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# Detailed Business Case Supporting Growth and Transforming Road Safety between Omokoroa and Te Puna

26<sup>th</sup> July 2017

Revision 3

Transforming Road Safety & Supporting Growth between Omokoroa and Te Puna

Detailed Business Case to proceed from initiation to implementation



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## 4.4. Short List Options (Workshop Two)

Using the above process, the following four options in Table 4-4 were shortlisted for further assessment. Table 44 were shortlisted for further assessment. Table 44 were shortlisted for further assessment.

	OPTION 4B (HEREAFTER REFERRED TO AS OPTION A)	OPTION 5A (HEREAFTER REFERRED TO AS OPTION B)	OPTION 6B (HEREAFTER REFERRED TO AS OPTION C)	OPTION 6E (HEREAFTER REFERRED TO AS OPTION D) (OPTION SIMILAR TO THE DESIGNATED ALIGNMENT IN THE DISTRICT PLAN).
<b>Lanes</b>	Two lanes on existing alignment	2+1 lane (i.e. alternating passing lanes)	Increasing capacity of road from two lanes to four lanes on the existing alignment	Increasing capacity of road from two lanes to four lanes following the 2001 designation
<b>Median</b>	Barrier along full length of midblock	Barrier along full length of midblock	Where practicable, divided by median barriers along full length of midblock.	Barrier along full length of midblock
<b>Omokoroa/Youngson Intersection</b>	Roundabout	Roundabout	Roundabout	Grade Separated
<b>Plummer's Point/Barrett Intersection</b>	Roundabout	Roundabout	Roundabout	Grade Separated
<b>Snodgrass/Te Puna Quarry Intersection</b>	Roundabout	Roundabout	Roundabout	Grade Separated
<b>Local Roads</b>	Left In/Left out only (Francis Road, Te Karaka, Munro, Gill and Ainsworth)	Closing all minor intersections Redirect traffic to a new offline local collector and connect all side roads to major collectors	Left In/Left out only (Francis Road, Te Karaka, Munro, Gill and Ainsworth)	Closing minor intersections and redirecting to a new offline local collector (revoking the existing SH to a collector road) to connect all side roads to major collectors
Note that all options include the following treatments where practicable: <ul style="list-style-type: none"> <li>• Rationalisation and redirect of private accessways</li> <li>• Road side barriers</li> </ul>				

**Table 4-4: Short Listed Options**

The results of the long list options assessment process and the resulting four shortlisted options and indicative designs were presented to stakeholders at the second Technical Advisory Group Workshop on 8th February 2017.

The stakeholders agreed with the MCA process and shortlisted options and requested further analysis to confirm the shelf life of the shortlisted options, and a review of the intersection forms for the four-lane options. The stakeholders expressed a preference for

Option D, although further assessment would be undertaken of all shortlisted options to determine accurate risks, costs, benefits, capacity before a recommended option could be identified. The stakeholders also requested some minor amendments to the wording of the Project Investment Objectives and target years.

#### 4.4.1. Short listed options assessment (Stages 4, 5 and 6)

To assess the short list options, following a six-stage MCA process as determined in Section 4.3.1, the four short-listed options all satisfy the first three stages of the assessment criteria.

As part of that process the short listed options were analysed using the KiwiRAP Analysis Tool (KAT) What-if-analysis to assess the Road Protection Score (RPS) and subsequently the KiwiRAP Star Rating for each of the options.

SCORING SUMMARY	EXISTING	A	B	C	D
Average head-on RPS	12.28	0.00	0.00	0.00	0.00
Average intersection RPS	0.27	0.06	0.06	0.06	0.01
Average RPS	11.83	2.11	2.11	2.05	1.04
Average run-off road RPS	7.16	2.54	2.54	2.44	1.51
Average Star Rating (calculated)	2.80	4.56	4.56	4.58	4.98
Average Star Rating (published)	2.00	4.00	4.00	4.00	4.00

**Table 4-5: KiwiRAP What -if Analysis**

The calculated road protection scores in Table 4-5 show that while all short list options would achieve Objective 2, Option D would achieve the greatest improvement to the Road Protection Score and KiwiRAP Star Rating. Therefore, from a road safety perspective Option D is considered the most desirable option.

Assessment of the latter stages 4, 5 and 6 are summarised below:

**Stage 4:** the short list options were assessed based on their economics and BCR range - Options with BCR's less than 1 are discarded. The options with the higher BCR range are taken forward to Stage 5.

**Stage 5:** the remaining options were assessed against the design life of the infrastructure - Options with shorter design lives are discarded.

**Stage 6:** the remaining options were assessed against network resilience, as this was one of the problems identified in the Waihi to Tauranga PBC - Options with lower resilience are discarded, leaving the recommended option for further detailed evaluation.

The outcome of this assessment is summarised on Table 4-6. Detailed assessment of stages 4, 5 and 6 along with the evaluation of the short-listed options against these additional stages is included in Appendix D4 – Short List Option Detailed Assessment. Appendix D4 – SHORT LIST OPTION DETAILED ASSESSMENT.

OPTION	DESCRIPTION	STAGE 4 ECONOMICS AND BCR RANGE	STAGE 5 DESIGN LIFE	STAGE 6 NETWORK RESILIENCE
A	Median barrier, RAB major, left in/out minor	Discard	Discard	Discard
B	Passing lane, RAB major, close and redirect minor, new offline local collector	Discard	Discard	Discard
C	4 lane online, RAB major, left in/left out minor	Proceed	Proceed	Discard
D	4 lane offline (2001 designation), grade sep major, close and redirect minor, new offline local collector	Proceed	Proceed	Proceed

Table 4-6: Short List Options Assessment

With negative BCRs, Options A and B were discounted early in the Short List MCA process. Option D was selected over Option C despite similar assessment results in terms of the BCR and design life. The key differences between the remaining options C and D that aided this selection process are as follows:

- Option C is online and in the absence of an alternative route, construction would result in significant disruption to the existing State Highway traffic that is already operating at sub-standard levels due to the high traffic flows. Option D is an offline solution resulting in minimal disruption to the existing State Highway traffic during construction, only requiring limited temporary traffic management at key locations where it ties into the existing road network.
- Option C provides better resilience than the existing State Highway. However, in the case of a major incident blocking two or more lanes of the SH, traffic could face diversions adding between 21km to 160km (13 minutes to 96 minutes) to a journey.
- Option D retains most of the existing SH2 as a local collector road, which provides an alternative route for local traffic whilst providing the new 4-lane road for through-traffic. The local collector road also provides network resilience by providing a suitable and short alternative route in the case of a major incident on the State Highway.
- Option D has a full diamond grade separated (bridge) at Omokoroa with a capacity passed 2060, a roundabout would only have capacity until 2031.
- Option D also provides a greater reduction in DSIs than Option C. Both of these options have median barriers and shoulder barriers throughout, and four lanes of traffic on the State Highway. However, Option C includes roundabouts at each of the major intersections and left in left out intersections for the minor side road

connections. Option D provides overbridges at Plummer's Point and Snodgrass Road, and a grade separated intersection at Omokoroa Road, and provides a local collector road for all the minor side road connections. Grade separated intersections provide a safer environment for joining high speed traffic than roundabouts and left in left out intersections.

Due to the above reasons, Option D was selected as the recommended option.

## 4.5.Recommended Option

### 4.5.1. Refinement of Recommended Option (Workshop Three)

Following the identification of Option D as the recommended option, consideration was given to the optimisation of the major intersections. The stakeholders at Technical Workshop 2 requested a review of the intersection forms for the major intersections of the four-lane options to determine whether a full grade separated intersection was the most appropriate solution at each intersection, and was cost beneficial for the forecast traffic flows.

As a result, each major intersection (Omokoroa Road/Youngson Road, Plummer's Point Road/Barrett Road, and Snodgrass Road/Te Puna Quarry Road) were reconsidered in turn to determine if a full diamond grade separated intersection (on and off ramps in both directions connecting SH2 to the local road network), roundabout, or grade separated intersection with none or some on or off ramps, are the appropriate solution. A summary of this process is in Table 4-7 below.

SOLUTIONS CONSIDERED		JUSTIFICATION
<b>Snodgrass Road/ Te Puna Quarry Road</b>		
Roundabout and local collector road	<b>Discard</b>	<ul style="list-style-type: none"> <li>• Low existing and forecast traffic growth does not justify full roundabout</li> <li>• Delays SH traffic</li> <li>• High property costs for additional land</li> <li>• Potential queuing issues for local road intersections</li> </ul>
Overbridge, northbound on/off ramps, and local collector road	<b>Discard</b>	<ul style="list-style-type: none"> <li>• Low existing and forecast traffic growth does not justify on/off ramps, as there is a local collector road fulfilling these traffic movements</li> <li>• High property costs for additional land</li> </ul>
Overbridge, northbound on ramp only, and local collector road	<b>Discard</b>	<ul style="list-style-type: none"> <li>• Low existing and forecast traffic growth does not justify on ramp, as there is a local collector road fulfilling this traffic movement</li> <li>• High property costs for additional land</li> </ul>
Overbridge and local collector road	<b>Proceed</b>	<ul style="list-style-type: none"> <li>• Limited access onto Snodgrass Road/Te Puna Quarry Road from SH</li> <li>• Limited property impacts</li> <li>• Footprint within designation</li> <li>• Retaining local road connection either side of SH</li> </ul>

SOLUTIONS CONSIDERED		JUSTIFICATION
<b>Plummer's Point Road/ Barrett Road</b>		
Full diamond GSI with local collector road	<b>Discard</b>	<ul style="list-style-type: none"> <li>High property costs for additional land</li> <li>Additional resource consents would be required</li> <li>Poor transport planning to have a grade separated interchange 2km from another grade separated interchange</li> </ul>
Roundabout with local collector road	<b>Discard</b>	<ul style="list-style-type: none"> <li>Low existing and forecast traffic growth does not justify full roundabout</li> <li>Delays SH traffic</li> <li>Large costs to move electricity substation</li> <li>Potential queuing issues for local road intersections</li> </ul>
Overbridge and local collector road	<b>Discard</b>	<ul style="list-style-type: none"> <li>Access for Plummer's Point Road / Barrett Road would need to use local road network rather than SH</li> <li>Removes passing trade from existing businesses relying on north bound traffic</li> </ul>
Overbridge, northbound off ramp, and local collector road	<b>Proceed</b>	<ul style="list-style-type: none"> <li>Local roads continue to provide access at a low growth intersection</li> <li>North bound off ramp retained for vehicles accessing Plummer's Point Road / Barrett Road from Tauranga (in PM particularly)</li> <li>North off ramp is on the existing SH alignment – less earthworks required than other options</li> <li>North off ramp provides access to existing businesses relying on north bound traffic</li> <li>Minimal cost to keep local road on existing SH alignment</li> </ul>
Overbridge, northbound on/off ramps, and local collector road	<b>Discard</b>	<ul style="list-style-type: none"> <li>Low existing and forecast traffic growth does not justify on/off ramps, as there is a local collector road fulfilling these traffic movements</li> <li>High property costs for additional land</li> <li>Additional resource consents would be required</li> </ul>
Overbridge, southbound on ramp, northbound off ramp, and local collector road	<b>Discard</b>	<ul style="list-style-type: none"> <li>Low existing and forecast traffic growth does not justify on/off ramps, as there is a local collector road fulfilling these traffic movements</li> <li>High property costs for additional land</li> <li>Additional resource consents would be required</li> </ul>
Overbridge, southbound on ramp, northbound on/off ramps, and local collector road	<b>Discard</b>	<ul style="list-style-type: none"> <li>Low existing and forecast traffic growth does not justify on/off ramps, as there is a local collector road fulfilling these traffic movements</li> <li>Additional and expensive earthworks required</li> <li>Additional resource consents would be required</li> </ul>
<b>Omokoroa Road/ Youngson Road</b>		
Full diamond GSI with local collector road	<b>Proceed</b>	<ul style="list-style-type: none"> <li>As a result of the above refinements, the design life of a dual lane roundabout at Omokoroa is 2034 with the addition of the Snodgrass and Plummer's Point traffic</li> <li>Design life could be increased further to &gt;2060 through the introduction of smaller roundabouts at the top of the on/off ramps</li> </ul>
Roundabout with local collector road	<b>Discard</b>	<ul style="list-style-type: none"> <li>As a result of the above refinements, the design life of a dual lane roundabout at Omokoroa is 2031 with the addition of the Snodgrass and Plummer's Point traffic</li> <li>Short design life would require significant works to retrofit future solution</li> </ul>

SOLUTIONS CONSIDERED		JUSTIFICATION
Roundabout with flyover to Omokoroa and local collector road	<b>Discard</b>	<ul style="list-style-type: none"> <li>As a result of the above refinements, the design life of a dual lane roundabout at Omokoroa with the addition of the Snodgrass and Plummer's Point traffic is 2040 for the PM peak and 2049 for the AM peak</li> <li>Similar BCR to GSI</li> <li>Better design life than roundabout but not as good as GSI</li> </ul>

**Table 4-7: Refinement Assessment**

Based on the assessment of options, the refined Option D is the recommended option as it best meets the reliability and safety objectives, with lower construction risks, and lower environmental and social impacts.

The refined Option D will provide:

- a new offline highway with four lanes and central median barrier,
- grade separated interchange at Omokoroa Road,
- overbridges for local traffic at other major intersections with a northbound off ramp at Plummer's Point,
- retains the existing highway as a local road to provide access for local traffic,
- most closely aligns with the existing designation in the District Plan,
- the posted speed limit on the new SH2 alignment will be 100km/h with 80km/hr on the existing alignment when it becomes a local road.

It is anticipated that it will reduce the number of death and serious injuries by 16, over a 5 year period, whilst providing substantial additional capacity and quicker journeys, for an estimated cost of \$ [REDACTED]

The Recommended Option plans and cross sections can be found in Appendix D5 – Recommended Option.

#### 4.5.2. Supplementary Treatments.

Supplementary treatments to be considered in the next stage include:

- A facility for bus stops on local roads;
- The potential for a dedicated bus / HOV lane to maximise people throughput within a four lane highway;
- Potential for a Park and Ride at Omokoroa junction;
- No footpath on new four lane state highway or local road, review demand and suitability at pre-implementation stage for local road;
- No cycle lanes - encourage the use of the Omokoroa to Tauranga cycle trail and alternative routes on local road;
- Facility for high occupancy lanes, this could reduce overall capacity; and.



- The opportunity for tolling on the proposed offline four lane road.

The following extract is from Appendix E3 of the Detailed Business Case – EEM Worksheets: SH2 Omokoroa to Te Puna Economic Analysis

**Crashes**

crash migration from TNL -Snodgrass RAB is 2km from end of TNL so not considered an issue  
 crash migration to west of Omokoroa - none considered because no low speed curves (<75km/hr) within 2km

Percentage of traffic that remain on existing alignment with Option 6e built: **14%** based on Tauranga Transport Model (varies from 6% in interpeak to 14% in AM peak)

**Travel Time**

Speed/Flow curves used to determine travel times. These speed flow curves have been correlated and similar to SH2 Kopuku section and Tauranga Transport Model speed flow curves

**Road Category** for Travel Time and VOC :

**RS**

for State Highways

**Roughness**

Has been ignored in this assessment

**Cost Values used in economics**

Eastbound

TIME PERIOD DATA	see TIMEPERIOD worksheet c	Hrs/Day	%of AADT	annualisation	directional slit
PERIOD	DESCRIPTION				
1	Weekday night	12	1%	245	50
2	Weekday day (interpeak)	8	7%	245	50
3	Weekday peak (AM and PM)	4	8%	245	60
4	Weekend day	8	7%	120	50
5	Weekend night	16	2%	120	50

TT & CRV COST/HR	tab A4.3	R.S
Period	TT	CRV
1	25.34	4.23
2	25.34	4.23
3	25.34	4.23
4	19.21	5.22
5	19.21	5.22

UPDATE FACTORS 2016			
OPERATING COSTS		base date: July	
TT	1.45	2002	
VOC	0.98	2015	
ACC	1.03	2015	
Reliability	1.45	2002	
CONSTRUCTION COSTS			
Estimate at year	2016		
Base date =	2016		
Factor for base date =	1.00		

**Traffic Growth**

1) Traffic growth Rate from above =

Adjustment for Time Zero =

Tab A6.4.4

minus

Acc Growth =

4.00%

1.00%

3.00%

2) This is applied to both DM and OPT