

**MACKAY REGIONAL COUNCIL
CYCLEWAY STRATEGY
STRATEGY UPDATE 2011 - 2016**

APRIL 2011

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1 INTRODUCTION

Council has determined that a requirement exists to review the Mackay City Bicycle Plan (MCBP) and extend the plan to include a whole region approach to cycle traffic planning. Amalgamation has changed the boundary of the Mackay City Council local government area to now include the previously existing Sarina and Mirani local government areas. The Sarina and Mirani areas are to be included in the whole region approach to the development of a cycleway strategy for the Mackay Regional Council (MRC).

The scope of work is to review the existing MCBP produced by Gutteridge Haskins and Davey Pty Ltd (GHD). The original strategic plan is still valid; however, the construction program and costs are reviewed to refocus the plan with priorities for the next five years, and with a vision of a ten year time frame. The plan would be expected to be reviewed in early 2010 with implementation commencing in early 2011.

A number of factors have changed since the original report in 1999 and it is timely to update the areas of population growth and a review of cycleway usage compared to 1998 and 1999 when the study was completed. As indicated above the inclusion of the townships of Sarina, Mirani and Marian is required based on the new boundaries of the local government area of MRC.

One of the changes in this report is the difference in approach between this report and the GHD report. The GHD report focussed on the treatment methods used in each zone with the route (link) being an important secondary consideration. This report focuses on the links as the primary consideration with the treatment methods within those links being a secondary consideration. This report also considers the importance of the growing recreational cycle numbers in the route hierarchy.

The main body of the report below contains the program for continuing with a bicycle strategy plan and extends that strategy to the surrounding regions. The body of the report builds on the complete study by GHD in 1999 as a basis for developing the strategy into 2020.

The information and data collated is held in the appendices as supporting information to the report and planning information.

2 BACKGROUND

In 1998/1999 GHD were commissioned to provide MCC with a Bicycle Plan for the city of Mackay. In the years since the adoption of that strategy there has been considerable change. The two most significant changes to impact on the plan are the amalgamation of the Mackay, Sarina and Mirani local government areas into the Mackay Regional Council, and the development of cycling as a significant recreational activity in Australia.

It is accepted that the bicycle is an efficient form of transportation over short and medium distances. Several recognised 'bicycle cities' such as Amsterdam, Beijing, Stockholm, and to an extent, Canberra, already exist. In them, the bicycle, like the car, is a normal part of everyday life. These cities have planned or at least catered for bicycles, and as a result boast a large proportion of residents and visitors using bicycles for their transport needs.

The overseas experience cannot be directly applied to the Mackay Region for a number of reasons, including influences of climate and the community demographics. However some of the philosophies can be used to create a bicycle network that is tailored to the needs of the community. Studies supported by the road network authorities in Australia and New Zealand including work in Hamilton City is more relevant to the Mackay situation although this work still needs to be adjusted to meet the climatic conditions of tropical North Queensland. It is significant that the design and construction standards used in Australia and New Zealand were developed by joint committees and are published by Austroads.

Provisions for cyclists must form part of an integrated approach to land use and transport planning. The fundamental objective for planning bikeways is not simply to provide recreational facilities, but also transport networks for commuters.

The environmental, health, economic and social benefits of cycling are wide ranging, including, but not limited to:

- Reduced air and noise pollution.
- Improved community health and fitness through regular exercise.
- Reductions in traffic congestion and road accidents by having fewer motor vehicles on the roads.
- Increased personal mobility, particularly for people without access to motor vehicles.
- Increased tourism appeal of "bicycle friendly" destinations.
- Reductions in public expenditure on road infrastructure, the health system, motor vehicle and fuel imports.
- A greater choice in modes of travel and in recreational activities.

"Pedal power" is growing throughout Australia, encouraged by the provision of safer, more convenient and accessible environment for cyclists, particularly those of school age. Such an environment is being established in Mackay region and the continuance of the programme is essential if the benefits of increased bicycle usage are to be further realised.

In the last ten to twenty years the shape and style of cycling has changed significantly in Australia. The increase in the popularity of individual sports generally and success of Australian athletes on the world stage in events such as triathlons and "Le Tour de France" along with the development of the bicycle has encouraged more people to use bicycles as a preferred method of

training and fitness. This also leads to the increase of commuter use of the cycle.

The number of people cycling to, from and within the City and region is growing significantly. This is attributed to the relatively flat topography of the region, the increased awareness of the need for exercise, and the increased environmental awareness of the carbon footprint and energy use.

Working against the trend for increased cycling is a number of constraints. The construction of the network in a fragmented way over the recent past has created an incomplete network and so many of the issues and constraints such as bridge crossings, high speed arterial routes, and complex intersections remain.

The principal constraints presently limiting bicycle activity in and around the Mackay region are:

- The safety risks associated with on-road cycling, with an average of 26 bicycle accidents per year being reported to Police, particularly within the vicinity of the city centre (MCC, 2008).
- Parental concern for child safety both on journeys to and from school and in the use of bikeway and recreational walking paths.
- River crossings and major transport routes (e.g., highways and rail lines) forming partial or complete barriers to bicycle movement.
- Some poorly maintained unsafe bikeways.
- The dispersed pattern of development north of the Pioneer River and outside the urban area.
- Incomplete cycleway network

A good start has been made on the creation of a safe, legible and comprehensive bicycle network within the region. The advantages of a well planned bicycle network catering for all types of users ranging from commuters to residents, school children to recreationalists and tourists remain the same as in the 1999 report. The challenge for Council is to complete the missing links within the cycle network to provide the coherent network proposed in 1999.

3 THE AREA

Mackay Regional Council local government area is located on the central coast of Queensland, approximately 800 kilometres north of Brisbane and has a population of approximately 112,607 (ABS 30 June 2008). The municipality covers a total mainland area of 7621.9 km² as it now includes the Mackay urban area and the former Pioneer Shire, following amalgamation in 1994 and in March 2008 the Queensland Government amalgamated various local government areas such that Mackay Regional Council was formed including the previous Mackay City Council and including the former local government areas of the Shires of Sarina to the South and Mirani to the west.

Mackay is a prosperous centre which has traditionally thrived on the sugar and coal mining industries. Increasingly, the region is also becoming a popular tourist destination and has inherited additional tourist attractors with the inclusion of the shires to the south and west of the City within the regional council area. The most significant change since the 1999 study is the population growth due to the growth in mining sector particularly the Fly-In Fly-Out part of the industry which allows families to live and be educated on the coast where there is infrastructure while the income is earned on more remote mine sites where permanent infrastructure is not provided. This is good for the growth in the region.

The urban area of Mackay, located on the coast, is extremely well suited for cycling due to its favourable climate, generally flat topography, road layout and the different opportunities offered for tourism, recreation, retail, employment and education.

4 STRATEGY PHILOSOPHY / ROUTE HEIRACHY

4.1 Strategy Philosophy

The cycleway strategy to date has focussed on the road network route hierarchy and the development of an overlay cycleway hierarchy. The overlay cycleway route hierarchy is shown in the drawings Appendix A.

This report proposes no changes to the existing and proposed cycleway network but recommends a programme to complete the significant links so that the network is completed on a route by route basis. In order to achieve this, the Routes are shown on the drawing and related to the appended spreadsheet which forms the basis of the program. The spreadsheets contained in Appendix B propose treatment types as well as proposals for inclusion in the capital works programme.

The intent is to further develop the cycleway philosophy previously held for Mackay City area and continue to build on the work already complete, include the townships of Marian, Mirani and Sarina in the cycleway strategy and develop a strategy for the other regional areas outside of the urban area. Both Mirani and Sarina have some designated cycle ways close to school and park areas although at present these are not connected to either residential or town centre areas.

The strategy philosophy is to identify and complete the route elements where there are significant accident black spots, complete the most significant commuter and school commuter routes, so that the cycleway links within the city and towns are complete.

The hierarchy proposed for the next 10 year planning horizon is based on four(4) levels of cycleway hierarchy which overlay on the existing road hierarchy. The two are not necessarily directly linked but the higher level cycleway routes are generally located on the higher level roads such as

arterial and sub-arterial roads whereas lower level cycleway are more likely to be located on local roads. As the road hierarchy relates to usage and volume of motor vehicle traffic, the cycleway hierarchy is designed to relate directly to the proposed cycleway usage(type of traffic), classifications, route treatments and facilities. Significant portions of the cycleway network may be off road but nevertheless form a significant part of the cycleway strategy..

4.2 Route Hierarchy

The Route Hierarchies include the following:

4.2.1 Commuter routes

The commuter routes are based within the existing road hierarchy and are the link between the residential zones and destination zones. Generally Commuter routes will be part of the road network and will follow the road hierarchy (Arterial, Sub-arterial and collector) make provision for single file cycling within the carriageway. The purpose of the high level commuter routes is to encourage the use of cycles as the transportation means of commuting between home and a destination and is expected to attract more competent riders.

4.2.2 School commuter routes

School commuter routes while similar in nature to commuter routes have a greater emphasis on safety of young riders. School commuter routes will be developed on roads in the network that are generally in the lower road hierarchies (collectors and local streets). The routes will tend to be within the carriageway. A greater emphasis on safety is proposed for school commuter routes. Younger riders as a rule will be less aware of traffic, use smaller cycles which are less stable and tend to ride in weaving pattern identified as lack of attention.

4.2.3 Recreational Routes

Generally these will be defined as off-road pathways within recreational reserves. The likely users of these routes are people riding for fitness and adults with very young children. The concept of these routes is to provide opportunities for recreational cycling by developing safe pathways where riding competence can be established. These routes are characterised by creating destinations such as play grounds, rest stops (with shade and water) and other areas to stop which could include fitness activity equipment. Recreational routes can also allow for mountain bike (MTB) or "Bike Motocross (BMX) challenges with short more challenging circuits within the network.

4.2.4 Training Routes

The development of training routes is new to the Cycleway strategy and fits particularly with the inclusion of the Regional areas (those roads outside of the built up areas).

Training routes can be developed with minimal treatment of the road surface and tend to be low traffic volume roads although would still be classified as arterial or sub-arterial routes. The key features of the training routes is the combination of hills and flats included within the route along with known distances. Riders using training routes tend to ride when traffic volumes are low such as early mornings or weekends.

4.3 Cycleway Classifications

In order to establish a system of classification which clearly describe the type of treatment for the cycling facilities the following classification are proposed.

Classification	Facility/Design Standards	User Group
Major Commuter	On Road Facilities – Standard Treatments C,D,E	All cyclists
School commuter	On Road Facilities – Standard Treatments C,D E	Mostly School Children
Casual Recreation	Off Road Standard Treatment A,B, F	Predominantly families for recreation
Training	On Road Standard Treatment G	Clubs and individuals generally high speed training
Off Road Training	Off Road Standard Treatment F, H	Clubs and individuals – specialist off road training

4.4 Cycling Facilities and Design Standards

4.4.1 Facility Types

In order to establish a bicycle network which meets the needs of the Mackay Region's residents and visitors, it will be necessary to use a range of design treatments chosen primarily for their appropriateness in a given location. The alternative treatments are categorised as either:

- Off-road facilities.
- On-road facilities.

The types of bicycle facilities proposed for the Mackay Regional network include:

- Off-Road Facilities
 - Standard Treatment A - Shared Bicycle/Pedestrian Path.
 - Standard Treatment B - Widen Existing to Create Shared Path.
 - Standard Treatment F - Exclusive Bicycle Path.
 - Standard Treatment H - Exclusive Mountain Bike Path
- On-Road Facilities
 - Standard Treatment C - Dedicated Bicycle Lane/No Parking.
 - Standard Treatment D - Shared Bicycle/Car Parking Lane.
 - Standard Treatment E - Shared Bicycle/Vehicle Zone (<3,000 vpd).
 - Standard Treatment G – Training Route Identification

Specifications for each of these treatments are largely based on those set out in *AUSTROADS Guide to Traffic Engineering Practice, Part 14 - Bicycles (1993)* and an assessment of existing conditions for each section of the network. Table 4.4-1 summarises the width requirements for each of these treatments. Appendix F details their design requirements and indicative costs.

Preferred bicycle routes into future urban areas are also included in the bicycle network plan. These are indicative route proposals only. Their eventual location and treatment will be determined by Council and other relevant agencies at the time of development.

Standard Treatment	Absolute Minimum (m)	Desirable Minimum (m)	Desirable Width (m)	Desirable Maximum (m)	Clearance Width (m)
Off- Road					
A – Shared Use Path	2.0	2.5	3.0	-	0.2-0.5
B – Widened Footpath	2.0	2.5	3.0	-	0.2-0.5
F – Exclusive Bicycle Path	2.0	2.5	3.0	-	0.2-0.5
H – Exclusive Bicycle Path MTB	Marked Track No Specific Treatment				
On-Road					
C – Dedicated Bike Lane ¹	1.0	1.5	2.0	3.0	0.5
D – Shared Bike/Parking Lane	1.0	1.5	2.0	3.0	0.5
E – Shared Bike/Motor Vehicle Zone	-	-	-	-	-
G – Training Route	Route Markings signage only	-	-	-	-

Table 4.4.1: Width Requirements for Recommended Bikeway Treatments. (Source: AUSTROADS 1993)

¹ Note that the widths in on road treatments C and D in this table are the bike lane widths, and need to be added to any width allowance for motor vehicle use such as parking.

Indicative costs for each Standard Treatment will be based on *Rawlinson's Australian Construction Handbook - 12th Edition* adjusted to 2008 rates. At certain locations or problem areas (e.g., intersections and bridge crossings), it will be necessary to implement specialised treatments.

5 BI-CYCLE ROUTE SPATIAL HIERARCHY

The hierarchical approach adopted for route planning translates the four cycleway hierarchies (section 4.2) into four spatial hierarchies for purpose of route definition and corridor mapping.

Four spatial levels were considered:

Trunk or Cross-city; Marked in our schedule as "LR" for Link Route (following Arterial and sub-arterial roads)

District; Marked in our schedule as "CCT" for Circuit Route (following local collector streets)

Neighbourhood; Marked in our schedule as "CCT" for Circuit Route (local streets and off road routes)

Recreation Off Road; Marked RR or TR (Route not on the road network)

5.1 Trunk (Cross-City or LINK) Routes

The main aim of trunk or cross-city routes is to link the City's commercial centres and major employment nodes.

5.1.1 Commercial Centres

The Strategic Plan for the City of Mackay identifies and provides direction for the development of Regional, Sub-Regional and Local Convenience Centres, as discussed in Section 6.2 of the GHD² Report. These are the primary locations of employment and retail activity within the urban areas and should provide a focus for the bicycle network.

5.1.2 Other Facilities

In addition to the commercial centres, other cross-city "facilities" include the Council Administration Centre and associated facilities, the Central Queensland University Campus, the Ooralea/Paget industrial area, Mackay Harbour and the College of TAFE. Appropriate connections should be made to these facilities. The Link to the CQU campus follows Bernborough Avenue to the Peak Downs Highway then east to Nebo Road (Bruce Highway). The cycleway access to the Mackay Base hospital has also been improved with a connection over the new bridge (hospital bridge) and through Lagoon Street.

² The relevant parts of the GHD 1999 report are included in Appendix G.

5.1.3 Road Corridor

The City's Arterial and Sub-Arterial Roads provide an opportunity for an integrated road corridor based trunk bicycle network. The main routes include:

- Bruce Highway.
- Peak Downs Highway.
- Mackay-Bucasia Road.
- Slade Point Road.
- Harbour Road.
- Paradise Street.
- Mackay Bypass Road
- Mackay-Eungella Road
- Sarina Coast Road

The road corridor network will provide connections to and linkages between the City's commercial, employment and business nodes. The main purpose of the network will be to provide for the journey to work. Some parts of the main road network will be used by cyclists whether or not it is a designated route.

5.2 District (Feeder and Circuit) Routes

District level facilities include community centres, libraries, sport and recreation facilities, high schools, public transport nodes, beaches and some public open spaces.

Feeder (district) routes are intended to provide a link between residential catchments, district facilities and focal points. In general terms, they supplement the trunk routes and support the neighbourhood routes.

Long term opportunities exist within Mackay city to develop district routes along the Gooseponds Creek open space corridor and the southern bank of the Pioneer River. DTMR advise that there is adequate room available to provide a bicycle/pedestrian underpass of the Bruce Highway at the Gooseponds Creek Bridge, together with on/off ramps to the highway bike lanes.

There is also work being planned to upgrade the river pathway link (Gordon Street, Canleands River Street) as part of landscape works.

These routes would provide a major recreational function, as well as facilitating commuter travel. Completion of parts of the open space-based routes will rely on partial property acquisitions and the timing of neighbouring subdivision.

5.3 Neighbourhood Routes

Neighbourhood routes are lower order connections, intended to link smaller residential catchments with neighbourhood focal points and facilities, such as primary schools and minor public open spaces.

These routes also include recreation space provided as part of planned subdivision and development.

5.4 Recreation

The new category of recreation routes includes on-road training routes designated TR and off road recreation routes designated RR. The on road training routes can be designated by general signage on the road. Off Road Routes can be developed by cycling clubs and other community groups to augment the cycleway network, and provide additional opportunities for cycle based activity.

6 PRIORITY PLANNING NETWORK

The bicycle network presented in this Plan is intended as a strategic overview of proposed bikeways in the City. The network should not be considered to include all possible bikeways to be built in the City, but rather a strategic indication of bikeway routes, construction standards and supporting actions that may be reviewed and added to over time.

6.1 Mackay Strategy

In summary, the Mackay City bicycle network is characterised by the following key components:

- Optimum integration of existing infrastructure into the bikeway network.
- Trunk commuter bikeway corridors radiating from the city heart to:
 - Bakers Creek via the southern suburbs.
 - Walkerston.
 - The harbour, Paget industrial area and Mackay airport.
 - Slade Point via North Mackay.
 - Bucasia and Eimeo via Mt Pleasant and Beaconsfield.
- District bikeway corridors linking suburban facilities. Key routes include:
 - South of the river - Bridge Road, Holland Street, Shakespeare Street, and Milton Street.
 - North of the river - Mackay-Bucasia Road (Beaconsfield-Mt Pleasant), Bedford Road, Celeber Drive, Keeleys Road and Eimeo Road.
- Intersection Treatments on Key routes especially Highways and Major Collector roads recognising that the Main Roads Network forms a significant part of the cycleway network for commuter traffic.
 - Shakespeare Street .
 - Walkerston. Link (Peak Downs Bruce Highway Intersection)
 - Bruce Highway
- Local area bikeway systems north and south of the river, facilitating short bicycle journeys, and providing access to the City's network of higher order routes.

- Two major cross-river links via the Ron Camm Bridge (as part of the Bruce Highway Upgrade Project) and Forgan Smith Bridge.
- Improved CBD access for commuter cyclists and recreationalists via Milton, River, Brisbane and Alfred Streets.
- Nomination of trunk bicycle routes to service future urban development areas throughout the Northern Beaches and Walkerston.
- Long term recreational cycling circuits including paths running on the north and south banks of the Pioneer River, an extension of the Gooseponds Creek bikeway to Glenella, and the Lagoons bikeway.
- Specialised intersection treatments to eliminate hazardous blackspots (e.g., Nebo Road / Peak Downs Highway intersection and Evans Avenue / Harbour Road / Barnes Creek Road intersection).
- Specialised intersection treatments at confluence of major routes (particularly at signalised intersections)
- A localised bikeway network serving the Seaforth township, including a shared bicycle/pedestrian path to the primary school.

While some of the projects have been completed work is still required to complete the networks.

6.2 Sarina, Mirani, Marian Strategy

The strategy for bicycle transport in the smaller towns and villages is primarily to provide safe access to and from the school to residential areas. In addition to the cycle way link to schools, housing developments should also allow for recreational cycling in parks and other reserve spaces.

6.2.1 Sarina

The accident record for the Sarina for Bicycle accidents indicates a small number of traffic related incidents in the township.

In Sarina there is a small length of existing shared path cycleway in Hoey Street which runs along behind the school and adjacent sports grounds.

The proposal here links this pathway with the business district in town and the schools on the western side of the highway. The highway and rail corridor through the main street of Sarina results in some difficult crossing points. However the recommended crossing point at the existing traffic lights avoids the problems of being too close to the rail corridor and allows for a controlled crossing of the major highway.

6.2.2 Mirani and Marian

Mirani and Marian are handled together as there is only 6 kilometres between the townships.

For Mirani there is a designated cycleway proposed to link the existing pathway (south of the rail corridor) to the schools, and recreation zone.

For Marian neighbourhood cycleway should be provided as part of the new subdivision areas to provide for local recreation.

Develop an “on highway” link between the community areas near Kennys Road to Anzac Avenue then along the river (Mackay Eungella Road) to Mirani.

6.3 Rest of Region Strategy

The rest of region strategy at this time is based around providing training routes/opportunities in locations around the key townships. A number of out and back circuits may be identified as possible future training routes.

An opportunity for a cycle way route for training cyclists between Sarina Beach and Sarina is one opportunity that could be developed by providing suitable advisory signage. The roads are already used by training cyclists and the additional signage would provide warnings to motorists to take care. A list of possible training routes is set out below.

Some suggested training routes are:

- Sarina to Sarina Beach.
- Sarina to Armstrong Beach/Freshwater Point.
- Sarina to Koumala.
- Sarina to Coleston Park.
- Sarina to Moana Caravan Park.
- Mirani to Walkerston.
- Mirani to Eungella.
- Marian to Eton.
- Walkerston to Mackay.
- The Leap to Mackay.
- Calen to Bloomsbury.
- Bloomsbury to Midge Point.

7 WORK TO DATE

An extensive amount of work has already been completed to develop cycleway network. Local cycleway routes and links have been developed in the Northern Beaches and northern suburban areas, and central areas along with the eastern recreational areas.

A drive-over survey of the cycleway network confirmed the establishment of the cycle routes in the network. The work to date on the attached drawing is shown in green.

As a general rule, it was found that the areas around most schools had been serviced by a cycle path or route. Suburban circuit routes were also well developed. This was particularly true for the Northern Beaches area and for the new suburban developments.

Elements of the Cycleway network that could not be confirmed by some form of evidence on the ground (eg: signage, line marking) are indicated as red lines or proposed routes on the map.

8 PRIORITISED PLAN

This section includes a prioritised plan for the Regional Cycleway strategy.

The intent of the plan is to maintain the cycleway hierarchy, and simplify to three(3) main areas of focus for the coming five(5) years. The three areas of focus are to

- Develop existing roads on the hierarchy list into the cycle way network by adding signage and markings as applicable.
- Improve intersection safety at key points in the network
- Develop and include key Main roads into the network.

The first focus is on consolidating the current network and closing some of the gaps in the network including designating some roads as part of the school access links. Sarina and Mirani have not been addressed in the previous study and would be included as a priority in including school gate access links to the local cycleway networks. It is also believed that Creek Street in Walkerston should be included in this category. By including some of these roads we would be “picking the low hanging fruit” or doing the straight forward low cost parts first.

It is also important to ensure that the North – South linkages across the river are well defined and allowance has been made for cycle traffic across all bridges.

The second focus is on improvements in intersection safety. A number of intersections have been identified on busy link roads, and these include some key intersections on the main highways. Treatments for intersections with traffic lights (signals) can be addressed by providing priority cycle lanes (refer photograph). Roundabouts particularly those on Main Roads present a greater difficulty and may need to be addressed further down the priority list.

The higher order Main Roads also need to be included in the priority list for signage and development of the network. Cycle traffic already uses the Primary road network of highways, and collectors and needs to be considered in traffic planning of these routes through the city networks.

In more details the plan includes priorities for

- Completing some major routes with signage both as a formal legal designator in parts and informal notice of the cycle way network. This

is considered a low cost option in developing the coherent network. Improvements in signage along Paradise Street and Milton Street will cement the links

- Intersection treatments at critical points especially at highways and other primary road hierarchy routes. High priority intersections include the Peak Downs/ Nebo Road Intersection allowing the link to Walkerston, Intersections along Shakespeare Street, Intersections along Malcomson Street
- Bridge Crossings and allowance for cycle traffic as part of the current projects.
- Minor works to link the part networks in Mirani, Sarina and Walkerston. With Intersection Treatments on the Bruce Highway at Anzac Street for the highway crossing that links the schools on the east and west sides of the road in Sarina and links across the Peak Downs Highway in Mirani and Walkerston.

Low priority works include the more difficult off road cycle ways such as the Binnington Esplanade Link. The Binnington Esplanade work is likely to require a boardwalk option in order to protect the environment, as a result the solution is likely to be of high cost.

A copy of the Prioritised Plan in Excel format is attached at Appendix B

APPENDIX A – Maps/Drawings

APPENDIX B – Prioritised Plan

APPENDIX C – Community Profile

APPENDIX D – Existing Cycling Environment

Existing Cycling Environment

Types of Cyclists

Different types of cyclists have different needs and trip purposes, which determine their preferred cycle route. For example, commuters give higher priority to time saving, convenience and directness, in order to maintain their speed and momentum. For the recreational cyclist, these factors are less important.

There are four basic types of cyclist in Mackay City as follows:

- School cyclists.
- General commuters.
- Recreational and tourist cyclists.
- Sports cyclists.

School Cyclists

A major bicycle user group in any area are students cycling to and from school. For children and teenagers, cycling is both a form of recreation and personal transport. Recreational cycling typically takes place within a 1 km distance from home and transportation cycling usually extends to about 5 km from home. Where older students prefer to use on-road facilities, children and beginner cyclists tend to feel more comfortable on off-road bikeways that are separated from motor vehicle traffic.

School cyclists, particularly of primary age, have limited comprehension of the dangers of cycling. Even if they are aware of the road rules, they often lack the full understanding of all factors that combine to cause either a safe or unsafe bicycle trip. For these reasons, children and teenagers riding bikes have a great deal to gain from the establishment of a safe and connective network of bikeways.

General Commuters

The general commuter group comprises cyclists commuting to and from places other than school, such as the workplace, shops and recreation facilities etc.

General commuters require both on-road and off-road bikeways. Work commuters give higher priority to time-saving, convenience and directness, in order to maintain their speed and momentum. Therefore, they are not averse to riding on roads if it provides a more efficient route. In contrast, persons riding to the local shop for example, may prefer to use a path away from road traffic or cycle amongst the traffic along the road.

It is important to note, that generally commuters require end of trip facilities such as secure bicycle parking and shower facilities at popular destinations, particularly the workplace.

Recreational and Tourist Cyclists

Recreational and tourist cyclists ride for pleasure and value amenity very highly. This category of cyclist will be interested in cycling to places of significance and through areas of interest. For tourists, cycling provides an enjoyable and inexpensive way of seeing an area.

The cycling ability of recreational and tourist cyclists will vary greatly as will the distance they ride, but generally they have much to gain from a bicycle network which serves major nodes and places of interest, as well as selected recreational routes into nature reserves and rural areas.

Recreational and tourist cyclists rely heavily on directional signage, rest points and refreshment stops on-route. Mackay's urban area offers a well established network of scenic recreational cycle routes. For example, many family groups enjoy leisurely Sunday rides through the Lagoons and Goose ponds.

Sports Cyclists

Sports cyclists ride for fun and fitness, though the attitude of sports cyclists varies considerably between individuals. Many value amenity very highly, but most put a strong emphasis on cycle facilities with a high quality surface and good alignment. For sports riders, a high quality facility will generally make up for a moderate amount of traffic or lack of scenery.

The distance covered by sports cyclists can range from 10 to over 100 kilometres. Generally the routes that they follow are not so dependent on a specific origin or destination, but rather on the route itself.

Through the consultation process, it was found that several sports cycling groups use corridors throughout the City for training and competitive purposes. Some popular routes appear to be:

- Northern circuit:

City centre → Mount Pleasant → Beaconsfield → Andergrove → Slade Point to the Harbour return.

- Southern circuit:

City centre → West Mackay → South Mackay → East Mackay → North Mackay return.

- The Walkerston loop.
- The Dolphin Heads loop.

Popular long distance sports cycling / training rides from Mackay include:

- Seaforth.
- Mt Blackwood.
- Mt Charlton.
- Mirani.
- Eton Range.

- Sarina.

Other User Groups

A bikeway is never used **only** by cyclists. It generally becomes a recreation / transport facility for pedestrians, joggers, wheelchair users, roller-bladers, skateboarders, baby strollers and other users (of all age groups).

Shared bikeways have been a popular initiative by governments in recent years and are becoming an important element in regional transport plans. However, the conflicting needs of different users on shared bikeways are increasingly apparent, often resulting in collisions, typically through:

- Narrow path widths.
- A lack of awareness by one or both parties.
- The speed differential (e.g., between pedestrians and commuter cyclists).
- Poor sight distances.
- Users not staying left (i.e., lack of pathway "etiquette").
- Poor signage.
- Poor pathway edges.
- Groups congregating on the pathway and impeding traffic flow.

By providing sufficiently wide shared facilities the safety and useability for present and future users is improved. Shared facilities are also used by those with special needs such as the intellectually and physically handicapped, thus reinforcing the need for adequately designed shared paths for the same reasons mentioned earlier. It is therefore, necessary to consider the particular location of all potential user groups in the design process for shared paths, on a case by case basis.

Bicycle Ridership Levels

Mackay City

A review of 1996 Census data provides the best available source of information on existing cycling levels. However, it should be noted that this 'journey to work' data does not account for many of the common cycling trips made by students, as well as shopping trips and recreational cycling (e.g., just "going for a ride" or visiting friends). Therefore, current bicycle use in Mackay would represent a much higher proportion of the total modal share than Census figures suggest.

The 1996 Census showed that for journey to work trips made by Mackay City's employed population:

- 79.5% comprised one mode of transport and 0.9% included two or more.
- Of single mode trips, 3.2% were made by bicycle alone, compared with 86.1% by private car (as driver or passenger), 2.0% by motor bike or scooter, 1.4% by public transport and 5.1 % on foot.
- 79.7% of bicycle commuters were male.

Where the journey to work comprises more than one mode of transport, the second or third mode has not been specified by the ABS, for example, bus or bicycle. Therefore, it is not possible to provide a total figure for journey to work trips made by bike. However, the available figures indicate an overwhelming dependence on the private car for commuters (as passenger or driver), with less than 1% of the employed population travelling to work by bus.

When comparing the journey to work profiles of other Queensland municipalities, it is evident that Mackay City has the highest rate of car dependency and a slightly higher than average level of bicycle use.

Urban Localities

At the Urban Centre / Locality (DCL) level, the proportion of single mode trips to work made by bicycle is highest in the areas of:

- Farleigh (5.6%).
- Central Mackay (4.4%).
- Bakers Creek (3.5%).
- Walkerston (2.2%).

Although the scope of this study is limited to the urban portion of the City, it is evident that many people in rural areas are cycling to work, particularly in Calen (3.9%). Data also showed cycling was not a preferred method of travel to work for employed persons residing in Blacks Beach or Seaforth. The connection routes between rural settlements are typically high speed arterial corridors or narrow isolated access roads with rough unsealed shoulders, which are not "bicycle friendly".

Future Ridership Levels

The level of bicycle usage is very much linked to latent demand. This means that if people have the opportunity to travel by bicycle, they will take it. If the investment is made into quality facilities now, an increase in the number of trips made by bicycle in the future can be expected.

Accordingly, the following target is set for Mackay:

By the year 2015, trips by bicycle in Mackay City will represent 10% of the total modal share.

The achievement of this target rests primarily on Council's implementation of this Plan and the ongoing development of positive planning strategies that encourage cycling.

A similar approach is being adopted elsewhere throughout Australia. Examples of targets for increased cycling in other localities are provided below:

Integrated Regional Transport Plan for South East Queensland (IRTP) – 2% to 5% of the modal share for the region by 2011. This target has since increased to 8%.

The Perth Metropolitan Transport Strategy – 5.7% (in 1991) of all trips to 8% by 2010 and 11.5% by 2029.

National goal – double number of trips by bicycle from 2.5% (in 1996) by 2001 and quadruple the proportion of trips by 2010 (these figures have been suggested in the preparation of *the National Strategic Bicycle Plan for Australia*).

Existing Bicycle Facilities

Bicycle Network - Form and Coverage

Mackay's bikeway network has largely evolved from an off-street system. To date, approximately 45km of bikeways have been constructed throughout the City, of which about 70% are off-street shared bicycle / pedestrian paths, with the balance running on-street. The extent of existing facilities is illustrated on the appended network plans.

Bikeways can be seen to be concentrated within the urban area. Shared facilities over short distances have also been constructed in Bakers Creek, Walkerston, Slade Point and Bucasia. These isolated links have not been successfully integrated with the rest of the network. Bikeways do not extend as far north as Eimeo, Blacks Beach or Shoal Point.

The existing network generally consists of:

- Recreational shared paths meandering through parkland areas and reserves (e.g., Queens Park, Goose ponds and the Lagoons systems).
- Discontinuous off-road paths of varying widths along arterial, sub-arterial and collector roads, radiating from schools and serving neighbourhood catchment areas.
- On-road shared bike / parking lanes terminating outside the city centre.

The principal connections include the following:

South of the River

On-road commuter lanes along sections of Bridge Road, Wellington, Alfred, Shakespeare, Juliet, Goldsmith and Griffin Streets.

An off-road link along the northern side of the Peak Downs Highway commencing opposite Bernborough Avenue, diverting through the Lagoons reserve to Holland Street.

A north-south off-street corridor along Paradise Street from Archibald Street to Milton Street, diverting east behind Mackay State High School, Mercy College and St Mary's Primary School.

North of the River

Off-road paths with few discontinuities, serving local primary and secondary schools north of the river, running along Celeber Drive, Oak Street, Andergrove Road and Bedford Drive.

Dedicated bicycle lanes on road shoulders along Harbour Road, between the Slade Point Road roundabout and Evans Avenue (community feedback has indicated that these are too narrow for the allocated speed).

Mackay City Centre

No specific provisions have been made for cyclists in the Mackay city heart area. Although available space is constrained, the city centre speed limit of 20km/h imposed on some corridors (primarily Victoria Street) and the Local Area Traffic Management (LATM) devices installed (e.g., mini-roundabouts, raised slowing devices / speed bumps) have enabled cyclists to mix freely with motor vehicle traffic in relative safety.

The principal hazards of cycling in the city centre include car doors opening onto approaching cyclists, motorists not giving way or not seeing cyclists, and collisions on footpaths with pedestrians.

Although existing facilities are relatively comprehensive, they lack connectivity, particularly within the city centre precinct and northern beaches area. A primary objective of this Bicycle Plan will be to establish an integrated network which promotes a high level of connectivity and access between generators and attractors.

Existing off-street facilities provide a pleasant cycling environment away from traffic, particularly favouring recreational cyclists and children travelling to school.

In its present form, the network (as a whole) does not facilitate direct or efficient travel for commuter cyclists because:

- The shared off-road paths are intermittent, circuitous, narrow and heavily trafficked by other user groups.
- Many of the on-road bike lanes are rough, pot-holed, difficult to identify through poor signage and line marking, do not extend to key urban destinations (e.g., employment and retail centres) and are narrow in places.

Bridge Crossings

Few provisions have been made for cyclists at existing bridge crossings. As a consequence of urban development, cross-river bicycle travel is a necessity for many residents north of the river.

Foran Smith Bridge

Foran Smith Bridge has a shared off-road path on its western side and carries approximately 361 cyclists and 145 pedestrians per day (Mackay Bridge Study, 1994). The path is of sub-standard width (widest point is 1.7 metres) and will require upgrading to safely accommodate existing and future cyclist / pedestrian flow. Some commuter cyclists in Mackay consider there to be sufficient room on the bridge to provide on-road lanes on both sides,

however, Council and Department of Transport & Main Roads (DTMR) do not support this.

Hospital Bridge

Hospital Bridge is a narrow two lane bridge that presents a "squeeze" point for cyclists crossing it. In the absence of any on or off-street paths, cyclists are forced into the main traffic stream. This situation is typical of most bridge crossings / overpasses throughout the City. Future bridge options are being investigated as part of Mackay Area Integrated Transport Study (MAITS).

Ron Camm Bridge

As part of DTMR's Bruce Highway Upgrade Project (Nebo Road - Phillip Street), the Ron Camm Bridge has been duplicated, and the new bridge came into use in February 1999. This bridge is a priority route for cyclists, linking the city centre and southern suburbs with the growing northern beaches area.

Facilities for cyclists have been incorporated into the design of the new and existing bridges, as well as their approaches and major intersections on-route, as summarised below:

A 2.0m dedicated bicycle lane on the shoulder of the outbound (new) bridge.

A 1.6m dedicated bicycle lane on the shoulder of the inbound (old) bridge.

2.0 - 2.5m wide dedicated bicycle lanes on the road shoulders approaching on the two bridges, commencing from the Hume Street / Bruce Highway intersection, through to Malcomson Street (the lanes narrow over in some sections).

A 1.6m bicycle lane over the Gooseponds Creek crossing.

Heaths Road / Sams Road intersection is controlled by signals with a pedestrian phase. Travelling from the south, cyclists can make a right turn into Sams Road by dismounting their bicycle and crossing at the lights, or for more experienced / commuter cyclists, make the turn with the other traffic. In this case, cyclist holding bars and a bicycle "head start" storage area will be provided (refer to Section 4.4 of AUSTRROAD S, Part 14).

Mackay-Bucasia Road / Malcomson Street intersection

Travelling from the south, cyclists can make the right turn by dismounting and crossing with the signalised intersection's pedestrian phase or crossing with other traffic, again from a head start box.

The right turn and northbound lanes will be separated by a median. Accordingly, cyclists wishing to turn right will need to merge from their western shoulder lane, across the northbound lanes to make the turn.

For cyclists travelling south along the Bruce Highway towards Ron Camm Bridge, bicycle lanes will not be continuous and in some locations, cyclists will be required to dismount before merge lanes.

Construction Standards

Council advise that the standard for bikeway construction in Mackay is *AUSTROADS Guide to Traffic Engineering Practice, Part 14 - Bicycles (1993)*. Many of the existing facilities observed throughout the study area do not meet AUSTROADS standards, and in some cases, are of inadequate width and construction for safe passage by cyclists, pedestrians and other user groups. Therefore, many existing bikeways require upgrading to make them consistent with current AUSTROADS guidelines.

Key areas requiring attention include:

- Path widening.
- Resurfacing.
- Removal of overgrown vegetation and regular maintenance checks.
- New signage (direction, distance) and / or upgrading existing signage.
- Crossing treatments where bikeways meet roads and intersections.

The scope of this study did not extend to a detailed audit of all existing bikeways.

Schools

Of the primary schools which responded to the Bicycle Plan survey 55% had bicycle storage racks. A figure for secondary schools was not sought by the study team, however, as over 60% of the high school students surveyed commute daily to school by bicycle, it is assumed that their respective schools provide some form of bicycle storage.

Major Shopping Centres / Precincts

City Centre

There appears to be few provisions for bicycle parking in Mackay's city centre. Most cyclists either lean their bicycles up against shop fronts or lock them against street signs and rails. This was also highlighted during the community consultation process. The provision of bicycle parking would be easily achieved by installing racks in centralised, accessible and visible locations and / or replacing some car parking spaces with parking rails. An even distribution of new parking facilities throughout the main shopping area would lead to their increased use by cyclists, and consequently, fewer conflicts between users on pathways and roads.

Canelands Shoppingtown

Canelands Shoppingtown management advised that racks with a total capacity to hold 30 bicycles are distributed around the centre. These are located in the pedestrian mall area, adjacent to entries of Woolworths, Big W and the centre management office. It is important to note that these facilities are not signed or directly illuminated for night time use. Centre management considers that existing rack allocation is adequate and meets demand, with

the exception of peak school holiday periods. Shower facilities are provided, but are accessible to staff only. The centre has no intention of installing additional bicycle racks, shower and change facilities for public use in the near future.

Mt Pleasant Shopping Centre

Centre management advice that the recently completed centre redevelopment includes bicycle parking facilities.

Public Transport Terminals

The major public transport interchanges are:

- Mackay Train Station, Ooralea.
- Mackay Coach Terminal, city centre.
- Mackay Airport.

These are considered trip generators / attractors, and as such, should be equipped with appropriate end of journey facilities for passengers and staff, particularly bicycle parking, shower and change facilities.

Mackay Train Station

Queensland Rail advise that secure bicycle parking facilities for public use are not installed at the train station, simply because there is no perceived demand, unlike major metropolitan stations, operating dual mode "park and ride" schemes. However, lock away facilities with a capacity to hold six bicycles are provided for staff members. This is a similar case for shower and change facilities.

Mackay Coach Terminal

Bicycle parking facilities for staff and passengers have not been provided at the coach terminal primarily due to the costs for purchase, installation and maintenance. Management representatives also commented that the risk of theft was another deterrent for purchasing bicycle racks.

Future plans for refurbishment of the coach terminal do not include bicycle facilities.

Mackay Airport

Mackay Port Authority (owners and operators of the Mackay Airport) advised that no bicycle facilities are currently provided at the main terminal. They indicated that there has been no demand for public facilities (e.g., bicycle racks) at the terminal and there are no plans to provide such facilities in the near future. Only a small proportion of airport staff cycle to work on a regular basis to which informal arrangements for bicycle storage have been made.

In conclusion, there appears to be a lack of bicycle support facilities at key urban destinations within Mackay City, particularly bicycle parking. It is vital to

provide support facilities to encourage ridership and these facilities should be progressively increased to keep pace with growing cyclist numbers.

Signage and Maintenance

Directional signage for cyclists in Mackay is limited to standard bikeway identification and warning signs at the start and finish of formal routes. Faded bicycle logos / stencils are also printed on the surface of shared and dedicated road-side lanes. Warning signs for motorists have also been erected where bicycle paths cross roads. Significant improvements will be required in this area to achieve a more strategic and effective signage system.

Several poorly maintained bikeways were observed littered with leaves, sticks, rubbish and other such debris, or poorly surfaced pot-holed paths with rough protruding edges (e.g., Glenpark Street overpass). These conditions pose safety risks for both on and off-road cycling.

Bicycle Education Programs

To date, the principal focus of bicycle safety education conducted in Mackay has been "Bike Ed".

Bike Ed is a bicycle safety course developed by Queensland Transport's Road Safety Division. The program aims to teach children in the 8 to 13 years age group how to ride bicycles safely (on roads and bicycle paths) and equip them with the necessary knowledge to recognise and deal with the hazards of modern traffic.

The package has been designed for use by trained teachers in the school environment and trained volunteer instructors in local communities.

In 1991, Queensland Transport (QT) distributed Bike Ed kits to all primary schools within the State. In the study area, approximately 40% of primary schools participate in the program, conducted both within schools and at the Mt Pleasant Police Citizens Youth Club (PCYC). It is the individual school's responsibility to organise these single morning or full day sessions, with a follow-up session the following year. Courses are also available for special needs children.

The PCYC has a purpose built outdoor circuit for Bike Ed tuition, complete with road signage, line markings, intersections and traffic signals. As part of this study's community consultation program, survey forms were sent to all schools in the municipality. The results outlining the success of existing education schemes and preferred approaches are summarised in Section 8.1.2. QT advised that a number of community education strategies are conducted within the City as well as, the issue of improved bicycle safety education be addressed in the study recommendations.

Road Network and Implications for Cycling

Existing Conditions

The existing road network in the Mackay area initially developed in two stages, north and south of the Pioneer River. More recently, following establishment of river crossings, there has been a strengthening of north - south regional links via the Bruce Highway, as well as, east - west links between the industrial areas (sugar mills) and the port have become important routes.

Historically the Bruce Highway was the major road through the municipality, due to its role as the major north - south coastal link in Queensland. The Bruce Highway is the only National Highway through Mackay. In total, the Bruce Highway / Nebo Road section through the urban area carries approximately 18, 000 to 27,000 vehicles per day (vpd) depending on the location (DMR, 1997).

The other major routes are the:

- Western corridor via the Peak Downs Highway.
- East - west link through the City and to the port via Malcomson Street and Harbour Road.
- Various routes accessing northern beaches settlements (e.g., Slade Point Road, Mackay - Bucasia Road).

Roads within Mackay City can generally be categorised into five functional classifications, namely:

- Primary arterial roads.
- Secondary arterial roads.
- Sub-arterial roads.
- Collector streets.
- Local streets.

Primary Arterial Roads

Primary arterials are major national or state roads, carrying substantial traffic volumes and linking major centres. They provide the most direct routes and may have two to six lanes depending on traffic volumes.

The traffic density and speed of cars and trucks on these roads are the major concerns for bicycle users. Experienced commuter cyclists typically avoid less direct routes as it increases their travel time and they will continue to use arterial roads even though these may be more hazardous.

The only primary arterial road that passes through Mackay City is the Bruce Highway. In the southern portion of the study area, Nebo Road / Bruce Highway is a popular, though sometimes dangerous route, for commuter cyclists to the CBD.

Secondary Arterial Roads

Secondary arterials are in many ways similar to primary arterials. The principal difference is that they are regionally important link roads rather than perhaps state wide or nationally important. They also carry substantial traffic volumes and generally provide the most direct routes, having two to six lanes depending on traffic volumes.

Secondary Arterial Roads tend to link major centres within a region rather than between regions. Their traffic density and speed of motor vehicles, as well as their use by experienced commuter cyclists are similar to primary arterials.

Secondary arterial roads in the study area include:

- Malcomson Street.
- Peak Downs Highway.

Sub-Arterial Roads

Sub-arterials are generally less busy than arterials. They tend to link smaller centres within a region.

Sub-arterials are reasonably direct routes which generate dense and fast moving traffic.

Cyclists preferably require cycle lanes along these routes due to the inherent danger and conflict with motor vehicles. Off-road facilities are also an option.

Along these routes if ample space is available. These may take the form of dedicated bicycle lanes or shared facilities with pedestrians.

Sub-arterial roads within the study area include:

- Barnes Creek Road.
- Beaconsfield Road.
- Bridge Road.
- Eimeo Road.
- Gordon Street.
- Harbour Road.
- Keeleys Road.
- Mackay - Bucasia Road.
- Mackay - Habana Road.
- Paradise Street.
- River Street.
- Sams Road.
- Slade Point Road.
- Sydney Street.

Collector Streets

Collector streets gather local traffic and channel it onto sub-arterials and arterials. They may also link smaller centres as part of their 'collecting' function.

In terms of traffic volumes, collector streets tend to vary considerably depending on their collection 'catchment'. Collector streets serving larger 'catchments' will invariably be busier and have a greater mix of motor vehicles.

Collector streets are often suitable routes for on-street bicycle facilities such as cycle lanes, due to their lower traffic volumes. Often, they are useful in functioning as main recreational cycle routes which link to commuter routes along major roads.

Local Streets

Local streets serve the local neighbourhood directly. They are often indirect, have low traffic volumes and relatively low speeds. They are generally suitable as part of a bikeway network, although they are inefficient for commuters who prefer direct routes to reduce travel time. Recreational and younger riders on the other hand, benefit from the lower volumes and traffic speeds which results in increased safety.

Traffic Volumes

Traffic volumes are an important consideration in selecting appropriate treatments for on-road bicycle routes. Traffic volume information used for this study was obtained from DTMR's Annual Average Daily Traffic (AADT) counts for major roads.

Accordingly, three traffic volume categories from the DTMR's "*Road Design Manual*" have been adopted:

- High – above 15, 000 vpd
- Medium – 3, 000 vpd to 15,000 vpd
- Low – below 3, 000 vpd

Most of the secondary arterial and some sub-arterial roads in Mackay would fit into the high traffic volume category, although varying road widths would determine their suitability for bicycle routes. Most collector streets and some sub-arterial roads carry traffic volumes characteristic of the medium category.

Low volumes are generally found in local streets or minor collector streets. The threshold of 3,000 vpd is based on AUSTROADS guidelines, which suggest that where traffic exceeds 3,000 vpd, it is desirable that additional space for bicycles be provided along a road by incorporating treatments such as shared bicycle / car parking lanes, wide kerbside lanes, sealed shoulders or an exclusive bicycle lane.

Bicycle Crash Review

Overview

An assessment of bicycle crashes is an important factor in the development of a safe cycling environment aimed specifically at preventative measures to reduce the number, severity and frequency of incidences.

Cyclists are at high risk on the roads, particularly after dark, simply due to their vulnerability amongst vehicular traffic. 154 fatal bicycle accidents were recorded in Queensland between 1986 and 1996, a majority of which occurred in urban areas. The incidence of bicycle-related crashes in off-road situations has also included numerous fatalities and it has been found that road users, including cyclists, affected by alcohol are over-represented in crashes resulting in injury. (Legislative Assembly of Queensland, 1996).

A review of the QT's Road Crash Database, involving cyclist related crashes for Mackay City was undertaken for the period 1992 to 2008. In total, 203 reported bicycle crashes have occurred in Mackay City during this period, including six cyclist fatalities at Evans Avenue (1996), Bruce Highway (1994 & 2001), Mackay - Slade Point Road (1997), Paradise Street (2002) and Webster Street (2006).

To be included on the database, bicycle crashes must meet the following criteria:

- The crash occurs on a public road.
- A person is injured.
- The value of the property damage is greater than \$2,500 after 1 December 1992 (or greater than \$1,000 prior to December 1991).
- At least one vehicle was towed away.

Limitations of Bicycle Crash Data

The injuries reported to Police are, by and large, only those involving motor vehicles and tend to be the more severe ones. Most cyclist injuries however, are minor and arise from falls, not collisions. These injuries are rarely reported to Police.

From research undertaken previously, it has been shown that the incidence of bicycle accident under-reporting is extremely high. The *Geelong Bikeplan* (1977) for instance, estimated that only 1 in 30 bicycle accidents are reported. Therefore, a more realistic figure for bicycle injury accidents in Mackay could be closer to 6, 090 (i.e., 30 x 203) or more, given the higher traffic volumes and greater intensity of development experienced in recent years.

Summary of Findings

The following table indicates the number and severity of crashes for the period 1998 to 2007.

Severity	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
Fatal	0	0	0	1	1	0	0	0	1	0	3
Hospitalised	6	1	9	7	4	11	6	6	6	6	62
Medical Treatment	11	11	13	12	12	4	7	8	9	4	91
Minor Injury	6	7	3	7	5	3	3	5	6	2	47
Property Damage	0	0	0	0	0	0	0	0	0	0	0
Total	23	19	25	27	22	18	16	19	22	12	203

Bicycle Crashes - City of Mackay (Source: QT Road Crash Database, 1992-2008)

Key findings include the following:

- 54% of cycle crashes occurred at intersections and 46% were at mid-block
- Locations.
 - Almost 75% of crashes required hospitalisation or medical treatment.
 - Almost 20% of bicycle crashes occurred in Mackay's CBD.
 - Approximately 30% of bicycle crashes occurred on existing on-road bikeways.
 - Crash locations were concentrated within the urban portion of the municipality, particularly within the city centre and along its major approach routes.
 - 19 accidents occurred along highway corridors, including one fatality.
 - Numerous accidents occurred in the vicinity of train and tram line crossings.

This gives strong evidence for the need to provide:

- Safe, well constructed bicycle corridors into the city centre and along major through-routes, in order to reduce the potential for conflict with motor vehicles.
- Better signage and designation of bikeways to enhance the awareness of cyclists, motorists and pedestrians.
- Specialised design treatments at intersections, in response to the high incidence of conflict between different road users, commonly of a serious nature.

The bicycle accident statistics confirmed some major problem areas for cyclists in the study area:

- The section of Shakespeare Street, between Nebo Road and Creal Street, had 12 accidents.
- The extent of Juliet and Sydney Streets, with 9 and 10 accidents respectively.
- Malcomson Street and Evans Avenue, from Mt Pleasant Shopping Centre to

- Martin Street had 12 accidents.
- Routes regularly travelled by heavy industrial traffic such as Harbour Road.
- High speed and heavily trafficked routes including the Peak Downs and Bruce Highways.

Multiple accident intersections (recording at least two accidents) included:

- Bridge Road / Nebo Road, West Mackay.
- Bridge Road / Paradise Street, West Mackay.
- Nebo Road / Bagley Street, Mackay.
- Nebo Road / Archibald Street, Ooralea.
- Bedford Road / Coles Road, Mt Pleasant.
- Bedford Road / Andergrove Road, Andergrove.
- Shakespeare Street / Nebo Road, Mackay.
- Shakespeare Street / Wood Street, Mackay.
- Sydney Street / Victoria Street, Mackay.
- Harbour Road / Slade Point Road, Mackay Harbour.
- Mackay-Bucasia Road / Philip Street, Mt Pleasant.
- Evan Street / Juliet Street, East Mackay.
- Beaconsfield Road / Norris Road, Beaconsfield.

Other roads with poor accident records for cyclists in Mackay City include

- Paradise Road, South Mackay (with 7 accidents).
- Peak Downs Highway, Walkerston (2).
- Milton Street, Central Mackay (8).
- Bedford Road, Andergrove (7).
- Bridge Road, West and South Mackay (8).
- Wood Street, Central Mackay (3).
- Gordon Street, Central Mackay (4).
- The QT database did not record any bicycle accidents for the Seaforth area between 1991 and April 1997.

Planning Framework

This section sets the MCBP in context. The existing bicycle planning framework is briefly discussed, based on a review of relevant reports and strategies. A review of existing funding sources for bicycle facilities will also be undertaken.

Bicycle Planning Initiatives

In the late 1970's significant work was undertaken by Council towards the establishment of urban bikeway networks, north and south of the Pioneer River. As a result, two strategies were produced:

Bikeway Plan for the City of Mackay (1978).

Development of a Cycleway System in North Mackay (1979).

Although the respective bikeway strategies were not prepared concurrently, many of their recommendations were implemented. These strategies shared the same primary objective to provide safe bicycle access to local schools. Whilst the needs of other cyclist types including commuters, were acknowledged, they were considered of secondary importance. Both bikeway strategies embraced the "4Es" concept (Engineering, Education, Enforcement and Encouragement) originally developed as part of the *Geelong Bike Plan (1977)*, Australia's first major bicycle plan.

Bikeway Plan for the City of Mackay, 1978

This comprehensive discussion paper set out to investigate the total cycling situation in Mackay with the view towards developing a bikeway network strategy. It comprised site-specific short and long term recommendations for implementation by Council. The recommendations presented were primarily derived from an assessment of school cyclist characteristics and needs, based on the assumption that provisions for school cyclists would automatically transfer to other cyclist types.

The Plan was based on four broad initiatives:

- A focus on the provision of off-road bikeways.
- Encouraging use of low volume residential streets instead of heavily trafficked arterial roads.
- Improving main road conditions for cyclists, including the reduction or elimination of dangerous intersections and the avoidance of squeeze points.
- Implementation of minor traffic improvements to improve conditions for all road users.

The proposed bikeway network included:

- Treatment of conflict points between competing modes of transport at locations in the vicinity of schools, to achieve safer local cycling conditions.
- A system of cross-city link routes between high schools, serving a regional catchment.

It is also important to note the Bikeway Plan also contained recommendations for improved cyclist safety, education and awareness, but for the purpose of this document shall not be mentioned here.

Development of a Cycleway System in North Mackay, 1979

This strategy focussed on the designation of off-street bike paths, based on a five year implementation program. In this regard, it was recommended that continuous bikeways on each side of the Goose ponds from Valley Street to Evans Avenue should receive highest priority. This has since become Mackay's principal east-west recreational route.

In terms of on-street facilities, the urban road network was undergoing significant change at that time (e.g., the construction of major arterial routes) with Council preferring to focus on off-street opportunities. The legalities of designating on-street bike lanes were also uncertain. Consequently, the bikeway network evolved largely as an off-road system until the mid 1980's.

The Plan's bikeway proposals were made for the North Mackay area (encompassing Andergrove / Beaconsfield, North Mackay, Mt Pleasant and Glenella) and Slade Point. Proposed paths did not extend beyond the urban area.

By the mid 1980's, the needs of commuter cyclists were more widely recognised, with a shift in planning efforts from off-street recreational cycling to the provision of more direct on-street commuter bikeways. Bicycle planning was undertaken on an ad-hoc basis without a formal strategy to guide the decision making process. Bikeway construction continued to be limited to the urban area.

Mackay City Strategic Plan, 1998

The 1994 Council recognised the need to review future planning directions for the City, culminating in the preparation of the Mackay City Planning Scheme, including a Strategic Plan. The Strategic Plan (currently pending gazettal) presents the preferred broad land use structure and major infrastructure provision for the City of Mackay. It provides a statutory framework for the City's growth, based on a planning horizon for implementation up to 2011.

The need to link existing and future residential, employment, tourist, business, educational and recreational areas with an integrated network of bicycle facilities is recognised as part of the Strategic Plan's proposed transport network.

The intent of the Transport Corridor designation is:

"... to depict the network of arterial and sub-arterial roads, railways, and cycleways required to ensure the convenient and safe movement of people and goods throughout the City. Completion and protection of this network is integral to the urban growth strategy..."

In planning the bicycle network, the Strategic Plan is the most important reference tool, providing an overall guide to the City's preferred pattern of development, emerging role, road network and hierarchy of centres, as well as other significant opportunities and constraints.

Mackay Recreation, Sport & Open Space Plan, 1998

Open space and bicycle planning are implicitly linked. Prior to the commencement of this study, Council commissioned the preparation of a Recreation, Sport & Open Space Plan (RSOS). This plan presents a vision for the future's provision of recreation, sport and open space resources in the Mackay City urban area. RSOS resources are typically popular bicycle trip generators and attractors. The RSOS recognises this, with access (particularly for pedestrians and cyclists) being a priority action.

Key recommendations relating to the achievement of interconnected and accessible RSOS resources include the following:

- Provision of pedestrian and cycle pathways that effectively link RSOS areas with residences and community services through implementation of this Bicycle Plan.
- Conversion of closed rail lines to pedestrian / cycle corridors.
- Development of safe pedestrian and cycle routes in existing urban areas by "calming" selected streets.
- Establishment of easements for recreational access through private land.
- Encouraging QT to incorporate adequate provision in the design of major highways and arterial roads to ensure the safe and convenient passage of pedestrians, cyclists and wildlife along open space corridors.

The Open Space Plan's recommendations were reviewed to ensure that Mackay's RSOS resources and the bicycle links to them are planned in an integrated manner.

The Open Space Plan will also be used to identify general opportunities for open space / bikeway corridors and future RSOS resources.

Existing Funding Sources

Mackay City Council's combined footways / bikeways works fund for the 2009/10 financial year was \$835,000.

Apart from this, the other major source of funding for bicycle facilities is the *Transport Infrastructure Development Scheme (TIDS)*, including the *Safe School Transport Program (Safe ST)* administered by the Queensland DMR.

Transport Infrastructure Development Scheme (TIDS)

TIDS subsidies are generally provided to Local Governments for works pertaining to Local Government Controlled Roads on a 50 / 50 basis (DMR / Local Authority) This funding is available for both on and off-road facilities. Under the Scheme, projects are evaluated on how well they meet TIDS objectives for improvements to the local road system, including the development of bikeway networks and achieving improved safety and traffic operations.

Safe School Transport Program (Safe ST)

The Safe ST Program, totalling \$1 million per annum state-wide, is funded by DMR's infrastructure budget as part of the TDDS Program and provides a maximum subsidy of 50%.

This program focuses on the provision of support facilities (e.g., school crossings) rather than construction of actual bike paths. Safe ST Officers liaise with schools directly to determine their road safety concerns and develop strategies to address these concerns. A funding application for these works is then made by the Local Authority to DMR on behalf of the school. Pre-schools, primary and secondary schools are eligible to apply for funding assistance. The extent of Commonwealth Government funding is unknown at this stage.

Additional revenue sources for bikeway infrastructure and education/awareness programs could include:

- Private sponsorship.
- Health promotion funding.
- Commonwealth trails funding.
- Environmental levies.

APPENDIX D – Generators and Attractors

Generators and attractors refer to areas stimulating significant cycling activity. In formulating the bicycle network, the basic approach involved the identification of existing and potential trip generators and attractors within the study area and nominating appropriate bicycle links between them.

Typically generators and attractors include existing and future urban areas, employment and business nodes, shopping centres, recreation areas (e.g., beaches, parks and sports complexes), tourist attractions, public transport interchanges and educational nodes. These are examined in later sections.

Stage 2 also involved consideration of existing and potential opportunities and constraints for cycling such as topographic conditions, road / traffic characteristics, as well as bicycle crash data and preferred cyclist desire lines.

Generators and Attractors

The most significant attractor and generator of bicycle activity within Mackay City is the urban area itself. The city centre in particular generates a high cycling demand, whilst the suburbs around it offer different attractions to which cyclists will travel. Attractors typically include employment, education, retail and recreation nodes, as discussed below.

Future urban growth areas (e.g., Northern Beaches and South Walkerston) are also recognised as potential trip attractors / generators for integration into the bicycle network.

EDUCATIONAL INSTITUTIONS

The 29 schools within the study area (2006) are influential cycling nodes, ranging from small primary schools such as Seaforth State School to larger secondary schools like Mackay North State High, with approximately 1, 524 pupils.

While some of the smaller schools are in themselves only minor generators, there is typically a strong community demand for safe routes to school. It is anticipated that the number of students cycling to school in the future will increase, as cycling facilities become more accessible and widespread, and safer bikeways are provided.

Tertiary education campuses including Central Queensland University (Ooralea) and the TAFE College (city centre) are also included as major cycling nodes.

CENTRES (OF BUSINESS, ADMINISTRATION AND EMPLOYMENT)

These have the capacity to act as major generators/attractors, in terms of their mix of commercial, administrative, retail, community, recreation, cultural and tourist activities. Shopping districts in particular are major activity areas for cyclists.

The Mackay CBD is the major administrative, cultural, retail and professional service centre for the region. Although it is connected to northern settlements

by the road network, in the short term it is separated from the most rapidly growing proportion of the population. A number of small suburban convenience centres have been established in response to the population increase in these areas, as detailed in

Hierarchy of Centres	Location
Regional Centre	Mackay CBD
Sub-Regional Centre	Mt Pleasant Shopping Centre
Local Convenience Centres	West Mackay
	North Mackay
	Andergrove
	Nindaroo
	Blacks Beach
	Bakers Creek
	Bucasia
	Walkerston
	Ooralea

Other major employment centres such as hospitals and large industrial precincts (e.g., Paget, sugar mills and port areas) are also recognised as potential generators and attractors.

SPORT, RECREATION AND COMMUNITY FACILITIES

Major sport, recreation and community facilities provide foci for cycling within the study area. The following generators and attractors have been identified:

- Popular beaches.
- Parks and open space reserves.
- Community / neighbourhood centres.
- Sport and recreation facilities (e.g., sports grounds, indoor sports centres and tennis courts).
- The surf life saving club.
- Public libraries.
- Public swimming pools.
- Multi-screen cinema complex.
- Scout and guide huts.
- Police Citizens Youth Club (PCYC), Mt Pleasant.
- Cycling velodromes and BMX tracks.

PUBLIC TRANSPORT

In terms of transport nodes and potential cycling attractors, the coach terminal, train station and airport are the most important because of their combined employment / tourism function and opportunities offered for long distance dual-mode travel.

In order to enhance the viability of bicycle transportation, it is imperative that:

The bikeway network makes efficient and safe connections with major generators and/or attractors.

Secure bicycle parking and other support facilities are provided at these destinations and on-route.

REGIONAL GENERATORS AND ATTRACTORS

On a larger scale, generators and attractors located outside the primary study area also have implications on the local cycling network.

It was found that significant bicycle activity is not limited to urban localities in Mackay, with high ridership levels registered in some outlying townships. Community feedback has also highlighted numerous opportunities for bicycle touring throughout the region.

Major regional attractions include:

- National Park features and facilities (e.g., Eungella and Cape Hillsborough).
- Coastal resorts and camp grounds (e.g., Laguna Quays and Kinchant Dam).
- Tourist attractions (e.g. Finch Hatton Gorge).

This presents an opportunity to develop a regional bicycle strategy providing links between Mackay, Whitsunday, Proserpine, Eungella, Sarina, Townsville, Rockhampton and Cairns for both transportation and recreational / tourism purposes.

APPENDIX F – Standard Treatments (From GHD Report)

Standard Bikeway Treatments

Off-Road Facilities

Standard Treatment A - Shared Bicycle / Pedestrian Path

Description

This treatment provides an ideal cycling facility particularly for:

- The area set aside for the footpath / nature strip.
- Routes along beachfront esplanades, rivers and creeks.
- Popular recreational routes.
- Routes that are regularly used by young or inexperienced cyclists which require a high level of safety.

Commuter cyclists will be discouraged to use shared facilities if they fail to provide sufficiently high travel speeds and do not follow a direct route. Ideally, pedestrians, cyclists and other user groups share these facilities harmoniously, keeping as far to the left as practical and passing on the right where it is safe to do so. As documented in this Plan, the absence of established pathway etiquette has led to difficulties in the "sharing" aspect their use.

Design

This treatment may be:

- Two-way along one side of a road; or
- One-way (each way) along both sides of a road.

In Mackay's case, Option (a) is considered best. The alternative one-way configuration is achieved at extra cost and is more likely to become congested with cyclists travelling in both directions at an inconvenience to other users of this shared path. However, the preferred option should be determined by Council on a case by case basis.

If a route designed according to the specifications of Treatment A is particularly amenable, scenic and/or of tourist interest, it could be expected to generate a significant amount of additional traffic (e.g., bicycles and pedestrians).

If a shared path is particularly problematic, Council should consider implementation of a treatment which separates different modes. A segregated facility is appropriate where the level of bicycle and pedestrian use is particularly high, to minimise user conflicts (e.g., busy foreshore promenades or river frontages). These paths are provided for the use of cyclists and pedestrians (together with other non-cyclists), segregated from one another by a continuous white line, coloured pavement treatment or physical separation of the two paths.

Section 6.3.2 of AUSTRROADS Part 14 recommends that the absolute minimum width for a two-way shared path is 2.0 metres, the desirable minimum is 2.5 metres and the desirable width is 3.0 metres. In addition, a

minimum clearance of between 0.2 metres and 0.5 metres on either side of the pavement is required. In Mackay's case, the 3.0metres width will be difficult to achieve in many instances due to the location of existing utility services. Therefore, it is recommended that the 2.0 metres width is adopted as a minimum with adequate signage.

At rest points and other points on-route where people are likely to congregate, shared paths should be wider, to avoid conflict between users. At these locations, "passing lanes" may be appropriate to eliminate the potential conflict point. The design specifications for Treatment A are shown in Section 6.3.1 of AUSTRROADS Part 14 Figure 12(a). Design recommendations for segregated paths are contained in Section 6.3.1 of AUSTRROADS Part 14 and illustrated in Figure 12(b).

Indicative Cost

Pavement

Rigid pavement: \$240 / linear metre (\$120/m² at 2 m wide).

Flexible pavement: \$160 / linear metre (\$80/m² at 2 m wide).

Markings

Line marking: \$1.50 / 1linear metre.

Logos: \$20 each.

Signage

Route marking signs - (450 mm x 300 mm): \$140 each.

- (600 mm x 400 mm): \$160 each.

Directional signs - (450 mm wide): \$140 each.

- (600 mm wide): \$160 each.

Therefore, a typical two-way off-street shared facility with limited ancillary works will cost in the order of \$255,000 per kilometre with the following components:

- 2.0 metre wide off-street shared facility with logos every 200 metres.
- Route marking signs (on both sides) on average every 500 metres.
- Twin directional signs on average every 500 metres (such as in changes of direction, intersections with other cycle routes etc.)

A typical 4.5 metre wide segregated path with a central separation line, twin route marking signs and limited ancillary works will cost in the order of \$580,000 per kilometre.

Standard Treatment B - Widen Existing Path to Create a Shared Facility

Description

Standard Treatment B is a slight variation on Treatment A. The main difference is that 'B' involves widening the existing footpath, thus creating a shared facility to safely accommodate both bicycles and pedestrians, whereas 'A' is constructed "from scratch".

Design

Again, where existing footpaths run along both sides of a road, a two-way path along one side of the road is more desirable than the one-way configuration on both sides. It is preferable for one side to be selected for widening (i.e., a two-way facility) with the other becoming a dedicated pedestrian path.

It is recommended that the minimum width of 2.0 metres (as per Treatment A) be applied to all widened paths, as shown in Section 6.3.1 of AUSTRROADS Part 14 Figure 12 (a) of . Council's Construction Program has indicated a preference for concrete paths. They also note that increasing the width of paths in some locations is constrained by a longitudinal joint problem.

Indicative Cost

Pavement

Rigid pavement: \$120 / linear metre (\$120/m² at 1 m wide).

Flexible pavement: \$80 / linear metre (\$80/m² at 1 m wide).

Markings

Line marking: \$1.50 / linear metre.

Logos: \$20 each.

Signage

Route marking signs - (450 mm x 300 mm): \$140 each

- (600 mm x 400 mm): \$160 each

Directional signs - (450 mm wide): \$140 each

- (600 mm wide): \$160 each

Therefore, widening an existing footpath and converting it into a two-way off-street shared facility will be in the order of \$136,000 per kilometre with the following components:

- An existing footpath requires widening by 1.0 metre with logos every 200 metres.
- Route marking signs (on both sides) on average every 500 metres.

- Twin directional signs on average every 500 metres (e.g., changes of direction, intersections with other cycle routes, etc).

Standard Treatment F - Exclusive Bicycle Path

Description

Exclusive bicycle paths are those specifically constructed or dedicated for cyclists. In Mackay Council's case, this treatment may be appropriate along some State-controlled roads which are subject to DTMR's restrictions on on-road bikeways.

Design

Exclusive bicycle lanes can be designed to achieve an alignment which facilitates uninterrupted and safe bicycle travel at a relatively high constant speed (e.g., 30km/h). This is particularly suitable for commuter bicycle routes.

Exclusive bicycle lanes should not be located where a high number of cross movements are made (e.g., shopping precincts) and suitable access for maintenance purposes should also be considered along the route.

Section 6.3.1 of AUSTRROADS Part 14 specifies that the desirable width of such a path depends on the bicycle traffic volume and the use for which it is intended. In most circumstances, a path width of 2.0 - 3.0 metres is appropriate, with 0.2-0.5 metres clearance (refer to Figure 13).

Indicative Cost

Pavement:

Rigid pavement: \$360 / linear metre (\$120/m² at 3 m wide).

Flexible pavement: \$240/ linear metre (\$80/m² at 3 m wide).

Markings:

Line marking: \$1.50 / linear metre.

Logos: \$20 each.

Signage:

Route marking signs - (450 mm x 300 mm): \$140 each.

- (600 mm x 400 mm): \$160 each.

Directional signs - (450 mm wide): \$140 each.

- (600 mm wide): \$160 each.

Therefore, if a 3.0 metre wide path is established with the following components a two-way exclusive bike path will cost in the order of \$400,000 per kilometre:

- 3.0 metre wide off-street shared facility with logos every 200 metres.
- Route marking signs (on both sides) on average every 500 metres.
- Twin directional signs on average every 500 metres (such as in changes of direction, intersections with other cycle routes etc.)

On-Road Facilities

Standard Treatment C - Wide Sealed Shoulders (Dedicated Bicycle Lane / NO Parking)

Description

Wide sealed shoulders are found on carriageways that are constructed sufficiently to provide a clear width of pavement in the order of 2 to 3 metres wide outside the lane edge markings. These lanes are often designated as 'breakdown' lanes on major roads. Consequently, they can have a dual use as this area generally provides an ideal bikeway because of its high quality surface and alignment.

a) Between Centres

As discussed, practically all categories of the cycling community will use major "trunk" routes within centres, whereas the links between centres will mainly be used by commuter and sports/touring cyclists.

For this reason, it will be adequate to mark these bikeways with a white line, logos and directional signage to provide a suitable cycling facility. Naturally, regular sweeping and maintenance will be required to ensure the safety and amenity of the link, as will suitable treatments of intersections on-route.

b) Within Centres

Due to the much broader range of cyclists and cycling ability that can be expected to utilise on-street facilities close to and within key centres, as well as higher traffic volumes and more intersections and turning movements, it is necessary to provide more elaborate cycling facilities.

If wide sealed shoulders are to be considered, they should:

- Be well marked for both cyclists and motorists. Options such as alternative surfacing types to highlight the cycle lane for motorists and cyclists are particularly effective (e.g., coloured asphaltic concrete). By making the cycle lane visually distinguishable, it prevents cars parking in it, establishes cyclists' rights and raises motorist awareness of cyclists on that section of road.
- Provide alternative treatments at intersections. Inexperienced cyclists (e.g., school cyclists, some recreationalists, some commuters and older persons cycling) will often be unwilling or unable to cross major intersections together with vehicular traffic,

especially since wide shoulders are often taken over by traffic lanes in these locations, forming squeeze points. For this reason, on-street cycle lanes will usually divert onto the verge and run off-street to avoid major intersections. Pedestrian crossings or a pedestrian phase at a signalised crossing should be provided in these instances to facilitate safe crossing of the intersection. Clear signage is most important at these locations.

In contrast, experienced cyclists, particularly commuters, would typically prefer to remain on road and cycle through major intersections, rather than divert to a parallel off-road path. Therefore, continuity lines for cycle lanes through major intersections should be provided. A range of intersection treatments are provided in AUSTRROADS Part 14 (e.g., holding bars, head start boxes) and should be considered on a case by case basis.

Design

Section 4.3.2 of AUSTRROADS Part 14 recommends a desirable maximum width for wide kerbside lanes of 1.2 metres for the cycle lane and a 1.0 metre buffer between the vehicle lanes. It is recommended that a 1.5 - 2.0 metres cycle lane width (including buffers) is adopted by Mackay City Council.

The preferred configuration for Treatment C is shown in Figure 14.

Indicative Cost

Pavement:

Smooth shoulder seal: \$160 / linear metre (80/m² at 2.0 m wide each side).

Markings:

Line marking: \$1.50 / linear metre.

Logos: \$20 each.

Signage:

Route marking signs - (450 mm x 300 mm): \$140 each.

- (600 mm x 400 mm): \$160 each.

Directional signs - (450 mm wide): \$140 each.

- (600 mm wide): \$160 each.

Therefore, a typical two-way off-street shared facility with limited ancillary works will cost in the order of \$60, 000 per kilometre with the following components:

- Lines marked on the road side of the bicycle lane on both sides of a road, requiring 25% smooth sealing.
- Logos every 200 metres on both sides.

- Route marking signs (on both sides) on average every 500 metres.
- Twin directional signs on average every 500 metres (such as in changes of direction, intersections with other cycle routes etc.)

For Treatment C bikeways on state controlled roads, satisfactory pavement drainage will need to be provided by extending the full existing pavement depths across the shoulders prior to sealing. Therefore, a base cost of \$180/m will be applied to Treatment C proposals located on state controlled roads.

Standard Treatment D – Shared Bicycle/Parking Lane

Description

Within the CBD and centres of retail, business or commercial activity, there is invariably a high demand for parking along the main roads. Similarly on streets running through residential areas, the instance of on-street parking is high.

In these cases, restricting parking in order to dedicate the kerbside lane to cycling will often be met with resistance from motorists, so a solution needs to be reached that maintains an acceptable level of parking whilst still providing a high quality bicycle lane.

A shared parking/bicycle lane is a treatment specifically designed to cope with vehicle parking and bicycle movements simultaneously. It must be wide enough not only to cater for the parked vehicle and the cyclist's envelope, but also an open car door which constitutes a major safety concern for cyclists. A typical example of a shared lane is shown in Section 4.3.1 of AUSTRROADS Part 14

Design

Section 4.3.1 of AUSTRROADS Part 14 specifies that the minimum width of shared lanes should be 3.5 metres. Experience has shown that this is unacceptable except over short distances (at pinch points for example) and those designed at 4.0 to 4.2 metres wide lanes provide a much more satisfactory facility for cyclists. However, due to space constraints in some locations such as in the case of Mackay a width of 3.5 metres is considered more achievable. In heavily trafficked/high speed zones, 4.0 metres should be the absolute minimum width.

As with other on-street facilities, continuity of routes is of major concern and care must be taken to ensure that intersections, turning bays, bridge crossings and the like do not cause a discontinuity along the cycle route.

Indicative Cost

Pavement:

Smooth shoulder seal:	\$160 / linear metre (251m ² at on average, 2.0 m wide each side).
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Markings:

Line marking: \$1.50 / linear metre.

Logos: \$20 each.

Signage:

Route marking signs - (450 mm x 300 mm): \$140 each.

- (600 mm x 400 mm): \$160 each.

Directional signs - (450 mm wide): \$140 each.

- (600 mm wide): \$160 each.

Therefore, a typical two-way off-street shared facility with limited ancillary works will cost in the order of \$48, 000 per kilometre with the following components:

- Lines marked on the road side of the bicycle lane on both sides of a road, requiring 25% smooth sealing.
- Logos every 100 metres on both sides.
- Route marking signs (on both sides) on average every 500 metres.
- Twin directional signs on average every 500 metres (such as in changes of direction, intersections with other cycle routes etc.)

Standard Treatment E - Shared Bicycle Motor Vehicle Zone

Description

Some streets in the urban area carry relatively low traffic volumes (i.e., < 3,000 vpd). These are considered safe enough for cyclists to become part of a 'shared zone'. In addition, any 'traffic calming' devices that may be deployed in these areas would be a bonus in that they would slow the small amount of traffic. This type of treatment would indicate that cyclists and vehicles use the same roadway and travel at similar speeds.

Design

This type of treatment is ideal in that existing infrastructure is utilised. The only addition would be bicycle route signs. These would have the dual role of indicating where the route continues to the cyclist and warning motorists that they are in a shared zone with cyclists.

Signs, therefore, are critical in both alerting motorists and cyclists in the area, in addition to providing route information. The latter role is a major factor in establishing route continuity.

The preferred configuration for Treatment E is shown in Section 4.3.1 of AUSTRROADS Part 14.

Indicative Cost

Signage:

Route marking signs	- (450 mm x 300 mm): \$140 each.
	- (600 mm x 400 mm): \$160 each.
Directional signs	- (450 mm wide): \$140 each.
	- (600 mm wide): \$160 each.

Therefore, this facility will cost in the order of \$5,000 per kilometre with the following components:

- That the existing road surface is adequately smooth
- Includes both route and directional signs every 500 metres or at direction changes (on both sides)
- Support Facilities

Bicycle Parking/Storage

One of the major concerns of cyclists is the security of their bicycle while it is parked (i.e., unattended). In recent years, the incidence of bicycle related theft in Australia has risen by an estimated 100% p.a. with the combined result of increased bicycle usage and the easily transportable nature of bicycles. (Schmidt, 1997: 17). Therefore, secure bicycle parking facilities must be available at destination points.

Facility Type

The type of facility is dependent on the:

- Number of bicycles to be accommodated.
- Level of security required at the destination.

Facilities can range from fully enclosed bicycle lockers to exposed parking rails, and the type of facility specified depends largely on the user. For example, short term bicycle parking needs to be close to riders' destinations and is well served by rail-type locking facilities. They allow the frame and both wheels to be locked and rely on observation by the public to prevent wilful damage.

On the other hand, all day parking for employees and public transport commuters, could take the form of bicycle lockers or, for individual organisations, a storage cage with a common key for users. Cyclists would still lock their bicycles inside the cage, but the cage would prevent vandalism and would provide further security.

One existing car parking space (2,400mm x 5,400mm) can also be modified with the installation of bicycle racks, to provide parking for up to ten bicycles.

Location

Bicycle parking facilities should be located in visible, well lit areas with significant pedestrian traffic rather than being hidden out-of-sight. Highly visible, well signed bicycle parking facilities have the added benefit of advertising the potential to ride to certain destinations.

Provision

AUSTROADS Part 14 provides guidelines on the provision of bicycle parking structures.

Shower and Change Facilities

Places of employment should provide shower and change facilities for employees who choose to cycle to work. Naturally these facilities would benefit other employees who exercise before work or during breaks.

The initial expense of providing these facilities could be offset by the need for fewer parking spaces and an improved level of fitness/health of employees. As a bonus for many businesses, providing such facilities is an allowable tax deduction.

Rest Facilities and Refreshment Stops

Rest facilities should include some or all of the following:

- Drinking fountains.
- Shade structures and seating.
- Public telephones and toilets.
- Air for bicycle tyres.

The frequency and type of facilities provided vary according to cycle route type (e.g., recreation, commuter, tourist and training). Recreational and tourist routes typically require more facilities than commuter routes, for example. AUSTROADS' do not provide specific recommendations on the provision and spacing of on-route facilities. Based on a review of previous studies, the following standard intervals are recommended.

Facility	Interval (m)	
	Recreational/Tourist paths	Commuter Paths
Drinking Fountains	2,500	5,000
Shelter Structures/Seating	2,500	5,000

It is recognised that a lot of cyclists carry their own water bottles hence, the need for frequently placed fountains is not a high priority.

Telephones and public toilets are generally accessible at facilities on-route (e.g., parks and shopping centres), as are air pumps for bicycle tyres (e.g., at service stations or hand pumps attached to the bicycle frame).

It is also important to note that it is the Council's responsibility to ensure that on-route bicycle facilities are not concealed from public view and are adequately identified with directional signage on the approach.

Lighting

Generally, on-street bicycle routes in built-up areas are adequately lit by existing road lighting. Off-road routes, however, may not have lighting, but should be lit nonetheless. The design and placement of these should avoid reflection or glare which might cause discomfort to cyclists.

Since a majority of proposed off-road paths will be shared facilities, lighting should be of an existing standard used by Council for footpaths.

Due to the nature of lighting in its many forms and designs, costs are not provided. These should be established at a later stage when detailed planning is undertaken, on a case by case basis.

Other Street Furniture

Street furniture, such as drinking fountains, seats, bollards and the like should not be obtrusive to the cyclist. Generally, these should be designed to a height that is visible to the cyclist (approximately 1.1 metres) and, where appropriate, setback from bikeways, by at least 2 metres. The pathway should be clear of obstacles to a height of 2.5 metre, including tree branches, signs and other objects. Table 4.4.1 illustrates the clearance distances required by cyclists, and these should be preserved as a minimum.

Route Continuity and Legibility

The key to providing an attractive, functional and safe network of cycle routes is continuity. Cycle routes do not need to have the same configuration throughout the study area (e.g., all off-road or all integrated with street traffic). However, they must be integrated and continuous within a network. Cycle route continuity can also be impacted on by slowing devices on-route and avoiding debris on the road etc.

Signage

The network must also be legible with cycling routes, both on and off-road, organised into a coherent pattern through easily recognisable symbols which identify destinations, distance and direction.

Part 9 of The Manual of Uniform Traffic Control Devices sets out the devices for identification of facilities designated in the Queensland Traffic Act for the

use of cyclists. All bicycle facilities need to be indicated by the relevant regulatory sign.

Route Identification

Colour-coding may be used, such that the signposting of commuter routes is different to those on routes established to serve other cyclist types. Likewise, the degree of difficulty could be colour or number coded, i.e., steeper sections of routes for strong, fit cyclists, and alternative, easier routes for young or novice cyclists.

At locations where alternative route treatments have been established (e.g., to provide safe crossings of busy intersections for inexperienced cyclists), they should be clearly marked with an easily identifiable sign. Other information signs should be used where appropriate to identify changes to pavement conditions, regulations and behavioural codes of conduct and safety tips. These should be used only where necessary.

Route and Line Marking

On-road bicycle lanes should be clearly marked by an unbroken white line. For shared parking/bicycle lanes, this should be painted along both sides of the lane. If it is a dedicated bicycle lane along a kerb, only the right hand line needs to be marked.

Stencils of bicycles painted on the roadway or standard blue and white cyclist symbols on signs should mark the route to cyclists (and motorists for on-road facilities). Similarly, painted bicycle and pedestrian logos should be used to designate off-road shared facilities. The use of stencilled logos is relatively inexpensive and thus, should be used abundantly to minimise conflict and confusion for all users. The use of coloured pavement should also be considered by Council, particularly on busy shared paths and around roundabouts.

Sight Distances

Sight distances are a base parameter of the geometric design of cycle facilities. Since a large proportion of the proposed bikeways in Mackay's network run on or along roads, the alignment geometry will be of limited concern. At intersections however, sight distance is a major concern.

Local Area Traffic Management

From a cycling perspective, it is crucial that neighbourhood precincts are established with Local Area Traffic Management (LATM) schemes and reduced speed limits to make streets within the precinct safe for cycling.

The LATM concept was specifically aimed at improving the safety and amenity of local areas for pedestrians and cyclists. The potential benefits however, are rarely maximised in implementation because the needs of the cyclists and pedestrians are often overlooked.

LATM Devices

These devices range from the speed hump to raised platforms, thresholds and median islands. If installed carelessly, they can cause 'squeeze points' which are potentially hazardous for cyclists (e.g., East Gordon Street, Beaconsfield, Holts and Harvey Roads). By following a simple list of design procedures that consider the passage of cyclists, these devices can be made "bicycle friendly" for a negligible increase in cost.

Location of LATM Devices

This issue is of particular concern for cyclists who rely on their momentum to reduce effort. For example, placing humps, raised sections and thresholds at the very bottom of a hill will force the cyclist to unnecessarily slow down, resulting in a slower, harder climb up the other side. These devices can serve their purposes just as effectively by being placed halfway down hills, for instance.

Reduced Urban Speed Limits

Many local cyclists are in support of reduced speed limits in the Mackay urban area (particularly the CBD) to facilitate safer and more comfortable on-road cycling. Since February 2003, reduced urban speed limits have been enforced to residential streets throughout Queensland (50 km/h). This move was designed to save lives, reduce serious injury and property damage and make urban areas more liveable for local communities.

Liability

Cyclists, pedestrians and motorists have certain responsibilities under the *Queensland Traffic Act (1994)*.

When using on-road facilities, cyclists have the same liabilities and obligations as drivers of other vehicles under the Act. On routes comprising the shared use of footpaths or where cycle paths traverse parklands, bicycles are treated as special class vehicles giving them the right to use the pathway. In these situations, cyclists are:

- Required to give way to any pedestrian entering or upon the shared path.
- Obligated to take due care to avoid collisions with pedestrians.
- Generally liable for any incidents involving pedestrians.

On dedicated cycle paths, the cyclist is obligated to take due care to avoid any pedestrians. However, the question of liability is less clear due to it being a dedicated facility. It is Mackay Regional Council's responsibility to ensure that shared or dedicated bicycle facilities are adequately constructed, signed and maintained to avoid liability claims.

Behaviour of Cyclists

The *Queensland Justices Regulations (1997)* stipulate the penalties and offences for which a traffic infringement notice may be issued i.e., an "on the spot" fine.

The Bicycle Offence Penalty Scheme (BOPS), which was introduced in 1993 following legalisation of footpath cycling, contains commonsense rules which are designed to protect life, particularly the lives of cyclists. Under BOPS, a \$30-\$75 fine may be issued to cyclists who:

- Disobey police direction.
- Disobey official traffic signals (e.g., stop, give way, keep left).
- Disobey a traffic control signal (e.g., red light).
- Fail to give way to a pedestrian on a crossing.
- Fail to keep left.
- Fail to give way.
- Ride more than two abreast.
- Make improper turns.
- Fail to show sufficient light at night.
- Fail to give proper signals.
- Misuse a bicycle lane.
- Carry more persons than for which the bicycle or tricycle is designed.
- Fail to stop at a level crossing.
- Remove both hands from the handlebars while riding.
- Allow a bicycle to be drawn by a vehicle while riding.
- Fail to comply with a freeway sign.
- Disobey a pedestrian signal.
- Ride on a footpath in a manner which is dangerous to pedestrians.
- Fail to wear a securely fitted helmet of approved design.
- Using a mobile phone whilst cycling.

A penalty may also apply for riding a defective bike. An offending adult cyclist (17 years and over) will be issued with an on-the-spot Traffic Offence Notice. These offences do not incur demerit points on a driver's licence. For cyclists aged 10 to 16 years, a number of formal cautions/warnings are given before a penalty is applied. Under BOPS, Queensland Police can issue a Bicycle Offence Notice which give young offenders several chances to obey a road rule or purchase a helmet before being fined.

Maintenance and Repair of Bikeways

Maintenance of bikeways facilities on the Local Controlled Road Network together with off-road facilities is the responsibility of Mackay Regional Council. Facilities sharing the State Controlled Road Network would normally be maintained by the Department of Transport and Main Roads although the works would normally be delegated to Council under its contractual obligations under the RMPC Contract.

On-road bikeways often get covered by debris such as glass, gravel and litter pushed from the motor vehicle lanes. Off-road paths will be littered with leaves, sticks, rubbish and other such debris. For off-road shared paths, poor design, construction and maintenance standards significantly increase the safety risks.

Root invasion is also a factor that frequently contributes to reducing effective widths and trip quality as both on-and off-road routes suffer surface

deformation and cracking. This attribute is vitally important to consider when planning cycling encouragement. Asphalt concrete has been proven to be highly durable in regard to cracking, root invasion and subsidence. Ensuring that the final seal on stone surface roads is done with crusher dust will also seal the gaps between the stones.

Intersection / Crossing Treatments

General Treatments

The location and design of roundabouts, intersections and bridge crossings require special consideration to ensure that a 'bicycle friendly' solution is achieved. It is recommended that Council consider the following design options for all future construction and upgrading work.

AUSTROADS Guide to Traffic Engineering Practice, Part 14 - Bicycles provides full details of each of the following intersection/crossing treatments.

1) Roundabouts

Roundabouts have been widely adopted because of their ability to reduce the number of serious automobile accidents at intersections, in addition to promoting relatively unimpeded traffic flow. An unfortunate side effect however, has been an increase in crash risk for cyclists.

The appropriate cyclist crossing treatment when encountering roundabouts depends on several factors, including the type of route approaching the roundabout (on-road or off-road), motor traffic volumes through the roundabout, number of lanes and the speed environment of the approach roads.

In general, off-road bike paths will divert around the roundabout (onto the side street) and cross at some distance away from the roundabout area via a bicycle crossing. A pedestrian crossing could be incorporated into the design.

On-road routes will either cross through the roundabout with the motor traffic, if the traffic volumes, road geometry and speed environment are suitable, or divert off-road and cross in a similar way to off-road routes.

A typical example of this treatment is shown in Section 4.3.1 of *AUSTROADS Part 14 Figure 20 (a)*. Some "bicycle friendly" designs for roundabouts successfully implemented in Europe are illustrated in *Figure 20(b)*.

2) Intersections

While the detailed design of any intersections involving cyclists should be fully investigated by Council prior to implementation, the following standard crossing treatments convey the general concept that should be aimed for in bicycle friendly intersection design.

Off-Road to Off-Road Intersection

Where an off-road bike path encounters an intersection, it will preferably divert slightly and cross at some distance away from the intersection. In this case,

special care should be taken at the detailed design stage to ensure safe passage for all user groups. In some instances, particularly when utilising existing footpaths as shared facilities, the crossing would remain at the existing location with upgrading as required. A typical example of this treatment is shown in Section 4.3.1 of AUSTRROADS Part 14 Figure 21.

On-Road to On-Road Intersection

Where cyclists utilise on-road routes to cross an intersection, they are usually quite visible to motorists as they are sharing the same roadway. However, there is still a problem for motorists being able to anticipate bicycle movements as cyclists cross in front of them.

The treatment required depends on factors such as the speed environment, traffic volumes and intersection control. These should be assessed at the detailed design option to determine the most appropriate option.

In general, cyclists should stay on road through the intersection where:

- The intersection control is formalised (e.g., traffic lights).
- It is a low speed environment (i.e., 60km/h or less).
- There are low traffic volumes, particularly along the cross street.

If a combination of these factors is unsuitable, the cycle route should be temporarily diverted off-road, with a crossing provided away from the intersection (similar to pedestrian crossings). A typical example of this treatment is shown in Section 4.3.1 of AUSTRROADS Part 14 Figure 22.

Off-Road to On-Road Transition

Where an off-road bicycle path meets an on-road bicycle path, there is a need to separate cyclists travelling in different directions so that they are travelling in the same direction as the vehicular traffic. Warning signage is required to indicate these areas of conflict between not only cyclists and motorists, but also cyclists and pedestrians, and even between cyclists themselves.

A bicycle crossing is required for cyclists travelling in the contra-flow direction to vehicular traffic. Cyclists travelling in the same direction as the vehicular traffic simply proceed to the next section of bicycle path via a transitional ramp. A typical example of this treatment is shown in Section 4.3.1 of AUSTRROADS Part 14 Figure 23.

3) Bridges

Bridge structures are particularly costly. They may form the only crossing/link over a river, for example, and they should be constructed and/or amended only if there is a demonstrated need.

A frequent problem with existing bridges is that insufficient room is provided for cyclists resulting in dangerous squeeze points. Although this does not usually warrant widening of a bridge, other treatments may be appropriate e.g., warning signage. This treatment may be necessary for crossing the

Hospital Bridge (a bicycle route is not proposed over the bridge) so that any cyclists that do use it are aware of the potential dangers.

Often it is possible to incorporate shared pedestrian/bicycle paths along a bridge. These should be wide enough to allow safe movement by all users i.e., 3.0 metres wide. Although some treatments over narrow paths situated on bridges ask cyclists to dismount and walk over the bridge, these are frequently disregarded due to the inconvenience. At major crossings and bridges, many cyclists will not dismount and walk across, as instructed by signs. The main target group that would do this is school cyclists (depending on age and parental guidance). The existing Forgan-Smith Bridge has a narrow shared pedestrian/bicycle path along its western side and experiences these types of users.

AUSTROADS provides suitable design standards guiding the construction of 'bicycle friendly' bridges (on and off-road). Determination of costs for specialised treatments is beyond the scope of this study. They vary immensely depending on their design and situation. Costs should be obtained when detailed planning of these projects is undertaken. A simple cost-benefit analysis will then indicate whether the expense is justified.

Specialised Treatments

Bruce Highway/Peak Downs Highway Intersection, Ooralea

A specialised treatment is required at this intersection due to the high traffic volumes along both corridors and the existing off-road paths on the north and western sides of the intersection. The intersection is signal controlled with no pedestrian phasing.

The treatment east of the intersection is proposed to be an on-road dedicated shoulder bicycle lane. Cyclists travelling west would cross with motor vehicles and continue along a shoulder lane until a proposed bicycle crossing, to be situated approximately 150 metres from the intersection. This would allow cross-over to the existing off-road path on the northern side of Peak Downs Highway. Cyclists travelling east across the intersection would go on-road just prior to the intersection, cross with motor vehicles, and continue along a proposed shoulder bicycle lane.

Barnes Creek Road/Harbour Road/Evans Avenue Intersection, North Mackay

A specialised treatment is required at this intersection due to the road network configuration, and a combination of bikeway treatments. The intersection is signal controlled with no pedestrian phasing. A major motor vehicle movement travelling north is the situated on the left turn into Evans Avenue from Barnes Creek Road.

An existing two-way off-road bicycle path exists along the western side of Barnes Creek Road up to its intersection with Evans Avenue. It is proposed to continue this off-road treatment along the southern side of Evans Avenue.

This provides connectivity with existing dedicated shoulder bicycle lanes on either side of Harbour Road, north of Evans Avenue.

It is proposed to establish two bicycle crossings, one across Harbour Road, approximately 150 metres north of Evans Avenue, and another across Evans Ave, approximately 150 metres west of the subject intersection. This 150 metre distance negates much of the conflict between bicycle and motor vehicle movements that may occur at the intersection, thus increasing safety for cyclists.

The Harbour Road crossing is proposed to be a two stage median crossing as there is an existing median. The Evans Avenue crossing will be a typical single stage crossing. Both crossings would require cyclists to dismount. This treatment is intended to serve primarily school and less confident cyclists. It is acknowledged that more experienced cyclists would prefer to travel through the intersection with other traffic, therefore, it is proposed that continuity lines be provided through the intersection to formalise the cyclists' movement path.

APPENDIX G – Route Information (GHD Report)

Bicycle Route Treatments

Taking the bicycle route hierarchy to a more detailed level, basic design/engineering treatments have been proposed for each route. These proposals are indicative only and are intended to provide Council with an indication of the costs involved to progressively develop a bicycle network throughout Mackay. As each link is addressed for implementation, the recommended construction/design must be reviewed in conjunction with relevant Council and state government departments.

Each treatment is identified as follows:

- Establish new off-road shared bicycle/pedestrian path.
- Widen existing path to form an off-road shared bicycle/pedestrian path.
- Establish an exclusive off-road bikeway.
- Establish dedicated bicycle lanes on road shoulders.
- Establish on-road shared bicycle/parking lanes.
- Establish a bicycle/motor vehicle 'local area' shared zone.

The bicycle route numbers (e.g., "C2") , are cross-referenced with the following treatment descriptions.

- Existing bikeways that are considered in satisfactory condition but require minor improvement works (e.g., signage and line marking).
- Potential bicycle routes are not limited to the bikeways recommended in this Plan, particularly in the case of road improvements or construction. Bikeway proposals should never be rejected on the grounds that the road is not part of the designated bicycle network.

Recommendations for the study area are made on a precinct basis.

The off-road segregated treatment has been provided in the Plan for Council's future consideration only. It is not considered that any routes require this treatment at present.

Central Mackay Precinct

The Central Mackay precinct incorporates Mackay City Centre, East Mackay, West Mackay, South Mackay and Ooralea (encompassing Central Queensland University).

A1 - Establish a shared bicycle/pedestrian path on the eastern side of Nebo Road, adjacent to the Showground reserve. Commence treatment north of Shakespeare Street and continue along the southern side of Gordon Street, terminating at Milton Street. This route is primarily intended for through-cyclist traffic providing a connection between Canelands Shoppingtown (Route B5) and the city centre.

Cyclists travelling north towards Ron Camm Bridge will need to travel on-road over a short distance with the other traffic, to access the on-road dedicated lanes commencing north of the Bruce Highway / Nebo Road intersection.

A4 - For route continuity, establish a shared bicycle/pedestrian path between Canelands Park and the reserve on the northern side of River Street. The new shared path would extend across the end of Ian and McCalister Streets.

A23 - Establish a shared bicycle/pedestrian path in the reserve on the eastern side of Binnington Esplanade (south) between Prudhoe Street and Bridge Road.

A24 - Extend the existing Lagoons shared path north (parallel to Lagoon Street) up to Landsdowne Road. Ultimately, establish a full bikeway circuit around the Lagoons as part of the Botanic Gardens development in that location (recommendation of the *Mackay Recreation, Sport & Open Space Plan, 1998*).

B1 - Widen the existing path along the western side of Milton Street to form a shared facility. Commence treatment south of George Street roundabout and extend to Gordon Street.

On the approach to Milton / Gordon Street intersection, divert path north-west through Showground reserve and provide safe crossing some distance away from the intersection.

B2 - Widen the existing pedestrian path in Canelands Park to provide a shared facility. There is an opportunity for this path to provide a continuous link with the levee path behind Canelands Shopping Centre.

B3 - Conduct improvement works to existing bicycle path running from Milton Street behind Mackay State High School, Mercy College and St Mary's Catholic School and through to Juliet Street. Works should include:

- Installation of warning signage along route where bike path crosses roads (e.g., Kenilworth and Forth Streets).
- Removal of hazardous railings and replacement with more suitable slowing devices.
- Removal of "Bicycle Only" signs and installation of "Shared Bikeway" signage.

B4 - Widen the existing pedestrian path through Queens Park to establish a shared facility. Width of 3.0 metres is preferred in this location. Erect appropriate signage to enhance pedestrian and cyclists' awareness.

B5 - Widen the existing path along the western side of Milton Street. Commence treatment from George Street intersection and continue along western side of Mangrove Road (providing access to Canelands Shoppingtown). Widen path on northern side of River Street, then divert to southern side at Sydney Street (signalised crossing) and continue treatment through to Brisbane Street. Provides connection with proposed Routes D2 (along Brisbane Street) and B7 (Forgan Smith Bridge - Barnes Creek Road).

An opportunity also exists to construct a shared path on the existing levee bank skirting the swimming pool grounds and the Cane lands Shopping Centre customer car park.

B6 - Widen existing path on northern side of Webberley Street from Nebo Road to Paradise Street, providing links to proposed Route E3 and existing facility on Paradise Street.

Another section of widening is required at the southern end of Route E3 from Ennio Court running through the reserve behind Wallace and Lindesay Courts, linking up to the shared bicycle/parking lanes in Absolon Street (Route D7).

C1- Establish widened shoulders to provide dedicated bicycle lanes along Gordon Street, Tom Lawson Street and continuing along East Gordon Street to Binnington Esplanade (north). Route C1 provides direct access between East Mackay, Town Beach and the City Heart.

C5 - To provide access to the airport and surrounding industrial uses, provide dedicate bicycle lanes along Milton Street, between Archibald Street and East Boundary Road.

This corridor presents a good opportunity for bicycle lanes with low demand for on-street parking and line marking already in place.

D1 - Establish on-road shared bicycle/parking lanes on Alfred Street between Milton and Brisbane Streets.

D2 - Establish shared bicycle/parking lanes along Brisbane Street from River Street to Alfred Street, where Route D1 commences. Also establish a short section along Gordon Street between Brisbane and Tennyson Streets to provide a connection with Route C1.

D3 - In response to the poor standard of existing facility, re-establish wide on-road shared bicycle/parking lanes along Goldsmith Street from Bridge Road, north to East Gordon Street. This is a direct north-south corridor providing city heart access and serving East and South Mackay.

Priority works should include:

- Widening of shared lane to safely accommodate parked vehicles and bicycle traffic.
- Lane marking and printed logos/stencils on bitumen.
- Signage to enhance motorist and cyclist awareness.
- Also establish a short section of Treatment D along Bridge Road between Goldsmith and Beverley Streets.

D4 - Establish on-road shared bicycle/parking lanes along the whole length of Binnington Esplanade (north) to provide a pleasant recreational route with beach access. Ultimately, extend this path south to coincide with the residential subdivision occurring in the area.

D5 - Establish on-road shared bicycle/parking lanes along Holland and Shakespeare Streets. Commence treatment at the Holland Street / Bridge

Road intersection and continue through to Shakespeare Street, then extend west towards the city centre.

The section between Sydney and Milton Streets is very tight and no scope exists for an alternative off-road treatment due to utilities on the path. Hence, the continuation of on-road lanes is considered most practical.

West of Sydney Street, there is ample room available for on-road lanes - these should extend to Goldsmith Street, where existing on-road lanes are located.

Although Alfred Street provides a suitable north-south parallel corridor for cyclists, Shakespeare Street has been included in response to strong community demand.

Route D5 provides an alternative corridor to busy Nebo Road for city centre access.

D6 - Establish on-road shared bicycle/parking lanes along Evan Street, between Stevensen and Goldsmith Streets. This section is quite tight and the road surface is very bumpy. However, the footpaths are constrained and an off-road treatment would not be feasible without some significant works, hence, on-road bike lanes are considered more practical.

D7 - Establish on-road shared bicycle/parking lanes along Webster Street from Archibald Street (Route D20) and west into Absolon Street (past South-West Mackay Neighbourhood Centre), joining proposed Route B6 at Napier Street.

D1 - Extend the existing on-road lanes on Shakespeare Street to Town Beach. Establish on-road shared bicycle/parking lanes along Shakespeare Street from Rae Street to Binnington Esplanade (north). The existing road pavement surface is extremely rough.

D15 - To facilitate commuter access to the Paget industrial area, establish on-road shared bicycle/parking lanes along Connors Road from Archibald Street, south to Boundary Road. Extend treatment east along Boundary Road to Milton Street. Ensure shoulder widening is adequate to safely accommodate large industrial vehicles and the cyclist envelope.

D20 - To address an existing "missing link", establish on-road shared bicycle/parking lanes along Archibald Street between Connors Road and Milton Street. It is noted that opportunities exist to undertake this work as part of the upgrading to be undertaken by Council in the near future.

E1- Establish a shared bicycle/motor vehicle zone along Evan Street between proposed bikeways on Binnington Esplanade and Goldsmith Street.

E2 - Establish a shared bicycle/motor vehicle zone along Bridge Road between Beverley Street and Binnington Esplanade (south). Also extend treatment south into Beverley and Petrie Streets to provide access to Far Beach.

In the long term, continuous beachfront bikeways should be established, extending between the two sections of Binnington Esplanade to Illawong Drive. This would have very high recreational value.

E3 - To achieve bikeway connectivity between the two sections of proposed Route B6, establish a short section of shared bicycle/motor vehicle zone commencing at Ennio Court (where an off-road path emerges from a reserve abutting properties on Lindesay, Wallace and Ivana Courts) and continue along Ulanda Drive to Paradise Street.

E4 - To achieve bikeway connectivity between proposed Route D5 and the existing Lagoons bikeway, establish a shared bicycle/motor vehicle zone along Holland Street from Lagoon Street to Bridge Road.

E5 - Establish a shared bicycle/motor vehicle zone along Bemborough Avenue from the Central Queensland University campus to Peak Downs Highway. This section provides direct access to the university and diverts cyclists away from the Bruce Highway.

Should traffic numbers (i.e., bicycles and motorised vehicles) along Bemborough Avenue increase significantly re-establish Route E5 as dedicated on-road lanes with appropriate line marking and signage to increase cyclist safety.

E6 - Establish a shared bicycle/motor vehicle zone along James Street (from Shakespeare Street) to Hamlet Street, then divert west and south to Sophia Street and Forth Streets, terminating at the existing path running behind Mackay State High School and Mercy College.

To achieve route continuity, a section of the path would need to extend through a vacant lot (Lot 3 on RP 884697) or those adjoining it - negotiation with landowners would be required in this instance.

Northern Mackay Precinct

This precinct includes North Mackay, Mount Pleasant, Glenella, Beaconsfield, Andergrove and the Mackay Harbour area.

A3 - Establish a shared bicycle/pedestrian path along the northern side of Phillip Street (between Arthur Street and Mackay-Bucasia Road).

A5 - Establish a shared bicycle/pedestrian path along the eastern side of Norris Road. Commence treatment from the existing off-road path north of Scriha Street (Route B 11) and extend south to Fitzgerald Primary School. It also provides access to the Pioneer Valley Hospital.

The extension of any bikeway treatment south down Norris Road would not be feasible due to its steep grades and poor sight distances.

A6 - Establish a shared bicycle/pedestrian path along the western side of Mulherin Drive from Harbour Road to the southern end of JM Mulherin

Memorial Park. This route would access the popular Harbour Beach area from Harbour Road.

In the long term, pathway configurations may require alteration as part of harbour redevelopment (refer to proposed Route C6).

A12 - To facilitate bicycle access between Beaconsfield and Mt Pleasant, establish an off-road shared path on the western side of Holts Road from Beaconsfield Road to Mackay-Bucasia Road. Provide a crossing treatment for cyclists and pedestrians from Mansfield Drive (Route A16).

Provide a suitable treatment at the Holts / Mackay Bucasia Road intersection, which has been a major black-spot for traffic accidents in recent years (DMR advise that the intersection is programmed for an upgrade in the near future, hence, a crossing facility could be integrated with the improvement works).

Continue Treatment A on the western side of Mackay-Bucasia Road. At the multi-modal crossing there is little scope to run the path on-road due to a major pinch point, therefore, retrofit bike/pedestrian access on the western side of the bridge and extend the facility south to the existing path in the vicinity of Louden Street.

A13 - As a continuation of Route E7 on Charles Hodge Drive, construct a short section of shared bicycle/pedestrian path along an existing easement (east of Trojan Court) to Malcomson Street.

Extend treatment south across Malcomson Street to an opposite easement, ending at Hugh Reilly Court. Although this land parcel appears to be part of the Mt Pleasant Tavern, it is in Council's ownership.

The crossing of Malcomson Street will require warning signage for motorists on the approach. This part and crossing should be lit for night time use to enhance safety.

A14 - Broomdykes Drive forms a circuit with Eaglemount Road. Council advise that the incidence of speeding cars in this location is increasing. In response to this and the high number of child cyclists residing in this area, establish a shared bicycle/pedestrian path on the northern side of Broomdykes Drive (starting and ending at Eaglemount Street) to serve the residential area within it.

A15 - Establish a short section of shared bicycle/pedestrian path on the southern side of Murrays Road, from the existing shared path to Schapers Road. This provides a direct path to Northview Primary School.

A16 - Establish shared bicycle/pedestrian paths along Mansfield Drive. Commence treatment on northern/western side from Beaconsfield Road. Cross to the eastern side at Karri Court where sight distances are good. Continue path north into Nadina Court, ending at Eaglemount Road, to directly serve the new primary school (opened in 1999).

The proposed shared path is located on the opposite side to the school in order to minimise user conflicts (e.g., cyclist, pedestrian and motorist), particularly at busy pick up/drop off times.

A17 - As a continuation of the existing bikeway on Glenpark Street (ending at McMahon Street), establish a shared bicycle/pedestrian path on the eastern side of Glenpark Street, from the rail line overpass to Coles Road roundabout.

This is a lower priority action as a parallel bikeway route is available via Bedford Road (between McMahon Street and Coles Road). Glenpark Street however, has better grades for cycling.

A18 - Establish a shared bicycle/pedestrian path outside the North Mackay High School, on the western side of Valley Street, for a short distance to Green Street, at which point it continues as a widened shared path (Route B21).

A19 - Establish a shared bicycle/pedestrian path on the eastern side of Valley Street, from Holack Street to the Gooseponds bikeway (located just north of Malcomson Street).

A20 - To directly serve the Andergrove Primary School, establish a shared bicycle/pedestrian path on the western side of Banksia Avenue, between Femleigh Avenue to just north of Pine Street.

A21 - To facilitate bicycle route continuity, establish a shared bicycle/pedestrian path over a short distance on the northern side of Femleigh Avenue for approximately 180 metres.

A22 - Establish a shared bicycle/pedestrian path on the southern side of Eaglemount Drive from Bedford Road to the new primary. Little scope exists for an off-road path on the northern side, which is very constrained by utilities and steep grades.

The hill crest at Creese Street will constrain options for bikeway facilities, which is compounded by steep cuttings on either side. One scenario would be to limit parking and provide a dedicated on-road bicycle lane, however, this is not considered safe, because cyclists would be required to travel contra-flow to the traffic over the hill crest. Therefore, a continuation of the off-road path over the hill, albeit at considerable extra cost, is considered the safest option.

Ultimately, Route A22 should be extended north-west to coincide with future subdivision in the area, linking through to Harveys Road.

B7 - Upgrade existing shared facility on western side of Forgan Smith Bridge. Priority works should include:

- Resurfacing and widening of shared path.
- Removal of rough edges.
- Printed logos/stencils on bitumen designating shared facility.
- Abundant signage to enhance awareness and minimise user group conflicts (*"Cyclists must give way to pedestrians on bridge "*).

The shared path on Barnes Creek Road to Evans Avenue has recently been widened through TIDS funding. Signage needs to be erected along this widened section.

As Forgan Smith Bridge is the main entry corridor to the city centre for all traffic modes to and from the northern suburbs, it is imperative that Route B7 is treated as a high priority.

B8 - Widen the existing pedestrian path on the south-eastern side of Evans Avenue from Malcomson Street and extend to Willis Street at the edge of the Gooseponds. Some resurfacing works and entry improvements near the Gooseponds are required at this point.

The existing dedicated bike/pedestrian path along Evans Avenue between Willis Road and Quarry Street (closed to vehicular traffic) requires upgrading treatment, principally resurfacing, installation of signage and lighting, and removal of hazardous bollards.

Widen existing path on western side of Canberra Street from Petersen Street turning west into Ungerer Street and along a laneway to Evans Avenue. Provide signage at laneway access point.

B9 - Widen and seal an existing shared path along the southern side of Riverside Drive from Cremorne

Street to Sams Road. At present, this path is fairly isolated, resulting in personal safety concerns for cyclists and pedestrians. Lighting would be required, as would significant vegetation removal, to ensure sight distances are adequate.

This route is significant as it forms part of an access corridor to Mt Pleasant Shopping Centre and diverts cyclists away from busy Sams Road and the East West Connector Road.

A preferred long term link continues west from Riverside Drive along the riverbank (when the land becomes available - currently under cane) to the existing shared path on Riverleigh Drive.

B10 - Widen existing path along the eastern side of Glenpark Street from Evans Avenue North, over the existing bridge, to the ramp providing access to McMahon Street. This facility should be extended to Coles Road (as Route A17). The overpass and McMahon Street ramp require signage and resurfacing.

B11- Widen existing path along the eastern side of Norris Road from Scriha Street, crossing to the western side at the BMX track, turning left onto Beaconsfield Road, and crossing north into Cutler Drive. Upgrade existing crossing at Norris / Beaconsfield Road intersection and Norris Road overpass.

Continue treatment along the eastern side of Cutler Drive onto Celeber Drive, crossing to the western side just past the Whitsunday Anglican School and extend to the Bedford Street roundabout. Route B11 then follows the northern

side of Oak Street until Maple Drive. On the southern side of Oak Street, the existing footpath should also be widened between Maple Drive and Andergrove Road / Keeleys Road.

B12 - Widen existing path along the western side of Maple Drive from Oak Street and extend to the southern side of Fernleigh Avenue, to the existing path through parkland on the corner of Fernleigh Avenue and Bedford Road.

At Bedford Road, continue along the eastern side south to Newton Street at which point an existing shared path commences on the western side. Continue route B12 south from Eaglemount Road along Bedford Road along its western side.

B20 - Widen the existing footpath on the western side of Bedford Road, from the Coles Road roundabout north to the Oak Street / Celeber Drive roundabout.

B21 - Widen the existing footpath on the western side of Valley Street between Green and Holack Streets, at which point it crosses to the eastern side, in order to connect with the Gooseponds bikeway, and to minimise user conflict on the footpath outside the local shops (on western side) at the Valley / Malcomson Street intersection.

B22 - To achieve route continuity, widen the existing path on the western side of Harbour Road, to provide a shared off-road facility. Commence from Evans Avenue north, opposite Vine Street, where existing on-road lanes have been line marked by DTMR. Cyclists can cross outside the local shops, at an existing crossing point in the median - warning signage is required to formalise this.

B23 - Widen the existing footpath on the northern side of Pioneer Street, from Phillip Street to Schapers Road. Although widening of the path is heavily constrained by existing utilities, an off-road treatment is preferred as this route would cater primarily for school cyclists and other local / neighbourhood trips.

B24 - Widen existing path on the eastern side of Glenpark Street from Evans Avenue (Route B10) south to Malcomson Street, in order to provide direct access to the swimming pool and John Breen Park.

C2 - Establish dedicated bicycle lanes on the road shoulders along Beaconsfield Road between Glenpark Street and Norris Road.

C3 - Short Term Recommendation:

To provide an extension of the commuter lanes along the Bruce Highway, establish dedicated lanes along Mackay-Bucasia Road to Philip Street. At the Malcomson Street roundabout, provide holding bars for cyclists. It is intended that this route will primarily serve experienced cyclists accessing and exiting the Bruce Highway bike lanes.

Long Term Recommendation:

DTMR indicate that the long term solution in this busy area will take advantage of Mackay-Bucasia Road's wide reserves, by providing an off-road facility.

C4 - Establish dedicated bicycle lanes on the road shoulders along Hill End Road from the existing underpass beneath the Bruce Highway to the Magpie Sports Ground. This route also serves Glenella Primary School.

Ensure adequate signage is erected on approaches to the underpass which forms a small squeeze point.

An opportunity also exists to provide a bikeway connection south down Glenella Road from the Primary School to the proposed long term link along Gooseponds Creek.

C6 - Short Term Recommendation:

Establish dedicated lanes along Harbour Road from the Slade Point Road roundabout to Mulherin Drive, providing access to Harbour Beach, tourist jetties and Mulherin Park.

Long Term Recommendation:

Based on Mackay Port Authority's Long Term Development Plan (2005 and beyond), construct bikeways to coincide with the extension of Mt Bassett Drive and along the new access road to Mulherin Drive / Harbour Beach. Off-road facilities are preferred in this case. As a long term action, extend bikeways south to East Point development.

D8 - Establish on-road shared bicycle/parking lanes along Hamilton Street from Harbour Road west to Canberra Street. Continue this treatment south along Canberra Street up to Petersen Street, where the bicycle route continues off-road (Route B8).

D9 - Establish a short section of on-road shared bicycle/parking lanes along Evans Avenue North from the northern entrance to the Gooseponds at Quarry Street to Glenpark Street (vehicular access from Glenpark Street to Evans Avenue North has been blocked). Ensure bicycle warning and 'Give Way' signs are erected to alert cyclists of the potential danger of a sharp bend on the approach before Glenpark Street.

As a future/long term link, this route should be extended from Evans Avenue to the north of Valley Street, near North Mackay State High School.

D10 - Establish on-road shared bicycle/parking lanes along Evans Avenue from approximately 25 metres west of Harbour Road to Malcomson Street.

In its present condition, traffic volumes along this section of Evans Avenue are considered too high to provide a safe on-road facility. However, DMR advise that traffic volumes will fall considerably once the East West Connector Road

is operational. Hence, the Evans Avenue corridor will become more conducive to cycling.

D12 - Establish on-road shared bicycle/parking lanes along Schapers Road from Davey Street to Pioneer Street.

An extension of this treatment along Schapers Road should be investigated to serve the future residential area north of Schapers Road.

D13 - Establish on-road shared bicycle/parking lanes along Beaconsfield Road between Cutler Drive and Harveys Road. This forms part of the major north-south link between the northern beaches and city centre.

D14 - Establish on-road shared bicycle/parking lanes along Phillip Street from Pioneer to Arthur Street.

D17 - Establish on-road shared bicycle/parking lanes along Grendon Street from Evans Avenue to its northern end near Swayne Street. It is proposed that a future/long term link be extended from Grendon Street on the eastern side of Gooseponds Creek, to connect with the existing Gooseponds bikeway system.

E7 - Establish a shared bicycle/motor vehicle zone along Charles Hodge Drive from Lindesay Street, to the existing laneway east of Trojan Court, where the path continues as Route A13 down an easement.

E8 - Establish a shared bicycle/motor vehicle zone along Tolcher Street from Murrays Road to link with the existing path in the park on the northern side of Baxter Drive.

E9 - Establish a shared bicycle/motor vehicle zone along Davey Street from Schapers Road to the existing underpass beneath the Bruce Highway.

E10 - As a continuation of Route A13, establish a shared bicycle/motor vehicle zone along Hugh Reilly Court, Meyer Street, Daniel Street and south into Willets Road. At which point a connection should be provided to the existing Gooseponds bikeway system.

E11 - Establish a shared bicycle/motor vehicle zone along Riverleigh Drive from Sams Road, south to an existing shared path (partly sealed/partly gravel) that provides access to the river bank. The path should be extended north of Riverleigh Drive across Sams Road, through to the opposite subdivision, connecting up to the Gooseponds bikeway. A suitable bicycle/pedestrian crossing of Sams Road will be required in the vicinity of Riverleigh Drive.

E12- Establish a shared bicycle/motor vehicle zone along a network of streets in northern Beaconsfield. Starting at Bedford Road, north of Fernleigh Avenue, this network continues into Nadarmi Drive, past Mackillop School, splits both ways along Banksia Avenue, moves into Pine Street, Wattle Street and finally into Cabbage Tree Road.

E13- To achieve bicycle route continuity, establish a short section of shared bicycle/motor vehicle zone along Cremorne Street from Barnes Creek Road and connecting with proposed Route B9 along Riverside Drive.

E20v- Establish a shared bicycle/motor vehicle zone along Caledonian Drive, from Broomdykes Drive to Bedford Road. The middle section of Caledonian Drive is yet to be constructed.

Slade Point Precinct

The Slade Point area incorporates Slade Point and its approaches from both Mackay Harbour and Andergrove.

A26 - Establish a shared bicycle/pedestrian path on the eastern side of Pacific Esplanade (in the open space reserve). Commence treatment from the southern end of Pacific Esplanade and extend to Gannet Street.

B13 - Conduct improvement works to an existing off-road bikeway running parallel to Keeleys Road on its southern side from Lenemann Street. In particular, some resurfacing, lighting, signage and vegetation removal is required due to its relative isolation.

Alternatively, replace this bikeway with on-road bike lanes for the full length of Keeleys Road (Route C8), to increase visibility and security for cyclists, particularly for cycling at night.

B14 - Increase width of existing off-road shared path on western side of Slade Point Road from Kenmore Street, north to Slade Point Primary School, Pheasant Street. Continue treatment along existing bikeway on northern side of Pheasant Street, into the reserve adjacent to the bowling club, and through to the southern side of Jukes Street, ending at Amhurst Street.

Erect signage along Slade Point Road section of route to improve motorist and cyclists' awareness.

B25 - Widen the existing path on the north-eastern side of Gannet Street, from Ocean Avenue (Route D16) to Pacific Esplanade (Route A26).

C7 - To provide continuity between different bikeway sections on Slade Point Road, establish dedicated bicycle lanes over a short distance, from David Muir Street to south of Keeleys Road, where an exclusive off-road bicycle path commences on the eastern side (Route F1).

C8 - In response to the "missing links" on Keeleys Road, dedicated bicycle lanes on the road shoulders from:

- Slade Point Road to Lenahan Street.
- Andergrove Road east to providing a connection with the existing isolated off-road path (Route B 13), located approximately 1km east of Andergrove Road.

This treatment provides a continuous bikeway link along Keeleys Road between Andergrove and Slade Point. As discussed above (Route B13), the

treatment could be applied along the entire corridor, in response to security concerns for cyclists using the off-road path.

An opportunity also exists to provide an off-road treatment along all of Keeleys Road, but this would be achieved at considerable extra cost. The southern side would be most practical, integrating with the existing section of off-road bikeway (Route B13). Good visibility of the off-road path from the road (for security reasons) will be a key design consideration.

D16 - Establish a circuit of on-road shared bicycle/parking lanes serving the Slade Point area. Commence treatment from the existing off-road path at Slade Point Primary School, continue along Wren Street and Ocean Drive to Gannet Street, where bikeways continue as Routes B25 and A26.

Complete circuit by providing shared lanes along South Pacific Avenue from Pacific Esplanade and into Amhurst Street, linking up to the existing off-road path along the southern side of Jukes Street (Route B14).

F1 - DTMR have advised that off-road facilities are preferred on Slade Point Road. Accordingly, provide a two-way exclusive off-road bicycle path on the eastern side of Slade Point Road to facilitate safe and direct commuter cyclist access to the city centre.

Commence the treatment south of Keeleys Road and extend to the Harbour Road / Slade Point Road roundabout. It is anticipated that experienced commuter cyclists will then divert on-road to enter the roundabout in the same fashion as other vehicles. For less confident/inexperienced cyclists, a suitable off-road roundabout treatment may be required to increase safety.

Adequate room is available adjacent to Slade Point Road to construct the off-road path. At the bridge crossing of the multi-modal corridor/rail line, there is a pinch point - cyclist facilities will need to be retrofitted to the eastern side of the bridge over this short section.

Bucasia Precinct

The suburbs of Nindaroo, Eimeo, Blacks Beach, Dolphin Heads, Bucasia and Shoal Point are included in this precinct.

A2 - Established a shared bicycle/pedestrian path through the reserve on the western side of Mackay-Bucasia Road from the existing path on Wallmans Road to Bucas Drive, where another existing path commences. Where the path runs parallel to John Oxley Drive, provide a short connection through to Thomas Mitchell Court.

This route will need to be sufficiently wide to carry commuter cyclists (as shown by ABS data) and students travelling to Eimeo Road State School.

A7 - Establish a shared bicycle/pedestrian path along the south-eastern side of Eimeo Road, just past the Eimeo Road Primary School and before the road crest, to the sag following, where sight distance is greater and there is

adequate road reserve to establish dedicated bicycle shoulder lanes (Route C12).

In the future, extend links north into McHugh or Adair Street to serve the growing residential areas north of Eimeo Road.

B15 - Widen and improve existing off-street bikeway along the western side of Mackay-Bucasia Road from Sologinkin Road, and continue treatment into Wallmans Road. At intersection of Eimeo and Mackay-Bucasia Roads, the existing bicycle/pedestrian crossing (consisting of warning signage and a cyclist refuge) is adequate to provide safe access to Eimeo Road Primary School.

B16 - Widen existing path along the eastern side of Downie Avenue commencing from Bezzina Court near the Hibiscus Shopping Centre, north onto Shoal Point Road, past Bucasia Primary School and terminating approximately 15 metres north of Homestead Bay Avenue.

This route does not extend north to Shoal Point as existing conditions on Shoal Point Road are considered highly unsuitable for cycling (e.g., narrow, winding, rough surface and poor visibility) and offer very little scope for bikeway construction.

In the long term, it is recommended that Route B16 be extended north along the future collector road running parallel to Shoal Point Road and serving the future urban area west of Shoal Point.

C9 - Widen road shoulders to establish dedicated bicycle lanes along Harveys Road from Beaconsfield Road to Mackay Bucasia Road. It is intended that a bikeway connection to Eaglemount Drive will be provided in the future residential area abutting Harveys Road.

Route C9 diverts cyclists away from a hazardous stretch of Eaglemount and Harveys Roads.

C10 - Widen road shoulders to establish dedicated on-road bicycle lanes along Mackay-Bucasia Road from Sologinkin Road to Harveys Road.

Along the northern section of Route C10, the sealed shoulders are of adequate width and line marking is already in place. Appropriate signage is required to formalise the facility, which is already a popular route for cyclists.

South of Mackay-Bucasia Road, conditions are not as favourable, however, scope exists for an extension of Treatment C to Harveys Road.

DTMR have indicated a preference for off-road facilities in this location. Accordingly, there is scope for a dedicated off-road path on the eastern side, but constraints along the corridor mean that construction costs would be considerably higher than the proposed on-road treatment.

Route C10 connects with proposed Route DB and forms part of a commuter linking northern Mackay with the city centre.

C12 - Widen road shoulders to establish dedicated bicycle lanes along Eimeo Road from the road sag approximately 400 metres west of Melanie Street, linking to an off-road path (Route A7), and continuing to Shann Street. From here it proceeds along Shann Street, ending at Admiral Drive.

Route C12 would serve local residents on-route and the Dolphin Heads resort for tourist cyclists. It also provides a connection to the commuter corridor on Mackay-Bucasia Road.

DTMR has concerns relating to on-road facilities along Eimeo Road. It is understood that the proposed Eimeo Bypass Road to the south will result in a decrease in traffic volumes on Eimeo Road. Therefore, it is considered appropriate for a bicycle route to be identified along Eimeo Road, in order to serve the primary school. The timing of Eimeo Bypass Road will be reliant to the surrounding land development.

Opportunities also exist to provide internal parallel routes coinciding with future subdivision south of Eimeo Road

C13 - Establish a dedicated two-way bicycle lane on the northern road shoulder along Blacks Beach Road from Eimeo Road to Pacific Drive.

E14 - Establish a shared bicycle/motor vehicle zone along Sologinkin Road west from Mackay-Bucasia Road to Rural View Drive. This provides an access point to a future residential areas north and south of Sologinkin Road.

E15 - Establish a shared bicycle/motor vehicle zone creating a bikeway circuit through Bucasia. Commence treatment at Fisher Street, continuing south down Waverley Street, west at Walters Avenue, north into Edmonds Street, and finally west into Downie Avenue until its intersection with Shoal Point Road.

The local bikeway system provides direct access to the beach and Bucasia Primary School. It also links up to the off-road path along the eastern side of Shoal Point Road (Route B16)

E16 - Establish a shared bicycle/motor vehicle zone along Pacific Drive from Blacks Beach Road, and east into Pitt Street to provide access to Blacks Beach.

Walkerston Precinct

The Walkerston area incorporates Walkerston and its approaches, including the Racecourse Mill area.

A8 - Establish a shared bicycle/pedestrian path along the southern side of Dutton Street (Peak Downs Highway) from High Street to Branscombe Road, to provide link with an existing path across the Bakers Creek Bridge.

Schools and a public library are served en-route. Although this section is quite constrained by existing utilities and street furniture, an off-road facility is preferred due to the anticipated users of the path i.e., predominantly school cyclists.

B17 - Widen and improve the existing pedestrian path along the southern side of Peak Downs Highway from Pugsley Street, east over Bakers Creek Bridge. The existing shared path over bridge crossing represents a pinch point for cyclists. Ensure sight distances are clear and erect cautionary signage and protective railing.

C14 - Establish dedicated bicycle lanes on the road shoulders along the Peaks Downs Highway. Commence treatment from existing off-road bicycle path on its northern side near Bernborough Avenue, Ooralea, and extend to High Street in Walkerston. Route C14 is considered the only viable east-west commuter link to Walkerston. There is no scope for off-road facilities due to the many constraints within the corridor.

Note: In response to DMR's bikeway restrictions on state controlled roads, Route C14 is intended as a short term recommendation only. Off-road commuter facilities should be constructed when road upgrading takes place or when funding becomes available.

D18 - Establish on-road shared bicycle/parking lanes along Creek Street from Dutton Street (Peak Downs Highway) to McLennan's Park. This route accesses a bicycle velodrome at McLennan's Park.

D19 - Establish a small network of on-road shared bicycle/parking lanes from the Peak downs Highway, along Pugsley Street, into Camerons Road, Luscombe Street and Margaret Street. The Camerons Road section will provide access to a new residential estate to the west. A similar treatment is proposed for Kellys Road, south of the Peak Downs Highway, to access future growth areas and commercial centre in southern Walkerston.

Bakers Creek Precinct

The Bakers Creek area incorporates Paget, Ooralea (south of the Central Queensland University campus), Bakers Creek and Dundula.

A9 - Establish a shared bicycle/pedestrian path along the eastern side of Main Street from the Dundula Primary School fronting Cooks Lane, to Main Street's intersection with the Bruce Highway.

A10 - Establish a short section of shared bicycle/pedestrian path along the southern side of Temples Lane from its intersection with the Bruce Highway to Main Street, at which point it continues along an existing off-road path (as Route B19).

B18 - Widen and seal the existing earth/dirt track used by pedestrians and cyclists along the western side of the Bruce Highway to provide an off-road shared path. Commence treatment approximately 10 metres north of Stockroute Road and extend to dedicated bicycle shoulder lanes along Bruce

Highway (proposed Route C15), north of Farrellys Lane, opposite the caravan park.

B19 - Upgrade and widen existing pedestrian path along the eastern side of Main Street from Temples Lane to Dundula Primary School (Cooks Lane). This route runs parallel to the proposed commuter bikeway along the Bruce Highway (Route C16). Route B19 would mainly serve local bicycle and pedestrian traffic generated by the school.

C15 - Establish dedicated bicycle lanes on the road shoulders along Boundary Road from Bernborough Avenue to the Bruce Highway. Also continue this treatment along Broadsound Road / the Bruce Highway from the Peak Downs Highway, south to Farrellys Lane, to connect with an existing off-road path (Route B18).

The section between Boundary Road and Peak Downs Highway is constrained, however, line marking and signage should be continued for commuter cyclists over this short distance.

C16 - Establish dedicated bicycle lanes along shoulders of the Bruce Highway for commuter travel. Commence treatment from proposed Route B18, north of Stockroute Road and continue south to Gorman Street, where Route C16 links up to a local area shared bicycle/motor vehicle zone (Route E17)

Erect cautionary warning signs for cyclists on the approach to pinch points at crossings of Bakers Creek and the North Coast Rail line.

Note: In response to DTMR's bikeway restrictions on state controlled roads, Routes C15 and C16 are intended as a short term recommendation only. Off-road commuter facilities should be constructed when road upgrading takes place or when funding becomes available.

E17 - Establish a local shared bicycle/motor vehicle zone in the area bounded by Matsen Street, Ivers Street, the North Coast Railway and the Bruce Highway (south of Bakers Creek).

Seaforth Precinct

A11- Establish a shared bicycle/pedestrian path through the parkland reserve from Pilchowski Avenue to Sandfly Creek running parallel to Seaforth Port Newry Road. This short path forms part of a central bikeway connection through Seaforth (Route C11).

A25 - To serve the Seaforth Primary School, establish a shared bicycle/pedestrian path on either side of Seaforth-Mount Ossa Road, from Joe Jackson Avenue, south to the school. An off-road facility is preferable in this location due to its anticipated use by predominantly young/novice cyclists.

Alternatively, if funds are not available for an off-road path, conduct shoulder widening on the northern side of Seaforth-Mount Ossa Road to provide a dedicated two-way on-road bicycle lane. A barrier/trash screen would also be

preferred to provide protection for cyclists along this corridor and abundant signage.

C11 - Widen shoulder on north-eastern side of Seaforth-Port Newry Road to provide a dedicated two-way bicycle lane. Commence treatment from Sandfly Creek (Route A11) and continue along Walsh and Palms Avenues to George Street. Extend south for a short distance to Joe Johnson Avenue. Erect cautionary signage for cyclists at pinch point over Sandfly Creek.

E18 - Establish a shared bicycle/motor vehicle zone along Pilchowski Avenue and Frangipani Avenue in the northern residential area of Seaforth.

E19 - Establish a shared bicycle/motor vehicle zone along Poinciana Avenue, Jamieson Street, Evans Avenue and George Street (north of Palms Avenue) to service the southern residential area of Seaforth.