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SUBJECT	Manukau Rail Crossing Cycle Routes Economics Update

Opus is currently working on project feasibility assessments of three proposed cycle routes in the Manukau area. The advice used as the basis for the draft project feasibility report (PFR) was that a Benefit Cost Ratio (BCR) of 1 or more would be sufficient to secure funding for further investigation of these projects. However recent advice has been that achieving an Economic Efficiency of "Medium" (a BCR of 2 or more) is required to secure funding for these projects. It has also been highlighted that the actual costs of the bridge component of the three routes is higher than the 2010 estimate assumed in the draft PFR.

This information has necessitated a revised approach to both the costs and benefits claimed on this project. This memo provides an outline of the approach taken in the draft PFR and also the new economic analysis that now takes into account the revised assumptions for this project.

In addition to the Value Engineering and revised Economic Evaluation a scheme Risk Register has been included in Appendix B.

1.1 Background

In 2010 three rail bridges located on the cycle routes being studied were rebuilt by KiwiRail to provide sufficient height clearance for the Auckland Electrification Project (AEP). At this time Opus prepared a funding application for Manukau City Council (MCC) to provide enhanced cycle facilities on the bridges to encourage an increase in cycling in the area.

The three rail bridges have subsequently been constructed, with the enhanced cycle lanes provided. In order to capitalise on the enhanced cycle lanes on the rail crossings, the extension of the cycle route facilities has been assessed at a project feasibility level. The three routes are as follows:

- Route 1 consists of Station Road and St George Street between Portage Road and Kolmar Road in the Papatoetoe area.
- Route 2 includes Browns Road between Roscommon Road and Great South Road.
- Route 3 includes Weymouth Road, Selwyn Road, Station Road between Selwyn Road and Great South Road, and Alfriston Road between Sykes Road and Great South Road.

1.2 Initial Approach

The first iteration of the reporting was undertaken on the assumption that funding for these schemes had already been allocated at the time the bridge components were constructed. As such it was assumed that achieving a BCR of 1 would be sufficient for each route to trigger funding approval for the next stage of works.

This assumption had significant influence on the approach taken to date. Firstly, the approach to benefits was kept consistent with the 2010 Funding Report with no further benefit streams or changes to the key assumptions being sought. Secondly, under the understanding that funding approval was only reliant on achieving a BCR of 1 or more a higher level of service (LOS) was sought than may have been the case if stricter value for money criteria was in place. For example both on road cycle lanes and off road cycle path facilities were recommended in high trip generating land- uses (e.g. schools).

The outcomes of this initial approach were that all three routes had BCRs of over 1 as shown in the following table.

Table 1: Route BCR's from Original Approach

Route	PV of Benefit	PV of Cost	BCR
Route 1 Preferred Option	$2,009,886	$1,098,375	1.83
Route 2 Preferred Option	$3,550,537	$1,624,223	2.19
Route 3 Preferred Option	$6,850,051	$1,685,102	4.07

1.3 Revised Approach

In late April, the Auckland Transport and Opus project teams were advised that BCR's of 2 or more would be required to secure funding and progress to the next stage of investigation. It was also identified that the cost for the construction of the bridge component of the projects was significantly higher than the 2010 estimate which had been used to inform the assumptions in the draft PFR, as a result the BCR's reported to date were under reporting the expected total costs of the projects.

The benefits assumed in the draft PFR were limited to the following:

- Health and Environmental Benefits for Cycling Facility, and
- Safety Benefits.

Working with the updated value for money criteria and updated actual costs for the bridge construction, and considering approaches used on other recent cycling projects our revised economic analysis has also included benefits for:

- Travel Time Benefits, and
- Health and Environmental Benefits for Walking (Route 1 only).

It has also been necessary in some locations to revisit the desired LOS of the route and remove or amend discrete elements of the cycling infrastructure. This has mainly been limited to the removal of off road shared path where an alternative on road cycle lane can be provided.

1.4 Benefits

The revised economic evaluation incorporates a wider range of benefits and practices than was proposed in the draft PFR. The following benefits have been considered for the economic evaluation and the relevant update factors have been used to reflect latest changes in NZTA's Economic Evaluation Manual. Detailed information for procedures undertaken within the economic evaluation methodology is included in Appendix A for reference.

Travel Time Cost Savings

The travel time cost savings have been applied to existing cyclists and predicted new cyclists resulting from the proposed cycle routes. Travel time benefits were applied to both the existing cyclists due to improved cycle facilities and the new cyclists in order to account for varying travel time benefits to new cyclists on the route.

Health and Environmental benefits for Walking facility

The health and environmental benefits have been applied to the new pedestrian trips generated as a result of the proposed new shared path in front of Papatoetoe West School for Route 1.

Health and Environmental Benefits for Cycling Facility

The health and environmental benefits associated with each of the proposed routes have been assessed for the number of additional cycle trips per day along the routes.

Safety Benefit for Cycling Facility

The safety benefits of providing the proposed facilities are assessed for the number of existing and additional cycle trips generated per day along the routes.

The benefits are calculated in 2012 dollar values and are discounted for the period between 2015 to 2044 (30 years of benefit claiming period after completion of construction). Total benefits for each of the proposed routes are summarised in Table 1.

Table 2: Summary of Benefits

Source of Benefit	Total Benefit		
	Route 1	Route 2	Route 3
Travel Time Benefits (Cycling)	$867,603	$1,546,714	$3,581,320
Health and Environmental Benefits (Walking and Cycling)	$2,525,775	$2,252,136	$4,843,253
Safety Benefits (Cycling)	$291,053	$274,469	$574,643
Total	$3,684,432	$4,073,319	$8,999,216

1.5 Cost Estimates

The Cost Estimates have been revised to identify cost saving options along the proposed cycle routes, under the conditions that the benefits provided by the proposed walking and cycling improvements are not compromised by the reduction of the level of provision.

The preferred option for Route 2 Browns Road in the draft PFR consists of on road cycle lanes along the entire length of the route and additional off-road cycle path facilities in the vicinity of the school to cater for the school based cycle traffic. Revisiting the option identifies that provision of an additional off-road cycle path would not generate any extra benefit in terms of travel time, health and environment benefits, or safety benefits. The cost associated with the off-road cycle path has therefore been deducted from the initial cost estimation.

Additional maintenance costs, above existing maintenance costs, have been calculated based on the assumption of full thermoplastic green paint rehabilitation every seven years.

Table 3 summarises the revised cost estimation of new cycle facility improvements for each of the routes and the NPV of total expenditure to date provided by Auckland Transport. A summary of expenditures of each cycle route is included in Appendix B.

Table 3: Summary of Costs

Cost Items	Route 1	Route 2	Route 3
Facilities after cost saving review	Retain on road cycle lanes and shared path around school	Retain on road cycle lanes and remove cycle path around school	Retain on road cycle lanes and cycle path around school
Revised Cycleway Cost (Maintenance Cost)	$540,000 ($416,250)	$1,116,000 ($544,813)	$1,380,000 ($1,545,000)
NPV Revised Cycleway Cost (NPV Maintenance Cost)	$471,957 ($108,737)	$975,377 ($142,322)	$1,206,112 ($403,602)
Total expenditure to date	$858,621	$925,082	$727,783
NPV cost including IA Grant	**$1,439,315**	**$2,042,781**	**$2,337,496**

Further consideration should be given towards ways of improving the LOS of cycle facilities around school areas at the Scheme Assessment phase of this project.

1.6 Benefit Cost Ratio

The revised benefit cost ratio has been calculated based on the revised benefits of the cycle routes, revised cycleway cost, and the NPV of total expenditure to date. The BCRs for the preferred option of each route are summarised in Table 4 below.

Table 4: Benefit Cost Ratios

Items	Route 1	Route 2	Route 3
NPV Benefits	$3,684,432	$4,073,319	$8,999,216
NPV cost including IA Grant	$1,439,315	$2,042,781	$2,337,496
Revised BCR	**2.6**	**2.0**	**3.8**

1.7 Sensitivity Analysis

Opus has undertaken sensitivity testing on the economic evaluation to develop a better appreciation as to the BCR's sensitivity to changes in cost and variable factors and as to the likely range of BCR values. Table 5 outlines the results of a sensitivity analysis of the Benefit Cost Ratio for the three cycleway routes.

Table 5: Sensitivity Analysis of Benefit Cost Ratios

Items	Route 1	Route 2	Route 3
50% Cost Increase	1.9	1.4	2.5
50% Cost Reduction	3.1	2.6	5.2
50% Increase in Cycle Demand	3.7	3.0	5.8
0% General traffic growth	1.9	1.4	2.8
Reduced Discounting Rate from 8% to 6%	3.3	2.5	4.9

The sensitivity analysis items that are seen to increase the BCR show the Economic efficiency for Route 1 and Route 2 remaining at Medium efficiency. Route 3 is seen to increase in Economic Efficiency from Medium to High for 3 sensitivity tests.

The sensitivity analysis items that are seen to reduce the BCR will still achieve value for money, with BCR values greater than 1. However, they would reduce the Economic Efficiency from Medium to Low for Route 1 and Route 2. Route 3 remains at Medium efficiency.

1.8 Next Steps

Once the results of the value engineering exercise have been reviewed and approved by Auckland Transport, an amended draft PFR report including revised information on benefit cost ratio, option assessment and other relevant sections will be issued to Auckland Transport at a later agreed date.

Appendix A:

Economic Evaluation

COST-BENEFIT ANALYSIS OF PREFERRED OPTIONS: **WORKSHEET 3**

1. Project Options	Route 1	Route 2	Route 3
COSTS:			
2. Capital Costs	$1,330,578	$1,900,459	$1,933,895
3 Maintenance Costs	$108,737	$142,322	$403,602
4. Total Costs (2) + (3)	$1,439,315	$2,042,781	$2,337,497
BENEFITS:			
5. TRAVAL T ME BENEFIT	$867,603	$1,546,714	$3,581,320
6. HEALTH & ENVIRONMENT BENEFIT	$2,525,775	$2,252,136	$4,843,253
7. SAFETY BENEFITS	$291,053	$274,469	$574,643
8. Tangible Benefits (5) to (7)	$3 684 432	$4 073 319	$8 999 216
9. Tangible B/C Ratio (8) / (4)	2.6	2 0	3.8

NZTA's
Economic Evaluation Manual Vol 1

BCR Calculation

OPUS

Route 1 Station Rd / St George St
Preferred Option

Time Zero	1/07/2012	
Year of Estimate	2012	
Construction Period	1	Months
Benefit period	1.5 to 31.5	
Construction Start	1/01/2014	
Construction payment	See Assumptions Sheet	

TRAVEL TIME SAVING							HEALTH & ENVIRONMENT BENEFIT							SAFETY BENEFITS						Discounting	Amount included in Benefit Period	CONSTRUCTION COSTS				
Calendar Year	Time Stream Year	Discount Factor	Calculated Annual Amount	Interpolated Annual Amount	Discounted Annual Amount	Amount Included in Benefit Period	Calendar Year	Time Stream Year	Discount Factor	Calculated Annual Amount	Interpolated Annual Amount	Discounted Annual Amount	Amount Included in Benefit Period	Calendar Year	Time Stream Year (Disc)	Discount Factor	Calculated Annual Amount	Interpolated Annual Amount	Discounted Annual Amount	Amount Included in Benefit Period		Calendar Year	Time Stream Year	Discount Factor	Calculated Annual Amount	Amount Included in Benefit Period
																								Construction	540,000	
2006							2006							2006												
2007							2007							2007												
2008							2008							2008												
2009	-4	1.36048896					2009	-4	1.36048896					2009	-4	1.36048896										
2010	-3	1.259712					2010	-3	1.259712					2010	-3	1.259712										
2011	-2	1.1664					2011	-2	1.1664					2011	-2	1.1664										
2012	-1	1.08	$63,013.44	$63,013.44			2012	-1	1.08	$183,445.35	$183,445.35			2012	-1	1.08	$21,138.98	$21,138.98				1/07/2013	0		1	540,000	
2013	0	1		$64,903.85			2013	0	1		$188,948.71			2013	0	1		$21,773.14									
2014	1	0.925925926		$66,794.25			2014	1	0.925925926		$194,452.07			2014	1	0.925925926		$22,407.31				1/01/2015	1.75	0.873993953	540,000	$471,957
2015	2	0.85733882		$68,684.65	$58,886.02	$29,443.01	2015	2	0.85733882		$199,955.43	$171,429.55	$85,714.78	2015	2	0.85733882		$23,041.48	$19,754.36	$9,877.18						
2016	3	0.793832241		$70,575.06	$56,024.76	$56,024.76	2016	3	0.793832241		$205,458.79	$163,099.81	$163,099.81	2016	3	0.793832241		$23,675.65	$18,794.50	$18,794.50	Birdge widening Cost					$858,621
2017	4	0.735029853		$72,465.46	$53,264.28	$53,264.28	2017	4	0.735029853		$210,962.15	$155,063.48	$155,063.48	2017	4	0.735029853		$24,309.82	$17,868.44	$17,868.44				83,250		
2018	5	0.680583197		$74,355.86	$50,605.35	$50,605.35	2018	5	0.680583197		$216,465.51	$147,322.79	$147,322.79	2018	5	0.680583197		$24,943.99	$16,976.46	$16,976.46		7	0.583490395	83,250	$48,576	
2019	6	0.630169627		$76,246.27	$48,048.08	$48,048.08	2019	6	0.630169627		$221,968.87	$139,878.04	$139,878.04	2019	6	0.630169627		$25,578.16	$16,118.58	$16,118.58		14	0.340461041	83,250	$28,343	
2020	7	0.583490395		$78,136.67	$45,592.00	$45,592.00	2020	7	0.583490395		$227,472.23	$132,727.86	$132,727.86	2020	7	0.583490395		$26,212.33	$15,294.64	$15,294.64		21	0.198655748	83,250	$16,538	
2021	8	0.540268885		$80,027.07	$43,236.14	$43,236.14	2021	8	0.540268885		$232,975.59	$125,869.46	$125,869.46	2021	8	0.540268885		$26,846.50	$14,504.33	$14,504.33		28	0.115913721	83,250	$9,650	
2022	9	0.500248967		$81,917.48	$40,979.13	$40,979.13	2022	9	0.500248967		$238,478.96	$119,298.85	$119,298.85	2022	9	0.500248967		$27,480.67	$13,747.18	$13,747.18		35	0.067634543	83,250	$5,631	
2023	10	0.463193488		$83,807.88	$38,819.26	$38,819.26	2023	10	0.463193488		$243,982.32	$113,011.02	$113,011.02	2023	10	0.463193488		$28,114.84	$13,022.61	$13,022.61						
2024	11	0.428882859		$85,698.28	$36,754.53	$36,754.53	2024	11	0.428882859		$249,485.68	$107,000.13	$107,000.13	2024	11	0.428882859		$28,749.01	$12,329.96	$12,329.96						
2025	12	0.397113759		$87,588.69	$34,782.67	$34,782.67	2025	12	0.397113759		$254,989.04	$101,259.65	$101,259.65	2025	12	0.397113759		$29,383.18	$11,668.46	$11,668.46						
2026	13	0.367697925		$89,479.09	$32,901.28	$32,901.28	2026	13	0.367697925		$260,492.40	$95,782.51	$95,782.51	2026	13	0.367697925		$30,017.34	$11,037.32	$11,037.32						
2027	14	0.340461041		$91,369.49	$31,107.75	$31,107.75	2027	14	0.340461041		$265,995.76	$90,561.19	$90,561.19	2027	14	0.340461041		$30,651.51	$10,435.65	$10,435.65						
2028	15	0.315241705		$93,259.90	$29,399.41	$29,399.41	2028	15	0.315241705		$271,499.12	$85,587.84	$85,587.84	2028	15	0.315241705		$31,285.68	$9,862.55	$9,862.55						
2029	16	0.291890468		$95,150.30	$27,773.47	$27,773.47	2029	16	0.291890468		$277,002.48	$80,854.38	$80,854.38	2029	16	0.291890468		$31,919.85	$9,317.10	$9,317.10						
2030	17	0.270268951		$97,040.70	$26,227.09	$26,227.09	2030	17	0.270268951		$282,505.84	$76,352.56	$76,352.56	2030	17	0.270268951		$32,554.02	$8,798.34	$8,798.34						
2031	18	0.250249029		$98,931.11	$24,757.41	$24,757.41	2031	18	0.250249029		$288,009.20	$72,074.02	$72,074.02	2031	18	0.250249029		$33,188.19	$8,305.31	$8,305.31						
2032	19	0.231712064		$100,821.51	$23,361.56	$23,361.56	2032	19	0.231712064		$293,512.56	$68,010.40	$68,010.40	2032	19	0.231712064		$33,822.36	$7,837.05	$7,837.05						
2033	20	0.214548207		$102,711.91	$22,036.66	$22,036.66	2033	20	0.214548207		$299,015.92	$64,153.33	$64,153.33	2033	20	0.214548207		$34,456.53	$7,392.59	$7,392.59						
2034	21	0.198655748		$104,602.32	$20,779.85	$20,779.85	2034	21	0.198655748		$304,519.28	$60,494.51	$60,494.51	2034	21	0.198655748		$35,090.70	$6,970.97	$6,970.97						
2035	22	0.183940507		$106,492.72	$19,588.33	$19,588.33	2035	22	0.183940507		$310,022.64	$57,025.72	$57,025.72	2035	22	0.183940507		$35,724.87	$6,571.25	$6,571.25						
2036	23	0.170315284		$108,383.12	$18,459.30	$18,459.30	2036	23	0.170315284		$315,526.00	$53,738.90	$53,738.90	2036	23	0.170315284		$36,359.04	$6,192.50	$6,192.50						
2037	24	0.157699337		$110,273.53	$17,390.06	$17,390.06	2037	24	0.157699337		$321,029.36	$50,626.12	$50,626.12	2037	24	0.157699337		$36,993.21	$5,833.80	$5,833.80						
2038	25	0.146017905		$112,163.93	$16,377.94	$16,377.94	2038	25	0.146017905		$326,532.72	$47,679.62	$47,679.62	2038	25	0.146017905		$37,627.38	$5,494.27	$5,494.27						
2039	26	0.135201764		$114,054.33	$15,420.35	$15,420.35	2039	26	0.135201764		$332,036.08	$44,891.86	$44,891.86	2039	26	0.135201764		$38,261.54	$5,173.03	$5,173.03						
2040	27	0.125186818		$115,944.74	$14,514.75	$14,514.75	2040	27	0.125186818		$337,539.44	$42,255.49	$42,255.49	2040	27	0.125186818		$38,895.71	$4,869.23	$4,869.23						
2041	28	0.115913721		$117,835.14	$13,658.71	$13,658.71	2041	28	0.115913721		$343,042.80	$39,763.37	$39,763.37	2041	28	0.115913721		$39,529.88	$4,582.06	$4,582.06						
2042	29	0.107327519		$119,725.54	$12,849.85	$12,849.85	2042	29	0.107327519		$348,546.17	$37,408.60	$37,408.60	2042	29	0.107327519		$40,164.05	$4,310.71	$4,310.71						
2043	30	0.099377333		$121,615.95	$12,085.87	$12,085.87	2043	30	0.099377333		$354,049.53	$35,184.50	$35,184.50	2043	30	0.099377333		$40,798.22	$4,054.42	$4,054.42						
2044	31	0.092016049		$123,506.35	$11,364.57	$11,364.57	2044	31	0.092016049		$359,552.89	$33,084.64	$33,084.64	2044	31	0.092016049		$41,432.39	$3,812.44	$3,812.44						
2045	32	0.085200045		$125,396.75	$10,683.81		2045	32	0.085200045		$365,056.25	$31,102.81		2045	32	0.085200045		$42,066.56	$3,584.07							
2046	33	0.078888931					2046	33	0.078888931					2046	33	0.078888931										
						$867,603							$2,525,775							$291,053						$1,439,315.18

OPUS

Route 2 Browns Rd
Preferred Option

Time Zero	1/07/2012	
Year of Estimate	2012	
Construction Period	1	Months
Benefit period	1.5 to 31.5	
Construction Start	1/01/2014	
Construction payment	See Assumptions Sheet	

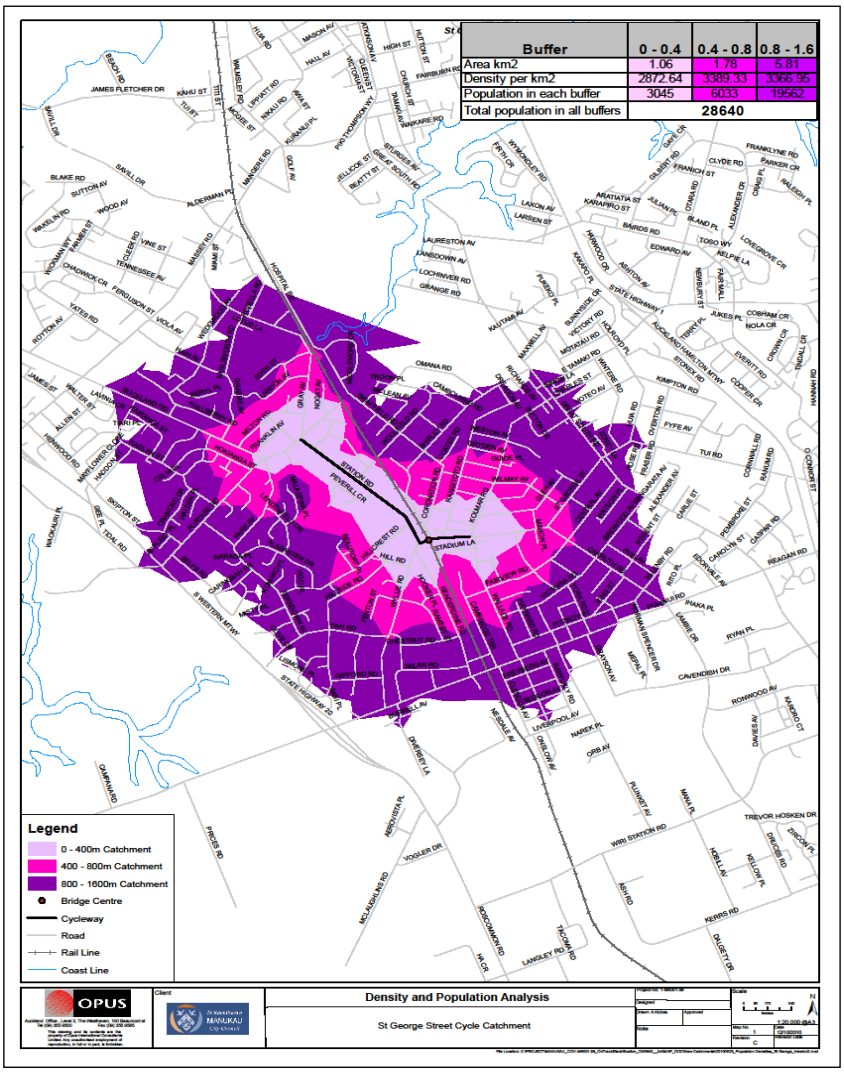
TRAVEL TIME SAVING							HEALTH & ENVIRONMENT BENEFIT							SAFETY BENEFITS					Discounting	Amount included in Benefit Period	CONSTRUCTION COSTS				
Calendar Year	Time Stream Year	Discount Factor	Calculated Annual Amount	Interpolated Annual Amount	Discounted Annual Amount	Amount Included in Benefit Period	Calendar Year	Time Stream Year	Discount Factor	Calculated Annual Amount	Interpolated Annual Amount	Discounted Annual Amount	Amount Included in Benefit Period	Calendar Year	Time Stream Year (Disc)	Discount Factor	Calculated Annual Amount	Interpolated Annual Amount	Discounted Annual Amount	Amount Included in Benefit Period	Calendar Year	Time Stream Year	Discount Factor	Calculated Annual Amount	Amount Included in Benefit Period
																							Construction	1,116,000	
2006							2006							2006											
2007							2007							2007											
2008							2008							2008											
2009	-4	1.36048896					2009	-4	1.36048896					2009	-4	1.36048896									
2010	-3	1.259712					2010	-3	1.259712					2010	-3	1.259712									
2011	-2	1.1664					2011	-2	1.1664					2011	-2	1.1664									
2012	-1	1.08	$112,336.79	$112,336.79			2012	-1	1.08	$163,571.10	$163,571.10			2012	-1	1.08	$19,934.48	$19,934.48			1/07/2013	0		1	1,116,000	
2013	0	1		$115,706.90			2013	0	1		$168,478.23			2013	0	1		$20,532.51								
2014	1	0.925925926		$119,077.00			2014	1	0.925925926		$173,385.37			2014	1	0.925925926		$21,130.54			1/01/2015	1.75		0.873993953	1,116,000	$975,377
2015	2	0.85733882		$122,447.10	$104,978.66	$52,489.33	2015	2	0.85733882		$178,292.50	$152,857.08	$76,428.54	2015	2	0.85733882		$21,728.58	$18,628.75	$9,314.38						
2016	3	0.793832241		$125,817.21	$99,877.76	$99,877.76	2016	3	0.793832241		$183,199.63	$145,429.77	$145,429.77	2016	3	0.793832241		$22,326.61	$17,723.58	$17,723.58	Birdge widening Cost					$925,082
2017	4	0.735029853		$129,187.31	$94,956.53	$94,956.53	2017	4	0.735029853		$188,106.77	$138,264.09	$138,264.09	2017	4	0.735029853		$22,924.65	$16,850.30	$16,850.30				108,963	
2018	5	0.680583197		$132,557.41	$90,216.35	$90,216.35	2018	5	0.680583197		$193,013.90	$131,362.02	$131,362.02	2018	5	0.680583197		$23,522.68	$16,009.14	$16,009.14		7	0.583490395	108,963	$63,579
2019	6	0.630169627		$135,927.52	$85,657.39	$85,657.39	2019	6	0.630169627		$197,921.03	$124,723.82	$124,723.82	2019	6	0.630169627		$24,120.71	$15,200.14	$15,200.14		14	0.340461041	108,963	$37,097
2020	7	0.583490395		$139,297.62	$81,278.82	$81,278.82	2020	7	0.583490395		$202,828.16	$118,348.29	$118,348.29	2020	7	0.583490395		$24,718.75	$14,423.15	$14,423.15		21	0.198655748	108,963	$21,646
2021	8	0.540268885		$142,667.73	$77,078.93	$77,078.93	2021	8	0.540268885		$207,735.30	$112,232.92	$112,232.92	2021	8	0.540268885		$25,316.78	$13,677.87	$13,677.87		28	0.115913721	108,963	$12,630
2022	9	0.500248967		$146,037.83	$73,055.27	$73,055.27	2022	9	0.500248967		$212,642.43	$106,374.16	$106,374.16	2022	9	0.500248967		$25,914.82	$12,963.86	$12,963.86		35	0.067634543	108,963	$7,370
2023	10	0.463193488		$149,407.93	$69,204.78	$69,204.78	2023	10	0.463193488		$217,549.56	$100,767.54	$100,767.54	2023	10	0.463193488		$26,512.85	$12,280.58	$12,280.58					
2024	11	0.428882859		$152,778.04	$65,523.88	$65,523.88	2024	11	0.428882859		$222,456.70	$95,407.86	$95,407.86	2024	11	0.428882859		$27,110.89	$11,627.39	$11,627.39					
2025	12	0.397113759		$156,148.14	$62,008.58	$62,008.58	2025	12	0.397113759		$227,363.83	$90,289.30	$90,289.30	2025	12	0.397113759		$27,708.92	$11,003.59	$11,003.59					
2026	13	0.367697925		$159,518.25	$58,654.53	$58,654.53	2026	13	0.367697925		$232,270.96	$85,405.55	$85,405.55	2026	13	0.367697925		$28,306.95	$10,408.41	$10,408.41					
2027	14	0.340461041		$162,888.35	$55,457.14	$55,457.14	2027	14	0.340461041		$237,178.10	$80,749.90	$80,749.90	2027	14	0.340461041		$28,904.99	$9,841.02	$9,841.02					
2028	15	0.315241705		$166,258.45	$52,411.60	$52,411.60	2028	15	0.315241705		$242,085.23	$76,315.36	$76,315.36	2028	15	0.315241705		$29,503.02	$9,300.58	$9,300.58					
2029	16	0.291890468		$169,628.56	$49,512.96	$49,512.96	2029	16	0.291890468		$246,992.36	$72,094.72	$72,094.72	2029	16	0.291890468		$30,101.06	$8,786.21	$8,786.21					
2030	17	0.270268951		$172,998.66	$46,756.17	$46,756.17	2030	17	0.270268951		$251,899.49	$68,080.61	$68,080.61	2030	17	0.270268951		$30,699.09	$8,297.01	$8,297.01					
2031	18	0.250249029		$176,368.76	$44,136.11	$44,136.11	2031	18	0.250249029		$256,806.63	$64,265.61	$64,265.61	2031	18	0.250249029		$31,297.13	$7,832.08	$7,832.08					
2032	19	0.231712064		$179,738.87	$41,647.66	$41,647.66	2032	19	0.231712064		$261,713.76	$60,642.24	$60,642.24	2032	19	0.231712064		$31,895.16	$7,390.49	$7,390.49					
2033	20	0.214548207		$183,108.97	$39,285.70	$39,285.70	2033	20	0.214548207		$266,620.89	$57,203.03	$57,203.03	2033	20	0.214548207		$32,493.19	$6,971.36	$6,971.36					
2034	21	0.198655748		$186,479.08	$37,045.14	$37,045.14	2034	21	0.198655748		$271,528.03	$53,940.60	$53,940.60	2034	21	0.198655748		$33,091.23	$6,573.76	$6,573.76					
2035	22	0.183940507		$189,849.18	$34,920.95	$34,920.95	2035	22	0.183940507		$276,435.16	$50,847.62	$50,847.62	2035	22	0.183940507		$33,689.26	$6,196.82	$6,196.82					
2036	23	0.170315284		$193,219.28	$32,908.20	$32,908.20	2036	23	0.170315284		$281,342.29	$47,916.89	$47,916.89	2036	23	0.170315284		$34,287.30	$5,839.65	$5,839.65					
2037	24	0.157699337		$196,589.39	$31,002.02	$31,002.02	2037	24	0.157699337		$286,249.43	$45,141.34	$45,141.34	2037	24	0.157699337		$34,885.33	$5,501.39	$5,501.39					
2038	25	0.146017905		$199,959.49	$29,197.67	$29,197.67	2038	25	0.146017905		$291,156.56	$42,514.07	$42,514.07	2038	25	0.146017905		$35,483.37	$5,181.21	$5,181.21					
2039	26	0.135201764		$203,329.59	$27,490.52	$27,490.52	2039	26	0.135201764		$296,063.69	$40,028.33	$40,028.33	2039	26	0.135201764		$36,081.40	$4,878.27	$4,878.27					
2040	27	0.125186818		$206,699.70	$25,876.08	$25,876.08	2040	27	0.125186818		$300,970.82	$37,677.58	$37,677.58	2040	27	0.125186818		$36,679.43	$4,591.78	$4,591.78					
2041	28	0.115913721		$210,069.80	$24,349.97	$24,349.97	2041	28	0.115913721		$305,877.96	$35,455.45	$35,455.45	2041	28	0.115913721		$37,277.47	$4,320.97	$4,320.97					
2042	29	0.107327519		$213,439.91	$22,907.98	$22,907.98	2042	29	0.107327519		$310,785.09	$33,355.79	$33,355.79	2042	29	0.107327519		$37,875.50	$4,065.08	$4,065.08					
2043	30	0.099377333		$216,810.01	$21,546.00	$21,546.00	2043	30	0.099377333		$315,692.22	$31,372.65	$31,372.65	2043	30	0.099377333		$38,473.54	$3,823.40	$3,823.40					
2044	31	0.092016049		$220,180.11	$20,260.10	$20,260.10	2044	31	0.092016049		$320,599.36	$29,500.29	$29,500.29	2044	31	0.092016049		$39,071.57	$3,595.21	$3,595.21					
2045	32	0.085200045		$223,550.22	$19,046.49		2045	32	0.085200045		$325,506.49	$27,733.17		2045	32	0.085200045		$39,669.61	$3,379.85						
2046	33	0.078888931					2046	33	0.078888931					2046	33	0.078888931									
						$1,546,714							$2,252,136							$274,469					$2,042,781.21

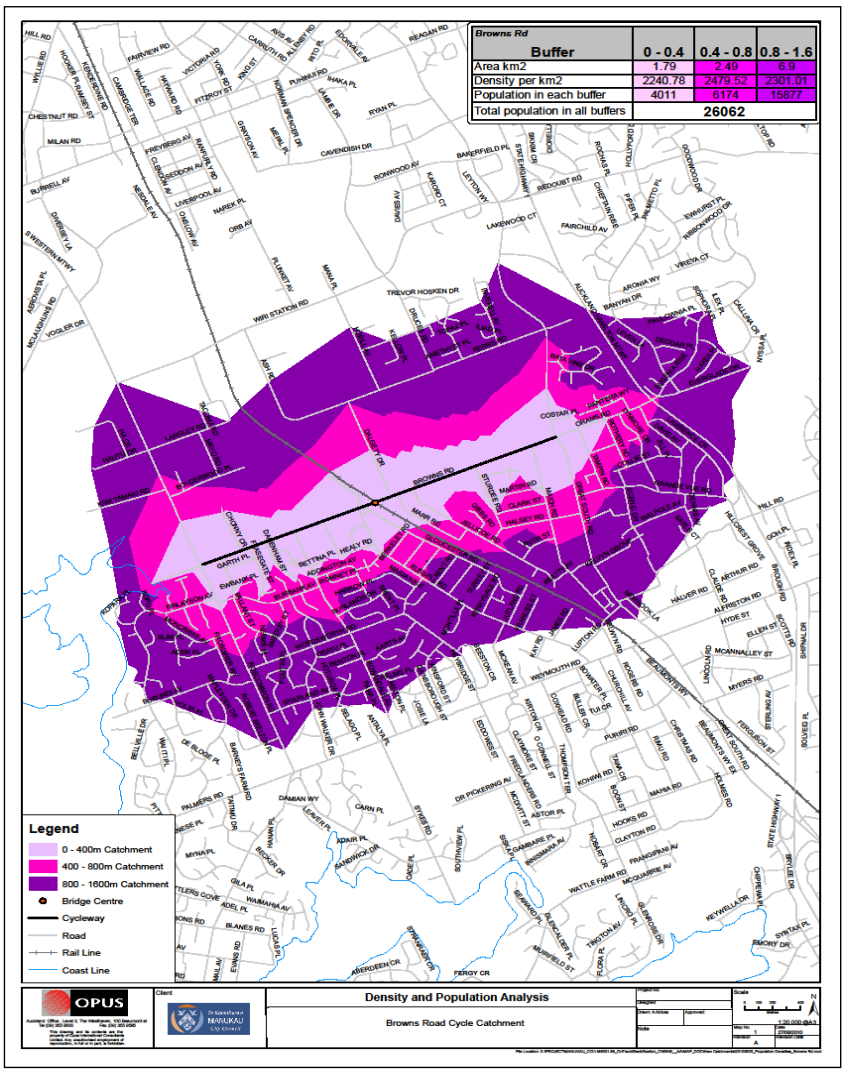
OPUS

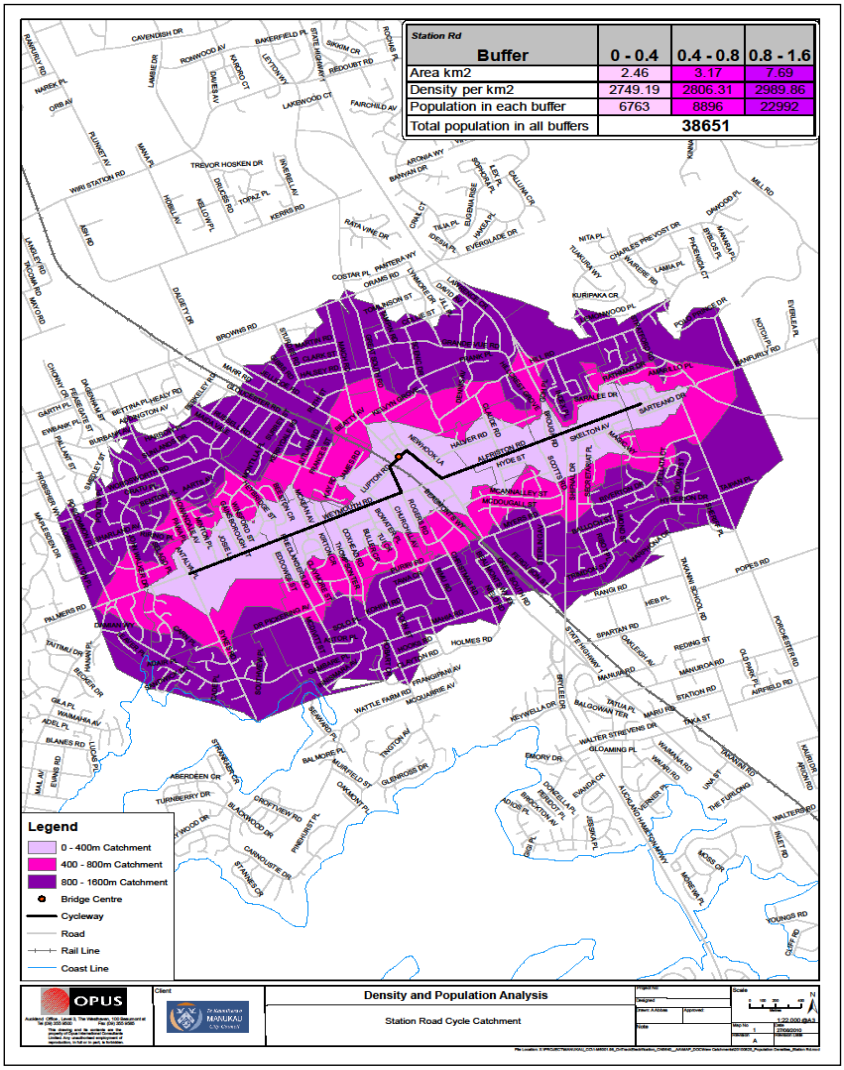
Route 3 Weymouth Rd / Alfriston Rd
Preferred Option

Time Zero	1/07/2012	
Year of Estimate	2012	
Construction Period	1	Months
Benefit period	1.5 to 31.5	
Construction Start	1/01/2014	
Construction payment	See Assumptions Sheet	

TRAVEL TIME SAVING							HEALTH & ENVIRONMENT BENEFIT							SAFETY BENEFITS						Discounting	Amount included in Benefit Period	CONSTRUCTION COSTS				
Calendar Year	Time Stream Year	Discount Factor	Calculated Annual Amount	Interpolated Annual Amount	Discounted Annual Amount	Amount Included in Benefit Period	Calendar Year	Time Stream Year	Discount Factor	Calculated Annual Amount	Interpolated Annual Amount	Discounted Annual Amount	Amount Included in Benefit Period	Calendar Year	Time Stream Year (Disc)	Discount Factor	Calculated Annual Amount	Interpolated Annual Amount	Discounted Annual Amount	Amount Included in Benefit Period			Calendar Year	Time Stream Year	Discount Factor	Calculated Annual Amount	Amount Included in Benefit Period
																							Construction		1,380,000	
2006							2006							2006													
2007							2007							2007													
2008							2008							2008													
2009	-4	1.36048896					2009	-4	1.36048896					2009	-4	1.36048896											
2010	-3	1.259712					2010	-3	1.259712					2010	-3	1.259712											
2011	-2	1.1664					2011	-2	1.1664					2011	-2	1.1664											
2012	-1	1.08	$260,108.83	$260,108.83			2012	-1	1.08	$351,762.18	$351,762.18			2012	-1	1.08	$41,735.93	$41,735.93				1/07/2013	0		1	1,380,000	
2013	0	1		$267,912.09			2013	0	1		$362,315.05			2013	0	1		$42,988.00									
2014	1	0.925925926		$275,715.36			2014	1	0.925925926		$372,867.91			2014	1	0.925925926		$44,240.08				1/01/2015	1.75		0.873993953	1,380,000	$1,206,112
2015	2	0.85733882		$283,518.62	$243,071.52	$121,535.76	2015	2	0.85733882		$383,420.78	$328,721.52	$164,360.76	2015	2	0.85733882		$45,492.16	$39,002.19	$19,501.10							
2016	3	0.793832241		$291,321.89	$231,260.71	$231,260.71	2016	3	0.793832241		$393,973.64	$312,748.98	$312,748.98	2016	3	0.793832241		$46,744.24	$37,107.08	$37,107.08	Bridge Widening Cost					$727,783
2017	4	0.735029853		$299,125.15	$219,865.92	$219,865.92	2017	4	0.735029853		$404,526.51	$297,339.06	$297,339.06	2017	4	0.735029853		$47,996.31	$35,278.72	$35,278.72				309,000		
2018	5	0.680583197		$306,928.42	$208,890.32	$208,890.32	2018	5	0.680583197		$415,079.37	$282,496.05	$282,496.05	2018	5	0.680583197		$49,248.39	$33,517.63	$33,517.63		7	0.583490395	309,000	$180,299	
2019	6	0.630169627		$314,731.68	$198,334.35	$198,334.35	2019	6	0.630169627		$425,632.24	$268,220.51	$268,220.51	2019	6	0.630169627		$50,500.47	$31,823.86	$31,823.86		14	0.340461041	309,000	$105,202	
2020	7	0.583490395		$322,534.95	$188,196.04	$188,196.04	2020	7	0.583490395		$436,185.10	$254,509.82	$254,509.82	2020	7	0.583490395		$51,752.55	$30,197.11	$30,197.11		21	0.198655748	309,000	$61,385	
2021	8	0.540268885		$330,338.21	$178,471.46	$178,471.46	2021	8	0.540268885		$446,737.97	$241,358.62	$241,358.62	2021	8	0.540268885		$53,004.62	$28,636.75	$28,636.75		28	0.115913721	309,000	$35,817	
2022	9	0.500248967		$338,141.48	$169,154.92	$169,154.92	2022	9	0.500248967		$457,290.83	$228,759.27	$228,759.27	2022	9	0.500248967		$54,256.70	$27,141.86	$27,141.86		35	0.067634543	309,000	$20,899	
2023	10	0.463193488		$345,944.74	$160,239.35	$160,239.35	2023	10	0.463193488		$467,843.70	$216,702.16	$216,702.16	2023	10	0.463193488		$55,508.78	$25,711.31	$25,711.31						
2024	11	0.428882859		$353,748.01	$151,716.46	$151,716.46	2024	11	0.428882859		$478,396.56	$205,176.09	$205,176.09	2024	11	0.428882859		$56,760.86	$24,343.76	$24,343.76						
2025	12	0.397113759		$361,551.27	$143,576.98	$143,576.98	2025	12	0.397113759		$488,949.43	$194,168.55	$194,168.55	2025	12	0.397113759		$58,012.94	$23,037.73	$23,037.73						
2026	13	0.367697925		$369,354.54	$135,810.90	$135,810.90	2026	13	0.367697925		$499,502.30	$183,665.96	$183,665.96	2026	13	0.367697925		$59,265.01	$21,791.62	$21,791.62						
2027	14	0.340461041		$377,157.80	$128,407.54	$128,407.54	2027	14	0.340461041		$510,055.16	$173,653.91	$173,653.91	2027	14	0.340461041		$60,517.09	$20,603.71	$20,603.71						
2028	15	0.315241705		$384,961.07	$121,355.78	$121,355.78	2028	15	0.315241705		$520,608.03	$164,117.36	$164,117.36	2028	15	0.315241705		$61,769.17	$19,472.22	$19,472.22						
2029	16	0.291890468		$392,764.33	$114,644.16	$114,644.16	2029	16	0.291890468		$531,160.89	$155,040.80	$155,040.80	2029	16	0.291890468		$63,021.25	$18,395.30	$18,395.30						
2030	17	0.270268951		$400,567.60	$108,260.98	$108,260.98	2030	17	0.270268951		$541,713.76	$146,408.41	$146,408.41	2030	17	0.270268951		$64,273.32	$17,371.08	$17,371.08						
2031	18	0.250249029		$408,370.86	$102,194.41	$102,194.41	2031	18	0.250249029		$552,266.62	$138,204.19	$138,204.19	2031	18	0.250249029		$65,525.40	$16,397.67	$16,397.67						
2032	19	0.231712064		$416,174.13	$96,432.57	$96,432.57	2032	19	0.231712064		$562,819.49	$130,412.07	$130,412.07	2032	19	0.231712064		$66,777.48	$15,473.15	$15,473.15						
2033	20	0.214548207		$423,977.39	$90,963.59	$90,963.59	2033	20	0.214548207		$573,372.35	$123,016.01	$123,016.01	2033	20	0.214548207		$68,029.56	$14,595.62	$14,595.62						
2034	21	0.198655748		$431,780.66	$85,775.71	$85,775.71	2034	21	0.198655748		$583,925.22	$116,000.10	$116,000.10	2034	21	0.198655748		$69,281.64	$13,763.20	$13,763.20						
2035	22	0.183940507		$439,583.92	$80,857.29	$80,857.29	2035	22	0.183940507		$594,478.08	$109,348.60	$109,348.60	2035	22	0.183940507		$70,533.71	$12,974.01	$12,974.01						
2036	23	0.170315284		$447,387.18	$76,196.88	$76,196.88	2036	23	0.170315284		$605,030.95	$103,046.02	$103,046.02	2036	23	0.170315284		$71,785.79	$12,226.22	$12,226.22						
2037	24	0.157699337		$455,190.45	$71,783.23	$71,783.23	2037	24	0.157699337		$615,583.82	$97,077.16	$97,077.16	2037	24	0.157699337		$73,037.87	$11,518.02	$11,518.02						
2038	25	0.146017905		$462,993.71	$67,605.37	$67,605.37	2038	25	0.146017905		$626,136.68	$91,427.17	$91,427.17	2038	25	0.146017905		$74,289.95	$10,847.66	$10,847.66						
2039	26	0.135201764		$470,796.98	$63,652.58	$63,652.58	2039	26	0.135201764		$636,689.55	$86,081.55	$86,081.55	2039	26	0.135201764		$75,542.02	$10,213.41	$10,213.41						
2040	27	0.125186818		$478,600.24	$59,914.44	$59,914.44	2040	27	0.125186818		$647,242.41	$81,026.22	$81,026.22	2040	27	0.125186818		$76,794.10	$9,613.61	$9,613.61						
2041	28	0.115913721		$486,403.51	$56,380.84	$56,380.84	2041	28	0.115913721		$657,795.28	$76,247.50	$76,247.50	2041	28	0.115913721		$78,046.18	$9,046.62	$9,046.62						
2042	29	0.107327519		$494,206.77	$53,041.99	$53,041.99	2042	29	0.107327519		$668,348.14	$71,732.15	$71,732.15	2042	29	0.107327519		$79,298.26	$8,510.89	$8,510.89						
2043	30	0.099377333		$502,010.04	$49,888.42	$49,888.42	2043	30	0.099377333		$678,901.01	$67,467.37	$67,467.37	2043	30	0.099377333		$80,550.34	$8,004.88	$8,004.88						
2044	31	0.092016049		$509,813.30	$46,911.01	$46,911.01	2044	31	0.092016049		$689,453.87	$63,440.82	$63,440.82	2044	31	0.092016049		$81,802.41	$7,527.13	$7,527.13						
2045	32	0.085200045		$517,616.57	$44,100.95		2045	32	0.085200045		$700,006.74	$59,640.61		2045	32	0.085200045		$83,054.49	$7,076.25							
2046	33	0.078888931					2046	33	0.078888931					2046	33	0.078888931										
						$3,581,320							$4,843,253							$574,643						$2,337,496.69


Buffer | 0 - 0.4 | 0.4 - 0.8 | 0.8 - 1.6
Area km2 | 1.06 | 1.78 | 5.81
Density per km2 | 2872.64 | 3389.33 | 3366.95
Population in each buffer | 3045 | 6033 | 19562
Total population in all buffers | 28640
Legend
0 - 400m Catchment
400 - 800m Catchment
800 - 1600m Catchment
Bridge Centre
Cycleway
Road
Rail Line
Coast Line
OPUS
Client
Density and Population Analysis
St George Street Cycle Catchment


Browns Rd
Buffer | 0 - 0.4 | 0.4 - 0.8 | 0.8 - 1.6
Area km2 | 1.79 | 2.49 | 6.9
Density per km2 | 2240.78 | 2479.52 | 2301.01
Population in each buffer | 4011 | 6174 | 15877
Total population in all buffers | 26062
Legend
0 - 400m Catchment
400 - 800m Catchment
800 - 1600m Catchment
Bridge Centre
Cycleway
Road
Rail Line
Coast Line
OPUS
Client
Density and Population Analysis
Browns Road Cycle Catchment


Station Rd Buffer | 0 - 0.4 | 0.4 - 0.8 | 0.8 - 1.6
Area km2 | 2.46 | 3.17 | 7.69
Density per km2 | 2749.19 | 2806.31 | 2989.86
Population in each buffer | 6763 | 8896 | 22992
Total population in all buffers | 38651
Legend
0 - 400m Catchment
400 - 800m Catchment
800 - 1600m Catchment
Bridge Centre
Cycleway
Road
Rail Line
Coast Line
OPUS
Client
Density and Population Analysis
Station Road Cycle Catchment

St George Street

SP11 Walking and cycling facilities continued

Worksheet 7 – Cycle demand **2012**

	New and existing cyclists			
	Buffers (km)	<0.4	0.4 to <0.8	0.8 to ≤ 1.6
1	Area (km^2)	1.06	1.78	5.81
2	Density per square kilometre	2872	3389	3367
3	Population in each buffer **(3)** = **(1)** x **(2)**	3044	6032	19562
4	Total population in all buffers (Sum of **(3)**)		28639	
5	Commute share (single value for all)		0.60%	
6	Likelihood of new cyclist multiplier	1.04	0.54	0.21
7	Row **(7)** = **(3)** x **(6)**	3166	3258	4108
8	Sum of row **(7)**		10532	
9	Cyclist rate **(9)** = (**(5)** x 0.96) + 0.32%		0.90%	
	Annual Traffic Growth (Base Year to Forecast)			
10	Total existing daily cyclists **(10)** = **(4)** x **(9)**		257	
11	Total new daily cyclists **(11)** = **(8)** x **(9)**		94	
	Likelihood Scale Factor		100%	
	Existing Cylists		257	
	Factored new daily cyclists		94	

	New and existing pedestrians
	Existing Pedestrians
	New Daily Pedestrians

Browns Rd

SP11 Walking and cycling facilities continued

Worksheet 7 – Cycle demand **2012**

	New and existing cyclists			
	Buffers (km)	<0.4	0.4 to <0.8	0.8 to ≤ 1.6
1	Area (km^2)	1.79	2.49	6.9
2	Density per square kilometre	2241	2480	2301
3	Population in each buffer **(3)** = **(1)** x **(2)**	4011	6175	15877
4	Total population in all buffers (Sum of **(3)**)		26063	
5	Commute share (single value for all)		0.60%	
6	Likelihood of new cyclist multiplier	1.04	0.54	0.21
7	Row **(7)** = **(3)** x **(6)**	4172	3335	3334
8	Sum of row **(7)**		10841	
9	Cyclist rate **(9)** = (**(5)** x 0.96) + 0.32%		0.90%	
	Annual Traffic Growth (Base Year to Forecast)			
10	Total existing daily cyclists **(10)** = **(4)** x **(9)**		234	
11	Total new daily cyclists **(11)** = **(8)** x **(9)**		97	
	Likelihood Scale Factor		100%	
	Existing Cylists		234	
	Factored new daily cyclists		97	

	New and existing pedestrians
	Existing Pedestrians
	New Daily Pedestrians

Weymouth Rd

SP11 Walking and cycling facilities continued

Worksheet 7 – Cycle demand **2012**

	New and existing cyclists			
	Buffers (km)	<0.4	0.4 to <0.8	0.8 to ≤ 1.6
1	Area (km^2)	2.46	3.17	7.69
2	Density per square kilometre	2749	2806	2990
3	Population in each buffer **(3)** = **(1)** x **(2)**	6763	8895	22993
4	Total population in all buffers (Sum of **(3)**)		38651	
5	Commute share (single value for all)		0.60%	
6	Likelihood of new cyclist multiplier	1.04	0.54	0.21
7	Row **(7)** = **(3)** x **(6)**	7033	4803	4829
8	Sum of row **(7)**		16665	
9	Cyclist rate **(9)** = (**(5)** x 0.96) + 0.32%		0.90%	
	Annual Traffic Growth (Base Year to Forecast)			
10	Total existing daily cyclists **(10)** = **(4)** x **(9)**		346	
11	Total new daily cyclists **(11)** = **(8)** x **(9)**		149	
	Likelihood Scale Factor		100%	
	Existing Cylists		346	
	Factored new daily cyclists		149	

	New and existing pedestrians
	Existing Pedestrians
	New Daily Pedestrians

St George St

Pedestrian Counts	
School Name	Papatoetoe West
number of student	760
% of Pedestrian (arrival)	30.0%
% of Pedestrian (departure)	30.0%
Total daily Pedestrian Trips	456
proportion of Pedestrian using the propose route	50%
Total daily Pedestrian Trips using the propose route	228
sum	228
Assumed that Student Pedestrian is about 50% of all pedestrian	
Therefore, all pedestrian =	456
Assumed that 10% of all pedestrian are new	
Therefore, new pedestrian =	46

St George St

SP11 Walking and cycling facilities continued

Worksheet 4 - Travel time cost savings (Cycle)

		2012 Existing Users		2012 New Users	
1	Road type (Select)	Urban arterial			
2	Travel time data				
	Walkers and/or cyclists average annual daily traffic current (AADT) (or volumes affected by the improvement)	257		94	
	Traffic growth rate (per annum)	3 00%			
	Travel time cost (TTC)	$ 19.36			

	Do-minimum		Option	
Length of route (km)	L^{dm}	1.50	L^{opt}	1.50
Mean mode speed	VS^{dm}	25	VS^{opt}	25
Relative attractiveness				1.80

3	Annual TTC for the do-minimum $\frac{AADT \times 365 \times L^{dm} \times TTC}{VS^{dm}}$	= $	108964	(a)	39854	(d)
4	Annual TTC for the option $\frac{AADT \times 365 \times L^{opt} \times TTC}{VS^{opt} \times RA}$	= $	60535	(b)	22141	(e)
5	Value of annual TTC savings	(a) - (b) = $	48428	(c)	17713	(f)
	Total TTC Savings	(c) + 0.5 x (f) = $			57285	

Browns Rd

SP11 Walking and cycling facilities continued

Worksheet 4 - Travel time cost savings (Cycle)

		2012 Existing Users		2012 New Users	
1	Road type (Select)	Urban arterial			
2	Travel time data				
	Walkers and/or cyclists average annual daily traffic current (AADT) (or volumes affected by the improvement)	234		97	
	Traffic growth rate (per annum)	3.00%			
	Travel time cost (TTC)	$ 19.36			

	Do-minimum		Option	
Length of route (km)	L^{dm}	2.70	L^{opt}	2.70
Mean mode speed	VS^{dm}	25	VS^{opt}	25
Relative attractiveness				1.90

3	Annual TTC for the do-minimum $\frac{AADT \times 365 \times L^{dm} \times TTC}{VS^{dm}}$	= $	178582	(a)	74028	(d)
4	Annual TTC for the option $\frac{AADT \times 365 \times L^{opt} \times TTC}{VS^{opt} \times RA}$	= $	93991	(b)	38962	(e)
5	Value of annual TTC savings	(a) - (b) = $	84592	(c)	35066	(f)
	Total TTC Savings	(c) + 0.5 x (f) = $			102124	

Weymouth

SP11 Walking and cycling facilities continued

Worksheet 4 - Travel time cost savings (Cycle)					2012 Existing Users		2012 New Users	
1	Road type (Select)				Urban arterial			
2	Travel time data							
	Walkers and/or cyclists average annual daily traffic current (AADT) (or volumes affected by the improvement)				346		149	
	Traffic growth rate (per annum)				3.00%			
	Travel time cost (TTC)			$	19.36			
		Do-minimum		Option				
	Length of route (km)	L^{dm}	4.20	L^{opt}	4.20			
	Mean mode speed	VS^{dm}	25	VS^{opt}	25			
	Relative attractiveness				1.90			
3	Annual TTC for the do-minimum							
	$\frac{AADT \times 365 \times L^{dm} \times TTC}{VS^{dm}}$			= $	410756	(a)	176886	(d)
4	Annual TTC for the option							
	$\frac{AADT \times 365 \times L^{opt} \times TTC}{VS^{opt} \times RA}$			= $	216187	(b)	93098	(e)
5	Value of annual TTC savings			(a) - (b) = $	194568	(c)	83788	(f)
	Total TTC Savings			**(c) + 0.5 x (f) = $**			236463	

St George St

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) 3.00%

1 Health and environment benefits for footpaths and other pedestrian facil ties

Benefit = number of add t onal pedestrians/day x length of new facil ty in km x 365 x $2.70

2012 L 0.50 x NPD 46 x 365 x $2.70 x DF 1.00 = $ 22667 **(a)**

2 Health and environment benefits from improvements at hazardous sites

(provision of overbridges, underpasses, br dge w dening or intersection improvements for pedestrians)

Benefit = number of add t onal pedestrians/day x 365 x $2.70

2012 NPD x 365 x $2.70 x DF 1.00 = $ 0 **(b)**

Transfer total **(a)** or **(b)** to **D** on worksheet 1.

Health and environment benefits for cycling facility

Mode growth rate (per annum)

3 Health and environment benefits for cycle lanes, cycleways or increased road shoulder w dths

Benefit = number of add t onal cycle trips/day x length of new facility in km x 365 x $1.40

L **(c)**

4 Health and environment benefits from improvements at hazardous sites

(provision of overbridges, underpasses, br dge w dening or intersection improvements for cyclists)

Benefit = number of add t onal cycle trips/day x 365 x $4.20

2012 NTD 94 x 365 x $4.20 x DF 1.00 = $ 144102 **(d)**

Transfer total **(c)** or **(d)** to **D** on worksheet 1.

Safety benefits for cycling facility

5 Safety benef t for cycle lanes, cycleways or increased road shoulder widths in the absence of a specif c accident analysis

Benefit = number of new and existing cycle trips/day x length of new facil ty in km x 365 x $0.05

L **(e)**

6 Safety benef t from improvements at hazardous s tes in the absence of a specific acc dent analysis

(provision of overbridges, underpasses, br dge w dening or intersection improvements for cyclists)

Benefit = number of new and existing cycle trips/day x 365 x $0.15

2012 NTD 351 x 365 x $0.15 x DF 1.00 = $ 19217 **(f)**

Transfer total **(e)** or **(f)** to **E** on worksheet 1.

Browns Rd

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) 3.00%

1 Health and environment benefits for footpaths and other pedestrian facil ties

Benefit = number of additional pedestrians/day x length of new facility in km x 365 x $2.70

2012 L [ ] x NPD [ ] x 365 x $2.70 x DF 1.00 = $ 0 **(a)**

2 Health and environment benefits from improvements at hazardous s tes

(provis on of overbr dges, underpasses, bridge w dening or intersect on improvements for pedestrians)

Benefit = number of additional pedestrians/day x 365 x $2.70

2012 NPD [ ] x 365 x $2.70 x DF 1.00 = $ 0 **(b)**

Transfer total **(a)** or **(b)** to **D** on worksheet 1.

Health and environment benefits for cycling facility

Mode growth rate (per annum)

3 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

[ ] [ ] [ ] **(c)**

4 Health and environment benefits from improvements at hazardous s tes

(provis on of overbr dges, underpasses, bridge w dening or intersect on improvements for cyclists)

Benefit = number of additional cycle trips/day x 365 x $4.20

2012 NTD 97 x 365 x $4.20 x DF 1.00 = $ 148701 **(d)**

Transfer total **(c)** or **(d)** to **D** on worksheet 1.

Safety benefits for cycling facility

5 Safety benef t for cycle lanes, cycleways or increased road shoulder w dths in the absence of a specific acc dent analysis

Benefit = number of new and existing cycle trips/day x length of new facility in km x 365 x $0.05

L [ ] [ ] [ ] **(e)**

6 Safety benef t from improvements at hazardous sites in the absence of a specific accident analysis

(provis on of overbr dges, underpasses, bridge w dening or intersect on improvements for cyclists)

Benefit = number of new and existing cycle trips/day x 365 x $0.15

2012 NTD 331 x 365 x $0.15 x DF 1.00 = $ 18122 **(f)**

Transfer total **(e)** or **(f)** to **E** on worksheet 1.

Weymouth Rd

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) 3.00%

1 Health and environment benefits for footpaths and other pedestrian facil ties

Benefit = number of additional pedestrians/day x length of new facility in km x 365 x $2.70

2012 L ____ x NPD ____ x 365 x $2.70 x DF 1.00 = $ 0 **(a)**

2 Health and environment benefits from improvements at hazardous s tes

(provis on of overbr dges, underpasses, bridge w dening or intersect on improvements for pedestrians)

Benefit = number of additional pedestrians/day x 365 x $2.70

2012 NPD ____ x 365 x $2.70 x DF 1.00 = $ 0 **(b)**

Transfer total **(a)** or **(b)** to **D** on worksheet 1.

Health and environment benefits for cycling facility

Mode growth rate (per annum)

3 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 4.20 x NTD 149 x 365 x $1.40 x DF 1.00 = $ 319784 **(c)**

4 Health and environment benefits from improvements at hazardous s tes

(provis on of overbr dges, underpasses, bridge w dening or intersect on improvements for cyclists)

Benefit = number of additional cycle trips/day x 365 x $4.20

____ ____ ____ **(d)**

Transfer total **(c)** or **(d)** to **D** on worksheet 1.

Safety benefits for cycling facility

5 Safety benef t for cycle lanes, cycleways or increased road shoulder w dths in the absence of a specific acc dent analysis

Benefit = number of new and existing cycle trips/day x length of new facility in km x 365 x $0.05

L 4.20 x NSD 495 x 365 x $0.05 x DF 1.00 = $ 37942 **(e)**

6 Safety benef t from improvements at hazardous sites in the absence of a specific accident analysis

(provis on of overbr dges, underpasses, bridge w dening or intersect on improvements for cyclists)

Benefit = number of new and existing cycle trips/day x 365 x $0.15

____ ____ ____ **(f)**

Transfer total **(e)** or **(f)** to **E** on worksheet 1.

Evaluation Assumptions

Assumptions

Description	Value
Discount Rate	8%
Minimum Commuter Costs	$3.40
GST	15%
Growth Rate	3.0%

Travel Time Costs - EEM Vol.2 SP11 Worksheet 4 Table 1

Road Type	Travel Time Cost $/hr(2008)
Urban Arterial	19.36
Urban Other	19.31
Rural Strategic	27.67
Rural Other	27.04

Benefit Factors for Cycle Facilities - EEM Vol.2 SP11 Worksheet 4 Table 2

Type of Cycle Facility	Relative Attractive.
On-street with parking, no marked cycle lane	1.0
On-street with parking, marked cycle lane	1.8
On-street without parking, marked cycle lane	1.9
Off-street cycle path	2.0

New Facility Benefits - EEM Vol.2 Table 8.2 & 8.3

Benefit	New Ped Facility $/ped km	New Cycle Facility $/cyc km
Health	2.6	1.3
Safety	0	0.05
Road Traffic Reduction	0.1	0.1

Benefit Update Factors - EEM Vol.1 A12.2

Benefit	Update Factor
Travel Time	1.37
VOC	1.06
Accident Cost Savings	1.2
Comfort Benefits	1.39
Driver Frustration	1.37
Passenger Transport User Benefits	1.1
Walking and Cycling	1.1
Travel Behaviour Change Benefits	1.1

Appendix B:

Risk Register

RISK REGISTER: 464-13-246-PS - Manukau Cycle Routes - Project Feasibility Report

	Prepared by	[redacted]	Activity	Project Feasibility Report	
	Reviewed by		Sources of Information	Project Team	Links to:
	Compilation Date	Jun-13			

No.	Description	Description	Risk Owner	Threat/ Opportunity	Existing Controls	Consequence	Severity Description	Severity Rating (C)	Probability Description	Probability Rating (L)	Highest Score =CxL	Risk Mitigation Strategy	
1.0		Project Risks											
1.1	Report Type and Funding Application Requirements	Project Feasibility Report and supporting documents not to NZTA standards for Scheme Assessment level funding applica ions	AT	T	Liaison with NZTA to date	Need to fund shortfall/cost difference fall solely to AT.	Mod	30	UL	3	90	Continued liaison, discussion and agreement with NZTA that reports and supporting documents meet NZTA requirements for funding.	
1.2	Concept Designs	Drawings not undertaken to SAR / Preliminary Design standard	AT/Opus	T		Potential for changes to designs with time and cost increase. Potential impact to Opus reputation if drawings are progressed within AT as Scheme Assessment level drawings	Mod	30	UL	3	90	Project team continuity and background context would help to smoothly transition from PFR to Detailed Design.	
1.3	Utility Services	Loca ion of services on routes may impact on design / construciton of cycle routes	AT	T	None to date	Time and cost increase	Mod	30	UL	3	90	Liaison with service authorities	
1.4	Client Decision Process	Client internal disagreements between options (walking and cycling, traffic operations etc)	AT	T	Internal AT processes	Time and cost increase	Mod	30	UU	2	60	Collaborative approach between consultants and relevant Auckland Transport departments.	
1.5	Stakeholder Interest	Consultation resuslts in request for design changes or lack of buy-in. Protest / Public opposition	AT	T	Current Relationships / Liaison with Stakeholders	Potential for changes to designs with time and cost increase.	Mod	30	Lik	5	150	Collaborative approach to stakeholder consultation. Early identification and engagement with Special Interest Groups.	
1.6	Environmental Impact	Investigation may require further, more detailed environmental assessment including: stormwater, arboreal,	AT	T	Limited envirnmental assessment undertaken as part of PFR	Time and cost increase	Min	20	UL	3	60	Plan to undertake more detailed environmental impact assessment at early stage	
1.7	Road Designation	New designs falling outside exisitng cross section requiring land take.	AT / Opus	T	Topo Survey / Corridor Design / Land Requirement Plans	Additional time, cost, consultation	Mod	30	UU	2	60	Identification during preliminary/detailed design of land boundary, shared path, geotechnical and structural parameters that may impact on Road Corridor extents.	
1.8	Health & Safety	Poorly implemented health & safety plan results in injury to staff or public.	AT / Opus	T	Health and Safety Plan and Internal Processes	Injury to staff of public	Maj	40	UU	2	80	Health & Safety implemented as top priority requiring protocols to be adhered to throughout project. Team Briefing.	
											0		
											0		
											0		
											0		
											0		

LEGEND

Severity		Probability		The following colours are used to detail risk categories:
50 Sub	Substantial	5 Lik	Likely	Extreme ⩾250
40 Maj	Major	4 QC	Quite Common	Very High ⩾140
30 Mod	Moderate	3 UL	Unlikely	High ⩾70
20 Min	Minor	2 UU	Unusual	Moderate ⩾30
10 Neg	Negligent	1 R	Rare	Low > 10
				Negligible < 10

Risk Matrix

Probability \ Severity	10	20	30	40	50
1	10	20	30	40	50
2	20	40	60	80	100
3	30	60	90	120	150
4	40	80	120	160	200
5	50	100	150	200	250

OPUS