fact sheet two

Energy Efficiency

This is the second in a series of fact sheets produced by the District Council of Mount Barker on Sustainable Residential Subdivision Design. Council's Development Plan identifies a number of areas within and adjacent to existing townships that are intended for residential development. A number of policies within the Development Plan require that residential development, including residential subdivisions, satisfy a range of sustainability objectives and principles.

This is one of five fact sheets, which cover the following topics:

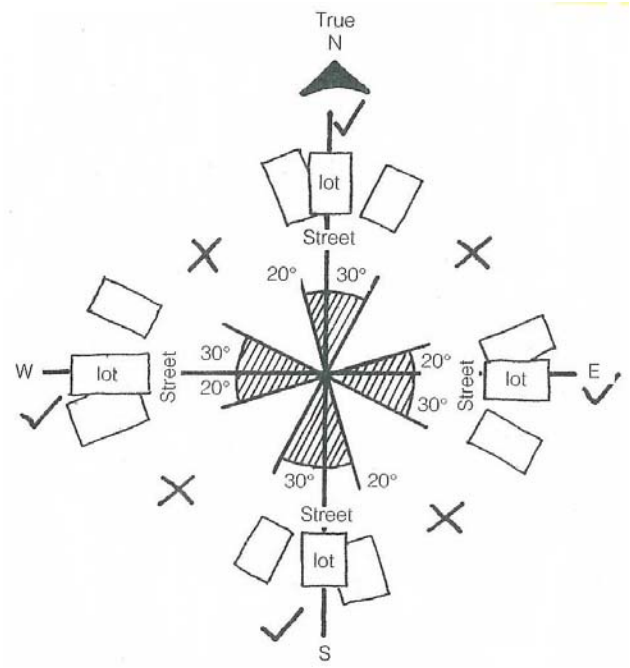
- Site Analysis
- **Energy Efficiency**
- Water Sensitive Urban Design (WSUD)
- Biodiversity, Open Space and Buffers
- Sustainable Transport

How does subdivision design effect energy efficiency?

The size, shape and orientation of a residential allotment will determine how easy or difficult it is to achieve energy efficient house designs. So it's important to consider the orientation of roads and allotment design if the development is to maximise opportunities to orientate internal living areas and private open space to capitalise on solar access from the north. What is commonly referred to as 'passive solar design' means designing and orientating houses and private open space to allow solar access during the cooler months and prevent or minimise solar access during the warmer months. In doing so, occupants can minimise their energy costs associated with heating or cooling internal spaces, while improving the comfort and useability of indoor and outdoor space.

What is the ideal allotment orientation?

The diagram below illustrates the ideal allotment orientation range to facilitate solar access for internal and external living areas. The preferred orientation range is for the long boundary of an allotment being between 20° west and 30° east of true north, or between 30° south and 20° north of east. For houses sited parallel to the boundary on lots beyond this range, winter heat decreases and careful sun control is needed to prevent overheating in summer. Of course, all of this assumes that the dwelling will be designed and orientated according to passive solar design principles.

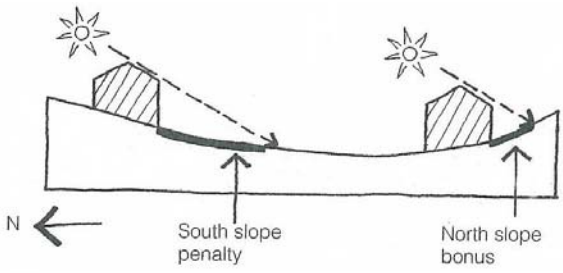


The preferred orientation range for the long boundary of allotments
(Source: Energy Efficient Housing Manual, Energy Victoria, 1994)

Allotments located on the northern side of an east-west aligned street offer the best opportunities for solar access because they allow uninterrupted solar access to north facing living areas located to the rear of a house, and private open space located behind the house. It is also the easiest orientation to exclude solar access to internal living areas during the warmer months. While these are general 'rules', there are specific factors that also need to be taken into account, as detailed below.

What about sloping sites?

On sloping sites, north facing sites improve opportunities for solar access while south facing slopes limit solar access. The steeper the slope, the greater the advantage or disadvantage. Accordingly, smaller allotments should be concentrated on northern slopes and larger/deeper lots on southern slopes.



Slope affects solar access
(Source: Energy Efficient Housing Manual, Energy Victoria, 1994)

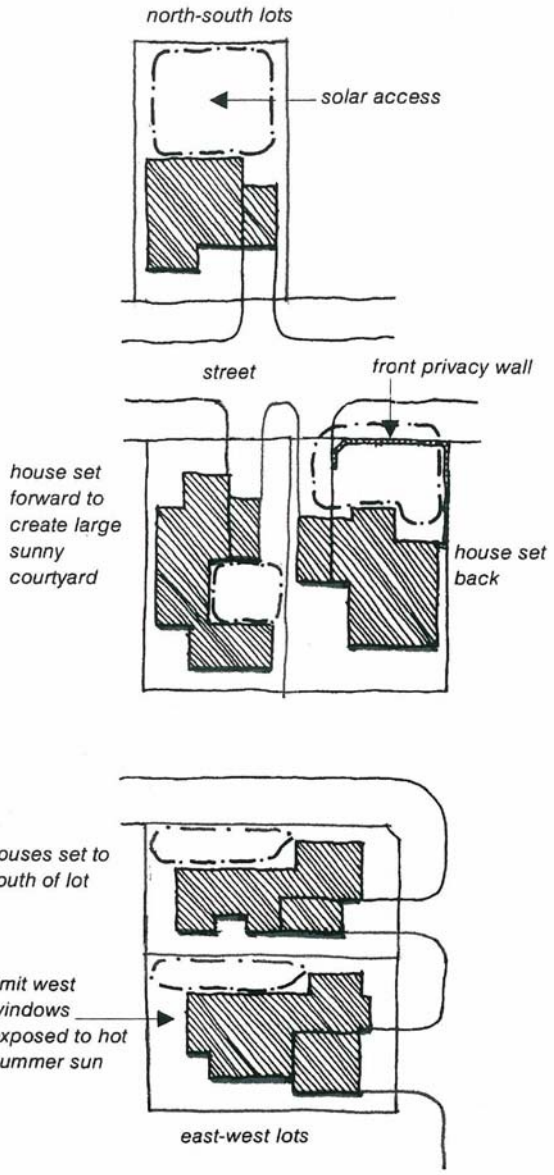
What about allotment size and shape?

Generally it is desirable to include a mix of allotments sizes within a residential development project. Therefore, using the above information, it's desirable that the narrower and smaller allotments be located on the northern side of east-west streets.

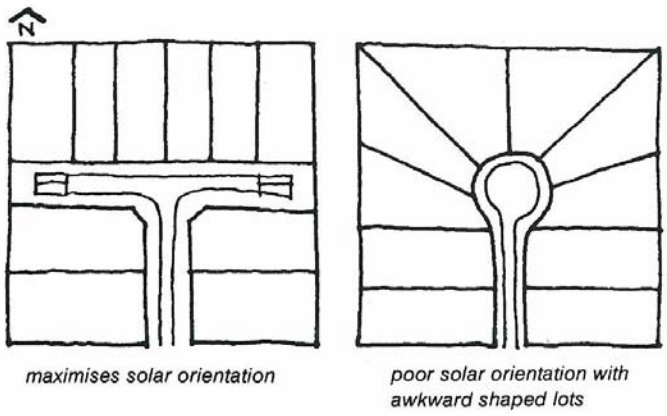
North-south aligned allotments on the south side of the street need to be wider to allow internal living space with a northerly orientation. This also allows for dwelling and site designs that could incorporate parts of the private open space to the side of the dwelling where it will achieve reasonable solar access.

East-west aligned allotments need to be wider again to prevent overshadowing of adjacent dwellings or private open space on allotments to the south, and to allow dwellings to be set back from the northern boundary to allow solar access into north facing living space.

It is also preferable to create regular and rectangular shaped allotments, rather than splay shaped allotments, to maximise lot yield efficiency and allow for standard house designs that address the street and achieve optimum solar access.



Lot size and orientation affects solar access potential to private open space and internal living areas



Regular shaped allotments are more space efficient and better facilitate solar access

Other influences on allotment size and road layout

The slope of the land has implications for allotment design and solar access. It is also preferable to avoid locating smaller allotments on the steeper portions of land to both minimise the need for cut and fill and the resultant visual obtrusiveness of development. Generally, therefore, larger allotments should be located on steeper land.

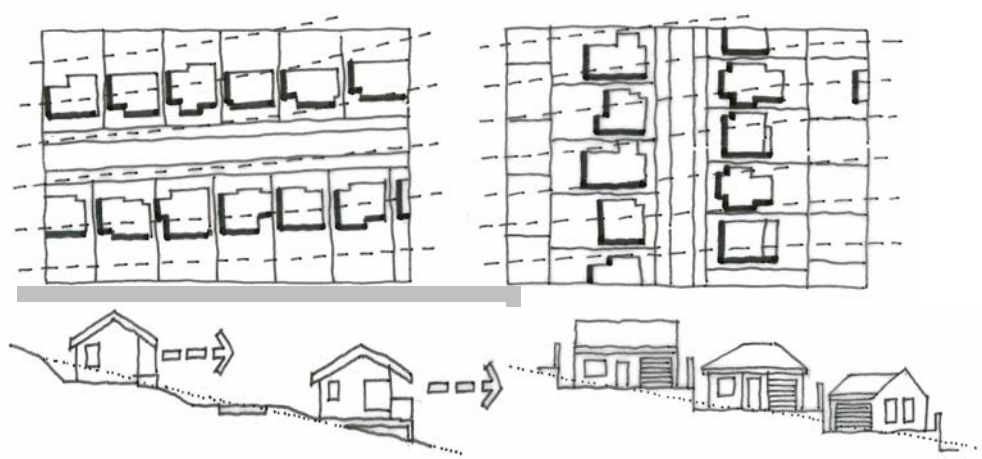
It is also desirable that roads generally follow the contours on sloping sites. Doing so will minimise the amount of cut and fill required to construct roads and to create benches for dwelling sites. Reducing the amount of earthworks associated with a residential development reduces costs and minimises energy inputs. Creating roads that follow rather than traverse contours can make it easier and more cost effective to implement stormwater management requirements.

Another factor influencing allotment size is the existence of vegetation. Where a site contains vegetation to be retained, one way of ensuring its long term retention and protection is to locate the vegetation on larger allotments that are of sufficient size to also accommodate a dwelling and outbuildings. This issue is discussed in further detail in **Fact Sheet Four - Biodiversity, Open Space and Buffers**.

Making Trade-offs

Sometimes other considerations, such as the desire to follow the contours of the land, will mean that the ideal orientation of roads and allotments for solar access will be compromised. Council recognises that it's not always possible to achieve the optimum energy efficient layout. The onus is on the applicant to clearly explain the design choices that have been made and the reasons for making such choices. This is usually best communicated with the assistance of a site analysis plan (**see Fact Sheet One - Site Analysis**).

Generally larger allotments will allow sufficient flexibility to design a dwelling according to energy efficiency principles. Therefore, where it is not possible to achieve the preferred allotment orientation referred to above, larger (wider) allotments should be considered.



Roads that follow contours (left) minimise cut and fill, the need for unsightly retaining walls, and maximise long distance views. Roads that traverse contours (right) require retaining walls, which impair the streetscape, and increase the potential for overlooking into neighbouring properties.

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