

## **PROCUREMENT AND RISK SHARING**

### **Full Paper**

## **SUSTAINABLE SUBURBS – THE DEVELOPER’S CHALLENGE**

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## **ABSTRACT**

As our cities expand, developers are transforming more and more land to create our suburbs of the future. Developers and government bodies have a golden opportunity to design suburbs that are not only great places to live, but also are environmentally sensitive and sustainable. This is a unique opportunity, as significant changes after development are constrained by the configuration of the subdivision, and then by the construction of the dwellings.

This paper explores some of these issues by presenting initial findings from the CRC-CI, Sustainable Subdivisions Project. The Project examines the drivers and barriers that land developers face when trying to achieve sustainable subdivisions. This paper will review the results from a series of industry interviews and workshops and explore possible ways forward. In addition, the possible effect on the way future land subdivision is managed and planned as a result of recent changes in the energy efficiency provisions of the Building Code of Australia will be explored.

This paper highlights problems that both builders and land developers may face through poor subdivision design. Finally an innovative program being driven by a major land developer will be introduced. The program aims to deliver over 400 energy and water efficient homes through a series of compulsory and voluntary schemes that the developer is designing, funding and implementing. This program is the first large-scale development in Australia that demonstrates how developers can help achieve environmentally sensitive and sustainable suburbs of the future.

**Keywords: Subdivision, sustainable, orientation, energy efficiency ratings, regulations.**

## **INTRODUCTION**

As our cities expand, developers are transforming more and more land to create our suburbs of the future. Over the last year Australia has seen an 8.2% increase in the number of dwelling units approved (Australian Bureau of Statistics, 2004) although this increase is now slowing. This growth has been a boom for land developers with many finding that demand for land is exceeding that available and they have had to adopt lottery style methods for land sales. As a result of this buying frenzy it is perhaps understandable that factors such as environmental considerations and sustainability may be overlooked. However, developers and government have continued to pursue these areas resulting in new Australia wide energy efficiency regulations for residential buildings and the development of energy efficient housing projects and estates.

The new energy efficiency regulations within the Building Code of Australia (Australian Building Codes Board, 2003) require all houses to achieve a certain performance level, although these vary from state to state. Attaining the required Energy Efficiency Ratings (EER) and addressing other sustainability factors has been the responsibility of the designer. At present, designs are deemed to comply with the mandated requirements through the inclusion of specified construction requirements or through performance evaluation. With this focus on the construction, the role of the subdivision in this process has largely been ignored. However, the expectation is that regulations will continue to be toughened. For example, in Victoria, the present minimum EER rating of 4 (which also requires water efficiency measures) is set to increase to 5 Stars in July 2005. More stringent standards will mean that allotment size and orientation will become increasingly important.

In Queensland, the new dwelling trend is increasing at a faster rate than the Australian average. Indeed, the 2003 December quarter saw a 15.1% increase in dwelling commencements, the highest for nine years (Australian Bureau of Statistics, 2004a). Energy Efficiency Ratings on domestic dwellings only became mandatory in Queensland on 1 September 2003 (Australian Building Codes Board, 2003) and at present a minimum Star rating of 3.5 is required. The effect of this Standard has been to raise awareness of the issue of sustainability and developers, builders and consumers alike are looking for information and tools.

This paper explores some of these issues by presenting initial findings from the CRC-CI, Sustainable Subdivisions Project. The paper examines the drivers and barriers that land developers face when trying to achieve sustainable subdivisions and reviews the results from a series of industry interviews and explores possible ways forward. In addition, the possible effect on the way future land subdivision is managed and planned as a result of recent changes in the energy efficiency provisions of the Building Code of Australia is explored, and finally an innovative energy efficiency program being driven by a major land developer is introduced that demonstrates how industry can drive change.

## **TRADITIONAL SUB-DIVISIONS**

To gain an understanding of the drivers and barriers considered important by land developers, the researchers undertook a series of interviews in Southeast Queensland (SEQ) (Mead and Wales 2004). Key informants were asked to discuss traditional subdivision design and then to address industry and market demand for sustainability practices. The original intention was to hold a number of workshops,

but following industry discussions this was changed to individual interviews as it was believed that this method would facilitate more open discussions. For this reason, the interview participants were not identified. In all, some twenty-two interviews were held with representatives from a range of government and industry associations, project and development managers, urban planners and designers from both large and small development companies, developers and marketing representatives. The following reviews the results from the key informant interviews.

## **YIELD**

Not surprisingly, key informants overwhelmingly identified yield as the most important driver when configuring allotments within development sites. In greenfield developments, yield takes into account factors such as the;

- Cost of the initial site purchase,
- Projected return,
- Time necessary in which to gain the return, and
- Legislation, local mandates and regulations.

Development involves significant investment and the financial outlay and the projected timeframe for return are paramount. Where possible, staggered land settlement payments are tied to conditions and approvals. This effectively maximises the developer's liquidity and lessens the period between the period of financial outlay and return. Other factors affect yield, including location, topography, zoning requirements, allotment size, and market competition and consumer perceptions.

## **LOCATION**

The location of the development site for market demand is of prime consideration. To make the development financially viable, the location of the site has to be perceived as attractive within the market. This is achieved in part through the associated services at, or near, the development site. While larger developers will provide amenities and facilities within master-planned community developments, those with less resources, or with smaller development sites, will use locations near existing 'draw cards', such as schools, child minding and shops.

## **TOPOGRAPHY**

Topography is one of the physical elements of a site that most influences yield as it presents environmental and engineering constraints unique to each sub-division development. Topography can dictate the development layout - the steeper the terrain, the more constraints the site will impose on form of development that can occur. As a result, areas with gradual terrain are more desirable.

## **ZONING**

The preference is for land that is self or code assessable. Although zoning can be changed, sites that are impact assessable and require community notification are avoided as they attract public attention. If objections are lodged with the local regulatory body, the delays to the development approval process can significantly reduce profit and may render the development economically unviable.

## **ALLOTMENT SIZE**

Another issue related to zoning is local authority requirements that the developer provide low-density development while also providing services that cannot be easily supported by a low-density population. Other factors affecting density (or allotment size) include investors' financial viability factors, consumer requirements, expectations and affordability, the range of residential dwelling types available, and locational factors. However, increasingly, regulatory bodies are insisting on greater densities. While this provides greater opportunity for the developers to fund the required infrastructures, developers are also aware that the same residents who expect infrastructure and close proximity to ongoing services, often do not want their suburb to look overly dense.

## **COMPETITION**

Competition between developers has played a significant role in how developments are subdivided. As an example, one developer may have 600m<sup>2</sup> allotments at \$180,000 each. Then to secure the market, a rival developer will sub-divide with 700m<sup>2</sup> allotments for a lesser price of \$175,000. Both are gambling on which alternative the market will support. In Queensland's recent development boom, competition has not been as critical. However, as developers discussed the downturn in recent months, it became apparent that competition would become more important and influence the manner in how a subdivision takes place.

## **AESTHETIC APPEAL**

All informants discussed the aesthetic appeal of mature vegetation and landscaped their developments as a financial investment to compliment allotment sales. Even when all existing vegetation had been completely removed, it is normal practice to re-introduce vegetation for entry, procession and parkland appeal. Only two informants were including native plants for environmental benefit.

## **SUPPLY AND DEMAND**

Traditionally, land developers supply a familiar product to a familiar market – that is the project home and land package. Sustainability has not been a factor and has only recently entered the process and usually as a result of a change in regulations. While the BCA requirements are universal, at present local government authority requirements vary from area to area, effectively allowing developers who are not prepared to alter their methods to 'leapfrog' to areas with fewer requirements. Fewer requirements translate to lower costs and consumers, especially first homebuyers, buy wherever they can maximise the return on their investment.

## **SUSTAINABLE SUB-DIVISIONS**

Despite these dominant drivers, there are a growing number of proactive developers who are aware of sustainability issues, who engage sustainable principles in subdivision outlays and in construction, and promote this to their clients as being desirable. Some developers even go as far as providing environmental plans and site analysis recommending layout for a home suited to each specific site. These developers realise that pressure to develop sustainably is growing. They are also aware that as clients become more knowledgeable of sustainable principles, they will start demanding sustainable practices and these developers will be able to respond appropriately. However, even these interested and proactive developers identified numerous barriers that need to be overcome in order to achieve sustainable suburbs.

## **DEFINING SUSTAINABILITY**

Sustainability is a complex issue that is open to numerous interpretations and definitions. What does the word 'sustainability' mean? How is the meaning interpreted in practice? How can it be measured? Who recognises the measures? While the long term cost of avoiding addressing the issue may be clear, in the short term, who pays? How can developers implement a concept that is not clearly defined, that most fear will involve additional financial outlay that the consumer may not want or be able to afford? In this sense, use of the word 'sustainability' is a significant barrier to its implementation.

## **SUSTAINABLE SUBDIVISIONS**

It could be argued that it is impossible to have a truly sustainable suburb, as all subdivisions and suburbs consume finite resources. However a more pragmatic approach is to view sustainability as a method of actively reducing the impact that today's subdivisions - tomorrow's suburbs - have on the environment.

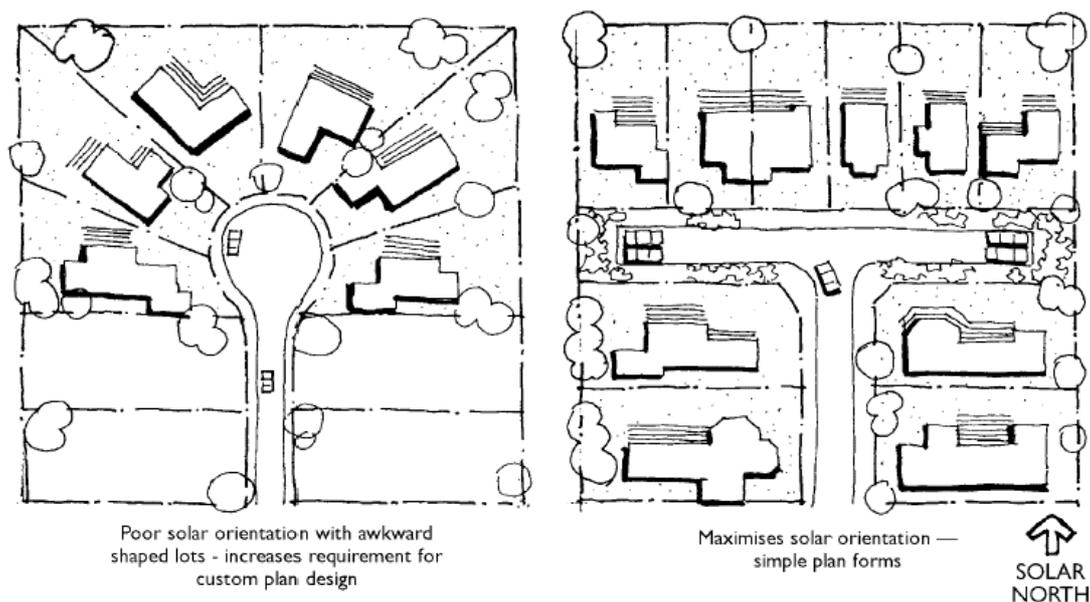
Within the development of subdivisions, there are numerous aspects related to sustainability, including environmental degradation, waste and pollutants, construction methods and materials and developer and consumer energy consumption and water use. To limit and focus the discussions, the interviews focused on energy use - specifically, the energy efficiency of dwellings as this is now incorporated into the BCA. To achieve the required EER and to predict how dwellings may perform in future, it is important to understand the relationship between subdivisional layouts and the energy efficiency of the dwelling.

## **MEASURING SUSTAINABILITY**

The current 3.5 rating for residential construction in South-East Queensland can be met with no reliance on appropriate subdivision orientation. However in order to meet higher sustainability criterion, all informants commented on the need for tools or methodologies in both subdivision development and construction. Regulations were viewed as dictating the minimum standard required, but benchmarks are needed to enable developers so they know what they have to do, and how to do it – without losing any competitive edge in the market. A tool is needed that can measure design options of elements such as orientation, natural ventilation and light. This would enable all parties to understand what 'sustainability' covers, and how to measure it, within the level playing field of industry.

## **REGULATORY BARRIERS**

At present, there is little reward for implementing sustainable principles within developments. Developers trying to incorporate sustainable innovation often find that it does not fit under the criteria of the local planning authorities that will then not approve the development application. Of the regulatory bodies interviewed, some were more receptive to sustainable initiatives, while others were not. For example, Figure 1 shows two subdivisional layouts. The layout on the right is regarded as the better for solar orientation. However, one regulatory body would not allow such hammerhead access, preferring the more familiar cul-de-sac layout shown on the left.



**Figure 1 Maximising solar orientation in subdivisions.** Source: (Commonwealth Department of Housing and Regional Development 1995).

Other regulatory barriers identified included the instance where a developer included water tanks and a sewage treatment system in their development, and then was not rewarded with reduction to land rates from local regulatory bodies for the provision of these services. Town plans often do not have any guidelines in place for 'innovative', 'sustainable' or a 'new' type of development and the development process does not take into account that innovative solutions are often untested. Consequently, the cautious nature of regulatory bodies can restrict innovation to avoid incurring the uncertainty of unknown maintenance and replacement costs. One developer summed this attitude with the statement: '(planning) regulations do not keep up with innovation'.

## **MARKET BARRIERS**

Valuers also play a critical role. Valuers assess the value of a home on comparative residences in the immediate area, but do not take into account factors such as allotment orientation, or that a home with large eaves and access to natural light and breezes has on-going economic benefits. This has significant implications for financiers who will not recognise the additional costs involved and only finance homes to the valuers' assessments. Without market recognition, developers who finance and implement innovation that is not supported by the market are the first to be impacted upon. The second impact falls on the consumer, who has to pay for innovation without the support of a financier. Sustainable factors are effectively devalued.

## **DRIVING SUSTAINABLE DESIGN**

Traditionally, the house buying public has looked to the builder as the expert when it comes to energy efficiency. However, with large estate developments, the land developer is also able to influence a client's buying habits. Consequently, these professions can have a significant influence on the decisions that homebuyers make.

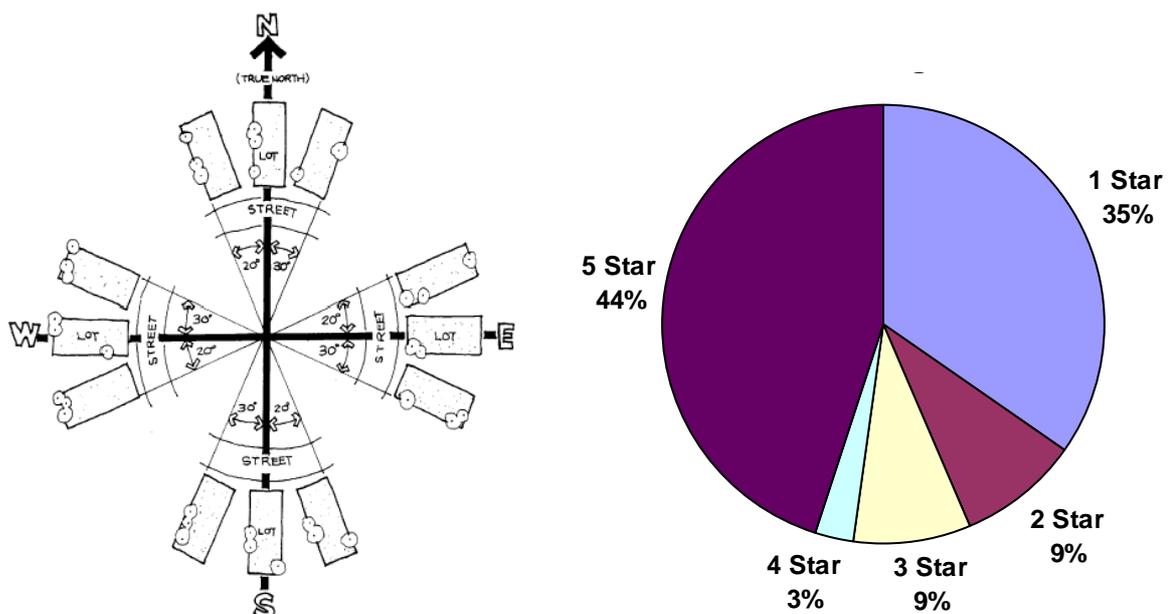
Energy efficiency of dwellings is influenced by material choices, design layout and orientation. Subdivision design has little impact on material choice, but can affect design layout and impacts directly on orientation. Correct solar orientation of a dwelling will help in maximising winter sun penetration and minimising solar gain in summer. Poorly orientated blocks make achieving these results difficult. This is especially true for project homes that typically have limited scope for design changes.

## **RATING SUBDIVISION LAYOUTS**

As has been noted, a methodology for rating sustainability within subdivisions is required. A rating methodology was developed several years ago by Sustainable Energy Authority of Victoria and was later modified by Sustainable Energy Development Authority (SEDA 2003). The Sustainable Subdivisions project is looking at the appropriateness of adopting this rating scheme for SEQ.

The SEDA methodology is a simple three-step process;

1. Determine the orientation of an allotment along its long boundary. To achieve the highest rating of 5 Stars, the long boundary must be oriented so that one axis is within  $30^{\circ}$  east and  $20^{\circ}$  west of true solar north, as shown in Figure 2. Allotments outside these orientations receive a 1 Star rating.
2. Determine the width of the block by measuring at right angles to the long axis. East/west allotments have a greater width requirement than north/south allotments to allow for set back of the dwelling along the northern boundary.
3. Determine the star rating by finding which width band an allotment falls into. The allotments are rated on their ability to accommodate a dwelling with good solar access. Corrections can be made to allow for the slope of the allotment, which will either improve or hinder solar access. Allotments with a slope in excess of 20% receive a 1 Star rating. Concessions are made for allotments that have guaranteed open space to the north or are larger than  $1000m^2$ .



**Figure 2 Preferred orientations of allotment.      Figure 3 Trial rating of subdivision**

**Source: (Commonwealth Department of Housing and Regional Development 1995))**

An initial trial of this methodology has been undertaken on a new subdivision in SEQ. Of the 69 allotments surveyed, 35% of allotments within the subdivision rated at one star, while 44% rated at the maximum 5 Star (Figure 3). SEDA in their design guidelines, aim for performance criteria of at least 80% of allotments rating 5 stars with the remainder rating either 4 or 3 stars. The initial findings suggest that current subdivision practice is falling well short of the mark.

## **DEVELOPERS DRIVING INNOVATION**

Despite the barriers that exist for the uptake of sustainable development, some developers are still keen to trial innovative ideas and encourage their clients to adopt many of the principles of sustainability. One such development is Sanctuary Pocket, a 400 home site, 33-hectare village located 20kms west of the Brisbane's Central Business District. The development will require homeowners to include specified energy and water-saving features into their homes. In return, each block sold will come with a pre-negotiated arrangement for the supply of a solar hot water system and a rainwater tank (Delfin, 2004). Residents must demonstrate the inclusion of these (or other) systems and also select a minimum of six additional energy and six water saving devices from a range suggested by the developer. Energy choices cover orientation, increasing ventilation, limiting low-efficiency lighting and improved insulation while water saving choices include irrigation control devices, AAA rated shower roses, mixer taps, pervious areas for car washing and gutter guards for increased flow to the rainwater tanks. The developer acknowledges that many of the other features are relatively standard inclusions. The intent is to make features considered to be desirable from a sustainable point of view and readily identifiable and clearly linked to a range of benefits. Residents will also be eligible for a discounted home loan rate that has been negotiated by the developer.

The developer estimates that the 400 homes built will save 1,740 tonnes of greenhouse gas emissions per year (the equivalent to taking 350 cars off the road) and 108 million litres of water per year. The developer is also running workshops for home owners and builders to improve design and orientation for a better performing home and sponsoring builders to undertake accredited sustainability courses through a local industry association.

Brisbane City Council is using the development as their first Trial Rainwater Tank Community in Brisbane, which will determine the viability of rainwater tanks in urban environments. This development provides a case study of collaboration between developer, builders, product suppliers, local authorities and financiers to include a series of compulsory and voluntary features to encourage a higher level of sustainable development that is consistent throughout the entire development.

The first allotments were released for sale in March and by the end of May; around a third of had been sold indicating that consumers are responding to the concept. The developer is considering including covenants that require solar hot water and water tanks as benchmark for all future releases. However the developer is closely monitoring consumer choices to ensure that it is the sustainable features and not just the rate of development in SEQ that is fuelling the sales.

## **CONCLUSIONS**

Although the momentum towards energy efficiency is slow, it is multi-directional, encompassing elements such as energy and water. However, the industry representatives interviewed believe it is only a matter of time before momentum builds, and increased sustainable energy efficiency becomes the standard. To encourage this growth, there are several key areas that need to be taken into consideration.

- Required and desired sustainability practices need to be clearly articulated and consistent to retain the competitive nature of industry. There is a need for collaboration between local authorities, agencies, developers and consumers – to share a vision that is of benefit all parties
- Where possible, incentives need to be introduced into the industry to make sustainable practices more attractive to the developers, suppliers and the homeowners, as well as emphasise the importance of the practice.
- Tools that measure energy efficiency need to be site specific, apply to the whole of industry, and take into account factors such as orientation, adjacent built forms, deciduous and evergreen vegetation, and a broad range of construction materials.
- Sustainable practices in development need to be recognised by the valuation and financial industry to overcome the financial barrier.
- There is a need for research to demonstrate that new and innovative models of sustainable development are more affordable than traditional models of development.

Regardless of these challenges, some developers are leading the way and demonstrating how sustainable suburbs can be incorporated into the current marketplace. Developments such as Sanctuary Pocket are acting as real world examples of what can be achieved and are providing the necessary driver that will enable large-scale adoption by the industry of sustainability practices in subdivision developments.

## **REFERENCES**

Australian Building Codes Board, 2003. Building Code of Australia – Amendment 13, Canberra.

Australian Bureau of Statistics, 2004. 8731.0 Building approvals, Australia – March 2004 key figures. ABS website <http://www.abs.gov.au/Ausstats>.

Australian Bureau of Statistics, 2004a. 8750.0 Building activity, Australia: Dwelling unit commencements, preliminary – December 2003 key figures. ABS website <http://www.abs.gov.au/Ausstats>.

Commonwealth Department of Housing and Regional Development (1995). AMCORD 95: A National Resource Document for Residential Development. Canberra, AGPS.

Delfin (2004). Sanctuary Pocket: Naturally a part of Forest Lake.

Mead, E. and N. Wales (2004). Benchmarking the Practices, Perceptions and Design of Sustainable Sub-Divisions. Brisbane, CRC Construction Innovation.

SEDA (2003). Energy Smart Homes Model Policy, Sustainable Energy Development Authority's Energy Smart Homes Policy for Adaptation and Implementation by Councils, Energy Victoria.