	Grey Myrtle	6 x 4 m
Cupaniopsis anacardiodes	Tuckeroo	8 x 6 m
Tristaniopsis laurina 'Luscious'	Water Gum	10 x 8 m
Waterhousia floribunda 'Green Avenue'	Green Avenue Lilly Pilly	15 x 9 m
Western Road *Characteristics – Strengthen biodiversity connection between University Creek and Mars Creek*		
Angophora costata	Smooth-Barked Apple	15 x 10 m
Eucalyptus paniculata	Grey Ironbark	20 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Syncarpia glomulifera	Turpentine	25 x 12 m

Primary Internal Roads Planting Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
University Avenue (University Creek riparian planting) *Characteristics - Evergreen riparian planting to the median, complimentary to creek vegetation, no planting along creek frontage*		
Angophora costata	Smooth-Barked Apple	15 x 10 m
Allocasuarina littoralis	Black She-Oak	8 x 4 m
Ceratopetalum apetalum	Coachwood	12 x 8 m
Syncarpia glomulifera	Turpentine	25 x 12 m
Synoum glandulosum	Scentless Rosewood	8 x 4 m
Tristaniopsis laurina	Water Gum	10 x 8 m
University Avenue (non-riparian planting) *Characteristics - Strong double avenue of deciduous street tree planting*		
Agathis robusta	Queensland Kauri Pine	20 x 10 m
Flindersia australis	Crows Ash	15 x 7 m
Malus ionensis 'Plena'	Bechtel's Crabapple	6 x 5 m
Pyrus calleryana	Chanticleer	8 x 5 m
Tristaniopsis laurina	Water Gum	10 x 8 m

Primary Internal Roads Planting Schedule (continued)

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Research Park Drive *Characteristics - Dark green foliage, dense crown, complimentary to creek vegetation*		
Flindersia australis	Crows Ash	10 x 8 m
Syncarpia glomulifera	Turpentine	25 x 12 m
Toona ciliata	Red Cedar	10 x 6 m
Acmena smithii	Lilly Pilly	18 x 12 m
Waterhousia floribunda 'Green Avenue'	Green Avenue Lilly Pilly	15 x 9 m
Innovation Road *Characteristics – Dark green foliage, dense crown, complimentary to creek vegetation*		
Angophora costata	Smooth-Barked Apple	15 x 10 m
Eucalyptus punctata	Grey Gum	15 x 8 m
Syncarpia glomulifera	Turpentine	25 x 12 m
Corymbia maculata	Spotted Gum	25 x 12 m
Waterhousia floribunda	Weeping Lilly Pilly	18 x 12 m
Western Precinct Road *Characteristics – Small, evergreen*		
Backhousia myrtifolia	Grey Myrtle	6 x 4 m
Cupaniopsis anacardiodes	Tuckeroo	8 x 6 m
Tristaniopsis laurina 'Luscious'	Water Gum	10 x 8 m
Waterhousia floribunda 'Green Avenue'	Green Avenue Lilly Pilly	15 x 9 m

Secondary East-West Links Planting Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Secondary East-West Streets *Characteristics – Small, deciduous*		
Pistacia chinensis	Chinese pistachio	8 x 6 m
Pyrus ussuriensis	Manchurian Pear	9 x 7 m
Ulmus parvifolia	Chinese Elm	10 x 11 m

Secondary North-South Links Planting Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H x W)
Secondary North-South Streets *Characteristics – Small, evergreen*		
Backhousia myrtifolia	Grey Myrtle	6 x 4 m
Cupaniopsis anacardiodes	Tuckeroo	8 x 6 m
Flindersia australis	Crows Ash	10 x 8 m
Tristaniopsis laurina 'Luscious'	Water Gum	10 x 8 m
Waterhousia floribunda 'Green Avenue'	Green Avenue Lilly Pilly	15 x 9 m

3.13 WATER MANAGEMENT

Water management strategies across the campus have been developed to improve both the flow of water on the site and its quality.

A number of principles and objectives have been identified:

- The identification and control of flood and public safety issues.
- Limitation of frequent creek flows and creek flow velocities to avoid creek bed/bank erosion and sedimentation.
- Enhanced ecological health and biodiversity within the riparian corridors.
- Integration of bio-retention systems with the overall landscape strategy for the campus.
- Enhancement of visual amenity.
- Intergenerational equity attained through the provision of a healthy, functioning riparian corridor.
- Provision of site based, street level and corridor edge bio-retention systems.
- Extensive vegetation of lots and streetscapes.
- Provision of extensive deep rooted vegetation in strategic areas.

Flood Management

Extensive studies have been undertaken on the performance and management of University Creek. The plan formulated by TTW seeks to manage flows within the creek corridor and develop solutions that are environmentally and hydrologically sustainable.

Modifications in the creek zone have been designed to manage flood conditions, at Talavera Road in particular, while ensuring that low flow figures for 5-year storm events are not increased.

Two other stakeholders have been consulted in the process – the New South Wales Office of Water and the City of Ryde.

The New South Wales Office of Water has confirmed that their objectives are to achieve the following:

- Soft engineering solutions.
- Bank stabilisation with emphasis on fully structured planting solutions.
- Protection of endangered communities.
- Extent of in-stream storage to remain neutral.
- Existing inlets to be addressed to limit erosion.
- Proposed relocation of stream course not an issue.

Ryde Council's particular areas of interest are reducing flooding over Council assets and water quality and biodiversity.

Key outcomes of the strategy are:

- Raising in-stream storage capacity generally and reducing flows rates at crossings.
- Raising the level of University Avenue at the creek crossing to allow management of flows in the creek corridor.
- Raised crossing levels to limit overflow at crossings.
- Return creek reaches to natural wetland environment.
- Reconfigure existing stormwater outflow pipes throughout the creek where undercut by water flows and cause erosion.
- Localised widening of the creek to maintain low velocities and enable in-stream planting with no change proposed to stream depth.

Water Sensitive Urban Design

The proposed stormwater management strategy focuses on minimising the impacts of development on the total water cycle and maximising the environmental, social and economic benefits achievable by adopting responsible and sustainable stormwater management practices. The stormwater management strategy consists of the following elements.

On Lot Treatments

Adoption of appropriate waterwise landscaping practices and maximisation of pervious areas.

On-site stormwater detention in accordance with Council's DCP requirements.

Street Level Treatments

Gross pollutant traps will be used on all site outlets to remove litter and vegetative matter, and 80% of sediment load. This strategy keeps litter and sediment out of the bio-retention swales and the University Creek riparian corridor.

Bio-Retention Systems

Selected zones of bio-retention swales and "raingardens" will be integrated within targeted open space areas to achieve nutrient reductions. They will also function to assist in detaining first flush flows to replicate the natural wetting and drying regime discharging to University Creek and Mars Creek Corridors.

Edge Treatments

Additional bio-retention systems are proposed along the edge of corridor perimeter roads to attain higher than nominated Council nutrient reductions. They are to be integrated with the riparian corridor as an edge buffer.

The above treatments form a treatment train to reduce sediment and nutrient loads to meet Council's stormwater quality targets.

3.14 LIGHTING, SAFETY AND SECURITY

Successful precincts work both during the day and at night with lighting a crucial element that both attracts people and helps navigate precincts. Very often, the highest usage is actually after hours and it is essential that lighting is functional and inviting.

Energy efficiency in light selection and operation will be important to the sustainability goals of the University.

There are three areas where lighting plays a role:

Identity

Lighting can reinforce the identity and character of an area or precinct at night. Through effects, lighting can highlight key elements or simply unify a precinct through a common approach.

Safety

Security lighting is essential. Lighting main circulation paths and adjoining areas so that there are no dark spots or shadows that could harbour threats will add to the enjoyment of users.

Variety

Lighting can be used to change the character and mood of a place on a seasonal or special event purpose. The lighting of elements to reflect a holiday or season is an effective and popular device to add variety or interest to a place.

A number of principles have been identified. These include:

Precinct Lighting

In order to unify the precinct, a common lighting colour is proposed.

Iconic Building Lighting

The lighting of key building facades reinforces the University's identity and creates landmarks within the campus. Selected buildings can be lit with coloured lights to emphasise entry points.

Illuminated advertising is not permitted.

Approach Lighting

The introduction of specialised lighting on the approaches to entry points reinforces the sense of the precinct as a unique place. This sense of identity and anticipation will enhance the experience and perception of all precincts.

Open Space Lighting

Each space will have its own character and identity and lighting of these spaces at night for safety and legibility is important whether they are in use or not.

Pedestrian zones can use animated or moving projections over horizontal (and some vertical) planes.

Temporary lighting can also be used before and during special events to further highlight the occasion.

Each space will have the minimum level of security lighting needed through the later night hours.

Solar lighting is encouraged.

Street Lighting

Street lighting shall be provided to at least City of Ryde standards. Metal halide lamps that provide a white light that better renders flesh tones are to be used across the campus.

Public lighting is divided into smart poles and pedestrian poles. Smart poles and pedestrian poles will be used for public lighting.

Bus shelters will have integrated lighting.

Security

Feeling safe and secure, even at night or when people are on their own, is importatant on the campus. Crime Prevention Through Environmental Design (CPTED) guidelines should be used for all developments and projects. It aims to reduce the opportunities for crime by increasing the effort and risks for offenders, as well as reducing the rewards.

Principles include:

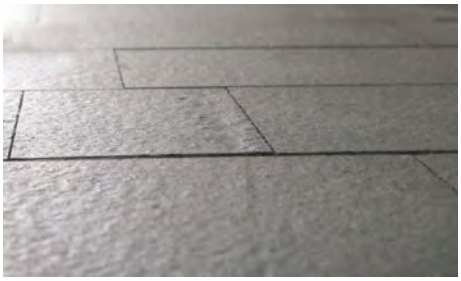
- Occupied buildings with windows overlooking public spaces and streets.
- Quality street lighting, and lighting to public places, that enhances visibility and safety.
- Prominent, well-located and well-lit pedestrian entrances.
- Public places that attract people rather than discourage people from gathering.

3.15 PAVING

Paving materials in the precincts are to match existing campus areas. The paving will be patterned to delineate the different character and use of areas within the streetscape and public domain. The palette will be a mix of honed concrete pavers, insitu concrete paths and granite paving.

The surface treatments through the riparian corridor will take a softer organic approach and will consists of timber, sandstone and decomposed granite as juxtaposition to the urban campus environment.

LOCATION	PAVING TYPE	IMAGES	ADDITIONAL NOTES/ COMMENTS
Primary public domain spines			
Wally's Walk	Paving Body: – Insitu coloured concrete with saw cut paving pattern to match existing Wally's Walk paving	*Existing Wally's Walk Insitu concrete* 	All new paving works as per existing specifications.
Macquarie Walk and Sir Christopher Ondaatje Avenue	Paving Body: – Insitu off-white concrete with exposed aggregate finish – Aggregate: 10mm Nepean River Gravel – Finish: Exposed aggregate Header Course/Banding: – 300 x 300mm precast concrete paver – Colour: Dark grey, equal to Adbri Masonry 'Charcoal' – Finish: Standard	*Insitu concrete*  *Precast concrete paver* 	-

LOCATION	PAVING TYPE	IMAGES	ADDITIONAL NOTES/ COMMENTS
Campus gateways			
All	Paving Body: – Equal to G684 Black Fuding (dark grey) granite pavers – Finish: Flame exfoliated – Size: 600 x 300 x 60mm and 300 x 300 x 60mm	*Black Fuding granite pavers* 	-
Shared ways and service roads			
All	Paving Body: – Ecotrihex® 181 x 88 x 80mm – Colour: 'Charcoal' – Finish: Standard Header Course/Banding: – Ecotrihex® 181 x 88 x 80mm – Colour: 'Natural' – Finish: Standard	*Ecotrihex® 'Charcoal'*  *Ecotrihex® 'Natural'* 	Unit paving to communicate shared spaces.

LOCATION	PAVING TYPE	IMAGES	ADDITIONAL NOTES/ COMMENTS
Primary internal roads			
All	Paving Body: – Insitu asphaltic concrete paving Header Course/Banding: – 300 x 300mm precast concrete paver – Colour: Off-white or light grey, equal to Adbri Masonry 'Ivory' – Finish: Standard	*Asphaltic concrete*  *Header course/banding* 	Header and body paving to pathways only. Carriageway as per Engineers specifications.
Secondary east-west and north-south links			
All	Paving Body: – Asphaltic concrete paving	*Asphaltic concrete* 	-

3.16 STREET FURNITURE

Although a relatively minor element of the campus landscape, street furniture has a significant influence on the experience of the public domain. A uniform suite of street furniture is to be used throughout the campus to ensure that the various precincts are integrated with a discrete background language.
The palette of street furniture will need to include benches, tables, bins, bollards, bicycle racks, bubblers and water refill stations, tree pits/guards, lighting and bus shelters.

Street Furniture Principles

- High quality street furniture should provide a fresh and contemporary appearance appropriate to the environmental requirements of the campus.
- Furniture should be robust, with minimal maintenance requirements and the ability to withstand heavy use.
- Maintain consistent materials, layout and geometry in sourcing and installing street furniture.
- With the exception of individually designed elements, street furniture should be readily commercially available to ensure a consistent palette can be sourced in the future.
- The suite of street furniture will need to include DDA compliant elements and options.
- Minimise clutter by grouping streetscape elements together to maximise legibility and usability of the public domain.









3.17 PUBLIC ART

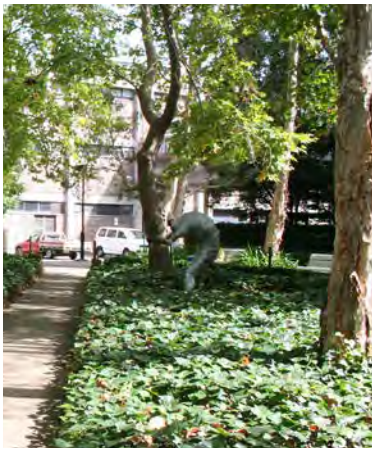
Macquarie University is committed to the introduction of public art across the campus. The provision of public art within the campus is an important step to contributing to the identity of the campus' public domain and establishing a sense of 'place' at Macquarie University.

These installations will provide the visitors with an intellectual aspect to the environment to complete the cultural enrichment that can be gained by enjoying what the campus open spaces have to offer.

Public Art Principles

- Public artworks are to be integrated into the public domain.
- Artworks should provide interest, create engagement and be the expression of contemporary culture.
- A description of each artwork and its concept should accompany the artwork as a story of its installation.










C8A LINCOLN



4

BUILT FORM

4. BUILT FORM

4.1 PRINCIPLES

The success of the campus plan will be subject to the quality of development realised.

Urban Form

Macquarie University's success as a built environment has been largely through the quality of its landscape and parkland setting. New development should be consistent with the overall identity of the campus while creating a distinct identity for key precincts.

The plan aims to maintain the overall character and environment of the campus. Principles underpinning the built form strategy are:

- Definition of major spaces by built form.
- Encourage consistent facade alignments on major thoroughfares, to reinforce the edges of major spaces.
- Focused activation of ground levels on major spaces with retail, cafes or student services.
- Buildings to have a clear address to either a road or a main open space.
- Locate tallest development at the train station.
- Increased height in the Academic Core to contain the size and increase the vitality of the Core.
- Preservation of solar access to key open spaces.
- Lower buildings located furthest from the train station.

The public domain will be defined through the creation of built edges to streets and open spaces.

A range of setback types including fixed build-to lines that define an 'urban edge' for high activity, high density environments, and minimum setbacks that allow more flexibility and can incorporate landscape for a less formal 'open space edge'.

The plan seeks to create a defined scale to the public domain through active podium edges with taller elements setback from street, open space and building edges. Articulation zones provide interest and variety as well as modulation in form, rhythm and scale.

Design Outcomes

To meet these expectations, high quality design is required. Innovative design that maximises the potential of sites and their location must add to the overall quality and character of the campus.

Within this strong public domain setting, the challenge is to create a consistent built form approach that while reinforcing a common language, creates opportunities for diversity and variety within the campus. Just as the environment has played an important role in the public domain, new buildings on campus will be expected to adopt innovative environmental initiatives.

Key considerations for the new buildings are:

- Respond to the strong landscape setting.
- Adopt key built form elements that define the public domain.
- Allow for individual expression in building design within a common language of materials and finishes.
- Use colours and materials that are consistent and/or responsive to the design palette of common materials, colour and finishes within the precinct.
- Embody environmentally sensitive design principles.
- Ensure that building facades are environmentally responsive.
- Windows with northern, eastern and western aspects are to incorporate shading elements.



FIGURE 27: BUILDING DEFINITION

4.2 BUILDING HEIGHTS

As described in the Concept Plan, the key principles of building heights across the campus are:

- Highest development at the train station.
- Increase the height in the Academic Core to contain the size and increase the vitality of the Core.
- Preservation of solar access to key open spaces.

There are two levels of control on the building heights. The zone of development along Herring Road which falls under the Herring Road Priority Precinct has nominated maximum FSR and heights under the LEP, and the rest of the campus has 'Illustrative Heights' outlining the recommended heights proposed.

Controls to limit overshadowing of key open spaces are identified in individual lot controls. The definition of heights are taken from existing ground level.

At the Herring Road Gateway, heights are managed to create a symmetry around the Waterloo Road axis. The scale of the adjacent buildings is limited on the street frontage to create a human scale to the entry.

Roofs that are visible from surrounding buildings should be activated.

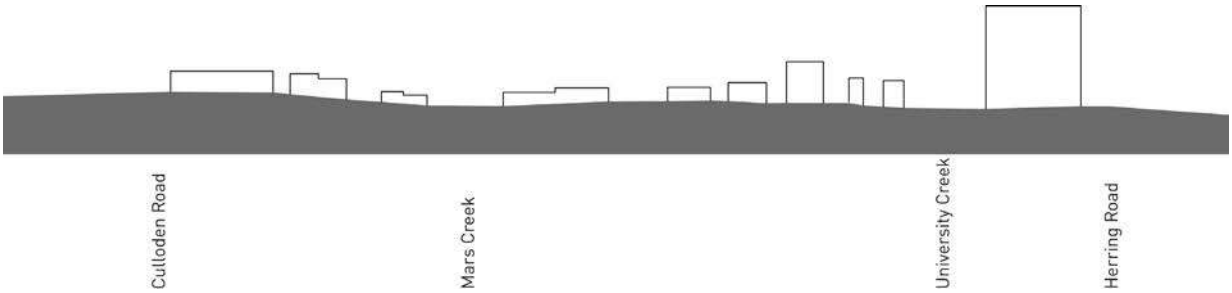


FIGURE 27: SECTION THROUGH CAMPUS SHOWING TOPOGRAPHY AND INDICATIVE BUILDING HEIGHTS

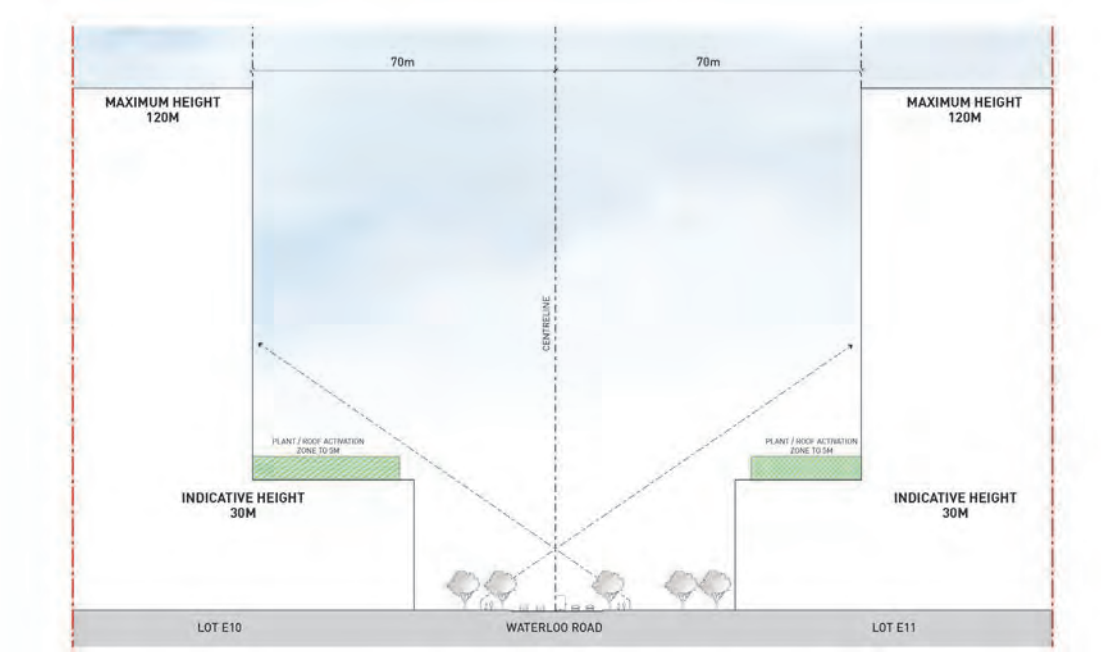


FIGURE 29: SECTION THROUGH HERRING ROAD GATEWAY AND MAXIMUM/INDICATIVE BUILDING HEIGHTS



FIGURE 30: INDICATIVE BUILDING HEIGHTS

4.3 ARTICULATION

The key architectural objective of the precinct guidelines is the development of a high quality architecture that responds appropriately to its environmental and site context. The development of a rich and interesting architecture on sites is dependent on both the massing of buildings and their detailing and articulation.

The key principles for the articulation of buildings across the campus are:

- Buildings must demonstrate contemporary expression and environmental responsiveness and function must respond to place, environment and the urban character of each precinct.
- Elements such as balconies and sun shading that create a sense of scale or rhythm on the facades are to be employed to add to the richness of the architectural expression.
- To mediate the level changes across a number of the sites, a masonry base (brick, stone or terracotta) is recommended on all sites.
- Building entries must be clearly articulated and be visible from the public domain.
- Building articulation is to be generated through the expression of overall massing as well as separate parts of a building, such as entries, access stairs, walkways, sun shading and balconies. Elements that are required to moderate environmental conditions, such as sunlight, breezes and screening, are to be designed to enliven a building's facade.

Basements

With significant level changes occurring across a number of sites, the treatment of basement parking and the design resolution of these frontages to major pedestrian spaces is an important issue.

Designs are to ensure:

- Minimise the extent of parking levels that extend above grade.
- Basement parking on commercial and academic buildings should not extend by more than one level above adjoining grade levels.
- All parking to be screened where possible by active uses or by high quality facades.
- Treatment of frontages to major pedestrian spaces to ensure a high quality pedestrian experience.





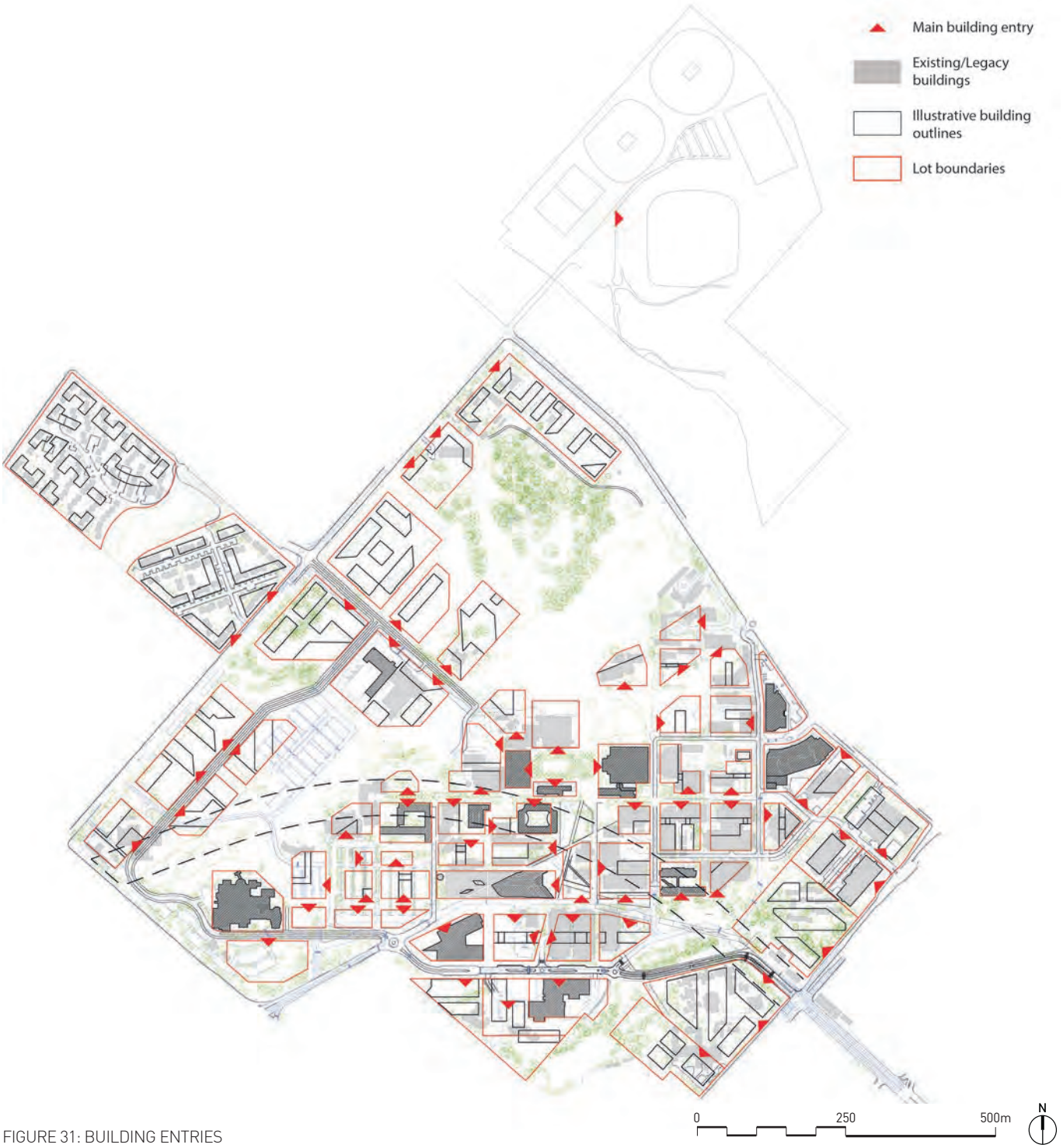


FIGURE 31: BUILDING ENTRIES

4.4 ACTIVATION

Ground floor active uses promote a sense of vibrancy and safety throughout the campus. Activity zones have been identified along the major pedestrian frontages and around key open spaces. Uses include student services, food, retail and information centres. Activation is also provided by building entries, windows and foyers.

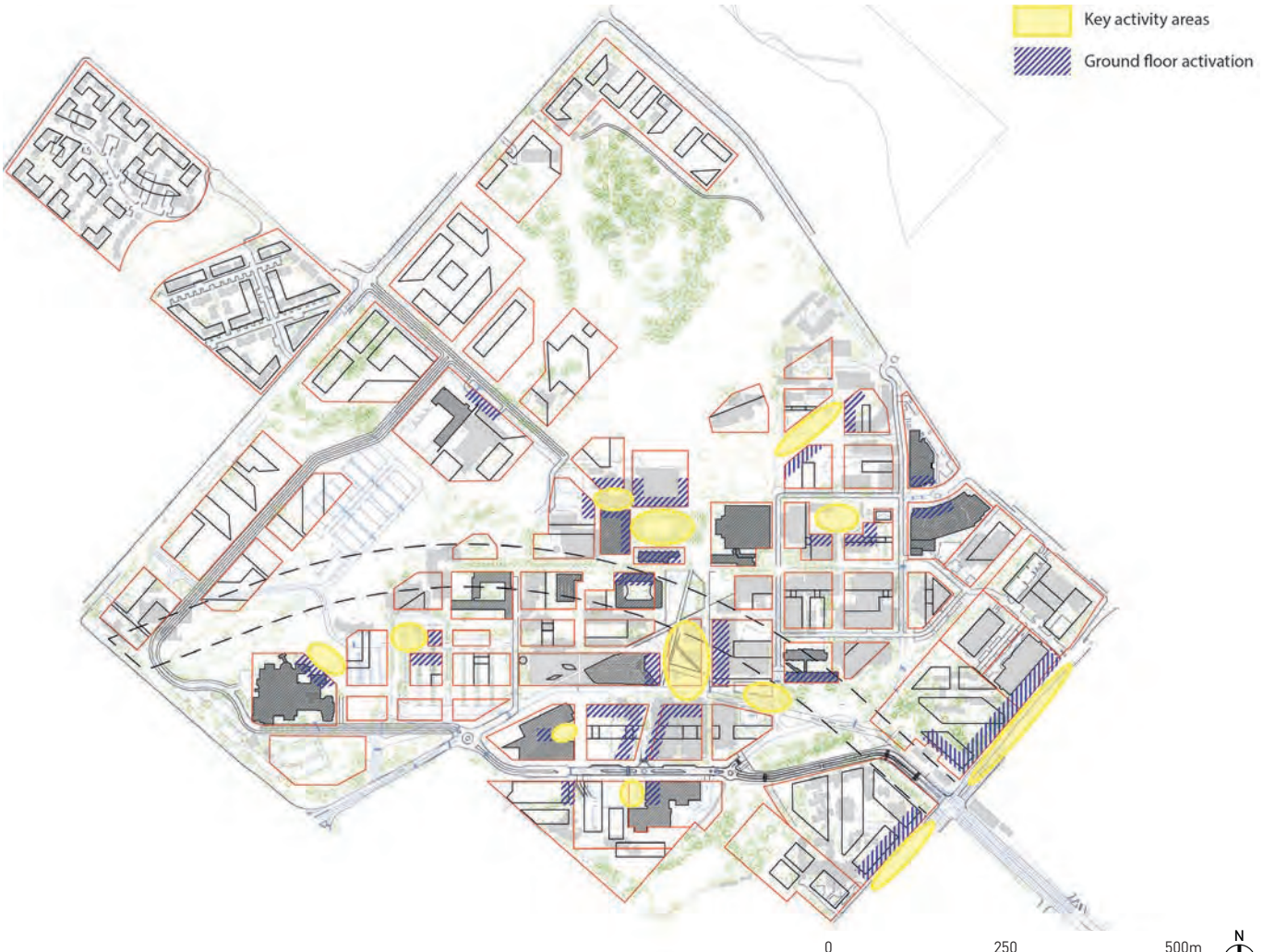


FIGURE 32: LAND USE

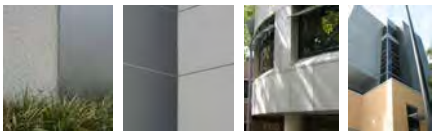
4.5 MATERIALS

The guidelines seek to apply a common palette of materials appropriate to place and environment that will unify the differing building characters within various precincts. As highlighted in the Concept Plan, buildings should express different characters for the various precincts within a common language of materials and finishes.

These guidelines seek to encourage a common language and reinforce the contemporary and modern expression of buildings within the different precincts.

The key principles are:

- A common materials palette across the campus, with a clear distinction between low rise and high rise areas.
- Predominantly white or off-white/ silver or grey base colours and a series of accent colours with emphasis given to key locations including important corners and vistas.
- Western facades should be predominantly solid or screened to reduce solar gain.
- Northern facades should be predominantly glazed with sun shading.
- Glass with a reflectivity greater than 20% is not permitted.
- Low glare roof materials must be used.
- Develop a contemporary architectural expression that creates a human scale to the public domain enlivened by smaller scale articulation elements such as louvres, balconies, roof overhangs.
- Use a range of materials that are appropriate to function, maintenance, and scale.
- Low rise podium facades that can easily be seen by the pedestrian should comprise high quality durable materials with developed architectural details.
- Materials for higher elements that are more difficult to service and maintain should be low maintenance, while less detail may be required.







4.6 BUILDING LIGHTING



Successful developments work both during the day and at night. Lighting is a crucial element that both attracts visitors and assists them in navigating sites.

The careful illumination of buildings and open spaces for access, accents and building identification within individual lots will contribute to the success and night time experience of the campus. Lighting also assists with safety. Main circulation paths and adjoining areas should be sensibly lit so that there are no dark spots or shadows that could shelter threats.

Internal illumination should be allowed to shine through the glazing, thereby offering a 'glowing jewel' effect. Such lighting is to be carefully controlled to avoid excess energy use.

The key principles are:

- Buildings must have a strong night-time building presence and entries to be visible from their primary vehicular and pedestrian access points.
- Lighting should integrate fixture style with the building's architectural character.
- Visible point sources of building illumination must be minimised.
- Investigate opportunities to utilise solar (photovoltaic) technology, high efficiency fixtures or alternative energy sources as energy saving measures.
- Across the site, white metal halide light or white LED must be used for external lighting rather than yellow sodium vapour lamps.

4.7 BUILDING SIGNAGE

The adoption of signage objectives is aimed at creating a cohesive, attractive and informative signage package that allows identification of buildings but does not impact the character and quality of the campus.

The key principles are:

- Building identification signage should relate only to tenants within the building, the building name or names of donors where appropriate.
- On sites within Precinct E and F, building identification signage is to be a maximum size of 25m^2 and should not be on any frontage facing the Academic Core.
- Signage lighting is to be arranged and maintained so that the light source is not directly visible from a public right-of-way or adjacent property.
- As part of the detailed proposal submission, a plan is to be submitted for approval by Macquarie University showing the location of the proposed signage and detailing dimensions, proposed colour, material, and method of illumination.







4.8 SUSTAINABILITY

Macquarie University is committed to incorporating sustainability into its actions and practices as part of its responsibility to the community and the environment, as well as promoting a healthy workplace and campus for staff and students.

New development within the campus is required to:

- Maintain, respect and restore biodiversity
- Create quality, comfortable, healthy and safe environments
- Ensure responsible resource use (especially non-renewable resources)
- Explore energy collection, energy conservation and waste re-use
- Consider adaptation, recycling, and deconstruction of buildings and materials
- Minimise pollution and environmental impacts
- Balance capital, efficiency and building lifecycle costs.

The Statement of Commitments in the Concept Plan approval identifies several key conditions to be met by each development:

- Commercial development on the site shall be capable of achieving the following targets:
  - Buildings should achieve a minimum 4-star Green Star rating.
  - Buildings should achieve a minimum 4.5-star NABERS rating.
  - Retail development will comply with any reasonable future rating tool provided by the Australian Greenhouse Rating Scheme.
  - Each development is to provide measures to capture, retain, and minimise litter, oil, sediment, nutrients, and pollutants prior to stormwater runoff discharge to the receiving creeks.

All campus development will consider the University's Sustainability Guidelines.



4.9 LOT LANDSCAPING

The guidelines seek to ensure that planting within development lots enhances the quality of the private domain and is consistent with and contributes to the landscape quality of the public domain.

Visual extension of the public domain landscaping through to the private domain is encouraged.

A series of requirements have been established for on-site planting and landscaping:

- Landscape within the lots must complement the public domain character through the selection of plant species, materials and finishes.
- All development sites must be suitably landscaped and contribute towards the overall character and quality of the precinct.
- The landscape is to be maintained to a high level, including the proper pruning, weeding, removal of litter, fertilisation and replacement of plants to ensure that the intended character and quality is retained.
- All landscape materials and finishes shall be selected with consideration to the whole of life costs, maintenance requirements and longevity.
- Landscaping is to be designed to enhance water quality and conservation. Particular attention shall be given to the prevention of nutrients entering any water body via run-off or ground water.
- No landscaping will be permitted, which in any way endangers health or public safety by creating a traffic or fire hazard, obstructing vision, or which is detrimental to the use of surrounding private property or the public domain.
- Landscaping is to be completed prior to building occupation.
- A landscaping plan prepared by a suitably qualified landscape architect must be prepared for the development of each lot and describe:
  - Landscape design rationale and concept.
  - Location, extent and type of all materials and finishes including all hardscape, softscape and feature elements.
  - Plant species, numbers, installation, mature sizes and positions of all trees, shrubs, ground covers and turf areas.
  - Finished levels.
  - Irrigation system specifications.
  - Location and type of all structures and amenities within the landscape.
- Where there is planting on slabs, the structural load must accommodate a minimum of 800mm depth for tree planting, 450mm depth for shrub and 150mm for ground cover planting and turf.
- A maintenance schedule is to be prepared and implemented for all developments ensuring that the intended character and quality is retained. The plan should detail the schedule and method of pruning, weed and litter removal, fertilization, plant replacement and irrigation.







5

LOT CONTROLS

5. LOT CONTROLS

5.1 LEGACY BUILDING LOTS

A number of buildings across the campus have been identified as Legacy Buildings. These are recent buildings that are unlikely to be redeveloped in the short term or buildings that may have architectural or cultural importance to the university. No specific controls have been developed for these lots.

These buildings may be upgraded or refurbished over time or may be demolished and redeveloped after review and justification.

Depending on the extent of the alterations and additions proposed, these buildings may require a Development Application or a Review of Environmental Factors (REF).

Some of the legacy buildings are located on lots that have space for new development. These lots, A20, A23 and B07, have design controls outlined in this section.



FIGURE 33: LEGACY BUILDING LOTS

5.2 INDIVIDUAL LOTS

Indicative controls have been proposed for the individual lots, supporting the key principles and objectives for each. The controls are intended to be flexible to allow and encourage design excellence and innovation.

5.2.1 Precinct A

Precinct A, the Academic Core, is located in the centre of the campus and adjoins Talavera Road. The precinct contains several legacy building lots (shown in grey).

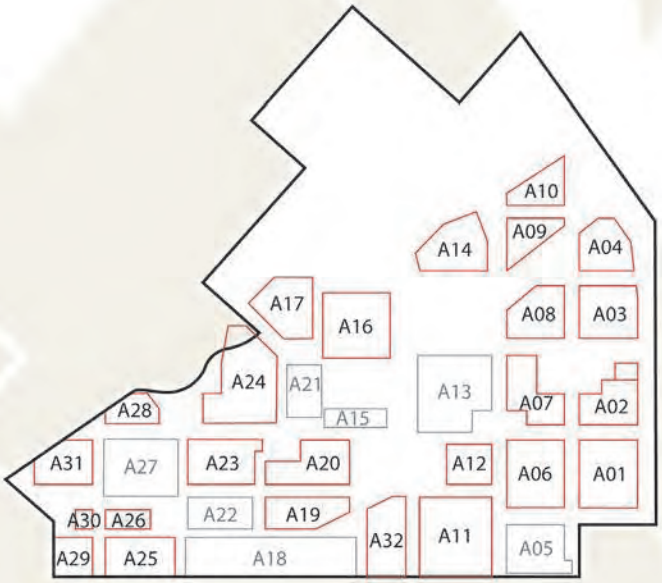


FIGURE 34: LOTS WITHIN PRECINCT A

LOT A01

Architectural Principles

Lot A01 is located on the eastern end of Wally's Walk at the junction of Research Park Drive. The lot has been identified for car parking along with other uses.

Built Form

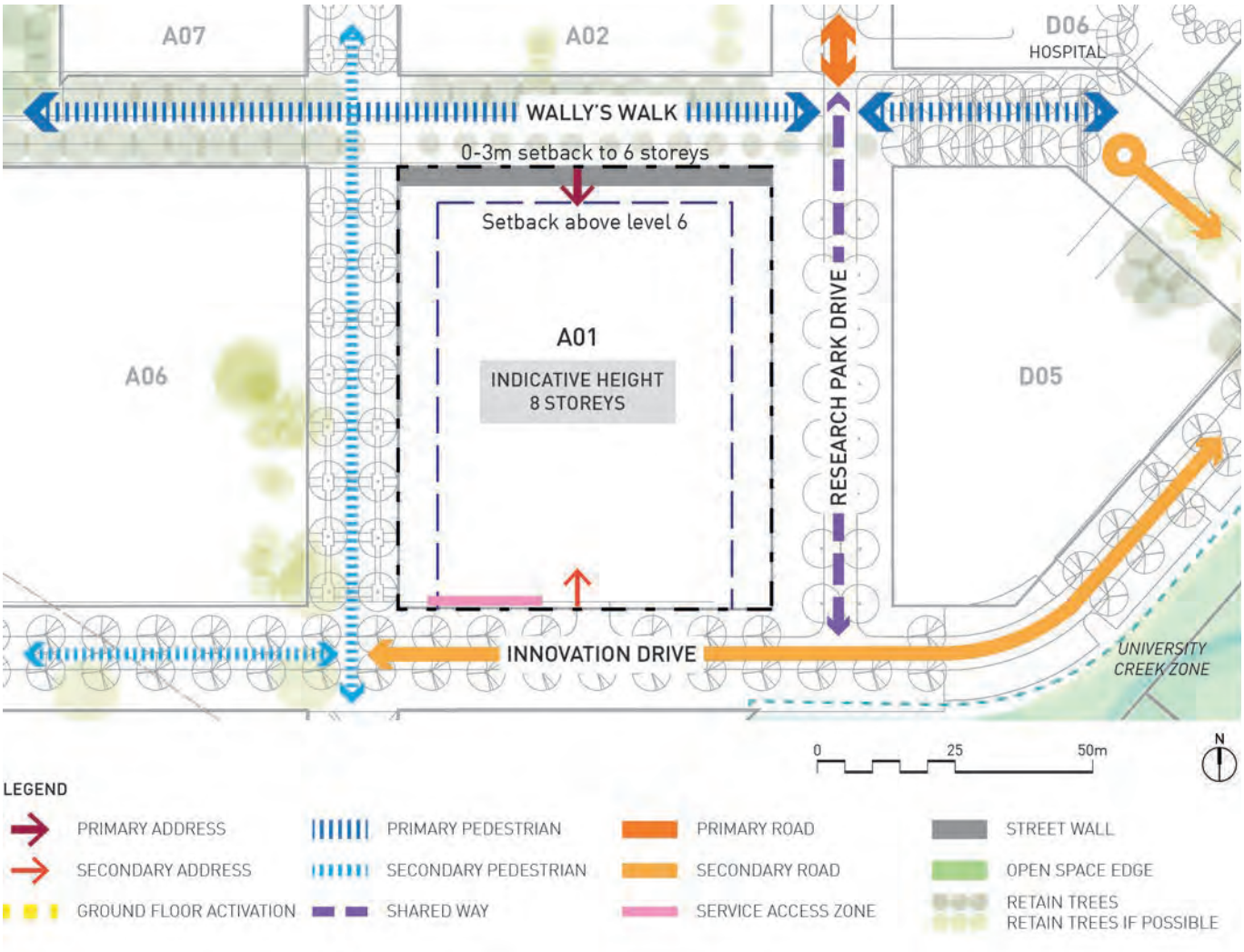
- Indicative height 8 storeys.
- Reinforce street wall to a recommended height of 6 storeys along the northern frontage to Wally's Walk.

Access

- Primary address located indicatively on Wally's Walk along the northern boundary.
- Secondary address located indicatively on Innovation Road along the southern boundary.
- Service access from Innovation Road along the southern frontage.

Landscape

- Significant trees along Wally's Walk to be retained.
- Review and retain significant trees if possible.
- Refer to the Wally's Walk and University Creek landscape guidelines in the Public Domain chapter.



LOT A02

Architectural Principles

Lot A02 is located on the eastern end of Wally's Walk at the junction of Research Park Drive. The lot is located opposite Macquarie University Hospital. A substation is located directly to the north of the lot. The lot is abutting the Frank Mercer Biological Sciences Garden.

Built Form

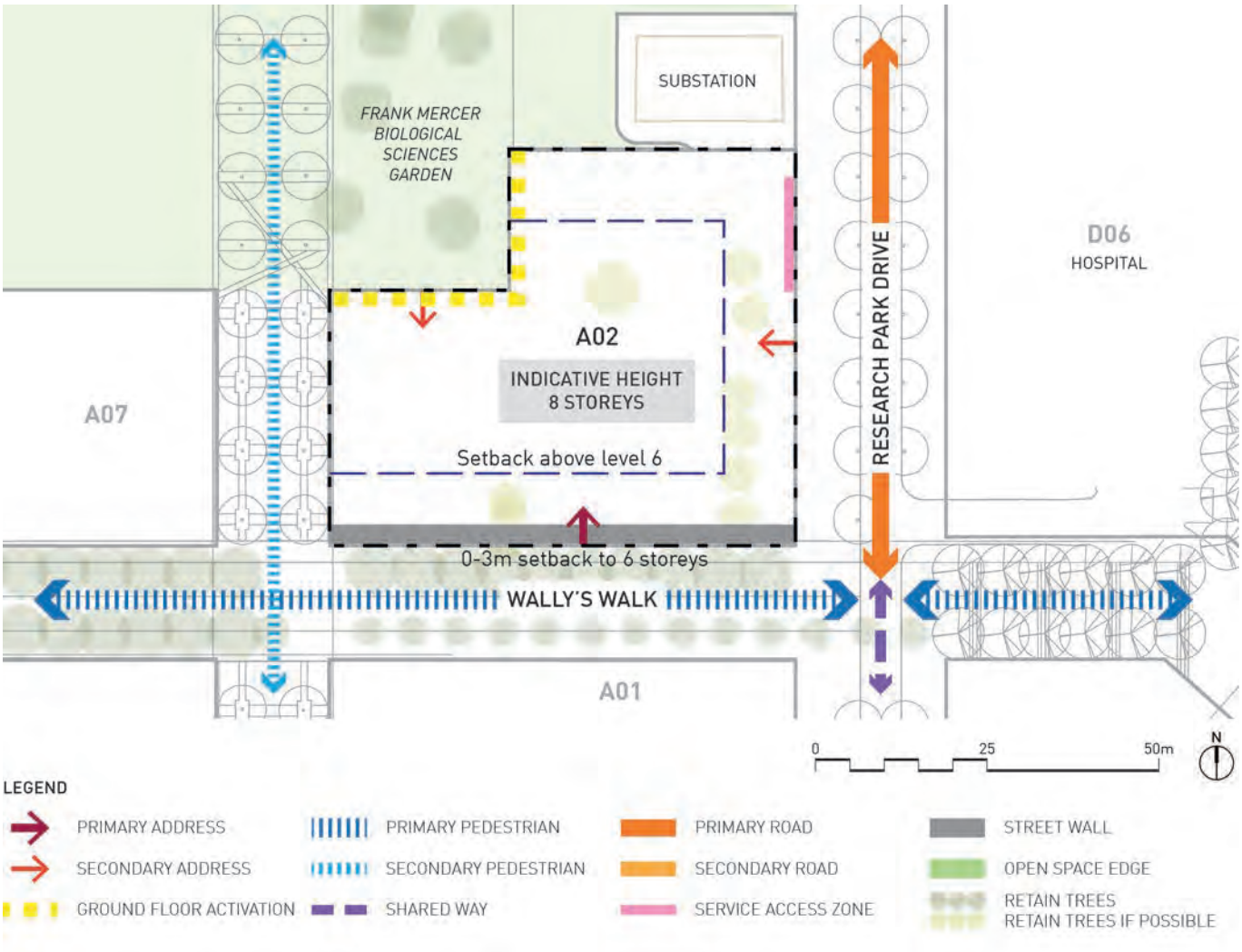
- Indicative height 8 storeys.
- Reinforce street wall to a recommended height of 6 storeys along the southern frontage to Wally's Walk as well as the Frank Mercer Biological Sciences Garden.

Access

- Primary address located indicatively on Wally's Walk along the southern boundary.
- Secondary address located indicatively on Research Park Drive along the eastern boundary and from the Frank Mercer Biological Sciences Garden.
- Service access from Research Park Drive along the eastern frontage.

Landscape

- Significant trees along Wally's Walk to be retained.
- Review and retain significant trees if possible.
- Refer to the Frank Mercer Biological Sciences Garden, Wally's Walk and Research Park Drive landscape guidelines in the Public Domain chapter.



LOT A03

Architectural Principles

Lot A03 is located north-east of the Academic Core near the Talavera Road Gateway and opposite the Australian School of Advanced Medicine (ASAM).

Built Form

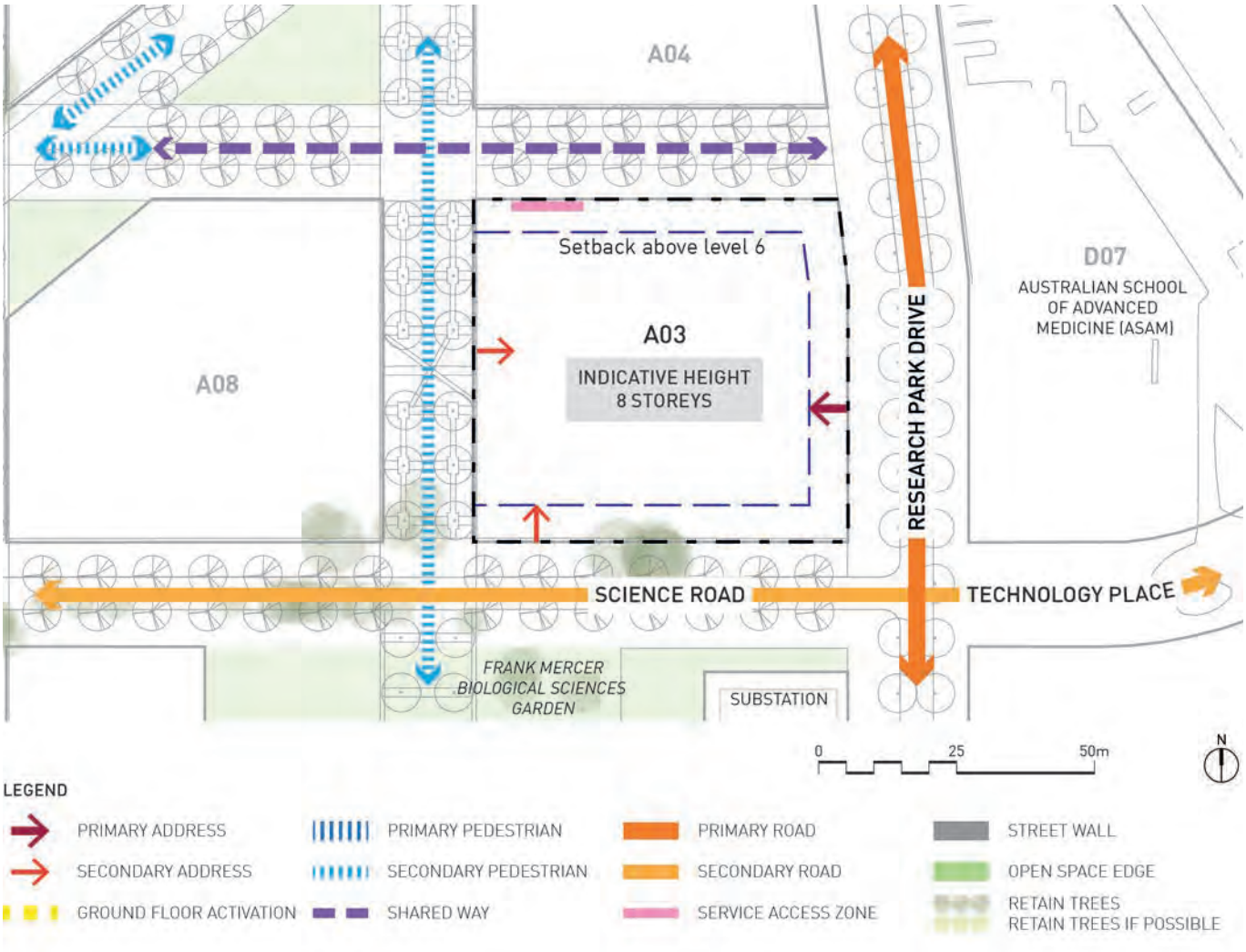
- Indicative height 8 storeys.
- Setback above level 6.

Access

- Primary address located indicatively on Research Park Drive along the eastern frontage.
- Secondary address located indicatively on the pedestrian route along the western frontage and/or along Science Road.
- Service access from the shared way along the northern frontage.

Landscape

- Review and retain significant trees if possible.
- Refer to the Research Park Drive and Frank Mercer Biological Sciences Garden landscape guidelines in the Public Domain chapter.



LOT A04

Architectural Principles

Lot A04 is located in the north-east corner of the campus at the Talavera Road Gateway and adjacent to the Macquarie University Hospital. This gateway location is suitable for a taller building.

Built Form

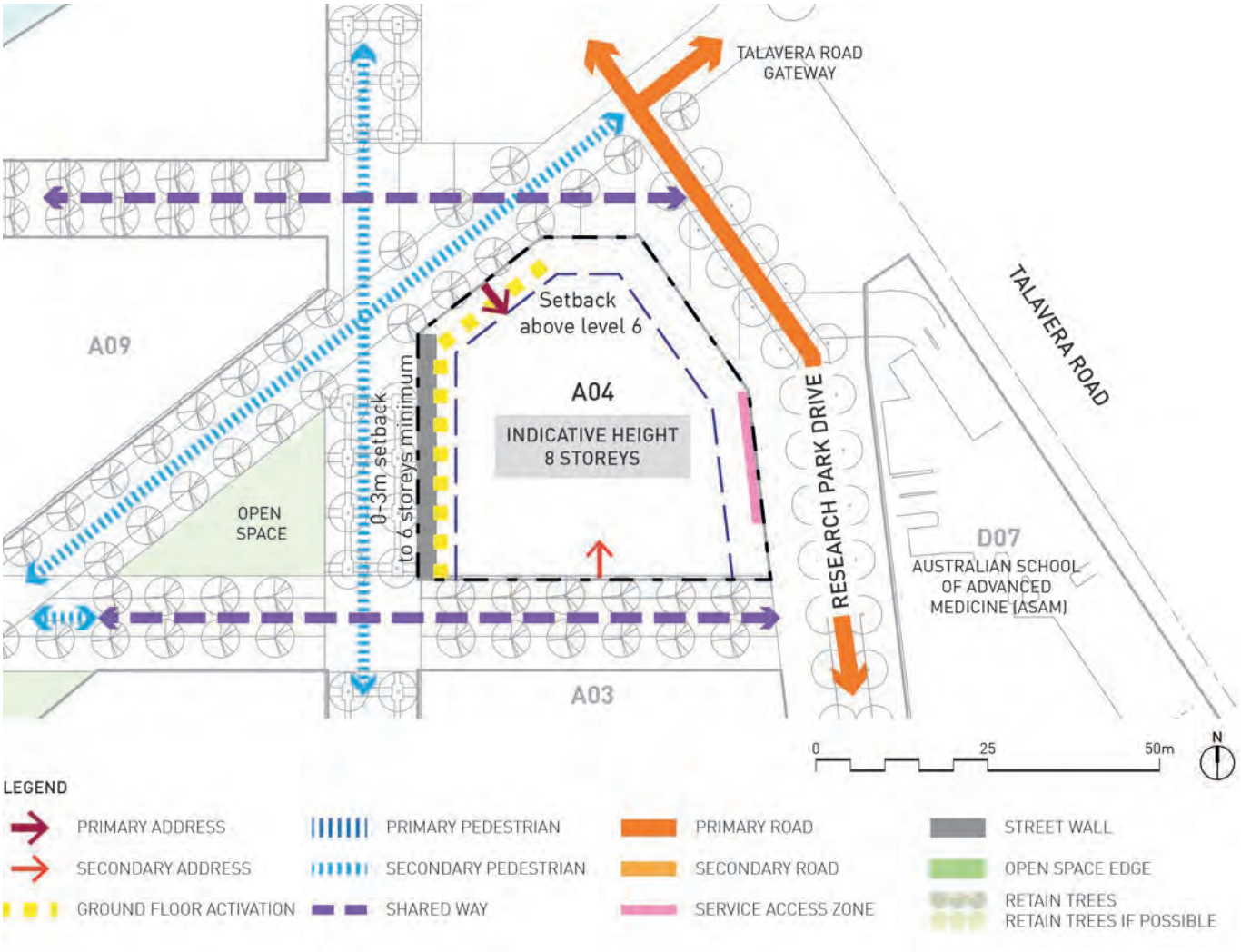
- Indicative height 8 storeys.
- Reinforce street wall along the western frontage to a recommended height of 6 storeys.
- Building to address the open space adjacent to the west.

Access

- Primary address located indicatively on the pedestrian route near the Talavera Road Gateway.
- Secondary address located indicatively on the pedestrian route along the southern frontage.
- Service access from Research Park Drive along the eastern frontage.

Landscape

- Relationship to open space to the west.
- Refer to the Research Park Drive and Talavera Road Gateway landscape guidelines in the Public Domain chapter.



LOT A06

Architectural Principles

Lot A06 is located on the corner of Wally's Walk and Eastern Road, east of the Academic Core. The lot is situated above the rail corridor.

Built Form

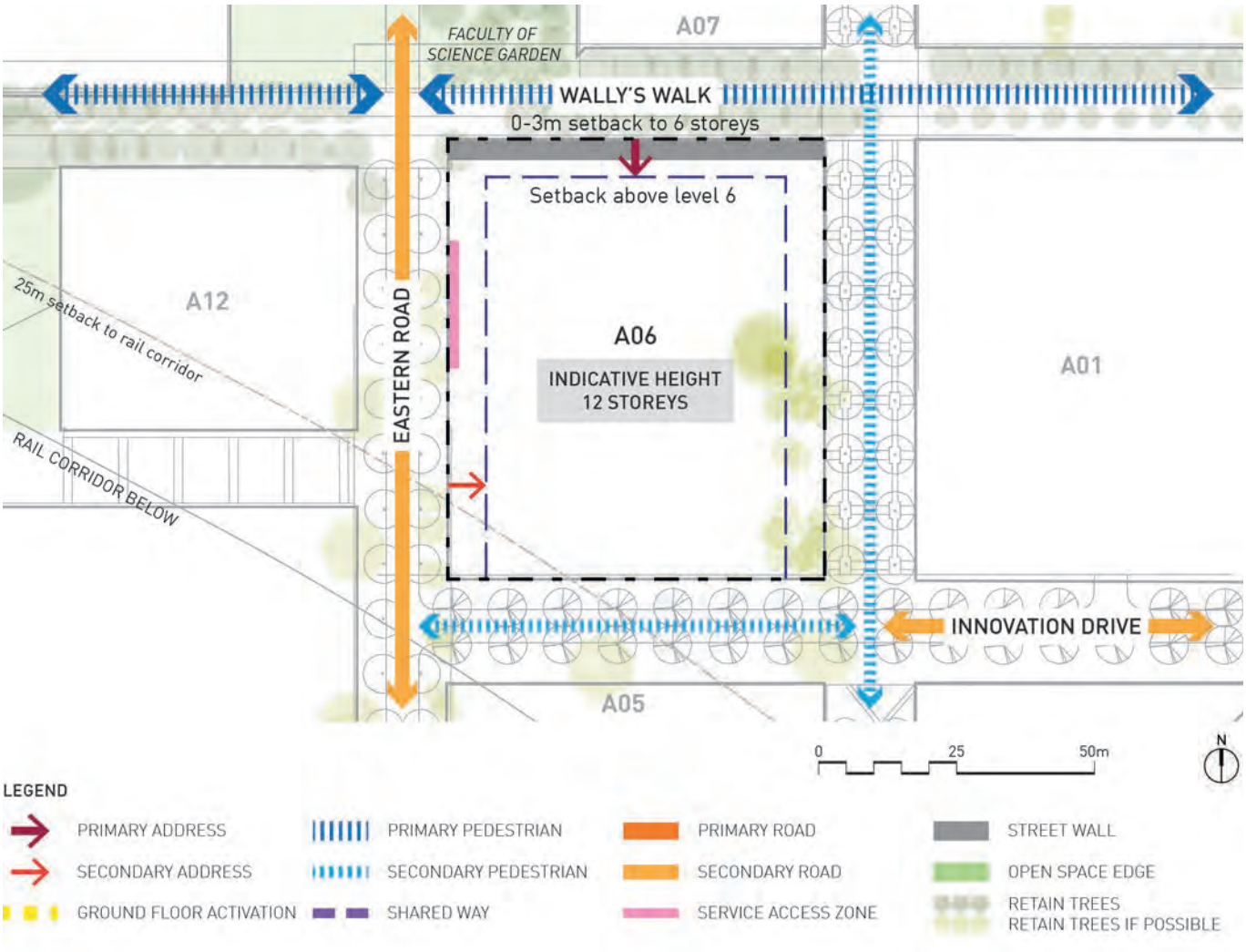
- Indicative height 12 storeys.
- Reinforce street wall along northern frontage on Wally's Walk to a recommended height of 6 storeys.
- Built form to address Wally's Walk.

Access

- Primary address located indicatively on Wally's Walk along the northern frontage.
- Secondary address located indicatively on Eastern Road along the western frontage.
- Service access from Eastern Road along the western frontage.

Landscape

- Significant trees along Wally's Walk to be retained.
- Review and retain significant trees if possible.
- Refer to the Wally's Walk and Faculty of Science Garden and Wally's Walk landscape guidelines in the Public Domain chapter.



LOT A07

Architectural Principles

Lot A07 is located along Wally's Walk in the east of the Academic Core. It is adjacent to the Frank Mercer Biological Sciences Garden in the north-east corner and the Faculty of Science Garden along Wally's Walk in the south-west corner.

Built Form

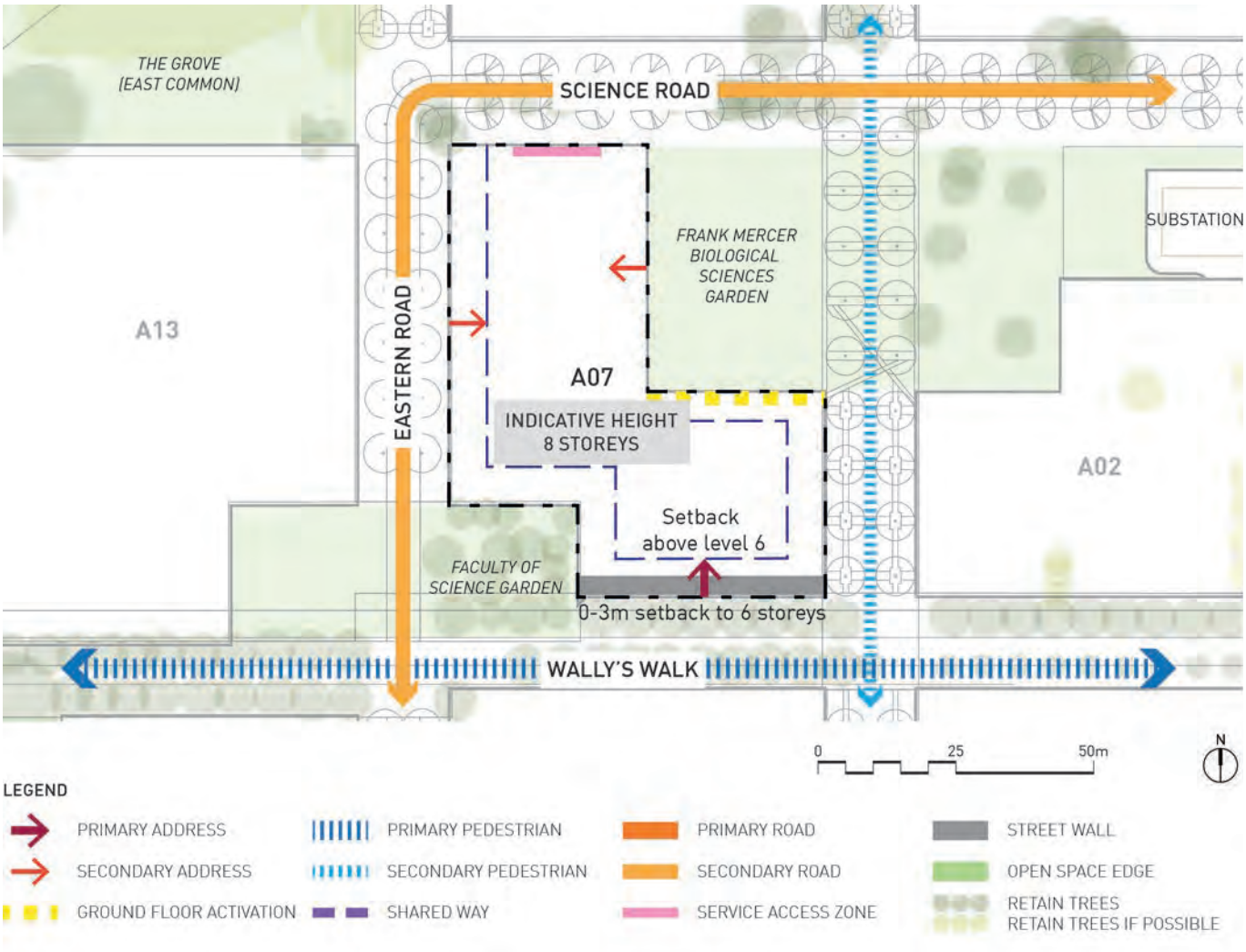
- Indicative height 8 storeys.
- Reinforce street wall to an indicative height of 6 storeys along the southern frontage to Wally's Walk.

Access

- Primary address located indicatively on Wally's Walk along the southern frontage.
- Secondary addresses located indicatively on Eastern Road along the eastern frontage and from the Frank Mercer Biological Sciences Garden.
- Service access from Technology Place along the northern frontage.

Landscape

- Establish a relationship to the Frank Mercer Biological Sciences Garden as well as the Faculty of Science Garden.
- Significant trees along Wally's Walk to be retained.
- Review and retain significant trees if possible.
- Refer to the Frank Mercer Biological Sciences Garden, Faculty of Science Garden and Wally's Walk landscape guidelines in the Public Domain chapter.



LOT A08

Architectural Principles

Lot A08 is adjacent to The Grove (East Common) open space on the corner of Technology Place and Eastern Road.

Built Form

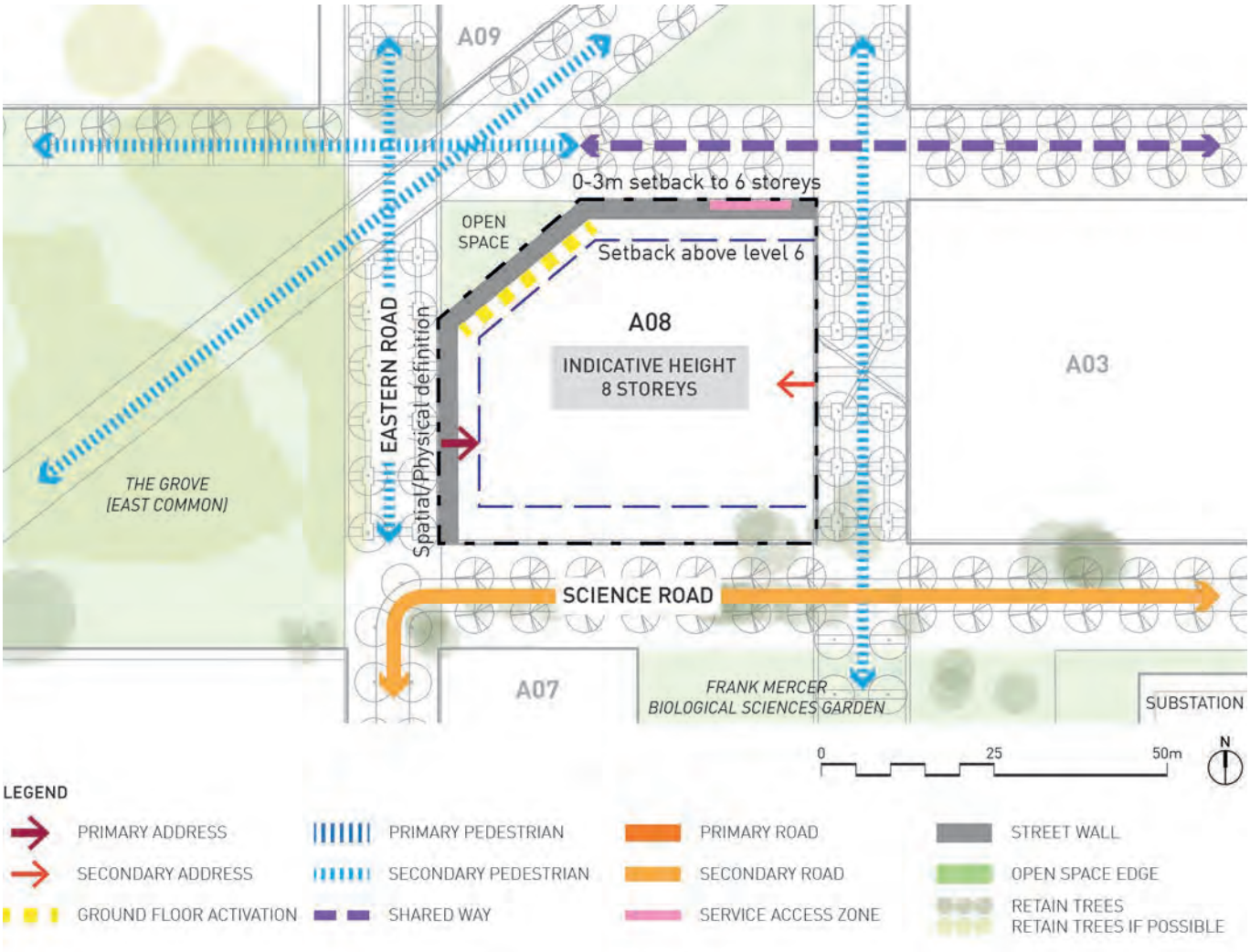
- Indicative height 8 storeys.
- Reinforce street wall along the western, north-western and northern frontages to a recommended height of 6 storeys.
- Building to address the Eastern Road primary frontage and The Grove (East Common) opposite.

Access

- Primary address located indicatively on Eastern Road along the western frontage from The Grove (East Common).
- Secondary address located indicatively on the pedestrian route along the eastern frontage.
- Service access from the shared way along the northern frontage.

Landscape

- Landscape forecourt to relate with walkways and The Grove (East Common).
- Review and retain significant trees if possible.
- Refer to The Grove (East Common) and Frank Mercer Biological Sciences Garden landscape guidelines in the Public Domain chapter.



LOT A09

Architectural Principles

Lot A09 is located in the north-east corner of the Academic Core along the diagonal footpath from Talavera Road Gateway to The Grove (East Common).

Built Form

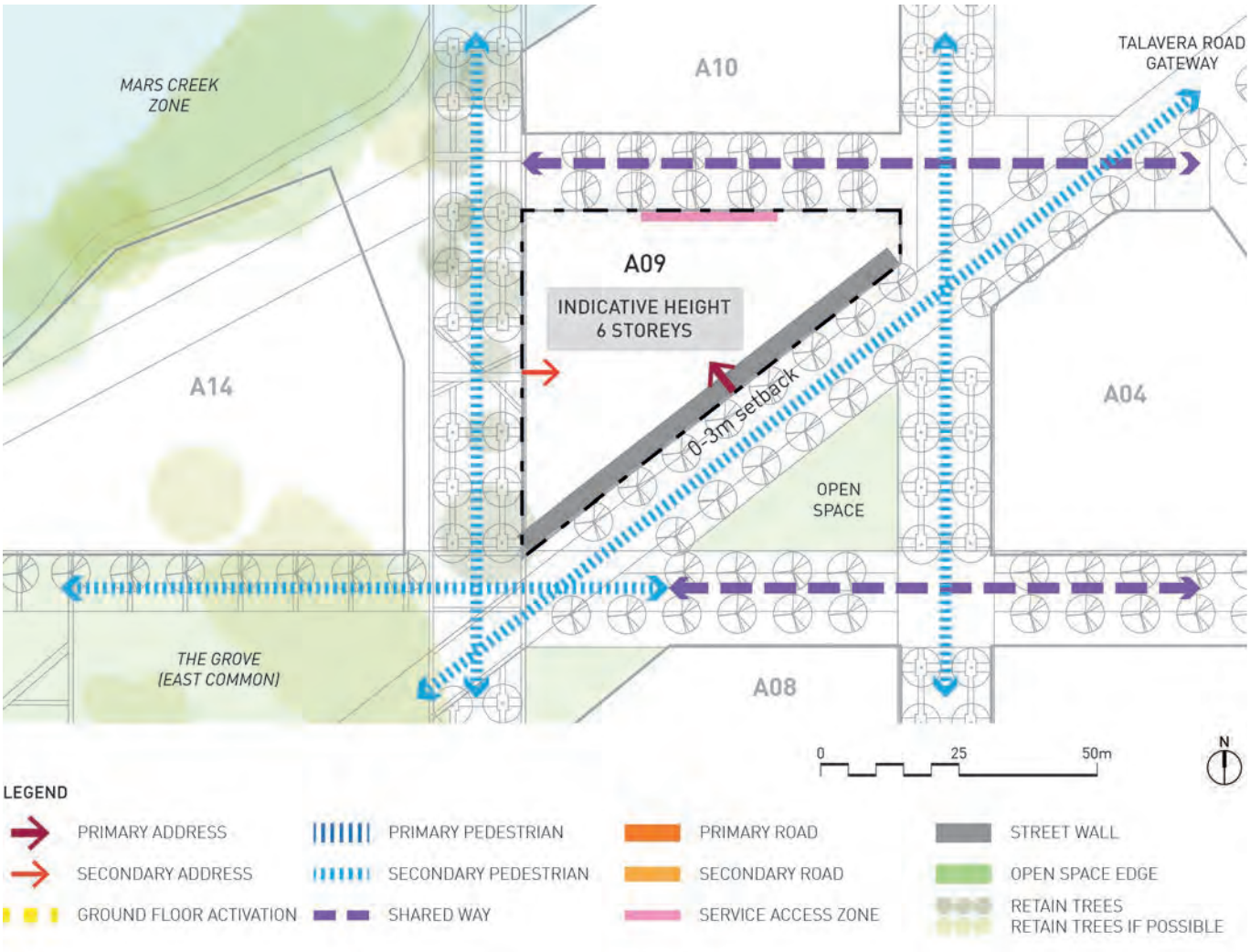
- Indicative height 6 storeys.
- Reinforce street walls facing the diagonal pedestrian route from Talavera Road Gateway to The Grove (East Common).

Access

- Primary address located indicatively on the diagonal pedestrian route along the south-east frontage from the open space.
- Secondary address located indicatively on the pedestrian route along the western frontage.
- Service access from the shared way along the northern frontage.

Landscape

- Significant trees on pedestrian route along western frontage to be retained.
- Review and retain significant trees if possible.
- Refer to the Talavera Road Gateway landscape guidelines in the Public Domain chapter.



LOT A10

Architectural Principles

Lot A10 is located in the north-east corner of the Academic Core at the Talavera Road Gateway and Mars Creek.

Built Form

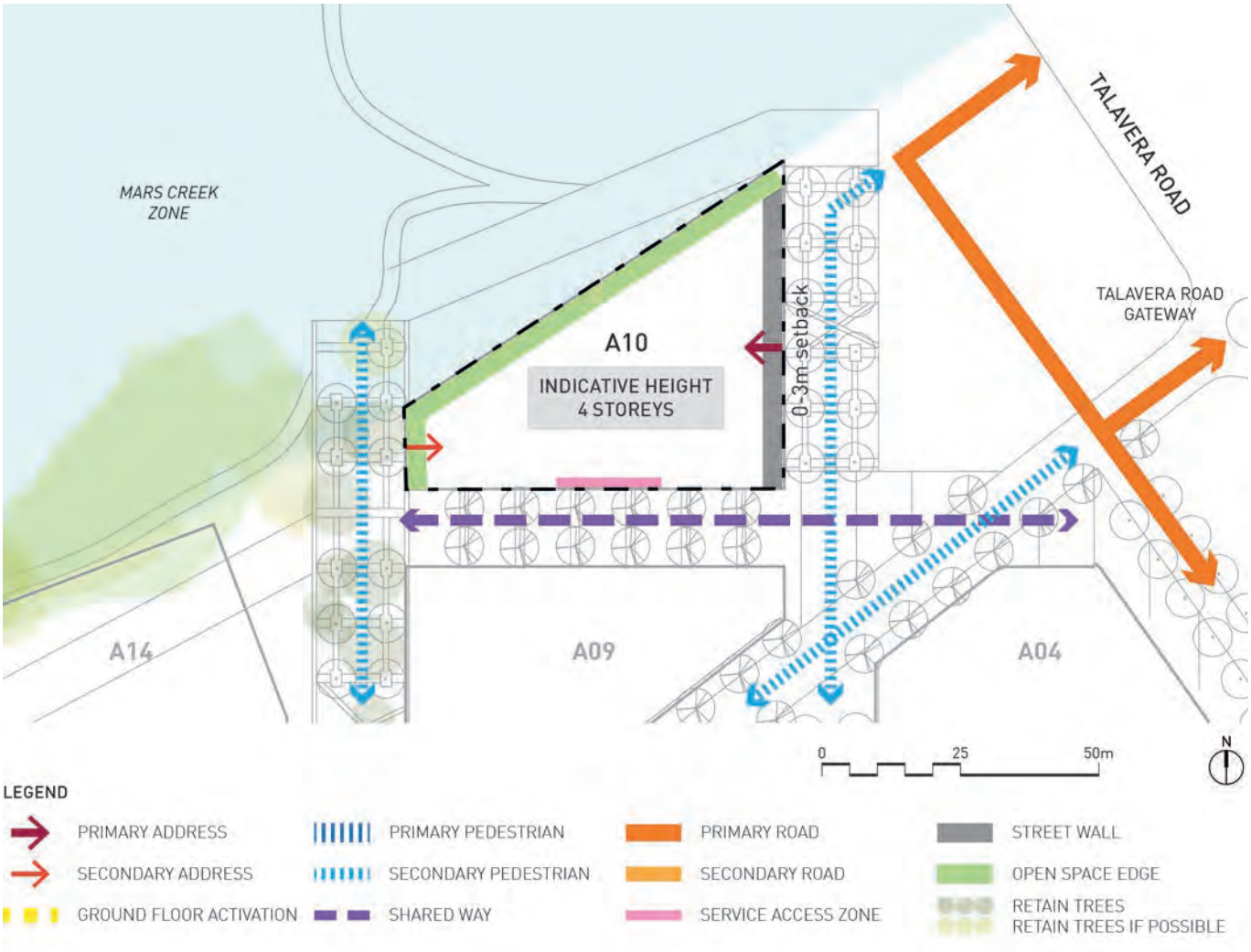
- Indicative height 4 storeys.
- Reinforce street walls on eastern boundary addressing the Talavera Road Gateway.
- Building to address Mars Creek.

Access

- Primary address located indicatively on the pedestrian route along the eastern frontage.
- Secondary address located indicatively on the pedestrian route along the western frontage.
- Service access from the shared way along the southern frontage.

Landscape

- Interface with Mars Creek.
- Review and retain significant trees if possible.
- Refer to the Mars Creek landscape guidelines in the Public Domain chapter.



LOT A11

Architectural Principles

Lot A11 is a large lot located on the corner of the primary pedestrian routes Sir Christopher Ondaatje Avenue and Macquarie Walk. The lot is situated above the rail corridor.

Built Form

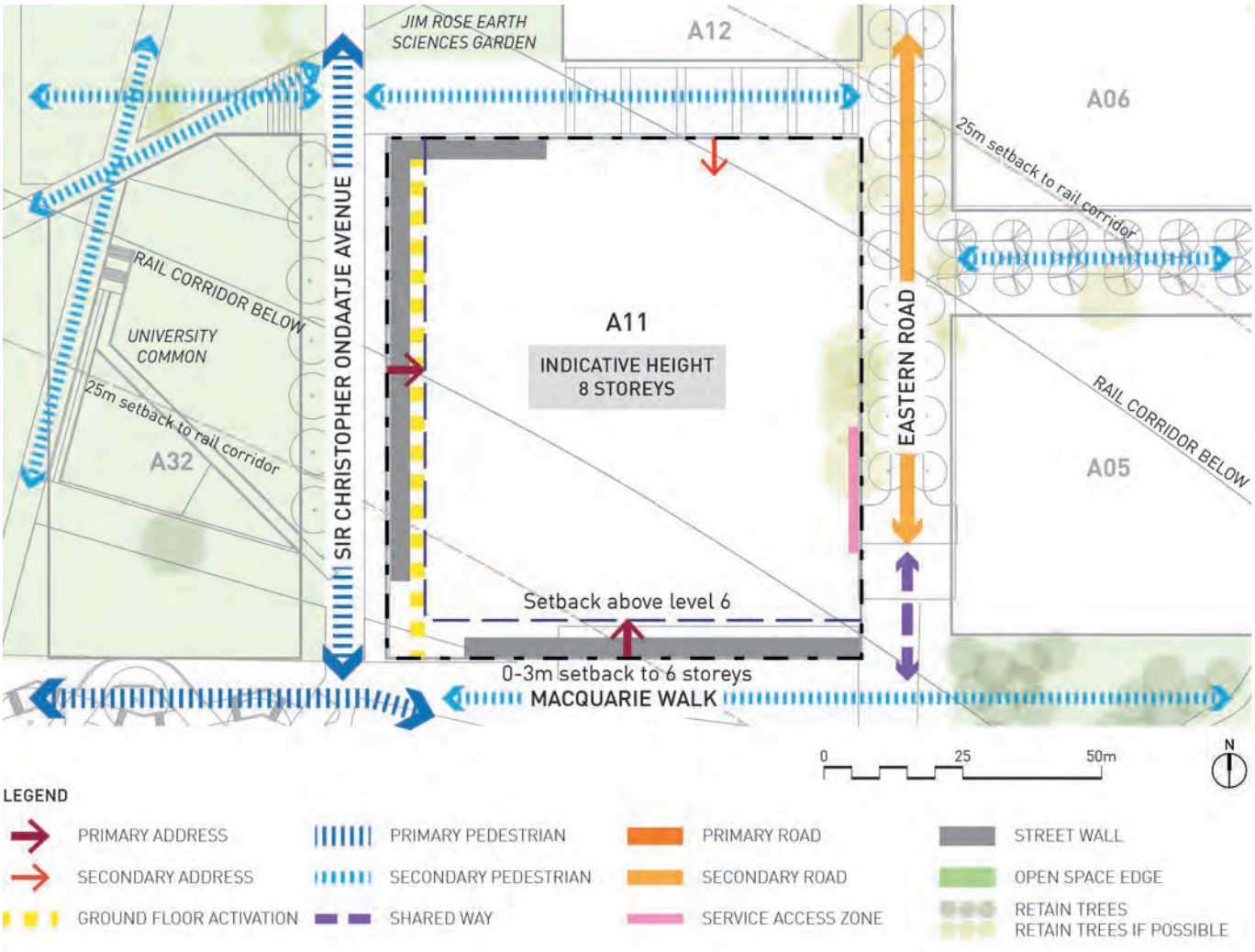
- Indicative height 8 storeys.
- Reinforce street wall along Sir Christopher Ondaatje Avenue and Macquarie Walk.

Access

- Two possible primary addresses located indicatively on Sir Christopher Ondaatje Avenue along the southern frontage and/or Macquarie Walk along the western frontage.
- Secondary address located indicatively on the pedestrian route along the northern frontage.
- Service access from Eastern Road along the eastern frontage.

Landscape

- Create a landscaped interface with Sir Christopher Ondaatje Avenue and Macquarie Walk.
- Consider interface with Jim Rose Earth Sciences Garden.
- Review and retain significant trees if possible.
- Refer to the Sir Christopher Ondaatje Avenue, Macquarie Walk, University Common and Jim Rose Earth Sciences Garden landscape guidelines in the Public Domain chapter.



LOT A12

Architectural Principles

Lot A12 is located in the heart of the campus at the intersection of primary pedestrian routes Wally's Walk and Sir Christopher Ondaatje Avenue. The Jim Rose Earth Sciences Garden is located immediately to the west of the lot. The lot is situated above the rail corridor.

Built Form

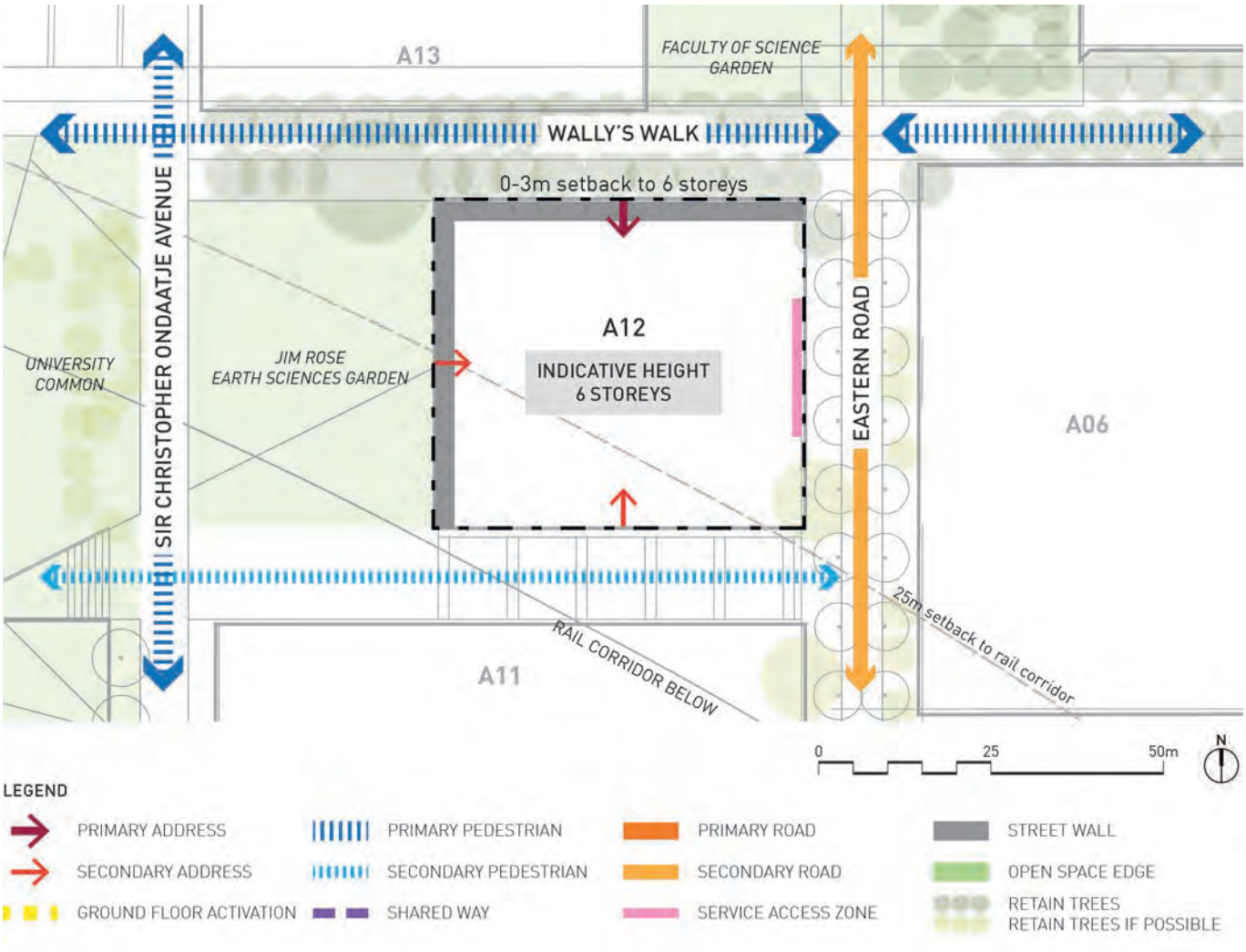
- Indicative height 6 storeys.
- Reinforce street wall on the northern frontage to Wally's Walk and the western frontage to the Jim Rose Earth Sciences Garden.

Access

- Primary address located indicatively on Wally's Walk along the northern frontage.
- Secondary addresses located indicatively from the Jim Rose Earth Sciences Garden along the western frontage and/or the pedestrian route along the southern frontage.
- Service access from Eastern Road along the eastern frontage.

Landscape

- Create interface with the Jim Rose Earth Sciences Garden.
- Significant trees along Wally's Walk to be retained.
- Review and retain significant trees if possible.
- Refer to the Wally's Walk, Sir Christopher Ondaatje Avenue, Jim Rose Earth Sciences Garden and Faculty of Science Garden landscape guidelines in the Public Domain chapter.



LOT A14

Architectural Principles

Lot A14 is located on the northern end of the Sir Christopher Ondaatje Avenue. The lot is on the key north-to-south pedestrian route through the Academic Core.

Built Form

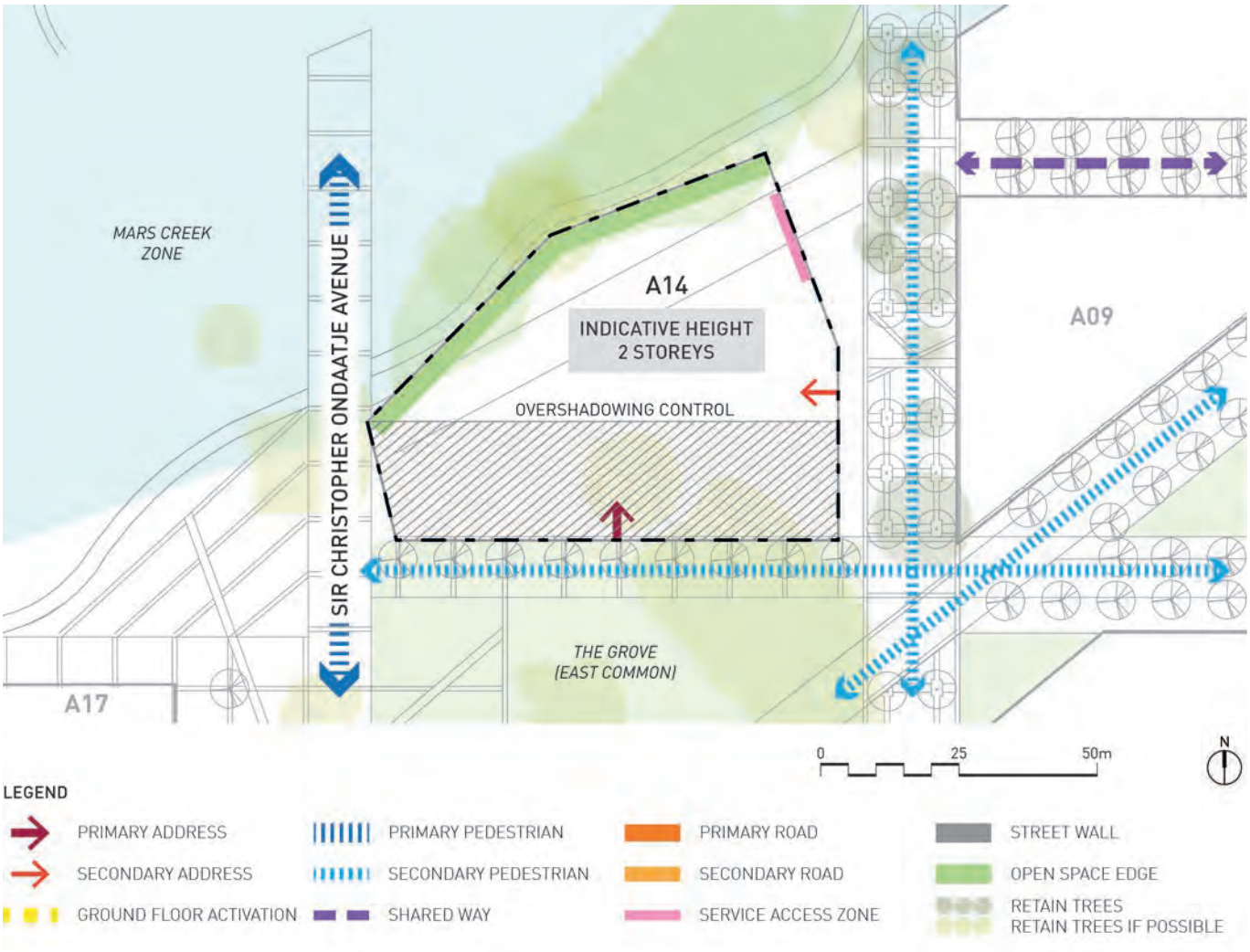
- Indicative height 2 storeys.
- Building to address Mars Creek.
- Reinforce street wall on southern frontage facing The Grove (East Common).
- Overshadowing control on the southern frontage. Height to be determined to minimise shadows on northern frontage of The Grove (East Common) between 11am and 2pm in mid-winter.

Access

- Primary address located indicatively on The Grove (East Common) along the southern frontage.
- Secondary address located indicatively on pedestrian route along the eastern frontage.
- Service access from the shared way along the north-east frontage.

Landscape

- Interface with Mars Creek.
- Interface with The Grove (East Common).
- Review and retain significant trees if possible.
- Refer to the The Grove (East Common), Sir Christopher Ondaatje Avenue and Mars Creek landscape guidelines in the Public Domain chapter.



LOT A16 AND 17

Architectural Principles

Lots A16 and A17 are located in the far north of the Academic Core. These lots are bounded by Gymnasium Road, Mars Creek and Sir Christopher Ondaatje Avenue. The lot adjacency requires consideration of joint servicing due to limited vehicle access to Lot A17 via Gymnasium Road.

Built Form

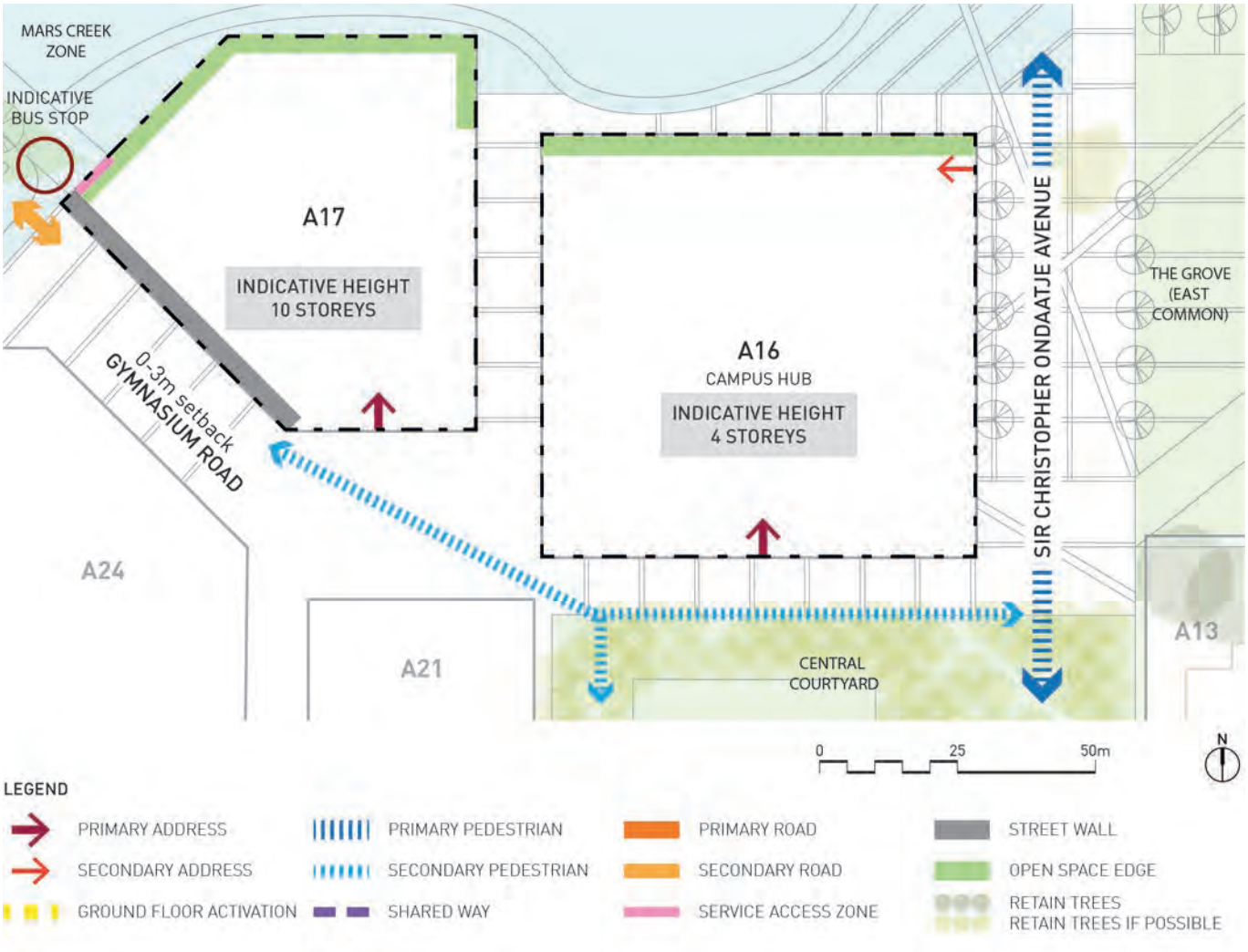
- Indicative height 4 (A16) and 10 (A17) storeys.
- Reinforce street walls to Gymnasium Road Gateway and Sir Christopher Ondaatje Avenue.
- Buildings to address the Mars Creek zone.
- Reinforce built edge to Central Courtyard

Access

- Primary address located indicatively on Gymnasium Road along the diagonal pedestrian route and south-west frontage from the Central Courtyard.
- Secondary address located indicatively on Sir Christopher Ondaatje Avenue along the eastern frontage.
- Service access from Gymnasium Road along the western frontage.

Landscape

- Interface with Sir Christopher Ondaatje Avenue.
- Interface with Mars Creek.
- Review and retain significant trees if possible.
- Refer to the Central Courtyard, The Grove (East Common), Sir Christopher Ondaatje Avenue and Mars Creek landscape guidelines.



LOT A19

Architectural Principles

Lot A19 is centrally positioned in the Academic Core, tucked between the new library and the Law School building (C5C), on the western side of University Common and Central Avenue. Building C3A is possibly to be retained. The lot is situated above the rail corridor.

Built Form

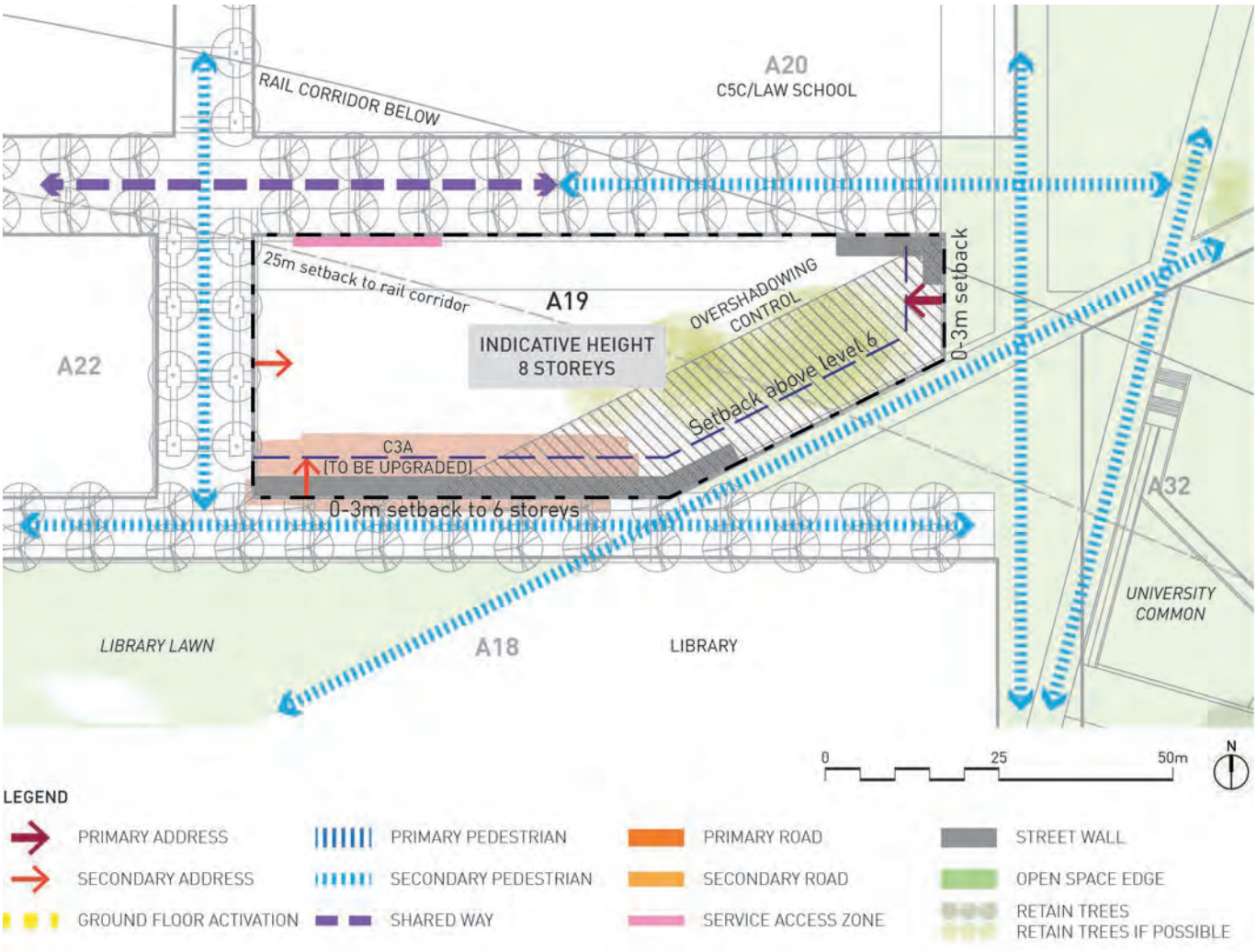
- Indicative height 8 storeys.
- Reinforce street wall along southern, eastern and the south-east diagonal frontages.
- Setback above level 6.
- Overshadowing control on the south-east corner. Height to be determined to minimise shadows on south-west corner of University Common between 11am and 2pm in mid-winter.

Access

- Primary address located indicatively on pedestrian route along the eastern frontage.
- Possible secondary addresses located indicatively on pedestrian routes on the southern and western frontages.
- Service access from the shared way along the northern frontage.

Landscape

- Interface with University Common and Library Lawn.
- Review and retain significant trees if possible.
- Refer to the University Common and Library Lawn landscape guidelines in the Public Domain chapter.



LOT A20

Architectural Principles

Lot A20 is centrally located within the Academic Core. The lot has an existing building to be retained. In the event it is redeveloped, the setback is moved in line with the adjacent lot A19. There is room for a new building on the western side of the lot. The lot is situated above the rail corridor.

Built Form

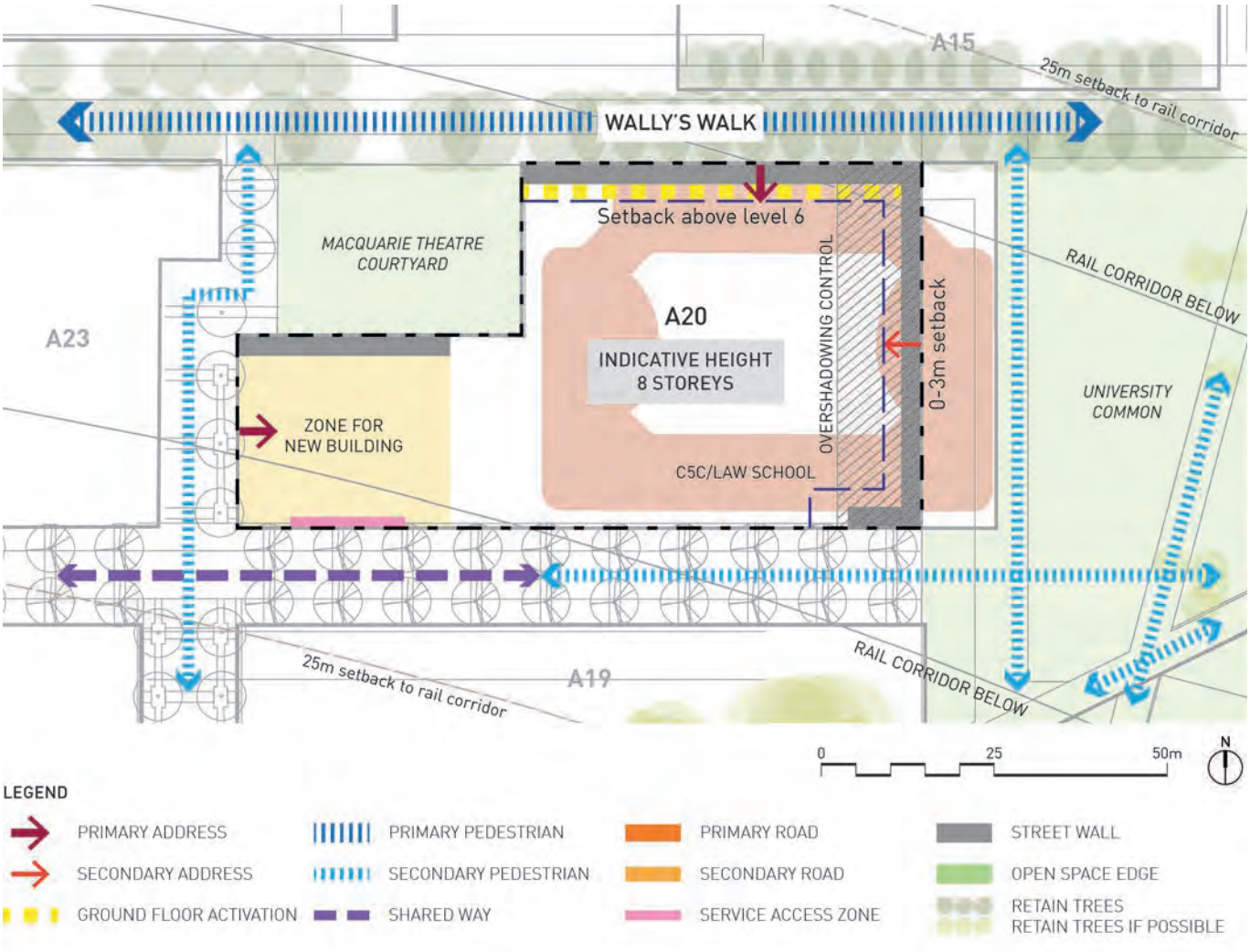
- Indicative height 8 storeys.
- Reinforce street wall on the north along Wally's Walk.
- Overshadowing control on the eastern frontage. Height to be determined to minimise shadows on western frontage of University Common between 11am and 2pm in mid-winter.

Access

- Primary addresses located indicatively on Wally's Walk and the pedestrian route along the western frontage.
- Secondary address located indicatively on the pedestrian route along the eastern frontage.
- Service access from the shared way along the southern frontage.

Landscape

- Interface with Macquarie Theatre Courtyard and University Common.
- Significant trees along Wally's Walk to be retained.
- Review and retain significant trees if possible.
- Refer to the Macquarie Theatre Courtyard, Wally's Walk and University Common landscape guidelines in the Public Domain chapter.



LOT A22

Architectural Principles

Lot A22 is located centrally within the Academic Core adjacent to Western Road and Western Road Park.

Built Form

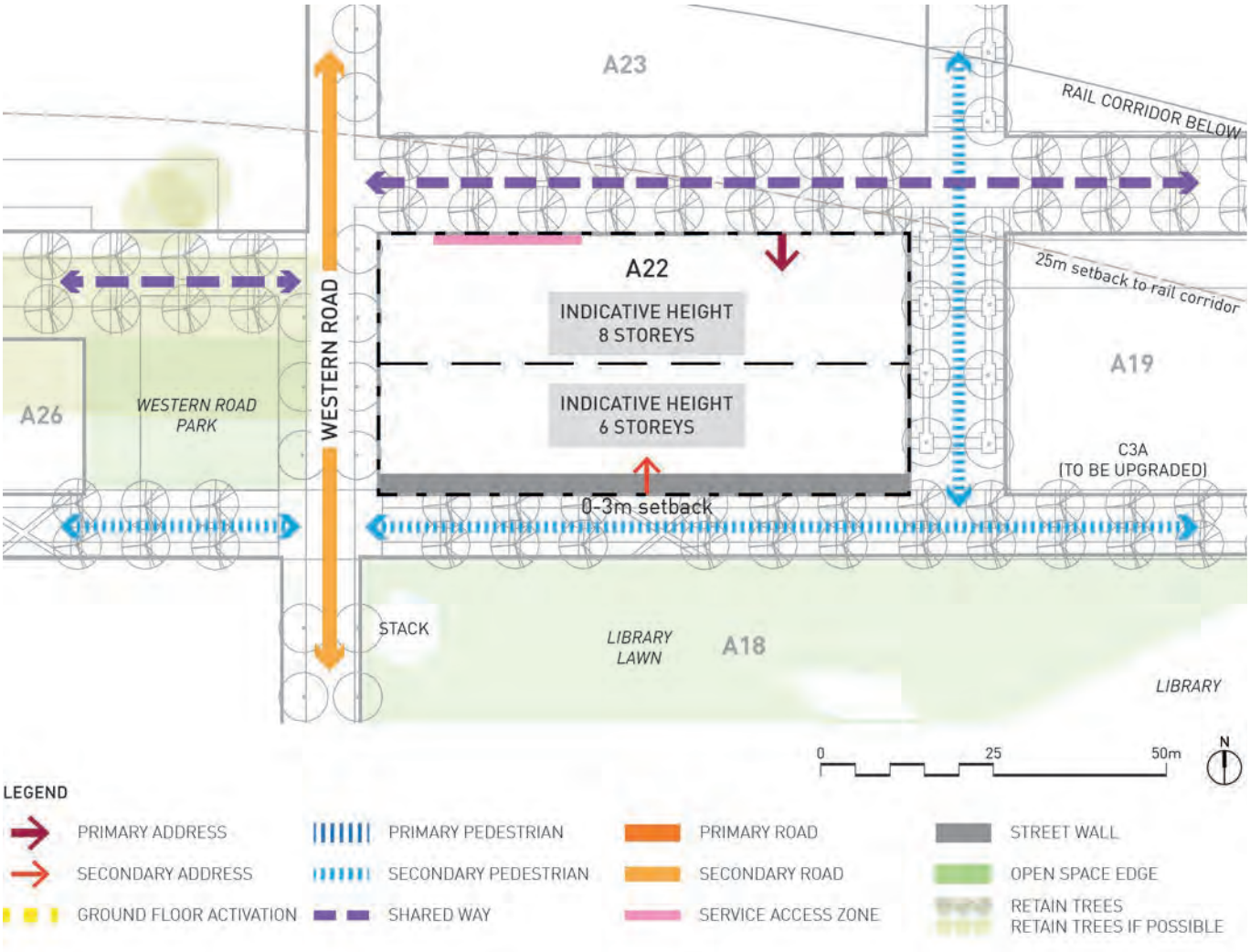
- Indicative height 8 storeys in northern section and 6 storeys in southern section of lot.

Access

- Primary address located indicatively on the shared way along the northern frontage.
- Secondary address located indicatively on the pedestrian route along the southern frontage.
- Service access from the shared way along the northern frontage.

Landscape

- Refer to the Western Road Park and Library Lawn landscape guidelines in the Public Domain chapter.



LOT A23

Architectural Principles

Lot A23 is located in the western portion of the Academic Core on the corner of Wally's Walk and Western Road. The lot has an existing building that will be retained. However, there is room for a new building on the western part of the lot. The lot is situated above the rail corridor.

Built Form

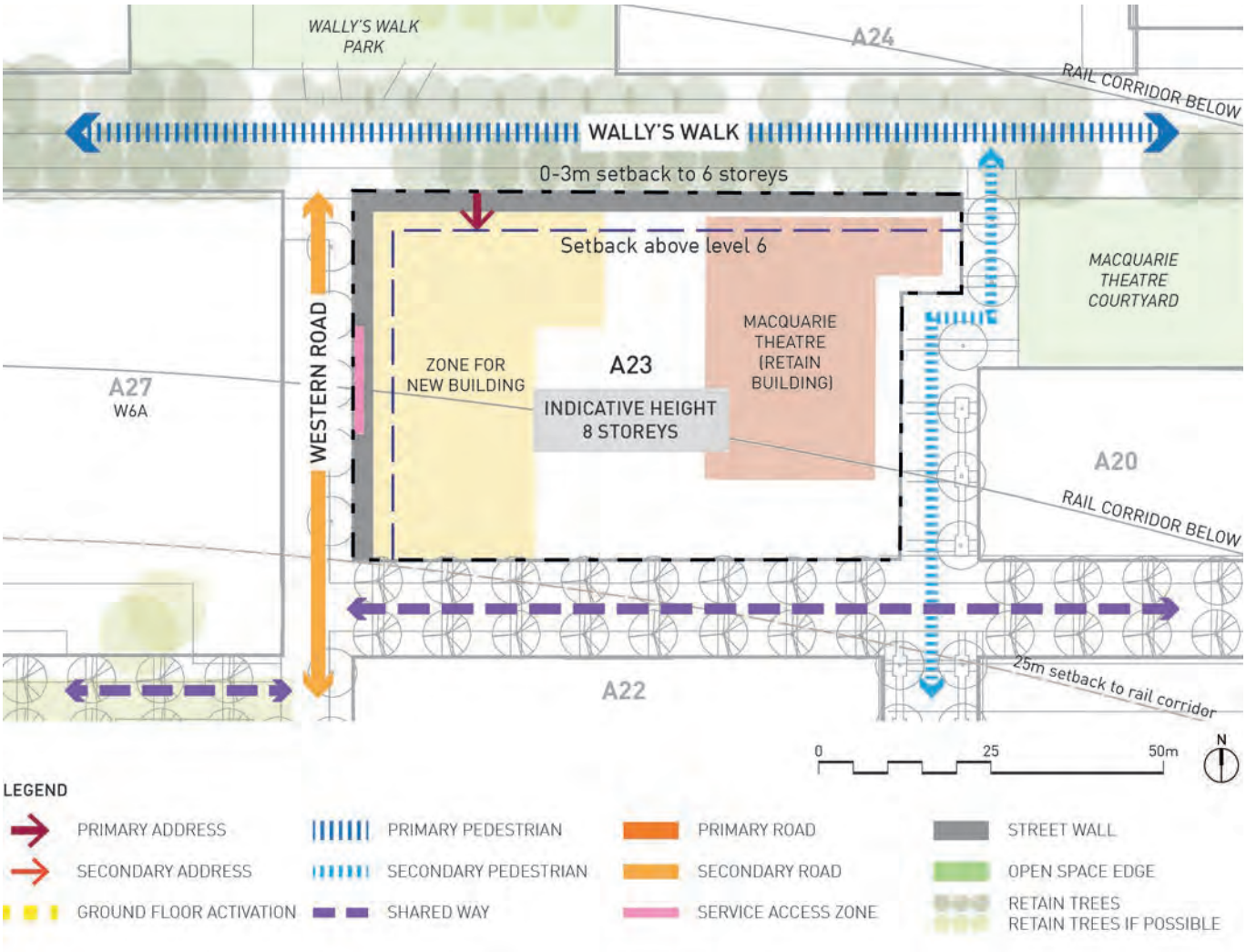
- Indicative height 8 storeys.
- Reinforce street wall along Wally's Walk and Western Road.
- Setback above level 6.

Access

- Primary address located indicatively on Wally's Walk on the northern frontage.
- Secondary address located indicatively on shared way along the southern frontage.
- Service access from Western Road along the western frontage.

Landscape

- Interface with Wally's Walk.
- Significant trees along Wally's Walk to be retained.
- Review and retain significant trees if possible.
- Refer to the Wally's Walk, Wally's Walk Park and Macquarie Theatre Courtyard landscape guidelines in the Public Domain chapter.



LOT A24

Architectural Principles

Lot A24 is located on Wally's Walk in the north-west sector of the Academic Core. The lot is on top of the rail easement.

Built Form

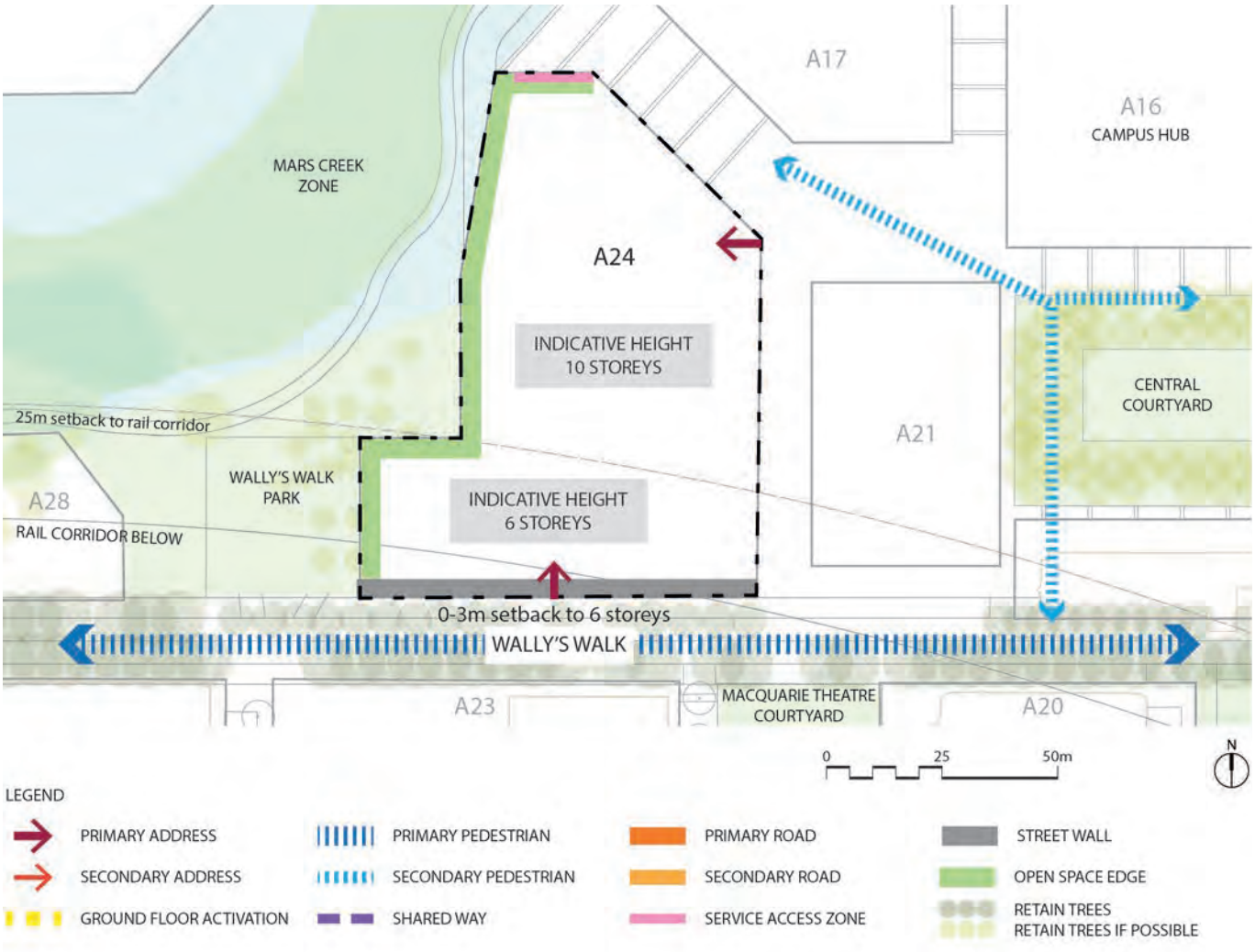
- Indicative height 6-10 storeys.
- Reinforce street wall along Wally's Walk on the south.
- Softer landscape edges to creek zone.
- Building to address the Mars Creek zone.

Access

- Primary address located indicatively on Wally's Walk along southern frontage.
- Service access from the shared way on the Gymnasium Road axis along the northern frontage.

Landscape

- Interface with the Mars Creek zone.
- Interface with Wally's Walk Park.
- Significant trees along Wally's Walk to be retained.
- Review and retain significant trees if possible.
- Refer to the Wally's Walk, Wally's Walk Park, Central Courtyard and Mars Creek landscape guidelines in the Public Domain chapter.



LOT A25

Architectural Principles

Lot A25 is located in the western zone of the Academic Core, adjacent to Library Lawn at the rear of the library on the corner of Macquarie Walk and Western Road.

Built Form

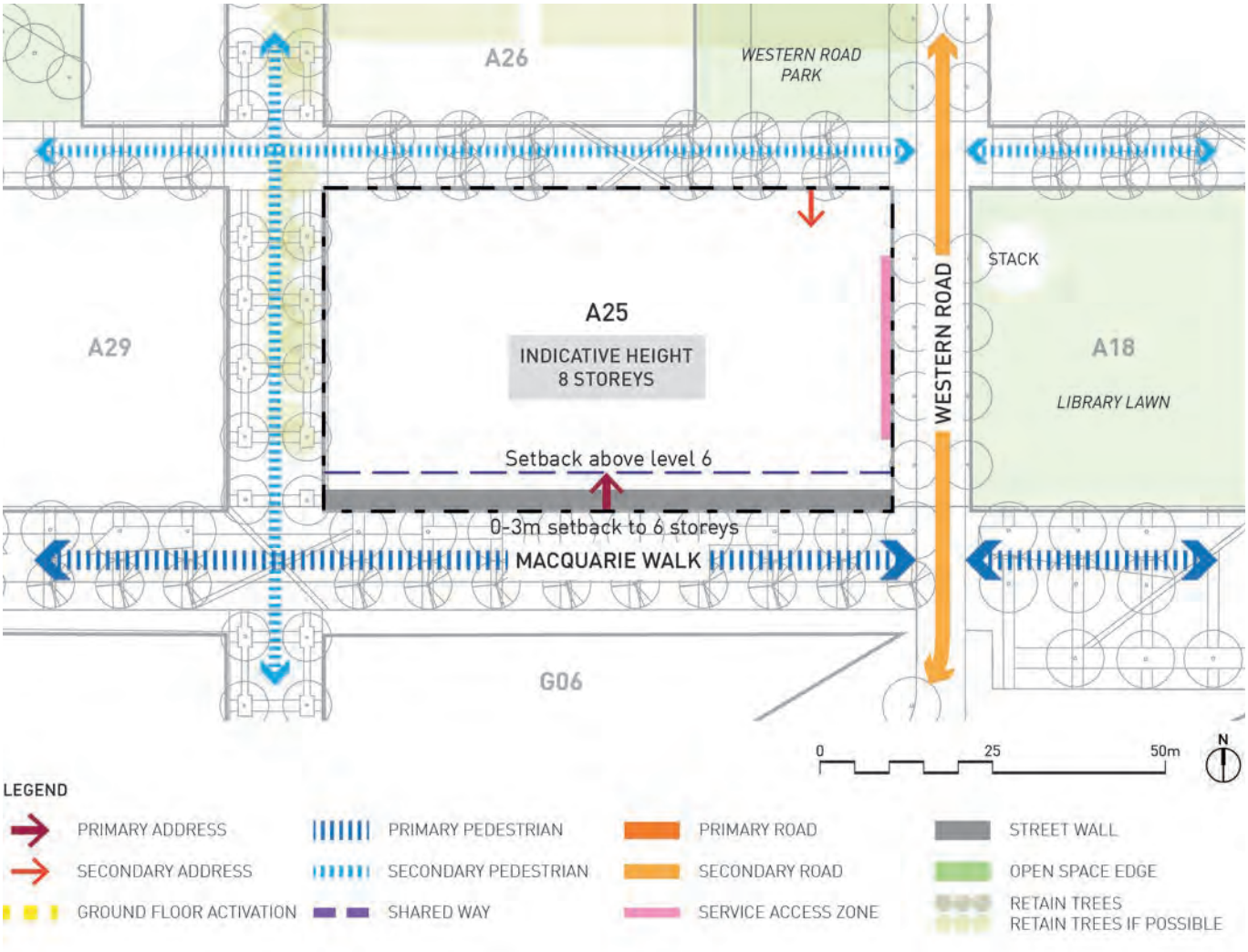
- Indicative height 8 storeys.
- Reinforce street wall along Macquarie Walk.
- Setback above level 6.

Access

- Primary address located indicatively on Macquarie Walk along the southern frontage.
- Secondary address located indicatively on the pedestrian route along the northern frontage from Western Road Park.
- Service access from Western Road along the eastern frontage.

Landscape

- Review and retain significant trees if possible.
- Refer to the Macquarie Walk, Library Lawn and Western Road Park landscape guidelines in the Public Domain chapter.



LOT A26

Architectural Principles

Lot A26 is located in the western part of the Academic Core. The lot is adjacent to a small open space along Western Road. The lot is discreet as is it not located on primary pedestrian or vehicle routes.

Built Form

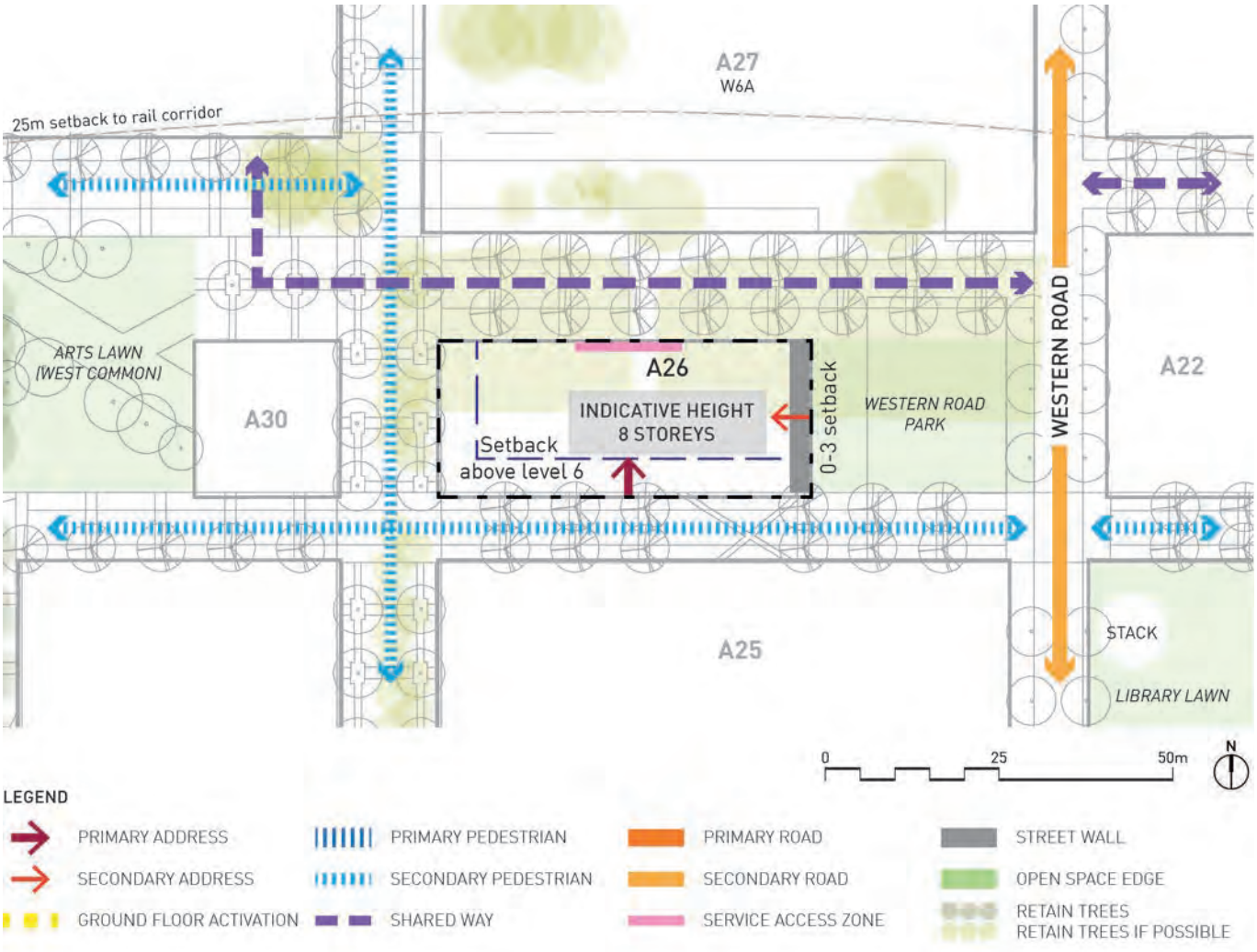
- Indicative height 8 storeys.
- Building is to address the pocket park.
- Reinforce street wall along the eastern frontage facing Western Road Park.

Access

- Primary address located indicatively on pedestrian route along the southern frontage.
- Secondary address located indicatively on eastern frontage from Western Road Park.
- Service access from the shared way along the northern frontage.

Landscape

- Interface with Western Road Park.
- Review and retain significant trees if possible.
- Refer to the Western Road Park landscape guidelines in the Public Domain chapter.



LOT A28

Architectural Principles

Lot A28 is located on the end of Wally's Walk fronting Mars Creek.

Built Form

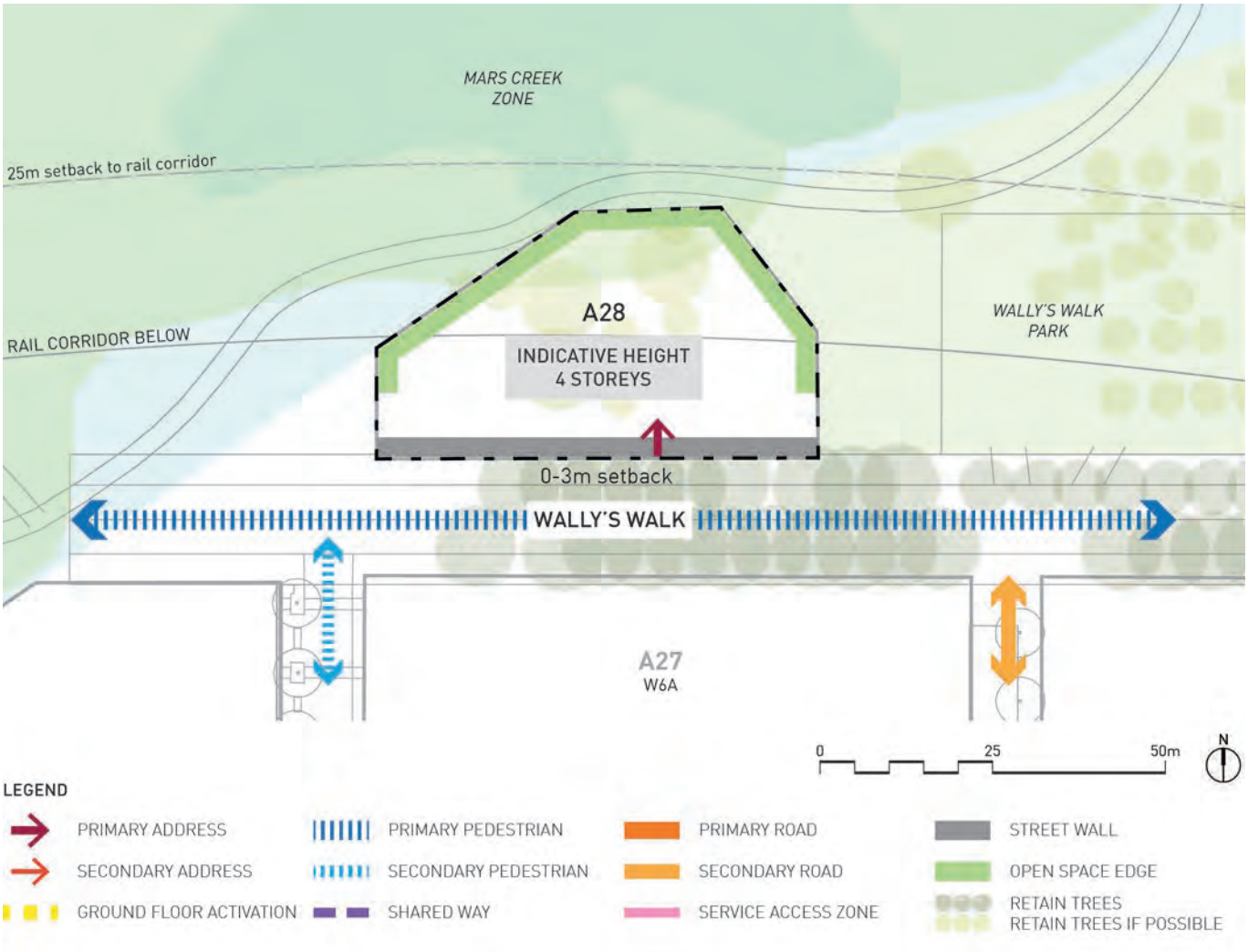
- Indicative height 4 storeys.
- Building to address Mars Creek.
- Reinforce street wall along Wally's Walk.

Access

- Primary address located indicatively on Wally's Walk along the southern frontage.
- There is no service access to the lot.

Landscape

- Interface with Mars Creek.
- Interface with Wally's Walk.
- Interface with Wally's Walk Park.
- Significant trees along Wally's Walk to be retained.
- Review and retain significant trees if possible.
- Refer to the Wally's Walk, Wally's Walk Park and Mars Creek landscape guidelines in the Public Domain chapter.



LOT A29

Architectural Principles

Lot A29 is located in the western part of the Academic Core, towards the western end of Macquarie Walk and on the southern side of the Arts Lawn (West Common).

Built Form

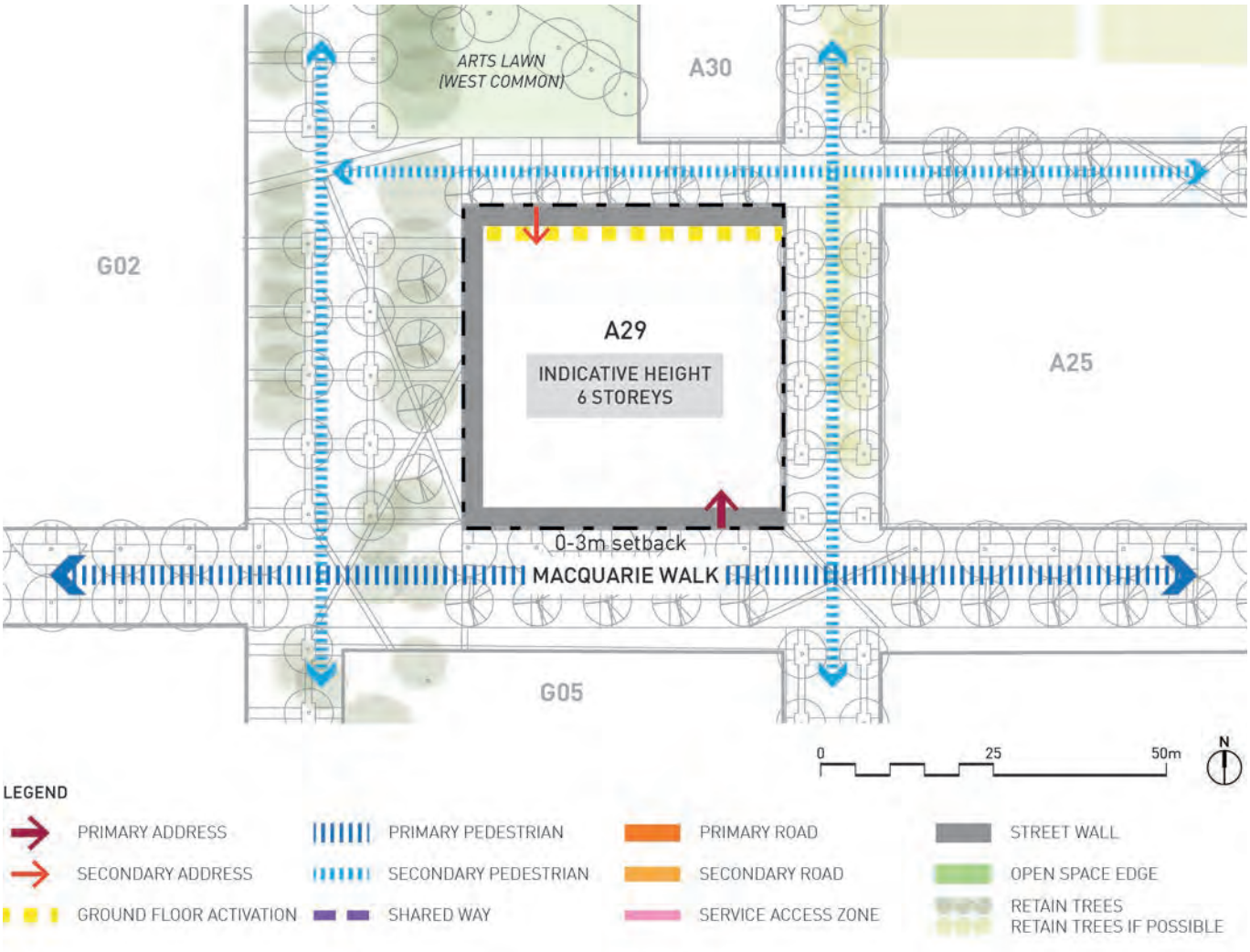
- Indicative height 6 storeys.
- Reinforce street walls on southern, western and northern frontage.
- Active uses are encouraged on northern frontage facing the Arts Lawn (West Common).

Access

- Primary address located indicatively on Macquarie Walk along the southern frontage.
- Secondary address located indicatively along the northern frontage from Arts Lawn (West Common).
- There is no service access to the lot.

Landscape

- Grove of existing eucalypts on western side of lot to remain.
- Review and retain significant trees if possible.
- Refer to the Macquarie Walk and Arts Lawn (West Common) landscape guidelines in the Public Domain chapter.



LOT A30

Architectural Principles

Lot A30 is located towards the far western side of the Academic Core on the eastern side of the Arts Lawn (West Common). The lot provides a social hub for the western campus.

Built Form

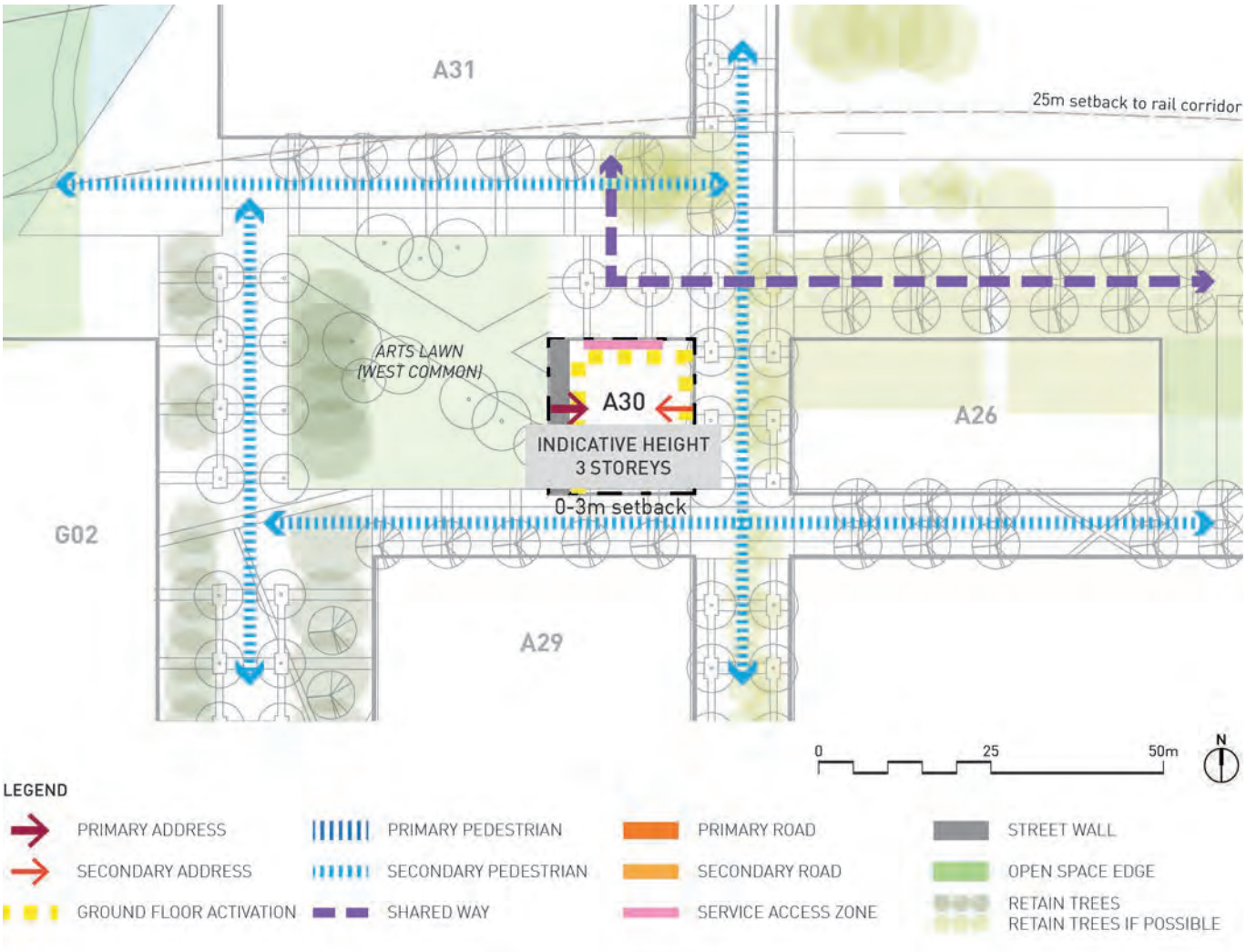
- Indicative height 3 storeys.
- Building is to address the Arts Lawn (West Common).
- Reinforce street wall along Arts Lawn (West Common) frontage.
- Active uses are encouraged for the whole of the ground floor.

Access

- Primary address located indicatively along the western frontage from the Arts Lawn (West Common).
- Secondary address located indicatively on pedestrian route along the eastern frontage.
- Service access from the shared way along the northern frontage.

Landscape

- Interface with Arts Lawn (West Common).
- Review and retain significant trees if possible.
- Refer to the Arts Lawn (West Common) landscape guidelines in the Public Domain chapter.



LOT A31

Architectural Principles

Lot A31 is located on the western fringe of the Academic Core, terminating the western end of the primary pedestrian route, Wally's Walk. The Arts Lawn (West Common) is on the south of the lot and the Mars Creek zone is to the east and north.

Built Form

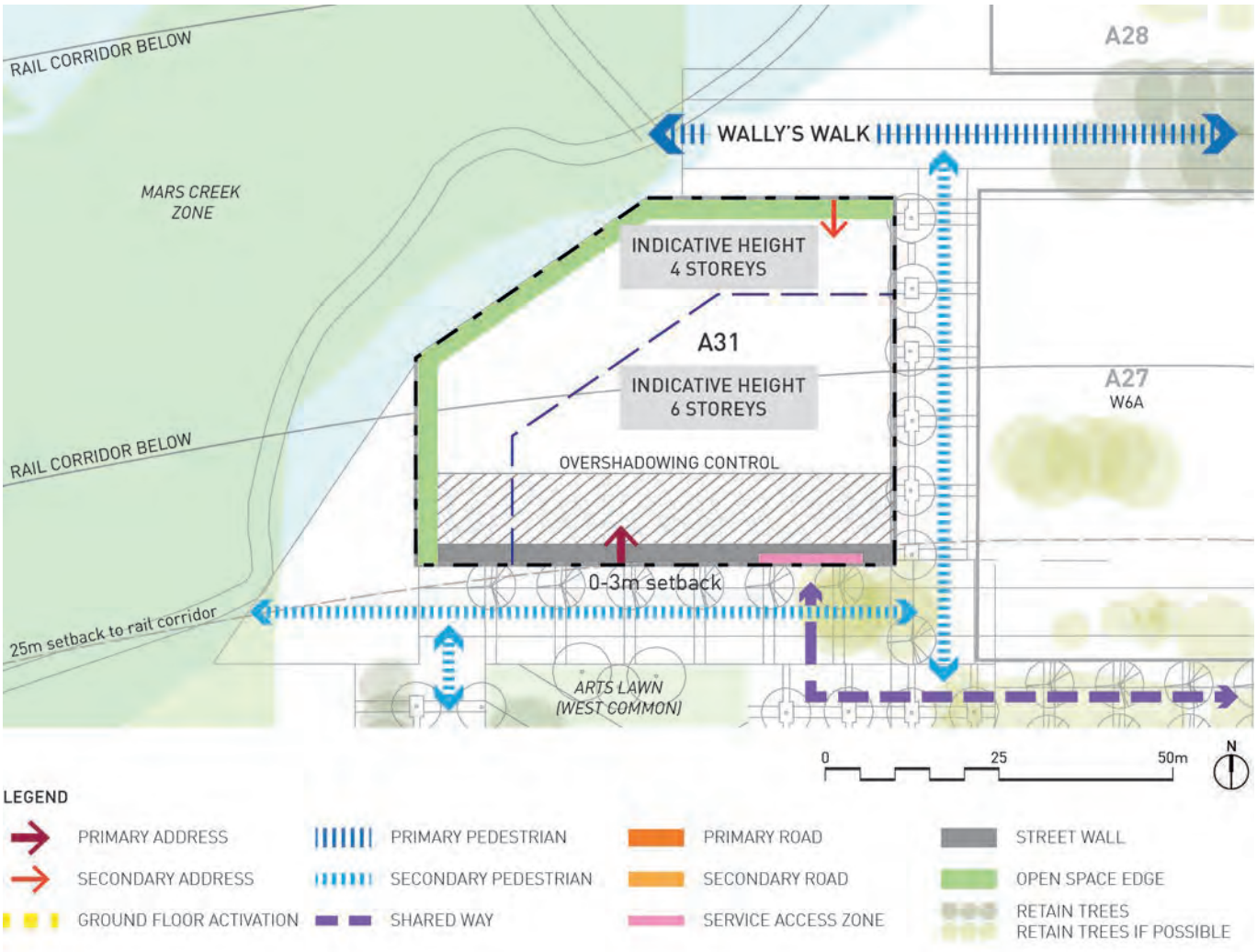
- Indicative height 6 storeys.
- Reinforce street wall along southern frontage facing the Arts Lawn (West Common).
- Building is to address the Mars Creek zone.
- There is an overshadowing control along southern frontage. The height is to be determined with a requirement to maximise solar access to the Arts Lawn (West Common) open space between 11am and 2pm in mid-winter.

Access

- Primary address located indicatively on pedestrian route along the south frontage from the Arts Lawn (West Common).
- Secondary address located indicatively on Wally's Walk along the northern frontage.
- Service access from the shared way along the southern frontage.

Landscape

- Interface with Mars Creek.
- Review and retain significant trees if possible.
- Refer to the Wally's Walk, Mars Creek and Arts Lawn (West Common) landscape guidelines in the Public Domain chapter.



LOT A32

Architectural Principles

Lot A32 is located underground, below the University Common on the corner of the primary pedestrian routes Sir Christopher Ondaatje Avenue and Macquarie Walk. The lot is situated above the rail corridor and there is a change in level across the University Common.

Built Form

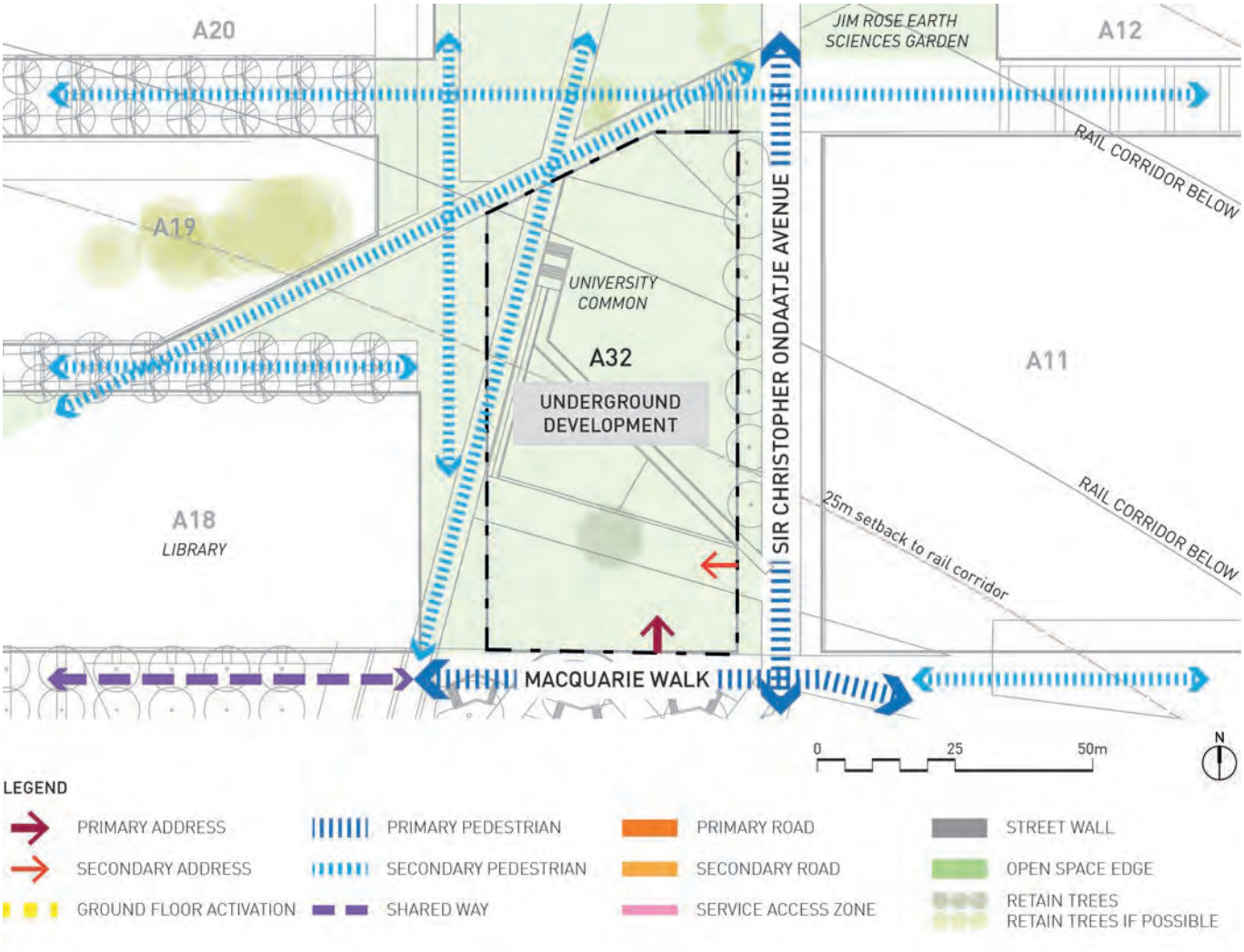
– Underground development.

Access

– Primary address located indicatively on Macquarie Walk along the southern frontage.
– Secondary address located indicatively on Sir Christopher Ondaatje Avenue along the eastern frontage.
– There is no service access to the lot.

Landscape

– Interface with University Common.
– Review and retain significant trees if possible.
– Refer to the University Common, Sir Christopher Ondaatje Avenue and Macquarie Walk landscape guidelines in the Public Domain chapter.



5.2.2 Precinct B

Precinct B, the University housing precinct, is located in the north-west of the campus and adjoins Culloden, Waterloo and Vimera Roads.



FIGURE 35: LOTS WITHIN PRECINCT B

LOT B01

Architectural Principles

Lot B01 is located on the intersection of Waterloo and Vimera Roads. It's on University-owned land across Culloden Road from the main campus. It is identified for University housing. The lot is adjacent to residential buildings on Vimiera Road.

Built Form

- Indicative height 4 storeys around boundary and 6 storeys in the centre.
- The lot is suitable to support several buildings.
- Buildings are to address Waterloo Road, Vimiera Road and the network of secondary roads within the lot.

Access

- Primary addresses located indicatively on Waterloo Road along the north-east frontage and Vimiera Road along the north-west frontage.
- Service access from the internal secondary roads.

Landscape

- Possible central open space.
- Landscape buffer along Vimera Road to setback development.
- Interface with Culloden Creek zone on southern boundary.
- Review and retain significant trees if possible.
- Refer to the Culloden Creek landscape guidelines in the Public Domain chapter.



LOT B02

Architectural Principles

Lot B02 is located across from the main campus on the corner of Culloden and Waterloo Roads, at the Gymnasium Road Gateway. It is identified for University housing.

Built Form

- Indicative height 4 storeys around boundary and 6 storeys in the centre.
- The lot is suitable to contain several buildings.
- Buildings are to address Culloden and Waterloo Roads and the network of secondary roads throughout the lot.

Access

- Primary address located indicatively on Culloden Road along the south-east frontage.
- Secondary addresses located indicatively along the internal secondary roads.
- Service access from Culloden Road along the south-east frontage and internal secondary roads.

Landscape

- Interface with Culloden Creek zone on northern boundary.
- Interface with the Gymnasium Road Gateway.
- Review and retain significant trees if possible.
- Refer to the Culloden Creek and Gymnasium Road Gateway landscape guidelines in the Public Domain chapter.



LOT B03

Architectural Principles

Lot B03 is bounded by Gymnasium, Culloden and West Precinct Roads within the Gymnasium Road Gateway of the campus.

Built Form

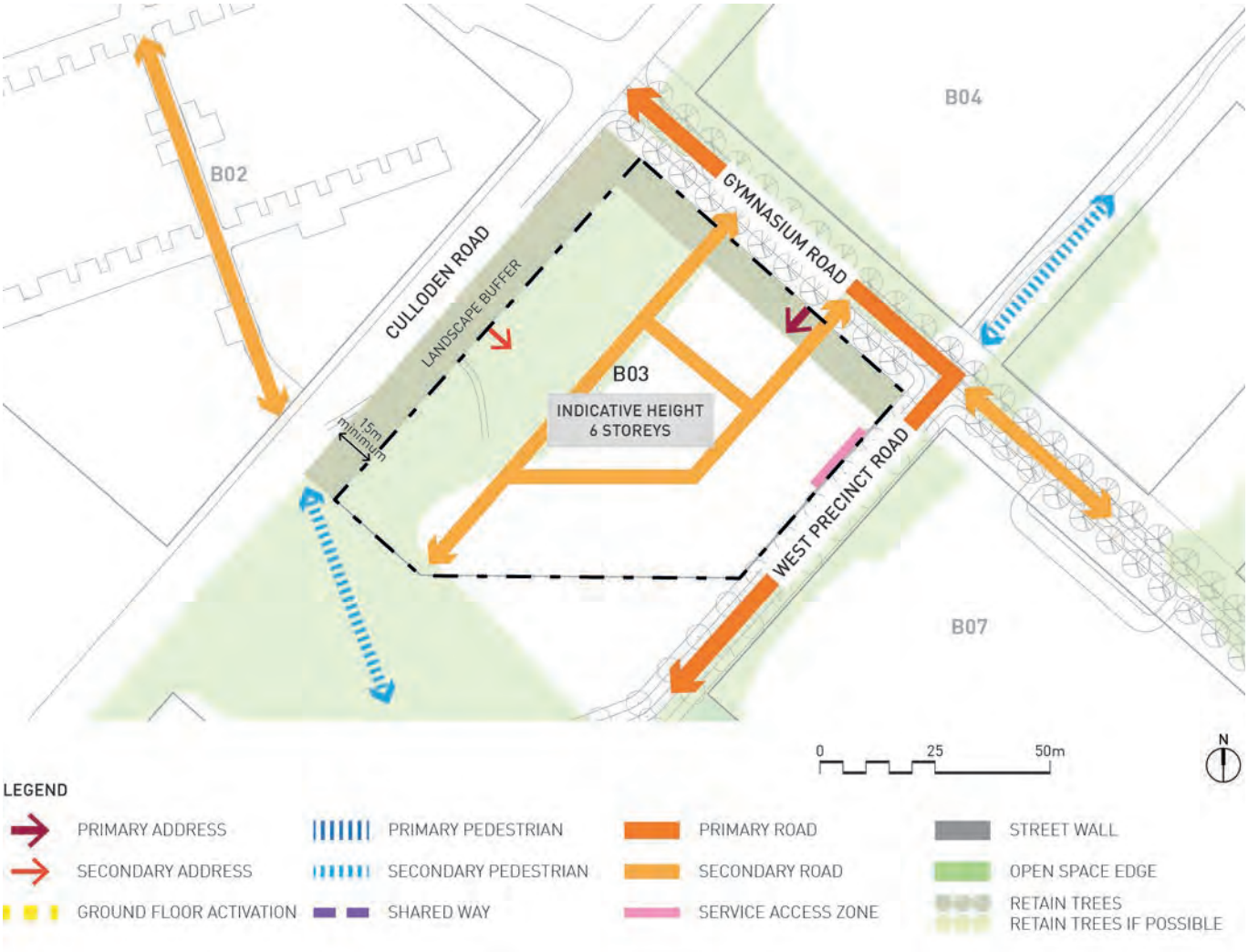
- Indicative height 6 storeys.
- The lot is suitable to support multiple buildings.
- Buildings are to address Culloden and Gymnasium Roads.

Access

- Primary address located indicatively on Gymnasium Road along the north-east frontage.
- Potential secondary address located indicatively on Culloden Road along the north-west frontage.
- Service access from West Precinct Road along the north-east frontage and the internal secondary roads.

Landscape

- Interface with the Gymnasium Road Gateway.
- Landscape buffer along Culloden Road.
- Review and retain significant trees if possible.
- Refer to the Gymnasium Road Gateway and West Precinct Road landscape guidelines in the Public Domain chapter.



LOT B04

Architectural Principles

Lot B04 is located on the corner of Culloden and Gymnasium Roads within the Gymnasium Road Gateway in the north of the campus. The lot is adjacent to residential buildings on Culloden Road.

Built Form

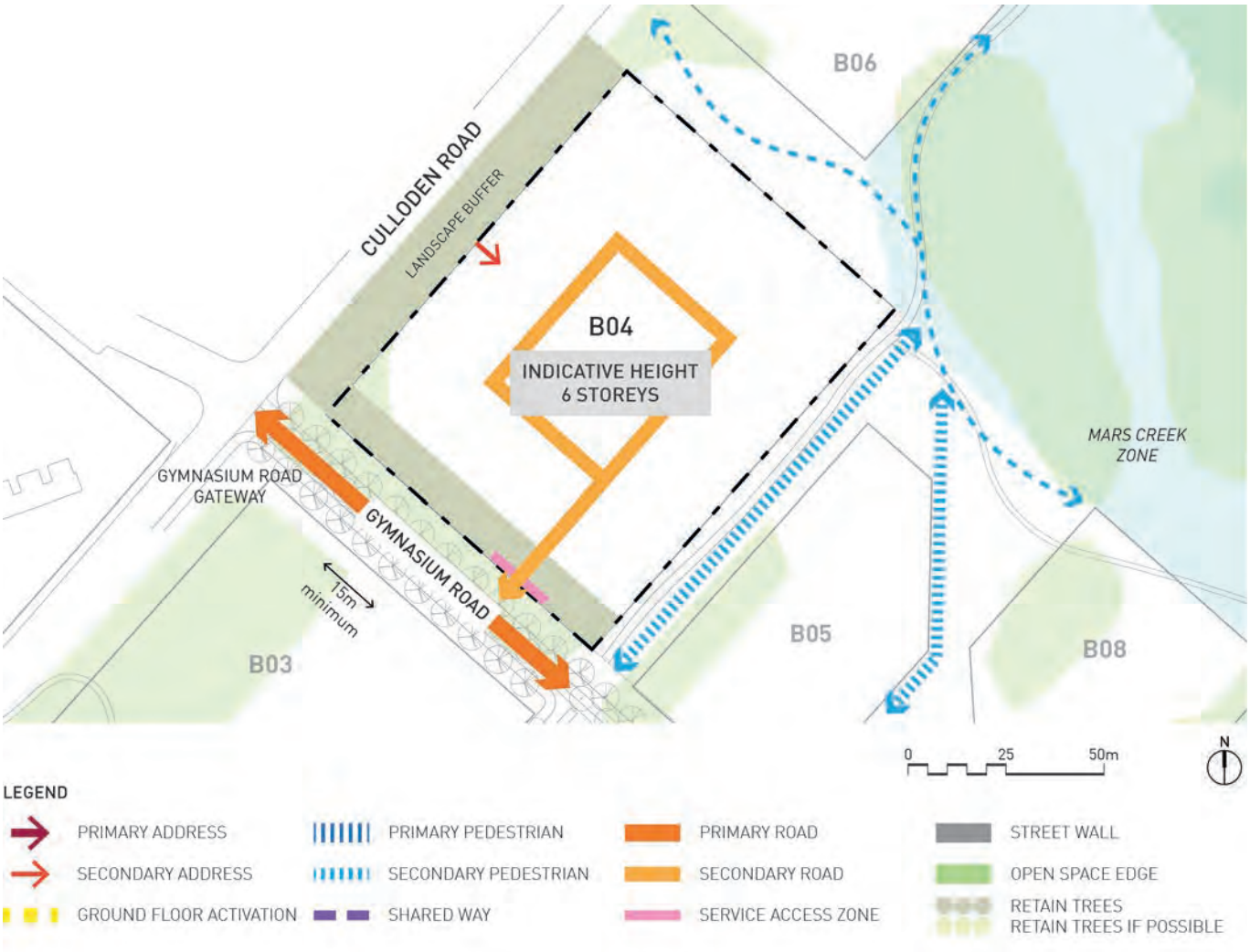
- Indicative height 6 storeys.
- The lot is suitable to contain several buildings.
- Buildings are to address Culloden and Gymnasium Roads.

Access

- Primary address located indicatively on Gymnasium Road along the south-west frontage.
- Potential secondary address located indicatively on Culloden Road along the north-west frontage.
- Service access from Gymnasium Road along the south-west frontage.

Landscape

- Interface with the Gymnasium Road Gateway and Mars Creek zone.
- Landscape buffer along corner of Culloden and Gymnasium Roads
- Review and retain significant trees if possible.
- Refer to the Gymnasium Road Gateway and Mars Creek landscape guidelines in the Public Domain chapter.



LOT B05

Architectural Principles

Lot B05 is located near the Gymnasium Road Gateway, adjacent to West Precinct and Gymnasium Roads.

Built Form

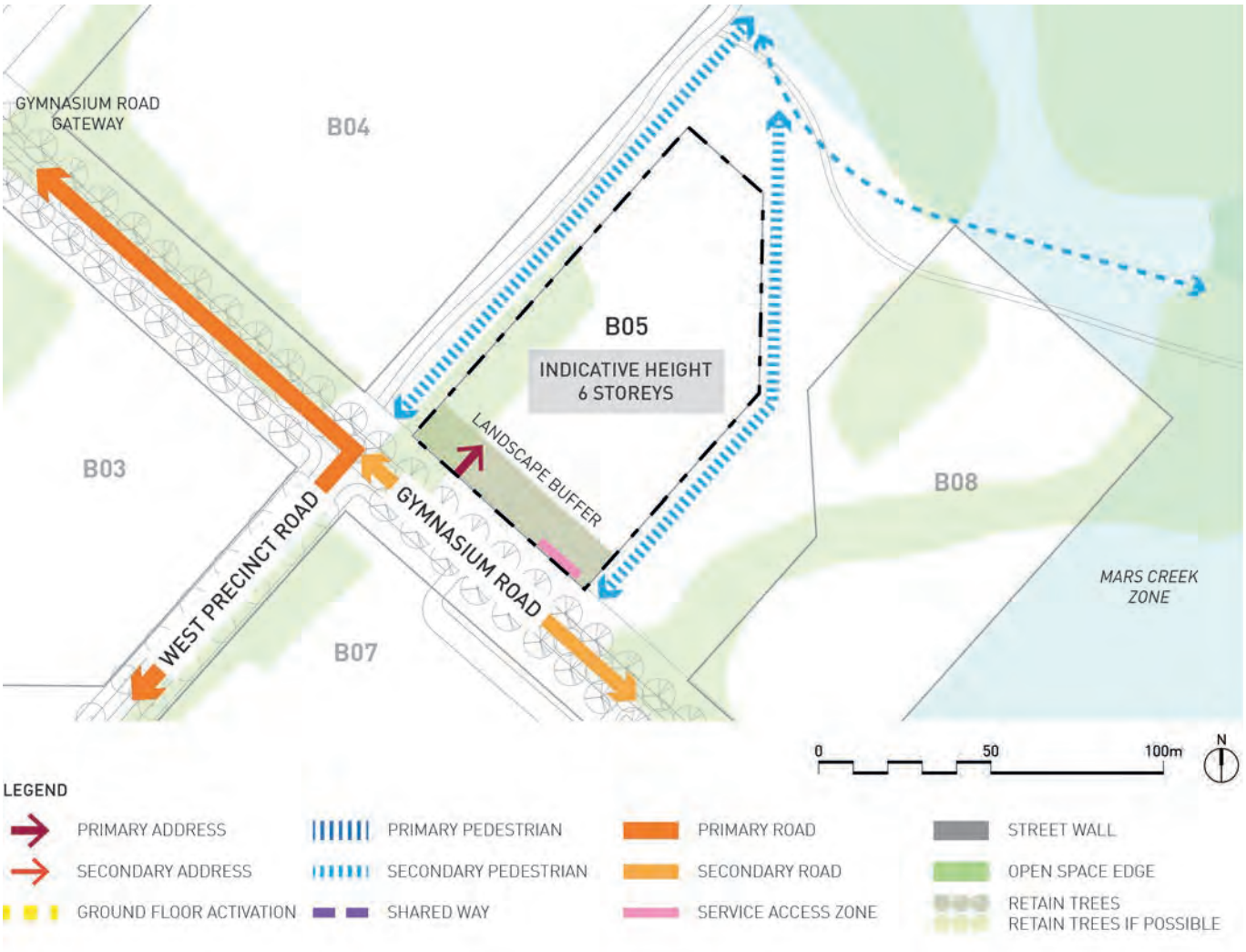
- Indicative height 6 storeys.
- Building is to address Gymnasium Road.

Access

- Primary address located indicatively on Gymnasium Road along the south-west frontage.
- Service access from Gymnasium Road along the south-west frontage.

Landscape

- Interface with the Gymnasium Road Gateway and Mars Creek zone.
- Landscape buffer along Gymnasium Road.
- Review and retain significant trees if possible.
- Refer to the Gymnasium Road Gateway, West Precinct Road and Mars Creek landscape guidelines in the Public Domain chapter.



LOT B06

Architectural Principles

Lot B06 is located on Culloden Road in the north of the main campus. The lot is adjacent to residential buildings on Culloden Road.

Built Form

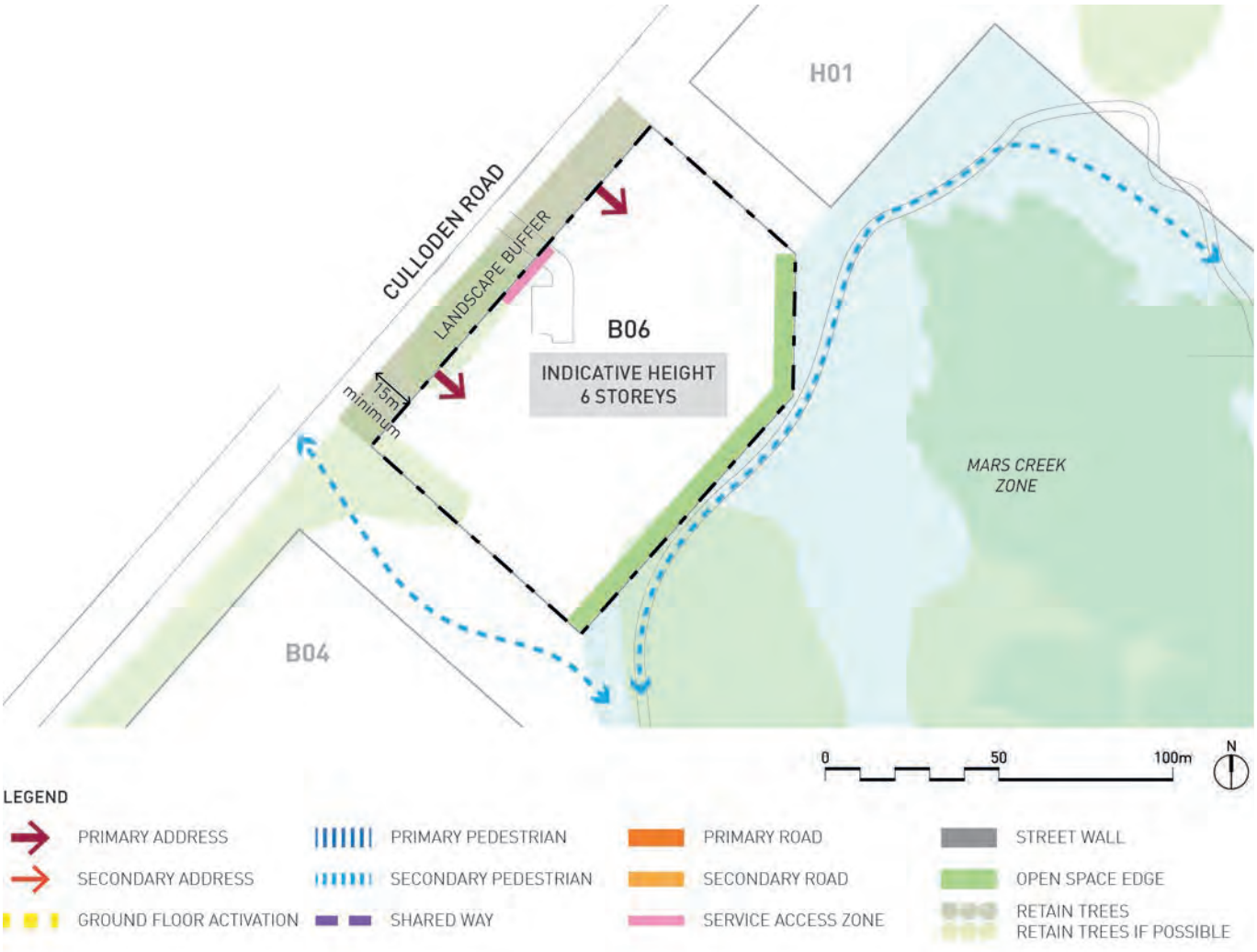
- Indicative height 6 storeys.
- Building is to address Culloden Road and the Mars Creek zone.

Access

- Primary addresses located indicatively on Culloden Road along the north-west frontage.
- Service access from Culloden Road along the north-west frontage.

Landscape

- Interface with the Mars Creek zone.
- Landscape buffer along Culloden Road.
- Review and retain significant trees if possible.
- Refer to the Mars Creek landscape guidelines in the Public Domain chapter.



LOT B07

Architectural Principles

Lot B07 is located on the corner of the West Precinct and Gymnasium Roads, fronting the Mars Creek Zone. The lot has an existing building, the Sport and Aquatic Centre, to be retained.

Built Form

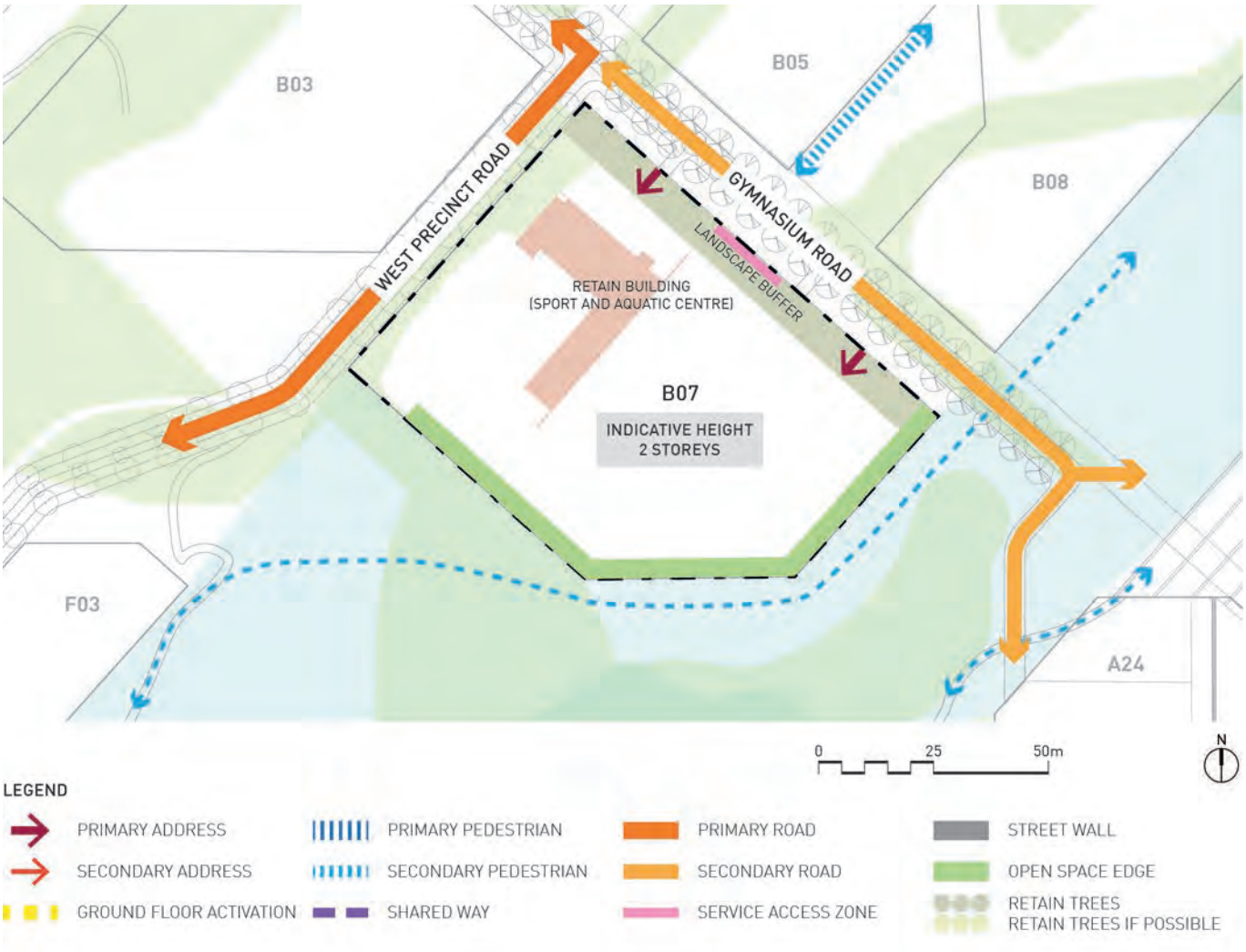
- Indicative height 2 storeys.
- Building is to address Gymnasium Road and Mars Creek zone.

Access

- Primary addresses located indicatively on Gymnasium Road along the north-east frontage.
- Service access from Gymnasium Road along the north-east frontage.

Landscape

- Interface with Mars Creek zone.
- Landscape buffer along Gymnasium Road.
- Review and retain significant trees if possible.
- Refer to the West Precinct Road and Mars Creek landscape guidelines in the Public Domain chapter.



LOT B08

Architectural Principles

Lot B08 is located at the southern end of Gymnasium Road, fronting the Mars Creek zone. The building is for public use.

Built Form

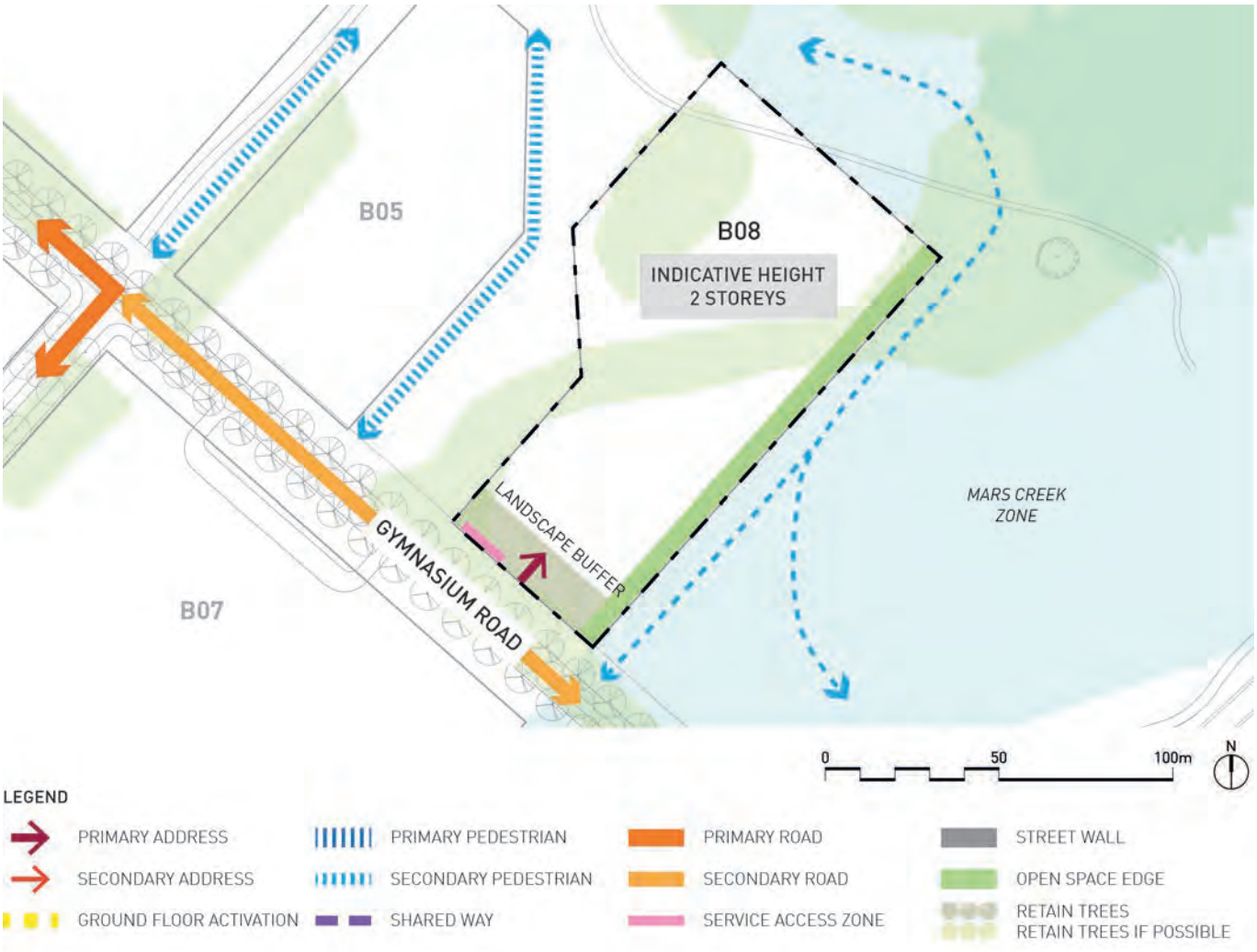
- Indicative height 2 storeys.
- Building is to address Gymnasium Road and Mars Creek zone.

Access

- Primary address located indicatively on Gymnasium Road along south-west frontage.
- Service access from Gymnasium Road along south-west frontage.

Landscape

- Interface with the Mars Creek zone.
- Review and retain significant trees if possible.
- Refer to the Mars Creek landscape guidelines in the Public Domain chapter.



5.2.3 Precinct C

Precinct C, the University open space and playing fields, is located in the far north of the campus and adjoins the M2 Motorway.

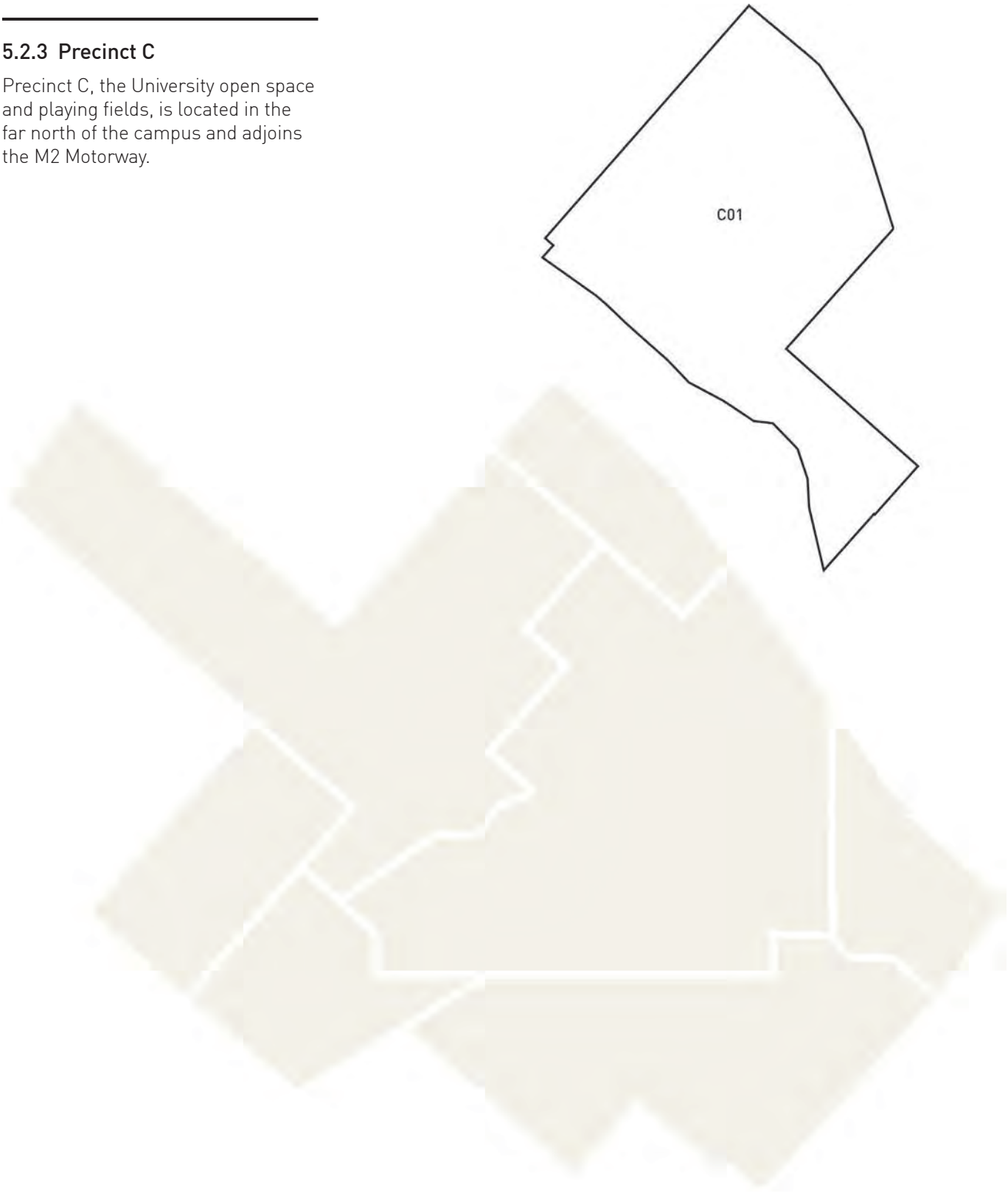
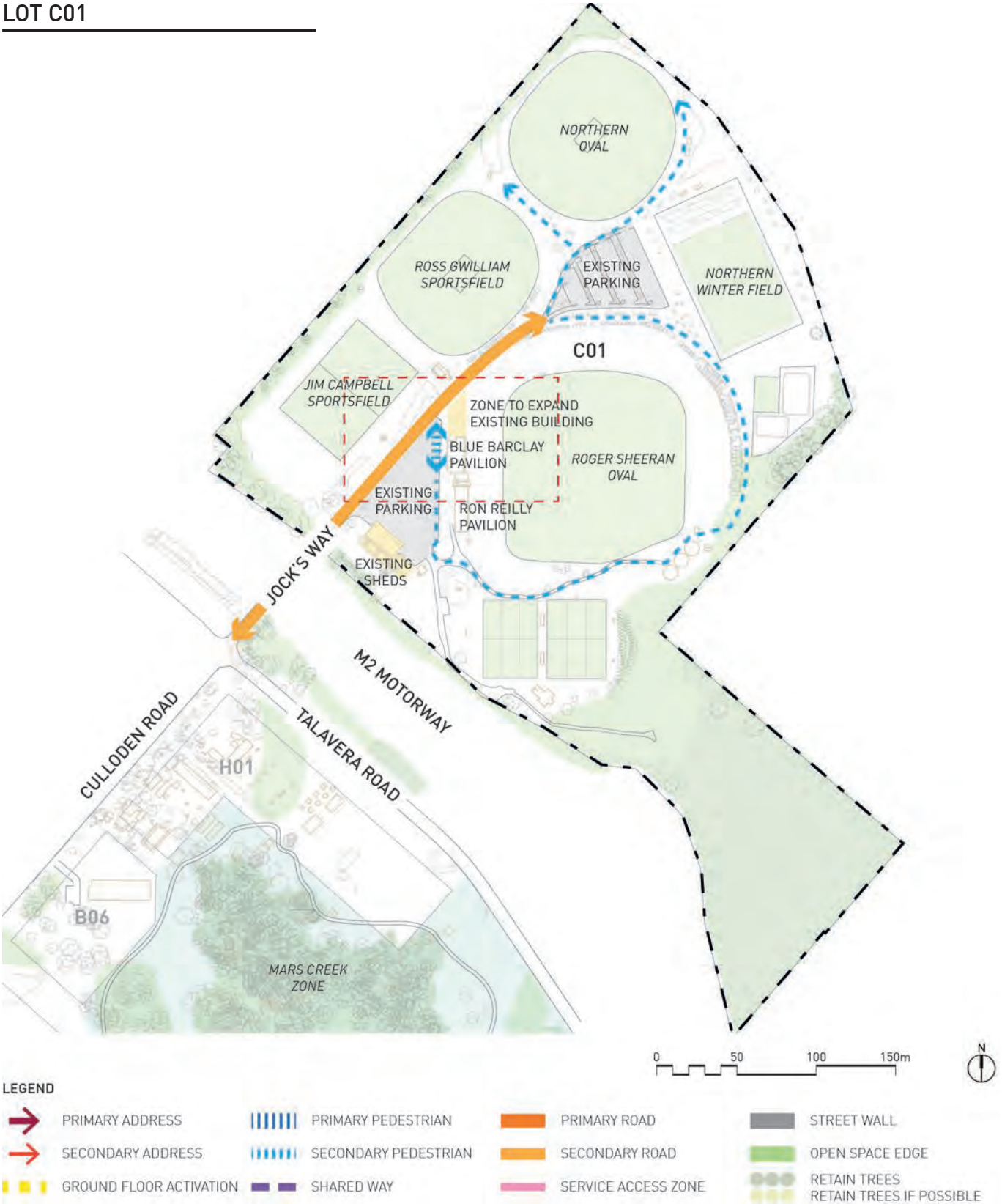


FIGURE 36: LOT WITHIN PRECINCT C

LOT C01


NORTHERN OVAL
ROSS GWILLIAM SPORTSFIELD
EXISTING PARKING
NORTHERN WINTER FIELD
C01
JIM CAMPBELL SPORTSFIELD
ZONE TO EXPAND EXISTING BUILDING
BLUE BARCLAY PAVILION
ROGER SHEERAN OVAL
EXISTING PARKING
RON REILLY PAVILION
EXISTING SHEDS
JOCK'S WAY
M2 MOTORWAY
CULLODEN ROAD
TALAVERA ROAD
H01
B06
MARS CREEK ZONE
0
50
100
150m
N
LEGEND
PRIMARY ADDRESS
SECONDARY ADDRESS
GROUND FLOOR ACTIVATION
PRIMARY PEDESTRIAN
SECONDARY PEDESTRIAN
SHARED WAY
PRIMARY ROAD
SECONDARY ROAD
SERVICE ACCESS ZONE
STREET WALL
OPEN SPACE EDGE
RETAIN TREES
RETAIN TREES IF POSSIBLE

Architectural Principles

Lot C01 is located on University land across the M2 Motorway, north of the main campus. The lot contains sports fields and ancillary buildings, storage sheds and car parking.

Built Form

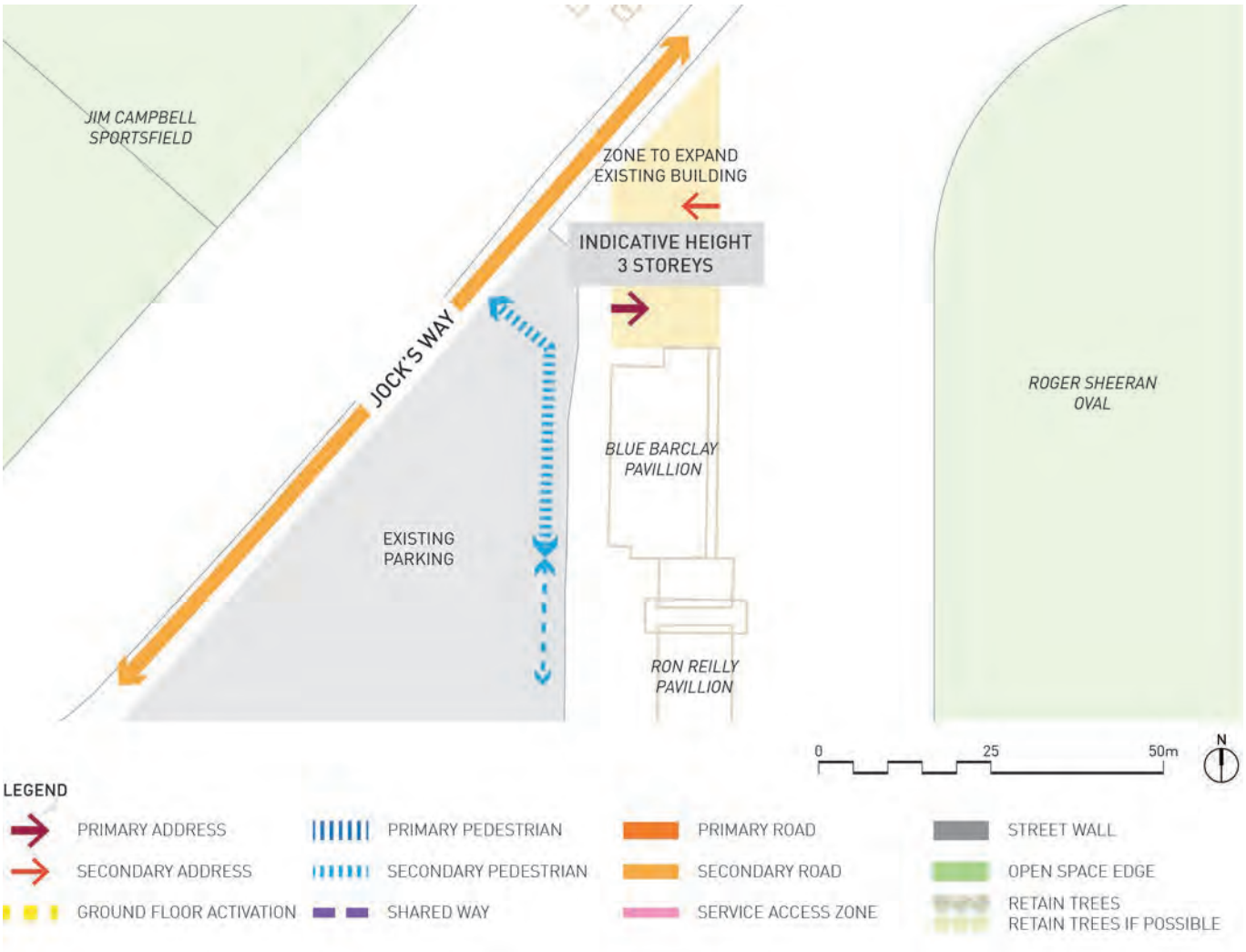
- Indicative height 3 storeys.
- Building should be expanded to the same axis north of the Blue Barclay Pavilion, between the pavilion and Jock's Way.
- Building should address Roger Sheeran Oval.
- Indicatively the eastern frontage of the building should align with the Blue Barclay Pavilion.
- New support facilities (ancillary to the sports field and/or university uses) up to 3 storeys may be delivered independently (ie. outside of the Blue Barclay Pavilion expansion zone) within Precinct C.

Access

- Primary address located indicatively to the new building from the existing parking.
- Secondary address located indicatively to the new building from Roger Sheeran Oval.
- No service access proposed for the new building.

Landscape

- Interface with Roger Sheeran Oval.
- Review and retain significant trees if possible.
- Refer to the Macquarie University Sports Fields landscape guidelines in the Public Domain chapter.



5.2.4 Precinct D

Precinct D, the Macquarie University Research Park (MURP) and private hospital, is located in the east of the campus, on the corner of Talavera and Herring Roads. Legacy building lots are shown in grey.

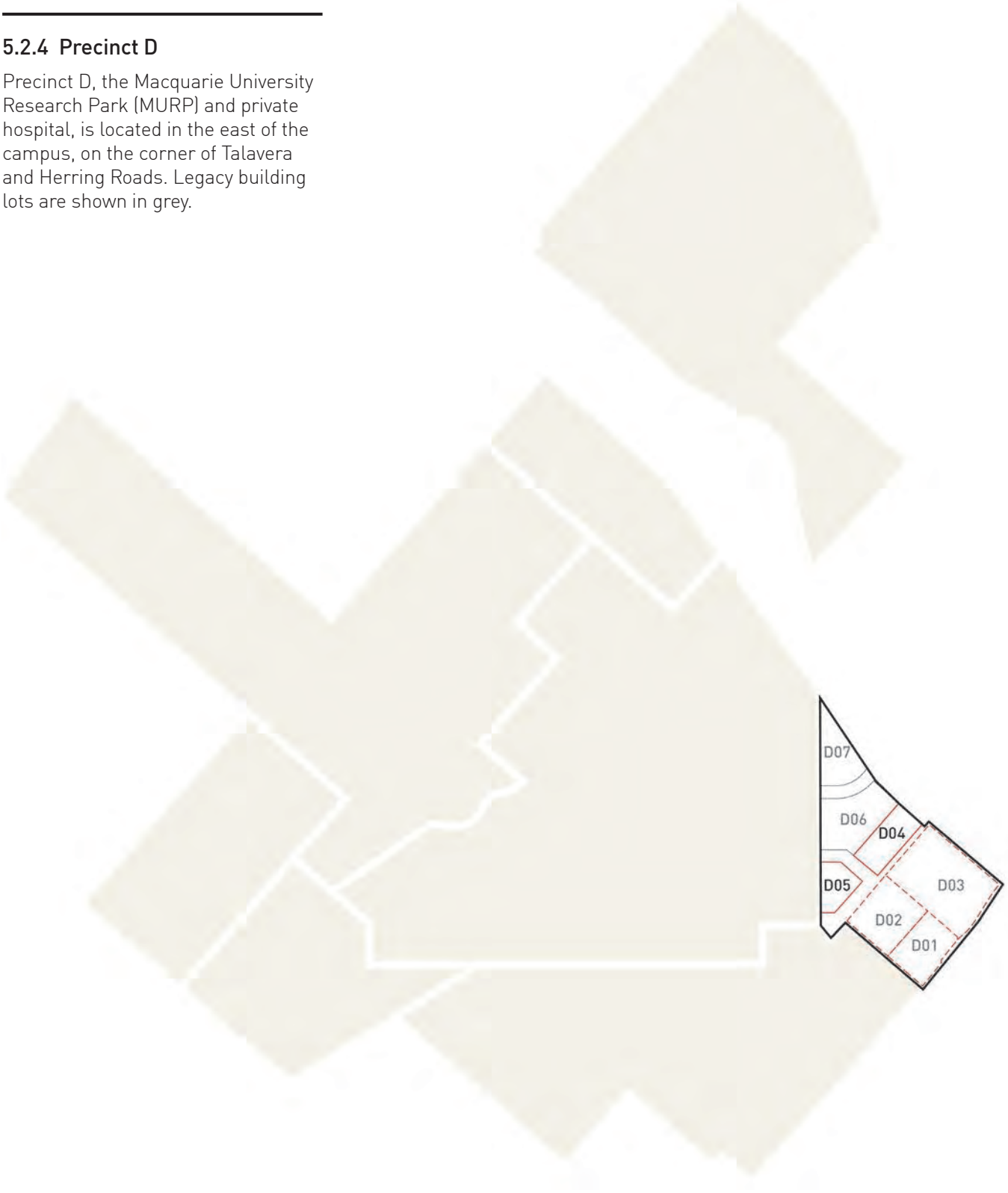


FIGURE 37: LOTS WITHIN PRECINCT D

LOT D01

Architectural Principles

Lot D01 is located on the eastern end of the Macquarie University Research Park Precinct, at the intersection of Herring Road and Innovation Road.

Lot boundaries generally match LEP mapping.

Built Form

- Lot Area 6,098 m².
- Maximum FSR 2.5:1.
- Maximum height 45m.
- Built form should address Herring Road.
- Preserve maximum GFA of 15,245 m² if Herring Road is widened.

Access

- Primary address located on Herring Road.
- Secondary addresses located on north-east and north-west frontages along Innovation Road and at Lot D02.
- Service access from the shared way along north-west frontage.

Landscape

- Interface with open space linking with Interchange Plaza.
- Review and retain significant trees where possible.
- Refer to the Innovation Road and Herring Road landscape guidelines in the Public Domain chapter.
- Accommodate widened footpath zone on Innovation Road frontage.



LOT D02

Architectural Principles

Lot D02 is located towards the eastern end of both the Macquarie University Research Park and Innovation Road. The lot lies directly on the University Creek zone.

Lot boundaries generally match LEP mapping.

Built Form

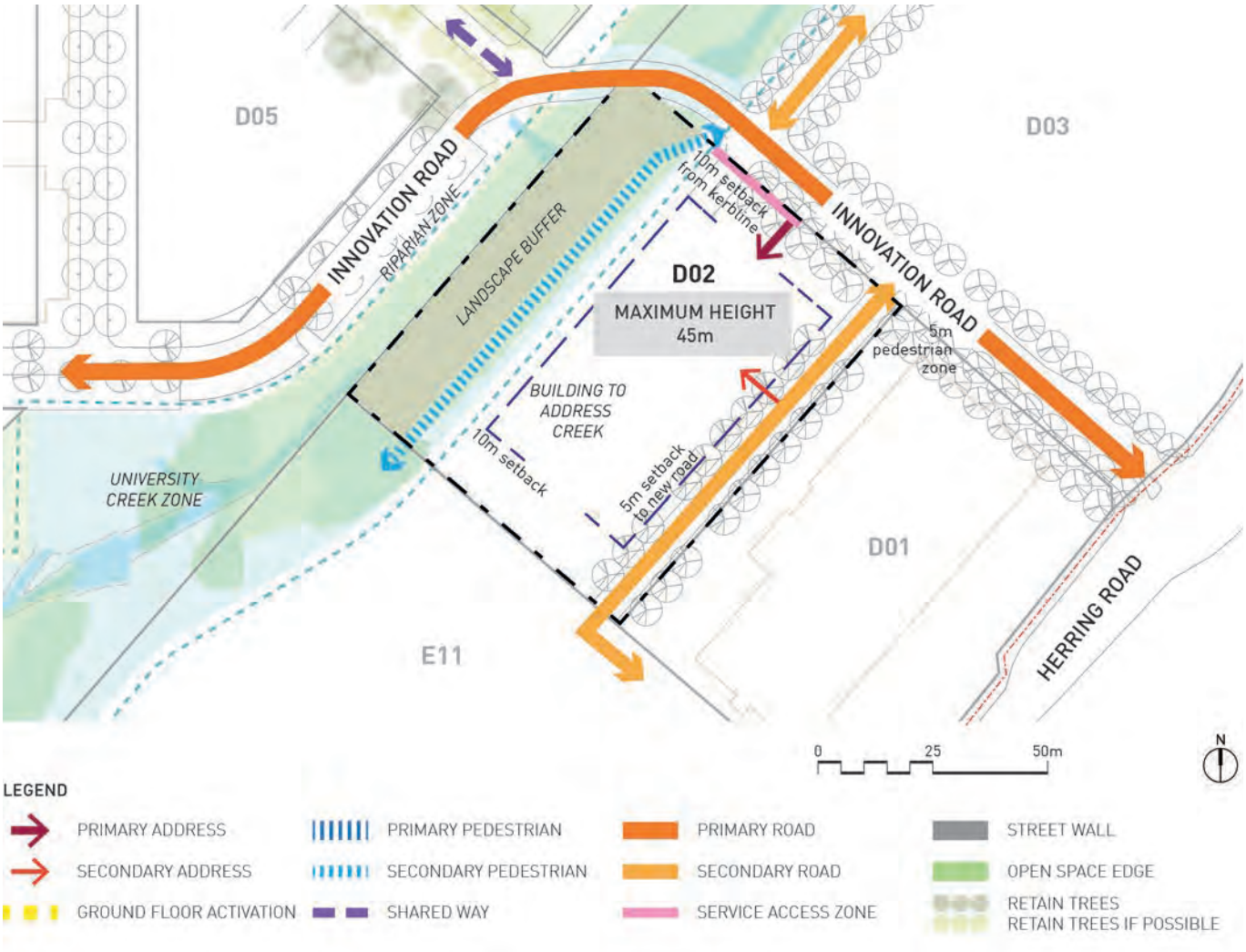
- Lot Area 6,098 m².
- Maximum height of 45m.
- Reinforce open space edge along University Creek zone.
- Built form should address University Creek along the western frontage.
- Maximum FSR 3.0:1.

Access

- New secondary road between E11 and Innovation Road.
- Primary address on north-east frontage along Innovation Road.
- Secondary address on the shared way along the south-east frontage
- Service access from Innovation Road on the north-east frontage.
- Accommodate widened footpath zone on Innovation Road frontage.

Landscape

- Interface with University Creek zone.
- Review and retain significant trees where possible.
- Refer to the University Creek and Innovation Road landscape guidelines in the Public Domain chapter.



LOT D03

Architectural Principles

Lot D03 is located towards the eastern end of the Macquarie University Research Park, at the intersection of Herring Road and Innovation Road. The lot lies directly on the University Creek zone.

Lot boundaries generally match LEP mapping .

Built Form

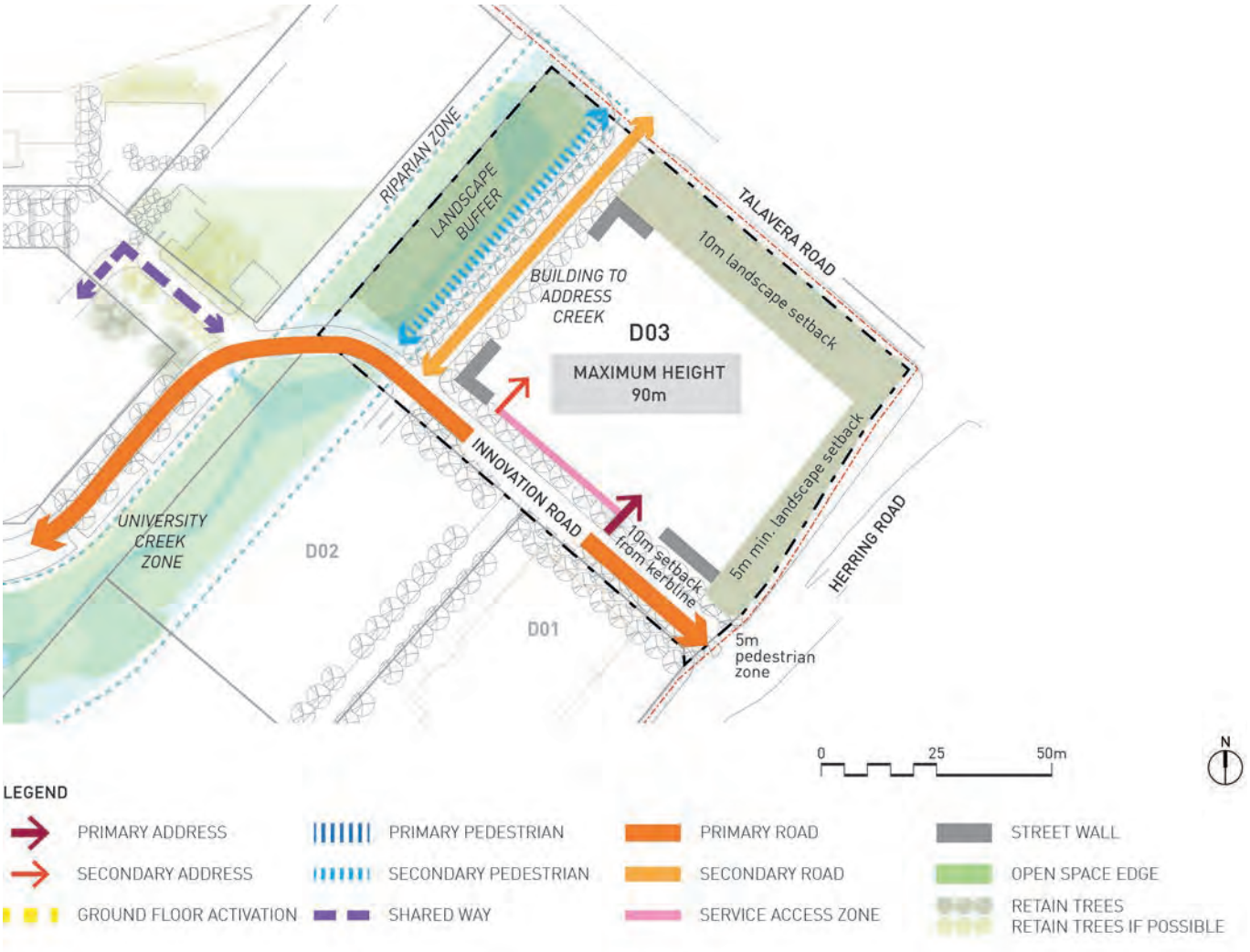
- Lot Area 14,192 m².
- Preserve maximum GFA of 63,864 m² if Herring Road is widened.
- Maximum height 90m.
- Built form should address University Creek.
- Maximum FSR 4.5:1.

Access

- New secondary road between Innovation Road and Talavera Road.
- Primary address located on Innovation Road on the south-west frontage.
- Secondary address located on the south-west frontage.
- Service access from Innovation Road.
- Accommodate widened footpath zone on Innovation Road.

Landscape

- Interface with University Creek zone.
- Review and retain significant trees where possible.
- Refer to the University Creek and Innovation Road landscape guidelines in the Public Domain chapter.



LOT D04

Architectural Principles

Lot D04 terminates the eastern end of Wally's Walk. The lot is adjacent to the Macquarie University Hospital and lies directly on the University Creek zone.

Built Form

- Lot is suitable for a tall building.
- Indicative height of 12 storeys.
- Celebrate the start/end of Wally's Walk.
- Reinforce open space edge along Wally's Walk.
- Building to address University Creek.
- Building setback above RL 53.0 to ensure views to creek.

Access

- Primary address located indicatively on southern frontage from the open space and also from Talavera Road on the northern frontage.
- Service access from Wally's Walk along the southern frontage.

Landscape

- Interface with University Creek zone.
- Open space at end of Wally's Walk.
- Significant trees along Wally's Walk to be retained.
- Review and retain significant trees where possible.
- Refer to the University Creek, Innovation Road and Wally's Walk landscape guidelines in the Public Domain chapter.



LOT D05

Architectural Principles

Lot D05 is located on the eastern edge of the Academic Core. The lot lies directly on the University Creek zone.

Built Form

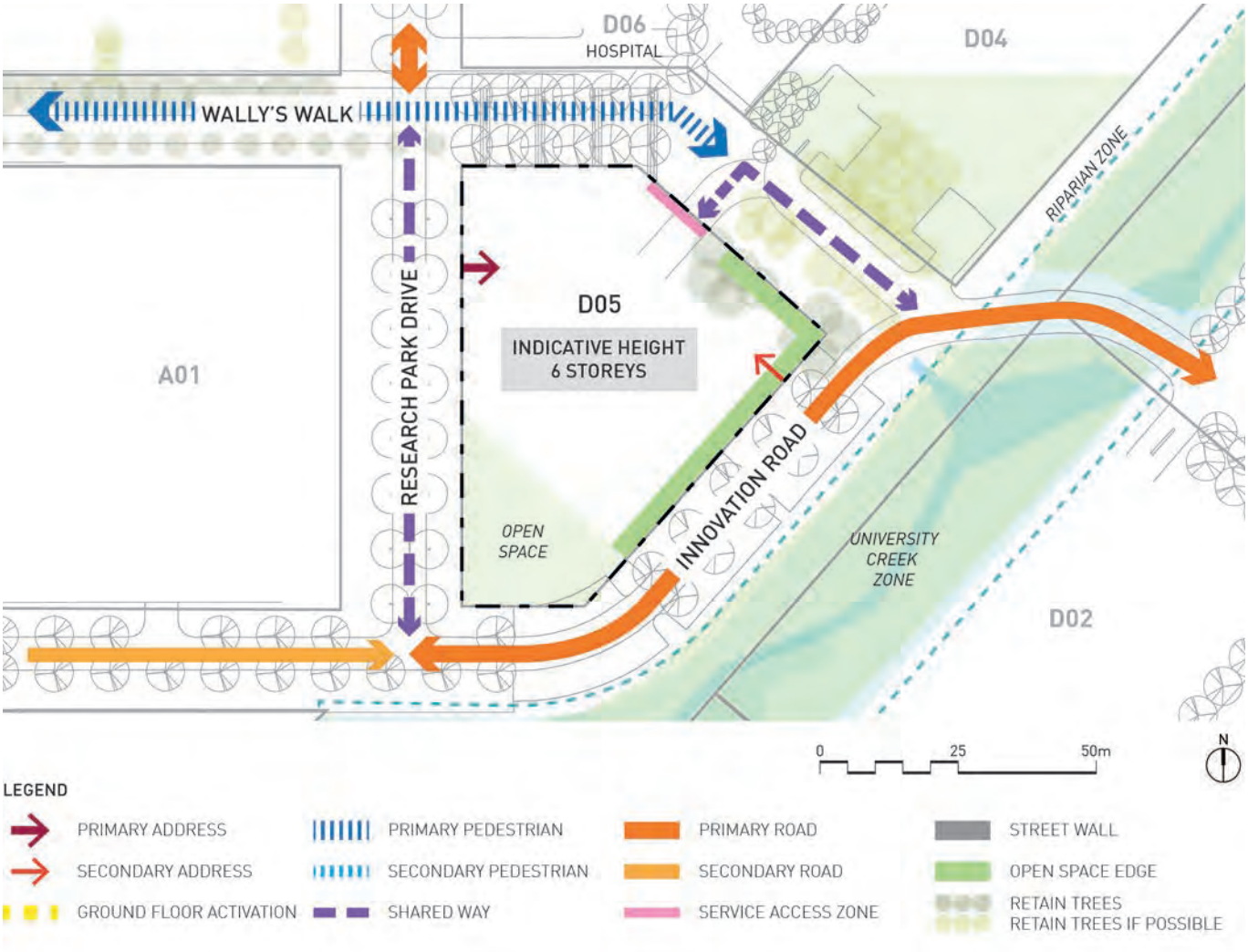
- Indicative height 6 storeys.
- Reinforce street wall to a recommended height of 6 storeys along the creek frontage.
- Built form should address creek.
- Optimise solar access to creek.

Access

- Primary address located indicatively on Research Park Drive along the western frontage.
- Secondary address located indicatively on Innovation Road along south-east frontage from University Creek.
- Service access from Wally's Walk along north-east frontage.

Landscape

- Interface with University Creek zone.
- Provide open space on southern corner of lot.
- Significant trees along Wally's Walk to be retained.
- Review and retain significant trees where possible.
- Refer to the University Creek, Wally's Walk, Research Park Drive and Innovation Road landscape guidelines in the Public Domain chapter.



5.2.5 Precinct E

Precinct E, which forms part of the Academic Core, is located in the southern end of the campus. It adjoins University Avenue and Herring Roadand also consists of two major gateways into the campus at Balaclava Road and Herring Road Gateways .



FIGURE 38: LOTS WITHIN PRECINCT E

LOT E02

Architectural Principles

Lot E02 is bounded by Macquarie Walk and the western end of University Avenue. It is located on the southern end of the Academic Core.

Built Form

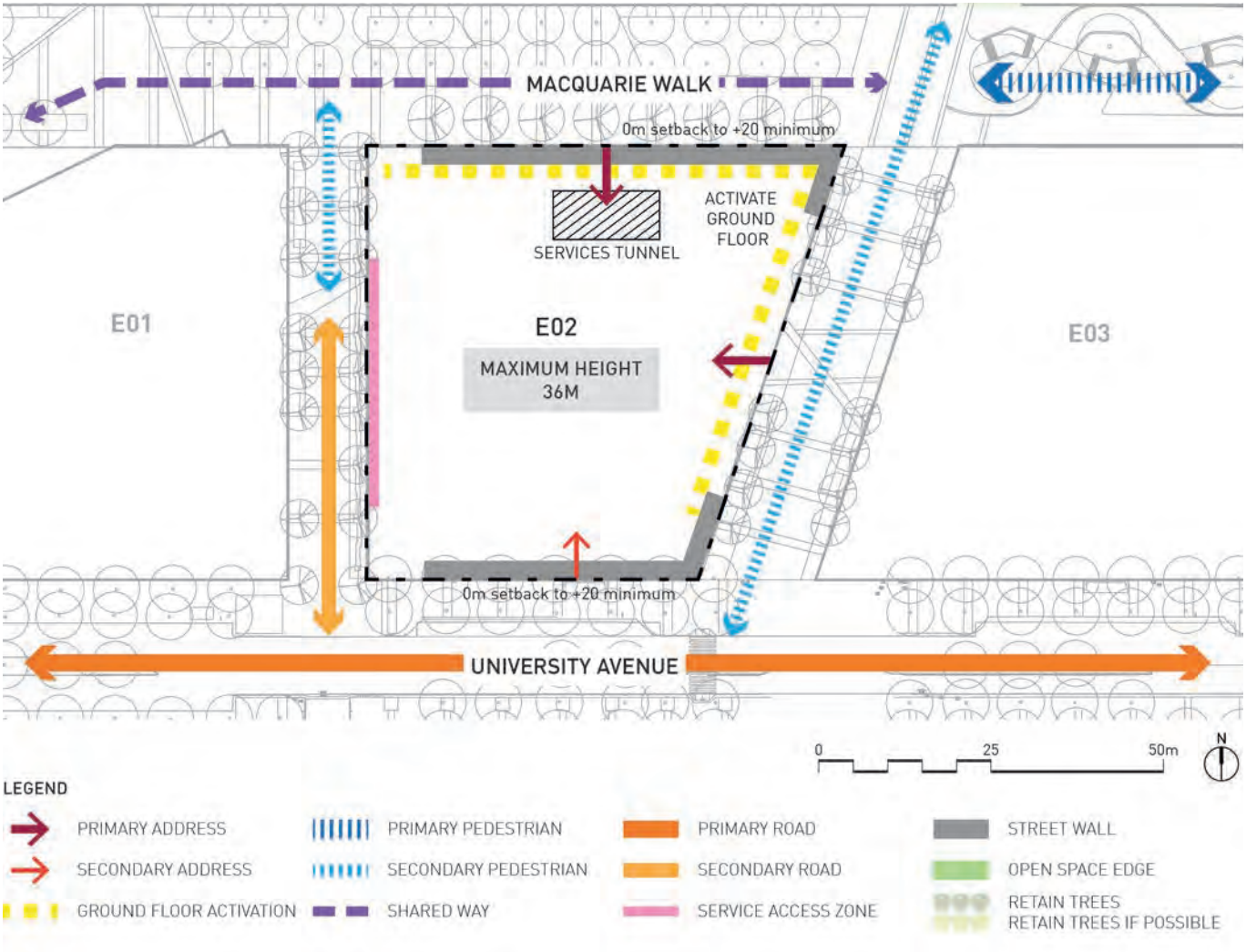
- Indicative height 8 storeys.
- Reinforce street wall to Macquarie Walk and University Avenue.
- Activate Macquarie Walk and pedestrian link frontages.
- High quality facades to Macquarie Walk and University Avenue.

Access

- Primary addresses located on Macquarie Walk and eastern frontage.
- Secondary address located on University Avenue.
- Service access from the secondary road on the western frontage.
- Preserve access to existing service tunnel.

Landscape

- Interface with Macquarie Walk and University Avenue.
- Review and retain significant trees where possible.
- Refer to the Macquarie Walk, and University Avenue landscape guidelines in the Public Domain chapter.



LOT E03

Architectural Principles

Lot E03 is located in the southern end of the Academic Core at the intersection of Macquarie Walk and Sir Christopher Ondaatje Avenue.

Built Form

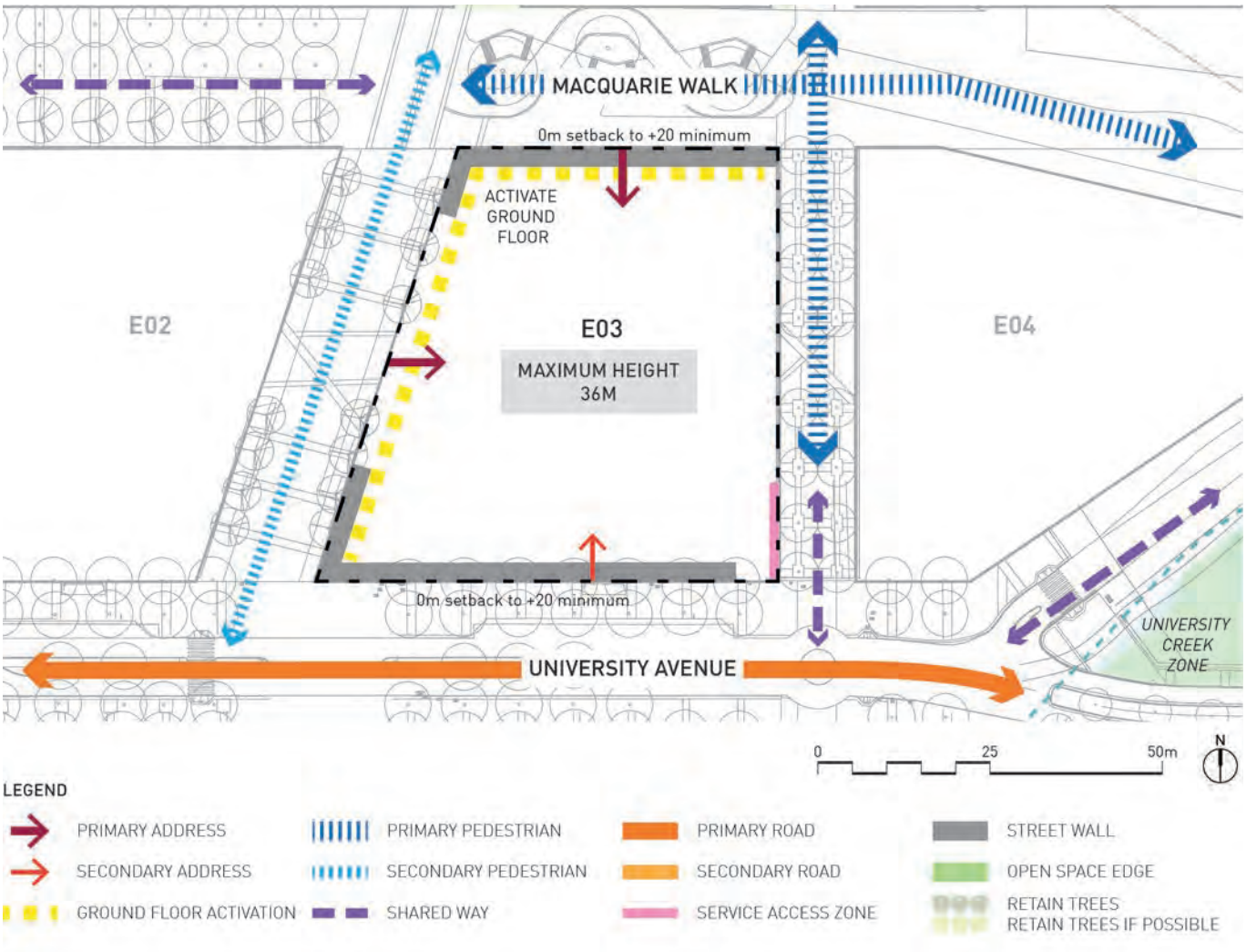
- Indicative height 8 storeys.
- Reinforce street wall to Macquarie Walk, University Avenue and the secondary pedestrian way on the western frontage.
- Activate Macquarie Walk and pedestrian link frontages.
- High quality facades to Macquarie Walk and University Avenue

Access

- Primary addresses located indicatively on Macquarie Walk and along western frontage.
- Secondary address located on University Avenue along the southern frontage.
- Service access from eastern end of University Avenue, along the eastern frontage.

Landscape

- Interface with the Plaza Zone of Macquarie Walk and also University Avenue.
- Review and retain significant trees where possible.
- Refer to the Macquarie Walk, Sir Christopher Ondaatje Avenue and University Avenue landscape guidelines in the Public Domain chapter.



LOT E04

Architectural Principles

Lot E04 is located in the southern end of the Academic Core at the intersection of Macquarie Walk and Sir Christopher Ondaatje Avenue.

Built Form

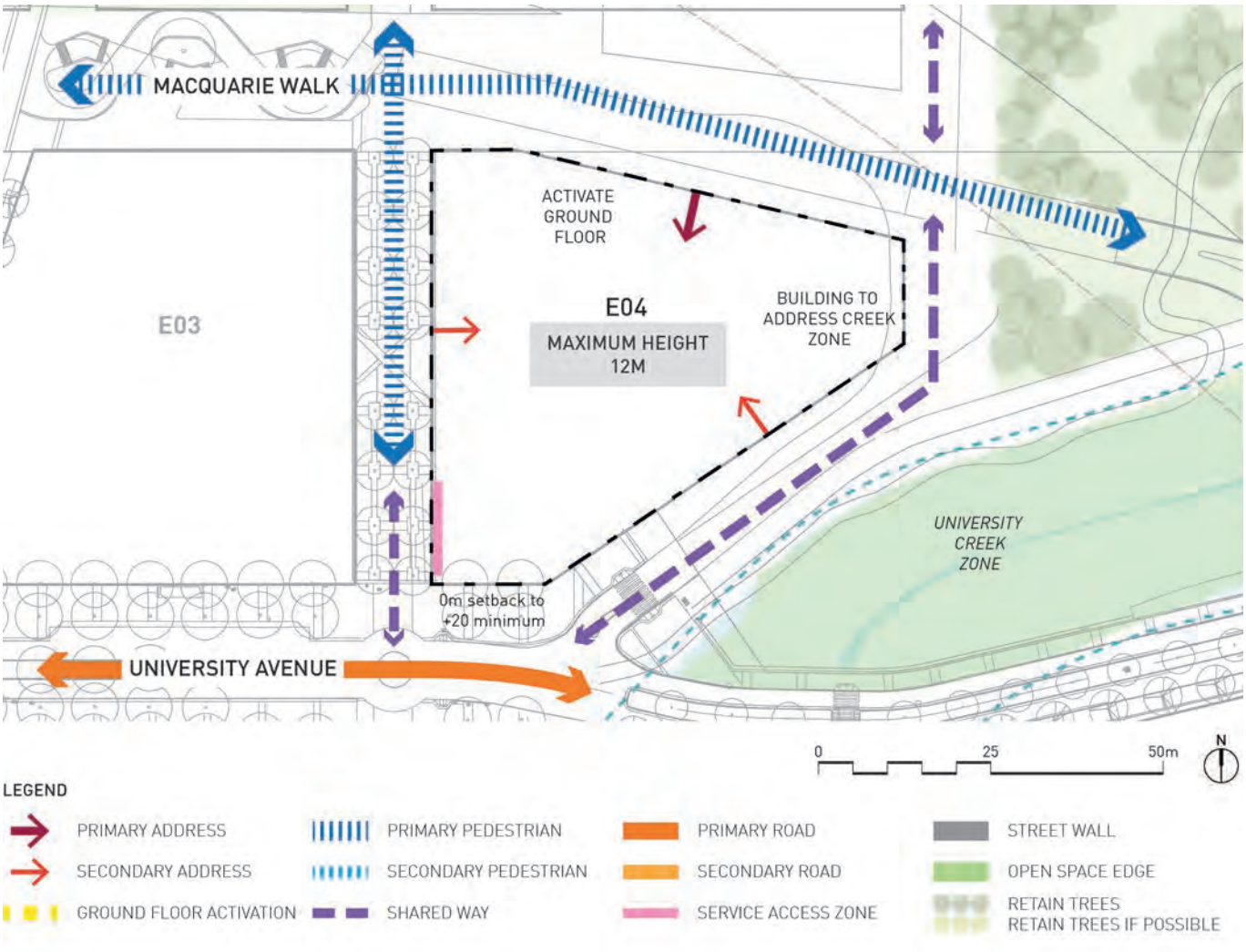
- Indicative height 3 storeys.
- Develop as unique built form at campus entry.

Access

- Primary address located on Macquarie Walk on the northern frontage.
- Secondary access on southern frontage and Sir Christopher Ondaatje along the western frontage.
- Service access from southern frontage.

Landscape

- Interface with the plaza zone of Macquarie Walk, Sir Christopher Ondaatje Avenue and also the University Creek zone.
- Refer to the Macquarie Walk, Sir Christopher Ondaatje Avenue, University Avenue and University Creek landscape guidelines in the Public Domain chapter.



LOT E07

Architectural Principles

Lot E07 completes the precinct south of University Avenue. The site sits behind the Cochlear Building and is seen as a potential expansion of Cochlear. The site should have an address off a future open space on the Cochlear carpark.

Built Form

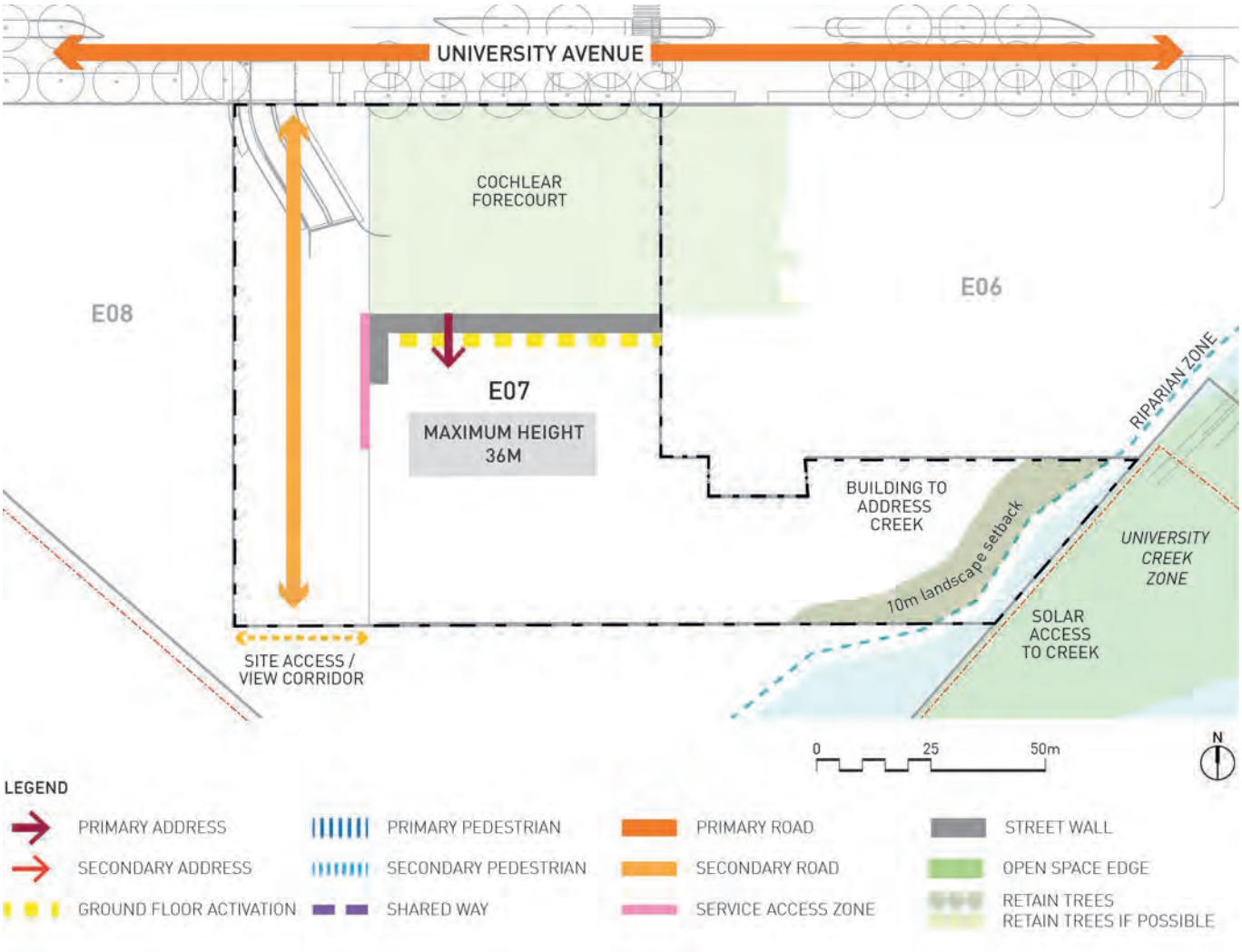
- The site has a height limit of 36m.
- A high quality facade resolution is needed towards University Avenue.
- Streetwall definition to 20-24m towards University Avenue (match Cochlear Stage 1).
- 3m minimum setback above streetwall line.
- Environmental management elements should be incorporated into the exposed western face of the building.
- Building to address University Creek along eastern frontage.
- High quality facade required.

Access

- Primary pedestrian access from the Cochlear forecourt.
- Vehicular access is off the corridor to the west.

Landscape

- 10m buffer to riparian zone.
- Retain significant trees where possible.



LOT E08

Architectural Principles

Lot E08 is located in the southern end of the Academic Core along University Avenue.

Built Form

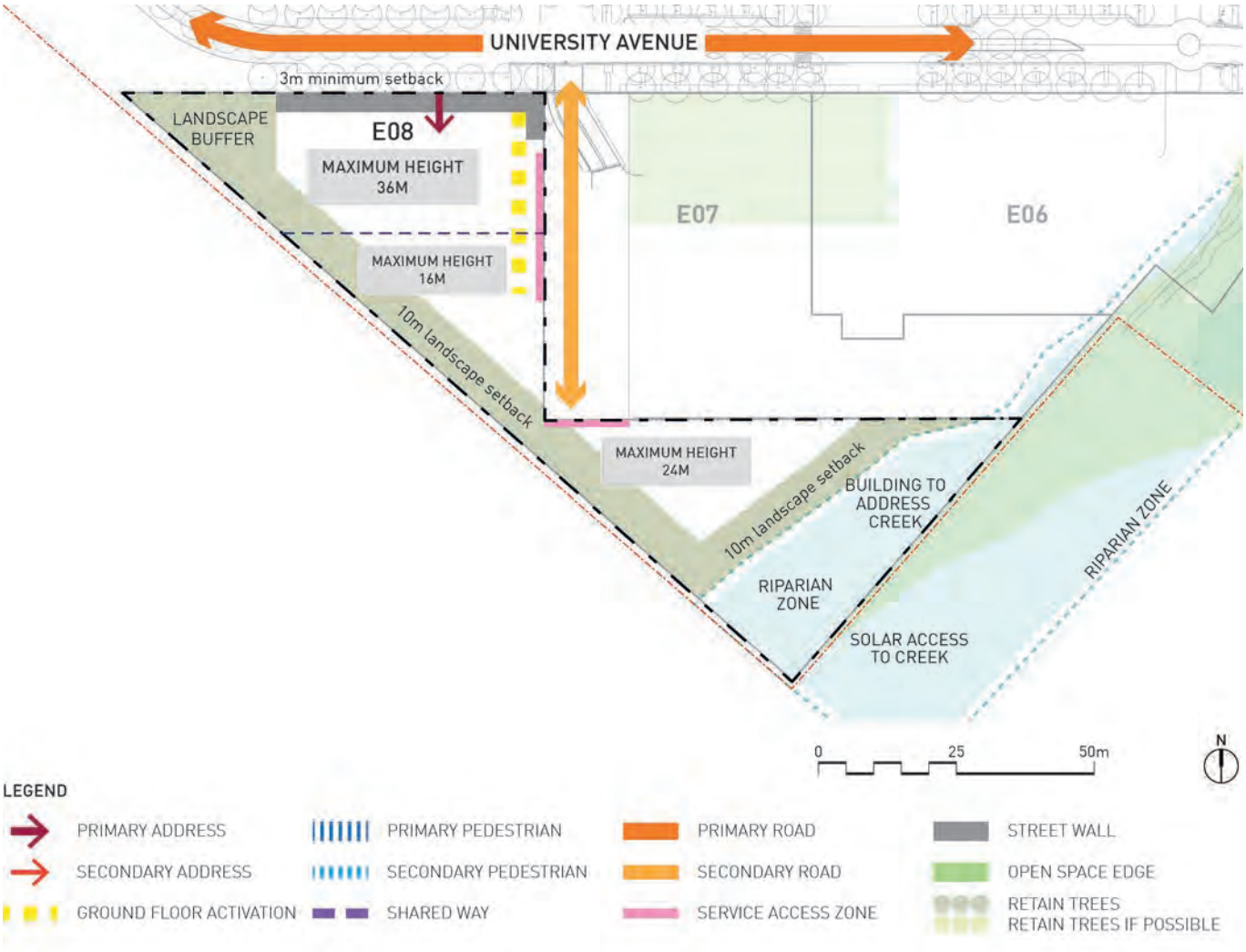
- Indicative height 3-8 storeys.
- Reinforce street wall to University Avenue on the northern frontage and the secondary road on the eastern frontage.
- Street wall definition to 20-24m on University Avenue.
- 3m minimum setback above street wall.

Access

- Primary address located indicatively on University Avenue along the northern frontage.
- Service access from the secondary road along the eastern frontage.

Landscape

- 10m landscape buffer along southern boundary.
- Review and retain significant trees where possible.
- Refer to the University Avenue landscape guidelines in the Public Domain chapter.



LOT E09

Architectural Principles

Located in the south-east corner of Precinct E, Site E09 affects a scale transition to lower buildings to the south of the University. Located on the edge of the campus, the site is adjacent to high density residential development on Herring Road.The site is subject to height and FSR controls in the Ryde LEP.

Lot boundaries generally match LEP mapping.

Built Form

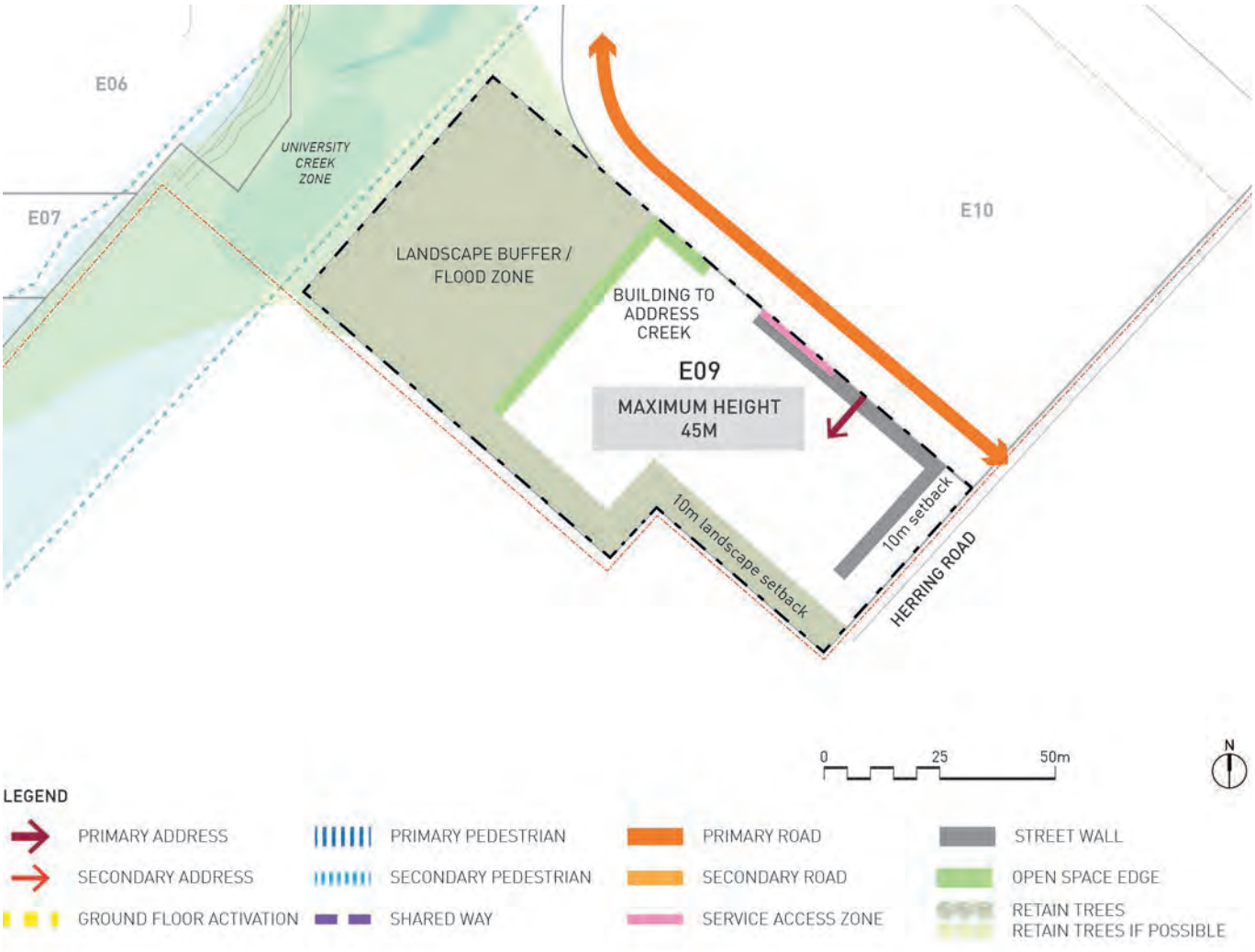
- Maximum FSR 3.5:1.
- A 10m minimum landscape buffer along the southern boundary to ensure adequate building separation.
- A 10m setback is required on Herring Road.
- Streetwall definition is required on the Herring Road frontage.
- 3m minimum setback above streetwall line (8 storeys).
- Environmental management elements should be incorporated into the exposed western face of the building.
- Building to address University Creek.

Access

- Vehicular access is off the new north south road.
- Car parking is to be set back to allow activation of the open space frontage.

Landscape

- Landscape interface at University Creek.
- Refer to University Creek landscape guidelines in Public Domain chapter.



LOT E10

Architectural Principles

Lot E10 forms a gateway to the campus at the Herring Road entry. Like E11, the site is set back from the road to manage the high scale of buildings at the Herring Road Gateway. The site is subject to height and FSR controls in the Ryde LEP. Lot boundaries generally match LEP mapping.

Built Form

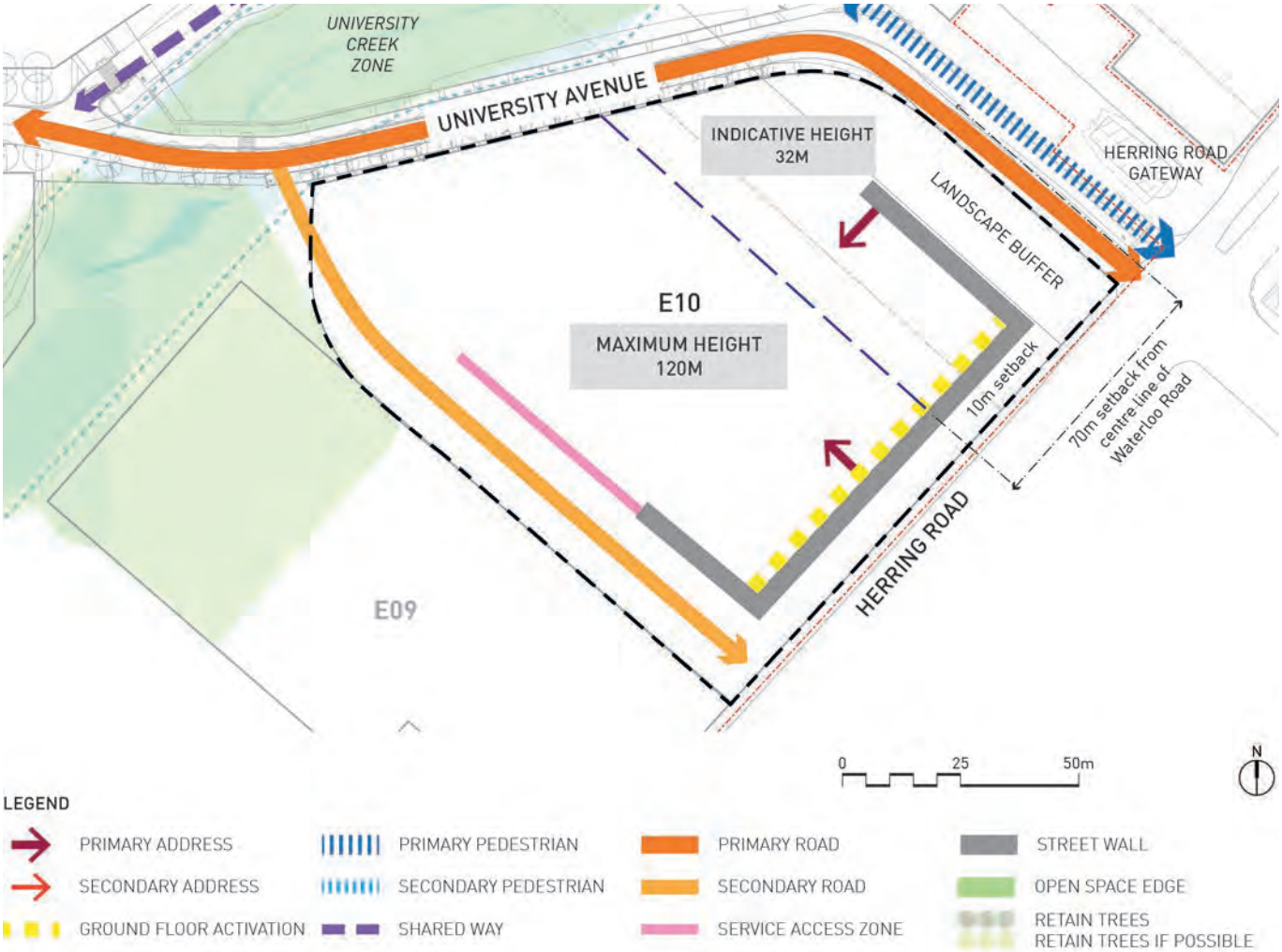
- Maximum FSR 3.5:1.
- Maximum height of 120m.
- A high quality architectural resolution is required in this visible site.
- Primary streetwall definition on the Herring Road and Waterloo Road frontages.
- Taller elements to set back the streetwall line (above 8 storeys).
- Environmental management elements should be incorporated in the exposed western face of the building.
- Activate roofs to lower buildings.
- Setback upper levels of low rise building at Gateway above 30m.

Access

- New secondary road between University Avenue and Herring Road.
- Primary pedestrian access from Herring Road and Herring Road Gateway.
- No vehicular access from University Avenue.
- Service access from new road on southern boundary.

Landscape

- Landscape interface at Herring Road Gateway.
- Reinforce planting along University Avenue.
- Refer to University Avenue landscape guidelines in Public Domain chapter.



LOT E11

Architectural Principles

Lot E11 terminates the eastern end of University Avenue at the with Herring Road. The lot is adjacent the Unviversity Creek zone and also Macquarie University Station. Lot boundaries generally match LEP mapping.

Built Form

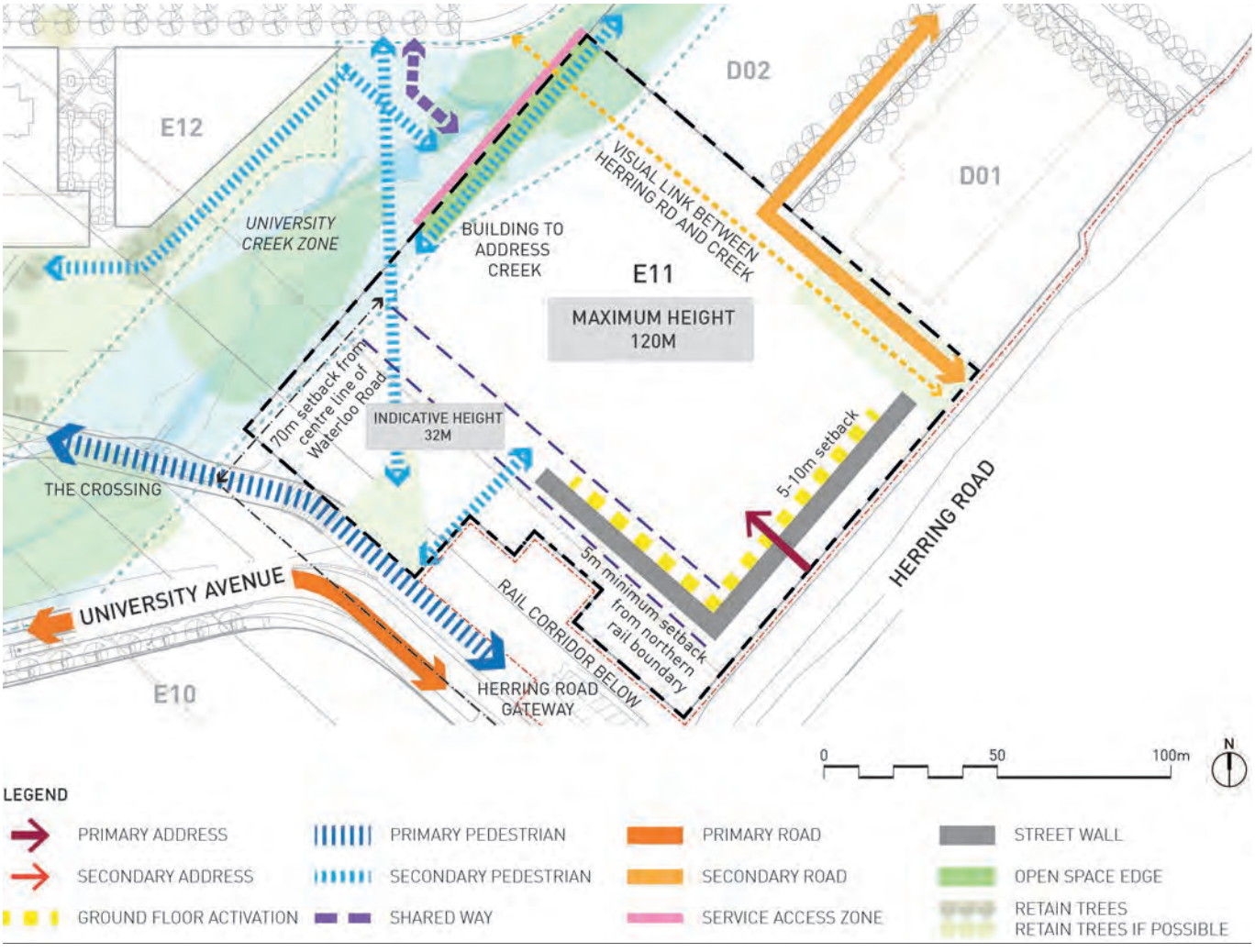
- Maximum height of 120m.
- Maximum GFA of 128,000 m², excluding air rights.
- Reinforce open space edge along the north-west corner adjacent University Creek.
- Reinforce street wall to Herring Road.
- Building to address University Creek.
- Preserve Herring Road address.
- Possible use of air rights over rail service building.
- Activate roofs to lower buildings.
- Setback upper levels of low rise building at Gateway above 30m.

Access

- New secondary road from Herring Road to Innovation Road.
- Primary address located indicatively on Herring Road along the south-east frontage.
- Service access from the shared way on the north-west frontage.
- Retail to link to Macquarie Centre.

Landscape

- Interface with University Creek zone.
- Preserve riparian corridor.
- Open space at crossing boundary.
- Review and retain significant trees where possible.
- Refer to the University Avenue and University Creek landscape guidelines in the Public Domain.



LOT E12

Architectural Principles

Lot E12 is located on the eastern end of the Academic Core along Innovation Road. The lot is adjacent the Unviversity Creek zone and above the rail corridor which runs below the lot.

Built Form

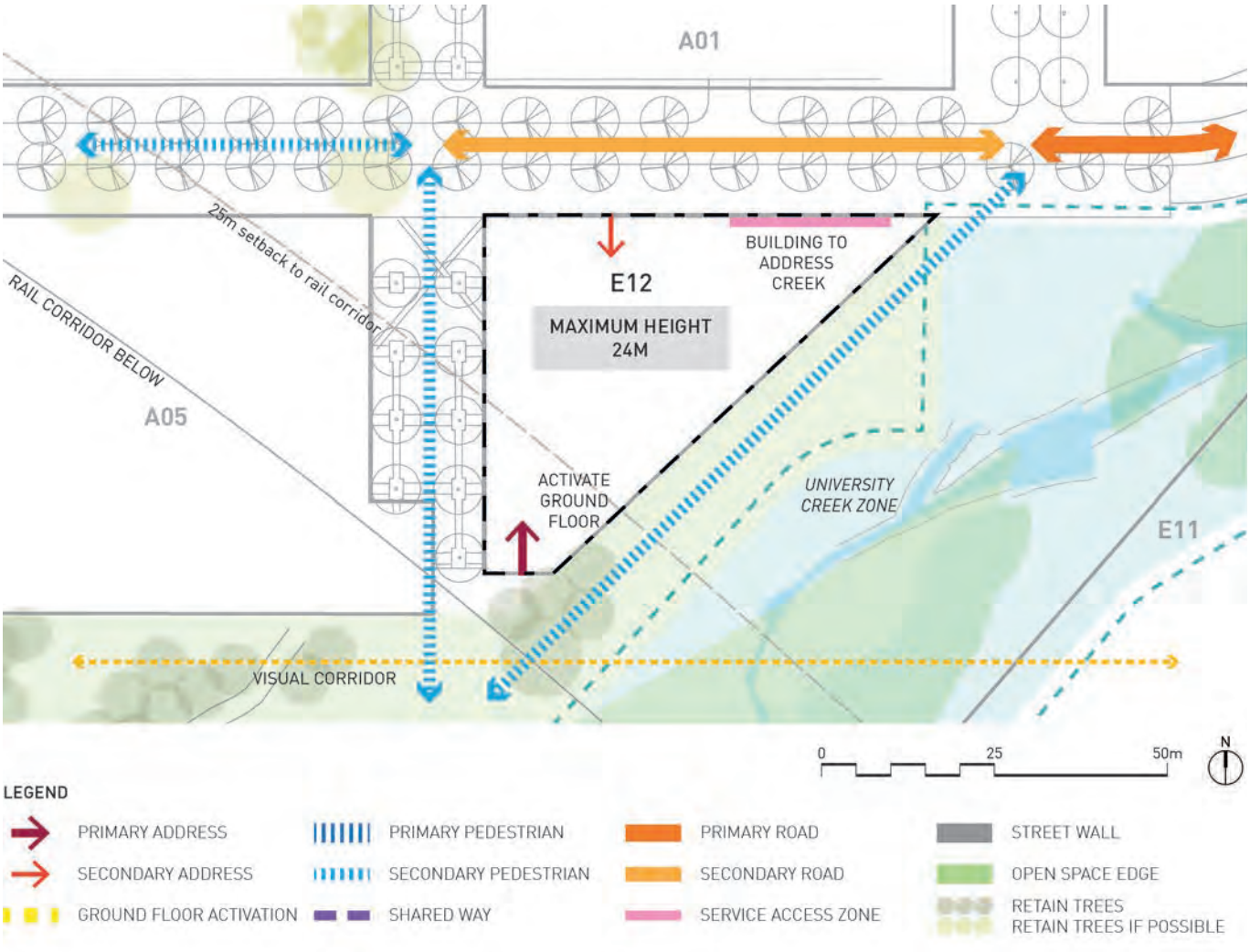
- Buildings to address University Creek.
- Indicative height of 6 storeys.
- Optimise solar access to creek.

Access

- Primary address located indicatively on Macquarie Walk along the southern frontage.
- Secondary address located indicatively along the northern frontage.
- Service access from the northern frontage.

Landscape

- Interface with University Creek zone.
- Refer to the Innovation Road, Macquarie Walk and University Creek landscape guidelines in the Public Domain chapter.



5.2.6 Precinct F

Precinct F, Epping Road West, is located in the south-west of the campus, on the corner of Culloden and Epping Roads.

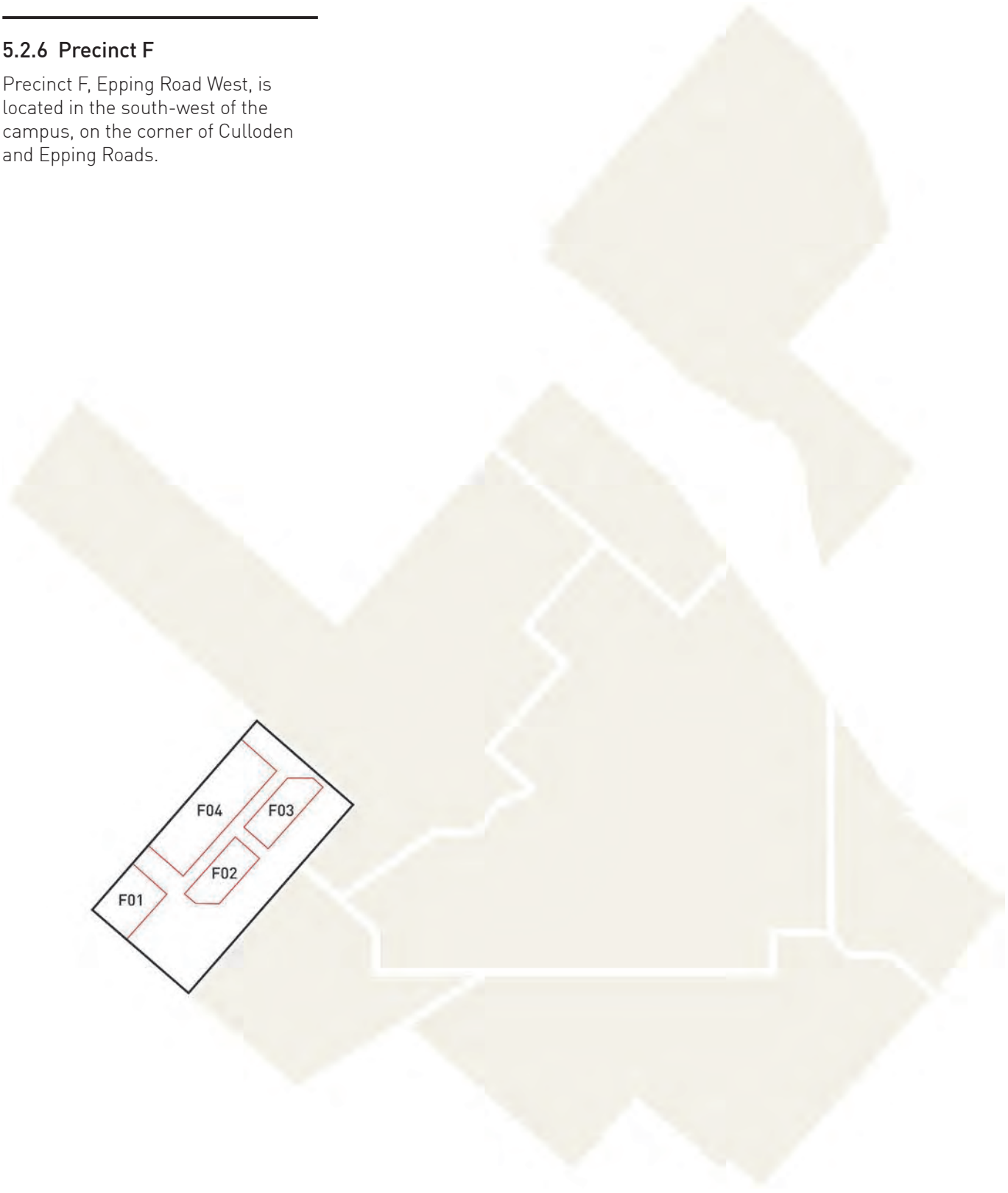


FIGURE 39: LOTS WITHIN PRECINCT F

LOT F01

Architectural Principles

Lot F01 is located in the far western corner of the campus adjacent to the intersection of Culloden and Epping Roads. The lot is adjacent to residential buildings on Culloden Road.

Built Form

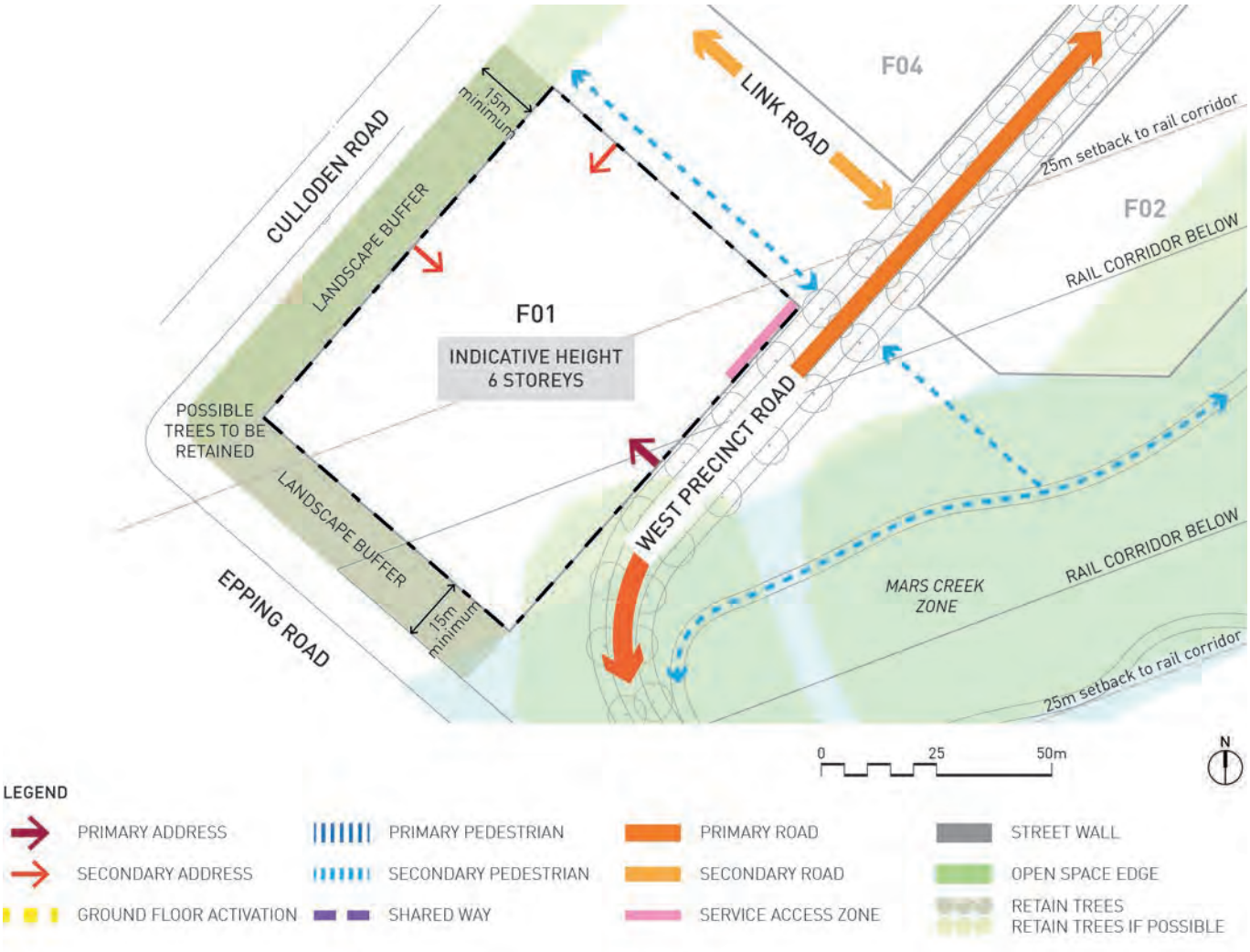
- Indicative height 6 storeys.
- The lot is suitable to contain several buildings.
- Buildings are to address Mars Creek on its south-eastern frontage.

Access

- Primary address located indicatively on West Precinct Road along the south-east frontage.
- Possible secondary addresses located indicatively on Link Road along the north-east frontage and Culloden Road along the north-west frontage.
- Service access from West Precinct Road along the south-east frontage.

Landscape

- Landscape buffer along corner of Culloden and Epping Roads.
- Review and retain significant trees if possible.
- Refer to the West Precinct Road and Mars Creek landscape guidelines in the Public Domain chapter.



LOT F02

Architectural Principles

Lot F02 is located in the western corner of the campus along West Precinct Road and facing the Mars Creek zone.

Built Form

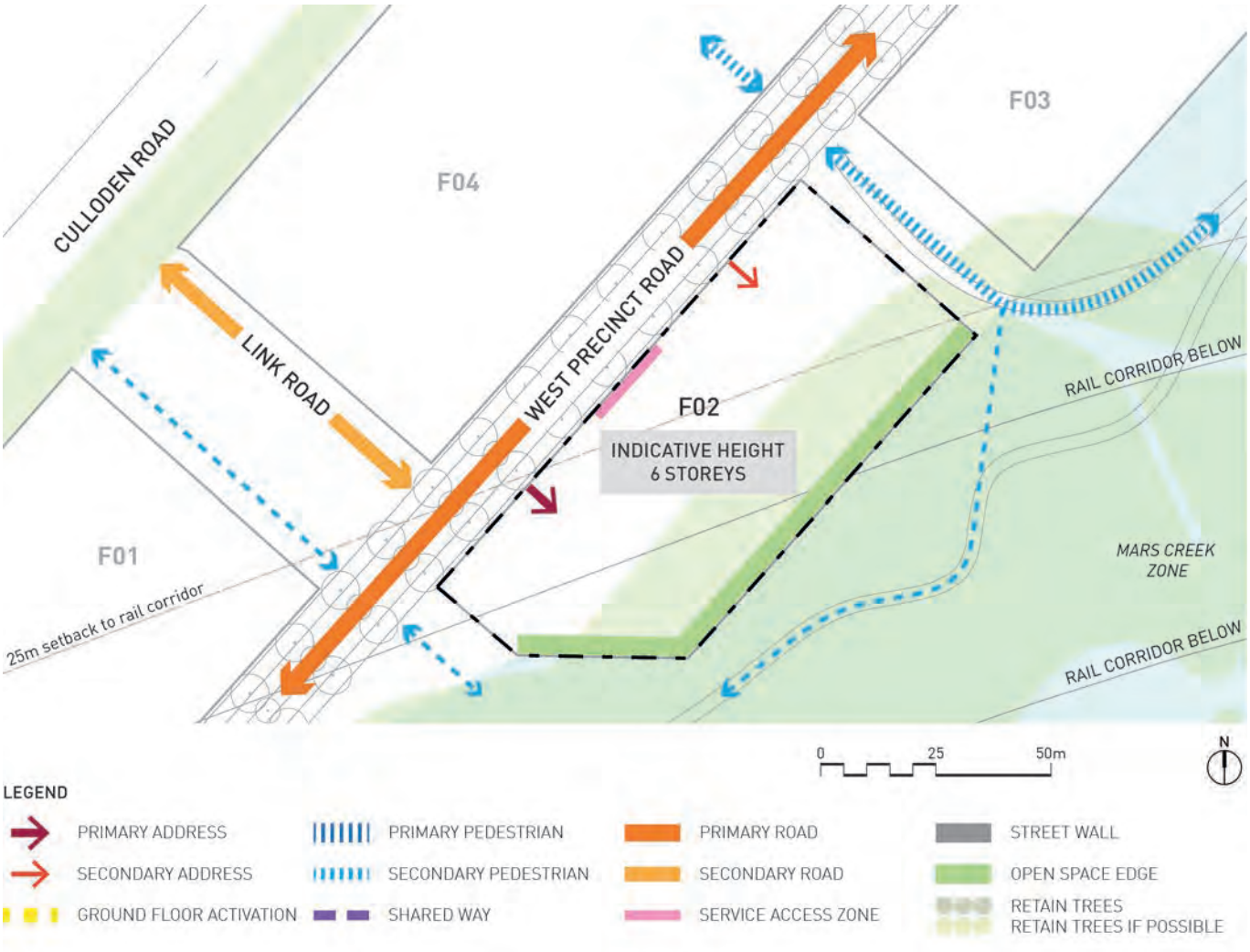
- Indicative height 6 storeys.
- The lot is suitable to contain several buildings.
- Buildings are to address Mars Creek.

Access

- Primary address located indicatively on West Precinct Road along the north-west frontage.
- Possible secondary address also located indicatively on West Precinct Road along the north-west frontage.
- Service access from West Precinct Road along the north-west frontage.

Landscape

- Interface with the Mars Creek zone.
- Review and retain significant trees if possible.
- Refer to the West Precinct Road and Mars Creek landscape guidelines in the Public Domain chapter.



LOT F03

Architectural Principles

Lot F03 is located in the western part of the campus, sitting in between West Precinct Road and the Mars Creek zone.

Built Form

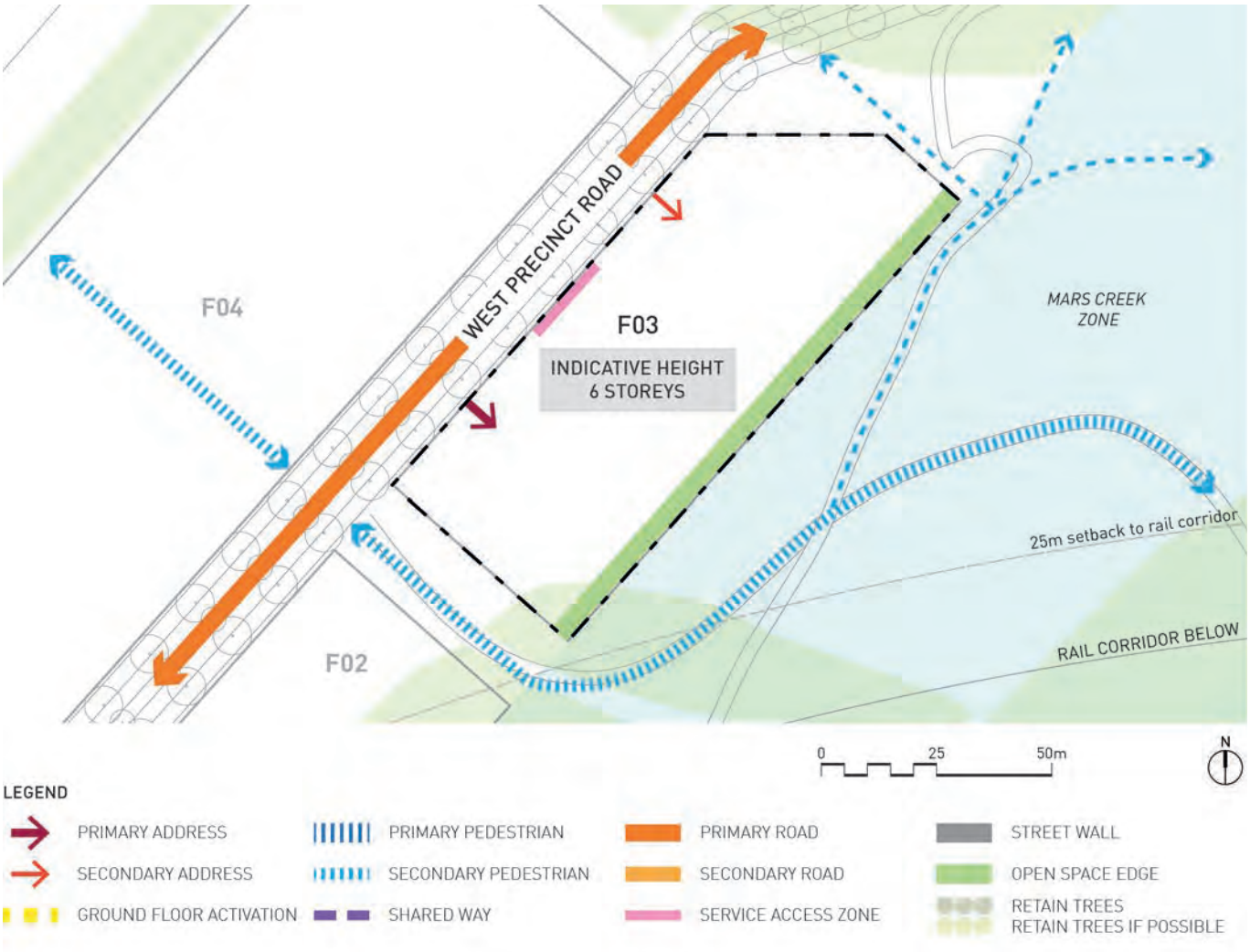
- Indicative height 6 storeys.
- The lot is suitable to contain several buildings.
- Buildings are to address Mars Creek.

Access

- Primary address located indicatively on West Precinct Road along the north-west frontage.
- Possible secondary address also located indicatively on West Precinct Road along the north-west frontage.
- Service access from West Precinct Road along the north-west frontage.

Landscape

- Interface with the Mars Creek zone.
- Review and retain significant trees if possible.
- Refer to the West Precinct Road and Mars Creek landscape guidelines in the Public Domain chapter.



LOT F04

Architectural Principles

Lot F04 is located on the western edge of the campus sitting in between West Precinct Road and Culloden Road. The lot is identified for car parking and/or commercial development. The lot is adjacent to residential buildings on Culloden Road.

Built Form

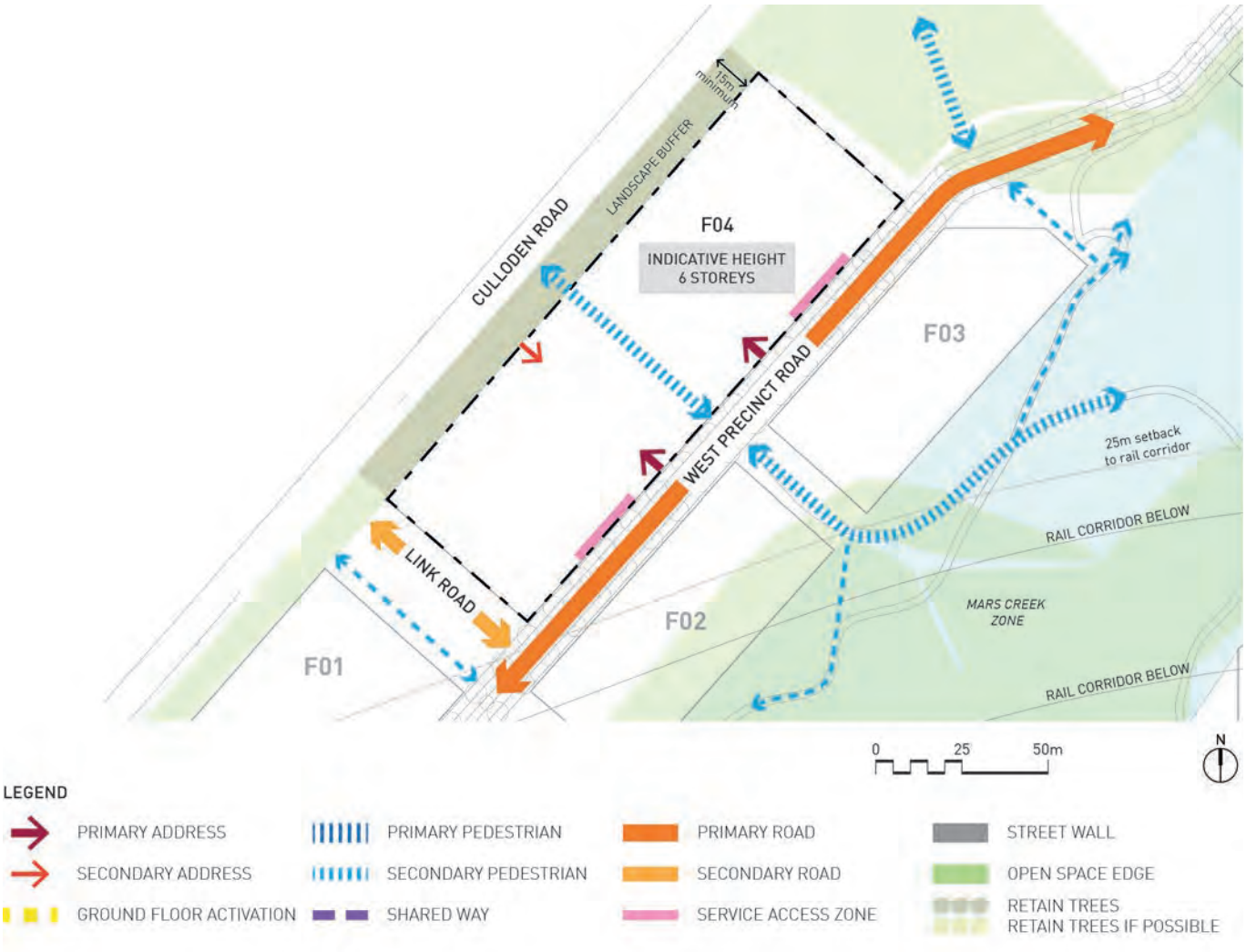
- Indicative height 6 storeys.
- Structured car parking is to be appropriately screened.
- Buildings to address Culloden Road behind a landscape buffer.

Access

- Primary addresses located indicatively on West Precinct Road along the south-east frontage.
- Potential secondary address located indicatively on Culloden Road along the north-west frontage.
- Service access from West Precinct Road along the south-east frontage.

Landscape

- Landscape buffer along Culloden Road.
- Review and retain significant trees if possible.
- Refer to the West Precinct Road landscape guidelines in the Public Domain chapter.



5.2.7 Precinct G

Precinct G, the Epping Road precinct expansion, is located in the south-west of the campus and adjoins Epping Road. The precinct contains a legacy building lot (shown in grey).

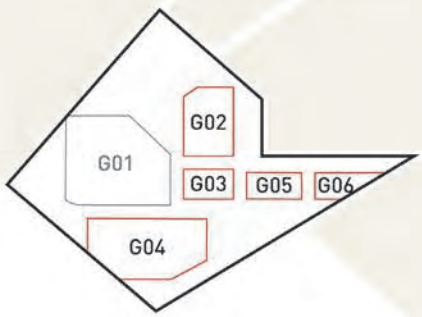


FIGURE 40: LOTS WITHIN PRECINCT G

LOT G02

Architectural Principles

Lot G02 is located on the western side of the Academic Core. The lot is bounded by Wally's Walk, Mars Creek Plaza and Mars Creek.

Built Form

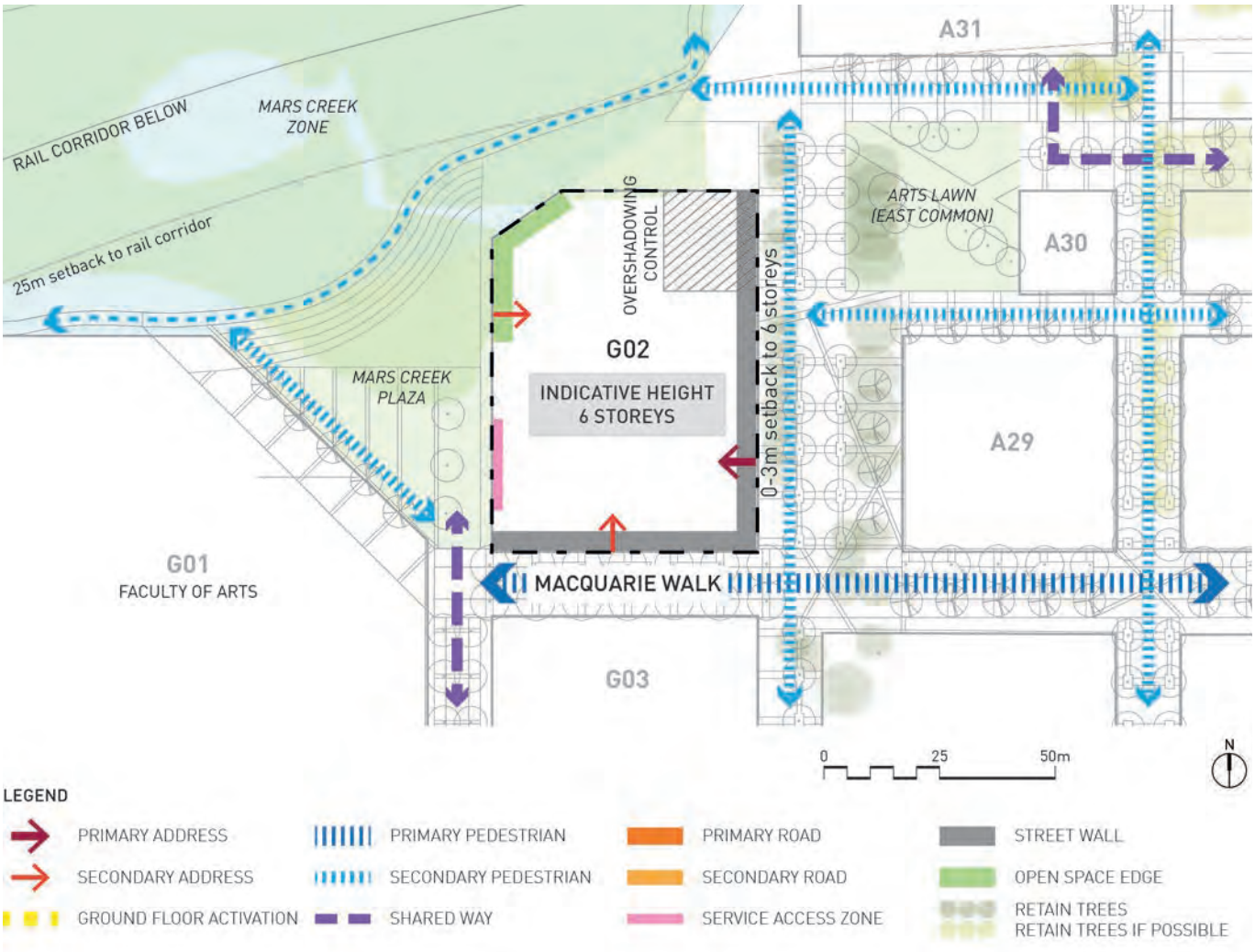
- Indicative height 6 storeys.
- Building is to address Mars Creek zone.
- Reinforce street wall along Macquarie Walk and the eastern frontage.
- There is an overshadowing control along north-east corner. The height is to be determined with a requirement to maximise solar access to the Arts Lawn (West Common) open space between 11am and 2pm in mid-winter.

Access

- Primary address located indicatively on pedestrian route along the eastern frontage.
- Possible secondary addresses located indicatively on Macquarie Walk and from Mars Creek Plaza.
- Service access from the shared way on the western frontage from Mars Creek Plaza.

Landscape

- Interface with the Mars Creek and Mars Creek Plaza.
- Interface with Arts Lawn (West Common) and the retained trees along the eastern frontage.
- Review and retain significant trees if possible.
- Refer to the Macquarie Walk, Arts Lawn (West Common), Mars Creek Plaza and Mars Creek landscape guidelines in the Public Domain chapter.



LOT G03

Architectural Principles

Lot G03 is located in the west of the Academic Core. The lot is bounded by Macquarie Walk to the north, the Faculty of Arts building on the west, University Avenue on the south and a pedestrian route on the east.

Access

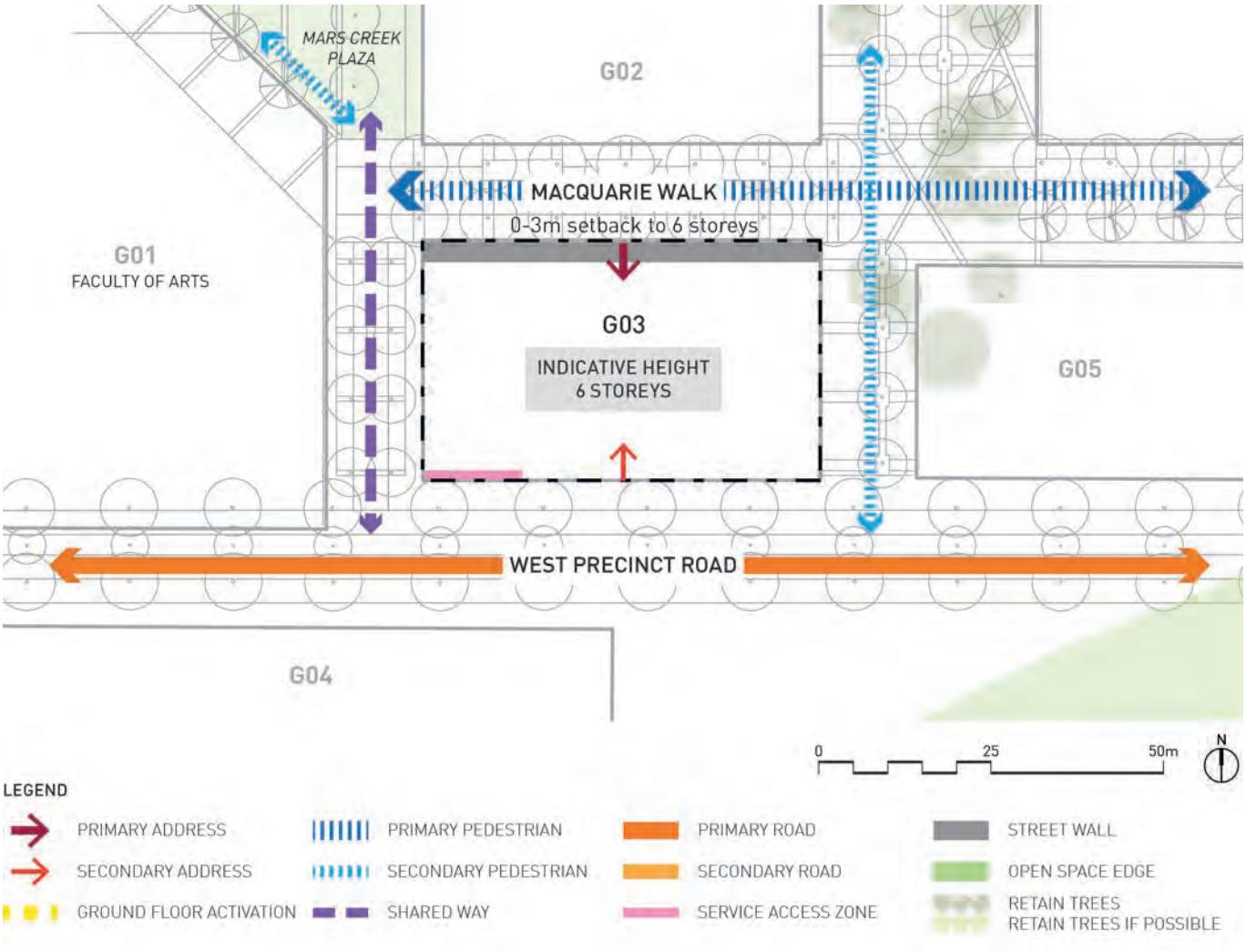
- Primary address located indicatively on Macquarie Walk along the northern frontage.
- Service access from the shared way along the western frontage.

Landscape

- Review and retain significant trees if possible.
- Refer to the Macquarie Walk, Mars Creek Plaza and University Avenue landscape guidelines in the Public Domain chapter.

Built Form

- Indicative height 6 storeys.
- Reinforce street wall along Macquarie Walk.



LOT G04

Architectural Principles

Lot G04 is located along University Avenue, opposite the Faculty of Arts. The lot is identified for car parking. It is in a prominent location on Balaclava Road Gateway.

Built Form

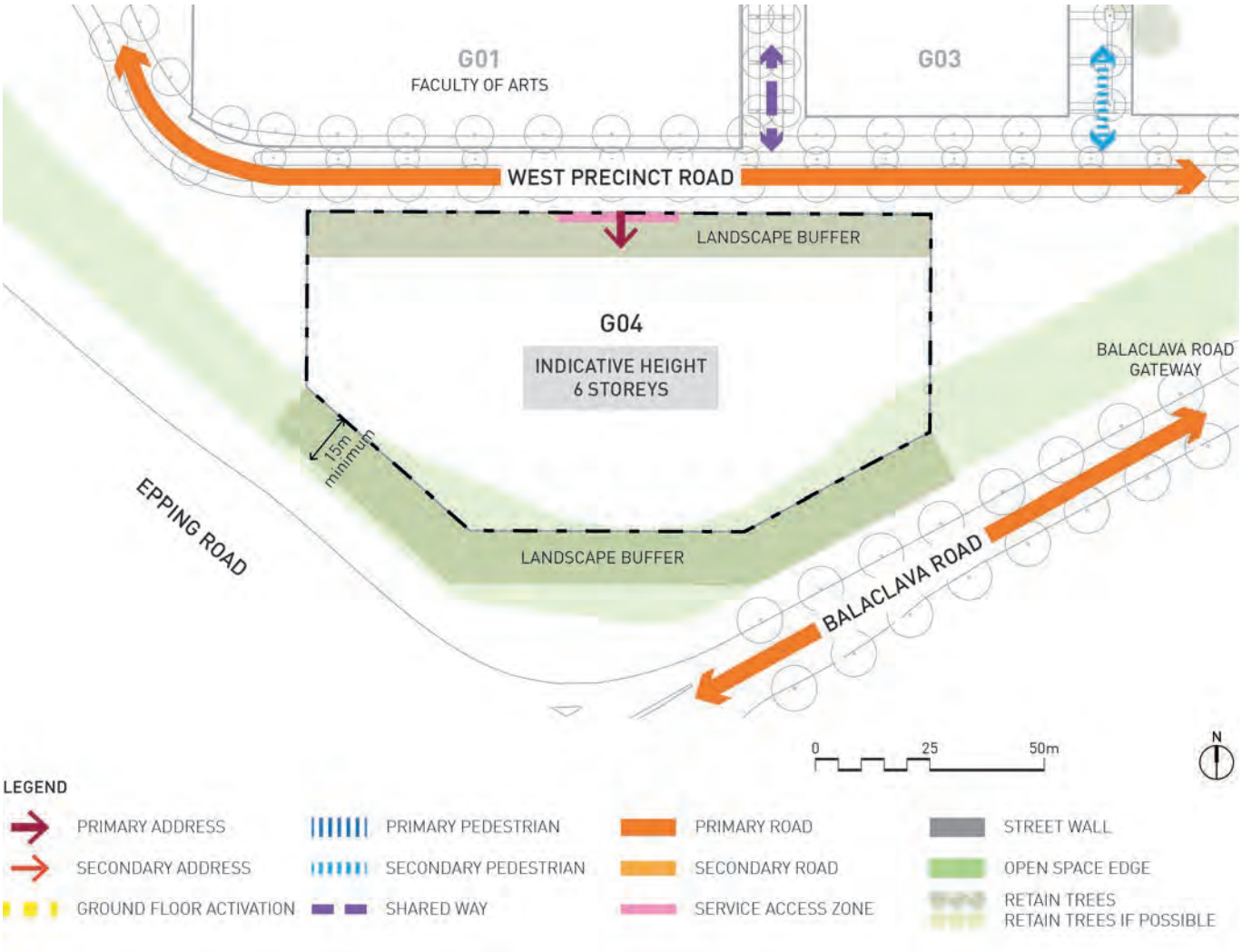
- Indicative height 6 storeys.
- Reinforce street wall along University Avenue.
- Structured parking should be appropriately screened.

Access

- Primary address located indicatively with the service access on University Avenue along the northern frontage.

Landscape

- Interface with Balaclava Road Gateway.
- Landscape buffer on corner of Epping and Balaclava Roads.
- Review and retain significant trees if possible.
- Refer to the University Avenue and Balaclava Road Gateway landscape guidelines in the Public Domain chapter.



LOT G05

Architectural Principles

Lot G05 is located in the southwest corner of the Academic Core along West Precinct Road. The lot is in a prominent location within the Balaclava Road Gateway.

Built Form

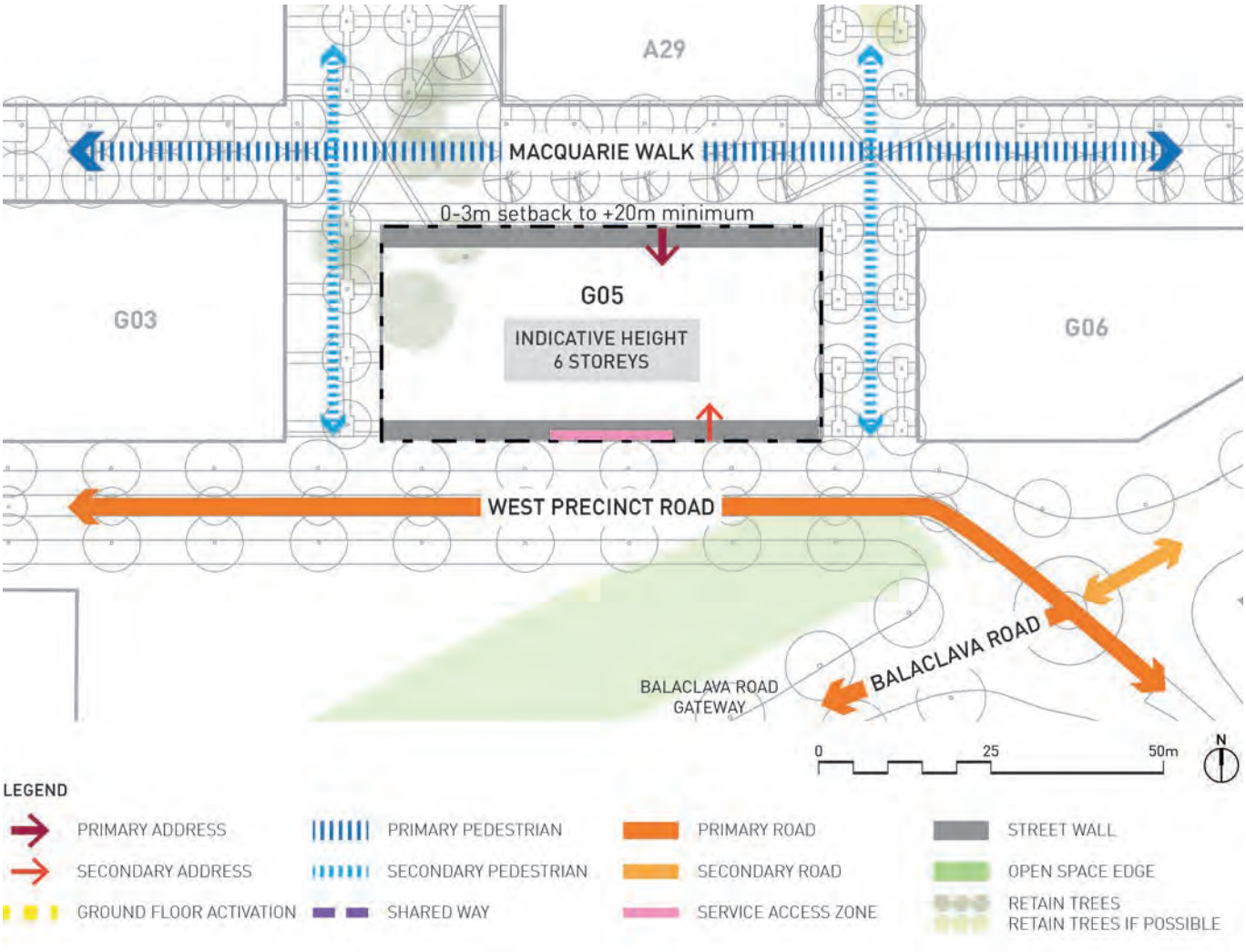
- Indicative height 6 storeys.
- Building is to address West Precinct Road/Balaclava Road Gateway.
- Reinforce street walls along Macquarie Walk and West Precinct Road.

Access

- Primary address located indicatively on Macquarie Walk along the northern frontage.
- Possible secondary address located indicatively on West Precinct Road along the southern frontage.
- Service access from West Precinct Road along the southern frontage.

Landscape

- Interface with Macquarie Walk
- Interface with University Avenue and Balaclava Road Gateway
- Review and retain significant trees if possible.
- Refer to the University Avenue and Balaclava Road Gateway landscape guidelines in the Public Domain chapter.



LOT G06

Architectural Principles

Lot G06 is located in the south-west corner of the Academic Core on the Balaclava Road Gateway.

Built Form

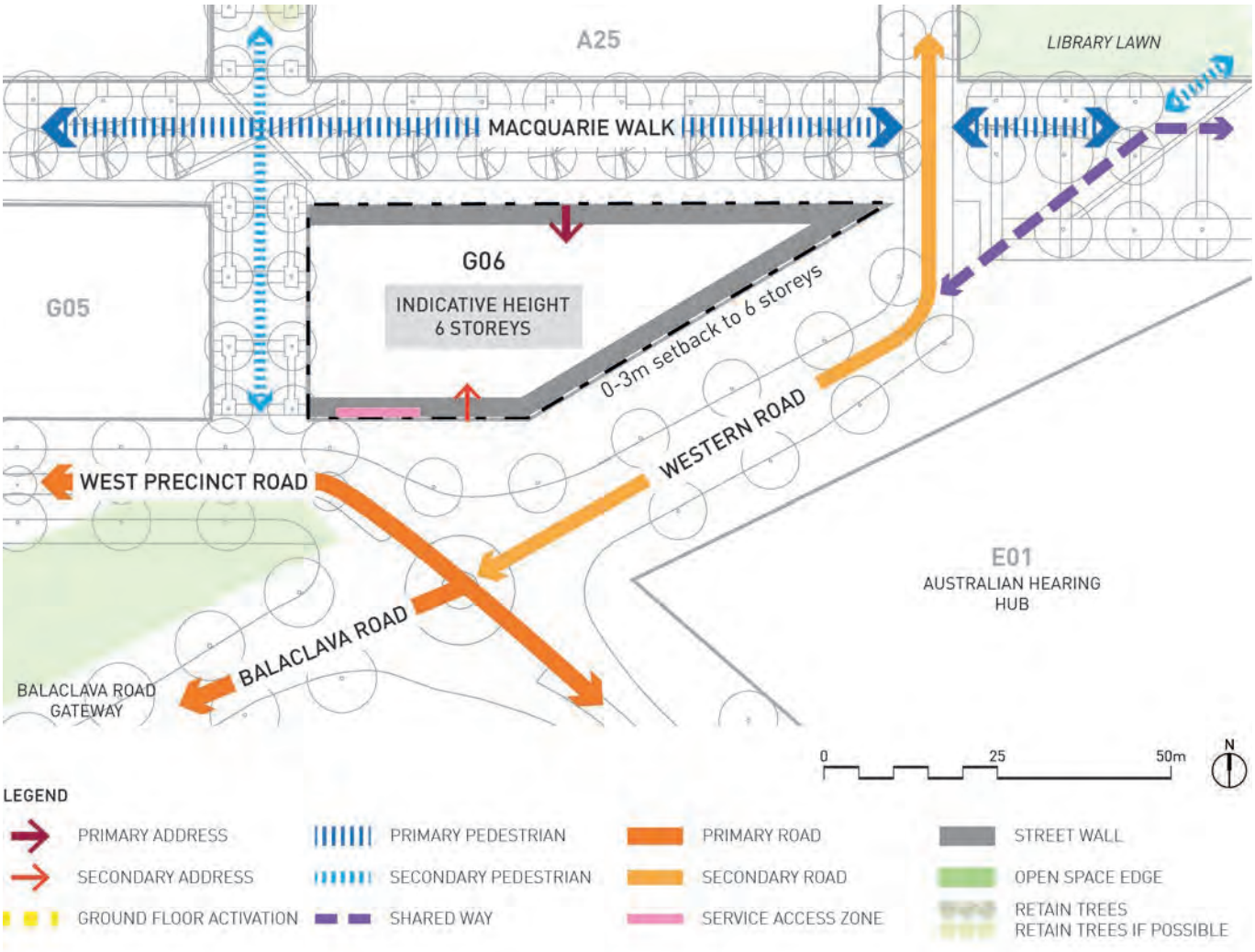
- Indicative height 6 storeys.
- Building is to address Balaclava Road Gateway and Macquarie Walk.
- Reinforce street wall along Macquarie Walk, Western Road and West Precinct Road.

Access

- Primary address located indicatively on Macquarie Walk along the northern frontage.
- Secondary address located indicatively on West Precinct Road along the southern frontage.
- Service access from West Precinct Road along the southern frontage.

Landscape

- Interface with Macquarie Walk and University Avenue.
- Review and retain significant trees if possible.
- Refer to the Macquarie Walk and Balaclava Road Gateway landscape guidelines in the Public Domain chapter.



5.2.8 Precinct H

Precinct H, Talavera Road North, is located in the north of the campus, on the corner of Culloden and Talavera Roads.

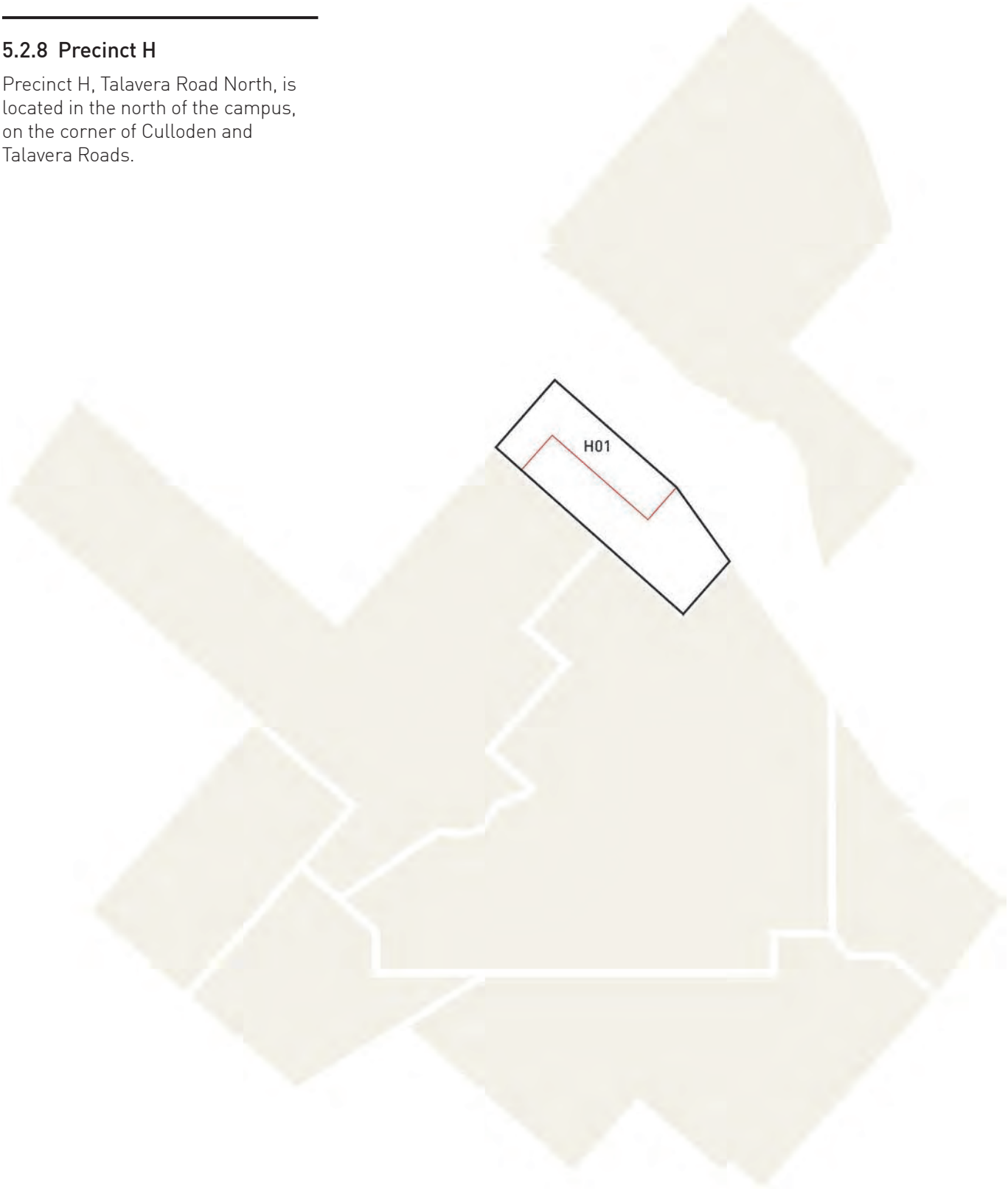


FIGURE 41: LOTS WITHIN PRECINCT H

LOT H01

Architectural Principles

Lot H01 is located in the northern corner of the campus, adjacent to the intersection of Culloden and Talavera Roads. The lot is adjacent to residential buildings on Culloden Road.

Built Form

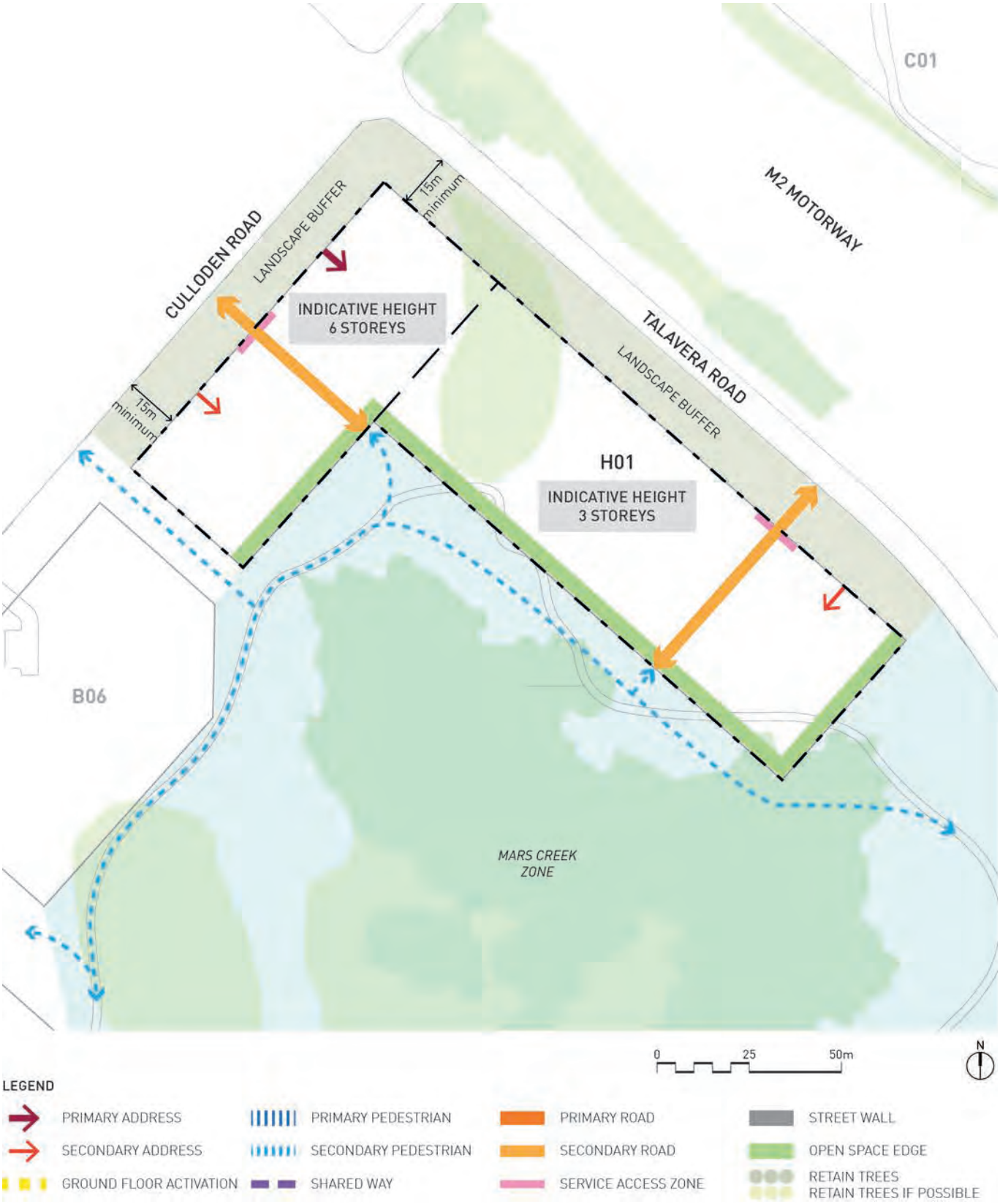
- Indicative height 6 storeys in north-west section and 3 storeys in north-east section of lot.
- The lot is suitable to contain several buildings.
- Buildings are to address the Mars Creek zone, Culloden and Talavera Roads behind a landscape buffer.

Access

- Primary address located indicatively on Culloden Road along the north-west frontage.
- Possible secondary addresses located indicatively on Culloden Road along the north-west frontage and Talavera Road along the north-east frontage
- Possible service access from both Culloden Road along the north-west frontage and Talavera Road along the north-east frontage.

Landscape

- Landscape buffer along corner of Culloden and Talavera Roads.
- Interface with the Mars Creek zone.
- Review and retain significant trees if possible.
- Refer to the Mars Creek landscape guidelines in the Public Domain chapter.


C01
M2 MOTORWAY
CULLODEN ROAD
LANDSCAPE BUFFER
15m minimum
INDICATIVE HEIGHT
6 STOREYS
TALAVERA ROAD
LANDSCAPE BUFFER
15m minimum
H01
INDICATIVE HEIGHT
3 STOREYS
B06
MARS CREEK
ZONE
0
25
50m
N
LEGEND
PRIMARY ADDRESS
SECONDARY ADDRESS
GROUND FLOOR ACTIVATION
PRIMARY PEDESTRIAN
SECONDARY PEDESTRIAN
SHARED WAY
PRIMARY ROAD
SECONDARY ROAD
SERVICE ACCESS ZONE
STREET WALL
OPEN SPACE EDGE
RETAIN TREES
RETAIN TREES IF POSSIBLE



MACQUARIE
University

6.1 LANDSCAPE MANAGEMENT PLAN
(INCORPORATING WEED MANAGEMENT PLAN)

6. SUPPORTING DOCUMENTS

Landscape Management Plan

(incorporating Weed Management Plan)

Macquarie University

June 2017



context

Document Control

ISSUE	DESCRIPTION	SIGNED	DATE
A	Preliminary Draft Issued for Review	DM	21/05/15
B	Final Draft Issued for Review	DM	27/05/15
C	Final Issue	DM	15/07/15
D	Final Issue	DM	31/07/15
E	**Final Issue to update Precinct D**	DM	16/06/17

Landscape Management Plan
(Incorporating Weed Management Plan)

Macquarie University

June 2017

context

Table of Contents

1.0 Introduction 1

1.1 The Need for this Landscape Management Plan 1

1.2 Where This Plan Applies 2

1.3 Landscape Maintenance Responsibility 3

1.4 Landscape Management Principles 3

1.5 Report Structure 4

1.6 Intensity of use 5

1.7 Arboretum 7

2.0 General Site Conditions 9

2.1 Soil 9

2.2 Existing Vegetation 9

2.2.1 Cultural Plantings 9

2.2.2 Mars Creek Vegetation and Riparian Corridor 11

2.2.3 University Creek Vegetation and Riparian Corridor 12

3.0 Specific Landscape Types 14

3.1 Specimen Trees 14

3.1.1 Soil Management for Trees 15

3.1.2 Fertilising, composting and mulching 16

3.1.3 Pruning 17

3.1.4 Replacement Plantings 19

3.1.5 Tree Guards, surrounds and Stakes 19

3.2 Mass Planting Areas 20

3.2.1 Soil Management for Mass Planted Areas 22

3.2.2 Fertilising, Composting and Mulching 23

3.2.3 Pruning 24

3.2.4 Replacement Plantings 24

3.2.5 Weeding 24

3.3 Planting on Slab 26

3.3.1 Soil Management for On Slab Planting 27

3.4 Lawn Grasses and Sports Turf Grasses 28

3.4.1 Soil management and mowing for Turf in High Traffic Areas 31

3.4.2 Soil management and mowing for Turf in Passive Recreation Areas 32

3.4.3 Soil management and mowing for Turf in in Sports Fields 32

3.4.4 Weeds in Turf 33

3.5 Native Grasses 33
4.0 All Areas of the Campus 35
4.1 Disease and Insect Control 35
4.2 Irrigation 35
5.0 Specific Landscape Management Activities for Specific Areas of the Campus 39
5.1 Primary public domain spines 39
Wally's Walk 39
Macquarie Walk 40
Sir Christopher Ondaatje Avenue 44
5.2 Primary parks and plazas 46
The University Common and Library Lawn 46
The Central Courtyard 48
The Grove (East Common) 50
Arts Lawn (West Common) 51
5.3 Secondary Parks and plazas 51
Frank Mercer Biological Sciences Garden 51
Jim Rose Earth Science Garden 51
Mars Creek Plaza 52
Wally's Walk Park 53
Western Road Park 54
Macquarie Theatre Courtyard 54
Cochlear Forecourt 55
5.4 Creek corridors and parklands 56
University Creek 56
Mars Creek 56
Culloden Creek 56
5.5 Primary roads and pedestrian connections 57
University Avenue 57
Research Park Drive 57
Innovation Drive 57
Eastern Road 58
Western Avenue 58
West Precinct Road 58
Secondary East-West Pedestrian Connections 59
Secondary North-South Pedestrian Connections 59
5.6 Sports field and facilities 59

6.0 Protective Measures 60
6.1 Protection of Existing Vegetation 60
6.2 Tree Protection 60
6.3 Erosion, Contamination and Sedimentation Control 60
6.4 Tree Removal and Disposal of Vegetation on Site 61
7.0 Monitoring and Reporting 62

Appendices

Appendix A – Illustrative Master Plan
Appendix B – Three Monthly Maintenance Audit Form
Appendix C – Reference Documents

Figures

Figure 1 Extent of the campus covered by this LMP....2
Figure 2 High intensity open space – Central Courtyard....6
Figure 3 Passive open space – Mars Creek Lawn....6
Figure 4 Mars Creek Riparian Zone showing regeneration of the 20m riparian corridor....7
Figure 5 Arboretum interpretive signage....8
Figure 6 Bushcare interpretive signage....9
Figure 7 2014 Aerial view. Source: SIX Maps....10
Figure 8 1943 Aerial view. Source: SIX Maps....10
Figure 9 1930's Aerial view. Source: Macquarie Uni Archives....11
Figure 10 Underground culverts on Mars Creek should be considered for removal. This pipe travels in a direct line under the ampitheatre so the creek may need a slight diversion if the pipe is removed. Note that very little water is actually flowing in the pipe. 12
Figure 11 Specimen trees - *Liquidamber styraciflua* - in the Macquarie Theatre courtyard 15
Figure 12 Recently planted avenue of *Tristaniopsis laurina* in the central median of the recently upgraded University Avenue. These should be progressively underpruned to “lift” the canopy to four metres to allow for passing large vehicles....18
Figure 13 The dead tree in the background should be immediately replaced as this is a high profile location used for graduation photos....19
Figure 14 The metal surround should be removed well before the trunk outgrows the circumference....20
Figure 15 Recent mass planting of natives - Lomandra, Westringia Leptospermum and Melaleuca. A lower Phosphorous component fertiliser should be used in areas of solely native planting. 22
Figure 16 While not a noxious weed and more of a nuisance weed, the Portulaca species in this bed could be easily controlled if the garden bed were more densely planted. 25
Figure 17 Planting and lawn over a concrete slab near the library. Note the shape of the garden bed results in an area too narrow and difficult to plant. A different resolution could have prevented this. 27
Figure 18 The lawn in the Central Courtyard is underperforming due to wear, possibly poor construction and competition from tree roots. A larger raised lawn may be preferable. 28
Figure 19 The Ampitheatre is a special case but in most circumstances a slope such as this is too steep for safe mowing and should be planted. Note that the mowing regime has allowed the grass to grow long which is desirable in an area of occasional use. 30
Figure 20 A native grass (*Themeda triandra*) intended for an ornamental purpose only, but with infrequent mowing can be used as a lawn for occasional use....33
Figure 21 "Castellated kerb" allows water into the central median where it is "polished" by vegetation and slowed from entering the stormwater system. Planting benefits by being passively watered. 36
Figure 22 A partially planted drainage swale in the Cochlear Forecourt. 37

Figure 23 The western end of Wally's Walk - Plane Trees with Ivy below. 39
Figure 24 Plane trees adjacent to the building are stunted due to shade and proximity to the building..... 40
Figure 25 The “Crossing” bridge over University Creek will “land” behind the clump of Tallowoods shown in the centre of the picture and will connect with Macquarie Walk. 41
Figure 26 Looking West down the Axis of the proposed Macquarie Walk. The Creek transition Zone ends where it intersects with Christopher Ondaatje Walk at the pedestrian crossing in the middle ground. 42
Figure 27 Grey Gum street trees outside the library -the precedence for future streetscape planting along Macquarie Walk. Note stakes and metal collar should be removed. 43
Figure 28 When traffic is removed, the southern edge of the Walk can be converted to a formal avenue. The existing Flooded Gums shown can be retained in the background. 44
Figure 29 The edge of the University Common from Sir Christopher Ondaatje Avenue planted with Liquidambers..... 45
Figure 30 Clover in lawn. The Clover adds nitrogen but does not wear well. Take remedial action if the lawn does not increase in vigour as the weather warms. 47
Figure 31 Shrub beds between the Central Courtyard/Wally's Walk and the University Common. Replace with plantings that allow a visual connection between the spaces – small trees with clear trunks and low under-planting..... 48
Figure 32 Dead Lemon Scented Gum should be replaced. 49
Figure 33 The existing lawn should be raised and the intersecting paths removed. 50
Figure 34 Path through the Grove 51
Figure 35 Bare spots could be replanted with appropriate species. Watering requirements should be checked. 52
Figure 36 Potential view from the proposed Mars Creek Plaza 53
Figure 37 Wally's Walk Park..... 53
Figure 38 Mondo Grass bed requiring replacement planting..... 54
Figure 39 Steeply sloping lawn should be replaced with low maintenance groundcovers such as *Lomandra* shown at the top of bank. 55
Figure 40 Cochlear Building frontage to University Avenue requires replacement planting. 56

1.0 Introduction

This report has been prepared to support the Campus-wide Macquarie University Design Excellence Strategy and Urban Design Guidelines. The Design Excellence Strategy and Urban Design Guidelines are required under Condition B4 of the Concept Plan approval, and will act as a guiding document in implementing the recently completed Macquarie University Campus Master Plan 2014. In addition to the Design Excellence Strategy and Urban Design Guidelines, the Concept Plan conditions of approval also require detailed management plans to support new development in each precinct. These include the requirement to prepare a Landscape Management Plan as contained in this document.

The Landscape Management Plan (LMP) describes the landscape management activities to be undertaken by the Macquarie University Property Office or its agents for the long-term care of the Universities various open spaces. The historic and current landscape is discussed, the general landscape management principles of the University are outlined, and general landscape management activities are described. There is a focus on specific landscape types with particular management activities, and on landscape management activities which support the goals and objectives of the Design Excellence Strategy and Urban Design Guidelines. It proposes management activities which may be specific to and promote the landscape character of each precinct within the open space network.

The LMP covers the landscape management of both the existing and proposed future constructed landscapes, and the Vegetation Management Plan (VMP) prepared by CONTEXT/Lesryk Environmental Consultants 2015 covers the management of remnant native vegetation areas and habitat rehabilitation zones. There is some overlap as some areas of remnant vegetation, particularly in riparian corridors have been planted with introduced species over the years.

The campus open space is currently undergoing major changes as new projects are commenced and the Masterplan is implemented. For this reason the LMP does not provide a schedule or timetable of activities or reporting. A timetable of activities, reporting and inspections should be prepared by the Property Office for existing open space areas and new areas included as they are completed.

1.1 The Need for this Landscape Management Plan

Due to its high quality landscape setting, Macquarie University is recognised as a ‘Campus in the Park’. The ongoing management of the campus landscape is therefore fundamental in reinforcing the experience of the University into the future.

The Macquarie campus contains examples of biodiversity under threat from past extensive habitat loss. Around four hectares of the endangered Sydney Turpentine Ironbark Forest (STIF) community occurs as remnant bush around the University grounds, particularly to the northwest of the Mars Creek Lake.

In addition the University maintains the whole campus as an Arboretum comprising all trees and plants on the campus. These trees, growing in natural and planted habitats, provide a valuable resource for teaching and research and a pleasing and relaxing environment for the enjoyment of staff, students and visitors to the university. Where appropriate the university provides interpretive material throughout the campus which describes the arboretum, trees and ecological processes. The arboretum also provides habitat for many native birds and animals.

1.2 Where This Plan Applies

This LMP applies the entire open space network of the campus and includes landscape areas over podium or roofs, streetscapes and the sports fields. It includes all precincts. These are;

—**Precinct A** Academic Core

—**Precinct B** University Housing

—**Precinct C** University Open Space and Playing Fields

—**Precinct D** Macquarie University Research Park (MURP) and Private Hospital

—**Precinct E** Station South

—**Precinct F** Epping Road West

—**Precinct G** Epping Road Precinct Expansion

—**Precinct H** Talavera Road North

Refer to figure 1 showing the extent the area covered by the plan.



Figure 1 Extent of the campus covered by this LMP

1.3 Landscape Maintenance Responsibility

The Macquarie University Property Office will hold the first level of responsibility for the implementation of the Landscape Management Plan. The on-going, day-to-day implementation, monitoring and reviewing of the LMP will be undertaken by the by the Assets Manager, Campus.

1.4 Landscape Management Principles

The following landscape management principles have been identified as being consistent with the Concept Plan:

Minimise environmental impacts that may result from landscape management activities and utilise environmentally sustainable practices

Preserve, enhance and promote the bushland character of the university

For new and replacement plantings, consider the use of endemic plant species in the first instance. Next consider the appropriateness that the species selection may have in enhancing the character of the precinct or space in which it is to be planted and whether the species can enhance the Arboretum collection

Use specimen trees to unify and define the landscape character of particular outdoor spaces

Provide a safe environment, minimising potential risks to people, buildings and property

Incorporate water sensitive urban design (WSUD) techniques to manage stormwater, slow runoff, recharge groundwater, store for re-use and to passively irrigate landscape areas

Apply best practice bush regeneration in bushland areas and best practice landscape maintenance in landscaped areas

Provide a continuous and legible high quality path network that provides for safe, equitable and efficient movement. Give precedence to pedestrians over vehicles and improve access to all areas of the campus

Ensure that all new works comply with the requirements of AS 1428 Access and Mobility Design

Target noxious weeds and feral animals through the use of integrated pest management approaches

Integrate building and landscape design to provide external meeting and teaching and learning spaces

Provide opportunities for Aboriginal, environmental and informal learning and study in the landscape

Maintain high quality outdoor spaces, precincts and streetscapes

Maintain high quality sports precincts

Maintain high quality passive recreation areas

Manage bushfire risk in accordance with recognised guidelines

Provide opportunities for greater community involvement

Appropriately fund, plan and manage landscape maintenance to provide a measurable improvement of the campus landscape appearance, safety and amenity.

1.5 Report Structure

This report is to be read in conjunction with the:

- Macquarie University Campus Masterplan 2014 (Cox Richardson Architects and Planners 2014)
- Design Excellence Strategy and Urban Design Guidelines 2015 updated 2017, prepared by Cox Richardson Architects and Planners in conjunction with CONTEXT
- Vegetation Management Plan (VMP) 2015 for Macquarie University, prepared by Lesryk Environmental Consultants in conjunction with this LMP.

Section 1.0 provides an introduction to the LMP

Section 2.0 describes the general site conditions

Section 3.0 describes Specific Landscape Types

Section 4.0 describes management activities common to all landscape areas of the campus

Section 5.0 describes specific landscape management activities for specific areas of the campus

Section 6.0 describes Protective Measures for trees and vegetation

Section 7 Monitoring and Reporting

The report is structured to avoid duplication by separating maintenance activities into two categories:

1. Specific Landscape types – Those maintenance activities that are specific to particular landscape types. The specific landscape types are:
    a. Specimen Trees. These may be planted in lawn areas or in paving areas, as avenues and as street trees or in groupings
    b. Mass Planting Areas. These may be composed of single species plantings or mixes which may include trees shrubs and groundcovers
    c. Planting on Slab.
    d. Lawn Grasses and Sports Turf Grasses
    e. Native Grasses

2. All areas of the campus – Those maintenance activities that apply to all areas of the landscape within the University. These activities include:
    a. Disease and Insect Control
    b. Irrigation

3. Specific landscape management activities for specific areas of the campus. Specific areas of the campus are required to be managed in particular ways in order to preserve and enhance their unique landscape integrity. The specific areas are:

    a. Herring Road Gateway
    b. Balaclava Road Gateway
    c. Gymnasium Road Gateway
    d. Talavera Road Gateway
    e. Wally's Walk
    f. Macquarie Walk
    g. Sir Christopher Ondaatje Avenue

h. The Central Courtyard
i. The University Common
j. The Library Forecourt
k. Arts Lawn (West Common)
l. The Grove (East Common)
m. Mars Creek
n. University Creek
o. Culloden Creek
p. Mars Creek Plaza
q. Wally's Walk Open Space
r. Macquarie Theatre Courtyard
s. Cochlear Forecourt
t. Jim Rose Earth Science Garden
u. Talavera Park
v. Frank Mercer Biological Sciences Garden
w. University Avenue
x. Research Park Drive
y. Eastern Road
z. Western Road
aa. West Precinct Road
bb. Innovation Drive
cc. East-West Pedestrian Connections
dd. North-South Pedestrian Connections
ee. Sports Fields
ff. Residential Colleges

1.6 Intensity of use

A key factor in the frequency and types of landscape maintenance activities required for particular areas is the intensity of their use.

High Intensity Open Spaces

High intensity spaces occur throughout the campus and are places which provide pedestrian linkages to buildings within the University as well as being spaces that encourage social and leisurely activities. They are mixed use zones.

High intensity spaces include Streetscapes such as University Ave near the train station, The Central Courtyard, The University Common, The Library Forecourt, The Arts Lawn and The Grove.



Figure 2 High intensity open space – Central Courtyard

Passive Open Spaces

Passive areas include smaller, informal spaces which cater for outdoor learning opportunities, breakout areas and recreational uses and larger areas which see occasional use by small numbers of people.

These spaces on the campus include Mars Creek Plaza, Wally's Walk Park, Macquarie Theatre Courtyard, Jim Rose Earth Science Garden, Talavera Park and Frank Mercer biological Sciences Garden, Mars Creek and University Creek.



Figure 3 Passive open space – Mars Creek Lawn

Sports Fields

Located on the corner of Talavera Road and Culloden Road in North Ryde the Macquarie University Sports Fields comprises of seven hectares of playing areas. Sports fields have short periods of intense activity and long periods of low activity.

The Sports Fields include Jim Campbell Sportsfield, Ross Gwilliam Sportsfield, Northern Oval and Roger Sheeran Oval.

Riparian Corridors and Bushland Areas

The riparian corridors on the Macquarie University campus run along Mars Creek and University Creek. The riparian areas are generally areas of low activity although recent riparian rehabilitation upgrades may encourage greater activity. Bushland areas should be managed using bush regeneration techniques that have a low environmental impact.

Bushland management zone relates to bushland areas within the campus. Bushland on the North-west corner of the campus is mapped as Bushfire Prone land Vegetation Category 2 and is to be managed with a 30 metre perimeter vegetation buffer.

Areas of mass planting are not generally susceptible to compaction from pedestrian usage therefore heavier textured soils can be used.



Figure 4 Mars Creek Riparian Zone showing regeneration of the 20m riparian corridor

1.7 Arboretum

The arboretum at Macquarie University is unique in being the only arboretum in Sydney that is located on a university campus. It contains trees that are remnant to the native plant communities as well as recent landscape planting. The arboretum is a resource for teaching and research and provides habitat for native birds and other animals. The campus contains a series of walks and gardens, some themed, which display a range of interesting plant species.

The University was established in the 1960's. Prior to this time, the main use of the area was for market gardens. During that time pockets of remnant vegetation were retained. These pockets are still evident and have increased in size over the last 4 decades. As a result of the changes in land use in the surrounding suburbs, there is an increase in the importance of the native vegetation within the campus. Located on the north-western corner of the campus and to the west of the lake

is the main area of remnant Sydney Turpentine Ironbark Forest vegetation community, however smaller pockets are located near the railway station and scattered throughout the campus.

When undertaking planting or replanting at the University, consider the introduction of rare and unusual native and exotic species to increase the arboretum's collection.

Macquarie University is located near areas of native vegetation in Christie Park and Lane Cove National Park. A key goal of the campus landscape management is integrate the campus with the natural surrounding areas and to encourage biological diversity.



Figure 5 Arboretum interpretive signage

A Bushcare Group has recently been established at Macquarie University to preserve the natural environment in particular the native vegetation and the watercourses. The activities of this group will be focussed around the restoration of the riparian zones with native vegetation. There is also a focus around improving the natural flow and water quality of Mars and University Creeks and improving the connectivity between areas of remnant native vegetation.



Figure 6 Bushcare interpretive signage

2.0 General Site Conditions

2.1 Soil

Macquarie University is located at the geological boundary between Hawkesbury Sandstone and Ashfield Shale of the Wianamatta Group. The gently undulating topography, remnant shale/sandstone transition forest communities (Sydney Turpentine Ironbark Forest, Sandstone Ridgetop Woodland) and occasional loose sandstone boulders in the creek line reflect this characteristic landscape typology.

As noted in the Geomorphologic Assessment conducted by Coffey Geotechnics, 'the geological profile typically consists of topsoil or pavement overlying residual clay. The Bedrock is generally shallow throughout the site, with the depth of overlying clay generally decreasing with elevation'.

2.2 Existing Vegetation

2.2.1 Cultural Plantings

The predominately native landscape at Macquarie University is the result of over 40 years of continuous planting, transforming the site from its previous use an orchard and market garden into

a ‘Campus in a Park’. It was the intention of Professor Clough, the original landscape architect for the campus, to create a gradual landscape journey from the urban streetscapes outside the campus through the transitional campus building zone to the natural landscape of Mars Creek and its densely planted native backdrop beyond.

Historical aerial photography (refer Figure 7, 8 and 9) illustrates the previous clearing of large tracts of existing vegetation for cultivation as an orchard and market garden. The 1943 view was taken after a bushfire and illustrates the reduced canopy that resulted.



Figure 7 2014 Aerial view. Source: SIX Maps



Figure 8 1943 Aerial view. Source: SIX Maps



Figure 9 1930's Aerial view. Source: Macquarie Uni Archives

Over 14,000 trees and shrubs were planted by Macquarie University throughout the campus between the late 1960s and 1970s, of which some 10,000 have matured and still exist on site. It was the intention of Professor Clough, the University planner at that time, to create a gradual 'landscape journey' from the 'urban streetscape' outside the campus into a natural core.

The earlier streetscapes are defined by informal plantings of *Corymbia, Eucalyptus* and *Syncarpia* species; mainly *Corymbia maculata, Corymbia citriodora* and *Eucalyptus saligna*. The tree planting is often in clumps and form part of the greater open space layout rather than the definition of the roadway. Due to the consistency of size and species, most of the trees within the streetscape would have been planted during the 60s and 70s, however there are a number of naturalized trees in the vicinity of the road reserves.

More recent plantings, for example on University Avenue, are laid out in a formal boulevard arrangement with regular spacing providing shade for the length of the road.

2.2.2 Mars Creek Vegetation and Riparian Corridor

Mars Creek is located at the northern extent of the Macquarie University campus. Land use of the creek corridor incorporates remnant bushland, planted exotic and native woodland, mown exotic grassland, teaching & research facilities and animal enclosures. The restoration of vegetation along Upper Mars Creek through the implementation of the two VMP's has been a success. Ideally, similar rehabilitation, including the possible removal of underground culverts, should be adopted downstream of Gymnasium Road.

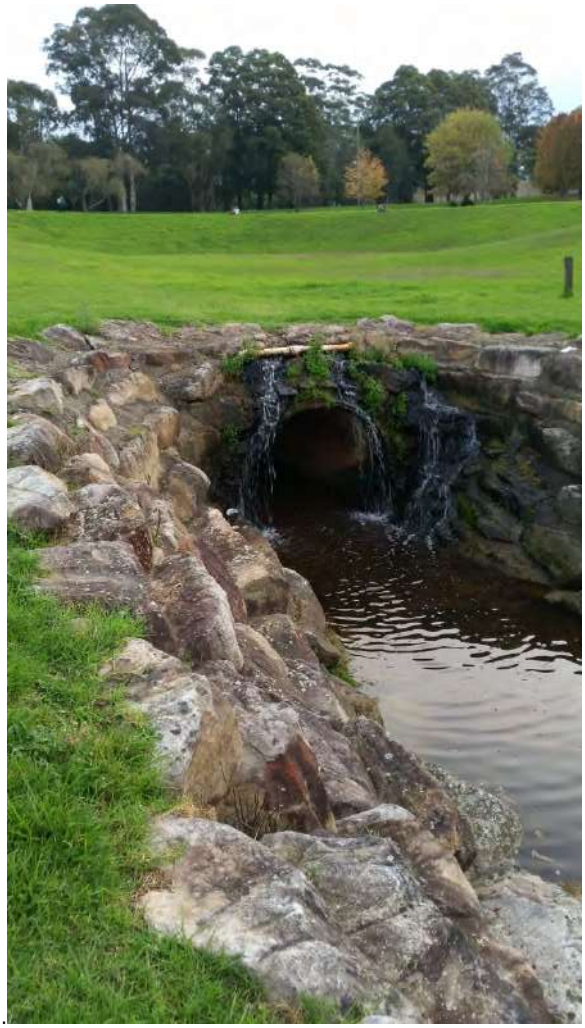


Figure 10 Underground culverts on Mars Creek should be considered for removal. This pipe travels in a direct line under the ampitheatre so the creek may need a slight diversion if the pipe is removed. Note that very little water is actually flowing in the pipe.

Mown lawns with planted Eucalyptus spp. and exotic deciduous trees form an open space perimeter in the south west of the creek corridor. Generally, Mars Creek is situated in a highly modified urban landscape with adjacent development including education facilities, medium density housing and commercial complexes, with Lane Cove National Park located to the north west of the creek corridor. (Total Earth Care, 2014)

A large, remnant stand of Sydney Turpentine Ironbark Forest (STIF) is located in the northern area of the creek corridor, with a smaller remnant stand of STIF located in the central area of the corridor south of the existing gymnasium building.

Refer to the Vegetation Management Plan (Lesryk, 2015) for additional information regarding the ongoing management of vegetation within the Mars Creek riparian corridor.

2.2.3 University Creek Vegetation and Riparian Corridor

University Creek is located in the southern area of the Macquarie University campus. Although a 'natural' watercourse, University Creek has been substantially altered over the past 50 years, with culverts, storm water inlets, constructed creek beds and banks contributing to its current flow and

flood regime. The south-eastern area of the creek zone and downstream is subject to periodic flooding.

The riparian corridor has been physically defined and limited by the development of the campus buildings, infrastructure and recreation zones over the last four decades and is often less than the desired 20m in width from the top of the bank. The current planting defines the creek line and creates a range of landscape experiences from the more open parkland landscape in the south west to a more ‘structured’ landscape past Research Park Drive to the north east.

The existing landscape in the riparian corridor of University Creek comprises open parklands and mown lawns set within rising topography on either side of the creek. The majority of the trees within the riparian corridor are native and are believed to have been planted in the late 1960’s and early 1970’s. Some remnant stands of STIF and Sydney Sandstone Ridgetop Woodland occur within the riparian zone. Recent plantings in conjunction with the University Avenue roadworks have re-introduced a balance of lawn, native lawn and STIF understorey to accommodate and balance biodiversity with passive recreation within the creek environs.

Refer to the Vegetation Management Plan (Lesryk, 2015) for additional information regarding the ongoing management of vegetation within the University Creek riparian corridor.

3.0 Specific Landscape Types

3.1 Specimen Trees

The existing trees on the Campus help to define spaces and provide character, shade, screening, wind protection, habitat, and a sense of scale. As each mature tree could be considered to have a commercial value ranging from several hundred to several thousand dollars (depending on the age, species, size and valuation method), it can be considered that the existing tree-scape is valuable in financial terms and is a major and physical asset.

In principle any tree with a trunk diameter of more than 150mm should be assessed by a qualified arborist prior to removal. This should not apply if the tree has major structural faults, is clearly senescent, an environmental weed or poses a health and safety risk.

Underground works, including excavation and service trenching, are frequently the major cause of damage to existing healthy trees. Consideration must been given to protection of the critical root zones of existing trees.

Tree selection for replacement and new tree plantings will be subject to individual designs however some key considerations for both landscape architects and landscape staff are to select endemic trees that contribute to local biodiversity first, then to consider whether the species can contribute to the character of the precinct in which it is planted (for instance, does it complement existing trees or contribute to a proposed theme for the space). Finally trees should be considered for their contribution to the goals of the University Arboretum.

All tree management on campus should refer to the *City of Ryde DCP 2010 Part 9.6 Tree Preservation* and the *City of Ryde Urban Forest Technical Manual and Application Guide.*

Refer to Section 6 for Tree Protection Measures.

All existing trees on Campus have been surveyed.

Avoid whipper-snipping grass at the base of trees because this can cause ring-barking and tree death. Clip around tree bases by hand or instead plant low groundcovers or mulch at the base of trees. Where trees are planted in paved areas, adjacent to the trunk use:

1. Gravel
2. resin-bonded gravel
3. permeable paving surrounds
4. proprietary tree grate or
5. a combination of the above



Figure 11 Specimen trees - *Liquidamber styraciflua* - in the Macquarie Theatre courtyard

3.1.1 Soil Management for Trees

Wherever trees are to be planted it is important to understand wether the existing in situ topsoil can be used as backfill, wether new topsoil, soil mix, soil conditioner or amendments needs to be imported, or if a mix of the above is best.

In general, the greater the soil/subsoil depth (the effective root depth) - the larger the tree that can be supported with minimal maintenance. The ideal soil profile for trees will have at least 3 horizons where the “A” horizon is the topsoil, the “B” horizon is Subsoil and the “C” horizon is the Subgrade. The minimum recommended topsoil depth for trees is 250mm with a minimum subsoil depth of 200mm. This will provide the tree with the minimum moisture/nutrient reserve and anchorage capacity.

In addition to a physical inspection of the soil to be used to assess field texture and structure and drainage capability, soils should also be analysed by a soil laboratory for the following properties at a minimum:

- pH
- Salinity (electrical conductivity)
- Cation exchange properties and exchangeable cations
- Major and minor nutrients
- Organic matter (%)

Where tree specimens in container sizes 25 litres or larger are to be planted, the subsoil should also be tested for:

- pH
- Salinity (electrical conductivity)

- Cation exchange properties and exchangeable cations
- Aggregate stability.

The most common amendments used to bring soils up to a standard suitable for plant growth are:

- Lime or dolomite to make acid pH soils more alkaline.
- Lime or Gypsum to enhance exchangeable calcium and eliminate sodicity
- Gypsum to make clay soils more friable
- Composts and/or manures to improve organic matter and nutrients levels
- Single or complete fertilisers often with trace elements to correct a particular deficiency or multiple deficiencies.

it is important that the backfill soil is returned in the layers in which it was excavated so that topsoil with organic content is placed back near the top 300mm of the backfill. Where the existing site topsoil backfill is unsuitable or insufficient it can be made up with:

Sandy loam or site won topsoil mixed with; Composted soil conditioner conforming with AS 4454	70-100% by volume 0-30% by volume	Eg. 8 parts washed sand/2 parts sandy loam/1 part compost. Amendments as reported by the soil test results.

(Leake and Haege 2014, p.87)

Where the tree pit is deeper than 300mm (usually for trees in containers over 45 litres) and the existing site subsoil is unsuitable or insufficient a topsoil medium low in organic matter is required so that the organic matter does not “sour” at depths where there is less oxygen, It can be made up with a sandy, well-drained medium which contains low organic matter An example of the components may be:

Sandy loam	60-80% by volume
On-site clay loam or clay topsoil or subsoil	20-30% by volume
Composted soil conditioner conforming with AS 4454	<10% by volume

(Leake and Haege 2014, p.96)

3.1.2 Fertilising, composting and mulching

To ensure the health and vigour of trees are maintained.

All trees whether native or exotic will perform better when the soil conditions are healthy. Building healthy soils is the key to achieving the long term maintenance goals of mass-planted landscape areas. Soil health is primarily achieved with regular applications of organic soil conditioners such as animal manures, decomposed green waste or proprietary blends of compost.

Fertilising and composting are not critical maintenance activities except where there are obvious deficiencies but should be assessed on an annual basis by observation and leaf analysis.

Maintain an adequate level of mulch maintained in planter beds in order to maximise water conservations and to supress weeds.

Note: NPK ratios listed are for native trees. Increase P above >=5 for exotic trees.

Maintenance Action Required	Frequency
Where obvious deficiencies are evident 60 grams/plant (trees) Controlled Release fertiliser such as Nutricote Total TE 360 Day - 17.6: 2.9:6.9 per plant. Or:	Only to be applied if the plant is noticeably under stress and the plant will benefit from the application of the fertiliser Inspect annually; however apply in late Spring if required.
3 x 20 gram slow release fertiliser tablet per plant . N:P:K ratio – 18:3:10	Only to be applied if the plant is noticeably under stress and the plant will benefit from the application of the fertiliser Inspect annually; however apply in late Spring if required.
Where soils are dry, hydrophobic and as a regular maintenance procedure, top up all garden beds with 30-50mm depth of Soil conditioner as composted animal manure, decomposed green waste or proprietary blends such as “Botany Humus” as available from Australian Native Landscapes. For extreme cases use a proprietary soil-wetting agent.	Bi-annually, applied at any time of year.
Maintain mulch to a depth of 75mm, through periodic applications. Use same mulch as originally specified in each planting	As required, however should not be necessary more than once per year

3.1.3 Pruning

Carry out all tree pruning in accordance with AS 4373 Pruning of amenity trees. Prune trees to maintain driver sight lines; to remove dead wood from over hanging paths, cycle-ways and roads, to maintain vegetation health and to remove branches or trees that are likely to pose a risk to public safety. Prune to an extent where this will not re-occur as a problem in the period to next routine maintenance without compromising overall form and growth potential of the tree.

Suitable timing for pruning should be determined by the arborist so as to maintain vegetation health, however all trees should be inspected regularly and especially after high winds to determine any action required.

Of particular note are recent avenue tree plantings on University Avenue. Refer to Figure 12. The *Tristaniopsis laurina* will eventually require underpruning to 4 metres to accommodate passing buses. This should be achieved over a period of time with the first pruning 12 months after establishment to “lift” the crown and provide a clear trunk to one metre. The following year the trunk should be lifted to 2 metres and so on until the tree is mature enough to have a velar trunk to

4m with a well-balanced crown.



Figure 12 Recently planted avenue of *Tristaniopsis laurina* in the central median of the recently upgraded University Avenue. These should be progressively underpruned to "lift" the canopy to four metres to allow for passing large vehicles.

Suitable timing for pruning should be determined by the arborist so as to maintain vegetation health.

Dead limbs containing hollows should not be removed unless there is a risk to public safety; limbs with hollows that are trimmed from trees should be left in a suitable location on the ground to provide habitat.

The installation of nest boxes should be considered if tree hollows are removed.

Removed timber and native vegetation, unless diseased, should be considered for reuse on-site either as habitat logs in bushland areas where appropriate, or mulched in garden beds.

Prune to reduce continuous canopy within the APZ.

Remove dead or dying trees from the campus as required. This may be necessary when trees mature, after damage or adverse environmental conditions.

Pruning - Work Required	Frequency
Prune to remove split leaders, remove dead and heavily damaged limbs. As maturity permits prune lower branches to collar to 2.5 metres min. above ground level. (note; this is a general rule only as some trees have low branches which are essential to the form of the tree, and some trees will be sued for screening purpose where low foliage is required.)	As required
Prune all trees when limbs and branches hang lower than 4 metres over a roadway or parking	

space and 3 m over a walkways, path or cycleway	

3.1.4 Replacement Plantings

To ensure that the density, species and design intent of established tree plantings is maintained. In figure 5 illustrates the *Liquidamber* tree planting at the graduation statues, a tree has died and snapped mid-trunk. This should be replaced immediately with the largest specimen that can be reasonably procured and practically handled into position.

Replacement Plantings - Work Required	Frequency
Replace failed, senescent or damaged plantings. Densities, sizes and species used are to be in accordance with those specified in the original landscape plans.	As required
Water replacement plantings for a minimum of 12 weeks after planting	As required to ensure survival.



Figure 13 The dead tree in the background should be immediately replaced as this is a high profile location used for graduation photos.

3.1.5 Tree Guards, surrounds and Stakes

Replace tree guards/stakes when damaged and/or remove them when no longer required.

Remove tree surrounds where there is the danger that trunks will outgrow the diameter of the surround. Refer to figure 14.

Work Required	Frequency of Work
- Replace tree guards or stakes for trees and shrubs if they are damaged or removed prior to the establishment of the plant. Replace with the same or equivalent guard/stake.	As required until final removal at 12 months

- Remove tree guards and stakes	after planting



Figure 14 The metal surround should be removed well before the trunk outgrows the circumference.

3.2 Mass Planting Areas

Mass planting areas can vary in appearance from mass plantings of single species (eg. *Lomandra sp., Dianella sp. Liriope sp.*) to more complex beds containing advanced trees, low and tall shrubs and ground covers. Planting sizes can include tubestock up to super advanced or semi-mature container sizes. In general, mass planted beds are either planted with native species or exotic species but may also include both.

Mass planted areas must balance design and aesthetics with the application of the principles of Crime Prevention through Environmental Design (CPTED). The highest priority for the management of mass planted beds should be given to areas that pose a security risk or are currently high maintenance.

The key differences in the management of native plants are their requirement for low-phosphorous fertilisers and a lower fertiliser rate than exotic species generally (although this doesn't apply to Australian rainforest plants – some species of which are endemic to the locality). Plants of the Pea group (including *Acacias, Pultenaeas* and *Hardenbergias*) and *Casuarinas* are also able to fix their own Nitrogen.

Natives also have lower water requirements in comparison to exotics and are adapted to the harsher Australian conditions.

Endemic native plants will tolerate site soils without amendment better than exotics, and if no fertilisers are added there may be a lesser invasion by exotic weeds.

For the above reasons native plantings make a more sustainable option in respect of the long term landscape management and should always should be considered for use on the campus before exotic species. For ease of maintenance it may be beneficial to keep native and exotic species apart although this may not always satisfy design intentions.

Most native plants including native rainforest plants prefer free draining soils.

Exotic planting beds will generally require more frequent fertilising, watering in dry periods and will benefit from more frequent applications of soil conditioner.

The edges of the beds will be defined by appropriate means. Beds shall be weed free and mulched annually to suppress weed growth and retain moisture content within the soil. Where irrigation is not present, garden beds should be watered during dry spells to remove undue plant stress and the potential for die-back.

Pruning will be carried out on shrubs that require it according to species to remove the dead and damaged branches and to retain natural shape and encourage good flowering to improve health and vigour. Where die-back of plant material has been identified new plants will be planted as soon as possible, using species originally specified or that maintain the character and continuity of the planting.



Figure 15 Recent mass planting of natives - Lomandra, Westringia Leptospermum and Melaleuca. A lower Phosphorous component fertiliser should be used in areas of solely native planting.

The key management activities required for mass planting areas are:

3.2.1 Soil Management for Mass Planted Areas

Areas of native mass planting require a sandy loam to clay loam topsoil mix which is suitable for the planting of grasses, woody and herbaceous perennials and occasionally trees. The following mix is suitable for plants that do not have high nutrient requirements and are not susceptible to compaction. Note that if phosphorous sensitive natives are used, the phosphorous levels of all components must be checked for suitability. Additional drainage may be required depending on the situation.

Sandy loam or site won topsoil mixed with; Composted soil conditioner conforming with AS 4454	70-100% by volume 0-30% by volume	*Eg. 8 parts washed sand/2 parts sandy loam/1 part compost.* *Amendments as reported by the soil test results.*

(Leake and Haege 2014, p.87)

Areas of exotic mass planting with higher nutrient requirements can have a higher compost component as below:

Sandy loam or site won topsoil mixed with; Composted soil conditioner conforming with AS 4454	70-90% by volume 10-30% by volume 30-60% by volume for organic	*Eg. 8 parts washed sand/2 parts sandy loam/3 parts compost.* *Amendments as reported by the soil test results.*

	soil variant	

(Leake and Haege 2014, p.89)

3.2.2 Fertilising, Composting and Mulching

To ensure the health and vigour of mass plantings are maintained.

All mass planted areas whether native or exotic will perform better when the soil conditions are healthy. Building healthy soils is the key to achieving the long term maintenance goals of mass-planted landscape areas. Soil health is primarily achieved with regular applications of organic soil conditioners such as animal manures, decomposed green waste or proprietary blends of compost.

Fertilising and composting are not critical maintenance activities except where there are obvious deficiencies but should be assessed on an annual basis by observation and leaf analysis.

Note: NPK ratios listed are for native plants. Increase P above >=5 for exotic mass planting beds.

Maintenance Action Required	Frequency
50-100 grams per square metre of Organic fertiliser such as Dynamic Lifter Composted chicken manure, Blood and Bone, fish meal and seaweed NPK ratio – 3.7:2:1.8	Annually. Applied late Spring and again in autumn (higher rate for fast-growing plants).
Where obvious deficiencies are evident use10 grams/plant (groundcovers), 20 grams/plant (shrubs) and 60 grams/plant (trees) Controlled Release fertiliser such as Nutricote Total TE 360 Day - 17.6: 2.9:6.9 per plant. N:P:K ratio– 18:3:10	Annually. Applied late Spring
Where soils are dry, hydrophobic and as a regular maintenance procedure, top up all garden beds with 30-50mm depth of Soil conditioner as composted animal manure, decomposed green waste or proprietary blends such as “Botany Humus” as available from Australian Native Landscapes. For extreme cases use a proprietary soil-wetting agent.	Bi-annually
All currently mulched areas should gradually be converted to groundcover where possible. Mulch should continue to be applied to a depth of 75mm to retain moisture and minimise weeds until groundcover is established. Mulch applied should be weed-free.	As required, however should not be necessary more than once per year.

3.2.3 Pruning

Ground cover and shrubs should be maintained at a maximum height of 0.5 m along path edges for personal security. Appropriate species selection in these areas will reduce the need for ongoing maintenance.

Remove dead or dying plant material from mas planted areas on the campus as required. This may become necessary as plantings mature, after damage or adverse environmental conditions.

Pruning Mass Planted Areas - Work Required	Frequency
For low shrub species as per appropriate type: Tip prune to encourage density to 50-100mm	As required after flowering
For low shrub species as per appropriate type: Prune evenly to a height of 500mm above ground along path edges. Prune away from paths where required	Every 4 years after flowering

3.2.4 Replacement Plantings

To ensure that the density and species of established plant material within mass planted areas is maintained.

Replacement Plantings in Mass Planted Areas - Work Required	Frequency
Replace failed, senescent or damaged plantings. Densities, sizes and species used are to be in accordance with those specified in the original landscape plans.	As required
Water replacement plantings for a minimum of 12 weeks after planting.	As required to ensure survival.

3.2.5 Weeding

Weeding is listed under “Mass Planted Areas” because it is the area of greatest concern for weeds in the fabricated landscape, note however that weed control in bushland and other landscape types is also covered in this section.

A noxious weed is a plant declared to be noxious under the NSW Noxious Weeds Act 1993. Noxious weeds can be agricultural weeds, environmental weeds or have a direct impact on human health.

Environmental weeds are non-local plants that can invade and change natural areas and threaten the survival of native plants and animals. After land clearing, environmental weeds are considered to be the next greatest threat to our indigenous biological diversity.

Environmental weeds have the potential to readily invade garden bed areas and potentially impact on the adjacent areas of bushland and creek reserves.

In addition to the environmental hazard posed by weeds, weeds occurring in mass planted beds, growing from the base of trees and from pavement can be unsightly and presents an untidy appearance.

The Ryde Council currently has a defined list of noxious weeds in the City of Ryde: http://www.ryde.nsw.gov.au/Environment/Animals+and+Plants/Noxious+Weeds This list defines plants that are classified as weeds and should be removed from the Campus and not planted in any new works.

This list provides a good basis for management and includes many problem garden weeds. However there are further species that have been identified under the Weed Management Act (1999) that should be specifically excluded from the site. Many of these plants are commonly available in the nursery trade so their use needs to be broadly discouraged.

For control of weeds on the Campus comply entirely with the ***Noxious and environmental weed control handbook*** *a guide to weed control in non-crop, aquatic and bushland situations NSW D P I* Management Guide Sixth Edition. A copy of the handbook can be downloaded at the link:

http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0017/123317/noxious-and-environ-weed-control-handbook.pdf



Figure 16 While not a noxious weed and more of a nuisance weed, the Portulaca species in this bed could be easily controlled if the garden bed were more densely planted.

To ensure that environmental and noxious weeds do not reproduce within or spread into mass planted areas and compete with plantings and spread to other areas or nearby bushland.

Weeding and weed control is considered to be a critical maintenance action.

Maintenance Action Required	Frequency
Prevent reproduction of weeds by destroying seedlings and established weeds before seed set or other propagules form. Remove by hand in the first instance (where infestations are low). Ensure that the entire weed including all roots is removed. Dispose of the weeds off site.	Monthly
Remove by Herbicide application any weeds which cannot be controlled by hand removal. Herbicide application must occur before weed seed set. Non-target species and areas must be reinstated if damaged by herbicide application.	
Herbicide use to be in accordance with regulation rates and manufacturers recommendations. Herbicide use must comply with the requirements of the *Noxious and environmental weed control handbook. a guide to weed control in non-crop, aquatic and bushland situations.* NSW Department of Primary Industry Management Guide, Sixth Edition.	
After spraying, lop any dead weeds flush with the ground surface and dispose of the cuttings.	
Use of bio-degradable herbicide is mandatory	

3.3 Planting on Slab

On slab planting areas require particular vigilance in terms of their landscape maintenance. On slab planting areas should be designed with excellent drainage characteristics, but this leaves them susceptible to rapid drying-out because they do not have the moisture buffering capacity provided by subsoils. On slab planting should incorporate sub-surface drip irrigation to prevent drying out On campus they are generally intensive areas and any lawn on slab will be subject to increased wear.



Figure 17 Planting and lawn over a concrete slab near the library. Note the shape of the garden bed results in an area too narrow and difficult to plant. A different resolution could have prevented this.

3.3.1 Soil Management for On Slab Planting

`On slab soil media 'A' horizon requires a well-drained growing media with a saturated density of under 2400kg/m^3. To maintain the structure and porosity of the soil over long periods of time and to avoid volume loss the formulation must include low density mineral components such as ash, perlite, scoria, pumice and diatomaceous earth or the artificial components of urea formaldehyde and Styrofoam.

Physically, the media has the properties of a potting mix and is assessed using the methodology of AS 3743.

The "A" horizon on-slab would typically be 300mm deep for all on-slab planter boxes, containers and garden beds and may be composed of:

Sandy loam or site won topsoil	20-40% by volume
Horticultural ash, perlite, or similar lightweight low-density mineral matter or mixtures of these	30-60% by volume
Composted soil conditioner conforming with AS 4454	20-30% by volume

(Leake and Haege 2014, p.100)

Where the soil profile is deeper than 300mm, an on slab soil media "B" horizon is required. The characteristics are an open granular well-drained growing media with a total saturated density under 2400kg/m^3. This growing media is to be used on the subsurface layer below the 'A' horizon soil.

To maintain the structure and porosity of the soil over long periods of time and to avoid volume loss the formulation must contain low-density mineral components including ash, perlite, scoria, pumice and diatomaceous earth, or artificial components such as urea formaldehyde and Styrofoam. (Leake and Haege 2014, p.102)

Sandy loam or site won topsoil	10-30% by volume
Horticultural ash, perlite, or similar lightweight low-density mineral matter or mixtures of these	30-50% by volume
Composted 10mm pine bark	20-40% by volume
Composted soil conditioner conforming with AS 4454	<20% by volume

3.4 Lawn Grasses and Sports Turf Grasses

Significant areas of the Campus are surfaced in exotic lawn, turf or pasture grass. These areas contribute to the character of the Campus, and are important to open space and passive recreation areas. However, they have high demands for maintenance, and require commitment of significant resources particularly in irrigation, fertilizing and mowing and the maintenance of a thick sward that does not wear readily.

The level of maintenance required for particular lawn areas should be considered within the context of their intensity of use.



Figure 18 The lawn in the Central Courtyard is underperforming due to wear, possibly poor construction and competition from tree roots. A larger raised lawn may be preferable.

The traditional European aesthetic determines that grass should be kept lush and green all year round. This is possible and appropriate for high use areas but this perception is gradually changing and it is now more acceptable that in the Australian climate, lawn areas may be subject to seasonal change and browning off in summer. This aesthetic is appropriate for low-use areas that will not be subject to year-round wear.

Specific issues with the existing lawn and grass on the Campus include:

- A range of grass varieties are used on campus. Has one variety been observed to perform better than others?
- In some high use areas, compaction and wear caused by pedestrian and service vehicle has caused grass to die with bare soil remaining.
- While maintaining a complete grass cover under mature trees is desirable, it can be difficult to maintain. A surface mulch or groundcover planting may be more appropriate.
- Maintenance and access for mowing of grass on steep is a potential occupational health and safety risk. Embankments steeper than 3:1 should be considered for planting treatments so that mowing is not required. Tractor drawn mowers should never mow slopes steeper than 3:1 and it is not advisable to use hand mowers on slopes between 3:1and 2:1 and never on slopes 2:1 or steeper.
- Restrict the provision of high quality, well maintained lawn to sports fields, high traffic areas and premium passive use areas. Aim to reduce the amount of resources dedicated to maintaining lawn and grass areas. Clippings should remain where they fall under most circumstances and should not be raked up and removed. In high traffic areas this may require more frequent mowing so that the clippings are smaller and fall into the turf more easily.
- Designate 'lawn maintenance zones' for Campus. Within these zones grass may be irrigated, mown, fertilized and otherwise maintained as necessary to provide high quality lawn, suited to its uses. Such is the case with the inner grassed areas of the central campus which is mown with a catcher.
- In low-use areas, irrigation, fertilization, mowing and maintenance should be reduced.
- Good drainage is essential to turf health. Identify prolonged wet spots and rectify with sub-surface drainage installation.
- Areas of “Grass-Pave” parking occur on campus – These may be replaced in the future. In the meantime to maintain adequate grass cover, lawn management practices such as watering during dry oeriods, fertilising and topdressing must be implemented.
- Outside the lawn maintenance zones, plant deep rooting, drought tolerant grass varieties and planting or seeding of "Mowless" type grasses. A *Microlaena* lawn has recently been sown on University Creek. The use of tufting type native grasses may be more appropriate in some areas.
- More sustainable grass and turf management practices should be explored across the Campus, including limiting the use of fertilizers and developing an irrigation masterplan to determine a strategic and water efficient approach to irrigation on the site.



Figure 19 The Ampitheatre is a special case but in most circumstances a slope such as this is too steep for safe mowing and should be planted. Note that the mowing regime has allowed the grass to grow long which is desirable in an area of occasional use.

Compaction

On occasion where compaction of turf areas cannot be managed through prevention, and the quality of turf is declining (usually due to poor drainage), special machines that remove cores of soil, make slits or grooves or spike holes must be used. Perform all these operations as often as necessary when turf is in active growth in summer (but not when temperatures are extreme or there are drying winds). Following these procedures, turf may require more frequent watering to offset the increase in evaporation.

Topdressing

Topdressing is a thin layer of growing media applied to turf. Components are usually sand but whatever is used it *must always be more free-draining than the growing media under the turf and should always have the same consistency over consecutive applications*. Topdressing over time and properly applied will fill hollows and provide a smooth finish. The addition of free-draining sand will also improve drainage and infiltration and therefore improve turf health. It is an operation suited to all High Traffic areas and less so to large expanses of passive recreation lawn.

Thatch Management

Thatch – the decomposing dead parts of turf - builds up over time on the surface of the rootzone. Some thatch is beneficial and is normally decomposed by earthworms at a rate that keeps it at an optimal level, but as it gets too thick (for instance when pH is too high or when chemicals are applied – both of which kill earthworms), most of the turf ends up rooted in the thatch rather than in the topsoil which exposes it to rapid drying out during hot periods.

Thatch can be controlled by vertical mowing. The blades are set so they penetrate to the bottom of the thatch. If the thatch is thick, a second pass may be required at right angles to the first. Following vertical mowing remove the cut thatch.

3.4.1 Soil management and mowing for Turf in High Traffic Areas

Areas of high usage require soils that allow for a high resistance to compaction. A sandy, well drained turf underlay allows for fast drainage and a sufficient water holding capacity for turf growth. Example components are:

Medium grade clean sand Sandy loam soil or site soil Composted soil conditioner conforming with AS4454	60-80% by volume 10-30% by volume 10% by volume	e.g.7 parts washed sand/2 part sandy loam/1part compost

(Leake and Haege 2014, p.82)

Base level requirements for turf fertilisers in high traffic areas are:

Lime and/or dolomite	2kg/m^3 at mixing
Balanced compound NPK turf starter fertiliser	2.9kg/100m^2 after placement
Minor trace elements	300g/m^3 at mixing

(Leake and Haege 2014, p.82)

To ensure that the density of the grass sward and the height of the grass in high traffic areas is maintained:

Turf in High Traffic Areas - Work Required	Frequency
Remove litter before mowing	At each mowing
Cut grass height must not be less than 40mm or greater than 60mm high. Do not remove more than 50% of the grass height at any one time.	Spring – every 5 weeks Summer – every 4 weeks Autumn – every 5 weeks Winter – every 12 weeks
Clippings to be removed. Consider leaving clippings where they fall if acceptable.	At each mowing

3.4.2 Soil management and mowing for Turf in Passive Recreation Areas

Soils in passive areas require the provision of moderate resistance to compaction. In these areas a sandy loam 'turf underlay' topsoil mix is suitable. This soil mix provides a high water holding capacity reducing the requirement for watering during dry periods.

Example components are:

Medium-coarse grade washed sand Sandy loam soil or site soil Composted soil conditioner conforming with AS4454	30-50% by volume 40-60% by volume 10% by volume	e.g.5 parts washed sand/4 part site soil or sandy loam/1part compost

To ensure that the density of the grass sward and the height of the grass in passive recreation areas are maintained:

Turf in Passive Recreation Areas - Work Required	Frequency
Remove litter before mowing	At each mowing
Cut grass height must not be less than 50mm or greater than 80mm high. Do not remove more than 50% of the grass height at any one time.	Spring – every 6 weeks Summer – every 5 weeks Autumn – every 6 weeks Winter – every 12 weeks
Clippings to remain where they fall except when near drains or footpaths	At each mowing

3.4.3 Soil management and mowing for Turf in in Sports Fields

Sports turfs require a sandy root zone soil for rapid drainage which contains a minimum amount of silt and clay to provide a reasonable cohesion and water holding capacity. The main requirement being that the rootzone allows for rapid removal of rain or irrigation water so that play is interrupted for the shortest time. The infiltration rate should vary between 150mm/hr (newly laid sports turf) to 50mm/hr after several years of play. An example of the components to use are:

Medium grade clean sand Sandy loam soil or site soil Composted soil conditioner conforming with AS4454	80-90% by volume 5-10% by volume 5-10% by volume	e.g. 8 parts washed sand/2 parts sandy loam/1 part compost

(Leake and Haege 2014, p.84)

Base level requirements for sports turf fertilisers are the same as for High traffic areas.

Rolling

In addition to the management techniques listed for Turf in High Traffic Areas, sports field turf and specifically cricket pitches will require rolling during preparation of the pitch for a match. Prior to

rolling, the lower part of the rootzone must not be too wet or too dry. Rolling must be undertaken only by experienced greenkeepers.

Other sports turf types will require rolling from time to time during renovation.

3.4.4 Weeds in Turf

Many weeds in turf are controlled by regular mowing and others are encouraged when lawns are cut too low, as is Bindii – the most common and unpleasant weed in turf. Where Bindii *(Soliva pterosperma)* occurs in the lawn raise the mowers cutting height. Bindii also prefers acidic, low-nutrient soil, so apply dolomite at the rate of one handful per square metre in autumn and fertilise turf with a handful of poultry manure per square metre in spring, summer and autumn.

3.5 Native Grasses

Native grasses are a viable alternative to lawn grasses where areas are only used occasionally. Many native grass species are capable of being mown infrequently and just as mowing helps to increase the sward of lawn grasses, it has the same effect on native grasses.

A distinction must be made between native grass areas on campus that are intended to be walked and sat upon (as these may require mowing) and those which are purely ornamental. Where native grasses are for ornamental purposes only, a larger selection of species can be used.

The advantages of native grasses over exotics grasses are that they require less water and fertiliser and less frequent mowing.



Figure 20 A native grass (*Themeda triandra*) intended for an ornamental purpose only, but with infrequent mowing can be used as a lawn for occasional use.

Suitable species are:

Microlaena stipoides (Weeping Grass) and cultivars

*Themeda triandra (*Kangaroo Grass) and cultivars

Bothriochloa macra (Red Grass)

Rytidosperma spp. (Wallaby Grass)

Zoysia macrantha (Prickly Couch) and cultivars

Echinopogon caespitosus (Tufted Hedgehog Grass)

Poa affinis (Poa)



Figure 7 A *Microlaena* lawn. *Microlaena Stipoides* has recently been sown via hydromulching in the University Creek corridor.

Native grasses can be grown on those soil mixes listed for turf in section 3.4.1 and 3.4.2 depending on the intensity of use. Note that fertilisers should be decreased in areas planted to native grasses because it degrades native grasses in favour of exotic grasses and annual weeds.

To ensure that native grasses are maintained in a way that supports their survival and persistence in the landscape:

Native Grasses - Actions Required	Frequency
Mow all areas of native grasses flatter than 3H:1V. Do not mow during flowering and seeding. Where mowing is required at this time, mow in a pattern that allows sections of at least 50% of any given area to persist with flowering seed heads. Maintain length not less than 200mm.	Minimum of once per year to a maximum of two times per year
Native Grass Areas steeper than 3H:1V (and including all other areas where burning may replace mowing as a management tool) may be maintained by controlled / planned fire according to ecological and catchment requirements; in some communities, no planned fire will be applied, but in other areas fire will be applied within a defined fire frequency range and prescription. The action must be co-ordinated with Roads and Maritime, Rural Fire Service and Local Council.	As required during the controlled burn season as established by the Rural Fire Service

4.0 All Areas of the Campus

4.1 Disease and Insect Control

Always consider biological and non-chemical controls in favour of chemical controls in the first instance because the margin for error is far greater with chemicals. For example most insecticide will also harm beneficial insects as well as the target species.

For a comprehensive reference to the identification, diagnosis and control of of pests and diseases refer to "*What Garden Pest or Disease Is That? Organic and Chemical Solutions for Every Garden Problem" by Judy McMaugh 2000 New Holland*

4.2 Irrigation

Water sensitive urban design principles must be applied in order to minimise the use of potable water. This may include:

- Falling pavements to landscape or grass areas or by introducing permeable pavements
- Harvesting stormwater from nearby buildings for storage and later use for the irrigation of the sports fields
- The use of sub-surface irrigation in order to reduce the use of water.
- The use of bio-retention vegetated swales to slow and polish runoff and recharge groundwater

Water Sensitive Urban Design principles should be incorporated into the surrounding landscape to slow and filter runoff for the improvement of the water quality of the catchments of Mars Creek and University Creek.



Figure 21 "Castellated kerb" allows water into the central median where it is "polished" by vegetation and slowed from entering the stormwater system. Planting benefits by being passively watered.



Figure 22 A partially planted drainage swale in the Cochlear Forecourt.

New building works require detention tanks and/or infiltration retention systems for storing stormwater. Tank storages should be considered as a source of irrigation water for gardens in the vicinity. Plantings on slab will almost certainly require an automatic irrigation system, usually delivered by a sub-surface drip network. Ensure that irrigation valve boxes are located in convenient and logical locations and set flush with the ground. Ensure enough garden taps are also provided so that all areas of the garden can be watered if automatic irrigation fails. Assume 30 metre length hoses to be used so 60-65 metres between tap locations is a good general rule.

The irrigation system to be designed, supplied and installed by an experienced specialist irrigation sub-landscape contractor, nominated by the Landscape Contractor and approved by the University or their landscape consultant. After selection they will be required to prepare detailed irrigation plans and specification for approval by the University prior to commencing work. The Landscape Contractor will co-ordinate the irrigation installation to the Universities approval. Ensure completion of the irrigation system before the commencement of any other landscape works, so as to provide a readily available supply of water to planting areas.

Upon completion of the installation of irrigation works the Landscape Contractor is to run through the system to ensure that it is operating correctly and instruct the client's representative in the correct operation and maintenance of the system. Manuals, warranties, and a minimum of two programs, summer and winter are to be provided to the client's representative at the time of completion.

At the completion of the installation the landscape contractor must provide complete dimension drawings, based on the approved design plan, of the entire irrigation system as executed, clearly indicating the type and location of all sprinkler lines, heads, etc. This is essential to ensure that the irrigation lines and valve boxes can be located for repair and replacement.

The University has an all of campus drawing prepared by David Buckle and Associates titled; *"Macquarie University Hydraulic Services Potable Cold Water and Fire Hydrants".* This drawing should be referred to when new tap points and irrigation is to be installed and Work as Executed irrigation drawings should be kept with this document.

5.0 Specific Landscape Management Activities for Specific Areas of the Campus

Each of the following specific areas of the campus has been identified in the Macquarie University Design Excellence Strategy and Urban Design Guidelines and a series of landscape principles for each has been described with the objective of retaining and enhancing the identity of each.

The following maintenance issues for each specific area are highlighted with a view to improving the management of the spaces in order to achieve these principles.

5.1 Primary public domain spines

Wally's Walk

Character

Wally's Walk is characterised by an avenue of Plane trees running for the full length of the Walk. Not all trees are uniform in size and some trees are suffering due to overshadowing and close proximity to buildings. The understorey is varied throughout its length, there are occasional large weedy gaps in the understorey, but the predominant understorey plant is *Hedera Helix* (English Ivy).

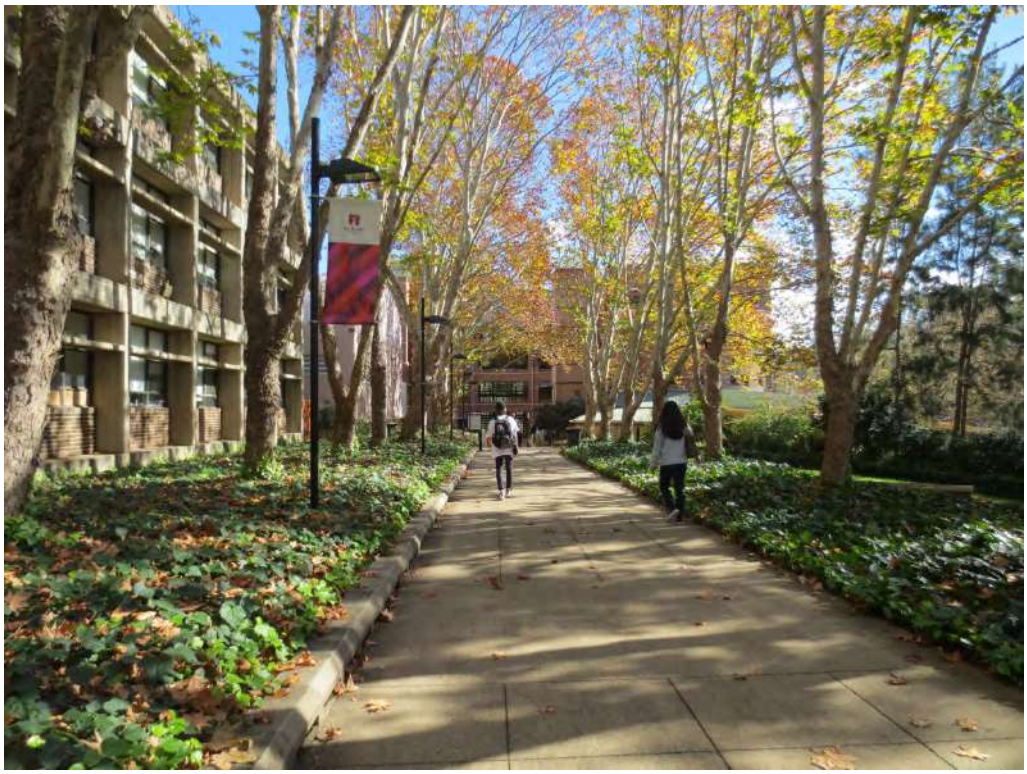


Figure 23 The western end of Wally's Walk - Plane Trees with Ivy below.

Comments

- Consider the introductions of *Platanus* (Plane Tree) hybrids when making replacements and choose types that are suited to shaded situations. Infill bare areas with understorey planting.

- Consider replacement of the *Jacaranda* at the Corner with Christopher Ondaatje Ave with a Plane Tree
- Infill bare understorey areas with new groundcovers to match existing.
- Use a limited understorey palette with *Hedera Helix* as the dominant species

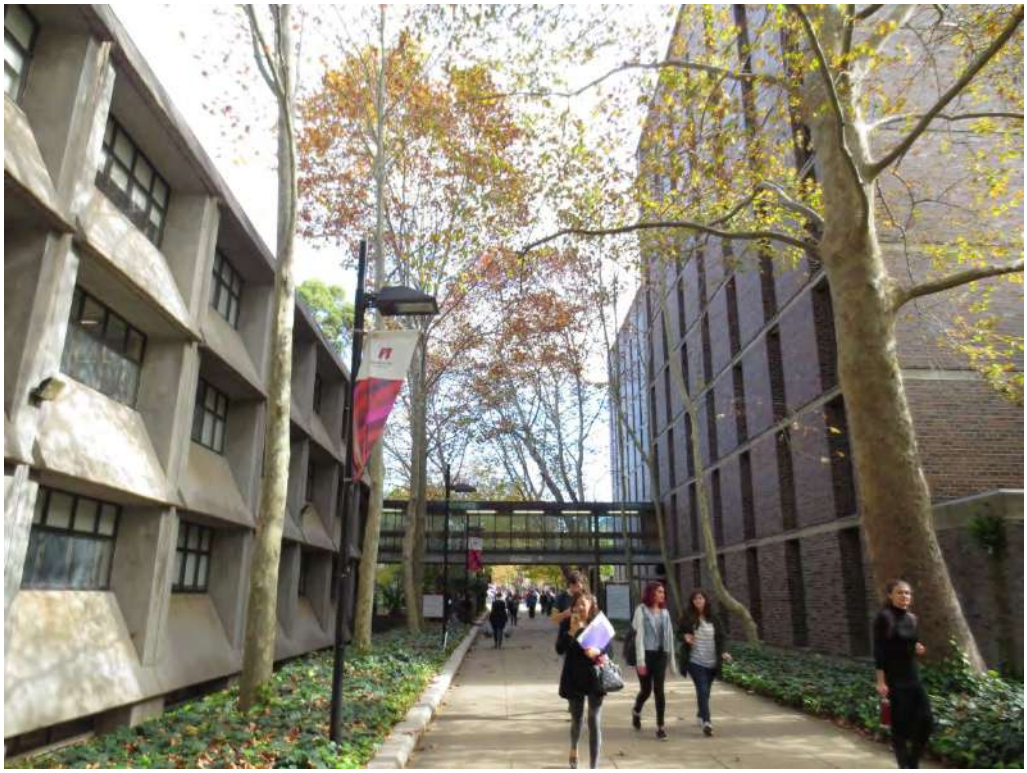


Figure 24 Plane trees adjacent to the building are stunted due to shade and proximity to the building

Wally's Walk Replacement Tree Schedule

Botanical Name	Common Name	Mature Size (H x W)	Notes
Platanus x acerifolia	London Plane	14 x 10m	Plane trees form an Avenue for the full length
Platanus improved cultivars			

Macquarie Walk

Character

Macquarie Walk is currently a road but will eventually be pedestrianised and will be the key pedestrian link due to its connection in the east with the railway station. The current Herring road "Gateway" and University Creek "Crossing" projects will establish strong landscape themes for the Walk.

Comments

Starting in the east, an avenue of Queensland Kauri (*Agathis robusta*) is proposed. This will provide an iconic entry where Macquarie Walk meets University Avenue. The Walk will then traverse

University Creek via a proposed 9 metre wide bridge. The landscape surrounds in this section of the walk will be viewed from the bridge and will consist of the existing riparian trees with proposed endemic understorey planting and native grass lawns accessible to the University population. Where the bridge" lands" to the western side of the creek there is a significant clump of existing Tallowoods (*Eucalyptus microcorys*) which are to be retained.



Figure 25 The "Crossing" bridge over University Creek will "land" behind the clump of Tallowoods shown in the centre of the picture and will connect with Macquarie Walk.

The creek transition zone of the walk terminates where the walk intersects with Christopher Ondaatje Ave after which a Plaza Zone commences adjacent to the proposed University Common.



Figure 26 Looking West down the Axis of the proposed Macquarie Walk. The Creek transition Zone ends where it intersects with Christopher Ondaatje Walk at the pedestrian crossing in the middle ground.

The planting will transition here from the informal planting of the Creekside to formal streetscape planting which will continue to the west. Exotic deciduous trees should be used to delineate the "Plaza".

The current precedent for streetscape planting occurs at the library and the Australian Hearing Hub where Grey Gums (*Eucalyptus punctata*) have been planted as a street tree. It is suggested that over time the full length of the Walk with the exception of the Plaza Zone, riparian zone and the intersection with University Avenue to the south should be planted with an avenue of Grey Gums.

The landscape management goals of the Macquarie Walk will be to strengthen each of these planted landscape zones – use riparian trees and planting in the Creek Zone, use exotic deciduous trees in the Plaza Zone, use Pyrus "Chanticleer" to match those on University Avenue at the intersection and use Grey Gums as the street tree for the length of the Walk. The underplanting on the south-eastern edge of Macquarie Walk opposite the Common should be bold and dense to form an edge to the plaza and to visually terminate the common.



Figure 27 Grey Gum street trees outside the library -the precedence for future streetscape planting along Macquarie Walk. Note stakes and metal collar should be removed.

Existing street trees along Macquarie Drive have a galvanised metal collar around the base of the trunk to keep the gravel surround in place. This should be removed over time to prevent trunk girdling. Timber stakes on existing street trees should also be removed.

Suggested Macquarie Walk Replacement Tree Schedule

Botanical Name	Common Name	Mature Size (H x W)	Notes
Agathis Robusta	Queensland Kauri	14 x 10m	Gateway Entry street trees
Anetholea anisata	Aniseed Tree		Creek Zone tree planting
Angophora costata	Smooth-barked Apple		
Allocasuarina littoralis	Black She-oak		
Ceratopetalum apetalum	Coachwood		
Synoum glandulosum	Scentless Rosewood		
Syncarpia glomulifera	Turpentine		
Tristaniopsis laurina	Water Gum		
Eucalyptus punctata	Grey Gum		Street trees from University Common to the South

Nyssa sylvatica	Black Gum	11 x 6 m	Plaza trees delineating University Common
Pyrus ussuriensis	Manchurian Pear	9 x 7 m	
Ulmus parvifolia	Chinese Elm	10 x 11 m	
Pyrus "Chanticleer"	Ornamental Pear	9 x 7 m	Intersection with University Avenue in the South



Figure 28 When traffic is removed, the southern edge of the Walk can be converted to a formal avenue. The existing Flooded Gums shown can be retained in the background.

Sir Christopher Ondaatje Avenue

Character

Sir Christopher Ondaatje Avenue runs North-south and takes in several campus spaces along the way. As a result it takes on the character of the spaces that it passes through – notably the University Common and the Central Courtyard. This is compatible with the landscape principles which seek to reflect Asian sensibilities of enclosure and openness. Ultimately the Avenue will connect Mars and University Creeks.



Figure 29 The edge of the University Common from Sir Christopher Ondaatje Avenue planted with Liquidambers

Comments

To reinforce these principles with the landscape planting the existing garden beds in front of buildings should be reinforced with dense plantings that create an edge. Where new trees are required use screening trees against buildings such as Lilly Pilly (where sunlight access to buildings is not affected), and use deciduous trees in open areas to increase the sense of contrast between openness and enclosure. Pruning should be undertaken to "lift" the canopy of deciduous trees and evergreen native trees should not be under-pruned to maintain bushiness to the ground.

Where there is space; for instance where the Walk passes the Common and the Grove, consider planting double rows of avenue trees.

The existing under-planting has large gaps which could be infilled to improve delineation. The Avenue is also used for interpretive plantings along its length. This should be continued but with consideration for denser planting within interpretive planting areas to achieve a consistent look along the length of the walk and to exclude weeds.

Sir Christopher Ondaatje Avenue Replacement Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H X W)	NOTES
Flindersia australis	Crows Ash	10 x 8 m	Other species may be used eg; for interpretive gardens.
Arytera lautererana	Corduroy Tamarind	10 x 8 m	
Toona ciliata	Red Cedar	20 x 10 m	

Brachychiton discolor	Pink Lacebark	10 x 5 m	

5.2 Primary parks and plazas

The University Common and Library Lawn

Character

The University Common is a very large open space with a large expanse of lawn, planted and paved areas.

Comments

Various tree species are used throughout the Common. No particular extant species is seen as a precedent for further planting. Consider extending the range of species to more unusual selections to improve the arboretum collection. Generally frame outside extent of the space with evergreen native trees and use deciduous trees to delineate plaza areas.

The central feature of the Common is the large expanse of lawn for passive recreation. The lawn requires attention due to invasion by Clover and other weeds. The Clover advantages the lawn by reducing the amount of nitrogen fertiliser the lawn requires, but does not wear well. Observe the lawn as the warm season returns and observe whether the turf increases and the Clover decreases. If not, apply a single application of a proprietary spring lawn fertiliser followed at six to eight-week intervals by an application of sulphate of ammonia at 15g per sq m. The nitrogen content encourages grass growth and acts as a deterrent to the clover. Other weeds such as Bindi's may require chemical control before seed set.

The open vista across the library lawn should be retained.



Figure 30 Clover in lawn. The Clover adds nitrogen but does not wear well. Take remedial action if the lawn does not increase in vigour as the weather warms.

Shrub garden beds to the north and south of the Common require replanting. A strong planting theme should be developed that includes tall shrubs/small trees not commonly used in landscape plantings to improve the arboretum collection. A visual connection to the central courtyard can then be achieved with lower under-planting.



Figure 31 Shrub beds between the Central Courtyard/Wally's Walk and the University Common. Replace with plantings that allow a visual connection between the spaces – small trees with clear trunks and low under-planting.

Suggested University Common Replacement Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H X W)	NOTES
Angophora costata	Smooth-Barked Apple	15 x 10 m	
Pyrus ussuriensis	Manchurian Pear	9 x 7 m	
Arytera lautererana	Corduroy Tamarind	10 x 8 m	
Rhodoleia championii	Hong Kong Rose	5 x 5 m	Replacement small trees for north and south shrub beds
Tabebuia argentea	Silver Trumpet Tree	5 x 5 m	
Barklya syringifolia	Crown of Gold	5 x 5 m	

The Central Courtyard

Character

The Central Courtyard is dominated by a grid planting of nearly 100 Lemon-scented Gum (*Corymbia citriodora)* planted to represent a Phalanx of the Roman Army.

The courtyard was once mostly grassed, now only a smaller central lawn, broken up by paths, remains. The lawn is worn and not conducive to use for sitting.

The surrounding buildings are concrete, the paving and the trunks are grey and the furniture is silver.

Comments

Wherever Gums are damaged or die they should be replaced immediately to maintain the integrity of the original plan. The lawn should be raised and the paths that dissect it removed to make it more useful and to improve the condition of the lawn. Colourful furniture, some sections of brighter paving and some judicious under-storey planting would all help to brighten up the space.



Figure 32 Dead Lemon Scented Gum should be replaced.



Figure 33 The existing lawn should be raised and the intersecting paths removed.

Central Courtyard Replacement Tree Schedule

BOTANICAL NAME	COMMON NAME	MATURE SIZE (H X W)	NOTES
Corymbia citriodora	Lemon-scented Gum	30 x 10 m	Replace dead or dying trees immediately

The Grove (East Common)

Character

The Grove is an informal space with a forest atmosphere created by a grove of Eucalypts with a sensitively fitted sinuous path and picnic settings.

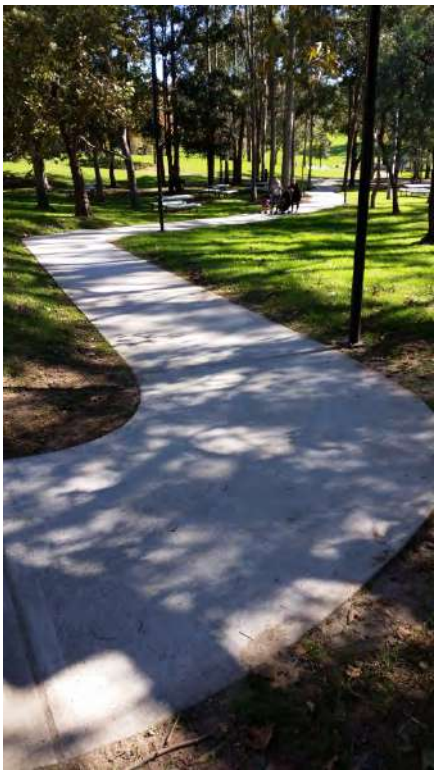


Figure 34 Path through the Grove

Comments

The Grove requires attention to the lawn area under the trees to ensure that a thick sward is maintained. Where turf is to be replanted, shade tolerant varieties could be introduced.

To the East of the Grove adjacent to the paved forecourt of Building E7b and to the west Adjacent to the Campus Hub Building there is the opportunity for deciduous shade tree planting with preferably interesting species to add to the Arboretum collection.

Arts Lawn (West Common)

The Arts Lawn will be built on land that is currently a car park. Some existing Eucalypts occur at the edges of the car park. These should be retained where possible in any future development. The landform should step down towards Mars Creek and planting should not prevent a visual link to the Creek.

5.3 Secondary Parks and plazas

Frank Mercer Biological Sciences Garden

The diversity of plantings should be maintained and enhanced in the spirit of the teaching garden for which it was envisaged. A landscape maintenance audit should be undertaken to ensure that the objectives of the garden and the cultural requirements of all plantings are being met.

Jim Rose Earth Science Garden

The diversity of plantings should be maintained and enhanced in the spirit of the teaching garden for which it was envisaged. Currently there are many bare spots in the garden. A landscape maintenance audit should be undertaken to ensure that the objectives of the garden and the

cultural requirements of all plantings are being met. The courtyard is divided into two sections, with the gardens on the north and west planted with Laurasian (predominantly) northern hemisphere species while the gardens on the eastern and southern sides are planted with Gondwanan (predominantly) southern hemisphere species. The path between the two is referred to as the "Wallace Line". The audit should identify further replacement plantings that continue the biogeographic story and which also contribute to making the garden a pleasant retreat.

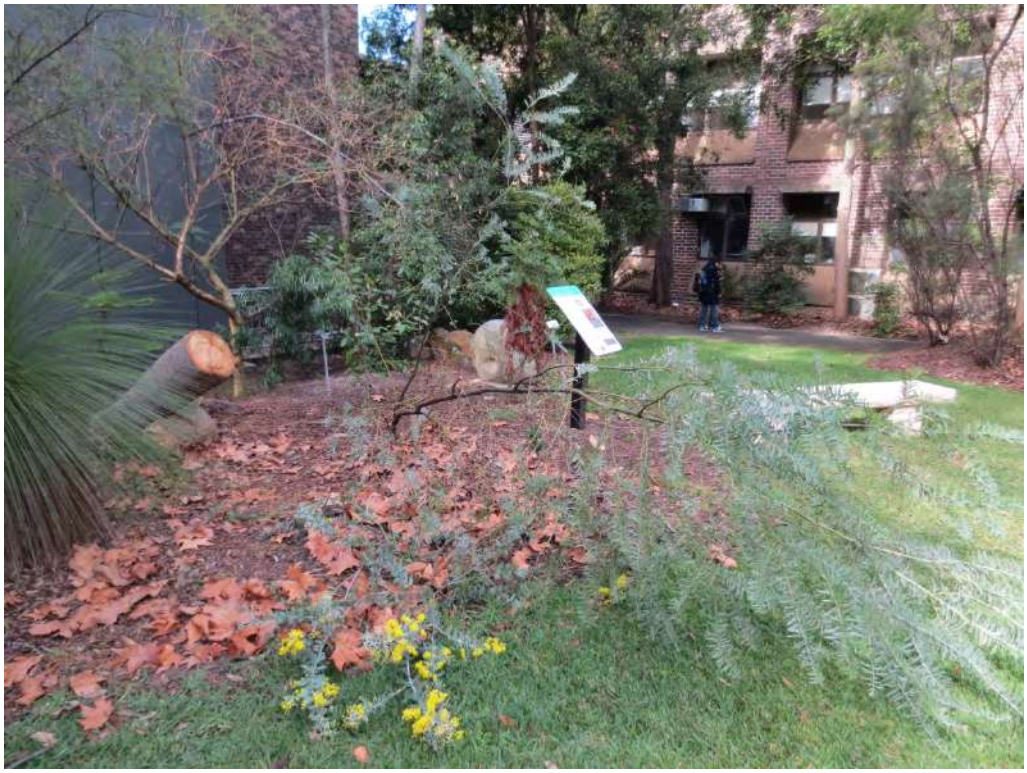


Figure 35 Bare spots could be replanted with appropriate species. Watering requirements should be checked.

Mars Creek Plaza

Mars Creek Plaza is a proposed plaza which will terminate the future extension of Macquarie Walk. Ensure that any future planting does not screen views to Mars Creek or prevent solar access. The Plaza will mediate between the more formal Macquarie Walk and the natural area down to Mars Creek.



Figure 36 Potential view from the proposed Mars Creek Plaza

Wally's Walk Park

The lawn is a popular passive recreation space as it slopes to the north with views to the Mars Creek corridor.

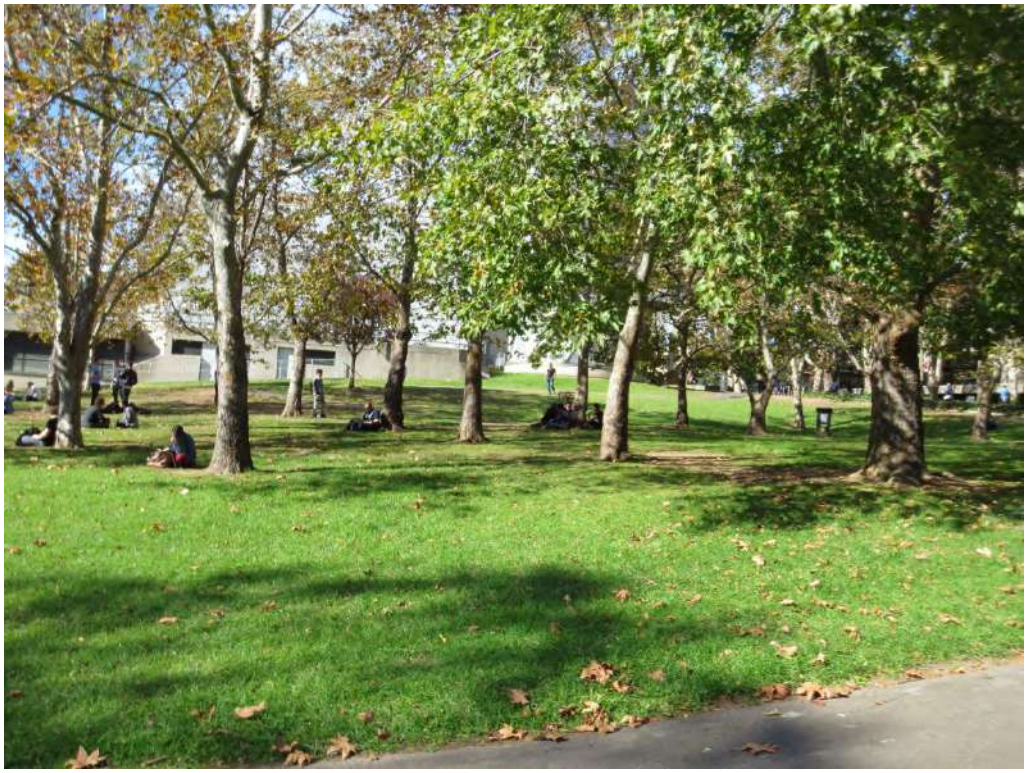


Figure 37 Wally's Walk Park

There are a few spots where the lawn has worn or is underperforming and also gaps in planting. These should be reviewed for any remedial action that can be taken.

Western Road Park

The recently completed Western Road Park is a roof garden (refer to section 3.3). The landscape maintenance schedule accompanying the construction documentation should be reviewed for inclusion into the ongoing maintenance and inspection checklist and as-built drawings should be reviewed and updated for location of irrigation.

Macquarie Theatre Courtyard

Character

The Macquarie Theatre Courtyard is a fairly recent landscape wrapping around two sides of the building - east and south - with large areas of gravel and concrete pavement.

There are patches of Mondo Grass missing at the entrance which should be replaced immediately. A steeply sloping lawn to the south of the building is planted to lawn. This area is difficult to access for maintenance and should be replanted in its entirety with a low maintenance, drought-tolerant groundcover such as *Lomandra* (already planted at the top of the bank)



Figure 38 Mondo Grass bed requiring replacement planting



Figure 39 Steeply sloping lawn should be replaced with low maintenance groundcovers such as *Lomandra* shown at the top of bank.

On the grassy bank leading up to building W3A there are sections of the slope too steep for grass to succeed. Consider replacement with low-maintenance, drought-tolerant garden beds.

Cochlear Forecourt

The Cochlear Forecourt landscaping is now well-established. There are some bare areas on the University Avenue frontage which require replacement landscaping and denser plant spacing.



Figure 40 Cochlear Building frontage to University Avenue requires replacement planting.

5.4 Creek corridors and parklands

University Creek

A Landscape Rehabilitation plan has been prepared for University Creek. For management purposes the Creek has been divided into a number of reaches. The reaches are currently being rehabilitated in association with roadworks along University Avenue. For further maintenance issues relating to the creek, refer to the Plan prepared for Mars Creek (below) and also the Vegetation Management Plan 2015.

Mars Creek

A Mars Creek Environmental Plan prepared by Storm Consulting was commissioned in 2010/11 by the University. Habitat restoration has been an overwhelming success. Over time further sections of the highly modified creekline may be naturalised, changing the maintenance priorities in the zone. For further maintenance issues relating to the creek, refer to the Plan and also the Vegetation Management Plan 2015.

Culloden Creek

Culloden Creek corridor provides opportunities for the restoration of the Sydney Turpentine-Ironbark Forest and passive open space. Refer to the Vegetation Management Plan 2015.

5.5 Primary roads and pedestrian connections

Each of the universities internal roads and pedestrian connections are characterised by unique street tree planting. The length of the roads are not necessarily planted with a single species, making the most important aspect of landscape management the height to which each species is under-pruned of lower branches to make clearance for pedestrians and vehicles, but also to suit the species type and to achieve a relatively consistent canopy. For each road below the street tree under-pruned height has been noted.

University Avenue

University Avenue is changing to accommodate future uses. Parts of its length have been upgraded with formal street tree planting of *Pyrus "Chanticleer"* where adjacent to buildings, and *Tristaniopsis laurina* where alongside University Creek. The final section up to Herring Road is proposed to be planted with an avenue of Kauri Pines (*Agathis robusta*). Each of these trees has a distinctive form different from the next.

BOTANICAL NAME	COMMON NAME	Underprune lower branches to a height of; (m)
Agathis robusta	Kauri Pine	5
Pyrus calleryana "Chanticleer"	"Chanticleer"	3
Tristaniopsis laurina	Water Gum	3

Research Park Drive

Research Park Drive will terminate at University Creek where Water Gums make a connection with the creek landscape and Crow's Ash and Red Cedar will provide tall and imposing avenue from the Talavera Road.

BOTANICAL NAME	COMMON NAME	Underprune lower branches to a height of; (m)
Flindersia australis	Crow's Ash	5
Toona ciliata	Red Cedar	5
Waterhousia floribunda Cv.	"Green Avenue" Weeping Lilly Pilly	3

Innovation Drive

Innovation Drive street trees reinforce the University Creek Crossing with Weeping Lilly Pilly and Turpentine, and acknowledges the sandstone Geology at its interface with Herring Road with Smooth-Barked Apple and Grey Gum

BOTANICAL NAME	COMMON NAME	Underprune lower branches to a height of; (m)
Angophora costata	Smooth-Barked Apple	5
Eucalyptus punctata	Grey Gum	5
Waterhousia floribunda	Weeping Lilly Pilly	3

Eastern Road

BOTANICAL NAME	COMMON NAME	Underprune lower branches to a height of; (m)
Eucalyptus paniculata	Grey Ironbark	5
Eucalyptus punctata	Grey Gum	5
Syncarpia glomulifera	Turpentine	5

Western Avenue

BOTANICAL NAME	COMMON NAME	Underprune lower branches to a height of; (m)
Angophora costata	Smooth-Barked Apple	5
Eucalyptus paniculata	Grey Ironbark	5
Eucalyptus punctata	Grey Gum	5

West Precinct Road

BOTANICAL NAME	COMMON NAME	Underprune lower branches to a height of; (m)
Cupaniopsis anacardiodes	Tuckeroo	3
Tristaniopsis laurina "Luscious"	Water Gum	3
Waterhousia floribunda Cv.	"Green Avenue"	3

Secondary East-West Pedestrian Connections

BOTANICAL NAME	COMMON NAME	Underprune lower branches to a height of; (m)
Pistacia chinensis	Chinese pistachio	3
Pyrus ussuriensis	Manchurian Pear	3
Ulmus parvifolia	Chinese Elm	3

Secondary North-South Pedestrian Connections

BOTANICAL NAME	COMMON NAME	Underprune lower branches to a height of; (m)
Backhousia myrtifolia	Grey Myrtle	3
Elaeocarpus eumundii	Blueberry Ash	3
Flindersia pimenteliana	Maple Silkwood	3

5.6 Sports field and facilities

Macquarie University sports fields

Macquarie University maintains approximately seven hectares of high quality specialist playing areas at high standard, suitable for a range of intended uses. Resource use in maintaining the sports fields should be environmentally sustainable due to their location in proximity to The Lane Cove River Catchment and sensitive bushland. Runoff from irrigation and excess fertiliser should be minimised and turf areas should be managed for minimum disease by providing good growing conditions. Chemical use should be discouraged. Amenity of spectators should be enhanced.

Sports ovals will continue to be maintained by a contractor who has expertise in this type of landscape management. This approach has worked well in recent years. To assist the contractor maintain the ovals to a high standard, the university should consider upgrading grounds maintenance equipment. An audit of the type and condition of existing equipment is needed to determine priorities for future.

One of the goals is to 'adopt further water sensitive urban design practices to minimise potable water consumption'. It recommends that current irrigation practices for the sports ovals are reviewed to identify water efficiency and drought proofing strategies.

Sporting Fields – Suggested Replacement Tree Schedule - species from the broader Sydney Sandstone Ridge-top Woodland community to provide shade for spectators at the perimeter of fields where space is available:

BOTANICAL NAME	COMMON NAME	MATURE SIZE

		(H X W)
Angophora costata	Smooth-Barked Apple	15 x 10 m
Corymbia gummifera	Red Bloodwood	25 x 10 m
Eucalyptus haemastoma	Broad-leaved Scribbly Gum	15 x 10 m
Eucalyptus piperita	Sydney Peppermint	20 x 10 m
Eucalyptus sclerophylla	Hard-leafed Scribbly Gum	20 x 10 m
Eucalyptus squamosa	Scaly Bark	7 m

6.0 Protective Measures

6.1 Protection of Existing Vegetation

Existing vegetation and newly planted areas need protection during construction and establishment. During construction and establishment periods, temporary fencing should be placed at the extent of area to be protected, preferably beyond the drip-line of trees to be protected.

The fencing methods should include flagging tape, stakes and temporary fencing, clearly identifying the area to be protected and restricting pedestrian and vehicular access to the protected zone.

Following completion of the construction period (including establishment), all temporary works should be removed when they are no longer required.

6.2 Tree Protection

Tree protection on all development sites within the City of Ryde must comply with *Australian Standard 4970 – 2009 Protection of trees on development sites.*
Refer also to the *City of Ryde DCP 2010 Part 9.6 Tree Preservation* and the *City of Ryde Urban Forest Technical Manual and Application Guide.*

The relevant Australian Standards are:

- *AS 4970 Protection of trees on development sites.*
- *AS 4687 Temporary fencing and hoardings*

6.3 Erosion, Contamination and Sedimentation Control

During construction, all precautions necessary should be undertaken to prevent erosion, contamination, and sedimentation of the site, surrounding areas and drainage systems, including but not limited to the following:

- Progressive restoration of the riparian corridor (refer to Landscape Restoration Plan incorporating Vegetation Management Plan)

- Construction of temporary drains and catch drains
- Diversion and dispersal of concentrated flows to points where the water can pass through the site without detrimental impacts
- Construction and maintenance of silt traps to prevent discharge of scoured material to downstream areas
- Stabilisation of exposed soil surfaces (e.g. through sterile grass seeding, erosion control meshing, or mulching using vegetative material removed from the study area)
- Use of erosion and sediment control measures to collect sediment and to reduce flow velocities
- Construction of temporary fencing
- Regular monitoring and maintenance of all erosion and sediment control structures throughout the construction and operational phases of the development to ensure their effective function.

6.4 Tree Removal and Disposal of Vegetation on Site

All significant trees removed as a result of construction works are to be replaced by the same species and planted in a suitable location corresponding with the relevant vegetation community within the riparian corridor. Refer to the Landscape Rehabilitation Plan incorporating Vegetation Management Plan for University Creek.

For any significant trees removed for construction works, consideration should be given to retaining the woody parts whole or in sections, and placed on the ground in the riparian corridors of Mars Creek and University Creek to provide habitat for native fauna.

All other native vegetation that is identified for removal should be chipped for use as mulch. All weed material is to be separated and removed from the cleared material prior to chipping. Mulch should be stockpiled at approved locations around the site and be used in locations from where it was derived to ensure any seed stock located within the mulch will be located in appropriate site conditions.

Any vegetation, topsoil or other materials not identified for re-use shall be either disposal of off-site or in an area where the material will not wash into existing vegetation, Mars Creek or University Creek.

7.0 Monitoring and Reporting

Regular inspections of all landscape areas should be undertaken by the Campus Assets Team to ensure that maintenance is carried out according to the plan. The inspections should not be less frequent than three (3) monthly (or immediately after high rainfall/wind/heat events) with the objective that all areas are visited at least once within that period and an inspection checklist prepared and filled out during each inspection and a Three Monthly Maintenance Audit Form Submitted. (Refer to Appendix F). As well as open space currently in use, the inspection should include the ongoing protection of all existing vegetation and new revegetation works during its establishment period.

Maintenance staff should receive the audit form and carry out any remediation work required.

Appendix A – Illustrative Masterplan



Appendix B – Three Monthly Maintenance Audit Form

This form is to be completed by the Campus Asset Manager responsible for landscape assets.
Two copies of this completed form are required. One is to be issued to maintenance staff for action. The second is to be maintained for records.
Extra pages can be attached to the electronic record if needed

Date of Inspection: _____

Inspected by: _____

Location	Landscape Type / Area	Issue	Remediation Works Required	Cost Estimate	Date to be completed	Variation/ Defect?

Signed: _____ Date: _____

Issued to: _____ Date: _____

Appendix C – Reference Documents

The following Australian Standards are referred to in this report:

- AS 1319 Safety signs for the occupational environment
- AS 4373 Pruning of amenity trees
- AS 4454 Composts, soil conditioners and mulches
- AS 4687 Temporary fencing and hoardings
- AS 4970 Protection of trees on development sites
- AS 1428 Access and Mobility Design

The following documents are referred to in this report:

- Macquarie University Campus Masterplan 2014 (Cox Richardson Architects and Planners 2014)
- Design Excellence Strategy and Urban Design Guidelines, prepared by Cox Richardson Architects and Planners in conjunction with CONTEXT
- Vegetation Management Plan (VMP) for Macquarie University, prepared by Lesryk Environmental Consultants 2015 in conjunction with this LMP.
- Precinct E Landscape Management Plan, prepared by CONTEXT 2010.
- University Creek Landscape Rehabilitation Plan (Incorporating Vegetation Management Plan) prepared by CONTEXT 2010.
- Mars Creek Environmental Plan (Storm Consulting 2011)
- Noxious and environmental weed control handbook. a guide to weed control in non-crop, aquatic and bushland situations. NSW Department of Primary Industry Management Guide, Sixth Edition.
- Soils for Landscape Development. Selection, Specification and Validation. Simon Leake and ELke Haege. CSIRO Publishing 2014.
- the City of Ryde DCP 2010 Part 9.6 Tree Preservation
- City of Ryde Urban Forest Technical Manual and Application Guide 30th September 2014
- Coffey Geotechnics, 2009, Geomorphological Assessment of University Creek, North Ryde.
- What Garden Pest or Disease Is That? Organic and Chemical Solutions for Every Garden Problem. Judy McMaugh 2000 New Holland.



Vegetation Management Plan

(incorporating Threatened Species Plan)

Bushland Remnants, Macquarie University

July 2015

context

Lesnok ENVIRONMENTAL

Document Control

ISSUE	DESCRIPTION	SIGNED	DATE
A	Preliminary Draft Issued for Review	DM	21/05/15
B	Final Draft Issued for Review	DM	27/05/15
C	Final Draft Issued for Review	DM	23/06/15
D	**Final Issue**	**DM**	**31/07/15**

Vegetation Management Plan
(Incorporating Threatened Species Plan)

Bushland Remnants, Macquarie University

July 2015

context

with

Lesnok ENVIRONMENTAL

Table of Contents

Executive Summary 1

1. Introduction 3

2. Methods 5

2.1 Literature review 5

2.2 Field survey 5

3. Results 6

3.1 Literature review 6

3.1.1 Vegetation 6

3.1.2 Threatened species 9

3.1.2 (a) Flora 9

3.1.2 (b) Fauna 9

3.1.3 Soils 9

3.2 Study area description 10

3.2.1 Vegetation communities/fauna habitats 10

3.2.1 (a) Sydney Turpentine – Ironbark Forest 10

3.2.1 (b) Coastal Shale Sandstone Forest 11

3.2.1 (c) Coastal Enriched Sandstone Dry Forest 13

3.2.1 (d) Hornsby Enriched Sandstone Exposed Woodland 13

3.2.1 (e) Constructed Riparian Scrub 14

3.2.1 (f) Flooded Gum Forest 14

3.2.2 Endangered ecological communities 15

3.2.3 Wildlife corridors 15

3.2.4 Threatened species 16

3.2.4 (a) Flora 16

3.2.4 (b) Fauna 16

4. Vegetation resilience and condition 17

5. Management classes 19

6. Management issues and goals 21

7. References 26

Appendices

Appendix A: Database searches

Appendix B: Photographic record of the area surveyed

Appendix C: Photographic record of the study area

Figures

Figure 1: Study area

Figure 2: Vegetation mapping of the study area

Figure 3: Study area vegetation

Figure 4: Resilience/Condition classes

Figure 5: Management Classes

Tables

Table 1: Management classes

Table 2: Summary of management issues and goals

Glossary

Terms used throughout this report are:

- DECC — NSW Department of Environment and Climate Change (now known as the NSW Office of Environment and Heritage)
- DECCW — NSW Department of Environment, Climate Change and Water (now known as the NSW Office of Environment and Heritage)
- EPBC Act — Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
- LGA — Local Government Area
- m/m^2/km — metre(s) / square metres / kilometres
- NSW — New South Wales
- NPWS — NSW National Parks and Wildlife Service
- OEH — Office of Environment and Heritage
- TEC — Total Earth Care
- TSC Act — NSW *Threatened Species Conservation Act 1995*
- VMP — Vegetation Management Plan

Executive Summary

On behalf of the Macquarie University Property, Lesryk Environmental Pty Ltd was contracted by Context to prepare a Vegetation Management Plan (VMP). The purpose of the VMP is to:

- describe the native vegetation present within the University grounds
- assess its conservation significance
- provide comment on the value of those fauna habitats and dispersal links present
- identify management issues and goals
- recommend appropriate monitoring and maintenance regimes.

The VMP has been developed following on a review of literature relevant to the study area and from the undertaking of site investigations of those bushland remnants present within the University grounds. During these site investigations the diversity of plants and communities present was recorded, as were the dominant, obvious, fauna species.

The University grounds support a number of disparate areas of remnant native vegetation, the following communities being identified:

- Coastal Shale Sandstone Forest
- Coastal Enriched Sandstone Dry Forest
- Hornsby Enriched Sandstone Exposed Woodland
- Sydney Turpentine-Ironbark Forest.

Two “constructed” communities, Riparian Scrub and Flooded Gum Forest have also developed from rehabilitation works undertaken by the University.

Of these six communities, the Sydney Turpentine-Ironbark Forest is listed as a critically endangered ecological community on both the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 and NSW Threatened Species Conservation Act 1995. The largest area of Sydney Turpentine-Ironbark Forest occurs in the Northwest Remnant while two smaller areas of this critically endangered ecological community are present elsewhere in the University grounds,

A small population of Darwinia biflora, which is listed as a vulnerable plant species on both the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 and NSW Threatened Species Conservation Act 1995, occurs in Hornsby Enriched Sandstone Exposed Woodland in Ecology Reserve. A population of the state listed vulnerable plant species, Epacris purpurascens var. purpurascens occurs in Coastal Shale Sandstone Forest within the Northwest Remnant.

Fauna species of conservation significance known or likely to occur in the vicinity of the University grounds are the Powerful Owl, Grey-headed Flying-fox, Yellow-bellied Sheathtail-bat, Eastern Freetail-bat, Eastern False Pipistrelle, Eastern Bentwing-bat and Greater Broad-nosed Bat. Each of these species is listed as vulnerable under the NSW Threatened Species Conservation Act 1995, whilst the Grey-headed Flying-fox is also listed as vulnerable under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

There is considerable variation within and amongst the native vegetation remnants in terms of their resilience and condition. Accordingly, four management classes have been developed by the University’s Property Section in order to prioritise and target management that will improve their biodiversity values.

It was found that the highest priority area was the Northwest Remnant. Strategies recommended to conserve this area include continuation (and systematic monitoring) of bush regeneration/rehabilitation, expanding the size of the remnant and application of “ecological” burns.

Other high priority areas are Mars Creek within Ecology Reserve and Sydney Turpentine-Ironbark Forest along University Creek. The riparian area of Marks Creek has been degraded by erosion, sedimentation, changes to soil nutrient levels and subsequent weed invasion. Its restoration requires engineering solutions beyond the expertise of the authors. Implementation of a VMP that has been prepared for remnant Sydney Turpentine-Ironbark Forest within the University Creek corridor would assist in maintaining its value (excluding vegetation already earmarked for removal i.e. at the ‘station site’). For the other vegetation remnants present in the University grounds, and for general improvement in its provision of fauna habitat, a range of issues, strategies and goals are provided.

It is considered that implementation of this VMP and others which it encompasses will meet the aims therein and maintain and enhance the biodiversity values of Macquarie University’s native vegetation.

1. Introduction

This report has been prepared to support the Campus-wide Macquarie University Design Excellence Strategy and Urban Design Guidelines.

The Design Excellence Strategy and Urban Design Guidelines are required under Condition B4 of the Concept Plan approval, and will act as a guiding document in implementing the recently completed Macquarie University Campus Master Plan 2014. In addition to the Design Excellence Strategy and Urban Design Guidelines, the Concept Plan conditions of approval also require detailed management plans to support new development in each precinct. These include the requirement to prepare a Vegetation Management Plan (VMP) as contained in this document.

Lesryk Environmental Pty Ltd has been contracted by Context Landscape Design to prepare this VMP (Figure 1). The purpose of the VMP is to:

- describe the native vegetation within the University grounds and assess its conservation significance
- provide comment on the value of those fauna habitats and dispersal links present
- identify management issues and goals
- recommend appropriate monitoring and maintenance regimes.



Figure 1. Study Area

2. Methods

2.1 Literature review

To assist in the preparation of this VMP a number of disparate studies that contain detailed information on the vegetation and fauna habitat of the study area were reviewed. These studies are:

- a conservation assessment and resilience mapping report prepared for Ecology Reserve (TEC 2010a)
- a conservation assessment and resilience mapping report for the Northwest Remnant (TEC 2010b) and an update of that report (TEC 2014)
- two vegetation management plans prepared for different sections of Mars Creek (Cardno 2010, Storm Consulting 2011)
- an ecological constraints analysis for lands that occur adjacent to University and College Creeks (Lesryk 2010a) and a VMP for a Sydney Turpentine – Ironbark Forest remnant within that area (Lesryk 2010b)
- a Review of Environmental Factors for road and drainage works along University and College Creeks (Definity 2010)
- a biodiversity enhancement plan prepared for the University as part of a post-graduate study exercise (Jurik and Aung 2014)
- A preliminary ecological assessment of Macquarie University conducted by EDAW (EDAW 2006).

2.2 Field survey

A field survey of the Universities bushland areas[1] was conducted by Paul Burcher (B.App.Sc) and Stephen Bloomfield (B.App.Sc) on 10 and 28 April 2015. The survey involved traversing the bushland areas of the site noting vegetation structure, species composition, condition and fauna habitat features. As detailed studies have already been undertaken on the intact bushland of the study area, these surveys were limited in time and scope.

The vegetation descriptions provided within this report draw on those of TEC (2010a, 2010b, 2014) as well notes made by the authors in the field.

[1] Those bushland stands within the University that were investigated as part of this VMP will hereafter be referred to as 'the study area'.

3. Results

3.1 Literature review

3.1.1 Vegetation

EDAW undertook a preliminary ecological investigation of the University's grounds in 2006 (EDAW 2006). This was limited to the collation and review of existing, readily accessible information. Using the classification of NPWS (2002), they found three vegetation communities in the study area, these being:

- Sandstone Ridgetop Woodland within Ecology Reserve
- Western Sandstone Gully Forest within Ecology Reserve and Fauna Park
- Sydney Turpentine Ironbark Forest in two locations in the east of the study area near University Creek and within the Fauna Park as well as beside, and upslope of, Mars Creek west of Gymnasium Road.

TEC (2010a, 2010b and 2014) has undertaken detailed studies of the vegetation of Ecology Reserve and that of Fauna Park and its surrounds (collectively known as the Northwest Remnant). Following the classification system of DECCW (2009), Ecology Reserve was mapped as supporting two vegetation communities, these being:

- Coastal Enriched Sandstone Sheltered Forest
- Hornsby Enriched Sandstone Exposed Woodland.

Despite recognising and mapping variations within the structure and species composition of the intact native vegetation of the Northwest Remnant, TEC labelled all of it Sydney Turpentine - Ironbark Forest. The reports by TEC also include assessments of conservation significance, resilience and condition mapping and some management recommendations, these being incorporated into this report.

Storm Consulting (2011) prepared a VMP for a previously cleared 230 m section of Mars Creek where it runs through the 'Y' section of the university. This involved describing the biological and abiotic character of the area and prescribing on-ground works for site preparation, planting of native vegetation, soil amelioration and bolstering, installation of habitat features, weed control and the implementation of a two-year maintenance period.

In association with the development of temporary car parking facilities on previously cleared land to the east of the area addressed by Storm Consulting (2011), a VMP was prepared for the left bank of a 195 m section of Mars Creek. The report followed a similar format to that of Storm Consulting (2011), with proposed works planned, and budgeted over, a two-year period.

Lesryk (2010a) undertook an ecological constraints report which informed the Review of Environmental Factors prepared for works undertaken within and adjacent to University and College Creeks (Definity 2010). Lesryk found that three native vegetation communities occurred in this part of the study area namely:

- Smooth-barked Apple Open Forest
- Red Bloodwood – Sandstone Stringybark Woodland
- Rushland.

A modified area of remnant canopy trees with limited native understorey and groundcover on the right bank of University Creek was also considered to qualify as Sydney Turpentine-Ironbark Forest

under the TSC Act, but not as the corresponding community under the stricter definitions of the EPBC Act.

Subsequent to the Lesryk study, and recommended as a concept plan condition for proposed works along University Creek (Infinity 2010), Lesryk (2010b) prepared a VMP for the patch of Sydney Turpentine-Ironbark Forest on the right bank of University Creek. It described the vegetation and fauna habitat, the remnant's condition and resilience, and framed performance measures, techniques and specification for its rehabilitation.

The most recent regional vegetation mapping that includes the study area was undertaken by NPWS (OEH 2013), which was an update of DECCW (2009). None of the study area's bushland was visited during this mapping exercise. As such, interpretation was based on aerial photographs, this indicating the presence of the following native vegetation communities (Figure 2):

- Coastal Enriched Sandstone Dry Forest covering most of the Fauna Park
- Coastal Shale-Sandstone Forest in the north of the Fauna Park and near Mars Creek to the south of the Fauna Park
- Hornsby Enriched Sandstone Exposed Woodland in Ecology Reserve
- Sydney Turpentine-Ironbark Forest beside, and upslope of, Mars Creek west of Gymnasium Road and in three patches near University Creek.

Elsewhere, patches of planted eucalypts and other landscaped plantings are indicated as 'Urban Exotic/Native' or 'Weeds and Exotics'.

Vegetation mapping of the Cumberland Plain undertaken by NPWS (2002) indicates that the following occur within the study area:

- Sandstone Ridgetop Woodland and Unclassified Vegetation in Ecology Reserve
- Turpentine-Ironbark Margin Forest in the Fauna Park and along Culloden Road
- Turpentine-Ironbark Forest along Culloden Road south of the Waterloo Road intersection.



Figure 2. Vegetation Mapping of the Study Area (OEH 2013)

3.1.2 Threatened species

3.1.2 (a) Flora

The review of reports prepared in relation to the study area show that one threatened flora species has been recorded. This is the shrub, *Epacris purpurascens* var. *purpurascens*, which is listed as vulnerable under Schedule 2 of the TSC Act. TEC (2010a) found this species in three discrete locations in the Northwest Remnant. Their follow-up survey in 2014 found that one of these sub-populations had increased in extent and numbers (from two to 25); the second had remained the same, while the third occurrence of two plants had disappeared.

Epacris purpurascens var. *purpurascens* was also reported to occur in Ecology Reserve (Downing and Paternoster [2010] in TEC 2010b) though no details on the exact location or number of plants present is supplied. There is also a 2011 record of *Darwinia biflora* in the University's Herbarium (J. Macris pers. comm.). This small shrub, which is listed as vulnerable on the TSC Act and the EPBC Act, was found in Ecology Reserve in open sandstone woodland near the access trail from Christie Park.

OEH (2015) indicates 18 other flora species listed on the Schedules of the TSC and/or EPBC Acts that have been found within a 5 km radius of the study area (Appendix A). There is also a 2011 record of Darwinia biflora in the University's Herbarium (J. Macris pers. comm.). This small shrub, which is listed as vulnerable on the TSC Act and the EPBC Act, was found in Ecology Reserve in open sandstone woodland near the access trail from Christie Park.

3.1.2 (b) Fauna

OEH (2015a) indicates 35 species listed on the Schedules of the TSC and/or EPBC Acts that have been detected within 5 km of the study area. Of these, one is known to have breed within the campus grounds, this being the Green and Golden Bell Frog (*Litoria aurea*). This species was recorded breeding in the Lungfish Ponds near Fauna Park during the early 1990's (OEH 2015a, White and Pyke 1996) and from Macquarie University Industry Park in 1999 (OEH 2105a), however, it is no longer thought to be present on campus.

3.1.3 Soils

Three soil landscapes, namely the Glenorie, Lucas Heights and Gymea soil landscapes, are mapped by Chapman and Murphy (1989) as occurring in the study area.

The Glenorie soil landscape occurs on the upper slopes of the study area generally above the 60 m contour line. This soil landscape is derived from the underlying Ashfield and Bringelly Shales of the Wianamatta Group. On upper slopes, such as those in Fauna Park, soils are generally moderately deep red and brown podzols. Along drainage lines, such as Mars Creek, humic gleys, yellow podzols and gleyed podzols may occur (Chapman and Murphy 1989).

The Lucas Heights soil landscape occurs immediately downslope of the Glenorie soil landscape and covers most of Fauna Park, and the lower slopes near Mars Creek east of Gymnasium Road. It also occurs east of University Creek. The geology of the Lucas Heights soil landscape is primarily the Mittagong Formation, however this unit may include minor intrusions of Hawkesbury Sandstone and Ashfield Shale. Soils are moderately deep, hard-setting yellow podzols and yellow soliths (Chapman and Murphy 1989).

The Gymea soil landscape occurs on the steeper sandstone slopes adjacent to Mars Creek north of the M2 Motorway. Soils of this landscape are derived from the underlying Hawkesbury Sandstone. They are shallow to moderately deep yellow earths, earthy sands on crests and inside

of benches, shallow siliceous sands on leading edges of benches; localised gleyed podsolic soils and yellow podsolic soils on shale lenses and shallow to moderately deep siliceous sands along drainage lines (Chapman and Murphy 1989).

Disturbed Terrain is also mapped as occurring in an ellipsoid shaped area stretching from the playing fields across the M2 to the north-eastern part of Fauna Park. It is noted that soil landscape mapping was undertaken prior to construction of the M2 Motorway.

3.2 Study area description

3.2.1 Vegetation communities/fauna habitats

Six distinct vegetation communities were recognised in the study area (Figure 3). For ease of reference, nomenclature follows that of OEH (2013), apart from constructed communities.

3.2.1 (a) Sydney Turpentine – Ironbark Forest

Sydney Turpentine – Ironbark Forest occurs on the Glenorie soil landscape on gently sloping land in the upper third of the Northwest Remnant (Zone 5 of TEC 2014). The native soil in this zone has a strong clay influence and shows little evidence of Hawkesbury Sandstone. The canopy is dominated by Turpentine (*Syncarpia glomulifera*) and Red Mahogany (*Eucalyptus resinifera*) with occasional White Stringybark (*E.globoidea*) and a few Grey Ironbark (*E.paniculata*). The understory, which is generally to 6 m, is sparse to mid-sparse and dominated by Sweet Pittosporum (*Pittosporum undulatum*).

Within the boundary fences the groundcover to 0.75m is dense and dominated by Basket Grass (*Oplismenus imbecillus*), Kidney Weed (*Dichondra repens*), Weeping Meadow Grass (*Microlaena stipoides*), Wiry Panic (*Entolasia stricta*), Common Rush (*Juncus usitatus*), Flax-lily (*Dianella caerulea*) and Mat-rush (*Lomandra longifolia*). There are also seedlings of Sweet Pittosporum, Turpentine and Mock Olive (*Notolaea longifolia*). To the east of the boundary fence, canopy trees of the community are present above a regularly slashed groundcover of introduced grasses such as Panic Veldt Grass (*Ehrharta erecta*) and Carpet Grass (*Axonopus affinis*).

TEC (2014) commented that bush regeneration works within this vegetation type, and the reduction of the negative influence of herbivory, have increased its structural and floristic diversity and improved its resilience and condition.

Small degraded patches of Sydney Turpentine – Ironbark Forest also occurs in the narrow strip of land between Talavera Road and near Mars Creek upstream of Gymnasium Road where just a few canopy trees remain.

On the right bank of University Creek, south of the new University Avenue, is another remnant of Sydney Turpentine – Ironbark Forest covering about 0.1ha. Here the canopy is dominated by Smooth-barked Apple, along with Turpentine, Blackbutt and Thin-leaved Stringybark. There is a sparse to mid-dense shrub layer composed of Lantana (*Lantana camara*), Sweet Pittosporum, Dogwood (*Ozothamnus diosmifolius*) and Sydney Golden Wattle (*Acacia longifolia*). The groundcover is dense and dominated by Morning Glory (*Ipomoea indica*) and Panic Veldt Grass, with a few indigenous species such as Flax-lily, Weeping Meadow Grass, Beard Heath (*Leucopogon juniperinus*) and Mat-rushes (*Lomandra spp*).

Lesryk (2010b) found that there was a low level of weed invasion in this remnant, and that it could regenerate and recover without the need for supplementary revegetation works.

Sydney Turpentine – Ironbark Forest is listed as an endangered ecological community under the TSC Act and a critically endangered ecological community under the EPBC Act.

Fauna Habitat

This area is suitable for the foraging and sheltering requirements of small to large birds, reptiles, amphibians and mammals, particularly those that are urban tolerant (i.e. possums). Given the lack of hollows, breeding requirements would be restricted to the smaller and medium sized nest building birds.

3.2.1 (b) Coastal Shale Sandstone Forest

This community occurs within the Lucas Heights soil landscape downslope of the Sydney Turpentine – Ironbark Forest in the Northwest Remnant and as small patches in the University Creek catchment near Herring Road north of railway station entrance. Its floristic composition exhibits a mix of species found on both sandstone and clay. In the Northwest Remnant the canopy is variously dominated by Snappy Gum (*Eucalyptus racemosa*), Red Mahogany, Smooth-barked Apple (*Angophora costata*) and Red Bloodwood (*Corymbia gummifera*) with occasional occurrences of Sandstone Stringybark (*E.sparsifolia*) and Turpentine while in the Herring Road remnant there is a canopy of Red Bloodwood and Sandstone Stringybark. The shrub layer to 3m is diverse and common species are Bushy Needlebush (*Hakea sericea*), Tick Bush (*Kunzea ambigua*), Sydney Golden Wattle, Sweet-scented Wattle (*A.suaveolens*), Pillflower (*Ozothamnus diosmifolius*), Sweet Pittosporum (*Pittosporum undulatum*), Blackthorn (*Bursaria spinosa*), *Leucopogon juniperinus* and Pine-leaved Geebung (*Persoonia pinifolia*). The ground layer is also often dense with common species being Mat-rush (*Lomandra longifolia*), Kangaroo Grass (*Themeda triandra*), Bladey Grass (*Imperata cylindrica*), Weeping Meadow Grass (*Microlaena stipoides*), Bracken (*Pteridium esculentum*) and Flax-lily (*Dianella caerulea* var. *producta*). In the Herring Road remnant there is a mix of native and introduced species in the groundcover with Agapanthus (*Agapanthus africanus*), Mat-rush (*Lomandra longifolia*), Flax-lily and *Leucopogon juniperinus* being common.

A small, degraded patch of this community occurs between Talavera Road and the M2. Here there is a canopy of Smooth-barked Apple, Red Mahogany, Snappy Gum and Red Bloodwood with a simplified understorey of Sweet Pittosporum and a groundcover dominated by Bladey Grass.

Fauna habitat

The Northwest Remnant is suitable for the foraging and sheltering requirements of small to large birds, reptiles, amphibians and mammals, particularly those that are urban tolerant (i.e. possums). Given the lack of hollows, breeding requirements would be restricted to the smaller and medium sized nest building birds.



Figure 3. Study Area Vegetation

3.2.1 (c) Coastal Enriched Sandstone Dry Forest[2]

This community occurs on the lower slopes adjoining Mars Creek in Ecology Reserve. It is dominated by a 25 m high canopy of Sydney Peppermint (*Eucalyptus piperita*) and Smooth-barked Apple. Small tree species commonly include Old Man Banksia (*Banksia serrata*), Sweet Pittosporum and Parramatta Green Wattle (*Acacia parramattensis*). A shrub layer to 4 m is dominated by Paperbark Tea-tree (*Leptospermum trinervium*), Tick Bush, Bushy Needlebush (*Hakea sericea*), Flax-leaved Wattle (*Acacia linearis*) and Pink Spider Flower (*Grevillea sericea*). Ground layer species include Mat-rush (*Lomandra longifolia*), Flax-lily (*Dianella caerulea* var. *producta*), Bracken (*Pteridium esculentum*), Saw Sedge (*Gahnia clarkei*) and Wiry Panic (TEC 2010).

This community suffers significant weed growth compared to the woodland that occurs upslope. Most of this weed growth occurs directly along the edges of Mars Creek and on the left bank between the creek and the cleared area upslope. Common weed are Trad (*Tradescantia fluminensis*), Small-leaf Privet (*Ligustrum sinense*), Large-leaf Privet (*Ligustrum lucidum*), Japanese Honeysuckle (*Lonicera japonica*), Mist Flower (*Ageratina riparia*), Crofton Weed (*A. adenophora*) and Black Ash (*Acer negundo*) (TEC 2010). Some Coral Trees (*Erythrina crista-galli*) that previously occurred along the bank (TEC 2010) have been successfully poisoned.

3.2.1 (d) Hornsby Enriched Sandstone Exposed Woodland

This community occurs on the dry exposed, north-facing slope of Ecology Reserve. The canopy is dominated by 10 m to 15 m tall Snappy Gum (*Eucalyptus racemosa*) with a mid-storey commonly composed of Dwarf Apple (*Angophora hispida*) and Old Man Banksia (*Banksia serrata*), these reaching a height of 8 m. The often dense shrub layer that is 2 m to 6 m tall is particularly diverse with common species being Paperbark Tea-tree (*Leptospermum trinervium*), Tick Bush, Hop Bush (*Dodonaea triquetra*), Bush-pea (*Pultenaea tuberculata*) and Bushy Needlebush. The groundcover, which is composed of low shrubs and forbs, is dominated by *Micrantheum ericoides,* Wiry Panic (*Entolasia stricta*), Coral Heath (*Epacris pulchella*), Spear Oat Grass (*Anisopogon avenaceus*), *Bossiaea obcordata* and Twisted Sedge (*Cyathochaeta diandra*). Common twiners include Apple Berry (*Billardiera scandens*) and Devil's Twine (*Cassytha pubescens*). Weed species in this community are generally absent (TEC 2010).

Fauna habitat

Due to its contiguity with large expanses of bushland in Lane Cove National Park[3], the presence of rock outcrops and a drainage line, and its structural and floristic diversity, Ecology Reserve is considered suitable habitat for a range of both flying and non-flying mammals, smaller bird species and herpetofauna that are disadvantaged by those weedier, structurally simple habitats that occur elsewhere in the study area.

[2] Following DECCW (2009) this community was referred to as Coastal Enriched Sandstone Sheltered Forest by TEC (2010) but there has been a slight name change in the updated version of the regional mapping by OEH (2013).

[3] Which occurs immediately north of the University grounds.

3.2.1 (e) Constructed Riparian Scrub

Along Mars Creek, upstream of Gymnasium Road, is dense scrub that has been formed from plantings carried out as part of the works associated with the implementation of two VMP's (Cardno 2010, Storm Consulting 2011). In that part of the plantings near the carpark there is dense growth of young eucalypts such as Smooth-barked Apple and Sydney Peppermint and shrubs such as Wattles (*Acacia spp*) and Water Gum (*Tristaniopsis laurina*), whilst near the creek, common groundcover species are Mat-rush (*Lomandra longifolia*), Flax-lily (*Dianella caerulea*), Bracken (*Pteridium esculentum*) and Kangaroo Grass (*Themeda australis*).

Fauna habitat

This area consists of densely planted reeds, sedges, shrubs and small trees. The drainage line has steps and riffle sequences, as well as snags. These habitats provide for the foraging, breeding and/or sheltering requirements of a range of small to medium birds, insectivorous bats (microchiropterans), reptiles, amphibians and invertebrates.

No stags or hollows are present within this area. As such no hollow-dependant species would be roosting or breeding in this environment.

The Buff-banded Rail (*Gallirallus philippensis*), which is considered regionally significant (DECC 2008), was detected utilising this habitat area during the field survey.

3.2.1 (f) Flooded Gum Forest

This community occurs adjacent to an ephemeral drainage line west of the Culloden Road/Waterloo Road intersection. The canopy is dominated by 30 m tall planted Flooded Gum (*Eucalyptus grandis*), a species native to the NSW north coast and south-east Queensland. Other canopy species present are Blackbutt (*Eucalyptus pilularis*), Spotted Gum (*Corymbia maculata*) and Swamp Oak (*Casuarina glauca*). The small tree layer consists of the introduced Privet (*Ligustrum spp*) and Black Ash, and the native Sweet Pittosporum. The groundcover contains a mixture of grasses, forbs and herbs. Common species are Weeping Meadow Grass (*Microlaena stipoides*), Flax-Lily, Mat-rush, Scurvy Weed (*Commelina cyanea*), Kidney Weed and the noxious weed, Asparagus Fern (*Asparagus aethiopicus*). The creek banks are vegetated by a dense growth of Crofton Weed (*Ageratina adenophora*).

Aerial photography (http://maps.six.nsw.gov.au/) shows that this area had been cleared as part of the region's agricultural development well before 1943.

Whilst the canopy of this forest is dominated by introduced species it does have the potential to be further rehabilitated towards native bushland. In its current form, this community is also a habitat for plants and animals.

Fauna habitat

This area is suitable for the foraging and sheltering requirements for a narrow range of native birds, mostly aggressive edge-tolerant species such as Noisy Miner (*Manorina melanocephala*) and Laughing Kookaburra (*Dacelo novaeguineae*). Due to the dense vegetative cover and the presence of a drainage line, some reptiles and amphibians may also be present. Some native mammals, particularly those that are urban tolerant (i.e. possums and some microchiropterans) are likely to be present, however, given the lack of stags and hollows, these species are unlikely to be breeding or sheltering in this forest.

The Powerful Owl (*Ninox strenua*), which is listed as threatened under the TSC Act, has been recorded in Marsfield Park, approximately 800 m to the south-west, and may occasionally forage through this forest.

3.2.2 Endangered ecological communities

One TSC Act listed endangered ecological community occurs in the study area, namely Sydney-Turpentine Ironbark Forest. This community is located in the upper part of the Northwest Remnant and on the right bank of University Creek near Morling College. There are also some remnant trees of this community near Research Park Drive that include species from both this community and Coastal Shale Sandstone Forest that could be regarded as part of the endangered ecological community.

Although TEC (2010b and 2014) mapped all of the Northwest Remnant as Sydney-Turpentine Ironbark Forest only that area designated as 'Zone 5' by TEC (2010b) is considered to conform to the description for this community provided by the NSW Scientific Committee. This patch, the one near University Creek and the remnant trees do not qualify as the EPBC Act critically endangered ecological community of the same name as they are all less than the area thresholds required under the Threatened Species Scientific Committee's determination (TSSC 2005).

3.2.3 Wildlife corridors

At a regional scale there is a tenuous link between the vegetation on campus and Lane Cove National Park. Whilst this link is present, it is acknowledged that the M2 is a major barrier to the dispersal movements of ground traversing native fauna. Therefore, the movements that do occur are considered to be restricted to medium and large sized birds, mega and micro-chiroptera, and those reptiles and amphibians that are tolerant of traversing through those culverts present.

For those species that do cross the M2, south into the University campus from Lane Cove National Park, a fragmented corridor is present. To connect with Terrey's Creek, which is approximately 1 km to the west, this corridor follows a number of urban 'stepping stones' including Marsfield and Stewart Parks. The bushland present in association with Terrys Creek is contiguous with Lane Cove National Park. It is noted that only flying species are considered to use the entirety of this corridor.

The main corridor within the campus grounds is that which incorporates those habitat areas that extend along Mars Creek, including the Northwest Remnant. The lack of developed habitat between Macquarie Lake and Gymnasium Road is recognised as a barrier to the movement of fauna, particularly small birds. This area has also been recently highlighted as a 'significant gap' within the 'Biodiversity Enhancement Plan' (Jurik and Aung 2014).

In addition, though there are open woodland stands outside the Mars Creek corridor, there is a lack of any form of understorey development which also prevents the dispersal of small birds and ground traversing species.

The University Creek corridor does not link up with any other significant areas of habitat outside the boundaries of the University campus. The buildings present in association with the University, and the surrounding road network (including the M2), are a major barrier to the dispersal movements of native fauna. Therefore, the movements that do occur are considered to be restricted to urban-tolerant medium and large sized birds, possums, mega and micro-chiroptera, and reptiles and amphibians. This would include animals such as the Noisy Miner (*Manorina melanocephala*), Laughing Kookaburra (*Dacelo novaeguineae*), Common Brushtail Possum (*Trichosurus vulpecula*), Eastern Water Dragon (*Physignathus lesueurii*), Eastern Water Skink (*Eulamprus leuraensis*), *Lampropholis* species, Striped Marsh Frog (*Limnodynastes peronii*) and

Common Eastern Froglet (*Crinia signifera*). Each of these species was recorded in association with University Creek during a 2009 fauna investigation of this system (Lesryk 2009a). It is noted that Long-finned Eels (*Anguilla reinhardtii*) were also identified within University Creek during that study (Lesryk 2009a).

Flying mammals (mega and micro-chiroptera) and larger birds from beyond the campus grounds (i.e. within the nearby Lane Cover National Park) are considered to traverse the urban infrastructure boundaries and may utilise and forage within both this corridor and the University grounds.

3.2.4 Threatened species

3.2.4 (a) Flora

As discussed in section 3.1.2 (a), two threatened species have been recorded in the study area, these being *Epacris purpurascens* var. *purpurascens and Darwinia biflora*. *Epacris purpurascens* var. *purpurascens* is listed as vulnerable under the TSC Act and is known to occur in the Coastal Shale Sandstone Forest of the Northwest Remnant. *Darwinia biflora* is listed as vulnerable under the TSC Act and the EPBC Act and is known to occur in Hornsby Enriched Sandstone Exposed Woodland in Ecology Reserve near Christie Park.

Of the 18 other flora species listed under the Schedules of the TSC and EPBC Acts which have been found within a 5 km radius of the study area (Appendix A), *Tetratheca glandulosa* has suitable potential habitat in the eastern, upper slopes of Ecology Reserve.

3.2.4 (b) Fauna

Of the 35 threatened fauna species detected within 5 km of the study area, it is considered that seven are considered likely to occur within/utilise the University grounds. These are the:

- Powerful Owl (*Ninox strenua*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)
- Eastern Freetail-bat (*Mormopterus norfolcensis*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*).

Each of these species is listed as vulnerable under the TSC Act, whilst the Grey-headed Flying-fox is also listed as vulnerable under the EPBC Act.

Given the lack of stags, tree hollows and suitable cave substitutes, none of these species are considered to utilise those habitats present in the university grounds for breeding or roosting purposes. They are expected to forage throughout the study area on occasion.

4. Vegetation resilience and condition

Figure 4 indicates the vegetation resilience and condition of the different vegetation communities in the study area. This map is derived from work done by TEC (2010a, 2010b, 2014) in the Northwest Remnant and Ecology Reserve, and by the authors elsewhere. The following key from TEC (2010) was used to classify the vegetation remnants present.

Vegetation Resilience and Condition Classes Key

1 Soil profile intact for regeneration pathways (possible original soil profile and possible soil stored seed, seed rain or underground plant parts capable of reshooting)

2 Virtually weed free and all vegetation layers present (except if due to natural causes e.g. fire, storm) **VERY HIGH**

2* Some minor weed growth or layers absent

3 Minor weed infestations but no layers absent **HIGH**

3* Weed infestations or disturbance leading to decline of at least one layer

4 Loss or strong decline of at least one layer but some active resilience at ground layer **MEDIUM**

4* Loss or strong decline of at least two layers with no or little active resilience at ground layer. **LOW**

1* Soil profile NOT intact for regeneration pathways (No possibility of original soil profile nor any possibility for regeneration of soil-stored seed, seed rain or underground plant parts capable of reshooting) **NOT NATIVE VEGETATION**



Figure 4. Resilience / Condition Classes

5. Management classes

The study area's management classes follow the Bushland Asset Classes developed by Macquarie University's Property Section. To retain consistency with the University's Operational Management Manual the same system has been adopted for this VMP. Table 1 details the five classes. The study area's bushland, and its management classes, are illustrated on Figure 5 (overleaf).

Table 1: Management classes

Management Class	Distinguishing features
1. High Integrity Bushland	Class 1 vegetation is in good to very good condition. On average, this vegetation requires only half-an-hour per 100 m^2 each year to maintain its state. In addition to meeting the 'healthy' target criteria, Class 1 has probably the lowest year to year maintenance cost of any land use in the University.
2. Managed Recovery	Class 2 usually covers vegetation for which there has been an intervention to trigger native regeneration. It requires ongoing weeding effort to keep the balance of plant regrowth favouring native flora until the forest structure fully regenerates. Class 2 is on a trajectory towards becoming /returning to Class 1. Management effort averages around two hours per 100 m^2 per annum (broadly labour-comparable with lawn maintenance).
2a. Bushcare Program	Class 2a are the 'Managed Recovery' sites adopted by bushcare@mq and supported with a recurring component of volunteer work. In terms of the sustained management effort involved, bushcare sites usually consume somewhere between Classes 2 and 3 in allocated time per year.
3. Intensive Management	Class 3 may be either degraded bushland at the very beginning stages of weed removal, or a recent planted bushland site that is subject to high weed invasion risk. On average, around 10 hours per 100 m^2 a year is required to support the development of native resilience. All areas of Class 3 should become Class 2 following 1-3 years at this intensity of management, and optimally become Class 1 bushland within 8-15 years.
4. Outside Scope	Sites at present excluded from ecological management initiatives. Examples include future development precincts; sites where existing uses would not be compatible with ecological restoration; and several regeneration areas 'in-waiting'.



Figure 5. Management Classes

6. Management issues and goals

The following section is a discussion of the various management issues that pertain to the bushland remnants of the study area. A summary of these issues has been provided in Table 2.

It is considered that the highest priority for management of the study area's bushland is the maintenance, and possible expansion of, the Sydney Turpentine-Ironbark Forest and Coastal Shale Sandstone Forest that occurs in the Northwest Remnant. This will require ongoing weed control and supplementary planting of component species in areas where they are depleted. Details on the current condition of the vegetation and changes since 2010 are contained in TEC (2014). Macquarie University Property should investigate the possibility (and cost) of expanding the Sydney Turpentine-Ironbark remnant eastwards to encompass existing canopy trees that occur above an introduced grass groundcover. Apart from increasing the overall area of this endangered ecological community, this would also enhance the resilience of the remnant and improve fauna habitat.

Another important component of management will be the application of fire to assist in stimulating regrowth of a range of fire-adapted species. Fire will also reduce areas of dominance by a narrow range of species such as Tick Bush. It is recommended Macquarie University Property consult the Rural Fire Service and/or NSW Fire and Rescue about assistance with such burns, which would also act to reduce bushfire hazard to the buildings within Fauna Park.

For wet sclerophyll forests such as the Sydney Turpentine–Ironbark Forest and Coastal Shale Sandstone Forest communities, prescribed burns should be conducted at intervals of between 15 and 30 years (NPWS 2004).

It is recommended that monitoring plots be established within the Northwest Remnant to determine changes in vegetation structure and composition over time and thus the efficacy of the regeneration and rehabilitation methods being employed. For cost-effectiveness, this would best be conducted by undergraduate students under the supervision of qualified staff but could also be carried out by suitable contractors.

Apart from the loss of two plants, the *Epacris purpurascens* var. *purpurascens* population appears to be viable and will continue to be so with the undertaking of continued bush regeneration works.

Another high priority area for vegetation management is Mars Creek within Ecology Reserve. The riparian area, within both the university's property and downstream in Lane Cove National Park has been degraded by erosion, sedimentation, changes to soil nutrient levels and subsequent weed invasion. These have arisen as a result of modification to the creek upstream, including the provision of culverts under the M2, the proliferation of hard surfaces and other deleterious features of urban development.

Appropriate fire intervals in Ecology Reserve also need determining. The last wildfire was in 2002 and an interval of this ilk is well within that considered suitable for heathy woodland vegetation (NPWS 2003). A prescribed burn has been agreed with OEH for next one to two years when this section of the valley is reach in their hazard reduction program. Surveys for *Darwinia biflora* are also more likely to be successful after fire due to propagation of the species and ease of detection with less shrub and groundcover vegetation present.

The restoration of vegetation along Upper Mars Creek through the implementation of the two VMP's has been successful. Ideally, similar rehabilitation, including the possible removal of underground culverts, should be adopted downstream of Gymnasium Road. This would provide

further habitat for locally occurring flora and fauna and provide a linkage between currently partially isolated habitat areas along and near the creek.

Engineering solutions to moderate flow volumes and velocities into Ecology Reserve (e.g. construction of a device north of the M2 or increasing the capacity of University Lake) should be considered but are beyond the expertise of the authors. A rehabilitation plan for the riparian area of Ecology Reserve should be formulated using species typical of Coastal Enriched Sandstone Dry Forest as described by OEH (2013).

Instigation of the VMP for the rehabilitation of the University Creek Sydney Turpentine-Ironbark Forest remnant (Lesryk 2010b) has been delayed due to the works associated with new University Avenue access. Once this has been completed, as a high priority, it is recommended that the VMP be acted upon.

As part of the Station North development, the Coastal Shale Sandstone Forest remnant near Herring Road will be removed. Amongst other measures to offset the loss of this woodland, Lesryk (2010c) proposed the translocation of its soil to an area between the University's playing fields and Lane Cove National Park. When the development of the Station North site commences, it is recommended that these works proceed.

Due to the relatively young age class of the canopy species within the study area, there are no hollow-bearing trees present. This could be rectified by the installation of artificial nest boxes. The design and placement of such boxes should favour their adoption by microchiropterans as their roosting habitats are more restricted locally whereas hollow-dependent birds (such as cockatoos, lorikeets and kookaburras) are common. Other fauna habitat embellishments that could be adopted are enhancement of reed vegetation around the wetland area of Upper Mars Creek to assist species, such as the regionally significant Buff-banded Rail; and the provision of more woody debris and sandstone boulders within the Northwest Remnant and along Upper Mars Creek, which would assist in regeneration of populations of invertebrates, reptiles and amphibians.

Given its relatively small and isolated nature, and that it is vegetated primarily with introduced species and therefore difficult to rehabilitate, it is considered the Flooded Gum Forest west of Culloden Road is a low priority area for vegetation management.

Table 2: Summary of management issues and goals

Area	Vegetation Type/Condition Class	Priority	Management Class	Management Issues	Goals
Northwest Remnant	Sydney Turpentine-Ironbark Forest (STIF) and Coastal Shale Sandstone Forest (CSSF) all classes	High	1, 2, 4	Fire Management Monitoring	Increased floristic diversity, stimulation of natural regeneration and establishment of successional diversity. Mosaic of areas with different fire history Determine effectiveness of rehabilitation strategies.
	Sydney Turpentine-Ironbark Forest/Medium and Coastal Shale Sandstone Forest/Medium	High	2	Weed Control/bush regeneration	Condition Class upgraded to high. Determine effectiveness of weed rehabilitation strategies.
	As above.	Moderate	4	Future regeneration	Progressive migration of mown edge.
	Coastal Shale Sandstone Forest/Very High-High	High	3	*Epacris purpurascens* var. *purpurascens* population. Monitoring	Maintenance of population at or above existing level.
Ecology Reserve	All Vegetation	High		Prescribed burn	Maintain and enhance biodiversity
	Coastal Enriched Sandstone Dry Forest/Medium	High	2	Weed Control/bush regeneration	Condition Class upgraded to high Stabilisation of banks.

Area	Vegetation Type/Condition Class	Priority	Management Class	Management Issues	Goals
	Coastal Enriched Sandstone Dry Forest/High-Very High	Low	1	Removal of Spotted Gums	Prevent spread and overshading by introduced species.
	Hornsby Enriched Sandstone Exposed Woodland	Low	1	Survey for threatened flora species	Determine presence/absence.
Mars Creek	Constructed Riparian Scrub and Coastal Enriched Sandstone Dry Forest/low	Moderate	2, 3	Weed Control and supplementary planting Enhance reed vegetation, particularly around wetland area	Condition Class upgraded to medium. Provide further protective habitat for fauna species, such as Buff-banded Rail.
	Cleared area downstream of Gymnasium Road	Moderate		Vegetation rehabilitation	Creation of riparian zone habitat/wildlife corridor complimenting that upstream.
University Creek	STIF/Medium (adjacent to Dunmore Lang College)	High	2	Instigation of VMP for STIF (excluding 'station site'); Weed Control and supplementary plan	Condition Class upgraded to high Replenishment of native ground covers in riparian area
	Remnant STIF/CSSF trees near Research park Drive	Moderate	4	Loss of remnant canopy	
	CSSF near Herring Road	Moderate	4	Removal of remnant for Station North development	Translocation of soil to area adjacent to University's playing fields or adjoining Fauna Park remnant

Area	Vegetation Type/Condition Class	Priority	Management Class	Management Issues	Goals
West of Culloden Road	Flooded Gum Forest	Low	4	Weed Control (esp. Privet and Black Ash) Planting of native canopy and understorey species	Condition Class upgraded to medium.
All areas	All types	Low	All	Lack of hollow-bearing trees. Increase to quantities of sandstone outcrops and coarse woody debris	Initiate and monitor installation of artificial nest boxes for microchiropterans to improve habitat for these species within the campus. Provision of habitat for invertebrates, reptiles and amphibians.

7. References

Cardno 2010, *Vegetation management plan for Upper Mars Creek valley*. Unpublished report prepared for Macquarie University Office of Property

Chapman, GA, and Murphy, CL 1989, *Soil landscapes of the Sydney 1:100,000 sheet*, Soil Conservation Service of NSW, Sydney, NSW

Churchill, S 2008, *Australian Bats*, Reed - New Holland, Frenchs Forest, NSW

Cogger, H 2004, *Reptiles and Amphibians of Australia*, Reed Books, Chatswood, NSW

Definity 2010, *Macquarie University, University and College Creeks, Review of Environmental Factors June 2010.* Unpublished report prepared for Macquarie University Property.

Department of Environment and Climate Change 2008, *Rapid fauna habitat assessment of the Sydney Metropolitan Catchment Management Authority Area*, Department of Environment and Climate Change, Hurstville, NSW

Department of Environment, Climate Change and Water 2009, *The Native Vegetation of the Sydney Metropolitan Catchment Management Authority Area.* Department of Environment and Climate Change NSW, Hurstville, NSW

EDAW 2006, *Macquarie University preliminary ecological assessment*, EDAW, unpublished report prepared for Macquarie University Office of Property

Frith, HJ (Ed) 2007, *Complete book of Australian birds*, Readers Digest, Surry Hills, NSW.

Jurik, J and Aung, T 2014, *Biodiversity Enhancement Plan*. Unpublished report prepared for GSE844 - Environmental Management Practice at Macquarie University.

LesryK Environmental Consultants 2010a, *Ecological Constraints Report, University and College Creeks Study, Macquarie* University. Unpublished report prepared for Definity, St Leonards.

- 2010b *Vegetation Management Plan for Sydney Turpentine-Ironbark Forest Macquarie University, Ryde.* Unpublished report prepared for Definity, St Leonards.

- 2010c *Vegetation and Habitat Offset Works to Compensate for Clearing Vegetation in the Station North Precinct at Macquarie University, Macquarie Park*. Unpublished report prepared for Definity, St Leonards

NSW National Parks and Wildlife Service 2002, *Native Vegetation of the Cumberland Plain, Western Sydney.* NSW National Parks and Wildlife Service, Hurstville, NSW

- 2004, *Guidelines for ecologically sustainable fire management*, NSW National Parks and Wildlife Service, Hurstville, NSW

Office of Environment and Heritage 2013, *The native vegetation of the Sydney Metropolitan Area, volume 2: vegetation community profiles*, version 2.0., NSW Office of Environment and Heritage, Sydney, NSW

- 2015a, *Bionet: Atlas of NSW Wildlife: Point records for the Sydney CMA area*, NSW Office of Environment and Heritage, Sydney, NSW

- 2015b, *Threatened Species*, NSW Office of Environment and Heritage, Sydney, NSW. http://www.environment.nsw.gov.au/threatenedspecies/

Storm Consulting 2011, *Vegetation management plan for Upper Mars Creek valley*, unpublished report prepared for Macquarie University Office of Property

Total Earth Care 2010a, *Conservation assessment and resilience mapping*

Ecology Reserve, Macquarie University, unpublished report prepared for Macquarie University Office of Property

- 2010b, *Conservation assessment and resilience mapping Northwest Remnant, Macquarie University*, unpublished report prepared for Macquarie University Office of Property

- 2014, *Vegetation community mapping assessment and update 2014*

Northwest Remnant, Macquarie University, unpublished report prepared for Macquarie University Office of Property

Threatened Species Scientific Committee 2005, *Turpentine-Ironbark Forest of the Sydney Basin Bioregion. Advice to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee (TSSC) on amendments to the List of Ecological Communities under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. Australian Government Department of the Environment http://www.environment.gov.au/node/14559

White, AW and Pyke, GH 1996, Distribution and conservation status of the Green and Golden Bell Frog Litoria aurea in New South Wales, *Australian Zoologist*, 30(2):177-89

Van Dyck, S and Strahan, R (Eds) 2008, *The mammals of Australia* (3rd edition), Reed New Holland, Sydney, NSW.

Appendix A: Locally-occurring threatened flora species

Key

E - endangered

V - vulnerable

X - extinct

CE - critically endangered

Species	Status		Habitat (OEH 2015b & author's field notes)
	EPBC	TSC	
Acacia bynoeana	V	E	Heath/scrub on clayey ridge-tops and slopes.
Acacia pubescens	V	V	Variety of plant communities, including Cooks River/ Castlereagh Ironbark Forest, Shale/ Gravel Transition Forest and Cumberland Plain Woodland.
Callistemon linearifolius	V	V	Rock platforms in dry sclerophyll forest on the coast and adjacent ranges.
Darwinia biflora	V	V	Heath/scrub on clayey ridge-tops and slopes between Lane Cove and the Hawkesbury River.
Darwinia peduncularis	V	V	On or near rocky outcrops on sandy, well drained, low nutrient soil over sandstone.
Deyeuxia appressa	E	E	Record is from 1941. Locally extinct and little known of its ecology.
Epacris purpurascens var. purpurascens		V	Open forest/woodlands on deeper shales and near creeks.
Eucalyptus camfieldii	V	V	Heath/scrub on clayey ridge-tops and slopes.
Eucalyptus nicholii	V	V	Northern tablelands species commonly planted in Sydney.
Eucalyptus scoparia	V	V	Northern tablelands species commonly planted in Sydney.
Genoplesium baueri		V	Sparse sclerophyll forest and moss gardens over sandstone.
Grammatis stenophylla	E	E	Grows on rocks in rainforest and in wet sclerophyll forest.
Haloragodendron lucasii	E	E	Very localised in sheltered gullies in Barra Brui.
Leptospermum deanei	V	V	In sandstone scrub near watercourses.
Melaleuca deanei	V	V	Heath/scrub on clayey ridge-tops.
Persoonia hirsuta	E	E	Woodland and heath on clayey ridge-tops

Pimelea curviflora var. curviflora	V	V	Heath/scrub on clayey ridge-tops.
Prostanthera marifolia	X	CE	Unknown. Formerly confined to the Seaforth area.
Tetratheca glandulosa	V	V	Heath/scrub on moderately clayey ridge-tops and slopes.
Wilsonia backhousei		V	Saltmarsh

Appendix B: Locally-occurring threatened fauna species

Key

E - endangered

V - vulnerable

EP - endangered population (TSC Act only)

M - migratory (EPBC Act only)

Scientific name	Common name	EPBC	TSC	Habitat*	Likelihood of occurrence
Pseudophryne australis	Red-crowned Toadlet		V	Almost totally confined to drainage lines in areas of Hawkesbury Sandstone, especially those that support weathered shale lenses.	Low. There is no habitat within the study area for this animal.
Litoria aurea	Green and Golden Bell Frog	V	E	Inhabits a variety of environments, including disturbed sites, ephemeral ponds, wetlands, marshes, dams and stream-sides, particularly those that contain one or more of the following aquatic plants: bullrush (*Typha spp*.), spikerush (*Eleocharis spp*.), *Juncus kraussii, Schoenoplectus litoralis* and *Sporobolus virginicus*. Prefers water bodies with a lack of well-developed emergent vegetation, free of chemical contamination and no introduced fish species.	Low. Formerly recorded in Lungfish Ponds (east of Northwest Remnant near Talavera Road) in the 1990s but apparently no longer extant.
Varanus rosenbergi	Rosenberg's Goanna		V	The preferred habitat of the Heath Monitor includes wet and dry sclerophyll forests, woodlands and heath lands particular those that occur on sandy or calcareous	Low. Could potentially occur in

Scientific name	Common name	EPBC	TSC	Habitat*	Likelihood of occurrence
				soils. The Heath Monitor is mostly a terrestrial species, shelter in burrows, hollow logs and rock crevices.	Ecology Reserve.
Nettapus coromandelianus	Cotton Pygmy-Goose		E	This species is found in coastal and sub-coastal districts of north eastern NSW, formerly as far south as the Clarence River. The Cotton Pygmy-goose is an almost entirely aquatic species, preferring deep freshwater lagoons, swamps and dams. It uses tree hollows adjacent to water for nesting and breeding sites.	Low. There is no habitat within the study area for this animal.
Ptilinopus superbus	Superb Fruit-Dove		V	Distributed along the Queensland coast between Byfield and Cape York Peninsula, however migrations to southeastern Australia do occur at irregular intervals. The Superb Fruit-dove inhabits rainforests, and occasionally nests in nearby eucalypt forests, and feeds on a range of rainforest fruits, particularly the laurels.	Low. There is no habitat within the study area for this animal.
Apus pacificus	Fork-tailed Swift	M		Aerial feeder that rarely lands in Australia during summer migration.	Low. May potentially fly over the study area.
Hirundapus caudacutus	White-throated Needletail	M		Aerial feeder that rarely lands in Australia during summer migration.	Low. May potentially fly over the study area.
Ephippiorhynchus asiaticus	Black-necked Stork		E	Inhabits freshwater wetlands, where it mainly eats fish, though also known to eat reptiles, frogs, crabs, rodents and carrion.	Low. There is no habitat within the study area for this animal.

Scientific name	Common name	EPBC	TSC	Habitat*	Likelihood of occurrence
Ardea ibis	Cattle Egret	M		Wet pasture with tall grass, shallow open wetland and margins, mudflats.	Low. There is no habitat within the study area for this animal.
Botaurus poiciloptilus	Australasian Bittern	E	E	Shallow, vegetated freshwater or brackish swamps, usually dominated by tall, dense reed beds of Cumbungi.	Low. There is no habitat within the study area for this animal.
Ixobrychus flavicollis	Black Bittern		V	Occurs through the wet coastal areas of NSW, Queensland, the Northern Territory and Western Australia, favouring densely vegetated watercourse margins.	Low. There is no habitat within the study area for this animal.
Haliaeetus leucogaster	White-bellied Sea-Eagle	C		Large rivers, fresh and saline lakes, reservoirs, estuaries, coastal seas, islands.	Low. There is no habitat within the study area for this animal.
Hieraaetus morphnoides	Little Eagle		V	Open and riparian woodlands, grassland and arid regions, shunning dense forest.	Low. May potentially fly over the study area.
Pandion cristatus	Eastern Osprey		V	The Osprey is a large, coastal, fish eating raptor which has been recorded feeding upon mullet, rock cod, brim, leather jacket and whiting. This species normally builds a huge stick nest either in a large, dead tree, on a rocky outcrop or on the ground, though artificial structures	Low. There is no habitat within the study area for this animal.

Scientific name	Common name	EPBC	TSC	Habitat*	Likelihood of occurrence
				have also been known to be utilised.	
Numenius minutus	Little Curlew	M		Most often found feeding in short, dry grassland and sedgeland, including dry floodplains and blacksoil plains, which have scattered, shallow freshwater pools or areas seasonally inundated.	Low. There is no habitat within the study area for this animal.
Callocephalon fimbriatum	Gang-gang Cockatoo		V, EP[4]	In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. Moves to lower altitudes in winter, preferring more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. Requires large tree hollows for nesting and roosting.	Low. Potential to fly across/forage within northern portion of project area.
Calyptorhynchus lathami	Glossy Black-Cockatoo		V	Eucalypt woodland and feeds almost exclusively on casuarina fruit. Requires large tree hollows for nesting.	Low. Potential to fly across project area.
Glossopsitta pusilla	Little Lorikeet		V	Eucalyptus forest and woodland, particularly along water courses. Requires small tree hollows for nesting	Low. Potential to fly across project area.
Lathamus discolor	Swift Parrot	E	E	Autumn-spring non breeding migrant from Tasmania. When over-wintering on the mainland, this species is dependent on winter-flowering eucalypt species and	Low. Potential to fly

[4] Endangered population in the Hornsby and Ku-ring-gai LGAs.

Scientific name	Common name	EPBC	TSC	Habitat*	Likelihood of occurrence
				lerp.	across/forage within northern portion of project area.
Ninox connivens	Barking Owl		V	Timbered hills, forests and savannah woodlands of coastal and subcoastal eastern and northern Australia.	Low. There is no habitat within the study area for this animal.
Ninox strenua	Powerful Owl		V	Large tracts of open or closed sclerophyll forest or woodlands but can occur in fragmented landscapes as well. Gullies consisting of wet to dry sclerophyll forest with a dense understorey. Nests in large hollows, nearly always in the trunk or top of a mature eucalypt.	High. Recorded in Marsfield park and Lane Cove National park. Likely to occur in Ecology Reserve and possibly the Flooded Gum Forest near Culloden road.
Tyto novaehollandiae	Masked Owl		V	Open forest with a sparse mid-storey layer, but with patches of dense low ground cover.	Low. There is no habitat within the study area for this animal.
Merops ornatus	Rainbow Bee-eater	M		The Rainbow Bee-eater inhabits open forests and woodlands, often near water bodies. This bird roosts at night in shrubs. They are breeding migrants to Australia, nesting in burrows dug into sandy banks or bare, flat ground.	Low. Potential to fly across/forage within northern portion of project area.

Scientific name	Common name	EPBC	TSC	Habitat*	Likelihood of occurrence
Anthochaera phrygia	Regent Honeyeater	E	CE	Open forests, woodlands, timbered watercourses, and a variety of other habitat types. This species feeds primarily on four eucalypt species, Red Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Yellow Box (*E. melliodora*) and Yellow Gum (*E. leucoxylon*) as well as heavy infestations of mistletoe (*Amyema spp.*).	Low. Potential to fly across/forage within northern portion of project area.
Daphoenositta chrysoptera	Varied Sittella		V	Eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Low. Potential to fly across/forage within northern portion of project area.
Petroica boodang	Scarlet Robin		V	The Scarlet Robin breeds in scrubby eucalypt forests and woodlands but forage out into more open habitat in autumn and winter.	Low. There is no habitat within the study area for this animal.
Dasyurus maculatus	Spotted-tailed Quoll	E	V	Wet and dry sclerophyll forests through to rainforests. Males known to move up to 8 km in one night.	Low. There is no habitat within the study area for this animal.
Cercartetus nanus	Eastern Pygmy-possum		V	Heathland, woodland and rainforest that support a large number of proteaceous and myrtaceous plants.	Low. There is no habitat within the study area for this animal.

Scientific name	Common name	EPBC	TSC	Habitat*	Likelihood of occurrence
Petaurus australis	Yellow-bellied Glider		V	Restricted to areas of tall, mature eucalypts.	Low. There is no habitat within the study area for this animal.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Rainforests, open forests, woodlands, Melaleuca swamps, Banksia woodlands, commercial fruit crops and urban areas including residential gardens.	High. Potential to forage within/traverse study area.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat		V	Although considered a forest dweller, collections of this species have come from a variety of habitats. Roosts in hollow-bearing trees.	High. Potential to forage within/traverse study area. No roosting habitat present.
Mormopterus norfolkensis	Eastern Freetail-bat		V	Hollow-roosting bat that forages in dry eucalypt forests and woodlands.	High. Potential to forage within/traverse study area. No roosting habitat present.
Falsistrellus tasmaniensis	Eastern False Pipistrelle		V	Hollow-roosting bat that forages in eucalypt woodland.	High. Potential to forage within/traverse study area. No roosting habitat present.
Miniopterus schreibersii	Eastern Bentwing-bat		V	Cave-roosting bat that forages in well-timbered habitats	High.

Scientific name	Common name	EPBC	TSC	Habitat*	Likelihood of occurrence
oceanensis				and open grasslands.	Potential to forage within/traverse study area. No roosting habitat present.
Scoteanax rueppellii	Greater Broad-nosed Bat		V	Hollow-roosting bat that forages in eucalypt woodlands and rainforest.	High. Potential to forage within/traverse study area. No roosting habitat present.

* Habitat requirements were generally extracted from Frith (2007), Churchill (2008), Cogger (2000), Van Dyck and Strahan (2008) and OEH (2015b) with other references used being identified in the bibliography.

Appendix C: Photographic record of the study area

Plate1: Sydney Turpentine – Ironbark Forest, Northwest Remnant



Plate 2: Coastal Shale Sandstone Forest, Northwest Remnant.



Plate 3: Mars Creek, Ecology Reserve showing scouring of banks



Plate 4: Riparian Scrub, Upper Mars Creek



Plate 5: Flooded Gum Forest west of Culloden Road.



6. SUPPORTING DOCUMENTS

6.3 UTILITIES MANAGEMENT PLAN AND STORMWATER MANAGEMENT PLAN

Stormwater Management Plan & Utilities Management Plan (Rev. 1)

Macquarie University, Macquarie Park, NSW

Prepared for Macquarie University / 16 June 2017

131406 P

Taylor Thomson Whitting (NSW) Pty Ltd, Consulting Engineers | ABN 81 113 578 377
48 Chandos Street, St Leonards NSW 2065 | +612 9439 7288 | ttw.com.au

Structural
Civil
Traffic
Facade
Consulting
Engineers

Contents

1.0 Introduction 3
1.1 Macquarie University 3
1.2 Relevant Documents 9
2.0 Riparian Zone, Flooding and Stormwater 10
2.1 Stormwater Drainage 10
2.1.1 Design Criteria 10
2.2 Water Sensitive Urban Design 10
2.2.1 Rainwater Reuse 10
2.3 Flooding 11
2.3.1 University Creek 11
2.3.2 Mars Creek 13
2.3.3 Flooding Controls 14
2.4 Construction Phase Stormwater Management 14
3.0 Roadworks 15
4.0 Utilities 15
5.0 Hydraulic Services 15
5.1 Existing Potable Water and Fire Hydrant Services 15
5.1.1 Masterplanning Potable Water and Fire Hydrant Services 16
5.2 Existing Sewer 16
5.3 Masterplanning Sewer 16
5.4 Existing Natural Gas Services 16
5.5 Masterplanning Natural Gas Services 17
6.0 ELECTRICAL SERVICES 18
6.1 Existing Electrical Services 18
6.2 Masterplanning Electrical Services 18
6.3 Existing Telecommunications 18
6.4 Masterplanning Telecommunications 18
Appendix A – Flood Maps
Appendix B – Hydraulic Services
Appendix C – Electrical Services

© 2017 Taylor Thomson Whitting

1.0 Introduction

Macquarie University is planning to develop parcels of land within the campus for commercial, research and University use.

This report has been prepared to summarise the utilities, stormwater design and flooding constraints present at Macquarie University, in Macquarie Park, for master-planning purposes.

TTW have prepared the stormwater and flooding strategy. David Buckle and Associates have prepared servicing strategy for water, sewer and gas. JDG Consulting have prepared electrical and communications servicing strategy.

1.1 Macquarie University

The University is bound by Culloden Road to the west, Talavera Road to the north, Herring Road to the east and Epping Road to the south.

Mars Creek and University Creek run through the University in a north easterly direction. The location plan, aerial image, Master Plan and precinct plan are shown in Figures 1 to 4 respectively.

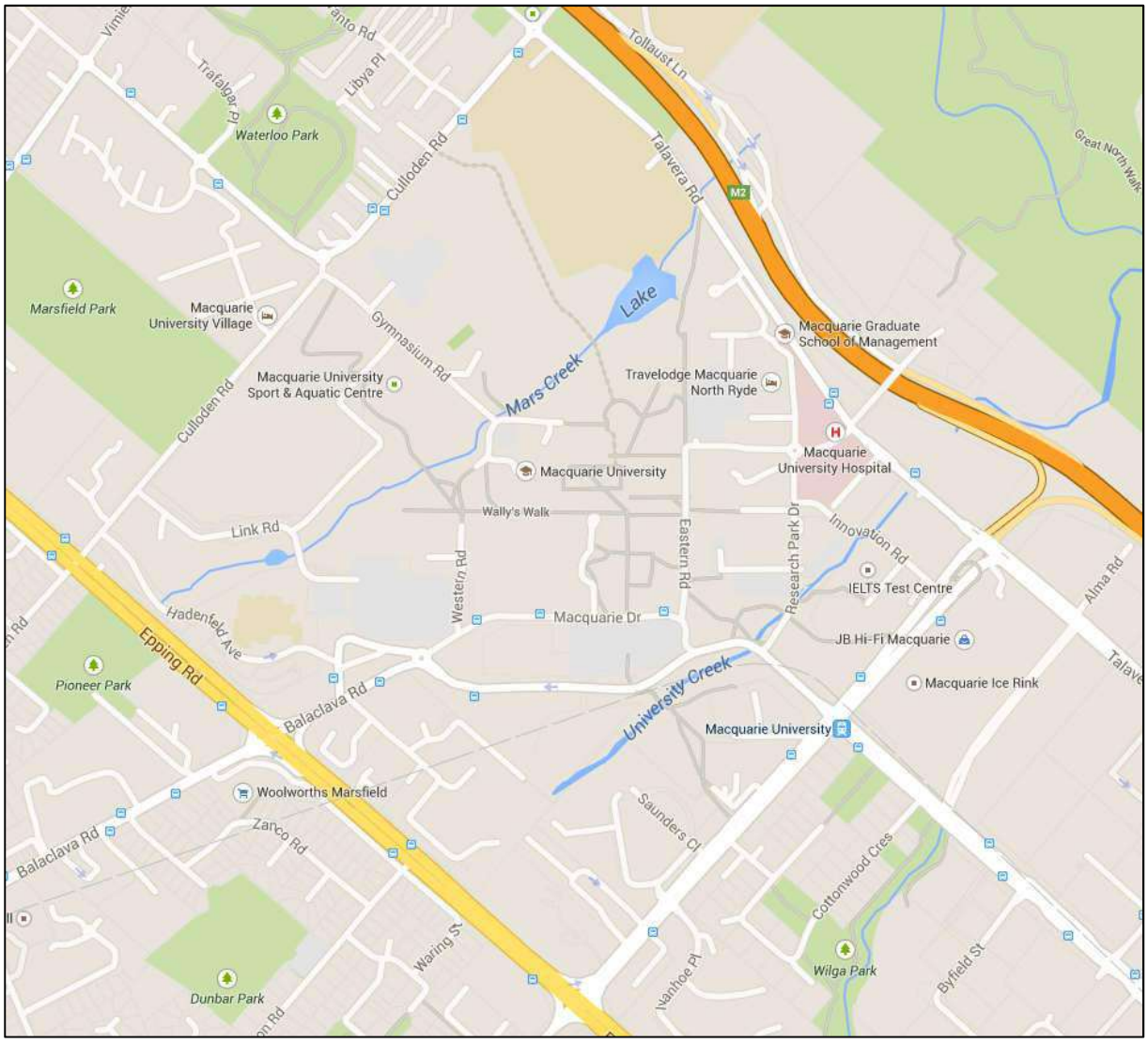


Figure 1 Locality Plan (source: Google)

© 2017 Taylor Thomson Whitting



Figure 2 Aerial Photo

© 2017 Taylor Thomson Whitting

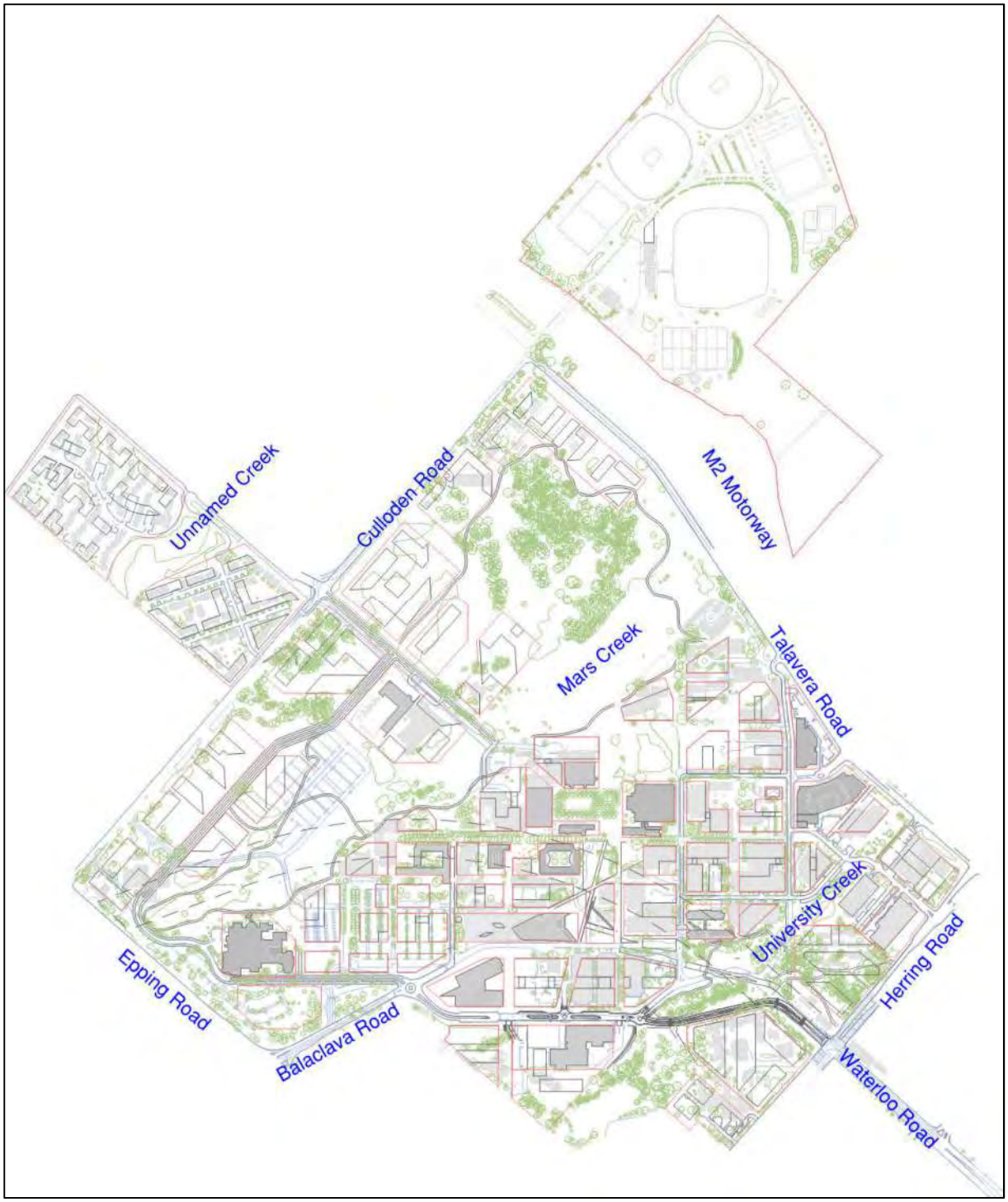


Figure 3 Macquarie University Master Plan

© 2017 Taylor Thomson Whitting

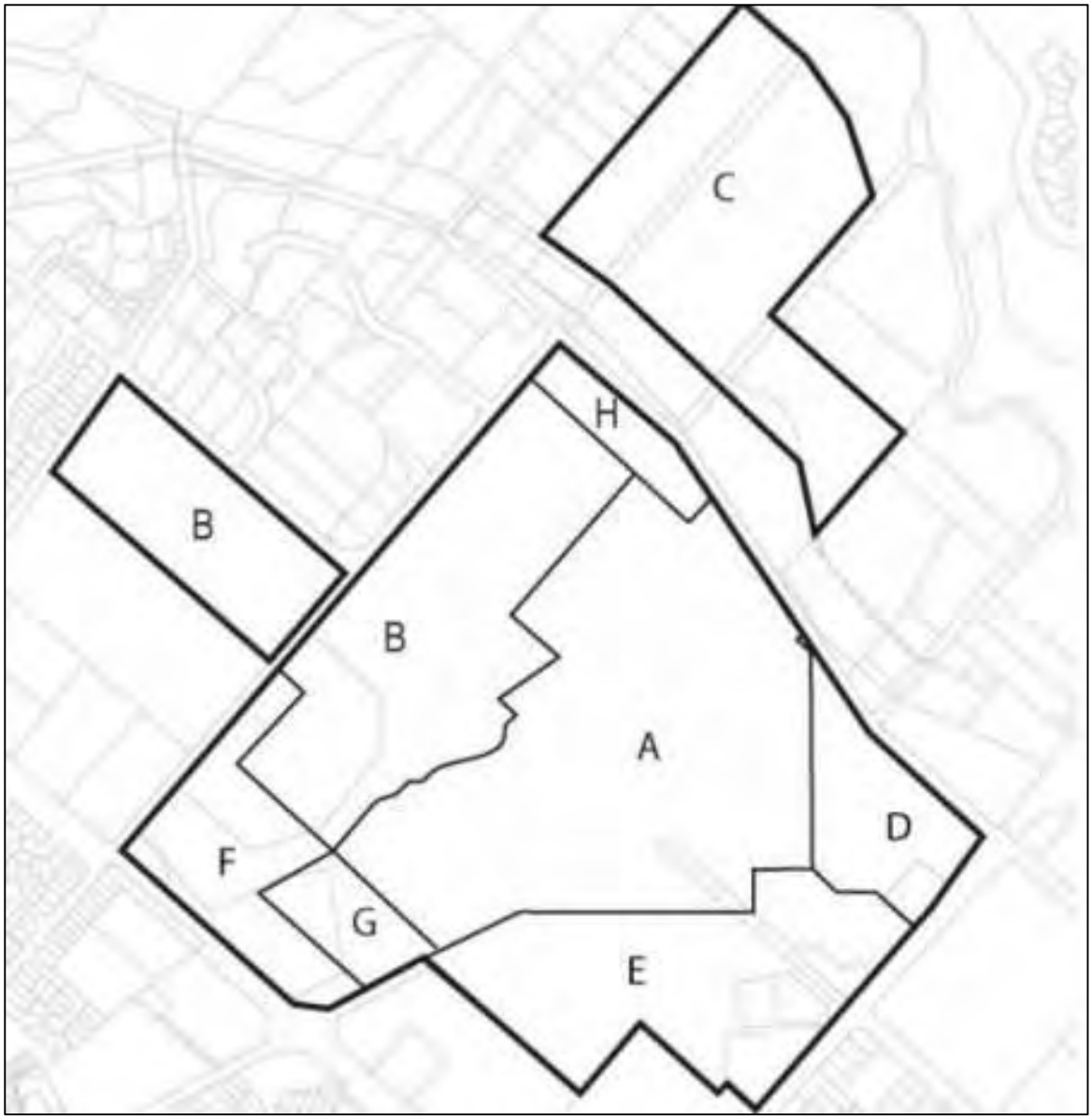


Figure 4 Precinct Layout (Source Cox Design Excellence Strategy and Urban Design Guidelines)

Table 1 University Precincts

Precinct A	Academic Core
Precinct B	University Housing
Precinct C	University Open Space and Playing Fields
Precinct D	Macquarie University Research Park (MURP) and Private Hospital
Precinct E	Station South
Precinct F	Epping Road West
Precinct G	Epping Road Precinct Expansion
Precinct H	Talavera Road North

© 2017 Taylor Thomson Whitting

Under the Concept Plan, the maximum additional GFA across the campus is limited by precinct as per Table 2. Under the master plan, this represents a vision for growth over the next 50 years.

Minor changes to the Concept Plan precinct boundaries are proposed due to the adjustments, upgrades and development under the Master Plan. Changes to these boundaries are shown in Figure 5.

Table 2 Maximum additional GFA

Precinct D	136,000 m^2
Precinct E (Station North)	90,000 m^2
Precinct E (Station South)	85,000 m^2
Precinct E (Triangle South of University Avenue)	155,000 m^2
Precinct F	70,000 m^2
Precinct A	61,200 m^2
Other	Not nominated

© 2017 Taylor Thomson Whitting

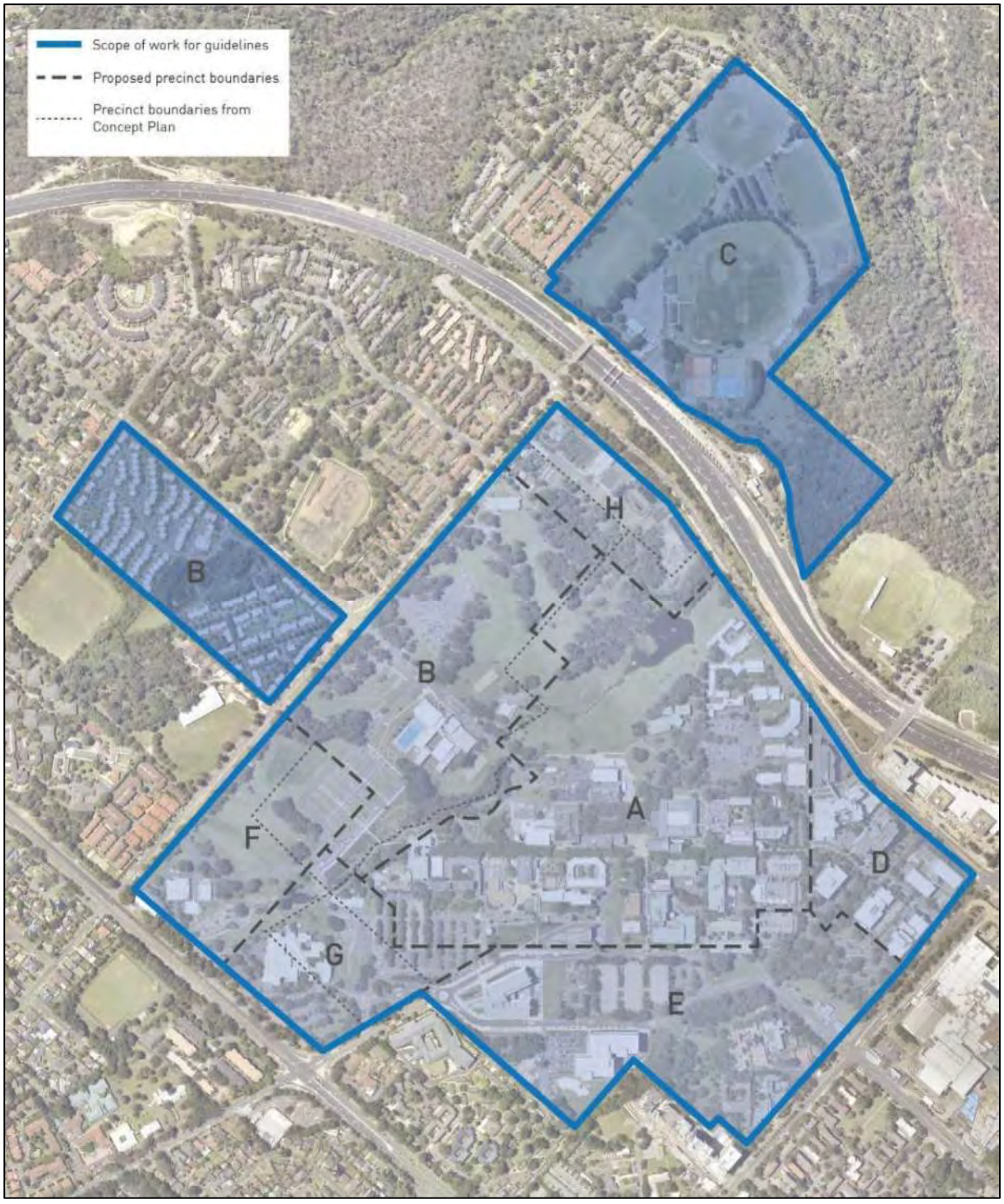


Figure 5 Proposed Precinct Boundaries (Source Cox Design Excellence Strategy)

© 2017 Taylor Thomson Whitting

1.2 Relevant Documents

The following documents have been reviewed in preparing this document:

- City of Ryde Development Control Plan 2014 (DCP)
- University Creek Stormwater Management Plan (TTW, December 2014)
- Macquarie Park Floodplain Risk Management Study & Plan (Bewsher, 2010)
- Mars Creek Catchment Environmental Plan (Storm Consulting)
- Civil Engineering plans prepared by TTW
- Architectural plans (Cox Richardson)
- Macquarie University Design Excellence Strategy and Urban Design Guidelines draft 6 (Cox Richardson)
- Macquarie University Infrastructure Plan

© 2017 Taylor Thomson Whitting

2.0 Riparian Zone, Flooding and Stormwater

C4 – Riparian Zone, Flooding and Stormwater	Preparation of a Stormwater Management Plan, incorporating a Vegetation and Threatened Species Plan (on a precinct basis as required via C3).	Landscape Rehabilitation Plan and Vegetation Management Plan Stormwater Management Plan Utilities Management Plan	Previous studies expanded to include the remainder of the main campus.

2.1 Stormwater Drainage

2.1.1 Design Criteria

Drainage designs for future works will follow the requirements set out in the DCP. Subsurface systems will be designed to capture and convey a 20-year storm event. Overland flow paths will be designed to convey flows from a 100-year storm event.

The IFD extracted from the Bureau of Meteorology's IFD tool and presented in Table 3 will be used for future design development.

Table 3 IFD data

	2-YEAR	**50-YEAR**
1 hour	36.27 mm/hr	70.83 mm/hr
12 hour	8.21 mm/hr	17.68 mm/hr
72 hour	2.61 mm/hr	5.89 mm/hr
Skew	0.00	
F2	4.3	
F50	15.85	

2.2 Water Sensitive Urban Design

The City of Ryde DCP 2014 Part 8.2 provides the following stormwater quality targets:

b. WSUD measures incorporated into the development must satisfy the following pollutant target controls;
   - 90% reduction in the post development mean annual load of total pollutant loads (greater than 5mm)
   - 85% reduction in the post development mean annual load of Total Suspended Solids (TSS)
   - 60% reduction in the post development mean annual load of Total Phosphorous (TP)
   - 45% reduction in the post development mean annual load of Total Nitrogen (TN)

It is recommended that the above removal rates are incorporated to future developments at the University.

2.2.1 Rainwater Reuse

With extensive landscaped areas, Macquarie University is well placed to capture roof water for irrigation use. It is recommended that roof water capture is considered for future developments at the University

© 2017 Taylor Thomson Whitting

2.3 Flooding

Flood studies have been undertaken for both University Creek and Mars Creek.

2.3.1 University Creek

TTW has undertaken flood modelling for University Creek. Refer to University Creek Stormwater Management Plan (TTW, December 2014) for details of the flood modelling. Results of the analysis are presented in **Figure 6** and **Figure 7**. A more detailed map of the proposed flood levels is contained in Appendix A.

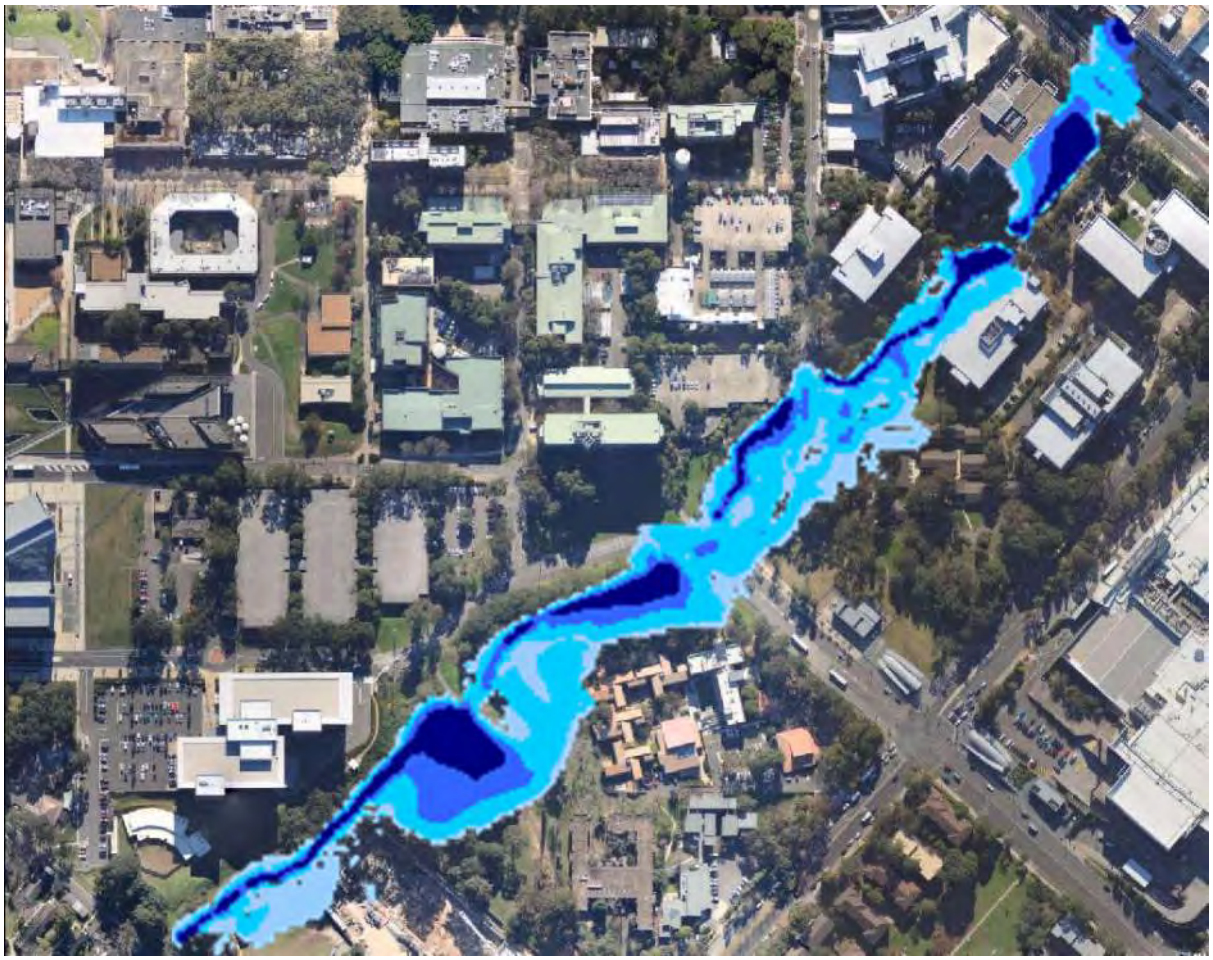


Figure 6 Pre-2013 100-year flood model results in University Creek

© 2017 Taylor Thomson Whitting

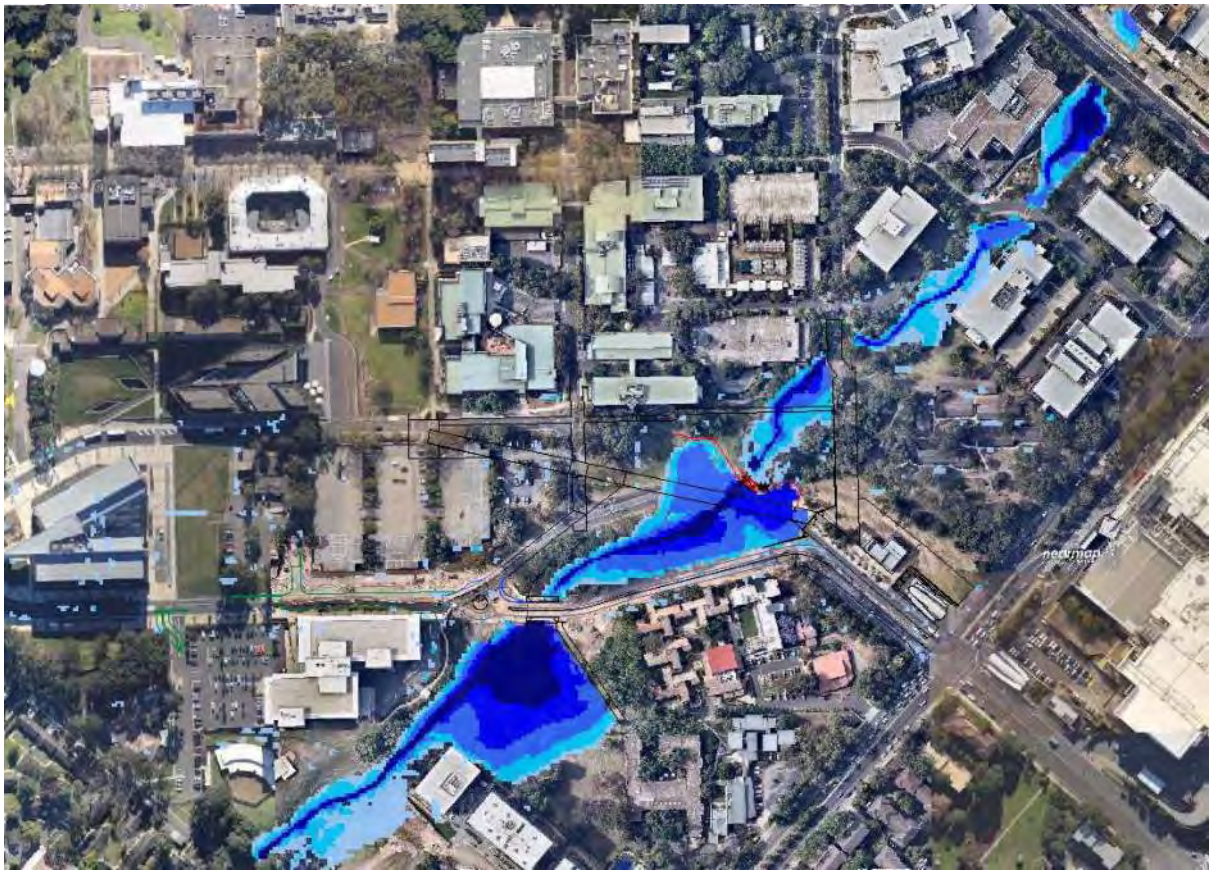


Figure 7 Proposed 100-year flood results in University Creek (Refer to Appendix A for detailed map)

© 2017 Taylor Thomson Whitting

2.3.2 Mars Creek

Bewsher prepared a flood study report covering Mars Creek in April 2010. The results from their 100-year flood modelling are presented in **Figure 8**.



Figure 8 Extract from Bewsher's report - 100 year flood modelling results in Mars Creek

Storm Consulting prepared a Catchment Environmental Plan for Mars Creek. The plan includes flood mapping and levels. Refer to Appendix A in this document for the full flood map with levels. Developments adjacent to the creek will consider flooding and riparian setbacks.



Figure 9 Extract from Storm Consulting's Mars Creek Catchment Environmental Plan

© 2017 Taylor Thomson Whitting

2.3.3 Flooding Controls

The Ryde Council DCP 2014 outlines the following controls for building adjacent to flood affected land:

- The level of habitable floor areas to be equal to or greater than the 100 year flood level plus freeboard of 500mm.
- Non-habitable floor levels to be equal to or greater than the 100 year flood level plus freeboard of 500mm where possible, or otherwise no lower than the 20 year flood level plus freeboard of 500mm unless justified by a site specific assessment.
- Habitable floor levels to be minimum 500mm above adjacent ground levels.
- Non-habitable floor levels to be minimum 300mm above adjacent ground levels.
- Garages capable of accommodating more than 3 motor vehicles on land zoned for urban purposes, or enclosed car parking, must be protected from inundation by floods equal to or greater than the 100 year flood.

The DCP 2014 (chapter 8.2, section 4.4.2) includes the requirement that the entrance to basement car parks is above the Probable Maximum Flood (PMF). Correspondence with Council has confirmed this requirement due to the risk of basement car park flooding.

- Basement parking or parking at levels below the adjacent flood levels, a bunded crest at the estimated PMF (probable maximum flood) level prior to descent into the parking area, must be provided such that inundation of the area is prevented.

Modelling of the PMF flood event will need to be undertaken for both Mars Creek and University Creek to inform constraints on future development.

2.4 Construction Phase Stormwater Management

During the construction, erosion and sediment control plans shall be implemented to prevent sediment laden stormwater from entering the council drainage network and the local watercourses. Stormwater controls on site will be detailed in an erosion and sediment control plan, generally in accordance with the “Blue Book” - Managing Urban Stormwater: Soils and Construction (Landcom NSW). The plan will vary based on construction staging and methodology, but will typically include:

- upstream clean water diversion;
- silt fences;
- sedimentation basin;
- dust control; and
- vehicle wash down.

The erosion and sediment control plan includes an inspection and maintenance schedule. The erosion and sediment control plan mitigates against sediment laden stormwater entering the council drainage system and the downstream environment.

© 2017 Taylor Thomson Whitting

3.0 Roadworks

The proposed road layout requires realignment and widening to accommodate the Concept Plan site layout required and the recently constructed Eastern Entry and Precinct E works. New roads are proposed in precincts B, F and G.

4.0 Utilities

C14 – Utilities	Preparation of: – A detailed water supply infrastructure analysis – Services masterplan – Water supply needs analysis. Prior to the submission of the first application for building works.	Utilities Management Plan	Previous study expanded to include the remainder of the main campus.

Macquarie University has developed a campus wide Infrastructure Plan. This plan will be updated to incorporate future infrastructure changes due to the Masterplan development. Any proposed works must refer to the latest version of the Infrastructure Plan.

5.0 Hydraulic Services

David Buckle and Associates has prepared services plans for hydraulic servicing for the masterplan. Notes and overview plans have been included in Appendix B of this document.

The existing Macquarie University site has no stand-alone hydraulic services and relies entirely upon external authority infrastructure as its source of basic services. The authorities responsible for delivering these services have over the past several years been apprised of Macquarie University's expansion plans going forward and have augmented and or planned to augment their infrastructure to cater for the anticipated demands. Feasibility studies have been carried out to validate the assumptions made in projected loads.

5.1 Existing Potable Water and Fire Hydrant Services

Water supply is provided to the site by water mains surrounding the site which are controlled by Sydney Water. Previous studies have indicated that these mains are capable of supporting the proposed developments with some off site augmentation being required by Sydney Water to meet demand. This augmentation requirement is particularly relevant to the North Western segment of the core campus where this off site augmentation will need to have been completed prior to development.

The existing core campus site at Macquarie University has two connections to this Sydney Water infrastructure located within Balaclava Road (Figure 10) and Culloden Roads (Figure 11). These two points feed the privately owned internal water services infrastructure / ring mains that serve the internal development zones within the site. The layout of the existing Macquarie University potable water network is detailed in campus zone plans developed by David Buckle & Associates (NSW) P/L:

© 2017 Taylor Thomson Whitting



Figure 10 Balaclava Rd Main Meter



Figure 11 Culloden Road Main Meter

5.1.1 Masterplanning Potable Water and Fire Hydrant Services

Current masterplanning provides for all developments on the perimeter of the site to be supported by Sydney Water external infrastructure including the future residential expansion of residential (3,500 beds) on the western side of main campus. The masterplanning zones are shown on the accompanying drawing titled H01 Hydraulic Services Concept Plan Services Zoning (refer Appendix B).

All internal development sites will be supported by the Macquarie University internal water mains infrastructure. The internal water mains infrastructure which is monitored on behalf of the University by David Buckle & Associates (NSW) Pty. Ltd. has been interrogated by applying additional loads and has shown that the planned developments can be supported by installing the mains extensions shown on the accompanying drawing titled H02 Hydraulic Services Concept Plan Potable Water & Fire Hydrants (refer Appendix A).

This process of determining water demand analysis for each proposal and incorporating projected peak loads into the hydraulic model of the network is to be carried out for each development proposal prior to commencement to ensure that the existing campus local infrastructure is capable of supporting the projected load.

There is a potential requirement for fire water storage on site to cope with water demand in the case of a fire on site during the domestic demand peak period

5.2 Existing Sewer

The main Campus is serviced by two sewer carriers known as the Mars Creek Carrier and the Balaclava Road Carrier, both of which are Sydney Water assets. Apart from the Sydney Water sewers, the Campus is serviced by a network of sewerage reticulation lines owned and maintained by the University.

5.3 Masterplanning Sewer

Future works will require extensions of the existing sewer network.

Discussion in 2008 with Sydney Water indicated future work planned for 2017 to 2067 would require amplification of the Balaclava Road Carrier beneath the M2 Motorway. Further studies will be required to determine the extent and staging of the augmentation.

5.4 Existing Natural Gas Services

© 2017 Taylor Thomson Whitting

Gas infrastructure to Macquarie University is provided by Jemena. This external infrastructure has recently been upgraded and is capable of supporting current projected loads with the possible exception of any large form of alternative energy scheme such as co–generation and or fuel cell technology adoption.

The Macquarie University campus is provided currently with three independent gas services feeding the internal gas networks. These networks consist of 1 x 100kPa service and 2 x 210kPa services. The layout of the existing Macquarie University natural gas network is detailed in campus zone plans developed by David Buckle & Associates (NSW) P/L:

5.5 Masterplanning Natural Gas Services

The 2 x 210kPa services have adequate capacity to serve projected loads as indicated by the Macquarie University Masterplan by installing the natural gas extensions shown on the accompanying drawing titled H03 Hydraulic Services Concept Plan Natural Gas (refer Appendix B).

The 100kPa service is currently stressed and requires monitoring of future load capacity. The system is capable of being augmented by increasing pressure through the network or be distressed by load shedding proposals.

As with the water services any proposed development fronting public roads on the perimeter of the site will be served with natural gas direct from the authority mains located within the street.

Any proposed development on the site will require the preparation of a gas load analysis for inclusion in the authority and or internal mains capacity models to ensure that the existing infrastructure is capable of supporting he proposed load.

© 2017 Taylor Thomson Whitting

6.0 ELECTRICAL SERVICES

JDG Consulting has prepared electrical and telecommunication servicing plans for the masterplan. Notes and overview plans have been included in Appendix C of this document

6.1 Existing Electrical Services

Ausgrid currently provide electricity supply to the Macquarie University site with High Voltage feeders from both Epping Zone Substation which is located to the West of the site and Macquarie Zone Substation to the East.

Ausgrid currently service the Precinct E Station South site via the Epping Zone Substation to the north-west of the University Campus.

New high voltage conduits run underground from the Macquarie Park Zone Substation along Waterloo Road have been installed to accommodate additional proposed HV augmentation cabling to service the proposed new developments. Internal to the University Campus new conduits run in easement allocations to Ausgrid requirements.

High voltage (HV) (Voltage 11kV) distribution cables run underground in conduit along Epping Road from the north-west to Herring Road then run on the north-west side of Herring Road to the north-east past Waterloo Road.

HV distribution cables also run underground in conduit along Balaclava Road from the north-west to University Ave then run both to the north along Western Road to the north of the Campus and on the south-east side of University Ave to the centre of the Campus.

Residential Colleges facing Herring Road are supplied via the existing HV distribution cables and kiosk substations that will eventually be decommissioned and removed from site.

6.2 Masterplanning Electrical Services

Development for the Macquarie University site within the long term will require augmentation of the current Ausgrid network.

All existing and new services will be run underground. Augmentation of the electricity supply inside the University is required to serve the demands anticipated in Precinct E.

It is proposed to secure an additional 2 off HV distribution feeders from Ausgrid by undertaking additional augmentation works with approval of Ausgrid.

As the masterplan development of the University progresses, the feasibility of establishing a new Ausgrid Zone Substation and the options available to the University in regard to electricity supply to meet all foreseeable future demands will need to be assessed.

In the longer term, utilisation of HV distribution from Ausgrid either from a new Campus Zone Substation or otherwise from an existing upgraded Zone Substation via augmentation works will be based on the options available at the time of construction.

6.3 Existing Telecommunications

Telstra Corporation currently serves the site via the local Telstra telephone exchange to the north-west of the University Campus. Residential Colleges are supplied via the existing telecommunication services running along Herring Road.

6.4 Masterplanning Telecommunications

It is important to note that at this stage no copper or fibre services have been set aside to accommodate the new developments.

© 2017 Taylor Thomson Whitting

New underground telecommunication conduits running from the Herring Road / Waterloo Road intersection will be installed to accommodate additional proposed telecommunication requirements of proposed new developments.

New Telecommunications conduits and pits will be required to be installed within the footpath of all new road infrastructure to provide the capacity for new development to connect copper and fibre services.

Prepared by
TAYLOR THOMSON WHITTING (NSW) PTY LTD



EIRIAN CRABBE
SENIOR ENGINEER

Authorised By
TAYLOR THOMSON WHITTING (NSW) PTY LTD



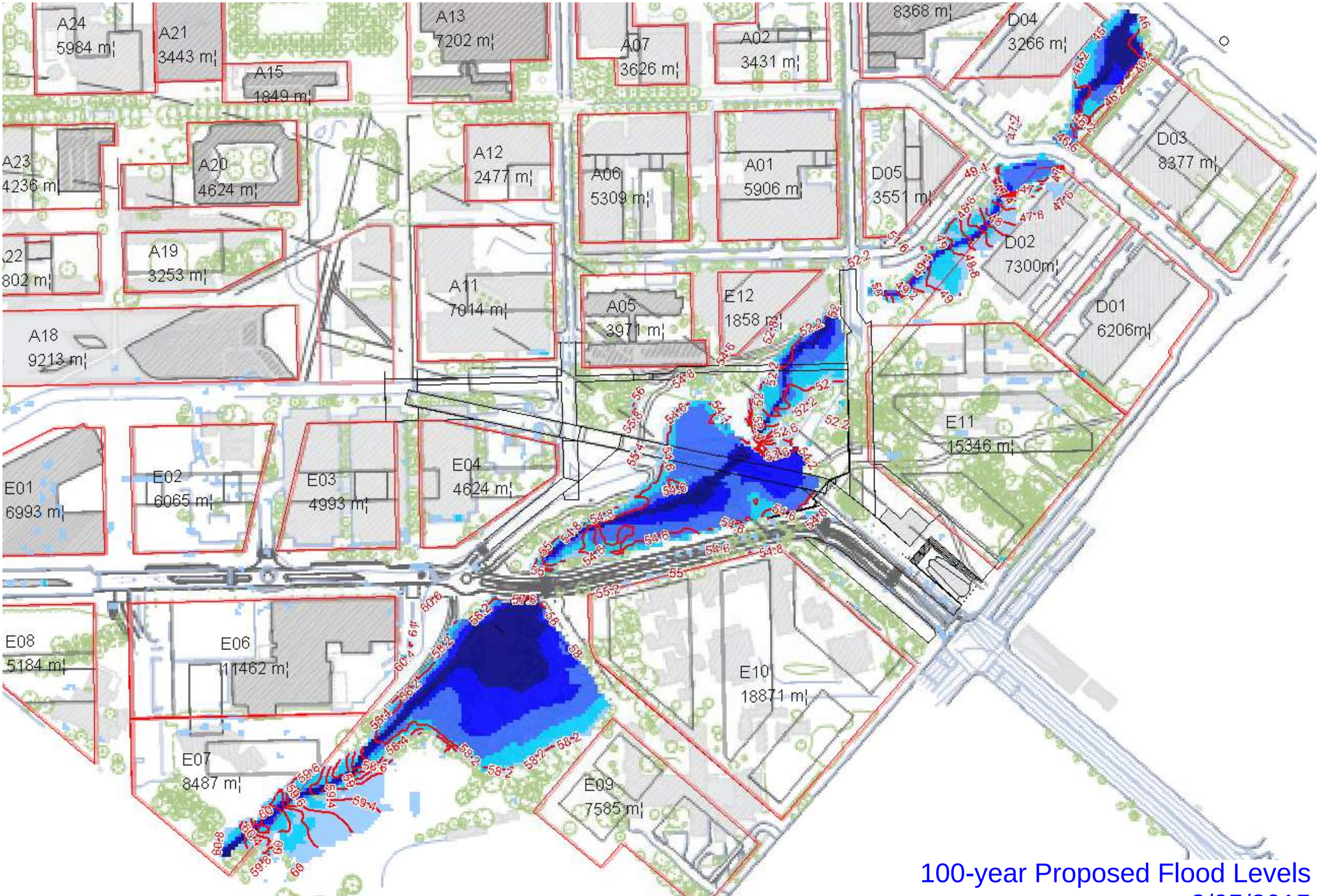
STEPHEN BRAIN
TECHNICAL DIRECTOR

\\ttw\dfs\Jobfiles\2013\1314\131406\Reports\TTW\170616 Stormwater and Utilities Managment Plan Rev. 1.docx

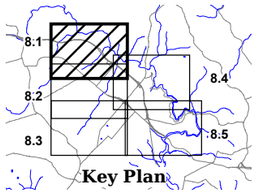
© 2017 Taylor Thomson Whitting

Appendix A – Flood Maps

© 2017 Taylor Thomson Whitting



100-year Proposed Flood Levels
8/05/2015



Mapping Limit

NORTH

LEGEND
Water Depth (m)

- 0.1 to 0.2
- 0.2 to 0.4
- 0.4 to 0.6
- 0.6 to 0.8
- 0.8 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- > 2.0
- Flood Contour (m)

0 200 400
metres

Culloden Road
Mars Creek
Mars Creek
M2 Motorway
Talavera Road
University Creek
Herring Road
Waterloo Road
Epping Road
Balaclava Road
MIERA ROAD
M2 MOTORWAY

Bewsher

Job No: J1609
File: Fig8.1_MP_Exg100y_02
Date: 4 May 10

City of Ryde - Macquarie Park Floodplain Risk Management Study and Plan

Figure 8.1
Simulation of 100 Year ARI Flood
(Sheet 1 of 5)

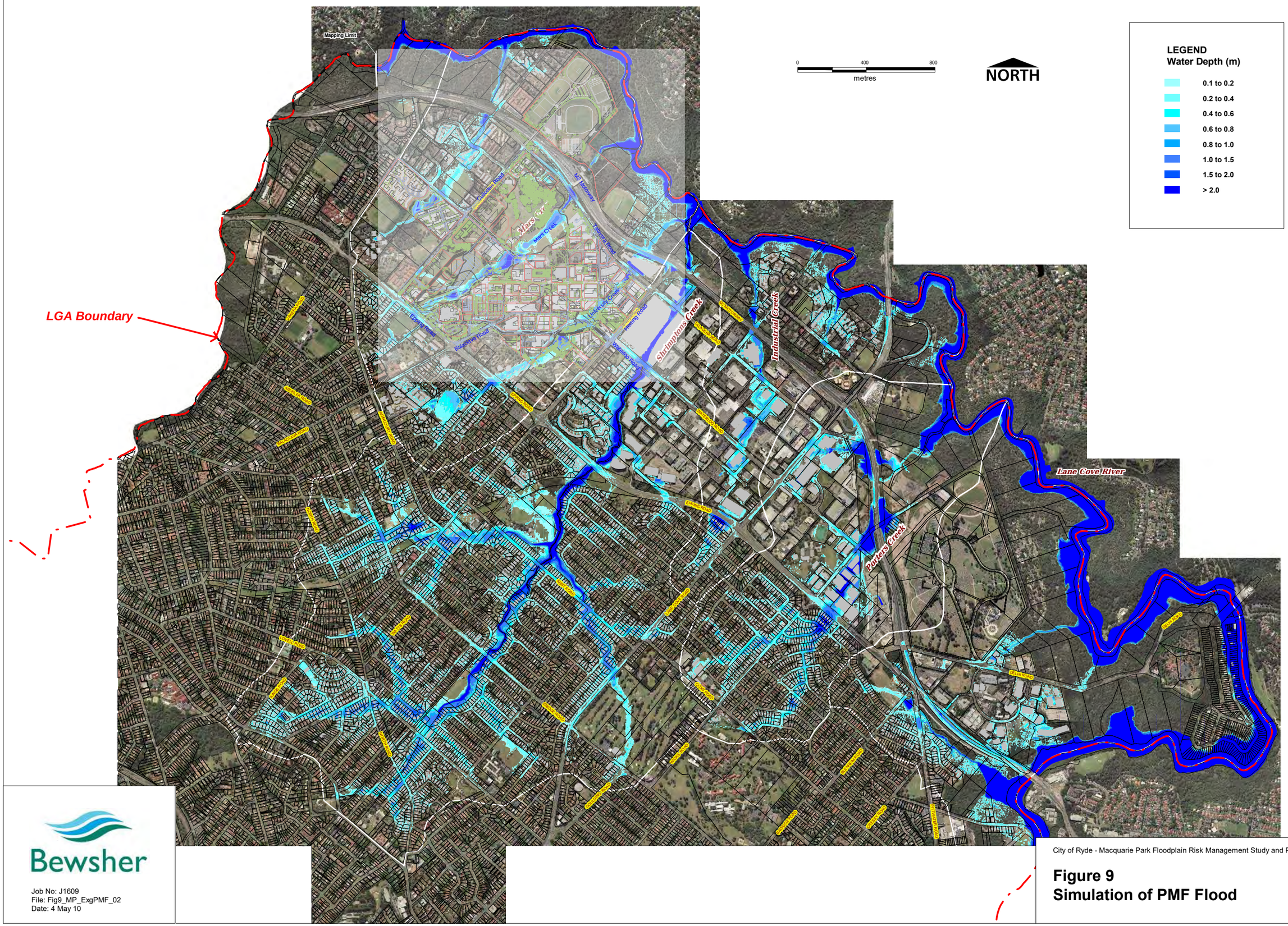

Mapping Limit
LGA Boundary
0
400
800
metres
NORTH
LEGEND
Water Depth (m)
0.1 to 0.2
0.2 to 0.4
0.4 to 0.6
0.6 to 0.8
0.8 to 1.0
1.0 to 1.5
1.5 to 2.0
> 2.0
Mars Creek
Shrimptons Creek
Industrial Creek
Porters Creek
Lane Cove River
M2 Motorway
Epping Road
Waterloo Road
Herring Road
Culloden Road
Talavera Road
Balaclava Road
Delhi Road
Khartoum Road
Ryedale Road
Bellevue Road
Wicks Road
Pittwater Road
Victoria Road
Coxs Road
Quarry Road
Kellett Road
Shaftsbury Road
Ashley Crescent
Bridge Road
Wattle Grove
Wattle Road
Wilga Street
Kalang Road
Kirkpatrick Street
Kent Road
Ormonde Road
Ormonde Parade
Ormonde Drive
Ormonde Avenue
Ormonde Crescent
Ormonde Close
Ormonde Lane
Ormonde Place
Ormonde Court
Ormonde Terrace
Ormonde Mews
Ormonde Walk
Ormonde Gardens
Ormonde Grove
Ormonde Rise
Ormonde Boulevard
Ormonde Circuit
Ormonde Esplanade
Ormonde Promenade
Ormonde Square
Ormonde Quadrant
Ormonde Arcade
Ormonde Passage
Ormonde Alley
Ormonde Lane
Ormonde Way
Ormonde Street
Ormonde Road
Ormonde Avenue
Ormonde Drive



Figure 49 100 Year ARI Design Flood Event, Existing Catchment Peak Flood Extent

Culvert ID	Top Water Level - Culverts (mAHD)							
	Existing				Post Development			
	No blockage			50% blockage	No blockage			50% blockage
	1 yr ARI	5 yr ARI	100 yr ARI	100 yr ARI	1 yr ARI	5 yr ARI	100 yr ARI	100 yr ARI
C1	69.56	69.99	70.94	64.47	69.33	69.54	69.72	70.77
C2	63.10	63.48	64.07	61.56	63.025	63.42	63.95	64.32
C3	58.52	58.98	60.15	60.06	58.44	58.89	60.09	59.98
C4	55.66	56.08	56.64	57.44	55.58	56.02	56.56	57.26
C5	53.62	53.82	54.02	54.47	53.58	53.80	54.00	54.47
C6	40.61	40.88	41.32	45.59	40.46	40.84	41.13	45.84

Table G: Top Water Levels in 30 minute storm events

Appendix B – Hydraulic Services

© 2017 Taylor Thomson Whitting

DBA Hydraulics
Building Environmental Services
ABN: 103 106 282 875

David Buckle & Associates (NSW) Pty Ltd
Suite 8, 38 Rowe St, Eastwood NSW 2122
02 9804 8086 david@davidbuckle.com.au
http://www.davidbuckle.com.au

Utilities Report

Company	**:**	**Taylor Thompson Whitting (NSW) Pty. Ltd.**	**Date**	**:**	**17 July 2015**
Attention	**:**	**Stephen Brain**	**From**	**:**	**Len Hutton**
Project	**:**	**Macquarie University Masterplanning to 2065**	**Sent**	**:**	**By email**
Subject	**:**	**Utilities Report for Hydraulic Services**	**File**	**:**	**3020**

Introduction

This report has been prepared to satisfy Condition 4 of the Macquarie University Concept Plan which requires a Utilities Management Plan to be put in place as contained in this document.

The existing Macquarie University site has no stand alone hydraulic services and relies entirely upon external authority infrastructure as its source of basic services. The authorities responsible for delivering these services have over the past several years been apprized of Macquarie University's expansion plans going forward and have augmented and or planned to augment their infrastructure to cater for the anticipated demands. Feasibility studies have been carried out to validate the assumptions made in projected loads.

The services covered by this study are potable water and natural gas supplies. Each of these services is described as follows.

Potable Water & Fire Hydrant Services

Existing Services

Water supply is provided to the site by water mains surrounding the site which are controlled by Sydney Water. Previous studies have indicated that these mains are capable of supporting the proposed developments with some off site augmentation being required by Sydney Water to meet demand. This augmentation requirement is particularly relevant to the North Western segment of the core campus where this off site augmentation will need to have been completed prior to development.

The existing core campus site at Macquarie University has two connections to this Sydney Water infrastructure located within Balaclava Road (Figure 1) and Culloden Roads (Figure 2). These two points feed the privately owned internal water services infrastructure / ring mains that serve the internal development zones within the site. The layout of the existing Macquarie University potable water network is detailed in campus zone plans developed by David Buckle & Associates (NSW) P/L:

- 2976 MU Potable Cold Water & Fire Hydrants H-000 to H-020

The cover page of the Potable Cold Water & Fire Hydrants document set is displayed as Figure 3.

David Buckle & Associates (NSW) Pty Ltd
Suite 8, 38 Rowe St, Eastwood NSW 2122
02 9804 8086 david@davidbuckle.com.au
http://www.davidbuckle.com.au

Utilities Report



Figure 1. Balaclava Rd Main Meter



Figure 2. Culloden Road Main Meter

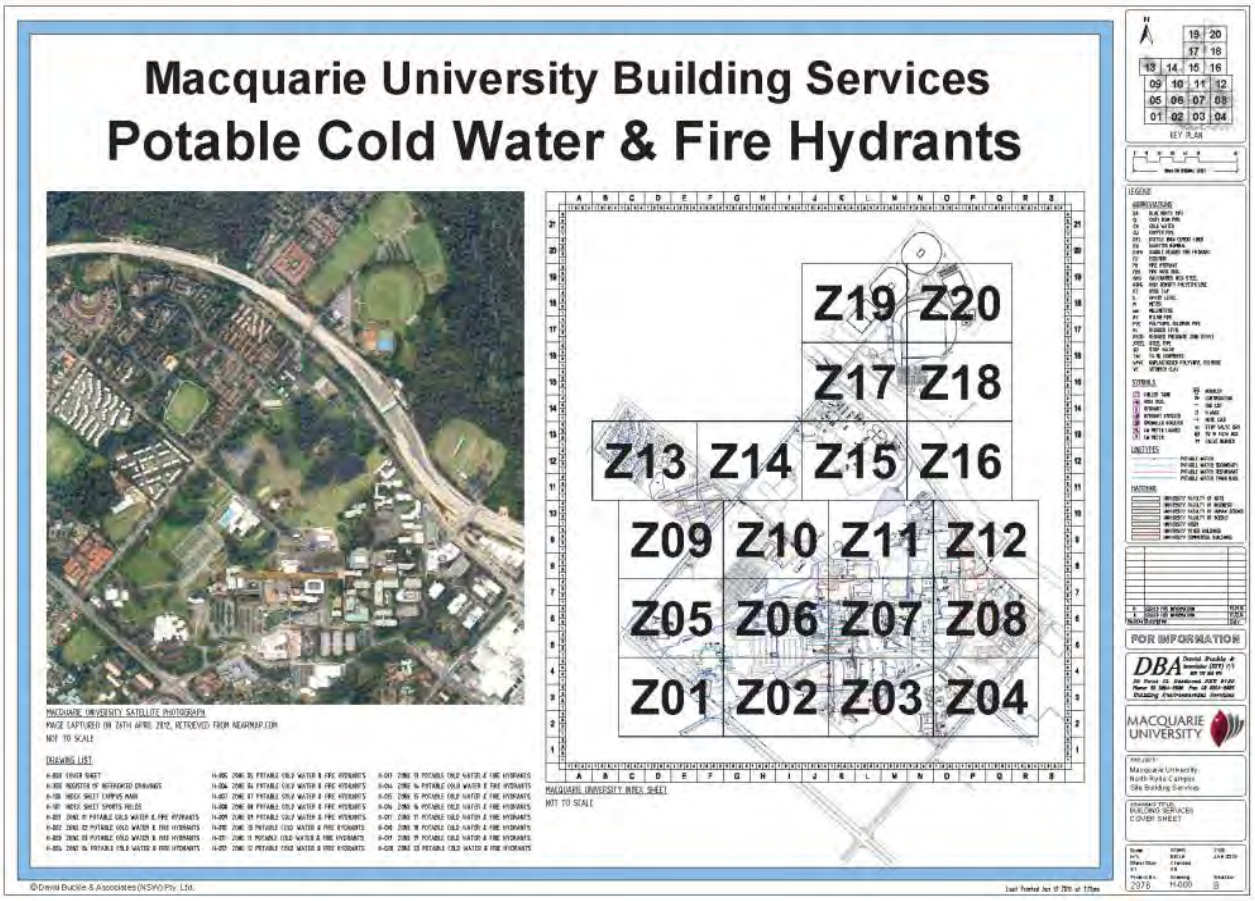


Figure 3. Macquarie University Potable Cold Water & Fire Hydrants zone plans index page.

David Buckle & Associates (NSW) Pty Ltd
Suite 8, 38 Rowe St, Eastwood NSW 2122
02 9804 8086 david@davidbuckle.com.au
http://www.davidbuckle.com.au

Masterplanning

Current masterplanning provides for all developments on the perimeter of the site to be supported by Sydney Water external infrastructure including the future residential expansion of residential (3,500 beds) on the western side of main campus. The masterplanning zones are shown on the accompanying drawing titled H01 Hydraulic Services Concept Plan Services Zoning (refer Appendix A).

All internal development sites will be supported by the Macquarie University internal water mains infrastructure. The internal water mains infrastructure which is monitored on behalf of the University by David Buckle & Associates (NSW) Pty. Ltd. has been interrogated by applying additional loads and has shown that the planned developments can be supported by installing the mains extensions shown on the accompanying drawing titled H02 Hydraulic Services Concept Plan Potable Water & Fire Hydrants (refer Appendix A).

This process of determining water demand analysis for each proposal and incorporating projected peak loads into the hydraulic model of the network is to be carried out for each development proposal prior to commencement to ensure that the existing campus local infrastructure is capable of supporting the projected load.

Supply Design Principals

The design principals to be adopted for Macquarie University water infrastructure are aimed at providing a robust network with a degree of redundancy built in by the inclusion of multiple connections to Sydney Water mains and the adoption of ring mains and sub ring main loops ensuring that each significant asset is fed from a network without a single point failure. This level of redundancy will require the planned extension of Sydney Water mains in Talavera Road to avoid single point weakness. This degree of protection is provided in two levels of security. The primary level of security being provided to those services reticulated within the primary services tunnel feeding the core academic buildings where this level of security of supply already exists. The non core academic buildings are currently served from direct buried street services which currently are not provided with this level of redundancy and need extensions to perimeter mains or completion of sub loops to shore up mains stability.

The exception to this general principal is the sports field precinct which is isolated from the campus and the authority infrastructure by the M2 Motorway.

The sports field precinct varies from the main campus in that it is virtually on a peninsula and relies upon a single point of connection to Sydney Waters infrastructure via a meter and backflow prevention station located at Culloden Road Sports Precinct entrance (Figure 4).



Figure 4. Sports Fields Main Meter

David Buckle & Associates (NSW) Pty Ltd
Suite 8, 38 Rowe St, Eastwood NSW 2122
02 9804 8086 david@davidbuckle.com.au
http://www.davidbuckle.com.au

Potable water use in this precinct is limited various showers and sanitary facilities around the sports fields and greenkeepers sheds with no significant commercial usages. The Utilities Action Plan continues to adopt this level of land use as sports fields and open parkland. The anticipated peak water demands for potable use would never exceed the current peak simultaneous demands imposed by the irrigation system requirements.

We are currently unaware of any sub-metering or monitoring of functional usages in this precinct.

The primary water usage in the sports field precinct is top up water supply to the various irrigation systems employed around the precinct. Subject to prevailing climate and drought conditions this water supply to irrigation systems can be curtailed at any time given notice by Sydney Water.

An alternative water supply suitable for use as irrigation is being researched. The source of this supply is a sewer mining system adopting a natural biological filtration bed system which we understand is still undergoing final certification processes.

It should be noted that the current irrigation systems installed have been constructed in such a manner as to be able to adopt an alternative water supply without risking back flow contamination of the potable water supply usages.

Any change of use or alternative water supply proposals proposed for this precinct will require the preparation of a demand analysis to be incorporated into the overall hydraulic model to ensure that the current infrastructure is capable of supporting the proposal.

Natural Gas Services

Existing Services

Gas infrastructure to Macquarie University is provided by Jemena. This external infrastructure has recently been upgraded and is capable of supporting current projected loads with the possible exception of any large form of alternative energy scheme such as co–generation and or fuel cell technology adoption.

The Macquarie University campus is provided currently with three independent gas services feeding the internal gas networks. These networks consist of 1 x 100kPa service and 2 x 210kPa services. The layout of the existing Macquarie University natural gas network is detailed in campus zone plans developed by David Buckle & Associates (NSW) P/L:

- 2976 MU Natural Gas & High Voltage Electricity H-000 to H-020

The cover page of the Natural Gas & High Voltage Electricity document set is displayed as Figure 5.

David Buckle & Associates (NSW) Pty Ltd
Suite 8, 38 Rowe St, Eastwood NSW 2122
02 9804 8086 david@davidbuckle.com.au
http://www.davidbuckle.com.au

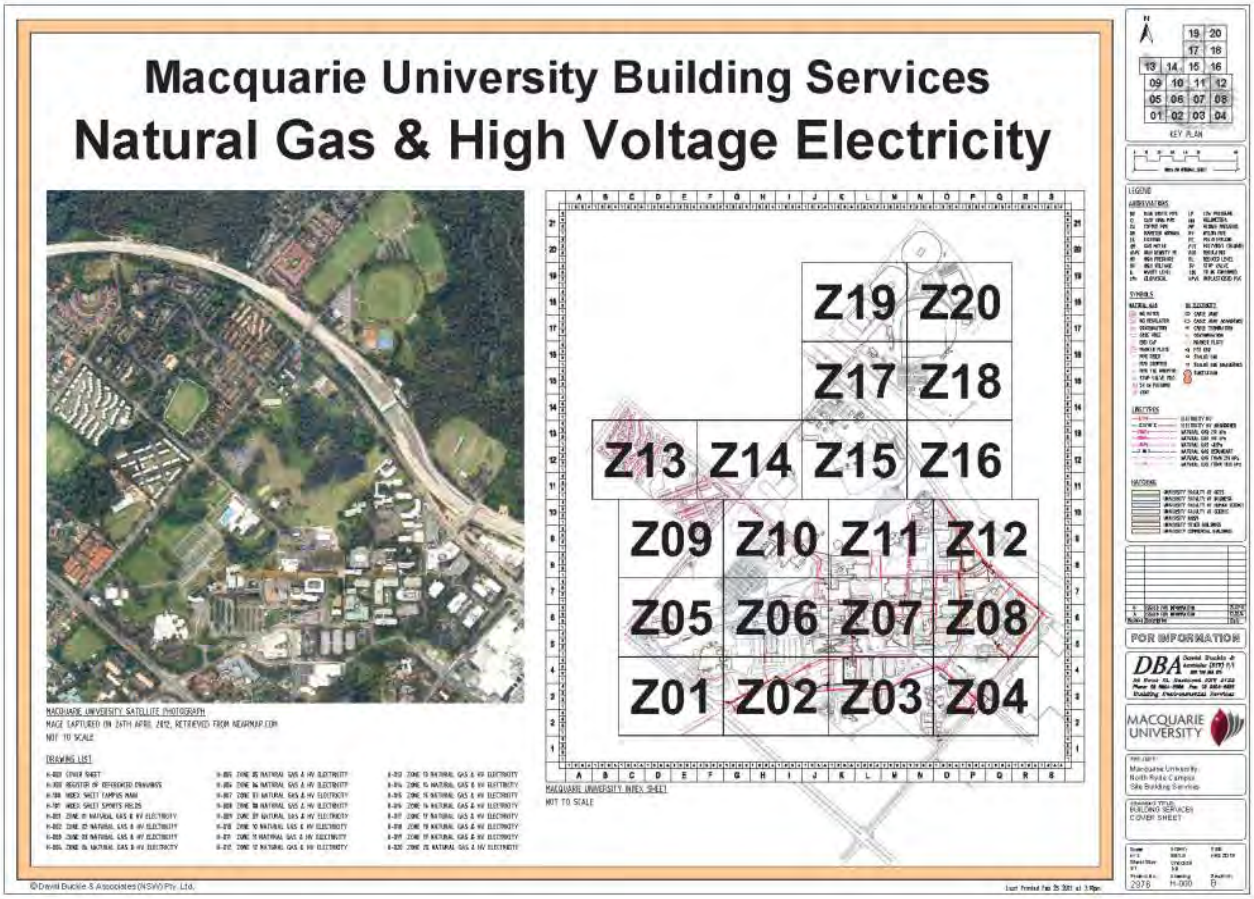


Figure 5. Macquarie University Natural Gas & High Voltage Electricity zone plans index page.

Masterplanning

The 2 x 210kPa services have adequate capacity to serve projected loads as indicated by the Macquarie University Masterplan by installing the natural gas extensions shown on the accompanying drawing titled H03 Hydraulic Services Concept Plan Natural Gas (refer Appendix A).

The 100kPa service is currently stressed and requires monitoring of future load capacity. The system is capable of being augmented by increasing pressure through the network or be distressed by load shedding proposals.

As with the water services any proposed development fronting public roads on the perimeter of the site will be served with natural gas direct from the authority mains located within the street.

Any proposed development on the site will require the preparation of a gas load analysis for inclusion in the authority and or internal mains capacity models to ensure that the existing infrastructure is capable of supporting he proposed load.

David Buckle & Associates (NSW) Pty Ltd
Suite 8, 38 Rowe St, Eastwood NSW 2122
02 9804 8086 david@davidbuckle.com.au
http://www.davidbuckle.com.au

Utilities Report

Services Tunnels

The original Macquarie University campus site was developed around a central plant concept with central services reticulated to points of use via a tunnel system which linked all key buildings. The advantage of the tunnel concept was that all services remained accessible for servicing or connection to and rendering upgrade works easy without the need for excavation or major interruption to services. In the ensuing years and following changes in social behaviour these tunnels have been adopted by security staff as a method of discrete movement around the site and for covert building entry.

Following the early construction of buildings on the site the tunnel system of servicing buildings from central plant has lost favour and the later buildings have adopted local packaged plant and not been connected to, or the tunnels extended to cover them. The current master plan concept is to re-embrace the tunnel concept and extend the current system of tunnels to cover the future core academic structures. This concept is illustrated in the accompanying drawings titled H02 Hydraulic Services Concept Plan Potable Water & Fire Hydrants and H03 Hydraulic Services Concept Plan Natural Gas (refer Appendix A).

The adoption of the tunnel concept will enable the reticulation of central energy waste heat and cooling from any central energy plant without interruption to faculty services and render such sustainable energy projects more viable. This tunnel system is restricted to the core academic campus precinct.

In cognisance of the security staff preference for use of the tunnel system as a concealed access way we propose a change of design parameter for the tunnel system by introducing a system of building connection point alcoves whereby all valves and connection points within the tunnels will be located in gated alcoves immediately outside the tunnels leaving the spine of the system free for access.

Should you require any further information please contact the undersigned.

Yours truly,
For David Buckle & Associates



Len Hutton

David Buckle & Associates (NSW) Pty Ltd
Suite 8, 38 Rowe St, Eastwood NSW 2122
02 9804 8086 david@davidbuckle.com.au
http://www.davidbuckle.com.au

Appendix A

The following documents are attached as Appendix A:

- H01 Hydraulic Services Concept Plan Services Zoning
- H02 Hydraulic Services Concept Plan Potable Water & Fire Hydrants
- H03 Hydraulic Services Concept Plan Natural Gas

ZONES

SPORTS FIELDS / OPEN SPACE ZONE SERVICED BY AUTHORITY STREET MAINS

PERIMETER ZONE SERVICED BY AUTHORITY STREET MAINS (TYP)

ACCOMMODATION PRECINCT INDEPENDENT OF CAMPUS INFRASTRUCTURE

CORE ACADEMIC ZONE SERVICED BY UNIVERSITY (TYP)

PERIMETER ZONE SERVICED BY AUTHORITY STREET MAINS (TYP)

PERIMETER ZONE SERVICED BY AUTHORITY STREET MAINS (TYP)

CORE ACADEMIC ZONE SERVICED BY UNIVERSITY (TYP)

EXISTING SERVICES TUNNEL (TYP)

COMMERCIAL ZONE SERVICED BY UNIVERSITY (TYP)

IMAGERY REFERENCE:
GOOGLE EARTH PRO V 7.1.2.2041. (JANUARY 1, 2014). MACQUARIE UNIVERSITY, NSW, AUSTRALIA. 33° 46 25.77"S, 151° 46' 45.54"W, EYE ALT 1 KM. AEROMETREX 2015. HTTP://WWW.EARTH.GOOGLE.COM [JULY 16, 2015].

LEGEND:

LINETYPES AND HATCHING:

- EXISTING SERVICES TUNNEL OUTLINE (TUNNEL OFFSET 4M FOR CLARITY)
- PERIMETER AUTHORITY MAIN SERVICED
- NON-ACADEMIC COMMERCIAL MU SERVICED
- CORE ACADEMIC MU SERVICED
- SPORTS FIELDS AUTHORITY MAIN SERVICED

ABBREVIATIONS:

CW	COLD WATER	kPa	KILOPASCAL
DN	DIAMETER NOMINAL	NG	NATURAL GAS
EX	EXISTING	TYP	TYPICAL

Revision	Description	Date
P3	PRELIMINARY ISSUE FOR INFORMATION	17.07.2015
P2	PRELIMINARY ISSUE FOR INFORMATION	29.05.2015
P1	PRELIMINARY ISSUE FOR COMMENT	07.05.2015

THIS DRAWING IS TO BE REPRODUCED IN COLOUR

0 10 20 30 40 50 60 70 80
80mm ON ORIGINAL SHEET

TTW TaylorThomsonWhitting
Consulting Engineers
48 Chandos Street, St Leonards NSW 2065
T: +61 2 9439 7288 F: +61 2 9439 3146 ttwsyd@ttw.com.au
Taylor Thomson Whitting (NSW) Pty Ltd A.C.N. 113 578 377

DBA Hydraulics
Building Environmental Services
Suite 8, 38 Rowe St. Eastwood NSW 2122
02 9804 8086 david@davidbuckle.com.au
http://www.davidbuckle.com.au
David Buckle & Associates (NSW) P/L ABN 33 106 282 875

CLIENT:
MACQUARIE UNIVERSITY
OFFICE OF MAJOR PROJECTS
SYDNEY NSW 2109
PH: (02) 9850 7111

PROJECT:
CAMPUS MASTER PLAN
HYDRAULIC SERVICES

DRAWING TITLE:
HYDRAULIC SERVICES
CONCEPT PLAN
SERVICES ZONING

PRELIMINARY

SCALE	DRAWN	DATE
1:250	EB/LH	JULY 15
SHEET	CHECKED	REVISION
B1	DB	P3
PROJECT NO.	DRAWING	NORTH
3020	H-01	

LAST PRINTED
July 17 2015 at 10:32am

POTABLE WATER AND FIRE HYDRANTS

EXISTING COLD WATER SERVICE (TYP)
EX CW DN100
DN150
EX CW DN300
EXISTING SYDNEY WATER MAIN (TYP)
EX CW DN250
EX CW DN150
CW DN150
PROPOSED COLD WATER SERVICE (TYP)
EX CW DN150
CW DN150
EX CW DN150
EXISTING SYDNEY WATER MAIN (TYP)
EX CW DN150
CW DN100
EXISTING COLD WATER SERVICE (TYP)
EX CW DN100
EX CW DN150
EX CW DN250
EX CW DN150
CW DN100
CW DN100
EX CW DN150
EXISTING SERVICES TUNNEL (TYP)
PROPOSED SERVICES TUNNEL EXTENSION (TYP)
EX CW DN150
EX CW DN250
PROPOSED COLD WATER SERVICE (TYP)
EX CW DN150
CW DN150
CW DN150
CW DN150
CW DN100
EX CW DN250
EXISTING SERVICES TUNNEL (TYP)
EX CW DN150
EX CW DN300
EX CW DN150
EX CW DN150
EXISTING COLD WATER SERVICE (TYP)
EX CW DN200
EXISTING SYDNEY WATER MAIN (TYP)
EX CW DN150
EX CW DN600
EX CW DN100
EX CW DN500

IMAGERY REFERENCE:
GOOGLE EARTH PRO V 7.1.2.2041. (JANUARY 1, 2014). MACQUARIE UNIVERSITY, NSW, AUSTRALIA. 33° 46 25.77"S, 151° 46' 45.54"W, EYE ALT 1 KM. AEROMETREX 2015. HTTP://WWW.EARTH.GOOGLE.COM [JULY 16, 2015].

LEGEND:

LINETYPES AND HATCHING:

- EXISTING SERVICES TUNNEL OUTLINE (TUNNEL OFFSET 4M FOR CLARITY)
- SERVICES TUNNEL EXTENSION PROPOSED
- EX WATER SERVICE
- PROPOSED WATER SERVICE
- SYDNEY WATER NETWORK

ABBREVIATIONS:

CW	COLD WATER	kPa	KILOPASCAL
DN	DIAMETER NOMINAL	NG	NATURAL GAS
EX	EXISTING	TYP	TYPICAL

SYMBOLS:

- END CAP
- SERVICE CONTINUATION

Revision	Description	Date
P3	PRELIMINARY ISSUE FOR INFORMATION	17.07.2015
P2	PRELIMINARY ISSUE FOR INFORMATION	29.05.2015
P1	PRELIMINARY ISSUE FOR COMMENT	07.05.2015

THIS DRAWING IS TO BE REPRODUCED IN COLOUR

0 10 20 30 40 50 60 70 80
80mm ON ORIGINAL SHEET

TaylorThomsonWhitting
Consulting Engineers
48 Chandos Street St.Leonards NSW 2065
T: +61 2 9439 7288 F: +61 2 9439 3146 ttwsyd@ttw.com.au
Taylor Thomson Whitting (NSW) Pty Ltd A.C.N. 113 578 377

DBA Hydraulics
Building Environmental Services
Suite 8, 38 Rowe St. Eastwood NSW 2122
02 9804 8086 david@davidbuckle.com.au
http://www.davidbuckle.com.au
David Buckle & Associates (NSW) P/L ABN 33 106 282 875

CLIENT:
MACQUARIE UNIVERSITY
OFFICE OF MAJOR PROJECTS
SYDNEY NSW 2109
PH: (02) 9850 7111

PROJECT:
CAMPUS MASTER PLAN
HYDRAULIC SERVICES

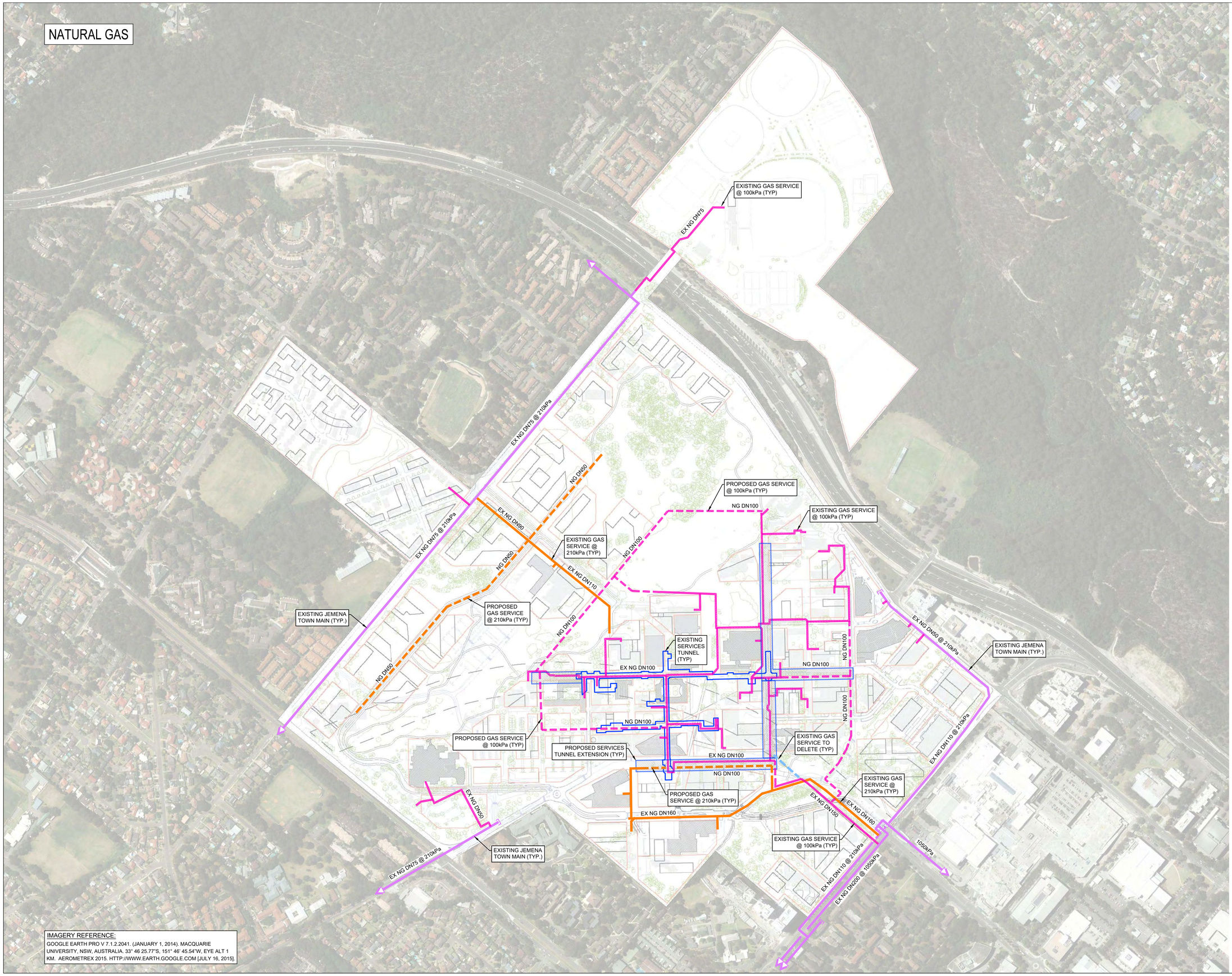
DRAWING TITLE:
HYDRAULIC SERVICES
CONCEPT PLAN
POTABLE WATER & FIRE HYDRANTS

PRELIMINARY

SCALE	DRAWN	DATE
1:3000	EB/LH	JULY 15
SHEET	CHECKED	REVISION
B1	DB	P3
PROJECT NO.	DRAWING	NORTH
3020	H-02	

LAST PRINTED
July 17 2015 at 10:36am

NATURAL GAS



IMAGERY REFERENCE:
GOOGLE EARTH PRO V 7.1.2.2041. (JANUARY 1, 2014). MACQUARIE UNIVERSITY, NSW, AUSTRALIA. 33° 46 25.77"S, 151° 46' 45.54"W, EYE ALT 1 KM. AEROMETREX 2015. HTTP://WWW.EARTH.GOOGLE.COM [JULY 16, 2015].

LEGEND:

LINETYPES AND HATCHING:

- EXISTING SERVICES TUNNEL OUTLINE (NOTE: TUNNEL OFFSET 4M FOR CLARITY)
- SERVICES TUNNEL PROPOSED
- EX GAS SERVICE @ 100kPa
- EX GAS SERVICE @ 210kPa
- EX GAS SERVICE TO DELETE
- PROPOSED GAS SERVICE @ 100kPa
- PROPOSED GAS SERVICE @ 210kPa
- JEMENA TOWN MAIN

ABBREVIATIONS:

CW	COLD WATER	kPa	KILOPASCAL
DN	DIAMETER NOMINAL	NG	NATURAL GAS
EX	EXISTING	TYP	TYPICAL

SYMBOLS:

- END CAP
- SERVICE CONTINUATION

Revision	Description	Date
P3	PRELIMINARY ISSUE FOR INFORMATION	17.07.2015
P2	PRELIMINARY ISSUE FOR INFORMATION	29.05.2015
P1	PRELIMINARY ISSUE FOR COMMENT	07.05.2015

THIS DRAWING IS TO BE REPRODUCED IN COLOUR

0 10 20 30 40 50 60 70 80
80mm ON ORIGINAL SHEET

TaylorThomsonWhitting
Consulting Engineers
48 Chandos Street St.Leonards NSW 2065
T: +61 2 9439 7288 F: +61 2 9439 3146 tlwsyd@ttw.com.au
Taylor Thomson Whitting (NSW) Pty Ltd A.C.N. 113 578 377

DBA Hydraulics
Building Environmental Services
Suite 8, 38 Rowe St. Eastwood NSW 2122
02 9804 8086 david@davidbuckle.com.au
http://www.davidbuckle.com.au
David Buckle & Associates (NSW) P/L ABN 33 106 282 875

CLIENT:
MACQUARIE UNIVERSITY
OFFICE OF MAJOR PROJECTS
SYDNEY NSW 2109
PH: (02) 9850 7111

PROJECT:
CAMPUS MASTER PLAN
HYDRAULIC SERVICES

DRAWING TITLE:
HYDRAULIC SERVICES
CONCEPT PLAN
NATURAL GAS

PRELIMINARY

SCALE	DRAWN	DATE
1:2000	EB/LH	JULY 15
SHEET	CHECKED	REVISION
B1	DB	P3
PROJECT NO.	DRAWING	NORTH
3020	H-03	

LAST PRINTED
July 17 2015 at 10:41am

Frawley Design Services Pty Ltd
ABN: 23 059 201 900
PO Box 519
Kensington NSW 1465
Phone: 02 9663 3004
Fax: 02 9313 8806
Email: info@frawleydesignservices.com.au
www.frawleydesignservices.com.au

MACQUARIE UNIVERSITY
RYDE CAMPUS MASTER PLAN
SEWERAGE RETICULATION

EXISTING SEWERAGE SYSTEM

The main Campus is serviced by two sewer carriers known as the Mars Creek Carrier and the Balaclava Road Carrier, both of which are Sydney Water assets. The accompanying plan shows the location of these sewers and their respective catchments.

In addition there is a Sydney Water sewerage system that services the University's housing villages on the north-western side of Culloden Road.

Apart from the Sydney Water sewers shown on the plan, the Campus is serviced by a network of sewerage reticulation lines owned and maintained by the University.

MASTER PLAN PROPOSALS

1. Commercial Development Sites

In accordance with Sydney Water's servicing policies, individual points of connection to a sewer main will be required for each leasehold parcel of land excised by subdivision. To comply with these policies, it will be necessary to extend Sydney Water's sewer system to provide a connection point within the boundaries of each parcel.

2. Impacts on Sydney Water's Infrastructure

a) In early 2008 discussions were held with Sydney Water regarding the proposed expansion of Gross Floor Areas (GFA) within precincts Station South and Epping Road West. At that time it was estimated that expansion would proceed in keeping with the following timeframes:

- 2007-2012: - 75,000m^2 GFA
- 2012-2017: - another 75,000m^2 GFA
- 2017-2031: - a further 200, 000m^2 GFA

In response, Sydney Water determined that the existing sewer system had sufficient capacity for the proposed developments of 2007-2012 and 2012-2017. However the development planned for 2017-2031 would require amplification of the Balaclava Road Carrier beneath the M2 Motorway.

b) The extent of mains augmentation based upon the current Master Plan cannot be determined accurately without further study. All the same, a preliminary examination clearly indicates that there will be no spare capacity in either sewer Carrier beyond 2017 and as a consequence, upsizing will be necessary.

Brian Frawley

Brian Frawley
MIS Aust

PLAN

ACCOMPANYING FRAWLEY DESIGN SERVICES' REPORT DATED 6.9.2012

SEWER

225 mm

CULLODEN RD

WATERLOO RD

TRAFALGAR PL

UBYA PL

TALAVERA RD

CARRIER

SEWER

CREEK

300 mm P.

MARS

MACQUARIE UNIVERSITY

APPROX EXTENT OF CATCHMENT

M2 MWY

CHRISTIE RD

CARRIER

375mm

MWY

EPPING RD

BALACLAVA RD

SEWER

300MM P.

ROAD

BALACLAVA

KARALEE ST

KARINGAL CT

LUNIKET ST

KOORONG

ZANICO

WARING

HERRING

WATERLOO CRES

ALMA

TALAVERA

VIMIERA

For WSC use only.
Not for distribution or sale.
Date of Production: 31/08/2012

Copyright Reserved Sydney Water 2012
No warranty is given that the information shown is complete or accurate.
SYDNEY WATER CORPORATION

Map:173 Grid:N16 Edition:Sydney UBD Edition 41

0m 40m 80m 120m 160m 200m

Scale 1:5000

Page

Appendix C – Electrical Services

© 2017 Taylor Thomson Whitting

JDG Consulting

Level 3 Accredited Service Provider
Green Futures Pty Ltd
A.C.N. 078 387 489
Suite 407 Atlas Norwest
2-8 Brookhollow Ave
Baulkham Hills NSW 2153
Ph: 02 8861 1888
Fax: 02 8861 1899
www.jdgconsulting.com.au
Email:jdg@jdgconsulting.com.au

28 May 2015

Mr Stephen Brain,
Taylor Thomson Whitting Pty Ltd
L3, 48 Chandos Street
St Leonards NSW 2065

Our ref: 15-2133

MACQUARIE UNIVERSITY
AUTHORITY ELECTRICAL AND TELECOMMUNICATIONS INFRASTRUCTURE

Electrical

Ausgrid currently provide electricity supply to the Macquarie University site with High Voltage feeders from both Epping Zone Substation which is located to the West of the site and Macquarie Zone Substation to the East.

Internal to the University campus, High Voltage conduits and cables reticulate within the footpaths. HV feeders from Epping Zone substation enter the site from Herring Road to the north, Balaclava Road to the South West and also Culloden Road to the North West. More recent connections from Macquarie Zone substation enter the site via Waterloo Road with the majority of the site electricity supply capacity available from Macquarie Zone Substation at the South Eastern end of the site.

The greater part of the proposed development within the Macquarie University is within the South East portion of the site adjacent the Waterloo Road entry. HV feeders run within Waterloo Road footpath from Macquarie Zone substation providing supply to existing private development along University Ave and Research Park Drive. Current Ausgrid works are providing additional feeder connections along Waterloo Road from the Macquarie Zone Substation into University Avenue that will provide supply for future development around the Macquarie Park station precinct and existing buildings will be replaced with new high rise mixed development north and south of the station precinct.

Further development within the Macquarie University is proposed in the short term including refurbishment of existing buildings and existing HV infrastructure is sufficient to provide supply to these developments.

Development for the Macquarie University site within the long term will require augmentation of the current Ausgrid network to enable connection of supply including new conduit and HV cabling within the footpaths of the future roads that will be constructed to strengthen the connection between Culloden Road, University Ave and Macquarie Drive. Limited capacity for connection of additional HV feeders from Epping Zone substation and Macquarie Zone Substation are available due to existing road infrastructure constraints and the reducing capacity of the electricity supply available from the existing Ausgrid network infrastructure due to the rapidly developing commercial district of Macquarie Park adjacent to Macquarie University. It is envisaged that a new Ausgrid Zone Substation will be required to be constructed at a location that allows for connection to the existing transmission cabling to support long term development within the Macquarie University site.

Telecommunications

Telstra Corporation currently serves the site via the local Telstra telephone exchange to the north-west of the University Campus. Residential Colleges are supplied via the existing telecommunication services running along Herring Road.

New underground telecommunication conduits and pits connect services running from the Herring and Waterloo Road intersection and can accommodate additional proposed telecommunication requirements of proposed new developments.

It is important to note that at this stage no copper or fibre services have been set aside to accommodate the new developments.

New Telecomminciations conduits and pits will be required to be installed within the footpath of all new road infrastructure to provide the capacity for new development to connect copper and fibre services.

Yours faithfully,

JDG Consulting



Cheralee Heynes

Director

Drawing No.:	Size:	Plot Date.:
1821-E01	A0	4.07.12

Date	No.	Description
4.07.12	A	MASTERPLAN ISSUE FOR INFORMATION

LEGEND

- S.35642 — SUBSTATION LOCATION & NUMBER
- HV DISTRIBUTION FROM EPPING ZONE SUBSTATION
- HV DISTRIBUTION FROM MACQUARIE PARK ZONE SUBSTATION

EXISTING FEEDERS FROM EPPING ZONE SUBSTATION

TO ENERGY AUSTRALIA'S EPPING ROAD MAJOR ZONE SUBSTATION

FROM EPPING ZONE SUBSTATION

FROM MACQUARIE PARK ZONE SUBSTATION

S.35789 — ASTRONOMY AND OBSERVATORIES

S.35642 — Capacity 1.0MVA

S.8731 — Capacity 1.0MVA

S.35642 — Capacity 1.8MVA

S.35643 — Capacity 1.8MVA

S.35844 — Current — Capacity 3.0MVA

S.7328 — Capacity 3.0MVA

S.8146 — Capacity 3.0MVA

S.8147 — Capacity 3.0MVA

S.8472 — Capacity 1.0MVA

S.35012 / S.35013 — Capacity 1.0MVA

S.3673 — Capacity 1.0MVA

S.47942

S.35014 — Capacity 4.5MVA

S.8729 — CoGen — Capacity 4.5MVA

S.1915 — Capacity 3.0MVA

S.5923 — AFTVS&R School

S.4564

S.2728

S.5328

S.4564

S.2044

S.3740

S.4514

S.5465

S.5448

S.6861

S.3515

S.3771

S.6154

S.6636

S.4873

S.7741

S.7740

S.6151

S.8697

S.8696

S.1796

S.7699

Panel 5

Epp Pa 14

Epp Pa 2

Epp Pa 19

MQ Pa 17

MQ Pa 10

Sports Centre

Library

Tunnel

Current

Future

6.500A Station Precinct North

AHH

Cochlear

CoGen

Capacity 4.5MVA

Capacity 1.0MVA

Capacity 800kVA

Capacity 600kVA

Capacity 1.8MVA

Capacity 3.0MVA

Capacity 1.0MVA

Capacity 4.5MVA

Capacity 3.0MVA

Capacity 3.0MVA

Capacity 3.0MVA

Capacity 1.0MVA

Capacity 1.0MVA

Capacity 4.5MVA

Capacity 3.0MVA

Capacity 1.8MVA

Capacity 1.8MVA

Capacity 3.0MVA

Capacity 3.0MVA

Capacity 3.0MVA

Capacity 1.0MVA

Capacity 1.0MVA

Capacity 4.5

Drawing No.:	Size:	Plot Date.:
1821-E02	A0	4.7.12

Date	No.	Description
4.07.12	A	INVENTORY REPORT ISSUE

DISCLAIMER

THIS DRAWING HAS BEEN PREPARED BY JDG CONSULTING BASED ON VISUAL OBSERVATIONS MADE ON CAMPUS AND REPRESENTS THE ASSUMED INTERCONNECTIONS BETWEEN SUBSTATIONS AND BUILDING MSBs AS AT JUNE 2012 - A TOTAL AUDIT OF THE CAMPUS ELECTRICAL DISTRIBUTION SYSTEM HAS NOT BEEN UNDERTAKEN AND THEREFORE THE DETAILS INCLUDED ON THIS SCHEMATIC MUST NOT BE RELIED UPON WITHOUT VERIFICATION BY A SUITABLY QUALIFIED ENGINEER.

SPECIAL NOTE

INTERCONNECTIVITY BETWEEN SUBSTATIONS AND MSBs AS SHOWN ARE RELATIONSHIPS AND NOT CONSUMER MAIN ROUTES

SPECIAL NOTE

SUBSTATION POSITIONS SHOWN ON THIS DRAWING ARE APPROXIMATE ONLY AND SHALL NOT BE CONSTUED AS OTHERWISE

S.35789 FROM EPPING ZONE SUBSTATION

UNIVERSITY HOUSING

94.616

129.733

W11 LIGHTHOUSE THEATRE

S.8421 FROM EPPING ZONE SUBSTATION

W10A GYM Sports Centre

E14D GRADUATE SCHOOL OF MANAGEMENT

S.7391 FROM EPPING ZONE SUBSTATION

E11A

F9A

F9B F9C

E10D CARPARK

FROM MACQUARIE PARK ZONE SUBSTATION FUTURE S.47259

S.35642 S.35643

S.35844

F7A F7B

C9B

S.8729 FROM EPPING ZONE SUBSTATION

CoGen

E7B COURTYARD

E7A

E8A E8B E8C

S.1915

FROM EPPING ZONE SUBSTATION

FROM MACQUARIE PARK ZONE SUBSTATION

S.6154 FROM EPPING ZONE SUBSTATION

Tunnel

Theatre

W6C

X5B

X5A

C5B C5C

C5A

E5A E5B

E6A

F5B CARPARK

F5A CARPARK

S.7328 FROM EPPING ZONE SUBSTATION

S.4873 FROM EPPING ZONE SUBSTATION

S.7741

S.8422

S.8147 FROM EPPING ZONE SUBSTATION

Banksia Cottage X6A

S.7392 FROM EPPING ZONE SUBSTATION

FROM EPPING ZONE SUBSTATION S.4874

S.7740

E3B

E3A

S.8146 FROM EPPING ZONE SUBSTATION

F3A CARPARK

AUSTRALIAN FILM TV & RADIO SCHOOL

FROM EPPING ZONE SUBSTATION S.5923

X4 CARPARK

X3 CARPARK

W4 CARPARK

Tunnel

S.36012 S.36013 TBS

S.8697 S.8698 FROM EPPING ZONE SUBSTATION

FROM EPPING ZONE SUBSTATION S.1796

170.388

X2A

FROM EPPING ZONE SUBSTATION S.3673

E1 CARPARK

C1 CARPARK

S.4564 FROM EPPING ZONE SUBSTATION

S.36014

FROM MACQUARIE PARK ZONE SUBSTATION

94.616

ROBERT MENZIES COLLEGE

FROM EPPING ZONE SUBSTATION S.3771

DUNMORE LANG COLLEGE

FROM EPPING ZONE SUBSTATION S.3515

FROM MACQUARIE PARK ZONE SUBSTATION

MACQUARIE UNIVERSITY
SYDNEY ~ AUSTRALIA

Electrical Consultant:

JDG Consulting
Suite 407, Atlas Building
2-8 Brookhollow Ave
Baulkham Hills NSW 2153
Phone: 02 8861 1888
Fax: 02 8861 1899
jdg@jdgconsulting.com.au
www.jdgconsulting.com.au

JDG Consulting
Engineering Consultants
ASP Level 3 &
Electrical Services

Project:

MACQUARIE UNIVERSITY CAMPUS
HERRING ROAD
MACQUARIE PARK

Drawing Title:

ELECTRICITY INFRASTRUCTURE MASTER PLAN SUPPLY ARRANGEMENTS

Drawing No.

1821-E02

Drawn By:	Scale:	Rev:
JDG	NTS	A

Project No.:	Date:
12-1821	4.07.12

Do not dimension or scale off this drawing - always refer to architectural plans

6.4 TRANSPORT AND ACCESSIBILITY REPORT

6. SUPPORTING DOCUMENTS

Macquarie University

Macquarie University Design Guidelines

Transport and Accessibility Report

Rev A | 16 March 2017

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 224322-09

Arup
Arup Pty Ltd ABN 18 000 966 165

Arup
Level 10 201 Kent Street
PO Box 76 Millers Point
Sydney 2000
Australia
www.arup.com

ARUP

Contents

Page

1 Introduction 3
1.1 Background 3
1.2 Macquarie University Master Plan 3
1.3 Report Structure 3

2 Existing Transport Conditions 4
2.1 Road Network 4
2.2 Car Parking 6
2.3 Public Transport 7
2.4 Walking 9
2.5 Cycling 10
2.6 Travel Patterns 11

3 Design Objectives 14
3.1 User Groups 14
3.2 Hierarchy of Movement 15
3.3 Design Principles 16

4 Transport Strategy 17
4.1 Overview 17
4.2 Opportunities and Constraints Analysis 17
4.3 Pedestrians 18
4.4 Cyclists 19
4.5 Bus Movements 20
4.6 Future Public Transport Upgrades 22
4.7 Road Network 24
4.8 Road Cross Sections 26
4.9 Parking 27

Tables

Table 1 Macquarie University bus services
Table 2 Journey to Work Census Data – Trips to Macquarie Park
Table 3 MQU road hierarchy

Figures

Figure 1 Road Network Surrounding Macquarie University
Figure 2 Existing onsite parking
Figure 3 Bus stop locations
Figure 4 Existing pedestrian desire lines
Figure 5 Existing cycling routes
Figure 6 Main mode of transport to Macquarie University
Figure 7 MQU travel trends
Figure 8 Home location of MQU students and staff
Figure 9 Hierarchy of movement
Figure 10 Proposed pedestrian network
Figure 11 Proposed bicycle network
Figure 12 Bus services through MQU
Figure 13 Sydney Metro Northwest map
Figure 14 Sydney Metro Project
Figure 15 New access road into Precinct E
Figure 16 Changes to access arrangements and internal road network
Figure 17 Cross section – primary road
Figure 18 Cross section – secondary road
Figure 19 Car parking strategy

1 Introduction

1.1 Background

This report has been prepared to provide transport design guidelines, supporting the Campus-wide Macquarie University Design Excellence Strategy and Urban Design Guidelines.

The Design Excellence Strategy and Urban Design Guidelines are required under Condition B4 of the Concept Plan approval, and will act as a guiding document in implementing the recently completed Macquarie University Campus Master Plan 2014.

In addition to the Design Excellence Strategy and Urban Design Guidelines, the Concept Plan conditions of approval also require detailed management plans to support new development in each precinct. These include the requirement to prepare a transport and accessibility report as contained in this document.

This document supports the transport principles and objectives outlined in the Transport Accessibility Constraints and Design Solutions Report (Arup, 2010) developed for the Precinct E Concept Plan.

1.2 Macquarie University Master Plan

Macquarie University (MQU) has previously developed a Concept Plan which was granted approval on 13 August 2009. The previous Concept Plan looked at an increase in commercial and academic space within the university. The plan also proposed additional housing precincts for university purposes, upgrading the road network and rationalisation of University car parking locations.

In 2014, MQU revisited the campus vision to address the next 50 year phase of the University's growth, reflected in the Macquarie University Campus Master Plan 2014. Importantly, the Master Plan does not represent a significant change to the development potential achieved during the timeframe of the approved Concept Plan.

1.3 Report Structure

This Transport and Accessibility report, which supports the *Macquarie University Design Excellence Strategy and Urban Design Guidelines* addresses the following issues:

Section 1 Introduction

Section 2 Existing Transport Conditions

Section 3 Design Objectives

Section 4 Transport Strategy

2 Existing Transport Conditions

2.1 Road Network

2.1.1 Major Roads

MQU is surrounded by a number of major roads which carry significant traffic volumes. These roads, including the administrative classification, are:

- Epping Road (State road)
- M2 Motorway (State road)
- Herring Road (Regional road between Epping Road and Talavera Road)
- Talavera Road (Regional road between Lane Cove Road and Talavera Road)
- Waterloo Road (Local road)
- Balaclava Road (Local road)
- Culloden Road (Local road)

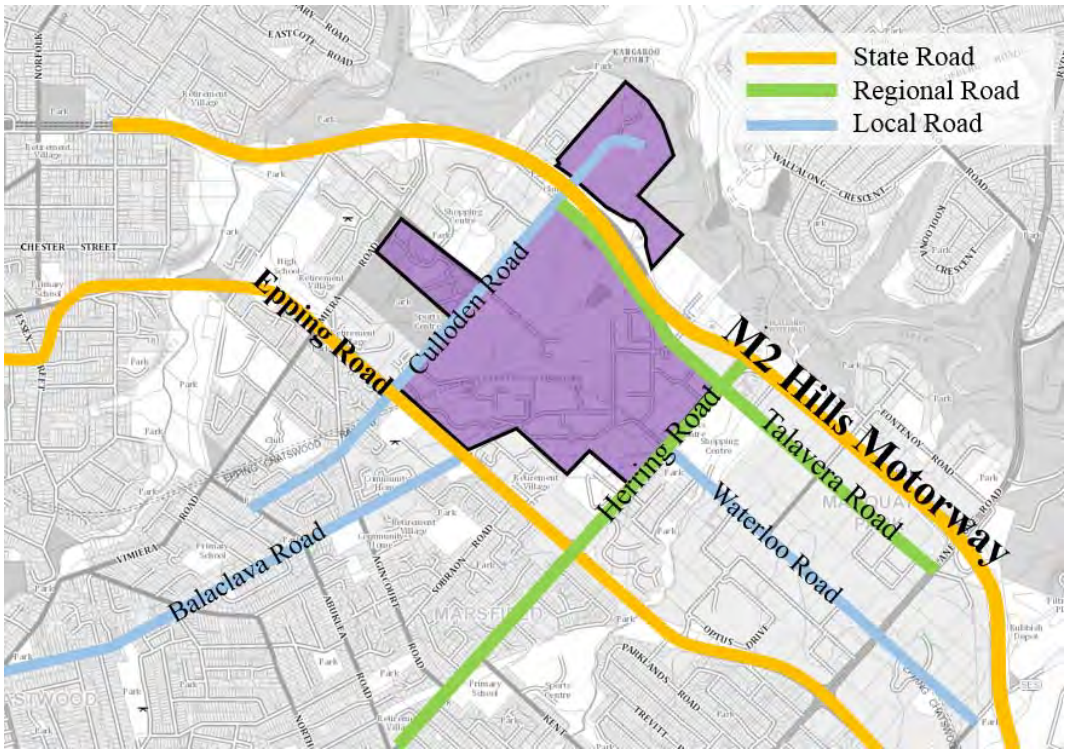


Figure 1 Road Network Surrounding Macquarie University

Source: SixMaps 2015

2.1.2 Key Intersections

The operation of the Macquarie Park road network is primarily a function of the performance of key intersections including:

- **Waterloo Road / Herring Road:** Directly adjacent to MQU and Macquarie Shopping Centre, this intersection is signalised with pedestrian crossing facilities on all approaches. The northern leg of this intersection provides direct access to MQU.
- **Epping Road / Balaclava Road:** Controlled by traffic signals with pedestrian crossing facilities on all approaches. Left turn slip lanes are provided on the north, south and west approaches. Bus priority lanes exist on Epping Road.
- **Epping Road / Herring Road:** Controlled by traffic signals with pedestrian crossing facilities on all approaches. Bus priority lanes exist on Epping Road.
- **Herring Road / Talavera Road / M2 Ramps:** The eastern leg of this signalised intersection provides vehicular access to the westbound on-ramp of the M2 Motorway. The western leg provides access to Talavera Road from the new M2 off ramp, with only left and right turn movements permitted. Pedestrian crossing facilities are provided on the eastern and northern legs. Right turn movements from Talavera Road into Herring Road are for buses only.
- **Talavera Road / Technology Place / Christie Road:** This intersection is controlled by traffic signals, with pedestrian crossing facilities on all four legs. The Christie Street leg of the intersection is an extension of the eastbound off-ramp and on-ramp of the M2 Motorway.
- **Culloden Road / Waterloo Road:** At the northern end of the campus, this intersection is controlled by a roundabout. There are no dedicated pedestrian crossing facilities provided. The southern leg (Gymnasium Road) of the intersection is off-centre with the other three approaches.

2.2 Car Parking

There are currently in the order of 4,000 on-site parking spaces across the campus in a mixture of multi-storey and at-grade car parking areas. These areas are accessed from a number of internal circulation roads. All parking is operated under a restricted parking area scheme. Short term parking and annual permits are available for students and staff.

During peak semester periods, the demand for parking near the Academic Core can significantly exceed supply, while more remote parking areas typically have some spare capacity.

Current parking areas within MQU are indicated in Figure 2.

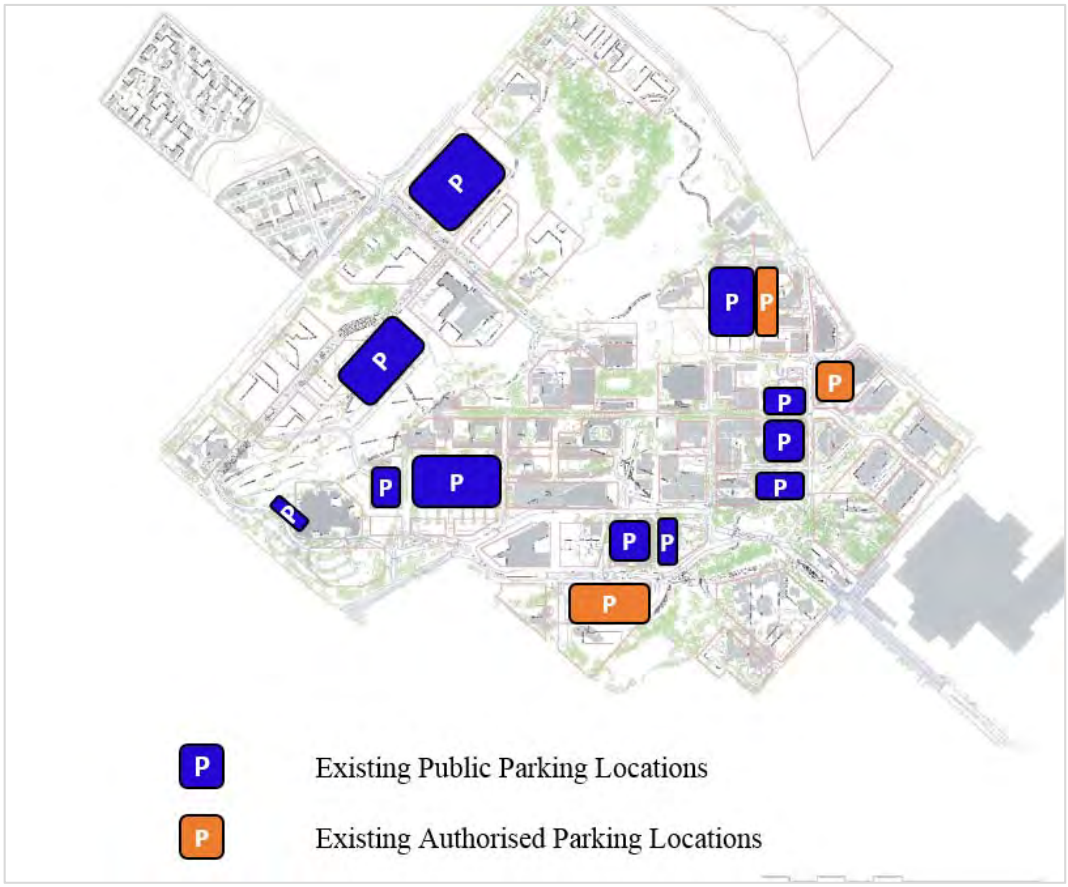


Figure 2 Existing onsite parking

2.3 Public Transport

2.3.1 Buses

MQU is served by 24 different bus routes, running to and from the campus throughout the day. Additionally, some further bus services utilise the nearby bus interchange on Herring Road adjacent to Macquarie Shopping Centre.

Bus services run at high frequencies in both the morning and evening peak periods (approximately 70 services in the peak hours) with lower frequencies at off-peak times.

University Avenue currently provides bus stop locations within MQU. Further interchange facilities are provided both within the campus and at the Macquarie Shopping Centre. The area between University Avenue and Balaclava Road is currently used as a layover facility for some terminating buses, prior to commencing their next route service.

A summary of existing bus services through MQU is presented in Table 1 and bus stop locations illustrated in Figure 3.

Table 1 Macquarie University bus services

Route No.	Route	Frequency during peak hour		Operator
		8.00am to 9.00am	5.00pm to 6.00pm	
M41	Hurstville to Macquarie	6	6	Metro Bus
M54	Parramatta to Macquarie Park	6	6	Metro Bus
140	Manly to Epping	1	1	Sydney Buses
197	Macquarie University to Mona Vale	1	3	Forest Coach Lines
288	Epping to City	3	3	Sydney Buses
290	Epping to City	5	2	Sydney Buses
292	Marsfield to City	2	2	Sydney Buses
294	Macquarie Centre to City	2	1	Sydney Buses
295	North Epping to Macquarie Centre	4	4	Sydney Buses
459	Macquarie University to Strathfield	2	2	Sydney Buses
506	Macquarie University to City	3	3	Sydney Buses
507	Macquarie University to City	2	3	Sydney Buses
518	Macquarie University to City	2	3	Sydney Buses
544	Auburn to Macquarie Centre	2	2	Sydney Buses
545	Parramatta to Chatswood	6	6	Sydney Buses
550	Chatswood to Parramatta	0	0	Sydney Buses
565	Chatswood to Macquarie University	1	2	Transdev NSW Buses

Route No.	Route	Frequency during peak hour		Operator
		8.00am to 9.00am	5.00pm to 6.00pm	
575	Macquarie University to Hornsby	4	4	Transdev NSW Buses
611	Macquarie University to Blacktown	5	7	Hills Bus
619	Castle Hill to Macquarie Park	4	2	Hills Bus
621	Castle Hill to City	2	3	Hillsbus
630	Blacktown to Macquarie Centre	2	2	Hillsbus
651	Castle Hill to Macquarie and City	2	3	Hillsbus
740	Plumpton to Macquarie Park	3	2	Busways

Source: Sydney Buses, Hills Buses, Transdev, Busways and Forest Coach Lines 2015



Figure 3 Bus stop locations

2.3.2 Trains

MQU is unique in that it is the only metropolitan university in Sydney with a dedicated railway station. Macquarie University Station is located only a short walk from the Academic Core, providing services between 5am and 11pm on a typical weekday. Since the integration of the station with the CityRail network in October 2009, 13 train services every hour (nine towards the city) arrive at the station during peak hours. These services provide direct rail access to Epping and Chatswood.

2.4 Walking

Universities are unique in the sense that they concentrate a variety of functions within reach of pedestrians and are considered as self contained neighbourhoods where classrooms, offices, apartments, student centres, child care facilities, performance halls, art galleries, gymnasiums, swimming pools, sports arenas, shopping places etc are all in close proximity.

Campus design is based on the notion that walking is an expected mode of transport within the university.

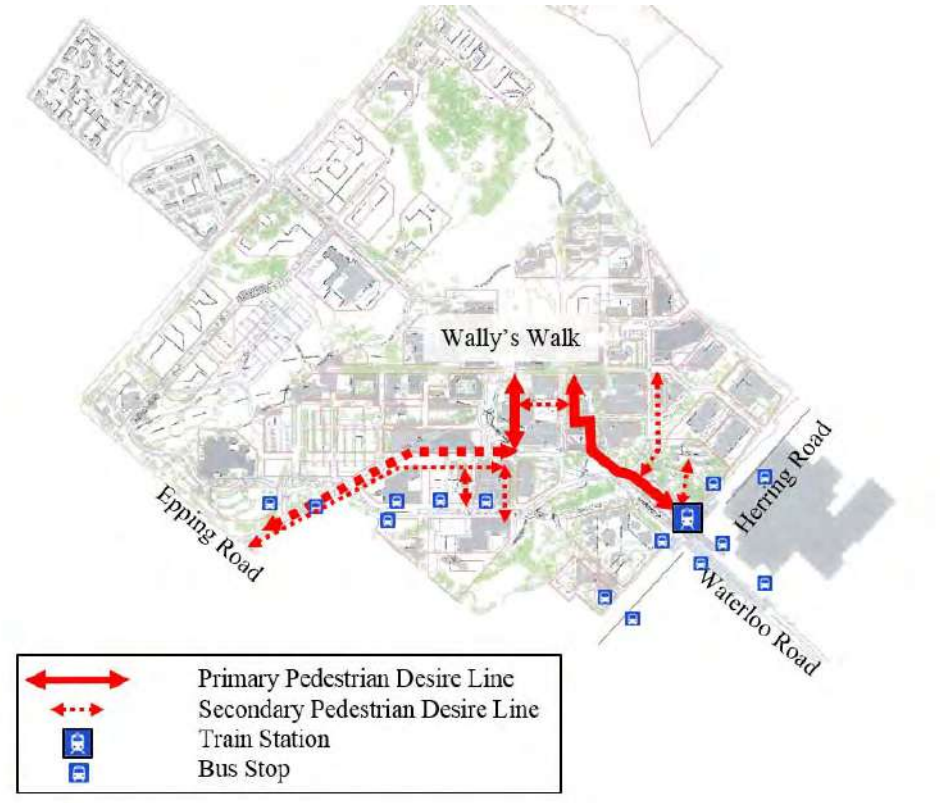


Figure 4 Existing pedestrian desire lines

The key pedestrian desire lines, shown in Figure 4 are focused on the Academic Core and transport nodes such as the railway station, bus stops and parking areas. These paths are well defined through the use of lighting, wide footpaths and seating. A series of small pathways run through the Academic Core, providing

students access between the various land uses contained within MQU. The local vehicle circulation roads within the campus do provide for pedestrian movements.

2.5 Cycling

There are presently no dedicated cycling facilities (i.e. on road bike lanes, shared paths) within MQU. Some end of trip facilities are provided, such as parking, showers and lockers. Two additional bike hubs have recently been constructed on campus, adjacent to both Eastern Road near the Central Courtyard and Western Road near the W4 car park. Each of these hubs include capacity to store 26 bikes in a secure cage, 2 solar powered showers and 28 lockers.

Cycling currently makes up only a small proportion of overall trips to MQU. Reasons for this may include:

- The University is surrounded by high traffic, major arterial roads which are not conducive to walking and cycling.
- Isolated on and off-road cycle facilities currently exist in the vicinity of the campus, but these do not yet constitute a comprehensive network.

A summary of the existing cycle network surrounding MQU is shown in Figure 5. The majority of the cycle routes located within MQU are shared with pedestrians.

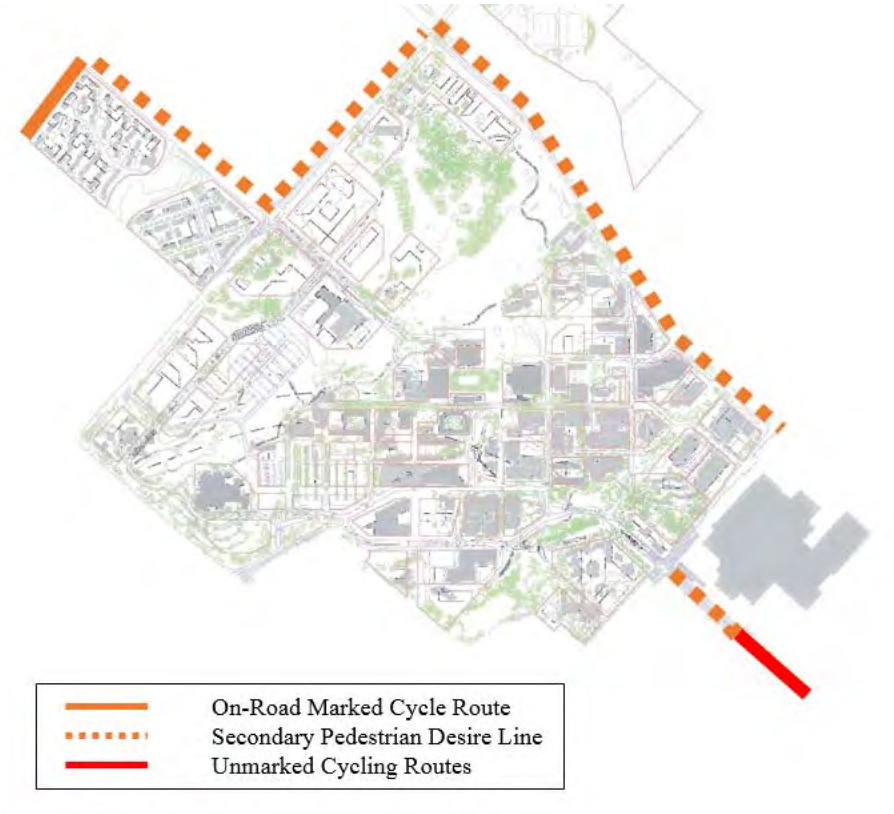


Figure 5 Existing cycling routes

2.6 Travel Patterns

Existing data relating to student and staff travel patterns to MQU has been taken from 2011 Journey to Work Census data, and a user travel survey undertaken as part of a campus sustainability strategy in 2014. The 2006 census data is also analysed to gain and understanding the travel habits before the opening of the Epping to Chatswood rail line.

2.6.1 Journey to Work

The Journey to Work Census data for all trips with a final destination of Macquarie Park is presented in Table 2. It should be noted that this data only includes those people who consider Macquarie Park to be their location of full time employment and therefore excludes student trips.

Table 2 Journey to Work Census Data – Trips to Macquarie Park

Mode	2006	2011
Car as driver	74%	67%
Bus	8%	7%
Car as passenger	6%	4%
Train	5%	16%
Walked only	5%	4%
Other mode	2%	2%

As seen from the table, more recent census data indicates a mode shift from car users to public transport as a journey to work method. The proportion of car users decreased from 74% to 67%, while train users increased from 5% to 16% following the opening of the Epping to Chatswood rail line in 2009.

2.6.2 2014 Travel Survey

GTA Consultants was commissioned by MQU in July 2014 to undertake a travel demand survey of the site. A total of 967 students, staff and employees completed both physical and online surveys. The results of the travel survey with respect to access mode into MQU is shown in Figure 6. This indicates that private vehicle at 30% is still the most popular mode of transport to the University, however access by bus (21%) and rail (27%) are also popular modes of transport.

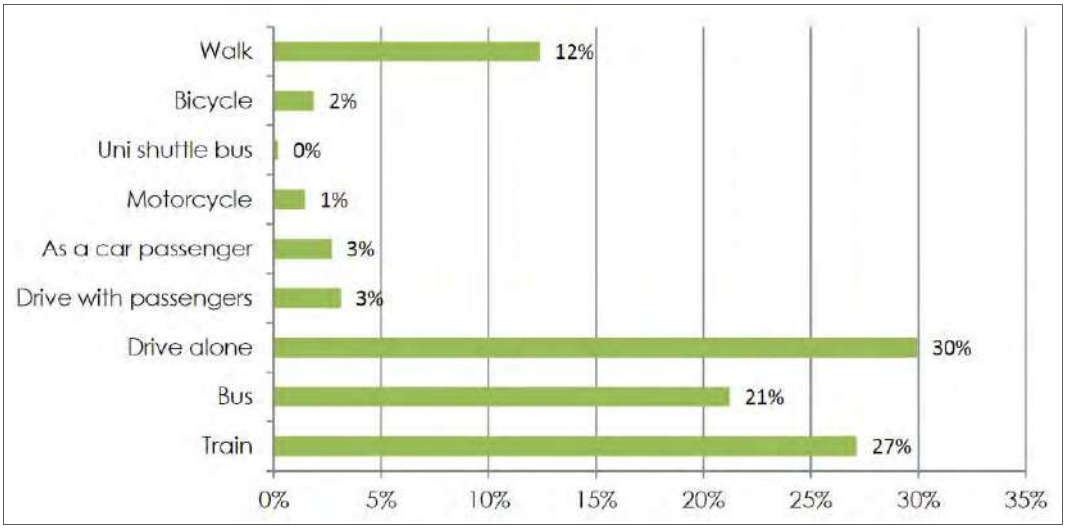


Figure 6 Main mode of transport to Macquarie University

Source: 2014 Macquarie University travel survey report (GTA Consultants)

The level of public transport usage (train and bus) has increased significantly from 13% in 2010 to 37% in 2012 (plus a proportion of 14% multi-modal trips) and 48% in 2014. Bus usage has increased from 8% to 21% over this period, whilst train usage has increased from 6% to 27%. The increase in train patronage is reflective of the improved train frequencies servicing the Macquarie University Railway Station. A summary of the travel trends to MQU is shown in Figure 7.

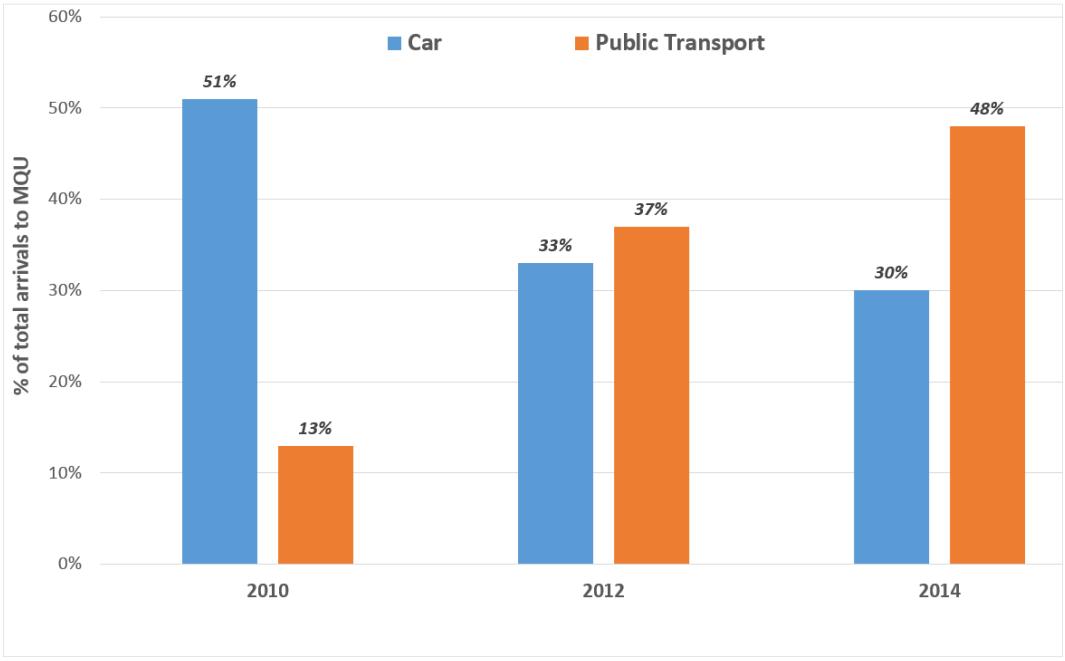


Figure 7 MQU travel trends

2.6.3 Demographic Data

The 2014 Macquarie University Travel Survey analysed the distribution of the home location of students and staff. This distribution is presented in Figure 8, and demonstrates a high proportion of students and staff live within close proximity (5km) to the campus. This is within feasible cycling distance. Further, a high number of students and staff live within a 2km radius of the campus which is a viable walking distance.

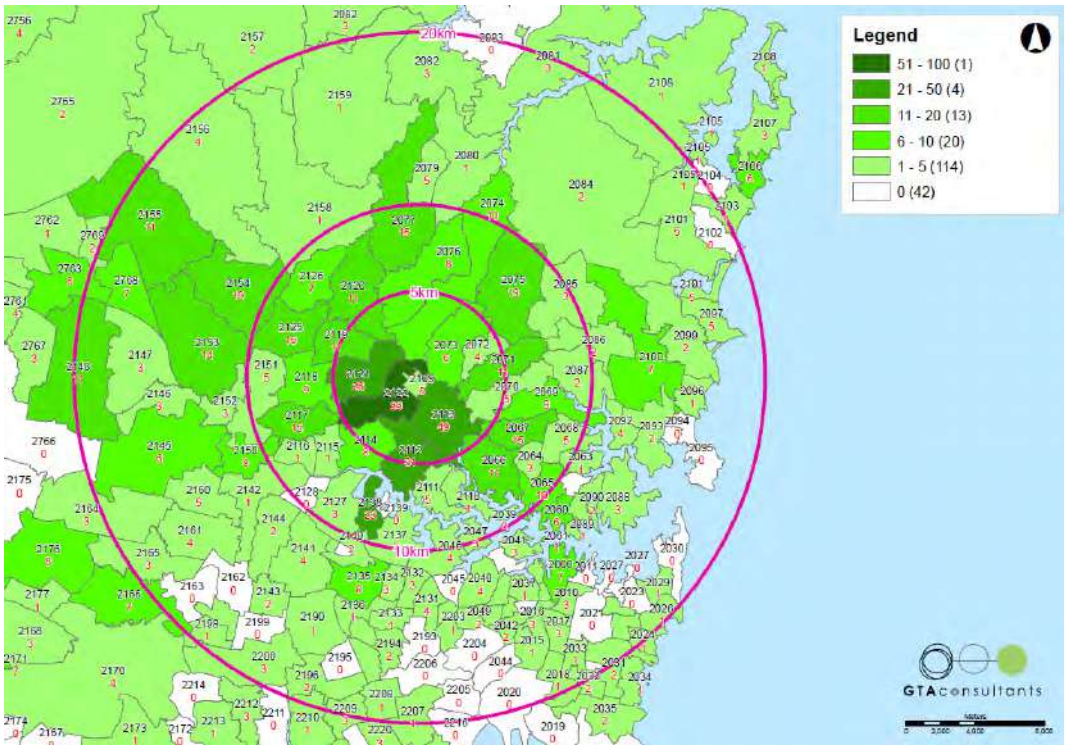


Figure 8 Home location of MQU students and staff

Source: 2014 Macquarie University travel survey report (GTA Consultants)

The majority of staff and students were found to reside in the northern Sydney area. The top five postcodes for student/staff population were as follows:

- 2122: Eastwood, Marsfield
- 2133: Macquarie Park, North Ryde, East Ryde
- 2112: Putney, Ryde, Denistone East
- 2121: Epping, North Epping
- 2138: Rhodes, Liberty Grove, Concord

3 Design Objectives

3.1 User Groups

Universities are unique in the sense that they hold distinct communities. They concentrate a variety of functions within reach of pedestrians and are considered as self contained neighbourhoods where classrooms, offices, apartments, student centres, child care facilities, performance halls, art galleries, gymnasiums, swimming pools, sports arenas and shopping places are all in close proximity. They have their own streets, squares and open spaces, where people can stroll and get together. Campus design is based on the notion that walking is an expected mode of transport within the university.

The various land uses within the Macquarie University campus define the user groups of the campus. The key land uses of Macquarie University include:

- Academic Core
- commercial and research precinct
- open space
- university housing
- parking
- sporting fields

User groups for the purposes of transport are then defined as:

- students
- staff
- commercial employees
- visitors
- through traffic
- deliveries

It will be an integral part of the wider university campus and master planning strategy to consider the needs of all of these user groups.

The flexible nature of classes and timetables influence pedestrian environment and movement. Recreational facilities invite a wide range of patrons to the university outside typical university times including weekends. University housing on the periphery of the campus also provides people presence outside typical university times. Patronage to the campus is also influenced by semester dates with typical class timetables run for approximately half of the year.

Traffic and observational data suggests that movements to the Macquarie University campus follow typical peak periods, that is, they have strong weekday AM and PM peaks although these peaks are not as pronounced as an office development.

3.2 Hierarchy of Movement

The transport strategy for the Macquarie University campus is based on a hierarchy of movement as illustrated in Figure 9.

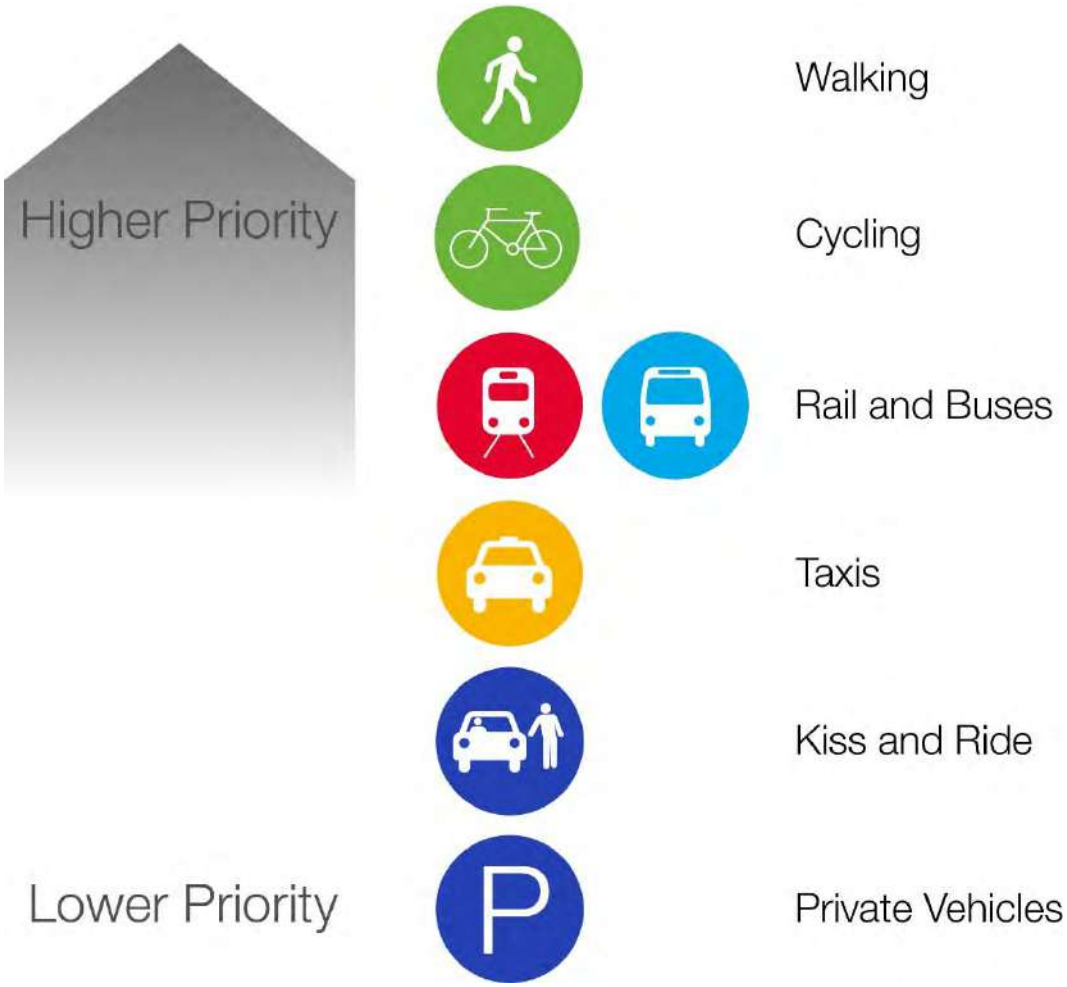


Figure 9 Hierarchy of movement

The hierarchy assumes that priority will be given to non-motorised forms of transport – walking and cycling, in addition to public transport – bus and train. The lowest priority will be given to the private car and parking. Walking is the primary mode of transport within the campus.

The hierarchy of movement supports the intention of the Macquarie University Concept Plan including:

- a 40% non-car mode share target for both academic and commercial uses.
- a cap on the total car parking supply.

Existing travel data suggests the current non-car mode share across the campus is currently significantly below the 40% non-car mode share target.

3.3 Design Principles

The following transport design principles have been developed for the Macquarie University campus:

- to provide a road, pedestrian and bicycle network for the precinct that is consistent with the intention of the Concept Plan for the overall campus
- to provide high quality, direct pedestrian access to Macquarie University Station the Academic Core and other key areas
- to provide good access to bus stops
- to separate pedestrian and vehicular traffic by providing convenient and safe movement paths for pedestrians, and, wherever possible, giving pedestrians priority at conflict points such as intersections
- to provide high quality facilities for bicycle traffic
- to minimise vehicular traffic as much as possible, particularly non-university 'rat-running' traffic
- to permit efficient access to the various car parking facilities which will generally consist of basement parking within new commercial developments
- to provide an attractive urban environment with high levels of amenity including the creation of 'entry statements' at the Balaclava Road and Herring Road entrances to the Campus
- to protect the environmental qualities and water management function of University Creek, Mars Creek and College Creek by minimising the number of water crossings
- to minimise vehicular traffic movements through the Academic Core and direct private vehicles to the periphery of the campus
- to remove all bus layovers within the campus

4 Transport Strategy

4.1 Overview

The Macquarie University Master Plan has been developed to enhance connectivity, safety and amenity for all campus users – particularly pedestrians. It is intended to direct vehicular traffic to the periphery of the campus to improve the pedestrian environment within the campus core. A new pedestrian focused landscaped entry from Herring Road is planned which will provide a direct, uninterrupted pedestrian link between Macquarie University railway station and the core of the campus.

4.2 Opportunities and Constraints Analysis

Specific opportunities and constraints that were identified in developing the transport strategy for the Macquarie University campus include:

Opportunities

- re-configured road network leading to improved facilities for pedestrians and cyclists
- enhanced access between the Academic Core and public transport nodes including Macquarie University station and the Herring Road bus interchange
- improved intersections and pedestrian road crossing points
- improved gateway to the university from external roads, particularly at the Herring Road gateway

Constraints

- limited number of vehicular and pedestrian crossings of University Creek
- topography of precinct with a significant fall from the Academic Core towards University Creek
- conflict between high volumes of pedestrians and vehicular traffic
- need to provide vehicular access to all development parcels rather than providing access to a small number of perimeter car parks
- the need to retain vehicular access to railway station service building
- potential for changes to road network to lead to an increase in non-university through traffic
- requirement to maintain bus movements (including bus layover) within the campus in the short term

4.3 Pedestrians

Macquarie University campus has been designed on the basis that walking is an expected and primary mode of transport.

The proposed pedestrian network for the Macquarie University campus is based on a network of primary, secondary and tertiary links. It is based on key attractors and the likely intensity of pedestrian movement on each link. Pedestrian desire lines will be characterised by movements between the rail station, Herring Road bus interchange, car parks, Macquarie Centre and the Academic Core. Other key nodes include student housing, recreational facilities and the private hospital. Pedestrian crossings will be provided on major desire lines, to cater for the future north-south walking links

Fundamental to the transport strategy for the MQU campus is the establishment of the Academic Core as a pedestrian precinct, with vehicular access north of Macquarie Walk (previously known as Western Road) generally limited to service and emergency vehicles.

The transport strategy proposes some key amendments to the road network layout and configuration servicing the campus compared to that presented in the initial Concept Plan. These amendments are targeted to enhance pedestrian safety and connectivity, and include

- Removal of vehicular traffic along Macquarie Drive to pedestrianise this route from Balaclava Road to Waterloo Road.
- Closure of Research Park Drive near University Avenue. This measure would facilitate the provision of a continuous, uninterrupted pedestrian connection between Macquarie University railway station and the Academic Core of the campus. This will include a new pedestrian bridge across University Creek.
- Reducing the width of the University Avenue road carriageway to support a widened footpath on the northern side of the road. The Herring Road entry to the University will require a major reconfiguration to create a ‘gateway’ – incorporating a wide, tree lined pedestrian oriented environment. This will create a public realm commensurate with a private road serving a pedestrian oriented campus, accommodating the increased pedestrian movements expected as the campus grows over the coming years.
- Conversion of Macquarie Drive north of Western Road (now known as Macquarie Walk) from a bus link to a pedestrian only route
- Provision of a new vehicle and pedestrian connection from Talavera Road serving Precinct E

There will also be provision of tactile pavement surfacing along Waterloo Road within the University campus. This will have the effect of slowing vehicle speeds as drivers realise they are no longer travelling along an arterial road. This will discourage drivers from utilising this road as a through route, reducing traffic volumes and providing an improved environment for both pedestrians and cyclists.

The proposed pedestrian network for the MQU campus is shown in Figure 10. The network will be a combination of footpaths along road corridors and other walkways.

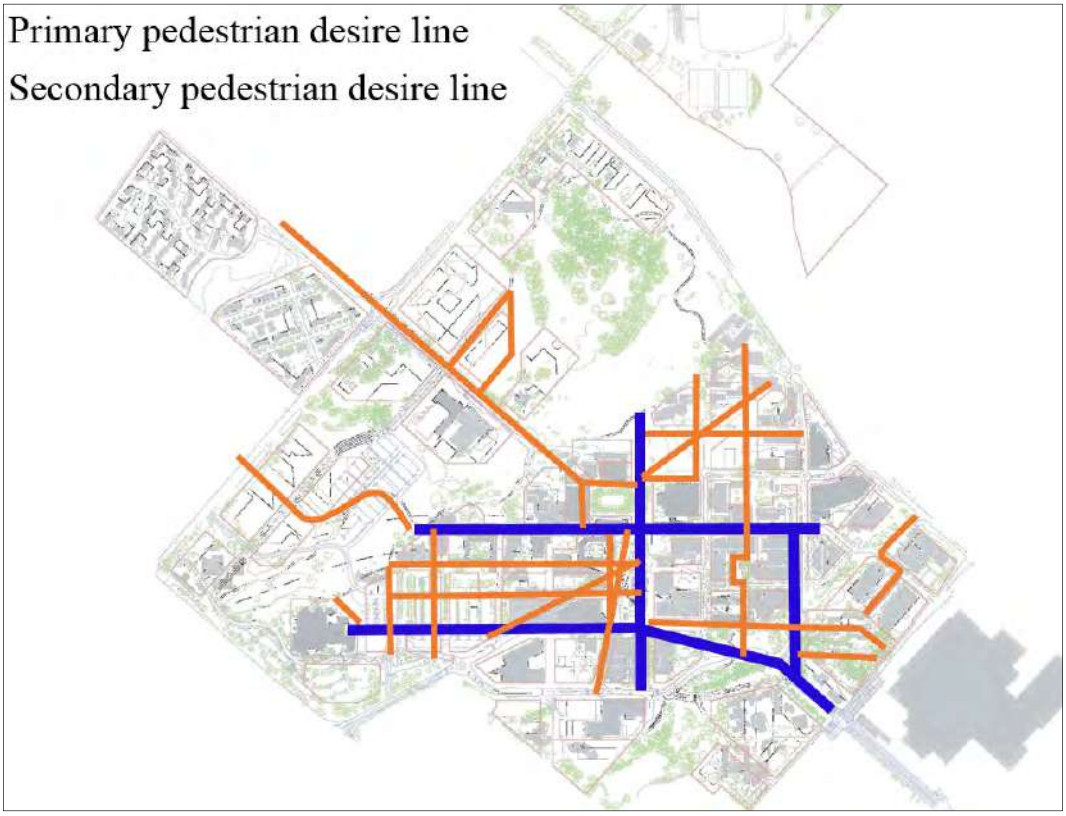


Figure 10 Proposed pedestrian network

4.4 Cyclists

Macquarie University has long promoted cycle access to the campus. The Master Plan formalises the main cycle corridors around the campus provides links to regional and district networks.

The proposed bicycle network for the MQU campus is shown in Figure 11. The network will include connections to key external bicycle routes including:

- Waterloo Road and Shrimptons Creek
- Talavera Road and Brown's Waterhole
- Culloden Road
- Epping Road

University Avenue will be the primary bicycle route though the campus. This will provide for a direct connection to the shared path on the eastern side of Epping Road and will also minimise conflicts with pedestrians in the Academic Core.

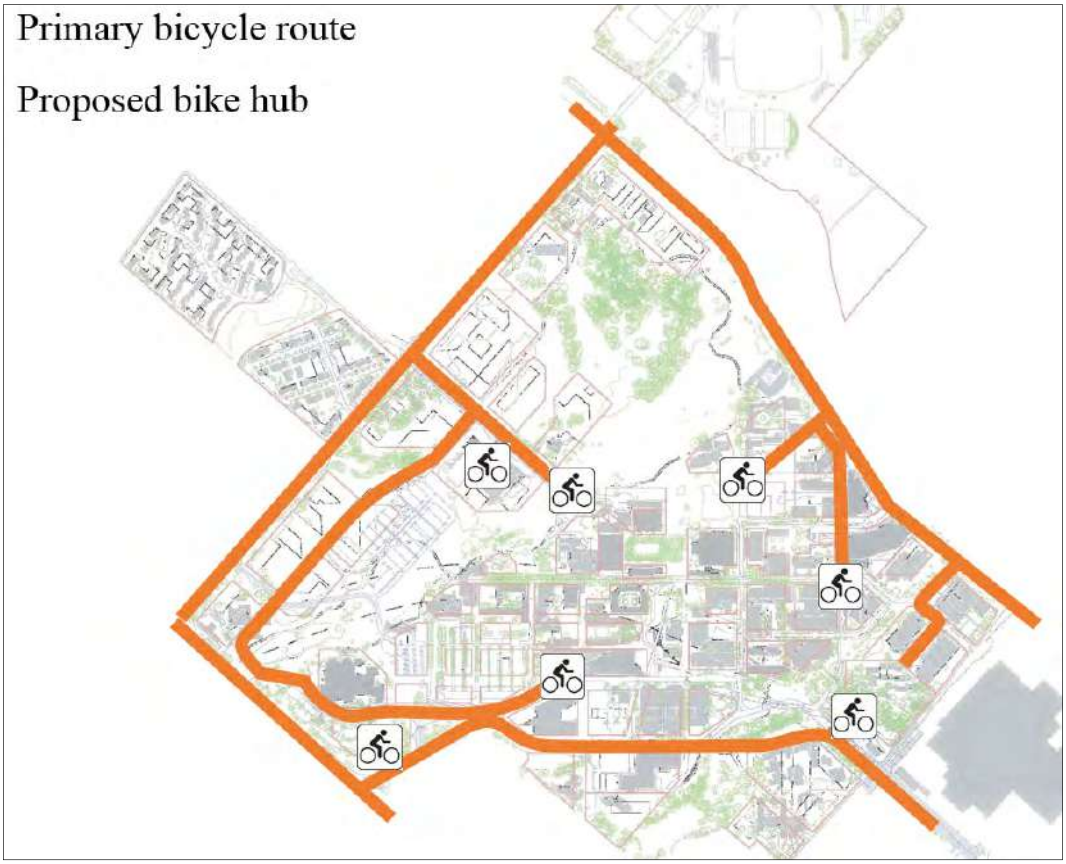


Figure 11 Proposed bicycle network

In addition to the marked bicycle routes, all roads within the university will support cycling by maintaining low vehicular traffic speeds with low vehicular traffic volumes.

Bike hubs are located on the fringe of the Academic Core so that cyclists can conveniently park their bikes close to where they need to go.

4.5 Bus Movements

Approximately 70 bus services per hour currently pass through the MQU campus. While the movement of buses through the campus is integral to providing good public transport access for students and staff, the transport strategy has been developed to minimise their impact on pedestrian movements and safety within the core of the campus.

The routing of buses though the campus has therefore been modified as part of the long term Concept Plan road layout. The transport strategy proposes to re-route all eastbound bus services that currently utilise Macquarie Drive to University Avenue. This is shown in Figure 12. Bus stops are to be located on University Avenue, with good pedestrian connections to be provided into the Academic Core.

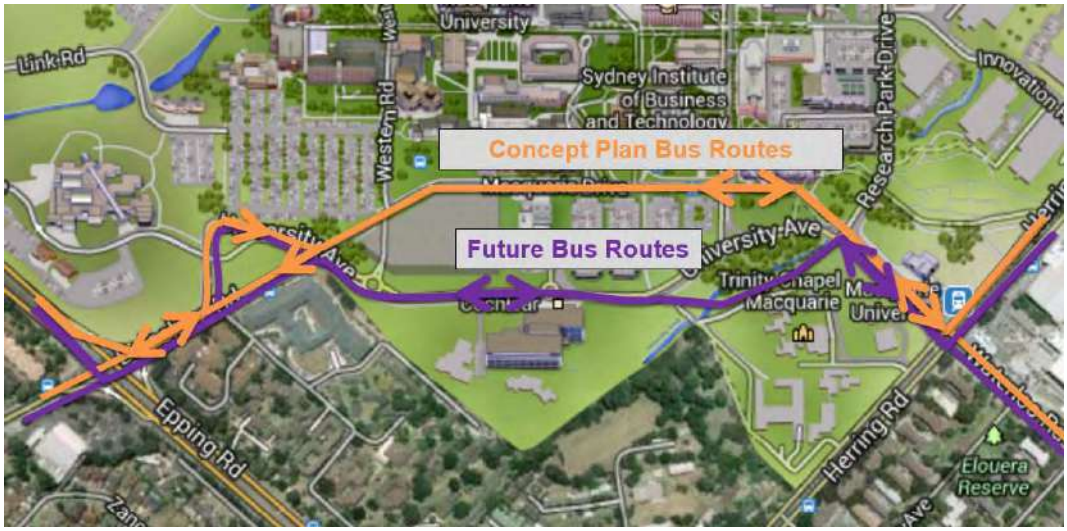


Figure 12 Bus services through MQU

Transport for NSW are currently investigating the provision of an improved bus interchange on Herring Road adjacent to Macquarie Centre to replace the existing bus interchange. It has been assumed that if this interchange is constructed, a significant proportion of existing campus bus services will continue to be routed through the university. However, the new interchange, with increased capacity, would allow for some of the less frequent services to be removed from the campus road network.

A number of bus services currently layover (i.e. extended stays between services) within the campus. The transport strategy makes provision for layover bays however these should be located well away from the Academic Core. The longer term plan is that no buses will layover on the MQU campus. This is in association with the development of the Herring Road bus interchange.

4.6 Future Public Transport Upgrades

Several public transport enhancements have the potential to benefit MQU in the future. These are described in the section below.

4.6.1 Sydney Metro Northwest

Sydney Metro Northwest (previously known as the North West Rail Link), is the first stage of Sydney Metro. The project is scheduled for completion in 2019 and will deliver eight new railway stations to Sydney's North West, providing a connection into Chatswood and the Sydney CBD. Passengers will be provided with rail services every four minutes during peak periods and every 10 minutes across the day.

The new rail line will ultimately connect with Metro City & Southwest - the second stage of the Sydney Metro network. This will provide residents of the Riverstone Town Centre with direct rail services between Bankstown, the Sydney CBD, North Sydney, Macquarie Park and the North West Growth Centre.

The Sydney Metro Northwest map is illustrated in Figure 13.

MQU will benefit from this new rail system which will have trains operating every four minutes during peak hours.

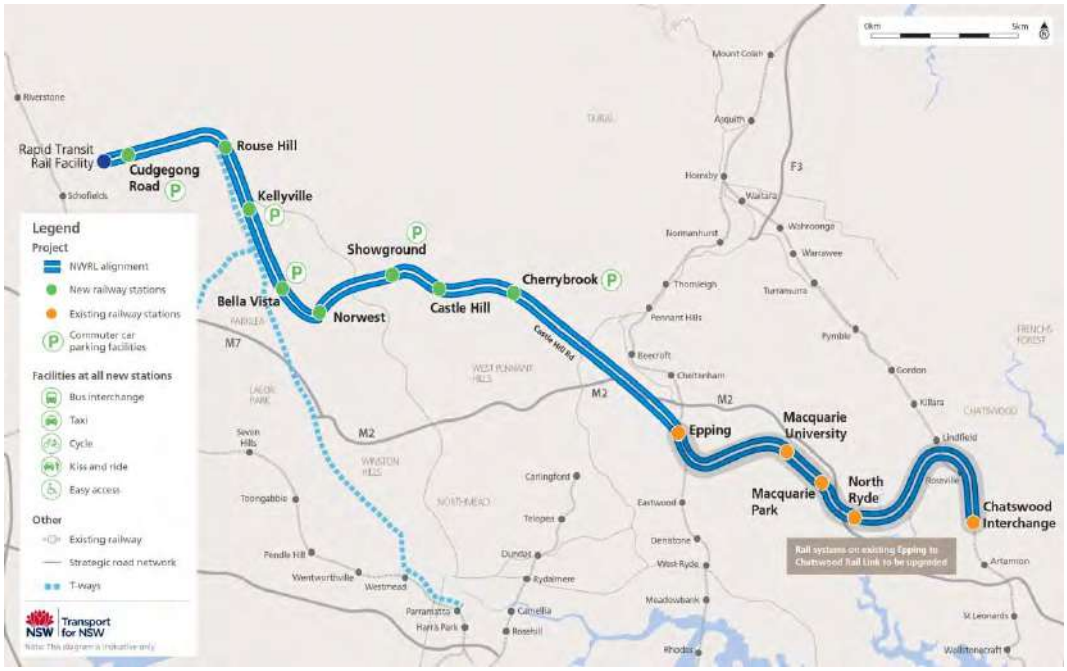


Figure 13 Sydney Metro Northwest map

Source: Transport for NSW, 2014

4.6.2 Sydney Metro City and Southwest

Sydney Metro is the next major rail project identified in Sydney's Rail Future. Sydney Metro scope has been developed to meet the Project objectives and deliver key elements of Stages 4 and 5 of Sydney's Rail Future.

In June 2014 the NSW Government announced the Sydney Metro concept, including the Sydney Harbour Crossing and Western Extension to Bankstown proposals. The project would extend rapid transit under Sydney Harbour, through the central business district (CBD) of Sydney and west to Bankstown, with capacity to run up to 30 trains per hour in each direction through the city on the new line.

The Project represents a major increase in the capacity of Sydney's rail network, providing a 60 per cent increase in the number of trains in the peak periods and catering for an extra 100,000 customers per hour. Sydney Metro would significantly improve reliability across the rail network by addressing current and emerging constraints such as train crowding, platform and station crowding, and network complexity.



Figure 14 Sydney Metro Project

Source: Transport for NSW

4.7 Road Network

The road network supporting the campus will generally be based on the road alignments presented in the Concept Plan with no additional roads proposed. The plan includes a hierarchy of roads that contributes to an understanding of the land requirements, alignment and design.

The proposed road hierarchy is summarised in Table 3.

Table 3 MQU road hierarchy

Primary road (17.5m – 30m)	**Secondary road (17.5m – 20m)**
• Balaclava Road • University Avenue • Innovation Road • West Precinct Road • Research Park Drive (northern end) • Hadenfield Road	• Eastern Road • Technology Place • Western Road • Gymnasium Road

Since the development of the MQU Concept Plan, there have been a number of variations to the envisaged road network layout. These variations are primarily the result of enhancements to the pedestrian network within the campus. Variations to the road network compared to that initially envisaged in the Concept Plan includes the following:

- The primary roads are no longer 3 or 4 lanes as described in the Concept Plan, they are now 2 lanes. The secondary roads and shareways are the same as the Concept Plan
- Closure of the southern end of Research Park Drive (connecting with University Avenue) to facilitate the provision of a continuous, uninterrupted pedestrian connection between Macquarie University railway station and the Academic Core of the campus
- Conversion of Macquarie Drive north of Western Road (now known as Macquarie Walk) from a bus link to a pedestrian only route
- Realignment of University Avenue to support vehicular access into commercial developments with Precinct E
- Conversion of the existing one-way section of Balaclava Road to two-way operation to enhance pedestrian and vehicular movements in the precinct. This measure would alleviate the existing issue of buses impacting on traffic movements as they turn left into Hadenfield Avenue, as well as safety issue of bus passengers having to cross two lanes of northbound traffic on Hadenfield Avenue.
- Provision of a new access road into Precinct E which connects to Talavera Road (see Figure 15)

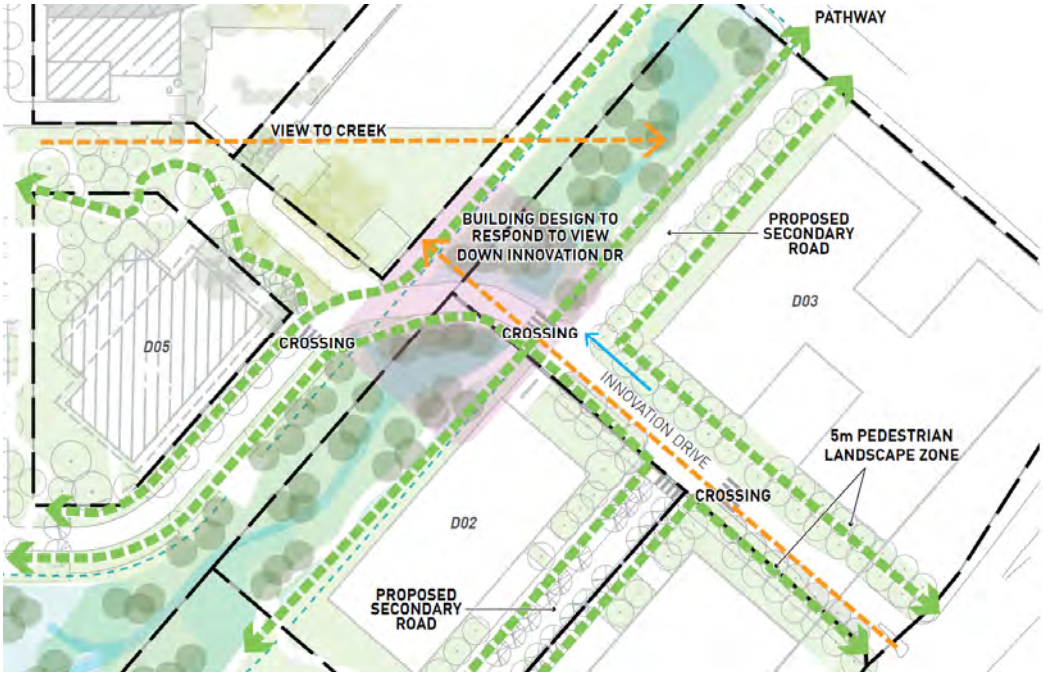


Figure 15 New access road into Precinct E

- Reducing the width of the University Avenue road carriageway to support a widened footpath on the northern side of the road.

These changes to the road network are summarised in Figure 16 below.

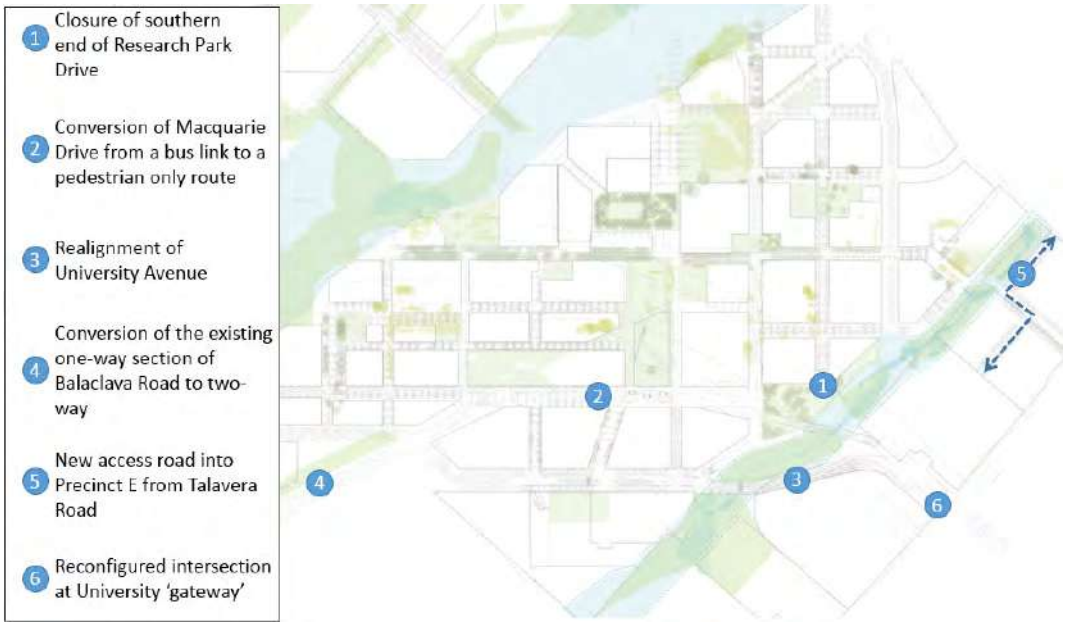


Figure 16 Changes to access arrangements and internal road network

4.8 Road Cross Sections

Road cross sections for primary and secondary roads within the campus are illustrated in Figure 17 and Figure 18 respectively.

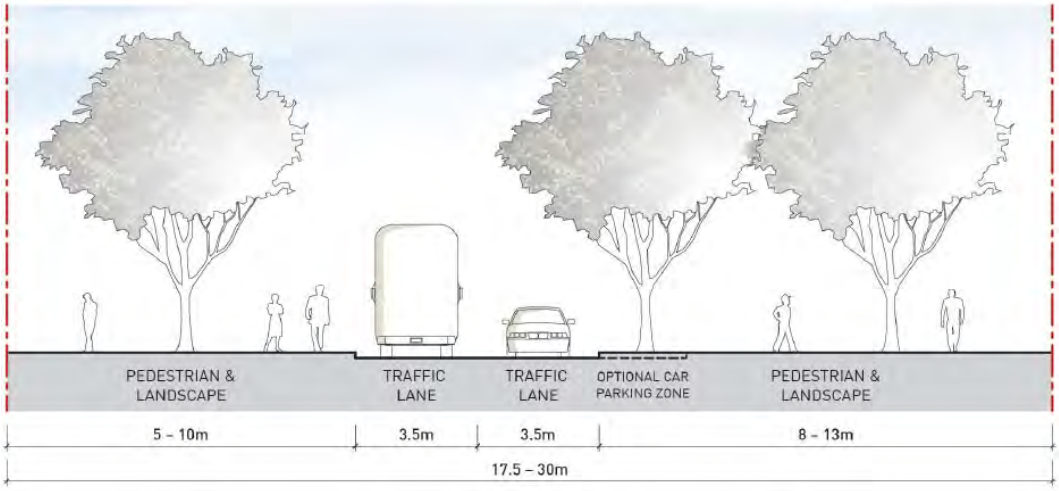


Figure 17 Cross section – primary road

Source: Cox Richardson architects

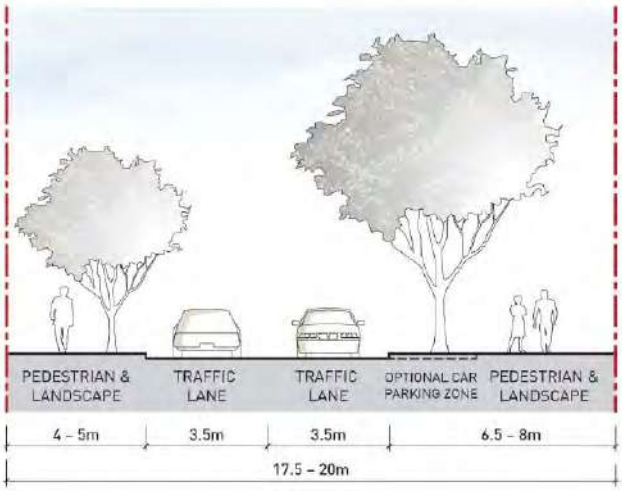


Figure 18 Cross section – secondary road

Source: Cox Richardson architects

4.9 Parking

4.9.1 Parking Strategy

The transport strategy has been developed to remove traffic from the campus core by locating car parking areas at the periphery of the campus. As presented in Figure 19 below, three new major car parking areas are proposed on the western and northern boundaries of the campus – providing over 3,000 parking bays. The parking structures will be linked directly to the pedestrian network, providing convenient and safe access to and from the Academic Core.



Figure 19 Car parking strategy

4.9.2 Parking Controls

Each new development within the MQU campus will generally be self-sufficient in terms of parking with parking to be contained within the basement of each development where appropriate. The Macquarie University Concept Plan condition (B1) permits a maximum of 10,800 spaces across the campus.

Parking for commercial uses will generally be provided at a rate of no more than 1 space per 80m^2 GFA. There is, however, some flexibility in the provision of parking across the campus, i.e. some developments could have a higher rate of parking and others a lower rate of parking, as long as the overall maximum number of spaces for the precinct is not exceeded.

It would be expected that on full-development of the campus, sites closest to the railway station would have lower parking rates than those located furthest from the railway station.

6.4 CONSULTATION REPORT

6. SUPPORTING DOCUMENTS

Consultation Report

Background

The Campus-wide Design Excellence Strategy and Urban Design Guidelines were initiated by Macquarie University in 2014. The objective of the Guidelines is to develop the Concept Plan for the whole Campus (with the exception of Precinct E and the part of Precinct D which is subject to the Urban Activation Precinct) and satisfy those Concept Plan Conditions of Approval required to enable submission of Development Applications within the Campus.

Status

Meetings have taken place with City of Ryde Council and the Department of Planning and Environment to discuss the Guidelines. Consultation has also been undertaken with the relevant service providers. Consultation will be ongoing with Council and the Department up until finalisation of the Guidelines. Further consultation and meetings will be undertaken with RMS, Transport for NSW, Council and the Department to develop the guidelines for Precincts E and D when the Urban Activation Precinct is gazetted.

Email and Written Correspondence			
Date	Subject	Between / To / From	Company
18 December 2015	University Creek, Macquarie University Notification under S*tate Environmental Planning Policy (Infrastructure) 2007*	Tim Henderson Guna Verrasingham	TTW City or Ryde
20 January 2015	Notification of changes to works in University Creek	Guna Verrasingham Tim Henderson	City or Ryde TTW
2 May 2011	Controlled Activity Approval – Modification works along Macquarie University Creek, Macquarie University	Greg Brady Mark Broomfield	NSW Office of Water MQU
Various	Macquarie University – University Creek CAA - Macquarie University, University Creek CAA changes	Gina Potter Stephen Brain	NSW Trade and Investment TTW
26 May 2015	MQU Current Ausgrid works and current and proposed developments	Cheralee Heynes Cedric Halforty	JDG Consulting Ausgrid
3 June 2015	Preferred point of entry and high voltage connection for the establishment of customer substation	Cheralee Heynes Cedric Halforty	JDG Consulting Ausgrid
Various	Multiple statements of available pressure and flow – Balaclava and Culloden Roads	Robert Wickham	Sydney Water
N/A	Macquarie University Ryde Campus Master Plan sewerage reticulation	Brian Frawley	Frawley Design Services Pty Ltd
N/A	Sydney Water services plans	N/A	Sydney Water
N/A	Jemena services plans	N/A	Jemena

Meetings (refer to attached meeting notes)			
Date	Subject	Between	Company
18 March 2015	Briefing on Campus-wide Guidelines with Department of Planning and Environment		
		Simon Bennett	DPE
		Mark Broomfield	Macquarie University
		Cameron Kline	Macquarie University
		John Richardson	Cox Richardson
		Ian Connolly	Cox Richardson
		Kim Vandenberg	Cox Richardson
		Kate Tudehope	JBA
16 April 2015	Briefing on Campus-wide Guidelines with City of Ryde Council		
		Dominic Johnson	City of Ryde
		Lexie Macdonald	City of Ryde
		Meryl Bishop	City of Ryde
		Mark Broomfield	Macquarie University
		Cameron Kline	Macquarie University
		John Richardson	Cox Richardson
		Kim Vandenberg	Cox Richardson
		Kate Tudehope	JBA
29 May 2015	Follow-up Discussion on Campus-wide Guidelines with City of Ryde Council		
		Lexie Macdonald	City of Ryde
		Meryl Bishop	City of Ryde
		Cameron Kline	Macquarie University
		Ian Connolly	Cox Richardson
		Kate Tudehope	JBA

Macquarie University Correspondence

1. TTW correspondence with Council and Office of Water

2. JDG correspondence with Ausgrid

3. DBA correspondence with Sydney Water and Jemena

1. TTW correspondence with Council and Office of Water

Taylor Thomson Whitting (NSW) Pty Ltd Consulting Engineers ACN 113 578 377
48 Chandos Street St Leonards NSW 2065 PO Box 738 Crows Nest NSW 1585
T 61 2 9439 7288 F 61 2 9439 3146 ttwsyd@ttw.com.au www.ttw.com.au

18/12/2014 131406

John Neish
General Manager
Ryde City Council
Locked Bag 2069
NORTH RYDE NSW 1670

Attention: Guna Verrasingham

UNIVERSITY CREEK, MACQUARIE UNIVERSITY

NOTIFICATION UNDER STATE ENVIRONMENTAL PLANNING POLICY (INFRASTRUCTURE) 2007

Dear Guna,

We refer to the above application for the rehabilitation and enhancement of University Creek within the grounds of Macquarie University. This letter follows on from earlier consultation undertaken in 2010 between Macquarie University and Council officers on this proposal.

The proposal involves a range of works, including re-aligning and re-contouring University Creek, stabilisation works, re-vegetation of the riparian corridor, and provision of a new pedestrian bridge. Overall, the proposed works seek to provide an improved water quality, flooding and public domain outcome for Macquarie University and the City of Ryde. The Stormwater Management Plan and Plans of the proposed rehabilitation works are attached for your information.

NSW Office of Water provided a Controlled Activity Approval for the works under the Water Management Act 2000 on 2 May 2011 (10 ERM2010/0230).

Under clause 111(1) of the State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP), development for the purposes of stormwater management systems may be carried out by or on behalf of a public authority without consent on any land.

For the purposes of the Infrastructure SEPP:

- Macquarie University is a public authority; and
- a stormwater management system means works for the collection, detention, distribution or discharge of stormwater, stormwater quality control devices, and stormwater reuse schemes.

© 2014 Taylor Thomson Whitting

TTW
TaylorThomsonWhitting

Structural
Civil
Traffic
Facade
Engineers

TTW Group

Directors
RT Green BE Hons MEngSc FIE Aust
D Carolan BE Hons MEngSc MIEAust
R Mackellar BE Hons MIEAust
B Young BE Hons MIEAust
M Eddy BE Hons MIEAust
R McDougall BE MIEAust
Technical Directors
P Yannoulatos BE Hons Dip LGE MIEAust
D Genner BE Hons MIEAust
S Brain BE Hons MIEAust
D Jeffree BE MIEAust
N Burdon ME(Civil) MIPENZ MIEAust
H Nguyen BScEng MIEAust
R Pratikna BE MConstMgt MIEAust
Associate Directors
S Schuetze BE Hons MIEAust
M Rogers BSc Hons MIEAust
D Taylor BE Hons MIEAust
J Tropiano BE MIEAust
P Lambley BE MIEAust
J Haling BE Hons MIEAust
D Mayne MEng Hons MIEAust
K Berry BE Hons MIEAust
G Fowlie BE Hons MIEAust
W Alexander BE Hons MIEAust
R Milsted MEng Hons MIEAust
Associates
S Nixon BE Hons MIEAust
N Biason BE MIEAust
N Khambatta BE Hons BCom MIEAust
M King BE Hons MIEAust
Jonathan Miles BE Hons
G Petschack JP
M Raddatz
Manager Facade
N McClelland BSc BE Hons MBA MIEAust

The proposed rehabilitation and enhancement works to University Creek are therefore classified as Development Permitted Without Consent under the Infrastructure SEPP.

Pursuant to clause 15 of the Infrastructure SEPP (consultation with Councils – development with impacts on flood liable land), we are now formally notifying you of the proposal, and we request that you provide any comments within 21 calendar days of the date of this letter.

It should be noted that Cox Richardson are also currently notifying RailCorp in accordance with clause 85/86 of the Infrastructure SEPP. We have notified the Office of Water of the changes to the approved scheme.

Should no correspondence be received in writing within the requested timeframe, we will assume that Council has no comment regarding this amended development and we will finalise the proposed works.

Should you require anything further please contact the undersigned.

For and on Behalf of

Taylor Thomson Whitting (NSW) Pty Ltd



TIM HENDERSON

Engineer

P:\2013\1314\131406\Letters\141216 Council notification.doc

Attached: Original and amended plans

Stormwater Management Plan

© 2014 Taylor Thomson Whitting

Tim Henderson

From: Guna Veerasingham [GVeerasingham@ryde.nsw.gov.au]
Sent: Tuesday, 20 January 2015 3:04 PM
To: Tim Henderson
Subject: RE: Notification of changes to works in University Creek (5 of 5)

Categories: 131406

Hi Tim,

I have reviewed the University Creek Stormwater Managements Plan. I also refer to TTW letter dated 18 December 2014.

The report confirmed that post developed outflow rate (Basin 1) from the Macquarie University will be much less than the pre developed flow rate. This is acceptable to City of Ryde. Please note that the models were not provided to City Ryde for its review. It is noted the report did not address the water quality component in details.

Therefore, City of Ryde is unable to comment on the report findings.

Please note that, I did not receive any formal letter from the Macquarie University.

Kind Regards

Guna Veerasingham
Team Manager Stormwater
Infrastructure Integration

City of Ryde
Lifestyle and opportunity @ your doorstep

This email is privileged and confidential. If you are not the intended recipient please delete the message and notify the sender. The use, copying or distribution of this message or any information it contains, by anyone other than the intended recipient is prohibited. Unless stated otherwise, this email represents only the views of the sender and not the views of the City of Ryde. Please note: information provided to Council in correspondence may be made publicly available, in accordance with the Government Information Public Access Act (GIPA Act) 2009.

From: Tim Henderson [mailto:Tim.Henderson@ttw.com.au]
Sent: Thursday, 18 December 2014 3:39 PM
To: Guna Veerasingham
Cc: Stephen Brain; robert.alcock@mq.edu.au; Ian.Connolly@cox.com.au; Cameron Kline
Subject: Notification of changes to works in University Creek (5 of 5)

Email 5 of 5

Tim Henderson
Civil Engineer
TaylorThomsonWhitting

L3, 48 Chandos St, St Leonards, NSW 2065
T: +61 2 8437 7206
W: www.ttw.com.au

TTW Sydney will be closed from the 24th December 2014 and re-open on the 5th January, 2015. We wish you a safe and joyous break and a happy New Year.



Please consider the environment before printing this email

From: Tim Henderson
Sent: Thursday, 18 December 2014 3:36 PM
To: 'gunav@ryde.nsw.gov.au'
Cc: Stephen Brain; 'robert.alcock@mq.edu.au'; 'Ian.Connolly@cox.com.au'; 'Cameron Kline'
Subject: Notification of changes to works in University Creek (1 of 5)

Guna,

Find attached our covering letter for the amended works on University Creek.

Also attached is the updated Stormwater Management Plan.

The following emails contain the drawings showing the proposed changes.

Regards,

Tim

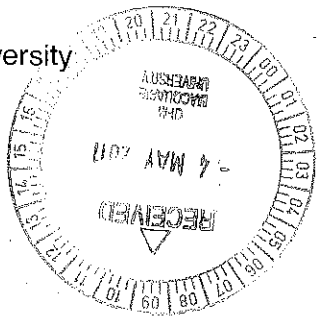
This email has been scanned by the Symantec Email Security.cloud service.
For more information please visit http://www.symanteccloud.com

NSW GOVERNMENT | Office of Water

Contact: Greg Brady
Phone: 02 9895 6154
Fax: 02 9895 7501
Email: greg.brady@ohn.nsw.gov.au

Our ref: 10 ERM2010/0230
File No: 9053772
Your Ref:

Macquarie University
Office of Major Projects
Building Y6A Macquarie University
North Ryde NSW 2109



Attention: Mark Broomfield

2 May 2011

Dear Mr Broomfield

Re: Controlled Activity Approval – ERM2010/0230 - Issue Date 2 May 2011
Modification works along Macquarie University Creek, Macquarie University

I refer to your application dated 15 June 2010 for a Controlled Activity Approval under the *Water Management Act 2000*. The NSW Office of Water acknowledges receipt of your application fee of $1,757.

Controlled Activity Approval

The NSW Office of Water has determined to grant you a Controlled Activity Approval. Please find enclosed the **Notice of Determination** together with your Controlled Activity Approval.

Your Controlled Activity Approval will expire on **2 May 2016**.

Please read carefully the conditions of the Controlled Activity Approval and seek clarification from the NSW Office of Water for any condition not fully understood.

You are required to provide a copy of this Approval and any annotated documentation to your certifier and to all contractors engaged in the implementation of these works or the Vegetation Management Plan (VMP) to ensure they are also aware of the conditions.

The Controlled Activity Approval must be kept current until all works have been completed. Applications for extension of the Controlled Activity Approval should be made to the NSW Office of Water, in writing, at least one month prior to the expiry date.

Security Deposit

The NSW Office of Water acknowledges receipt of your security which will be held until such time as the works, rehabilitation and any specified maintenance period related to this Controlled Activity Approval are complete. If the application is amended or the scope of the works are changed, then the value of the security may also be amended. Details of the security are as follows:

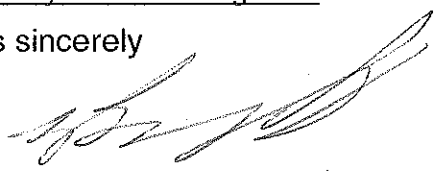
Registration Number	Provider	Value
195448840	NAB	$132,500
194025395	NAB	$132,500

Any security held by the NSW Office of Water for these works will only be returned after the reporting requirements and conditions of the approval have been met. If necessary, the works will be inspected by an officer from the NSW Office of Water to confirm that the requirements and conditions of the approval have been met. The current fee includes an inspection for each stage as listed. However, if extra inspections are required then additional fees will be incurred.

Additional fees may also apply if amendments or an extension to this Controlled Activity Approval are requested. Please contact the NSW Office of Water for advice on fees and charges.

Any questions regarding this correspondence should be directed to Greg Daley, greg.daley@water.nsw.gov.au

Yours sincerely



Greg Brady
Licensing Officer
NSW Office of Water
Licensing South

Enc:
Notice of Determination
Controlled Activity Approval
Annotated plans

Tim Henderson

From: Stephen Brain
Sent: Monday, 2 February 2015 2:57 PM
To: Tim Henderson
Subject: FW: FW: 10 ERM 2010/0230/File No: 9053772 for Macquarie University - University Creek CAA - Macquarie University, University Creek CAA changes

---

From: Gina Potter [mailto:gina.potter@dpi.nsw.gov.au]
Sent: Friday, 16 January 2015 5:27 PM
To: Stephen Brain
Subject: Re: FW: 10 ERM 2010/0230/File No: 9053772 for Macquarie University - University Creek CAA - Macquarie University, University Creek CAA changes

Ok.

I would like you to send me the plans by mail.

this is to include:
- a cover sheet that references exactly what plans are changing from existing CAA to new CAA
- 1 x overall plan that clearly shows old works vs new works
- 2 x altered plans

A cheque for $298. This is our hourly charge x 2. If it takes longer than 2 hours there will be a further charge. Please note that this CAA expires in June 2016. If the works are not completed by that time an extension will be required. The bonds we are currently holding for ERM10-0230 will remain in place.

regards,

Gina Potter | Water Regulation Officer
Water Regulation Group
NSW Trade & Investment | Level 11, 10 Valentine Avenue Parramatta | P O Box 3720 Parramatta 2124
T: +61 2 8838 7566 | F: +61 2 8838 7554
E: gina.potter@dpi.nsw.gov.au

On 14 January 2015 at 15:12, Stephen Brain <Stephen.Brain@ttw.com.au> wrote:

Gina

Kate Tudehope from JBA advised that:

The works are being undertaken as 'Development without Consent' under the Infrastructure SEPP. We're preparing a Review of Environmental Factors (REF) to accompany the application. The REF will be authorised / approved by the University, not Council.

As you know, we had a CAA for a previous REF. Whilst this is as completely new REF, we're just seeking to have the CAA amended.

As part of the consultation requirements under the Infrastructure SEPP, and separate to the CAA, we intend to consult with Council about the proposal.

Do Macquarie University need to provide anything further for your requirements?

Kind regards

Stephen Brain

From: Kate Tudehope [mailto:KTudehope@jbaurban.com.au]
Sent: Wednesday, 14 January 2015 1:45 PM
To: Stephen Brain
Cc: 'Robert Alcock'; 'Ian Connolly'; Darren Mansfield; Choong Oi
Subject: RE: 10 ERM 2010/0230/File No: 9053772 for Macquarie University - University Creek CAA - Macquarie University, University Creek CAA changes

Hi Stephen,

That's correct. The works are being undertaken as 'Development without Consent' under the Infrastructure SEPP. We're preparing a Review of Environmental Factors (REF) to accompany the application. The REF will be authorised / approved by the University, not Council.

As you know, we had a CAA for a previous REF. Whilst this is as completely new REF, we're just seeking to have the CAA amended.

As part of the consultation requirements under the Infrastructure SEPP, and separate to the CAA, we intend to consult with Council about the proposal.

Happy to discuss,

Kate.

Kate Tudehope / Senior Planner / JBA

Office +61 2 9956 6962 Direct +61 2 9409 4932

JBA - urban development services / jbaurban.com.au / @JBAnsw

Level 7, 77 Berry Street, North Sydney (PO Box 375, North Sydney NSW 2059)

This e-mail is intended only for the use of the individual or entity named above and may contain information that is confidential and privileged. If you are not the intended recipient, you are hereby notified that any dissemination, distribution or copying of this e-mail is strictly prohibited. If you have received this e-mail in error, please notify us by return e-mail or telephone, and delete the original message.

From: Stephen Brain [mailto:Stephen.Brain@ttw.com.au]
Sent: Wednesday, 14 January 2015 11:31 AM
To: Kate Tudehope
Cc: 'Robert Alcock'; 'Ian Connolly'; Darren Mansfield; Choong Oi
Subject: FW: 10 ERM 2010/0230/File No: 9053772 for Macquarie University - University Creek CAA - Macquarie University, University Creek CAA changes

Kate

I understand the works are not a section 96 or a new DA, can you confirm?

Thanks

Steve Brain

From: Gina Potter [mailto:gina.potter@dpi.nsw.gov.au]
Sent: Tuesday, 6 January 2015 12:42 PM
To: Stephen Brain
Cc: Robert Alcock; Ian Connolly; Choong Oi; Darren Mansfield
Subject: Re: 10 ERM 2010/0230/File No: 9053772 for Macquarie University - University Creek CAA - Macquarie University, University Creek CAA changes

Hi Stephen,

Will this be submitted to Council as an s96? Or will this be a new DA? In any case, changes will have to be referred to us from Council.

regards,

Gina Potter | Water Regulation Officer
Water Regulation Group
NSW Trade & Investment | Level 11, 10 Valentine Avenue Parramatta | P O Box 3720 Parramatta 2124
T: +61 2 8838 7566 | F: +61 2 8838 7554
E: gina.potter@dpi.nsw.gov.au

On 18 December 2014 at 08:34, Stephen Brain <Stephen.Brain@ttw.com.au> wrote:

Gina

Attached are overlays showing the proposed works in the riparian zone amended from that previously approved under the CAA.

The original planting plan will be amended to reflect the new works.

Please call to discuss when you have a chance

Thanks

Stephen Brain

0413 153 883

Stephen Brain
Technical Director

L3, 48 Chandos St, St Leonards, NSW 2065
T: +61 2 9439 7288
M: +61 413 153 883
W: www.ttw.com.au

TTW Sydney will be closed from the 24th December 2014 and re-open on the 5th January, 2015. We wish you a safe and joyous break and a happy New Year.

Please consider the environment before printing this email

From: Stephen Brain
Sent: Monday, 15 December 2014 8:48 AM
To: 'gina.potter@dpi.nsw.gov.au'
Cc: 'Robert Alcock'; 'Ian Connolly'; john.macris@mq.edu.au
Subject: Macquarie University, University Creek CAA changes

Gina

Attached are overlays showing the proposed works in the riparian zone amended from that previously approved under the CAA.

The original planting plan will be amended to reflect the new works.

Please call to discuss when you have a chance

Thanks

Stephen Brain

From: Robert Alcock [mailto:robert.alcock@mq.edu.au]
Sent: Wednesday, 19 November 2014 2:00 PM
To: Stephen Brain
Cc: John Macris; Ian Connolly
Subject: University Creek CAA

Stephen,

I have been advised that both Greg Brady and Greg Daley have parted from Office of Water and the new contact is Gina Potter ph 8838 7566 or gina.potter@dpi.nsw.gov.au

Regards

Rob Alcock
Senior Project Manager Infrastructure
PROPERTY
MACQUARIE UNIVERSITY NSW 2109

Ph: +61 (0)2 9850 1362
Fax: +61 (0)2 9850 7181

Mb: +61 427 871 537

Email: robert.alcock@mq.edu.au

This message is intended for the addressees named and may contain confidential information. If you are not the intended recipient, please delete it and notify the sender. Views expressed in this message are those of the individual sender, and are not necessarily the views of the Macquarie University Property or Macquarie University.

Please consider the environment before printing this email.

This email has been scanned by the Symantec Email Security.cloud service.
For more information please visit http://www.symanteccloud.com

This message is intended for the addressee named and may contain confidential information. If you are not the intended recipient, please delete it and notify the sender. Views expressed in this message are those of the individual sender, and are not necessarily the views of their organisation.

This email has been scanned by the Symantec Email Security.cloud service.
For more information please visit http://www.symanteccloud.com

This email has been scanned by the Symantec Email Security.cloud service.
For more information please visit http://www.symanteccloud.com

This message is intended for the addressee named and may contain confidential information. If you are not the intended recipient, please delete it and notify the sender. Views expressed in this message are those of the individual sender, and are not necessarily the views of their organisation.

Taylor Thomson Whitting (NSW) Pty Ltd Consulting Engineers ACN 113 578 377
48 Chandos Street St Leonards NSW 2065 PO Box 738 Crows Nest NSW 1585
T 61 2 9439 7288 F 61 2 9439 3146 ttwsyd@ttw.com.au www.ttw.com.au

10.02.2014 131406 P

Water Regulation Group
NSW Trade & Investment
P O Box 3720
Parramatta NSW 2124

Attention: Gina Potter

Macquarie University - University Creek

CAA changes

Dear Gina,

As requested in your email to Stephen Brain on 16/01/2015, please find attached:

- Approved plans for the Controlled Activity Authority - C104 [P5] and C106 [P8]
- Amended plans for the creek works in University creek - C104 [P6] and C106 [P9]
- A cheque for $298. (Your hourly charge x 2)

The key change between the approved plans and the amended plans is the removal of the road crossing and culvert control, and replacement with an elevated pedestrian bridge and a flood control weir which has equivalent hydraulic capacity as the previously approved system.

Should you require anything further please contact the undersigned.

For and on Behalf of

Taylor Thomson Whitting (NSW) Pty Ltd

Tim Henderson

Civil Engineer

P:\2013\1314\131406\Letters\150205 Office of Water letter.doc

© 2015 Taylor Thomson Whitting

TTW
TaylorThomsonWhitting

Structural

Civil

Traffic

Facade

Engineers

TTW Group

Directors
RT Green BE Hons MEngSc FIE Aust
D Carolan BE Hons MEngSc MIEAust
R Mackellar BE Hons MIEAust
B Young BE Hons MIEAust
M Eddy BE Hons MIEAust
R McDougall BE MIEAust
Technical Directors
P Yannoulatos BE Hons Dip LGE MIEAust
D Genner BE Hons MIEAust
S Brain BE Hons MIEAust
D Jeffree BE MIEAust
N Burdon ME(Civil) MIPENZ MIEAust
H Nguyen BScEng MIEAust
R Pratikna BE MConstMgt MIEAust
Associate Directors
S Schuetze BE Hons MIEAust
M Rogers BSc Hons MIEAust
D Taylor BE Hons MIEAust
J Tropiano BE MIEAust
P Lambley BE MIEAust
J Haling BE Hons MIEAust
D Mayne MEng Hons MIEAust
K Berry BE Hons MIEAust
G Fowlie BE Hons MIEAust
W Alexander BE Hons MIEAust
R Milsted MEng Hons MIEAust
Associates
S Nixon BE Hons MIEAust
N Biason BE MIEAust
N Khambatta BE Hons BCom MIEAust
M King BE Hons MIEAust
Jonathan Miles BE Hons
G Petschack JP
M Raddatz
Manager Facade
N McClelland BSc BE Hons MBA MIEAust

NSW GOVERNMENT | Office of Water

Controlled Activity Approval-(amended)

issued under the Water Management Act 2000 - for controlled activity on waterfront land in New South Wales

Reference No: 10 ERM2010/0230		**File No: 9053772**	
Controlled Activity Approval issued to: (Approval Holder)			
Name of Approval Holder:	**Macquarie University Office of Major Projects**		
Postal Address:	**Building Y6A Macquarie University**		
	Town/City **North Ryde**	State **NSW**	P/Code **2109**
Company Name:	**Macquarie University Office of Major Projects**		
Office Address:	**Building Y6A Macquarie University**		
	Town/City **North Ryde**	State **NSW**	P/Code **2109**
Property Owner/s:			
Name of Owner/s (1)	**Macquarie University**		
Postal Address:	**Macquarie University**		
	Town/City **North Ryde**	State **NSW**	P/Code **2109**
Name of Owner/s (2)			
Postal Address:			
	Town/City	State	P/Code
At the site described as:			
Property Address:	Macquarie University Creek, Macquarie University		
Lot 7	DP: 1047085	Portion	Parish
Lot 114	DP: 1129623	Portion	Parish
Name of watercourse	Macquarie University Creek		
Local Council: Ryde City Council		Development Reference:	
Details of Controlled Activity to be undertaken: ('the Controlled Activity')			
Modification works along Macquarie University Creek – reconstruct 2 road crossings with reconfigured culverts and road layouts – reconstruct 1 pedestrian crossing to accommodate future road with reconfigured culverts – bed and bank stabilisation – weed eradication – bed and bank planting – rectify existing pipe outfalls with rip rap and planting			
Period of Approval:			
Date of amended Issue: 09 April 2015		**Date of Expiry: 2 May 2016**	

Reference No: 10 ERM2010/0230	File No: 9053772
Conditions of Approval: This controlled activity approval is granted subject to the conditions listed.	

Number Condition

Plans, standards and guidelines

1 This Controlled Activity Approval number 10 ERM2010/0230 only applies to the controlled activity carried out at the location marked on Plan No. 1 (i.e. ***Overview of Geomorphological Condition and Sediment Dynamics of University Creek and Dwr SKC05, rev 1***) as approved by the NSW Office of Water and stamped on 2 May 2011 and 12 July 2012 and 09 April 2015. This Controlled Activity Approval does not permit controlled activities at any other site.

2 The approval holder must not transfer this Controlled Activity Approval 10 ERM2010/0230 without the written approval of the NSW Office of Water.

3 The approval holder must keep a copy of the current Controlled Activity Approval 10 ERM2010/0230 on site at all times and make this approval available to officers from the NSW Office of Water on request.

4 If the controlled activities described in this Controlled Activity Approval 10 ERM2010/0230, have not commenced or been completed within the period of this approval, the approval holder must apply to the NSW Office of Water for a new approval or seek an extension prior to the lapsing of the consent.

5 The approval holder must notify the NSW Office of Water in writing within 14 calendar days of any change in (i) site management; (ii) land ownership; (iii) land occupation.

6 The approval holder must comply with the requirements of each of the plans approved by the NSW Office of Water and stamped on 2 May 2011 and/or 12 July 2012 to the extend where the new works replace the old as follows:

Overview of Geomorphological Condition and Sediment Dynamics of University Creek; dwg no. Drawing 5; dated 27 Oct 09; by Coffey Geotechnics

Plan Showing Cross Section And Setout Stakes And Location Of Photographs Taken At University Creek, Macquarie University, Macquarie Park; dwg no. 34939S0 sheet 1, 2 and 3; dated 18-06-2012; by Lockley Land Title Solutions

University Avenue Waterloo Road, Job No 111484, dwg SKC05, rev P1, SKC06, sheets 1 and 2, Rev P2, all by Taylor Thomson Whitting

Macquarie University Creek Civil and Stormwater Masterplan; Job no: 111484: dwg No's:

C102; issue P1 dated 15.06.12;

C105, issue P1 dated 14.06.12

C106, issue P1 dated 14.06.12

C107, issue P1 dated 14.06.12

C109, issue P1 dated 27.06.12

C110, issue P1 dated 27.06.12

C111, issue P1 dated 27.06.12

C113, issue P1 dated 18.06.12

C114, issue P1 dated 18.06.12, all by Taylor Thomson Whitting

Landscape Plan – Sheets 1 to 9; dwg no. 10526_LWD_4001_D; issue D dated 14.07.10; by Context

Landscape Sections – Sheet 1; dwg no. 10526_LWD_5001_B; issue B dated 01.06.10; by Context

Macquarie University University Creek Rehabilitation Works, drawing set: dwg No's: 10526_LWD_0000, 4001 to 4004, 5001, all issue F, 8001 and 8002, all issue C, by Context

Typical Landscape Details And Planting Schedules; dwg no. 10526_LWD_5001_B; issue B dated 01.06.10; by Context

Macquarie University University Creek, Landscape Rehabilitation Plan (incorporating Vegetation

Management Plan, dated June 2012, by Context

The approval holder must comply with the requirements of each of the plans approved by the NSW Office of Water and stamped on 09/04/2015 as follows:

i. Plan No. C106, Siteworks Sht 2, Rev P8, dated 07/02/2013, prepared by Taylor Thomson Whitting

ii. Plan No. C106, Siteworks Sht 2, Rev P9, dated 28/11/2014, prepared by Taylor Thomson Whitting

iii. Plan No. C104, Civil & Stormwater Masterplan, Rev P5, dated 30/11/2012, prepared by Taylor Thomson Whitting

iv. Plan No. C104, Civil & Stormwater Masterplan, Rev P6, dated 28/11/2014, prepared by Taylor Thomson Whitting 28/11/2014

7 N/A

8 The approval holder must submit for approval, by the NSW Office of Water, any amendments to a plan listed in Condition 6 (six) prior to carrying out any works in relation to the approved controlled activity.

9 The approval holder must clearly mark on the ground, the boundaries of the areas where the controlled activity is to be carried out before commencement of the controlled activity, and maintain the markings until the works are completed.

10 - 15 N/A

16 The approval holder must maintain the approved controlled activity on waterfront land for a period of two (2) years from the date of completion of the controlled activity works.

17 The approval holder must complete a maintenance period of two (2) years after final planting for all areas described in the Vegetation Management Plan approved by the NSW Office of Water and stamped on 12 July 2012.

18 - 20 N/A

21 At practical completion and/or at the end of the maintenance period, the approval holder must provide a final written report to the NSW Office of Water evidencing completion of the approved controlled activity.

22 The approval holder must provide a report on the implementation of the vegetation management plan (VMP) to the NSW Office of Water at the completion of the revegetation works and at every twelve (12) months up to the end of the maintenance period that must include: (i) a schedule and map showing the vegetation species, number and location of initial and any replacement plantings and propagation materials, and (ii) the date of planting of vegetation, and (iii) the percentage cover of groundcover, shrubs, trees and weeds, and (iv) any problems that impacted on the survival rates of plants including climatic, fire, flooding and vandalism, and (v) a map of the location of any staged activities, and (vi) photographs showing the revegetation works during the reporting period.

23 N/A

24 The approval holder must provide a progress report to the NSW Office of Water every twelve (12) months.

25 The approval holder must notify the NSW Office of Water in writing within seven (7) days if the controlled activity (i) ceases for a period of more than 30 calendar days; or (ii) is terminated before its full completion, or (iii) is resumed.

26 The approval holder must provide security of $265,000 by way of bank guarantee to the NSW Office of Water prior to commencing the controlled activity work. The security deposit will be held until such time as the controlled activity, together with any rehabilitation or revegetation works, have been completed in accordance with the conditions of this approval. The approval holder must certify compliance with the conditions of this Controlled Activity Approval (certificate of compliance) prior to the release of any security being held for the controlled activity.

27 - 34 N/A

34 The approval holder must construct the box culverts so that the level of the bottom surface of the box

culverts are at the same level as the natural bed level of the river.

35 - 36 N/A

37 The approval holder must remove surplus material when operations cease and the controlled activity is completed.

38 - 41 N/A

42 The approval holder must establish erosion and sediment control works prior to the commencement of any other works on the site.

43 N/A

44 The approval holder must use only biodegradable materials for any erosion control matting in the riparian corridor.

45 The approval holder must decommission all erosion and sediment control works using a suitably qualified person when the site has stabilised.

46 The approval holder must (i) implement erosion and sediment control measures in accordance with the requirements of the Managing Urban Stormwater Manual, Volume 1, Soils and Construction (Landcom, 4th Edition, March 2004) prior to any works commencing at the site; and (ii) maintain the control measures for the duration of the approval to prevent sediment and dirty water entering the waterway.

47 - 59 N/A

60 The approval holder must ensure that all rock rip-rap surfaces are rough and aligned with the adjoining bed, bank and floodplain profile.

61 - 64 N/A

65 The approval holder must not use wire mesh structures, concrete, spray concrete, concrete grouting, crib walling, masonry or car tyres for bank stabilisation.

66 - 67 N/A

68 The approval holder must delineate, protect and maintain a riparian corridor as shown in the VMP in condition 69 .

69 The approval holder must revegetate all areas identified in the approved Vegetation Management Plan stamped by the NSW Office of Water on 12 July 2012. The approval holder must monitor and maintain revegetation works for a period of 2 (two) years in accordance with the approved vegetation management plan.

70 N/A

71 The approval holder must not remove or damage native vegetation on waterfront land.

72 The approval holder must not compromise the implementation of the Vegetation Management Plan (VMP) for any work and/or controlled activity at the site.

73 - 75 N/A

END OF CONDITIONS

Fee: Amendment fee $298 **has been paid** exclusive of GST **Receipt No:** PAP1053862

Controlled Activity Approval 10 ERM2010/0230 issued by: Gina Potter

2. JDG correspondence with Ausgrid

Tim Henderson

From: Cheralee Heynes [cheralee@jdg.com.au]
Sent: Tuesday, 26 May 2015 5:31 PM
To: 'Cedric Halforty'
Cc: 'David Matley'; Stephen Allan
Subject: MQ Current Ausgrid works and current and proposed developements
Attachments: 2067 - MQ Staging Proposal to Ausgrid 260515.pdf

Cedric,

Please find attached details of the current and future development for MQ University that is associated with the current Ausgrid projects SC05544 and the cable remediation project.

Please note loading and approximate dates of connection and the proposed connection staging for the new feeders.

Please provide this detail to HV planning to enable progression of the current projects.

Cheers,
Cheralee

JDG Consulting

Cheralee Heynes Associate | Electrical Engineer
Suite 407, Level 4, 2-8 Brookhollow Ave, Baulkham Hills NSW 2153 | PO Box 8114 Baulkham Hills BC NSW 2153
P: 02 8861 1888 F: 02 8861 1899 M: 0422 244 316 E: cheralee@jdgconsulting.com.au W: www.jdgconsulting.com.au

CONFIDENTIAL NOTICE
The contents of this email and its attachments are for the named recipient only, confidential, the subject of copyright & may be privileged. Any unauthorised use or distribution of the contents is expressly prohibited and will be considered a breach of the Company's copyright. If you receive this email in error, please contact us & delete the email. Any electronic version of an attachment does NOT represent professional advice by the Company. Only the signed original, hard copy version of the document represents the professional advice provided by the Company. Liability limited by a scheme approved under Professional Standards Legislation.

Macquarie University - Campus Electrical Infrastructure future Operational requirements as at May 2015.

Timeframe	Ausgrid Projects	Current & Planned Campus Building & Infrastructure Projects	Proposed GFA	Current GFA	Precinct Supplied from	Current Rating	Current Max Load	Anticipated Load on Completion of Project	Anticipated Load 2016	Anticipated Load 2017	Anticipated Load 2018	Anticipated Load 2019	Anticipated Load 2022	Estimated Cost	Status
Delivery May 2016	NEW CHAMBER SUBSTATION (Ausgrid project No. SC05544)	Construction of new Science Precinct Buildings with staged construction.	To serve proposed new buildings - GFA 60,000 sqm	Two existing buildings to be transferred for initial load	MPZSS	0 Amps	0 Amps	900 Amps	900 Amps	900 Amps	3500 Amps	5500 Amps	5500 Amps	$2M	Tendered for Construction
Delivery March 2016	New Kiosk Substations	A staged project to refurbish buildings E7A, E7B, Stage 1 of 3 to provide new infrastructure for replacement of existing Chamber Substation S1915 in stage 3.	38,000sqm	36,600sqm	EZSS	4000 Amps	2690 Amps	3350 Amps	3350 Amps	3350 Amps	3350 Amps	3350 Amps	3350 Amps	$40M	Tendered for Construction
Delivery March 2016	HV Feeders from Macquarie Zone Substation Completion Project	Station North Precinct Development Station South Precinct Development	240,000 GFA	University housing to be demolished.	MPZSS	0 Amps	0 Amps	800 Amps (*Stage 1)	800 Amps	3500 Amps (*Stage 2)	7500 Amps	7500 Amps	15000 Amps (*Stage 3)	$0.6M	Ready for tender

Macquarie Zone Substation Feeder establishment staging of connection of Load		Expected new load required for development.
Stage 1	Connection of 2 new 500AL3 HV cables from Macquarie Zone Substation to Macquarie University. Proposed connection point is existing substation S.4874 Macquarie Uni Becton currently on Epping Zone Panel 47. Proposal is to cut the existing HV cables in Research Park Drive and join together to complete the Panel 47 feeder cable connection and then join the two HV cables connected to substation S.4874 to the two new feeders from Macquarie Zone Substation. Alternatively, one cable could remain connected from Panel 47 and one new feeder TJointed to Panel 47 to provide connectivity to Panel 47 from the new Macquarie Zone Substation Feeders.	No new load for Macquarie University is required at commissioning of the cables. Proposed connection into S.4874 allows for 800Amps to be connected to new feeders and shifted from existing Epping Zone Panel 47 depending on approved arrangement. Temporary builders supply will be requested for stage 2 works.
Stage 2	Establish new chamber substations for supply to Station North Precinct. Expected connection will be 2 off 2 (or 3) x 1500kVA substations to be connected into one of the new feeders Panel 2L and 29L as shown on Stage 2 sketch (sheet 3) dated 25 May 2015. Substation S.4874 will remain connected feeding the existing Becton building. Cencept design and marketing for Station North Precinct commencing June 2015. Construction expected to commence 2017 with completion and full connection of load 2018.	Development will be mixed residential/commercial multi storey towers positioned behind the train station accessed from both Herring and University Avenue. Expected diversified load is 7500Amps. Temporary builders supply will be required at construction commencement.
Stage 3	Establish new chamber substations for supply to Station South Precinct. Expected connection will be 2 off 2 (or 3) x 1500kVA substations to be connected into one of the new feeders as shown on Stage 3 sketch 25 May 2015. Existing buildings to be demolished. Works are expected to commence 2019 with completion 2020.	Development will be mixed residential/commercial multi storey towers positioned at the current location of the Robert Menzies building. Expected diversified load is 7500Amps.

Notes:

1. New Science Precinct chamber substation to supply new buildings with initial load from adjacent buildings F7B & F9B. New Science buildings to have staged construction commencing 2017 with completion 2019.

2. Chamber Substation S1915 is located inside building E7B, from which electrical sub-mains radiate to supply 6 other buildings, thus E7B MSB is a precinct MSB, the refurbishment project provides the opportunity to replace S1915, with a new dual kiosk installation, to allow transfer of the existing electrical loads from E7B MSB and a new precinct switch room.

3. Incomplete HV feeder installation to be completed. The project was originally stopped by Ausgrid due with water at MQ Zone. Existing non energised Cables to be tested and extended at both ends and commissioned. Transfer of existing Kiosk substation S4874 from existing Epping Zone Panel 47 supply to feeder cables for an initial load to allow energising of the cables and connection to the zone for future loads. Refer Staging below and on attached diagrams.

S.8421
S.8723
S.1915
Tunnel
S.7328
Capacity
3.0MVA
S.8147
S.8422
S.36012
S.36013
S.7392
Library
S.8146
Pa51
S.35642
S.35643
S.65031
S.47529
S.35844
S.6154
S.4873
S.7741
S.7740
Pa47
S.4874
S.8697
S.8698
S.1796
Pa10
Tunnel
S.3673
Hearing
Hub
Pa14
Current
FROM EPPING ZONE
SUBSTATION
S.47942
Cochlear
S.36014
Capacity
4.5MVA
S.3771
NEW & EXISTING 11kV FEEDERS
FOR KNOWN NEW DEVELOPMENT
FROM MACQUARIE
PARK ZONE
SUBSTATION
S.3515

LEGEND

- S.35642 — SUBSTATION NUMBER
- EA SUBSTATION - KIOSK OR CHAMBER
- EPPING ZS 11kV FEEDER - RUN U/G
- MACQUARIE ZS 11kV FEEDER - RUN U/G
- BUILDING DEVELOPMENT AREAS

EXISTING - PROPOSED CONNECTION FOR SC05544

2067 Sheet 1 25 May 2015

JDG Consulting

S.8421
S.8723
S.1915
Tunnel
S.8422
S.7392
S.36012
S.36013
Library
Tunnel
S.3673
Hearing
Hub
S.47942
FROM EPPING ZONE
SUBSTATION
Cochlear
S.36014
Capacity
4.5MVA
S.8147
S.7328
Capacity
3.0MVA
S.8146
S.65031
4.5 MVA
Pa51
S.35642
S.35643
S.47529
S.35844
S.6154
S.4873
S.7741
Pa47
S.4874
S.7740
S.8697
S.8698
S.1796
Pa10
Pa14
Current
Pa2L
Pa29L
FROM EPPING ZONE
SUBSTATION
NEW & EXISTING 11kV FEEDERS
FOR KNOWN NEW DEVELOPMENT
S.3771
S.3515
FROM MACQUARIE
PARK ZONE
SUBSTATION

LEGEND

- EA SUBSTATION - KIOSK OR CHAMBER
- S.35642 SUBSTATION NUMBER
- EPPING ZS 11kV FEEDER - RUN U/G
- MACQUARIE ZS 11kV FEEDER - RUN U/G
- BUILDING DEVELOPMENT AREAS

STAGE 1 - COMPLETION OF REMEDIATION WORKS

2067 Sheet 2 25 May 2015

JDG Consulting

S.8421
S.8723
S.1915
Tunnel
S.7328
Capacity
3.0MVA
S.8147
S.8422
S.7392
S.36012
S.36013
Library
Tunnel
S.8146
S.35642
S.35643
Pa51
S.35789
S.47529
S.65031
4.5 MVA
S.35844
S.6154
S.4873
S.7741
Pa47
S.4874
S.7740
S.8697
S.8698
Pa10
5 MVA
Station
Precinct
North
S.1796
S.3673
Hearing
Hub
Pa14
Pa2L
Pa29L
FROM EPPING ZONE
SUBSTATION
S.47942
Current
Cochlear
S.36014
Capacity
4.5MVA
S.3771
NEW & EXISTING 11kV FEEDERS
FOR KNOWN NEW DEVELOPMENT
FROM MACQUARIE
PARK ZONE
SUBSTATION
S.3515
FROM EPPING ZONE
SUBSTATION

LEGEND

- EA SUBSTATION - KIOSK OR CHAMBER
- S.35642 SUBSTATION NUMBER
- EPPING ZS 11kV FEEDER - RUN U/G
- MACQUARIE ZS 11kV FEEDER - RUN U/G
- BUILDING DEVELOPMENT AREAS

STAGE 2 - STATION NORTH PRECINCT CONNECTION 2067 Sheet 3 25 May 2015

JDG Consulting

S.8421
S.8723
S.1915
Tunnel
S.8422
S.7392
S.36012
S.36013
Library
Tunnel
S.3673
Hearing
Hub
S.47942
FROM EPPING ZONE
SUBSTATION
Cochlear
S.36014
Capacity
4.5MVA
S.8147
S.7328
Capacity
3.0MVA
S.8146
Pa51
S.35642
S.35643
S.65031
4.5 MVA
S.47529
S.35844
S.6154
S.4873
S.7741
S.7740
Pa47
S.4874
S.8697
S.8698
Pa10
6 MVA
Station
Precinct
North
S.1796
Pa14
Current
Pa2L
Pa29L
FROM EPPING ZONE
SUBSTATION
Station
Precinct
South
6 MVA
S.3771
NEW & EXISTING 11kV FEEDERS
FOR KNOWN NEW DEVELOPMENT
FROM MACQUARIE
PARK ZONE
SUBSTATION
S.3515

LEGEND

S.35642 — EA SUBSTATION - KIOSK OR CHAMBER
SUBSTATION NUMBER
EPPING ZS 11kV FEEDER - RUN U/G
MACQUARIE ZS 11kV FEEDER - RUN U/G
BUILDING DEVELOPMENT AREAS

STAGE 3 - STATION SOUTH PRECINCT CONNECTION

2067 Sheet 4

25 May 2015

JDG Consulting

Tim Henderson

From: Cedric Halforty [chalfort@ausgrid.com.au]
Sent: Wednesday, 3 June 2015 12:02 PM
To: Cheralee Heynes
Subject: Macquarie University
Attachments: D15 371802 SC05544 - XCH013324 - HVCon Response Amendment A.pdf

Hi Cheralee,

Just want to say thank you for the load forecast plan. Our Distribution Planning Section is satisfied with the plan and hence has advised that connection details will be issued for both the Science Precinct substation and the feeder cable project. I have meanwhile received the connection details for the Science Precinct Substation and it is attached. Nic Lamb is now looking after this project. Regarding the feeder cable project could you please advise whether a new kiosk substation is to be connected to the feeder cables or do you still want to connect an existing substation to the feeder cables

Regards,

Cedric

From: "Cheralee Heynes" <cheralee@jdgconsulting.com.au>
To: "Cedric Halforty" <chalfort@energy.com.au>,
Date: 02/06/2015 10:27 AM
Subject:

Cedric,

I could only find the response which I flicked to you. I have to go and will look later if needed. Please let me know.

Cheers,
Cheralee

JDG Consulting

Cheralee Heynes Associate | Electrical Engineer

Suite 407, Level 4, 2-8 Brookhollow Ave, Baulkham Hills NSW 2153 | PO Box 8114 Baulkham Hills BC NSW 2153

P: 02 8861 1888 F: 02 8861 1899 M: 0422 244 316 E: cheralee@jdgconsulting.com.au W: www.jdgconsulting.com.au

CONFIDENTIAL NOTICE

The contents of this email and its attachments are for the named recipient only, confidential, the subject of copyright & may be privileged. Any unauthorised use or distribution of the contents is expressly prohibited and will be considered a breach of the Company's copyright. If you receive this email in error, please contact us & delete the email. Any electronic version of an attachment does NOT represent professional advice by the Company. Only the signed original, hard copy version of the document represents the professional advice provided by the Company. Liability limited by a scheme approved under Professional Standards Legislation.

This e-mail may contain confidential or privileged information.
If you have received it in error, please notify the sender immediately
via return e-mail and then delete the original e-mail.
If you are the intended recipient, please note the change of sender email address to @ausgrid.com.au.

Ausgrid has collected your business contact details for dealing with you in your business capacity. More information about how we handle your personal information, including your right of access is contained at http://www.ausgrid.com.au/

HVCON2014_255A Project Number: SC-05544

02 June 2015

Sent to: "Manager – Distribution Planning" (Mark Appleton) / Negotiating Officer – Hornsby (Nic Lamb)

Copy to: Branch File 342.081 General (Macquarie Park)

PREFERRED POINT OF ENTRY AND HIGH VOLTAGE CONNECTION FOR THE ESTABLISHMENT OF CUSTOMER SUBSTATION S.65031 MACQUARIE UNI NO.15, MACQUARIE UNIVERSITY

Following is a reply to your initial request dated 2nd July 2014 and subsequent correspondence requesting the Preferred Point of Entry and the HV connections for the above project.

PREFERRED POINT OF ENTRY

The preferred point of entry for the proposed substation is from the Research Park Dr entrance to the site.

HV CONNECTIONS

1) Refer to attached diagrams.

2) Close a normally open point at Sw/B at S.35643 Talavera Christie No.3.

3) Form a normally open point at Sw/A at S.35642 Talavera Christie No.2.

4) Close a normally open point at Sw/A at S.47529 Talavera Technology.

5) Form a normally open point at Sw/B at S.47529 Talavera Technology.

6) Where trenching works are required install a 4 x 150mm conduit bank suitable for HV use.

VOLTAGE DROPS AND NOMINAL 3 PHASE FAULT LEVELS

1) Assuming a source three phase Fault Level on the Tx1 11kV group busbar at S.8000 Macquarie Park zone substation of 8.87kA, the three phase fault level* on the HV side of the proposed substation S.65031 is anticipated to be 6.40kA.

2) Assuming a maximum voltage level on the Tx1 11kV group busbar at S.8000 Macquarie Park zone substation of 10.55kV, the voltage level* at the proposed substation S.65031 is anticipated to be 10.46kV (0.84%VD).

*Please note this data is NOMINAL, and for a NORMAL network configuration. It is based on the current data in the GIS, and on the 11kV Busbar fault information provided by Subtransmission Planning. The actual Voltage Drop and 3 Phase Fault Levels may differ (for example) due to network switching, paralleling of Transformers, the effects of future projects, Transformer tap settings, and the currency / accuracy of the GIS data and the 11kV busbar fault level provided. The Fault Level is not the minimum Fault Level for equipment ratings. See NS-114 (Chamber Substations), NS-117 (Kiosks Substations), NS-122 (Pole Mounted Substation) and also refer to "Clause 1.10.4 and 7.5.4" of the New South Wales Service and Installation Rules dated October 2006 Amendment 2: January 2009 for further information.

Notes:-

1. Where single core cables are to be installed for lengths greater than 10 metres, always use 300mm² Cu bundled single core cables ie.Triplex, unless stated otherwise by Distribution Planning.
2. When cables are installed in Thermally Stable Bedding (TSB) material the data capture must include the appropriate Conductor Codes and geo spatial of the cross section. If TSB needs to be installed then Distribution Planning will specify requirements.
3. When additional ducts (such as LV ducts) are combined with HV ducts in the same trench, if > 4 ducts are installed (excluding communication ducts) then TSB should be installed. Please contact Distribution Planning to discuss TSB requirements.
4. To minimise the effect of mutual heating on parallel sections of mains, whenever new cable/s are installed (for parallel lengths in excess of 10m) a minimum separation of 4 meters is to be maintained from all Transmission assets (33-330 kV) and 2m is to be maintained from existing distribution mains (415V/11kV) (transverse crossings are not a significant issue), unless stated otherwise by Distribution Planning.
5. Wherever excavation is carried out, please email Andrew Lloyd- Engineer- Standards & Communications to determine if an additional duct suitable for Fibre/Communications will be required.
6. These HV Connections are only valid for a period of 12 months from the day of issue.

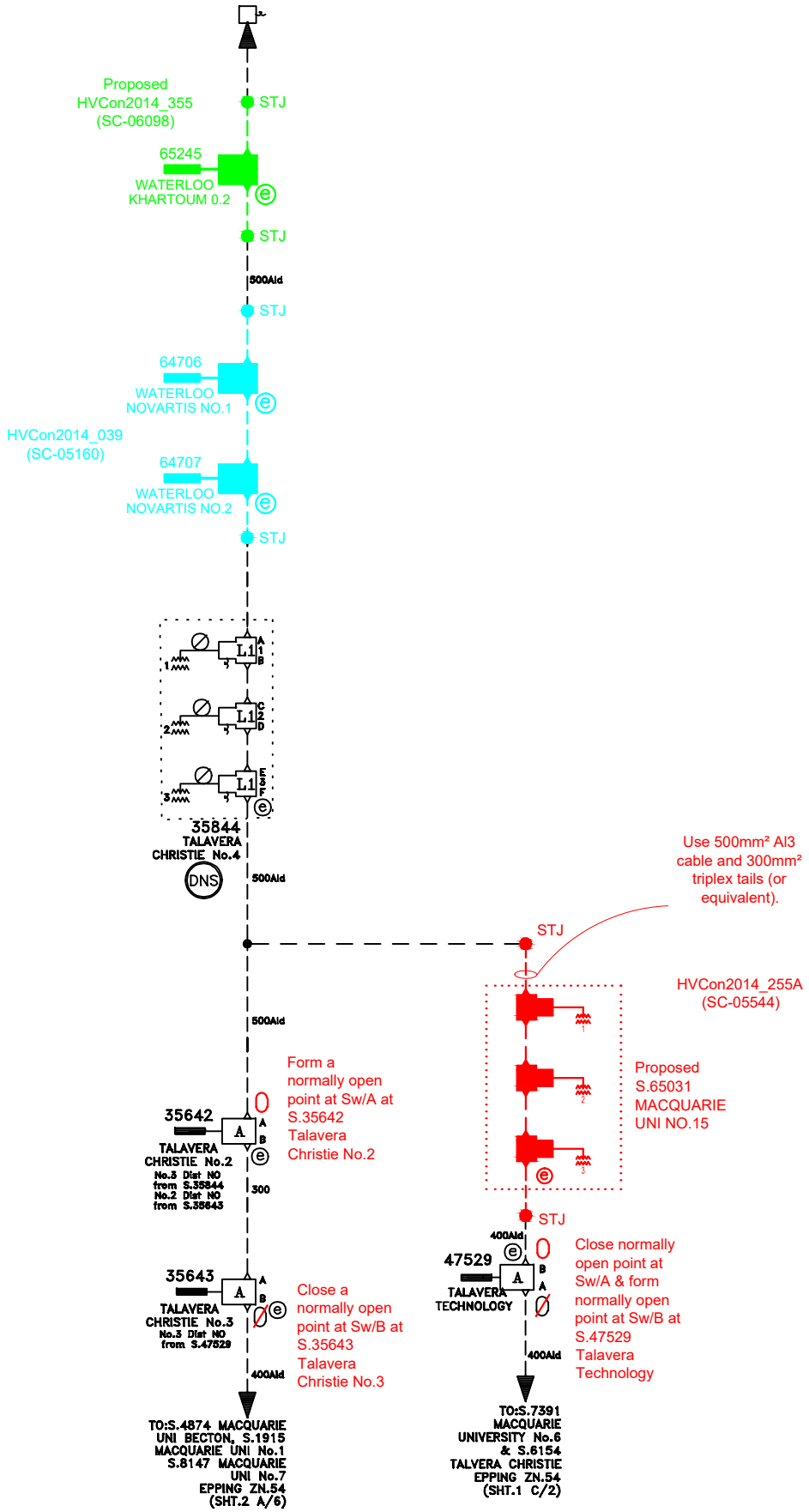
There are no other special planning requirements, however should there be any further changes to the loading information, substation design or site details please discuss with Ahmad Chehade on telephone extension 34639.

_____

Ahmad Chehade
Engineering Officer - Distribution Planning Sydney

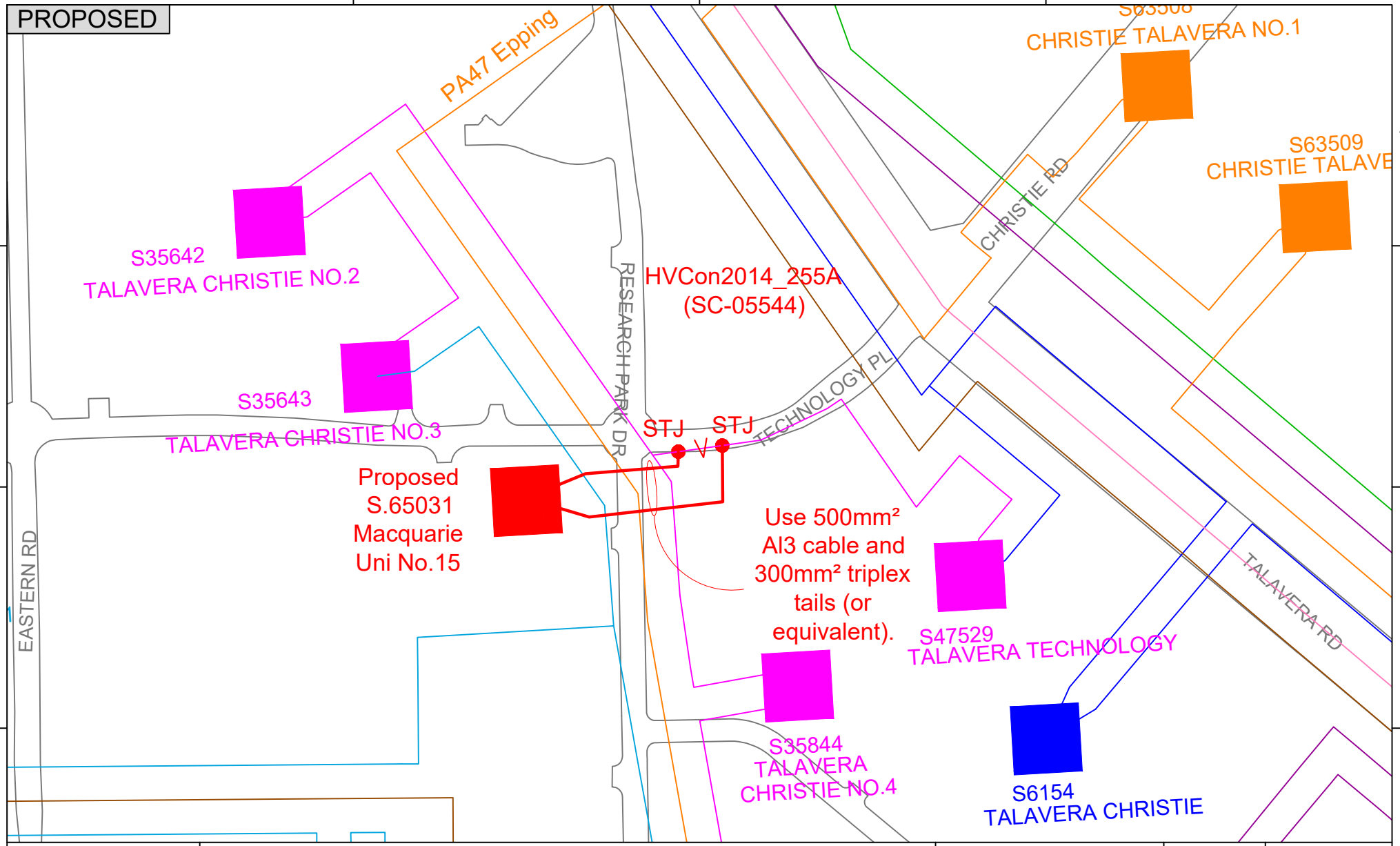
PROPOSED

10R



Ausgrid Distribution Planning Level 6 570 George St Sydney NSW 2000	HIGH VOLTAGE CONNECTION FOR THE ESTABLISHMENT OF CUSTOMER SUBSTATION S.65031 MACQUARIE UNI NO.15, MACQUARIE UNIVERSITY	MACQUARIE PARK 81	SAP NUMBER: SC-05544 PROJTRAK No.: ---- 2 JULY 2015
		A4 HVCON2014_255A AMD 1	Sheet 3 of 4 Sheets

©



Ausgrid
Distribution Planning
Level 6 570 George St
Sydney NSW 2000

HIGH VOLTAGE CONNECTION FOR THE ESTABLISHMENT OF CUSTOMER SUBSTATION S.65031 MACQUARIE UNI NO.15, MACQUARIE UNIVERSITY

MACQUARIE PARK 81	SAP NUMBER	SC-05544	
	PROJTRAK No.	----	
	2 JULY 2015		
A4	HVCON2014_255A	AMD 1	Sheet 4 of 4 Sheets

©

3. DBA correspondence with Sydney Water and Jemena

Tim Henderson

From: Rami Osman [Rami.Osman@jemena.com.au]
Sent: Wednesday, 24 June 2015 7:02 AM
To: David Buckle
Subject: D87373-Mac Uni Waterloo and Herring Rds valve covers
Attachments: b1sp6049.pdf; 20111104_003.jpg

Importance: High

Hi David,
Earlier, I have sent you the preliminary design and an example of what type of lids we can provide, the best way to match the landscaping is to sand blast the lids, it will not be a 100% match (like what you proposed earlier) but within acceptable level.
Furthermore, the syphon stones are the existing small yellow ground markers, the colour of these markers will stay the same to comply with the Australian Standard.

Finally, our designer has highly recommended that the lids and the syphon stones shall be installed when the installation of the new landscape will commence, so we can match the levels. Therefore, I would appreciate if you can give me a 2months early notice before commencing landscaping, so I can proceed with this project.

If you need any further information please contact me,
Thanks & Regards,
Rami Osman
Project Manager
External WorksTeam
Jemena
4A Bellevue Circuit, Pemulwuy, NSW 2145
Postal Address: P.O.Box 1220, North Sydney, NSW 2059
(02) 9867 7250 | 0437 274 46
rami.osman@jemena.com.au | www.jemena.com.au

Natural Gas Jemena bringing energy to life

From: David Buckle [mailto:david@davidbuckle.com.au]
Sent: Tuesday, 23 June 2015 4:29 PM
To: Rami Osman
Subject: RE: D87373-Mac Uni Waterloo and Herring Rds valve covers

Rami,

The architect and the uni need confirmation of what action you are taking.
We expressed a strong preference for gatic infill covers with infill to match the pavement as per the station covers..
Can you please confirm what you propose to do to improve the appearance of these multiple covers.

Regards,

David Buckle

David Buckle & Associates (NSW) Pty.Ltd. Suite 8, 38 Rowe Street Eastwood NSW 2122
Ph: 02 9804-8086 Fax: 02 9804-8685 Mob: 0438-007277 email:david@davidbuckle.com.au

---

From: Rami Osman [mailto:Rami.Osman@jemena.com.au]
Sent: Tuesday, 23 June 2015 10:57

To: David Buckle
Subject: RE: D87373-Mac Uni Waterloo and Herring Rds valve covers

Hi David,

I tried to call you earlier and I left a message, can you please clarify your email? What do you mean by" we are ok to document the 3 Gatic infill covers for this now"?

Happy to discuss it on the phone.

If you need any further information please contact me,
Thanks & Regards,
Rami Osman
Project Manager
External WorksTeam
Jemena
4A Bellevue Circuit, Pemulwuy, NSW 2145
Postal Address: P.O.Box 1220, North Sydney, NSW 2059
(02) 9867 7250 | 0437 274 46
rami.osman@jemena.com.au | www.jemena.com.au

From: David Buckle [mailto:david@davidbuckle.com.au]
Sent: Sunday, 21 June 2015 12:16 PM
To: Rami Osman
Subject: RE: D87373-Mac Uni Waterloo and Herring Rds valve covers

Rami,

Could you advise the status of this please

Regards,

David Buckle

David Buckle & Associates (NSW) Pty.Ltd. Suite 8, 38 Rowe Street Eastwood NSW 2122
Ph: 02 9804-8086 Fax: 02 9804-8685 Mob: 0438-007277 email:david@davidbuckle.com.au

---

From: David Buckle
Sent: Wednesday, 29 April 2015 04:52
To: 'Rami Osman'
Subject: FW: D87373-Mac Uni Waterloo and Herring Rds valve covers

Rami,

Can you confirm we are ok to document the 3 Gatic infill covers for this now.

Regards,

David Buckle

David Buckle & Associates (NSW) Pty.Ltd. Suite 8, 38 Rowe Street Eastwood NSW 2122
Ph: 02 9804-8086 Fax: 02 9804-8685 Mob: 0438-007277 email:david@davidbuckle.com.au

From: David Buckle
Sent: Wednesday, 1 April 2015 03:26
To: Rami Osman
Subject: RE: D87373-Mac Uni Waterloo and Herring Rds valve covers

Hi Rami,

Confirming our desire to have Cast Iron Inset type covers equal to those supplied by Aco Polycrete.
http://www.acoaus.com.au/access/acctrix.php

They provide design assistance and have all the technical information.

I spoke to the Architect and they do intend to use the same paving as is currently laid on the Station side.

Your pits will be secure once the covers and frames are installed and the veneer finishes would be installed by the paving contractor.
This would all be to your approval.

Please let me know if you need anything further.
I'll catch up with you next week and hopefully confirm the cover types.

Regards,

David Buckle

David Buckle & Associates (NSW) Pty.Ltd. Suite 8, 38 Rowe Street Eastwood NSW 2122
Ph: 02 9804-8086 Fax: 02 9804-8685 Mob: 0438-007277 email:david@davidbuckle.com.au

---

From: Rami Osman [mailto:Rami.Osman@jemena.com.au]
Sent: Wednesday, 1 April 2015 12:12
To: David Buckle
Subject: D87373-Mac Uni Waterloo and Herring Rds valve covers
Importance: High

Hi David,

As per our site meeting, we are still waiting to receive the information from you.

If you need any further information please contact me,
Thanks & Regards,

Rami Osman
Project Manager-External Works
Jemena
4A Bellevue Circuit, Pemulwuy, NSW 2145
(02) 9867 7250 | 0437 274 467
rami.osman@jemena.com.au | www.jemena.com.au



From: David Buckle [mailto:david@davidbuckle.com.au]
Sent: Thursday, 19 March 2015 11:44 AM
To: Rami Osman
Cc: Robert Alcock; Stephen Brain; Danny Guerrera; Adrian Gallegos
Subject: RE: Mac Uni Waterloo and Herring Rds valve covers

Thanks Rami,

I will forward the latest pavement drawing.

Confirming our meeting Wed 25/3 at 12 midday to discuss.
I've sent a meeting invite via outlook.

Regards,

David Buckle

David Buckle & Associates (NSW) Pty.Ltd. Suite 8, 38 Rowe Street Eastwood NSW 2122
Ph: 02 9804-8086 Fax: 02 9804-8685 Mob: 0438-007277 email:david@davidbuckle.com.au

---

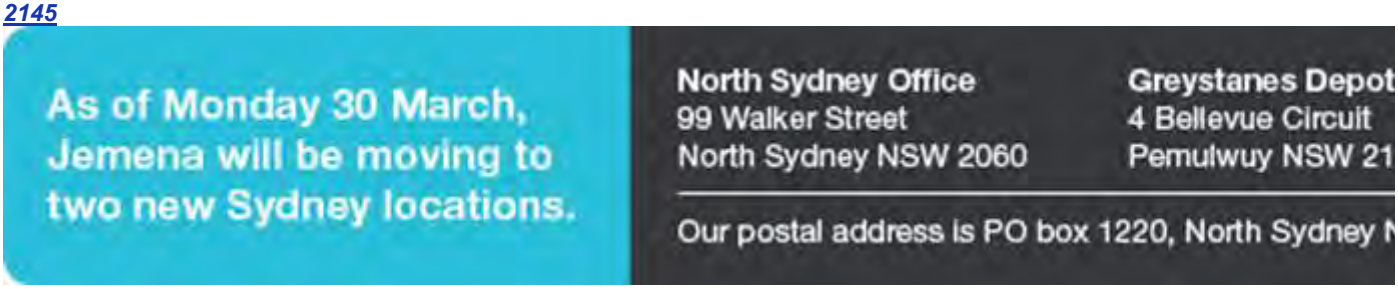
From: Rami Osman [mailto:Rami.Osman@jemena.com.au]
Sent: Monday, 16 March 2015 03:41
To: David Buckle
Cc: Robert Alcock; Stephen Brain; Danny Guerrera; Adrian Gallegos
Subject: RE: Mac Uni Waterloo and Herring Rds valve covers
Importance: High

Dear David,
I tried to call you earlier and I left a message.
Just a follow up email regarding the Landscaping design drawing and colour, can you please provide me these information, so I can liaise with the designer for the panels.

If you need any further information please contact me,
Regards,

Rami Osman
Project Manager
Jemena
100 Bennelong Parkway, Sydney Olympic Park, NSW 2127
(02) 9397 9440 | 0437 274 467
rami.osman@jemena.com.au | www.jemena.com.au

We are moving! As of Monday 30 March 2015, Jemena's new depot will be located at 4 Bellevue Circuit, Pemulwuy NSW 2145



From: Adrian Gallegos
Sent: Friday, 13 March 2015 3:39 PM
To: David Buckle
Cc: Robert Alcock; Stephen Brain; Rami Osman; Danny Guerrera
Subject: RE: Mac Uni Waterloo and Herring Rds valve covers

Thanks for meeting with me yesterday David.

Rami Osman will oversee the project on behalf of Jemena. He will be in contact to look at your landscape plan, and is already in touch with one of our designers looking at options.

He will arrange a budget price for you and organise a pipeline locator for the mains crossing of Waterloo Road and the front of the University.

Rami's contact details are as follows:



Rami Osman – Project Coordinator

Jemena
External Works
100 Bennelong Road
Sydney Olympic Park, NSW 2127, Australia

Email: rami.osma
Phone: 0293979
Mobile: 0437274
Fax:

Danny Guerrera from Land Services will be in contact to arrange for an easement of Jemena assets on University grounds.

Regards

Adrian Gallegos
Program Manager
Jemena
100 Bennelong Parkway, Sydney Olympic Park, NSW 2127
(02) 9397 9272 | 0407 910 756
Adrian.gallegos@jemena.com.au | www.jemena.com.au

Jemena
bring ng energy to life

As of Monday 30 March, Jemena will be moving to two new Sydney locations.

North Sydney Office
99 Walker Street
North Sydney NSW 2060

Greystanes Depot
4 Bellevue Circuit
Pemulwuy NSW 21

Our postal address is PO box 1220, North Sydney

From: David Buckle [mailto:david@davidbuckle.com.au]
Sent: Friday, 13 March 2015 3:22 PM
To: Adrian Gallegos
Cc: Robert Alcock; Stephen Brain
Subject: FW: Mac Uni Waterloo and Herring Rds valve covers

Hi Adrian,

Thanks for your time on site yesterday, much appreciated. Hopefully we can work to tidy all this up and get a good result.

Here are my notes, please feel free to add or amend if you see anything I've missed.

. The University are redeveloping the area and want to rationalise the various valve boxes and the regulator under 3 rectangular inset covers similar to the attached images.
. New pavement levels will be very close to existing, say within 50mm.
. We need to accurately locate the existing 1050 kPa and 210 gas lines gas lines as the records seem to conflict with what we see on site
. We need to confirm the pipework arrangement and valving.
. The existing retaining wall is moving and the risers need to be relocated as per my sketch.

Could you put me in touch with the correct people in Jemena who can assist in resolving the details and commit to actions.

Thanks again,

David Buckle

David Buckle & Associates (NSW) Pty.Ltd. Suite 8, 38 Rowe Street Eastwood NSW 2122
Ph: 02 9804-8086 Fax: 02 9804-8685 Mob: 0438-007277 email:david@davidbuckle.com.au

---

From: David Buckle
Sent: Wednesday, 4 March 2015 11:14
To: adrian.gallegos@jemena.com.au
Subject: FW: Mac Uni Waterloo and Herring Rds valve covers

Adrian,

Neale Hilton passed on your name as being the right person to contact so hopefully that is ok.
We are hydraulic services consultants acting for Macquarie University.
There is a Jemena district regulator on University land, in the footpath of the extension of Waterloo Road, corner Herring Road North Ryde.
The University has a Gateway Project which will result in significant improvements to pavements and amenity.
Levels over the Jemena equipment will remain substantially unaltered but the University wants to rationalise the existing valve and regulator covers preferably under 1 or 2 gatic insert covers so all that is visible would be the edge strips, similar to a sewer manhole in decorative pavement.
I have attached a street view image.
This infrastructure is inside the University Boundary.

Could we meet to discuss this.

Regards,

David Buckle

David Buckle & Associates (NSW) Pty.Ltd. Suite 8, 38 Rowe Street Eastwood NSW 2122
Ph: 02 9804-8086 Fax: 02 9804-8685 Mob: 0438-007277 email:david@davidbuckle.com.au

---

From: Neale Hilton [mailto:Neale.Hilton@jemena.com.au]
Sent: Thursday, 26 February 2015 07:17
To: David Buckle
Subject: RE: Mac Uni Waterloo and Herring Rds valve covers

Neither has the service going to Trinity Chapel
Looks like there are two issues for the Uni, 1 to get an easement/s created, and 2 renew the proposed new hard surfacing to the current levels.
Technically I am not knowledgeable to advise of what is required to change the type of covers or raise or lower any component of this Regulator Station. I suggest that this be itemised and sent to
Jemena – Land Services
Attn A. Gallegos
PO Box 6507
SILVERWATER NSW 2128

Neale Hilton
Network Development Manager
Jemena
Level 20, 111 Pacific Hwy, North Sydney, NSW 2060
M 0402 060 151
neale.hilton@jemena.com.au | www.jemena.com.au

From: David Buckle [mailto:david@davidbuckle.com.au]
Sent: Thursday, 26 February 2015 5:14 PM

To: Neale Hilton
Subject: RE: Mac Uni Waterloo and Herring Rds valve covers

No it's University land.
The boundary is shown on the attached Survey and runs with the property line along Herring Rd crossing the old Waterloo Rd road reserve.
I can't see an easement either.

Regards,

David Buckle

David Buckle & Associates (NSW) Pty.Ltd. Suite 8, 38 Rowe Street Eastwood NSW 2122
Ph: 02 9804-8086 Fax: 02 9804-8685 Mob: 0438-007277 email:david@davidbuckle.com.au

---

From: Neale Hilton [mailto:Neale.Hilton@jemena.com.au]
Sent: Thursday, 26 February 2015 02:23
To: David Buckle
Subject: RE: Mac Uni Waterloo and Herring Rds valve covers

Isn't this a public street?

Neale Hilton
Network Development Manager
Jemena
Level 20, 111 Pacific Hwy, North Sydney, NSW 2060
M 0402 060 151
neale.hilton@jemena.com.au | www.jemena.com.au

From: David Buckle [mailto:david@davidbuckle.com.au]
Sent: Thursday, 26 February 2015 2:20 PM
To: Neale Hilton
Subject: RE: Mac Uni Waterloo and Herring Rds valve covers

Neale,

Ok fair enough. If there is no option on the type of covers what is the best way to ensure they are flush or does it happen after the new pavement?
Can our contractor liaise at the time? Do they still have to be yellow?
The architect will ask!

Regards,

David Buckle

David Buckle & Associates (NSW) Pty.Ltd. Suite 8, 38 Rowe Street Eastwood NSW 2122
Ph: 02 9804-8086 Fax: 02 9804-8685 Mob: 0438-007277 email:david@davidbuckle.com.au

---

From: Neale Hilton [mailto:Neale.Hilton@jemena.com.au]
Sent: Thursday, 26 February 2015 02:00
To: David Buckle
Subject: RE: Mac Uni Waterloo and Herring Rds valve covers

David
Hans is not part of Jemena and as such may have given the impression that your request can be sustained. As I understand the components associated with this District Regulator are ISO 9000 approved and there is no selection of various lids/covers.
Jemena has ground restoration agreements with local Councils to rectify hard surfaces and what looks like from the photo this will need to be done. Would you like me to advise accordingly.

Neale Hilton
Network Development Manager
Jemena
Level 20, 111 Pacific Hwy, North Sydney, NSW 2060
M 0402 060 151
neale.hilton@jemena.com.au | www.jemena.com.au

From: David Buckle [mailto:david@davidbuckle.com.au]
Sent: Thursday, 26 February 2015 11:37 AM
To: Neale Hilton
Subject: FW: Mac Uni Waterloo and Herring Rds valve covers

Hi Neale,

We are looking to tidy up the valves and covers under one or 2 gatic infill covers so we can match the finishes of new pavement planned by Macquarie University.
I contacted Hans as he knows the site and he doesn't think a 'beautification' project would be an issue provided access is maintained to the valves and below ground regulator.
Would you know the correct person to approach for approval of this?
Pavement levels will be very close to existing.

Regards,

David Buckle

David Buckle & Associates (NSW) Pty.Ltd. Suite 8, 38 Rowe Street Eastwood NSW 2122
Ph: 02 9804-8086 Fax: 02 9804-8685 Mob: 0438-007277 email:david@davidbuckle.com.au

---

From: David Buckle
Sent: Thursday, 26 February 2015 11:25
To: Hans Foertsc (hfoertsc@agl.com.au)
Subject: Mac Uni Waterloo and Herring Rds valve covers

Hi Hans,

Hope you are well.
We are getting closer to tidying up the Herring Rd entrance to Macquarie Uni and as part of the project they want to do something about these existing valves and the regulator cover in the pavement.
They are re-paving and we wonder if there could be 1 or 2 larger inset type covers that would be less obtrusive.
Levels of the new paving will be very close to existing.

I'll call you to discuss.

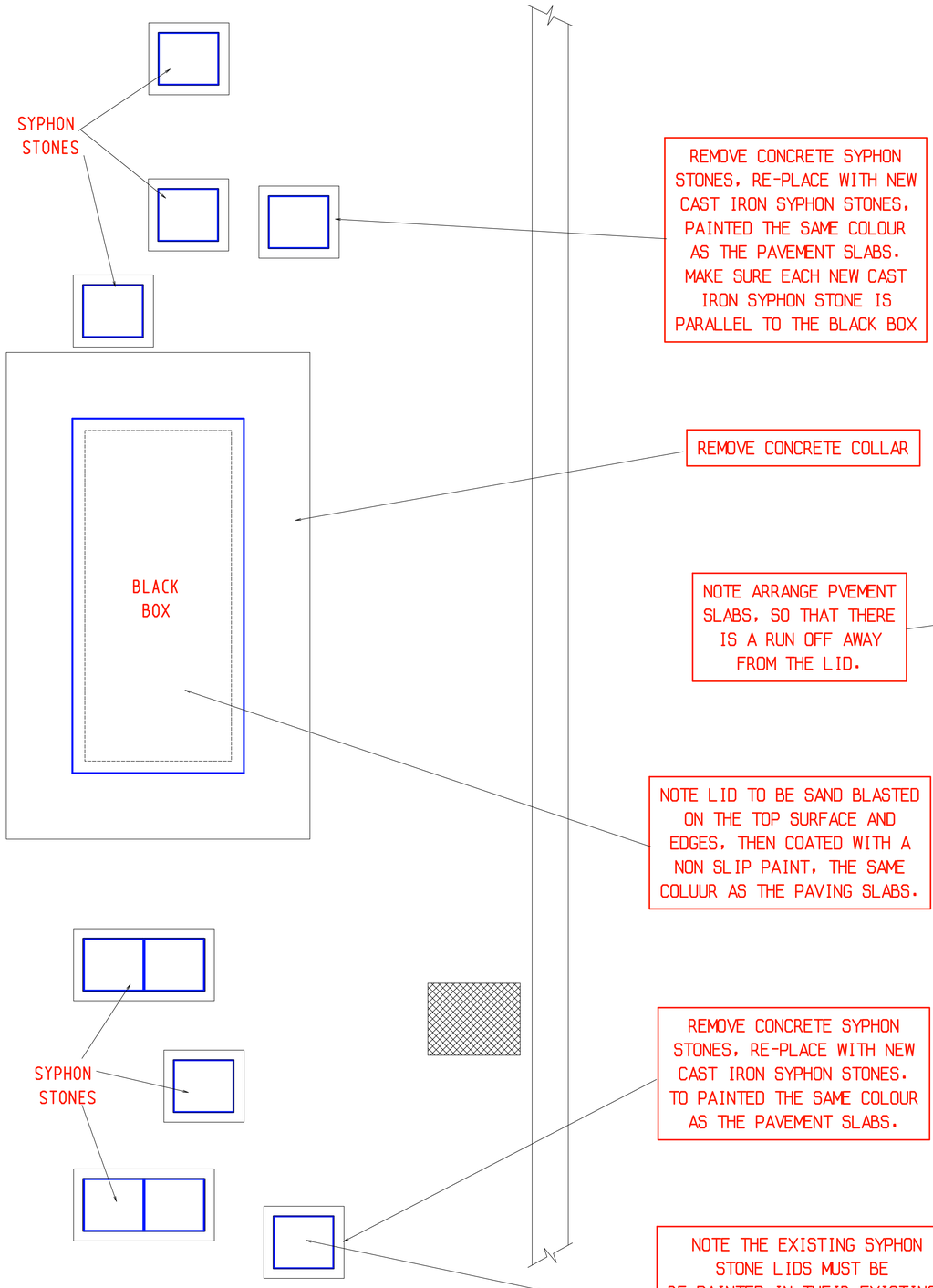
Regards,

David Buckle

David Buckle & Associates (NSW) Pty.Ltd. Suite 8, 38 Rowe Street Eastwood NSW 2122
Ph: 02 9804-8086 Fax: 02 9804-8685 Mob: 0438-007277 email:david@davidbuckle.com.au

****
This is a confidential message intended for the named recipient(s) only. The contents herein are privileged to the sender and the use thereof is restricted to the intended purpose. If you have received this e-mail in error, please do not use, disclose, distribute, copy, print or relay on this email. If receipt is in error, please advise the sender by reply email. Thank you.
****
****
This is a confidential message intended for the named recipient(s) only. The contents herein are privileged to the sender and the use thereof is restricted to the intended purpose. If you have received this e-mail in error, please do not use, disclose, distribute, copy, print or relay on this email. If receipt is in error, please advise the sender by reply email. Thank you.
****
****
This is a confidential message intended for the named recipient(s) only. The contents herein are privileged to the sender and the use thereof is restricted to the intended purpose. If you have received this e-mail in error, please do not use, disclose, distribute, copy, print or relay on this email. If receipt is in error, please advise the sender by reply email. Thank you.
****
****
This is a confidential message intended for the named recipient(s) only. The contents herein are privileged to the sender and the use thereof is restricted to the intended purpose. If you have received this e-mail in error, please do not use, disclose, distribute, copy, print or relay on this email. If receipt is in error, please advise the sender by reply email. Thank you.
****
****
This is a confidential message intended for the named recipient(s) only. The contents herein are privileged to the sender and the use thereof is restricted to the intended purpose. If you have received this e-mail in error, please do not use, disclose, distribute, copy, print or relay on this email. If receipt is in error, please advise the sender by reply email. Thank you.
****
****
This is a confidential message intended for the named recipient(s) only. The contents herein are privileged to the sender and the use thereof is restricted to the intended purpose. If you have received this e-mail in error, please do not use, disclose, distribute, copy, print or relay on this email. If receipt is in error, please advise the sender by reply email. Thank you.
****
****
This is a confidential message intended for the named recipient(s) only. The contents herein are privileged to the sender and the use thereof is restricted to the intended purpose. If you have received this e-mail in error, please do not use, disclose, distribute, copy, print or relay on this email. If receipt is in error, please advise the sender by reply email. Thank you.
****





REMOVE CONCRETE SYPHON STONES, RE-PLACE WITH NEW CAST IRON SYPHON STONES, PAINTED THE SAME COLOUR AS THE PAVEMENT SLABS. MAKE SURE EACH NEW CAST IRON SYPHON STONE IS PARALLEL TO THE BLACK BOX

REMOVE CONCRETE COLLAR

NOTE ARRANGE PVEMENT SLABS, SO THAT THERE IS A RUN OFF AWAY FROM THE LID.

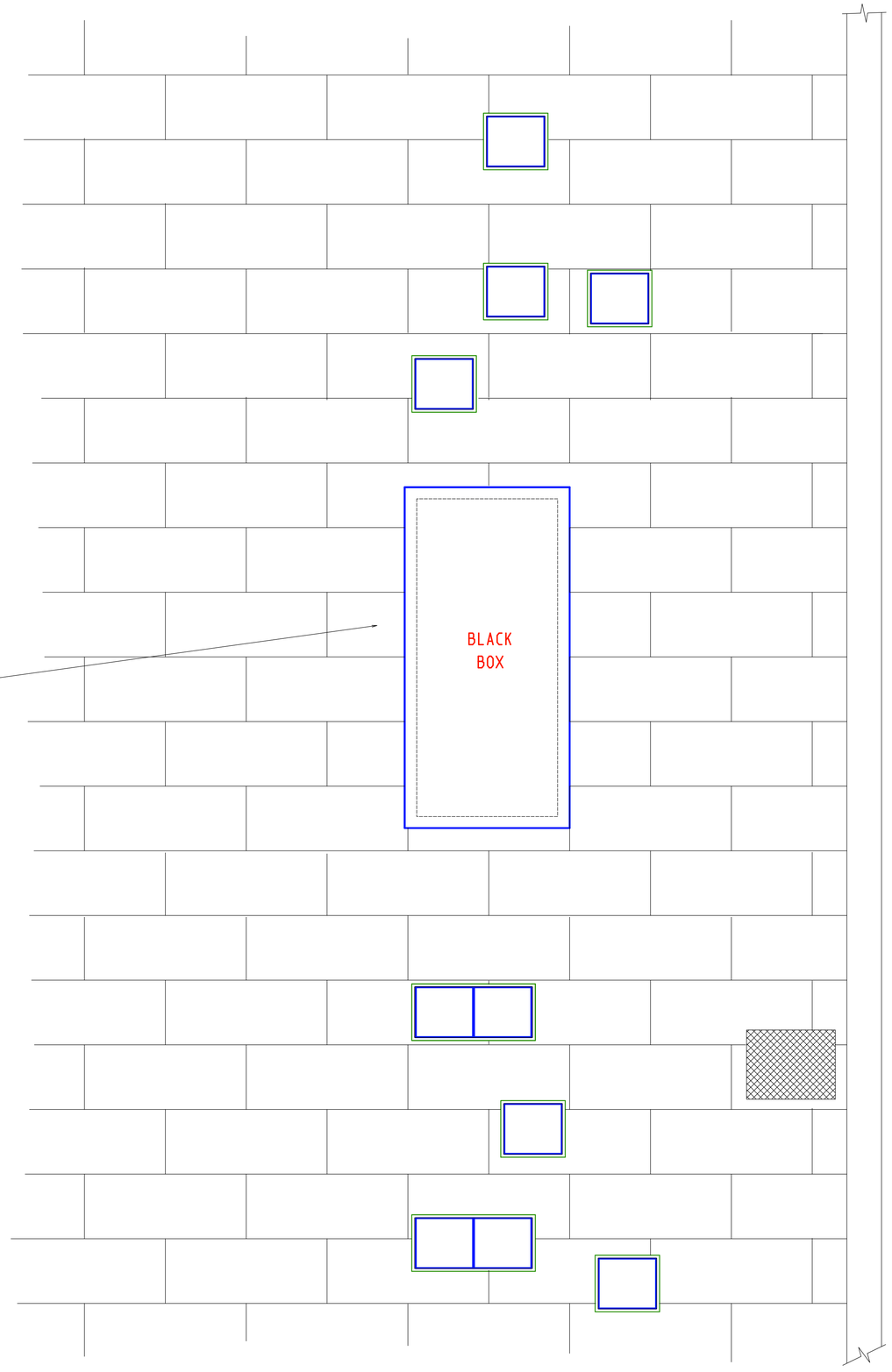
NOTE LID TO BE SAND BLASTED ON THE TOP SURFACE AND EDGES, THEN COATED WITH A NON SLIP PAINT, THE SAME COLUUR AS THE PAVING SLABS.

REMOVE CONCRETE SYPHON STONES, RE-PLACE WITH NEW CAST IRON SYPHON STONES. TO PAINTED THE SAME COLOUR AS THE PAVEMENT SLABS.

NOTE THE EXISTING SYPHON STONE LIDS MUST BE RE-PAINTED IN THEIR EXISTING COLOURS IE. LIGHT OR DARK YELLOW, WHICH INDICATES THE SYSTEM PRESSURE

EXISTING LAYOUT

PAVEMENT TILES NOT SHOWN



PROPOSED ARRANGEMENT

ISSUED FOR COMMENT

Date Stamp: 23-04-2015 Time: 10:30

This drawing is designed by Jemena Asset Management for the Client and is held by JAM on behalf of the Client. No part of this drawing may be reproduced, stored in a retrieval system in any form or transmitted by any means or used for any other purpose including manufacture without the prior written permission of the Company.

REV	PARTICULARS	CHKD/ENG	DATE	DRAWN	APPR
~	~	~	~	~	~
A	ISSUED FOR COMMENT.	~	23-4-2015	KW	~

Jemena Asset Management Pty Ltd ABN 53 086 013 461

COMP REF: //G/SOP/AE_CAD/JOBS/METSET/M209

SECONDARY PRESSURE UPGRADE TO SYPHON STONES AND BLACK BOX LID, AT THE ENTRANCE TO MAQUARIE UNIVERSITY.

PROJECT No.	APPROVED	ENGINEER	CHECKED	DRAWN	DATE	SCALE
50068179	-	KW	-	KW	23-04-2015	NTS

Jemena ENGINEERING SERVICES

DRAWING No. B1-SP-6049 REV. A

A3

DBYD Address:
n/a Culloden Road
Marsfield NSW 2122

DBYD Job No: 9427836

DBYD Sequence No: 46731629

Copyright Reserved Sydney Water 2015

No warranty is given that the information shown is complete or accurate.

SYDNEY WATER CORPORATION

Scale: 1:1500

Date of Production: 16/07/2015

Plan 1 of 3

N

0m 7m 14m 21m 28m

A3

CULLODEN

RD

ST

RD

EPPING

Chatswood - Epping

94116

CP

DBYD Address:
n/a Culloden Road
Marsfield NSW 2122

DBYD Job No: 9427836

DBYD Sequence No: 46731629

Copyright Reserved Sydney Water 2015

No warranty is given that the information shown is complete or accurate.

SYDNEY WATER CORPORATION

Scale: 1:1500

Date of Production: 16/07/2015

N

0m 7m 14m 21m 28m

A3

RD

Railway

225 VC

225 VC

225 VC

225 VC

225 VC

225 VC

300 VC

300 VC

DBYD Address:
n/a Culloden Road
Marsfield NSW 2122

DBYD Job No: 9427836

DBYD Sequence No: 46731629

Copyright Reserved Sydney Water 2015

No warranty is given that the information shown is complete or accurate.

SYDNEY WATER CORPORATION

Scale: 1:1500

Date of Production: 16/07/2015

Plan 3 of 3

N

0m 7m 14m 21m 28m

A3

FORESTER

3.66 W. PHWY

TARANTO

TRAFALGAR

PL

LIBYA

WATERLOO

RD

DBYD Address:
Culloden Rd
Macquarie Park NSW 2113

DBYD Job No: 299453

DBYD Sequence No: 20458384

Copyright Reserved Sydney Water 2011

No warranty is given that the information shown is complete or accurate.

SYDNEY WATER CORPORATION

Scale: 1:1500

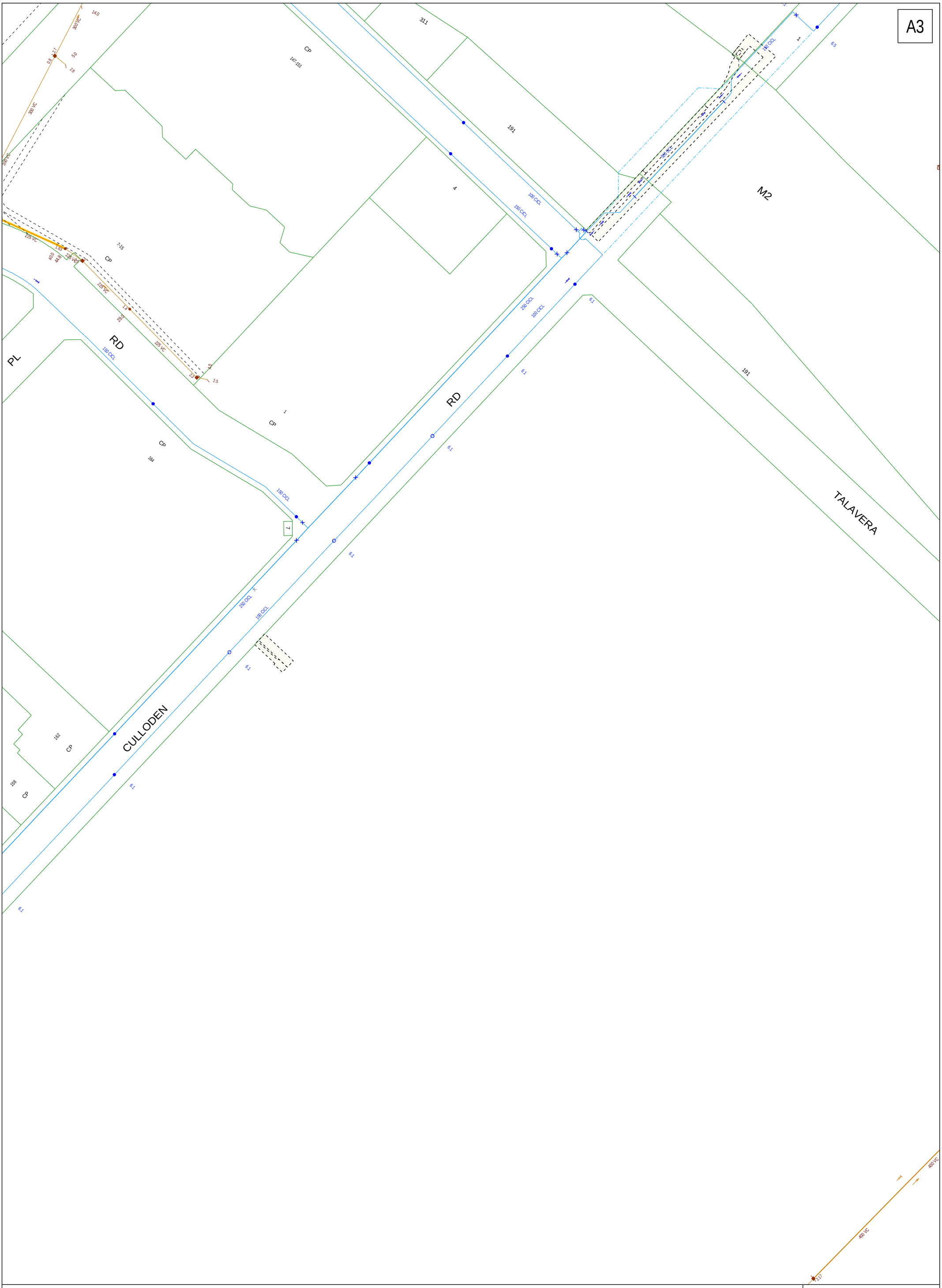
Date of Production: 19/01/2011

Plan 1 of 3

N

0m 7m 14m 21m 28m

A3



DBYD Address:
Culloden Rd
Macquarie Park NSW 2113

DBYD Job No: 299453

DBYD Sequence No: 20458384

Copyright Reserved Sydney Water 2011

No warranty is given that the information shown is complete or accurate.

SYDNEY WATER CORPORATION

Scale: 1:1500

Date of Production: 19/01/2011

Plan 2 of 3

N

0m 7m 14m 21m 28m

A3

712

191

MWY

191

709

100

M2

DBYD Address:
Culloden Rd
Macquarie Park NSW 2113

DBYD Job No: 299453

DBYD Sequence No: 20458384

Copyright Reserved Sydney Water 2011

No warranty is given that the information shown is complete or accurate.

SYDNEY WATER CORPORATION

Scale: 1:1500

Date of Production: 19/01/2011

Plan 3 of 3

N

0m 7m 14m 21m 28m

A3

EPPING

RD

BALACLAVA

RD

WARING

RD

CP

CP

DBYD Address:
Epping Rd
North Ryde NSW 2113

DBYD Job No: 299459

DBYD Sequence No: 20458760

Copyright Reserved Sydney Water 2011
No warranty is given that the information shown is complete or accurate.
SYDNEY WATER CORPORATION

Scale: 1:1500

Date of Production: 19/01/2011

Plan 1 of 1

N

0m 9m 18m 27m 36m

A3

HERRING RD

WATERLOO

NSP - MACQUARIE SHOPPING CENTRE CAR PARK

DBYD Address:
Herring Rd and Waterloo Road
Macquarie Park NSW 2113

DBYD Job No: 299461

DBYD Sequence No: 20458662

Copyright Reserved Sydney Water 2011
No warranty is given that the information shown is complete or accurate.

SYDNEY WATER CORPORATION

Scale: 1:1500

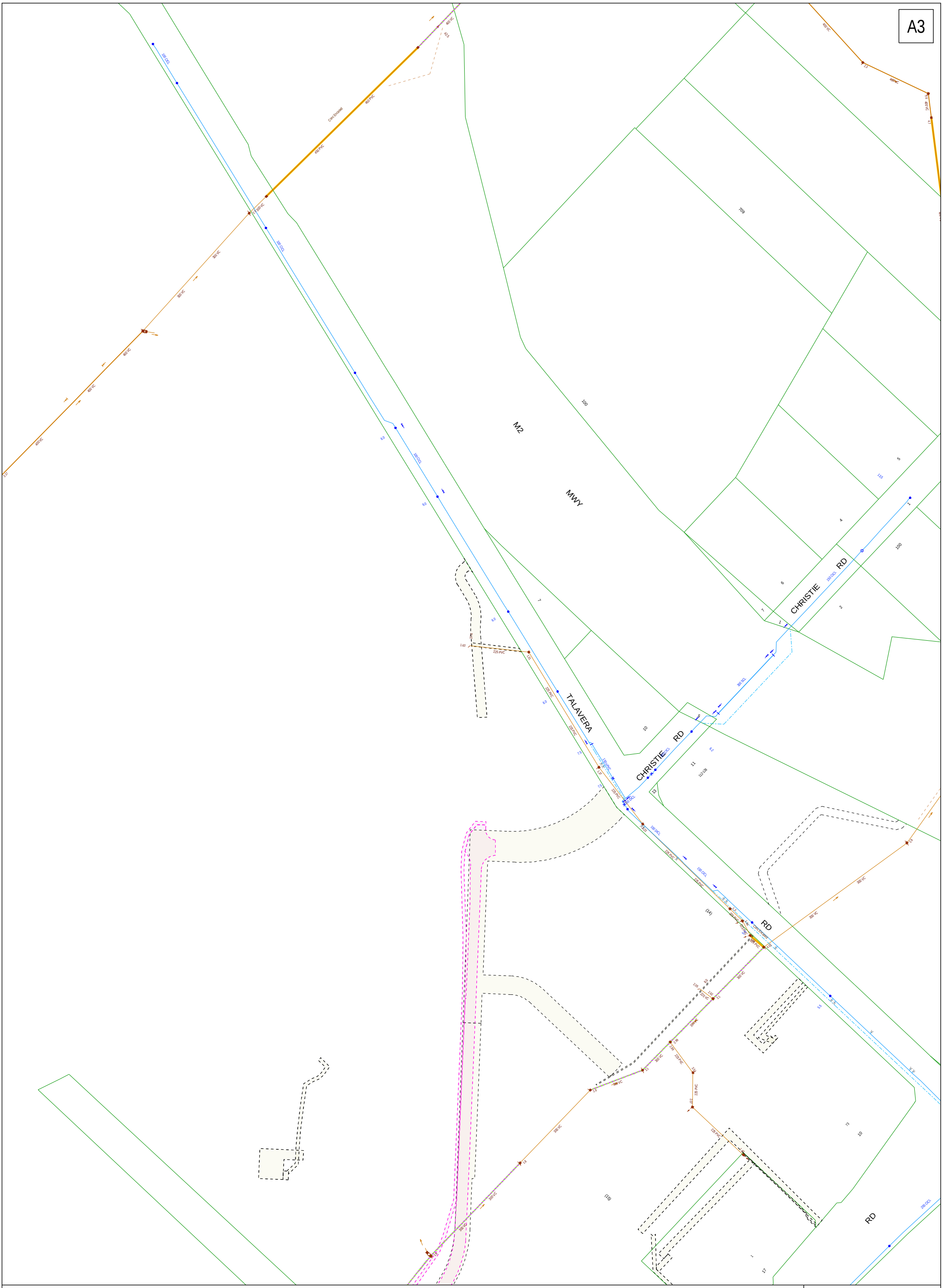
Date of Production: 19/01/2011

Plan 1 of 1

N

0m 9m 18m 27m 36m

A3



DBYD Address:
Talavera Rd
Macquarie Park NSW 2113

DBYD Job No: 299508

DBYD Sequence No: 20460004

Copyright Reserved Sydney Water 2011

No warranty is given that the information shown is complete or accurate.

SYDNEY WATER CORPORATION

Scale: 1:2000

Date of Production: 19/01/2011

Plan 1 of 1

N

0m 9m 18m 27m 36m

Statement of Available Pressure and Flow

Sydney WATER

David Buckle & Associates
Suite 8 / No. 38 Rowe Street
Eastwood, 2122

WMS No: **252910**
Contact No: 8849-3531
Fax No: 8849-3063

Attention: David Buckle

Date: 17/12/2012

Pressure & Flow Application Number: 8316035
Your Pressure Inquiry Dated: Fri December 14 2012
Property Address: 94-116 Culloden Rd, Marsfield 2122

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency fire fighting, and are not to be construed as availability for normal domestic supply for any proposed development.

ASSUMED CONNECTION DETAILS

Street Name: Balaclava Road	Side of Street: East
Distance & Direction from Nearest Cross Street	150 metres North from Epping Road
Approximate Ground Level (AHD):	77 metres
Nominal Size of Water Main (DN):	300 mm

EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT

Normal Supply Conditions	
Maximum Pressure	65 metre head
Minimum Pressure	35 metre head

WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS	Flow l/s	Pressure head m
Fire Hose Reel Installations (Two hose reels simultaneously)	0.66	35
Fire Hydrant / Sprinkler Installations (Pressure expected to be maintained for 95% of the time)	5 10 20 25 30 40	36 35 34 33 33 31
Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the water main)	5 10 20 25 30 40	34 34 33 32 31 29
Maximum Permissible Flow	*43*	*29*

(Please refer to reverse side for Notes)

For **Robert Wickham**
Principal Planner
Urban Growth – Asset Services

E-MAIL
17/12/2012

Statement of Available Pressure and Flow

Sydney WATER

David Buckle & Associates (NSW) Pty.Ltd
Suite 8, 38 Rowe Street
Eastwood, 2122

Attention: Len Hutton

WMS No: **252710**
Contact No: 8849-3531
Fax No: 8849-3063

Date: 17/12/2012

Pressure & Flow Application Number: 8315486
Your Pressure Inquiry Dated: Fri December 14 2012
Property Address: 94-116 Culloden Rd, Marsfield 2122

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency fire fighting, and are not to be construed as availability for normal domestic supply for any proposed development.

ASSUMED CONNECTION DETAILS

Street Name: Culloden Rd	Side of Street: East
Distance & Direction from Nearest Cross Street	50 metres East from Waterloo Rd
Approximate Ground Level (AHD):	76 metres
Nominal Size of Water Main (DN):	150 mm

EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT

Normal Supply Conditions	
Maximum Pressure	66 metre head
Minimum Pressure	34 metre head

WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS	Flow l/s	Pressure head m
Fire Hose Reel Installations (Two hose reels simultaneously)	0.66	34
Fire Hydrant / Sprinkler Installations (Pressure expected to be maintained for 95% of the time)	5 10 15 20 30 40 50	37 36 35 34 32 29 26
Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the water main)		
Maximum Permissible Flow	65	11

(Please refer to reverse side for Notes)

FOR **Robert Wickham**
Principal Planner
Urban Growth – Asset Services

E-MAIL
17/12/2012

2790

Sydney WATER

Statement of Available Pressure and Flow

David Buckle & Associates
Suite 8 / 38 Rowe Street
Eastwood, 2122

Attention: David Buckle

WMS No: **84486**
Contact No: 8849 3531
Fax No: 8849 3111

Date: 01/07/2010

Pressure & Flow Application Number: 2910065
Your Pressure Inquiry Dated: Wed June 30 2010
Property Address: Lot 114 Culloden Rd North Ryde 2113

FAXED 1/07/2010

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency fire fighting, and are not to be construed as availability for normal domestic supply for any proposed development.

ASSUMED CONNECTION DETAILS

Street Name: Balaclava Road	Side of Street: South
Distance & Direction from Nearest Cross Street	75 metres East from Epping Road
Approximate Ground Level (AHD):	78 metres
Nominal Size of Water Main (DN):	300 mm

EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT

Normal Supply Conditions	
Maximum Pressure	64 metre head
Minimum Pressure	36 metre head

WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS	Flow l/s	Pressure head m
Fire Hose Reel Installations (Two hose reels simultaneously)	0.66	36
Fire Hydrant / Sprinkler Installations (Pressure expected to be maintained for 95% of the time)	5 10 20 25 30 40	37 36 35 34 33 30
Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the watermain)	5 10 20 25 30 40	35 35 33 32 30 28
Maximum Permissible Flow	77	13

(Please refer to reverse side for Notes)

AR

Robert Wickham
Team Leader
Asset Planning

Statement of Available Pressure and Flow

Sydney WATER

David Buckle & Associates
Suite 8 / 38 Rowe Street
Eastwood, 2122

Attention: David Buckle

WMS No: **163749**
Contact No: 88493531
Fax No: 88493113

Date: 27/10/2011

Pressure & Flow Application Number: 3300376
Your Pressure Inquiry Dated: Wed October 19 2011
Property Address: 94-116 Culloden Rd Marsfield 2122

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency fire fighting, and are not to be construed as availability for normal domestic supply for any proposed development.

ASSUMED CONNECTION DETAILS

Street Name: Balaclava Road	Side of Street: South
Distance & Direction from Nearest Cross Street	75 metres East from Epping Road
Approximate Ground Level (AHD):	76 metres
Nominal Size of Water Main (DN):	250 mm

EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT

Normal Supply Conditions	
Maximum Pressure	66 metre head
Minimum Pressure	37 metre head

WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS	Flow l/s	Pressure head m
Fire Hose Reel Installations (Two hose reels simultaneously)	0.66	37
Fire Hydrant / Sprinkler Installations (Pressure expected to be maintained for 95% of the time)	5 10 20 25 30 40 50	38 38 36 36 35 33 30
Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the water main)	5 10 20 25 30 40 50	36 36 34 33 32 29 26
Maximum Permissible Flow	57	23

(Please refer to reverse side for Notes)

Robert Wickham
Team Leader
Asset Planning

General Notes

This report is provided on the understanding that (i) the applicant has fully and correctly supplied the information necessary to produce and deliver the report and (ii) the following information is to be read and understood in conjunction with the results provided.

1. Under its Act and Operating Licence, Sydney Water is not required to design the water supply specifically for fire fighting. The applicant is therefore required to ensure that the actual performance of a fire fighting system, drawing water from the supply, satisfies the fire fighting requirements.

2. Due to short-term unavoidable operational incidents, such as main breaks, the regular supply and pressure may not be available all of the time.

3. To improve supply and/or water quality in the water supply system, limited areas are occasionally removed from the primary water supply zone and put onto another zone for short periods or even indefinitely. This could affect the supply pressures and flows given in this letter. This ongoing possibility of supply zone changes etc, means that the validity of this report is limited to one (1) year from the date of issue. It is the property owner's responsibility to periodically reassess the capability of the hydraulic systems of the building to determine whether they continue to meet their original design requirements.

4. Sydney Water will provide a pressure report to applicants regardless of whether there is or will be an approved connection. Apparent suitable pressures are not in any way an indication that a connection would be approved without developer funded improvements to the water supply system. These improvements are implemented under the Sydney Water 'Urban Development Process'.

5. Pumps that are to be directly connected to the water supply require approval of both the pump and the connection. Applications are lodged through Quick Check Agents (List available on Sydney Water Website - www.sydneywater.com.au). Where possible, on-site recycling tanks are recommended for pump testing to reduce water waste and allow higher pump test rates.

6. Periodic testing of boosted fire fighting installations is a requirement of the Australian Standards. To avoid the risk of a possible 'breach' of the Operating Licence, flows generated during testing of fire fighting installations are to be limited so that the pressure in Sydney Water's System is not reduced below 15 metres. Pumps that can cause a breach of the Operating Licence anywhere in the supply zone during testing will not be approved. This requirement should be carefully considered for installed pumps that can be tested to 150% of rated flow.

Notes on Models

1. Calibrated computer models are used to simulate maximum demand conditions experienced in each supply zone. Results have not been determined by customised field measurement and testing at the particular location of the application.

2. Regular updates of the models are conducted to account for issues such a urban consolidation, demand management or zone change.

3. Demand factors are selected to suit the type of fire-fighting installation. Factor 1 indicates pressures due to system demands as required under Australian Standards for fire hydrant installations. Factor 2 indicates pressures due to peak system demands.

4. When fire-fighting flows are included in the report, they are added to the applicable demand factor at the nominated location during a customised model run for a single fire. If adjacent properties become involved with a coincident fire, the pressures quoted may be substantially reduced.

5. Modelling of the requested fire fighting flows may indicate that local system capacity is exceeded and that negative pressures may occur in the supply system. Due to the risk of water contamination and the endangering of public health, Sydney Water reserves the right to refuse or limit the amount of flow requested in the report and, as a consequence, limit the size of connection and/or pump.

6. The pressures indicated by the modelling, at the specified location, are provided without consideration of pressure losses due to the connection method to Sydney Water's mains.

7. Modern pipes have quality assured, factory applied, concrete lining. Some older pipes are, however, designated CICLIS (cast iron concrete lined in-situ). In this situation, results are obtained using conservative modelling techniques to account for the uncertain quality of the lining. However, it is recommended that the applicant obtains verification of any results by field-testing. Appropriate notification to Sydney Water by the accredited service provider shall be given before testing is undertaken (conditions may apply).

Statement of Available Pressure and Flow

Sydney WATER

David Buckle & Associates (NSW) Pty Ltd
Suite 8, 38 Rowe Street
Eastwood, 2122

Attention: Len Hutton Date: 13/03/2015

Pressure & Flow Application Number: 9057740
Your Pressure Inquiry Dated: Fri March 13 2015
Property Address: 94-116 Culloden Rd Marsfield 2122

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency fire fighting, and are not to be construed as availability for normal domestic supply for any proposed development.

ASSUMED CONNECTION DETAILS

Street Name: Balaclava Rd	Side of Street: South
Distance & Direction from Nearest Cross Street	175 metres East from Epping Rd
Approximate Ground Level (AHD):	76 metres
Nominal Size of Water Main (DN):	300 mm

EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT

Normal Supply Conditions	
Maximum Pressure	66 metre head
Minimum Pressure	36 metre head

WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS	Flow l/s	Pressure head m
Fire Hose Reel Installations (Two hose reels simultaneously)	0.66	36
Fire Hydrant / Sprinkler Installations (Pressure expected to be maintained for 95% of the time)	5 10 20 25 30 40 50 60	37 36 36 35 34 32 30 27
Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the water main)	5 10 20 25 30 40 50 60	36 35 34 33 33 31 28 26
Maximum Permissible Flow	81	19

(Please refer to reverse side for Notes)

For any further inquiries regarding this application please email :
connections@sydneywater.com.au

2790

Statement of Available Pressure and Flow

Sydney WATER

David Buckle & Associates
Suite 8 / 38 Rowe Street
Eastwood, 2122

Attention: David Buckle

WMS No: **84466**
Contact No: 8849 3531
Fax No: 8849 3111

Date: 01/07/2010

FAXED 1/07/2010 bw

Pressure & Flow Application Number: 2910055
Your Pressure Inquiry Dated: Wed June 30 2010
Property Address: Lot 114 Culloden Rd North Ryde 2113

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency fire fighting, and are not to be construed as availability for normal domestic supply for any proposed development.

ASSUMED CONNECTION DETAILS

Street Name: Culloden Road	Side of Street: East
Distance & Direction from Nearest Cross Street	25 metres South from Waterloo Road
Approximate Ground Level (AHD):	78 metres
Nominal Size of Water Main (DN):	150 mm

EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT

Normal Supply Conditions	
Maximum Pressure	64 metre head
Minimum Pressure	36 metre head

WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS	Flow l/s	Pressure head m
Fire Hose Reel Installations (Two hose reels simultaneously)	0.66	36
Fire Hydrant / Sprinkler Installations (Pressure expected to be maintained for 95% of the time)	5	37
	10	36
	15	36
	25	34
	26	34
	35	32
	45	29
	55	26
Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the watermain)	5	35
	10	35
	15	34
	25	32
	26	32
	35	30
	45	27
	55	24
Maximum Permissible Flow	67	19

(Please refer to reverse side for Notes)

for **Robert Wickham**
Team Leader
Asset Planning

Statement of Available Pressure and Flow

Sydney WATER

David Buckle & Associates
Suite 8 /No. 38 Rowe Street
Eastwood, 2122

Attention: David Buckle

WMS No: **163748**
Contact No: 88493531
Fax No: 88493113

Date: 24/10/2011

Pressure & Flow Application Number: 3300371
Your Pressure Inquiry Dated: Wed October 19 2011
Property Address: 94-116 Culloden Rd Marsfield 2122

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency fire fighting, and are not to be construed as availability for normal domestic supply for any proposed development.

ASSUMED CONNECTION DETAILS

Street Name: Culloden Road	Side of Street: East
Distance & Direction from Nearest Cross Street	400 metres South from Waterloo Road
Approximate Ground Level (AHD):	77 metres
Nominal Size of Water Main (DN):	150 mm

EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT

Normal Supply Conditions	
Maximum Pressure	65 metre head
Minimum Pressure	35 metre head

WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS	Flow l/s	Pressure head m
Fire Hose Reel Installations (Two hose reels simultaneously)	0.66	35
Fire Hydrant / Sprinkler Installations (Pressure expected to be maintained for 95% of the time)	5 10 20 25 30 40 50	36 36 34 33 32 29 26
Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the water main)	5 10 20 25 30 40 50	34 33 31 30 28 25 20
Maximum Permissible Flow	67	10

(Please refer to reverse side for Notes)

Jean Wickham

Robert Wickham
FOR **Team Leader**
Asset Planning

General Notes

This report is provided on the understanding that (i) the applicant has fully and correctly supplied the information necessary to produce and deliver the report and (ii) the following information is to be read and understood in conjunction with the results provided.

1. Under its Act and Operating Licence, Sydney Water is not required to design the water supply specifically for fire fighting. The applicant is therefore required to ensure that the actual performance of a fire fighting system, drawing water from the supply, satisfies the fire fighting requirements.

2. Due to short-term unavoidable operational incidents, such as main breaks, the regular supply and pressure may not be available all of the time.

3. To improve supply and/or water quality in the water supply system, limited areas are occasionally removed from the primary water supply zone and put onto another zone for short periods or even indefinitely. This could affect the supply pressures and flows given in this letter. This ongoing possibility of supply zone changes etc, means that the validity of this report is limited to one (1) year from the date of issue. It is the property owner's responsibility to periodically reassess the capability of the hydraulic systems of the building to determine whether they continue to meet their original design requirements.

4. Sydney Water will provide a pressure report to applicants regardless of whether there is or will be an approved connection. Apparent suitable pressures are not in any way an indication that a connection would be approved without developer funded improvements to the water supply system. These improvements are implemented under the Sydney Water 'Urban Development Process'.

5. Pumps that are to be directly connected to the water supply require approval of both the pump and the connection. Applications are lodged through Quick Check Agents (List available on Sydney Water Website - www.sydneywater.com.au). Where possible, on-site recycling tanks are recommended for pump testing to reduce water waste and allow higher pump test rates.

6. Periodic testing of boosted fire fighting installations is a requirement of the Australian Standards. To avoid the risk of a possible 'breach' of the Operating Licence, flows generated during testing of fire fighting installations are to be limited so that the pressure in Sydney Water's System is not reduced below 15 metres. Pumps that can cause a breach of the Operating Licence anywhere in the supply zone during testing will not be approved. This requirement should be carefully considered for installed pumps that can be tested to 150% of rated flow.

Notes on Models

1. Calibrated computer models are used to simulate maximum demand conditions experienced in each supply zone. Results have not been determined by customised field measurement and testing at the particular location of the application.

2. Regular updates of the models are conducted to account for issues such a urban consolidation, demand management or zone change.

3. Demand factors are selected to suit the type of fire-fighting installation. Factor 1 indicates pressures due to system demands as required under Australian Standards for fire hydrant installations. Factor 2 indicates pressures due to peak system demands.

4. When fire-fighting flows are included in the report, they are added to the applicable demand factor at the nominated location during a customised model run for a single fire. If adjacent properties become involved with a coincident fire, the pressures quoted may be substantially reduced.

5. Modelling of the requested fire fighting flows may indicate that local system capacity is exceeded and that negative pressures may occur in the supply system. Due to the risk of water contamination and the endangering of public health, Sydney Water reserves the right to refuse or limit the amount of flow requested in the report and, as a consequence, limit the size of connection and/or pump.

6. The pressures indicated by the modelling, at the specified location, are provided without consideration of pressure losses due to the connection method to Sydney Water's mains.

7. Modern pipes have quality assured, factory applied, concrete lining. Some older pipes are, however, designated CICLIS (cast iron concrete lined in-situ). In this situation, results are obtained using conservative modelling techniques to account for the uncertain quality of the lining. However, it is recommended that the applicant obtains verification of any results by field-testing. Appropriate notification to Sydney Water by the accredited service provider shall be given before testing is undertaken (conditions may apply).

Statement of Available Pressure and Flow

Sydney WATER

David Buckle & Associates (NSW) Pty Ltd
Suite 8, 38 Rowe Street
Eastwood, 2122

Attention: Len Hutton Date: 13/03/2015

Pressure & Flow Application Number: 9016407
Your Pressure Inquiry Dated: Thu January 29 2015
Property Address: 94-116 Culloden Rd Marsfield 2122

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency fire fighting, and are not to be construed as availability for normal domestic supply for any proposed development.

ASSUMED CONNECTION DETAILS

Street Name: Culloden Rd	Side of Street: East
Distance & Direction from Nearest Cross Street	Corner with Waterloo Rd
Approximate Ground Level (AHD):	75 metres
Nominal Size of Water Main (DN):	150 mm

EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT

Normal Supply Conditions	
Maximum Pressure	67 metre head
Minimum Pressure	38 metre head

WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS	Flow l/s	Pressure head m
Fire Hose Reel Installations (Two hose reels simultaneously)	0.66	38
Fire Hydrant / Sprinkler Installations (Pressure expected to be maintained for 95% of the time)	5 10 20 25 30 40 50	39 38 38 37 36 35 33
Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the water main)	5 10 20 25 30 40 50	37 37 36 36 35 33 31
Maximum Permissible Flow	67	27

(Please refer to reverse side for Notes)

For any further inquiries regarding this application please email :

connections@sydneywater.com.au



PYMBLE 7A

SCALE 1:2000

50 0 50 100 150 200

THIS MAP UPDATED ON 20/12/10
THIS PLAN IS DIAGRAMATIC ONLY. DISTANCES SCALED FROM THIS PLAN MAY NOT BE ACCURATE.

DATE ALTERED:..... BY:.....

E6D	PY4C	PY4D
E9B	PY7A	PY7B
E9D	PY7C	PY7D

ADJOINING MAPS

656 263 264	HORNSBY RYDE
NETWORK AREA	MUNICIPALITY AREA

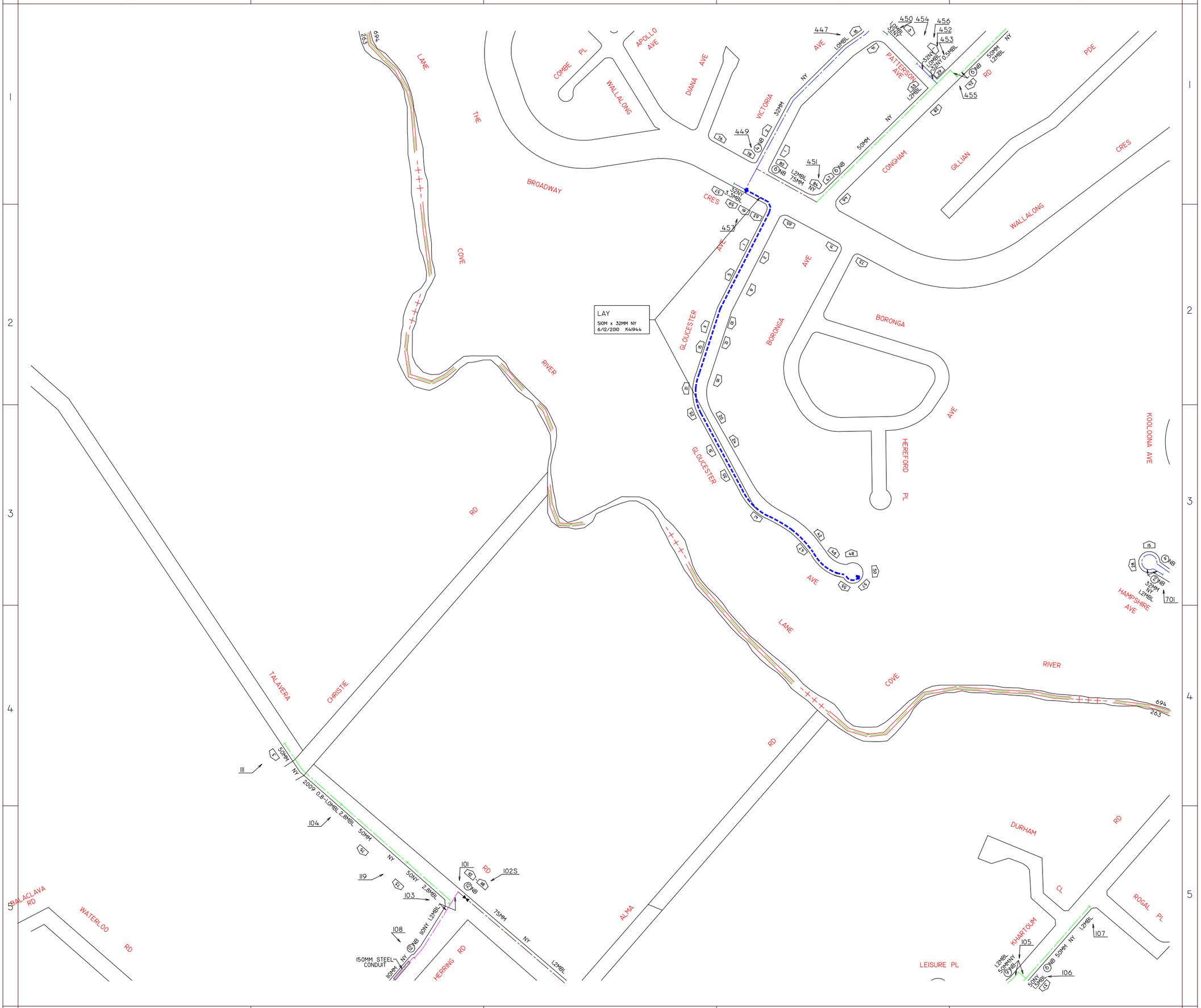
Jemena

KEY

MAX ALLOWABLE OPERATING PRESSURE

T	TRUNK MAIN	7000 kPa
P	PRIMARY MAIN	3500 kPa
S	SECONDARY MAIN	1050 kPa
		300 kPa
		210 kPa
		7 kPa
400		400 kPa
100		100 kPa
		2 kPa
	PROPOSED MAINS	
PR II-2 3	STEEL MAIN PROJECT NUMBER	
P	PRESSURE MONITORING STATION	
	VALVE	
	SYSTEM PRESSURE REGULATOR	
S	SIPHON	
123	NETWORK NODES	
123S	ITEM DETAIL SKETCH AVAILABLE	
298	VALVE NUMBER (OLD NUMBERING)	
6NB	6 INCH CAST IRON MAIN	
150MM	150MM STEEL MAIN	
110MM PE/NY	110MM POLYETHYLENE/NYLON MAIN	
6NB 50MM NY	50MM NYLON INSERTED INTO 6NB MAIN CAST IRON MAIN	
1.2MBL	DISTANCE IN METRES OF MAIN FROM BUILDING LINE (TOLERANCE OF 0.4M)	
1957	YEAR LAID	
	MUNICIPALITY BOUNDARY	
	NETWORK BOUNDARY	
123	HOUSE NUMBER	

PYMBLE 7A



PYMBLE 7B

SCALE 1:2000

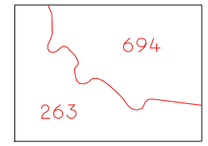
50 0 50 100 150 200

THIS MAP UPDATED ON 06/12/10
THIS PLAN IS DIAGRAMATIC ONLY. DISTANCES SCALED FROM THIS PLAN MAY NOT BE ACCURATE.

DATE ALTERED:..... BY:.....

PY4C	PY4D	PY5C
PY7A	PY7B	PY8A
PY7C	PY7D	PY8C

ADJOINING MAPS



NETWORK AREA



MUNICIPALITY AREA

Jemena

KEY

MAX ALLOWABLE OPERATING PRESSURE

T	TRUNK MAIN	7000 kPa
P	PRIMARY MAIN	3500 kPa
S	SECONDARY MAIN	1050 kPa
		300 kPa
		210 kPa
		7 kPa
400		400 kPa
100		100 kPa
		2 kPa
	PROPOSED MAINS	
PR II-2 3	STEEL MAIN PROJECT NUMBER	
P	PRESSURE MONITORING STATION	
	VALVE	
	SYSTEM PRESSURE REGULATOR	
S	SIPHON	
123	NETWORK NODES	
123S	ITEM DETAIL SKETCH AVAILABLE	
298	VALVE NUMBER (OLD NUMBERING)	
6NB	6 INCH CAST IRON MAIN	
150MM	150MM STEEL MAIN	
110MM PE/NY	110MM POLYETHYLENE/NYLON MAIN	
6NB 50MM NY	50MM NYLON INSERTED INTO 6NB MAIN CAST IRON MAIN	
1.2MBL	DISTANCE IN METRES OF MAIN FROM BUILDING LINE (TOLERANCE OF 0.4M)	
1957	YEAR LAID	
	MUNICIPALITY BOUNDARY	
	NETWORK BOUNDARY	
123	HOUSE NUMBER	

PYMBLE 7B



PYMBLE 7C

SCALE 1:2000

50 0 50 100 150 200

THIS MAP UPDATED ON 25/10/10
THIS PLAN IS DIAGRAMATIC ONLY. DISTANCES SCALED FROM THIS PLAN MAY NOT BE ACCURATE.

DATE ALTERED:..... BY:.....

E9B	PY7A	PY7B
E9D	PY7C	PY7D
P3B	GIA	GIB

ADJOINING MAPS

263 / 264	RYDE
NETWORK AREA	MUNICIPALITY AREA

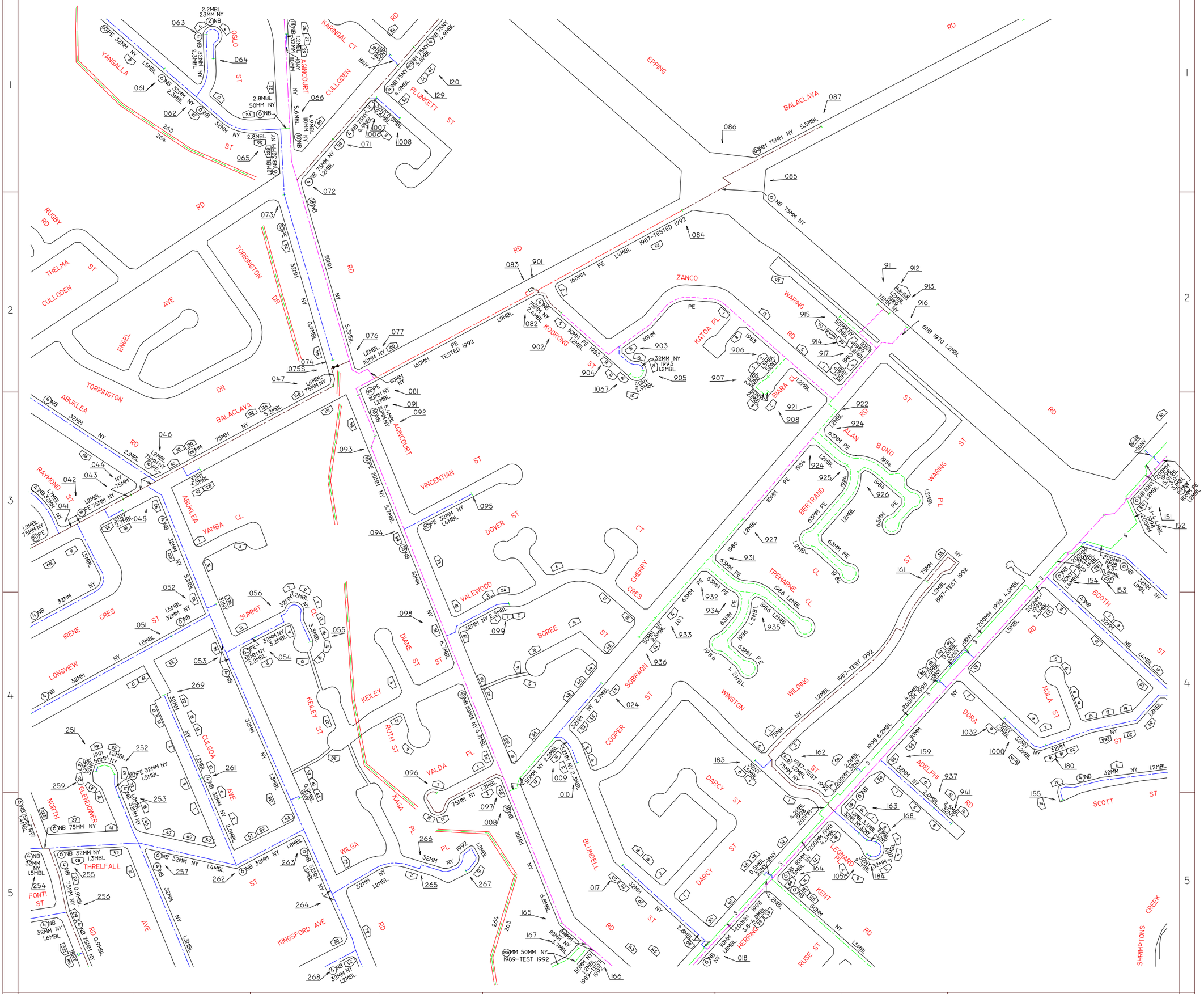
Jemena

KEY

MAX ALLOWABLE OPERATING PRESSURE

T	TRUNK MAIN	7000 kPa
P	PRIMARY MAIN	3500 kPa
S	SECONDARY MAIN	1050 kPa
		300 kPa
		210 kPa
		7 kPa
400		400 kPa
100		100 kPa
		2 kPa
	PROPOSED MAINS	
PR 11-2 3	STEEL MAIN PROJECT NUMBER	
P	PRESSURE MONITORING STATION	
	VALVE	
	SYSTEM PRESSURE REGULATOR	
S	SIPHON	
123	NETWORK NODES	
123S	ITEM DETAIL SKETCH AVAILABLE	
698	VALVE NUMBER (OLD NUMBERING)	
6NB	6 INCH CAST IRON MAIN	
150MM	150MM STEEL MAIN	
110MM PE/NY	110MM POLYETHYLENE/NYLON MAIN	
6NB 50MM NY	50MM NYLON INSERTED INTO 6NB MAIN CAST IRON MAIN	
1.2MBL	DISTANCE IN METRES OF MAIN FROM BUILDING LINE (TOLERANCE OF 0.4M)	
1957	YEAR LAID	
	MUNICIPALITY BOUNDARY	
	NETWORK BOUNDARY	
123	HOUSE NUMBER	

PYMBLE 7C



PYMBLE 7C

SCALE 1:2000

50 0 50 100 150 200

THIS MAP UPDATED ON 10/06/2015
THIS PLAN IS DIAGRAMATIC ONLY. DISTANCES SCALED FROM THIS PLAN MAY NOT BE ACCURATE.
DATE ALTERED:..... BY:.....

E9B	PY7A	PY7B
E9D	PY7C	PY7D
P3B	GIA	GIB

ADJOINING MAPS

263 264

NETWORK AREA

RYDE

MUNICIPALITY AREA

Jemena

KEY

MAX ALLOWABLE OPERATING PRESSURE

T	TRUNK PIPELINE	7000 kPa
P	PRIMARY MAIN	3500 kPa
S	SECONDARY MAIN	1050 kPa
400	NETWORK MAIN	400 kPa
	NETWORK MAIN	300 kPa
	NETWORK MAIN	210 kPa
100	NETWORK MAIN	100 kPa
30	NETWORK MAIN	30 kPa
	NETWORK MAIN	7 kPa
	NETWORK MAIN	2 kPa
	PROPOSED MAINS	
PR II-2 3	STEEL MAIN PROJECT NUMBER	
P	PRESSURE MONITORING STATION	
	VALVE	
	SYSTEM PRESSURE REGULATOR	
S	SIPHON	
123	NETWORK NODE	
123S	NETWORK VALVE NODE	
(298)	VALVE NUMBER	
6NB	6 INCH CAST IRON MAIN	
150MM	150MM STEEL MAIN	
110MM PE/NY	110MM POLYETHYLENE/NYLON MAIN	
(6)NB 50MM NY	50MM NYLON INSERTED INTO 6NB MAIN CAST IRON MAIN	
1.2MBL	DISTANCE IN METRES OF MAIN FROM BOUNDARY LINE	
1957	YEAR LAID	
	MUNICIPALITY BOUNDARY	
	NETWORK BOUNDARY	
123	HOUSE NUMBER	

PYMBLE 7C

PYMBLE 7D

SCALE 1:2000

50 0 50 100 150 200

THIS MAP UPDATED ON 04/01/2011
THIS PLAN IS DIAGRAMATIC ONLY. DISTANCES SCALED FROM THIS PLAN MAY NOT BE ACCURATE.

DATE ALTERED:..... BY:.....

PY7A	PY7B	PY8A
PY7C	PY7D	PY8C
GIA	GIB	G2A

ADJOINING MAPS

263 / 265	RYDE

NETWORK AREA MUNICIPALITY AREA

Jemena

KEY

MAX ALLOWABLE OPERATING PRESSURE

T	TRUNK MAIN	7000 kPa
P	PRIMARY MAIN	3500 kPa
S	SECONDARY MAIN	1050 kPa
		300 kPa
		210 kPa
		7 kPa
400		400 kPa
100		100 kPa
		2 kPa
	PROPOSED MAINS	
PR II-2 3	STEEL MAIN PROJECT NUMBER	
P	PRESSURE MONITORING STATION	
	VALVE	
	SYSTEM PRESSURE REGULATOR	
S	SIPHON	
123	NETWORK NODES	
123S	ITEM DETAIL SKETCH AVAILABLE	
298	VALVE NUMBER (OLD NUMBERING)	
6NB	6 INCH CAST IRON MAIN	
150MM	150MM STEEL MAIN	
110MM PE/NY	110MM POLYETHYLENE/NYLON MAIN	
6NB 50MM NY	50MM NYLON INSERTED INTO 6NB MAIN CAST IRON MAIN	
1.2MBL	DISTANCE IN METRES OF MAIN FROM BUILDING LINE (TOLERANCE OF 0.4M)	
1957	YEAR LAID	
- + + + -	MUNICIPALITY BOUNDARY	
	NETWORK BOUNDARY	
123	HOUSE NUMBER	

PYMBLE 7D

Frawley Design Services Pty Ltd
ABN: 23 059 201 900
PO Box 519
Kensington NSW 1465
Phone: 02 9663 3004
Fax: 02 9313 8806
Email: info@frawleydesignservices.com.au
www.frawleydesignservices.com.au

MACQUARIE UNIVERSITY
RYDE CAMPUS MASTER PLAN
SEWERAGE RETICULATION

EXISTING SEWERAGE SYSTEM

The main Campus is serviced by two sewer carriers known as the Mars Creek Carrier and the Balaclava Road Carrier, both of which are Sydney Water assets. The accompanying plan shows the location of these sewers and their respective catchments.

In addition there is a Sydney Water sewerage system that services the University's housing villages on the north-western side of Culloden Road.

Apart from the Sydney Water sewers shown on the plan, the Campus is serviced by a network of sewerage reticulation lines owned and maintained by the University.

MASTER PLAN PROPOSALS

1. Commercial Development Sites

In accordance with Sydney Water's servicing policies, individual points of connection to a sewer main will be required for each leasehold parcel of land excised by subdivision. To comply with these policies, it will be necessary to extend Sydney Water's sewer system to provide a connection point within the boundaries of each parcel.

2. Impacts on Sydney Water's Infrastructure

a) In early 2008 discussions were held with Sydney Water regarding the proposed expansion of Gross Floor Areas (GFA) within precincts Station South and Epping Road West. At that time it was estimated that expansion would proceed in keeping with the following timeframes:

- 2007-2012: - 75,000m^2 GFA
- 2012-2017: - another 75,000m^2 GFA
- 2017-2031: - a further 200, 000m^2 GFA

In response, Sydney Water determined that the existing sewer system had sufficient capacity for the proposed developments of 2007-2012 and 2012-2017. However the development planned for 2017-2031 would require amplification of the Balaclava Road Carrier beneath the M2 Motorway.

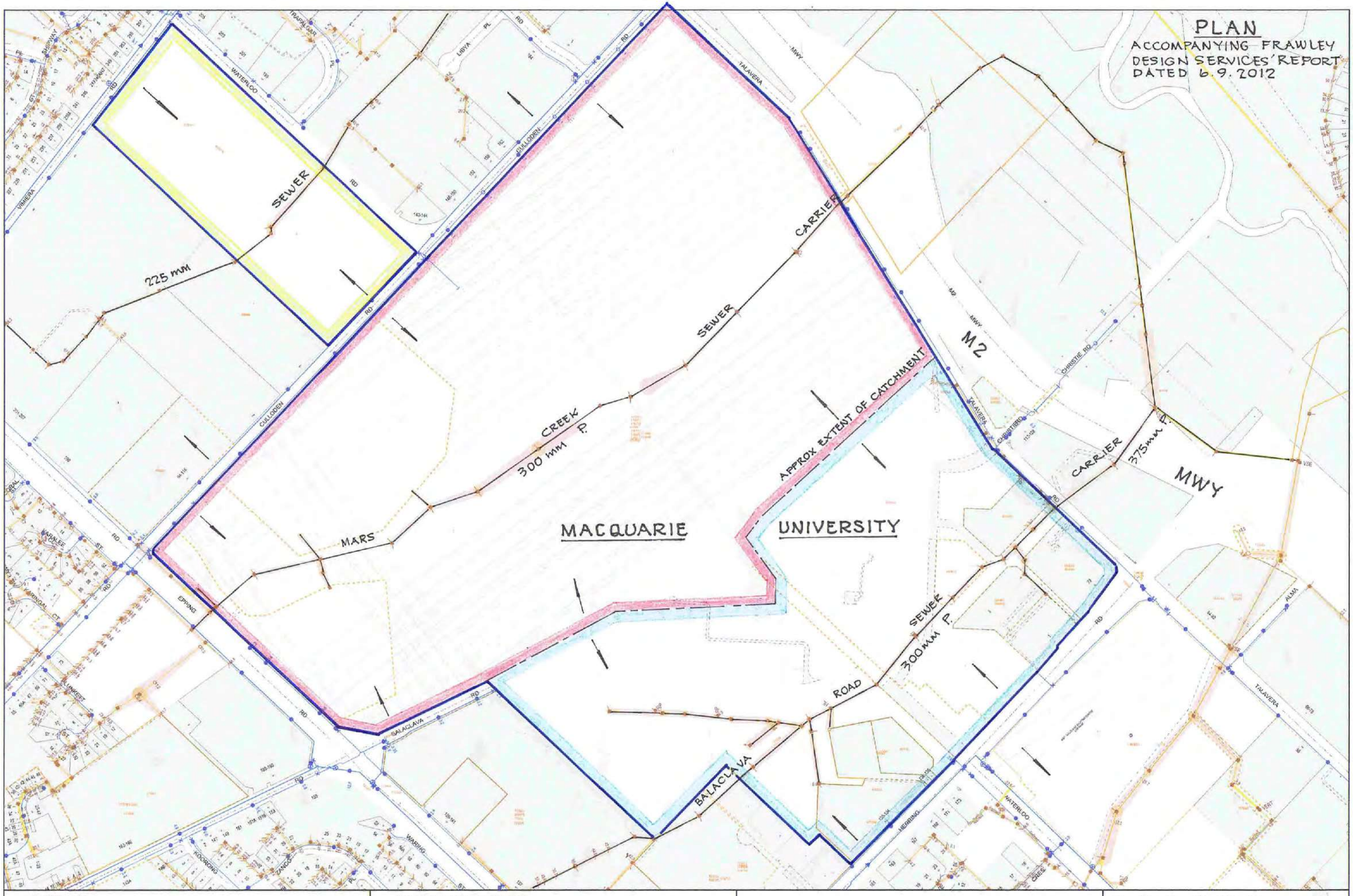
b) The extent of mains augmentation based upon the current Master Plan cannot be determined accurately without further study. All the same, a preliminary examination clearly indicates that there will be no spare capacity in either sewer Carrier beyond 2017 and as a consequence, upsizing will be necessary.

Brian Frawley

Brian Frawley
MIS Aust

PLAN

ACCOMPANYING FRAWLEY DESIGN SERVICES' REPORT DATED 6.9.2012



For WSC use only.
Not for distribution or sale.
Date of Production: 31/08/2012

Copyright Reserved Sydney Water 2012
No warranty is given that the information shown is complete or accurate.
SYDNEY WATER CORPORATION

Map:173 Grid:N16 Edition:Sydney UBD Edition 41

0m 40m 80m 120m 160m 200m

Scale 1:5000

Meeting Notes

MEETING SUBJECT: Macquarie University, Design Excellence Strategy and Urban Design Guidelines

LOCATION: Department of Planning and Environment

DATE: 18 March 2015

ATTENDEES:
Simon Bennett (SB) – Department of Planning and Environment
Mark Broomfield (MB) – Macquarie University
Cameron Kline (CK) – Macquarie University
John Richardson (JR) – Cox Richardson
Ian Connolly (IC) – Cox Richardson
Kim Vandenberg (KV) – Cox Richardson
Kate Tudehope (KT) - JBA

PROJECT NO: 11230

- MB provided background on the Guidelines and the Campus Masterplan, with the Masterplan being prepared to guide development on the Campus for the next 50 years.
- IC explained the approach to the Guidelines, and the desire to create Guidelines for the remainder of the Campus (with the exception of the Precinct E, and part of Precinct D which forms part of the UAP), rather than continuing on a precinct-by-precinct basis.
- IC explained the proposed content and approach to the Guidelines, and that the Guidelines for the remainder of the Campus are intended to be less detailed than the previously approved Precinct E Guidelines.
- SB noted that DPE would be flexible about the level of detail that goes into the Guidelines, noting that a lesser level of detail than what was included for Precinct E would be appropriate.
- KT noted that there are some discrepancies between the Concept Plan approved precinct boundaries, and the boundary alignments under the proposed Guidelines. It was also noted that Precinct C has been included in the Guidelines to enable future redevelopment of sporting facilities in this precinct.
- SB said that the Department would consider this, and whether a modification to the Concept Plan was required.
- IC noted that the Guidelines are predicated on Macquarie Drive being pedestrianised.
- MB noted that there is already 60% modal split for public transport within the Campus.
- IC acknowledged that there will be some height sensitivity in Precinct B, where it has interfaces with residential properties.
- MB confirmed the intention to consult with Ryde Council, noting the Concept Plan conditions do not require Council to formally approve the Guidelines.
- SB noted that DPE would provide MQU with comment on the Guidelines.

Meeting Notes

MEETING SUBJECT: Macquarie University, Design Excellence Strategy and Urban Design Guidelines

LOCATION: City of Ryde Council

DATE: 16 April 2015

ATTENDEES:
Dominic Johnson (DJ) – City of Ryde Council
Lexie Macdonald (LM) – City of Ryde Council
Meryl Bishop (MBi) – City of Ryde Council
Mark Broomfield (MBr) – Macquarie University
Cameron Kline (CK) – Macquarie University
John Richardson (JR) – Cox Richardson
Kim Vandenberg (KV) – Cox Richardson
Kate Tudehope (KT) - JBA

PROJECT NO: 11230

- LM said that Council appreciated the energy and rigour that MQU and Cox had put into developing Guidelines for its own Campus.
- MBr questioned the progress on the gazettal of the UAP.
- DJ noted that the UAP is now being considered more rigorously given the issues being experienced at the North Ryde Station site.
- DJ questioned the implications of the heritage item on the site, and noted that this was being addressed by the Vice Chancellor's committee on the State-wide basis.
- MBr provided background on the Guidelines and the Campus Masterplan. MBr also noted that the University is now developing its own land, and the reduced level of detail in the proposed Guidelines reflects this. It was noted that the Guidelines cover the whole of the Campus (with the exception of Precinct E, and the part of Precinct D which is within the UAP). These areas would be incorporated into the Guidelines when the UAP is gazetted.
- LM noted that this provides Council with greater comfort about the absence of controls for Precinct E, which presents some interface concerns.
- DJ questioned whether the University intends the Guidelines to override Council's DCP, particularly in the context of the Draft DCP which has recently gone on public exhibition.
- KT noted that this was the case – the Guidelines are required by the Part 3A Concept Plan, and so override any local LEP or DCP. Further, any SSD DA would not need to consider Council's DCP.
- Council questioned how this would work in practice, and what Council officers would assess future development applications against.
- MBr noted that the Guidelines will provide DCP-level controls for development within the Campus, and that MQU is happy to work with Council to provide the necessary level of detail.

Notwithstanding this, if Council continue to enforce the DCP over the Campus, it will not hold any statutory weight.

- LM questioned regional cycling and pedestrian navigation.
- IR noted that the Guidelines have been designed to improve navigability into the Macquarie Centre and Macquarie Park.
- MBi noted that the Draft DCP seeks to reduce residential parking rates.
- KT noted that parking rates are determined by the Concept Plan, and that this was not a concern or MQU.
- IR noted that the intention of the Masterplan and Guidelines is to move parking to the extremities, and pedestrianise internal parts of the Campus.
- MBr noted that the University's intention is to move towards street addresses.
- LM noted that Council's key concerns were:
  - Built interfaces at all campus boundaries.
  - Pedestrian and vehicular access.
  - Street setbacks.
  - WSUD.
- MBi noted that Council does not want to surrender the DCP in areas with interfaces, for example where the B4 zone adjoins the R2 zone, where there are steps down in scale etc.
- JR said that more detailed controls could be developed for the Campus interfaces.
- MBr noted that Macquarie Drive was being converted into Macquarie Walk.
- DJ questioned the University's upcoming development plans, and the impetus for completing the Guidelines.
- CK noted that a DA will soon be lodged for Buildings E7A and E7B, which has triggered the requirements for the Guidelines. Council has confirmed that no Urban Design review is required for this DA.
- DJ confirmed that the DA could be lodged ahead of the Guidelines being finalised, however said finalisation of the Guidelines would likely be subject to conditions.
- MBi questioned whether MQU would be making a submission on the Draft DCP, and requested that the submission address key issues with the Draft DCP, and discrepancies between the Draft DCP and proposed Guidelines.
- KT confirmed that MQU will be making a submission on the Draft DCP, and that key issues and discrepancies will be identified.

Meeting Notes

MEETING SUBJECT: Macquarie University, Design Excellence Strategy and Urban Design Guidelines

LOCATION: City of Ryde Council

DATE: 29 May 2015

ATTENDEES:
Lexie Macdonald (LM) – City of Ryde Council
Meryl Bishop (MB) – City of Ryde Council
Cameron Kline (CK) – Macquarie University
Ian Connolly (IC) – Cox Richardson
Kate Tudehope (KT) - JBA

PROJECT NO: 11230

- Following receipt of MQU's submission on the Draft DCP, LM noted Council's intention to take MQU out of the DCP. LM noted that this view had to be confirmed with Dominic Johnson.
- Council was comfortable that Guidelines for Precincts E and D will be detailed after gazettal of the UAP, and noted that the a detailed response would be required at this interface.
- LM was very pleased with the level of detail, and the vision / principles which support the Guidelines around pedestrianisation, moving vehicles and bikes to the edge etc.
- LM noted that Council has concerns about accessibility between the student housing precinct and Macquarie Square.
- IC noted that the University is very cognisant of student safety, and this is a key priority. However, the intention of the pedestrian network is to bring people into the centre of the Campus, and not to provide a direct route to the shops.
- LM liked the approach to the public domain, noting that it completed Council's public domain requirements.
- LM noted that there are no clear controls about setbacks, asking how a planner would assess a proposed development against the Guidelines.
- LM suggested that that a new section be added before the lot controls to address setbacks and active frontages (similar to the Gladesville DCP).
- LM questioned how the varying setbacks eg. along Wally's Walk, align with CPTED principles.
- LM noted that 'active frontages' means more than just retail spaces. This can include entries, retail, windows etc. and said that the Guidelines might benefit from a broader definition of 'active frontages'.
- LM requested that the Guidelines nominate a minimum quantum of open space to be maintained. LM added that the increased densities associated with the UAP were dependent on MQU retaining open space.

- CK noted that the open space on the MQU is privately owned. Whilst MQU is happy for the public to use the space, it should not form part of Council's open space calculations for the Herring Road precinct.
- MB agreed with this position, and said it was unreasonable to require a certain amount of open space to be retained. However, MB said that it would be good for the Guidelines to contain text about the intention / principle to retaining open space on the Campus.
- MB noted that last year, OEH undertook additional vegetation mapping which affect the site.
- CK noted that MQU does not do any tree removal without offsets.
- IC noted that there is a commitment to retaining the significant vegetation on the site, and developing consistent with the guiding principles for the Campus, including the grid structure and areas of significant vegetation and open space.
- LM was supportive of the overshadowing controls.
- LM / MB noted that there should be scope / flexibility to vary the Guidelines, and that MQU should be able to do this as the landowner. This process for updating the Guidelines should be documented as part of the Guidelines.
- LM / MB also suggested that the hierarchy of documents (including the DCP's position below the Concept Plan approval and Urban Design Guidelines) should be documented in the Guidelines.
- LM / MB noted that there is a need for more detailed controls at all of the Campus' interfaces, with Council requiring greater comfort around how these interfaces will work, and any amenity impacts.