Report

Processes for developing affordable and sustainable medium-density housing models for greyfield precincts

Appendix 2

authored by

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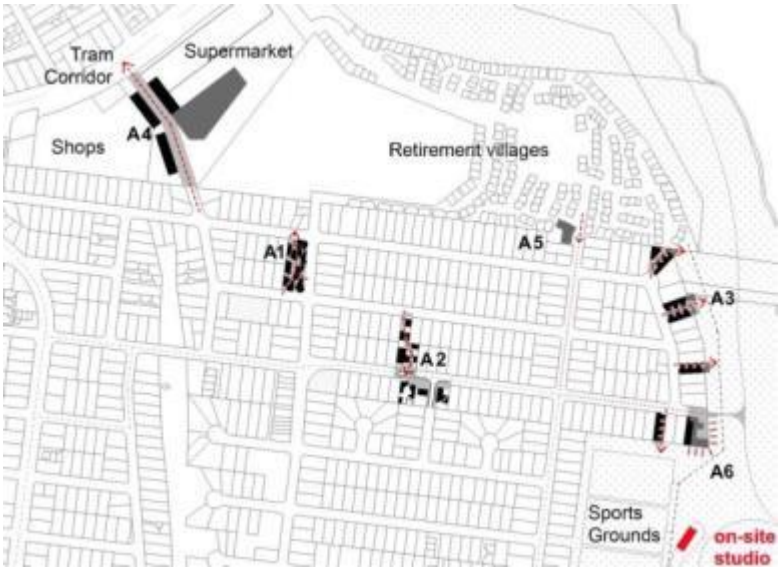
1 ARCHITECTURE DESIGN STUDIO

The Masters of Architecture Design Studio at Monash University involved 15 students[1] and ran for a semester from July 2013. The following provides a summary of student projects developed and the ideas presented to community at the engagement forums. They are categorised into key thematic groups and located on area maps of the two study locations (Area A and Area B).

1.1 Area A

Figure 1: Area A concept design strategies location map



Project locations correspond to place-specific opportunities for delivering higher densities with minimal impact on surrounding residents, taking advantage of existing services and amenity to support population increases and improving connections and generally enhance the neighbourhood overall.

Figure 2: Little Hill City: small hyper dense 'village' with publicly accessible elevator

(A1) Little Hill City: using four consolidated sites at the end of a block (only one of four sides abut neighbouring properties) the proposition tested building masses up to four storeys with substantially reduced street setbacks. Small scale public and retail spaces are provided at ground floor and a publicly accessible elevator is used to traverse the steep topography, enabling an accessible path to the nearby tram and shops. (Image by Beshara Taouk)

[1] Participating students: Sera Borensztajn, Michael Bradey, Radoslaw Buczek, Stacey Epstein, Emilia Fabris, Joel Grey, Nancy Iosofidis, Miranda Keogh, Ellie Kirk, James Kladouris, Lara Pannuzzo, Gretel Stent, Beshara Taouk, Michael Truong, Sophie Weber.

Figure 3: 'Bus Stop Green' project, before

Figure 4: 'Bus Stop Green' project, after

(A2) Bus Stop Green: sites adjacent to local bus services were redeveloped as two-storey cluster housing, also providing upgrades to the street and existing bus stop. Generous, landscaped street setbacks and reconditioned road spaces, including new traffic calming infrastructure and paving treatments, change the hierarchy of the road and create spaces for small parks/play areas. The activated street encourages passive surveillance of public spaces and a new pedestrian route through the housing sites increases neighbourhood connectivity with a direct route to the bus stop. (Images by Joel Grey)

Figure 5: Back of House: Park edge, before

Figure 6: Back of House: Park edge, after

(A3) Back of House: land parcels on the fringe of parkland were redeveloped at higher densities without impacting on neighbouring properties. The dwellings at the back of the block have immediate access to parkland, potentially reducing the amount of private open space required. The siting of new dwellings increases access to the park for surrounding residents. Small commercial and community programs are located on the threshold between the development and the park, increasing the functionality of the open space amenity and improving security for the currently underused community resource. (Images by Lara Pannuzzo)

Figure 7: Service Hub Shortcut

(A4) Service Hub Shortcut: the existing, poorly-defined and unsafe pedestrian linkage from the main residential area to the tram corridor and shops is re-landscaped and activated with new housing and a public swimming pool. The pool provides a significant recreational opportunity for the adjacent retirement villages, enabling greater age-diverse social interaction. (Image by Gretel Stent)

Figure 8: Village Gateway, before

Figure 9: Village Gateway, after

(A5) Village Gateway: opening the barrier between the existing retirement village and established residential area to the south creates opportunities for greater integration between the two *(A6). A childcare facility* spanning the border is proposed as a kind of 'gatehouse'. (Images by Michael Bradey)

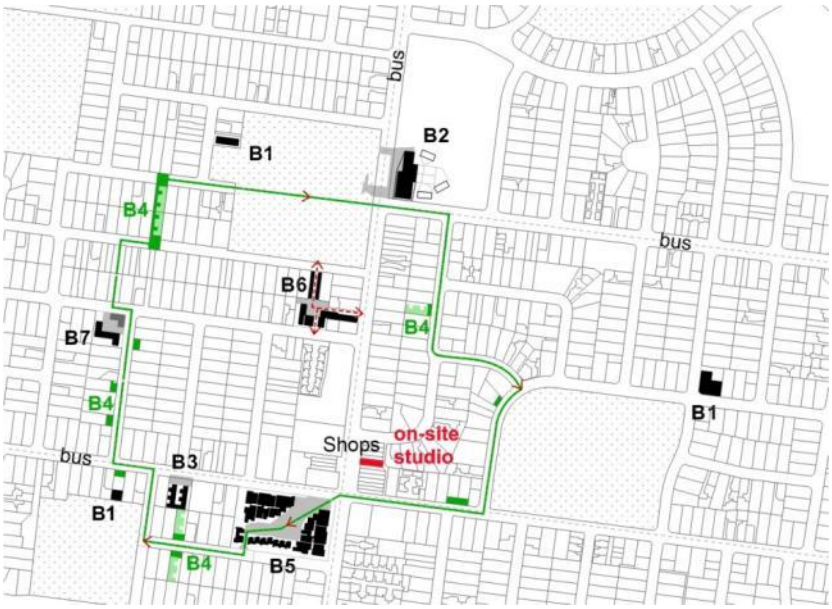
Figure 10: Bike Highway beacon before

Figure 11: Bike Highway beacon, after

(A6) Bike Highway Beacon: a corner allotment protruding into expansive parkland was identified for its presence, potential public role and its proximity to an extensive 'bicycle highway' connecting to the inner city. A new complex including an art gallery, residency studio, community room and café are proposed, serving as a marker and rest-stop on the existing recreational corridor. (Images by Michael Bradey)

1.2 Area B

Figure 12: Area B concept design strategies location map



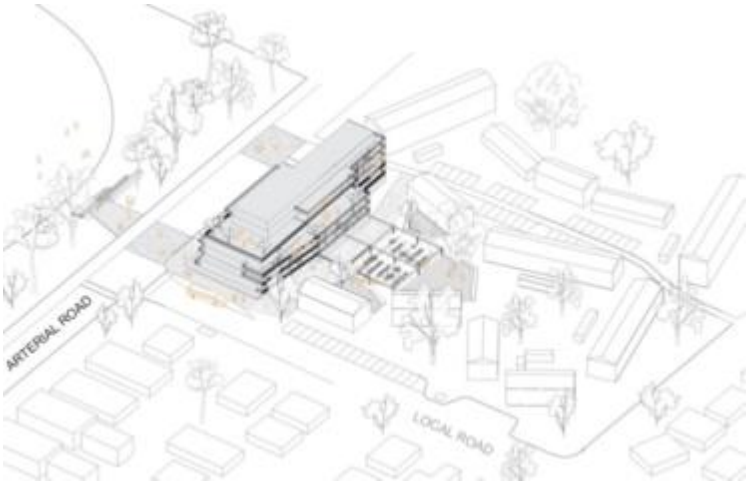
Project locations were selected to deliver high density housing in specific areas to minimise impact on surrounding residents. Large public housing estates that do not directly abut traditional suburban sites have resulted in some larger scale projects with opportunities for new public and community amenities. Projects sought to connect the abundance of reserves, sports grounds and parks in the area through residential areas, enhancing the neighbourhood and streetscape.

Figure 13: Mansion on the edge of park

Figure 14: Mansion on the edge of sports ground

(B1) Mansion on the Park: this strategy proposed a single, tall building (four to five storeys) at each of the many large parks and sports grounds distributed around the suburb. The 'mansion on the park' model restricts density to targeted sites allowing other established residential areas to remain unchanged. Age-friendly accommodation of sufficient scale supports shared on-site care. New facilities at ground level (e.g. a physio practice or local heritage archive) are carefully selected to complement local activities and serve on-site residents alike. (Image by Michael Truong)

Figure 15: Corner hub and cross-over



(B2) Corner hub and cross-over links an existing housing estate to the park and ameliorates a busy road arterial with new pedestrian crossings. The major road frontage and independence of the large site from the existing low-rise fabric was an opportunity for new mixed tenure six-storey apartments on the corner of the site. It transforms a prominent part of the suburb, which is presently viewed as run-down and unattractive. The rest of the estate could be redeveloped in time. (Image by Emilia Fabris)

Figure 16: Bus Stop Combo, before

Figure 17: Bus Stop Combo after

(B4) Bus Stop Combo: selects sites at existing bus stops and proposes small nodes of targeted density. The bus routes are the only public transport available within the one kilometre area and tend to be located on busier arterial roads. The scheme proposes public realm upgrades in the form of 'bus stop combos'—small shops, offices, community services and urban terraces seamlessly integrate with new bus 'super-stops'. A suite of options at different scales can be replicated and calibrated to the immediate context (a suite of small, medium, and large 'combos'). (Image by James Kladouris)

Figure 18: Green Belt, before

Figure 19: Green Belt, after

(B4) Green Belt: transforms tertiary residential streets into new bicycle and pedestrian networks, reclaiming underutilised road reserves for new recreational and outdoor community uses. Interventions ranged from simply planting vegetables on the nature strip to traffic calming and small sports courts. Local residents could 'opt-in' by removing fences and utilising setback spaces. With gradual take-up, a new neighbourhood network could link up existing public open spaces. The scheme works in with the previous project 'Bus-stop-combo'.(Image by Radoslaw Buczek)

Figure 20: Pause and Play Plaza

(B5) Pause and Play Plaza: redevelops an existing public housing estate at the intersection of two main roads into a new neighbourhood centre. It is offered as an alternative to the existing shops and public spaces which are not conducive to much more than a quick stop for petrol or groceries. Likewise, surrounding residential streets are uniformly conditioned for car use. A new retail complex with shop-top housing on the perimeter of the block is opened at key corners to enable access to a new central plaza where a mix of local uses (e.g. nurseries, internet cafes, a laundromat) provide an active 'third place' for the community to stop, gather and interact. (Image by Sophie Weber)

Figure 21: The Piazza

(B6) The Piazza: Three adjoining residential lots that span across a block are redeveloped as a new public piazza, combining higher density housing and new types of pedestrian friendly public space while carefully managing overshadowing and overlooking of neighbouring properties. The project preserves a sense of openness for neighbouring back yards, while laneways through the site provide shortcuts between the sporting oval and the shops. (Image by Sera Borensztajn)

Figure 22: Community Car Park

(B7) Community Car Park: responds to the inevitable need for more parking as housing densities increase. Rather than providing this directly with the dwelling, the project groups parking on a larger consolidated site, serving all new dwellings in a walkable distance. To optimise site use, housing is provided above and a small community facility is located on the street frontage. Parking can be shared by multiple uses at different time of the day; the new structure and driveway are designed for transient public activities such as markets or informal play activities. (Image by Nancy Iosofidis)

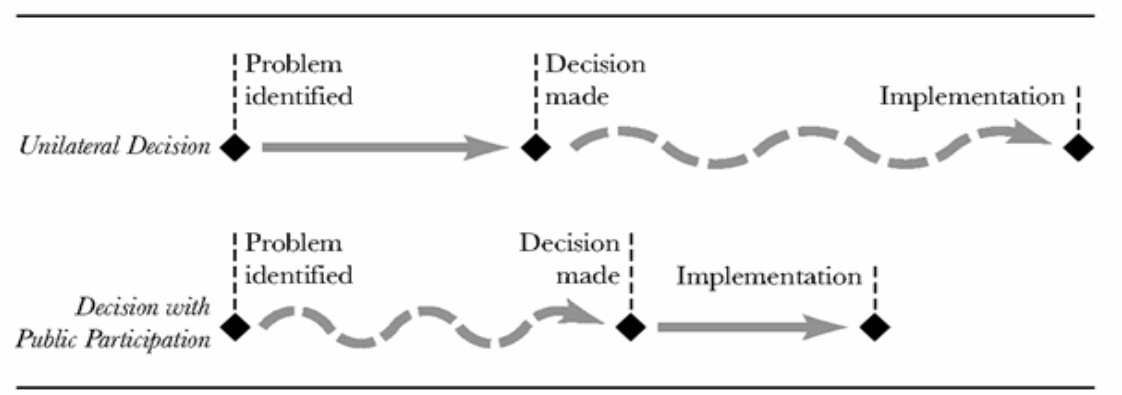
2 COMMUNITY ENGAGEMENT

The following presents context information around how the community engagement methodology was developed, a detailed account of that methodology, and the data outputs from the four-part engagement workshop events.

2.1 Preamble

The first chapter of Creighton's *Public Participation Handbook* (2005) defines what public participation is and, equally as importantly, what it is not. In doing so he clearly articulates that engagement with the public should be concerned with making the *correct* decision, that is the decision which satisfies constituents and which can therefore be implemented more effectively, as opposed to seeing 'what we can get away with'; a distinction that has apparently been lost in many Australian projects (Kelly 2010; Productivity Commission 2011). Public participation then seeks to find the most effective way to generate consensus by using methods that encourage collaboration, rather than to build consensus, through manipulation or coercive advertising, for example. The logic being that decisions made through consensus, though more difficult to generate, have tackled the range of issues that may otherwise result in reworking the plan later on, and are thus far easier to implement; as illustrated in Figure 23 below.

Figure 23: Unilateral versus public participation decision implementation time



Source: Creighton 2005, p.18

The successes of public participation in urban planning nationally (Randwick City Council 2010; City of Subiaco 2012) and internationally (Vancouver 1995; Christchurch City Council 2011), a strong and well developed academic history and set of methodologies (Arnstein 1969; Abbott 1996; Sanoff 2000; Innes & Booher 2004; Aulich 2009; Eversole 2012) and the existence of an international public participation educational body (International Association for Public participation(IAP2 2007), has seen Australian Federal Government demand that local governments develop methodologies for effectively harnessing community input for planning (COAG Reform Council 2012). While this call has come after the fact, with most states having already developed their own documents (Department of Planning 2003; Department of Sustainability and Environment 2005; Local Government Association of South Australia 2008; Department of Communities 2011), it indicates that the power of stakeholder engagement to achieving positive ends has been endorsed federally and is therefore an effective mechanism for effecting positive change.

Community engagement traditionally assumes a bottom up approach, but also acknowledges the limitations of time and budget placed upon governing bodies. As

such, the discourse tends to invoke ladders or spectrums of engagement, which illustrate the types of engagement, their practical uses and the level of involvement of both organisers and respondents. The most widely used and current schema is IAP2's Spectrum of Public Participation—see Figure 24.

Figure 24: Spectrum of public participation (IAP2 2007)

	INFORM	CONSULT	INVOLVE	COLLABORATE	EMPOWER
PUBLIC PARTICIPATION GOAL	To provide the public with balanced and objective information to assist them in understanding the problems, alternatives and/or solutions.	To obtain public feedback on analysis, alternatives and/or decision.	To work directly with the public throughout the process to ensure that public issues and concerns are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision-making in the hands of the public.
PROMISE TO THE PUBLIC	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and issues are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for direct advice and innovation in formulating solutions and incorporate your advise and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.
EXAMPLE TOOLS	• Fact sheets • Websites • Open houses	• Public comment • Focus groups • Surveys • Public meetings	• Workshops • Deliberate polling	• Citizen Advisory committees • Consensus-building • Participatory decision-making	• Citizen juries • Ballots • Delegated decisions

With the goal of gaining public participation in projects, the spectrum identifies the reason for engagement (a fact that is often overlooked) and, through focusing on the 'promise to the public', assists practitioners in delivering the most effective product to their clients. It is also a starting point for highlighting the correct engagement tools, the discussion of which begins to unpack the budgetary and time constraints of the project, as well as the requirements that must be satisfied.

2.2 Preservation of confidentiality

All public engagement material and activity carefully avoided any mention of DHS landholdings or redevelopment of public housing property. While DHS landholding data provided essential information for the research team regarding the potential for integrated precinct redevelopment, it also comes with the responsibility of assuring the privacy of tenants; so that their property cannot be identified as social housing by a third party, or that social housing tenants involved in engagement activities do not become incensed due to assuming that their property is being considered for demolition. Thus, as a further precaution, at any point of public engagement involving maps or other spatial representations, the precinct allotment pattern was altered to avoid its identification as public housing landholdings, while maintaining the spatial distribution of dwellings. This provides researchers with the ability to work on a foundation that both protect individual rights while also providing a realistic representation of potential precinct lots.

2.3 Methodology

2.3.1 Exposition of process

Engagements in both study areas adopted a plan consisting of three stages, which can each be categorised on the IAP2 spectrum: Pre-engagement, On-site Presence, and Primary Engagement Event.

2.3.2 Pre-engagement

Local government managers, planners and community participation officers were the first port of call. It was imperative that municipal officers were both aware and supportive of the process, as there would likely be a significant amount of tacit information among government officers relating to pertinent local issues, existing and prior engagements, and relevant points of contact within the community. In addition to providing valuable advice and assistance in achieving successful engagement outcomes, their guidance was necessary due to the risks and sensitivities that speculation on urban redevelopment can trigger.

Similarly, activating and pre-engaging with established community groups is important for a number of reasons: they hold significant community knowledge; due to their incorporation they have the potential to wield power locally; their established social network has the capacity to attract more members of the local community; and, through initial engagement and dialogue, has the potential to gain intelligent and honest feedback, as opposed to polemical rhetoric. By engaging with the existing community structure the research demonstrated the respect required of the local community, as well as, in accordance with community development principles (Mowbray 2005; Ife & Tesoriero 2006; King & Cruickshank 2012), using the pre-existing social resources of the community to empower its constituents. As mentioned, the initial identification of these groups came from meetings with municipal officers, and afterwards from the connections that initial meetings with these groups produced.

Initial meetings with municipal officers and interest groups largely sit in the ‘inform’ and ‘consult’ IAP2 spectrum; as researchers were informing relevant organisations about the planned events, gathering broad local information and seeking information as to further contacts in both areas. Effectively these meetings were lead-in conversations where trust is established and the community becomes ‘known’ to the researchers. Potentially they can also reduce conflict and misunderstanding at later public engagement workshops. Though input from members of these organisations may ultimately contribute to the research, no data, other than additional contacts and improving the understanding of local context, was formally captured here.

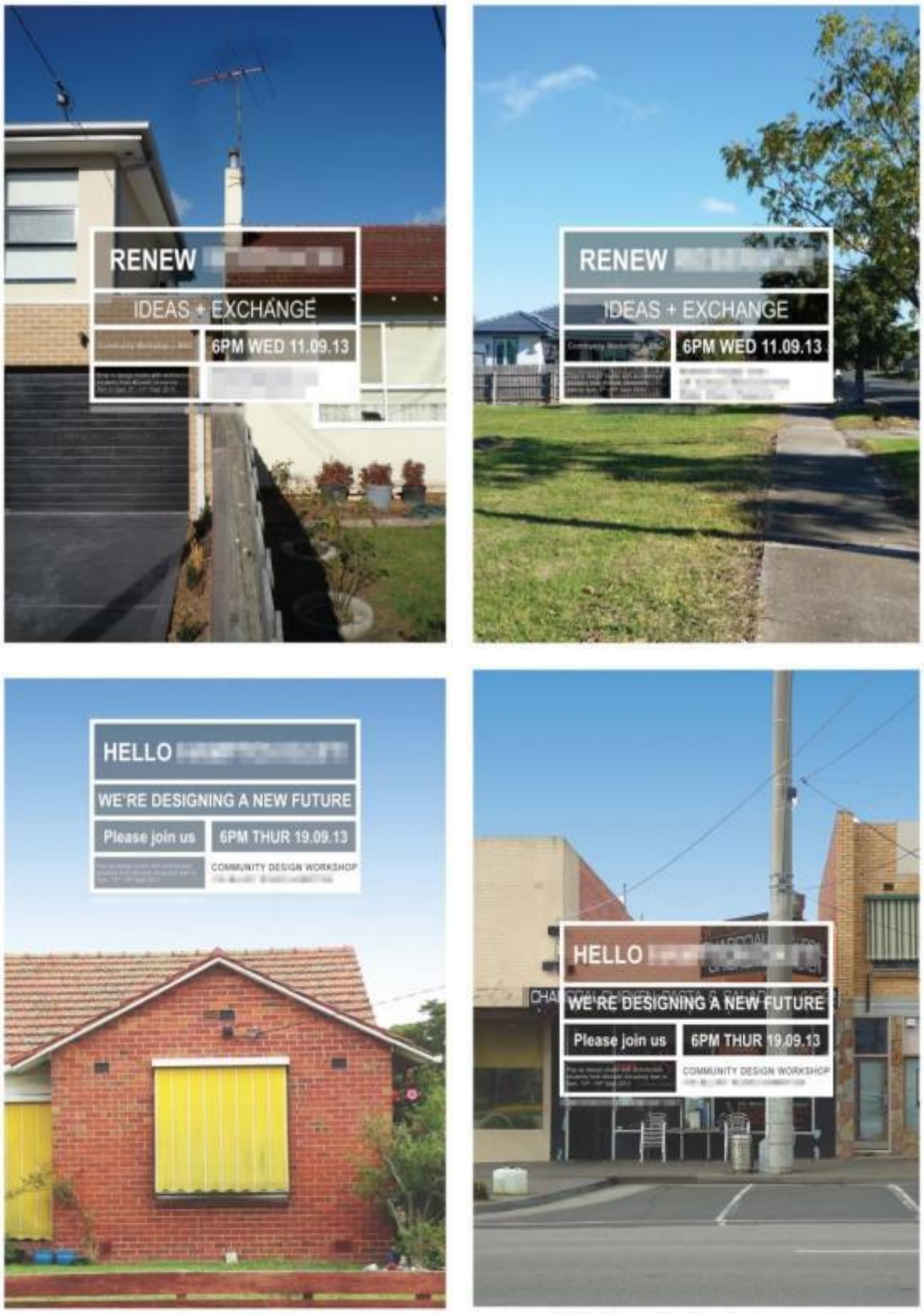
Local residents (both public and private) and their feedback on precinct design opportunities, outside of any group affiliation, were the focal point of the engagement. As such, their feedback required the most attention and management. This was done through establishing on-site presences and hosting formally run workshops at which data capture occurred.

2.3.3 On-site presence

At an early meeting, municipal officers in Study Area A suggested that engagement would be most effective if researchers actually visited and took up occupation in the area for a sustained period of time. It was thus decided to begin the engagements (in terms of making contact with the general public) with an *in-situ* design studio intensive. This studio involved architecture students and researchers working to set-up the space, developing design strategies that were ultimately presented at a final workshop, running open design critiques, gathering site information and building a

large physical model of the area as an engagement tool. Furthermore, a campaign of disseminating information about the engagement was directed from the studio (with letter-box drops and customised poster pin-ups (Figure 25) complementing a web-site).

Figure 25: Engagement posters distributed around area prior to workshop event



Working on site allowed the students to immerse themselves in the local context of the research area as well as acting as an ‘open house’ to locals; where the engagement project could be introduced and general feedback acquired. The aim of the open houses was not to gather explicit data, but rather to:

- → Better inform students and researchers of the site and local issues for designs.
- → Demonstrate to community our commitment to investigation/engagement.
- → Ultimately to encourage higher levels of community participation.

Due to design strategies still being in progress until the final workshops, recording all comments from passers-by served little purpose. However, a social researcher was on hand to capture comments in the final days of the open house; when local groups were invited to formally view the exhibit. Observations from these sessions were included in the data gathering phase, as were interviews with students as to their interactions with locals and the knowledge they gather through their design work.

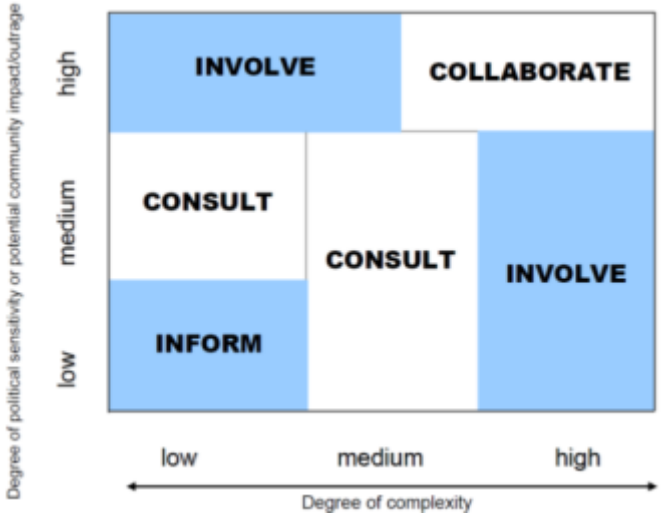
2.3.4 Primary engagement event

The final and most substantive stage of the engagement was an open public workshop event. This was primarily an inquiry driven by a design process (Gooding & Metz 2006; Zeisel 1981; Infrastructure 2003), which aimed to test specific redevelopment scenarios by obtaining community responses to a series of designs, of varying scale and incorporating different uses and urban relationships, for each locality.

It was pivotal to the project that data from this event was captured in a way that could be analysed and used effectively by the research team. As such, the event required significant design to ensure it effectively captured the responses of attendees at both a micro and macro level. Due to this activity being focused partly on feedback to existing designs, but also on novel solutions to existing issues, it is both divergent and convergent.

Given the high degree of political sensitivity and potential for community impact/outrage, as well as the complexity of the engagement (in attempting to tackle a wide range of issues relating to urban redevelopment), this primary aspect of the engagement sits between the ‘involve’ and ‘collaborate’ sections of the IAP2 spectrum. This is supported by the ‘promise to the public’ for each of these sections, with ‘involvement’ promising 'we will work with you to ensure that your concerns and issues are directly reflected in the alternatives developed' and ‘collaborate’ promising 'we will look to you for direct advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions' (see Figure 26).

Figure 26: Community engagement matrix



Source: Local Government Association of South Australia 2008, p.16

It was thus vital that the workshop facilitated individuals to:

1. Comment on features that are specific to individual designs.
2. Comment on the barriers and opportunities for redevelopment, contextualised within the local environment.
3. Comment on the barriers and opportunities to redevelopment broadly.

As such, the workshop followed a program of introduction followed by three separate discussions:

- An introductory presentation kicked things off, providing a swift overview of all design strategies and the engagements' objectives. The narrative advanced was one of: 'Change is already happening. More change is going to happen. If you would like to be involved in the transformation of your area, what do you consider acceptable/unacceptable?'
- The first discussion allowed attendees to explore the exhibition, examining scenarios and discussing them with students and researchers. Using adhesive notes, attendees were invited to leave comments on each of the projects. These comments were gathered and collated by researchers for later analysis.
- The second was a round table discussion, where attendees responded to themes that arose in the first discussion and commented on the collective assembly of strategies forming the precinct. Transcending the individual precinct components, the discussion was primarily directed toward residents' broader aspirations, and opinions on trade-offs and tipping points. Moreover, as the discussion was held as a group, participants had the opportunity to hear other people's points of view, contesting these or adjusting their own such that there may be some movement towards consensus. The discussion was recorded for later transcription, coding and analysis.
- The third involved each attendee developing a list of personal primary redevelopment concerns. This final data-gathering point ensured that the opinions of all (not just the vocal) attendees, as well as themes which may not have been covered in the second discussion, were captured.

All discussion grew from or was at least coloured by the presentation of tentative/hypothetical design propositions. Presenting student work was considered

useful as its obvious hypothetical nature may reduce the tensions and anxieties that more ‘serious’ redevelopment propositions could evoke. Further, employing design as a sounding board and tool for discussion gives people something reasonably resolved and specific that they can actually see and judge. A reaction to this is thus probably more reliable than to a verbal description of the same issues and propositions—which will struggle to include the same level of complexity. A person’s response to a ‘real’ designed artefact tells us about their attitudes to both ‘What’ and ‘How’, for example the ‘what’ could be introducing apartment-style housing, and the ‘how’ could touch upon architectural style or quality, the moderation of building scale through clever massing, or the inclusion of urban amenities such as child-care and community facilities.

2.3.5 Account of engagements

Study Area A

Once the Study Area A was identified, the municipal offices of the Local Government Area it was located in were contacted and a meeting between researchers and relevant local government officers initiated. This meeting was attended by statutory planners and community engagement officers. Their input was helpful in the final selection of one of two possible study areas identified by the researchers (each 1 kilometre square and roughly 500 metres apart). They advised against operating in a residential area closer to the local activity centre, due to having recently run a neighbourhood regeneration there and the high probability of ‘engagement fatigue’ locally. They were able to identify recent redevelopment issues, engagement projects and relevant interest groups, having recently held intensive engagement on new state zoning regulations. The groups and associations indicated as key local contacts were:

- a local 'neighbourhood house'
- two local (public housing) Tenants Associations
- a local Progress Association
- a sports club located directly in the study area.

Staff attended monthly meetings with all groups five weeks prior to the final workshop to provide an overview of the research and gain local support, and again one week prior to the event. Key staff from other local organisations (the names of which were gathered at these meetings) were contacted and provided with information on the engagement process. Roughly 20 hours was spent in direct contact with locals, both educating them as to the issues and asking for attendance.

Concurrently, researchers also went about acquiring space for design students to work in situ. This was initially identified as being in a local health centre, but was finally relocated to a local rugby club on the edge of the research area—where they would finalise their work before presentation to the general public.

One week prior to engagements students presented their work to date at a ‘mock engagement’, where industry experts commented on the standard of work and its readiness for community engagement. Outcomes of this process resulted in a uniform colour scheme being developed and personal narratives of designers being honed so as to more effectively describe the potential of the design, as well as showing students how to more effectively acquire data from respondents.

Figure 27: Design strategy presentation material

Students were split into two groups, with one group continuing to develop designs for each research area. The entire student and research body moved into the rugby club one week before the organised workshop. Design students continued to work on their design strategies, while the rest of the students began constructing a scale model of the suburb and advertising the event through letterbox drops and placing posters around the area.

Two days prior to the workshop local residents and members of associations were invited into the space to provide comment on the work to date as well as their opinions of the locale generally—which informed researchers as to the key motivations and concerns of residents before the workshop, as well as getting local 'gate-keepers' (O'Riley 2009) onside for the event.

The night of the workshop saw 40 local residents attend, the majority being community members who had previously met face-to-face. The workshop began with an overview to the research, after which attendees were asked to examine the individual projects; leaving comments on each using supplied post-it notes. Thirty minutes was allowed for this process during which time attendees moved throughout the space, interacting with designers, supplying both verbal and written comment on designs and their impression of them.

Figure 28: Posters advertising the engagement around Area A

Figure 29: Post-it notes providing project specific feedback

Figure 30: Facilitated discussion around large model of entire study area

Figure 31: Discussion around specific design strategies and general themes

This initial phase of the research was brought to an end by attendees being invited to gather around the scale model of the suburb. A (recorded) group conversation was led by a convener who commenced by having students 'report back' on their individual discussions, identifying the key hypotheses presented by the projects and summarising the responses they received. The convener then steered the group discussion towards the larger scale, drawing out their views on the coordination of the projects as an integrated precinct, and the net effect within the existing neighbourhood. This allowed locals to speak about broader concerns and aspirations, and pick up issues that had not been touched upon by the projects presented.

Once the key points had been discussed, attendees were (as the final piece of data) asked to supply a 'top 5' of their key redevelopment concerns, after which food was served and informal discussion among attendees, researches and students began.

Attendee's comments on individual designs, as well as their 'top 5', were gathered for collation. All research staff and participants were, over the following three days, formally interviewed as to their personal interaction with attendees, as related to design outcomes. Audio and video footage of the workshop was transcribed, coded and analysed shortly after.

Study Area B

A similar process was undertaken in Study Area B. Initial meetings with the Chief Executive Officer and relevant staff in planning and community outreach from Local Government provided information on existing planning issues and recent engagements, however, as opposed to Area A's council meeting, it provided little in the way of contact details for relevant groups. Field work and pre-engagement activities were also unable to uncover local relevant interest groups, which resulted in less outreach by such channels prior to the workshop event.

However, considerable exposure and some face-to-face interaction with the community was enabled through the shopfront location and setup of a 'pop-up' design studio. Researchers were able to secure a studio space with a large window frontage in the local shopping strip with high volumes of foot and vehicle traffic. Students were able to work in full view of passers-by for a whole week, and community members frequently came in for a chat.

As with Area B, the student body was divided in two; one group developing their designs while the other built a scale model of the locale and advertised the event. Aside from the letter-box drop, and placement of posters, four local schools were also asked to distribute advertisements to the event in their weekly newsletter.

Figure 32: Posters advertising the engagement around Area B

Figure 33: Students working on-location (L), engagement material (R)

The evening of the workshop saw 30 local residents attend, and ran as per the previous engagement, with data capture occurring in three distinct stages: comments on individual designs, a group discussion and obtaining attendees ‘top 5’ issues of redevelopment concerns. Data was gathered, collated, coded and analysed as previously described.

Figure 34: Shop front studio space

Figure 35: Discussion around specific design strategies and general themes

2.4 Outcomes

The following are outputs from each of the three stages of data capture at the primary engagement events.

2.4.1 Study Area A—Responses to individual projects

A1 Little Hill City—Although the new means to get up the hill proposed by this scheme was well received, and some thought the fine grain public space running through it might develop into something special, there were several misgivings. These included concerns about loitering and security due to the site being too far away from urban bustle to be properly activated, and the small amount of private open space being inadequate/unappealing.

A2 Bus Stop Green—Locals responded well to the additional social space and utility presented, and most thought traffic slowing measures were a good idea. Concerns were raised about the clustered car parks being too large and thus susceptible to use by non-residents for anti-social behaviour. Additional security measures were requested, including suggestions to include small business tenancy.

A3 Back of House—The connectivity to parkland, which is currently seen as barren and unsafe, was well received, to the point where some said it 'should have been done a long time ago'. The higher housing density was viewed favourably as it could provide security through community policing (passive surveillance). Residents

welcomed the smaller scale activity zones—shops, sporting facilities, and they also wanted things in the park, like a communal veggie garden. Cars and existing 'nuisances' (e.g. trial bikes) must be taken into account.

A4 Service Hub Shortcut—Locals confirmed that the informal thoroughfare is currently problematic, but is very important and will become more-so in time. The proposals for its upgrade was very warmly received, as was the idea of a pool or other community facility as a new inclusive social space.

A5 Village Gateway—The proposal to form a new connection between the retirement village and neighbourhood behind received mixed responses. There was notable interest in encouraging interaction between young and old, and some thought the through connection to the tram route created was valuable to all residents. However, the big fence is there for a reason—it was pointed out that security is important to aged people and they have a right to it; as such any gateway would need to be carefully managed.

A6 Bike Highway Beacon—Locals were extremely positive about this idea, as it addressed two key issues around the park—its lack of security and insufficient amenity to sustain real use and community activity. Reinforcing and connecting to the existing bike trail was also welcomed. The increased density and height proposed was deemed quite acceptable in light of these benefits, barring a few tweaks to the building's massing and architectural language, and a sound strategy to deal with parking needs.

2.4.2 Group/roundtable discussion

The following provides a summary of the roundtable conversations at the workshop, based on coding and analysis of a transcription.

Directions/guidance

Big picture:

- → change and growth viewed very favourably if they support—
- → greater security
- → more vibrant community with greater activation of public realm
- → more shops/services.

Tipping points for urban change:

- → no more than three (possibly four) storeys (in general residential areas)
- → should not compromise privacy or impinge on other people's amenity
- → larger scale/height developments should provide something to community life.

Incremental change:

- → Important to start with existing assets and structures that could play a big role in day-to-day life, but are currently degraded and failing. Identify community/urban centres that are already well connected to the neighbourhood, such as depressed local shops.

New housing that engages with the public realm:

- → faces the street
- → doesn't hide people away
- → looks, feels like it's part of the community (e.g. balconies, thoroughfares).

Neighbourhood character:

- No need to mimic, but keep the feel of the existing. Integrate with the architectural fabric that already exists (this was as much about community cohesion as aesthetic taste). Don't stick out 'like dogs' balls'.

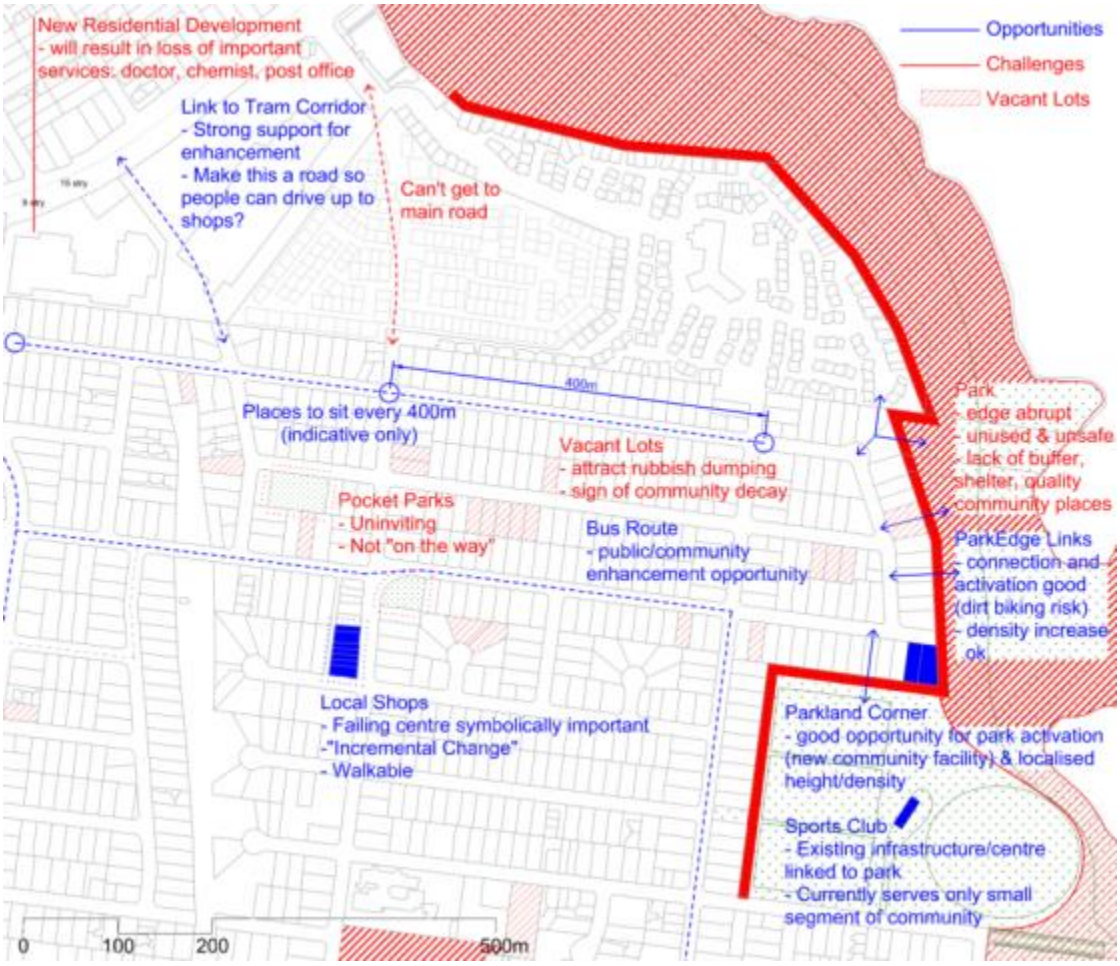
New facilities:

- parking and public toilets required
- underground parking preferred
- quality not quantity of open space.

Encourage mix:

- allow a diversity of socio-economics, age and uses
- avoid people being priced out. Social mix is part of the areas character.

Figure 36: Site specific knowledge



Needs/aspirations

More provision for community life in public realm:

- Shelter, buffer, places to congregate, small meeting places, a café or market, things built into the landscape, places to get together, places to sit every 400 metres, public toilets.

Small local hub of services and basic amenities:

→ Chemist, doctors, post office, cafe; things that everyone can use will survive economically and create some public traffic—these services are also important to retirement village residents.

More opportunities for community, education and recreation programs

Top-5 Opportunities/issues/concerns

A total of 88 discrete responses (statements the size of a post-it note) were analysed and grouped into categories as shown in Table 1.

Table 1: Data collected on key concerns of residents (Study Area A)

Area of concern	N
The necessity of community space to support social connections locally	15
The desire for greater access to shops and the creation of more opportunities for public amenity locally	10
Access to public transport	9
Fears regarding security and personal safety	7
More public facilities, such as bins, toilets and barbeques	7
Redevelopment heights should not exceed 3–4 storeys	5
Concern that social housing and social inclusion may be left out of future development	5
Car slowing or traffic reduction	3
Redevelopment density being considerably higher than existing	2
Parking	2

2.4.3 Study Area B—Responses to individual projects

B1 Green Belt—Although there was some querying of the need for more green space when several parks can be found nearby, the proposal to deprioritise cars by diversify treatments and uses of streets and introduce landscaping was very positively received. In particular, the boost to sustainable transport, improved pathways to local parks and gardens, and the new feeling of conviviality and community were strongly approved. For some, this revived a nostalgic tradition of children playing and sharing the streetscape and bumping in to people strolling around. The idea was also seen as a powerful tool to open up the public housing estates and reconnect them with the community (as the Drummond Street cycle route in Carlton, Victoria has demonstrated).

B2 Mansion on the Park—The great height and possible overshadowing caused by the proposals were very controversial; some were satisfied by the incorporation of extensive sustainability measures, however, it seemed clear the scheme would need to be revised to medium-rise to gain any real acceptance. However, the concept of incorporating new programs that were complementary to adjoining community functions was well received, as was the provision of aged care housing.

B3 Corner Hub and crossover—The projects' reception indicated localised intensive density can be considered acceptable, particularly on this site, which is on the corner of a large public housing estate and also on a main road. The additional communal space needed further consideration, with locals saying spaces for offices and club meetings were required, rather than more libraries.

B4 Bus Stop combo—The project was well liked, although there were some concerns about the reliability and safety of the bus network underpinning it, and parking provision for new services. Suggestions were to make the 'combos' more site specific—so that they responded to the surrounding area and local needs.

B5 Pause and Play Plaza—The intersection and existing estate is viewed as an eye-sore, so the proposal to redevelop brought immediate support. Furthermore, some remarked that the plaza 'concept is spot-on', as walkability and new neighbourhood destinations were desired and liked. The opportunity for the community to share expensive resources and mix functions and recreation was welcomed. However, more variegation in building forms and massing were needed.

B6 The Piazza—The proposal for historical European style coupling of medium density housing and public space received positive feedback from young to middle-aged attendees—they expressed they'd be happy with an apartment if they could have spared space. There was also excitement about how the piazza would be used at different times of the day—and notions of a sustainable kibbutz or small scale community were raised. Elderly attendees were less impressed, due to a lack of private outdoor space for gardening.

B7 Community Car Park—The idea of pre-emptive parking provision for staged development (although perhaps difficult to communicate) was well liked and firmed up support for bringing more people into the neighbourhood. The concept that this car park could be dual use, and that cars were kept underground was also appreciated. There were questions as to the purpose of a library on the site—other programs were preferred.

2.4.4 Group/roundtable discussion

The following provides a summary of the roundtable conversations at the workshop, based on coding and analysis of a transcription.

Directions/guidance

Big picture:

- → Growth is accepted so long as it is planned for; infrastructure and services must be increased to support it.
- → Walkability is valued.
- → Consider the net environmental/ecosystem impacts of development.
- → View that the DHS land is being underutilised.

Tipping points for urban change:

- → Sensitivity to heights greater than two storeys, but height and density are not necessarily concerns in themselves. Larger-scale/height developments could be ok if not 'back-to-back', and need to be isolated from existing low-rise in some way. Avoid overshadowing and overbearing private open space. Modulate mass to respond to surroundings.
- → Larger scale/height developments will be more acceptable if they provide something to community life, or if they have excellent environmental features

Transforming streets

- → Support for shifts away from car dominance of the public realm, enthusiasm for cycling and walking—'We want to create a space that makes it possible to have a public life'.

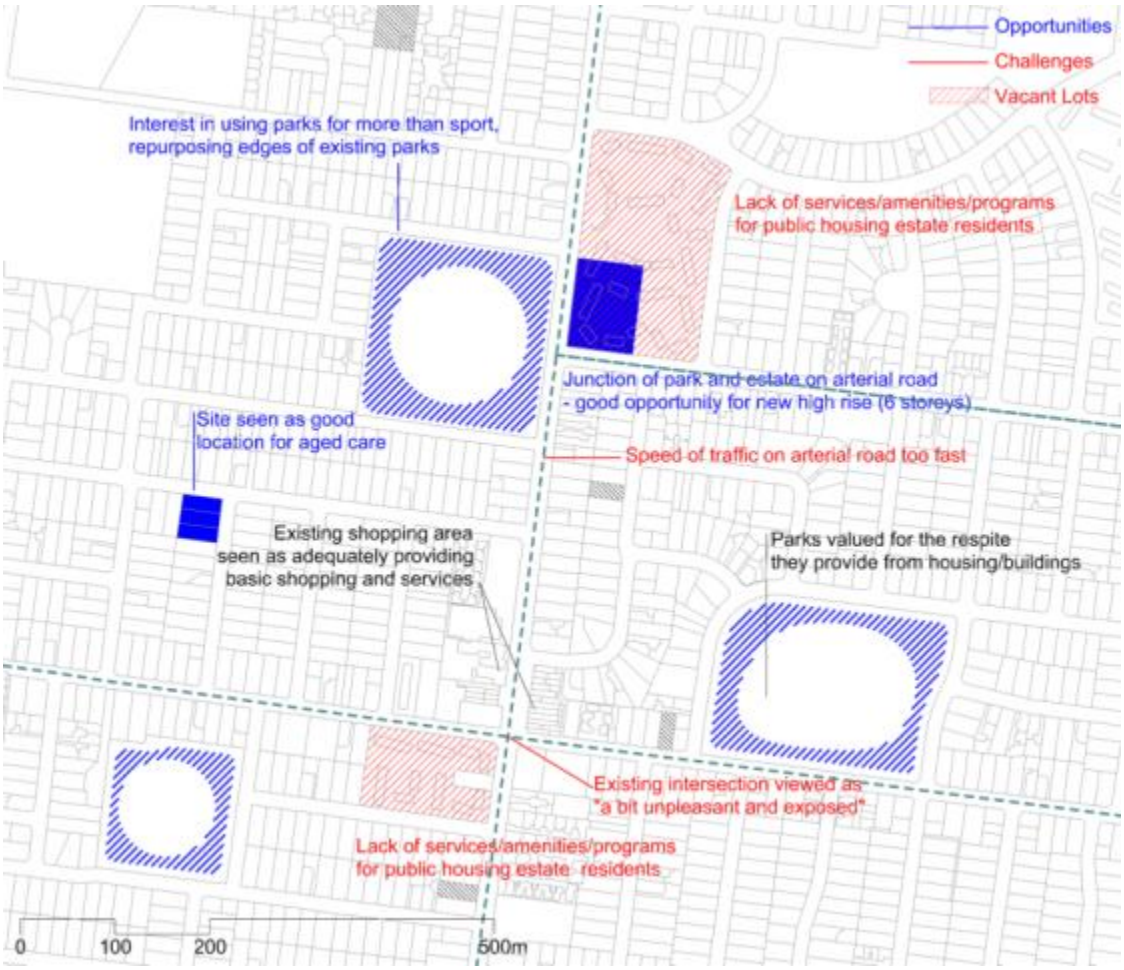
Negotiations around parking:

- parking provision can be negotiated down so long as facilities are within walking distance
- clustered parking accepted if safe and sheltered and not inconvenient
- underground parking is preferred.

Ageing society:

- Support for integrated aged care—ageing in place. Close to shops and public transport and part of the broader community. Avoid segregation.

Figure 37: Site specific knowledge



Needs/aspirations

New spaces for semi-private or organised community uses and support for public housing residents

- Bookable/rentable spaces for work or recreation: 'hot-desks', 'IT hub', 'yoga', 'craft groups', NFP groups (should not require contract), 'But no more libraries!'
- Programs for young families and the ageing
- Interest in shared facilities to reduce consumption
- Interest in mixed/adjacent facilities (cafe + child-care + parking)

→ Strong desire among public housing residents for more social services and community facilities—'We have apartment blocks, grass, and that's it'.

Smaller housing types

→ Two groups are growing—the aged and the unmarried single or couple—we desperately need smaller accommodation.

Top-five opportunities/issues/concerns

A total of 54 discrete responses (statements the size of a post-it note) were analysed and grouped into categories as shown in Table 2 below.

Table 2: Data collected on key concerns of residents (Study Area B)

Area of concern	N
Combined services and community space	13
Smaller apartments for submarkets (aged and singles)	6
Conserve open space	5
Social utility	5
Sustainability	5
Consultation and involvement in the planning process	5
Social and affordable housing	4
Reduce traffic flow through residential areas	3
Height and density	2
Public transport access	2
Develop shopping areas and providing more retail opportunities	2
Intelligent 'age in place'	1
Massing of buildings and creation of 'buffer' space	1

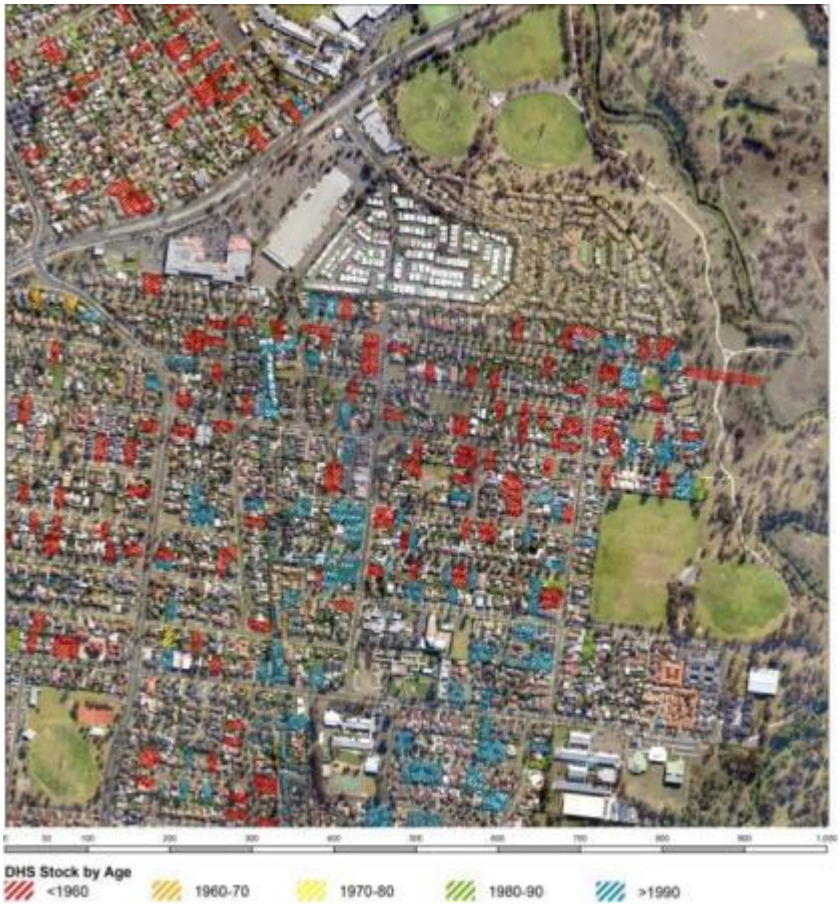
3 DESIGN DEVELOPMENT

The following section is comprised of collated data about the existing physical conditions, recent development activity and sales information in the two study areas. In addition are several design studies that examine and compare the outcomes of different design opportunities and approaches.

3.1 Existing conditions, recent development activity and sales

3.1.1 Study Area A

Figure 38: Aerial view of Area A

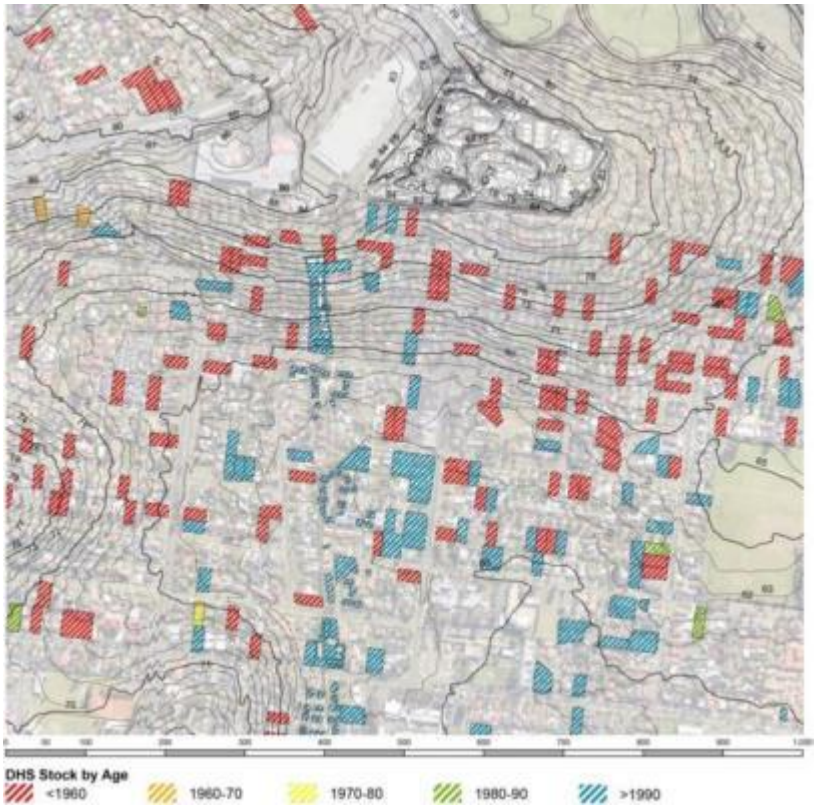


Shows the spread of different ages of DHS housing stock across Area A, categorised into decades. In this case there are roughly equal parts of older supply that is likely to have reached the end of its life, and more recent developments, less than 25 years old. Stock appears to be evenly spread across the precinct, often occurring in clusters of two or more blocks at a time. In addition the aerial shows the residential area is surrounded by a large park/reserve to the east, schools to the south and a main road, commercial precinct and residential villages to the north.

Figure 39: Building footprints in Area A

Shows very clearly the low density nature of the precinct, comprised almost wholly of detached dwellings with very few subdivisions. There is also a clear pattern apparent of building type, particularly towards the centre of the precinct, where building footprints are very similar in scale and position on the block.

Figure 40: Contour map of Area A



Shows the very steep and varying topography in Area A, particularly towards the north and west.

Figure 41: Recent developments mapped out over area

The most common development is replacement of a single dwelling with a dual occupancy. There are few higher density examples within the study area; net increase of three and more dwellings are more common on the peripheries/outside the study area. Lots shaded grey show 1-for-1 replacement, that is a single dwelling knocked-down and rebuilt. Sites that have been cleared but not redeveloped again are currently vacant lots (shaded red).

Source: Housing Development data 2004–11.

Figure 42: Recent sales (since 2009) mapped out over Area A

There does not appear to be an obvious pattern present, suggesting the spread and variety of prices is more dependent on dwelling quality than the location, however not enough data was available to make a conclusive assumption.

Source: publicly accessible real estate data 2014.

3.1.2 Study Area B

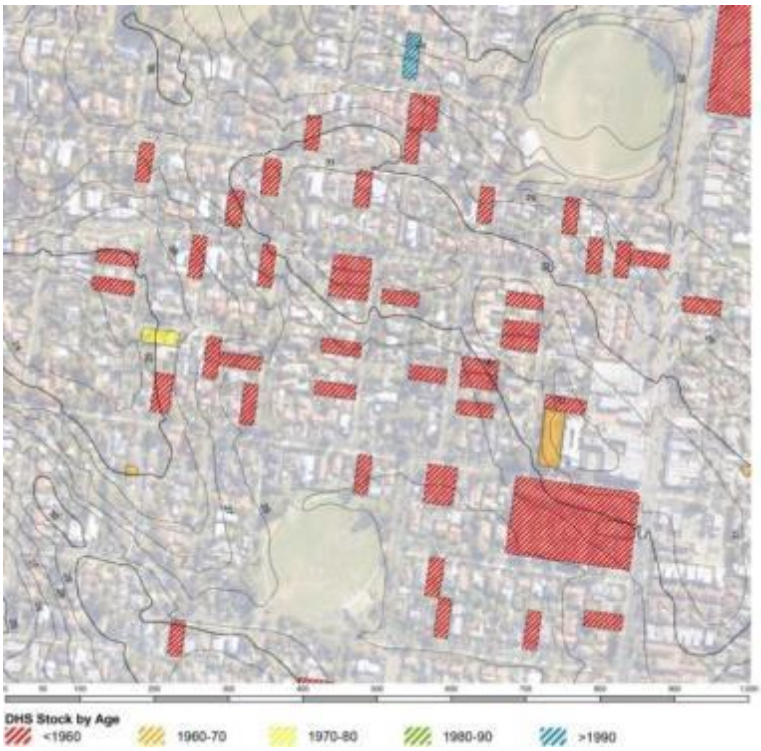
Figure 43: Aerial view of Area B

DHS stock has been categorised into decades of construction and mapped onto the aerial photograph. This image shows the spread of different ages of DHS housing stock, and in this case nearly all stock is well over 50 years old and most likely at the end of its life. Although there are some consolidated blocks, most stock sits alone as a single block, suggesting the bulk of the original estate has been sold off over time, apart from the higher density housing estates. The area appears to be predominantly residential, with an abundance of sports fields and local shopping strip surrounded by medium density housing towards the east.

Figure 44: Building footprints in Area B

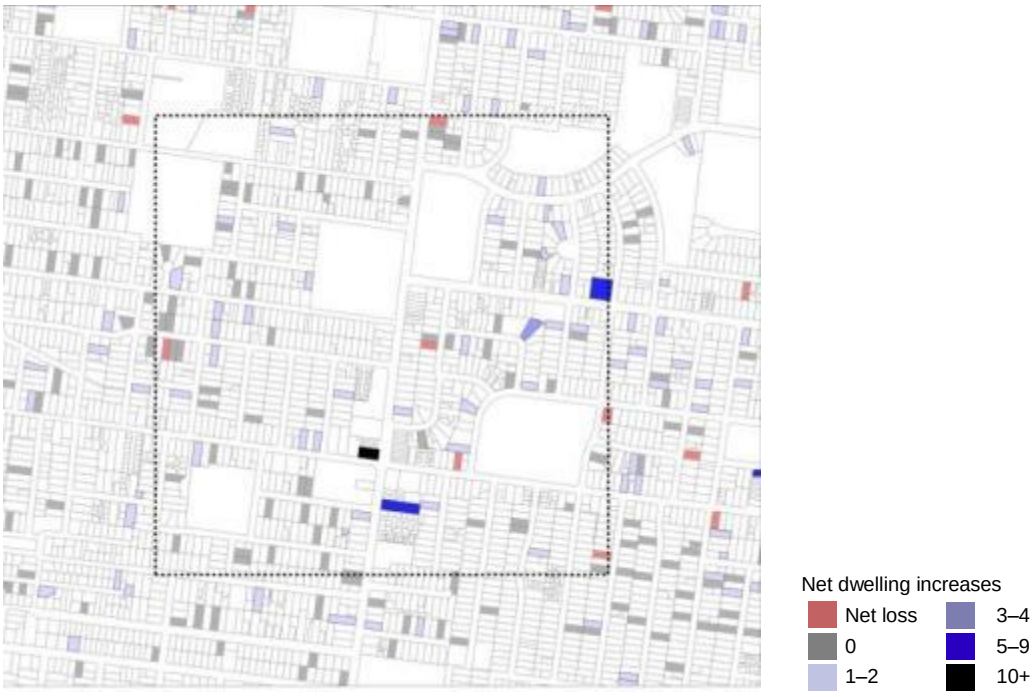
Shows a relatively denser scenario than in Area A, particularly around the shopping strip/main road running north-south, where there is a mix of apartment buildings and low-rise villas/units. In addition there is a significantly higher proportion of dual and triple occupancy subdivisions scattered throughout the precinct. Many of the building footprints are much larger than those in Area A, particularly when looking at single houses on single blocks.

Figure 45: Contour map of Area B



In contrast again to Area A, Area B is a much less steep, more even terrain across the entire precinct, apart from a small drop down towards the south-west corner, making it significantly more accessible particularly for less able people in the community.

Figure 46: Recent developments mapped out over Area B



There is a reasonable amount of redevelopment occurring in Area B, the most common type being a 1-for-1 replacement; that is an existing dwelling knocked down and replaced with a new one. In addition there are several examples of dual and triple occupancy developments evenly spread across the study area, and a few examples of higher density development (most likely apartments) towards the centre of the precinct.

Source: Housing development data 2004–11.

Figure 47: Recent sales (since 2009) mapped out over Area B

There does not appear to be an obvious link between the location of a site and price, despite a significant difference in median house prices across the four zones shown. Rather it is possible that property prices may be more dependent on the quality or size of the dwelling and land area, however the limited data available does not allow for a conclusive assumption.

Source: Real estate data in public domain, 2014.

3.2 Comparative design studies

Exemplary SHI housing models (Murray et al. 2013) were relocated onto the sites selected for each precinct design scenario to compare yield and quality outcomes. Typologies were chosen and positioned to achieve maximum density while still adhering to general planning laws (e.g. Rescode) and providing one car park for every dwelling as is the case in both the business-as-usual and precinct models.

Figure 48: Suite of SHI models in their original context

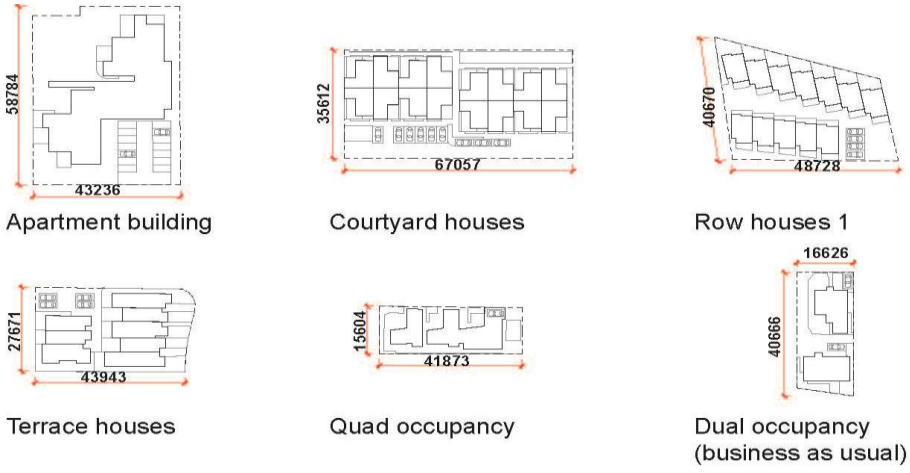
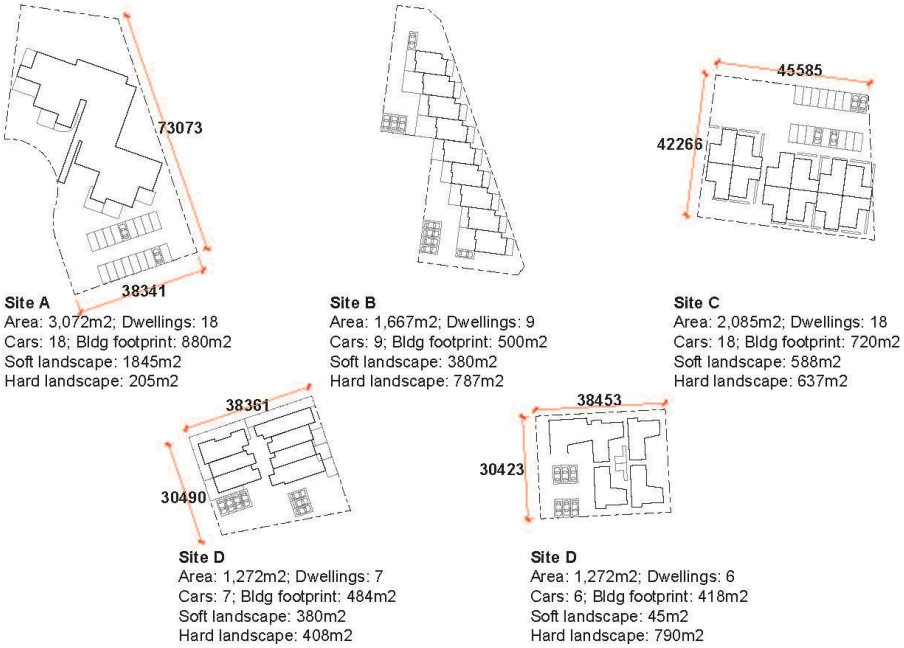
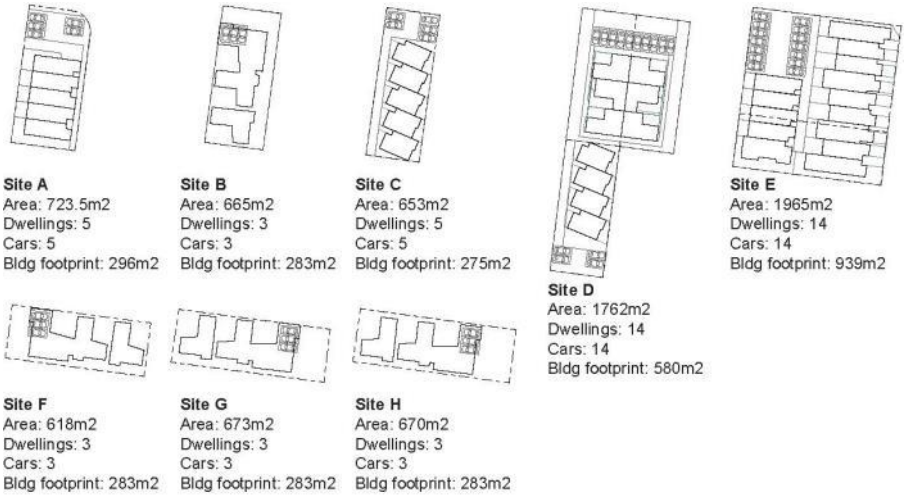


Figure 49: SHI models sited in the Park edge scenario



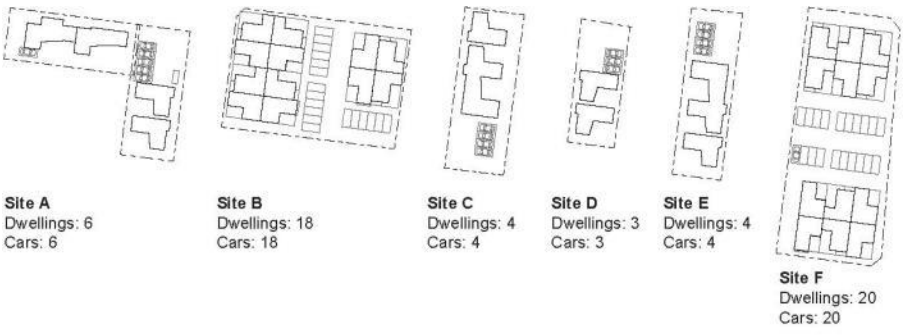
Park edge sites comprise five consolidated blocks (total 12 single lots).

Figure 50: SHI models sited in the Green streets precinct



Green streets sites comprise eight single and consolidated blocks (total 12 single lots).

Figure 51: SHI models sited in the Local shops precinct



Local shops sites comprise six single and consolidated blocks (total 12 single lots).

Figure 52: Comparable SHI developments in Green streets precinct

3.3 Public realm development

3.3.1 Design study concerning priorities of public realm development

Figures 53 and 54 show the extent and development priority of public realm works in the Park edge and Local shops precincts. Green streets has not been included because all works have been costed into the overall development works of that scenario. The area shaded blue is included in development costs and deemed integral to the overall precinct design, whereas the area shaded black is an additional cost excluded from initial development costs, that is, it is desirable but could happen in time with different funding methods.

Figure 53: Public realm works in Park edge precinct

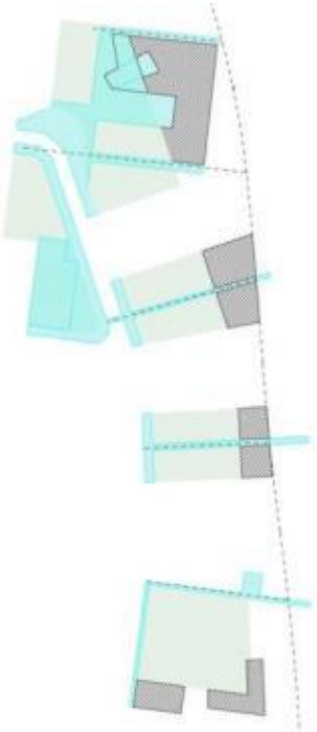
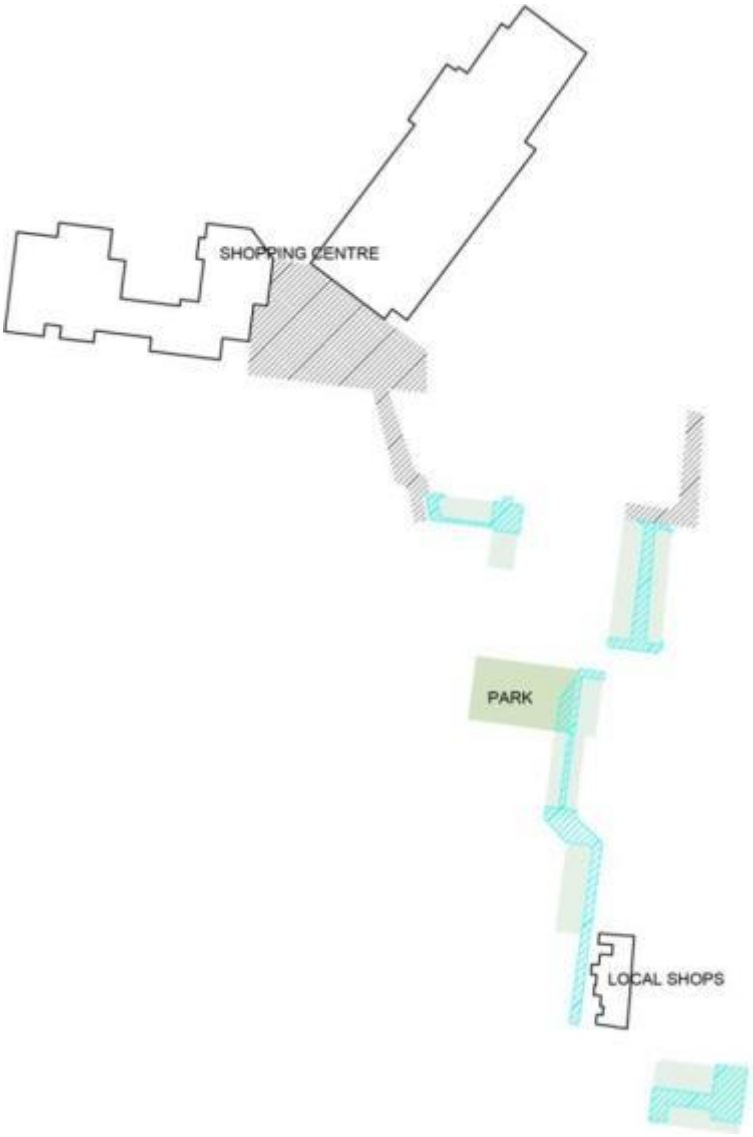


Figure 54: Public realm works in Local shops precinct



Included in development costs
(Considered integral to precinct design and should be completed with housing delivery)

Excluded from development costs
(Desirable but could happen over time with different funding/delivery options)

District-wide water capture, filtration and re-use
(Desirable but likely needs external funding at least in part. Precinct model makes this an option where site-by-site would not even consider)

4 VIABILITY

The following provides contextual information for the methods and assumptions used in the short and long-term viability assessments and documents the outcomes. Together, they form the basis of the findings in Section 5.3 of the Final Report.

4.1 Relevant issues and evidence

4.1.1 Lack of knowledge about residential infill and lack of concern for design quality

Relatively little is known about the current pattern of small-scale residential infill, the quality of its outcomes or its collective impact on established suburbs (Szafraniec & Holloway 2012; Newton et al. 2011; Phan et al. 2008). Section 2.2 of the Final Report discusses some of the barriers and knowledge gaps that impede design innovation. This section elaborates on design and quality issues relevant to development viability.

Rowley and Phibbs (2012) contend that: policy formation lacks a fundamental understanding of the challenges associated with infill development; existing research is preoccupied with planning issues; and very little work has identified a broader range of barriers to infill supply. In short, the literature fails to recognise that developers need to make a profit. Rowley and Phibbs undertook a series of Investigative Panels with industry stakeholders (public and private) to examine infill delivery from an economic perspective, from which they synthesised 40 possible points of intervention to incentivise diverse and affordable redevelopment within the private sector. Of the 40 suggestions, only one addressed design quality (which was actually about the efficacy of development approvals (Rowley & Phibbs 2012, pp.40–41):

> If developers want to build a standard scheme consistent with local planning documents they should be able to opt for a rules-based approach; a tick box exercise with a quick decision. For more innovative development there could be a merit-based approach which rewards quality design and housing diversity. [Quoting panel members:] 'If you come with a good design solution you can get rewarded, there needs to be that flexibility'. … 'Move planning away from a prescribed model. Whether you can have cluster housing, dual occupancy, etc.—they are all just houses. If dwellings are permissible they are permissible and then you stay within a height plane, e.g. four-storey area, two-storey area and then the market delivers the appropriate house type.

While the authors recognise that design is important, it was not discussed in detail by the panels. Nor did industry members consider that design and construction innovation would have a significant impact in the short-term. The above comments and lack of concern for design within the forums indicates a number of underlying industry attitudes:

- Design quality is not considered to be economically important.
- The immediate barriers to ‘getting units on the ground’ are considered independently to the long-term quality of development and its impacts. For example, housing diversity is considered a by-product of supply and demand rather than a strategic urban aspiration.
- Design quality is an exceptional provision not a standard expectation. It is used as a bargaining chip to gain developer ‘rewards’. Or design quality is a risk and a ‘reward’ is due if that risk is taken on. Given that *innovation* is not on the immediate development agenda, then design-risk perhaps indicates a poor quality benchmark to begin with.

The profitably of commercial activities is important: development needs to occur and a productive industry needs to be sustained. However, if design quality does not feature as a development concern, then it cannot be expected that the industry will exercise sufficient quality control to achieve good urban outcomes. It is argued here that the quality of the built environment has a central role to play in the long-term viability of infill redevelopment.

4.1.2 The issue of property value

Property value is perhaps the most significant factor for the viability of infill redevelopment. Higher value suburbs—where medium-density redevelopment is more viable—usually correspond with better quality physical environments, better access to amenity and services and greater socio-economic advantage (Rowley & Phibbs 2012; Bramley 2008). In low value suburbs—where urban regeneration is often most needed—medium-density redevelopment is not financially feasible (Pradolin 2009). This raises several short- and long-term considerations for a new precinct redevelopment model for greyfield suburbs.

Locations for redevelopment

Determined by short-term financial interests alone, higher density and better performing developments would concentrate in high value suburbs. This type of 'selective' renewal would, in effect, increase the value of already 'wealthy' urban areas. Without other mechanisms to encourage a more equitable distribution of redevelopment across established suburbs, profit-driven infill could deny upgrades to a large proportion of the city (Newton et al. 2011), exacerbate socio-spatial disadvantage (Cheshire et al. 2014; Hulse et al. 2014), and adversely impact broader levels of participation and productivity (e.g. workforce distributions; absenteeism; see Yates et al. 2007; Horne et al. 2008). These concerns are particularly pertinent for future decisions about government-owned housing assets distributed across Melbourne's middle suburbs.

Development impact on property values

Understanding how infill development can affect property values provides important insights for increasing affordable housing supply and initiating sustainable urban transformations. Neighbourhood quality is capitalised into housing values in two ways: neighbourhood effects (physical appearance, shared amenity, services, crime etc.) and spillover effects (adjacency to neighbouring properties) (Ooi & Le 2013). The rate and magnitude of price rises/falls varies through the interaction of different physical, social and market variables. Data and analysis of redevelopment impacts in Melbourne's middle suburban housing market is not readily available. A brief overview of international evidence is provided as a basis for this research.[2]

- *Spillover effects of housing development*—Edmiston (2012) estimates that single family dwellings delivered by the community sector increases the value of nearby properties by 11.8 per cent (4.8% per annum) and this impact drastically falls off outside a 150 metres radius. Impacts of public sector developments vary with housing type, tenant groups and the existing socio-economic composition of a neighbourhood (see below). Funderburg and MacDonald (2010) found that over a two to three years period and within a 800 metres radius: low-rise, concentrated low-income family housing had negative spillover effects (2–4%); high quality

[2] All studies employ hedonic regression modeling (or its subsets). This long-established method for estimating property values has recognised limitations (time-variances; definition of controls for externalities). Each study describes in detail the place-specific conditions of the analysis, the research limits and the significance of the results. For brevity, key issues and findings are reviewed here but it is noted that the results are highly qualified.

mixed income developments had insignificant effects; and newly constructed housing for elderly tenants had positive effects (2–4%). It is noted that figures describe differentials in growth between nearby properties and those further afield—all properties appreciated during the timeframes examined. A limitation of the analysis was the inability to distinguish between built form and tenant group causalities. The research concluded that negative impacts can be reduced or eliminated when development is well-integrated with the surrounding neighbourhood, however, better design metrics are needed to identify and quantify specific structural levers.

- *Neighbourhood amenity and quality*—Improving the appearance of neighbourhoods and providing amenity to support higher levels of community participation also has a positive effect on property value (Edmiston 2012). Value increases are heavily influenced by the existing site conditions, where removing the 'blight' of dilapidated building stock or utilising vacant land is often of greater importance than what is ultimately delivered (Ooi & Le 2013; Edmiston 2012; De Sousa et al. 2009). Having said this, estimates indicate that non-residential uses have a greater spillover effect despite the perception that low density housing 'estates' were most desirable (De Sousa et al. 2009). In the respective cities of Milwaukie and Minneapolis, the net effect of commercial development offered the greatest benefit (15.8% & 4.6%) followed by parks (11.7% & 4.4%), residential (8.6% & 3.1%) and industrial (4.7% & 3.2%). It was posed that the difference in growth rates between cities was due to a stronger housing market in Minneapolis. Here, initial property prices were less affected by 'blighted' brownfield sites. While the net effect was much greater in Milwaukie, it simply reversed existing negative effects with a return to property norms. Evidence also suggests that the price of dwellings near train lines were discounted whereas those proximate to major roads were elevated. This perhaps indicates preferences in travel mode and that the unappealing aspects of transit (noise etc.) are more significant than levels of access to public transport (Ooi & Le 2013; De Sousa et al. 2009). The location of dwellings and transport types illustrates existing conflicts between sustainable development and profitable development.

- *Socio-economic biases*—Publicly-subsidised housing is subject to pre-existing stigmas that bias its redevelopment impact. Negative effects are largely due to quality differences in housing stock and preferences for race and income levels within the community (Funderburg & MacDonald 2010). An examination of low income housing tax credit projects (LIHTC) in different socio-economic areas found nearby properties reduced in value in wealthy suburbs; negative but insignificant impacts were recorded in middle class neighbourhoods; and in low-income areas, the impacts were ambiguous. Edmiston (2012) notes that even though many LIHTC projects are delivered by the community sector, they have different development requirements and are often occupied by rental assistance tenants. She suggests one reason for the differing effects of public and community sector developments is that community housing focuses on home ownership. Homeowners typically stay longer in an area, better maintain their homes and are more active in the community. Again, it was found that negative impacts could be overcome with better housing design and tenant management (Funderburg & MacDonald 2010).

- *Scale and geographic scope*—Section 5.3 of the Final Report illustrates how coordinating greyfield sites for precinct-scaled redevelopment has a greater physical effect on neighbourhood quality than developing the same sites in isolation. This design response to site dispersion and clustering corresponds with the geographic scope of spillover estimates. The distance, magnitude and rate of spillover are influenced by the scale and type of development. The evidence

indicates it can be as small as a block for residential infill (150–500 metres radius) or as large as a neighbourhood for brownfield renewal. The effect of suburban infill increases with project scale or if cumulative investments occur within the same catchment area (Edmiston 2012; Funderburg & MacDonald 2010). However, the scale of brownfield and high-rise projects did not make a significant difference (De Sousa et al. 2009; Ooi & Le 2013). De Sousa et al. conclude that both small- and large-scale redevelopments are worthy of public investment which supports current shifts in strategic policy away from city-led redevelopment of a few large sites to city-facilitated redevelopment of an increased number of smaller projects.

4.1.3 Individual versus collective development, culture change and uplifted infill activity

More research is required to understand the place-specific market conditions of dispersed redevelopment in Melbourne's greyfields. However, evidence suggests that the collective impact of integrated precinct designs could potentially shift the overall cost-profit balance of medium density infill, particularly in low-value suburbs. With clear policy direction, initial development stages can also modify market conditions. Rowley and Phibbs (2012) discuss the value uplift that occurs when properties are rezoned for strategic intensification. Ooi and Le (2013) estimate that the 'premium' applied to new dwellings at project launch (prior to construction) immediately increase nearby property prices (also noting the decrease experienced upon project completion when new dwelling supply suppresses existing market offers). These, and similar, market 'tactics' must be considered in parallel with housing affordability.

Design innovation, combined with strategic support, could influence the current culture of infill redevelopment in established suburbs. Kelly et al. (2011) show that an appetite exists for a diverse range of well-located dwellings and that this demand is unmet by the homogenous nature of current housing supply. In a risk-averse, price-point driven industry the introduction of new and innovative design models is a challenge. It is argued here that government leadership is required to demonstrate the feasibility of more appropriate design outcomes in greyfield contexts. The demonstration value is two-fold: to shift current industry culture (supply and demand sides) and encourage more diverse market offerings, as well as catalyse uplifts in good quality infill activity. In addition to the spillover effects on surrounding property values, Schwarts (2006) and Edmiston (2012) describe the demonstration value of community and public sector development resulting in higher levels of private home financing.

4.1.4 Recalibration of short- and long-term imperatives

Section 2.2 of the Final Report raises some sustainable design benefits that are not taken up by the market due to increased upfront costs. This section elaborates on this issue from an economic perspective. Private markets fail to capture benefits like improved environmental performance, neighbourhood quality, community participation or public health impacts (Groenendijk 2006). These are long-term development outcomes that advantage societies and/or governments. Development also offers third party cost-savings through more efficient use of existing infrastructure, transportation and community services, which in turn increase asset values for land-owners (De Sousa et al. 2009) but few gains are offered to developers (Rowley & Phibbs 2012; Groenendijk 2006). Developers have a narrow view of development benefits, focusing solely on their own financial interests. Good quality development outcomes can contribute to the value uplift of near-by properties and catalyse subsequent increases in development activity within the overall industry (Edmiston 2012). Higher levels of activity may eventually result in cheaper building costs (as volume increases, economies of scale may occur through increased expertise and refinement of delivery processes; Groenendijk 2006; Newton et al. 2011) but it is not likely that individual

developers will be interested in contributing to these long-term industry effects (Rowley & Phibbs 2012).

Unless third party benefits can be (partly) passed on to those bearing the development costs, the quality and quantity of infill redevelopment will be limited (Groenendijk 2006; Rowley & Phibbs 2012). Cost, profit and risk sharing arrangements will be essential for precinct redevelopment in greyfield suburbs. Groenendijk (2006) suggests that a prerequisite for successful risk- and profit-sharing arrangements is that all parties have a general overview of costs and benefits, but this is often lacking in sustainable development initiatives. Stakeholders cannot or do not provide transparent information about property prices, development costs and benefits. Budgets and funding are restricted to individual parts of the project rather than integrated into the whole process, resulting in (partial) funding gaps and project failures.

4.2 Methodology

The aim of the viability assessments is to examine the short- and long-term impacts (both financial and physical) of integrated precinct designs, with a view to aiding decisions about the potential redevelopment of dispersed public housing land in greyfield suburbs. A detailed feasibility study was not within the scope of this project. The methods employed have been driven by three key challenges:

1. There is very little existing analysis specific to Melbourne's middle suburban infill housing market (Szafraniec & Holloway 2012; Howley & Phibbs 2012).
2. A lack of adequate design metrics impedes meaningful estimation of market effects attributable to specific dwelling and neighbourhood qualities (Funderburg & MacDonald 2010). In addition, the research examines a new and 'untested' infill model for which there is little precedent.
3. Stakeholders often cannot, or will not, provide transparent accounts of the overall costs and benefits of sustainable development which inhibits effective risk/profit sharing arrangements (Groenendijk 2006) and in turn impedes the implementation of innovative design and technology.

The study explores new ways of modeling infill design alternatives and their potential net financial impact over 20 years.

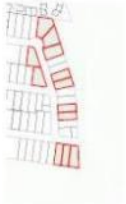
The assessments are design-driven in the sense that they speculate on future propositions and, through the creation and resolution of those propositions, provide insights about the conditions and contexts within which they are generated (Murray 2014). The costs and modeling are based on the design knowledge generated in previous stages of the research which cohere the expertise of the local community, housing providers, local government and the research team. Having incorporated the 'qualitative' design knowledge within each precinct scenario, the viability assessments are tasked with 'quantifying' their net impacts. The assessment method has been structured to enable a comparison of the costs and quality of different development approaches in 'as of now' market condition and then extrapolates their potential net impact over a 20-year lifecycle to explore their overall costs and benefits under shifting market conditions.

4.2.1 'As of now' comparative cost tests

The short-term cost tests engage with some known, and so far insurmountable, issues with infill redevelopment (e.g. developer margin, resident resistance; summarised in Figure 55; also see Rowley & Phibbs 2012; Newton et al. 2011). They are not formal cost estimates of the proposed designs, which was outside the scope of this project.

Rather they are structured as basic ‘working’ calculations to examine how different allowances and economic factors can potentially impact on the viability of individual development outcomes. To some extent, it is expected that higher density and higher quality precinct designs will not be feasible under ‘as of now’ market conditions. The aim of the comparative cost tests is to explore the degree to which this might occur compared to lower-risk development models, identify sources of expense and potential areas for future cost efficiencies.

Figure 55: Development scenarios for comparative analysis

	Development approach 1: Business as Usual	Development approach 2: Best-practice (SHI + private sector)	Development approach 3: Integrated precinct
			
URBAN IMPACT	"Death by 1,000 cuts" Sub-optimal outcomes Adverse impact at aggregate urban level.	Adversarial, opportunistic lot-by-lot. Valuable sites consumed in short-term. Lost opportunity in long-term.	Cooperative, integrated precinct approach Broader urban and social benefits. Significant player on local scale
Engagement + approval	No engagement required, little resistance Low-risk approval process . Potential as-of-right development	No engagement, resistance is common Adversarial: VCAT + 3rd party appeal Occurs independently to local initiatives	Engagement: community, CHOs and LGAs. Genuine community plan, uptake + participation New strategic instruments: UDF; greyfield zone
Assembly and delivery processes	Lot-by-lot approach 20% profit required per development 5% open space contribution per development LGA pays for community infrastructure 'Pot-luck' transfers to CHOs No opportunity for delivery and management efficiencies No opportunity for district-wide services		Single, place-based economic package **Strategic** development + sale of DHS land 20% profit required on parts of precinct only Potential reduction in development fees Potential alternatives for funding/delivery Management efficiencies, incl. decanting Potential for district-wide services
Time	PD D DD Cons	PD D DD Cons	PD D DD Cons
	PD=Pre-design; D=Design; DD=Design development; Cons=Construction		
Dwelling types + Potential yield	2-for-1 replacement low density, diversity, quality	Av. 4.5 dwellings per lot High quality, limited diversity	Av. 6.5 dwellings per lot High quality, diversity, transformative
based on 12 sites:	**24** dwellings; 12 net new	**54** dwellings; **42** net new	**78** dwellings; **66** net new
OPTIONS			**Strategic** acquisitions for greater benefit Local businesses + community 'buy-in' Utilise other public land (non-DHS owned) Community-based services Alternative finance options

The rates and items have been determined in consultation with industry and each scenario has been 'costed' in the same way, which enables relative conclusions to be drawn from the research. A detailed breakdown is provided for the three development approaches (BAU, SHI and Coordinated Precincts) across the three-site-clusters (12-lots: Park edge, Green streets, Local shops) with an aggregate outcome if the site-clusters were combined (36-lots). All scenarios have been run in Study Areas A and B to test the impact on differing property values. The calculations are set out to show:

- → The relative costs of delivering different precinct types and the potential revenue from sales of dwellings and community assets.
- → Adjusted totals if the cost of public housing land was subsequently discounted and open space contributions were applied.
- → An indication of the cost efficiencies that might be achieved by a coordinated precinct approach and the number of DHS lots that would need to be sold to 'break even'.

An additional column has been added to the coordinated precinct costs to show the relative totals generated at an 'improved' dwelling price. These are not included in the Final Report but provided an initial indication of the potential impacts of integrated public realm upgrades, enhanced amenity and services.

Data sources and definitions

Table 3: Data sources

Land value	**Median vacant residential land prices in each location (Department of Transport, Planning and Local Infrastructure 2014). $0 capital improved value assumed.**
Partnerships	Community engagement, assembly of development partnerships: 5% of build cost. Nominal amount determined in consultation with industry.
Site works	Demolition, excavation, site retention: $5,000 per allotment plus a nominal amount for site works reflecting the complexity of construction (e.g. underground parking). Determined in consultation with industry.
Build cost	Area rates determined in consultation with industry (Figure 56).
Professional fees	Percentage allocation of build cost, varied for the complexity of redevelopment approaches. Determined in consultation with industry.
Developer margin	20% of build cost. Applied to all scenarios based on the assumption that financial institutions will require a margin irrespective of who the 'developer' is (public, private or NFP). Determined in consultation with industry.
Time delays	5% of build cost. Nominal allowance for prolonged planning approvals and/or development disputes resolved through planning tribunals (e.g. VCAT). Determined in consultation with industry.
Contingency	10% of build cost. Nominal allowance for unforeseen costs. Determined in consultation with industry.
Median unit price:	(Department of Transport, Planning and Local Infrastructure 2014). For the purposes of this research, units are defined as on-ground dwellings (attached or semi-detached) that have the ability for future extension (either vertical or horizontal).
Apartment price:	In the middle suburbs, apartments typically cost less than houses/units with land. This is in part due to the size and type of current apartment offerings and the perception that land titles are a better investment than built capital. Land offers flexibility to extend or alter a dwelling which is more limited for apartments. Data specific to apartments was not accessible within this research; prices were determined from a desktop review of recent sales.
Saleable community assets:	Potential sale of community facilities and commercial premises to private operators. Sale prices are indicative only, based on the cost to construct plus the land value. Determined in consultation with industry.
Open space contribution:	5% of build cost; this is waived for the precinct scenarios where direct contributions are made through the public realm upgrades delivered.
Development efficiencies:	A nominal amount of 7.5% of the build cost representing potential cost efficiencies achieved by a precinct approach. This might include economies of scale, consolidated professional fees and the time/cost savings associated with a single approval process for the whole precinct rather than multiple approvals required for a lot-by-lot approach.

Figure 56: Data and definitions used for viability calculations

ASSUMPTIONS / VARIABLES

http://www.dtpli.vic.gov.au/__data/assets/pdf_file/0003/116796/VPSR_Jul_Sep2013.p

Property	AREA A			AREA B			
Median Land Value	$ 556 per m2			$ 1,573 per m2			source: Department of Transport, Planning and Local Infrastructure (2014 b) - stats c
Median House Price	$ 509,000			$ 1,175,000			source: Department of Transport, Planning and Local Infrastructure (2014 a) - 3rd q
Median Unit Price	$ 375,000			$ 670,000			source: Department of Transport, Planning and Local Infrastructure (2014 a) - 3rd q
Apartment Price	$ 300,000			$ 620,000			assumed: Median unit price less $50K (MAS to define in method)
Improved unit price	$ 425,000			$ 720,000			assumed: median unit + 50K (MAS to define in method)
Improved apartment price	$ 330,000			$ 650,000			assumed: apartment price + $30K (MAS to define in method)
Developable Land	**1km study AREA A**			**1km study AREA B**			
	DHS all	DHS selected	all lots in 1km study area	DHS all	DHS selected	all lots in 1km study area	
Number of lots	153	24	665	71	12	717	source: Department of Housing (2013)
Number of lots as % 1km study area	23%	4%	100%	10%	2%	100%	source: Department of Housing (2013)
Total lot area (m2)	108,076	16918	412,980	92,477	7,052	511,876	source: Department of Housing (2013)
Lots as % of 1km study area	26%	4%	100%	18%	1%	100%	source: Department of Housing (2013)
Av. lot size (m2)	706	705	621	657	588	557	source: Department of Housing (2013)
	*residential land only			*residential land only			
	**excludes land already strata titled / subdivided			**excludes land already strata titled / subdivided			
				*** excludes large housing estates			

Construciton Rates			Tenure Mix	
Multi-level apartments	$ 2,500	\m2 (tbc)	Market	50%
Double storey, attached	$ 2,000	\m2 (tbc)	Social	50%
Single storey, semi-detached	$ 1,800	\m2 (tbc)	including:	public housing
Commercial	$ 2,750	\m2 (tbc)		community housing
Infrastructure	$ 1,200	\m2 (tbc)		NRAS
Hard landscaping	$ 500	\m2 (tbc)		essential services
Soft landscaping	$ 300	\m2 (tbc)		aged + assisted living
				other?

Development definitions / measures

No. allotments:	
Site area (m2):	allotment site boundary
Additional public land (m2):	external to allotment boundary but integral to precinct design
Total precinct area (m2):	total of above
No. dwellings:	
assisted living units	do not have full kitchens - part of a care facility
1BR	40-50m2: typical apartment/small unit, often with constrained plan (e.g. bathroom off bedroom)
1.5 BR	50m2 or more: internal design allows for overnight guests, bathroom off living areas etc
2 BR	65m2+ apartment / 90m2+ townhouse
3 BR	75m2+ apartment / 115m2+ townhouse
4 BR	130m2+ townhouse/villa unit
5 BR	150m2+ townhouse/villa unit
Dwelling types:	classified by likely sale price
units	townhouses, dual occs, villa units, ground level units where separate dwelling is above only (i.e. no shared party walls
apartments	all dwellings 'in the air', ground level units where separate dwelling above + shared party walls on more than one side
No. Carparks:	total carparks provided for development (incl. visitors and parking allocations for public facilities)
per dwelling	total carparks divided by total dwellings
Public realm upgrades (m2)	public uses within allotment site boundary or additional public land to be regenerated by proposed development
Community / commercial facility	costed at a commercial rate
Public infrastructure	costed at a built infrastructure rate. Includes carparking decks etc
Landscape infrastructure	costed at 'hard landscape' rate. Includes ground treatments, servicing and infrastructure required for public use / access.
Green landscaping	costed at 'soft landscape' rate. Includes vegetation and planting designed to enhance the quality and types of open space amenity provided by the proposed development
Residential areas:	
Multi-level apartments	vertical + horizontal separation required
2 storey attached	party wall separation only, 2 storey construction
1 storey sem-detached	party wall separation only, single story construction
Open space:	
Landscaping:	costed as 'soft landscape': green landscaping including both private and common areas (excludes public areas calculated
Landscaping infrastructure:	costed as 'hard landscape': driveways, courtyards and infrastructure including both private and common areas (excludes public areas calculated above)
Indicators:	excludes land areas beyond site boundaries; e.g. public realm upgrades
Building footprints:	gross ground floor area
Open space:	site area less building footprints, includes hard and soft landscape
Floor area ratio:	total gross floor area : site area
Site Coverage (%):	building footprints : site area
Net density (dw/ha):	number of dwellings per hectare of site area (excludes roads, public open space, community amenity etc)
PUBLIC REALM CONTRIBUTIONS by others	Works and services requiring additional funding mechanisms, partnerships and delivery processes. Future urban and community potentials excluded from initial development costing, but made possible by precinct provisions.
Floor area (saleable)	Gross floor area in m2 including balconies and carports
Community assets (saleable)	Community buildings and the land they occupy that could be sold privately for additional revenue, price includes cost of con
Open space contribution (to LGA)	Monetary contribution equal to 5% of the total land value being developed, payable from the developer to the LGA (Council)

Figure 57: Development data for comparative design scenarios

	PRECINT #1: PARK EDGE				PRECINCT #2: GREEN STREETS				PRECINCT #3: LOCAL SHOPS			
	BAU	SHI	PRECINCT		BAU	SHI	PRECINCT		BAU	SHI	PRECINCT	
No. allotments:	**12**	**12**	**12**		**12**	**12**	**12**		**12**	**12**	**12**	
Site area (m2):	9100	9100	9100		7,747	7,747	7,747		7814	7814	7814	
Additional public land (m2):	0	0	2385		0	0	3,845		0	0	2449	
Total precinct area (m2):	**9100**	**9100**	**11485**		**7,747**	**7,747**	**11,592**		**7814**	**7814**	**10263**	
No. dwellings:	**24**	**58**	**89**		**24**	**50**	**68**		**24**	**53**	**77**	
assisted living units	0	0	0		0	0	12		0	0	0	
1BR	0	31	0		0	31	4		0	24	0	
1.5 BR	0	6	20		0	12	9		0	9	34	
2 BR	24	15	49		24	7	34		24	20	34	
3 BR	0	4	8		0	0	6		0	0	3	
4 BR	0	2	10		0	0	3		0	0	3	
5 BR	0	0	2		0	0	0		0	0	3	
saleable residential floor area (m2)	2676	4660	12733		2676	3587	4166		2676	4462	9759	
Dwelling types:	**24**	**58**	**89**		**24**	**50**	**68**		**24**	**53**	**77**	
units	24	27	39		24	38	28		24	24	29	
apartments	0	31	50		0	12	40		0	29	48	
No. Carparks:	**24**	**58**	**95**		**24**	**50**	**94**		**24**	**55**	**83**	
per dwelling	1.00	1.00	1.07		1.00	1.00	1.38		1.00	1.04	1.08	
Construction areas (m2)												
Public realm upgrades:				**Facilities provided**				**Facilities provided**				**Facilities provided**
Community / commercial facility	0	300	456	Childcare centre	0	0	300	Community centre	0	0	37	Pharmacy / medical
Community / commercial facility	0	0	0		0	0	1947	Health centre + assisted	0	0	42	Community Room
Public infrastructure	0	0	668	Parking deck + rec space	0	0	0		0	0	0	
Landscape infrastructure	0	0	1661	Landscape infrastructure	0	0		Landscape infrastructure	0	0	882	Landscape infrastructure
Green landscaping	0	0	1377	Green landscape	0	0		Green landscape	0	0	247	Green landscape
Dwelling construction:	**2676**	**4660**	**12733**		**2676**	**3587**	**4166**		**2676**	**4462**	**9759**	
Multi-level apartments	0	3235	7474		0	1250	1665		0	3000	6271	
2 storey attached	0	165	5006		0		1848		0	632	3429	
1 storey sem-detached	2676	1260	253		2676	2337	653		2844	830	59	
Open space:	**6424**	**6065**	**2511**		**5071**	**5147**	**4840**		**4975**	**5818**	**4169**	
Landscaping infrastructure:	2952	2827	350		2952	3153.5	1495		2410	4444	1436	
Green landscaping:	3472	3238	2161		2119	1993.5	3345		2565	1374	2733	
Inidcators:												
Building footprints:	2676	3002	4455		2676	2197	2937		2676	1996	3645	
Open space:	6424	6098	4645		5071	5550	4810		4975	5818	4169	
Floor area ratio:	0.29	0.51	1.40		0.35	0.46	0.54		0.34	0.57	1.25	
Site Coverage (%):	29%	33%	49%		35%	28%	38%		34%	26%	47%	
Net Density (dw/ha):	26	64	98		31	65	88		31	68	99	
PUBLIC REALM CONTRIBUTIONS by others												
	n/a	n/a	2838	Open space upgrades to park edge				private lots acquired or opt into street network	n/a	n/a	1210	Pedestrian connection to public tranport
	n/a	n/a	500 lineal m.	Water capture, filtration + reuse					n/a	n/a	110	Connection to retirement village

4.2.2 Life-cycle assessment: multi-criteria optimisation modeling

The life-cycle assessment examines the net financial impact of different infill development approaches over a 20-year timeframe. It employs a long-established method for optimising outcomes under a set of limits or constraints. Optimisation has been used in urban research fields to assess the 'best' allocation of scarce resources, the most effective combination of land uses, optimal performance of sustainable energy and water systems and the most efficient phasing of building maintenance (Ligmann‐Zielinska et al. 2008; Haque & Asami 2010; Bazmi & Zahedi 2011; Sotelo-Pichardo et al. 2014; Martinaitis & Uzsilaityte 2010). To the authors' knowledge, optimisation has not yet been applied to design and development assessments.

The method for assessing long-term development viability has been generated for three reasons. Firstly, sustainable development assessments require tools and processes that have the capacity to negotiate the multiple, and often conflicting, imperatives of a 'triple bottom line'. Multi-objective optimisation is a recognised approach to making complex trade-offs between sustainable criteria (Zavadskas & Turskis 2011; Bramley 2008). Secondly, sustainable development involves different stakeholders with a wide range of agendas and perspectives; often it isn't possible to identify explicit criteria for the stakeholder-group at the outset of an assessment process and/or inter-relates the breadth of user preferences involved. This situation currently exists for greyfield precincts. Optimisation allows decision-makers to experiment with criteria, explore alternative outcomes and learn more about the problem at hand as they search for solutions—in effect revealing user preferences as part of the assessment process (Xiao et al. 2007). Finally, decisions would ideally be based on detailed feasibility studies. However, this requires a level of design resolution, detailed data and specification of development arrangements that are often unavailable in the early stages of decision-making processes. Optimisation models enable dynamic adjustments to be made throughout various stages of assessment. Initial models might incorporate uncertain data, conditions or phasing with subsequent iterations becoming more sophisticated as preliminary decisions, preferences and project details are confirmed (Zavadskas & Turskis 2011; Xiao et al. 2007; Ligmann‐Zielinska et al. 2008).

Figure 58: An incremental approach to sustainable urban transformation

Source: Dench Analytics

The model developed for this research explores the potential transition from BAU lot-by-lot development to a higher instance of coordinated precinct outcomes over a 20-year period. By doing so, it examines the inputs and barriers associated with different levels of urban transformation (Figure 58). The study is not intended to 'solve' for the most feasible option, nor does it prescribe specific development arrangements (e.g. land ownership, finance, partnerships). By first comparing the net impact of different infill development scenarios, the research poses new

ways of considering the long-term costs and quality of development outcomes while exploring the conditions, limits and levers imposed at different intervals in the development life-cycle.

A classic optimisation model

Linear programming and optimisation

Linear optimisation models are of the form:

Find n-vector $\boldsymbol{x} = (x_1, \ldots\ldots, x_n)^T$ to maximise an objective function

$$\boldsymbol{c}^T\boldsymbol{x} = c_1x_1 + \ldots. + c_nx_n$$

subject to the constraints:

$$a_{11}x_1 + a_{12}x_2 + \cdot \; + a_{1n}x_n \leq b_1$$
$$a_{21}x_1 + a_{22}x_2 + \cdot \; + a_{2n}x_n \leq b2$$
...
$$a_{m1}x_1 + a_{m2}x_2 + \cdot \; + a_{mn}x_n \leq b_m$$

and:

$$x_1 \geq 0, \quad x_2 \geq 0, \ldots, \quad x_n \geq 0$$

Applying linear optimisation to targeted precinct redevelopment

The model maximises development profits over a 20-year period, subject to a set of constraints or limits. The bulk of these constraints are linear, while some are nonlinear. The imposition of constraints prevents infinite profits being achieved and serves to make the model as realistic as possible. The mathematical definition given above can be simply translated into a set of statements describing the current model:

Maximise the sum of profits over 20 years derived from unit and apartment sales

subject to constraints in the:

number of lots available for development in any period

the 'snowball' effect of increased stakeholder awareness of development benefits [3],

share of developments which are allocated to BAU, SHI and PRE categories

yield of precinct development by type [BAU, SHI and PRE] and location [A or B]

areas [m^2] of development by type [BAU, SHI and PRE] and location [A or B]

costs [cost per m^2] of development, as well as

prices within completed developments

and:

number of lots available $\geqslant 0$

snowball factor $\geqslant 0$

share of developments $\geqslant 0$

yield of precinct development $\geqslant 0$

areas [m^2] of development by type $\geqslant 0$

costs [cost per m^2] of development $\geqslant 0$, *as well as*

prices within completed developments $\geqslant 0$.

[3] 'Snowball effect' is defined as the acceleration of land made available by local residents, developers, DHS and/or others as they recognise the benefits of development involvement.

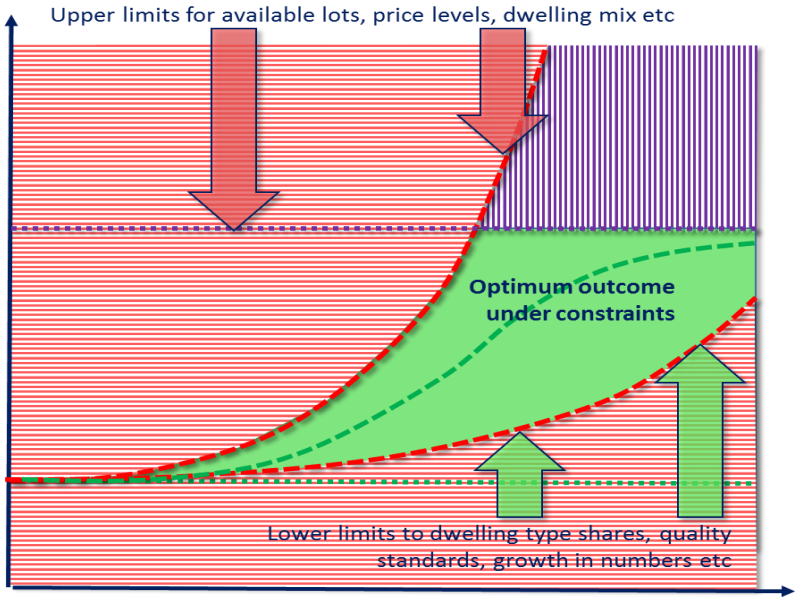
Constraints and variables used in the optimisation model

The limits and/or variables are set for each location, precinct design scenario and degree of optimism/pessimism of the 'strategic directions'. Therefore, sets of limits and variables are specific to:

Location	Design scenario	'Strategic direction'
→ *Area A, or*	→ Park edge, or	→ 'Do nothing' [pessimistic settings], or
→ *Area B and:*	→ Green streets, or	→ 'Housing quality benchmark' [mid-range settings], or
	→ Local shops and:	→ 'Strategic urban transitioning' [optimistic settings].

The combination of three levels of settings generates 18 distinct sets of constraints and variables, which can be seen as either leading to improved performance, or dampening performance from otherwise higher levels. Figure 59 illustrates the factors at play upon an otherwise stable pattern of development. It shows how the various constraints narrow the range of optimum outcomes and how the optimum level can vary progressively over time. Table 4 that follows defines the constraints and variables used in the model. Table 5 lists the magnitude of limits imposed over time. All costs and prices are given in constant dollars.

Figure 59: Optimisation of upper and lower limits



The Pareto front is the 'best', most optimal solution (dotted green). Sub-optimal solutions also reside in the 'decision space' (shaded green) and are still subject to decision constraints. Infeasible options do not meet the decision criteria (outside red dotted lines).

Source: Dench Analytics

The size and speed of the optimisation model

When any of the 18 sets of constraint and variable settings are imported into the model, the following model sizing is created:

- 1304 variables, of which 220 are nonlinear
- 1322 constraints, of which 180 are nonlinear
- 2840 non-zero cells, of which 360 are in nonlinear constraint lines.

Each scenario run takes approximately five seconds and up to 55 000 transformations of the model's equations to arrive at an optimal profit solution.

Table 4: Definition of constraints and variables used in the optimisation model

Category	Constraints	Variables set for each scenario
1. *Number* of lots available for development in any period:	The maximum DHS lot numbers available within the square kilometre. The maximum *total* lot numbers available within the square kilometre. The *share* of these lots to be used in a given period.	Number of lots per location (Area A or B). Refer development data (Figure 57). Number of lots per development type BAU, SHI or PRE. Refer development data (Figure 57) Maximum inter-period percentage growth in lots used. Conservative estimate is initially set at 12.5% p.a. representing a maximum of approx. 30 lots per year.
2. *Snowball* effect on lots available for use in any period:	The maximum and minimum annual percentage increase in lots available for use within a given scenario and period.	Percentage increase in rate of land released by property owners (local residents, developers, DHS and others) as they recognise the benefits of involvement in developments completed under each strategic direction ('Do nothing' 'Housing quality benchmark' and 'Strategic urban transitioning'). See Table 5 for year 1 and year 20 factors.
3. *Share* of developments which are allocated to BAU, SHI and PRE categories:	The maximum percentage category share available within a given scenario and period, given that: BAU% + SHI% + PRE% = 100% The minimum percentage category share available within a given scenario and period.	Maximum and minimum inter-period percentage of development types (BAU, SHI and PRE) completed under each strategic direction ('Do nothing' 'Housing quality benchmark' and 'Strategic urban transitioning'). See Table 5 for year 1 and year 20 factors.
4. *Yield* of precinct development by type (BAU, SHI and PRE) and location (A or B)	Determined by design scenarios.	Number of unit and apartment types constructed per design scenario (Park edge, Green streets and Local shops). Refer development data (Figure 57).
5. *Areas* (m^2) of development by type (BAU, SHI and PRE) and location (A or B):	Determined by design scenarios.	Site areas for development. Additional public use areas required. Dwelling areas by type (units, apartments). Hard-surfaced areas required. Soft-surfaced areas required. Refer development data (Figure 57).
6. *Costs* (per m^2) of development:	Determined by short-term cost tests.	Unit cost per m^2 for site purchase, infrastructure, commercial, hard-surfaced and soft-surfaced areas, Unit cost per m^2 for construction by type (unit or apartment), Development overheads (%) by type (BAU, SHI and PRE). Refer cost data (Figure 56).
7. *Prices* within completed developments by period:	Maximum and minimum annual percentage price rise limits for units, leading to: maximum and minimum price levels for units maximum and minimum annual percentage price rise limits for apartments, leading to: maximum and minimum price levels for apartments.	Percentage increase in sale prices relative to the physical quality and level of amenity provided by development type (BAU, SHI and PRE) completed under each strategic direction ('Do nothing' 'Housing quality benchmark' and 'Strategic urban transitioning'). See Table 5 for year 1 and year 20 factors.

Table 5: Magnitude of constraints applied to different scenarios

		'Do nothing'		Housing quality benchmark		Strategic urban transitioning	
		Year 1	Year 20	Year 1	Year 20	Year 1	Year 20
Development share max	BAU	100%	100%	100%	80%	100%	30%
	SHI	0%	15%	0%	40%	0%	50%
	PRE	0%	0%	0%	15%	0%	50%
Development share min	BAU	100%	80%	0%	40%	0%	10%
	SHI	0%	0%	0%	0%	0%	0%
	PRE	0%	0%	0%	0%	0%	0%
Snowball effect	Max	0%	2.5%	0%	15%	0%	30%
	Min	0%	0.6%	0%	3.8%	0%	7.5%
Price rise per annum	Max	0%	1%	0%	4%	2.5%	5%
	Min	0%	0%	0%	3%	1%	3%

See Section 5.3 in Final Report for a description of each 'strategic direction'. Basis for nominating magnitudes of constraints are described in assumptions below.

Source: Dench Analytics

4.3 Assumptions

Due to the scope of this study, the speculative nature of the design scenarios and the lack of place-specific data and analysis about residential infill redevelopment, the short- and long-term viability tests include the following assumptions.

Median prices—The use of median prices does not reflect the size and diversity of dwellings. For example, in the Park edge cluster, the yields for SHI (50 dwellings) and Precinct (68 dwellings) developments do not reflect the increased residential floor area of precinct (almost three times greater: 4660 square metres SHI and 12 730 square metres precincts). Sales based on $/m^2$ would overcome this issue, but presents a different set of challenges for the research. Dwelling diversity is a key aim for the project; dwelling types have been determined through the design research, responding to stakeholder feedback and specific physical contexts. Delivering a range of dwelling types and sizes impacts on achievable yields, as do the different building types appropriate for various sites. Calculating revenue by $/m^2$ negates the 'actual' yield achievable in diverse multi-residential projects and, so, the real sales possible. Apartments are not common 'products' in most suburban neighbourhoods; limited sales data exists that accurately reflect the proposed designs. International evidence suggests that the relationship between floor area and cost is not linear (Ooi & Le 2013). Establishing accurate prices for different dwelling types would require detailed pricing analysis outside the scope of this study (Edmiston 2012; Funderburg & MacDonald 2010). Median prices are used in the comparative cost tests but residential floor areas noted for each outcome.

Public realm enhancements—It is recognised that other sources of finance, land and/or surrounding development may contribute to public realm enhancements. However, the extent of contributions cannot be predicted at this stage. The 'as of now' cost comparisons consider this through open space contributions (precincts are exempted in lieu of direct physical upgrades) and nominal revenues from community asset sales. Figures could vary pending, say, different types of ownership and service delivery (e.g. public/private/community child care), or if local government involvement included land/funding, or if more substantial development contributions were introduced in line with other strategic zones. The long-term financial forecasts are less straight

forward; more research is required to determine sales data for the range of community and commercial uses proposed and how this might vary over time. Saleable community assets are excluded from long-term profit calculations at this stage. As such, net financial impacts of 'strategic urban transitioning' will likely be higher than presented here (BAU and 'housing quality benchmark' do not deliver saleable community assets and so the outcomes would not change).

Land costs—The cost have been included in both the short- and long-term viability scenarios. As funding arrangements, partnerships and procurement processes have not yet been prescribed, it is not possible to nominate the extent to which public housing land might be subsidised. In the long-term forecasts, redevelopment of privately owned allotments could encompass an assortment of ownership and capital funding (e.g. investors, small builders/developers, residents down-sizing and 'keeping half', etc.). The modeling examines the net impact of urban transformations in greyfields in terms of development quality, time and cost without land subsidies. Any financial gains or investment leveraging made possible by development partnerships or procurement would be in addition to the outcomes presented here.

Sample set—For the purposes of the long-term forecasting, all lots in the study areas have initially been allowed to redevelop over the course of the 20 years. It is acknowledged that, in reality, regeneration of all residential allotments is unlikely, however, this enables the optimisation model to register the 'snowball' effect on development activity using a relatively small pool of available lots.

Snowball effect—Evidence suggests that social housing development catalyses higher incidents of private home finance (Schwartz et al. 2006; Edmiston 2012), indicating that more desirable economic and physical conditions are brought about by the initial development. It is assumed that uplifts in redevelopment activity will ensue as local residents, developers, DHS and/or others recognise the benefits of development involvement and accelerate the availability of their land. No effect would occur in the first year, but land availability incrementally increases over time relative to the quality developments delivered (see Table 5 note impact on land *availability* only—growth in lot *usage* is capped at 12.5%).

Development impact on property values—The impact of redevelopment in low and high value suburbs is captured in the median sale prices of the units and apartments; the differential between the cost to deliver and dwelling sale prices varies over time depending on the quality of urban transformations achieved under the respective 'strategic directions' (see Table 5). Empirical analysis of development effects on property prices was not within the scope of this study. International evidence (see Section 4.1 above) has guided the magnitude of property appreciation in the life-cycle modeling:

1. *Spillover effect:* this study takes a conservative approach, adopting modest price rises over time, ranging from 2–5 per cent per year for well-designed outcomes (Edmiston 2012; De Sousa et al. 2009) with negligible effects from BAU development.
2. *Scale and geographic scope*: 'impact radii' of 150 metres for single dwellings and 800 metres for multi-residential were adopted (Edmiston 2012; Funderburg & MacDonald 2010). As several developments occur across the 1 square kilometre study areas over time, it is assumed the spillover effects would be similar for all surrounding properties.
3. *Socio-economic influence*: the designs prescribe a 50:50 social-private tenant mix and local communities have indicated support. It is assumed that negative impacts will not result from the socio-economic composition of existing and proposed neighbourhoods (Edmiston 2012; Funderburg & MacDonald 2010).
4. *Neighbourhood amenity and quality*: estimates of consolidated development (De Sousa et al. 2009) suggests that mixed uses and public realm upgrades proposed by precincts would have a greater impact on surrounding property values than lot-by-lot residential development. It is not clear how this would apply to dispersed development; additional property price rises have not been imposed at this stage.

4.4 Outcomes

4.4.1 'As of Now' viability—comparative cost tests

Figure 60: Comparative cost test: Park edge

PARK EDGE X 12 LOTS	BAU		SHI		PRECINCT		
Dwelling Yeild (total)	24	dwellings	58	dwellings	89	dwellings	
	24	units	27	units	39	units	
	-	apartments	31	apartments	50	apartments	
Saleable residnetial floor area	2,676	m2	4,660	m2	12,733	m2	
Build cost							
m2 x apt	-		3,235	$ 8,087,500	7,474	$ 18,685,000	
m2 x attached	-		165	$ 330,000	5,006	$ 10,012,000	
m2 x semi-detached	2,676	$ 4,816,800	1,260	$ 2,268,000	253	$ 455,400	
m2 x commercial	-	$ -	300	$ 825,000	456	$ 1,254,000	
m2 x infrastructure	-	$ -	-	$ -	668	$ 801,600	
m2 x hard landscape	2,952	$ 1,476,000	2,827	$ 1,413,500	2,011	$ 1,005,500	
m2 x soft landscape	3,472	$ 1,041,600	3,238	$ 971,400	3,538	$ 1,061,400	
TOTAL BUILD COST	9,100	**$ 7,334,400**	11,025	**$ 13,895,400**	19,406	**$ 33,274,900**	

COMPARATIVE COST TEST - AREA (A)							
COSTS							
Land value (assumes $0 capital value)		$ 5,059,600		$ 5,059,600		$ 5,059,600	
Engagement, assemble partners (% of build)	0%	$ -	0%	$ -	5%	$ 1,663,745	
Demolition, excavation, site retention	nom.	$ 60,000		$ 60,000		$ 140,000	$80K additional all
Build cost		$ 7,334,400		$ 13,895,400		$ 33,274,900	
Professional fees (% of build)	3%	$ 220,032	8%	$ 1,111,632	11%	$ 3,660,239	
Developer margin (% of build)	20%	$ 1,466,880	20%	$ 2,779,080	20%	$ 6,654,980	
Time delays e.g. approvals, VCAT (% of build)	0%	$ -	5%	$ 694,770	0%	$ -	
Contingencies	10%	$ 733,440	10%	$ 1,389,540	10%	$ 3,327,490	
SUBTOTAL		**$ 14,874,352**		**$ 24,990,022**		**$ 53,780,954**	
							AT IMPROVED VALUE
SALES							
units		$ 9,000,000		$ 10,125,000		$ 14,625,000	$ 16,575,000
apartments		$ -		$ 9,300,000		$ 15,000,000	$ 16,500,000
community assets		$ -		$ -		$ 2,805,088	$ 2,805,088
SUBTOTAL		**$ 9,000,000**		**$ 19,425,000**		**$ 32,430,088**	**$ 35,880,088**
TOTAL		**-$ 5,874,352**		**-$ 5,565,022**		**-$ 21,350,866**	**-$ 17,900,866**
LAND / FEES							
land value		$ 5,059,600		$ 5,059,600		$ 5,059,600	$ 5,059,600
open space contribution (5% land value)		-$ 252,980		-$ 252,980		$ -	$ -
SUBTOTAL		**$ 4,806,620**		**$ 4,806,620**		**$ 5,059,600**	**$ 5,059,600**
TOTAL		**-$ 1,067,732**		**-$ 758,402**		**-$ 16,291,266**	**-$ 12,841,266**
OTHER							
potential efficiencies e.g. economies of scale (7.5% build)		$ -		$ -		$ 2,495,618	$ 2,495,618
sale of DHS properties @ median house price		$ 1,527,000		$ 1,018,000		$ 14,252,000	$ 10,639,618
		(3 properties)		(2 properties)		(28 properties)	(16 properties)
SUBTOTAL		**$ 1,527,000**		**$ 1,018,000**		**$ 16,747,618**	**$ 13,135,235**
TOTAL		**$ 459,268**		**$ 259,598**		**$ 456,352**	**$ 293,969**
PUBLIC REALM UPGRADES BY OTHERS							
							Open space upgrades to park edge Water capture, filtration + reuse

COMPARATIVE COST TEST - AREA (B)							
COSTS							
Land value (assumes $0 capital value)		$ 14,314,300		$ 14,314,300		$ 14,314,300	
Engagement, assemble partners (% of build)	0%	$ -	0%	$ -	5%	$ 1,663,745	
Demolition, excavation, site retention	nom.	$ 60,000		$ 60,000		$ 140,000	$80K additional all
Build cost		$ 7,334,400		$ 13,895,400		$ 33,274,900	
Professional fees (% of build)	3%	$ 220,032	8%	$ 1,111,632	11%	$ 3,660,239	
Developer margin (% of build)	20%	$ 1,466,880	20%	$ 2,779,080	20%	$ 6,654,980	
Time delays e.g. approvals, VCAT (% of build)	0%	$ -	5%	$ 694,770	0%	$ -	
Contingencies	10%	$ 733,440	10%	$ 1,389,540	10%	$ 3,327,490	
SUBTOTAL		**$ 24,129,052**		**$ 34,244,722**		**$ 63,035,654**	
							AT IMPROVED VALUE
SALES							
units		$ 16,080,000		$ 18,090,000		$ 26,130,000	$ 28,080,000
apartments		$ -		$ 19,220,000		$ 31,000,000	$ 32,500,000
community assets		$ -		$ -		$ 4,176,004	$ 4,176,004
SUBTOTAL		**$ 16,080,000**		**$ 37,310,000**		**$ 61,306,004**	**$ 64,756,004**
TOTAL		**-$ 8,049,052**		**$ 3,065,278**		**-$ 1,729,650**	**$ 1,720,350**
LAND / FEES							
land value		$ 14,314,300		$ 14,314,300		$ 14,314,300	$ 5,059,600
open space contribution (5% land value)		-$ 715,715		-$ 715,715		$ -	$ -
SUBTOTAL		**$ 13,598,585**		**$ 13,598,585**		**$ 14,314,300**	**$ 5,059,600**
TOTAL		**$ 5,549,533**		**$ 16,663,863**		**$ 12,584,650**	**$ 6,779,950**
OTHER							
potential efficiencies e.g. economies of scale (7.5% build)		$ -		$ -		$ 2,495,618	$ 2,495,618
sale of DHS properties @ median house price		$ -		$ -		$ -	$ -
		(0 properties)		(0 properties)		(0 properties)	(0 properties)
SUBTOTAL		**$ -**		**$ -**		**$ 2,495,618**	**$ 2,495,618**
TOTAL		**$ 5,549,533**		**$ 16,663,863**		**$ 15,080,268**	**$ 9,275,568**
PUBLIC REALM UPGRADES BY OTHERS							
							Open space upgrades to park edge Water capture, filtration + reuse

Figure 61: Comparative cost test: Green streets

GREEN STREETS X 12 LOTS	BAU		SHI		PRECINCT		
Dwelling Yeild (total)	24	dwellings	50	dwellings	68	dwellings	
	24	units	38	units	28	units	
	-	apartments	12	apartments	40	apartments	
Saleable residnetial floor area	2,676	m2	3,587	m2	4,166	m2	
Build cost							
m2 x apt	-	$ -	1,250	$ 3,125,000	1,665	$ 4,162,500	
m2 x attached	-	$ -	-	$ -	1,848	$ 3,696,000	
m2 x semi-detached	2,676	$ 4,816,800	2,337	$ 4,206,600	653	$ 1,175,400	
m2 x commercial	-	$ -	-	$ -	2,247	$ 6,179,250	
m2 x infrastructure	-	$ -	-	$ -	-	$ -	
m2 x hard landscape	2,952	$ 1,476,000	3,154	$ 1,576,750	1,495	$ 747,500	
m2 x soft landscape	2,119	$ 635,700	1,994	$ 598,050	3,345	$ 1,003,350	
TOTAL BUILD COST	7,747	**$ 6,928,500**	8,734	**$ 9,506,400**	11,253	**$ 16,964,000**	

COMPARATIVE COST TEST - AREA (A)							
COSTS							
Land value (assumes $0 capital value)		$ 4,307,332		$ 4,307,332		$ 4,307,332	
Engagement, assemble partners (% of build)	0%	$ -	0%	$ -	5%	$ 848,200	
Demolition, excavation, site retention	nom.	$ 60,000		$ 60,000		$ 100,000	$40K additional all
Build cost		$ 6,928,500		$ 9,506,400		$ 16,964,000	
Professional fees (% of build)	3%	$ 207,855	8%	$ 760,512	11%	$ 1,866,040	
Developer margin (% of build)	20%	$ 1,385,700	20%	$ 1,901,280	20%	$ 3,392,800	
Time delays e.g. approvals, VCAT (% of build)	0%	$ -	5%	$ 475,320	0%	$ -	
Contingencies	10%	$ 692,850	10%	$ 950,640	10%	$ 1,696,400	
SUBTOTAL		**$ 13,582,237**		**$ 17,961,484**		**$ 29,174,772**	
							AT IMPROVED VALUE
SALES							
units		$ 9,000,000		$ 14,250,000		$ 10,500,000	$ 11,900,000
apartments		$ -		$ 3,600,000		$ 8,400,000	$ 13,200,000
community assets		$ -		$ -		$ 7,048,278	$ 7,048,278
SUBTOTAL		**$ 9,000,000**		**$ 17,850,000**		**$ 25,948,278**	**$ 32,148,278**
TOTAL		**-$ 4,582,237**		**-$ 111,484**		**-$ 3,226,494**	**$ 2,973,506**
LAND / FEES							
land value		$ 4,307,332		$ 4,307,332		$ 4,307,332	$ 4,307,332
open space contribution (5% land value)		-$ 215,367		-$ 215,367		$ -	$ -
SUBTOTAL		**$ 4,091,965**		**$ 4,091,965**		**$ 4,307,332**	**$ 4,307,332**
TOTAL		**-$ 490,272**		**$ 3,980,481**		**$ 1,080,838**	**$ 7,280,838**
OTHER							
potential efficiencies e.g. economies of scale (7.5% build)		$ -		$ -		$ 1,272,300	$ 1,272,300
sale of DHS properties @ median house price		$ 509,000 (1 property)					
SUBTOTAL		**$ 509,000**		**$ -**		**$ 1,272,300**	**$ 1,272,300**
TOTAL		**$ 18,728**		**$ 3,980,481**		**$ 2,353,138**	**$ 8,553,138**
PUBLIC REALM UPGRADES BY OTHERS							

private lots acquired or opt into street network

COMPARATIVE COST TEST - AREA (B)							
COSTS							
Land value (assumes $0 capital value)		$ 12,186,031		$ 12,186,031		$ 12,186,031	
Engagement, assemble partners (% of build)	0%	$ -	0%	$ -	5%	$ 848,200	
Demolition, excavation, site retention	nom.	$ 60,000		$ 60,000		$ 100,000	$40K additional all
Build cost		$ 6,928,500		$ 9,506,400		$ 16,964,000	
Professional fees (% of build)	3%	$ 207,855	8%	$ 760,512	11%	$ 1,866,040	
Developer margin (% of build)	20%	$ 1,385,700	20%	$ 1,901,280	20%	$ 3,392,800	
Time delays e.g. approvals, VCAT (% of build)	0%	$ -	5%	$ 475,320	0%	$ -	
Contingencies	10%	$ 692,850	10%	$ 950,640	10%	$ 1,696,400	
SUBTOTAL		**$ 21,460,936**		**$ 25,840,183**		**$ 37,053,471**	
							AT IMPROVED VALUE
SALES							
units		$ 16,080,000		$ 25,460,000		$ 18,760,000	$ 20,160,000
apartments		$ -		$ 7,440,000		$ 17,360,000	$ 26,000,000
community assets		$ -		$ -		$ 8,637,849	$ 8,637,849
SUBTOTAL		**$ 16,080,000**		**$ 32,900,000**		**$ 44,757,849**	**$ 54,797,849**
TOTAL		**-$ 5,380,936**		**$ 7,059,817**		**$ 7,704,378**	**$ 17,744,378**
LAND / FEES							
land value		$ 12,186,031		$ 12,186,031		$ 12,186,031	$ 4,307,332
open space contribution (5% land value)		-$ 609,302		-$ 609,302		$ -	$ -
SUBTOTAL		**$ 11,576,729**		**$ 11,576,729**		**$ 12,186,031**	**$ 4,307,332**
TOTAL		**$ 6,195,793**		**$ 18,636,546**		**$ 19,890,409**	**$ 22,051,710**
OTHER							
potential efficiencies e.g. economies of scale (7.5% build)		$ -		$ -		$ 1,272,300	$ 1,272,300
sale of DHS properties @ median house price		$ - (0 properties)		$ - (0 properties)		$ - (0 properties)	$ - (0 properties)
SUBTOTAL		**$ -**		**$ -**		**$ 1,272,300**	**$ 1,272,300**
TOTAL		**$ 6,195,793**		**$ 18,636,546**		**$ 21,162,709**	**$ 23,324,010**
PUBLIC REALM UPGRADES BY OTHERS							

private lots acquired or opt into street network

Figure 62: Comparative cost test: Local shops

COMBINED SCENARIOS X 36 LOTS	BAU		SHI		PRECINCT		
Dwelling Yeild (total)	72	dwellings	161	dwellings	234	dwellings	
	72	units	89	units	96	units	
	-	apartments	72	apartments	138	apartments	
Saleable residnetial floor area	8,028	m2	12,709	m2	26,658	m2	
Build cost			-		-		
m2 x apt	-	$ -	7,485	$ 18,712,500	15,410	$ 38,525,000	
m2 x attached	-	$ -	797	$ 1,594,000	10,283	$ 20,566,000	
m2 x semi-detached	8,196	$ 14,752,800	4,427	$ 7,968,600	965	$ 1,737,000	
m2 x commercial	-	$ -	300	$ 825,000	2,782	$ 7,650,500	
m2 x infrastructure	-	$ -	-	$ -	668	$ 801,600	
m2 x hard landscape	8,314	$ 4,157,000	10,425	$ 5,212,250	5,824	$ 2,912,000	
m2 x soft landscape	8,156	$ 2,446,800	6,606	$ 1,981,650	9,863	$ 2,958,750	
TOTAL BUILD COST		**$ 21,356,600**		**$ 36,294,000**		**$ 75,150,850**	

COMPARATIVE COST TEST - AREA (A)							
COSTS							
Land value (assumes $0 capital value)		$ 13,711,516		$ 13,711,516		$ 13,711,516	
Engagement, assemble partners (% of build)	0%	$ -	0%	$ -	5%	$ 3,757,543	
Demolition, excavation, site retention	nom.	$ 180,000		$ 180,000		$ 360,000	$180K additional e
Build cost		$ 21,356,600		$ 36,294,000		$ 75,150,850	
Professional fees (% of build)	3%	$ 640,698	8%	$ 2,903,520	11%	$ 8,266,594	
Developer margin (% of build)	20%	$ 4,271,320	20%	$ 7,258,800	20%	$ 15,030,170	
Time delays e.g. approvals, VCAT (% of build)	0%	$ -	5%	$ 1,814,700	0%	$ -	
Contingencies	10%	$ 2,135,660	10%	$ 3,629,400	10%	$ 7,515,085	
SUBTOTAL		**$ 42,295,794**		**$ 65,791,936**		**$ 123,791,757**	
							AT IMPROVED VALUE
SALES							
units		$ 27,000,000		$ 33,375,000		$ 36,000,000	$ 40,800,000
apartments		$ -		$ 21,600,000		$ 37,800,000	$ 45,540,000
community assets		$ -		$ -		$ 10,155,128	$ 10,155,128
SUBTOTAL		**$ 27,000,000**		**$ 54,975,000**		**$ 83,955,128**	**$ 96,495,128**
TOTAL		**-$ 15,295,794**		**-$ 10,816,936**		**-$ 39,836,629**	**-$ 27,296,629**
LAND / FEES							
land value		$ 13,711,516		$ 13,711,516		$ 13,711,516	$ 13,711,516
open space contribution (5% land value)		-$ 685,576		-$ 685,576		$ -	$ -
SUBTOTAL		**$ 13,025,940**		**$ 13,025,940**		**$ 13,711,516**	**$ 13,711,516**
TOTAL		**-$ 2,269,854**		**$ 2,209,004**		**-$ 26,125,113**	**-$ 13,585,113**
OTHER							
potential efficiencies e.g. economies of scale		$ -		$ -		$ 5,636,314	$ 5,636,314
sale of DHS properties @ median house price		$ 2,545,000		$ -		$ 20,869,000	$ 8,144,000
		(5 properties)				(41 properties)	(16 properties)
SUBTOTAL		**$ 2,545,000**		**$ -**		**$ 26,505,314**	**$ 13,780,314**
TOTAL		**$ 275,146**		**$ 2,209,004**		**$ 380,201**	**$ 195,201**
PUBLIC REALM UPGRADES BY OTHERS							
				Open space upgrades to park edge Water capture, filtration + reuse private lots acquired or opt into street network		Connection to public tranport Connection to retirement village Open space upgrades	

COMPARATIVE COST TEST - AREA (B)							
COSTS							
Land value (assumes $0 capital value)		$ 38,791,753		$ 38,791,753		$ 38,791,753	
Engagement, assemble partners (% of build)	0%	$ -	0%	$ -	5%	$ 3,757,543	
Demolition, excavation, site retention	nom.	$ 180,000		$ 180,000		$ 360,000	$180K additional e
Build cost		$ 21,356,600		$ 36,294,000		$ 75,150,850	
Professional fees (% of build)	3%	$ 640,698	8%	$ 2,903,520	11%	$ 8,266,594	
Developer margin (% of build)	20%	$ 4,271,320	20%	$ 7,258,800	20%	$ 15,030,170	
Time delays e.g. approvals, VCAT (% of build)	0%	$ -	5%	$ 1,814,700	0%	$ -	
Contingencies	10%	$ 2,135,660	10%	$ 3,629,400	10%	$ 7,515,085	
SUBTOTAL		**$ 67,376,031**		**$ 90,872,173**		**$ 148,871,994**	
							AT IMPROVED VALUE
SALES							
units		$ 48,240,000		$ 59,630,000		$ 64,320,000	$ 69,120,000
apartments		$ -		$ 44,640,000		$ 78,120,000	$ 89,700,000
community assets		$ -		$ -		$ 13,270,199	$ 13,270,199
SUBTOTAL		**$ 48,240,000**		**$ 104,270,000**		**$ 155,710,199**	**$ 172,090,199**
TOTAL		**-$ 19,136,031**		**$ 13,397,827**		**$ 6,838,205**	**$ 23,218,205**
LAND / FEES							
land value		$ 38,791,753		$ 38,791,753		$ 38,791,753	$ 38,791,753
open space contribution (5% land value)							$ -
SUBTOTAL		**$ 38,791,753**		**$ 38,791,753**		**$ 38,791,753**	**$ 38,791,753**
TOTAL		**$ 19,655,722**		**$ 52,189,580**		**$ 45,629,958**	**$ 62,009,958**
OTHER							
potential efficiencies e.g. economies of scale		$ -		$ -		$ 5,636,314	$ 5,636,314
sale of DHS properties @ median house price		$ -		$ -		$ -	$ -
		(0 properties)		(0 properties)		(0 properties)	(0 properties)
SUBTOTAL		**$ -**		**$ -**		**$ 5,636,314**	**$ 5,636,314**
TOTAL		**$ 19,655,722**		**$ 52,189,580**		**$ 51,266,272**	**$ 67,646,272**
PUBLIC REALM UPGRADES BY OTHERS							
				Open space upgrades to park edge Water capture, filtration + reuse private lots acquired or opt into street network		Connection to public tranport Connection to retirement village Open space upgrades	

Figure 63: Comparative cost test: Combined precinct designs

COMBINED SCENARIOS X 36 LOTS	BAU		SHI		PRECINCT		
Dwelling Yeild (total)	72	dwellings	161	dwellings	234	dwellings	
	72	units	89	units	96	units	
	-	apartments	72	apartments	138	apartments	
Saleable residnetial floor area	8,028	m2	12,709	m2	26,658	m2	
Build cost			-		-		
m2 x apt	-	$ -	7,485	$ 18,712,500	15,410	$ 38,525,000	
m2 x attached	-	$ -	797	$ 1,594,000	10,283	$ 20,566,000	
m2 x semi-detached	8,196	$ 14,752,800	4,427	$ 7,968,600	965	$ 1,737,000	
m2 x commercial	-	$ -	300	$ 825,000	2,782	$ 7,650,500	
m2 x infrastructure	-	$ -	-	$ -	668	$ 801,600	
m2 x hard landscape	8,314	$ 4,157,000	10,425	$ 5,212,250	5,824	$ 2,912,000	
m2 x soft landscape	8,156	$ 2,446,800	6,606	$ 1,981,650	9,863	$ 2,958,750	
TOTAL BUILD COST		**$ 21,356,600**		**$ 36,294,000**		**$ 75,150,850**	

COMPARATIVE COST TEST - AREA (A)							
COSTS							
Land value (assumes $0 capital value)		$ 13,711,516		$ 13,711,516		$ 13,711,516	
Engagement, assemble partners (% of build)	0%	$ -	0%	$ -	5%	$ 3,757,543	
Demolition, excavation, site retention	nom.	$ 180,000		$ 180,000		$ 360,000	$180K additional e
Build cost		$ 21,356,600		$ 36,294,000		$ 75,150,850	
Professional fees (% of build)	3%	$ 640,698	8%	$ 2,903,520	11%	$ 8,266,594	
Developer margin (% of build)	20%	$ 4,271,320	20%	$ 7,258,800	20%	$ 15,030,170	
Time delays e.g. approvals, VCAT (% of build)	0%	$ -	5%	$ 1,814,700	0%	$ -	
Contingencies	10%	$ 2,135,660	10%	$ 3,629,400	10%	$ 7,515,085	
SUBTOTAL		**$ 42,295,794**		**$ 65,791,936**		**$ 123,791,757**	
							AT IMPROVED VALUE
SALES							
units		$ 27,000,000		$ 33,375,000		$ 36,000,000	$ 40,800,000
apartments		$ -		$ 21,600,000		$ 37,800,000	$ 45,540,000
community assets		$ -		$ -		$ 10,155,128	$ 10,155,128
SUBTOTAL		**$ 27,000,000**		**$ 54,975,000**		**$ 83,955,128**	**$ 96,495,128**
TOTAL		**-$ 15,295,794**		**-$ 10,816,936**		**-$ 39,836,629**	**-$ 27,296,629**
LAND / FEES							
land value		$ 13,711,516		$ 13,711,516		$ 13,711,516	$ 13,711,516
open space contribution (5% land value)		-$ 685,576		-$ 685,576		$ -	$ -
SUBTOTAL		**$ 13,025,940**		**$ 13,025,940**		**$ 13,711,516**	**$ 13,711,516**
TOTAL		**-$ 2,269,854**		**$ 2,209,004**		**-$ 26,125,113**	**-$ 13,585,113**
OTHER							
potential efficiencies e.g. economies of scale		$ -		$ -		$ 5,636,314	$ 5,636,314
sale of DHS properties @ median house price		$ 2,545,000		$ -		$ 20,869,000	$ 8,144,000
		(5 properties)				(41 properties)	(16 properties)
SUBTOTAL		**$ 2,545,000**		**$ -**		**$ 26,505,314**	**$ 13,780,314**
TOTAL		**$ 275,146**		**$ 2,209,004**		**$ 380,201**	**$ 195,201**
PUBLIC REALM UPGRADES BY OTHERS							
				Open space upgrades to park edge Water capture, filtration + reuse private lots acquired or opt into street network		Connection to public tranport Connection to retirement village Open space upgrades	

COMPARATIVE COST TEST - AREA (B)							
COSTS							
Land value (assumes $0 capital value)		$ 38,791,753		$ 38,791,753		$ 38,791,753	
Engagement, assemble partners (% of build)	0%	$ -	0%	$ -	5%	$ 3,757,543	
Demolition, excavation, site retention	nom.	$ 180,000		$ 180,000		$ 360,000	$180K additional e
Build cost		$ 21,356,600		$ 36,294,000		$ 75,150,850	
Professional fees (% of build)	3%	$ 640,698	8%	$ 2,903,520	11%	$ 8,266,594	
Developer margin (% of build)	20%	$ 4,271,320	20%	$ 7,258,800	20%	$ 15,030,170	
Time delays e.g. approvals, VCAT (% of build)	0%	$ -	5%	$ 1,814,700	0%	$ -	
Contingencies	10%	$ 2,135,660	10%	$ 3,629,400	10%	$ 7,515,085	
SUBTOTAL		**$ 67,376,031**		**$ 90,872,173**		**$ 148,871,994**	
							AT IMPROVED VALUE
SALES							
units		$ 48,240,000		$ 59,630,000		$ 64,320,000	$ 69,120,000
apartments		$ -		$ 44,640,000		$ 78,120,000	$ 89,700,000
community assets		$ -		$ -		$ 13,270,199	$ 13,270,199
SUBTOTAL		**$ 48,240,000**		**$ 104,270,000**		**$ 155,710,199**	**$ 172,090,199**
TOTAL		**-$ 19,136,031**		**$ 13,397,827**		**$ 6,838,205**	**$ 23,218,205**
LAND / FEES							
land value		$ 38,791,753		$ 38,791,753		$ 38,791,753	$ 38,791,753
open space contribution (5% land value)							$ -
SUBTOTAL		**$ 38,791,753**		**$ 38,791,753**		**$ 38,791,753**	**$ 38,791,753**
TOTAL		**$ 19,655,722**		**$ 52,189,580**		**$ 45,629,958**	**$ 62,009,958**
OTHER							
potential efficiencies e.g. economies of scale		$ -		$ -		$ 5,636,314	$ 5,636,314
sale of DHS properties @ median house price		$ -		$ -		$ -	$ -
		(0 properties)		(0 properties)		(0 properties)	(0 properties)
SUBTOTAL		**$ -**		**$ -**		**$ 5,636,314**	**$ 5,636,314**
TOTAL		**$ 19,655,722**		**$ 52,189,580**		**$ 51,266,272**	**$ 67,646,272**
PUBLIC REALM UPGRADES BY OTHERS							
				Open space upgrades to park edge Water capture, filtration + reuse private lots acquired or opt into street network		Connection to public tranport Connection to retirement village Open space upgrades	

4.4.2 Life-cycle assessment—optimisation modeling x 18 scenarios

Figure 64: Dwelling count & profit—'Do nothing' Park edge Area A

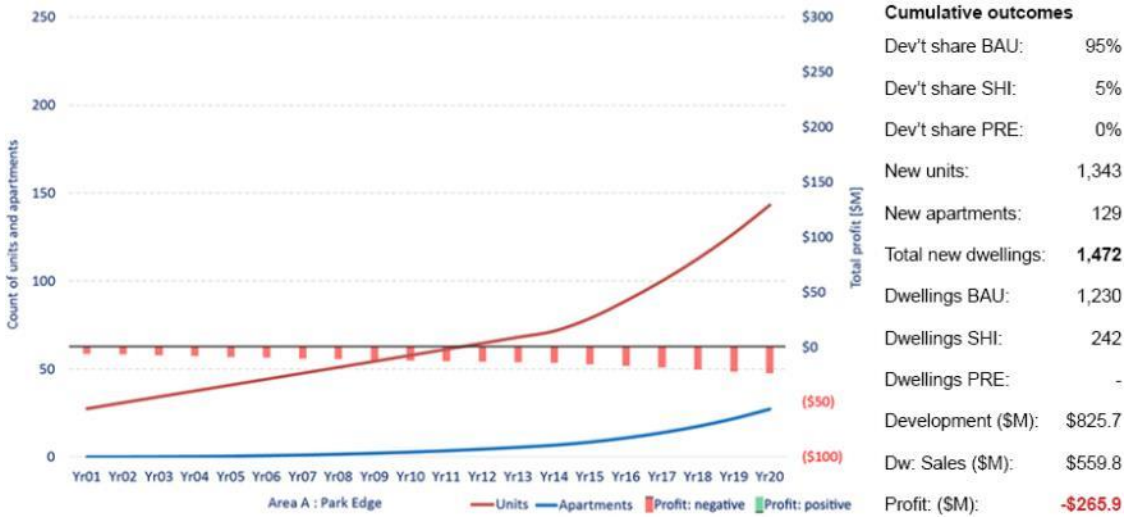


Figure 65: Dwelling count & profit—'Housing quality' Park edge Area A

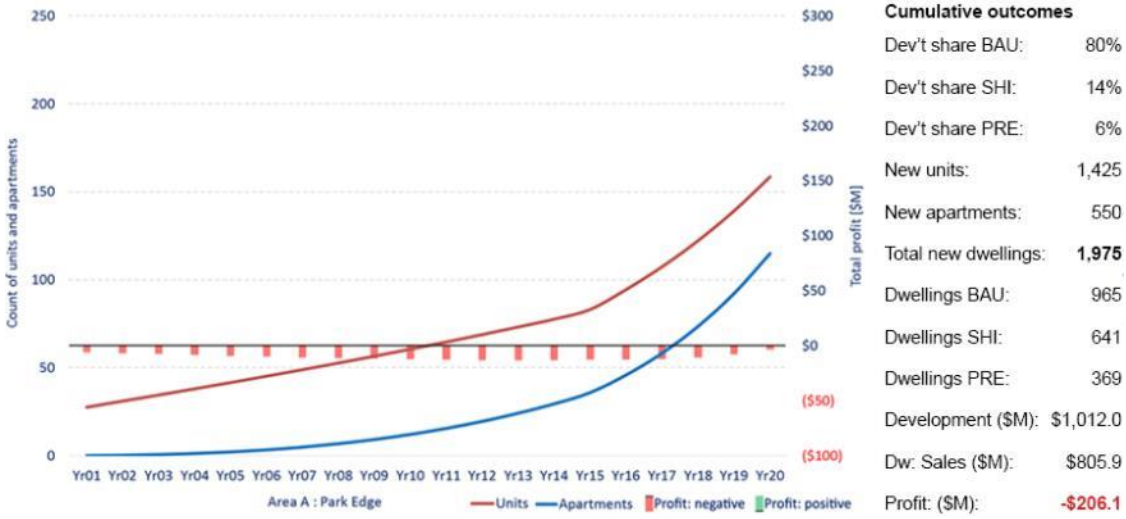
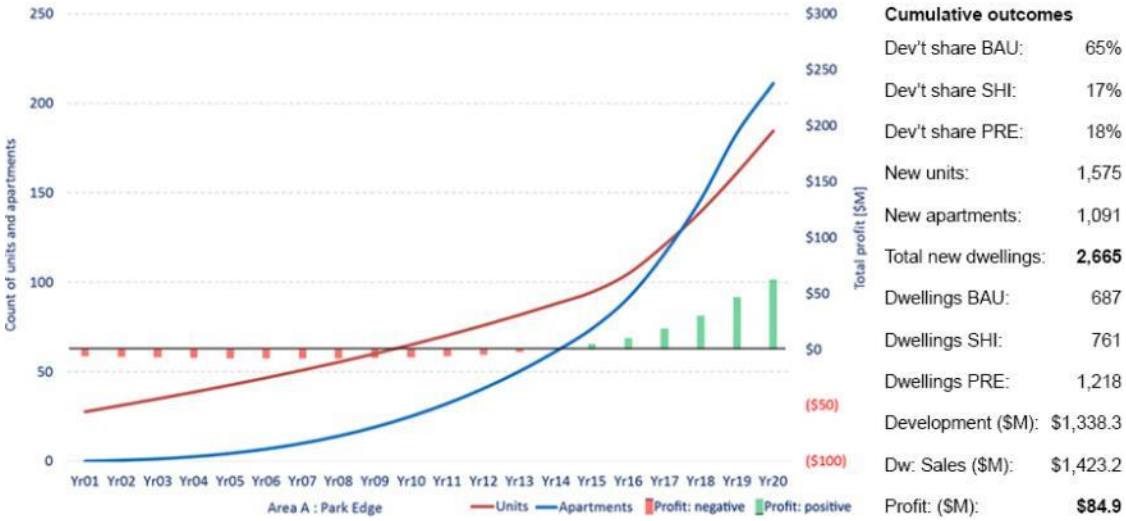


Figure 66: Dwelling count & profit—'Strategic transitioning' Park edge Area A



Source: Dench Analytics

Figure 67: Dwelling count & profit—'Do nothing' Park edge Area B

Figure 68: Dwelling count & profit—'Housing quality' Park edge Area B

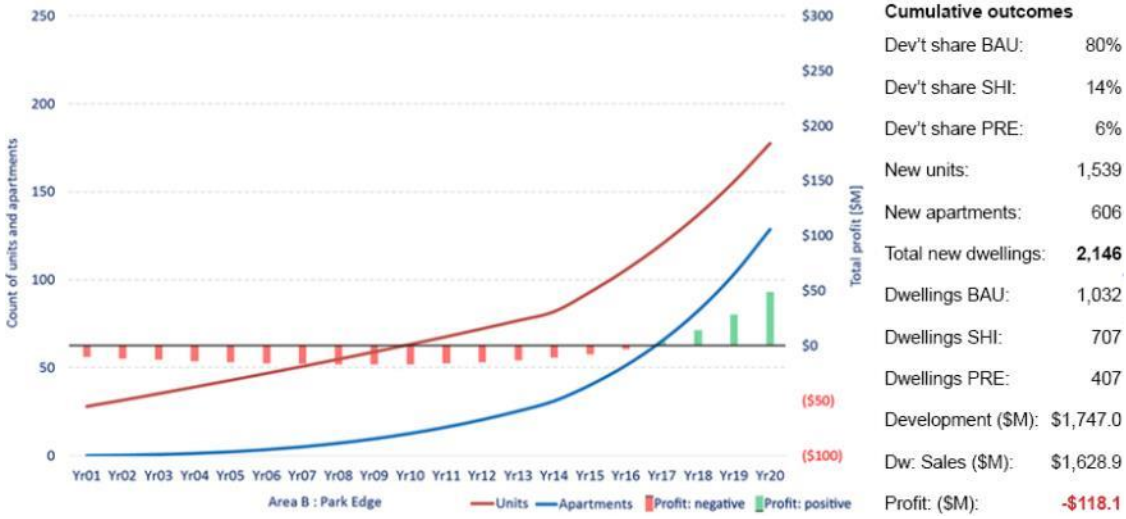
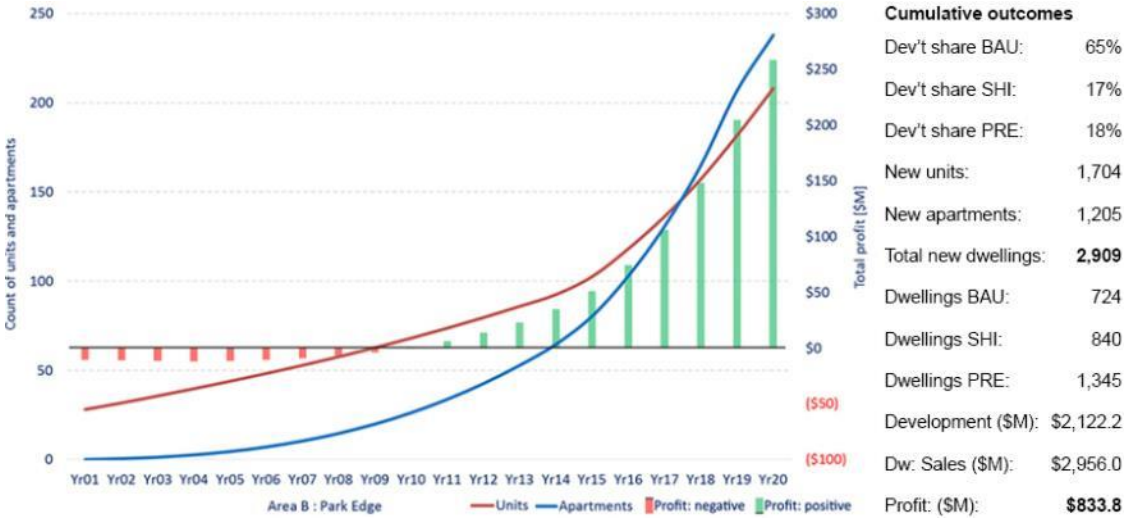


Figure 69: Dwelling count & profit—'Strategic transitioning' Park edge Area B



Source: Dench Analytics

Park edge—discussion

In Study Areas A and B, the 'Do nothing' scenarios (Figures 64 and 67) result in an unprofitable development outcome per year; the 'deficit' increases over the course of the development life-cycle, generating a cumulative loss of -$256 million and -$439 million respectively. The larger deficit in Area B is a result of the higher starting property values in this location combined with the low quality, low yield development delivered under this 'strategic direction'. The increasing financial loss over time suggests that, without some form of intervention (regulatory, market or otherwise), the negative cost trend will continue in both locations. Incentivising development growth and uplift would only intensify the losses incurred. To improve the financial outcomes, the design and development approach would need to change. A cumulative total of 1472 dwellings in Area A and 1590 dwellings in Area B represent a net increase of 1.2 dwellings per lot in both locations. This is a poor outcome for sustainable urban transitioning, and an underutilisation of well-located greyfield sites, when compared to the other scenarios. The diversity of dwelling provisions is also lacking, with the growth in units climbing steeply away from the slower growth in apartments; 95 per cent of lots developed are for two-bedroom BAU dwellings. The disproportionate supply of units (91% of cumulative total, 1343 dwellings) compared with apartments (9% of cumulative total; 129 dwellings) will be exacerbated as time goes on.

The 'Housing quality benchmark' scenarios (Figures 65 and 68) offer a marginal benefit for long-term development viability; in Area A a negative profit is generated per year resulting in a cumulative deficit of -$200 million; Area B reaches profitability by year 17 but the cumulative profit is still negative (-$118 million). By seeking to maximise dwelling sales over the development lifecycle, the optimisation modeling results in an oscillating profit curve. The cost deficits increase per annum until year 9, after which time profitability upturns. This indicates that the initial investment in urban regeneration has improved conditions for development viability. Under this 'strategic direction', a greater share of dwellings is delivered by SHI (14%), improving the quality and density of housing provisions. Limited integrated precincts (6% of lots developed) provide some dwelling diversity and public realm enhancements. Compared with the previous scenario, the quality, type and density of new housing supply are improved. Further research is required to test the impact of development staging; for example what would happen if precincts were prioritised for initial investment? In Area A, the growth in profit is much slower than in Area B, which can be largely attributed to the starting property values in the respective areas. The mix of development approaches result in a similar rate of growth in dwelling types, however, the cumulative total of units (72%) is much larger than apartments (28%). The majority of dwellings are delivered by BAU and SHI, providing little diversity in housing supply, with more than 80 per cent of dwellings being one and two-bedroom units.

Both Study Areas A and B result in a cumulative 20-year profit under the 'strategic urban transitioning' scenario ($85 million and $834 million respectively) (Figures 66 and 69). The overall profit is much greater in Area B. This is partially due to the higher number of lots available for redevelopment in this location. As with the previous scenario, the initial development activity provides a negative return until year 14 in Area A and year 9 in Area B, but this time the share of development types result in more favourable physical outcomes (dwelling quality, density and public realm upgrades) which incentivise earlier increases in development growth, uplift and price rises. The optimisation of these conditions in Area B far outstrips the possible outcomes in the lower value Area A. The 'payback' period for Areas A and B occurs in years 18 and 14 respectively. The share of development types also means a greater diversity of and quality of dwellings are provided; in these models the new apartment supply overtakes units in year 17; the majority of dwellings are delivered by a precinct

and SHI approach (46% and 29% respectively); and 35 per cent increase in yield is achieved over the previous scenario.

Figure 70: Dwelling count & profit—'Do nothing' Green streets Area A

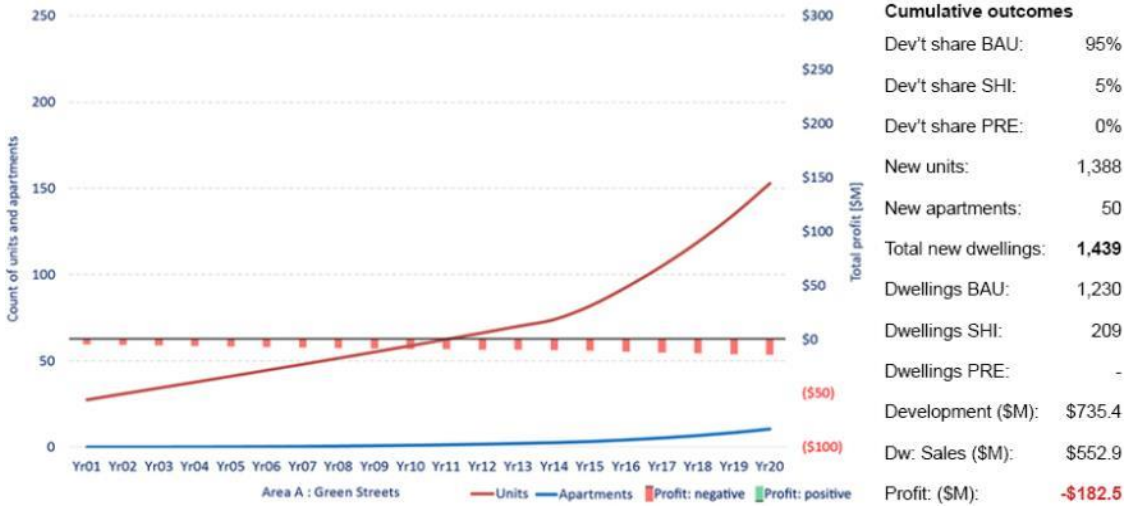
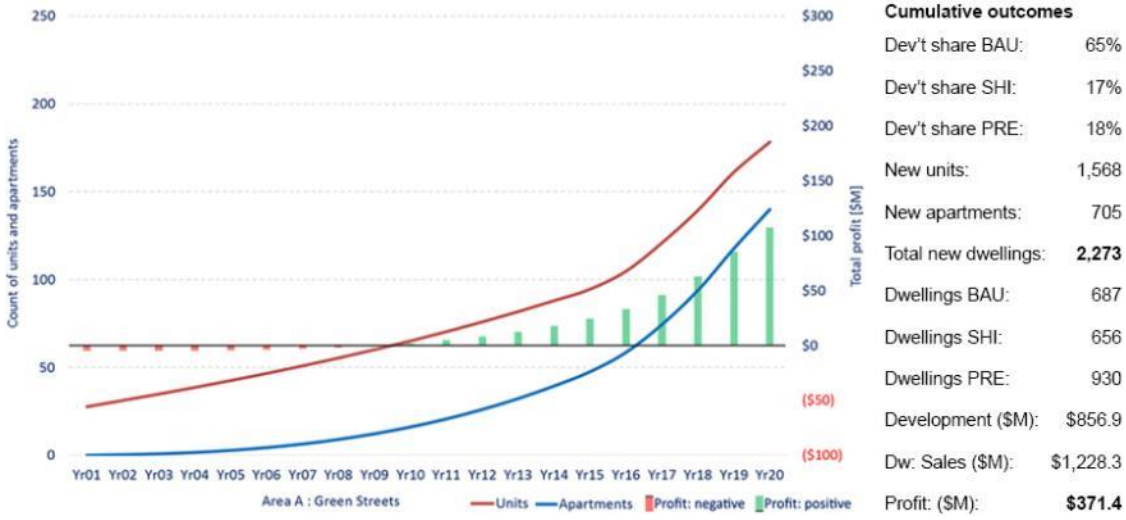


Figure 71: Dwelling count & profit—'Housing quality' Green streets Area A

Figure 72: Dwelling count & profit—'Strategic transitioning' Green streets Area A



Source: Dench Analytics

Figure 73: Dwelling count & profit—'Do nothing' Green streets Area B

Figure 74: Dwelling count & profit—'Housing quality' Green streets Area B

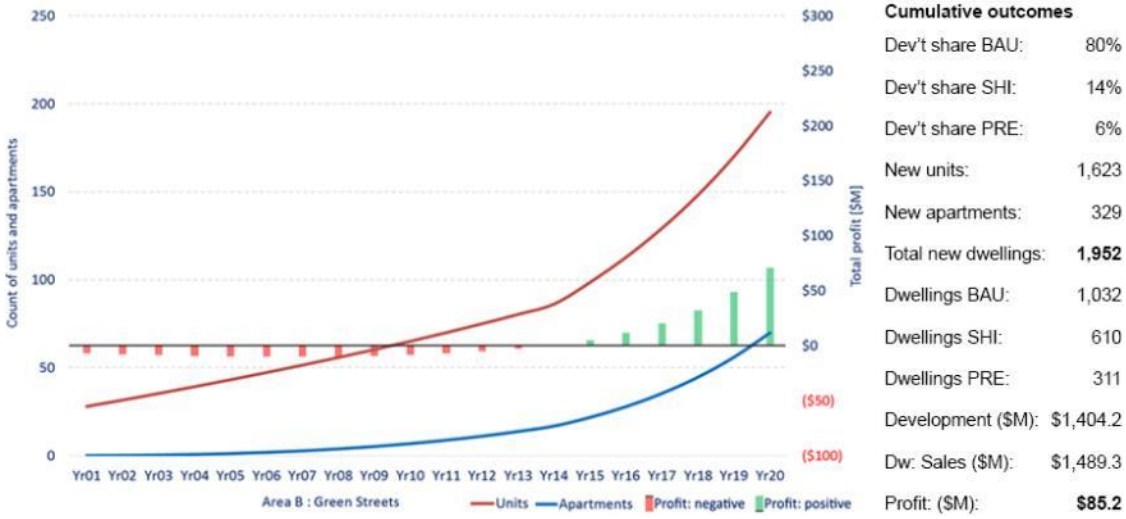
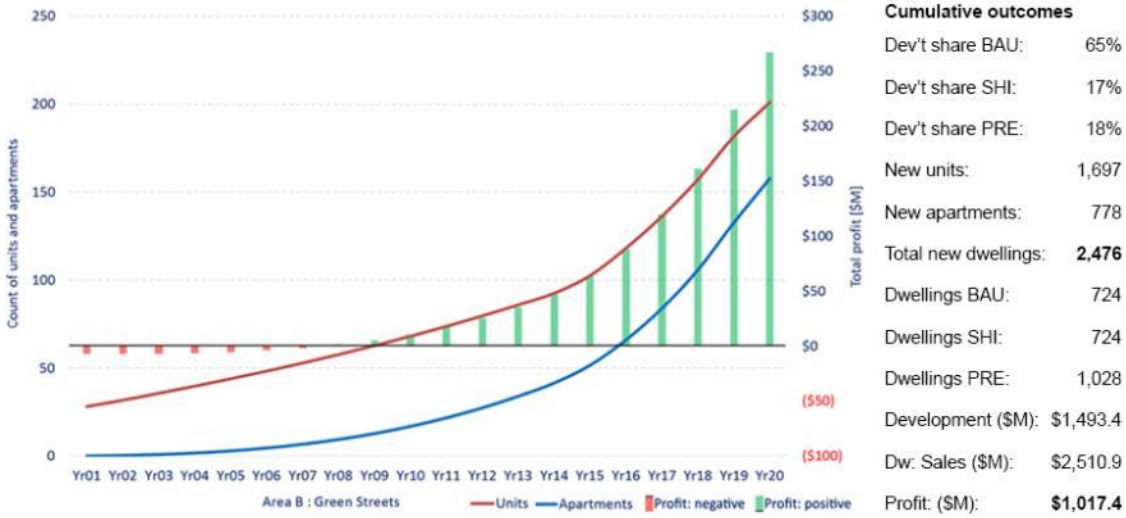


Figure 75: Dwelling count & profit—'Strategic transitioning' Green streets Area B



Source: Dench Analytics

Green Streets—discussion

The ‘Do nothing’ scenarios for Green streets (Figures 70 and 73) return an increasing deficit per annum, generating a cumulative loss of -$182 million and -$267 million in Areas A and B respectively. If the conditions of ‘do nothing’ continue, urban regeneration would be economically unviable ongoing. The higher costs in Area B can be attributed to the higher land values in this area and the additional lots available for development. The diversity of dwellings is highly limited; 95 per cent of lots are developed by BAU with the remainder developed by SHI. This results in a disproportionately high (91%) number of one and two-bedroom units compared with very low provisions of (9%) of apartments. 83 per cent of dwellings are for homogenous, low quality BAU outcomes. The cumulative net increase in both areas is 1.2 dwellings per lot. The overall costs of this scenario far outweigh the benefits; it is a poor outcome for urban regeneration in terms of dwelling yield, diversity, quality and economic viability.

The ‘Housing quality benchmark’ scenarios initially return a financial loss per annum but reach profitability by year 16 and 14 in Areas A and B respectively. Area A results in a cumulative deficit of -$37.8 million while Area B generates an overall gain of $85 million. Green streets is the only design scenario delivered under this ‘strategic direction’ that achieves a cumulative profit. This can be largely attributed to a better balance between the dwelling yields delivered, the lower cost of construction and the higher sale prices of the high proportion of units supplied. As with the SHI approach, the context-specific precinct design mostly comprises low-rise, medium density dwelling typologies in response to the surrounding residential fabric. As a result, a growing divergence in the number of apartments and units occurs over time (which is not the case for the Park edge or Local shops scenarios under this strategic direction). This model enhances the diversity of dwellings compared with the previous scenario. The cumulative proportion of units (83%) and apartments (17%) is still quite distinct, yet it achieves a similar cumulative net increase (1.7 dwellings per lot) to the Local shops (1.8 dwellings per lot), and presents a small reduction when compared with Park edge (2.0 dwellings per lot).

By comparison, units and apartments grow in parallel under the ‘strategic urban transitioning’ scenario for Green streets (Figures 72 and 75), with a cumulative proportion of 69 per cent and 31 per cent respectively. The changed nature in dwelling supply is largely due to the increased proportion of precinct redevelopment delivered under this scenario (18% compared with 6% under the previous model). The overall dwelling yields achieved are 2273 in Area A and 2476 in Area B, representing a 27 per cent increase over the ‘Housing quality benchmark’ model and a cumulative net increase of three dwellings per lot. Both The cumulative profit returned in each study area is strong; once again the initial development activity presents a per annum deficit with an upturn to profitability occurring in years 9 and 7 for Areas A and B respectively with the payback periods occurring by years 14 and 12. The investment in public realm upgrades and community assets proposed by the precinct approach, along with more appropriate dwelling yields increases, contributes to better physical and social urban outcomes, development growth, uplift and property price rises which, in combination, deliver good quality living environments, as well as create the conditions for viable urban transformations ongoing.

Figure 76: Dwelling count & profit—'Do nothing' Local shops Area A

Figure 77: Dwelling count & profit—'Housing quality' Local shops Area A

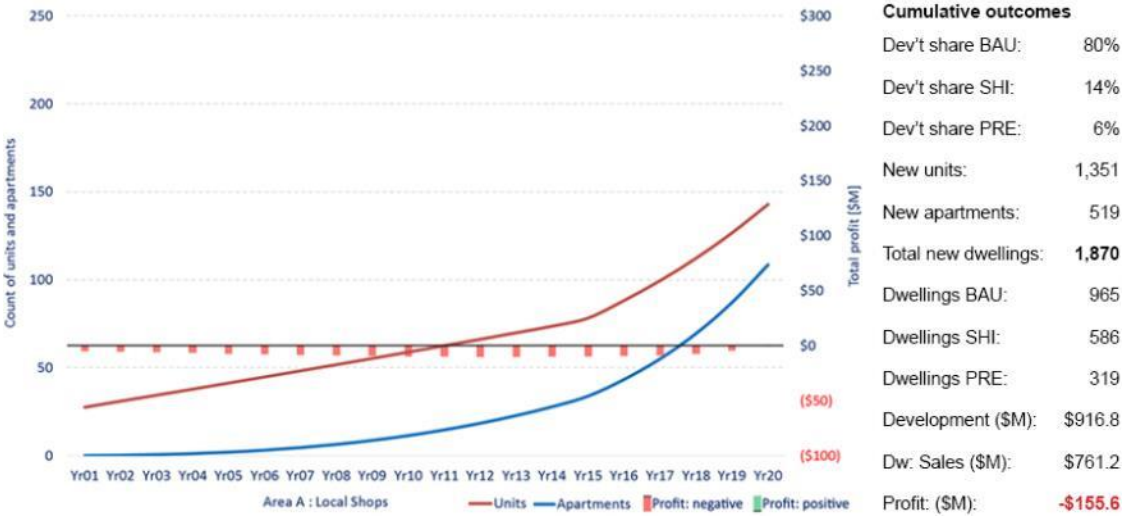


Figure 78: Dwelling count & profit—'Strategic transitioning' Local shops Area A

Source: Dench Analytics

Figure 79: Dwelling count & profit—'Do nothing' Local shops Area B

Figure 80: Dwelling count & profit—'Housing quality' Local shops Area B

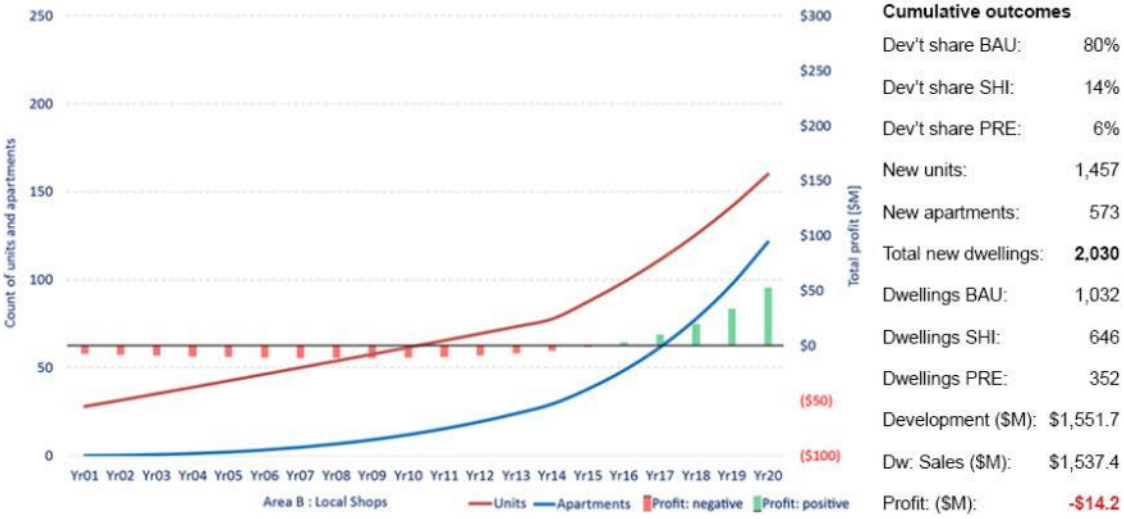


Figure 81: Dwelling count & profit—'Strategic transitioning' Local shops Area B

Source: Dench Analytics

Local shops—discussion

The overall trends in dwelling supply delivered by Local shops and Park edge are comparable: divergence in unit and apartment growth under 'Do nothing'; parallel growth in units and apartments under 'Housing quality benchmark'; apartment growth overtakes unit growth in 'strategic urban transitioning'. While the physical outcomes correlate, the profit generated by each scenario is significantly different, particularly in Area B. The following discussion focuses on these Area B anomalies (Figures 67 to 69 and Figures 79 to 81). The cumulative profits generated under the various 'strategic direction are:

Table 6: Profit comparison—Local shops and Park edge in Area B

	Local shops	Park edge	Difference
'Do nothing'	-$298M	-$439	-$141M
'Housing quality benchmark'	-$14M	-$118M	-$104M
'Strategic urban transitioning'	$842M	$834M	$12M

These seemingly erratic differentials show the significant impact that land values, context-specific design opportunities and the respective development approaches have on the viability of urban transitions. The net density achieved by the Local shop precinct is similar to that in Park edge with approximately 99 dwellings per hectare. However, the net density achieved by the BAU approach differs; 26 dwellings per hectare in Park edge compared with 31 dwellings per hectare in local shops. This is due to the larger site area constituting the Park edge lot-clusters and the respective dwelling yields achieved under the BAU and precinct approaches for each scenario. When repeated across the 1 square kilometre area, the aggregate impact is considerable.

The negative profit in the 'Do nothing' scenarios stems from the adverse economic performance of a BAU approach in this location (95% of development undertaken); the profit difference between Local shops and Park edge ($141 million) is due to the higher land costs (from more land area) used in the Park edge scenario without a commensurate increase in dwelling yield/sales. That is to say, the deficit generated by standardised 2-for-1 BAU dwelling outcomes intensifies on larger land assemblies. This additional deficit is compounded by the multiplication of these outcomes across the 1 square kilometre over the course of the 20 years.

The difference in the cumulative deficits returned under 'housing quality benchmark' is reduced (-$104 million) as fewer BAU development are delivered. Under 'this strategic direction' The Local shops scenario almost breaks even (-$14 million), whereas the Park edge scenario loses over -$100 million. In this case, the mix of development approaches, dwelling yields and the cost to deliver the Local shops scenario begins to reconcile with property prices, development growth and uplift. The potential revenue gained from this mix of redevelopment is not enough to offset the higher construction costs of the Park edge precinct as well as recover the cost imposts incurred by the extent of BAU outcomes on larger land assemblies.

Under the conditions of 'strategic urban transitioning', BAU is phased out over the 20-year life-cycle. The mix of development outcomes allows the higher yield opportunities of the Park edge designs to generate enough revenue to offset the cost of construction and the adverse impacts of BAU development. In addition, the Local shops scenario comprises a higher proportion of apartment types than the Park edge scenario, which attracts lower sale prices in this modeling exercise. The combination

of these factors contributes to the seemingly exponential profit-growth in the Park edge scenario.

4.5 Further research

4.5.1 Detailed feasibility study based on development costs and prices specific to a middle suburban 'greyfield' market

The short- and long-term viability assessments have provided a preliminary indication of the potential value and efficacy of integrated precinct redevelopment of dispersed public housing assets in greyfield suburbs. More accurate estimation of development risks and benefits would be provided with a detailed feasibility study. This requires resolution of the design propositions with specified financing, partnership and procurement arrangements. Determining the most effective construction methods, development staging and tenure mixes would impact on the dwelling sales and rental streams available. More research is also required to determine the magnitude of development impacts on 'greyfield' property values and accurate $\$/m^2$ pricing for a diversity of new dwelling types in middle suburban contexts.

4.5.2 Suggested enhancements to the optimisation model

The initial model has demonstrated the capability to optimise profitability and hence project attractiveness to a range of stakeholders, encompassing a range of qualitative and spatial outcomes which can affect the timing, delivery and take-up of redevelopment opportunities. A number of constraints and variables can be modified to make subsequent versions of the model more realistic and flexible. Further proficiencies could also be added to the front-end Excel interface or other software to increase power and complexity in order to achieve even more realism and performance. The following points cover these two categories of enhancement and performance improvement.

4.5.3 Enhancements within the constraint categories

Lot availability and usage could be varied over time to reflect specific public housing policies, potential land releases and/or market demand and industry trends. This could accelerate earlier take up of available land, which was slow in this preliminary model, or test specific timing and effects of a strategic program of precinct redevelopment. These changes could vary across locations, reflecting more realistic levels of development attractiveness in differing contexts. The impact of different design and development outcomes could also be varied over time and location. The number of units and/or apartments or area-related variables could be related to measures of design quality and amenity delivered by different precinct types. Alternative outcomes could dynamically adjust constraint and variable settings regarding lot acquisition, development costs and sale prices, enabling forecasting of optimal yields and development phasing. Further research would need to be undertaken to develop suitable design metrics and pricing models to test their effect on model outcomes.

4.5.4 Additional enhancements to consider in further research

The development definitions, structures, costings, pricings, etc. were determined prior to the design and development of this initial optimisation model. All the constraints and variable inputs were specified, therefore, for agreed BAU, SHI and precinct alternatives. There is great opportunity to broaden the number and structure of such development alternatives, thereby exerting a beneficial multiplier effect on all outcomes of the model. The precinct locations, scale and spatial distribution were also determined prior to the design of the optimisation model. The number and type of precincts could be expanded significantly based on alternative criteria, including

different numbers or configurations of DHS lots, the nature of lot clustering and proximity to targets not already considered, including transport or other services. Two locations are currently used, but the model can obviously be used across a far wider range of locations within Melbourne, greater Victoria or elsewhere.

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