

## Chapter 5

# Subdivision and Infrastructure Urban Subdivision



## 5 Subdivision and Infrastructure – Urban subdivision

This chapter is divided into three sections, as follows:

- 5.1 Residential Subdivision
- 5.2 Commercial Subdivision
- 5.3 Industrial Subdivision

### 5.1 Residential Subdivision

#### 5.1.1 *Minimum Allotment Sizes*

The Lismore Local Environmental Plan 2000 specifies the following minimum lot sizes in urban zones:

<b>Zone</b>	<b>Minimum lot size</b>
2(a) - Residential Zone	400* m <sup>2</sup>
2(f) - Residential (Flood Liable) Zone	No subdivision for dwellings is permitted

Clause 51(4) of the Lismore Local Environmental Plan permits subdivision of residential land to lots of less than 400m<sup>2</sup> if a covenant restricts the erection of a dwelling to a particular site on the lot, or if strata subdivision is proposed.

#### 5.1.2 *Provision of Sewerage*

Lot layout and sewerage networks are to be designed to ensure that each lot can be connected to sewer by gravity connection.

Community title or strata title properties with significant number of dwellings that are unable to be sewered by gravity may under exceptional circumstances install a common, privately owned pump station in accordance with Policy 7.2.2 at <http://www.lismore.nsw.gov.au/Mayor>Councillors & Staff/Management Documents/Business & Enterprise Policies>

#### 5.1.3 *Neighbourhood Planning*

This plan encourages a concept of neighbourhood design for particular sites, integrating surrounding urban areas while creating distinctive, identifiable and relatively self contained neighbourhoods based on the following design principles:

- higher residential densities;
- increased local self sufficiency (local employment and service provision);
- reduced travel to employment (interconnected streets and local centres within walking distance);
- smooth travel speed and flow;
- lot orientation to minimise building energy use;
- provision of accessible public transport; and
- higher levels of public safety.

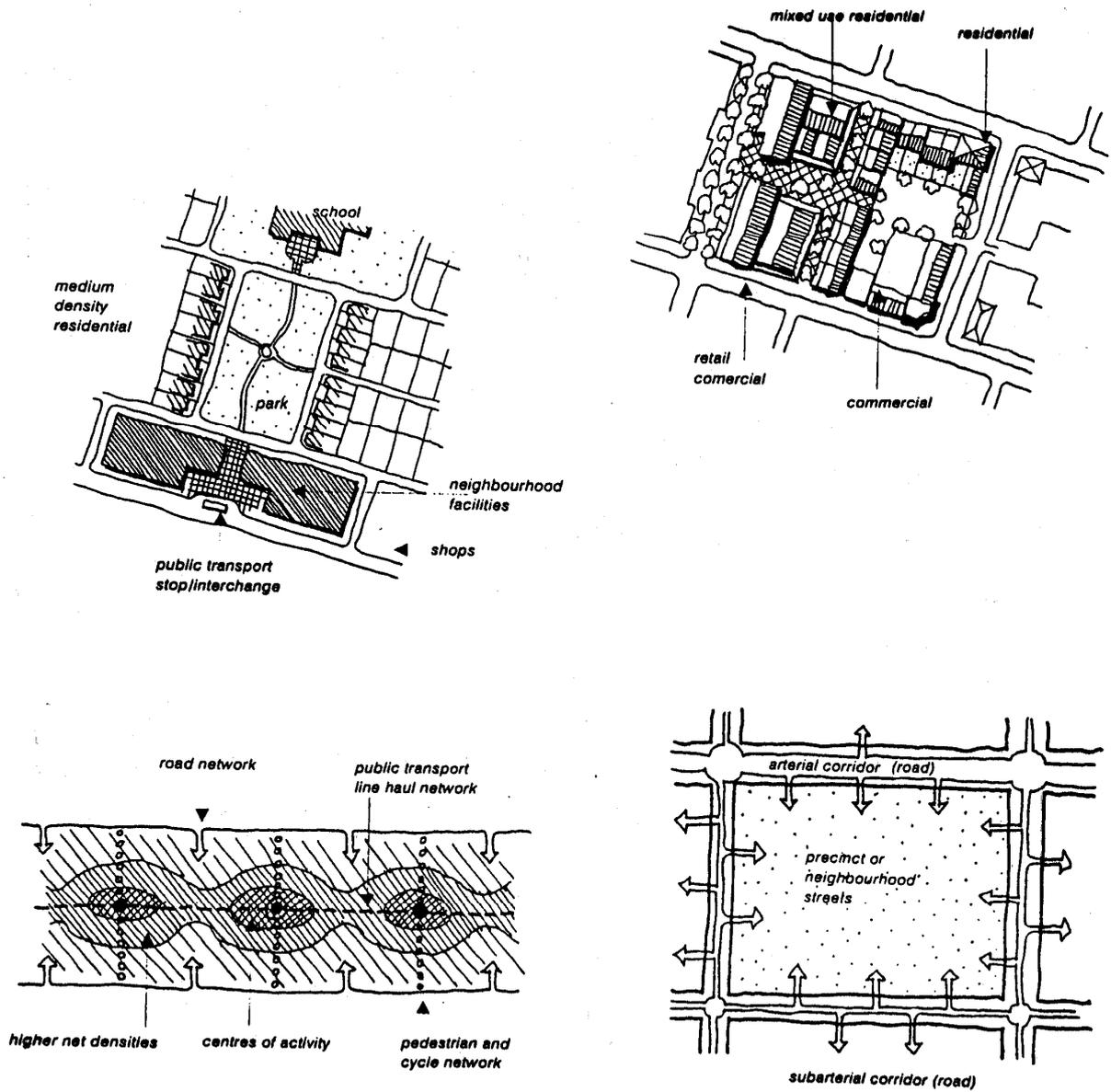


Figure 5-1: Mixed use urban centres

## 5.1.4 Design Elements

### Element:- Neighbourhood Design

<b>OBJECTIVE</b>
<p>To provide safe, convenient and attractive neighbourhoods that meet the diverse and changing needs of the community by:</p> <ul style="list-style-type: none"> <li>• Offering a wide choice in good quality housing and associated community facilities;</li> <li>• Encouraging walking and cycling;</li> <li>• Minimising energy consumption; and</li> <li>• Promoting a sense of place through neighbourhood focal points and the creation of a distinctive identity which recognises, and where relevant, preserves the natural environment.</li> </ul>

<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved when the Phases in the Design Process (refer section 5) are followed and where:</p> <ol style="list-style-type: none"> <li>1. The subdivision layout responds to site characteristics, setting, landmarks and views through street and open space networks.</li> <li>2. The subdivision layout enhances positive features of the existing urban character and townscape.</li> <li>3. Neighbourhood identity is reinforced by locating community facilities at focal points within convenient walking distance for residents.</li> <li>4. The street network provides a high level of internal accessibility and good external connections for local vehicle, pedestrian and cycle movements, with traffic management to restrain vehicle speed, deter through traffic and create safe conditions for all road users.</li> <li>5. The street layout and lot density minimise fuel use by reducing travel distances, maximising public transport effectiveness, and encouraging walking and cycling to daily activities.</li> <li>6. The street and lot layout enables efficient provision of physical services.</li> <li>7. The street and lot orientation and lot dimensions facilitate the siting and design of energy efficient dwellings.</li> <li>8. The lot design and layout provide a variety of lot sizes and enable a variety of housing types and other compatible land uses.</li> <li>9. The lot design and layout provide for higher densities in areas close to the CBD, services, public transport, open space etc.</li> </ol>	<p>There are no recommended suggested solutions for this Element, as each situation requires an individual approach.</p>

<p><b>10.</b> The layout provides well distributed public open spaces that contribute to the character of the development, provide for a range of uses and ages, are cost effective to maintain, and contribute to stormwater management and environmental care.</p> <p><b>11.</b> The layout ensures that major linear or regional open spaces are located to define the boundaries of neighbourhoods.</p> <p><b>12.</b> The layout retains significant vegetation and habitat areas, particularly koala habitat.</p> <p><b>13.</b> The layout is integrated with the surrounding urban environment, complements existing attractive streetscapes and landscapes, and provides for shared use of public facilities by adjoining communities.</p> <p><b>14.</b> The layout enhances personal safety, and minimises potential for crime through surveillance by pedestrians and drivers of passing vehicles.</p> <p><b>15.</b> The pedestrian network is safe, attractive and efficient, running largely along public spaces fronted by houses, and avoiding areas that generate major breaks in surveillance on routes used at night.</p> <p><b>16.</b> The layout of residential development provides:</p> <ul style="list-style-type: none"> <li>• protection from bushfire;</li> <li>• incorporates natural and cultural features;</li> <li>• minimises soil erosion;</li> <li>• avoids development on flood prone and hazardous i.e. unstable land;</li> <li>• avoids contaminated areas e.g. cattle tick dip sites.</li> </ul>	
---	--

**Element:- Major Movement Networks**

<b>OBJECTIVE</b>	
To provide movement networks for vehicles, public transport, pedestrians and cyclists that are integrated, cost effective, environmentally acceptable, and minimise the impact of traffic on the residential environment.	
<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
The objective may be achieved where:	The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:

1. The street network meets local needs and allows for the provision of public transport, for pedestrians and cyclists, and for expected vehicle traffic in a co-ordinated manner.
  
2. The arterial road network has the capability to accommodate public transport services and has capacity to safely and efficiently accommodate projected movements.
  
3. The street network connects with external traffic routes in a manner which maximises movement efficiency on the traffic routes.
  
4. Corridor traffic routes are more convenient for through traffic than streets within precincts.
  
5. Streets within any neighbourhood do not operate as through traffic routes for externally generated traffic (other than for pedestrians, cyclists public transport).
  
6. Safe and efficient connections between transport corridors and residential neighbourhoods are provided.
  
7. Safe and convenient links are provided for pedestrians and cyclists across transport corridors.
  
8. The spacing of connections between street networks in neighbourhoods, and road networks in corridors, protects the performance of the road corridors and preserves the quality of the street networks in the neighbourhoods.
  
9. Access arrangements for housing along an arterial road do not impede the traffic performance of the road.

The plan conforms to a Development Control Plan approved by Council which provides for public transport, pedestrians and cycleways.

**OR**

A Traffic Study with the proposal provides for an integrated approach to movement systems in a manner specified in this Plan

Provision is to be made for arterial road corridors as specified in Council's Regional City Plan.

The street network conforms to a Development Control Plan for the area and/or Traffic Study with the proposal showing an existing and proposed major road network above the level of arterial road which satisfies projected district travel.

The street network provides for pedestrians and cyclists in accordance with the requirements of this plan.

The street network conforms to a Development Control Plan for the area, showing an existing and proposed road network which satisfies projected district travel.

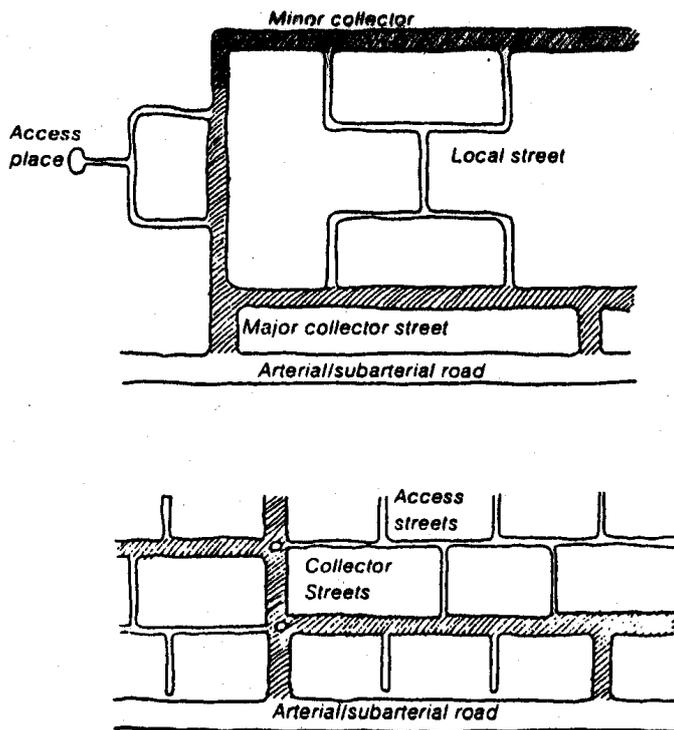
Through traffic with projected traffic volumes exceeding those specified in *Table 5-2* is not preferred in neighbourhood streets.

Connections between residential streets and arterial roads are in accordance with the requirements of *Table 5-3*.

Intersections between the external roads and the internal road network are located so as to minimise restriction of movement on the roads, and to avoid traffic volumes in excess of 3000 vpd on local collector streets.

Proposed housing development along a movement corridor does not have direct vehicle access to an arterial road unless there are no suitable alternatives. In this case provision must be made for vehicular access, to and from the road, to be in a forward direction and preferably shared between allotments.

## Minimum Standards and techniques



Source: AMCORD

Figure 5-2: Road Hierarchy / classification

Table 5-1: Residential Street Types

Street	Function
<p><b>Private Laneway (including right of way)</b></p> <p><b>Privately owned right of way or access easement under Community Title.</b></p>	<p>is an access street to be held in private ownership. These streets provide a shared carriageway for use by pedestrians, cyclists and vehicular traffic. No provision for parking is made within the laneway. The laneway services less than 10 dwellings where the majority of those dwellings do not utilise the lane as the sole means of access. Where the laneway is the sole means of access the number of lots it services is to be less than 5.</p>
<p><b>Access Place (e.g. small cul-de-sac)</b></p>	<p>is a street in which the residential environment is dominant. These streets provide a shared carriageway for use by pedestrians, cyclists and vehicular traffic. Footpaths not required. There is only one entry and exit point. Generally, the number of dwellings does not exceed 10. Traffic volume, less than 100 veh/day.</p>
<p><b>Local Street</b></p>	<p>is a street in which the residential environment is dominant. Minor streets provide a shared carriageway for use by pedestrians, cyclists and vehicular traffic. Paved footpaths not required. Pedestrian movements are facilitated by paths in the verge if it links to a Collector Street. Traffic volume, less than 2,000 veh/day.</p>
<p><b>Collector Street</b></p>	<p>typically collects traffic from lower volume streets and may provide bus routes within residential neighbourhoods. Separate provision to be made for cyclists and pedestrians which provide district connections. On-street parking is provided in the carriageway. Traffic volume, up to 3,000 veh/day.</p>
<p><b>Sub-arterial Street</b></p>	<p>connects collector streets with higher volume arterial roads. Its function is to facilitate the convenient and safe movement of residential traffic to and from the arterial road system. Access to lots is restricted because of higher volumes of traffic.</p>
<p><b>Arterial Roads</b></p>	<p>connect major urban areas and provide inter-regional linkages. Because of the high volumes of traffic direct access to individual lots is denied.</p>

**Element:- Local Street Networks**

<b>OBJECTIVE</b>	
To create street networks in which the function of each street is clearly defined, providing acceptable levels of access, safety and convenience for all users.	
<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <p><b>Function and structure</b></p> <ol style="list-style-type: none"> <li>1. The street network has a clear structure and component streets conform to their function in the network.</li> <li>2. The network has clear physical distinctions between each type of street. These distinctions are based on function, legibility, convenience, traffic volumes, vehicle speeds, public safety and amenity.</li> <li>3. The design features of each type of residential street encourage driver behaviour appropriate to the primary function of the street.</li> </ol> <p><b>Safety, access and convenience</b></p> <ol style="list-style-type: none"> <li>4. Intersections along residential streets are spaced to create safe and convenient vehicle movements.</li> <li>5. The street network creates convenient movement for residents between their homes and higher order roads.</li> </ol> <p><b>Mode choice</b></p> <ol style="list-style-type: none"> <li>6. There is provision for efficient bus routes which are direct and safely accessible by foot from all dwellings and activity centres.</li> <li>7. The alignment and geometry of streets carrying bus routes provide for ease of movement of buses between developments and major activity centres without complicated turning manoeuvres and without facilitating high traffic speeds.</li> <li>8. The street network facilitates walking and cycling within the neighbourhood and to local activity centres.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p><b>Function and structure</b></p> <p>Streets link with other streets that are no more than two levels higher or lower in the hierarchy and cul-de-sacs are minimised.</p> <p>The street network reflects the characteristics specified in <i>Table 5-1, 5-2, 5-3, 5-4 and 5-5</i>.</p> <p><b>Safety, access and convenience</b></p> <p>Intersections are spaced as set out in <i>Table 5-3</i>.</p> <p>The driving distance from any dwelling to the nearest collector (or higher-order) road is minimised.</p> <p>Turning movements at intersections are minimised in order to travel from any home to the most convenient collector street or higher order road.</p> <p><b>Mode choice</b></p> <p>Public transport routes and stops are provided as set out in <i>Element – Public Transport</i>.</p> <p>Streets provide a safe, convenient and legible network for pedestrians and cyclists in accordance with <i>Element – Pedestrian and Cyclist Facilities</i>.</p>

**Urban design and character**

9. The street network takes account of the topography and vegetation, respects any existing or potential site assets, and takes advantage of opportunities for views.

10. The street network takes account of the streetscapes that may be created or that already exist

11. The street network is oriented, where practical, to promote efficient solar access for dwellings.

12. The street network takes account of natural drainage and open space systems.

**Environmental protection**

13. Traffic generated by a development is within the acceptable capacity of the roads.

14. Streets do not operate as through traffic routes for externally generated traffic, while limiting the length of time local drivers need to spend in a low speed environment.

15. The street network is designed to reduce traffic speeds and volumes to acceptable levels, with most dwellings fronting streets with low volumes.

16. The impact of measures intended to restrain traffic speeds and/or volumes takes account of the needs of other street users and adjoining dwellings, by avoiding:

- stop start conditions;
- increased vehicle emissions;
- unacceptable traffic noise to adjoining dwellings;
- devices which reduce convenience or safety levels for cyclists and public transport.

17. Streets and lots are located so that dwellings are not subject to unacceptable levels of traffic noise.

**Cost effectiveness**

18. Streets and carriageway widths and street lengths optimise the cost effectiveness of the street network.

19. The network provides for the cost effective provision of public utilities.

**Urban design and character**

The street network permits the establishment of streetscapes that incorporate the provisions of *Element Neighbourhood Design*.

The streets are aligned in east-west or north-south direction, wherever possible.

**Environmental protection**

Intersections within the street network are either roundabouts or other appropriate traffic management treatments to slow and control traffic.

Traffic speeds and volumes are restrained through measures such as:

- limiting street length;
- introducing bends; and
- introducing slow points

Traffic noise in residential streets should not exceed 55 dB(A) L<sub>10</sub> at the front of dwellings.

**Cost effectiveness**

The length of sub-arterial streets is minimised, except where the topography or the location of major traffic routes makes a longer distance unavoidable.

The network caters for the provision of public utility networks including water, sewerage, electricity, and telecommunications.

## Minimum Standards and Techniques

Table 5-2: Classification of Residential Streets

Street level/type and function	Design speed (km/hr.)	Indicative traffic vol. (vpd)	Stopping sight dist. (metres)
Private laneway or Right of Way	10	< 100	
Access Place	40	< 100	30
Local Street	40	< 2,000	30
Collector Street	60	< 3,000	70
Sub-arterial Street	60	3,000	70
Arterial Road	- usually designed for speeds of 80 km/hr.		

Table 5-3: Desirable Minimum Intersection Spacing

Street Type	Same side of street (metres)	Opposite side of the street (metres)	
		Left/right	Right/left
Laneway or Right of Way	Refer to	Austroads	Pt. 5.
Access Place			
Local Street			
Collector Street			
Sub-arterial Street	approx.	0.5 km.	
Arterial Road	approx.	1 km.	

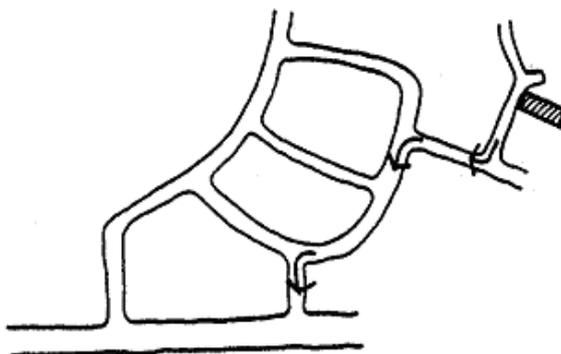


Figure 5-3: Minimise turning movements from the lot to collector streets

**Element:- Pedestrian and Cyclist Facilities**

<b>OBJECTIVE</b>	
To encourage walking and cycling by providing safe and convenient movement networks to points of attraction within and beyond the development.	
<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <p><b>Planning</b></p> <ol style="list-style-type: none"> <li>1. The residential street and path network provides a network of pedestrian and cyclist routes, with connections to adjoining streets, open spaces and activity centres.</li> <li>2. A network of footpaths and cycle routes is provided that accounts for: <ul style="list-style-type: none"> <li>• the need to encourage walking and cycling;</li> <li>• likely users (e.g. school children, parents with prams, the aged and people with disabilities, commuter and recreational cyclists);</li> <li>• opportunities to link open space networks and community facilities, including public transport, local activity centres and schools;</li> <li>• topography;</li> <li>• cyclist and pedestrian safety.</li> </ul> </li> </ol> <p><b>Location and design</b></p> <ol style="list-style-type: none"> <li>3. The location of footpaths and cycleways in a street reservation is determined by: <ul style="list-style-type: none"> <li>• whether vehicle speeds and volumes are low and the use of the street pavement by cyclists does not affect the comfort and safety of pedestrians;</li> <li>• whether pedestrians and cyclists are protected from parked vehicles and vehicles moving along the street and on driveways;</li> <li>• whether postal delivery will be significantly inconvenienced;</li> <li>• the location of physical services;</li> <li>• cross falls;</li> <li>• landscaping;</li> <li>• whether there is any development fronting that part of the street;</li> <li>• cyclist and pedestrian safety;</li> <li>• cost effective construction.</li> </ul> </li> <li>4. The alignment of paths allows safe and convenient use by pedestrians and cyclists and is varied to preserve trees and other significant features. A focus on vistas and landmarks add visual interest where they exist.</li> <li>5. Footpaths and cycleways are well lit and located where there is casual surveillance.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p><b>Planning</b></p> <p>Where a Development Control Plan, Traffic Study with a proposal, or an approved Pedestrian and Cyclist Plan exists, pedestrian and cyclist paths are to be provided in accordance with that plan.</p> <p><b>Location and design</b></p> <p>Footpaths and cycleways are provided in accordance with <i>Table 5-5</i>.</p> <p><b>OR</b></p> <p>Footpaths are provided on one side of streets with traffic volumes greater than 1,000 vpd. No footpaths are required on streets with a traffic volume &lt;1,000 vpd as pedestrians can share with vehicles in a low speed environment.</p> <p>Collector streets on which there is access to lots or where there is a planned pedestrian or cyclist path are provided with a separate path on each side clear of the carriageway pavement.</p> <p>A pedestrian (only) footpath, where required, is 1.5 metres wide.</p>

6. Footpaths or shared paths are designed and constructed of appropriate width, longitudinal gradient and sight distance to cater for the number of projected pedestrians and cyclists, and user types (e.g. the aged, the very young, people with prams and people with disabilities).

7. Design of streets accommodates pedestrian and cyclist use of street pavements in access places, and cyclist use of street pavements in access streets and collector streets.

8. Provision is made for the location of seats in appropriate places.

9. There is adequate provision for passing with paths widened at potential conflict points or junctions on high use facilities to allow for passing of pedestrians/cyclists.

**Safe Crossings**

10. Safe street crossings are provided for all street users with safe sight distances and adequate pavement markings, warning signs and safety rails (where appropriate for cyclists).

**Construction**

11. Pedestrian and cyclist paths are constructed to provide a stable surface for projected users which is easily maintained.

Footpaths are widened to 2.0 metres minimum in the vicinity of meeting points, schools, shops and other activity centres and along Sub-arterial Streets or where linking these activities.

Cycle paths and shared paths have widths in accordance with *Figure 5-4*.

Maximum longitudinal gradient of cycle paths to be no greater than that at any adjacent street pavement.

Dedicated cycle paths are provided in accordance with the Lismore Cycleways Plan.

Paths are widened at potential conflict points or junctions in areas of high use, such as schools, corner stores etc.

**Safe Crossings**

Where traffic volumes exceed 5,000 vpd or speeds exceed 50 km/h, safe crossings are created with the use of pedestrian refuges, slow points, thresholds or other appropriate mechanism.

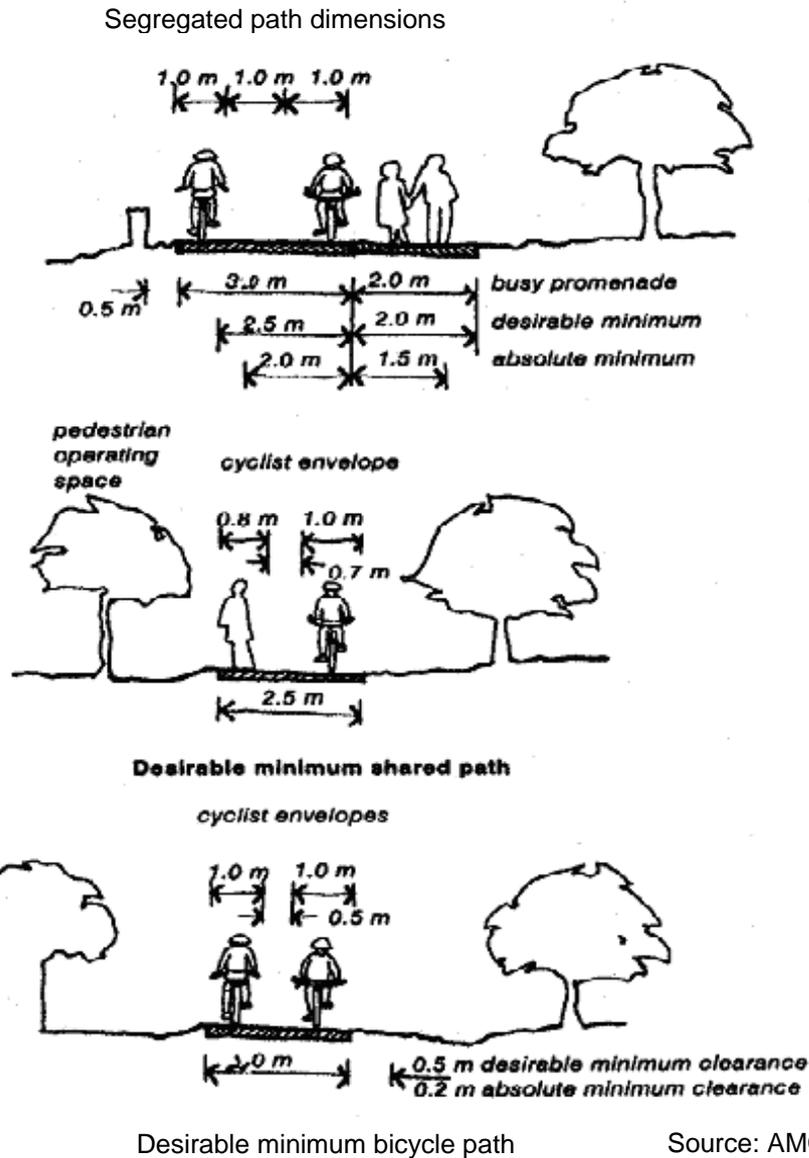
Pram and wheelchair crossings are provided at all kerbs and are adequately designed for this purpose as well as assisting sight impaired people.

**Construction**

Footpaths are to be constructed in accordance with Councils *"General Specification for the Construction of Road and Drainage Works"*.

Cycleways may be constructed of an asphalt sealed pavement or equivalent standard concrete pavement.

# Minimum Standards and techniques



Desirable minimum bicycle path

Source: AMCORD

Figure 5-4: Protection for cyclists and pedestrians

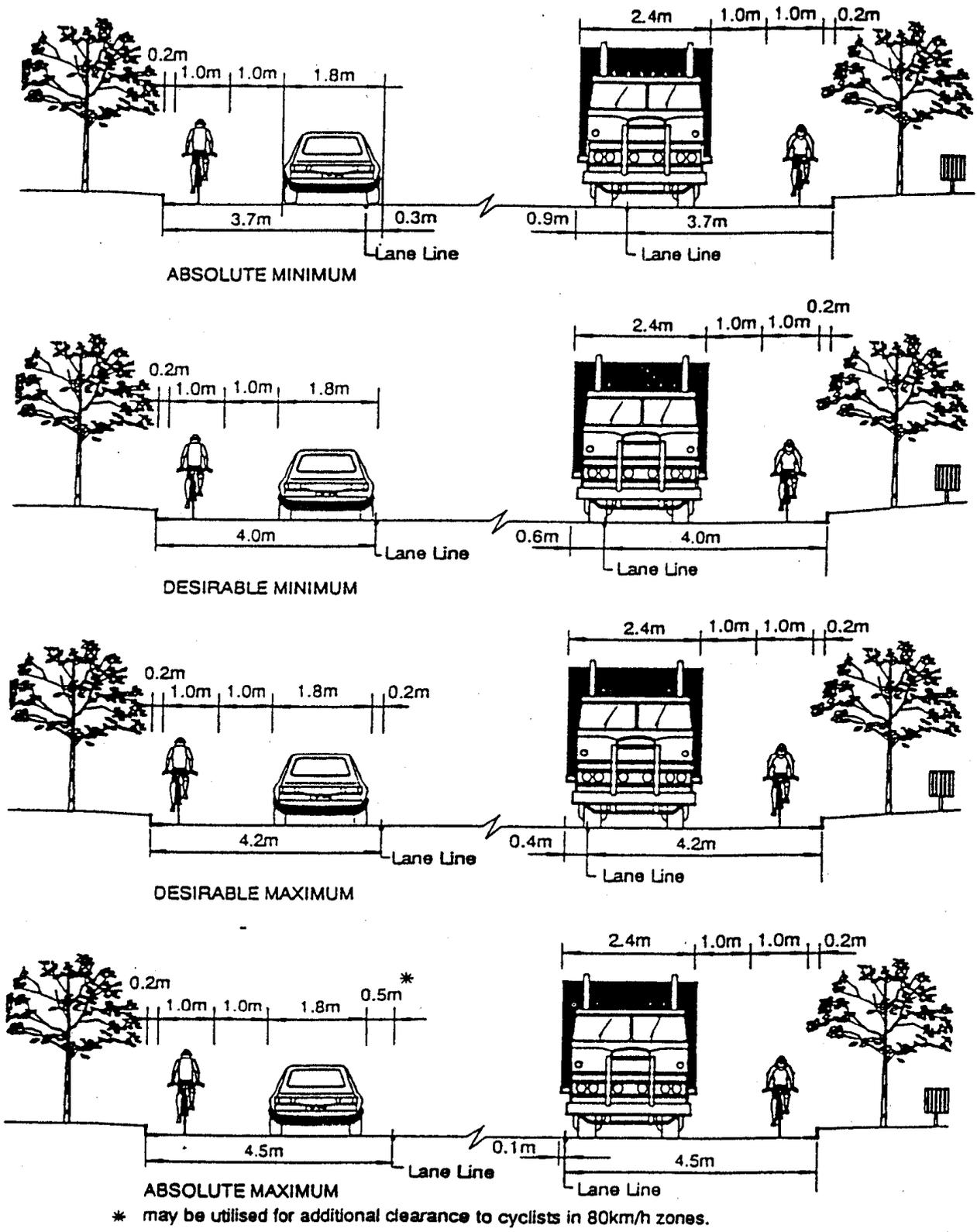


Figure 5-5: Designing for cyclists on collector and sub-arterial roads

**Element:- Public Transport**

<b>OBJECTIVE</b>
To increase opportunities for choice in mode of transport and provide cost effective and energy efficient public transport services that are accessible and convenient to the community.

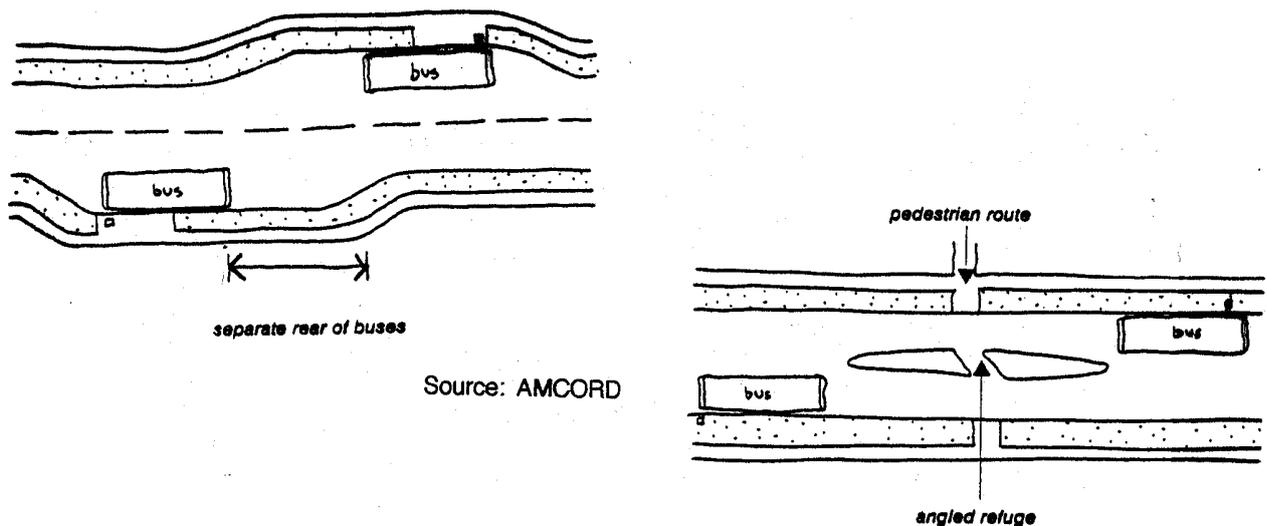
<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <p><b>Planning</b></p> <ol style="list-style-type: none"> <li>1. Neighbourhood densities are provided at levels that encourage the economic provision of regular public transport services.</li> <li>2. Net residential densities within walking distance of public transport stops are provided at levels that take advantage of the infrastructure investment and support the economic operation of services.</li> <li>3. A network of public transport routes is provided that takes account of: <ul style="list-style-type: none"> <li>• projected travel demand;</li> <li>• distribution of likely demand;</li> <li>• scale and time of demand;</li> <li>• characteristics of travellers;</li> <li>• travel time;</li> <li>• operating characteristics;</li> <li>• cost of providing the service;</li> <li>• route location and design.</li> </ul> </li> </ol> <p><b>Route location and design</b></p> <ol style="list-style-type: none"> <li>4. Convenient connections to adjoining areas and other public transport routes, (including future routes), provide for ease of movement of buses between developments, and link activity centres within and external to the development.</li> <li>5. Buses are able to safely gain access to the development without complicated turning manoeuvres.</li> <li>6. The alignment and geometry of the streets that form the bus route allow for the efficient and unimpeded movement of buses, without facilitating high traffic speeds.</li> </ol> <p><b>Bus stop location and design</b></p> <ol style="list-style-type: none"> <li>7. Public transport stops provide for pedestrian safety, security, comfort and convenience.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p><b>Planning</b></p> <p>Where a Development Control Plan or other planning instrument exists, routes and neighbourhood and net residential densities conform with that plan.</p> <p><b>OR</b></p> <p>Neighbourhood densities are at least 12 dwellings per ha and/or net residential densities are not less than 16 dwellings/ ha, or at other such densities as approved by Council.</p> <p>The majority of lots are within 400 metres safe walking distance from an existing or potential bus route.</p> <p><b>Route location and design</b></p> <p>Bus routes linking residential areas across roads which carry in excess of 2,000 vpd are designed to enable a left turn into the road from one area followed by a right turn from the road into the adjoining residential area.</p> <p>Routes for regular bus services are designed in accordance with <i>Table 5-4 and 5-5</i>.</p> <p><b>Bus stop location and design</b></p> <p>Bus stops are, or are planned for, 400 metre spacings where the route serves residential development.</p>

<p><b>8.</b> Bus stops are designed to prevent vehicles from overtaking a stationary bus, or vehicle speeds are reduced to ensure safe pedestrian crossing.</p> <p><b>9.</b> Bus stops are located and designed to provide shelter, seats, adequate lighting and timetable information, are overlooked from nearby buildings, and are located to minimise adverse impact on the amenity of nearby dwellings.</p>	<p>The siting of bus stops is related to the pedestrian path network.</p> <p>Bus shelters are to be provided at key locations.</p>
--	--

### Minimum Standards and Techniques

Table 5-4: Minimum requirements for Bus Routes

STREET CARRIAGEWAY WIDTHS	
One-way:	6.5 metres
Two-way:	9.0 metres or 7.5 metres where bus bays are provided with a traffic calming and management.
TURNING CIRCLES	
Maximum desirable pavement crossfall:	3%
Maximum desirable longitudinal gradient:	6%
Absolute maximum gradient:	6%
Radius 15 metres for single bus	
ROUNDBABOUTS	
Absolute maximum gradient:	12%



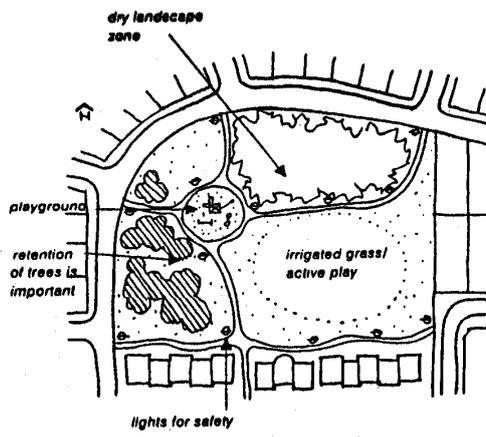
Source: AMCORD

Figure 5-6: Traffic control for buses

**Element:- Public Open Space**

<b>OBJECTIVE</b>
To provide, where appropriate, public open space that meets user requirements for outdoor recreational and social activities and for landscaping that contributes to the identity and environmental health of the community.

<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"> <li>1. The multi functional role of public open space and its use as a community facility is recognised and promoted.</li> <li>2. Public open space provides: <ul style="list-style-type: none"> <li>• a range of recreation settings, corridors for community paths, and attractive urban environment settings and focal points;</li> <li>• adequate facilities to meet the needs of the community as reflected by indicators such as population density and demographic structure;</li> <li>• accessibility to users in conjunction with existing facilities;</li> <li>• opportunities for the incorporation of existing trees, rocks, streams and other sites of natural or cultural value, and linkage of habitats and wildlife corridors;</li> <li>• opportunities to link public open spaces into a legible network;</li> <li>• public safety and reasonable amenity of adjoining land users in the design of facilities and associated engineering works;</li> <li>• for future maintenance requirements;</li> <li>• opportunities for regional open space to meet neighbourhood open space requirements;</li> <li>• a clear relationship between public open space and adjoining land uses established by appropriate treatment including alignment fencing, landscaping, and issues of noise, security and surveillance;</li> <li>• avoidance of continual lengths of solid fencing along open space areas for security, surveillance, aesthetic and maintenance reasons.</li> </ul> </li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>Public open space is provided in accordance with an approved open space strategy or Development Control Plan.</p> <p>Submission of a plan and documentation showing:</p> <ul style="list-style-type: none"> <li>• the adjacent street reserves, carriageways, parking bays, footpaths, cycleways and street and park lighting;</li> <li>• existing vegetation and proposed general character of tree planting and landscaping (including proposed species);</li> <li>• existing rare or significant vegetation, natural habitats and features (e.g. creeks) which are retained, enhances or otherwise affected;</li> <li>• general arrangement of hard landscaping elements and major earth cuts, fills and mounding;</li> <li>• indicative treatment of any drainage systems, along with general information on fencing, access points and furniture;</li> <li>• proposed recreation facilities; and</li> <li>• the age groups of intended user targets and the facilities to be provided to service the user group;</li> <li>• the distances from the furthest lot in the development.</li> </ul> <p>Parks include provision for lighting where appropriate in accordance with <i>Australian Standard 1158.1</i> (1986).</p> <p>Parks are located so that at least 50% of their perimeter length has a direct frontage to a public road and near facilities such as community facilities, sports fields shops etc.</p> <p>Parks should have a minimum area of 5,000m<sup>2</sup>, except where their function is primarily to provide cyclist / pedestrian connection or habitat linkages.</p>



Source: AMCORD

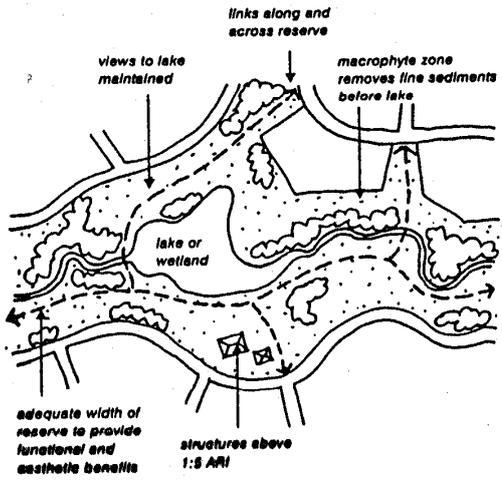


Figure 5-7: Designing for open space

5.1.5 Physical Infrastructure

Element:- Street design and on Street Parking

OBJECTIVE	
To provide for streets that: <ul style="list-style-type: none"> <li>• fulfil their designated functions within the street network,</li> <li>• accommodate public utility services,</li> <li>• accommodate drainage systems, and</li> <li>• create a safe and attractive environment.</li> </ul>	
PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
The objective may be achieved where:  <b>Function and width</b> 1. The design features of each type of residential street convey its primary function.	The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:  <b>Function and width</b> The following street components for each type of street are as specified in <i>Table 5-5</i>

2. The street reserve width is sufficient to cater for all street functions, including:

- safe and efficient movement of all users;
- provision for parked vehicles;
- provision of landscaping;
- location, construction and maintenance of public utilities.

3. The verge width is sufficient to provide for special site conditions and future requirements.

**Designing for safety**

4. The design facilitates safe use by pedestrians, particularly people with disabilities, the aged and children, by:

- providing a carriageway width which allows vehicles to proceed safely at the operating speed intended for that level of street;
- making allowances for restrictions caused by on street parking;
- providing a horizontal and vertical alignment which is not conducive to excessive speeds;
- promoting the safety of pedestrians at bus stops and other crossing points;
- promoting the safety of cyclists in streets and at crossing points.

5. Speed reduction techniques are used to achieve desired speeds, as part of a design for the whole street environment, and include the following principles:

- slow points including either horizontal or vertical deflection are designed to slow traffic to design speeds;
- slow points and carriageway narrowing are designed to take into account the needs of cyclists, by ensuring speed compatibility, adequate space for concurrent passage or off street diversions;
- landscape design, on street parking and streetscape design are used to complement speed restriction measures;
- speed restriction techniques and devices are not used in isolation; and
- the verge provides safe sight distances, taking into account expected vehicle speeds and pedestrian and cyclist movements.

- street reserve widths;
- carriageway widths;
- verge widths;
- parking within street reserve;
- kerb type;
- pedestrian cyclist facilities;
- number of desired lots the road is to service.

The verge width is increased where necessary to allow space for larger scale landscaping, indented parking, future carriageway widening, retaining walls, cycle paths or overland flow paths.

Traffic speeds and volumes are restrained through one or more of the following measures:

*(i) Limiting street length*

Where street 'leg' length is limited to control vehicle speed, the lengths between slow points are designed to restrict operating speeds as specified in *Table 5-3*.

*(ii) Introducing bends*

Where bends are introduced to control speeds to 20 km/h or less, the deflection angle in the change of the alignment of a street or pavement is at least the angle determined from *Table 5-6*.

*(iii) Introducing slow points*

Where slow points are used to allow speeds greater than 20 km/h, the length of street between two bends or slow points complies with the distances specified in *Table 5-7*.

6. Safe sight distances, based on vehicle travel speeds, exist at property access points, pedestrian and cyclist crossings and at junctions and intersections.

#### **Driveway Access**

7. The carriageway and verge width allows for unobstructed access to individual lots, even when a car is parked on the opposite side of the street.

Driveway egress movements do not create a safety hazard.

Street and lot design ensures suitable vehicle access to all lots.

#### **Geometric Design**

8. Bus routes have a carriageway width that:

- allows for the movement of buses unimpeded by parked cars;
- safely accommodates cyclists;
- avoids cars overtaking parked buses.

9. The horizontal and vertical alignments satisfy safety criteria and reflect physical land characteristics and major drainage functions.

10. Geometric design for intersections, roundabouts and slow points is consistent with the vehicle speed intended for each street.

11. Kerb radii at intersections and junctions are kept to a minimum, subject to:

- satisfying required turning manoeuvres;
- keeping pedestrian crossing distances to a minimum;
- controlling the speed of vehicles.

Speed reduction devices are part of a design for the total street environment.

Where speed restriction devices are used in isolation, they include:

- full horizontal displacement of the vehicle path;
- swept vehicle paths to have a 20 m radius;
- constriction on exit rather than on entry (otherwise there is a risk that the device may be used as a short cut);
- additional pavement treatment behind the kerb for large vehicle;
- line marking and signposting

#### **Driveway Access**

Motorists can enter or reverse from a lot in a single movement.

Lot design enables driveways on Sub-arterial Streets and streets which carry more than 5,000 vpd to be designed to promote forward movement of vehicles across the verge. Refer *Figure 5-11*.

Driveway gradients are a preferred maximum grade of 20% with an absolute maximum grade of 29%. Maximum change of grade is 12.5%.

#### **Geometric Design**

The geometry of streets identified as bus routes provides suitable turning, stopping sight distance, grade and parking for buses (as determined from appropriate design documents), and has maximum carriageway widths within the ranges specified in *Table 5-4*.

Longitudinal gradients do not exceed the gradients specified in *Table 5-5*.

Curve super elevation does not exceed 6%.

For downgrades of 5-10% street design should be based on an increase of the maximum speed of 5 km/h. For downgrades >10%, this maximum speed should be increased by 10 km/h.

Desirable crossfall on street pavement is to be 3%.

Design complies with AUSTRROADS Guidelines.

Sufficient area is provided at the head of hammer head cul-de-sac for waste disposal vehicles to make a 3 point turn.

Kerb radii are a minimum 8 m.

**12.** Siting conditions on land abutting major and minor distributor roads ensure that all vehicles can enter or leave the street in a forward direction.

Street and parking design enables adequate servicing of waste collection vehicles to all lots.

***On street parking***

**13.** Carparking is provided in accordance with projected needs which are determined by:

- the number and size of probable future dwellings;
- the carparking requirements of likely future residents;
- availability of public transport;
- likely future on-site parking provisions;
- locations of non residential uses such as schools and shops;
- the occasional need for overflow parking.

**14.** Carparking is designed and located to:

- conveniently and safely serve users, including pedestrians, cyclists and vehicles;
- enable efficient use of car spaces and accessways including adequate manoeuvrability between the street and lots;
- fit in with any adopted street network and hierarchy objectives, and any related traffic management plans;
- be cost effective;
- achieve relevant streetscape objectives.

Turning vehicles are accommodated using turning templates, to enable the following turns to be made in a single forward movement:

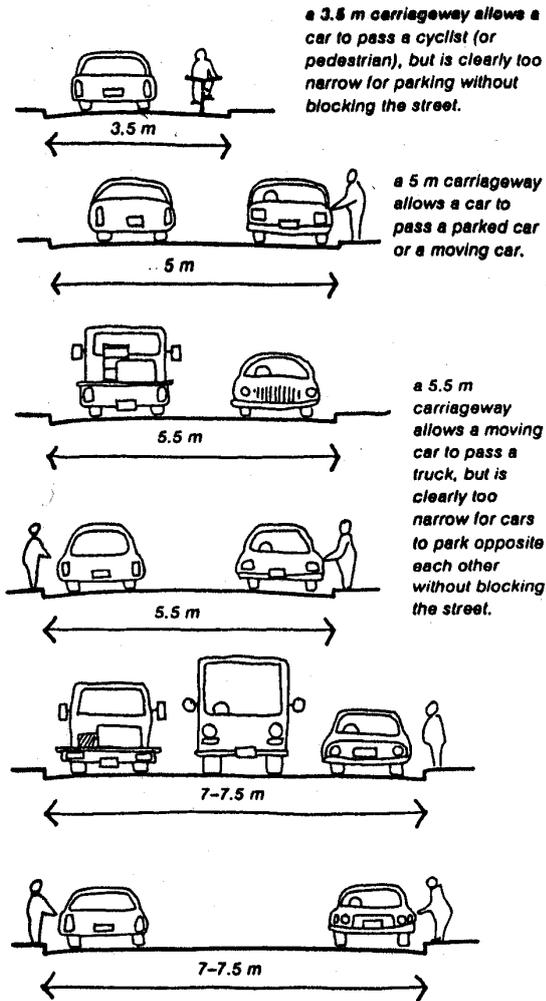
- between collector and access streets, the design heavy rigid vehicle (turning path radius 15 m.) using any part of the pavement.
- between access streets, the 99 % design car (turning path radius 7.5m), using the correct side of the pavement only.

***On street parking***

One on street parking space is to be provided for each dwelling. These are to be located against the kerb or in parking bays constructed within the verge, located within 20m of each allotment.

Provision of on-street car parking may be reduced where allotments are within easy walking distance of shopping, employment, educational, public transport or other facilities which may reduce the demand for private motor vehicles.

# Minimum Standards and techniques



Source: AMCORD

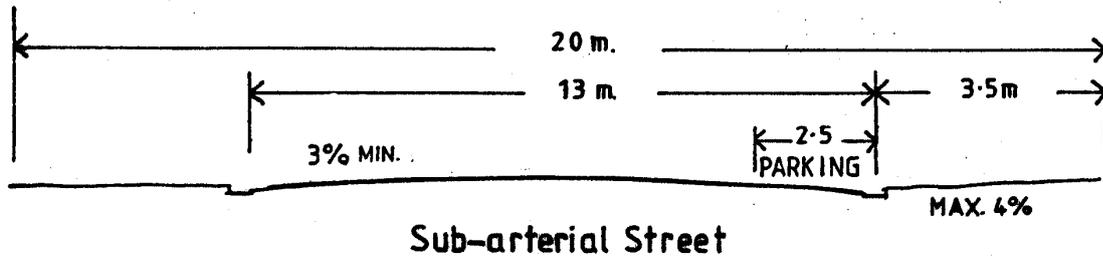
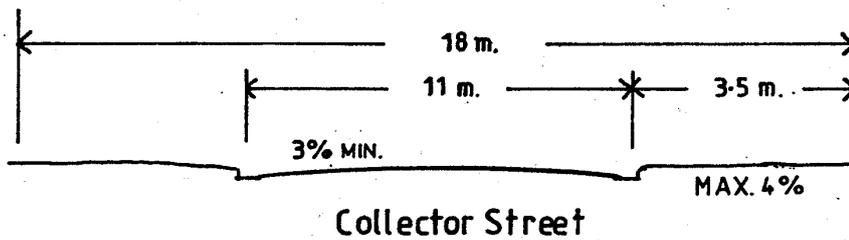
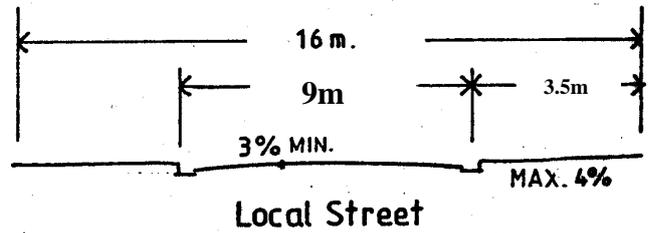


Figure 5-8: Carriageway widths

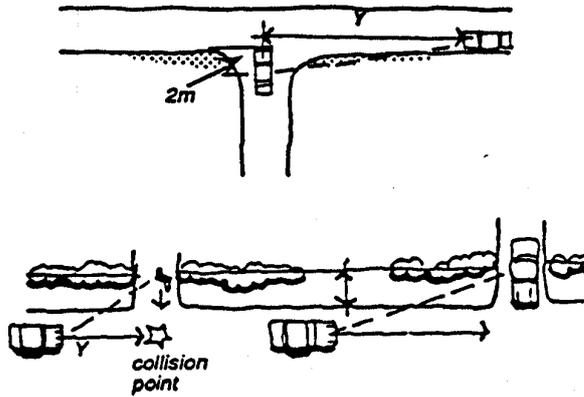
Table 5-5: Urban Residential Street Characteristics  
(refer Fig. 5-2, Tables 5-1, 5-2, 5-3 & 5-4)

Element	Battle-axe lots	Access Place	Local Street	Collector Street	Sub-arterial Street
<u>Road Reserve Width</u> metres	Minimum of the greater of 3m per lot or sum carriageway width & verge width	<14	16	18	20
<u>Carriageway Width</u> Metres (pavement cement stabilised)	3m - 1 lot 4m - 2 lots 6m - 3 lots or more	6  5 with designed traffic calming, mgmt & parking	9  6.5 with designed traffic calming, mgmt & parking	11 (incl. bus route) 7.5, (9 bus route) with designed traffic mgmt & parking	13  11 with designed traffic mgmt & parking
<u>Preferred max. longitudinal gradient (%)</u>	20%	16 %	16 %	12 %	8 %
<u>No. travel lanes</u>	1	2+	2+	2+	2+
<u>Parking in reserve</u>	None	Kerb/verge + indent parking @ 1 / 1 lot if pavement < 6m.	Kerb/verge + indent parking @ 1 / 1 lot if pavement 6.5m.	Carriageway	Carriageway
<u>Kerb type</u>	Layback	Layback	Layback	Upright	Upright
<u>Footpath Formed in concrete</u>	Nil, road	Nil, road	1 x 1.5 m. in verge if links to collector street	1 x 2 m. in verge	1 x 2 m. in verge
<u>Cycleway</u>	Road	Road	Road	Combined footpath	Combined footpath
<u>Verge width</u> Metres	2 x 1m minimum	2 x 4  2 x 4.5 with traffic calming	2 x 3.5  2 x 4.5 with traffic calming	2 x 3.5  2 x 4.5 with traffic calming	2 x 3.5  2 x 4.5 with traffic calming
<u>No. of lots to be serviced</u>	< 5 sole access <10 with alternate access	< 11	< 200	< 300	> 300

Table 5-6: Street leg length and travel speed.

Street type	target travel speed (km/hr)	Max. leg length between slow points
Access Place	30	75 - 100
Local Street	40	120 - 140
Collector Street	50	120 - 150

**Priority Junctions and Driveways**

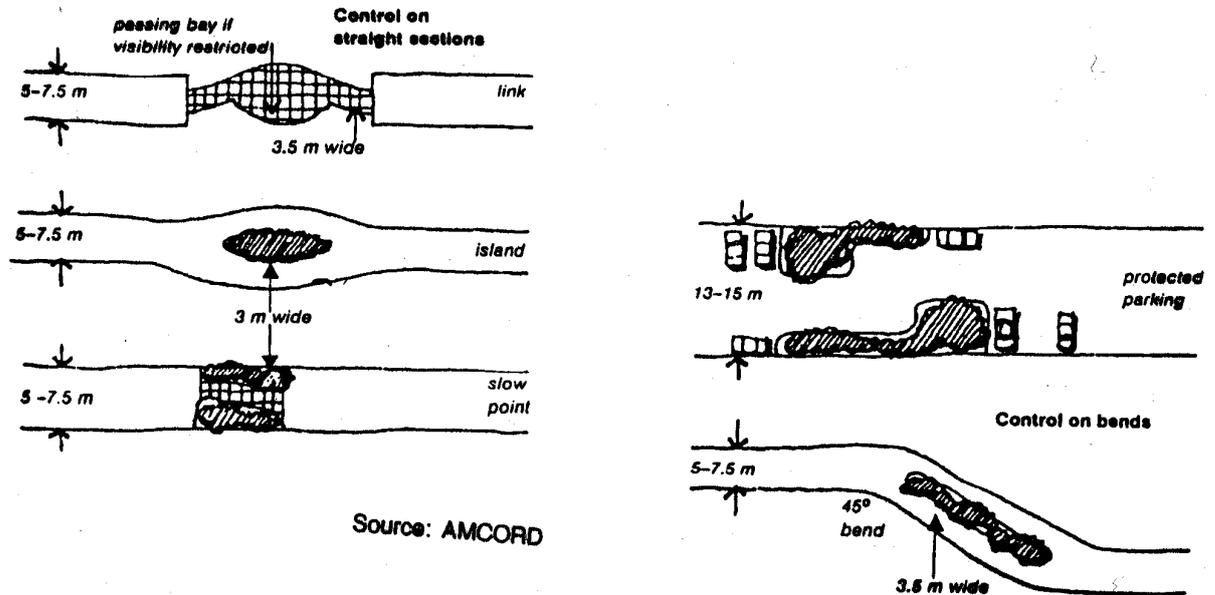


Visibility uninterrupted by fixed objects to be provided over entire shaded area. Hilly terrain may require junctions to be moved onto or well away from crests to satisfy sight distance requirements.

Stopping distance Y is directly related to speed. Increased speed requires increased verge width to improve visibility of people or cars coming out of driveways or at intersections.

Source: AMCORN

Figure 5-9: Street design and visibility



Source: AMCORN

Figure 5-10: Measures to control vehicle speed

Table 5-7: Minimum deflection angles for traffic control devices (20 km/hr).

Bend type	Street pavement width	
	5.0 - 6.0 metres	7.0 - 7.5 metres
Single bend	70°	90°
Chicane (two reverse single bends)	45° - 45°	60° - 60°

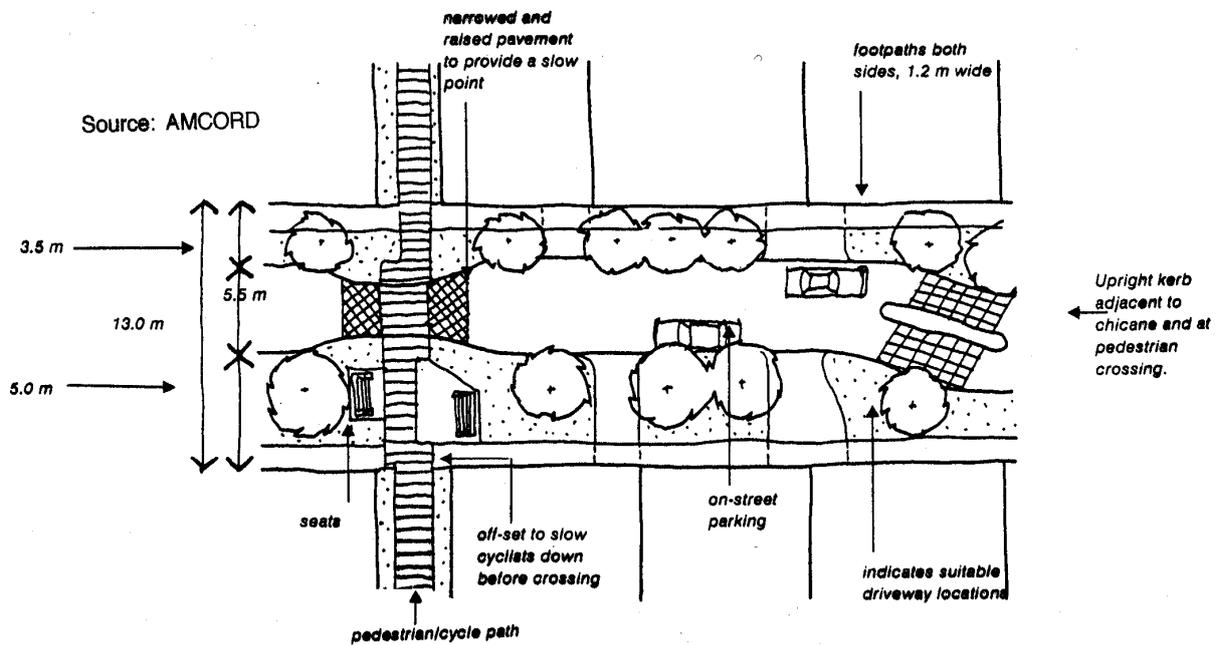
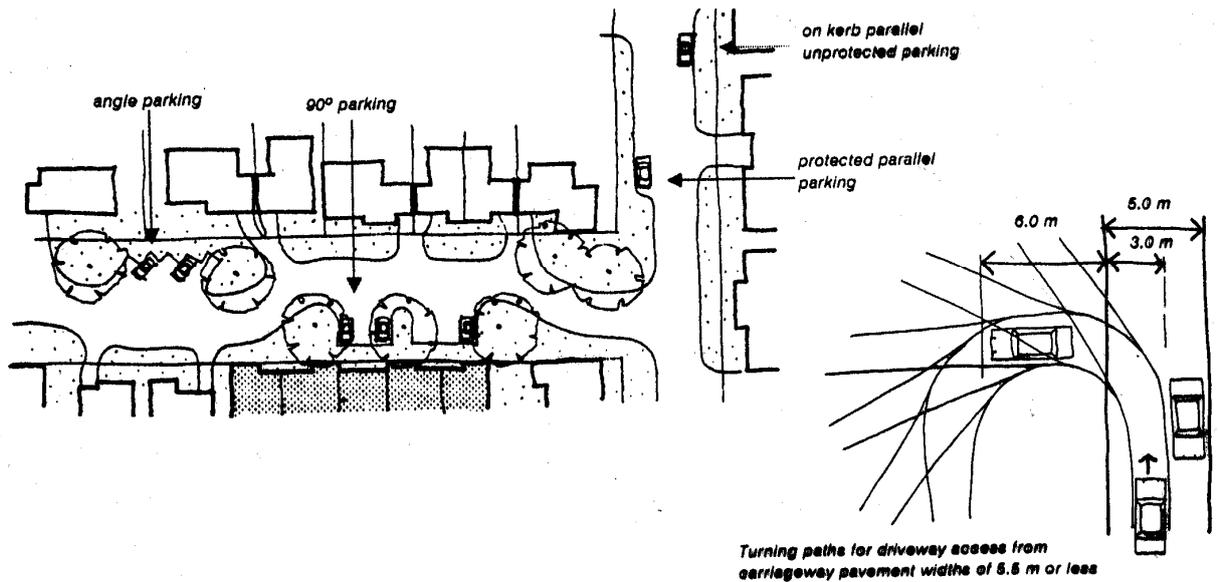
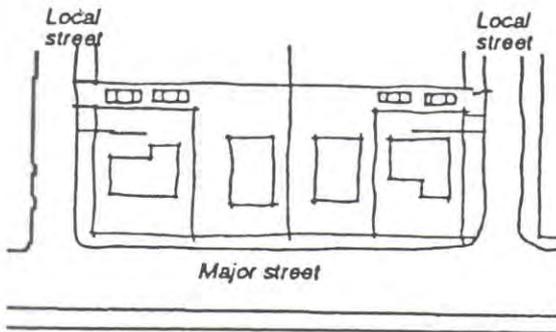
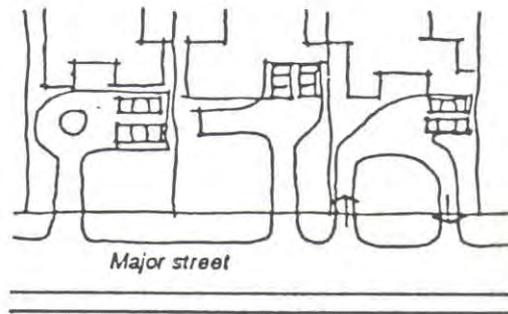


Figure 5-11: Examples of verge and on-street parking treatment

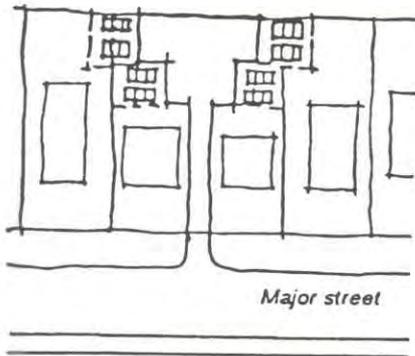
Lots with car access from side street



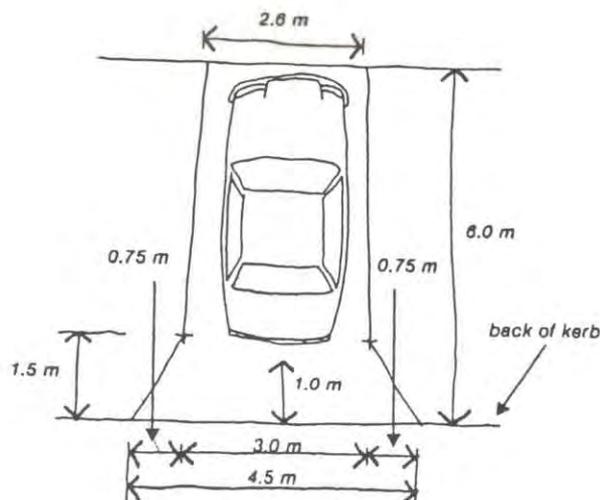
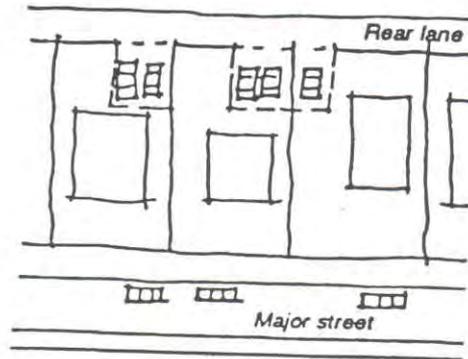
Wide lots allow for large driveways so vehicles can enter and exit forwards



Shared driveways reduce the number of entry points and allow vehicles to enter and exit forwards



Adding a rear lane provides vehicle access for houses fronting a major street.



Source: AMCORD

Driveway and kerb crossover design for narrow streets, where pavement is 5.5 m or less in width.

Figure 5-12: Options to control access on Trunk collector streets

## Street Construction

OBJECTIVE	
To construct streets that support the design intentions without unnecessary construction and whole of life cycle costs.	
PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"> <li>1. The pavement edging and landscaping support the specified functions and amenity of the street.</li> <li>2. The pavement edge: <ul style="list-style-type: none"> <li>• controls vehicle movements by delineating the carriageway for all users;</li> <li>• assists in controlling stormwater runoff; and</li> <li>• provides for people with disabilities, by allowing safe passage of wheelchairs and other mobility aids.</li> </ul> </li> <li>3. Street pavement surfaces are well designed and durable enough to carry wheel loads of travelling and parked vehicles; ensure the safe passage of vehicles, pedestrians and cyclists; the discharge of rainfall, and the preservation of all-weather access; and allow for reasonable travel comfort.</li> <li>4. Consistent with <i>Performance Criteria</i> 3, public street construction and whole of life cycle costs are kept low.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>Pavement and landscape materials are used, where appropriate, to distinguish different street functions.</p> <p>Pavement edges at pedestrian crossings are constructed for wheelchair and pram access and to assist sight-impaired people in accordance with <i>AS1428 Pt 1 and Pt 4</i>.</p> <p>Flexible pavement construction and kerb and gutter profiles are based on the requirements contained in Council's <i>"General Specification for the Construction of Road and Drainage Works"</i>.</p>

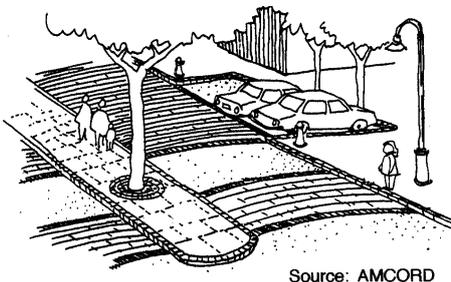


Figure 5-13: Pavement treatment

## Element:- Utility Services

OBJECTIVE	
To ensure that residential areas are adequately serviced with sewerage, water, fire fighting, electricity, street lighting and communication services in a timely, cost effective, co-ordinated and efficient manner that supports sustainable development practices.	
PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"> <li>1. Design and provision of utility services, including sewerage, water, electricity, street lighting, and communication services, are cost effective over their life cycle and incorporate provisions to minimise adverse environmental impact in the short and long term.</li> <li>2. Compatible public utility services are located in common trenching in order to minimise the land required and the costs for underground services.</li> <li>3. Cables for cable television should be underground where electricity service is underground.</li> <li>4. Development occurs within locations where there is an adequate water supply for domestic and fire fighting purposes.</li> <li>5. Development is staged to ensure that each stage is fully serviced before a new area is released.</li> <li>6. Public lighting shall be designed to maximise energy efficiency.</li> <li>7. Water supply and sewerage networks are accessible, easy to maintain, and cost effective based on life cycle costs.</li> <li>7. Sewerage networks to be designed to ensure that each lot can be connected to sewer by gravity connection.</li> <li>8. The selection of materials used for water supply and sewerage works is determined by suitability, durability, ease of maintenance and whole of life cost effectiveness, achieving beneficial environmental impacts/energy savings etc. from new materials and technologies.</li> <li>9. Adequate buffers are maintained between utilities and houses to protect residential amenity and health.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>The design and provision of utility services conforms to Council's;</p> <ul style="list-style-type: none"> <li>• <i>"General Specification for the Construction of Road and Drainage Works"</i>,</li> <li>• <i>"Specification for the Construction of Sewers"</i>, and</li> <li>• <i>"Specification for the Construction of Water Reticulation"</i>.</li> </ul> <p>Lot layout to be designed to ensure that each lot can gravitate into the sewer. This might require a building envelope and a minimum floor level.</p> <p>The requirements of other relevant supply authorities.</p> <ul style="list-style-type: none"> <li>▪ Public lighting to be designed in accordance with: <ul style="list-style-type: none"> <li>○ Australian Standard AS/NZS 1158 "Lighting for Roads and Public Spaces";</li> <li>○ The NSW Public Lighting Code; and</li> <li>○ Any relevant street lighting service agreements between council and the service provider.</li> </ul> </li> <li>▪ The efficiency of public lighting lamps should be no less than 60 lumens/watt (Note that mercury vapour lamps do not meet this criterion).</li> <li>▪ Public lighting lamps should be shielded such that no light is emitted above the horizontal thus minimising wasted light.</li> </ul>

## 5.1.6 Stormwater Management

### Element:- Stormwater Drainage

OBJECTIVE	
<p>To provide major and minor drainage systems which:</p> <ul style="list-style-type: none"> <li>• Adequately protect people and the natural and built environments to an acceptable level of risk and in a cost effective manner, in terms of initial cost and maintenance, and</li> <li>• Contribute positively to environmental enhancement of catchment areas.</li> </ul>	
PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objective may be achieved where:</p> <p><b>Major system</b></p> <ol style="list-style-type: none"> <li>1. The major stormwater drainage system has the capacity to safely convey stormwater flows resulting from the relevant design storm under normal operating conditions, taking partial minor system blockage into account.</li> <li>2. The major system has the capacity to convey safely, but possibly with flooding, stormwater flows resulting from events more extreme than the design storm without significant property damage.</li> <li>3. Ground floor levels of all buildings are located above the design flood level to provide protection to property in accordance with the accepted level of risk.</li> <li>4. Floodways are developed for storms greater than pipe capacity and which ensure that there is a low risk of property damage.</li> <li>5. Community benefit is maximised through the retention of natural streams and vegetation wherever practicable and safe, the incorporation of sports grounds and other less flood sensitive land uses into the drainage corridor and the placement of detention basins where necessary to control stormwater.</li> <li>6. The major system is designed to ensure that there are no flow paths which would increase risk to public safety and property.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p><b>Major system</b></p> <p>The design and construction of the major storm drainage system are in accordance with the requirements of <i>Australian Rainfall and Runoff (1987)</i> and Council's <i>"General Specification for the Construction of Road and Drainage Works"</i>.</p> <p>The major system design is undertaken on a Total Catchment Management basis.</p> <p>The major system design outflow is matched to the capacity of any existing downstream system and where necessary detention basins etc. are provided to retard stormwater flows onto downstream properties.</p>

**Minor System**

7. The minor storm drainage system has the capacity to control stormwater flows under normal operating conditions for the relevant design storm with minimal risk of blockage.

8. Drainage networks are well defined to ensure there are no hidden flow paths which could reduce their capacity to convey design flows.

9. The design of the minor system takes full account of existing downstream systems.

10. The minor system design allows for the safe passage of vehicles at reduced speed on streets which have been affected by runoff from the relevant design storm.

11. The minor system is accessible and easily maintained.

12. Where a portion of the minor system lies within a site, access is available for maintenance.

13. The selection of materials used for the construction of the minor system is based on their suitability, durability, maintainability and cost-effectiveness.

**Site drainage**

14. Subdivision design and layout provides for adequate site drainage.

**Drainage Outlets**

15. All stormwater systems shall be designed to discharge appropriate water volume, velocity and quality to an acceptable legal point of discharge.

**Minor System**

The design and construction of the minor storm drainage system are in accordance with the requirements of *Australian Rainfall and Runoff(1987)* and Council's "*General Specification for the Construction of Road and Drainage Works*".

The minor system design outflow is matched to the capacity of any existing downstream system.

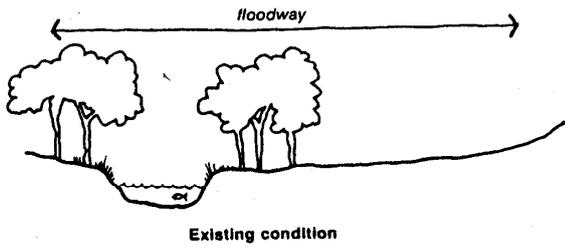
The minor system allows for the safe passage of vehicles at reduced speeds on streets which have been affected by runoff from a 20% AEP storm event.

**Site drainage**

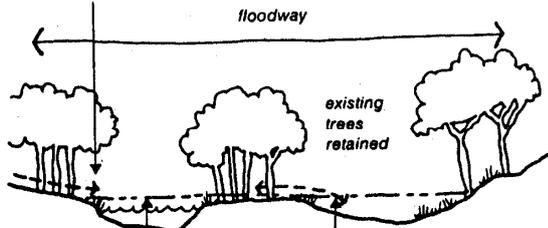
Where site topography prevents the discharge of stormwater directly to the street gutter or a Council controlled piped system, inter-allotment drainage is provided to accept runoff from all existing or future impervious areas that are likely to be directly connected.

The design and construction of the inter allotment drainage system are in accordance with the requirements of *Australian Rainfall and Runoff (1987)* and Council's "*General Specification for the Construction of Road and Drainage Works*".

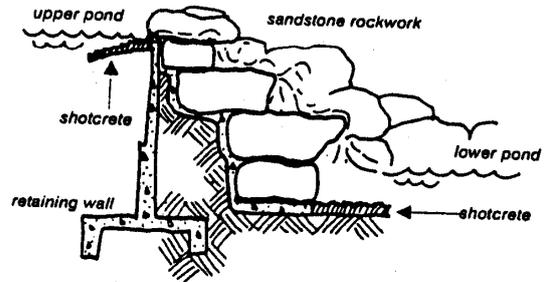
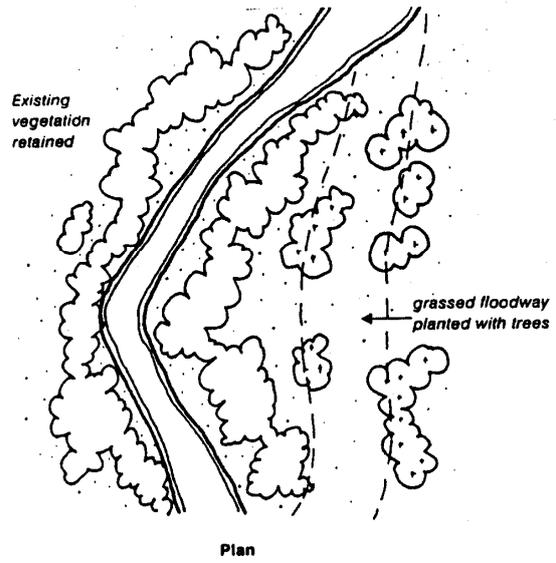
Inter-allotment drainage should preferably not service more than 10 lots.



local flows maintain water supply for trees



Preferred treatment



Source: AMCORD

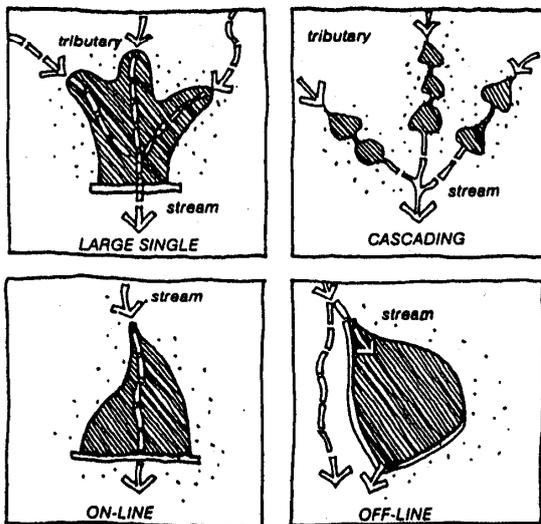
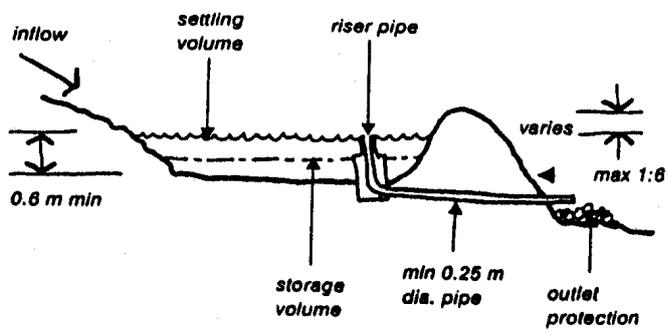
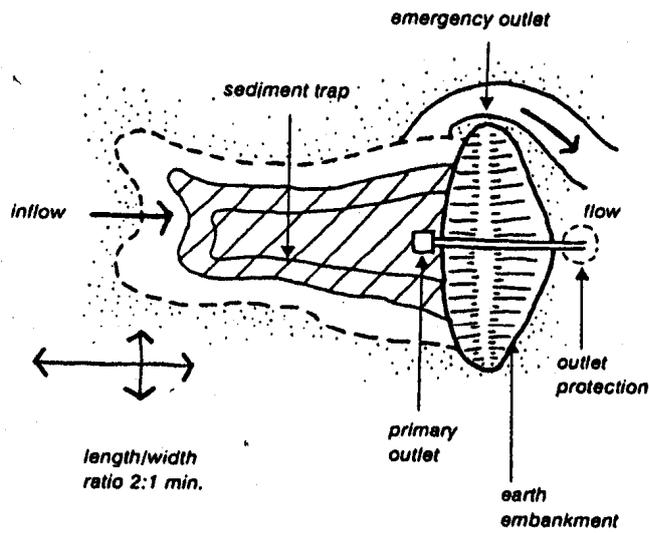


Figure 5-15: Stormwater drainage



Source: AMCORD

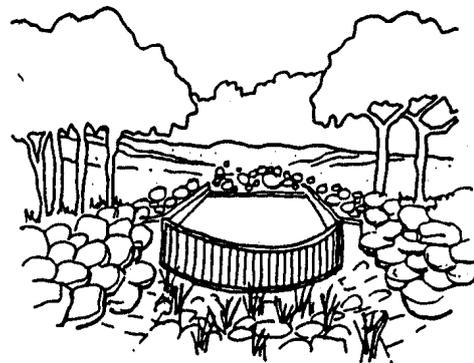
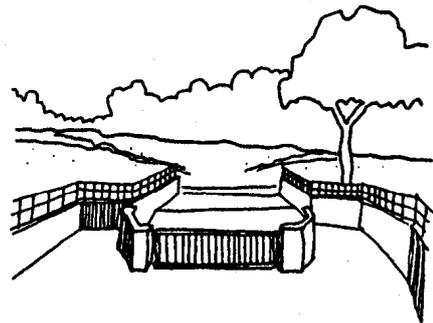


Figure 5-16: Gross pollutant traps

### Element:- Water Quality Management

OBJECTIVE	
<p>To provide water quality management systems which:</p> <ul style="list-style-type: none"> <li>ensure that disturbance to natural stream systems is minimised, and</li> <li>stormwater discharge to surface and underground receiving waters, both during construction and in developed catchments, does not degrade the quality receiving waters.</li> </ul>	
PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"> <li>Adequate provision is made for measures during construction to ensure that the land form is stabilised and erosion is controlled.</li> <li>The system design optimises the interception, retention and removal of water-borne pollutants through the use of appropriate measures prior to discharge to receiving waters.</li> <li>The system design minimises the environmental impact of urban runoff on surface receiving water quality and on other aspects of the natural environment e.g. vegetation by employing techniques which are appropriate and effective in reducing runoff and pollution travel.</li> <li>Point sources of pollution in the catchment should be identified and their impact minimised until their impact can be eliminated.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>An Erosion and Sediment Management Plan is prepared by properly qualified personnel using recognised and locally accepted design methodologies.</p> <p>The Erosion and Sediment Management Plan is to comply with the Department of Land and Water Conservation's <i>Urban Erosion and Sediment Control Manual</i>, and Council's <i>"General Specification for the Construction of Road and Drainage Works"</i> and <i>"Soil Erosion and Sediment Control Guidelines"</i>.</p> <p>Water pollution control ponds or wetlands are developed (where appropriate) for final treatment before discharge to the wider environment and should be sited to minimise impacts on the natural environment.</p>

### 5.1.7 Streetscape and Lot Layout

#### Element:- Streetscape and landscaping

OBJECTIVE	
<p>To provide attractive streetscapes that:</p> <ul style="list-style-type: none"> <li>Reinforce the functions-of a street,</li> <li>Enhance the amenity of buildings and environs, and</li> <li>Are sensitive to the built form, landscape and environmental conditions of the locality.</li> </ul>	
PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"> <li>The street and landscape design achieves: <ul style="list-style-type: none"> <li>the creation of attractive residential environments with clear character and identity;</li> <li>respect for existing attractive streetscapes in established areas;</li> </ul> </li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>A <b>Landscape Plan</b> is submitted that demonstrates how the Performance Criteria are met, showing:</p>

<ul style="list-style-type: none"> <li>• appropriate streetscapes in areas where desired future urban character has been defined;</li> <li>• provision for appropriate street tree planting taking into account the natural landscape, the image and role of the street, solar access requirements, soils, selection of appropriate species, and services;</li> <li>• use of such features as views, vistas, existing vegetation and landmarks.</li> </ul> <p>2. The design of the landscape in public streets:</p> <ul style="list-style-type: none"> <li>• defines a theme for new streets, or complements existing streetscapes and integrates with new developments;</li> <li>• is sensitive to site attributes;</li> <li>• complements the functions of the street;</li> <li>• reinforces desired traffic speed and behaviour;</li> <li>• is of an appropriate scale relative to both the street reserve width existing or expected future building bulk;</li> <li>• promotes safety and casual street surveillance;</li> </ul> <ul style="list-style-type: none"> <li>• improves privacy and minimises unwanted overlooking;</li> <li>• incorporates existing vegetation where possible and desirable;</li> <li>• promotes the planting of native vegetation in environmentally sensitive areas;</li> <li>• appropriately accounts for streetscapes and landscapes of heritage significance</li> <li>• assists in microclimate management;</li> <li>• maximises landscaped areas where appropriate;</li> <li>• integrates and forms linkages with parks, reserves and transport corridors;</li> <li>• enhances opportunities for pedestrian comfort;</li> <li>• achieves lines of sight for pedestrians, cyclists and vehicles;</li> <li>• provides adequate lighting for pedestrian and vehicle safety;</li> <li>• provides attractive and co-ordinated street furniture and facilities to meet user needs;</li> <li>• satisfies maintenance and utility requirements and minimises their visual impact of above ground utilities;</li> <li>• buffers residential areas from non-residential uses e.g. industry, busy roads.</li> </ul>	<ul style="list-style-type: none"> <li>• the street reserve and intended locations of the carriageway, parking bays, footpaths, cycleway systems, speed control devices and, where practicable, driveways, bus stops, street lighting and substations;</li> <li>• location of existing vegetation to be removed or conserved;</li> <li>• location, species and general character of tree planting and hard and soft landscape treatment;</li> <li>• the intended location of buildings.</li> </ul> <p>Landscape is in accordance with Council's "<i>Landscape Guidelines</i>",</p> <p>OR</p> <p>any approved landscape strategy for the area.</p> <p>Compliance with this requirement is achieved by submission of a plan meeting the performance criteria and showing:</p> <ul style="list-style-type: none"> <li>• boundaries and areas of communal open space including sites for specific recreational uses;</li> <li>• existing vegetation and proposed general character of landscape treatment;</li> <li>• general arrangement of hard landscaping elements and major earth cuts, fills and mounding;</li> <li>• indicative treatment of floodways and drainage lines, along with general information on fencing, access points, furniture, pavement style, and treatment of the verge including any associated parking or drainage requirements;</li> <li>• landscape plantings in buffers is to be dense to minimise future maintenance.</li> </ul>
---	--

**Element:- Lot Layout**

<b>OBJECTIVE</b>
<p>To provide a range and mix of lot sizes to suit a variety of dwellings and household types, with areas and dimensions to meet user requirements.</p> <p>To provide lots that are oriented where practicable to enable the application of energy conservation principles.</p>

<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <p><b>Size</b></p> <p><b>1.</b> Lots have the appropriate area and dimensions for the siting and construction of a dwelling and ancillary outbuildings, the provision of private outdoor space, convenient vehicle access and parking.</p> <p><b>2.</b> Lot size and dimensions take into account the slope of the land and the desirability of minimising earthworks/retaining walls associated with dwelling construction.</p> <p><b>3.</b> Lot sizes and dimensions enable dwellings to be sited to:</p> <ul style="list-style-type: none"> <li>• protect natural or cultural features;</li> <li>• acknowledge site constraints; including soil erosion and bushfire risk;</li> <li>• retain special features such as trees and views.</li> </ul> <p><b>4.</b> Lot sizes meet the projected requirements of people with different housing needs, and provide housing diversity and choice.</p>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p><b>Size</b></p> <p>Lots are capable of containing a building envelope of 25 x 15 metres. The building envelope is to be shown on development plans.</p> <p>Lots with an area of less than 400m<sup>2</sup> will be assessed as integrated housing development.</p> <p>Lots with an area less than 300m<sup>2</sup> are square or rectangular in shape.</p> <p>Lots with an area less than 350m<sup>2</sup> are located on land with a slope of less than 10%.</p> <p>Smaller lots to be located on flatter areas and on hilltops.</p> <p>Lots on slopes should be larger to reduce the need for building earthworks, compensate for loss of useful open space, potential difficulties with house construction and provision of access. Generally at least 1,000 m<sup>2</sup> where slopes are over 15 %.</p> <p>Residential lots on slopes over 20% are not favoured.</p> <p>For lots on land greater than 25% slope provide house plans with the subdivision application, demonstrating that house construction is possible, as is the provision of usable open space, bushfire asset protection zone, driveway access and stormwater management.</p> <p style="text-align: center;">OR</p> <p>The developer is to construct houses on the lots and the occupation certificates for the houses are to be issued prior to issue of the subdivision certificate.</p>

<p><b>User requirements</b></p> <p>5. Lot frontages are orientated to streets and open spaces so that personal and property security, deterrence of crime and vandalism, and surveillance of footpaths and open spaces are facilitated.</p> <p>6. Lot design precludes the need to reverse onto a major or minor distributor road</p> <p><b>Orientation and energy</b></p> <p>7. Lots are orientated to facilitate the siting of dwellings to take advantage of microclimatic benefits, and have dimensions to allow adequate on-site solar access, taking into account likely dwelling size and the relationship of each lot to the street.</p>	<p><b>User requirements</b> A Positive Covenant (or other legally binding agreement acceptable to Council) is to be created on the title of new lots having direct vehicular access to a Sub-arterial Street requiring driveways to be designed to allow entry and exit in a forward direction.</p> <p><b>Orientation and energy</b></p> <p>Lot design allows for houses to be built with north facing windows which receive maximum winter sun.</p> <p>Lot design ensures that each lot:</p> <ul style="list-style-type: none"> <li>• will not be overshadowed by neighbouring houses to the north.</li> <li>• can have a sufficiently long north facade to receive winter sun.</li> </ul> <p>Streets are aligned in a north-south or east west direction, where practical.</p>
--	--

### Minimum Standards and techniques

1. Access to steep lots should have a preferred maximum gradient of 20% and an absolute maximum gradient of 29%, with a maximum change in grade of less than 12.5%.
2. Cut and fill is to be limited to 1.2 metres below or above natural ground level.
3. Direct vehicular access onto arterial roads will be generally denied.

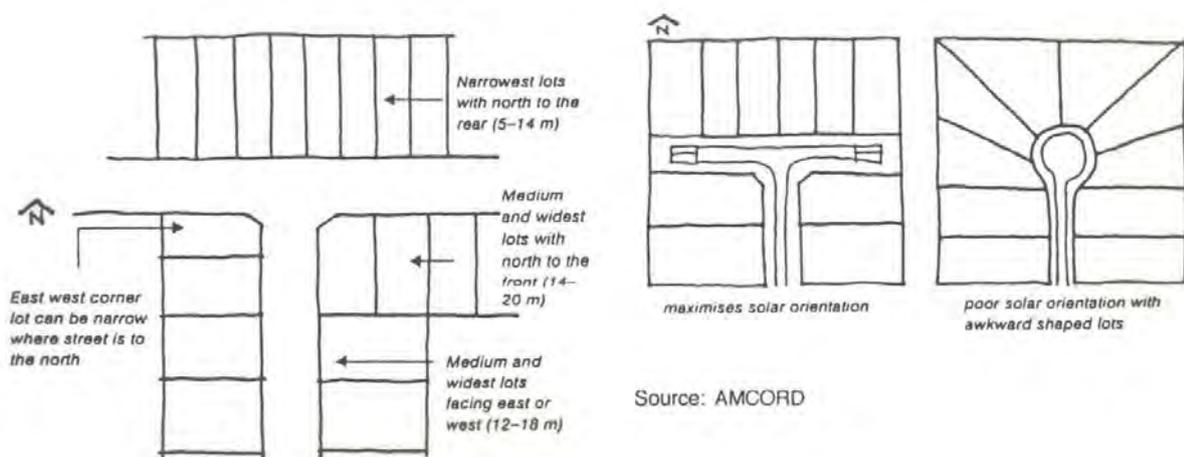


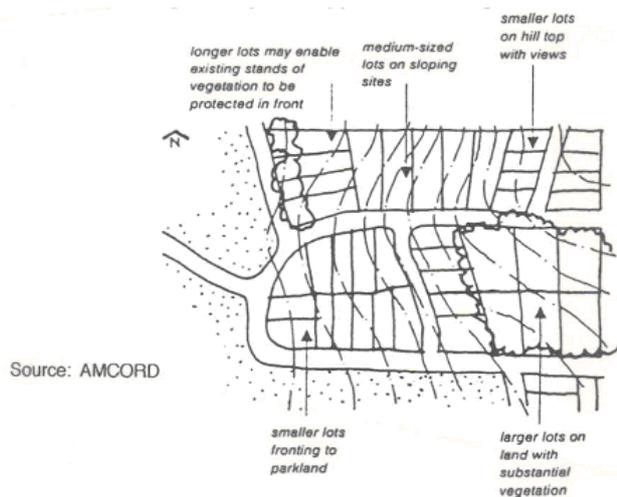
Figure 5-17: Lot orientation and solar access

**5.1.8 Environmental Protection**

OBJECTIVE	
To ensure that the development of residential land recognises and protects areas and items of environmental significance.	
PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objective may be achieved where:</p> <p><b>Natural environment</b>            1. The design identifies and maintains the value of rare, endangered or uncommon flora, fauna and ecosystems.</p> <p><b>Natural landscape</b>            2. The design maintains and improves significant visual landscape elements such as ridgelines, water systems and prominent natural features.</p> <p><b>Cultural heritage</b>            3. The design conserves and enhances buildings, archaeological and other sites of recognised heritage significance.</p>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>Land suitable for urban bushland is dedicated to Council.</p>

**Minimum standards and techniques**

1. The design complies with the requirements of State Government and Lismore City Council for the protection of native vegetation.
2. The design complies with the requirements of State Government and Lismore City Council for the protection of environmental and cultural heritage



### 5.1.9 Buffers to Avoid Landuse Conflict

OBJECTIVE	
To minimise land use conflicts between residential land and other potentially incompatible land uses through the establishment of appropriate buffers.	
PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"> <li>1. Buffer areas are provided between residential and other land uses in order to avoid the potential for land use conflict and the creation of public health risks.</li> <li>2. Landscape plans are to include the proposed treatment of buffer areas.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>Subdivision of residential land is to be in accordance with Chapter 11 - Buffer Areas.</p> <p>A minimum 50 m. industrial buffer area is to be created between industrial and residential land uses.</p> <p>Buffer areas are to be landscaped in accordance with an approved landscape plan and prior to release of land titles plans.</p>

### 5.1.10 Subdivision of Buildings

OBJECTIVES	
To allow separate titles to be created for parts of a development.	
To provide for the effective and efficient management of common or shared facilities.	
PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"> <li>1. The range and extent of body corporate activities are limited to those legally permitted.</li> <li>2. The street and lot layout clearly defines the public, communal and private areas of a development, including the function, ownership and management of open spaces and communal areas.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>Such measures may include:</p> <ul style="list-style-type: none"> <li>• creating separate sites for each dwelling with their own public street frontage;</li> <li>• limiting communal land to driveways only;</li> <li>• designing dwellings to minimise the need for corporate building management; and</li> <li>• ensuring that cost effective management is practicable where communal open space or shared facilities are provided.</li> </ul>

## **Minimum Standards and Techniques**

1. The building/s were erected in accordance with a Development Consent issued after 27/2/92 by Lismore City Council under the Lismore Local Environmental Plan, 1992, otherwise development approval is required.
2. The building/s have been completed in accordance with relevant legislation.
3. Separate utility service meters / junctions are provided to each dwelling and if necessary any common area.
4. All private open space areas are to be allocated to a dwelling unit.

## 5.2 Commercial Subdivision

### 5.2.1 Minimum Allotment Sizes

This section applies to land in the commercial zones described below. The Plan does not specify minimum lot sizes for subdivision of land in the commercial zones.

- Zones: 3(a) - Business Zone;  
 3(b) - Neighbourhood Business Zone; and  
 3(f) - Services Business (Flood Liable) Zone.

A minimum frontage of 5 m. and depth of 20 m. is preferred (except for strata subdivision).

This reflects the manner in which the majority of lands in commercial zones are currently developed. Commercial subdivisions will most likely be of a minor nature such as boundary adjustments and strata subdivision of existing buildings or consolidation of existing lots.

### 5.2.2 Design Elements

The subdivision layout and street design and capacity criteria for commercial areas are mutually interdependent. This plan encourages a design concept for commercial areas reflecting the constraints of particular sites, providing for the land use mix and integration with surrounding commercial areas.

#### Element:- Area Design

OBJECTIVE	
To provide secure, convenient and efficient commercial subdivisions that meet the needs of commerce and shoppers and residents.	
PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objective may be achieved when the phases in the Design Process (refer to section 6) are followed and where:</p> <ol style="list-style-type: none"> <li>1. The subdivision responds to site characteristics.</li> <li>2. The street network provides a high level of internal accessibility and good external connections for vehicles, pedestrians and cyclists.</li> <li>3. The street and lot layout minimises infrastructure costs and enables efficient provision of physical services.</li> <li>4. The street and lot orientation and lot dimensions facilitate the siting and design of energy efficient buildings.</li> </ol>	<p>There are no recommended suggested solutions for this element, as each situation requires an individual approach.</p>

<p><b>5.</b> The lot design and layout provides a variety of lot sizes to enable commercial and other complementary uses permitted in the zones.</p> <p><b>6.</b> The layout retains significant vegetation and habitat areas, incorporates natural features and minimises soil erosion.</p> <p><b>7.</b> The layout is integrated with the surrounding urban environment, providing landscaped buffers and street landscaping.</p> <p><b>8.</b> The layout provides for personal and property safety and minimises the potential for crime through surveillance by pedestrians and drivers of passing vehicles.</p> <p><b>9.</b> A pedestrian and cycleway network is provided that is safe, attractive and efficient running in public space.</p> <p><b>10.</b> The layout and ground level height of lots provides an acceptable level of protection from flooding.</p>	
--	--

**Element: Major Movement Networks**

The capacity of existing and design of new movement (street) networks in commercial subdivisions should provide for the likely amount and type of traffic generated by future uses.

The network should provide for factors such as:

- type of commercial activities e.g. retail shops, bulk stores, restaurants, cafes, offices etc.;
- size of individual activities;
- amount of commercial related light industrial and complementary activities and
- proximity to public transport

that effect traffic generation.

<b>OBJECTIVE</b>
To provide for the economical and efficient construction and maintenance of movement and access systems, with acceptable levels of amenity, safety and convenience, for all street users.

PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objective may be achieved where:</p> <p><b>1.</b> The street network meets the local needs of all street users and for the likely traffic in a co-ordinated manner.</p>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>The proposal conforms to the Lismore Traffic Study and models developed by Rust PPK, or a Development Control Plan approved by Council which provides for all street users.</p>

<p>2. The existing and proposed arterial road network has the capacity to accommodate the projected traffic movements.</p> <p>3. The proposed street network efficiently connects with external traffic routes.</p>	<p><b>OR</b></p> <p>A Traffic Study with the proposal provides for an integrated approach to movement systems in a manner specified in this Plan</p> <p>Provision is to be made for arterial road corridors as specified in Chapter 1 of Part B of this plan.</p> <p>The development conforms to any adopted Development Control Plan for the area and/or Traffic Study with the proposal showing a road network meeting required service levels.</p> <p>The street network provides for bus routes and pedestrians and cyclists in accordance with the requirements of this plan.</p> <p>Road connections within and between the proposed development and the existing road network shall meet the requirements of Councils <i>"General Specification for the Construction of Road and Drainage Works"</i>.</p>
---	--

### Minimum Standards and Techniques

1. Road classification for commercial streets should reflect the Lismore Traffic Study and models by PPK and Tables 5-8, 5-10 and 5-11.

Table 5-8: Classification of Commercial Streets

Street level/type and function	Design speed (km/hr.)
Service Lane	10
Local Street	40
Collector Street	60
Sub-arterial Road	60

**Element:- Local Street Networks**

<b>OBJECTIVE</b>	
To ensure existing and new street networks provide for commercial and ancillary usage whilst providing acceptable levels of access, safety and convenience.	
<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <p><b>Function and structure</b></p> <ol style="list-style-type: none"> <li>1. The proposed street network has a clear structure not exceeding the function of the existing network.</li> <li>2. The network has clear physical distinctions between streets based on function, legibility, convenience, anticipated traffic volume, vehicle speed, safety and amenity.</li> </ol> <p><b>Safety, access and convenience</b></p> <ol style="list-style-type: none"> <li>3. Intersections along commercial streets are spaced to create safe and convenient vehicle movements.</li> </ol> <p><b>Mode choice</b></p> <ol style="list-style-type: none"> <li>4. There is provision for bus routes.</li> </ol> <p><b>Design and Character</b></p> <ol style="list-style-type: none"> <li>5. The street network takes account of the topography, vegetation and watercourses.</li> <li>6. The proposed street network takes account of the existing street network and streetscape.</li> <li>7. The street network is orientated, where practical, to promote building energy efficiency.</li> </ol> <p><b>Environmental Protection</b></p> <ol style="list-style-type: none"> <li>8. Future traffic will be within the acceptable capacity of the existing and proposed streets.</li> </ol> <p><b>Cost effectiveness</b></p> <ol style="list-style-type: none"> <li>9. Streets and carriageway widths and street lengths to optimise the cost effectiveness of the street network without comprising street function.</li> <li>10. The network provides for the cost effective provision of public utilities.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p><b>Function and structure</b></p> <p>Proposed streets link with other streets that have capacity to accommodate increased traffic.</p> <p>The street network reflects the characteristics specified in <i>Tables 5-8 and 5-10</i>.</p> <p><b>Safety, access and convenience</b></p> <p>The location of intersections are to meet Councils "<i>General Specification for the Construction of Road and Drainage Works</i>" and AUSTRROADS Guidelines.</p> <p>Streets should intersect only with streets of the same or next classification (Refer to <i>Table 5-8</i>).</p> <p><b>Mode choice</b></p> <p>Public transport routes and stops are provided as set out in Element – Public Transport.</p> <p><b>Design and Character</b></p> <p>The street network permits establishment of streetscapes that incorporate the provisions of Element Streetscape and Landscape.</p> <p><b>Cost effectiveness</b></p> <p>The network caters for the provision of public utility networks including water, gas, sewerage, electricity and telecommunications.</p>

**Element:- Pedestrian and Cyclist Facilities**

<b>OBJECTIVE</b>
To encourage walking and cycling between residential, commercial and industrial areas.

<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <p><b>Planning</b></p> <p>1. The commercial street and path network provides a network of safe pedestrian and cyclist routes with connections to adjoining pedestrian and cyclist routes.</p> <p><b>Location and Design</b></p> <p>2. The location of footpaths and cycleways in the street is determined by:</p> <ul style="list-style-type: none"> <li>• low vehicle speed;</li> <li>• cyclist and pedestrian safety and comfort;</li> <li>• on-street parking;</li> <li>• location of infrastructure services;</li> <li>• landscaping;</li> <li>• safety;</li> <li>• cost efficiency.</li> </ul> <p>3. The design of footpaths and cycleways is to:</p> <ul style="list-style-type: none"> <li>• permit casual surveillance;</li> <li>• be aligned to permit safe and convenient use;</li> <li>• permit shared use.</li> </ul> <p><b>Safe Crossings</b></p> <p>4. Safe street crossings are to be provided for all street users with safe sight distances, pavement markings, warning signs and safety rails (where appropriate).</p> <p><b>Construction</b></p> <p>5. Pedestrian and cyclist paths are constructed to provide a stable surface for projected users which is easily maintained</p>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p><b>Planning</b></p> <p>Cycleway facilities are to provided in accordance with the Lismore Cycleway Plan</p> <p><b>OR</b></p> <p>an approved Traffic Study which provides for an integrated approach to movement systems in a manner specified in this Plan.</p> <p><b>Location and Design</b></p> <p>Footpaths and cycleways are to be provided in collector streets and in accordance with the Lismore Cycleway Plan.</p> <p><b>Safe Crossings</b></p> <p>Street crossings are to be provided in accordance with the Lismore Cycleway Plan.</p> <p>Crossings are to be designed to reflect anticipated street traffic volumes.</p> <p><b>Construction</b></p> <p>Footpaths are to be constructed in accordance with Councils "<i>General Specification for the Construction of Road and Drainage Works</i>".</p> <p>Cycleways are to be constructed of an asphalt sealed or equivalent standard pavement.</p>

**Minimum standards or techniques**

Refer to Figure 5-4: Provision for Cyclists and Pedestrians

**Element:- Public Transport**

<b>OBJECTIVE</b>
To increase the opportunity for choice in mode of transport to places of employment and shopping and provide convenient and accessible cost effective and energy efficient public transport services.

<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <p><b>Planning</b></p> <p>1. The commercial trunk/collector street is to provide for public transport.</p> <p><b>Route location and design</b></p> <p>2. Convenient connections to adjoining areas and other public transport routes provide for ease of movement of buses.</p> <p>3. Buses are to be able to safely gain access to the area without complicated manoeuvres.</p> <p>4. Street alignment and geometry of commercial access streets are to allow for the unimpeded movement of buses, without retracing the route.</p> <p><b>Bus stop location and design</b></p> <p>5. Public transport stop to provide for pedestrian safety, security, comfort and convenience.</p> <p>6. Bus stops are designed to prevent vehicles overtaking a stationary bus, or vehicle site distances adequate to ensure safe pedestrian crossings.</p> <p>7. Bus stops are located and designed to provide shelter, seats and adequate lighting (where required) and timetable information.</p>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p><b>Planning</b></p> <p>Where a Development Control Plan or other planning instrument exists, routes that conform with that plan</p> <p><b>Route location and design</b></p> <p>Routes for bus services are to be designed in accordance with <i>Table 7-2</i>.</p> <p><b>Bus stop location and design</b></p> <p>The location of bus stops is to relate to the pedestrian network.</p>

**Minimum Standards and Techniques**

Table 5-9: Minimum requirements for Bus Routes

<b>STREET CARRIAGEWAY WIDTHS</b>	
One-way: 6.5 metres	
Two-way: 9.0 metres or 7.5 metres where bus bays are provided with a traffic calming and management.	
<b>TURNING CIRCLES</b>	
Maximum desirable pavement crossfall:	3%
Maximum desirable longitudinal gradient:	6%
Absolute maximum gradient:	6%
Radius 15 metres for single bus	
<b>ROUNDBABOUTS</b>	
Absolute maximum gradient:	12%

### 5.2.3 Physical Infrastructure

#### Element:- Road reserve and carriageways

OBJECTIVES	
<p>To provide an appropriate street reserve width to accommodate the required carriageway, and to provide for the primarily pedestrian function of the verges.</p> <p>Carriageway width to be sufficient to enable the street to perform its required traffic and parking functions efficiently, safely and conveniently.</p> <p>Carriageway construction standards to minimise both capital cost and future maintenance costs.</p>	
PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objectives may be achieved where:</p> <ol style="list-style-type: none"> <li>1. Minimum street reserve width at any point to be not less than the sum of the minimum widths required for the carriageway and verges.</li> <li>2. Carriageway width providing two lanes for moving traffic (one each way), and a parking lane each side wherever there is frontage to commercial lots.</li> <li>3. Lane widths to be appropriate for the movement and parking of service vehicles, and for access to lots with minimum interference to moving traffic.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objectives and performance criteria:</p> <p>Road reserve and carriageways are provided in accordance with <i>Table 7-4</i>.</p>

#### Minimum Standards and Techniques

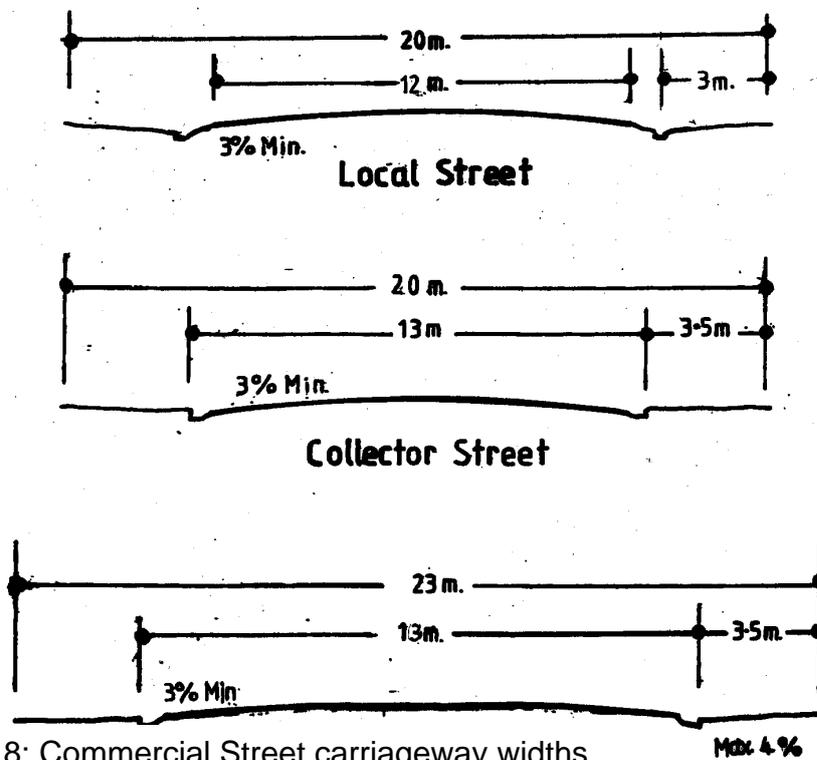


Figure 5-18: Commercial Street carriageway widths

Table 5-10: Characteristics of Commercial Streets (refer Table 7-1).

Characteristic	Service Lane	Local Street	Collector Street	Sub-arterial
<u>Road Reserve Width</u> metres	18	20	20 Design for intersections & roundabouts etc.	23 Design for intersections & roundabouts etc.
<u>Carriageway Width</u> (pavement cement stabilised)	Travel 2 x 3.5 Parking 1 x 2.5  Total 9.5 metres	Travel 2 x 3.5 Parking 2 x 2.5  Total 12 metres	Travel 2 x 3.5 Parking 2 x 3  Total 13 metres	Travel 2 x 3.5 Parking 2 x 3  Total 13 metres
<u>No. travel lanes</u>	2	2+	2+	2+
<u>Parking in reserve</u>	Carriageway	Carriageway	Carriageway	Prefer none
<u>Kerb type</u>	Upright	Upright	Upright	Upright
<u>Footpath</u>	1 x 3	2 x 3	2 x 3.5	2 x 3.5
<u>Cycleway</u>	Road	Road	Provided	Provided

**Element:- Verges**

OBJECTIVE
To provide an area between the street carriageway and commercial lots sufficient to maintain the functions of safety, amenity and convenience.

PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"> <li>Verge widths are to provide adequately for: <ul style="list-style-type: none"> <li>safety and visibility;</li> <li>street amenity e.g. street landscaping, seating, public art and other civic facilities;</li> <li>new building projects and associated spaces e.g. terraces, plazas, parks etc.;</li> <li>utility services;</li> <li>pathways.</li> </ul> </li> <li>Verge crossfalls are to be suitable for: <ul style="list-style-type: none"> <li>lot access;</li> <li>pedestrian movement;</li> <li>drainage.</li> </ul> </li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>Road reserve and carriageways are provided in accordance with <i>Table 5-10</i>.</p> <p>Additional width may be required where a dual use path (pedestrian and cycleways) are proposed.</p> <p>Maximum crossfalls in verge 4%.</p>

### **Element:- Parking**

<b>OBJECTIVES</b>
To provide sufficient and convenient parking for shoppers, employees, visitors and commercial vehicles.  To ensure that parked vehicles do not obstruct the passage of vehicles on the carriageway, or create traffic hazards.

<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
The objectives may be achieved where:  <b>1.</b> Provision of a parking lane on the carriageway of all commercial streets, where there is adjacent frontage of commercial lots.	The following suggested solutions are <b>ONE WAY</b> of meeting the objectives and performance criteria:  Parking is to be provided in accordance with Table 5-10.

### **Element:- Street Construction**

<b>OBJECTIVE</b>
To construct streets that support the design and intended use without unnecessary construction and whole of life cycle costs.

<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
The objective may be achieved where:  <b>1.</b> The pavement edging and landscaping support the function of the street.  <b>2.</b> The pavement edge: <ul style="list-style-type: none"><li>• controls vehicle movements by delineating the carriageway;</li><li>• assists in the control of stormwater.</li></ul> <b>3.</b> Street pavement surfaces are; <ul style="list-style-type: none"><li>• well designed and durable enough to carry wheel loads of travelling and parked vehicles;</li><li>• ensure the safe passage of vehicles, pedestrians and cyclists;</li><li>• discharge of rainfall;</li><li>• all-weather access;</li><li>• reasonable travel comfort.</li></ul> <b>4.</b> Public street construction and whole of life cycle costs are kept low.	The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:  Pavement and landscape materials are used to distinguish different street functions.  Pavement edging in accordance with <i>Table 5-10</i> .  Flexible pavement and kerb construction is to be based on the requirements outlined in Councils " <i>General Specification for the Construction of Road and Drainage Works</i> ".

**Element:- Utility Services**

<b>OBJECTIVE</b>	
<p>To ensure that commercial areas are adequately serviced with sewerage, water, gas, fire fighting, electricity, street lighting and communication services in a timely, cost effective, co-ordinated and efficient manner.</p>	
<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"> <li>1. Design and provision of utility services are cost effective over their life cycle and incorporate provisions to minimise adverse environmental impact.</li> <li>2. Compatible public utility services are located in common trenching in order to minimise the land required and the costs for underground services.</li> <li>3. Public lighting shall be designed to maximise energy efficiency.</li> <li>4. Development occurs within locations where there is an adequate water supply for fire fighting.</li> <li>5. Development is staged to ensure that each stage is fully serviced before a new area is released.</li> <li>6. Water supply and sewerage networks are accessible, easy to maintain, and cost effective based on life cycle costs.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>The design and provision of utility services conforms to:</p> <p>Councils:</p> <ul style="list-style-type: none"> <li>• <i>"General Specification for the Construction of Road and Drainage Works"</i>,</li> <li>• <i>"Specification for the Construction of Sewers"</i>, and</li> <li>• <i>"Specification for the Construction of Water Reticulation"</i>.</li> </ul> <p>and</p> <p>the requirements of other relevant supply authorities.</p> <p>Lot layout to be designed to ensure that effluent from each lot can gravitate into the sewer. This might require a building envelope and minimum floor level.</p>

## 5.2.4 Stormwater Management

### Element:- Stormwater Drainage

<b>OBJECTIVE</b>	
<p>To provide major and minor drainage systems which:</p> <ul style="list-style-type: none"> <li>adequately protects people and the natural and built environments to an acceptable level of risk and in a cost effective manner in terms of initial cost and on-going maintenance, and</li> <li>contributes positively to environmental enhancement of catchment areas.</li> </ul>	
<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <p><b>MAJOR SYSTEM</b></p> <ol style="list-style-type: none"> <li>The major stormwater system has the capacity to safely convey stormwater flows resulting from the relevant design storm events under normal operating conditions.</li> <li>The major system has the capacity to convey safely, but possibly with flooding, stormwater flows resulting from events more extreme than the design storm without significant property damage.</li> <li>Community benefit is maximised through the retention of natural streams and vegetation, wherever practical.</li> <li>The major system is designed to ensure that there are no flow paths which would increase risk to public safety and property.</li> </ol> <p><b>MINOR SYSTEM</b></p> <ol style="list-style-type: none"> <li>The minor storm drainage system has the capacity to control stormwater flows under normal operating conditions for the relevant design storm with minimal risk of blockage.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p><b>MAJOR SYSTEM</b></p> <p>The design and construction of major stormwater drainage systems are in accordance with the requirements of:</p> <ul style="list-style-type: none"> <li><i>Australian Rainfall and Runoff (1987), and</i></li> <li>Councils, "<i>General Specification for the Construction of Road and Drainage Works</i>".</li> </ul> <p>The major system design is undertaken on a Total Catchment Management basis.</p> <p>The major system design outflow is matched to the capacity of any existing downstream system and where necessary detention basins etc. are provided to retard stormwater flows onto downstream properties.</p> <p><b>MINOR SYSTEM</b></p> <p>The design and construction of minor stormwater drainage systems are in accordance with the requirements of:</p> <ul style="list-style-type: none"> <li><i>Australian Rainfall and Runoff (1987), and</i></li> <li>Councils, "<i>General Specification for the Construction of Road and Drainage Works</i>".</li> </ul>

6. Drainage networks are well defined to ensure there are no hidden flow paths which could reduce their capacity to convey design flows.

7. The design of the minor system takes full account of existing downstream systems.

8. The minor system design allows for the safe passage of vehicles at reduced speed on streets which have been affected by runoff from the relevant design storm.

9. The minor system is accessible and easily maintained.

10. Where a portion of the minor system is within a site, access is available for maintenance.

11. The selection of materials used for the construction of the minor system is based on their suitability, durability, maintainability and cost-effectiveness.

**SITE DRAINAGE**

12. Subdivision design and layout provides for adequate site drainage.

**DRAINAGE OUTLETS**

13. All stormwater systems shall be designed to discharge appropriate water volume, velocity and quality to an acceptable legal point of discharge.

The minor system design outflow is matched to the capacity of any existing downstream system.

The minor system allows for the safe passage of vehicles at reduced speeds on streets which have been affected by runoff from a 1 in 20 year storm event.

**SITE DRAINAGE**

Where site topography prevents the discharge of stormwater directly to the street gutter or a Council controlled piped system, inter-allotment drainage is provided to accept runoff from all existing or future impervious areas that are likely to be directly connected.

The design and construction of inter-allotment stormwater drainage systems are in accordance with the requirements of:

- *Australian Rainfall and Runoff (1987), and*
- *Councils, "General Specification for the Construction of Road and Drainage Works".*

**Element:- Water Quality Management**

<b>OBJECTIVE</b>	
<p>To provide water quality management systems which:</p> <ul style="list-style-type: none"> <li>• ensure that disturbance to natural stream systems is minimised, and</li> <li>• stormwater discharge to surface and underground receiving waters, both during construction and in developed catchments, does not degrade the quality of water in the receiving waters.</li> </ul>	
<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"> <li>1. Adequate provision is made for measures during construction to ensure that the land form is stabilised and erosion is controlled.</li> <li>2. The system design optimises the interception, retention and removal of water-borne pollutants through the use of appropriate measures prior to discharge to receiving waters.</li> <li>3. The system design minimises the environmental impact of urban runoff on surface receiving water quality and on other aspects of the natural environment e.g. vegetation, by employing techniques which are appropriate and effective in reducing runoff and pollution travel.</li> <li>4. Point sources of pollution in the catchment should be identified and their impact minimised until their impact can be eliminated.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>An Erosion and Sediment Management Plan is prepared by properly qualified personnel using recognised and locally accepted design methodologies.</p> <p>The Erosion and Sediment Management Plan is to comply with the Department of Land and Water Conservation's <i>Urban Erosion and Sediment Control Manual</i>, Council's <i>"General Specification for the Construction of Road and Drainage Works"</i>. and <i>Soil erosion and sediment control guidelines</i>.</p> <p>Water pollution control ponds or wetlands are developed (where appropriate) for final treatment before discharge to the wider environment and should be sited to minimise impacts on the natural environment.</p>

## 5.2.5 Streetscape and Lot Layout

### Element:- Streetscape and Landscape

OBJECTIVE	
<p>To provide an attractive commercial streetscape that:</p> <ul style="list-style-type: none"> <li>reinforces the functions of street network,</li> <li>enhances the amenity of the area generally and future buildings and</li> <li>are sensitive to the landscape and environmental conditions of the locality.</li> </ul>	
PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"> <li>The street and landscape design achieves: <ul style="list-style-type: none"> <li>the creation of commercial environments with character and identity;</li> <li>compliments attractive streetscapes in established areas;</li> <li>provision for street tree planting, taking into account the natural landscape, the image and role of the street, soils, selection of appropriate species and services;</li> <li>use of existing features such as vegetation, landmarks etc.</li> </ul> </li> <li>The design of the landscape in public streets: <ul style="list-style-type: none"> <li>defines a theme for new streets or complements existing streetscapes;</li> <li>is sensitive to site attributes;</li> <li>complements the function of the street;</li> <li>reinforces desired traffic speed and behaviour;</li> <li>is of an appropriate scale to street width and the likely bulk of buildings;</li> <li>promotes safety and casual street surveillance;</li> <li>incorporate existing vegetation,</li> <li>promotes the planting of native vegetation in environmentally sensitive areas;</li> <li>maximises landscaped areas, where appropriate;</li> <li>enhances pedestrian comfort;</li> <li>achieves effective line of sight for pedestrians, cyclists and motorists, provides adequate lighting;</li> <li>satisfies maintenance and utility requirements and minimises their visual impact of above ground utilities.</li> </ul> </li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>The plan conforms to a Development Control Plan or commercial centre strategy approved by Council which provides for landscaping and public facilities.</p> <p><b>OR</b></p> <p>A Landscape Plan is submitted that demonstrates how the Performance Criteria are met showing:</p> <ul style="list-style-type: none"> <li>the street reserves and indicative locations of the carriageway, parking lanes/bays, cycleways and footpaths, traffic management devices;</li> <li>location of existing vegetation to be removed and/or conserved;</li> <li>location, species and general character of tree planting and hard and soft landscape treatment;</li> <li>indicative location of buildings.</li> </ul> <p>Landscape is in accordance with Council's "<i>Landscape Guidelines</i>" and any approved landscaping strategy.</p> <p>Compliance with the performance criteria is achieved by a Landscape Plan showing:</p> <ul style="list-style-type: none"> <li>boundaries and areas of open and landscaped space;</li> <li>existing vegetation and proposed character of landscape treatment;</li> <li>general arrangement of hard landscaping elements and major earth works;</li> <li>indicative treatment of floodways and drainage lines;</li> <li>landscape plantings in buffers is to be dense to minimise future maintenance.</li> </ul>

**Element:- Lot Layout**

<b>OBJECTIVES</b>
<p>To provide a range and mix of lot sizes to suit a variety of commercial uses with areas and dimensions to meet user requirements.</p> <p>To provide lots that are orientated, to minimise energy consumption.</p>

<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objectives may be achieved where:</p> <p><b>SIZE</b></p> <p>1. Lots have the appropriate area and dimensions for the siting and construction of a commercial building, the provision of storage space, vehicle access, manoeuvring and parking and landscaping.</p> <p><b>USER REQUIREMENTS</b></p> <p>2. Lot frontages are orientated to streets and open spaces so that personal and property security, deterrence of crime and vandalism, and surveillance of footpaths and open spaces are facilitated.</p> <p>3. Lot design is to preclude the need to reverse onto the public street and collector and arterial roads in particular.</p> <p><b>ORIENTATION AND ENERGY</b></p> <p>4. Lots are orientated, where possible, to facilitate the siting of buildings to take advantage of micro-climate and on-site solar access.</p>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objectives and performance criteria:</p> <p><b>SIZE</b></p> <p>A variety of lot sizes should be provided to meet market demand.</p> <p>Lots should be regular and rectangular in shape.</p> <p>Lot shape and area should be sufficient to permit easy access to the rear of the lot.</p>

**Element:- Subdivision of Buildings**

<b>OBJECTIVES</b>
<p>To allow separate titles to be created for parts of a development.</p> <p>To provide for the effective and efficient management of common or shared facilities.</p>

<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objectives may be achieved where:</p>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objectives and performance criteria:</p>

<p>1. The range and extent of body corporate activities are limited to those legally permitted.</p> <p>2. The street and lot layout clearly defines the public, communal and private areas of a development, including the function, ownership and management of landscape and access areas.</p>	<p>Such measures may include:</p> <ul style="list-style-type: none"> <li>• creating separate sites for each commercial space;</li> <li>• incorporating car parking facilities in the same strata lot as the shop or office to which they relate or are identified as communal property;</li> <li>• designing buildings to minimise the need for corporate building management;</li> <li>• ensuring that cost effective management is practicable where communal landscape or shared facilities are provided.</li> </ul>
--	---

### Minimum Standards and Techniques

1. The building/s were erected in accordance with a Development Consent issued after 27/2/92 by Lismore City Council under the Lismore Local Environmental Plan, 1992, otherwise development approval is required.
2. The building/s have been completed in accordance with relevant legislation.
3. Separate utility service meters / junctions are provided to each commercial space and if necessary any common area.

**Note:**

Applicants should be aware of the requirements of s37 of the Strata Titles Act, 1973.

## 5.3 Industrial Subdivision

### 5.3.1 *Minimum Allotment Sizes*

This section applies to subdivision of land in the industrial zones of the Lismore Local Environmental Plan 1992, (as amended). The Plan does not specify lot sizes for subdivision of land in the industrial zone. A variety of lot sizes should be provided to meet market demand and requirements of a variety of industrial uses.

In general, this Plan specifies the following minimum lot sizes:

- 1,000 m<sup>2</sup> with a satisfactory size and shape, and
- an average of 1,500m<sup>2</sup> where the proposed subdivision is accompanied by a development plan which demonstrates that the land can be satisfactorily developed for an industrial purpose in accordance with Chapter 3 - Industrial Development.

**Note:**

The above preferred minimum lot sizes do not apply to industrial strata or community title lots.

### 5.3.2 *Design Elements*

***The subdivision layout and street design criteria for industrial estates are mutually interdependent. This plan encourages a design concept for industrial estate/parks reflecting the constraints of particular sites and integration with surrounding industrial areas.***

**Element:- Estate Design**

<b>OBJECTIVE</b>
To provide secure, convenient and efficient industrial subdivisions that meet the needs of industry.

<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved when the phases in the Design Process (refer to section 6) are followed and where:</p> <ol style="list-style-type: none"><li>1. The subdivision responds to site characteristics.</li><li>2. The street network provides a high level of internal accessibility and good external connections for large vehicles, pedestrians and cyclists.</li><li>3. The street and lot layout minimises infrastructure costs and enables efficient provision of physical services.</li><li>4. The street and lot orientation and lot dimensions facilitate the siting and design of energy efficient buildings</li><li>5. The lot design and layout provides a variety of lot sizes to enable industrial and other complementary uses permitted in the zone.</li><li>6. The layout retains significant vegetation and habitat areas, incorporates natural features and minimises soil erosion.</li><li>7. The layout is integrated with the surrounding urban environment, providing landscaped buffers and street landscaping.</li><li>8. The layout provides for personal and property safety and minimises the potential for crime through surveillance by pedestrians and drivers of passing vehicles.</li><li>9. A pedestrian and cycleway network is provided that is safe, attractive and efficient running in public space and avoiding areas that are not easily observable at night.</li><li>10. The layout and ground level height of lots provides an acceptable level of protection from flooding.</li></ol>	<p>There are no recommended suggested solutions for this element, as each situation requires an individual approach.</p>

**Element:- Major Movement Networks**

The design of movement (street) networks in industrial subdivisions should provide for the likely amount and type of traffic generated by future uses.

The network should provide for factors that effect traffic generation such as:

- type of industry;
- size of individual industries;
- amount of industry related retailing and complementary activities and
- proximity to public transport.

<b>OBJECTIVE</b>	
To provide for the economical and efficient construction and maintenance of movement and access systems, with acceptable levels of amenity, safety and convenience, for all street users.	
<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"> <li>1. The street network meets the local needs of all street users and for the likely traffic in a co-ordinated manner.</li>   <li>2. The existing and proposed arterial road network has the capacity to accommodate the projected traffic movements.</li>   <li>3. The proposed street network efficiently connects with external traffic routes.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>The proposal conforms to a Development Control Plan approved by Council which provides for all street users.</p> <p><b>OR</b></p> <p>A Traffic Study submitted with the proposal provides for an integrated approach to movement systems in a manner specified in this Plan</p> <p>Provision is to be made for arterial road corridors as specified in Council's Regional City Plan.</p> <p>The development conforms to any adopted Development Control Plan for the area and/or Traffic Study with the proposal showing a road network meeting required service levels.</p> <p>The street network provides for bus routes and pedestrians and cyclists in accordance with the requirements of this plan.</p> <p>Streets are to be designed to restrict the traffic volume on each street to a limit appropriate to the street classification.</p> <p>Street layout is to exclude unplanned through traffic.</p> <p>Road connections within and between the proposed development and the existing road network shall meet the requirements of Councils "<i>General Specification for the Construction of Road and Drainage Works</i>".</p>

## Minimum Standards and Techniques

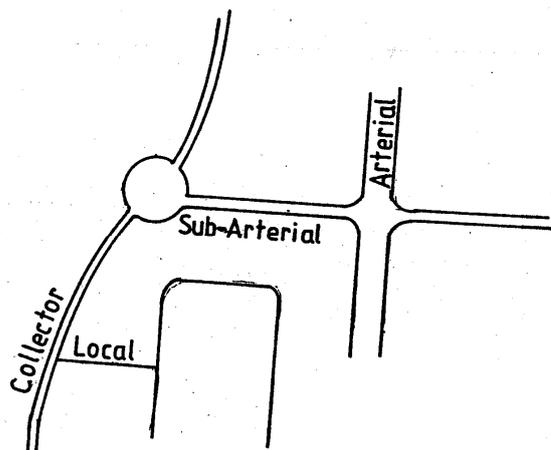


Figure 5-19: Road Hierarchy

Table 5-11: Classification of Industrial Streets

Street level/type and function	Design speed (km/hr.)	Stopping distances (metres)
Local Street	40	30
Collector Street	40	30
Sub-arterial Street	60	70
Arterial Road	80	100

### Element:- Local Street Networks

OBJECTIVE	
To create street networks which provide for industrial usage whilst providing acceptable levels of access, safety and convenience.	
PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objective may be achieved where:</p> <p><b>Function and structure</b></p> <ol style="list-style-type: none"> <li>1. The proposed street network has a clear structure not exceeding the function of the existing network.</li> <li>2. The network has clear physical distinctions between streets based on function, legibility, convenience, anticipated traffic volume, vehicle speed, safety and amenity.</li> </ol> <p><b>Safety, access and convenience</b></p> <ol style="list-style-type: none"> <li>3. Intersections along industrial streets are spaced to create safe and convenient vehicle movements.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p><b>Function and structure</b></p> <p>Proposed streets link with other streets that have capacity to accommodate increased traffic.</p> <p>The street network reflects the characteristics specified in <i>Tables 5-1,5-2, 5-3 and 5-4.</i></p> <p><b>Safety, access and convenience</b></p> <p>Intersections are spaced as set out in <i>Table 5-2.</i></p>

<p><b>Mode choice</b></p> <p>4. There is provision for bus routes within Sub-arterial Streets.</p> <p><b>Design and Character</b></p> <p>5. The street network takes account of the topography, vegetation and watercourses.</p> <p>6. The proposed street network takes account of the existing street network and streetscape.</p> <p>7. The street network is orientated, where practical, to promote building energy efficiency.</p> <p><b>Environmental Protection</b></p> <p>8. Future traffic will be within the acceptable capacity of the existing and proposed streets.</p> <p><b>Cost effectiveness</b></p> <p>9. Streets and carriageway widths and street lengths should optimise the cost effectiveness of the street network without comprising street function.</p> <p>10. The network provides for the cost effective provision of public utilities.</p>	<p>The locations of intersections are to meet Council's "General Specification for the Construction of Road and Drainage Works".</p> <p>Total number of intersections should be minimised.</p> <p>Streets should intersect only with streets of the same or next classification (refer to Table 8-1).</p> <p><b>Mode choice</b></p> <p>Public transport routes and stops are provided as set out in Element 6.11.6.</p> <p><b>Design and Character</b></p> <p>The street network permits establishment of streetscapes that incorporate the provisions of Element Estate Design.</p> <p><b>Cost effectiveness</b></p> <p>The network caters for the provision of public utility networks including water, sewerage, electricity and telecommunications.</p>
---	---

## Minimum Standards and Techniques

Table 5-12: Desirable Minimum Intersection Spacing - Industrial Streets

Street Type	Same side of street (metres)	Opposite side of the street (metres)	
		Left/right	Right/left
Local Street	Austroads	Pt. 5.	
Collector Street			
Sub-arterial Street			

**Element:- Pedestrian and Cyclist Facilities**

<b>OBJECTIVE</b>
To encourage walking and cycling between residential, commercial and industrial areas.

PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objective may be achieved where:</p> <p><b>Planning</b></p> <p>1. The industrial street and path network provides a network of safe pedestrian and cyclist routes with connections to adjoining pedestrian and cyclist routes.</p> <p><b>Location and Design</b></p> <p>2. The location of footpaths and cycleways in the street is determined by:</p> <ul style="list-style-type: none"> <li>• low vehicle speed,</li> <li>• cyclist and pedestrian safety and comfort,</li> <li>• on-street parking,</li> <li>• location of infrastructure services including postal services,</li> <li>• landscaping,</li> <li>• safety, and</li> <li>• cost efficiency.</li> </ul> <p>3. The design of footpaths and cycleways is to:</p> <ul style="list-style-type: none"> <li>• permit casual surveillance,</li> <li>• be aligned to permit safe and convenient use,</li> <li>• permit shared use.</li> </ul> <p>4. Access streets are to be designed to permit cyclist use of the street pavement.</p> <p><b>Safe Crossings</b></p> <p>5. Safe street crossings are to provide for all street users with safe sight distances, pavement markings, warning signs and safety rails (where appropriate).</p> <p><b>Construction</b></p> <p>6. Pedestrian and cyclist paths are constructed to provide a stable surface for projected users which is easily maintained</p>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p><b>Planning</b></p> <p>Cycleway facilities are to provided in accordance with the Lismore Cycleway Plan</p> <p><b>OR</b></p> <p>an approved Traffic Study which provides for an integrated approach to movement systems in a manner specified in this Plan.</p> <p><b>Location and Design</b></p> <p>Footpaths and cycleways are to be provided in Collector Streets and in accordance with the Lismore Cycleway Plan.</p> <p><b>Safe Crossings</b></p> <p>Street crossings are to be provided in accordance with the Lismore Cycleway Plan.</p> <p>Crossings are to be designed to reflect anticipated street traffic volumes.</p> <p><b>Construction</b></p> <p>Footpaths are to be constructed in accordance with Councils "<i>General Specification for the Construction of Road and Drainage Works</i>".</p> <p>Cycleways may be constructed of an asphalt sealed pavement or equivalent standard concrete pavement.</p>

## Minimum Standards or Techniques

Refer to Figure 5-4: Provision for Cyclists and Pedestrians

### **Element:- Public Transport**

<b>OBJECTIVE</b>	
To increase the opportunity for choice in mode of transport to places of employment and provide convenient and accessible cost effective and energy efficient public transport services.	
<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <p><b>Planning</b></p> <p>1. The industrial Collector Street is to provide for public transport.</p> <p><b>Route location and design</b></p> <p>2. Convenient connections to adjoining areas and other public transport routes provide for ease of movement of buses.</p> <p>3. Buses are to be able to safely gain access to the area without complicated manoeuvres.</p> <p>4. Street alignment and geometry of collector streets are to allow for the unimpeded movement of buses.</p> <p><b>Bus stop location and design</b></p> <p>5. Public transport stops to provide for pedestrian safety, security, comfort and convenience.</p> <p>6. Bus stops are designed to prevent vehicles overtaking a stationary bus, or vehicle site distances adequate to ensure safe pedestrian crossings.</p> <p>7. Bus stops are located and designed to provide shelter, seats and adequate lighting (where required) and timetable information.</p>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p><b>Planning</b></p> <p>Where a Development Control Plan or other planning instrument exists, routes conform with that plan</p> <p><b>Route location and design</b></p> <p>Routes for bus services are to be designed in accordance with <i>Table 5-13</i>.</p> <p><b>Bus stop location and design</b></p> <p>The location of bus stops is to relate to the pedestrian network.</p>

## Minimum Standards and Techniques

Refer to Table 5-4: Minimum requirements for Bus Routes

**Element:- Flooding**

<b>OBJECTIVES</b>
To ensure the subdivision of flood prone land for industrial purposes provides for future development appropriate for the land.

<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"> <li>1. Industrial subdivision is not permitted in floodways or on land not suited to the proposed use.</li> <li>2. Finished ground levels which provide for floor levels to be constructed at or above the 1 in 20 flood event.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>Subdivision and development of industrial land is to be in accordance with Chapter 8 - Flood Prone Lands.</p> <p><b>OR</b></p> <p>A Flood Study prepared on behalf of Council and/or other Council approved hydraulic consultants substantiate the proposed use of the land.</p> <p>No filling is permitted in floodways, other than to return landform to its original state.</p>

**Element:- Buffers to Avoid Land Use Conflicts**

<b>OBJECTIVE</b>
To minimise land use conflicts between industrial land and other potentially incompatible land uses through the establishment of appropriate buffers.

<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"> <li>1. Buffer areas provided between industrial and residential land uses.</li> <li>2. Landscape plans are to include the proposed treatment of buffer areas.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>Subdivision of industrial land is to be in accordance with Chapter 3 - Industrial Development and Chapter 11 - Buffer Areas.</p> <p><b>OR</b></p> <p>A minimum 50 m. industrial buffer area is to be created between industrial and residential land uses.</p> <p>Buffer areas are to be landscaped in accordance with an approved landscape plan and prior to release of land titles plans.</p>

### 5.3.4 Physical Infrastructure - Street Design

#### Element:- Road Reserve and Carriageways

OBJECTIVES	
<p>To provide an appropriate street reserve width to accommodate the required carriageway, and to provide for the function of the verges.</p> <p>Carriageway width to be sufficient to enable the street to perform its required traffic and parking functions efficiently, safely and conveniently, but in the interests of economy to be no greater than necessary for these purposes.</p> <p>Carriageway construction standards to minimise both capital cost and future maintenance costs.</p>	
PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objectives may be achieved where:</p> <ol style="list-style-type: none"> <li>1. Minimum street reserve width at any point to be not less than the sum of the minimum widths required for the carriageway and verges.</li> <li>2. Carriageway width providing two lanes for moving traffic (one each way), and a parking lane each side wherever there is frontage to industrial lots.</li> <li>3. Lane widths to be appropriate for the movement and parking of heavy vehicles, and for access to lots with minimum interference to moving traffic.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objectives and performance criteria:</p> <p>Road reserve and carriageways are provided in accordance with <i>Table 5-14</i>.</p> <p>Cul-de-sacs should generally be avoided in industrial estates.</p>

#### Minimum Standards and Techniques

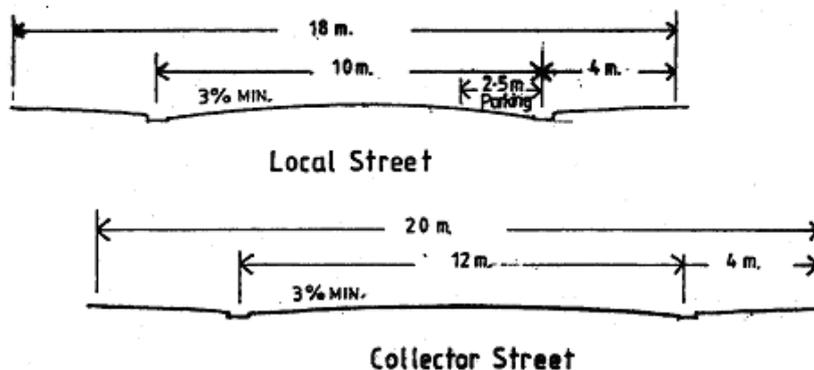


Figure 5-20: Carriageway Widths

Table 5-14: Characteristics of Industrial Streets  
(refer Tables 5-11 and 5-12)

Characteristic	Local Street	Collector Street	Sub-arterial Street
<u>Road Reserve Width</u> Metres	20	20	20 Design for intersections & roundabouts etc.
<u>Street Width</u> <u>Carriageway</u>  (pavement cement stabilised)	Travel 2 x 3.5 Parking 2 x 2.5  Total 12 metres	Travel 2 x 3.5 Parking 2 x 2.5  Total 12 metres	Travel 2 x 3.5 Parking 2 x 3  Total 13 metres
<u>Cul-de-sac bulb</u> Metres	15 m. radius		
<u>No. travel lanes</u>	2+	2+	2+
<u>Parking in reserve</u>	Carriageway	Carriageway	Carriageway
<u>Kerb type</u>	Upright	Upright	Upright
<u>Footpath</u>	Nil	Nil	1 x 1.2 m. in verge
<u>Cycleway</u>	Road	Road	Good visibility with footpath 1 x 3.5 m.
<u>Verge width</u> Metres	2 x 4	2 x 4	2 x 4

**Element:- Verges**

OBJECTIVE
To provide a buffer area between the street carriageway and industrial lots sufficient to maintain the functions of safety, amenity and convenience, but in the interests of economy not providing a width more than necessary.

PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"> <li>Verge widths provide adequately for: <ul style="list-style-type: none"> <li>safety and visibility;</li> <li>amenity,</li> <li>utility services;</li> <li>cycleways and pathways</li> </ul> </li> <li>Verge crossfalls are suitable for: <ul style="list-style-type: none"> <li>lot access;</li> <li>pedestrian movement;</li> <li>drainage.</li> </ul> </li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>Road reserve and carriageways are provided in accordance with <i>Table 5-14</i>.</p> <p>Additional width may be required where a dual use path (pedestrian and cycleways) is proposed in a Trunk/Collector street.</p> <p>Maximum crossfalls in verge 4%.</p>

**Element:- Road Design Speeds, Alignment and Geometry**

<b>OBJECTIVE</b>	
The provision of a street environment which allows all street users to travel, park and access allotments with safety and convenience.	
<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <p><b>1.</b> Street speed, alignment and geometry are based on an appropriate design minimum speed.</p>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>Road design, alignment and geometry be in accordance with Council's <i>"General Specification for the Construction of Road and Drainage Works"</i>.</p> <p>Street speed, alignment and geometry provided in accordance with Table 5-11, where appropriate.</p>

**Element:- Parking**

<b>OBJECTIVES</b>	
To provide sufficient and convenient parking for employees, visitors and commercial vehicles.	
To ensure that parked vehicles do not obstruct the passage of vehicles on the carriageway, or create traffic hazards.	
<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objectives may be achieved by:</p> <p><b>1.</b> Provision of a parking lane on the carriageway of all industrial streets, where there is adjacent frontage of industrial lots.</p>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objectives and performance criteria:</p> <p>Parking is to be provided in accordance with Table 5-14.</p> <p>Provision of on-street parking is to be one (1) car space per 12 metres of lot frontage.</p>

### **Element:- Street Construction**

<b>OBJECTIVE</b>
To construct streets that support the design and intended use without unnecessary construction and whole of life cycle costs.

<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"><li>1. The pavement edging and landscaping support the function of the street.</li><li>2. The pavement edge:<ul style="list-style-type: none"><li>• controls vehicle movements by delineating the carriageway;</li><li>• assists in the control of stormwater.</li></ul></li><li>3. Street pavement surfaces are:<ul style="list-style-type: none"><li>• well designed and durable enough to carry wheel loads of travelling and parked vehicles;</li><li>• ensure the safe passage of vehicles, pedestrians and cyclists;</li><li>• discharge of rainfall;</li><li>• all-weather access;</li><li>• reasonable travel comfort.</li></ul></li><li>4. Public street construction and whole of life cycle costs are kept low.</li></ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>Pavement and landscape materials are used to distinguish different street functions.</p> <p>Pavement edging in accordance with <i>Table 5-14</i>.</p> <p>Flexible pavement and kerb construction is to be based on the requirements outlined in Councils "<i>General Specification for the Construction of Road and Drainage Works</i>".</p>

### **Element:- Utility Services**

<b>OBJECTIVE</b>
To ensure that industrial areas are adequately serviced with sewerage, water, fire fighting, electricity, street lighting and communication services in a timely, cost effective, co-ordinated and efficient manner.

<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"><li>1. Design and provision of utility services are cost effective over their life cycle and incorporate provisions to minimise adverse environmental impact.</li><li>2. Compatible public utility services are located in common trenching in order to minimise the land required and the costs for underground services.</li><li>3. Public lighting shall be designed to maximise energy efficiency.</li></ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>The design and provision of utility services conforms to:</p> <p>Council's;</p>

<p>3. Development occurs within locations where there is an adequate water supply for fire fighting and the demand of industry.</p> <p>4. Development is staged to ensure that each stage is fully serviced before a new area is released.</p> <p>5. Water supply and sewerage networks are accessible, easy to maintain, and cost effective based on life cycle costs.</p>	<ul style="list-style-type: none"> <li>• "General Specification for the Construction of Road and Drainage Works",</li> <li>• "Specification for the Construction of Sewers", and</li> <li>• "Specification for the Construction of Water Reticulation".</li> </ul> <p>The requirements of other relevant supply authorities.</p>
---	--

### Minimum Standards or Techniques

Refer to Figure 5-14: Typical Shared Trenching

#### 5.3.5 Stormwater Management

##### Element:- Stormwater Drainage

OBJECTIVES
<p>To provide major and minor drainage systems which:</p> <ul style="list-style-type: none"> <li>• adequately protects people and the natural and built environments to an acceptable level of risk and in a cost effective manner in terms of initial cost and on-going maintenance, and</li> <li>• contributes positively to environmental enhancement of catchment areas.</li> </ul>

PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objective may be achieved where:</p> <p><b>MAJOR SYSTEM</b></p> <p>1. The major stormwater system has the capacity to safely convey stormwater flows resulting from the relevant design storm events under normal operating conditions.</p> <p>2. The major system has the capacity to convey safely, but possibly with some flooding, stormwater flows resulting from events more extreme than the design storm without significant property damage.</p> <p>3. Community benefit is maximised through the retention of natural streams and vegetation, wherever practical.</p>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p><b>MAJOR SYSTEM</b></p> <p>The design and construction of major stormwater drainage systems are in accordance with the requirements of:</p> <ul style="list-style-type: none"> <li>• <i>Australian Rainfall and Runoff (1987)</i>, and</li> <li>• Council's, "<i>General Specification for the Construction of Road and Drainage Works</i>".</li> </ul> <p>The major system design is undertaken on a Total Catchment Management basis.</p> <p>The major system design outflow is matched to the capacity of any existing downstream system and where necessary detention basins etc. are provided to retard stormwater flows onto downstream properties.</p>

4. The major system is designed to ensure that there are no flow paths which would increase risk to public safety and property.

**MINOR SYSTEM**

5. The minor storm drainage system has the capacity to control stormwater flows under normal operating conditions for the relevant design storm with minimal risk of blockage.

6. Drainage networks are well defined to ensure there are no hidden flow paths which could reduce their capacity to convey design flows.

7. The design of the minor system takes full account of existing downstream systems.

8. The minor system design allows for the safe passage of vehicles at reduced speed on streets which have been affected by runoff from the relevant design storm.

9. The minor system is accessible and easily maintained.

10. Where a portion of the minor system is within a site, access is available for maintenance.

11. The selection of materials used for the construction of the minor system is based on their suitability, durability, maintainability and cost-effectiveness.

**SITE DRAINAGE**

12. Subdivision design and layout provides for adequate site drainage.

**DRAINAGE OUTLETS**

13. All stormwater systems shall be designed to discharge appropriate water volumes, velocity and quality to an acceptable legal point of discharge.

**MINOR SYSTEM**

The design and construction of minor stormwater drainage systems are in accordance with the requirements of:

- *Australian Rainfall and Runoff (1987), and*
- Council's, "*General Specification for the Construction of Road and Drainage Works*".

The minor system design outflow is matched to the capacity of any existing downstream system.

The minor system allows for the safe passage of vehicles at reduced speeds on streets which have been affected by runoff from a 1 in 20 year storm event.

**SITE DRAINAGE**

Where site topography prevents the discharge of stormwater directly to the street gutter or a Council controlled piped system, inter-allotment drainage is provided to accept runoff from all existing or future impervious areas that are likely to be directly connected.

The design and construction of inter-allotment stormwater drainage systems are in accordance with the requirements of:

- *Australian Rainfall and Runoff (1987), and*
- Council's, "*General Specification for the Construction of Road and Drainage Works*".

**Element:- Water Quality Management**

<b>OBJECTIVE</b>
<p>To provide water quality management systems which:</p> <ul style="list-style-type: none"> <li>• ensure that disturbance to natural stream systems is minimised, and</li> <li>• ensures stormwater discharge to surface and underground receiving waters, both during construction and in developed catchments, does not degrade the quality of water in the receiving waters.</li> </ul>

<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"> <li>1. Adequate provision is made during construction to ensure that the land form is stabilised and erosion is controlled.</li> <li>2. The system design optimises the interception, retention and removal of water-borne pollutants through the use of appropriate measures prior to discharge to receiving waters.</li> <li>3. The system design minimises the environmental impact of urban runoff on the surface receiving water quality and on other aspects of the natural environment by employing techniques which are appropriate and effective in reducing runoff and pollution travel.</li> <li>4. Point sources of pollution in the catchment should be identified and their impact minimised until their impact can be eliminated.</li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>An Erosion and Sediment Management Plan is prepared by properly qualified personnel using recognised and locally accepted design methodologies.</p> <p>The Erosion and Sediment Management Plan is to comply with the Department of Land and Water Conservation's <i>Urban Erosion and Sediment Control Manual</i>, Council's <i>"General Specification for the Construction of Road and Drainage Works"</i> and <i>"Soil Erosion and Sediment Control Guidelines"</i>.</p> <p>Water pollution control ponds or wetlands are developed (where appropriate) for final treatment before discharge to the wider environment and should be sited to minimise impact on the natural environment.</p>

**5.3.6 Streetscape and Lot Layout**

**Element:- Streetscape and Landscaping**

<b>OBJECTIVE</b>
<p>To provide an attractive industrial streetscape that:</p> <ul style="list-style-type: none"> <li>• reinforces the functions of the street network,</li> <li>• enhances the amenity of the area generally and future buildings and</li> <li>• are sensitive to the landscape and environmental conditions of the locality.</li> </ul>

<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objective may be achieved where:</p> <ol style="list-style-type: none"> <li>1. The street and landscape design achieves: <ul style="list-style-type: none"> <li>• the creation of industrial environments with character and identity;</li> <li>• compliment any attractive streetscapes in established areas;</li> </ul> </li> </ol>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objective and performance criteria:</p> <p>A Landscape Plan is submitted that demonstrates how the Performance Criteria are met showing:</p>

<ul style="list-style-type: none"> <li>• provision for street tree planting, taking into account the natural landscape, the image and role of the street, soils, selection of appropriate species and services; and</li> <li>• use of existing features such as vegetation, landmarks etc.</li> </ul> <p><b>2. The design of the landscape in public streets:</b></p> <ul style="list-style-type: none"> <li>• defines a theme for new streets or complements existing streetscapes;</li> <li>• is sensitive to site attributes;</li> <li>• complements the function of the street;</li> <li>• reinforces desired traffic speed and behaviour;</li> <li>• is of an appropriate scale to street width and the likely bulk of buildings;</li> <li>• promotes safety and casual street surveillance;</li> <li>• incorporates existing vegetation;</li> <li>• promotes the planting of native vegetation in environmentally sensitive areas;</li> <li>• maximises landscaped areas, where appropriate;</li> <li>• enhances pedestrian comfort;</li> <li>• achieves effective line of sight for pedestrians, cyclists and motorists, provides adequate lighting;</li> <li>• satisfies maintenance and utility requirements and minimises their visual impact of above ground utilities.</li> </ul>	<ul style="list-style-type: none"> <li>• the street reserves and indicative locations of the carriageway, parking lanes/bays, cycleways and footpaths, traffic management devices;</li> <li>• location of existing vegetation to be removed and/or conserved;</li> <li>• location, species and general character of tree planting and hard and soft landscape treatment; and</li> <li>• indicative location of buildings.</li> </ul> <p>Landscape is in accordance with Council's "<i>Landscape Guidelines</i>" and any approved landscaping strategy.</p> <p>Compliance with the performance criteria is achieved by a Landscape Plan showing:</p> <ul style="list-style-type: none"> <li>• boundaries and areas of open and landscaped space;</li> <li>• existing vegetation and proposed character of landscape treatment;</li> <li>• general arrangement of hard landscaping elements and major earth works;</li> <li>• indicative treatment of floodways and drainage lines;</li> <li>• landscape plantings in buffers is to be dense to minimise future maintenance.</li> </ul>
---	---

**Element:- Lot Layout**

<b>OBJECTIVES</b>
<p>To provide a range and mix of lot sizes to suit a variety of industrial uses with areas and dimensions to meet user requirements.</p> <p>To provide lots that are orientated, where practical that minimises energy consumption.</p>

<b>PERFORMANCE CRITERIA</b>	<b>SUGGESTED SOLUTIONS</b>
<p>The objectives may be achieved where:</p> <p><b>SIZE</b></p> <p>1. Lots have the appropriate area and dimensions for the siting and construction of an industrial building, the provision of storage space, vehicle access, manoeuvring and parking and landscaping.</p>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objectives and performance criteria:</p> <p><b>SIZE</b></p> <p>Lots should have a minimum area of 2,000m<sup>2</sup>. A lot size of 1,500m<sup>2</sup> may be considered where the subdivision plan is accompanied by a development plan that shows the land can be developed in accordance with Chapter 3 - Industrial Development.</p>

<p><b>USER REQUIREMENTS</b></p> <p>2. Lot frontages are orientated to streets and open spaces so that personal and property security, deterrence of crime and vandalism, and surveillance of footpaths and open spaces are facilitated.</p> <p>3. Lot design is to preclude the need to reverse onto the public street and collector arterial roads in particular.</p> <p><b>ORIENTATION AND ENERGY</b></p> <p>4. Lots are orientated, where possible, to facilitate the siting of buildings to take advantage of micro-climate and on-site solar access.</p>	<p>A variety of lot sizes should be provided to meet market demand.</p> <p>Lots should be regular and rectangular in shape.</p> <p>Lot shape and area should be sufficient to permit easy access to the rear of the lot and allow trucks to manoeuvre on-site without reversing onto or off the lot.</p> <p>Generally a frontage to depth ratio between 1 : 2 and 1 : 3 is considered satisfactory.</p>
---	---

**Element:- Subdivision of Buildings**

<p><b>OBJECTIVES</b></p>
<p>To allow separate titles to be created for parts of a development.</p>
<p>To provide for the effective and efficient management of common or shared facilities.</p>

PERFORMANCE CRITERIA	SUGGESTED SOLUTIONS
<p>The objectives may be achieved where:</p> <p>1. The range and extent of body corporate activities are limited to those legally permissible.</p> <p>2. The street and lot layout clearly defines the public, communal and private areas of a development, including the function, ownership and management of landscape and communal areas.</p>	<p>The following suggested solutions are <b>ONE WAY</b> of meeting the objectives and performance criteria:</p> <p>Such measures may include:</p> <ul style="list-style-type: none"> <li>• limiting communal land to driveways only;</li> <li>• designing buildings to minimise the need for corporate building management; and</li> <li>• ensuring that cost effective management is practicable where communal landscaping or shared facilities are provided.</li> </ul>

**Minimum Standards and Techniques**

1. The building/s have been completed in accordance with relevant legislation.
2. Separate utility service meters / junctions are provided to each unit and if necessary any common area.

**Updated: 26/2/08**