Density and Outer Urban Development in Melbourne

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ABSTRACT

For decades, Australian planners generally have accepted the conventional position that increasing the density of urban settlement on the urban fringe will reduce the quality of suburban living but achieve negligible land savings (Bunker 1986, Braby, 1989, McLoughlin, 1991, Gutjahr, 1991, and Lewis, 1999). McLoughlin, for example, argued that increasing outer urban density would not significantly restrict outward urban growth because the amount of land required for roads and utility infrastructure, retail and service centres, schools and other community facilities and public open space must remain constant regardless of the area devoted to residential dwellings and the population.

This paper analyses this conventional position, related policy positions of Australian governments, and current practice. It analyses the assumptions and values inherent in the position and shows that the amount of land required for non-residential purposes is not a constant. The paper demonstrates that increased residential densities and a reduced area devoted to non-residential purposes may improve residential amenity and save significant amounts of land.

The issue of residential density is once again an important issue in strategic land use planning in Australia. Most major cities have completed or are completing new strategic plans. These generally seek to increase residential densities. The paper examines the relationships between density and other components of urban form and the relationships between these elements and the notion of sustainability.

The paper reviews the approach advocated in the Melbourne strategic plan, *Melbourne 2030,* to planning for outer urban development in Melbourne. It analyses governance and current policy, and places the *Melbourne 2030* objective of increased outer urban densities in the context of best international practice and historical approaches. It also provides a critique of the Victorian government's attempt to redirect a proportion of outer urban development to mixed use activity centres in the established residential area of the city; provides details on land supply and reviews current development practice in each outer urban growth corridor, and in Melbourne generally; examines the impacts of the introduction of a legislated urban growth boundary for Melbourne; and demonstrates the land savings from different scenarios of increased residential density and urban design.

WHY STUDY OUTER URBAN GROWTH CORRIDORS AND THEIR URBAN FORM?

The debate over urban consolidation in Australia has generally ignored the issue of density in the outer urban suburbs of Australian cities, an omission that has led to a serious inconsistency in policy. Governments are emphasising the need for urban intensification in established areas of cities while continuing to allow outer urban areas to be developed at average densities that are among the lowest in the world. This inconsistency in policy is creating or reinforcing two city types: urban

intensification in higher income, well serviced established areas; and poorly serviced, largely lower income outer urban areas developed at average densities which are among the lowest in the world. This inconsistency is a consequence of the 'neo-liberal' revolution in governance which affected planning systems during the 1990s in Australia. Using this model, governments liberalised rules that limited medium density and high-rise development in cities, and avoided regulations which would control urban form and mandate increased densities in outer urban areas. In Melbourne, deregulation and an increased reliance on markets has led to both increased amounts of medium density and high-rise development in Melbourne's inner suburbs and CBD, and low density broad-scale residential development in outer suburbs. Development companies have become the primary determiners of urban form in both inner and outer areas. At the urban fringe, they largely continue to regard intensification, changes to hierarchical retail structures and a reversion to more traditional forms of urban design as a high commercial risk.

Unless current practices are changed in Melbourne, land set aside in outer urban areas will be used up for housing faster than necessary, and large areas of land squandered. Melbourne's comparatively advantageous position on land supply in both Australian and international terms will be lost with substantial economic, social and environmental costs. Melbourne's car dependence will increase, resulting in seriously congested outer urban areas and unabated pressure towards prioritising public infrastructure spending for outer urban freeways that fail to encourage shorter trip lengths and shifts to sustainable transport modes. Environmental conditions will worsen. Inequalities in terms of travel times and costs, housing diversity, type, price, and affordability, access to facilities, and other social and environmental factors will become entrenched.

The Victorian Government recently adopted a new metropolitan planning strategy, *Melbourne 2030*, and introduced an Urban Growth Boundary (UGB), in an attempt to reintroduce a measure of state control over the direction and type of urban development in Melbourne. Melbourne 2030 maintains the policy of concentrating outer urban development within urban growth corridors and separating these from green wedges. A firm UGB is one precondition for redirecting investment to defined activity centres from wasteful and costly land speculation. In turn, the growth boundary will come under increased development pressure if activity centres are not developed. While about 40 per cent of total new dwellings approvals between 1996–2003 occurred in the inner and middle ring suburbs of Melbourne, only about 20 per cent of Melbourne's population growth occurred there and the proportion is decreasing (Buxton & Tieman, 2004). The Victorian Government is now seeking to redirect most growth towards nominated mixed-use activity centres and reduce the proportion of growth in the outer urban growth corridors.

However, the government is proposing little change to the density of outer urban areas. *Melbourne 2030* anticipates that more compact, interconnected and integrated new suburbs will be developed. The strategy projects a gradual increase in gross residential density from a current average of 10 units per hectare to a 2030 target of 15 units per hectare, interpreted in the Urban Development Program (UDP) as a 28-year average (2003–2030) of 12.5 units per hectare (DSE, 2003b). An important reason for the reluctance of governments to require changes to densities in outer suburbs, and of researchers to investigate the issue of outer urban densities, is the prevailing view that density increases do not significantly affect the area of a city or its transport patterns. Brian McLoughlin (1991, 1992) popularised the first view, and Paul Mees (1994, 1995, 2000) the second. McLoughlin's argument has been much more influential than that of Mees. The failure to increase densities in outer urban growth areas will jeopardise compliance with Melbourne 2030 (DOI, 2002a) objectives by preventing the achievement of growth targets in activity centres, and by leading to renewed pressure to remove or substantially alter the Urban Growth Boundary (UGB) and allow further residential development in Melbourne's green belt.

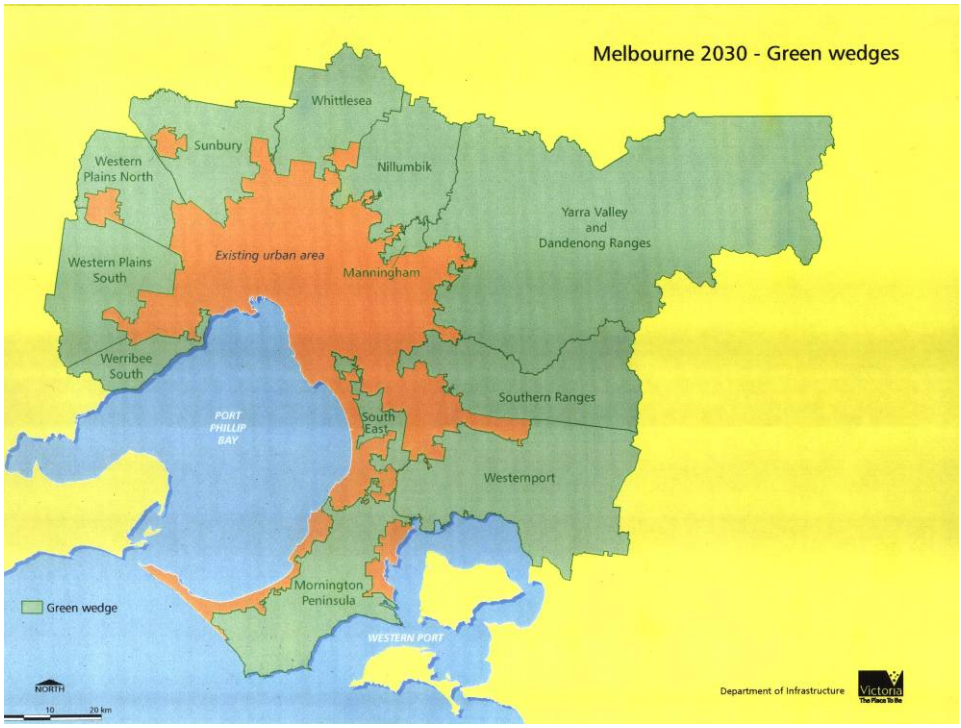

Figure 1: Melbourne's Green Wedges 2003 and the Urban Growth Boundary
Source: DOI 2002

RESEARCH OBJECTIVES

This study examines the concept of density as an element of urban form, describes the prevailing patterns of outer urban development and examines the impacts on land supply and area of various scenarios of increases to residential density over time. It evaluates current practice, including a number of case studies in growth areas, according to sustainability criteria and proposes alternatives.

METHOD

The report relied on data contained in the Urban Development Program (UDP) (DSE, 2003b, 2004a) for calculations of land supply in Melbourne. UDP maps were used to calculate the number of approved lots. The report assumed that future greenfield residential land will be developed at a net residential density (including minor parks) of 10 dwellings per hectare unless otherwise stated in the UDP report or online interactive mapping facility.

Three density scenarios are used to demonstrate the potential for increased dwelling numbers from increased dwelling densities in growth corridors. These scenarios calculated increased dwelling yields under various assumptions of increases in average density. They use three projection periods: the 2004–2005 and 2006–2008 figures are respectively equivalent to the 1–2 year forecast and 3–5 years forecast outlined in the 2004 UDP report, while the 2009 and beyond figure is the projection given for the 6+ year horizon in the document. Density figures are calculated by dividing the anticipated number of dwellings by the available land area. Projections for dwelling yields are generally based on subdivision plans.

The broad evaluation of greenfield developments against sustainable design criteria, identifies all developments in the growth area municipalities included in the 2000 Metropolitan Housing Forecast (25,924 housing units in total) and constructed by 2004. These developments were then assessed against sustainable design criteria using spatial characteristics including street orientation and connectivity, and location in relation to open space, using a 2003 Melway map.

DEFINITIONS OF DENSITY

Technically, it is almost self-evident to assume that the amount of land needed for new development will decrease in inverse proportion with residential density. The reality, however, is more complex and requires an analysis of the term 'residential density'.

The terms and definitions of Cardew (1996), and the work of Loder and Bayly et.al. (1994), and that summarised by Magri (1994) are used here. The density of an urban area can be altered by manipulating the different components which comprise urban form. Residential site density can be kept constant while modifying the consumption of land by streets, open spaces and other non-residential uses. Conversely, residential site density can be increased and other components remain constant. The overall density of an urban area is therefore affected by the efficiency of land use by all components of urban structure.

The density definitions used in this report, derived from Cardew (1996), are:

- The **site** is to be understood as the land area directly sold to the end users, that is, the residential lots including cluster lots for multiple dwellings. Site density is immediately determined by the average lot size in a subdivision (allowing for shared properties on strata titles), e.g. an average lot size of 500 sq m for single-family housing will result in a site density of 20 units per hectare.
- **Net residential area** is to be understood as the land occupied by residential housing plus the streets and pathways required to access them.
- **Gross residential area** adds to net residential area the land occupied by auxiliary land uses such as local parks and open spaces, neighbourhood community facilities, primary schools, and local shopping and services. This category highlights how the gross residential density is influenced by the degree of spatial integration between residential and non-residential uses, and among different non-residential uses, as opposed to their complete segregation.
- **Release area** takes a strategic planning perspective to density measurements, as it is based on the total land zoned and released for greenfield development. Apart from the land uses contained in the gross residential area, the release area may include regional parkland, large-scale transport and utility infrastructure, secondary schools, regional retail and service facilities, town centres and employment districts, though this tends to vary significantly from case to case.
- **Metropolitan area** is the total built-on land in a given locality, including land uses incompatible with residential neighbourhoods such as heavy industry, freeways, airports, seaports etc, and also including major parks except where these are dedicated nature reserves and consist of remnant bushland. This definition also features in the urbanised area definitions of metropolitan regions in Kenworthy and Laube (1999).

DOES DENSITY MATTER?

Melbourne 2030 does not clearly indicate the density definition or category used in the suggested aim of 15 lots per hectare. The average density given by DSE (2004a) for subdivisions constructed in 2002 and 2003 of 9.7 dwellings per hectare appears to relate to the net residential area, plus minor open spaces. The calculation of density at subdivision level routinely includes small local parks. The Melbourne 2030 target of 15 dwellings per hectare for growth area land zoned or intended for greenfield residential development also appears to refer to a category of net residential area plus local parks.

McLoughlin (1991) and Gutjahr (1991) criticised the Victorian Government requirement introduced in the early 1990s for an average density of 15 lots per hectare in the Berwick-Pakenham (Casey-Cardinia) and Werribee (Wyndham) growth corridors. McLoughlin and Gutjahr argued that the land savings achievable by increasing densities at the urban fringe from 10 to 15 dwellings per hectare were negligible in the context of the extent of overall metropolitan growth in Melbourne.

McLoughlin's criticism of increased urban densities has led to widespread acceptance of the view that increasing outer urban densities is not a viable policy position. McLoughlin uses different definitions of density than Cardew.

Table 1: Density Definitions

Land Uses Contained in Definition	**1** Residential Lots Only (both single and strata-titled)	**2** Land Uses Contained in (1), Plus: Public streets and pedestrian/ cycle access ways	**3** Land Uses Contained in (2) plus: Local parks, local community facilities, primary schools, local commercial facilities	**4** Land Uses Contained in (3) plus: Share of arterial roads and dedicated public transport routes, regional parks, regional community and commercial facilities, secondary schools, mixed-use and business areas	**5** All Urban Uses Within Continuously Developed Urban Area
McLoughlin (1991)			Net Residential Density	Gross Residential Density	Overall Urban Density
Loder and Bayly et.al. (1994)	Site Density[1]	Net Dwelling Density[2]	Neighbourhood Dwelling Density		Urban Centre Dwelling Density[3]
Cardew (1996)	Site Density	Net Residential Density	Gross Residential Density	Release Area Density	Metropolitan Area Density
WAPC (2000)		Net Subdivisible Area Density[4]	Project Area Density		

McLoughlin believed that increased gross residential densities, both in the established city and in growth areas, saved insignificant amounts of land and did little to restrict outward urban growth. This is, he argued, because the amount of land required for roads and utility infrastructure, retail and service centres, schools and other community facilities, and public open space, must remain constant regardless of the area devoted to residential dwellings and the population of those areas. Given this constant, and since dwellings make up only part of any urban extension, increasing residential density in a new development must be subject to a principle of diminishing returns for overall metropolitan density. McLoughlin assumes that for every one million inhabitants in a metropolitan area, there needs to be 33,333 hectares of land dedicated to services and infrastructure. These are made up of 10,000 hectares of land dedicated to secondary schools, medium sized parks, local employment facilities, cultural and administrative centres (thus roughly matching the release area definition in Table 1), and 23,333 hectares for land uses with metropolitan-wide significance, such as freeways, railways, airports, large employment centres, universities, and large urban parks. This results in lower figures for release area and metropolitan density than for gross residential density of the urbanised areas. As a result, he argues, increasing the gross residential density from 30 to 40 people per hectare would only reduce the radius of the city by one kilometre, and 35 people per hectare by only 500 metres. Doubling gross residential density from 25 to 50 people per hectare

[1] Loder and Bayly advise to take separate site density measures for single- and strata-titled parts of residential areas.
[2] Only includes roads that provide legal access to lots.
[3] ABS metropolitan area definitions are used, which include a proportion of rural land at the urban fringe.
[4] Gross subdivisible area is also used and includes mandatory open space.

(100 per cent) would only increase the metropolitan density from 13.6 to 18.8 people per hectare (38 per cent).

Both McLoughlin, and Lewis (1999) believe that these areas of land devoted to services and infrastructure must be considered constants in a metropolitan context in the interest of quality of life, a concept not clearly defined other than in spatial terms. To reduce this land allocation would "make a direct assault on those qualities which make Melbourne liveable" (Lewis, 1999:117). McLoughlin's critique is underpinned by a belief that increasing urban density has significant economic, social and environmental costs. This position reinforces a preference for suburban development that is based on low-density, single-family housing, functional segregation and reliance on motor transport for movement of people and goods, consistent with the views of advocates of urban dispersal.

McLoughlin then proceeds to calculate the impact of an estimated growth in population of 660,000 between 1991 and 2001 on the rate of conversion of rural land to urban at the metropolitan fringe of Melbourne. This is done in two scenarios.

The first is of concentric growth along 100 kilometres of the perimeter of the 1991 built-up area, allowing for some 50 per cent of the perimeter as non-extendable due to geographical constraints. The second scenario is of new development concentrated in the three main outer growth corridors (Werribee/Wyndham, South Eastern/Casey-Cardinia and Plenty/Whittlesea) with an average width of 6 kilometres each. In both scenarios, uptake of new urban land between 1991 and 2001 would range between a figure of 31,429 and 18,333 hectares. The higher figure would be an increase of 15.5 per cent over the existing urbanised area in 1991 (Kenworthy & Laube, 1999) and is based on a gross residential density in new development of 25 persons per hectare, or about 7.5 housing units at McLoughlin's assumption of 3.3 inhabitants per dwelling. The lower figure would represent a 9 per cent increase in the metropolitan area based on a gross residential density of 50 persons, or about 15 housing units, per hectare.

McLoughlin subsequently employs his concentric growth scenario to demonstrate that the lower density figure would expand the average radius of the built-up area in 1991 of 30 kilometres by an additional 3.14 kilometres and the higher density figure by 1.83 kilometres, a growth rate of 10.5 per cent or 6.0 per cent respectively. In the corridor-based growth scenario, the length of urban expansion along the corridors, using these two density criteria, would range between 21.5 and 12.5 kilometres respectively in the case of Wyndham and Casey-Cardinia, and between 9.5 and 5.5 kilometres respectively in the case of Whittlesea. McLoughlin considers these variations too marginal to merit the effort required to achieve a higher density scenario, or to offset the social, economic and environmental costs he believes are associated with it.

McLoughlin's model contains assumptions about the character of urban development, spatial standards in residential and non-residential uses, and the feasibility and desirability of change within these patterns. Fifteen years onwards, it is time to review these assumptions.

CRITIQUE OF MCLOUGHLIN'S CASE

Three arguments are made against McLoughlin's position and that of others who share his view such as Braby (1989), Bunker (1986), Gutjahr (1991) and Lewis (1999).

The first addresses their argument that raising gross residential densities does little to restrict outward growth because the constancy of the amount of land required for non-residential purposes in a city must mean that the metropolitan density is only marginally affected. This argument contains a fundamental error. The amount of land needed for non-residential purposes is not a

constant and its reduction need not detrimentally affect the amenity of residents. It may actually improve amenity.

The area of land devoted to services and infrastructure McLoughlin considered fixed in its consumption of space depends on the expansion and configuration of residential areas and offers a range of opportunities for specific density increases with beneficial effects on urban amenity, or marginal adverse impacts. For example, shopping centres, conventionally consisting of land-consuming single-storey buildings surrounded by large parking lots in locations outside a walkable context, can be replaced by more accessible, mixed-use neighbourhood and town centres. Increased employment could occur in mixed-use centres rather than being concentrated in dedicated, car-dependent industrial areas or office parks. The ability of urban areas above a certain density threshold with walkable characteristics to support high-quality public transport and a substantial share of non-motorised travel would reduce the need for space-intensive high-capacity roads and parking facilities. Different subdivision patterns can reduce the amount of space allocated to local roads. The provision of open spaces can highlight their accessibility to the surrounding neighbourhood, and their spatial relationships with adjoining land uses as factors to be considered with size. Fundamentally, McLoughlin ignores the reciprocal relationships between residential density and the land needed for non-residential purposes. The length and width of both the arterial and local road network, and land provided for various utilities, is determined by the expansion of the urban area and the density of residents and jobs in it. The higher the residential density and the greater the reliance on high quality public transport and mixed-use centres, the less a city expands outward and the lower is the space required for roads and other services.

A theoretical calculation, using McLoughlin's own hypothetical example, can be used to demonstrate the unrealistic nature of his position. McLoughlin assumes that a city of one million must require 33,333 hectares for services and infrastructure, and therefore could not occupy an area less than 33,333 hectares even where the density of the residential precincts rises to infinity (i.e. assuming, for the sake of the model, that the residential areas are so dense they no longer occupy any space at all). McLoughlin's hypothetical city thus does not allow for a metropolitan density of more than 30 inhabitants per hectare under any circumstances. The inaccuracy of this assumption becomes obvious when considering the metropolitan density of most European cities, which commonly exceeds the limit of this theoretical calculation. European cities contain higher densities, such as Barcelona (191 inhabitants per hectare of metropolitan area), Helsinki (33), Zürich (44), Munich (56), Amsterdam (57) or Vienna (69) (UITP, 2001).

McLoughlin also errs in his assumption on the scope of uses which should be included in his calculation of the constant non-residential land supply. The difference between gross residential density and metropolitan area density, and the principle of diminishing returns when increasing the former has only limited relevance at the urban fringe where the potential for intensifying urban form is high. Additional large non-residential land-consuming uses with metropolitan significance in Melbourne's growth areas are limited. Therefore, the differences between the figures for gross residential density and metropolitan density when applied to the residential growth areas are unlikely to be major. As a result, increases in gross residential density will have a greater impact on the metropolitan density category (Cardew, 1996) in growth areas than on the metropolitan density of Melbourne as a whole. A local, rather than a metropolitan, perspective on density adjustments is required to appreciate their potential contribution to a more sustainable urban form in greenfield development.

In addition, some 22,200 hectares of industrial land is available in metropolitan Melbourne, of which approximately 5,100 is vacant. *Melbourne 2030* envisages an additional potential of 3,600 hectares to be zoned for industrial purposes by 2030 (DSE, 2003b). Hence a total of more than 8,700 hectares of additional industrial land is proposed, a figure which is almost 50 per cent of the

land supply for greenfield residential areas. This high amount of industrial land may represent a wasted resource, particularly compared to its potential conversion to denser residential and mixed-use on a model applied elsewhere in the residential growth areas. In addition, several thousand hectares of zoned industrial land is available for reuse in the established metropolitan area (DSE, 2004a:122,126). Less land-consumptive patterns of development and better integration of non-obtrusive industrial land uses are needed on land zoned for future industrial areas.

Secondly, McLoughlin's argument necessarily involves an underestimation of the potential for increased densities in the established urban area and on the urban fringe to save significant amounts of land. Table 2 shows that in his hypothetical example of a circular city of one million inhabitants, increasing the gross residential density from 30 to 50 persons per hectare would reduce the metropolitan area from 66,666 to 53,333 hectares, that is by 13,333 hectares. Thus a 67 per cent increase in gross residential density yields a drop in metropolitan land consumption of 20 per cent. Even under the unrealistic assumptions that inform McLoughlin's model, this is a significant result, although he minimises it.

The Victorian Government's Urban Development Program (DSE, 2004a) estimates that by shifting some demand from broadhectare land in growth areas to established areas (aspirational scenario), there is a potential for saving approximately 29,000 lots in growth areas in the 15 years to 2019 by reducing the uptake from the trend scenario of 151,000 lots. This is a potential saving of about 19 per cent. This figure is significantly lower than the potential reduction in land uptake of 33 per cent that would eventuate if the level of demand specified in the trend scenario was maintained but gross residential densities were to increase from 10 to 15 lots per hectare. A combination of an aspirational projection of greenfield dwelling demand and increased gross residential densities would yield a land saving of nearly 7,000 out of 15,100 hectares, or 46 per cent, over a trend projection with unchanged densities.

Table 2: Density Modelling After McLoughlin (1991) and Lewis (1999), Based on a Hypothetical, Circle-Shaped City of One Million People

Gross Residential Density (people per hectare)	**Gross Residential Area** (hectares)	**Release Area** (hectares)	**Release Area Density** (people per hectare)	**Metropolitan Area** (hectares)	**Metropolitan Area Density** (people per hectare)	**Urban Radius** (km)
25	40,000	50,000	20.0	73,333	13.6	15.3
30	33,333	43,333	23.1	66,666	15.0	14.6
35	28,571	38,571	25.9	61,904	16.2	14.0
40	25,000	35,000	28.6	58,333	17.1	13.6
45	22,222	32,222	31.0	55,555	18.0	13.3
50	20,000	30,000	33.3	53,333	18.8	13.3
2000	500	10,500	95.2	33,833	29.6	10.0
Infinite	0	10,000	100.0	33,333	30.0	10.0

Table 3 summarises these scenarios, utlilising the Department of Sustainability and Environment's (DSE) projected 15-year demand figures for the Trend and Aspirational cases (DSE, 2004a), each combined with current (10 units per hectare) and Melbourne 2030 target (15 units per hectare) gross residential densities. This calculation shows that a greater impact will be gained from increasing density within the range envisaged by Melbourne 2030 than by moving from the trend to the aspirational scenario without changing densities. The gross residential density figures used here are composites of a range of assumptions regarding site density and the relative land requirements for roads and access, open spaces and other non-residential uses.

Table 3: Achievable Land Savings under Various Scenarios with Constant Assumptions on Housing Demand: GRD = Gross Residential Density; Column 1 derived from Table 3.1, DSE 2004a

	Number of Housing Units 2004–2019	Gross Residential Land Required (hectares)	Land Savings Compared to Scenario Trend, 10 units per hectare
Scenario Trend, GRD of 10 units per hectare	151,000	15,100	
Scenario Aspiration, GRD of 10 units per hectare	122,000	12,200	**19%**
Scenario Trend, GRD of 15 units per hectare	151,000	10,067	**33%**
Scenario Aspiration, GRD of 15 units per hectare	122,000	8,133	**46%**

Thirdly**,** the argument against increasing densities also underestimated both the potential scale and the rapidity of change. McLoughlin (1991:153) predicted in 1991 that "population levels are likely to go on falling in most inner and middle-ring suburbs" and that "even if… intra-urban consolidation would occur… it will take some considerable time; not much will be achieved by 2001 compared with the much easier fringe-and-corridor growth". Soon after this prediction, patterns of urban growth in Melbourne began to change fundamentally. The amount of medium density and high-rise housing increased by over 600 per cent in the ten years from 1991, and between 1996 and 2001 accounted for 40 per cent of all residential development (Buxton & Tieman, 2004, 2005). McLoughlin's 1991 projection of a metropolitan population growth of 660,000 within 10 years proved to be almost twice the actual rate, amounting to just over 340,000 during the 1991–2001 period (ABS, 2003). The population in inner Melbourne increased by 75,000 inhabitants during the same decade, accounting for 22 per cent of total metropolitan growth (ABS, 2003).

It is usually assumed that cities change slowly and that increasing density in areas set aside for new growth will not significantly increase the density of the total metropolitan area because of the disproportionate size of each. This argument has been used by Stretton (1996) and others against using changes to urban form as a method of achieving higher energy efficiency in a city. However, the proposed increase in the residential area of Melbourne through residential development in the growth areas between 2001 and 2031 is nearly 20,000 hectares (DSE, 2003a), an increase of about 8 per cent over the total urbanised area of Melbourne (UITP, 2001). This figure is for greenfield residential developments only and does not include the future expansion of industrial areas on previously undeveloped land. Total new housing, including both greenfield development and residential development planned within the established metropolitan area, will constitute an increase of 402,000 housing units between 2002 and 2019 (DSE, 2004a), or 30 per cent over the 2001 metropolitan base figure of 1,344,926 (ABS, 2003).

A strategy of substantially increasing gross residential density on the fringe plus decreasing the amount of land required for services and infrastructure (increasing release area and metropolitan density), coupled with substantial infill at major sites and nominated mixed-use activity centres, and limited redevelopment of existing residential areas, is a viable strategic approach to reducing the outward spread of Melbourne and substantially increasing the residential density of Melbourne both in nominated areas and overall.

LAND AVAILABILITY AND DEMAND

There are three sources of land for future dwelling construction in Melbourne: greenfield land in urban growth areas; land in nominated activity centres, major development sites in activity centres and other infill locations; and dispersed development anywhere in the metropolitan area, such as residential streets.

The VictorianGovernment has compared trend and aspirational scenarios. Trend scenarios indicate the number of housing starts (or developed lots) in various areas under current distribution patterns, while aspirational scenarios show the distribution patterns sought by *Melbourne 2030*. The proportion of development in outer urban growth areas, or greenfield sites, is expected to fall from the trend of 38 to the aspirational target of 31 per cent. Dispersed urban and non-urban residential development across metropolitan Melbourne, defined as development anywhere in residential areas, is to be reduced from 38 to 28 per cent of total new dwellings approved, and new dwellings in activity centres and major redevelopment sites are to be increased from 24 to 41 per cent of the total (Table 4).

Table 4: Proposed Housing Starts in Metropolitan Melbourne, Based on an Anticipated Demand of 634,500 Additional Housing Units between 2001–2031. Source DSE, 2004a

Location	Scenario Trend		Scenario Aspiration	
	%	No. of Units	%	No. of Units
Greenfield	38	241,100	31	196,700
Activity Centres and Major Redevelopment Sites	24	152,300	41	260,100
Dispersed in Established Areas	38	241,100	28	177,700
Total	**100**	**634,500**	**100**	**634,500**

Melbourne's land supply compares very favourably to most other world cities. On 2004 figures, about 180,500 additional broadhectare or greenfield lots are available in the growth areas (DSE, 2004a:19), assuming rates of development at the low current average gross residential density of 10 lots per hectare; 67 per cent of this land is already zoned for residential purposes (DSE, 2004a). This is 18 years supply of greenfield land in designated growth areas at trend demand and unchanged densities, 22 years supply at aspirational demand and unchanged densities, and 26 years supply at aspirational demand and increased densities to a new average of 12.5 dwellings per hectare (DSE, 2004a). The Government's 15-year supply target in broadhectare land across metropolitan Melbourne is exceeded under both the current and aspirational trends. A substantial land bank remains in most specific growth areas.

Broadhectare lot construction in Melbourne occurred at a rate of 17,756 dwellings per year for 2002–03 (DSE, 2004a, Table 3.2), up from 14,300 reported in the 2003 UDP (DSE, 2003b). If this rate continues it represents only 10 years greenfield land supply. The latest UDP (DSE, 2004a) assumes that a total of 354,250 dwellings will be required between 2004 and 2019 in the established and greenfield areas of Melbourne, a yearly average of 23,600. Dwelling approvals in the 2002–03 financial year totalled 35,692 (ABS, various years). This means that the recent annual rate of dwellings being constructed on greenfield sites (17,756) is equivalent to about 75 per cent of the predicted average yearly demand for total new dwellings between 2004–2019 (23,600) and about one half of the dwelling approvals in the year 2002–03. This current rate of greenfield housing production almost certainly exceeds even the trend scenario figure of 38 per cent of total residential demand for 2002–03 specified in Melbourne 2030. In the future, the trend scenario would enable only 9,000 greenfield dwellings to be constructed annually. Under the aspirational scenario, the figure of 17,756 must be reduced to 7,300 dwellings.

The UDP shows that, the amount of land within the UGB (including some minor exceptions outside) available for greenfield residential development to satisfy demand was 17,976 hectares in March 2004. Of this figure, 15,425 hectares (86 per cent) are located within six municipalities identified as designated growth areas (DSE, 2004a, and UDP website maps and data). These are shown in table 5.

Each of these growth areas has already experienced rapid population growth during recent years. Between 1991 and 2001, the number of dwelling units in Casey and Cardinia grew by 54 per cent, in Whittlesea by 32 per cent, in Hume by 38 per cent, in Melton by 58 per cent and in Wyndham by 49 per cent, against a Melbourne-wide figure of 18 per cent (ABS, 2003). On current trends, the six growth area municipalities will have well in excess of one million inhabitants between them by 2030 (from just over 600,000 in 2001), nearly the equivalent of present-day Perth or Auckland.

In the west (including the Wyndham and Melton East growth areas and the municipalities of Wyndham, Hobsons Bay, Maribyrnong, Moonee Valley, Brimbank and Melton), significant additional greenfield development will continue. More than 15 years land supply exists for broadhectare development with 55,092 lots available (80 per cent of which are already zoned residential) and 54,204 expected to be developed under the trend, and 40,391 under the aspirational scenarios over 15 years. Most land is available in Wyndham and Melton. A projected 15-year supply exists in the Caroline Springs and Melton area, with most available in Melton and 6–8 years supply in Caroline Springs. An additional 28,841 lots are proposed for development in established areas under the trend scenario, and 42,653 under the aspirational scenario.

Table 5: Greenfield (Broadhectare) Residential Land Available in Metropolitan Melbourne
Source: DSE, 2004a (Compiled from UPD 2004 online maps)

LGA	**Available Broadhectare Gross Residential Land in Hectares (DSE, 2004a)**			
	Anticipated Take-Up 2004–2005	Anticipated Take-Up 2006–2008	Supply 2009 and Beyond	**Total from 2004**
Cardinia	269	569	1,669	**2,507**
Casey	696	1,046	1,090	**2,832**
Hume	303	519	747	**1,569**
Melton	626	779	473	**1,878**
Whittlesea	468	1,019	1,990	**3,478**
Wyndham	687	830	1,643	**3,161**
Total Growth Areas	**3,050**	**4,762**	**7,613**	**15,425**
Non-Growth Areas	488	1,140	923	**2,552**
Total Melbourne	**3,538**	**5,902**	**8,536**	**17,976**

In the north (including the Craigieburn, Epping North and Mernda growth areas and the municipalities of Whittlesea, Hume, Moreland, Banyule, Nillumbik and Darebin), significant development will also continue. More than 20 years supply exists for broadhectare development, with 56,286 lots available (70 per cent of which are already zoned residential) and 34,963 expected to be developed under the trend and 26,002 under the aspirational scenarios. Most land is available in the Whittlesea and Hume growth areas. A 15-year supply exists in Hume, with 15,560 lots available with 14,907 projected to be developed by 2019 under the trend scenario. Land availability in Whittlesea is more than double the 15-year requirement with 38,500 lots available (61 per cent of which are currently zoned residential) and 18,353 projected to be developed under the trend scenario. A 6–10 year supply exists in Craigieburn in Hume under the trend and 10–12 years supply under the aspirational scenarios. An additional 21,183 lots are proposed for development in established areas under the trend, and 30,144 under the aspirational scenarios.

The south region is expected to account for 40 per cent of future greenfield development over the next 15 years. This region comprises the municipalities of Bayside, Cardinia, Casey, Frankston, Glen Eira, Greater Dandenong, Kingston and Mornington Peninsula. Casey has provided most land in recent years but increasingly the Cranbourne area of Casey and Cardinia will provide the bulk of

land, with one third of available identified land in Casey and two thirds in Cardinia requiring rezoning for residential use. A substantial land supply is available in the south eastern growth area, with 65,980 lots available (54 per cent of which are already zoned residential) and 58,760 expected to be developed under the trend and 52,109 under the aspirational scenarios over 15 years. Of this, 24,974 lots are available in Cardinia, substantially exceeding the trend scenario projection of 18,073 over 15 years. About 15 years supply is available in Casey, with 27,406 lots available and a projected development of 27,355 lots by 2019 under the trend scenario. An additional 48,549 dwellings are proposed for development in established areas under the trend and 55,199 under the aspirational scenarios (all figures derived from data for broadhectare lot construction potential and projected additional dwellings for growth areas, DSE, 2004a).

In summary, under the Melbourne 2030 aspirational scenario, 196,700 greenfield dwellings are expected to be constructed to 2031, while 180,500 lots currently exist and a 22-year supply at average densities of about 10 lots per hectare. A total of 241,100 lots would be required under the trend scenario, suggesting an 18-year supply. However, 225,625 lots, or a 26-year supply, would be available at the 12.5 lots per hectare average proposed under Melbourne 2030, which would exceed the aspirational dwelling numbers to 2030 and provide a supply beyond the year 2031. On the trend scenarios to 2019, more than 15 years supply exists in all growth areas at the current average densities of 10 lots per hectare.

Table 6: Overview of Future Housing Supply and Demand in Sub-Metropolitan Regions
Source: DSE, 2004a.

Region	Greenfield Supply: Total lots (10 dw/ha)	Greenfield Demand: Trend to 2019	Greenfield Demand: Aspiration to 2019	Greenfield Years Supply (Trend)	Greenfield Years Supply (Aspiration)	Established Areas Demand (Trend)	Established Areas Demand (Aspiration)	Total Demand
West (inc. Melton and Wyndham)	55,092	54,204	40,391	+15	+24	28,841	42,653	83,045
North (inc. Hume and Whittlesea)	56,286	34,963	26,002	+24	+25	21,183	30,144	56,146
East	3,104	3,248	3,330	+16	+15	48,083	48,001	51,331
South (inc. Casey and Cardinia)	65,980	58,760	52,109	+17	+22	48,549	55,199	107.309
Inner						56,418	56,418	56,418
Metro Melbourne	**180,382**	**151,175**	**121,833**	**+18**	**+26**	**203,073**	**232,416**	**354,248**

DISCUSSION OF ISSUES

A number of issues arise from these figures and the assumptions behind them.

Firstly, the Government's selection of a 15-year time frame as a buffer is exceptional by world standards.

Secondly, it is likely that the Government's commitment to maintaining a 15-year land supply will be interpreted as requiring this buffer in every growth area and region. There is no reason why this should be so. Land availability in these areas could reasonably be considered in the context of total regional and gross metropolitan land supply.

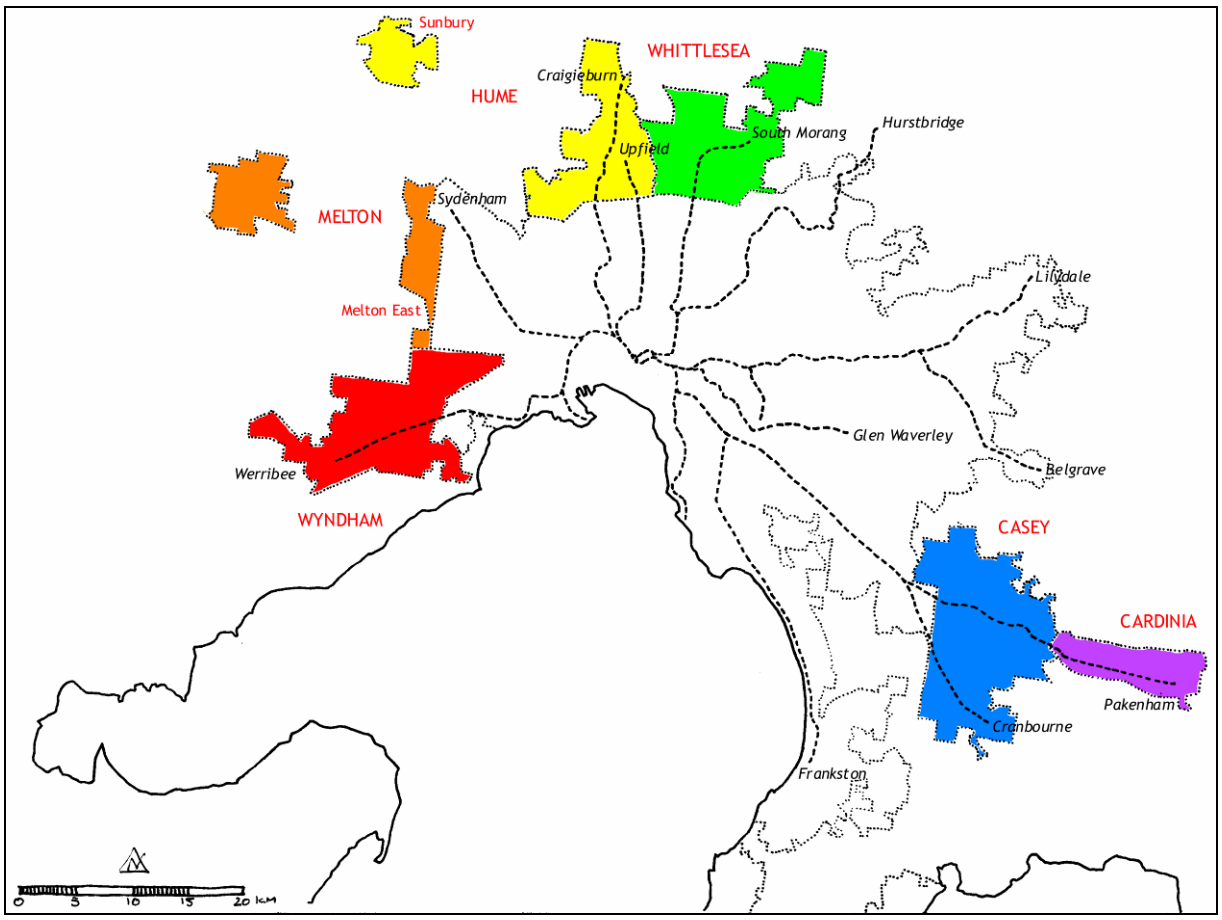

Figure 2: ***Overview of Melbourne's Growth Areas, Showing the Urban Growth Boundary and Suburban Rail Network, Including Proposed Extensions According to Melbourne 2030***

*Thirdly***,** Melbourne 2030 contains no method of achieving the strategy's dual aspirational aims of reduced rates of broadhectare development in growth areas and increased rates of development in activity centres in established areas. The operations of the market are not delivering the required reduction of the rate of greenfield development sought by Melbourne 2030. It is likely that only substantial government intervention will achieve the change sought, in particular, through a reduction in the annual rate of residentially zoned and subdivided land approved for development. However, the Government is taking the opposite course of action by undertaking to maintain a 15-year buffer of available land in urban growth areas. This removes the incentive for the redirection of investment from growth areas to activity centres and for more efficient use of land through increased densities. The continuing availability of such a large land supply promotes land releases determined not by government public policy aspirations but by developer conservatism and profits. With few exceptions, different development companies build different types of housing in either growth or established areas, but not both, catering to different markets. Companies building detached housing in outer urban areas will not easily shift to building partments and town houses in activity centres. The most likely impact of the UGB is to concentrate investment into growth areas, not to redirect it into activity centres.

Fourthly, residential land values have increased in Victoria, but the increase is not due to the introduction of a legislated UGB. The UGB did not fundamentally change Melbourne's strategic corridor/green wedge plan, only its method of implementation, and increased the area of growth area land significantly in 2004. There is no land shortage in the growth areas. Sequencing and land release is being determined by the market, not by government at present.

Fifthly, the projections for land supply in the established areas and in outer urban growth areas significantly underestimate the true availability of land for infill sites and broadhectare land, but

may overestimate the availability of land for dispersed development anywhere within the existing metropolitan area. Melbourne 2030 estimates that 170,000 additional dwellings will be built as dispersed residential development to 2030. This figure is arbitrary and its method of calculation not explained. The figure is over twice the amount of medium and high-rise development constructed in the metropolitan area in the ten years from 1991–2001. On the other hand, estimates of dwelling yield from specific infill sites, at 84,200, almost certainly underestimate the land available. Broadhectare land would also yield considerably more dwellings than projected if dwelling density was increased.

SUSTAINABILITY AND URBAN CONTAINMENT IN MELBOURNE'S GROWTH AREAS

Various scenarios can be proposed to demonstrate alternative approaches to conventional broadhectare greenfield development. The capacity of the existing growth areas for additional residential development is calculated under various assumptions of target density (table 7).

The capacity of growth areas for additional residential development was calculated using various assumptions of target density in three scenarios. Current projections of demand for greenfield residential development were used together with the trend for residential densities as identified in the UDP (DSE, 2004a).

Table 7: Overview of Dwelling Yield by Growth Area Municipality under the Four Density Scenarios, Assuming a Constant Land Supply, and Additional Dwelling Yield in Per Cent over the No Change Scenario. Based on DSE 2004a

LGA	Available Greenfield Land in Hectares	Overview of Greenfield Dwelling Yields under the Four Scenarios			
		No Change No change until 2008, 10 dw/ha from 2009	**Scenario 1** No change until 2008, 12.5 dw/ha from 2009	**Scenario 2** 12.5 dw/ha from 2006, 15 dw/ha from 2009	**Scenario 3** 15 dw/ha from 2006, 20 dw/ha from 2009
Cardinia	2,507	24,974	29,560 (+18%)	34,803 (+39%)	44,570 (+78%)
Casey	2,832	27,406	30,563 (+12%)	36,400 (+33%)	44,465 (+62%)
Hume	1,569	15,560	17,048 (+10%)	20,865 (+34%)	25,897 (+66%)
Melton	1,878	18,823	20,354 (+8%)	22,974 (+22%)	27,285 (+45%)
Whittlesea	3,478	38,500	40,954 (+6%)	47,308 (+23%)	59,808 (+55%)
Wyndham	3,161	32,809	36,555 (+11%)	42,439 (+29%)	52,730 (+61%)
Total Growth Areas	**15,425**	**158,072**	**175,034 (+11%)**	**204,789 (+30%)**	**254,756 (+61%)**
Non-Growth Areas	2,552	22,310	26,029 (+17%)	33,052 (+48%)	40,519 (+82%)
Total Melbourne	**17,976**	**180,382**	**201,062 (+11%)**	**237,841 (+32%)**	**295,275 (+64%)**

To what extent are development companies delivering urban sustainability outcomes? Conventional greenfield development is characterised by large average lot sizes, poor street connectivity, relatively uniform housing types with no particular solar orientation or adherence to environmental features in single-use, car-dependent suburbs. However, an analysis of recent greenfield developments in outer urban corridors, and an assessment of compliance of some subdivisions to sustainability criteria, as case studies, shows some change in the nature of greenfield development.

In particular, variable but generally satisfactory performance was often evident on connectivity and the integration of environmental features with the built environment, especially the solar orientation of buildings. Modified grid systems are increasingly being used instead of movement systems based on a hierarchical, curvilinear pattern with numerous cul-de-sacs. A market segment of smaller houses on smaller blocks has emerged. Changes in strategic planning at state and local council levels from the late 1990s and changes in developer practice are probably responsible for these changes. These trends should become more widely adopted in the implementation of the Victorian mandatory 5 star energy efficiency and water standards, and a revised Clause 56 to ResCode outlining new design standards for greenfield development. However, average densities and lot sizes remain comparatively high. Attached housing and multiple dwellings are rare.

Table 8 evaluates the major greenfield developments in the growth area municipalities identified in the 2000 Residential Forecast (DOI, 2000) against a set of sustainable design criteria.

Table 8: Compliance with Sustainability Criteria Across Recent Greenfield Development in Melbourne's Growth Areas (in Percentage of Major Development Projects Weighted by Number of Housing Units) Based on DOI 2000

LGA	Connectivity of Movement Network	Integration of Watercourses	Easy Access to Local Parks	Mix of Housing Forms and/or Lot Sizes	Solar Orientation of Lots
Cardinia Berwick Views, Pakenham Park, Panorama	**100%**	**80%**	**92%**	**80%**	**50%**
Casey Timbarra, Redwood, Lynbrook, Ormond Rise, Woodlands, St John's Wood, Kingsmere, Hillsmeade, Cypress Hill, Berwick Springs, Central Park, Brindalee Park	**69%**	**69%**	**40%**	**52%**	**66%**
Hume Creekwood Village, Fairways Village, Jacksons Hill, Mickleham Grande, Roxburgh Park	**91%**	**98%**	**93%**	**98%**	**55%**
Melton Banchory Grove, Bellevue Hill, Burnside, Caroline Springs, Taylors Hill, Watervale	**70%**	**40%**	**77%**	**79%**	**76%**
Whittlesea Botanica Park, Laurimar Park, Mill Park Lakes, Rivergum	**40%**	**100%**	**96%**	**23%**	**26%**
Wyndham Conquest Park, Deloraine, Dunraven Heights, Knightsbridge, Newminster, Sanctuary Lakes, The Boardwalk, Wyndham Green	**60%**	**79%**	**73%**	**57%**	**78%**
Total Growth Areas	**74%**	**70%**	**70%**	**68%**	**79%**

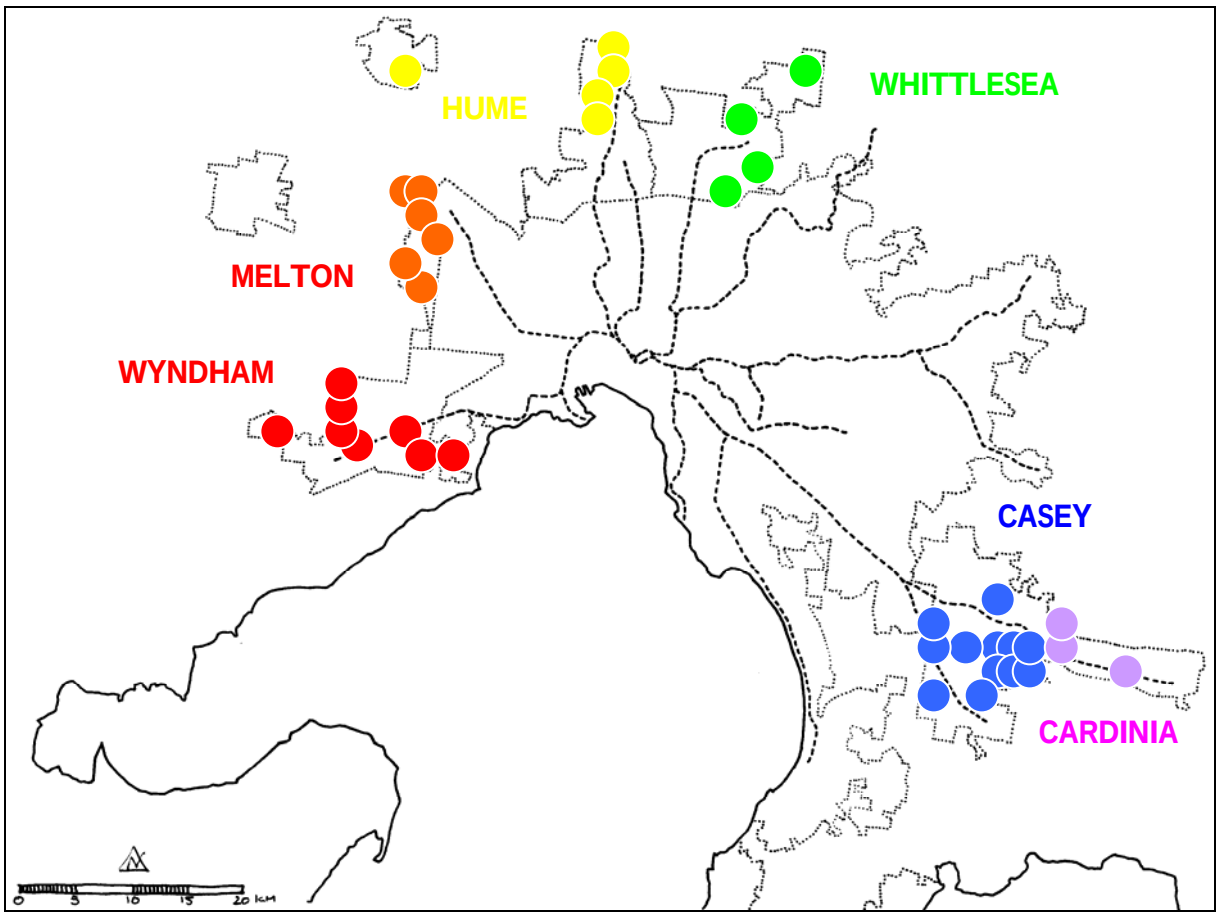

Figure 3: Location of Major Greenfield Developments as Identified in the 2000 Residential Forecast
Source: DOI 2000, Table 16

CONCLUSION

The new Melbourne metropolitan strategic land use plan has developed a framework of policies aimed at increasing Melbourne's compactness. However, the plan and its implementation ignores the importance of increasing residential density in new outer urban growth areas. This failure is influenced by both conceptions about the unimportance of increasing outer urban residential density and the role of government as a facilitator for decisions by development companies. The failure will also lead to serious environmental, economic and social impacts unless the government fully realizes its objective of reclaiming metropolitan planning by adopting criteria to redesign new outer suburbs.

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