

# Memorandum

To: David Croft, NZTA Principal Advisor for Planning and Investment  
Cc: Stuart McDougall (RLTP Manager)  
From: Veraina Tanielu, Graduate Funding Advisor  
Date: 5 May 2014  
Subject: **2012-15 Beach Rd Cycle Highway Design Funding Application and updated Economic Analysis clarification**

## Purpose

The purpose of this memo is to respond to the queries received in the email dated 3rd April. The response from Auckland Transport was tabled in a list (please refer to the email dated 4<sup>th</sup> April) to summarise these queries and a revised Economic Analysis was undertaken to address these. A discussion of some items follows the summary table.

Please note that the SP11 Worksheets from the 2010 version of the EEM have been used for comparison with the SP11 Worksheets used in the funding application (please refer to Attachment 1).

Item No.	Information required/ Action	Responsibility	AT Response
1	Clarification on why the profiles for Beach Road (HHL) and Grafton Gully Cycleway (HMM) are not similar, namely the assessment of the "Effectiveness".	AT Assessor (RLTP team)	Please see response in the email from Veraina Tanielu of AT, dated Friday 4 <sup>th</sup> April.
2	Projected demand of 450 new cyclists is overstated, so amend the expected new cyclists as 300 in the economic analysis.	PM/Consultant	This has been amended in the revised Economic Analysis (please refer Attachment 1)
3	Travel time cost savings to be applied to current users only (200 current cyclists per day rather than 450 cyclists.)	PM/Consultant	This has been amended in the revised Economic Analysis (please refer Attachment 1)
4	Cost of the do minimum to be reassessed as the cost to install additional cycle warning signs, advance cycle stop boxes at signals, and cycle sharrow markings as a minimum.	PM/Consultant	On Worksheet 2 the do minimum is assumed to be maintenance of the status quo only. The 'do minimum' you have suggested – more signs and sharrow markings is more of a standalone option and has not been considered in the revised Economic Analysis.
5	Maintenance costs for the cycleway should be included in the economic evaluation as identified in the Opus peer review.	PM/Consultant	This has been amended in the revised Economic Analysis (please refer Attachment 1)
6	Incremental BCR analysis to be done and added to the economic analysis as option cost and benefits are dissimilar.	PM/Consultant	Please refer to the discussion below.
7	Clarify preferred option as referral to Option C in Peer Review but Option F in the SAR.	AT Assessor (RLTP team)	The preferred option is Option F which is a variation to Option C in the AECOM Draft SAR and scored a higher ranking in the multi criteria analysis.
8	Alternate BCR document from the BCR calculation tool.	AT Assessor (RLTP team)	The values entered into the Cycling BCR Machine (from Anna Percy) are not those used in the project but used as a worked example for our SP11 workshops.

## Discussion:

- **Revised SP11 Worksheets – Economic analysis (Items 2,3,5)**

Please note that the SP11 Worksheets have been modified to illustrate some of the suggested changes. The BCR that has been used in the funding application (as submitted) will remain the same. A discussion of some items follows the summary table.

The SP11 worksheets have been reworked to align with some of the suggestions in the table above, namely:

- Using a decreased cycle demand rather than the 450 cyclists used in the SAR, a cycle demand of 297 cyclists has been used as was calculated from SP11 Worksheet 7
- Travel time cost savings only calculated for the 200 existing cyclists along Beach Road rather than the new and existing cyclists
- Including assessed maintenance costs

A 1.5% growth rate has been used in the revised worksheets (as was used in the original assessment) and is considered to be conservative. The calculated BCR using these inputs is 1.07

- **Item 6 Incremental and BCR Analysis**

The designer's comments in the Economic Analysis Peer Review tracking form regarding a BCR incremental analysis, are as follows: "... – it can safely be assumed that the economic benefits will not differ markedly between all options. Incremental analysis is therefore of little benefit to differentiate between options."

This shows that an incremental BCR analysis is not necessary and has not been carried out in the reworked SP11 worksheets.

- **Sensitivity Analysis**

Sensitivity test	Input value	Benefits	Costs	BCR	Outliers
Growth rate halved (%)	0.75	2,804,753	2,805,960	1.00	
Growth rate doubled (%)	3	3,445,093	2,805,960	1.23	
Cycle demand 25% above the estimated demand	375	3,515,756	2,805,960	1.25	
Cycle demand 25% below the estimated demand	225	2,519,926	2,805,960	0.90	x
Costs 25% above estimate	3,772,301	2,997,924	3,772,301	0.79	x
Costs 25% below estimate	2,263,381	2,997,924	2,263,381	1.32	

The above table shows that the BCR is particularly sensitive to these inputs: a significantly lower cycle demand and a decreased cost estimate, both of which are unlikely scenarios. By removing these outlying values from the sensitivity testing shows that the calculated BCR is robust.

## Conclusion

The revision to the Economic Analysis shows that if the suggested changes are made to the SP11 Worksheets then the BCR decreases from 1.8 (as submitted in the funding application) to **1.07**, which results in the **same Efficiency rating**.

Please note that this has only been done to illustrate how the BCR differs with the suggested changes and will not be changed in the submitted application.

## Attachments

Attachment 1: Revised Economic Analysis – SP11 Worksheets

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Spreadsheet v 1.04 (17-June-10)

**SP11 Walking and cycling facilities** continued

**Worksheet 1 - Evaluation summary**

<b>1</b>	Evaluator(s)	Veraina Tanielu		
	Reviewer(s)	Tom Caiger		
<b>2</b>	Activity details			
	Approved organisation name	AT		
	Activity name	Beach Road Cycle Facilities		
	Your reference			
	Activity description	Dedicated cycleway on Beach Rd between Parnell Rs and Britomart Pl		
	Describe the issues to be addressed	Lack of cycle facilities along Beach Road		
<b>3</b>	Location			
	Brief description of location	Beach Road in the inner CBD		
<b>4</b>	Alternatives and options			
	Describe the do-minimum	As is, with cyclists riding in the Beach Road traffic lanes		
	Summarise the options assessed	Cycle lanes and dedicated cycle facility		
<b>5</b>	Timing			
	Time zero (assumed construction start date)	1 July	2014	
	Expected duration of construction (months)			6
	Period of analysis			30
<b>6</b>	Economic efficiency			
	Date economic evaluation completed (mm/yyyy)	5/05/2014		
	Base date for costs and benefits	1 July	2013	
	Land designation required			
<b>7</b>	Data (only fill the applicable data)			
	Existing pedestrian/cycling volumes	200	AADT in year	
	Estimated new pedestrian/cyclist volume	297		AADT
	Estimated motor vehicle volumes			AADT
	Estimated motor vehicle speed	50		km/h
	Pedestrian/cyclist growth rate	1.50		%
	Width available for walking/cycling before	0		m
	Width available for walking/cycling after	3		m
	Length walked/cycled after works	0.95		km
	Length walked/cycled before works	0.95		km
	Expected reduction in private vehicle travel			km per year
<b>8</b>	PV cost of do-minimum		\$	66,690 <b>A</b>
<b>9</b>	PV cost of the preferred option		\$	2,872,650 <b>B</b>
<b>10</b>	Benefit values from worksheet 4, 5, 6			
	PV travel time cost savings	\$ 649,134	C x Update factor <sup>TTC</sup>	1.37 = \$ 889,314 <b>X</b>
	PV facility benefits	\$ 1,792,495	D x Update factor <sup>WCB</sup>	1.10 = \$ 1,971,745 <b>Y</b>
	PV accident cost savings	\$ 114,055	E x Update factor <sup>AC</sup>	1.20 = \$ 136,866 <b>Z</b>
<b>11</b>	BCR <sub>N</sub>	=	$\frac{\text{PV net benefits}}{\text{PV economic costs}} = \frac{\text{X} + \text{Y} + \text{Z}}{\text{B} - \text{A}}$	= $\frac{2997924}{2805960} = 1.07$

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**SP11 Walking and cycling facilities** *continued*

**Worksheet 2 - Cost of do-minimum**

**1** Historic maintenance cost data (indicate whether assessed or actual)

Maintenance costs for the site over last three years

Year 1	\$	5700
Year 2	\$	5700
Year 3	\$	5700
Maintenance costs for the site this year	\$	5700
Assessed future maintenance costs	\$	5700

**2** PV of annual maintenance and inspection costs following the work

Annual cost = \$ 5700 x 11.70 = \$ 66690 (a)

**3** PV of periodic maintenance costs (including any capital work)

Time zero 1st July in the year

Periodic maintenance will be required in the following years:

Year	Type of maintenance	Amount \$	SPPW <sup>1</sup>	Present value
Sum of PV of periodic maintenance \$				0 (b)

**4** PV of annual operating costs

Annual cost = \$ x 11.70 = \$ 0 (c)

**5** PV cost of the do-minimum

(a) + (b) + (c) = \$ 66690 **A**

Transfer the PV cost of do minimum **A**, to **A** on worksheet 1

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**SP11 Walking and cycling facilities** continued

**Worksheet 3 - Cost of the option(s)**

<b>1</b>	PV of estimated cost of proposed work (as per attached estimate sheet)				
		\$	3023045	x 0.93 =	\$ 2811432 (a)
<b>2</b>	PV of maintenance in year 1				(b)
<b>3</b>	PV of annual maintenance costs following the work				
	(years 2 to 30 inclusive)	\$	5700	x 10.74 =	\$ 61218 (c)
<b>4</b>	PV of periodic maintenance costs				
	Time zero			1st July in the year	
	Periodic maintenance will be required in the following years:				
Year	Type of maintenance	Amount \$	SPPWF	Present Value	
Sum of PV of periodic maintenance costs =				\$	0 (d)
<b>5</b>	PV cost of additional annual maintenance				
		\$		x 10.74 =	\$ 0 (e)
<b>6</b>	PV of total cost of option				
	PV total costs (a) + (b) + (c) + (d) + (e) =				\$ 2872650 <b>B</b>
	Transfer the PV total cost for the preferred option <b>B</b> , to <b>B</b> on worksheet 1				

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## SP11 Walking and cycling facilities continued

### Worksheet 4 - Travel time cost savings

<b>1</b>	Road type (Select)	Urban arterial		
<b>2</b>	Travel time data			
	Walkers and/or cyclists average annual daily traffic current (AADT) (or volumes affected by the improvement)	200		
	Traffic growth rate (per annum)	1.50%		
	Travel time cost (TTC)	\$ 19.36		
		<b>Do-minimum</b>		<b>Option</b>
	Length of route (km)	$L^{dm}$	0.95	$L^{opt}$ 0.95
	Mean vehicle speed	$VS^{dm}$	15	$VS^{opt}$ 20
	Relative attractiveness			1.00
<b>3</b>	Annual TTC for the do-minimum			
		$\frac{AADT \times 365 \times L^{dm} \times TTC}{VS^{dm}}$		= \$ 89508 <b>(a)</b>
<b>4</b>	Annual TTC for the option			
		$\frac{AADT \times 365 \times L^{opt} \times TTC}{VS^{opt} \times RA}$		= \$ 37295 <b>(b)</b>
<b>5</b>	Value of annual TTC savings	<b>(a) - (b) = \$</b>		52213 <b>(c)</b>
<b>6</b>	PV of travel time cost savings	<b>(c) x DF<sup>TTC</sup> = \$</b>		649134 <b>C</b>
	Transfer the PV of travel time cost savings for the preferred option <b>C</b> , to <b>C</b> on worksheet 1			

## SP11 Walking and cycling facilities continued

### Worksheet 5 - Benefits for walking and cycling facilities

Health and environment benefits for walking facility					
Mode growth rate (per annum)					1.50%
<b>1</b> Health and environment benefits for footpaths and other pedestrian facilities					
Benefit = number of additional pedestrians/day x length of new facility in km x 365 x \$2.70					
L		x NPD		x 365 x \$2.70 x DF	12.43 = \$ 0 (a)
<b>2</b> Health and environment benefits from improvements at hazardous sites (provision of overbridges, underpasses, bridge widening or intersection improvements for pedestrians)					
Benefit = number of additional pedestrians/day x 365 x \$2.70					
		x NPD		x 365 x \$2.70 x DF	12.43 = \$ 0 (b)
Transfer total (a) or (b) to D on worksheet 1.					
Health and environment benefits for cycling facility					
Mode growth rate (per annum)					1.50%
<b>3</b> Health and environment benefits for cycle lanes, cycleways or increased road shoulder widths					
Benefit = number of additional cycle trips/day x length of new facility in km x 365 x \$1.40					
L	0.95	x NTD	297	x 365 x \$1.40 x DF	12.43 = \$ 1792495 (c)
<b>4</b> Health and environment benefits from improvements at hazardous sites (provision of overbridges, underpasses, bridge widening or intersection improvements for cyclists)					
Benefit = number of additional cycle trips/day x 365 x \$4.20					
		x NTD		x 365 x \$4.20 x DF	12.43 = \$ 0 (d)
Transfer total (c) or (d) to D on worksheet 1.					
Safety benefits for cycling facility					
<b>5</b> Safety benefit for cycle lanes, cycleways or increased road shoulder widths in the absence of a specific accident analysis					
Benefit = number of new and existing cycle trips/day x length of new facility in km x 365 x \$0.05					
L		x NSD		x 365 x \$0.05 x DF	12.43 = \$ 0 (e)
<b>6</b> Safety benefit from improvements at hazardous sites in the absence of a specific accident analysis (provision of overbridges, underpasses, bridge widening or intersection improvements for cyclists)					
Benefit = number of new and existing cycle trips/day x 365 x \$0.15					
		x NSD		x 365 x \$0.15 x DF	12.43 = \$ 0 (f)
Transfer total (e) or (f) to E on worksheet 1.					



SP11 Walking and cycling facilities continued

Worksheet 6 - Accident cost savings

Movement category	All movements	Vehicle involvement	Push cycle		
1 Do-minimum mean speed	15	Road category	Urban Arterial		
Posted speed limit	50	Traffic growth rate	1.50%		
2 Option mean speed	20				
Do-minimum	Severity				
	Fatal	Serious	Minor	Non-injury	
3 Number of years of typical accident rate records	5				
4 Number of reported accidents over period			2		
5 Fatal/serious severity ratio (tables A6.19(a) to (c))	0.08	0.92	1	1	
6 Number of reported accidents adjusted by severity (4) x (5)			2		
7 Accidents per year = (6)/(3)			0.40		
8 Adjustment factor for accident trend (table A6.1(a))			0.88		
9 Adjusted accidents per year = (7) x (8)			0.352		
10 Under-reporting factors (tables A6.20(a) to (b))	1	1.5	2.75	7	
11 Total estimated accidents per year = (9) x (10)			0.968		
12 Accident cost, 100km/h limit (tables A6.21(e) to (h))	3,100,000	330,000	18,000	1,200	
13 Accident cost, 50km/h limit (tables A6.21(a) to (d))	3,100,000	325,000	17,000	1,000	
14 Mean speed adjustment = ((1) - 50)/50			-0.7		
15 Cost per accident = (13) + (14) x [(12) - (13)]	3,100,000	321,500	16,300	860	
16 Accident cost per year = (11) x (15)			15,782		
17 Total cost of accidents per year (sum of columns in row (16) fatal + serious + minor + non-injury)	\$15,782				
Option					
18 Percentage accident reduction	0	0	80	80	
19 Percentage of accidents 'remaining' [100 - (18)]	100	100	20	20	
20 Predicted accidents per year (11) x (19)			0.19		
21 Accident cost, 100km/h limit (tables A6.21(e) to (h))	3,100,000	330,000	18,000	1,200	
22 Accident cost, 50km/h limit (tables A6.21(a) to (d))	3,100,000	325,000	17,000	1,000	
23 Mean speed adjustment = ((2) - 50)/50			-0.6		
24 Cost per accident = (22) + (23) x [(21) - (22)]	3,100,000	322,000	16,400	880	
25 Accident cost per year = (20) x (24)			3,176		
26 Total cost of accidents per year (sum of columns in row (25) fatal + serious + minor + non-injury)	\$3,176				
27 Annual accident cost savings = (17) - (26)	\$12,607				
28 PV accident cost savings = (27) x DF <sup>AC</sup>	\$114,055				
Transfer PV of accident cost savings, E for the preferred option to E on worksheet 1					

## SP11 Walking and cycling facilities *continued*

### Worksheet 7 – Cycle demand

New and Existing cyclists			
Buffers (km)	<0.4	0.4 to <0.8	0.8 to ≤ 1.6
<b>1</b> Area (km <sup>2</sup> )	1.2626496	2.2679488	8.8144448
<b>2</b> Density per square kilometre	4958	3221	3487
<b>3</b> Population in each buffer <b>(3) = (1) x (2)</b>	6260.22	7305.06	30735.97
<b>4</b> Total population in all buffers (Sum of <b>(3)</b> )	44301.25		
<b>5</b> Commute share (single value for all)	1.50%		
<b>6</b> Likelihood of new cyclist multiplier	1.04	0.54	0.21
<b>7</b> Row <b>(7) = (3) x (6)</b>	6510.63	3944.73	6454.55
<b>8</b> Sum of row <b>(7)</b>	16909.91		
<b>9</b> Cyclist rate <b>(9) = ((5) x 0.96) + 0.32%</b>	1.76%		
<b>10</b> Total existing daily cyclists <b>(10) = (4) x (9)</b>	779.70		
<b>11</b> Total new daily cyclists <b>(11) = (8) x (9)</b>	297.61		