Appendix P Economic Evaluation Worksheets and Peer Review

GENERAL ROADING IMPROVEMENT WORKS:
EVALUATION SUMMARY

WORKSHEET 1

1 Evaluator(s) Dhimantha Ranatunga
Reviewer(s) David Wanty

2 Project / Package Details

Approved Organisation Name	MWH (NZ) Ltd
Project / Package Name	Otaki to Levin RoNS
Your Reference	
Project Description	Otaki to Levin RoNS
Describe the problem to be addressed	Levin Bypass

3 Location

Brief description of location: SH1 and SH57 north of Otaki to north of Levin

4 Alternatives and Options

Describe the Do Minimum	Retain existing state highway
Summarise the options assessed	Levin Bypass Option 46

5 Timing

Time Zero	1 July 2012
Assumed construction start date)	1 July 2018
Expected duration of construction (Months)	24 months

6 Economic Efficiency

Date economic evaluation completed (mm/yyyy)	27 September 2011
Base date for costs	1 July 2012
AADT at Time Zero (SH1 Taylors Rd)	9,000
Traffic Growth Rate at Time Zero (%)	1.5%

Existing Roughness	3.20	IRI or NAASRA	Existing Traffic Speed	50-100	km/hr
Predicted Roughness	3.20	IRI or NAASRA	Predicted Traffic Speed	50-100	km/hr
Affected SH1 before improvements	30.600	km	Posted Speed Limit	50-100	km/hr
Affected SH57 and Queen St (W / E)	17.500	km	Road Type		
Bypass total sectional length:	32.130	km	Gradient Before Improvements	0%	
			Gradient After Improvements	0%	

7 PV Cost of Do Minimum — **Cost $** $5,851,150 **A**

8 PV Cost of the preferred Option — **Cost $** $311,383,255 **B**

9 Benefit values from Worksheet 4, 5 or 6

PV Travel Time Cost savings:	$	$8,509,114	C	x Update Factor^{TT}	1.33	= $	$11,317,122	W
PV VOC & CO2 savings:	$	$2,066,361	D	x Update Factor^{VOC}	1.04	= $	$2,149,015	Y
PV Accident Cost savings:	$	$52,591,435	E	x Update Factor^{AC}	1.17	= $	$61,531,979	Z

10 B/C Ratio = $\frac{W + Y + Z}{B - A}$ = $\frac{\text{BENEFITS}}{\text{COSTS}}$ = $\frac{11317122 + 2149015 + 61531979}{311383255 - 5851150}$ = **0.25**

11 FYRR = $\frac{1^{st}\text{ Year BENEFITS}}{\text{COSTS}}$ = $\frac{6054540.18}{311383255 - 5851150}$ = **2.0%**

TTC year 1 benefits (Mid Yea	$	$524,041
(Mid Year 6.5 discounted)		
VOC & CO2 year 1 savings:	$	$135,655
(Mid Year 6.5 discounted)		
2011 annunal AXS	$	$5,394,844

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Simplified Procedure 3 - General Road Improvements

GENERAL ROADING IMPROVEMENT WORKS:
EVALUATION SUMMARY

WORKSHEET 1

1 Evaluator(s) Dhimantha Ranatunga
Reviewer(s) David Wanty

2 Project / Package Details

Approved Organisation Name	MWH (NZ) Ltd
Project / Package Name	Otaki to Levin RoNS
Your Reference	
Project Description	Otaki to Levin RoNS
Describe the problem to be addressed	Levin Bypass

3 Location

Brief description of location: SH1 and SH57 north of Otaki to north of Levin

4 Alternatives and Options

Describe the Do Minimum	Retain existing state highway
Summarise the options assessed	Levin Bypass Option 64

5 Timing

Time Zero	1 July 2012
Assumed construction start date)	1 July 2018
Expected duration of construction (Months)	24 months

6 Economic Efficiency

Date economic evaluation completed (mm/yyyy)	27 September 2011
Base date for costs	1 July 2012
AADT at Time Zero (SH1 Taylors Rd)	9,000
Traffic Growth Rate at Time Zero (%)	1.5%

Existing Roughness	3.20	IRI or NAASRA	Existing Traffic Speed	50-100	km/hr
Predicted Roughness	3.20	IRI or NAASRA	Predicted Traffic Speed	50-100	km/hr
Affected SH1 before improvements	30.600	km	Posted Speed Limit	50-100	km/hr
Affected SH57 and Queen St (W / E)	17.500	km	Road Type		
Bypass total sectional length:	32.420	km	Gradient Before Improvements	0%	
			Gradient After Improvements	0%	

7 PV Cost of Do Minimum — **Cost $** $5,851,150 **A**

8 PV Cost of the preferred Option — **Cost $** $302,720,845 **B**

9 Benefit values from Worksheet 4, 5 or 6

PV Travel Time Cost savings:	$ -$28,839,102	**C**	x Update Factor^{TT}	1.33	= $	-$38,356,005	**W**
PV VOC & CO2 savings:	$ -$28,210,751	**D**	x Update Factor^{VOC}	1.04	= $	-$29,339,181	**Y**
PV Accident Cost savings:	$ $61,568,939	**E**	x Update Factor^{AC}	1.17	= $	$72,035,659	**Z**

10 B/C Ratio = $\frac{W + Y + Z}{B - A}$ = $\frac{\text{BENEFITS}}{\text{COSTS}}$ = $\frac{-38356005 + -29339181 + 72035659}{302720845 - 5851150}$ = **0.01**

11 FYRR = $\frac{1^{st}\text{ Year BENEFITS}}{\text{COSTS}}$ = $\frac{4321007.21}{302720845 - 5851150}$ = **1.5%**

TTC year 1 benefits (Mid Yea	$	-$2,022,719
(Mid Year 6.5 discounted)		
VOC & CO2 year 1 savings:	$	-$2,005,282
(Mid Year 6.5 discounted)		
2011 annunal AXS	$	$8,349,008

GENERAL ROADING IMPROVEMENT WORKS:
EVALUATION SUMMARY

WORKSHEET 1

1 Evaluator(s) Dhimantha Ranatunga
Reviewer(s) David Wanty

2 Project / Package Details

Approved Organisation Name	MWH (NZ) Ltd
Project / Package Name	Otaki to Levin RoNS
Your Reference	
Project Description	Otaki to Levin RoNS
Describe the problem to be addressed	Levin Bypass

3 Location

Brief description of location: SH1 and SH57 north of Otaki to north of Levin

4 Alternatives and Options

Describe the Do Minimum	Retain existing state highway
Summarise the options assessed	Levin Bypass Option 66

5 Timing

Time Zero	1 July 2012
Assumed construction start date)	1 July 2018
Expected duration of construction (Months)	24 months

6 Economic Efficiency

Date economic evaluation completed (mm/yyyy)	27 September 2011
Base date for costs	1 July 2012
AADT at Time Zero (SH1 Taylors Rd)	9,000
Traffic Growth Rate at Time Zero (%)	1.5%

Existing Roughness	3.20	IRI or NAASRA	Existing Traffic Speed	50-100	km/hr
Predicted Roughness	3.20	IRI or NAASRA	Predicted Traffic Speed	50-100	km/hr
Affected SH1 before improvements	30.600	km	Posted Speed Limit	50-100	km/hr
Affected SH57 and Queen St (W / E)	17.500	km	Road Type		
Bypass total sectional length:	32.650	km	Gradient Before Improvements	0%	
			Gradient After Improvements	0%	

7 PV Cost of Do Minimum **Cost $** $5,851,150 **A**

8 PV Cost of the preferred Option **Cost $** $299,797,694 **B**

9 Benefit values from Worksheet 4, 5 or 6

PV Travel Time Cost savings:	$	-$20,359,573	C	x Update Factor^{TT}	1.33	= $	-$27,078,232	W
PV VOC & CO2 savings:	$	-$19,305,192	D	x Update Factor^{VOC}	1.04	= $	-$20,077,400	Y
PV Accident Cost savings:	$	$51,901,878	E	x Update Factor^{AC}	1.17	= $	$60,725,197	Z

10 B/C Ratio = $\frac{W + Y + Z}{B - A}$ = $\frac{\text{BENEFITS}}{\text{COSTS}}$ = $\frac{-27078232 + -20077400 + 60725197}{299797694 - 5851150}$ = **0.05**

11 FYRR = $\frac{1^{st}\text{ Year BENEFITS}}{\text{COSTS}}$ = $\frac{4626505.92}{299797694 - 5851150}$ = **1.6%**

TTC year 1 benefits (Mid Yea	$	-$1,139,925
(Mid Year 6.5 discounted)		
VOC & CO2 year 1 savings:	$	-$1,122,245
(Mid Year 6.5 discounted)		
2011 annunal AXS	$	$6,888,676

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Simplified Procedure 3 - General Road Improvements

GENERAL ROADING IMPROVEMENT WORKS:
EVALUATION SUMMARY

WORKSHEET 1

1 Evaluator(s) Dhimantha Ranatunga
Reviewer(s) David Wanty

2 Project / Package Details

Approved Organisation Name	MWH (NZ) Ltd
Project / Package Name	Otaki to Levin RoNS
Your Reference	
Project Description	Otaki to Levin RoNS
Describe the problem to be addressed	Levin Bypass

3 Location

Brief description of location: SH1 and SH57 north of Otaki to north of Levin

4 Alternatives and Options

Describe the Do Minimum	Retain existing state highway
Summarise the options assessed	Levin Bypass Option 73

5 Timing

Time Zero	1 July 2012
Assumed construction start date)	1 July 2018
Expected duration of construction (Months)	24 months

6 Economic Efficiency

Date economic evaluation completed (mm/yyyy)	27 September 2011
Base date for costs	1 July 2012
AADT at Time Zero (SH1 Taylors Rd)	9,000
Traffic Growth Rate at Time Zero (%)	1.5%

Existing Roughness	3.20	IRI or NAASRA	Existing Traffic Speed	50-100	km/hr
Predicted Roughness	3.20	IRI or NAASRA	Predicted Traffic Speed	50-100	km/hr
Affected SH1 before improvements	30.600	km	Posted Speed Limit	50-100	km/hr
Affected SH57 and Queen St (W / E)	17.500	km	Road Type		
Bypass total sectional length:	32.010	km	Gradient Before Improvements	0%	
			Gradient After Improvements	0%	

7 PV Cost of Do Minimum **Cost $** $5,851,150 **A**

8 PV Cost of the preferred Option **Cost $** $300,217,146 **B**

9 Benefit values from Worksheet 4, 5 or 6

PV Travel Time Cost savings:	$	-$15,052,605	C	x Update Factor^{TT}	1.33	= $ -$20,019,964	W
PV VOC & CO2 savings:	$	-$15,503,713	D	x Update Factor^{VOC}	1.04	= $ -$16,123,862	Y
PV Accident Cost savings:	$	$60,580,224	E	x Update Factor^{AC}	1.17	= $ $70,878,862	Z

10 B/C Ratio = $\frac{W + Y + Z}{B - A}$ = $\frac{\text{BENEFITS}}{\text{COSTS}}$ = $\frac{-20019964 + -16123862 + 70878862}{300217146 - 5851150}$ = **0.12**

11 FYRR = $\frac{1^{st}\text{ Year BENEFITS}}{\text{COSTS}}$ = $\frac{5897917.91}{299797694 - 5851150}$ = **2.0%**

TTC year 1 benefits (Mid Yea	$	-$1,135,331
(Mid Year 6.5 discounted)		
VOC & CO2 year 1 savings:	$	-$1,131,459
(Mid Year 6.5 discounted)		
2011 annunal AXS	$	$8,164,708

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Simplified Procedure 3 - General Road Improvements

GENERAL ROADING IMPROVEMENT WORKS:
EVALUATION SUMMARY

WORKSHEET 1

1 Evaluator(s) Dhimantha Ranatunga
Reviewer(s) David Wanty

2 Project / Package Details

Approved Organisation Name	MWH (NZ) Ltd
Project / Package Name	Otaki to Levin RoNS
Your Reference	
Project Description	Otaki to Levin RoNS
Describe the problem to be addressed	Levin Bypass

3 Location

Brief description of location: SH1 and SH57 north of Otaki to north of Levin

4 Alternatives and Options

Describe the Do Minimum	Retain existing state highway
Summarise the options assessed	Levin Bypass Option 75

5 Timing

Time Zero	1 July 2012
Assumed construction start date)	1 July 2018
Expected duration of construction (Months)	24 months

6 Economic Efficiency

Date economic evaluation completed (mm/yyyy)	27 September 2011
Base date for costs	1 July 2012
AADT at Time Zero (SH1 Taylors Rd)	9,000
Traffic Growth Rate at Time Zero (%)	1.5%

Existing Roughness	3.20	IRI or NAASRA	Existing Traffic Speed	50-100	km/hr
Predicted Roughness	3.20	IRI or NAASRA	Predicted Traffic Speed	50-100	km/hr
Affected SH1 before improvements	30.600	km	Posted Speed Limit	50-100	km/hr
Affected SH57 and Queen St (W / E)	17.500	km	Road Type		
Bypass total sectional length:	32.240	km	Gradient Before Improvements	0%	
			Gradient After Improvements	0%	

7 PV Cost of Do Minimum **Cost $** $5,851,150 **A**

8 PV Cost of the preferred Option **Cost $** $288,249,365 **B**

9 Benefit values from Worksheet 4, 5 or 6

PV Travel Time Cost savings:	$	-$17,583,774	C	x Update Factor^{TT}	1.33	= $	-$23,386,420 W
PV VOC & CO2 savings:	$	-$17,677,259	D	x Update Factor^{VOC}	1.04	= $	-$18,384,349 Y
PV Accident Cost savings:	$	$50,927,855	E	x Update Factor^{AC}	1.17	= $	$59,585,590 Z

10 B/C Ratio = $\frac{W + Y + Z}{B - A}$ = $\frac{\text{BENEFITS}}{\text{COSTS}}$ = $\frac{-23386420 + -18384349 + 59585590}{288249365 - 5851150}$ = **0.06**

11 FYRR = $\frac{1^{st}\text{ Year BENEFITS}}{\text{COSTS}}$ = $\frac{4148516.05}{299797694 - 5851150}$ = **1.5%**

TTC year 1 benefits (Mid Yea	$	-$1,307,403
(Mid Year 6.5 discounted)		
VOC & CO2 year 1 savings:	$	-$1,274,037
(Mid Year 6.5 discounted)		
2011 annunal AXS	$	$6,729,956

GENERAL ROADING IMPROVEMENT WORKS:
EVALUATION SUMMARY

WORKSHEET 1

1 Evaluator(s) Dhimantha Ranatunga
Reviewer(s) David Wanty

2 Project / Package Details

Approved Organisation Name	MWH (NZ) Ltd
Project / Package Name	Otaki to Levin RoNS
Your Reference	
Project Description	Otaki to Levin RoNS
Describe the problem to be addressed	Levin Bypass

3 Location

Brief description of location: SH1 and SH57 north of Otaki to north of Levin

4 Alternatives and Options

Describe the Do Minimum	Retain existing state highway
Summarise the options assessed	Levin Bypass Option 76

5 Timing

Time Zero	1 July 2012
Assumed construction start date)	1 July 2018
Expected duration of construction (Months)	24 months

6 Economic Efficiency

Date economic evaluation completed (mm/yyyy)	27 September 2011
Base date for costs	1 July 2012
AADT at Time Zero (SH1 Taylors Rd)	9,000
Traffic Growth Rate at Time Zero (%)	1.5%

Existing Roughness	3.20	IRI or NAASRA	Existing Traffic Speed	50-100	km/hr
Predicted Roughness	3.20	IRI or NAASRA	Predicted Traffic Speed	50-100	km/hr
Affected SH1 before improvements	30.600	km	Posted Speed Limit	50-100	km/hr
Affected SH57 and Queen St (W / E)	17.500	km	Road Type		
Bypass total sectional length:	33.240	km	Gradient Before Improvements	0%	
			Gradient After Improvements	0%	

7 PV Cost of Do Minimum **Cost $** $5,851,150 **A**

8 PV Cost of the preferred Option **Cost $** $308,072,873 **B**

9 Benefit values from Worksheet 4, 5 or 6

PV Travel Time Cost savings:	$ -$18,208,829	C	x Update Factor^{TT}	1.33	= $	-$24,217,743	W
PV VOC & CO2 savings:	$ -$19,597,415	D	x Update Factor^{VOC}	1.04	= $	-$20,381,312	Y
PV Accident Cost savings:	$ $50,333,217	E	x Update Factor^{AC}	1.17	= $	$58,889,864	Z

10 B/C Ratio = $\frac{W + Y + Z}{B - A}$ = $\frac{\text{BENEFITS}}{\text{COSTS}}$ = $\frac{-24217743 + -20381312 + 58889864}{308072873 - 5851150}$ = **0.05**

11 FYRR = $\frac{1^{st}\text{ Year BENEFITS}}{\text{COSTS}}$ = $\frac{4328269.02}{299797694 - 5851150}$ = **1.4%**

TTC year 1 benefits (Mid Yea	$	-$1,101,818
(Mid Year 6.5 discounted)		
VOC & CO2 year 1 savings:	$	-$1,209,374
(Mid Year 6.5 discounted)		
2011 annunal AXS	$	$6,639,461

BCR AND INCREMENTAL ANALYSIS

WORKSHEET 7

Time Zero 1/07/2012 Base Date 1/07/2011

BCR_N	Do Minimum	64	66	73	75	64	66	73	75
	PV of Benefits as Calculated ($mill)					PV of Net Benefits ($mill)			
Travel Time Cost Savings						-$38.4	-$27.1	-$20.0	-$23.4
VOC & CO2 Savings						-$29.3	-$20.1	-$16.1	-$18.4
Accident Cost Savings						$72.0	$60.7	$70.9	$59.6
PV Total Net Benefits						$4.3	$13.6	$34.7	$17.8
	PV of Costs as Calculated ($mill)					PV of Net Costs ($mill)			
PV Capital Costs	$0	$295.0	$292.0	$292.5	$280.5				
Maintenance Costs	$5.9	$7.8	$7.8	$7.7	$7.7				
PV Total Net Costs	$5.9					$296.9	$293.9	$294.4	$282.4
					BCR_N	**0.01**	**0.05**	**0.12**	**0.06**

BASE OPTION FOR COMPARISON			NEXT HIGHER COST OPTION			INCREMENTAL ANALYSIS			Preferred Option BCR	Then Incremental BCR
Option	Total Costs	Total Benefits	Option	Total Costs	Total Benefits	Incremental Costs	Incremental Benefits	Incremental BCR_N	B/C <= 2	1.0
	(1)	(2)		(3)	(4)	(5) = (3) - (1)	(6) = (4) - (2)	(7) = (6) / (5)	2 < B/C < 4	2.0
75	$282.4	$17.8	66	$293.9	$13.6	$11.5	-$4.2	-0.37	B/C >= 4	4.0
75	$282.4	$17.8	73	$294.4	$34.7	$12.0	$16.9	**1.41**		
73	$294.4	$34.7	64	$296.9	$4.3	$2.5	-$30.4	-12.14		

Preferred Option = 73

aurecon

Project: Otaki to North of Levin Expressway

Independent Peer Review Report

Prepared for: NZ Transport Agency

Project: 218083

6 December 2011

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Independent Peer Review for Improvement Projects

Section A: General

Applicant for funding assistance: *(Organisation)*	NZ Transport Agency
Evaluator: *(Applicant's representative responsible for the project analyses and report)*	Dhimantha Ranatunga and David Wanty, MWH New Zealand Ltd
Evaluation date:	October to December 2011
Reviewer: *(Name and organisation)*	Melanie Muirson, Aurecon New Zealand Ltd Christchurch
Project name:	SH1 Otaki to North of Levin Expressway
Problem description:	The section of SH1 subject to the project investigation is located from north of Levin (south of the Manawatu River) to the boundary of the Peka Peka to Otaki RONS project (RP 967/0.50 to RP 995/3.30). The existing highway has high traffic volumes and has short inefficient passing opportunities. This results in a reduced level of service which leads to driver frustration, particularly in high demand holiday periods. The highway passes through a number of towns and settlements such as Levin and there are two substandard rail overbridges located at Ohau and Manakau. It should be noted that as part of this project, SH57 from Levin to Rolston's Corner Rest Area is included in the study area.
Alternatives and options considered:	Eighty one contiguous corridors were identified through a detailed analysis. Using a MCA, this was narrowed down to 13 contiguous corridors. A further analysis short listed four corridors with two further corridors that will continue to be developed. The corridors include: • Contiguous Corridors 64, 66, 73 and 75 are eastern options that pass east of Levin and either passes east or west of Manakau. • Contiguous Corridor 46 – passes west of Levin • Contiguous Corridor 76 – passes east of Levin via a remote valley to the east of Manakau.

Preferred option:	Because this is a Scoping Report, four corridor options have been recommended to be taken into the Scheme Assessment phase for further detailed investigation. The corridors include: • Contiguous Corridors 64, 66, 73 and 75.
Do-minimum description:	Retain the existing two lane highway on its current alignment with reduced levels of service, congestion and a lack of passing opportunities.
Project cost: *(Undiscounted construction/implementation cost, including escalation. Include lease and operating costs where applicable.)*	The Feasibility Expected Estimates as per the values in the economic evaluation are: Contiguous Corridor 64: $457 M Contiguous Corridor 66: $453 M Contiguous Corridor 73: $457 M Contiguous Corridor 75: $437 M Contiguous Corridor 46: $482 M Contiguous Corridor 76: $472 M
Key project attributes: *(e.g. length (km), accident history, existing and predicted roughness, existing and predicted traffic speed, etc)*	2011 AADT (Time Zero) • AM Peak: 6,973 vehicles per day • Interpeak: 6,180 vehicles per day • PM Peak: 7,485 vehicles per day Traffic Growth • 1.5% per annum for light vehicles • 2.0% per annum for heavy vehicles Do Minimum mean and Option design speeds range between 50km/h and 100km/h dependent on the location along the route with the speed limits being restricted to 50km/h in towns such as Levin. The Do minimum and Option Corridors have been modeled in SATURN. More discussion on this will follow. Five Year Crash History – 14 fatal injury, 39 serious injury, 125 minor injury and 298 non-injury crashes for all three sections on SH1 and the section of SH57 between

Section B: Conclusions

Conformity: *(With the Planning, programming and funding manual and the Economic evaluation manual)*	This evaluation is generally in accordance with the relevant NZTA guidelines.	
Credibility: *(Problem description, results of economic evaluation, costs, key benefits, assumptions, risks)*	This is an evaluation at the Scoping Report Phase. The intention was to narrow down the large number of potential corridor options so that a manageable number of corridor options can be taken through to the Scheme Assessment Phase.	
Choice of do-minimum:	Acceptable to the Reviewer.	
Identification of options:	The identified options (preferred Contiguous Corridor Options) are acceptable to the Reviewer.	
Economic efficiency evaluation: *(Reviewer's analysis versus evaluator's analysis, incremental analysis – see Sections D and E)*	Refer to Sections D and E and comments given in Sections F and G.	
Sensitivity and risk analysis:	The sensitivity analysis has not yet been undertaken for this project to test the robustness of the BCR to the major variables such as project costs, traffic growth rates and impacts on the travel time and VOC benefits in the evaluation.	
Assessment profile: *(Reviewer's profile versus evaluator's profile)*	Evaluator's profile	Reviewer's profile
	Strategic Fit: Not assessed	*Strategic Fit*: Not assessed
	Effectiveness: Not assessed	*Effectiveness*: Not assessed
	Economic efficiency: Not assessed	*Economic efficiency*: Low
Reviewer's comments:	This is a simplified evaluation for SH1 Otaki to North of Levin Expressway project in the Scoping Report phase. It is acknowledged that all options have been identified at this stage and four preferred contiguous corridor alignments have been recommended to take forward to the scheme assessment phase. Refer to following sections for further details. This is a final peer review report and the discussions	

	and additional information has been reviewed and commented upon in this report. All references following the issue of the draft report are given in ***bold italics*** to ensure that the received responses and agreed changes are noted.
Funding applicant's responses: *(Answers to discrepancies, departures from procedure and reviewer's concerns)*	Refer to the attached emails.

Section C: Reviewer's Recommendations

Based on the review undertaken of the Otaki to North of Levin Expressway economic evaluation the following recommendations have been made:

- There is a discrepancy in the costs and benefits given in the evaluations versus the values given in the Draft Scoping Report and summary notes provided by the Evaluator. The correct values need to be reported. ***Spreadsheets have been recomputed and updated where necessary.***
- Clarify where the travel time and vehicle operating cost savings are obtained for the evaluations as the values given in Worksheet 1 for each project are not consistent with the values given in the travel time and VOC spreadsheets. ***Spreadsheets have been recomputed and updated where necessary.***
- Clarify the percentage of CO_2 of the total VOC costs in the evaluation. There are inconsistencies between the report and the evaluation worksheets. ***The VOC spreadsheet has been updated to use a 4% CO_2, with an update factor of 1.04 as advised in F2.***
- Traffic volumes from 2016 were proportioned against the 2011 traffic volumes to calculate the percentage crash reduction however consideration should be given to using the volumes from 2018 when the expressway is assumed to be completed. ***As the 2018 volumes would be linearly interpolated from 2016 to 2026, the proportions for 2018 should be the same as for 2016.***
- Review the crash analysis spreadsheets, particularly for the Method C worksheets, to ensure that the most up to date worksheets are being used. ***Worksheet C has been updated to the latest version of the EEM1, as the previous Method C did not divide by the length of the section, as such all spreadsheets have been recomputed and updated as necessary.***
- Ensure that a sensitivity analysis is undertaken to assess the 4% and 6% discount rate scenarios as per the EEM1 guidelines. ***Summary of the sensitivity analysis has now been reviewed. Sensitivity spreadsheet was provided which covered the following:***
    - ***4%,6%,10% discount rate scenarios***
    - ***double VOC***
    - ***95th percentile project cost estimates***
    - ***2026 model values occurring in 2031***
    - ***2026 model values occurring in 2021***
    - ***+/- 25% crash cost savings.***

- The economic evaluation worksheets state that the construction period is expected to be 18 months. It is questioned whether this is reasonable given the scale of the project, hence this will impact on the benefits gained from the construction of approximately 30km of expressway. This requires clarification. ***The worksheets have been updated to 24 months to be consistent with the discounting spreadsheets. In addition MWH has refined the project costs by discounting into the years at which the costs will occur, as shown below. This has had a significant impact on the value of the discounted costs. Spreadsheets have been recomputed and updated as necessary.***

Further detail is given in the following sections.

Section D: Evaluator's Economic Efficiency Analysis

Note that these values are taken from the economic evaluation spreadsheets directly as they are not consistent with the values given in neither the Draft Scoping Report document nor the notes provided by the evaluator.

Contiguous Corridor Options						
Present Value (PV) Benefits - ($ Million)	**64**	**66**	**73**	**75**	**46**	**76**
Travel Time Savings	-$21	-$15	-$10.9	-$13.2	-$7.8	-$14.8
Vehicle Operating Cost Savings	-$17.6	-$12.3	-$10.1	-$11.4	$1.9	-$13.2
Crash Cost Savings	$78	$78.3	$73.8	$67.1	$58.7	$65.9
TOTAL PV Benefits	**$39.4**	**$51.0**	**$52.8**	**$42.5**	**$52.8**	**$39.4**
PV COSTS - ($ Million)						
Option Construction & Maintenance Costs	$430	$426	$430	$411	$453	$444
Maintenance Cost Savings	-$5.9	-$5.9	-$5.9	-$5.9	-$5.9	-$5.9
TOTAL PV Costs	**$424.1**	**$420.1**	**$424.1**	**$405.1**	**$447.1**	**$438.1**
Benefit Cost Ratio (BCR)	**0.09**	**0.12**	**0.12**	**0.10**	**0.15**	**0.09**
First Year Rate of Return (FYRR)	**2%**	**1%**	**2%**	**2%**	**1%**	**1%**

Section E: Reviewer's Economic Efficiency Analysis

A full re-evaluation has not been undertaken by the Reviewer, however it is recommended that the Analyst consider the issues raised and discuss any queries with the Reviewer. ***This has since been undertaken with the updated evaluation provided by the Analyst as follows.***

Contiguous Corridor Options				
Present Value (PV) Benefits - ($ Million)	**64**	**66**	**73**	**75**
Travel Time Savings	-$28.3	-$20.5	-$14.6	-$17.7
Vehicle Operating Cost Savings	-$23.5	-$16.4	-$13.4	-$15.1
Crash Cost Savings	$77.4	$77.7	$75.6	$68.5
TOTAL PV Benefits	**$25.6**	**$40.8**	**$47.7**	**$35.6**
PV COSTS - ($ Million)				
Option Construction & Maintenance Costs	$295	$292	$292.5	$280.5
Maintenance Cost Savings	$1.9	$1.9	$1.8	$1.8
TOTAL PV Costs	**$296.9**	**$293.9**	**$294.4**	**$282.4**
Benefit Cost Ratio (BCR)	**0.09**	**0.14**	**0.16**	**0.13**
First Year Rate of Return (FYRR)	**1.4%**	**2.2%**	**2.3%**	**2.0%**

The incremental BCR analysis was undertaken with the target incremental BCR being 1.00 with Option 73 as the preferred option.

Section F: Reviewer's Comments on Differences

F1	**Travel Time Cost Benefits** The travel time cost saving benefits were calculated using outputs from the SATURN transport modelling software. The travel time benefits were determined using the queuing delays and link cruise times in the "Travel Time Output". The models were run for the AM and PM peak periods and the Interpeak period for Years 2011, 2016, 2026 and 2041. The economic evaluations for each corridor have been prepared using the Simplified Procedures spreadsheets with the latest update factor of 1.33 being applied. The travel time costs have initially been calculated using Rural Strategic congested and uncongested costs per hour. However it has been noted that the congested values will be updated to use Urban Arterial values while it is intended to use a composite uncongested value using a 60/40 Rural Strategic / Urban Arterial split for the link cruise times. This is based on an urban/rural split in travel demand between the current highway and significant length of highway through the urban area of Levin. The Reviewer supports this methodology. However it was noted that the total analysis period travel time costs on Worksheet 1 for each option were difficult to find from the Travel Time and VOC worksheets. It seems that an averaged value has been used but is not clear exactly where this value came from despite the Reviewer doing their on calculations. This needs to be clarified. ***The WS1 values for TTC came from the TTC and VOC spreadsheet which have been updated to match (previously very minor differences).***
F2	**Vehicle Operating Cost Benefits** The vehicle operating cost savings benefits were calculated using outputs from the SATURN transport modelling software. The vehicle operating cost benefits were determined using the "Total Travel Distance" fuel output. The economic evaluations for each corridor have been prepared using the Simplified Procedures spreadsheets with the latest update factor of 1.04 being applied. The VOC costs have been derived using the EEM Rural Strategic ratio of fuel to operating costs. Again this will need to be updated to ensure that the route reflects both the urban and rural components or the routes. The carbon dioxide costs have been reported as 3.15% of the VOC based on 10% heavy vehicle proportion overall for the equations of light and heavy vehicles. A cost of $40 per tonne and an update factor of 1.00 has been used. CO_2 should use the

	same update factor as VOC of 1.04. The evaluation uses a percentage of 3.12% and there is a question mark give about whether the update factor should be 1.00 or 1.04. More clarification is required regarding these values to ensure consistency. The methodology is agreeable to the Reviewer for calculating the percentage of CO_2. Similarly to the travel time costs, the vehicle operating costs for the total analysis period given on Worksheet 1 are not consistent with the values given in the Travel Time and VOC spreadsheets. Clarification is required. ***The WS1 values for VOC came from the TTC and VOC spreadsheet which have been updated to match (previously very minor differences). MWH has changed CO_2 to be 4.0% of VOC and with same 1.04 update factor.***
F3	**Reported Crash History** The reported crash history used in the evaluation has not been supplied in detail but a summary is given in the Draft Scoping Report. The five year reported crash history was extracted from CAS between 2006 and 2010. In total there have been 14 fatal crashes, 39 serious injury, 125 minor injury and 298 non-injury crashes. This includes both SH1 and SH57 in the study area. It was highlighted that the collective and personal crash risk for the highways were rated as being Medium-High or High as per the NZTA High Risk Rural Roads guide. This justifies the proposed treatment philosophy of a Safe System Transformation Works which entails larger cost infrastructure works.
F4	**Crash Costs** A detailed Crash Analysis has been used to evaluate the crash savings for the Do Minimum and Option for the economic evaluation of the corridors. The route has been divided into separate sections to take into account key intersections and mid-blocks. For the existing highway Method A crash analysis has been used for the Do Minimum and Methods A and C for the Options. For the proposed expressway sections, Method B crash rate analysis has been used. These methods are acceptable to the Reviewer. It is evident that the crash cost savings provide the most benefits to the project. The percentage crash reductions for the existing highway crash by crash analyses are based on the reduction in traffic volumes between 2011 (existing) and 2016. One could question whether this comparison should be based on 2018 volumes when the construction is completed, based on the assumptions made? Refer to F5 for further comment on the construction period. It was noted that the individual sections have been evaluated using the section's growth rates and volumes. The Crash Rate (Method B) analyses are based on the EEM worksheets and the values used are suitable for the types of sections evaluated. The only comment to make is that the Table reference on the worksheets for the interchanges is incorrect

	and should refer to Table A6.8(a) instead of A6.6(7). The Weighted Crash Analysis (Method C) for the existing highway uses the correct coefficients however the worksheets require updating to meet the latest A6.5 and A6.6 worksheets in the EEM1. These need to be updated accordingly. ***Worksheet C has been updated to the latest version of the EEM1, as the previous Method C did not divide by the length of the section, as such all spreadsheets have been recomputed and updated as necessary.***
F6	**Discounting and Analysis Period** The analysis was undertaken in September 2011 and the analysis period used in the discounting was 30 years as per the EEM1 for the start of construction in 2018. The Base Date is shown as 1 July 2012 on Worksheet 1 (WS1). This should be corrected to 1 July 2011 as the base date is the financial year in which the cost estimates were prepared. Time Zero is correctly given as 1 July 2012. Worksheet 1 states that the construction period is expected to be 18 months. It is questioned whether this is reasonable given the scale of the project, hence this will impact on the benefits gained from the construction of approximately 30km of expressway. I tis noted that the discounting spreadsheets assume a two year construction period. Clarification is required. ***The worksheets have been updated to 24 months to be consistent with the discounting spreadsheets. In addition MWH has refined the project costs by discounting into the years at which the costs will occur, as shown below. This has had a significant impact on the value of the discounted costs. Spreadsheets have been recomputed and updated as necessary.***
F7	**Other Project Benefits and Costs** Other benefits that would be gained from this corridor project such as walking and cycling benefits, congestion reduction and driver frustration have not been assessed. Also the wider economic impacts including the direct economic impact of removing state highway traffic away from Levin have not been included as part of this evaluation. It was noted that this aspect is being evaluated on the entire corridor.

Section G: Other Comments on the Evaluation

G1	**Update Factors** The evaluation was undertaken in September 2011 and the SP3 economic evaluation uses the update factors released by NZTA in September 2011.
G2	**Maintenance Costs** Worksheet 2 in the evaluations show that the maintenance costs for the Do Minimum only includes routine maintenance and does not detail any periodic maintenance.

	Similarly for the Options, only routine maintenance was considered. For this stage of the project this level of detail is acceptable how it is recommended that the periodic maintenance items such as programmed reseals and rehabilitations are included in the SAR phase evaluations for both the Do Minimum and Options.
G3	**Capital Costs** The feasibility estimates have been prepared for each corridor option and are in accordance with NZTA's Cost Estimation Manual requirements. The Reviewer cannot specifically comment on rates and quantities used however it is noted in the Draft Scoping Report that the estimates were prepared with consideration given to previous large projects. Funding risks of between 41% and 45% have been assessed highlighting the high level of uncertainty in preparing a cost estimate at this stage of the project.
G4	**Sensitivity Analysis** It was noted that the Sensitivity analysis has been undertaken for the Options by varying the discount rates, traffic growth rates, and other factors such as doubling the fuel costs in the evaluations. Discounting should also be considered for the 6% and 4% discount rates as per the EEM1 guidelines. ***Summary of the sensitivity analysis has now been reviewed. Sensitivity spreadsheet was provided which covered the following:*** • ***4%,6%,10% discount rate scenarios*** • ***double VOC*** • ***95th percentile project cost estimates*** • ***2026 model values occurring in 2031*** • ***2026 model values occurring in 2021*** • ***+/- 25% crash cost savings.*** ***MWH had previously undertaken the sensitivity analysis and had supplied the spreadsheets for applying a 6% and 10% discount rate to the travel time and VOC (plus project costs), doubling the VOC, and applying the 2026 model values for travel time and fuel usage as occurring in 2031 or 2021. However they did not supply a summary table of the sensitivity effects. As advised MWH has now included the 4% discount rate and have also applied these to the crash benefits; in addition they have undertaken varying the crash benefits by +/- 25% and the project costs (95th percentile cost), noting that they have adjusted the discounting for the project costs.***

G5	**SATURN Model** It is acknowledge that a SATURN model has been undertaken to model the base network (Do Minimum) and the identified corridor options. The AM and PM peak periods and the Interpeak period for Years 2011, 2016, 2026 and 2041 were modelled. This Peer Review will not assess the inputs and outputs from the model as a separate Peer Review is planned to be undertaken in parallel with the review stage of the Draft Scoping Report.
G7	**Traffic Volumes and Growths** For simplicity at this stage of the project, the Time Zero AADT and traffic growths are given as follows for the project area: 2011 AADT (Time Zero) • AM Peak: 6,973 vehicles per day • Interpeak: 6,180 vehicles per day • PM Peak: 7,485 vehicles per day Traffic Growth • 1.5% per annum for light vehicles • 2.0% per annum for heavy vehicles Clarification was given for the traffic volumes and growth in the Draft Scoping Report Appendices. Heavy Commercial Vehicle percentage (HCV %): The percentage of heavies used in the evaluation is 10% which is reasonable given that the heavy vehicle percentage can range between 6% and 16% depending on the time period along the route.
G8	**Incremental BCR** An incremental BCR have been undertaken. The results show that Corridor Option 75 is the preferred option. ***MWH provided an updated incremental BCR analysis with the results now showing Option 73 to be the economically preferred option.***

Section H: Attachments

H1: Reviewer's Evaluation

A full re-evaluation has not been undertaken, however it is recommended that the Analyst considers the issues raised and discuss any queries with the Reviewer.

Following discussions and correspondence with MWH, all comments raised have been addressed.

H2: Record of Email Discussions

Please refer to attached emails.

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New Zealand

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E christchurch@aurecongroup.com
W aurecongroup.com

Melanie Muirson

From: Melanie Muirson
Sent: Thursday, 10 November 2011 4:46 p.m.
To: David Wanty
Cc: Josephine Draper; Louise Strogen
Subject: Otaki to Levin Expressway - Economic Evaluation Peer Review
Attachments: 2011_Peer Review_SH1 Otaki to Levin.pdf

Hi Dave

As discussed please find attached the draft peer review report for your perusal and discussion. Once you have sent through the calculations on the sensitivity analysis, first year rate of return and the incremental analysis, I will update the peer review and include any further comments based on our discussions so far. I thought it was best to send the draft peer review as it stands so you can see the detailed comments and provide any necessary response.

Regards
Mel

Melanie Muirson BE (Civil) MET MIPENZ CPEng
Senior Transport Engineer, Aurecon
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Unit 1 150 Cavendish Road Casebrook Christchurch 8051
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http://www.aurecongroup.com

Melanie Muirson

From: David Wanty <David.K.Wanty@nz.mwhglobal.com>
Sent: Thursday, 24 November 2011 12:27 p.m.
To: Melanie Muirson
Cc: Dhimantha Ranatunga; Phil Peet
Subject: RE: Otaki Levin economics
Attachments: WS7 Incremental bcr.xlsx; BCR FYRR and Sensitivity analysis WS5.6.xlsx

Hi Melanie,

Attached is the BCR/FYRR worksheet as well as the Incremental BCR WS7.

Responses to the following recommendations in blue below:

Section C: Reviewer's Recommendations

Based on the review undertaken of the Otaki to North of Levin Expressway economic evaluation the following recommendations have been made:

- There is a discrepancy in the costs and benefits given in the evaluations versus the values given in the Draft Scoping Report and summary notes provided by the Evaluator. The correct values need to be reported.

Spreadsheets have been recomputed and updated as necessary.

- Clarify where the travel time and vehicle operating cost savings are obtained for the evaluations as the values given in Worksheet 1 for each project are not consistent with the values given in the travel time and VOC spreadsheets

Spreadsheets have been recomputed and updated as necessary.

- Clarify the percentage of CO2 of the total VOC costs in the evaluation. There are inconsistencies between the report and the evaluation worksheets.

The VOC spreadsheet has been updated to use a 4% CO2 , with an update factor of 1.04 as advised in F2.

- Traffic volumes from 2016 were proportioned against the 2011 traffic volumes to calculate the percentage crash reduction however consideration should be given to using the volumes from 2018 when the expressway is assumed to be completed.

As the 2018 volumes would be linearly interpolated from 2016 to 2026, the proportions for 2018 should be the same as for 2016.

- Review the crash analysis spreadsheets, particularly for the Method C worksheets, to ensure that the most up to date worksheets are being used.

Worksheet C has been updated to the latest edition, as the previous Method C did not divide by

the length of the section, as such all spreadsheets have been recomputed and updated as necessary.

• Ensure that a sensitivity analysis is undertaken to assess the 4% and 6% discount rate scenarios as per the EEM1 guidelines.

Sensitivity spreadsheet attached which covers the following; 4%,6%,10% discount rate scenarios, double VOC,
95th %tile project cost estimates, 2026 occurring in 2031, 2026 occurring in 2021 and +- 25% accident cost savings.

We had previously undertaken the sensitivity analysis and had supplied the spreadsheets for applying a 6% and 10% discount rate to the travel time and VOC (plus project costs), doubling the VOC, and applying the 2026 model values for travel time and fuel usage as occurring in 2031 or 2021. However we did not supply a summary table of the sensitivity effects; as advised we have now included the 4% discount rate and have also applied these to the accident benefits; in addition we have undertaken varying the accident benefits by +/- 25% and the project costs (95th percentile cost), noting that we adjusted the discounting for the project costs as discussed below..

• The economic evaluation worksheets state that the construction period is expected to be 18 months. It is questioned whether this is reasonable given the scale of the project, hence this will impact on the benefits gained from the construction of approximately 30km of expressway. This requires clarification.

The worksheets have been updated to 24 months to be consistent with the discounting spreadsheets.

In addition, we have refined the project costs by discounting into the years at which the costs will occur, as shown below.

Spreadsheets have been recomputed and updated as necessary.

Section F: Reviewer's comments on differences (not already addressed above)

- F1: The WS1 values for TTC and VOC came from the TTC and VOC spreadsheet which have been updated to match (previously very minor differences)
- F2 We have changed CO2 to be 4.0% of VOC and with same 1.04 update factor

Section G: Reviewer's other comments on evaluation (not already addressed above)

- G4: summary of sensitivity analyses attached – refer above
- G8: Incr BCR analysis attached – refer above

Note that we are not 100% sure whether the preferred option is 73 (incr BCR 1.03 above that for 75 which had BCR of 0.06) as WS7 has BCR <=2 but no specific criterion on incr BCR is BCR is <1

And as previously forewarned, some further options relating to staging of route 66 (second listed option in WS7) are currently being modelled. Short details are

66 sub-option 1: “Do-Min” consists of seven safety related projects on existing network
66 sub-option 2: “2 lane” consists of 2 lane variant of route 66 with roundabout at Queen Street East rather than interchange
66 sub-option 3A: “Staged south” consists of constructing the southern portion of route 66
66 sub-option 3B: “Staged north ” consists of constructing the northern portion of route 66
66 sub-option 3C: “Staged” consists of constructing all of route 66 (already modelled)
66 sub-option 4: “2+1” consists of constructing a 3 lane variant of route 66 (as a 2+1 form with wire-rope median barriers)

For further comments please contact Dhimantha DDI 04 381 6735 as I will be on leave from noon tmw, returning Mon 6 Dec.

Regards,

Dave Wanty, 24/11/2011

MWH
BUILDING A BETTER WORLD

David Wanty, BE/ME (Civil), MSc (Transport Planning & Eng); MIPENZ, CPEng, IntPE(NZ); MITE; RPEQ
Principal Traffic and Transportation Engineer
National Specialist - Traffic Engineering

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Wellington 6141	Fax:	+64 4 381 6739

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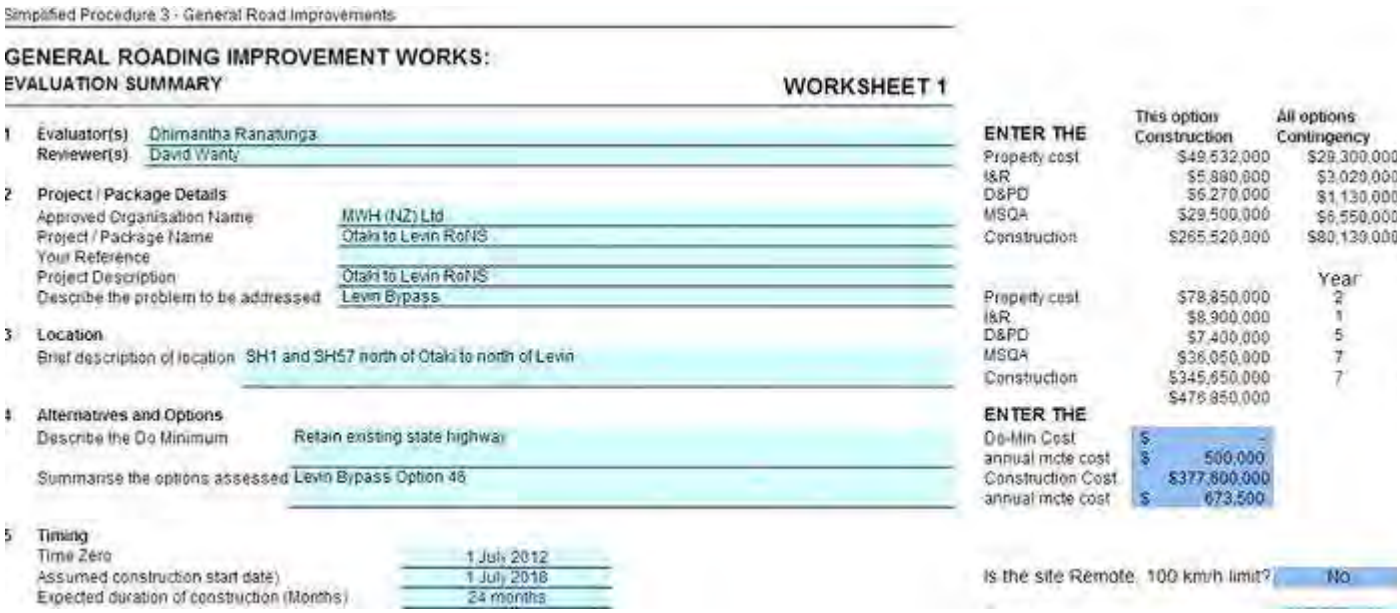

Simplified Procedure 3 - General Road Improvements

GENERAL ROADING IMPROVEMENT WORKS:
EVALUATION SUMMARY **WORKSHEET 1**

1 Evaluator(s) Dhimantha Ranatunga
Reviewer(s) David Wanty

2 Project / Package Details
Approved Organisation Name MWH (NZ) Ltd
Project / Package Name Otaki to Levin RoNS
Your Reference
Project Description Otaki to Levin RoNS
Describe the problem to be addressed Levin Bypass

3 Location
Brief description of location SH1 and SH57 north of Otaki to north of Levin

4 Alternatives and Options
Describe the Do Minimum Retain existing state highway
Summarise the options assessed Levin Bypass Option 46

5 Timing
Time Zero 1 July 2012
Assumed construction start date) 1 July 2018
Expected duration of construction (Months) 24 months

ENTER THE	This option Construction	All options Contingency
Property cost	$49,532,000	$29,300,000
I&R	$5,880,000	$3,029,000
D&PD	$6,270,000	$1,130,000
MSQA	$29,500,000	$6,550,000
Construction	$265,520,000	$80,139,000

		Year
Property cost	$78,850,000	2
I&R	$8,900,000	1
D&PD	$7,400,000	5
MSQA	$36,050,000	7
Construction	$345,650,000	7
	$476,850,000	

ENTER THE	
Do-Min Cost	$ -
annual mcte cost	$ 500,000
Construction Cost	$377,800,000
annual mcte cost	$ 673,500

Is the site Remote, 100 km/h limit? No

If required, we are able to send the updated worksheets.

Melanie Muirson

From: Dhimantha Ranatunga <Dhimantha.C.Ranatunga@nz.mwhglobal.com>
Sent: Tuesday, 6 December 2011 10:10 a.m.
To: Melanie Muirson
Cc: David Wanty
Subject: RE: Otaki Levin economics
Attachments: WS7 Incremental bcr.xlsx; BCR FYRR and Sensitivity analysis WS5.6.xlsx

Hi Melanie,

We've fixed some referencing errors that affected the crash benefits as well as correcting the number of crashes for one section (north of Levin to the Manawatu river).
The spreadsheets have all been updated accordingly, with no changes to the methodology.

Cheers,

MWH
BUILDING A BETTER WORLD

Dhimantha Ranatunga
Graduate Transportation Engineer
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Mob: 021 123 0557

From: Melanie Muirson [mailto:MuirsonM@ap.aurecongroup.com]
Sent: Wednesday, 30 November 2011 2:21 p.m.
To: Dhimantha Ranatunga
Subject: RE: Otaki Levin economics

Hi Dhimantha

I sent Dave an email to say that I'd look at the updated comments this week but I understand that he is on leave. I will try to get a revised peer review report back to you before the end of the week.

Many thanks
Melanie

Melanie Muirson BE (Civil) MET MIPENZ CPEng
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From: Dhimantha Ranatunga [mailto:Dhimantha.C.Ranatunga@nz.mwhglobal.com]
Sent: Wednesday, 30 November 2011 2:18 p.m.
To: Melanie Muirson
Cc: Phil Peet; David Wanty
Subject: RE: Otaki Levin economics

Hi Melanie,

How are you going with the review of our updates to the Otaki Levin economics?
We're aiming to send an updated scoping report to NZTA this week and would appreciate your comments.

Cheers,

Dhimantha Ranatunga
Graduate Transportation Engineer

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PO Box 9624 Te Aro	Tel: +64 4 381 6735 Fax: +64 4 381 6739
Wellington	Mob: 021 123 0557

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From: David Wanty
Sent: Thursday, 24 November 2011 12:27 p.m.
To: melanie.muirson@aurecongroup.com
Cc: Dhimantha Ranatunga; Phil Peet
Subject: RE: Otaki Levin economics

Hi Melanie,

Attached is the BCR/FYRR worksheet as well as the Incremental BCR WS7.

Responses to the following recommendations in blue below:

Section C: Reviewer's Recommendations

Based on the review undertaken of the Otaki to North of Levin Expressway economic evaluation the following recommendations have been made:

- There is a discrepancy in the costs and benefits given in the evaluations versus the values given in the Draft Scoping Report and summary notes provided by the Evaluator. The correct values need to be reported.

Spreadsheets have been recomputed and updated as necessary.

- Clarify where the travel time and vehicle operating cost savings are obtained for the

evaluations as the values given in Worksheet 1 for each project are not consistent with the values given in the travel time and VOC spreadsheets

Spreadsheets have been recomputed and updated as necessary.

• Clarify the percentage of CO2 of the total VOC costs in the evaluation. There are inconsistencies between the report and the evaluation worksheets.

The VOC spreadsheet has been updated to use a 4% CO2 , with an update factor of 1.04 as advised in F2.

• Traffic volumes from 2016 were proportioned against the 2011 traffic volumes to calculate the percentage crash reduction however consideration should be given to using the volumes from 2018 when the expressway is assumed to be completed.

As the 2018 volumes would be linearly interpolated from 2016 to 2026, the proportions for 2018 should be the same as for 2016.

• Review the crash analysis spreadsheets, particularly for the Method C worksheets, to ensure that the most up to date worksheets are being used.

Worksheet C has been updated to the latest edition, as the previous Method C did not divide by the length of the section, as such all spreadsheets have been recomputed and updated as necessary.

• Ensure that a sensitivity analysis is undertaken to assess the 4% and 6% discount rate scenarios as per the EEM1 guidelines.

Sensitivity spreadsheet attached which covers the following; 4%,6%,10% discount rate scenarios, double VOC,
95th %tile project cost estimates, 2026 occurring in 2031, 2026 occurring in 2021 and +- 25% accident cost savings.

We had previously undertaken the sensitivity analysis and had supplied the spreadsheets for applying a 6% and 10% discount rate to the travel time and VOC (plus project costs), doubling the VOC, and applying the 2026 model values for travel time and fuel usage as occurring in 2031 or 2021. However we did not supply a summary table of the sensitivity effects; as advised we have now included the 4% discount rate and have also applied these to the accident benefits; in addition we have undertaken varying the accident benefits by +/- 25% and the project costs (95th percentile cost), noting that we adjusted the discounting for the project costs as discussed below..

• The economic evaluation worksheets state that the construction period is expected to be 18 months. It is questioned whether this is reasonable given the scale of the project, hence this will impact on the benefits gained from the construction of approximately 30km of expressway. This requires clarification.

The worksheets have been updated to 24 months to be consistent with the discounting spreadsheets.

In addition, we have refined the project costs by discounting into the years at which the costs will occur, as shown below.

Spreadsheets have been recomputed and updated as necessary.

Section F: Reviewer's comments on differences (not already addressed above)

- F1: The WS1 values for TTC and VOC came from the TTC and VOC spreadsheet which have been updated to match (previously very minor differences)
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- G4: summary of sensitivity analyses attached – refer above
- G8: Incr BCR analysis attached – refer above

Note that we are not 100% sure whether the preferred option is 73 (incr BCR 1.03 above that for 75 which had BCR of 0.06) as WS7 has BCR <=2 but no specific criterion on incr BCR is BCR is <1

And as previously forewarned, some further options relating to staging of route 66 (second listed option in WS7) are currently being modelled. Short details are
66 sub-option 1: "Do-Min" consists of seven safety related projects on existing network
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For further comments please contact Dhimantha DDI 04 381 6735 as I will be on leave from noon tmw, returning Mon 6 Dec.

Regards,

Dave Wanty, 24/11/2011

<< OLE Object: Picture (Device Independent Bitmap) >>

David Wanty, **BE/ME (Civil), MSc (Transport Planning & Eng); MIPENZ, CPEng, IntPE(NZ); MITE; RPEQ**
Principal Traffic and Transportation Engineer
National Specialist - Traffic Engineering

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<< OLE Object: Picture (Device Independent Bitmap) >>

If required, we are able to send the updated worksheets.

<< File: WS7 Incremental bcr.xlsx >> << File: BCR FYRR and Sensitivity analysis WS5.6.xlsx >>

Appendix Q Social and Environmental Screen

NZ TRANSPORT AGENCY
WAKA KOTAHI

PSF 13

Social and Environmental Management Form

(Refer *Professional Services Guideline (PSG/13) Social and Environmental Management* for guidance in completing PSF/13)

Option Description:

Social and Environmental Screen			Social and Environmental Assessment		
Issue	**Effects**	**Degree of effect**	**Requirements**	**Addressing effects and meeting requirements**	
Social and environmental issues	*Describe the potential social and environmental effects of the option, including where the option may improve social and environmental outcomes*	*H / M / L / NA***	*List all legal requirements and relevant NZTA social and environmental objectives*	*List actions to be taken to meet specific social and environmental requirements and objectives and address all effects identified. Include an estimated cost.*	
				Specific Actions	**Estimated Cost ($)**
Noise *eg construction noise, traffic noise, maintenance noise, presence of sensitive receivers (homes, schools, hospitals).*	Inevitably some people living in rural areas will be exposed to additional traffic noise (permanent) and construction noise (temporary). In determining the preferred route (scheme development or Route Stage) noise will be taken into account and through a combination of route choice and design, noise will be mitigated as far as practical. Removing through traffic from Levin, Manakau and Ohau will result in benefits in terms of noise reduction in parts of those settlements.	Degree M	Resource consent / designation conditions Details: Specific NZTA objectives Details: Other Details:		
Air quality *eg dust, air pollution, greenhouse gas emissions, odour.*	As for noise, it is inevitable that some rural residents will experience greater exposure to transport emissions. However this will be offset by the number of people in the area's towns whose exposure will be reduced. Dust emissions are at greatest risk of occurring during construction. This will be dealt with	Degree L	Resource consent / designation conditions Details: Specific NZTA objectives		

Option Description:					
Social and Environmental Screen			**Social and Environmental Assessment**		
Issue	**Effects**	**Degree of effect**	**Requirements**	**Addressing effects and meeting requirements**	
Social and environmental issues	*Describe the potential social and environmental effects of the option, including where the option may improve social and environmental outcomes*	*H / M / L / NA***	*List all legal requirements and relevant NZTA social and environmental objectives*	*List actions to be taken to meet specific social and environmental requirements and objectives and address all effects identified. Include an estimated cost.*	
				Specific Actions	**Estimated Cost ($)**
	through the construction management plan. Planting will assist with long-term dust management. Greenhouse gas transport-related emissions will be reduced by reducing stop/start travel through the area reducing congestion and providing for continuous flow for through traffic.		Details: Other Details:		
Water resources *eg sedimentation, contaminants in road run-off, climate change impacts (sea level rise and changing rainfall patterns), impacts on sensitive water bodies, changing hydrological cycles and water flow patterns.*	In choosing the corridors for further investigation, the presence of lakes in particular, was taken into account. Main lakes and wetlands have been avoided. The rivers and other waterways run generally at right angles to a future route, and crossings will minimise run-off into these water bodies. For the same reason, there should be little impact from the expressway and water flow patterns. Ground water levels are high in some parts of the area and design will take this into account. The identified corridors are away from the coast and will not be subject to sea level rise for the foreseeable future.	Degree L	Resource consent / designation conditions Details: Specific NZTA objectives Details: Other Details:		
Erosion and sediment control *eg soil slips, landslides, water erosion (raindrop, sheet, rill gully, tunnel, channel) and wind erosion (dust)*	The corridor area is generally flat, and erosion will not be an issue. Sediment control will be addressed in design and construction management planning.	Degree L	Resource consent / designation conditions Details: Specific NZTA objectives Details: Other		

Option Description:					
Social and Environmental Screen			**Social and Environmental Assessment**		
Issue	**Effects**	**Degree of effect**	**Requirements**	**Addressing effects and meeting requirements**	
Social and environmental issues	*Describe the potential social and environmental effects of the option, including where the option may improve social and environmental outcomes*	*H / M / L / NA***	*List all legal requirements and relevant NZTA social and environmental objectives*	*List actions to be taken to meet specific social and environmental requirements and objectives and address all effects identified. Include an estimated cost.*	
				Specific Actions	**Estimated Cost ($)**
			Details:		
Social responsibility *eg social severance, social interaction, connectivity*	The chosen corridors avoid main centres of population and minimise severance - the diversion of future through-traffic will improve connectivity within the town. However, parts of the rural community may have reduced accessibility to Levin, by having to travel further to town where local roads are terminated. This will be investigated carefully at scheme assessment, Route, stage.	Degree M/L	Resource consent / designation conditions Details: Specific NZTA objectives Details: Other Details:		
Culture and heritage *eg wahi tapu and Statements of Identified Maori Interests, archaeological sites, historic buildings, places, trees and special features.*	The chosen corridors took into account areas of significance to tangata whenua, archaeological sites, listed buildings and trees, and landscape features. It also took into account Maori land. Such areas have generally been able to be avoided. Where such areas remain within the corridor their presence will be taken into account in choosing the route. Additional studies in the scheme assessment will investigate and identify any hitherto unidentified sites or resources.	Degree M/L	Resource consent / designation conditions Details: Specific NZTA objectives Details: Other Details:		
Ecological resources *eg significant vegetation, fauna passage, habitat*	Valued ecological resources were identified during the early stages of the scoping study and have, as far as possible, been avoided. When they remain within and near to the corridor, their presence will be taken into account in route choice and design.	Degree M/L	Resource consent / designation conditions Details: Specific NZTA objectives		

Option Description:					
Social and Environmental Screen			**Social and Environmental Assessment**		
Issue	**Effects**	**Degree of effect**	**Requirements**	**Addressing effects and meeting requirements**	
Social and environmental issues	*Describe the potential social and environmental effects of the option, including where the option may improve social and environmental outcomes*	*H / M / L / NA***	*List all legal requirements and relevant NZTA social and environmental objectives*	*List actions to be taken to meet specific social and environmental requirements and objectives and address all effects identified. Include an estimated cost.*	
				Specific Actions	**Estimated Cost ($)**
protection, special trees, reinstatement of vegetation, slope stabilisation, use of low-growth vegetation to reduce maintenance costs.	Opportunities for ecological enhancement will be taken into account when designing the expressway.		Details: Other Details:		
Spill response and contamination *eg spills from vehicle accidents, on-site storage of fuels, excavations of contaminated soils/clean fill*	Investigations to date have no identified any relevant contaminated sites. Spills from vehicle crashes on the expressway is a potential effect that will be considered in the scheme assessment phase particularly.	Degree	Resource consent / designation conditions Details: Specific NZTA objectives Details: Other Details:		
Resource efficiency *eg in situ pavement recycling, energy efficiency, initiatives to reduce waste to landfill, use of*	Potential measures to increase resource efficiency will be considered in subsequent phases of project investigation.	Degree	Resource consent / designation conditions Details: Specific NZTA objectives Details: Other		

Option Description:					
Social and Environmental Screen			**Social and Environmental Assessment**		
Issue	**Effects**	**Degree of effect**	**Requirements**	**Addressing effects and meeting requirements**	
Social and environmental issues	*Describe the potential social and environmental effects of the option, including where the option may improve social and environmental outcomes*	*H / M / L / NA***	*List all legal requirements and relevant NZTA social and environmental objectives*	*List actions to be taken to meet specific social and environmental requirements and objectives and address all effects identified. Include an estimated cost.*	
				Specific Actions	**Estimated Cost ($)**
local materials.			Details:		
Climate change: adaptation and mitigation *eg sea level rise, green house gas emissions, increase incidence of flooding and coastal storms*	The corridor is away from the coast, so will not be directly subject to sea level rise for the foreseeable future. The area is however, lowlying (and close to rivers and some areas of existing high groundwater). A number of rivers and waterways need to be crossed. These will be addressed during design stages.	Degree L	Resource consent / designation conditions Details: Specific NZTA objectives Details: Other Details:		
Visual quality *eg landscaping, retaining walls, noise walls, views from roads neighbouring properties*	The corridor crosses relatively few areas of high existing landscape quality. Because of the general level flat topography, the expressway will not be seen from a great distance. Specific attention will be paid to local and neighbouring visual impact once the preferred route is chosen.	Degree L	Resource consent / designation conditions Details: Specific NZTA objectives Details: Other Details:		
Vibration *eg construction and maintenance vibration, pavement*	No historic buildings are thought to be close to a possible alignment. The presence of dwellings will be taken into account in route choice. A reduction in vibration from heavy traffic will be experienced in properties near the existing State Highway 1, which includes dwellings and a number of historic buildings.	Degree L	Resource consent / designation conditions Details: Specific NZTA objectives		

Option Description:					
Social and Environmental Screen			**Social and Environmental Assessment**		
Issue	**Effects**	**Degree of effect**	**Requirements**	**Addressing effects and meeting requirements**	
Social and environmental issues	*Describe the potential social and environmental effects of the option, including where the option may improve social and environmental outcomes*	*H / M / L / NA***	*List all legal requirements and relevant NZTA social and environmental objectives*	*List actions to be taken to meet specific social and environmental requirements and objectives and address all effects identified. Include an estimated cost.*	
				Specific Actions	**Estimated Cost ($)**
surface, heavy traffic vibration, presence of sensitive receivers including historic buildings and features.			Details: Other Details:		
Landuse and transport integration *eg integration of land use and development with transport networks, reverse sensitivity, access management.*	The corridor will take through traffic away from main settlements and will enable better access for local people and traffic within these areas, and opportunities for enhanced development and redevelopment near to the old State Highway 1 corridor. The identification of access points on and off the expressway is yet to be made. There may be some reverse sensitivity effects due to the widespread presence of rural-residential development in Horowhenua District.	Degree M/L	Resource consent / designation conditions Details: Specific NZTA objectives Details: Other Details:		
Urban design *eg context-sensitive design, including aesthetics of structures (refer PSG/12 for guidance).*	The corridors avoid all settlements including Levin, so the context of the expressway will not be an urban one. The approach and principles towards design of structures, etc., are set out in section 9-8 of the scoping study.	Degree L	Resource consent / designation conditions Details: Specific NZTA objectives Details: Other Details:		

Option Description:

Social and Environmental Screen			Social and Environmental Assessment		
Issue	**Effects**	**Degree of effect**	**Requirements**	**Addressing effects and meeting requirements**	
Social and environmental issues	*Describe the potential social and environmental effects of the option, including where the option may improve social and environmental outcomes*	*H / M / L / NA***	*List all legal requirements and relevant NZTA social and environmental objectives*	*List actions to be taken to meet specific social and environmental requirements and objectives and address all effects identified. Include an estimated cost.*	
				Specific Actions	**Estimated Cost ($)**
Public health *eg stress to individuals and community, personal security, cycling and walking opportunities.*	There will be some additional stress during the consultation stage of the project to the wider community, and to those directly affected by the chosen route and those living nearby on an ongoing basis. However, the community in Levin, Manakau and Ohau will experience reduced stress from a safer and less noisy environment, with slightly improved air quality. The project will improve the connectivity of walking and cycling networks hopefully leading to an increase in uptake of these healthy modes of travel.	Degree M/L	Resource consent / designation conditions Details: Specific NZTA objectives Details: Other Details:		
Cycling infrastructure *eg on highway cycle lanes, segregated cycle path adjacent to SH, links into local cycling network*	This project will seek to provide for cyclists either in the expressway corridor or through parallel links.	Degree L	Resource consent / designation conditions Details: Specific NZTA objectives Details: Other Details:		
Cycle crossing facilities *eg shared cycle/pedestrian crossing at traffic signals, widened traffic island to accommodate*	Local road crossings of the new expressway will consider cyclists so as not to have any adverse impact in this area.	Degree L	Resource consent / designation conditions Details: Specific NZTA objectives Details:		

Option Description:					
Social and Environmental Screen			**Social and Environmental Assessment**		
Issue	**Effects**	**Degree of effect**	**Requirements**	**Addressing effects and meeting requirements**	
Social and environmental issues	*Describe the potential social and environmental effects of the option, including where the option may improve social and environmental outcomes*	*H / M / L / NA***	*List all legal requirements and relevant NZTA social and environmental objectives*	*List actions to be taken to meet specific social and environmental requirements and objectives and address all effects identified. Include an estimated cost.*	
				Specific Actions	**Estimated Cost ($)**
cyclists where cycle route crosses SH, dropped crossings			Other Details:		
Walking infrastructure *eg new or widened footway, connections to local road footways*	The expressway could produce a severance effect on communities. Therefore the design will look to include numerous locations where pedestrians can cross the corridor safely.	Degree L	Resource consent / designation conditions Details: Specific NZTA objectives Details: Other Details:		
Pedestrian crossing facilities *eg signalised crossings, traffic islands, dropped crossings, pedestrian desire lines*	See above.	Degree L	Resource consent / designation conditions Details: Specific NZTA objectives Details: Other Details:		
Bus related infrastructure	Due to the low level of existing public transport provision the expressway would have a limited impact. Travel times for intercity services would decrease.	Degree L	Resource consent / designation conditions		

Option Description:					
Social and Environmental Screen			**Social and Environmental Assessment**		
Issue	**Effects**	**Degree of effect**	**Requirements**	**Addressing effects and meeting requirements**	
Social and environmental issues	*Describe the potential social and environmental effects of the option, including where the option may improve social and environmental outcomes*	*H / M / L / NA***	*List all legal requirements and relevant NZTA social and environmental objectives*	*List actions to be taken to meet specific social and environmental requirements and objectives and address all effects identified. Include an estimated cost.*	
				Specific Actions	**Estimated Cost ($)**
eg bus laybys, hardstandings, build-outs into carriageway at bas stop			Details: Specific NZTA objectives Details: Other Details:		
Priority lanes *eg potential to include bus, freight, HOV or HOT lane either through the reallocation of existing roadspace or new construction to make certain modes more efficient and widen travel choice*	Little or no potential for priority lanes for this project.	Degree NA	Resource consent / designation conditions Details: Specific NZTA objectives Details: Other Details:		
Traffic management *eg potential for ITS, variable message signing, variable speed*	ITS infrastructure could have a positive effect and therefore this will be progressed in accordance with regional and RoNS strategies.	Degree L	Resource consent / designation conditions Details: Specific NZTA objectives		

Option Description:					
Social and Environmental Screen			**Social and Environmental Assessment**		
Issue	**Effects**	**Degree of effect**	**Requirements**	**Addressing effects and meeting requirements**	
Social and environmental issues	*Describe the potential social and environmental effects of the option, including where the option may improve social and environmental outcomes*	*H / M / L / NA***	*List all legal requirements and relevant NZTA social and environmental objectives*	*List actions to be taken to meet specific social and environmental requirements and objectives and address all effects identified. Include an estimated cost.*	
				Specific Actions	**Estimated Cost ($)**
management, ramp signalling			Details: Other Details:		

**

H	High	Permanent, serious and widespread adverse effects and/or opportunities for social and environmental improvement. Adverse effects to be avoided; opportunities to be actively pursued.
M	Medium	Major, medium-term adverse effects and/or opportunities for social and environmental improvement. Where cost-effective, adverse effects to be avoided and opportunities pursued (significant mitigation may be required).
L	Low	Limited, short-term adverse effects and/or opportunities for social and environmental improvement. Where cost effective, adverse effects to be avoided and opportunities pursued (mitigation may be required).
NA	Irrelevant	No effect and/or opportunity. No action required.

Appendix R Risk File

464 PN WELLINGTON NORTHERN CORRIDOR RoNS - OTAKI TO NORTH OF LEVIN INVESTIGATION AND REPORTING

Activity	Scoping Report
Contract No.	**464PN**
Date	Sep-11

Analysts Name(s)	Bob Barraclough, Phil Peet, Steve Oldfield
Reviewers Name(s)	Gina Waibl
Sources of Information	Various

No.	Name	Description	Status	Threat or Opportunity	Comment	Consequence		Likelihood		Score = C x L[1]	Risk Category	Option 73 NE3, SE1	Option 66 NE2, SE3	Option 75 NE3, SE3	Option 76 NE3, SE4	Option 19 NW3, SW1
						Description	Rating (C)	Description	Rating (L)							
1	**ACCESS AND SEVERANCE**															
1.1	Social severance	New expressway creates social severance, perceived or actual	L	T		Major	70	Likely	5	**350**	**Extreme**	Similar	Similar	Similar	Lower	Higher
1.2	Loss of access	Loss of access to property, schools, recreation, Marae, Urupa etc	L	T		Major/substantial	85	Likely	5	**425**	**Extreme**	Similar	Similar	Similar	Lower	Higher
1.3	Reduced connectivity	Expressway severs or restricts links across new highway.	L	T		Medium	40	Likely	5	**200**	**V high**	Similar	Similar	Similar	Lower	Lower
1.4	Access blocked	Landowners prevent access to land for investigations	L	T		Medium	40	Unusual	2	**80**	**High**	Similar	Similar	Similar	Similar	Same
2	**LAND AND PROPERTY**															
2.1	Maori owned land	Possible issues with Te Ture Whenua Maori Act, Maori Reserves and land with multiple-owners	L	T		Substantial	100	Likely	5	**500**	**Extreme**	Similar	Similar	Similar	Similar	Higher
2.2	Landowners	Demand from landowners for early purchase of land	L	T		Substantial	100	Unlikely	3	**300**	**V high**	Similar	Similar	Similar	Similar	Similar
2.3	Property	Locations of properties may affect alignment	L	T		Major	70	Likely	5	**350**	**Extreme**	Similar	Similar	Similar	Similar	Similar
2.4	Lifestyle properties	Locations of properties may affect alignment	L	T		Major	70	Likely	5	**350**	**Extreme**	Similar	Similar	Similar	Similar	Similar
3	**CULTURAL**															
3.1	Cultural sites	Values around dunelands, urupa, waahi tapu and pa sites	L	T		Substantial	100	Unlikely/quite common	3.5	**350**	**Extreme**	Similar	Similar	Similar	Similar	Higher
3.2	Finds	Unexpected cultural/archaeological finds during construction	L	T		Medium	40	Likely	5	**200**	**V high**	Similar	Similar	Similar	Similar	Higher
3.3	Marae	Expressway route may affect Marae	L	T		Substantial	100	Unusual	3	**300**	**V high**	Similar	Similar	Similar	Similar	Higher
3.4	Involve Iwi	Involve Iwi in decision making from start	L	O		Substantial	100	Likely	3	**300**						
4	**CONSULTATION**															
4.1	Change in attitude	Community attitudes change during consultation period leading to redesign, delays or additional costs	L	T		Substantial	100	Unlikely	3	**300**	**V high**	Similar	Similar	Similar	Similar	Similar
4.2	Change in attitude	Community supports route.	L	O		Substantial	100	Very Unlikely	1	**100**						
4.3	Revisit options	Consultees try to re-open discussion on route options further down the track	L	T		Major	70	Unusual	2	**140**	**V high**	Similar	Similar	Similar	Similar	Similar
4.4	Iwi	Opposition to route from Iwi	L	T		Substantial	100	Quite common	4	**400**	**Extreme**	Similar	Similar	Similar	Similar	Higher
4.5	Iwi	Support for route from Iwi	L	O		Substantial	100	Likely	3	**300**						
4.6	Third parties	Delays due to late approvals from third parties	L	T		Medium	40	Quite common	4	**160**	**V high**	Similar	Similar	Similar	Similar	Higher
4.7	TLAs	TLAs in project area have conflicting requirements which are difficult to reconcile	L	T		Major	70	Unusual	2	**140**	**V high**	Similar	Similar	Similar	Similar	Similar
5	**CONSENTS**															
5.1	Opposition	Affected parties oppose route resulting in protracted consent process	L	T		Minor	10	Likely	5	**50**	**Moderate**	Similar	Similar	Similar	Similar	Higher
5.2	Agreements	Stakeholders delay agreement/approval	L	T		Major	70	Unlikely	3	**210**	**V high**	Similar	Similar	Similar	Similar	Higher
5.3	Re-examination	Consultees try to reopen discussions on alternatives	L	T		Medium/Major	40	Unlikely	3	**120**	**High**	Similar	Similar	Similar	Similar	Similar
5.4	Construction impacts	Impacts on physical and natural environment, people and communities	L	T		Negligible to Substantial	50	Likely	5	**250**	**V high**	Similar	Similar	Similar	Similar	Similar
5.5	NIMBY	Strong coordinated opposition to route from affected parties	L	T		Substantial	100	Quite common	4	**400**	**Extreme**	Similar	Similar	Similar	Similar	Similar
5.7	Water bodies	Difficulties associated with crossing water courses	L	T		Medium	40	Likely	5	**200**	**V high**	Similar	Similar	Similar	Similar	Similar
5.8	Consent conditions	Consenting authorities impose onerous conditions.	L	T		Medium	40	Unlikely	3	**120**	**High**	Similar	Similar	Similar	Similar	Similar
5.9	Statutory processes change	Revision to statutory procedures during the life of the designation (or before designation) affects design and submissions	L	T		Major	70	Rare	1	**70**	**High**	Similar	Similar	Similar	Similar	Similar
5.10	Regional plan	Revision to regional planning rules affects design and submissions	L	T		Medium	40	Rare	1	**40**	**Moderate**	Similar	Similar	Similar	Similar	Similar
5.11	Lag between consents and construction	Long lead time to construction leads to challenge during designation process.	L	T		Medium	40	Rare	1	**40**	**Moderate**	Similar	Similar	Similar	Similar	Similar
6	**ENVIRONMENTAL**															
6.1	Adverse impacts	Adverse impacts on areas of environmental significance	L	T		Minor to Major	40	Quite common	4	**160**	**V high**	Similar	Similar	Similar	Higher	Higher
6.2	Climate change	Climate change parameters are changed prior to construction	L	T		Minor	10	Unusual	2	**20**	**Low**	Similar	Similar	Similar	Similar	Similar
6.3	Natural Disaster	Areas prone to liquefaction, flooding or tsunami force choice of otherwise less than optimal route.	L	T		Minor	10	Likely	5	**50**	**Moderate**	Similar	Similar	Similar	Higher	Higher
7	**ECONOMICS**															
7.1	Existing businesses	Impacts of expressway on existing business	L	T		Minor to substantial	55	Likely	5	**275**	**V high**	Similar	Similar	Similar	Similar	Similar
7.2	Benefits	Scheme shows inadequate benefits	L	T		Substantial	100	Unusual	2	**200**	**V high**	Similar	Similar	Similar	Similar	Similar
7.3	Development	Project compromises future development	L	T		Minor to medium	25	Unlikely	3	**75**		Similar	Similar	Similar	Similar	Similar
7.4	Uncertainty/blight	Development constrained by uncertainty on timing of expressway	L	T		Negligible to major	35	Likely	5	**175**	**V high**	Similar	Similar	Similar	Similar	Higher
7.5	Existing businesses	impacts of expressway on existing business - positive	L	O		Medium	40	Unlikely	2	**80**						
7.6	Existing highway	Cost uncertainty arising from demands for remedial work to existing highway before handover to TLA	L	T	More a Detailed Design/construction risk	Minor	10	Likely	5	**50**	**Moderate**	Similar	Similar	Similar	Similar	Similar
7.7	Structures	Influence of cost of structures constrains alignment to reduce number	L	T		Minor	10	Likely	5	**50**	**Moderate**	Similar	Similar	Lower	Lower	Lower
7.8	High value land	Impacts of expressway crossing high value land	L	T		Minor	10	Likely	5	**50**	**Moderate**	Similar	Similar	Similar	Similar	Similar
7.9	Severance	Impact of land severance due to alignment - land may have to be purchased.	L	T		Minor	10	Likely	5	**50**	**Moderate**	Similar	Similar	Similar	Similar	Similar
7.10	Cost fluctuations	Changes in relative costs may affect relative merits of different options	L	T		Minor	10	Likely	5	**50**	**Moderate**	Similar	Similar	Similar	Similar	Similar
7.11	Local infrastructure	Effect of expressway on Local infrastruture leads to additional project cost	L	T		Minor	10	Likely	5	**50**	**Moderate**	Similar	Similar	Similar	Similar	Similar
7.12	Construction materials	Materials suitable for construction not available locally.	L	T		Minor	10	Rare	1	**10**	**Low**	Similar	Similar	Similar	Similar	Similar
7.13	Cost estimating	Insufficient information for accurate cost estimating	L	T		Medium	40	Unusual	2	**80**	**High**	Similar	Similar	Similar	Similar	Similar
7.14	Maintenance	Significant maintenance costs of option.	L	T		Minor	10	Unusual	2	**20**	**Low**	Similar	Similar	Similar	Higher	Higher
7.15	Do-minimum	Inappropriate or deficient assessment of do-minimum used in assessment of options leading to selection of wrong option	L	T		Substantial	100	Rare	1	**100**	**High**	Similar	Similar	Similar	Similar	Similar
7.16	Road user costs	Reduced travel times as result of expressway construction	L	O		Medium	40	Almost certain	5	**200**						
7.17	Reliability	Increased reliability as result of expressway construction	L	O		Minor	10	Almost certain	5	**50**						
7.18	Demand/land use assumptions	Uncertainty in demand and land use assumptions	L	T		Medium	40	Unusual	2	**80**	**High**	Similar	Similar	Similar	Similar	Similar
8	**DESIGN (INCL GEOTECH)**															
8.1	Flooding	Areas subject to marine or fluvial inundation	L	T		Major	70	Likely	5	**350**	**Extreme**	Higher	Similar	Higher	Similar	Higher
8.2	Earthquake	Areas potentially vulnerable to earthquake hazards such as liquifation, tsunami, ground shaking.	L	T		Substantial	100	Likely	5	**500**	**Extreme**	Similar	Similar	Similar	Higher	Higher
8.3	Peat	High construction and maintenance costs over peat	L	T		Minor	10	Likely	5	**50**	**Moderate**	Similar	Similar	Similar	Lower	Higher
8.4	Reduce access	Opportunities to restrict access to highway at intersections	L	O		Minor	10	Almost certain	5	**50**						
8.5	Noise	Increased road generated noise	L	T		Minor	10	Almost certain	5	**50**	**Moderate**	Similar	Similar	Similar	Similar	Similar
8.6	Noise	Fewer properties affected by noise.	L	T		Negligible	1	Likely	5	**5**	**Low**	Lower	Higher	Lower	Lower	Lower
8.7	Route security	Levin by-pass will provide additional route security	L	O		Minor	10	Almost certain	5	**50**						
8.8	Taylors Road	Uncetainty over junction at Taylors Road	L	T		Minor	10	Likely	5	**50**	**Moderate**	Similar	Similar	Similar	Similar	Similar
8.9	Power lines	Power lines on western and eastern sides of project area constrain route locations.	L	T		Minor	10	Likely	5	**50**	**Moderate**	Similar	Similar	Similar	Higher	Similar
8.10	Gas pipeline	A high pressure gas pipeline to the west of the project area.	L	T		Minor	10	Likely	5	**50**	**Moderate**	Similar	Similar	Similar	Similar	Higher
8.11	Railway	The present road corridor runs close to the railway for much of its length south of Levin. This constrains development of the existing road to expressway standard.	L	T		Minor	10	Likely	5	**50**	**Moderate**	Similar	Similar	Similar	Lower	Lower
8.12	Koputaroa Road	Existing road that could be widened as part of an eastern bypass	L	O		Negligible	1	Almost certain	5	**5**						
8.13	Queen Street East	Queen Street East is a possible link to the centre of Levin if an eastern bypass is the preferred route	L	O		Minor	10	Likely	3	**30**						
8.14	North of Levin	Exisitng highway north of Waiterere beach turnoff crosses open farmland and it appears that it could be widened to expressway standard without significant difficulty.	L	O		Minor	10	Almost certain	5	**50**						
8.15	Local road changes	Possibility of local road changes constrains the corridor.	L	T		Minor	10	Likely	5	**50**	**Moderate**	Similar	Similar	Similar	Similar	Similar
8.16	Population changes	Areas with high population growth rates will have a significant effect on traffic volumes and composition.	L	T		Minor	10	Likely	5	**50**	**Moderate**	Similar	Similar	Similar	Similar	Similar
8.17	Contaminated land	Contaminated land may constrain alignment, or increase cost of construction.	L	T		Minor	10	Likely	5	**50**	**Moderate**	Similar	Similar	Similar	Similar	Similar
8.18	Omissions	Possibility that scope is omitted from I&R phase, leading to inaccurate cost estimates and rework.	L	T		Minor	10	Likely	5	**50**	**Moderate**	Similar	Similar	Similar	Similar	Similar
8.19	Utilities	Design can be made to accommodate services in accessible areas without disruption to traffic.	L	O		Negligible	1	Almost certain	5	**5**						
8.20	Urban form	Potential for improving urban form	L	O		Minor	10	Expected	4	**40**						
8.21	RoNS Standards	Uncertainty in interpretation of RoNS Standards	L	T		Medium	40	Quite common	4	**160**	**V high**	Similar	Similar	Similar	Similar	Similar
8.22	Speed management	Opportuinity to improve speed management	L	O		Negligible	1	Almost certain	5	**5**						
8.23	Modelling	Delays in setting up traffic model	L	T		Medium	40	Quite common	4	**160**	**V high**	Similar	Similar	Similar	Similar	Similar
8.24																
8.25	Inconsistency	Inconsistency between projects.	L	T		Minor	10	Quite common	4	**40**	**Moderate**	Similar	Similar	Similar	Similar	Similar
8.26	Over weight and over dimension loads	Expressway does not cater for overweight and over dimension loads	L	T		Minor	10	Rare	1	**10**	**Low**	Similar	Similar	Similar	Similar	Similar
9	**POLITICAL**															
9.1	Favour one alignment	External pressure favours particular alignment or modifies chosen option	L	T		Neglible to substantial	55	Unlikely	3	**165**	**V high**	Similar	Similar	Similar	Similar	Similar

No.	Name	Description	Status	Threat or Opportunity	Comment	Consequence		Likelihood		Score = C x L[1]	Risk Category	Option 73 NE3, SE1	Option 66 NE2, SE3	Option 75 NE3, SE3	Option 76 NE3, SE4	Option 19 NW3, SW1
						Description	Rating (C)	Description	Rating (L)							
9.2	Change of Government	New Government delays, postpones, modifies or cancels project.	L	T		Medium to substantial	70	Quite common	4	**280**	**V high**	Similar	Similar	Similar	Similar	Similar
9.3	Change of policy	Government changes policy on RoNS, delaying, postponing, modifying or cancelling project.	L	T		Negligible	1	Quite common	4	**4**	**Low**	Similar	Similar	Similar	Similar	Similar
10	**OTHER**															
10.1	Level of service	Level of service of current highway not kept up during Investigation Design and Construction periods	L	T		Minor	10	Unlikely	3	**30**	**Moderate**	Similar	Similar	Similar	Similar	Similar
10.2	Standards	NZTA changes standards	L	T		Minor	10	Unlikely	3	**30**	**Moderate**	Similar	Similar	Similar	Similar	Similar
10.3	Funds	Funding no longer available	L	T		Medium to substantial	70	Quite common	4	**280**	**V high**	Similar	Similar	Similar	Similar	Similar
11	**OTHER RISKS IDENTIFIED, BUT NOT CONSIDERED PROJECT RISKS AT THIS STAGE**															
11.1	Resources	Insufficient resources to design or construct expressway	P		NZTA risk											
11.2	Public transport	Disruption to public transport during construction and afterwards	P		Community risk											
11.3	Public transport	Improvement to public transport after construction	P		Community opportunity											
11.4	Cycling	Disruption to cyclists during and after construction	P		Community risk											
11.5	Cycling	Improved cycling facilities after construction	P		Community opportunity											
11.6	Population	Expressway increases population growth rates putting pressure on local infrastructure and communities	P		Community risk											
11.7	Freight	Expressway increases freight volumes putting pressure on local infrastructure and communities	P		Community risk											
11.8	Linkages	Improved links with other State Highways	L	O	NZTA benefit											
11.9	Blight	Effect of blight on property in or close to option	P		Community risk											
11.10	Expectations	Community expectations for completion of expressway by a certain time cannot be met.	P		Community risk											
11.11	Traffic disruption	Traffic disruption during construction	P		Community risk											
11.12	Emergency vehicles	Expressway construction increases emergency vehicle response times due to longer journeys	P		Community risk											
11.13	Emergency vehicles	Expressway construction improves emergency vehicle response times	P		Community opportunity											
11.14	Development	Opportunity to enhance development east of Levin and elsewhere	P		Community opportunity											
11.15	Negative development	Expressway impairs development in District	P		Community risk											
11.16	Travel Time	Poor design causes significant volumes of traffic to use existing route after construction.	P		Community risk											
11.17	Utilities	Uncertainty on existence and location of existing services	P		Construction risk											
11.18	Unexpected geotech	Possible geotechnical surprises discovered during D&PD phase	P		Design phase risk											
11.19	Maintenance	Existing bridges can be down-rated for local road usage	P		Detailed Design/ construction opportunity											
11.20	Staging	Benefits of building expressway in stages	P		Not an investigation opportunity											
11.21	Construction	Adverse effects during construction.	P		Construction risk											

LEGEND

L	Live
E	Emerging
P	Parked
C	Closed
T	Threat
O	Opportunity

[1] The following colours are used to detail risk categories:

Opportunities	Extreme	>=350
	Very High	350-200
	High	200-70
	Moderate	70-30
	Low	4-30
	Negligible	1-3

GENERAL RISK TREATMENT PLAN

Activity	Otaki to North of Levin Scoping Report
Contract No.	464-PN
Date	Sep-11

Analysts Name(s)	Bob Barraclough
Reviewers Name(s)	Gina Waibl
Sources of Information	Various

No.	Name	Threat or Opportunity	Treatment Type	Treatment Progress	Treatment Actions	Responsibility	Timing	Resources	Monitoring & Reporting	Treatment Cost	Risk Reduction
1	ACCESS AND SEVERANCE										
	Issues are social severance, loss of access and reduced connectivity.	Threat	Minimise	Partially identified, but not yet started	Consultation, design (including access roads) and land purchase/land swaps/compensation. Factors were included in option evaluation criteria. No other special treatments required at this stage.	NZTA, MWH	Before submission of NoR	All	Fundamental aspect of request for RC and NoR	Included in Scheme Assessment cost	Unlikely to be eliminated, but aim is to reduce issues to minor at worst.
2	LAND AND PROPERTY										
	Principal issues appear to be difficulties arising from Maori owned land and lifestyle blocks	Threat	Minimise	Partially identified, but not yet started	Consultation, choice of alignment to minimise effects on Maori land and lifestyle blocks. Factors were included in option evaluation criteria. Other treatment is to route around proprty boundaries rather than through properties, to the extent possible.	NZTA, MWH	Before submission of NoR	All	Fundamental aspect of request for RC and NoR	Undetermined. Principal cost is in land acquisition.	Risk expires when land is acquired.
3	CULTURAL										
	Area has considerable cultural history and heritage and this must be well managed and protected as well as it can be.	Threat	Minimise	Commenced, though not yet fully identified.	Consult with Maori and try to involve Iwi in decision making. Cultural and archaeological significance increases from east to west, so eastern alignment options are likely to have less cultural impact. Develop protocols acceptable to Iwi and HPT for unexpected archaeological finds. Involve Iwi in dealing with unexpected finds. Factors were included in option evaluation criteria. Project has a nominated cultural advisor who was on the option evaluation panel.	NZTA, MWH	Agreements and protocols must be in place before submission of NoR.	All	Fundamental aspect of request for RC and NoR	Included in Scheme Assessment cost	Provided work is completed properly during Scheme Assessment stage, residual risk is unexpected discoveries during construction. This can be handled satisfactorily with Iwi and HPT protocols for unexpected discoveries, but remains a risk cost.
4	CONSULTATION										
	Principal risks arise from the possibility of community opposition, community change of heart and conflicting requirements of different TLAs.	Threat	Minimise	Commenced, though not yet fully identified.	Identify opposition and conflicting requirements by consultation and develop strategies to reduce opposition. Continue disseminating information to reduce risk of a change of heart. Be consistent in approach and have no hidden agendas to reduce risk of change of heart. TLAs are treated as key stakeholders.	NZTA, MWH	Before submission of NoR	All	Opposition is likely to be overt, so monitoring is automatic.	Included in Scheme Assessment cost	It is unlikely that opposition to the scheme will be eliminated, but it should be managed so it doesn't impact on the progress (or cost) of the project.
5	CONSENTS										
	The risks under this heading include opposition, onerous consent conditions, changes to statutory processes and consents expire before construction starts	Threat	Minimise	Commenced, though not yet fully identified.	It is probable that the NoR will go to a Board of Inquiry for consideration. All the project efforts so far have been geared to satisfying BoI requirements. The BoI process will address many of the risks in this category. The project team is undertaking a procedure that will minimise the risks associated with a submission to the BoI. It is expected that any changes to statutory procedures will be signalled in sufficient time for the project team to develop appropriate measures to mitigate or eliminate any additional risks. The ACRE process and MCA are well established as techniques for optimising route options. They are recognised by consentinig authorities as a legitimate means of selecting the preferred option.	NZTA, MWH	Before submission of NoR	All	Fundamental aspect of request for RC and NoR	Included in Scheme Assessment cost, except any changes in legislation.	The team's work plan is based on minimising the risk of the application for Designation being rejected.
6	ENVIRONMENTAL										
	The risks under this heading are the normal environmental risks (some of which are considered under other headings).	Threat	Minimise	Commenced, though not yet fully identified.	Most of the environmental risks are addressed by the Resource Consent conditions. The mitigation measures under section 5, Consents, above apply to this heading. Damage is minimised by using the MCA selection process.	NZTA, MWH	Before submission of NoR	All	Fundamental aspect of request for RC and NoR	Included in Scheme Assessment cost, except any changes in legislation.	The team's work plan is based on minimising the risk of the application for Designation being rejected.
7	ECONOMICS										
	There are a number of economic risks which can be loosely grouped as follows:										
	Scheme benefits	Threat	Minimise	Commenced, though not yet fully identified.	The preferred alignment will ideally be chosen to maximise project benefits, however other constraints may require the selection of a sub-optimal alignment in terms of the benefits. When selecting an alignment, the effect on the benefits will be kept in mind to ensure that the alignment chosen is the optimal balance between cost, benefits and other constraints.	NZTA, MWH	Before submission of NoR	All	Fundamental aspect of request for RC and NoR	Included in Scheme Assessment cost.	The team's work plan is based on optimising benefits.

No.	Name	Threat or Opportunity	Treatment Type	Treatment Progress	Treatment Actions	Responsibility	Timing	Resources	Monitoring & Reporting	Treatment Cost	Risk Reduction
	Scheme costs	Threat	Minimise	Commenced, though not yet fully identified.	The preferred alignment will be chosen to minimise project costs, however other constraints may require the selection of a sub-optimal alignment in terms of cost. When selecting an alignment, the effect on the costs will be kept in mind to ensure that the alignment chosen is the optimal balance between cost, benefits and other constraints. Cost was one of the criteria used in the MCA.	NZTA, MWH	Some before submission of NoR, but mostly in Detailed Design phase.	All	Fundamental aspect of request for RC and NoR	Initial work included in Scheme Assessment cost. Principal cost optimisation occurs in Detailed Design phase.	The team's work plan is based on minimising costs.
	Community economic risks	Threat	Minimise	Commenced, though not yet fully identified.	The two principal community risks are loss of passing trade business in Levin when it is bypassed and loss of productive land. The first will be mitigated by investigation by experts followed by careful design. This might turn the threat into an opportunity. Land values have been considered in the ACRE process and the risks are balanced against other risks.	NZTA, MWH	Before submission of NoR.	All	Fundamental aspect of request for RC and NoR	Included in Scheme Assessment cost.	It is expected that the construction of a bypass around Levin will enhance passing trade business, turning the threat into an opportunity.
8	DESIGN (INCL GEOTECH)										
		Threat	Minimise	Commenced, though not yet fully identified.	Many of the design risks have been mitigated through the ACRE process - identifying constraints and choosing routes which avoid the constraints as far as possible. The detailed design will further mitigate these risks, the largest of which are now geotechnical risks. Geotechnical risk will be mitigated by geotechnical investigations in the I&R and D&PD phases. Unfortunately, the most geologically stable land is located at the foot of the mountains and the most easterly route was not considered to be one of the better options. One of the principal factors in rejecting western routes was the higher geotechnical risk (including flooding and tsunami). Geotechnical risk will be one of the criteria used to choose the preferred alignment and will be balanced against the other risks and constraints. Geotechnical factors were one of the criteria used in the MCA, which leads to management of these risks.	NZTA, MWH	Some before submission of NoR, but mostly in Detailed Design phase.	All	Fundamental aspect of request for RC and NoR	Initial work included in Scheme Assessment cost. Principal cost optimisation occurs in Detailed Design phase.	The team's work plan is based on minimising geotechnical risk, consistent with other constraints and with minimising other risks.
9	POLITICAL										
		Threat	Minimise	Commenced, though not yet fully identified.	The largest threat to the project is estimated to be the threat of delay, postponement, modification or cancellation. Probably the only mitigation is to advance work to the stage where these actions become politically unacceptable to the wider community. A well presented case and management of community concerns through consultation will ensure that the scheme meets RoNS objectives.	NZTA, MWH	Some before submission of NoR, but mostly in Detailed Design phase.	All	Not required	Initial work included in Scheme Assessment cost.	It seems unlikely that this risk can be reduced effectively by any work carried out by the project team.
10	OTHER										
		Threat	Minimise	Commenced, though not yet fully identified.	The risks under this heading are generally risks that will be addressed through the Scheme Assessment, consultation and design processes.	NZTA, MWH	Some before submission of NoR, but mostly in Detailed Design phase.	All	Not required	Initial work included in Scheme Assessment cost.	Various.