Evaluation of David Low Way Bicycle Lanes

Prepared for Queensland Department of Transport and Main Roads

CDM RESEARCH

Contents

Document history and status

Revision	Date issued	Author	Revision type
1	14/12/2016	C. Munro	Issue-1

Distribution of Copies

Revision	Media	Issued to
1	PDF	Department of Transport and Main Roads

Printed:	14 December 2016
Last saved:	13 December 2016 03:06 PM
File name:	0100 TMR David Low Way Bicycle Lanes Evaluation (Issue-1).docx
Project manager:	C. Munro
Name of organisation:	Department of Transport and Main Roads
Name of project:	Evaluation of David Low Way Bicycle Lanes
Project number:	0100

Executive Summary

The Department of Transport and Main Roads (TMR) commissioned CDM Research to undertake an evaluation of on-road bicycle lanes installed on David Low Way between Sunshine Coast Airport and Peregian Beach. The bicycle lanes have been installed in stages over a number of years, and often as part of wider road resheeting projects. In this evaluation it is assumed the project costs amount to around $3.58 m invested in 2010 and 2012 to provide kerbside bicycle lanes in sections along the road.

Two fieldwork activities were undertaken to obtain input data for the evaluation:

- video-based manual counts classified by mode, direction of travel and time of day over a sequential 7-day period (Saturday 22 October and Friday 28 October 2016), and
- intercept surveys with path users undertaken on two weekdays and two weekend days.

The counts and surveys were undertaken immediately south of the Heron Street roundabout in Peregian Beach. The data was input into a cost-benefit analysis to estimate the monetary project benefits. The key results of this evaluation are as follows:

- Average daily traffic between 5 am and 7 pm on the path of around 247 users, with weekends (417 riders) being much busier than weekdays (179 riders).
- The intercept surveys suggest that almost all riders are riding for recreation or sport (95% on weekday mornings and all riders on weekend mornings). The average trip distance was 37.7 km over 77 minutes, equivalent to an average speed of 29 km/h.
- Most riders started and finished their ride in Noosa Heads (17%), followed by Peregian Beach (13%).
- Most riders (81%) would have ridden irrespective of the presence of the bicycle lanes, while most of the remainder (16%) would not have travelled.
- Reflecting the demographic of many riders, 44% would have ran or jogged if they could not have ridden while another 18% would have walked. This suggests a degree of physical activity substitution between riding and other physical activity, such that – for at least some riders – there may not have been a net physical activity gain as a result of the bicycle lanes.
- The cost-benefit analysis suggests the project represents very good value for money; the BCR for the central discount rate of 7% was 4.3. The benefits are almost exclusively health benefits to all-new cycling trips which the investment has generated.
- There are safety disbenefits because of the project encouraging all-new cycling trips, thereby exposing riders to risks to which they would not otherwise have been exposed. Nonetheless, these risks are more than compensated by the health benefits.

- We suggest caution is warranted in interpreting the project BCR, given the small sample size and uncertainty about the project scope and cost. Nonetheless, the BCR is sufficiently positive to suggest the project benefits exceed the costs.
- It is suggested that a case can be made more broadly for investment in comparatively lower cost and lower quality provision such as on-road bicycle lanes where there is latent demand from confident road riders, as is clearly the case on David Low Way.

1 Introduction

1.1 Background

CDM Research was commissioned by the Queensland Department of Transport and Main Roads (TMR) to undertake an evaluation of the on-road bicycle lanes installed in stages along David Low Way between Sunshine Coast Airport and Noosa. The bicycle lanes have been installed at various times over the past six years and are of varying width and configuration. For the purposes of the present evaluation the project was the considered to be the following:

- Shoulder sealing and bicycle lane marking from Keith Royal Drive (near Sunshine Coast Airport) to Boardward Boulevard (Mount Coolum): $2.54 m, 5.4 km, December 2009
- Shoulder sealing and bicycle lane marking from Boardwalk Boulevard (Mount Coolum) to Warran Road (Yaroomba): $1.04 m, 1.7 km, November 2012

These projects exclude bicycle lanes installed along David Low Way in Peregian Beach prior to January 2010[1], for which costs appear to be unavailable. However, these projects above include complete road resheeting costs, which we may reasonably expect to at least partially compensate for the exclusion of the bicycle lanes in Peregian Beach. However, we would suggest there is significant uncertainty in the overall cost estimate of $3.58 m – it is possible the cycling-related project cost is both substantially lower or higher than this estimate.

Additionally, it is noted that a shared path alongside David Low Way between Willaim Street (Mount Coolum) and Emu Mountain Road (Peregian Beach) was constructed in 2013 at a cost of $1.87 m. It is possible that at least some of the bicycle riders subject to the intercept survey had ridden on this path. However, our assumption is that instead most riders chose to use the roadway at this location (which has marked kerbside bicycle lanes) given that most riders were keen sport cyclists.

1.2 Methodology

This evaluation adopted a cost-benefit analysis (CBA) methodology as developed previously for TMR (CDM Research 2016). The CBA tool is implemented online[2]. The methodology requires a number of inputs, of which the most important are:

- average daily pedestrian and cyclist counts,
- average distances walked/ridden, and
- diversion rates and induced travel proportions.

[1] The earliest date for which Nearmap imagery is available.

[2] https://cdmresearch.shinyapps.io/ActiveTravelBenefits/

The latter refer to the proportion of demand that:

- was already walking/riding before the project, and have changed their route to use the project,
- have diverted from other transport modes (e.g. private car, public transport), and
- all-new trips that would not have otherwise occurred in the absence of the project.

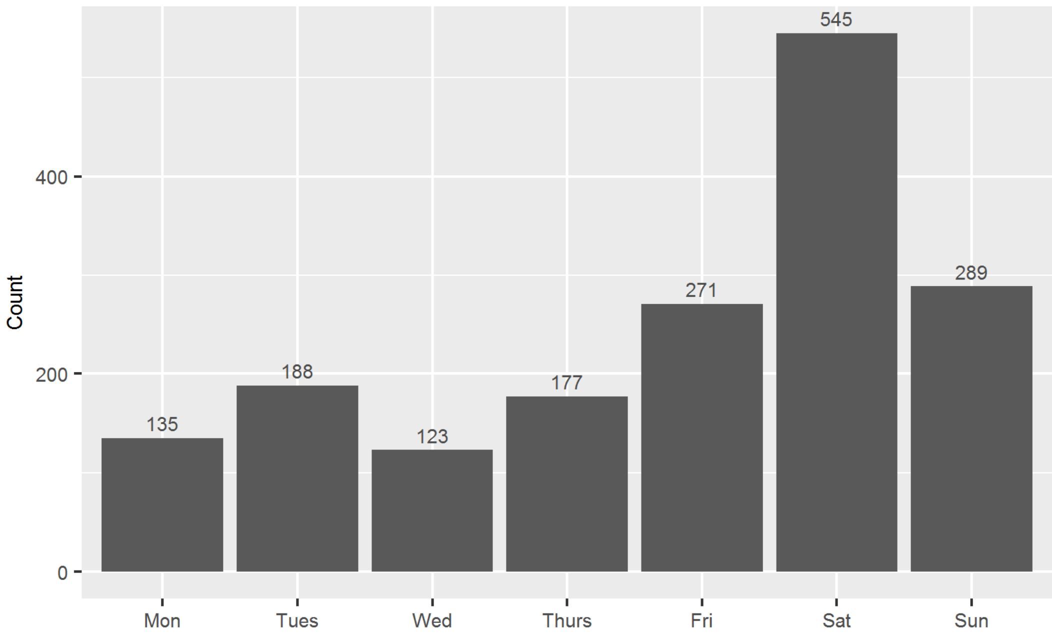
To obtain these input parameters two fieldwork activities were undertaken:

1. video-based manual counts classified by mode, direction of travel and time of day from 5 am to 7 pm between Saturday 22 October and Friday 28 October 2016, and
2. intercept surveys with path users undertaken between 6 am and 9 am on Wednesday 16 November, Friday 18 November and Friday 25 November and between 8 am and 11 pm on Saturday 26 November 2016.

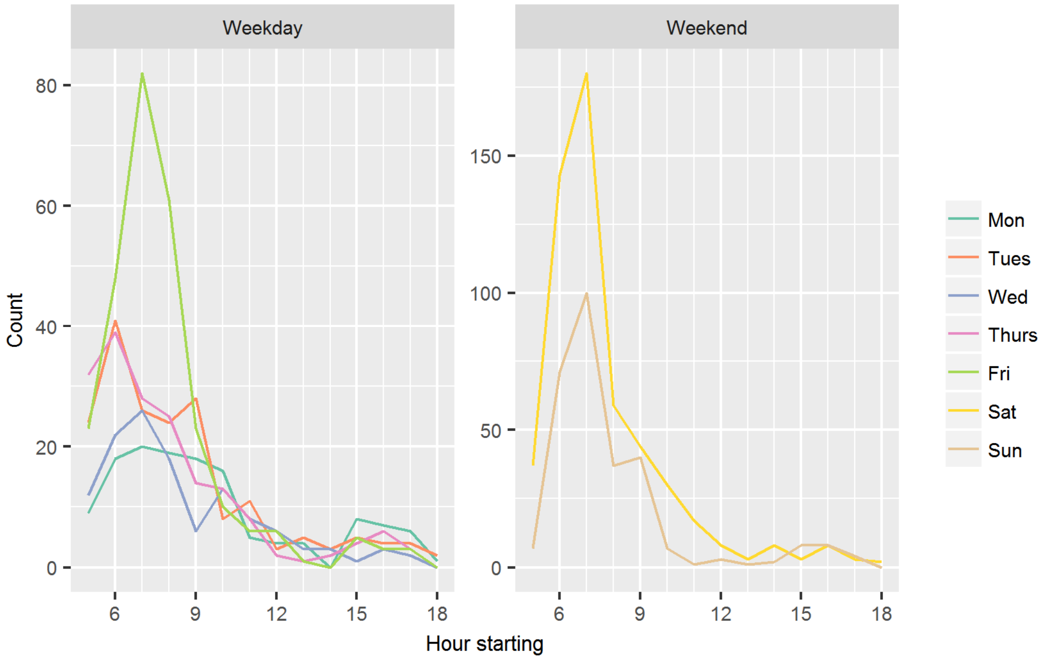
The counts and intercept surveys were both undertaken on the road south of the Heron Street roundabout in Peregian Beach near the IGA supermarket. This report first presents the summary data obtained from the fieldwork activities before then providing the output of the cost-benefit analysis.

2 Counts

The average daily count on David Low Way at Peregian Beach was 247 bicycle riders between 5 am and 7 pm, with weekends (417 riders) being much more popular than weekdays (179 riders). The counts by day of week fluctuated as shown in Figure 2.1; Saturdays were far busier than the other days of week. The time of day profile suggests demand is strongest during the early morning period (Figure 2.2). These trends are consistent with a route that is predominantly used by recreation and sport training cyclists.



■ **Figure 2.1: Day of week (counts are from 5 am to 7 pm)**



■ **Figure 2.2: Time of day by day of week (hourly bins)**

3 Intercept surveys

Intercept surveys were conducted with bicycle riders using the roadway immediately south of the roundabout at Heron Street over four morning periods (three weekdays and one weekend day). Given challenges encouraging riders to stop, and doing so safely, a number of interviews were completed at a nearby café which riders were observed to frequent. A total of 52 complete interviews were obtained.

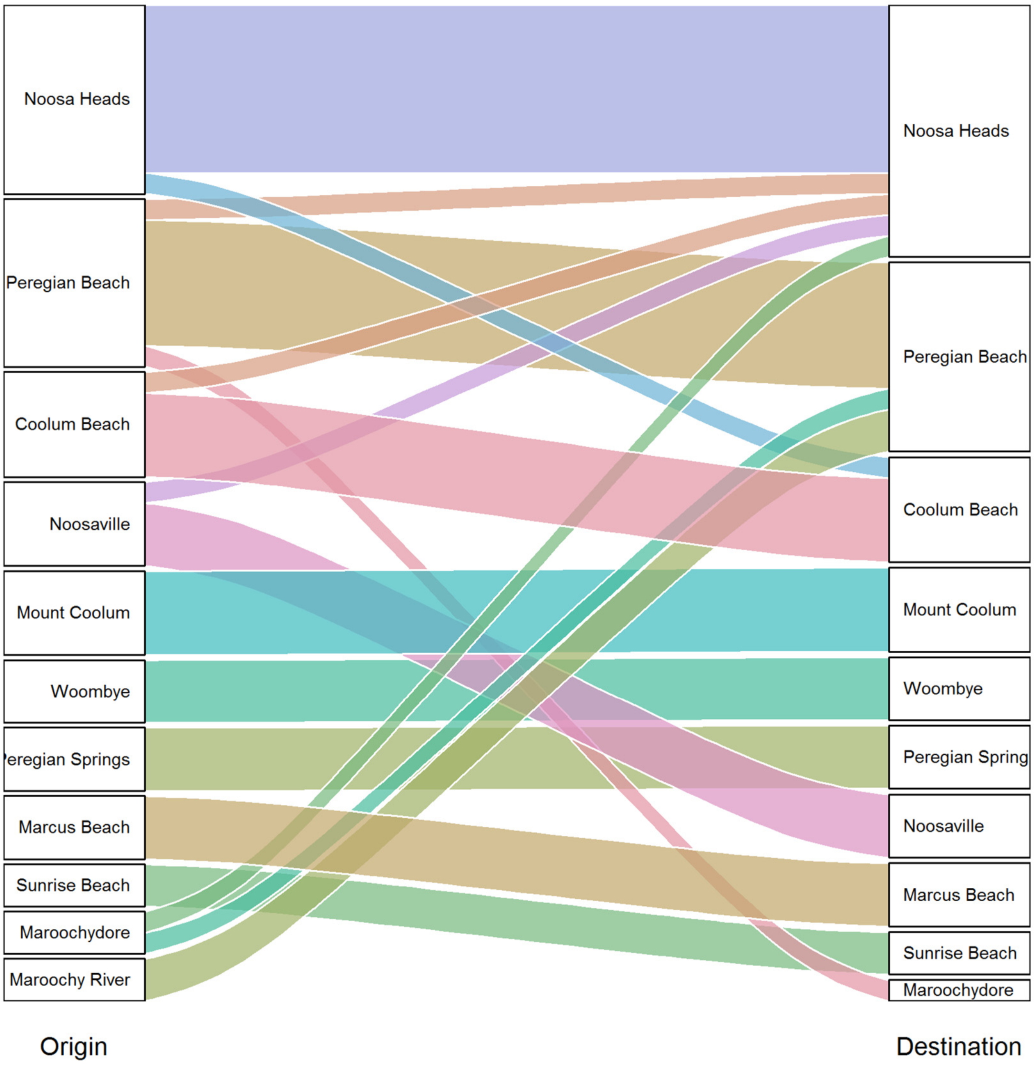
Almost all bicycle riders were travelling for recreation; on weekdays 95% of riders were doing so, increasing to 100% on weekends. The small minority not travelling for recreation on weekdays were commuting to work. The average cycling trip extended for 77 minutes over 38 kilometres (Table 3.1), equivalent to an average speed of 29.2 km/h.

Table 3.1: Trip distance and duration statistics

	Distance	Duration
Average	37.7 km	77.4 mins
Median	35.5 km	70 mins
Minimum	0.5 km	5 mins
Maximum	110 km	210 mins

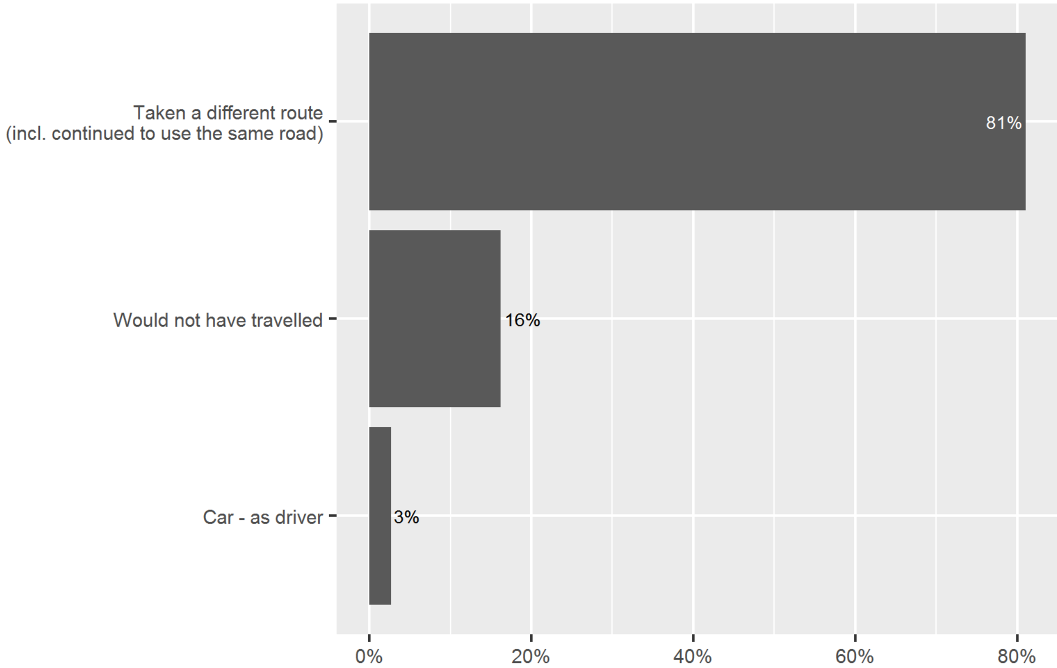
The trip origin and destination suburbs for recreation cycling trips are shown in Figure 3.1. The major trip flows are as follows:

- to and from Noosa Heads (17%),
- to and from Peregian Beach (13%),
- to and from Coolum Beach (8%), and
- to and from Mount Coolum (8%).



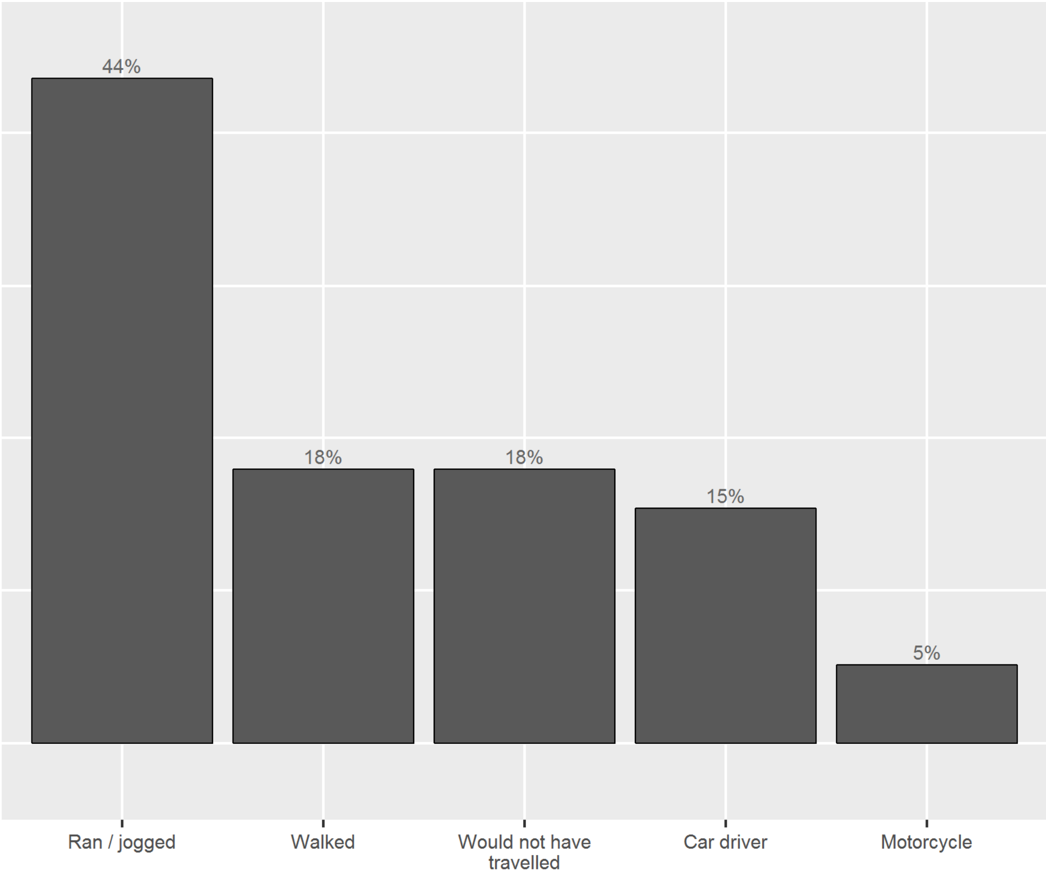
■ **Figure 3.1: Origins and destinations of cycling trips for recreation (n=48)**

Respondents were asked what they would have done for their trip if the bicycle lane was not present. In most cases the rider indicated they would have taken a different route or continued to use David Low Way (Figure 3.2). In this context, most riders would presumably have continued to use David Low Way regardless of the bicycle lane given the absence of obvious alternative routes. Around 16% of riders indicated they would not have travelled if the bicycle lanes were not present and a small minority would have driven a car.



- **Figure 3.2: What would you have done if the bicycle lane was not here?**

Bicycle riders were also asked what they would have done if they could not have used their bicycle for their trip. Just under half of cyclists indicated they would otherwise have ran or jogged, with a further 18% walking instead (Figure 3.3). This suggests these riders, most of whom are sport cyclists, would achieve some level of physical activity irrespective of being able to ride.



■ **Figure 3.3: What would you have done if your bicycle was not available for this trip?**

Respondents were asked after the survey if they had any other comments about the pathway. These comments are provided verbatim in Appendix B. Most respondents indicated support for the bicycle lanes, with most concern raised about the provision for bicycle riders at roundabouts.

4 Cost-benefit analysis

The cost-benefit analysis framework as described in CDM Research (2016) was used to estimate the monetary benefits against the costs of the project. The key elements of this framework are:

- broad consistency with the current national guidelines (Transport and Infrastructure Council 2016),
- 30-year economic life with no residual value at the end of the appraisal period,
- estimates mortality and morbidity health benefits using a willingness to pay methodology for valuing statistical life,
- no safety in numbers effect,
- 70% of bicycle travel in the area occurs on-road without provision, 20% on-road with bicycle lanes, 10% on off-road shared paths and none on footpaths,
- relative risks for bicycle lanes of 0.5, off-road shared paths of 0.3 and footpaths of 1.8 (all relative to on-road with no provision),
- cumulative annual demand growth of 3%,
- rule-of-half applies to the willingness-to-pay component of health costs, vehicle operating and parking costs, PT fares for all users and travel time savings for new users only,
- Monte Carlo simulation to represent parameter uncertainty,
- capital and operating cost estimates to +/-10% at 95% confidence level, and
- demand estimates to +/-20% at 95% confidence level.

The input assumptions to the cost-benefit analysis are summarised in Table 4.1, and are based wherever possible on the survey data. The estimated project cost of $5.94 m was provided by TMR, and consists of bicycle lanes at Peregian Beach, Marcoola and Point Arkwright that have been installed in stages since 2010.

Table 4.1: Economic assumptions

Parameter	Assumption	Source
General assumptions		
Economic life	30 years	
Discount rate	3%, 7%, 10%	
Health benefit ramp-up period	5 years (linear)	Genter et al. (2009)
Effective average motorist speed	30 km/h	Estimate
Effective average cyclist speed	25 km/h	Estimate
Effective average walking speed	6 km/h	Estimate
Effective average PT speed	15 km/h	Estimate
Bicycle riders		
Opening year demand (AADT)	247	Video counts
Average trip distance	37.7 km	Intercept surveys
Diversion: car	3%	Intercept surveys
Diversion: PT	0%	Intercept surveys
Diversion: walk	0%	Intercept surveys
Diversion: reassign	81%	Intercept surveys
Diversion: induced	16%	Intercept surveys
Transport purpose split	5%	Intercept survey
Change in trip distances	0 km	Assume no change
Facility		
Length	7.1 km	Total est. length of bicycle lanes
Type	On-road lanes	
Diverted motor vehicle travel time by period	Busy: 10% Medium: 30% Light: 60%	Guesstimate
Investment		
Capital cost	2010: \$2.54 m 2012: \$1.04 m Total: \$3.58 m	TMR, costs by year are an estimate
Operating cost	\$10,000 p.a.	Guesstimate

The results of the cost-benefit analysis are summarised in Table 4.2. For the central discount rate of 7% the BCR is 4.3, indicating very good value for money. The BCR remains positive even for the highest discount rate of 10%.

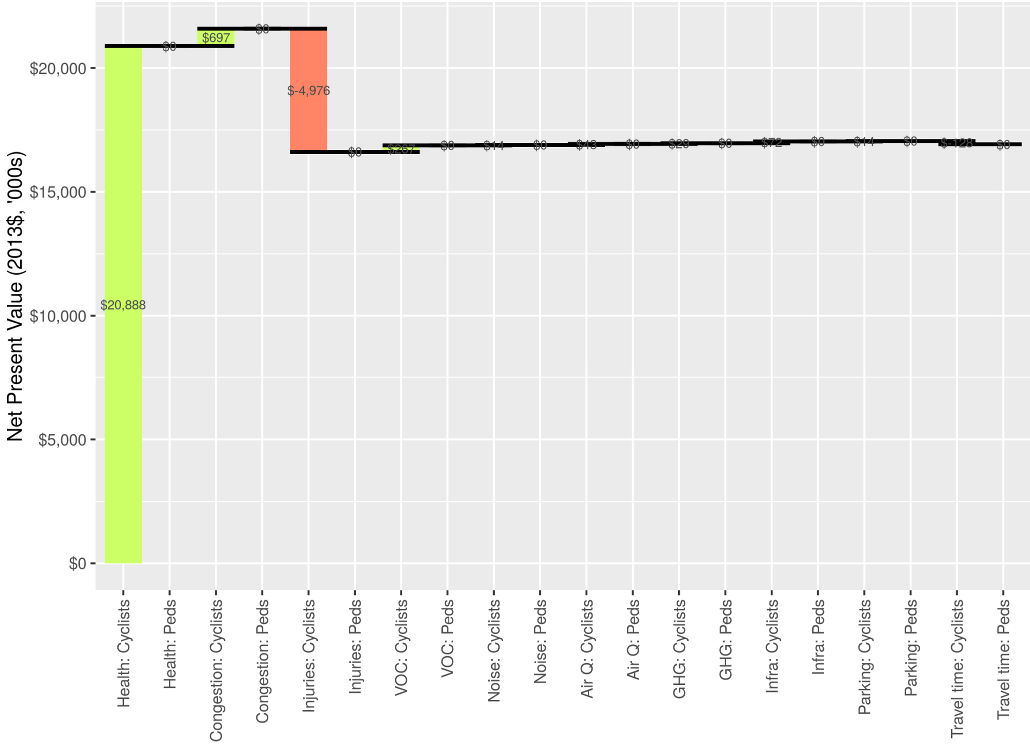
■ **Table 4.2: Economic assessment**

	Discount rate		
Parameter	**4%**	**7%**	**10%**
Benefit-Cost Ratio (BCR)	7.9	4.3	2.5
Likelihood BCR < 1.0	0%	0%	0%
Net Present Value (NPV)	$27.25 m	$13.00 m	$6.08 m
Present Value of Benefits (PVB)	$31.17 m	$16.92 m	$10.00 m
Present Value of Costs (PVC)	$3.92 m	$3.92 m	$3.92 m

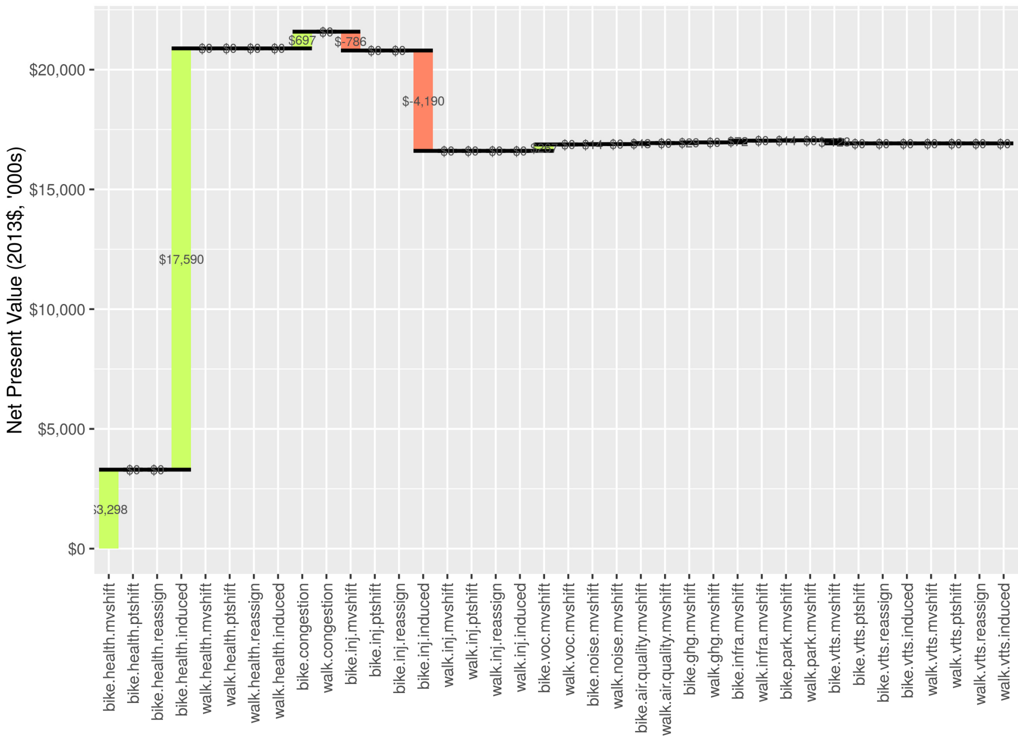
All values are 2013 prices and values.

The breakdown of the NPV for the central discount rate is shown in Figure 4.1. Almost all of the benefits accrue from cyclist health, with minor traffic congestion benefits. The detailed breakdown of the benefits by user class are shown in Figure 4.2. This figure suggests that most of the health benefits are attributable to induced travel; that is, the 16% of recreation riders who indicated they would not have ridden in the absence of the bicycle lanes (Figure 3.2). This proportion, combined with the long average trip distance of 37.7 km, result in substantial monetised health benefits. The disbenefits accrue largely to cyclist injuries. While there is no doubt bicycle lanes will improve safety where installed[3], most riding will continue to be undertaken on roads with no cyclist provision. Moreover, the all-new riding trips will be exposed to traffic injury risks to which they would not otherwise have been exposed.

[3] The model assumes bicycle lanes will reduce crash risk by 50% compared to the untreated road. This assumption is based on the research evidence from bicycle lane safety studies undertaken elsewhere. It is possible the improvement will be greater on David Low Way than many of the sites from which this estimate is based given the comparatively high traffic speeds on much of David Low Way.



■ **Figure 4.1: Summary breakdown of net present value**



■ **Figure 4.2: Detailed breakdown of net present value**

5 Discussion

David Low Way is a popular sport cycling route. Provision is made for bicycle riders through kerbside bicycle lanes at intermittent locations along the road from near Sunshine Coast Airport north along the coast to Noosa. This provision is generally in the form of on-road bicycle lanes running along the kerb, and in built-up areas green pavement treatments are used across unsignalised side streets. This provision has been provided incrementally over a number of years, both as independent cycling-specific projects and as part of wider roadworks. As such, it is difficult to isolate the cycling-specific investment from wider road improvements. Given these challenges, the estimated project cost of $3.58 m should be treated as indicative only. Similarly, this means that the cost-benefit analysis should be treated with caution – given that the capital cost is a key component of this analysis.

Bicycle riders appreciate the bicycle lane, and are supportive of extensions and improvements to the lane. Moreover, a significant minority of riders (19%) indicated they would not have ridden if the lane were not present. This alone is suggestive of positive health benefits to these riders. However, such views are somewhat moderated by considering that 44% of riders would have ran or jogged if they could not have ridden. In other words, among this cohort there appears to be ready substitution to other forms of physical activity such that, at least for some riders, there may be no net health benefit.

Assumptions around physical activity are critical to the robustness of the cost-benefit analysis, for which the vast majority of the benefits are assumed to come from health. Indeed, the very favourable BCR of 4.3 for the central discount rate can almost entirely be attributed to these health benefits. The comparatively small sample size (52 respondents, of which eight would not have ridden and two would have driven a car) is marginal upon which to be confident about the induced travel which is key to the benefits. Furthermore, the possible physical activity substitution raises additional concerns about these health assumptions. Nonetheless, in the absence of data to the contrary we would suggest the bicycle lanes are likely to represent good value for money. That is, their benefits are likely to still exceed their costs even under more conservative health assumptions. Primarily, this can be attributed to the low capital cost ($3.58 m) for a fairly long length (albeit discontinuous) facility.

More broadly, the question then arises as to whether comparatively low-cost but lower quality facilities such as bicycle lanes represent “better” value for money than higher quality protected cycleways and off-road paths. Clearly, such a question will be context dependent. However, we suggest from this evaluation there is a reasonable basis to argue that lower cost on-road bicycle lanes can represent value for money where:

- latent bicycle rider demand is high, and
- the predominant rider type are confident road riders.

David Low Way clearly meets these criteria, such that the project benefits appear to exceed the costs.

References

CDM Research. 2016. 'Measuring the Benefits of Active Travel'. Prepared for Queensland Department of Transport and Main Roads.

Genter, J. A., S. Donovan, B. Petrenas, and H. Badland. 2009. 'Valuing the Health Benefits of Active Transport Modes'. Research Report 359. Wellington, N.Z.: NZ Transport Agency.

Transport and Infrastructure Council. 2016. 'Australian Transport Assessment and Planning Guidelines: M4 Active Travel'. http://atap.gov.au/mode-specific-guidance/active-travel/files/m4_active_travel.pdf.

Appendix A: Intercept survey script

We're completing a quick survey on the bike lane. Could you help us?

1. INTERVIEWER enter mode of travel
    a. Bicycle rider
    b. Pedestrian
2. In what suburb did you start your trip, and where will you finish your trip?
    a. Start: ____________
    b. Finish: ___________
3. How long will the trip take?
    a. Hours: _____
    b. Minutes ____
4. How far is the trip?

    ____ km
5. What is the purpose of your trip?
    a. Commuting to or from work
    b. Fitness, recreation or sport
    c. Shopping
    d. School, university or other education activity
    e. Other: __________
6. How would you have made this trip if this bike lane wasn't here?
    a. Taken a different route (incl. used the road)
    b. Would not have travelled
    c. Car – as driver
    d. Car – as passenger
    e. Motorcycle
    f. Train
    g. Bus
    h. Ferry
    i. Taxi
    j. Don't know
    k. Other: __________
7. What would you have done if you couldn't ride your bike for this trip?
    a. Would not have travelled

   b. Used a car – as the driver
   c. Used a car – as the passenger
   d. Motorcycle
   e. Train
   f. Bus
   g. Ferry
   h. Taxi
   i. Walked
   j. Ran / jogged
   k. Don't know
   l. Other: ___________

8. IF TRANSPORT PURPOSE: Which of the following best describe how easily you could have used a car for this trip?
   a. I had a car available and could easily have got access to it
   b. I could have got a car from another person where I started my trip (e.g. another household member)
   c. I did not have ready access to a car to make this trip
   d. I do not have a drivers licence
   e. Other: _________

9. IF COULD HAVE USED CAR: Would it have taken more or less time to reach your destination by car?
   a. More time
   b. Same time
   c. Less time

10. IF TRANSPORT PURPOSE: Which of the following best describes how easily you could have made this trip by public transport?
   a. I had a convenient public transport alternative
   b. I had a public transport alternative but it would have taken longer
   c. I did not have a viable public transport alternative
   d. Other: _________

11. IF COULD HAVE USED PUBLIC TRANSPORT: Would it have taken more or less time to reach your destination by public transport?
   a. More time
   b. Same time
   c. Less time

12. INTERVIEWER enter any other comments: _______________

Appendix B: Verbatim comments

Very good
Lovely lane, very safe, build more. Appreciate.
Good for cyclists. Much safer for both cyclists as well as vehicles.
Lane is good.
Problem is the roundabout, drivers need to be educated about the safety aspect.
They are very good, nice and safe.
It is really good.
Pretty good, cars try to come on the lanes.
Smooth lanes, very useful, good work done.
Very good.
Great work done.
Money well spent, it is safer now.
Pretty good dedicated lane for the cyclist, good.
Good consideration by the authorities. Keep it up.
Pretty good thing.
Good lane, love it.
Extend it.
Smooth lane, should have more of them.
I am encouraged to use my bicycle more. Like it, thanks.
Great work, nice path.
Quite good cycle path
Beautiful facility.
Fantastic lane, build more of these.
Fantastic lane but should have a separation from the main road.
Nice and smooth lane, but not safe as it is along the road.
Very nice work done. Need to be extended and expanded.