State Highway 58

Value Engineering Report

Summary of VE exercise undertaken including updated project economics and cost estimation

MWH now part of Stantec

Prepared for:
NZ Transport Agency

Prepared by:
Jamie Povall

May 2017

Revision	Description	Author		Quality Check		Independent Review	
0		Jamie Povall	May 2017	Dhimantha Ranatunga	May 2017		

This document entitled “State Highway 58 Value Engineering report” was prepared by Stantec New Zealand Ltd (“MWH, now part of Stantec”) for the account of NZ Transport Agency. Any reliance on this document by any third party is strictly prohibited. The material in it reflects the professional judgment of MWH, now part of Stantec in light of the scope, schedule and other limitations stated in the document and in the contract between MWH, now part of Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, MWH, now part of Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that MWH, now part of Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by ____
(signature)

Jamie Povall

Reviewed by ____
(signature)

Dhimantha Ranatunga

Approved by ____
(signature)

Enter Name

Table of Contents

LIST OF TABLES

LIST OF APPENDICES

Executive Summary

This report details the Value Engineering Exercise undertaken as part of the project in April and May 2017, following recommendations made by the NZ Transport Agency Value Assurance Committee.

Improved project cost-effectiveness is proposed by reducing the horizontal radii of the four realignment sites from the 400mR originally proposed, to 300mR. This will deliver considerable cost savings (of $6-7M) which also has a beneficial impact on the projects Benefit-Cost Ratio. No other cost reducing options are proposed.

The project expected estimate, following value engineering, is estimated at $46M, delivering a BCR of 1.3.

1.0 INTRODUCTION

1.1 REPORT PURPOSE

Following discussions at NZ Transport Agency Value Assurance Committee (VAC), the project team have been requested to identify options for reducing the overall project costs to improve value for money.

As part of the Value Engineering (VE) exercise, it is noted by the NZ Transport Agency that if the predicted KiwiRAP star rating were to drop below the 4 star level that is predicted based on the latest scheme design, to around 3.5 star, this would be deemed acceptable (as this would be consistent with the ONRC CLoS for a Regional state highway).

1.2 SCOPE OF REVIEW

1.2.1 Design & Estimates

a. Compartmentalising Estimate: This involves splitting out the different elements geographically in order to understand section by section costs explicitly – in particular the realignments (but also other elements) – not to be confused with the 'Region' costs from the SAR
b. Non-realignment cost estimate: For the four remaining sections proposed for realignment (excluding scour site) a concept design for those sections for widening only (no realignment) will be undertaken in order to calculate the cost to identify the 'additional' cost of realigning as opposed to just upgrading the existing
c. A review of the potential to scale back the extent of the realignments (i.e. reducing the proposed horizontal curve radii) will be undertaken with an updated concept design and cost estimate. An initial concept is to reduce the proposed realignment curve radius down to around 250 or 300mR for each of the four remaining realignment sections.

1.2.2 KiwiRap Calculations

a. A review of the curve crash risk assessment previously completed will be undertaken to determine the effect on the predicted KiwiRAP score if one or more realignments were removed. It is not expected that this will identify further benefits as KiwiRAP is a very coarse tool that almost certainly will not recognise this subtlety.
b. Overview tests on the effects of removing some aspects of scope and their impacts on KiwiRAP will be undertaken.

1.2.3 Non-Physical Works Costs

a. A review of the effect is of adjusting some of the cost ranges for the non-physical works items (property, TTM, P&G etc.) will be undertaken.

2.0 REALIGNMENT ASSESSMENT

2.1 INITIAL ASSESSMENT

2.1.1 Individual Realignment & Component Costs

For the current Option 5 proposals, the estimates have been compartmentalized to provide the individual costings of key sections, geographically, as follows:

Table 1: Individual realignment & component costs

Section	Cost*	Comment
Realignment Section 1	$3.0M	Section closest to SH2/58 interchange
Realignment Section 2	$2.4M	At the Haywards uphill (westbound) passing lane
Realignment Section 5	$8.1M	Top of Haywards Hill
Realignment Section 3	$3.3M	South of Mount Cecil Road
Moonshine Roundabout	$4.2M	Includes approaches
Flightys / Murphys Roundabout	$3.1M	Includes approach works and new bridge

**Costs shown are base estimate figures inclusive of property estimates*

Note that Realignment Section 4 has been constructed so is not provided. The cost build up by elemental items has previously been provided[1].

2.1.2 Non-realignment Cost Estimate

The same linear metre extent of each of the 4 remaining sections proposed for realignment have been redesigned with no realignment, but still subject to the improved cross section. These are provided below:

Table 2: Non-realignment cost estimate

Section	No Realignment Cost[2]*	With 'Full' Realignment Cost*	Difference
Realignment Section 1	$1.6M	$3.0M	$1.4M
Realignment Section 2	$1.6M	$2.4M	$0.8M
Realignment Section 5	$1.9M	$8.1M	$6.2M
Realignment Section 3	$1.8M	$3.3M	$1.5M
	$6.9M	$16.8M	9.9M

[1] MWH Technical Note for VAC Working Group, supplied March 2017

[2] These costs make no allowance for additional widening to provide the required Stopping Sight Distance (SSD) around curves. Given the low horizontal radii of some of the existing curves, along with only modest shoulder and median widths (with barrier), widening is expected to be needed in numerous locations.

**Costs shown are base estimate figures inclusive of property estimates*

The assessment shows that the 'additional' cost of realigning the remaining four sections is approximately $10M more than the cost of undertaking the improved cross section on the existing alignment.

A very high cost is associated with Realignment Site 5 which was added to the project scope late in the process in order to achieve a fairly consistent horizontal geometry throughout the corridor.

2.1.3 Alternative 250mR Realignment

In this scenario, the realignment proposed is lessened, with the curve realignments reduced from generally around 400mR to 250mR. The 250mR radii has been selected on the basis of providing an approximate design speed of 80km/h with 6% super elevation. Should 85km/h design speed be required, the super elevation could be increased to 7%.

The cost estimates below, allow for widening to achieve Stopping Sight Distance requirements for 80km/h design speed (assuming a reaction time of 2 seconds and a deceleration coefficient of 0.36).

For Realignment Site 3 (south of Mount Cecil Road), the existing horizontal radii curves are already greater than 250mR and therefore they would not be subject to realignment; but there is still an additional cost in this scenario beyond the 'no realignment cost' to widen for SSD requirements. See footnote for further details.

Table 3: Alternative 250mR realignment

Section	No Realignment Cost[3]*	With 'Full' Realignment Cost*	Realignment reduced to 250mR
Realignment Section 1	$1.6M	$3.0M	$2.5M
Realignment Section 2	$1.6M	$2.4M	$1.9M
Realignment Section 5	$1.9M	$8.1M	$2.7M
Realignment Section 3	$1.8M	$3.3M	$2.4M[4]

**Costs shown are base estimate figures inclusive of property estimates*

2.1.4 Summary

There is an opportunity to significantly reduce project costs by reconsidering the realignments. The remaining realignments could be removed entirely from the project scope, or the scale of the realignment could be reduced to a lower standard. Removing the

[3] These costs make no allowance for additional widening to provide the required Stopping Sight Distance (SSD) around curves. Given the low horizontal radii of some of the existing curves, along with only modest shoulder and median widths (with barrier), widening is expected to be needed in numerous locations.

[4] It is noteworthy that the realignment Section 3, the current horizontal curve radii in this section are both already above 250mR, but the increase in cost shown ($1.8M to $2.4M) is associated with curve widening to achieve Stopping Sight Distance (SSD), which had not been allowed for in the situation where the road was not being realigned.

realignment entirely saves around $10M, whereas reducing the scale provides a saving of around $7M (if the realignments are reduced to 250mR).

Given there is only around a $3M difference between these two scenarios, it would be preferable to undertake some realignment as opposed to nothing at all.

Should the reduced scale realignments be acceptable to the Transport Agency, this would provide a design speed of 80-85km/h through the realigned curves, which would be consistent with the proposed speed limit reduction for the corridor (from 100km/h to 80km/h).

Reducing the realignment radii as described would need to be considered against the context of the entire route. A higher standard realignment radii (of around 400mR) was proposed previously as it delivered a more consistent route geometrically and avoided the need for higher super elevation. By reducing the minimum radii to 250mR, it does mean that the eastern end of the route is more constrained and has a tighter geometry than the rest of the route[5]. This may be acceptable given the terrain here (over Haywards Hill) is more challenging and undulating and potentially therefore could be considered in a different environmental context with lower design standards than the remainder of the route; but this needs further discussion with NZ Transport Agency experts.

If the reduced radii approach is acceptable, then it is possible that median and edge barrier strikes become more common, both through nuisance hits and through loss of control crashes. The effect of additional barrier strikes, such as maintenance cost or lane closures has not been considered at this stage.

2.2 ADDITIONAL ASSESSMENT FOLLOWING DISCUSSION WITH DR. FERGUS TATE

In discussions with Dr. Tate on 9 May 2017, it was recommended to assess the cost implications of providing a minimum of 300mR for the realignment sites, as this was a more forgiving curve radii and easier for drivers to interpret (then the 250mR option).

Table 4: Additional assessment following discussion with Dr. Fergus Tate

Section	No Realignment Cost*	With 'Full' Realignment Cost*	Realignment reduced to 250mR	Realignment reduced to 300mR[6]
Realignment Section 1	$1.6M	$3.0M	$2.5M	$2.5M
Realignment Section 2	$1.6M	$2.4M	$1.9M	$1.9M
Realignment Section 5	$1.9M	$8.1M	$2.7M	$2.7M
Realignment Section 3	$1.8M	$3.3M	$2.4M[7]	$2.4M

[5] The Scour Site Realignment that was accelerated and has been constructed as a 420mR curve. This is the western-most of all five proposed realignments meaning that if the remaining realignments were constructed to 250mR, then the recently completed scour site works would not be located between two lower standard realignments which would be undesirable.

[6] This cost is slightly higher than the 'Full' realignment cost because in the original proposal Realignment Site 1 was proposed as 280mR, so the 300mR proposal is an increase on this.

[7] It is noteworthy that the realignment Section 3, the current horizontal curve radii in this section are both already above 250mR, but the increase in cost shown ($1.8M to $2.4M) is associated with curve widening to achieve

Section	No Realignment Cost*	With 'Full' Realignment Cost*	Realignment reduced to 250mR	Realignment reduced to 300mR[6]
	$6.9M	$16.8M	$9.5M	$11.1M

**Costs shown are base estimate figures inclusive of property estimates*

Changing the radii to 300mR provides an opportunity to deliver a cost reduction of almost $6M from the base estimate. Given the additional cost to raise the radii from 250mR to 300mR is around $1.5M, this is considered to be a more appropriate and cost-effective design solution.

3.0 KIWIRAP ASSESSMENT

Additional KiwiRAP calculations have been undertaken to test a number of different scenarios. It is noted that KiwiRAP Assessment Tool (KAT) is an excellent instrument particularly for very high level corridor assessments such as for PBCs, but that the nature of the tool means it is less suited to very detailed assessments.

The calculated KiwiRAP score for a variety of tests is provided below.

Table 5: KiwiRap assessment

Scenario	KiwiRAP
Existing	2.7
Option – incl. curve realignment	3.9
Option – excl. curve realignment	3.9
Option – median barrier removal (and no flush median)	2.9
Option – edge barrier removal	3.6
Option – edge and median barrier removal	2.8
Option – no shoulder widening	3.8
Option – no roundabouts	3.8
Option – no median barrier, but flush median	3.1

KiwiRAP does not account for the subtlety of the curve realignments so some caution is needed when using the tool for this level of assessment – this is shown in Table 2 above in the third and fourth rows where there is no difference in the calculated score (of 3.9) with or without realignments, as the tool is not able to discern between the two options. For very targeted and localised improvements, the tool is a less helpful guide.

For the corridor wide treatments, the tool is more useful and clearly demonstrates that the biggest effect on the score is the provision of a median barrier, which is logical given the

Stopping Sight Distance (SSD), which had not been allowed for in the situation where the road was not being realigned.

volumes on SH58 combined with the geometry mean cross centerline crashes are a significant risk.

To reduce the KiwiRAP to a score of around 3.5, the initial tests suggest that all of the edge barrier and shoulder widening could be removed from scope. However, this is not recommended as both are deemed to be vital components of the package of improvements to deliver a Safe System compliant corridor – for example there are multiple edge hazards that require protection along the route and loss of control crashes make up two thirds of all high severity crashes on the corridor.
The scenario runs undertaken show that removing the realignments entirely makes no difference to the calculated KiwiRAP score[8] and so changing the scale of realignments (from 400mR to 250mR) would also have no effect on the score. This is due to the limitations of the tool and not a true reflection of the safety level of the different approaches – which would be graduated with highest standard of realignment likely to be most safe, and no realignment providing the least safety benefit.

4.0 SCOPE REDUCTION OPTIONS

Methods of securing additional cost savings beyond just the realignments have also been investigated. The current physical works cost estimate has been worked through in detail and subject to parallel estimation. As such it is reasonable to accept the estimate is accurate and robust and cost savings will only be achieved through trimming scope.

Substantial cost savings could therefore be achieved in the following ways:

4.1 CROSS-SECTION STANDARDS

The cross section could be reduced beyond what is currently proposed. The median width at 2m is already essentially at the minimum for barrier deflection proposes and so should not be reduced further. In theory the lane widths at 3.5m could potentially be reduced but this is an over-dimension route and so this would need to be investigated further along with consulting with stakeholders. Lane widths of 3.2m would result in a total cross section reduction of 0.6m of pavement construction. Along the length of the almost 9km route this would provide savings in the region of $1m-$1.5M.

The sealed shoulder width could be reduced to 1.0m (instead of 1.5m), saving 1.0m from the cross section. The cost saving is estimated at $2m-2.5M. This would have safety implications and is unlikely to be acceptable.

Given the implications of such changes and the relatively modest savings, we would not recommend a revision to the proposed cross section. Lane widths of 3.2m and sealed shoulder widths of 1.0m would be inconsistent with the 800m already constructed at the Scour Site project.

[8] Previously we have provided a KiwiRAP range and for the current Option (Opt 5) this was provided as 3.9 to 4.5 to allow calculation of the DSI savings range. The KAT tool provided a calculated score of 3.9 and this was taken as the lower end of the range given the benefits of the realignments were not included in this figure (hence 3.9 to 4.5 range)

4.2 PROJECT EXTENTS

The full extent of project treatment could be reduced to lessen the overall length of treatment. This would mean that there would be no work (or vastly reduced works) on part of the route. Previously the investigations have considered staging the implementation of the project based on different staging strategies. Given the project is safety focused, the safety strategy was deemed most appropriate. The safety strategy identified highest to lowest priority and reducing the project extent could include completely omitting the lowest priority sections from the project entirely. The implications of this are fairly severe; the standard would be inconsistent and would likely lead to crash migration. There would also be a poor perception from customers.

We would not recommend this course of action as this is a Safe System corridor treatment.

5.0 CONCLUSION

5.1 GEOMETRY

If the four remaining realignment sites are reduced to 300mR, then it is expected to reduce the overall project cost (i.e. expected estimate) to approximately $7M. This is likely to be the most appropriate and realistic way of achieving significant savings to improve value for money on the project.

This approach would have no effect on the calculated post-completion KiwiRAP score (of around 3.9 to 4.1). This approach does lessen the overall route consistency marginally, however not to an unacceptable extent and the proposed method of cost reduction has been accepted by VAC.

5.2 RESILIENCE

This is a safety rather than resilience-driven project. In the event that resilience was the primary objective then the improvements almost certainly would be different to the safety works; however resilience remains a key consideration as this has been identified as a high risk route particularly around Haywards Hill (i.e. in the do-minimum situation Haywards Hill remains a very high resilience risk site).

In the ‘full’ realignment proposal (for larger, higher standard realignments), there is the potential to provide some resilience benefit if the slope cut design was undertaken in an appropriate manner; but as some of the slopes remain untouched (because they do not require any realignment), then a level of risk remains (i.e. without improving all of the high risk slopes in the entirety, slope failure risk and associated road closure remains).

In the ‘reduced’ realignment scheme there is still an opportunity to provide resilience benefits again subject to appropriate slope cuts and mitigation measures. The level of benefit is likely to be reduced given the extent of slope cuts are reduced (because the extent of realignment is lessened).

In all scenarios, a level of resilience risk remains as there would be sections along Haywards Hill that would not be subject to any slope cutting works meaning that in a large earthquake event untreated sections would result in slope failure closing the road. In the situation where the realignments lengths are greater, the opportunities for improving slope stability are more extensive. As such it is reasonable to expect that whilst road closures would still eventuate, the duration of closure would be shorter because less of the route would be susceptible to slope failure.

5.3 COST ESTIMATE UPDATE

A full cost estimate update has been undertaken based on reducing the proposed realignment radii to 300mR for the four remaining sites as described in Section 2.2 of this report.

The updated cost estimate for the project is as follows:

- EXPECTED ESTIMATE: $46.4M
- 95th PERCENTILE ESTIMATE: $53.3M
- 5th PERCENTILE ESTIMATE: $40.8M

5.4 ECONOMICS UPDATE

The economic evaluation for the project has also been updated to reflect the latest project costs. The crash cost savings for the changed radii (from around 400mR to 300mR for the four remaining realignment sites) have not been updated in the economics but the economic effect on the BCR is considered to be negligible.

The updated BCR, following value engineering, has been calculated as 1.3 and is detailed in the table below.

Table 6: Benefit cost ratio

Section	Expected Cost Estimate	Present Value (PV) Cost	Travel Time, VOC and CO2 Benefits	Safety Benefits	Total PV Benefits	BCR
Value Engineering Update	$46.4M	$40.8M	-$3.3M	$56.5M	$53.2M	1.3

Table 7: Sensitivity testing

Type	Variable/Comment	BCR
Costs	Base Estimate	1.5
	Expected Estimate	1.3
	95th Percentile Estimate	1.1
Benefits (Safety)	Crash Reduction: Pessimistic	1.2
	Crash Reduction: Median	1.3
	Crash Reduction: Optimistic	1.4
Discount Rate	4% Discount Rate	1.7
	6% Discount Rate	1.3
	8% Discount Rate	1.0
Traffic Growth	AS below -1%	1.0
	+0.5% growth to 2021, 2021 onwards as per WTSM (2021-2031: 1.3%, 2031+ : >0.1%)	1.3
	As above + 1%	1.6

The sensitivity testing shows the BCR is robust in the 1-3 'Low' economic efficiency band under a range of likely scenarios, with the BCR being most sensitive to changes in the cost estimate, discount rate and traffic growth.

An updated TIO economic summary sheet is provided as an appendix to this report.

APPENDIX A: TIO ECONOMIC SUMMARY SHEET

Worksheet 1 - Evaluation Summary and TIO Upload

Upload V1.0 (1Oct13)

This spreadsheet can be automatically uploaded into Transport Investment Online. To enable automatic upload please do not adjust the columns or rows.

Activity name		SH58 Safety Improvements: SH2 to Lanes Flat			
Reference					
Evaluator(s) - name, organisation		Dhimantha Ranatunga, MWH			
Reviewer(s) - name, organisation		Phil Peet & Dave Wanty, MWH			
Date of evaluation	mm/yyyy	07-2016			
Time zero / implementation start date	1 July yyyy	2018			
Construction duration	Months	36			
Base date of costs and benefits	yyyy	2016			
Location		State Highway 58, from SH2/Haywards Hill to Bradey Road (RP0/0.5 to RP0/9.3)			
Problem definition		Reduce high severity crashes and improve customer levels of service along the route			
Do minimum description		Continued Maintenance, Tranmission Gully and Petone to Grenada Constructed by 2021.			
Alternatives considered (or page references to relevant)		Refer SAR addendum			
Options considered (or page references to relevant)		Refer SAR addendum			
Preferred option description		Curve realignment of 5 sites, 1.5m full extent shoulder widening, central WRB median , edge guardrail			

Statistics		**Base rate**	**Growth rate (%)**	**New users/transfer**
Road traffic - Annual Average Daily Traffic (AADT)	AADT	14,250	1.00	
Pedestrians - Annual Average Daily	Count	0	0.00	0
Cyclists - Annual Average Daily	Count	0	0.00	0
Annual Patronage - Total	Count	0	0.00	0
Annual Patronage - Peak Period	Count	0	0.00	
Freight volume	tonnes	0	0.00	0
Heavy Vehicles Volume	AADT	560	0.00	
Heavy Vehicles Volume	%	4.00		
Road Category		Rural strategic		

		Before	**After**
Roughness	IRI/NAASRA	0	0
Posted speed	km/h	80	80
Average traffic speed	km/h	80	80
Length of road / route	km	8.80	8.80
Road width	metres	9.00	12.00
Travel time on route	minutes	7	7

		Period start am	**Period stop am**	**Period start pm**	**Period stop pm**
Peak Period		0715	0845	1615	1745
Peak Period Traffic flow	Vehicles/hr	1900			
Period of crash analysis	yyyy - yyyy	2010	2014		

	Fatal	**Serious**	**Minor**	**Non Injury**
Recorded crashes in period (row 4 crash analysis)	3.0	9.0	31.0	75.0
Total estimated crashes per year - do minimum (row 11)	0.6	1.8	6.2	15.0
Predicted crashes per year - preferred option (row 20)	0.1	0.2	1.9	4.5

Heavy Vehicle Trips Saved (average per year)	count	0
Vehicle Operating Cost Savings (per annum)	$/vehicle	0
Travel time savings (per day)	minutes	0

Costs		**Do minimum**	**Preferred option**
Construction / implementation	$	0	46,354,243
Present Value Construction / implementation	$	0	39,140,539
Present Value Maintenance, renewal and operating costs	$	1,311,181	1,405,292
Present Value Total costs (whole of life)	$	1,311,181	40,545,831
Present Value Cost savings	$	0	
Present Value Funding assistance	$	0	

Benefits (Present Value)		
Travel time cost savings	$	123,695
Vehicle operating cost savings	$	-3,295,324
Crash cost savings	$	56,518,628
Seal extension benefits	$	0
Driver frustration reduction benefits	$	0
Risk reduction benefits	$	0
Vehicle emission reduction benefits	$	-122,737
Other external benefits (noise, visual, impact etc)	$	0
Mode change benefits	$	0
Walking and cycling health benefits	$	0
Service or facility user benefits	$	0
Parking user cost savings	$	0
Dis-benefits during implementation/construction	$	0
Road Traffic reduction benefits	$	0
National strategic benefits	$	0
Agglomeration benefits (WEB)	$	0
Increased Labour Supply (WEB)	$	0
Imperfect Competition (WEB)	$	0
Total Benefits Present Value	$	53224262.45

Non monetised benefits or national strategic factors	List non monetised benefits or national strategic benefits which should be considered	
Benefit Cost Ratio (BCRn) National	1.30	
Benefit Cost Ratio (BCRg) Government	1.30	
First Year Rate of Return (FYRR)	0.06	
Sensitivity Analysis - BCR range	1.00	1.70

APPENDIX B: COST ESTIMATES

Project Estimate - Form C

Project Name: SH58 Design Option 06

DBE

Detailed Business Case Estimate

Item	Description	Base Estimate	Contingency	Funding Risk Contingency
A	**Nett Project Property Cost**	**1,529,000**	**229,350**	**382,250**
	Project Development Phase			
	- **Consultancy Fees**	Nil	Nil	Nil
	- **NZTA Managed Costs**	Nil	Nil	Nil
B	**Total Project Development**	**Nil**	**Nil**	**Nil**
	Pre-implementation Phase			
	- **Consultancy Fees**	1,788,178	268,227	447,044
	- **NZTA Managed Costs**	230,000	34,500	57,500
C	**Total Pre-implementation**	**2018178**	**302727**	**504544**
	Implementation Phase			
	Implementation Fees			
	- **Consultancy Fees**	1,909,869	286,480	477,467
	- **NZTA Managed Costs**	230,000	34,500	57,500
	- **Construction Monitoring Fees**	0	0	0
	Sub Total Base Implementation Fees	**2139869**	**320980**	**534967**
	Physical Works			
1	Environmental Compliance	1,012,000	151,800	151,800
2	Earthworks	4,391,364	1,317,409	878,273
3	Ground Improvements	0	0	0
4	Drainage	4,002,558	600,384	600,384
5	Pavement and Surfacing	5,470,181	820,527	820,527
6	Bridges	1,880,000	564,000	470,000
7	Retaining Walls	414,012	62,102	62,102
8	Traffic Services	2,814,747	422,212	422,212
9	Service Relocations	4,027,109	604,066	604,066
10	Landscaping	929,615	139,442	139,442
11	Traffic Management and Temporary Works	3,656,400	548,460	548,460
12	Preliminary and General	5,205,000	780,750	780,750
13	Extraordinary Construction Costs	0		
	Sub Total Base Physical works	33,802,986	6,011,152	5,478,016
D	**Total for Implementation Phase**	**35942854**	**6332133**	**6012983**
E	**Project Base Estimate** (A+C+D)	**39,490,032**		

F	**Contingency** (Assessed/Analysed)	**(A+C+D)**	**6,864,209**
G	**Project Expected Estimate**	**(E+F)**	**46,354,242**
	Nett Project Property Cost Expected Estimate		1,758,350
	Project Development Phase Expected Estimate		**Nil**
	Pre-implementation Phase Expected Estimate		2,320,905
	Implementation Phase Expected Estimate		42,274,987

H	**Funding Risk Contingency** (Assessed/Analysed)	**(A+C+D)**	**6,899,778**
I	**95th percentile Project Estimate**	**(G+H)**	**53,254,019**
	Nett Project Property Cost 95th percentile Estimate		2,140,600
	Project Development Phase 95th percentile Estimate		**Nil**
	Pre-implementation Phase 95th percentile Estimate		2,825,449
	Implementation Phase 95th percentile Estimate		48,287,970

Date of Estimate	**Cost Index (Qtr/Year)**
Estimate prepared by G. CORIN	**Signed** **GC**
Estimate internal peer review by J. POVALL	**Signed** **JP**
Estimate external peer review by	**Signed**
Estimate accepted by NZTA	**Signed**

Note: (1) These estimates are exclusive of escalation and GST.

(2) Project Development Phase Estimates are set to Nil as these are now sunk costs.

Construction and Property Estimate

Supplied with Funding Application for: Investigation
Estimate Stage: Detailed Business Case

Item	Description	Base Estimate	5th%	Contingency	Funding Risk
A	**Nett Project Property Cost**	**1,529,000**	**114,700**	**229,350**	**382,250**
	Construction				
1	MSQA, NZTA Managed Costs and Consent Monitoring Fees	2,139,869	160,500	320,980	534,967
	Physical Works				
2	Environmental Compliance	1,012,000	75,900	151,800	151,800
3	Earthworks	4,391,364	658,700	1,317,409	878,273
4	Ground Improvements	0	0	0	0
5	Drainage	4,002,558	300,200	600,384	600,384
6	Pavement and Surfacing	5,470,181	410,300	820,527	820,527
7	Bridges / Structures	1,880,000	282,000	564,000	470,000
8	Retaining Walls	414,012	31,100	62,102	62,102
9	Traffic Services	2,814,747	211,100	422,212	422,212
10	Service Relocations	4,027,109	302,000	604,066	604,066
11	Landscaping	929,615	69,700	139,442	139,442
12	Traffic Management and Temporary Works	3,656,400	274,200	548,460	548,460
13	Preliminary and General	5,205,000	390,400	780,750	780,750
14	Extraordinary Construction Costs	0	0	0	0
B	**Total Construction**	**35,942,854**	**3,166,100**	**6,332,133**	**6,012,983**
Total Base Estimate		**37,471,854**			
Total 5th Percentile Estimate			**40,752,654**		
C	**Contingency**			**6,561,483**	
Project Property Cost Expected Estimate				**1,758,350**	
Construction Expected Estimate				**42,274,987**	
Total Expected Estimate				**44,033,337**	
D	**Funding Risk**				**6,395,233**
Project Property Cost 95th Percentile Estimate					**2,140,600**
Construction 95th Percentile Estimate					**48,287,970**
Total 95th Percentile Estimate					**50,428,570**

Base Date of Estimate	**29 May 2017**	**Cost Index**	
Estimate prepared by:	**Graeme Corin**	**Signed**	**GC**
Estimate internal peer review by:	**Jamie Povall**	**Signed**	**JP**
Estimate external peer review by:		**Signed**	
Estimate approved by NZTA Project Manager:		**Signed**	

Note: These estimates are exclusive of escalation and GST.