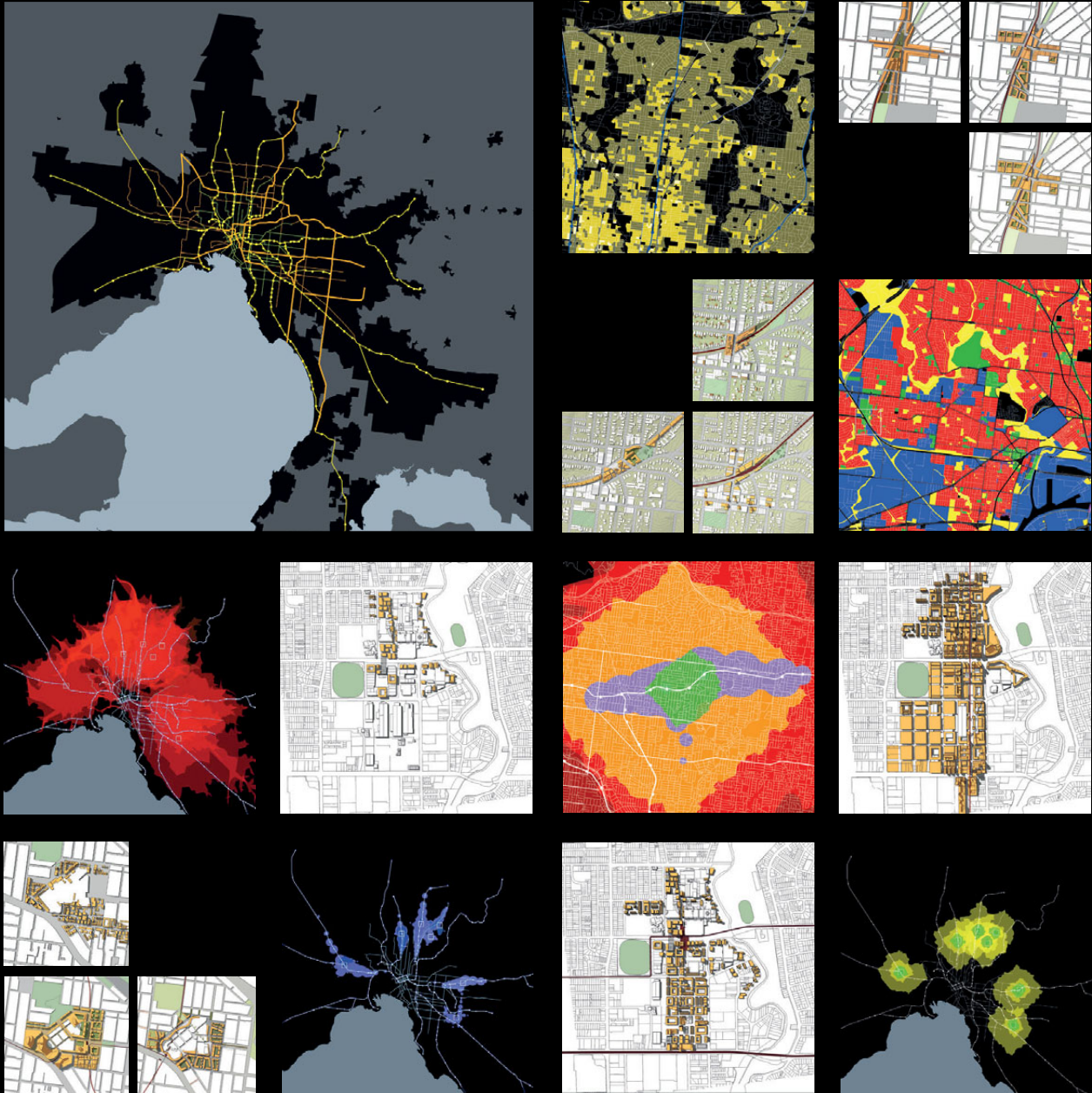


INTENSIFYING MELBOURNE

Transit-Oriented Urban Design for Resilient Urban Futures



Report on the Australian Research Council Linkage Project 100200590

Edited by Kim Dovey and Ian Woodcock

Melbourne School of Design, The University of Melbourne
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Transit-Oriented Urban Design for Resilient Urban Futures

Cities are often said to be the engines of the global economy in an age of rapid urbanization. Car-dependent cities - particularly those that characterize North America and Australasia - are largely cities of suburban sprawl, freeways, shopping malls and poor public transport. They are also cities of great opportunity for significant reductions in carbon emissions through transit-oriented intensification within existing suburbs combined with improvements to transit services and shifts to active modes of transport. Such development, however, depends on a multi-scalar understanding that links the shaping of built form and public space at an urban design scale to larger scales of metropolitan structure and urban flows. This research project is an investigation of how such urban design and transport opportunities might be developed in Melbourne. We seek to show how transit-related problems and opportunities at different scales interconnect to form synergies and alliances both between projects and between scales. Through a series of design research studies we explore scenarios for the transformation of suburban railway stations, tram corridors, private shopping malls, university campuses and post-industrial zones. The analysis is undertaken within a theoretical framework of self-organization, emergence, complexity, adaptation and assemblage. Design research at every scale is argued to be a necessary link in the process of unlocking capacities for urban transformation.

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CONTEXT

Australian cities are some of the lowest density and most car-dependent on the planet: intensified urban development and improved public transport to meet the imperatives of population growth and a low-carbon future is a major challenge. Despite decades of compact city policy there has been little change to the practice of ever-expanding suburban fringe development and freeway building that entrenches and exacerbates car-dependency. One of the major blockages to transformational change has been a lack of design vision that can capture the public imagination for more sustainable urban futures. In 2010 we commenced an ARC Linkage research project called 'Intensifying Places: Transit-Oriented Urban Design for Resilient Australian Cities'. This project seeks to analyse the potentials for Australian cities through developing visions for transit-oriented futures that can achieve broad community acceptance in a democratic framework. The research emphasis is on both design quality and resilience – on the quality of urbanity created or enhanced by design intervention and on the socio-spatial resilience embodied in high levels of urban amenity, accessibility, economic vitality and equity. A key hypothesis is that given improved transit, transit-oriented development can achieve such outcomes but success hinges on the quality of the urban design and the contribution of such design to improved social, environmental and economic outcomes. Melbourne is a key test-site for these issues, with low densities, entrenched car-dependency, and the potential for innovative and globally-applicable propositions for change. The urban policy framework has long called for intensification within existing activity centres and along transit corridors but change has been difficult in the face of community resistance to what is seen as a threat to the valued character of suburban life (Dovey & Woodcock 2011).

The project title, 'Intensifying Places' connects two key issues for designing future sustainable cities. 'Intensification' incorporates the increased efficiencies of higher residential and employment density with the better use of scarce resources. 'Place' is a term that brings together issues of urban design qualities and intensities with everyday concerns of communities and markets. The two concepts come together in addressing the challenge of creating resilient cities, through the design of intensified urban places. More than just density, this is an intensification of activities and amenities - of social and economic vitality. Intensified places involve qualitative and quantitative improvements; they are more efficient but also more dynamic and more resilient in the face of economic, social and ecological change.

THEORY

ASSEMBLAGE

The theoretical framework deployed here has been developed from two primary sources. The first of these is 'assemblage' theory based on the work of Deleuze and Guattari (1987). The term 'assemblage' here is a translation of the French 'agencement' which is akin to a 'layout', 'arrangement' or 'alignment' – it suggests at once both dynamic process and a diagrammatic spatiality. Assemblage is also a useful way of re-thinking theories of 'place' in terms of process, identity formation and becoming (Dovey 2010). An assemblage is a whole that is formed from the interconnectivity and flows between constituent parts — a socio-spatial cluster of interconnections between parts wherein the identities and functions of both parts and wholes emerge from the flows between them (DeLanda 2006). Transit-oriented development is not a thing or a collection of things, it is the assembled connections, alliances and liaisons between them that are crucial (Deleuze & Parnet 2007: 69). For our purposes these interconnections are social, spatial and environmental. Assemblage is at once verb and noun — both the process of assembly and the assembled outcome. It is the flows of life, people, materials and ideas that give sites within cities an emergent sense of place. The dynamism of assemblage involves the ways territories and boundaries are inscribed and erased, the ways identities are formed, expressed and transformed. Assemblage thinking operates against any notions of place as contained or stable – transit-oriented developments are held in place by connections, tensions, flows and desires.

RESILIENCE

The levels of complexity, adaptability and self-organization embodied in urban assemblages suggest a second and complementary framework of resilience theory based in theory of complex adaptive systems (Gunderson & Holling 2002; Walker & Salt 2006). The task here is to understand the dynamics of complex systems where the outcome of a system depends on unpredictable interactions between parts. This is work that grows out of a mix of theories of cybernetics, chaos, complexity and resilience, much of it transferred from the study of natural systems. A complex system is one where the parts adapt to each other in unpredictable ways - they self-organise. The detailed outcomes of such a system cannot be determined in advance but rather 'emerge' from practices of adaptation and self-organisation (Johnson 2001). Key properties of complex adaptive systems include the diversity and redundancy of different parts such that each performs a multiplicity of functions where no single part is crucial to success and the system can adapt by moving forms, functions and flows around. The tendency to maximize efficiency of the system – often the goal of formal planning – can lead to a loss of redundancy. As with assemblage theory, there is no easy way to define the 'system' as each transit node is an interactive part of further systems at higher scales. While such theory is useful for understanding complexity and adaptation the term 'system' carries connotations of predictability and systematic control — the 'complex adaptive assemblage' is a more accurate and useful label. Understood in this way, urbanization historically shows the emergence and succession of different urban assemblages over time. In Australia, with urbanization beginning after the industrial revolution, urban morphology was linked primarily to walking, cycling and transit. Following the second-world war, under modernist planning and Fordist production, Australian cities embraced motorization and suburbia, firmly entrenching a car-dependent urban assemblage. The challenge now is how to replace the 'resilience' of the current assemblage with one that provides Australian cities with a new resilience in the face of climate change, peak oil and population growth.

URBAN DMA

How such theory translates into research on the ground can be understood in one way as an assembled intersection of density, mix and access - the primary categories we have used for analysis at multiple scales.

DENSITY

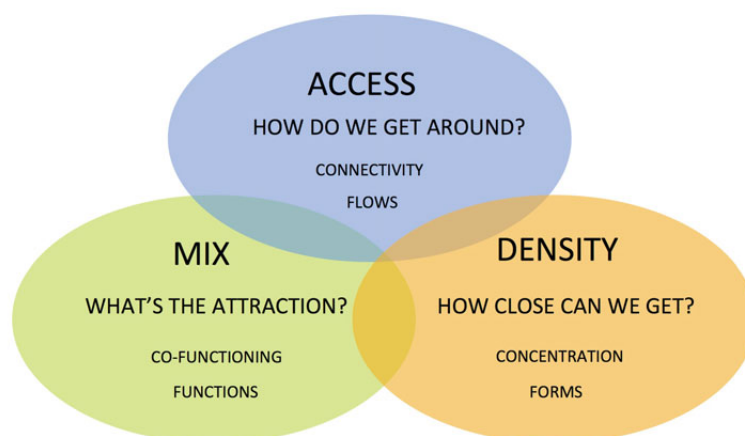
Density shortens distances between people and the places they need access to. The question of density is one of how much activity, population and built form can be concentrated into a given urban area. Analysis here incorporates the study of land coverage (building footprints), building typology and height. Population densities centre on measures of people, dwellings and jobs per hectare. What concentrations of built form make sense in terms of shortening the distances between attractions while maintaining amenity? How close can we get to where we want or need to be?

MIX

Mix involves the mix of landuses, built forms and populations – how are different activities, amenities and people juxtaposed spatially? The study of mix is a study of co-functioning – the alliances and synergies between functions, between home, work and play; between production, exchange and consumption. What's the attraction between different parts of the mix?

ACCESS

How do we get around the city? How do we make connections between where we are and where we want or need to be? What are the access routes and are they tree-like or networked? How permeable or fast are they at different scales and for different modes of transport? What mix of walking, cycling, car, bus, tram and train do we use and how does it differ at different scales? What is the speed and volume of traffic flow? How are intensities of flow produced, constrained and enabled by allocations of public space to different modes of transport?



This research investigates the intersections between density, mix and access because that is where the synergies of transit-oriented urbanism are found. These synergies have been traditionally described as those between transport, landuse and built form; they can also be seen as the more alliterative connectivity, co-functioning and concentration, perhaps forms, functions and flows. The question of built form density is intimately linked to population densities of jobs, residents and visitors, and thereby to transport flows. Yet transport makes no sense separated from the landuses that attract those flows, the ways those flows are mediated and the built forms that frame them. Urban intensity emerges at the intersections between what we might call the urban DMA - density, mix and access. Like biological DNA it does not determine outcomes but sets a framework for what is possible.

DESIGN RESEARCH

This is a design research project in the sense that many of the research questions we have outlined cannot be answered in advance of an investigation of the urban design outcomes. Design is generally seen as infill within a planning framework: planning comes first, urban design fills in the smaller scale and three-dimensional framework, and architecture fills in the details. We suggest that this sequence from larger to smaller scale embodied in such thinking is neither accurate nor useful. Cities and the vital neighbourhoods, activity centres, zones and corridors within them emerge as a result of both top-down and bottom-up processes and concepts; they are both organized from above and are self-organizing – the challenge is to understand the interrelationships between them.

The role of design here operates at multiple scales - well-designed infrastructure networks at the 100 km scale enhance capacities at smaller scales while high-quality urban design at the 1 km scale enables better flows within and between regions, with higher levels of intensification and greater capital gains. The potential for development of any given activity centre has a great deal to do with establishing and nourishing inter-connections and synergies with other centres – particularly through its local integration with the public transport network. There are synergies between larger and smaller scales in that the infrastructure investment required to better connect any given activity centre can be paid for in part by the capital gains created through high-quality design. A part of what is being produced are new flows of desire and new urban property markets. A key issue here lies in the role of design research in establishing the capacity for new development as a pre-requisite to understanding the benefits of infrastructure investment and the potential capital flows that might fund it. High-quality urban design is a wealth-creating activity that increases the attractiveness and productive capacity of the city; it provides uplift in land values that can provide funding streams for infrastructure.

Design vision, in this sense, must encompass all scales of the city from ten metres to a hundred kilometres. We need to enlarge the public imaginary with regard to how major infrastructural investments at the larger scale can transform the city at every scale. Yet until we explore the urban design possibilities at the smaller scales we will not understand the potential yield of particular redevelopment sites. If the politics of urban planning proceeds in the absence of design vision then it becomes either driven or paralyzed by ideology rather than imagination.

Design research is a speculative mode of inquiry that explores the 'space of possibility' embodied in a particular urban assemblage (DeLanda 2011) - the range of possible spatial transformations that might be effected under different design strategies. Design research then generates forms of spatial knowledge about urban futures that becomes a basis for strategic decisions and investments – particularly infrastructural investments. This production of knowledge through design research has a peculiarly spatial character – it is not linear, linguistic or numeric. Through a range of visual and spatial techniques, such as drawing, diagramming and 3-D modeling, design research generates, articulates and tests a range of possible urban scenarios at different scales. Design research takes the essential unpredictability of urban systems and outcomes as a starting point and seeks to experiment with the existing city as a laboratory. These experiments are not scientific because the context and future adaptations cannot be controlled. However, design research does involve a level of rigour in testing the possibilities - more accurately the 'compossibilities' - that emerge from the alliances and synergies between different parts of the urban assemblage. Design research exposes new ways of thinking and new definitions of the problem.

The ways one thinks about the issue of transit oriented development has a lot to do with how one thinks new public transport infrastructure should be funded. Should it be funded by the state, by private profits, by capital gains on public land, by a levy on specific or general uplifts in property markets, or by anticipated increases in tax revenue flows from expanded economic activity generated over the long term? The most likely successful outcome is a mix of these, but the kind of mix will depend on the specific capacities and potentials of individual cases. But this capacity – this space of possibility – cannot become known without design research. When focused on typical conditions that are replicated across our cities, this design knowledge becomes applicable more broadly. We build a knowledge base for the transformation of transit networks, corridors, malls, campuses and activity centres. Design research is not a form of consultation that displaces normal design practice directed at immediate solutions, rather it is directed at changing ways of thinking about the city and its possible futures, changing conceptions of economic sustainability, livability, social equity and the value of public transport versus private cars. The test, in the end, is not whether we have found a solution so much as some steps towards a more productive way of thinking about the city.

METHODS

Our method has been to analyze Melbourne for potentials and capacities for transit-oriented intensification and improvements to transit at multiple scales. We selected three primary scales of 100 km (metropolis), 10 km (20 minute city) and 1km (urban design case studies). After a large number of scoping studies we have selected case studies according to the following criteria:

PUBLIC TRANSPORT ACCESS:

What sites within the existing city have the best network access and where are the sites where new public transport investment could deliver maximum value? Our primary focus was on trains and trams as high and medium capacity public transport respectively. A key sub-issue here is the degree of integration of the larger public transport system into a genuine network. We were thus looking for sites with potential to add value to the whole network through greater network connectivity. We were also looking for potential to extend existing lines and to add new ones to create a networked rather than radial tram/train system.

CAPACITY:

What is the capacity for new development within walkable proximity to existing or potential transit? The issue is potential development yield and such capacity incorporates factors such as lot-size, heritage, ownership and market demand. If ownership is in private hands then the capacity to use future capital gains to pay for infrastructure development is limited (although land tax levies are possible). Railway corridors often have significant parcels of adjacent public land as easements, stations, public carparks or marshalling yards; air-rights can add to this potential in some locations. Tram corridors are generally lined with a range of small private lots where the capacity is limited by distributed ownership but the overall capacity is significant because of the extensiveness of the network (Adams 2009).

AMENITY:

What is the capacity to leverage higher density development off existing place-based amenity such as walkability and a good land-use mix of public open space, recreation, social and retail facilities? A key issue is the potential uplift in livability and amenity through the intensification process.

REPLICABILITY:

To what degree does this case constitute a typical place type that is likely to be found in other parts of Melbourne and other cities? How can this design research add to a larger body of knowledge?

RESIDENT RESISTANCE:

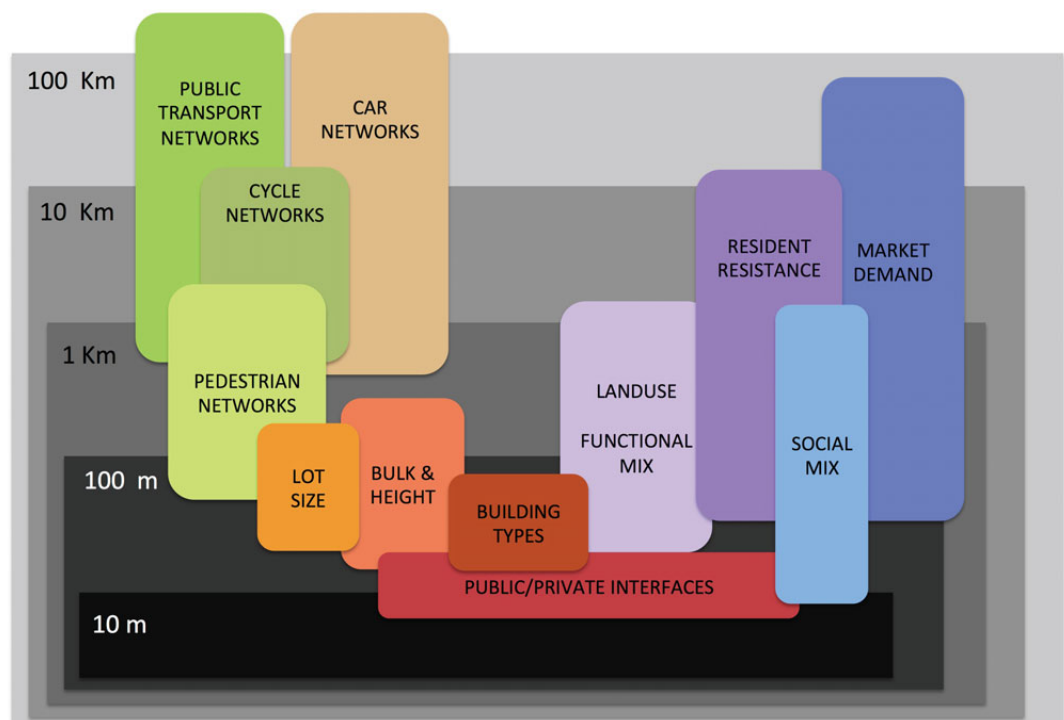
What is the likely level of resident opposition to urban intensification and new transport infrastructure? While resistance in some locations may render any form of transformation unlikely, others were selected in order to test the capacity for urban design vision to enlarge the urban imagination.

The primary opportunities included a mix of railway stations, tramlines, shopping malls, university campuses and post-industrial zones. We selected seven primary case studies and developed a range of urban design scenarios for each based on different levels of and designs for transport investment. Our goal is not to replicate practice by designing a singular optimal solution, but to demonstrate and compare the different opportunities, densities and yields that can emerge from different approaches. A key research question lay in the different opportunities that are opened up by elevated versus buried railway lines. Some of these scenarios were then tested in interviews with stakeholders. The scenarios are not proposals but are intended to stimulate new ways of thinking about the future city.

As academics we have worked on this project with leading practitioners from both public and private sectors. While our own disciplines span architecture, urban design and planning, those of our partners also incorporate transport planning and community development bringing knowledge and expertise from multiple scales and disciplines. Many of our partner meetings have been run as workshops designed to generate and test multiple scenarios for different parts of the city. The workshops have enabled social, economic, environmental, and design quality issues to be integrated in a manner that is not possible within a purely academic or practice framework.

SCALES

Transit urbanism cannot be understood at a single scale but require a multi-scale analysis – the capacity of a site to produce intensification depends on both existing and possible connections at several scales of both space and time. Such a hierarchy of scales is not a hierarchy of importance. Cities emerge as a result of both formal top-down controls and informal bottom-up practices, through both lateral and multi-scale connections. Our focus is on the interdisciplinary capacity to think across scales and to understand the relations between them. The key issues of transport, morphology, land-use, economics and sociality overlap at different scales. While our key interests are in the morphological issues, these cannot be seen in isolation from the larger context.



For the purposes of this project we are focused on three primary scale frameworks: the 100 km metropolis and hinterland, 10 km zones and 1 km case studies.

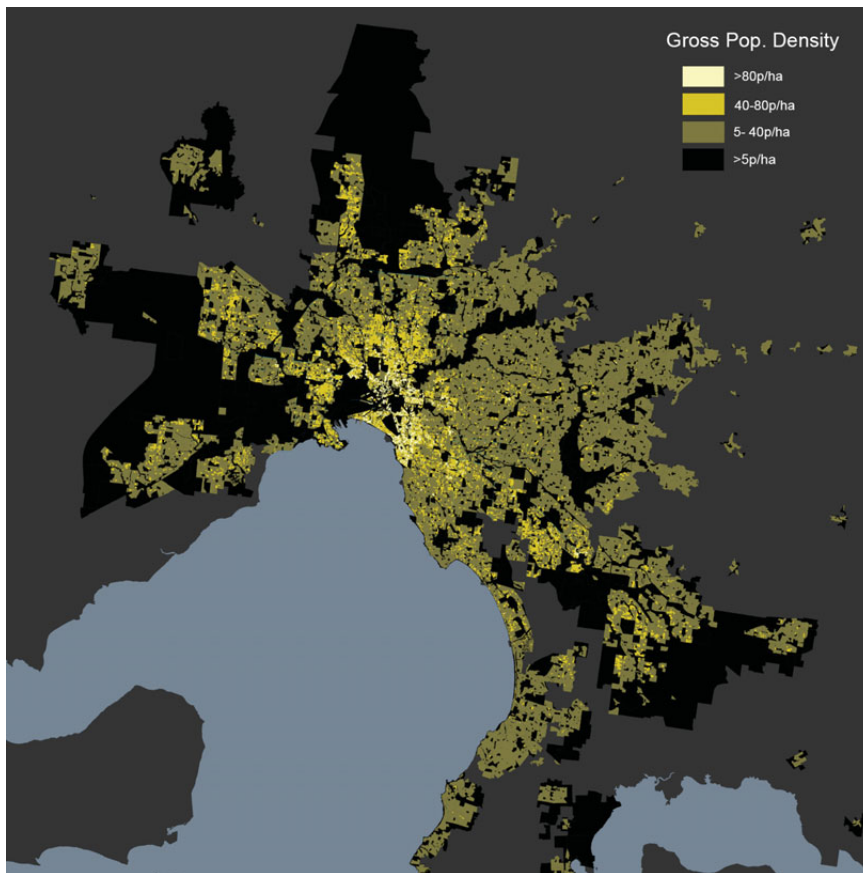
100 X 100 KM

METROPOLIS

At this scale we can see the relationship of the city to the region and the conundrum of car dependency. An urban growth boundary, designed to limit sprawl, has expanded over time to meet the demand for car-based suburbs. Developers own most of the urban fringe land and comprise a powerful lobby for more low-density suburbs. As new fringe suburbs develop with minimal public transit they stimulate the market for more freeways. The freeways in turn consume the vast bulk of transport funding and stimulate demand for more fringe development. This is a metropolitan assemblage that is utterly inconsistent with a low-carbon future. To break this escalating cycle we need to identify the multiplicity of opportunities for urban growth within the existing city.

DENSITY

The vast bulk of the Melbourne metropolitan area is inhabited at suburban densities of under 40 persons/hectare, a density at which frequent public transport is a very expensive service. The few pockets of over 80 persons/hectare are rare and concentrated in the inner city. Vast areas within the urban growth boundary have densities below 5 persons/hectare.



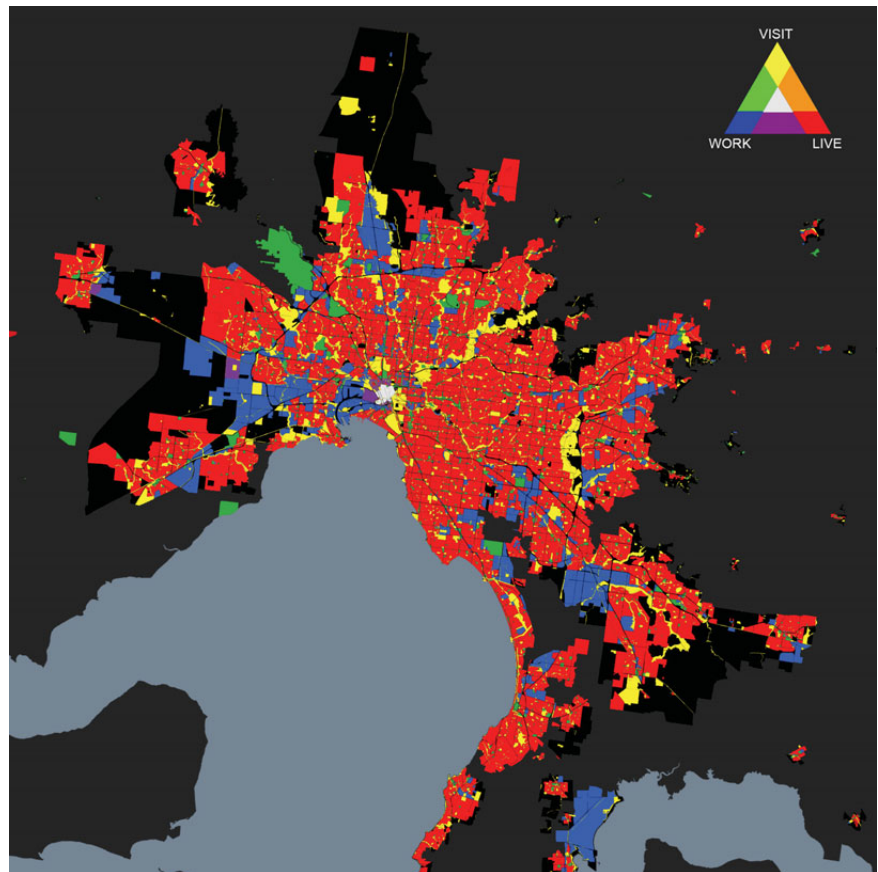
Gross Population Density (p/ha)

100km

MIX

Functional Mix

For the functional mix map the existing planning zones have been adapted to the mixed-use triangle (Nes et al. 2012) designed to help an understanding of how traffic flows between parts of the city that are primarily devoted to living (red), working (blue) and visitation (yellow), plus the mixes between them. Only the central city shows a rich mix of all three primary functions at present, with largely residential suburbs extending between 20-50 km from the centre. The yellow zones of visitation include activity centres, parks, beaches and airport. The work/visit zones (green) are primarily educational but include the airport.

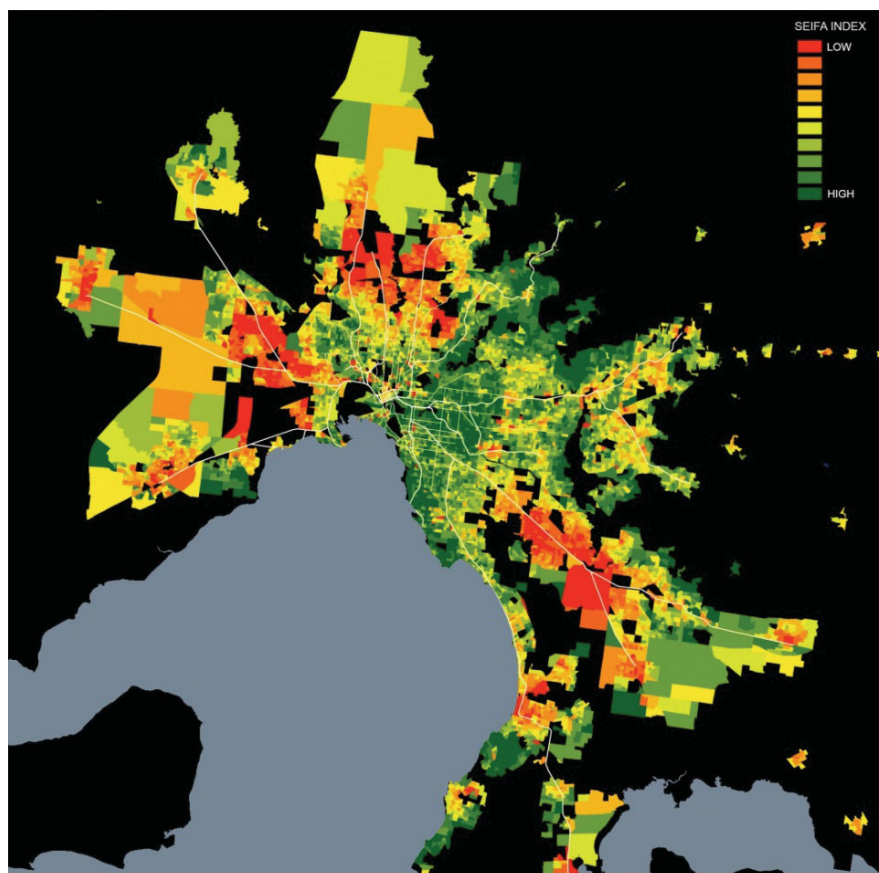


Functional Mix

100km

Social Mix

The social mix map shows the segregations and concentrations of wealth (green) and socio-economic disadvantage (red) across the metropolitan area. While the inner city is socially mixed, most of the wealth occupies a broad band across the southeast from the bayside suburbs to the hills of the eastern fringe. Disadvantage is concentrated on the urban fringe to the west, north and distant southeast. A key relationship between these two maps lies in the congruence between three large concentrations of blue (work) in the functional mix map and of red in the social mix. These are concentrations of industry and relative poverty.



Social Mix (SEIFA Index)

100km



Existing trains and trams

100km



Existing level crossings

100km

ACCESS

Melbourne possessed a large tram system and the world's most extensive suburban rail system at the end of the 19th century. The city's pre-World War II form largely results from these flows of movement combined with walking and cycling. Despite many proposals for additional and extended rail lines since then, few have been implemented. Melbourne now boasts the world's largest tram system with a total of 400km of routes operating on 250km of tracks.

At this scale the radial tree-like structure of the train system is most apparent. The tram system primarily covers the inner-city and is also relatively tree-like rather than networked. We have omitted the bus system because it is largely slow, low-volume and infrequent. We can also read the extent of car-dependency through the vast suburban areas that lie within the growth boundary yet beyond easy access to high volume public transit.

While Melbourne's early form was driven by transit, the contemporary metropolis is largely the product of the private car. A network of arterial roads is supplemented by major roads and freeways that provide good lines of radial and orbital movement. Much of the freeway layout follows the State's 1969 Transportation Plan, which has served as an enduring legacy.

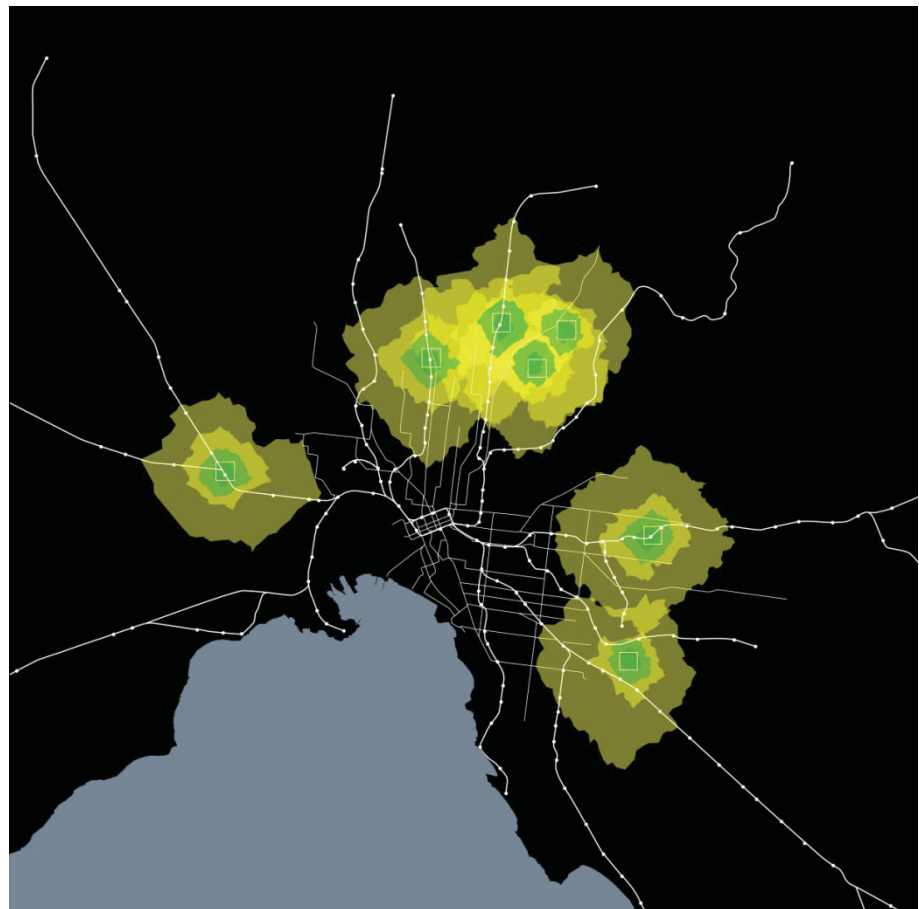
One of the greatest challenges is that Melbourne has a total of around 170 level crossings where the train system blocks the car, bus, tram and pedestrian networks every time a train passes. While at lower densities this is manageable, the increasing frequency of train services is strangling the network. Here the challenge is to design grade separations along significant stretches of rail line in a manner that is integrated with intensification strategies. Such scenarios will be explored at the 1 x1 km scale.

ISOCHRONE MAPPING

Isochrones are a means of showing zones of access across the city within a given time limit using different transport modes. Zones of access have been mapped for four transport modes: walk, cycle, public transport and car, across time zones of 5, 10, 20 and 30 minutes for each of our case study sites. The data is drawn from Google maps and public transport timetables. Isochrones are particularly useful for understanding how people make decisions between different transport modes for different trips.

WALK & CYCLE

Walking and cycling access zones are of most interest up to the 20 minute range - they provide substantial access but do not extend to the central city. Cycling zones are a relatively consistent size for the different case studies, which perhaps reflects the relative flatness of Melbourne rather than consistent riding conditions. Both walking and cycling demonstrate capacity more than reality because such modes are mediated by weather, time of day and safety issues.



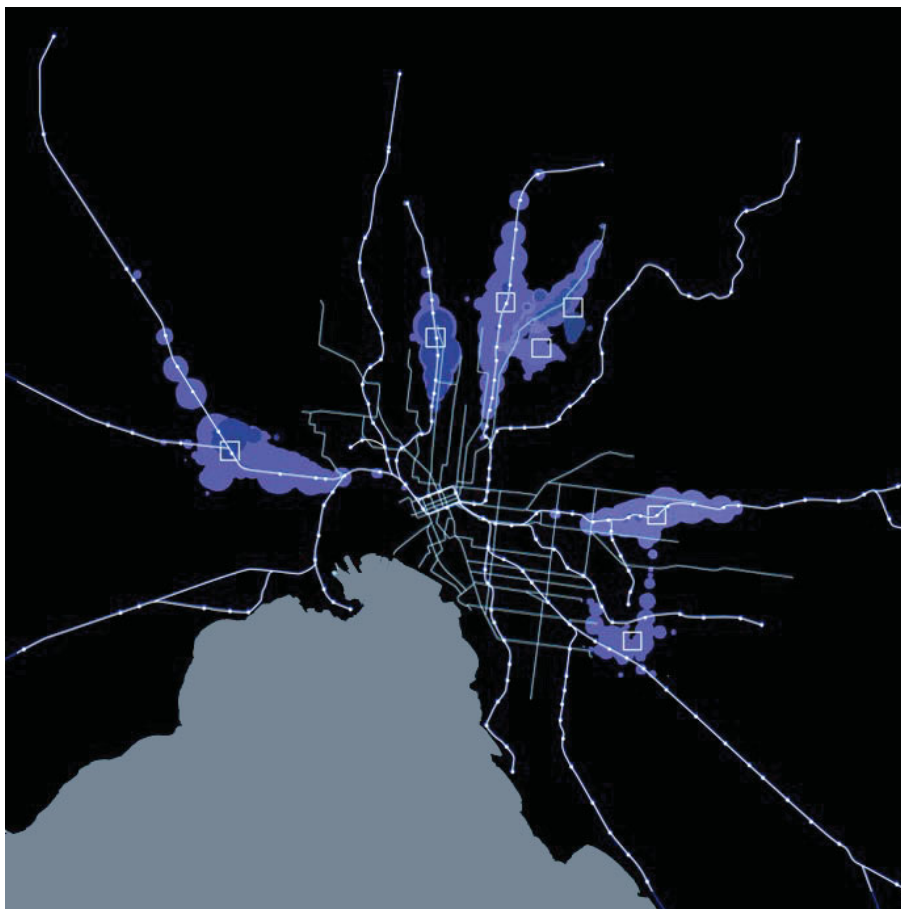
Walking and cycling access zones at 10 and 20 minutes

50km

PUBLIC TRANSPORT

Public transport zones include time taken to walk to and between stops and stations, as well as average waiting times (frequency of service). Both public transport and car access differs for different times of day and we have measured these for the morning peak (8-9am), midday (12-3pm) and evening (7-9pm). For ease of mapreading we have omitted the midday isochrones which always fall between the peak and evening measures. Car access zones are mediated by the possible need to find and connect to and from parking locations at either or both ends of the trip. While this will vary from about 0-10 minutes for different locations we have added 5 minutes total to each trip to account for this on average.

The radial pattern of the railway system is strongly reflected in the public transport access zones where sites are located on these lines. Those sites detached from tram and train lines (Northland, Chadstone, La Trobe) have clearly smaller zones of access. Public transport access is greater during the morning peak (lighter blue) and less during the evening (darker) due to lower frequencies. There are no 5 or 10 minute isochrones for public transport because waiting times ensure that access zones are negligible. At the 20 minute range these zones are constrained and negligible at some sites during the evening. None of our case study sites is accessible within 20 minutes from any other by public transport.



Public Transport access zones (20 minutes)
during the morning peak (lighter) and evening (darker)

50km

CARS

Car access zones increase by about 75% between the morning peak and evening. The morning peak zone is constrained for those driving in the direction of the city centre. At a 20 minute drive the case study sites remain out of range from the central city except in the evening; at a 30 minute drive all case studies have access to the central city and are strongly integrated laterally.

In comparing cars with public transport at this metropolitan scale it becomes clear that despite the fact that most of our case study sites are centred on public transit nodes, the choice between cars and public transport is far from competitive for most trips and at most times of day. On average cars have access to a spatial range that is about 10 times that of public transport. This gap is accentuated during the evening period when road congestion eases and public transport becomes less frequent. A large part of the challenge is to design a city where this map would see the blue zones eclipsing the red.



Car Access Zones (20 minutes) during the morning peak (brighter) and evening (darker)

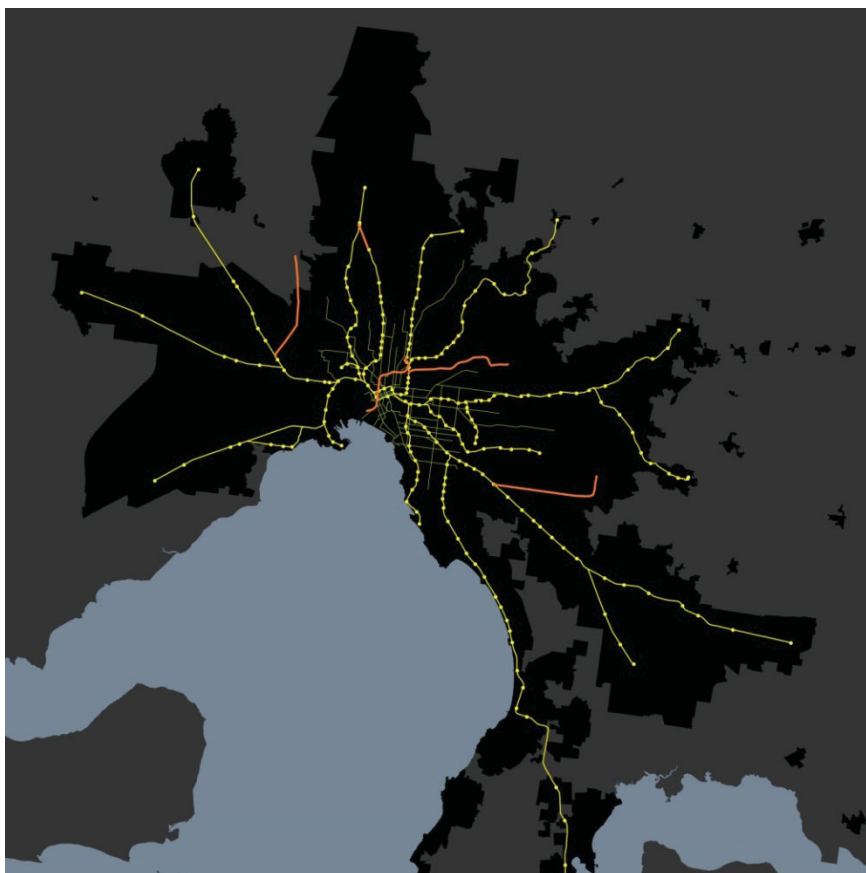
50km

TRANSIT SCENARIOS

While there are many engineering and economic challenges with regard to transit development that we cannot address here, from an urban design perspective we suggest two major challenges. First is the overarching imperative is to transform the radial rail and tram systems into an integrated network geared to the polycentric city - enabling inter-suburban flows without passing through the central city. Second is to expand the number of rail and tram lines to service both middle and outer suburban areas. While much could be achieved by radically improving bus services, only rail-based transit (trains, and light rail/trams) can achieve the quantum leap in capacity required for the necessary transformation. The challenge is to find new routes for both tram and train that can provide maximum uplift and be integrated with the emergence of walkable, mixed-use neighbourhoods with minimum damage to existing amenity.

SCENARIO 1: PTV PLAN

Public Transport Victoria (PTV) is the statutory authority responsible for planning, managing and marketing transit services for Melbourne; their 2012 Network Development Plan for Metropolitan Rail is a 20-year plan to improve the efficiency, reliability and patronage on Melbourne's rail system. This plan aims to reshape the system to become a metropolitan network with increased service frequencies across the system. The plan includes regional connections, extensions to existing lines (including an airport connection), a major new underground line through the central city and many upgrades of the existing network.



PTV Plan (2014)

100km

Despite the projected expenditure (in 2012 costs) of \$30 billion, the PTV plan remains largely a radial system, albeit with much higher capacity than the current system. The only parts of the city where the potential for network effects is created is in the city centre, the large activity centre of Footscray and parts of the inner-south eastern suburbs. This plan largely continues the bias of the current system and is counter to a metropolitan-wide network. Many middle and outer suburban areas will remain without rail services, along with many large activity centres, regional malls, university campuses and strategic brownfield redevelopment sites.

SCENARIO 2: BZE PLAN

Beyond Zero Emissions (BZE) is an NGO working to design and implement a zero emissions economy for Australia. The BZE Heavy Rail Plan for Melbourne seeks to turn the existing hub-and-spoke system into a metropolitan wide network with a large number of new lines, primarily aligned with arterial roads. Many of these new lines are orbital, including an inner-city 'loop'. Some elements of PTV's Network Development Plan are incorporated, notably the airport connection. An outer orbital line connects all of the radial lines in the metropolitan area

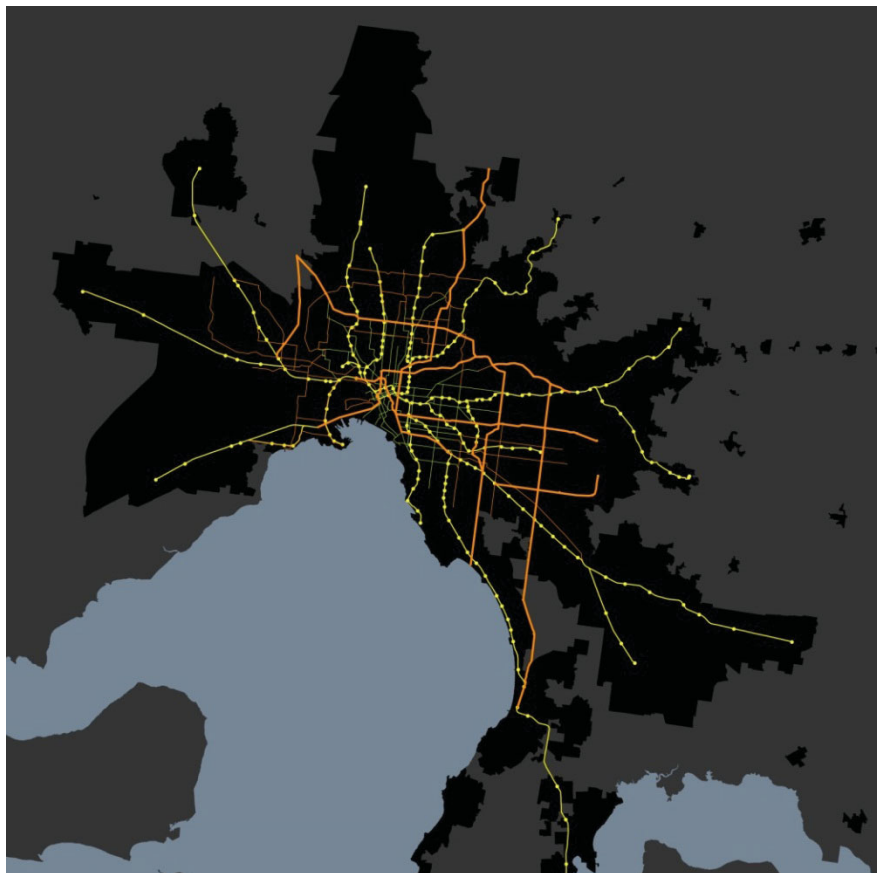
SCENARIO 3: IP PLAN

This scenario is just one of a number that we have pursued to meet the challenges Melbourne faces in becoming a low-carbon, transit-oriented metropolis. This plan takes the majority of the elements of the PTV Network Development plan and embraces the network thinking of the BZE scenario to transform the current hub-and-spoke system into a network of cross-city lines. In this scenario, the airport connects both south to the central city and east to Monash University and Frankston via an orbital line through the northern, eastern and south-eastern suburbs. A new north-south line along Warrigal Road connects Doncaster and Box Hill activity centres to, Deakin University and Chadstone Shopping Mall. A new radial line in the north connects La Trobe University and Northland Shopping Centre into this network. This scenario also embodies significant additions to the light rail network into those parts of Melbourne that have little or no services – the west, the outer north and the outer southeast.



BZE Plan

100km



IP Scenario

100km

10 x 10 KM

20 MINUTE CITY

The 10 x 10km frame (100 square km) occupies the middle ground between the metropolis and neighbourhood, between metropolitan planning and urban design. This is the scale at which sub-centres of the polycentric city emerge; where interconnections between employment, housing, services, recreation and transport become crucial. The ideal of the '20 minute city' - where most of the desired urban amenities are accessible within 20 minutes – is essentially multi-scalar but when focused on multi-modal public transport, cycling and walking (with declining or congested car usage) we find a range of maybe 3-10 km is accessible in 20 minutes.

At the 10km scale we begin to see a city of everyday connections between suburbs and activity centres, between housing and jobs, education and recreation. This is the scale at which we can understand how local public transport networks connect with metropolitan ones—the ways buses, trams and trains connect with each other and with bikes, pedestrian networks. Some significant intensification opportunities identifiable at this scale involve the transformation of radial transit lines into interconnected networks that enable dispersed lifestyles of work and leisure to become both more localized as well as more accessible via active modes of transport other than private car. We can begin to see visions for genuine mobility choices and new flows that will in turn produce markets for new types of development.

The area of analysis at the 10 x 10 km scale is difficult to define – it is not a neighbourhood and it crosses local government jurisdictions. It is a cluster or constellation of existing and potential interconnections that is in turn connected to adjacent clusters; it has scale but no clear boundaries. It is a cluster of places with potential for the emergence of low-carbon urbanism through an intensification of active transport flows, built forms and multi-scalar alliances. While current frameworks are primarily metropolitan, municipal and neighbourhood, we suggest that the 10 x 10 km scale is a crucial framework for rethinking the 20 minute city.

We have identified three suburban zones at the 10 x 10 km scale with significant intensification opportunities in order to explore the potential interconnections between the project types listed above. Currently, each of these regions is an assemblage of railways, tram lines and activity centres in proximity to campuses, malls and post-industrial precincts (which are often disconnected from the primary public transport network). Our task has been to understand each region as an assemblage and to interrogate it for scenarios of potential intensification of land uses and transit connectivity. These scenarios include both redevelopment around existing transport infrastructure and the design of new transport connections that generate potential. A key question is the relationship between intensification potential and infrastructure investment – to what extent does the latter have to occur to realise the former? In a market-driven planning context, this co-dependence between infrastructure and intensification becomes a crucial conundrum.



Zones (10x10km) and cases (1x1km)

30km



Area more than 400m away from rail transport

30km

NORTH ZONE

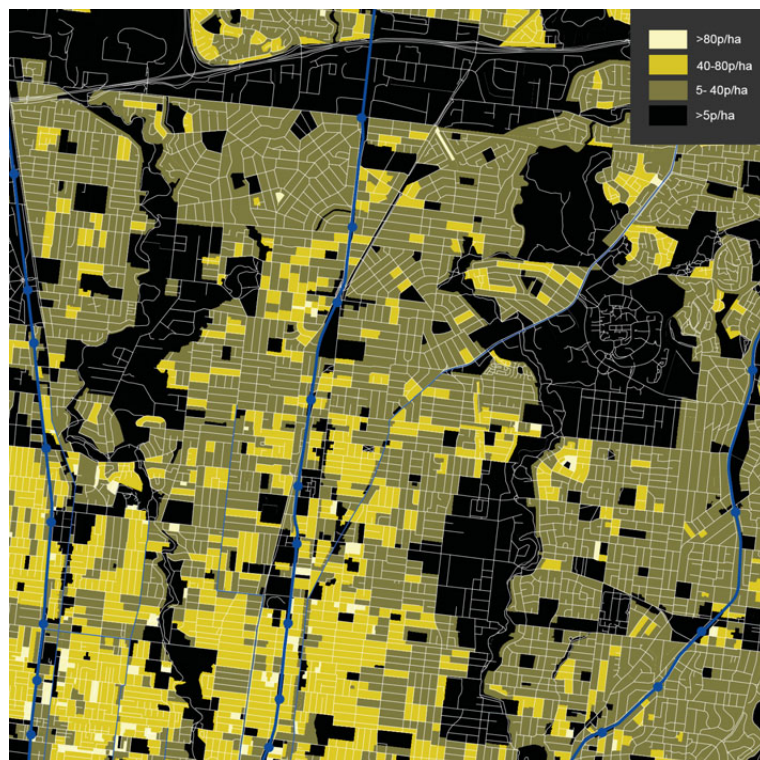
This zone extends from the outer ring road to the middle-ring suburb of Thornbury, from Coburg in the west to Heidelberg in the east. It incorporates the Preston market, Northland mall, La Trobe University, and Reservoir. Two major creeks run from north to south - Merri Creek to the west and Darebin Creek to the east. While the creeks have high environmental and recreational value for walkers and cyclists, there is considerable untapped amenity and the majority of development turns it back on them. The area is in transition from a manufacturing economy with four major industrial zones. The southern part of the zone is gentrifying and intensifying, but the northern areas have lower than average property values and high levels of disadvantage. Beyond the walkable catchments of the tram corridors and rail stations, large parts of the zone are car-dependent. The major challenge here is to better connect the major attractors to each other and to residential areas. There is enormous potential for new synergies within this zone.

DENSITY

Residential densities in this zone range from some very substantial industrial and open space zones with negligible density to some zones of over 40 people/hectare near the tram and rail lines in the southwest corner. The vast bulk of the suburban landscape is below 40 people/hectare.

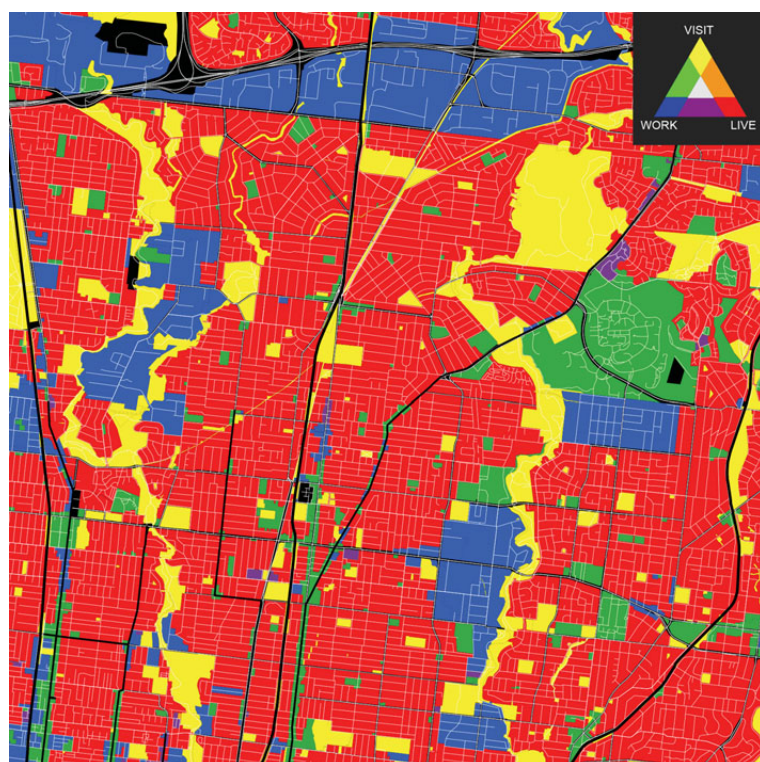
MIX

While most of the activity centres lie on or adjacent to rail or tram lines, Northland (the mall serving the broader region) and the campuses of La Trobe and RMIT Universities are poorly connected to transit and largely car-dependent. Most dwellings in the zone are low density, single-storey detached houses. Some infill of between 4-12 storeys is occurring along tram corridors in the southern area. There are few sites of heritage significance.



Density (p/ha)

10km



Functional mix

10km

Within the zone are several large areas of industrial land (shown in blue on the map), some with significant potential for mixed-use redevelopment, especially those adjacent to Darebin Creek in the east and Merri Creek in the west. The socio-economic status of this zone varies significantly, with some of the most disadvantaged suburbs in the metropolitan area in the eastern and northern areas. The southern area of Thornbury is rapidly gentrifying and property values there are above the metropolitan median.

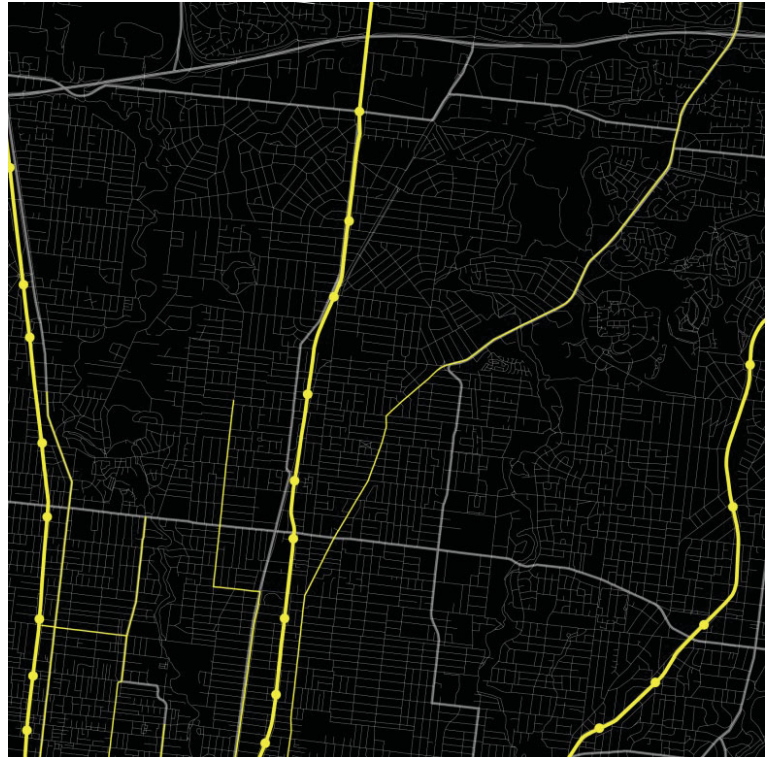
ACCESS

The North Zone is served by three rail lines and four tram routes, all in north-south alignments with no significant network effects. Most residential areas are serviced only with infrequent bus services that are poorly geared to trams and trains. Interconnections between the four major attractors – La Trobe University, Reservoir, Preston market and Northland shopping mall - are very poor.

TRANSIT SCENARIO

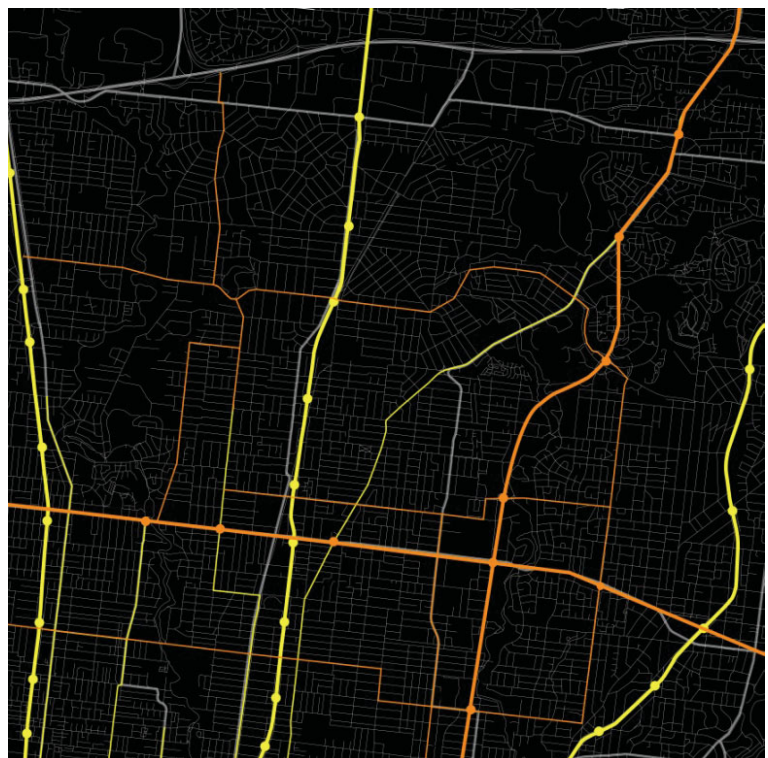
In this scenario two new rail lines provide north-south and east-west connectivity. Several extensions and additions to the tram system provide further crucial east-west links with frequent, medium capacity services within the region, linking key activity centres (Preston, Reservoir, Coburg, La Trobe University, Northland) and redevelopment sites.

This would enable employment and residential intensification to occur in all activity centres, along with residential intensification around existing and new rail stations, along existing and new tramway corridors, and within larger transit interchange nodes. New synergies are made possible between the cluster of major centres comprising Reservoir, Northland and La Trobe, due to fast and frequent transit between them.



Existing access (yellow)

10km



Proposed Tram and Rail Scenario (orange)

10km

SOUTHEAST ZONE

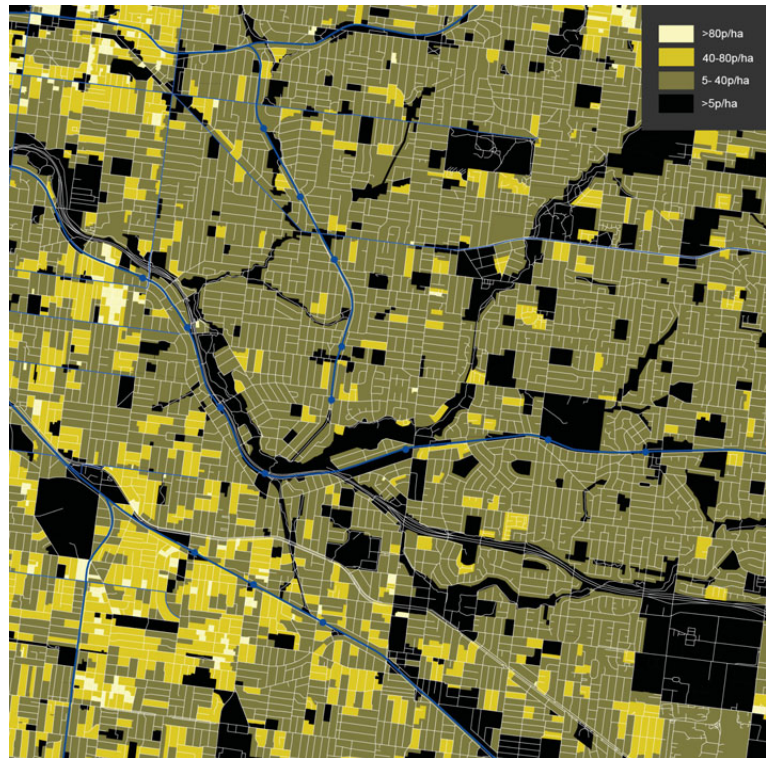
This zone encompasses an established suburban landscape with relatively high property values and high amenity. It extends from Camberwell and Surrey Hills in the north to Oakleigh in the south, from Caulfield in the west to Clayton in the south east. The two major campuses of Monash University (Clayton and Caulfield) are included along with Deakin University (Burwood). The intensification potential is concentrated in very constrained locations due to the effect of entrenched resident resistance.

DENSITY

This is a suburban landscape where densities are generally low and evenly distributed with no noticeable increase around transit nodes.

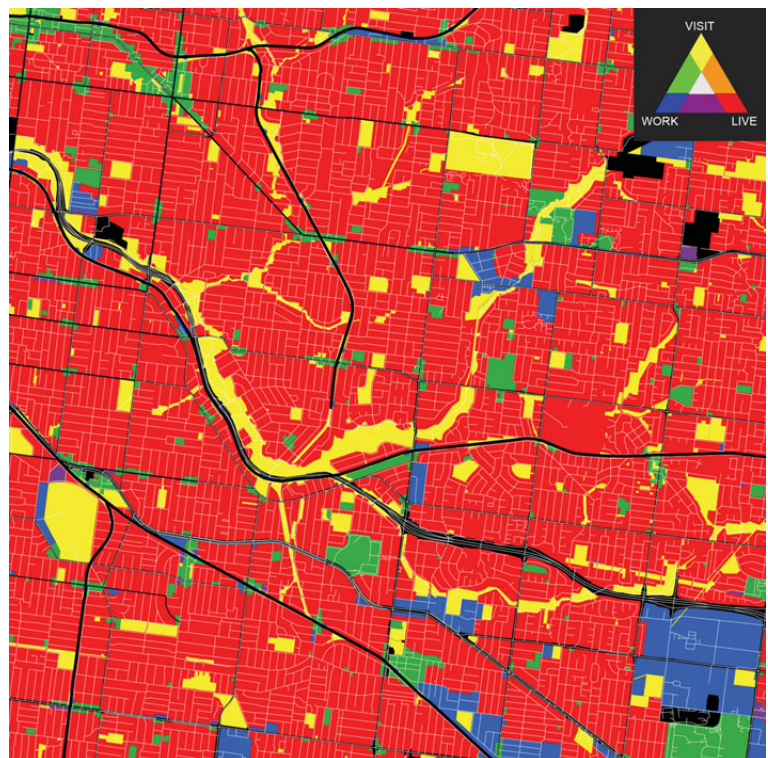
MIX

There are two Principal Activity Centres (Chadstone and Camberwell), a Specialised Activity Centre (Monash) and several Major Activity Centres in the zone. Most of the zone is residential, with some of Melbourne's most leafy suburbs in the west and north of the zone where house prices are substantially above the median. Most of the remaining industrial precincts are small and ripe for redevelopment with higher intensity mixtures of residential, retail and commercial uses. All three of the university campuses have potential for intensification and integration into their local hinterlands as hybrid activity centres, providing cultural and recreational amenity as well as retailing and employment.



Density (p/ha)

10km

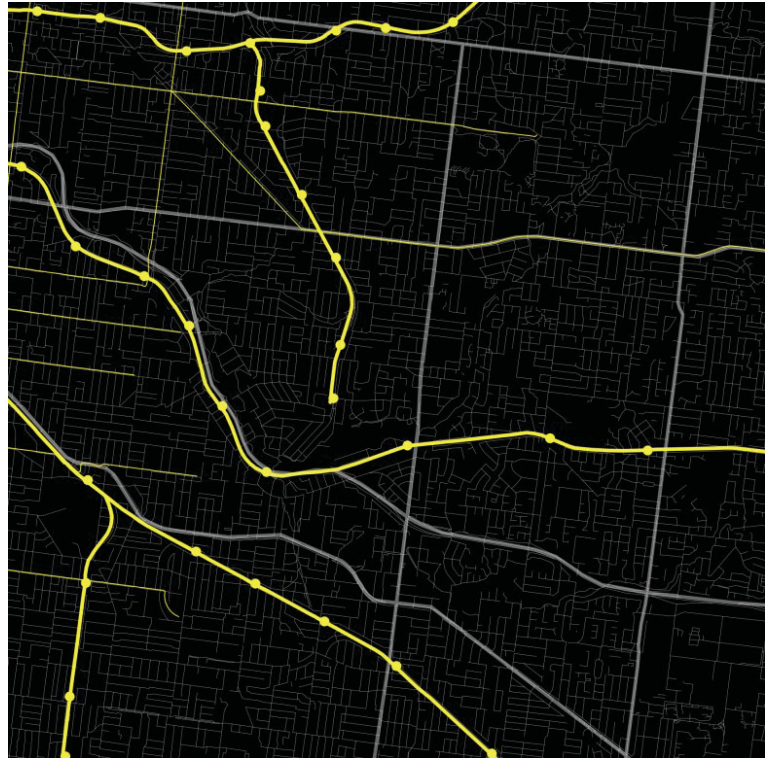


Functional mix

10km

ACCESS

The zone has five rail corridors connecting to the central city plus eight tramlines primarily serving the western areas. Most of the zone's activity centres (with the exception of Chadstone mall) are located on the principal transit system with easy access to the city, however access between them by modes other than private car is generally difficult. The Clayton campus of Monash University and its medical precinct, the most substantial attraction in the zone, is connected only by bus. Several of Melbourne's key freeways and arterial roads pass through the zone, serving as the major link between the broader south and east region, the central city, the port, the airport and beyond.

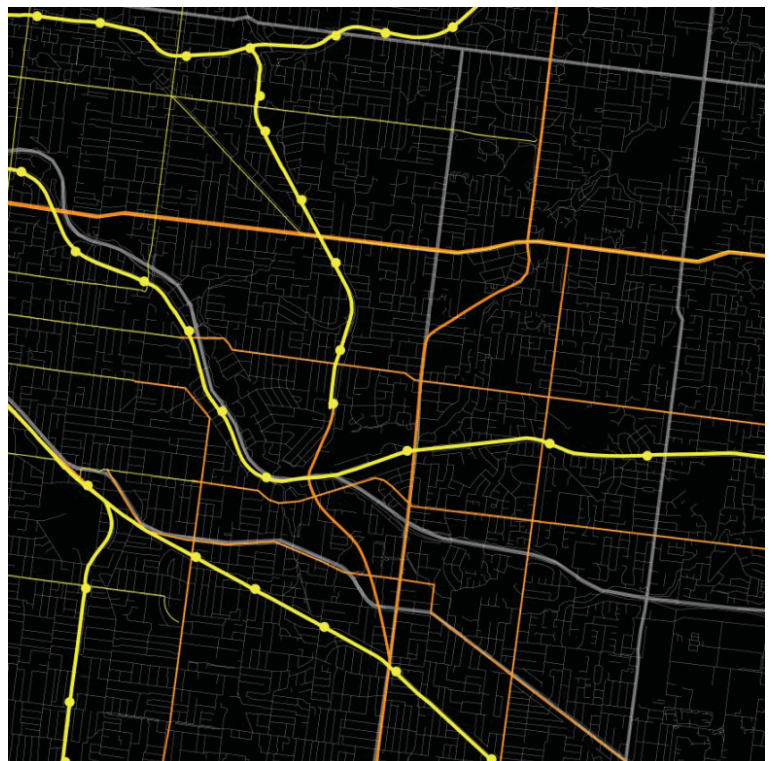


Existing access (yellow)

10km

TRANSIT SCENARIO

New rail lines create a network of fast, high capacity transit connecting this zone to the broader region to the north, east and south. All of the existing tram routes are extended and some new lines added to create a richer network within the region. All of the zone's activity centres, employment areas and university campuses are linked to the rail and tram network. The three university campuses have substantial areas of carpark that can be redeveloped for residential and mixed-use functions. Chadstone shopping centre can become transformed beyond its big box retail focus to become a major urban hub with hotels, housing and production in addition to retailing. The zone as a whole can achieve a transformation in the range and location of retailing, community and cultural facilities.



Proposed Tram and Rail Scenario (orange)

10km

WEST ZONE

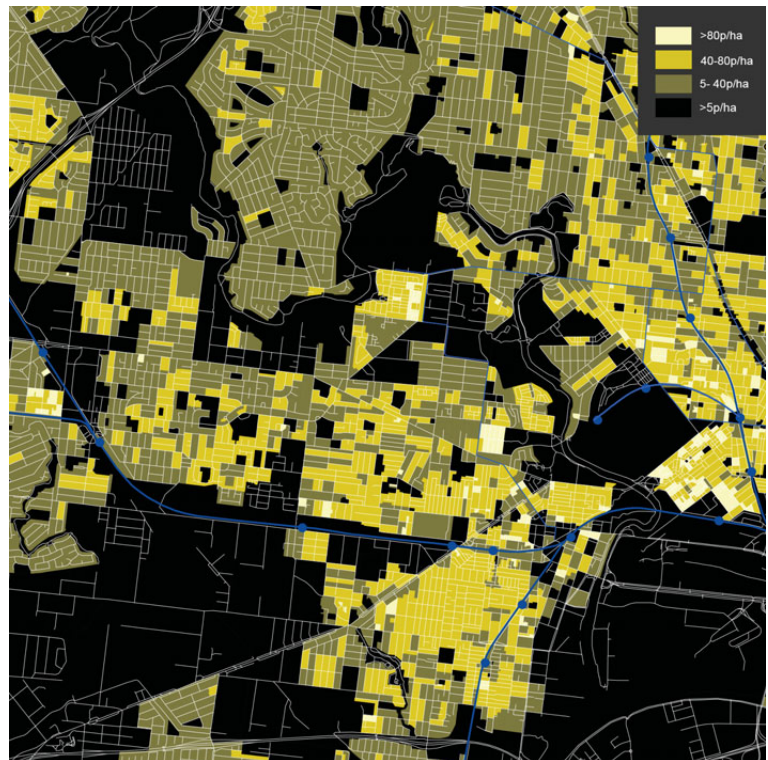
This zone covers much of the relatively disadvantaged industrial west of Melbourne from the inner city suburbs of Kensington and Footscray in the southeast to Sunshine in the west and Mooney Ponds in the north.

DENSITY

The residential density map shows vast industrial and former military areas with negligible residential use. There are large areas of industrial land in this zone and the region more broadly that create employment and disconnections between residential areas.

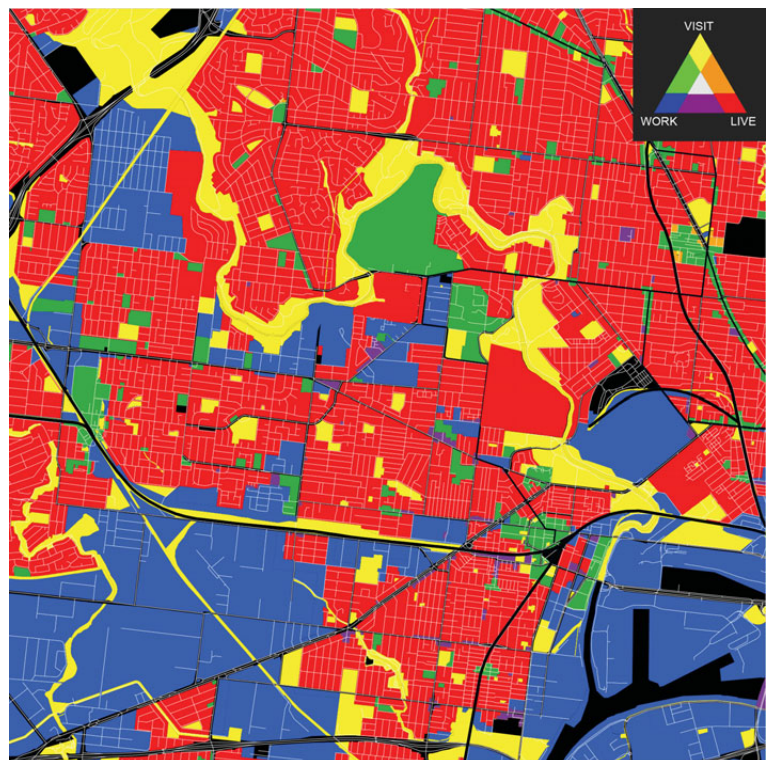
MIX

Retail and commercial activity within the zone is concentrated in a number of major activity centres of Footscray, Sunshine and Moonee Ponds plus the Highpoint regional shopping mall. There are two major campuses of Victoria University (Sunshine and Footscray). Apart from some gentrification and urban renewal in the inner west, most of the zone is disadvantaged and property values are low to average. Large low-density public housing estates are significant elements in the functional mix along with suburban housing. The Maribyrnong River is a significant environmental and recreational amenity that is now being exploited for residential development.



Density (p/ha)

10km



Functional mix

10km

ACCESS

The zone is served by three primary rail corridors and three tram routes, whose layout provides only limited connectivity to the eastern part of the zone. While most of the larger activity centres are on the transit system, most inhabitants of the zone would find it hard to use transit to move around efficiently within the zone. The zone is well-served by freeways and major arterial roads that provide significantly better access within the zone, to the central city, the port, the airport and beyond than the transit system. Amenity on many of the high capacity roads and some of the smaller arterials is low due to significant freight traffic.



Existing access (yellow)

10km

TRANSIT SCENARIO

The primary addition for this scenario is the extension of the trainline to connect with the airport to the north. A series of new tramline connections are also proposed to generate a network that is integrated with existing trams.



Proposed Tram and Rail Scenario (orange)

10km

1 x 1 KM

URBAN DESIGN

We now move to the scale of the neighbourhood or precinct at which issues of built form and the shaping of public space come to the fore. Here our understanding of the city moves from abstract cognition to everyday life. We can map and understand the ways particular sites operate as key attractors and we can analyse relations of permeability to walkability and local access. Measures of density - both populations and built forms - transform as we move from gross measures across broad suburban areas to focus on precincts, sites and net measures. This is the scale at which design and development overlays and height limits play out. Questions of urban and neighbourhood character come to the fore: on one hand, resident groups may organize to defend against higher density or 'over-development' however defined; on the other, developers may seek to create new character or leverage existing character for market appeal. At this scale land-use begins to transform into a more nuanced understanding of functional mix; this in turn is linked to a mix of densities, building types, housing types and social classes. This is the scale at which sites and capacities for intensified development can be identified; where opportunities emerge to re-design the localized assemblages that privilege and produce active transport within existing car-dominated suburbs.



Sunshine main street

STREETSCAPE

At the 100 metre scale of the streetscape we encounter issues such as lot-size or grain, building typology, bulk and height. Here the phenomenology of streetscape and social life overwhelms the broader cognition of the city. We begin to see the development potential of specific sites - we can calculate yields, net densities and profits. We can understand how the new development can add amenity to the local neighbourhood through more shops and services, more accessible and frequent public transport, new public space and facilities with an increase in street life and vitality. Synergies become apparent between density, public transport, walkability and public health. Only at this scale can we understand what kind of development makes sense because here the impact on the city becomes sensory - concrete rather than abstract. We can understand how a developer's desire for bulk and height can conflict with resident desires to protect from overlooking and overshadowing. What does 'overdevelopment' or 'underdevelopment' mean? At what height and bulk does a lively and livable transit corridor become seen as a shady and unlivable canyon (Woodcock et al. 2010, 2012)? The invention of new urban types and the design/regulation of the public/private interface proceeds at this scale. Here we catch (or fail to catch) the public imagination for a better urban future.

ENCOUNTER & INTERFACE

It is at the smaller scales that the city delivers the intensive social encounters that most define the urban experience. This is the scale at which we encounter others in public space—the scale at which we shop, meet, loiter and perform. It is also the primary scale at which density translates into intensity, largely mediated by the public/private interface and the detailed design of urban space (Dovey & Wood 2011). While the various measures of density (Dwellings/Ha, Habitable Rooms/Ha, Jobs/Ha, Floor Space Index, Floor Area Ratio, Plot Ratio) are mapped at larger scales, this is where the interactions between differences take place in public space; where intensity becomes the emergent effect of the larger assemblage.



Chadstone interface

CASES

MAJOR RAIL-BASED ACTIVITY CENTRES

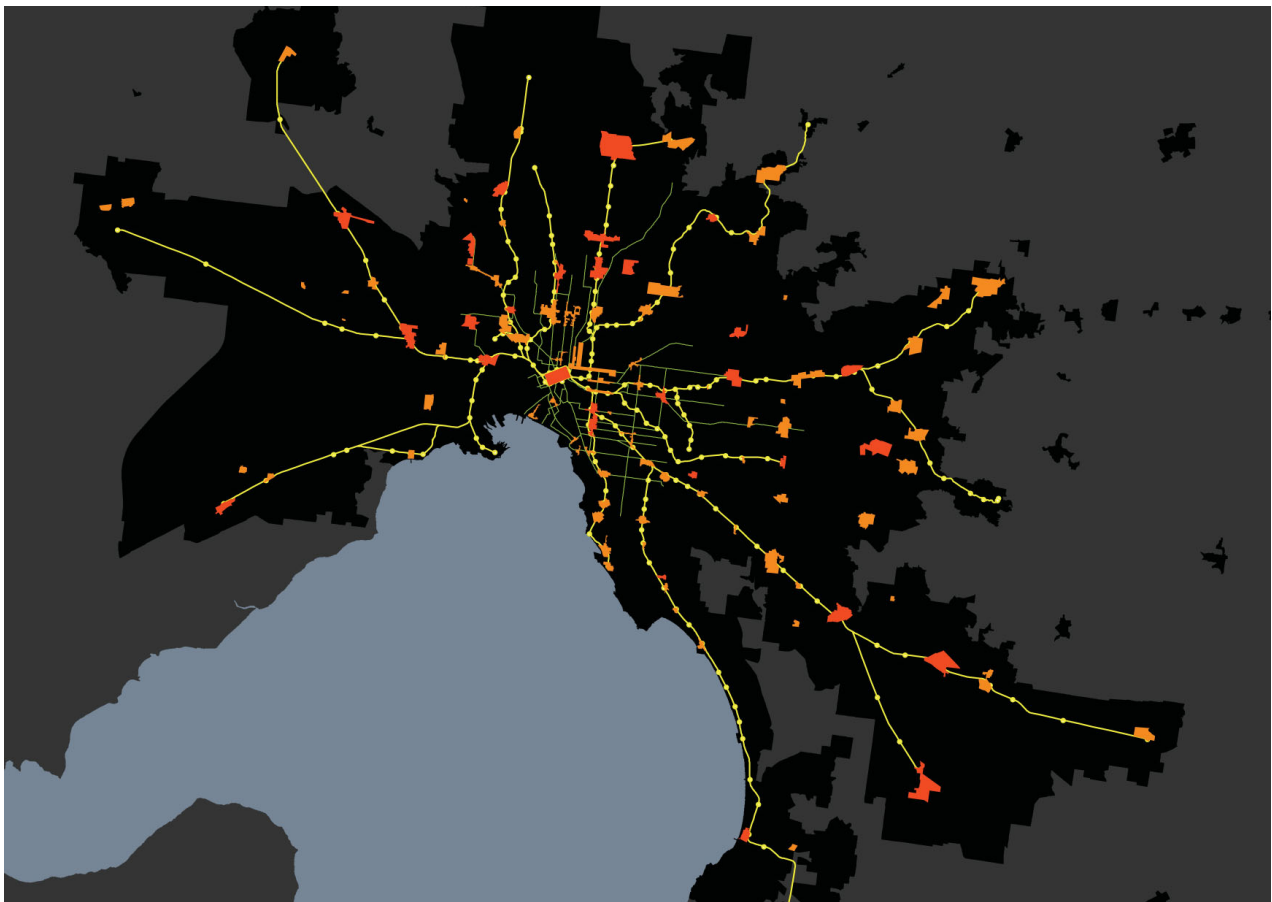
Apart from the five stations in the central city, about 30% of Melbourne's railway stations are associated with major activity centres that have potential for intensification within their pedestrian catchment. These are also generally modal interchanges with other forms of public transit such as bus and tram. These large rail-based centres rarely include the larger regional malls.

MINOR RAIL-BASED ACTIVITY CENTRES

About 70% of the 204 stations on the Melbourne rail system are in low-density suburban locations. Such sites often have a small neighbourhood shopping strip, a large car park and other land uses close by, including industrial. Many are surrounded by residential development and there is often significant community resistance to change. While the intensification capacity of individual projects is often limited, such opportunities are replicated across the metropolitan network and are substantial in total.

PRIVATE SHOPPING MALLS

Private shopping malls within the suburbs comprise some of the busiest activity centres in the metropolitan area and are largely disconnected from the public transport system. Yet the provision of high volume public transport could provide the leverage to enable such malls to integrate effectively with their suburban hinterland. We have selected shopping malls as case studies in order to explore the potential for development on the surrounding land and because they are fundamentally inconsistent with a low-carbon future.



Activity centres (red = major, orange =minor)

100km

TRAM CORRIDORS

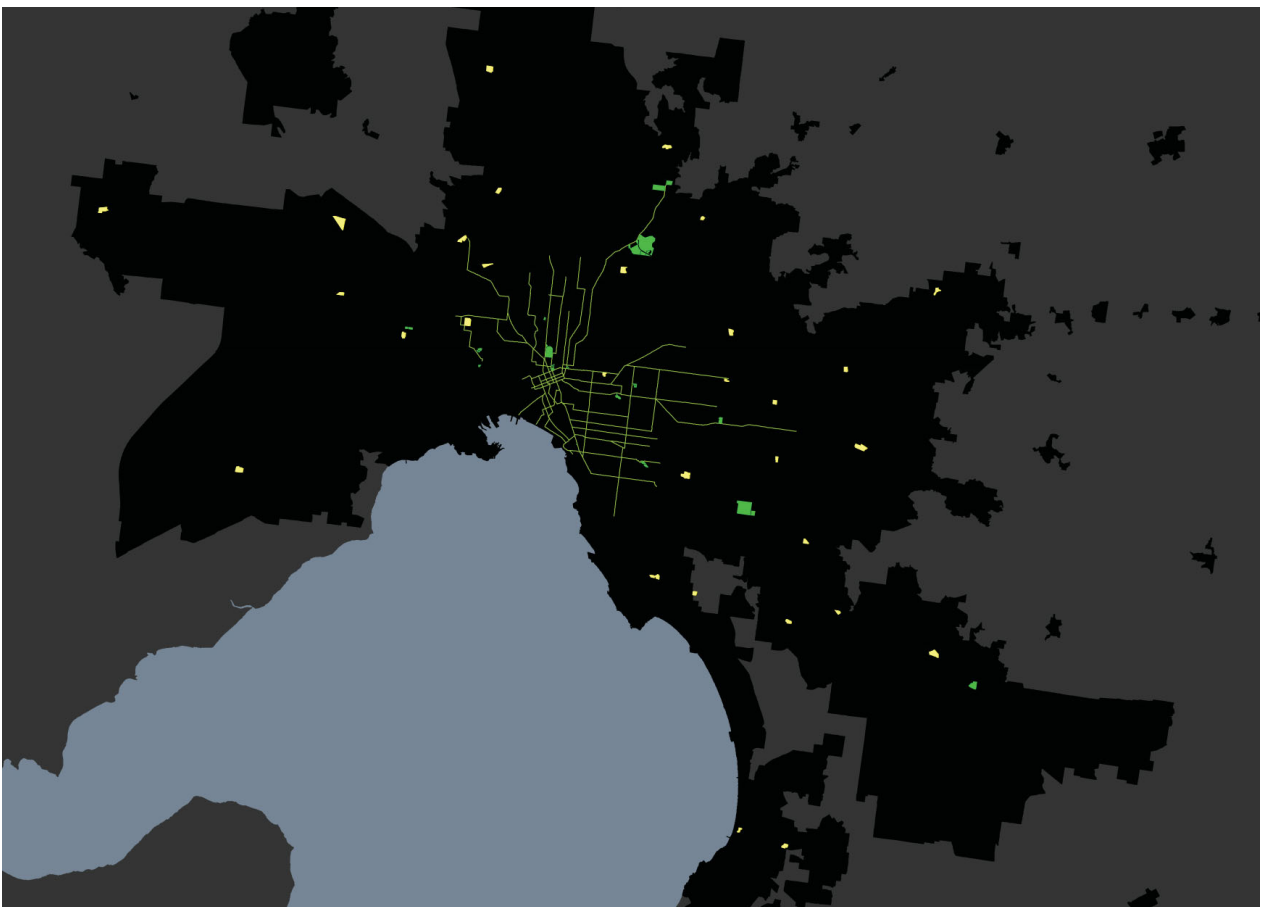
Melbourne has a very substantial tram network, much of it lined by 1-2 storey development in a mix of retail, commercial and residential. While the potential for high-density is limited, that for 4-8 storey development is significant and the tram corridors are very extensive (Adams, 2009; Woodcock et al, 2011). A significant issue is that most of the tram network runs in mixed traffic, meaning trams are delayed by increasing car congestion. Re-allocating public space in favour of trams, cyclists and pedestrians will improve this situation as well as the character of intensified tramway streetscapes.

UNIVERSITY CAMPUSES

Suburban university campuses have tended to be designed primarily for car access and mono-functionality. Like shopping malls they tend to be surrounded by car parks and poorly connected to the local neighbourhood. Since the land is generally consolidated and under quasi-public ownership there can be great potential for new development that can also be leveraged to fund better public transport connections.

POST INDUSTRIAL ZONES

A large number of industrial zones throughout the metropolitan area are in a transition phase with the decline of manufacturing industry. There is great potential for the redevelopment of such sites into mixed use as they are integrated into the transit network.



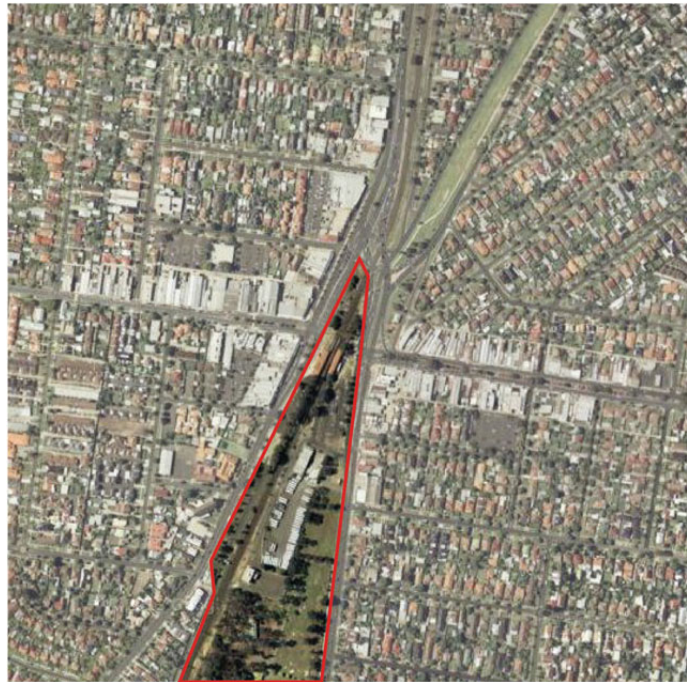
Malls (yellow), tram corridors and campuses (green)

100km

RESERVOIR

Reservoir is a large rail-based activity centre in Melbourne's disadvantaged northern region about 12 kilometres and a 25 minute train ride from the central city. The railway - with adjacent level crossing, roadways and parking for ~500 cars - cleaves the existing retail and community activity into two very separate main streets with about 150 metres and a 5 minute walk between them. While the rail connection to the city is relatively frequent and there are bus connections, there are no fast, frequent and high-volume transit connections to the nearby shopping and employment centres of Northland (3 km) and La Trobe University (3.5 km).

A major barrier to redevelopment is a low level of market demand. Reservoir ranks low in the status hierarchy of suburban Melbourne and a large part of the challenge here is to transform the place identity.



PUBLIC LAND

1km

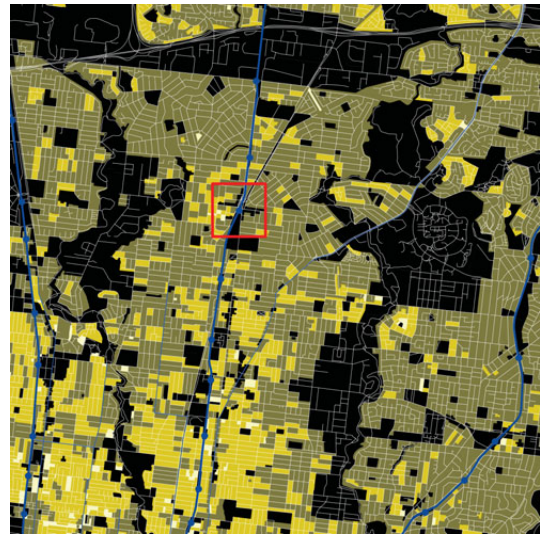
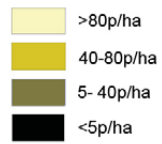
The major opportunity is to invest in east-west light rail connections so that Reservoir becomes highly accessible to and from Coburg in the west but particularly La Trobe and Northland to the east (see 10 x 10 km maps). These new transit lines would enhance local resident access to the train, create network effects and build demand for living and working in Reservoir. The second major potential emerges at the 1km scale in the form of a wedge of about 15 hectares of relatively vacant public land immediately adjacent to the railway and extending about 800 metres south from the station.

A further major barrier to any redevelopment is the level-crossing that divides Reservoir into two. The conundrum here is that the current lack of demand makes it difficult to fund a grade separation – whether the rail is elevated or buried – yet any development that compromises a future grade separation leaves Reservoir with a very poor future and wastes considerable opportunity. The long-term prospect is that Reservoir can be transformed from an isolated station to become an integrated node of a revitalized university/retail/residential cluster; and from a relatively low-income suburb to more socially mixed; from a univalent suburban morphology to a mix of housing types and densities.



Reservoir railway station

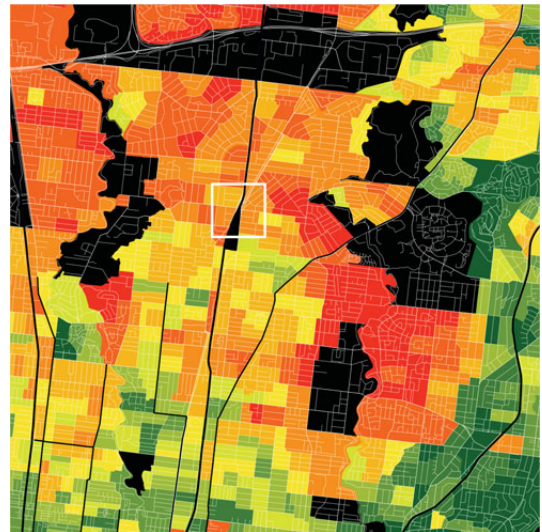
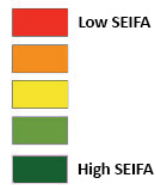
DENSITY



People/Ha

10km

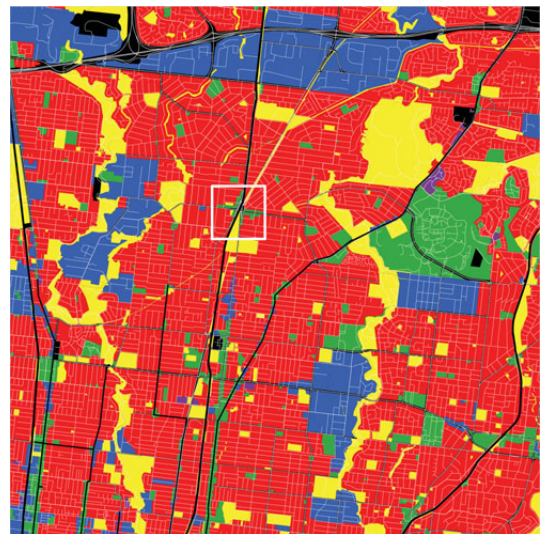
SOCIAL MIX



SEIFA Index

10km

FUNCTIONAL MIX

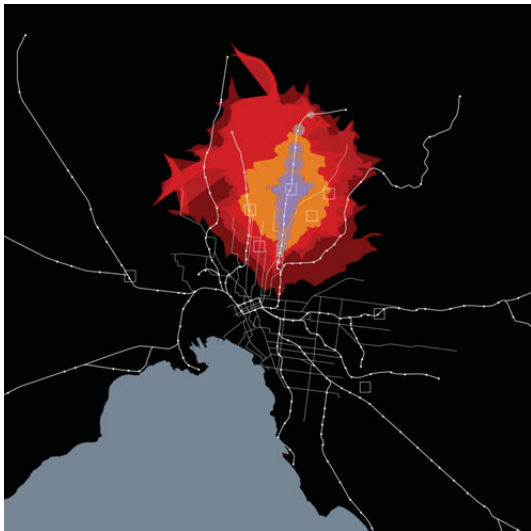


10km



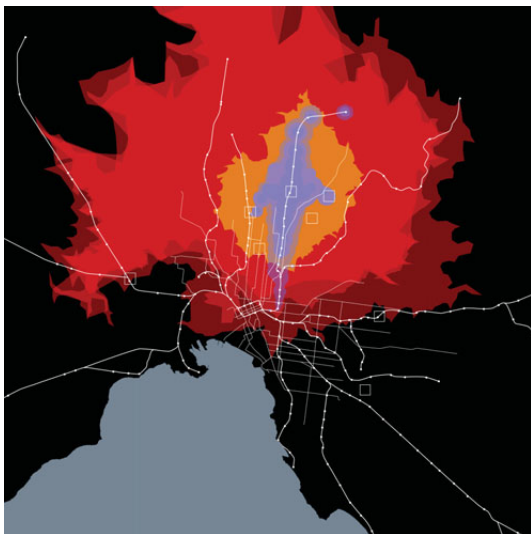
5, 10, 15, 20 Min. Walking

5km



20 Min. Car (red), PT (blue) & Cycling (orange)

50km



30 Min.

50km

ACCESS

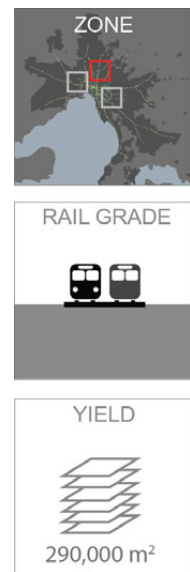
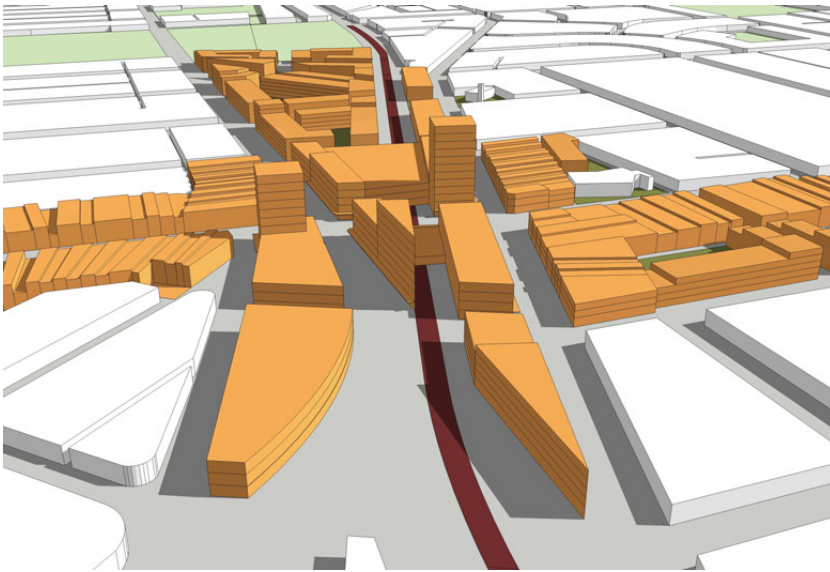
These maps show that the train enables public transport (light blue) to compete with the car for city access during the morning peak (bright red), however it cannot compete in any other direction or in the evening. One needs a car or bike to get access to the nearby activity centres within 20 minutes. Public transport is so infrequent in the evening that walking has a greater range in most directions. The area accessible by car from Reservoir station is about 8 times that of public transport in the morning peak and 680 times during the evening.

BARRIERS TO CHANGE:

"... it is a safe labour seat. The libs will never win it, the labour party will never lose it... They can just ignore it. ...All political parties spend money in marginal seats. They are the ones that make or break a government. Not the safe ones." (Developer)

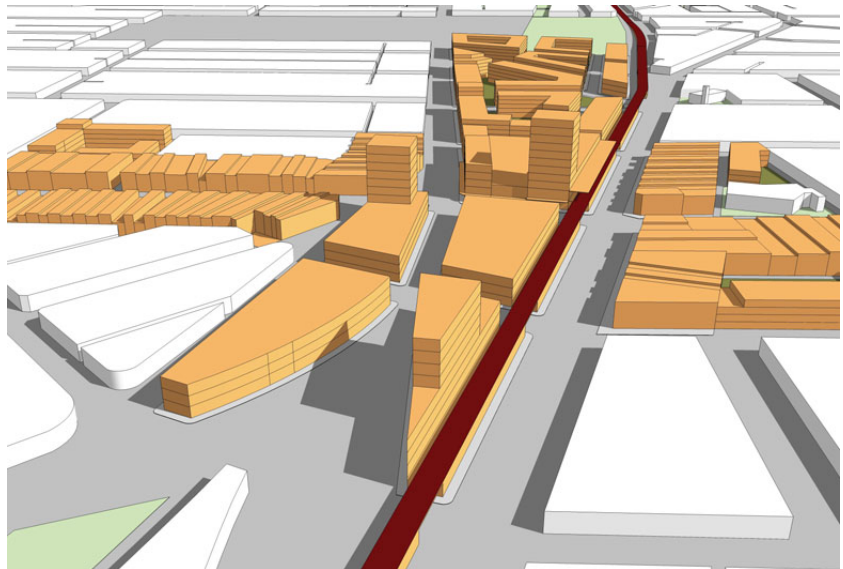
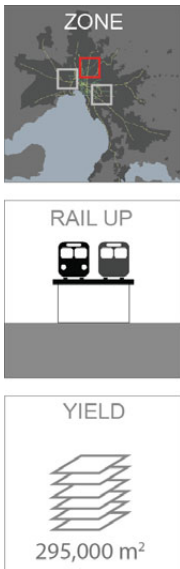
"The market isn't there. Why would you buy an apartment ...when you can buy a house ...the same distance to the train. And you won't be able to get the apartments onto the market much cheaper than a house. I would buy the house." (Planner)

SCENARIO 1: LEVEL CROSSING



This scenario explores the prospect of redevelopment without grade separation; it seeks to connect and integrate both existing (but separated) activity strips into a single assemblage with substantial new development on the wedge of railway land. In this scenario an east-west tram is not possible and Reservoir remains relatively isolated from La Trobe and Northland. The yield of this scenario is 290,000 sq m.

SCENARIO 2: ELEVATED RAIL



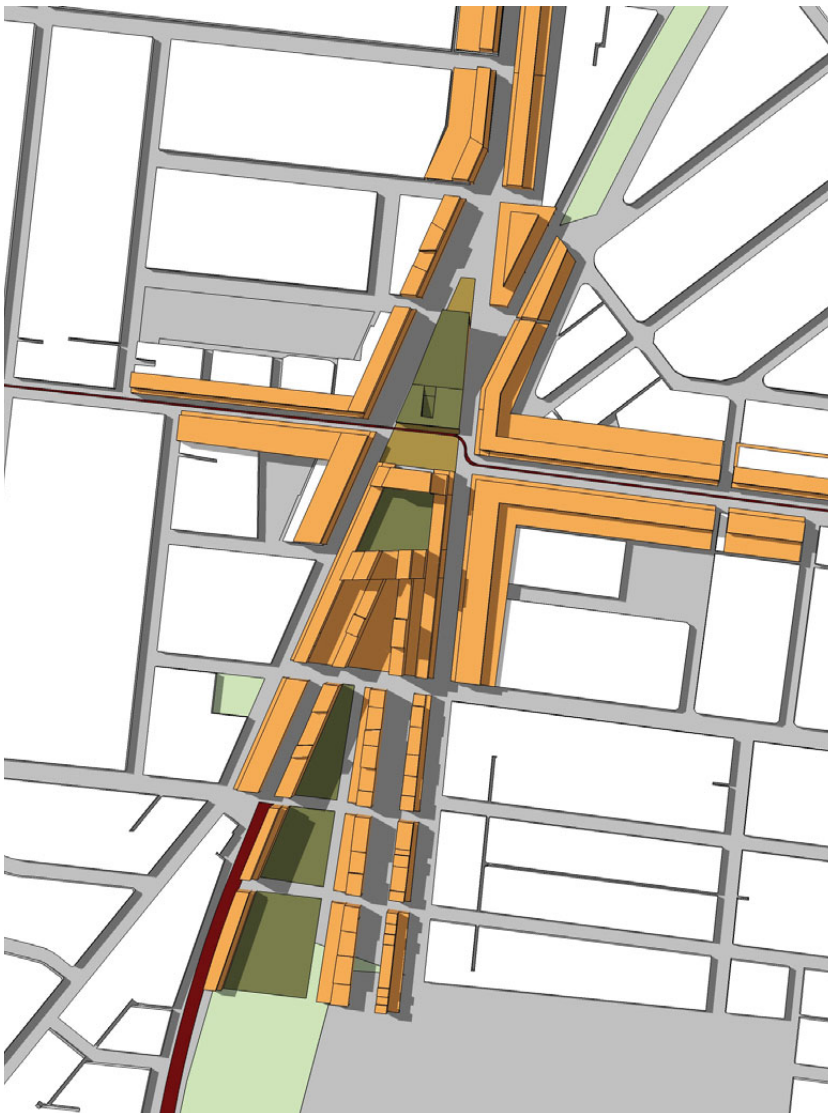
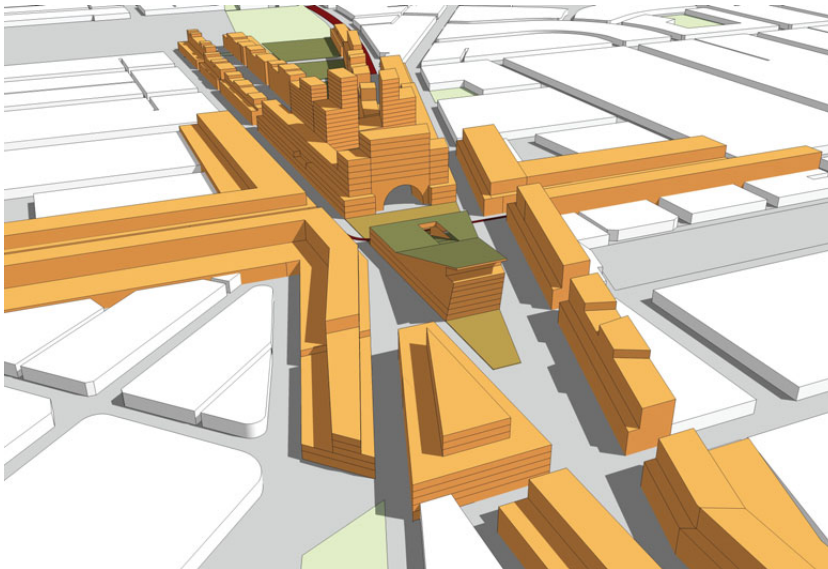
This scenario provides a grade separation to allow a high capacity tram connection between La Trobe, Northland, West Preston and Coburg, with Reservoir as a major modal interchange. The railway is elevated on the western side of the current alignment, allowing rail services to run during construction and maximizing the area for development on the VicTrack land. The land beneath the platforms and tracks would be developed with 1-2 storeys of retail, commercial and community facilities, providing a strong street interface focused on new public space around the transit interchange. Once the transit connectivity is established, the sites immediately adjacent to the station would be developed as commercial, primarily about 4-5 storeys, with two 12-15 storey towers. The yield is 295,000 sq m.



BARRIERS TO CHANGE:

"I find the difficulty you would have is getting it through council - that is where the obstacle would be."
(Developer)

SCENARIO 3: UNDERGROUND RAIL



This scenario explores what is possible if the railway were to be buried and a new east-west tram were able to situate Reservoir as a hub connecting Northland and La Trobe to the east with Coburg to the west. This is likely to maximize demand and enable medium to high density development on the adjacent railway land. In this scenario a new public plaza is located adjacent to the station with elevated green space above new public facilities opposite. The yield of this scenario is 550,000 sq m reflecting the increased capacity to build above the railway easement.

SUNSHINE

Sunshine is a large rail-based activity centre in Melbourne's disadvantaged western region, about 25 minutes from the city by train and is on the State's preferred route for a rail link to the airport. The activity centre is large and stretches between two stations – Sunshine, at the south with a large bus interchange, and Albion to the north. Public transport facilities are some distance from the main centres of retailing and recreational educational activity as well as the campus of Victoria University. The rail lines fork, dividing the activities into three quite separate areas, with the main centre of commercial activity being a hardtop mall about 600m from either station.

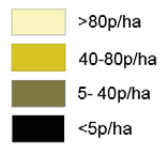
Sunshine has enormous potential that has been investigated using a range of very different scenarios. What all three of our visions have in common are ways of connecting the parts of Sunshine by elevating or trenching the rail tracks to varying degrees and allowing different kinds of transit-oriented foci to develop at different densities.

While Sunshine has a strong residents group, it is likely that the primary concerns of local residents would focus on leveraging services, improved access to open space and other public amenity from any intensification process. Sunshine is a relatively unseen part of Melbourne that needs to become more exposed and integrated - the airport train link is the great opportunity to achieve this.



Sunshine

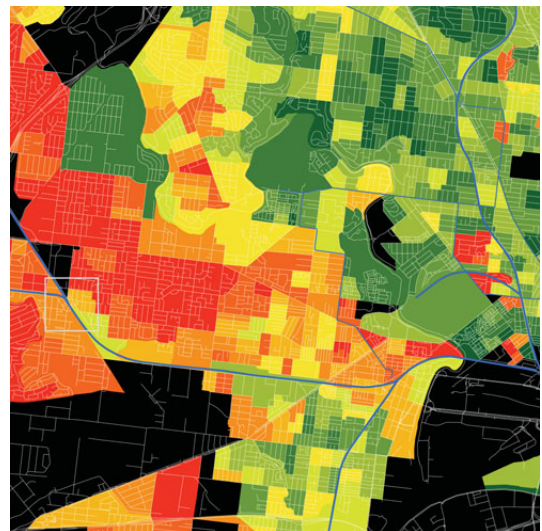
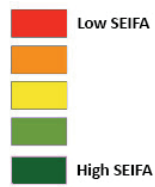
DENSITY



People/Ha

10km

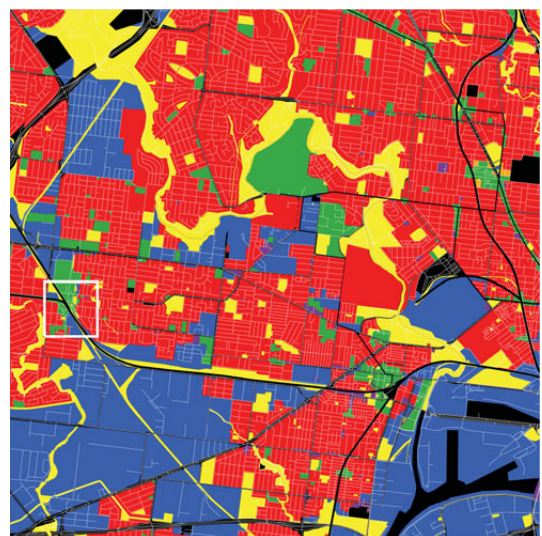
SOCIAL MIX



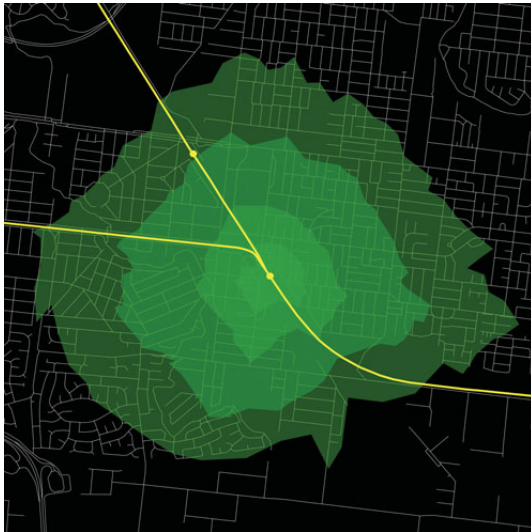
SEIFA Index

10km

FUNCTIONAL MIX

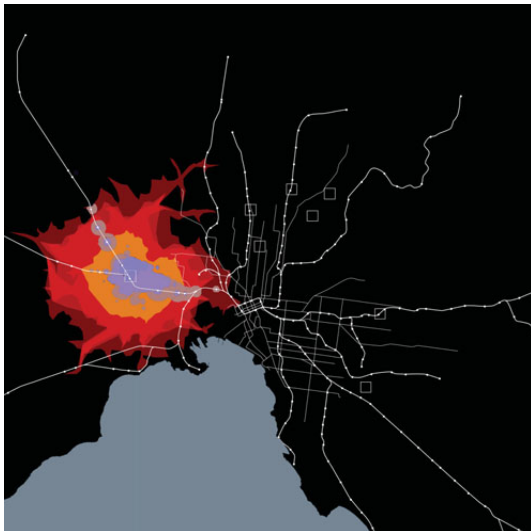


10km



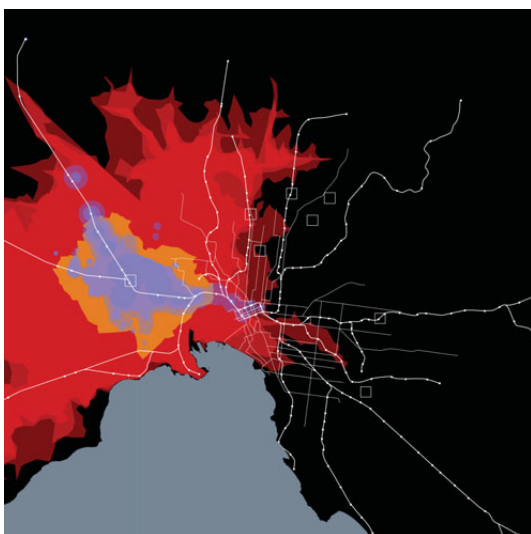
5, 10, 15, 20 Min. Walking

5km



20 Min. Car (red), PT (blue) & Cycling (orange)

50km



30 Min.

50km

ACCESS

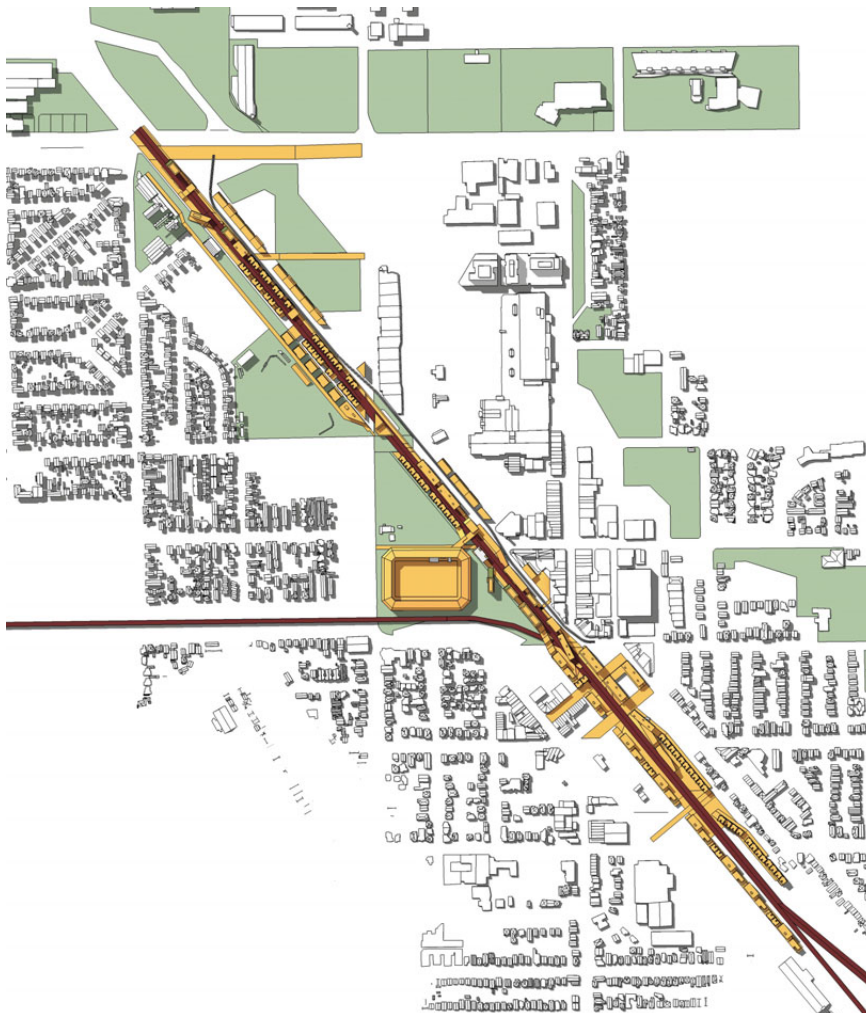
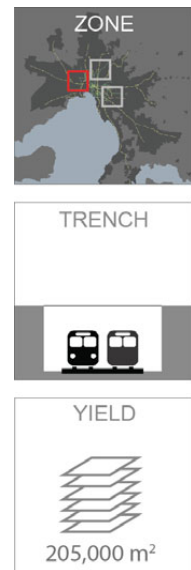
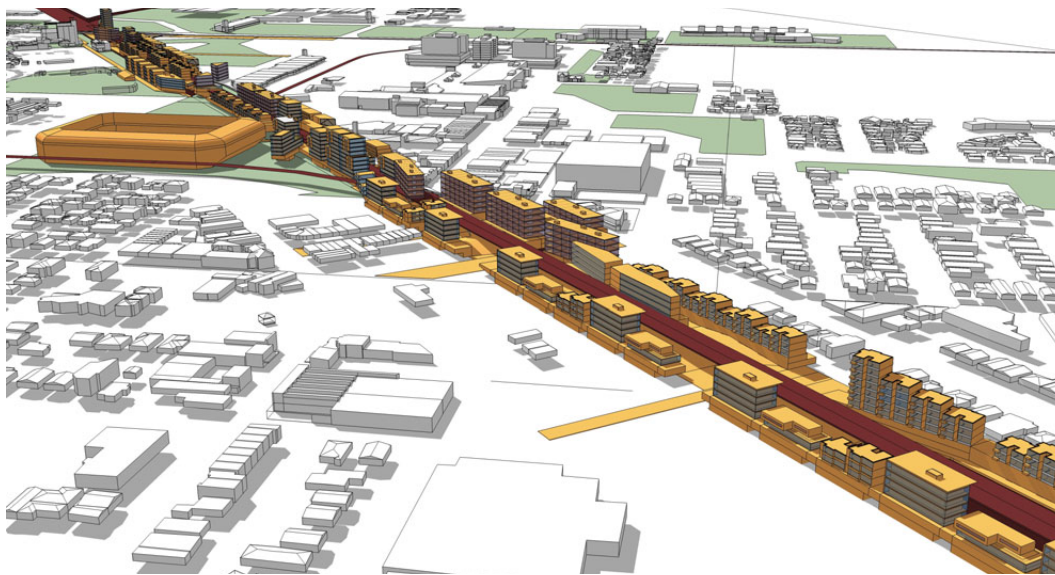
Sunshine is a major public transport node and access to the city by rail competes well with the car during the morning peak but is non-competitive at other times. Cycling access is constrained in the northeastern direction. At the 30 minute range public transport access is relatively substantial by both bus and train. The area accessible by car from Sunshine station is about 4 times that of public transport in the morning peak and 50 times during the evening.

BARRIERS TO CHANGE:

"My question is really how are you going to move that from a concept design into reality... has there been a commercial lens put over it and ...has there been buy in by the community?" (Planner)

"...the size of that intervention is going to be absolutely ginormous, compared to what my gut feeling is about what the value capture in the short term is going to be" (Developer)

SCENARIO 1: TRENCHED RAIL

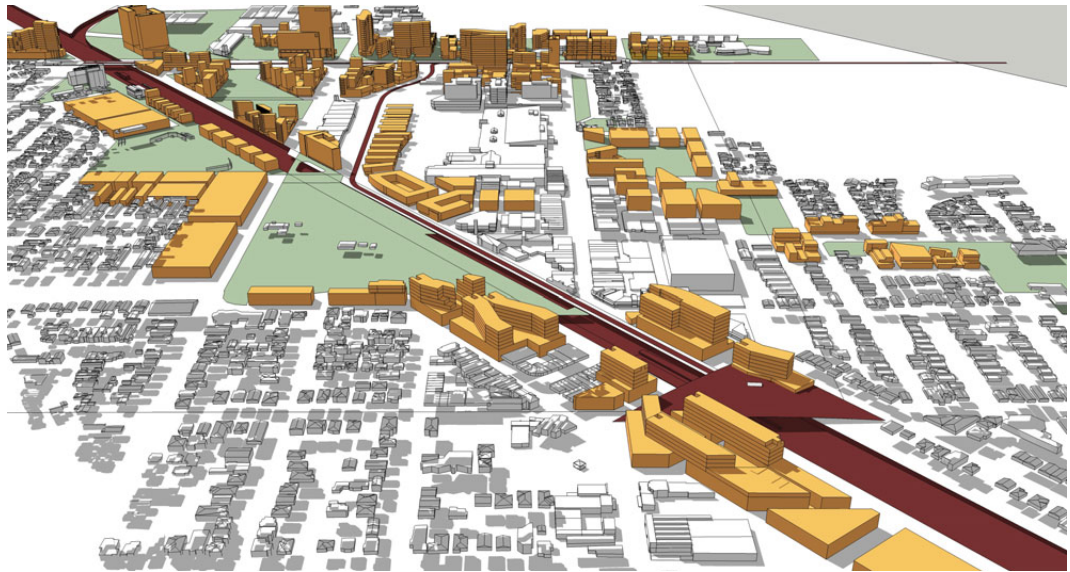
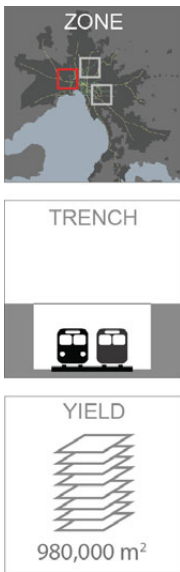


This scenario focuses on the development potential of the corridor of public land associated with the main rail line through Sunshine. The line is trenched for the majority of its length allowing ground level connections to be made across it wherever possible. The railway land is developed at medium rise intensity of between 6-8 storeys along the entire corridor from south of Sunshine station to Albion station. As a catalyst to capitalize on Sunshine station's centrality within the west, a football stadium is suggested adjacent to the station and main retailing centre just north of Sunshine station. The yield of this scenario is 205,000 sq m.

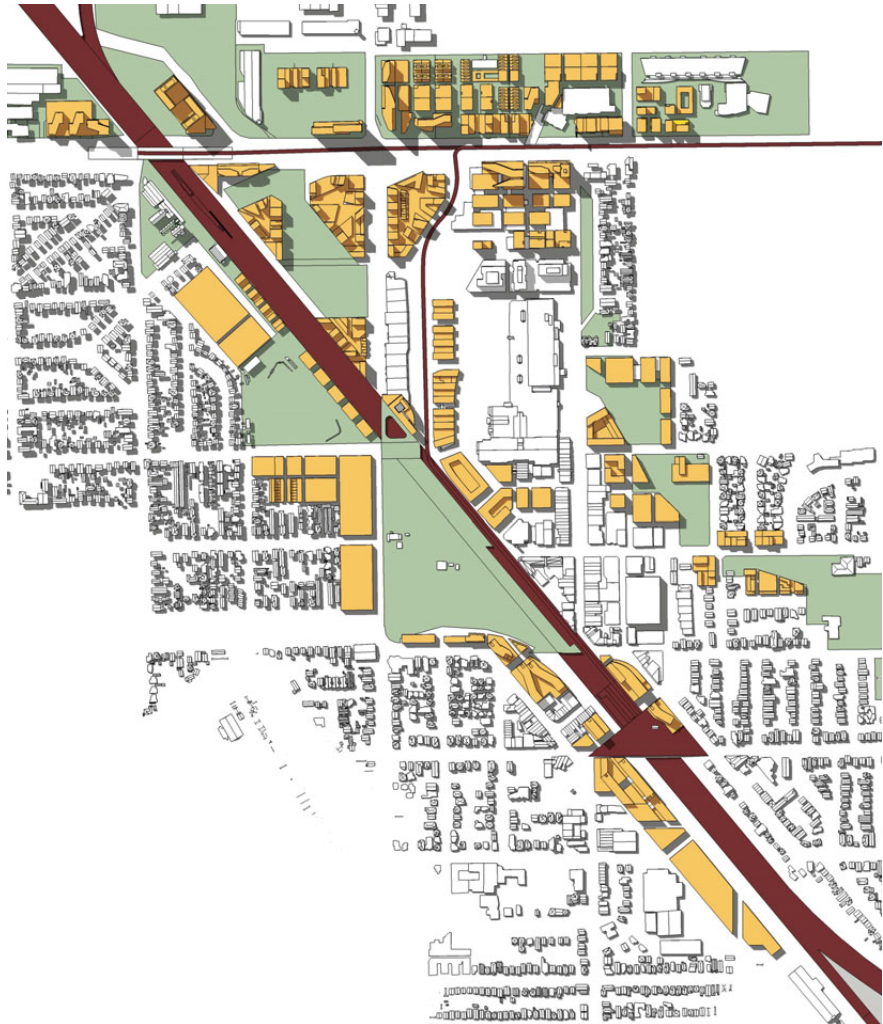
BARRIERS TO CHANGE:

"It is exciting looking at this stuff, and there is potential, but the challenge... is looking at the drivers that will unlock development potential, and the timing of it. Because at first glance I look at that and go 'that's an awful lot of space' and what is the program? You have to be talking at least 50 years and maybe beyond." (Planner)

SCENARIO 2: TRENCHED / UNDERGROUND RAIL



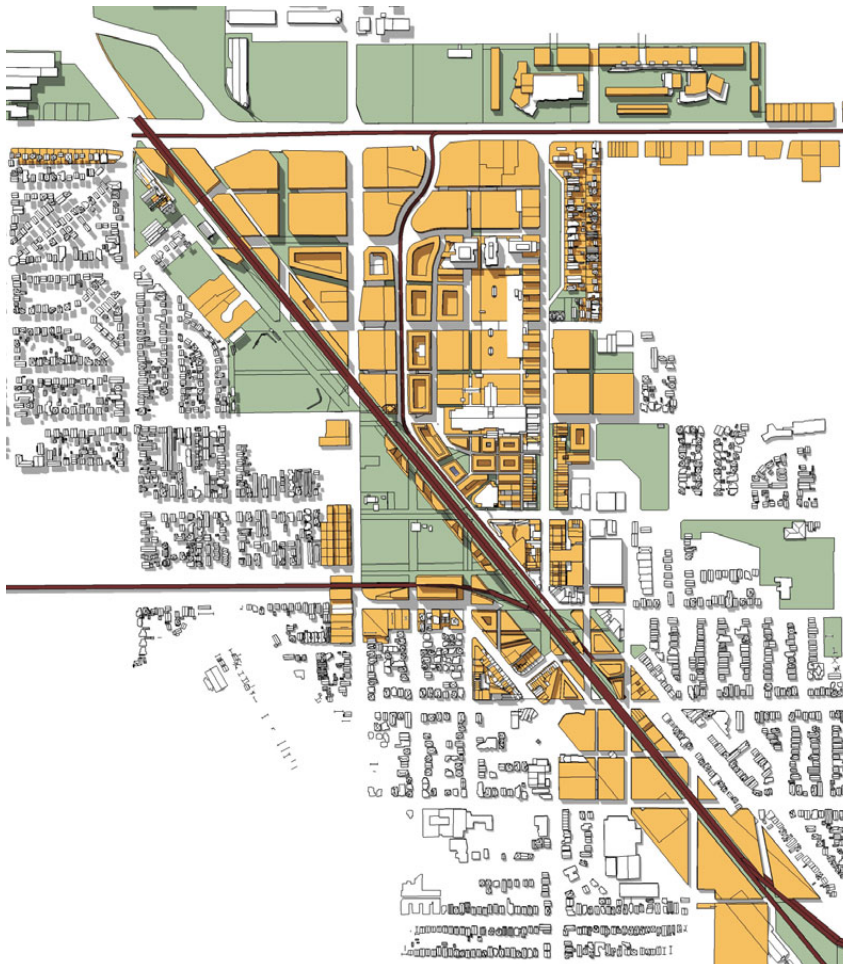
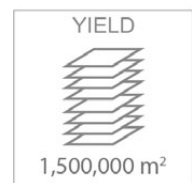
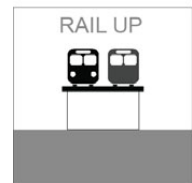
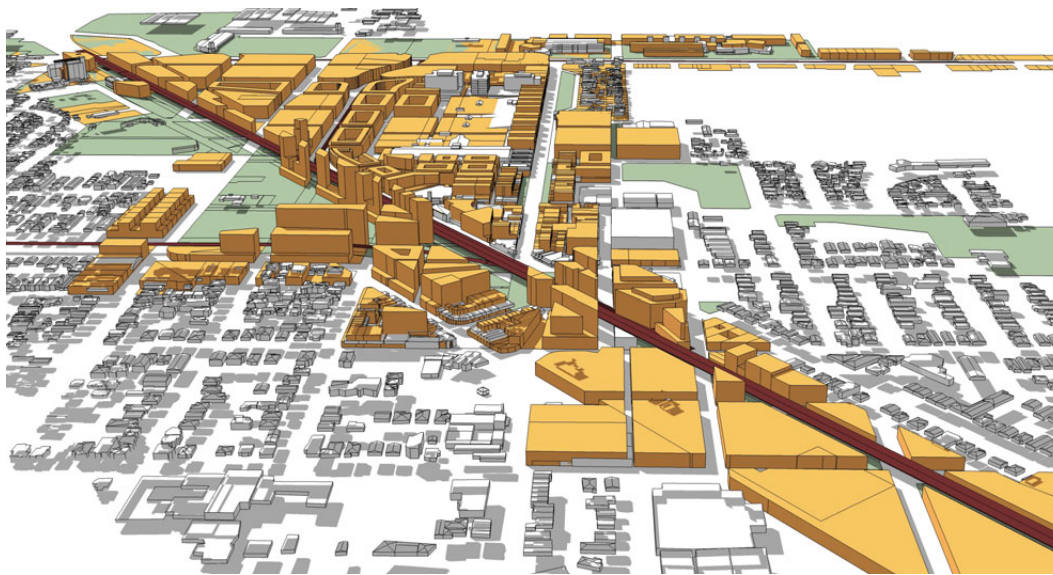
This scenario trenches the rail lines in the centre of Sunshine to allow the extension of the park on the west to connect with the central retailing precinct. Associated with this grade separation is a re-designed station that brings the rail, buses and new light rail network into a new modal interchange hub. Intensification in Sunshine in this scenario is concentrated in a series of walkable high-rise clusters close to transit (train and light rail) nodes within the activity centre – reflecting the ad-hoc nature of property ownership rather than an idealized masterplan that would require the state to intervene in land assembly. The yield of this scenario is 980,000 sq m, a very large amount of space that would require a long time-frame for take-up.



BARRIERS TO CHANGE:

"I would find it difficult to see how... the development economics would allow you to contemplate something as ambitious as full trenching, where the prospects of recovering that cost through land development ...could even stack up." (Planner)

SCENARIO 3: ELEVATED RAIL



This scenario explores the prospect of elevating the railway tracks to maximize the potential for ground level connectivity. The public land adjacent to the elevated rail, with park frontage, is developed with high-rise residential towers on retail and commercial podiums that utilize the space beneath the elevated tracks. Sunshine Station is redeveloped with high-rise commercial and mixed use podium and tower development framing a new high-quality pedestrian plaza. This scenario also imagines redevelopment of the substantial car parks surrounding the shopping mall into perimeter-block mixed-use urban blocks. Substantial intensification of the Victoria University Campus on Ballarat Road can also occur, providing a mix of residential and community cultural uses for Sunshine as well as the University. The yield of this scenario is 1,500,000 sq m.

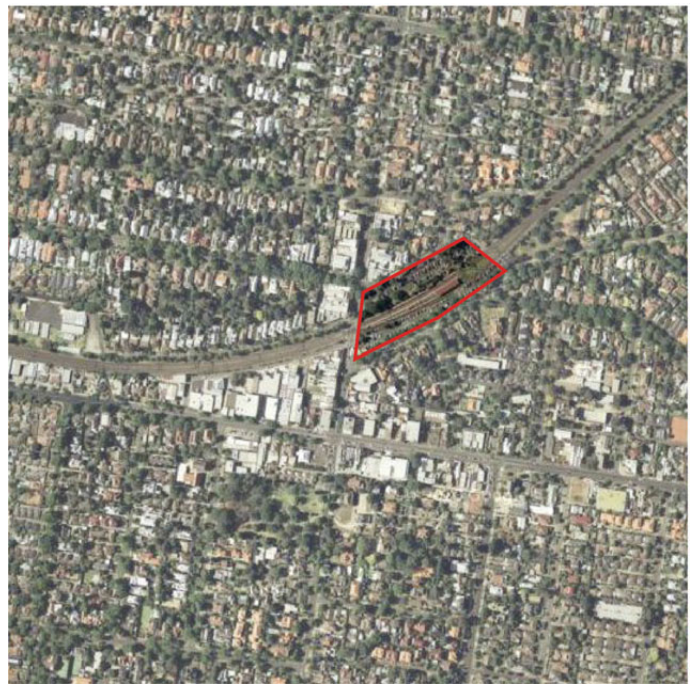
BARRIERS TO CHANGE:

"It is exciting looking at this stuff, and there is potential, but the challenge... is looking at the drivers that will unlock development potential, and the timing of it. You have to be talking at least 50 years and maybe beyond." (Planner)

"I have a lot of time for Sunshine - with the right work and the right consultants, it could go nuts... but the problem is the land isn't easily assemblable" (Developer)

SURREY HILLS

Surrey Hills is a largely residential suburban neighbourhood in Melbourne's leafy eastern zone centred on a railway station that provides a relatively frequent 20 minute ride to the central city. The station and its 355 car spaces occupy 2.2 ha of public land. Adjacent to the station is a park, a small north/south shopping strip (Union Road) of cafes and specialty stores and a small industrial zone. This is all surrounded by relatively up-market housing in a mix of detached and multi-unit developments of 1-2 storeys. A major east/west traffic artery located 100 metres south of the station (Canterbury Road) has considerable scope for intensification. Dwellings in Surrey Hills are in high demand but resident resistance to intensification is strong. The railway was constructed along the former creek bed of a shallow valley and the station site could be redeveloped to a height of up to 8 storeys at the peak without impacting the existing privacy or sunlight of surrounding housing.



PUBLIC LAND

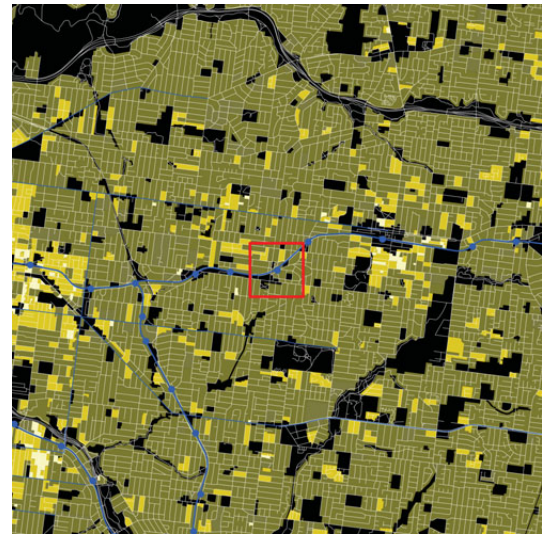
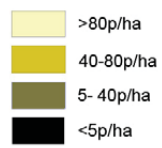
1km

The railway is at grade and a key barrier to change is the level crossing which frequently blocks a key north/south arterial road that is also a major bus route. It makes little sense to develop this site prior to grade separation, and the opportunities to generate capital gains on public land could be significant. The existing park is badly exposed to the railway, relatively inaccessible and underused. The neighbourhood within walkable distance of the station is highly walkable and relatively permeable, however the railway presents a largely impermeable barrier with only dark and narrow underpasses when trains are passing. The opportunity here is to generate greater diversity of housing, employment and retail options together with upgraded parkland, new public space and greater pedestrian permeability across the train line.



Surrey Hills station car park and level crossing

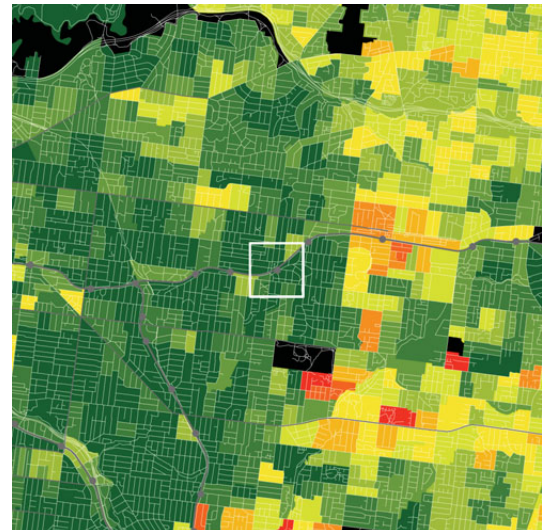
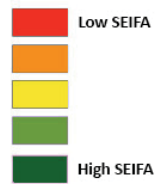
DENSITY



People/Ha

10km

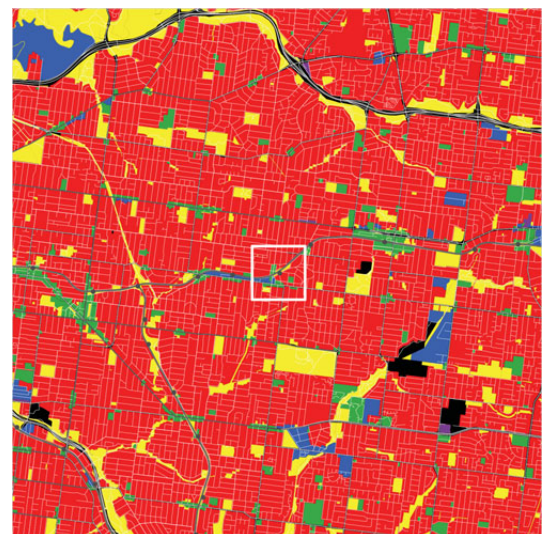
SOCIAL MIX



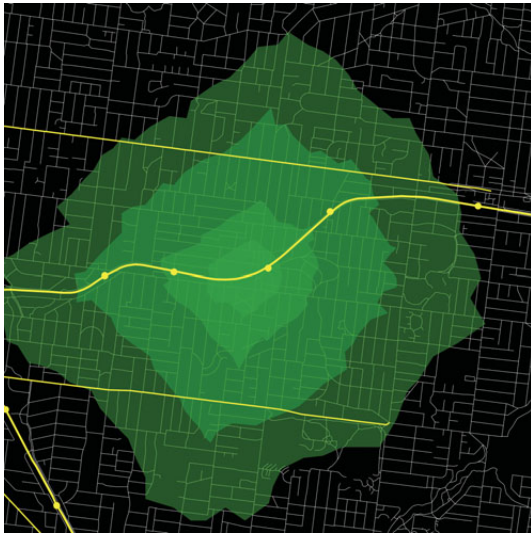
SEIFA Index

10km

FUNCTIONAL MIX



10km

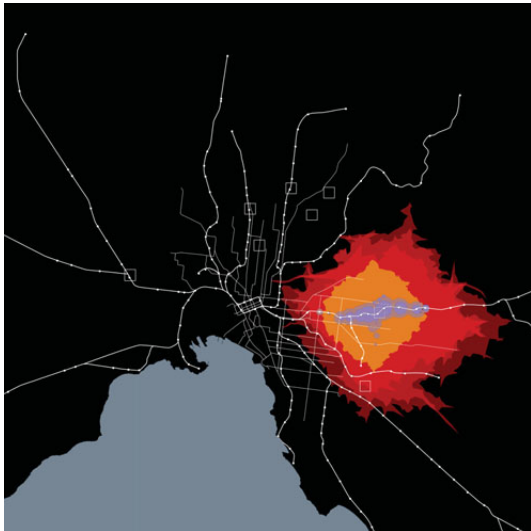


Walking : 5, 10, 15, 20 Min.

5km

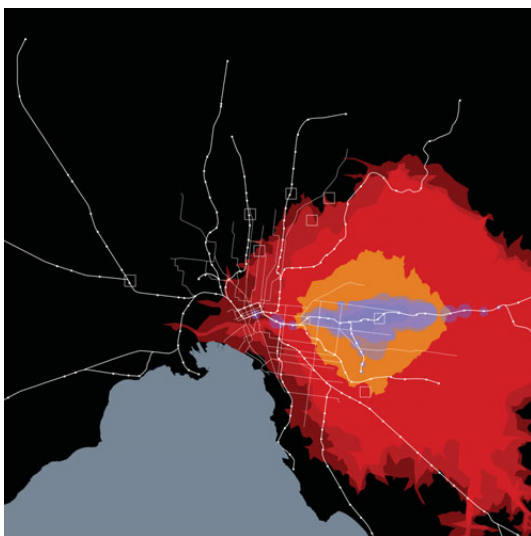
ACCESS

Surrey Hills railway station has good access to the central city and is competitive with the car during the morning peak but contracts very substantially in the evening. Cycling access is generally more extensive than public transport for most of the day in all directions; it is competitive with the car over 20 minutes in some directions at some times. In general terms these isochrones show a high level of car dependency that will only be partially decreased by a better rail service. North/south public transport cannot be addressed without a grade separation. The area accessible by car from Surrey Hills station is about 8 times that of public transport in the morning peak and 500 times during the evening.



20 Min. Car (red), PT (blue) & Cycling (orange)

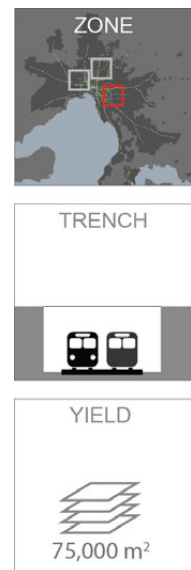
50km



30 Min.

50km

SCENARIO 1: RAIL AT GRADE

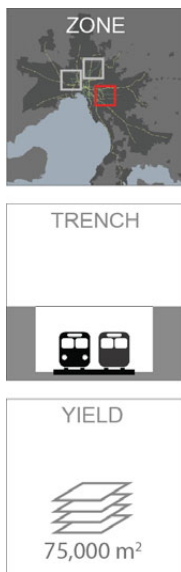


BARRIERS TO CHANGE:

"Our communities are saying to us loudly and forcefully, 'we don't want 4/5/6 storeys in our activity centres, we would like to retain the two storey streetscape, maybe we might compromise and have some additional height'... that is what I think we are obligated to consider and find a compromise. It is political suicide to do anything other than that, and it is not respecting the voice of the community." (Planner)

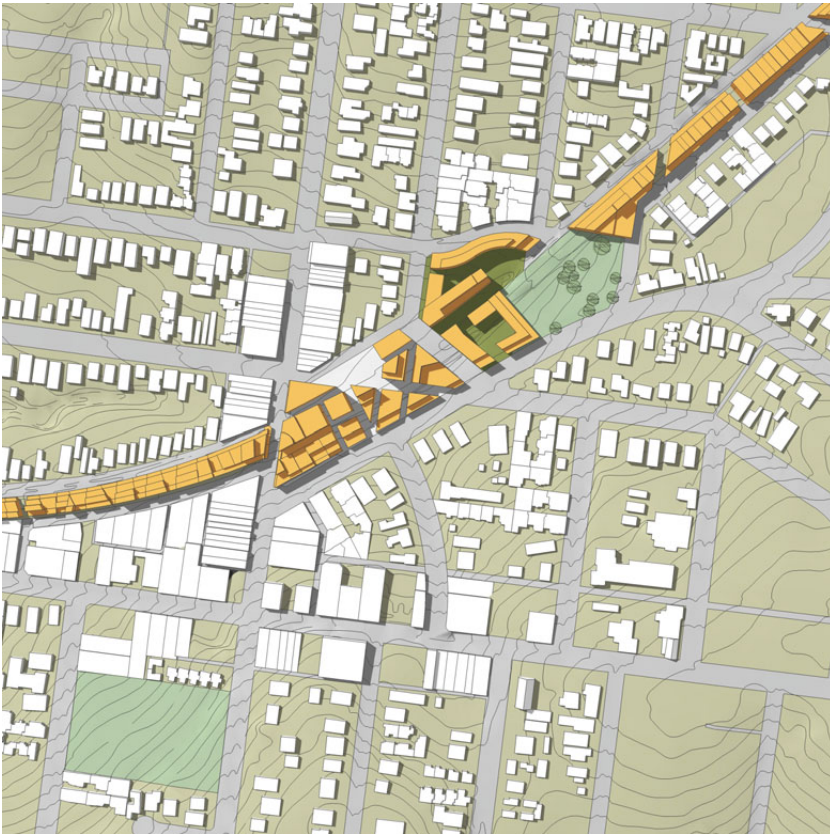
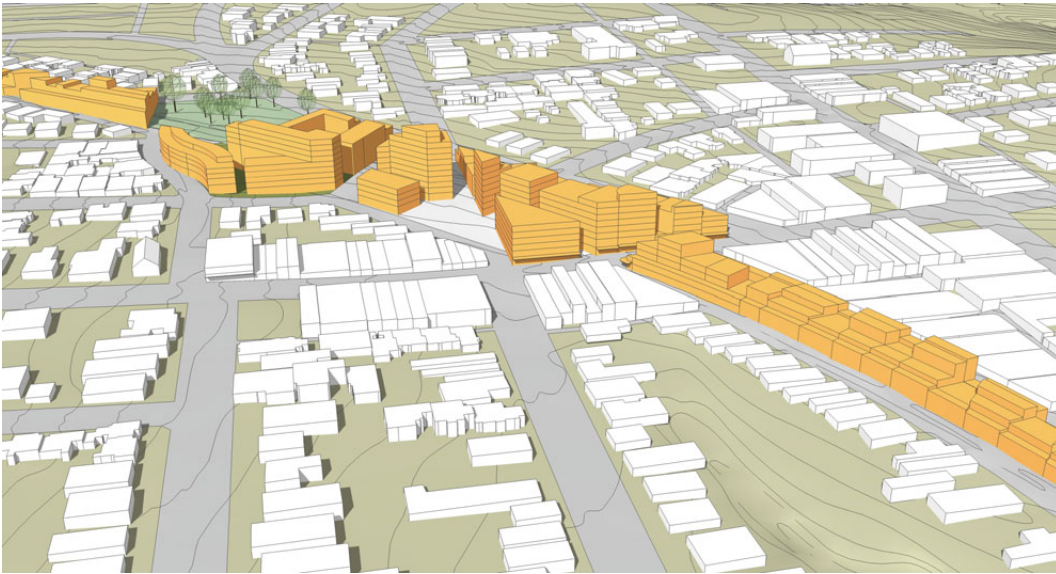
This scenario explores what is possible on this site without investing in grade separation. The existing carpark is developed on either side of the station while protecting neighbouring properties from overshadowing and overlooking. The density peaks with taller structures of up to 10 storeys at the junction of Union Road and the railways. This scheme also models the forms of development that would be possible within the larger hinterland including substantial projects along the traffic artery of Canterbury Road and intensification of the existing shopping strip. The yield of this scenario within the railway station site is 40,000 sq m.

SCENARIO 2: TRENCHED RAIL



This scenario envisions an excavated trench for the railway with the new Union Road bridge framed with substantial new development on either side and extending along the former carpark to the east. This provides scope for a series of modestly scaled residential towers that will capture views to the city and suburbs. This scenario requires the redevelopment of some of the existing shopping strip and imagines substantial incremental intensification within the suburban hinterland. The yield from the railway station site and redeveloped shops is 75,000 sq m.

SCENARIO 3: RAIL UNDERGROUND



This scenario explores the prospects for redevelopment if the railway were fully buried and the entire strip of land above made available. It contains all redevelopment to the railway station and easement. It incorporates an enlarged parkland and new civic spaces, streets and laneways as well as high levels of permeability across the railway. Continuous development above the railway easements would mix housing with small scale production and commercial. The yield of this scenario is 105,000 sq m.

BATMAN

Batman is a railway station in Melbourne's north, a 20 minute train ride from the city. The station forms a barrier between a fast-developing activity centre on former industrial land to the west and large underutilized sites close to the high amenity of the Merri Creek and Coburg Lake to the east. To the west is about 80 hectares of mostly single-storey industrial buildings with some residential properties and substantial tracts of empty and underutilized land. To the east and south are residential areas, mainly 1- 2 storey detached dwellings. The station currently has low passenger volume and no parking, yet it is on a key east-west arterial (Gaffney Street), and close to the major north-south tram route (Sydney Road). The potential of the larger assemblage involves better pedestrian and cycle connections from the railway station through the new development and tram corridor to the creek and its extensive bike trails.



PUBLIC LAND

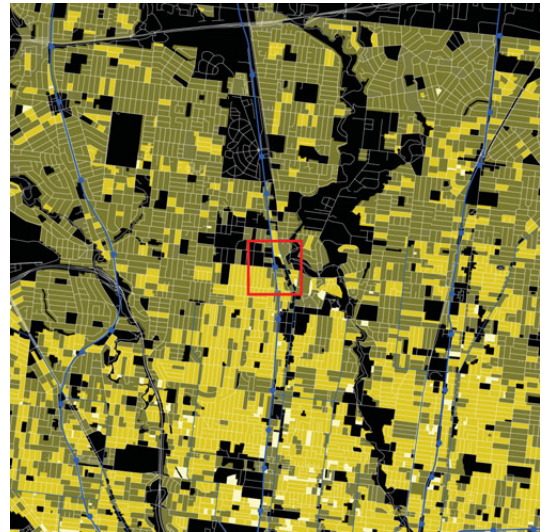
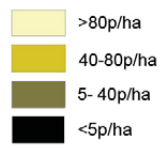
1km

The existing level crossing blocks the east-west flows, yet any grade separation here would need to be part of a series along the rail corridor. Without grade separation, the potential for intensification is primarily on private land with a low yield and continued blockage of the car, bus, cycle and pedestrian network. The challenge at Batman is to envision the station as part of a larger precinct connecting the Merri Creek and Coburg Lake on the east to the burgeoning activity centre to the west. It is also to engage with the larger rail corridor rather than a single station. There is 3.5 ha of public land associated with the railway, and immediately to the east of the station is a large block of under-utilised private land and some smaller-lot subdivisions along Sydney Rd that are ripe for intensification.



Batman railway station

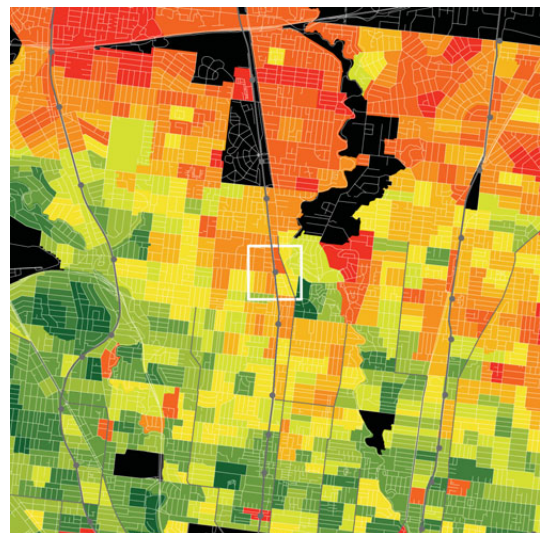
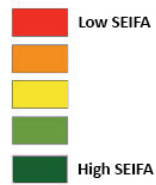
DENSITY



People/Ha

10km

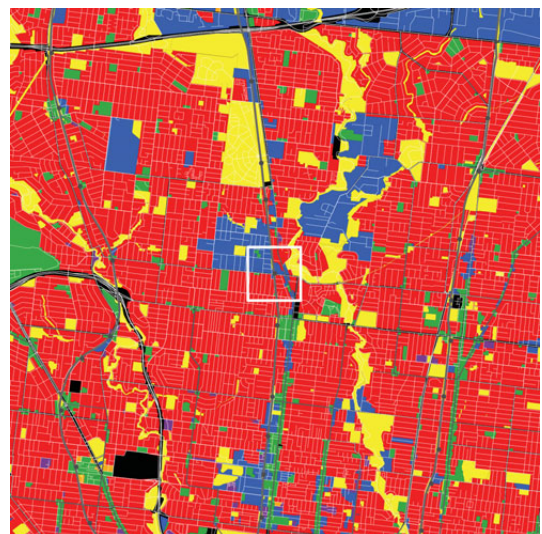
SOCIAL MIX



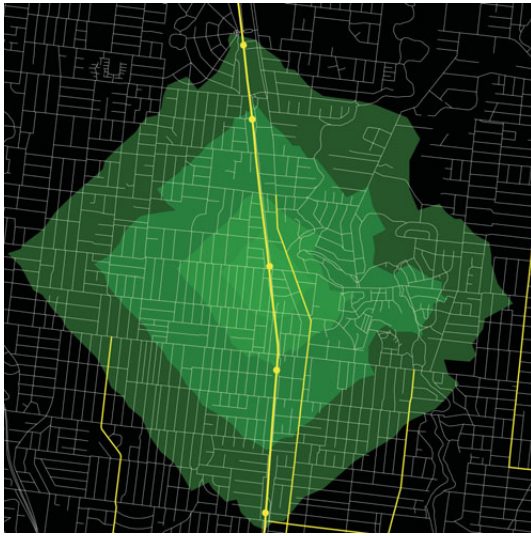
SEIFA Index

10km

FUNCTIONAL MIX

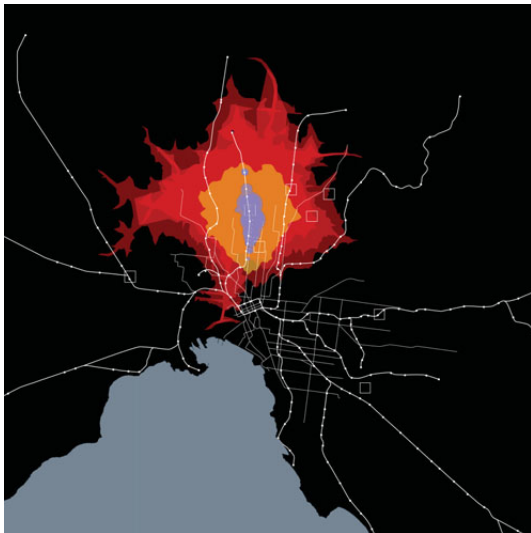


10km



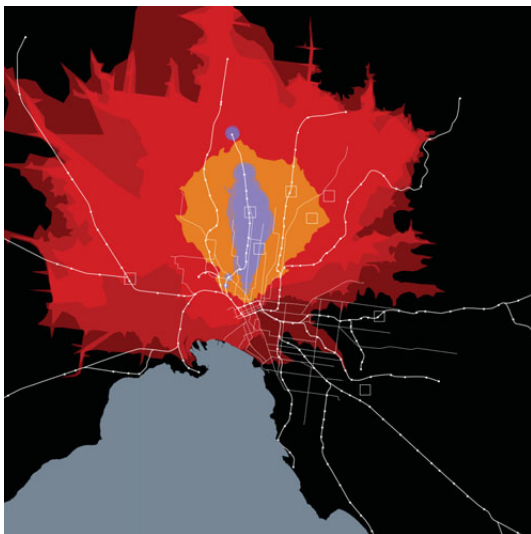
5, 10, 15, 20 Min. Walking

5km



20 Min. Car (red), PT (blue) & Cycling (orange)

50km



30 Min.

50km

ACCESS

Batman is located on parallel north/south tram and train lines. During the morning peak (bright red) cars are constrained in the city direction and public transport is competitive, however public transport cannot compete at any other time of day in any direction. It is notable that it is the tram rather than high volume rail that gives fastest access to the city. Cycling has a greater range than either over both 20 and 30 minutes. The area accessible by car from Batman station is about 12 times that of public transport in the morning peak and 30 times during the evening.

BARRIERS TO CHANGE:

"The council's response is one thing, but also whether the market is ready is another key question. Would people buy into places like this?" (Planner)

SCENARIO 1: RAIL AT GRADE



In this scenario, the railway infrastructure remains in place. The scenario focuses on providing a generous public space connection eastwards from the station to the creek, with a rail-bus interchange on Gaffney St, framed by low-to-medium rise (3-8 storeys) buildings that are primarily residential with retail and commercial uses facing the main public spaces. Incremental intensification within the station's walkable catchment is envisaged on the west and south. Infrastructure costs are minimal in this scenario though with the level crossing remaining in place, improvements to both rail services and east-west transport will be compromised by congestion. Pedestrian connectivity within the station precinct will also remain constrained and can only be extended if an overpass or subway is added to the station. Likewise, Sydney Road is a busy arterial and without significant reconfiguration to tram priority with associated pedestrian and cyclist-oriented urban design, the connection to the creek will be constrained while tantalizingly close. The yield of this scenario is 70,000 sq m - all on private land.

SCENARIO 2: ELEVATED RAIL



Here the railway is elevated to create an expanded Batman precinct to become a modal interchange between rail, trams and buses. Elevating the rail line allows a dramatic increase in pedestrian connectivity, as well as allowing high-capacity public transport along Gaffney St to connect with other activity centres to the east and west. The emerging activity centre immediately west of the station is connected directly with the amenity of the Merri Creek and Coburg Lake parkland. The area beneath the station would be developed with retail, commercial and community uses, while the land immediately adjacent to the station would be developed with a mixture of uses up to 12 storeys. This could be student accommodation, young families, professionals and older persons, as well as commercial, with retail at ground level. The remainder of the intensification would be a mix of retail and residential framing high quality pedestrian links to the Merri Creek frontage. With large land parcels, this scenario could include a high-intensity campus integrated with the station precinct. The yield of this scenario is 135,000 sq m.

SCENARIO 3: UNDERGROUND RAIL



In this scenario, the rail line is buried to create an expanded Batman precinct to become a modal interchange between rail, trams and buses. Trenching allows a dramatic increase in pedestrian connectivity across the rail line, as well as allowing high-capacity public transport along Gaffney St to enhance east-west connectivity. The grade separation allows the emerging activity centre to the west to be connected directly with development at the station and to its east, making the most of the amenity of the Merri Creek and Coburg Lake parkland. The focus of the intensified development would be a network of high quality pedestrian streets connecting the western side of the station with the east and to the creek frontage. Development would be predominantly 4-5 storeys with several towers on Gaffney Street peaking at 9-10 storeys. This is the most expensive scenario and would need to be part of a comprehensive undergrounding exercise along the Upfield Corridor. The yield of this scenario is 155,000 sq m.

CHADSTONE

Chadstone is Melbourne's largest and oldest private shopping mall, located about 15 kilometres from central Melbourne near the junctions of a major freeway and two major vehicular arteries. It is also within a kilometre of two railway lines and several tramlines, none of which has walkable access to the mall. Tension with adjacent suburban neighbourhoods has led to the construction of a high perimeter wall with limited access points. The challenge and the potential here is to turn a private and essentially anti-urban type inside out to become a real urban centre through the process of intensification. The larger context of Chadstone includes a small industrial zone about a half kilometre away that is ripe for redevelopment and the likelihood of ongoing car-based redevelopment along existing traffic arteries.



CAR PARK

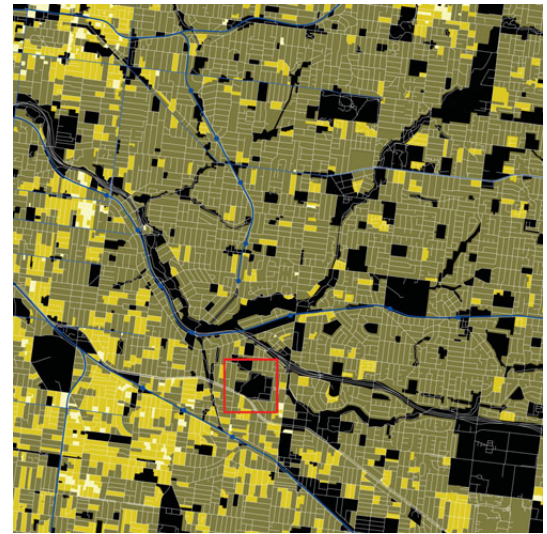
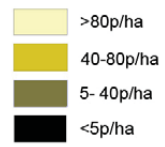
1km

The most obvious uplift would be a relatively short underground rail connection that could link Chadstone mall to three of Melbourne's busiest rail lines, augmented by extensions to existing tram lines for more localized traffic. The primary development opportunity lies in converting the many hectares of existing private car parks and access routes into a mix of intensified functions with both public and private ownership while integrating new public facilities and open spaces with the walkable hinterland. This is a highly profitable mall where there is little incentive for the owners to cede control unless options for a major transformation can be opened up with high levels of public transport investment. The most obvious investment is a new underground rail connection plus local tram connections that would enable Chadstone to become a key node of a future low-carbon city. The most credible scenario is to enable such a transformation to occur without demolishing the mall and its flows of capital. There is a high level of resident resistance to any expansion of the centre. The most effective transformations are likely to be staged incrementally over the long term as car usage and parking demand declines. Integration with the neighbouring walkable community will require a high level of engagement and a focus on the long-term benefits for this community.



Chadstone shopping mall car park

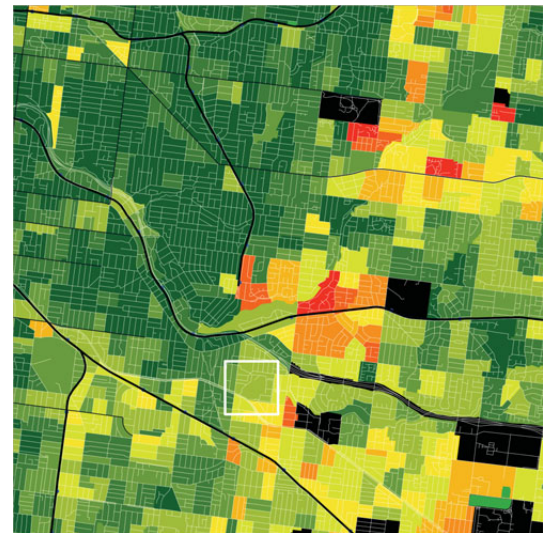
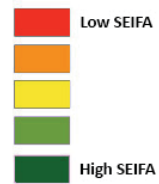
DENSITY



People/Ha

10km

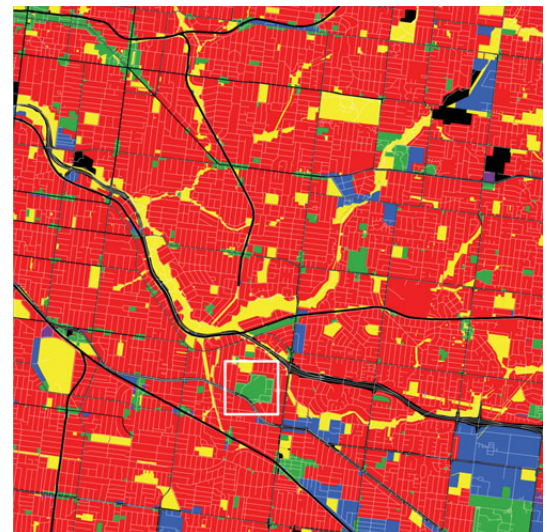
SOCIAL MIX



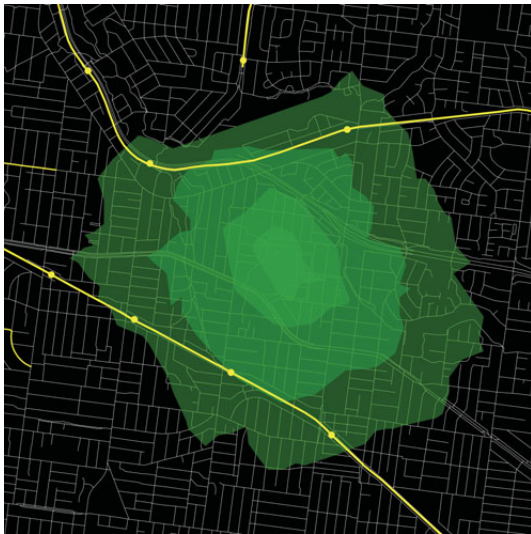
SEIFA Index

10km

FUNCTIONAL MIX



10km

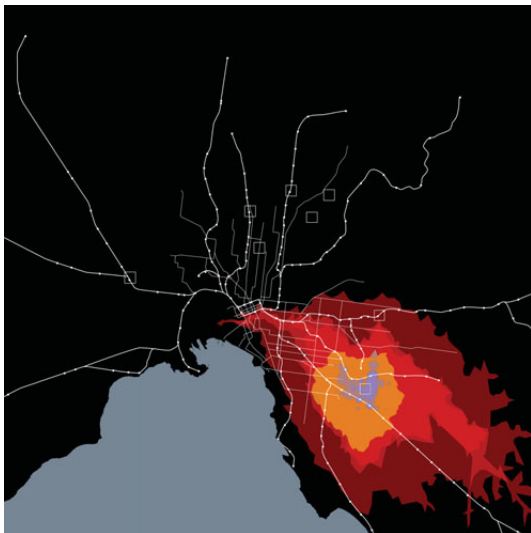


5, 10, 15, 20 Min. Walking

5km

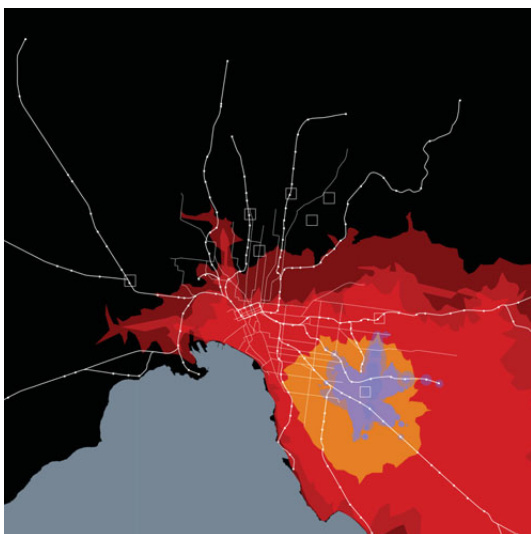
ACCESS

Chadstone is well connected to arterial roads and freeways especially in radial directions, giving 30 minute car access to both central city and countryside at any time. Public transport is limited to buses and cannot compete with cars at any time or in any direction. Cycling access zones are substantially larger than public transport in nearly every direction and at all times. The area accessible by car from Chadstone is about 12 times that of public transport in the morning peak. There is negligible range for public transport during the evening.



20 Min. Car (red), PT (blue) & Cycling (orange)

50km



30 Min.

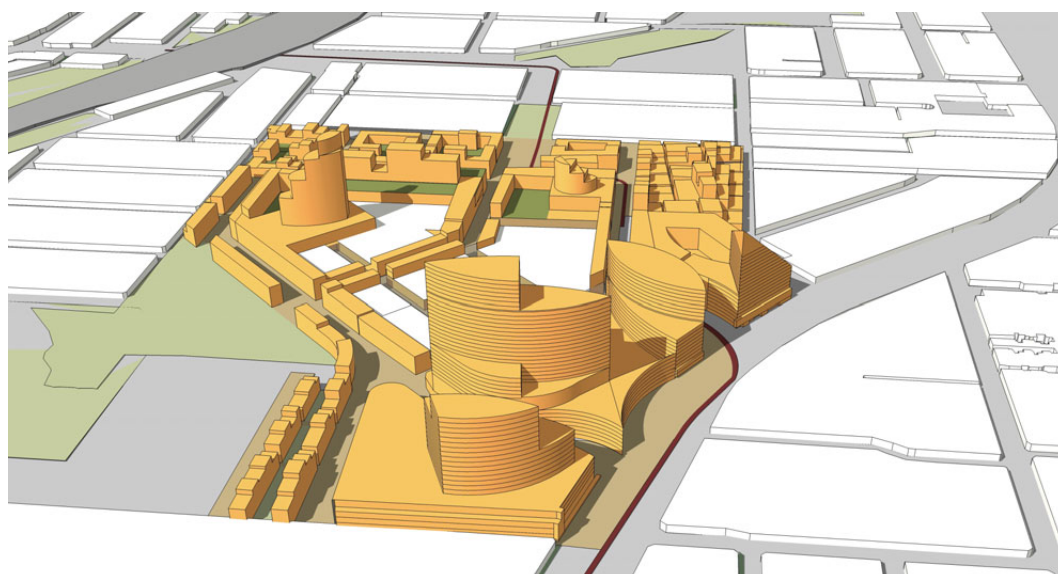
50km

SCENARIO 1: RAIL UNDERGROUND



This scenario envisages a relatively short underground rail connection linking Chadstone to three of Melbourne's busiest rail lines plus extensions of existing nearby light rail lines to integrate with the existing tram network. New development is contained to the existing carpark zones surrounding the mall with a largely perimeter block typology forming a transition zone between the mall and the surrounding neighbourhood. It allows for some 14 storey towers to the west of the site where there is no significant impact on adjacent neighbourhoods. The existing blank walls of the mall are redeveloped to produce a lively pedestrian interface with the new development but the mall itself remains intact. The yield of this scenario is 400,000 sq m, all on carpark land.

SCENARIO 2: RAIL UNDERGROUND



BARRIERS TO CHANGE:

"Breaking down the wall... around Chadstone... would be met with great resistance from the residents. They don't want traffic flowing through their quiet residential streets." (Planner)

The second scenario imagines the same transit investment as for scenario 1, gearing Chadstone into the metropolitan train and tram networks. This vision erodes the perimeter boundary and extends adjacent streets across it to form a new public street network through the redeveloped carpark zone. The boundaries between the existing mall and new development are also eroded to become public streets with tram connections. Dense development of up to about 30 stories is envisaged along the arterial of Dandenong Road and there is also the prospect of high-rise commercial and residential towers emerging on the sites of the existing anchor stores within the mall. Between the mall and its hinterland, there are many potential ways of inserting permeable mixed-use residential blocks, with ground-level commercial, community and small scale production functions that would allow Chadstone to emerge as a public rather than private city. The yield of this scenario is 920,000 sq m, all on carpark land.

SCENARIO 3: PRECINCT REDEVELOPMENT



The third scenario demonstrates how investment in an underground rail line, close to but not within the mall site, could induce a broader field of urban intensification. Combined with a light rail extension, this scenario explores the way that the mall might become integrated into a broader corridor of incremental development that incorporates a nearby industrial precinct with creek frontage that is also ripe for redevelopment. Here a new tram connection forges an urban linkage between the mall and the industrial estate enabling an intensification vision that integrates and encompasses the larger district. The yield of this scenario is 1,775,000 sq m, mostly outside the Chadstone site.

NORTHLAND

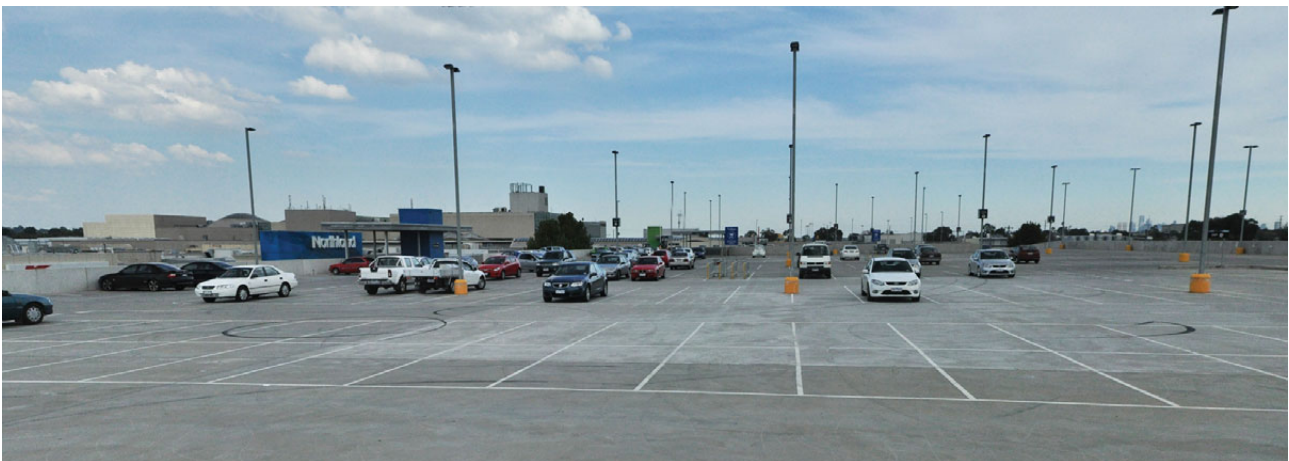
Northland is a Principal Activity Centre incorporating Northland Shopping Mall, big-box retailing and an industrial zone covering a total of about 80 hectares. The precinct is a major retailing and employment centre without access to high volume public transit. It is tantalizingly close yet disconnected from the major activity centres of Preston (2 km) and Reservoir (3 km) as well as La Trobe University (2.5 km). The site is intersected by two east-west arterials - Murray Road (running between the mall and big box retailers) and Bell Street 800 metres to the south. The mall, on a 17 hectare site, has almost 10 hectares of retail, 14 cinema screens and 4800 free parking spaces – primarily in single storey buildings. The nature reserve and cycle/walk trail of Darebin Creek forms the eastern edge of the precinct where the creek valley is lined with the rear of industrial buildings and the blank walls and service bays of the mall.



CAR PARK

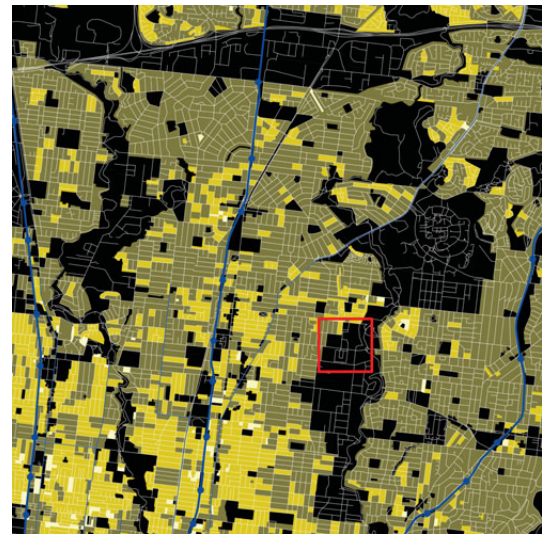
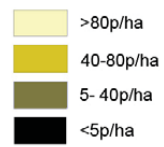
2km

The northern and western edges of the mall interface with largely single-storey detached housing. The industrial zone is all single or double storey on lots of up to 4 hectares. Much of the industrial zone lines the banks of Darebin Creek with high potential for residential and mixed use development. The larger industrial blocks hold long-term potential for high-density redevelopment with no impact on existing residential areas. The population of the larger region is culturally and socially diverse with a relatively low socio-economic profile. Resident resistance to intensification is unlikely. The challenge here is to invest in high-capacity mass transit to achieve a modal-shift in accessibility, diversify the functional mix and catalyse redevelopment of the adjacent industrial area into a high-density mixed-use employment, production and residential precinct that maximizes access to the considerable amenity of the Darebin Creek. The potential for growth with socio-economic uplift and low-carbon outcomes is huge but cannot be achieved without major transit investment.



Northland shopping mall car park

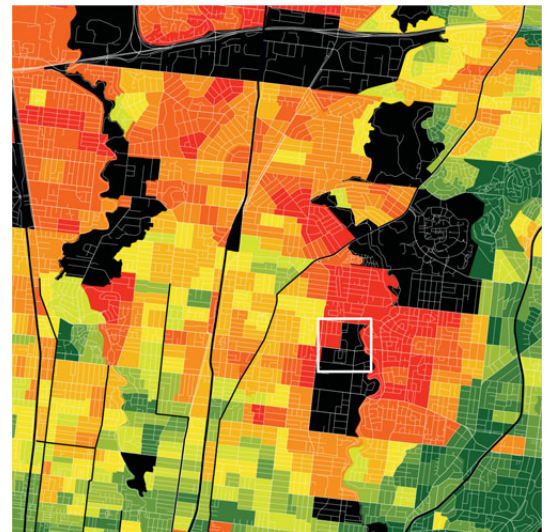
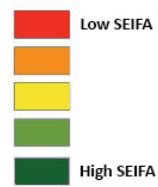
DENSITY



People/Ha

10km

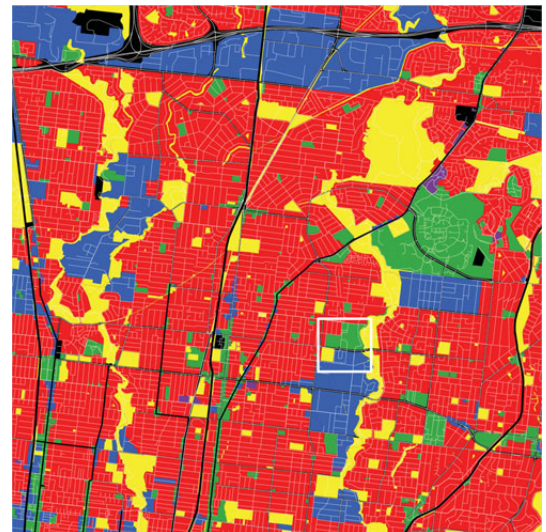
SOCIAL MIX



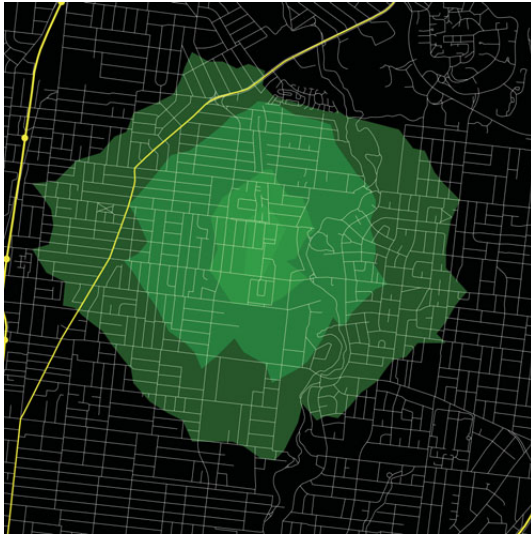
SEIFA Index

10km

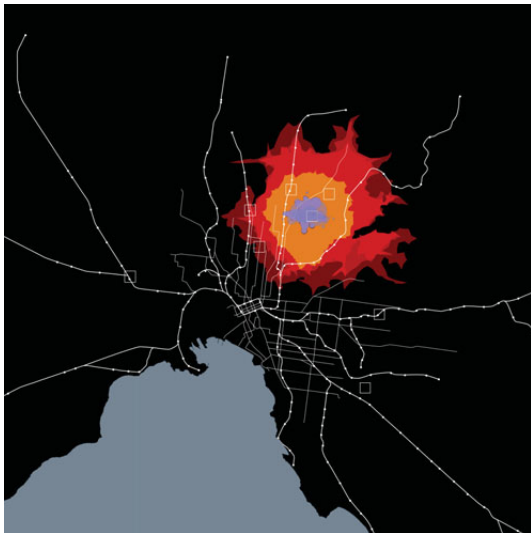
FUNCTIONAL MIX



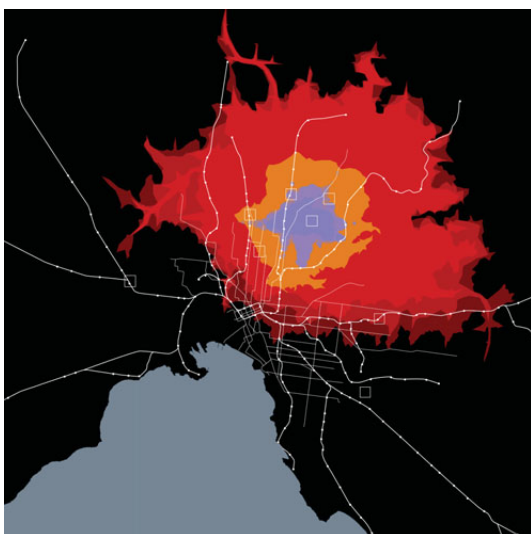
10km



5, 10, 15, 20 Min. Walking 5km



20 Min. Car (red), PT (blue) & Cycling (orange) 50km

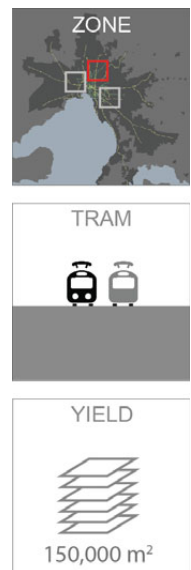


30 Min. 50km

ACCESS

These maps show an extremely car-based centre. Northland is 11km from the centre of Melbourne, a 20 minute car ride but an hour by public transport (bus). The mall has a major bus interchange but service after hours and on weekends is limited. The nearest rail stations are a 10-15 minute bus ride away. While the Darebin Creek provides an attractive recreational bike route, most bike access to Northland is poor. The area accessible by car from Northland is about 16 times that of public transport in the morning peak and 46 times during the evening.

SCENARIO 1: NEW TRAM AND DISTRIBUTED DEVELOPMENT



This is a minimalist scenario where the bus interchange is re-located to Murray Road and a high-capacity tram is added, connecting Northland to Preston, Reservoir and La Trobe University. Small and medium-grain mixed-use retail, commercial and residential development with pedestrian-friendly street interfaces is envisaged along the Murray Road corridor. Higher density envelopes will enable incremental development over big box stores and car parks. The creek-frontages of both the mall and industrial properties are to be redeveloped to take advantage while protecting this amenity and providing better access. The yield of this scenario is 150,000 sq m, all on private land.



BARRIERS TO CHANGE:

"The first things that roll out have to be great, not reasonable. You have to sell off that image that you are building- this is where we are going and this is putting it on the map.... Getting it right in the early stages is critical in overcoming that stigma and the poor image and identity"
(Planner)

SCENARIO 2: NORTHLAND-BELL PRECINCT REDEVELOPMENT

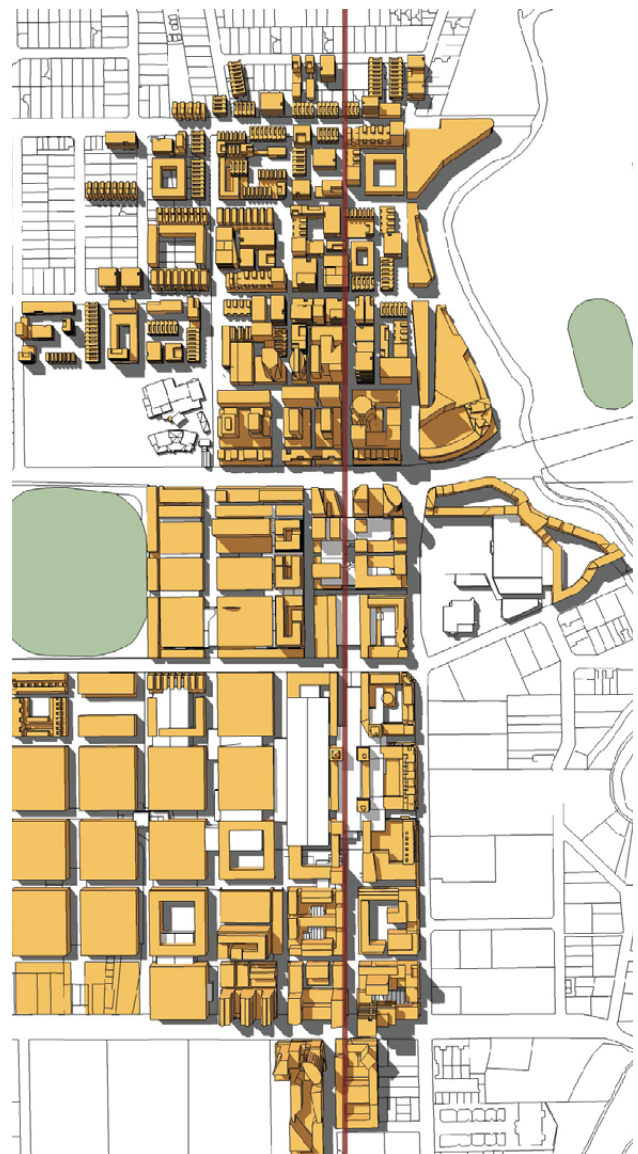


This scenario uses a broader brush to imagine what might happen if Northland could be connected with a redeveloped Bell Street precinct 800 metres to the south. There are no high-volume east-west transit links in the northern region of Melbourne and the 40 metre wide easement of the Bell Street corridor has long been noted as a prospect for such an orbital link connecting the eastern and northern suburbs to the west and the airport. This scenario explores the option of an elevated metro along Bell Street, incorporating high-intensity mixed-use development around the metro station and re-development of the 800 metre axis to the shopping mall. Such transit investment would transform property values on private land and these capital gains would need to be recouped to help fund such a project. Creek frontage properties would be incrementally redeveloped to take advantage of significant amenity. The yield in this vision is 500,000 sq metres, all on private land.

SCENARIO 3: UNDERGROUND RAIL



In this scenario we explore the opportunities that are unleashed if a new radial underground metro line were built in addition to the Murray road tram and Bell Street elevated rail. Such a line would connect Bell Street, the Northland shopping mall, La Trobe and RMIT universities to each other and to the central city. This may seem wishful but the total uplift and synergy for the northern region could make it viable. This scenario for the Northland part of this corridor includes wholesale redevelopment of all industrial areas together with incremental redevelopment of the mall and big box retailing. The result could be an intensified urban precinct extending for more than a kilometre with pedestrian-oriented mixed-use retail, commercial, leisure and residential functions. The yield of this scenario is 1,770,000 sq m.



BARRIERS TO CHANGE:

"In actual fact there is real resistance to having any form of higher density development above Northland shopping centre - resistance from the landowner and investors... If you start putting things like residential above your retail areas, if it is owner occupied, they are really limiting their future options – in their mind." (Planner)

LYGON

This case study focuses on the prospects for incremental development along a tramline and tests a specific set of urban design controls. We selected a 1 kilometre stretch of Lygon Street in Brunswick (about 5 km north of the central city) that is already undergoing redevelopment. This is a relatively typical condition in Melbourne, with the tram corridors being predominantly either retail strips or housing on small lots, with the majority of shopfronts on very narrow lots. Immediately behind these corridors is a hinterland of low-density suburbia.

The more detailed parts of this project analysed patterns and types of intensification along six Melbourne tram routes (Woodcock et al 2013). Our approach for this case study was to explore the outcomes of a local government urban design code that enables intensified development within building envelopes. A large number of lots with redevelopment potential were allocated at random to a number of designers from our research teams working independently, who created sketch-up designs within the code for insertion into a 3-D digital model. Of particular interest are the constraints imposed by lot-size and access, height and land use.



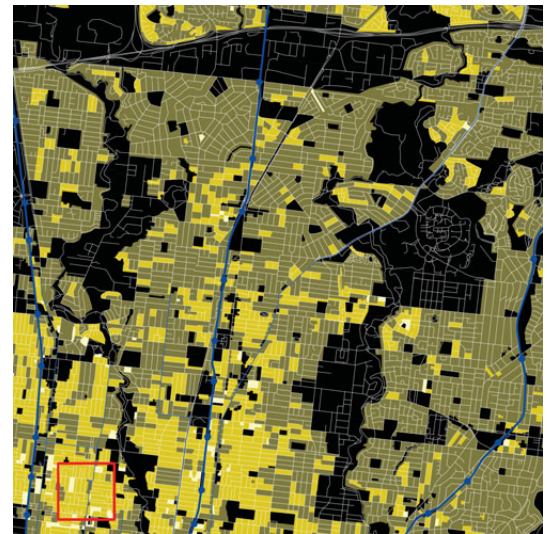
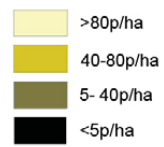
TRAM CORRIDOR

500 x 750m



Lygon St

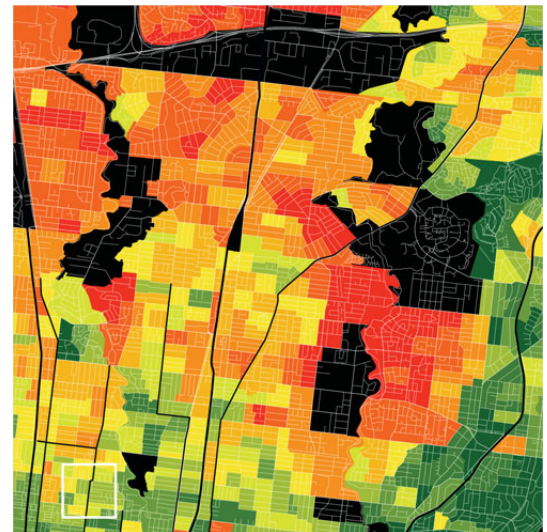
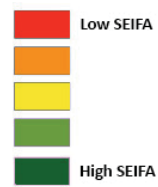
DENSITY



People/Ha

10km

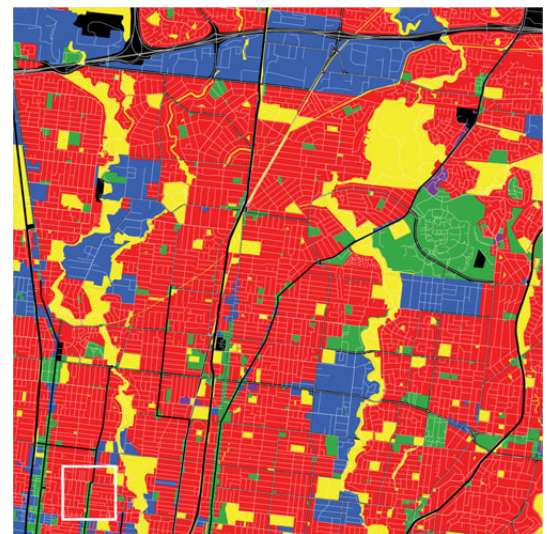
SOCIAL MIX



SEIFA Index

10km

FUNCTIONAL MIX



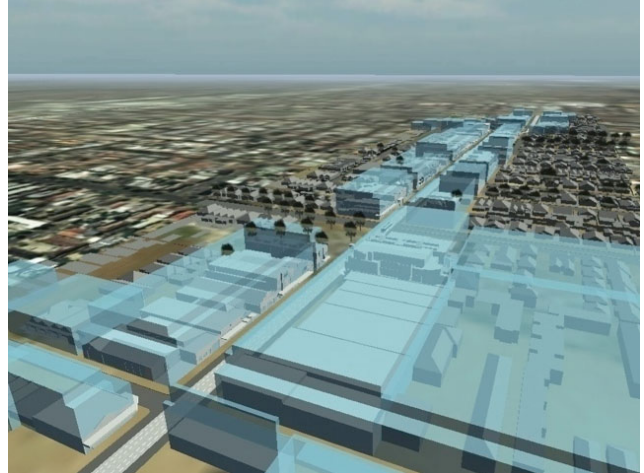
10km

Existing condition



3-D model of existing conditions

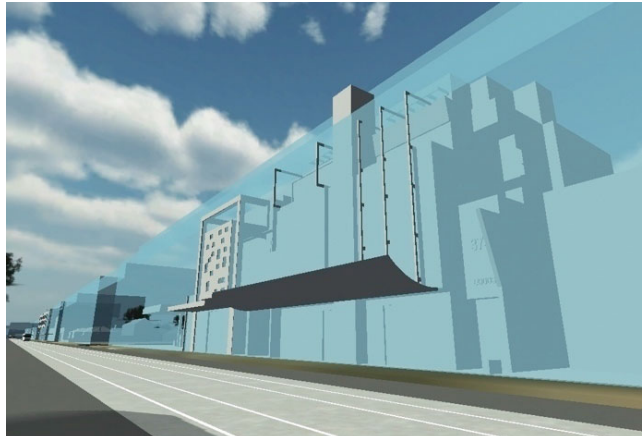
Development controls



3-D digital model of existing urban conditions with the building envelope controls overlaid in blue



Existing streetscape in Lygon Street.

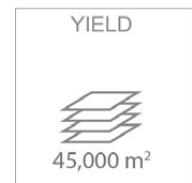
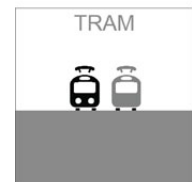


Street level view of building envelope controls



Lygon St

SCENARIO: 60% REDEVELOPMENT



The resulting 3-D digital model illustrates how the intensified streetscapes could look with about 60% of the street redeveloped. The process of using a variety of designers mimicked the reality of sites being developed incrementally by a range of developers. The resulting streetscapes were potentially quite diverse within a tightly regulated height framework. Responses to these images and to a fly-through model were presented to stakeholders from the local residents group as well as members of the planning, design and development sector. There was generally a positive reaction across stakeholder groups, with a preference for the more consistent height of the 4-5 storey streetwalls over the inconsistent form of the 3 storey streetscapes regulated by the State's mandatory 'ResCode'.

BARRIERS TO CHANGE

We cannot contend to have made more than a few steps towards the kinds of transformation that low-density and car-dependent cities such as Melbourne might take in the quest for a more resilient city. We conclude this report with a brief assessment of the barriers to change in this context. What follows is augmented with quotes from a range of planners, architects, urban designers and developers engaged in the Melbourne planning and development industries whom we interviewed as part of the project.

POLITICS

A key political barrier is that all major parties view urban development through the short-term lens of election strategy. While the need for major urban transformation is recognized by politicians, it is not seen as a vote winner. One viewpoint is that transformational change can only occur in safe seats of the opposition party: "the liberal party can do it in labor seats, and the labor party can do it in liberal seats". In this regard it will be easier for the Liberals to redevelop Sunshine, Reservoir and Northlands while it would be easier for Labor to redevelop Surrey Hills and Chadstone. Yet this requires politicians to invest in regions that don't vote for them.

THE BLAME GAME

The political structure is divided between local and state levels where the state holds all the power and the purse strings, yet local councils take much of the responsibility for development decisions. Much of the blame for inaction falls upon local councils who are often elected to enforce the anti-development views of their residents. The state government does not want the electoral backlash that flows from urban intensification and is happy for local government to be seen as responsible. Yet local councils are not funded nor staffed to deal with the complexities of transit-oriented development.

LACK OF CERTAINTY

There is a prevailing lack of certainty and transparency in the planning system - as one developer puts it: "for a system that is designed around rules, it is amazing how there is the absence of certainty in planning. It is not good for ...consumers, developers, government, or the economy in general. It becomes a stranglehold on productivity." There is a clear need for 'as of right' approvals for intensified development within walkable catchments of transit, mediated by clear urban design codes and design quality reviews.

SITE-BY-SITE PLANNING

Local councils are not effectively empowered to make decisions because most larger scale developments are ultimately decided by the Minister or the planning tribunal VCAT. Councils often send developments to VCAT without a decision for fear of being blamed by residents, developers and the state. One result is that developers submit ambit claims that go to VCAT or to the Minister where a decision is made on a site-by-site basis. Whatever specific planning framework is in place is reduced to a guideline. If the urban design framework is unclear, such as requirements to 'respect the neighbourhood character', then smart barristers will exploit those ambiguities.

CAPTURING CAPITAL FLOWS

In general terms there is a low level of economic understanding of the ways in which cities work as engines of growth and production. While there is a recognition of agglomeration economics there is little capacity to model it or base development decisions upon the synergies produced by transit-oriented investment. The ways in which urban infrastructure investment creates capital gains and increased economic flows need to be better understood to ensure that capital gains due to public investment can be captured to fund that investment. There are many examples of sophisticated and well-established mechanisms for public funding of transit infrastructure from the North America, Western Europe and Japan.

MARKET-BASED IDEOLOGY

The prevailing neo-liberal orthodoxy suggests that the market is the central productive force for change and the role of government is to get out of the way. Yet the cost of burying and decking railway lines is a key constraint on development that cannot be covered by market forces alone, as one developer puts it: "Outside of some really concentrated CBD locations it is just not economically feasible. So you end up with a negative land value, that really becomes the stumbling block." All of the best transit-oriented developments globally are undertaken with strong public involvement.

RESIDENT RESISTANCE

Attitudes to intensified development in Melbourne remain locked into suburban ideologies that suggest that any thing over two storeys is high density and threatens Melbourne's character and livability. Resident groups, particularly in wealthier and older suburbs, are well organized and often quite powerful; as one developer puts it: "when you take on the inner suburbs - the wealthy, well educated suburbs - you are provoking a pretty powerful opponent. The further out you go the less opposition you have... ". The planning process encourages ambit claims from developers that aggravate local communities and entrench the resistance and cynicism about the planning process. When residents oppose all change this is often an ambit claim that mirrors the ambit claims of developers.

LACK OF VISION

While there has been no shortage of plans there has been a dearth of design vision for the overall city that might catch the public imagination. There is a need for more design research that explores multiple scenarios for intensification of transit nodes; these visions need to become the basis for cost-benefit analysis and public debate in order to build community and political support for implementation. The range of talent within Melbourne design professions has scarcely been tapped in this regard.

ELEVATED RAIL

We have presented a limited number of analyses and scenarios as a means of re-thinking the options for a more resilient Melbourne. They often hinge upon key questions with regard to public transport investment and particularly the elimination of level crossings. While we are not expert in engineering or economics it is clear that many stretches of railway line will need to be elevated or trenched in order to achieve the ground level connectivity necessary for the intensive networks of a resilient city. It is also becoming clear that the difference in cost and disruption to existing rail services is far less for elevated rail than with trenched or buried railways. While elevated rail delivers less development capacity than a tunnel it can be designed and integrated in a highly effective manner at about a third of the cost. Until recently elevated rail options have been relatively unthinkable for Melbourne and it is a key challenge to re-think such attitudes.

The barriers to change sketched here are substantial but so are the opportunities and the arguments for transformational change. It is difficult to avoid the conclusion that the most significant problem is the degree to which urban planning practice has become politicized through site-by-site planning, ministerial interference and ambiguous planning codes with all major decisions geared to short term political cycles. Breaking this cycle is the biggest challenge of all. The problem of funding is essentially one of priorities and budget allocation. The refusal to fund major public transport infrastructure, despite the clear economic and environmental advantages over other investments, is because it rarely produces political capital in the short term.

All of the barriers sketched above will need to be addressed in order to achieve the necessary transformations. With mounting fuel costs and an inevitable carbon tax applied to transport, such priorities will change. Patronage on public transport has already dramatically risen and increased crowding on trains and trams will add to political pressure for investment. The inter-dependence of rail and road flow capacities will increasingly focus attention on the need for grade separations. But will this be done on the basis of political priorities rather than maximizing intensification outcomes? Can it be done while keeping the community on board? Will the full range of scenarios and visions be debated before decisions are made?

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