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Attention: Dave Moule

Dear Dave

## Ngahinapouri Multi-Criteria Analysis

### 1 Introduction

As part of the Village Concept Plan process for Ngahinapouri, Tonkin & Taylor Ltd (T+T) have been requested to undertake a Multi Criteria Analysis (MCA) for the intersection options presented in the Village Concept.

The form of the intersection is a key part of the Village Concept Plan therefore a robust and transparent approach to the assessment of each option was required. This report presents the reasoning behind the criteria chosen for the MCA, their weighting as well as summarising the results of the scoring undertaken.

This MCA should be read in conjunction with the T+T Ngahinapouri Concept Plan: Transportation Assessment, dated January 2021, ref: 1008305.1000 and the Boffa Miskell Village Concept plan.

### 2 Options

The Boffa Miskell Village Concept Plan presents the options currently being considered for the SH39 intersection at Ngahinapouri. These options have been established and agreed in collaboration with Waipa District Council (WDC), Boffa Miskell Ltd (Boffa Miskell), T+T and members of the community (including the majority landowner of the proposed development area) during the Village Concept Planning Process. The following 6 options have been considered in the MCA:

- 1 Do Nothing (except local road upgrade)
- 2 Staggered-Intersection
- 3 Traffic Signals
- 4 Standard Roundabout
- 5 Offset Roundabout
- 6 Three Leg Roundabout

### 3 MCA criteria and weighting

The criteria used to evaluate the options were agreed through discussion with WDC stakeholders to be the most appropriate representation of the Council's overarching community, urban design and

transport outcomes. Each of the criteria has an agreed weighting (as a percentage) which provides a balanced approach to the evaluation, with no single criteria being able to skew the overall results.

Being predominantly a transport element assessment, the highest weighted category is transport objectives amounting to 50% of the overall score. Criteria are presented Table 3.1 through to Table 3.3.

Table 3.1: WDC Objectives

Criteria	Evaluation criteria	Weighting
Connected with Community	Is this what the community wants?	5%
Environmental and Cultural Champion	Does this enhance the environmental and cultural wellbeing of the community?	5%
Economically Progressive	Does this contribute positively to the local economy and provide value to the community?	5%
Socially Responsible	Does this enhance quality of life for local community?	5%

Table 3.2: Urban Design Objectives

Criteria	Evaluation criteria	Weighting
Community Facilities and Amenities	Does this enhance the proposed community?	5%
Self-explaining Roads	Does this provide a user-friendly intersection and road network for all users?	5%
Place Making	Does this contribute to the desired sense of place?	5%
Open space network	Does this enhance the open space network?	5%
Regulatory Risk	How likely is this to meet asset owner approval or achieve RMA compliance?	10%

Table 3.3: Transport Objectives

Criteria	Evaluation criteria	Weighting
Road safety (vehicle)	Does this reduce crash risk?	10%
Road safety (pedestrian and cyclist)	Does this enhance safety of vulnerable road users?	10%
Efficiency (traffic)	Does this improve traffic movements?	5%
Buildability	Is this feasible?	10%
Ongoing Liability	What are the long-term maintenance and operational risks?	15%

Criteria for the WDC objectives have been chosen to align with the Waipa 2050 Growth Strategy. Further information on the design criteria is presented in the Village Concept Plan.

The objectives of the New Zealand Transport Agency (NZTA), the Ministry of Education (MoE) and the community are encompassed in the finalised criteria. These objectives were established during a workshop held at WDC on 29 October 2019.

The weighting of the various criteria reflects the discussions held with each stakeholder and have been agreed following consultation with Boffa Miskell and WDC.

## 4 Scoring

Scoring was undertaken using a seven-point scale (Figure 4.1) to improve granularity of results and to allow for subtle differences between options to be represented in the scoring.

3	Significant enhancement
2	Moderate enhancement
1	Slight enhancement
0	Neutral
-1	Slight detraction
-2	Moderate detraction
-3	Significant detraction (Fatal Flaw)

Figure 4.1: Seven-point scale.

Any criteria that scores a '-3', is considered to be a fatal flaw within the option and should automatically exclude it from further consideration.

The scoring of options was completed individually prior to the workshop to allow participants time to consider each option and how they perceive the relative "fit" to the evaluation criteria. The consolidated results were shared prior to provide a shared understanding of the trends and any significant differences in opinion or interpretation. A summary of the weighted results from the individual scoring broken down by objective is given in Figure 4.2.

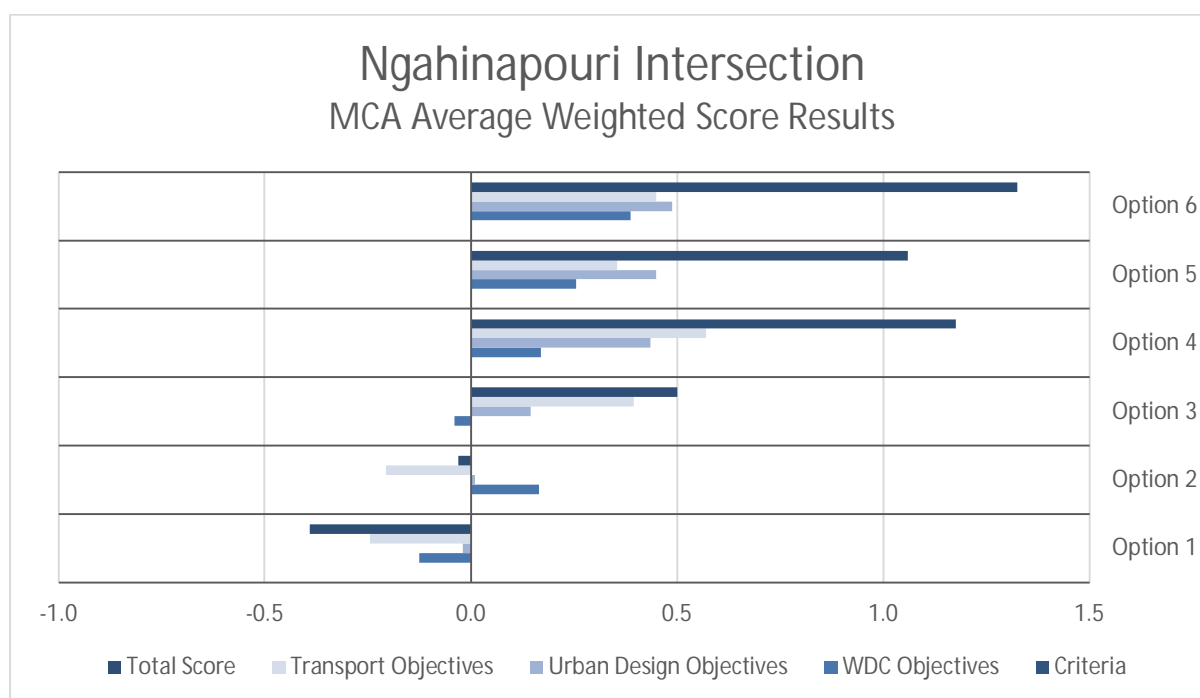


Figure 4.2: Average of individual MCA scores

A joint workshop was held at WDC offices on 20 January 2021 with representatives of planning, engineering and urban design directorates as well as consultant representatives of T+T and Boffa Miskell, to review the criteria and develop an agreed score.

Prior to reviewing the scores, the participants confirmed that the objectives and criteria were correct; the weighting for each criterion was appropriate and the seven-point scale suitable.

Each of the six options was assessed from first principles, with any discrepancies in score discussed and resolved to provide an agreed final score in Table 4.1. Rough Order Cost Estimates for each option have been presented in the T+T transportation assessment and added to Table 4.1 for completeness. The rough order costs for all options, including Options 2 to 6 indicated in Table 4.1 below, also include the costs associated with the required local road upgrades. For the purposes of the MCA, costs have not been assessed, instead each option has been assessed on merit only with the costs factored in at the end. The workshop scores, broken down in to the three objectives, are shown in Figure 4.3 below.

Table 4.1: MCA Score Summary

Option	Description	Weighted Score	Ranking	High Level Cost
1	Do Nothing (apart from local road upgrades)	-0.85	6	\$3.75m
2	Staggered Intersection	-0.55	5	\$6.15m
3	Traffic Signals	0.20	4	\$6.70m
4	Standard Roundabout	1.25	2	\$8.95m
5	Offset Roundabout	1.15	3	\$10.45m
6	Three Leg Roundabout	1.85	1	\$8.75m

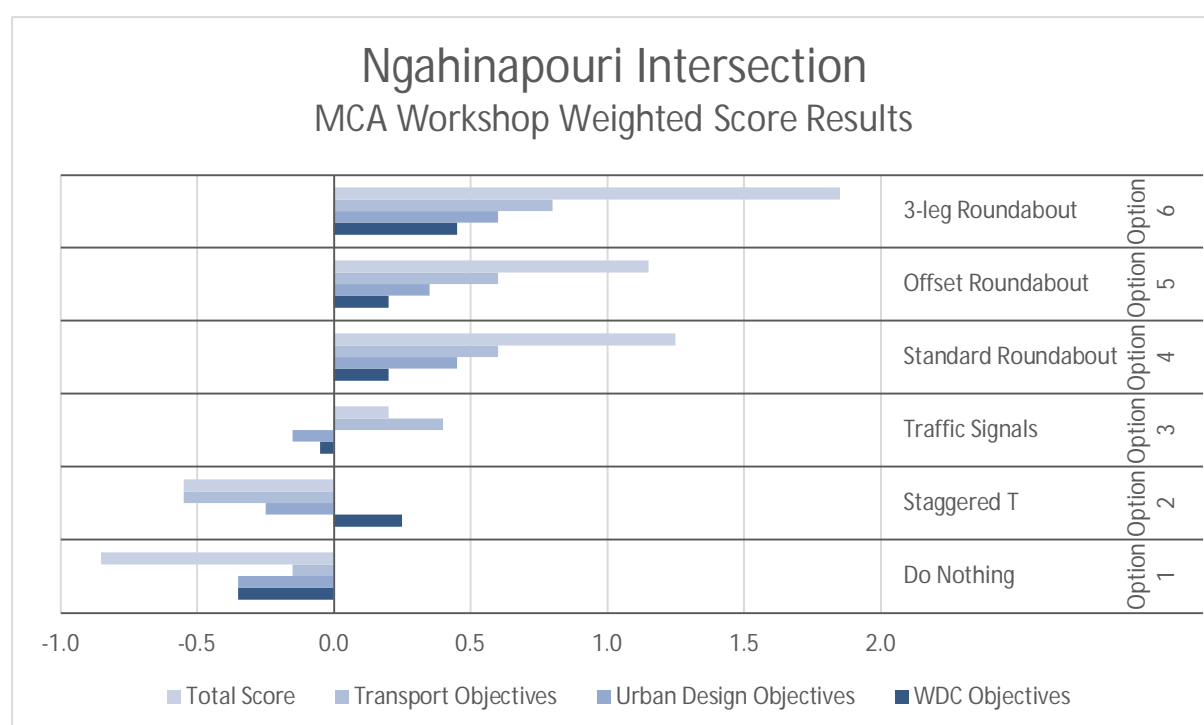


Figure 4.3: Workshop MCA Scores

#### 4.1 Discussion on scoring

In both the individual scenario and the agreed workshop assessment the scores and results are very similar. The main differences are in the value put on urban design, and Council objectives differing due to the variation in perception of value between individuals.

Overall the results are consistent with the highest scoring option being the Three Leg Roundabout arrangement.

Specific commentary around scoring was captured as follows.

#### 4.1.1 WDC objectives

There have been significant complaints from residents over the intersection layout in its current form. The staggered intersection was the original idea that was socialised with the residents, a roundabout was not originally proposed, and subsequent discussions indicate that a roundabout of some kind will be the preferred option.

#### 4.1.2 Urban design objectives

The staggered intersection option is likely to reduce developable land and may detract from Waipa 2050 objectives<sup>1</sup>, however subsequent consultation with the affected landowner indicates they believe the land in such an area would be developable into a small commercial / community centre.

Consideration of pedestrians, cyclists, motorists and residents is included within the self-explaining roads scoring.

Regulatory risk covers a high-level risk-based assessment on acceptability of the proposal and if it will result in a legal challenge situation (i.e. Environment Court). Further, NZTA may restrict future development if the intersection is not appropriate (i.e. place a limit on number of lots or trip generation until an improved intersection is constructed). NZTA have previously indicated that they would support a roundabout at this location, with no objections to the specific three leg arrangement presented in option 6.

#### 4.1.3 Transport objectives

Safety and efficiency scores are derived from empirical data provided in the earlier T+T transportation assessment for crash prediction and intersection modelling.

## 5 Conclusion

The outcome of the MCA takes account of a diverse range of criteria which represent the objectives of Waipa District Council, Urban Design and Transportation. The MCA provides a subjective comparative analysis of the option variations for the interaction of SH39 and Reid Road and is weighted to mitigate any bias within the scoring of any one option.

The MCA examined five intersection design options against the benchmark of "do nothing": Staggered intersection; Traffic Signals; Standard Roundabout; Offset Roundabout and Three Leg Roundabout. These intersection forms are discussed in detail in the T+T Transportation Assessment, dated January 2021, ref: 1008305.1000 and the Boffa Miskell Village Concept plan.

The MCA indicates that the preferred intersection form is a roundabout. Given that results of the workshop scoring indicate that a roundabout is the preferred option, and that the three leg roundabout is also the highest scoring and least expensive of the three roundabout options, it is not considered necessary to undertake a more detailed cost benefit analysis at this stage.

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<sup>1</sup> Waipa 2050 Growth Strategy, Waipa District Council (November 2017)

## 6 Applicability

This report has been prepared for the exclusive use of our client Boffa Miskell Ltd, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

T+T agrees this report may also be used by Waipa District Council for the purposes set out in, or able to be reasonably inferred from, the Contract, on the basis that the aggregate liability of T+T to Boffa Miskell Ltd in respect of any such use or reliance is subject to the limitations and exclusions of liability set out in the Contract.

This report may not be relied upon in other contexts or for any other purpose, or by any person other than Boffa Miskell Ltd and WDC, without T+T's prior written agreement.

Tonkin & Taylor Ltd

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## Appendix A: Workshop MCA scoring table

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## Multi-criteria Analysis (MCA)

Criteria	Evaluation criteria	Weighting	Option 1		Option 2		Option 3		Option 4		Option 5		Option 6	
			Do Nothing	Staggered T	Traffic Signals	Standard Roundabout	Offset Roundabout	3-leg Roundabout						
			Score	Weighted score	Score	Weighted score	Score	Weighted score	Score	Weighted score	Score	Weighted score	Score	Weighted score
<b>WDC Objectives</b>		<b>20%</b>	<b>-7.00</b>	<b>-0.35</b>	<b>5.00</b>	<b>0.25</b>	<b>-1.00</b>	<b>-0.05</b>	<b>4.00</b>	<b>0.20</b>	<b>4.00</b>	<b>0.20</b>	<b>9.00</b>	<b>0.45</b>
Connected with Community	Is this what the community wants?	5%	-2.00	-0.10	2.00	0.10	-2.00	-0.10	1.00	0.05	1.00	0.05	3.00	0.15
Environmental and Cultural Champion	Does this enhance the environmental and cultural wellbeing of the community?	5%	-1.00	-0.05	1.00	0.05	-1.00	-0.05	1.00	0.05	1.00	0.05	1.00	0.05
Economically Progressive	Does this contribute positively to the local economy and provide value to the community?	5%	-2.00	-0.10	1.00	0.05	1.00	0.05	1.00	0.05	1.00	0.05	2.00	0.10
Socially Responsible	Does this enhance quality of life for local community?	5%	-2.00	-0.10	1.00	0.05	1.00	0.05	1.00	0.05	1.00	0.05	3.00	0.15
<b>Urban Design Objectives</b>		<b>30%</b>	<b>-5.00</b>	<b>-0.35</b>	<b>-3.00</b>	<b>-0.25</b>	<b>-1.00</b>	<b>-0.15</b>	<b>8.00</b>	<b>0.45</b>	<b>7.00</b>	<b>0.35</b>	<b>10.00</b>	<b>0.60</b>
Community Facilities and Amenities	Does this enhance the proposed community?	5%	-1.00	-0.05	1.00	0.05	0.00	0.00	2.00	0.10	2.00	0.10	2.00	0.10
Self-explaining Roads	Does this provide a user-friendly intersection and road network for all users?	5%	-1.00	-0.05	-1.00	-0.05	2.00	0.10	2.00	0.10	2.00	0.10	3.00	0.15
Place Making	Does this contribute to the desired sense of place?	5%	-1.00	-0.05	-1.00	-0.05	-1.00	-0.05	2.00	0.10	2.00	0.10	3.00	0.15
Open space network	Does this enhance the open space network?	5%	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.05	1.00	0.05	0.00	0.00
Regulatory Risk	How likely is this to meet asset owner approval or achieve RMA compliance?	10%	-2.00	-0.20	-2.00	-0.20	-2.00	-0.20	1.00	0.10	0.00	0.00	2.00	0.20
<b>Transport Objectives</b>		<b>50%</b>	<b>-2.00</b>	<b>-0.15</b>	<b>-5.00</b>	<b>-0.55</b>	<b>5.00</b>	<b>0.40</b>	<b>8.00</b>	<b>0.60</b>	<b>8.00</b>	<b>0.60</b>	<b>10.00</b>	<b>0.80</b>
Road safety (vehicle)	Does this reduce crash risk?	10%	-2.00	-0.20	-1.00	-0.10	1.00	0.10	3.00	0.30	3.00	0.30	3.00	0.30
Road safety (pedestrian and cyclist)	Does this enhance safety of vulnerable road users?	10%	-2.00	-0.20	-2.00	-0.20	2.00	0.20	1.00	0.10	1.00	0.10	2.00	0.20
Efficiency (traffic)	Does this improve traffic movements?	5%	-1.00	-0.05	0.00	0.00	1.00	0.05	3.00	0.15	3.00	0.15	3.00	0.15
Buildability	Is this feasible?	10%	3.00	0.30	-1.00	-0.10	2.00	0.20	2.00	0.20	2.00	0.20	3.00	0.30
Ongoing Liability	what are the long term maintenance and operational risks?	15%	0.00	0.00	-1.00	-0.15	-1.00	-0.15	-1.00	-0.15	-1.00	-0.15	-1.00	-0.15
<b>TOTAL SCORE</b>		<b>100%</b>	<b>-14.00</b>	<b>-0.85</b>	<b>-3.00</b>	<b>-0.55</b>	<b>3.00</b>	<b>0.20</b>	<b>20.00</b>	<b>1.25</b>	<b>19.00</b>	<b>1.15</b>	<b>29.00</b>	<b>1.85</b>
COST ESTIMATE (\$M)				3.75		6.15		6.7		8.95		10.45		8.75
Score Value Ratio				-0.23		-0.09		0.03		0.14		0.11		0.21
Ranking				6		5		4		2		3		1
				Option 1 - Do Nothing		Option 2 - Staggered T		Option 3 - Traffic Lights		Option 4 - Standard Roundabout		Option 5 - Offset Roundabout		Option 6 - 3-leg Roundabout