
South East Rangiora Development Area

Assessment of effects on the 2035 transport network

Prepared for	Bellgrove Rangiora Limited
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1. Introduction

Bellgrove Rangiora Limited commissioned Abley to undertake analysis using the Rangiora Microsimulation Transport Model (Rangiora Model) to assess the potential future transport effects of residential development within the South East Rangiora Development Area (SER-DA).

Abley has maintained the Rangiora Model on behalf of the Waimakariri District Council (WDC) and updated the model on several occasions to assist WDC in planning activities for landuse growth and road network development. The Rangiora model has been developed and maintained by Abley for WDC over the past 13 years. Permission has been granted by WDC for the model to be used for the purpose of modelling the effects of the Bellgrove Rangiora Limited SER-DA rezoning submission.

The most recent significant model development was the 2017 base model with 2021, 2041 and 2048 future year horizons to assess landuse growth including potential land outside of the urban boundary. This work included assessments of the Eastern Rangiora Link Road (ERLR) given the significant scale of development in the eastern side of Rangiora. It is understood that the ERLR is included in Council's Long Term Plan.

More recently, Abley has been engaged by Waimakariri District Council to assess the installation of new traffic signals along the Southbrook Road corridor. As part of this engagement the base year of the model was updated to 2020 and a future year of 2035 was developed by interpolating the 2021 and 2041 models. This included extensive local area validation checks along the Southbrook Road corridor to ensure modelled traffic volumes appropriately represented current surveyed traffic flows at 2020. The resultant 2035 future year model has been used for the assessment presented in this technical note.

2. Methodology

2.1 Outline of testing procedure

The following steps were undertaken assess the future transport network:

1. The scale of residential development refined in the key growth zones in the east and west of Rangiora within the 2035 model was reviewed and updated where required. The quantum of development assumed is summarised in section 2.2 below.

2. The model network was refined to reflect recent subdivisions that have developed or under construction and align key connection points with regards to this. The network has additional roads to test longer term future scenarios so only the future roading network that is likely to be established can be traversed by vehicles in the model. The ERLR is included in the model scenario for 2035. This is considered appropriate on the basis of its inclusion in the Waimakariri District Long Term Plan.
3. The model was run through the standard procedures and data extracted to assess network performance. A single scenario was run that includes the updated network, refined landuse and Eastern Arterial with the SER-DA.

2.2 Model assumptions

Abley prepared a 2035 model for WDC as part of prior Southbrook Rod modelling, which included local are validation based on 2020 observed traffic volumes and was interpolated between the 2020 and 2048 Waimakariri District Development Strategy models.

When the 2048 Rangiora traffic model was build, it took into consideration future forecast flows from the Greater Christchurch CAST (Christchurch Assignment and Simulation Traffic) model to understand the forecast demands at the model externals (that is the boundary conditions for roads feeding into or out of the Rangiora model study area) and extent of interaction between Rangiora and other parts of the District (and Greater Christchurch). This relationship with the CAST model provides confidence that the Rangiora model generally reflects (and is consistent with) future wider trends across Greater Christchurch from the higher order CAST model. By interpolating the 2035 model between the 2020 and 2048 scenarios, this relationship with the CAST model is retained for the purposes of the SER-DA development scenario assessment.

The 2035 Rangiora model network is shown in Figure 2.1, which includes the following future greenfield growth assumptions:

1. Zone 111, which approximates the North East Rangiora Development Area and includes the Bellgrove North subdivision, has 754 households by 2035
2. Zone 110, which includes the SER-DA and the Bellgrove South block, has 1,121 households by 2035
3. Zone 109, which approximates the West Rangiora Development Area, has 516 households by 2035.

With respect to the assessment of the SER-DA it is noted that Zone 110 generally covers the SER-DA. The 1,121 households assumed at 2035 includes approximately 690 households modelled in the wider development area to the south of Northbrook Road and a total of 430 dwellings on the Bellgrove South block corresponding to the rezoning submission.

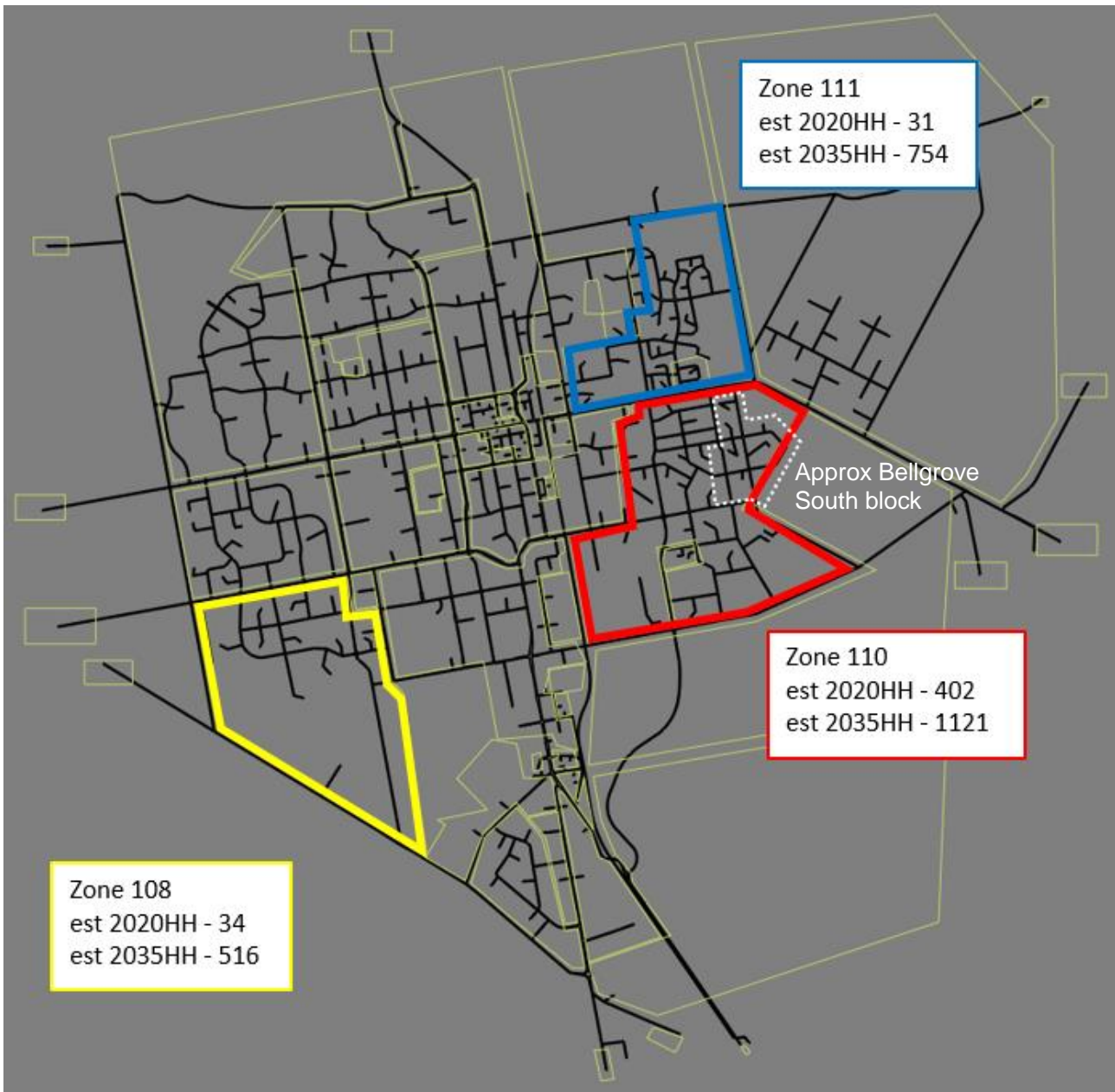


Figure 2.1 Transport model network with 2020 and 2035 household assumptions

2.3 Model runs

The Paramics Discovery modelling package includes elements of stochasticity, which means that results are variable from run-to-run. The industry standard method for reporting these results is to complete several individual model runs, which are then averaged into a final reported result. This process has been followed, and the results reported here are the average of five individual modelling runs.

The model is run through all periods (morning, interpeak and evening peak periods), however, only the morning and evening peak hour operation is reported as these are the critical periods for network operation.

3. Results

The model results are presented as the level of delay (in seconds) and the Level of Service (LoS) of key intersections. Level of Service is a classification used by traffic engineers to interpret the performance of the road network as described and with the thresholds shown in Table 3.1. In the context of intersections LoS is represented as a function of delay. Ideally in busy urban areas during commuter peak periods the LoS should be LoS E or better, although LoS F is not atypical in the urban context.

Table 3.1 Level of Service definitions and criteria

Definitions Of LoS				
LOS	Description	LoS criteria		
		Link (vehicles per hour)	Intersection (delay/veh)	
			Priority	Signal/Rotary
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 900-1700 depending on link type	50 sec	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 720-1360 depending on link type	35 sec	55 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 585-1105 depending on link type	25 sec	35 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 450-850 depending on link type	15 sec	20 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.	Not Applicable	Not Applicable	
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>			

Key intersections have been assessed and the full outputs of the intersection operation and performance is shown in Appendix A. A summary table which shows the overall intersection flow (number of vehicle movements), average delay (in seconds) and LoS is shown in Table 3.2. The operation of the wider network has been carefully reviewed to ensure that network operation is satisfactory at other nearby intersections that have the potential to be affected by the proposed development.

Table 3.2 Key overall intersection performance

Scenario	AM Peak (0800-0900)			PM Peak (1700-1800)		
	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS
Intersection						
Southbrook Road/PaknSave/Mitre10 Signals	1508	11	B	1416	13	B
Southbrook Road/South Belt/Percival Street Signals	2644	25	C	2167	23	C
Southbrook Road/Torlesse Street/Coronation Street Signals	2428	24	C	1997	15	B
MacPhail Ave(EA)/Kippenberger Ave/Bellgrove Blvd Roundabout	1144	3	A	1359	4	A
MacPhail Ave(EA)/Northbrook Road Roundabout	757	3	A	1041	3	A
MacPhail Ave(EA)/Boys Road Roundabout	861	3	A	917	3	A
Lineside Road/Eastern Arterial Priority Control with slip merge	1127	20	C	1295	5	A
Northbrook Road/Ivory Street Priority Control	1422	15	C	1243	6	A
Ivory Street/High Street/Ashley Street Signals	1537	23	C	1514	23	C
High Street/Kippenberger Ave/East Belt Roundabout	1615	5	A	1613	4	A
Kippenberger Ave/ Homestead Drive Priority Control	891	9	A	904	10	A
Kippenberger Ave/ Devlin Avenue Priority Control	786	10	A	790	4	A
Kippenberger Ave/ Rangiora Woodend Rd/ Golf Link Rd Priority Control	729	6	A	744	5	A
Rangiora Woodend Rd/ Boys Rd Priority Control	1009	17	C	978	12	B

All intersections on the network are operating at LOS C or better which is considered appropriate in the urban environment during peak periods. Of note the busy Southbrook Road corridor intersections are operating with excellent LoS as a result of the inclusion of (and relief provided) by the Rangiora Eastern Link.

The traffic demands in the peak hours on these two key links is shown in Table 3.3 to understand whether the corridors themselves are exceeded in the future 2035 scenarios.

The capacity of urban arterials is generally considered to be in the order of up to 1400 vehicles per lane per hour. This is considered to be an appropriate capacity for both the Southbrook Road and REL corridors, and represents the upper end of the LoS E range for link capacity.

It is noted that in the morning (AM) and evening (PM) peak Southbrook Road is operating at LoS E and approaching capacity however the REL is operating well below capacity. It is noted that southbound on Southbrook Road (South Belt to Torlesse St) in the morning peak has a high level of demand due to the local schools and adjacent high generating land use activities. Importantly the REL has residual capacity which demonstrates that with the inclusion of the SER-DA and traffic associated with the rezoning submission, the network will operate satisfactorily overall.

Table 3.3 Traffic Demands on Key Roads

Scenario	AM Peak (0800-0900)			PM Peak (1700-1800)		
	Northbound	Southbound	Total	Northbound	Southbound	Total
Southbrook Road (south of South Belt)	1084	1406	2490	1288	841	2129
Southbrook Road (south of Torlesse Rd)	787	1140	1927	1231	655	1886
Rangiora Eastern Arterial (south of Boys Road)	135	394	530	432	217	649

4. Conclusions

The 2035 Rangiora model has been run to test the full impacts of greenfield development in Rangiora including the full development of the SER-DA. This includes the rezoning sought by Bellgrove Rangiora Limited on the Bellgrove South land between Kippenberger and Northbrook Roads.

In 2035 when the Rangiora East Link is expected to be operational, the transport network operates with excellent LoS and modest delays at key intersections during peak periods. This demonstrates that the level of traffic anticipated by the SER-DA including the rezoning submission can be comfortably accommodated by the future Rangiora transportation network.

Southbrook Road/PaknSave/Mitre10 Signals

Approach	AM Peak (0800-0900)						PM Peak (1700-1800)					
	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS
Southbrook Rd Sth Left	13	9	A	263	11	B	3	12	B	421	13	B
Southbrook Rd Sth Thru	218	10	A				376	13	B			
Southbrook Rd Sth Right	32	21	C				41	15	B			
Mitre10 Access West Left	57	8	A	60	9	A	97	13	B	100	14	B
Mitre10 Access West Thru												
Mitre10 Access West Right	3	27	C				4	32	C			
Southbrook Rd Nth Left	33	9	A	1137	11	B	107	6	A	656	6	A
Southbrook Rd Nth Thru	1019	10	A				505	5	A			
Southbrook Rd Nth Right	85	23	C				44	20	C			
PaknSave Access East Left	3	27	C	48	27	C	9	24	C	238	29	C
PaknSave Access East Thru												
PaknSave Access East Right	46	27	C				229	29	C			
Intersection	1508	11	B	1508	11	B	1416	13	B	1416	13	B

Southbrook Road/South Belt/Percival Street Signals

Approach	AM Peak (0800-0900)						PM Peak (1700-1800)					
	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS
Southbrook Rd Sth Left	269	15	B	1084	21	C	396	21	C	1288	22	C
Southbrook Rd Sth Thru	698	22	C				798	23	C			
Southbrook Rd Sth Right	117	33	C				93	19	B			
South Belt West Left	16	18	B	571	29	C	11	17	B	363	21	C
South Belt West Thru	88	24	C				75	18	B			
South Belt West Right	467	31	C				277	22	C			
Percival St Nth Left	8	19	B	797	26	C	8	22	C	376	29	C
Percival St Nth Thru	774	26	C				349	29	C			
Percival St Nth Right	14	32	C				19	31	C			
South Belt East Left	165	25	C	193	26	C	65	25	C	140	26	C
South Belt East Thru	21	30	C				60	28	C			
South Belt East Right	7	31	C				16	25	C			
Intersection	2644	25	C	2644	25	C	2167	23	C	2167	23	C

Southbrook Road/Torlesse Street/Coronation Street Signals

Approach	AM Peak (0800-0900)						PM Peak (1700-1800)					
	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS
Southbrook Rd Sth Left	7	14	B	787	17	B	18	14	B	1231	17	B
Southbrook Rd Sth Thru	768	16	B				1199	17	B			
Southbrook Rd Sth Right	12	35	C				14	21	C			
Coronation St West Left	17	33	C	25	34	C	9	47	D	11	43	D
Coronation St West Thru	1	24	C									
Coronation St West Right	7	37	D				2	26	C			
Southbrook Rd Nth Left	165	17	B	1292	28	C	12	6	A	669	8	A
Southbrook Rd Nth Thru	1124	29	C				650	8	A			
Southbrook Rd Nth Right	3	28	C				7	40	D			
Torlesse St East Left	8	22	C	324	29	C	3	35	D	86	32	C
Torlesse St East Thru	6	29	C				1	40	D			
Torlesse St East Right	310	30	C				81	32	C			
Intersection	2428	24	C	2428	24	C	1997	15	B	1997	15	B

MacPhail Ave(EA)/Kippenberger Ave/Bellgrove Blvd Roundabout

Approach	AM Peak (0800-0900)						PM Peak (1700-1800)					
	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS
MacPhail Ave Left				66	4	A				198	5	A
MacPhail Ave Thru	33	4	A				99	5	A			
MacPhail Ave Right	33	4	A				99	5	A			
Kippenberger Ave West Left	64	2	A	498	3	A	109	4	A	637	4	A
Kippenberger Ave West Thru	386	3	A				455	4	A			
Kippenberger Ave West Right	47	3	A				73	4	A			
Bellgrove Blvd Left	4	7	A	139	5	A	2	7	A	84	5	A
Bellgrove Blvd Thru	78	4	A				45	5	A			
Bellgrove Blvd Right	56	5	A				38	5	A			
Kippenberger Ave East Left	48	4	A	442	3	A	27	4	A	440	3	A
Kippenberger Ave East Thru	394	3	A				409	3	A			
Kippenberger Ave East Right							4	2	A			
Intersection	1144	3	A	1144	3	A	1359	4	A	1359	4	A

MacPhail Ave(EA)/Northbrook Road Roundabout

Approach	AM Peak (0800-0900)						PM Peak (1700-1800)					
	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS
Spark Lane Left	62		2 A	212	2	A	104		2 A	566	2	A
Spark Lane Thru	75		1 A				231		2 A			
Spark Lane Right	75		1 A				231		2 A			
Northbrook Road West Left	33		3 A	195	3	A	43		3 A	199	4	A
Northbrook Road West Thru	92		3 A				119		4 A			
Northbrook Road West Right	70		3 A				37		3 A			
MacPhail Ave Left	2		2 A	235	4	A	3		2 A	144	4	A
MacPhail Ave Thru	201		5 A				125		4 A			
MacPhail Ave Right	32		3 A				16		4 A			
Northbrook Road East Left	54		4 A	114	4	A	39		3 A	133	3	A
Northbrook Road East Thru	60		4 A				89		3 A			
Northbrook Road East Right							4		2 A			
Intersection	757		3 A	757		3 A	1041		3 A	1041		3 A

MacPhail Ave(EA)/Boys Road Roundabout

Approach	AM Peak (0800-0900)						PM Peak (1700-1800)					
	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS
Eastern Arterial South Left	10		2 A	135	3	A	6		2 A	432	4	A
Eastern Arterial South Thru	105		4 A				392		4 A			
Eastern Arterial South Right	20		2 A				33		3 A			
Boys Road West Left	36		1 A	162	1	A	32		2 A	142	3	A
Boys Road West Thru	122		1 A				109		3 A			
Boys Road West Right	3		1 A				1		3 A			
Spark Lane Left				335	2	A				218	1	A
Spark Lane Thru	311		2 A				204		1 A			
Spark Lane Right	24		2 A				14		2 A			
Boys Road East Left	80		3 A	229	4	A	12		2 A	126	3	A
Boys Road East Thru	149		5 A				109		3 A			
Boys Road East Right							4		2 A			
Intersection	861		3 A	861		3 A	917		3 A	917		3 A

Lineside Road/Eastern Arterial Priority Control with slip merge

Approach	AM Peak (0800-0900)						PM Peak (1700-1800)					
	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS
Lineside Rd Sth Thru	105		6 A	443	4	A	401		7 A	804	5	A
Lineside Rd Sth Right	337		4 A				427		4 A			
Lineside Rd Nth Left	30		1 A	295	2	A	34		0 A	276	2	A
Lineside Rd Nth Thru	265		2 A				257		2 A			
Eastern Arterial East Left	296		3 A	389	7	A	218		2 A	215	3	A
Eastern Arterial East Right	93		20 C				2		31 D			
Intersection	1127		20 C	1127		7 A	1339		31 D	1295		5 A

Northbrook Road/Ivory Street Priority Control

Approach	AM Peak (0800-0900)						PM Peak (1700-1800)					
	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS
Northbrook Road SW Thru	402		0 A	620	4	A	404		0 A	619	3	A
Northbrook Road SW Right	218		10 B				248		9 A			
Ivory Street Nth Left	100		1 A	506	1	A	131		1 A	369	1	A
Ivory Street Nth Thru	406		1 A				235		1 A			
Northbrook Road East Left	234		5 A	296	7	A	184		2 A	256	6	A
Northbrook Road East Right	62		15 C				87		13 B			
Intersection	1422		15 C	1422		7 A	1289		13 B	1243		6 A

Ivory Street/High Street/Ashley Street Signals

Approach	AM Peak (0800-0900)						PM Peak (1700-1800)					
	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS
Ivory Street Sth Left	3		23 C	490	23	C				603	23	C
Ivory Street Sth Thru	283		21 C				424		24 C			
Ivory Street Sth Right	204		26 C				179		23 C			
High St West Left	4		39 D	109	31	C	11		26 C	125	32	C
High St West Thru	103		31 C				112		33 C			
High St West Right	2		22 C				2		37 D			
Ashley St Nth Left	87		23 C	535	22	C	108		21 C	323	21	C
Ashley St Nth Thru	26		17 B				13		12 B			
Ashley St Nth Right	423		22 C				202		21 C			
High St East Left	195		22 C	403	22	C	184		21 C	463	22	C
High St East Thru	108		22 C				130		22 C			
High St East Right	100		21 C				150		23 C			
Intersection	1537		23 C	1537		23 C	1514		23 C	1514		23 C

High Street/Kippenberger Ave/East Belt Roundabout

Approach	AM Peak (0800-0900)						PM Peak (1700-1800)					
	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS
East Belt South Left	84	11	B	179	10	B	137	10	A	183	10	A
East Belt South Thru	11	11	B				26	10	A			
East Belt South Right	84	10	A	657	4	A	21	8	A	745	2	A
High St West Left	181	4	A				50	2	A			
High St West Thru	46	3	A	204	6	A	103	2	A	162	9	A
High St West Right	431	4	A				592	2	A			
East Belt North Left	56	5	A	576	3	A	44	8	A	522	3	A
East Belt North Thru	91	6	A				77	9	A			
East Belt North Right	57	5	A	1615	5	A	41	9	A	1613	4	A
Kippenberger Ave East Left	37	3	A				40	2	A			
Kippenberger Ave East Thru	126	3	A	1615	5	A	32	3	A	1613	4	A
Kippenberger Ave East Right	413	3	A				450	3	A			
Intersection	1615	5	A	1615	5	A	1613	4	A	1613	4	A

Kippenberger Ave/ Homestead Drive Priority Control

Approach	AM Peak (0800-0900)						PM Peak (1700-1800)					
	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS
Kippenberger Ave West Thru	42	1	A	403	1	A	91	2	A	463	2	A
Kippenberger Ave West Right	362	1	A				411	2	A			
Kippenberger Ave East Left	361	3	A	371	3	A	389	2	A	376	3	A
Kippenberger Ave East Thru	10	7	A				28	8	A			
Homestead Dr Nth Left	32	6	A	116	8	A	21	3	A	65	10	A
Homestead Dr Nth Right	84	9	A				51	10	B			
Intersection	891	9	A	891	8	A	991	10	B	904	10	A

Kippenberger Ave/ Devlin Avenue Priority Control

Approach	AM Peak (0800-0900)						PM Peak (1700-1800)					
	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS
Kippenberger Ave East Thru	5	1	A	354	2	A	12	1	A	378	2	A
Kippenberger Ave East Right	349	2	A				403	2	A			
Kippenberger Ave West Left	372	2	A	393	2	A	396	2	A	386	2	A
Kippenberger Ave West Thru	21	3	A				36	4	A			
Devlin Ave Sth Left	23	4	A	39	7	A	14	4	A	26	4	A
Devlin Ave Sth Right	16	10	A				13	9	A			
Intersection	786	10	A	786	7	A	873	9	A	790	4	A

Kippenberger Ave/ Rangiora Woodend Rd/ Golf Link Rd Priority Control

Approach	AM Peak (0800-0900)						PM Peak (1700-1800)					
	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS
Kippenberger Ave West Thru	10	1	A	375	2	A	16	1	A	337	2	A
Kippenberger Ave West Right	365	2	A				357	2	A			
Rangiora Woodend Rd East Left	294	3	A	307	3	A	380	3	A	379	3	A
Rangiora Woodend Rd East Thru	13	4	A				27	4	A			
Golf Links Rd Nth Left	33	6	A	48	5	A	23	3	A	29	5	A
Golf Links Rd Nth Right	15	4	A				10	5	A			
Intersection	729	6	A	729	5	A	813	5	A	744	5	A

Rangiora Woodend Rd/ Boys Rd Priority Control

Approach	AM Peak (0800-0900)						PM Peak (1700-1800)					
	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS	Flow	Avg Dly	LOS
Rangiora Woodend Rd SE Thru	187	0	A	425	1	A	165	0	A	503	1	A
Rangiora Woodend Rd SE Right	238	1	A				356	1	A			
Rangiora Woodend Rd NW Left	350	3	A	393	4	A	299	3	A	321	5	A
Rangiora Woodend Rd NW Thru	43	13	B				56	15	C			
Boys Rd SW Left	16	17	C	191	17	C	16	11	B	153	12	B
Boys Rd SW Right	175	17	C				160	16	C			
Intersection	1009	17	C	1009	17	C	1053	16	C	978	12	B