Synergistic density: Exploring the potential of correlating infill development with upgraded public open space in greyfield suburbs

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ABSTRACT

This paper explores the potential of a new strategy for achieving infill development in Australian greyfield suburbs. This strategy concerns the residential densification of areas adjacent to upgraded public open space (POS). The paper argues the correlation of upgraded POS and residential densification could achieve positive synergies. These synergies include the provision of significant amenity developed as an incentive for local communities to support infill development that achieve higher residential densities. The potential of this approach is tested, in a design projection exercise, in the Perth greyfield Local Government Area of Bayswater which has significant infill targets and large reserves of POS. Parks and street verges contain the most amount of land of all the POS types in the study area and as such they form the principal focus of this research paper.

Keywords

Infill development, public open space, street verges, greyfield

Introduction

The context of this research paper is the stress placed on the need for residential urban infill development in the current planning policies of all Australian state and territory capital cities. Infill development is typically being sought to maintain and protect both rural and biodiversity rich land on city fringes (NSW Government, 2010) and reduce infrastructure costs, commuting times, and the continued concentration of economic and social vulnerabilities on the fringes of our cities (Kelly et al., 2011b). Collectively, capital city planning policies stipulate that 60% of all new residential development should be infill (Bolleter and Weller, 2013) and yet it is predicted that only 45% will be achieved in 2013 and 2014 (Australian Commonwealth Government, 2010). This shortfall can be explained by a variety of factors such as typically
piecemeal, unplanned approaches to infill development, community resistance (the NIMBY\textsuperscript{1} factor), and both a lack of successful benchmark projects and incentives for developers. Given Australia’s population is projected to grow from 23 million to 42.5 million by 2056\textsuperscript{2} (Australian Bureau of Statistics, 2011) this current shortfall in meeting infill targets, if continued, will seriously compound over time. At a regional scale the failure of Australian cities to meet their respective infill targets means that they will continue to sprawl in what is recognised as a typically unhealthy, costly, unsustainable and unproductive manner (Dodson and Sipe, 2008, Kelly et al., 2011a, Newman et al., 2009, Department of Planning Government of Western Australia, 2010). At the same time the sprawl will create a process for the growth of city form which will become increasingly difficult to reverse.

In pursuit of infill development, urban planning strategies have focused primarily on Activity Centres, otherwise known as Transit Oriented Developments (TODs) (Calthorpe and Fulton, 2001) and the possibility of increased residential density along major road corridors (Duckworth-Smith, 2012, City of Melbourne, 2010, Woodcock et al., 2010).\textsuperscript{3} While these fundamental approaches have validity, it is our contention that for Australian cities to be truly resilient\textsuperscript{4} we need a greater diversity of strategies for achieving the required infill development.

To date, the potential advantages of upgrading existing POS, principally parks and streetscapes, in Australia’s greyfield suburbs as a means of providing enhanced amenity to encourage and enable increased residential density has not been researched. It is our hypothesis that the optimal provision of upgraded POS which provides increased amenity, can offer an incentive for greyfield communities to support well designed infill development at higher densities than are currently being achieved.\textsuperscript{5} Studies have shown that residents are willing to

\textsuperscript{1} NIMBY is an acronym ‘not in my back yard.’

\textsuperscript{2} This projection is the ‘series A’ projection which is the highest provided by the Australian Bureau of Statistics.

\textsuperscript{3} In fact much of the infill development that has been achieved in recent years is through opportunistic subdivision of individual lots resulting in the loss of the Australian backyard and its replacement with typically unusable residual spaces HALL, T. 2010. The Life and Death of the Australian Backyard, Collingwood Victoria, CSIRO Publishing..

\textsuperscript{4} The ‘resilience’ of cities refers to their ability to respond to crises and adapt in a way that may cause them to grow differently NEWMAN, P., BEATLEY, T. & BOYER, H. 2009. Resilient Cities, Island Press.

\textsuperscript{5} Haphazard ‘do it yourself’ (DIY) subdivision of suburban backyards typically achieves a doubling to tripling of current densities but with reduced amenity. Through a planned, precinct based approach it is reasonable to expect this density increase would be higher and with improved amenity.
trade off paying higher prices for houses adjacent to good quality POS (Crompton, 2007). As such, we argue, people will potentially accept trade-offs such as living in a higher density or allowing greater residential densification in their neighbourhood if it ensures them access to high quality POS. In addition, we posit that infill models concentrated adjacent to upgraded POS will provide positive health outcomes for occupants.

It is well recognised that POS plays a variety of important roles in our community. Parks in particular, provide a venue for social interaction, play and active and passive recreation for children and adults which benefits individual and community health and wellbeing (Wood, 2008). Parks also have the potential to provide ecosystem services such biodiversity, reduced ambient temperature, improved air quality and assist with urban water management systems (Western Australia Department of Sport and Recreation, 2010). Street verges while often being an often overlooked public resource (Thompson and Meenachi-Sunderam, 2007) in fact contain a significant cumulative land area. In this respect, street verges have potential to provide far greater amenity and ecosystems services than they do in their current underperforming state.

The following sections of this paper explore, through a spatial ‘design projection’ exercise (Swaffield and Deming, 2011), the potential synergies of residential infill development occurring adjacent to the upgraded POS of parks and streetscapes.

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6 Verges are legally the property of local governments and as such they can be considered as POS THOMPSON, S. & MEENACHI-SUNDERAM, D. The Nature Strip: An Environmental and Social Resource for Local Communities. Satate of Australian Cities, 2007 University of South Australia, Adelaide.
Testing the correlation of infill development and upgraded POS in the study area

The study area selected for this exercise of design projection is the Local Government precinct of Bayswater which is situated 6km north east of Perth’s central business district (Fig 1). Located in the middle ring of Perth’s suburban form, the study area contains under-utilised property assets, infrastructure and services which are characteristic of greyfield suburbs across Australia (Newton et al., 2011). As such the research findings proposed in this paper should be generalisable, within reason, to the greyfield suburbs of Australia’s other capital cities.

Figure 1: The study area

The study area has a high infill development target, seeking the provision of an additional 8500 dwellings (or approximately 19,550 people) by 2031 (Department of Planning Government of Western Australia, 2010). While a Town Planning Scheme (TPS) has been adopted by the City of Bayswater which sets out how the additional infill dwellings will be distributed, there remains no clear plan for how, or indeed whether, POS will be upgraded to provide amenity and ecosystem services to this increased population. This is problematic in that infill development in the study area, to date, has resulted in the loss of large private gardens which at one point would have provided substantial amenity and ecosystem services (Hall, 2010). This situation is reflected
in the fact that the Bayswater LGA lost 11.9% of its vegetation cover between 2001-2004 alone (McManus, 2010), through the progressive subdivision of large residential blocks (Fig 2).

Figure 2: Typical DIY subdivision of suburban backyards in the study area has resulted in the loss of significant vegetation cover which historically provided ecosystem services

A survey of the study area reveals that while there is a large amount of POS much of it is underutilised. This ubiquitous landscape, comprising parks, school grounds and verges, is typically turfed and equals a vast 563 Hectares or 17% of the area of the total study area. This pastoral landscape, offers little in ecological and, to a degree, social terms and consumes increasingly valuable resources such as fertilizer, water (Grose, 2010), and energy.7 The classification of the study area’s POS into a series of types and the measurement of their respective areas is illuminating; of the study area’s 563 Ha of POS, the area of street verges equals 403 Ha (or 72% of the total amount of POS) and the area of parks equals 54 Ha (10%)

7 This overall situation of low performing POS can be partly explained through the fact that there has never been a coordinated, holistic plan for these remnant POS which could begin to address either their cumulative inputs, or alternately their cumulative potential; the management of remnant POS being the responsibility of a number of different stakeholders who have not traditionally been well integrated. Perhaps most significantly, these ubiquitous landscapes are often only thought of as having a singular aesthetic or recreational function and beyond that are not actually expected to do anything.
(Fig 3,4). The remaining areas of POS include drainage reserves (6%), foreshore reserves (5%), freeway reserves (3%), schools (3%) and railway reserves (1%). Given their significant area and their occurrence in other greyfield settings this paper explores the potential, in spatial terms, of the upgrading of both streetscapes and parks to incentivise and compensate for urban densification.

Figure 3: The remnant POS types of the study area. Despite initial appearances the largest area of POS is found in verges.
Figure 4: The pastoral nature of POS within the study area requires significant inputs of water, fertiliser and energy for its survival.

The potential of correlating upgraded parks and residential densification in the study area

As has been discussed, the existing planning for infill development in the study area does not correlate POS and residential densification to any significant degree, rather densification is proposed principally in relation to public transport nodes, in particular those in Maylands and Morley (Fig 5). To provide an alternative to this situation we propose a new model in which urban densification is correlated with access to both parks and public transport. To establish the metrics associated with this proposed densification we initially established a 1400m, 5 minute cycleable catchment\(^8\) centred around the existing major public transport nodes (three train stations and a bus port). Following this we identified all the parks within this cycleable catchment of public transport and delineated a 200m walkable catchment around these parks\(^9\) (Fig 6). Our calculations are that this resulting developable area of 294 Ha would need to be developed at \(~R40\) to achieve the study area’s infill target of 8500 dwellings.\(^{10}\)

\(^{8}\) Cyclists average about 17km per hour DEAKIN UNIVERSITY AUSTRALIA. 2013. Walking Bike Riding [Online]. Melbourne. Available: http://www.deakin.edu.au/travelsmart/walking-cycling.php [Accessed 27.04 2013]. as such a cyclist takes about 5 minutes to travel 1400m. The 5minute cycleable catchment has been proposed as an alternative to the orthodox 5 minute walkable catchment as it is better suited to both the study area’s sprawled urban form.

\(^{9}\) This figure reflects studies from the USA which have shown that approximately 80% of the price effects of parks occur within 200m of parks CROMPTON, J. 2007. The impact of parks on property values: empirical evidence from the past two decades in the United States. Managing Leisure, 10, 203-218. This will be discussed in greater detail later in the paper.

\(^{10}\) There are presently 4,511 dwellings in this area. When these are added to the infill target of 8,500 dwellings the total number of dwellings to be accounted for is 13,011. To achieve this in the given area requires a density of R44. This density has roughly informed our visualisations of densification which follow.
Figure 5: The existing Town Planning Scheme for the study area does not correlate public open space with proposed residential densification to any significant degree.
Figure 6: Potentially developable areas within a 5 minute cycleable catchment of public transport nodes and a 200m walkable catchment of POS. These areas arguably offer very good access to public transport and also potentially significant amenity if the parks are upgraded.

The existing parks within the 5 minutes cycleable catchment of public transport nodes are typically ‘District Parks’, as defined in the Perth’s Plan for the Metropolitan Region Perth and Fremantle (Stephenson and Hepburn, 1955). These district parks cater primarily for organised team sports and as such are dominated by large turfed ovals (Fig 7). This form of POS can be regarded as being increasingly out of step with changing recreational patterns and the demands of populations living at increased residential densities. Data from both the Australian Bureau of Statistics (ABS) (2010) and Western Australian Physical Activity Taskforce (2009) indicate that the most prevalent form of exercise for Australians is now walking, either for recreation or transport, not organised team sports.¹¹

¹¹ The average Australian will spend 81 minutes a week walking, 34 minutes gardening, 12 minutes cycling, but only 6 minutes participating in organised sports AUSTRALIAN BUREAU OF STATISTICS 2010. Participation in Sport and Physical Recreation. Canberra: Australian Bureau of Statistics.
Figure 7: Hillcrest Park which is located within a cycleable catchment of public transport offers little other than the infrastructure required for organised team sports. The parks appears to exert little effect on the surrounding suburban form which is typically low density (~R12-25)

In light of this situation we believe that the hierarchies by which existing parks are considered in greyfield settings could be reconfigured to adapt to these changing recreational patterns, and the necessary adjacent levels of residential densification. A sketch of this hierarchy of POS within the study area includes ‘Urban Parks,’ located in the aforementioned cycleable catchment of public transport, and ‘Suburban Parks,’ located outside of these zones and in areas where residential densification is unlikely to occur (Fig 6). Significantly the park types referred to in this hierarchy are not defined primarily by their size and frequency of distribution, as is found in the Stephenson and Hepburn planning for POS (Stephenson and Hepburn, 1955) and Liveable Neighbourhoods (West Australian Planning Commission and Infrastructure, 2007). Rather the parks are defined in terms of the relationship to residential density and the correlating level of funding they require both for their initial upgrade and ongoing maintenance; the presumption being that parks in denser settings need to be higher performance, and as such require higher budgets.

**Urban Parks**

In this hierarchy Urban Parks located within the cycleable catchment of public transport nodes would be designed to be ‘high performance’ with respect to the provision of both amenity and, to a degree, ecosystem services. In terms of amenity the Urban Parks would be dedicated to passive
and informal active recreation in preference to organised team sports requiring large ovals. While children in this region will still require access to ovals this could be provided for in the existing school sites which all presently have ovals. The upgraded Urban Parks could include community gardens, spaces for social activities, facilities for passive recreation such as walking, facilities for informal active recreation pursuits such as jogging, volleyball, table tennis, and challenging play spaces for children of various ages. Importantly the Urban Parks would be highly ‘designed’ evoking an identity for the park and its immediate context. These parks are the flexible, robust and participatory communal backyards for people living at higher densities (Fig 8).

The Urban Parks would also be reconfigured so as to provide some ecosystem services to their adjacent residential populations. Given their comparatively small area and the demands of people living at higher densities however, the ecological function of the Urban Parks would be secondary to their social and recreational functions.

12 We have conducted a systematic study of popular parks of a similar size (~2.5-12 Ha) which offer significant amenity to populations living at a high density. The selected parks were: Hyde Park (North Perth), Parc de Bercy (Paris), Park Diagonal Mar, (Barcelona), Millennium Park (Chicago) and Bryant Park (New York). This initial survey indicated that there is no direct correlation between residential density and the exact functions that a park needs to perform, all of the parks offering a different range of functions which relate to the local culture and climate. That said all of these parks precluded large organized team sport infrastructure and typically offered a large number of different functions and spatial experiences, and typically some escape from the city into a simulacrum of nature.

13 While multi functionality in POS becomes increasingly important in dense, constrained urban settings we believe there is a danger ‘when it tries to do everything.’
Figure 8: An example of a reconfigured Urban Park which could offer a wide diversity of attractions and functions. This image shows Paris’ Parc De Bercy montaged into the existing site of Hillcrest Park. Parc de Bercy was one of the precedent parks we have studied and offers a multitude of park functions and spatial experiences. This increased amenity should catalyse a densification of the surrounding urban form, shown here indicatively at a density of ~R40 and above.

The development of the Urban Parks and the densification of their walkable catchment, we propose could be initiated through the following process. Initially the walkable catchment would be rezoned by the Local Government at an increased density of R40 or higher. This process would trigger land tax and council rates increases, increased stamp duty revenue\(^{14}\) and developer contributions, which would flow to the Local Government. It is proposed that this additional revenue is directed in part towards the upgrading of the parks. For this upgrade to be significant we believe the parks will need to be upgraded to a level of $300 per m\(^2\). This figure equates to what could be considered an ‘exceptional’ standard, and is commensurate with the cost

\(^{14}\) Land tax is calculated on the Unimproved Land Value (ULV) which is assumed to be 30% of the residential properties market value PRACSYS 2012. Fremantle Traffic Bridge; Economic and Social Benefit Assessment. Perth: Pracsys. Council rates are calculated on the Gross Rental Value (GRV) of the property which is assumed to be 5% of the market value ibid. Both of these are expected to increase with a higher density zoning being introduced. Stamp duty revenue will presumably increase as a greater number of dwellings exist to be bought and sold.
of an average of Australian Institute of Landscape Architects (AILA) award winning parks which we have surveyed between the years of 2008 and 2012 (Australian Institute of Landscape Architects, 2013). Through a process known as ‘hedonic uplift’ (Pracsys, 2012) this upgrade of POS will produce an increase in private land value in the adjacent areas which will again provide additional public revenue via increased council rates and land taxes. It is suggested that the positive impact on property values could be approximately 20% (Crompton, 2007) (Fig 9).

Figure 9: The rezoning of the area adjacent to the Urban Parks at a higher density will produce an increase in land taxes and rates which can be directed towards the upgrade of the public open space.

15 The concept in which increments of enhanced value attributable to a parks is used to fund park development is known as the ‘proximate principle’ and was considered conventional wisdom amongst planners and park advocates in the late 19th and early 20th centuries. The proximate principle provided the rationale for John Nash’s development of London’s Regent’s Park, Birkenhead park and Central Park. CROMPTON, J. 2007. The impact of parks on property values: empirical evidence from the past two decades in the United States. Managing Leisure, 10, 203-218.
UPZONING OF AREAS ADJACENT TO URBAN PARKS
2013+

PARKS UPGRADED TO EXCEPTIONAL STANDARD ($3000/M²)

AREA WITHIN 200M WALKABLE CATCHMENT OF P0S REZONED R40+
TRIGGERS INCREASED LAND TAXES AND RATES/DEVELOPER CONTRIBUTIONS

INFRASTRUCTURE RECONFIGURED FROM CENTRALIZED TO DECENTRALIZED SYSTEMS

PUBLIC TRANSPORT NODE

RESIDENTIAL DENSIFICATION (R40+)

+13,000 DWELLINGS

DENSIFICATION AROUND URBAN PARKS
2013++
The densification of 200m walkable catchments around the Urban Parks requires that many of the infrastructure networks which service these properties will need to be upgraded to accommodate the demands of an increased population. This upgrade should be carried out with a view to trying to reduce the reliance of each precinct, consisting of parks and their surrounding urban form, on centralised water, power, energy and wastewater infrastructure (Grace, 2013). Decentralised infrastructure in this context could include wastewater treatment plants (potentially located in the Urban Parks) which could clean and recycle grey and blackwater from the adjacent densified area for use in irrigating both soft landscapes in the parks and streetscapes, and recharging shallow aquifers. Higher stormwater flows resulting from the increasingly urbanised catchment could be redirected towards nutrient stripping basins in the Urban Parks. The Urban Parks could also be sites where green waste could be systematically collected and composted for use within the precinct (Grace, 2013). In these respects the upgraded Urban Park and its densified walkable catchment could begin to function as a cell of decentralised infrastructure which is to a degree cut free from the inefficiencies of rapidly ageing, cumbersome, centralised infrastructure (Grace, 2013). Importantly this infrastructural function should not be pursued to the point that it negatively impacts on the Urban Parks in terms of their provision of amenity.

**Suburban Parks**

Correspondingly the Suburban Parks are located in the study area at a maximum distance from public transport, where residential densification is unlikely to occur to any great degree. The Suburban Parks would be dedicated to organised team sports, as they would incorporate the requirements of team sports relocated from the Urban Parks, and also to broad scale ecological function such as biodiversity, carbon sequestration, mitigation of climatic extremes (Barnett, 2013), cleansing of air (Brack, 2002), flood mitigation, storm water attenuation (Wong, 2006) and food production. Despite the relatively small numbers of people who participate in organised team sports (Australian Bureau of Statistics, 2010) studies have indicated there is a shortage of ovals for organised team sports in Perth (Centre for Sport and Recreation Research, 2013), in part because of a under provision of ovals in newer fringe suburbs. It is intended that the
multifunctional ovals incorporated in the Suburban Parks would be planned to accommodate multiple sporting codes which could occur over different times of the day, night, and week.16

**The potential of upgraded streetscapes to catalyse density**

Studies of the nature and function of POS in Perth have tended to focus primarily on parks (Australian Institute of Landscape Architects, 2012, Hedgecock, 2012, Centre for Sport and Recreation Research, 2013). However, within the study area the area of verges comprises roughly 9 times the area of the parks. As such, verges potentially offer a greater source for amenity and ecosystem services provision than parks do. The enormous land area bound up in verges can be explained by extremely generous road reserves; despite the significant length of Local Roads in the study area (some 250 linear km) and their arrangement in both gridded and curvilinear plan forms the same street generous street section is unremittingly applied. This section constitutes a typically 20.2m wide road reserve which contains wide verges (6.5m on each side of the road) and a wide roadway (7.2m) (Fig 10). This streetscape condition is dictated by infrastructural requirements, services being laid horizontally beneath the verge area (Thompson and Meenachi-Sunderam, 2007), and the requirements of private and service vehicles.17

Figure 10: The expansive streetscape of the study areas ‘Local Roads.’

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16 Synthetic playing surfaces may need to be considered to facilitate increased demands on these ovals.

17 At least 12 government agencies and private companies have legal powers to do works in streets which significantly complicates efforts to reconfigure streetscapes. MOBBS, M. 2012. Sustainable Food, Sydney, NewSouth Publishing.
The failure of these streetscapes to be considered as POS in which people may recreate or choose to spend time reflects the situation in which up until recently residents have had a generous provision of private open space and henceforth haven’t required the streetscapes to provide significant amenity; areas of Bayswater that are still at low residential density of R12, we calculate, provide an extremely generous 206m² of private open space per person. However as residential density has increased in the study area there has been no upgrade of streetscapes to compensate for the loss neither of private outdoor space nor of vegetation. At a density of ~R25 the zoning of much of the study area, and given the housing types that the market is currently delivering, this will result in a reduction of private open space to ~50m² per person. To compound the issue this private open space is not only reduced in area but also in quality, a consequence of much of it being a driveway. The ‘death’ of the Australian backyard is well documented elsewhere (Hall, 2010), and architects have responded with housing typologies which provide more usable private open space (London and Anderson, 2008) however there has

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18 This is calculated as a typically 530m² of garden space, front and back, divided by 2.56 people which is the current statistic average number of people per household AUSTRALIAN BUREAU OF STATISTICS. 2011. Population Projections, Australia, 2006 to 2101 [Online]. Australian Bureau of Statistics. Available: http://www.abs.gov.au/Ausstats/abs@.nsf/mf/3222.0 [Accessed 09.02.2011 2011].

19 The current housing types being delivered are the battle axing of large lots and the demolition of the old front house and the replacement with a 3-6 strata unit development.

20 The housing typologies shown in the following visualisations of reconfigured streetscapes relate principally to those in this publication. These typologies, in part, attempt to also maximise the usability and amenity of private open space.
been a paucity of proposals for how streetscapes can be reconfigured to provide amenity to residents living at increased densities.\textsuperscript{21}

This may be because, as Tony Hall describes, while the public domain generally can ‘share the ability to provide biodiversity, aesthetic pleasure and a beneficial microclimate… it cannot replace the backyard’ (2010). Hall attributes this to the fact that the public domain and front gardens are public and semi-public respectively and thus cannot ‘offer the same privacy and degree of security of the backyard’ (2010), an assertion with which we would fundamentally agree. Thompson and Meenachi-Sunderam (2007) also identify the blurring of public and private space which typically occurs in street verges as having adverse implications for the functionality of verges in social and recreational terms. Nonetheless given that private open space is being squeezed to such an extent, we believe a shift will occur whereby residents will, to a degree, accept the lack of privacy inherent in the public domain, for the amenity it can offer.\textsuperscript{22}

To engage with this situation we have developed a number of scenarios by which these ‘local road’ streetscapes could be upgraded so as to provide amenity and ecosystem services to residents living at the typical current zoning density of R25, but which could also allow for even higher densities. Amenable POS in this instance refers to that which can provide an improved walking environment, facilities for informal recreation, particularly for children, and areas for the potential cultivation of food, as well as mitigating climatic extremes (Barnett, 2013), cleansing of air (Brack, 2002) and providing flood mitigation and storm water attenuation (Wong, 2006).

The process by which the upgrading and densification of streetscapes could be enacted is as follows. We envisage that upon the achievement of a consensus from the residents of a street section\textsuperscript{23} the lots adjoining the street would be zoned at a higher density (~R40) resulting in increased land taxes and rates, and subsequently developer contributions which could be directed

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\textsuperscript{21} The ‘Suburban Lineal Park’ proposal by Neeson Murcutt is notable exception to this LONDON, G. & ANDERSON, S. 2008. Take 7 Housing Australia: How architects can make a difference, ACT, Australian Institute of Architects.

\textsuperscript{22} The Western Australian Physical Activity Taskforce survey PHYSICAL ACTIVITY TASKFORCE 2009. Physical Activity Levels of Western Australian Adults 2009. Perth: Government of Western Australia. found that the most commonly used facilities for recreation were the home (55%), the street and footpath (33%) and cycle or walking path (30.5%) indicating that people are certainly comfortable with recreating in the public domain if not occupying it for substantial lengths of time. Anecdotally children are comfortable to use streetscapes for play over long periods.

\textsuperscript{23} This presumption, that this indeed could be achieved, will be explored, as part of an Australian Research Council funded project which will engage directly with the community of Bayswater regarding these issues.
to reconfiguring infrastructure and applying upgraded landscape treatments. This upgrade would then help to attract residents who otherwise might not consider living at such a density. The subsequent increased stamp duty revenue, resulting from the increased number of dwellings (Pracsys, 2012), could then be directed towards the ongoing maintenance of the streetscape at a high level (Fig 11). Essential to the maintenance of the upgraded streetscape will also be a high degree of involvement by the adjacent residents. Ideally the energy that residents have historically dedicated in the construction of their backyards could actually be translated to the POS. In short the upgrade of streetscape aims to produce a flexible, functional structure for encouraging community participation; the upgraded streetscape is not intended to be the ‘end’ in itself.

While the selection of particular street sections for reconfiguration would be dependent on the consensus of residents’, within our proposal only streets within the 5 minute cycleable catchment of public transport would be candidates for this process, reflecting the requirement for density to occur adjacent to public transport (Fig 12). The authors envisage that to initiate the process an upgraded and densified streetscape demonstration project could be constructed with the involvement of the Western Australian Department of Planning. This demonstration project could provide groups of residents from other streets, a model to replicate or respond to.

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24 There is some evidence that this is beginning to occur in some of the denser areas of Australian cities. MOBBS, M. 2012. Sustainable Food, Sydney, NewSouth Publishing.
Figure 11: The following images potential synergies between the upgrading and residential densification of a street section. The upgraded streetscape in this instance entails the reconfiguration of the roadway so that it ‘meanders’ creating usable area of POS rather than merely bisecting the road reserve directly down the middle. A playground could be a significant element sited within a consolidated area of POS. Street upgrades could adopt a variety of different configurations of which this is only one.
Figure 12: The length of ‘local roads’ within the 5 minute cycleable catchment of public transport, which are not constrained by a high number of private vehicle movements or buses, is approximately 50km. These streetscapes could be candidates for upgrading and densification.
Conclusion

Through this paper the authors have endeavoured to test the potential for increasing densification around upgraded POS in greyfield settings in spatial terms. A second phase of research in this area, which the AUDRC and the Centre for Built Environment and Health (CEBH)\(^{25}\) are currently seeking federal funding for, will explore to what degree upgraded public open space (POS) can be offered as an incentive to greyfield communities to support increased infill development. Through a substantial community consultation process this research phase will test what ‘trade-offs’ are acceptable to communities between different types and density of urban infill development and different types of upgraded POS amenity. The authors are aware that for the research to gain veracity, it needs to move beyond spatially representing densification into a new phase of research where community attitudes become integrated fully into the design process. This second phase of research will also require a closer study of the development economics which have necessarily been superficially covered in this brief paper. The existing low quality of the public domain in greyfield suburbs is to a large degree, a result of thinly stretched Local Government budgets and as such viewing this issue through an economic and not merely spatial lens is essential.

In this research we have proposed upgraded POS, in the form of parks and streetscapes, which could achieve synergies with increased residential densification. These synergies could extend to the garnering of community acceptance for infill, positive economic effects, and the provision of amenity and ecosystem services for residents living at higher densities. At a broader scale we believe this research points to a much needed additional strategy for infill development which could be applied in greyfield suburbs but also potentially at a metropolitan scale. The limited number of infill development strategies promoted in the current metropolitan plans for our capital cities creates a situation in which, if any number of these strategies were to fail, our cities will continue to sprawl\(^{26}\) in an increasingly unhealthy, costly, unsustainable and

\(^{25}\) CEBH is a research centre at UWA whose mission is ‘To undertake policy-relevant research that builds capacity and influences planning and urban design policy and practice to create healthy and sustainable communities.’

\(^{26}\) Above and beyond the 40% greenfield development which on average the capital city plans propose BOLLETER, J. & WELLER, R. 2013. Made in Australia: The future of Australian cities, Perth, University of Western Australia Press.
unproductive urban form (Dodson and Sipe, 2008, Kelly et al., 2011a, Newman et al., 2009, Department of Planning Government of Western Australia, 2010). It is towards the avoidance of this fate that this paper has been directed.

Acknowledgements

The author would like to acknowledge Professor Richard Weller as the source for a number of the key ideas explored in this paper and to thank him for his ongoing contributions to the project. Thanks go to Professor Geoffrey London for his helpful feedback on the design work and the final draft of the text. Thanks also to Professor Fiona Bull from the UWA Centre for the Built Environment and Health for her contributions to the related ARC grant application. Finally gratitude is due to Dinis Candeias for his significant contributions to the graphics and design.

Dr Bolleter is employed as an Assistant Professor at the Australian Urban Design Research Centre (AUDRC) which is generously funded by the West Australian Department of Planning and the University of Western Australia.

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