

AUSTROADS RESEARCH REPORT

**Pedestrian-Cyclist Conflict Minimisation
on Shared Paths and Footpaths**



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First Published 2006

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National Library of Australia
Cataloguing-in-Publication data:

Pedestrian-Cyclist Conflict Minimisation on Shared Paths and Footpaths
ISBN 1 921139 37 4

Austroads Project No. NS1018

Austroads Publication No. AP-R287/06

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Pedestrian-Cyclist Conflict Minimisation on Shared Paths and Footpath



Austrroads
Sydney 2006

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SUMMARY

Most urban transport strategies in Australia include the desire to increase walking, cycling and public transport and, correspondingly, to reduce the extent of reliance on the private car. This has arisen for a range of reasons, initially environmental and sustainability-related, but increasingly related to issues of community and individual well-being.

Pedestrians and cyclists, whilst both being vulnerable road users compared to the occupants of a motor vehicle, differ greatly from each other in terms of speed of travel, ability to take evasive action and even the nature of the movement activity. This activity is much more likely to be a social nature for the pedestrian.

The interaction between pedestrians and cyclists is increasingly causing safety concerns, exacerbated by the use of wheeled recreational devices, including wheelchairs, powered scooters and gophers. Some of these concerns are real and others are perceived, but nevertheless important in terms of people's willingness to walk. The more governments are successful in increasing the amounts of walking and cycling, the greater these concerns will become – potentially limiting the extent and sustainability of such gains.

Paths and footpaths are essential spaces in the transport network to support walking and cycling activities. If they are to continue to effectively support increased usage by both groups, management of shared use, particularly where that results in actual or potential conflict, will need to be addressed.

Austrroads commissioned ARRB to investigate actual and potential conflicts between cyclists and pedestrians and to develop best practice engineering, traffic management and urban design measures and education and awareness strategies to minimise conflict and to improve both perceived and actual safety on shared paths and footpaths.

The first stage of the project identified key issues associated with pedestrian/cyclist interaction and conflict through a literature review and consultation with key stakeholders. It also included a review of current practice in Australia and overseas.

A review of the Austrroads *Guide to Traffic Engineering Practice, Part 13 - Pedestrians* and *Part 14 - Bicycles* indicated that, whilst there are no major conflicts between the two documents, neither deals with conflicts in a very complete or satisfactory way.

- Part 13 does not deal to any great extent with shared use or the pedestrian/cyclist conflict that may arise.
- Part 14 has several references to pedestrian/cyclist conflict but there is a need to relate the potential for conflict to engineering design parameters and standards.
- Amendments to reflect the outcome of the study should be produced in a form that suits the new Austrroads Guide, namely a concise guide on the subject supported by a commentary on the issue.

The key issues identified were considered and confirmed by the project Steering Committee.

Conflict between pedestrians and cyclists often arises from pressures exerted by motorised traffic. In order to minimise conflict, holistic solutions are needed where conditions are improved for cyclists and/or pedestrians but not for one at the expense of the other.

Looked at another way, the key objective should be to minimise the extent to which interaction between cyclists and pedestrians becomes a cause of conflict – there are many types of positive interactions that should be encouraged. Even manifestly ‘inadequate’ path width can be overcome with goodwill and consideration.

‘Prevention is better than cure’. Where possible, it is desirable to plan/provide for staging the conflict minimisation options to get it right at the beginning rather than retrofit. Retrofitting is inefficient and constrained by the original construction.

It should also be noted that behavioural initiatives can be a form of ‘treadmill’ if not self-sustaining. Measures that require continual reinforcement (as, for example, with some types of enforcement or awareness initiatives) run the risk of requiring substantial resources on a continuing basis – resources that could otherwise be used for new initiatives.

A number of strategies can be applied in both the short term and long term to minimise conflict between cyclists and pedestrians. These were identified and discussed in Working Paper 2, based on a literature review as well as input from the initial stakeholder surveys and stakeholder workshops held in a number of locations throughout Australia.

Key conflict minimisation strategies addressed are:

- Integrated policy, strategy and planning
- Urban design and place-making
- Infrastructure planning
- Infrastructure design
- Infrastructure construction and maintenance
- Information
- Regulation
- Enforcement
- Education and awareness-raising
- Travel behaviour change

The issue of conflict on paths is by no means a new one, although it may be becoming more serious as the number of people walking or cycling increases after a prolonged period of decline in many places, combined with a high level of reliance on shared facilities. It is most unlikely, therefore, that there is any single ‘silver bullet’ that will, on its own, achieve the objective of minimising conflict.

It follows that a combination of measures is likely to be required to reduce conflict on paths effectively. However, since both the existing situation and the opportunities for change differ from place to place, the appropriate packages will need to be configured individually to suit specific situations.

In particular, it is recommended that the *Australian Road Rules* (National Road Transport Commission 1999) be amended to re-introduce the requirement for all path users on shared paths to keep left in order to match and support the many sensible codes of conduct already in use and the widespread and effective practice of centre-line marking with ‘keep left’ and similar stencils.

Given that a combination of initiatives is likely to be required and that the packaging of issues will need to be situation-specific, it is more likely that a suitable package can be found for specific situations if each issue is addressed by a number of options.

Specific strategies addressing the issues are also provided in the 'Information Notes' available as individual documents, in electronic form, on the website of the Australian Bicycle Council (<http://www.abc.dotars.gov.au>).

These Information Notes do not replace existing guidelines (for example, the Austroads Guide to Traffic Management) but are intended to complement them, to draw attention to issues that may need to be addressed in specific situations and to suggest ways in which they can be resolved or, at least, minimised. Users should also refer to local state or territory guidelines for bicycle facilities.

The information in these Information Notes will be considered in future reviews of the Austroads *Guide to Traffic Management*.

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1 INTRODUCTION

Most urban transport strategies in Australia include the desire to increase walking, cycling and public transport and, correspondingly, to reduce the extent of reliance on the private car. This has arisen for a range of reasons, initially environmental and sustainability-related, but increasingly related to issues of community and individual well-being.

Pedestrians and cyclists, whilst both being vulnerable road users compared to the occupants of a motor vehicle, differ greatly from each other in terms of speed of travel, ability to take evasive action and even the nature of the movement activity, which is much more likely to be a social activity for the pedestrian. Interacting (e.g. conversing) with a fellow pedestrian is likely to make pedestrians less aware of the presence of other users, including cyclists.

The interaction between pedestrians and cyclists is increasingly causing safety concerns, exacerbated by the use of wheeled recreational devices, including wheelchairs, powered scooters and go-karts. Some of these concerns are real and others are perceived, but nevertheless important in terms of people's willingness to walk. The more governments are successful in increasing the amounts of walking and cycling, the greater these concerns will become – potentially limiting the extent and sustainability of such gains.

At the same time, the Australian population is ageing, with continuing increases in the proportion of seniors and persons with disabilities. Whilst these trends are often thought of in terms of limitations on physical mobility, this is by no means the only consequence – other disabilities, such as vision-impairment and hearing-impairment are associated with ageing. Vision and hearing impairment have implications for the level of awareness of other users and the ability to interpret signage and other information while using a path.

Paths and footpaths are essential spaces in the transport network to support walking and cycling activities. If they are to continue to effectively support increased usage by both groups, management of shared use, particularly where that results in actual or potential conflict, will need to be addressed.

Austroroads commissioned ARRB to investigate actual and potential conflicts between cyclists and pedestrians and to develop best practice engineering, traffic management and urban design measures and education and awareness strategies to minimise conflict. The aim is to improve both perceived and actual safety on shared paths and footpaths.

In consultation with the project Steering Committee, ARRB identified a range of key stakeholders from the bicycle and pedestrian sectors, from whom information was sought in response to the following questions:

- What are the key conflict issues that arise from interaction between cyclists and pedestrians on shared paths and footpaths?
- What options can you suggest to resolve these conflict issues?
- Can you advise of any specific situations that can inform the project as case studies, including both good and bad practice? [diagrams or photographs explaining the situation would be useful.]
- Can you suggest any research references or other documentation that would be useful to the study?

The survey form circulated to the stakeholders is attached as Appendix A.

The first stage of the project identified key issues associated with pedestrian/cyclist interaction and conflict through a literature review and consultation with key stakeholders. It also included a review of current practice in Australia and overseas.

The second stage of the project identified and discussed options (strategies) for addressing the issues agreed by the project Steering Committee. It included a literature review as well as input from the initial stakeholder surveys and stakeholder workshops held in a number of locations throughout Australia.

This report covers both stages of the project, with specific strategies addressing the issues being discussed in 'Information Notes' available as individual documents, in electronic form, on the website of the Australian Bicycle Council (<http://www.abc.dotars.gov.au>).

These Information Notes do not replace existing guidelines (for example, the Austroads Guide to Traffic Management) but are intended to complement them, to draw attention to issues that may need to be addressed in specific situations and to suggest ways in which they can be resolved or, at least, minimised. Users should also refer to local state or territory guidelines for bicycle facilities.

The information in these Information Notes will be considered in future reviews of the Austroads *Guide to Traffic Management*.

2 LITERATURE REVIEW OF PEDESTRIAN/CYCLIST ISSUES

2.1 Reasons for walking/cycling

It is imperative that the design and construction of new roads and road upgrades clearly reflect the needs of all road users and not just motor vehicles. It will never be cheaper to incorporate the appropriate pedestrian and cyclist facilities than at that point in time. Road authorities should conduct thorough evaluations of the planning process and the siting, design and effectiveness of pedestrian and cyclist safety facilities to constantly seek ways of maximising benefits from the installation of these facilities (Legislative Assembly of Queensland 1993).

Moderate exercise which can be obtained from walking and cycling is known to provide health benefits including: reducing heart disease; obesity; stroke and diabetes; among others. In addition, the use of walking and cycling as transport modes can substitute a number of car journeys undertaken, such as trips to school or shops, which leads to better air quality and sustainable land-use planning (Road Safety Council 1998a, Department for Transport 2005b). For these reasons many governments are encouraging increased participation in public cycling and walking. An increase in cycling and walking participation and the integration of the two activities can provide benefits and potentially some problems. If governments are to encourage participation they must then provide areas where cyclists and pedestrians can travel safely.

The Department for Transport (2004d) in the UK produced an 'Action plan: Walking and Cycling', describing the benefits of government/council promotion of walking and cycling. These include improved facilities such as street lighting and better surfaces, less litter and cleaner streets, tourism promotion and a potential increase in public transport use reducing the general traffic load. However, the action plan fails to acknowledge the issue arising from cyclists and pedestrians sharing the same path.

2.2 On-road vs off-road provision for cyclists

The degree of separation of a cycle facility from motorised traffic is a fundamental issue in cycle planning. The aim of segregated cycle path networks is to provide pleasant, off-road cycle paths free of conflict from motorised traffic that serve all areas. However, it is only practical to provide such networks when planning new suburbs and townships. In towns that already exist, cycle networks are based around the established (mostly arterial) road network, with the remaining issue of whether to provide a physically separated cycle path (Land Transport Safety Authority 2004).

There are a number of factors that will influence whether roads or paths will best suit cyclists' needs. Subject to the appropriate design standards being achieved, roads generally have the following advantages over paths (Land Transport Safety Authority 2004):

- they are direct, coherent, convenient, efficient and available everywhere
- they have established intersection controls
- they serve well the needs of experienced cyclists
- they have high levels of surveillance and hence personal security.

Between intersections, isolated paths generally have the following advantages over roads (Land Transport Safety Authority 2004):

- they have no motor traffic, slower speeds, low stress and an attractive environment
- they provide extra links that advantage all cyclists
- they serve well the needs of novice/child cyclists.

There appears to be no clear advantage between roads and paths in terms of safety, conflict with other users, expense and maintenance (Land Transport Safety Authority 2004).

2.3 Integration of cyclists and pedestrians

It should not automatically be assumed that cyclists can be better catered for off the carriageway because there is no improved on-road solution available. The shared or adjacent pathway needs to be attractive to new cyclists and those already using the carriageway, whilst also addressing the needs of pedestrians. The Department for Transport (2004e) states that the proposed shared pathway should satisfy the following criteria:

- safe for all pathway users including persons with disabilities and visual impairment
- accessible from the carriageway at junctions and have minimum 'give ways'
- at least as convenient as the on-road equivalent, based on genuine desire lines without detours
- a convenient link between trip generators, attractors and other network elements
- well designed, attractive, comfortable and have a good riding surface
- encouraging alternative transport modes.

However there are important potential safety benefits resulting from integration of cyclists and pedestrians, which should be considered when evaluating the need for an off-road solution. These benefits are discussed in sections 2.3.1 and 2.3.2. The types of paths for cyclists are shown in Section 2.3.3.

2.3.1 Cyclists

A report on Pedestrian and Cyclist Safety from the TravelSafe Committee (1993) states that the main cause of fatal bicycle accidents is the collision with motor vehicles. The report comments that segregating cyclists from road traffic provides clear safety benefits to cyclists. Integration of cyclists with pedestrians may cause an increase in pedestrian/cyclist accidents. However, these will be considerably less severe than cyclist/motorist collisions which often result in serious injury or death to the cyclist. At the same time, however, paths may offer a lower level of service to cyclists, especially at intersections and where the path crosses roads and driveways.

2.3.2 Pedestrians

The Department for Transport (2004a) in the UK state in their Local Transport Note: *Adjacent and Shared Use Facilities for Pedestrians and Cyclists* that although the result of allowing cyclists to share footpaths with pedestrians can result in less space for pedestrians, there are some safety benefits. Improved surfacing and lighting is often the result where new construction is required in the conversion of a footpath to a shared path. These improved facilities may lead to a potential benefit to personal security as greater numbers of users including cyclists will frequent previously quiet locations. An increase in user numbers may be used as an argument to install road crossing facilities.

2.3.3 Types of Paths

There are three main path types for cyclists: exclusive cycle path, shared path and separated path. These are described in Table 2.1 below.

Table 2.1: Types of paths available to cyclists

Type of path	Description	Advantages	Disadvantages	Recommendation
Exclusive cycle path	Can only be used legally by cyclists	<ul style="list-style-type: none"> ▪ Cyclists can generally proceed without delays ▪ Usually a higher LOS 	<ul style="list-style-type: none"> ▪ Sometimes used by pedestrians when their own facilities are relatively poor 	<ul style="list-style-type: none"> ▪ Preferred where there are likely to be significant volumes of commuter cyclists ▪ Care is required to ensure that pedestrians can be accommodated elsewhere
Shared path	Shared with pedestrians and possibly others (e.g. horse riders)	<ul style="list-style-type: none"> ▪ Useful to cyclists and pedestrians, hence maximises benefit to general community ▪ It is beneficial to vulnerable cyclists where an existing footpath can be adapted/widened 	<ul style="list-style-type: none"> ▪ Pedestrian-cyclist conflict is common with significant volume of cyclists and pedestrians or a mix of recreational pedestrians and commuting cyclists ▪ LOS for cyclists can be poor where interference by other path users results in slower speeds 	<ul style="list-style-type: none"> ▪ Shared paths are beneficial to a range of path users but need to be managed effectively ▪ Appropriate with modest numbers of pedestrians and cyclists ▪ It is important that the path's design is suitable for its use and demand, that authorities adequately monitor users' behaviour on the path, and that the connections between path, road and driveways are carefully considered
Separated path	Separate sections for cyclists and pedestrians	<ul style="list-style-type: none"> ▪ May help to avoid pedestrian-cyclist conflict common on shared paths ▪ Cyclists can ride without the delays possible on paths shared 	<ul style="list-style-type: none"> ▪ Higher cyclist speeds are possible, however pedestrians from the separated path can stray into cycling space ▪ Higher cost of path due to increased width 	<ul style="list-style-type: none"> ▪ Appropriate if large numbers of cyclists and pedestrians will use them ▪ There should be adequate separation between cyclists and pedestrians (e.g. different path levels)
Cycle path next to road	Generally paved in a different colour and texture from adjoining sections of the berm, and may be separated by a low kerb. Common facility in Europe	<ul style="list-style-type: none"> ▪ Can offer a low-stress environment that can be very attractive to many cyclists ▪ Particularly helpful for short lengths such as squeeze points in the road carriageway 	<ul style="list-style-type: none"> ▪ In NZ, cyclists on paths are required to give way to other traffic when crossing side roads, which results in delays ▪ Intersections are where cyclists are at highest risk ▪ Path obstructions/visibility issues: <ul style="list-style-type: none"> - inadequate clearance for visibility at driveways - frequent or busy driveways - inadequate clearance from opening doors of parked vehicles - bus passengers boarding and alighting from cycle path - pedestrians encroaching on the cycle path when the footpath is congested or while waiting to cross - garbage awaiting collection obstructing the path ▪ where cyclists ride in both directions along paths, drivers using driveways and side roads may not expect cycle traffic from both directions 	<ul style="list-style-type: none"> ▪ Between intersections, cycle paths next to roads can provide attractive and safe facilities for a wide range of cyclists. ▪ Consider safety and delay issues at intersections where it's preferable for the path to rejoin the roadway.

Type of path	Description	Advantages	Disadvantages	Recommendation
			<ul style="list-style-type: none"> ▪ it is less convenient to turn right from cycle path next to road ▪ it is expensive to establish this facility due to relocating kerb lines 	

(Adapted from Land Transport Safety Authority 2004)

2.4 Appreciation of conflict

There is considerable debate as to whether cyclists and pedestrians sharing the same paths poses problems. Shared paths and cycle use of footpaths is the most common mode of providing cycle facilities in Australia, but European (including UK and Ireland) guidelines stress the importance of separating the two wherever possible.

During the Galway City Community Forum (2003), it was stated that the presence of cyclists on footpaths reduced safety and comfort for pedestrians, in particular the young, seniors and persons with disabilities. The forum noted that cyclists can reach speeds in excess of 30 mph (48 km/h) represent a serious injury hazard to pedestrians.

Road Safety Council (1998a) believes that where paths are shared between pedestrians, cyclists and in-line skaters, pedestrians are vulnerable due to the greater speed and mass of cyclists and in-line skaters.

The Department for Transport (2004e) in the UK in their report *Policy, Planning and Design for Walking and Cycling* does not believe there is any justification for excluding cyclists from pedestrian paths. A study carried out for the Department for Transport by the Transport Research Laboratory has shown that accidents occurring in these areas are 'very rare' (only one pedestrian/cyclist accident in 15 site years) in the sites studied (Department for Transport 1993). The suggestion is that cyclists change their behaviour when situations require, such as slowing down, and dismounting when the pedestrian density increases or taking evasive action when obstacles are encountered. Where there are higher flows of pedestrians or cyclists, the cyclists are encouraged to follow defined path to aid orientation and assist effective movements in the area. At lower flows, both users mingle readily (Department for Transport 1993).

Surveys carried out for the Department for Transport in recent years have shown that shared use routes are acceptable by both pedestrians and cyclists, and that users would not wish to revert to pedestrian only use at the expense of putting cyclists at risk (Department for Transport 2004b).

Graw & König (2002) produced a report on fatal pedestrian-bicycle collisions which investigated the circumstances of such accidents. Again the relative rarity of bicycle/pedestrian collisions is stated. Findings included:

- the cyclist is usually the cause of the accident though the pedestrian suffers the more serious injuries
- cyclists involved in the accidents are usually young persons, whilst seniors are the most likely pedestrian victims.

Stutts, JC & Hunter, WW(1999) carried out a survey of a total of 2558 persons treated for injuries incurred while bicycling or walking, at eight hospital emergency departments over a one year period in three US states. The results show that only 0.8% of injuries to people occurred in a pedestrian-bicycle collision.

In his report for the NSW Local Government Road Safety Conference 2001, Salomon (2001) declared that shared pathways are safer than public roads for cyclists and walkers, though minor accidents do occur and with greater use of these shared paths there is potential for the incidence of these accidents to increase. The report identifies a number of measures to reduce the risk of accidents, while maintaining the policy of ongoing shared use of off-road paths for non-motorised travel.

2.5 Perceptions of conflict between cyclists and pedestrians

The reality and perceptions of conflict on paths may not be the same, particularly as people often generalise from limited personal experiences – the single upsetting incident will remain in the mind much more clearly than the large number of uneventful occasions. However, the authors are aware of only two studies that have attempted to quantify the influence of path design and usage parameters on user perceptions of conflict.

2.5.1 UK Countryside Agency

The study focussed on paths that fulfilled the characteristics of ‘Greenways’, in that they ‘promote more sustainable and healthy transport through the creation of networks of attractive routes on which walkers, horseriders and cyclists can travel for business or pleasure in safety’. Most will connect open spaces and other facilities in and around towns (www.greenways.gov.uk). Paths included in the study were, nevertheless, very different in visual appearance. They also varied in the social, economic, cultural and environmental context in which they were situated.

Whilst the study was driven primarily by the concerns of the Countryside Agency, the conclusions are also applicable to interaction on shared paths in many urban locations. The importance of both people-based and environment-based factors in perceptions of conflict supports the broad-based approach in this Working Paper, including strategy, planning, design, construction and maintenance for shared facilities as well as direct behavioural initiatives.

a) Reason for the study

Shared-use facilities are a vital element in providing access to the countryside, but safety is an important issue. Although shared facilities are seen to provide safe routes for cyclists and walkers, away from busy roads, some have argued that their very use is dangerous in that physical collisions between different types of users and verbal disagreements over the use of space are also safety issues. Whilst the level of concern may be greater than the current risk of accidents, such anxiety can undermine people’s confidence. As a result, users may have a less enjoyable experience or avoid using such routes altogether. Consequently, interest groups argue that because of ‘conflict’ on paths there should be segregated facilities.

b) Previous research

There is no single conflict-generating mechanism. Causes may include user behaviour, the physical environment (poor design and maintenance; inherent nature of routes such as pinch points) or the interaction between the two (when ‘people versus people’ may not be the problem but people versus people *and* sub-optimal facilities leads to actual and perceived conflict. The principal people-generated causes of conflict are:

- unpredictable and unexpected interactions
- lack of an agreed protocol for dealing with actual conflict
- perceived clashes of values between user
- frustration in task/goal achievement.

Other factors involved in conflict may include:

- competition for scarce resources
- escalating annoyance
- negative experience
- goal interference
- inability to achieve expected benefits
- mutually-exclusive goals/values/norms
- manner/purpose of use
- attribution of blame to others/external factors
- lack of perceived control over desired outcomes
- prior knowledge and experiences.

No physical design will guarantee that negative interactions will be eliminated, but users' expectations of the setting are an integral part of the complex system that governs interactions. When the system breaks down, conflict occurs.

Management strategies to resolve conflict often focus on separating uses and users; others have included signs or markings, speed limits and surface materials which generate audible warning of approach. Few of these physical measures have had much success, partly because it is unlikely that unidimensional solutions to the multi-dimensional causes of perceived and actual conflict will be effective, and partly because they are ignored when the sites are not crowded or obscured when they are. An increasing emphasis has been placed on the development of guiding principles and best practice guidance. Although codes of practice are difficult to enforce, there is a general agreement that a standardised etiquette is required for all users of shared-use routes.

c) *Findings*

- Cyclists accommodate to the presence of others, willingly or otherwise, by decreasing their speed, whereas walkers adopt a less erratic course, which results in their travelling along the path more quickly.
- The objective likelihood of encountering another path user is lower than commonly perceived as only a small percentage of users (12% in the study) overtook or met people travelling in the opposite direction.
- The way in which people remember events predisposes them to perceiving encounters with others as being more frequent than they actually are.
- Overall, most people's experience of paths and their encounters with others is peaceful, unintrusive, co-operative and agreeable. Nobody reported hostility and less than 10% (and in most cases less than 2-3%) reported intrusion, competition or disagreeableness. If there is a dimension of conflict which registers with respondents it was feelings of intrusion.
- Most increase in perceived hostility and competitiveness arises where the journey purpose is leisure. However, use of the path for exercise purposes is a significant explanatory factor in the rating of hostility.
- Most increase in the rating of perceived intrusion arises when the respondent is using the path as part of group (in the act of using the path). However, membership of an interest group or user group did not affect the level of perceived conflict.

- There are significant correlations between some path characteristics and perceived conflict:
 - poor lighting
 - visibility
 - path maintenance
 - unkempt verges.

This suggests that perceived conflict is related to the state of the paths themselves.

- Whether or not the person interacted with communicated with the respondent was significant in explaining the level of perceived intrusion.
- One feature stands out as being extremely important in all scenarios – considerate behaviour.
- There is an increase in perceived conflict as path width and speed of travel increase in importance.

d) *Conclusions from the study*

While generally not experiencing high levels of conflict when using shared-use routes, most people recognise the potential for – or have experienced – conflict situations. These range from relatively minor intrusion and disagreeability to more significant forms of hostility and competition. The perception or experience of conflict can lead to consequences ranging from emotional reactions to behaviour modification, the most extreme of which is active avoidance of the route.

Paths are often less busy than may be thought. Therefore, the number of interactions is lower than expected and do not in themselves generate conflict. Reported conflict is at almost non-existent levels. Whilst it is clear that, in the minds of some people, shared use routes are the scenes of conflict, the evidence found in the study suggests conflict is an extremely infrequent occurrence.

It appears that the factors people think are important causes of conflict are less important in reality. In real life situations, the behaviour of others, the type of people on the path and environmental influences are less important to perceived conflict than when people think about paths in an abstract situation.

Actual and perceived conflict does not appear to be a serious problem for most of the people most of the time on most paths. However, there are particular situations in which such conflicts are most likely to occur. These may be:

- environmentally-induced, such as poor surface, poor signing, lack of lighting, blind corners and pinch points
- person-induced, such as fear of accidents or crime. ironically, this leads to contradiction – collisions with other users can occur when the path is busy, but fear of attack is perceived to be most likely when the path is not busy.

Despite the range of path situations, there was very little difference in people's behaviour towards the various sites. At a process level, it matters little what official designation a path has or its intended use by those responsible for managing it. The authors believe that to many users 'a path is a path' and the results are therefore 'generalisable to a much wider range of path situations'.

There is confusion and ambiguity in current rights of use, partly for historical reasons and partly due to lack of signing.

Shared-use routes are most likely to work well when they met the specific needs of local communities. Community involvement in the planning, design and management of shared-use routes not only leads to increased use, because people get what they want, but also to heightened awareness of considerations such as maintenance and education.

2.5.2 User perceptions of the quality of service on shared paths

Hummer *et al.* (2005a) have developed a method for rating the perceived level of service provided by shared paths for cyclists that avoids the limitations of the US Highway Capacity Manual (Transportation Research Board 2000 – see section 5.3.4) on the basis of user responses to video ‘ride-throughs’ of a number of paths and situations. They identify the limitations of the HCM approach as being that it:

- has not been calibrated or validated for us conditions
- does not account for ‘passive passings’, i.e., events when the test bicyclist is passed by a faster path user
- assumes that there is always adequate room for the test bicyclist to pass with no change in speed or lateral positioning
- assumes that the test bicyclist will always pass any bicyclist or pedestrian encountered that is going slower
- accounts for pedestrians and bicycles only
- is based on single values of mean bicycle and pedestrian speed
- is limited to two-lane (8-foot wide) and three-lane (10-foot wide) paths.

The primary data are illustrated in Figure 2.1, but Hummer *et al.* (2005a) undertook a more detailed statistical analysis to derive a relationship between user-rating and the most significant path and operational parameters:

$$\text{Overall rating (Scale 1-5)} = 5.446 - (0.00809 * \text{wevents}) - (15.86 * \text{rwidth}) - (0.287 * \text{clin})$$

where:

- wevents = meetings per minute + 10* active passings per minute
- rwidth = 1/path width (in feet)
- clin = presence of a centreline (0 if no; 1 if yes).

Converting rwidth to metric (i.e. rwidth = 1/path width (in metres)):

$$\text{Overall rating (Scale 1-5)} = 5.446 - (0.00809 * \text{wevents}) - (4.83 * \text{rwidth}) - (0.287 * \text{clin}) \quad [\text{Eqn 1}]$$

The sign of the centre line variable is explained by Hummer *et al.* (2005a) in terms of a feeling of restriction by cyclists on a path with a centreline. However, this does not appear to accord with anecdotal evidence in Australia where a centreline is seen as providing some greater assurance of the lateral positioning of oncoming users. In the absence of local evidence to support the negative sign for presence of a centreline on a path, it would be appropriate to drop this component of the formula if it were to be adopted for local use.

A related paper (Rouphail *et al.* 2004) provides information to support estimation of the variable ‘wevents’, and a further paper (Hummer *et al.* 2005b) provides evidence of the ability of the model to provide estimates of meetings and passings on paths (Figure 2.2).

The outlier in Figure 2.2 is attributed to the presence of a large number of fast runners on that path disrupting the collection of data.

This model will be more comprehensively reported in a forthcoming report (Hummer *et al.* forthcoming), but in the meantime these results provide a reasonable basis for assessment of paths.

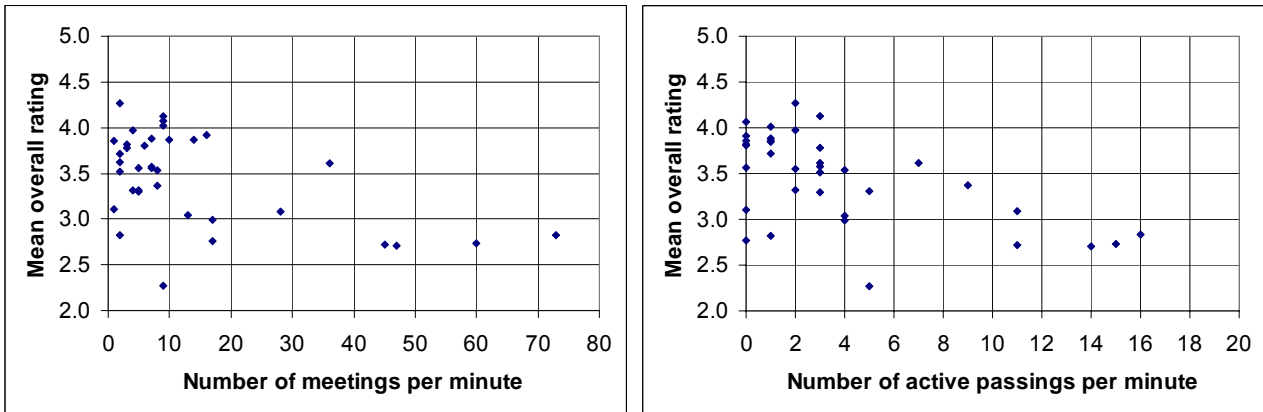
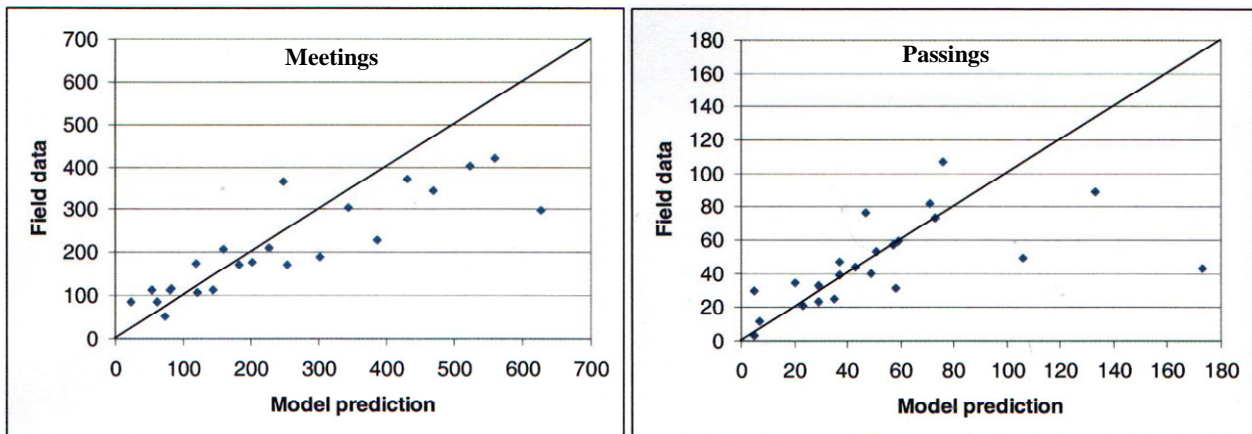


Figure 2.1: Quality of service rating of paths by frequency of interactions with other users

Note: 'Meetings' are 'opposing direction' events and 'passings' are 'same-direction' events. 'Active passings' are same direction events where the user in question passes another user (a pedestrian or a slower cyclist).



(Hummer *et al.* 2005b)

Figure 2.2: Model prediction versus field data for meetings and passings

2.6 Conflict Issues

The key issues that may lead to conflict between pedestrians and cyclists fall into three broad categories: Inappropriate path user behaviour, poor path design and poor path maintenance. They are discussed in sections 2.6.1- 2.6.4, along with other issues in section 2.6.5.

2.6.1 Inappropriate user behaviour

A survey carried out by Walter (1995) in Victoria has shown that 32% of Yarra survey respondents and 78% of Jells Park survey respondents saw the behaviour of users as a problem encountered when using the paths surveyed.

Similar results were shown in the Survey of Older Road Users carried out by Fildes *et al.* (1994) – 35% of pedestrians claimed that bicycles caused the problems when they are out walking. Older pedestrians were also more likely to report these problems than younger ones.

Speed of cyclists

Pedestrians have taken issue with speeds at which cyclists travel on shared paths (Road Safety Council 1998a). The current Australian road standards for design specify that shared paths must be able to accommodate the range of speeds at which cyclists travel, recommending that standard shared footways should accommodate cyclists travelling at up to 30 km/h, and that where it services a high proportion of commuting cyclists it should be up to 50 km/h (McInnes, 1998).

Keep to the left

The keep-to-the-left rule, along with overtaking on the right, is not always followed on shared paths (Walter 1995, Road Safety Council 1998a). However, the introduction of pavement markings in the form of a centre white line and opposing arrows by Bicycle Victoria has shown 29% more users moving to the left (Walter 1995). Note, however, that the *Australian Road Rules* (National Road Transport Commission 1999) have removed the requirement for pedestrians to keep left on footpaths or shared paths.

Give way to pedestrians

Another issue contributing to conflict on shared paths is failure to give way to pedestrians, who are the most vulnerable shared path user (Road Safety Council 1998a).

Uncontrolled dogs

An issue was being faced in Victoria that some municipalities and other authorities were considering free-running areas for dogs, with some of these coinciding with shared footpaths (McInnes, 1998). However, it has been suggested that a code be introduced for dogs to be kept on leashes on paths and within a certain distance of the paths. This is in order to avoid the issue of uncontrolled dogs creating potential conflict between cyclists and pedestrians.

Cycling on footpaths

In some states (Queensland, Tasmania, ACT and NT) cyclists of all ages are permitted to ride on footpaths. This has caused considerable safety problems for the very young and senior pedestrians in some quarters (Legislative Assembly of Queensland 1993). However, the above states/territories also report that the perception of the level of bicycle/pedestrian conflicts on footpaths is greater than the reality of incidents (ORS WA 2002).

An examination of available data suggests that legalising cycling on footpaths by all ages may not adversely impact on the safety and amenity of footpaths. This is because the amount of footpath cycling is not expected to change from the current level (ORS WA 2002).

There is a growing concern amongst pedestrians, particularly visually impaired people, with regards to cyclists riding illegally on footpaths and shared use paths where part of the footpath was converted into a cycle track (Davies 1999).

Education issues

Different rules on the roads and paths (e.g. keep left rule from the *Australian Road Rules*, National Road Transport Commission 1999) may send confusing messages to children and possibly adversely impact on future attitudes to road rules. Educating cyclists and pedestrians on orderly use of the shared paths appears to be the logical instrument for reducing path user conflicts (Threfall 2000).

Lack of courtesy

Poor attitudes, lack of courtesy and inattention to other path users is another conflict area. This includes the growing trend of path users to use earphones and portable music players which prevent cyclists from making themselves heard (Threfall 2000, Road Safety Council 1998a).

Correspondingly, users may not be aware that others, especially seniors, may have a hearing impairment that makes it difficult to hear an approaching cyclist even when warning is given.

Other behavioural issues

Road Safety Council (1998a), Department for Transport (2004c) and Walter (1995) have also identified other behavioural issues as contributing to conflict on shared paths:

- lack of awareness, confusion or disregard for protocol and law on paths
- lack of awareness of other user's needs and abilities (e.g. cycling performance limitations) and failure to respond
- pedestrians wearing inadequate reflective clothing; cyclists wearing dark clothing/ footwear at night
- cyclists illegally riding without lights at night
- pedestrians walking in pairs or groups; cyclists riding two abreast or in groups
- pedestrians failing to give adequate warning of presence; cyclists failing to have or use a bell
- pedestrians moving unpredictably on path
- lack of control of children; child pedestrians with no perception of left, right and give way and having immature peripheral vision; child cyclists/inexperienced cyclists with inadequate skills.

2.6.2 Poor path design

27% of Yarra survey respondents saw the design of the path as a concern (Walter 1995).

Signage and line marking

Unmarked shared paths with no centre lines and few information or location signs can contribute to conflict between cyclists and pedestrians (Road Safety Council 1998a). Lack of signage on paths also has been identified as an issue in the City West Pedestrian Links Forward Design Study (Pedalpower 2001).

It should however be noted that users do not always comprehend signage in the manner intended by those who originate the message. A signage comprehension survey undertaken by Banks *et al.* (1998) has indicated that out of 28 proposed signs, 11 were interpreted correctly by 80%, 7 by 51-79% and 11 by 50% or less.

The effectiveness of a 'Shared Path Rules' trial sign was evaluated on three shared use paths in Brisbane (Davies 2000). The results indicated that signs can make a difference in path sharing behaviour and help increase people's knowledge about how to share paths. However the signs have had little impact on user perceptions of comfort.

Lighting

Lack of lighting on paths causing reduced levels of safety and legibility was also reported as a deficiency by the Road Safety Council (1998a) and in Pedalpower (2001).

Inadequate path capacity

Inadequate capacity of shared paths to handle the volume and types of usage has been identified as an issue by the Road Safety Council (1998a).

This was also confirmed by Pedalpower (2001), which identified inadequate (or non-existent) path capacity to cope with increased pedestrian volumes expected to be generated by major tourist activity following opening of the National Museum of Australia and future intensive urban development planned for Civic West.

Width of pathway

Conflict can be created between cyclists and pedestrians on narrow pathways (Road Safety Council 1998a). This is especially true of paths where usage is high and passing is frequent (Shafer *et al.* 1999). Studying shared footways, Moore (1994) and Heywood (1994) found that cyclists often feel that pedestrians impede their progress by taking up too much width as they walk or run side by side. On the other hand, pedestrians and runners most often are concerned with cyclists passing too close and/or too fast. Footway designed to accommodate user types and levels can play a major role in meeting safety and mobility objectives.

Pedalpower (2001) has also identified that narrow footpaths contribute to low pedestrian safety and amenity.

Pedestrian and cyclist organisations agreed that bicycle routes should normally be provided by redistributing space from cars and not pedestrians (Cyclists' Touring Club and Pedestrians Association 1995).

Design unsuitable for persons with disabilities and related groups

Persons with disabilities, seniors and young children are especially vulnerable to injury because of their reduced sensory, cognitive and motor capacities. Persons with disabilities and seniors may be apprehensive about facilities that are not segregated by a kerb or physical barrier (Department for Transport 2004b). Poor access for persons with disabilities has also been identified as an issue in Pedalpower (2001).

Other design and location issues

Other design deficiencies leading to conflict on shared paths include (Road Safety Council 1998a):

- access issues
- blind or acute corners and bends
- inappropriate landscaping
- inappropriate path surfaces i.e. concrete joiners, paving slabs, brick paving
- poor visibility and sightlines

- poor layout and installation of bollards or grab rails causing obstruction; also presence of furniture, signs and obstacles on paths
- dangerous ramps
- lack of detour provisions and signage when paths are closed.

2.6.3 Poor path location

Location deficiencies on shared paths include:

- user and commuter unfriendly (Road Safety Council 1998a)
- paths too hilly (Road Safety Council 1998a)
- paths not responsive to needs, i.e. lack of opportunities to link communities with open space networks, community facilities and public services and lack of good connection with local streets (Road Safety Council 1998a)
- paths interrupted by roads (Walter 1995).

2.6.4 Poor path maintenance

Poor maintenance such as tree roots degrading path surface, corrugations and debris etc on shared paths is another issue contributing to conflict (Road Safety Council 1998a).

It was a major problem for the Yarra survey, with 41% of respondents expressing concern resulting from corrugations, tree root damage and glass debris (Walter 1995).

2.6.5 Other issues

These include the following (Road Safety Council 1998a):

- maps and directories not updated and not easy to read.

3 CONSULTATIONS WITH KEY STAKEHOLDERS

Key stakeholders in the bicycle and pedestrian field were consulted to identify the issues associated with the conflict between pedestrians and cyclists on paths (see Appendix A). The collated responses from the initial stakeholder surveys are presented in section 3.1. They have been further grouped into broad categories to assist in interpretation.

3.1 Conflict issues

3.1.1 *Inappropriate user behaviour*

- Dogs running out under cyclists – owners not keeping dogs on leash or within arms reach, which may result in the dog running out in front of the cyclist. There are also difficulties with parents pushing prams and walking dogs at the same time, especially two abreast.
- Both pedestrians and cyclists not keeping left (even though they would most likely do that on the road). This ties in with cyclists failing to overtake pedestrians on the right.
- Pedestrians and cyclists travelling in groups or two abreast, i.e. cycle clubs or walking with a friend and taking up the whole path and not moving over for other users.
- Speed differential between cyclists and pedestrians. When commuting, it is not uncommon for cyclists to want to maintain speed at or above 25km/h. The speed differential is the main cause of angst amongst pedestrians, especially older pedestrians, as they feel vulnerable should a collision occur. Speed differential between cyclists of different ages and abilities is also an issue.
- Lack of bells on bicycles or failure to use them at all or with sufficient warning, due to an image problem, poor enforcement and general poor knowledge of this effective warning device. Cyclists tend to come upon slower riders and pedestrians quickly and do not always have a good process for warning pedestrians of their approach and what is expected of them. Primary school aged cyclists in particular need a better understanding of the warning process as they become more skilled at cycling.
- Note that some pedestrians may hear a cyclist ringing his/her bell for some time and still not register what is happening.
- This is also related to the issues where people with personal stereos or engaged in animated conversation may not hear the warning bell.
- Lack of awareness as follows:
 - Path users are often unaware of speed characteristics of the other users, e.g. pedestrians have a 2 m forward horizon and cyclists are looking much further ahead due to their increased speeds.
 - Whilst cyclists generally expect pedestrians to be on the pathway, pedestrians are unaware that many paths are to be shared with cyclists due to lack of knowledge and lack of signage. They rarely expect there to be anyone coming up behind to overtake them.
 - Many pedestrians do not realise that they are not permitted to walk on a cycle-only path. Some also ‘camp’ on cycle only paths to talk as they do not want to stand on the wet grass next to the path, or either are just not aware or considerate of other users of the path.
 - Lack of general awareness that a path is to be shared by many types of pedestrians, cyclists and other users with different intentions, e.g. dog walkers, roller bladers, very young children, seniors and people with disabilities, pram users.

- Lack of courtesy and consideration, e.g. irresponsible users who give other users a bad name such as cyclists who do not slow down and scare pedestrians. Some cyclists do not have the patience to overtake slowly and carefully.
- Lack of knowledge by both cyclists and pedestrians as to the rules/guidelines on shared path etiquette and the relevant *Australian Road Rules* (National Road Transport Commission 1999), e.g. what age of cyclist is allowed on footpaths.
- Lack of proper lighting: dark clothing worn and dogs walked in unlit places after dusk, cyclists not using legal lighting at night.
- Cyclists not giving way to pedestrians.
- Unpredictable behaviour of path users, e.g. dog walkers, children, adults getting a fright.
- Unauthorised use by vehicles and motorcycles, e.g. motorists parking on paths forcing some users onto the roadway.
- Cyclists riding illegally on footpaths, and cyclists seeking to use paths and trails designated for walking only.
- Entering the path at right angles to approaching users.

3.1.2 Poor path design

- Narrow paths that cannot comfortably accommodate users each way, i.e. a path may be technically wide enough, however, in reality many paths are only just wide enough to cater for a cyclist and pedestrian travelling very slowly. Note that cyclists may have to leave the path if the path is not wide enough which can be dangerous.
- Narrow paths often without hard packed ground adjacent to them (or where this is overrun with vegetation) also make the interactions difficult.
- Squeeze points such as narrow bridges, bollards and chicanes are another issue.
- Poor line of sight resulting in near misses and collisions from not seeing each other. Some paths also have buildings and vegetation obscuring the corners, which exacerbates the issue of speed differentials.
- Obstructions and constrictions to paths: paths placed on the edge of sporting fixtures - used to site spectator chairs, bollards, signs and safety barriers.
- Inappropriate cambers, gradients and curves, e.g. unnecessary winding causing cyclists to speed up to achieve their destination or square corners resulting from poor understanding of bicycle dynamics as well as the need to maintain constant speed and have the ability to avoid a collision with another cyclist or pedestrian.
- Paths not of sufficient standard to cope with high volumes, especially where commuter routes are inappropriately placed in reserves where higher speeds are inconsistent with a more quiet setting. Many paths are just adapted footpaths and not purpose built for shared use – major retrofitting exercise is needed.
- Poor path signage – signage missing or unclear. Directional and locational signs are rare and warnings of steep paths, changing conditions or blind corners seem not to be very common.
- Poor path lighting at night - no street lights.
- Footpaths that do not have a ramp to road level.
- Using path surfaces not appropriate to shared use paths, and changing surfaces along a path may lead to confusion.

3.1.3 Poor path location

- Paths inappropriately sited, setting up unnecessary conflict, e.g. where cycle path is put between car park and BBQ areas/children play areas or in off-leash dog areas. Paths that lead cyclists into busy pedestrian places such as shop frontages and picnic areas also create hazards.

3.1.4 Poor path maintenance

- Maintenance activities on shared paths do not always happen in a timely manner, allowing dangerous conditions to remain.
 - Common short term issues include flooding, debris, overhanging branches and litter; long term ones include cracks, broken edges and potholes.
 - Other issues include poorly maintained linemarking, signage and landscaping.

3.1.5 Other issues

- Infrastructure issues:
 - There will always be some conflict on shared use paths where there is heavy traffic.
 - There is not enough on-road provision for cyclists. (see comment).
- Poor visibility of path users to motorists backing out of their driveways onto the shared path. This is exacerbated by the presence of fences or walls adjacent to the driveway.
- Questioning of the legitimacy of cyclists riding on shared paths and for under 12 years old (and adults, where allowed) riding on footpaths. General policy of authorities providing off road paths for cyclists is often misguided, and has a two-fold consequence for cyclists – they are seen as a nuisance on many paths but at the same time motorists are led to believe that cyclists should be off roads.

4 CURRENT BICYCLE AND WALKING STRATEGIES

4.1 Transport strategies

There is a strong consensus among urban and metropolitan transport strategies that the historical trend of increasing use of the private car for personal travel has to be reversed for a range of reasons, including:

- congestion
- local and global (greenhouse) environmental impacts
- oil (transport energy) depletion
- urban sprawl and land use impacts
- road and transport safety
- increasing cost of providing and maintaining transport infrastructure and services
- social inclusion and equity.

Some strategies set targets for reduced car use relative to the 'business as usual' expected outcome (e.g. Department of Transport 1995, Brisbane City Council 2003). Others are less quantitatively specific but are equally clear on the direction (e.g. Department of Transport and Urban Planning 2003).

Where targets have been set, they have been powerful drivers of new initiatives. In addition to conventional infrastructure and service delivery approaches, voluntary travel behaviour change programs (TravelSmart) have had important beneficial impacts on the levels of both cycling and public transport use.

Whilst strategies are based on the need to achieve substantial increases in both cycling and walking (as well as other alternatives to the private car), reference to the inter-relationship between cycling and walking is usually in terms of both providing a convenient and effective means of expanding the catchment for public transport (trains and buses).

Both walking and cycling components have commonly included reference to infrastructure (footpaths, shared paths, cycle lanes, etc) and other forms of provision and encouragement (e.g. at signalised intersections) without recognition of the potential for conflict by:

- directly between the pedestrians and cyclists where they share the same space
- the indirect impact of other (non-movement) uses of pedestrian or cycle space.

This is not just an Australian phenomenon. The *Mayor's Transport Strategy for London* (Greater London Authority 2001), possibly the most comprehensive and radical integrated transport strategy for a major urban area, deals with bikes (section 4j) and buses (section 4f) separately. The *Strategy* (section 4g, *Streets for All*) does state:

Measures can be used individually or collectively to support the policies and proposals of the Strategy. Of particular importance is the use of street space allocation to assist road safety initiatives; support bus, pedestrian and cyclist initiatives; and to ensure that initiatives, such as the proposed central London congestion charging scheme, do not result in diverted traffic using unsuitable streets [current author's emphasis].

However, there is no implication that there might be conflict between the pedestrian and cyclist initiatives.

4.2 Bicycle and walking strategies and plans

The Australian national cycling strategy (Austroads 2005), whilst acknowledging the potential of walking to contribute to some of the same objectives and outcomes as cycling, does not discuss the interactions between them.

The UK National Cycling Strategy (Department for Transport 1996) also focuses on promoting both cycling and walking, without acknowledging the potential for conflict. This is a surprising omission given the long-standing and successful campaigns by persons with disabilities, particularly the blind, in the UK for separation from cyclists. Only Policy 7 even deals with both walking and cycling in terms of common interests:

Policy 7: The authority will ensure that development does not sever routes used by cyclists or pedestrians or unjustly prejudice accessibility by walking or cycling.

At a state level in Australia, references to walking in bicycle strategies and plans are few and usually in similar terms to the parent transport strategy (see, for example, the *WA Bike Ahead Strategy* (Department of Transport 1996)).

The *Queensland Cycle Strategy* (Queensland Transport 2003) does acknowledge, indirectly, the different needs of pedestrians and cyclists when it states:

Safe cycling can be achieved by designing and building quality facilities that account for the needs of riders and pedestrians. This particular design [Figure 4.1] provides separate paths for riders and walkers (page 29).



Figure 4.1: Separation of cycle and pedestrian facilities

(Queensland Transport 2003)

Note: Lateral restrictions (poles on left, rails on right) on cyclist operating space that reduce the effective width of the cycle facility.

More specifically, discussion of ‘building a bicycle network’ (page 6) states the importance of:

Reducing the speed difference between bicycles and other modes where separation is impractical or undesirable. This applies to roads shared with cars and pathways shared by bicycles and pedestrians.

Queensland Transport (2004a) has also published an *Action Plan for Pedestrians 2004-2006*. The Action Plan states:

Pedestrian and cyclist interaction is an important issue in Queensland. As more shared facilities for cycling and walking are introduced in Queensland increased demand is leading to conflict among users (page 6).

Actions developed to address conflict include promoting the Cycle Notes as a guide for addressing conflict, and providing guidance to local government authorities on strategies to reduce conflict through design and engineering solutions and behaviour management.

The New South Wales *Action for Bikes: BikePlan 2010* (Roads and Traffic Authority 1999a) deals with pedestrian and cyclist issues only in the context of bicycle couriers, but does so in terms that are also applicable in other contexts:

Pedestrians and fast moving bicycles do not mix and all cyclists need to exercise care in areas of large pedestrian movements, especially in the presence of children or the elderly (page 13).

Whereas, in Australia, walking and cycling tend to be dealt with as separate entities, the recently-released New Zealand walking/cycling draft strategy (Ministry of Transport 2005) brings them together in a single document.

While some measures can benefit both walking and cycling — for example, both modes of transport can benefit from environments that result in slower motor vehicle speeds — most of the ‘on the ground’ facilities required by walking and cycling are different. Care needs to be taken when designing transport environments to ensure that these differences are understood and considered and that the specific needs of each mode of transport are catered for appropriately. Where conflicts might arise, emphasis needs to be placed on finding solutions that work for both modes of transport. [Current author’s emphasis] (Ministry of Transport 2005, page 10).

It also acknowledges potential synergies:

Not only will improved walking and cycling environments reduce road fatalities among pedestrians and cyclists, but road environments that are safer for pedestrians and cyclists also benefit public transport users and tend to be safer for motor vehicle use. In the longer term, it is possible that reduced motor vehicle traffic, resulting from shifts to walking, cycling, and public transport, may also help improve safety on our roads. (Ministry of Transport 2005, page 9).

New Zealand walking and cycling strategies – best practice report (Macbeth, et al.2005) advise that in some situations pedestrians and cyclists can easily and safely share facilities, but in most cases they should be kept separate. This is because pedestrians and cyclists often have quite different needs. For example, pedestrians typically cross roads at right angles and at quite a different speed from traffic, whilst cyclists may merge to the centre of the road and move with motorised traffic.

Education, enforcement and encouragement components of walking and cycling strategies, however, may be more similar than design requirements for walking and cycling. If the strategies are combined, the walking and cycling issues should be addressed separately as only some features are common. However, whether the documents are separate or combined is generally less important than the decision to produce the strategies (Macbeth, et al.2005).

The United Kingdom has also joined up its action plans for cycling and walking (Department for Transport 2004d), but this is also primarily in the context of synergies, rather than conflicts. For example:

Walking & Cycling Fund Toolkit. DfT will provide local authorities with the toolkit they need to set up local Cycling and Walking Project Funds, using their local transport plan funding, to support small-scale non-highway improvements to facilities for walkers and cyclists (page 26).

Professional training for cycling and walking. DfT will work with the English Regions Cycling Development Team, the National Cycling Strategy Board and walking organisations to develop training modules for transport professionals on design for safe and pleasant walking and cycling journeys (page 53).

Working with professional institutions. DfT will work with the National Cycling Strategy Board and walking groups to persuade professional institutions and universities to take on the training modules developed for walking and cycling as part of their programmes of undergraduate teaching and continuing professional development (page 53).

5 CURRENT PRACTICE IN AUSTRALIA, NEW ZEALAND AND OTHER OVERSEAS COUNTRIES

5.1 Existing guidelines and practice in Australia and New Zealand

5.1.1 *Austroads guide to traffic engineering practice*

A requirement of this project is to recommend amendments to Austroads guidelines, specifically the Guide to Traffic Management. The focus is on mainly Parts 13 and 14 with respect to the interaction of pedestrians and cyclists on shared paths and the minimisation of conflicts that may occur. The key tasks comprise:

- a review of existing guides to identify any areas of conflict
- devising amendments to reflect the outcome of the study.

This report reviews Austroads GTEP Parts 13 and 14 with respect to minimisation of conflict between pedestrians and cyclists.

Background

Safety and conflict on bicycle paths and shared paths is similar to that for road systems in that human, path design and vehicle characteristics may all play a part in the occurrence of a conflict or a crash.

In recent years several road authorities have developed signs to encourage better behaviour on shared paths. For over a decade Austroads' GTEP Parts 13 and 14 have provided guidelines for good design practice with respect to pedestrian and bicycle facilities. Although both guides mention conflict between pedestrians and cyclists the subject is not raised as a significant issue in its own right, with Part 14 relating particular design parameters to the potential for conflict. The relatively 'silent' operation of bicycles can also be a factor in the perception of conflict and potential for conflict on shared paths.

The pedestrian and cyclist populations both include a wide range of experience and abilities that may contribute to conflict. Road authorities are currently considering the needs of older drivers and how these can be incorporated into design standards. It is reasonable to expect that the growth in numbers of senior pedestrians could also contribute to a future potential for serious conflict on shared paths.

New Austroads Guides

Austroads publications are to be restructured in the next few years. The GTEP series will be replaced by the *Guide to Traffic Management*. Other relevant Austroads Guides are *Road Design* and *Road Safety*.

It is currently proposed that under the new structure the requirements for pedestrians and cyclists would not be covered in a discrete part, but would be integrated throughout the (web-based) publications. Therefore, the second key task referred to in the introduction above is likely to require the content of the current Parts 13 and 14, and any suggested amendments, to be dispersed throughout the new Guides.

The current proposal is that footpaths and off-road paths would be covered in the *Guide to Road Design* in a Part discussing Roadside Design. This Part will provide concise guidelines as to 'What' should be provided. The 'Why' (discussion of issues, reasons behind design parameters and designs) will be provided in an associated Commentary.

Nature of conflict on shared paths

Cyclists contribute to conflict on shared paths through:

- individual riders passing too close at relatively high speed – a function of a basic desire to maintain speed either in training, recreation or commuting
- similar action by groups (at the extreme, a peleton)
- failure to warn pedestrians of their approach or intention to pass
- excessive speed in inappropriate situations (e.g. sharp curve, narrow path).

Pedestrians contribute to the conflict through:

- individuals failing to keep to the left and to maintain a predictable path
- groups occupying the width of the path
- children not being adequately supervised
- use of other vehicles and toy vehicles (powered scooters, roller blades, roller skis)
- dogs not being kept under control.

The quiet nature of cycling and the use by pedestrians of radio/CD headsets are contributing factors.

Engineering design and traffic management standards used for paths can also be causal or contributing factors. Engineering aspects include:

- planning regarding path location and abutting land use (restaurants, car parking activity)
- horizontal (and sometimes vertical) alignment
- sight distance
- width
- clearances to obstacles and fences
- gradient
- layout of access points
- bridge widths and approach alignments
- pavement markings
- regulatory, warning and guide signs
- design of road crossings
- and more recently, behavioural signs.

Review of GTEP Parts 13 and 14

Appendix B provides a review and summary of the sections of GTEP Parts 13 and 14 that relate to shared paths and conflict between cyclists and pedestrians. This review identifies all sections of the guides that either currently refer to pedestrian/cyclist conflict or are seen to be relevant to the issue. A brief subject description, quotes and comment are provided.

There do not seem to be any major anomalies between Parts 13 and 14, except in relation to path width, and this probably is a function of Part 13 being an older edition than Part 14. Similar design principles are mentioned in each part for providing for joint use and dealing with conflict (i.e. use of a well designed separated path).

One of the advantages of the proposed new Austroads Guides is that duplication of information, an obvious deficiency of current Guides, will be eliminated. Subjects will be covered in only one location with references to all other relevant subject areas, thus eliminating different advice being given in different parts of guides.

From the review it is evident that GTEP Part 13 pays little attention to shared facilities and hence the potential conflicts that might arise, although a specific mention is made of conflict between users in a couple of places in the text. However, there are subject areas and guidelines that relate directly to shared use facilities and these have been identified – for example, the needs of wheelchair users and visually impaired persons who may choose to use shared facilities in growing numbers as the general population ages.¹

On the other hand, although GTEP Part 14 does not discuss cyclist/pedestrian conflict as a subject in its own right, it does make several references to the conflict between cyclists and other path users, including pedestrians. These references are in relation to planning, the type of path to be used, and the design standards that should be used for safe operation of paths and to assist path users to avoid conflict. However, there is not a strong and coherent connection drawn between pedestrian/cyclist conflict and the combination of standards used. A rewrite of the guide should provide a stronger case for the selection of standards based on the need to minimise the potential for conflict.

Conclusion

The review of Part 13 – *Pedestrians* and Part 14 – *Bicycles* of the current Austroads Guide to Traffic Engineering Practice has revealed that:

- Part 13 does not deal to any great extent with shared use or the pedestrian/cyclist conflict that may arise.
- Part 14 has several references to pedestrian/cyclist conflict but there is a need to relate the potential for conflict to engineering design parameters and standards.
- Amendments to reflect the outcome of the study should be produced in a form that suits the new Austroads Guide, namely a concise guide on the subject supported by a Commentary on the issue.

5.1.2 Other Austroads documents

The report by Damen & Taylor (2001) entitled *Traffic Flow Models Allowing for Pedestrians and Cyclists* refers to cyclist and pedestrian conflict only in low traffic volume streets and at bus stops.

¹ As an example, when the Principal Shared Paths along the suburban passenger rail lines were being planned in Perth, there was strong support from the Royal Perth Hospital Rehabilitation Centre, most of the patients at which are paraplegic or quadriplegic, for an additional link to one of those paths as it would greatly enhance the independent movement options available to wheelchair-bound people resident at the Centre.

5.1.3 State/Territory guidelines

New South Wales

The Roads and Traffic Authority (Roads and Traffic Authority 2003) has published a set of guidelines entitled *NSW Bicycle Guidelines*, developed to assist road designers, engineers and planners to design and construct high-quality bicycle transport facilities. These guidelines address issues such as planning and engineering concepts, major types of bicycle facilities, bicycle facilities on- and off-road within and not within reserves, bicycle facilities at intersections, surface treatments, line-marking, signage, maintenance, bicycle parking and safety audits. The guidelines recognise the potential for conflict by stating that:

Good bicycle network facilities, like roadways, should be designed to reduce the seriousness of accidents and conflicts and cater for all members of the community. In places where separation is impossible or undesirable, the most effective means of crash prevention is to reduce the speed difference between bicycle riders and cars. This can also apply to paths shared with pedestrians' (Section 3.3, page 12).

The conflict is also mentioned in Section 4.4 page 18, where, in a shared path in a road reserve '*cycling is more comfortable unless large numbers of pedestrians are present*', and '*riders and pedestrians sometimes do not respect each other's use of the facility*'.

Shared Paths – User Advisory Signs (Roads and Traffic Authority 2001) provides guidance for the message text and installation of user advisory signs for shared paths.

Queensland

Three Cycle Notes published by Queensland Transport are relevant to the potential conflict that can occur on footpaths and shared paths. Good design processes and appropriate design for the expected type of off-road path are covered in Cycle Note B3 *Designing Good Quality Off-Road Cycling Facilities* (Queensland Transport 2004a). Cycle Note C1 *Assessing Footpaths for Shared Use* discusses the current legislation, types of problems on footpaths, determining when a footpath ban is required, and risk management (Queensland Transport 2004b). Finally, Cycle Note C2 *Reducing Conflict Between Bicycle Riders and Pedestrians* (Queensland Transport 2004d) examines the causes of conflict on shared bicycle/pedestrian paths and provides guidance on methods to reduce this conflict. Methods discussed include planning considerations to minimise conflict on new off-road bicycle/pedestrian facilities, design and maintenance considerations and campaign strategies.

Standard bicycle/pedestrian shared and separate path signs are presented in the *Queensland Manual of Uniform Traffic Control Devices Part 9: Bicycle Facilities* (Department of Main Roads 2003).

Victoria

Cycle Notes 3, 10, 11 and 12 published by VicRoads are of relevance to this project. VicRoads (1999) Cycle Note No. 3 deals with shared bicycle/pedestrian path design issues such as path widths, clearances to obstacles, path curvature and sight distance. More information on the design standards for off-road bicycle paths, such as widths and signage, is included in VicRoads (2002) Cycle Note No. 12. Finally, detailed information on signage and linemarking for off-road bicycle paths is provided in VicRoads (2001) Cycle Note No. 10 *Behavioural Signs* and VicRoads (2004a) Cycle Note No. 11 *Directional Signs*.

Western Australia

Conflict issues between cyclists and pedestrians are identified by Road Safety Council (1998a). The Council also recommends a range of planning/engineering and maintenance/environmental solutions to be adopted over a period of time, along with a program designed to educate users that the paths are shared and that users have different needs, and supporting this through an appropriate level of enforcement. It lists a number of measures that should be given priority to ensure that the conflict between pedestrian and cyclist is reduced.

Guidelines for Bicycle Directional Signage are currently being developed (Main Roads Western Australia 2004).

5.1.4 New Zealand guidelines

Land Transport Safety Authority (2004) is a best practice guide covering all aspects of cycle network and route planning. It focuses on the role and importance of cycle infrastructure in cycling strategic plans and on planning for cycling as a mode of transport. The guide has tools that may help both cycle planners and communities. It expands on Chapter 2 of the Austroads GTEP Part 14 (Austroads 1999), and complements the New Zealand cycle design supplement (CDS) to that guide (Transit New Zealand 2005).

The *Guidelines for facilities for blind and vision-impaired pedestrians RTS 14* (Land Transport Safety Authority 2003) provide best practice design, installation and performance standards of pedestrian facilities for blind and vision-impaired people both for new facilities and for those that need to be upgraded. Standardising pedestrian facilities will improve consistency of directional and warning messages to blind and vision impaired people, as well as increase their safety throughout the entire walking journey.

5.2 Existing traffic and user regulations in Australia and New Zealand

5.2.1 Australian road rules

A number of *Australian Road Rules* (National Road Transport Commission 1999) are relevant to the issues of potential conflict between cyclists and pedestrians on footpaths and shared paths. These rules are presented below in a slightly simplified form for clarity purposes.

Pedestrians and persons travelling in or on wheeled recreational devices and wheeled toys

- Rule 236 – a pedestrian must not unreasonably obstruct the path of any driver or another pedestrian.
- Rule 239 – a pedestrian must not be on a part of a separated footpath designated for the use of bicycles, unless the pedestrian is crossing the path. However, a pedestrian may be on the separated footpath designated for the use of bicycles, if the pedestrian is in or pushing a wheelchair, or is on rollerblades, roller skates or a similar wheeled recreational device, or there is no traffic control device indicating that the pedestrian is not permitted to be on that part of the separated footpath.
- Rule 242 – a person travelling in or on a wheeled recreational device or wheeled toy on a footpath or shared path must a) keep to the left of the footpath or shared path unless it is impracticable to do so, and b) give way to any pedestrian (except a person travelling in or on a wheeled recreational device or wheeled toy) who is on the path or footpath.
- Rule 243 – a person travelling on rollerblades, roller skates, or a similar wheeled recreational device, must not be a part of a separated footpath designated for the use of pedestrians unless the person is crossing the path. This person must keep out of the path of any bicycle if travelling on a part of separated footpath designated for the use of bicycles.

It should also be noted that the *Australian Road Rules* (National Road Transport Commission 1999) have abandoned the requirement for pedestrians to keep left on shared paths. It is however recommended that they be amended to re-introduce this requirement for all path users on shared paths in order to match and support the many sensible codes of conduct already in use and the widespread and effective practice of centre-line marking with 'keep left' and similar stencils.

Bicycle riders

- Rule 249 – the rider of a bicycle must not ride on a part of separated footpath designated for the use of pedestrians.
- Rule 250 - the rider of a bicycle who is 12 years old or older must not ride on a footpath if another law of this jurisdiction prohibits it. The rider of a bicycle riding on a footpath or shared path must a) keep to the left of the footpath or shared path unless it is impracticable to do so and b) give way to any pedestrian on the footpath or shared path.
- Rule 251 – the rider of a bicycle riding on a footpath or shared path must keep to the left of any oncoming bicycle rider on the path.
- Rule 252 – the rider of a bicycle must not ride on a length of footpath or road to which a 'no bicycles' sign or marking applies.
- Rule 253 – the rider of a bicycle must not cause a traffic hazard by moving into a path of a pedestrian.
- Rule 258 – a person must not ride a bicycle that does not have a bell, horn, or similar warning device in working order.
- Rule 259 – the rider of a bicycle must not ride at night or in hazardous weather conditions causing reduced visibility unless the bicycle or the rider displays appropriate lighting.

Other potential users

- Rule 288 – a driver (except the rider of a bicycle) is not allowed to drive on a path, unless: it is allowed by a traffic control device, they are entering or leaving a road related area, are permitted to drive on the path under another law, or are driving in accordance with motorised wheelchair subrule (3). The driver (except if entering or leaving a road related area) must give way to all other road users and to animals on the path.
- Rule 302 – the rider of an animal must give way to any pedestrian on a footpath.

5.2.2 New South Wales

In NSW, the *Australian Road Rules* are incorporated into *Road Transport (Safety and Traffic Management) (Road Rules) Regulation 1999* along with NSW variations. This essentially means that all rules listed in Section 5.2.1 above also apply in NSW. For NSW purposes, the variation of Rule 250 reads as follows:

26 Riding on a footpath.

- (1) For the purposes of rule 250 (1) of the *Australian Road Rules*, a rider of a bicycle who is 12 years of age or older must not ride on a footpath unless:
 - (a) if the rider is an adult - the rider is accompanying a child under 12 years of age who is riding on the footpath and the child is under the rider's supervision, or
 - (b) if the rider is not an adult - the rider is under the supervision of an accompanying adult as referred to in paragraph (a), or
 - (c) the rider is a postal worker who is riding the bicycle in the course of his or her duties as a postal worker.

With the introduction of the new *Australian Road Rules*, the Roads and Traffic Authority (Roads and Traffic Authority 1999b) has also developed a guide entitled *Changes to Road Rules in NSW Guide*, which provides detailed information about changes to road rules in NSW.

5.2.3 Victoria

The Victorian version of the *Australian Road Rules, Road Rules – Victoria* (Victoria. Parliament 1999) have been incorporated into the *Road Safety (Road Rules) Regulations 1999*. Under the *Road Rules- Victoria*, people aged 12 years of age or older are not permitted to ride their bicycles on the footpath, unless they qualify for an exemption as outlined below:

- a. people aged 18 years of age or older who are accompanying a child who is under 12 years of age and the child is under the rider's supervision
- b. people who have a physical or an intellectual disability and who carry a certificate signed by a medical practitioner that states that it is undesirable, impractical or inexpedient for them to ride on the road
- c. people engaged in the delivery of postal articles for or on behalf of Australia Post.

A brochure entitled *Cyclist Visibility* has been produced by VicRoads (2000). It relates primarily to cyclists travelling on roads however the rules also could apply to riding on paths.

Victoria has also developed a community based campaign called Share the Road. Whilst this campaign is aimed at increasing drivers' and cyclists' awareness of each other, a reference is made to cyclists wearing bright clothing and using lights, and safe cycling for children and on shared paths (VicRoads 2004a).

Finally, VicRoads (2004b) have produced a self-regulated code of conduct for road cycling, which did not mention riding on paths. However, Bicycle Victoria (n.d.) has published a short leaflet entitled *Sharing Off-Road Paths when Commuting or Touring*. This leaflet provides a short summary of rules and etiquette on shared paths from the cyclist's perspective.

5.2.4 Queensland

Queensland's Road Rules are contained within the *Transport Operations (Road Use Management-Road Rules) Regulation 1999*. Some of the most important rules for pedestrians are also presented on the internet, including giving way to pedestrians if using a wheeled recreational device such as a scooter, skateboard or rollerblades, and walking on the side of the path designated for pedestrians on separated paths (Queensland Transport 2005b). The *Road Rules for Cyclists* article lists most of the Rules stated in section 5.2.1 (Queensland Transport 2005a). It should be noted that in Queensland, cyclists of any age are allowed to ride on a footpath unless prohibited by a bicycle prohibition sign.

A *Road User Code of Behaviour* is also presented on the internet (Queensland Transport 2005c). It includes a code of behaviour for pedestrians, users of wheeled recreational devices and cyclists when using footpaths, shared paths and separated paths.

Queensland Transport (2005d and 2005f) list safety tips for cyclists and pedestrians on sharing paths safely. Separate safety tips for cyclists are discussed in Queensland (2003f) but they appear to relate mostly to riding on the road.

5.2.5 Western Australia

In WA, most rules applying to cars also apply to cyclists. A full list of these can be found in the *Road Traffic Act 1974*, *Road Traffic Code 2000* and *Road Traffic (Bicycles) Regulations 2000*. The *Australian Road Rules* been adopted into the above law.

In WA, only riders under 12 years of age are permitted to ride on a footpath, unless a no bicycles sign has been erected.

The Department for Planning and Infrastructure has also produced a series of cycling brochures that relate to potential conflict on shared paths and footpaths. In their *Cycling on Roads and Shared Paths* brochure, rules state that riders must only travel in single file on all paths, animals must not be tied to a moving bike, a power-assisted bicycle must not use the path when the power assistance is engaged. Also, it is an offence to speed and ride carelessly and recklessly (Department for Planning and Infrastructure 2005c). Courtesy also indicates that the cyclist should slow down when passing pedestrians and should always ring the bell about 30 m before reaching them. The *Cycling and the Law* brochure also deals with rules affecting cyclists (Department for Planning and Infrastructure 2005a). The third brochure, *Cycling at Night*, provides information on reflectors, lights, power sources and being alert (Department for Planning and Infrastructure 2005b).

Road Safety Council (1998b) is a guide for all shared path users to their responsibilities and rights in order to help minimise conflicts between them. However, this has not been updated to reflect the *Australian Road Rules* and is currently out of print.

5.2.6 South Australia

The *Australian Road Rules* have been made into Regulations under the *Road Traffic Act (SA)*. The Regulations applying to cyclists are also set out in a document entitled *Cycling and the Law* (Transport SA 2000). They state that every bicycle must have an effective warning device in working order and within easy reach, the bicycle must have appropriate lighting if riding at night or in hazardous weather conditions. It further states that when riding on any path, the rider must exercise due care and consideration for pedestrians and other users, give warning to pedestrians or other users of approach by sounding the bell or horn and keep to the left of any oncoming bicycle rider. When using footpaths and shared paths, the rider must give way to any pedestrian and keep to the left of the path unless impracticable to do so.

It is against the law in South Australia to ride on the footpath unless you are under the age of 12 or carrying and complying with a certificate issued by a doctor.

Transport SA (n.d.a) have developed a set of behavioural guidelines entitled *Share the Road*. Whilst some guidelines are applicable to footpath behaviour, there is no specific reference made to footpaths and shared paths.

An information brochure summarising the laws applying to skateboarders and rollerbladers has also been published by Transport SA (n.d.b). It makes reference to skating on footpaths as well as well as roads.

Additionally, Adelaide City Council (undated) has also produced guidelines for users of shared paths entitled *Sharing our Paths and our City*, aiming particularly for the use of the Linear Park Shared Path. It has behavioural guidelines for cyclists and pedestrians as well as people preparing to use the river for rowing.

5.2.7 Tasmania

In Tasmania, the *Australian Road Rules* have been adopted by incorporation into *Traffic (Road Rules) Regulations 1999 (S.R. 1999, No. 131)* along with local Tasmanian laws (Tasmania. Parliament 1999). A review of the regulations indicates no local law preventing riders over 12 years of age from riding on a footpath, hence riders of any age may ride on footpaths. The Department of Infrastructure, Energy and Resources (2003) also lists the rules applicable to skating on footpaths, as well as the skaters' code of conduct. No additional information appeared to be available for cyclists or pedestrians that related to potential conflict on shared paths and footpaths.

5.2.8 Australian Capital Territory

The *ACT Road Rules Handbook* written by Road Transport (2006) has incorporated a number of the *Australian Road Rules* for cyclists. The relevant rules are stated below in a simplified form.

- The rider of a bicycle riding on a footpath or shared path must keep to the left of the footpath or shared path unless it is impracticable to do so, and must give way to any pedestrians on the footpath or shared path.
- The rider of a bicycle must not cause a traffic hazard by moving into the path of a driver or a pedestrian.
- A person must not ride a bicycle that does not have a bell, horn, or similar warning device in working order.
- The rider of a bicycle must not ride at night or in hazardous weather conditions causing reduced visibility unless the bicycle or the rider displays appropriate lighting.

In the ACT, pedestrians may also use bicycle paths. The following rules apply to bicycle paths:

- It is against the law to ride a bicycle on a path within 10 metres of an open shop.
- Pedestrians must keep to the left of any white centreline that may be on the path.
- If approaching pedestrians from behind, cyclists must ring their bell to let them know they are coming, slow down as they pass and give them right of way.

In the ACT, people of any age may ride on footpaths. Brief guidance is given in a brochure on *Enjoying Safe Cycling in the ACT* (Department of Urban Services 2005).

5.2.9 Northern Territory

In the Northern Territory, the *Australian Road Rules* are incorporated into *Traffic Regulations – Northern Territory of Australia* (Department of Planning and Infrastructure 2004). Riders of any age may ride on footpaths. No additional information appeared to be available for cyclists or pedestrians that related to potential conflict on shared paths and footpaths.

5.2.10 New Zealand

In New Zealand, it is only permissible to cycle on a footpath if:

- you are delivering to letter boxes
- the path has been declared and signed as a cycle path.

New Zealand does not permit young cyclists to ride on the footpath, unless the bicycle is so small it does not meet the definition of a bicycle.

It should be noted that New Zealand research into deaths of young cyclists (aged 5-13) in urban areas found that most were related to use of footpaths (7), or of cyclists leaving driveways (2). Only one out of 11 urban fatal crashes involving cyclists under 13 years was the cyclist riding in the normal on-road position.

New Zealand does not currently have rules relating to shared path use, however Transit New Zealand proposes to adopt some rules along the lines of the Australian rules, i.e. cyclists need to give way to pedestrians, pedestrians must not unreasonably hinder other path users.

5.3 Existing guidelines and practice overseas

5.3.1 Denmark

A review of *Collection of Cycle Concepts* (Jensen et al. 2000) indicates that Denmark has few places where motor vehicles, bicycles and pedestrians share the same area. In most cases, they are separated from each other such that each type of traffic has its own area.

Road Directorate (2000) did not include any specific reference to shared paths and footpaths.

Bicycle traffic is prohibited in some pedestrian areas. However, if it is permitted, and there are no cycle lanes or cycle track, cyclists must always give way to pedestrians. If there is enough space and high pedestrian volumes, cycle tracks may be installed to reduce the conflicts between cyclists and pedestrians (Figure 5.1). These should be indicated by a change in level or pavement type and height (20-70 mm).



(Road Directorate 2000)

Figure 5.1: Two-way cycle track in pedestrian street

Conflicts can also be limited by permitting bicycle access only outside peak pedestrian times (Figure 5.2).



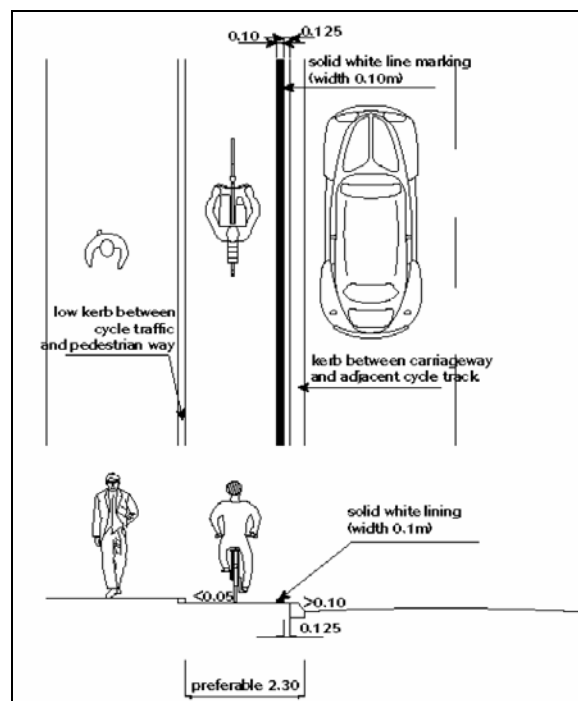
(Road Directorate 2000)

Figure 5.2: This pedestrian street is a 5-9am short cut for cyclists

5.3.2 Ireland

Dublin Transportation Office (1997) provides some specification and dimension guidelines for the installation of a one way or two way cycle track on a footway. The guidelines do not provide specifications for shared paths, but state that 'a raised adjacent cycle track as a two-way provision should be avoided' (page 34). For a one-way cycle track:

- The cycle track should be adjacent to the roadway.
- Cycle traffic travels in the same direction as traffic on the adjacent carriageway.
- Street furniture cannot be placed between the cycle track and the carriageway.
- Segregation between cyclists and pedestrians may be indicated by a continuous white line or, preferably, by a small raised kerb of 0.05 m. (Figure 5.3).



Source: (DTO 1997)

Figure 5.3: Segregated cycle and pedestrian paths adjacent to the roadway

DTO (1997) also gives guidance for the design of cyclist and pedestrian areas in shopping centres, residential areas and parks as well as pedestrian and cyclist access to bridges, tunnels and provision of paths along canals and rivers. These take into account the potential for conflict between pedestrians and cyclists.

5.3.3 United Kingdom

Department for Transport (2004d), in its *Walking and Cycling: An Action Plan* describes the different ways in which they aim to increase walking and cycling. There appears to be no reference to potential conflict between pedestrians and cyclists on shared paths and footpaths, other than a commitment to improving the maintenance of cycle paths and footpaths and the creation of secure, well lit routes. These issues have also been identified as a priority by seniors and persons with disabilities.

The Department has also published a number of Local Transport Notes (LTN) that deal with improving conditions for pedestrians and cyclists. LTN 1/04 *Policy, Planning and Design for Walking and Cycling* (Department for Transport 2004e) sets out the policy context that supports the promotion of pedestrian and cyclist facilities, and describes some common design principles for pedestrian and cycle provision. It states that there are no real factors to justify excluding cyclists from pedestrianised areas. LTN 1/04 also states that there may be some circumstances where shared or adjacent use with pedestrians is desirable and care needs to be taken to minimise the potential for conflict. Annex C of this LTN summarises the attitudes to shared use facilities, whilst Annex D suggests a number of key messages as a basis for a code of conduct notice for cyclists with respect to pedestrians.

LTN 2/04 *Adjacent and Shared Use Facilities for Pedestrians and Cyclists* (Department for Transport 2004a) introduces a robust system for practitioners to evaluate and justify the need for shared use (

Box 1). It provides guidance on site assessment, consultations, design, selecting the scheme, associated facilities, general design requirements and other issues.

Box 1: Demonstrating the case for an adjacent or shared use solution

It should not automatically be assumed that cyclists can be better served off the carriageway because an improved on-carriageway solution is not available. It is necessary to demonstrate that an adjacent or shared use route will be attractive to new cyclists and those already using the existing carriageway, while addressing the needs and concerns of non-cyclists. It should be shown that the proposed solution will:

- be safe for all users, including persons with disabilities and especially those with visual impairment, in terms of both traffic safety and personal safety
- be accessible from the carriageway at junctions and avoid frequent 'Give Ways'
- be at least as convenient as the on-road equivalent, and based on genuine desire lines without detours that deter use
- form a convenient link between trip generators, attractors, and other elements of the network
- be well designed, attractive, comfortable to use, and have a good riding surface
- give advantage to those modes being encouraged by policy.

Source: DfT (2004a)

Department of the Environment, Transport and the Regions (2000) states in its *Encouraging Walking: Advice to Local Authorities* that badly designed schemes for shared use can cause conflicts between pedestrians and cyclists. It recommends that 'local authorities should aim to provide separately for cyclists, preferably on the carriageway [...]. Where this is not practical they should try to separate the cycle path from the footpath by a difference in level or a physical barrier' (Page 20, paragraph 3.36). It also addresses issues such as improving the environment for walking and improving pavements.

The Department also provides guidance on the use of tactile paving surfaces on segregated shared cycle track/footway surface and delineator strips (Department for Transport n.d).

5.3.4 United States

The US Department of Transportation (Pedestrian and Bicycle Information Center n.d.a and n.d b) has produced a *Bikeability Checklist* and *Walkability Checklist* that can be used to rate a local neighbourhood's bikeability and walkability, and provides guidelines on what can be done to improve the ratings. There is no explicit reference to potential conflict, however, some questions related to issues such as space provided for walking/cycling, comfort, safety of walk/cycle and the surface ridden on. These issues may influence the perceived and actual levels of conflict.

The Highway Capacity Manual (Transportation Research Board 2000) offers methodology for estimating the level of service (LoS) provided by off-road shared paths for both pedestrians (Chapter 18) and cyclists (Chapter 19). However, this is only applicable to paths 2.4 m wide (in the case of the pedestrian LoS) or 2.4 m and 3.0 m (for cyclist LoS) and makes a number of important assumptions, including that bicycle movements are equal in both directions.

The methodology is based on the number of passing and opposing events experienced by the user. 'Events' is a more useful measure than number of users as it measures the interactions between users, which are the potential source of conflict.

Not surprisingly, the level of service decreases with increasing levels of usage and user interaction, In particular, the *Highway Capacity Manual* indicates that:

- Pedestrian level of service on a 2-way shared path of 2.4 m width is worse than LoS D where bicycle use exceeds 105 per hour in each direction.
- Cyclist level of service is worse than LoS D:
 - on a 2-way shared path of 2.4 m width where the total number of events exceeds 150 per hour
 - on a 2-way shared path of 3.0 m width where the total number of events exceeds 300 per hour.

Table 5.1: Pedestrian level of service for shared two-way paths

Pedestrian level of service	Number of events/hour	Corresponding bicycle service volume per direction (bicycles/hour)
A	≤38	≤28
B	>38 up to 60	>28 up to 44
C	>60 up to 103	>44 up to 75
D	>103 up to 144	>75 up to 105
E	>144 up to 180	>105 up to 131
F	>180	>131

(Transport Research Board), 2000, Exhibit 18-8)

Table 5.2: Cyclist level of service for shared two-way paths

Cyclist level of service	Frequency of events (events/hour) 2.4 m wide paths	Frequency of events (events/hour) 3.0 m wide paths
A	≤ 40	≤ 90
B	>40 up to 60	>90 up to 140
C	>60 up to 100	>140 up to 210
D	>100 up to 150	>210 up to 300
E	>150 up to 195	>300 up to 375
F	>195	>375

(Transportation Research Board 2000, Exhibit 19-2)

In broad terms, the acceptable cyclist volume for any given level of service doubles with the transition from a 2.4 m wide path to a 3 m wide one.

Whilst the limitation to 2.4/3.0 m wide paths is important, it does encompass the more common widths for new paths or path upgrades where heavy usage is anticipated. The 'equal directional usage' assumption is more problematic (especially, for example, in the case of paths that serve commuter functions, whether to work, school or other activity centre).

In addition, there is no mechanism to estimate the number of events, either passings or meetings.

Hummer *et al.* (2005a) have attempted to address these limitations in the case of perceived level of service for cyclists (see section 2.5.2).

6 KEY ISSUES

Table 6.1 summarises the Key Conflict Issues presented in sections 2.6 and 3.1.

Table 6.1: Key conflict issues between pedestrians and cyclists on shared paths and footpaths

Issue		Brief description
<i>Users and usage</i>		
Footpath users	Cycling on footpaths	In some States/Territories, cyclists of all ages are permitted to ride on footpaths. Whilst this has caused concern for some, it appears that the perception of resulting pedestrian/bicycle conflict is greater than the actual number of incidents.
	Education issues	Different rules on roads and paths may send confusing messages to path users.
	Other legal users of paths	Wide range of legal users adds to the complexity of interactions and conflicts between pedestrians and cyclists.
	Unauthorised use of paths	Cyclists using walking paths and trails, or riding illegally on footpaths. May include anything from in-line skates and motorised (2-wheel) scooters to horse riders and trail bikes. May include illegal parking of vehicles on paths.
	Non-movement uses in activity centres and other busy places	High level of competing, non-movement uses, with consequent pedestrian distraction, as well as high volumes of pedestrians and cyclists in a low-speed environment.
Persons with disabilities	Range of abilities	Persons with disabilities may have physical, sensory, cognitive or intellectual impairments, that are not always apparent to other path users.
Young and inexperienced users	Child pedestrians and cyclists	Younger people have little perception of left, right and give way and have immature peripheral vision. They have limited skills, control and co-ordination. Uncontrolled child pedestrians may exacerbate the conflict.
	Novice and returning adult cyclists	Inexperienced adult cyclists are likely to be most comfortable riding on paths, rather than on the road, as a way of gaining experience and developing confidence necessary for riding on the road. They may lack knowledge, competence and/or confidence.
User behaviour: awareness	Lack of awareness	Users may be unaware of the fact that the paths is to be shared with other users, and/or of the speed characteristics of the other users. Many pedestrians do not realise they cannot walk on a cycle only path.
	Lack of etiquette knowledge	Both cyclists and pedestrians may lack knowledge as to the rules/guidelines on shared path etiquette and laws.
	Lack of courtesy	Cyclists may not slow down when overtaking pedestrians, or pedestrians may not move over to let the cyclist pass. The conflict may be exacerbated by inattention by pedestrians using earphones and portable music players, hence unable to hear the cyclist.
	Lack of give way	Cyclists not giving way to pedestrians. Complicated by removal of requirement for pedestrians to keep left on paths.
	Poor conspicuity	Users wearing dark clothing, and cyclists not using proper lighting at night. [Note: Solutions may include improved lighting for paths, as well as user actions.].
User behaviour: operational	Users not keeping left	Pedestrian and cyclists not keeping left, even though they would do that if driving/riding on the road. Complicated by removal of requirement for pedestrians to keep left on paths, as advice to pedestrians walking on roads without footpaths is to face the oncoming traffic. As the bicycle is a quiet vehicle, pedestrians (especially those with a hearing impairment, for example) may feel more comfortable facing oncoming cyclists.
	Users travelling in groups	Users taking up the entire width of the path. Walking as a social activity with lack of focus on what is going on around. Walking as 'sightseeing' activity, with lack of focus on what is happening on the path. Cyclists in groups may be in 'social' mode or 'training' mode where the emphasis is on sustained effort.
	Unpredictable user behaviour	Some users such as dog-walkers, children, adults getting a fright may behave unpredictably.

Table 6.1: Key conflict issues between pedestrians and cyclists on shared paths and footpaths (continuation)

Issue	Brief description	
<i>Users and usage</i>		
User behaviour: operational (cont.)	Lack of warning of presence	Cyclists may lack bells or fail to use them at all or with no sufficient warning, due to image problem, poor enforcement and general poor knowledge of the device. Pedestrians may also fail to give adequate warning of presence.
	Sudden entry onto path	Users entering the path at right angles to approaching users. Poor lateral sightlines especially at property boundaries and minor intersections. Lack of 'access control' (e.g. continuous accessibility from beaches or recreation areas). Can also occur at train and bus stations, where there may be large numbers of people moving across the path at times.
	Users with ancillary equipment	Pedestrians or cyclists carrying large loads occupy more space (e.g. on entering path with long item such as surfboard). Load itself may be 'unstable' – light but large items (e.g. surfboard) may blow across path in side breezes. Users may pay attention to managing the load rather than to other users of the path.
	Uncontrolled dogs	Dogs may run out under cyclists if owners are not keeping them on a leash or within arm's reach. Also, parents pushing prams (or people riding bikes) whilst walking the dog may be an issue. Some types of leash not readily visible. Extendable leashes do not necessarily prevent dog from rushing across path away from owner.
Speed	Speed differential between cyclists and pedestrians	Many cyclists wish to travel fast, which causes angst amongst slowly travelling pedestrians and less able cyclists. Many cyclists, even the 'less able' travel faster than pedestrians, or the cyclists themselves, realise. On the other hand, some pedestrians move more slowly than a cyclist might expect.
	Speed differences of different types of pedestrian or cyclist.	Neither pedestrians nor cyclists are homogenous groups. Speed (and style of use) differences within each group will add complexity to interactions <u>between</u> the two groups.
	Speed of other users	Other users will travel at a variety of speeds and may be less predictable – either objectively, because their speed varies, or subjectively, because pedestrians and cyclists are less familiar with them.
<i>Footpath and shared path planning</i>		
Shared strategy and planning	Potential conflict resolution at early stages.	Pedestrians and cyclists have issues in common (especially with respect to motor vehicle traffic) but also issues of conflict. Dealing effectively with these at the early stages of strategy and planning (including organisational structures) would be beneficial.
Network continuity	Different types of users	Paths are often not suitable facilities for some users (e.g. commuter cyclists). May be desirable to provide both on-road and off-road facilities for cyclists where there is substantial commuter-type use.
	Lack of linkage	Lack of opportunities to link communities with open space networks, community facilities and public services as well as lack of good connection with local streets. Important to have information and visual linkage as well.
	Interruption of path network	Path interrupted by roads and driveways. Lack of visual, as well as physical, continuity. Infill development can increase the number of driveways and the frequency of usage. Visual continuity can be impaired if crossover/driveway is continuous across path.
Path location	Inappropriate path location	Inappropriate siting may contribute to conflict, e.g. where a cycle park is placed between a car park and BBQ areas, or in dog leash areas. People will tend to walk on the side of the path that has attractions. Attractions on both sides of path will increase the amount of movement across the path.

Table 6.1: Key conflict issues between pedestrians and cyclists on shared paths and footpaths (continuation)

Issue	Brief description	
<i>Users and usage</i>		
Path location (cont.)	Car parking adjacent to paths	Angle parking adjacent at path at the kerb leads to parked cars overhanging the path and reducing the effective path width. Parallel parking adjacent at path at the kerb leads to problems with car doors opening into the travelled way and, effectively reduces the width of the path as users avoid the kerbside part of the path. Either can adversely affect usability of paths in close proximity to activities/destinations (e.g. schools, shops) for both pedestrians and cyclists.
	General location deficiencies	User unfriendly and commuter unfriendly paths. Paths adjacent to property boundaries/fences make it difficult and potentially dangerous for both path users and motorists exiting properties across the path – will be exacerbated with infill development (see <i>Network Continuity</i>).
<i>Path design</i>		
Design standards	Historically variable, often constrained, with variety of users/usage, including people with disabilities.	May need to design multi-purpose facilities for the 'higher' types of usage where there are multiple types of users, either together or at different times (but see, also, <i>Network Continuity</i>). A path may be recreational (relatively slow cycling and possibly high levels of walking) at weekends but commuter during the week. Primary issue is safety and amenity rather than simple capacity. It may be technically possible to carry a large number of users, but if people do not feel safe they will not use the facility.
Path capacity	Narrow paths	Paths may be too narrow to comfortably cater for users each way, especially where usage is high and passing frequent. Cyclists may need to leave path if it is not wide enough, which can be dangerous.
	Insufficient path capacity	Paths may be of insufficient capacity to cope with high user volumes and numerous user types, or simply be adapted footpaths.
	High Usage	There will always be greater conflict on shared paths where there is heavy traffic. May require separate facilities for different users.
Path access and continuity	Access issues	Issues such as footpaths lacking a ramp to road level or adequate road crossing points.
	Design unsuitable for persons with disabilities	Persons with disabilities and seniors may be apprehensive about facilities that are not segregated by kerb or physical barrier, or have poor access. The detail of path design (and construction/maintenance) is critical for persons with disabilities, as a single non-accessible point can preclude the whole journey.
	Inappropriate landscaping	Poor landscaping may include lack of flat wide grassed area on both sides of the path.
	Lack of detour provisions	Lack of detour provisions and signage when paths are closed.
Path geometry	Design speed for facilities	Most footpaths are not designed for the speed at which cyclists travel – even 'slow' cyclists will often be travelling 10+km/h.
	Poor line of sight	Poor line of sight on the path may result in collisions from not seeing each other.
	Inappropriate path gradients and curves	Paths can be unnecessarily winding, causing cyclists to speed up to reach their destination, have square corners, or be too hilly. Provision of 'rest points' for persons with disabilities can introduce disturbing and distracting elements for cyclists.
	Path obstructions	Paths may be obstructed and constricted through the use of seating (formal and informal), bollards, grab rails, signs, safety barriers, bus shelters and bus stop furniture, and other obstacles.

Table 6.1: Key conflict issues between pedestrians and cyclists on shared paths and footpaths (continuation)

Issue	Brief description	
<i>Users and usage</i>		
Path geometry (cont.)	Street furniture	Street furniture, not directly associated with the movement purpose of footpaths, may impede movement and exacerbate conflicts. Most important for cyclists, at one end of the spectrum, and persons with disabilities (including vision-impairment as well as physical disabilities) at the other.
Path quality	Inappropriate path surface	Path surfaces may not be appropriate to shared use paths, e.g. brick paving, concrete joiners. Also, surface changes may lead to confusion. Skid resistance in the wet may be an issue for some surfaces in some locations –affects cornering and braking and on hills.
	Path surface irregularities	Potential conflicts between requirements for tactile ground surface indicators (for people with vision impairments) and other users (particularly those with wheels). Issues with utility service covers within footpaths.
	Poor path lighting	Lack of lighting on paths reduces levels of safety and legibility. Includes path delineation as well as overhead illumination.
	Control of loose material	In locations where loose material (e.g. beach sand) is a consistent hazard, path design/construction should also address management of such material.
Signage and information	Poor path signage and line marking	Signage could be missing or unclear, with no marked centreline. Poor directional/destination signage can affect levels of use and can also distract users from what is going on around them (other users).
	Unclear map information	Maps and directories not updated and/or not easy to read. Applies to both paper and e-maps. Refer to Travel Smart access maps and DPI (electronic) Access Map for central Perth.
Path safety	Safety Audit	For new shared facilities and modifications to existing facilities (including change in footpath/shared path status), impacts on safety and convenience of both pedestrians and cyclists need to be assessed.
<i>Path maintenance</i>		
	Poorly maintained paths	Maintenance activities do not always happen in a timely manner, allowing dangerous conditions to remain. Common issues include flooding, cracks, broken edges, potholes, poorly maintained line marking signage and landscaping (including overhanging branches).
	Management of extraneous material	Loose material (e.g. drifting sand, leaves, broken glass and fruit drop from trees, litter) or other impediments (which may include long-term ones such as proximity to building sites) reduce the effective path width and also create hazards (e.g. reducing cyclist ability to steer or brake).
	Public utilities	Local governments consistently have problems with path management during, and adequacy of reinstatement of paths following, work by utilities (e.g. water, gas, electricity, telecoms). Leads to uncertainty, lack of continuity and/or loss of effective width.

7 KEY OPTIONS FOR PEDESTRIAN/CYCLIST CONFLICT MINIMISATION

7.1 Principles

Conflict between pedestrians and cyclists often arises from pressures exerted by motorised traffic. In order to minimise conflict, holistic solutions are needed where conditions are improved for cyclists and/or pedestrians, but not for one at the expense of the other.

Looked at another way, a key objective should be to minimise the extent to which interaction between cyclists and pedestrians becomes a cause of conflict – there are many types of positive interactions that should be encouraged. Even substantial reductions in effective path width can be overcome with goodwill and consideration (Figure 7.1).



(Photo: T Smedley/Sustrans UK)

Figure 7.1: With appropriate behaviour, interaction does not lead to conflict

'Prevention is better than cure'. Where possible, it is desirable to plan/provide for staging the conflict minimisation options to get it right at the beginning rather than retrofit. Retrofitting is inefficient and constrained by the original construction.

It should also be noted that behavioural initiatives can be a form of 'treadmill' if not self-sustaining. Measures that require continual reinforcement (as, for example, with some types of enforcement or awareness initiatives) run the risk of requiring substantial resources on a continuing basis – resources that could otherwise be used for new initiatives.

Salomon (2001) states that in order to reduce the risks of accidents on shared pathways while maximising the benefits, the same management and regulatory techniques as are used on public roads should be applied.

There are limitations on the extent to which regulatory signs can be used on paths, but advisory signs may be able to provide similar messages.

Moore (1994), cited in Litman and Blair (2004) lists twelve principles for minimising conflicts on multiple-use trails:

- Recognize conflict as goal interference.
- Provide adequate trail opportunities.
- Minimise number of contacts in problem areas.
- Involve users as early as possible.
- Understand user needs.
- Identify the actual sources of conflict.
- Work with affected users.
- Promote trail etiquette.
- Encourage positive interaction among different users.
- Favour 'light handed' management.
- Plan and act locally.
- Monitor progress.

7.2 Key strategies

A number of strategies can be applied in both the short term and long term to minimise conflict between cyclists and pedestrians. For example, Davies (2000) suggests that in the short term, improved signage in conjunction with clear path markings and public education measures such as education campaigns using leaflets or through media and cycling organisations should be sufficient to minimise conflict between cyclists and pedestrians. In the long term, however, widening paths and separating pedestrians and cyclists and creating safe on-road alternatives for higher speed cyclists may be the best solutions. In most cases, it is important to get the policy, strategy and planning done well to avoid conflict between pedestrians and cyclists becoming a problem that has to be addressed in a reactive way later on.

Key conflict minimisation strategies are listed below:

- integrated policy, strategy and planning
- urban design and place-making
- infrastructure planning
- infrastructure design
- infrastructure construction and maintenance

- information
- regulation
- enforcement (combined with 'regulation' for the purpose of the *information notes*)
- education and awareness-raising
- travel behaviour change.

8 DEVELOPING THE TOOLKIT

8.1 Issues and options

The options (strategies) outlined in section 7.2 were further developed to identify the issues addressed, the recommended approach, and discussion including best practice from Australia and overseas. This information is contained in the *Information Notes* in Section 9.

8.2 Outline specification for toolkit

The stated objective for the pedestrian-cyclist conflict minimisation project is the development of a 'toolkit suitable for use by state government agencies, local government authorities and their consultants. The Toolkit includes best practice resources, guidelines, strategies and designs and in a suitable format to be placed on the ABC website.

Appropriate criteria for such a toolkit include:

- accessibility, including speed of access, recognising that many people do not have high-speed modems
- legibility of structure
- simplicity and usability in both hard-copy and electronic formats.
- The toolkit structure is based on the following:
 - It has a 'table of contents, with hyperlinks to component documents, and includes a link to free download of Acrobat Reader for those who do not already have this application installed on their computers.
 - Documents in Acrobat .pdf format are downloadable individually. PDF files have a number of advantages over HTML, particularly in terms of:
 - predictable printing – what you see is what you get, whereas HTML can present and print differently depending on computer, browser and printer set-up
 - ease of updating – conversion to .pdf is very straightforward, so source documents can be held in amendable form (such as MS WORD) and reconverted after updating.
 - The whole toolkit (including title/contents page) is also downloadable as a single .pdf file.
 - An individual paper (Information Note) is provided for each issue.
 - Maximum of four A4 pages per issue/document with a standard presentation style and format (see over). This facilitates production of hard copy versions if desired (e.g. for handing out at conferences) and creates an overall image that promotes recognition.
 - The toolkit is expandable in terms of the number of issues included – achieved by having a simple document format and structure, with the main linkages being via a single contents page.
 - It is adaptable to provide a similar 'feel' to other policy and guideline documents of the ABC, especially those that lend themselves to 'part' formats.

The structure of the toolkit is illustrated in Figure 8.1 with initial entry being via the Australian Bicycle Council website. Other websites (such as those of bicycle user groups), shown as 'third party websites', are also likely to want to have direct linkage to the toolkit. This will enhance the value and accessibility of the toolkit and the information contained in it.

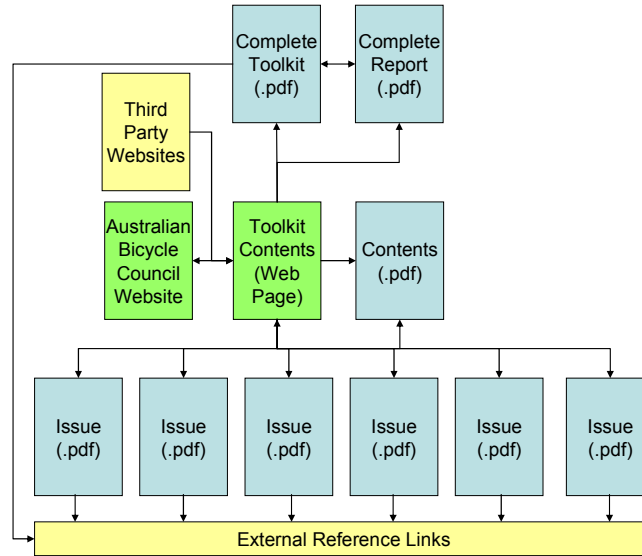


Figure 8.1: Structure of the Toolkit

Figure 8.2 illustrates the format for the individual documents (illustrative only). Any subsequent pages are similar to that shown.

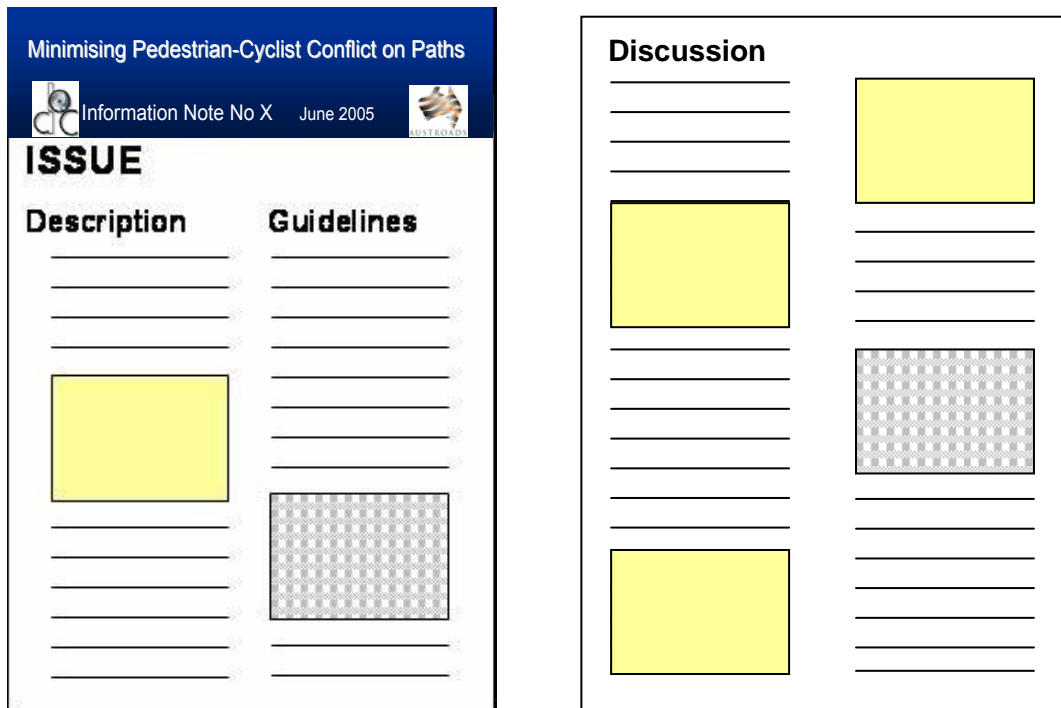


Figure 8.2: Illustrative format for toolkit guidelines and information notes

9 ASSESSMENT OF KEY OPTIONS

The issue of conflict on paths is by no means a new one. However, it may be becoming more serious as the number of people walking or cycling increases after a prolonged period of decline in many places, combined with a high level of reliance on shared facilities. It is most unlikely, therefore, that there is any single 'silver bullet' that will, on its own, achieve the objective of minimising conflict.

It follows that a combination of measures is likely to be required to reduce conflict on paths effectively. However, since both the existing situation and the opportunities for change differ from place to place, the appropriate packages will need to be configured individually to suit specific situations. Individual initiatives cannot be assessed in isolation, therefore, with any great robustness.

In general terms, the options identified are consistent with, but expand the boundaries of, the now-traditional 4-Es approach to bicycle planning:

- engineering
- encouragement
- education
- enforcement.

Boundaries are expanded to include more strategic levels of policy and planning as well as broader concepts of travel behaviour change. Hence this report acknowledges the need for a truly integrated suite of measures rather than ad-hoc interventions into processes that might already have got off on the 'wrong track'.

Many of the options outlined in this report will have a beneficial impact on the incidence of conflict between pedestrians and cyclists but do not have this as their primary rationale. It would be erroneous, therefore, to assess such initiatives solely in terms of their contribution to reducing such conflict. In general, the approach has been taken that suggests improvements in the quality and certainty of either the walking or cycling experience, will either directly reduce conflict or will make users more tolerant of interactions with other users. In this way, they do not result in conflict.

9.1 User and key stakeholder responses to options

In order to gauge user and key stakeholder responses, half-day workshops were held in Perth, Adelaide, Melbourne, Canberra, Sydney and Brisbane. Attendance ranged between 10 and 40, with participants being drawn from a wide range of areas including:

- state government transport agencies, including cycling interests
- other state government agencies, such as health, ageing and disability agencies
- local government
- cycling groups
- walking groups, including users and the Pedestrian Council of Australia
- disability groups and individuals with a disability
- road safety interests.

The general consensus was that the range of options was appropriate and likely to be useful, although there were some responses that some were less likely to be effective than others. There were also some suggestions for additional detail to be included under some of the options.

9.1.1 Options less likely to be effective

High level issues

Focussing on high level (and hence usually longer term) issues can run the risk of distracting attention from those things that can make a difference here and now.

Additional infrastructure

Concern was expressed that there was often limited or no ability to expand path capacity or to provide separate paths for pedestrians and cyclists, particularly within existing road reserves. There was support for consideration of reallocation of road reserve space between users (especially between motor vehicles and non-motorised users).

Even where there is space (e.g. in recreation reserves), it might not be desirable to provide additional paths if this would detract from the aesthetic or recreational values of the area.

Separation of pedestrians and cyclists was regarded as unaffordable as a broad scale strategy.

Splitting existing paths

Few paths are wide enough to allow splitting into pedestrian and cyclist components and still provide sufficient width for each type of user. In practice, users will not always keep to their own part of the path.

Codes of conduct

Codes of conduct and other information that had to be sought out by the user were regarded as being of limited value, as those users who were most likely to be the 'cause' of problems would be the least likely to seek out such information. However, such information was regarded as of value in enhancing general levels of awareness. Avenues of dissemination include local newspapers, community groups and school-based initiatives.

There was a preference for simple information at the point of use, in terms of ability actually to influence behaviour. However, there was concern that such information should not give a false sense of security to users who had legal priority (usually pedestrians), as users still needed to be aware of potential conflicts with other users.

Regulation and Enforcement

Regulation and enforcement were seen as being a 'pigeon pair', with enforcement being required to make regulation effective. Within this:

- Speed limits (regulation) were seen as being highly problematic given the difficulties of enforcement and the fact that the appropriate speed on any multi-use facility will vary from time to time (e.g. between peak commuter periods and weekends/recreational times; or between times of high [such as retail opening hours in commercial/retail precincts] and low pedestrian activity).

Speed management was regarded as being better expressed in terms of a requirement or encouragement to travel at an appropriate speed for the circumstances.

Nevertheless, advisory speed limits have been used successfully in a small number of places (e.g. Vancouver, Canada) and may be worth trying.

- Local government enforcement of regulations relating to use (e.g. al fresco dining or retail displays) or abuse (e.g. illegal parking on or over footpaths) of footpaths was seen as being highly variable and often ineffective at present, but with potential for substantial improvement.
- Provision of separate facilities for cyclists and pedestrians can be ineffective unless the configuration (e.g. spatial separation) is such as to minimise movement of pedestrians along or across the cyclist path. Both paths also need to be of a comparable standard relative to the requirements of each type of user.

Whilst police enforcement of traffic rules on paths was regarded as problematic, it was suggested that there would be value in increasing the use of police on bikes as a means of enhancing education and awareness – prevention through demonstration and visible presence rather than enforcement.

9.1.2 Additional items for inclusion in the options

Road crossings

Where paths cross roadways, they are usually discontinuous. In the case of shared pathways, there may be provision for pedestrians to cross, but not cyclists – unless they dismount and walk their bikes across. In practice, cyclists will often, but not always, ride across the road at such places, where the configuration of the crossing does not preclude their doing so (e.g. mazes).

This is especially an issue at signalised road crossings. Whilst this is not technically on the path, it does cause uncertainty and confusion that can result in conflict between cyclists and pedestrians on the path at approaches to road crossings.

Provision of information

To the extent that conflict is a result of or is exacerbated by the use of wheeled mobility or recreational devices, information on sharing paths and other aspects of use could be provided at point of sale.

Better signage

Public transport nodes and interchanges should provide better signage to surrounding destinations.

Use of warning devices

Concern was consistently expressed about the lack of use of warning devices by cyclists to alert pedestrians of their approach. At the same time, it was recognised that pedestrians' responses to a warning may themselves be unpredictable. This might be for a range of reasons, including that the pedestrian may not hear the warning (e.g. due to hearing impairment), leading to uncertainty and conflict. This may be best addressed by advice that cyclists exercise caution (including slowing down) when approaching pedestrians, particularly from behind, especially if there is no indication that the pedestrian is aware of their presence.

It was also stated that warning devices such as bells are sometimes used, or misunderstood as a form of aggression, with the cyclist assuming right of way once the warning had been given.

9.1.3 Other comments

- It is important to design facilities to elicit the desired behaviours so that interaction is 'self-policing'.
- There is a need to distinguish, in the information and guidance provided to both users and planners/providers, between 'shared paths' (sometimes called 'community paths') and footpaths, even where all cyclists are allowed to use footpaths. Both design standards and expectations of users are different on these two types of paths.
- It was further suggested that there might be value in specific indication of the predominant use of a path (e.g. commuter, recreational, school) and the appropriate speed (but see concern about speed limits in 9.1.1 above).
- Separation can lead to 'aggressive territoriality', which could be counter-productive.
- Conflict may be exacerbated where gradients allow higher cyclist speeds.
- Signage to identify present location, as well as destination, could reduce uncertainty.
- It is important to ensure that users can move off the path to avoid conflicts, wherever possible – minimise lateral constraints such as fencing, except where necessary to avoid a worse conflict (e.g. motor vehicle traffic).
- A possible change of traffic laws was proposed to allow use of standard regulatory signs (e.g. 'stop'; 'give way') on paths. [This issue was raised during consultation, but it is already permissible to use such signs (see Information Note 9) and change to regulations is not required. Change to practice and awareness of the potential to use such signs may need to be encouraged.]
- There is a need for more consistent provision for both cyclists and pedestrians (especially between adjoining local governments).
- Messages need to be kept simple.
- More and better enforcement of requirements for dogs to be under control would be useful.
- Small pavers can easily shift and result in surface irregularities that are a particular problem to people with vision or mobility impairments. They are also likely to cause cyclists to take evasive action resulting in potential conflict with other users.

9.2 How well are the issues addressed?

Given that a combination of initiatives is likely to be required and that the packaging of issues will need to be situation-specific, it is more likely that a suitable package can be found for specific situations if each issue is addressed by a number of options. The extent to which this is so is indicated in Table 9.1.

Table 9.1: Summary of relationship of issues and options

Issue \ Option	Information Note 2: Integrated policy, strategy and planning	Information Note 3: Urban design and placemaking	Information Note 4: Infrastructure planning	Information Note 5: Infrastructure design	Information Note 6: Construction and maintenance	Information Note 7: Information	Information Note 8: Education and awareness-raising	Information Note 9: Regulation	Information Note 9: Enforcement	Information note 10: Travel behaviour change
Footpath users	✓	✓	✓			✓	✓	✓	✓	
People with disabilities	✓	✓	✓	✓					✓	
Young/inexperienced			✓	✓		✓				
User awareness	✓	✓	✓			✓	✓	✓	✓	✓
User operational			✓	✓		✓	✓	✓	✓	✓
Speed		✓	✓	✓		✓	✓	✓	✓	✓
Shared strategy/planning	✓	✓	✓							✓
Network continuity			✓	✓						✓
Path location			✓	✓						
Design standards			✓	✓	✓					
Path capacity				✓	✓			✓	✓	
Access and continuity	✓	✓			✓					✓
Path geometry					✓					
Path quality				✓	✓					
Signage and information	✓	✓				✓		✓		✓
Path safety	✓	✓			✓		✓		✓	
Path maintenance					✓					

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APPENDIX A SURVEY FORM

In reply please quote : RC5262

27 July 2004

Pedestrian-Cyclist Conflict Minimisation on Shared Paths and Footpaths

ARRB Transport Research has been commissioned to undertake a project on 'Pedestrian-Cyclist Conflict Minimisation on Shared Paths and Footpaths', for the Australian Bicycle Council and Austroads. The purpose of this project is to identify ways of improving both perceived and actual cyclist and pedestrian safety in these shared transport environments.

Stage 1 of the project is about identifying key issues associated with pedestrian-cyclist interaction on shared facilities. It is important that we seek input from a wide range of stakeholders, at this early stage, to help us define the project scope more clearly and to identify issues to be addressed.

To get things rolling, we have identified a number of possible conflict issues. Your feedback will enable us to confirm and expand on this preliminary issues list.

- Speed differentials
- Unpredictability of cyclists or pedestrians
- Limited mobility or perception (e.g. hearing, vision, intellectual) abilities of persons with disabilities
- Poor visibility (e.g. no lights, dark clothing)
- Poor awareness of rights, responsibilities and rules for shared environments
- Facilities (e.g. narrow paths; footpaths)
- Signage (missing or unclear)
- People walking pets.

Once issues are identified, we need to devise ways to most effectively address them. We are not seeking detailed information at this stage, but we would also like to know what you consider to be the most effective ways to address the issues that you have suggested.

To generally help inform the project, we would also appreciate information on any situations that you can identify that may be used as case studies (including both good and bad practice) by the project. We are also interested in research references and other relevant documentation.

How You Can Help

Prior to undertaking work on the development of strategies and actions to improve pedestrian-cyclist safety on paths, we wish to understand what key stakeholders (State government, local government, user groups, users and others) see as important for such approaches to be effective. Please take the time to complete and return the attached form – or simply send an e-mail to iank@arrb.com.au with your thoughts on the project and its objectives and outcomes.

We are particularly interested in hearing about good or bad practice, including examples of both.

More detail of the project, with an electronic version of this note and survey form, is available on the Australian Bicycle Council website http://www.abc.dotars.gov.au/current_projects.htm.

Your responses by Friday 3 September, 2004, would be greatly appreciated. However, we will continue to accept input during the course of the project and will also be seeking specific feedback on proposals later in the year.

Reply by fax (+61 8 9227 3030), mail (PO Box 512, Leederville, WA 6903) or e-mail iank@arrb.com.au.



Ian Ker
Project Manager

Space has been provided on the attached sheet for
your response



Pedestrian-Cyclist Conflict Minimisation on Shared Paths and Footpaths

What are the key conflict issues that arise from interaction between cyclists and pedestrians on shared paths and footpaths?

What options can you suggest to resolve these conflict issues?

Can you advise of any specific situations that can inform the project as case studies, including both good and bad practice? [Diagrams or photographs explaining the situation would be useful.]

Can you suggest any research references or other documentation that would be useful to the study?

<p>Contact Information (optional)</p> <p>Name:</p> <p>Organisation:</p> <p>Phone:</p> <p>E-mail:</p>

Your responses by Friday 27 August 2004 would be greatly appreciated.

Reply by fax (+61 8 9227 3030), mail (PO Box 512, Leederville, WA 6903) or email: iank@arrb.com.au.

APPENDIX B DETAILED REVIEW OF AUSTRROADS GUIDE TO TRAFFIC ENGINEERING PRACTICE, PART 13 – PEDESTRIANS AND PART 14 – BICYCLES

GTEP Part 13 – Pedestrians

Introduction

Table 1.4. Minimum widths of footpaths and cycle paths are provided (with reference to Australian Model Code for Residential Development, Edition 2 – November 1990).

Walkways and footpaths

Page 16, fourth paragraph. Statement that ‘Collector roads and arterial roads in the vicinity of schools should be provided with footpaths and desirably off-road cycle paths, shared or segregated footways, to increase school trip safety’. No discussion is included on potential for conflict, or how a satisfactory design is achieved.

Page 16, sixth paragraph. ‘Many persons with disabilities undertake much of their travel either on foot or in wheelchairs and so the development of a network of adequate footpaths is important for their mobility’. This statement is not extended to off-road shared paths.

Figure 2.1 (Source AS 1428.2 1992, still current version). The Figure shows path width requirements based on a pedestrian with disabilities, wheelchair, and pedestrian with a pram plus a wheelchair. Part 13 and 14 are silent on users with disabilities with respect to shared paths, i.e. not used as a basis for required width with respect to conflict.

Section 2.1.1 – Width, second paragraph. Reinforces Figure 2.1 in stating that 1.5 m is the minimum for two wheelchairs to pass whereas 1.8 m is desirable.

Section 2.6 – Joint footway/bicycle facilities. Fourth paragraph, last sentence recognises conflict, ‘However, conflict does occur between bicycles and other users, particularly pedestrians. It is therefore important to design shared paths so that the frequency and consequences of conflict are minimised. This includes providing paths which have sufficient width and adequate sight distances around curves and over crests’.

Section 2.6 fifth paragraph. ‘A shared footway should not be used in high pedestrian activity areas such as shopping centres’. Sixth paragraph, recommended widths are provided but they need to be updated to match current Part 14. Reference to Part 14 is included.

Treatments for pedestrians crossing roads

Section 3.3 – Surfaces. ‘It is important that changes in a footpath’s surface, particularly at crossings, be easily detectable’. This requirement can be translated to intersections of paths where sight impaired pedestrians need to negotiate shared paths. How can conflict be minimised for a growing population of aged people (with sight and mobility impairments)? Equity of access and safety for older pedestrians may become an issue beyond general conflict minimisation.

Section 3.4.1 – Pedestrian refuges, paragraph 3. Widths of refuges are described including requirements for pedestrians with prams and bicycles.

Pedestrian guidance measures

Section 4.2.3 – Visual cues, paragraph 3. Importance of visual contrast for visually impaired persons is discussed. Relates to separated paths and also shared paths.

Section 4.2.4 – Tactile and other physical cues, second paragraph. Mentions the use of tactile tiles ‘when used in a consistent and coordinated way, can indicate to pedestrians the appropriate direction of movement and places where particular caution is required on a shared footway’. Suitability for use of tactile tiles and guidance for use along shared footways may be an emerging issue e.g. minimisation of conflict and equity versus safety of others (frail pedestrians and cyclists).

Pedestrian access to public transport

Section 5.1, Bus and tram stops. Conflict is not mentioned. Bikes are not yet carried on trams and buses, but able to be wheeled onto trains in Victoria. Issue of bicycles in these crowded pedestrian areas not mentioned.

Special treatments

Section 8.5 – Pedestrianisation, sixth paragraph. This paragraph discusses the integration of a bicycle route into a pedestrian area scheme. ‘consideration of location, signing and pavement treatment to ensure that both pedestrians and cyclists operate in a safe manner’.

Appendix A

Specifies manoeuvring requirements for persons with disabilities and is relevant to any path provided for pedestrian use, including shared paths.

Appendix C

Example of a pedestrian safety audit checklist. No mention of shared use of paths as a safety issue for consideration.

GTEP Part 14 – Bicycles

Introduction

Chapter 1 does not specifically mention conflict between cyclists and other user groups including pedestrians. However, it does mention the need to cater for various bicycle users.

Page 1, Paragraph 4. Stresses the importance of understanding that bicycle riders include people with a broad range of skill and experience. However, this section of the guide does not identify this as a factor leading to conflict (i.e. speed differentials and different behaviour related to trip purpose, age and experience). Differences need to be appreciated at the planning stage and project development stage regarding a decision to integrate or separate various users.

Planning for cyclists

Chapter 2 does not specifically mention conflict between cyclists and other user groups including pedestrians. However, it does refer to behaviour and safety.

Section 2.1, page 2, second column, second last paragraph. Discusses personal security that is not strictly related to conflict between users but requires a similar approach with some design features.

Section 2.2.1, second column. An objective of the National Bicycle Strategy is that 'safety for cyclists, both on and off road, is continuously improved'.

Section 2.2.2, page 4. Discusses state or territory bicycle strategies that should aim to 'ensure the development of behavioural and safety awareness programs aimed at improving cyclist safety in general' and to 'reduce the frequency of bicycle crashes and the severity of injuries resulting from crashes'.

Section 2.2.3, second column. Discusses local strategic bicycle plans and includes an aim to 'develop encouragement and other appropriate behavioural programs with an aim of increasing the use of cycling facilities as well as the safety of cycling, in the local area'.

Section 2.2.4.1, second column, second last dot point. No connection is made to conflict but recognition is given to the need to adopt 'road and path construction and maintenance practices that result in road and path surfaces that are free of debris and smooth enough to provide a reasonable level of comfort for cyclists'. Surface deformation due to tree roots, potholes and loose material are not mentioned as factors that require evasive action and that could contribute to conflict with other users.

Bicycle rider requirements

Chapter 3 describes bicycle rider requirements. No mention is made of conflict between users. However, two of the requirements 'Space to Ride' and 'Speed Maintenance' are significant factors that contribute to conflict between users. A third, 'Smooth Surface' may also be a factor.

Section 3.2, third paragraph. Mentions alternative forms of pedal cycles (e.g. tandems, recumbents, refer Appendix C) and the possible need to design for them. Examples of other groups that could contribute to conflict are included.

Roads

Section 4.5.3 – Ramps – is the first specific reference in GTEP Part 14 to the conflict between cyclists and pedestrians. It is mentioned in the context of ramps from the road to a shared path in order to enable cyclists to safely bypass a squeeze point. It suggests that the ramp design should restrict the speed at which cyclists can leave the road and enter the path if conditions exist that would lead to conflict (e.g. abutting land use, high level of pedestrian usage, pedestrians leaving gateways, etc).

Section 4.7 (d), Road closures and Figure 4-37. This guidance applies to permanent closure of a local street as part of local area traffic management. The treatment of the intersection between the bicycle paths and footpaths is a potential area for conflict that is not discussed. This second edition of GTEP Part 14 appears to give priority to cyclists. Perhaps the pedestrians should have priority (i.e. footpath appears as the continuous surface).

Road intersections

Section 5.4.2.3, Bicycle 'head start' storage area and Figure 5-11. This is not related to conflict minimisation on shared paths, but is a treatment designed to place cyclists in view of traffic waiting in adjacent lanes and to discourage cyclists from entering into the pedestrian crossing area.

Figure 5-15 has additional examples of head start areas.

Figure 5-21, 'Through access at junctions' (i.e. bypass of signals) could be relevant if the treatment shown was replaced by a shared path in order to achieve the same outcome for cyclists. Section 5.4.2.7 discusses the treatment and recognises that the treatment would only be used where pedestrian activity is low and the proportion of senior, visually impaired and pedestrians with disabilities is also low.

Section 5.5.2.4, Approach – Other roundabouts. Figures 5-29 and 5-30 illustrate the use of shared paths to enable inexperienced cyclists to circumnavigate roundabouts. Potential for conflict may exist but it is likely to be at low speed.

Section 5.5.3 and Figure 5-31 – Service road treatments. Short sections of shared path around this type of signalised intersection, is illustrated. Potential for low speed conflict.

Paths

Section 6.2, first paragraph, specifically states that 'where sufficient demand exists, paths should be provided for the exclusive use of cyclists and pedestrians' and that 'separated paths may reduce the potential for conflict and allow the bicycle path section to operate at reasonable speed'.

Section 6.2, second paragraph, lists an extensive range of users that have different characteristics and thereby gives an insight into the potential for conflict.

Section 6.2 – Characteristics of use – second column, third last paragraph. The relative cost benefit of providing shared use paths where cyclist/pedestrian use is low is mentioned. The potential for conflict between cyclists and other users, particularly pedestrians is raised with respect to busy paths. Option of a separated path is mentioned.

Section 6.2, second column, last paragraph mentions the reluctance of commuter cyclists to use many paths because they cannot travel at the same speed as is possible on the road network. This results because the conflict with other users adversely affects 'speed maintenance'.

Section 6.2, last paragraph notes that 'crashes and even fatalities occur on paths and may be the result of high density use or, as a result of the mixed use by leisure and commuting traffic. Careful consideration of separated paths for differing user needs may be required to minimise risk within limited budgets'.

Section 6.3.2 – Horizontal curvature. Conflict is not mentioned but horizontal curvature can be a causal factor.

Section 6.3.3 – Capacity of paths. In the last paragraph the relationship between path width and opportunities to overtake is mentioned.

Section 6.3.4 – Width of paths, first paragraph. It is noted that the width of paths is an important factor in relation to construction costs and operational considerations. Furthermore 'it (path width) can have a significant bearing on the level of convenience and conflict between users and potentially on path safety as well'.

Section 6.3.5 – Clearances. Although conflict is not mentioned in this section, the clearance to path-side obstacles can be a factor with respect to cyclists riding close to the edge (create extra space by having the cyclist envelope encroach over the edge of the path or because an escape area exists).

Section 6.3.6.2 – Although not stated, gradient can be a factor in conflict and safety particularly on down hill movements because of the increased speed of cyclists.

Section 6.3.7 – Although not stated, sight distance is an important factor in minimising conflict both at mid-block locations (vegetation too close to edges) and also at intersections and at entrances to/exits from underpasses. Refer also to Figure 6-5.

Section 6.5.2 – Factors influencing roadside alignment. This section deals with the lateral location of paths within verges. The need to (desirably) locate the path so as to provide both separation from road traffic and to allow sight distance to cars and pedestrians leaving properties is discussed.

Section 6.6 – Types of paths for cycling and Figure 6-15. The figure provides a flow chart for the determination of the type of path to be provided. Notes to the figure suggest a measure for the level of demand ‘in order to limit the incidence of conflict between users, that is, significantly lower than the capacity of the principal path types’.

Section 6.6.1 – Shared use paths, third paragraph, also refers to the ‘potential for conflict between the various users of a shared use path’ and that ‘to minimise this, a shared use path should be designed to a high standard which provides adequate sight distance between cyclists and other users’. Use of a separation line is recommended but a connection to conflict is not considered. This section also recommends that ‘major recreational paths should be 4.0 m wide to permit the cyclist groups/couples to pass pedestrian couples or other cyclist groups’. Figure 6-19 illustrates this.

Section 6.6.2 – Separated paths. These paths are offered as a solution to dealing with large numbers of pedestrians and cyclists. Appropriate locations are along foreshores and promenades etc. However, it is noted that public understanding of the correct use of them is not good and that careful design, prominent signing and pavement symbols for both pedestrians and cyclists at close spacing are required. In some high volume situations separated paths have not been successful because of the poor discipline of both pedestrians and cyclists.

Section 6.7.2.2 and Figure 6-29 – Preferred treatment of road/path intersection is to provide curves in paths on approach to roads to control cyclists to a safe speed. ‘Care is required in respect of give way requirements where a path for cycling intersects with a footpath located adjacent to and parallel to the road’.

Section 6.7.2.3 (a) – Controlled crossings. ‘Where pedestrian and cyclist demand are both heavy there is a tendency for pedestrians to move to the front and block the progress of cyclists using the crossing. In such cases consideration should be given to segregating cyclists and pedestrians.’ The new RTA guide shows a treatment for the separation of pedestrians and cyclists at signalised intersections.

Section 6.9 – Public lighting of paths. It is recognised that paths that would attract night time use should be lit, and that cyclists need to see other cyclists. However, no mention is made of the lack of lighting being a factor in the conflict between cyclists and pedestrians about the time of dawn and dusk.

Provision at structures

Section 7.4.3 – Underpasses, second column, last paragraph. ‘If an underpass is used the alignment of the path on the approach should be designed such that users can see through the culvert.’ This is required not only for personal security but also to eliminate conflict due to poor sight distance that would result from a tight curve into the culvert.

Traffic control devices

No behavioural signs (as per VicRoads, RTA and MRWA) included as they were not generally accepted when second edition of GTEP Part 14 was published.

Section 9.6.2 – Paths. Second paragraph, first dot point. Advice that ‘A separation line should be used to separate opposing bicycle traffic movements on heavily trafficked sections of paths or where sight distance is restricted. Although implied, no mention is made of the benefit of a centre line to reduce conflict. Fifth dot point proposes that ‘bicycle and pedestrian symbols and arrows provide a very useful method of advising of the presence of pedestrians and bicycles as well as the correct use of paths’.

Section 9.7 – Pavement surface colour, last paragraph. ‘On separated paths it is desirable to provide contrasting surfaces. A more highly textured or brick paving surface would be used for the pedestrian path as it is likely to have a rougher finish thus discouraging cyclists from encroaching into the pedestrian path’.

Appendix A – Bicycle safety audit checklist

Could be expanded to emphasise the need to ensure that design standards adequately address issues/parameters that lead to conflict.

INFORMATION RETRIEVAL

Austrroads, 2006, **Pedestrian-Cyclist Conflict Minimisation on Shared Paths and Footpaths**, Austrroads, Sydney, A4, 77pp

Keywords:

Pedestrian, cyclist, bicycle, footpath, shared path, pedestrian cyclist interaction, pedestrian cyclist conflict, path user

Abstract:

The interaction between pedestrians and cyclists is increasingly causing safety concerns, exacerbated by the use of wheeled recreational devices, including wheelchairs, powered scooters and gophers. Some of these concerns are real and others are perceived, but nevertheless important in terms of people's willingness to walk. The more governments are successful in increasing the amounts of walking and cycling, the greater these concerns will become – potentially limiting the extent and sustainability of such gains.

This report investigates actual and potential conflicts between cyclists and pedestrians and develops strategies to minimise conflict and to improve both perceived and actual safety on shared paths and footpaths. These issues and ways of addressing them were identified in consultation with both pedestrian and bicycle stakeholders, to ensure that the outcomes reflected a balanced view of pedestrian-cyclist interaction.

Specific issues have been addressed in specific 'Information Notes', which are available as individual documents, in electronic form, on the website of the Australian Bicycle Council (<http://www.abc.dotars.gov.au>).

These Information Notes do not replace existing guidelines (for example, the Austrroads Guide to Traffic Management) but are intended to complement them, to draw attention to issues that may need to be addressed in specific situations and to suggest ways in which they can be resolved or, at least, adverse impacts for cyclists and bus operators and passengers can be minimised. Users should also refer to local state or territory guidelines for bicycle facilities.

The information in these Information Notes should be considered in future reviews of the Austrroads *Guide to Traffic Management*.