

# REALISING DEVELOPMENT ORIENTATED TRANSIT

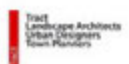
## PERTH LIGHT RAIL MASTERCLASS

23-25 SEPTEMBER, 2011



EVAN JONES for the  
AUSTRALIAN COUNCIL FOR NEW URBANISM  
PLANNING INSTITUTE OF AUSTRALIA (W.A.)

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# EXECUTIVE SUMMARY



## THE PERTH LIGHT RAIL MASTERCLASS

brought together key built environment professionals in September 2011 under the guidance of internationally acclaimed urban designers Stef Polyzoides and Wendy Morris. The Masterclass investigated transit oriented development opportunities along the first three proposed LRT routes in the draft *Public Transport Plan for Perth, 2031*; an LRT spine proposed through Perth's Northern Suburbs to the city, and proposed links from the City to Curtin University and the University of Western Australia - also known as the Knowledge Arc.

Peter Newman and Jan Scheurer of Curtin University Sustainability Policy (CUSP) Institute see Perth as needing to create another cross-city rail network which can be a new light-rail technology, integrated with land development and involving a private operator that can establish a new kind of public transport system in Perth<sup>1</sup>.

All proposed light rail routes were found to have opportunities to integrate with land development and support the aim of achieving a more compact urban form proposed in *Directions 2031*.

## LRT NORTH

Key origins and destinations and redevelopment opportunities for the Northern LRT route are Edith Cowan University, and the Mirrabooka and Dianella Plaza centres. The Masterclass considered that the heavily-engineered LRT system as currently proposed by the Government would result in considerable negative impacts on urban place-making and regeneration along Fitzgerald Street. An alternative fit-for-purpose LRT was proposed for the Northern Corridor so that it can run fast down sections of track where priority is

<sup>1</sup>The Knowledge Arc Light Rail: A Concept for Delivering the Next Phase of Public Transport in Perth. Peter Newman and Jan Scheurer, Curtin University Sustainability Policy (CUSP) Institute



assigned to meet regional transit demands, and go more slowly when passing through activity centres along Fitzgerald Street to stimulate urban regeneration at key locations.

### LRT SOUTH-EAST

An overall corridor redevelopment plan was developed for the proposed link to Curtin University, commencing with the Albany Highway redevelopment opportunities and envisaging comprehensive plans for the Technology Park and Curtin University.

It was estimated that some 9,500 residential dwelling units and

163,000 square metres of retail, mixed use and commercial could be added along the proposed LRT line.

### LRT SOUTH-WEST

The South West Light Rail between the CBD, the QEII Hospital and the University of Western Australia would facilitate an increase in the density and intensity of use around these destinations. In particular, a Light Rail Line would catalyse an opportunity for an Urban Village between UWA and its neighbouring district to the QEII Hospital, offering real potential for dense development on and off campus, and providing student/worker housing, affordable and market housing.

### CONCLUSION

Light rail works best as part of an integrated strategy that assimilates transit, land-use and development and fit-for-purpose governance arrangements<sup>2</sup>. Land-use and development aspects of the Perth Light Rail proposals should be better developed in unison with transport proposals so that transit design does not preclude Transit Oriented Development opportunities and the ability of the new LRT system to underpin urban consolidation.

<sup>2</sup>An Introduction to Transit-Oriented Development, Hank Dittmar with Dena Belzer and Gerald Autler. In The New Transit Town: Best practices in Transit Oriented Development, Dittmar, H and Ohland G, Island Press 2004

# INTRODUCTION



**THIS BOOKLET** is an edited summary of outcomes of a three day Transit Oriented Development (TOD) Masterclass held for industry professionals in Perth in September 2011 by the Australian Council for New Urbanism and the Planning Institute of Australia (W.A.) Division.

The new Public Transport Plan for Perth in 2031 introduces Light Rail Transit (LRT) as a new rapid transit system. The Masterclass brought together urban planners, transit planners, architects and others into a design process to test proposals for LRT in Perth and develop an urban design response for transit oriented development opportunities arising from the proposed LRT.

The Masterclass was limited to considering three proposed elements; an LRT spine proposed through Perth's Northern Suburbs and proposed links from the city to Curtin University and the University of Western Australia - also known as the Knowledge Arc. Other important light rail proposals such as a line to Stirling City Centre were not investigated and may be of equal or greater importance for early implementation.



**Figure 1:** Masterclass Light Rail Routes for Investigation

The Masterclass was led by internationally acclaimed urban designers Stef Polyzoides and Wendy Morris and this report draws heavily from their generous advice in describing the principles and practices of transit oriented development. Professor Peter Newman from Infrastructure Australia and co-author of The Knowledge Arc Light Rail offered the Masterclass the benefit of his international knowledge of LRT and how to position LRT as an Infrastructure Australia project for Perth.

Transport experts Jim Higgs and Chris Stapleton gave input on key design challenges for the light rail facilities. Facilitators and participants are noted in relevant sections of the report.



# THE CASE FOR LRT



**THE CASE FOR LIGHT RAIL** as the next phase of city development in Perth to ease congestion and contribute to sustainability and liveability is compelling. According to Peter Newman and Jeff Kenworthy, cities with modern streetcars have:

- 41% lower energy use per passenger/km than bus cities
- 18% lower automobile passenger kms per capita
- 23 % lower transport emissions per capita

- 38% fewer transport deaths
- Peter Newman and Jan Scheurer of Curtin University Sustainability Policy (CUSP) Institute prepared a Knowledge Arc Light Rail Transit proposal that sets out a substantial rationale for LRT (see <http://sustainability.curtin.edu.au/research/publications/publications.cfm>).

They argue that Perth has done well in its public transport development since rail electrification and extensions of the heavy rail to each major corridor. Public transport is now

faster than traffic down each major corridor. The passenger load on rail has increased from 7 million a year in 1991 to 55 million a year in 2009.

It is a global success story that is told around the world and has led to other Australian cities finally moving to expand their rail systems – with Federal Government assistance through Infrastructure Australia.

Newman and Scheurer reason that the Perth metropolitan region is growing fast and its traffic is a problem with an increase in car



ownership and the freeways are all full at peak time even with the rail system down the centre carrying the equivalent of 8 lanes of traffic.

They see Perth as needing to create another cross-city rail network which can be a new light-rail technology, integrated with land development and involving a private operator that can establish a new kind of public transport system in Perth. The many advantages include:

- Light rail - a modern tram can fit into street medians or replace or share a lane and can carry up to 20 times more people than a lane of traffic.
- It can run fast down sections of track where priority is assigned and can go slow when near pedestrians.
- It can provide the means for funding the infrastructure through value capture associated with planned land developments at stations.
- LRT is attractive to developers as it gives the boost that is needed to genuinely get people out of their cars and thus enables much less parking and much more productive and attractive development to be placed on nearby sites.

The Knowledge Arc Light Rail Transit proposal identifies development now planned along the route as including:

- The doubling of Curtin University (including six 20 storey towers of residential activity);
- The doubling of Technology Park;
- The large increase in residences on the western side of Victoria Park as



... a tram can fit into street medians or replace or share a lane which can carry up to 20 times more people than a lane of traffic.

well as commercial development along Albany Highway;

- The Riverside Development by the Metropolitan Redevelopment Authority on the river adjacent to the WACA and Trinity College which are also building extensive high rise and medium rise residences and commercial premises;
- The eastern end of Central Perth where most of the new high rise has been happening and more is expected;
- The Northbridge link or Hub is the largest urban regeneration in Central Perth directly above the Central rail station and the new underground bus terminal. If linked by the Knowledge Arc LRT it would create the biggest interchange point in the whole metropolitan public transport system - now easily linking the whole metropolitan area to Curtin and UWA as well as the rest of the Knowledge Arc centres;
- The redevelopment of the Princess Margaret Hospital (PMH) site on Thomas Street;
- The largest health complex in Perth with the new PMH and Sir Charles Gardiner Hospitals which are seriously compromised in their growth and functionality by traffic and parking issues; and

- The University of Western Australia complex, the State's premier knowledge hub which is set to double in size and has little ability to increase its parking.

The Masterclass reviewed current plans for LRT and tested the proposed LRT routes before they are fully fixed. GB Arrington of PB Placemaking suggests that successful TOD starts with the earliest decisions on the shape and design of the transit system<sup>3</sup> and the Masterclass looked at the key aspects of:

- Critiquing the existing plans for the LRT – by testing the proposed operational approach, stops, spacings and design
- Exploring the different scales of TOD - regional, 400m radius nodes; station stop precincts
- Testing opportunities and constraints for TOD along the routes
- Testing transit facility design – for TOD-friendliness and transit performance
- Exploring architecture for TODs, including architecture of its place/context
- Exploring and progressing funding and implementation concepts



LRT is attractive to developers as it gives the boost that is needed to genuinely get people out of their car

<sup>3</sup>Transportation: Being An Alternative To The Car Is Not Enough: Making Transit More Sustainable. G.B. Arrington, Network Sustainable Development November 2004 • Issue No. 59 • Volume XIX • Number 3

# LRT IN PERTH



Figure 2: LRT routes for Perth, in the latest Public Transport Plan for Perth, 2031

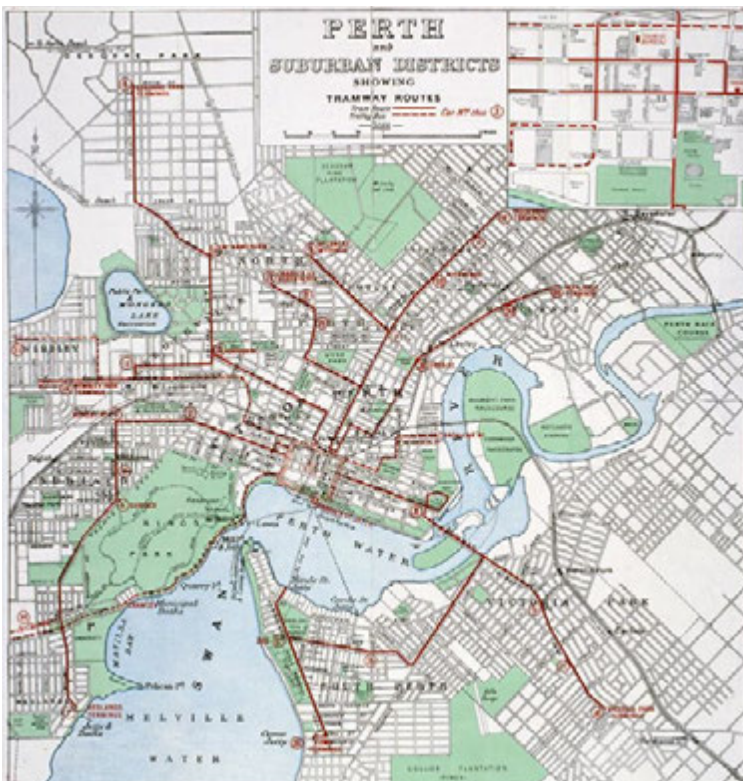


Figure 3: Perth and suburban districts showing original tramway routes



## PERTH'S ELECTRIC TRAM SYSTEM

was inaugurated in 1899 and covered a street mileage of over 50 km the 1930s, but was wound down from 1949, and closed in 1958 as all growth became auto-oriented. The original tram system both connected the suburbs to Perth and generated a walkable urbanism with mixed use development occurring around multiple stops that supported local retail.

# MASTERCLASS TRANSIT ORIENTED DEVELOPMENT PRINCIPLES



## 1. TRANSIT-LED LAND USE

**THE INTEGRATION** of transit and land use through Transit Oriented Developments (TOD) to create more liveable and sustainable communities is an important model of sustainable urbanism and a key tool for urban redevelopment.

TOD is defined as moderate to higher density development, located within an easy walk of a major transit stop, generally with a mix of residential, employment and shopping opportunities designed for pedestrians without excluding cars<sup>4</sup>.

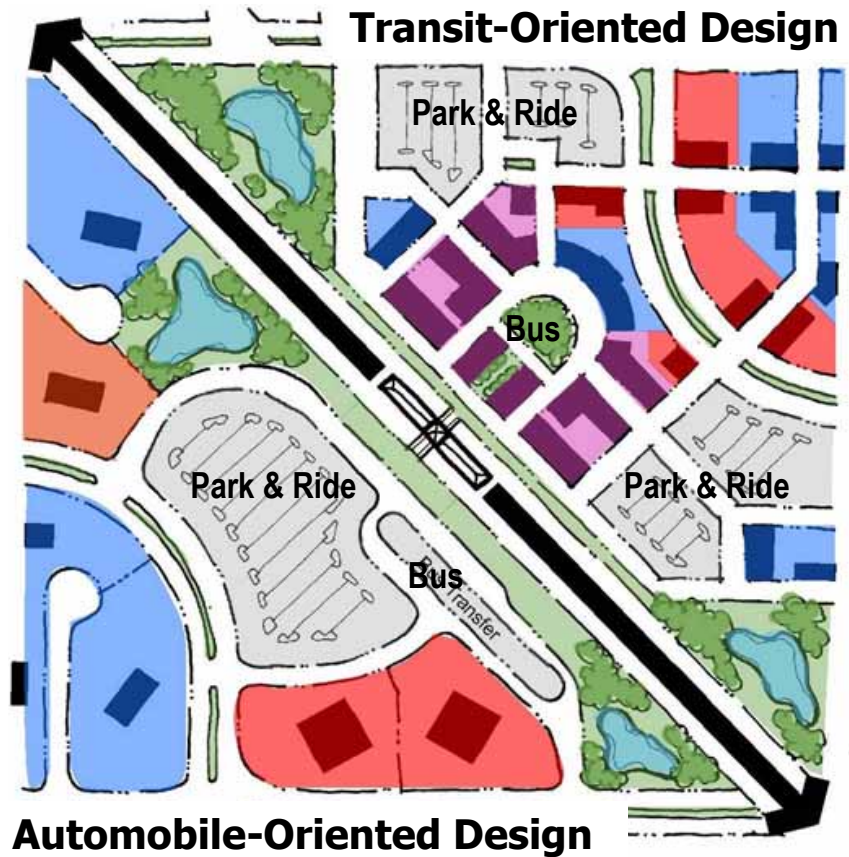
Transit's ability to facilitate sustainable development is dependent on designing facilities that support development by integrating pedestrian access from the local street network and foster more diverse and more intense land-uses.

Otherwise, transit can exclude urban redevelopment where independent facilities are designed separately from neighbourhoods. Common problems include the exclusive use of streets for LRT stations which stifles vehicular access to neighbouring land uses; pedestrian-hostile drop-off and bus interchanges immediately adjacent to stations; and provision of large parking areas around stations.

To be sustainable, shifts in both land use and transit are required. To effect regional land use change, local transit facilities need to be designed to support both transit performance and redevelopment. Where provided this way, Development Oriented Transit can catalyse the redevelopment of under utilised urban land and intensify the building fabric of areas along a light rail route. Station sites and the neighbourhoods, district and corridors surrounding them become accessible to metropolitan populations as living, working, retail and entertainment destinations. Their economic potential and physical form can be transformed<sup>5</sup>.

<sup>4</sup>Caltrans TOD Study

<sup>5</sup>Stefanos Polyzoides, Notes on Transit Oriented Development. First published in Banerjee, Loukaitou-Sideris: A Routledge Companion to Urban Design, Routledge, London, 2009



**Figure 4:** Auto or Development Oriented Transit?

Source: G.B. Arrington, PB Placemaking, Understanding the Fundamentals of TOD

## 2. MULTI-PURPOSE ARTERIAL STREETS AND BOULEVARDS

Streets have multiple roles in urban life and are more than public utilities or linear physical spaces that permit carriage of people and goods. They are places to live and to do business and facilitate the interplay of human activity. Streets moderate the form and structure and comfort of urban communities and play a vital role in the vibrancy of communities<sup>6</sup>.

Movement-seeking land-uses migrate to movement-rich lines, producing multiplier effects on movement which then attract more retail, greater density and mix of uses. This dynamic process is called the "movement economy"<sup>7</sup>.

Good arterial streets are a busy and animated part of a city's movement

economy. The land uses - retail and commercial enterprises, residential and public services (such as a school, library or post office) that locate in the street are critical to the area's vitality and prosperity<sup>8</sup>. Easy accessibility and clear way-finding for both pedestrians and traffic are important to capture passing trade

as well as service local catchments.

It is crucial to activate streets by addressing them with ground level uses with many windows and doors for an active, vital, safe and stimulating environment. Circulating pedestrians and traffic with on-street parking sustain this type of street frontage development.



Figure 5: Westgarth Street/High Street, Melbourne – Integrating land-use with cars and trams to maintain a vital local centre

<sup>6</sup>Great Streets Allan B Jacobs

<sup>7</sup>Movement Economy Dependent on Urban Design. Mehmet Topçu, Kadriye Deniz Topçu, Ayşe Sema Kubat, Proceedings, 6th International Space Syntax Symposium, Istanbul, 2007

<sup>8</sup>Main Street Handbook- A User's Guide to Main Street, Portland Metro, March 1996

**//** The location of stops determines the ability of transit to catalyse redevelopment. The aim is to build places as well as a transit project.

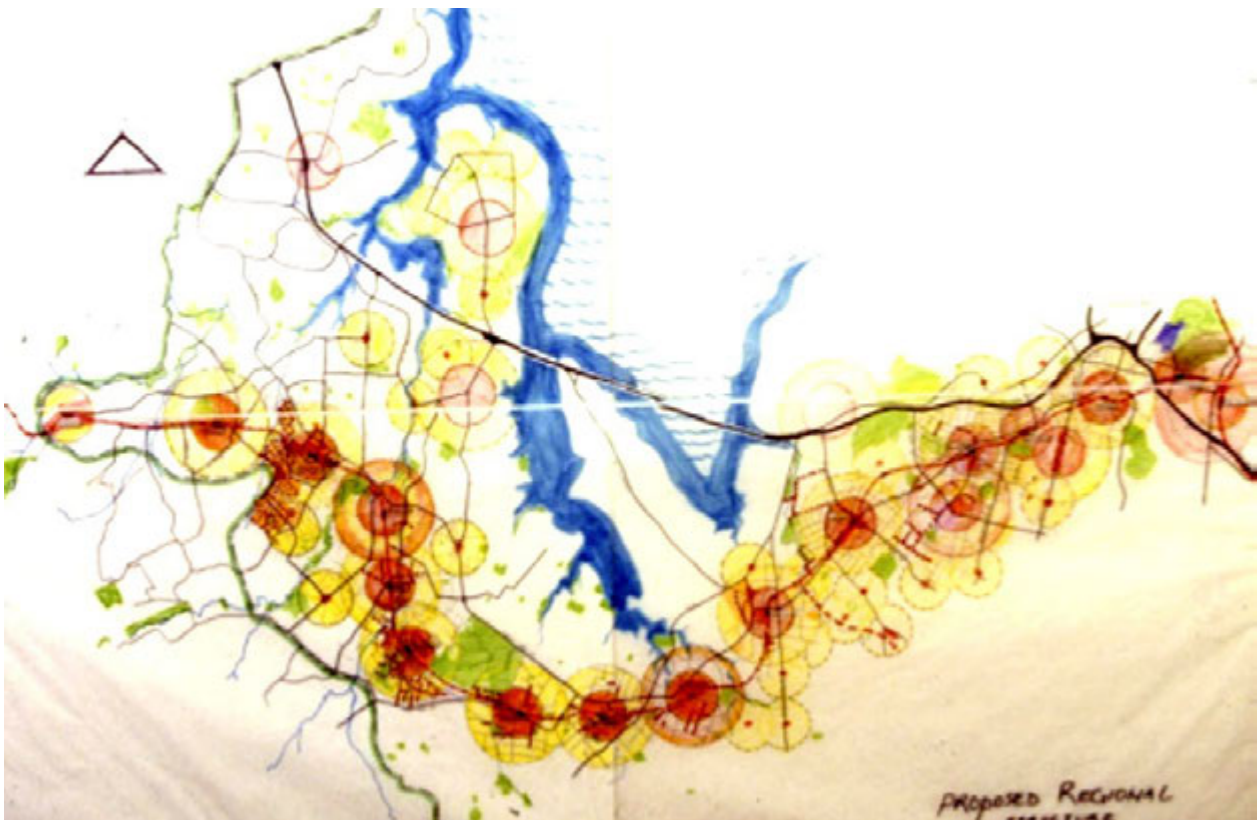
### 3. ROUTE CHOICE

Successful TOD starts with the earliest decisions on the location and design of the transit system. The choice of a light rail route to link key destinations determines the viability of a transit system and establishes the redevelopment opportunities along the route. The location of stops determines the ability of transit to catalyse redevelopment. The aim is to build places as well as a transit project.

Stops should be tested to ensure that they are located at places that have the potential to be further intensified by an appropriate mix of uses that encourage pedestrian activity and transit ridership<sup>9</sup>.

Principles to enhance the opportunity for TOD:

- Stations must be located in areas with development potential
- Transit facilities must be designed in a compact, pedestrian-friendly manner
- The design of station facilities must allow for direct pedestrian connections to adjacent communities
- TOD must be appropriately incorporated into the transit facility design including bus route interchange opportunities
- Any designated park-and-ride area must be designed in a manner that does not separate the station from the community it is intended to serve.



**Figure 6:** Auckland Waitakere Transit Investigation – Ecologically Sustainable Design

<sup>9</sup>Stefanos Polyzoides, Notes on Transit Oriented Development. First published in Banerjee, Loukaitou-Sideris: A Routledge Companion to Urban Design, Routledge, London, 2009

## 4. LRT SPACING AND STOPS

LRT stops depend on what opportunities the urbanism of the light rail route offers when balancing the objectives of mobility and improved access.

From a transit perspective, wide stops for rapid operation makes light rail useful for longer trips for moving passengers along a corridor. Lower operational speeds and close station stops at around 800 metres serve denser suburbs and best support walkability and urban regeneration. In practice light rail can respond to both, with faster speeds and wider stops in outer suburban areas, and slower speeds and more frequent stops in inner suburbs and the inner city.

By better serving exiting suburbs with easy access and creating opportunities for urban redevelopment, the whole city becomes less dependent on longer-distance twice-daily trips.

Important stops and TOD precincts should be located where significant intensification is required at key development or redevelopment opportunities along the route. These stations should also host key bus route interchange opportunities along LRT corridors.

Pedsheds should be prepared for each proposed stops to identify how connected the stop will be with the local neighbourhood. Any significant missing streets/walkable connectivity gaps should be identified and new streets should be located, or pedestrian links added where a street is not practical.

Relative urban densities along the corridor (within 500m of route or 800m of likely stops) should also



**Figure 7:** Albert Park TOD, Melbourne, Ground Floor Land-Use, Ecologically Sustainable Design, 2006



**Figure 8:** New Lynn, Auckland, New Zealand, TOD Concept Plan, Ecologically Sustainable Design

<sup>10</sup>Jeremy Edge, "The impact of transport schemes on land values: what is the evidence?" *Self-financing Transport Projects Through Land Value Gains: Too Good to be True?* Conference, London, 20 May 2003

<sup>11</sup>Matthew Doherty, "Funding public transport development through land value capture programs".

<sup>12</sup>Transportation: Being An Alternative To The Car Is Not Enough: Making Transit More Sustainable. G.B. Arrington, *Network Sustainable Development* November 2004 • Issue No. 59 • Volume XIX • Number 3

be considered to help prioritise station location. Small-scale intensification options for typical single dwelling residential areas should be investigated along the LRT route, especially near stops.

## 5. STATION DESIGN

Transit stops have dual roles as stops in the transport network and as a local place in a neighbourhood and need to balance transport and urban development issues.

Station design is characterised as to whether the station is predominantly for trip origins or trip destinations. This informs the type of uses and development that the station may support including housing, shops and employment. It establishes the framework for station design, and establishes the structure of places around the station, and by extension, the building and development strategies that are unique to the profile of each station.

Buildings, open space, landscape and infrastructure should assume a particular character depending on where they are located. For example, small, low rise, detached, mixed-use buildings would be expected in lower intensity urban settings. Attached, mid-rise, mixed use buildings and large, high-rise, vertical mixed-use buildings would be common in middle and high intensity urban locations respectively.

Station access should be interconnected and multi modal. Buildings should define a realm of public space of thoroughfares, parks and plazas, whilst parking should be hidden, wherever possible. The density of the particular buildings deployed should vary by the degree

of their closeness to the transit station; the closer the station, the denser the building.

## 6. LAND VALUES FOR REDEVELOPMENT

By improving urban accessibility light rail transit can increase land values and be a catalyst for opportunities in the vicinity of stations, on vacant sites along the LRT route and through intensification of existing development. Some of the value created by the transit link can be used to assist with the funding of LRT projects. By this relationship of mutual benefit, transit can catalyse development<sup>10</sup>.

The development of transport infrastructure, although often necessary to propel urban regeneration, may not in itself be sufficient to generate development.

Compared to the US where urban arterials are often blighted or occupied by low-value land uses, a particular condition of the proposed Perth LRT routes is intact and relatively valuable residential and commercial development. As values are already relatively high, the value adjustment may be marginal for many years after the transit is built. Comprehensive redevelopment may not be catalysed, and sufficient additional value may not be generated to materially assist with infrastructure funding. It could also inhibit the desired redevelopment<sup>11</sup>.

The high land-value condition of Perth emphasises the need to ensure that all opportunities for new development on available sites along the proposed LRT lines be identified and facilitated. Also, to catalyse urban intensification, changes in development standards



Figure 9: New Urbanist Enquiry-by-Design approach to interactive public design processes. Perth LRT Masterclass

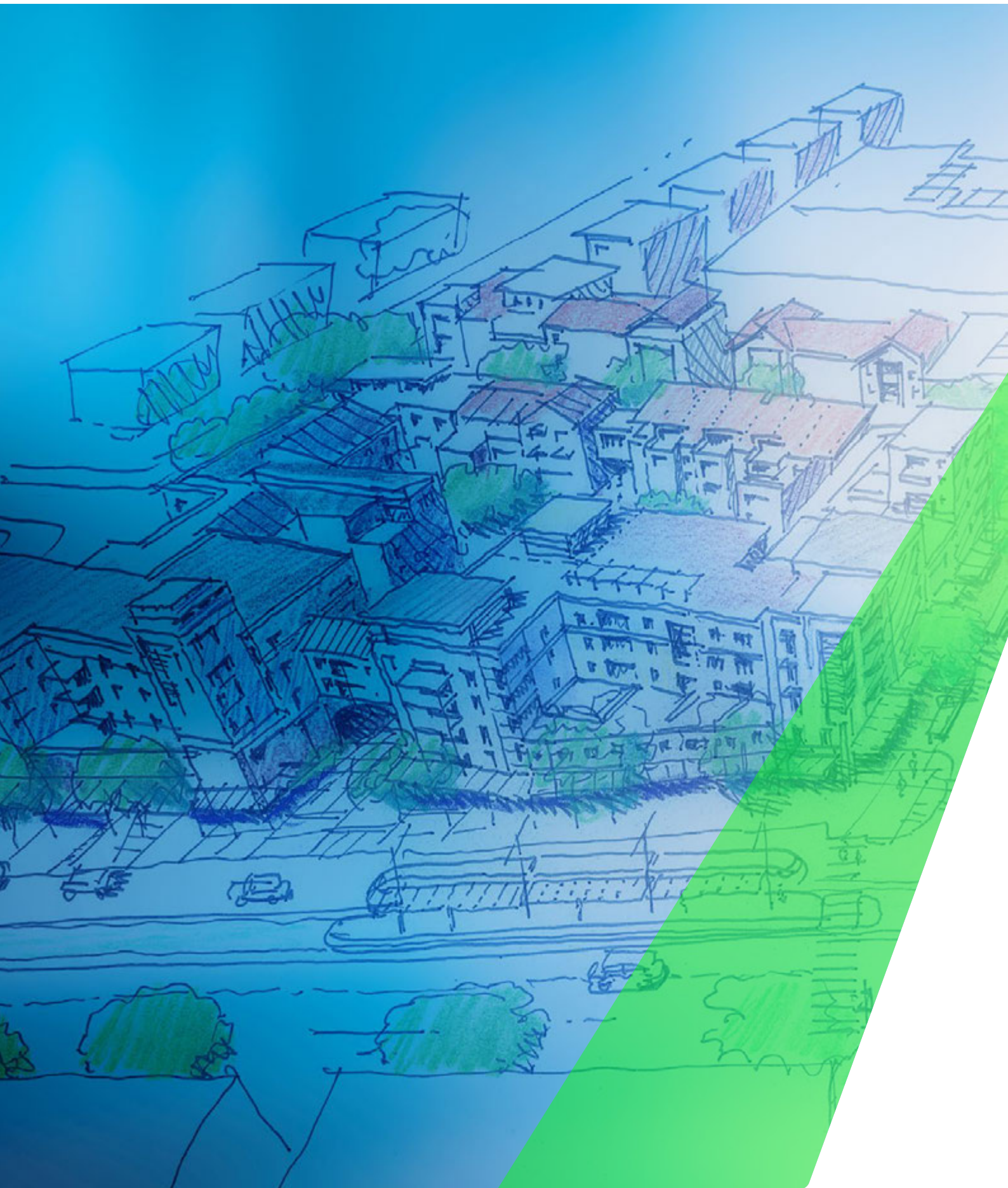
may be required, such as increasing densities in the vicinity of stations and reducing parking to building ratios. Consideration also needs to be given to expeditious approval processes.

## 7. COMMUNITY SUPPORT

LRT has the potential for transformative community change, but it requires community support.

New transit systems typically raise community concerns about impacts from the construction, changes to movement patterns and worries over the effects of additional development along the transit system. It is essential that a case for more than transit is argued. To gain local and wider community support LRT proposals need to be part of community's vision for growth<sup>12</sup>.

The development of proposals related to a transit system should be linked through a community participatory process such as an Urban Design Charrette. Using this method, the community of neighbours living in proximity to stations can raise issues of local concern or sensitivity and discern the mobility, economic development and physical design benefits that a station design may produce for them.







# PERTH LRT NORTH

EXPERTISE/ROLE	PARTICIPANT
<b>Facilitators/Urban Designers</b>	Clive Alcock Ben De Marchi
<b>Transport specialist</b>	Jim Higgs
<b>Urban designer or architect</b>	Sonny Embleton Bret White
<b>Transport focus</b>	Maireed Cantwell Andrew Foreman Donald Yates
<b>Planning focus</b>	Catherine Evans Tayne Evershed Daniel Heymans Rosy Serventy
<b>Engineering focus</b>	Danya Alexander John White
<b>AUDRC</b>	Julian Bolleter

## NORTHERN CORRIDOR CONTEXT

**PERTH'S NORTHERN CORRIDOR** is located between the Perth-Joondalup and Perth-Midland Rail lines. Buses along the Alexander Drive route to Perth City are approaching overload. The projected patronage is equivalent to the Fremantle, Armadale and Midland lines. LRT is proposed to move the current and projected large volumes efficiently.

Key destinations and redevelopment opportunities for the Northern LRT are Perth City, Edith Cowan University, and Mirrabooka centre.

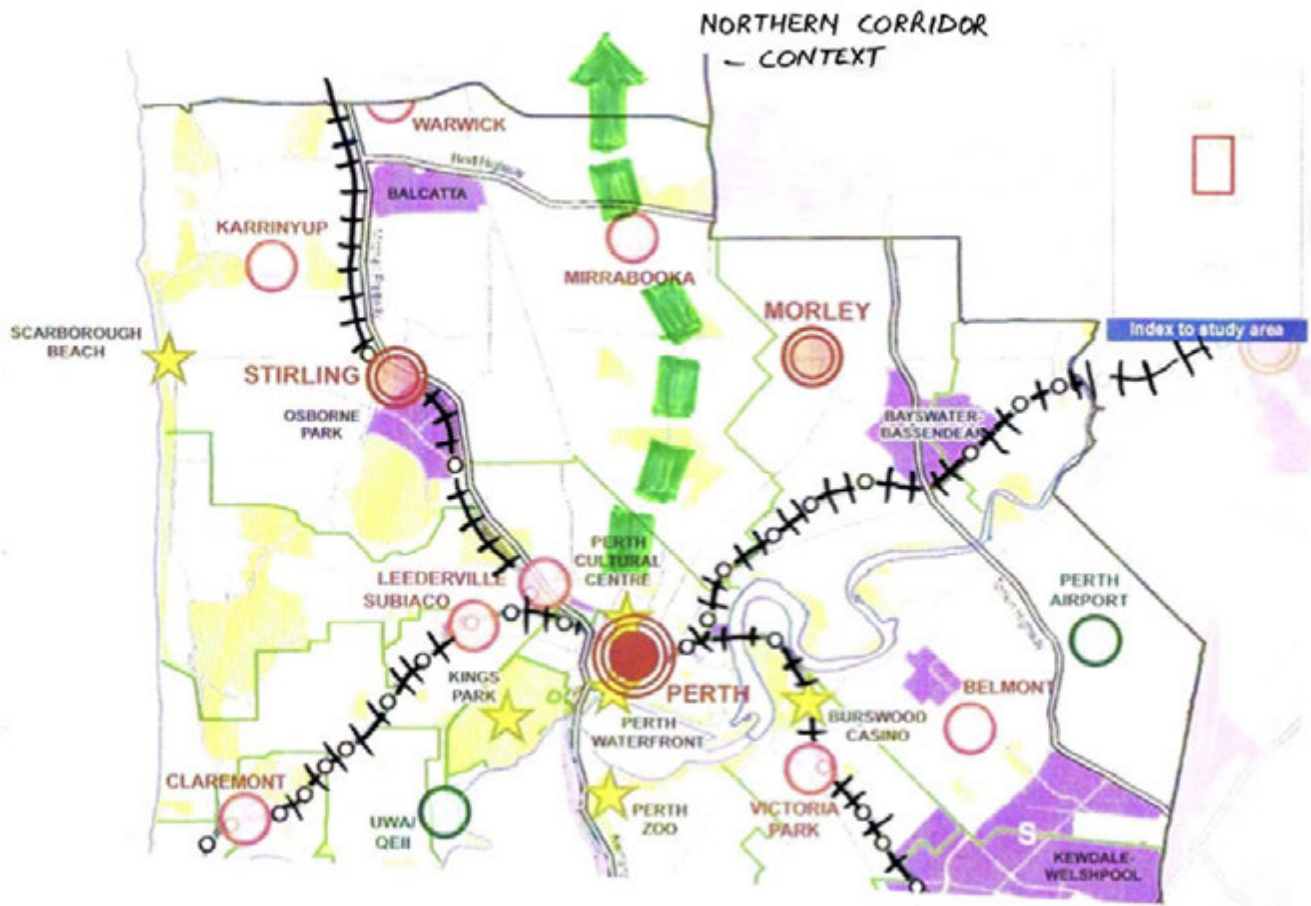


Figure 10: Northern Corridor LRT Context

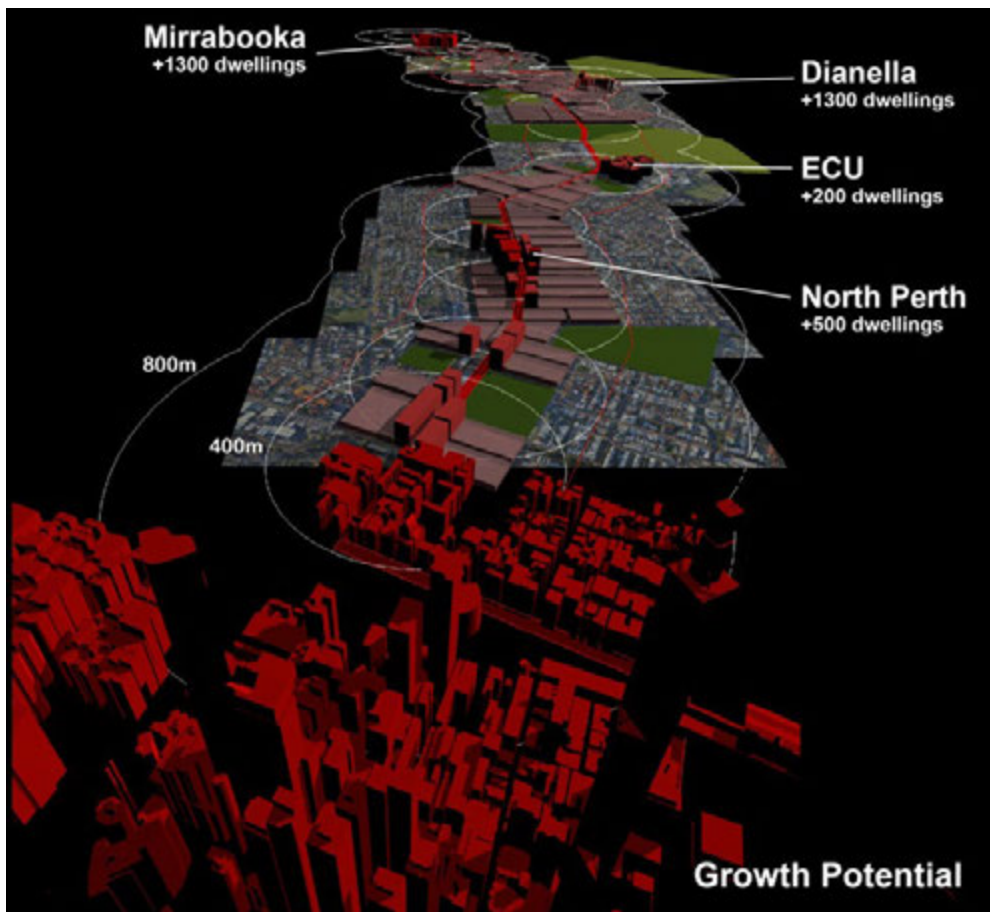


Figure 11: Northern LRT Corridor Growth Potential

## ROUTE CHOICES

Alternative route choices to the Department of Transport’s proposed Perth – Mt Lawley ECU – Mirrabooka route were investigated. These included Mirrabooka/ Nollamara Avenues to Wanneroo Road and then either continuing to Perth City via Charles St or to Perth City via Walcott Street/Fitzgerald Street .

The alternative routes add additional time, but increase potential catchment areas for redevelopment and the likely intensity of redevelopment as follows:

Route	Length (km)	Number of Stops	Time (in comparison with Route A) (mins)	Catchment Area (in comparison with Route A) (ha)
A	7.4	10	-	-
B	7.6	11	+1	+20
C	6.7	10	+2	+16

This high level analysis indicates that alternative routes should be considered if more priority is to be given to catalysing redevelopment.

## NORTHERN LRT ROUTE CHARACTERISTICS

The current Perth – Mt Lawley ECU – Mirrabooka route has two distinguishing characteristics. The northern half of the proposed route from Mirrabooka to North Perth has wide road alignments to run along, such as Alexander Drive allowing fast running.

The walkable catchment along this part of the route is limited because of current low densities along the route, poor interconnectivity of the road network from Alexander Drive northwards and large areas of public open space and recreational areas along the route, particularly the Yokine reserve and the Mount Lawley Golf Club.

The southern half along Fitzgerald Street from Walcott Street into

the City will be relatively slow in comparison, unless as proposed, significant priority is given to the LRT by removing cars, adding intersection underpasses and providing few stops.

Fitzgerald Street is unsuited to traffic removal as there is no parallel local street behind it to enable easy access to business. Fitzgerald Street is one of Perth’s few lively inner-city localities with strong traditional urbanism and its shops and businesses require frontage access and parking to maintain viability.

### Build Places Not Projects

The workshop considered that the Government’s proposed LRT system would result in considerable impacts on urban place-making and regeneration potential along key areas of the proposed route.

The current transit proposals include diverting all traffic from Fitzgerald Street, closing or converting some local streets into culs-de-sac at station locations and sinking a \$25 million tunnel under Walcott Street

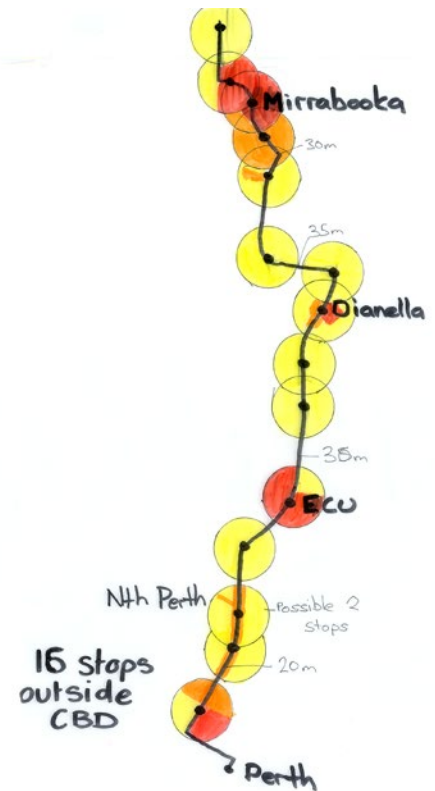


Figure 12: Perth – Mt Lawley ECU – Mirrabooka as currently proposed by State Government (Route A)

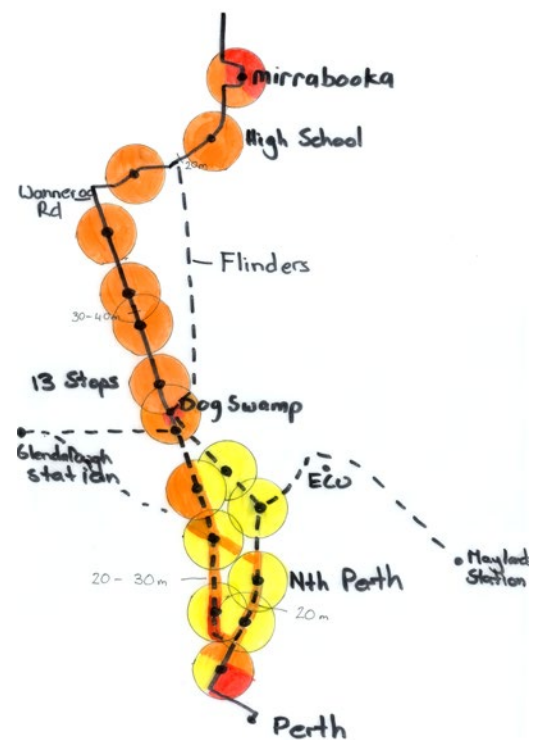


Figure 13: Alternative Route Options along Wanneroo Road (Route C - via Charles St, Route B - via Walcott/ Fitzgerald St)

with a 130 metre entry and exit. The proposed tunnel at Walcott Street is unnecessary as the intersection is already light-controlled; it will be ugly and it will deny a key stop at the Walcott Street junction, preventing local patronage.

If these anti-urban transit proposals remained unaltered, land-uses along Fitzgerald Street will downgrade and the opportunity for comprehensive redevelopment will be mostly lost.

Re-development along Fitzgerald Street would be important as revenue-generation to help fund the new LRT. It is also noteworthy that expensive engineering proposals are planned such as tunnels, making the funding task more difficult.

Practical engineering alternatives were therefore generated at the

workshop to sustain both transit and land-use. An affordable fit-for-purpose LRT is proposed that can run fast down sections of track where priority is assigned to meet regional transit demands, and can go slow in existing activity centres to stimulate urban regeneration at key locations.

The objective for Fitzgerald Street is to keep traffic and add trams with priority, similar to many of Melbourne's 20 metre streets. In that way efficient service can be delivered whilst sustaining urban development and revitalisation.

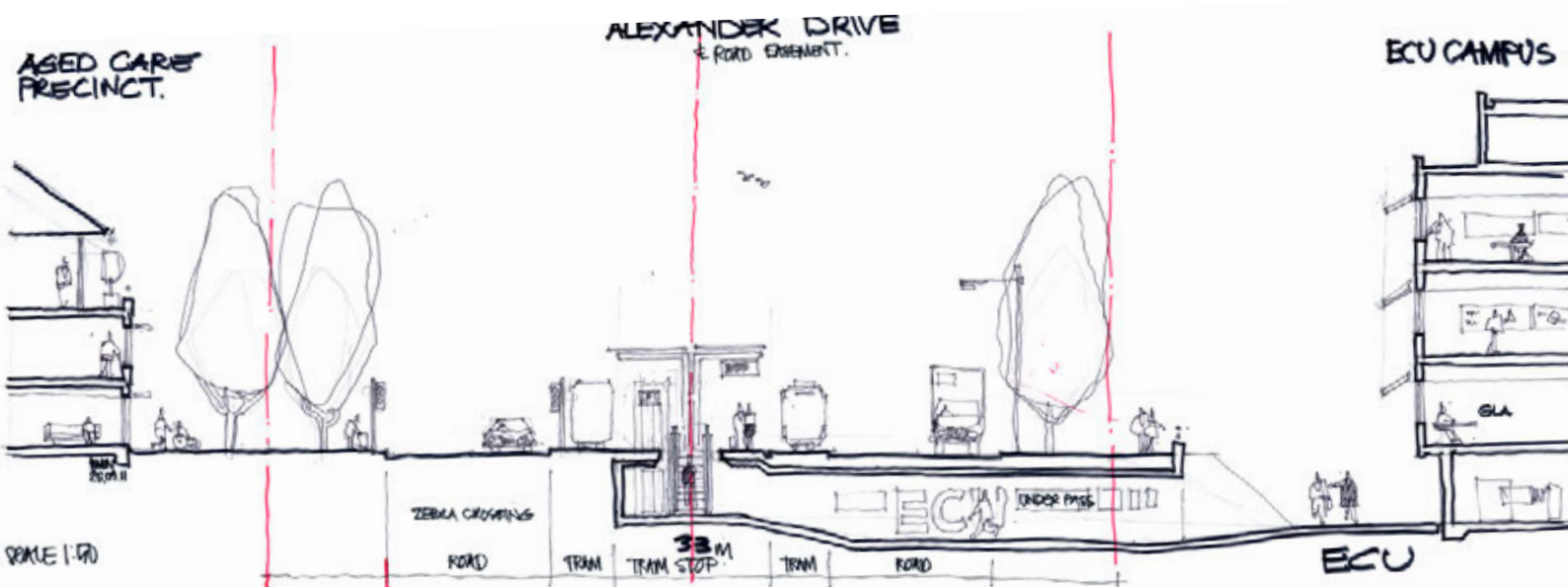
Low land value and denser corridor development along the Alexander Drive/Mirrabooka Avenue route with apartment development is improbable in the immediate future as land values are relatively high already.

## REDEVELOPMENT OPPORTUNITIES

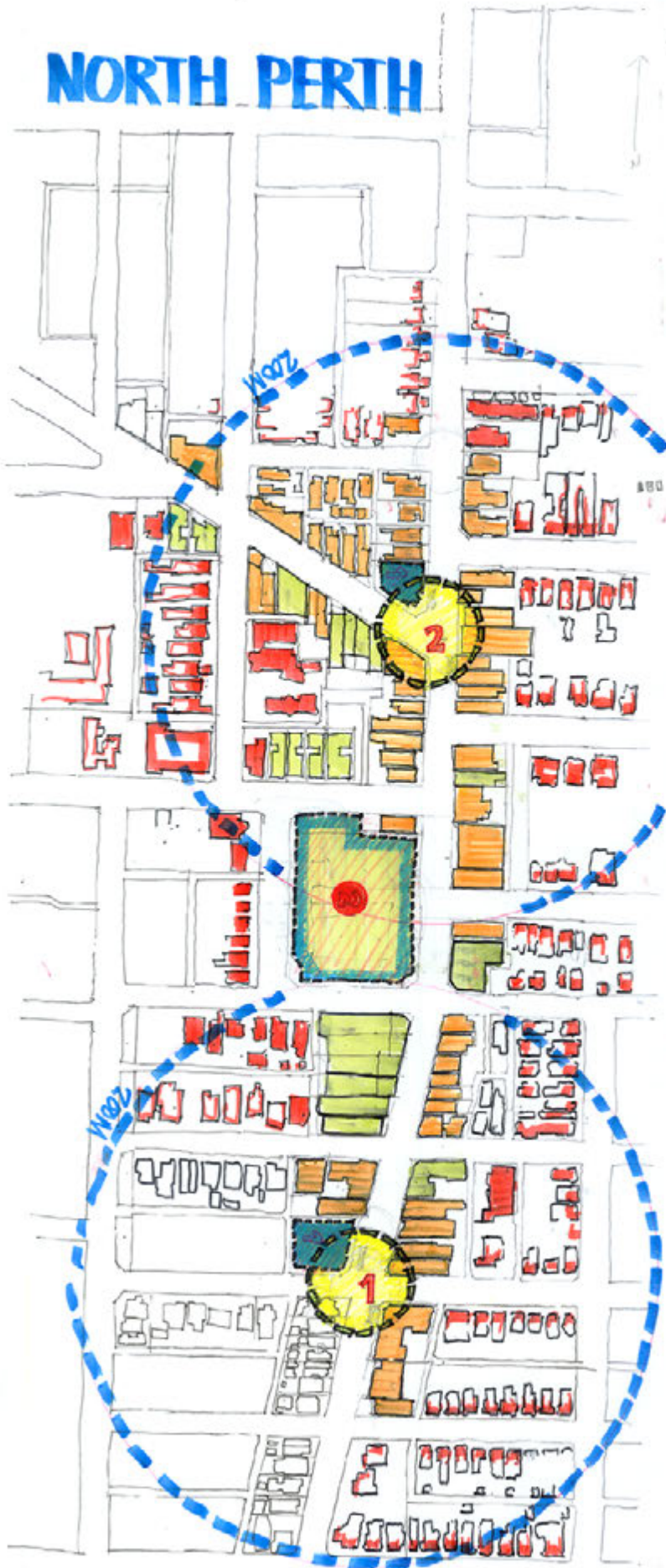
### Edith Cowan University

A key development opportunity along the route is student housing at Edith Cowan University which will help contain travel and utilise the proposed light rail, but could not generate any infrastructure revenues, as the land is in public ownership.

An expensive underground link to the Edith Cowan University is proposed by Government to the east, whereas an at-grade crossing is proposed to retirement housing to the west. It would seem that light-controlled crossings both east and west would be the most cost-effective solution.



**Figure 14:** Cross section of State Government proposed underpass on Alexander Drive at Edith Cowan University showing potential development at the University. The need for an underground crossing was questioned at the masterclass.



North Perth is an opportunity for intensification based on a new light rail line.

### NORTH PERTH

North Perth is an opportunity for intensification based on a new light rail line. However, the redevelopment sites are small and the Melbourne experience would indicate that redevelopment of these older 19th Century centres will be slow.

The workshop explored two LRT stations sites in a bar-bell configuration to maximise walkable pedestrian catchments and anchor redevelopment. An alternative single stop at the North Perth Plaza also merits consideration from an urban revitalisation perspective.

This arrangement would provide for 3 and 4 story unified mixed-use redevelopment between Grosvenor Avenue and Angove Street, with North Perth Plaza as the heart. In time the existing shopping centre could be reconfigured to an urban model, burying the supermarket and wrapping commercial and residential land uses around the frontage.

Figure 15: Masterclass proposed dumbbell stops at Grosvenor Avenue and Angove Street.



Figure 16a: Portal or gateway development proposed, corner Grosvenor Avenue and Fitzgerald Street – Plan View

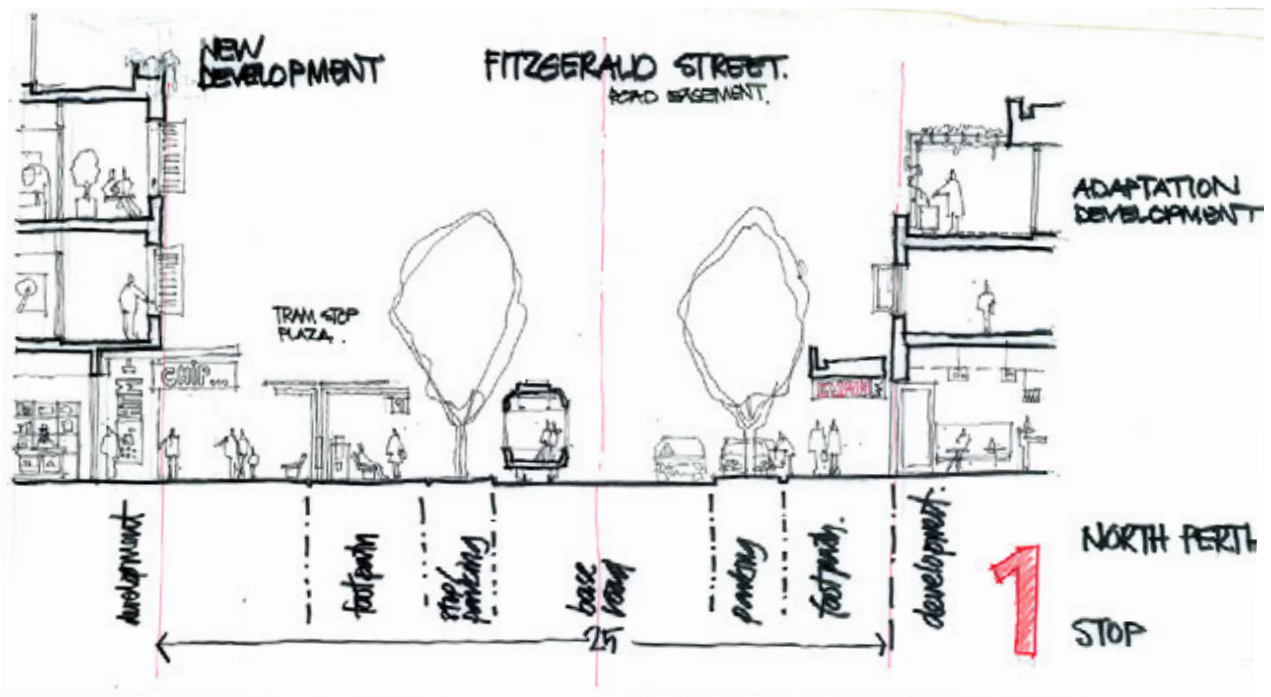


Figure 16b: Portal or gateway development proposed, corner Grosvenor Avenue and Fitzgerald Street – Section



Figure 17a: Portal or gateway development proposed, corner Angove Street and Fitzgerald Street – Plan View

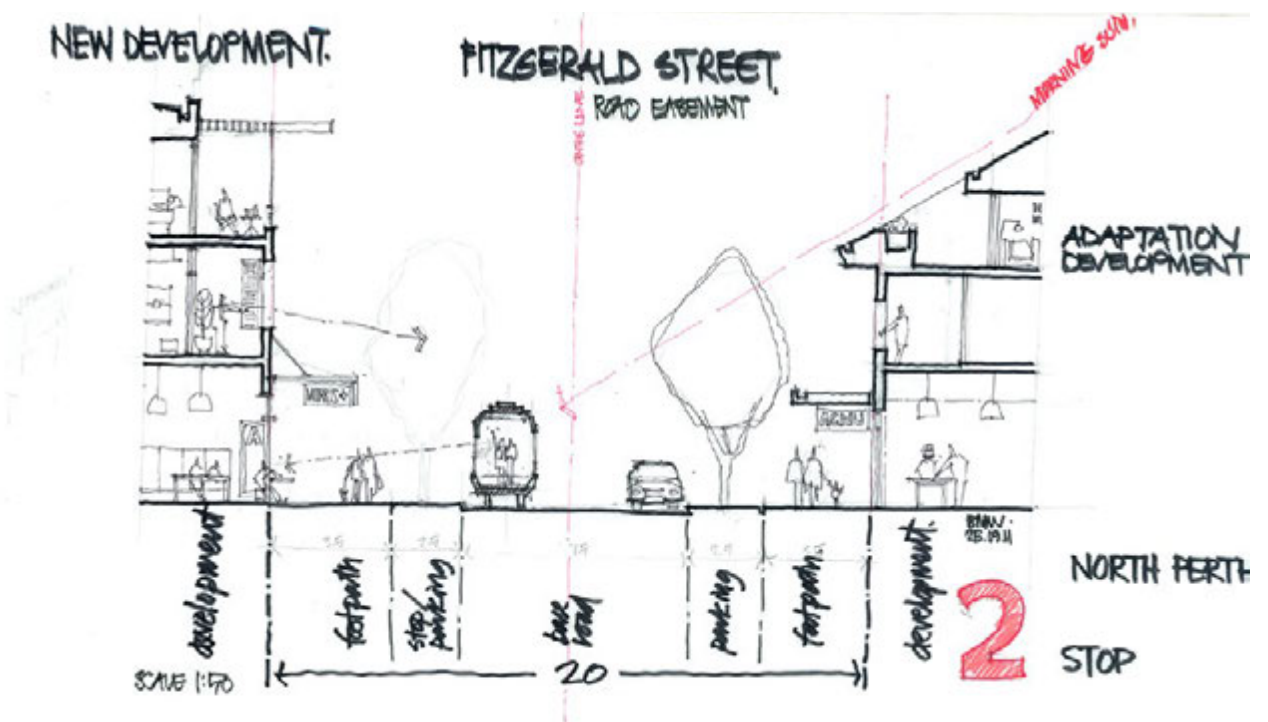


Figure 17b: Portal or gateway development proposed, corner Angove Street and Fitzgerald Street – Section

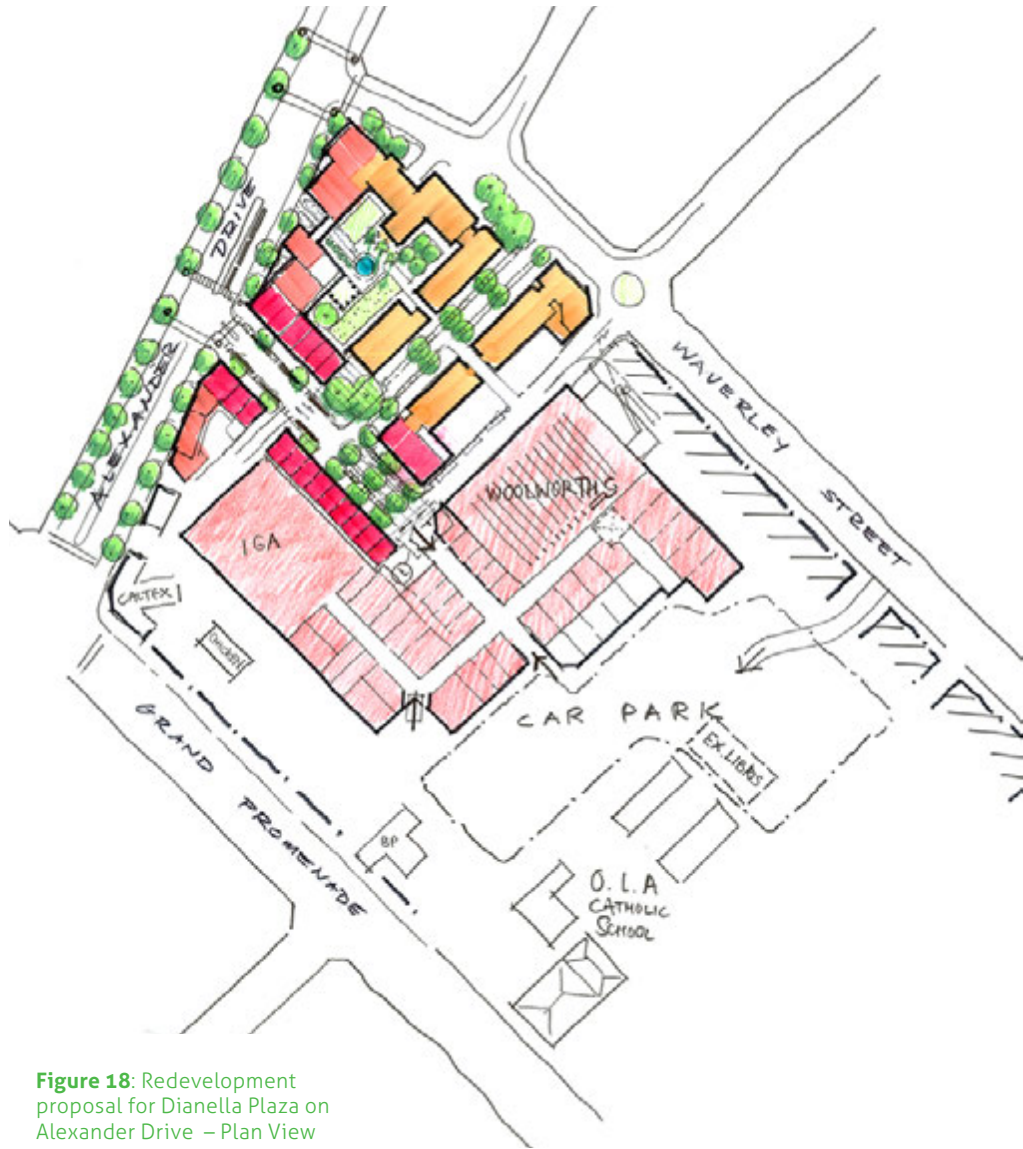
## DIANELLA PLAZA

There is an opportunity to build a TOD at the Dianella Plaza. Current DoT plans only include a 1.2 ha bus interchange to circulate on to deliver and pick up LRT passengers. The workshop proposes to move the LRT stop to facilitate a transit-oriented development proposal at Dianella Plaza.

A new 'main street' link is proposed to provide for a mixed use development to the frontage of the functional Dianella Plaza Mall. The parking will be left through the back to service the mall. Buses are proposed to circulate and lay over with 6 bus stops and 3 layover bays allowing easy access to a tram stop on Alexander Drive. An alternative to buses entering and exiting this new Dianella main street is to have a 'U' shaped circulation using Waverley Street and the new main street access points to allow buses to stop on both sides of Main Street, but not have to turn around on Main Street. An investigation of traffic lights and turning arrangements would be needed to resolve appropriate access from Alexander Drive.

Urban development would comprise 5 stories to the street, and 3 stories facing existing residential streets. Ground floor retail and business is proposed with residential use above.

This proposal could completely reinvent Dianella Plaza and promote adjacent urban redevelopment, transforming a single-use monolithic retail-box into an appealing urban environment that is mutually supportive of light rail.



**Figure 18:** Redevelopment proposal for Dianella Plaza on Alexander Drive – Plan View



**Figure 19:** Redevelopment proposal for Dianella Plaza on Alexander Drive – Axonometric View



## MIRRABOOKA CENTRE

The LRT terminates at Mirrabooka and it plays a key role in transferring bus passengers to the CBD. There has been debate on the location of the LRT stop at Mirrabooka; either at the front (east) or rear (west) of the existing bus station. These options were considered at the workshop looking at both operational and urban benefits of each location.

From an urban perspective, the stop location at the proposed

town square at the front of the bus station is strongly preferred to ensure that the square is fed with passengers embarking and disembarking, ensuing a more lively and functional space – which in turn will catalyse further redevelopment of the centre. Turning movements for the light rail were considered to be acceptable on the street system in this configuration.

The option of urbanising the area around a Light Rail stop on the rear (westward side) of the bus station was also investigated, but

was generally agreed as an inferior outcome that would have less synergy with the urban renewal of the Mirrabooka Centre.

Renewal of the Mirrabooka Centre has been extensively investigated by the City of Stirling and the workshop followed these proposals. An initial stage of development in an area under State Government ownership is recommended via the extension of Milldale Way to the proposed main street and town square.

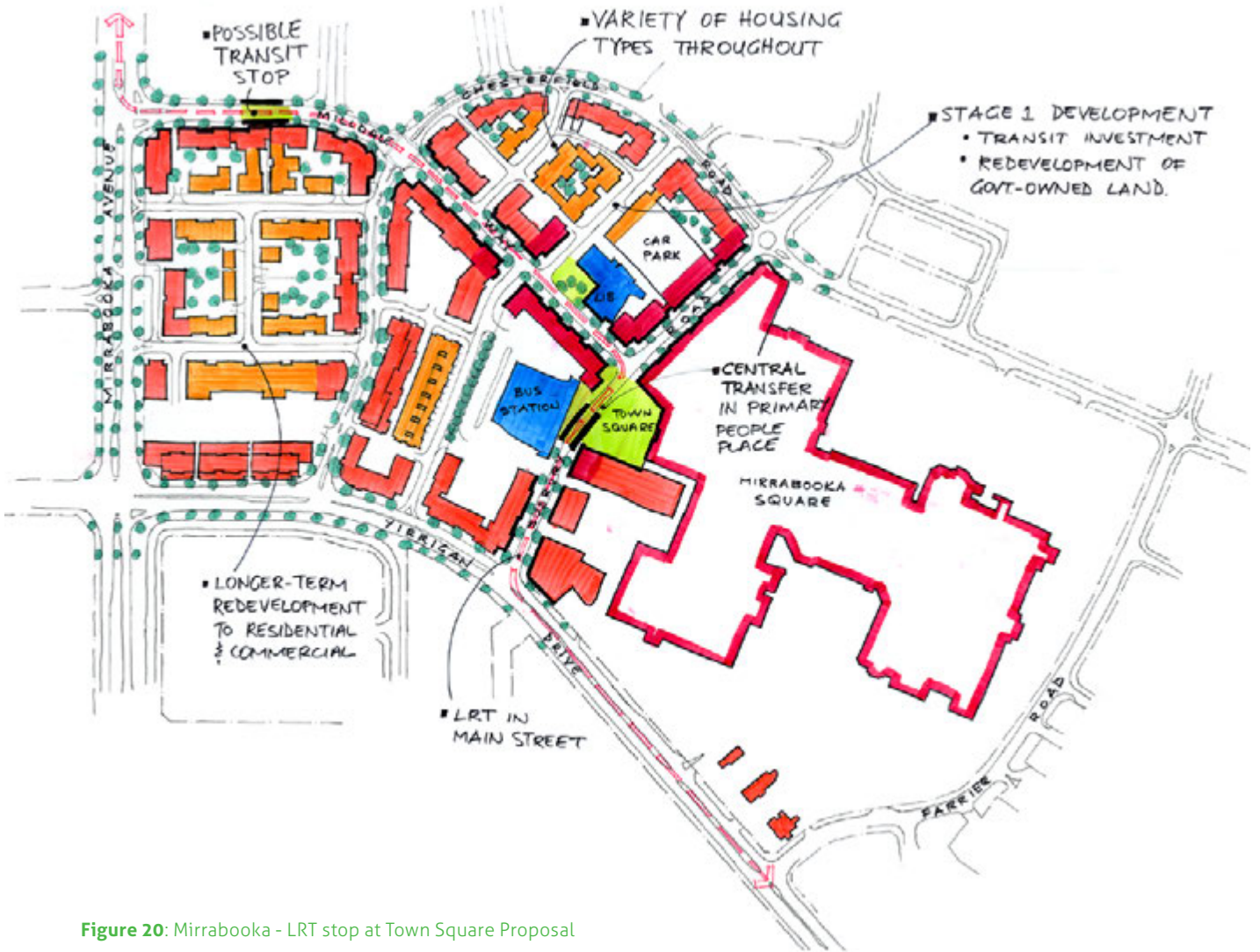


Figure 20: Mirrabooka - LRT stop at Town Square Proposal



Figure 21: Whitehorse Road, Balwyn, Victoria – a similar condition to Fitzgerald Street Perth

## ROAD DESIGN STANDARDS AND TRAM ROUTE AMENITY

To integrate land use and development with LRT stops and alignments, the key design challenges for the light rail facilities are to keep them as space-efficient as possible and to facilitate integration with foot and vehicular traffic.

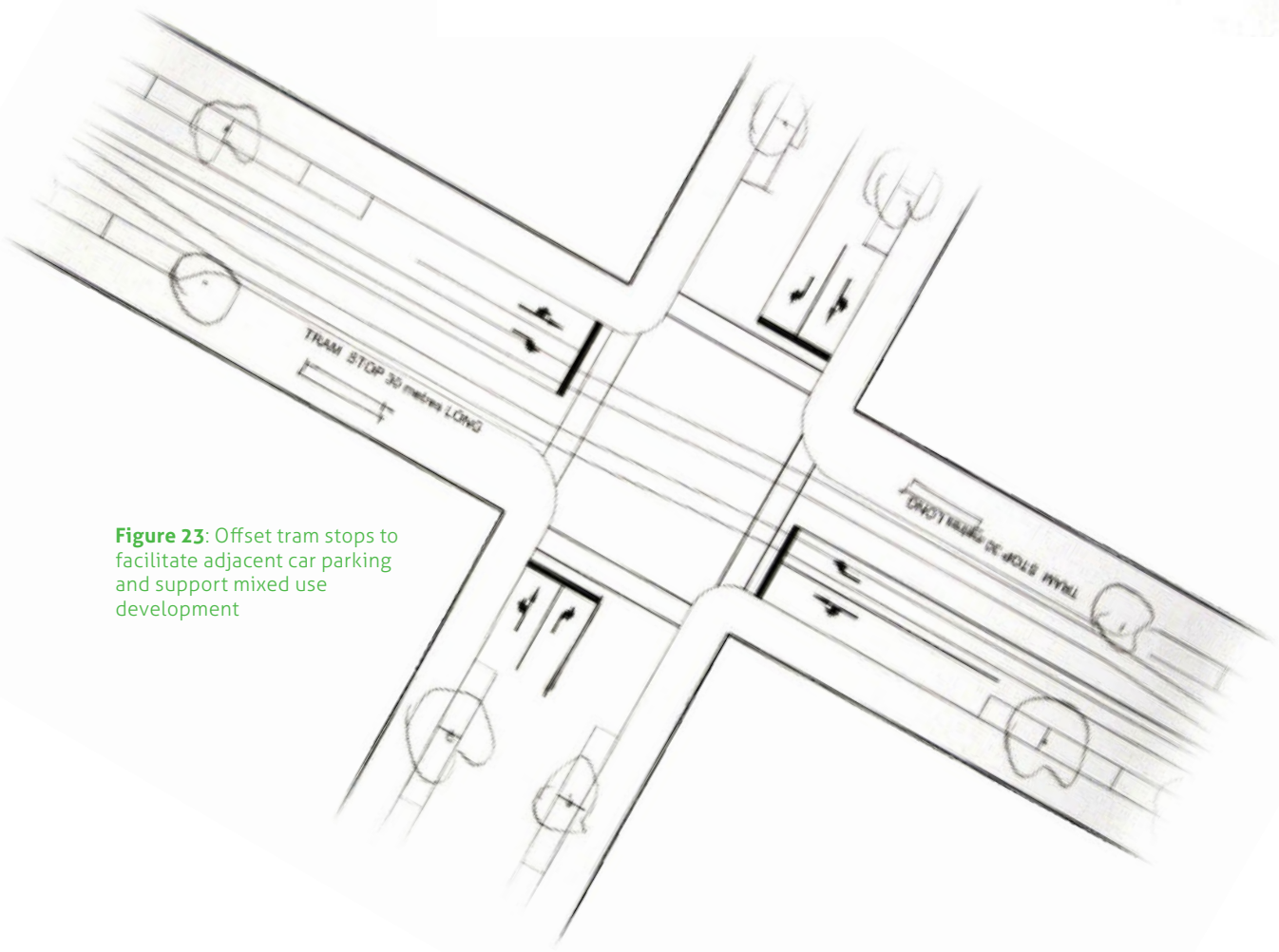
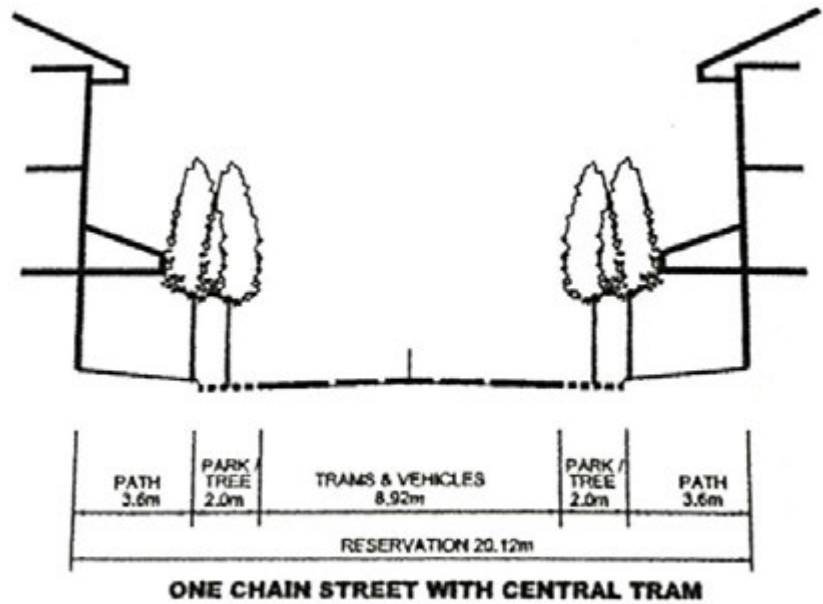
This requires all LRT facilities to be kept as tight as possible and requires reasonable compromises between development objectives and engineering standards. Context is essential, with development objectives prevailing where transit oriented development can be supported, and the ability to have a sharper engineering focus where transit is the clear priority.

Current Government draft design standards indicate 3 distinct forms of on-street LRT:-

1. Integrated On-Street Tramways: the tracks are in the roadway and can be used by other vehicles and pedestrians
2. Segregated On-Street Tramways: where tracks can be crossed or used sometimes
3. Protected On-Street Tramways: physical barrier "protects" the tracks from other vehicles

To achieve the Masterclass objective of retaining the amenity in the urban streets, especially the "one-chain" (20 metre) width streets, the design response is to have integrated on-street tramways with cars sharing tracks, to keep (and maximize) car parking, and to offset the inbound and outbound stops so everything can fit.

**Figure 22:** One Chain (20 metre) street with central tram



**Figure 23:** Offset tram stops to facilitate adjacent car parking and support mixed use development



Jim Higgs -We need to think "TRAM" NOT "TRAIN" to protect the local activity centres!



# PERTH LRT SOUTH EAST

EXPERTISE/ROLE	PARTICIPANT
<b>Facilitators/Urban Designers</b>	Peter Richards Malcolm Mackay John Stimson
<b>Transport specialist</b>	Chris Stapleton
<b>Urban designer or architect</b>	Oliver Penman Felicity Dowling Suzanne Barker Ben Fereday Phil Slater
<b>Transport focus</b>	Gary Merritt Frank Lindsay Donald Veal
<b>Planning focus</b>	Denise Morgan Andrew Patterson Karen Wright Rochelle Lavery
<b>Engineering focus</b>	Jamie Mullins John Wong
<b>AUDRC</b>	Paul Verity

## EXISTING CONDITIONS

**THE JOURNEY** from the CBD to Curtin University has a range of townscape elements. A new significant office development has been located in the causeway precinct, giving way to large car yards into Victoria Park. The original low-scale 19th century development of the Victoria Park shops is interrupted with more car yards before the East Victoria Park shopping precinct. Single-family housing occupies Kent Street before the expansive Technology Park and Curtin Universities.

LRT South-East presents significant urban renewal opportunities at the Causeway, Technology Park and Curtin University, with redevelopment opportunities through Albany Highway and Kent Street.

## LRT ROUTE OPTIONS

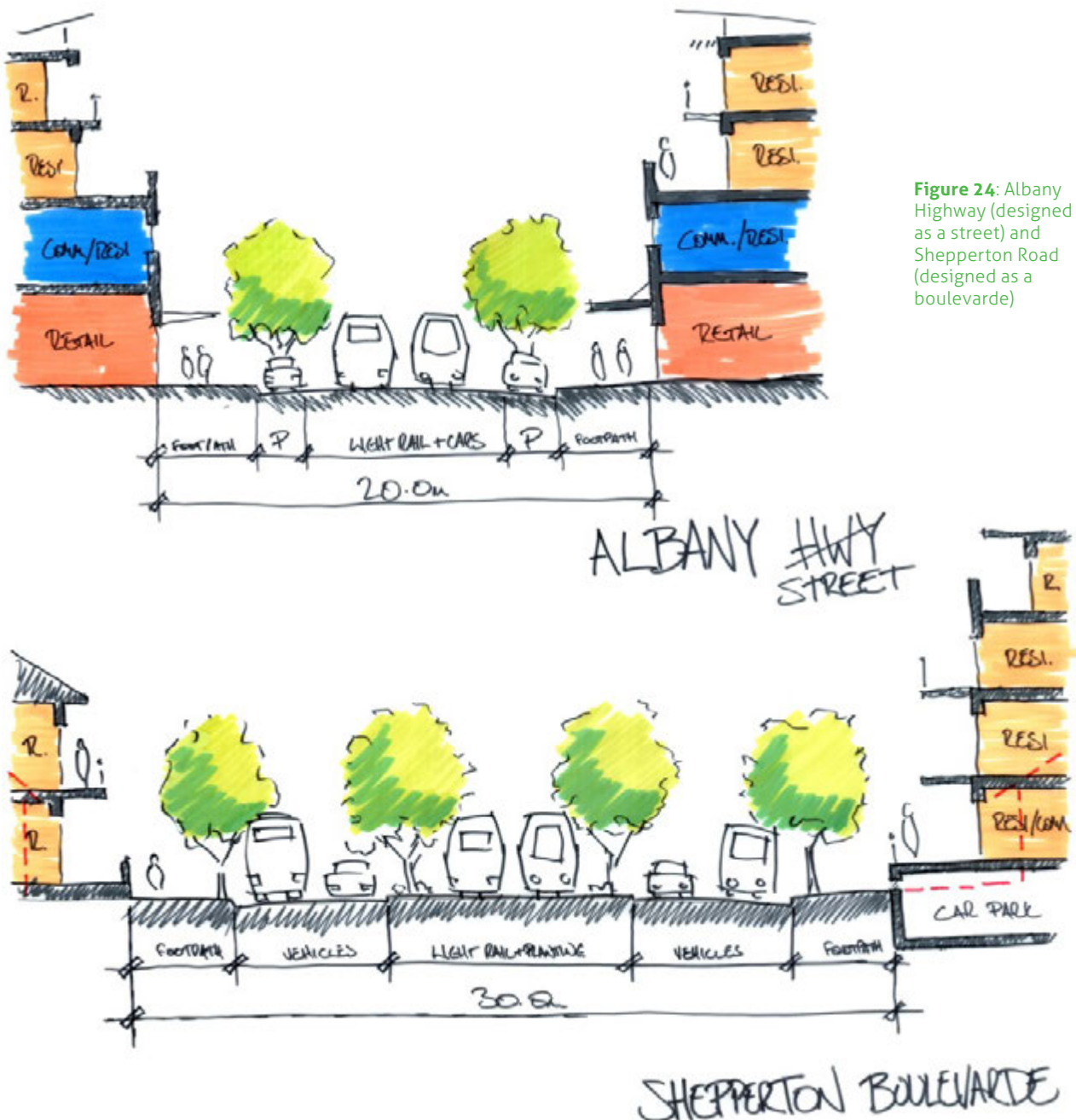
Two options for the LRT route through Victoria Park were considered: Albany Highway or Shepperton Road. The Albany Highway route would benefit existing businesses and enhance the evening and weekend economies.

It has more potential LRT stops and greater redevelopment opportunities and would be likely to be delivered at a lower cost.

It may be marginally slower than Shepperton Road and given the tight 20 metre reserve, there may be a loss of on-street parking and interruption to business during construction.

There are substantial redevelopment opportunities of the car yards at the northern end of Albany Highway, and from Duncan Street between Albany Highway and the Victoria Park Station.

The Shepperton Road option could result in extensive development of a substantial scale of 6 to 8 stories and a much improved street environment as a transit boulevard. It would be a marginally quicker route but has a steep section and two 90 degree turns. Moreover, its width, traffic volume and speed would be unfriendly to pedestrians and urban renewal along it may weaken existing Albany Highway businesses.



**Figure 24:** Albany Highway (designed as a street) and Shepperton Road (designed as a boulevard)



Figure 25: Shepparton Road designed as a boulevard with flanking commercial and residential development

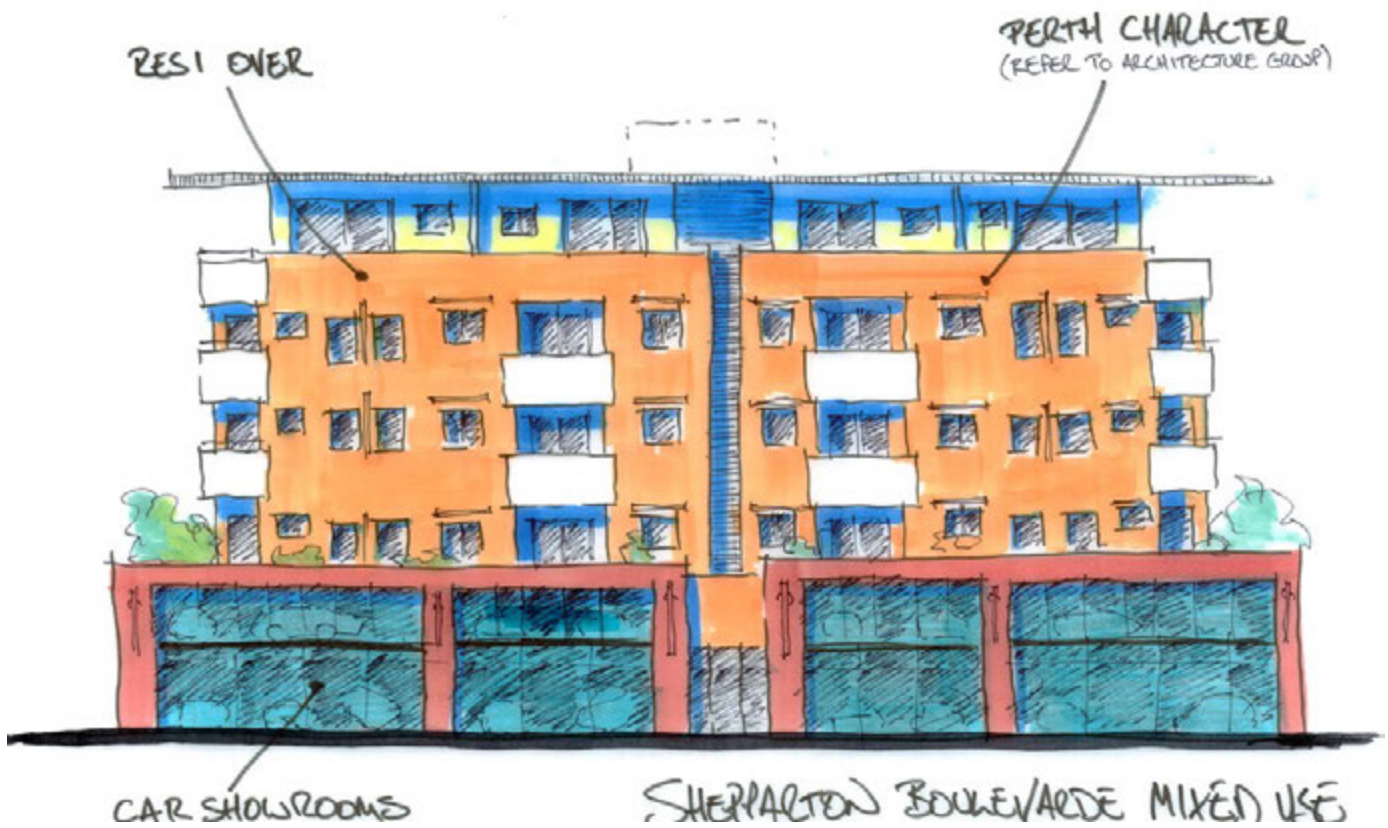


Figure 26: Mixed use building proposal with Shepparton Road with boulevard treatment



Albany Highway was chosen as the preferred route for investigation.

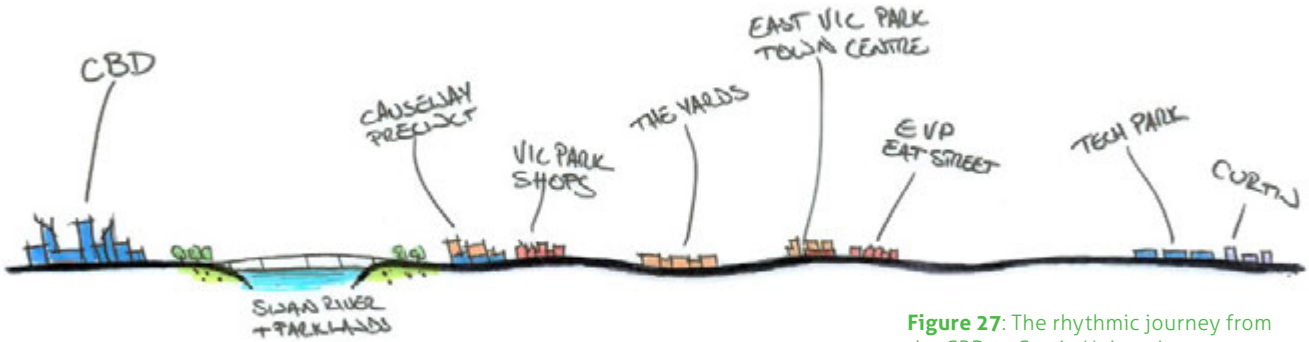


Figure 27: The rhythmic journey from the CBD to Curtin University

## ALBANY HIGHWAY – CURTIN UNIVERSITY ROUTE

Albany Highway was chosen as the preferred route for investigation. A pedestrian oriented corridor plan was prepared that includes LRT stops at approximately 400m spacings with 11 stops in all, and 3 at Curtin University. Stops were adjusted to respond to pedestrian-shed walkability and to respond to redevelopment opportunities generated by the pattern of the surrounding urban development.

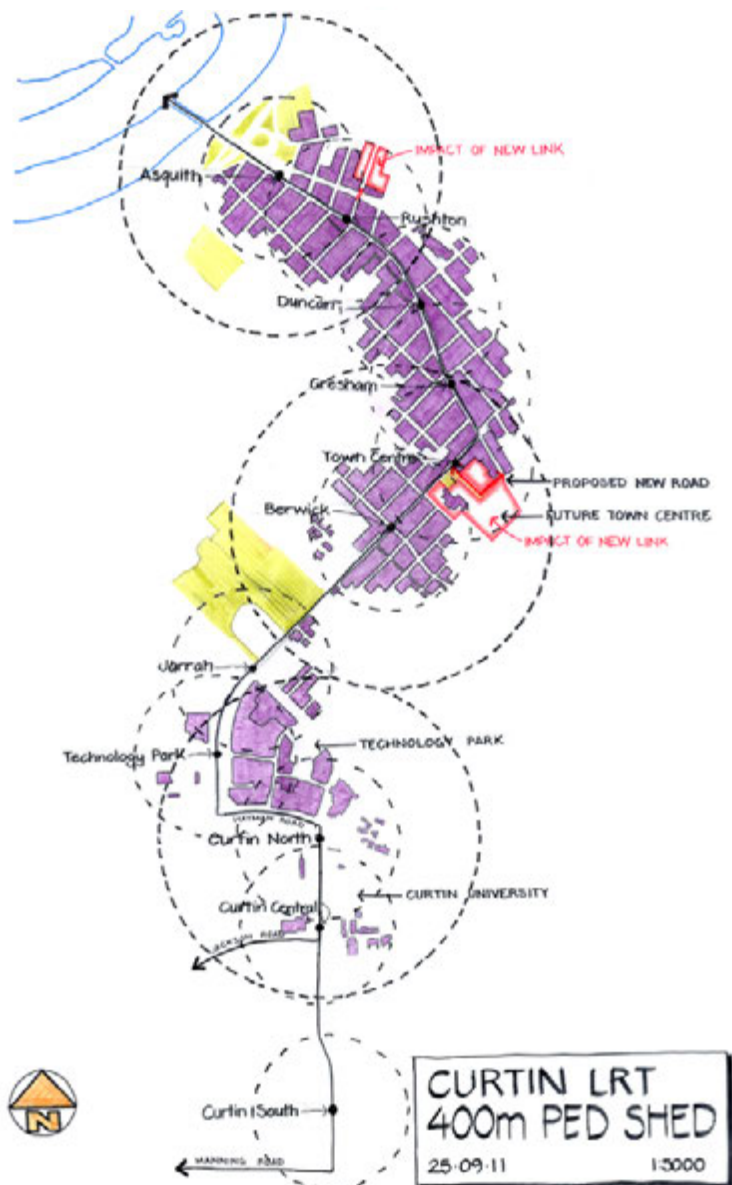


Figure 28: Pedestrian sheds around proposed LRT Stops - Albany Highway route - Causeway to Curtin University



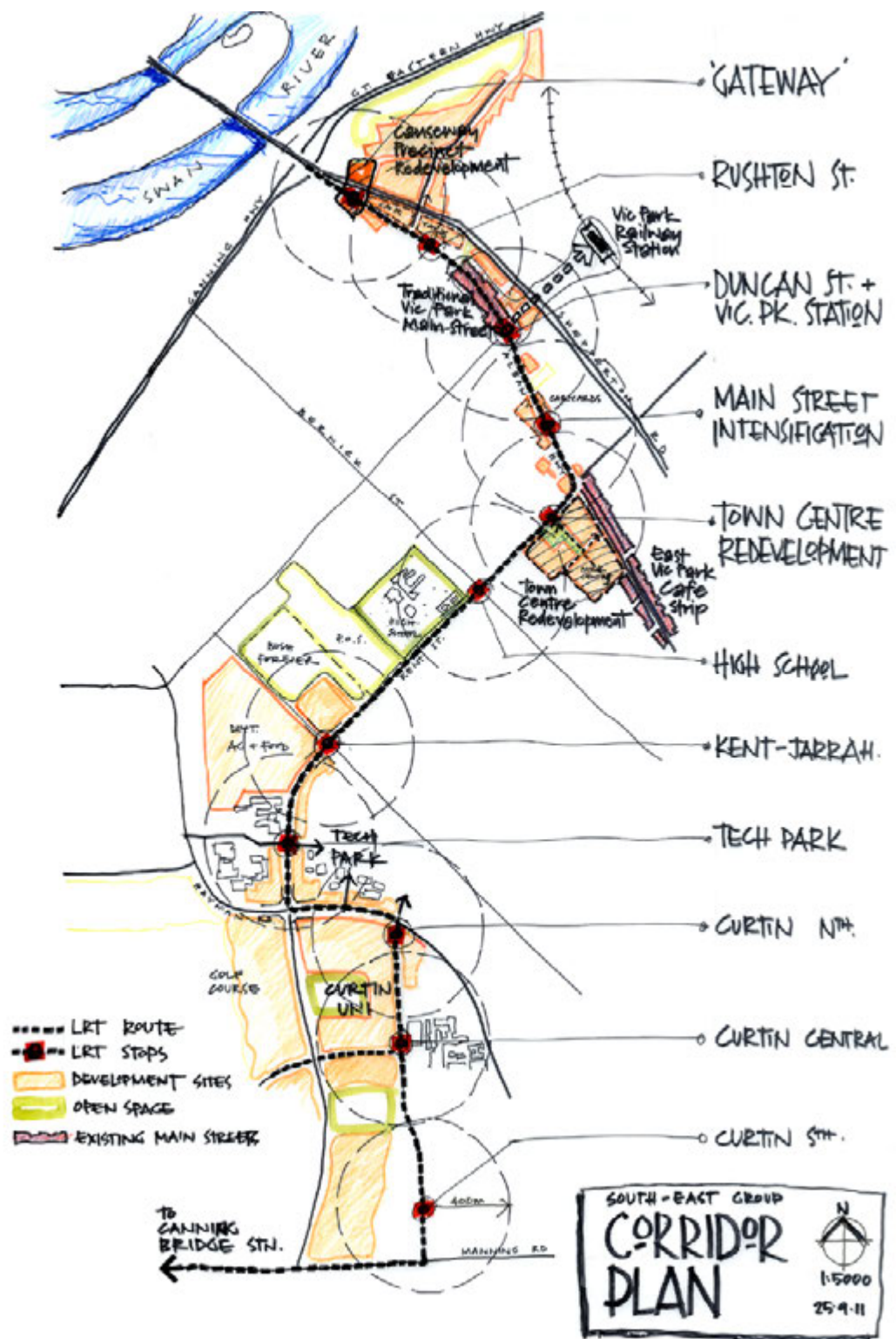


Figure 29: Potential development sites near proposed LRT stops - Causeway to Curtin University

An overall corridor redevelopment plan was developed by the South-east team, commencing with the Albany Highway redevelopment opportunities and then envisaging comprehensive plans for the Technology Park and Curtin University.

It was estimated that some 9,500 residential dwelling units and 163,000 square metres of retail, mixed use and commercial could be added along the proposed LRT line.



Figure 30: Perth LRT South East Causeway Precinct Redevelopment Plan

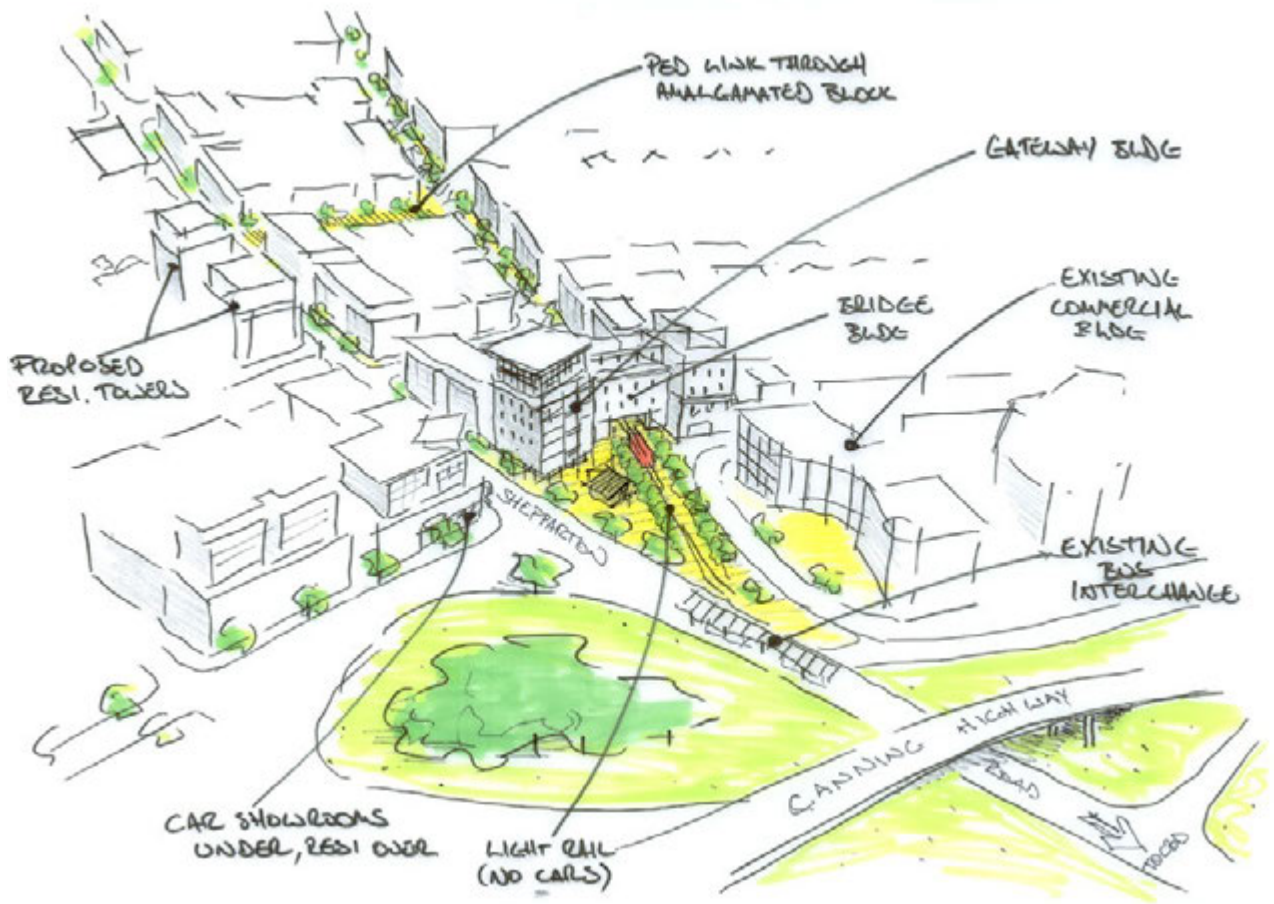


Figure 31: Perth LRT South East Causeway Precinct Sketch



Figure 32: Perth LRT South East Duncan Street Redevelopment Section



Figure 33: Perth LRT South East Duncan Street Redevelopment Sketch



Figure 34: Gresham Street Station Plan as a catalyst for car yard redevelopment



Figure 35: Typical Section of Gresham Street - State Street Station Area

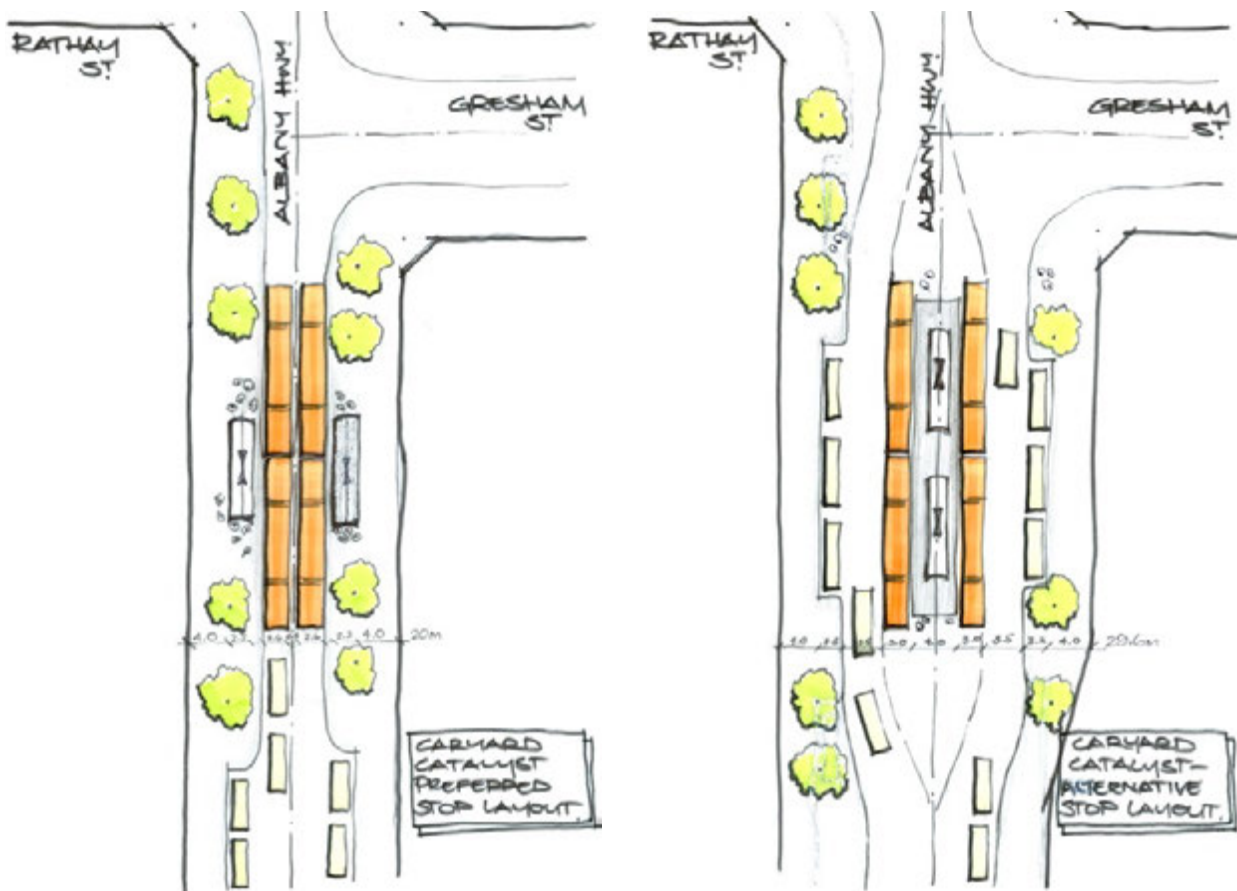


Figure 36: Proposed Gresham Street - State Street Station Layout Alternatives

# SINGLE LOT REDEVELOPMENT ALBANY HIGHWAY - VIC PARK

LOT 12m x 40m (APPROX) = 480m<sup>2</sup>  
 8 x APARTMENTS (A/E 70m<sup>2</sup> EACH/  
 2 BED/1BATH+STUDY)  
 150m<sup>2</sup> GROUND FLOOR COMMERCIAL  
 P.R. = 1.48  
 RES DENSITY = R166

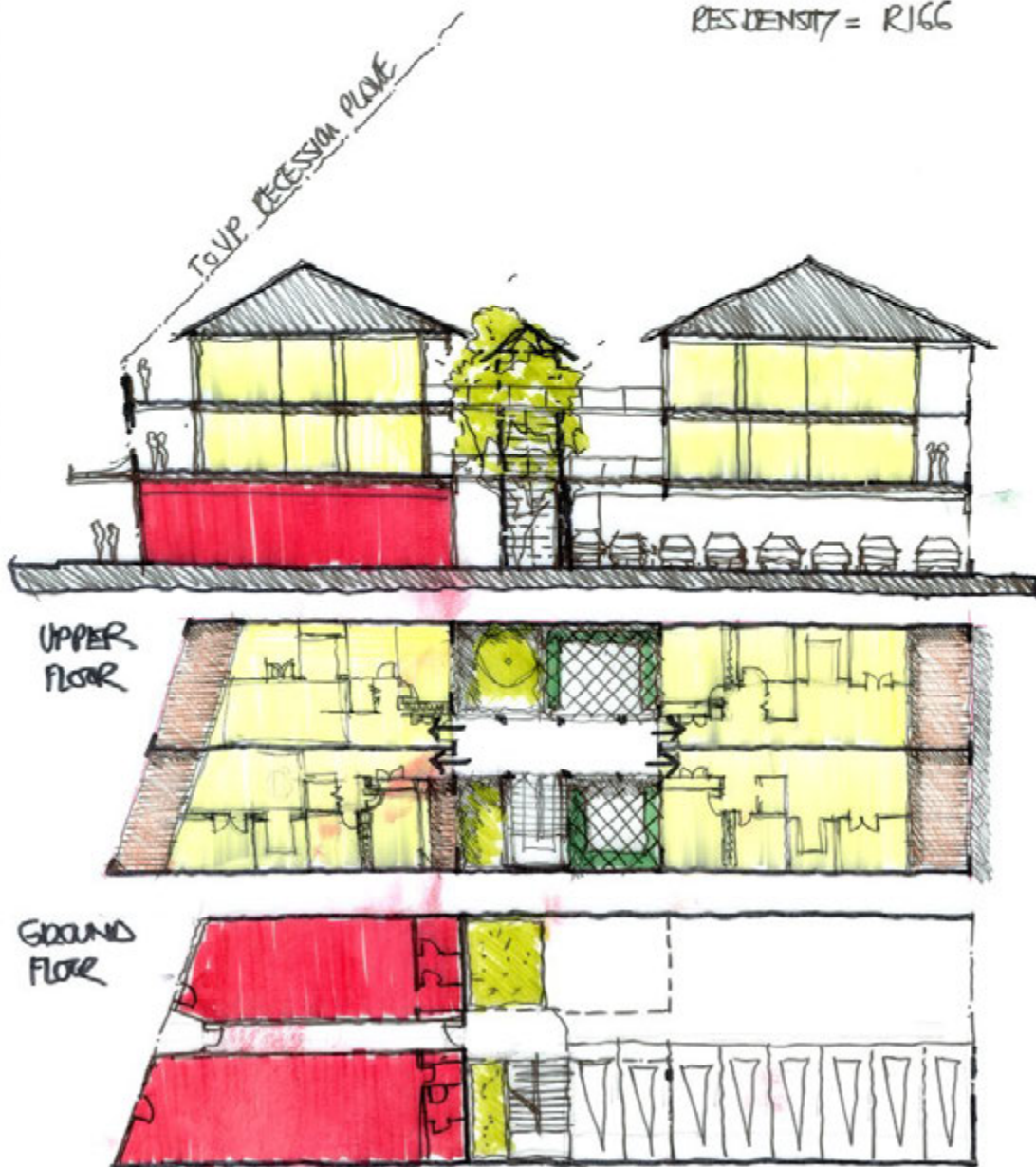
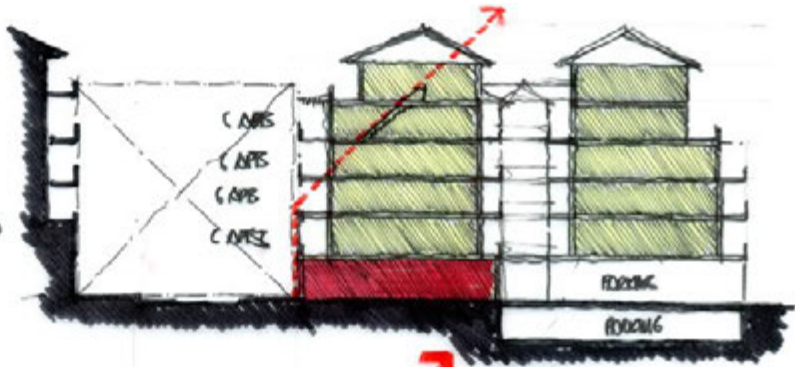


Figure 37: Albany Highway redevelopment opportunities - single lot redevelopment typology

# DOUBLE LOT REDEVELOPMENT ALBANY HIGHWAY

## WITHOUT RECESSION PLANE

960m<sup>2</sup>  
24 APARTMENTS  
440m<sup>2</sup> COMM  
PR: 2.2  
RES DENSITY: R250  
(NET)



## WITH RECESSION PLANE

960m<sup>2</sup>  
16 APARTMENTS  
440m<sup>2</sup> COMM  
PR: 1.63  
RES DENSITY: R166  
(NET)

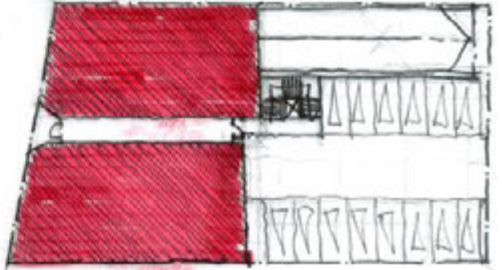
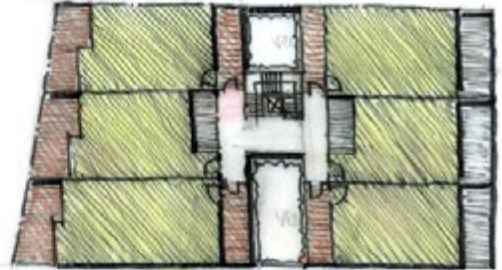
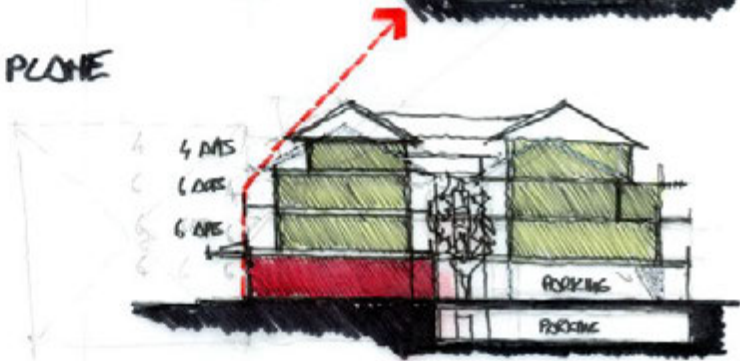


Figure 38: Albany Highway redevelopment opportunities - double lot redevelopment typologies



**Figure 39:** 'Curtilona' Curtin University site compared with the Barcelona urban grid at the same scale, to indicate its size and scope for development



## CURTIN UNIVERSITY

The large size and consequent substantial development opportunities at Curtin University can be revealed by digitally overlaying a section of Barcelona, Spain over the campus site – 'Curtilona'. This gives rise to the potential of an urban grid based on the new LRT line to support mixed uses, including education.

LEGEND	
	RETAIL
	COMMERCIAL
	UNIVERSITY

**CURTIN NORTH  
PRECINCT**  
25-09-11 1:1000

**Figure 40:** Curtin University site redevelopment using an urban grid





Figure 41: Curtin University site redevelopment - urban grid sketch

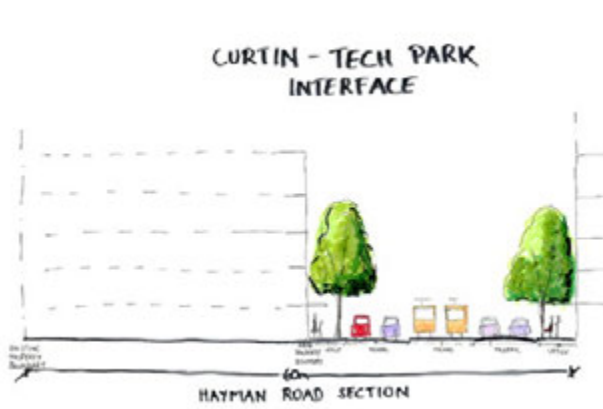


Figure 42a: Curtin University site redevelopment – interface with the technology park

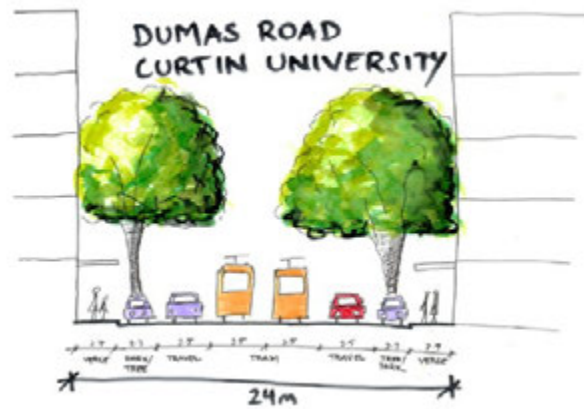


Figure 42b: Curtin University site redevelopment – proposed Dumas Road section

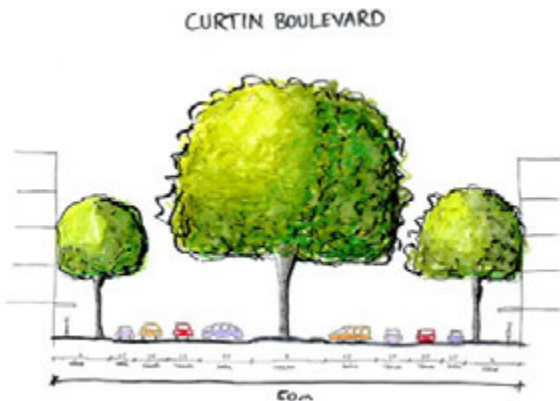


Figure 43a: Curtin University site redevelopment – Curtin Avenue with boulevard treatment

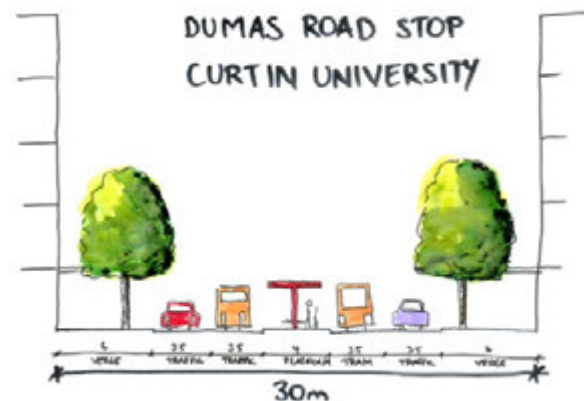
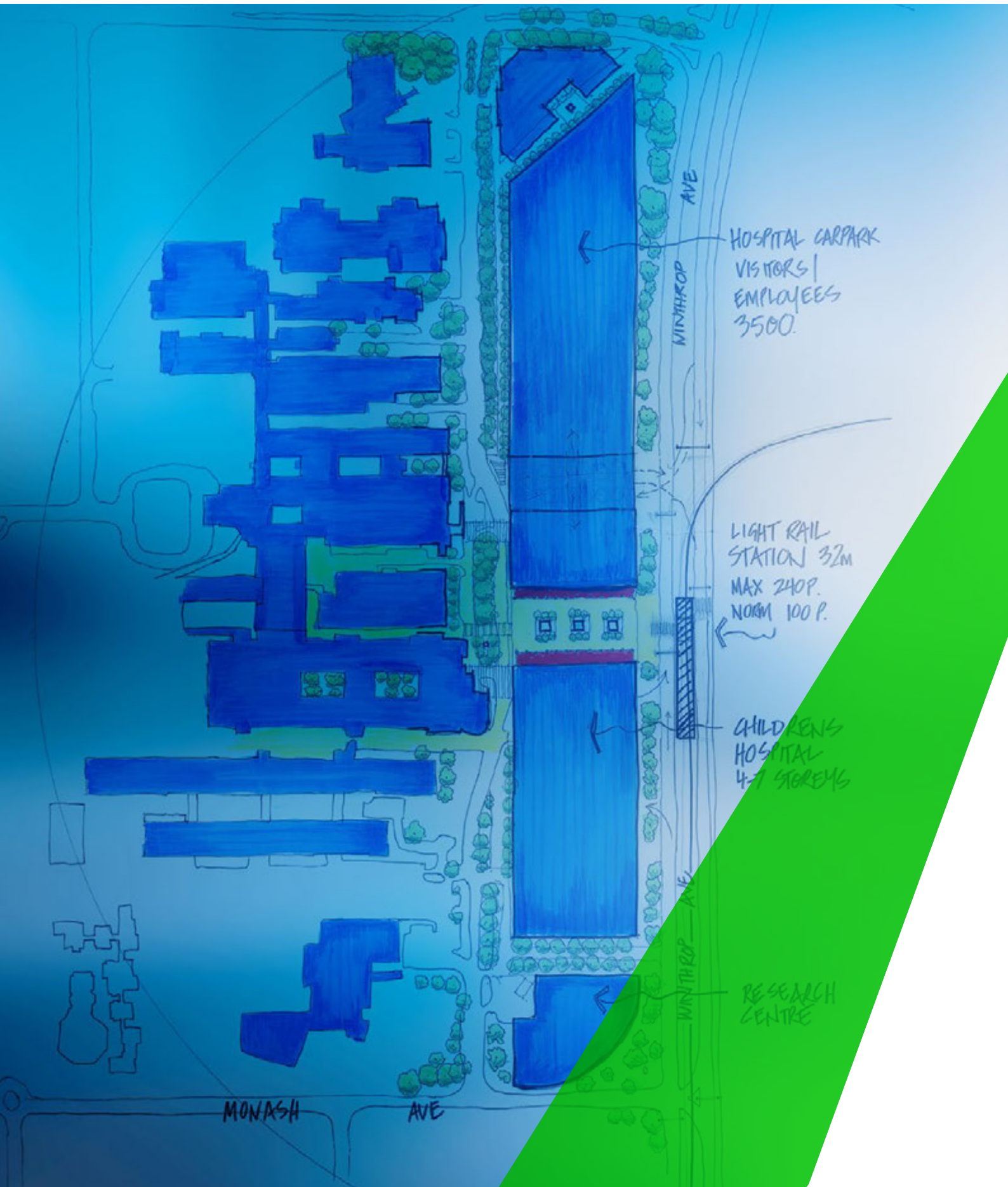


Figure 43b: Curtin University site redevelopment – Dumas Road LRT stop section



# PERTH LRT SOUTH WEST

EXPERTISE/ROLE	PARTICIPANT
<b>Facilitators/Urban Designers</b>	Steve Thorne Peter Annand Chris Hair
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<b>Urban designer or architect</b>	Jeff Thierfelder Naomi Kavanagh
<b>Transport focus</b>	Simon Cox Louise Howells Michael Somerville-Brown
<b>Planning focus</b>	Mark Bancroft Robina Crook Jeremy Holland Lucian Iocob Michael Murphy Michael Willcock
<b>Engineering focus</b>	Christie McKinnon Eamonn O'Lionnain
<b>AUDRC</b>	Doina Olarv (UWA)



**THE SOUTH WEST LRT** is proposed to enhance travel options between Perth, the University of Western Australia and the major QEII Hospital. The Masterclass looked at both the transport task in terms of making LRT an attractive and preferred choice for commuters and increasing the density and intensity of land use along the route.

The objectives for the South West Light Rail developed by the Masterclass are to:

- Enhance travel options between Perth CBD and UWA, QEII and Kings Park
- Increase the density and intensity of use around these destinations
- Integrate and reconnect the park with the CBD (and with QEII and UWA)
- Make LRT an attractive and preferred choice for commuters

After preliminary investigations, it was also evident that LRT could provide an opportunity for connecting Kings Park with the city and this was explored through design.

The State Government's draft Transport Plan includes an Indicative route for the Perth LRT South West route - through West Perth then via Thomas Street to QEII and UWA.

There are several key travel reasons and destinations along the route:

- UWA/Perth CBD – Academia/business
- QEII/UWA – Teaching hospital synergies
- QEII/Perth CBD – Accessibility to health services
- Perth CBD/Kings Park – 6 million

visitors annually, ready access to CBD

- Metrorail/LRT/Perth Underground CBD and Esplanade
- Kings Park/QEII/UWA – Access hospital and new knowledge village
- Perth visitors/residents/park – improved access
- Perth Waterfront/QEII/UWA – Improved connection and development along the Swan

The UWA (60%) and QEII (30%) represent the large majority of AM peak attractions (excluding CBD).

## ROUTE ANALYSIS

The Masterclass tested alternative route options:

### Option: 1

Thomas Street Route which is the proposed State Government

alignment of locating the LRT through West Perth and along Thomas St.

### Option 2

Thomas Street Route with LRT diverting through Subiaco to pick up additional worker patronage

### Option 3

Mounts Bay Road Route to test a shorter route to UWA and the QEII and continuing west and terminating at the Shenton Park Station to provide rail-LRT transfers

### Option 4

Kings Park Route – the possibility of an alignment through Kings Park to shorten travel distances and provide a recreation function for the proposed LRT

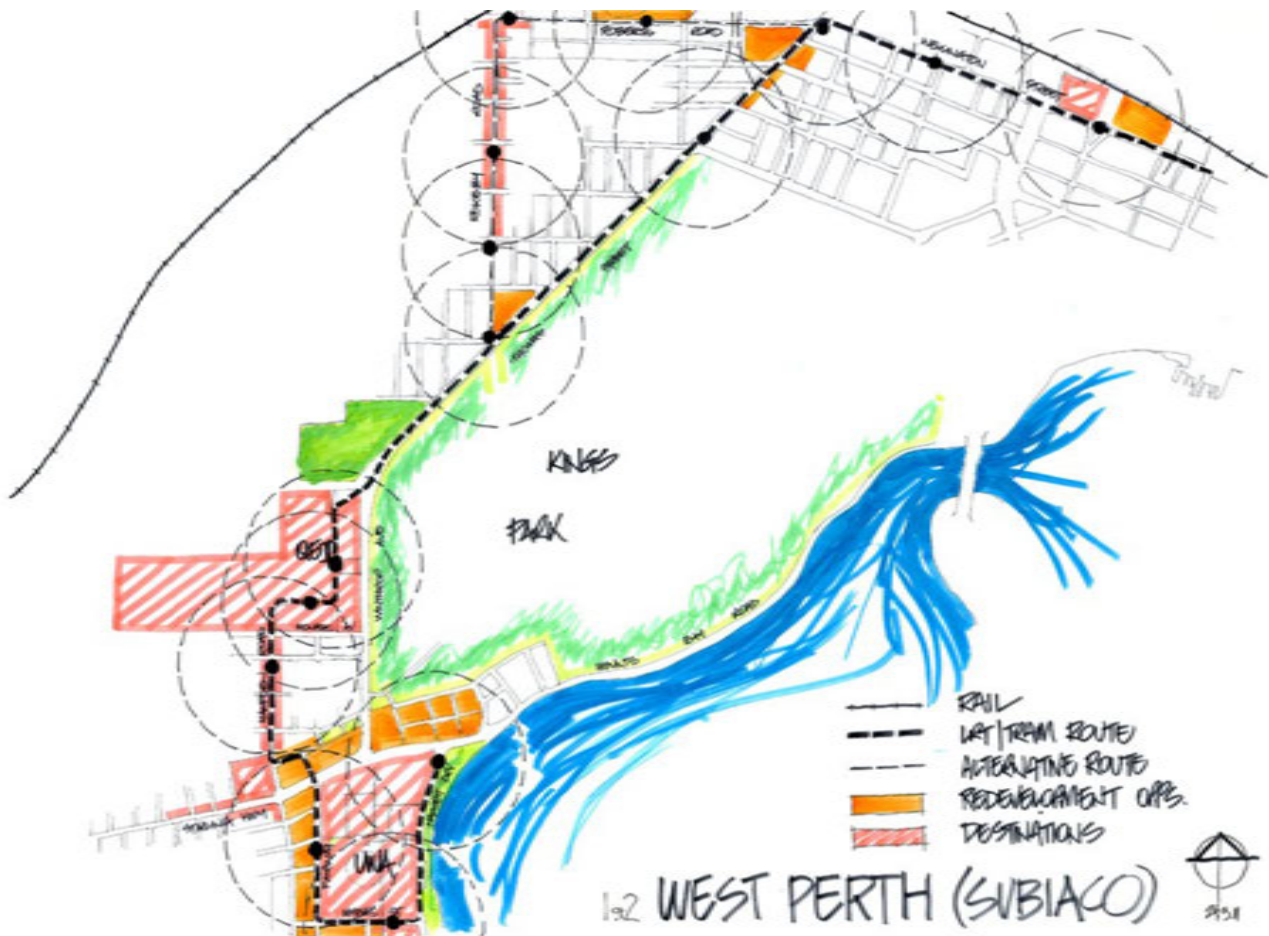


Figure 44: Option 1: Thomas Street Route A and Option 2: Thomas Street Route B via Subiaco



Figure 45 : Option 3: Mounts Bay Road Route



Figure 46: Option 4: Kings Park Route

**Options 1/2:** Thomas Street Route would provide a coherent and permanent connection between the CBD, the QEII hospital and the University of Western Australia. It would catalyse the formation of the structure of UWA into an Urban Village, and provides a substantial increase in urban residential accommodation supporting Directions 2031.

UWA and its neighbouring district up to the QEII Hospital offer real potential for dense development on and off campus, providing student/ worker housing and affordable housing.

Additionally, middle income people may be attracted by socio-economic-demographics of the area and may well commute to CBD.

Urban Renewal opportunities are considerable for a variety of mixed-uses – academic, creative, scientific, service, leisure, entertainment and related activities. The development of a key “centre” or “Creative/ Academic” node at Broadway could have major social/economic/ place-making benefits for Perth.

There is moderate growth potential in West Perth and only a one-sided catchment along Thomas Street and high land and development values indicating limited redevelopment opportunities in the short and medium terms.

This route also connects to the Princess Margaret Hospital site and will support its possible future redevelopment.

**Option 3:** Perth Station/Esplanade - Mounts Bay Rd - UWA/QEII integrates with the Esplanade Station and replaces busses along Mounts Bay Road.

**Option 4:** Kings Park Route would provide a direct connection and opportunities for non-commuter use (e.g. tourist and recreation).

The route proposed through Kings Park is along an already excavated line to QEII and then UWA and to a possible new Ferry stop at Crawley.

The number of visitors to Kings Park is in the millions and the use of the South West LRT by a fraction of those visitors would substantially assist with viability.

### Route Option Analysis

The routes were analysed for travel time, development opportunities, station walkability and related factors as follows (*Subiaco was excluded from the second table due to its slow travel time*):

Route	Travel Times (mins)
1. West Perth	23.5
2. Subiaco	30.5
3. Esplanade/Mounts Bay Rd/UWA-QEII/Shenton Park	24.9
4. Kings Park/St..George’s Terrace	23.9

Route	Travel Times (mins)	Trips	Development Opportunities	Legibility and Connectivity	Impact on other Transport	Total
1. West Perth	+1	+1	+1	+1	-1	+3
3. Esplanade/Mounts Bay Rd/Shenton Park	+2	-1	0	+2	-2	+1
4. Kings Park/ St..George’s Terrace	+1	0	+2	+2	0	+3

(+2 excellent to -2 poor)



Figure 47: Pedestrian Catchment Analysis Option 1: Thomas Street



Figure 48: Pedestrian Catchment Analysis Option 3: Esplanade / Mounts Bay Rd

The analysis indicated:

- In terms of patronage, the West Perth and Subiaco options provide 2-way patronage during peak hours, whereas the Mounts Bay Road and King's Park options have significant one way 'tidal' peak demand.
- Subiaco, whilst not as direct as the other routes, could still work as a connection simply between Subiaco Station and the QEII hospital and the University of Western Australia based on the socio-demographic compatibility. The further connection into the CBD from Subiaco duplicates the railway.

- The Thomas Street route proposed by the State Government is indirect between QEII and UWA with many right-angle turns, resulting in longer travel times. Winthrop Avenue is proposed as an alternative by the Masterclass for fast connection between QEII and UWA. Adjustments were proposed by the Masterclass to improve directness and better support the proposed UWA Urban Village.
- The University would attract morning/evening tidal flows, the QEII Hospital will attract riders all day, as would Kings Park. The residential catchments are one-sided and have limited

redevelopment potential, with stable low density housing which is unlikely to change in the foreseeable future. Consequently the stops on Thomas St can be more widely spaced to assist the speed and timeliness of LRT.

Based on criteria of travel times, patronage, development opportunities, legibility and connectivity and impact on other transport, the proposed West Perth Route and Kings Park would be preferred. The Mounts Bay Rd Route is already well served by an existing bus service that provides fast and direct connection to UWA/QEII along the waterfront.





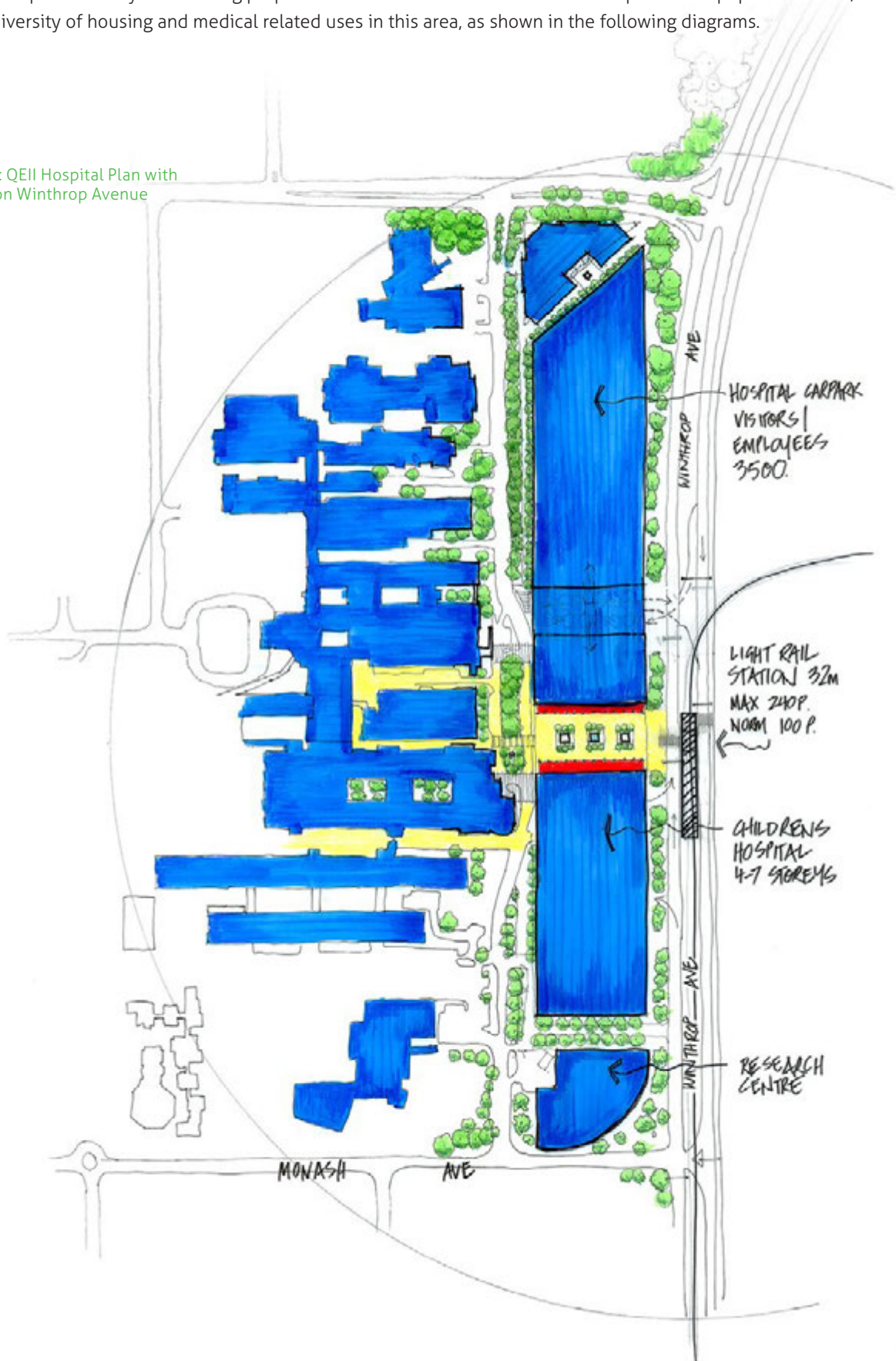
Figure 49: Pedestrian Catchment Analysis Route 4: Kings Park Route

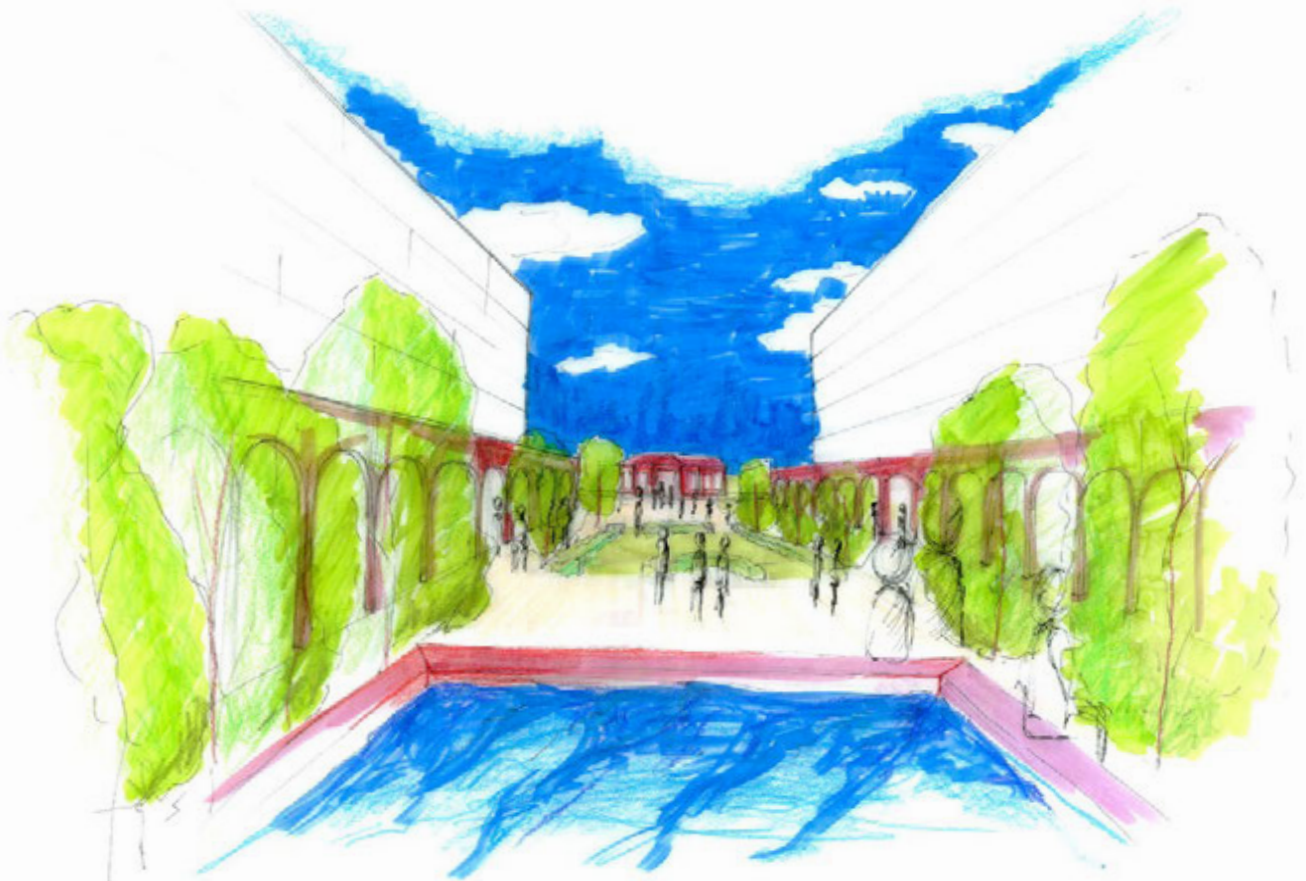
## QEII HOSPITAL

Rather than run the light rail within the hospital campus as currently proposed by the Government, it is suggested to continue the light rail down Winthrop Avenue. This creates an opportunity to create a civic forecourt with sheltered walkways that connect the light rail station with the hospital.

The redevelopment of key surrounding properties to the south would assist to build up the local population base, provide diversity of housing and medical related uses in this area, as shown in the following diagrams.

**Figure 50:** QEII Hospital Plan with LRT stop on Winthrop Avenue





**Figure 51:** QEII Hospital Forecourt with LRT stop on Winthrop Avenue

## UWA URBAN VILLAGE/WEST END

The urban village should be considered as both on and off campus and as providing for student housing, worker housing, and staff housing for the university and hospital. This will build self-containment and feed the LRT system in both directions. The Urban Village Core around Broadway can be very significant as a medium density, mixed-use precinct (both on and off campus).

Three LRT stops are proposed on and around the university, starting with Winthrop Avenue (south end) which creates urban renewal prospects for north-east and north-west of Winthrop Avenue.

The proposal retains the UWA heritage buildings and spaces. A 'green-finger' connection is made

to Kings Park, and taller buildings are proposed around the tram stop to frame the view towards the University and Winthrop Hall. These proposals to formalise both sides of Stirling Highway are to have the effect of providing significant housing for the University and breaking the barrier of Stirling Highway to link the University with its northern neighbouring areas.

Recognising local sensitivities to both height and building typologies, buildings are proposed to be graduated from 2-3 storeys, 4-6 storeys and some 8 storeys.

The Perth Circle Bus Route too can gain efficiencies as instead of having to go up Hampden Rd and turning around and coming all the way back out again, it now has the opportunity of using newly established street blocks established by the proposal.

The second LRT stop is proposed on Clark Street to link into the central east-west access that currently defines the heart of the University.

Clark Street between Broadway and Fairway could become a revitalised centre for student life as well as the neighbourhood centre of this part of Nedlands. In turn this would support the retail, business and entertainment uses already established along Broadway.

The LRT is proposed to be taken through Myers Street to terminate at a stop at Hackett Drive so that it can reach the southern part of the campus and one day connect to a Swan River Ferry. Connection to a ferry further integrates the transport system. It would also allow for an alternative route by LRT from river to ferry terminal to the university and hospital.

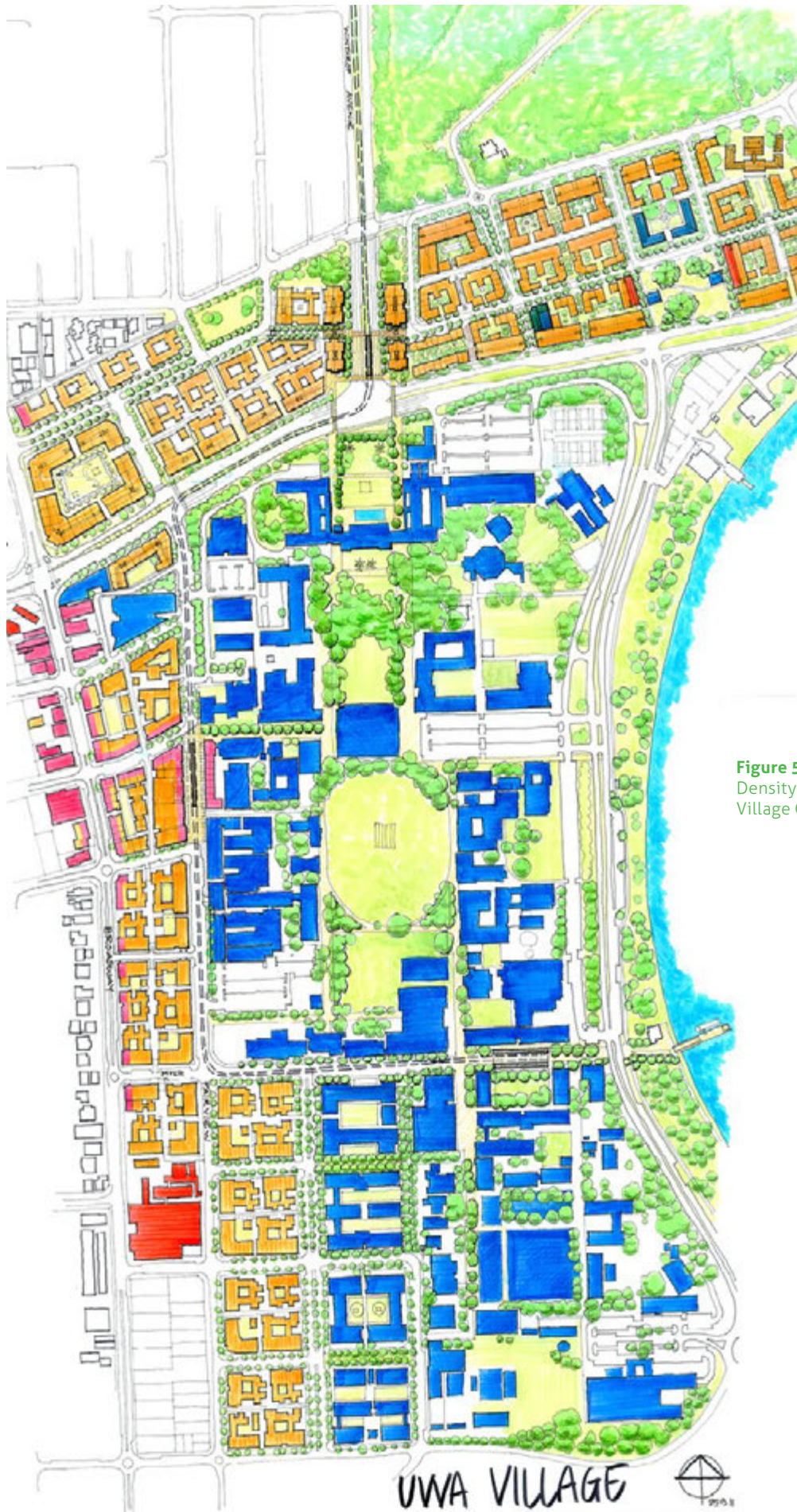


Figure 52: Plan for University + Density Residential + Mixed-Use Village Centre



Figure 53: UWA Urban Village with compatible buildings for sensitive residential areas.

The estimated development yield of the UWA Village and surrounds plans are:

- Residential units – 7,000 units (5,000 university)
- Retail – 5,000m<sup>2</sup>
- Commercial – 5,000m<sup>2</sup>
- University – 10,000m<sup>2</sup>

This provides an opportunity for a major mixed-use node fed by university knowledge-based industries, leisure and hospital/ medical industries to form a partly self-contained, well connected Transit Oriented Village.

**ACTIONS, STRATEGIES, PRIORITIES**

The Masterclass recommended the following:

1. Ensure capacity of Perth/ Esplanade transport hub for future connection/integration
2. Prepare community engagement strategy
3. Construct LRT via Route 1 or 4 to QEII and UWA

4. Reduce proposed parking station at QEII and direct \$90 million to LRT
5. Negotiate funding transfer for bus replacement to bring forward the timing of the LRT
6. Create integrated village/Campus Masterplan to foster delivery of the transit-oriented knowledge based village at UWA.

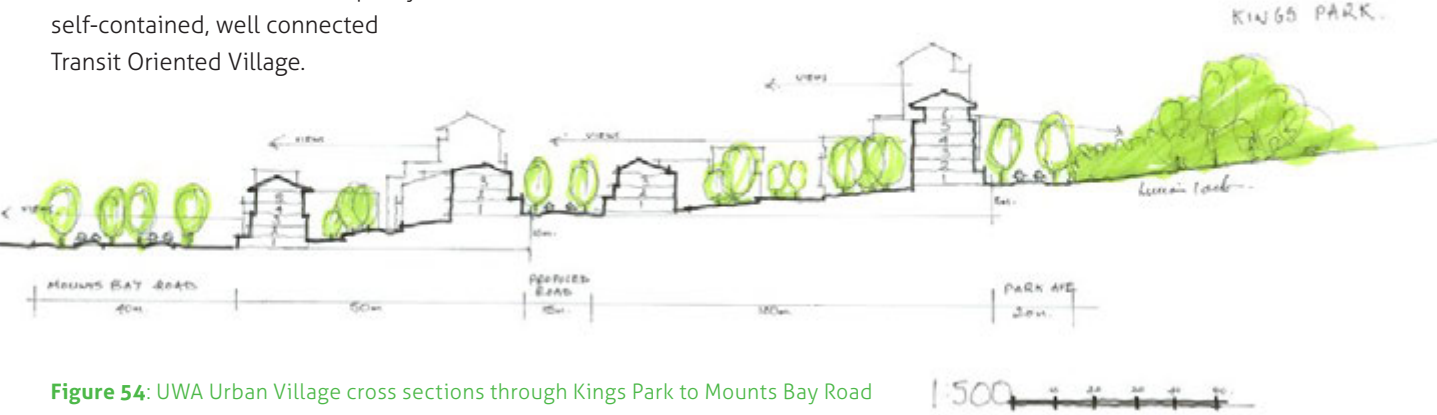


Figure 54: UWA Urban Village cross sections through Kings Park to Mounts Bay Road



# ARCHITECTURE OF PLACE

EXPERTISE/ROLE	PARTICIPANT
<b>Facilitators/Urban Designers</b>	Chip Kaufman Crystal Olin Xiaojian
<b>Urban designer or architect</b>	Mark Johnston Anna Evangelisti
<b>Planning focus</b>	Melanie Bradley
<b>AUDRC</b>	Patrick Hubble



## AN APPROACH TO BUILT FORM

**BUILT FORM** is a key consideration in urban renewal projects within existing communities. There were a range of views on approaches to the inclusion of new buildings into existing communities along the proposed LRT lines. Stefanos Polyzoides outlined that The New Urbanism perspective is that new TOD projects should contribute to complementing existing street and city block form and local built character to generate authentic places.

Complexity and variety are key:

- TOD projects should be fitted into existing contexts authentically to ensure continuity of the history of towns and cities;
- New buildings should be designed in conjunction with adjacent existing buildings to generate characterful and distinctive public spaces;
- Diverse types of buildings can include variety of dwelling

units by type and size, and be expressed in an assortment of vernacular and contemporary styles.

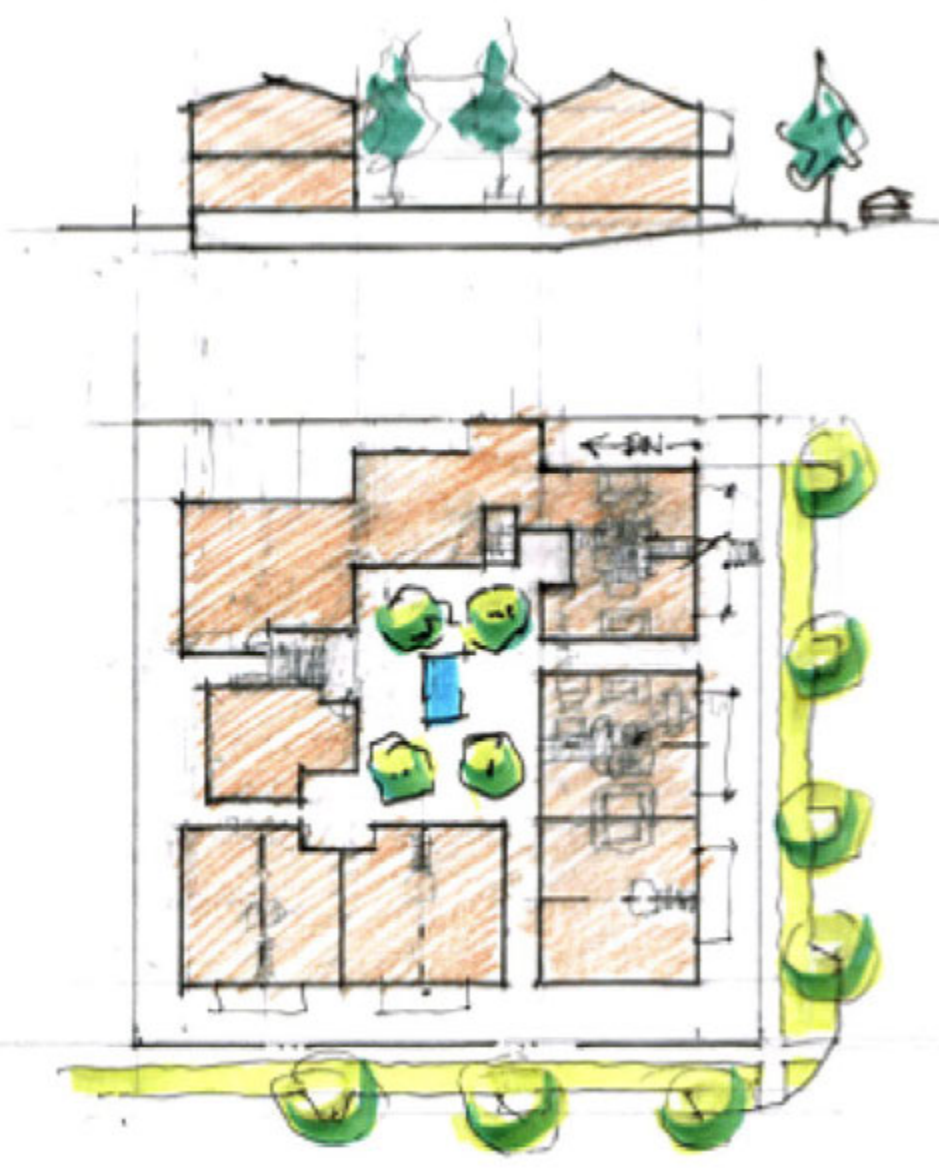
Stefanos Polyzoides further advised that the essential building-scale design ingredient of TOD is a 'space-first strategy' so that new buildings embrace the station and LRT right of ways, and frame them into a coherent realm of defined public space:

- Street design should be people friendly including on-street parking, drop off lanes, and slow moving traffic to provide for maximum pedestrian connectivity;
- Buildings in a transit station context should be designed to accommodate a variety of uses over time.
- Ground floors should be activated continuously, with commercial frontages predominating.
- Parking should be placed behind and under buildings, with car entrances located discreetly, to have the least disruption to pedestrian-dominant urban public space.

## URBAN TYPOLOGIES

A key concern in urban renewal is the unpredictable built form outcome of the R Codes (WA's residential development controls). There is little predictability in what sort of structures may emerge. The workshop looked at building typologies for urban renewal to generate a wide range of appropriate building types for use and re-use in development and redevelopment along the transit lines. The concept is for the generated building types to be applied and mixed, as appropriate to each location, to generate the fabric of street blocks and define the public realm<sup>14</sup>.

**Figure 55a:** Townhouse typology exploration - plan



<sup>14</sup>The Language of Towns and Cities: A Visual Dictionary; Dhiru A. Thadani: Typology-Architectural by Stefanos Polyzoides





Figure 55b: Townhouse typology exploration – vernacular expression

Urban coding offers predictability by establishing the building, open space, landscape, and street configurations that deliver an orderly urban form, by many development interests, over time.

## URBAN CODING

Building types – for living such as single houses and apartments, for working such as commercial office and recreation as well as mixed use buildings can be coded for building form rather than metrics such as setbacks, lot coverage and density. Form-based codes can regulate buildings by controlling their configuration and disposition on their lot<sup>15</sup> and locating appropriate building types in the right locations, such as bigger buildings in urban areas of highest intensity.

Urban coding offers predictability by establishing the building, open space, landscape, and

street configurations that deliver an orderly urban form, by many development interests, over time.

In order to make codes authentic and place-specific, they must be based on existing subdivision patterns and lot configurations. So rather than producing a generic set of building typologies, typologies should be based on the site dimensions and characteristics commonly found in Perth.

In that way they will be responsive to the essential character of Perth, and responsive to their relative place within the overall urban structure.

<sup>15</sup>The Smart Growth Manual; Andres Duany and Jeff Speck with Mike Lyndon



Figure 56: Form Based Code – Example of an approach to building types in relation to intensity of location (Stef Polyzoides)



Figure 57: Metro Rail, Del Mar Station, Pasadena. Photo: Stefanos Polyzoides



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