Projects

Included is a sample selection of projects completed at the University of Melbourne across three interrelating subjects: GIS for Design and Development, Public Transport Network Planning and Land Use and Urban Design.

01 Where to Grow in Bendigo?
GIS for Design and Development

A preliminary suitability analysis incorporating current planning and transport-land use strategies by City of Greater Bendigo to identify suitable sites for transit-oriented urban intensification within current Urban Growth Boundary (UGB).

Key capabilities: ESRI ArcGIS spatial analysis from a variety of open-source raster and vector datasets and the application of planning theory in a practical GIS context.

02 User-centered Public Transport Network Plan
Public Transport Network Planning

A summarised public transport plan that places the user's needs and experiences at the centre of its strategies. Network planning principles were adopted from best practice examples in similar low-density cities such as Toronto and Zurich. The plan provides an example of how four existing indirect, infrequent bus services are consolidated into a direct, high frequency trunk route.

Key capabilities: Analysis using publicly available PTV and geospatial data (GIS) of current public transport services to identify existing service constraints towards opportunities for more efficient and redesigned services..

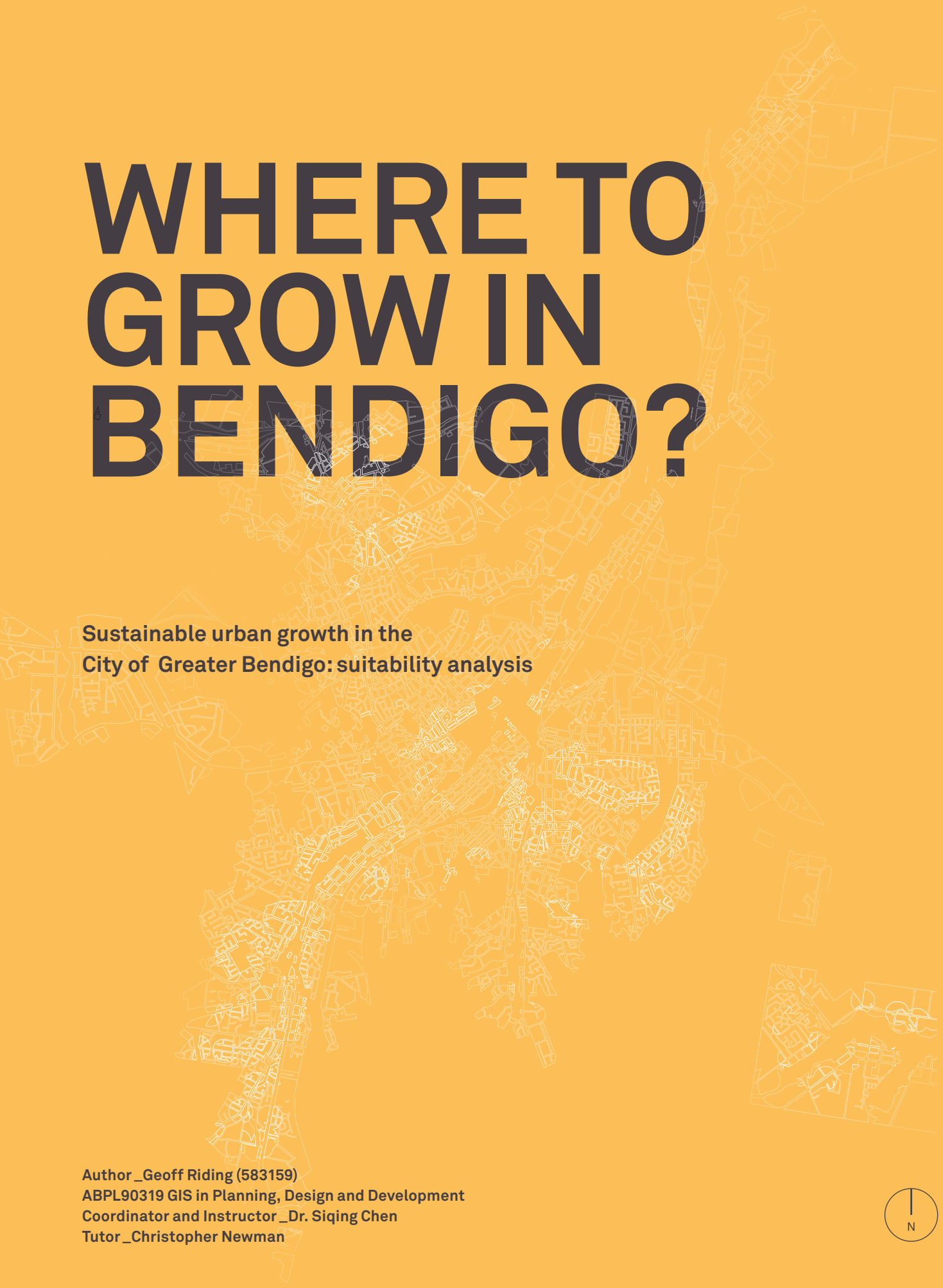
03 Queens4: Urban Design Framework
Land Use and Urban Design

A urban design framework for the urban renewal and development of the former Fitzroy Gasworks site in parallel to the then expected completion of the East-West Link. The plan aims to leverage existing strengths of accessibility and creative business clusters while addressing pressing challenges of affordable housing and ecological regeneration of a heavily contaminated site.

Key capabilities: Field work included an analysis of public life and pedestrian networks utilising Jan Gehl's metholodogies alongside detailed site context analysis incorporating multiple datasets and field observations. In turn, detailed design guidelines were developed in response and organised around four principles of accessibility, social equity, ecological urbanism and temporal creativity.

WHERE TO GROW IN BENDIGO?

Sustainable urban growth in the City of Greater Bendigo: suitability analysis



Author _Geoff Riding (583159)
ABPL90319 GIS in Planning, Design and Development
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Tutor _Christopher Newman

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Where to grow in Bendigo?

The problem and the question of density
18,000 dwellings are required to house the projected population growth in Greater Bendigo—the geospatial problem of "where to grow" is the primary focus of this project. However, before project objectives and subsequent planning goals are developed to that effect—the question of density is an important consideration. One of the key aims of *Melbourne 2030* was to increase the dwelling density from 10 dwellings per hectare to 15 dwellings per hectare.[17] The modestness of this increase has come under criticism as the Victorian government continues to allow greenfield developments at low densities occur whilst supposedly emphasising the need for urban intensification in established areas.[18] There are general inconsistencies in how density is measured, with the literature employing varying definitions with considerable overlap. This project will adopt the methodology used by Richard Cardew's analysis into average residential densities in Sydney as it provides a comparable, if not more compact, base to build upon.[19]

This project draws upon a recent analysis undertaken by SJB architects into residential densities required to trigger and maintain commercial and community activity centres—which has indicated that a gross residential density of approximately 26 dw/ha provides the spatial density required to maintain a range of mixed-use activity centres within walking distances.[20]

For the purpose of simplicity, a figure of 30 dw/ha is adopted for this project, which would calculate the area required for 18,000 dwellings to 600 hectares, halving the land area required if the *Melbourne 2030* gross density of 15 dw/ha is adopted (1200 ha). For comparison, Caroline Springs has a gross density of 10 dw/ha.

_Average lot size

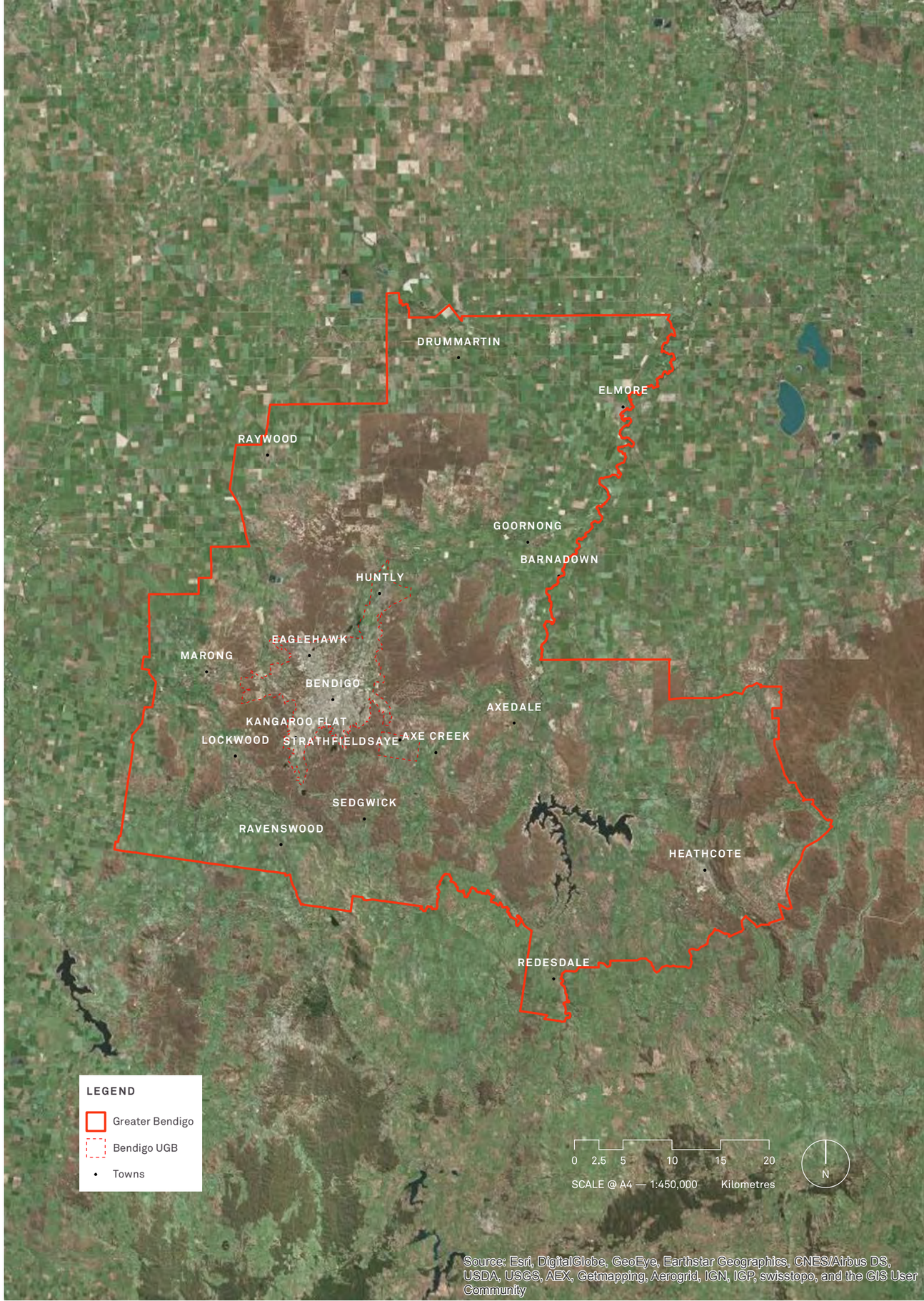
30 dw/ha GRD
18,000 dwellings
area required = 600 ha

71%	residential
24%	roads
3%	open space
2%	other

avg. lot size = 237 sqm

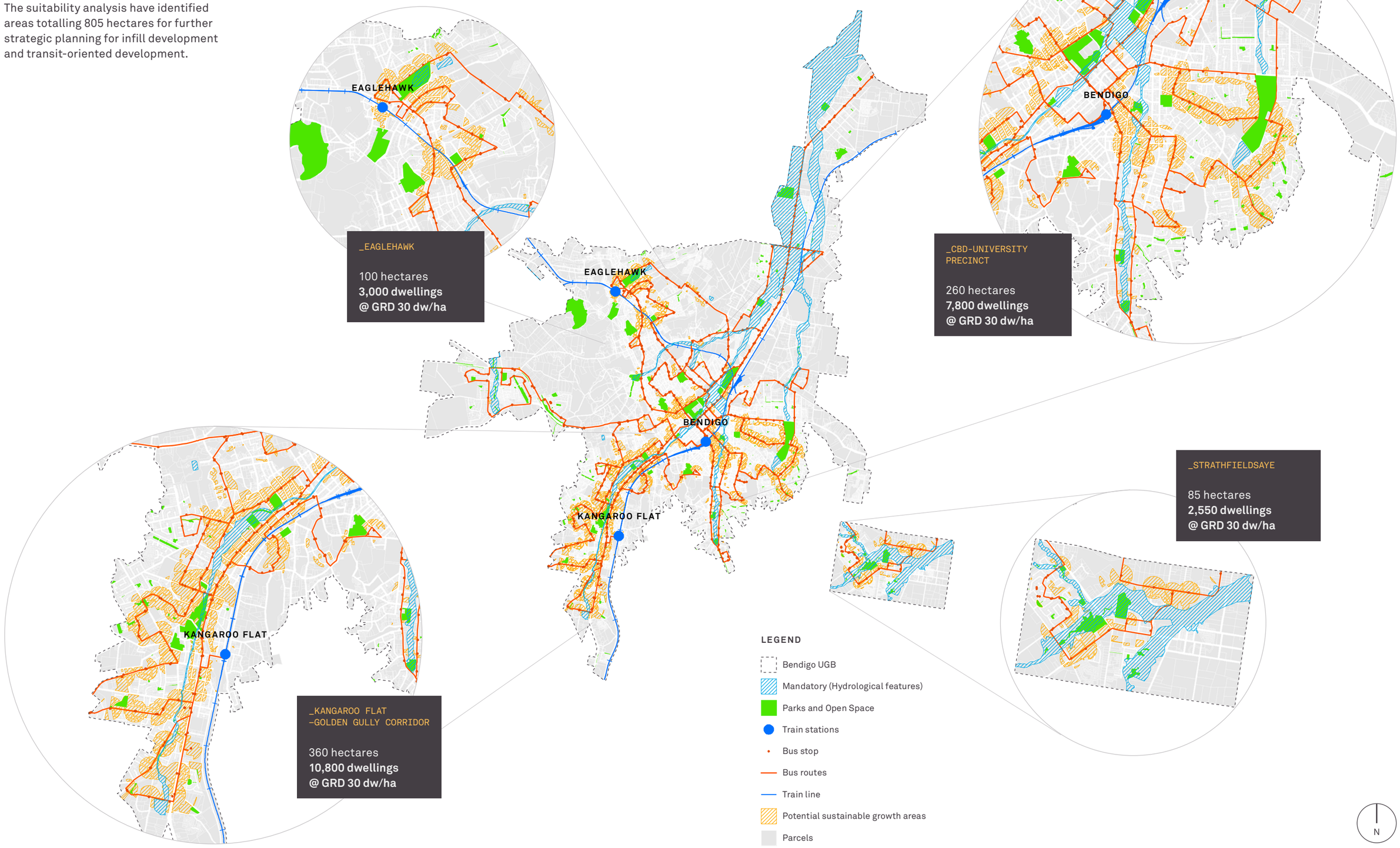
Source: Richard Cardew, "Residential Densities in Sydney," Australian Planner 33, no. 2 (January 1, 1996): 105–13, doi:10.1080/07293682.1996.9657724, 112.

17 State Government of Victoria, "What Are Growth Areas, and Where Are They?," *Melbourne 2030*, accessed June 11, 2015, http://www.nre.vic.gov.au/melbourne2030online/content/implementation_plans/03a_about.html.
18 Michael Buxton and Jan Scheurer, "Density and Outer Urban Development in Melbourne," *Urban Policy and Research* 25, no. 1 (March 1, 2007): 91–111, doi:10.1080/08111140701222831.
19 Richard Cardew, "Residential Densities in Sydney," *Australian Planner* 33, no. 2 (January 1, 1996): 105–13, doi:10.1080/07293682.1996.9657724.
20 Simon McPherson and A. Haddow, "Shall We Dense?/Save: My Life," in *Proceedings of the World Sustainable Building Conference*, 2011, http://www.irbnet.de/daten/iconda/CIB_DC23053.pdf.



Sustainable Urban Growth Potential

The suitability analysis have identified areas totalling 805 hectares for further strategic planning for infill development and transit-oriented development.



Flowchart

All datasets were processed and clipped with ugb (manually digitised from Regional Growth Plan, Greater Bendigo Planning Scheme). Activity centres, activity_ugb, was also manually digitised from Greater Bendigo Planning Scheme)

_Data sources

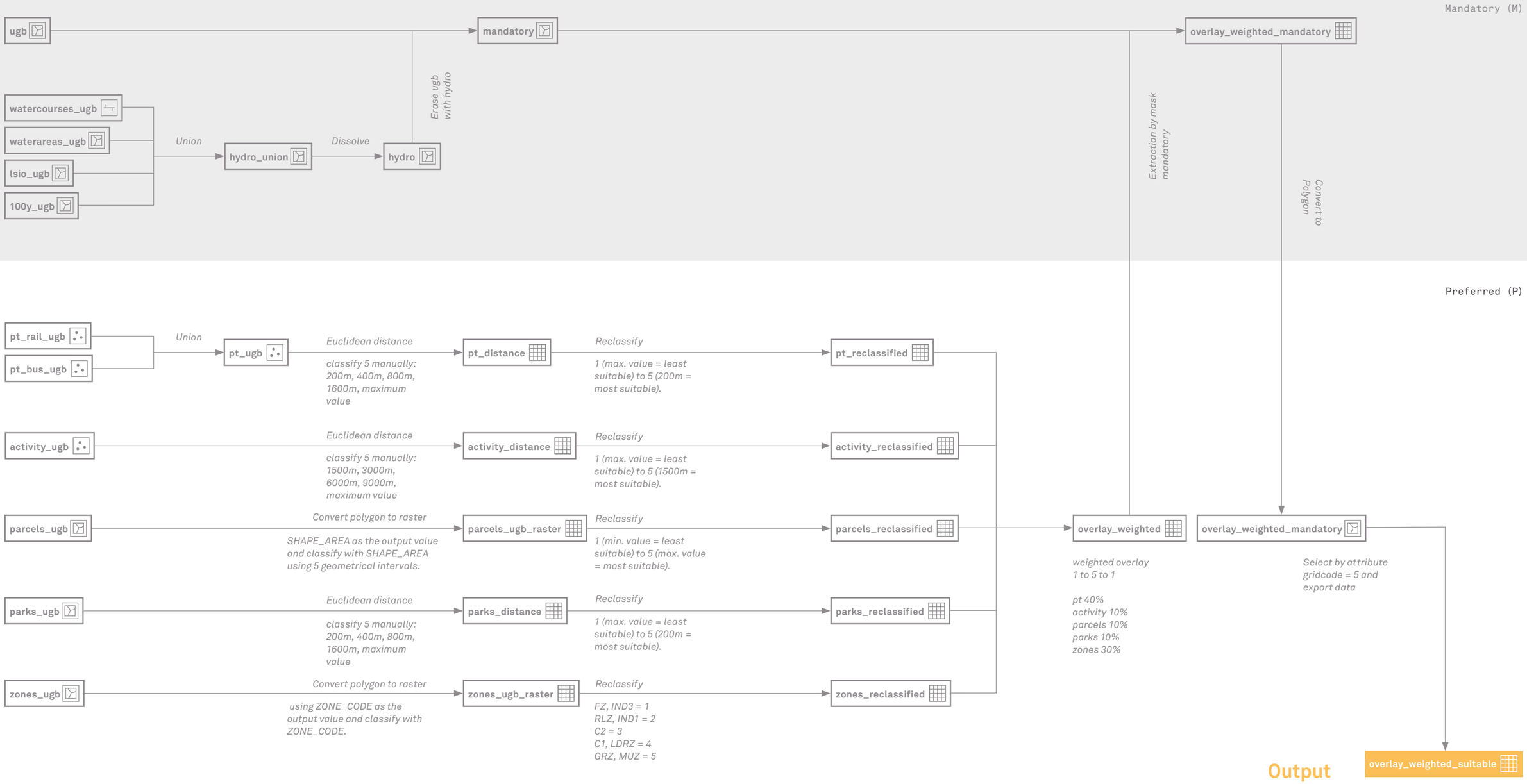
_Public Transport Victoria
rail.shp
bus_stops.shp

_Dept. Sustainablity and Environment
watercareas.shp
watercourses.shp
lsio.shp
100Y_flood.shp

_LandVictoria
zones.shp
parcels.shp

Inputs

Intermediate maps



THE USER-CENTERED PUBLIC TRANSPORT NETWORK PLAN

May 2016

SUMMARY

Geoff Riding (583159)

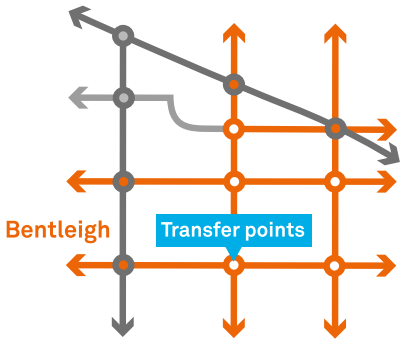
Public Transport Network Planning

Word count: **2995**
Sections 1–5: 1673
Section 6: 1322

4 GOALS

PTV in collaboration with the community set four overarching goals for transforming Melbourne into a world-class public transport city.

1 SMARTER, REDESIGNED BUS NETWORK



Utilise best-practice network planning principles redesign existing bus network into a **hierarchical network** with **simple and direct** routes to link more origins and destinations in a fast and convenient manner while using less operational resources.

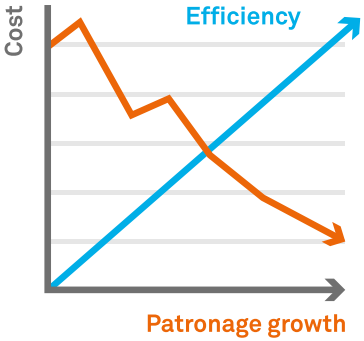
2 PRIORITISE PUBLIC TRANSPORT

Encourage shift away from the automobile by combining automobile disincentives with public transport incentives that improve **speed, consistency and reliability** such as upgrading Rights-of-Way (ROW) and granting high levels of priority at traffic intersections (Vuchic 1999).

3 ENHANCE USER EXPERIENCE

Enhance **user experience** by improving user relations between PTV and its operators by redesigning interchanges for pedestrians, upskilling drivers interpersonal communication skills, improving wayfinding and accessibility standards.

4 INCREASE NETWORK OPERATING EFFICIENCY



Reallocate existing service kilometres into more efficient routes to gain faster patronage growth rates to increase cost-recovery and ensure the economic viability of Melbourne Metro Project (Lawrie & Stone 2015).

6.1 BRIEF OVERVIEW OF OPTIONS

Constraints

The user-centered analysis of the study area identified critical constraints in the existing bus network:

- Non-existent network hierarchy containing of five high frequency routes, SmartBus 700, 900 and 903 and Monash University routes 601 and 630 amongst a variety of low frequency routes with differing operating patterns.
- Poor line structures with many routes operating on indirect and circuitous forms.
- Unstable routes and timetables with great reductions in service from weekday to weekends with 7 routes not operating on weekends.

Opportunities

Brimbank's success in reforming its bus network sets a local precedent with 10% growth in patronage in the first six months (Loader et al. 2015). This success was attributed to the use of network planning principles which represents opportunities to:

- Reinvest resources and service kilometres into routes servicing areas with high patronage potential
- Rationalise routes by straightening line structure and removing routes that unnecessarily overlap one another
- Co-ordinate buses with train timetables at all transfer nodes

Evaluation

Options were developed, see Figure 11, and conceptually modeled for comparative evaluation by PTV and the community with four goals as criteria.

- **Option A:** Redesign of bus network to introduce a clear hierarchy of fast, frequent SmartBus routes and standard routes
- **Option B:** Redesign of bus network with all high frequency routes
- **Option C:** Upgrade service levels (frequency and hours) of existing routes
- **Option D:** Removal of inefficient routes and upgrade frequencies of remaining existing routes

Option A was recommended as it satisfied all four goals and struck a balance between fewer, direct high frequency routes and lower frequency neighbourhood routes. These neighbourhood routes, as was the case with Brimbank, were popular with the community, particularly the elderly and those with impaired mobility (Loader et al. 2015). This balance allowed the network reallocate existing service kilometres between SmartBus and existing routes.

Option B and C did not meet the criterion to increase network operating efficiency. Modelling demonstrated that Melbourne's relative low population densities would result in insufficient patronage growth and low vehicle occupancy rates, providing no financial justification for such upgrades. Option D was rejected as many existing bus routes had routing, circuitous line structures that were operationally inefficient (Mees 2000). These routes would benefit from rationalisation as provided by Option A.

SmartBus 004 provides a case study of how Option A can be achieved by consolidating inefficient routes into fast, frequent 'trunk' routes.

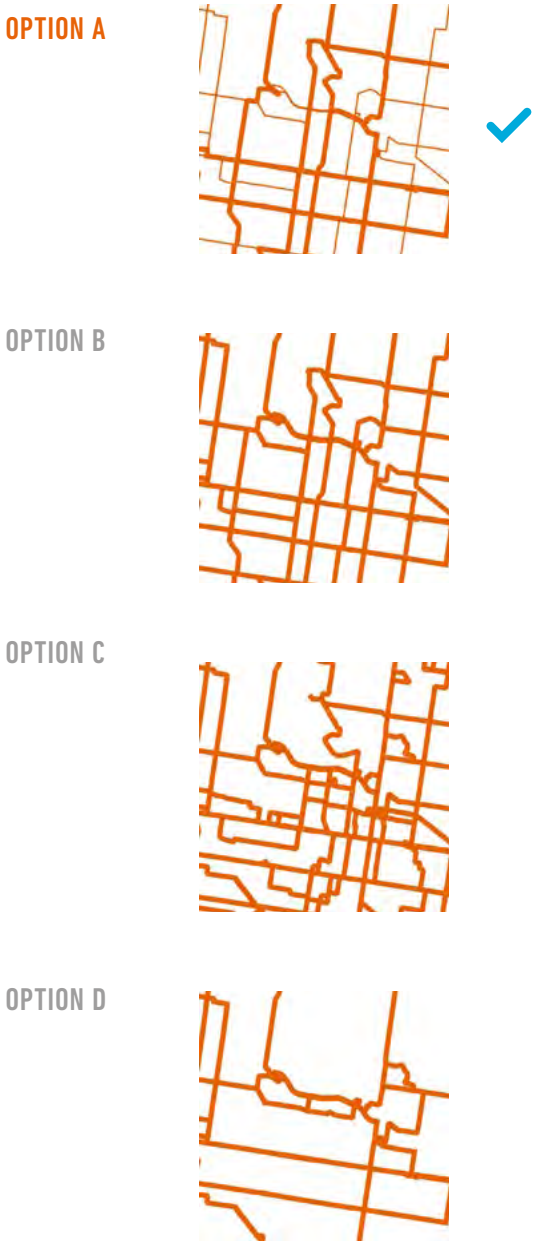


Figure 11. Options for evaluation.

6.3 SIMPLE AND STRAIGHT LINE STRUCTURE

The line structure of redesigned routes follow the **'one section - one line principle'** outlined in the *HiTrans Best Practice Guide 2: Public Transport – Planning the networks,* to increase operational efficiencies by removing unnecessary complexities in the network that tend to cause disturbances that propagate across the network, see Figure 13 (Nielsen et al. 2005, p.109).

Line geometry

Figure 14 demonstrates the line geometry of four existing routes and the new SmartBus 004. Compared with existing routes, the new route is straight and strictly adheres to the arterial road network with detours only necessitated by major origin-destinations such as Chadstone Shopping Centre. This rationalised geometry, along with bus priority, strengthens the routes clarity and image, making it clear to users where the route goes (Vuchic 2007).

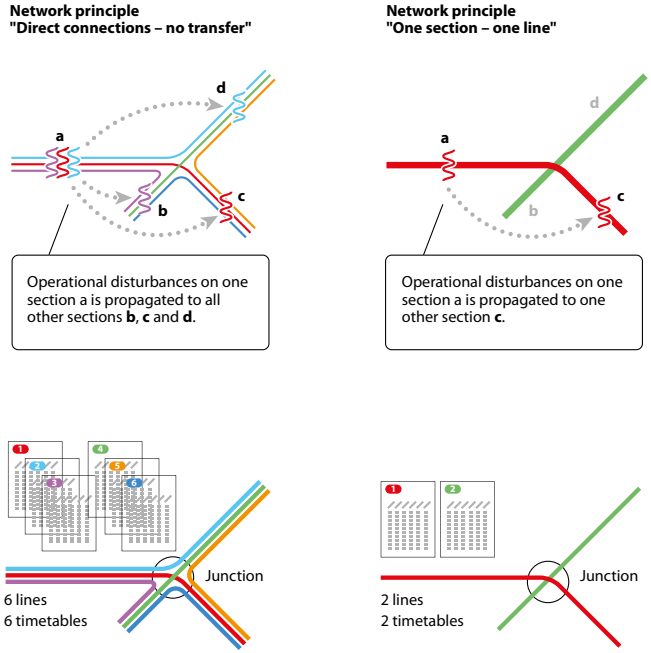


Figure 13. Best-practice 'one section - one line principle' simplifies network operations (from Nielsen et al. 2005, p.107, 109)

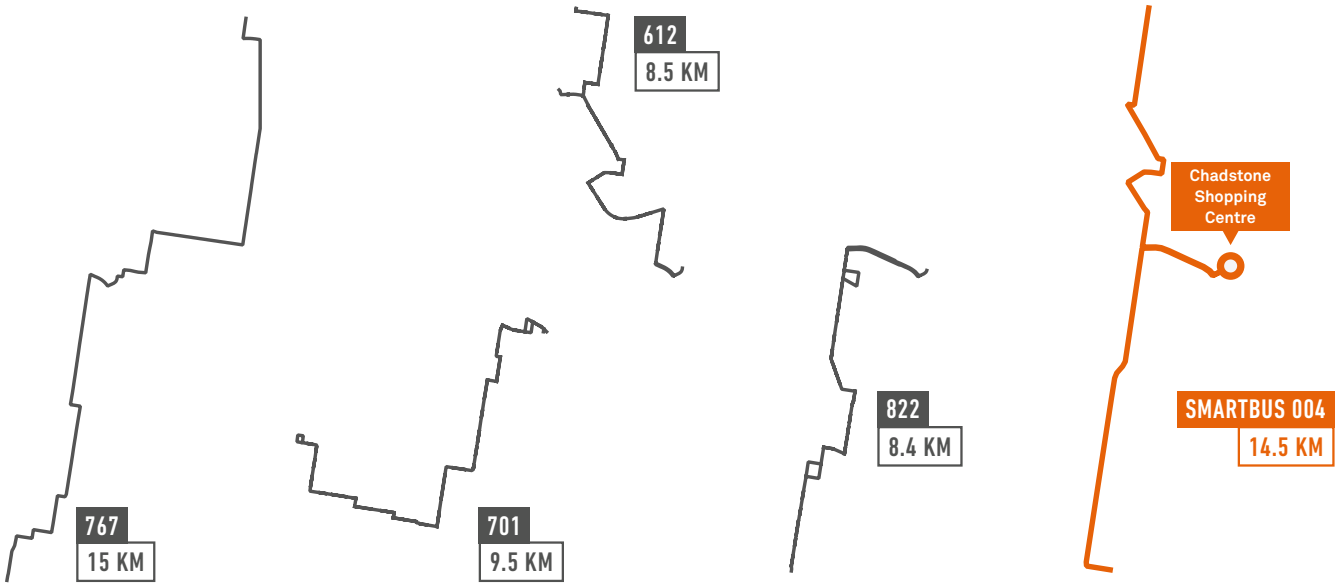
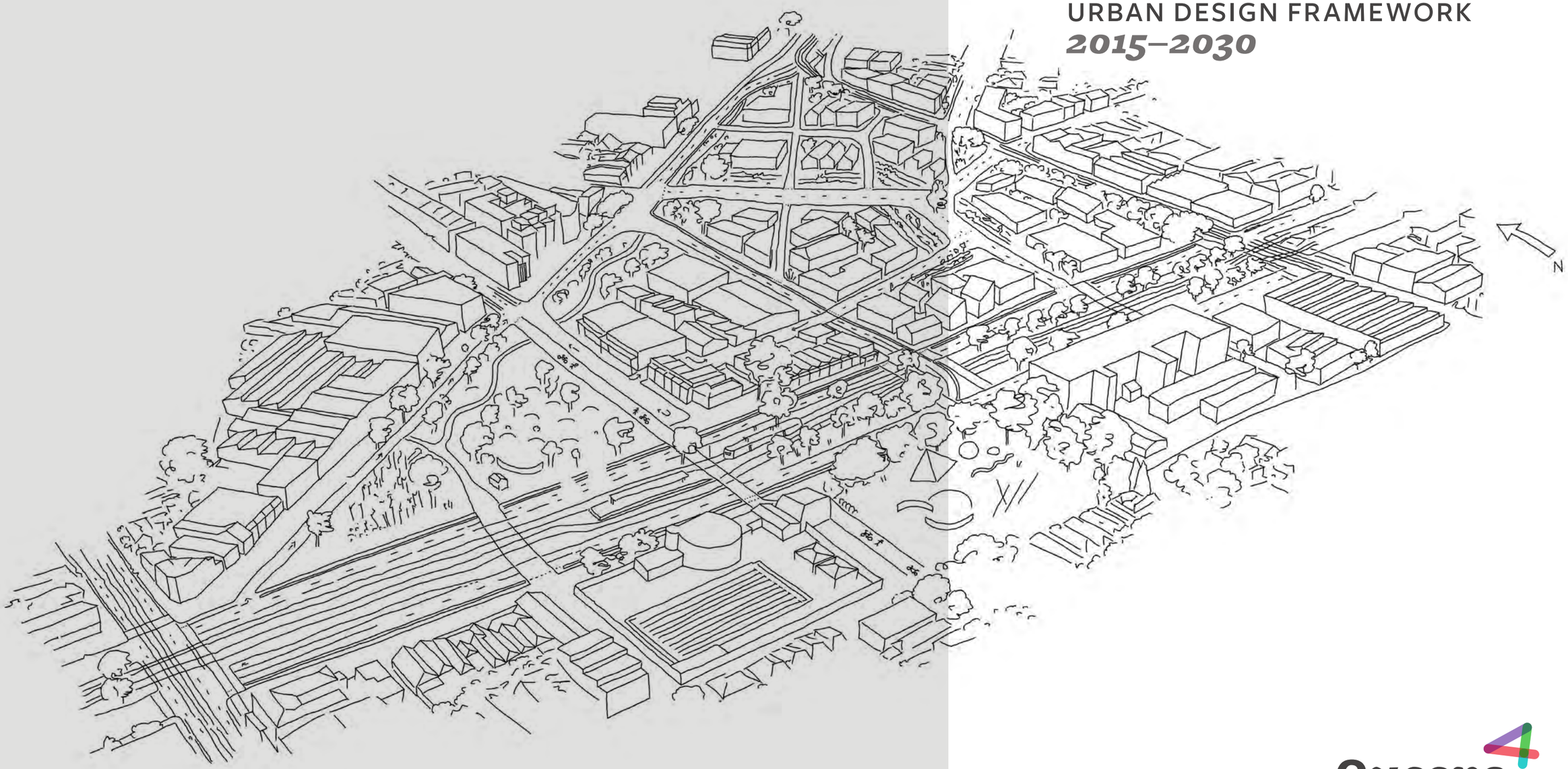


Figure 14. Geometric comparsion of line structure of routes 612, 822, 701 and 767 and proposed replacement SmartBus 004 route

Queens

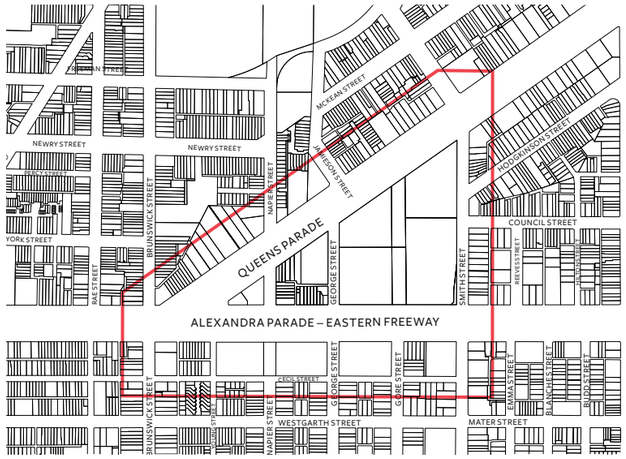
URBAN DESIGN FRAMEWORK
2015–2030



Queens

Introduction
THE SITE

Queens is a rare site located just 3km from Melbourne's CBD, wedged between Queens Parade and Alexandra Parade. Both are wide boulevards representative of an automobile era, further exemplified by the under-used former Fitzroy Gasworks site. In parallel to the East-West Link, this Urban Design Framework (UDF) aims to catalyse change towards sustainable urban forms and public spaces *for the people*.



ECOLOGY AND SUSTAINABLE DESIGN

The site is characterised by fragmented and under-used green space at Triangle Park and Smith Reserve with primarily introduced species of elm, oak and plane trees prevalent. Furthermore, there is a lack of productive 'green infrastructure' such as agricultural landscapes, rain gardens, water-harversting and pollutant filtering. As a result, the built environment is dominated by impermeable hard surfaces, wide roads, noise and unknown land contamination. There are opportunities, in parallel to East-West Link works, to transform the site from an abiotic automobile environment to an biotic environment for people.

SOCIO-ECONOMIC BARRIERS

The site is increasingly becoming an socio-economic barrier with the median house price in North Fitzroy at $1,120,000, and the median uni price at $557,750—putting housing out of reach with the lower income bracket quartiles. Limited community consultation highlight community tensions between social housing residents and 'new' residents and ongoing gentrification. Under-used publicly owned land, such as the former Fitzroy Gasworks site and, represent opportunities to overcome housing affordablity and rebuild a sense-of-community.

SOURCE: www. realestate.com.au, data 23 october 2014

WALKABLE?

In spite of the site's 'walkscore' of 94, field surveys carried out by the studio has shown a lack of pedestrian activity in addition to prolonged waiting time at all street crossings. Additionally, the dominance of large Boulevards and the impermeability of the large former Fitzroy Gasworks is a real urban barrier. However, the walkscore demostrate a high reward for the consildation of pathways and cycling lanes to complete the 'puzzle' and encourage higher pedestrian activity and sustainable transport.

SOURCE: www.walkscore.com & field survey by LUUD group 1

NEARBY CREATIVE CLUSTERS

The site adjoins directly next to Fitzroy and Collingwood, a cultural melting pot known for its indigenous heritage, cultural diversity and the vibrant arts and live music. In addition, creative firms such as graphic design, industrial design and architecture often locate their businesses in Fitzroy and Collingwood in re-used industrial-era buildings. Taken together, they form a 'cluster' of sustained temporal creative activty. In contrast, the site is largely void of such activity as studies by Shaw (2013) have shown.

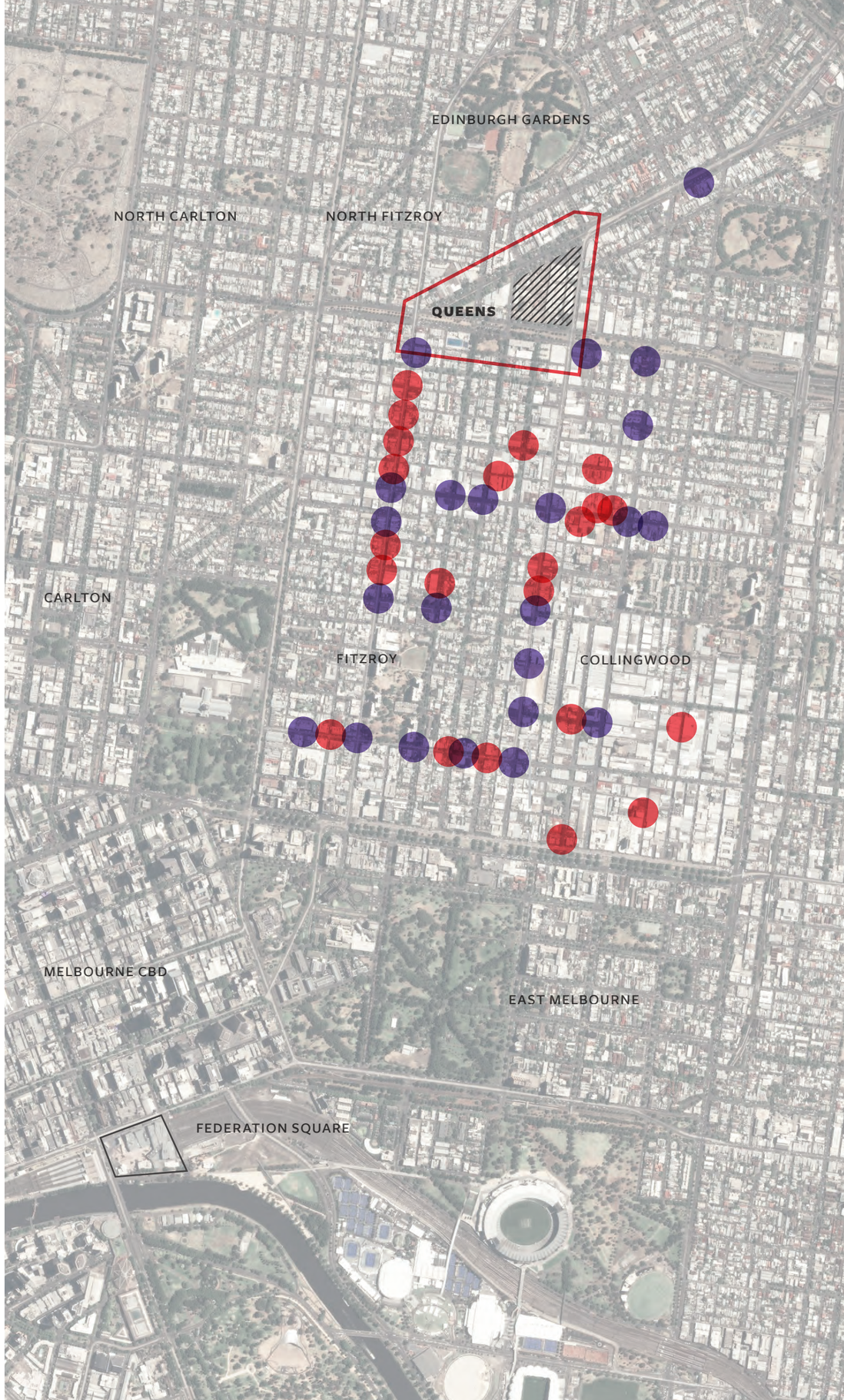
THE SITE

3km from Melbourne CBD
Area size of 250,000m²

IMAGE LEGEND

Site boundary
Federation Square size comparsion
Former Fitzroy Gasworks site
Live music
Arts & design

SOURCES: Shaw, 2013; Bing.com.au



Ecological urbanism
DESIGN GUIDELINES

1.0 Create connected, ecological and productive landscapes: integrating intrinsic ecological characteristics with agricultural productivity and water-sensitive urban design.

1.1 Connect existing green spaces from Edinburgh Gardens, Triangle Park and Smith Reserve through reclamation of car-parking spaces and roads to expand green space and integrate green infrastructure (see plan view).

1.2 Audit and remediate, as necessary, reclaimed land alongside Queens Parade to create a vegetated stormwater harvesting 'greenway', the Queens Greenway, incorporating a system of vegetative biofilters/ pollutant diverters, kerbside rain-gardens feeding into a larger seasonal-rain garden (see 1.6)

1.3 Plant hardy agricultural trees, bush foods and native vegetation throughout all public open space—adhering to the permaculture principle of multi-storied, multi-functional vegetation.

1.4 Establish agricultural allotments (10%) as mandatory requirement of the Gasworks affordable housing development and include rain harvesting infrastructure to service these (see 1.5).

1.5 Set mandatory requirement in the Gasworks affordable housing development for the provision of rainwater harvesting infrastructure (100% STORM rating for rainwater harvesting) and composting infrastructure in situ to minimize maintenance costs and benefit from locally produced biomass.

1.6 Prohibit the use of herbicides and pesticides in Yarra City Council weed management operations on productive landscapes and implement organic weed control practices to ensure the food-safety of agricultural soils and plants for human consumption.

1.7 Construct seasonal-rain garden with underground water storage providing irrigation to existing and new vegetation at Triangle Park and to prevent storm water from entering the Alexandra Parade mains drain.

PLAN VIEW
CONNECTING GREEN SPACES

- Site boundary
- Green space
- Green road crossing
- Productive landscapes
- Agricultural allotments
- Stormwater harvesting
- Seasonal rain-garden

0 25 50 100 150 200 250M
1:13,500 @ A3

2.0 Implement 'world-leading' environmental sustainable design (ESD) across new and existing urban forms: urban form transformation as catalyst for design innovation.

2.1 Adopt the Yarra Planning Scheme Amendment C133 to facilitate the achievement of best-practice ESD at planning stage of all developments.

2.2 Apply a Design and Development Overlay (DDO) to the Queens4 precinct to encourage the implementation of Building Integrated Photovoltaic (BIPV) solar in new buildings.

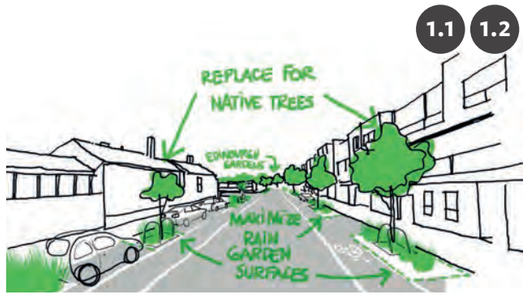
2.3 Survey existing urban trees; develop an urban forest strategy to replace trees near end-of-life with resilient trees to reduce heat island effect.

2.4 Advocate, via council initiatives and DDO (refer to 2.2) , to integrate 'micro' ESD measures such as compact urban gardens (balcony/container-based), composting and biomass/gas and grey-water recycling in urban developments.

2.5 Maximise localised recycling of materials and by-products from on-going site transformation works—kerbside rocks alongside Queens Parade to be re-used for rain gardens. costs and soil/water inputs.

2.6 Implement green/grass surfaces along light rail corridor on Alexandra Parade once constructed.

The building that grows, seeds are placed during building construction
SOURCE: EDOUARD FRANCOIS ARCHITECTS



Connecting green spaces and harvesting storm water

SOURCE: JO MORENO RIVERA

Permaculture principles for productive landscapes

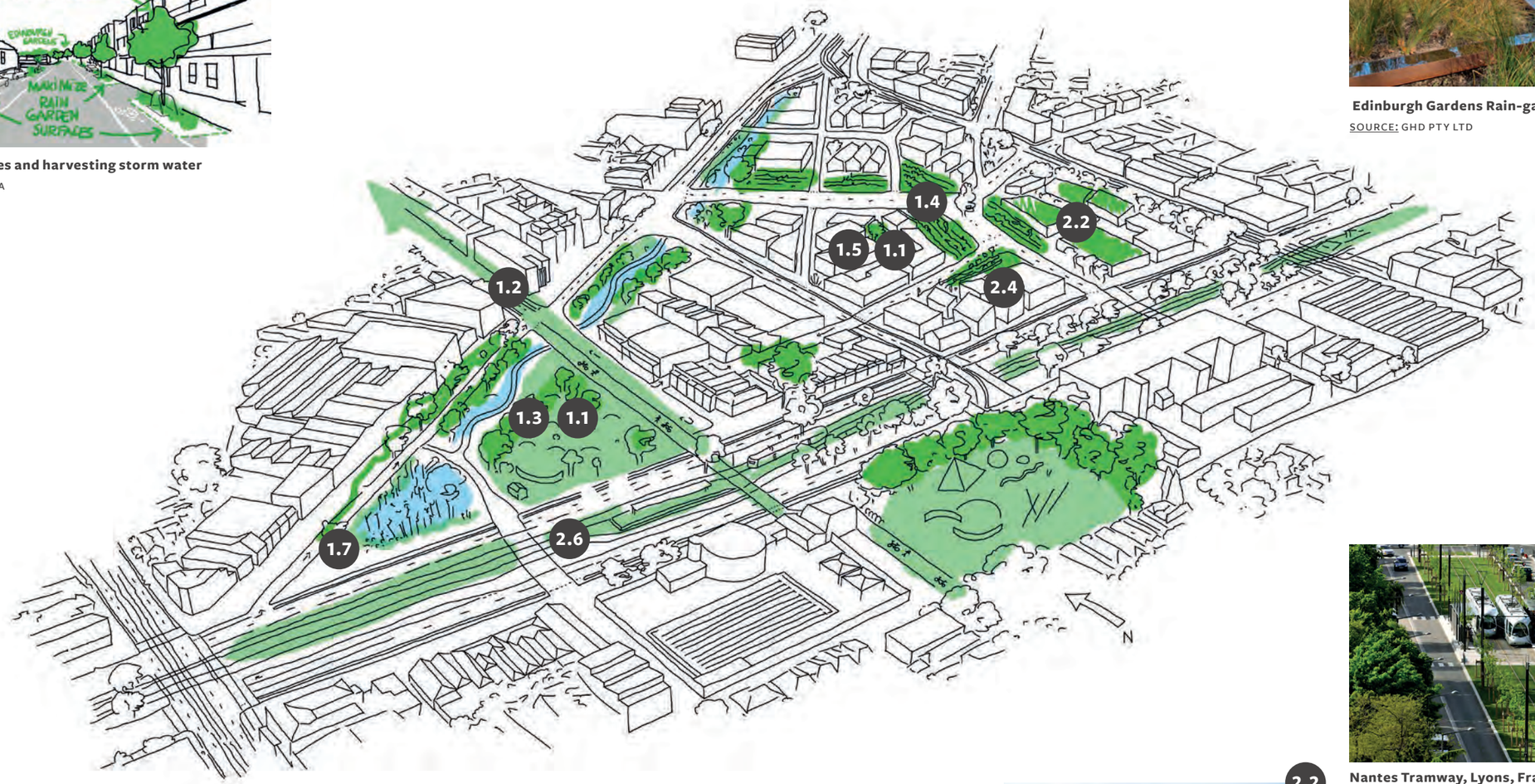
SOURCE: MOLLISON, 1988

Composting in situ

SOURCE: JO MORENO RIVERA

Edinburgh Gardens Rain-garden, Melbourne

SOURCE: GHD PTY LTD



Nantes Tramway, Lyons, France

SOURCE: FLICKR

BIPV at EVA Eva Lanxmeer, Netherlands

SOURCE: EVA LANXMEER, NETHERLANDS