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Guide to Traffic Management Part 7

Traffic Management in Activity Centres



Austroads



Guide to Traffic Management Part 7: Traffic Management in Activity Centres



Austroads

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Guide to Traffic Management Part 7: Traffic Management in Activity Centres

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This is the second edition of Part 7. This guide has been updated to reflect emerging and evolving practices related to the management of activity centres. It includes updates to network operation planning (Section 3.4.1), traffic calming and speed management (Section 3.6) and cycling implications for traffic management practice (Section 3.8.4). It also incorporates a new appendix with case studies on traffic management in activity centres (Appendix B), updates to design considerations for pedestrians with special needs (Appendix G) and a new appendix with guidance on passenger transport interchanges (Appendix I).

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Abstract

Austrroads Guide to Traffic Management: Part 7: Traffic Management in Activity Centres is concerned with the planning and management of centres typified by high levels of internal activity and interaction, especially by people on foot. It addresses the need to obtain a balance between providing for vehicular access and providing for pedestrian, cyclist and public transport needs without compromising the functionality of a site. It provides guidance for planners and engineers associated with the design, development and management of a variety of activity centres.

Part 7 presents the guiding principles for traffic management in activity centres, including the policy and planning context, and major considerations and processes involved. It outlines operational and physical measures to provide for movement to and within such centres, either as part of their planning or in their day-to-day management. It presents traffic management techniques and procedures that may be applied in activity centres and details their application in different kinds of centre, based on examples in practice.

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Contents

1.	Introduction.....	1
1.1	Purpose and Scope	1
1.1.1	Purpose: Getting the Balance Right	1
1.1.2	Scope and Structure of this Part.....	2
1.2	Context	2
1.2.1	Traffic Impacts of Developments	4
1.3	Definition of Activity Centres	4
1.3.1	Three Generic Types of Activity Centres.....	5
1.3.2	Three Types of Traffic Situation	5
1.3.3	A Typology of Activity Centres.....	6
1.4	Generic Situations and Summary Guidance	6
1.5	How to Use this Part of the Guide	7
2.	Principles and Objectives.....	9
2.1	General Guidance	9
2.1.1	Underlying Objective	9
2.1.2	Issues	9
2.2	Principles	10
2.2.1	Supporting Planning and Urban Design Objectives	10
2.2.2	Meeting the Movement Needs of All Users	12
2.2.3	Guiding Principles.....	13
2.2.4	Elements Needing Consideration	13
2.3	Policy and Planning Context	15
2.3.1	Policy Context.....	15
2.3.2	Planning Context for Walking and Cycling in Activity Centres	15
2.3.3	Transit Oriented Development.....	19
2.3.4	Civic and Heritage Context.....	20
2.3.5	Transport Network Considerations	21
2.3.6	Public Transport Connections and Access.....	25
2.3.7	Parking Policy and Planning.....	26
2.3.8	The Safe System Approach and Safety-conscious Planning.....	27
3.	Techniques for Traffic Management in Activity Centres.....	28
3.1	Information Gathering.....	28
3.1.1	Implications for Practice	28
3.2	Traffic and Transport Impact Studies	29
3.2.1	Implications for Practice	29
3.3	Managing Travel Demand and Mode Choice.....	30
3.3.1	Implications for Practice	30
3.4	Network Management	31
3.4.1	Network Operation Planning.....	32
3.4.2	Implications for Practice	32
3.5	Road Design and Capacity.....	33
3.5.1	General Comments about Cross-section	33
3.5.2	Creating Desired Design Conditions through Planning of the Centre	34
3.5.3	Implications for Practice	35
3.6	Traffic Calming and Speed Management.....	37
3.6.1	Appropriate Speed Environments	37
3.6.2	Ways to Influence Vehicle Speeds in Centres	37
3.6.3	Implications for Practice	38
3.7	Environmental Adaptation	38
3.7.1	Applying the Environmental Adaptation Process	39
3.7.2	Implications for Practice	39

3.8	Providing for Pedestrians and Cyclists.....	40
3.8.1	Pedestrians in Activity Centres.....	40
3.8.2	Pedestrian Implications for Traffic Management Practice.....	40
3.8.3	Bicycles in Activity Centres.....	43
3.8.4	Cycling Implications for Traffic Management Practice	44
3.9	Providing for Deliveries and Service Vehicles.....	47
3.9.1	Implications for Practice	47
3.10	Parking Management	48
3.10.1	Parking Search	49
3.10.2	Implications for Practice in Activity Centres	49
3.11	Public Transport Access and Operation.....	51
3.11.1	Implications for Practice	51
3.12	Signs and Information	53
4.	Examples and Summary Issues for Each Type of Activity Centre.....	55
4.1	Principal Activity Centres.....	55
4.1.1	Description.....	55
4.1.2	Key Issues and Cross-references	55
4.1.3	Examples	56
4.2	Town and Suburban Centres	59
4.2.1	Description.....	59
4.2.2	Key Issues and Cross-references	59
4.2.3	Examples	59
4.3	Arterial Shopping Strips.....	60
4.3.1	Description.....	60
4.3.2	Key Issues and Cross-references	60
4.3.3	Examples	60
4.4	Civic Precincts and Public Spaces	62
4.4.1	Description.....	62
4.4.2	Key Issues and Cross-references	62
4.4.3	Examples	63
4.5	Pedestrian Streets and Transit Malls	65
4.5.1	Description.....	65
4.5.2	Key Issues and Cross-references	65
4.5.3	Examples	65
4.6	Shopping Malls	67
4.6.1	Description.....	67
4.6.2	Key Issues and Cross-references	67
4.6.3	Example.....	67
4.7	Passenger Transport Interchanges	68
4.7.1	Description.....	68
4.7.2	Key Issues and Cross-references	68
4.7.3	Examples	68
4.8	Hospital and University Campuses	70
4.8.1	Description.....	70
4.8.2	Key Issues and Cross-references	70
4.8.3	Examples	70
4.9	Sports Complexes	72
4.9.1	Description.....	72
4.9.2	Key Issues and Cross-references	72
4.9.3	Examples	72
4.10	Tourist Centres	73
4.10.1	Description.....	73
4.10.2	Key Issues and Cross-references	73
4.10.3	Examples	73

4.11	Theme Parks, Exhibitions, Showgrounds etc.....	74
4.11.1	Description.....	74
4.11.2	Key Issues and Cross-references	74
4.11.3	Examples	75
4.12	Special Events in Public Places	75
4.12.1	Description.....	75
4.12.2	Key Issues and Cross-references	75
4.12.3	Examples	76
4.13	Freight Transfer Centres	77
4.13.1	Description.....	77
4.13.2	Key Issues and Cross-references	77
4.13.3	Examples	77
References		79
Appendix A	Higher-level Policies and Strategies Affecting Traffic Management Practice	86
Appendix B	Case Studies of Traffic Management in Activity Centres	88
Appendix C	Road Hierarchy and Pedestrians	118
Appendix D	Information Gathering.....	120
Appendix E	Speed Management in Pedestrian Areas.....	123
Appendix F	Measures for Environmental Adaptation	127
Appendix G	Design Considerations for Pedestrians With Special Needs	131
Appendix H	Parking Search	135
Appendix I	Passenger Transport Interchanges.....	136

Tables

Table 1.1:	Parts of the Guide to Traffic Management.....	3
Table 1.2:	Possible combinations and examples of centre type and traffic situation	6
Table 1.3:	Activity centre types	7
Table 1.4:	Summary of key traffic management guidance for the three types of activity centre	8
Table 2.1:	Example of objectives that may be considered in activity centre planning and urban design	11
Table 2.2:	Movement needs for activity centre users	12
Table 2.3:	Cross-references between element, planning context discussion and traffic management techniques.....	14
Table 2.4:	Example of guiding objectives for pedestrian plans (NSW).....	16
Table 2.5:	Example of guiding principles and criteria for bicycle plans	17
Table 2.6:	The roles of streets as a set of related pairs of contrasting properties	22
Table 3.1:	Sources on traffic-related data collection.....	28
Table 3.2:	Cross-references to pedestrian topics in Austroads Guides applicable to activity centres	43
Table 3.3:	Cross-references to cycling topics in Austroads Guides applicable to activity centres	47
Table 3.4:	Cross-references to public transport topics in Austroads Guides applicable to activity centres.....	53
Table 4.1:	Key issues in principle activity centres.....	55
Table 4.2:	Key issues in town and suburban centres	59
Table 4.3:	Key issues in arterial shopping strips.....	60
Table 4.4:	Key issues in civic precincts and public spaces.....	62
Table 4.5:	Key issues for pedestrian streets and transit malls.....	65
Table 4.6:	Key issues for shopping malls.....	67
Table 4.7:	Key issues for passenger transport interchanges.....	68
Table 4.8:	Key issues for hospital and university campuses	70
Table 4.9:	Key issues for sports complexes.....	72
Table 4.10:	Key issues for tourist centres	73
Table 4.11:	Key issues for theme parks, exhibitions and showgrounds	74
Table 4.12:	Key issues for special events in public places	76
Table 4.13:	Key issues for freight transfer centres	77

Figures

Figure 2.1: Bicycle storage facility in main street shopping precinct (Clarence Street, Sydney)18

Figure 2.2: Preserved facade of major railway station (Adelaide, SA).....20

Figure 2.3: Examples of link-place status definitions23

Figure 2.4: Example of a SmartRoads road use hierarchy around the Box Hill Activity Centre24

Figure 3.1: Single lane in each direction with median, parking lane, bicycle provision and separated turning lane (Donnybrook WA).....34

Figure 3.2: Environmental adaptation of a main street (Taree, NSW)39

Figure 3.3: Information signs near civic precinct (Bendigo, Victoria)54

Figure 4.1: Albert Street shared zone, Brisbane CBD56

Figure 4.2: Bicycle parking, Reddacliff Place, Brisbane CBD56

Figure 4.3: Brisbane Square, Reddacliff Place, Brisbane CBD57

Figure 4.4: Reddacliff Place, Brisbane Square Evacuation area, Brisbane CBD57

Figure 4.5: Grand Boulevard, Joondalup, WA58

Figure 4.6: Church Street, Parramatta, NSW59

Figure 4.7: Greensborough Shopping Centre, Main Street, Greensborough, Victoria60

Figure 4.8: Station Street, Fairfield, Victoria.....61

Figure 4.9: Upper Heidelberg Road, Ivanhoe, Victoria61

Figure 4.10: Jetty Road, Glenelg, South Australia61

Figure 4.11: Victoria Street, Taree, NSW62

Figure 4.12: Federation Square, Melbourne63

Figure 4.13: Victoria Square/Tarndanyangga, Adelaide, South Australia.....64

Figure 4.14: Pedestrianised section of Queen Street, Brisbane65

Figure 4.15: Shared zone in Albert Street, Brisbane.....66

Figure 4.16: Transit mall: Bourke Street, Melbourne CBD66

Figure 4.17: Church Street, Parramatta, NSW66

Figure 4.18: Chadstone Shopping Centre, Victoria.....67

Figure 4.19: Mawson Lakes Interchange, South Australia.....69

Figure 4.20: Eltham Modal Interchange, Victoria69

Figure 4.21: North-West T-Way, NSW69

Figure 4.22: Flinders Medical Centre, Bedford Park, South Australia70

Figure 4.23: Austin Hospital, Heidelberg, Victoria71

Figure 4.24: Childers Street, Australian National University, ACT71

Figure 4.25: West Lakes Boulevard, South Australia.....72

Figure 4.26: Bondi Beach, Sydney, NSW73

Figure 4.27: Victor Harbor, SA74

Figure 4.28: DreamWorld, Gold Coast, Queensland75

Figure 4.29: Supercar street race circuit, Hamilton, NZ76

Figure 4.30: Melbourne Port access, Victoria77

Figure 4.31: Intermodal Inland Port, Somerton, Victoria78

1. Introduction

1.1 Purpose and Scope

1.1.1 Purpose: Getting the Balance Right

Part 7 of the *Guide to Traffic Management* provides information about the considerations and process involved in managing traffic in activity centres, as defined in Section 1.3. It is aimed at those who are responsible for proposing operational and physical measures to provide for movement to and within activity centres, either as part of the planning of such centres or in their day-to-day management. 'Movement' and 'traffic' in this context are not limited to vehicles on roads, but it is unavoidable that this document (as part of the *Guide to Traffic Management*) has a primary focus on road traffic and the part that managing this traffic plays in activity centre planning and operation.

While this part makes reference to the processes for planning and approval of activity centres to provide the context, it is not intended to be a comprehensive guide to the land use and transport planning and urban design of such developments. Nor is it intended to be a complete manual for pedestrian access and circulation within centres. These are more appropriately dealt with in other resources and guides (such as Department of Urban Affairs and Planning 2001, Roads and Traffic Authority NSW 2002, Austroads 1998a and 1998b).

Traffic management in and around activity centres must acknowledge that the needs of vehicles will generally be of secondary importance in planning, design and management of the centre.

Transport planning and traffic management for activity centres seeks to support the purposes for which the centres exist. In addition, the policy objectives that are set for activity centres may require actions in transport planning and traffic management that have wider intent and effects in terms of travel behaviour, infrastructure and integrated planning.

Road authorities (at local and state levels) are responsible for road safety and the efficiency of road networks. The challenge presented by traffic management in places where there is a high level of pedestrian activity is to find ways to meet these responsibilities while furthering the purposes and essential attributes of the centre.

Without adequate access for at least some vehicles, most activity centres cannot adequately function. However, activity centres are (by definition) places of higher pedestrian activity, and the roads and access ways available to vehicles will generally not be exclusively or even predominantly for through traffic. Traffic management in and around activity centres must therefore acknowledge that the needs of vehicles will generally be of secondary importance in planning, design and management of the centre.

Thus, the purpose of traffic management in activity centres is to:

- provide adequately for vehicular access and circulation (including service, emergency and delivery vehicles)
- while implementing planning and policy intentions focusing on the movement of people, including those on foot, bicycle and public transport
- while enabling the functionality and enjoyment of the site by the people who use it.

The purpose of this part of the guide is therefore to help the practitioner get this balance right. This will inevitably involve working with a wide range of professional practitioners and stakeholders, finding innovative ways to achieve a satisfactory traffic and transport outcome, and acknowledging that a suboptimal outcome from a traffic point of view may sometimes be necessary, in the interests of the wider purposes and policies for the centre.

1.1.2 Scope and Structure of this Part

In the remainder of Section 1 the relationship of this part of the guide to the other parts is outlined. 'Activity centres' are defined and a broad typology, with summary guidance, is presented to provide a structure for the subsequent discussion.

In Section 2, the policy context and guiding principles for traffic management in activity centres are provided.

Section 3 presents information about specific aspects of this area of traffic management, and links to primary guidance in other parts of the guide.

Section 4 deals with applications in different kinds of activity centre, based on examples in practice.

The appendices present supplemental information to the guide, including:

- higher level policies and strategies affecting traffic management practice in activity centres (Appendix A)
- case studies of traffic management in activity centres (Appendix B)
- additional considerations for:
 - road hierarchies and pedestrians (Appendix C)
 - information gathering to support traffic management (Appendix D)
 - speed management in pedestrian areas (Appendix E)
 - measures to support environmental adaptation (Appendix F)
 - designing for pedestrians with special needs (Appendix G)
 - parking search (Appendix H)
 - passenger transport interchanges (Appendix I).

1.2 Context

Part 7 of the *Guide to Traffic Management* is limited to important principles and processes that relate to activity centres. The traffic management tools and procedures that may be applied in activity centres are not unique to this application. The practitioner will need to be familiar with, and may call on, the technical content of the various parts of the guide and the other Austroads guides.

The structure and content of the *Guide to Traffic Management* is outlined in *Part 1: Introduction to Traffic Management* (Austroads 2009a). Table 1.1 summarises the thirteen parts of the guide, all of which may be referred to in activity centre planning and traffic management. For example, in creating and assessing proposals for activity centre development or redevelopment, practitioners may have to:

- consider network management implications, including network operation planning (Part 4 of the guide, Austroads 2014a)
- consider road management (i.e. mid-block issues/design) including issues such as road space allocation on the surrounding network (Part 5 of the guide, Austroads 2014b)
- develop and design intersection, interchange and crossing layouts (Part 6 of the guide, Austroads 2013c)
- analyse traffic performance of options (Parts 2, 3 and 9 of the guide; Austroads 2008a, 2013a and 2014c)
- develop traffic control, signs and marking schemes (Part 10 of the guide, Austroads 2009f)
- consider parking requirements and layouts (Part 11 of the guide, Austroads 2008c)
- manage the interface between the development and adjacent local areas (Part 8 of the guide, Austroads 2008b).

Road hierarchy and function are covered in the Parts 1, 4, 5 of the guide (Austroads 2009a, 2014a and 2014b) and in relation to traffic generators, Part 12 (Austroads 2009g).

Traffic management principles are outlined in Parts 1 and 4 of the guide (Austroads 2009a and 2014a).

The particular relationship between Parts 7 and 12 of the guide (Austrroads 2009g) is outlined in Section 1.2.1.

Table 1.1: Parts of the Guide to Traffic Management

Part	Title	Content
Part 1	Introduction to traffic management	<ul style="list-style-type: none"> • Introduction to the discipline of traffic management. • Breadth of the subject and the relationship between the various Parts of the Guide.
Part 2	Traffic theory	<ul style="list-style-type: none"> • An introduction to the characteristics of traffic flow and the theories, models and statistical distributions used to describe many traffic phenomena. • Processes that practitioners should consider.
Part 3	Traffic studies and analysis	<ul style="list-style-type: none"> • Traffic and transport data collection surveys and studies. • Traffic analysis for mid-block situations (including freeways/motorways). • Analysis of signalised and unsignalised intersections, including roundabouts.
Part 4	Network management	<ul style="list-style-type: none"> • Broad strategies and objectives of managing road networks to provide effective traffic management for all road users. • Network needs for heavy vehicles, public transport users, pedestrians, cyclists and private motor vehicles. • Guidance on transport networks and network operation planning.
Part 5	Road management	<ul style="list-style-type: none"> • Guidance on managing mid-block traffic conditions. • Good practice for access management, allocation of space to various road users, lane management. • Application of speed limits.
Part 6	Intersections, interchanges and crossings	<ul style="list-style-type: none"> • Types of intersection and selection of intersection type. • Appropriate use and design of various intersection types. • Traffic management issues and treatments for intersections, interchanges and other crossings.
Part 7	Traffic management in activity centres	<ul style="list-style-type: none"> • Principles for planning the management of traffic in activity centres and associated transport nodes. • Techniques for traffic management in activity centres. • Examples and key considerations for various types of centres.
Part 8	Local area traffic management	<ul style="list-style-type: none"> • Planning and management of road space at a local area. • Guidance on selection, design, application and effectiveness of traffic control measures on an area wide or at least whole-of-street basis.
Part 9	Traffic operations	<ul style="list-style-type: none"> • Applications used in traffic operations. • System configuration and operation guidance. • Current practice for common systems including network monitoring, traffic signals, congestion management, incident management, freeway/motorway management and traveller information. • Related systems integration and interoperability issues.
Part 10	Traffic control and communication devices	<ul style="list-style-type: none"> • Signing and marking schemes. • Traffic signs, static and electronic. • Pavement markings and delineation. • Traffic signals and islands.
Part 11	Parking	<ul style="list-style-type: none"> • Parking policy. • Demand and supply. • On-street and off-street parking. • Parking guidance and control devices.
Part 12	Traffic impacts of developments	<ul style="list-style-type: none"> • Guidance on the need and criteria for impact assessment. • Detailed procedure for identifying and assessing the traffic impacts and mitigating their effects. • Assessment of safety, infrastructure and environmental effects.
Part 13	Road environment safety	<ul style="list-style-type: none"> • Principles and management of the safety of road environments within a traffic management context. • Links to relevant parts of the Guide to Road Design and Guide to Road Safety.

1.2.1 Traffic Impacts of Developments

An activity centre is a form of development and would be expected to be subject to traffic or transport impact assessment when it is proposed or expanded. Part 12 of the guide (Austroads 2009g) is thus especially relevant to specific developments within an activity centre and should be consulted in conjunction with this part, particularly on the following matters:

- legislation and policy
- integrated land use, transport and environmental planning
- incorporating road safety into town planning processes
- traffic impact assessment
- environmental and other issues
- impact mitigation
- design principles
- the components of access routes for developments
- operational and safety issues for each user group.

1.3 Definition of Activity Centres

'Activity centre' is an urban planning term for those places that are 'vibrant hubs where people shop, work, meet, relax and often live' (Department of Planning and Community Development 2012). The essential feature of activity centres, as understood in contemporary planning usage, is the concentration of people-activity. In planning terms, the distinguishing feature and purposes of activity centres are to cluster – rather than disperse – uses and activities to derive social, environmental and economic benefits for the community and business generally.

Activity centres play a key role in providing goods and services, employment and a cultural focus for the community, particularly those centres within residential neighbourhoods. Creating the right mix of uses can enhance the viability and vitality of the centres, creating more vibrant and diverse urban environments with more opportunities to live and work more closely, extending activity after hours and making the centres more interesting, safe and active. (Planning SA 2007, p. 16)

In activity centres, there is typically a mixture of land uses, higher pedestrian activity and a concentration of access movements by vehicle and public transport. They range in size and intensity of use from local neighbourhood centres to traditional town centres (either straddling or offset from major routes) and major regional malls. These can be distinguished by their level of public transport service, which in turn normally relates to the size of the centre and its catchment. They can also include special-purpose places of higher activity density, such as airport terminals, major hospital precincts and university campuses, which have a specific primary function but which can include a wide range of supporting land use and movement activities. These too are characterised by high levels of pedestrian movement and a concentration of access movements by vehicle and public transport.

Thus, in planning terms, activity centres may be categorised as follows (based on Department of Sustainability and Environment 2005):

- **Principal activity centres** – larger centres, typically at major public transport nodes, with a mix of activities, including high concentrations of employment.
- **Major (or regional) activity centres** – also have a mixture of activities and are well served by public transport (not necessarily at a major node), but serve smaller catchment areas.
- **Neighbourhood activity centres** – these centres have a limited mix of uses meeting local needs and are dominated by small business and shops. They offer some local convenience services and at least some public transport.

- **Specialised activity centres** – these are important economic precincts with a specific primary purpose, but which provide a mix of economic activities that generate high numbers of work and visitor trips (e.g. university campuses and airports). Specialised precincts, such as industrial parks and ‘innovation precincts’ (see Planning SA 2007, p. 101, for example), tend to fall outside the definition of ‘activity centre’ if they are more dispersed and do not have appreciable pedestrian movement. Normal local traffic network management techniques are usually applied in such cases.

Different distinctions are made in other jurisdictions. For example, the Metropolitan Adelaide strategy (Department of Planning and Local Government 2010, p. 206) identifies eight types of activity centres. It is clear that planning and management of movement to and within activity centres will usually play a supportive role to the wider planning, social and economic purposes of activity centres.

Activity centres are more than just ‘traffic generating developments’. While they do, by definition, generate movements (by all modes), they are characteristically defined by their higher level of internal activity and interaction, especially by people on foot¹. Other forms of development leading to high concentrations of traffic activity, such as freight terminals, major office buildings and light industrial areas, are not ‘activity centres’ in terms of the usual planning definition. Traffic management for such uses is dealt with in Part 12 of the guide (Austroads 2009g). However, some aspects of activity centre traffic management can be related to such developments and are noted where relevant in this part.

1.3.1 Three Generic Types of Activity Centres

There are broadly speaking three types of activity centre for the purposes of movement planning and management:

- mixed function community and commercial centres at various levels, from local to central city
- transport termini and interchanges – points of modal access and interchange, in which the transport infrastructure constitutes the primary purpose and form of the activity centre (freight transfer areas, airports, major rail termini etc.)
- special-use centres with a dominant activity that defines the purpose of the centre, perhaps with many ancillary activities that support or attach to it, such as university campuses, major hospital complexes and tourist complexes; which may be of a cultural, heritage, entertainment or outdoor recreation nature.

1.3.2 Three Types of Traffic Situation

In addition to the three types of activity centre, there are, in traffic management terms, three broad types of traffic situation that may require different policies, techniques and emphases:

- Activity centres through which a traffic route runs, in which the through traffic may impact on the centre and the people who use it. These situations, typically ‘main streets’ such as strip suburban shopping streets and highways through country town centres, are termed ‘Type II corridors’ (Roads and Traffic Authority NSW 2000, p. 8). Road hierarchy issues and definitions are dealt with in Parts 1, 4, 5 of the guide (Austroads 2009a, 2014a and 2014b). See also Section 3.7. These situations require clear policy decisions about the relative importance of the needs of the centre and the efficiency of the through road. The focus of traffic management in such cases is on how to maintain the target level of through traffic service without compromising the purposes and attributes of the activity centre.
- Activity centres which contain circulatory street systems but which are not penetrated by through traffic, or in which through traffic can conveniently be directed to other routes outside the centre. In these cases, the potential conflict between the various types of road user, and between traffic and the activities of the centre itself, presents the primary management challenge.

¹ References to pedestrians or movements by ‘foot’ in this guide include movements by mobility aides such as wheelchairs and electric scooters (‘gophers’).

- Activity centres that are ‘off-street’, in which all vehicular access and movement is external to the centre itself and all movement internally is by foot. In these cases, the primary management task is to deal with the concentration and parking of vehicles, access and circulation of delivery vehicles, and public transport passenger facilities, mostly on the periphery of the centre (horizontally or vertically). This will include managing safe and convenient pedestrian movement from these vehicles into the centre.

1.3.3 A Typology of Activity Centres

The three types of centre and the three different traffic situations suggest that the many types of activity centre can be categorised into nine generic situations, as illustrated in Table 1.2.

Table 1.2: Possible combinations and examples of centre type and traffic situation

Traffic situation	Type of activity centre		
	Mixed function centres (examples)	Transport termini and interchanges (examples)	Special-use centres (examples)
With through traffic – including ‘Type II corridors’ ¹	‘Main streets’: strip centres and rural town centres	Bus/light rail stop with adjacent activities	Some university campuses
Activity centres with internal streets but no through traffic	CBDs, district and local centres	Bus termini, airports, freight centres	University and medical campuses
Off-street (‘traffic free’ – i.e. no internal vehicular traffic)	Commercial malls	Major rail and bus stations; air terminal buildings	Theme parks, historic villages, building-based activity centres

¹ See Section 1.3.2.

It is important to stress that no one set of guidelines and practices can apply across all types of activity centre. What might be relevant in a large regional centre focused on a major bus or rail station may not fully apply in a suburban or country town centre, and vice versa. In addition, many existing activity centres do not meet the ideal planning vision in terms of their form, level of public transport service and so on. Those responsible for traffic management will need to identify which measures and approaches in the guide are appropriate to deal realistically with such situations as they are, while also providing input to the planning and development process itself.

1.4 Generic Situations and Summary Guidance

Although there are many different types of ‘activity centre’, and very many combinations of uses and activities that may occur in such places, the main distinction in traffic management terms is found in the degree to which traffic is allowed to penetrate and pass through the activity centre. In essence, as mentioned in Section 1.3.3, all activity centres fall into one of three types:

1. activity centres with through traffic
2. activity centres with internal streets (but not overtly catering for through traffic)
3. activity centres with no internal vehicular traffic.

Table 1.3 shows which of these three categories usually apply for various types of activity centre.

Table 1.4 summarises the major distinctions between the categories in terms of their traffic management approach and techniques. Section 4 notes matters that may need additional attention for specific types of activity centre.

Table 1.3: Activity centre types

Type of activity centre	Activity centres with through traffic	Activity centres with internal streets but no through traffic	Activity centres with no internal vehicular traffic
CBDs and other major regional centres	(✓)	✓	
Town and suburban centres	✓	✓	
Arterial shopping precincts	✓		
Civic precincts, public spaces		✓	✓
Pedestrian streets			✓
Shopping malls			✓
Passenger transport interchanges			✓
Retirement villages/gated communities		✓	✓
Hospital and university campuses		✓	
Sports stadia and complexes		✓	✓
Tourist centres		✓	
Fun parks, theme parks			✓
Special events in public places		✓	✓
Freight transfer interchanges, ports		✓	

✓ Common situation.

(✓) Found in practice, but subject to restraint.

1.5 How to Use this Part of the Guide

The material in this part of the guide can be approached in different ways:

- Table 1.2 and Table 1.3 may be used to identify the type of traffic situation (that is, in broad terms, how the centre relates to the road network) that applies in a given case, then Table 1.4 can be used to identify relevant guidance in this and other parts of the guide.
- Alternatively, Section 3 can be referred to directly to find guidance on specific issues.
- The material is structured to enable the reader to locate material on practice issues, without necessarily having first read the background principles in Section 2 each time the guide is used. However, some familiarity with Section 2 is advised, especially those matters concerning intent and the role of traffic management in relation to other issues.
- The examples in Section 4 are offered as illustrations and are not intended to limit what can be done in practice.
- Most importantly, as noted in Section 1.2, most of the traffic management tools and procedures that may be applied in activity centres are not unique to that application. For this reason, the user is frequently pointed to various other parts of the guide, and the other Austroads guides, rather than repeat the material here. This Part, therefore, can act as a ‘signpost’ to those parts of the guide that may apply to a given issue.

Note: That reference to a ‘part’ means a part of the *Guide to Traffic Management* (i.e. the guide), as outlined in Table 1.1. Reference to a numbered ‘Section’ means specifically a section of Part 7.

Table 1.4: Summary of key traffic management guidance for the three types of activity centre

Activity centre type	Examples	Key traffic management objectives and elements	Relevant sections of the Guide to Traffic Management
With through traffic	<ul style="list-style-type: none"> • Some regional centres • Some town and suburban centres • Other arterial shopping precincts 	<ul style="list-style-type: none"> • Sharing the street space • Moderating traffic speeds • Providing priority to on-road public transport • Maintaining adequate traffic capacity 	<p>Part 7: Sections 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10 and 3.11</p> <p>Parts 3, 4, 5, 8, 12, and 13 (Austroads 2013a, 2014a, 2014b, 2008b and 2009g)</p>
With internal streets (but not providing for through traffic)	<ul style="list-style-type: none"> • CBDs • Regional centres • Some town and suburban centres • Civic precincts, some public spaces • Freight transfer areas • Industrial parks • Most retirement villages and gated communities • Hospital and university campuses • Sports complexes • Tourist centres • Some special events in public places 	<ul style="list-style-type: none"> • Slowing traffic speeds • Providing shared streets where appropriate • Prioritising on-road public transport • Locating parking areas at entry to precinct, thereby minimising parking search for on-street parking • Providing directional signing for all road users – vehicular traffic and pedestrians 	<p>Part 7: Sections 3.4, 3.5, 3.6, 3.8, 3.10, 3.11 and 3.12</p> <p>Parts 4, 5, 6, 8, 9, 10, 11, 12 and 13 (Austroads 2014a, 2014b, 2013c, 2008b, 2014d, 2009f, 2008c, 2009g and 2009h)</p>
With no internal traffic	<ul style="list-style-type: none"> • Civic precincts, some public spaces • Pedestrian streets, transit malls • Shopping malls • Passenger transport interchanges • Some retirement villages and gated communities • Sports stadia • Fun parks, theme parks • Most special events in public places 	<ul style="list-style-type: none"> • Locating parking at periphery on all approaches • Providing on-road public transport into the precinct • Giving attention to pedestrian paths from parking areas • Managing pedestrian flow • Locating good signing with information at major trip generators • Considering security issues which may impact on pedestrian-friendliness of the centre • Providing lighting, especially for pedestrians 	<p>Part 7: Sections 3.8, 3.9, 3.10, 3.11 and 3.12</p> <p>Parts 4, 5, 9, 10, 11 and 12 (Austroads 2014a, 2014b, 2014d, 2009f, 2008c and 2009g)</p>

2. Principles and Objectives

2.1 General Guidance

2.1.1 Underlying Objective

The underlying objective guiding traffic management in activity centres was introduced in Section 1.1:

To provide adequately for vehicular access and circulation (including service, emergency and delivery vehicles) while implementing planning and policy intentions for those on foot, bicycle and public transport whilst enabling the functionality and enjoyment of the site by the people who use it.

Traffic management to meet this objective in activity centres may call on all the techniques covered by other parts of this guide, particularly network operation planning (Section 3.4). Section 1.2 has drawn attention to the relationship between this part and the others, and practitioners with responsibilities for traffic management in activity centres will need to be cognisant of the full range of techniques found in the whole guide.

2.1.2 Issues

In contributing to the operation and functionality of activity centres, those engaged in traffic management will need to be alert to the following issues:

- the conflicts between vehicle, cycle and pedestrian traffic
- the quality of the pedestrian environment, including surfaces, signs and lighting, location and amount of seating, quality of social spaces, safety and perceptions of security, and provisions for the mobility and sight impaired
- the quality, efficiency and continuity of pedestrian and cycle routes approaching and passing through the activity centre
- creating an adequate pedestrian level of service (space provision, impedances, etc.) within the centre
- providing adequately for delivery and service vehicle access
- managing parking issues (amount, location, access, cost and limitation)
- integrating bus, rail and other public transport services into the centre and with each other
- impact of traffic noise and pollution on people visiting and working in the centre
- impact of traffic on the visual environment and amenity of the centre.

In summary, the practitioner is required to apply the necessary traffic management techniques in order to:

- cope with traffic demand or (if policy has been established to do otherwise) to implement measures that suppress or redirect that demand
- deal adequately with arterial and other through movements, but also manage traffic behaviour and networks so that they do not compromise the functioning of the centre
- ensure that road users are not placed in unexpected or unconventional situations that cause risk or confusion, and that familiar (standard) guidance is given to them.

This part of the guide expands on these issues and offers direction on the traffic management measures that can be employed to deal with them. In addition to the resources provided in this and other parts of the guide, background guidance may also be found in literature sources that deal specifically with traffic and activity centres.

2.2 Principles

The two main focuses for managing traffic in activity centres are:

- support planning and urban design objectives established for the centre (Section 2.2.1)
- attend to the movement needs of all users of the centre and those travelling through or past it (Section 2.2.2).

Because users of a centre are a central consideration in urban design and planning, there is a degree of overlap between these two focuses, as indicated in Sections 2.2.1 and 2.2.2. They come together to suggest some key guiding principles (Section 0). The matters for attention in traffic management can then be outlined (Section 2.2.4).

2.2.1 Supporting Planning and Urban Design Objectives

The management of traffic and other vehicular movement in activity centres, through methods such as network operation planning, will usually be required to support, and conform to, the primary planning and urban design objectives adopted for the centre.

Urban design is very important in relation to the development of an activity centre. Urban design often dictates how traffic and transport should be provided in and surrounding activity centres, e.g. transport interchanges, shopping centres, airports etc. Accordingly, transport and traffic planners should be encouraged to work with urban designers to achieve satisfactory outcomes in term of traffic flow, road safety as well as aesthetics of an activity centre, understanding that these have a significant bearing on pedestrian flow and level of service (adapted from Roads and Maritime Services 2014).

The key objectives for an activity centre will normally be determined within a commercial and planning decision environment. This part of the guide seeks to encourage those responsible for traffic management to understand and, where opportunities allow, play a role in shaping and implementing those planning and design objectives.

The policy context may also set mode share targets, which the planning and management of the centre should seek to support.

Such broader objectives will typically be described in the following ways (based on Department of Sustainability and Environment 2005, p. 6):

- **Develop a good-quality public environment** – ensure public spaces within individual developments and throughout activity centres are comfortable, engaging environments.
- **Promote street-based patterns of connection** – directly link developments within activity centres and with their surrounding neighbourhoods using a fine-grained (i.e. dense) street system that accommodates diverse modes of travel.
- **Improve community safety** – promote the natural surveillance of public space and street edge activity. This can be achieved by ensuring buildings address the street and contain active uses on the ground floor. Clearly define public and private space.
- **Encourage a mix of uses** – optimise the diversity of uses in activity centres where the mix promotes vitality, extends the hours of activity and intensifies the use of existing infrastructure.
- **Improve pedestrian and cycling amenity** – encourage an increase in pedestrian and cycling traffic by maximising the convenience, safety and appeal of these modes of travel.
- **Promote a public transport focus** – better integrate public transport with activity centres by increasing community comfort, safety and accessibility.
- **Increase accessibility and integration** – ensure activity centres are a focus for the entire community, are accessible to all, and are physically integrated with the surrounding neighbourhood.

- **Encourage environmental sustainability** – promote the efficient reuse of existing assets, prolong the life cycle of structures, ensure energy efficiency and water and resource conservation and encourage appropriate orientation and use of materials.

It is clear that most of these design objectives have significant implications for traffic management. The traffic practitioner can play an important role, not only by ensuring that traffic provisions do not compromise the urban design objectives that have been adopted, but also by developing traffic management strategies that positively contribute to those objectives and the specific actions that support them. Table 2.1 shows an example of planning and urban design objectives for activity centres. Supporting traffic management measures that may be considered are outlined in Section 3:

From an urban design perspective, the street should be the principal agent for integrating activities into a coherent, compact, walkable centre. Streets are multifunctional public spaces that connect most activity within our towns and cities; therefore, extending the existing street system should be the starting point for any activity centre development. People gain access to, and move around, a centre using its streets and laneways. Activity that occurs along street edges, coupled with traffic in the street, tend to make footpaths feel safer than segregated pedestrian malls, particularly out of hours.

However, there is no single response to the design of activity centres; their future form will vary with individual circumstances. Every activity centre has its own characteristics, and one of the intentions of urban design is to reveal and highlight these (Department of Sustainability and Environment 2005, p. 4).

Planning and urban design objectives governing an activity centre arise in turn from the policy and planning context for the relevant jurisdiction, and the planning process for each specific case. The various aspects of this planning context are discussed further in Section 2.3. Refer also to the *Guide to Traffic Management Part 12: Traffic Impacts of Developments* (Austroads 2009g) for the related consideration of the planning context for traffic impact assessment.

Table 2.1: Example of objectives that may be considered in activity centre planning and urban design

Objective
<p>Street layout Develop a street layout that serves the centre, with a focus on public transport services. Provide a well-connected road network with co-located access for all users. Provide appropriate street widths.</p>
<p>Streets for people Design streets that comfortably and safely accommodate pedestrians and cyclists. Ensure vehicle traffic does not compromise a good walking and cycling environment.</p>
<p>Urban planning and design Integrate activity centre streets into the local street network. Intensify active uses along street frontages in the centre.</p>
<p>Pedestrian and cycle access Provide safe, attractive and direct pedestrian and cycling access to stations, interchanges and transit stops. Minimise the dividing effect of railway corridors on activity centres.</p>
<p>Service access Provide adequately for service access.</p>
<p>On-street car parking Cater for, and control, on-street parking to maximise benefit to the centre.</p>
<p>Off-street car parking Cater for, and control, off-street parking to maximise benefit to the centre. Minimise the visual impact of off-street car parks on the public space. Improve pedestrian and cycling safety and amenity in and around off-street parking.</p>

Source: Based on Department of Sustainability and Environment (2005).

2.2.2 Meeting the Movement Needs of All Users

The other main focus when managing traffic in activity centres is to consider the movement of people and goods and the needs of the various users of the centre. Identifying the users, the interactions between them and their competing and sometimes conflicting needs and demands are the main challenges for traffic management in activity centres. The planning and policy context for the centre may indicate that a degree of limitation on the numbers and conditions for some users needs to be imposed. There are several user types (the definition of whom may overlap more than one group) whose needs have to be considered, within those constraints (Table 2.2).

Table 2.2: Movement needs for activity centre users

User type	Movement considerations
Traders, staff, service providers, residents and other occupants of the centre	These people are an essential part of the life and purpose of the centre. How does traffic management support or impact upon their role in the centre?
On-street public transport	Is traffic management and infrastructure providing for maximum efficiency and reliability of on-street public transport operation?
Public transport passengers	Does traffic management impede or support convenient access to, from and between all public transport serving the centre, including provision and location of park-and-ride and kiss-and-ride facilities?
Pedestrians (including those with a disability as noted in Section 1.3)	Is the management of traffic guided by the paramount need to create and support a safe, convenient and pleasant environment for walking and interacting?
Cyclists	Does the allocation of street space, the provision of appropriate facilities and the management of all forms of movement create and support a safe, convenient and pleasant environment for cyclists?
Delivery and service vehicles	Is an appropriate level of delivery and service vehicle access provided?
Emergency services	Can police, fire and ambulance vehicles efficiently reach every part of the centre, under any traffic conditions and at any time of day?
Motorists visiting the centre	Are provisions for road traffic consistent with the planning and policy context for the centre (see Section 2.3) and are those coming to the centre by car directed efficiently to parking areas, with minimal impact on the functionality and amenity of the centre? Do motorcyclists require consideration?
Motorists dropping off passengers at the centre	Has provision been made for passengers to be dropped off in a safe and convenient location, by both private vehicles and by taxis? Passengers to be especially considered include the frail, the aged and the disabled.
Motorists collecting passengers at the centre	Has provision been made for passengers to be collected in a safe and convenient location, by both private vehicles and by taxis? Has provision for seating and shade been considered for these people to make it both safe and comfortable whilst waiting?
Motorists passing through	Are provisions for through or passing traffic consistent with the planning and policy context for the centre?

2.2.3 Guiding Principles

Taking into account the major considerations noted in Sections 2.2.1 and 2.2.2, network operation plans and traffic management policy and procedures in activity centres will typically be guided by the following principles and 'givens':

- By definition, activity centres are attractors of people and goods. Traffic management for the centre should be considered as an integral component of the management of this demand (including the amount, time, and mode of travel). For example:
 - The way traffic (and parking) is treated in the centre may influence travel behaviour choice.
 - Wider travel demand management measures (or the lack of them) may influence the quantity and nature of the traffic and parking that has to be dealt with in the centre.
- As part of the general intention to reduce reliance on car use to reach activity centres (especially those with relatively local catchments), attractive and direct routes for cyclists and pedestrians to the centre are required.
- The transport focus of activity centres should be based around strong integration with public transport, to the extent it is warranted by the scale, location, and type of centre.
- Urban design and higher-order transport policy decisions will guide detailed traffic design and management.
- Movement and access facilities must be adequate to meet the needs of the various functions of the centre. The nature of activity centres can be dynamic, changing in content and intensity. Provisions for access and movement within the centre should be able to respond to changing needs and circumstances.
- Provisions for movement and access must not be allowed to dominate the purposes for which the centre exists, nor be detrimental to them.
- The balance between quality of access to and within the centre and the needs of through traffic will properly have been examined at the planning stage. Where this has not received adequate attention, the role of the traffic manager may become more difficult.
- Conflicts between the needs of the through traffic and the centre may necessitate some form of separation between them. Where this is not possible, the balance that is reached between the two conflicting functions will require a policy decision appropriate for each case.
- Where an activity centre impacts on an arterial or other important road serving an essential regional transport function, measures must be taken to ensure that through or passing traffic has the agreed level of service, within the constraints noted in the previous points.
- Management of road cross-sections and traffic speeds will usually be valid approaches to managing roads through and within activity centres. Even on designated highways, it is usually neither feasible nor necessary to maintain normal arterial speeds and overtaking opportunities through the centre.

Road user safety and comfort in moving around the centre, especially when using the street space, is a paramount consideration. Safety-conscious planning (Section 2.3.8), safety auditing and consistent traffic engineering procedures for road user safety are essential tools in traffic management in activity centres.

2.2.4 Elements Needing Consideration

Arising from the guiding principles outlined in Section 0, the specific elements in the physical and operational environment that traffic management must consider and accommodate are as follows. Cross-references to further detail for each of these elements are shown in Table 2.3.

Table 2.3: Cross-references between element, planning context discussion and traffic management techniques

Element	Considerations	GTM 7 ⁽¹⁾		Other Austroads guidance ⁽¹⁾
		Planning context	Management techniques	
Street space allocation	Network operation planning Space allocation for pedestrians (possible provision of a median, width of footways, plazas etc.) Number of lanes required for through traffic (usually no more than one mid-block lane in each direction for moving traffic is needed) Whether or not separate provision will be made for cyclists	Section 2.2	Sections 3.4, 3.5 and 3.7	GTM 4 and GTM 5 (Austroads 2014a and 2014b)
Cycle facilities	Routes and storage, crossing facilities, etc.	Sections 2.2 and 2.3.2	Sections 3.4 and 3.6	GTM 4, GTM 5 and GTM 6 (Austroads 2014a, 2014b and 2013c)
Pedestrian crossings	Formal and informal pedestrian crossing facilities (designated crossings, pedestrian signals, medians and islands, kerb build-outs, grade separations, deterrents, etc.)	Sections 2.2 and 2.3.2	Section 3.8	GTM 6 and GTM 9 (Austroads 2013c and 2014c)
Pedestrian routes	Safety and quality of pedestrian routes within the centre	Sections 2.2 and 2.3.2	Section 3.4 and 3.8	GTM 4 (Austroads 2014a)
Loading and delivery areas	Services for loading and delivery vehicles to minimise potential conflict and loss of on-street parking	Section 2.2	Sections 3.4 and 3.9	GTM 11 (Austroads 2008c)
Provisions for on-street public transport	Bus and on-street tram/light rail provisions	Sections 2.2 and 2.3.6	Section 3.4 and 3.11	GTM 4 (Austroads 2014a)
Parking	Parking quantity, distribution and control – including the amount and type of on-street parking	Sections 2.2 and 2.3.7	Section 3.10	GTM 11 (Austroads 2008c)
Traffic circulation	Circulation of vehicles (access and parking search)	Section 2.3.5	Section 3.4, 3.5 and 3.10.1	GTM 4 and GTM 12 (Austroads 2014a and 2009g)
Providing for through traffic	Provisions for through traffic where centre straddles a traffic route (including possible rerouting of through traffic)	Section 2.2	Sections 3.4, 3.5 and 3.7	GTM 4 (Austroads 2014a)
Intersections	Treatment of intersections: forms of traffic control capacity through intersections dealing with pedestrian movements at roundabouts intersection design and treatments for access and safety	Section 2.3.8	Section 3.5	GTM 6 (Austroads 2013c)
Passenger transfer areas	Passenger transfer and waiting areas, including 'drop-off' bays for private drivers and taxis	Section 2.3.6	Section 3.11	GTM 4 and GTM 12 (Austroads 2014a and 2009g)
Signs, barriers etc.	Nature and extent of signs, barriers and other road furniture	Section 2.3.8	Section 3.12	GTM 10 (Austroads 2009f)
Traffic calming	Traffic calming measures (specifically, speed management and streetscaping techniques)	Section 2.3.8	Sections 3.6 and 3.7	GTM 8 (Austroads 2008b)
Side street access	Closure or limitation on side street access	Section 2.3.5	Sections 3.4 and 3.7	GTM 6 (Austroads 2013c)

Element	Considerations	GTM 7 ⁽¹⁾		Other Austroads guidance ⁽¹⁾
		Planning context	Management techniques	
Transitions at edge of centre	Linkages with surrounding areas and uses	Section 2.2	Section 3.7	GTM 8 (Austroads 2008b)
Integrated development	Proposed development or expansion considerations and implications for managing travel demand and mode choice	Sections 2.2 and Section 2.3.3	Sections 3.2 and 3.3	GTM 12 (Austroads 2009g) and Guide to Road Transport Planning (Austroads 2009c)

1 Guide to Traffic Management (GTM).

2.3 Policy and Planning Context

This guide does not cover the location and planning of activity centres, but it is important to foreshadow positive and negative consequences for access and circulation during the planning phase. This section includes guidance on the policy and planning-related matters that influence and may even control the traffic management processes that could be put into place. They provide the background and context within which traffic management in activity centres may be conducted, and also flag planning considerations that need input from traffic management specialists.

Note that there are widely varying views about planning practice and retailing philosophies that affect movement planning and management in centres (e.g. Sheppard 2008) and there is no ‘standard template’ either for the relationship of a centre to the road network or for the treatment of parking. The traffic management practitioner has to be able to work flexibly within a variety of planning concepts and physical conditions.

2.3.1 Policy Context

The transport, design and sustainability policy context and broad objectives that may apply in specific cases need to be identified as a basis for planning and management of activity centres. There are many national policies and strategies that impinge on traffic management and provide a framework for expanded thinking that embraces the wider social, economic and environmental context of transport decision-making. These include policies aimed particularly at changes in modal choice, and enhancing non-motorised modes and public transport, which recognise the value of these modes not only for mobility, but also for health, environmental and road safety benefit. Current higher-level policies and strategic plans that may affect traffic management in activity centres are listed in Appendix A.

In addition, state/territory/regional government policies and legislation need to be followed. These will change and be added to from time to time, and the practitioner has the responsibility to maintain awareness of the policies and legislation that may apply in a particular jurisdiction and situation.

2.3.2 Planning Context for Walking and Cycling in Activity Centres

While walking and cycling are frequently lumped together in transport and planning policy, as ‘non-motorised modes’, their physical needs within activity centres are quite different. Later discussion in this Part deals with measures to meet the needs of each mode of movement, and the extent to which provisions for walking and cycling are mutually supportive or sometimes potentially conflicting.

Creating a walkable and cycleable city is an important part of creating a sustainable city – one that is equitable, liveable, cost-effective, healthy, environmentally sound and safe (Department of Infrastructure, Planning and Natural Resources 2004, p. 2).

The following sections outline the different emphases that walking and cycling require in the planning process. The planning and policy objectives that follow provide the framework for traffic management measures that may be considered.

Pedestrian planning for activity centres

The policy context for pedestrian-based planning, especially at the local level and in areas of pedestrian concentration, is well documented in many guides and policies. There are also a growing number of guidelines for creating communities that encourage and sustain walking.

Within activity centres, in particular, the emphasis is on pedestrian movement rather than vehicle movement. While contemporary planning aims to maximise walking for transport purposes, including to and from centres of activity, the primary focus of planning and design for walking in activity centres is on the quality of the walking environment within the centre itself. Everyone who comes into a centre becomes a pedestrian at some point, no matter what mode they have used to reach the centre. The enjoyment and functionality of a centre depends on people being able walk at will within it. Planning guidance therefore stresses the need to provide a safe, convenient and connected pedestrian environment, typically through the sorts of processes and objectives in Table 2.4.

Table 2.4: Example of guiding objectives for pedestrian plans (NSW)

<p>To facilitate improvements in level of pedestrian access and priority, particularly in areas of pedestrian concentration.</p> <p>To reduce pedestrian access severance and enhance safe and convenient crossing opportunities on major roads.</p> <p>To identify and resolve pedestrian crash clusters.</p> <p>To facilitate improvements in the level of personal mobility and safety for pedestrians with disabilities and older persons through the provision of pedestrian infrastructure and facilities which cater to the needs of all pedestrians.</p> <p>To provide links with other transport services to achieve an integrated land use and transport network of facilities that comply with best technical standards.</p> <p>To ensure pedestrian facilities are employed in a consistent and appropriate manner.</p> <p>To link existing vulnerable road users plans in a co-ordinated manner (e.g. bike plans, maintenance programs, accessible public transport, etc.)</p> <p>To ensure that pedestrian facilities remain appropriate and relevant to the surrounding land use and pedestrian user groups.</p> <p>To accommodate special event needs of pedestrians.</p> <p>To meet obligations under the Commonwealth Disability Discrimination Act (1996). (This will include consideration of the needs of visually impaired pedestrians, hearing impaired pedestrians, wheelchair users, mobility impaired pedestrians.)</p>

Source: Roads and Traffic Authority NSW (2002).

Within centres, this focus affects all levels of planning, from the location and types of land uses in the centre down to the detail of links and spaces, and their urban design.

Traffic management proposals will need to be tested in terms of their impacts on ease and safety of walking within the centre, and the degree to which they support the pedestrian focus of centre planning.

Planning for pedestrians at the local level typically places emphasis on pedestrian accessibility and networks. At the more detailed scale within activity centres, accessibility becomes more a matter of the degree of clustering or separation of various activities. It can be assumed that most of the centre is pedestrian space, so permeability of blocks and sites (that is, the degree to which they can be passed through by pedestrians) is as important as formal street and walkway networks.

Rail stations, especially those that serve as a focus of bus services, are natural locations around which accessible centres can grow. The principles and practices of ‘walk-based catchments’ or ‘pedestrian pockets’ are especially pertinent in these places (see Section 4.7).

Matters concerning planning for pedestrians in centres that may impact on traffic management include the following (drawn from Department of Infrastructure, Planning and Natural Resources 2004, Department of Infrastructure 2002, Department of Sustainability and Environment 2005 and Department of Urban Affairs and Planning 2001):

- Within ‘accessible centres’, walking, cycling and public transport accessibility are the main basis of the design of the street network.
- Planning aims to provide walkable environments. This means that directness, comfort, interest, security and traffic safety are paramount concerns.
- Maximise accessibility to and within the centre via all transport modes and make it a better place for walking, cycling and using public transport.
- Planning requirements typically direct that designs should create multiple and direct walking and cycling connections to public transport stops.
- Higher residential densities are envisaged within walking distance of public transport nodes, with a mix of compatible uses such as shops and restaurants, on the ground floor of residential or commercial buildings.

Implications for traffic management are discussed in Section 3.8. For more information on the planning context, see Department of Infrastructure, Planning and Natural Resources (2004) and *Cities for Tomorrow* (Austroads 1998a and 1998b).

Bicycle planning for activity centres

Planning for bicycle travel and access is a high priority in all jurisdictions. As a component of sustainable transport policies, bicycle use must be actively encouraged in the planning, design and management of a centre.

There are many government policies and guidelines on this subject, and these local sources should be consulted. Typical guiding principles and criteria for bicycle planning are shown in Table 2.5. Where appropriate, these will also influence the management of bicycle movement within centres.

Table 2.5: Example of guiding principles and criteria for bicycle plans

Principle	Criteria
Coherence	Continuity of routes Consistent quality of routes and facilities Easy to follow Freedom of choice of routes
Directness	Efficient operating speed Delay time Detour factor ⁽¹⁾
Safety	Minimum risk of accidents on routes Minimum risk of conflict with car traffic Minimum risk of unsafe infrastructure
Attractiveness	Support for the system Attractiveness of environment Perception of social safety System attractiveness
Comfort	Smoothness of ride Comfortable gradient Minimum obstruction from vehicles Reduced need to stop (no. of stops per km) Protection from adverse climate
End of trip facilities	Provision of secure bicycle parking in convenient locations Provision of change facilities for commuters/workers

¹ Detour factor: Actual route length divided by airline distance.

Source: Based on Roads and Traffic Authority NSW (2003).

Inevitably, there will be a degree of compromise within many activity centres, for instance in terms of stops and delays. Traffic management also needs to allow for the reality that bicycles may not be compatible with pedestrian spaces, especially where pedestrian movement is moderate to intense, and to that extent the two modes must be considered separately in detailed design and management of the centre. In addition, it is not generally expected that bicycle movement from one part of the centre to another must always be accommodated in planning and management.

Matters concerning planning for bicyclists in centres that may impact on traffic management include:

- providing for direct and convenient bicycle access into the centre from surrounding areas, and thus the way in which the centre's internal networks integrate with routes used by cyclists to access the centre
- providing for bicycle movement through the centre and to bicycle parking/storage locations, which will affect road cross-section design, and the location of bicycle parking facilities and how access to them is provided
- including bicycle parking arrangements (Figure 2.1), especially at places of employment and at rail stations.

Implications for traffic management are discussed in Section 3.8.

Figure 2.1: Bicycle storage facility in main street shopping precinct (Clarence Street, Sydney)



Source: Provided by the Australian Bicycle Council

2.3.3 Transit Oriented Development

Many activity centres will be designated as 'transit oriented developments'. Related terms are 'urban village' and 'transit village'. While relatively new labels, they describe many elements of development that has historically occurred spontaneously around railway stations in some suburbs.

Transit oriented development (TOD) is a concept which advocates building communities around public transport nodes, providing well-designed and a diverse mix of housing, generating employment, promoting high-quality community facilities and enabling easy pedestrian and cycle access and strong connections between each of these components (Department of Infrastructure and Planning 2010).

Most governments have adopted some form of TOD policy, to locate a mix of trip generating land developments at locations with good transport accessibility. TOD is a natural consequence of merging policies on mode switch, pedestrian orientation, urban consolidation and mixed land uses.

TOD will lead to land use forms that reflect the nature of the transport system around which it concentrates. A key Austroads source (Austroads 1998a, p. 178) states that 'transit friendly' development means creating an attractive environment around transit stops or stations which supports pedestrians and transit use. It also involves creating a concentrated mix of land uses which, among other things, creates continuous activity over most of the day and evening.

Note that intensification of development in a centre may create traffic-related problems if the travel choice behaviour of users of the site is not sufficiently different from average behaviour across the urban area. Total residential traffic generation, for example, will increase if the rate of increase in population or households is not at least matched by a reduction in the rate of car use.

By implication, TOD accepts that the activity centre surrounding the transit node is not self-contained, and there is much travel coming and going from outside the immediate catchment of the centre. Not all activity centres (especially smaller and more local ones) have or need a transit node for their success, other than local services to bring visitors to it. However, many activity centres will conform to some degree to the 'TOD' concept, either by design or as a consequence of the sorts of activities that are found there. If the principles outlined in this Guide, including the emphasis on pedestrian planning and design are carried through in traffic management for the centre, then there will be consistency with the objectives of TOD planning.

In transport terms, the primary focus is on pedestrian movement and convenience, and access to the public transport station or boarding point. Guidelines for TODs typically include the following expectations or requirements concerning movement, drawn from Department of Transport (2007):

- Use pedestrian catchments (5 minute walk or 400 m from the 'heart' of activity) as the basis for delineating the boundaries of the town centre/civic core. Locate major pedestrian generators within this area.
- Identify the likely future market demand for high pedestrian generators and act to secure sites for these within the pedestrian catchment.
- Ensure the planning scheme requires new developments (private and public) to provide pedestrian/cyclist facilities.
- Locate the station/stop in a direct line of sight (for pedestrians), and within 200 m of a point central to the highest concentration of workers (not just shoppers), with direct pedestrian access.

Sources of further information: Department of Urban Affairs and Planning (2001), Department of Infrastructure and Planning (2010), Department of Transport (2007), Roads and Traffic Authority NSW (2002) and Austroads (1998a, pp. 177–84). See also Section 2.3.6.

2.3.4 Civic and Heritage Context

The 'quality' of the road as a space can be expressed in amenity and convenience, heritage and character, and the appeal as a place to meet, do business and for special events (Roads and Traffic Authority NSW 2000, p. 12).

Sometimes movement networks and the built form of the street space in a centre can be determined by heritage conservation issues or by the civic attributes of the street or space. This may arise from historic facades, trees and so on, sites and buildings of cultural importance or as a result of the need to create or protect spaces and vistas important to the identity or civic functioning of that place:

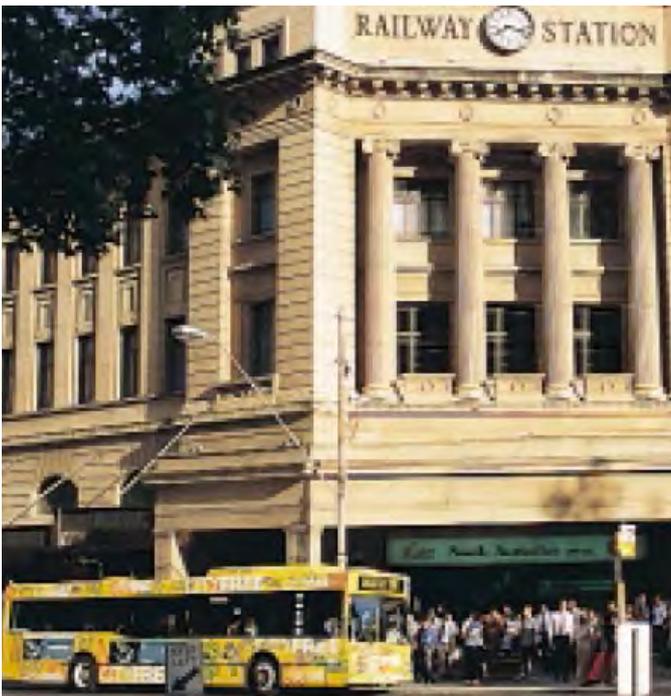
The Main Street in country towns is a major element in our heritage; it is a distinctly Australian vernacular space suited for different needs. With its linear character, unique proportions, and its verandas (or awnings and trees), the Main Street is a successful model of a robust environment which serves as a common setting for both pedestrians and vehicles. The set of linked spaces, with active edges, strong light and shade effects and often varied roofline, provides a clear and meaningful expression of the climate, people and their lifestyle. Sub-arterial centres generally do not display such character, although often there are buildings and spaces worth preserving (Roads and Traffic Authority NSW 2000 p. 29).

As a result, preserving heritage and enhancing townscape qualities are among the strategies for street frontage management in activity centres. Traffic management should not compromise these strategies:

Places that have some cultural significance are identified through careful study for conservation. The different degrees of conservation are maintenance, preservation, restoration, reconstruction and adaptation... The items may include trees, parks, statues, relics, signs, shop windows, verandas, facades, colours, buildings, but whole streetscapes and street layouts, too. Age is an irrelevant factor. It is important that the introduced traffic management devices are sympathetic with the character of the Main Street (Roads and Traffic Authority NSW 2000 p. 91).

Figure 2.2 shows an example of a preserved facade at the Adelaide Railway Station.

Figure 2.2: Preserved facade of major railway station (Adelaide, SA)



Source: From Planning SA (2000).

2.3.5 Transport Network Considerations

Part 4 of the guide (Austroads 2014a) contains background and guidance on road function and traffic hierarchy, as well as discussion of:

- bicycle networks
- pedestrian networks
- freight movement
- public transport networks.

Key planning issues covered in Part 4 of the guide (Austroads 2014a) affecting networks in activity centres are:

- the multi-function character of streets within centres
- impacts on public transport and essential commercial traffic of restraint measures directed at general traffic
- parking and loading facilities for delivery vehicles
- applying measures for pedestrians and cyclists in a mixed traffic environment
- developing network operation plans to guide the implementation of transport mode priorities and minimise performance gaps.

Part 12 of the guide (Austroads 2009g) provides guidance, which can be helpful in assessing how a centre caters for all road users and in managing and designing for them.

Principles

The guiding principle can be stated as follows:

Within accessible centres, walking, cycling and public transport accessibility should be the main basis of the design of the street network. Designs should create multiple and direct walking and cycling connections to public transport stops, reinforced by favourable road reserve treatments (Department of Infrastructure, Planning and Natural Resources 2004).

Planning typically aims to achieve the following objectives (Department of Sustainability and Environment 2005, Department of Urban Affairs and Planning 2001 and Roads and Traffic Authority NSW 2000):

- creating streets and spaces that reflect the character of the centre as a 'place', not just part of the road network
- providing street networks with multiple and direct connections to public transport services and efficient access for buses
- improving transport choice and promote an integrated transport approach by managing road traffic flow and priority of transport modes
- providing a well-connected street network that serves the purposes of the centre, with co-located access for all users
- providing appropriate roadway widths (see Section 3.5).

Road use prioritisation

The dominant feature of roads and streets in activity centres is that they will usually be expected to accommodate, if not positively reinforce, the pedestrian character of the centre. As noted in Section 2.3.2, the emphasis within activity centres is on pedestrian movement rather than vehicle movement.

Various ways to envisage, and design for, the multi-functional nature of streets and roadways in urban areas, including activity centres, have been devised over the years. This included the road/amenity classification system proposed in Victoria in the 1970s (Loder & Bayly 1978); which gave rise to designations such as the ‘environmental arterial’, ‘modified arterial’ and led to the environmentally-adapted mixed-function ‘Main Street’ (Roads and Traffic Authority NSW 2000, see Section 3.7).

A contemporary evolution of these concepts of the multifunctional arterial can be found in the ‘link-place’ concept (Jones et al. 2007, Svensson et al. 2004 and Marshall 2004). This is a way to deal with the apparently contradictory pairs of functional attributes of roads in centres (Table 2.6), which mean that streets in centres do not fit into the conventional road hierarchy model.

Table 2.6: The roles of streets as a set of related pairs of contrasting properties

Mobility function	Access function
<ul style="list-style-type: none"> • Circulation • ‘Through’ users • Arterial • Movement space • Street as link/transition • Transport sphere • Flow (vehicles/people) 	<ul style="list-style-type: none"> • Occupation • ‘Local’ users • Place • Exchange space • Street as place/destination • Urban sphere • Land use (people/activity)

Source: Marshall (2004).

‘Link’ status denotes the relative significance of a street section as a *link* in the network – related to conventional traffic hierarchy designation.

‘Place’ status denotes the relative significance of a street locale as an urban *place* in the whole urban area. Additionally, Svensson et al. (2004) noted that:

Whereas the ‘link’ status of a route will tend to stay constant over the length of a particular street, ‘place’ status will vary along a street, and could be different in principle for each locale. Indeed, street sections can be defined by changes in place status along a given street, as well as by changes in link status.

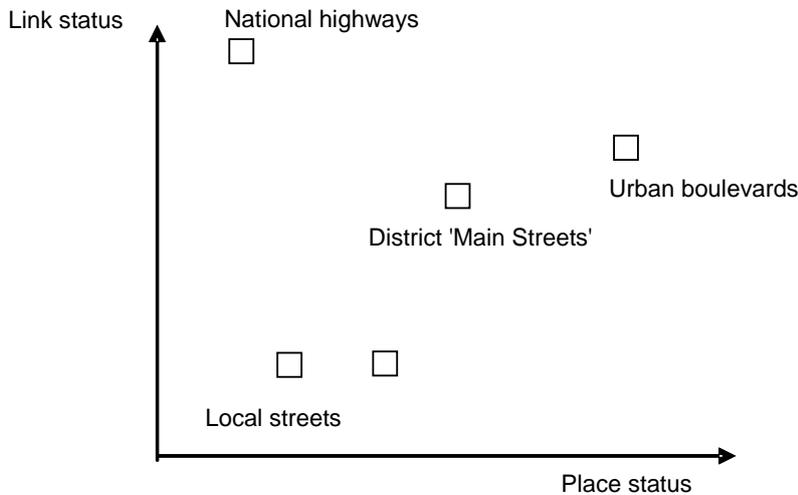
The two attributes do not trade off against each other, but are both acknowledged in how the street is designated, designed and managed.

The approach is based on two rules, stated by Marshall (2004):

1. Any street section has a combination of *link status* and *place status*. These variables are independent – and not one the inverse of the other, as with the ‘mobility function’ and ‘access function’ of conventional hierarchies (Figure 2.3).
2. Link status and place status will depend not only on the immediate attributes of the street section (including physical form and demand for use), but on their role with respect to the wider street and urban system considered as a whole.

Thus, as Figure 2.3 shows, the ‘place’ function of a section of road is not necessarily low even if its ‘link’ function is relatively high. In practice, street types towards the upper right of Figure 2.3 (that is, those which have both high status as a link in the network and high status as a place of activity) will need greater care in traffic management and design to allow the two attributes to operate satisfactorily side by side.

Figure 2.3: Examples of link-place status definitions



Source: Based on Marshall (2004).

However it is defined, 'the combination of link status and place status – which say something about the relative significance of a given street section relative to all others – can be used to guide decisions in the trade-off of street-space, between different transport modes and different urban activities' (Marshall 2004).

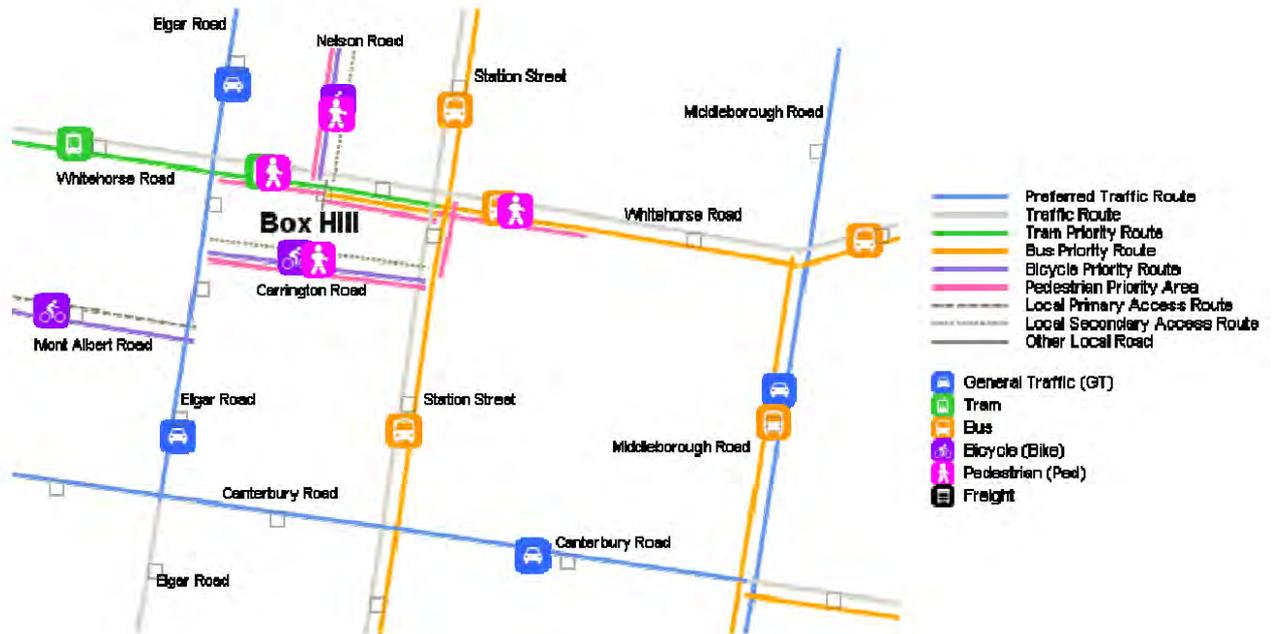
A link and place street hierarchy, based on these principles was developed in South Australia and is described in Appendix B and is discussed in greater depth in the *Streets for People Compendium for South Australian Practice* (Department of Planning, Transport and Infrastructure 2012).

Road use prioritisation is a key step in the network operation planning process (refer to Section 3.4.1 and Part 4 of the *Guide to Traffic Management*, Austroads 2014a). For example, the SmartRoads framework (VicRoads 2011) manages competing interests across the road network by prioritising road use by transport mode, place of activity and time of day. A core element of this framework was the creation of road use hierarchies identifying the priority of different transport modes by route and place, with a focus on key destinations within growth corridors, key activity centres and employment areas (Figure 2.4). The road use hierarchies provide a basis for the development of network operation plans to manage road use across multiple transport modes.

The application of network operation planning and road use hierarchies in an activity centre is discussed in the case studies included in Appendix B. For further guidance on the development of network operation plans, refer to Section 3.4 of this guide and Section 5 of the *Guide to Traffic Management Part 4* (Austroads 2014a).

Additional guidance on road hierarchies can be found in Parts 1, 4, 5 and 8 of the *Guide to Traffic Management* (Austroads 2009a, 2014a, 2014b and 2008b). An additional discussion of road hierarchy, with an emphasis on pedestrian needs, is given in Appendix C.

Figure 2.4: Example of a SmartRoads road use hierarchy around the Box Hill Activity Centre



Source: VicRoads (2011).

Pedestrian networks

See Sections 2.3.2 and 3.8. As noted in Section 2.3.2, permeability of blocks and sites (that is, the degree to which they can be passed through by pedestrians) is as important as formal street and walkway networks. Further guidance on pedestrian networks is provided in Section 4.7 of the *Guide to Traffic Management Part 4* (Austroads 2014a) and applying pedestrian networks to the network operation planning process is discussed in Section 5 of Austroads (2014a).

Bicycle networks

The key planning principle concerning cycle networks is typically to maximise cyclists' accessibility to centres, services, facilities and employment locations.

Bicycle access to destinations within the centre will comprise the terminal part of a journey. The scale and the nature of the roads and streets through an activity centre will determine the extent to which defined bicycle routes will be required within it. While approach routes to key foci such as a railway station will need to be defined and enhanced, it may not be necessary to provide for designated bicycle access to every possible destination. Deciding on where bicycles can be parked, and how bicycles get to those points, is part of the traffic management task.

For additional information on planning for cycle networks, see Sections 2.3.2 and 3.8. Further guidance on bicycle networks is provided in Section 4.6 of the *Guide to Traffic Management Part 4* (Austroads 2014a) and consideration of bicycle networks as part of the network operation planning process is discussed in Section 5 of Austroads (2014a).

2.3.6 Public Transport Connections and Access

The future growth and vitality of many activity centres will not be driven by motor vehicle access but by the ability of these centres to cater for increased public transport mode share to/from the centre, increased levels of public transport mode interchange within the centre, and increased associated pedestrian activity.

Good access by public transport, and convenient location of public transport boarding points, are integral components of activity centre planning. Public transport nodes include bus and light rail stops, ferry wharves, bus/rail interchanges, railway and transit way stations and taxi ranks. Centres will include major and district centres around railway and transit way stations, and key bus nodes. Smaller centres will usually be served by one or more bus or tram stops on a through route.

Major public transport nodes (railway stations, bus terminals etc.) will be significant elements in the components of the activity centre and will thus exert a strong influence on the way traffic and parking are managed. They will have priority in terms of space and access.

The location of public transport nodes will either be fixed (as in the case of railway stations and ferry wharves, for example) or be determined as part of passenger service planning and urban design of the centre. In either case, public transport nodes are mostly part of the pattern of uses and activities that those responsible for traffic management have to work with and support.

Traffic management input may sometimes be appropriate in determining roadside stops for buses or trams. In all cases, the location of public transport nodes should be planned in consultation with the relevant service providers; in order to recognise the needs of existing and potential land uses and have the highest possible accessibility for passengers.

The Department of Urban Affairs and Planning (2001) noted that:

These nodes should be located to maximise their walking catchment and access by other modes, such as bus, car and bicycle. Major nodes, such as railway stations, will usually be located in centres and can be the focus for the intensification of land uses to take advantage of their high accessibility. Others should seek locations with complementary land uses (e.g. bus stop and corner shop).

Planning guidance for transit-oriented development and transit access stresses the importance of having time-competitive feeder access by local transit services, and recognition of the strong relationship between public transport services and the functionality of the activity centre. Examples of principles and strategies are:

- Improve the transit focus of activity centres through greater integration with public transport facilities (Planning SA 2007).
- Plan and implement public transport infrastructure and services in conjunction with land use strategies to maximise access along corridors, and to and from centres (Department of Urban Affairs and Planning 2001).

The traffic management implications of this planning context for transit access are discussed in Section 3.11. Examples of passenger transport interchanges are presented in Section 4.7 and Appendix B.5. Public transport networks and network operation planning considerations are discussed in Sections 4.4 and 5 of the *Guide to Traffic Management Part 4* (Austroads 2014a) respectively.

Sources for more detail: Department of Infrastructure (2002), Department of Sustainability and Environment (2005), Department of Urban Affairs and Planning (2001) and Planning SA (2007).

2.3.7 Parking Policy and Planning

Parking supply is largely created by parking policies, local and state planning standards, and economic factors. Parking usage is influenced primarily by the level of attraction of the centre, by parking supply (quantity, location and limitations), and pricing:

Car parks are often poorly designed and located, and create unpleasant and potentially unsafe environments, and pedestrian barriers between different developments and the surrounding neighbourhood. Car parks must be available for an activity centre to remain viable, though the efficacy of their use, and their location and design can be improved to ensure pedestrian and cycling environments are not degraded. In many instances, they offer a substantial opportunity for the activity centre to be better integrated into the surrounding neighbourhood (Department of Sustainability and Environment 2005, p. 43).

Traffic management goals for the provision of car parking spaces associated with activity centres are:

- to provide the policy-determined level of parking
- to produce outcomes and development conditions that are consistent with other planning goals (e.g. in relation to public transport usage targets, urban design objectives, land utilisation visions and so on).

This will involve:

- understanding the complex set of relationships which affect parking usage associated with different kinds of centre and mix of land uses
- identifying who is affected by policy options, and how they are affected
- if demand exceeds supply, predicting and reacting to the consequences.

Knowledge of these consequences, and how they may apply in a given case, is an appropriate input into the establishment of parking levels, mix and location during the planning process:

Parking policy is about balancing 'disaggregated' demands, supply, and pricing, and determining rates of supply. 'Disaggregate' demands are the demands of each of the user types (e.g. commuters, shoppers, visitors, residents etc.) which may be competing to use a given area of parking. The policy development and assessments need to be carried out within such a framework (O'Brien 1994).

Specifically, traffic management input into the development of parking policy for a given centre can shed light on:

- opportunities for, and consequences of changing the user's behaviour, expectations and costs (which may raise equity issues)
- the role of parking policy (including availability and pricing) as a travel demand management and mode choice tool
- the risks (in terms of diversion of developers, businesses, employees or patrons to other places) of under-provision of parking, especially if it is not matched by adequate and appropriate alternative forms of transport to the centre
- availability of parking (on-street, private parking, casual areas etc.) and opportunities for additional or re-located parking
- the effects of overflow parking on local amenity, and establishing policies and measures to deal with it
- the different sources of demand by time of day and day of week, and the needs of couriers and deliveries
- the costs and feasibility of providing various levels of parking
- operational feasibility of parking levels and options being considered in the policy and planning stage.

The traffic management requirements associated with the adopted levels and locations of parking, including park and ride provisions, are discussed in Sections 3.10 and 3.11.

Parking policy, planning and practice is the subject of the *Guide to Traffic Management: Part 11* (Austroads 2008c), to which the user should refer.

2.3.8 The Safe System Approach and Safety-conscious Planning

Safe System approach

Safety is a prime objective in traffic management, and is pursued in accordance with the Safe System approach which underpins the national road safety strategies in Australia and New Zealand. The Safe System approach to road safety management recognises that humans make errors, that crashes will continue to occur and that humans have a limited tolerance to impact forces.

The approach aims to provide a safe road and traffic environment in which alert and responsible road users should not be killed or seriously injured as a result of a crash. It is structured around the basic pillars of safer roads, safer speeds, safer vehicles and safer road users.

In the context of providing and managing activity centre facilities, the Safe System approach aims to ensure that potential collisions are avoided and, if they occur, that the potential crash impact forces do not exceed human tolerance. Speed is a critical factor and is further discussed in Section 3.6. Pedestrians and cyclists are vulnerable users and a low-speed traffic environment is an essential consideration for activity centres. A key consequence thereof may be the need to reduce speeds within centres.

For additional guidance on the Safe System approach refer to Part 1 of the *Guide to Road Safety* (Austroads 2013b).

Safety conscious planning

As with any form of physical planning and urban design, traffic-related safety needs to be given specific consideration at the planning and design stages, and throughout the development and operation of a centre. This requires applying road safety engineering skills to the project, through an audit or some other approved and effective procedures (see Part 12 of the guide, (Austroads 2009g), Section 2.1.4). The *Guide to Road Safety Part 6: Road Safety Audit* (Austroads 2009b) recommends that an audit of a development be done separately from any 'traffic impact assessment', as these assessments are usually part of the design process and are not independent.

Procedures for considering road safety in the planning and development approval process are discussed in Part 12 of the guide (Austroads 2009g), Section 2.1. In summary, Part 12 stresses:

- Road safety is one of the most important aspects of managing the road system.
- Road safety should not be left as 'one of those matters which can be sorted out later through good design'.
- Road safety is often allowed to diminish in importance if it conflicts with other planning and design objectives.
- Road safety cannot in fact always be resolved through design and needs to be given prominence from the earliest stages of strategic planning.
- Road safety assessments should be part of the development approvals process.

Road safety underpins much of the traffic management guidance referred to in Section 3.

3. Techniques for Traffic Management in Activity Centres

3.1 Information Gathering

Traffic management in activity centres involves the same types of information gathering and analysis as in other applications. In addition, it may involve the assessment of other types of information unique to traffic systems in activity centres. Much of this data will be normally available from planning surveys and asset inventories as part of the centre's database, and may include such things as:

- elements of the road reservation, including driveways and building set-backs
- the nature of abutting land uses and activities
- studies of pedestrian movement and behaviour
- attitudinal surveys.

3.1.1 Implications for Practice

Specific items of information that may be required are listed in Appendix D.

Part 3 of the guide (Austroads 2013a) is the primary source of guidance on surveys for traffic management. Help with information gathering and processing on specific aspects can be found in other sources, as shown in Table 3.1.

Table 3.1: Sources on traffic-related data collection

Guidance on surveys for traffic management	Sources ⁽¹⁾
Traffic data required for development impact assessment	GTM 12 (Austroads 2009g), Census journey-to-work data, travel databases
Traffic growth estimates	GTM 12 (Austroads 2009g)
Parking data and surveys	GTM 3 and GTM 11 (Austroads 2013a and 2008c)
Traffic generation and distribution	GTM 12 (Austroads 2009g), Roads and Maritime Services (2013), Trips Database Bureau (n.d.), NZ Transport Agency (2011)
Economic evaluation	Guide to Project Evaluation, Australian Transport Council (2006)
Traffic impact studies	GTM 12 (Austroads 2009g)
Warrants for speed management devices	GTM 8 (Austroads 2008b)
Estimating AADT from small surveys	GTM 3 (Austroads 2013a)
Safety audits	Guide to Road Safety Part 6: Road Safety Audit (Austroads 2009b)
Walking audits	GTM 3 (Austroads 2013a), Cluster for Physical Activity and Health (2007), NZ Transport Agency (2008, 2009, 2010a), Pedestrian and Bicycle Information Center (2008a)
Cycling audits	BFA (2007), Pedestrian and Bicycle Information Center (2008b), Austroads (2009b)
Intersection analyses, delays etc.	GTM 3 (Austroads 2013a)

¹ Guide to Traffic Management (GTM).

3.2 Traffic and Transport Impact Studies

Whilst there will be different legislative requirements in different jurisdictions, it is recommended that a transport assessment, as described in this section, be considered for all development applications within activity centres. Often this will require the participation of the relevant government agencies if the proposed new development or rejuvenation of an activity centre is of a major scale.

New or expanding centres will usually be required to undergo a traffic impact study. Larger centres will need to be subjected to a more comprehensive transport impact study, and it may in any case be considered appropriate to conduct a transport assessment of an activity centre in order to identify all relevant movement planning and management issues. The scope and content of transport assessments, in comparison with traffic impact assessments, is outlined in Part 12 of the guide (Austroads 2009g).

3.2.1 Implications for Practice

Part 12 of the *Guide to Traffic Management* (Austroads 2009g) details traffic management tasks and issues that need to be attended to in both the planning and operation of an activity centre. In summary, these are:

- document the study area (site, centre, proposed development or expansion etc.), including layout and design features
- detail the traffic and parking conditions, in base year and planning year
- determine the level of traffic generation
- determine the distribution of this traffic (directions of approach and departure) and routes it will use
- identify paths and routes used by non-car traffic (deliveries, pedestrians, cyclists, buses etc.)
- assess effects on traffic operation and circulation, including intersections
- assess traffic operations within the centre
- identify mitigating treatments
- obtain other assessments:
 - infrastructure and pavement impact assessment
 - an independent road safety engineering assessment
 - environmental and economic assessments.

The fuller transport assessment may add the following considerations and tasks:

- assess the total travel characteristics of the centre (all modes)
- devise plans to influence the modes of travel to the centre (pedestrian plans, 'green travel' plans, integrated local transport plans, transport management and accessibility plans etc.)
- develop and implement mitigating plans:
 - accessibility and integration impacts with the local community
 - safety and security impacts
 - environmental impacts
 - highway and traffic impacts
 - strategies for enhancing public transport.

3.3 Managing Travel Demand and Mode Choice

As pointed out in Sections 2.2.1 and 2.3.1, a centre may be planned and function within the context of policies aimed at reducing car use. Managing the modes and demand for travel to activity centres is not directly a traffic management issue, but traffic management can contribute to targets set for mode share. Those responsible for traffic management should be aware of the policy options and techniques for demand management because shifts in the mode and time of travel may influence the level of road space demand. In addition, factors not under control of traffic management (such as changes in petrol prices and the influence of public health messages encouraging more physical activity and public transport use) may modify demand. Moreover, demographic changes within the catchment of an activity centre will also influence the frequency of access to an activity centre.

As in most other areas of modern traffic and transport planning, it may not always be possible or desirable to cater for unrestrained demand. Furthermore, traffic management options that may be contemplated for the centre will sometimes have an effect on the level or distribution of travel demand.

For these reasons, the practitioner will need to be aware of the tools for travel demand management (TDM) that may have application in, or an influence on, traffic management in activity centres. These tools include:

- parking provision, location, pricing and operation
- road pricing schemes, entry charges
- speed management
- enhancing alternative modes: public transport service and access, quality of pedestrian access and walking environment, and bicycle provisions
- on-road public transport preference measures
- travel behaviour change programs.

TDM issues are more fully covered in the Guide to Road Transport Planning (Austroads 2009c), Guide to Traffic Management Part 4: Network Management (Austroads 2014a), Guide to Traffic Management Part 12: Traffic Impacts of Development (Austroads 2009g), Austroads (2007). These and other specialised sources should be consulted for more detail on the techniques of implementation.

3.3.1 Implications for Practice

Travel demand management directed at reducing the level of traffic to and within the centre can involve the following traffic management investigations and activities:

- Investigate the sensitivity of parking demand to various supply and pricing policies, and develop a strategy to guide planning for parking in and around the centre.
- Support and facilitate public transport improvement plans, especially local bus improvements: considering coverage, routes, frequency, service hours, coordination with rail an interchange improvements; placing bus stops centrally rather than peripheral to activity areas or providing free bus travel within the centre (or via another form of people mover), etc.
- Develop and implement an integrated local transport plan, which may include many of the other measures in this list (ARRB Transport Research 2002).
- Encourage introduction of a centre-based community bus service or privately operated demand responsive type transport services to supplement the catchments of scheduled services.
- Consider developing and implementing a travel behaviour change plan, such as:
 - TravelSmart or similar program (see Brindle 2006, Land Transport NZ 2007, Maunsell Australia 2004 and TravelSmart Australia 2007).

Travel behaviour change programmes encourage voluntary change in travel behaviour by providing incentives for people to use sustainable modes of travel, thus reducing the need for car travel in our communities (Land Transport NZ 2007).

- A mobility management plan (or 'integrated travel plan'), such as a transport management and accessibility plan:

Mobility Management is a pro-active approach to managing demand to achieve desired outcomes. It can be applied as a strategic demand management tool or as a site-specific (or area-specific) measure. The aim is to reduce demand for and use of cars by increasing the attractiveness and practicality of other modes of transport (Roads and Traffic Authority NSW n.d.).

- A mobility management plan is an important component of both the assessment and ongoing operation of major developments and activity centres.
- Facilitate 'drop-off' by taxis and private car.
- Investigate the possibility of a local car share scheme (Wang & Brindle 2001, Roads and Traffic Authority NSW 2007), available commercial car share services can be found by searching 'car share').
- Develop road management plans (Part 4 of the guide, Austroads 2014a).
- Introduce traffic calming (speed management and traffic restraint plans). See Section 3.6 and Part 8 of the guide (Austroads 2008b).
- Support and facilitate walking and universal access improvement plans, and increased walking amenity (Section 3.8).
- Support and facilitate measures to encourage cycling, through cycling plans and provision, creation of appropriate speed environments for mixed traffic on streets to and within the centre (Section 3.8).

3.4 Network Management

Section 2.3.5 has drawn attention to the need to manage road and street networks within activity centres in response to their acknowledged function as 'places' as well as 'links' in the network. It also stressed the importance of:

- providing a well-connected street network with multiple and direct connections to public transport services and efficient access for buses
- improving transport choice and promoting an integrated transport approach by managing road traffic flow and priority of transport modes.

Part 4 of the *Guide to Traffic Management* (Austroads 2014a) is the primary resource for guidance on managing transport networks, covering:

- urban road networks, based on designated road functions
- public transport networks
- heavy vehicle networks (Section 3.9)
- bicycle networks (Section 3.8)
- pedestrian networks (Section 3.8).

Within accessible centres, walking, cycling and public transport accessibility should be the main basis of the design of the street network. Designs should create multiple and direct walking and cycling connections to public transport stops, reinforced by favourable road reserve treatments (Department of Infrastructure, Planning and Natural Resources 2004).

3.4.1 Network Operation Planning

Network operation planning is another important aspect for managing activity centres. A network operation plan aims to guide the operation and development of government or community visions. It provides a method of resolving or balancing conflicts between different transport modes and user groups in the day-to-day management of traffic on the road network. Guidance on this process is provided in Section 5 of the *Guide to Traffic Management Part 4* (Austroads 2014a) and Austroads (2009i and 2013d).

An example of the network operation planning process applied to an area in and around an activity centre is discussed in Appendix B.

3.4.2 Implications for Practice

In applying the available guidance to activity centres, the practitioner will need to be aware of the following practical implications:

- Fundamental decisions are required concerning through traffic in the centre, particularly if the centre straddles an important traffic route (i.e. part of the urban or regional movement system):
 - When is removal of through traffic justified, or even necessary?
 - Does it need to be catered for?
 - Can lower traffic performance through a centre be accommodated by better compensated for it outside the centre?
 - Is there a need for separate provision of a road-based public transport route passing through the centre?
 - What alternative routes are available?
 - Are there other ways to separate centre traffic from through traffic?
 - Can the activity centre be shifted away from the through traffic route?
If the decision is made to retain the through traffic route then some form of environmental adaptation will be needed (Sections 3.6 and 3.7).
- Network operation plans, road network management policies and strategies will be heavily influenced by decisions on the relative roles of each road section as a link and a place (see Section 2.3.5). These should be carried through consistently in street design and road network management.
- Centres offer prime opportunities for giving priority to on-road public transport and taxis through intersections and along potentially congested roads. This and other measures (as outlined, for example, in Parts 4 and 9 of the guide (Austroads 2014a and 2014c) and any guidance on bus requirements applying in the relevant jurisdiction) should be considered and applied where appropriate.
- Any restrictions of access to larger vehicles need to be identified and implemented (Part 4 Section 3.4.9 of the guide, Austroads 2014a).
- Heavy vehicle guidance noted in Section 3.9 should be applied.
- Suggested guidance on bicycle facility selection, signing, integration with public transport, and end-of-trip facilities should be employed (Part 4 Section 3.5 of the guide, Austroads 2014a).
- Attention should be given to pedestrian needs identified in Part 4 Section 3.6 of the guide (Austroads 2014a), the implications of which are noted in Section 3.8.
- Decisions should be made on provisions for various road users based on inputs and rules specified in Table 4.1 of Part 4 of the guide (Austroads 2014a).
- Network performance targets and assessment criteria should be set based on:
 - travel in the system (vehicle kilometres travelled)
 - delay related to each road user group, or
 - traffic density.

For example, in a pedestrian-oriented area such as an activity centre, performance targets for wait times to cross roads would be set low, as would vehicle throughput and traffic density.

3.5 Road Design and Capacity

3.5.1 General Comments about Cross-section

Road space is generally limited in activity centres and there is usually considerable competition for a share of the available space by the various road users and urban design requirements. In recent years, there has been a trend towards more equitable allocation of street space. This has generally resulted in less of the cross-section being devoted to moving vehicles (involving what has, in the USA, been termed 'road diets', Rosales 2006). The guiding principles for traffic management are that:

- Traffic service expectations are not high in or through activity centres, meaning that lower speeds and some delays are expected and tolerable and can thus be used as positive management tools.
- At lower speeds, lane widths can be narrower than normally required for free flow at higher speeds, keeping in mind the needs of buses and essential larger commercial vehicles.
- A single lane in each direction can provide adequate midblock capacity for the volumes of traffic expected within activity centres.
- Intersection configuration and capacity control the level of traffic service in activity centres.
- It may be preferable to use extra lanes at intersections to separate right and/or left-turning vehicles from through traffic, rather than increase the number of through lanes.
- Total roadway width should be minimised as necessary to reduce the crossing width for pedestrians and to increase pedestrian space in the street, both mid-block and at intersections.
- On-street parking often has lower priority than other demands on street space.
- Provision for other services, including utilities, must also be made within the right of way.

An example of a street within an activity where these principles have been applied is shown in Figure 3.1. More specific guidance on road cross-sections, widths of lanes etc. can be found in the *Guide to Road Design*. Capacity issues are detailed in Part 3 of the *Guide to Traffic Management* (Austroads 2013a). Note also the material in Sections 3.6, 3.7 and 3.8, which relates to cross-section elements.

Figure 3.1: Single lane in each direction with median, parking lane, bicycle provision and separated turning lane (Donnybrook WA)



Source: Provided by Main Roads WA (unpublished).

3.5.2 Creating Desired Design Conditions through Planning of the Centre

Design affecting traffic quantity and movement is more than design of the cross-section of the road. Development design in centres should ensure optimum pedestrian conditions and flow between different functions and retail outlets. The following planning guidance (from Department of Urban Affairs and Planning 2001) can be regarded as 'traffic management through planning,' which traffic practitioners should support and become familiar with:

- The co-location of lower intensity leisure facilities with complementary land uses such as schools and other educational institutions can justify increased frequencies for public transport services.
- Access by all transport modes should be encouraged. The configuration of shops and other services must seek a balance between pedestrian, cyclist and driver comfort, visibility and accessibility. Shopping centres and malls, entertainment complexes and personal services offices should be designed to allow direct and convenient access by walking, cycling and public transport and provide access for people with disabilities.
- Public transport and taxis should have direct access to retail areas. When retail or entertainment facilities are set back from the street, buses and taxis should be easily and directly rerouted through the facility with a sheltered stop at their front entrance. Bus stops and taxi ranks on the far side of large car parks should be avoided.
- As redevelopment occurs over time, retail complexes should be joined more directly with street frontages and bus stops.
- Commercial buildings should be orientated to the street, rather than to car parks.
- Car access and movement between buildings and the street should not create pedestrian barriers or be given priority.
- Integration of retail functions encourages single multi-purpose trips, particularly when pedestrians can move freely within a centre.
- Any retail location on main roads, which would afford high exposure, should not compromise the best use of the road and public transport infrastructure.

3.5.3 Implications for Practice

Sharing the street cross-section can typically involve:

- widening footways
- reducing the number of lanes for moving traffic
- perhaps converting the street to one-way operation so that only one lane total is required
- providing a median, frequent refuge islands, or intermittent streetscape features such as planter boxes, seating, lamp posts, rubbish bins and so on
- creating parking lanes (often intermittent rather than continuous) separate from the through lanes
- considering designated cycle lanes
- providing kerb build-outs at pedestrian crossing points
- separating turning vehicles from through vehicles at intersections.

Design guidance for these elements is found in the *Guide to Road Design*.

The feasibility and details of any of these measures should be tested in terms of:

- effects on road user safety
- road function and the needs of its environment
- traffic volume and acceptable level of service
- volumes of turning traffic, and their needs
- queue lengths likely to develop at intersections (refer to Part 3 of the guide, Austroads 2013a)
- vehicle mix and operating pattern (e.g. are there frequently-stopping vehicles, such as buses or service vehicles?)
- current and anticipated crash patterns
- pedestrian and cycle activity
- available right of way, and cost and feasibility of land acquisition
- availability of alternative traffic routes
- parking requirements
- effects of rail level crossings.

Medians

Medians in activity centres will almost always be restricted in width, and will rarely be wide enough to accommodate a turning lane. Nevertheless, care needs to be taken to ensure that a pedestrian in the median is adequately sheltered. Wheelchairs, electric scooters, bicycles being 'walked' and prams should be anticipated in the design. They should be raised where possible, but flush medians defined by pavement marking or differential surfacing are also effective in providing separation between opposing traffic and particularly in providing for pedestrians where space is at a premium, in those jurisdictions where vehicles are not permitted to traverse flush medians.

Sight lines

Adequate sight lines should be provided, especially past planting and other streetscaping elements, at points where pedestrians may enter the traffic space.

Width requirements

Rarely will there be a need for more than one lane in each direction for non-turning traffic. Short turn lanes may be provided at intersections and car park entries, especially to the right, but these should not generally be at the expense of road space for pedestrians or cyclists. Lane widths and clearances for moving vehicles, parking and bicycles are recommended in the *Guide to Road Design*. Note the provisions for application of the 'extended design domain' approach to allow for reductions in width requirements in low speed environments.

Intersections and driveways

The primary sources of guidance on intersection form and management are Guide to Road Design Part 4: Intersections and Crossings – General (Austroads 2009d) and Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings (Austroads 2013c).

Additional guidance is available in:

- Part 8 of the guide (Austroads 2008b), which refers to thresholds, driveway links and other intersection treatments that may find application in activity centres.
- Part 3 of the guide (Austroads 2013a) that deals with intersection analyses
- Part 9 (Austroads 2014c), which provides guidance on intersection operation.
- Part 12 of the guide (Austroads 2009g) that deals with site access and access management issues.

Key issues to consider when designing and controlling T and cross intersections in activity centres are:

- the selection of intersection treatment will depend on a range of factors including pedestrian and bike flows (volumes and desire lines), and traffic speeds
- estimating intersection capacity
- devising intersection types and treatments that support the urban design vision for the centre (entry statements, form, materials etc.).

In addition to being influenced by access management planning (see Parts 5 and 12 of the guide), (Austroads 2014b and 2009g) driveways raise issues both in location and design when located in activity centres.

Driveways and other points of vehicle entry to and exit from the roadway should be located away from the intersection area of influence, for safety and operational reasons. Intersection separation standards, where specified, should be observed. See Part 12 of the guide (Austroads 2009g, Section 3.3.2) for more detail in relation to driveway access for individual developments.

As general guidance, driveways should not be located within the typical peak hour queue length on the approach to signalised intersections, and advisedly not within 25 m of the stop line in any case. Driveways are recommended not to be located within 12 m of the stop or give way line at unsignalised intersections.

Driveway location will be determined by factors other than pedestrian activity. However, off-street developments and car parking facilities should generally be designed so that pedestrian entrances/exits are separate from vehicular entrances/exits. Splays, clear of obstructions, are required at the property line to ensure adequate visibility between vehicles on a driveway and pedestrians on the footpath. Suitable information or warning signs may need to be provided in order to control the speed of traffic and warn of the presence of pedestrians. Vehicle drivers exiting buildings and off-street car parks should be encouraged to give pedestrians an audible warning where sight distance is severely restricted.

3.6 Traffic Calming and Speed Management

An overview of the Safe System approach and the importance of speed management within activity centres is discussed in Section 2.3.8. A low-speed traffic environment is essential in a pedestrian-dominated street, whether or not other rules or measures have been introduced to facilitate safe and pleasant walking. Pedestrians and cyclists are particularly vulnerable road users. For vehicle-pedestrian collisions, the equivalent survival speed is about 30 km/h (refer to the *Guide to Road Safety Part 3: Speed Limits and Speed Management*, Austroads 2008d).

A conceptual basis for acknowledging streets within activity centres as ‘places’ as well as ‘links’ is presented in Section 2.3.5. The implications of this emphasis form the basis of traffic calming in centres. The principal Austroads source of guidance on traffic calming is the *Guide to Traffic Management Part 8* (Austroads 2008b). Although Part 8 describes mainly applications in residential neighbourhoods, the guide can be applied to circulatory and access roads within activity centres.

The intention of traffic calming in this context is to adapt the road to the environment that it serves. The purpose and techniques of ‘environmental adaptation’ and the specific case of centres straddling arterial roads is dealt with in Section 3.7 of this part.

3.6.1 Appropriate Speed Environments

As noted earlier (Section 3.5), lower traffic speeds open up traffic design and management possibilities that are able to support (and even be the prime means of implementation) of urban design objectives for a centre.

Manipulating the speed environment has a solid basis in traffic engineering experience. The known relationship between impact speed and pedestrian survival (Anderson et al. 1997, McLean et al. 1994) strongly supports desirable maximum speeds of 30–40 km/h in pedestrian environments, and lower in streets where there is appreciable interaction between pedestrians, cyclists and vehicles. Parts 5 and 8 of the guide (Austroads 2014b and 2008b) and the *Guide to Road Safety* provide more information on the relationship between speed and road user safety, especially for pedestrians and cyclists.

The primary Austroads source on speeds and injury is the *Guide to Road Safety Part 3: Speed Limits and Speed Management* (Austroads 2008d), which should be referred to for more detail.

Guide to Traffic Management Part 5: Road Management (Austroads 2014b) presents guidance on the setting of speed limits. Part 13 of the guide (Austroads 2009h) discusses management of the safety of road environments within a traffic management context, and provides cross-references to the *Guide to Road Safety* and the *Guide to Road Design*.

3.6.2 Ways to Influence Vehicle Speeds in Centres

There are several overlapping design and management concepts that may be considered as part of a strategy to reduce vehicle speeds (among other things), such as:

- ‘Main Street’ treatments (environmental adaptation – see Section 3.7)
- traffic calming (local area traffic management) devices and treatments
- pedestrian priority areas
- pedestrian malls and transit malls
- legislated ‘shared zones’ (streets and places)
- ‘road diets’
- ‘shared spaces’ by design (so-called ‘naked streets’).

These are briefly discussed in Appendix E. They are related concepts and differ mostly in degree and in the mix of urban design and traffic management measures that are employed.

Section 3.7 expands on the underlying intention in all these strategies to achieve environmental adaptation.

3.6.3 Implications for Practice

- Practitioners, whether urban designers, planners, architects or engineers, have a wide range of traffic management/urban design techniques from which to choose.
- Most experience has been with traffic calming (or 'local area traffic management') – Part 8 of the guide (Austroads 2008b) – and with environmental adaptation of main streets (Roads and Traffic Authority NSW 2000). These sources provide guidance on appropriate speed management techniques to maximise benefits and minimise dis-benefits for bus operation, in particular.
- Specific issues, such as pedestrian facilities, are dealt with in the relevant sections of this part and in other parts of the guide. Lower vehicle speeds are essential if increased integration of the street space, involving greater pedestrian-vehicle mixing, is envisaged.
- Speeds of on-street public transport and bicycles will need to be moderated where they are intended to share the street space with pedestrians.
- Refer to Section 3.7 for more specific guidance in terms of generic environmental adaptation.

3.7 Environmental Adaptation

Where through traffic compromises a centre, the choices are:

- Provide a bypass so that the through traffic does not impact the town and its centre. This is not always possible or desirable.
- Adapt the centre and the way its people use it, so that it can accommodate the through traffic. This is contrary to sustainability principles, is usually unacceptable to the local community, and is rarely equitable.
- Adapt the road and its traffic to the needs of the centre. This involves changing the road environment to change driving behaviour, to reduce negative impacts of the through traffic on the town and particularly on its centre, and to give priority to pedestrian movement.

The term 'environmental adaptation' originally arose from measures reported in Denmark to deal with the problems of conflict between through traffic on highways and the needs of the towns through which they pass (Herrstedt 1988). Because it refers to various ways to influence road user behaviour by adapting the environment, it is a useful term to describe all those design and management measures that involve manipulation of the physical environment and therefore which have strong relationship with urban design of the centre. Such techniques represent a desirable synergy between engineering and design objectives.

Environmental adaptation can take a range of forms in practice, depending on the extent to which speeds and through traffic movement are intended to be restrained. The alternative (and related) forms of treatment described in Section 3.6 can be considered.

'Main Street' treatments

Based on innovative research by the University of NSW, *Sharing the Main Street* was produced (Roads and Traffic Authority NSW 2000), a comprehensive guide to the application of the concepts of environmental adaptation to the main streets of towns and suburbs. Figure 3.2 shows an application of environmental adaptation.

Figure 3.2: Environmental adaptation of a main street (Taree, NSW)



Source: From Roads and Traffic Authority NSW (2000).

This detailed and accessible set of guidelines is highly recommended for traffic management in activity centres that straddle a through route, where a planning policy decision has been made to restrain the through traffic to make it subordinate to the needs of the centre. The guide may also contain ideas and techniques that can be adapted and applied on any roadways within other activity centres. The following material is derived largely from this source.

3.7.1 Applying the Environmental Adaptation Process

Once the planning and operational policies relating to traffic in and through the centre have been established, the environmental adaptation process involves activity directed at one or other of three objectives:

- deciding on, and supporting, a desired speed environment (the 'speed profile' along the street)
- ensuring that planning decisions support the desired distribution of pedestrian activity along the street (the 'activity profile'), defining the activity centre and the way it interfaces (or transitions) to the approach zones either side of it)
- achieving a high-quality pedestrian environment in the centre.

Environmental adaptation thus calls on engineering, planning and streetscape design skills.

The measures that can be considered for 'Main Streets' treatments, and most of the other environmental design and management concepts noted in Section 3.6, are summarised in Appendix F.

3.7.2 Implications for Practice

- The comprehensive material in *Sharing the Main Street* (Roads and Traffic Authority NSW 2000) should be consulted for guidance on any proposal involving environmental adaptation of a street, including the speed management options outlined in Section 3.6.
- The scope for environmental adaptation decreases with increased peak hour traffic volumes and narrower road reservations.
- The scope for narrowing the carriageway is influenced by the composition of the traffic stream, particularly the presence of large vehicles.

- Bus routes and stops have major influence on design.
- The needs of cyclists should be considered, and a decision made on whether or not specific provision is needed.
- Where there are shifts in traffic function during the day, priority measures need to be selected which do not impede peak hour traffic flow and also provide safe conditions for pedestrians at all times.
- Special attention should be given to overtaking vehicles and pedestrian movements in transition zones (the fringes of the centre).
- The design of the road space should recognise that pedestrians and motorists perceive the road environment differently.
- Landscape elements can make a significant contribution to the objectives of environmental adaptation, but must be used with care.
- Safe conditions should be created for all users.
- The special needs of people with disabilities must be considered.
- Safe conditions should be created at any stage in the development of a project.
- Emergency vehicle access should always be a factor in design.

Note the advice and requirements for traffic control devices and the design of traffic facilities that are contained in other manuals and guidelines such as AS 1742.13–2009 *Manual of Uniform Traffic Control Devices Part 13: Local Area Traffic Management*, and any guides and codes that apply to the jurisdiction in which the activity centre is located. The *Guide to Traffic Management Part 8: Local Area Traffic Management* (Austroads 2008b) also includes guidance and illustrations that are relevant to this subject, and flags some of the local guides and codes.

The needs of, and constraints exerted by, on-road public transport, service and emergency vehicles should also be considered. Any prevailing statutory requirements should, of course, be observed. It is important to involve key stakeholders such as public transport operators and emergency services in the selection and design of treatments. (See Part 8, Section 5 of the guide, Austroads 2008b).

3.8 Providing for Pedestrians and Cyclists

3.8.1 Pedestrians in Activity Centres

The central importance of planning and designing for pedestrians in activity centres has been stressed in Section 2.3.2. Pedestrian movement within centres can be expected to be ubiquitous – that is, they can occupy, use and traverse all public spaces, and buildings can be penetrated and passed through by pedestrians.

At this scale, therefore, the concept of a ‘network’ for pedestrians is not wholly useful. Nevertheless, guidance contained in Part 4 Section 3.6 of the guide (Austroads 2014a) should be heeded where appropriate.

Useful guidance can also be found in the NSW Pedestrian Access and Mobility Plan guidelines (Roads and Traffic Authority NSW 2002), NZ Transport Agency (2009) and the other sources used to collate practice guidance under the next sub-heading.

3.8.2 Pedestrian Implications for Traffic Management Practice

Traffic management is expected to contribute positively to the pedestrian environment and amenity by implementing or supporting the following actions and outcomes for pedestrians using activity centres. See also Section 3.11.

These practice guidelines are derived from a range of sources including City of Melbourne 2006, Cluster for Physical Activity and Health (2007), Department of Infrastructure, Planning and Natural Resources (2004), Department of Sustainability and Environment (2005), Department of Urban Affairs and Planning (2001), Planning SA (2007), Department of Transport (2007) and Roads and Traffic Authority NSW (2002).

Pedestrian access

- Ensure that pedestrian connections into surrounding areas are efficient and attractive, and that they lead directly into places of pedestrian activity, to encourage walking access to the centre. Consider the use of 'accessibility mapping' for this purpose (in which actual path distance is compared with airline distance – usually over a radius of 400 m or 800 m – to target sites and routes that need attention) (Department of Urban Affairs and Planning 2001, Roads and Traffic Authority NSW 2002).²
- Key land uses should be located within walking distance of each other (e.g. shops, library, childcare centres, cinemas, bus/rail interchange).
- The highest densities of housing and/or employment appropriate to an area should be located within walking distance of public transport nodes.
- Every building or other activity should have convenient and prominent pedestrian entrances, in terms of design, signing, lighting and gradient.

Pedestrian environment and amenity

- Avoid expanses of ground level blank walls along street frontages, large driveways and entrances to car parks, and long car park boundaries abutting the main pedestrian streets and paths.
- Ensure that walking environments are:
 - connected
 - safe
 - comfortable
 - well-signposted
 - sheltered and shaded.
- Pedestrian-only links should be short, well-lit and inviting. All elements of the 'walking environment' should be designed keeping people with disabilities in mind (see below).
- Pavement surfaces should be even and friendly to the infirm and those with mobility aids or other wheeled carriages.
- Street furniture and planting should be attractive but not obstruct footpaths or create blind spots, visibility obstructions (especially on the approach to places where pedestrians cross) or roadside hazards.
- Street space allocation in centres is normally expected to favour pedestrian activities. Design or create footway widths to support movement and the social life of the street, in order to accommodate expected pedestrian activity and prevent overcrowding.

Designing for pedestrians

- Consider the variety of people who will use the footpath, including people with wheelchairs, electric scooters or prams, and the sight impaired, all of whom travel at different speeds. Minimise changes in footpath levels and avoid physical barriers to accommodate these users. Footways should have ramps at all kerb corners for mobility aids and pram access, and tactile ground indicator tiles for vision impaired pedestrians. Design considerations for children, the elderly and people with disabilities are discussed in Appendix G.

² In planning literature, a detour factor analysis is commonly referred to as 'walking catchment' or 'ped-shed' analysis.

- All devices such as signal call buttons and pavement guidance should conform to the requirements of people with disabilities (e.g. AS 1428-2010, Land Transport NZ 2007, Main Roads WA 2013, Austroads 2000 and PPK Environment and Infrastructure 1998). Median islands or refuges assist people with disabilities to cross with assurance. The requirements of mobility and access legislation should be observed.
- Pedestrian access to buildings should be in accordance with AS 1428.1-2009 and Section D of the Building Code of Australia, particularly in relation to the provision for exit or escape facilities, construction of exits and access for people with disabilities. In New Zealand the equivalent document is NZS 4121-2001.
- Keep pedestrian crossing distances to a minimum through kerb extensions and tight turning radii, to slow traffic while still allowing buses to turn slowly and easily.

The acceptable length of a crossing will be determined by the overall carriageway width to be crossed and the nature of traffic control, e.g. the amount of time allotted at a traffic signal. In general, the distance to be travelled by pedestrians in negotiating a crossing should be minimised by ensuring that where practicable, the crossing is approximately at right angles to the carriageway. Some pedestrians, e.g. the elderly or infirm, cross slowly and may cause long delays to vehicles. Others may be deterred from using a crossing because of a perception of excessive exposure to traffic. Minimising the distance is therefore desirable both in terms of pedestrian safety and convenience and in terms of reduced vehicle delays.

- Attend to pedestrian needs identified in Section 3.6 of the *Guide to Traffic Management: Part 4* (Austroads 2014a), to avoid hazards such as:
 - footpaths which constrain movement due to street furniture and other obstacles
 - facilities which are inaccessible or hazardous for use by people with disabilities
 - inadequate provisions and safeguards in construction areas
 - traffic signal timings which do not allow adequate time to cross.
- Clearly signpost off-street car parks, bicycle paths, public transport stops and footpath connections.

Managing pedestrian-vehicle interaction

- Pedestrian audits of centres and public transport nodes should be undertaken as part of a pedestrian plan, and provide the basis for planning and development.
- Performance targets for wait times to cross roads should be set low, as should targets for vehicle throughput and traffic density. Reduced waiting times increase pedestrian priority and convenience. Pedestrian throughput should be a design parameter in busy walking environments.
- Apply guidance contained in Part 6 of the guide (Austroads 2013c) for installation and design of pedestrian signals and other crossings.
- Provide traffic treatments such as islands, medians and crossings to help pedestrians cross roads at desire lines, and widen footpaths to improve pedestrian conditions.
- Pay attention to pedestrian requirements at roundabouts. In low-speed environments, it may be appropriate to give pedestrians priority by installing signalised or unsignalised crossing facilities at the intersection.
- Use traffic calming, streetscaping, intersection treatments, pedestrian and cycle facilities, parking layouts and appropriate road crossing facilities to reduce vehicle speeds and create a safer pedestrian environment (Part 8 of the guide) (Austroads 2008b).
- Where appropriate, consider introducing a shared zone (Section 3.6).
- Circulation roadways, parking aisles and access driveways should be located where there is minimum conflict with heavy pedestrian movements between car parks, public transport stations and associated shopping facilities etc.
- Ensure that parked vehicles do not obstruct the line of sight to pedestrian crossing facilities and adjacent areas.

- Be careful not to expose pedestrians to conflict with cyclists. Avoid shared paths in the centre, where the volume of pedestrian traffic will usually be too great for cycling to be safely and comfortably accommodated with pedestrians (also refer to Section 3.8.4).
- Separate service vehicle access and loading areas from pedestrian movements, where possible, to minimise potential conflicts and the loss of on-street parking.
- Car parks, driveways and level changes that interrupt the footpath and cycle path connectivity should be minimised (Section 3.5.3).

Guidance on pedestrians elsewhere in the Austroads Guides

Table 3.2 summarises sources in other parts of the guide where the user will find guidance on matters concerning pedestrians that may apply to activity centres.

Table 3.2: Cross-references to pedestrian topics in Austroads Guides applicable to activity centres

Pedestrian topic	Where found in the guides ⁽¹⁾	Reference
General	GRD 4	Austroads (2009d)
Pedestrian networks and considerations for network operation planning	GTM 4	Austroads (2014a)
Pedestrian design parameters	GRD 6A	Austroads (2009e)
Geometric requirements	GRD 6A	Austroads (2009e)
Changes in level	GTM 5 Table 3.2	Austroads (2014b)
Surface treatments	GRD 6A	Austroads (2009e)
Driveways and footpaths	GTM7 Section 3.5.3 and Section 3.8.2 GTM 11	This guide Austroads (2008c)
Access to buildings	GTM 7, Section 3.8.2	This guide
Joint pedestrian/cycle facilities	GTM 5	Austroads (2014b)
Road crossings	GTM 5 and GTM 6	Austroads (2014b and 2013c)
Pedestrian guidance measures	GTM10 GTM 6 Table 3.3	Austroads (2009f) Austroads (2013c)
Access to public transport	GTM 5 Table 3.2	Austroads (2014b)
Pedestrians at roundabouts	GTM 6 GTM 8 GRD 4B	Austroads (2013c) Austroads 2008b) Austroads (2011)
Pedestrians at rail crossings	GTM 6	Austroads (2013c)
Shared zones	GTM 6 GTM 7 Section 3.6.2 and Appendix E GTM 8	Austroads (2013c) This guide Austroads (2008b)
Parking and pedestrians	GTM 11	Austroads (2008c)

¹ Guide to Traffic Management (GTM), Guide to Road Design (GRD)

3.8.3 Bicycles in Activity Centres

In order to satisfy policy intentions that positive steps are to be taken to encourage bicycling, and to provide the necessary physical conditions, traffic management can play a supportive role to the planning and urban design measures that are taken. In terms of bicycle network and movement performance, the ability to provide bicycle facilities and a safe road and traffic environment will play important roles in the effective management of cyclists.

Key objectives, from a traffic management point of view, are to:

- maximise cyclists' accessibility to centres and the services, facilities and employment they contain
- design streets that comfortably and safely accommodate cyclists
- ensure vehicle traffic does not compromise a good cycling environment
- ensure that cycling does not compromise a good walking environment.

A number of issues related to bicycles in activity centres arise from these objectives, which traffic management can influence or determine:

- bicycle planning as it relates to activity centres
- bicycle access within the centre
- bicycle facilities
- interaction with pedestrians
- interaction with other traffic
- bicycle parking.

3.8.4 Cycling Implications for Traffic Management Practice

The following guidance on these matters is derived from Department of Infrastructure, Planning and Natural Resources (2004), Department of Urban Affairs and Planning (2001) and Roads and Traffic Authority NSW (2003).

Bicycle planning for activity centres

Refer to Section 3.5 and to Part 4 of the guide (Austroads 2014a).

- Cycling catchments can be mapped in the same way as pedestrian catchments. As bicycles travel three to four times faster than a person on foot, the bicycle catchment for a five-minute ride is around 1.5 km. This potentially puts a large population within easy reach of the centre. Path detours can be calculated to identify indirect paths that need attention.
- Ideally, the centre will have a 'transport plan' (or 'mobility and access plan'), which forms the basis of bicycle provisions and management in the centre.
- Bicycle plans are not static, but are continually updated and considered in all planning and management processes and work programs.
- Bicycle (and pedestrian) plans for the centre are integrated with planning instruments to give them legal and policy effect.
- Conversely, traffic management, pedestrian and town centre improvement plans are aligned with bike plans to ensure that cyclist facilities and routes complement the physical form and needs of the centre.
- Public transport stops or nodes and local services, including primary schools, are co-located in and around local centres to maximise trip efficiency.
- Audits of 'bikeability' will assist in identifying elements of the bicycle infrastructure that need attention (Bicycle Federation of Australia 2007, Cluster for Physical Activity and Health 2007 and Pedestrian and Bicycle Information Center 2008b).

Access within the centre

- Within the centre, bicycle access should be safe, direct, continuous and comfortable between different locations.
- Some judgement is required to decide if cycling is to be expected (and catered for) between every destination within the centre. (See following remarks concerning bicycle parking.)

Bicycle facilities

- The primary aim is to create traffic conditions (primarily speeds) within the centre that are compatible with bicycle use on the same carriageway. Thus, measures to reduce the volume and speed of traffic should be considered first. These may reduce the potential for conflict sufficiently and thus minimise or even avoid the need for separate provisions for bicycles on the centre's streets.
- Where slow speeds and low volumes cannot be achieved, or depended upon, dedicated bicycle lanes can be considered where appropriate under bicycle planning guidelines (see Parts 4 and 5 of the guide, Austroads 2014a and 2014b). It will rarely be feasible or appropriate to provide separate bicycle paths within activity centres.
- Employ suggested guidance on bicycle facility selection, design, signing, integration with public transport and end-of-trip facilities (Roads and Traffic Authority NSW 2003; Parts 4, 5, 6 and 10 of the guide, Austroads 2014a, 2014b, 2013c and 2009f).
- Clearly signpost off-street car parks, bicycle paths, public transport stops and footpath connections.

Interaction with pedestrians

Many of the principles for walk-based activity centres (Section 2.3.2) apply to cycle access and circulation. However, bicycles and pedestrians can be an uncomfortable mix in some circumstances. Therefore, some degree of separation is often justified.

In pedestrian activity spaces, bicycles can be threatening and intrusive. It may be necessary to avoid shared paths and surfaces in the centre, where the volume of pedestrian traffic will usually be too great for cycling to be safely and comfortably accommodated. For example, it would not be appropriate to allow a footpath to be shared by pedestrians and cyclists along a ribbon/strip style shopping area along an arterial road. For further guidance on this topic, refer to Austroads (2006), Department of Transport (2006) and Davies et al. (2003).

Interaction with other traffic

- Include design elements that legitimise and elevate awareness of the presence of cyclists, particularly at intersections.
- Create slow-speed conditions on streets where cyclists mix with traffic within the centre.
- Exploit opportunities to use streetscaping, pedestrian and cycling facilities, and parking layouts to help restrain vehicle speeds.
- Manage traffic volumes and lower speeds through traffic calming, parking design and intersection design measures (see Part 8 of the guide, Austroads 2008b).
- Where appropriate, introduce shared zones (see Section 3.6).
- As noted above, separate bicycle lanes can be considered where it is unsafe for cyclists to share the road with motorised traffic.
- Whatever arrangement for integration with, or separation from, vehicular traffic is adopted, there should be no ambiguity about where the cyclist and other road users are situated on the road and what their mutual obligations and expectations are.
- Safe crossing points across busier roads may be necessary to minimise the disruption of cyclists travelling to activity centres. Cycle road crossings are an integral part of cycle routes, and intersection and crossing design should favour cyclists' convenience and safety within centres.

Bicycle parking

Not all bicycle parking needs are the same. Bicycle parking facility design should reflect the needs of several different cycling trip types (Roads and Traffic Authority NSW 2003):

- Collection and delivery of items: Providing 'ride-in' facilities may reduce the risks caused by bikes clustered around entrances to buildings or obstructing pedestrian pathways. Parking for such short stay users does not necessarily need to be highly secure, but should be near the entrance, or inside, the place visited.
- Shopping-type visits: Racks should be located at regular intervals to ensure that the bike is reasonably close to the destination and under observation.
- Meetings and appointments: Use is generally irregular and can be long-stay – up to a whole day. Users favour locations where lighting and surveillance are perceived to be good, usually at or near to main building entrances.
- Workplace: This is all-day use on a regular basis and can be expected to be combined with end-of-trip facilities such as showers, lockers etc. Demand for such parking is more likely to justify grouping of racks, often within areas where there is controlled access, such as in basement car parks, CCTV and casual monitoring by security staff. Individual bicycle lockers may be appropriate.
- Residential parking: This requires a high level of security, and bikes should not need to be taken a long distance into the building. This category generally includes higher density residential buildings such as apartment buildings and university residential colleges.

Suggestions for bicycle parking rates are given in Part 11 of the guide (Austroads 2008c).

Factors to consider when determining bicycle parking rates to be applied include (Roads and Traffic Authority NSW 2003):

- current levels of bicycle parking provided and their usage rates
- a visual inspection to identify locations where bicycle parking is in demand, paying particular attention to informal parking
- consultation with bicycle users, bicycle users groups and bicycle planning professionals
- current and expected number of employees or residents and their likely or desired use of bicycles
- current and expected number of visitors and their likely or desired use of bicycles for visiting the premises
- mode split targets included in a mobility management plan, bicycle plan or other local authority plan.

Well-designed bicycle parking within activity centres will help to minimise informal bike parking. Short-term bicycle parking needs to be convenient and should be located close to destinations in order to be effective. Otherwise, this may lead to bicycles parking at street furniture located closer to a destination, presenting a hazard to pedestrians or blocking pedestrian desire lines.

For further guidance on bicycle parking and other end-of-trip facilities, refer to Part 11 of the guide (Austroads 2008c) and AS 2890.3-1993.

Guidance on cyclists elsewhere in the Austroads Guides

Table 3.3 summarises sources in other parts of the guide where the user will find guidance on matters concerning provisions for cyclists that may apply to activity centres.

Table 3.3: Cross-references to cycling topics in Austroads Guides applicable to activity centres

Cycling topic	Where found in guides ⁽¹⁾	Reference
Bicycle planning	GTM 4 and Guide to Road Transport Planning	Austroads (2014a and 2009c)
Bicycle networks and considerations for network operation planning	GTM 4	Austroads (2014a)
Rider requirements	GRD 3 and GRD 6A	Austroads (2010a and 2009e)
On-road provisions	GTM 5 and GTM 8 GRD 3	Austroads (2014b and 2008b) Austroads (2010a)
Cycling facilities at intersections	GTM 6 GRD 4, GRD 4A and GRD 4B	Austroads (2013c) Austroads (2009d, 2010b and 2011)
Bike paths	GTM 5 GRD 4, GRD 4A, GRD 4B and GRD 6A	Austroads (2014b) Austroads (2009d, 2010b and 2011)
Traffic control devices	GTM 9 and GTM 10	Austroads (2014c and 2009f)
End-of-trip facilities	GTM 4 and GTM 11	Austroads (2014a and 2008c)
Showers and lockers	GTM 11	Austroads (2008c)
Parking	GTM 11	Austroads (2008c)

¹ Guide to Traffic Management (GTM), Guide to Road Design (GRD).

For key information related to the planning, design and management of cycling facilities, practitioners may also refer to the *Cycling Aspects of the Austroads Guides* (Austroads 2014d).

3.9 Providing for Deliveries and Service Vehicles

While it is unlikely that an activity centre will be penetrated by routes used by large or hazardous goods vehicles, provision will need to be made for large vehicles legitimately seeking delivery access to sites within the centre.

The primary sources of guidance on this subject are Part 4 Section 4.5 of the guide (Austroads 2014a) for the road network context, and AS 2890.2-2002 for parking considerations. To the extent that delivery or service routes penetrate activity centres and require large vehicles to negotiate intersections, reference should also be made to the Guide to Road Design Parts 4, 4A and 4B (Austroads 2009d, 2010b, 2011). Practitioners may also refer to the *Guidelines for Assessing Heavy Vehicle Access to Local Roads* (Austroads 2010c).

3.9.1 Implications for Practice

Matters concerning delivery and service vehicles relevant to activity centres are as follows:

- Delivery vehicles (including heavy vehicles) are essential to activity centres, especially those with commercial components. Their requirements in road networks (in terms of access and geometric issues) need to be acknowledged and provided for (Ogden 1992).
- Legitimate heavy vehicle access routes (for the purposes of deliveries and construction) should be located so that conflict with pedestrian movements and parking traffic is eliminated, or at least minimised.

- All movements at the access intersections should be designed for the largest truck typically expected to make deliveries to the centre, ideally without the truck encroaching into opposing traffic lanes. However, the impacts on pedestrians of doing so need to be balanced against the geometric requirements of trucks.
- All trucks should drive only forward when entering and leaving the road system.
- Where kerbside parking is provided, provision also needs to be made for delivery/pick up of goods and documents, and for parking of emergency and service vehicles. Where loading zones are required and permitted, regulations concerning signs, markings, permits etc. appropriate to the relevant jurisdiction should be observed (e.g. VicRoads 2000).
- Illegal use of loading zones by other vehicles can be a sign of insufficient parking provision, or that the maximum time periods allowed for kerbside parking are too long (this reducing turnover). If this happens, further investigation and readjustment will be required.
- VicRoads (2000) provides examples of:
 - criteria for provision of off-street loading bays
 - typical loading bay requirements for different land uses
 - passenger drop-off/pick up areas
 - customer pick up zones (which need to be close to the store exit or goods entry)
 - requirements for goods delivery to off-street developments.
- A loading zone needs to be as long as the longest vehicle likely to use it, and the number of vehicles that could normally be present at one time, e.g. one heavy rigid truck (or two smaller vehicles) – 16.5 m.
- Loading and other short-term parking requirements should be considered along a length of street, not just in isolation.
- Getting the mix of loading, bus and taxi zones right is of greatest importance and requires careful study of demand and consultation with the parties concerned.
- There is no single geometric provision for delivery vehicles that meets all situations. Practitioners need to use engineering judgement and common sense (VicRoads 2000).

3.10 Parking Management

The guidance offered in Part 11 of the guide (Austroads 2008c) should be consulted and followed for detailed parking practice. Matters in that part which particularly relate to activity centres are:

- parking demand, and factors influencing it
- parking supply – on-street and off-street
- parking policy and planning
- parking design
- parking and the environment, including urban design aspects
- design and operation of off-street parking facilities
- types and management of on-street parking, including payment methods
- providing for specific needs, including delivery vehicles, buses, motorcycles, bicycles, people with disabilities, emergency vehicles, taxis and car share vehicles
- park and ride facilities
- bicycle parking
- signs, pavement marking and electronic guidance systems.

Other matters needing consideration are as follows.

3.10.1 Parking Search

Typically, drivers do not accept the first vacant on-street parking space they come to in an activity centre. People try to park as close as they can to their final destination, and there is competition for kerbside parking spaces. This can lead to more traffic movement and consequent environmental impacts, including increased emissions:

A surprising amount of traffic isn't caused by people who are on their way somewhere. Rather it is caused by people who have already arrived. Our streets are congested, in part, by people who have gotten where they want to be but are cruising around looking for a place to park (Shoup 2006).

Much of the traffic on streets within activity centres is caused by cars searching for parking spaces ('cruising') – estimates of the proportion of traffic within centres caused by cruising commonly range up to 60% for local traffic, and typically around 30% for all traffic (Shoup 2006, Transportation Alternatives 2007). Search times for vacant on-street parking spaces in large and busy activity centres can average 10 minutes or more, depending on parking supply and available off-street alternatives. This is further discussed in Appendix H.

This has a number of implications for parking provision and traffic management in the centre:

- The greater the reliance on on-street parking, the more traffic the centre will experience at any point on the street network and the greater the vehicle kilometres of travel generated by the centre.
- Therefore, there is a downside to policies that encourage kerbside parking for urban design or sustainability objectives. This should be considered when kerbside parking policy (amount and duration) is being discussed.
- Deliberate under-provision of parking supply as a measure to encourage a change in travel choice behaviour will increase competition for fewer spaces and is likely to increase cruising and its consequences, unless the driver is given clear information about the level and location of available parking, both pre-trip and on approach to the centre.
- The location and supply of parking (both on- and off-street) can influence the parking search paths and therefore the extra amount of traffic that the centre will experience.

More often, activity centre planners will want to exploit 'opportunities to reclaim on-street parking to provide more public space and/or supplement walking and cycling routes where amenity can be improved and businesses not compromised' (City of Melbourne 2006). These intermittent expansions of the pedestrian space into the parking lane can reinforce a narrowed roadway cross-section. Sufficient width for cyclists needs to be provided.

3.10.2 Implications for Practice in Activity Centres

- Exploit parking supply and pricing as demand management tools.
- When considering kerbside parking quantity and duration, keep in mind the impacts on parking search time.
- Care needs to be exercised when locating parking areas and spaces so that potential search paths are intercepted as soon as possible after a vehicle enters the centre precinct.
- Consider providing parking areas outside the centre periphery with park-and-ride bus services as part of the parking fee.
- Clear information and guidance to motorists seeking parking spaces (e.g. by means of a parking advisory system), and providing adequately for them in the traffic system (such as storage lanes, turns at intersections and entries to off-street areas), are vital components of a parking management program. See Part 11 Section 10.2 of the guide (Austroads 2008c).
- The choice between angle and parallel on-street parking carries with it a number of planning and operational implications that need to be considered, as noted above.
- Provision needs to be made for parking of motorcycles and bicycles.

- However, even when separate parking provisions are made specifically for two-wheel vehicles, they are often parked in the pedestrian space. Local policy will need to be developed to either allow for this or to control it. In any case, care should be taken that the quality and adequacy of the pedestrian space is not compromised.
- Area-wide parking limits can help to reduce the number of signs required.
- Dual use of car parking areas should be exploited by (for example) recognising the difference between day and night peak usage when setting parking requirements. Car parks used during the day can be allowed to be used for night time activities without requiring additional car parking spaces (Department of Transport 2007).
- Be cautious about providing longer-term commuter parking within the centre. It is probably better to designate other stations away from the centre as park-and-ride stations. See Section 3.11.

Angle and parallel parking

The comparative merits of angle and parallel parking and their design and operational requirements are discussed in Part 11 of the guide (Austroads 2008c) and Roads and Traffic Authority NSW (2000). These documents should be consulted for information about this subject.

Special considerations that may apply in an activity centre are:

- consequences for pedestrian safety and amenity
- effects of parking on the visual image of a street
- the impacts of parking manoeuvres, especially when cross-sections have been constrained
- the parking gain normally sought with angle parking may not be desirable if limits on total centre parking are set
- on the other hand, increased kerbside parking may reduce the need for scarce space in the centre to be set aside for off-street parking
- back-in angle parking has negative effects on pedestrian and shopkeeper air quality and tends to be less suitable for high pedestrian activity areas than nose-in parking (Part 11 Section 7.4 of the guide, Austroads 2008c).

Centre-of-the-road parking

Centre-of-the-road parking is recommended only on lower-speed, non-arterial roads. In activity centres, where there is great competition for road space, it is unlikely that centre-of-the-road parking will prove to be appropriate or feasible except in very wide road reserves. Design and limitations of this form of parking are discussed in Part 11 Section 7.5 of the guide (Austroads 2008c).

Off-street parking

Off-street parking and access design are dealt with in Part 11 of the guide (Austroads 2008c). Additional factors to consider specifically in relation to activity centres include:

- The amount of parking supply has implications for traffic movement in the centre.
- Deliberate under-provision of parking, or a high relative cost for off-street parking, will both have the effect of increasing cruising around the centre's streets and a consequent lowering of street amenity.
- Access paths for vehicles wishing to use off-street parking areas should be such that impacts of this traffic on the functioning of the centre are minimised, by keeping access route length to a minimum and directing traffic away from the pedestrian core of the centre. Ideally, motorists should be presented with a parking opportunity as they first reach the centre's cordon.

- Parking pricing can either attract or deter drivers, and thus has an effect on the extent of cruising if nothing else is done to deter it. On-street parking would usually have higher cost than off-street because it would be perceived as being more convenient. This has the effect of influencing motorists to off-street areas, thus reducing parking search in the road network and the consequent effect on amenity. Shorter-term and higher-cost kerbside parking also encourages higher turnover.
- Commuter parking presents special challenges. Extensive long-term parking areas adjacent to a railway station create large 'lost' spaces within the centre's boundaries. They bring traffic into the centre that does not have a purpose in the centre itself, and also tend to increase the separation of the centre from its neighbouring residents. Furthermore, there is an incongruity in planning centres to encourage non-car travel, and at the same time encourage park-and-ride at stations in the centre to encourage public transport usage. A better strategy is to locate park-and-ride facilities at stations away from the centre. This matter is mentioned again in Section 3.11 in relation to access to stations (refer to Part 11 Section 9 of the guide, Austroads 2008c).

3.11 Public Transport Access and Operation

The planning context for traffic management directed at access to public transport nodes and interchanges has been outlined in Section 2.3. It is an essential objective of planning policy that activity centres be served by public transport. Given that, it can be expected that public transport access points (rail and bus stations, tram and light rail stops, taxi ranks, etc.) will have a primary place in the centre (physically and in terms of importance), and that road and traffic management will be required to support the accessibility and efficiency of public transport.

The place of public transport in centres is commonly expressed in terms of integrated land use and transport facility planning (see, for example, Planning SA (2007) and Department of Transport (2007)). While this level of planning is beyond the role of traffic management in centres, it provides the context within which traffic management in the centre can contribute by supporting public transport. The two main themes are:

1. efficiency of on-road public transport, including access to terminal and interchange locations
2. priority passenger access to rail and bus stations.

Passenger access to public transport, and especially the walking environment to stations and stops, has been noted in Sections 2.3.2, 2.3.6 and 3.8. Because it will be expected to penetrate into the core of activity in the centre, for maximum exposure to passengers, on-road public transport has to be accommodated (and given priority) in the streets and places it passes through.

3.11.1 Implications for Practice

Design or redevelopment of centres should involve traffic management input to planning direct and highly accessible connections to public and community transport facilities. Opportunities and consequences should be raised at this stage rather than after major location and urban form decisions have been made.

At the more detailed level, traffic management plays a key role in achieving the efficiency and access objectives, as listed in the following. The technical methods that can be applied require reference to the relevant parts of the *Guide to Traffic Management* and other Austroads guides.

The traffic practitioner is expected to contribute to the following actions and outcomes (drawn from a number of planning policy documents, including Department of Sustainability and Environment (2005), Department of Urban Affairs and Planning (2001) and Department of Transport (2007)).

On-road public transport in the traffic system

- Locate bus stops to maximise passenger accessibility, and consider personal safety, lighting and traffic management issues.
- Be alert to the changing passenger demand profile over the day (e.g. different patterns of arrivals and departures between morning and evening peaks, and variations between peak and off-peak).

- Develop a policy covering park-and-ride facilities. It may be decided that commuter parking should not be provided close to the centre's focal station, in which case alternatives such as provision of large commuter car parks at other stations or the provision of a bus service from remote car parks may be considered.
- Consider bus-only lanes and ensure that on-road public transport has priority at intersections and on-road sections within the centre.
- Think about whether or not indented bus bays are appropriate, considering the competition for street space needed for various users, pedestrian safety and amenity, whether or not interruptions to traffic are acceptable, and the service needs of the buses themselves (see Part 5 of the guide, Austroads 2014b).
- The needs of buses entering and leaving bus stands, especially where space is constrained, will influence the design.
- Consider the implementation of a transit mall (see Section 3.8 for pedestrian considerations and Section 4.5.3 for an example).
- In larger centres, consider the potential for handling public transport and general traffic on different levels i.e. grade separation. This may be appropriate where an activity centre is part of a rail/bus interchange, for example where co-located with a regional shopping and employment centre, and pedestrian routes are grade separated, allowing pedestrians direct access between the public transport terminal and the activity centre, and providing access to the centre in a much more direct way than for private car access.
- Develop a transitional strategy for dealing with the implications for the road and traffic system of plans to upgrade public transport to and within the centre, e.g. how will they affect the allocation of road space and the demand for and supply of parking? This strategy will help identify transitional and future road uses, widths and urban form.

Quality of passenger access to public transport

- Minimise low-activity uses, large car parks and blank walls around railway stations and modal interchanges.
- In general, public transport nodes/stops should be designed and managed to provide the following:
 - Good pedestrian access from all parts of the centre, including direct, safe and well-lit street connections or pedestrian links, safe pedestrian crossings and clear lines of sight to the stop. Traffic management should facilitate minimised walking and interchanging distances, and satisfy pedestrian desire lines.
 - Direct and convenient connections from the footpath to the shelter/waiting area and from the shelter/waiting area to the doors of the public transport vehicle, and vice versa. This may involve extensions into the road space, which traffic management would have to accommodate.
 - Clear identification of the public transport nodes and access points by attractive design and signing.
 - Access for all users, including appropriate provision for people with infirmities and disabilities — for example, ramps, kerb heights, and lifts at stations, tactile tiling and illuminated signs — and other users, such as bicycle storage for cyclists and pram and kerb ramps for people with strollers.
 - Taxi and private car drop-off points for passengers accessing buses and trains.
 - Well-managed precincts around such nodes to optimise amenity and safety.
 - Minimal and managed pedestrian-vehicle conflicts.
 - Adequate passenger space at roadside stops to avoid crowding and impedance of passing pedestrians.
- Interchanges between modes (e.g. bus/rail, bus/ferry) should provide (among other things):
 - Safe, direct and convenient transfers between modes. This may be horizontally or vertically, depending on the opportunities that the situation and design offer, but in either case the time and/or distance separation of the two modes should be minimised.

- Priority for pedestrians in the passenger transfer area. Passengers should not be exposed to buses or other vehicles as they make the transfer.
- Legible layout for users providing common destination and pick-up points, clear and uncomplicated transfer paths and wayfinding and information signage. This is particularly necessary for facilities where there is growth or an expected increase in new users.

Additional considerations for passenger transport interchanges are discussed in Appendix I. Interchange examples are presented in Section 4.7 and Appendix B.5.

Additional guidance

Table 3.4 summarises sources where the user will find guidance on matters concerning provisions for public transport that may apply to activity centres.

Table 3.4: Cross-references to public transport topics in Austroads Guides applicable to activity centres

Public transport topic	Where found in guides ⁽¹⁾	Reference
Public transport networks and considerations for network operation planning	GTM 4	Austroads (2014a)
Public transport planning	GTM 4, GTM 11, Guide to Road Transport Planning	Austroads (2014a, 2008c and 2009c)
Issues in managing on-road public transport	GTM 5	Austroads (2014b)
Managing road space allocation	GTM 5	Austroads (2014b)
Issues and requirements at intersections	GTM 6	Austroads (2013c)
Providing for buses in local area traffic management	GTM 8	Austroads (2008b)
Traffic control devices and traffic operations to support on-road public transport	GTM 9 and GTM 10	Austroads (2014c and 2009f)
Parking at public transport nodes and park-n-ride facilities	GTM 11	Austroads (2008c)
Design of bus stops and bus lanes	GRD 3	Austroads (2010a)
Design of public transport facilities at intersections	GRD 4	Austroads (2009d)
Passenger transport interchanges	GTM 7 Section 3.11 and Appendix I	This guide

¹ Guide to Traffic Management (GTM), Guide to Road Design (GRD).

3.12 Signs and Information

- Signing in activity centres is not just a matter of standard traffic signing – but any sign intended to advise or control drivers must conform to national standards (AS 1742 in Australia, and NZ Transport Agency (2010b) in New Zealand).
- In addition to traffic regulation, signs and information may be required in activity centres to do a number of things, e.g.:
 - direct motorists to parking areas
this may include information about parking availability using variable message signs
 - inform pedestrians and cyclists of the location of key buildings, toilets, information kiosks, etc., and to give path directions to car parks, special features (such as parks or lakes) and destinations outside the centre
 - provide an estimated walking time to major destinations e.g. from train station to activity centre.

- Generally speaking, the streetscape is improved if the minimum amount of signing needed safely to communicate to drivers is used. Reducing visual clutter is a key urban design objective. For further guidance refer to the *Guide to Traffic Management: Part 10* (Austroads 2009f), Cooper et al. (2010) and Department for Transport (2013).
- Information signs should preferably conform to a consistent format that reflects the image of the centre. These should be clearly distinguishable from essential traffic signs. An example is shown in Figure 3.3. For further guidance on pedestrian wayfinding schemes, see Grant (2006) for a scheme prepared for the City of Bendigo, Victoria and Department of Transport (2011).
- Where there are proposals to reduce or eliminate traffic signs (See Section 3.6.2) information signs are probably still required.
- In some cases, the use of differential pavement colours and materials may be able to communicate information such as directions more subtly than a sign.
- Signing for people with impaired vision is discussed in Part 6, (Austroads 2013c) Table 3.3 and Part 10, Section 2.2 of the guide (Austroads 2009f).

Figure 3.3: Information signs near civic precinct (Bendigo, Victoria)



Source: Provided by VicRoads (unpublished).

4. Examples and Summary Issues for Each Type of Activity Centre

Table 1.4 summarised the key traffic management objectives and elements for the three broad types of traffic situation at activity centres (with through traffic, with internal but no through traffic and with no internal traffic).

In this Section, some examples are presented. Key considerations and references to material in this guide and other parts of the guide are given for each of the types of activity centre identified in Table 1.3. The list includes other concentrated locations and activities (such as freight transfer centres and special events), which, while not strictly 'activity centres', do share many of their characteristics and traffic management solutions.

All the considerations noted in this part and the rest of the Guide to Traffic Management may be applicable in any one of these cases. The practitioner will have to assess what is relevant to a particular case.

4.1 Principal Activity Centres

4.1.1 Description

Principal activity centres include major regional centres (e.g. central business districts). They typically have relatively high levels of public transport access and many internal trips because of their scale and level of activity. They feature the widest spread of land uses and activities, often offering employment to a substantial proportion of the region's population.

4.1.2 Key Issues and Cross-references

Key traffic management issues that require consideration and relevant cross-references are provided in Table 4.1.

Table 4.1: Key issues in principle activity centres

Issue	Traffic management response discussed	
	GTM 7 ⁽¹⁾	Other resources ⁽¹⁾
Preparation of a transport management plan	Section 3.2	GTM 4 and GTM 12 (Austroads 2014a and 2009g)
Reducing car use to and within the centre	Section 3.3	GTM 12 (Austroads 2009g)
Managing competing transport modes	Section 3.4	GTM 4 (Austroads 2014a)
Level and pricing of parking	Section 3.10	GTM 11 (Austroads 2008c)
Congestion on approaches and nearby bypasses		GTM 5 and GTM 9 (Austroads 2014b and 2014c)
Relationship with public transport node and pedestrian access to it	Sections 2.3.3, 2.3.6 and 3.11	Department of Urban Affairs and Planning (2001), Roads and Traffic Authority NSW (2002)
Pedestrian priority, shared zones etc.	Sections 2.2, 2.3.2 and 3.8	GTM 6 (Table 5.4) and GTM 8 (Austroads 2013c and 2008b)
Difficulties for pedestrians with mobility issues (coping with traffic, access to public transport)	Section 3.8.2 and Appendix G	Austroads (2000) and NZ Transport Agency (2009)
Accommodating cyclists	Section 3.8	Refer to Table 3.3

¹ Guide to Traffic Management (GTM).

4.1.3 Examples

Brisbane, Queensland

Examples of traffic management techniques applied in the Brisbane CBD are shown from the Albert Street shared zone (Figure 4.1) and Reddacliff Place (Figure 4.2, Figure 4.3 and Figure 4.4).

Figure 4.1: Albert Street shared zone, Brisbane CBD



Source: Provided by Department of Transport and Main Roads Qld. (unpublished).

- Shared zone located adjacent to entrances to King George Square Bus Station and King George Square Cycle Centre.
- Maintains one-way access for service vehicles and wedding and funeral cortèges at the adjacent Albert Street Uniting Church; also maintains local traffic circulation.
- Zone is part of a contiguous pedestrian link across King George Square to the Queen Street Mall.
- Low speed environment emphasised by using same paving material for both vehicle paths and areas from which vehicles are restricted (delineated by bollards).

Figure 4.2: Bicycle parking, Reddacliff Place, Brisbane CBD



Source: Provided by Department of Transport and Main Roads Qld. (unpublished).

- Well-utilised bicycle parking located in multi-use public space close to major amenities e.g. Brisbane Square Library and Council's customer service centre.
- Positioned close to Brisbane's main shopping street – Queen Street Mall – a pedestrian street where bicycles are not permitted.
- Located immediately across North Quay from Brisbane's most significant commuter bicycle route, the Bicentennial Bikeway, which links the city centre to the University of Queensland.

Figure 4.3: Brisbane Square, Reddacliff Place, Brisbane CBD



Source: Provided by Department of Transport and Main Roads Qld. (unpublished).

- Note access to underground busway under Queen Street.
- Reddacliff Place has opened up pedestrian access between the CBD and the river.

Figure 4.4: Reddacliff Place, Brisbane Square Evacuation area, Brisbane CBD



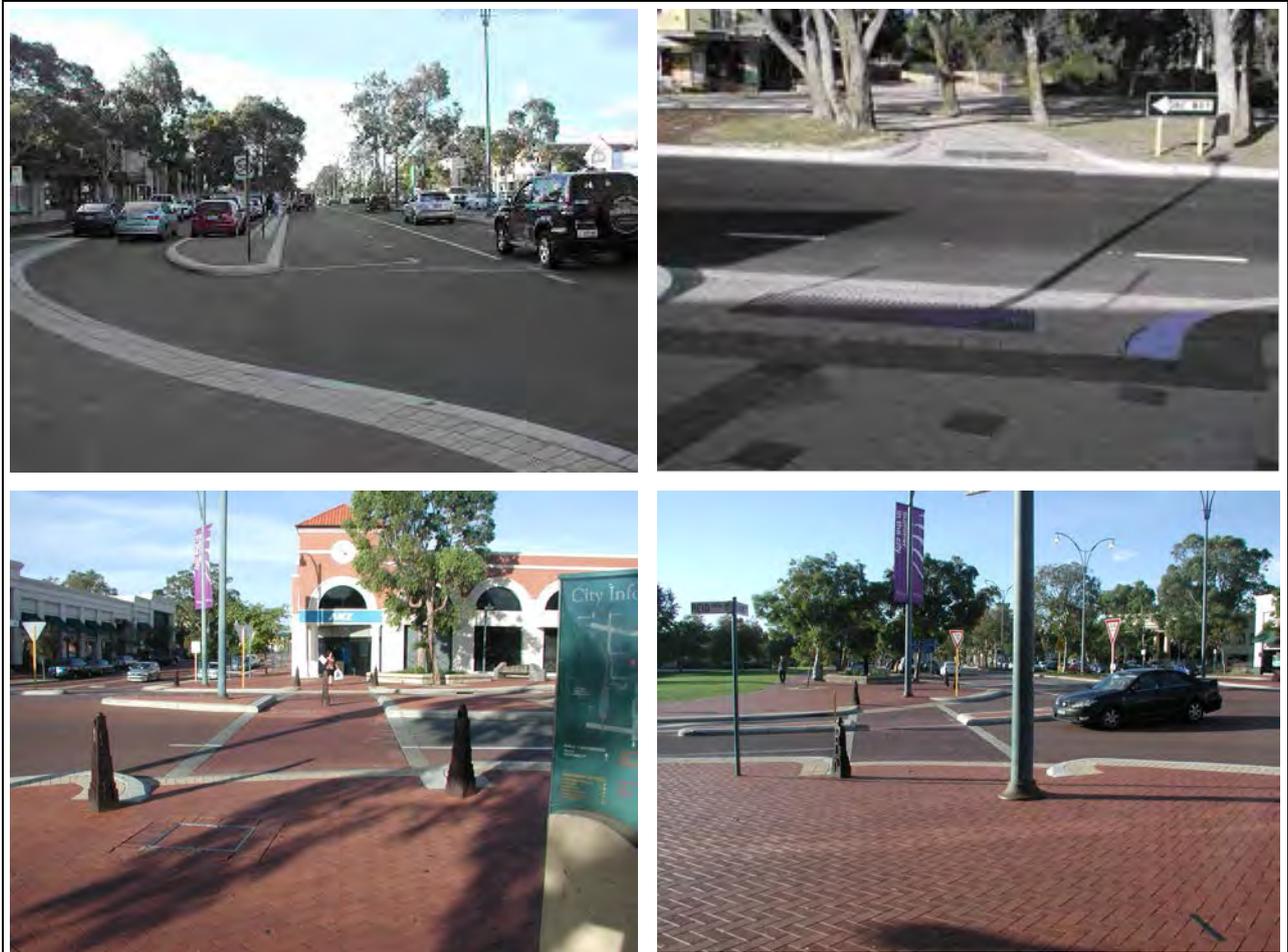
Source: Provided by Department of Transport and Main Roads Qld. (unpublished).

- Provides primary assembly area for the evacuation of Brisbane Square, the adjacent 42-storey office tower.
- Area is free of traffic hazards and no roads are required to be crossed to access this area from Brisbane Square in the event of evacuation of the building.

Grand Boulevard, City of Joondalup, Western Australia

Methods of traffic management utilised on Grand Boulevard in Joondalup, Western Australia are shown in Figure 4.5.

Figure 4.5: Grand Boulevard, Joondalup, WA



Source: Photos provided by Main Roads WA (unpublished).

- Posted speed limit of 50 km/h, reduced from 70 km/h on approaches.
- Extensive use of coloured asphalt to emphasise different lane applications and to effectively narrow down the roadway to provide a traffic calming influence.
- Demarcated cycle lanes.
- On and off-street parking.
- Use of median to separate opposing traffic and provide a pedestrian refuge.
- Wide pedestrian sidewalks.
- Principal public transport route (buses).
- Use of landscape elements to narrow the roadway environment.
- Paved threshold treatments at side streets to highlight pedestrian activity.

4.2 Town and Suburban Centres

4.2.1 Description

Smaller centres that have internal streets and which may adjoin an arterial traffic route but do not straddle it. Often adjacent to or enclosing a rail station and/or bus/train interchange.

4.2.2 Key Issues and Cross-references

Key traffic management issues that require consideration in town and suburban centres and relevant cross-references are provided in Table 4.2.

Table 4.2: Key issues in town and suburban centres

Issue	Traffic management response discussed	
	GTM 7 ⁽¹⁾	Other resources ⁽¹⁾
Bus provisions including stops, often at local station	Section 3.11	GTM 5 and GRD 3 (Austroads 2014b and 2010a)
Level and location of parking	Section 3.10	GTM 11 (Austroads 2008c)
Reducing traffic speed	Section 3.6	GTM 8 and GTM 13 (Austroads 2008b and 2009h)
Managing competing transport modes	Section 3.4.1	GTM 4 (Austroads 2014a)
Reallocation of street space and improvement of pedestrian environment	Sections 3.5, 3.7 and 3.8	Guide to Road Design Part 3 (Austroads 2010a), Rosales (2006), Roads and Traffic Authority NSW (2000)

¹ Guide to Traffic Management (GTM).

4.2.3 Examples

Examples of traffic management applications in town and suburban centres are shown from Parramatta, NSW (Figure 4.6) and Greensborough, Victoria (Figure 4.7).

Figure 4.6: Church Street, Parramatta, NSW

	<ul style="list-style-type: none"> • Narrowing of roadway has allowed widening of the sidewalk areas to cater for increased pedestrian activity. • Limiting available on-street parking. • 40 km/h speed limit due to increased pedestrian activity. • Speed humps used to support reduced speed limit. • Pedestrian crossing points formalised with use of marked pedestrian crossings. • Planting and fences used to restrict uncontrolled pedestrian crossing movements, and to improve aesthetics of the precinct.
<p>Source: Provided by Roads and Maritime Services (unpublished).</p>	

Figure 4.7: Greensborough Shopping Centre, Main Street, Greensborough, Victoria



Source: Provided by VicRoads (unpublished).

- Main Street has a 40 km/h speed limit.
- A large volume of pedestrians crosses between the shopping strip on the left and plaza on the right. The fence along the central median was installed as many pedestrians were not using the pedestrian operated signals to cross Main Street.
- Speed humps have been installed to deter through traffic from using Main Street and the number of traffic lanes have been reduced.
- There is now only one through traffic lane in each direction, as well as an exclusive bus lane (in red).
- The bus terminal is located north of the pedestrian operated signals.
- Through traffic is directed to a local bypass.

4.3 Arterial Shopping Strips

4.3.1 Description

Arterial shopping strips typically consist of active and extensive shopping strips that straddle a traffic route. This will often be located in a suburban centre or on a country town main street.

4.3.2 Key Issues and Cross-references

Key traffic management issues that require consideration in arterial shopping strips and relevant cross-references are provided in Table 4.3.

Table 4.3: Key issues in arterial shopping strips

Issue	Traffic management response discussed	
	GTM 7 ⁽¹⁾	Other resources ⁽¹⁾
Accommodating through traffic without compromising the centre	Sections 3.4 and 3.7	GTM 4 and GTM 9 (Austroads 2014a and 2014c)
Accommodating on-road public transport	Sections 3.4 and 3.11	Refer to Table 3.4
Accommodating cyclists	Sections 3.4 and 3.8	Refer to Table 3.3
Level and location of parking	Section 3.10	GTM 4 and 11 (Austroads 2014a and 2008c)
Lowering of traffic speed	Section 3.6	GTM 8 and GTM 13 (Austroads 2008b and 2009h)
Reallocation of street space and improvement of pedestrian environment	Sections 3.4, 3.5, 3.7 and 3.8	GTM 4 (Austroads 2014a), Guide to Road Design Part 3 (Austroads 2010a), Rosales (2006), Roads and Traffic Authority NSW (2000)
Unloading areas/kerbside zones	Section 3.9	GTM 11 and GTM 12 (Austroads 2008c and 2009g); and VicRoads (2000)

¹ Guide to Traffic Management (GTM).

4.3.3 Examples

Examples of arterial shopping streets, their characteristics and different traffic management practices are shown from Fairfield, Victoria (Figure 4.8), Ivanhoe, Victoria (Figure 4.9), Glenelg, SA (Figure 4.10) and Taree, NSW (Figure 4.11).

Figure 4.8: Station Street, Fairfield, Victoria



Source: Provided by VicRoads (unpublished).

- Station Street is renowned for its cafes and restaurants and is extremely busy on weekends.
- Accessible by public transport (bus and train – Fairfield Station)
- Parallel parking on one side of road and angled parking on other side of the road.
- This section of Station Street has a 40 km/h speed limit.
- A large number of pedestrians cross Station Street and use the painted median in the middle of the road to find gaps in the traffic.
- The pedestrian cross walks are painted yellow.

Figure 4.9: Upper Heidelberg Road, Ivanhoe, Victoria



Source: Provided by VicRoads (unpublished).

- Accessible by public transport (bus and train – Ivanhoe Station)
- A Clearway operates for the morning peak but not for the evening peak due to lack of support from traders.
- Parallel parking is available on both sides of road with car parks behind the shops.
- The speed limit on Upper Heidelberg Road is 60 km/h.
- An additional set of pedestrian operated signals was installed to deter pedestrians from crossing mid-block along Upper Heidelberg Road.

Figure 4.10: Jetty Road, Glenelg, South Australia



Source: Provided by Department of Planning, Transport and Infrastructure SA (unpublished).

- Jetty Road is a major tourist and shopping centre.
- Jetty Road is a two-lane, two-way road with on-street parking along both sides of the road as well as on side roads.
- Off-street parking is available from side roads.
- Trams run along the centre of Jetty Road and terminate at the beach end.
- Jetty Road is part of a bus route.
- Speed limit is 40 km/h.

Figure 4.11: Victoria Street, Taree, NSW



- Angle parking (with manoeuvring space) on one side, parallel on the other side.
- Median to separate opposing traffic, control U-turns, and provide shelter for pedestrians crossing the road.
- Single lane in each direction plus turning lane at intersection
- Extensive streetscaping works.
- Kerb extensions enlarge the pedestrian spaces and narrow crossing widths for pedestrians at intersections.
- Speed limit on this section of Victoria Street is 40 km/h.

Source: Provided by Greater Taree City Council (unpublished).

4.4 Civic Precincts and Public Spaces

4.4.1 Description

Civic precincts and public spaces allow people to congregate. They typically include public buildings and facilities but may have little or no retail or commercial activity; and may include recreation areas.

4.4.2 Key Issues and Cross-references

Key traffic management issues that require consideration in civic precincts and public spaces and relevant cross-references are provided in Table 4.4.

Table 4.4: Key issues in civic precincts and public spaces

Issue	Traffic management response discussed	
	GTM 7 ⁽¹⁾	Other resources ⁽¹⁾
Pedestrian access and amenity	Section 3.8	Refer to Table 3.2
Pedestrian movement across boundary traffic streams	Section 3.8	
Diversion of traffic around the precinct	Section 3.4	GTM 4, GTM 5 and GTM 9 (Austroads 2014a, 2014b and 2014c)

¹ Guide to Traffic Management (GTM).

4.4.3 Examples

Figure 4.12: Federation Square, Melbourne



Source: Provided by ARRB Group (unpublished).



Source: Provided by VicRoads (unpublished).



Source: Provided by VicRoads (unpublished).

- Located in the heart of Melbourne’s CBD, within the central traffic management area.
- Pedestrian access and circulation is a major criterion.
- Located opposite a major rail station (Flinders Street) and has frequent tram services on two boundaries.
- Provides a place for rallies, concerts, etc.
- Several cafes and galleries found within the precinct.
- Located adjacent to riverside pedestrian pathways.
- Precinct also connects pedestrians to the Southgate and Arts Centre precinct as well as the Sporting Complex.
- Tram stop located between Flinders Street and Federation Square, accessible by a signalised pedestrian crossing.
- Pedestrian fencing installed to direct pedestrians to the signalised crossing.
- Bike lanes provided in each direction.

Figure 4.13: Victoria Square/Tarndanyangga, Adelaide, South Australia

Victoria Square/Tarndanyangga is Adelaide’s principal square and is currently undergoing renovation to increase its accessibility for pedestrians and decrease the dominance of vehicular traffic. The first stage of construction was recently completed. Improvements on the central roadway included:

- a dedicated bus lane in the westbound direction
- pedestrian paths and bicycle lanes separated from traffic lanes on both the north and south sides of the square
- installation of features highlighting the square’s status as a space for pedestrians and cyclists such as distinctive paving and narrowed lanes
- flexibility to permit temporary road closures to provide a plaza for large events
- removal of central median and right-turn movements for general traffic from the central roadway (westbound buses are permitted to turn right from the bus lane, right-turning general traffic was diverted around the perimeter of square).

Other items of note include:

- a tram stop located on the west side of the square to the south of the central roadway
- a renovated central roadway shown during the Adelaide Fringe Festival.

(a) Renovated central roadway (February 2014)



Source: Copyright © nearmap Ltd. (2014).

(b) Central roadway prior to renovation (February 2012)



Source: Copyright © nearmap Ltd. (2014).

4.5 Pedestrian Streets and Transit Malls

4.5.1 Description

This type of activity centre consists of streets and areas closed to general traffic for all or part of the day (malls etc.).

4.5.2 Key Issues and Cross-references

Key traffic management issues for pedestrian streets and transit malls and relevant cross-references are provided in Table 4.5.

Table 4.5: Key issues for pedestrian streets and transit malls

Issue	Traffic management response discussed	
	GTM 7 ⁽¹⁾	Other resources ⁽¹⁾
Redirection of through and circulating traffic	Section 3.4	GTM 4, GTM 5 and GTM 9 (Austroads 2014a, 2014b and 2014c)
Decision on public transport operation through the street	Sections 3.6 and 3.11	Refer to Table 3.4
Interaction between pedestrians and buses/trams	Sections 3.6 and 3.8	GTM 5 (Austroads 2014b)
Deliveries and service vehicles	Section 3.9	GTM 11 and GTM 12 (Austroads 2008c and 2009g); and VicRoads (2000)

¹ Guide to Traffic Management (GTM).

4.5.3 Examples

Examples of pedestrian streets and transit malls include Queen Street and Albert Street shared zone (Figure 4.14 and Figure 4.15 respectively), Bourke Street transit mall, Melbourne (Figure 4.16) and Church Street, Parramatta, NSW (Figure 4.17).

Figure 4.14: Pedestrianised section of Queen Street, Brisbane

	<ul style="list-style-type: none"> • Pedestrianised section of Queen Street is Brisbane's main shopping street. No vehicles or bicycles are allowed, except for emergency vehicles and maintenance and service/delivery vehicles during limited hours. • Space also provides shade, shelter, seating, cafés and food stalls and the main central tourist information centre. • A section of the underground bus station, which links the South East and Inner City Busways, is located beneath this mall.
<p>Source: Provided by Department of Transport and Main Roads Qld. (unpublished).</p>	

Figure 4.15: Shared zone in Albert Street, Brisbane



Source: Provided by Department of Transport and Main Roads Qld. (unpublished).

- Shared zone in Albert Street entrance to mall provides one-way low speed access for service vehicles from Adelaide Street to Burnett Lane.
- Vehicle path delineated by similar paving materials in a darker shade than pedestrian-only areas, without any change in surface level that may be a hazard to pedestrians.
- Tactile markers provide warning for visually impaired pedestrians of shared zone at major crossing points (e.g. Adelaide Street footpath).

Figure 4.16: Transit mall: Bourke Street, Melbourne CBD



Source: Provided by VicRoads (unpublished).

- No vehicles or bicycles are allowed in this section of Bourke Street, except for emergency vehicles and trams, and service or delivery vehicles during limited hours.
- Pedestrians have access to the whole streetspace and do not need designated crossing facilities or locations.
- There are no devices to warn pedestrians of trams, as the sight distance along Bourke Street in both directions is good. Trams are limited to 10 km/h in the mall and operate with flashing hazard lights and warning bell.
- Retail shops are located on both sides of the mall.

Figure 4.17: Church Street, Parramatta, NSW



Source: Provided by Roads and Maritime Services (unpublished).

- Severe loss of circulation saw a downturn in trade and the gradual loss of quality strip shopping over a 20-year period.
- Mall was partially re-opened to traffic in 2007 as a countermeasure to loitering, crime levels and shop vacancy rates.
- Also refer to case study of Parramatta City Centre provided in Appendix B.5.

4.6 Shopping Malls

4.6.1 Description

Shopping malls consist of under-one-roof shopping centres with adjacent parking and transport facilities.

4.6.2 Key Issues and Cross-references

Key traffic management issues that require consideration at shopping malls and relevant cross-references are provided in Table 4.6.

Table 4.6: Key issues for shopping malls

Issue	Traffic management response discussed	
	GTM 7 ⁽¹⁾	Other resources ⁽¹⁾
Preparation of a transport management plan	Section 3.2	GTM 12 (Austroads 2009g)
Parking areas, access and circulation	Section 3.10	GTM 4 and GTM 11 (Austroads 2014a and 2008c)
Pedestrian access to centre from car park	Section 3.10	GTM 4 and GTM 11 (Austroads 2014a and 2008c)
Delivery vehicle paths and unloading	Section 3.9	GTM 11 and GTM 12 (Austroads 2008c and 2009g)
Traffic on adjacent arterials	Section 3.4	GTM 4, GTM 5 and GTM 9 (Austroads 2014a, 2014b and 2014c)
Priority access and stopping locations for on-road public transport, including taxis	Section 3.11	Refer to Table 3.4
Convenient access into the centre for public transport passengers	Sections 3.8 and 3.11	GTM 4 (Austroads 2014a)

¹ Guide to Traffic Management (GTM).

4.6.3 Example

Traffic management practices utilised at the Chadstone Shopping Centre (Victoria) are shown in Figure 4.18.

Figure 4.18: Chadstone Shopping Centre, Victoria

	<ul style="list-style-type: none"> • Access to Chadstone Shopping Centre is via Chadstone Road, Princes Highway or Warrigal Road. • An internal road runs around the perimeter of the shopping centre connecting all car parks and links Chadstone Road, Princes Highway and Warrigal Road. • 30 km/h speed limit applies to all internal roads within the shopping centre, combined with speed humps at strategic locations (before pedestrian crossings and at entrances/exits to car parks). • Pedestrian operated signals and pedestrian (zebra) crossings are located throughout the internal road layout. • Short-term drop-off/pick up parking area is located at entertainment section of centre, plus disabled parking, and parking zones for taxis and unloading or loading goods. • Bus terminal is located on eastern side of centre with an exclusive area for buses and an exclusive area for other vehicles. • Entry to car park area provides overhead lane advice (e.g. wayfinding).
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Source: Provided by ARRB Group (unpublished).

4.7 Passenger Transport Interchanges

4.7.1 Description

Passenger interchanges are transport nodes where people transfer from one vehicle to another, especially between different modes. This can range from simple local bus-train or car-train transfers at a suburban centre to high-intensity passenger interchanges in city centres and airport termini. Most cases in normal practice will be towards the local end of this spectrum.

4.7.2 Key Issues and Cross-references

Key traffic management issues that require consideration at passenger transport interchanges and relevant cross-references are provided in Table 4.7.

Table 4.7: Key issues for passenger transport interchanges

Issue	Traffic management response discussed	
	GTM 7 ⁽¹⁾	Other resources ⁽¹⁾
Pedestrian movement between modes – directness, safety, distance	Sections 3.8 and 3.11	GTM 4 (Austroads 2014a)
Grade separation of pedestrians and transit	Sections 3.8 and 3.11	GTM 6 (Austroads 2013c)
Quality of the pedestrian environment	Section 3.8	Refer to Table 3.2
Cyclist facilities	Section 3.8.3	GTM 11 (Austroads 2008c)
On-road vehicle access to the interchange	Section 3.11	GTM 11 (Austroads 2008c)
Ease of passenger drop-off and pick up by taxis and private vehicle	Section 3.11	GTM 11 (Austroads 2008c)
Taxi ranks or wait areas – size and location	Section 3.10	GTM 11 (Austroads 2008c)
Balance between short-term, all-day and long-term parking	Section 3.10	GTM 11 (Austroads 2008c)
Provision for bus pull-in and departure (drive-through preferred)	Section 3.11	GTM 5 (Austroads 2014b)

¹ Guide to Traffic Management (GTM).

4.7.3 Examples

Examples of passenger transport interchanges are shown in:

- Figure 4.19 (Mawsons Lake Interchange, South Australia)
- Figure 4.20 (Eltham Modal Interchange, Victoria)
- Figure 4.21 (North-West T-Way, north-western suburbs of Sydney, NSW).

Also refer to Appendix B.5, which discusses the bus-rail interchange in Parramatta, NSW.

Figure 4.19: Mawson Lakes Interchange, South Australia



Source: Provided by Department of Planning, Transport and Infrastructure SA (unpublished).

- Integrated bus, car parking and train interconnection is provided.
- Train station located on the other side of bus platform.
- Provides drop-off area and disabled parking next to interchange.
- Good lighting is available for day and night use of interchange.

Figure 4.20: Eltham Modal Interchange, Victoria



Source: Provided by VicRoads (unpublished).

- Even at relatively small scale, the same principles can apply.
- Provides for trains, buses, taxis, and passenger vehicles.
- Buses drive through.
- Eltham Railway Station is to the right in this view.
- To the left is the taxi rank.
- Pedestrians/public transport users are catered for by zebra crossings at suitable locations.
- There is also a drop-off/pick-up area provided.
- Through traffic is prohibited.

Figure 4.21: North-West T-Way, NSW



Source: Provided by Roads and Maritime Services (unpublished).

- A 'station' can be on a busway.
- Similar movement and access considerations apply as at rail stations.

4.8 Hospital and University Campuses

4.8.1 Description

Hospitals and university campuses typically consist of a range of buildings and services spread over an area, between which there is considerable pedestrian movement but also essential vehicular traffic (e.g. ambulances).

4.8.2 Key Issues and Cross-references

Key traffic management issues and practices at hospital and university campuses and relevant cross-references are provided in Table 4.8.

Table 4.8: Key issues for hospital and university campuses

Issue	Traffic management response discussed	
	GTM 7 ⁽¹⁾	Other resources ⁽¹⁾
Preparation of a transport management plan	Section 3.2	GTM 12 (Austroads 2009g)
Maximising public transport service and access	Section 3.11	Refer to Table 3.4
Employee parking, especially for key medical staff	Section 3.10	GTM 11 and GTM 12 (Austroads 2008c and 2009g)
Visitor/student parking	Section 3.10	GTM 11 and GTM 12 (Austroads 2008c and 2009g)
Minimising pedestrian-vehicle conflicts	Sections 3.6 and 3.7	GTM 8 and GTM 13 (Austroads 2008b and 2009h)
Providing direct access for ambulances	Section 3.9	GTM 8 (Austroads 2008b)

¹ Guide to Traffic Management (GTM).

4.8.3 Examples

Examples of traffic management practices at hospitals and university campuses are shown in:

- Figure 4.22 (Flinders Medical Centre, Bedford Park, South Australia)
- Figure 4.23 (Austin Hospital, Heidelberg, Victoria)
- Figure 4.24 (Australian National University, ACT).

Figure 4.22: Flinders Medical Centre, Bedford Park, South Australia

	<ul style="list-style-type: none"> • Bus interchange and taxi rank are located at main entrance to hospital. • Median fencing was installed to channel large volumes of pedestrians to use the pedestrian crossing. • Short-term on-street parallel parking runs along all of one side of the road with long-term off-street parking located close to the hospital entrance. • Flinders Drive is a local road and provides access to the hospital. It is also one of two access roads for the Flinders University, which is located past the hospital. • Emergency vehicles access the hospital via the emergency entrance located prior to the hospital's main entrance.
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Source: Provided by Department of Planning, Transport and Infrastructure SA (unpublished).

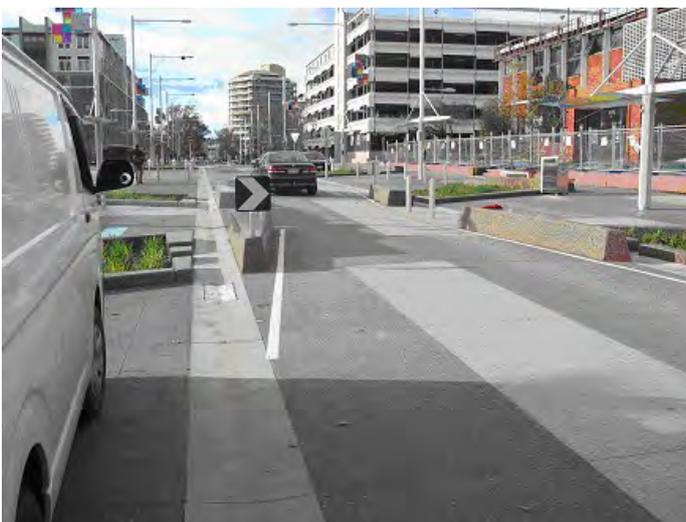
Figure 4.23: Austin Hospital, Heidelberg, Victoria



Source: Provided by VicRoads (unpublished).

- It was important to provide for pedestrians in this precinct, as the station is located on the right-hand side of this photo, which also connects to a bus terminus on the lower side of the station.
- There are a number of pedestrian crossing points including a zebra crossing.
- The street (Studley Road) has a 40 km/h speed limit.
- Access for emergency vehicles is via another street.

Figure 4.24: Childers Street, Australian National University, ACT



Source: Provided by Territory and Municipal Services Directorate, ACT (unpublished).

- Childers Street is a local street at the boundary of the Australian National University.
- University Hostel and Street Theatre are located on one side of the road; public car parks are located on the other side of the road.
- Road is located within the university precinct with a 40 km/h speed limit.
- Two 'one-lane slow points' are located approximately 75 m apart without control signs. They operate on a 'first-come first-served basis'.
- Parallel on-street parking is incorporated at a few locations along the road.
- Street furniture includes short concrete walls at the entry and exit to the slow points, stainless steel bollards to prevent parking on the verge and galvanised steel bicycle racks.
- Art works in the form of multi-coloured welded plates are erected on steel poles along the road.
- Grey-coloured concrete pavement patches are also introduced along the road to highlight the changed environment.
- This is not a shared zone. Vehicles still have priority over pedestrians.

4.9 Sports Complexes

4.9.1 Description

Areas containing a number of sports grounds and other facilities, for training and spectator events.

4.9.2 Key Issues and Cross-references

Key traffic management issues that require consideration at sports complexes and relevant cross-references are provided in Table 4.9.

Table 4.9: Key issues for sports complexes

Issue	Traffic management response discussed	
	GTM 7 ⁽¹⁾	Other resources ⁽¹⁾
Preparation of a transport management plan	Section 3.2	GTM 12 (Austroads 2009g)
High intensity public transport usage and movements	Section 3.11	GTM 9 and GTM 12 (Austroads 2014c and 2009g)
Parking location and quantity	Section 3.10	GTM 9, GTM 11 and GTM 12 (Austroads 2014c, 2008c and 2009g)
Pedestrian access from public transport and parking areas, especially across roadways	Sections 3.8, 3.11 and 3.12	GTM 4 and GTM 6 (Austroads 2014a and 2013c)
Management of buses and cars onto adjacent arterials		GTM 4, GTM 5, GTM 6 and GTM 9 (Austroads 2014a, 2014b, 2013c and 2014c)

¹ Guide to Traffic Management (GTM).

4.9.3 Examples

Figure 4.25 shows examples of traffic management practices used on West Lakes Boulevard adjacent to the AAMI Stadium West Lakes.

Figure 4.25: West Lakes Boulevard, South Australia

	<ul style="list-style-type: none"> • Bus interchange accessed by bus lane. • Median fencing installed to channel large volumes of pedestrians to use the pedestrian crossing. • Off street parking located on adjacent ovals. • Wide footpaths on both sides of West Lakes Boulevard to cater for large volumes of foot traffic. • Local roads sign posted with no parking and enforced during game time. • Speed limit reduced from 60 km/h to 40 km/h during game times.
<p>Source: Provided by Department of Planning, Transport and Infrastructure SA (unpublished).</p>	

4.10 Tourist Centres

4.10.1 Description

Villages and other accommodation areas serving large numbers of visitors, e.g. ski resorts, national parks, beach resorts.

4.10.2 Key Issues and Cross-references

Key traffic management issues and practices at tourist centres and relevant cross-references are shown in Table 4.10.

Table 4.10: Key issues for tourist centres

Issue	Traffic management response discussed	
	GTM 7 ⁽¹⁾	Other resources ⁽¹⁾
Preparation of a transport management plan	Section 3.2	GTM 12 (Austroads 2009g)
Encouraging slow vehicle speeds within the precinct	Sections 3.6 and 3.7	GTM 8 (Austroads 2008b)
Pedestrian-vehicle conflicts	Sections 3.6 and 3.8	GTM 8, GTM 13 Section 4.4.3 and GRS 6 Section 8.4 (Austroads 2008b, 2009h and 2009b)
Protection of fauna	Section 3.6	GTM 8 (Austroads 2008b)
Parking	Section 3.10	GTM 11 (Austroads 2008c)
Catering for non-car movement	Sections 3.3, 3.4, 3.8 and 3.11	Refer to Table 3.2 and Table 3.3
Children's traffic safety	Sections 3.6 and 3.8, Appendix G	GTM 13 (Austroads 2009h)
Signing and guidance	Section 3.12	GTM 10 (Austroads 2009f)

¹ Guide to Traffic Management (GTM), Guide to Road Safety (GRS).

4.10.3 Examples

Examples of traffic management practices used in tourist centres are shown in Figure 4.26 (Bondi Beach precinct, Sydney, NSW) and Figure 4.27 (Victor Harbor, SA).

Figure 4.26: Bondi Beach, Sydney, NSW

- Local area traffic management scheme installed to subdue through traffic.
- 40 km/h speed zone provided on Campbell Parade; 30 km/h and shared zone on Queen Elizabeth Drive
- Bike lanes provided on Campbell Parade.
- Includes off-street and on-street pay parking.
- Bus stops are located on main esplanade.
- Signalised crossings provide pedestrian access from the shopping precinct to the park and beachfront.

(a) Campbell Parade



Source: Provided by ARRB Group (unpublished).

(b) Queen Elizabeth Drive



Source: Provided by ARRB Group (unpublished).

Figure 4.27: Victor Harbor, SA



Source: Provided by ARRB Group (unpublished).

- Seaside tourist area with high pedestrian traffic in season travelling between town centre and beachfront.
- Includes extended pedestrian footpaths and paved road sections.
- One-way roads in town centre regulate traffic movements and facilitate pedestrian road crossing.
- Bollards and barriers provide protected areas for pedestrians and footpath diners.
- Kerbside fencing controls pedestrian movements toward specific crossing facilities.



Source: Provided by ARRB Group (unpublished).



Source Provided by Department of Planning, Transport and Infrastructure SA (unpublished).

4.11 Theme Parks, Exhibitions, Showgrounds etc.

4.11.1 Description

Enclosed areas where tourists and other visitors walk randomly between exhibits.

4.11.2 Key Issues and Cross-references

Key traffic management issues and practices at theme parks, exhibitions and showgrounds and relevant cross-references are provided in Table 4.11.

Table 4.11: Key issues for theme parks, exhibitions and showgrounds

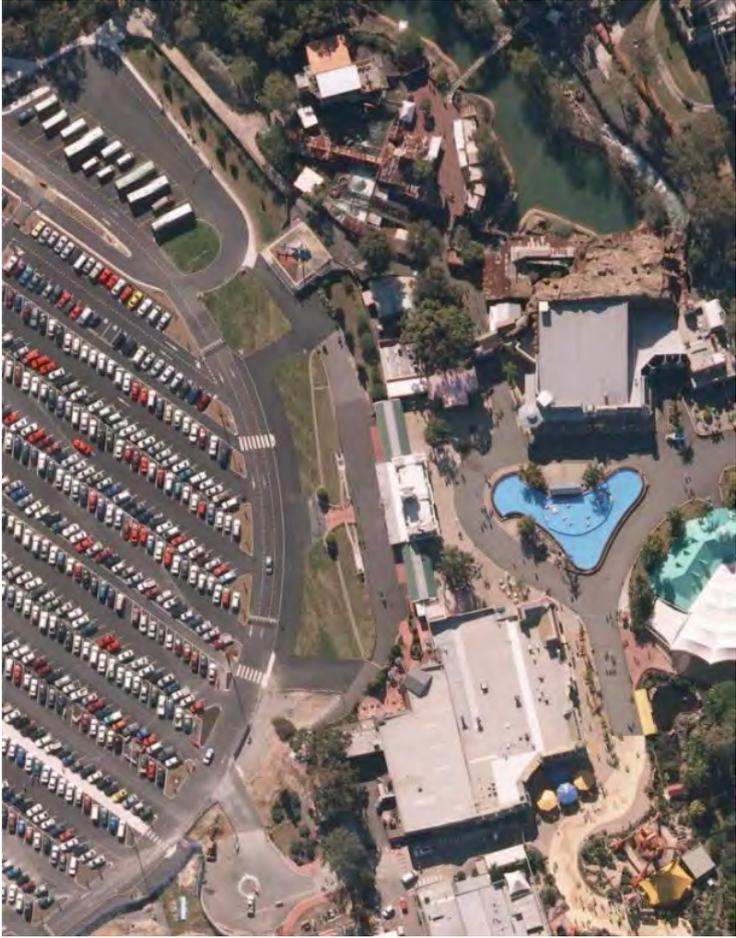
Issue	Traffic management response discussed	
	GTM 7 ⁽¹⁾	Other resources ⁽¹⁾
Preparation of a transport management plan	Section 3.2	GTM 12 (Austroads 2009g)
Bus and coach access and parking	Section 3.11	GTM 11 (Austroads 2008c)
Car parking at periphery	Section 3.10	GTM 11 (Austroads 2008c)
Pedestrian access from car parks to entrance	Sections 3.6 and 3.8	Refer to Table 3.2
Signing and guidance	Section 3.12	GTM 10 (Austroads 2009f)

¹ Guide to Traffic Management (GTM).

4.11.3 Examples

An example of traffic management practices at a theme park is shown in Figure 4.28.

Figure 4.28: DreamWorld, Gold Coast, Queensland

	<ul style="list-style-type: none"> • Access from service road connects to the Pacific Motorway interchange (highly visible site in close proximity to major transport corridor). • Includes a one-way (multi-lane) circulating carriageway. • Speed humps installed along the circulating carriageway (to limit speed). • One way parking aisles, with pedestrian walkways linking to zebra crossings provided every fourth aisle. • Dedicated parking for buses located in close proximity to park entrance. • Kerbside drop-off is available for persons with disabilities.
<p>Source: Provided by Department of Transport and Main Roads Qld. (unpublished).</p>	

4.12 Special Events in Public Places

4.12.1 Description

Temporary use of the road system or public domain for special events such as parades, cycle races, motor vehicle races and so on.

4.12.2 Key Issues and Cross-references

Key traffic management issues and practices at theme parks, exhibitions and showgrounds and relevant cross-references are provided in Table 4.12.

Table 4.12: Key issues for special events in public places

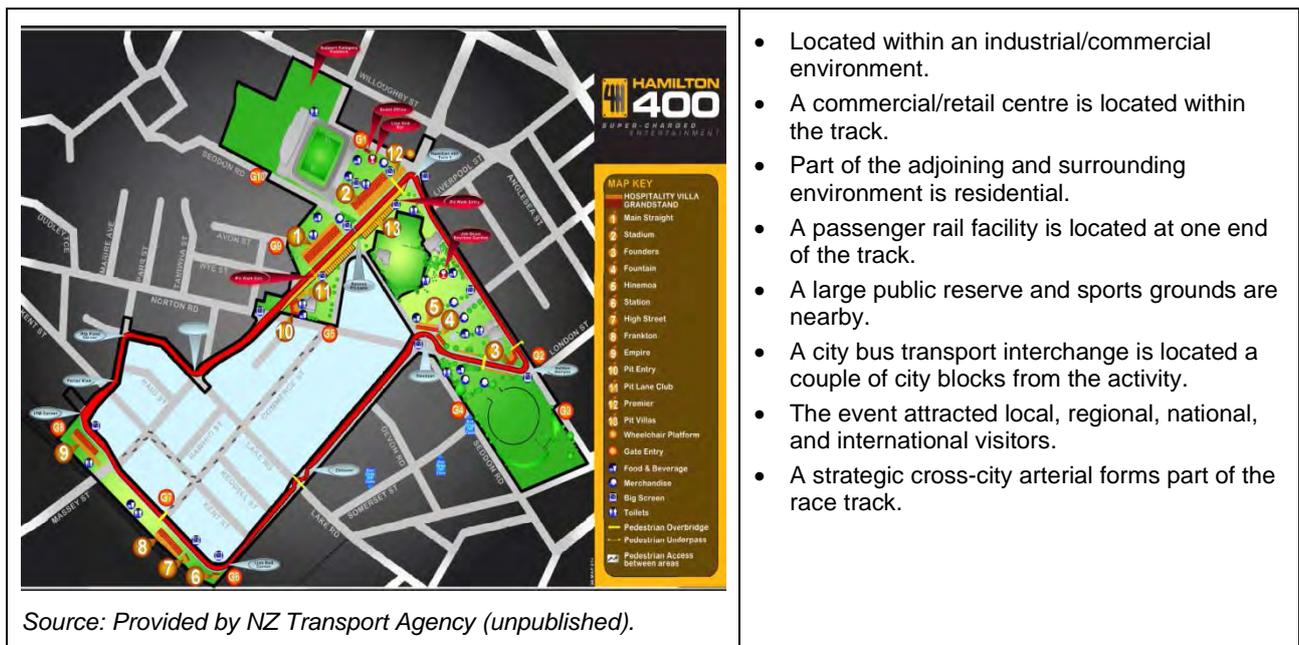
Issue	Traffic management response discussed	
	GTM 7 ⁽¹⁾	Other resources ⁽¹⁾
Preparation of an event management plan		GTM 9 Section 6.2 (Austroads 2014c)
Traffic diversion		GTM 4 and GTM 9 (Austroads 2014a and 2014c)
Spectator access and management	Sections 3.8, 3.11 and 3.12	GTM 9 (Austroads 2014c)
Understand the key characteristics of the local environment	Section 3.1	GTM 3 (Austroads 2013a)
Event needs and constraints		GTM 9 (Austroads 2014c)
Transportation event planning		GTM 9 (Austroads 2014c)
Parking	Section 3.10	GTM 11 (Austroads 2008c)
Public transport access	Section 3.11	GTM 4 (Austroads 2014a)
Walking, cycling and disabled access	Section 3.8, Appendix G	GTM 4, GTM 5 and GTM 6 (Austroads 2014a, 2014b and 2013c)
Temporary traffic management		GTM 9 and GTM 10 (Austroads 2014c and 2009f)
Permanent traffic management		GTM 9 and GTM 10 (Austroads 2014c and 2009f)

1 Guide to Traffic Management (GTM).

4.12.3 Examples

The Hamilton 400 V8 Supercar street race was held between 2008 and 2012. This example identifies traffic management practices necessary to support a major international motor sport event in a city commercial centre (Figure 4.29).

Figure 4.29: Supercar street race circuit, Hamilton, NZ



4.13 Freight Transfer Centres

4.13.1 Description

Places where freight is transferred between road, rail, air or marine vehicles.

4.13.2 Key Issues and Cross-references

Key traffic management issues and practices at freight transfer centres and relevant cross-references are provided in Table 4.13.

Table 4.13: Key issues for freight transfer centres

Issue	Traffic management response discussed	
	GTM 7 ⁽¹⁾	Other resources ⁽¹⁾
Preparation of a transport management plan	Section 3.2	GTM 12 (Austroads 2009g)
Heavy vehicle circulation and access to sites	Section 3.9	GTM 4 and GTM 12 (Austroads 2014a and 2009g)
Impacts on nearby arterials		GTM 4, GTM 5 and GTM 9 (Austroads 2014a, 2014b and 2014c)
Queuing and storage of large vehicles		GTM 3, GTM 9, GTM 11 and GTM 12 (Austroads 2013a, 2014c, 2008c and 2009g)
Employee parking	Section 3.10	GTM 11 and GTM 12 (Austroads 2008c and 2009g)

¹ Guide to Traffic Management (GTM).

4.13.3 Examples

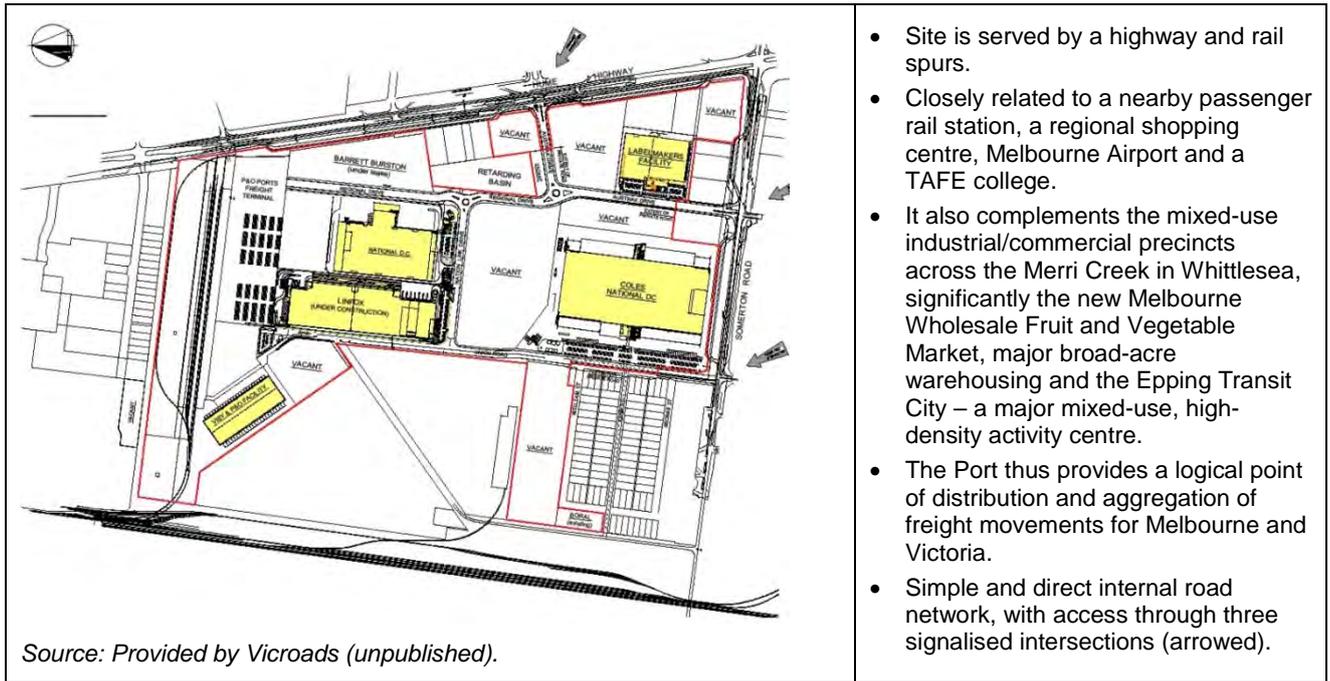
Examples of freight transfer centres are shown in Figure 4.30 (Melbourne Port access) and Figure 4.31 (Intermodal Inland Port at Somerton, Victoria).

Figure 4.30: Melbourne Port access, Victoria

	<ul style="list-style-type: none"> • The Melbourne Port is spread across a number of suburbs (West Melbourne, Port Melbourne, Docklands and Footscray) and centred with access to the Yarra River, Maribyrnong River and Port Phillip Bay. • The Melbourne Port is also serviced by rail. Works were completed on Footscray Road to eliminate the at-grade rail crossings. • The area has a 50 km/h area speed limit. • This photo shows a large number of trucks queuing. In this busy section, there are two designated lanes for truck parking. Truck lanes are marked by line marking on the road and a parking sign. • There is one through lane provided and the opposing traffic lanes are divided by a concrete median. • Due to the high number of trucks constantly parked in this location, the median kerbing is painted yellow to aid visibility to truck drivers.
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Source: Provided by VicRoads (unpublished).

Figure 4.31: Intermodal Inland Port, Somerton, Victoria



- Site is served by a highway and rail spurs.
- Closely related to a nearby passenger rail station, a regional shopping centre, Melbourne Airport and a TAFE college.
- It also complements the mixed-use industrial/commercial precincts across the Merri Creek in Whittlesea, significantly the new Melbourne Wholesale Fruit and Vegetable Market, major broad-acre warehousing and the Epping Transit City – a major mixed-use, high-density activity centre.
- The Port thus provides a logical point of distribution and aggregation of freight movements for Melbourne and Victoria.
- Simple and direct internal road network, with access through three signalised intersections (arrowed).

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Appendix A Higher-Level Policies and Strategies Affecting Traffic Management Practice

A number of higher-level policies have been developed that relate to traffic management practice in activity centres. Practitioners are referred to the following references for further guidance:

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- Ministry of Transport 2011, *Safer journeys: New Zealand's road safety strategy 2010-2020*, Ministry of Transport, Wellington, New Zealand, viewed 28 October 2014, <www.saferjourneys.govt.nz/assets/Uploads/SaferJourneyStrategy.pdf>.

Appendix B Case Studies of Traffic Management in Activity Centres

Case studies of different traffic management practices in activity centres that have been applied in Australia and New Zealand are presented in this appendix. This includes applications of:

- road use hierarchies to support the multi-functional nature of streets in activity centres (Appendices B.1 and B.2)
- network operation planning (Appendix B.2)
- speed management and reduced speed limit zones (Appendix B.3).

B.1 Developing and Applying a Link and Place Street Classification, South Australia

B.1.1 General

Section 2.3.5 discussed the challenges of multi-functional streets in urban areas, such as activity centres, and the principles of a 'link and place' street classification. These principles have been applied to the road network in South Australia (Department of Planning, Transport and Infrastructure 2012, Adelaide City Council 2012) to guide decisions in the trade-off of street space between different transport modes and activities and are discussed in this case study.

B.1.2 South Australia Link and Place Street Classification

A street hierarchy based on the link and place principles was developed in the City of Adelaide (Adelaide City Council 2012). The hierarchy consisted of a series of link status levels similar to a conventional mobility and access road hierarchy (refer to the *Guide to Traffic Management: Part 5*, Austroads 2014b). The link status levels were combined with place status levels that were developed based on the volumes of people observed on streets and in public places. A series of thresholds defined each status level (Table B 1).

Table B 1: Determining link and place street classification level

Link and place status label ⁽¹⁾	Link hierarchy level			Place hierarchy level ⁽⁶⁾			
	Status level	Movement characteristics	Average daily traffic ⁽²⁾	Status level	Level/intensity of on-street staying activities	Average distance travelled ⁽³⁾	Typical number of people 'staying' in place ⁽⁴⁾⁽⁵⁾
Metropolitan	I	Traffic of metropolitan-wide origin	More than 35 000	A	Very high and/or of state/metropolitan significance (due to cultural or tourist value)	More than 15 km	More than 100
Regional	II	Traffic of region-wide origin	20 000 to 35 000	B	High, with city-wide interest and large numbers of on-street staying users within a large precinct	7 to 15 km	50 to 100
District	III	Traffic of district-wide origin	8 000 to 20 000	C	Moderate, with visible on-street staying activities such as public seating, outdoor dining or concentration of public transport stops	3 to 7 km	20 to 50
Neighbourhood	IV	Traffic of neighbourhood-wide origin	3 000 to 8 000	D	Low, with few attractors such as corner shops or businesses that generate low levels of activity	1 to 3 km	5 to 20
Local	V	Local traffic from immediate streets	Less than 3 000	E	Used by local residents and workers only	1 km or less	0 to 5

1 Nominal labels given to status levels reflect the likely catchment from which link and place users are arriving.

2 The average number of vehicles in both directions recorded on a typical day between 7 am and 7 pm.

3 Average distance of journeys undertaken to reach destination.

4 Staying activities associated with the enjoyment of a place, such as sitting, playing sport, recreation uses, outdoor dining, lying down, etc.

5 Visual range: a 100 m length of a street or a 50 m radius for the park lands and open spaces, 'typical number of people' refers to everyday number of people staying in peak periods and for public spaces, excludes one-off special events.

6 If different status level is implied through tests, the lower is taken.

Source: Adelaide City Council (2012).

Application of a link and place hierarchy was discussed in the *Streets for People Compendium for South Australian Practice* (Department of Planning, Transport and Infrastructure 2012). This included a matrix applying the hierarchy to different types of streets (Figure B 1). As shown, the two-dimensional matrix provided an indication of the multi-functional nature of streets through the examples provided. West Terrace and North Terrace were both designated as regional corridors in the conventional road hierarchy, Figure B 1(b). However, when the place hierarchy was considered, Figure B 1(c); North Terrace had a more prominent importance than West Terrace.

Figure B 1: Link and place street classification examples

(a) Street examples



1. West Terrace, Adelaide

2. North Terrace, Adelaide



3. Fullarton Road, Highgate

4. Prospect Road, Prospect

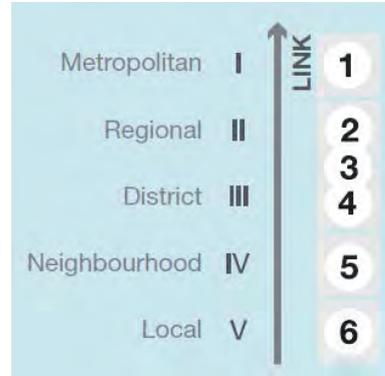


5. Elizabeth Street, Croydon

6. Torrens Street, Mawson Lakes

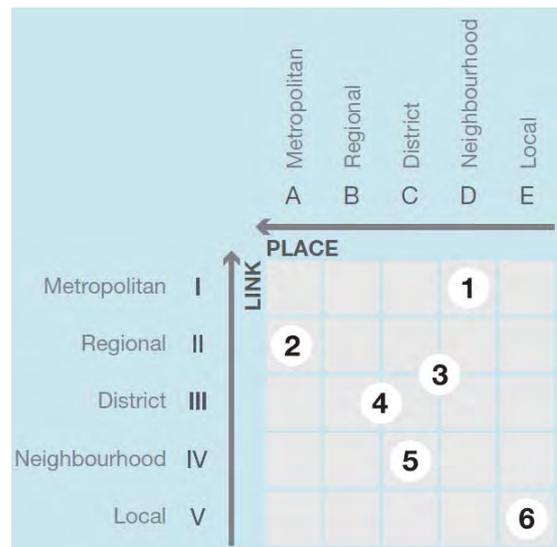
Source: Department of Planning, Transport and Infrastructure (2012), citing Natalya Boujenko (Intermethod) and Peter Jensen (Jensen Planning and Design).

(b) Applied to a conventional road hierarchy



Source: Department of Planning, Transport and Infrastructure (2012).

(c) Applied to a link and place hierarchy

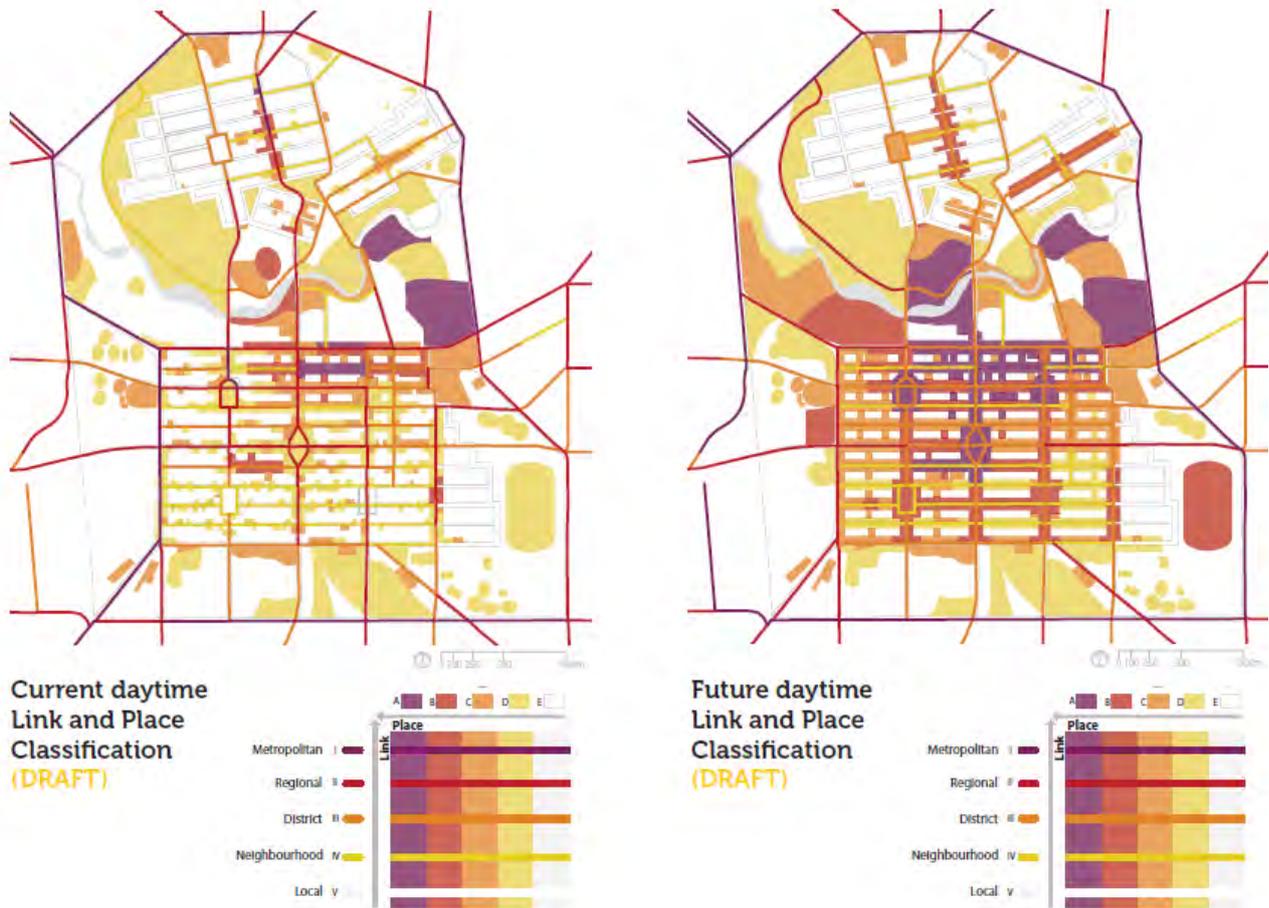


Source: Department of Planning, Transport and Infrastructure (2012).

B.1.3 Applying the Link and Place Street Classification

The City of Adelaide applied the link and place street classification to its entire street network in the City Centre and North Adelaide. Figure B 2 shows a draft of the current and future daytime link and place classification. The classification identified a number of areas of greater prominence in the place status in the future daytime classification than in the existing one.

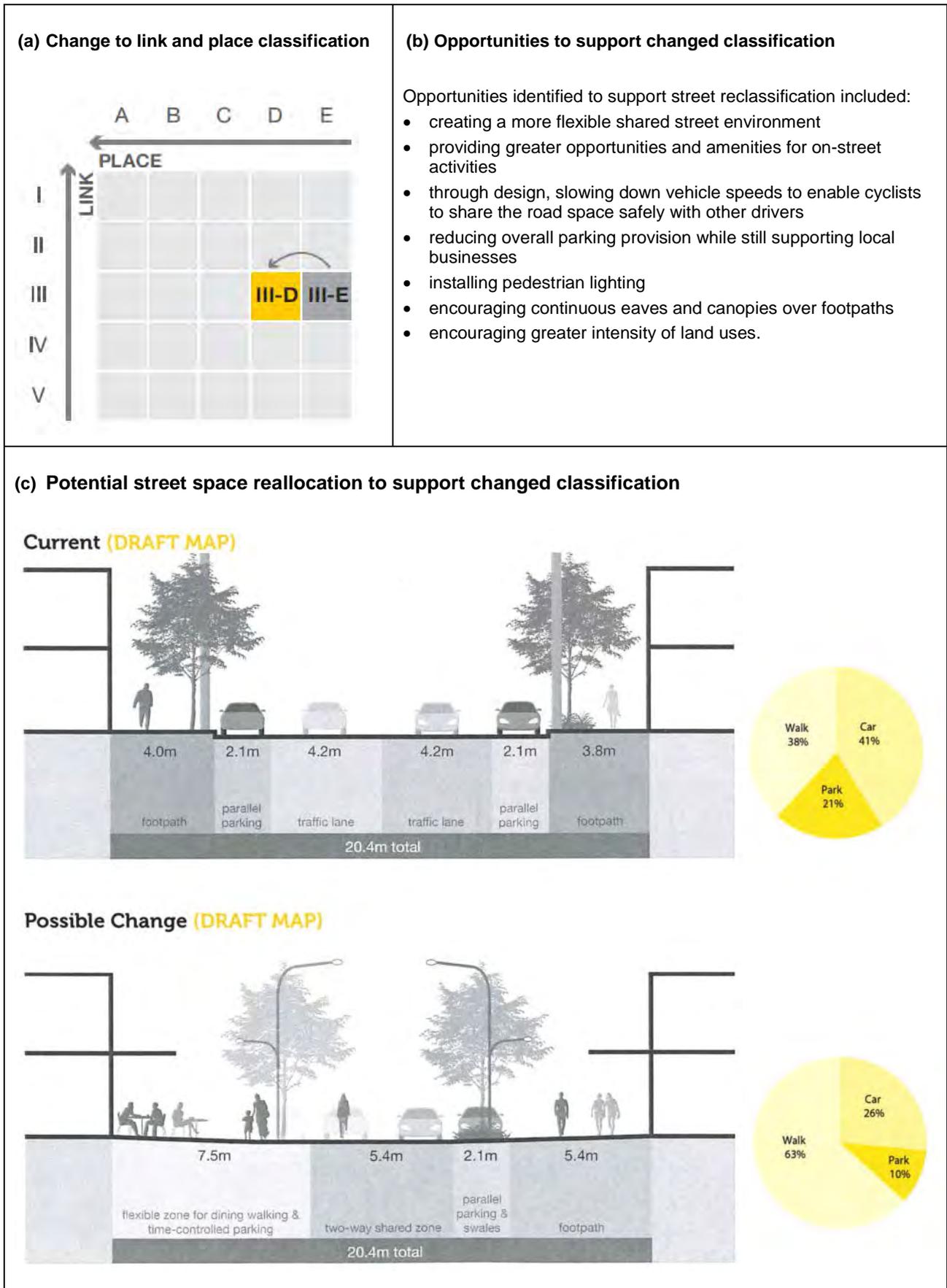
Figure B 2: Link and place classification applied to City of Adelaide



Source: Department of Planning, Transport and Infrastructure (2012).

To support potential future changes to the link and place classification, the Department of Planning, Transport and Infrastructure (2012) identified street space reallocations that supported classification changes. Potential changes to support street space reallocation for a 20 m wide street are shown in Figure B 3. These changes were expected to change the place status from III-E to III-D. This included an increase in street space dedicated to walking and pedestrian-based activities. This example presents one hypothetical reallocation of street space in an activity centre. However, a number of other design or operational changes may require consideration to address specific characteristics at a site.

Figure B 3: Potential street space reallocation for a 20 m wide street



Source: Department of Planning, Transport and Infrastructure (2012).

B.2 SmartRoads and Network Operation Planning at the Ringwood Activity Centre

B.2.1 Background

As noted in Section 3.4, network operation planning provides a process for considering the planning and operation of activity centres that may assist in obtaining an appropriate balance between different transport modes and user groups. This can support the day-to-day management of traffic on a road network in and around an activity centre.

This case study focused on how the network operation planning process was applied to the Ringwood Activity Centre, based on Austroads (2013d). For additional guidance on the network operation planning process, refer to the *Guide to Traffic Management: Part 4* (Austroads 2014a) and Austroads (2009i and 2013d).

The SmartRoads principles (VicRoads 2011) guided the network operation planning discussed in this case study.

B.2.2 Ringwood Activities Area

Ringwood is one of six central activities areas in metropolitan Melbourne, which are designated centres where housing and commercial development will take place, allowing Melbourne to move away from one centre (the central business district) to a number of centres. The Ringwood Activities Area is located in Maroondah City Council and is the focus of a substantial proportion of future employment growth and public investment in Melbourne.

In 2009, VicRoads and Maroondah City Council developed a road use hierarchy for the 'higher order' road network within the municipal area (mainly the freeway and arterial road network). A network operation planning process was then applied to the road network within the Ringwood Activities Area, with the aim of integrating the local and arterial road network in-line with broader Ringwood Activities Area objectives. This was guided by the SmartRoads planning process (VicRoads 2011). The work was undertaken in consultation with a range of stakeholders including Maroondah City Council, Department of Transport, Department of Planning and Community Development and ConnectEast (operator of Eastlink).

A series of four workshops were held in order to reach agreement on:

- broad Ringwood Activities Area objectives
- an integrated local and arterial road use hierarchy
- alignment of all future detailed signal operation and network management decisions with the agreed operating objectives.

B.2.3 Key Objectives and Performance Requirements for Network Operations

Key objectives for network operations were aligned with the Government objectives of:

- encouraging more environmentally sustainable travel modes, such as walking and cycling
- encouraging higher occupancy travel modes that use road space more efficiently
- reducing the overall demand for travel by ensuring that land use planning, and the community objectives it embodies, is coordinated with transport management policies.

Key network performance requirements for the Ringwood Activities Area were:

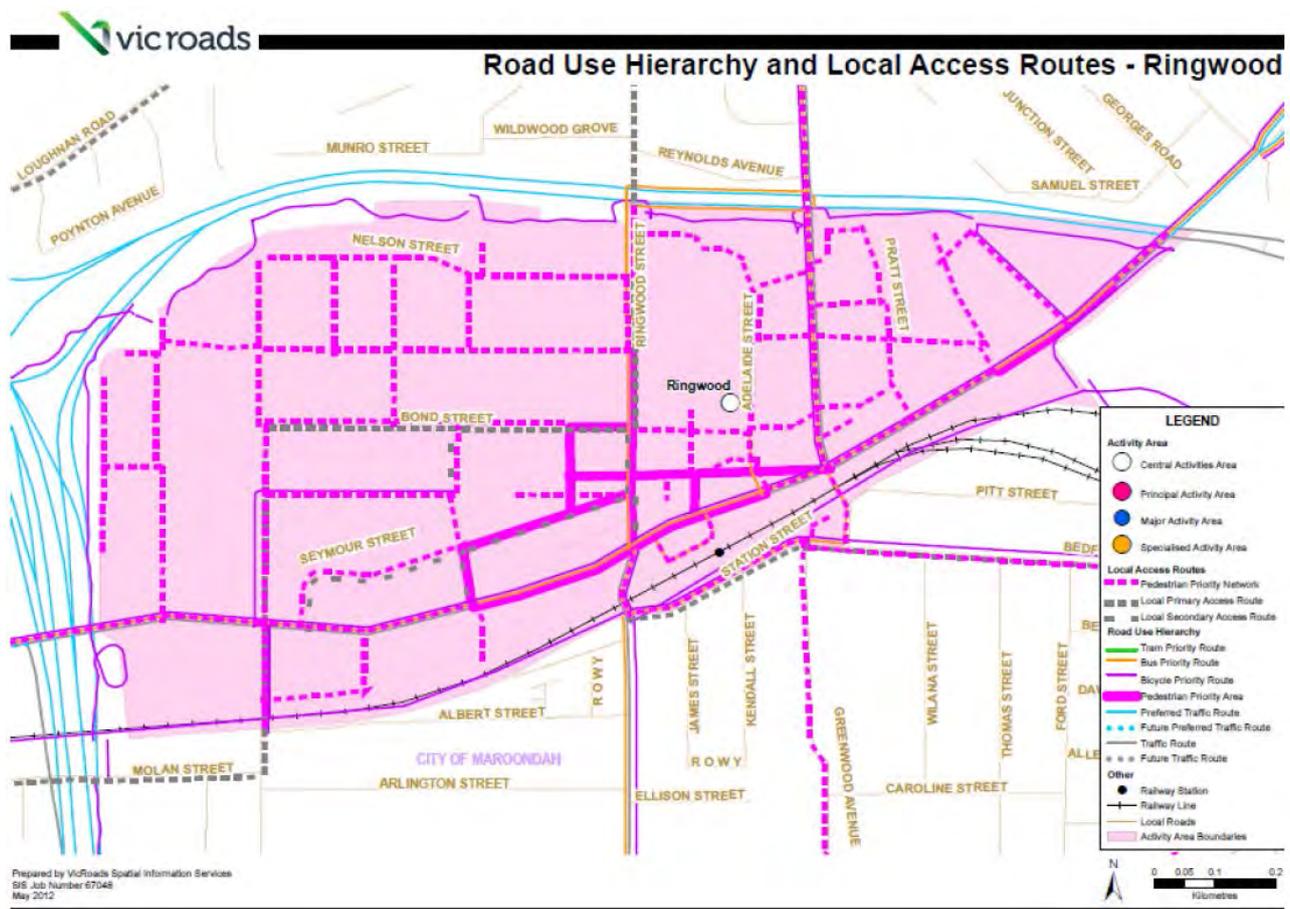
- for walking and cycling to be 'front of mind' modes of transport
- for public transport be the preferred motorised mode of access into the Ringwood Activities Area
- that where general traffic does not have a destination within the Ringwood Activities Area, it should be encouraged to use a bypass route.

B.2.4 Defining a Road Hierarchy and Priorities

Priorities for each transport mode on this network were developed collaboratively in a workshop with the local council, the Department of Transport and VicRoads for the whole local government area. The road hierarchy for the local road network was developed considering the objectives of the activity centre.

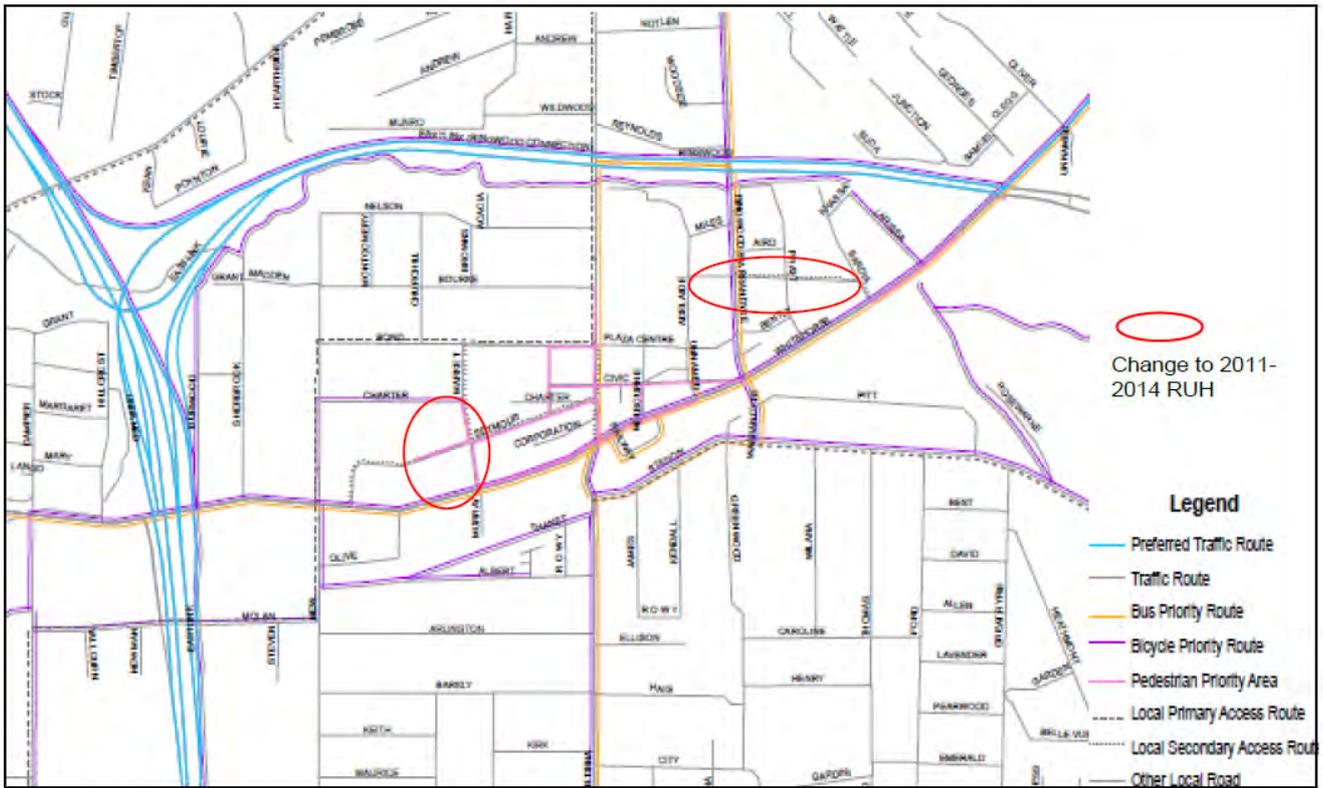
To consider existing and planned future network use, priority transport modes were identified on the arterial and local roads within the Ringwood Activities Area for years 2011–14 (Figure B 4) and beyond year 2014 (Figure B 5). This identified areas where the road user hierarchy was expected to change in the future, so that appropriate measures could be identified for planning and future management.

Figure B 4: Road user hierarchy for years 2011 to 2014



Source: Austroads (2013d), based on VicRoads (unpublished).

Figure B 5: Road user hierarchy for beyond year 2014



Note: RUH refers to road user hierarchy.

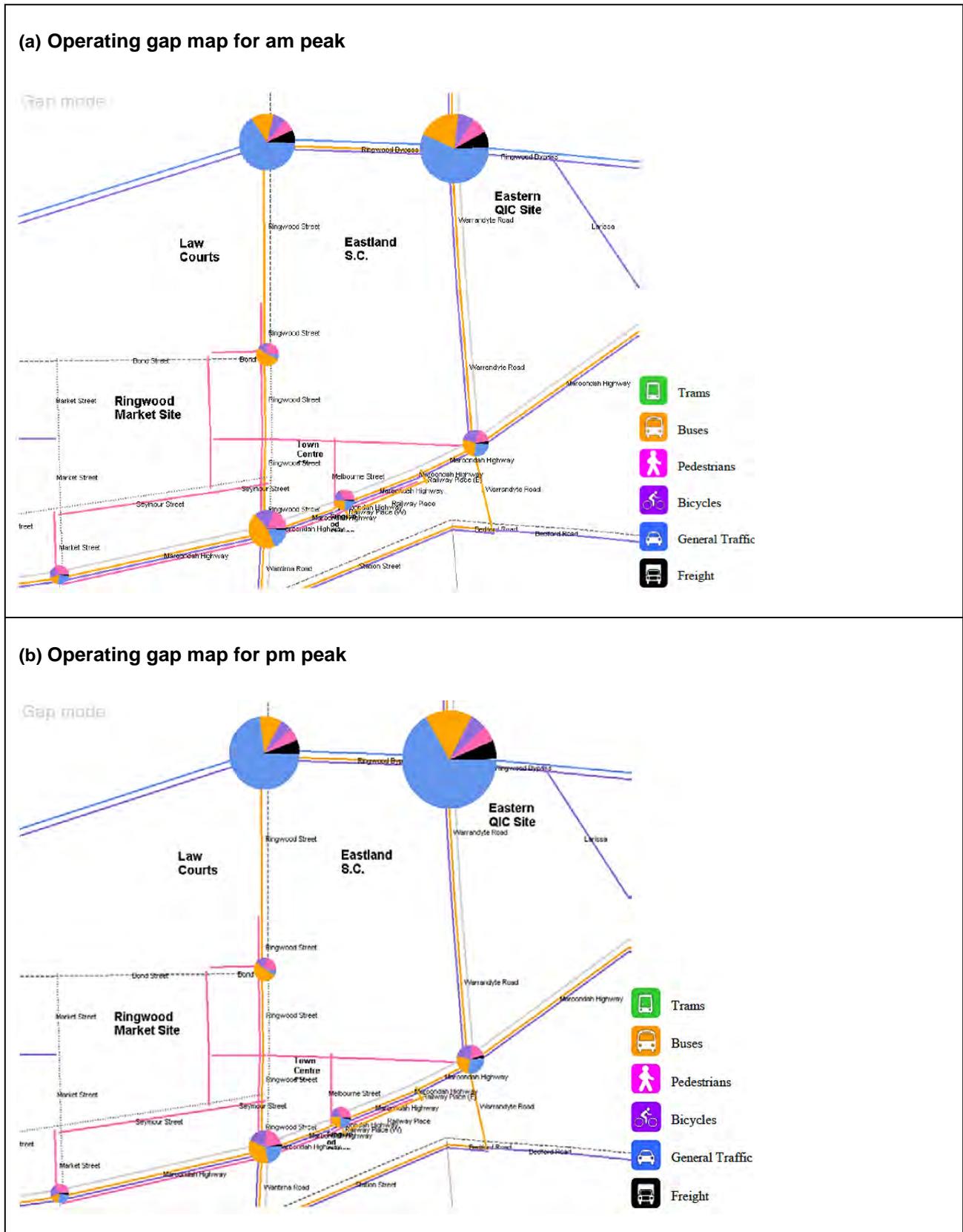
Source: Austroads (2013d), based on VicRoads (unpublished).

B.2.5 Gaps in Network Performance

SmartRoads (VicRoads 2011) defined an operating gap as the difference between the actual performance measured for a mode of travel compared against its target performance. This was used to determine the importance of each mode at a place and for a specified time-of-day.

Operating gaps were mapped to determine the magnitude of deficiencies for each mode relative to each other on local and arterial road networks within the activity area. Operating gap maps for the area are shown for the am and pm peak periods (Figure B 6). The size of the pie chart on a node indicates the magnitude of the operating gap with the pie slices indicating the modes impacted by the gap. As shown, the largest operating gaps were identified at the intersections of the Ringwood Bypass with Ringwood Street and Warrandyte Road.

Figure B 6: Ringwood Activities Area operating gap maps



Notes:

- Size of pie charts indicates the magnitude of the operating gap.
- Size of pie slice indicates the degree to which a mode of travel is impacted by an operating gap.

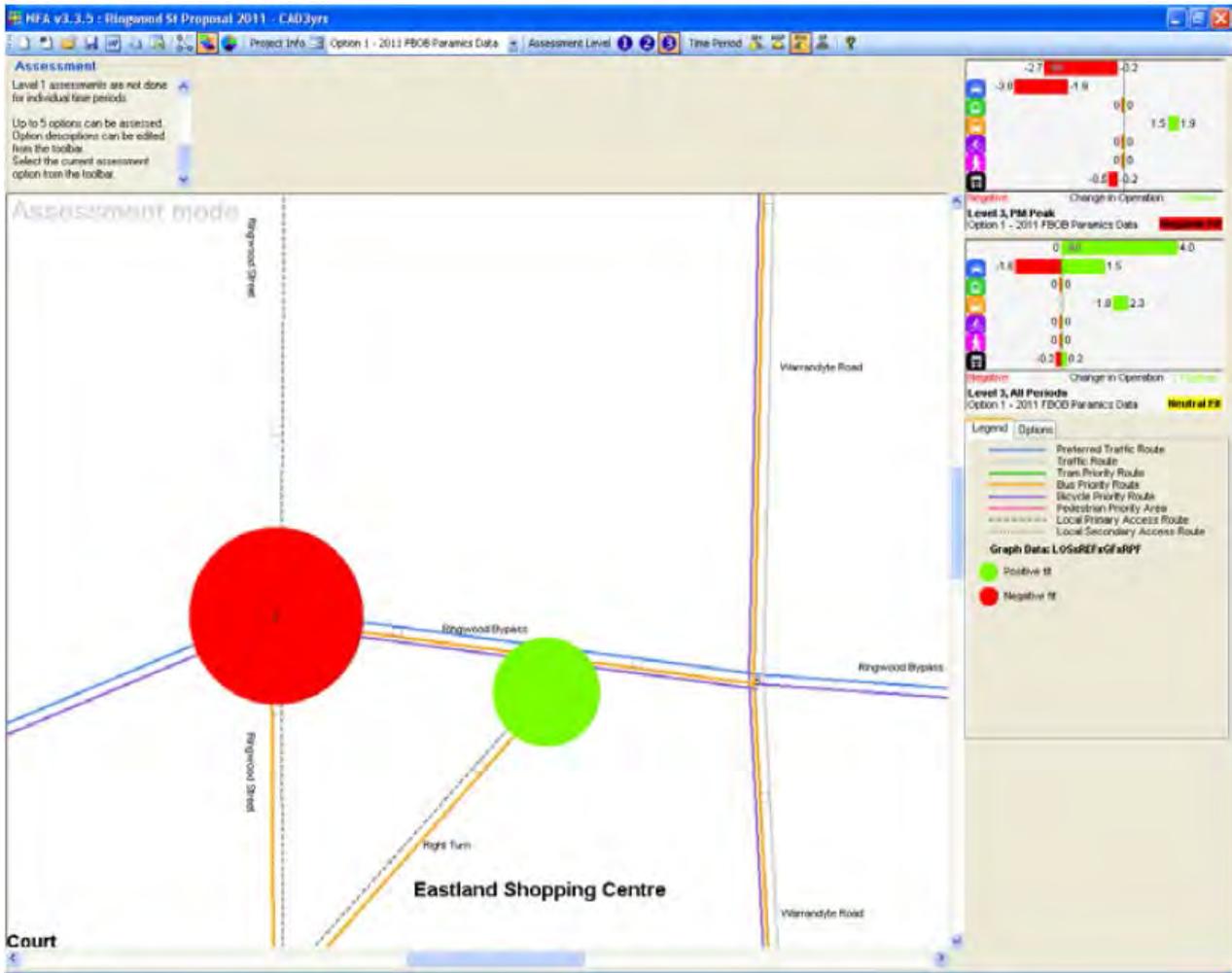
Source: Austroads (2013d), based on VicRoads (unpublished).

B.2.6 Management Options for Network Operations

At the time of writing, management options were yet to be identified for the Ringwood Activity Centre. However, an individual proposal was tested to determine whether it aligned with the road use hierarchy. The individual proposal tested was the conversion of a through lane on the south approach of the Ringwood Street and Ringwood Bypass intersection to a shared through and right-turn lane.

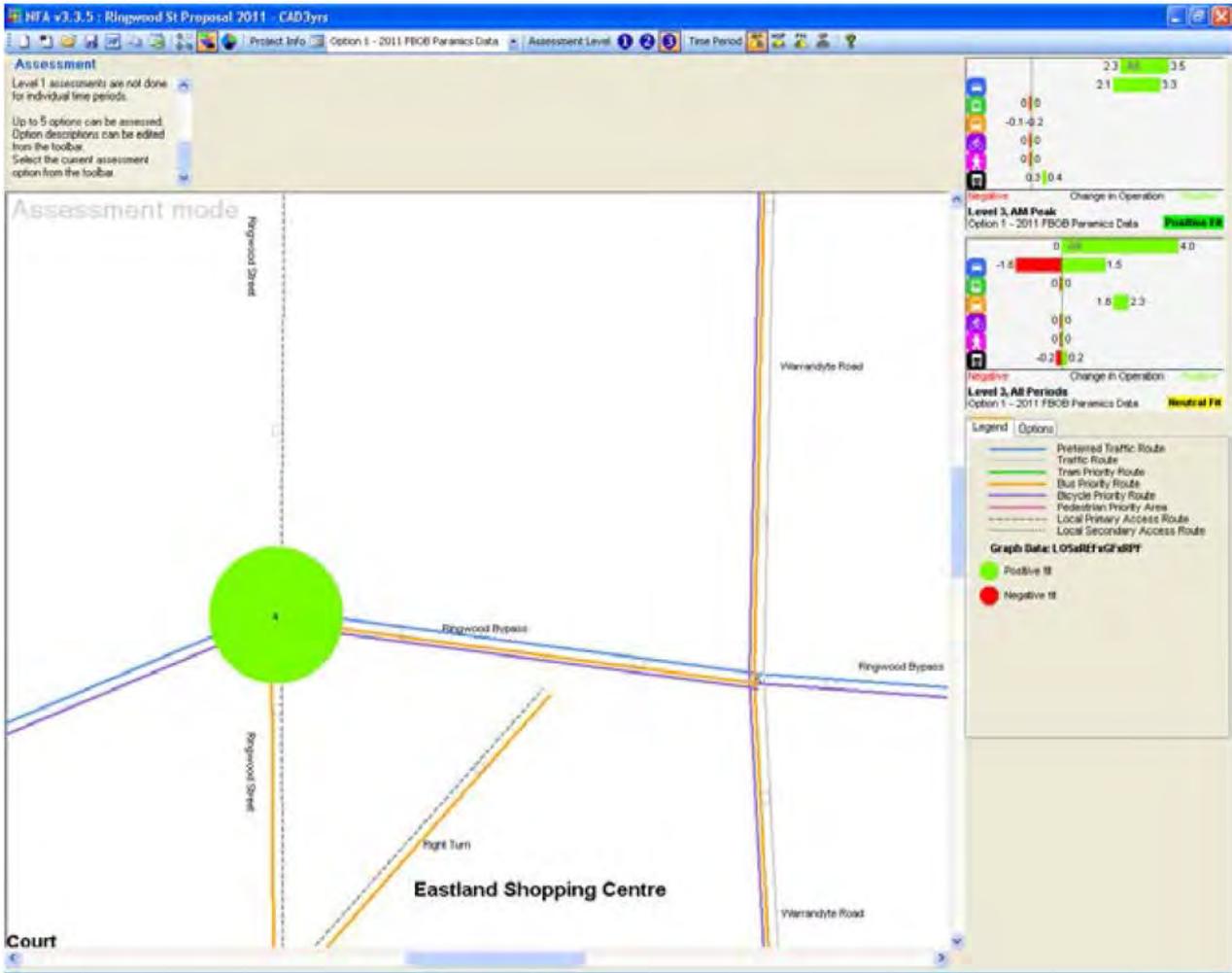
A network fit assessment was conducted to determine the impact of the proposed change. Results are shown for the am peak (Figure B 7) and pm peak periods (Figure B 8). Changes were indicated as negative (red), neutral or positive (green). This provided information to decision-makers regarding the necessary trade-offs between modes to aid in planning decisions.

Figure B 7: Network fit assessment for impact of proposal on am peak period



Source: Austroads (2013d), based on VicRoads (unpublished).

Figure B 8: Network fit assessment for impact of proposal on pm peak period



Source: Austroads (2013d), based on VicRoads (unpublished).

The network fit assessment process established by VicRoads enables decision-makers to gain an appreciation of the extent to which a proposal or group of proposals support the intent of time-based road use hierarchies. This assessment considers the network-wide impacts beyond a specific site of a proposal.

It is planned for all future proposals within the Ringwood Activities Area to be assessed against the SmartRoads framework. This is expected to include:

- using network operating gaps for identifying transport actions
- undertaking network fit assessments for all proposed transport and land use changes to align with network operation plans
- making the road use hierarchy and network operation plan available to all stakeholders to ensure better alignment of preliminary concepts with the network operation plan.

One area where the network planning process is expected to be applied is for planning a proposed upgrade to the railway station and bus interchange in the Ringwood Activities Area. Once the new interchange configuration and new bus routes are confirmed, review of the road use hierarchy will be required to consider whether bus priority routes reflect streets with elevated bus service levels.

B.2.7 Management of Future Changes

Many changes have been proposed to the land use within the Ringwood Activities Area in the next few years. Constant monitoring of the performance of each mode is planned and subsequent review of the operating gaps will be utilised to highlight where mitigating measures will be required to better align with the intended operation of the network. The road use hierarchy will also be reviewed to ensure it aligns well with any land use changes.

B.3 40 km/h Speed Zones in Activity Centres, ACT

B.3.1 Background

As discussed in Section 3.6, a low-speed environment is an essential component for accommodating high levels of pedestrians within activity centres. To aid in creating a low-speed environment, Roads ACT investigated the use of reduced speed zones around town centres in the ACT. This resulted in trials of 40 km/h speed zones in these activity centres.

The ACT had previously installed 40 km/h speed limits in school zones, work sites and other precincts such as hospitals and universities. A motion was passed in the ACT Legislative Assembly in March 2009 calling on the ACT Government to consult on reducing speed limits around shopping centres and community facilities to 40 km/h, and to report back to the Assembly with a plan of action. This approach also reflected a 2008 Parliamentary Agreement between the ALP ACT Branch and the ACT Greens.

The primary objective of the 40 km/h speed zones was to improve levels of safety for pedestrians and cyclists and support Safe System principles (Section 2.3.8) and appropriate speed environments (Section 3.6.1). Supporting aims included encouraging the uptake of walking and cycling in order to create more sustainable and liveable activity areas.

B.3.2 Review

A review was conducted to investigate the application of 40 km/h speed zones in high pedestrian activity areas, establish technical guidelines and consult with the ACT community. Outcomes concluded that the targeted application of reduced speed limits had merit in the ACT context, despite the ACT's general lack of strip shopping centres.

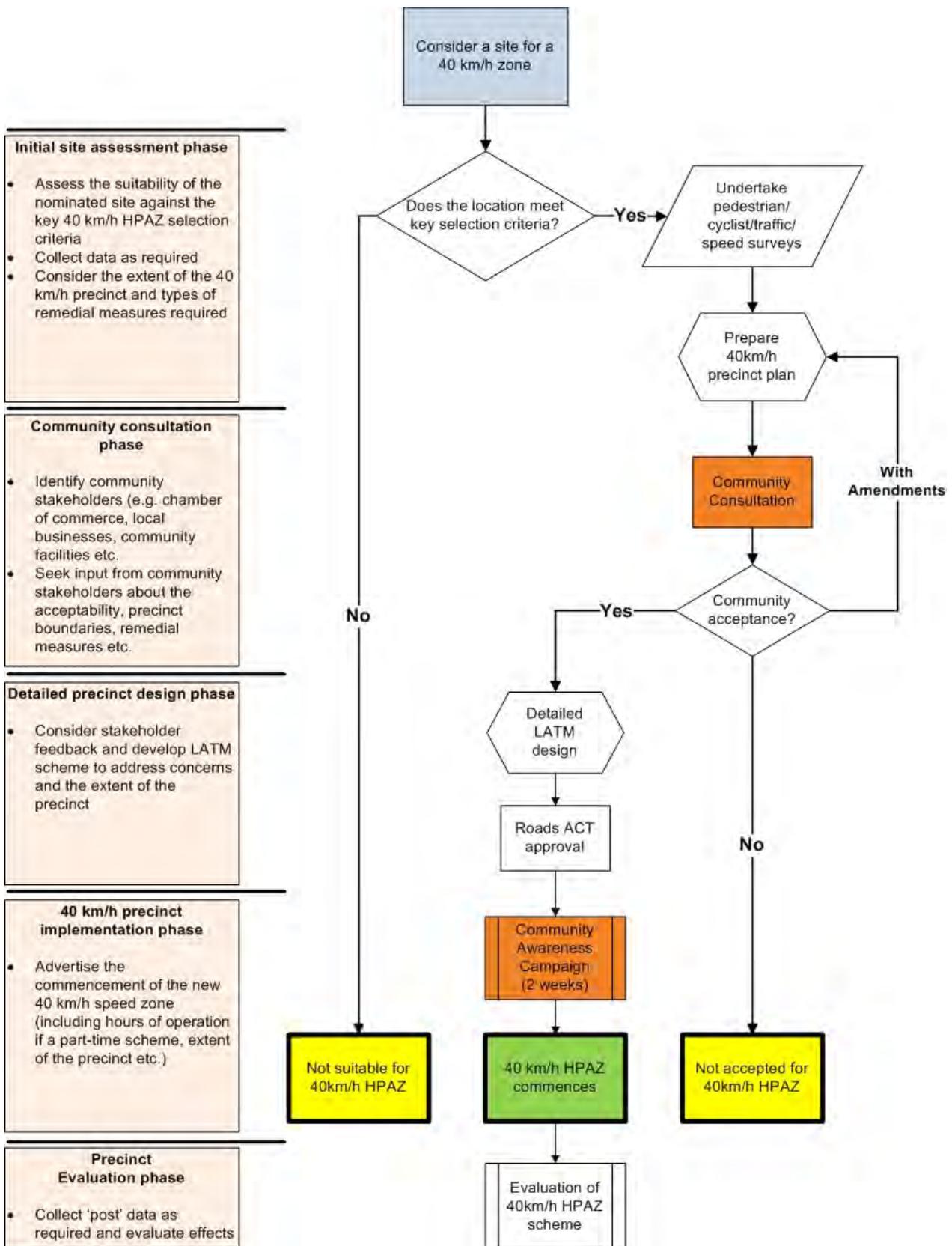
Findings included that:

- Reduced speed limit zones were most appropriate in areas with the highest pedestrian movements, namely town centres.
- They may also be appropriate at other types of centres (group and local) with high pedestrian movements, and merit consideration on a case-by-case basis.
- A minimum road length was required to avoid confusion to motorists.
- A certain level of engineering works would be necessary to support the lower speed limit.
- There was no strong justification for 40 km/h speed limits in the vicinity of community centres not linked to shopping centres and other signage or traffic management treatments were determined to be more appropriate for these locations.

Feedback from the community indicated mixed support for 40 km/h speed limits, with strong views held on both sides. While the majority (54%) of respondents supported the concept, a significant proportion (45%) was opposed.

As part of the review process, guidelines were developed for applying the 40 km/h speed zones to high pedestrian activity areas. This process is summarised in Figure B 9.

Figure B 9: High pedestrian activity zone implementation process



Note: HPAZ refers to high pedestrian activity zone.

Source: From Roads ACT (unpublished).

B.3.3 Implications for Traffic Management

Implications for identifying suitable locations for 40 km/h speed zones and other important factors in traffic management are summarised in Table B 2.

Table B 2: Traffic management implications for 40 km/h speed zones applied in the ACT

Areas of consideration	Traffic management implications
Land use	<ul style="list-style-type: none"> • Located at retail and community facilities that generate significant volumes of pedestrians and cyclists. • Considered areas with a minimum of 400 m of retail and commercial development.
Pedestrian and cyclist activity	<ul style="list-style-type: none"> • Targeted areas with high levels of pedestrian and cyclist movements. • No specific minimum threshold of pedestrian and cyclist activity was identified for the 40 km/h zones. Instead, pedestrian and cyclist activity was considered on a case-by-case basis.
Speed management	<ul style="list-style-type: none"> • Threshold treatments, consisting of entry signage, were used to clearly define the start of the reduced speed limit zones (refer to Figure B 10). • Speed cushions were installed at locations within the speed zones to create a road environment encouraging motorists to drive at 40 km/h or slower. Due to the trial nature of the 40 km/h speed zones, temporary traffic calming treatments were installed.
Precincts	<ul style="list-style-type: none"> • Precinct boundaries took into consideration the presence of community facilities. • Community facilities generating significant pedestrian and cyclist volumes were located in or adjacent to the precincts, such as educational establishments, child care centres, emergency services facilities or outdoor recreation facilities. • Boundaries were extended to areas of lower activity in some instances, in order to create clearly identifiable boundary points, provide more uniform precincts and reduce signing requirements.
Hours of operation	<ul style="list-style-type: none"> • 40 km/h zones operated on a full-time basis. • Part-time operation was considered, but full-time operation was chosen to provide consistent application within the ACT, maximise benefits for vulnerable road users and simplify signing requirements.

Source: Based on Roads ACT (unpublished).

Figure B 10: Entry sign into a 40 km/h speed zone



Source: Provided by Roads ACT (unpublished).

B.3.4 Trials of 40 km/h Speed Limits in Town Centres

Given the mixed views obtained from the community feedback during the review, the ACT Government conducted pilot projects of 40 km/h speed precincts to assess the effectiveness of the approach, gauge community perceptions and inform whether they should be considered at other centres. Following design work and consultation with stakeholders and the community, trials were implemented in the Gungahlin and Woden Town Centres in August 2011.

Both trial areas were situated adjacent to community facilities that generate significant pedestrian and cyclist volumes. At some locations, the precincts were extended to areas of lower activity in order to create clearer boundary points, provide more uniform precincts and minimise signing requirements. The entry into the Gungahlin Town Centre on Hibberson Street approaching from the east is shown in Figure B 11. The trial precincts are shown for the Gungahlin and Woden Town Centres in Figure B 12 and Figure B 13 respectively.

Figure B 11: Hibberson Street in Gungahlin Town Centre, ACT



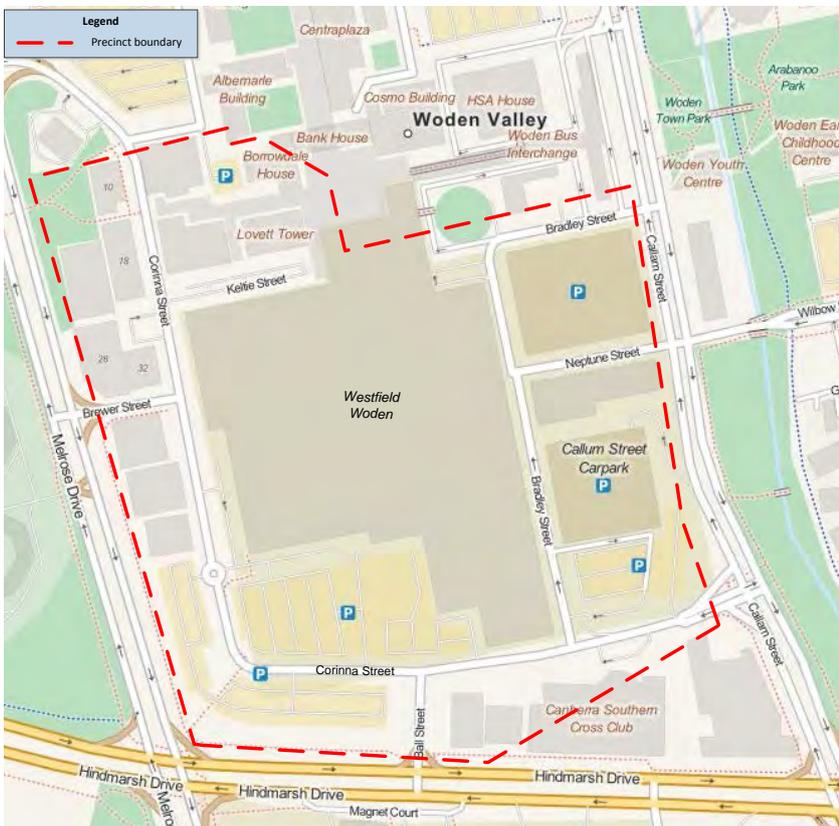
Source: Provided by Roads ACT (unpublished).

Figure B 12: Boundaries of Gungahlin Town Centre 40 km/h speed zone precinct



Source: Adapted from Openstreetmap (n.d.).

Figure B 13: Boundaries of Woden Town Centre 40 km/h speed zone precinct



Source: Adapted from Openstreetmap (n.d.).

B.3.5 Evaluation

As part of the trials, the precincts were evaluated before and after implementation of the 40 km/h speed zones and supporting traffic management arrangements. The results generally found positive effects and support from the community. Key findings included:

- Average and 85th percentile speeds were reduced after implementing signing and speed cushions including
 - speed reductions of up to 10 km/h in Woden Town Centre and 16 km/h in Gungahlin Town Centre
 - average speeds after implementation of less than 40 km/h
 - 85th percentile speeds after implementation of less than 40 km/h at most locations and slightly more than 40 km/h at a few locations.
- Three-quarters of the community (74% for Woden Town Centre and 78% in Gungahlin Town Centre) supported the reduced speed limit on a permanent basis.

Crash analysis was not conducted to consider the impact of the reduced speed zones due to the short time period available since implementation, low numbers of crashes and the limited sizes of the project areas.

B.3.6 Outcomes at Time of Publication

Outcomes of the trial led to an ACT Government decision to make the 40 km/h speed zones in Woden and Gungahlin Town Centres permanent. In addition, this led to the implementation of 40 km/h speed zones in the remaining town centres, including Belconnen and Tuggeranong Town Centres and Civic Centre, which were implemented in June 2013. Evaluation results from these remaining town centres are expected to be available in 2014.

Over time, it is expected that further 40 km/h speed zones will be considered at group centres, which are larger (regional) activity centres in the ACT.

B.3.7 Facts and Figures

Details of the Gungahlin and Woden Town Centre schemes are shown in Table B 3.

Table B 3: Details of Gungahlin and Woden Town Centre 40 km/h speed zones

Characteristic	Gungahlin Town Centre	Woden Town Centre
Pedestrian activity	<ul style="list-style-type: none"> • Maximum of 1200 pedestrians/hour 	<ul style="list-style-type: none"> • Maximum of 330 pedestrians/hour
Length of retail	<ul style="list-style-type: none"> • 450 m on Hibberson Street 	<ul style="list-style-type: none"> • 800 m on Corinna Street
Traffic management for 40 km/h speed zone for trial	<ul style="list-style-type: none"> • Multiple forms of signage throughout town- centre area • Five pairs of speed cushions 	<ul style="list-style-type: none"> • Multiple forms of signage throughout town- centre area • Single pair of speed cushions

Source: From Roads ACT (unpublished).

B.4 Application of Shared Space in Auckland CBD

As noted in Section 3.6.2 and Appendix E, developing shared spaces is a method that has been used to manage speed in pedestrian areas. It focuses on using the built environment and level of activity to provide a 'self-explaining' form of traffic management in order to influence road user interaction. This case study presents an example where shared space principles have been applied within the Auckland CBD.

B.4.1 Background

The material used for this case study is based on the report *An Evaluation of Shared Space in the Fort Street Area, Auckland, New Zealand* (Auckland Council 2012a), which summarised the shared space scheme implemented in this area and documented evaluation results.

Streets within the Fort Street area in the Auckland CBD were recently converted into shared space. Auckland Council set out a vision for transforming the Auckland CBD into an internationally successful business and cultural centre (Auckland Council 2012b). Part of this revitalisation included upgrading and maintaining inner-city streets and open spaces to international standards. Developing shared spaces at key locations was identified as an important part of this program. In addition to the Fort Street area, other areas within Auckland have been or are planned to be converted to shared space including Darby Street, Elliott Street and Lorne Street.

The Fort Street area is situated near the heart of the Auckland CBD and restaurants, shops and facilities. Prior to this project the area was primarily used to access other places of work or business, shops and services. Most pedestrians and drivers perceived it as a throughway, rather than a destination. However, the area was identified as a business location close to public transport, retail, education and recreation facilities. In 2008, it was identified as having significant potential for transformation into a more attractive and user-friendly environment.

A series of objectives were developed to guide upgrading the area to shared space including to:

- better integrate the area into the surrounding streetscape network
- provide greater pedestrian priority
- create a distinctive public space and provide opportunities for the area to be a popular destination in the CBD
- create a space that supports businesses and residents and provides opportunities for a variety of activities
- provide a high-quality, attractive and durable streetscape that contributes to a sustainable and maintainable CBD.

The project was split into three stages (Figure B 16). Areas developed into shared space included Jean Batten Place, Fort Lane and two sections of Fort Street – between Queen Street and Commerce Street and between Gore Street and Customs Street East (Stages One and Three). Conventional streetscaping improvements were completed on Commerce Street, Gore Street and the section of Fort Street between these streets (Stage 2). Evaluation reported by Auckland Council (2012a) assessed the Stage One improvements.

B.4.2 Shared Space Zones

A diagram of a typical shared space as implemented in the Auckland CBD is shown in Figure B 15. The shared space consisted of a level surface across the entire width of the road reserve. As indicated, the space was divided into a series of zones including:

- accessible zones running the length of each side of the street adjacent to the building edge, which were intended to be clutter free pedestrian-only areas (and included a roughened tactile strip of pavement to alert people to the boundary between this zone and the trafficable area), which provided greater certainty of separation for those users requiring it
- activity zones offering a shared area for fixed activities, street furniture and vegetation
- a trafficable zone permitting the movement of pedestrians and vehicles.

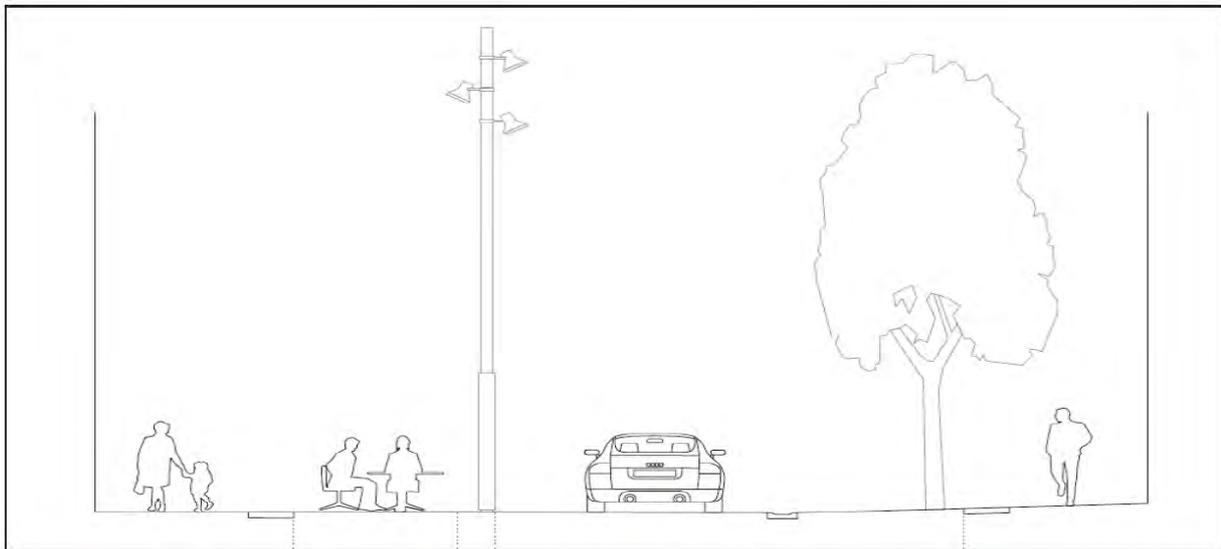
Photos from before and after installation of the shared spaces on Fort Street and Fort Lane are shown in Figure B 16 and Figure B 17.

Figure B 14: Fort Street shared space area



Source: Based on Auckland Council (2012a).

Figure B 15: Zones of a typical shared space in Auckland CBD



Accessible Zone
 Non-shared zone
 - clutter-free
 - pedestrian only

Activity Zone
 Shared zone
 - fixed activities
 - pedestrians
 - loading vehicles
 - outdoor dining
 - street furniture
 - trees

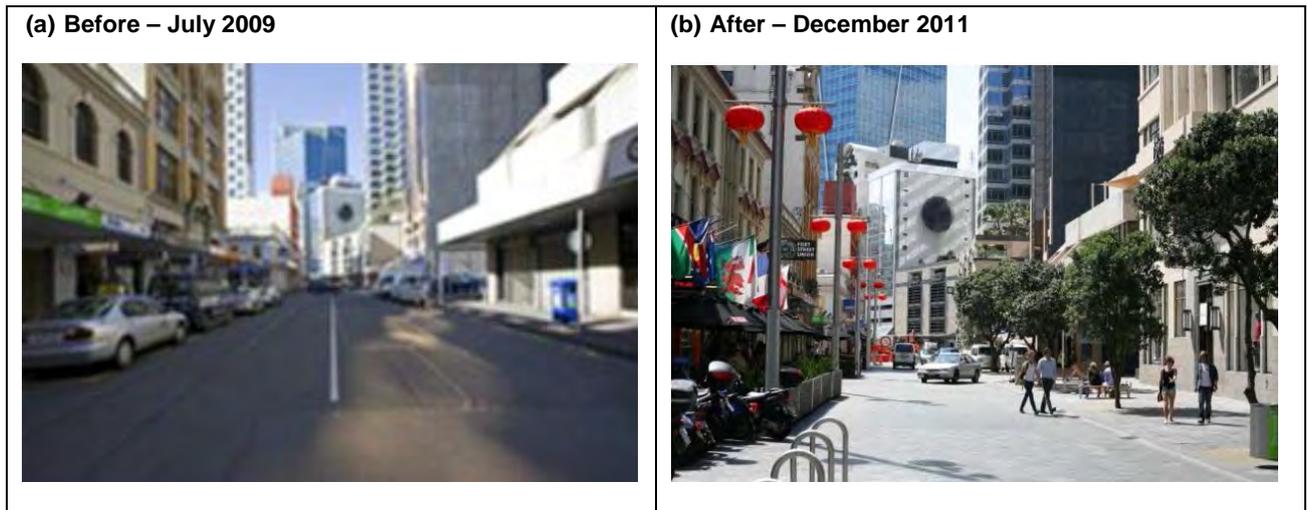
Trafficable Zone
 Shared zone
 - trafficable area
 - pedestrians
 - moving vehicles

Activity Zone
 Shared zone
 - fixed activities
 - pedestrians
 - loading vehicles
 - outdoor dining
 - street furniture
 - trees

Accessible Zone
 Non-shared zone
 - clutter-free
 - pedestrian only

Source: Auckland Council (2012a).

Figure B 16: Fort Street before and after installation of shared space



Source: Auckland Council (2012a).

Figure B 17: Fort Lane before and after installation of shared space



Source: Auckland Council (2012a).

B.4.3 Speed Management

A number of measures were used to encourage motorists to travel slowly through the Fort Street shared space area. These included measures that emphasised that the space was different from other road areas, permitted pedestrians to move more freely and supported an increase in pedestrian activity.

Table B 4: Measures supporting speed management

Measure	Purposes
<ul style="list-style-type: none"> • Providing a level surface across the entire street. 	<ul style="list-style-type: none"> • Indicating to motorists, pedestrians and cyclists that they were in a shared space and that different behaviour, traffic speed and awareness were required. • Requiring motorists to obtain behavioural cues from pedestrians. • Permitting pedestrians to move more freely. • Creating friction between road users and motorist uncertainty regarding pedestrian behaviour.
<ul style="list-style-type: none"> • Installing a paved surface distinct from other road areas. 	
<ul style="list-style-type: none"> • Minimising the amount of physical barriers separating transport modes (e.g. kerbs, bollards, barriers, pavement markings and signs). 	
<ul style="list-style-type: none"> • Allowing activities within the shared space (e.g. outdoor dining, permanent seat areas, and gathering and performance areas). 	
<ul style="list-style-type: none"> • Supporting the activation of businesses at the street edges. 	<ul style="list-style-type: none"> • Supporting increased levels of pedestrian activity.

Source: Auckland Council (2012a).

B.4.4 Traffic Management

Within the Fort Street shared space area, conventional traffic control devices were kept to a minimum initially and behavioural monitoring was applied to consider whether additional infrastructure was necessary. This provided the minimum amount of regulatory signing to enable enforcement and management of the space without overly cluttering the landscape.

Signs were placed at the entrances to the area designating it as a shared zone (Figure B 18). However, no specific posted speed limit was applied to the shared zone area and the default urban speed limit (50 km/h) applied.

Figure B 18: Traffic signs used at entry points to shared space



Source: Auckland Council (2012a).

Within the shared space, drivers are required to observe low speeds and give way to pedestrians. Vehicles are not permitted to stop, except between 6.00 and 11.00 am for 5-minute periods to allow for loading deliveries and drop-offs. Vehicles are never permitted to stop within accessible zones (refer to Figure B 15).

To enable creation of the shared space, the majority of on-street parking within the shared space areas was removed, but motorcycle and bicycle parking was retained.

B.4.5 Evaluation

A key objective of the improvements was to attract more pedestrians to this area of the Auckland CBD. Evaluation was conducted of the Stage One area (Figure B 14) comparing conditions before and after installation of the new shared space environments. The evaluation included analysis of pedestrian and vehicle volumes, vehicle speeds, vehicle and pedestrian monitoring and conducting surveys of pedestrians, vehicle users, retailers and property owners.

Key outcomes of the evaluation of the Fort Street area included (Auckland Council 2012a):

- Foot traffic increased by 50% during peak hours (comparing pre-works in 2008 to post-works in 2011).
- There were noticeably fewer vehicles and they travelled at slower speeds
 - fewer vehicles used the area per hour and over the full day on Fort Street and in Jean Batten Place
 - average speeds were reduced between 5 and 9 km/h
 - average speeds were reduced to 20 km/h during mid-day periods when the greatest pedestrian activity occurred
- Ninety-one per cent of users and stakeholders were highly complementary of the new shared space, compared to 17% before; over 75% of property owners determined that being sited near or adjacent to a shared space was valuable.
- Almost half of those surveyed (49%) would visit the area more often, as a destination in its own right.

The assessment occurred whilst the Fort Street shared spaces were still relatively new and provided an early indication of their impact on Auckland Council's objectives for upgrading the area. However, further evaluation and assessment of this and other similar schemes will be required to gain an understanding of the long-term impacts and benefits of shared space.

B.5 Parramatta City Centre Integrated Transport

B.5.1 Background

This case study discusses methods of traffic management that have been applied in the Parramatta City Centre to support public and active transport, while decreasing reliance on private vehicle trips.

Parramatta is a major economic centre and rapidly growing regional city in New South Wales with planned growth of 20 000 residents and 30 000 jobs by 2031. To support this planned growth and the significant impact that it would have on travel demand, the *Parramatta City Centre Integrated Transport Plan* (Parramatta City Council 2010) was developed.

The Integrated Transport Plan (ITP) recognised the challenges related to private car travel, potential issues in growth areas and the importance of encouraging more sustainable modes of travel in order to provide for planned demands. Transport planning objectives included (Gray 2008):

- improving access and amenity for pedestrians and cyclists
- improving the legibility of the city centre for pedestrians and drivers
- managing and balancing the needs of public transport users
- reducing commuter car traffic and unnecessary through traffic
- managing destination and through traffic more efficiently and minimising its impact.

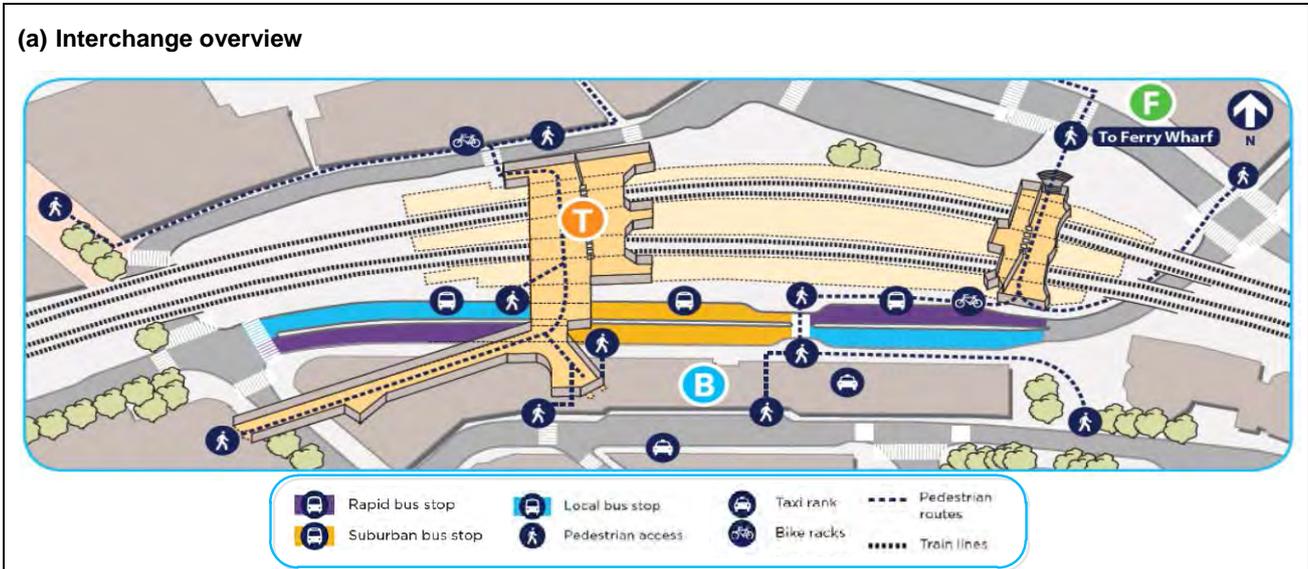
B.5.2 Facilitating Public Transport Use

As noted in Section 3.11, an essential objective of planning policy in activity centres is that they are served by public transport. In Parramatta, 26% of commuters used public transport to travel to and from the Parramatta CBD, and the Parramatta rail station was identified as the fourth busiest in the Sydney area (Transport for NSW 2013a). Public transport services in the Parramatta CBD include rail, bus and ferry services. In addition, a free shuttle bus circulates around the city centre. To support future growth and demand for public transport in Parramatta and the Western Sydney region, a light rail network has also been proposed.

Parramatta Transport Interchange

The hub of public transport in the Parramatta City Centre is the Parramatta Transport Interchange (Figure B 19). The interchange was completed in 2006 and linked the Parramatta rail station with a new bus interchange adjacent to the rail station.

Figure B 19: Parramatta Transport Interchange



Source: Transport for NSW (2013a).

(b) Signalised pedestrian crossing to access station



Source: Roads and Maritime Services (unpublished).

(c) Bus-only entrance and exit to interchange



Source: Roads and Maritime Services (unpublished).

(d) Outdoor cafes adjacent to bus pick-up area



Source: Roads and Maritime Services (unpublished).

(e) Interchange and adjacent retail area



Source: Parramatta City Council (2010).

The interchange consolidated bus services into one location, including local and suburban buses, the Western Sydney Transitway (T-way) and long distance coach buses. The interchange integrated bus and rail services with other facilities such as a nearby taxi stand, bicycle parking and a number of key destinations within close proximity. Other features of the interchange included:

- underground pedestrian connections and surface level pedestrian crossings between the rail station, bus interchange, adjacent streets and the Westfield Parramatta Shopping Centre
- lifts and escalators that provided access to all platforms
- bus-only access onto Argyle Street at the bus interchange, Figure B 19 (c)
- designated passenger set down and pick-up (i.e. kiss- and-ride) areas
- outdoor cafes located in the interchange precinct and adjacent to waiting areas, Figure B 19 (d).

However, a number of challenges with the transport interchange have been identified requiring future consideration (Parramatta City Council 2010, Transport for NSW 2013a). Due to bus contractual arrangements and the radial nature of bus routes, most services commence or terminate at the interchange. This affects congestion and local amenity in the city centre and creates a shortage of bus layover space at the interchange. Additionally, passengers are required to interchange between bus services in order to reach nearby destinations, thereby decreasing public transport connectivity between the areas around Parramatta.

Free Parramatta shuttle bus

To improve pedestrian access to the city centre, a free shuttle bus was introduced in 2008 that operates at a 10 minute frequency during daytime time periods. The bus service was introduced in order to (Parramatta City Council 2010):

- provide a fully accessible bus service around the city centre
- reduce walking distances and journey times for pedestrians
- connect significant destinations (e.g. Parramatta Transport Interchange, ferry wharf, Justice Precinct, NSW Police Headquarters and Jessie Street Centre).
- integrate bus services terminating at the interchange with locations around the city
- provide an alternative to moving around the city centre by car
- increase the visibility of businesses around the city
- re-connect the City Centre with areas further north
- promote economic growth.

B.5.3 Supporting Pedestrians and Cyclists

Pedestrian wayfinding

As noted in Section 3.8.2, a connected and well-signposted walking environment is an important aspect of providing pedestrian amenity. The Parramatta City Centre previously had an out-dated pedestrian wayfinding system and a confusing collection of other pedestrian signs. In 2008, a study was undertaken to audit the existing system, which led to the introduction of a new pedestrian wayfinding system in 2009. The system introduced signs containing 'heads-up' maps that included orientation to the viewer rather than north, 3D images of landmark buildings and pedestrian travel time, Figure B 19 (a). Fingerboard signs were also installed indicating distances and pedestrian travel time to key destinations in the city centre, Figure B 19 (b).

Figure B 20: Pedestrian wayfinding signs



Source: Provided by ARRB Group (unpublished).

Permeable blocks

Section 2.3.2 noted that permeable blocks and sites are as important as formal street and walkway networks for pedestrian planning. To consider this factor, a plan was developed to activate the city’s numerous small laneways to create a network of pedestrian routes and to develop new north-south pedestrian links in the CBD to complement the existing strong east-west road network within the city centre (Parramatta City Council n.d.). The plan included a series of actions for developing lanes as safe and desirable places, including increasing activation in the lanes. Activation included increasing pedestrian life and activities in the lanes, and developing lanes with more windows, entries and interesting elevations.

Church Street pedestrian mall

The Church Street pedestrian mall forms the main pedestrian thoroughfare within the city centre (Figure B 21).

However, the mall experienced a severe loss of circulation, a downturn in trade and the gradual loss of quality strip shopping over a 20-year period. This led to the mall being partially re-opened to traffic in 2007 on the section between Macquarie Street and George Street (Figure B 22). The change was made to increase the level of activity in the area and provide a countermeasure to loitering crime levels and shop vacancy rates. The re-opened section included a number of new features such as:

- planting of semi-mature trees
- improving lighting and installing pedestrian fences, planter boxes, public art and high quality seats and bins
- creating a narrow roadway with widened sidewalks that catered for pedestrian activity
- introducing a 40 km/h speed limit zone supported by speed humps
- limiting on-street parking.

Figure B 21: Church Street Pedestrian Mall



Source: Provided by Roads and Maritime Services (unpublished).

Figure B 22: Section of former Church Street pedestrian mall re-opened to vehicular traffic



Source: Provided by ARRB Group (unpublished).

At the time of writing, additional renovations were underway on the section of Church Street retained as a pedestrian mall. This area was being upgraded and renamed as Centennial Square (the historical name for this area of the city centre). Upgrades are expected to include improved lighting, modern paving and street furniture, new retail structures, and a new fountain.

Pedestrian and cycle amenity zone

A pedestrian and cycle amenity zone was proposed with the aim of reducing traffic speed, changing traffic flows and behaviour to improve pedestrian and cyclist road safety and increasing pedestrian accessibility by providing safer road crossings. Measures to support the zone included:

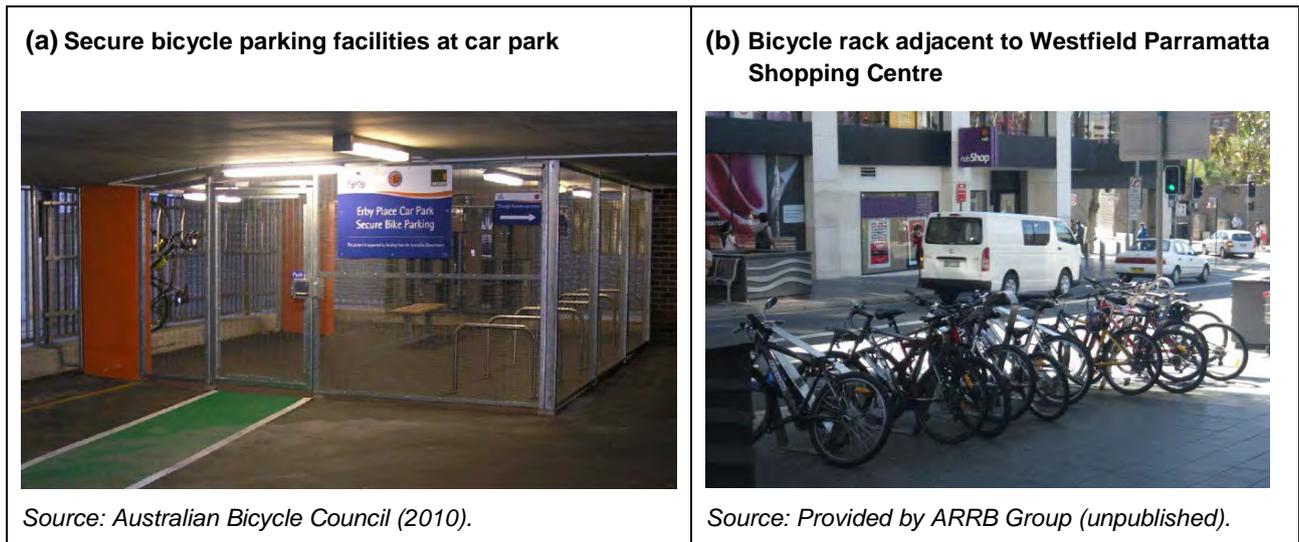
- introducing reduced 40 km/h speed zones on streets in the proposed zones
- providing pedestrian refuge islands, signalised pedestrian crossings and scramble pedestrian phasing at intersections
- implementing additional cycling routes to the city centre and increasing cycling parking provision
- considering measures to reduce pedestrian-vehicle conflicts at driveways
- investigating the widening of footpaths through the reallocation of road space.

Encouraging cycling

The Parramatta City Centre ITP and Bike Plan (Parramatta City Council 2010 and 2009) included a number of initiatives to encourage cycling. These included providing parking, enhancing awareness of bike lockers in the centre and improving cycle routes accessing the centre.

As part of efforts to improve bicycle parking with the Parramatta City Centre, secure bicycling facilities were installed in re-allocated space within the Horwood Place and Erby Place car parks in the city centre. Facilities included bicycle parking cages, lockers, changing rooms with showers, 24-hour surveillance of the storage area and green-coloured bicycle lanes that guide cyclists from the car park exterior to the location of the bicycling facilities (Figure B 23 (a)). Bicycle racks have also been provided at locations within the city centre (Figure B 23 (b)) and bike lockers at the Parramatta Transport Interchange and ferry wharf.

Figure B 23: Bicycle facilities in the city centre

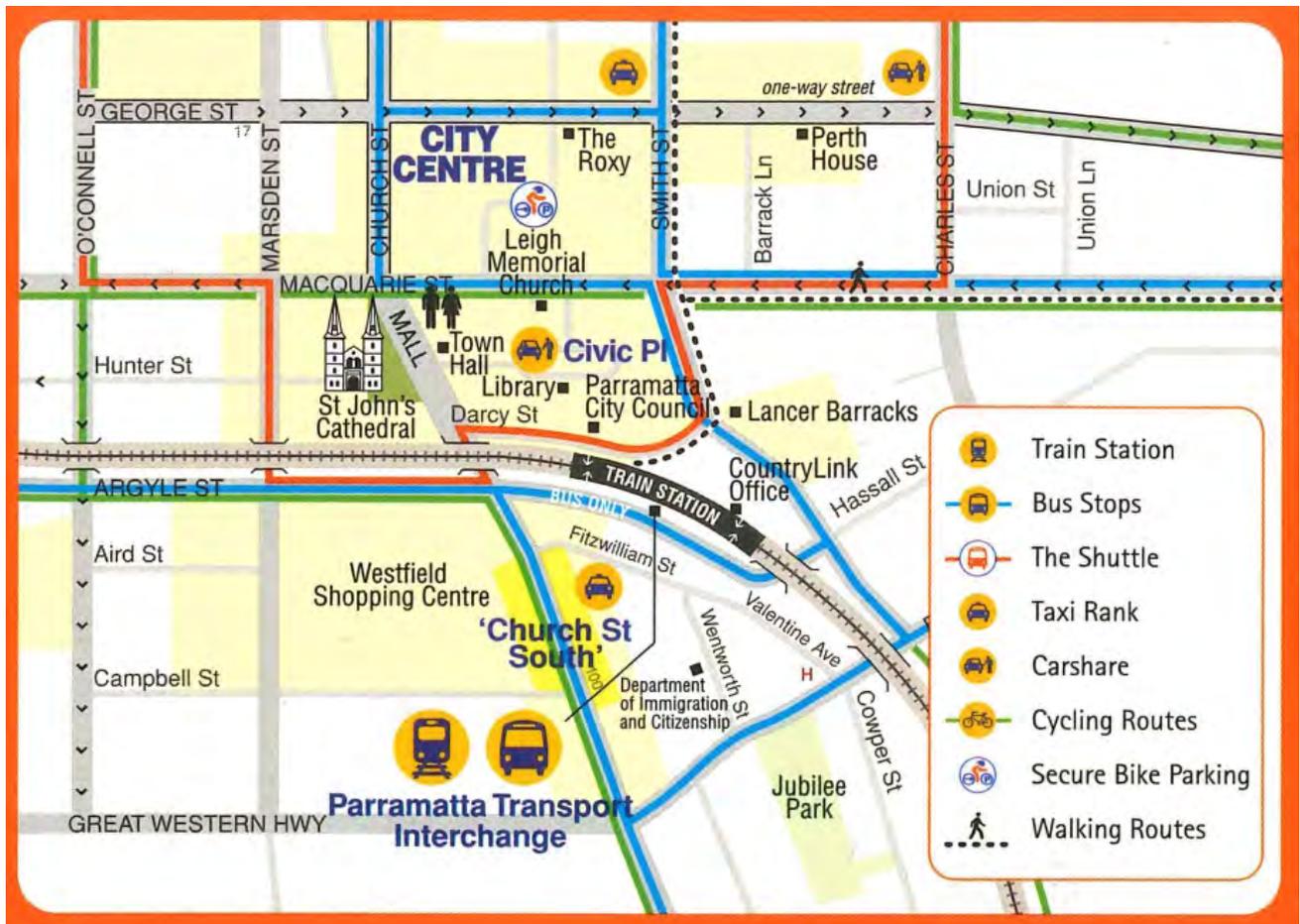


Several regional cycling routes lead to the city centre or its vicinity from surrounding areas including routes following the Parramatta River, M4 Motorway, T-way and rail corridors. However, missing links have been identified and plans proposed to improve connectivity and provide greater quality routes. This was expected to improve access to the city centre and provide cycleways traversing the city centre that will link with the regional routes (Parramatta City Council 2009, Transport for NSW 2013b).

B.5.4 Encouraging Sustainable Travel

In order to encourage sustainable travel to and from the Parramatta City Centre, the Parramatta City Council developed the *Sustainable Transport Guide* (Parramatta City Council n.d.). The guide contained comprehensive sustainable transport information based around a map of the city centre including transport facilities such as the Parramatta Transport Interchange, ferry wharf, bus stops (including stops for the free city centre shuttle bus), the locations of car share vehicles, taxi ranks and bicycle parking facilities (Figure B 24). The guide also indicated key pedestrian routes through the city centre, cycling routes and other community services.

Figure B 24: Parramatta City Centre Sustainable Transport Guide

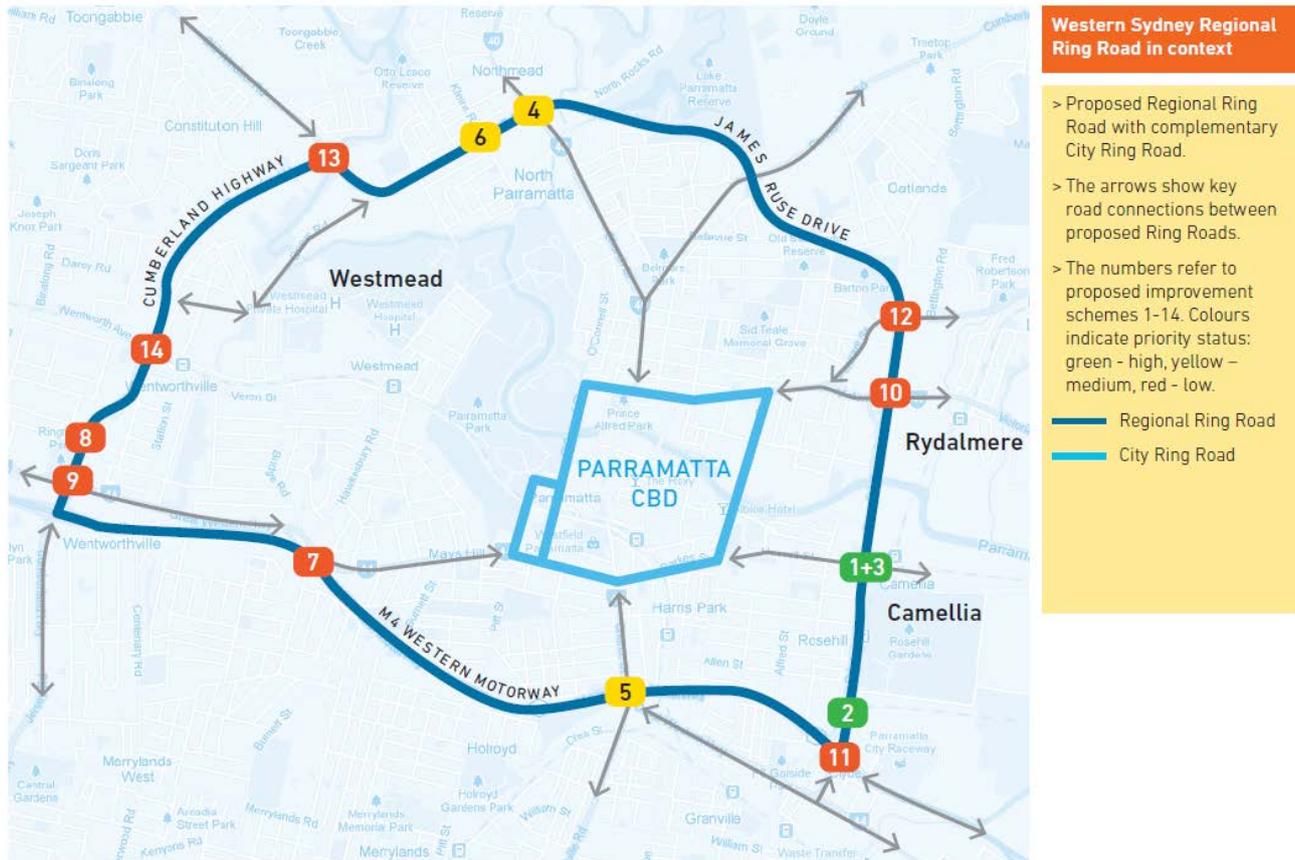


Source: Parramatta City Council (n.d.).

B.5.5 Network Management

Parramatta is served by eight strategic road corridors that converge on it, creating a challenge for managing the road network. In order to minimise the need for non-destination traffic to enter the city centre, two ring roads were identified – an inner city ring road located on the edge of the Parramatta CBD and an outer regional ring road (Figure B 25). The ring roads were proposed based on existing bypass road corridors around Parramatta. Upgrades were identified at key locations to improve the attractiveness of the bypass routes, particularly for locations with access or capacity limitations.

Figure B 25: Proposed regional and city ring roads



Source: Parramatta City Council (2012).

B.5.6 Car Parking

The *Parramatta City Centre Car Parking Strategy* and ITP (Parramatta City Council 2011 and 2010) developed a number of policy considerations for managing short and long-term parking and considering the resulting effects on traffic congestion and expected economic growth in the city centre.

One policy consideration was to shift the balance at car parks from commuter to short-stay parking. This was investigated in order to better serve the retail, dining and service sectors and minimise commuter pressure on the road network during peak periods in the city centre. To support this initiative, the ITP recommended relocating all-day commuter parking from the Parramatta City Centre core to its periphery. Two existing and two proposed car parks were identified, located adjacent or near to the proposed future city ring road (Figure B 25) which provided easy access to the arterial road network. The free Parramatta shuttle bus (Appendix B.5.2) connected the car parks with destinations in the city centre. In the long-term, this was expected to allow car parks within the city centre to be re-developed as part of the future growth of the city centre.

Another initiative realigned the layout of the Council's multi-story car parks. It was observed that leased space occupied the bottom decks of the car parks with commuters utilising the next available levels. This left the upper decks for short-stay visitors, contributing to the perception that there was a lack of public parking in the city centre. Shifting of leased and commuter parking to upper levels was recommended to address this issue.

B.5.7 Other Measures

A number of other measures have been introduced to support multi-modal transport in the Parramatta City Centre including (Parramatta City Council 2010):

- introducing a car sharing scheme into the Parramatta City Centre in 2007, with car share vehicles now available at several locations in the CBD
- locating taxi ranks at a number of points in the city centre to assist potential passengers in finding a taxi and reducing unnecessary circulating traffic
- providing dedicated motorcycle parking at a number of on and off-street locations to encourage motorcycling as a travel mode.

Appendix C Road Hierarchy and Pedestrians

For pedestrians to be considered and integrated as valid users of the road system, the measures which can be adopted to facilitate pedestrian movement will be influenced by functional road hierarchy considerations, i.e. the access and movement functions of the road. For the purposes of this commentary, road hierarchy is discussed in terms of 'Local Streets', 'Collector Streets' and 'Arterial Roads'.

C.1 Local Streets

Pedestrian movements in residential areas are now addressed explicitly at planning and policy levels, in recognition of walking as an important mode of travel for all trips in suburban areas. The *Australian Model Code for Residential Development (AMCORD)*, (Green Street Joint Venture 1992), specifies pedestrian and cyclist needs as an integral component of the total transportation network, and not as an afterthought subsidiary to the requirements of the motor vehicle. The provision of pedestrian facilities within residential areas should meet the objectives, performance, and deemed-to-comply criteria of AMCORD.

The overall pedestrian/vehicular conflicts may be reduced by design with separate pathways, open spaces for pedestrians, play areas for children away from vehicular intrusion, and by minimising through traffic.

A viable alternative is the implementation of shared zones (refer to Appendix E). Other local area traffic management techniques, which reduce the volume and speed of traffic in residential areas, significantly improve the general level of safety for pedestrians. However, the trend in some local street design to not provide a paved footpath is not in the best interests of most pedestrians, particularly those with mobility disabilities, as they are forced to travel on the roadway amongst vehicular traffic.

C.2 Collector Streets

In view of the increased vehicular traffic function and associated higher traffic speeds on collector streets the design should provide a footpath removed from the general path of vehicles. Other techniques such as kerb extensions and pedestrian refuges may also be used. On most collectors it is unlikely that vehicle and/or pedestrian volumes will be high enough to justify formal pedestrian crossing devices except outside schools, where a school crossing, associated parking bans, and a reduced speed limit may be considered. Generally, the use of integration techniques such as signing, speed deterrent devices, parking restrictions and traffic management measures may be applied where appropriate and these will enhance pedestrian safety.

C.3 Arterial Roads

Arterial roads constitute a major problem in pedestrian mobility and safety, as the provision for pedestrians on the arterial road system will be in conflict with the principal function of moving traffic. While a satisfactory balance may be achieved in environments with a low incidence of pedestrian demand, problems occur where arterial roads pass through the older strip shopping developments commonly encountered along arterial or sub-arterial roads.

There is scope for the use of grade (spatial) separation techniques on arterial roads. These are essential where pedestrians need to cross freeways and high-speed high-volume roadways. Elsewhere they are used where the expected pedestrian flow is high enough to justify the high costs involved, e.g. near a large school or a railway station. General treatments such as footpath (kerb) extensions and/or central refuge islands can be used to assist pedestrians to cross arterial roads. These may be combined with time separation techniques to provide the next best level of assistance to pedestrians.

The most common pedestrian crossing facilities on non-freeway arterial roads include zebra crossings, pedestrian operated signals, and pelican crossings (which include a flashing amber sequence for the motorist, commonly used in Perth, Sydney, Darwin, and the UK). Another type of signalised pedestrian crossing, a puffin crossing, includes pedestrian sensor mats and infra-red pedestrian detectors. Pelican and puffin crossings can significantly reduce vehicle delays compared with standard pedestrian operated signals by allowing the pedestrian crossing time to be reduced when pedestrians cross more quickly. Pedestrian safety is also expected to be enhanced with puffin crossings due to the ability of the installation to detect pedestrians late crossing the roadway and hold the vehicular traffic on a red signal. On the other hand, zebra crossings on arterial roads have been shown to be associated with higher pedestrian accident frequency and are now not favoured on this class of road. Treatments available to assist pedestrians at crossings of roads are further discussed in Section 8 of the *Guide to Traffic Management Part 6* (Austroads 2013c).

Appendix D Information Gathering

The following is a checklist of information that may be required in activity centre traffic management studies (based on Roads and Traffic Authority NSW 2000).

D.1 Existing Physical Conditions

Information on existing physical conditions may include:

- reservation width
- cross-sections and longitudinal section
- intersections and treatment
- property boundaries
- driveways and vehicular access
- building line and setbacks
- underground services.

D.2 Frontage Function

The nature of the activities abutting a road will have an influence on the level of pedestrian and vehicle activity it generates. Relevant information that may need to be gathered includes:

- pedestrian, vehicle-oriented, and mixed pedestrian/vehicle use activities
- major pedestrian traffic generators
- active and secondary frontage
- major vehicle traffic generators
- vehicular site access and laneways
- existing zoning and development conditions
- identification of any development proposals within the study area.

D.3 Traffic and Parking Management

Existing traffic management provisions and infrastructure to be noted could include:

- intersection control
- pedestrian and bicycle facilities, including grade separations and deterrents (fencing etc.)
- speed control and speed limits
- provision for cyclists
- taxi ranks
- provision for disabled
- bus stops and other transit stops nearby
- loading and unloading zones
- on-street parking parallel/angle, numbers, duration, utilisation
- off-street parking spaces, numbers, location, duration, utilisation.

D.4 Parking Demand and Usage

Current parking behaviour can either provide measures of demand for centre development and operation, or it can establish a benchmark that indicates the extent of behaviour change that might be required to achieve sustainability objectives for the centre. Parking studies can provide information on:

- current parking demand rates, by type of activity, time of day, length of stay and so on
- the way parking needs change as the usage of the centre changes across the day (e.g. entertainment uses becoming dominant in the evenings)
- current problem areas
- the convenience and quality of access, distribution and location of parking areas relative to walkways
- likely problems that may occur in the future, without intervention.

Procedures for parking studies are detailed in *Guide to Traffic Management: Part 11: Parking* (Austroads 2008c).

D.5 Vehicle Movement

Surveys of traffic movements (including cycling) will provide information on the following:

- traffic volumes (daily and peak hour at cordon points); additional information should be obtained if significant variations occur during the year (e.g. tourist season)
- times, volumes, and types of vehicles accessing the centre for deliveries and services
- speed profiles (both directions) for peak and off peak conditions, based on the 85th percentile speed (v85)
- O-D surveys; proportion of traffic which is through traffic
- public transport routes, frequency and patronage
- cycling (noting that observed level of cycling may not truly reflect the latent/suppressed level of demand for cycling that may occur if facilities were better).

D.6 Pedestrian Movements

Pedestrian volumes, behaviour, and desire lines are basic building blocks for infrastructure decisions, street space allocation, and dealing with conflicts with vehicles. Data to be collected may include:

- pedestrian desire lines
- pedestrian flows on footpaths (midblock, crossing imaginary line)
- activity profile (pedestrian attractors)
- pedestrians crossing at designated facility, location, time
- jaywalking numbers, location by street block, time; generally mid-block crossings without designated facilities
- jay-runner (pedestrian crossing at other than legally defined points, generally mid-block, and proceeding at running pace) numbers, location by street block and time.

Observations may be carried out manually or by use of technology such as infra-red sensors.

'Walking audits' can be used to supplement information on existing behaviour and needs.

The general purpose of an audit is to identify concerns for pedestrians and bicyclists related to the safety, access, comfort, and convenience of the environment. In addition to identifying problem areas, an audit can be used to identify potential alternatives or solutions (such as engineering treatments, policy changes, or education and enforcement measures (Pedestrian and Bicycle Information Center 2008a).

For further guidance on this topic, refer to Section 3.4.3 of the *Guide to Traffic Management: Part 3* (Austroads 2013a), Cluster for Physical Activity and Health (2007), NZ Transport Agency (2008, 2009, 2010a) and Pedestrian and Bicycle Information Center (2008a).

D.7 Attitudinal Surveys

There may be opportunities for interviews and other surveys aimed at finding out the reasons for the observed behaviour and what factors are important in sustaining or changing that behaviour. This is a specialised area and needs the input of appropriately trained professionals.

D.8 Safety Audit and Crash Data

Existing and potential future road safety issues can be indicated by safety studies:

- formal or informal safety audit of existing conditions and/or proposals (refer to the Guide to Road Safety: Part 6 (Austroads 2009b) for methodology)
- accidents: fatalities, injuries, property damage, proportion involving pedestrians – by location and in total (refer to the Guide to Road Safety: Part 8: Treatment of Crash Locations, Austroads 2009j)
- accident pattern by age of driver/age of pedestrians, day of week, time of day, type of accident (road user movement)
be aware that in small areas accident data may not be useful due to the small number of incidents
- reconnaissance and observations on road user behaviour, potential conflicts etc.

Appendix E Speed Management in Pedestrian Areas

Speed management in activity centres can employ a range of related traffic management and design concepts.

E.1 Traffic Calming Treatments in Activity Centres

Traffic calming is essentially about speed management.

Traffic calming techniques, as most widely applied, include vertical and horizontal speed control devices, intersection treatments such as roundabouts, pavement and kerb realignments, pedestrian treatments and variations in materials and colours. The *Guide to Traffic Management: Part 8* (Austroads 2008b) discusses these treatments and their application in detail.

Not all of these treatments will be applicable in activity centres. For example, there are limitations in many jurisdictions on the use of vertical speed control devices on bus routes. The practitioner will need to note the limitations of treatments specified in Part 8. Treatments that can find application in activity centres are noted in Section 3.7.

Physical treatments that are compatible with (or form part of) the architecture of the street are likely to find most ready application and acceptance in activity centres.

E.2 Pedestrian Priority Areas

'Pedestrian Priority Area' does not have an accepted official definition and does not clearly point to specific traffic management or design treatments. The term 'pedestrian priority' can take a variety of meanings, such as:

- A street or zone in which pedestrians have legal priority over vehicles, wherever they may choose to cross. This situation exists in a number of overseas jurisdictions.
- Simply a street or zone in which priority is given to developing 'pedestrian friendly' conditions, especially in relation to vehicles.

The 'pedestrian priority' concept underlies most of the traffic calming and speed management concepts for activity centres. It can involve changes in legal responsibility and priority (as in shared zones and the *woonerf*), or reflect priorities in physical provisions or budget allocations.

E.3 Reduced Speed Zones in Pedestrian Activity Areas

Speed zones may be implemented in activity centres with a lower speed limit than the urban default speed (i.e. 50 km/h). As noted in Part 5 of the *Guide to Traffic Management* (Austroads 2014b), a lower speed limit may be assigned to sections of a road or parts of a network that have a high probability of conflict between various road users. In road areas abutting commercial or recreational land-uses, substantial vehicle and high pedestrian movements may be generated into and across a road. For these types of areas, a number of road agencies in Australia and New Zealand have introduced reduced speed zones. Other traffic management or design changes may be necessary to support a reduced speed zone. Refer to Section 3.6 and Part 8 of the *Guide to Traffic Management* (Austroads 2008b).

Examples of reduced speed zones discussed in this guide are included in Section 4 and Appendix B.3. For further guidance on the application of speed limits, refer to Section 5 of the *Guide to Traffic Management: Part 5* (Austroads 2014b) and the *Guide to Road Safety: Part 3: Speed Limits and Speed Management* (Austroads 2008d).

E.4 Pedestrian Streets and Transit Malls

Pedestrian malls can exclude motor vehicles during part or all of the day. Limited access for delivery and service vehicles during part of the day is usually required. The status of bicycles in a pedestrian area needs a clear decision and enforcement. Current urban design tends to oppose full pedestrianisation of a street, on the grounds that some traffic is considered desirable to create a level of street 'activity' and personal security.

Transit malls allow on-road public transport (buses, trams and sometimes taxis) to pass through the pedestrian street. This aids their route efficiency in terms of directness and exposure to the highest passenger density. Speed limitations (down to 20 km/h or less) are usually required but are often ignored.

Pedestrian malls are discussed in Clause 10 of AS 1742.10-2009. Examples of pedestrian streets and transit malls are provided in Section 4.5.3.

E.5 Shared Zones

A shared zone is a segment of a street (or network of streets) in which drivers must give way to pedestrians. The speed is typically posted at 10 km/h (or nominal walking pace). In this application, a shared zone is thus a form of pedestrian priority area. Shared zones are mentioned in Part 5 (Tables 5.4 and 5.5) and Part 8 (Sections 2.2, and 7.5.7) of the *Guide to Traffic Management* (Austroads 2008b and 2014b). Also refer to Clause 3.2.6 of AS 1742.4-2008.

The shared zone in activity centres is related to the *winkelerf*, the retail area version of the *woonerf*, the 1970s Dutch concept of a shared slow-speed street in a residential environment. Experience in the *woonerf* has been that some pedestrians, especially the elderly, the mobility-restricted and parents of small children, are uncomfortable with having to walk on the same street surface as vehicles, and protected sidewalks where moving or parked vehicles cannot go are often required.

Examples of shared zones presented in this guide include:

- Albert Street shared zone, Brisbane CBD, Qld. (refer to Sections 4.1.3 and 4.5.3)
- Queen Elizabeth Drive shared zone, Bondi Beach, NSW (refer to Section 4.10.3)
- Fort Street area, Auckland, NZ (refer to Appendix B.4).

E.6 Roadway Reduction: 'Road Diets'

'A road diet entails removing travel lanes from a roadway and utilising the space for other uses and travel modes' (Rosales 2006).

Australian and New Zealand authorities have been employing such techniques for many years and there are many precedents to follow. In broad terms, it has been learned that midblock roadway width in urban centres can be traded off for gains in parking, bicycle provision and a median without significant reduction in total throughput. Rosales (2006) reported US research that concluded that:

- Observed conflicts reduced, from which it was concluded that crash rates would fall.
- Intersection delay did not increase significantly.
- Peak hour approach delay and queue lengths did increase.
- One through-lane in each direction and an opposing right turn lane at intersections performed better than a four-lane undivided road.
- Travel speeds did not change substantially.
- Levels of service were similar compared with four-lane cross-sections up to peak volumes of 1000 vehicles per hour per direction.

This suggests that single lane conversions are feasible at traffic volumes of 15 000 vpd or more, confirming European experience where such treatments have succeeded on streets carrying up to 20 000 vpd.

Traffic throughput is maintained because, in urban networks, intersections tend to control system capacity. However, care needs to be taken to check for queue lengths developed back from intersections, particularly signals. The success of lane and width reductions may depend on the degree of circulating compared with through traffic, and the side friction caused by on-street parking manoeuvres.

E.7 'Shared Space' ('Naked Streets')

'Shared space' (also referred to as 'shared streets' and sometimes misleadingly called 'naked streets') is a design approach that 'seeks to change the way streets operate by reducing the dominance of motor vehicles, primarily through lower speeds and encouraging drivers to behave more accommodatingly towards pedestrians' (Department for Transport 2011). Footways, kerbs, linemarking and intersection controls are typically removed. Precedents for the principal elements of this strategy could be found in Shared Zones (Appendix E.5) and in the Dutch *winkelerf* (application of *woonerf* methods to shopping areas). The most familiar existing environments that reflect pedestrian-vehicle interaction under minimal regulation and traffic control can be found in car parks and private traffic areas such as caravan parks.

The characteristic feature of these zero-management streets is the overt reliance on the built environment and level of activity rather than traffic management to influence road user interaction, sort out conflicts, and determine appropriate behaviour. It relies on uncertainty and the consequent (claimed) reduction in risk compensation.

Key design principles for creating shared spaces include (Department of Planning, Transport and Infrastructure 2012):

- reducing vehicular speeds below 25 km/h through physical measures
- providing the same level surface across the street, but retaining a gentle slope for stormwater drainage
- reducing the distinction between vehicular and pedestrian spaces, though vehicular paths should be legible
- removing physical barriers separating street users and different modes of transport
- removing traffic signs and minimising line markings
- minimising conventional traffic measures (e.g. signs, chicanes, traffic islands or road markings) in favour of visual cues in the street design
- encouraging local expression of the space through urban design.

An important principle to consider when creating shared spaces is that in order to enhance pedestrian priority, multiple cues may be required to reinforce that drivers no longer have the right-of-way (Transfund 2004).

The shared space concept is based on a sharp distinction between traffic routes and pedestrian streets, the latter being appropriate for zero traffic management treatment. Overseas guidance suggests that the concept may be considered where vehicle speeds are below 40 km/h, and preferably 25 km/h or less. Volumes are typically less than 5000 veh/d.

The status of roads on which pedestrian activity overlays an important traffic network function – where place and link functions are both relatively high – (such as a suburban strip or town centre straddling an arterial or main road) is unclear. This may prove to be a weakness of the concept, since these are the most common and problematic of activity centre situations.

Success of this concept may depend on the nature of the street's physical character, the functions of the centre it serves, and the detailing of the shared space. It is likely to be essential, in any event, to provide car-free parts of the street space for those pedestrians who choose not to assert priority in a shared space, as was the experience in the *woonerf* as mentioned above.

Recent developments of shared spaces in the UK are documented in a comprehensive guide (Department for Transport 2011), which presents the principles of the facilities, the needs and behaviour of the road users (pedestrians, cyclists and vehicle drivers), the development of shared space schemes and detailed advice on design. A recent application of shared space in Auckland is discussed in the case studies presented in Appendix B. Another example of shared space was implemented in Bendigo, Victoria and is discussed in Department of Transport (2012).

Appendix F Measures for Environmental Adaptation

Source and for further detail: Roads and Traffic Authority NSW (2000).

The range of measures for environmental adaptation falls into two major groups:

- control measures (traffic management and development control)
- design and construction measures (in the vehicle space and in the pedestrian space).

The measures vary a great deal in nature, cost, and timeframe required for implementation.

F.1 Measures to Achieve Desired Outcomes

The various measures can be categorised according to which of the three objectives noted in Section 3.7 they aim to support:

- measures to support a speed profile
- measures to support an activity profile
- measures to improve the quality of the road environment.

Table F 1 derived from *Sharing the Main Street* (Roads and Traffic Authority NSW 2000), lists measures (as 'primary' and 'supporting' measures) to achieve each of these objectives. Practitioners should also refer to Appendix A in *Sharing the Main Street*, which illustrates each measure and gives a brief commentary for each to highlight its specific aims, characteristics/applicability, limitations and expected impacts.

F.1.1 Measures to Achieve a Target Speed Profile

The principal objective of traffic management on streets within activity centres is to increase safety by reducing vehicle speed. The measures listed in Table F 1 should be combined as a package, since one single measure can seldom provide a solution for a reduction in vehicle speed. The effectiveness of a measure also varies. Part 8 of the guide (Austroads 2008b) contains advice on how to estimate the speed reducing effect of a device and how treatments can be combined to produce a desired speed profile through the techniques of 'speed based design'. The desired speed profile should anticipate a gradual and not a sudden change in speed, and reflect the maximum desired speed in the street section (the 'street speed'). (Roads and Traffic Authority NSW 2000, Figure 1.14).

Typically, the treatments to achieve a lower speed profile on a street entering an activity centre may commence with a gateway and/or a roundabout, followed by changes in the road cross-section, changes in parking layout, pavement surfacing, vegetation and street lighting, type of pedestrian crossings and intersection treatments.

Table F 1: Measures for environmental adaptation of streets through activity centres

Primary measures	Supporting traffic management measures
Measures to achieve a speed profile	
Speed zoning Gateway Roundabouts Traffic signals Staggered roadway Carriageway/lane narrowing Raised pavement within intersection Raised pavement mid-section Shared/raised pedestrian crossing Two lane entry threshold Pedestrian crossings Cross pavement markings Variable carriageway pavement Management of on-street parking Management of on-street loading Off-line bays Tree planting in median strip Tree planting in road shoulder	Shared space Side street closure T-intersection rearrangement Staggered intersections Channelisation Street lighting
Measures to achieve an activity profile (define and contain the pedestrian core)	
Activity-based zoning Frontage width control Floor space ratio control Mixed use development Infill/redevelopment Footpath extension Footpath utilisation Pedestrian crossings Bus stops Off-street vehicular access/parking Management of on-street parking Shared/raised mid-block crossing Side street closure (to create pedestrian continuity) Awning/veranda (to create climate protection)	Road closure – Main Street Shared space Narrow median Wide median Streetscape Heritage conservation Advertisement control Tree planting in footpath Tree planting in median strip Tree planting in road shoulder Street lighting Bicycle way Bicycle storage
Measures to improve the quality of the road environment	
Gateway Views and vistas Streetscape Footpath extension Footpath pavement design Footpath utilisation Tree planting in median strip Tree planting in road shoulder Tree planting in footpath Creating a community focus Heritage conservation Awning/veranda Advertisement control Street lighting	Shared space Variable carriageway pavement Differentially coloured bike and bus lanes Side street closure Carriageway/lane narrowing Narrow median Wide median Pedestrian crossings Management of on-street parking Bicycle storage Bus stops Off-street vehicular access/parking Light traffic thoroughfare Activity-based zoning Mixed use development Infill/redevelopment

Source: Roads and Traffic Authority NSW (2000). Refer to the Guide to Traffic Management Part 8 (Austroads 2008b) for further detail.

F.1.2 Measures to Support an Activity Profile

The main objective of establishing an activity profile is to define the area of highest pedestrian activity (the 'core zone' of the centre). The controls by which this is done are generally exercised through planning and development control, for example by creating a core where pedestrian-generating activities are concentrated and a transition zone where vehicle-oriented activities are located (Roads and Traffic Authority NSW 2000):

'Activities which attract both pedestrians and vehicles, such as supermarkets, may be located between these dominant forms of activity. Alternatively, they can be located with a pedestrian frontage at the front and a vehicle orientation at the rear'.

However, there are also road and traffic measures that can assist greatly in strengthening the core of a centre. These include footpath width, paving and utilisation, continuity of weather protection and pedestrian movement (e.g. side street closures), and creation of shared zones.

F.1.3 Measures to Improve the Quality of the Road Environment

Many of the measures available for creating a speed and activity profile can also be used to improve the quality of the road environment. For instance, footpath extensions (kerb build-outs) can enlarge and enhance the pedestrian space while also constraining the vehicle space in the street (Roads and Traffic Authority NSW 2000).

Where possible, it is preferable to use measures to influence and control traffic which are also part of the architectural and design toolkit for street improvements. While there is little technical information on the specific effects that such measures have on driver behaviour, it can be expected that measures that increase driver perception of a pedestrian-dominated space will contribute to the speed reducing effect of physical treatments and traffic control measures in the roadway itself.

F.1.4 Where and When Measures Can be Used

Sharing the Main Street (Roads and Traffic Authority NSW 2000, Table 4.5) provides advice on the suitability of different design and construction measures depending on peak hour flow, width of road reservation and shifts in priority.

F.2 Practical Issues

In applying the measures in combinations, the interactions between treatments (compatibilities and incompatibilities) need to be considered, including the following (drawn from Roads and Traffic Authority NSW 2000 p. 54):

- Bus stops are generally incompatible with angle parking.
- Taxi stands require a forward movement after picking up a passenger and are generally not appropriate in angle parking locations.
- Roundabouts work best with pedestrians and cyclists where speeds and volumes are low. In areas of high pedestrian activity, a formal pedestrian crossing can be combined with a roundabout.
- Rear angle parking adjoining footpaths with active pedestrian frontage are a potential health hazard and negatively impact on pedestrian (and shopkeeper) amenity.
- Where there is angle parking, a single lane and a median, a mountable median is required for emergency access in case of a breakdown or there should be occasional breaks in the median.
- Traffic signals create gaps for jaywalking, which is generally accepted (if not encouraged) in activity centres. Roundabouts are less effective in creating gaps because they do not form clear platoons.
- There are design implications with right-hand turning bays at intersections, which may affect jaywalking and cyclists.

- Signal cycles in activity centres are likely to give less priority to minimising delays to vehicles and greater priority to reducing the waiting time for pedestrians. This could have traffic management consequences, which would need to be resolved.
- In cases where there are a significant number of large vehicles (vans, four-wheel drives, farm vehicles and sports utility vehicles), visibility may be impaired for pedestrians. Visibility may also be reduced for drivers involved in parking and un-parking manoeuvres.
- Bus stops and pedestrian crossings present problems and opportunities that should be addressed. Bus stops should be on the departure side of pedestrian crossing facilities.
- There are situations where pedestrian crossings require signalisation. In other situations, signalisation is not necessary and may be counterproductive. The choice may be influenced by the degree to which planning and design considerations imply a downplaying of the traffic control environment and control of pedestrian movements, which would tend to militate against signals.
- Pedestrian area surface treatments should not be carried across the carriageway, unless pedestrians have priority and the appropriate 'zebra' or 'pedestrian crossing' markings are in place (Roads and Traffic Authority NSW 2001).
- There should be consistency in the use of different kinds of pavement, so that it is clear where the pavement is intended to be shared or allocated to a particular road user.
- Safety depends on unambiguity in cases where a centre straddles an important traffic link ('Type II roads' – see Section 1.3.2). The 'shared space' concept for cases where traffic is all local and/or circulating adopts a different strategy, as noted in the discussion of that concept in Appendix E. In corridors containing Type 2 roads, physical conditions and information (including signs and linemarking) should be such that appropriate behaviour is clearly indicated. However, the latter should be kept to a minimum and should be considered during detailed design.

Appendix G Design Considerations for Pedestrians with Special Needs

Pedestrian devices are often designed to cater for the 'normal' pedestrian, assuming that the pedestrian has satisfactory eyesight and hearing, is paying attention and is not physically hindered in any way. By virtue of these implicit assumptions, pedestrians under 12 years old and generally those over 50 can be misrepresented, as also are pedestrians with disabilities. These pedestrians will potentially experience difficulty and inconvenience with access.

Those groups who are most dependent on walking, who often do not have the option of driving a car, are often most impeded by some accessibility design practices. The following characteristics need to be considered in planning to reflect the needs of **all** pedestrians.

For further guidance, practitioners are referred to AS 1428-2010, NZS 4121-2001, NZ Transport Agency (2009), the *Guide to Road Design: Part 6A: Pedestrian and Cyclist Paths* (Austroads 2009k) and Austroads (2000).

G.1 Older Pedestrians

Changes in physical factors associated with ageing affect the ability of the elderly to function as pedestrians in the traffic environment. Deteriorating physical, cognitive and sensory abilities can affect their behaviours within a road environment, and this is not always adequately accounted for in the design of traffic facilities. Characteristics of older pedestrians include those shown in Table G 1.

Table G 1: Characteristics of older pedestrians

Characteristic	Resulting in	Impacting
Reduced range of joint motion	Slower walking speed	Crossing times Mean journey length
Vision problems, such as reduced acuity and poor central vision	Reduced ability to scan the environment	Ability to detect and avoid objects Sign legibility Kerb detection Crossing locations Trip hazards Maps
Limited attention span, memory and cognitive abilities	Needing more time to make decisions, difficulties in unfamiliar environments, lack of understanding of traffic signals	Positive direction signage 'Legibility' of streetscape Consistency of provision
Reduced tolerance for adverse temperature and environments	Preference for sheltered conditions	Route location and exposure
Decreased agility, balance and stability	Difficulties in changing levels	Provision of steps/ramps Kerb height Gradients Handrails Surface quality
Increased fear for personal safety and security	Fear of using all or part of a route	Lighting Surveillance Lateral separation from cars Provision of footpath Traffic speed and density
Slower reflexes	Inability to avoid dangerous situations quickly	Crossing opportunities
Reduced stamina	Shorter journeys between rests	Resting places Shelter
Reduced manual dexterity and coordination	Reduced ability to operate complex mechanisms	Pedestrian-activated traffic signals

Source: NZ Transport Agency (2009), citing Axelson et al. (1999), ITE (1998), Organisation for Economic Co-operation and Development (2001) and Florida Department of Transportation (1999).

G.2 Child Pedestrians

A child's physical size limits their ability to see and be seen from the kerb. This is particularly so when there are parked cars or plantations along the verge of the road. It is important to recognise, however, that there are additional factors that significantly contribute to the vulnerability of children in the road environment.

It is inappropriate to consider children to be 'miniature adults' in terms of traffic engineering design. In addition to their smaller physical size, their intellectual, psychological and sensory capacities are limited by virtue of their age and stage of development. Children do not reach an adult level of performance in traffic, i.e. do not have the perceptual and cognitive capacity to make sound judgements about traffic safety, until about 10–12 years of age.

Understanding and integrating traffic information is a basic problem for children. Even the protection offered by signalised crossings is undermined (which is also common to the elderly), where a false sense of confidence and security contributes to the lack of attention and higher risk-taking at these points. Therefore, traffic devices and treatments need to be reviewed from the child's perspective and appropriate measures taken to ensure their applicability in some situations. In order to maximise their safety, primary school age children generally need to be supervised (NZ Transport Agency 2009, based on Axelson et al. 1999). Characteristics of child pedestrians are shown in Table G 2.

Table G 2: Characteristics of child pedestrians

Characteristic	Resulting in	Impacting
Shorter height	Reduced ability to see over the tops of objects	Sight lines and visibilities
Reduced peripheral vision	Reduced ability to scan the environment	Sign legibility Kerb detection Crossing locations Trip hazards
Limited attention span and cognitive abilities	Inability to read or understand warning signs and traffic signals	Positive direction signage 'Legibility' of streetscape Use of symbols
Less accuracy in judging speed and distance	Inopportune crossing movements	Provision of crossing facilities
Difficulty localising the direction of sounds	Missing audible clues to traffic	Need to reinforce visual information
Unpredictable or impulsive actions	Poor selection of routes and crossings	Lateral separation from cars Provision of footpath Traffic speed and density Barriers
Lack of familiarity with traffic patterns and expectations	Lack of understanding of what is expected of them	Complexity of possible schemes

Source: NZ Transport Agency (2009), citing Axelson et al. (1999), ITE (1998), Organisation for Economic Co-operation and Development (2001) and Florida Department of Transportation (1999).

G.3 Pedestrians with Disabilities

Disabilities result in some form of functional loss or mobility impairment. Pedestrians with disabilities range from those who have the ability to walk, but have difficulty in doing so, (especially in negotiating steps and changes of grade), to those who require assistance to maintain balance and interpret directions, those that have impaired vision and those who require a mobility aide such as a wheelchair.

Surveys conducted of people with disabilities have found that 18.5% of the population in Australia and 17% in New Zealand are impaired in some way (Australian Bureau of Statistics 2009, Statistics New Zealand 2007).

G.3.1 Mobility-impaired Pedestrians

Mobility-impaired pedestrians are commonly thought of as using devices to help them to walk, ranging from canes, sticks and crutches to wheelchairs, walkers and prosthetic limbs. However, a significant proportion of those with mobility impairments do not use any visually identifiable device (NZ Transport Agency 2009, based on Axelson et al. 1999). Characteristics of mobility-impaired pedestrians are identified in Table G 3.

Table G 3: Characteristics of mobility-impaired pedestrians

Characteristic	Resulting in	Impacting
Extra energy expended	Slower walking speed	Crossing times Journey length Surface quality
Use of mobility aids	Increased physical space and good surface quality needed	Footpath width Footpath condition Obstructions Step depth Gaps/grates
Decreased agility, balance and stability	Difficulties in changing level	Provision of steps/ramps Kerb height Gradients Handrails Surface quality
Reduced stamina	Shorter journeys between rests	Resting places Shelter
Reduced manual dexterity and coordination	Reduced ability to operate complex mechanisms	Pedestrian-activated traffic signals
Vision problems, such as reduced acuity and poor central vision	Reduced ability to scan the environment	Ability to detect and avoid objects Sign legibility Kerb detection Crossing locations Trip hazards Maps

Source: NZ Transport Agency (2009), citing Axelson et al. (1999), ITE (1998), Organisation for Economic Co-operation and Development (2001) and Florida Department of Transportation (1999).

G.3.2 Sensory-impaired Pedestrians

Sensory impairment is often mistaken as being a complete loss of at least one sense, but a partial loss is far more common. Vision impairment mainly affects pedestrians' abilities, although to some extent hearing and proprioception (the ability to sense the location of parts of the body) can have an effect (NZ Transport Agency 2009, based on Axelson et al. 1999). Table G 4 identifies characteristics of sensory-impaired pedestrians.

Table G 4: Characteristics of sensory-impaired pedestrians

Characteristic	Resulting in	Impacting
Reduction in hearing ability	Missing audible clues to traffic	Need to reinforce visual information
Lack of contrast resolution	Reduced ability to distinguish objects	Sign legibility Small changes in level
Reduced vision	Reduced ability to scan the environment	Kerb detection Crossing locations Trip hazards Consistency of streetscape
Severe vision impairment	Use of mobility aid, guide dog and/or tactile feedback to navigate	Streetscape legibility Tactile pavement use

Source: NZ Transport Agency (2009), citing Axelson et al. (1999), ITE (1998), Organisation for Economic Co-operation and Development (2001) and Florida Department of Transportation (1999).

G.3.3 Wheeled Pedestrians

Wheelchair and mobility scooter users can legitimately use the pedestrian network, but in many ways their characteristics are very different from those of walking pedestrians. This means the network has to function differently when taking these users into account (NZ Transport Agency 2009). Characteristics of wheeled pedestrians are summarised in Table G 5.

Table G 5: Characteristics of wheeled pedestrians

Characteristic	Resulting in	Impacting
More susceptible to the effects of gravity	Slower speeds travelling uphill, faster speeds travelling on level surfaces or downhill	Route gradients Interaction with walking pedestrians
Chair/scooter width effectively increases the width of the pedestrian	Greater width required to use a route or pass others	Route widths (including across roads) Street furniture placement Passing places on narrow routes
Reduced agility	Increased turning radius (and turning circle)	Places to turn around Horizontal alignments Surface quality
Reduced stability	Greater potential for overbalancing	Sudden changes in gradient Crossfall Maximum forwards and sideways reach to pedestrian-activated traffic signals
User is seated	Eye level lower	Location of pedestrian-activated traffic signals Position of signs

Source: NZ Transport Agency (2009), citing Axelson et al. (1999), ITE (1998), Organisation for Economic Co-operation and Development (2001) and Florida Department of Transportation (1999).

Appendix H Parking Search

Shoup (2006) points out that small amounts of parking search time can add appreciable amounts of 'traffic' even though the total number of journeys has not changed. If, for example, it takes three minutes on average to find a kerbside space, and the average turnover is ten cars per space per day, then there are 30 minutes extra travel within the centre associated with each kerbside space per day.

If the cruise speed is 20 km/h, cruising creates 10 km extra travel per space per day in this example (20 km/h x 0.5 hours). Over a year of say 300 days of busy operation, this means that the parking search can create 3000 extra kilometres of travel per kerbside space – equivalent to crossing Australia, or approximately a fifth of the annual distance travelled by a car.

The road user costs of this extra (low speed, and therefore fuel-inefficient) travel have an economic value, which can be factored in when pricing on-street and off-street parking. As Shoup (2011) points out, 'free' kerbside parking carries a high cost.

From this point of view, it could be argued that, if there is to be kerbside parking, it should allow long-term usage so that turnover per space is minimised and short-term parkers are thus encouraged to go directly to off-street parking areas. It is, however, conventionally argued that kerbside spaces are needed as convenient parking for customers. The effect of the parking search that this causes should be considered when parking policy is established for busy activity centres.

Appendix I Passenger Transport Interchanges

A passenger transport interchange is a facility for the efficient transfer of large numbers of passengers to public transport services from various modes of private transport, and/or between different types of public transport. A railway station provides connections to bus services and some dedicated car parking is a form of interchange. Larger interchanges are sometimes referred to as multi-modal interchanges.

A modal interchange may include:

- rail services
- ferry services
- bus services and stops
- tram services and stops
- taxi ranks
- bicycle parking facilities (e.g. enclosures/cages, lockers and/or racks)
- park-and-ride facility (i.e. commuter parking)
- kiss-and-ride facility (i.e. passenger drop off and pick up).

An interchange facility should provide safe and efficient access for all modes of transport.

The provision of equitable access to public transport for persons who have a disability is most important and is supported by legislation. In relation to public transport and traffic management, provisions should be made so that new vehicles and new system infrastructure are accessible. Public transport authorities and operators, and road agencies are responding to this requirement by developing guidelines and programs for new works, and with respect to retrofitting existing facilities.

The primary planning and design object of interchanges is to ensure that all patrons can access the facility and pass through it and onto public transport vehicles in a safe and efficient manner. Wherever practicable, it is desirable that access for each mode of transport is separated in order to remove conflict between them and to provide efficient access for each. Where the design must balance competing demands for space or time it is recommended that the following priority should apply to user groups:

- pedestrians
- bicycles
- buses or coaches
- taxi
- kiss-and-ride
- park-and-ride (pay)
- park-and-ride (free).

In addition, the following principles should be observed:

- providing maximum possible separation of modes at all points (separation of pedestrians from motor vehicles is most important)
- minimising distance between access modes and the interchange (station) platforms
- providing easy orientation and smooth and safe circulation to and within the interchange (station) area for all modes
- providing adequate capacity for each access mode based on its design volume.

Capacity should be uniform but, if there are space constraints, it should be provided to individual modes in the order of their priorities.

Effective road signs, traffic signals, well-defined exclusive bus lanes and bus priority measures should all be considered to enhance access to major modal interchanges that are served by congested arterial roads.

All access to modal interchanges and within the various facilities should be designed in accordance with all relevant Austroads guidelines and Australian or New Zealand Standards.

A passenger transport interchange may be associated with an activity centre or some other form of development, such as a major shopping centre, but commercial objectives should not be allowed to compromise the transport objectives of an interchange.

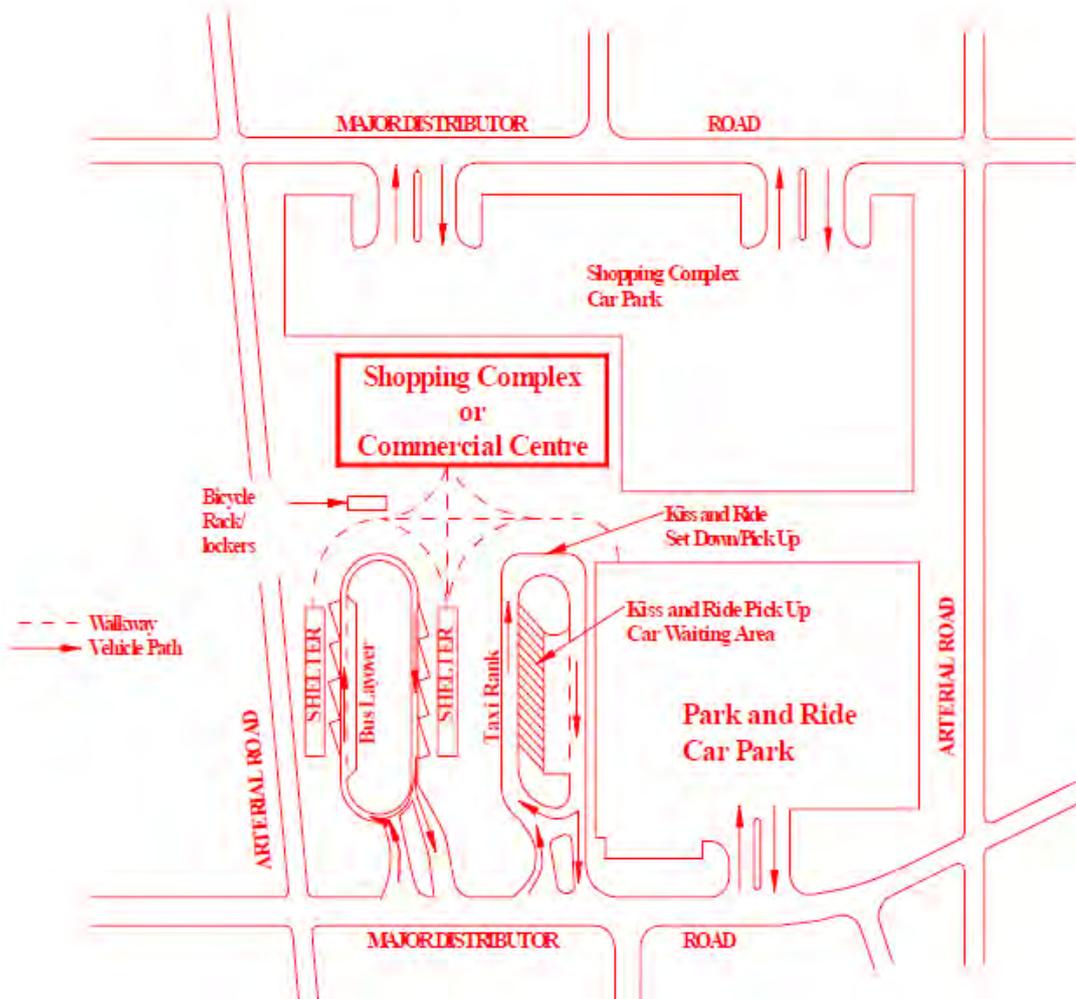
Additional design considerations include (Department of Transport 2008):

- integrating transit stops and interchanges into the design and layout of an activity centre
- designing active frontages along pedestrian paths to interchanges
- providing direct routes to interchange and ensure high visibility, activity and surveillance along these routes
- keeping public transport waiting areas clearly visible from the street and adjacent buildings and providing clear views of public transport arrival and departures
- integrating lighting with signage and landscaping to maximise safety, including the illumination of timetables at night
- providing current passenger information about services and the range of service timetables
- providing directional signage to platforms, stops, conveniences, shops, parking and taxi ranks to minimise confusion
- considering applicable equitable access requirements, such as provision of resting points (i.e. seats) between services.

Sources of further information on passenger transport interchanges include: Ministry of Transport (2008) and Department of Transport (2008). For additional guidance on parking considerations at interchanges, such as bicycle, park-n-ride and kiss-n-ride facilities, refer to the *Guide to Traffic Management: Part 11: Parking* (Austroads 2008c).

An example of a passenger transport interchange is shown in Figure I 1. Other examples of interchanges are discussed in Section 4.7 and Appendix B.5 of this guide.

Figure I 1: Example of a passenger transport interchange



Source: Based on Guillot (1984).

I.1 Railway Stations

The traditional railway station is a form of passenger transport interchange where local bus services often connect with train services (e.g. express service to CBD). Many suburban railway stations have also been developed to provide limited private car and bicycle parking to extend the catchment areas and encourage more people to use public transport.

While rail stations can carry large numbers of passengers they do not have the flexibility to deliver patrons to a very wide range of destinations. It is therefore essential that suitable on-road public transport services integrate with the rail services to provide a whole of journey solution. The critical stage of a bus/train journey is the transition between modes, and unless this transfer can be performed smoothly and efficiently, patronage figures will suffer.

The challenge at existing railway stations is to develop an effective interchange that caters for pedestrian, bus, taxi, bicycle and private car access within the physical, financial and environmental constraints that often exists.

Austroads' Guide to Traffic Management consists of 13 parts and provides comprehensive coverage of traffic management guidance for practitioners involved in traffic engineering, road design and road safety.

Guide to Traffic Management: Part 7: Traffic Management in Activity Centres is concerned with the planning and management of centres typified by high levels of internal activity and interaction, especially by people on foot. It addresses the need to obtain a balance between providing for vehicular access and providing for pedestrian, cyclist and public transport needs without compromising the functionality of a site. It provides guidance for planners and engineers associated with the design, development and management of a variety of activity centres.

Guide to Traffic Management Part 7



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