



# Taupo Town Centre Modelling



Prepared by



September 2009

# Taupo

## Town Centre Modelling



<u>Prepared by</u>	<b>Robyn Hyde</b> Transport Modeller/Analyst	Gabites Porter Consultants Ltd 138 Victoria Street P O BOX 25 103 Christchurch New Zealand
	<b>Pip Masters</b> Transport Modeller/Analyst	
<u>Approved by</u>	<b>David Smith</b> Senior Transportation Planner	
<u>Reviewed by</u>	<b>David Smith</b> Senior Transportation Planner	Telephone: +64 3 366 9871 Facsimile: +64 3 366 9870  Date: 10 September 2009 Reference: 4437 Status: Version 2a – Final

# CONTENTS

<b>1</b>	<b>INTRODUCTION</b>	<b>1</b>
<b>2</b>	<b>METHODOLOGY</b>	<b>1</b>
	2.1 Base Description	1
	2.2 Stage 1 Description	1
	2.3 Stage 2 Description	2
	2.4 Stage 3 Description	2
<b>3</b>	<b>VALIDATION</b>	<b>3</b>
<b>4</b>	<b>BASE</b>	<b>5</b>
	4.1 Base Traffic Volumes	5
	4.2 Level of Service	5
	4.3 Key Observations	5
<b>5</b>	<b>STAGE 1</b>	<b>14</b>
	5.1 Stage 1 Traffic Volumes and Changes	14
	5.2 Level of service	14
	5.3 Key Observations	14
<b>6</b>	<b>STAGE 2</b>	<b>27</b>
	6.1 Stage 2 Traffic Volumes and Changes	27
	6.2 Level of service	27
	6.3 Key Observations	27
<b>7</b>	<b>STAGE 3</b>	<b>40</b>
	7.1 Stage 3 Traffic Volumes and Changes	40
	7.2 Level of service	40
	7.3 Key Observations	40
<b>8</b>	<b>KEY FINDINGS</b>	<b>53</b>
<b>9</b>	<b>CONCLUSIONS AND RECOMMENDATIONS</b>	<b>55</b>

## APPENDICES

Appendix A - Level of Service

APPENDIX B - Intersection Turning Movements

## LIST OF FIGURES

1.	Base 2011 AM Peak Traffic Volumes	6
2.	Base 2011 PM Peak Traffic Volumes	7
3.	Base 2021 AM Peak Traffic Volumes	8
4.	Base 2021 PM Peak Traffic Volumes	9
5.	Base 2011 AM Peak LOS	10
6.	Base 2011 PM Peak LOS	11
7.	Base 2021 AM Peak LOS	12
8.	Base 2021 PM Peak LOS	13
9.	Stage 1 2011 AM Peak Traffic Volumes	15
10.	Stage 1 2011 PM Peak Traffic Volumes	16
11.	Stage 1 2021 AM Peak Traffic Volumes	17
12.	Stage 1 2021 PM Peak Traffic Volumes	18
13.	2011 AM Peak Traffic Volumes Change Plot <i>Base v Stage 1</i>	19
14.	2011 PM Peak Traffic Volumes Change Plot <i>Base v Stage 1</i>	20
15.	2021 AM Peak Traffic Volumes Change Plot <i>Base v Stage 1</i>	21
16.	2021 PM Peak Traffic Volumes Change Plot <i>Base v Stage 1</i>	22
17.	Stage 1 2011 AM Peak LOS	23
18.	Stage 1 2011 PM Peak LOS	24
19.	Stage 1 2021 AM Peak LOS	25
20.	Stage 1 2021 PM Peak LOS	26
21.	Stage 2 2011 AM Peak Traffic Volumes	28
22.	Stage 2 2011 PM Peak Traffic Volumes	29
23.	Stage 2 2021 AM Peak Traffic Volumes	30
24.	Stage 2 2021 PM Peak Traffic Volumes	31
25.	2011 AM Peak Traffic Volumes Change Plot <i>Stage 1 v Stage 2</i>	32
26.	2011 PM Peak Traffic Volumes Change Plot <i>Stage 1 v Stage 2</i>	33
27.	2021 AM Peak Traffic Volumes Change Plot <i>Stage 1 v Stage 2</i>	34
28.	2021 PM Peak Traffic Volumes Change Plot <i>Stage 1 v Stage 2</i>	35
29.	Stage 2 2011 AM Peak LOS	36
30.	Stage 2 2011 PM Peak LOS	37
31.	Stage 2 2021 AM Peak LOS	38
32.	Stage 2 2021 PM Peak LOS	39
33.	Stage 3 2011 AM Peak Traffic Volumes	41
34.	Stage 3 2011 PM Peak Traffic Volumes	42
35.	Stage 3 2021 AM Peak Traffic Volumes	43
36.	Stage 3 2021 PM Peak Traffic Volumes	44
37.	2011 AM Peak Traffic Volumes Change Plot <i>Stage 2 v Stage 3</i>	45
38.	2011 PM Peak Traffic Volumes Change Plot <i>Stage 2 v Stage 3</i>	46
39.	2021 AM Peak Traffic Volumes Change Plot <i>Stage 2 v Stage 3</i>	47
40.	2021 PM Peak Traffic Volumes Change Plot <i>Stage 2 v Stage 3</i>	48
41.	Stage 3 2011 AM Peak LOS	49
42.	Stage 3 2011 PM Peak LOS	50
43.	Stage 3 2021 AM Peak LOS	51
44.	Stage 3 2021 PM Peak LOS	52

# 1 INTRODUCTION

The purpose of this report is to consider a number of proposed changes to the road network within the CBD and to identify predicted transport network deficiencies in the Taupo CBD in 2011 and 2021 with and without the proposed changes. The report provides background to data gathering and processing, the transport modelling undertaken, describes the assessment methodology used, and provides an account of predicted deficiencies within the study area.

## 2 METHODOLOGY

This analysis has been carried out using the Taupo Tracks Transportation Model as described in the Taupo 2006 Transportation Model - Model Building Report, April 2007 with modifications as set out in section 2.1. This work considers the impact of introducing a number of changes to the Taupo CBD. Modelling has been completed in three stages specified as stage one through stage three.

The effects of these stages have been assessed and reported for 2011 and 2021 using the AM and PM models in this report.

### 2.1 Base Description

This base model includes:

- East Taupo Arterial
- Great Lakes Centre and road network of this area as per concept plan provided.
- Civic offices moved from current sites to adjacent to Great Lakes Centre with provision for 40 parks.
- Addition of roundabouts at the intersections of Spa Road and Tongariro Street, Spa Road and Titiraupenga Street and Titiraupenga Street and Poara Hapi Streets as per concept plan.

### 2.2 Stage 1 Description

This stage includes:

- Traffic calming along Tongariro Street/Lake Terrace. Tongariro Street/Lake Terrace between Spa Rd and Titiraupenga Street modelled at 30 kms.
- Tongariro Street reduced to 2 lanes.
- Signals removed from Story Place/Tongariro Street intersection and replaced with Give Way control for Story Place and Heuheu Street.

## 2.3 Stage 2 Description

This stage involves:

- As for Stage 1
- Priority given to Titiraupenga Street traffic through the addition of Give Way control to the side streets of Tamamutu and Heuheu Streets.
- Titiraupenga/Lake Terrace intersection changed to a Give Way from the west giving priority to Titiraupenga traffic.

## 2.4 Stage 3 Description

This stage involves:

- As for Stage 2
- Additional flyover crossing southbound, Norman Smith Street – Nukuhau Street with dual circulating roundabout at Spa Street/Nukuhau Street/Gascoigne Street intersection.
- Right hand turn banned at existing Tongariro Street/Norman Smith Street intersection.

### 3 VALIDATION

Using the 2006 Taupo Transportation Model as a base, validation has been completed by splitting and adding zones to improve refinement, and accurately represent activity currently occurring. In particular, there have been refinements made around the areas of Pak n Save, Countdown and Woolworths supermarkets, and also The Warehouse.

Particular detail has been paid to ensure that zone locators are fed into the right place in order to obtain sensible generation of traffic flows.

Parking allocation has been checked and refined in and around the CBD, as well as in the key retail areas mentioned above. Additional parks have also been added to ensure that there are enough parks allocated to the east side of Titiraupenga Street.

Network validation has been completed by comparing surveyed traffic counts at key locations with the traffic volumes produced in the 2006 Taupo Transportation Validated model for both the morning and evening peak periods.

AM PEAK							
<b>Cordon Number : 2</b>							
<b>Description : 2 East of Tongariro St/CBD Entrance (EB)</b>							
		<b>TOTAL</b>					
NODE1	NODE2	COUNT	VOLUME	CHANGE	%	GEH	
5207	593	1221	1145	-76	93.8	2.2	SPA RD EAST OF TONGARIRO ST
5208	279	497	453	-44	91.1	2	TAMAMUTU ST
5209	508	218	152	-66	69.7	4.9	HOROMATANGI ST 282.0
5211	299	426	396	-30	93	1.5	HEUHEU ST
<b>Cordon Number : 7</b>							
<b>Description : 7 South of Tamamutu Rd (NB)</b>							
		<b>TOTAL</b>					
NODE1	NODE2	COUNT	VOLUME	CHANGE	%	GEH	
293	282	814	616	-198	75.7	7.4	RUAPEHU ST
696	284	253	196	-57	77.5	3.8	TITIRAUPENGA ST
807	286	183	204	21	111.5	1.5	KAIMANAWA ST
695	5208	1127	1220	93	108.3	2.7	TONGARIRO ST BETWEEN HOROMAT
PM PEAK							
<b>Cordon Number : 2</b>							
<b>Description : 2 East of Tongariro St/CBD Entrance (EB)</b>							
		<b>TOTAL</b>					
NODE1	NODE2	COUNT	VOLUME	CHANGE	%	GEH	
5207	593	1221	1249	28	102.3	0.8	SPA RD EAST OF TONGARIRO
5208	279	419	450	31	107.4	1.5	TAMAMUTU ST
5209	508	204	120	-84	58.8	6.6	HOROMATANGI ST
5211	299	453	453	0	100	0	HEUHEU ST
597	1344	154	103	-51	66.9	4.5	TUWHARETOA ST EAST OF TONGARIRO
1315	1653	888	804	-84	90.5	2.9	TONGARIRO
<b>Cordon Number : 7</b>							
<b>Description : 7 South of Tamamutu Rd (NB)</b>							
		<b>TOTAL</b>					
NODE1	NODE2	COUNT	VOLUME	CHANGE	%	GEH	
293	282	859	641	-218	74.6	8	RUAPEHU ST
696	284	280	238	-42	85	2.6	TITIRAUPENGA ST
807	286	110	164	54	149.1	4.6	KAIMANAWA ST
695	5208	1154	1299	145	112.6	4.1	TONGARIRO BETWEEN HOROMATANGI & TA



## 4 BASE

### 4.1 Base Traffic Volumes

The 2011 and 2021 AM Peak and PM Peak traffic volumes for the Base model are shown in **Figure 1**, **Figure 2**, **Figure 3** and **Figure 4**.

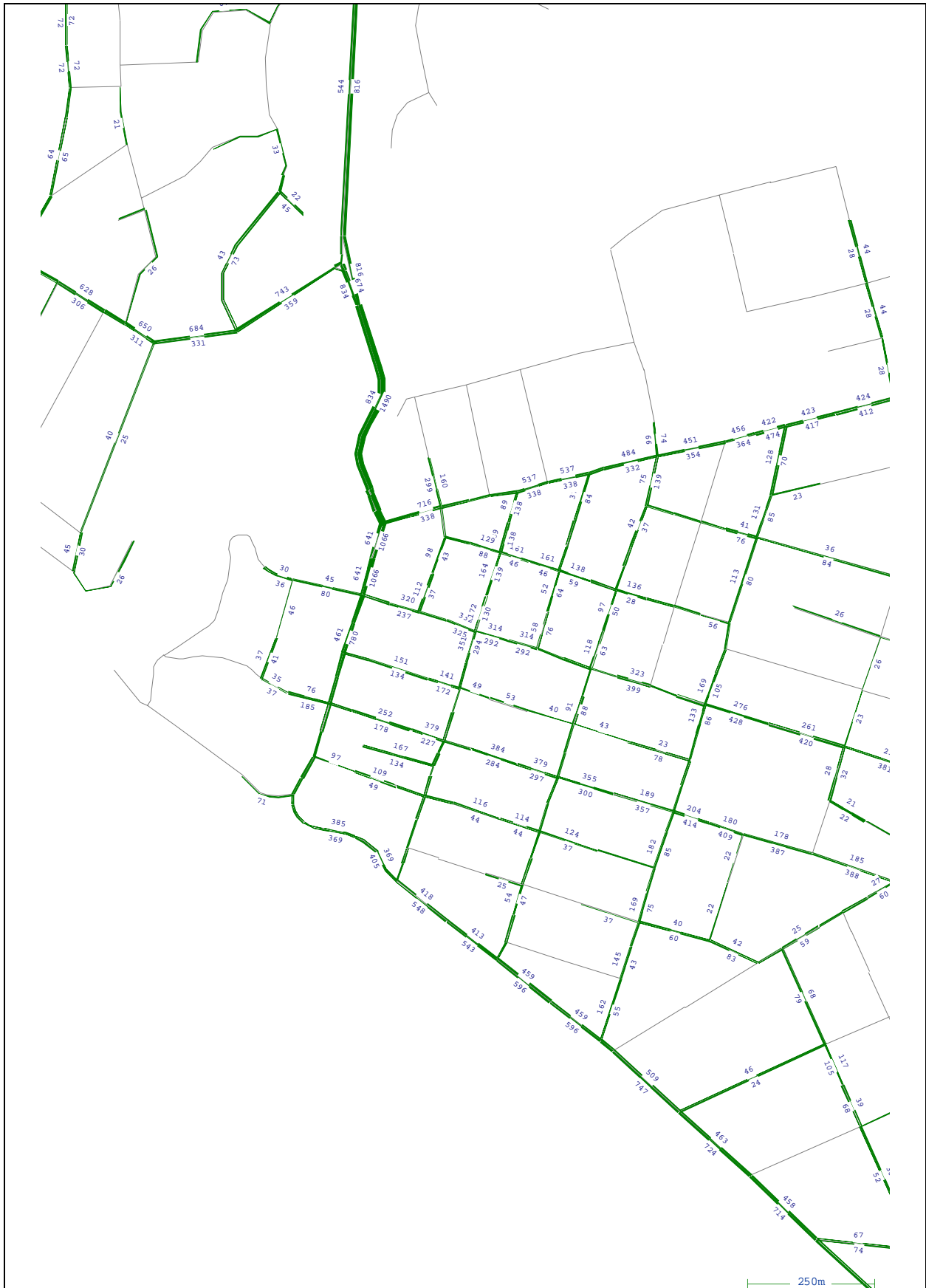
### 4.2 Level of Service

The 2011 and 2021 Level of Service for the AM and PM Peak periods have been modelled and are shown in **Figure 5**, **Figure 6**, **Figure 7** and **Figure 8** below. Please refer to Appendix A for the Level of Service boundaries.

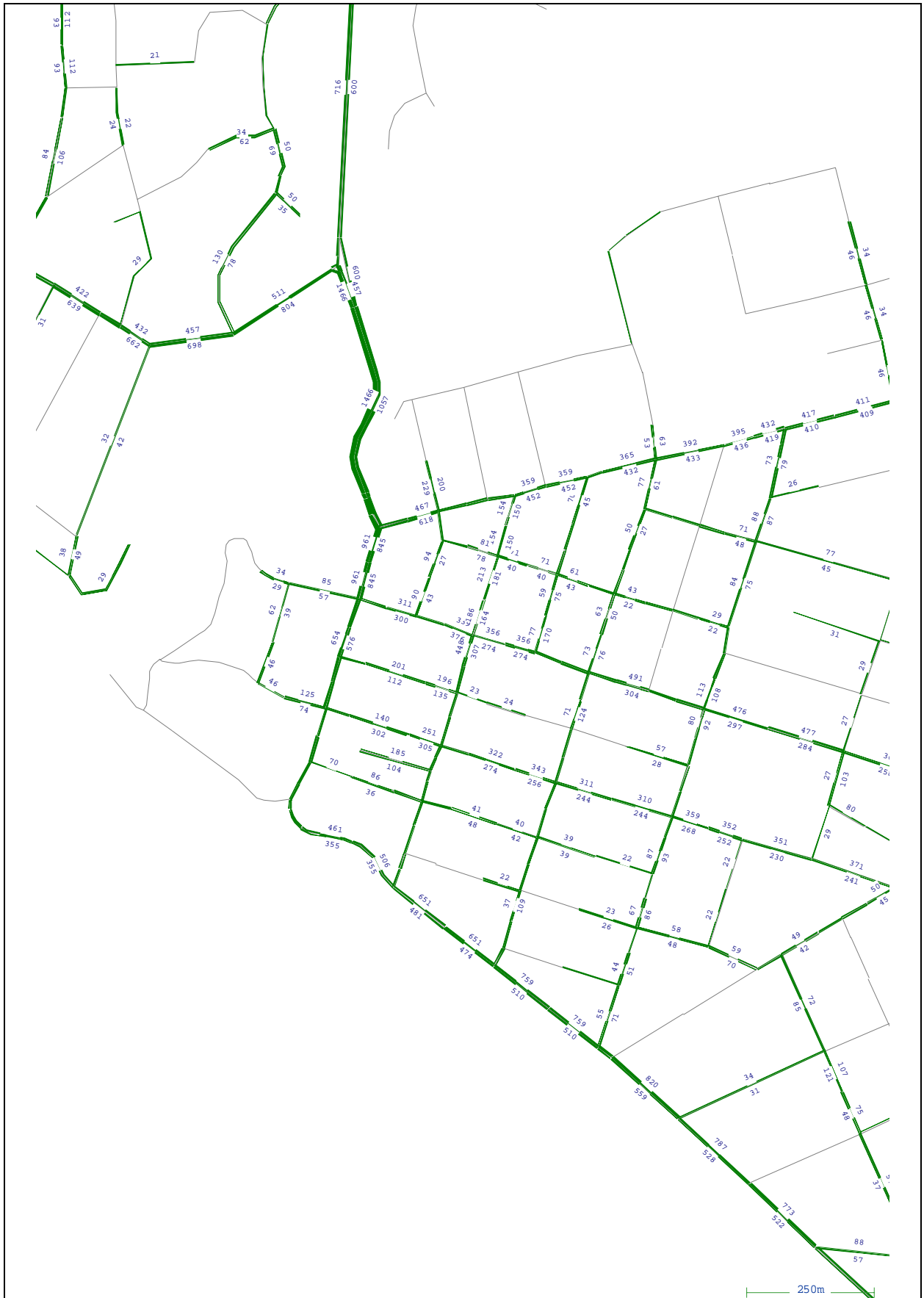
### 4.3 Key Observations

The following key points are identified in the Base network:

- Despite the East Taupo Arterial being included in the model, significant Level of Service issues remain on Tongariro Street north of Spa Road.
- In the 2011 morning peak period the Level of Service is F south bound on SH 1 north of Spa Road, and where Norman Smith Street traffic merges with Tongariro Street. By 2021 this Level of Service issue further extends back to Poihipi Road with a Level of Service E on Tongariro Street between Norman Smith Street and Poihipi Road. The intersection of Poihipi Road and Tongariro Street is a Level for Service F.
- During the evening peak period there is a Level of service E northbound on Tongariro Street between Spa Road and Norman Smith Street in 2011, and this deteriorates to Level of service F By 2021. The southbound link is Level of service D in 2011 decreasing to Level of service E by 2021.
- The intersection of Norman Smith Street and Tongariro Street is Level of service D in 2011 evening peak. By 2021, this deteriorates significantly to Level of service E, and Level of service E is also experienced at the intersection of Spa Road and Tongariro Street.
- Tamamuta Street and Tongariro Street intersection is Level of service D in 2011 and 2021 morning peak period, but deteriorates to Level of service E by 2021 in the evening peak period.
- The Westbound link of Norman Smith Street is Level of service in 2021 in the evening peak period.



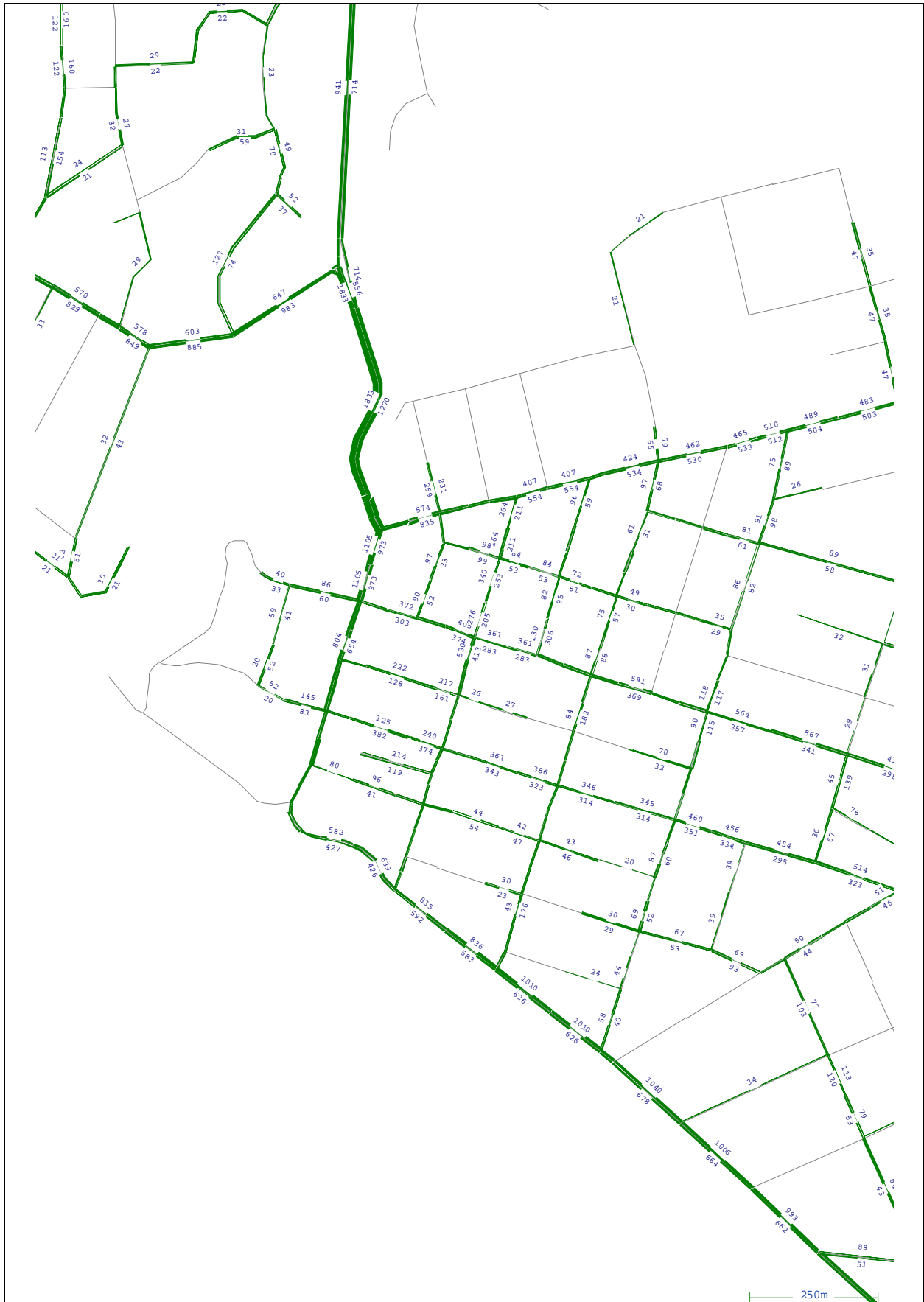
<p>Taupo Town Centre Modelling</p>	<p><b>Base 2011 AM Peak Traffic Volumes</b></p>	<p><b>Figure 1</b></p>
<p>Gabites Porter</p>		



<p>Taupo Town Centre Modelling</p>	<p><b>Base 2011 PM Peak Traffic Volumes</b></p>	<p><b>Figure 2</b></p>
<p>Gabites Porter</p>		



Taupo Town Centre Modelling	<b>Base 2021 AM Peak Traffic Volumes</b>	<b>Figure 3</b>
Gabites Porter		

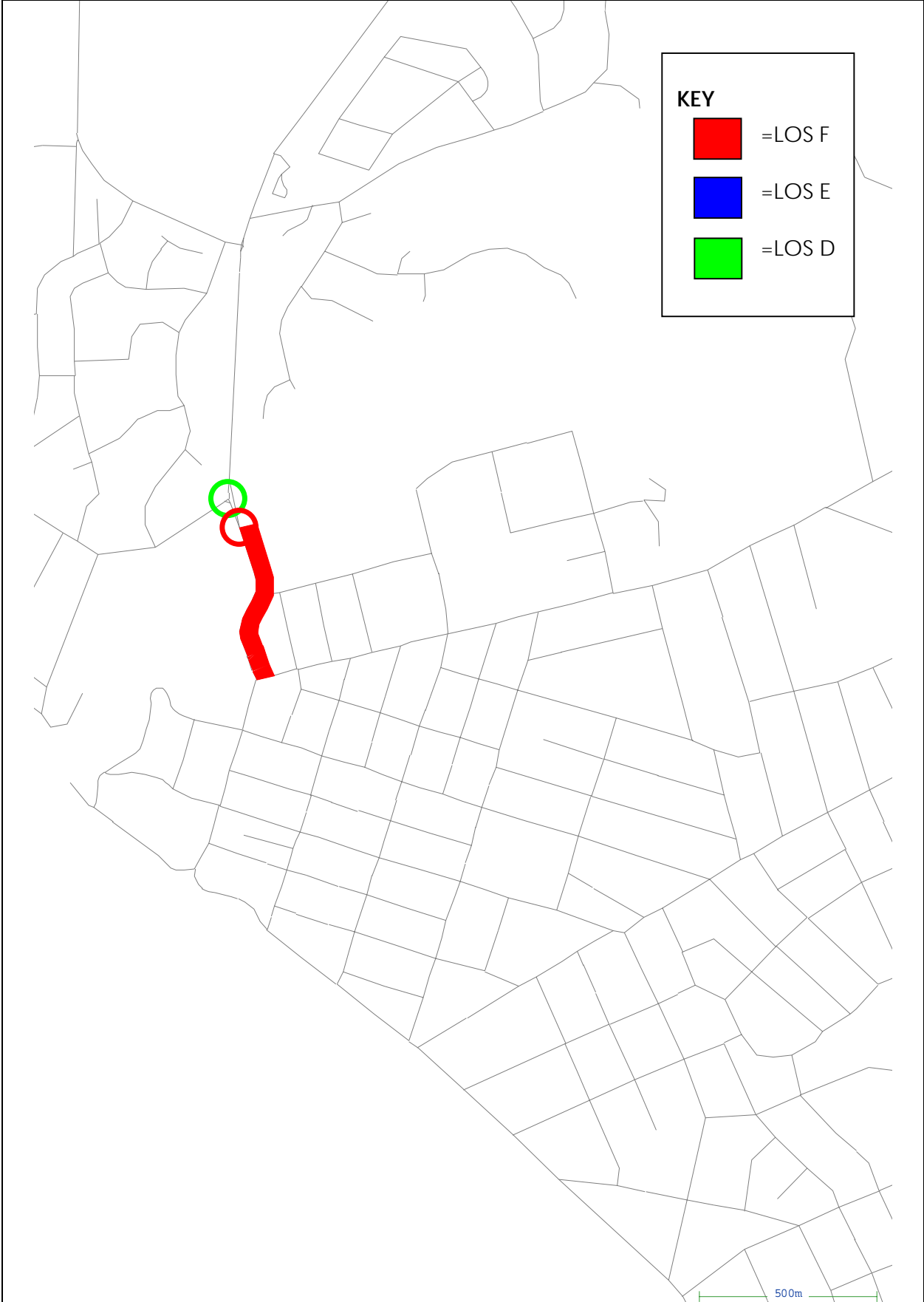


Taupo  
Town Centre Modelling

Gabites Porter

**Base  
2021 PM Peak  
Traffic Volumes**

**Figure 4**



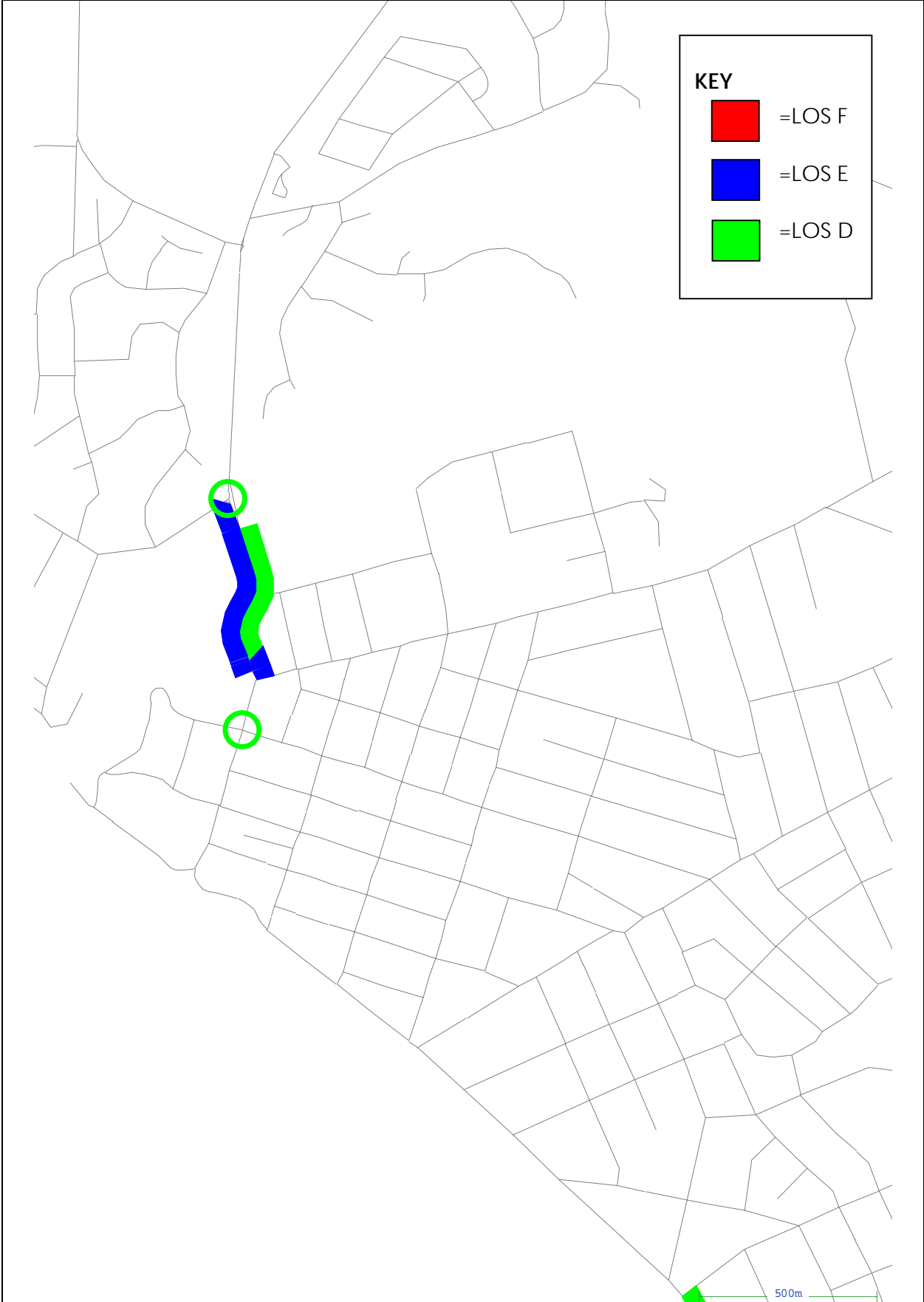
Taupo  
Town Centre Modelling

---

Gabites Porter

**Base**  
**2011 AM Peak LOS**

**Figure 5**



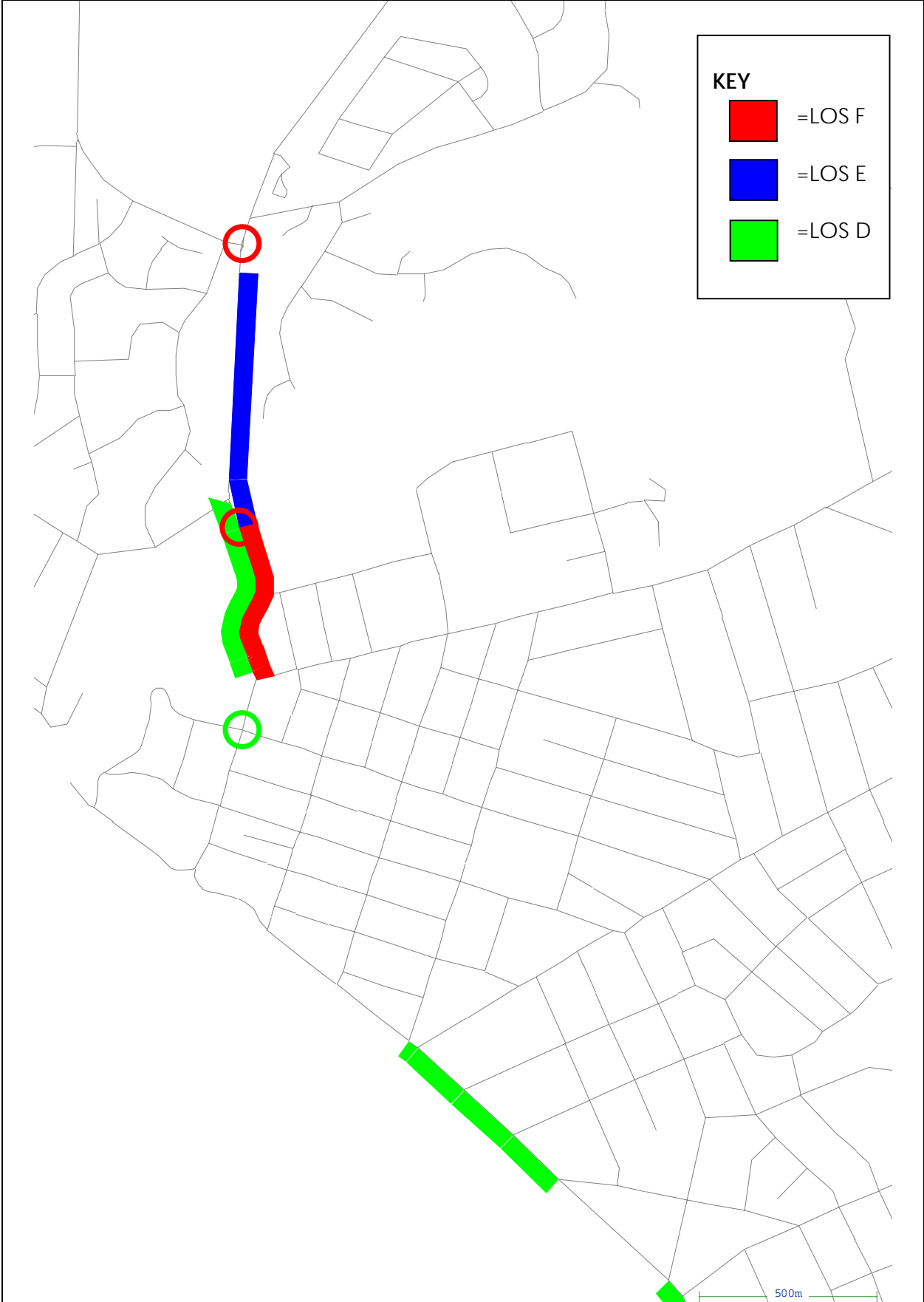
Taupo  
Town Centre Modelling

---

Gabites Porter

**Base**  
**2011 PM Peak LOS**

**Figure 6**



Taupo  
Town Centre Modelling

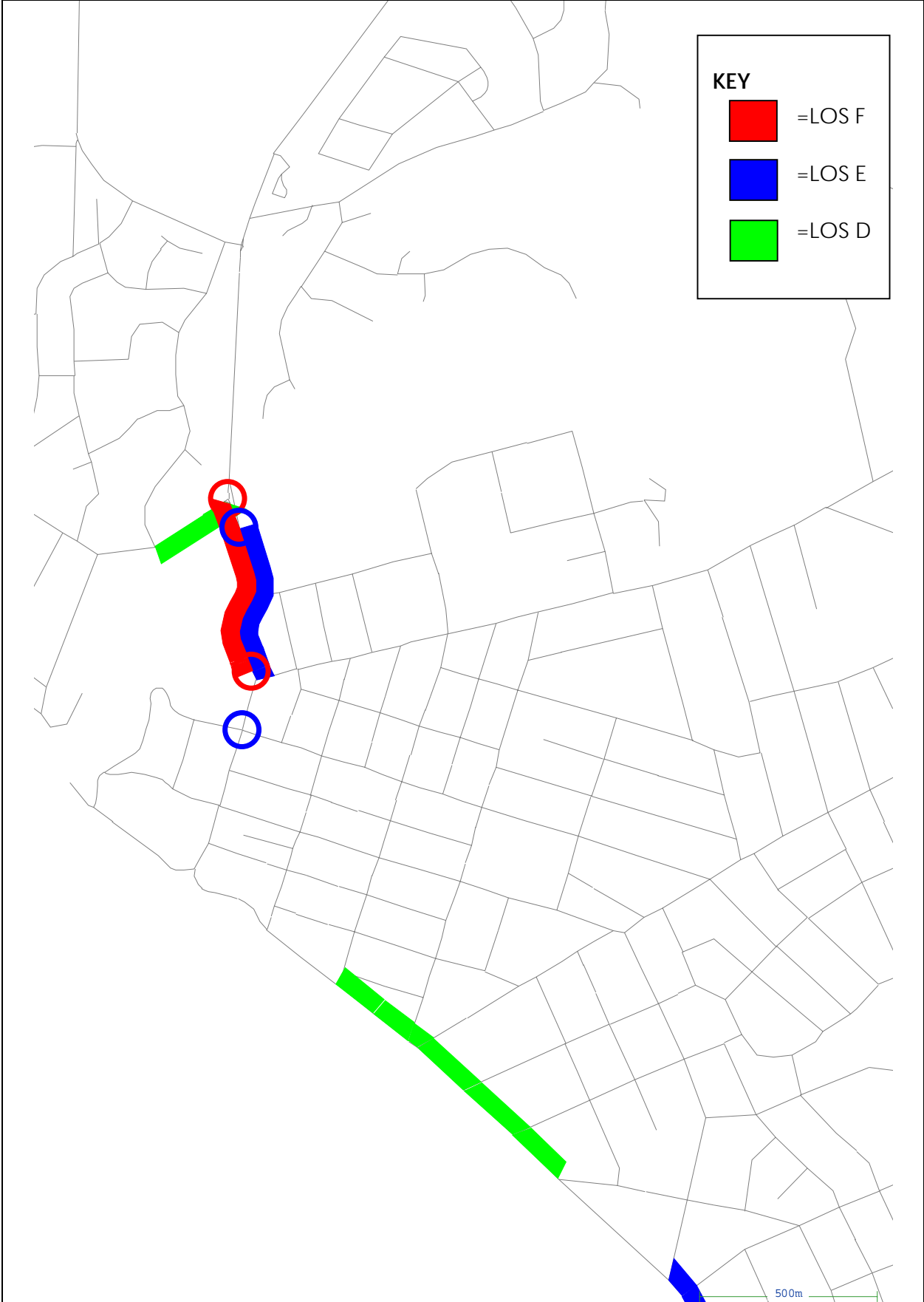
---

Gabites Porter

**Base  
2021 AM Peak LOS**

**Figure 7**





Taupo  
Town Centre Modelling

---

Gabites Porter

**Base**  
**2021 PM Peak LOS**

**Figure 8**

## 5 STAGE 1

### 5.1 Stage 1 Traffic Volumes and Changes

The 2011 and 2021 AM Peak and PM Peak traffic volumes for Stage 1 are shown in **Figure 9**, **Figure 10**, **Figure 11** and **Figure 12**.

Changes in traffic volumes between the Base and Stage 1 for the AM Peak and PM Peak periods are shown in **Figure 13** and **Figure 14**, **Figure 15** and **Figure 16**.

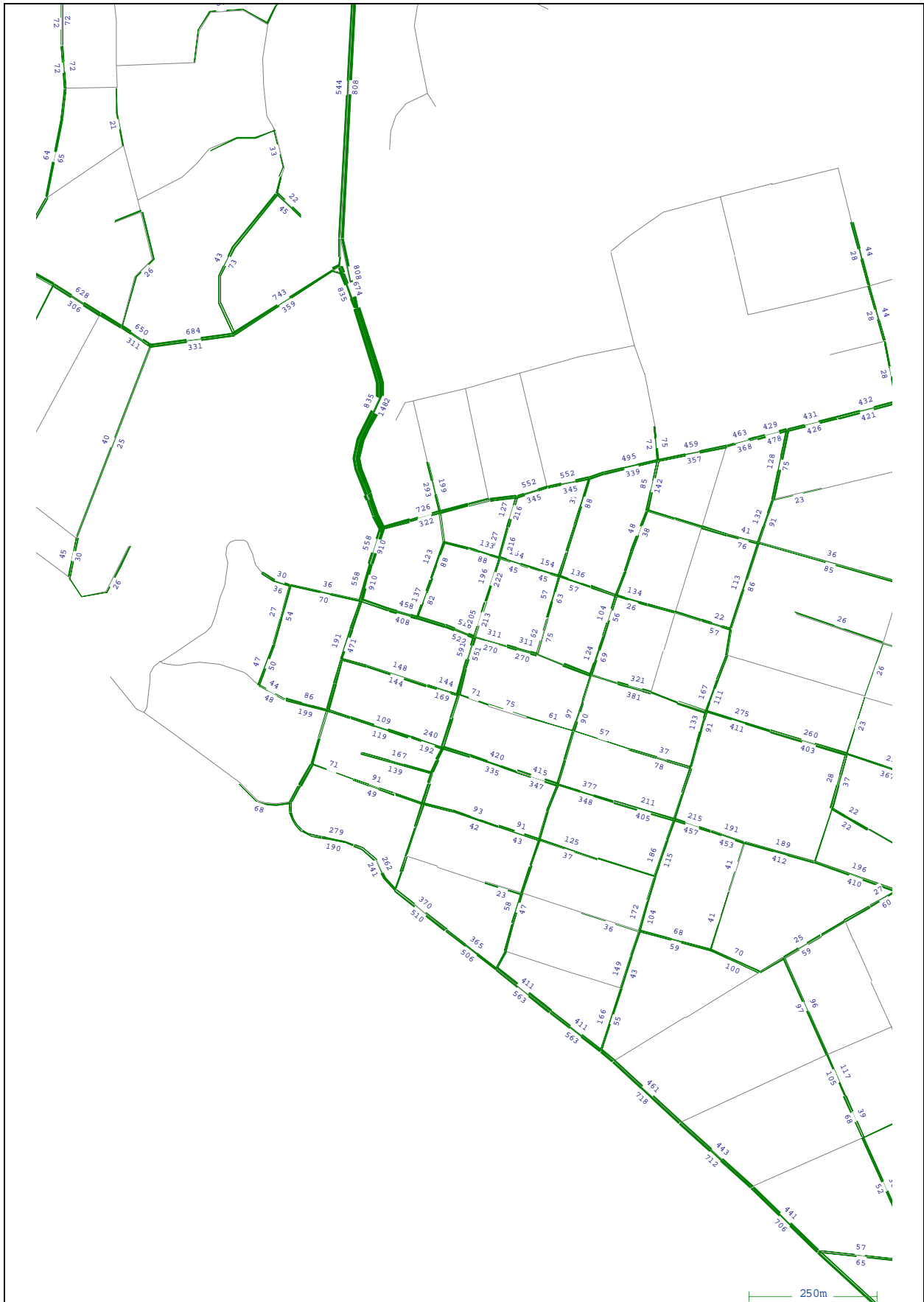
### 5.2 Level of service

The 2011 and 2021 Level of service for the AM and PM Peak periods have been modelled and are shown in **Figure 17**, **Figure 18**, **Figure 19** and **Figure 20** below.

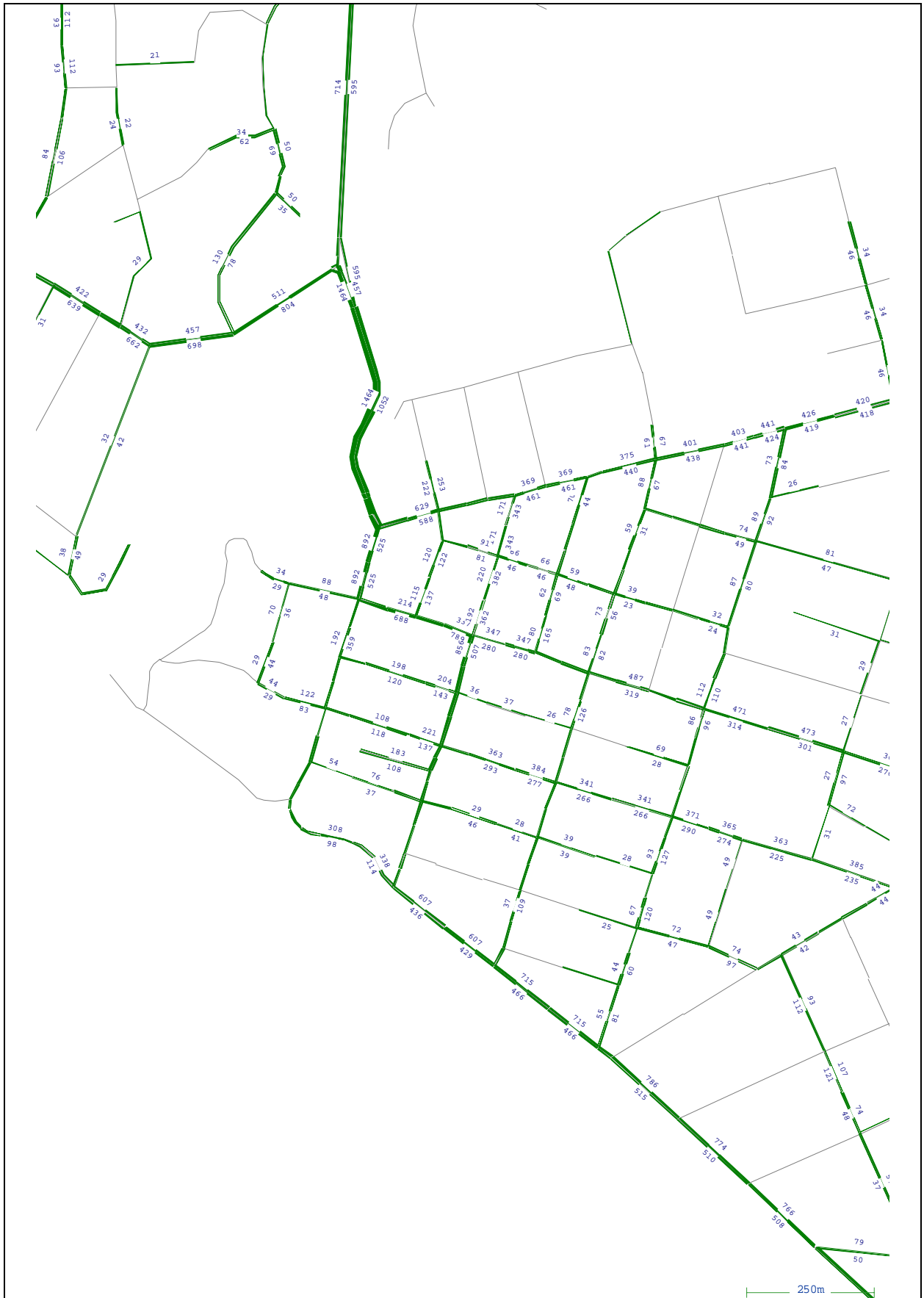
### 5.3 Key Observations

The following key points are identified by comparing traffic volumes and movements in the Base and Stage 1 networks:

- Reducing Tongariro Street to 2 lanes attracts traffic from Tongariro Street to Ruapehu Street south of Spa Road.
- In the AM peak period the Level of Service decreases from better than D to E by 2011 for southbound traffic on Tongariro Street south of Spa Road. This deteriorates further to LOS F by 2021.
- In the PM peak period the Level of Service for northbound traffic decreases from better than D to E south of Spa Road by 2011. Any increase in delays between 2011 and 2021 is not significant enough to reduce the Level of Service further.
- In the evening peak period there is a decrease in Level of Service on Tamamutu Street between Gascoigne Street and Ruapehu Street as traffic rat runs through Tamamutu Street to avoid Tongariro Street.
- This stage was initially modelled with priority control at Tongariro/Tamamutu Streets and yielded Level of Service E in the 2021 peak periods.
- A priority control at Tongariro/Heuheu intersection is sufficient as volumes on Tongariro Street to the south of Tamamutu Street have dropped significantly.
- The traffic calming is only effective in significantly reducing traffic volumes to the south of Tamamutu Street.



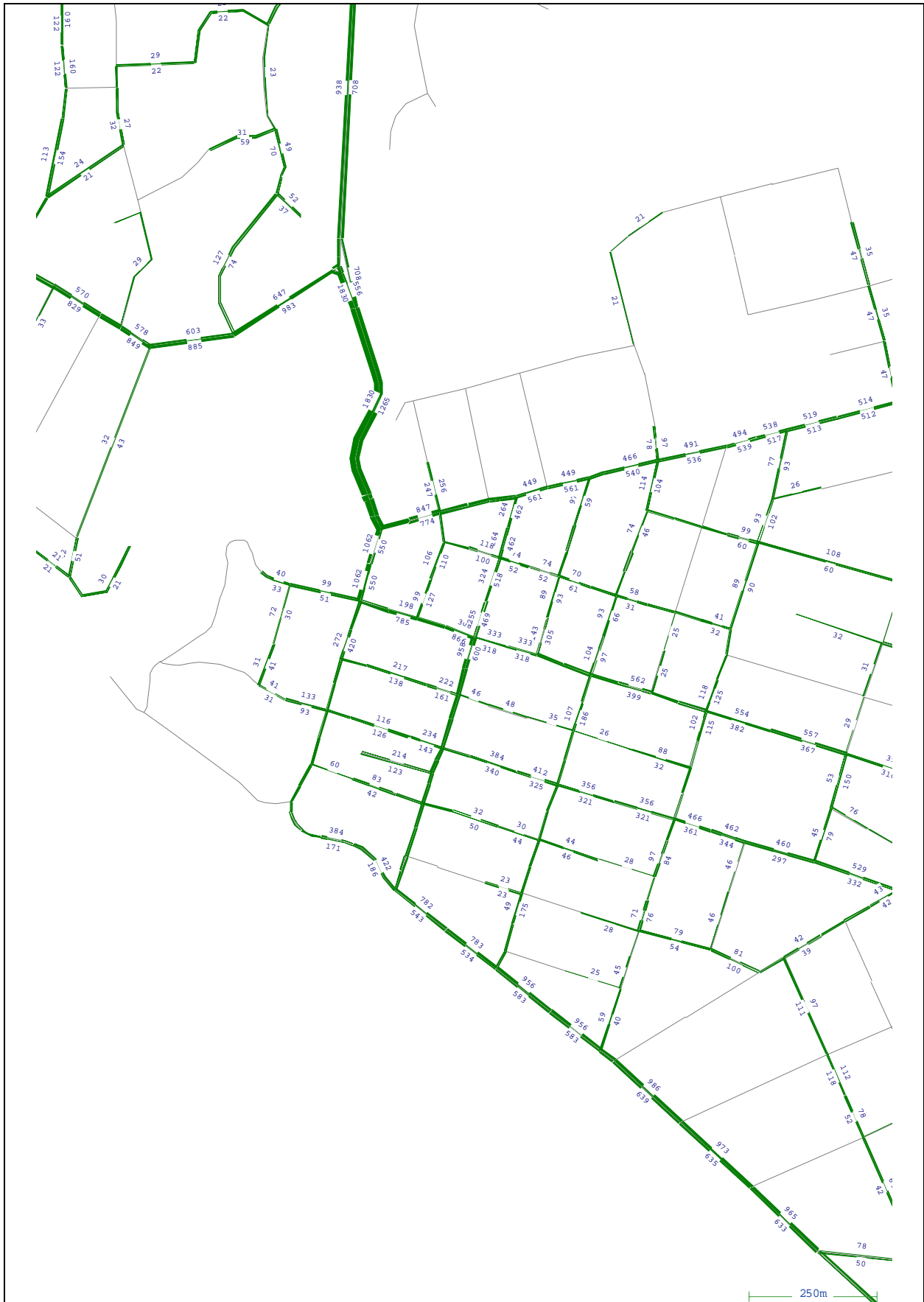
Taupo Town Centre Modelling	<b>Stage 1 2011 AM Peak Traffic Volumes</b>	<b>Figure 9</b>
Gabites Porter		



<p>Taupo Town Centre Modelling</p>	<p><b>Stage 1 2011 PM Peak Traffic Volumes</b></p>	<p><b>Figure 10</b></p>
<p>Gabites Porter</p>		



<p>Taupo Town Centre Modelling</p>	<p><b>Stage 1</b> <b>2021 AM Peak</b> <b>Traffic Volumes</b></p>	<p><b>Figure 11</b></p>
<p>Gabites Porter</p>		



<p>Taupo Town Centre Modelling</p>	<p><b>Stage 1 2021 PM Peak Traffic Volumes</b></p>	<p><b>Figure 12</b></p>
<p>Gabites Porter</p>		



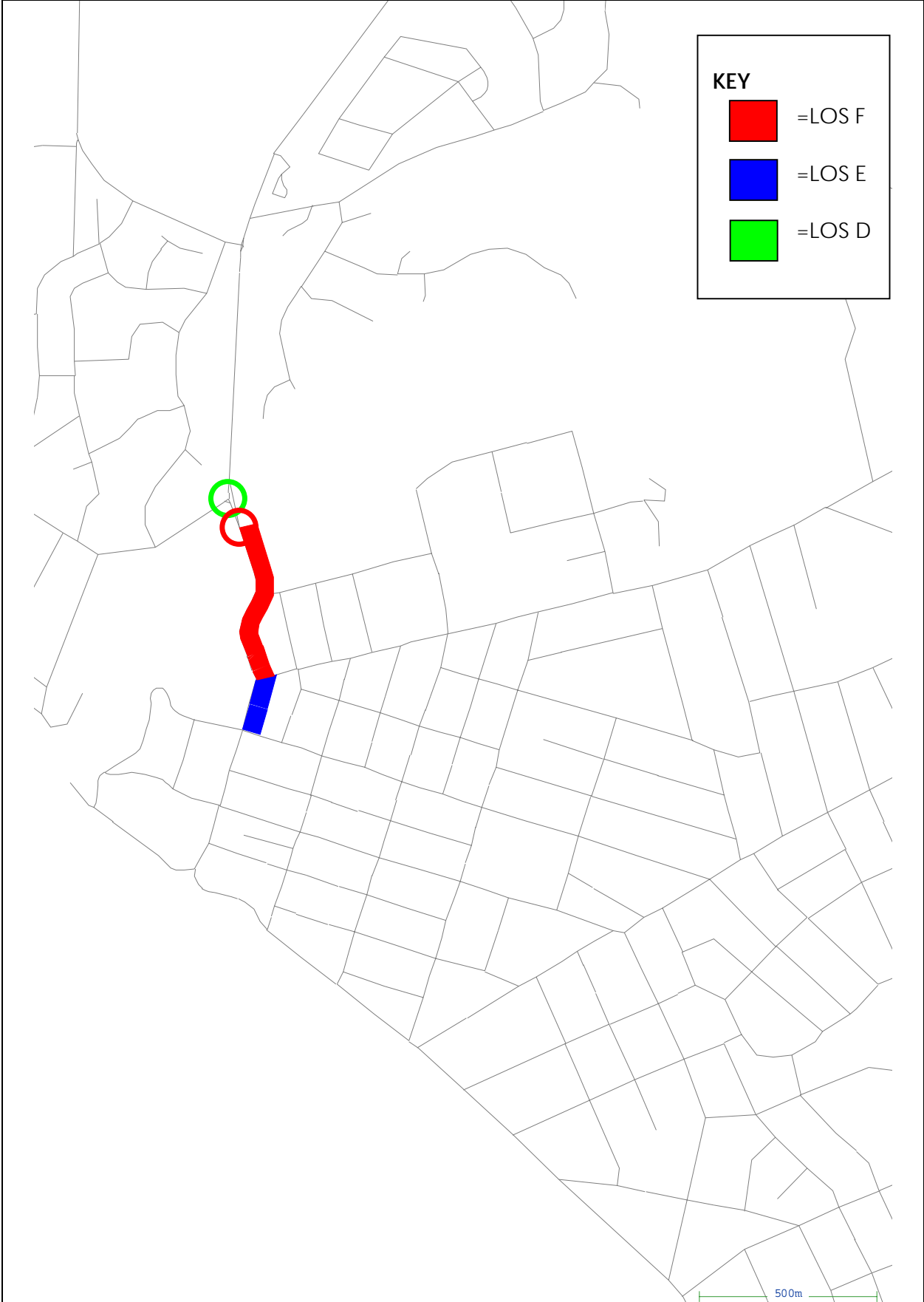








<p>Taupo Town Centre Modelling</p>	<p><b>2021 PM Peak</b> <b>Traffic Volumes Change Plot</b> <i>Base v Stage 1</i></p>	<p><b>Figure 16</b></p>
<p>Gabites Porter</p>		



**KEY**

- =LOS F
- =LOS E
- =LOS D

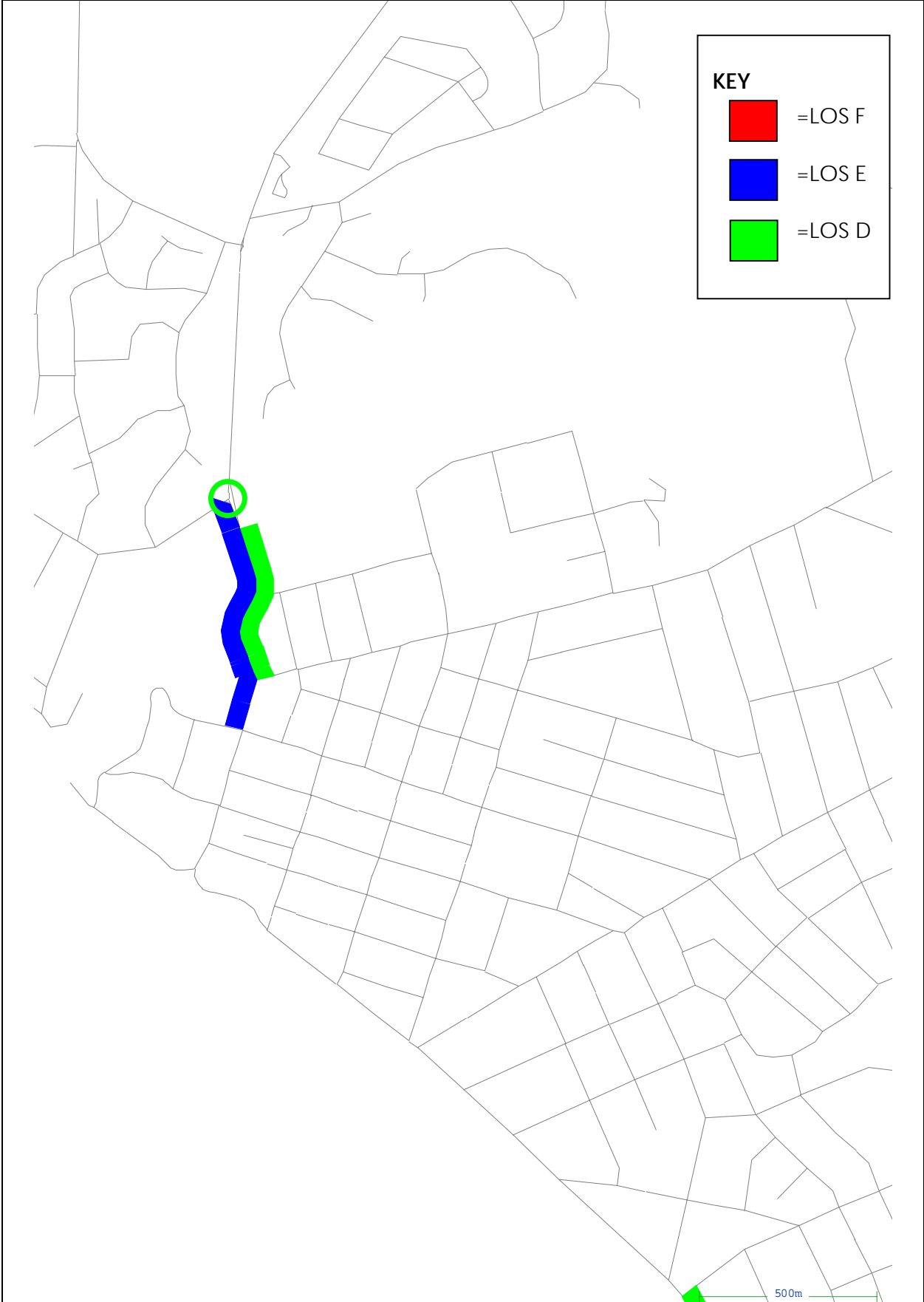
Taupo  
Town Centre Modelling

---

Gabites Porter

**Stage 1**  
**2011 AM Peak LOS**

**Figure 17**



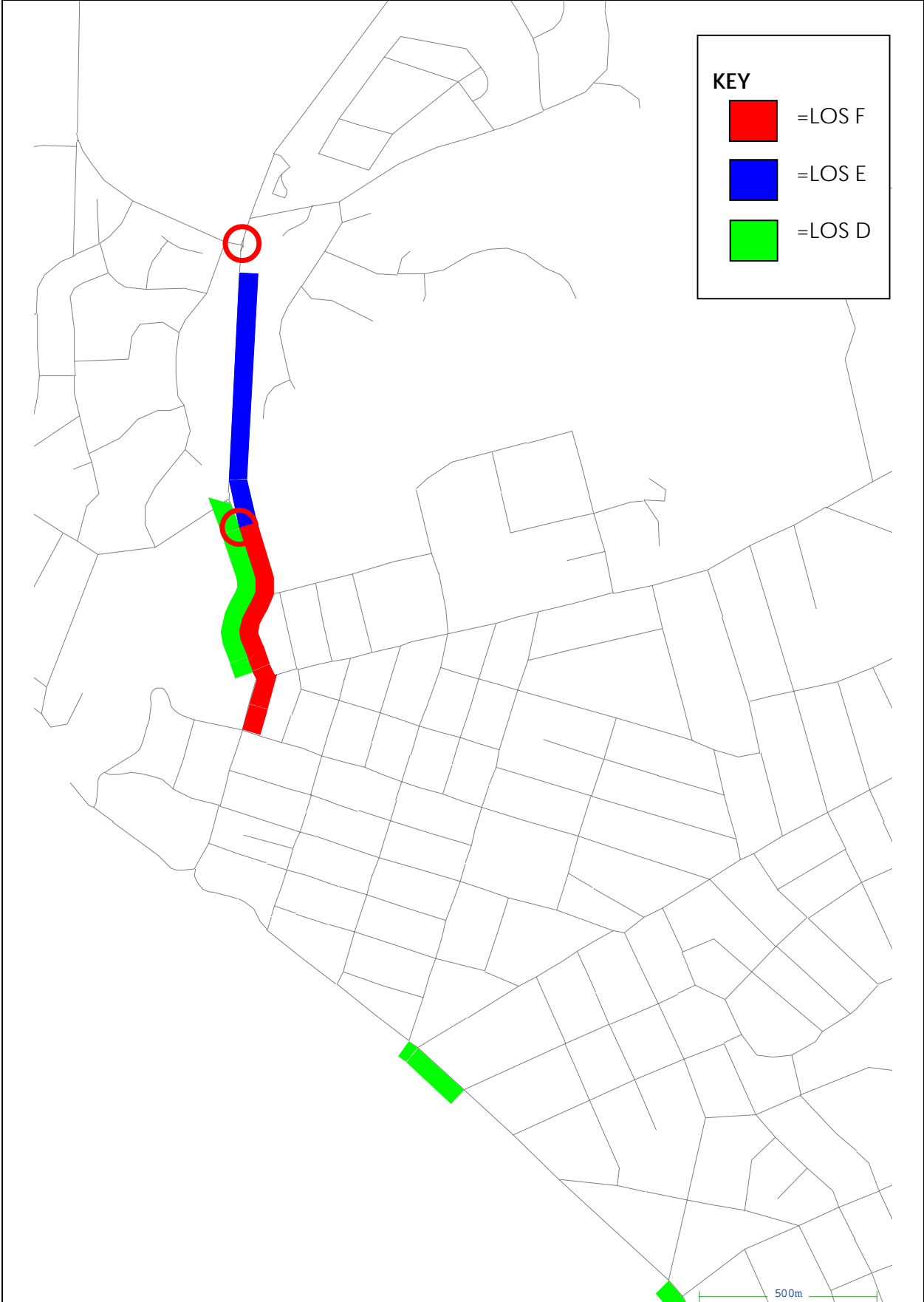
Taupo  
Town Centre Modelling

---

Gabites Porter

**Stage 1**  
**2011 PM Peak LOS**

**Figure 18**



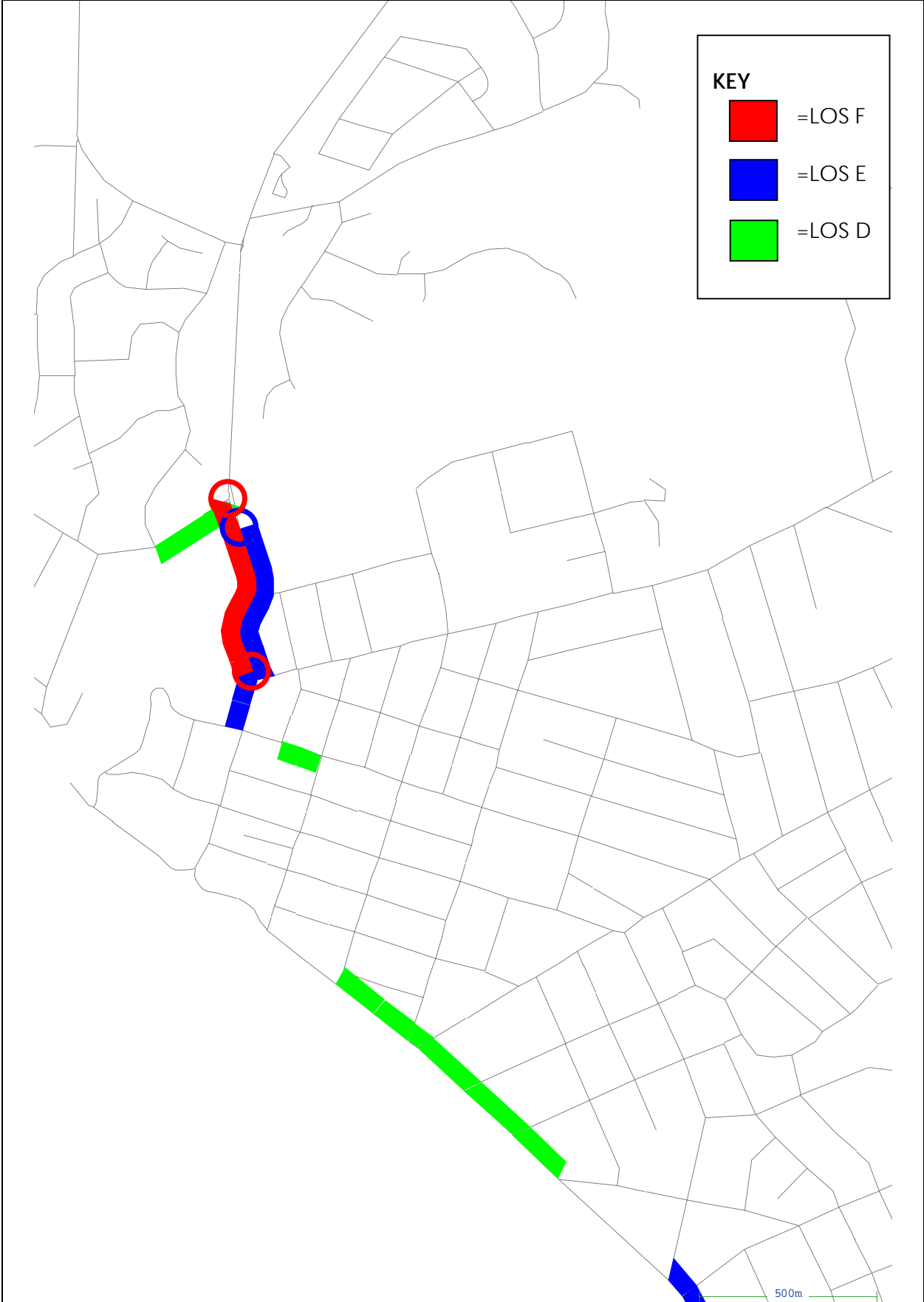
Taupo  
Town Centre Modelling

---

Gabites Porter

**Stage 1  
2021 AM Peak LOS**

**Figure 19**



Taupo  
Town Centre Modelling

---

Gabites Porter

**Stage 1  
2021 PM Peak LOS**

**Figure 20**

## 6 STAGE 2

### 6.1 Stage 2 Traffic Volumes and Changes

The 2011 and 2021 AM Peak and PM Peak traffic volumes for Stage 2 are shown in **Figure 21**, **Figure 22**, **Figure 23** and **Figure 24**.

Changes in traffic volumes between Stage 1 and Stage 2 for the AM Peak and PM Peak periods are shown in **Figure 25**, **Figure 26**, **Figure 27** and **Figure 28**.

### 6.2 Level of service

The 2011 and 2021 Level of service for the AM and PM Peak periods have been modelled and are shown in **Figure 29**, **Figure 30**, **Figure 31** and **Figure 32** below.

### 6.3 Key Observations

The following key points are identified by comparing traffic volumes and movements in the Stage 1 and Stage 2 networks:

- Changes to intersection priorities on Titiraupenga Street result in traffic shifting from Tongariro and Ruapehu Streets onto Titiraupenga Street with more traffic rat running through to Titiraupenga Street via Spa Road and Gascoigne Street/Paora Hapi Street.
- As a result of the traffic shift to Titiraupenga Street the Level of Service south bound on Tongariro Street between Spa Road and Tamamutu Street improves in the morning peak period from E to D in 2011 and from F to D by 2021.
- Similarly north bound on Tongariro Street between Spa Road and Tamamutu Street the Level of Service improves in the evening peak from E to D in 2011.
- Increased traffic volumes on Spa Road results in a deterioration in Level of Service between Tongariro Street and Runanga Street (from better than D at worst to E at worst) in the morning peak period by 2021.
- A slight decrease in east bound traffic on Tamamutu Street between Gascoigne Street and Ruapehu Street improves the Level of Service from D to better than D in the evening peak by 2021 however the Level of Service at the intersection of Spa Road and Gascoigne Street deteriorates from better than D to D as a result of increased traffic volumes on Spa Road.



<p>Taupo Town Centre Modelling</p>	<p><b>Stage 2</b> <b>2011 AM Peak</b> <b>Traffic Volumes</b></p>	<p><b>Figure 21</b></p>
<p>Gabites Porter</p>		





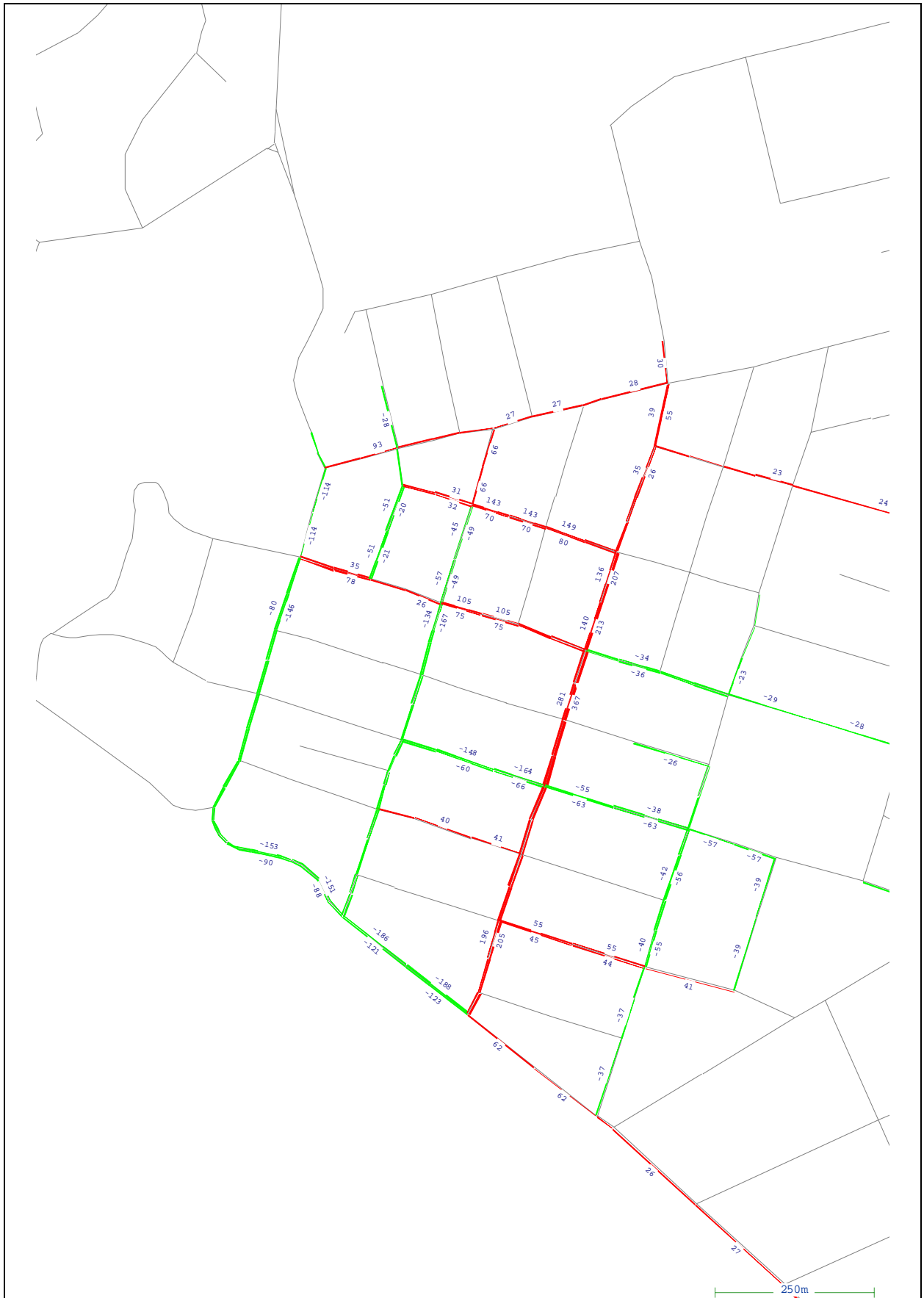
<p>Taupo Town Centre Modelling</p>	<p><b>Stage 2</b> <b>2011 PM Peak</b> <b>Traffic Volumes</b></p>	<p><b>Figure 22</b></p>
<p>Gabites Porter</p>		



<p>Taupo Town Centre Modelling</p>	<p><b>Stage 2</b> <b>2021 AM Peak</b> <b>Traffic Volumes</b></p>	<p><b>Figure 23</b></p>
<p>Gabites Porter</p>		



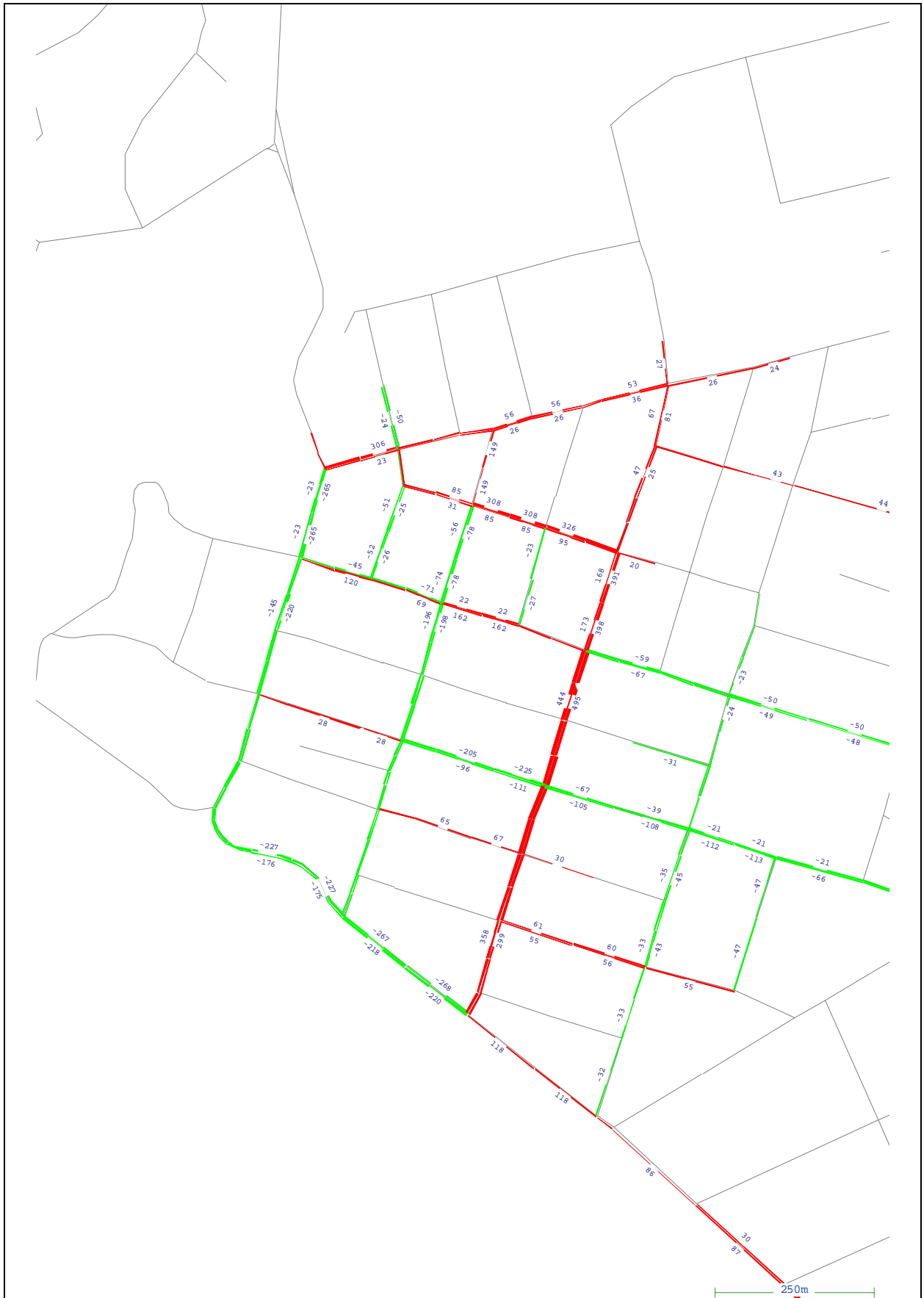
<p>Taupo Town Centre Modelling</p>	<p><b>Stage 2 2021 PM Peak Traffic Volumes</b></p>	<p><b>Figure 24</b></p>
<p>Gabites Porter</p>		



Taupo Town Centre Modelling	<b>2011 AM Peak Traffic Volumes Change Plot Stage 1 v Stage 2</b>	<b>Figure 25</b>
Gabites Porter		

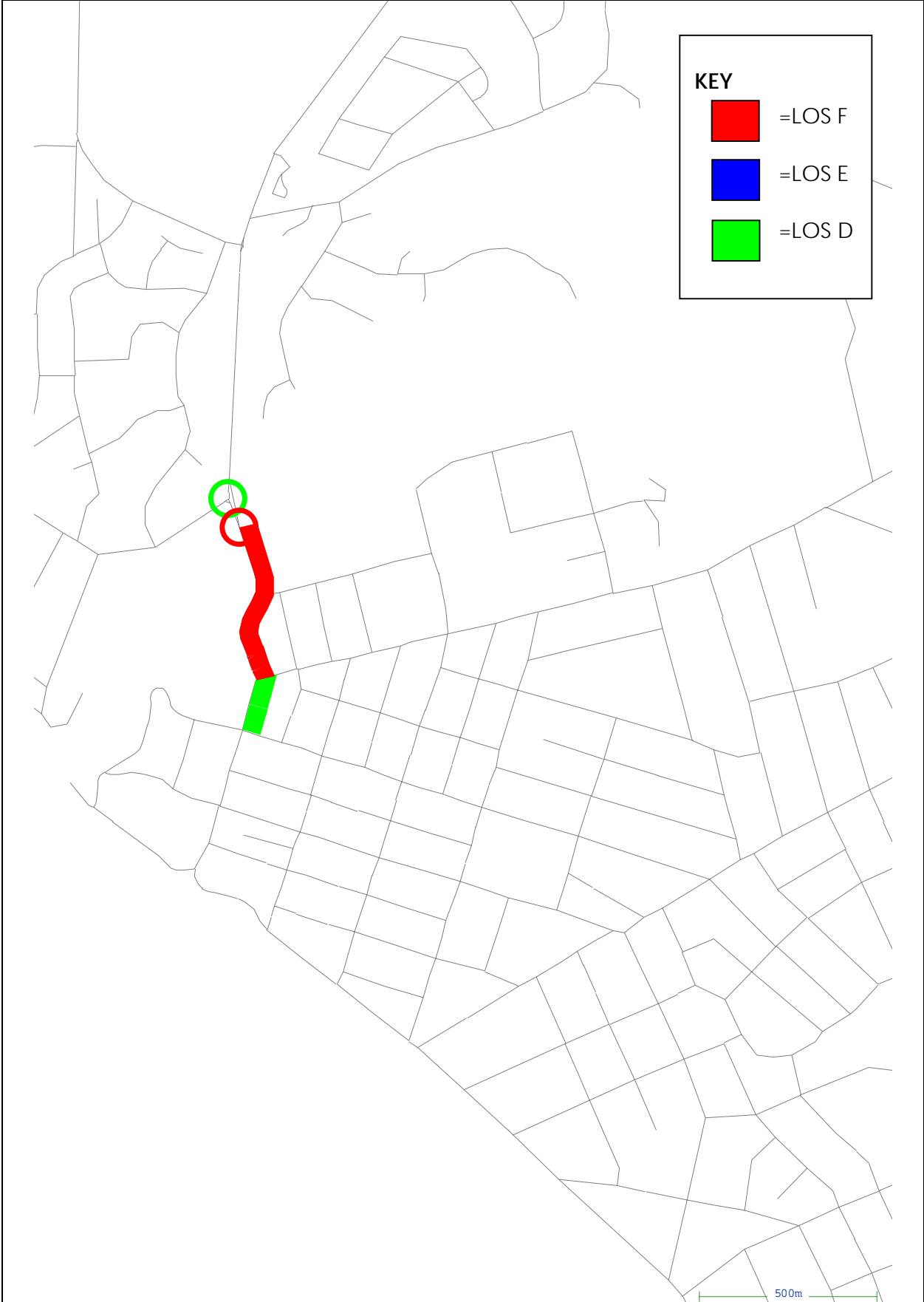


Taupo Town Centre Modelling	<b>2011 PM Peak Traffic Volumes Change Plot Stage 1 v Stage 2</b>	<b>Figure 26</b>
Gabites Porter		



Taupo Town Centre Modelling	<b>2021 AM Peak Traffic Volumes Change Plot Stage 1 v Stage 2</b>	<b>Figure 27</b>
Gabites Porter		





Taupo  
Town Centre Modelling

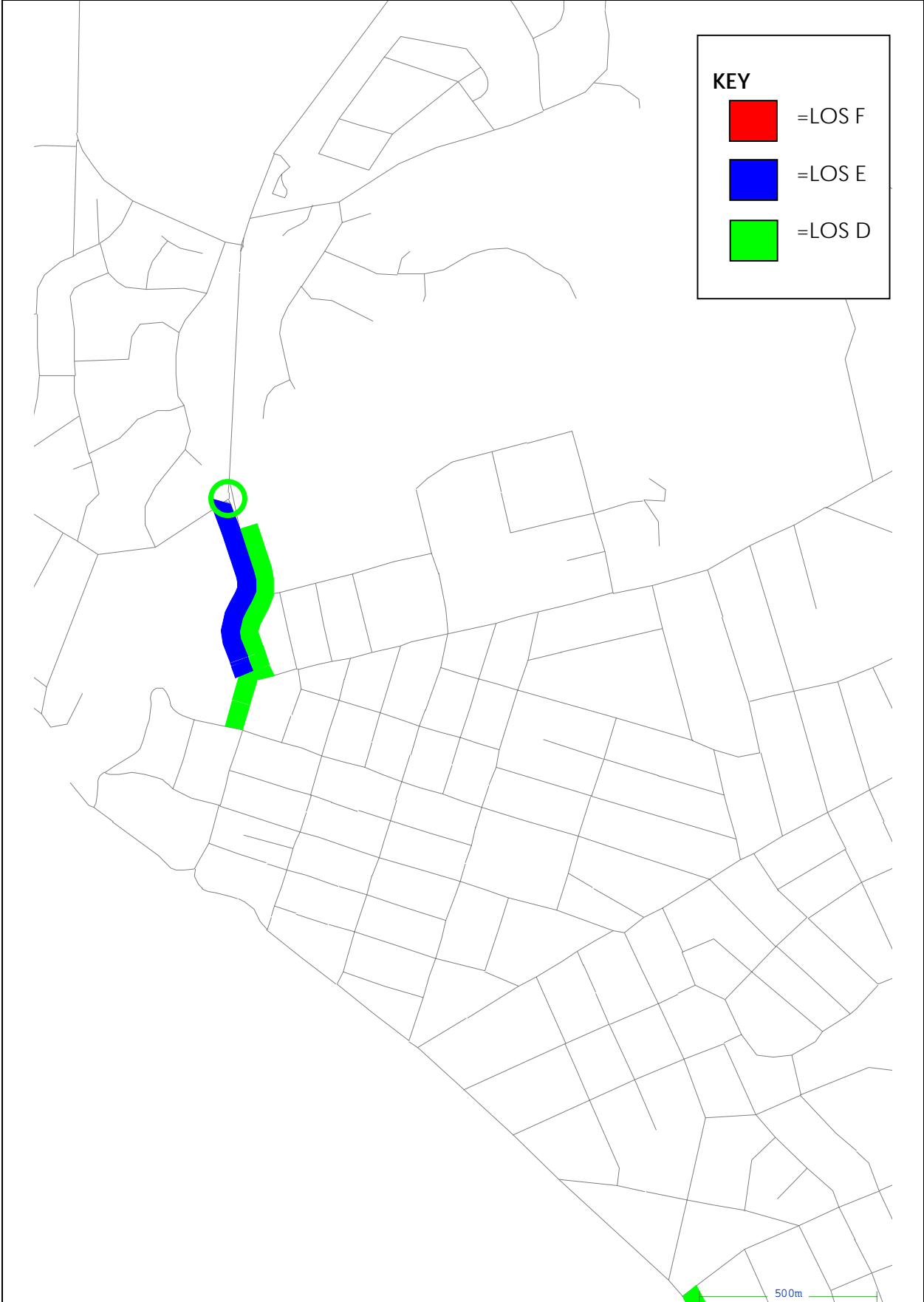
---

Gabites Porter

**Stage 2**  
**2011 AM Peak LOS**

**Figure 29**





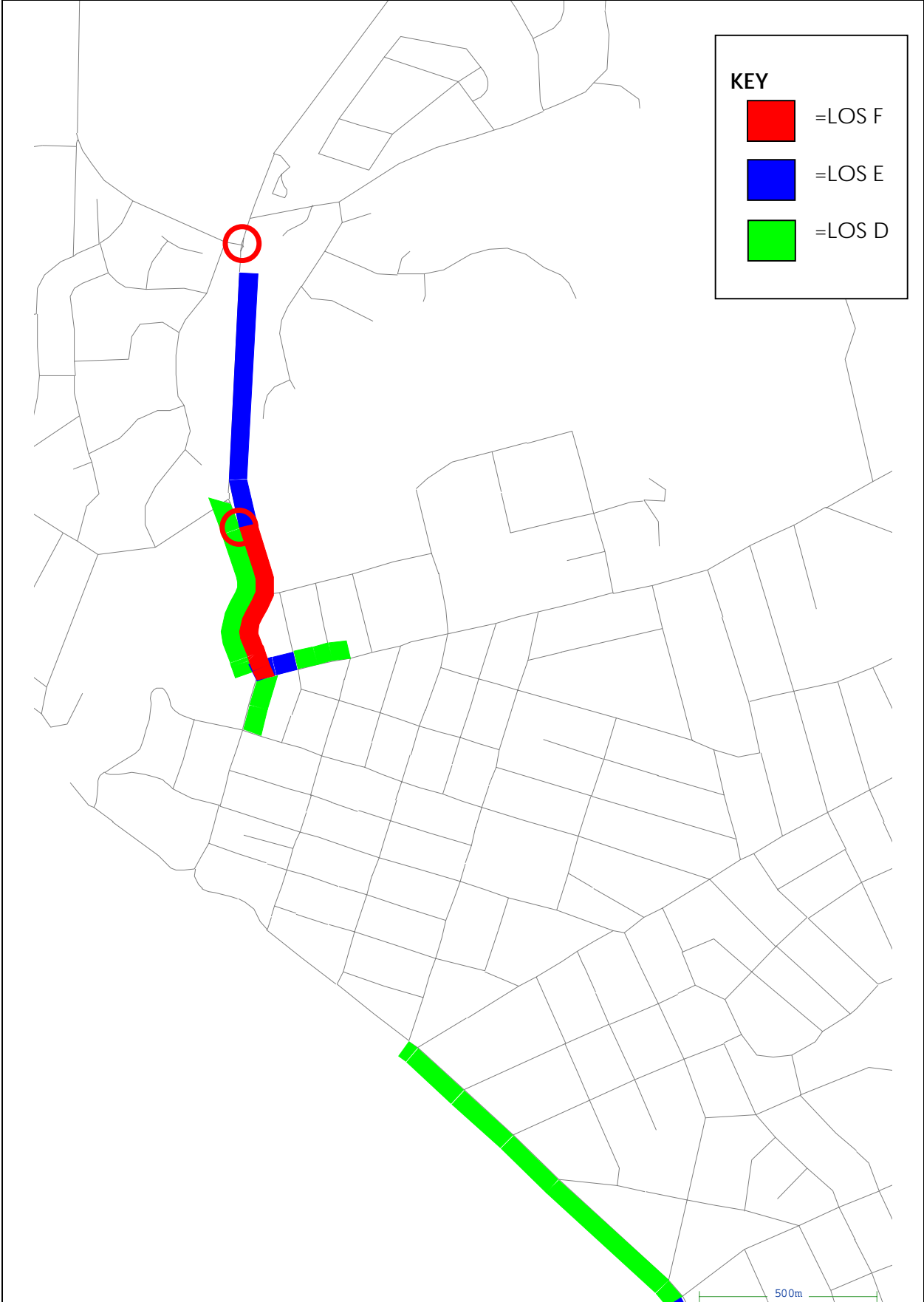
Taupo  
Town Centre Modelling

---

Gabites Porter

**Stage 2**  
**2011 PM Peak LOS**

**Figure 30**



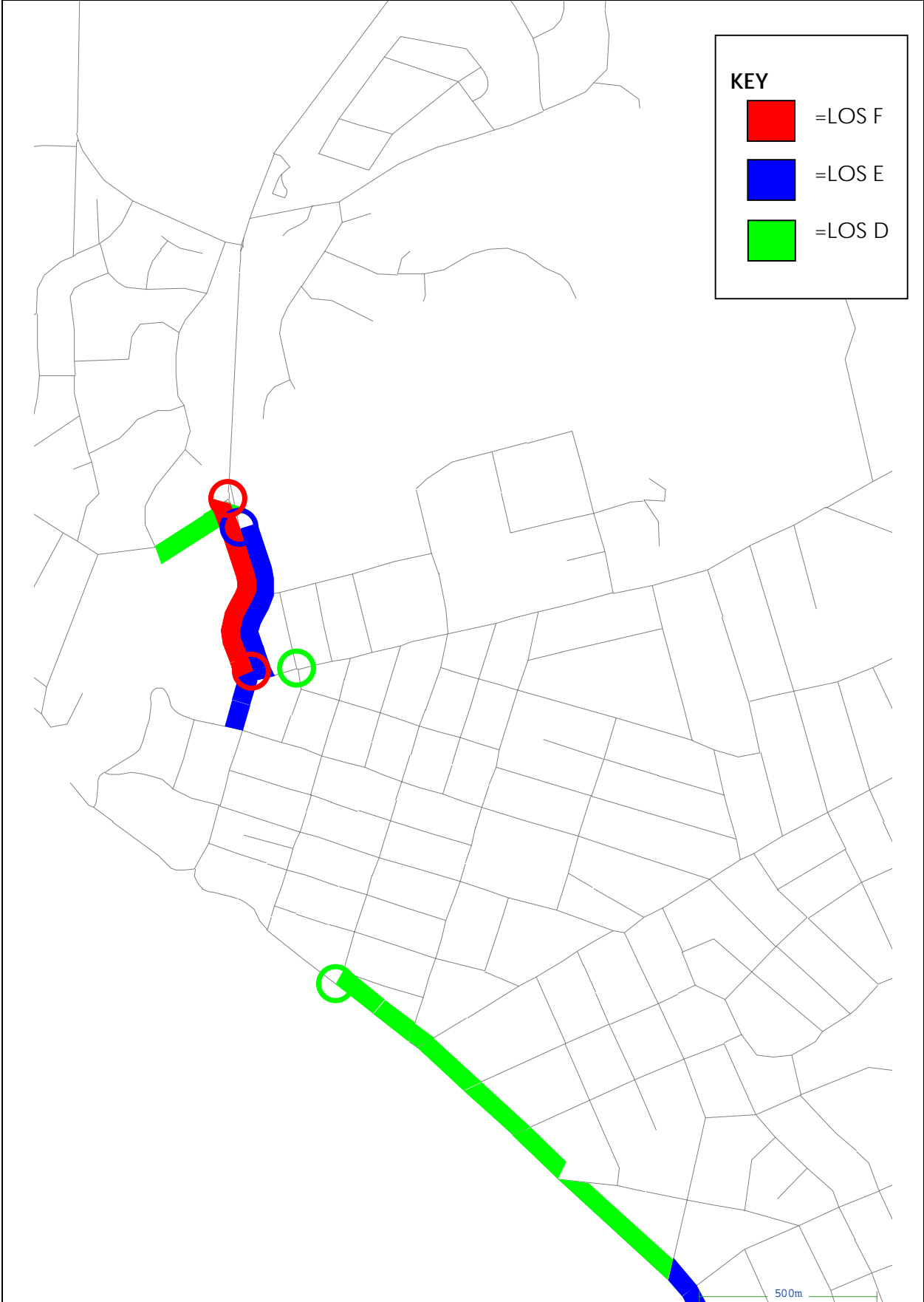
Taupo  
Town Centre Modelling

---

Gabites Porter

**Stage 2**  
**2021 AM Peak LOS**

**Figure 31**



Taupo  
Town Centre Modelling

---

Gabites Porter

**Stage 2**  
**2021 PM Peak LOS**

**Figure 32**

## 7 STAGE 3

### 7.1 Stage 3 Traffic Volumes and Changes

The 2011 and 2021 AM Peak and PM Peak traffic volumes for Stage 3 are shown in **Figure 33**, **Figure 34**, **Figure 35** and **Figure 36**.

Changes in traffic volumes between Stage 2 and Stage 3 for the AM Peak and PM Peak periods are shown in **Figure 37**, **Figure 38**, **Figure 39** and **Figure 40**.

### 7.2 Level of service

The 2011 and 2021 Level of service for the AM and PM Peak periods have been modelled and are shown in **Figure 41**, **Figure 42**, **Figure 43** and **Figure 44** below.

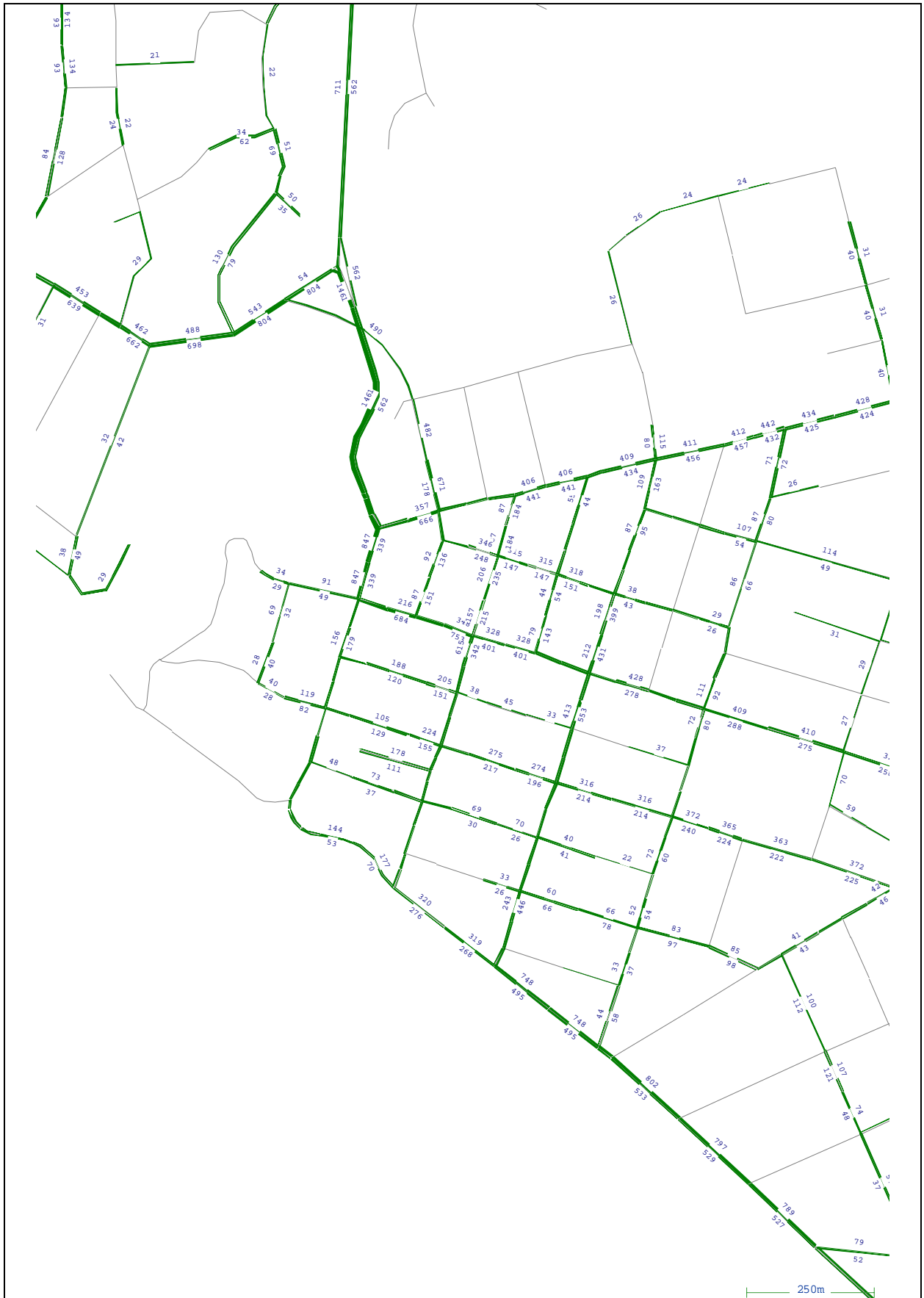
### 7.3 Key Observations

The following key points are identified by comparing traffic volumes and movements in the Stage 2 and Stage 3 networks:

- The addition of the southbound fly over from Norman Smith Street to Nukuhau Street results in traffic shifting off Tongariro Street.
- As a result of the traffic shift onto the new flyover, all Level of Service issues in the morning peak period in 2011 are resolved. By 2021 the new flyover, Norman Smith Street and Tongariro Street reduce to a Level of Service D, due to the increased land use activity to the north.
- In the evening peak period all Level of Service issues are resolved southbound, however the Control Gate Bridge and the top end of Tongariro Street northbound remain at Level of Service E and D respectively in 2011. By 2021 this deteriorates to Level of Service F and E northbound, and the intersection of Tongariro Street and Spa Road becomes Level of Service F. Norman Smith Street becomes Level of Service D westbound.
- As a result of increased traffic volumes on the new flyover and flow on to Gascoigne Street, there is an increase in east bound traffic on Tamatua Street between Gascoigne Street and Ruapehu Street generating a Level of Service D in the evening peak by 2021.



<p>Taupo Town Centre Modelling</p>	<p><b>Stage 3</b> <b>2011 AM Peak</b> <b>Traffic Volumes</b></p>	<p><b>Figure 33</b></p>
<p>Gabites Porter</p>		



<p>Taupo Town Centre Modelling</p>	<p><b>Stage 3</b> <b>2011 PM Peak</b> <b>Traffic Volumes</b></p>	<p><b>Figure 34</b></p>
<p>Gabites Porter</p>		

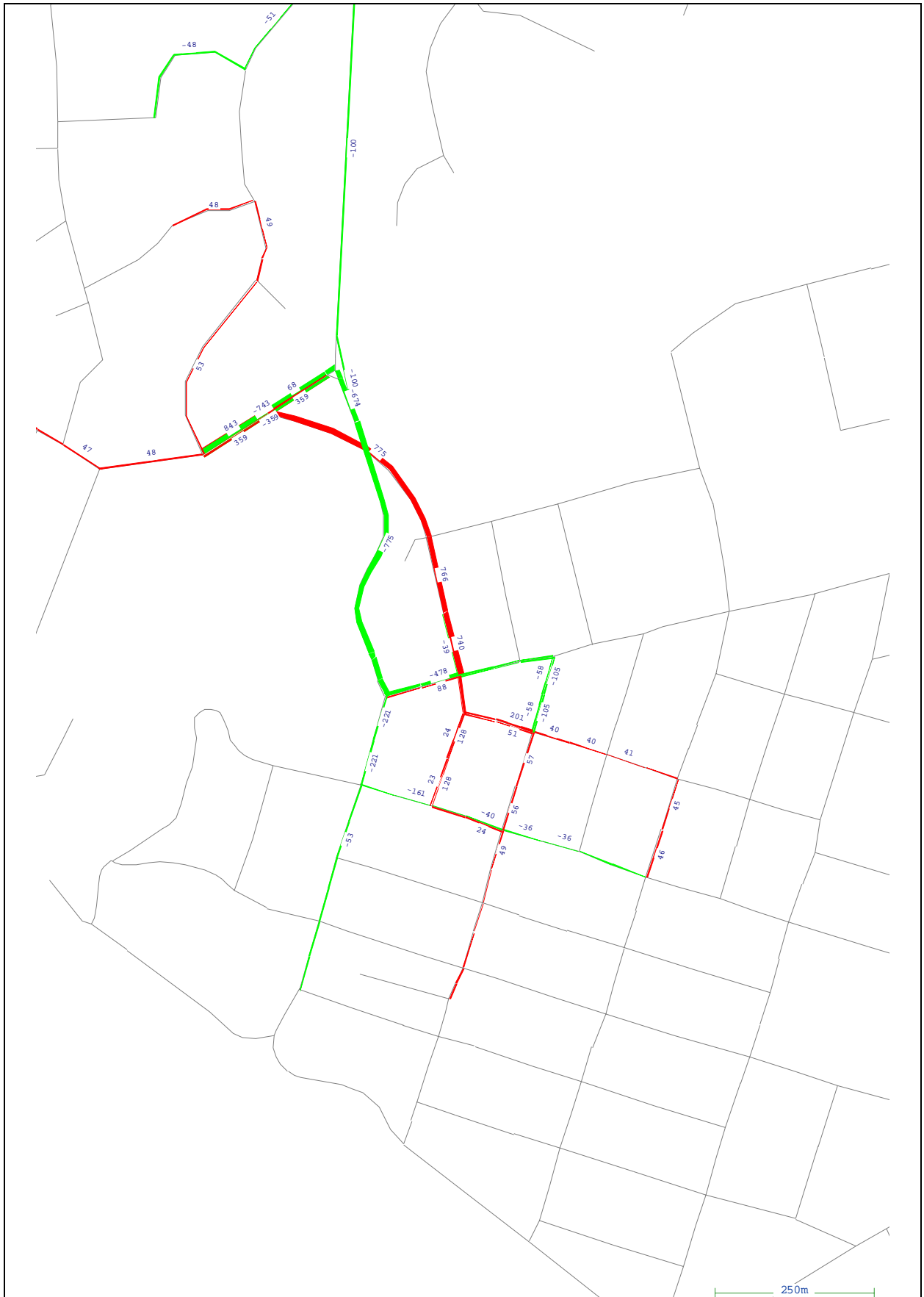


<p>Taupo Town Centre Modelling</p>	<p><b>Stage 3</b> <b>2021 AM Peak</b> <b>Traffic Volumes</b></p>	<p><b>Figure 35</b></p>
<p>Gabites Porter</p>		



<p>Taupo Town Centre Modelling</p>	<p><b>Stage 3</b> <b>2021 PM Peak</b> <b>Traffic Volumes</b></p>	<p><b>Figure 36</b></p>
<p>Gabites Porter</p>		



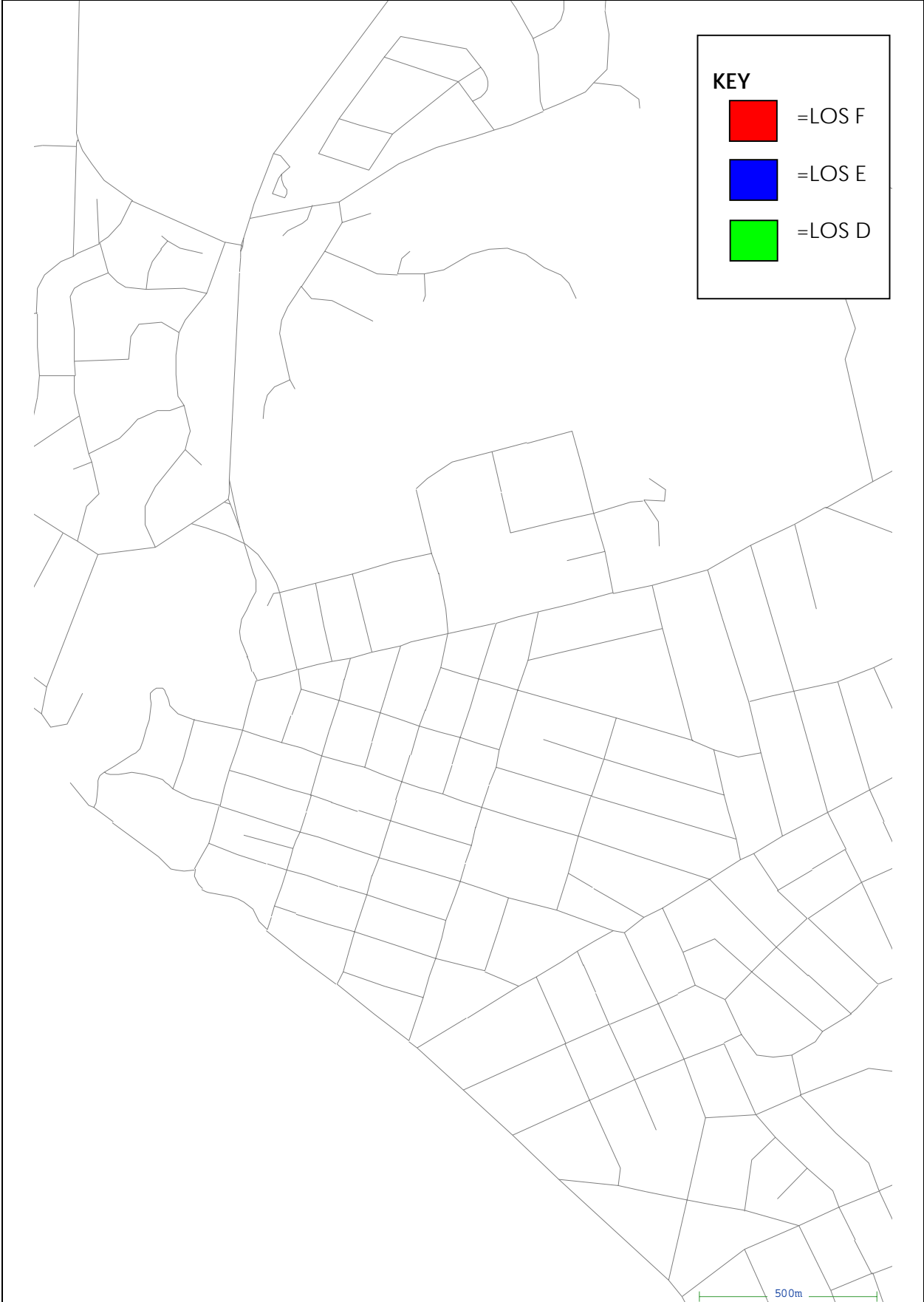


Taupo Town Centre Modelling	<b>2011 AM Peak Traffic Volumes Change Plot Stage 2 v Stage 3</b>	<b>Figure 37</b>
Gabites Porter		

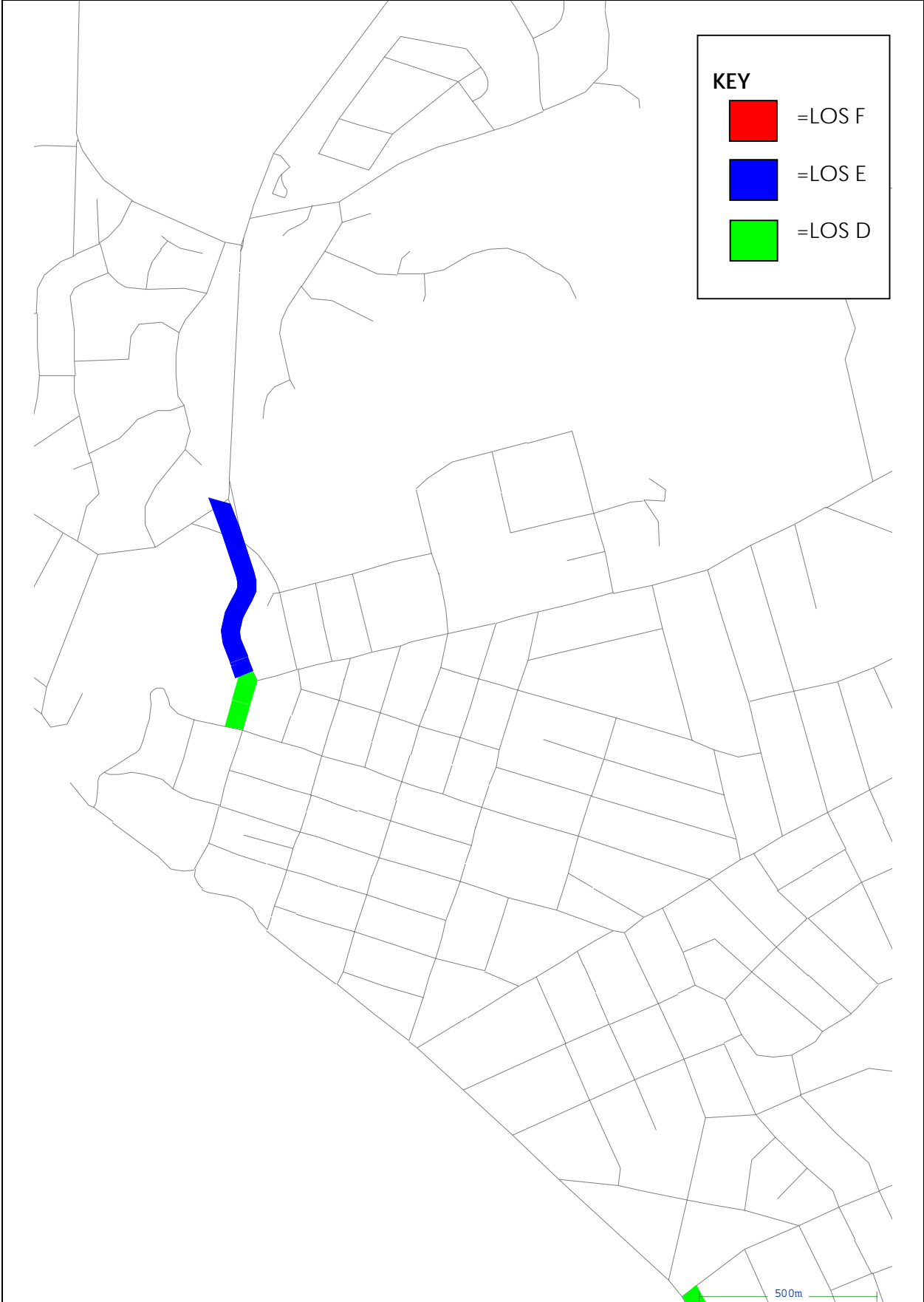








Taupo Town Centre Modelling	<b>Stage 3</b> <b>2011 AM Peak LOS</b>	<b>Figure 41</b>
Gabites Porter		



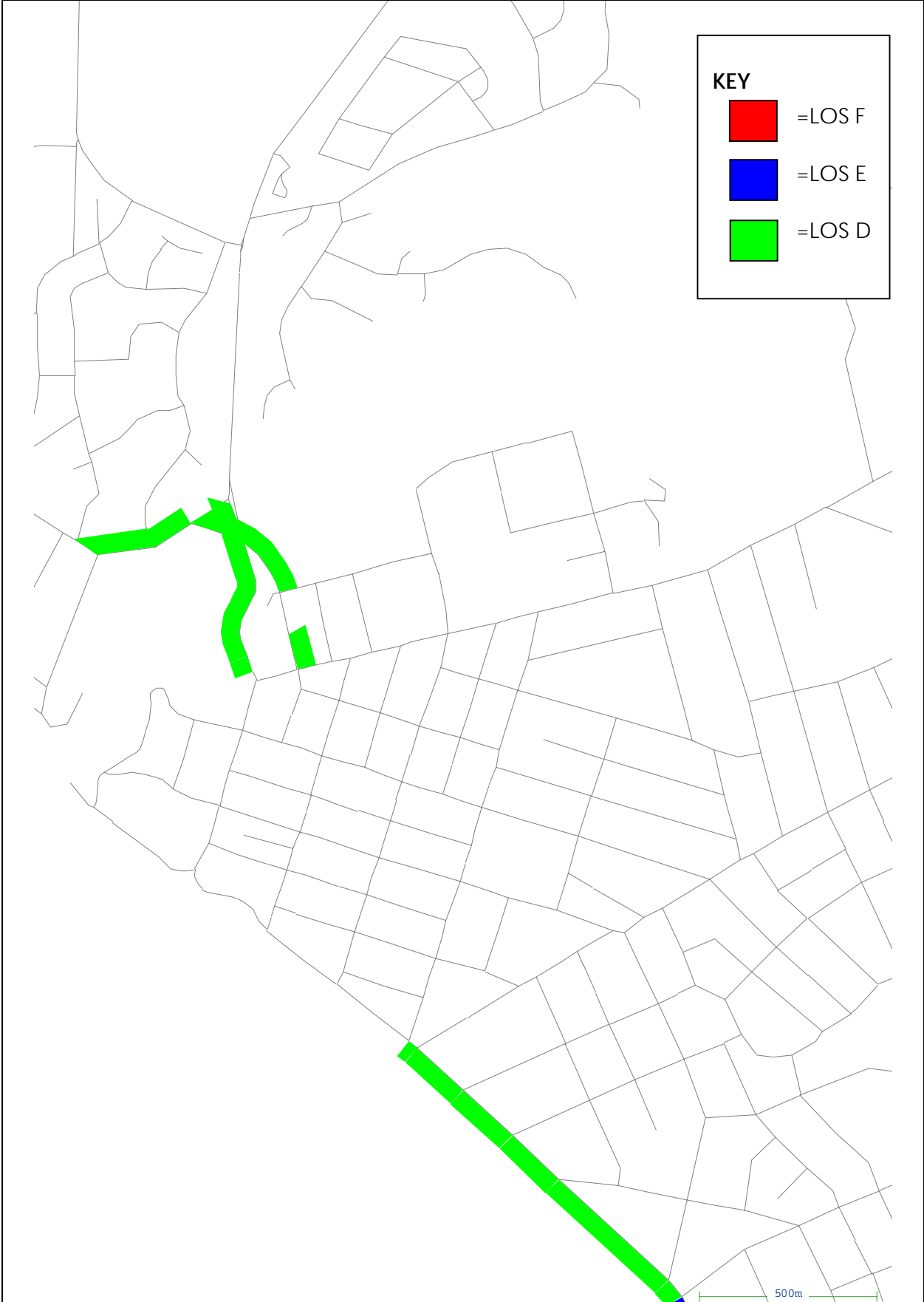
Taupo  
Town Centre Modelling

---

Gabites Porter

**Stage 3**  
**2011 PM Peak LOS**

**Figure 42**



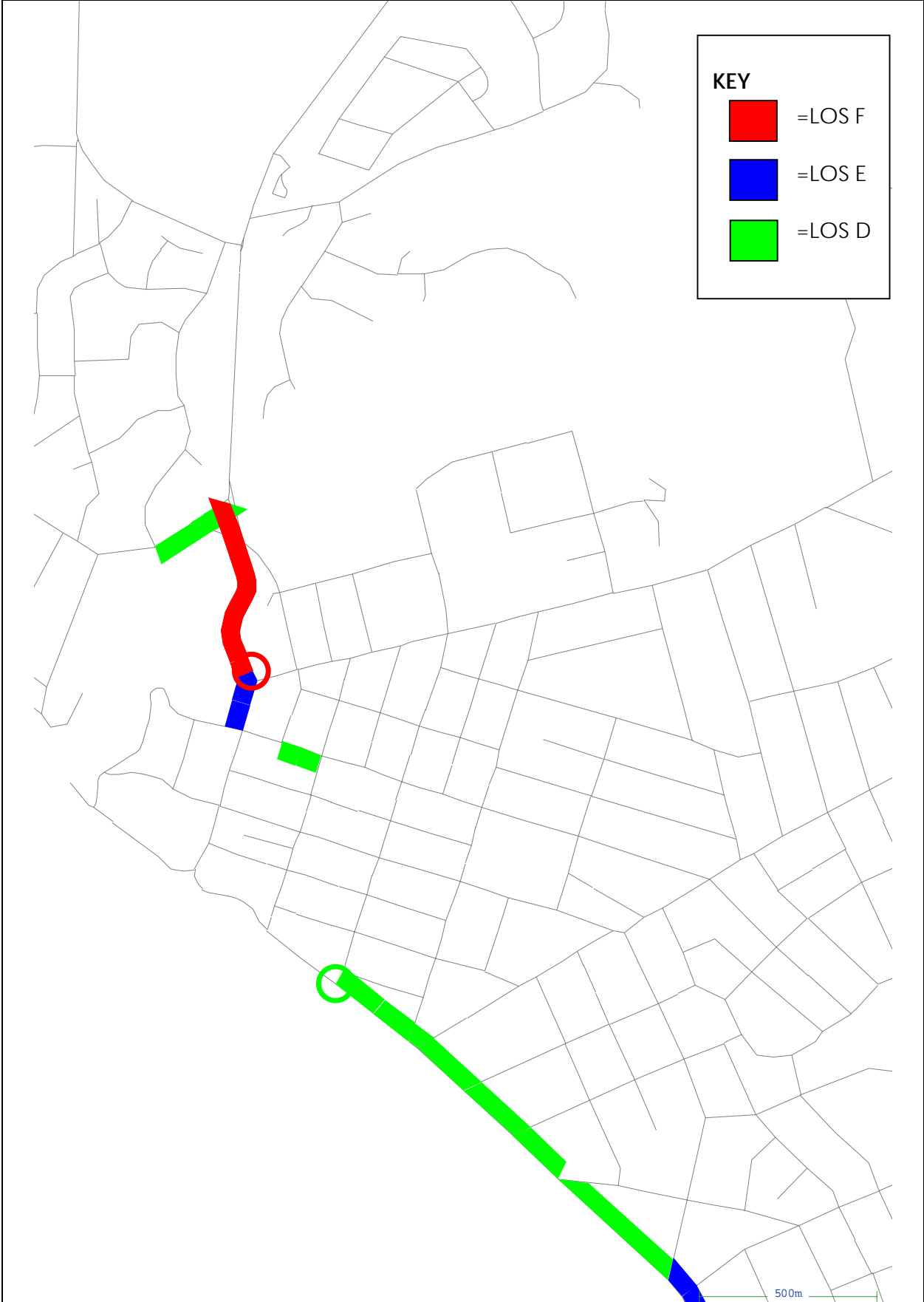
Taupo  
Town Centre Modelling

---

Gabites Porter

**Stage 3**  
**2021 AM Peak LOS**

**Figure 43**



Taupo  
Town Centre Modelling

---

Gabites Porter

**Stage 3**  
**2021 PM Peak LOS**

**Figure 44**



## 8 KEY FINDINGS

The key findings from the modelling are as follows:

### Base Case (No change to the current roading network)

- There are Level of Service issues at the intersection of Tongariro and Tamamutu Streets in the evening peak period of 2011 and 2021, and the morning peak period of 2021.
- There is congestion north of the town centre creating both link and intersection Level of Service issues north of Spa Road on Tongariro Street for all periods in both 2011 and 2021.
- Key intersections that need to be addressed are Tongariro Street/Norman Smith Streets, Tongariro Street/Spa Road, and Tongariro Street/Poihipi Road. The merge of traffic off Norman Smith Street onto Tongariro Street is also causing Level of Service issues.
- Level of Service deteriorates between 2011 and 2021 due to the increased land use activity to the north as well as regional and tourist activity.
- In 2021 Lake Terrace east of Kaimanawa Street is showing some pressure becoming Level of Service D.

### Stage 1 (Traffic calming on Tongariro Street)

- Introduction of traffic calming on Tongariro Street in Stage 1 encourages traffic off Tongariro Street and onto Ruapehu Street both in the morning and evening peak periods in 2011 and further still in 2021. There is also a small increase in traffic onto Spa Road and Heu Heu Street east of Ruapehu Street.
- By 2011 Tongariro Street southbound, between Spa Road and Tamamutu Street decreases to Level of Service E, and further deteriorates to Level of Service F by 2021 for the morning peak. In the evening peak, this section of Tongariro Street is Level of Service F for both 2011 and 2021.
- The traffic calming has no effect on resolving the Level of Service issues on the existing State Highway north of Spa Road.

### Stage 2 (Stage 1 plus change in priorities on Titiraupenga St)

- Prioritising the flow on Titiraupenga Street in Stage 2 effectively diverts traffic flow from Tongariro and Ruapehu Streets and onto Titiraupenga Street both in the morning and evening peak periods in 2011 and further still in 2021. It also encourages small increases in traffic on Spa Road and Paora Hapi Street.
- Stage 2 improves southbound traffic flow on Tongariro Street in 2021 between Spa Road and Tamamutu Street from Level of Service E to D in 2011 and from F to D in 2021 in the morning peak. There is an initial improvement from Level of

Service E to D northbound over this section in 2011, but in 2021 Level of Service E remains.

- Stage 2 did not change the Level of Service on Tongariro Street between Spa Road and Tamamutu Street in the evening peak (remaining at Level of Service E).
- As was the case with Stage 1, Stage 2 has no effect on the Level of Service issues on Tongariro Street and at the intersection of Norman Smith Street north of the CBD in either period of 2011 or 2021.

**Stage 3 (Stage 2 plus new Spa Rd roundabout and additional bridge crossing next to the existing Control Gates Bridge)**

- The addition of a flyover southbound from Norman Smith Street to Nukuhau Street, provides the most significant benefits in terms of improved Level of Service to the CBD. It provides relief on Spa Road and Tongariro Street and all CBD Level of Service issues are resolved in 2011. By 2021, the morning peak becomes Level of Service D on Norman Smith Street, Tongariro Street and the new flyover through to Nukuhau Street due to the increased land use to the north of the CBD.
- Stage 3 provides no relief to northbound traffic flow and has no impact on traffic flows on the East Taupo Arterial.
- Nukuhau Street corridor to Gascoigne Street may need widening to handle the increased volume of traffic generated by the introduced flyover from the north.

## 9 CONCLUSIONS AND RECOMMENDATIONS

The traffic calming of Tongariro Street implemented in Stage 1 successfully diverts traffic onto the other town centre roads while some traffic continues to be directed down Tongariro Street. The majority of traffic is diverted to Ruapehu Street however small increases also occur on Spa Road, Titiraupenga Street and other town centre streets. The magnitude of this diversion increases in 2021.

The impact on traffic flows on the northernmost block of Tongariro Street (i.e. Spa Road to Tamamutu Street) is modest with more significant reductions in traffic south of Tamamutu Street. While acknowledging it is acceptable for visitor traffic to run slowly through Tongariro Street, it is recommended that local peak traffic be encouraged to use Spa Road and Ruapehu Street. To avoid resulting congestion issues on Ruapehu Street it would be desirable to complete stages 1 and 2 concurrently.

The change of priorities along the Titiraupenga Street corridor in Stage 2 successfully increases traffic volumes on this corridor and reduces volumes along Tongariro Street further. It does, however, put pressure on the western end of the Spa Road corridor. The intersection of Spa Road, Nukuhau Street and Gascoigne Street will need attention prior to 2021 and four laning along Spa Road as far as Ruapehu Street may also be required. The reconfigured intersection of Titiraupenga Street and Lake Terrace may also be reaching capacity by 2021 in peak periods.

**Between the traffic calming and Titiraupenga Street priority changes, it is evident that the traffic moving through the town centre road network can be effectively managed such that traffic flows evenly along the existing north-south corridors without congestion in the vicinity.**

It is recommended, however, that further investigation is required to address the congestion modelled on the 2011 and 2021 road network at Norman Smith Street, Poihipi Road and on the Control Gate Bridge and the traffic merge locations either side of it. This issue will need to be considered in the future regardless of any town centre improvements.

The grade separated link modelled in this investigation is but one alternative, but does indicate that Nukuhau Street and in particular the dual roundabout design along Spa Road could be used to facilitate a second river crossing. **The two roundabouts are effective in providing sufficient intersection capacity and an appropriate level of accessibility between the north of town and the town centre.**

# APPENDICES



## APPENDIX A – Level Of Service

Level of Service is a subjective measure of the way in which a network is operating, given the traffic demands that are placed on it. It is a concept developed by American engineers, and has been generally internationally adopted. It is being used in this study to measure the performance of both roads and intersections.

### LOS Descriptions

Because it is subjective, individual regions have a local perception of how individual roads and intersections are operating and that affects the local interpretation of the LOS values. It is important to note that level of service tends to be much worse during the morning and evening peaks. The interval between these periods usually generates fewer trips and the trips tend to be shorter resulting much in a much better LOS. In this study the boundaries were adopted from those used in several studies and modified in discussion with Council Officers in order to reflect local perceptions of network operation.

This study focuses on LOS F, E, and D. The LOS boundaries, approved by representatives of the relevant stake holders, are described in **Table A1**, which provides a description of:

- LOS definitions describing the type of conditions a driver faces under each level
- Link LOS boundaries that describe the performance of traffic moving along a section of road and a function of traffic volume and link free flow speed.
- Intersection LOS boundaries, which are based on two different criteria: Worst approach delay for priority controlled intersections; and weighted average delay across all approaches for signalised intersections and roundabouts.

**Figure A1** shows how Link LOS varies depending on link type. It shows that the higher the vehicle volume and the lower the free speed the worse the LOS becomes. Link types are defined as follows:

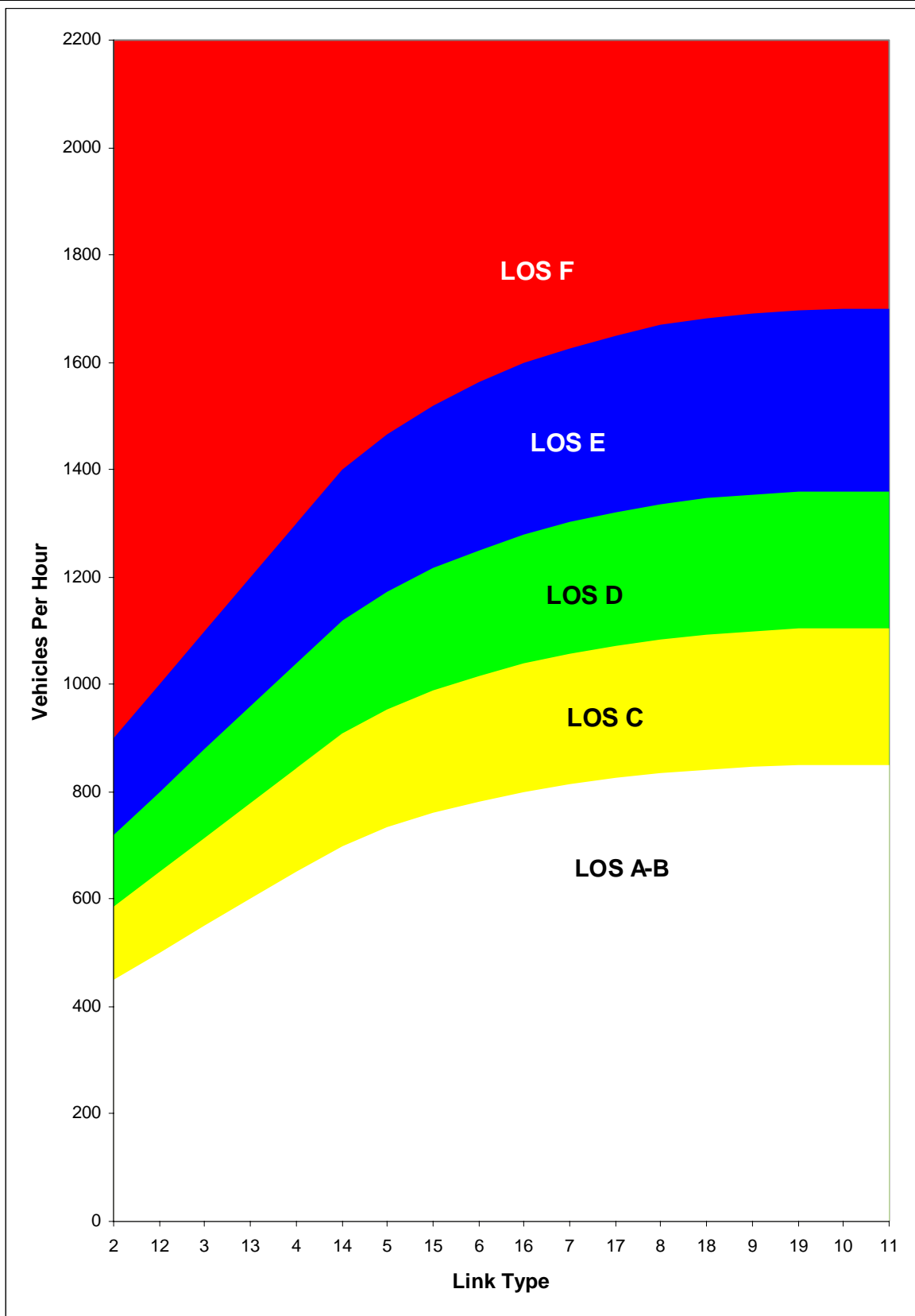
- Link type 1 equates to road speeds of 10km/hr
- Link type 2 and 12 equate to road speeds of 20km/hr and 25km/hr
- Link type 3 and 13 equate to road speeds of 30km/hr and 35km/hr
- Link type 4 and 14 equate to road speeds of 40km/hr and 45km/hr
- Link type 5 and 15 equate to road speeds of 50km/hr and 55km/hr
- Link type 6 and 16 equate to road speeds of 60km/hr and 65km/hr
- Link type 7 and 17 equate to road speeds of 70km/hr and 75km/hr
- Link type 8 and 18 equate to road speeds of 80km/hr and 85km/hr
- Link type 9 and 19 equate to road speeds of 90km/hr and 95km/hr
- Link type 10 and 11 equate to road speeds of 100km/hr and 105km/hr

This present day Level of Service provides a measure by which future network performance and deficiencies can be assessed given knowledge and experience of current conditions.

Definitions of LOS

Table A1

LOS	AustRoads Description	Taupo Town Centre Modelling LOS criteria		
		Link (vehicles per lane per hour)	Intersection delay (seconds/veh)	
			Priority (worst approach)	Signal/Rotary (weighted average)
LOS F	Forced flow. The amount of traffic approaching a point exceeds that which can pass it. Flow break-downs occur, and queuing and delays occur.	In excess of <b>900-1700</b> depending on link type	In excess of 50 sec	In excess of 80 sec
LOS E	Traffic volumes are at or close to <i>capacity and there is virtually no freedom</i> to select desired speed and to manoeuvre within the traffic stream. Flow is unstable and <i>minor disturbances within the traffic stream will cause break-downs in operation.</i>	Between <b>720-900</b> and <b>1360-1700</b> depending on link type	35 - 50 sec	55 - 80 sec
LOS D	Approaching unstable flow where <i>all drivers are severely restricted</i> in their freedom to select desired speed and to manoeuvre within the traffic stream. The general level of <i>comfort and convenience is poor</i> and small increases in traffic flow will cause operational problems.	Between <b>585-720</b> and <b>1105-1360</b> depending on link type	25 - 35 sec	35 - 55 sec
LOS C	Stable flow but most drivers <i>are restricted to some extent</i> in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of <i>comfort and convenience has declined noticeably.</i>	Between <b>450-585</b> and <b>850-1105</b> depending on link type	15 - 25 sec	20 - 35 sec
LOS B	Stable flow where drivers still <i>have reasonable freedom</i> to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is less than LOS A.	Between <b>0</b> and <b>450-850</b> depending on link type	0 - 15 sec	0 - 20 sec
LOS A	Free flow in which drivers are <i>virtually unaffected</i> by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high and the general level of <i>comfort and convenience is excellent.</i>			

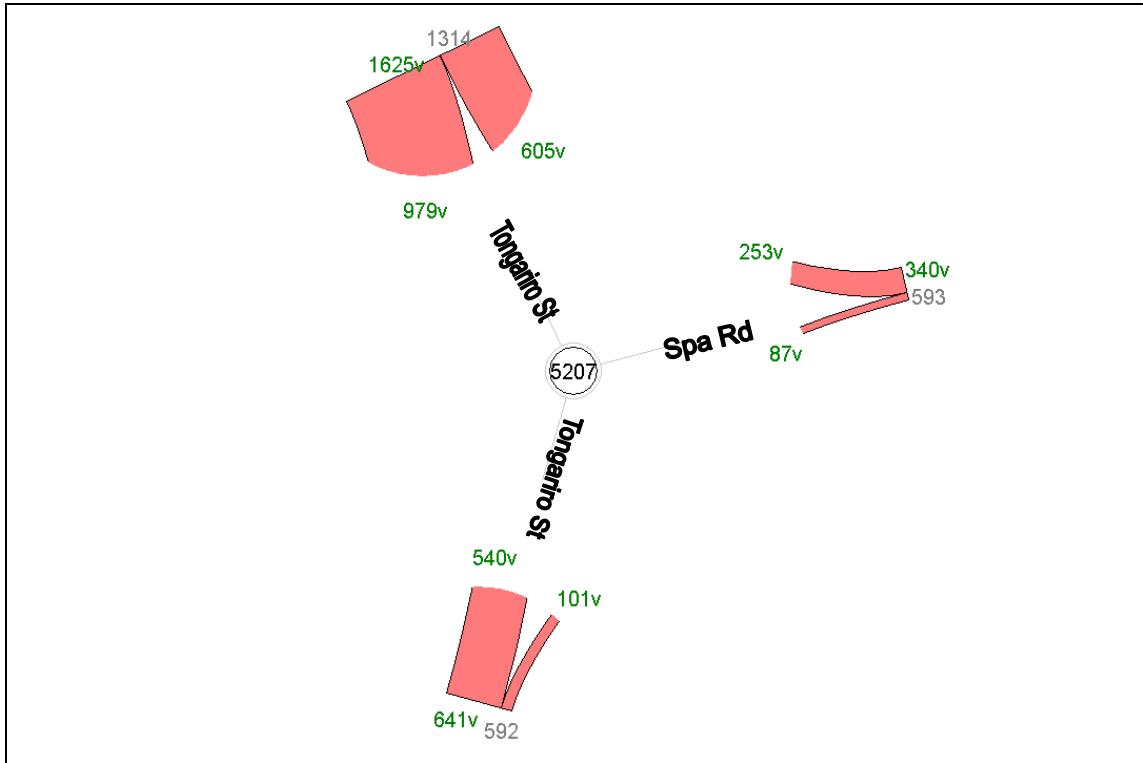


Taupo Town Centre Modelling	<b>Transport Study Link LOS Criteria</b>	<b>Figure A1</b>
Gabites Porter		

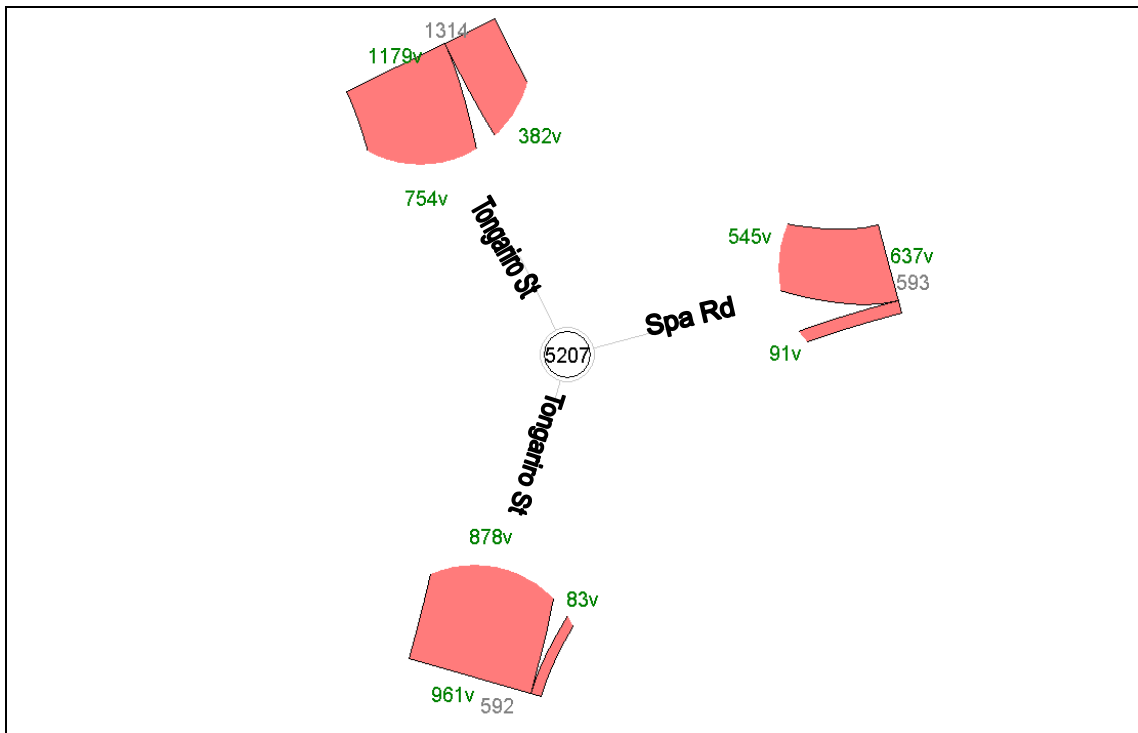
# APPENDIX B – Intersection Turning Movements

To follow are intersection turning movement diagrams for key intersections within the study area for each of the years reported (AM and PM peak periods).



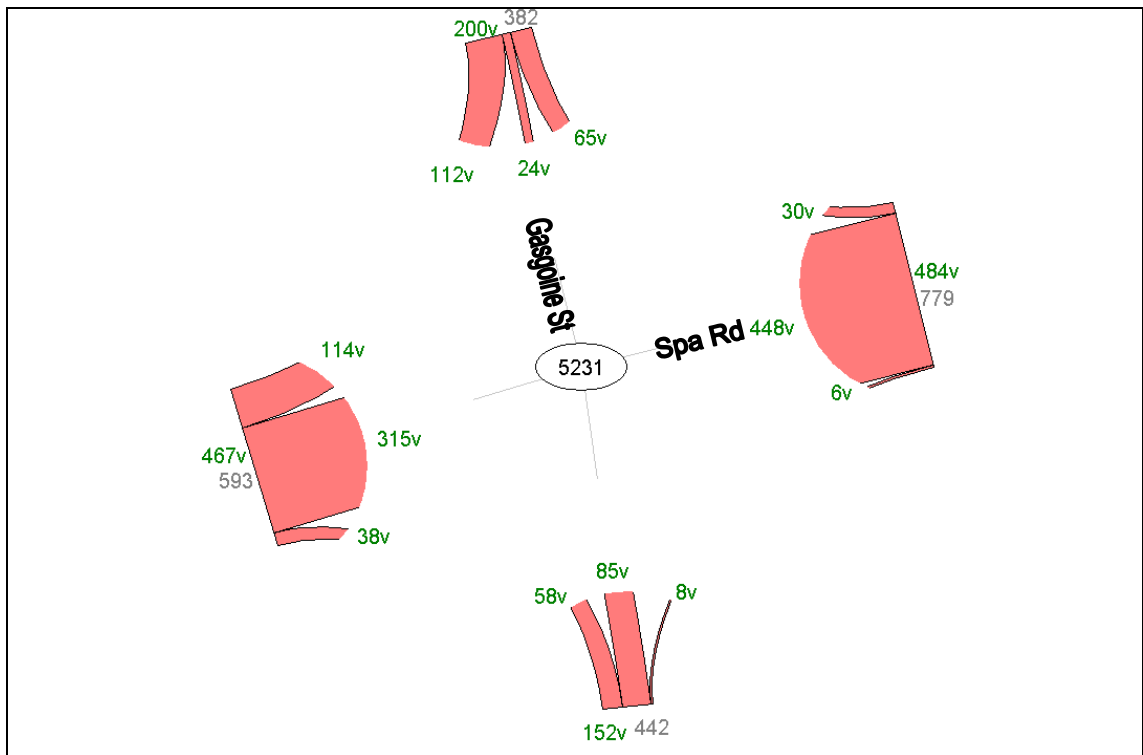
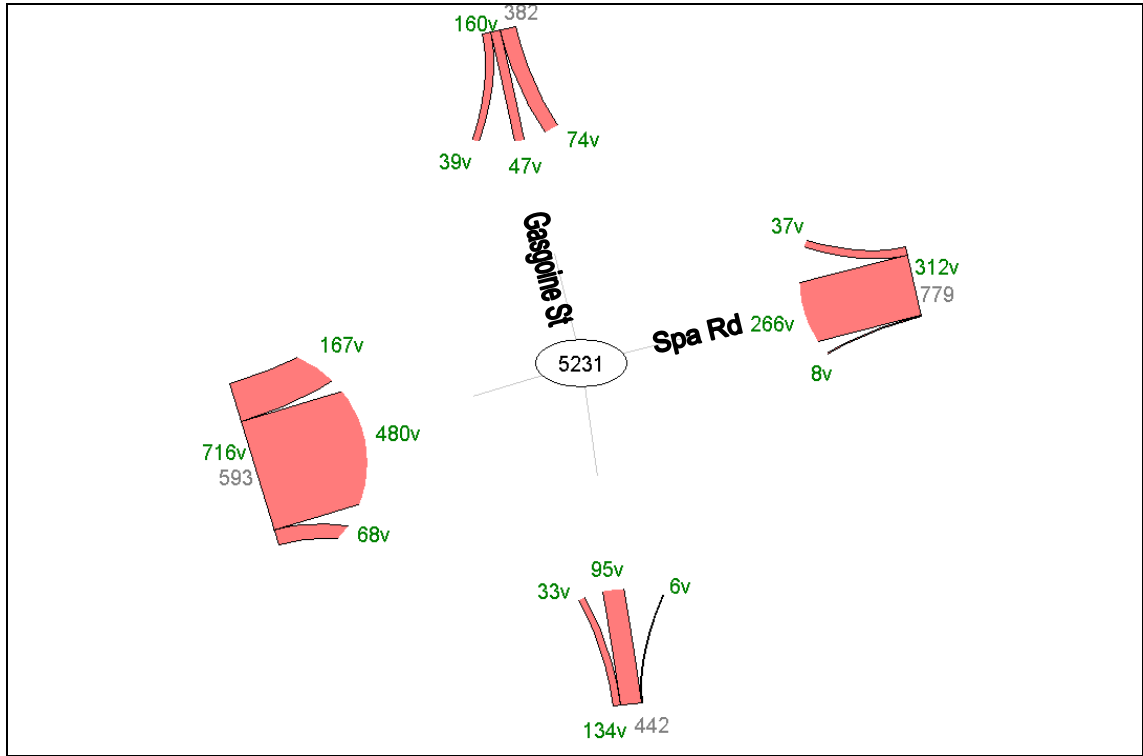


AM Peak

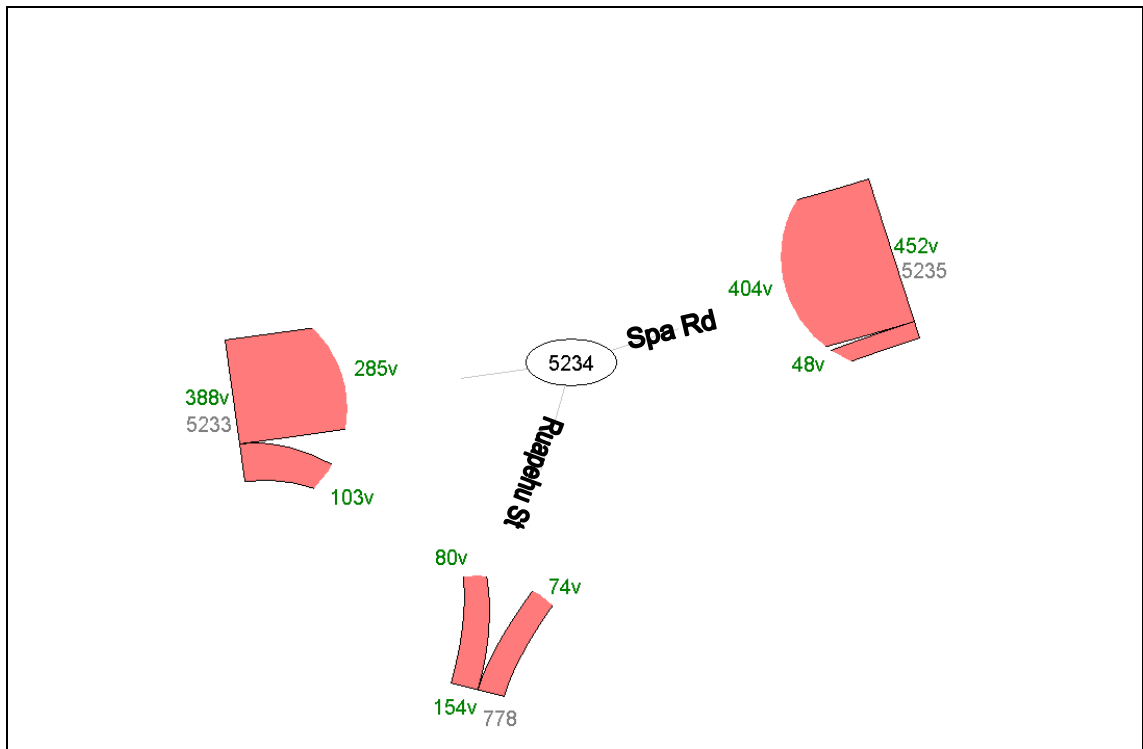
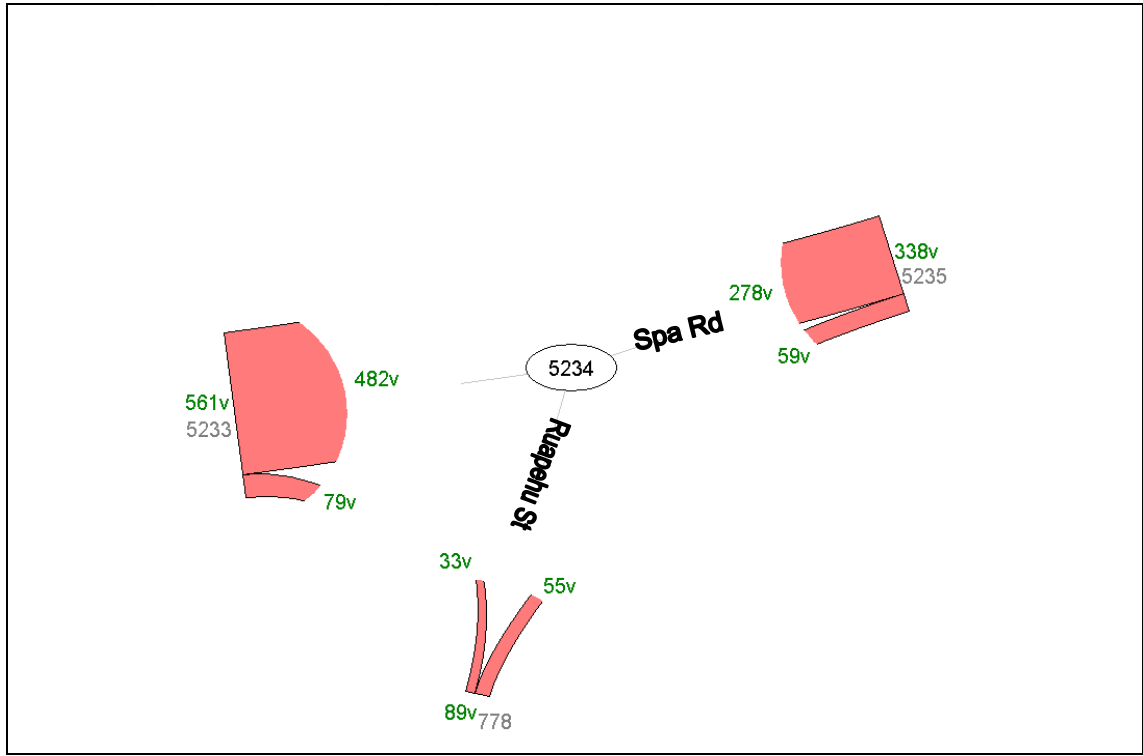


PM Peak

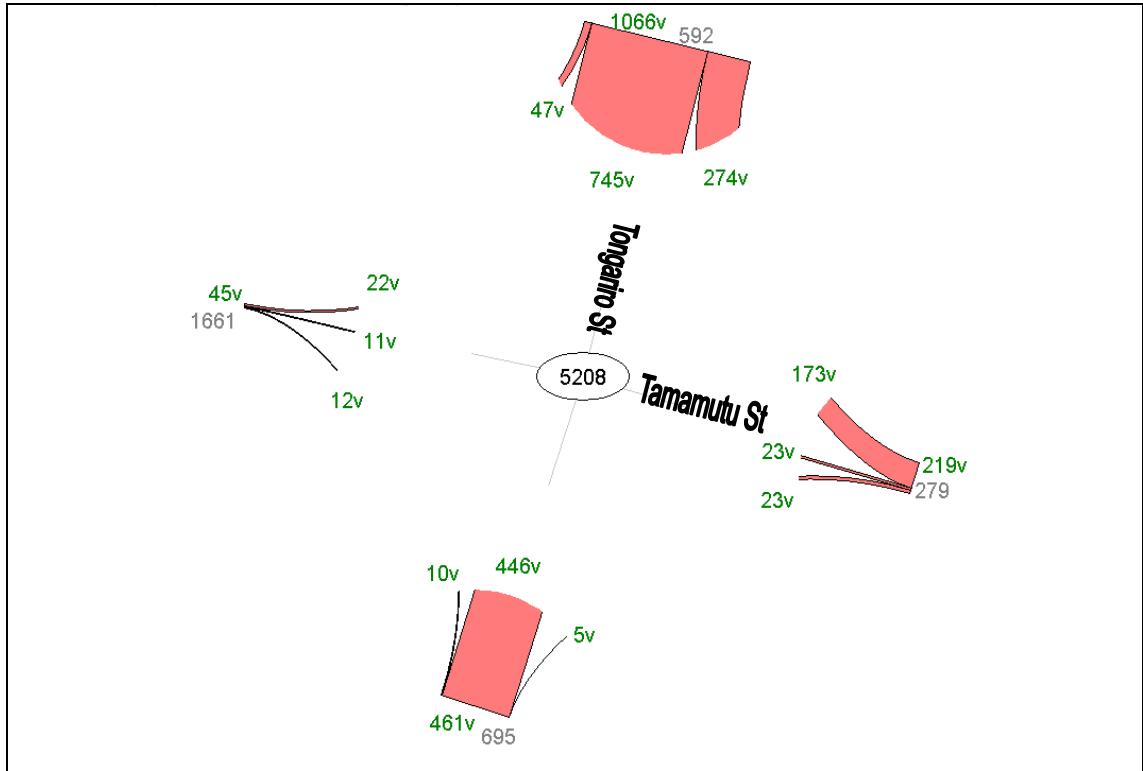
Taupo Town Centre Modelling	<b>2011 Base Intersection Turning Movements Tongariro St / Spa Rd</b>	Figure 1
Gabites Porter		



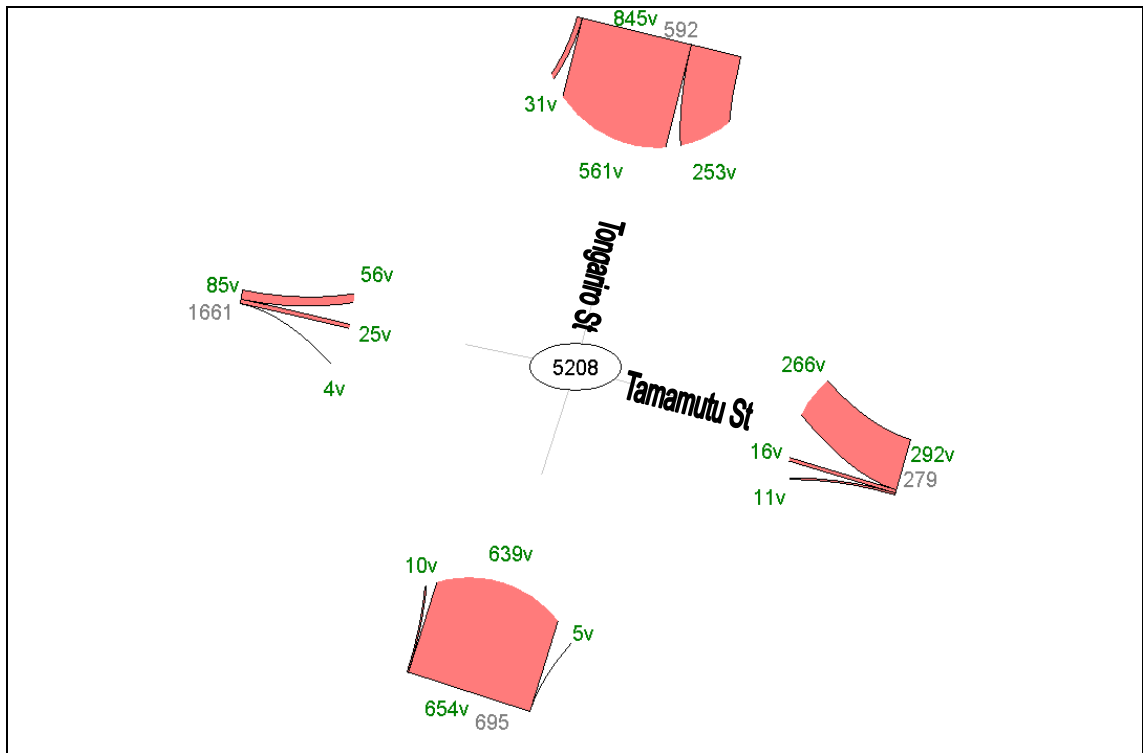
Te Awa Structure Plan Traffic Assessment	<b>2011 Base Intersection Turning Movements Gascoigne St / Spa Rd</b>	<b>Figure 2</b>
Gabites Porter		



Te Awa Structure Plan Traffic Assessment	<b>2011 Base Intersection Turning Movements Ruapehu St / Spa Rd</b>	<b>Figure 3</b>
Gabites Porter		

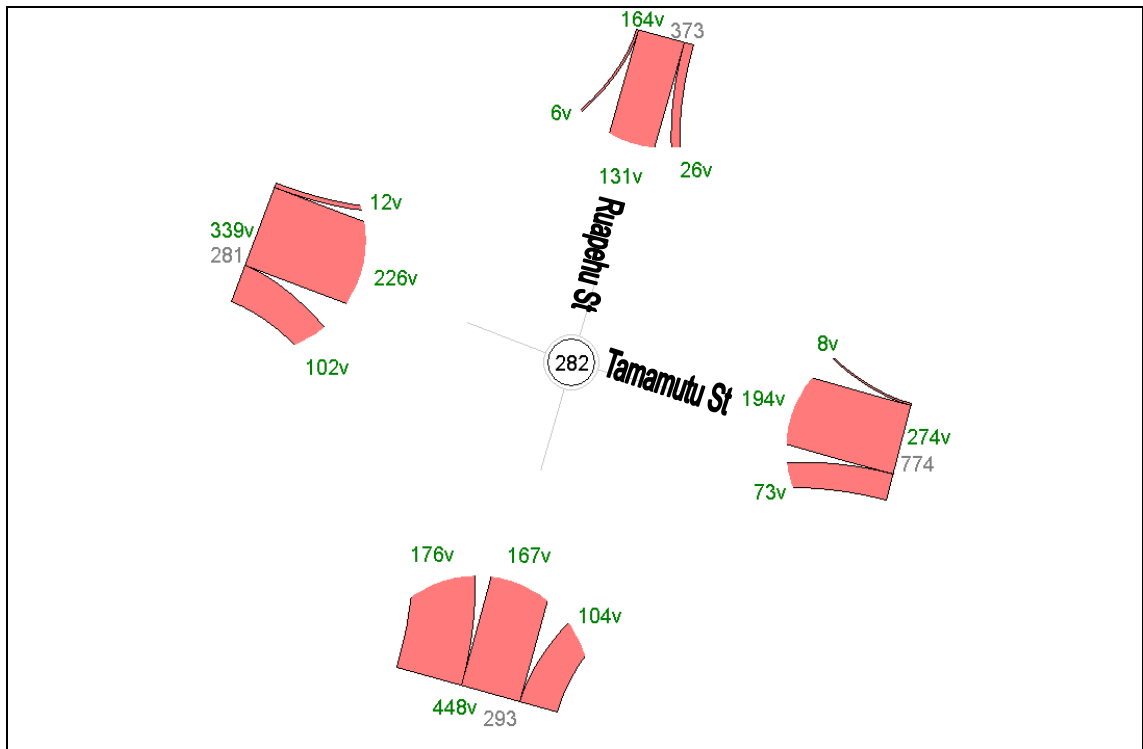
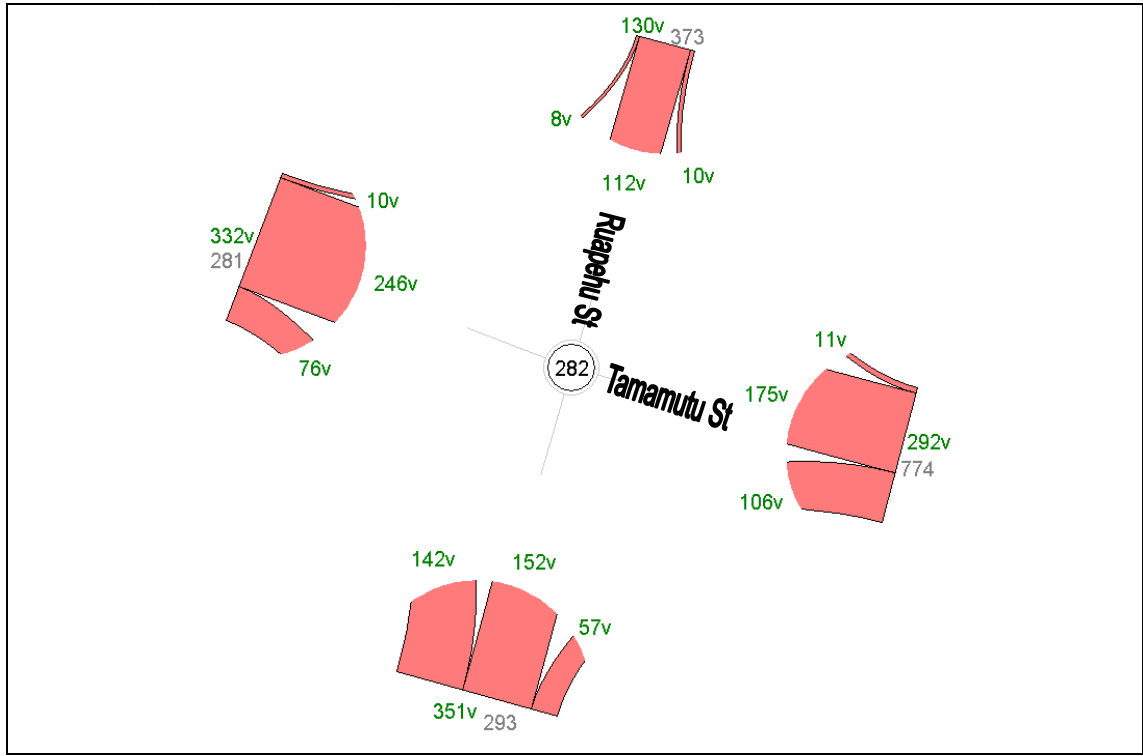


AM Peak

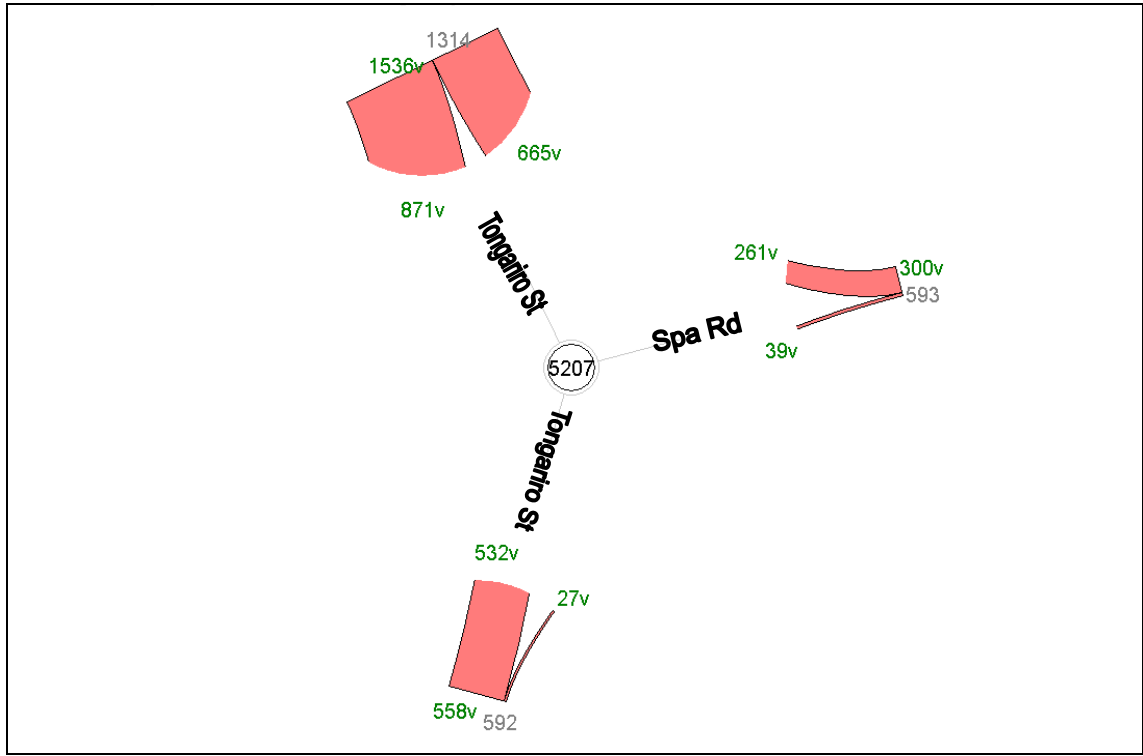


PM Peak

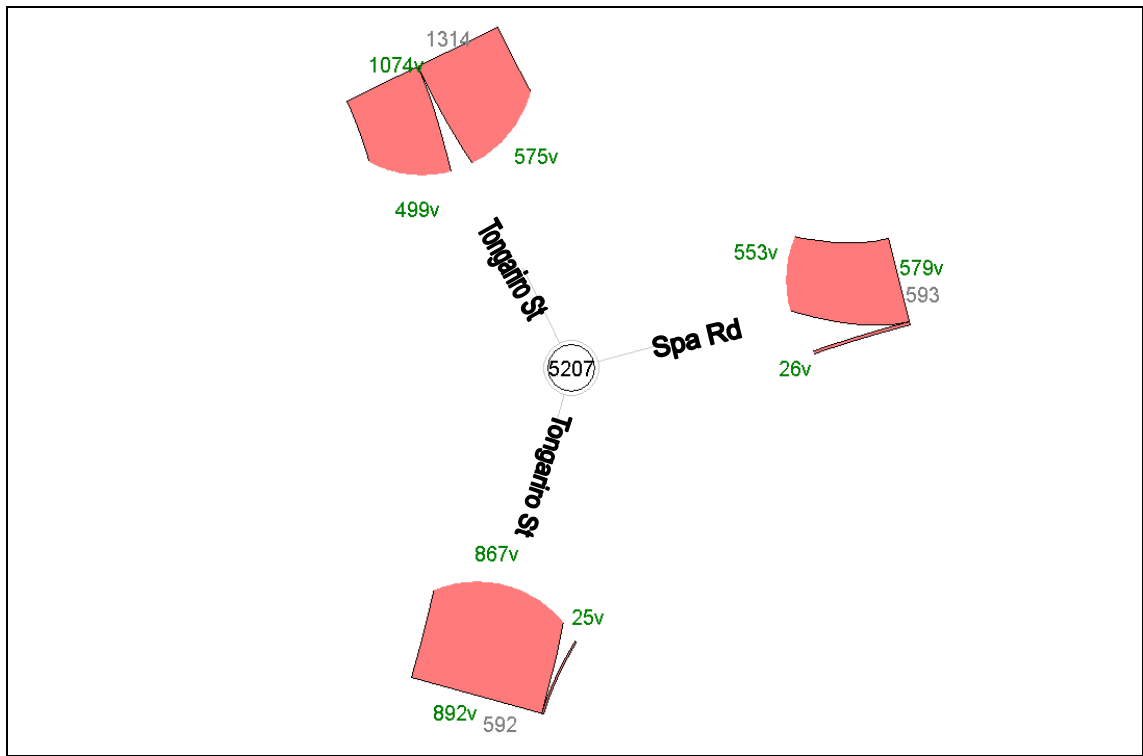
Te Awa Structure Plan Traffic Assessment	<b>2011 Base Intersection Turning Movements Tongariro St / Tamamutu St</b>	<b>Figure 4</b>
Gabites Porter		



Te Awa Structure Plan Traffic Assessment	<b>2011 Base Intersection Turning Movements Ruapehu St / Tamamutu St</b>	<b>Figure 5</b>
Gabites Porter		

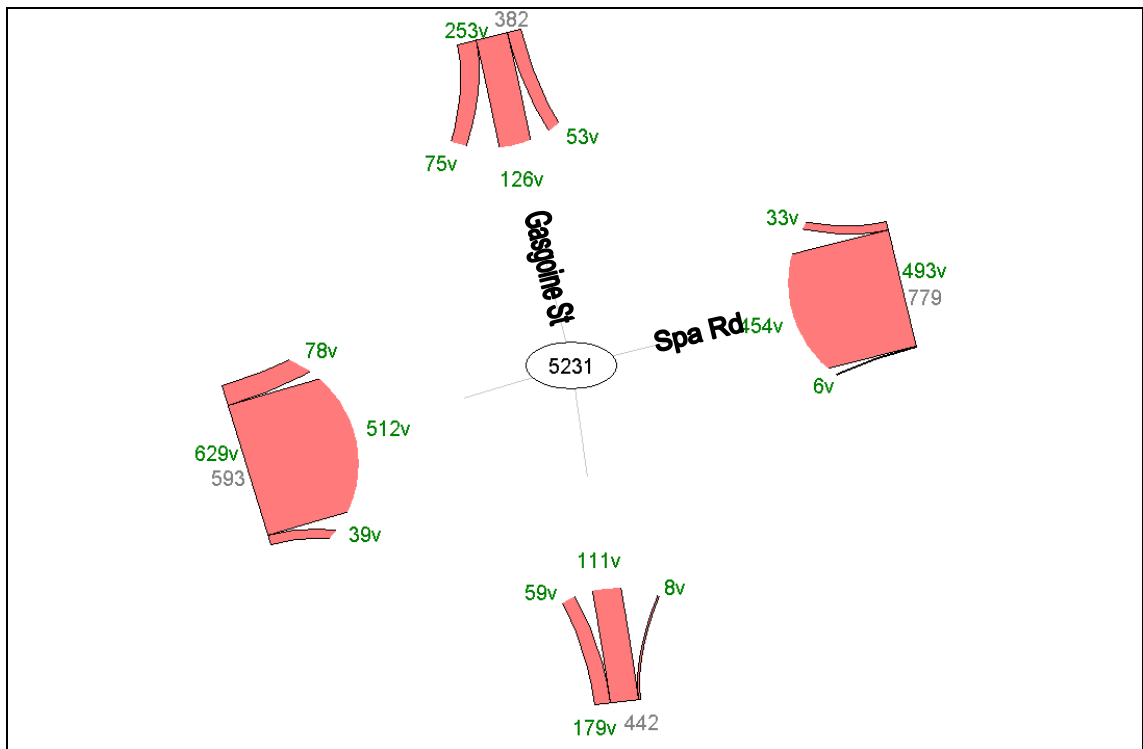
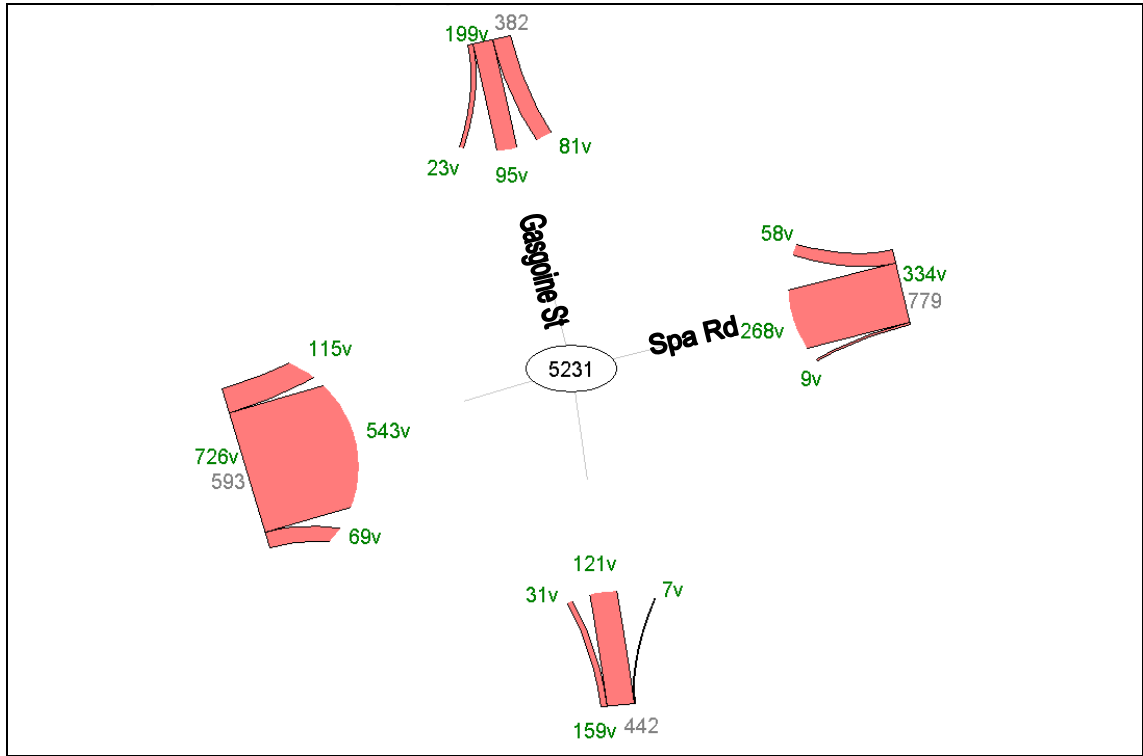


AM Peak

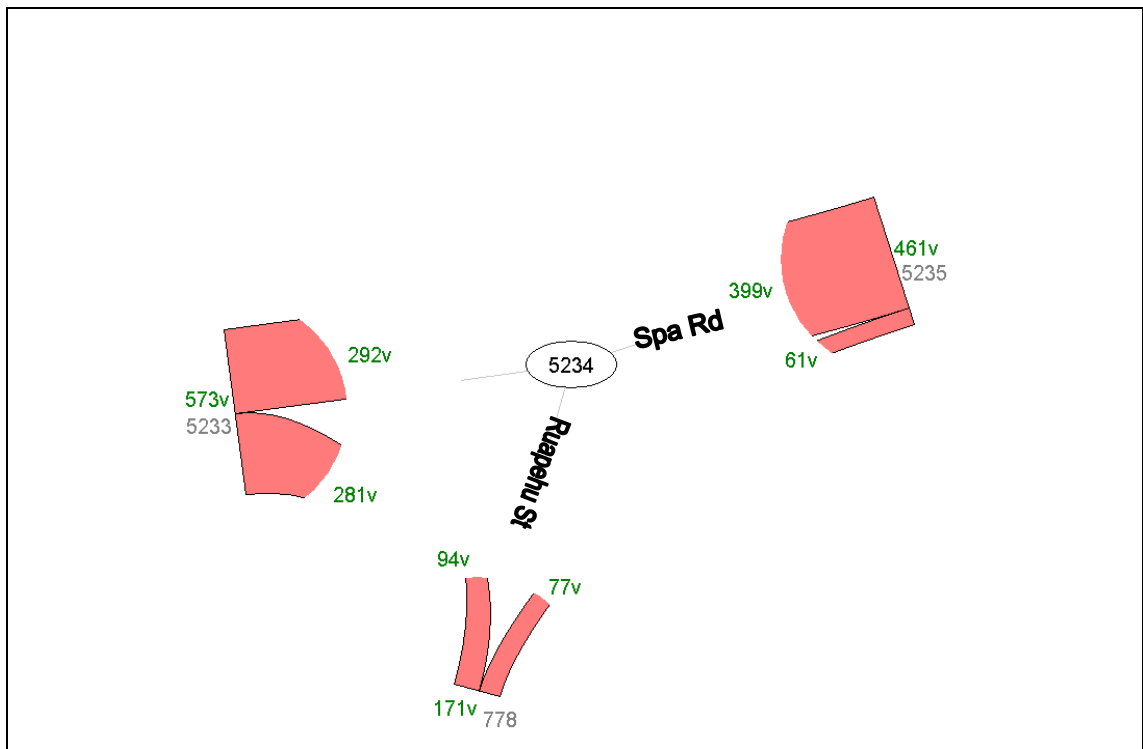
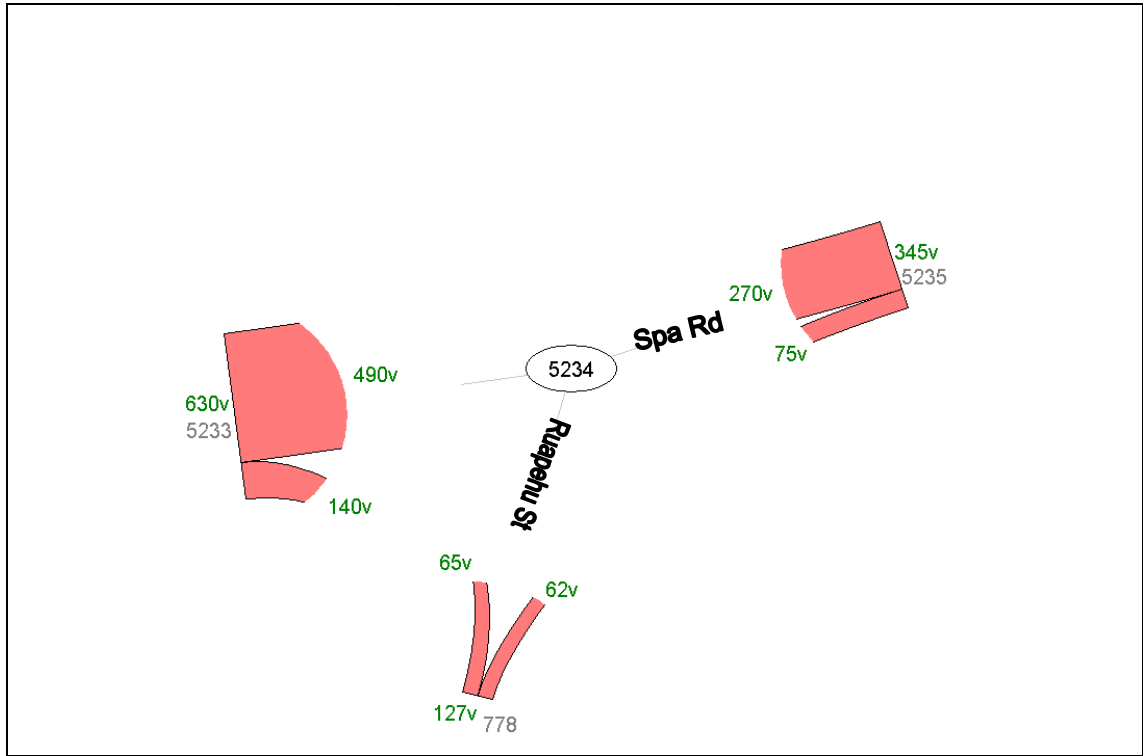


PM Peak

Te Awa Structure Plan Traffic Assessment	<b>2011 Stage 1 Intersection Turning Movements Tongariro St / Spa Rd</b>	<b>Figure 6</b>
Gabites Porter		

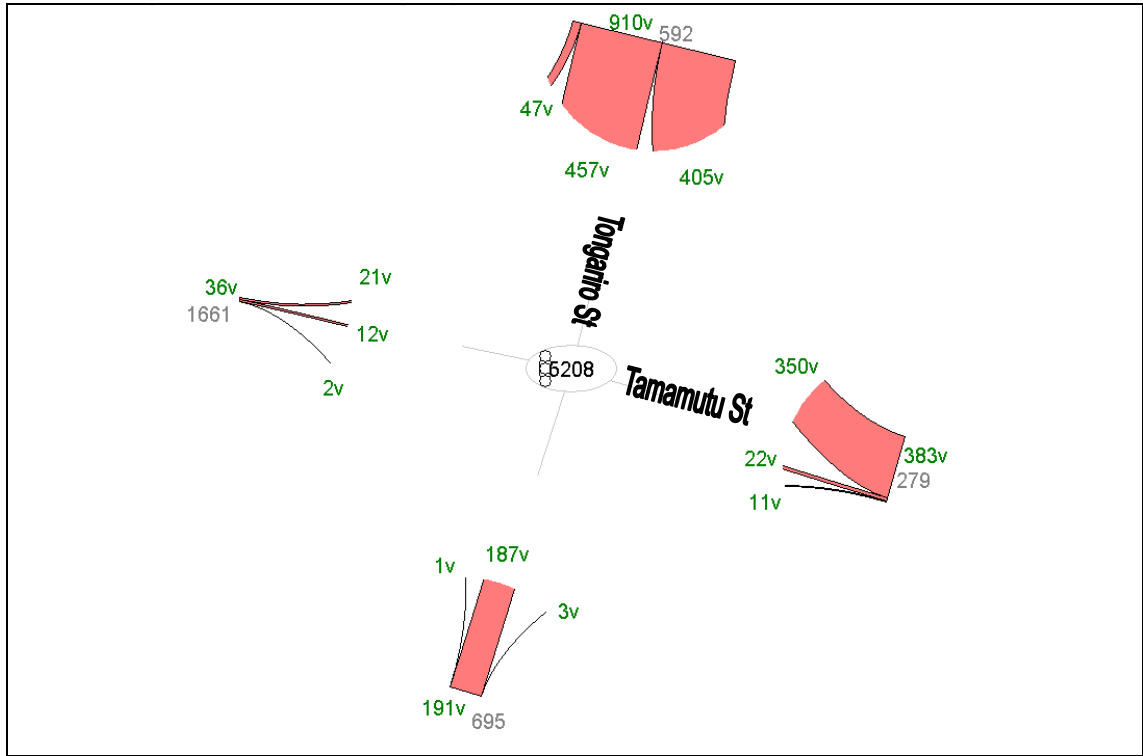


Te Awa Structure Plan Traffic Assessment	<b>2011 Stage 1 Intersection Turning Movements Gascoigne St / Spa Rd</b>	<b>Figure 7</b>
Gabites Porter		

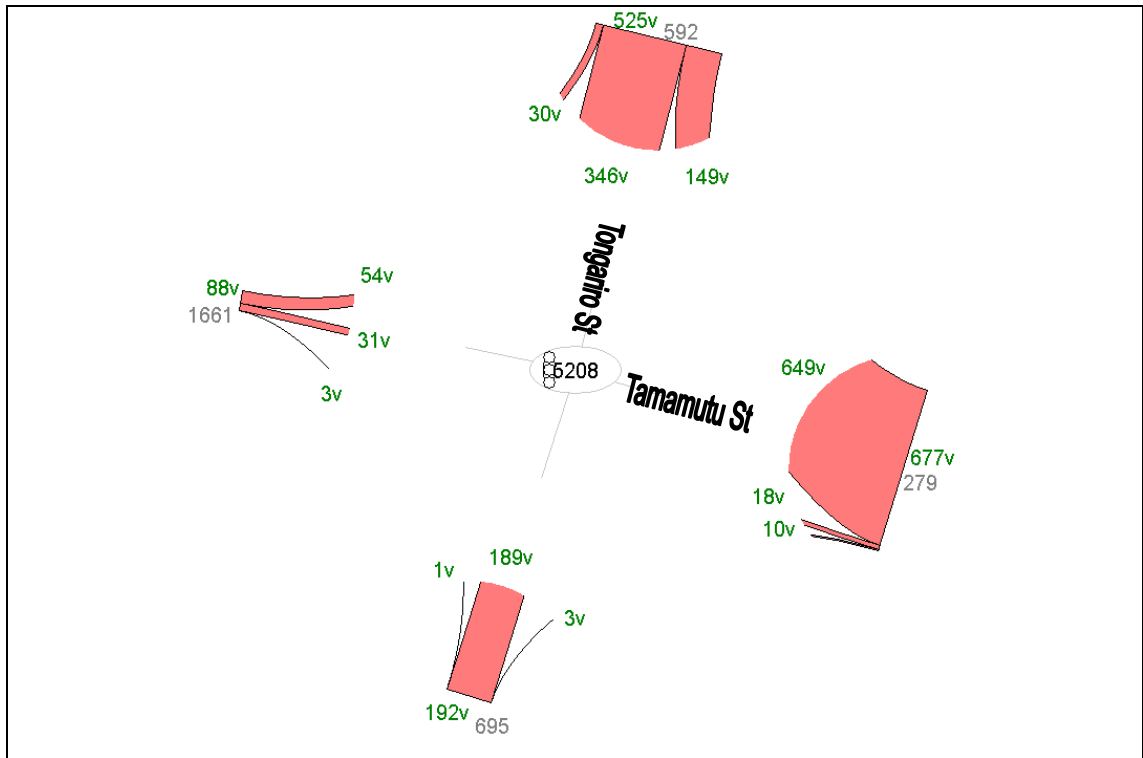


Te Awa Structure Plan Traffic Assessment	<b>2011 Stage 1 Intersection Turning Movements Ruapehu St / Spa Rd</b>	<b>Figure 8</b>
Gabites Porter		



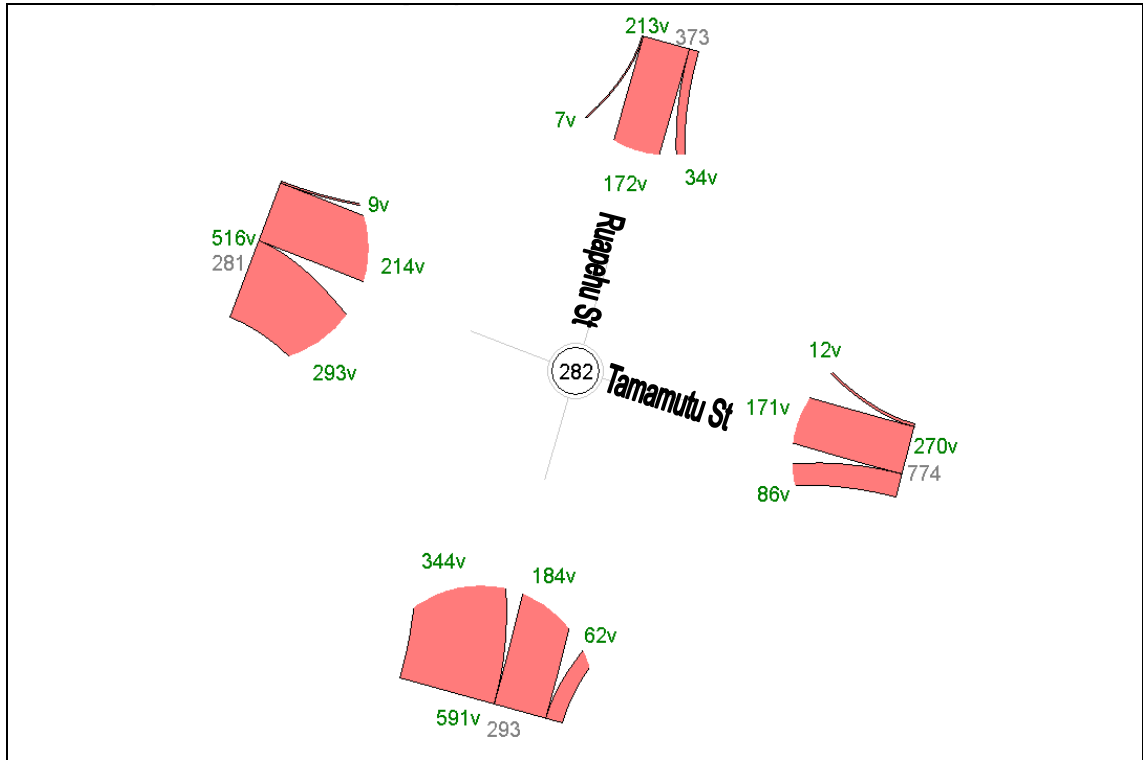


AM Peak

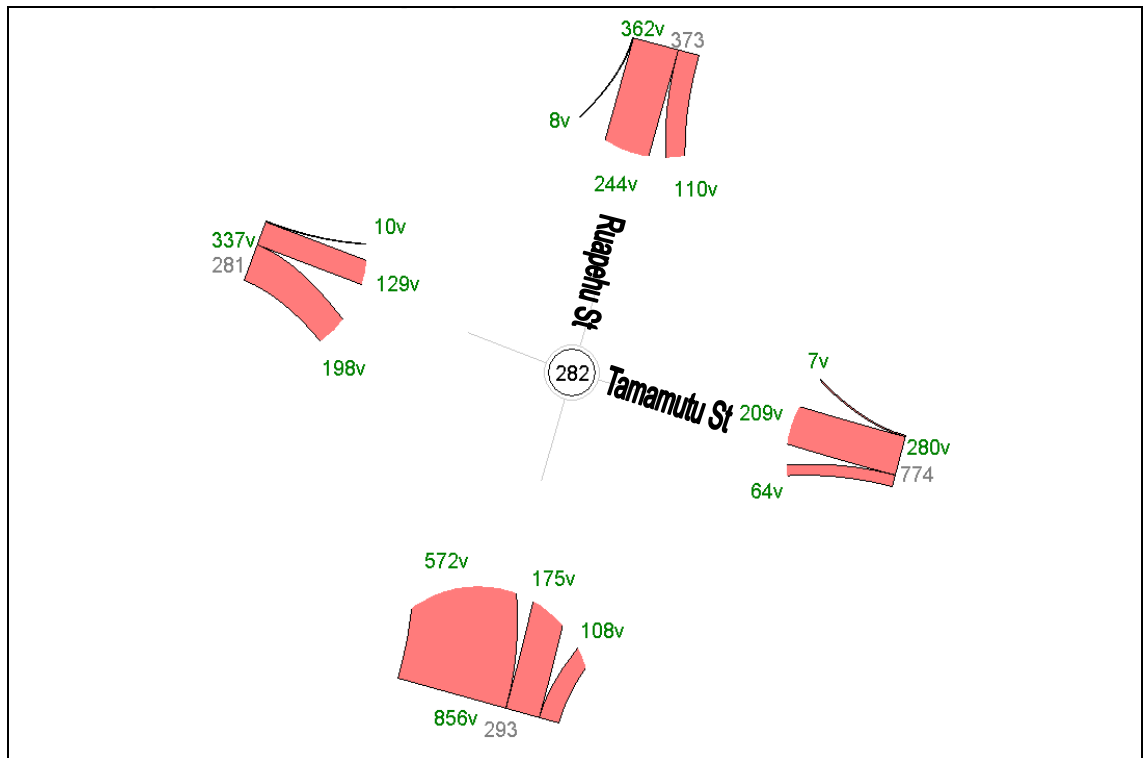


PM Peak

Te Awa Structure Plan Traffic Assessment	<b>2011 Stage 1 Intersection Turning Movements Tongariro St / Tamamutu St</b>	<b>Figure 9</b>
Gabites Porter		

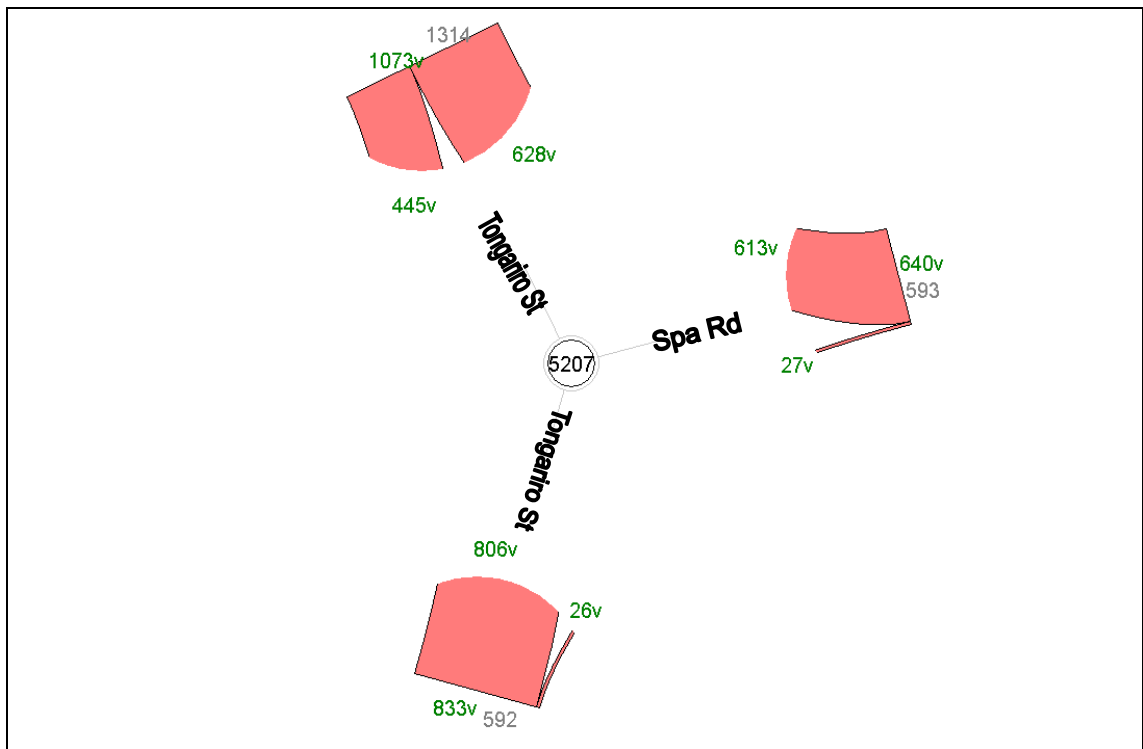
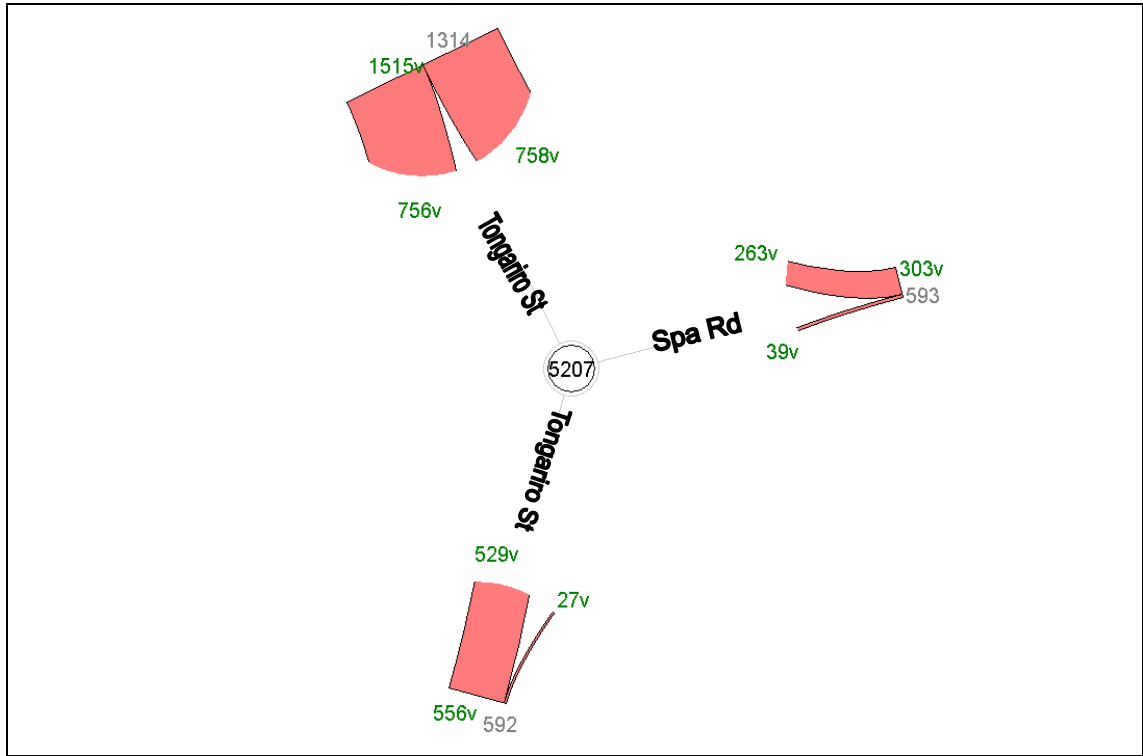


AM Peak

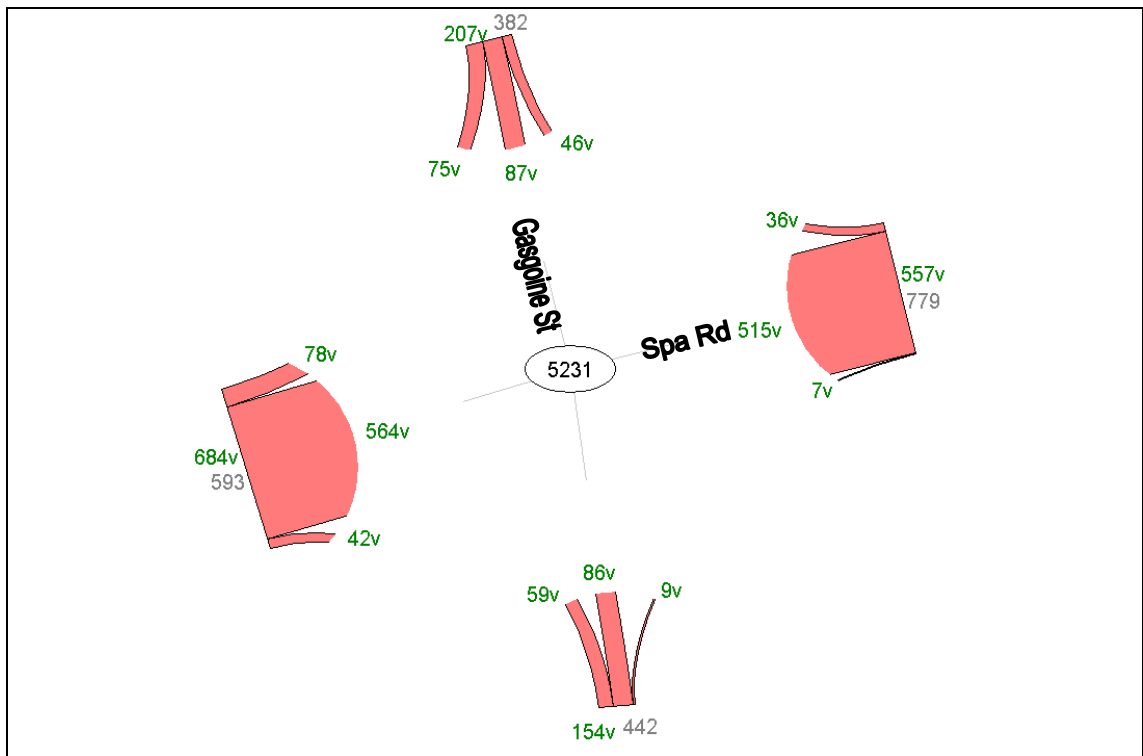
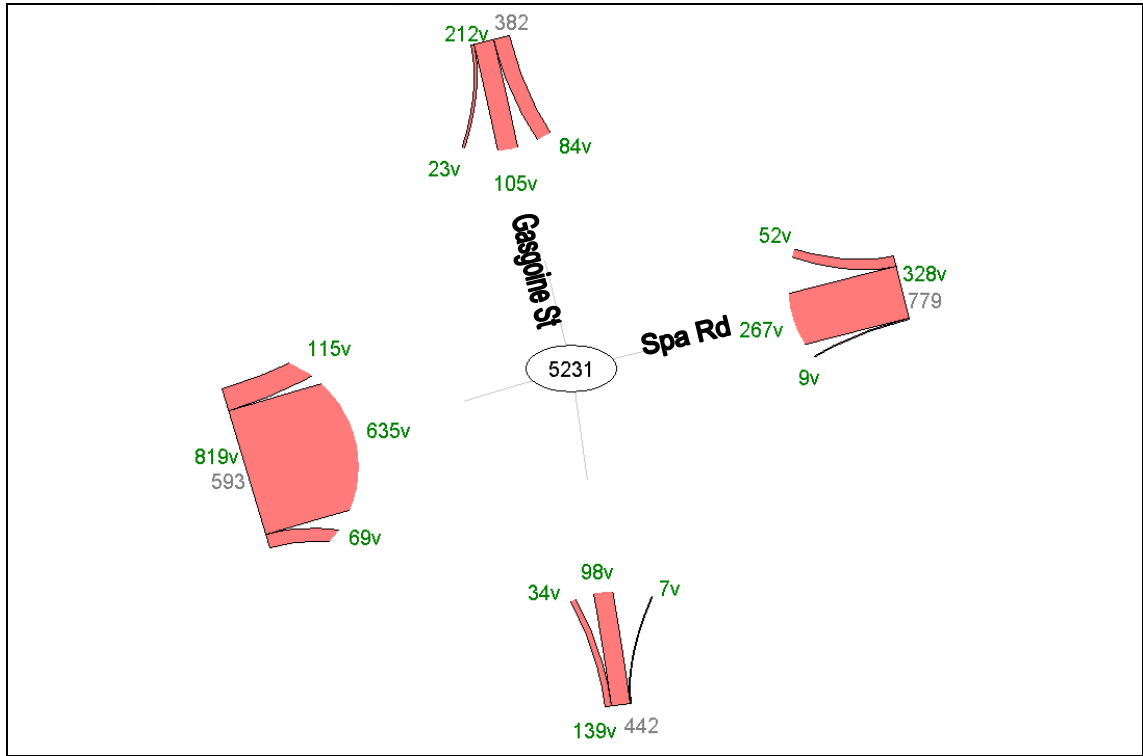


PM peak

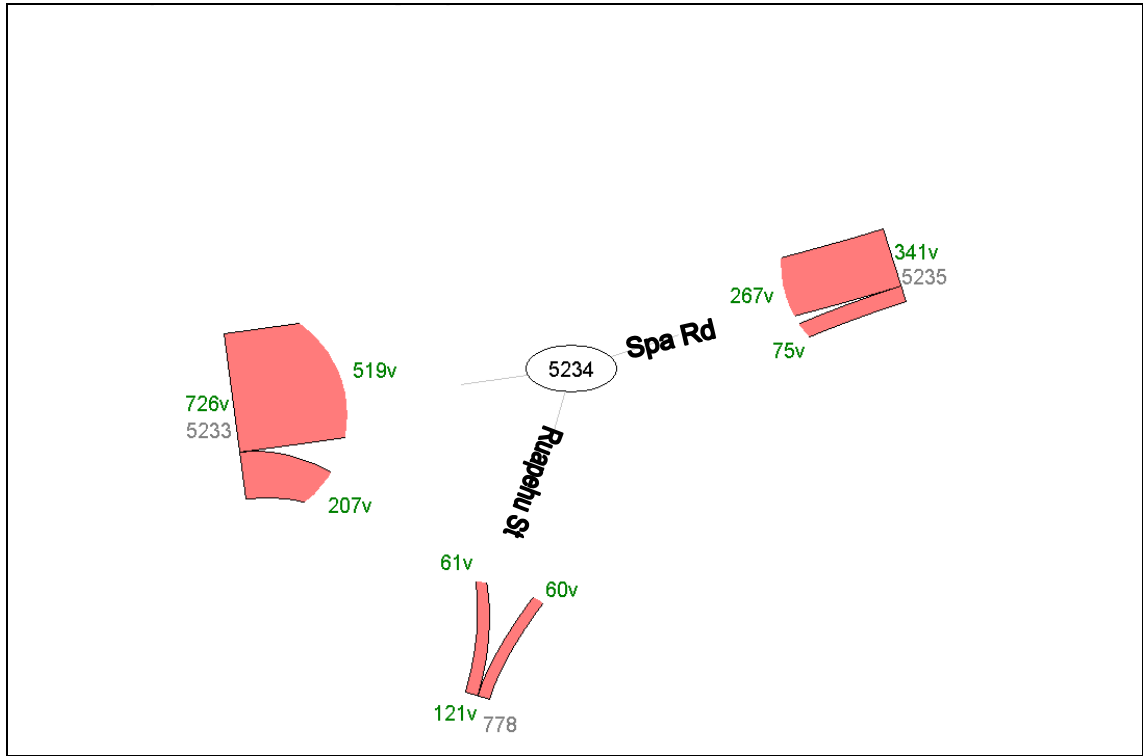
Te Awa Structure Plan Traffic Assessment	<b>2011 Stage 1 Intersection Turning Movements Ruapehu St / Tamamutu St</b>	<b>Figure 10</b>
Gabites Porter		



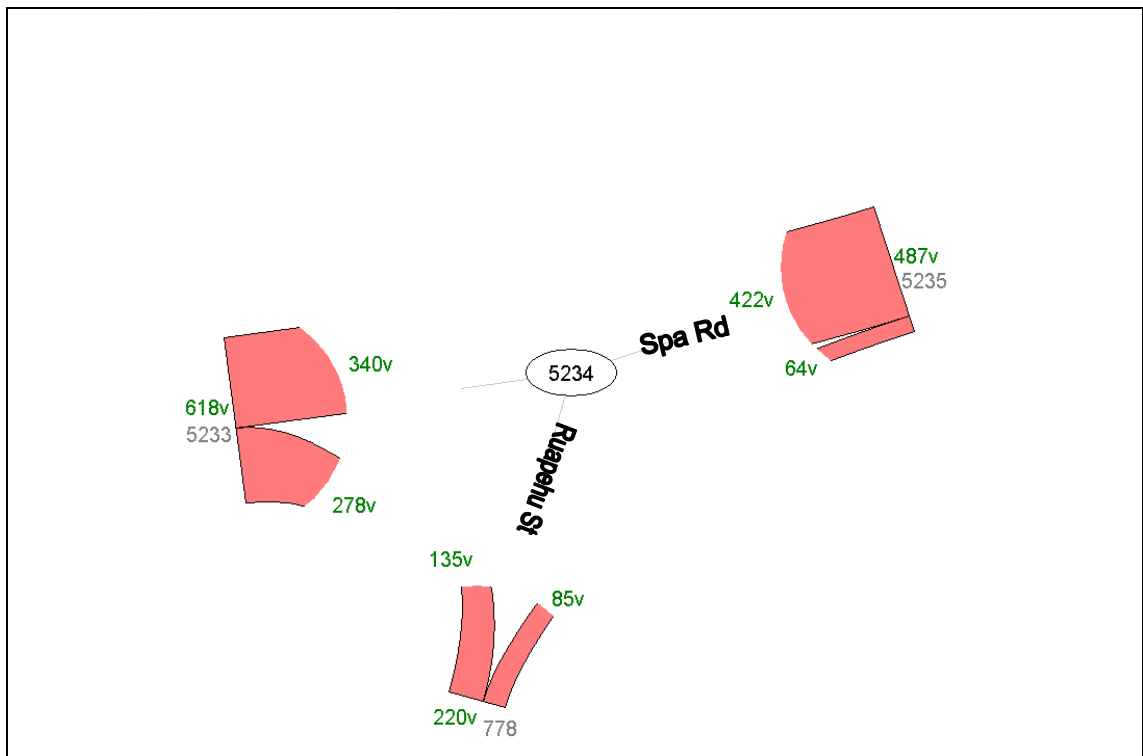
Te Awa Structure Plan Traffic Assessment	<b>2011 Stage 2 Intersection Turning Movements Tongariro St / Spa Rd</b>	<b>Figure 11</b>
Gabites Porter		



Te Awa Structure Plan Traffic Assessment	<b>2011 Stage 2 Intersection Turning Movements Gascoigne St / Spa Rd</b>	<b>Figure 12</b>
Gabites Porter		

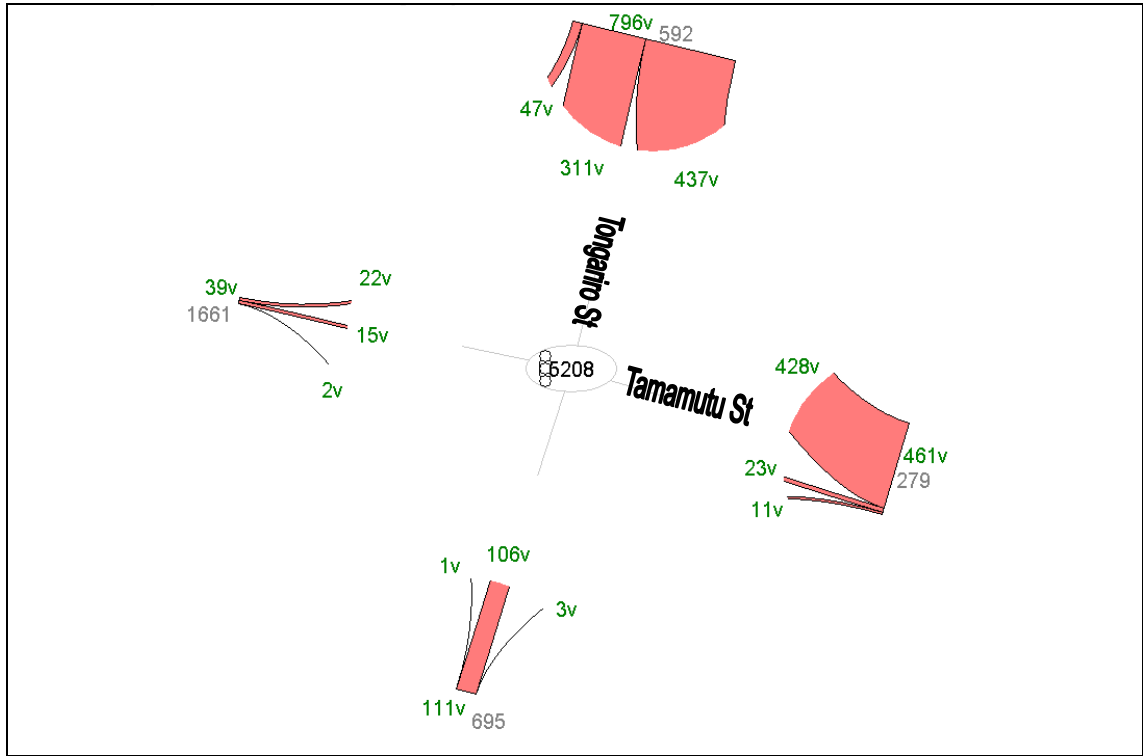


AM Peak

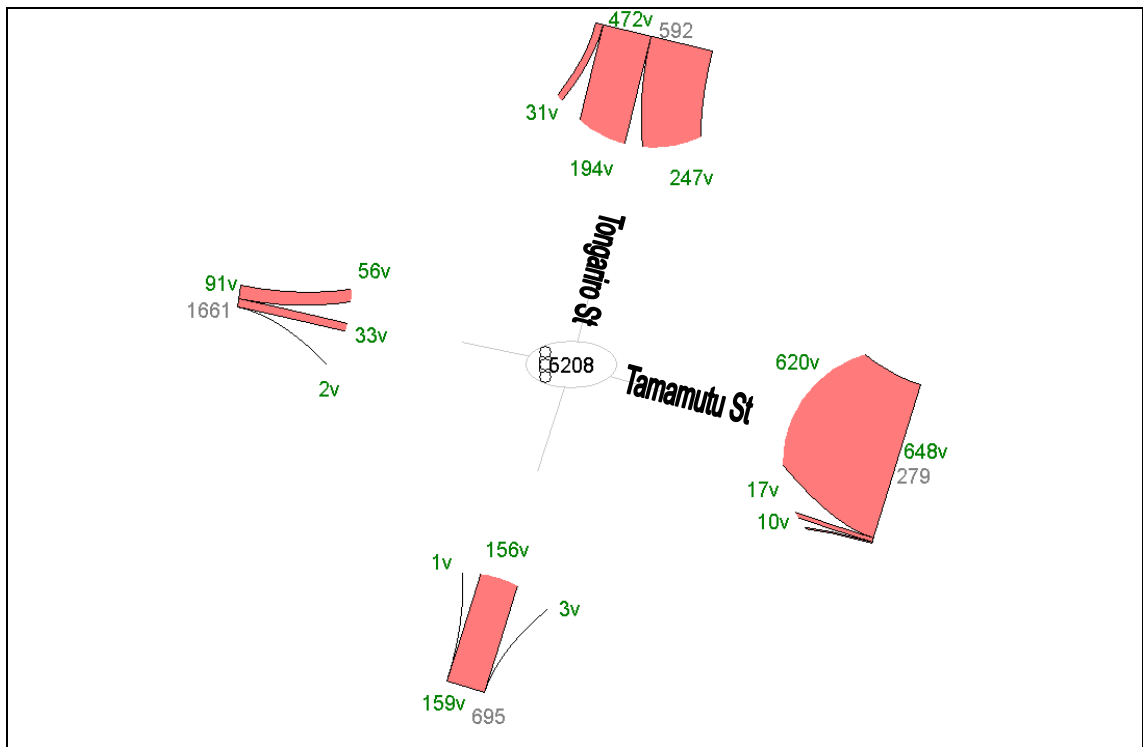


PM peak

Te Awa Structure Plan Traffic Assessment	<b>2011 Stage 2</b> <b>Intersection Turning Movements</b> <b>Ruapehu St / Spa Rd</b>	<b>Figure 13</b>
Gabites Porter		

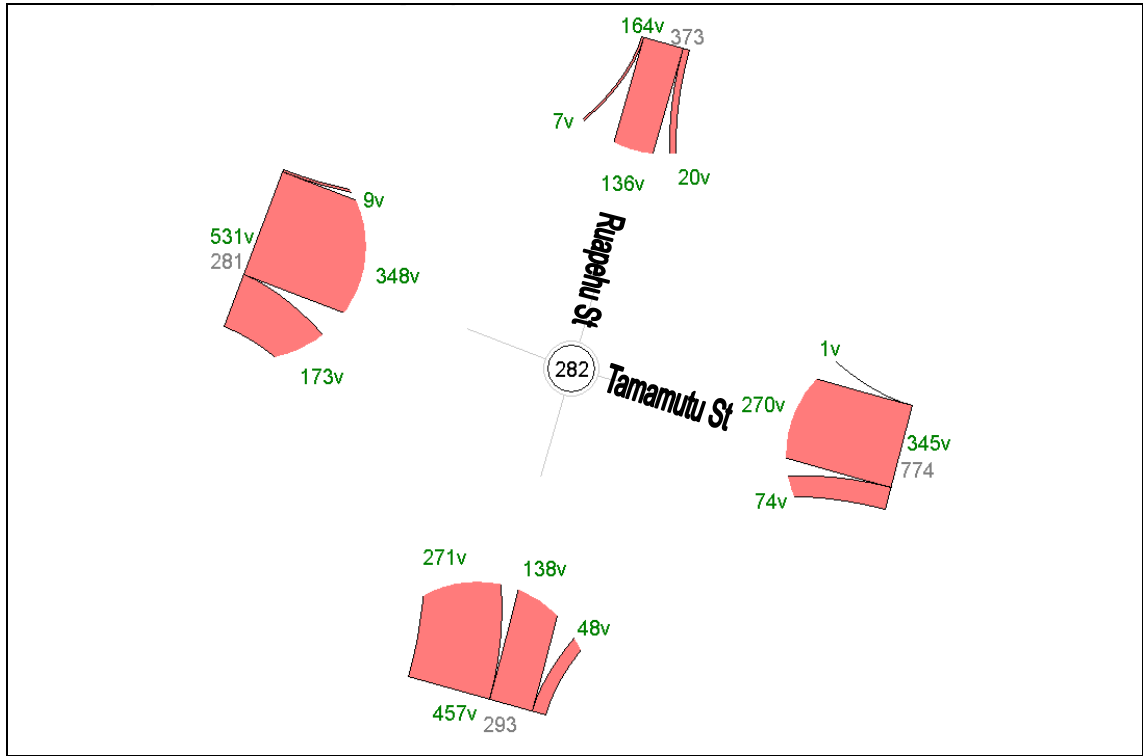


AM Peak

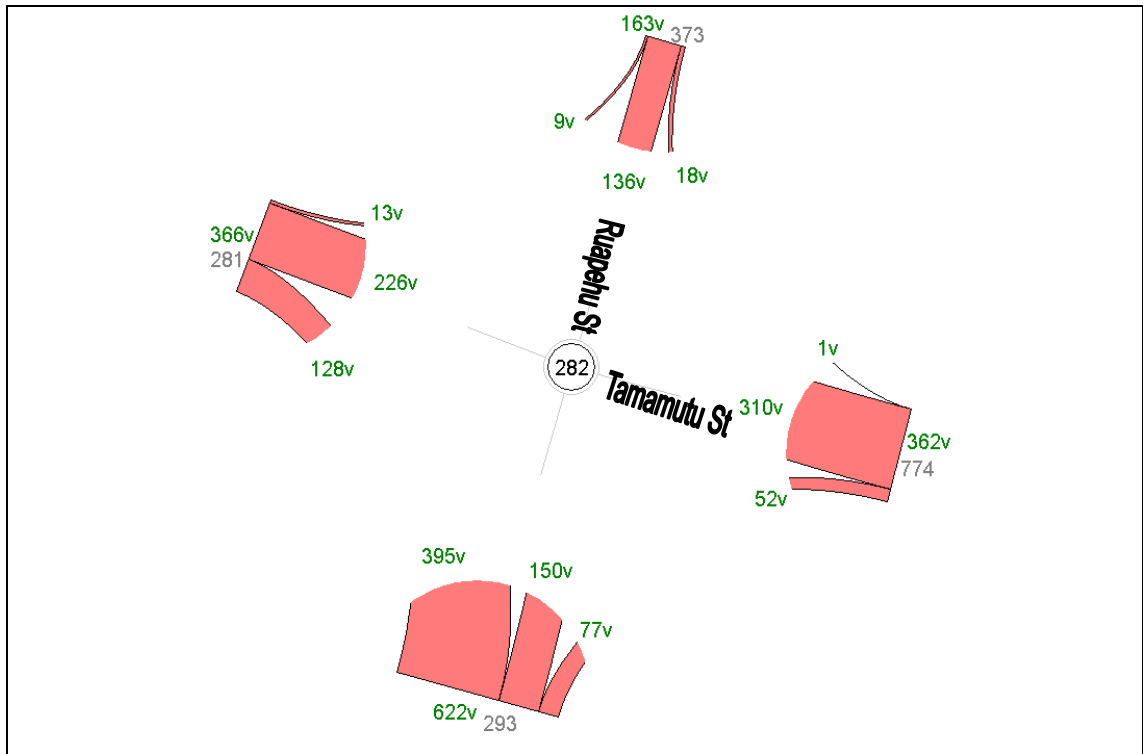


PM peak

Te Awa Structure Plan Traffic Assessment	<b>2011 Stage 2 Intersection Turning Movements Tongariro St / Tamamutu St</b>	<b>Figure 14</b>
Gabites Porter		

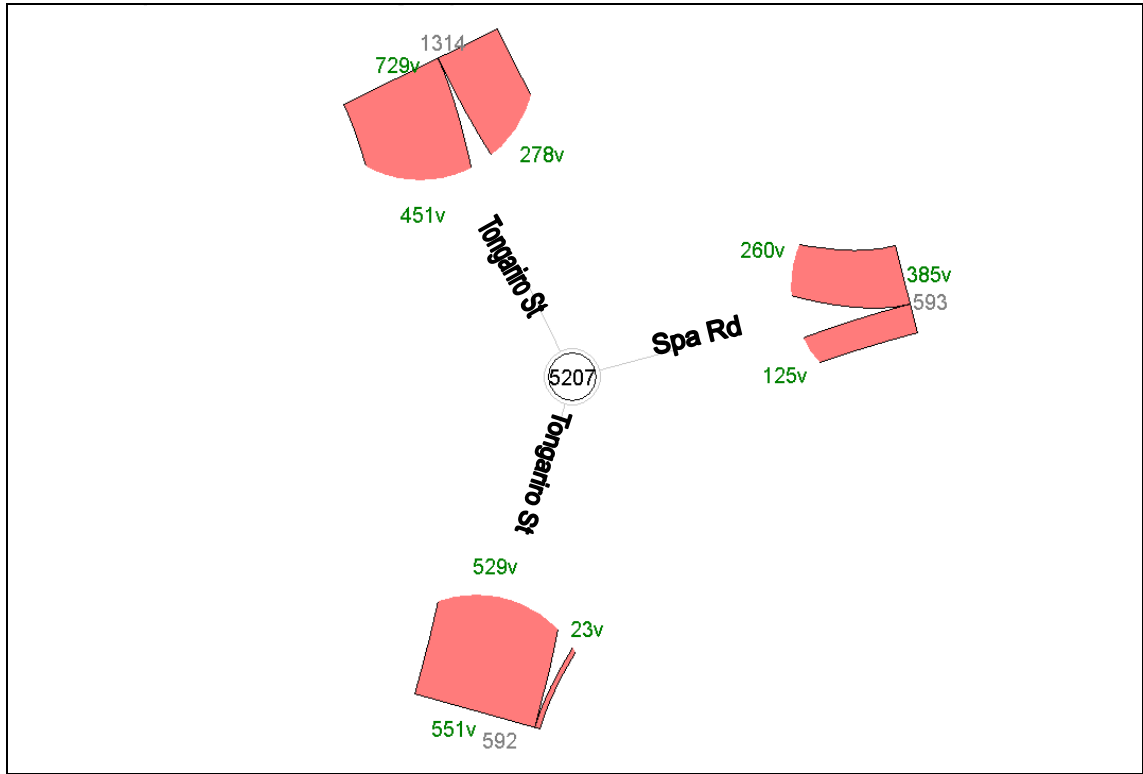


AM Peak

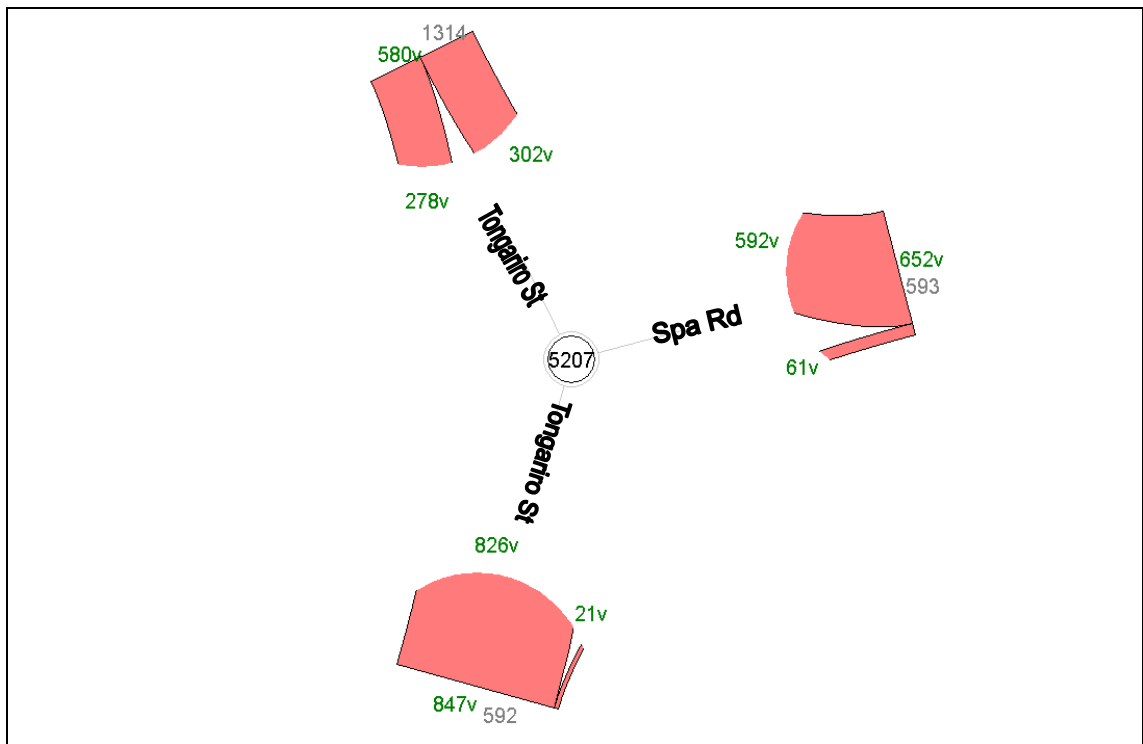


PM peak

Te Awa Structure Plan Traffic Assessment	<b>2011 Stage 2 Intersection Turning Movements Ruapehu St / Tamamutu St</b>	<b>Figure 15</b>
Gabites Porter		



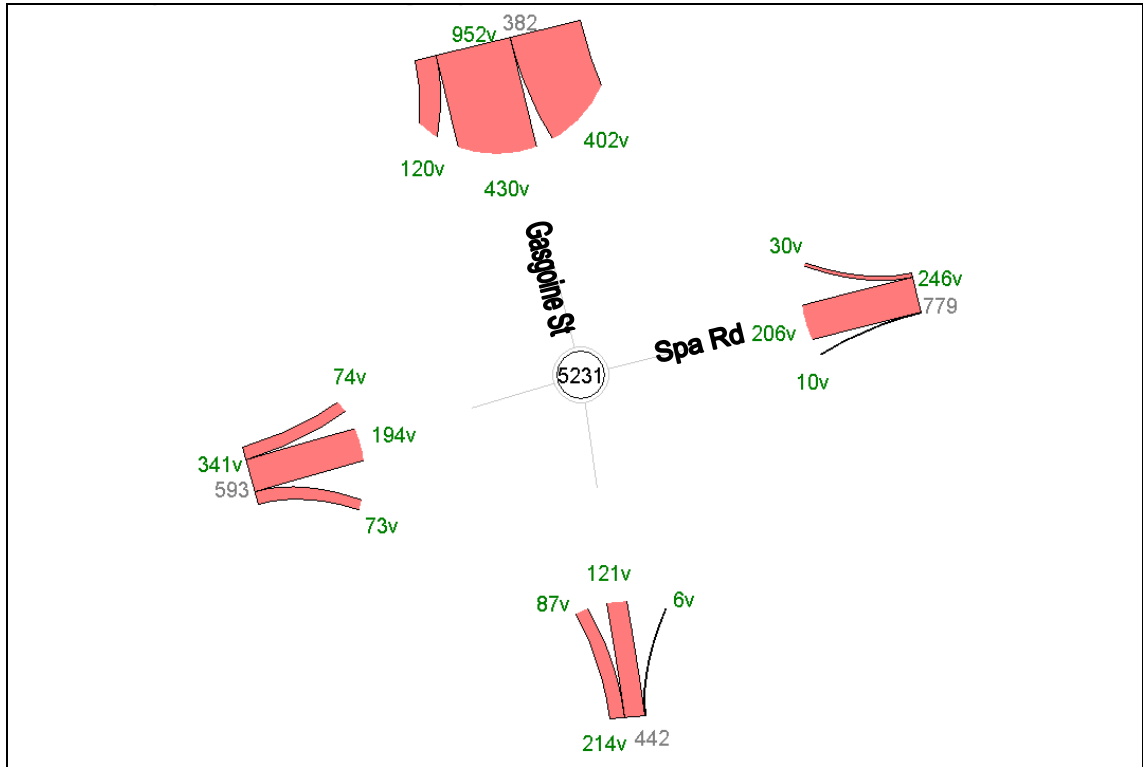
AM Peak



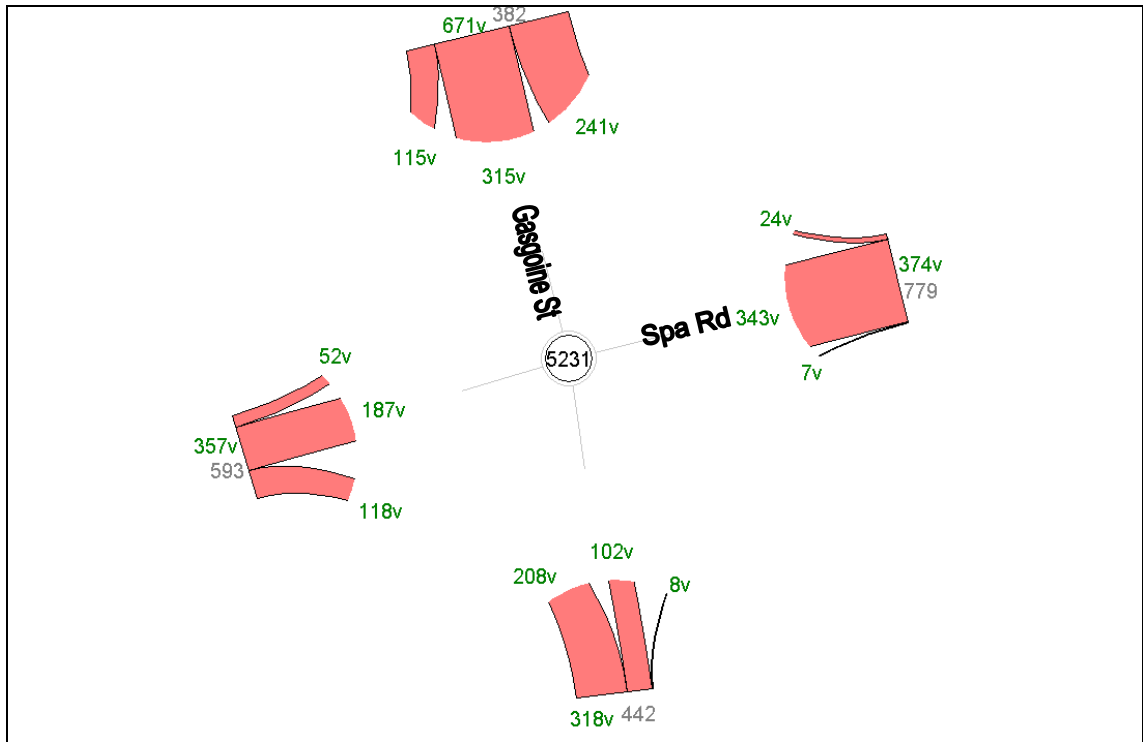
PM peak

Te Awa Structure Plan Traffic Assessment	<b>2011 Stage 3</b> <b>Intersection Turning Movements</b> <b>Tongariro St / Spa Rd</b>	<b>Figure 16</b>
Gabites Porter		



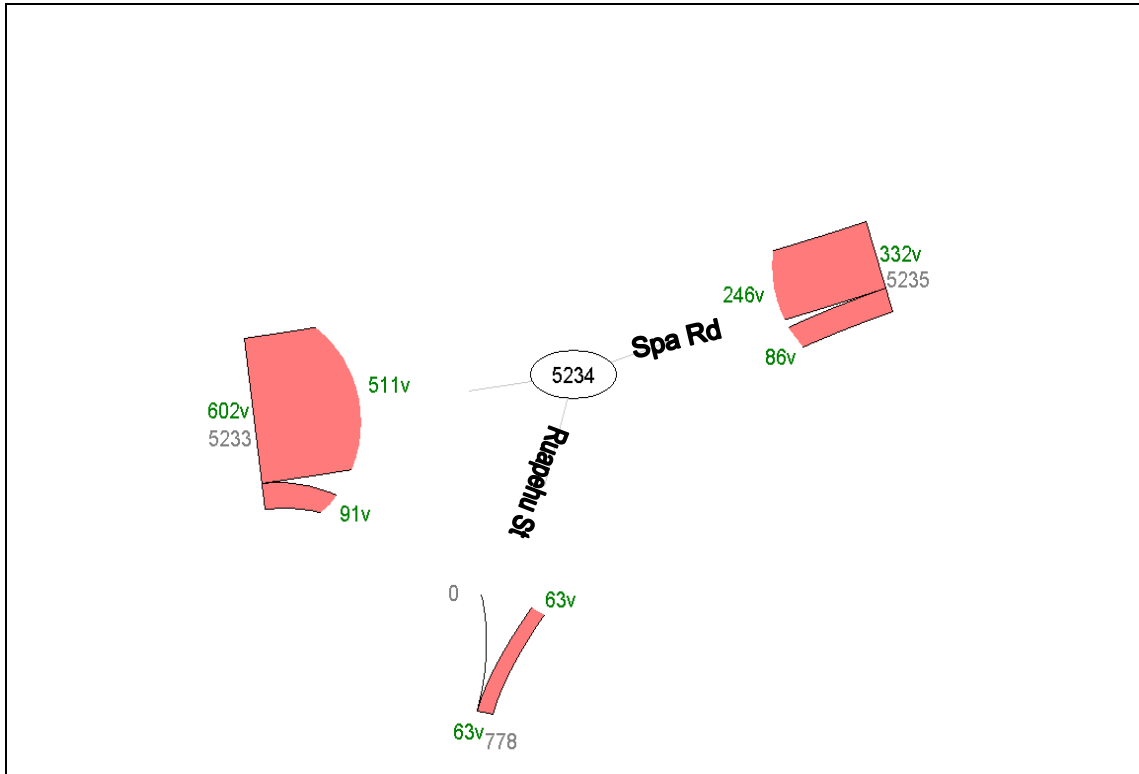


AM Peak

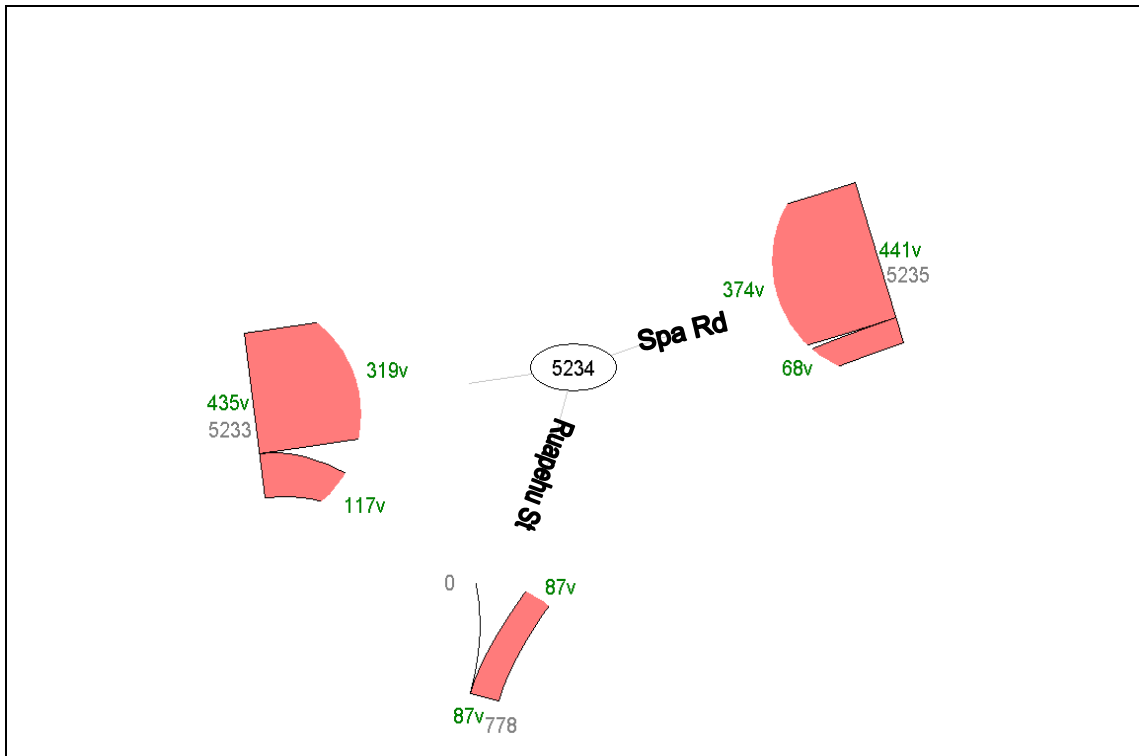


PM peak

Te Awa Structure Plan Traffic Assessment	<b>2011 Stage 3 Intersection Turning Movements Gascoigne St / Spa Rd</b>	<b>Figure 17</b>
Gabites Porter		

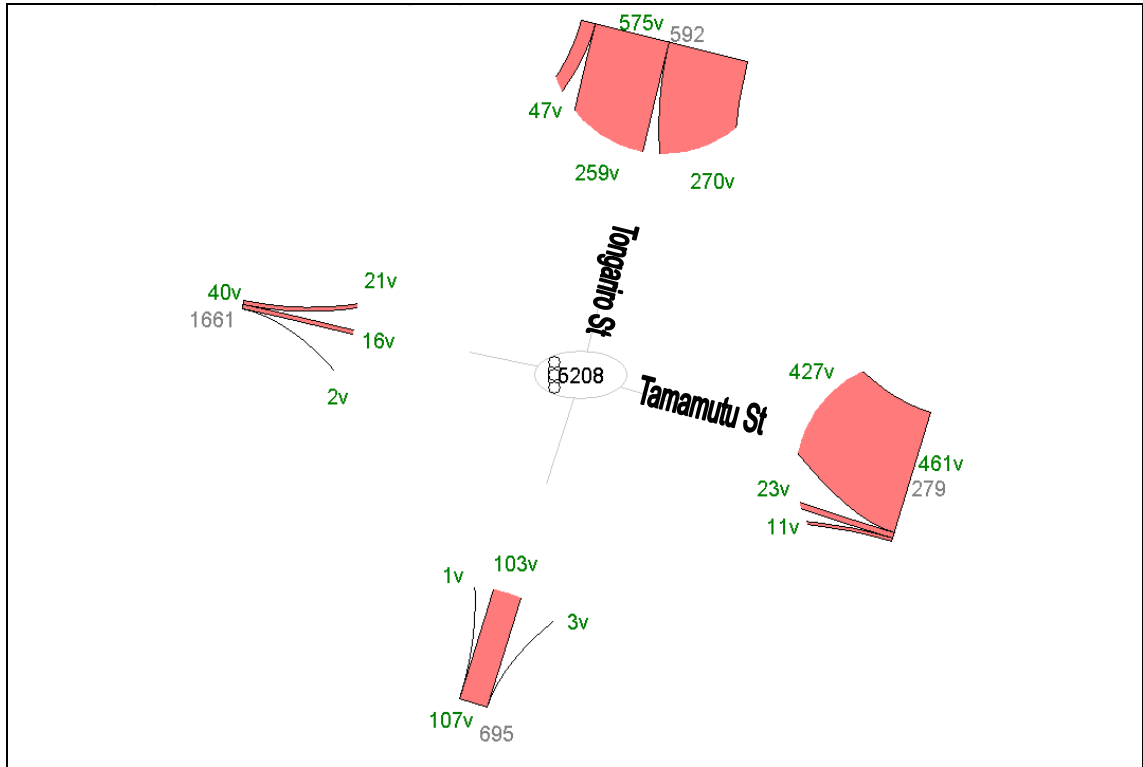


AM Peak

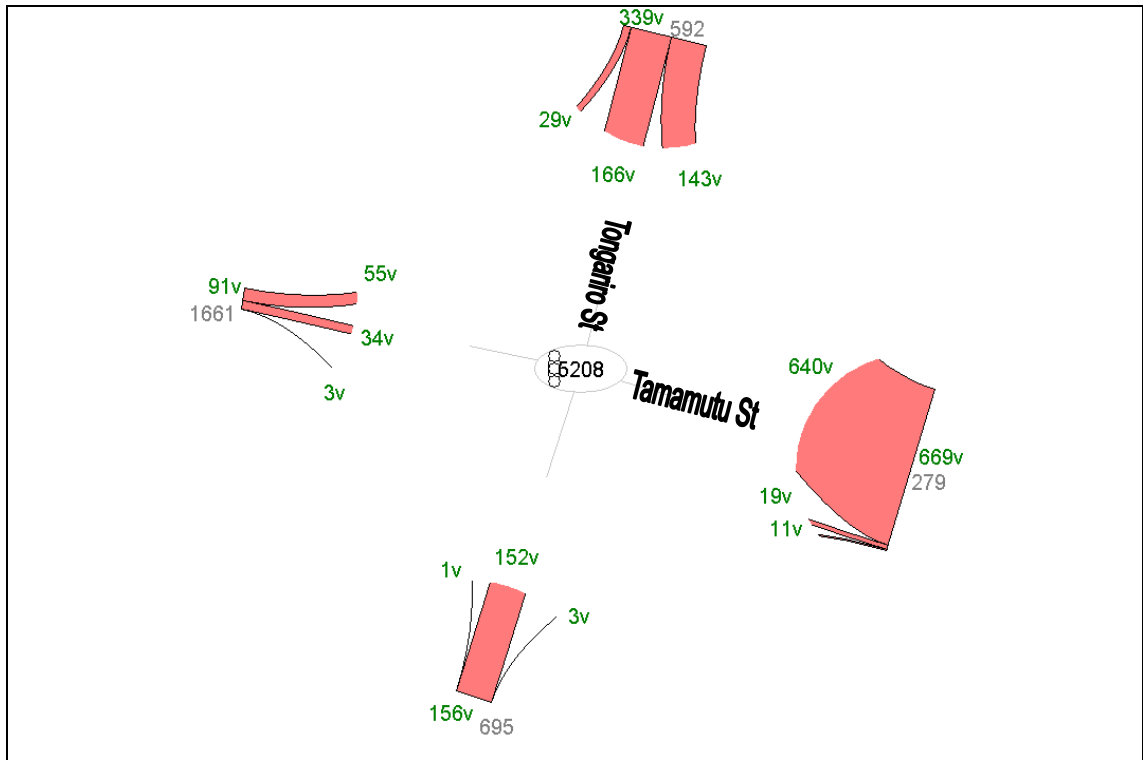


PM peak

Te Awa Structure Plan Traffic Assessment	<b>2011 Stage 3</b> <b>Intersection Turning Movements</b> <b>Ruapehu St / Spa Rd</b>	<b>Figure 18</b>
Gabites Porter		

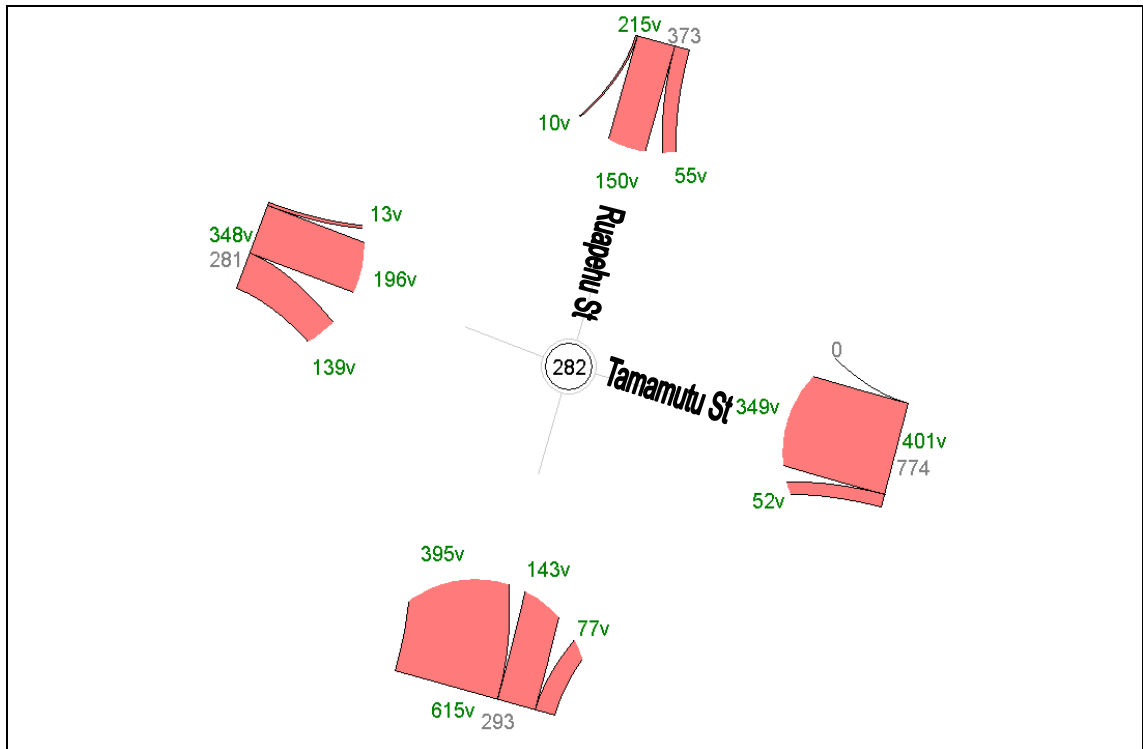
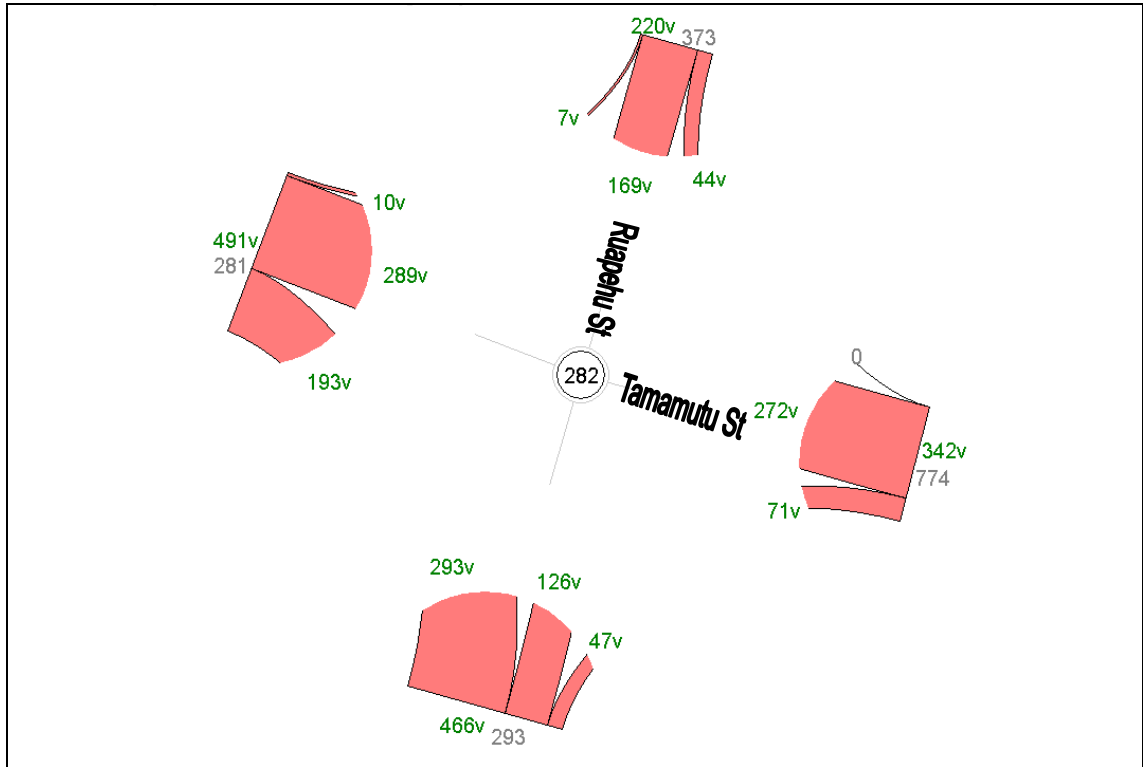


AM Peak

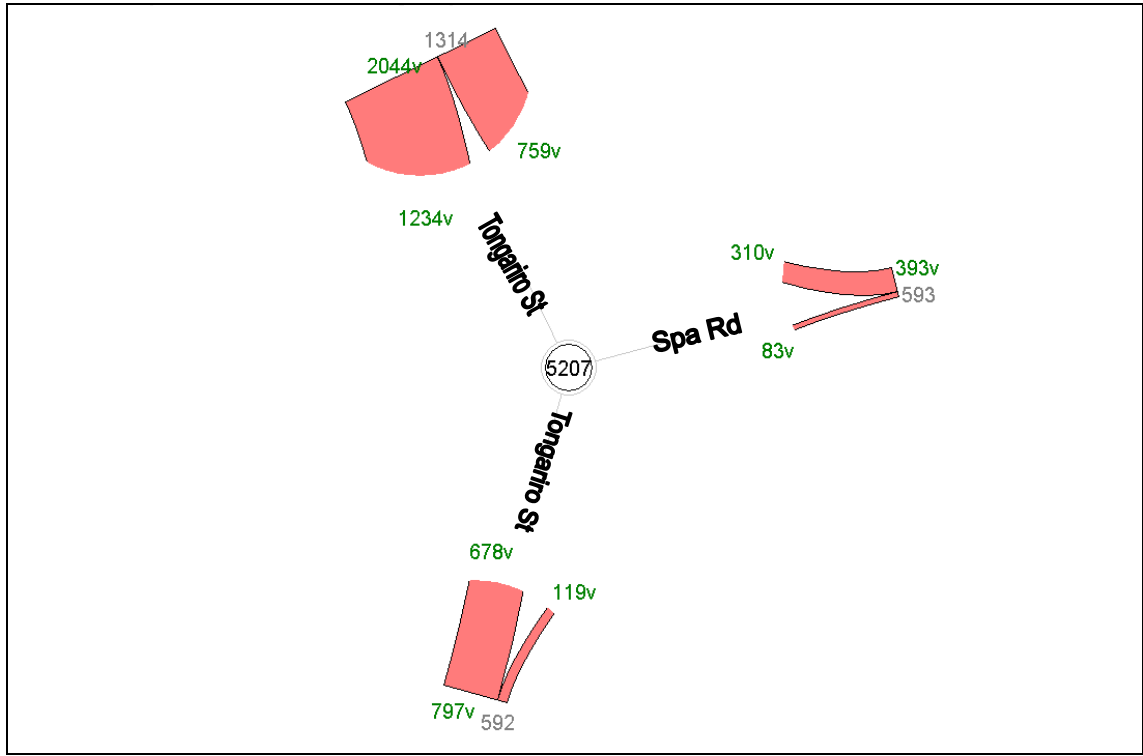


PM peak

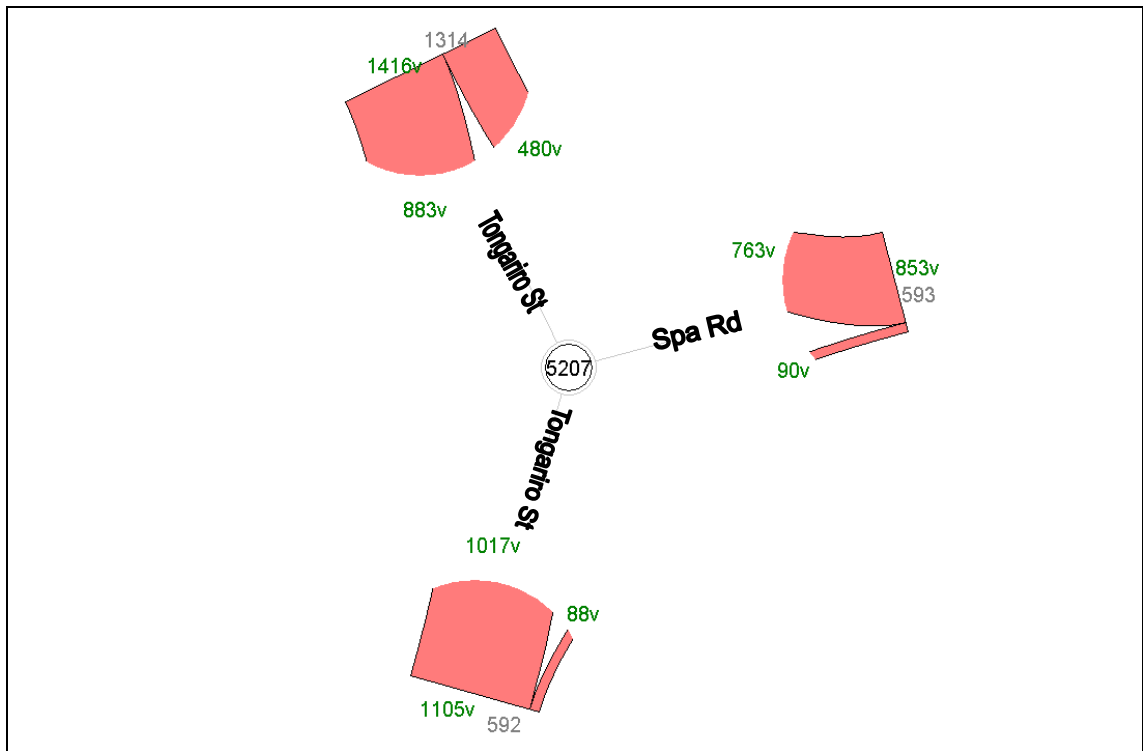
Te Awa Structure Plan Traffic Assessment	<b>2011 Stage 3</b> <b>Intersection Turning Movements</b> <b>Tongariro St / Tamamutu St</b>	<b>Figure 19</b>
Gabites Porter		



Te Awa Structure Plan Traffic Assessment	<b>2011 Stage 3 Intersection Turning Movements Ruapehu St / Tamamutu St</b>	<b>Figure 20</b>
Gabites Porter		

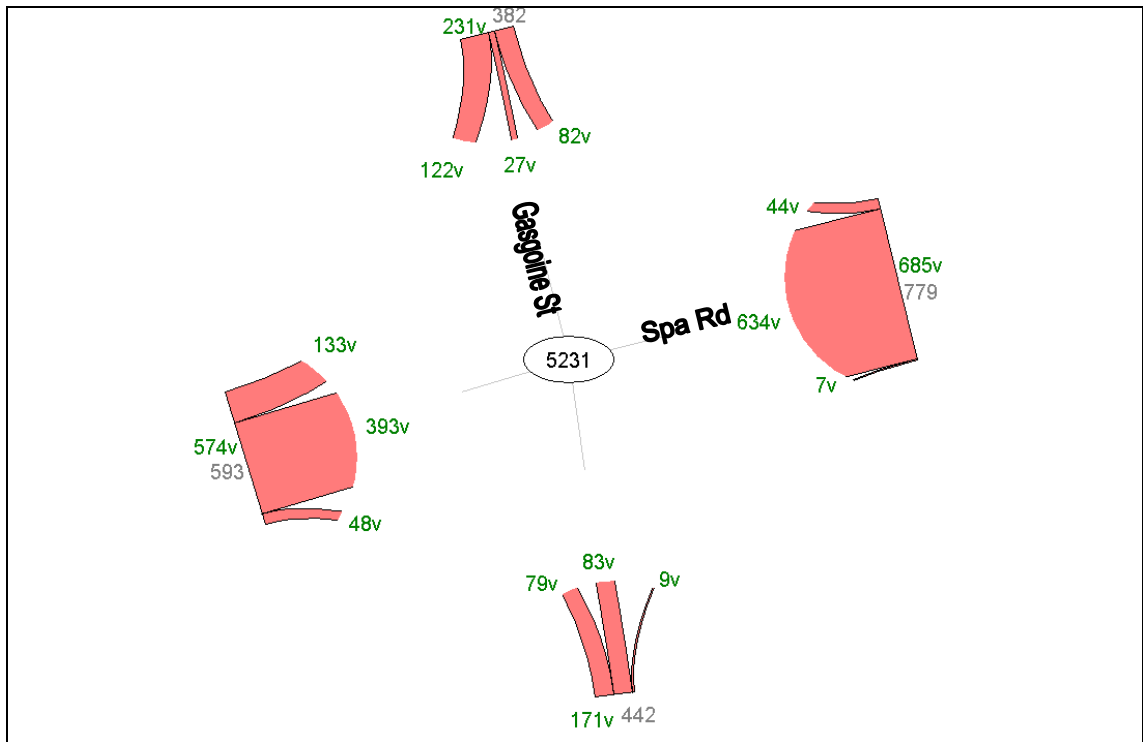
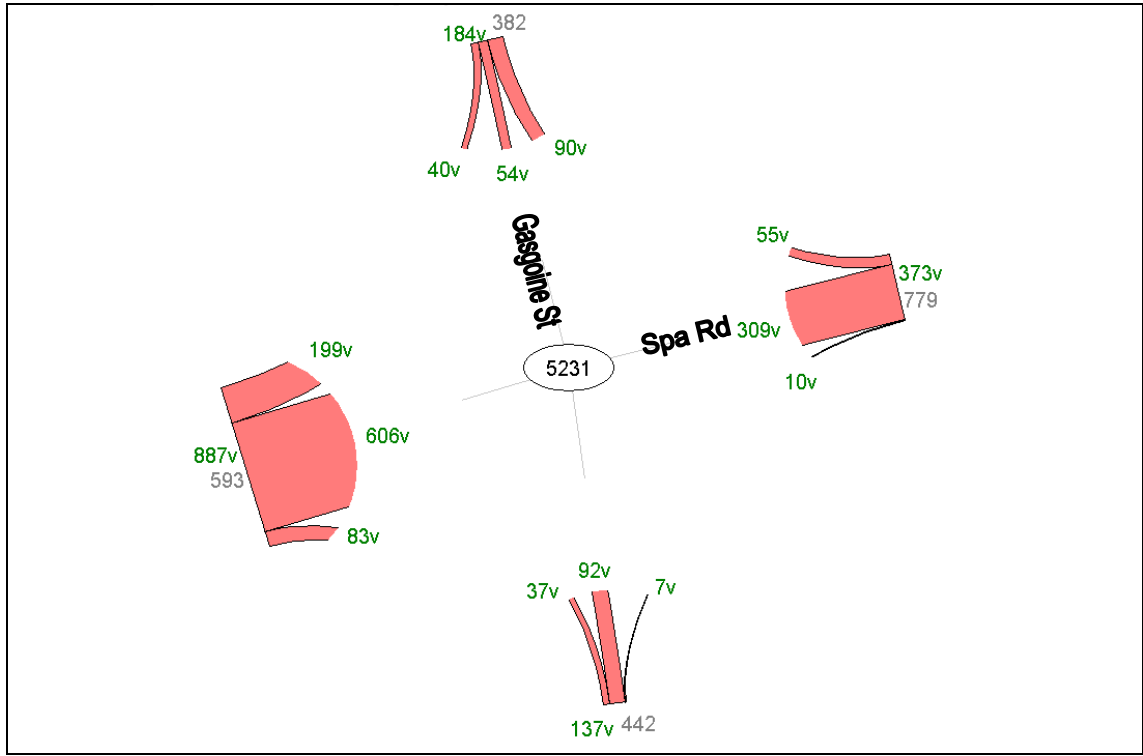


AM Peak

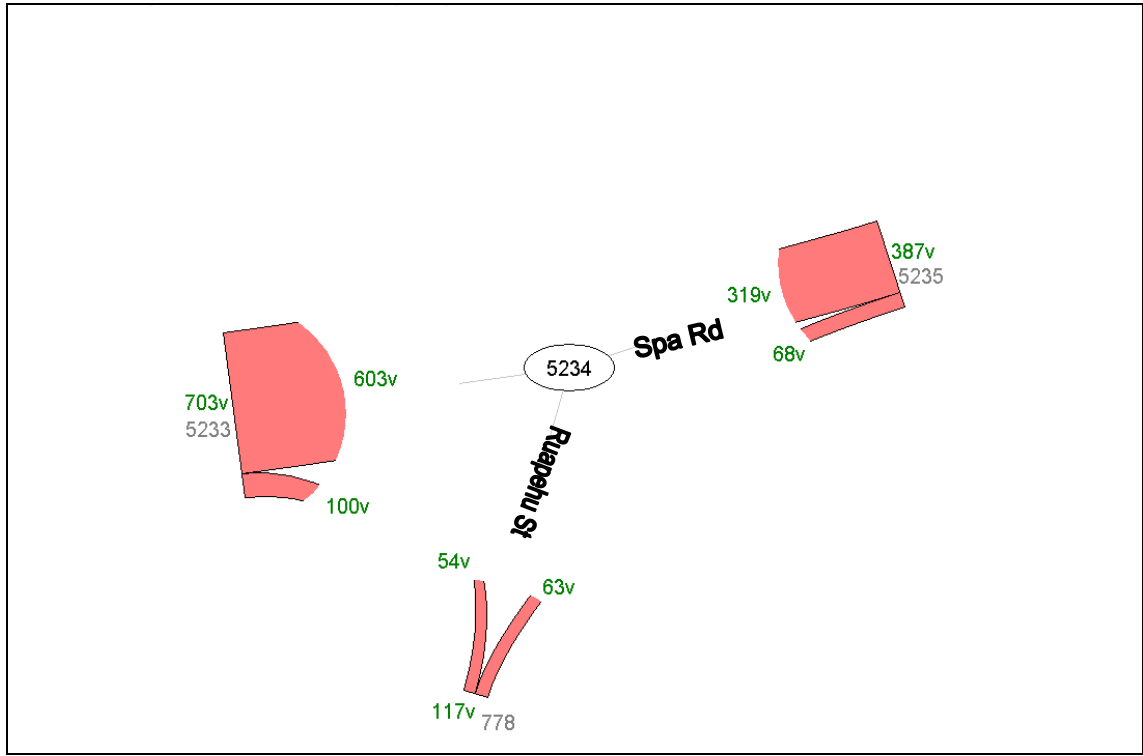


PM peak

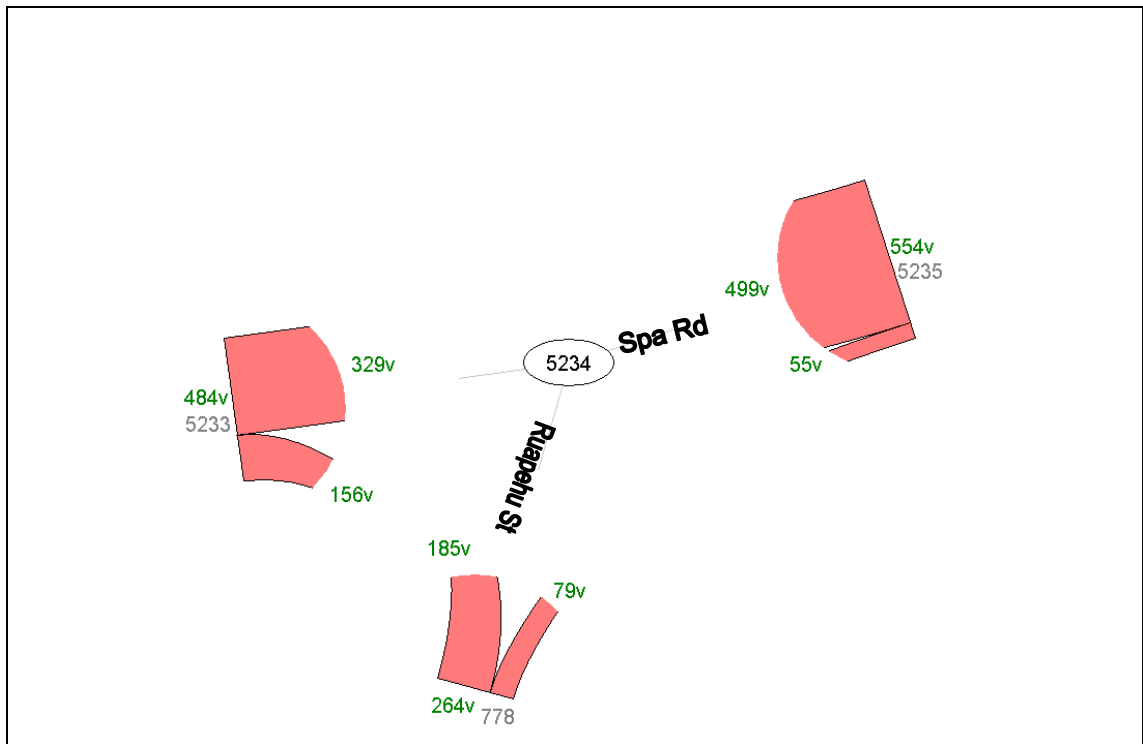
Te Awa Structure Plan Traffic Assessment	<b>2021 Base Intersection Turning Movements Tongariro St / Spa Rd</b>	<b>Figure 21</b>
Gabites Porter		



Te Awa Structure Plan Traffic Assessment	<b>2021 Base Intersection Turning Movements Gascoigne St / Spa Rd</b>	<b>Figure 22</b>
Gabites Porter		

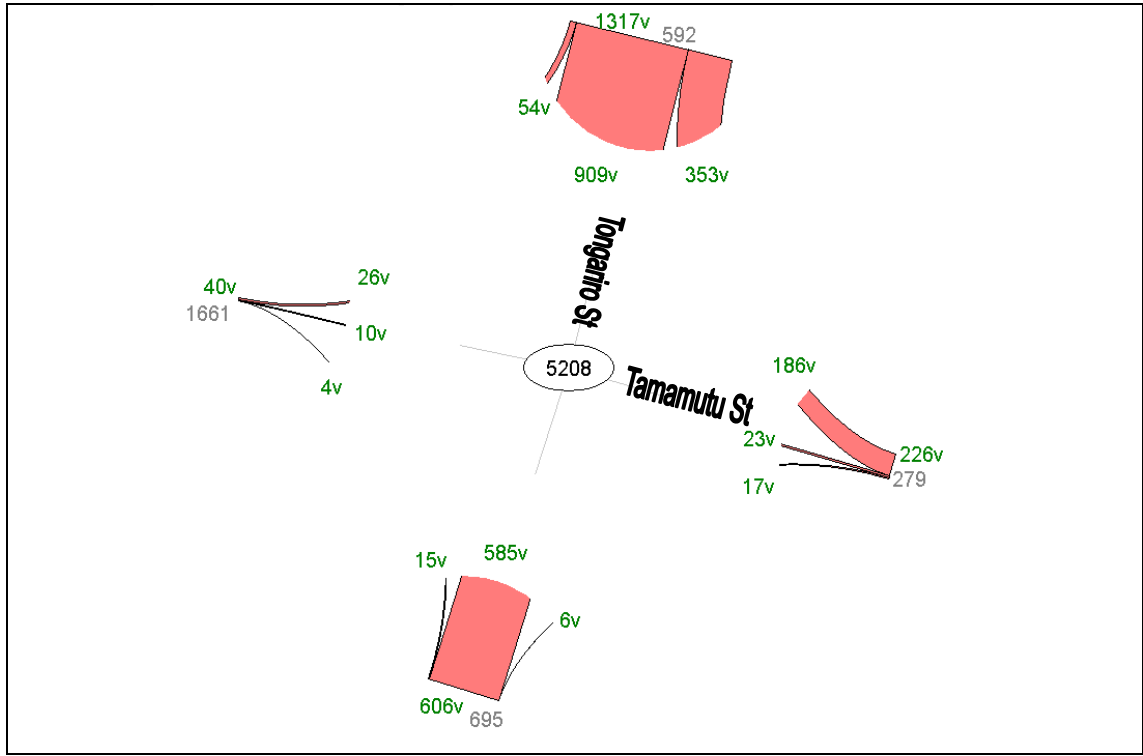


AM Peak

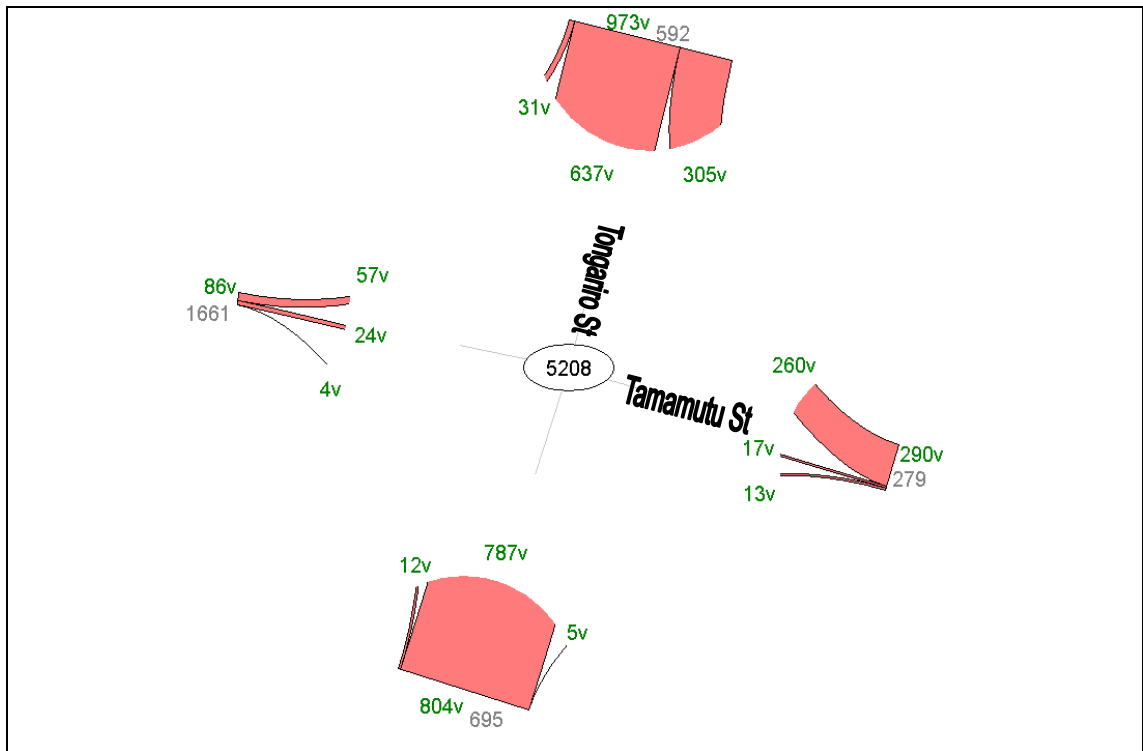


PM peak

Te Awa Structure Plan Traffic Assessment	<b>2021 Base Intersection Turning Movements Ruapehu St / Spa Rd</b>	<b>Figure 23</b>
Gabites Porter		



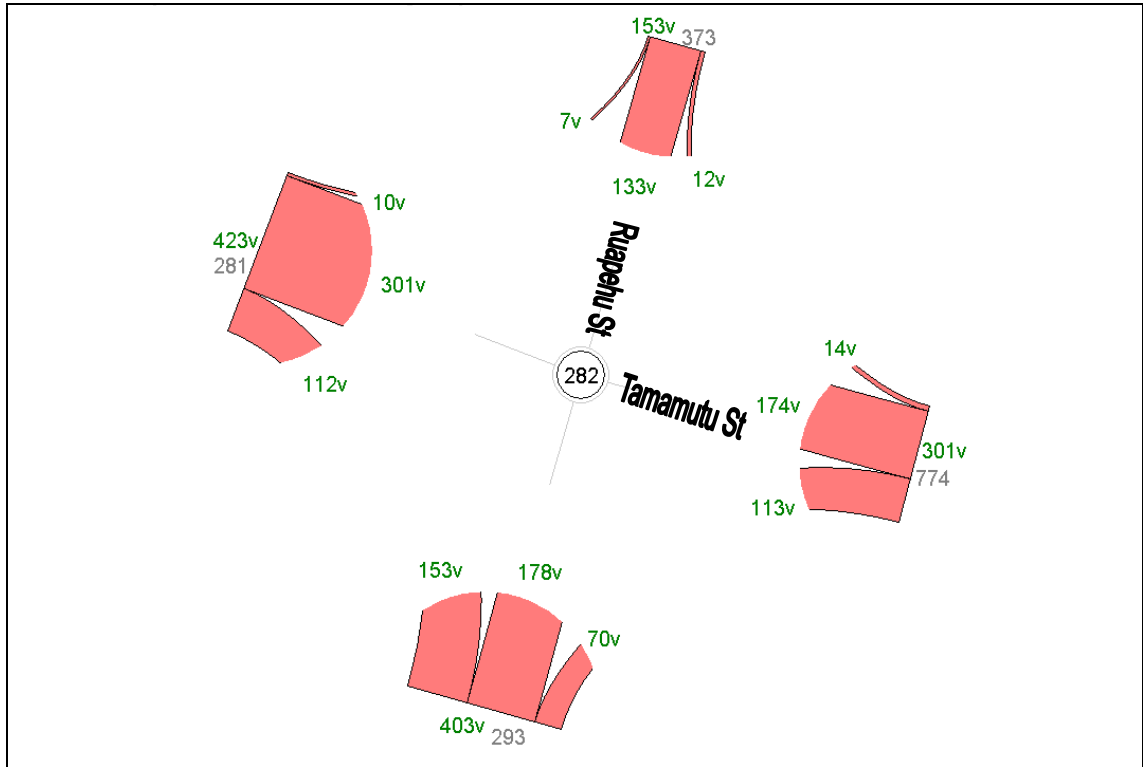
AM Peak



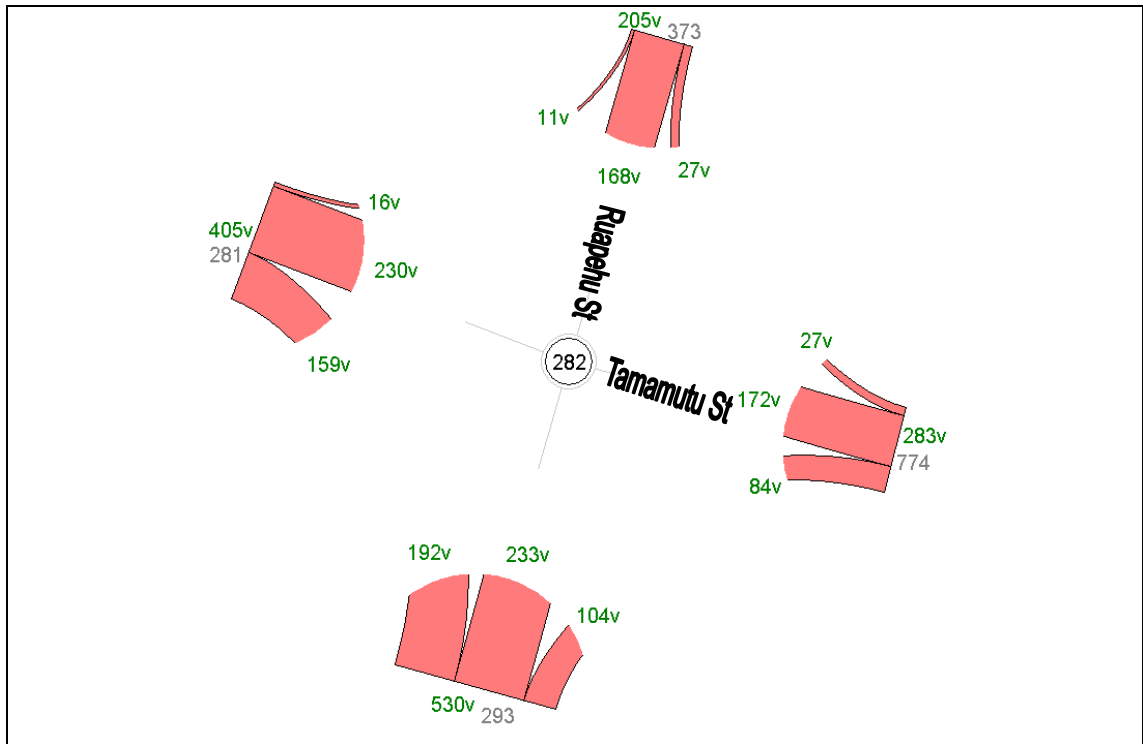
PM peak

Te Awa Structure Plan Traffic Assessment	<b>2021 Base Intersection Turning Movements Tongariro St / Tamamutu St</b>	<b>Figure 24</b>
Gabites Porter		



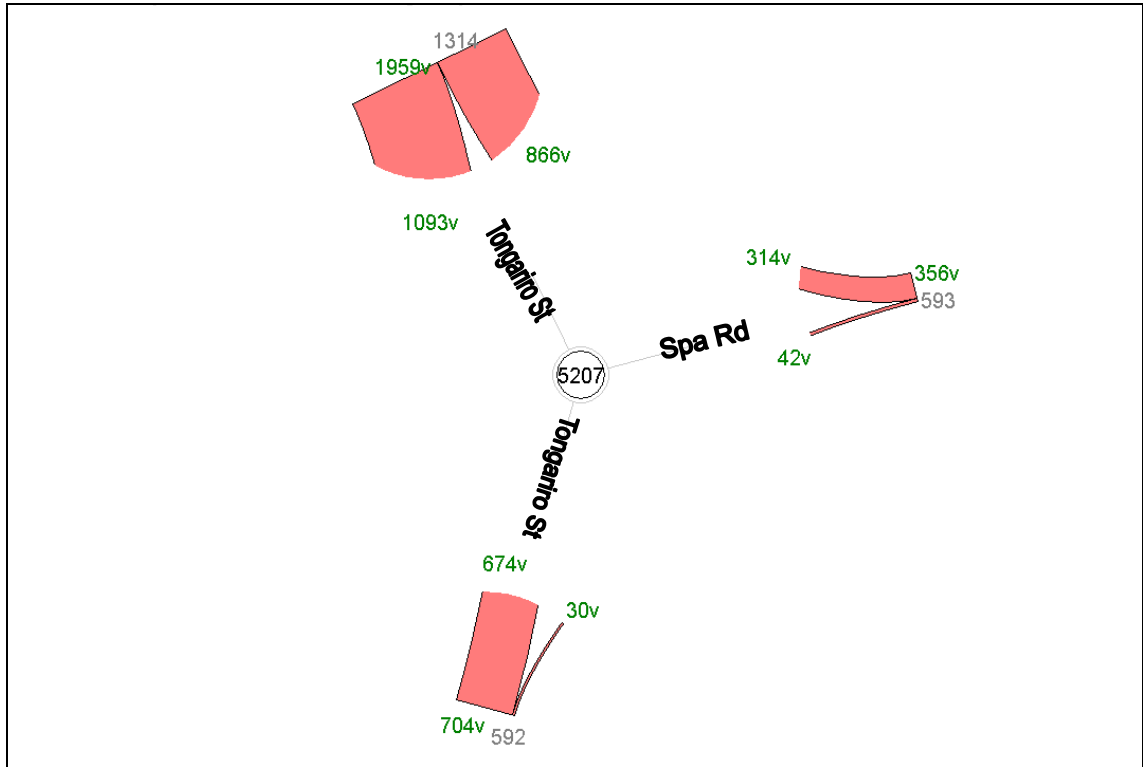


AM Peak

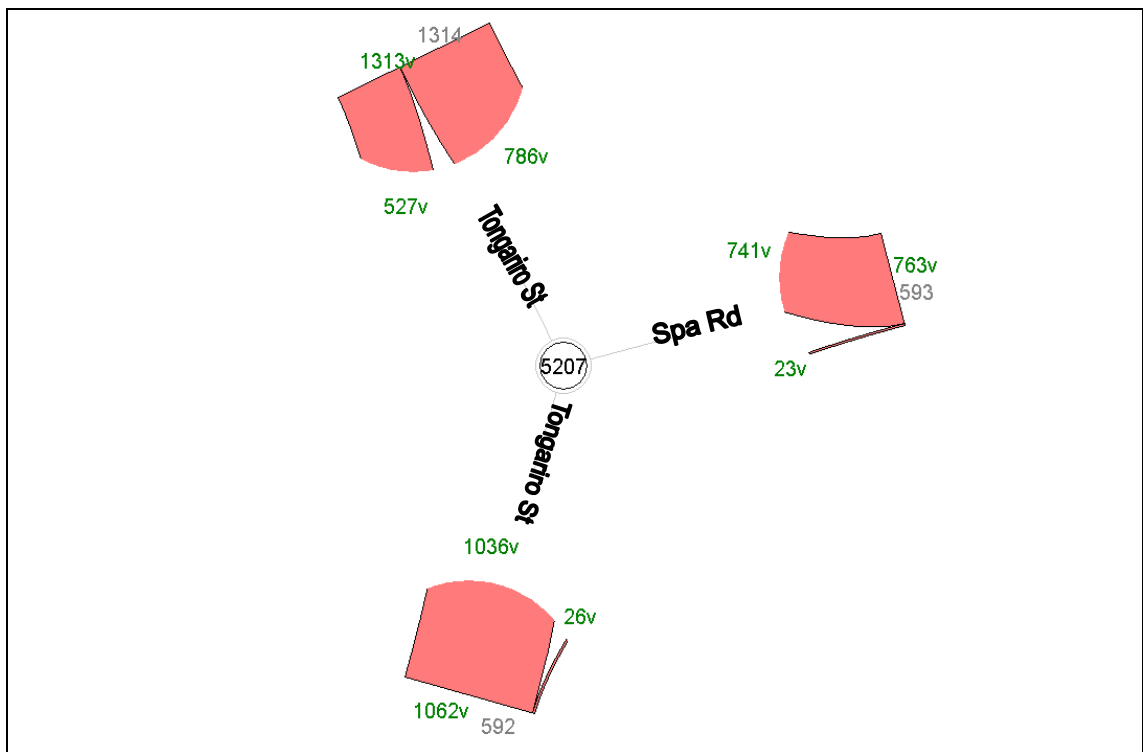


PM peak

Te Awa Structure Plan Traffic Assessment	<b>2021 Base Intersection Turning Movements Ruapehu St / Tamamutu St</b>	<b>Figure 25</b>
Gabites Porter		

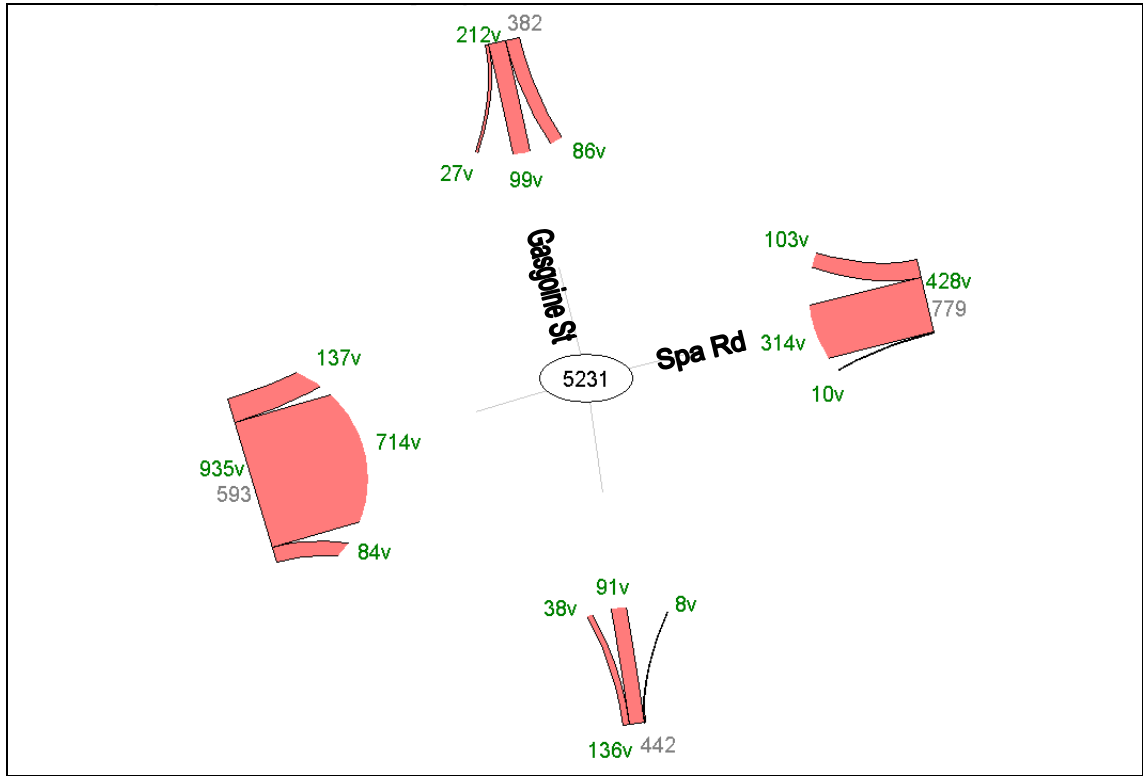


AM Peak

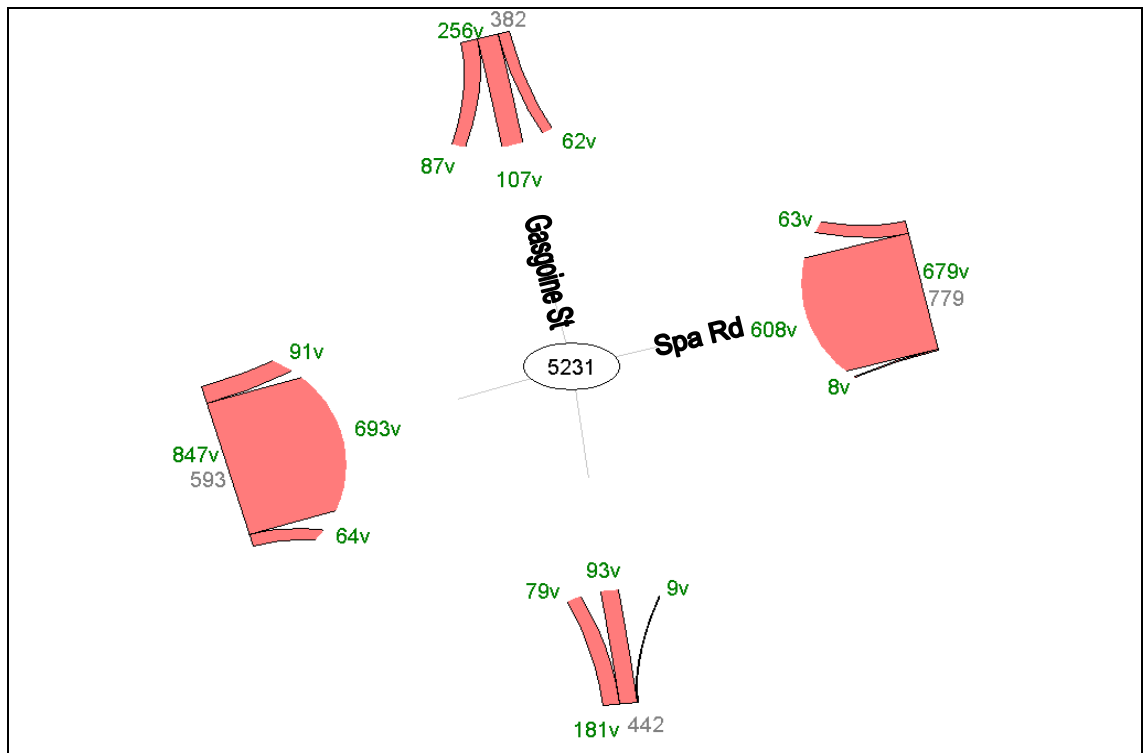


PM peak

Te Awa Structure Plan Traffic Assessment	<b>2021 Stage 1</b> <b>Intersection Turning Movements</b> <b>Tongariro St / Spa Rd</b>	<b>Figure 26</b>
Gabites Porter		

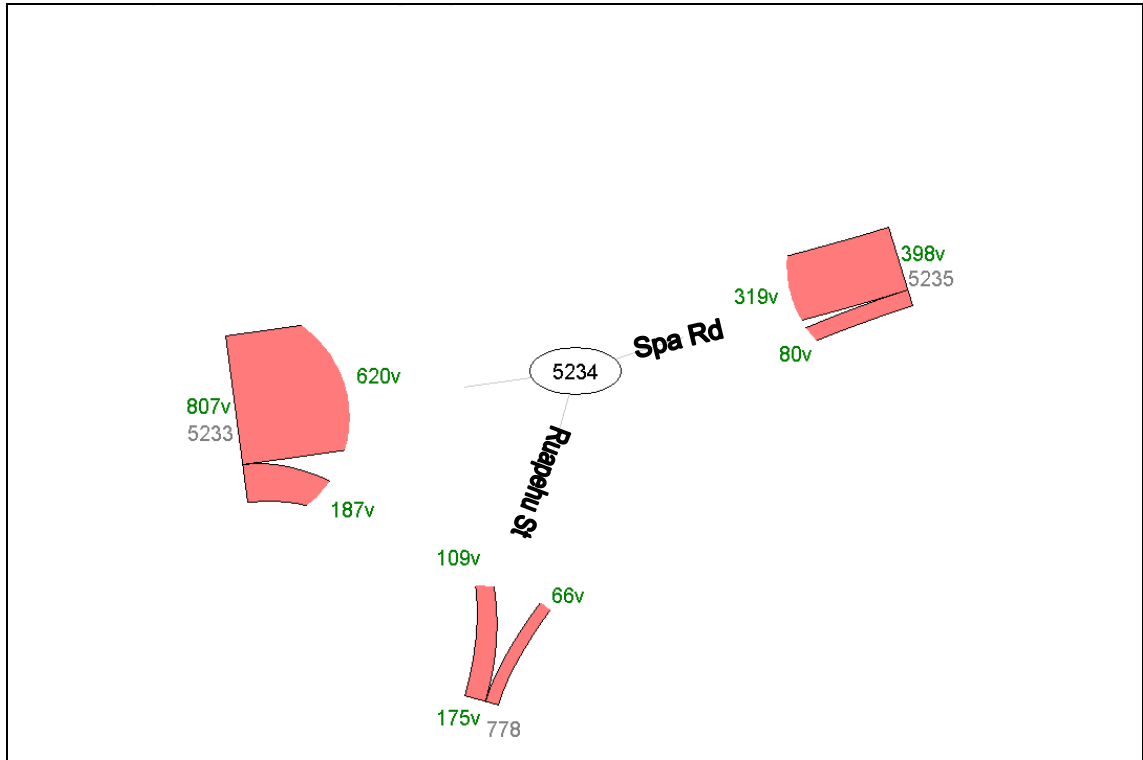


AM Peak

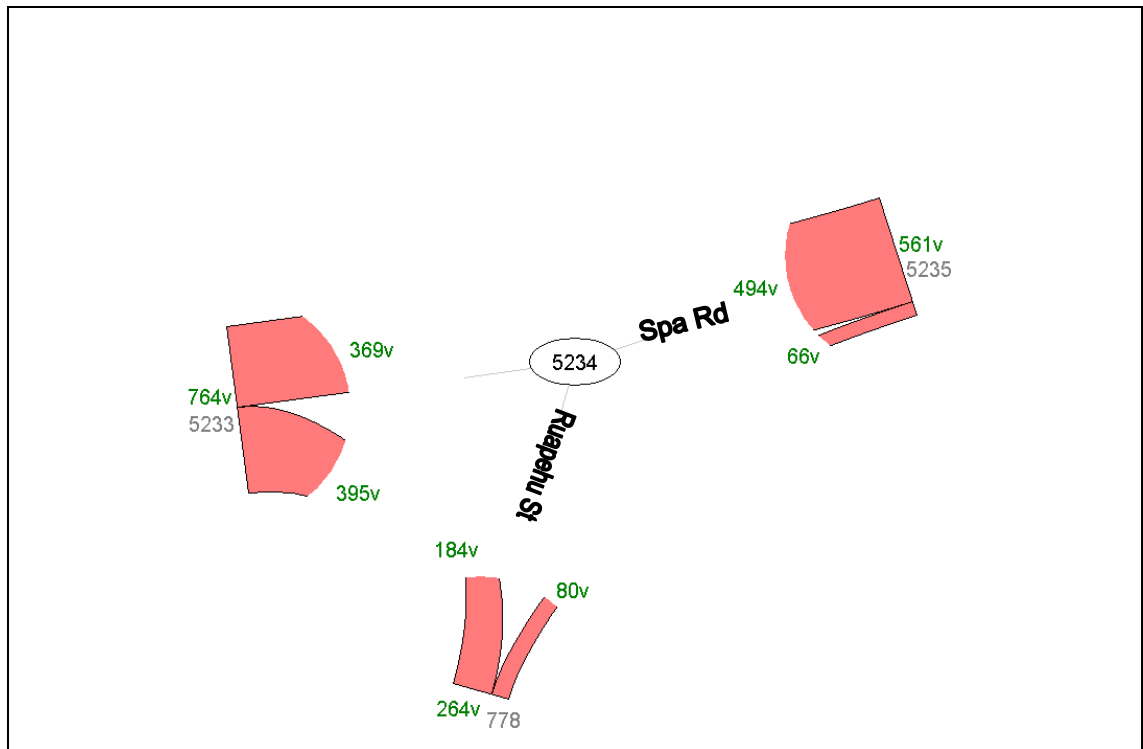


PM peak

Te Awa Structure Plan Traffic Assessment	2021 Stage 1 Intersection Turning Movements Gascoigne St / Spa Rd	Figure 27
Gabites Porter		

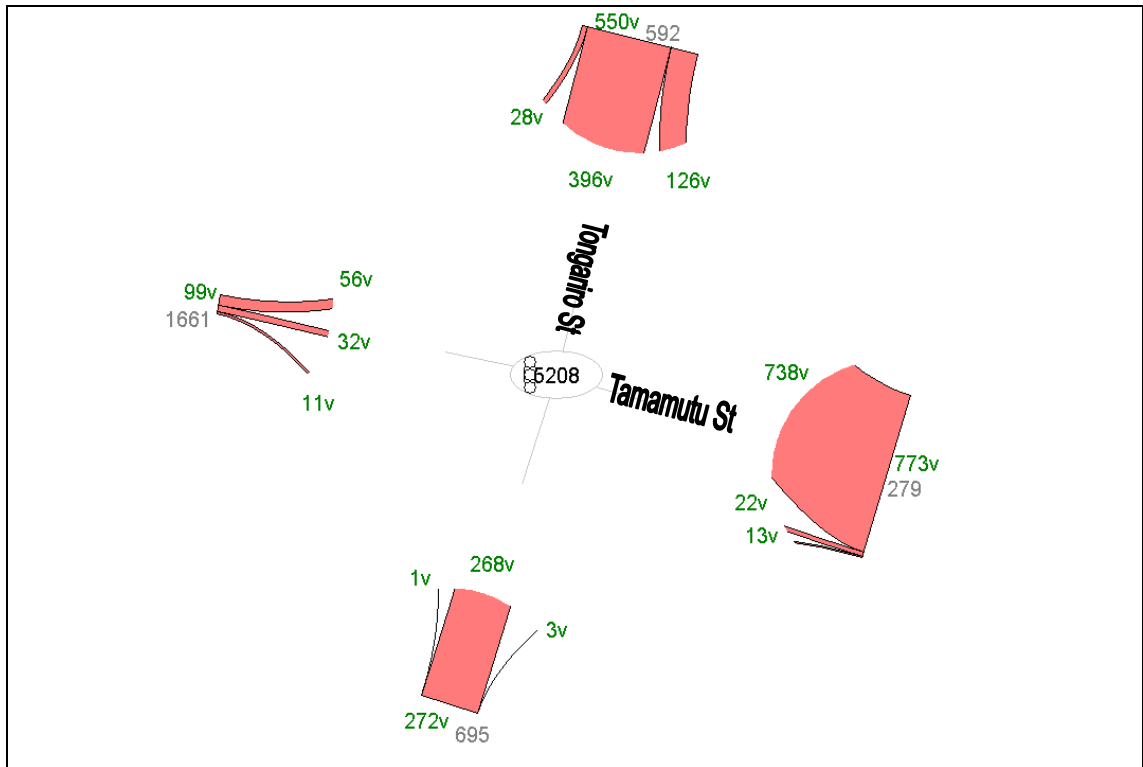
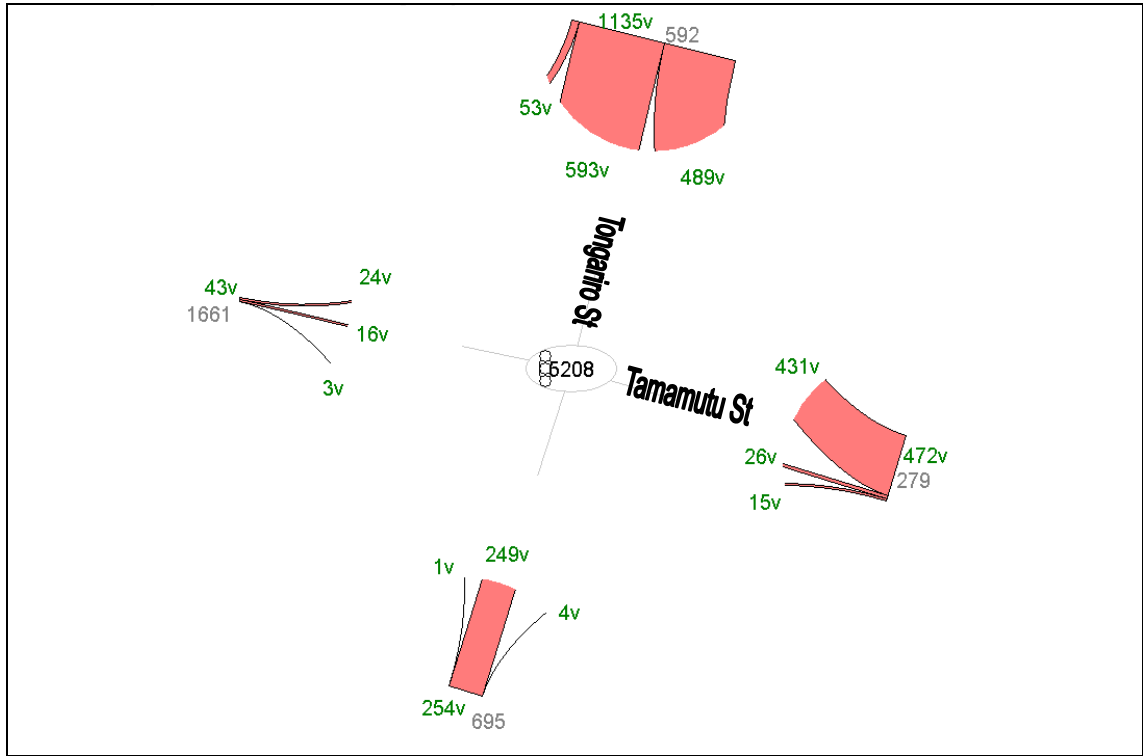


AM Peak

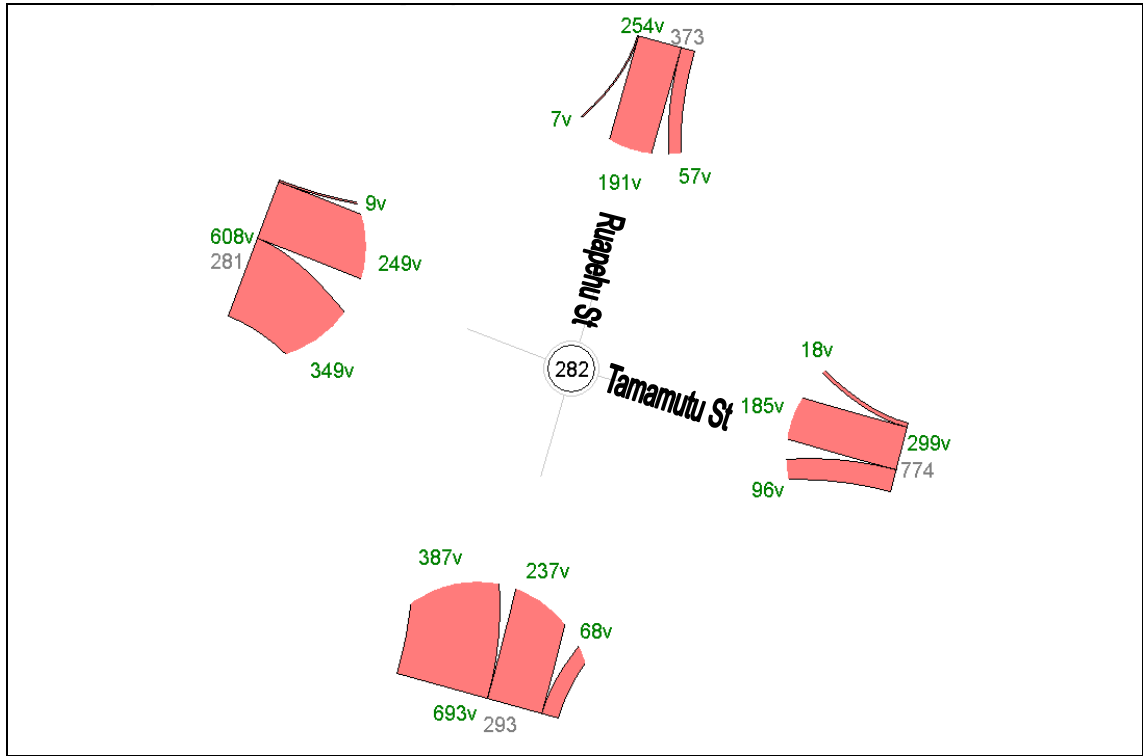


PM peak

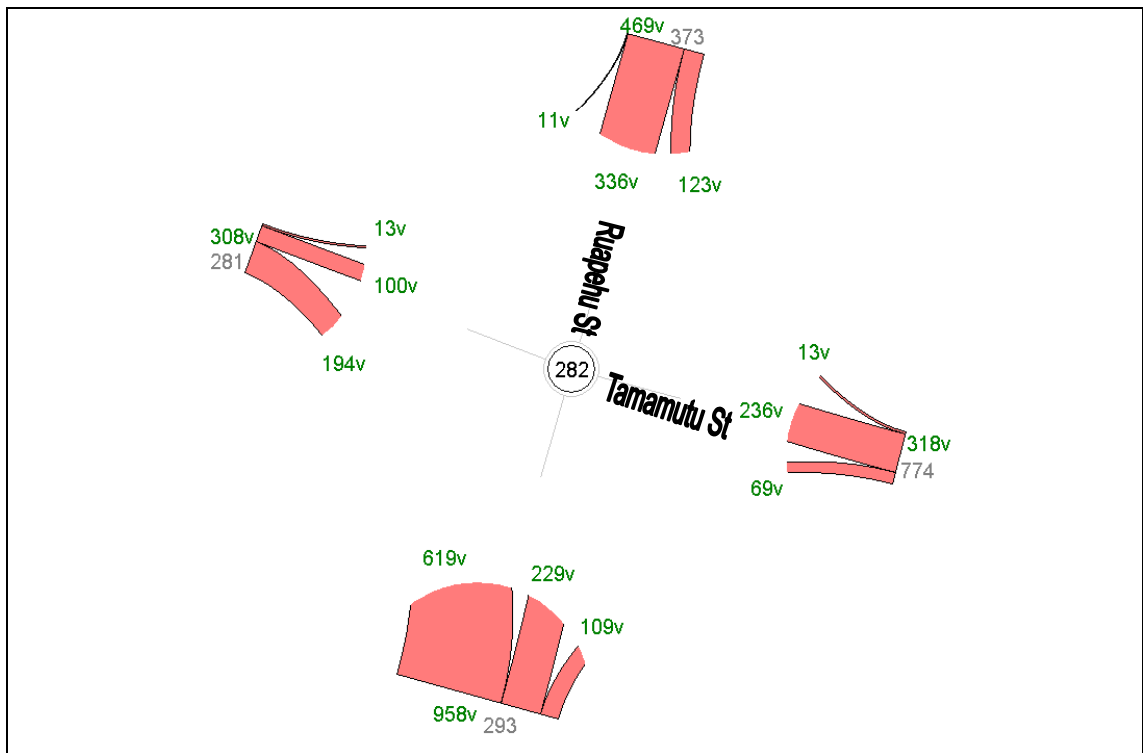
Te Awa Structure Plan Traffic Assessment	<b>2021 Stage 1 Intersection Turning Movements Ruapehu St / Spa Rd</b>	<b>Figure 28</b>
Gabites Porter		



Te Awa Structure Plan Traffic Assessment	<b>2021 Stage 1 Intersection Turning Movements Tongariro St / Tamamutu St</b>	<b>Figure 29</b>
Gabites Porter		

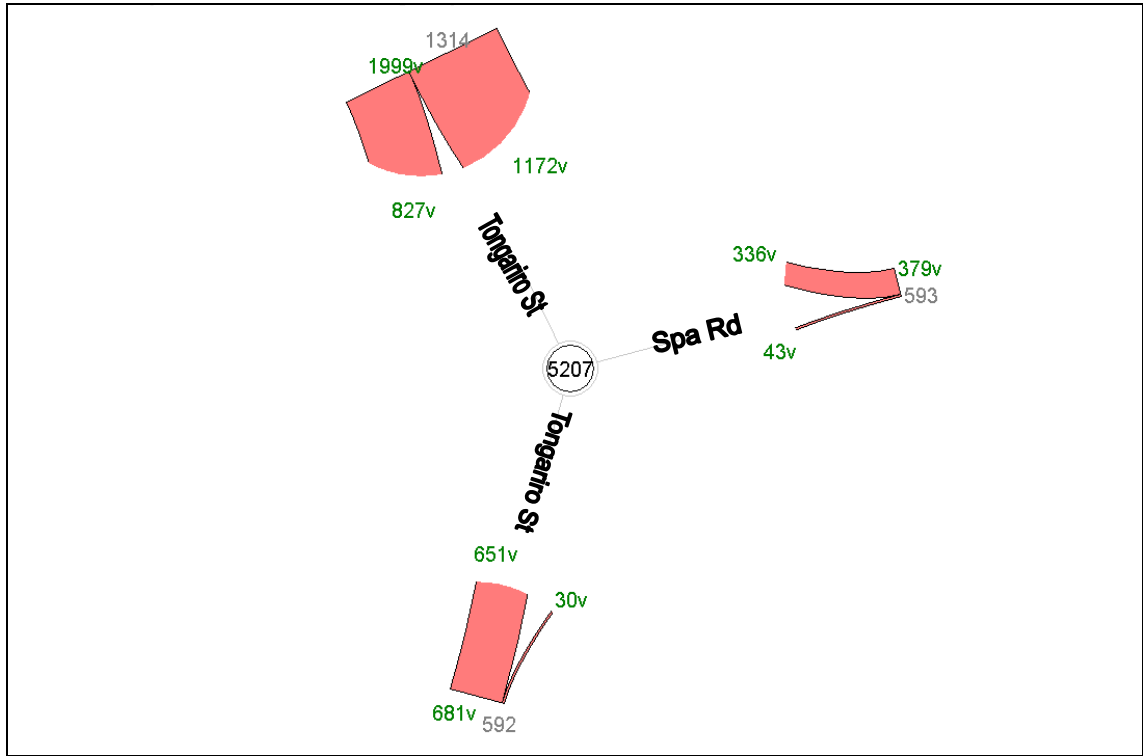


AM Peak

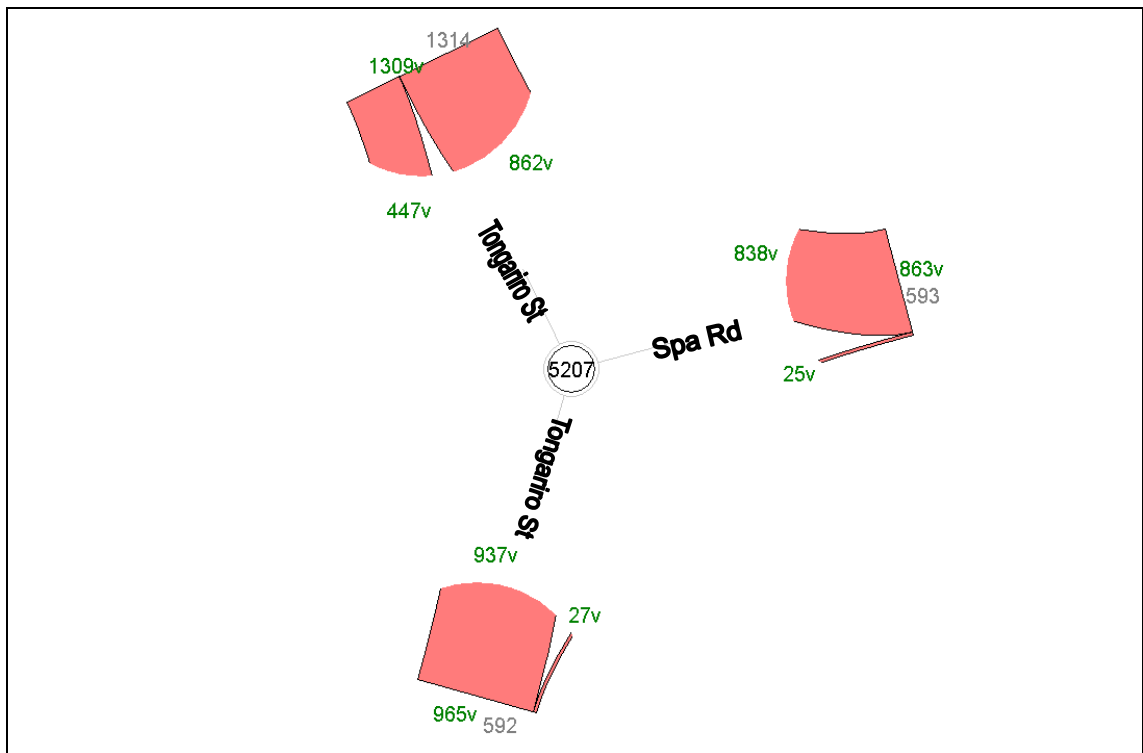


PM peak

Te Awa Structure Plan Traffic Assessment	<b>2021 Stage 1 Intersection Turning Movements Ruapehu St / Tamamutu St</b>	<b>Figure 30</b>
Gabites Porter		

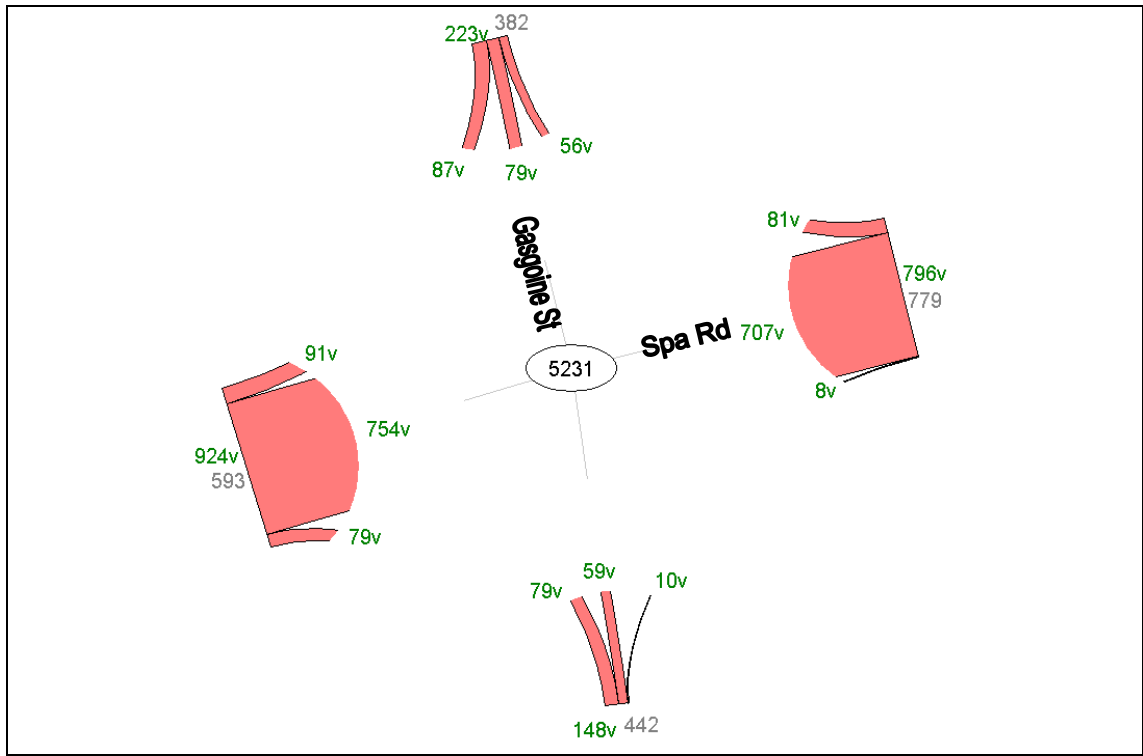
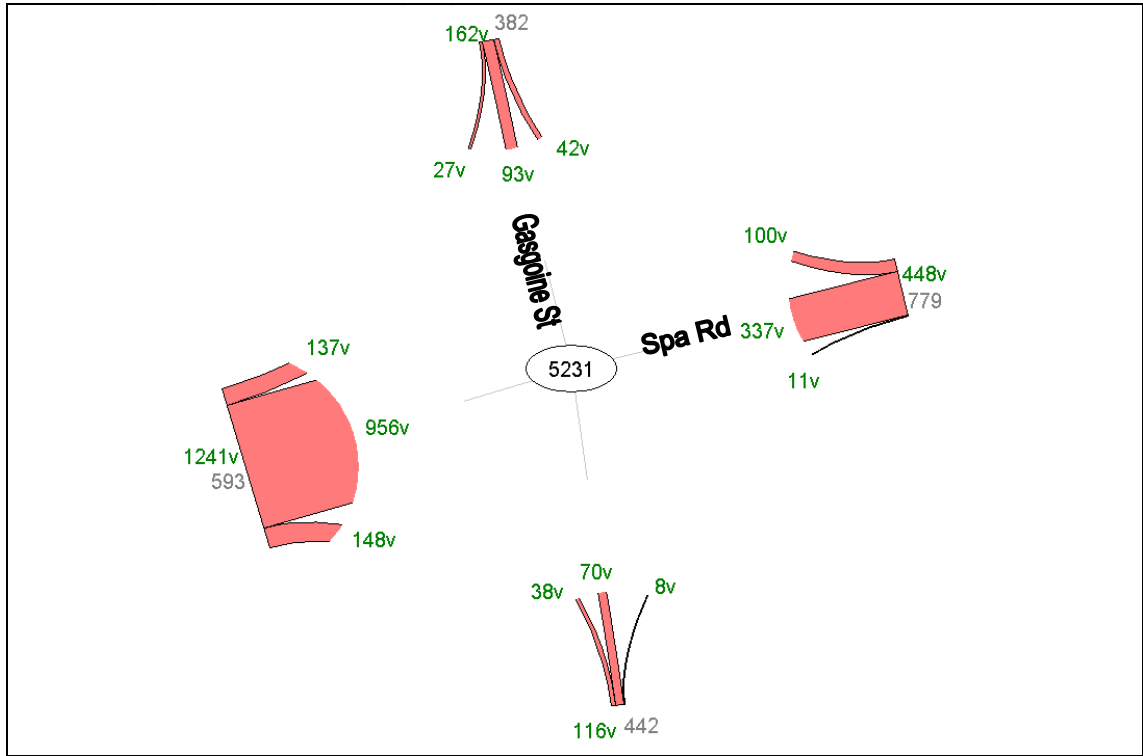


AM Peak



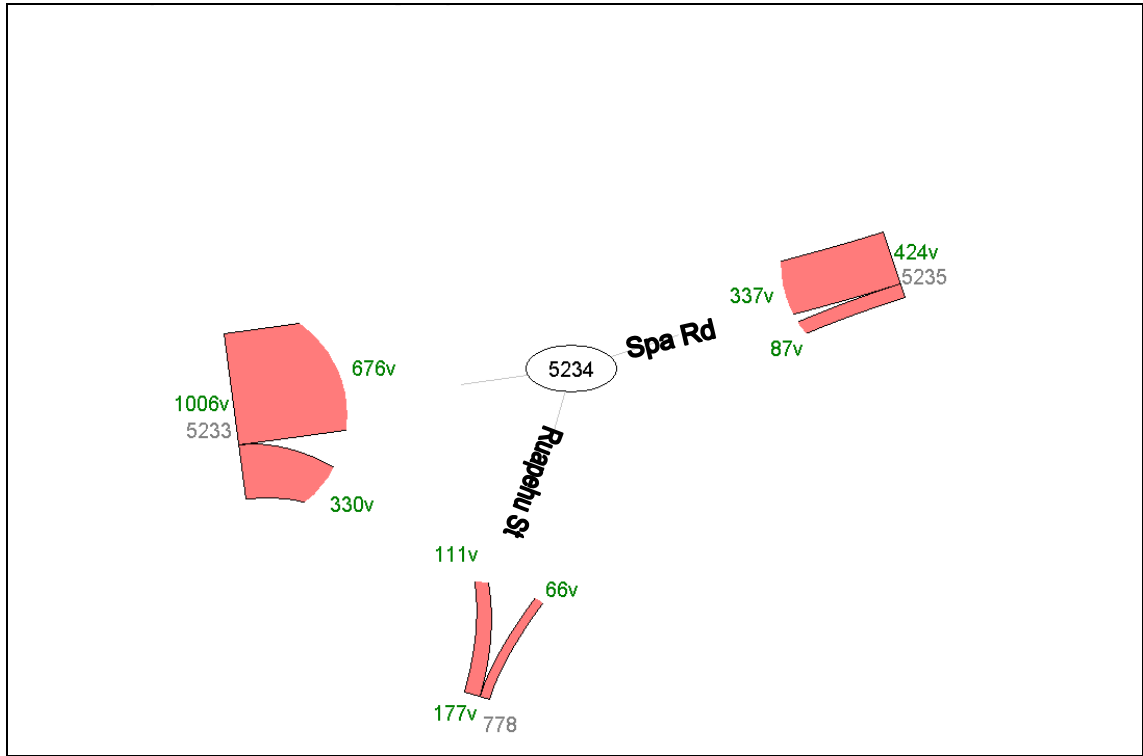
PM peak

Te Awa Structure Plan Traffic Assessment	<b>2021 Stage 2</b> <b>Intersection Turning Movements</b> <b>Tongariro St / Spa Rd</b>	<b>Figure 31</b>
Gabites Porter		

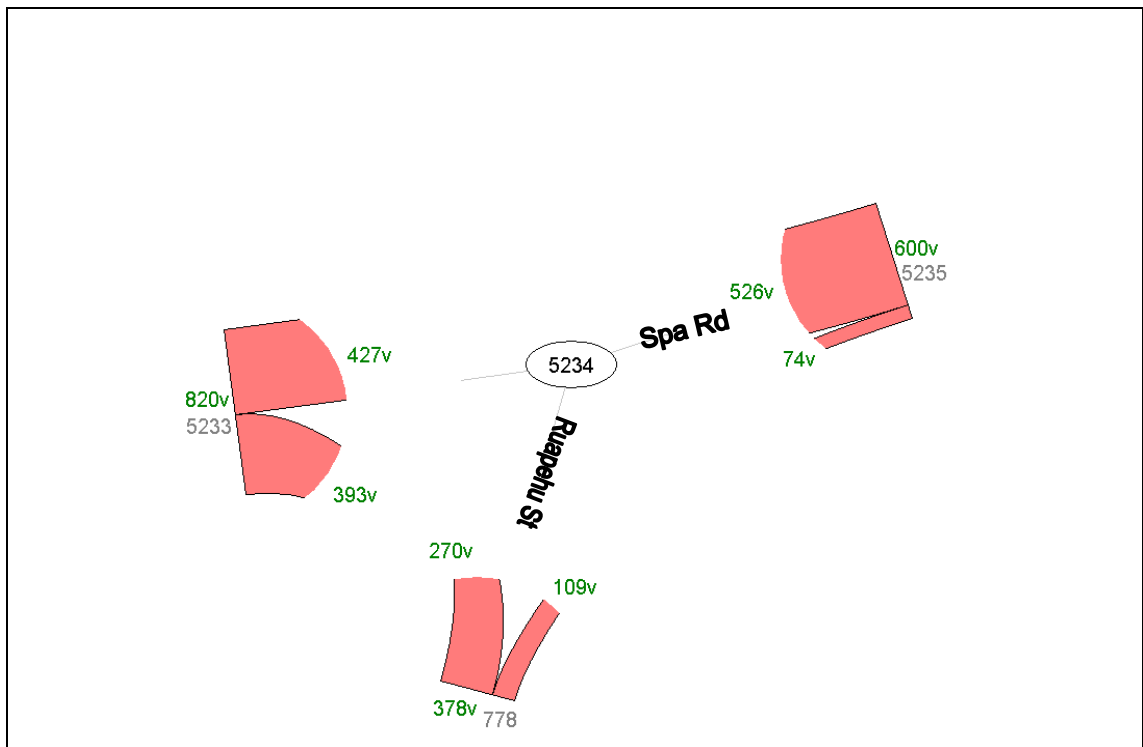


Te Awa Structure Plan Traffic Assessment	<b>2021 Stage 2 Intersection Turning Movements Gascoigne St / Spa Rd</b>	<b>Figure 32</b>
Gabites Porter		



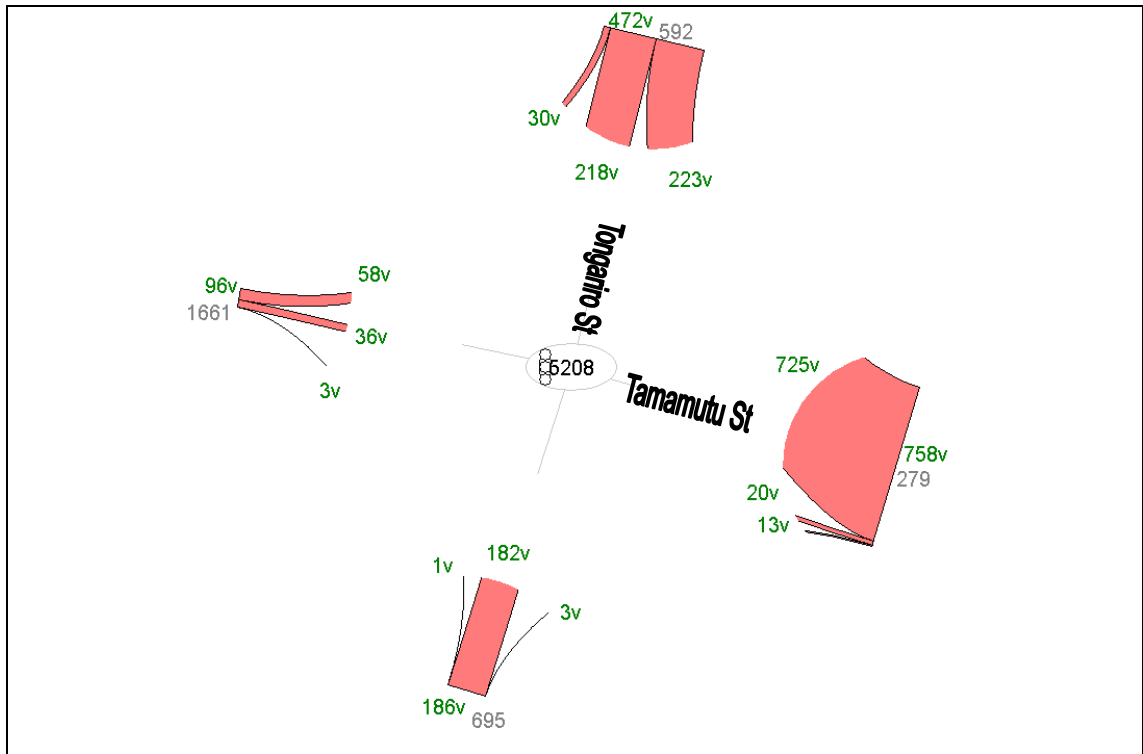
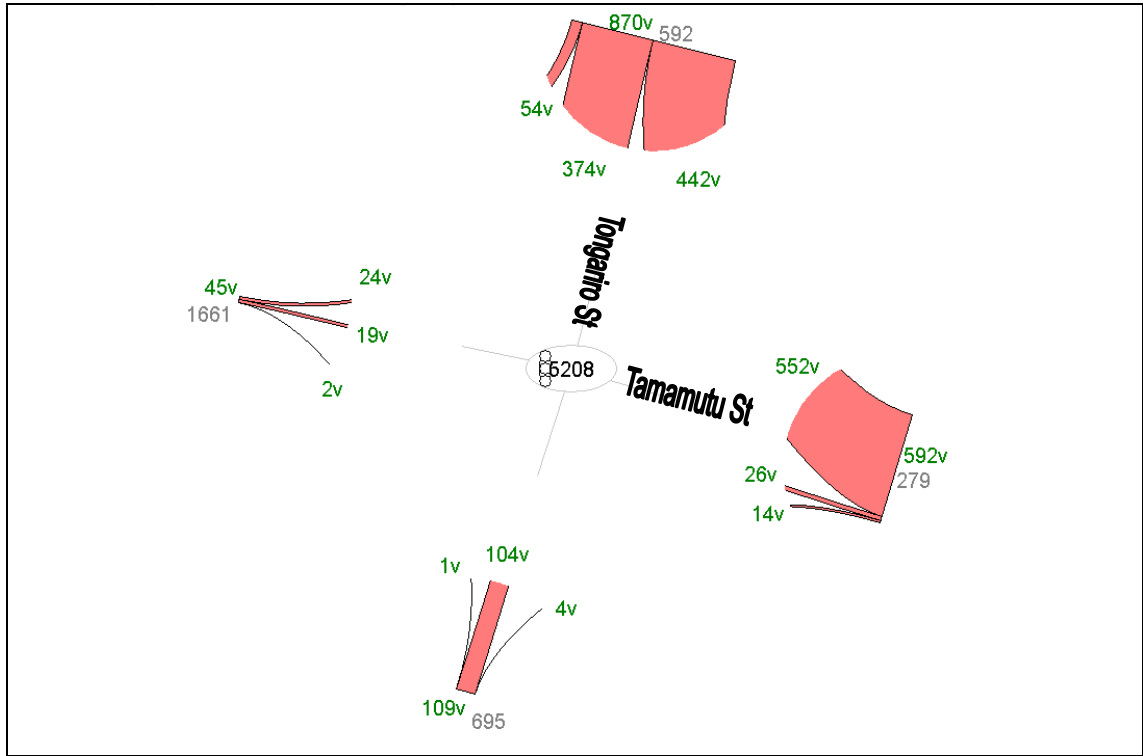


AM Peak



PM peak

Te Awa Structure Plan Traffic Assessment	2021 Stage 2 Intersection Turning Movements Ruapehu St / Spa Rd	Figure 33
Gabites Porter		



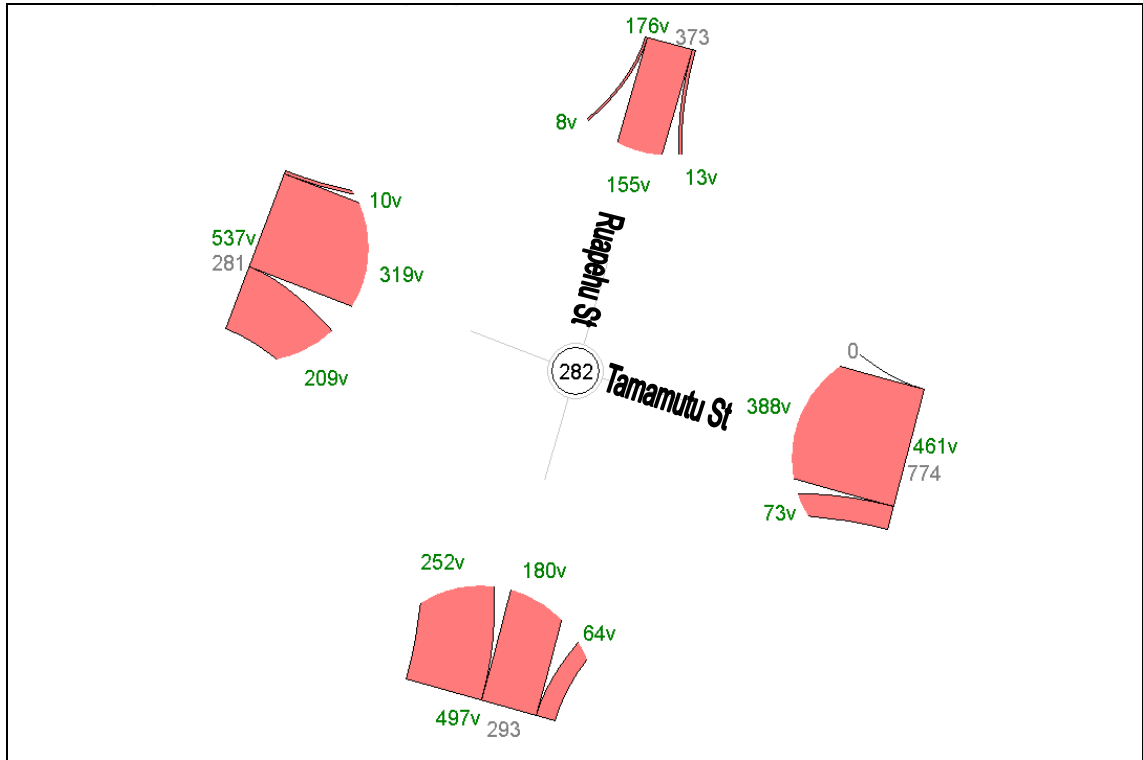
Te Awa Structure Plan  
Traffic Assessment

---

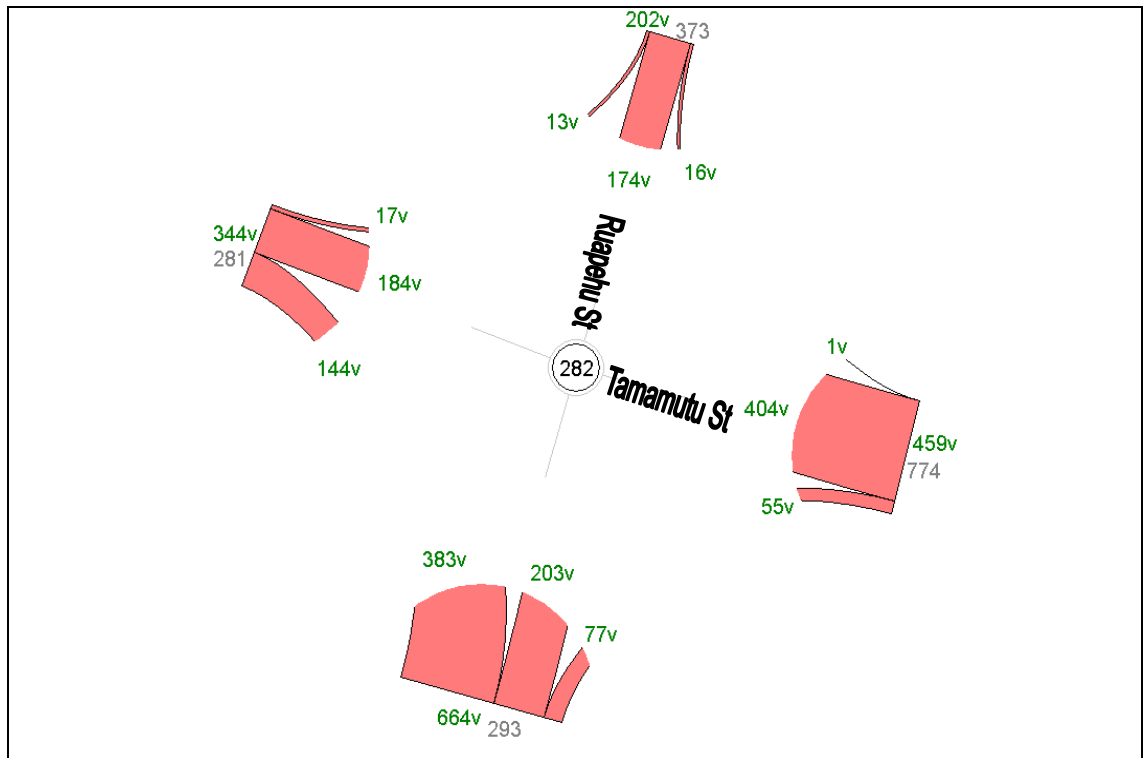
Gabites Porter

2021 Stage 2  
Intersection Turning Movements  
Tongariro St / Tamamutu St

Figure 34

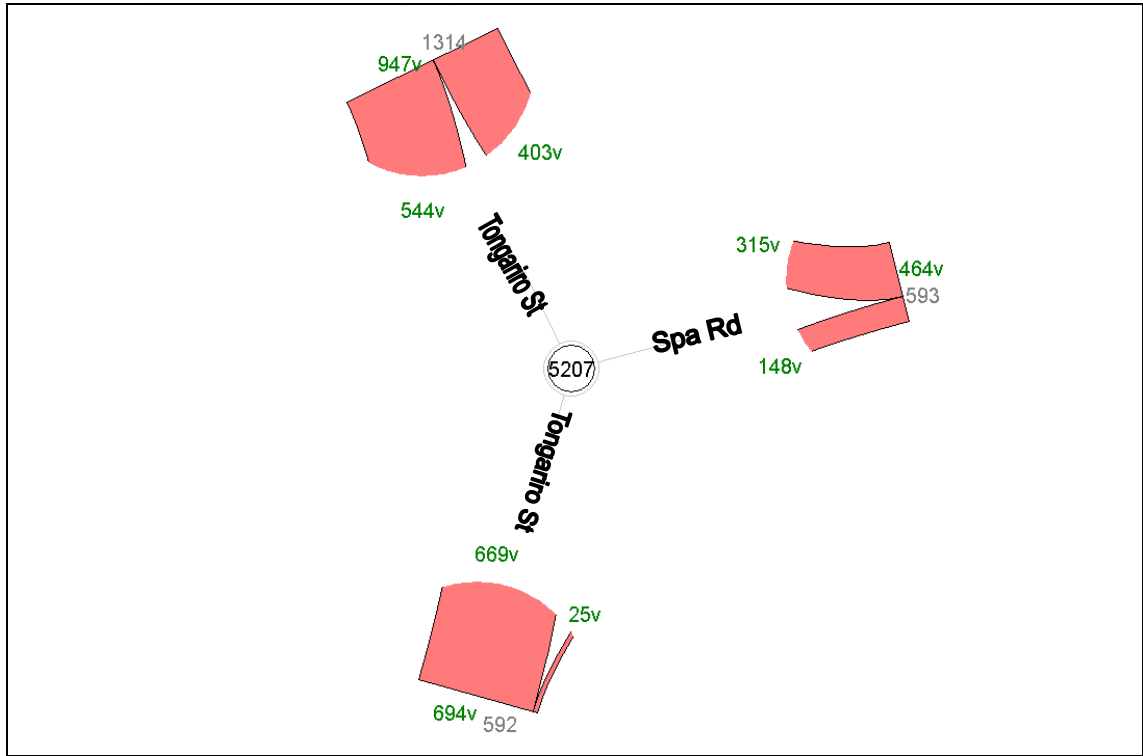


AM Peak

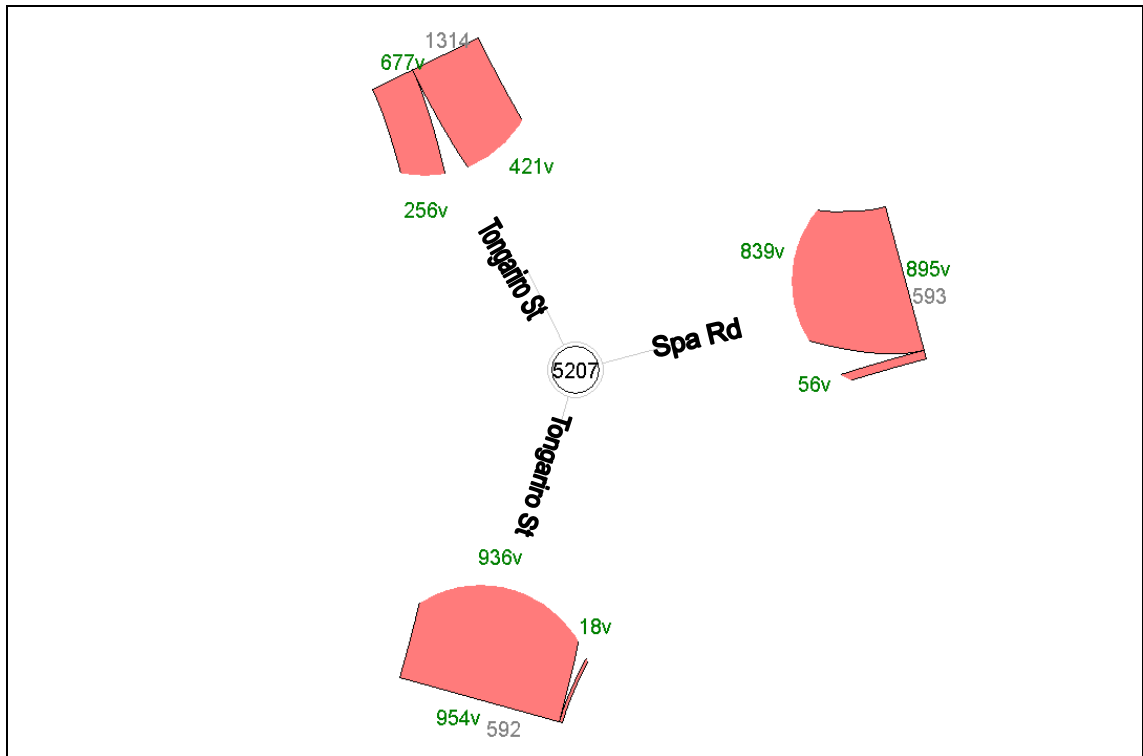


PM peak

Te Awa Structure Plan Traffic Assessment	<b>2021 Stage 2 Intersection Turning Movements Ruapehu St / Tamamutu St</b>	<b>Figure 35</b>
Gabites Porter		

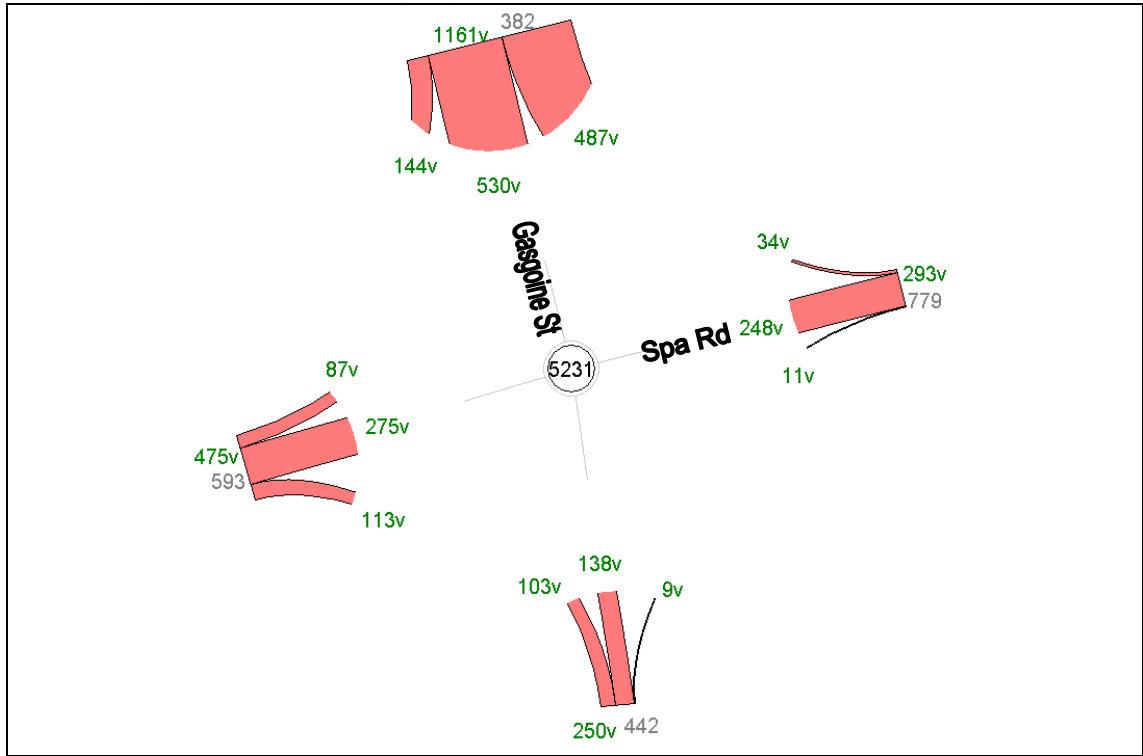


AM Peak

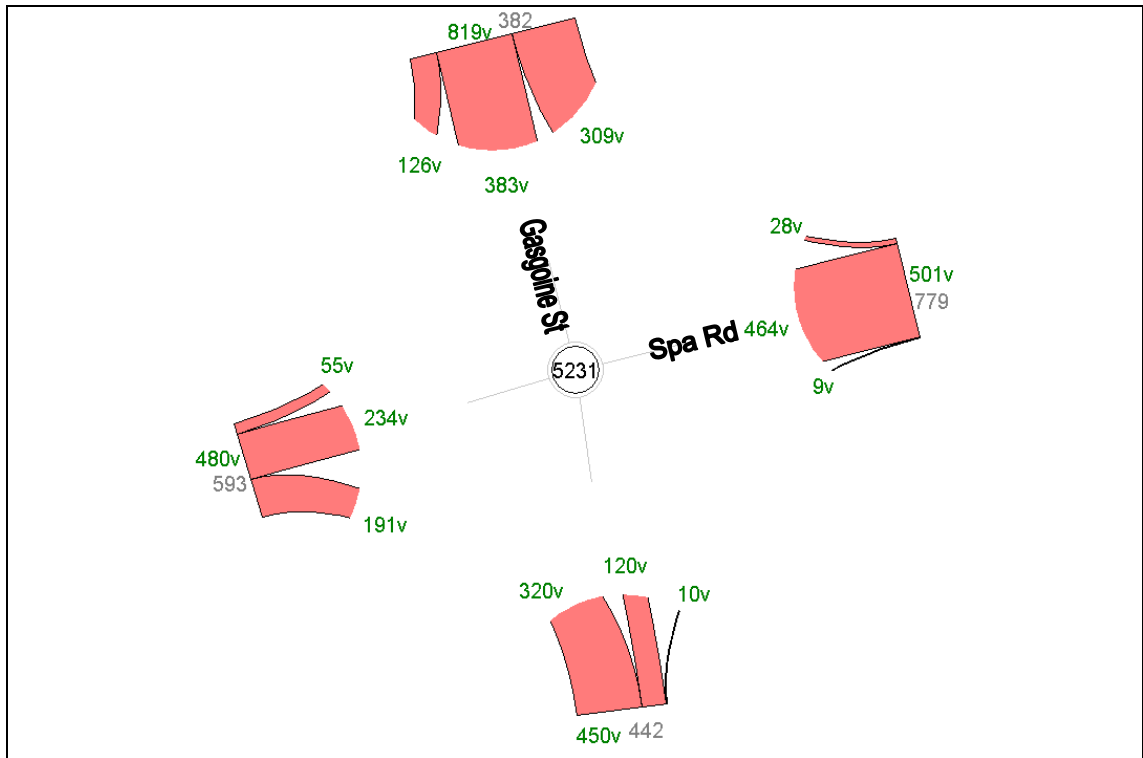


PM peak

Te Awa Structure Plan Traffic Assessment	<b>2021 Stage 3 Intersection Turning Movements Tongariro St / Spa Rd</b>	<b>Figure 36</b>
Gabites Porter		

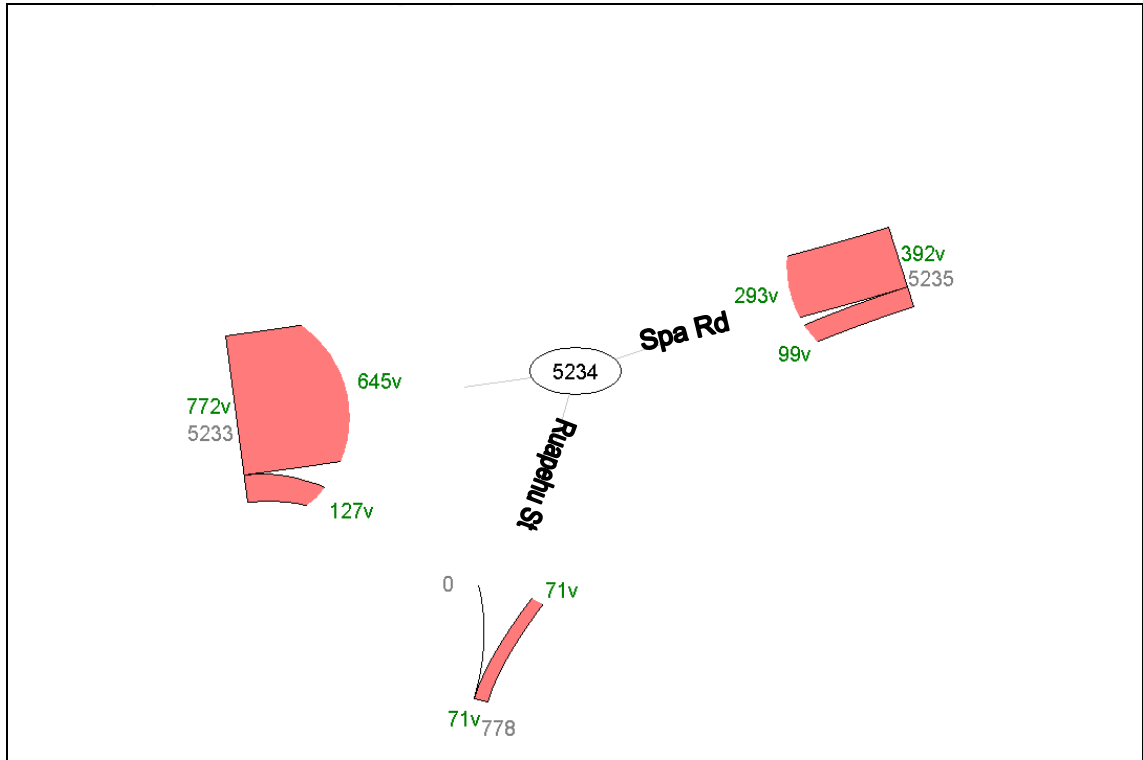


AM Peak

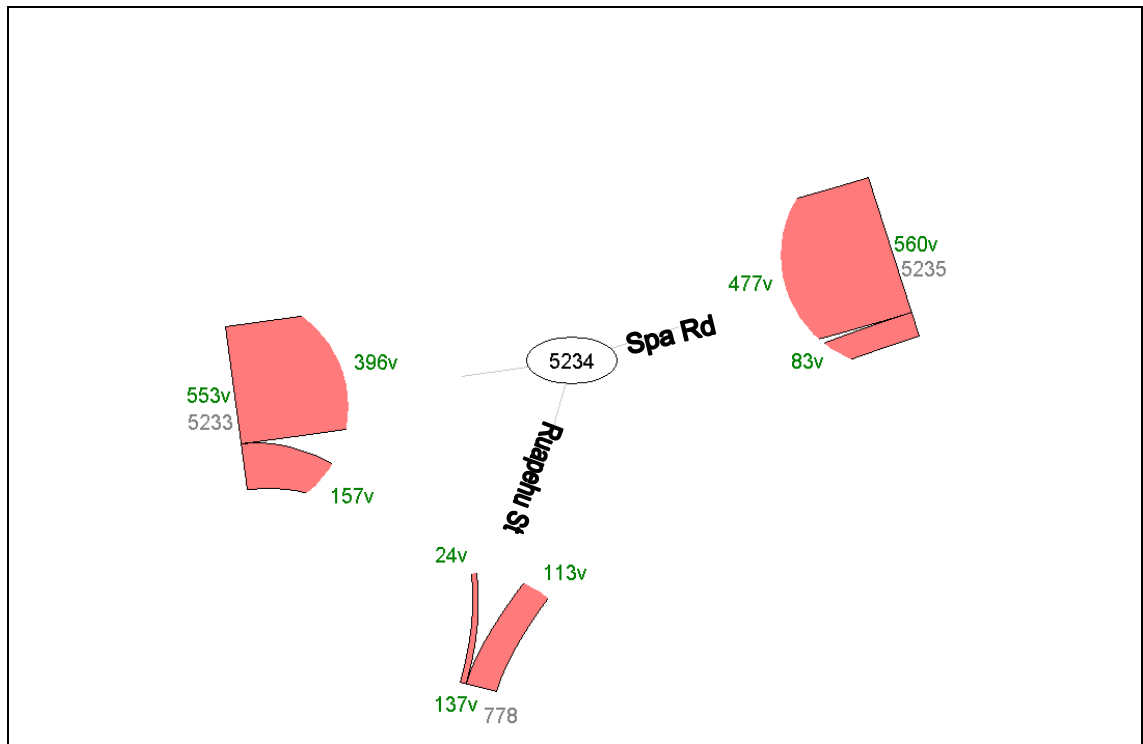


PM peak

Te Awa Structure Plan Traffic Assessment	<b>2021 Stage 3 Intersection Turning Movements Gascoigne St / Spa Rd</b>	<b>Figure 37</b>
Gabites Porter		

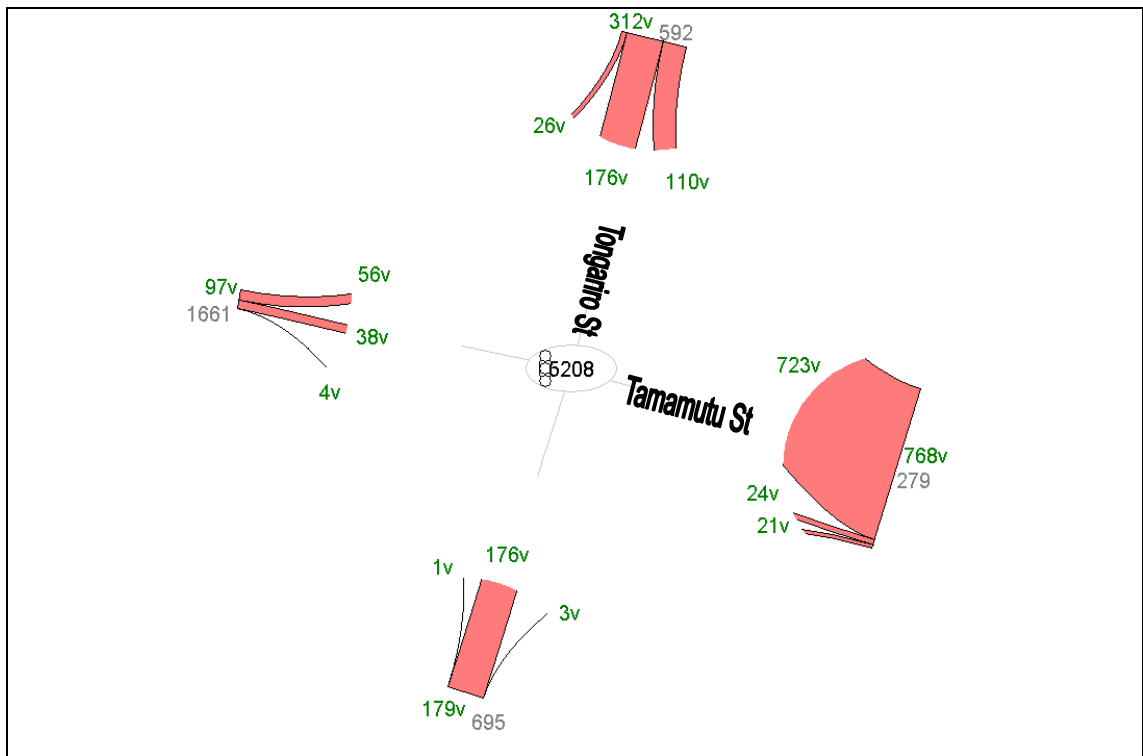
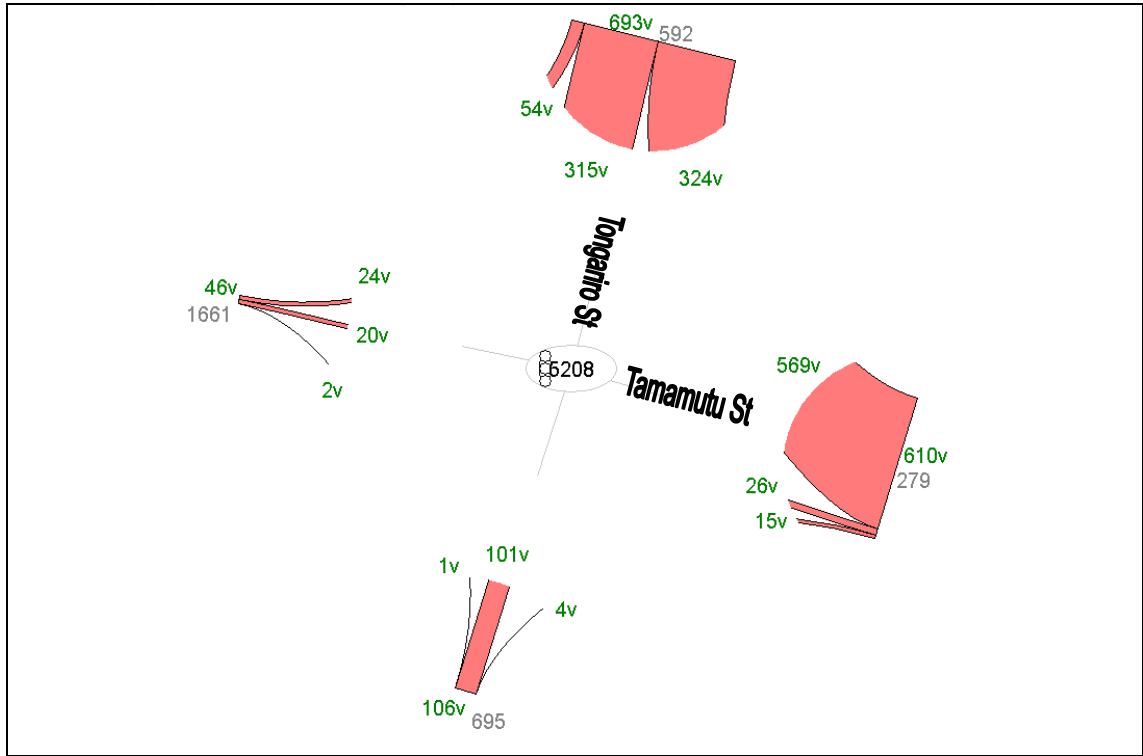


AM Peak



PM peak

Te Awa Structure Plan Traffic Assessment	<b>2021 Stage 3 Intersection Turning Movements Ruapehu St / Spa Rd</b>	<b>Figure 38</b>
Gabites Porter		



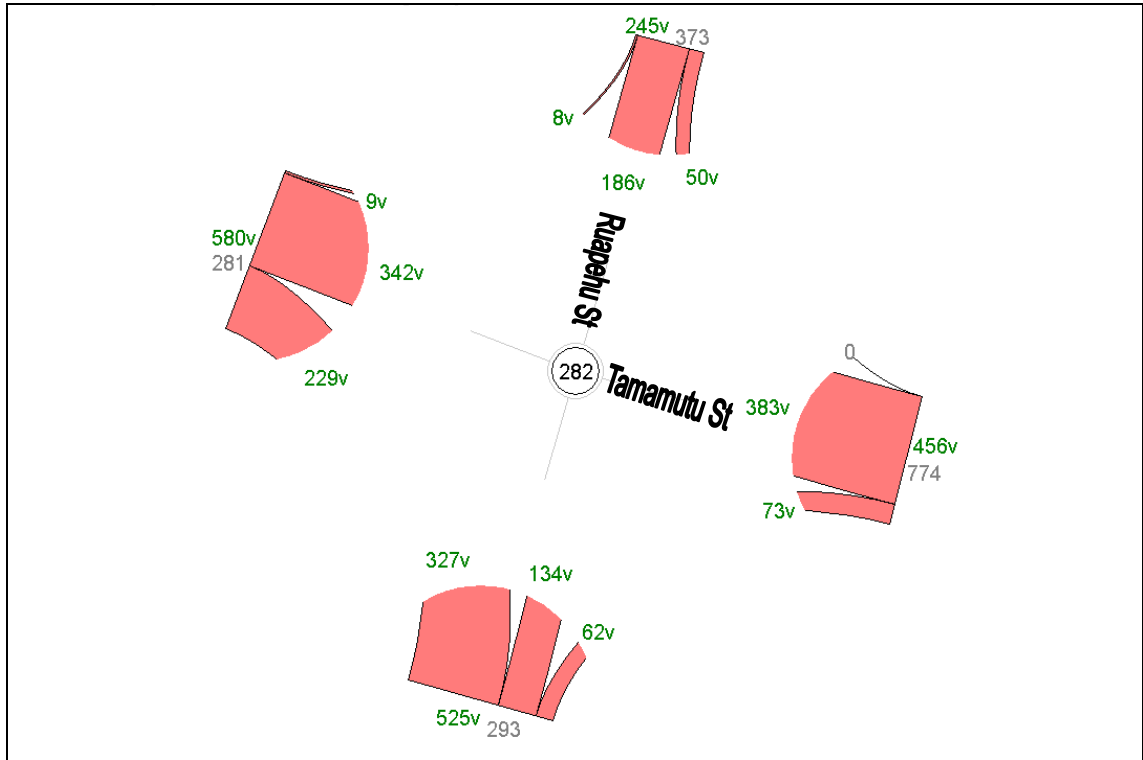
Te Awa Structure Plan  
Traffic Assessment

---

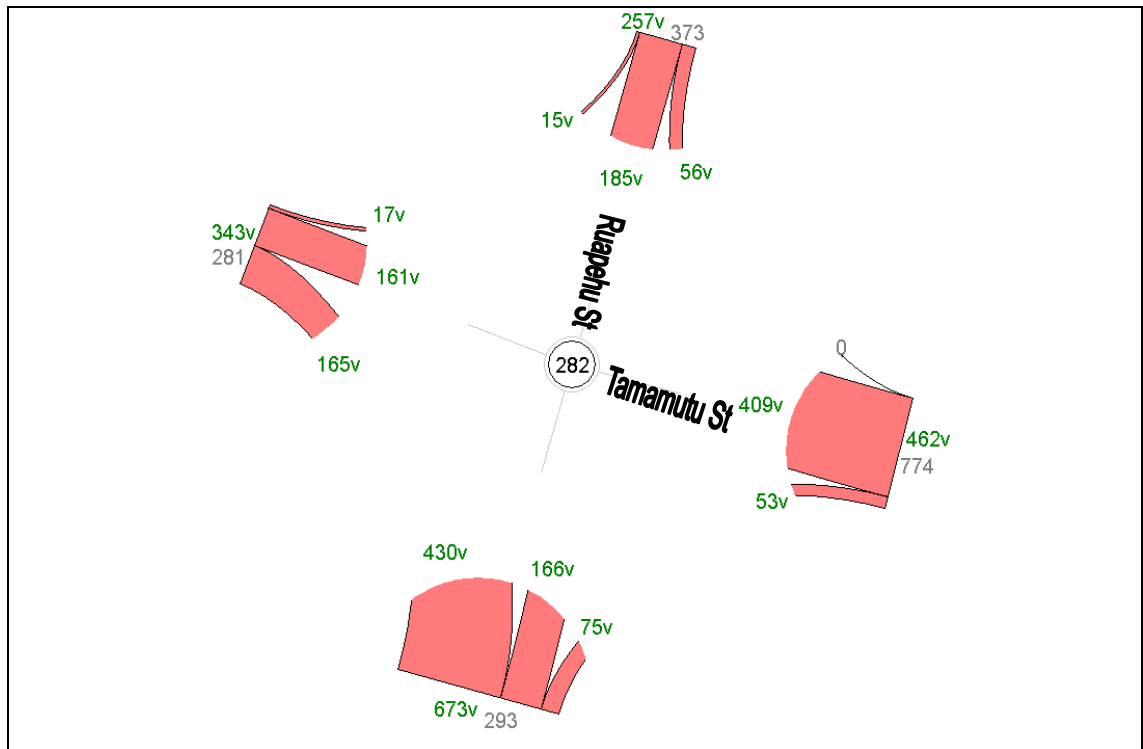
Gabites Porter

**2021 Stage 3**  
**Intersection Turning Movements**  
**Tongariro St / Tamamutu St**

Figure 39



AM Peak



PM peak

Te Awa Structure Plan Traffic Assessment	<b>2021 Stage 3 Intersection Turning Movements Ruapehu St / Tamamutu St</b>	Figure 40
Gabites Porter		