Technical Note 133

Guidance on the widths of shared paths and separated bicycle paths

November 2014

Feedback: Please send your feedback regarding this document to: tmr.techdocs@tmr.qld.gov.au

1 Purpose

The purpose of this technical note is to provide operational and best practice guidance on the widths of shared paths and separated paths in order to minimise potential conflict between users. Design guidance is provided in the Transport and Main Roads *Road Planning and Design Manual* Volume 3, Part 6A.

1.1 Introduction and background

The most common off-road facility for cyclists in Australia is the shared path. Increasing numbers of cyclists and pedestrians are using shared paths, creating the need for careful planning for their design, construction and management so that pedestrians and riders can share the path safely and in an environment designed to minimise conflict.

This technical note is a guide assessing to the optimal width of shared paths and to advise on when to segregate path users. Important considerations are the volume of cyclists and pedestrians who use a particular path and the way they move as riders or pedestrians when on the shared path.

This document is based on research in Victoria[1] and Queensland[2] that relates path widths to user volumes and operational behaviour. It provides guidance on path width and how this relates to path usage and supplements existing guidelines (Transport and Main Roads *Road Planning and Design Manual* Volume 3, Part 6A).

This technical note addresses the important area of existing paths with increasing usage rates where safety issues have become a major concern, and highlights some ‘best practice’ examples. New or planned paths where projected future usage is expected to grow quickly is an issue addressed in the department’s *Road Planning & Design Manual* Volume 3, Part 6A.

When evaluating the operation of existing paths or assessing future usage volumes, asset managers should always consider adjacent land uses and the location and uses of the path e.g.: river frontage, esplanade, school access, park access or near major retail strips. This may affect the operational dynamics of the shared path, the types of path users it attracts and the way the path ultimately functions.

Competing path uses (recreational vs commuting) will also need to be carefully assessed and impacts on path operation taken into account. Differing types of path use may also need to be resolved between different departments within path owning agencies and other path provider/manager organisations.

Guidance is provided in this document on the circumstances under which consideration should be given to separating cyclists from pedestrians. Additional guidance to path planners and managers is provided in a separate spreadsheet/workbook to aid practitioners in assessing path widths by considering varying inputs and level-of-service considerations.

[1] Cycle Note 21. Widths of Off-Road Shared Use Paths. VicRoads. Melbourne, Victoria. June 2010.

[2] *Bicycle and Pedestrian Capacity Model: North Brisbane Cycleway Investigation.* Report prepared by Sinclair Knight Merz, Malvern, Victoria for the Queensland Department of Transport and Main Roads. 30 March 2010.

The guidance in this technical note is intended to apply to longitudinal movements along straight sections of level paths with clear sightlines. Engineering judgement and professional experience will need to be applied when considering alternative path alignments, path intersections and conflicting desire lines.

Figure 1 – Typical shared paths

Shared paths are very common in Australia. Though they provide maximum separation for cyclists and pedestrians from motor vehicles, they operate as shared space with pedestrians having right of way. Bicentennial Bikeway, adjacent to Coronation Drive, Brisbane (2009).

2 Operation of shared paths

Shared paths are the most common form of off-road facility in Australia and involve cyclists and pedestrians sharing a path (Figure 1). On this type of facility pedestrians always have right of way over cyclists.

2.1 Meetings and passings

When cyclists and pedestrians use a shared path, they will often meet other cyclists and pedestrians travelling in the opposite direction (Figure 2a), or pass slower cyclists and pedestrians travelling in the same direction (Figure 2b-d). Active passing occurs when one user overtakes another (Figure 2b). Passive passing occurs when a slower moving path user is overtaken by another (Figure 2c).

2.2 Delayed passings

Delayed passings occur when cyclists have to slow down to pass other path users travelling in the same direction at a slower speed (Figure 2d). This usually occurs when a passing happens at the same time as a meeting, and there is insufficient room for these users to pass other path users. The number of delayed passings that occurs along a path is dependent upon the volume of path users, cyclist speed, direction of travel and path width. Because of the speed differential between cyclists and pedestrians, the number of delayed passings increases significantly as the volume of pedestrians increases.

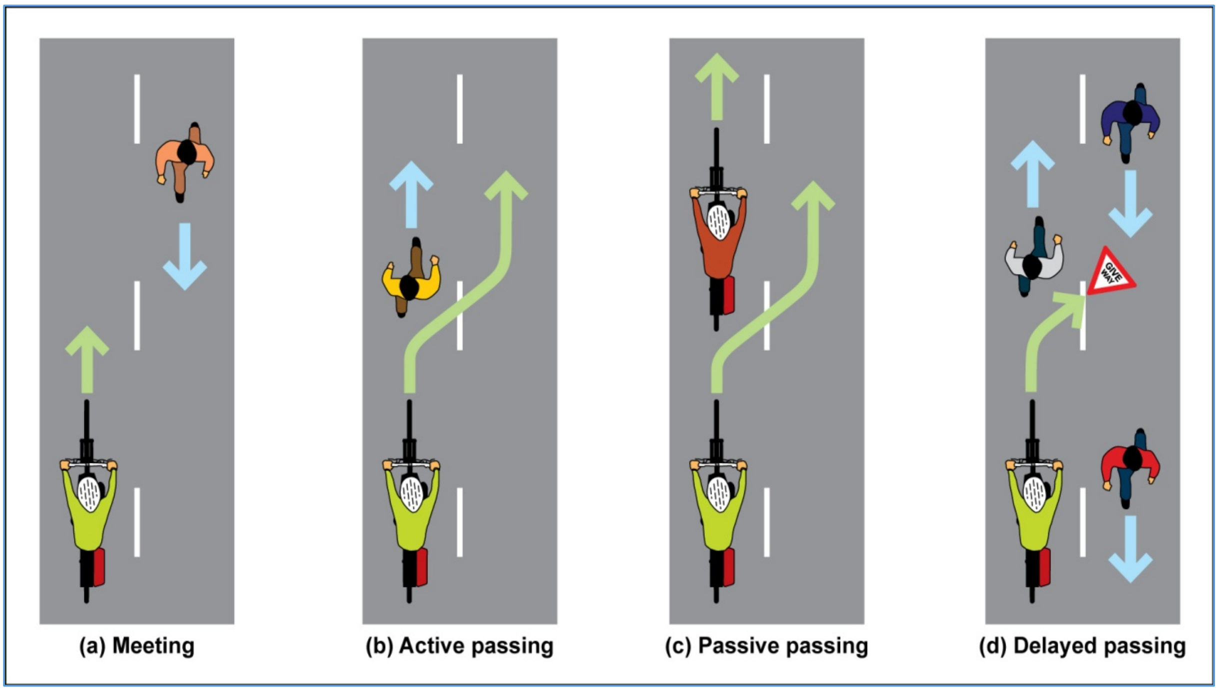
As the volumes of cyclists and pedestrians using shared paths increases the number of delayed passings for cyclists also increases. There is usually a reduction in the level of service and safety for all shared path users when this situation occurs.

To address this situation, paths may be widened or cyclists may be separated from pedestrians by providing a bicycle-only path and a footpath. Separation of user types provides substantial level-of-service and safety benefits for both user types and is the preferred treatment in high-use situations. Further guidance on separation and the operation of shared paths is provided in the Austroads publication *Pedestrian-Cyclist Conflict Minimisation on Shared Paths and Footpaths*[3].

2.3 Width of cyclists and pedestrians and clearances between them

For estimating path widths, cyclists and pedestrians are assumed to be about 0.7 m wide and to require a minimum clearance of 0.15 m on each side. When passing or meeting other path users, this results in a minimum clearance of 0.3 m between users.

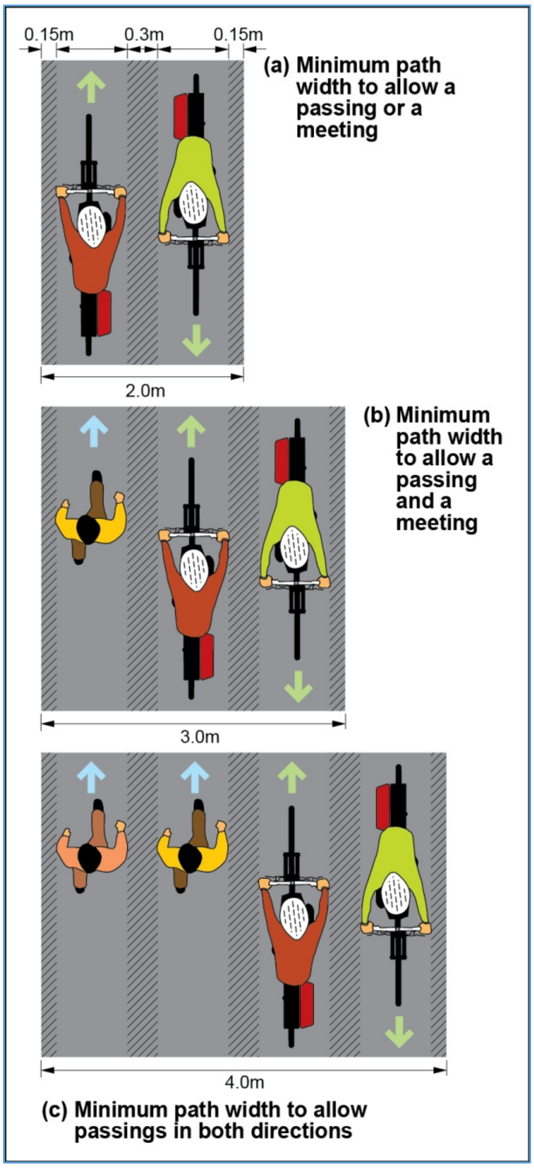
Figure 2 – Typical interactions of path users on shared paths



The minimum width to allow a passing and a meeting is 3.0 m (Figure 3b). The minimum width to allow passings in both directions is 4.0 m (Figure 3c).

[3] Pedestrian-Cyclist Conflict Minimisation on Shared Paths and Footpaths. Austroads (Publication No. AP–R287/06). Sydney. 2006.

Figure 3 (left): Minimum path widths to allow passings and meetings



Intermediate path widths, such as 2.5 m* or 3.5 m, allow greater clearances between path users and a slightly higher level of service (LOS), but do not add enough operating width to reduce the number of delayed passings. Providing additional width at less than one metre increments will improve cyclist and pedestrian level of service, but not throughput capacity.

As an example: If there is sufficient space for a 4.0 m shared path, then a segregated 1.5 m footpath and a 2.5 m bicycle path may be a better outcome in terms of throughput capacity, than a completely 'shared space'.

Refer to the department's *Road Planning and Design Manual* Volume 3, Part 6A for the impact on path capacity of path width and shared use with pedestrians.

With these calculations in mind, as an example: the presence of 200 pedestrians on a 3 metre path reduces its capacity to less than a third. Note that by increasing a 2.5 m path to 3.0 m (20% increase), the path capacity is may be doubled depending on path traffic. The presence of pedestrians reduces the carrying capacity of the path for cyclists.

3 Modelling path use – cyclist/pedestrian volumes and path width

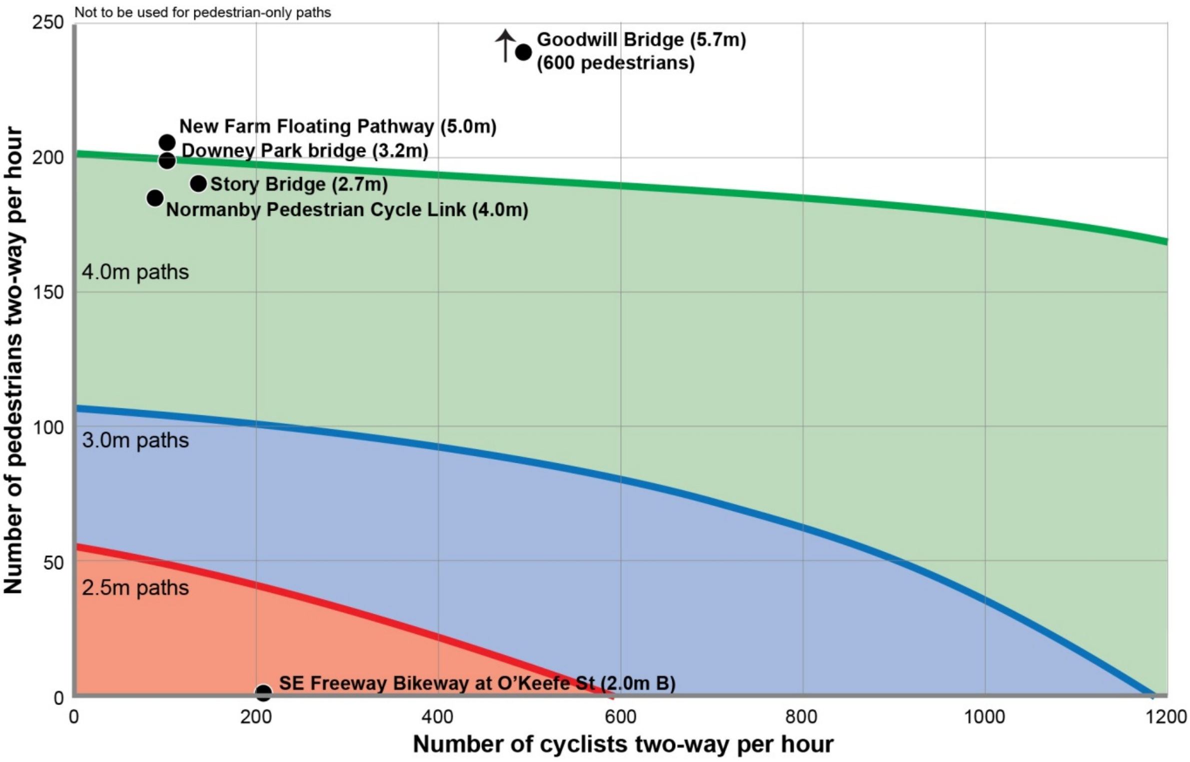
The frequency of meetings, passings and delayed passings that occur along a path is dependent on the volume of path users and the direction of travel (split). The frequency of delayed passings is also dependent upon the width of the path.

Probability theory allows path use to be modelled to estimate the number of meetings, passings and delayed passings that are likely to occur. These can be estimated as a function of path users volumes and path width, while also taking into account the directional split as shown in Figures 4 and 5.

Based on research[4], it has been assumed that 12 delayed passings per hour represents the upper limit of cyclists' tolerance for being delayed. This is equal to 6 delayed passings for a 30 minute trip or 1 delayed passing every 5 minutes.

If the combination of user volumes and path width cause the number of delayed passings to exceed 12 per hour, then widening the path and/or separating pedestrians from cyclists may be considered. In practice, many cyclists may avoid delayed passings by predicting a meeting ahead and slowing down in advance.

Figure 4: Capacity of commuter shared paths (75/25 directional split) in Brisbane showing volumes of pedestrians and cyclists (2009)



3.1 Path directional split

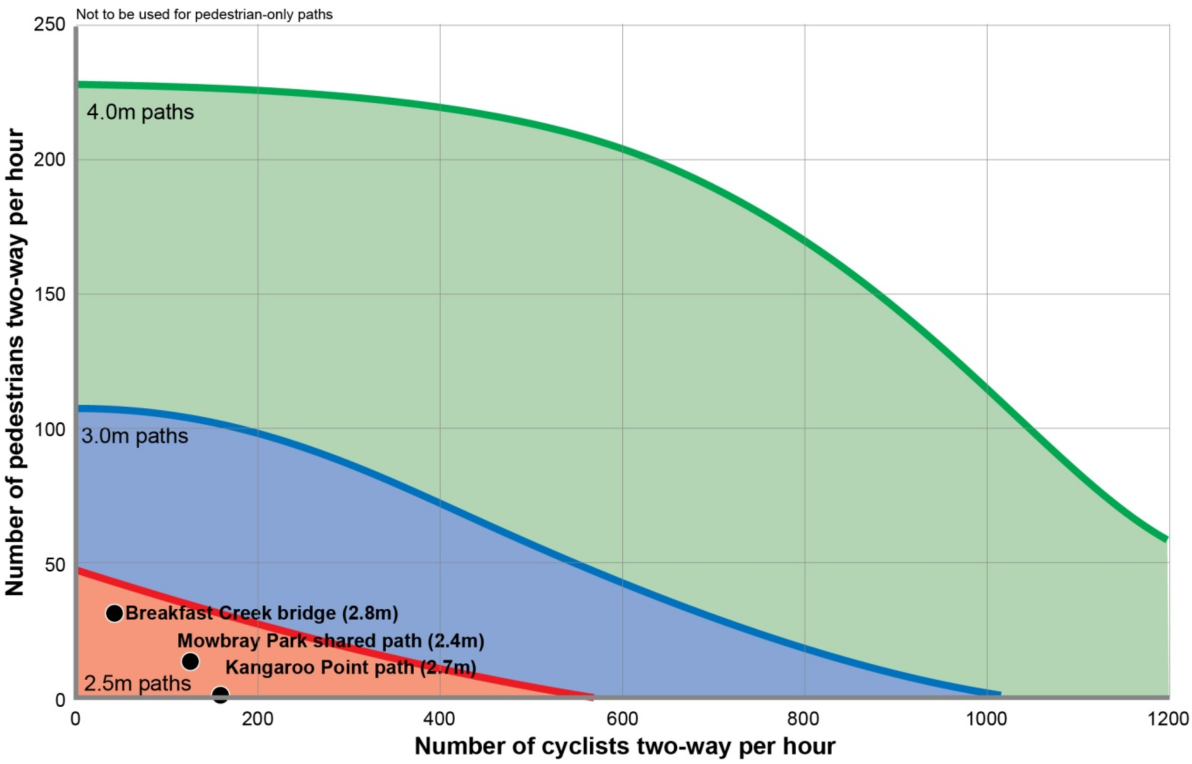
Paths that have a 75/25 directional split (or higher), typically commuter paths, produce fewer delayed passings and have a higher capacity than paths with a 50/50 directional split, typically recreational

---

[4] *Bicycle and Pedestrian Capacity Model: North Brisbane Cycleway Investigation.* Report prepared by Sinclair Knight Merz, Malvern, Victoria for the Queensland Department of Transport and Main Roads. 30 March 2010.

paths. This is because the number of passings and meetings that occur at the same time are fewer when most path users are travelling in the same direction.

Figure 5: Capacity of recreational shared paths (50/50 directional split) in Brisbane showing volumes of pedestrians and cyclists (2009)



Path directional split is not a consistent indicator of path use. This is usually determined by the location of the path and its connections to strong trip attractors and network linkages. References in this document to path-use in relation to direction split, e.g. recreational or commuter, are made only to illustrate the more common types of path usage on the examples provided.

Figures 4 and 5 show the width of some of Brisbane's more popular shared commuter paths and the volumes of pedestrians and cyclists that are using these paths. As indicated, many of these paths have sufficient capacity for the volumes of cyclists and pedestrians, based on current levels of usage.

3.2 Capacity of commuter and recreational paths in Brisbane

Table 2 indicates the estimated capacity of some of Brisbane's off-road commuter and recreational paths.

The number of delayed passings are relatively high on recreational paths and narrow paths such as the Mowbray Park path. While cyclists using these paths may have a higher tolerance for delayed passings than cyclists on commuter paths, widening these paths or separating cyclists from pedestrians would improve the capacity of the path and the LOS for all users.

		Peak Hour Volume (two-way)	Directional split		Estimated number of delayed passings per hour 2010
Path	Width	Cyclists	Pedestrians	(main flow)	estimated
Goodwill Bridge	5.7 m	496	537	71%	0.1
Bicentennial Bikeway (Toowong)	3.0-3.5 m	545	95	67%	17.4
Bicentennial Bikeway (Separated path)	3.5 m C 2.0 m P	538	161	58%	1.8
Bicentennial Bikeway (Kurilpa Bridge)	3.0 m C 2.0 m P	517	115	56%	1.7
Kangaroo Point path	2.7 m	169	-	66%	0.1
New Farm Floating Pathway	5.0 m	101	223	76%	0.0
SE Freeway Bikeway at O'Keefe Street	2.0 m C	203	-	89%	0.6
Normanby Link	4.0 m	99	184	54%	4.2
Story Bridge	2.7 m	130	192	82%	15.9
Mowbray Park path	2.4 m	133	17	58%	5.1
Downey Park bridge	3.2 m	109	200	98%	0.4
Breakfast Creek bridge at Kingsford Smith Drive	2.8 m	48	38	53%	0.6

Figures in red indicates that path exceeds delay tolerance of 12 delayed passings per hour.

4 Summary of path widths and broad guidelines for their use

A summary of path widths and broad guidelines for their usage is provided in the department's *Road Planning Design Manual* Volume 3, Part 6A.

Figure 6: Goodwill Bridge

The 5.7 m wide Goodwill Bridge is one of Brisbane's most heavily used shared path facilities.

5 Assessing path capacity and selecting path widths

In the event of the need to assess path capacity and select path widths, refer to the department's *Road Planning and Design Manual* Volume 3, Part 6A for procedure for assessing the capacity of existing paths, to assess the need for path upgrades, and to select appropriate widths for new paths.

6 Assessment calculation

With reference to the graphs and procedure outlined in the department's *Road Planning & Design Manual*, this section provides some examples of how to use both the graphs and the procedure to calculate path width for commuter and recreational paths.

Example 1: Bicentennial Bikeway at Toowong (unseparated section)

Using figures from the 2009 research this path is between 3.3 m and 3.5 m wide. It carries 545 cyclists and 95 pedestrians during the AM peak period. The "directional split" is 67/33.

These figures indicate that separation is advisable, particularly as the frequency of delay is high at 17.4 delayed passings per hour. Closer to the city, this path is separated, with a 3.0 m bike path and a 2.0 m footpath (Bicentennial Bikeway at Kurilpa Bridge). Though user volumes are similar in this location, the path operates with far fewer delayed passings (1.7 per hour), providing improved level of service and greater safety to pedestrians and cyclists.

Example 2: Mowbray Park shared path

Using figures from the 2009 research this path consists of a 2.4 m wide shared path. It carries 133 cyclists and 17 pedestrians during a weekend peak hour. The "directional split" is 58/42. The calculations are within the zone for a 2.5 m path. As a result it could be concluded that the capacity of this path meets demand at this location. However, as the frequency of delay is moderate (but not critical) at 5.1 delayed passings per hour, any further increase in usage may require either path widening or separation of the users to meet increased demand.

7 Separating cyclists from pedestrians

The most effective way to increase the capacity of off-road facilities for cyclists and pedestrians of 4.0 m width and above is to separate the user types by providing a separate footpath and a separate bicycle path.

7.1 The benefits of separation: increased capacity, safety and LOS

Separating cyclists from pedestrians recognises the speed differential between cyclists and pedestrians and reduces the number of delayed passings that cyclists experience along a path.

Separation improves the safety and sharing difficulties between the different user groups by providing clearly defined operating space designed to cater to their particular operating characteristics.

Separation also allows cyclists to maintain more comfortable speeds, reduces the potential for conflict between cyclists and pedestrians and improves the level of service for pedestrians, especially elderly pedestrians or those with a disability.

7.2 Effective separation requires effective design

Refer to the department's *Road Planning and Design Manual* Volume 3, Part 6A for guidelines for separating cyclists from pedestrians.

Figure 9: Cyclists and pedestrians are separated on this Perth path by a planted verge

Figure 10: Cyclists and pedestrians are separated by a painted line

The provision of a separating line alone is not sufficient to indicate to pedestrians and cyclists which part of the path they should use (Toowong). Visual separation (linemarking) however, may be appropriate and more useful to path users in some low volume situations as this treatment allows path users to temporarily use each other's part of the path when overtaking.

7.3 Separating cyclists from pedestrians – best practice examples

The photos on the following page show a number of examples of path separation best practice techniques from Australia and overseas. Surface texture and colour are used on many of these paths to separate pedestrians from cyclists and to make it clearer as to which paths cyclists and pedestrians are required to use. In retrofit situations where existing space is limited, surface colour has been used successfully in conjunction with linemarking and pavement logos to clearly indicate both cyclist and pedestrian operating space. In greenfields situations where space can be made available, landscaping and raised medians can also be used to physically separate the operating spaces. For details of recommended linemarking and regulatory signage for shared paths refer to *Manual of Uniform Traffic Control Devices* Part 9, Bicycle Facilities, Section 3.5.

Figure 11: Cyclists and pedestrians in this retrofit situation are separated by a kerb

Kangaroo Point Cycleway, Brisbane. This separated path is retrofitted into a limited space. Visual cues that support separation and encourage respect for the operating space of cyclists and pedestrians are pavement colour and a raised central median. Only recommended for short distances.

Figure 12: Cyclists and pedestrians in this greenfield site are separated by a planted verge

A greenfields development in Subiaco, Perth. Paths have been physically separated by hedges. Landscaped separating medians require careful design and installation as this type of treatment requires regular maintenance and can produce poor sightlines for the users and nearby roadway. The surface of the cycleway is coloured red – the colour used to define such facilities in WA.

Figure 13: Cyclists and pedestrians are grade separated

Approach paths to Eleanor Schonell Bridge, St Lucia, Brisbane. The bicycle path is separated from the footpath by a standard 150 mm kerb. The surfaces of both paths are contrasted. Logos should accompany the direction arrows on the bicycle path to match the adjacent footpath logo.

Figure 14: Cyclists and pedestrians separated visually by the pavement colour scheme

San Sebastian waterfront Spain. This two-way cycleway is separated from the waterfront walkway by a street furniture/planting zone. The path is well defined with red surface colour and contrasting adjacent pavement colour.

Figure 15: Cyclists and pedestrians separated visually by the pavement colour scheme and verge planting

Berlin, Germany. This new street development has one-way paired cycle paths and footpaths well defined with coloured pavement and contrasting separating strip (photo flipped to show Australian road travel direction).

Figure 16: Cyclists and pedestrians separated visually by the pavement colour scheme and linemarking

Bicentennial Bikeway, Coronation Drive, Auchenflower. This newly widened separated path uses green coloured pavement on the bicycle path in conjunction with linemarking and logos to clearly show the operating space for each user group.

Figure 17: Cyclists and pedestrians separated visually by the grassed median

Montreal, Canada. This separated path uses a grassed median to separate bicycle path from footpath. Note the shaded avenue of mature trees. Shade is particularly welcomed by users in hot climates such as parts of Queensland. This bicycle path is well delineated with centre-lining and pavement logos.

Figure 18: Cyclists and pedestrians separated visually by the planted median

Breda, the Netherlands. This two-way separated bicycle path is separated from the footpath by a planted median. The path is coloured red to indicate exclusive bicycle use.

For further information on this technical note, please contact:

Michael Langdon
Transport and Main Roads – Engineering & Technology Branch
Phone: (07) 3066 8965 Email: michael.j.langdon@tmr.qld.gov.au