Activity Corridor Intensification in Perth and the role of Design Based Research

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Abstract: The strategic plans of every major Australian city are attempting to direct a substantial proportion of future dwelling requirements within existing urbanised extents. This urban infill or residential intensification is generally intended to be realised in mixed-use nodes (Activity Centres) and along the public transport corridors which connect them (Activity Corridors) – a polycentric city model. In Perth, Western Australia, there has been substantial focus on the nodal development of Activity Centres through the issue of specific state planning policy (Western Australian Planning Commission, 2010).

Activity Corridors have received less attention in state policy in Western Australia yet have been identified as a possible means of systematically intensifying habitation and urban activity within the existing extents of sprawling cities. A recent report identified that 100–200,000 new dwellings could potentially be realised from intensifying development in selected land parcels along just seven roadway corridors in Perth.

There are metropolitan wide systemic challenges to enabling infill development across all Australian cities such as infrastructure prioritisation, planning restrictions, financing practices, community attitudes and the costs of development and constructing attached housing. In addition the urban intensification of Activity Corridors possesses its own unique site specific constraints and opportunities. Urban Design can play an important role in helping to address some of these general and specific challenges. This research presents a methodology for urban design based research in relation to achieving urban infill along Activity Corridors. Design typologies that emerge as a result of initial application of this methodology are shown with a view toward informing planning and design controls which incentivise appropriate development in these locations.

Introduction

The traditional suburban, automobile dependent and generally expansionistic paradigm of urbanisation has helped make Australian cities some of the most desirable places to live in the world. This pattern of development is however generally recognised as being unsustainable particularly in terms of its environmental impacts (Weller, 2009, Newman and Kenworthy, 1999, Rogers, 1997). Under this mode of urbanisation Perth's urban footprint has doubled in the last 40 years and could almost double again in the next 40 if population growth and urbanisation patterns hold as predicted. Given the dependence on automobile travel implicit in this urban form this has substantial implications for such environmental performance metrics as vehicle kilometres travelled[1]. In addition this has and will lead to substantial clearing of native vegetation in the Southwest Australia Ecoregion (SWAE) - one of only 34 global biodiversity hotspots[2].

There is an emphasis in strategic planning policy in Perth and other Australian capital cities to reconfigure their sprawling footprints toward a more compact polycentric model – a network of walkable high density centres connected by high capacity public transport routes. This alternative pattern of urbanisation is planned to be overlayed on the existing low rise, mostly suburban environment. Under this model habitation is concentrated within walking accessibility of existing and proposed public transport infrastructure providing mass transit to areas of economic and cultural activity theoretically reducing automobile dependence.

As a strategic diagram the nodes of this pattern, what are often referred to as Activity Centres, present as logical sites for urban intensification. They often sustain existing employment bases, retail

[1] Vehicle Kilometres Travelled (VKT) per person has more than doubled in Perth in the period 1965 to 2009. This ratio however has stabilised in recent times with an increasing share of trips being undertaken by public transport (Bureau of Infrastructure Transport and Regional Economics (BITRE), 2012, Bureau of Infrastructure Transport and Regional Economics (BITRE), 2010).

[2] International biodiversity hotspots are globally recognised as unique biogeographic regions which must contain at least 1,500 species of vascular plants (> 0.5 percent of the world's total) as endemics, and have to have lost at least 70 percent of their original habitat (see http://www.environment.gov.au/node/13908)

and community facilities and public transport connectivity. On the ground however they generally present much more challenging propositions for retrofitting to the walkable high density habitats that underpin this vision. In Western Australia sites designated as Activity Centres are often places of existing large scale retail complexes which lack the urban structure, such as high streets, that could provide a basis for walkable urban precincts.

Over time the urban fabric in these Activity Centre locations has been dominated by traffic and surface parking capacity expansions which have incrementally dismantled the walkability of the street network (Figure **1**). This is somewhat unsurprising however given the retailer's viability being substantially dependant on large catchments of customers in existing surrounding suburbs being able to access them easily by automobile.

Figure 1 Auto-oriented landscape of Stirling Activity Centre typical of Perth's Strategic City Centres, principally automobile accessed retail complexes.

Activity Centres that are dominated by this urban form may be more ideal for an intensification of commercial enterprises which rely less on an integrated, walkable public realm and large scale publicly led projects on government land holdings immediately adjacent to public transport which can establish their own urban structure. In Perth, Cockburn Central - the only Activity Centre to gain substantial investment in new dwelling units, has resulted from a large government land holding immediately adjacent to a commuter rail station. Similar to the Stirling Activity Centre example above the walkability of this *centre* beyond the immediate station precinct is however thwarted by the continued dominance of the automobile in an area which must organise tens of thousands of vehicle movements every day and the concentrated vehicular access flows to and from a regional shopping centre (Figure **2**). Site observations have identified that precinct residents drive across the road to access the adjacent shopping facilities rather than risk a hostile and unpleasant stroll.

The Option of Activity Corridors

If Activity Centres are problematic for residential intensification because of the conflicts between their auto-oriented urban structure and the production of attractive residential environments[3] where then in the polycentric city model can existing urban areas be intensified in a systematic fashion which would promise the kinds of yields necessary to attain the compact city?

[3] Evidence from the ongoing attempt to create an Activity Centre at Stirling in Perth, a location of strategic advantage only 7.5km from Perth CBD, would support this with the business case indicating a price tag of capital works associated with the establishment of a new urban centre in the order of $0.35-0.5bn AUS (Stirling Alliance, 2010).

Figure 2 The large government owned development precinct adjacent to Perth's southern suburbs commuter rail station at Cockburn Central Activity Centre

The polycentric vision reverts to those parts of the existing urban fabric in walking proximity to the public transport facility along the *spokes* of the network diagram. In literature to date these sites have been termed Activity Corridors. For commuter rail type transit systems this equates to nodal development around station locations but for road based public transport with their characteristic stop frequency a more continuous ribbon of potential intensification paralleling the carriageway emerges. This paper focusses on the latter, recognising the challenges and limitations of describing a centric or nodal concentration of intensified urban form in a predominantly low rise diffuse suburban context. Preference is given for the evenly dispersed linear pattern presented by the road based transit spine. Perth has an extensive bus network and a number of high frequency routes which would potentially support this continuous pattern of transit oriented intensification (figure **3**).

Figure 3 The pattern revealed by increasing the frequency of service of public transport services in Perth (data source – Transperth 2008)

Such a widespread pattern as that indicated in the frequency mapping in figure **2** suggests the possibility that only a moderate intensity of residential development may be required along these Activity Corridors to achieve a substantial overall quantity of infill. The moderate scale of built form

implicit in this suggestion would seem to correspond more closely with the existing low rise built form character of the adjacent suburbs which potentially avoids strong community opposition. This dispersed pattern of development also suggests that the costly provision of concentrated infrastructure upgrades and reconfigurations may also be avoided.

Where in these walkable catchments paralleling the road based public transport facility is redevelopment possible? Ideally everywhere, and with a particularly focussed form of government such as that which developed the linear transit oriented city in Curitiba maybe this would be a possibility (Cervero, 1998). In a democratic society with an urban fabric dominated by the private ownership of single residential lots the task of comprehensive transformation within a territory defined by the relatively abstract boundary of transit accessibility is difficult (Duckworth-Smith, 2013).

Typically the residential environments which flank the high frequency road based transit routes in cities such as Perth are inner and middle ring suburbs. These tend to be organised into walkable neighbourhood units bounded by busy roadways. They are fragmentary in their land ownership structure and yet traditionally united in their collective ambition to exist in an ideal state of balance between town and country settings. Within this cohesive and conservative socio-spatial territory residential intensification is generally perceived as a threat to character and residential environment quality making it an exceedingly difficult proposition.

The edges of these neighbourhoods which flank the busy roadways are however somewhat dislocated from this socially contiguous environment. Typically the lots fronting the busy roadways are subject to neglect and uncertainty and respond inappropriately to the challenging physical context of their setting particularly in regard to traffic noise and air quality (Figure **4**). This creates a potential suite of redevelopment sites immediately adjacent to the public transit facility along these roadways. A pattern which tends to border the perimeter of typical neighbourhood units and leaves the *contented* suburban *hinterland* intact (figure **5**).

Figure 4: caught in limbo – traditional dwelling types languish along one of Perth's busy arterial roadways

In a unique partnership between the Australian Urban Design Research Centre (AUDRC), the Property Council of Australia and the Office of Senator Scott Ludlum (Greens WA) with the assistance of the state land information agency Landgate a study was undertaken to quantify the infill potential of road based activity corridors. The quantitative analysis used a method similar to that proposed by City of Melbourne in 2009 (Adams, 2009) and was applied to a number of routes in Perth.

Activity Corridor Infill Development Potential Methodology

The method identifies cadastral parcels fronting busy roadways and within walking proximity to high frequency road based public transport routes. As well as the main transit route this included frontage properties along busy feeder roads (identified by their role in the functional road hierarchy) within walkable proximity to this facility. Subsequently cadastral parcels are excluded from the developable land supply on the grounds of heritage listing, parkland and conservation zoning and community uses. Further a proportion (50%) of strata titled properties are excluded which recognises the difficulty in achieving agreement between all owners, as required by current state legislation, to undertake redevelopment.

Applying this methodology on just seven of Perth's major roadways showed that over 100,000 dwellings could potentially be accommodated with development at a moderate intensity (Property Council of Australia et al., 2013). This represents approximately 80% of the infill dwelling targets

specified in the current strategic spatial planning framework Directions 2031. In some ways this is unsurprising. One of the assets of the sprawled city urban fabric is the extent of roadways and hence the supply of frontage properties. Developing at greater intensity or extending the number of routes - of which there are many, would realise higher yields again.

The results however have limitations. The calculation did not strictly define road based transit routes in terms of superior frequency and connectivity to places of employment concentration rather simply identify routes which did support a relatively frequent service and had generally high traffic flows. In this sense the methodology was not strictly transit oriented but biased toward simply revealing the extent of developable land along busy roadways. As discussed these frontage sites are often degraded and traditional dwelling configurations struggle with their contextual constraints of noise and pollution and are therefore potentially suited to redevelopment. So although the methodology may be relatively accurate in identifying developable land supply all these may not fall within the transit oriented domain. One of the advantages of identifying transit oriented locations is the ability to promote reduced automobile dependence in higher densities which has substantial potential for achieving more affordable dwellings as well as higher quality residential environments and environmental benefits from reduced private travel.

Further refinement of this methodology could therefore identify those portions of the road based transit network which are extremely well connected to concentrations of employment and other activity. This would enable the benefits of reduced automobile dependence to be more strongly supported and strengthen the rationale behind the calculation. The SNAMUTS model developed between Curtin University and RMIT provides a possible tool to improve the transit oriented outcomes of this methodology. Nonetheless it is evident that this pattern of urban intensification has the potential to provide substantial numbers of infill dwellings within the existing urbanised extents of Perth.

Figure 5: Neighbourhood perimeter development opportunities – only those properties along the busy roadways, where traditional dwelling types perform poorly are selected as possible sites for more intensive development.

Current Implementation Frameworks

Along several road based transit routes investigated in Perth there is evidence to suggest an emerging appetite from local authorities for a greater intensity of development along these corridors. The fringing properties tend to have increased density zoning provisions in their local planning schemes (figure **6**). This would suggest they are considered relatively neutral in relation to the complex socio-political landscape of adjacent suburban neighbourhoods which tend to resist residential intensification (Woodcock et al., 2009). Inspection of these locations would suggest however that these provisions are only marginally successful in attracting investment for residential infill projects. The planning provisions have facilitated relatively low dwelling yields and development

intensity predicated on a suburban character (figure **7**). Housing follows an established pattern of large grouped dwellings in the locations where this type is feasible with questionable outcomes in terms of the quality of the residential environments they provide.

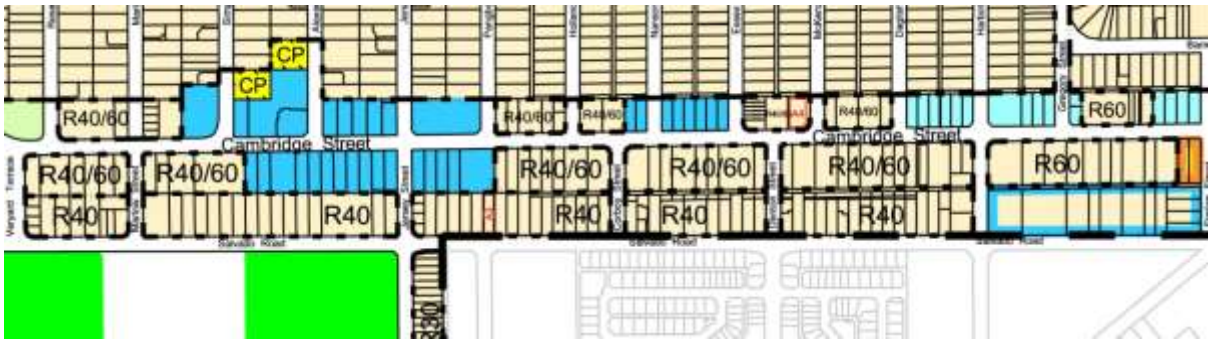

Figure 6: higher density zonings along Cambridge Street in West Leederville (source: Town of Cambridge *Town Planning Scheme No.1*)

Figure 7: Typical R60 zoning grouped housing infill along Charles Street in North Perth

Placing the qualitative assessment of these building types aside for the moment – the objective of Activity Corridor intensification, as part of a compact city model, would appear to be generally how to encourage greater uptake of more intense habitation in these locations? Traditional zoning based development controls would seem to be only marginally successful in incentivising development in these locations. Restrictions imposed by the planning and design codes for residential areas (the R-codes) has constrained yield and diversity of dwelling type in these medium density zonings. The R-codes have made multiple dwelling arrangements impractical in these areas by constraining the number of dwelling units allowed per lot which effectively only permits large floor area grouped and battle-axed dwellings (Darby, 2005).

Recent amendments (Western Australian Planning Comission, 2010) to the R-codes however have reverted back to plot ratio control for density zonings greater than R30 which potentially opens up opportunities for more diverse design responses.

The exact implications of this change in policy are still emerging. A review of several recent development applications in the local authorities of Stirling, Vincent and Melville however suggests that there is an appetite for the supply of smaller multiple dwelling arrangements now permissible under the new codes. At a recent workshop, hosted by the Department of Planning (WA) to review the progress of the codes amendment, it was discussed by local government planning officers that although the changes had stimulated supply they had substantial concerns concerning the qualitative impacts of design typologies that were emerging (Department of Planning WA October 2013). In particular concern was expressed that the application of the code was somewhat indiscriminate leading to applications for multiple dwellings (up to 8 units) in established neighbourhoods that had previously only allowed 2 and 3 unit grouped or battle-axed developments. These officers conveyed concern regarding the incongruous nature of these multiple dwelling types with the character and functionality of these areas. There was however widespread support at this workshop for the application of this code in areas of transit accessibility such as Activity Corridors which essentially confirms the poly-centric model of intensification being sought by state planning policy.

It would seem that the new codes provide the opportunity for greater variety and intensity of infill dwelling. Their suitability to Activity Corridor locations both in terms of functionality and feasibility remains largely untested.

Design Methodology

Planning and design controls can be a critical mechanism to help stimulate the supply of more intense dwelling configurations and a range of housing types. This is particularly the case when they acknowledge and match well with the realities of construction and development economics as well as providing attractive settings for habitation (ie where they balance supply and demand side aspects of the provision of housing).

A design based research method has been commenced which attempts to optimise planning and design controls in terms of appropriate scale and type of development in Activity Corridor locations (figure **8**). Subsequent work in this paper presents some of the initial findings of applying this method.

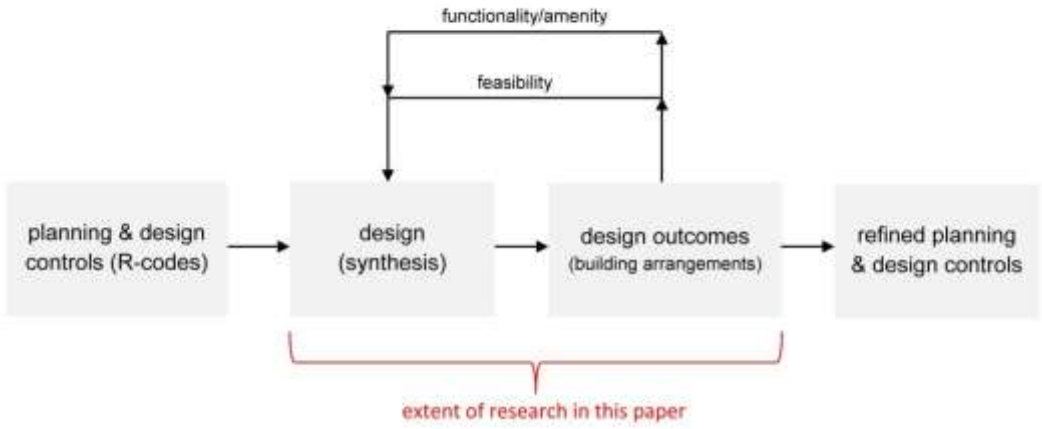

Figure 8: Design methodology

The initial steps of this methodology apply the recently amended planning and design controls to a suite of typical and generic sites along Activity Corridors in Perth. These designs are then modified according to industry and professional feedback. The forum for the initial feedback loop was the research and consultation done as part of the *Transforming Perth* study. This study attempted to isolate the feasibility and functionality/amenity factors which would influence the delivery and uptake of higher density housing along Activity Corridors. The results of this initial feedback loop are presented as design outcomes in this paper with key spatial metrics attached.

Those factors from the *Transforming Perth* study which are explicitly related to the realm of design, that is those which are principally concerned with the arrangement of physical and objective aspects of housing supply and demand have been selected. Subsequently these key factors have been translated into specific design actions by identifying the key spatial development controls that relate to them (table 1). The *Residential Flat Design Code* of the SEPP65 legislation from NSW provided an exemplary source to identify the key spatial development controls used in this process (NSW Planning Department, 2002). These actions are then synthesised into design propositions (drawings) of design typologies. These designs are by no means final propositions but the beginning of a process which aims to opyimise solutions to infill housing in typical Activity Corridor locations.

Subsequent development of this research will continue to test these outcomes with the development industry in terms of their feasibility. In addition amenity and functionality will also be continually tested with planning and design professionals as well as state and local government representatives. The design outcomes generated through this process can then be assessed in terms of conflicts or otherwise with key primary development controls (such as building height and the plot ratio allowances) of current legislation and hence allow scrutiny of their ability to permit designs which encourage investment in these locations. Ultimately this work could stimulate policy amendments which specifically address the development opportunities presented by Activity Corridor locations and therefore incentivise this model of residential intensification.

Initial Results & Discussion

The sites developed for the design exercise were representative of a number of typical Activity Corridor locations in Perth. They were not located within Activity Centres and were considered as an R60 zoning which is typical of lots in the inner and middle ring suburbs through which many of the Activity Corridors traverse. East-West lot orientations were selected as these are the most punitive in terms of overshadowing constraints and so created a 'worst-case' scenario which ensures applicability to other lot orientations. Four typical lot sizes (frontage by depth) were selected for design investigations, these were A) 12.5 x 39.5m, B) 14.5m x 42.5m, C) 20 x 48m (approximately 1/4 acre) and D) 28 x 42m (amalgamation of 2 x B).

The application of the R-codes initially determines the permissible built form scale and intensity through such controls as height, setback, parking and overshadowing. The principal controls extended are:

- only allow 50% of the adjacent lot to be overshadowed,
- limit building height to 10m (3 levels),
- front, side and rear boundary setback provisions of the R-codes,
- provide a variety of dwelling sizes including 1 bedroom dwellings,
- provide an average of 1 car parking bay per dwelling (public transport accessible locations).

As a first iteration of the feasibility and functionality/amenity testing design considerations derived from the *Transforming Perth* study were also applied. A number of the design actions derived concern the broader domains of the residential environment, such as the neighbourhood, and whilst important fall outside the scope of the design investigations being carried out here which principally concerns the individual site or development complex. The key design considerations from this study at this scale are summarised below:

- consider mostly individual lot solutions as amalgamations are complex and prohibitive,
- limit development height to 3 levels principally as a result of contextual design responses to adjacent surrounding areas and construction industry constraints.
- provide car parking at-grade (to support affordability and feasibility[4]),
- provide 'quiet side' to each dwelling and protect outdoor living areas from noise and pollution [5],
- consider maximising use of built form envelope to increase yield.

The designs for each of these typical lot sizes are illustrated on (figure **9**) and in Appendix A. Note that for illustrative purposes floor plan details (access, room arrangements etc.) have not been presented, although these have been completed to ensure designs are functional and able to be assessed correctly. Key findings of the design work to date include:

1) on narrow lots overshadowing substantially restricts the achievable built form envelope,
2) on wider lots intentions to explore low rise development typologies (equal to or less than 3 storeys) becomes the restricting factor on building height,
3) maximising use of the allowable built form envelope (loft habitation) permits significant yield increases however potentially raises detailed design and construction issues,
4) the provision of at-grade parking means that many outdoor living areas are elevated which may challenge current legislation regarding visual privacy control over neighbouring properties,
5) surface parking provision and overshadowing/height restrictions conspire to limit achievable yield to approximately 100 dwellings per hectare (dph) for all of the sites tested,
6) outdoor living areas should be situated behind frontage buildings which protect inhabitants from exposure to pollution sources; and
7) it is technically possible to realise a moderately high dwelling density (100 dph) utilising a range of unit sizes.

[4] Note that basement parking can have a substantial bearing on the construction cost (up to $50k per dwelling) and impact on affordability. The designs assume that in the majority of locations basement parking will render properties too expensive and limit feasibility.

[5] Previous research related to the health and well-being of habitation in these heavily trafficked locations also influences the design argument (Duckworth-Smith, 2012). This research identified the need to provide at least one major opening (door or window) from a habitable room into a *protected* outdoor zone and also for at least one private outdoor area per dwelling to be similarly sheltered. Protected zones are areas which meet a defined acoustic performance objective.

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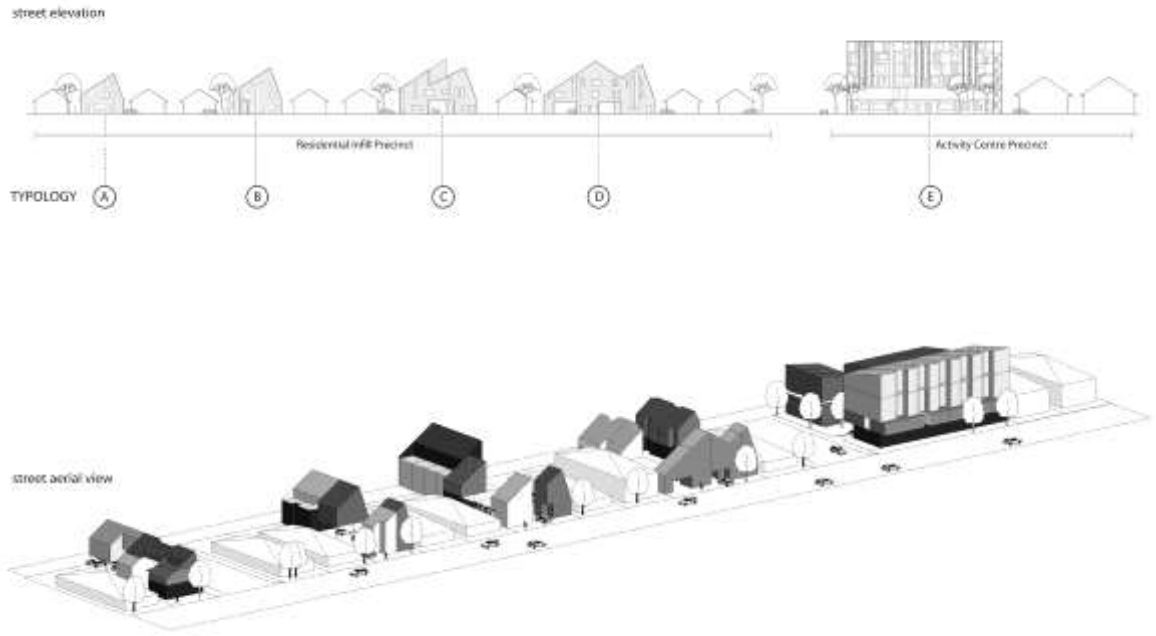

Figure 9: Preliminary design typologies for Activity corridors for various lot configurations for residential zonings (A to D) and an Activity Centre zoning (E – not considered).

Conclusion

The potential for Activity Corridors to contribute to a more compact city in Perth has been demonstrated at a strategic level through the *Transforming Perth* study. Urban design is promoted as an important discipline to help overcome the challenges of incentivising appropriate development in these locations. The design method presented has begun the process of developing building typologies which negotiate a position between their attractiveness to investment and habitation as well as considerations of the local context.

Initial consultations with development and design professionals have resulted in both general and site specific design considerations for configuring appropriate infill housing typologies. These have been applied during the initial iteration of the design methodology presented in this paper. It would appear that there is some congruency between the current (recently amended) planning and design controls (R-codes) and the intentions of these industries. This is particularly evident in the reversion to plot ratio control which allows greater flexibility in the size and number of dwelling units that can be provided. Development feasibility constraints and the expensive nature of sub-surface parking would seem to support buildings of 3 storeys or less which is consistent with height limits set by current policy. Some site specific design aspects such as protection from the noise and air quality are however not currently addressed by policy.

The research has shown that the initial application of the design method permits a development intensity of the order of 100 dwellings per hectare in Activity Corridor locations. Further iterations of the method (investigation and testing against feasibility and suitability) are required. The resulting typologies will ultimately be instructive in the formulation of built form development controls for these locations by seeking to align policy and investment decisions. This kind of tailored solution is an important step if Activity Corridors are likely to realise their demonstrated potential to contribute substantial infill dwelling numbers in Perth.

Without this envisaging of the residential environments, done in conjunction with economic pragmatics, Activity Corridor intensification may remain just another sensible strategic idea or perhaps worse lead to a suite of developments which condemn inhabitants to sub-standard amenity and poor well-being. This would be an unfortunate outcome, potentially scuttling the opportunity to realise this pattern of infill development which appears to hold substantial promise in terms of well located dwellings which reduce automobile dependence. Whilst specific aspects of the research are confined to Perth it is hoped that such a method and its outcomes will be instructive with regard to the residential intensification in other Australian cities.

Factor	Description	Key Spatial Aspects	Design Action
Development Site Availability	Infill development is mostly driven by the availability of vacant sites with appropriate zoning that are large enough to accommodate feasible developments. Assembling urban parcels is extremely challenging.	Lot Size Plot Ratio	Determine maximum permissible built form envelope. Concentrate mainly on individual lot solutions.
Permitted Scale & Intensity	Zoning regulations can impose heavy cost and compliance burdens on developers. Clever alignment between zoning regulation and current conditions in the construction and development sectors can deliver better outcomes.	Built Form Envelope Plot Ratio	Determine maximum permissible built form envelope.
Strata Legislation	A large number of low-density strata developments currently line Perth's activity corridors. Approval is needed from effectively 100 per cent of owners to dissolve a strata scheme making it virtually impossible to achieve change and renewal.	Lot Size	Determine maximum permissible built form envelope.
Blanket Building Height Restrictions	Blanket building height restrictions often produce poor design outcomes because the allowable building volume must be distributed across the lot. This leaves less space for innovative designs.	Built Form Envelope	Determine maximum permissible built form envelope.
Community Attitudes toward High Density Infill & Development	Concerns held in the community over the way higher density may bring increased traffic, impact the character of the neighbourhood, and reduce privacy are valid and need to be addressed.	Traffic Impact Contextual Design Visual Privacy Built Form Envelope	Appropriate rear setback/interface Assess traffic impacts on local streets Contextual materials and form
Finance Availability	Debt funding is essential – lender reluctance to fund units smaller than 50sqm has a significant impact on product mix and price point. Financiers are cautious of unproven markets.	Unit size	Avoid large numbers of small units.
Parking Requirements	Parking provision is a substantial cost burden, particularly at densities where it becomes impossible to accommodate surface parking. Sub-surface parking is extremely costly and demands higher returns which equates to the requirement for substantially higher dwelling yields.	Parking Ratio Parking Design	Explore the opportunities and impacts of surface parking. Examine feasibility thresholds for car-share schemes.
Construction Costs	Construction costs for multiple dwellings are substantially higher than small scale grouped housing based on traditional construction methods. Construction cost rates above 3 storeys are up to 3 times higher than standard low rise domestic rates. Basement parking is expensive.	Height Built Form Envelope	Consider low-rise multiple dwelling typologies such as stacked terraces which make efficient use of building envelopes. Consider alternative building technologies such as modular systems.
Provision & Funding of Infrastructure	Infrastructure charges are often unpredictable and can have a substantial impact on project viability.	Energy Efficiency Water Conservation	Test feasibility of strategies that reduce infrastructure demands and promote self-sufficiency at individual development scale
Public Infrastructure Uncertainty	Critical public infrastructure planning such as transport can be uncertain and impact on attractiveness of development in corridor locations	Street Layout	Resolve transport planning and design along critical corridors whilst preserving 'place value', where appropriate, to retain street attractiveness for future dwelling.
Corridor Design Challenges	There are specific concerns and challenges associated with living along busy roadways such as noise and air quality which can affect the attractiveness and quality of life in these locations particularly when affordability is a concern	Environmental Noise Air Quality	Design of dwelling must respond to the contextual constraints to ensure that amenity and well-being of inhabitants in maintained. Housing design can be compact and efficient but preserve amenity

Table 1: Translation of design related factors to achieve urban intensification along Activity Corridors from *Transforming Perth* study.

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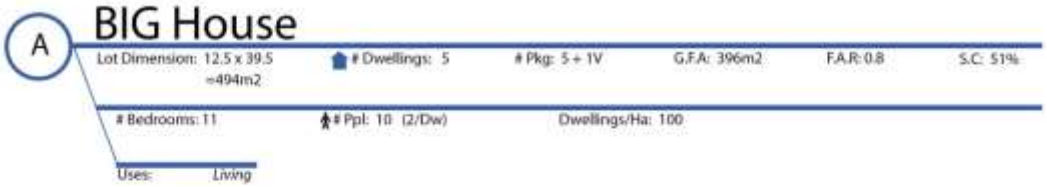
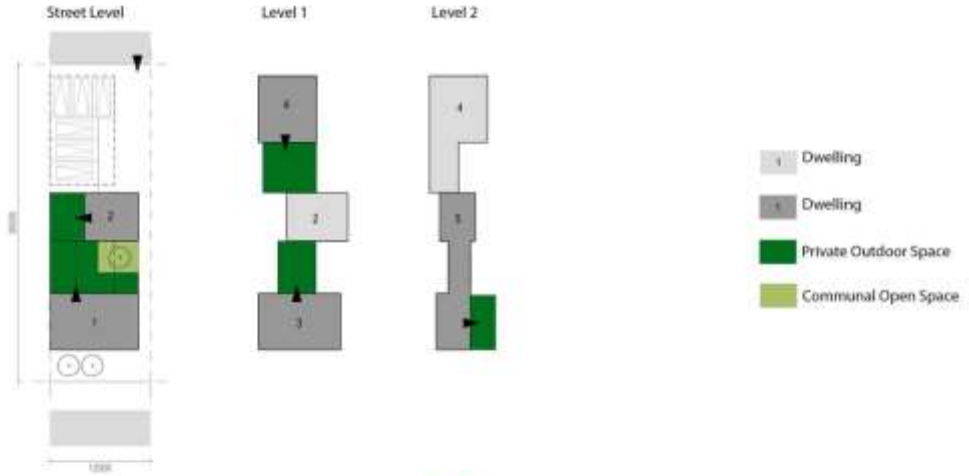


OVERSHADOWING PROVISION

DWELLING & OUTDOOR SPACE



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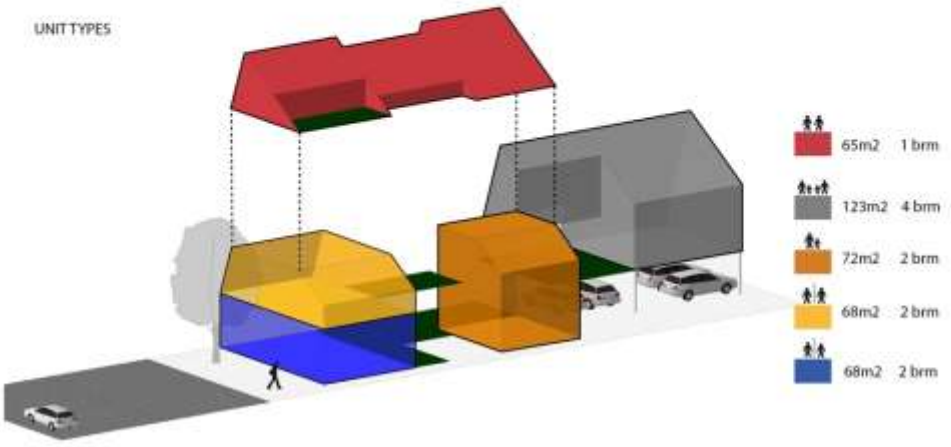

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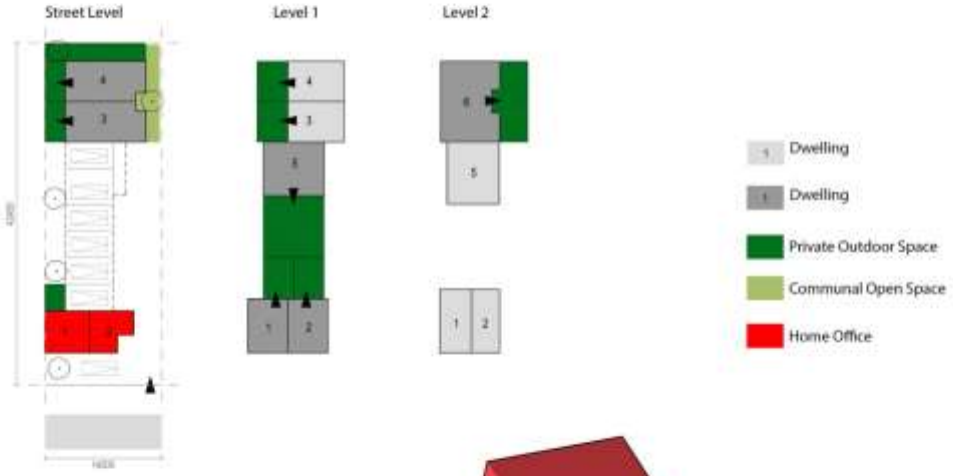

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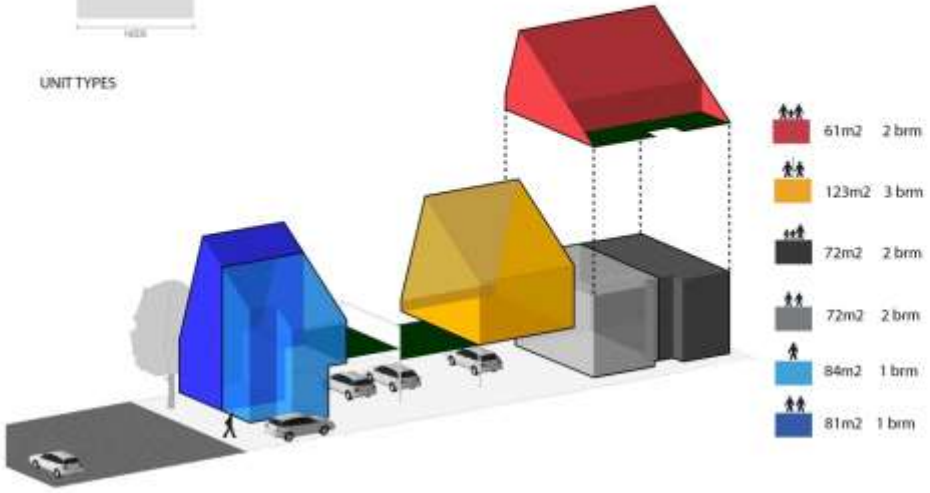

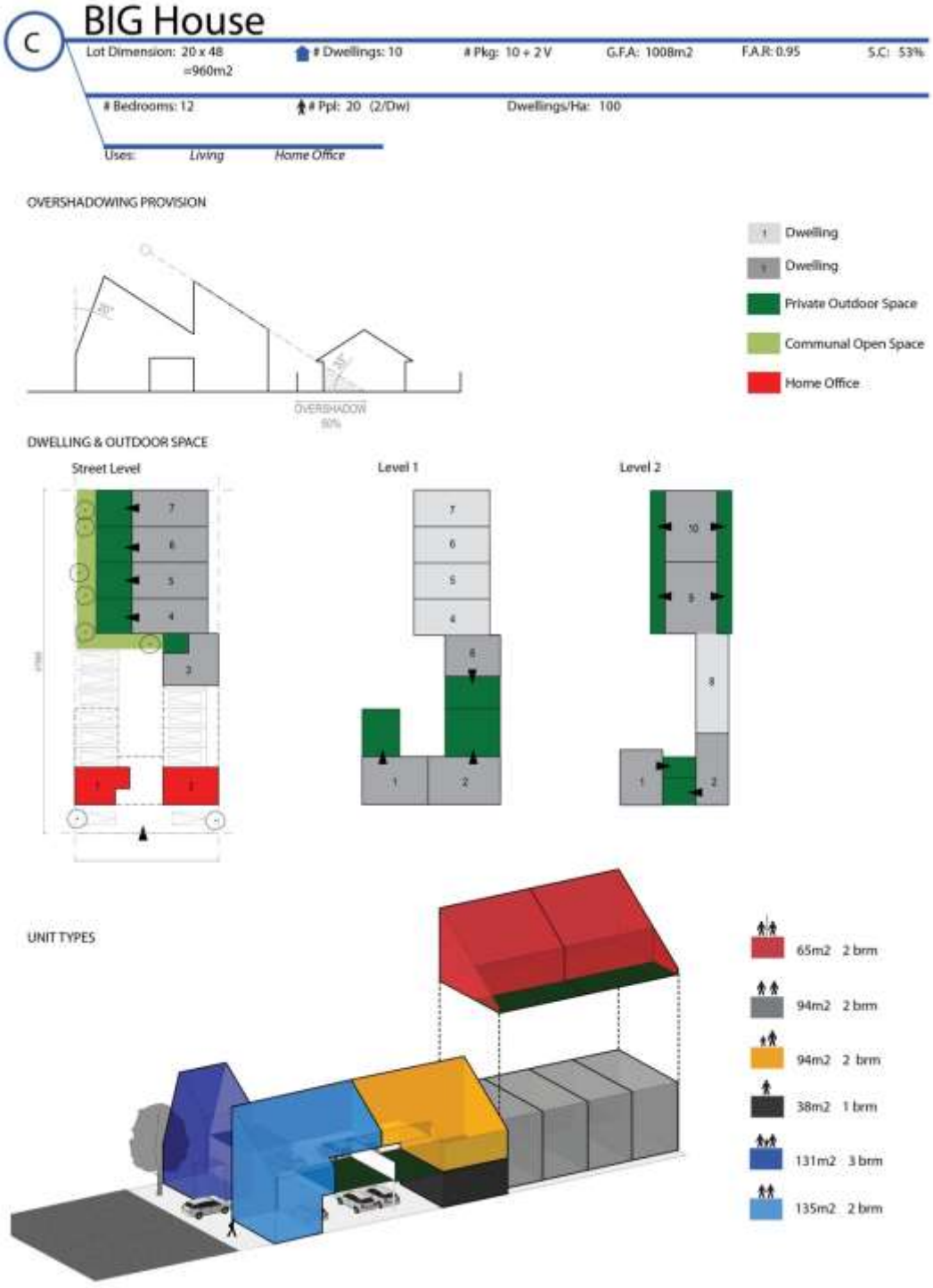
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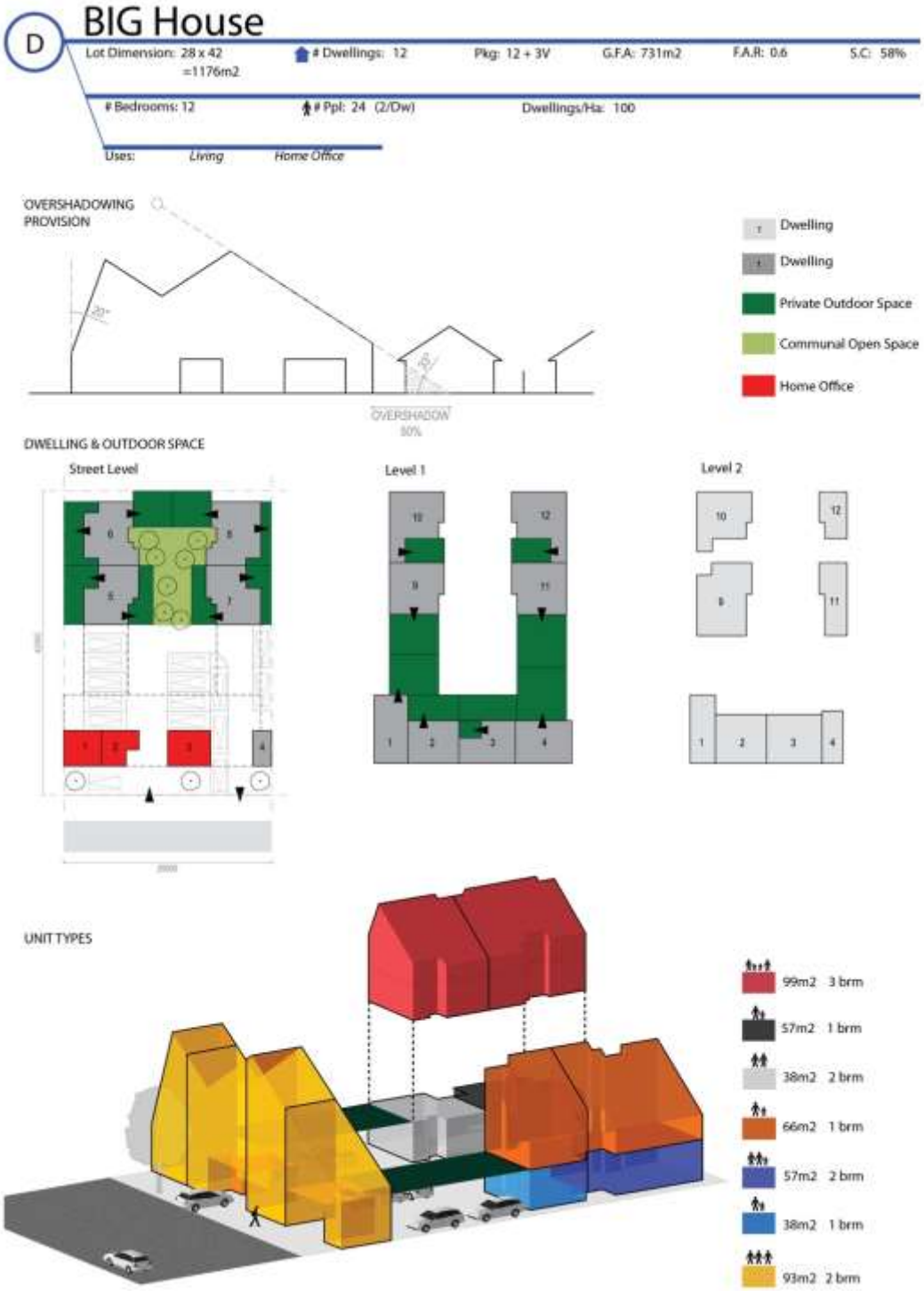
Pkg: 10 + 2V
G.F.A: 1008m2
F.A.R: 0.95
S.C: 53%
Bedrooms: 12
Ppl: 20 (2/Dw)
Dwellings/Ha: 100
Uses: Living Home Office
OVERSHADOWING PROVISION
OVERSHADOW
Dwelling
Dwelling
Private Outdoor Space
Communal Open Space
Home Office
DWELLING & OUTDOOR SPACE
Street Level
Level 1
Level 2
UNIT TYPES
65m2 2 brm
94m2 2 brm
94m2 2 brm
38m2 1 brm
131m2 3 brm
135m2 2 brm


D
BIG House
Lot Dimension: 28 x 42 =1176m2
Dwellings: 12
Pkg: 12 + 3V
G.F.A: 731m2
F.A.R: 0.6
S.C: 58%
Bedrooms: 12
Ppl: 24 (2/Dw)
Dwellings/Ha: 100
Uses: Living Home Office
OVERSHADOWING PROVISION
OVERSHADOW
Dwelling
Dwelling
Private Outdoor Space
Communal Open Space
Home Office
DWELLING & OUTDOOR SPACE
Street Level
Level 1
Level 2
UNIT TYPES
99m2 3 brm
57m2 1 brm
38m2 2 brm
66m2 1 brm
57m2 2 brm
38m2 1 brm
93m2 2 brm