STREET DESIGN MANUAL

WALKABLE NEIGHBOURHOODS

A contemporary guide for the design and development of Queensland’s residential neighbourhoods

DRAFT FOR CONSULTATION
Welcome to IPWEAQ’s Street Design Manual, a contemporary guide for the design and development of Queensland’s residential neighbourhoods. This guide is for engineers, designers, practitioners, stakeholders, and decision makers involved with design and planning.

IPWEAQ is committed to developing better communities by improving the standard and design of residential neighbourhoods. The Street Design Manual complements the Queensland Government’s model code for neighbourhood design and other policy initiatives offering technical design criteria for residential streets. It builds on previous IPWEAQ publications, Queensland Streets and Complete Streets, and draws material from Economic Development Queensland guidelines and relevant codes.

This Manual is not just about streets and motor vehicle access; it recognises streets as an important connector to multi-purpose social spaces in our neighbourhoods. It offers access options for active transport delivering safer neighbourhoods and a sense of community.

By including detailed practical guidance, this publication will be a valuable resource for local authorities, designers, and engineers.

The Street Design Manual will be available in electronic form after its launch in 2020 making it easy to update and access.

I would like to acknowledge the tireless efforts and commitment of IPWEAQ, its Steering Committee, and Working Groups which have facilitated the development of this draft for consultation to the wider industry. I encourage your feedback and solutions-focused input during the consultation period.

It is my pleasure to introduce the Street Design Manual and invite you to partake in industry consultation.

Yours sincerely

Craig Murrell
IPWEAQ President

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## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction</strong></td>
<td>7</td>
</tr>
<tr>
<td><strong>Part 1: Planning and Design Guidelines</strong></td>
<td>8</td>
</tr>
<tr>
<td>Element 1: Community Design</td>
<td>8</td>
</tr>
<tr>
<td>Element 2: Movement Network – Concept Design</td>
<td>10</td>
</tr>
<tr>
<td>Element 3: Neighbourhood Open Space Network</td>
<td>32</td>
</tr>
<tr>
<td>Element 4: Lot Design</td>
<td>41</td>
</tr>
<tr>
<td>Element 5: Activity Centres</td>
<td>47</td>
</tr>
<tr>
<td><strong>Part 2: Detailed Design Guidelines</strong></td>
<td>50</td>
</tr>
<tr>
<td>Element 1: Residential Street Design</td>
<td>51</td>
</tr>
<tr>
<td>Element 2: Active Transport</td>
<td>87</td>
</tr>
<tr>
<td>Element 3: Public Transport</td>
<td>94</td>
</tr>
<tr>
<td>Element 4: Design Detail</td>
<td>96</td>
</tr>
<tr>
<td>Element 5: Landscaping</td>
<td>99</td>
</tr>
<tr>
<td><strong>Part 3: Practice Notes</strong></td>
<td>102</td>
</tr>
<tr>
<td>1. Walkable and legible neighbourhoods</td>
<td>102</td>
</tr>
<tr>
<td>2. Increasing trees in our neighbourhoods</td>
<td>108</td>
</tr>
<tr>
<td>3. Contemporary lot typology</td>
<td>116</td>
</tr>
<tr>
<td>4. Designing for small lots</td>
<td>120</td>
</tr>
<tr>
<td>5. Rear lane design</td>
<td>134</td>
</tr>
<tr>
<td>6. Design for cyclists</td>
<td>144</td>
</tr>
<tr>
<td>7. Building a street cross-section</td>
<td>148</td>
</tr>
<tr>
<td>8. Verges</td>
<td>150</td>
</tr>
<tr>
<td>9. Traffic Volume</td>
<td>152</td>
</tr>
</tbody>
</table>
The Street Design Manual is in three parts:

**Part 1 – Planning and Design Guidelines**

Guidelines relating primarily to the planning and urban design of neighbourhoods, incorporating elements covering community design, the movement networks, the open space network, lot design, and centres.

**Part 2 – Detailed Design Guidelines**

Guidelines relating to the detailed design of neighbourhood infrastructure including traffic, streets, active transport, and services.

**Part 3 – Practice Notes**

Practice notes that provide additional information about matters covered in Parts 1 and 2 with real life examples and supporting information and references.

All parts draw from and include material from such documents as Economic Development Queensland guidelines and the Queensland Housing Code and Reconfiguration of a Lot Code.
This volume of the Street Design Manual (the Manual) builds on previous publications of the Institute of Public Works Engineers Australasia Queensland (IPWEAQ), namely Queensland Streets (1993) and Complete Streets (2010), and provides a contemporary guide for the design and development of residential neighbourhoods in Queensland.

Several major changes to urban development have occurred since Queensland Streets and Complete Streets were released, including:

- the adoption of several important state government policy documents (e.g., the State Planning Policy, Regional Plans and a Model Code for Neighbourhood Design);
- the creation of the Urban Land Development Authority (ULDA) which evolved into Economic Development Queensland (EDQ) and its approval role in major greenfield areas in SEQ; and
- greenfield development densities rising from around 10dws/ha in the early nineties to 15-20+dws/ha today.

While development densities have been steadily rising, many regulations, guidelines, standards, and practices have not been revised since they were established to support much lower density forms of development.

Unfortunately, during this period the overall health of our communities has declined when measured against a range of benchmarks. Our communities are experiencing high levels of chronic disease which are partially contributed to by our increasingly sedentary lifestyles.

Queensland is part of a growing international movement that is implementing measures aimed at making our neighbourhoods more walkable and healthier.

The objectives of this document therefore are threefold:

1. to complement and support the implementation of key state government policy initiatives such as the Model Code for Neighbourhood Design;

2. to provide leading practice guidelines to facilitate healthier communities by maximising active transport and recreation in our new neighbourhoods; and

3. to provide a resource document of leading practice solutions to assist developers, designers, and local authorities to plan and deliver high quality attractive neighbourhoods with a great sense of place and community.

This document is focused on greenfield development with a predominately residential land use focus. Designing for other land uses and brownfield development introduces a breadth and scope of issues and challenges beyond the intent and scope of this publication. However many of the principles, objectives, and strategies provided are still applicable to brownfield development.

The Manual has been produced to reflect the key principles and objectives espoused by the state government policies and other sources of leading development practice. Our new communities:

- are founded on a site-responsive design approach;
- incorporate a diverse range of housing options with residential densities achieving expressed policy targets;
- provide safe, comfortable, and convenient walking environments for all members, in particular unescorted primary school children, carers with babies in prams, people with walking impairments, and the elderly;
- ensure all active transport modes and public transport are prioritised and catered for;
- have streets that are fit for purpose and reflect their role within the wider urban context;
- have open spaces that are sized, located, and embellished to support the needs of their residents;
- exhibit world leading models of climatically responsive design;
- maximise the retention of stormwater runoff to sustain trees to support urban greening and cooling; and
- ensure land is treated as a finite and precious resource that is used as efficiently as possible.
ELEMENT 1 – COMMUNITY DESIGN

Overview
The Community Design element goes to the heart of achieving the Street Design Manual’s objective of providing guidelines to assist the planning and delivery of neighbourhoods with a great sense of place and community.

This element’s approach is strategic, covering more than a single neighbourhood and considers the characteristics of a collection of neighbourhoods, their facilities, and the range of attributes that help make new communities great places to live.

In contrast, a single neighbourhood approach is adopted in the latter elements, Movement Network, Neighbourhood Open Space Network, Lot Design, and Activity Centres.

Community Design also recognises the interaction and inter-relatedness these other elements and the value of site-responsive design approach at a strategic level. This relationship balances the sometimes competing aspects of the different elements to achieve the best sense of place and community.
1.1 SITE RESPONSIVE DESIGN

**Objective:**
To achieve a neighbourhood design that addresses site constraints and incorporates natural and cultural features to underpin a unique identity and sense of place.

**Strategy 1.1.1:**
Undertake a comprehensive site analysis and sieve mapping to create a constraints and opportunities plan.

Tip: Best practice site analysis will involve:
- site visits, not just desktop analysis; and
- a multi-disciplinary approach.

Refer to Practice Note 1: Walkable and legible neighbourhoods

**Strategy 1.1.2:**
A synthesis and balancing of opportunities and constraints to produce structure plan options.

Tip: Best practice will involve:
- looking for ways to create special unique features for the neighbourhoods;
- co-location of uses to conserve space and introduce interest and vitality;
- multiple options analysis;
- sanity checking with further onsite work; and
- a multi-disciplinary approach.

**Strategy 1.1.3:**
The final structure plan clearly identifies the matters to be addressed in subsequent design processes and identifies for protection those features that will underpin a sense of identity and place for the neighbourhood.

Tip: A best practice structure plan will:
- provide a clear framework for further design for individual neighbourhoods;
- sufficient detail for certainty while allowing flexibility;
- clear identification of non-negotiable elements, and
- be sanity checked and confirmed with relevant external stakeholders (especially service providers).
Overview
The movement network of a neighbourhood includes the network of surrounding roads, streets, pathways, corridors, and infrastructure necessary to accommodate the transport needs of the users within that neighbourhood.

This network needs to accommodate all relevant transport modes including walking, cycling (and other active transport modes), public transport, service vehicles (e.g. refuse collection and emergency), and other motor vehicles.

A successful movement network ensures the communities are safe, connected, and integrated with the urban and natural environment. It is a key factor in the creation of a sense of place.

The movement network provides the opportunity for shared functions within the same space such as services, landscaping, view lines, vehicles, ride-share infrastructure, public transport, and active transport.

Key Principles
The principal movement functions that a street must accommodate are:
• pedestrian movement;
• cyclist and non-motorised vehicles movement;
• public transport; and
• motor vehicles, including service vehicles and space for parking.

The principal place-making functions that a street must accommodate are:
• paths to support pedestrian movements;
• street tree planting;
• street furniture;
• landscaping;
• a variety of social activity;
• aesthetic treatments that enhance the streetscape and complement the adjoining built form;
• micro-climate mitigation; and
• ecological connectivity, where this is desirable.

The principal infrastructure functions that a street must accommodate are:
• stormwater conveyance (major and minor);
• stormwater quality;
• utility services (including emerging technologies); and
• lighting.
Element 2 is in two sections:

**Section A – Structure planning of the neighbourhood movement network**

This section provides strategies that address the structure planning of the movement network for the overall neighbourhood area, its external connections, boundary roads, internal collector streets.

The outcome of this work will confirm the key features of the neighbourhood that need to be considered at the more detailed concept design phase for the neighbourhood streets. These key features include:

- land uses (residential, non-residential, schools, parks, shops);
- physical constraints and opportunities (topographical, drainage, infrastructure, open space corridors);
- movement desire lines (pedestrians, cyclists and motor vehicles);
- climatic considerations – prevailing breezes, solar orientation;
- place-making opportunities; and
- infrastructure needs.

**Section B – Concept design of the neighbourhood streets**

This section provides strategies that address the concept design of the neighbourhood street network to respond to the structure planning outcomes.

The outcome of this work is identifying the general alignment of the street, open space, bus routes, and active transport paths.

This section does not provide specific dimensions for street sections, rather it suggests typical dimensions and aspects of the street network to be considered in the preparation of a neighbourhood’s concept design.

Part 2 – Detailed Design Guidelines establishes the size and dimension of each of the movement network components and assists in the creation of the appropriate cross-section for each of these components using the “Build-a-Street” concept, whereby the street or movement corridor is assembled from various component elements based upon the outcomes of the structure planning and concept design phases.
SECTION A – STRUCTURE PLANNING OF THE NEIGHBOURHOOD MOVEMENT NETWORK

The aim of the structure planning process is to develop movement network plans for active transport and motor vehicle transport for neighbourhoods.

The primary objectives of these network plans are:

- **A movement network based on a site responsive design.** Site responsive design identifies constraints and natural and cultural assets, underpinning the development of options for the movement networks with the aim of balancing competing interests to create a unique identity and sense of place integrated with neighbouring areas;

- **Safe, comfortable, and convenient active transport environments.** The layout of roads, streets, and open space in neighbourhoods:
  - (a) accommodates active transport infrastructure to connect dwellings with open space, education, recreation, retail, commercial, community, and employment uses in a direct manner;
  - (b) provides active transport infrastructure that ensures perceived and actual safety for pedestrians and cyclists of all ages and level of ability; and
  - (c) maximises comfort and enjoyment of users.

- **Public transport options are facilitated.** The layout of roads and streets in neighbourhoods facilitates existing and potential future public transport networks and links to destinations; and

- **Safe and effective environment for motor vehicles.** The layout of the road and street network provides for the movement of motor vehicles between and within neighbourhoods, whilst maintaining safety for all users (including pedestrians and cyclists.)
2.1. PEDESTRIANS

Objective
To develop a pedestrian movement network plan that provides safe and effective infrastructure to encourage trips by walking (or similar low-speed active transport modes e.g. mobility scooters) that achieve appropriate standards and convenience for equitable access and accessibility within and between neighbourhoods.

Strategy 2.1.1.
Identify desire lines for pedestrian related trips, recognising external neighbourhood connections, land uses, open space corridors, and the limitations of distance and topography.

Estimate approximate (high, medium, low) demand volumes for each desire line.

Strategy 2.1.2.
Identify an appropriate hierarchy of pedestrian pathways, cognisant of the desire lines and demands.

- **Principal Pedestrian Route** – Connects and provides access to and between major destinations (such as principal activity centres, major schools, major sports/recreation areas, rail or bus stations, residential areas).
- **Local (or Neighbourhood) Pedestrian Route** – Connects and provides access between residential areas and neighbourhood destinations.
- **Activity Place** (e.g. main street) – Provides access to commercial, retail, employment and community land uses (such as sub-regional or district activity centres).

Strategy 2.1.3.
Develop a network of pathways to achieve the pedestrian movement objectives.

Tip: To encourage walking trips over motor vehicle trips it is desirable for pedestrian connections to be more direct than motor vehicle routes.
Strategy 2.1.4.
Estimate the likely demands for pedestrian use of each desire line.

Use Table 2 – Typical Road and Street Concept Design Parameters to identify the type of pathway facility necessary to accommodate the appropriate:

- volume of users (one-way and passing);
- type of users (e.g. children, people with disabilities);
- function/purpose (e.g. commuter, recreation); and
- hierarchy (level of importance).
2.2. CYCLISTS

Objective
To develop a cycle movement network plan that provides safe and effective infrastructure to encourage trips by cycling (and/or other active transport modes) with appropriate levels of accessibility within and between neighbourhoods.

Strategy 2.2.1.
Identify desire lines for cyclist-related trips, recognising external neighbourhood connections, land uses, open space corridors, and limitations of distance and topography.

Estimate approximate (high, medium, low) demand volumes for each desire line.

Strategy 2.2.2.
Identify an appropriate hierarchy of cyclist routes, cognisant of the desire lines and demands.

- **Principal Cycle Route** – Connects major regional destinations (e.g. activity centres, major schools, major sports/recreation areas).
- **Secondary Cycle Route** – Connects to principal routes and attractors (e.g. rail or bus stations, neighbourhood centres, other schools).
- **Local (or Neighbourhood) Cycle Route** – Connects to secondary routes and provides connections to minor attractions (e.g. parks, residential areas).

Strategy 2.2.3.
Develop a network of cycleways to achieve the cycling movement objectives. This may include cycle lanes (on-street) cycle paths and shared paths (within the street or open space corridor).

Tip: To encourage cycling trips over motor vehicle trips it is desirable for cycling connections to be more direct than motor vehicle routes.

The network of cycle routes may be integrated with the other movement network infrastructure (e.g. shared paths, shared corridors, on-street) to reduce the width of the overall verge or street reserve.
Strategy 2.2.4.

Estimate likely (high, medium, low) demand volumes for cyclist use of each desire line.

Use Table 2 – Typical Road and Street Concept Design Parameters to identify the type of cycle facility necessary to accommodate the appropriate:

- volume of users (one-way and passing);
- type of users (children, confident);
- function/purpose (commuter, recreation);
- hierarchy (level of importance); and
- Level of Traffic Stress (LTS).

Refer to Practice Note 6: Design for cyclists.
2.3. PUBLIC TRANSPORT

Objective
To develop a public transport network plan that provides effective corridors and infrastructure to enable the implementation of an efficient public transport system. The network should allow public transport services to operate as effective/comparable transport services to private motor vehicle modes. The infrastructure should achieve appropriate standards, convenience, and levels of accessibility within and between neighbourhoods.

Strategy 2.3.1.
Identify catchment areas, including origins and destinations, for users of the public transport network/service, recognising external connections, land uses, and the limitations of distance and topography.

Estimate the likely (high, medium, low) demand volumes for public transport users.
Strategy 2.3.2.
Identify an appropriate hierarchy of public transport routes, cognisant of the origins, destinations and demands.

- **Principal Public Transport Route** – Provides regular services to/from major regional destinations (e.g. principal activity centres, major schools, major employment centres, major rail or bus stations).
- **Secondary Public Transport Route** – Provides services to/from district level destinations (e.g. district centres, other schools) and/or connection with principal routes (e.g. via interchange locations).
- **Local (or Neighbourhood) Public Transport Route** – Provides services to/from local attractions (e.g. neighbourhood centres, schools).

Strategy 2.3.3.
Develop a network of public transport routes (roads and streets of sufficient width), public transport stops and pedestrian connections (pathways to/from public transport stops), and associated infrastructure to achieve the public transport objectives.

Within neighbourhoods the network of public transport routes will typically be integrated with the other movement network infrastructure (e.g. road and street corridors) rather than in a separate corridor.

To encourage public transport trips (over other motor vehicle trips) it is desirable for public transport routes and stops to deliver a service that can compete with other motor vehicle trips.

Strategy 2.3.4.
Identify the likely principal, secondary and local public transport elements that ensure 90% of residents are within 400m of an existing or potential bus route.
2.4. MOTOR VEHICLES

Objective
To develop a major road and street network plan that provides safe and effective infrastructure to accommodate trips by motor vehicles (typically private motor vehicles) within and between neighbourhoods. Traffic safety considerations should include interaction with other movement networks.

Ensure that the road and street network for motor vehicles does not compromise the pedestrian and cycle objectives and strategies.

Strategy 2.4.1.
Identify the network of existing, proposed, and required roads (arterial and sub-arterial) carrying through traffic which connect to and traverse the study area. This network should be external to the neighbourhoods.

Strategy 2.4.2.
Identify a pattern for the key neighbourhood street network (major collector and collector) recognising the necessary connections to the external road network (arterial and sub-arterial).

Estimate the likely motor vehicle traffic volumes for each of the key neighbourhood streets using the trip generation rates from Practice Note x: Design for motor vehicles (trip generation and speed control) unless more exact information is available for the likely neighbourhood demographics.

Strategy 2.4.3.
Allow for an arterial road spacing of 1-2km and spacing of intersections along an arterial road from the neighbourhood street network of between 300-500m.

Strategy 2.4.4.
Allow for a sub-arterial road spacing of 0.8km to 1.6km and spacing of intersections along a sub-arterial road from the neighbourhood street network of between 200-300m.

Tip: These spacings may need further refinement near activity centres. Refer to Part 1, Element 5 - Activity Centres.
Recommended Road Hierarchy

**Arterial**
The primary objective of an arterial road is to serve as a major through traffic carrying route. Arterial roads will carry motor vehicle traffic efficiently whilst facilitating pedestrian and cycle movements along the corridor and across the corridor at strategic locations. They also play a key role in the public transport network.

Arterial roads are typically higher volume four-lane roads and will often form the principal connection between major regional/activity centres and/or suburbs.

**Sub-arterial**
Sub-arterial roads will typically provide a traffic carrying connection between residential, commercial, or industrial areas and arterial roads. They should serve a more efficient/convenient route than using the street network.

Sub-arterial roads are typically two- to four-lane roads that carry motor vehicle traffic efficiently whilst facilitating pedestrian and cycle movements along the corridor and across the corridor at strategic locations. They also play a key role in public transport.
Recommended Neighbourhood Street Hierarchy

**Major Collector**
A Major Collector generally has restricted or limited direct motor vehicle access to individual properties. Major Collector streets provide linkage between and within neighbourhoods to facilitate short trips for pedestrians, cyclists, and motor vehicles in a calm and low-speed environment. Major Collectors also provide connection between the Collector streets and the external road network (arterial and sub-arterial) and are the preferred location for any public transport route through a neighbourhood.

Development frontage to collector streets is appropriate for residential (and non-residential) development and parking is typically encouraged. They should not attract through traffic that leads to rat running by motorists.

Major collector streets are typically provided where the function and/or traffic volume on that street is such that there is a need to achieve higher traffic efficiency and/or to provide improved safety of users. On major collector streets, the following may be necessary:

- restricted or limited vehicular access to property (e.g. consolidated driveways, centre median, turning lanes);
- indented bus stops;
- indented parking lanes;
- separated cycle facilities (i.e. separate from motor vehicle traffic and/or pedestrians); and
- wide verges suitable for landscape/streetscape improvements.

**Collector**
A Collector Street provides direct motor vehicle access to individual properties. Collector streets provide linkage between and within neighbourhoods to facilitate short trips for pedestrians, cyclists, and motor vehicles in a calm and low-speed environment. Collectors also provide connection between the local neighbourhood access streets and the external road network. They may be used as a public transport route through a neighbourhood.

Development frontage to collector streets is appropriate for residential development. Vehicular access and parking are typically encouraged due to relatively low traffic volumes. They should not attract through traffic that leads to rat running by motorists.

**Access**
An access street provides direct access to individual properties. An access street also provides a connection to other access streets but is not so significant that it would function as a collector street.

It should facilitate movement by pedestrians and cyclists, without significant constraint by motor vehicle traffic needs. In general public transport does not utilise an access street.

**Local Access**
A local access street provides direct access to individual properties. A local access street is one that services only motor vehicle traffic for that street (i.e. it does not serve other streets) but allows the necessary connections for pedestrians and cyclists from other streets. It typically represents a cul de sac.

Public transport should not utilise a local access street.

**Laneway**
A laneway provides a very low volume, very low speed environment that provides vehicular access to the rear (or side) of individual properties, typically where vehicular access from the front of the lot is undesirable (for improved front street aesthetics or direct access to open space) or not achievable (due to road hierarchy, high traffic volumes or high demand for on street parking on the frontage street). A laneway services only motor vehicle traffic for that street (i.e. it does not serve other streets) but allows the necessary connections for pedestrians and cyclists from other streets.
CHAPTER 2 - SITE RESPONSIVE DESIGN

2.5 SITE RESPONSIVE DESIGN

Objective
The layout of streets in a neighbourhood:
(a) preserves and celebrates, where possible, the cultural elements, history, and vistas of the neighbourhood;
(b) addresses the context of surrounding existing and proposed future development;
(c) respects the natural slope and drainage lines; and
(d) provides opportunities for and is responsive to ecological corridors.

Strategy 2.5.1:
A site analysis is undertaken to identify matters to be accommodated in the design process.

Tip: The best urban design outcomes are likely with a multi-disciplinary approach (urban design, planning, engineering, landscape architecture, and marketing) to address these matters and balance competing objectives in the design process.

Refer to Practice Note 1: Walkable and legible neighbourhoods

Strategy 2.5.2:
A neighbourhood’s street layout connects with surrounding roads and streets in accordance with the overall future development structure and planning scheme provisions and by providing the appropriate connectivity for all transport modes.
Strategy 2.5.3:
To address site drainage issues the street layout:
• recognises and mirrors drainage lines;
• can accommodate the major drainage flows within the street reserves and open space drainage paths with appropriate freeboards and with due allowance for extreme events; and
• is designed to avoid trapped sags that result in overland flow paths through properties.

Tips:
1. The street layout should be developed in parallel and integrated with the site-based stormwater management and/or integrated stormwater management plans.
2. Designers should demonstrate at the street network planning stage that major drainage flows ($Q_{100}$) can be accommodated in the street carriageway with the required freeboard.
3. If stormwater quality management is to occur within the street reserve, designers should demonstrate that this is achievable within the street reserve and is a low maintenance cost solution.

Strategy 2.5.4:
Existing site vegetation is retained where practicable.

Tip: The street reserve may provide opportunities for increasing a neighbourhood’s green infrastructure where existing site vegetation (not impacted by infrastructure and not adversely impacting on other objectives) can be accommodated within the street reserves.

Refer to Practice Note 2: Increasing trees in our neighbourhoods.
2.6 SENSE OF PLACE, COMMUNITY AND SAFETY

Objective
The layout of streets in a neighbourhood contributes positively to the sense of place and community identity and reinforces their intended role and function.

Strategy 2.6.1:
Place making is enhanced by roads and streets that:
• identify and promote key gateways and nodes;
• are aligned with distant views and site features;
• provide both visual and physical connections to open space areas; and
• provide opportunities to highlight special characteristics of the neighbourhood (e.g. vegetation, cultural and heritage elements, architectural features).

Strategy 2.6.2:
The typical maximum street length, to achieve good pedestrian connections for each neighbourhood street type is:
• Collector – generally no maximum
• Access – 150-220 metres
• Local Access – 150 metres
• Laneway – 150 metres
Refer to Practice Note 1: Walkable and legible neighbourhoods

Strategy 2.6.3:
The length of Major Collector street with no direct residential lot access within a neighbourhood is minimised.

Tip: Driveways for individual property access may need to be constrained in some situations:
• if < 5,000vpd then access is permitted, and
• if > 5,000vpd then access restrictions/limitations need to be considered.
Strategy 2.6.4:
To assist in encouraging appropriate users’ behaviour, the design features of each type of street convey its primary function.

Tips: Techniques to assist in reading the function of a street:
• streets link with other streets that are no more than two levels higher or lower in the hierarchy;
• consistent street naming convention (e.g. drive, circuit, place, etc), and
• hierarchy in street infrastructure (e.g. planting, thresholds, etc).

Strategy 2.6.5:
The street layout facilitates way finding within the neighbourhood.

Tip: For legibility, the layout should not generally exceed 3rd order i.e. a driver should not have to make more than three turns or utilise more than three different streets between the neighbourhood Collector Street system and the destination.

Strategy 2.6.6:
The street layout discourages crime, vandalism, and anti-social behaviour by facilitating casual/passive surveillance of streets, paths and parkland through applying Crime Prevention Through Environmental Design (CPTED) principles (see CPTED Guidelines for Queensland Parts A and B).

Strategy 2.6.7
The street layout and other features, taken together, promote a suitable speed environment with the Target Maximum Speeds in the table below.

<table>
<thead>
<tr>
<th>Street Classification</th>
<th>Target Maximum Speed (km/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Collector</td>
<td>60</td>
</tr>
<tr>
<td>Collector</td>
<td>40 – 50</td>
</tr>
<tr>
<td>Access Street</td>
<td>30 – 40</td>
</tr>
<tr>
<td>Local Access Street</td>
<td>30</td>
</tr>
<tr>
<td>Laneway</td>
<td>20</td>
</tr>
</tbody>
</table>

Table 1 – Target Speeds for Streets

Practice Note x: Design for motor vehicles (trip generation and speed control)
2.7  FIT FOR PURPOSE

**Objective**
The streets in a neighbourhood have an alignment, width, and geometric design to accommodate:
(a) active, public, and motor vehicle transport infrastructure;
(b) motor vehicle access to dwellings;
(c) stormwater drainage (underground and overland) conveyance (minor and major);
(d) stormwater quality infrastructure;
(e) street trees and urban vegetation for urban cooling and stormwater quality management;
(f) utility services infrastructure (e.g. water, sewerage, telecommunications);
(g) refuse, delivery, and emergency service vehicles; and
(h) visitor parking.

**Tip:** In the absence of detailed design or specific network requirements, the neighbourhood street network will typically include the parameters in Table 2—Typical Road and Street Concept Design Parameters.

Refer to Part 2 Street Design Manuals for the Build-A-Street approach to determining street reserve widths.

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**Strategy 2.7.1:**
The street layout:
• delivers the desired active transport network in the most direct and safe manner by street reserves, pathway, and open space connections accommodating the size and types of pedestrian and cycle paths identified for that network;
• provides pedestrian and cycling infrastructure to connect:
  ° to open space and active movement networks in the surrounding area;
  ° open space, educational, employment, and community facilities within the neighbourhood; and
• provides for the pedestrian and cycling infrastructure needed for all streets.

---

**Strategy 2.7.2:**
The layout of the street network should be such that an appropriate level of connectivity and driver convenience is achieved.

**Tip:** The objective is to achieve a travel time of typically no more than 90 seconds within the low-speed environment of 36km/h (on average). The above seeks to avoid a situation where drivers are frustrated by excessive travel time at slow speed and might then seek to inappropriately increase their speed in the street network.

To achieve this, the street network should typically provide no more than 900m travel distance on the low-speed (<50km/h) street network between any lot and the Major Collector street or road network.
Strategy 2.7.3
The spacing of intersections along a Major Collector street is typically not less than 100m and along a collector street is typically not less than 60-100m.

Strategy 2.7.4:
Where residential densities exceed 15dws/ha, the street layout is predominately a rectilinear grid pattern or modified grid pattern responsive to topography and constraints with street block dimensions 150-220m in length.

Tip: To ensure that pedestrian and cycle paths are direct and avoid convoluted vehicle travel paths, the grid or modified grid pattern may benefit from four-way intersections. Refer to Part 2 of the Street Design Manuals for guidelines for their use and design.

Strategy 2.7.5:
The use of culs de sac is minimised.

Where culs de sac are used as an outcome of topographical constraints, they form part of a predominantly connected grid layout for the street and/or open space reserves, such that active transport routes are shorter and more convenient than motor vehicle routes.

Tip: Preferred cul de sac designs:
- limit their length of straight alignment to 130m to control vehicle speeds, and
- ensure the end (at least for pedestrian or cyclist connectivity) can be seen when turning into the cul de sac.

A wide pathway connection is provided at their end which complies with CPTED principles.
Strategy 2.7.8:
The introduction of rear laneways facilitates the achievement of residential densities greater than 15dws/ha and:

- minimises the number of vehicle crossovers of pedestrian and cycle paths;
- provides a suitable design solution for some no-access street locations; and
- delivers positive contribution to onsite and on-street carparking.

Tips Successful laneways:
- are not too long, nor too wide;
- introduce vegetation;
- have dwellings with habitable areas providing passive surveillance of the lane; and
- have reduced truncations at their entry and internal corners.

Refer to Practice Note 5: Rear lane design

Strategy 2.7.6:
To improve resident amenity and safety for active transport users, neighbourhood streets do not operate as through traffic routes for externally generated motor vehicle traffic.

Tip: The likelihood of such shortcutting or rat running may be minimised in two ways:
- The situation can be minimised by identifying the most likely ratrunning movements in the morning and evening peaks and keeping connections through the neighbourhood generally at right-angles rather than parallel to the main traffic movements, and/or
- off-setting intersections of residential streets to arterials, rather than using four-way signalised intersections or roundabouts.

Strategy 2.7.7:
The street layout results in generally 90% of proposed lots within 400m of an existing or potential bus route.
2.8 LAND USE EFFICIENCY

Objective
The layout of streets in a neighbourhhood provides for all required infrastructure and user requirements as efficiently as possible.

Strategy 2.8.1:
The street reserve widths are:
• the minimum total of the necessary verge, parking, and vehicle movement pavement widths as required by the street type and residential density; and
• increased where desirable for place creation and existing tree retention/additional tree planting.

Tip: As a general rule, street reserve percentages will typically be:
• Neighbourhoods less or equal to 15dws/ha 25 %
• Neighbourhoods 15-20dws/ha 25-30%
• Neighbourhoods 20-30dws/ha 30-35%

Notes:
1. Street reserve % = street area/(lot area + street area).
2. Usually no additional on-street parking allowance required.
3. May require some additional reserve area for on-street parking areas and/or rear lanes.
4. Will require additional reserve area for rear lanes and additional on-street parking areas.

Road reserve area increases for additional tree retention may be necessary depending on the extent of trees retained.

Refer to Practice Note 1: Walkable and legible neighbourhoods and Practice Note 2: Increasing trees in neighbourhoods for additional details.
2.9 CLIMATICALLY RESPONSIVE

Objective
The layout of roads and streets in a neighbourhood delivers a lot orientation that facilitates energy-efficient buildings and site design by:
(a) maximising solar access to the north in winter; and
(b) minimising solar access to the west in summer.

Strategy 2.9.1:
Where not constrained by other design matters (e.g. topography, views, drainage, etc) street alignments have predominately north-south or east-west orientation.
### ELEMENT 2 – MOVEMENT NETWORK – CONCEPT DESIGN

#### Table 2 – Typical Road and Street Concept Design Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Lane</th>
<th>Local Access Street</th>
<th>Access Street</th>
<th>Collector</th>
<th>Major Collector</th>
<th>Sub-Arterial</th>
<th>Arterial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical max. volume (vpd¹)</td>
<td>&lt; 250</td>
<td>&lt; 1,000</td>
<td>&lt; 3,000</td>
<td>&lt; 6,000</td>
<td>&lt; 7,500</td>
<td>&lt; 10,000</td>
<td>&lt; 30,000</td>
</tr>
<tr>
<td>Direct residential lot access</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes²</td>
<td>No³</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Indicative range of reserve widths (m)</td>
<td>6.5 – 8.0</td>
<td>13.5⁴ – 15.5</td>
<td>15.5 – 16.5</td>
<td>18 – 20</td>
<td>20 – 25</td>
<td>20+</td>
<td>25+</td>
</tr>
<tr>
<td>Desired max. length (m)</td>
<td>150</td>
<td>150</td>
<td>220</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Intersection spacing min. (m)</td>
<td>n/a</td>
<td>40</td>
<td>40</td>
<td>60 – 100</td>
<td>100</td>
<td>200 – 300</td>
<td>300 - 500</td>
</tr>
<tr>
<td>Pedestrian paths</td>
<td>Shared</td>
<td>One side</td>
<td>One side⁴</td>
<td>Both sides</td>
<td>Both sides</td>
<td>Both sides</td>
<td>Both sides</td>
</tr>
<tr>
<td>Cycle paths, either</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cycle lanes on carriageway</td>
<td>Shared</td>
<td>No</td>
<td>No</td>
<td>Yes⁵</td>
<td>Yes^6</td>
<td>Possibly⁷</td>
<td>Possibly⁷</td>
</tr>
<tr>
<td>• Off carriageway shared</td>
<td>No</td>
<td>No</td>
<td>Yes⁵</td>
<td>Yes^6</td>
<td>Yes³</td>
<td>Yes⁴</td>
<td>Yes⁴</td>
</tr>
<tr>
<td>• Off carriageway separated</td>
<td>No</td>
<td>No</td>
<td>Yes⁵</td>
<td>Yes^6</td>
<td>Yes³</td>
<td>Yes⁴</td>
<td>Yes⁴</td>
</tr>
<tr>
<td>Bus route</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Possibly⁷</td>
<td>Likely</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Notes:**

A. The street category should be determined by the function it performs and not just the motor vehicle traffic volume.

B. The determination of the appropriate type of cycle path and its dimensions should be the outcome of an analysis of the type and volume of cyclist activity and the motor vehicle speeds in the street.

1. For concept planning purposes, a rule for traffic generation is 8 vpd/2+ bedroom dwellings, 7 vpd/1-2 bedroom dwellings and units.

2. Direct vehicle access from residential lots is typically acceptable up to 5,000vpd. Above this traffic volume, direct access might be acceptable depending on the number of driveways, parking, and moving lane configuration. Usually no direct access is appropriate where traffic volumes exceed 7,500vpd.

3. Local access street reserves of 13.5m with narrower carriageways of 5.5m are suitable for local access streets for up to 50 contributing lots, providing traffic volumes are low and there is low potential for conflict between lot access/egress and on-street parking (e.g., few narrow frontage lots). For greater than 50 contributing lots, a carriageway width of 7.5m is recommended.

4. Unless required as part of the pedestrian movement network or in near vicinity of community facilities, parks, or schools where both footpaths both sides are appropriate.

5. Unless required as part of the cycling movement network or in near vicinity of community facilities, parks, or schools where the circumstances indicate this is a preferred solution.

6. Dependent upon the estimated pedestrian and cyclist demand.

7. Pedestrian access to loft homes on laneways to a street or park is no more than 75m. This may require a mid-block pedestrian link.
ELEMENT 3 – NEIGHBOURHOOD OPEN SPACE NETWORK

Overview

In the creation of a healthy, vital neighbourhoods, the open space network:
• encourages and promotes outdoor activities;
• creates a series of interconnected paths and spaces that promotes healthy communities;
• provides a range of local park opportunities;
• accommodates the planned location of trunk open space infrastructure;
• contributes to the legibility and character of the neighbourhood;
• links to existing parkland or open space networks wherever possible;
• meets the community’s needs and is designed to maximise use by the community it serves;
• offers a broad range of informal and formal experiences to the community; and
• provides opportunities for stormwater quality and quantity management.

As our new communities are developing at higher densities, the roles of open space are increasingly important:
• in connecting our commutes either by foot, cycle, or small electric vehicle;
• improving micro-climate through larger shade trees;
• allowing for informal recreation and socialisation opportunities; and
• creating a range and choice of open space opportunities and experiences.

Key design drivers are:
• embellished areas in urban developments provide greater community value than un-embellished; and
• greater utilisation of drainage and environmental reserves for community use increases the open space usage and allocation for the community.

The following objectives are designed to allow place-based solutions that are able to address the needs of the changing and evolving needs of our communities.
3.1 Adequate Provision of Neighbourhood Open Space

Objective
Sufficient land is provided for neighbourhood open space and community facilities appropriate to the characteristics of the neighbourhood and local community needs.

The different types of open space (local recreational parks) incorporated into four key types:

1. Informal parks;
2. Kick and play areas;
3. Linear park (e.g., hike, bike, and exercise tracks); and
4. Urban parks.

Strategy 3.1.1
The different types of local recreational parks are often stand-alone or incorporated into higher order open space types. The rates of provision of open spaces (local recreational parks) for neighbourhoods satisfies the area requirements of the Local Authority with the proportion of open space provided creditable as suggested in the table below.

<table>
<thead>
<tr>
<th>Park Type</th>
<th>Percentage Creditable Area ¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informal Park (tree retention)</td>
<td>75% (100% of natives)</td>
</tr>
<tr>
<td>Kick and Play</td>
<td>100%</td>
</tr>
<tr>
<td>Linear Park (inc. hike and bike)</td>
<td>40% of identified corridor</td>
</tr>
<tr>
<td>Urban Parks</td>
<td>125%²</td>
</tr>
</tbody>
</table>

¹ For each Park Type the area creditable against the area requirement of the Local Authority is the actual area of park provided multiplied by the relevant percentage.

² acknowledging that Urban Parks are generally provided for densities >25dws/ha and are more highly embellished

Tip: Each neighbourhood will have differing needs and requirements for open space provision as well as unique opportunities provided by its topography and site characteristics, as well as opportunities to co-locate open space and community uses.

Embrace topography. Not all parks need to be flat, kick-around spaces. Steep topography provides opportunities to vary recreational outcome and experience.
3.2 THE NEED FOR SOCIALISATION, INFORMAL RECREATION OPPORTUNITIES, AND DIVERSIFICATION

Objective
An open space recreational network that caters for changing needs within our communities is needed to ensure that we design for the whole of the community. Master Planning new areas will need to address opportunities that support healthy lifestyles and social interaction across a range of open space opportunities.

Strategy 3.2.1
Incorporate smaller embellished public spaces that are interconnected by a series of linear parks throughout the master planned area as part of a pedestrian or cycle network.

Tips:
- Seek to locate open space with points of interest, connected by pathways that offer attractive and pleasant walking/cycling circuits with a length of around 2km offering an ability for a 20-40 minute walk.
- The pathways should address both community-based linkages as well as passive recreational opportunities.
- Maximise the recreational and potential for social interaction in areas of open space by co-location of uses that offer opportunities for different user groups at different times of the day and of the week.

Strategy 3.2.2
Identify possibilities for informal recreation opportunities within areas that have a primary use of drainage or other requirements

Tip: Some drainage reserves, future road corridors, or energy easements may offer permanent or medium-term opportunities for incidental open space for informal recreation uses.

Maintenance and credit based open space systems at a local government level could be redefined to facilitate developments delivering the opportunities to support this strategy.

Strategy 3.2.3
Community and open space design incorporate a health and wellbeing plan that illustrates the various tracks, paths, and interconnected destinations (e.g. schools, shops, parks) that deliver:
- safe, attractive, and convenient paths for students to walk and cycle to school, community facilities, shops, and public transport nodes;
- substantial shade trees within the street and open space segments of these paths;
- lighting design which has been integrated with the tree planting design; and
- maximum use of stormwater for irrigation of trees and open space.
### 3.3 OPEN SPACE PROVISION THROUGH TYPE, SIZE, SHAPE, AND FUNCTIONALITY

**Objective**

Open space provision is reflective of creating liveable and healthy communities. Modern densities with its range of typologies requires us to provide a range of open space outcomes that together meet the overall needs of a diverse community and their evolving expectations.

**Strategy 3.3.1**

The options for the provision of open space:

<table>
<thead>
<tr>
<th>Park Type</th>
<th>Design Intent</th>
<th>Neighbourhood requirement</th>
<th>Minimum size and shape</th>
<th>Shape and characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informal park</td>
<td>Provide visual amenity and / or key linkages.</td>
<td>Provision of green space.</td>
<td>250m² of usable land</td>
<td>Minimum dimension 10 metres</td>
</tr>
<tr>
<td>Kick and play</td>
<td>Local parkland to encourage kick and play activities</td>
<td>Minimum of 1 kick and play.</td>
<td>2,000m² of usable kick about area</td>
<td>Minimum frontage dimension of 30m</td>
</tr>
<tr>
<td>Linear park (inc. hike, bike and exercise tracks)</td>
<td>Linking open space for connectivity Active May be included within some environmental parks</td>
<td>To provide connectivity and recreational opportunities.</td>
<td>Minimum width 10m</td>
<td>Linear as part of drainage corridor and or environmental corridor Inc. hike, bike and exercise paths/ tracks</td>
</tr>
<tr>
<td>Urban parks</td>
<td>Highly embellished urban spaces</td>
<td>For development of 25dws/ha and more and urban space is to be provided at a maximum spacing of 200m</td>
<td>250m²</td>
<td>N/A</td>
</tr>
</tbody>
</table>
3.4 LOCAL OPEN SPACE DISTRIBUTION

Objective
Within residential areas, local recreation parks are created which provide informal recreational opportunities to supplement private open space of the neighbourhood.

Strategy 3.4.1
Local recreational public open space areas are provided generally within the following distances of 90% of dwellings:

• 400m for a residential density < 25dws/ha; and
• 200m for a residential density > 25dws/ha.

Tip: Public open space requirements may be achieved by delivering small embellished local parks, incidental open space areas within infrastructure corridors, or district and regional open space areas and corridors.
3.5 LOCAL PARK TYPOLOGY DESIGN INTENT

Objective
The range of park types each have distinct characteristics and ways of meeting local community needs.

Strategy 3.5.1
The integration of flood and stormwater management practices into parks provides for efficient use of land and a practical compromise between water management and recreational use is provided where the flood immunity of parks and their facilities satisfies:

- local recreation parks – 10% min. of their area >2% AEP;
- urban parks – 5% min. of their area >2% AEP;
- other recreation parks – 70% min. of their area >20% AEP;
- sports parks – playing surfaces >5% AEP; and
- clubhouse, toilets and amenities blocks >1% AEP.

100% of area above 50% AEP is credited towards park contribution.

Strategy 3.5.2
The finished surface levels of all open space areas (exclusive of linear parks and major recreation parks) have:

- areas intended for active recreation and sports activity (and associated areas) free draining and with a slope between 1-3%;
- 80% of their area with a slope <=10%;
- the desirable maximum slope for grassed (mowed) areas of 16% (1 in 6) and absolute maximum slope of 25% (1 in 4); and
- maximum slope of planted batters of 33% (1 in 3).

Strategy 3.5.3
Local Kick and Play parks:

- have a minimum usable area of:
  » 2,000m² where residential densities are less than 20 dws/ha;
  » 1,000m² where residential densities exceed 20 dws/ha; and
- are predominantly square or rectangular with a dimension ratio no greater than 2:1.

Shade is provided to:

- 50% of the length of walking and cycling paths; and
- 50% of formal seating areas.

Tip: Shade can be provided by existing or new trees at maturity or shade structures. Percentage of shading should be calculated as at 9am or 3pm on 22 December.

Lighting and tree planting design should be integrated to ensure achievement of lighting design objectives.
Strategy 3.5.4
Linear Park:
• have a minimum usable area:
  » to accommodate walking tracks and other passive recreational uses where appropriate;
• opportunities for other recreational uses will have a grade of no more than 1:10 for a min. of 80% of their area; and
• Provide as a minimum a 2.5m wide concrete path.
Shade is provided to:
• 50% of the length of walking and cycling paths; and
• 33% of informal seating areas.

Tip: Shade can be provided by existing or new trees at maturity or shade structures. Percentage of shading should be calculated as at 9am or 3pm on 22 December.

Strategy 3.5.5
Local Hike Bike and Exercise tracks:
• have a minimum usable area:
  » to accommodate walking tracks and exercise tracks; and
• Provide as a minimum a 2m wide informal path.
Shade is provided to:
• 50% of the length of walking and cycling paths.

Tip: Shade can be provided by existing or new trees at maturity or shade structures. Percentage of shading should be calculated as at 9am or 3pm on 22 December.

Strategy 3.5.6
Urban Parks:
• have a minimum usable area of:
  » 250m² where residential densities are equal or greater than 25dws/ha; and
• have a grade of no more than 1:10 for a min. of 100% of their area.
Shade is provided to:
• minimum 50% of the urban space.

Tip: Shade can be provided by existing or new trees at maturity or shade structures. Percentage of shading should be calculated as at 9am or 3pm on 22 December.
3.6 MULTIPLE USE

Objective
A holistic approach is undertaken to the delivery of open space and service infrastructure which specifically considers multiple use of open space to optimise land uses and achieve the efficient use of land.

Strategy 3.6.1
The neighbourhood’s open space design recognises that efficient use of valuable greenfield land requires open space areas to have multi-use outcomes.

Tip: Co-location of community open space with education facilities.

Objective
Seek opportunities to introduce water (‘blue space’) into the neighbourhood’s open space network.

Strategy 3.6.2
Consider opportunities to introduce lakes and other permanent water bodies in parks provided they:
- form part of an overall integrated stormwater management system;
- are located in district or major recreation parks;
- are highly visible;
- have safe and active edge treatments; and
- are designed to maintain the required levels of water quality and minimise ongoing maintenance costs.

Tip: To recognize their importance in adding to positively to the open space and health of the community, a credit is provided towards the required open space provision of:
- Where the water quality standard supports secondary contact recreation – 50% of the water surface at normal fill level; and
- Where the water quality standard does not support secondary contact recreation – the area between the edge of the water body at normal fill level and a line 5m in from the water edge.
ELEMENT 4 – LOT DESIGN

Overview
Lot design and its ability to facilitate diversity of housing typologies and densities are essential in achieving quality urban outcomes. Lot design must be cognisant of and address key issues such as:

• development on slope;
• various typologies and densities;
• streetscape design and the impact of lot types and densities;
• housing typologies and diversity and their overall impact on streetscape character;
• setbacks and separation;
• driveway design and locations;
• relationship to road types; and
• on street parking.
4.1 SITE RESPONSIVE DESIGN

**Objective 4.1.1:**
The design of lots minimises the impact of cut and fill on the visual and physical amenity of the streetscape and adjoining lots.

**Strategy 4.1.1.1:**
Where lot retaining works are not carried out by the developer, lots of 450m² or less are located so that the slope on a lot does not exceed:
- 10% side slope (cross fall); and
- 5% lengthwise slope (longitudinal fall).

**Strategy 4.1.1.2:**
Where lot retaining works are carried out by the developer, retaining walls on side and rear boundaries are limited:
- for lots >50m² to 1m in height unless terraced;
- for lots <=450m² to 1m in height; and
- a maximum of 2.4m where combined with a boundary fence.

Tips:
1. Mid-lot terracing with the house design accommodating the terrace may be a consideration for minimising the extent of retaining walls on rear boundaries.
2. Retaining walls should be entirely contained within the lot to be retained.

**Strategy 4.1.1.4:**
Where a built-to-boundary wall is used as a retaining wall for an adjoining lot it is located on the low side of the lot to avoid drainage issues.

Refer to Practice Note 4: Designing for small lots.

**Objective 4.1.2:**
Lot size and shape facilitates retention of existing appropriate vegetation and planting of major trees in the road verges and lots.
Strategy 4.1.2.1:
If the development approval requires a Plan of Development, consideration is given to:

• increasing the front setback where existing vegetation suitable for retention has been identified as not affected by site earthworks or infrastructure and is within the first 3m of the front boundary;
• increasing front and rear boundary setback to provide sufficient space for deep/large canopy planting providing shade to recreational areas or complementing street verge planting; and
• planting areas being identified on rear lane lots to complement rear lane landscaping.

Strategy 4.1.2.2:
Identify opportunities for localised lot boundary realignment to assist retention of existing vegetation or to facilitate large tree planting adjoining street landscaping.

Tip: Corner truncations might be reconsidered from the standard 3x6m cord truncations to provide increased verge planting for large shade trees.
Varying of the straight front boundary for tree retention is not advisable due to impact on service location.
Standard sized diagramme here
Objective 4.1.3:
Lot size and shape facilitates energy efficient buildings and site design by:
• maximising solar access to the north in winter and minimising solar access to the west in summer;
• maximising access to prevailing summer breezes and minimising exposure to prevailing winter winds.

Strategy 4.1.3.1:
If the development approval requires a Plan of Development, consideration is given to:
• for lots less than 12.5m wide being annotated to require the private open space area and living areas being located on the northern side of lots oriented predominately north-south, or on the eastern side of lots oriented predominately east-west; or
• another solution to confirm the open space and living areas of dwellings on these lots are protected from the western afternoon sun and have winter morning sun access.

4.2 LOT SIZE, HOUSING DIVERSITY, AND STREETSCAPE

Objective 4.2.1:
The lot sizes and their distribution provide for:
• a range of housing options; and
• the higher densities located in the most accessible and well-serviced locations.

Strategy 4.2.1.1:
Lot sizes and shapes suit the standard house plans available from most builders in the local area.

Tip: Builders typically will have standard house plans for:
• lot depths of 25-27m and 30-32m; and
• lot widths of 5m, 7.5m, 10-10.5m, 12.5m, 14-15m and 16-20m.

Tip: Proposed new lot sizes be tested with building designers and the market before widespread introduction.

Objective 4.2.2:
An attractive streetscape is achieved.
Strategy 4.2.2.1:
Narrow lots (i.e. lots less than 12.5m in width) are dispersed and located so that:
• a diversity of housing choice is provided; and
• variety is achieved along the length of a single street block.

Strategy 4.2.2.2:
The lot layout results in no more than:
• eight contiguous narrow lots less than 10m wide except where serviced by
  a rear lane; and/or
• six contiguous narrow lots less than 7.5m wide except where serviced by
  a rear lane.

Strategy 4.2.2.3:
Three or more narrow lots are not located:
• opposite other narrow lots;
• opposite T-intersections;
• at the end of a cul de sac or other area of restricted on-street parking
  (e.g. slow points); and
• to detract from visual appearance of the streetscape (e.g. at prominent
  locations or on major view lines).

Tip: Integrated lots and dwelling design may also achieve the overall
objective without resort to individual lot/dwelling approaches.

4.3 LOT ACCESS, ON-STREET PARKING, AND INFRASTRUCTURE

Objective 4.3.1:
The extent of street frontages dominated by driveways is planned to achieve an adequate provision of on-street visitor
car parking.

Strategy 4.3.1.1:
Where the nett residential density exceeds 15 dws/ha, a carparking
analysis plan is submitted with the development application creating the
lots that shows on-street parking is provided at the rate of 0.75 carparking
spaces per dwelling and are generally located within 50m of the lot.
Strategy 4.3.1.2:
Where the minimum setback to the garage is 5m or more and the nett residential density is less than 15dws/ha a carparking analysis plan is not required.

Tips:
1. Where there is a localised concentration of narrow lots or narrow street pavements restrict on-street parking opportunities a carparking analysis might be required where the residential density is less than 15dws/ha.
2. Where residential densities exceed 17.5dws/ha it is likely that additional parking areas other than just the available on-street parking spaces will need to be designed into the subdivision layout.
3. Where residential densities exceed 20dws/ha it is likely that some rear lane lots will also be required to free up kerb space to achieve the on-street parking requirements.
4. Where residential densities exceed 30dws/ha, it is likely that almost all lots will require rear lane access to ensure the required on-street parking provision.

Objective 4.3.2:
Lot boundaries and titling facilitate the installation of infrastructure and minimise conflict with site planning and dwelling design.

Strategy 4.3.2.1:
The lot design:
• avoids minor mismatches in back property boundaries to minimise building set out mistakes;
• minimises lots significantly constrained by infrastructure or their easements;
• does not include drainage paths within lots; and
• does not result in a significant number of odd shaped lots that are difficult for standard house design and siting.
ELEMENT 5 – ACTIVITY CENTRES

Overview
Activity centres are critical to the support of neighbourhoods – providing retail, recreation, employment, education and community facilities.

In addition, they will be the focus of local and wider public transport services.

However, for the most part the location and design of activity centres is beyond the scope of the Street Design Manual in that:

- higher order centres require detailed, specific investigation, planning, and design and will be located on arterial and sub-arterial roads with a catchment of many neighbourhoods; and
- smaller centres will be typically located on sub-arterial and major collector streets with a catchment of several neighbourhoods and have limited impact on a single neighbourhood.

This element instead focuses on the strategies to ensure the successful intersection of the neighbourhood with the centre and the successful integration of the neighbourhood into the centre design.
5.1 NEIGHBOURHOOD AND CENTRE INTERSECTION AND INTEGRATION

Objective
The design of a centre and the adjoining neighbourhoods complements the uniqueness of the respective neighbourhood and adds to a neighbourhood’s sense of place, community and safety.

Strategies:
1. Activity centres have an interconnected street network of primary streets supported by secondary streets and lanes.

2. The street layout responds to the geometry of the surrounding street network, topography, and orientation.

3. The street network creates blocks of a size that accommodates the land-uses of the centre and enabling active development frontage to each street (i.e. open car parking areas, service spaces, and blank walls of large format retail).

4. Primary streets have a generally continuous active development frontage with no vehicle crossings. Primary streets are high amenity places incorporating local traffic, on-street parking, street trees, and generous paved verges.

5. Secondary street/lanes have a service function with no specific active frontage requirements and include open parking areas, service bays, and blank walls.

6. The focus of the activity centre is a Main Street scaled to suit the size of the activity centre. The main street connects into the broader through-street network and forms a direct and legible connection to surrounding land uses, higher and lower density housing on both sides of the arterial and sub-arterial street network.

7. The main street is a high amenity place with good spatial containment. This street may include bends and offset intersections to create deflected and terminated vistas. The main street has multiple pedestrian crossing points linking key destinations in the centre.

8. The street network provides multiple connections to surrounding areas and land uses. These routes are direct, safer, accessible, legible and memorable for the pedestrians and cyclists.

9. Intersections are designed for safe pedestrian crossings. Roundabouts are incorporated sparingly to enable turning vehicles.

10. Multiple access and egress points are provided onto the existing arterial and sub-arterial road network.

11. Parking is provided on the existing arterial and sub-arterial network to enable active development frontage to these corridors. Streets within centres accommodate additional parking where possible and provides significant on-street parking within the streets.
The Street Design Manual (Walkable Neighbourhoods), Part 2 – Detailed Design Guidelines, provide detailed engineering and landscape design information to support Elements outlined in Street Design Manual (Walkable Neighbourhoods), Part 1.

Part 2 provides guidance on the design of neighbourhood infrastructure including traffic, streets, active transport, landscaping and services.

Part 3 – Practice Notes, provide additional information about matters covered in Parts 1 and 2 with real life examples and supporting information and references.

All parts draw from and include material from Economic Development Qld guidelines and the Queensland Housing Code and Reconfiguration of a Lot Code.

This document revises and replaces previous publications of the Institute, namely Queensland Streets (1993) and Complete Streets (2010). Part 2 utilises the content of these previous publications where applicable and provides updated content based on contemporary leading practice in the design of infrastructure that supports our residential communities.

For the full introduction to and purpose of the Street Design Manual (Walkable Neighbourhoods), please refer to the Introduction in Part 1 of this document.
ELEMENT 1 – RESIDENTIAL STREET DESIGN

Overview
The Residential Street serves a number of functions, including:
• motor vehicle access – for residents, visitors, delivery, and service vehicles;
• movement of cyclists and pedestrians;
• parking – for visitors’ vehicles and overspill of residents’ vehicles, caravans, and boats;
• social and activity space – for neighbours to chat and children to play;
• streetscape and amenity – for residents and the general public;
• stormwater quantity and quality management – both underground and overland flow; and
• location of services – utility services to residences.
1. General Design Requirements

Objective
To achieve a reasonable compromise between designing for the motor vehicle and requirements of other street users. More vulnerable street users should be considered in order of priority over motor vehicles in design of the residential street system.

Strategy 1.1.1
Manage the conflict between motor vehicles and other street users by considering the function of Traffic Volume and Traffic Speed.

The greater the traffic volume and speed the greater the detriment to the goals of safety, amenity, convenience, and economy.

- **Safety** – greater chance of accidents with volume and increase in accident severity with speed.
- **Amenity** – increased traffic noise and exhaust fumes.
- **Convenience** – fewer opportunities for pedestrians to cross roads and drivers to enter traffic streams.
- **Economy** – greater construction costs to safely provide for increased traffic volume and speed.

Tip: Limit traffic volume and speed in residential streets to a level compatible with the safety and amenity of other street users. Above the acceptable limit of traffic volume, direct frontage of residential lots to the street should be avoided.

Strategy 1.1.2
Design the residential street system to provide for the characteristics of the various street users:

(a) Vehicles are mostly cars with some light delivery vehicles. There is the occasional larger vehicle such as:
   - garbage truck (weekly or bi-weekly);
   - larger truck (e.g. transporting building materials);
   - furniture van;
   - resident’s boat or caravan; and
   - local bus service - rarely, and then on a major street only.

(b) Pedestrians and cyclists are the most vulnerable street users and must be provided with convenient routes and a safe environment.

Tips
1. Larger vehicles must be able to negotiate the street but as they are less frequent, reduced speed and reduced passing clearances are acceptable for the situation of a car passing a truck or bus, and even more so for the rarer event of two trucks or buses passing.
2. Provide a low-speed environment, separate paths, and safe crossing points to promote pedestrian and cyclist safety.
Strategy 1.1.3
Implement the basic principle that vehicles do not have unrestricted two-way movement at all times in the low-volume, low-speed, residential street environment. This approach differs for different components of the network, i.e.:
• residential street - give way situations; and
• traffic route - unrestricted two-way movement.

Tips:
1. A vehicle having to slow or stop for a vehicle coming the other way will keep speeds low, which is in accordance with the design philosophy for residential streets.
2. Provide “One-Moving Lane” in lower order residential streets (whether constructed that way or caused by parking of vehicles) provided that:
   • passing opportunities are available at reasonable intervals; and
   • the incidence of opposing vehicle meetings is not sufficiently frequent to cause unreasonable delays.

Strategy 1.1.4
Provide street carriageways that clearly achieve three functional components as far as vehicles are concerned:
• a single moving lane;
• provision for opposing vehicles to pass; and
• provision for parked vehicles.

In subsequent elements, carriageway width is referred to in terms of the number of lanes e.g. Single Lane, Two Lane, or Three Lane. This does not imply either that lanes are linemarked on the carriageway, nor that a particular width of the carriageway is dedicated to a particular purpose.

Tip: As appropriate to the street type, provide a carriageway width designed to accommodate one, two, or three vehicles within its cross-section, irrespective of whether those vehicles are moving or parked.

Summary of Objectives – Element 1.1:
To provide:
• a high level of safety for all street users;
• acceptable levels of residential amenity and protection from the impact of traffic;
• a reasonable level of convenience for all street users; and
• maximum possible economy of construction, consistent with the other objectives.

Overall Performance Outcomes – Element 1.1:
(a) Limit traffic speed and volume in residential streets to be compatible with the safety and amenity of other street users and residents;
(b) Frontage of residential lots to be permitted only to streets where limitations of traffic speed and volume can be attained; and
(c) Limit carriageway and verge widths to the minimum necessary to satisfactorily provide for required traffic and active transport functions.
1.2  HIERARCHY OF STREET USERS

**Objective**
To achieve a reasonable compromise between designing for the needs of motor vehicles and those of other street users. More vulnerable street users should be considered as a higher priority over motor vehicles in design of the residential street system.

**Strategy 1.2.1**
Adopt a hierarchy of street users for consideration in design, in the following order, to ensure a balance of all modes. This does not necessarily imply an order of priority in the corridor, nor do all modes do not have to be accommodated in every transport corridor:

- the vulnerability of users influences the order in which the design and management of transport networks are considered;
- pedestrians are considered first, then cyclists, public transport users, specialist service vehicles (emergency services, waste, etc.), and other general motor vehicles; and
- the network for each mode is planned separately, without considering constraints from other modes or land uses, then assessed to provide a balanced level of service to meet the requirements of users.

<table>
<thead>
<tr>
<th>Consideration</th>
<th>User/mode</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Consider First</strong></td>
<td>Pedestrians</td>
</tr>
<tr>
<td></td>
<td>Cyclists</td>
</tr>
<tr>
<td></td>
<td>Public transport users</td>
</tr>
<tr>
<td></td>
<td>Freight &amp; specialist service vehicles</td>
</tr>
<tr>
<td><strong>Consider Last</strong></td>
<td>Other motor traffic</td>
</tr>
</tbody>
</table>

*Figure 1*
1.3 TRAFFIC VOLUME

Objective
To manage traffic volume in residential streets to achieve the following:

- **Safety** – to reduce the risk of accidents.
- **Amenity** – to avoid the loss of amenity due to increased noise and exhaust fumes.
- **Convenience** – to provide opportunities for accessing traffic streams or crossing roads.

Strategy 1.3.1
Restrict the traffic volume in the street to an acceptable Environmental Capacity by limiting the “Catchment” contributing traffic to the street to an appropriate extent.

Note: In a residential street, with through traffic excluded, this will be the product of the Catchment expressed in dwellings, times the Traffic Generation Rate, expressed in vehicle trips per day per dwelling.

Tips:
1. Design the local street network to exclude through traffic so only traffic actually generated by that catchment uses the street.
2. Streets with direct frontage access for allotments are limited to a traffic volume in the range of 5,000-7,500 vpd.
3. Unplanned Traffic Generators are excluded from the catchment through planning controls.

Strategy 1.3.2
Estimate traffic generation from residential areas, taking into account relevant factors such as:

- size of traffic catchment;
- geographical location;
- demography of population (e.g. young couples, families with adult children, retirees);
- location of and distance to facilities (e.g. shopping, schools, employment);
- economic situation of residents (number of cars per dwelling);
- availability of public transport; and
- time (as demography of the area changes).

Tip: For the various types of street in the network, restrict the catchment as suggested in Table 2.6.2 in Element 2 of Part 1. Refer to Part 3 for worked examples in the calculation of traffic volumes.
1.4 TRAFFIC SPEED

Objective
To provide a street environment which allows all users - motorists, pedestrians, and cyclists - to proceed safely and without unreasonable delays.

Strategy 1.4.1
Design the carriageway to discourage motorists from travelling above the intended speed by reflecting the functions of the street in the network. In particular, design the width and horizontal/vertical alignment to discourage excessive speeds. The resulting street geometry effectively restricts vehicular speeds to appropriate limits, i.e. the speed environment.

Tips:
1. Select the Design Speed appropriate to each street type, in accordance with Table 2.6.1 in Element 2 of Part I. Refer to Part 3 for worked examples in the calculation of traffic speed.
2. In addition to geometric design measures, a lower "speed environment" can be greatly assisted by visual reinforcement such as trees or landscaping in close proximity to the carriageway, particularly on the inside of bends, in Central Medians, and at the ends of straight sections. However, the effects of such visual measures are not readily quantifiable.
**Strategy 1.4.2**

Manage the speed profile in each residential street through design of the street geometry, e.g. vehicles slow at entry intersections, accelerate to a maximum, then decelerate to the end of the street, another intersection, speed control device or tight radius bend.

**Tips:**

1. Only on a long straight, or through a long curve or series of curves, will the maximum speed be sustained.
2. The following definitions are applicable:
   a. **SPOT SPEED**
      The Spot Speed is defined as the 85 percentile maximum operating speed (i.e. the maximum speed not exceeded by 85% of vehicles) at a particular point within the street.
   b. **STREET SPEED**
      The Street Speed is defined as the 85 percentile maximum operating speed attained at any point within the street.
   c. **DESIGN SPEED**
      The Design Speed is defined as the Street Speed selected as being appropriate for the street type.
3. The figure below shows the relationship between speed profile and street geometry.
Strategy 1.4.3
For each street type, ensure the design width and geometry is appropriate to the selected design speed. Achievement of the design speed is influenced by the width of carriageway, horizontal and vertical alignment, or a combination of these design inputs.

Tips:
1. Traffic speed on long straight streets is controlled only by the width of the carriageway. On a single-lane carriageway the Street Speed may be expected to be limited to 25 to 30 km/h, due to the constriction of carriageway width, and likelihood of having to slow or stop for opposing traffic.
2. On wider carriageways, actual speeds will vary considerably with traffic volume and the incidence of parked vehicles on the carriageway and street geometry. No single component of street design should be relied on to control traffic speed.
3. Key considerations in limiting speeds through speed restrictive design are:
   a. Total street length measured between intersections or to end of street;
   b. Limiting length of straights by introducing sharp bends;
   c. Curved alignment – a single curve or a series of curves;
   d. Speed control devices.
4. Refer to Part 3 for worked examples in the designing for appropriate street speeds.
5. The below figures contain design guidance in relation to traffic speed.
1.5 PARKING

Objective
To provide sufficient and convenient parking for residents, visitors and service vehicles, while ensuring that parked vehicles do not obstruct the passage of vehicles on the carriageway or create traffic hazards.

Strategy 1.5.1
Provide resident and visitor carparking according to projected needs, taking into account:

- total parking demand;
- parking opportunities within allotments; and
- non-residential and external parking generators.

Tips
1. Construct sufficient area within the street reserve to provide the following minimum level of parking:
   - separate dwellings and duplexes, where the Local Authority maintains control of the minimum level of parking within allotments - 0.5 spaces per lot, and
   - separate dwellings and duplexes, where no such control is maintained - 0.75 spaces per lot.
2. Where there is a large proportion of multiple dwellings, additional on-street visitor parking may be required.
3. Shared access driveways provide a great alternative to single-use driveways, however they can also reduce the amount of space otherwise available within each driveway for car parking.
4. Refer to figures below for example situations.
   - On-Carriageway Parallel - The “traditional” method, where the carriageway is of sufficient width to provide one or more moving lanes, and for parking on one or both sides.
   - Indented Parallel Parking Bays - A carriageway providing two moving lanes, or one moving lane with passing areas, may be supplemented by indented parking bays for parallel parking, on one or both sides of the carriageway.

The on-carriageway traditional parking method should be used where streets provide direct property access on both sides.

Only sufficient length of parking bay to cater for demand need be provided. Desirably the bays should be in a different surfacing to the moving lane(s).
Indented parallel parking bays may be used where driveway locations are controlled, such as streets with multiple dwellings, or where driveway access is from the rear via a laneway, or along public open space. Conflict between car parking and regular driveways makes parallel parking bays impractical where frequent direct property access is proposed. A continuous accessible path of travel must be provided between the parking lane and the property boundary.

- Indented 90 degree Parking Bays - Again a carriageway for one or two moving lanes may be supplemented by parking bays at 90 degrees to the carriageway, on one or both sides.

In the case of a single moving lane carriageway, the necessary width for vehicles to turn into the parking bays may provide also for opposing vehicles to pass. This parking configuration is considered suitable only for lower design speed streets, to 40 km/h maximum.

90 degree parking bays may be used where driveway locations are controlled, such as streets with multiple dwellings, or where driveway access is from the rear via a laneway, or along public open space. A continuous accessible path of travel must be provided between the parking lane and the property boundary.
Strategy 1.5.2
On-Street Parking is provided to ensure:

- no obstruction or danger to pedestrians or to the passage of vehicles on the carriageway;
- potential conflicts with on-road cycle lanes are mitigated;
- safe and convenient vehicle manoeuvring in and out of parking spaces can be achieved;
- efficient design of parking spaces and accesses; and
- sufficient clearance to allow convenient manoeuvring to and from driveways.

Tips
1. Provide at least one car space within 25m of each allotment (measured between the closest points).
2. Car spaces may either be provided on the carriageway (to ensure vehicle passing) or in constructed/indented bays within the verge. Where indented parking bays are proposed in the verge, a continuous accessible path of travel must be provided between the parking bays and the property boundary.
4. Special Parking bays may be provided in areas such as in the centre of cul-de-sac turning circles, combined with “hammerhead” or “V” turning areas, or within wide medians.
5. For parallel parking, either on-carriageway or in indented bays, the total length required will be dependent on:
   a. Design rate of parking demand (Spaces per lot)
   b. Average allotment frontage
   c. Driveway requirements
6. Refer to figures below for design guidance.
   - On narrower street carriageways such as below, the typical driveway geometry required is:

   ![Diagram of narrower street carriageway]

   Each driveway therefore requires 7.0m of lane length.
   - For average lot frontages of 17m or over, the possible parallel parking capacity is two spaces per lot.
For average frontages of less than 17m, the parking capacity is variable with driveway location, e.g.

- If driveway locations are designed in pairs, as shown above right, the higher capacity of 1.5 spaces per lot is available with the added bonus that the double driveway length is sufficient for a "passing bay".
- However, if driveway locations are not designed but are random depending on the individual house design, the average parking capacity will be somewhere between the two values, say 1.25 spaces per lot.

Where frontages of less than 12.0 m are proposed, special design of parking and vehicular access is necessary.

Examples of On-Street Parking Configurations:
1.6  PROVISION FOR PASSING

**Objective**
To provide sufficient and convenient opportunities for vehicles to pass other vehicles travelling in the opposite direction.

**Strategy 1.6.1**
Where there is a restriction in the number of moving lanes of traffic due to narrow carriageways or the presence of on-street parking, provide passing opportunities to ensure that delays from opposing traffic are acceptable to the majority of drivers.

<table>
<thead>
<tr>
<th>Tips:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passing opportunities should be provided so that the increase in travel time in any street length is limited to a maximum of 10%.</td>
</tr>
<tr>
<td><strong>Note:</strong> Single lane carriageways should be used by exception only, on a case by case basis, such as at single lane slow points or where a significant tree is to be preserved.</td>
</tr>
<tr>
<td><strong>For a Single Lane Carriageway:</strong></td>
</tr>
<tr>
<td>• Number of allotments in traffic catchment - 5 maximum (effectively a shared driveway);</td>
</tr>
<tr>
<td>• Provide indented visitor parking bays;</td>
</tr>
<tr>
<td>• Passing places to be specifically designed for either sole or dual use, consider co-locating with driveways;</td>
</tr>
<tr>
<td>• Minimum length of each passing place - 10.0m; and</td>
</tr>
<tr>
<td>• Use different materials such as concrete and provide amenity landscaping.</td>
</tr>
<tr>
<td><strong>For a Two-Lane Carriageway:</strong></td>
</tr>
<tr>
<td>• Number of allotments in traffic catchment – 100 to 300 maximum</td>
</tr>
<tr>
<td>• Additionally, where lot frontages are less than 17m, either:</td>
</tr>
<tr>
<td>• Designed passing spaces to be provided as for a single lane carriageway, or</td>
</tr>
<tr>
<td>• Additional indented parking spaces to be provided.</td>
</tr>
<tr>
<td><strong>For a Three-Lane Carriageway:</strong></td>
</tr>
<tr>
<td>• Number of allotments in traffic catchment – 600 to 750 maximum;</td>
</tr>
<tr>
<td>• Minimum of two lanes to be provided at any point, unless a “Slow Point” is deliberately designed;</td>
</tr>
<tr>
<td>• Where three lanes are provided, the minimum length of three lane section to be 35m.</td>
</tr>
</tbody>
</table>
Examples of Designed Passing Opportunities:

- Random - A carriageway width in excess of a single lane provides for both parking and passing of vehicles. The extent to which this extra width exceeds parking demand creates passing opportunities at random intervals, which will vary both from place to place and from time to time.
COMBINATION

Designed and Random passing opportunities may be combined in the same street.

The demand for passing opportunities is a function of the number of vehicles travelling in the opposite direction which a driver will encounter in a trip between home and the major road system.

DEMAND FOR PASSING OPPORTUNITY

This “Incidence of Opposing Meetings” varies with:

Traffic Volume of opposing traffic, which in turn will vary with:
- Number of lots in the traffic catchment;
- Time of day (Peak or off-peak traffic).

Travel Time which will vary with the travel distance and travel speed.

The Worst Case will be a trip between the extreme end of the street system and the major road system, “against the tide” of the peak hour traffic; while the Average Case is a trip from the mid-point of the street system, in an average hour.

The figure below gives an indication of the number of meetings with opposing vehicles which could be expected to occur under various circumstances, for a typical residential subdivision layout.

SUPPLY OF PASSING OPPORTUNITY - NO. OF LOTS IN CATCHMENT

Since the number of meetings with opposing vehicles increases with the number of lots in the “traffic catchment”, the supply of passing opportunity should also increase with the number of lots, from a minimum at the head of the catchment (i.e. nominally zero at the end of each cul-de-sac street) to a maximum at the connection(s) to the major road system. An Under-supply of opportunity will result in increasing delays to traffic, and in the extreme to virtual blockage of traffic trying to travel “against the tide”. On the other hand an Over-supply is wasteful of carriageway area, and undesirable for the reasons listed in Section 2.1.
1.7 CARRIAGEWAY WIDTH

Objective
To provide sufficient width of carriageway and verge to allow streets to perform their designated functions within the street network, while minimising street construction and life cycle costs and without compromising safety and amenity objectives.

Strategy 1.7.1
Provide the number and width of vehicle lanes in any street length to be sufficient to provide for:

• A single moving lane;
• The design level of on-carriageway parking; and
• Reasonable opportunity for passing of opposing vehicles.

Tip: Carriageway width (measured between channel inverts) to be:
• Single Lane - 3.5m;
• Two Lane - 5.5m to 6.0m; and
• Three Lane - 7.5m to 8.0m.
Note: Single lane carriageways should be used by exception only, on a case by case basis, such as at single lane slow points or where a significant tree is to be preserved.

Strategy 1.7.2
Carriageway widths are the minimum necessary for normal traffic movements to be carried out at the chosen design speed, with abnormal movements possible at reduced speed.

Tips:
1. Road designers must be conscious of over-sizing the carriageway for its intended purpose. Excessive width can lead to ambiguity in use of the pavement space where it can lead to belief that the available width can accommodate a vehicle being able to pass two cars parked side by side.
2. The carriageway width of each street length, in terms of the number of lanes, to be not less than as shown in the figure below.
Objective
To provide space in the street reserve, between the carriageway and the property boundary, sufficient for the functions of Safety, Amenity and Convenience, but in the interests of Economy, being no greater width than necessary. The following functions must be provided for within the verge:

- walking or using mobility devices, such as wheelchairs or scooters;
- street trees and landscaping;
- accommodating utilities;
- freeboard for stormwater; and
- visibility and safety.

Strategy 1.8.1
Provide a verge of sufficient width that caters for:

- walking or using mobility devices, such as wheelchairs or scooters;
- street trees and landscaping;
- accommodating utilities;
- freeboard for stormwater; and
- visibility and safety.

Tips:
1. The minimum verge width is determined by several factors including:
   - the offset from the carriageway (measured from the invert of the kerb and channel);
   - the width of pedestrian and cycle facilities;
   - the width of public transport facilities (the minimum verge width for a TransLink regular bus stop is 4.25m);
   - the offset from the property boundary (back of verge);
   - a minimum crossfall (typically 2.4%) to achieve drainage; and
   - a maximum crossfall (typically 2.5%) to achieve compliance with the Disability Standards for Accessible Public Transport 2002.

2. In practice the minimum verge width is 4.25m with barrier kerb (absolute minimum 4.15m) or 4.5m with mountable kerb (absolute minimum 4.4m). These verge widths are based on achieving the minimum height difference of 100mm between the back of kerb and property boundary to achieve freeboard under the Queensland Urban Drainage Manual (QUDM) without exceeding a verge crossfall of 2.5%.

3. Where freeboard is not required under the QUDM the verge width may be reduced only where a continuous path of accessible travel is catered for. An example of this is a 3.75m verge on the high side of a street with a one-way crossfall.

4. Verge widths should provide visibility to cater for:
   - vehicles reversing out of driveways; and
   - reaction time for unexpected events, such as a child running into the street. At 50km/h (the unposted urban speed limit in Queensland) a 4.25m verge assists the reaction time.

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1 TransLink Public Transport Infrastructure Manual (PTIM) 2015 drawing number DRG 5-0013
**Strategy 1.8.2**

Provide a continuous accessible path of travel\(^2\) with a smooth non-slip finish that is easy to maintain. Plain or full depth coloured concrete are preferred finishes.

**Tips**

1. Other surface finishes such as bitumen, tiles, or paving may be used where non-slip and well maintained. Exposed aggregate should not be used as it does not cater for the diversity of pedestrians.
2. Footpaths and crossings form the core of the pedestrian network and must cater for universal access. They are a dedicated space allowing people to move on foot or with mobility devices, such as wheelchairs or scooters. Pedestrians have the legal right of way on footpaths, including over driveway crossovers.
3. Increasing the depth of pedestrian facilities to 125mm instead of 100mm makes them trafficable so that the continuous accessible path of travel is not interrupted by driveways.

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\(^2\)Australian Standard AS1428-1—2009 Clause 6

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**Strategy 1.8.3**

Use barrier (upright) kerb and channel to:

- protect pedestrians by obstructing vehicles from mounting the kerb; \(^3\)
- provide stronger edge definition between the carriageway and verge to encourage better driving and parking behaviour; \(^4\)
- provide easier access to and from vehicles for people with disability and the elderly;
- provide more ground surface area for street trees;
- set the relative levels for pedestrian facilities and utilities within the verge;
- provide a consistent and predictable verge profile when installing driveway crossovers; and
- accommodate bus stops, which require barrier kerb. \(^5\)

**Tips:**

1. Mountable kerbs became common practice in Australia during the 1980s. Pak-Poy and Kneebone (1988) recommended mountable kerbs on the basis that:
   - it was cheaper in lower speed environments;
   - allowed formal or informal car parking on the verge;
   - provided for service vehicles in narrow streets; and
   - it eliminates the need for formal crossovers.
2. In practice mountable kerb has been used inappropriately in environments where direct property access is not required. Mountable kerbs have largely become redundant because they do not appropriately protect the pedestrian environment, encourage unlawful parking on the verge, and driveways constructed to the back of mountable kerb do not cater for people with disability.

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\(^3\)Pak-Poy and Kneebone 1988 Section 6.3
\(^4\)Street Design Guidelines for Landcom Projects 2009
\(^5\)TransLink Public Transport Infrastructure Manual (PTIM) 2015 drawing number DRG 5-0013
\(^6\)Pak-Poy and Kneebone 1988 Section 6.3
Strategy 1.8.4
Ensure the provision of accessible kerb ramps that are aligned with the path of travel, have a slip resistant finish, and have:

- a maximum rise of 190mm;
- a length not greater than 1520mm; and
- a gradient not steeper than 1 in 8 (12.5%) located within or attached to the kerb.

Australian Standard AS1428.1—2009 Clause 10.7

Strategy 1.8.5
Locate utilities (telecommunications, reticulated water, and reticulated sewerage) underneath footpaths wherever possible to keep verges to a minimum width and to cater for street trees.

Tips:
1. Utilities commonly found within the verge include:
   - electrical reticulation;
   - telecommunications;
   - reticulated water;
   - reticulated sewerage;
   - reticulated natural gas;
   - street lighting; and
   - stormwater.

2. The standard alignments for infrastructure vary between local governments and service providers.

3. An offset of 750mm from the property boundary to the footpath caters for electrical pillars, water meters, and small telecommunication pits. Where the telecommunication pits are wider than 750mm from the property boundary pay close attention to the finished surface levels so that the pedestrian facilities provide a continuous accessible path of travel.

4. The minimum offset from the property boundary to the footpath to cater for electrical pillars is 600mm.
Strategy 1.8.6

Construct driveway crossovers within the verge to the Institute of Public Works Engineering Australia standard drawings, finished in plain or full depth coloured concrete to match the footpath.

Tips:
1. Other crossover surface finishes such as bitumen, tiles, pavers, or exposed aggregate should not be used as they interrupt the continuous accessible path of travel along the footpath.
2. It is preferable not to cut the continuous accessible path of travel.
3. Increasing the depth of pedestrian facilities to 125mm instead of 100mm makes them trafficable so that the continuous accessible path of travel is not interrupted by driveways.
**Table 1: Recommended verge profiles**

<table>
<thead>
<tr>
<th>Verge type (abbreviation)</th>
<th>Verge width</th>
<th>Front of verge</th>
<th>Footpath or Shared path</th>
<th>Back of verge</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVZ</td>
<td>3.75m*</td>
<td>Zero</td>
<td>Zero</td>
<td>Zero</td>
</tr>
<tr>
<td>CV12</td>
<td>3.75m*</td>
<td>1.5m</td>
<td>1.2m</td>
<td>1.05m</td>
</tr>
<tr>
<td>CV15</td>
<td>3.75m*</td>
<td>1.5m</td>
<td>1.5m</td>
<td>0.75m</td>
</tr>
<tr>
<td>SVZ</td>
<td>4.25m</td>
<td>Zero</td>
<td>Zero</td>
<td>Zero</td>
</tr>
<tr>
<td>SV12</td>
<td>4.25m</td>
<td>2m</td>
<td>1.2m</td>
<td>1.05m</td>
</tr>
<tr>
<td>SV15</td>
<td>4.25m</td>
<td>2m</td>
<td>1.5m</td>
<td>0.75m</td>
</tr>
<tr>
<td>SV18</td>
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<td>1.8m</td>
<td>0.95m</td>
</tr>
<tr>
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<td>2m</td>
<td>0.75m</td>
</tr>
<tr>
<td>SV25</td>
<td>4.75m</td>
<td>1.5m</td>
<td>2.5m</td>
<td>0.75m</td>
</tr>
<tr>
<td>SV30</td>
<td>5.25m</td>
<td>1.5m</td>
<td>3m</td>
<td>0.75m</td>
</tr>
<tr>
<td>SV40</td>
<td>6.25m</td>
<td>1.5m</td>
<td>4m</td>
<td>0.75m</td>
</tr>
</tbody>
</table>

*The verge type abbreviation uses coding as follows:

- **Standard Verge (SV)**—a minimum verge width of 4.25m used in most circumstances with a corresponding increase in width for shared paths over 2m.
- **Constrained Verge (CV)**—a minimum verge width of 3.75m used in a constrained corridor or where freeboard under the QUDM is not required (for example, on the high side of a carriageway with a one way crossfall).
- **Zero (Z)**—a verge without a footpath or shared path.
- **Numeric (N)**—the path width represented in metres (decimal deleted).

** The front of verge is the space between the path of travel and the invert of the kerb and channel. In order to provide adequate space for street trees, pram ramps, and compliant driveway crossovers footpaths should be offset either 1.5m or at least 2m from the invert of the kerb and channel. Interim path of travel offsets between 1.5m and 2m are not preferred as compliant driveways are unlikely to be constructed. A 2m offset provides an adequate distance between the driveway transition and the continuous accessible path of travel.

*** The back of verge is the space between the path of travel and the property boundary.

**** Does not provide minimum 100mm freeboard above kerb under the Queensland Urban Drainage Manual.
1.9 STREET RESERVE WIDTH

Objective
To provide a street reserve width to enable the safe location, construction and maintenance of required paths and public utility services (above or below ground), and to accommodate the required level of amenity landscaping. In the interests of economy, the street reserve width should be no greater than necessary. At a minimum, the street reserve must cater for verge widths and carriageway widths that are fit for purpose.

Strategy 1.9.1
Ensure a minimum street reserve width (at any point) that is not less than the sum of the required minimum widths for the carriageway and the verge for each street type.

Tip:
1. Minimum reserve widths (based on two way crossfall):
   - Local access street (14m to 16m)
     2 x 4.25m verge + 5.5m carriageway (30km/h design speed) = 14m
     2 x 4.25m verge + 6.0m carriageway (40km/h design speed) = 14.5m
     2 x 4.25m verge + 7.5m carriageway (40km/h design speed) = 16m
   - Access street (16m to 17m)
     2 x 4.25m verge + 7.5m carriageway (40km/h design speed) = 16m
     2 x 4.25m verge + 8m carriageway (50km/h design speed) = 16.5m
     4.25m verge + 4.75m verge (2.5m shared path) + 8m carriageway (50km/h design speed) = 17m
   - Collector street (18m to 21m)
     4.25m verge + 4.75m verge (2.5m shared path) + 9m carriageway (50km/h design speed with parking on one side only) = 18m
     4.25m verge + 4.75m verge (2.5m shared path) + 11m carriageway (50km/h design speed with parking on both sides) = 20m
     4.25m verge + 4.75m verge (2.5m shared path) + 12m carriageway (60km/h design speed with parking on both sides) = 21m

2. Increase the verge width and the corresponding road reserve width to accommodate the desired standard of pedestrian and cycle infrastructure.

3. Refer to the Department of Transport and Main Roads for detailed design of separated off road cycle facilities.

4. A verge with separated off road cycle lanes will typically have a width of:
   - 6.25m for a one-way separated cycle lane
     1.5m front of verge + 2m one-way cycle path + 0.5m buffer + 1.5m path + 0.75m back of verge
   - 7.25m for a two-way separated cycle lane
     1.5m front of verge + 3m two-way cycle path + 0.5m buffer + 1.5m path + 0.75m back of verge

5. The verge width may be increased at localised points to retain significant landscape trees. Typically, this involves widening so that the Tree Protection Zone (TPZ) being wholly contained within the road reserve. Service alignments at localised widenings will need to be carefully considered.
Strategy 1.9.2

Use the “Build-A-Street” concept to enable the street cross section to be developed for each individual application/situation by combining each of the required elements for that particular street. The combination of elements should achieve a reserve width, verge width and carriageway (pavement) width that is fit for purpose and is the minimum necessary to accommodate the required function (relative to its hierarchical importance). Each element (or function) should not necessarily be considered cumulatively, but rather "shared use" should be applied where possible to avoid excess reserve or carriageway width.

Note: The “Build-A-Street” concept removes the conventional practice of “standard cross sections”.

Tips:
1. In the process of building a street, the reserve width, verge width and carriageway (pavement) width should be developed using the relevant street and road design guidelines in Part 2 of this document, as well as other industry standards (e.g. Austroads, local authority standard drawings/design standards, Department of Transport and Main Roads (DTMR) technical notes/guidelines, Public Transport Infrastructure Manual (PTIM)) as appropriate source documents. The guidance provided herein should not override these latter guidelines.
2. Part 3 contains worked examples of the “Build-A-Street” concept.
1.10 GEOMETRIC DESIGN

Objective
To establish fit-for-purpose geometric design criteria for the detailed design of the street, to provide for the safety, amenity and convenience for all users, with maximum economy of construction and maintenance.

Strategy 1.10.1
Ensure a speed restrictive alignment to restrict vehicle operating speeds to minimum practical, consistent with a reasonable travel time and the street type.

Tip

Strategy 1.10.2
Provide sufficient sight distance for safe vehicle operation at the design speed.

Tip:
1. In all residential streets (except for a major collector with no property access) the General Minimum Sight Distance (GMSD) is twice the stopping distance measured between the eye heights each 1.15m above the carriageway.
2. ...

Strategy 1.10.3
Design grades that are the minimum possible while appropriate for stormwater drainage, for safety and convenience of all road users.

Tips:
1. The maximum longitudinal grade on any street should generally not exceed 12% to ensure pedestrian walkability
2. The general maximum grade for all streets is 16%, however where this grade cannot be reasonably achieved, a steeper grade can be used for a short length on Access Streets.
3. The minimum longitudinal grade should be 0.30% based on construction tolerances and drainage requirements.

Strategy 1.10.4
The carriageway cross-section must provide good surface drainage, driver comfort, and practical allotment access.

Tips:
1. Generally, two way crossfall is preferred.
2. One way crossfall may be considered on access streets and laneways, provided no stormwater connections are made to kerb on the high side of the street. Consider freeboard requirements as per QUDM for lots on the low side.
3. Centre channels are generally not supported unless for shared driveway/single lane carriageways.
Strategy 1.10.5
Horizontal and Vertical Alignment is designed in accordance with geometric design standards of Austroads guidelines.

Note: This document provides geometric design guidelines for use in the residential street system (refer Part 3 – Practice Notes).

Tips:
1. Adequate sight distance is a significant factor in designing. The general minimum sight distance for Crest Vertical Curves should be twice the stopping distance for the Design Speed of the street.
2. The desired maximum Design Speed is maintained by intentionally designing a restrictive horizontal alignment.
3. Sharp curves should generally be avoided, while the following requirements must be considered to allow for safety and convenience of larger vehicles:
   • Minimum curve radius (carriageway centreline) – 10 to 15m depending on Street type
   • Carriageway widening (also known as the ‘elbow treatment’) – 0.5 to 1.0m depending on curve radius and generally in accordance with Figure below:

Typical widening at right-angle bend (property boundaries should coincide with chords angels where practical).
Source: Redland City Council Planning Scheme V7.1 2016
Table - Summary of Geometric Design Criteria - To be updated/inserted
1.11 INTERSECTIONS

Objective
To provide intersections between streets with maximum possible safety and convenience of operation, with minimum possible construction and operation cost.

Strategy 1.11.1
Safety of operation of intersections is achieved by:
- geometry that clearly establishes approach vehicle priority;
- adequate approach sight distance; and
- slow speed of negotiation, consistent with the level of convenience appropriate to the street type.

Tips:
1. In a residential environment, consider pedestrian and cyclist safety as a priority. Due to potential conflicts the selection of roundabouts for intersections requires careful consideration:
   a. On lower order streets (e.g. Access Street) roundabouts can generally function well because the volume of traffic typically allows for a safe interaction between pedestrians, cyclists and vehicles.
   b. On higher order roads where the active transport activity is anticipated to be high, roundabouts should be avoided unless specific design for pedestrian and cyclists is considered. DTMR TNR128 provides specific guidance.
2. T-Junctions or roundabouts should be designed in accordance with the principles of the relevant Austroads design guides.

Extracts from TNR128: Cycle tracks (TMR, 2015 and TMR Technical Guideline for Raised Priority Crossings (2019)}
Strategy 1.11.2

Design the street layout to result generally in intersections between streets of the same classification, or classification one above or below. Intersection spacing should avoid driver confusion and be appropriate to the street type, i.e. higher order streets will have greater spacing between intersections.

Tips:
1. Intersection spacing can be increased to achieve a through traffic movement function of a higher order road as frequent spacing often disadvantages road function.
2. In activated town centres the intersection spacing may be deliberately reduced to lower influence traffic speed and increase permeability.
1.12 TURNING AREAS

**Objective**
To provide for the turning of vehicles at the end of culs-de-sac with maximum safety and convenience of operation, visual and noise amenity, at minimum construction cost and land area requirement.

**Strategy 1.12.1**
Make provision for a turning area (either single-movement or three-point turn) at the end of every cul-de-sac.

Tip: A WCV is generally used to determine the required dimensions of the turning area or cul-de-sac based on its turning circle (approximated by an MRV). The local waste management authority should be consulted for appropriate WCV dimensions and turning circles.

**Strategy 1.12.2**
All turning areas accommodate the design vehicle appropriate for the street type.

Tip: Some local waste management authorities may allow for WCV to 'reverse in' in order to access an area, providing it is safe to do so.

**Strategy 1.12.3**
Turning areas result in the minimum area of carriageway and require the minimum area of land necessary.

Tip: A cul-de-sac or a 'bulb' shaped turning areas should be avoided where possible and should not be used solely for a provision of turnaround manoeuvre. A three-point turn turing area (exclusive of parking bays) should be considered as the most economical alternative, providing it is safe.

**Strategy 1.12.4**
Design turning areas to discourage parking within the area needed for turning movements.

Tips
1. Designers must consider a real possibility of a turning area becoming an extension of 'on-street' car park used by local residents and visitors. Co-sharing of turning areas can be considered in controlled environments such as the areas controlled by Community Management Schemes or similar.
2. Early consultation and engagement with local laws or parking rules enforcement authority may be necessary to guide the best possible outcome when trying to discourage parking within turning areas.
**DETAILED DESIGN GUIDELINES**

**TYPICAL MANOEUVRING AREAS FOR "MRV" TRUCK**

**DESIGN CRITERIA**

This turning area is based on the following:

1. **MRV** type garbage truck able to turn within paved area (8.5m turn radius)
2. 4.5m wheeled.
3. Truck able to turn any direction, to enable pick up either side, in each arm.
4. Standard **MRV** able to turn within street reserve by driving over banks where necessary.
5. Design space may be modified by adding parking bays or extending arms as access driveways.

Confirm appropriate Design Vehicle with the Local Council in every case.
 Preferred parking location, more central, & visible to approaching vehicles.

Note: - Street geometry for Three - Point Turn is compatible with rectangular allotments

THREE- POINT TURN AND RECTANGULAR LOTS

FIGURE 2.12.K

Note: - Cars can three-point turn in allotment driveways, but truck must turn where shown and reverse in the extended "arm".

TURNING AREA EXTENSION
1.13 SPEED CONTROL DEVICES

Objective

To safely restrict the maximum traffic speed at any point in the street to the appropriate limit for the street type.

Strategy 1.13.1

Restrict vehicle speeds at any point in the street to the Maximum Design Speed appropriate for the street type.

Tip:
1. The street alignment should be used to control the speed of vehicles as much as possible while the speed control devices should only be considered as last resort.
2. In designing the speed control devices, always consider accommodation of larger vehicles, especially if the road is a bus route.
3. If using landscaped traffic islands or build outs, always consult with landscaping professionals to select suitable plant species to ensure their height does not restrict visibility and their maintenance requirements are considered so they can be safely accessed.

Strategy 1.13.2

Speed control should be achieved by street alignment wherever possible with the use of speed control devices regarded as a last resort, rather than a routine measure.

Tip: Minimising the use of speed control devices will reduce the capital and maintenance cost of residential streets, as well as being less impactful on access for residents.

Example Speed Control Devices:
"DEFLECTED T" SPEED CONTROL DEVICE
1.14 LANDSCAPING

Objective
To provide street trees and landscaping that enhance the residential amenity of neighbourhood streets, providing shade and a pleasant environment for residents, pedestrians, and cyclists. Landscaping of the street reserve can positively influence the speed environment.

Strategy 1.14.1
Street trees are provided at suitable spacing along the verge so as to provide shade for footpath users, located so as to not restrict visibility, and with sufficient clearance to infrastructure. The proportion of trees at maturity is a major consideration of tree selection and planting location.

Tip: Street tree clearances and preferred species vary with different geographical areas and service authorities. Consider the timing of planting to avoid damage to trees. Some Council’s accept contributions in lieu of planting install trees following substantial build-out of the subdivision.

Strategy 1.14.2
Garden beds and amenity landscaping is used to soften hard infrastructure such as fences, traffic islands and paved verge areas, whilst balancing the cost of maintaining and future replacement of plantings.

Tip: Individual Councils generally have policies that relate to footpath gardens and plantings within the road reserve. Check with the local Council for their requirements.

Landscaping/street trees influencing speed environment
Overview

The provision of safe and convenient facilities for pedestrians and cyclists is of equal or higher importance to providing for the requirements of motor vehicles. In residential streets it is the primary consideration.

Pedestrian and cyclist facilities are essential for those who do not have a motor vehicle, or choose not to use it, e.g. school children, the elderly, shoppers and commuters connecting to bus routes or railway stations.

It is highly desirable to encourage residents to walk or cycle, for healthy recreation or as an alternative to the motor vehicle, with resultant reductions in traffic volume, parking demand, fuel consumption, and noise and air pollution.

The development of safe and convenient active transport networks is a primary consideration in the design of contemporary residential neighbourhoods.
2.1 Active Transport - General

Objective
To provide for the safe and convenient movement of pedestrians and cyclists throughout the development.

Strategy 2.1.1
Ensure the design of pathways within the adopted network accommodates safe pedestrian and cyclist use of the street system. Clearly delineate cycle space on higher trafficked streets.

Tip: Refer to Part 1 Element 2 for guidance on developing pedestrian and cyclist networks.

Strategy 2.1.2
Shared use of street pavements is generally not considered appropriate for pedestrians on all but the lowest trafficked streets. Provide paths of sufficient width for use by pedestrians and cyclists (where shared facilities are warranted), with widening of paths provided at conflict points on high use facilities, to allow for passing of pedestrians/cyclists in opposite directions.

Tip: Include recommended widths.

Strategy 2.1.3
Design paths to facilitate ease of use by the most vulnerable street users (i.e. disabled and aged). Construction to be durable, slip-resistant, with a crossfall and gradient complying with recommended guidelines.

Tip: Include recommended gradients and crossfalls.

Strategy 2.1.4
Maximum longitudinal gradient of cycle paths to be no greater than any adjacent street pavement and to provide for safe sight distances at crossings.

Strategy 2.1.5
Alignment of paths to be varied to preserve trees and other significant features and to add to visual interest.

Strategy 2.1.6
Crossing of pedestrian and cycle paths at major roads to be minimised, and where crossings are necessary they are designed for safety in accordance with Austroads Guidelines.
2.2 Major Road System – Provision for Active Transport

Objective
To recognise that pedestrians and cyclists are not compatible with motor vehicles on the Major Road system, where the higher volume and speed of vehicular traffic results in much greater risk for the pedestrian and cyclist, and to provide for their safe interaction on these higher trafficked roads.

Strategy 2.2.1
Where pedestrian and cycle routes follow Major Roads, provide for:
- shared paths for pedestrians and cyclists;
- specific on-road cycle lanes; or
- separate off-carriageway cycle paths.

Tip:
1. The cycle network plan should consider the suitability of on-road or off-road cycle paths, as well as shared paths. Refer Element 2 of Part 1 for development of network plans.
2. See Figure 2.2 below for guidance on separation of cyclists.

Source: Cycling Aspects of Austroads 2017

Strategy 2.2.2
Consider both pedestrians and cyclists, either by providing separate paths or dual-use paths. Even if paths intended only for pedestrians are provided, cyclists will inevitably use them anyway (and it is legal for them to do so).

Tip: Major roads should be provided with paths on the verge both sides. Consider the width of paths for the intended usage and provide legibility if separation is intended between pedestrian and cyclists.
Strategy 2.2.3
Provide a high level of convenience for active transport users, by ensuring the grade and travel distance of separate paths are no greater than for vehicular traffic, or pedestrians and cyclists may tend to use the carriageway in preference to the path.

Tip:

Distance is:
• vitally important to pedestrians;
• slightly less important to cyclists; and
• less important again to motorists.

Gradient is:
• vitally important to cyclists;
• slightly less important to pedestrians, and
• less important to motorists.

Strategy 2.2.4
Crossings of pedestrian and cycle ways across major roads must be carefully designed for safety and convenience.

Tips
1. Grade separation by underpass or overpass is the ideal, but generally only economically justifiable for Major Arterial roads.
2. For at-grade crossing of Arterial or Sub-Arterial roads:
   a. The crossing should be:
      • Staged, with a central refuge island, for lower volume roads, or
      • Signal controlled for higher volumes, desirably by location at a signal controlled intersection.
   b. Physical barriers should be provided, to require cyclists to dismount, and to prevent pedestrians crossing directly.

Note: The form of crossing to be provided should be discussed in advance with the relevant Road Authority.
2.3 Separate Reserves/Open Space Location for Active Transport Routes

**Objective**
Locate pedestrian and cycle routes in a separate pathway reserve or area of open space to minimise pedestrian and cyclist travel distances, rather than having to follow the longer distances via the street system, where connectivity must be limited to prevent through traffic infiltration.

**Strategy 2.3.1**
Pathway reserves are relatively short, providing connection between the ends of cul-de-sac streets, from streets to open space areas, or from residential streets to major roads. Pathway reserves should be sufficiently wide, well-lit, and have surveillance of the full length from each end, to comply with CPTED requirements.

Pathway reserves should be designed as dual-purpose pedestrian and cycle routes for practical and economic considerations, however they may be shared paths or separated.

Tip: Pathway reserves may serve additional purposes, such as a location for stormwater drain lines, interconnecting watermains or other services, or as overland stormwater flow paths. However in the latter case, care must be taken to ensure that the maximum depth and velocity of flow will not be a hazard to users.

**Strategy 2.3.2**
Public open space areas provide ideal locations for Pedestrian and Cycle paths, providing safety from vehicular traffic, and high environmental amenity. Provide sufficient lighting and visibility for the security of users. These paths also should in general be designed for dual pedestrian and cyclist use.

Tip: Paths around the perimeter of parks provide walking circuits but also consider convenient routes through parks to provide access to facilities (such as play equipment, etc) and to link to external routes either side of the park area.
2.4  Construction of Paths in Residential Streets

**Objective**
To provide safe and comfortable conditions for pedestrians and cyclists in residential streets, noting that every residential street serves as an active transport route, by designing for:

- minimum traffic speed and volume within each street type; and
- crossing points appropriate to the street type and location (e.g. mid-block or at intersections).

**Strategy 2.4.1**
Within Access Places and Access Streets, design for cyclists on-street due to the low traffic volume and low design speed. The verge cross-section should allow for construction of a footpath on at least one side of all access street types.

**Tip:** No special provision is generally required for cyclists to safely share the carriage-way with motor vehicles.

**Strategy 2.4.2**
Within Collector Streets, the higher traffic volume and speed necessitates the provision of a constructed dual-use path within the verge on at least one side. The verge cross-section should allow for construction of a footpath on at least one side of all access street types.

**Strategy 2.4.3**
Where pedestrian or cycle routes are located on Major Collector Streets and above, the high volume and speed of traffic on these streets requires special provision for both pedestrians and cyclists:

- **Pedestrians**  Constructed footpath within the verge, on both sides (may be dual-use); and
- **Cyclists**  Cycle paths or Dual-Use paths within the verge on one or both sides.

**Tip:** In some circumstances additional provision may be required for pedestrians and cyclists, such as:

- a designated pedestrian or cycle route, where a residential street forms part of a neighbourhood wide network; and
- where pedestrian or cyclist volumes may be significant, (e.g. approaching a school) a separate footpath for pedestrians with a separate cycle path, or a designated cycle lane on the carriageway may be warranted.
Strategy 2.4.4

Provide safe crossing facilities for active transport users that are appropriate to the street type, traffic volume and active network volumes.

Tips:
1. On Access and Collector Streets no special provision is usually required for pedestrian or cyclist crossing, due to the low speed environment already existing in these streets.
2. On Major Collector Streets, a median or refuge of 2.0m minimum width within the carriageway will greatly assist safe crossing of the street.
3. Where major pedestrian or cycle routes must cross a Major Collector Street, it may be desirable to create a lower speed environment by appropriate geometry or devices on either side of the crossing location.
4. Crossing points should not be combined with Slow Points or other traffic control devices, however, due to the resultant dividing of a driver’s attention.
5. Where mid-block pathways (pedestrian, cycle or dual-use) intersect with higher trafficked streets, physical barriers to prevent pedestrians or cyclists from directly crossing the street will assist safe crossing.

Example Crossing Treatments:
ELEMENT 3 – PUBLIC TRANSPORT

Overview
3.1 Public Transport - General

Objective

Strategy 3.1.1
Tip

Strategy 3.1.2
Tip

Strategy 3.1.3
Tip

Table - Summary of Active Transport Design Data To be updated
ELEMENT 4 – DESIGN DETAIL

Overview
4.1 Kerb and Channel

Objective

Strategy 4.1.1

Tip

4.2 Construction Materials

Objective

Strategy 4.2.1

Tip

4.3 Utility Services

Objective

Strategy 4.3.1

Tip

4.4 Stormwater Infrastructure

Objective

Strategy 4.4.1

Tip
4.5 Signs and Pavement Markings

Objective

Strategy 4.5.1

Tip

4.6 Streetscape

Objective

Strategy 4.6.1

Tip
5.1 Natural Landform

Objective

Strategy 5.1.1

Tip

5.2 Tree Retention

Objective

Strategy 5.2.1

Tip

5.3 Street Trees

Objective

Strategy 5.3.1

Tip

5.4 Street Furniture

Objective

Strategy 5.4.1

Tip
5.5 Open Space

Objective

Strategy 5.5.1

Tip
Walkable and legible neighbourhoods

Walking in neighbourhoods
One of the fundamental principles of Walkable Neighbourhoods is to provide safe, comfortable, and convenient walking environments for all members of our communities, including:

• unescorted primary school children;
• carers with babies in prams;
• people with walking impairments; and
• the elderly.

Without footpath infrastructure in a street, these members of the community are likely to be dissuaded from starting a walking journey.

For this reason Walkable Neighbourhoods proposes that a footpath is provided in every street; for the lower order streets, at least on one side, and in the higher order roads, on both sides.

Footpath infrastructure is considered to be the essential fundamental foundation to the creation of a walkable neighbourhood.

To encourage residents to use the footpath infrastructure, the footpath must provide connectivity in the neighbourhood and:

• offer, for the recreational user, walking routes to connect to friends in the area, walking circuits for interest, and connections with community facilities; and
• provide direct connection to schools, activity centres, and public transport facilities.

To encourage their use other essential features of the footpath network are the actual and perceived safety of the footpath network and the pleasantness of the walking journey.

Other practice notes address these aspects of the footpath network.

This practice note is primarily concerned with the connectivity of the footpath network in a neighbourhood provided by the layout of footpaths in streets, between streets, and in the open space network.

Street patterns
As most of a neighbourhood’s footpaths will be provided within the street, the streets pattern will significantly influence the degree of connectivity of the footpath network.

Of the typical street patterns:

Rectilinear grids:
• offer good connectivity provided the block lengths are not excessive. Long block lengths will reduce the connectivity in the direction of the short block dimension unless mid-block connections are provided; and
• allow multiple loop walking opportunities.

Modified grids:
• offer the potential for good connectivity as does the rectilinear grid, but may suffer from poor connectivity in some areas if there are poor cross-connections; and
• allow multiple loop walking opportunities.

Loops and culs de sac:
• will likely have poor connectivity without the extensive use of cross-connections; and
• will also likely have poor opportunities for loop walks without use of cross connections.
**Figure 1 - Examples of neighbourhood street patterns – Pedestrian connectivity in 500m radius catchment**

<table>
<thead>
<tr>
<th>Example</th>
<th>Layout characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harristown TRC</td>
<td>Pattern Type: Predominantly rectilinear grid</td>
</tr>
<tr>
<td></td>
<td>Typical block lengths: 250-460m long x 80m wide</td>
</tr>
<tr>
<td></td>
<td>Cul de sac lengths: Few - 150m max.</td>
</tr>
<tr>
<td></td>
<td>Infrastructure: Footpaths only to major collectors</td>
</tr>
<tr>
<td></td>
<td>Mid-block or cul de sac connections: Nil</td>
</tr>
<tr>
<td></td>
<td>Ability for walking loops: Fair</td>
</tr>
<tr>
<td></td>
<td>Overall comment: Reasonable overall connectivity</td>
</tr>
<tr>
<td>Aspley BCC</td>
<td>Pattern Type: Modified grid</td>
</tr>
<tr>
<td></td>
<td>Typical block lengths: 280-340m long x 60-80m wide</td>
</tr>
<tr>
<td></td>
<td>Cul de sac lengths: Several - 210m max.</td>
</tr>
<tr>
<td></td>
<td>Infrastructure: Footpaths only to major collectors</td>
</tr>
<tr>
<td></td>
<td>Mid-block or cul de sac connections: Nil</td>
</tr>
<tr>
<td></td>
<td>Ability for walking loops: Low</td>
</tr>
<tr>
<td></td>
<td>Overall comment: Poor overall connectivity</td>
</tr>
<tr>
<td>Riverhills BCC</td>
<td>Pattern Type: Curvilinear loops and culs de sac</td>
</tr>
<tr>
<td></td>
<td>Typical block lengths: Varies to 250m long x 80m wide</td>
</tr>
<tr>
<td></td>
<td>Cul de sac lengths: Many – 35 - 150m max.</td>
</tr>
<tr>
<td></td>
<td>Infrastructure: Footpaths only to major collectors</td>
</tr>
<tr>
<td></td>
<td>Mid-block or cul de sac connections: Minimal</td>
</tr>
<tr>
<td></td>
<td>Ability for walking loops: Low</td>
</tr>
<tr>
<td></td>
<td>Overall comment: Poor overall connectivity</td>
</tr>
<tr>
<td>North Lake MBRC</td>
<td>Pattern Type: Modified rectilinear grid</td>
</tr>
<tr>
<td></td>
<td>Typical block lengths: 150-200m long x 60m wide</td>
</tr>
<tr>
<td></td>
<td>Cul de sac lengths: Nil</td>
</tr>
<tr>
<td></td>
<td>Infrastructure: Footpaths to collectors, some streets and park network</td>
</tr>
<tr>
<td></td>
<td>Mid-block or cul de sac connections: No</td>
</tr>
<tr>
<td></td>
<td>Ability for walking loops: Very high</td>
</tr>
<tr>
<td></td>
<td>Overall comment: Very good overall connectivity</td>
</tr>
</tbody>
</table>
Block length
Excessive block length results in the potential for a lack of pedestrian connectivity in the direction of the short block dimension in the absence of mid-block cross-connections.

However, reducing block dimensions leads to a reduction in efficiency with:
• increased road percentages; and
• increased number of corner lots.
In a rectilinear grid, without constraints, block length is not set by any particular feature.

For a modified grid, the resulting longest block length will usually be defined by the number of cross blocks and will be a function of the lot depth and road width.

Instinctively block dimensions of 300-400m appear excessive.

Figure 1 provides an example to illustrate the outcome of different numbers of cross blocks per long block.

There is no perfect block length but the “three block pattern” provides a compromise between shorter block lengths and road and corner lot efficiency.

On this basis and allowing for lot depths up to 32m and road reserves varying from 15-18m for local streets and collectors, results in a maximum block length around 220m.

The shorter block dimension will vary depending on the arrangement of the long blocks but will typically be of the order of 140m in this arrangement.

Cross-connections
Cross connection location and design will be critical to improving the walkability of a neighbourhood in particular with their:
• locations impacting connectivity;
• width affecting perception of safety and impacting on adjoining lot amenity; and
• design playing an important role in increasing the attractiveness of a walk.

In general, the preferred cross connection characteristics are:
• shorter and wider over long and narrow;
• include walking and cycling paths; and
• multi-use such as additional on-street parking, tree retention, stormwater functions or play space.
**Figure 3 - Examples of street cross connections**

### Preferred characteristics:

| Length: Short as possible - 30m max. preferable | Width: 5m min. preferably wider |
| Infrastructure: Pedestrian and/or cycle path | Other: tree retention, additional parking, play space |

### Mid-block connections

- **Indooroopilly BCC**
  - Length: 90m
  - Width: 3m
  - Features: path only
  - Status: X

- **Forest Lake BCC**
  - Length: 64m
  - Width: 20m
  - Features: path, ex. trees, s/w flow
  - Status: ✓

- **Springfield Lakes IRC**
  - Length: 50m
  - Width: 15m
  - Features: path, ex. trees
  - Status: ✓

### End of cul de sac and Collector Street connections

- **Riverhills BCC**
  - Length: 60m
  - Width: 3m
  - Features: path only
  - Status: X

- **Pacific Pines GCCC**
  - Length: 50m
  - Width: Varies 5-40m
  - Features: path, trees, pocket park
  - Status: ✓

- **Forest Lake BCC**
  - Length: 5m
  - Width: 30m
  - Features: path, ex. trees, parking
  - Status: ✓

### Other connections

- **Mt Sheridan CRC**
  - Length: 60m
  - Width: 4m
  - Features: path only
  - Status: X

- **Marsden Marsden LCC**
  - Length: 70m
  - Width: 20m
  - Features: path, trees
  - Status: ✓

- **Redland Bay RBRC**
  - Length: 30m
  - Width: 20m
  - Features: path, ex. trees
  - Status: ✓
Figure 4 - Examples of street patterns

Preferred characteristics:

<table>
<thead>
<tr>
<th>Multiple connections to external street/road network</th>
<th>Rat running is minimised</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legibility</td>
<td>Good pedestrian connectivity</td>
</tr>
<tr>
<td>Block length 220m max. preferred</td>
<td>Block shapes allow for regular shaped allotments</td>
</tr>
</tbody>
</table>

**Grids**

- **Modified grid – Yarrabilba LCC**
  - Score: 6/6

- **Rectilinear grid – Rockhampton RCC**
  - Score: 5/6

- **Radiant grid – Sippy Downs SCRC**
  - Score: 5/6

- **Fake grid – Forest Lake BCC**
  - Score: 4/6

- **Offset grid – Strathpine MBRC**
  - Score: 4/6

- **Fragmented grid – Shailer Park LCC**
  - Score: 4/6

**Other**

- **Loops and lollipops – Riverhills BCC**
  - Score: 2/6

- **A bit of everything – Edmonton CRC**
  - Score: 2/6

- **Dendritic – Highland Park GCCC**
  - Score: 1/6
Figure 5 – Impact of increasing connections

Option 1 – Few Connections
Total area: 24.1ha
Road area: 5.1ha
Lot area: 15.8ha
Open space: 3.2ha

Option 2 – More Connections
Total area: 24.1ha
Road area: 5.2ha
Lot area: 15.7ha
Open space: 3.2ha
Impact: Lot area down by 0.6%

Option 3 – Wider Connections
(+ increased for trees)
Total area: 24.1ha
Road area: 5.56ha
Lot area: 15.44ha
Open space: 3.1ha
Impact: Lot area down by 2.3%
Increasing trees in our neighbourhoods

Queensland’s most pleasant suburbs without question would be those suburbs with large spreading trees providing shade, shelter, aesthetic qualities, and a celebration of our sub-tropical and tropical climates.

Unfortunately, in our new residential areas, particularly those with increased residential densities, the potential for large spreading trees in our neighbourhoods is being negatively impacted by:

- the high allowable site cover and small setbacks leading to limited trees within allotments; and
- a range of factors minimising the amount of trees and their size in the public realm.

In relation to this last aspect, the factors include:

- the shift of sewers from within allotments onto the street verge in higher density projects further increasing competition in the verge space available for street tree planting;
- the raw land price has increased so market competition is leading to an increased focus on minimisation of open space and road reserve to maximise saleable lot area; and
- builders and the purchaser demanding flat allotments resulting in significant earthworks and retaining walls.

Unfortunately, the current practice of street tree planting at the time of subdivision construction often results in street trees growing slowly or not achieving their full height due to damage and/or poor planting practices during the subsequent building phase.

As a consequence of the above in our new communities, large trees (either existing or new) are unlikely to be achieved within the allotments and the verge and are only likely to occur in park areas.

This practice note provides techniques to increase the potential for larger trees in our new communities focussed around four aspects:

1. Retention of existing trees;
2. Planned opportunistic tree planting;
3. Trees in lots; and
4. Implementation options.

1 Retention of existing trees

Objective: To save existing vegetation within new neighbourhoods where practical

The hierarchy of the potential for retention of existing trees in new neighbourhoods is:

- parks offer the best potential;
- the street reserve has some potential; and
- the allotment has almost no potential.

Some techniques to increase the retention of existing trees within the street reserve are:
Meandering the pavement in a wider street reserve

Specific street design for select areas

Intersection detailing

Narrowing the pavement in short sections
Often successful tree retention will require non-standard verge profiles
Case Study – Forest Lake Brisbane

Forest Lake in Brisbane was developed from 1990 to 2005 on a site that had been previously logged and was covered by regrowth.

The developer (Delfin) specifically chose as a marketing approach the retention of as much existing vegetation as possible; the marketing sub-phrase was Forest Lake: The Living Forest.

A planning and engineering design process was instituted to achieve this outcome.

<table>
<thead>
<tr>
<th>Forest Lake Tree Retention Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial vegetation assessment to identify ‘essential vegetation’</td>
</tr>
<tr>
<td>First cut neighbourhood layout with park area around essential vegetation</td>
</tr>
<tr>
<td>Vegetation assessment to identify ‘desirable vegetation’ in road reserves</td>
</tr>
<tr>
<td>Pavement and intersection refinement to retain desirable vegetation where practical</td>
</tr>
<tr>
<td>Detailed engineering design and construction to ensure identified desirable vegetation retained</td>
</tr>
</tbody>
</table>

In general, property boundary frontages were not amended or varied and were kept straight for installation and maintenance of verge services.

Modest tree retention within properties was achieved through building covenants but limited to within the first 2-3m setback and on lots where the front setback was 6m.

The above approaches were successful with trees retained at that time both continuing in place today and many acting as a frame for other private tree planting in the yards and verges.
2 Planned opportunistic tree planting areas

**Objective:** To identify and plan opportunities for additional street tree planting

*Take advantage of awkward spaces*

*Ends of a cul de sac as an opportunity*

*Corner truncations*

*Slow points and buildouts*
3 Trees in lots

Objective: To facilitate large tree growth within lots

Building development on small lots is controlled by either the relevant planning scheme, specific condition of planning approval (e.g. a PoD) or by the QDC.

For the most part new communities with small allotments will operate under a PoD.

Most contemporary PoDs for small lots:
- have a front setback of 3-4m with the garage setback 5-5.5m;
- have side and rear setbacks of 0.9-1m;
- provide for a zero lot line wall of 10-15m in length;
- site cover of 70-80%; and
- do not have any specific requirement for the size or location of private open space.

Consequently, opportunities for any significant vegetation within lots is unlikely.

An approach for consideration

Standard lots:
For select streets or lot types include in the PoD a requirement for a suitably located deep planting zone for significant tree planting.

These sites might be located to complement tree planting areas in the street e.g. buildouts.

Rear lane lots
Modest landscaping in lanes can significantly improve the appearance of the lane. This is particularly important where some dwellings have their address from the lane.

Simple PoD inclusions will assist in the delivery of greener lanes.
4. Implementation Options

**Objective: To maximise the size of street trees at maturity**

In residential estates traditional practice has been for the developer to install street trees at the time of subdivision. With higher residential densities and narrow lot frontages the chances of street trees planted at the time of subdivision and prior to building works surviving undamaged is remote. Consequently, poor tree repair and/or placement will result in delayed growth or the street trees not achieving their full height at maturity. This is further compounded by uncertain planting area preparation by the developer in the first place i.e. over compacted growing areas and/or poor tree installation techniques.

An alternative approach to new street tree implementation is for:
- the developer to install in the verge at the time of subdivision specifically prepared deep planting areas for future street tree planting; and
- the local authority to install the street trees after the building works have been completed.

Further, the local authority could allow the developer to also install fast growing street tree species in verge locations in addition to the prepared areas to facilitate street greening for marketing purposes.

Any of these trees that survive the post-development and building phase will complement the future street tree planting in the prepared street tree planting areas.
Examples of increasing large street tree opportunities - Overview

Widened connections

Street narrowing for tree retention

Widened feature entries

Corner truncations

Indented parking and buildouts

Corner truncations on major spine
Contemporary Lot Typologies

When the first edition of Queensland Streets was released in 1989 the minimum lot size in local authorities was in excess of 600sqm and the average lot size was likely to have exceeded 700sqm.

In 1992 Brisbane City Council approved the introduction at Forest Lake of the villa lot, a 300sqm lot with a zero lot line wall on one boundary.

The town cottage lot, 250sqm in size, was also introduced at Forest Lake several years later.

Both these products offered a more affordable, low maintenance three bedroom home with single garage.

Since that time a wide variety of new lot sizes and dwelling types have been introduced into Queensland greenfield residential projects, including:

- standard lots for detached dwelling designs on lots from 250sqm;
- specialised lots and detached dwelling designs on lots from 160sqm; and
- terrace lots, both front loaded and rear loaded, on freehold lots from 60sqm.

The 2018 Land Supply and Monitoring report indicates that between 2011/12 and 2017/18 the median lot size in SEQ decreased from approximately 550sqm to 430sqm.

In addition the report indicated for 2017/18 that:
- the most common size category was 350 to 450sqm; and
- 2% of lots produced were in the range 60-200sqm.

Contemporary lot types

This practice note provides examples of contemporary lot types and outlines the planning and design issues that need consideration with their introduction in a project.

Specific design issues for small lots and rear lanes are provided in Practice Notes 4 and 5, respectively.

Key considerations

The experience from many Queensland projects since the introduction of small lots over 25 years ago is that the matters for consideration in relation to contemporary lot typologies include:

- narrow frontage lots issues;
- site cover and setbacks;
- approval of dwelling plans;
- titling ahead of building; and
- bookend lots.

Narrow frontage lots issues

Where lot frontages are in excess of 12.5m double car accommodation can occur on site without restricting on-street parking. Refer to Practice Note x Provision for on-street parking.

Below 12.5m frontages on-street parking becomes increasingly restricted or precluded.

For this reason, concentrations of narrow fronted lots, irrespective of the overall project density, will need to be
assessed for on-street parking provision.

Even a small number of narrow frontage lots may also be inadvisable:

• at intersections or near roundabouts;
• adjacent to slow points; or
• around a cul de sac without additional parking or accessible bin pick up areas.

Site cover and setbacks

Most contemporary planning scheme provisions and plans of development allow for side and rear setbacks of 0.9-1.0m and site cover of 70-80% for smaller lots.

Issues arising with these setbacks include:

• lack of access to services and build over sewer issues;
• further reduced side access if site retaining walls are required impacting storage of refuse bins behind the building line.

For these reasons it is suggested:

• that services be kept out of small lots where possible, unless site specific setback provisions (e.g. in a PoD) have been designed to suit the services; and
• refuse bin enclosures are required as part of planning approval where side access is restricted.

Approval of dwelling plans

The requirement to approve dwelling plans for small lot development can restrict innovation and lead to building delays and increases minor amendment or generally in accordance with applications.

A suggested approach when considering a proposal that includes small lots is:

• no special requirement for any consideration of dwelling design where lots are 250sqm and above as standard builder’s plans are readily available;
• below 250sqm:
  • accept standard plans that have been built previously for the proposed lot size or
  • require indicative dwelling designs where no standard designs exist.

In relation to this last aspect, the preferred approach is that the PoD should only incorporate the key setback, site cover, and design aspects of the indicative plan, rather than the indicative design itself, to allow for flexibility in the future dwelling design.

This is the approach that was adopted on the Fitzgibbon Chase project with freehold lots down to 50sqm.

Titling ahead of building

At Fitzgibbon Chase the subdivision titles were created ahead of the building construction.

Prior to the commencement of the higher density areas, a review of practices in other parts of Australia revealed that very small lot development was possible with titling happening before building with appropriate PoD controls.
Titling ahead of building improves housing affordability in that where a dwelling project is completed by way of a land contract and build contract:

• stamp duty is reduced by avoiding double stamp duty and by the buyer only paying stamp duty on the land component, not the house and land component; and
• the purchaser pays interest on the land and building at their personal rate, compared to the builder paying commercial rates and including their margin.

Bookend lots
In the past corner lots have not been as desirable as a standard mid-block lot as:

• they can take longer to sell; and
• they require more land for the same sized house due to the increased corner setbacks.

The end of block, the bookend, provides significant opportunities to introduce small lots into a project as the bookend:

• allows for a lot with a depth less than the standard lot depths without impacting on the overall grid; and
• replaces the larger less desirable corner lot with a smaller corner lot.

Case Study – Fitzgibbon Chase

Background
Fitzgibbon Chase was the first residential project of the ULDA which became EDQ.

The project is located 12km from Brisbane’s CBD and totals 110ha in area, with approximately 55ha developable after allowance for environmental and flooding constraints.

The project feasibility was prepared on a fully commercial basis with the intention of demonstrating that housing choice and affordability could be produced with appropriate planning controls and housing innovation.

Over its development life from 2009 to 2018, freehold lot sizes were designed, developed, and sold, ranging from 50sqm to 600+sqm.

The resulting house and land packages provided significant choice and diversity in living options as well as affordability outcomes.

Lot Types
At the project launch in January 2010 only standard lot types were offered, namely:

• villa lots 250-320sqm;
• courtyard lots 450sqm; and
• traditional lots 500+sqm.

In conjunction with local builders, innovative housing types were investigated to test their marketability and impact on affordability.

This housing innovation included:

• rear-loaded and front-loaded terrace product on lots ranging from 60-175sqm; and
• rear lane loft homes on lots from 50sqm.

The strong market acceptance proved the concept of housing innovation with appropriate planning controls could deliver housing diversity and affordability outcomes.

Some of the key learnings from Fitzgibbon Chase in relation
to the delivery of the small lot housing is included in Practice Note 4 – Designing for small lots.

Since 2012 residential development projects in other PDAs have produced their own area specific lot types to address housing choice and affordability.

In some instances lot types similar to Fitzgibbon Chase have been introduced, but in many cases new lot types and housing designs have been produced to suit their local market. Refer to Figure 4 Yarrabilba snapshot.

Figure 3: Fitzgibbon Snapshot – Stage 3-4

Figure 4: Fitzgibbon Snapshot – Area C

Figure 5: Yarrabilba Snapshot – Precinct 3
Designing for small lots

Lots with frontages less than 15 metres require particular attention to detail in the urban and engineering design of their neighbourhoods, streets and the lots themselves to ensure amenity, functionality, legibility and safety to avoid conflicts and unnecessary costs and to simplify construction.

Small lot narrow frontages demand greater attention to detail in the location and coordination of services within both lots and the street verge to avoid conflicts between services and with driveways.

Critical issues
- zero lot line on low side, unless an integrated solution;
- slope across small lots, unless integrated solution: maximum 10 per cent across lot and 5 per cent longitudinal; and
- infrastructure clashes with zero lot lines and driveways.

This practice note focuses on three facets:
1. Street and Verge
2. Services
3. Lot levels and retaining.

1. Street and Verge

Speed control devices and roundabouts
- special attention at speed control devices and roundabouts;
- to ensure safe and convenient access to lots, these should be located such that they are clear of driveways or small lots. If this cannot be avoided, driveways should be constructed as part of the subdivision works to provide safe and convenient access;
- in all other cases, driveway access at speed control devices should be prohibited; and
- utilise features, such as trees and landscaping within speed control devices.

Flush kerb detail
- flush kerb should be provided to the low side edge of one-way crossfall pavements where fall is to swale or open space and pavements with no kerb and channel;
- flush kerb in this application should have chamfer or radius providing a 40mm difference in elevation from pavement edge to verge to minimize siltation and drainage problems; and
- bollards may be required for driver safety.

Street lights
- required within laneways over 60 metres for safety, preferably mid-block; and
- avoid locating on boundary of small lots, preferably locate on boundary of large lots.

Stormwater gullies – increased likelihood of clashes with driveways
- preferably located mid-block or non-driveway locations for large lots;
- avoid locating on driveway side of zero lot line boundary where known;
- avoid using large/long backstones;
- adoption of one way crossfall roads can minimize gullies on turning points and sags in internal access streets;
- no gully pits in front of small lots; and
- consider driveway access.
Bioretention pods – increased likelihood of clashes with driveways
- preferred location is on park frontages, higher order streets or in medians;
- undesirable in access and local access streets; and
- if unavoidable, locate on side without footpath, preferably on secondary frontage.

Rear lanes – limited space for services
- where possible, avoid locating utility services within laneways;
- where utility services within laneways cannot be avoided, generally locate within an unpaved section of laneway along the edge of the trafficable surface; and
- refer to Practice Note – 5 Rear lane design for further details.

Streetscape – impacts on access and amenity
Avoid:
- small lots at end of street at “T” intersections;
- too many lots in a run (refer to Part 1 Element 4: Lot Design); and
- single narrow lots amongst larger lots.

On-street car parking – reduced opportunities due to interaction of narrow frontages and driveways
- narrow lots should be opposite larger lots where possible;
- for rear lane lofts refer to Practice Note – 5 Rear lane design;
- should be constructed prior to driveways;
  - to ensure continuity of pavement treatment and footpath crossfalls; and
  - to provide priority to pedestrians and where necessary, cyclists.

Avoid cutting out the kerb by having a lower kerb profile.

Driveways – reinforce pedestrian and cyclist priority and increased likelihood of clashes with services
- should be constructed to conform with and not replace footpaths; and
- typically located on the zero-lot line boundary.

Street trees – increased likelihood of clashes with services and driveways
- coordinate location of street trees with entry and driveway locations for zero lot line lots; and
- use substantial trees, 100 litre minimum, to promote survival during construction.
2. Services

Water meters and conduits
Avoid:
• clashes with driveways for zero lot line lots.

Hydrants and valves
• preferably located opposite side boundaries of lots, or truncations, avoiding driveways.

Power pillars
• where positioning adjacent to zero lot line boundaries cannot be avoided, avoid clashes with driveways for zero lot line lots by offsetting to one side of boundary with adjacent lot; and
• power supply authority required minimum clearances to power supply pillars must be accommodated.

Communications pits
Avoid:
• clashes with driveways for zero lot line lots, offset to suit.

Sewer manholes and roofwater pits
• preferably locate sewer and roofwater mains within larger lots and along rear boundaries;
• avoid driveways;
• avoid locating sewer and roofwater mains along zero lot line boundaries and within corner lots; and
• minimise sewers down longitudinal boundary, do not bench.

Pad mounted transformers
• plan well in advance and avoid visually intrusive locations, place in parks and open space and screen visual impacts through landscaping;
• avoid locations along view lines;
• avoid locations within lots; and
• should be shown on sales plans.
**Telecommunications units**

- usually located within road reserve, however, as with pad mounted transformers, plan well in advance and avoid visually intrusive locations, place in parks and open space and screen visual impacts through landscaping;
- avoid locations along view lines; and
- should be shown on sales plans.

**Common trenching**

Common trenching, or shared service allocation, is encouraged and involves the provision of a number of services within one trench or service allocation area.

Advantages include:

- elimination of a number of single trenches, each with its own construction, settlement and reinstatement problems;
- accurate location of services for possible repair or maintenance;
- reduced verge width;
- increased verge width available for tree planting and/or landscaping;
- less conflict between services as depth relativities are known;
- more efficient use of construction equipment; and
- reduced verge and footpath disturbance for earlier establishment.

**Typical common trenching diagram**
Small lot servicing - mid lots
3. Lot levels and retaining

Zero lot lines
• on low side unless an integrated solution.

Overland flow – reduced capacity to accommodate within and across lots
• provide interallotment drainage;
• avoid small lots below large drainage catchments;
• avoid cutting and retaining on the uphill side of lots sloping steeply (more than 1 in 8) to the street, particularly with side slope as this generally results in diversion and concentration of overland flow along fencelines to a point of weakness; and
• identify any natural depressions in the landform and ensure overland flow to and within these is managed to avoid nuisance to downstream properties.

Boundary setbacks for sloping sites

[Diagram showing boundary setbacks with specifications]
Pad levels – complete major earthworks at subdivision stage to manage retaining and overland flow
• should be nominated with tolerance of +/- 100mm.

Retaining walls and boundary fences – manage retaining for amenity, solar access and structural integrity
• maximum height for retaining walls of 1.0m unless an integrated solution;
• combined height with boundary fence, maximum 2.4m;
• on zero lot lines, retaining wall feature treatment should extend to 100mm below nominated pad level for adjacent downslope lot; and
• benching of sites at subdivision stage not required if slope criteria met.

Footing detail - built to boundary
Construction details options - Zero lot line housing

- Gutter detail
  - Fascia built to boundary

- Gutter detail
  - Set back built to boundary
Side boundary detail - Concealed gutter built to boundary

- Build to boundary
  - 1st floor setback
  - 1000mm min
  - (10-14.9m frontages)

- Not to boundary setback
  - 900mm min
  - (10-12.4m frontages)
  - 1000mm
  - (12.5-14.9m frontages)

- Face brickwork or painted render finish

- Extend finish below PBL

- Max fall across site 10%

- PBL
Side boundary detail - Conventional fascia gutter built to boundary

- Build to boundary
  - 1st floor setback: 900mm min
  - 2000mm min (10-14.9m frontages)

- Not to boundary setback
  - 900mm min
  - 1200mm min (15-14.9m frontages)

Face brickwork or painted render finish

Max fall across site 15%
Side boundary detail - Recessed gutter built to boundary

- Build to boundary
  - 1st floor setback: 1000mm min
  - (10-14m frontages)

- Not to boundary setback
  - 900mm min
  - (10-12.4m frontages)

1000mm min

Face brickwork or painted render finish

1000mm max

Extend finish below PBL

max fall across site 10%
PRACTICE NOTE 4

Additional Illustrations
Rear lane design

Rear lanes play a pivotal role in achieving diverse housing at densities of 20+ dws/ha. Rear lanes deliver highly attractive streetscapes by locating driveways and garages to the rear of narrow lots. Rear lanes can be cost-effective when providing for loft apartments over lane-accessed garages and when serving small lots which front the rear lane.

A considerable advantage for developers and builders is that rear lanes enable small lots to be subdivided and individually titled and do not require building first, then titling – assisting cashflow and reducing risk.

The former Urban Land Development Authority (ULDA) developed rear lanes at Fitzgibbon Chase, for both rear garage access and loft fronts. Other developments throughout Australia have also been referenced in this practice note as examples of best practice in delivery of rear lanes.

This practice note has been prepared to assist in the design of rear lanes and the assessment of development applications involving rear lanes.

1. Types of rear lanes

Two functional types of rear lanes are typically used, namely those:

1. providing access to garages; and
2. those providing front door access to loft and other small dwellings.

Lanes providing front door accesses to dwellings should consider providing a higher level of amenity and landscaping within the lane.
## Rear lane design considerations

### All rear lanes:

<table>
<thead>
<tr>
<th>Should</th>
<th>Should generally not</th>
</tr>
</thead>
<tbody>
<tr>
<td>- be wide enough to enable safe and efficient vehicle movement, including through movement of service vehicles, but not be overly wide (maximum 6.5 m reserve width recommended in certain instances while - absolute maximum 7.5 m in most circumstances);</td>
<td>- be longer than 140 m without a mid-lane link;</td>
</tr>
<tr>
<td>- preferably be straight or at least a long radius curve or in a T-configuration (rather than H-lanes, dog-leg lanes or tightly curved lanes);</td>
<td>- create a more convenient or direct through-route alternative for vehicles, cyclists or pedestrians than the adjoining street network;</td>
</tr>
<tr>
<td>- where there is a bend or intersection incorporated into the design, ensure the swept path of a garbage truck is accommodated. Similarly, operational clearances for the garbage truck need to be considered;</td>
<td>- be dead ends or culs-de-sac;</td>
</tr>
<tr>
<td>- enable easy and safe access into and out of garages, avoiding tilt-panel or other doors that open into the lane;</td>
<td>- provide for visitor parking within the lane, unless in specifically designated areas;</td>
</tr>
<tr>
<td>- ensure rear yards of properties can be fenced for security, but have a centre draining profile with the stormwater catchment limited to the lane;</td>
<td>- have traffic calming devices; and</td>
</tr>
<tr>
<td>- have a pavement cross fall to the centre of 2.5 per cent to 3 per cent;</td>
<td>- be a drainage path for any catchment external to the lane.</td>
</tr>
<tr>
<td>- have pavement kerb constructed 100mm lower than the adjoining lot/building level to ensure stormwater is conveyed in the lane and not through the lot/building; and</td>
<td></td>
</tr>
<tr>
<td>- have good passive surveillance into, along and through lanes.</td>
<td></td>
</tr>
</tbody>
</table>

### Rear lanes that provide primary access to dwellings

Should also provide:

- a higher level of amenity and landscaping;
- a maximum 80 m from street visitor car parking to the entry of the dwelling fronting the rear lane;
- well landscaped entrances visible from within the lane;
- house numbers and letter boxes to indicate entry points to dwellings, in accordance with Australia Post requirements;
- provision for metered services and other infrastructure;
- pavement treatment and materials to enable ease of access to, and maintenance of, underground services (power, telecom, water, sewer);
- public lighting, with poles avoiding reversing vehicle paths;
- adequate sightlines for both pedestrians and cars at intersections; and
- acknowledgement of the (generally) low vehicle speed environment.
2. When to provide a rear lane
Rear lanes are an important part of the street pattern as residential densities increase, in activity centres and when an urban streetscape is sought.

Rear lanes:
1. free up kerb space for additional on-street visitor parking provision;
2. leads to uninterrupted path and cycle networks in busy streets; and
3. provide for significant increase in density and housing choice opportunities with rear loft product.

3. Lane width and Garage Access
A lane’s width and lack of a verge distinguish it from a street.

This distinction is important, to avoid any confusion as to its function so lanes widths should be kept to the minimum recommended. The lane’s function is further reinforced and the useable private open space on the lot is maximised by minimising building setbacks to lanes.

The width of the lane is determined by the space required for service infrastructure, vehicle turning movements, refuse bin collection, landscaping and planting, the lane length, and the creation of a lanescape (rather than a streetscape).

Lanes reserve widths should be no greater than 6.5-7.5 m.

To minimise the setback from the lane thereby maximising the private open space on the lot, the clear garage/carport entry will need to be wider than 2.4 m for a single garage/carport.

This is to accommodate the turning path of a typical, moderate-sized motor vehicle, when entering the garage/carport in a forward gear. The turning path must be clear of other obstructions, such as pillars and columns. The swept path will also determine location of landscape planting clear of driveways.

Table 1: Lane width and garage dimensions

<table>
<thead>
<tr>
<th>Lane width</th>
<th>Garage/carport door setback to laneway</th>
<th>Garage/carport door width clear when open</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.5m</td>
<td>0m</td>
<td>3m</td>
</tr>
<tr>
<td></td>
<td>1.5m</td>
<td>2.85m</td>
</tr>
<tr>
<td>7.5m</td>
<td>0m</td>
<td>2.8m</td>
</tr>
<tr>
<td></td>
<td>1.5m</td>
<td>2.6m</td>
</tr>
</tbody>
</table>

Garage/ carport openings - moderate sized motor vehicle

Note that by reducing garage/carport setbacks and providing a wider garage door, private open space (POS) within the lot can be maximized and in certain circumstances provide sufficient space for part-time tandem carparking within this POS (a carcourt). The closer the buildings are located to the property boundary and therefore the closer they are together across the lane, the less likely the lane will be confused with a street.

4. Lane length
The level of convenience, safety, and security experienced by lane users is also dependent on the length of the lane and the nature and number of dwellings to be accessed from it.

A rear lane at the end of a block will typically deliver a lane with a length of 57-64 m depending on the length of the lots adopted in the block design. A rear lane along the length of a block will typically deliver a block length of 120-140 m. A mid-block pedestrian/cycle link is recommended where the length of a rear lane is over 140 m.

5. Aesthetic treatment and landscaping
The principle of providing diversity in housing in new neighbourhood development should extend to the treatment of buildings and landscaping in rear lanes.

Buildings should exhibit diversity in design, materials, colours, textures and finishes, with designs complementary to local conditions.

Some low maintenance planting is preferred in all lanes. Planting areas should be at least 750mm square (or if rectangular have minimum dimensions of 500mm x 750mm), have no turf, and have at least one tree planted mid-block and at the ends of the lane.

Double garage/carport doors are appropriate when a diversity of building and landscaping materials and a variety in door treatment have been introduced, particularly when the lane services primarily garages. An appropriate lanescape can be more easily achieved when a diversity of
building materials and articulation has been introduced into above-garage dwellings and the door is setback at least 0.5 metres from the face of the main dwelling.

6. Lane definition

The lane should be detailed so it reads as a lane (and not a street). Defining the lane should include consideration of:

• changing threshold treatment (height, materials, colour, reduced corner truncations);
• providing flush kerbs to open up lane width;
• readily accommodate service infrastructure if it cannot otherwise be avoided e.g. electricity supply; and
• minimising setbacks to dwellings that front the lane.

The end of and entry to the lane should be clearly defined, which may include:

• the use of planting to define entry to an “industrial” looking lane;
• lanes with view lines open to space or landmark building and/or tree; and
• mandated two-storey construction on lots at lane entry or adjoining mid-block link.

A diversity of building and landscaping materials and recessed garage doors in loft homes off a rear lane (Fitzgibbon Chase)

A clearly defined rear lane with minimum separation between facing loft homes (Kensington Banks)

A diversity of building and landscaping materials and recessed garage doors in loft homes off a rear lane (Fitzgibbon Chase)

A clearly defined rear lane with minimum separation between facing loft homes (Kensington Banks)
Typical rear lane cross-section

7. Services
Where possible, all essential services (power, water, sewer, stormwater and telecom) should be provided in the street and not in the rear lane. Typically this will require lots and lofts facing a rear lane to be serviced from the street frontage via easements located in the side setback of the dwellings which front the street. This is typical where lots are serviced from both sides of the street and lofts facing the lane are subject to a community title scheme.

Loft homes/lots facing a rear lane which are proposed to be fee simple Torrens title (not subject to a community title) may require services to be provided within the lane. It is also efficient to locate services within the lane, where lots front a non-access connector street and/or parkway.
Essential services within the rear lane (Varsity Lakes)

In a 6.5 m wide lane, a mid-block link provides opportunities for electrical connection to light poles, as well as for trees and other planting and stormwater conveyance.

Street lighting poles can also be provided at the entrance to a rear lane, however this typically only lights to a distance of 25-30 m into the lane. As such a 6.5 m wide rear lane can be used where the lane is preferably no more than 60 m long and lit at both ends. Longer lanes may require a mid-block link location for street lighting.

Privately installed trip lighting may be considered as an alternative street lighting method where the 6.5 m wide rear lane is longer than 60 m, but this is not preferred.
Where mid-block links are not provided, the width of the lane (road reserve) may have to be increased to 7 or 7.5 m where all services are provided within the lane. In this situation, special attention also needs to be given to locating services to ensure there is sufficient separation between underground conduits and that access points to water meters and power boxes (green boys) are available and appropriately protected.
8. Address

Ensuring an appropriate address

It is imperative that each dwelling has an appropriate address for services such as Police, Ambulance, SES, Fire Brigade, and where required, Australia Post. This address may be different than the real property description (RPD). Whilst the real property description of a lot with two dwellings may relate to one street (or “Park Way”) address, the dwelling fronting the rear lane should have a service/postal address relating to the name of the lane. Number (lot) 3 Kuranda Park Way therefore includes a dwelling which fronts (number) 3 Palmerston Lane.

![Palmerston Lane off Carsegrove Avenue (Fitzgibbon Chase)](image)

Servicing small dwellings off a rear lane

Where loft homes over garages provide off-street car parking for other dwellings, the loft apartment is typically freehold title or subject to a community management scheme and/or volumetrically subdivided. In the illustration below, the smaller lot is freehold and not subject to a community title. One on-site car parking space is provided per dwelling. Two on-site car parking spaces are provided in tandem on the lot for the larger dwelling which fronts the street/park.

Refer to practice Note 7: Designing for small lots for further information. Tandem carparking provides additional on-site flexibility. One or both of the spaces could be used for cars, boats or an extension of private open space.
9. Small lots off rear lanes

The illustration below shows a solution for the provision of a small house on a freehold Torrens title (not subject to community titling) with a front door facing a rear lane. This solution takes advantage of the loft apartment provisions for balconies and other private open space and enables a small house to be provided on a lot with a zero building setback to all boundaries and 100 per cent site coverage.

Servicing small freehold dwellings off a rear lane (Image supplied courtesy of Ausbuild)

“Daintree Park Way” at Fitzgibbon Chase provides frontage to detached terrace houses including garages serviced via a rear lane.

Where a dwelling fronts onto a park, a thin strip of road reserve including a 1.5 m wide pathway should be provided to enable postal access to these lots. These strips of public road are typically called a “Park Way”.

PRACTICE NOTE 5
10. Parking analysis plan

Typically loft homes can be built on any lot serviced by a rear lane. Where it is anticipated that the majority of loft apartments or other small dwellings will be built, a parking analysis plan may be required to demonstrate that the surrounding streets can accommodate sufficient on-street parking within 150 m walking distance for visitors accessing dwellings, which front the rear lane. Typically 0.75 on-street car parking spaces are required per house.1

11. Bin storage and collection

Careful consideration of bin storage is needed, particularly where dwellings front a park or the lane. Dedicated bin storage should be located within the lot and not in the garage or the lane. The bin storage should be easily accessible, screened and well ventilated. Bins stored in driveways on lanes are an emerging issue and bin storage areas within garages are not desirable for residents. A properly designed lane will allow space for bins and garbage trucks on collection day.

Inadequate on-site bin storage leads to bins being left in the lane. Dedicated accessible, screened, and ventilated bin areas should be provided in each lot and not in the garage.

12. Lessons for Builders

- work out site levels exactly – due to the tight site, even minor slopes in the lane and across the site can lead to errors;
- design from the start the water/power/gas connections – very poor outcomes can occur if poorly detailed; and
- bin storage areas, if located off living areas may be used for purposes other than for bin storage.
Design for Cyclists

Aura: A Case Study

It is widely recognised that many people in Australia would like to cycle more regularly whether for recreation or to get to work or nearby services.

However, to generate real modal shift, cycling infrastructure needs to target and support the general public who are interested in cycling but are concerned for their safety or safety of others (i.e. where they need to share the road with cars or a footpath with pedestrians) and therefore they choose not to ride. This was noted back in 2008 by Rachel Smith identifying that up to 60% of the population are interested but are concerned for their safety.

The challenge of creating safe, accessible active transport networks that encourages more sustainable forms of transport has seen Stockland, Sunshine Coast Council and Economic Development Queensland develop individual responses, policies and standards which have been used collaboratively in the delivery of cycling infrastructure at Aura.

2. Aura: a Cycle City – A Unique Approach

Aura’s unique approach has focused on a provision of a dedicated, 2-way cycle track with a separated network adjacent. The approach to the cycle track design has focused on the following objectives.

A. NETWORKED APPROACH – CONNECTING THE COMMUNITY
   - connects key destinations and activity clusters (i.e. centres, employment precincts, major parks and recreation);
   - safe crossing points on major roads; and
   - provision of end of trip facilities at centre and major employment nodes.

B. TARGETED APPLICATION
   - positioned only on limited access roads;
   - supports responsive street network design to minimise obstructions; and
   - reinforces role in hierarchy.

C. SIGNATURE CONFIGURATION AND NETWORK FUNCTION (an active transport ‘beacon’)
   - highly legible;
   - safer; and
   - integrates with on-street and shared path network along creek corridors.

D. SPACE SAVING AND EFFECTIVE – STAGEABLE
   - allows staging of bridges and higher order dual carriageway roads; and
   - makes more efficient use of land.

1. About Aura

Aura, Stockland’s development of the Caloundra South Priority Development Area (PDA) on Queensland’s Sunshine Coast is Australia’s largest master planned community. The Caloundra South PDA covers 2,310ha of land and sits between the Bruce Highway to the west and Bells Creek road to the south. Once developed, Aura will provide approximately 20,000 dwellings and create 15,000 jobs.
Proposed cycle track and cycleway network plan

DESTINATIONS
Centres
Employment
Schools
Parks

ACTIVE TRANSPORT NETWORK
- Cycle track
- On-road (both sides)
- Off-road
- Kawana Arterial

Proposed cycle track section profile

2.5% FOOTPATH 2.0 3.0 CYCLE LANE 1.5 1.5 3.0%
Indicative lengths:
• Cycle track – 53.7km
• Off Road Share Path – 5.7km
• On Road – 10.7 km
This equates to approximately 60km of cycle infrastructure that is separated from general traffic lanes.

3. Key Achievements in first 2 years
• Successful delivery and usage of the cycle network which has seen over 50% of primary school students use the network to get to school.
• RideScore* partnership with Sunshine Coast Council, Baringa Primary School, and Stockland.
• Baringa Pedal park is one of the most popular parks on the Sunshine Coast, used by local residents and visitors alike. As a result, it was nominated by the Sunshine Coast Daily as one of the top 10 parks on the Sunshine Coast.
• Consistent feedback from residents and visitor on how much they love the cycle facilities and that it has increased how often they cycle.
• The early delivery of the veloway throughout Baringa has ensured positive behaviours of cycling are being adopted from the start of the new community.
• The early completion of over 4km of connecting cycle track to surrounding communities of Aura.

* RideScore is the first program of its type in Australia to record student cycle trips and provide real-time information to parents. The technology consists of a Bluetooth beacon being attached under the bike seat and a reader is positioned at the school’s bicycle storage area. An email notification is sent to the parent when the student arrives at and departs the school. Students accumulate one reward point for each day they cycle to school. Students are awarded prizes when they reach specified milestones.
5. Resource Material

- Technical Note 128 Selection and Design of Cycle Tracks – May 2015 – Qld Department of Transport and Main Roads
Demonstration Example 1 – Major Collector street with principal cycle corridor serving as a bus route

In the subject example, the Major Collector street does not provide property access driveways, but does have frontage land uses that create a need for on-street parking. Traffic volumes are in the order of 8,000vpd (total two-way). The design speed has been adopted as 60km/h. Pedestrian activity is considered to be reasonably high given the bus stops and adjacent land uses.

The resultant cross section is as follows:

- 7.5m verge, comprising:
  - 1.0m separation from boundary to footpath
  - 2.0m footpath
  - 3.0m two way separated cycle track
  - 1.5m separation from cycle track to kerb. This will include significant trees/vegetation;
- 2.5m parking lane
  (to be widened to 3.0m at an indented bus stop);
- 3.5m travel lane;
- 3.5m travel lane;
- 2.5m parking lane
  (to be widened to 3.0m at an indented bus stop); and
- 4.5m verge, comprising:
  - 1.5m separation from kerb to footpath. This will include significant trees/vegetation
  - 2.0m footpath
  - 1.0m separation from footpath to boundary.

TOTAL STREET RESERVE = 24m.
Demonstration Example 2 – Access street with principal pedestrian corridor

In the subject example, the Access street provides property access driveways, hence the need to accommodate on-street parking. Traffic volumes are in the order of 500 vpd (total two-way). The design speed has been adopted as 40 km/h. The street does not form part of a cycle corridor.

The resultant cross section is as follows:

- 5.4m verge, comprising:
  - 1.5m separation from boundary to footpath. This will include significant trees/vegetation
  - 2.4m footpath
  - 1.5m separation from footpath to kerb. This will include significant trees/vegetation;
- 5.5m carriageway (pavement). This will accommodate on-street parking and two way traffic in shared use arrangements; and
- 4.0m verge, comprising:
  - 1.5m separation from kerb to footpath. This will include significant trees/vegetation
  - 1.2m footpath
  - 1.0m separation from footpath to boundary.

TOTAL STREET RESERVE = 14.9m.

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Demonstration Example 3 – Collector street with secondary cycle corridor

In the subject example, the Collector street provides property access driveways, hence the need to accommodate on-street parking. Traffic volumes are in the order of 3,000 vpd (total two-way). The design speed has been adopted as 50 km/h. Pedestrian activity is considered to be low and for local use.

The resultant cross section is as follows:

- 4.5m verge, comprising:
  - 1.0m separation from boundary to path
  - 2.5m shared pedestrian/cycle path
  - 1.5m separation from path to kerb. This will include significant trees/vegetation;
- 2.3m parking lane;
- 3.0m travel lane;
- 3.0m travel lane;
- 2.3m parking lane; and
- 4.5m verge, comprising:
  - 1.5m separation from kerb to path. This will include significant trees/vegetation
  - 2.5m shared pedestrian/cycle path
  - 1.0m separation from path to boundary.

TOTAL STREET RESERVE = 19.6m.
Verges

The verge is the part of the street reserve between the carriageway and the property boundary.  

Functions of the verge

The verge provides space in the street reserve between the carriageway and property boundary for:

• walking or using mobility devices, such as wheelchairs or scooters;
• street trees and landscaping;
• utilities;
• freeboard for stormwater; and
• visibility and safety.

Minimum verge width

The minimum verge width is determined by several factors including:

• the offset from the carriageway (measured from the invert of the kerb and channel);
• the width of pedestrian and cycle facilities (path of travel);
• the width of public transport facilities (the minimum verge width for a regular bus stop is 4.25m);  
• the offset from the property boundary (back of verge);
• a minimum crossfall (typically 2%) to achieve drainage; and
• a maximum crossfall (typically 2.5%) to achieve compliance with the Disability Standards for Accessible Public Transport 2002.

In practice the minimum verge width is 4.25m with barrier kerb (absolute minimum 4.15m) or 4.5m with mountable kerb (absolute minimum 4.4m). These verge widths are based on achieving the minimum height difference of 100mm between the back of kerb and property boundary to achieve freeboard under the QUDM without exceeding a verge crossfall of 2.5%.

Where freeboard under the QUDM is not required the verge width may be reduced only where pedestrians are appropriately catered for. An example of this is a 3.75m verge on the high side of a street with a one-way crossfall.

Verge widths should provide visibility to cater for:

• vehicles reversing out of driveways; and
• reaction time for unexcepted events, such as a child running into the street. At 50km/h, the unposted urban speed limit in Queensland, a 4.25m verge has enough reaction time.

Footpaths and shared paths (path of travel)

Footpaths and shared paths must provide a continuous accessible path of travel with a smooth non-slip finish that is easy to maintain. Plain or full depth coloured concrete are preferred finishes.

Other surface finishes such as bitumen, tiles, or paving may be used where non-slip and well maintained. Exposed aggregate should not be used as it does not cater for the diversity of users.

Footpaths and crossings form the core of the pedestrian network and must cater for universal access. They are a dedicated space allowing people to move on foot or with mobility devices, such as wheelchairs or scooters. Pedestrians have the legal right of way on footpaths, including over driveway crossovers.

Increasing the depth of the path of travel to 125mm instead of 100mm makes them trafficable so that the continuous accessible path of travel is not interrupted by driveways.

In order to provide adequate space for street trees, pram ramps, and compliant driveway crossovers the path of travel should be offset either 1.5m or at least 2m from the invert of

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1 Street Design Guidelines for Landcom Projects 2009
2 TransLink Public Transport Infrastructure Manual (PTIM) 2015 drawing number DRG 5-0013
3 Australian Standard AS1428-1—2009 Clause 6
the kerb and channel. Interim path of travel offsets between 1.5m and 2m are not preferred as compliant driveways are unlikely to be constructed. A 2m offset provides an adequate distance between the driveway transition and the footpath to avoid cutting the continuous path of travel.

Figure 2: Compliant pram ramp and non-compliant driveway crossover with a 1.75m offset to the path of travel. Picture taken on Wishart Crescent BARINGA (3 August 2019)

Generally footpaths should have a minimum clear width of 1.8m to allow two wheelchairs to pass comfortably. Where the volume of pedestrians is expected to be lower, such as on minor streets, a 1.5m footpath may be appropriate on a case by case basis. The absolute minimum clear width to cater for a person with a wheelchair is 1.2m, however, footpaths this narrow should be avoided as they cater for a very low volume of pedestrians and are generally not comfortable to use.

Kerb types
Mountable kerbs became common practice in Australia during the 1980s. Pak-Poy and Kneebone (1988) recommended mountable kerbs on the basis that:
- it was cheaper in lower speed environments;
- allowed formal or informal car parking on the verge;
- provided for service vehicles in narrow streets; and
- it eliminates the need for formal crossovers.

In practice mountable kerb has been used inappropriately in environments where direct property access is not required. Mountable kerbs have largely become redundant because they do not appropriately protect the pedestrian environment, encourage unlawful parking on the verge, and driveways constructed to the back of mountable kerb do not cater for people with disabilities.

Barrier (upright) kerbs:
- protect the path of travel by obstructing vehicles from mounting the kerb;
- have stronger edge definition between the carriageway and verge and encourage better parking behaviour;
- provide easier access to and from vehicles for people with disability and the elderly;
- provides more ground surface area for street trees;
- set the relative levels for pedestrian facilities and utilities within the verge;
- provide a consistent predictable profile when installing driveway crossovers; and
- are required as bus stops.

Figure 3: Barrier kerb combined with established street trees provides edge definition and a sense of enclosure. Photo taken on Landsdowne Drive ORMEAU (17 September 2019)

Kerb ramps
Kerb ramps shall be aligned with the path of travel, have a slip resistant finish, and have:
- a maximum rise of 190mm;
- a length not greater than 1520mm; and
- a gradient not steeper than 1 in 8 (12.5%) located within or attached to the kerb.

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4 Pak-Poy and Kneebone 1988 Section 6.3
5 Pak-Poy and Kneebone 1988 Section 6.3
6 Street Design Guidelines for Landcom Projects 2009
7 Australian Standard AS1428.1—2009 Clause 10.7
Utilities
Utilities commonly found within the verge include:
- electrical reticulation;
- telecommunications;
- reticulated water;
- reticulated sewerage;
- reticulated natural gas;
- street lighting; and
- stormwater.

The standard alignments for infrastructure vary between local governments and service providers. To keep verges to a minimum width and cater for street trees utilities should be located underneath footpaths wherever possible (telecommunications, reticulated water, and reticulated sewerage).

An offset of 750mm from the property boundary to the path of travel caters for electrical pillars, water meters, and small telecommunication pits. Where the telecommunication pits are wider than 750mm from the property boundary pay close attention to the finished surface levels so that the pedestrian facilities provide a continuous accessible path of travel.

The minimum offset from the property boundary to the path of travel to cater for electrical pillars is 600mm.

Driveways
Driveway crossovers within the verge should be constructed to the IPWEAQ standard drawings and finished in plain or coloured concrete to match the footpath. Other crossover surface finishes such as bitumen, tiles, pavers, or exposed aggregate should not be used as they interrupt the continuous accessible path of travel.

Recommended verge profiles
Standard verge profiles reduce variation between local government areas and are more predictable for the designer, the contractor, and the end user.

Local governments may consider specifying a particular colour of full depth coloured concrete to create a local feel. For example, the Gold Coast Light Rail corridor, uses two standard colours of full depth coloured concrete.
The recommended verge profiles in Table 1 are based on using barrier kerb and channel with a 2.5% crossfall.

Using barrier kerb and channel routinely sets the relative levels for the verge and makes it easier to construct DSAPT compliant driveway crossovers and pram ramps.

**Table 1: Recommended verge profiles**

<table>
<thead>
<tr>
<th>Verge type (abbreviation)*</th>
<th>Verge width</th>
<th>Front of verge**</th>
<th>Path of travel</th>
<th>Back of verge***</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVZ</td>
<td>3.75m****</td>
<td>Zero</td>
<td>Zero</td>
<td>Zero</td>
</tr>
<tr>
<td>CV1.2</td>
<td>3.75m****</td>
<td>1.5m</td>
<td>1.2m</td>
<td>1.05m</td>
</tr>
<tr>
<td>CV1.5</td>
<td>3.75m****</td>
<td>1.5m</td>
<td>1.5m</td>
<td>0.75m</td>
</tr>
<tr>
<td>SVZ</td>
<td>4.25m</td>
<td>Zero</td>
<td>Zero</td>
<td>Zero</td>
</tr>
<tr>
<td>SV1.2</td>
<td>4.25m</td>
<td>2m</td>
<td>1.2m</td>
<td>1.05m</td>
</tr>
<tr>
<td>SV1.5</td>
<td>4.25m</td>
<td>2m</td>
<td>1.5m</td>
<td>0.75m</td>
</tr>
<tr>
<td>SV1.8</td>
<td>4.25m</td>
<td>1.5m</td>
<td>1.8m</td>
<td>0.95m</td>
</tr>
<tr>
<td>SV2.0</td>
<td>4.25m</td>
<td>1.5m</td>
<td>2m</td>
<td>0.75m</td>
</tr>
<tr>
<td>SV2.5</td>
<td>4.75m</td>
<td>1.5m</td>
<td>2.5m</td>
<td>0.75m</td>
</tr>
<tr>
<td>SV3.0</td>
<td>5.25m</td>
<td>1.5m</td>
<td>3m</td>
<td>0.75m</td>
</tr>
<tr>
<td>SV4.0</td>
<td>6.25m</td>
<td>1.5m</td>
<td>4m</td>
<td>0.75m</td>
</tr>
</tbody>
</table>

*The verge type abbreviation uses coding as follows:

- **Standard Verge (SV)**—a minimum verge width of 4.25m used in most circumstances with a corresponding increase in width for shared paths over 2m;
- **Constrained Verge (CV)**—a minimum verge width of 3.75m used in a constrained corridor or where freeboard under the QUDM is not required (e.g. on the high side of a carriageway with a one-way crossfall);
- **Zero (Z)**—a verge without a footpath or shared path; and
- **Numeric (N)**—the width of the path of travel represented in metres.

**The front of verge is the space between the path of travel and the invert of the kerb and channel. In order to provide adequate space for street trees, pram ramps, and compliant driveway crossovers footpaths should be offset either 1.5m or at least 2m from the invert of the kerb and channel.

***The back of verge is the space between the path of travel and the property boundary.

****Does not provide freeboard under the QUDM.
Traffic Volume

Traffic volume is a measure used to quantify the amount of vehicular, motorised, pedestrian or bicycle traffic using a road or street infrastructure including paths.

Determining Traffic Volume
Traffic volume is a major factor in designing the road and will generally determine the key parameters of the infrastructure required to accommodate such volume. Vehicular traffic is often expressed in Average Daily Traffic (ADT) calculated using an Annual Average Daily Traffic (AADT) - the total volume of traffic calculated on part of the road and divided by 365 days.

The following factors can influence traffic volume:
• site locality and its connectivity to road network;
• local attractors such as health clinics, hospitals, shopping centres, public transport stations, kindergartens or schools;
• travel behaviour (e.g. rat running and avoiding congested parts of road network);
• timing of travel - morning or afternoon peak or a defined local peak;
• weather conditions (e.g. flooding of roads can re-route traffic);
• events in the area; and
• emergency conditions.

To determine traffic volume, engineers can obtain traffic (or trip) generation data from traffic counts for a specific land use or by using one of the following sources:
• Local Government Planning Scheme;
• Guide to Traffic Generated Developments1; or
• other credible sources, if accepted for use by the Local Authority.

Example
In detached suburban areas with limited public transport services and active travel infrastructure, the reliance on vehicular trips will generally be higher than in the areas that are well connected to, and serviced by, public transport and active travel infrastructure.

Peak Hour Traffic Volume
Peak hour traffic is the amount of traffic using the road during the defined peak hour period. Generally, the AM and PM peaks are considered for estimation of traffic volume as a worst case scenario and the peak hour traffic volumes are sued to evaluate the performance of road network. The peak periods are determined through traffic counts and selecting a 1-hour period with the highest volume of traffic recorded for AM and PM scenarios. Often the wider ‘network peak’ can coincide with the local peak or a school traffic peak although in some instances these peak periods can be different.

Level of Service
Many local authorities use a Level of Service (LOS) as their desired standard of service (DSS) for the road network including intersections. LOS is a qualitative stratification of the performance measure or measures representing quality of service. A LOS definition is used to translate complex numerical performance results into a simple stratification system representative of road users’ perceptions of the quality of service provided by a facility or service3. LOS is generally represented by letters A to F, the latter indicates the worst intersection or road link performance situation (flow breakdown, demand is greater than capacity, and average vehicle delay exceeding 80 seconds).

When modelling is used (e.g. SIDRA) for assessment and establishment of DSS, the outputs are often described as Degree of Saturation (DOS) which is a modelled volume to capacity ratio used as proxy for LOS. The degree of saturation of an intersection approach ranges from close to zero for very low traffic flows up to 1.0 for saturated flow or capacity. The degree of saturation of a signalised intersection approach may be defined as the ratio of the arrival flow (demand) to the capacity of the approach during the same period. A degree of saturation greater than 1.0 indicates oversaturated conditions in which long queues of vehicles build up on the critical approaches.

Tip: When carrying out traffic counts in suburban areas, take a note of major traffic generators such as schools - it is best to avoid school holiday periods, public holidays, and student free days as the traffic volumes would generally be lower during these times.

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1 Transport Roads & Maritime Services, TDT 2013/04a, NSW Government
2 An ITE Information Report, Institute of Transportation Engineers, USA
3 Highway Capacity Manual, Transportation Research Board, 2016, USA
Many intersections and road links operate at a reduced level of service (e.g. LOS D, LOS E or even occasional LOS F) during the peak hours. Although it may not be the most convenient for commuters, occasional decrease in performance and increased delay during peak hour may be acceptable in some situations. The changes between levels of LOS are not necessarily proportional and should be assessed on each and individual basis. Figure 1 demonstrates an approximate change in delay compared to change in LOS, noting a sharp increase in delay time past LOS F at which point network fails.

Figure 1. Relationship between increase in traffic volume and increase in delay, compared to LOS.

Source: Syd Jerram RPEQ

Tip: Designers should be aware of differences between infrastructure required to maintain a specific LOS. In most cases, an increase in just one increment in LOS (e.g. from LOS E to LOS D) may trigger a significant upgrade of an intersection or a road link, potentially requiring extra land to accommodate additional road pavement width. It is important to note that LOS may worsen significantly during peak hours times and will perform well outside of those times.

Environmental capacity of a street

Designers must be aware of potential correlation between increasing traffic volumes and the degradation of residential amenity of a street. Designers should examine the key elements of a street and define the volume and character of the traffic permissible in the streets that it is consistent with good environmental conditions. It is suggested that the assessment of environmental capacity of the street becomes more significant as traffic increases and may not be as straightforward as assessing the exact quantity of traffic volume. Other factors such as traffic-generated noise, walkability, verge width, dwelling set-backs, pavement width, and local demographics must also be considered in evaluating the street capacity.

Example

The traffic volume for a new 350-lot residential development is calculated at 2,800vpd based on traffic generation of 8vpd/dwelling. It is assumed that each lot will have one dwelling. Proposed changes to the local planning scheme, due to be adopted in 6 months, will introduce higher densities for part of the development, potentially allowing 50 lots to be further subdivided into residential land parcels suitable to have one dwelling per each additional lot. Based on similar developments, the general community profile of the proposed development suggests a high car per dwelling ownership and an above average number of young children per household indicating that younger families favour this area. This is further explained by proximity to a district park, schools, and a bus station located across the major highway within 1 km distance.

A new road which will service this development is an Access Street type road (typical max. volume <3,000vpd). The local authority decided to consider the proposed planning scheme changes, resulting in re-calculation of traffic volume:

Proposed before planning scheme changes:
350 lots x 8vpd = 2,800 pd (assume 1 dwelling per lot)

After planning scheme changes:
(350 lots - 50 lots) + 100 lots = 400 lots (assuming 50 lots can each be subdivided into two)
400 lots x 8vpd = 3,200vpd

Consequently, because the proposed traffic volume of 3,200 is greater than the typical max. volume for Access Street, the designer must carefully consider the environmental capacity of the proposed street to accommodate proposed traffic. Factors such as car ownership per dwelling, the likelihood of children using the street for playing and occasional cycling, and connectivity to the nearest amenities must be considered. In this case the designer may decide to provide a suitable shared use path to connect development to the school and other key amenities to reduce reliance on vehicles. It may also be beneficial to understand if the school and bus station have adequate end of trip facilities to accommodate active travel.

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4 Assessing the Environmental Capacity of Local Residential Streets, Korey, G. and Chesterman, R., 2010, 12th WCTR
5 Traffic in Towns, Buchanan, 1963