



Stanley Street/Shotover Street, Queenstown

Traffic Modelling Report

RELEASED UNDER THE
OFFICIAL INFORMATION ACT





Stanley Street/Shotover Street, Queenstown

Traffic Modelling Report

Prepared By


Chris Morahan
Transportation Engineer/Traffic Modeller

Opus International Consultants Ltd
Christchurch Office
20 Moorhouse Avenue
PO Box 1482, Christchurch Mail Centre,
Christchurch 8140
New Zealand

Reviewed By


John Denney
Transportation Planning Team Leader

Telephone: +64 3 363 5400
Facsimile: +64 3 365 7858

Date: 8 September 2015
Reference: 6-XT177.62
Status: Final

Contents

Executive Summary	1
1 Introduction.....	2
1.1 Location.....	2
1.2 Existing Intersection Layout.....	3
1.3 Public Transport	4
2 Traffic Volumes.....	5
2.1 2015 Surveyed Traffic Volumes	5
2.2 2018 Traffic Volumes	6
2.3 2028 Traffic Volumes.....	7
3 Existing Intersection Performance.....	8
3.1 Model Setup	8
3.2 Calibration.....	9
3.3 2018 Base Year Results	11
3.4 2028 Design Year Results	12
4 Signalised Intersection.....	13
4.1 Design.....	13
4.2 Modelling	13
4.3 2018 Base Year Results	15
4.4 2028 Design Year Results	16
4.5 Effect on Public Transport	17
5 Network Model with Adjacent Stanley Street/Ballarat Street Intersection	18
5.1 Results - Both Intersections Signalised	19
5.2 Interim Results - Only Stanley Street/Ballarat Street Intersection Signalised	23
6 Conclusion	27
Appendix A – Queue Length Photograph Diagrams.....	28
Appendix B – Detailed SIDRA Outputs for Existing Roundabout	29
Appendix C – Concept Layout Plans	30
Appendix D – Detailed SIDRA Outputs for Signalised Intersection	31
Appendix E – Detailed SIDRA Outputs for Networked Signalised Intersections.....	32
Appendix F – Detailed SIDRA Outputs for Networked Signalised Intersection and Roundabout	33

Executive Summary

Opus International Consultants has been commissioned to investigate options for addressing congestion problems at the Stanley Street/Shotover Street intersection in Queenstown.

The intersection is located on State Highway 6A (SH6A) in central Queenstown. It is currently a single lane roundabout, with a zebra crossing on the northeast approach. The existing intersection currently operates at low levels of service with long queues and delays in peak periods. This is expected to worsen as the volume of traffic using the intersection increases with predicted population growth. A concept layout for a signalised intersection has been prepared. It can be accommodated within the existing road reserve.

Table 1 summarises the performance of the existing roundabout and proposed signalised intersection at an estimated opening date of 2018 and a design year 10 years beyond this of 2028.

Table 1 - Summary of results for do minimum and signalised intersection

	Do Minimum				Signalised Intersection			
	2018		2028		2018		2028	
	AM	PM	AM	PM	AM	PM	AM	PM
Intersection LoS	F	E	F	F	C	B	E	D
Average Vehicle Delay (s)	92	46	255	149	24	15	58	52
Worst 95 th Percentile Queue Length (m)	740	313	1848	971	95	55	358	331

The signalised intersection would perform significantly better than the existing roundabout in all peak periods. In 2018 it would operate at level of service (LoS) C in the AM peak period and LoS B in the PM peak period, compared to the existing roundabout which would operate at LoS F in the AM peak period and LoS E in the PM peak period. In 2028 it would operate at LoS E in the AM peak period and LoS D in the PM peak period, compared to the existing roundabout which would operate at LoS F in both peak periods.

A separate proposal to signalise the nearby Stanley Street/Ballarat Street intersection was modelled in a network with the Stanley Street/Shotover Street intersection. This showed that the intersections will have some interaction with each other. In the 2018 AM and PM peak periods, and the 2028 PM peak period, these interactions are small, with average delays increasing by 6 seconds or less when the intersections are modelled together in a network. In the 2028 AM peak period the interactions are more substantial, with average delays at the Stanley Street/Ballarat Street intersection increasing from 126 seconds to 182 seconds when the intersections are modelled together in a network.

Modelling was undertaken to assess the impact if the Stanley Street/Shotover Street roundabout was retained and the Stanley Street/Ballarat Street intersection was signalised. This showed that the roundabout would experience some benefits from the signalisation of the adjacent intersection, but would still operate at LoS E or F in all peak periods.

It is recommended that the proposed signalised intersection layout is investigated further, based on the significant improvement in intersection performance.

1 Introduction

Opus has been commissioned to investigate options for addressing congestion problems at the Stanley Street/Shotover Street intersection in Queenstown.

1.1 Location

The intersection is located on State Highway 6A (SH6A) in central Queenstown, as shown in Figure 1.

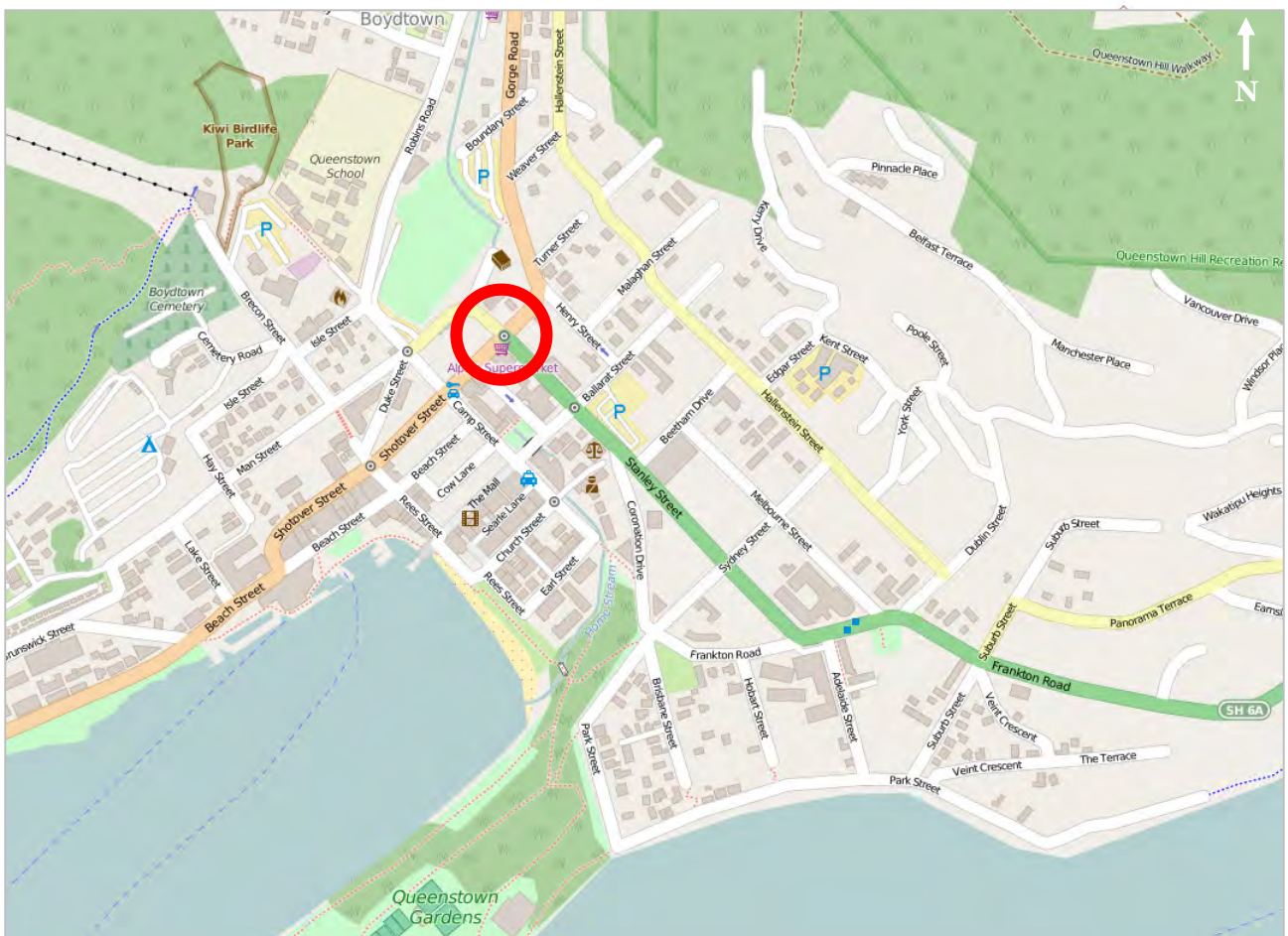


Figure 1 - Location of Intersection

The posted speed limit is 50km/h on all approaches to the intersection.

1.2 Existing Intersection Layout

The intersection is currently a single lane roundabout. The northwest and southwest approaches each have a single approach lane. The northeast and southeast approaches each have two approach lanes; one short left turn lane and one combined through and right-turn lane. There is a zebra crossing on the northeast approach. Figure 2 shows an aerial view of the existing intersection.



Figure 2 – Existing Stanley Street/Shotover Street intersection

Vehicles using the roundabout currently experience significant delays and queue lengths during peak periods. Queue lengths have been observed to extend in excess of 250m on the southwest and northeast approaches.

1.3 Public Transport

The Queenstown Bus Hub is located two blocks to the south of the intersection on Camp Street. Two bus routes currently pass through the intersection to and from this hub. The Number 11 (Queenstown/Airport/Remarkables Park) approaches from the southeast, turns left into Ballarat Street and loops around to the Bus Hub on Camp Street. The outbound service then travels northeast along Shotover Street, turning right at the intersection into Stanley Street.

The Number 12 (Quail Rise, Lake Hayes Estate) does a similar loop to access the Bus Hub. It approaches Queenstown from the north, turns left at the intersection into Stanley Street, then right into Ballarat Street and right again to the Bus Hub on Camp Street. The outbound service then travels northeast along Shotover Street, travelling straight through the intersection. This is shown in the map in Figure 3.

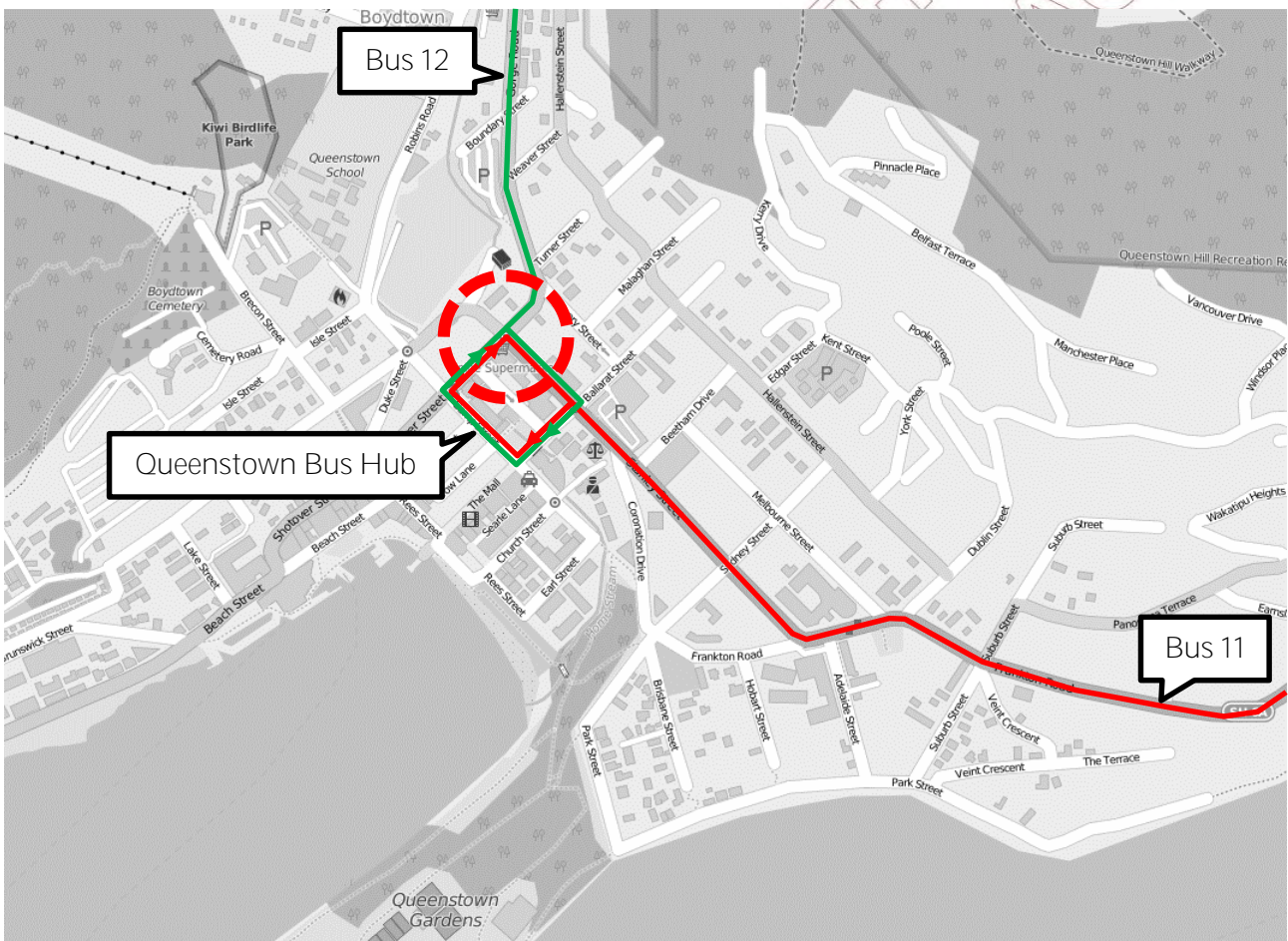


Figure 3 - Bus routes through intersection (sourced from www.connectabus.com)

2 Traffic Volumes

2.1 2015 Surveyed Traffic Volumes

Traffic was surveyed at the intersection on Thursday 9th July 2015, between 7:30-9:00am and 4:30-6:15pm.

Traffic volumes throughout 2014 were extracted from the Transport Agency count site on Stanley Street near the Millennium Hotel (approximately 500m southeast of the intersection). These show that traffic volumes are highest in the summer and winter, and lower in autumn and spring. The second week of July (when the surveys were conducted) represents the busiest winter week and has traffic volumes slightly higher than the 85th percentile week, as shown in Figure 4.

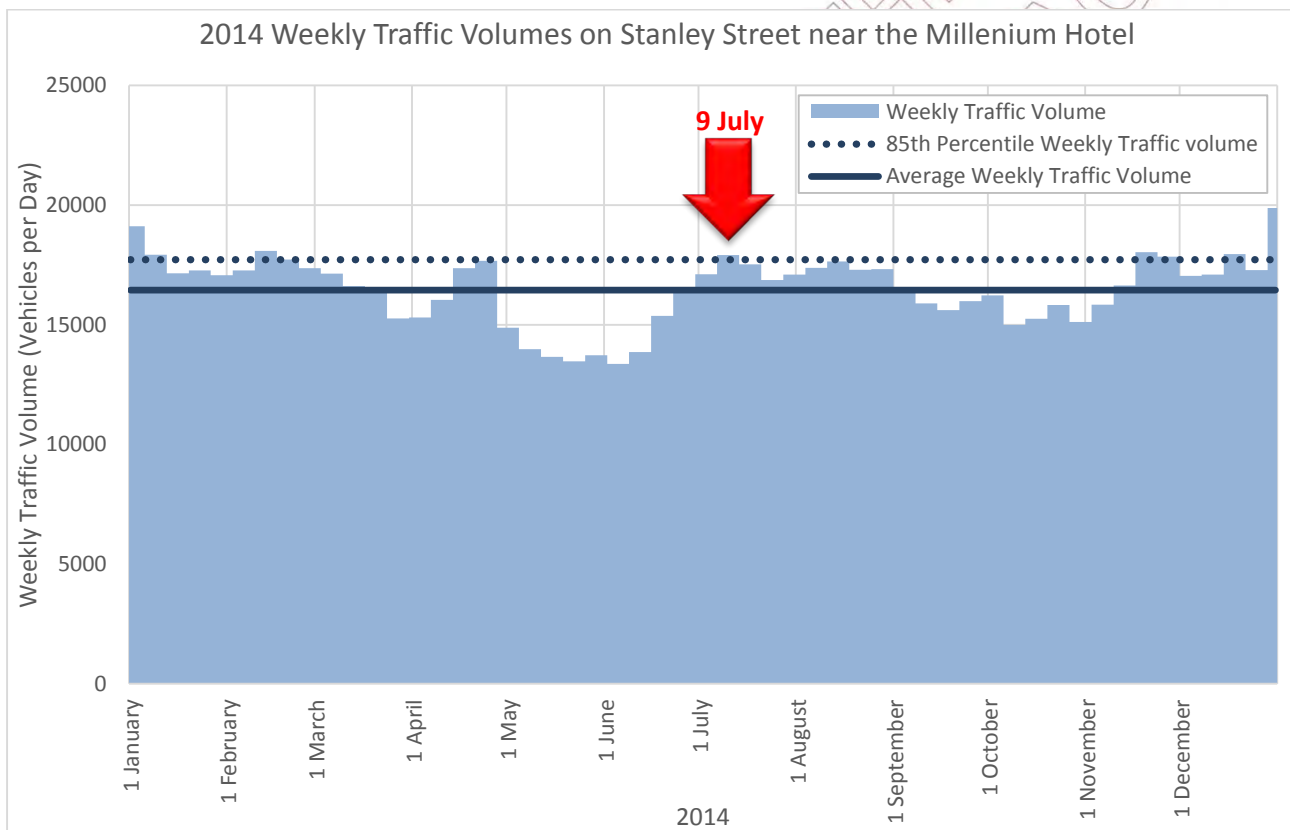


Figure 4 - Weekly Traffic Volumes throughout 2014 on Stanley Street near Millennium Hotel

The morning and evening peak hours were found to be 7:45-8:45am and 4:45-5:45pm respectively. The surveyed traffic volumes are shown in Figure 5.

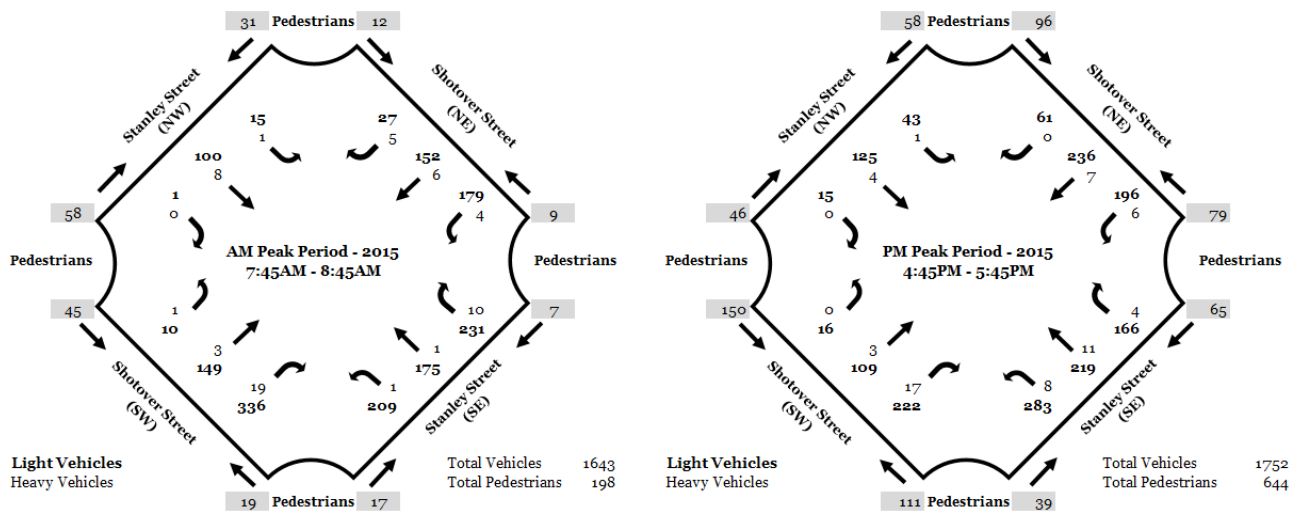


Figure 5 – Traffic and Pedestrian Volumes (Thursday 9/7/2015)

The total vehicle flow was slightly higher in the PM peak period than in the AM peak period. The SH6A (southwest and southeast) approaches show a tidal pattern, with a high right turn volume from the southwest approach in the AM peak period and a high left turn volume from the southeast approach in the PM peak period. Flows from the northeast approach are lower in the AM peak period compared to the PM peak period. The northwest approach has relatively low traffic volumes in both peak periods.

2.2 2018 Traffic Volumes

The base year for the intersection performance analysis has been taken as 2018, which is the estimated opening date for an intersection upgrade.

Traffic volumes at 2018 have been estimated by applying a growth factor to the 2015 surveyed traffic volumes. Transport Agency telemetry count sites have been investigated, with annual average daily traffic volumes extracted for the 5 year period 2010-2014. The nearest site, located on SH6A Stanley Street approximately 500m southeast of the intersection, had a growth rate of 2.1% per year over this period. The next nearest site, located on SH6A near Yewlett Crescent west of Frankton, had a growth rate of 3.8% per year over the same period. An intermediate value of 3% was considered appropriate to use for this analysis.

Growth has been assumed to be linear; therefore, 2015 traffic volumes were factored up by 3 years' growth, or 9%, to estimate the 2018 traffic volumes shown in Figure 6.

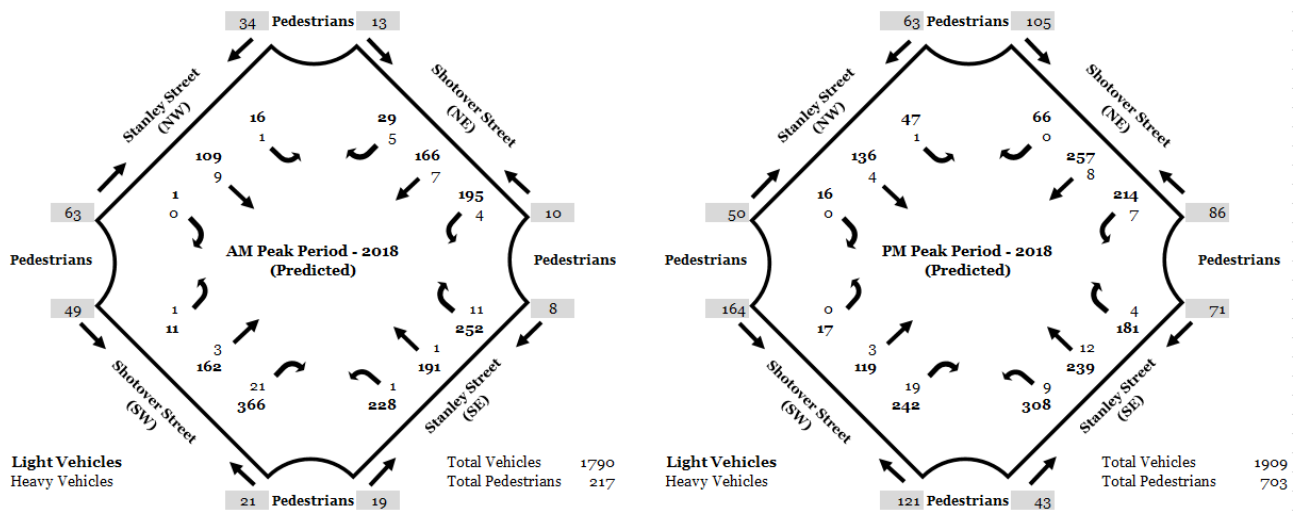


Figure 6 – Predicted Traffic and Pedestrian Volumes (2018)

2.3 2028 Traffic Volumes

The intersection performance was also assessed at a design year of 2028, which is 10 years after the estimated opening date. The growth was again calculated by adding 3% growth linearly for each year between 2018 and 2028 to a total of 30% growth on 2018 volumes. These predicted volumes for 2028 are shown in Figure 7.

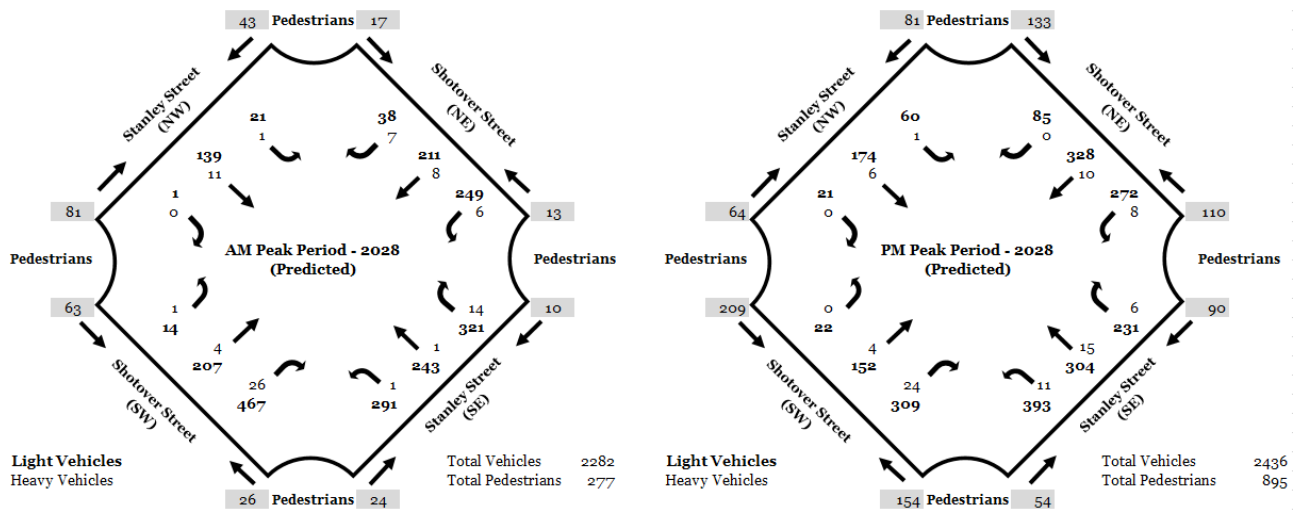


Figure 7 – Predicted Traffic and Pedestrian Volumes (2028)

3 Existing Intersection Performance

The intersection was modelled in SIDRA INTERSECTION 6.1.

3.1 Model Setup

The existing roundabout was modelled as a network with the following two components:

- The Stanley Street/Shotover Street roundabout; and
- The Shotover Street zebra crossing.

The layout of the SIDRA model for the existing roundabout is shown diagrammatically (not to scale) in Figure 8.

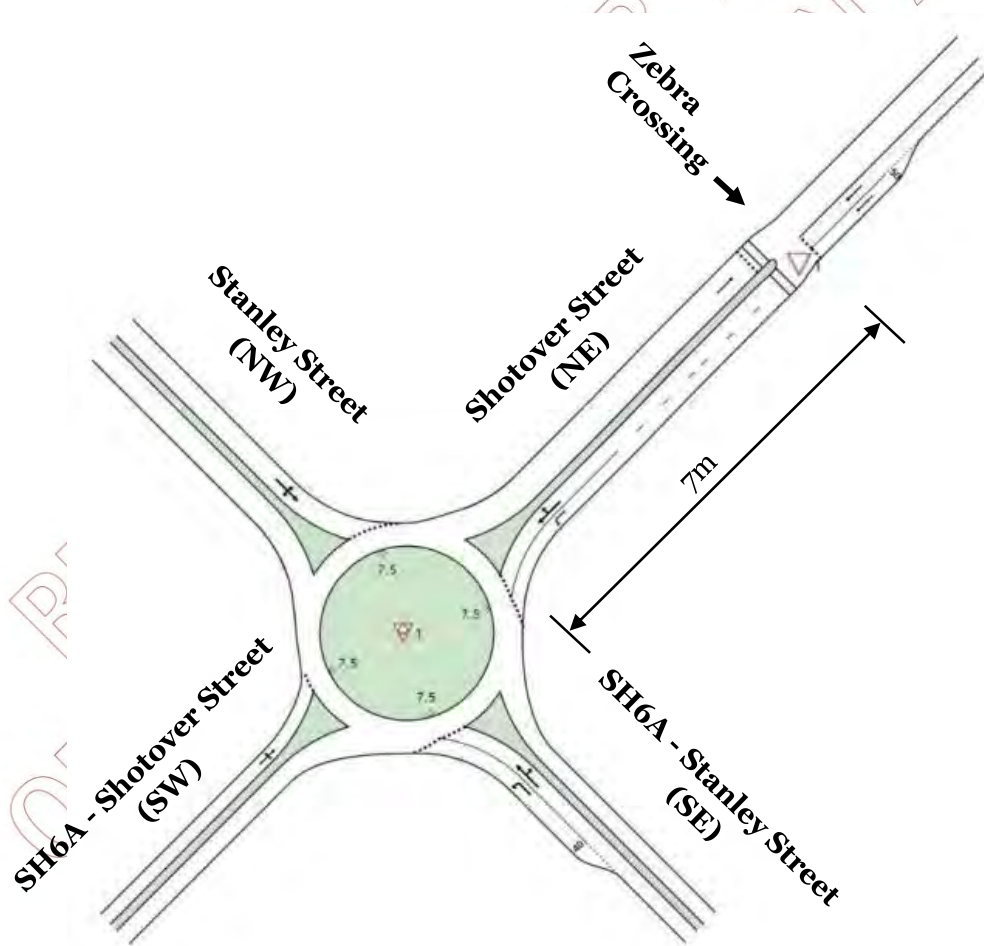


Figure 8 – Layout of existing intersection SIDRA model (not to scale)

The existing intersection was modelled with speeds of 50km/h, and a peak flow factor of 95% for 30 minutes. The roundabout geometry was measured from aerial photographs.

3.2 Calibration

In an attempt to calibrate the model of the existing roundabout to queue length observations, photographs were taken throughout the peak periods from the Skyline Gondola and Queenstown Hill. The photographs are included in Appendix A.

There were some limitations to the use of these photographs for calibration:

- Wider network effects influenced queue lengths observed at the intersection. Queues from adjacent intersections regularly extended into the Stanley Street/Shotover Street intersection. This may have caused lower throughput at the intersection, reverse priority (drivers letting others into gaps they would not normally let them into), and vehicle rerouting (approaching drivers seeing the queues and taking an alternative route if possible).
- Longer queues extended outside the photograph range, so their length could not be determined.
- In the AM peak period some queues were unable to be seen due to buildings obstructing visibility. This was resolved in the PM peak period by simultaneously taking a second set of photographs from a separate location.

One of the photographs is shown in Figure 9, showing the queue from the adjacent Stanley Street/Ballarat Street intersection extending back into the Stanley Street/Shotover Street intersection. Although it cannot be seen in this photograph, queues from the Shotover Street/Camp Street intersection to the southwest also extended back into the intersection.



Figure 9 - Queuing observed at intersection (5:10pm, Thursday 9 July 2015)

Due to the influence of the adjacent Stanley Street/Ballarat Street intersection on queue lengths, the calibration was investigated using a networked SIDRA model containing the intersections of Stanley Street/Shotover Street and Stanley Street/Ballarat Street. It is noted that whilst this model accounts for network effects from the Stanley Street/Ballarat Street intersection, it does not account for wider network effects from other intersections.

The 2015 AM and PM peak periods were modelled using default parameters for gap acceptance, follow up headway and environment factor. Table 2 compares the modelled 95th percentile queue lengths, with the worst observed queue lengths. A plus symbol after a number signifies a queue which extended beyond the edge of the photograph.

Table 2 - Modelled and Observed Queue Lengths

	Approach	Modelled Queue (m)	Observed Queue (m)	Comment
AM	Stanley Street (SE)	73	50	Similar lengths
	Shotover Street (NE)	165	65	Observed queue shorter due to wider network effects (vehicle rerouting and reverse priority)
	Stanley Street (NW)	22	65	Observed queue longer due to wider network effects (queues from adjacent intersections)
	Shotover Street (SW)	1,234	Not visible	
PM	Stanley Street (SE)	53	65	Similar lengths
	Shotover Street (NE)	600	250+	Similar lengths
	Stanley Street (NW)	32	100	Observed queue longer due to wider network effects (queues from adjacent intersections)
	Shotover Street (SW)	539	300+	Similar lengths

Queues modelled on the southeast approach are similar to the observed queues in both peak periods. Queues modelled on the northeast approach are similar to observed queues in the PM peak period (as far as can be ascertained from the photographs), and slightly longer in the AM peak period. This is thought to be due to wider network effects including vehicle rerouting and reverse priority. Queues modelled on the northwest are slightly shorter than observed queues in both peak periods. The photographs suggest this is due to queues from adjacent intersections limiting throughput at the intersection. Queues modelled on the southwest approach in the PM peak period are similar to observed queues (as far as can be ascertained from the photographs).

The roundabout parameters used in the modelling were originally chosen based on the intersection type, lane configuration, geometry and environment. The queue lengths modelled using these parameters appear to give a reasonable replication of the observed queue lengths. Of particular note is the fact that the southeast approach, which would be the least affected by wider network effects, returned similar modelled and observed queue lengths. However taking into consideration the limitations of the survey, an accurate calibration was not possible. The default parameters are therefore considered to be appropriate for this analysis.

3.3 2018 Base Year Results

The existing roundabout was modelled using traffic volumes for 2018. The results are summarised in Table 3. Detailed results including the network summary, roundabout summary, and zebra crossing summary are included for each time period in Appendix B. Queue lengths on the northeast approach are measured from the zebra crossing, whereas queue lengths on all other approaches are measured from the roundabout limit line.

Table 3 – 2018 Base Year Existing Roundabout Performance

Intersection Performance Measure	AM	PM
Intersection Level of Service (LoS)	F	E
Average Vehicle Delay (s)	92	46
LoS Stanley Street (SE)	C	C
LoS Shotover Street (NE)	F	F
LoS Stanley Street (NW)	B	B
LoS Shotover Street (SW)	F	F
95% Queue Length Stanley Street (SE)	95	115
95% Queue Length Shotover Street (NE)	161	313
95% Queue Length Stanley Street (NW)	12	18
95% Queue Length Shotover Street (SW)	740	240

Important points to note from Table 3 are:

- The intersection would operate at an overall LoS F in the AM peak period and E in the PM peak period.
- The northeast and southwest approaches would operate at LoS F in both peak periods.
- During the AM peak period the longest queue of 740m would occur on the southwest Shotover Street approach.
- During the PM peak period, the longest queue of 313m would occur on the northeast Shotover Street approach.

3.4 2028 Design Year Results

The existing roundabout was also modelled using predicted design year volumes for 2028. These results are summarised in Table 4, with detailed results included in Appendix B.

Table 4 – 2028 Design Year Existing Roundabout Performance

Intersection Performance Measure	AM	PM
Intersection LoS	F	F
Average Vehicle Delay (s)	255	149
LoS Stanley Street (SE)	E	F
LoS Shotover Street (NE)	F	F
LoS Stanley Street (NW)	B	B
LoS Shotover Street (SW)	F	F
95% Queue Length Stanley Street (SE) (m)	385	412
95% Queue Length Shotover Street (NE) (m)	318	669
95% Queue Length Stanley Street (NW) (m)	15	27
95% Queue Length Shotover Street (SW) (m)	1848	971

Important points to note from Table 4 are:

- The intersection would operate at an overall LoS F in both peak periods.
- The northwest approach would operate at LoS B in both peak periods, while all other approaches would operate at LoS E or F.
- In the AM peak period, the longest queue of 1.8km would occur on the southwest approach.
- In the PM peak period, the longest queue of 1km would occur on the southwest approach.

4 Signalised Intersection

4.1 Design

A concept layout plan for a proposed signalised intersection is attached in Appendix B, along with plans showing tracking paths for the design vehicles, which are a tour coach and a semi-trailer as specified in *RTS 18 New Zealand on-road tracking curves for heavy motor vehicles*. A 0.5m buffer around all vehicles has been provided.

The layout would not require any land acquisition.

The layout has been designed to accommodate a 12.6m tour coach without encroaching on adjacent lanes. Tracking paths of a 17.9m semi-trailer have also been checked. All movements can be completed by these vehicles, although some will require the trucks to encroach on adjacent lanes, in a similar manner to how large trucks currently manoeuvre through the existing roundabout.

The right-hand approach lanes on the southwest, northwest and northeast approaches have been set back to accommodate semi-trailers turning left into those approaches. This setback does not affect the traffic modelling. These setbacks could be reviewed in future if it is deemed unnecessary to accommodate these vehicle movements on all approaches.

Existing kerbs have been retained on all approaches except the southwest, where the buildout opposite Athol Street will need to be removed to accommodate the two approach lanes.

The proposal will result in the loss of 5 parking spaces; 1 on the Stanley Street northwest approach and 4 on Shotover Street southwest approach.

4.2 Modelling

The layout of the signalised intersection model is shown diagrammatically in Figure 10 below.

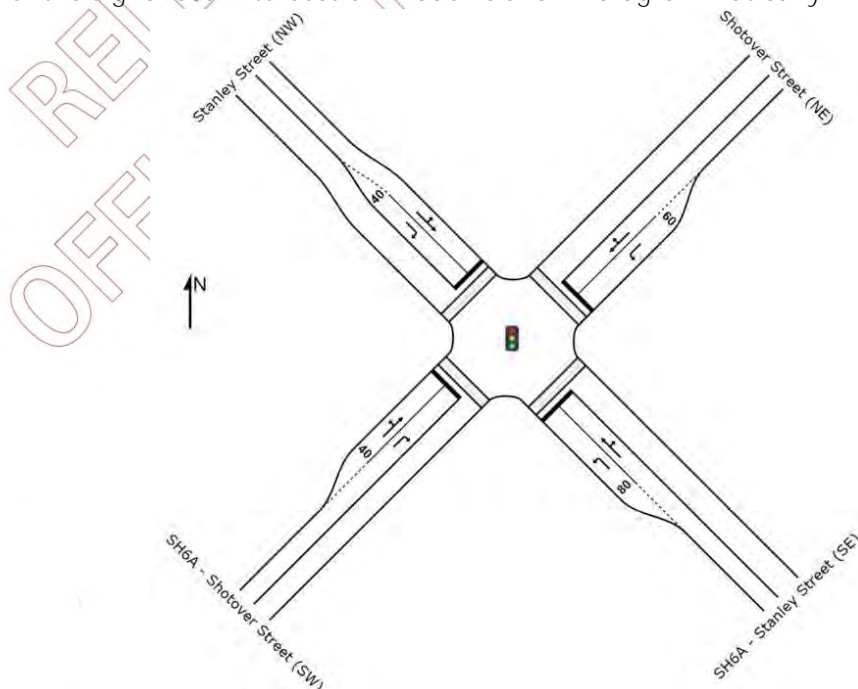


Figure 10 – Layout of signalised intersection SIDRA model (not to scale)

Gap acceptance parameters as recommended by *AustRoads Guide to Road Design Part 4A* were used. A peak flow factor of 95% was used with a 30 minute peak flow period.

Several phasing configurations were tested, with the best performing ones shown in Figure 11. The 2-phase arrangement resulted in the best intersection performance in the PM peak period, while the 4-phase arrangement resulted in the best intersection performance in the AM peak period. SIDRA was set to use the optimum cycle time with a maximum of 120 seconds.



Figure 11 – Phasing configurations

4.3 2018 Base Year Results

The base signalised intersection was modelled using 2018 traffic volumes. The results are summarised in Table 5, with full results included in Appendix D. The results from the existing roundabout modelling are also shown for ease of comparison.

Table 5 – Signalised Intersection 2018 Results

	AM Peak		PM Peak	
	Existing Roundabout	Proposed Signals (4 Phase)	Existing Roundabout	Proposed Signals (2 Phase)
Cycle Time	-	65	-	35
Average Vehicle LoS	F	C	E	B
Average Vehicle Delay (s)	92	24	46	15
Average Pedestrian LoS	-	C	-	B
Average Pedestrian Delay (s)	-	27	-	12
95% Queue Length Stanley Street (SE) (m)	95	88	115	38
95% Queue Length Shotover Street (NE) (m)	161	59	313	43
95% Queue Length Stanley Street (NW) (m)	12	39	18	18
95% Queue Length Shotover Street (SW) (m)	740	95	240	55

Important points to note from Table 5 are:

- The intersection would operate at LoS C in the AM peak period and LoS B in the PM peak period for vehicles.
- The traffic signals would result in a 68 second reduction in average vehicle delay in the AM peak period (compared to the existing roundabout), and a 31 second reduction in the PM peak period.
- The intersection would operate at LoS C in the AM peak period and LoS B in the PM peak period for pedestrians.
- The longest queue in the AM peak period of 95m would occur on the southwest approach. This is a 645m reduction compared to the longest queue with the existing roundabout.
- The longest queue in the PM peak period of 55m would occur on the southwest approach. This is a 258m reduction from the longest queue with the existing roundabout.

4.4 2028 Design Year Results

The signalised intersection was also modelled using 2028 traffic volumes. These results are summarised in Table 6, with detailed results included in Appendix D. The results from the existing roundabout modelling are also shown for ease of comparison.

Table 6 – Signalised Intersection 2028 Results

	AM Peak		PM Peak	
	Existing Roundabout	Proposed Signals (4 Phase)	Existing Roundabout	Proposed Signals (2 Phase)
Cycle Time	-	110	-	70
Average Vehicle LoS	F	E	F	D
Average Vehicle Delay (s)	255	58	149	52
Average Pedestrian LoS	-	E	-	B
Average Pedestrian Delay (s)	-	41	-	18
95% Queue Length Stanley Street (SE) (m)	385	230	412	135
95% Queue Length Shotover Street (NE) (m)	318	153	669	90
95% Queue Length Stanley Street (NW) (m)	15	94	27	41
95% Queue Length Shotover Street (SW) (m)	1848	358	971	331

Important points to note from Table 6 are:

- The intersection would operate at LoS E in the AM peak period and LoS D in the PM peak period for vehicles.
- The traffic signals would result in a 197 second reduction in average vehicle delay in the AM peak period (compared to the existing roundabout), and a 97 second reduction in the PM peak period.
- The intersection would operate at LoS E in the AM peak period and LoS B in the PM peak period for pedestrians.
- The longest queue in the AM peak period of 358m would occur on the southwest approach. This is a 1,490m reduction compared to the longest queue with the existing roundabout.
- The longest queue in the PM peak period of 331m would occur on the southwest approach. This is a 640m reduction compared to the longest queue with the existing roundabout.

4.5 Effect on Public Transport

The signalised intersection would result in reduced delays to buses travelling through the intersection. Table 7 shows the modelled delays that buses would experience using the existing roundabout and the proposed signalised intersection.

Table 7 - Modelled average delays (s) for bus movements

		Existing Roundabout				Signalised Intersection			
		2018		2028		2018		2028	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Bus 11	Outbound right turn: Shotover St (SW) into Stanley St (SE)	286	107	894	504	38	37	129	280
Bus 12	Outbound straight through on Shotover St: Northeastbound	103	107	892	506	13	11	20	15
	Inbound left turn: Shotover St (NE) into Stanley St (SE)	149	114	239	262	17	16	20	7

These results show that both buses will experience significantly lower delays in all peak periods under the signalised intersection.

RELEASED UNDER
OFFICIAL INFORMATION ACT

5 Network Model with Adjacent Stanley Street/Ballararat Street Intersection

The adjacent intersection of Stanley Street and Ballarat Street is located approximately 125m southeast of the Stanley Street/Shotover Street roundabout. The Transport Agency is currently investigating replacing the existing roundabout at this intersection with traffic signals. Opus produced a memorandum in May 2015 which included the preferred lane configuration and phasing, which are reproduced in Figure 12.

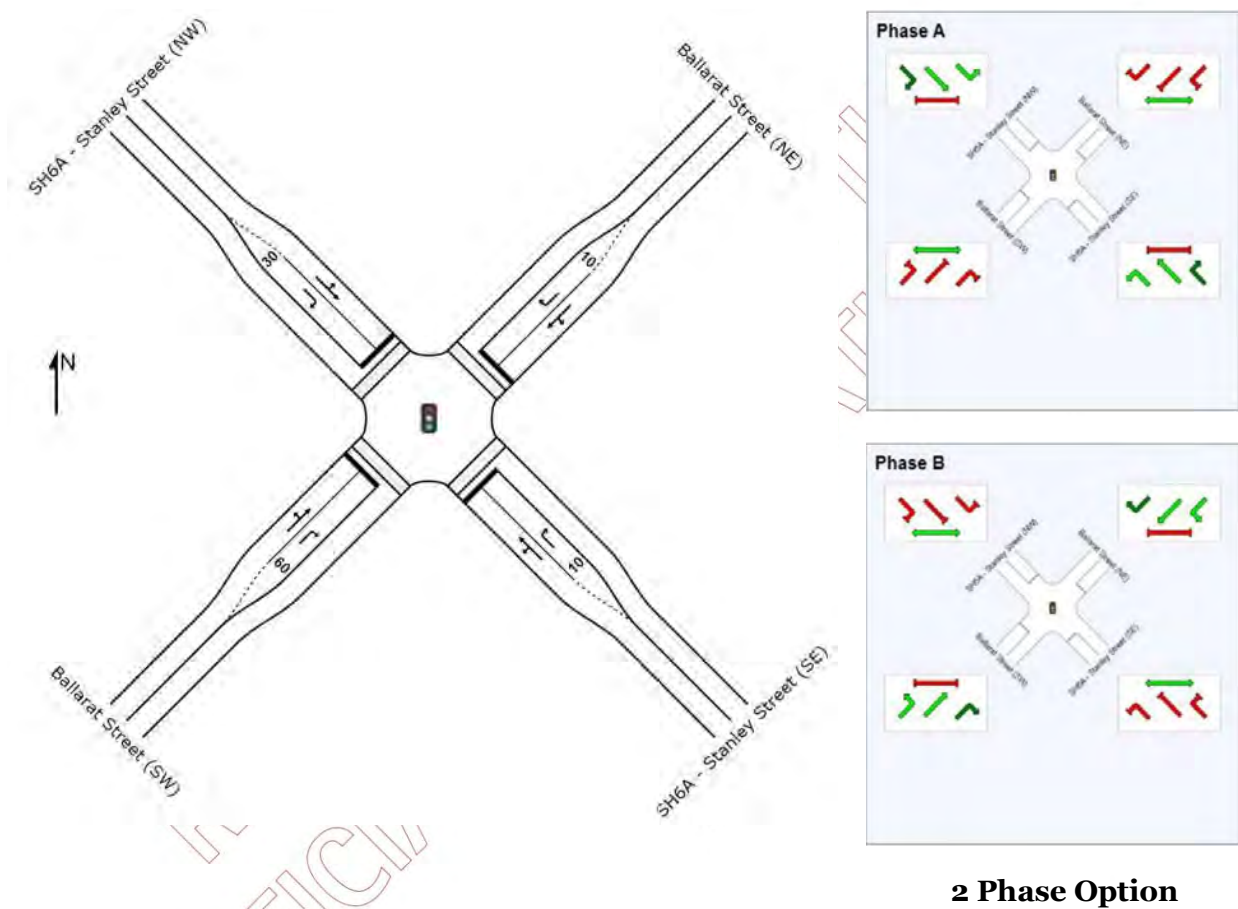


Figure 12 – Stanley Street/Ballararat Street preferred signalised lane configuration and phasing

It is noted that an alternative layout has been proposed in a memorandum dated 28 August 2015. This involves reducing the Ballarat Street northeast leg from two approach lanes to one approach lane. Traffic modelling (completed as part of the August memorandum) showed that performance under this layout would be almost identical to performance under the layout shown above. This change to the layout is not expected to significantly change any of the results reported in this chapter.

5.1 Results - Both Intersections Signalised

A network model was setup in SIDRA to assess effects of interactions between the two proposed signalised intersections. The network was setup with the configuration in Figure 13 (not to scale).

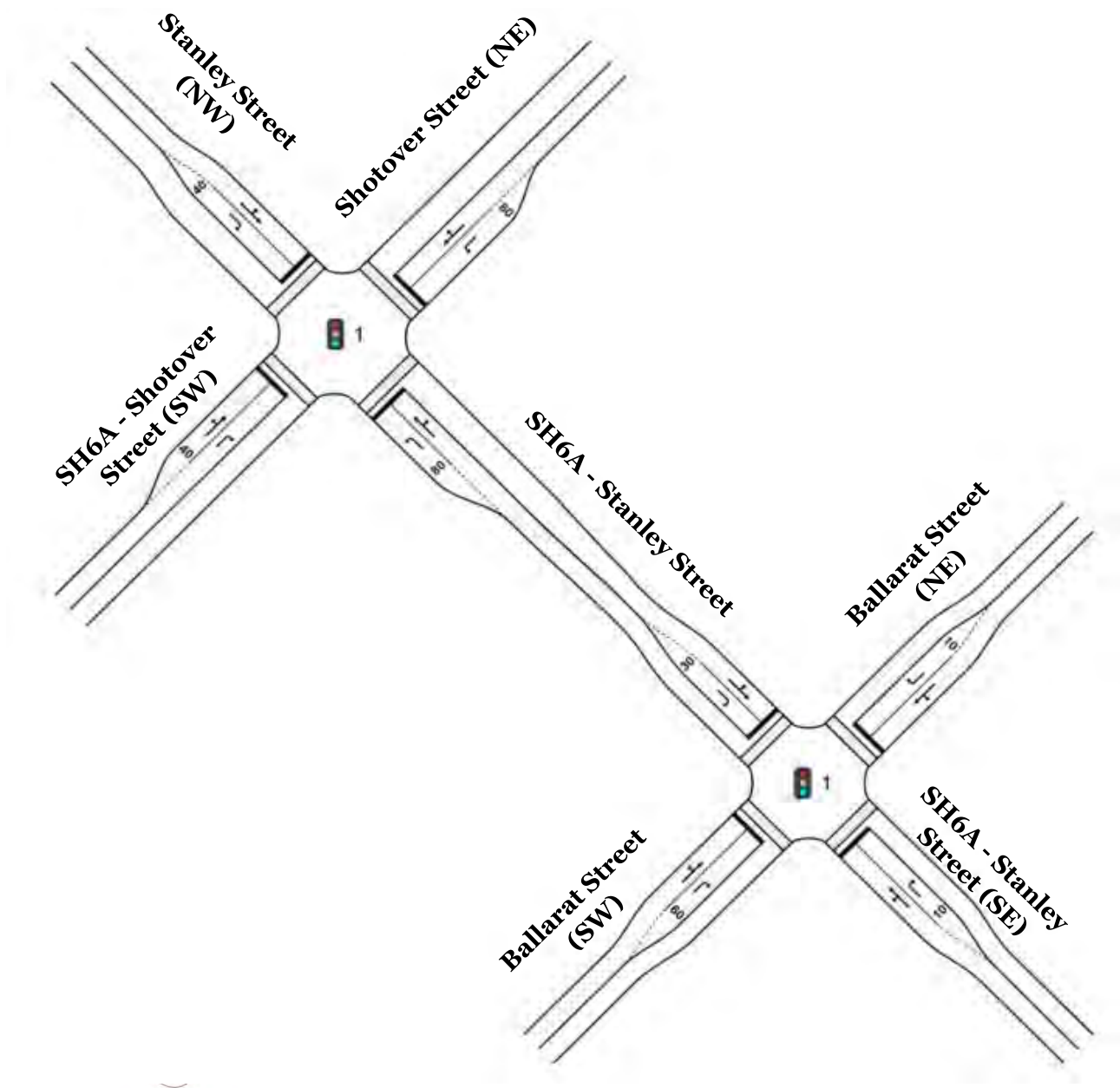


Figure 13 – SH6A – Stanley Street network model – both intersections signalised (not to scale)

The network was modelled using 2018 and 2028 traffic volumes. Traffic volumes at the Stanley Street/Ballarat Street intersection were factored up from the surveyed 2015 traffic volumes using the same methodology described earlier in this report for the Stanley Street/Shotover Street intersection. This involved assuming linear growth at a rate of 3% per annum. The resulting 2018 and 2028 traffic volumes are shown in Figure 14.

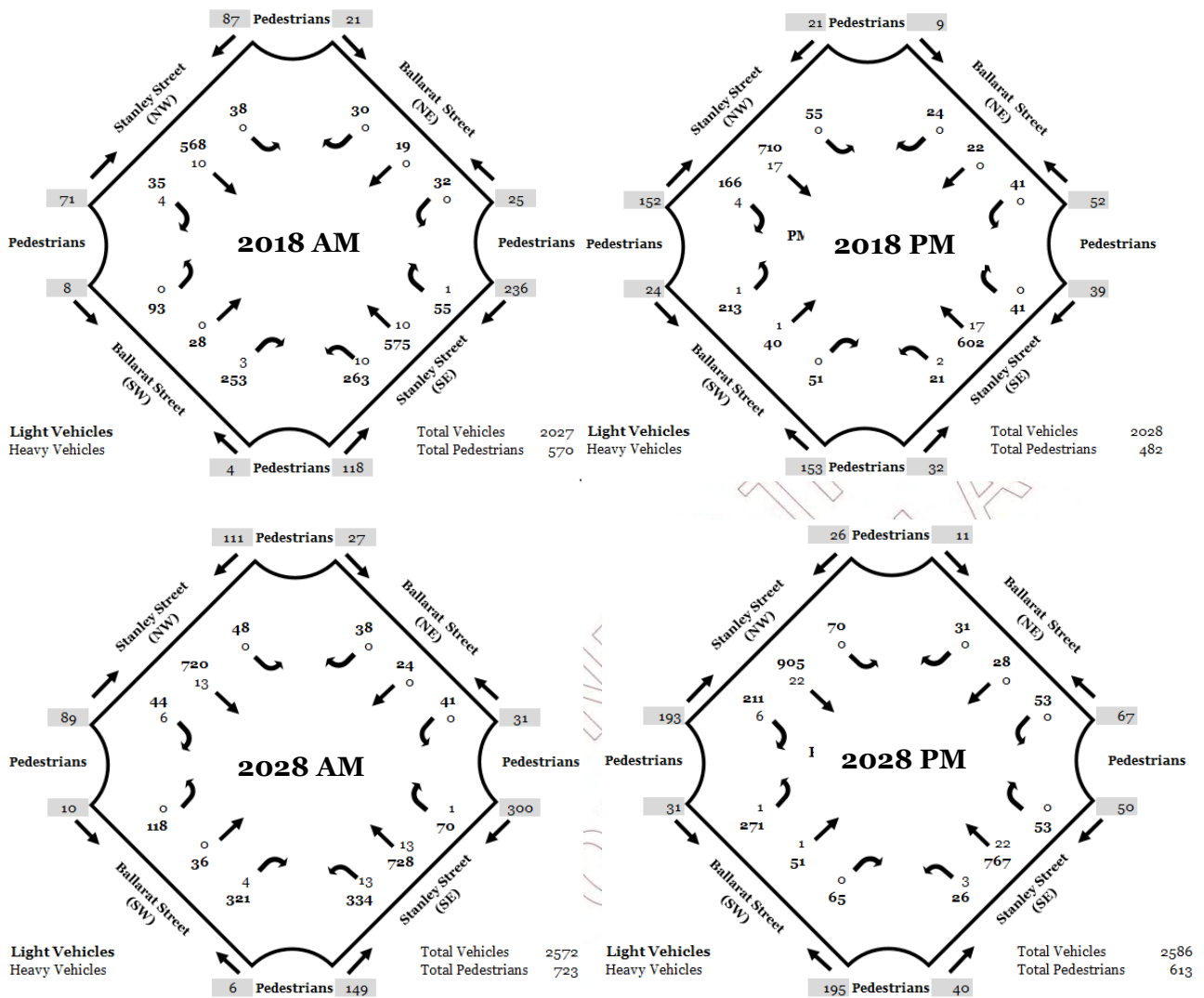


Figure 14 – Stanley Street/Ballarat Street traffic volumes

The results are summarised in Tables 8 and 9, with full results included in Appendix E. The results for the individually modelled intersections are also shown for ease of comparison.

Table 8 – 2018 network results (both intersections signalised)

	AM Peak				PM Peak			
	Individual Intersections		Networked Intersections		Individual Intersections		Networked Intersections	
	Shotover	Ballarat	Shotover	Ballarat	Shotover	Ballarat	Shotover	Ballarat
Cycle Time	65	80	80	80	35	55	55	55
Average Vehicle LoS	C	C	C	C	B	B	B	B
Average Vehicle Delay (s)	24	24	26	24	15	11	17	11
Average Pedestrian LoS	C	C	D	C	B	B	B	B
Average Pedestrian Delay (s)	27	27	32	27	12	16	16	16
SE Approach	88	271	83	271	38	97	26	97
NE Approach	59	13	74	13	43	11	58	11
NW Approach	39	8	48	8	18	21	23	21
SW Approach	95	87	105	87	55	54	81	54

Table 9 – 2028 network results (both intersections signalised)

	AM Peak				PM Peak			
	Individual Intersections		Networked Intersections		Individual Intersections		Networked Intersections	
	Shotover	Ballarat	Shotover	Ballarat	Shotover	Ballarat	Shotover	Ballarat
Cycle Time	110	95	75	75	70	60	75	75
Average Vehicle LoS	E	F	E	F	D	C	E	D
Average Vehicle Delay (s)	58	126	57	182	52	30	57	36
Average Pedestrian LoS	E	C	D	C	B	B	B	B
Average Pedestrian Delay (s)	41	29	32	21	18	17	18	19
SE Approach	230	1037	99	1322	135	174	119	282
NE Approach	153	19	95	14	90	15	96	18
NW Approach	94	20	60	23	41	128	43	103
SW Approach	358	276	339	116	331	153	359	156

Important points to note are:

- In 2018 the signalised intersections have little impact on each other.
- In the 2028 PM peak period the signalised intersections have little impact on each other.
- In the 2028 AM peak period the signalised intersections have a greater impact on each other.
 - Queues from the Stanley Street/Shotover Street intersection extend back into the Stanley Street/Ballarat Street intersection, which negatively affects its performance.
 - The Stanley Street/Ballarat Street intersection creates a high level of platooning for vehicles arriving at the Stanley Street/Shotover Street intersection, due to the high proportion of straight through movements along Stanley Street. This has a positive impact on intersection performance.
 - Conversely, the Stanley Street/Shotover Street intersection does not create such a high level of platooning in vehicles approaching the Stanley Street/Ballarat Street intersection from the northwest. Traffic entering this link at the Stanley Street/Shotover Street intersection is spread relatively evenly across all phases of the signal sequence, with significant traffic volumes from the southwest, northeast and northwest approaches. This lack of platooning results in a less significant positive impact on performance at the Stanley Street/Ballarat Street intersection.

RELEASED UNDER OFFICIAL INFORMATION ACT

5.2 Interim Results - Only Stanley Street/Ballararat Street Intersection Signalised

There is a possibility that the Stanley Street/Ballararat Street intersection will be signalised before the Stanley Street/Shotover Street intersection. Network models were set up in SIDRA to assess the operation of the two intersections together if the Stanley Street/Ballararat Street intersection was signalised before the Stanley Street/Shotover Street intersection.

The network was setup with the configuration in Figure 15 (not to scale):

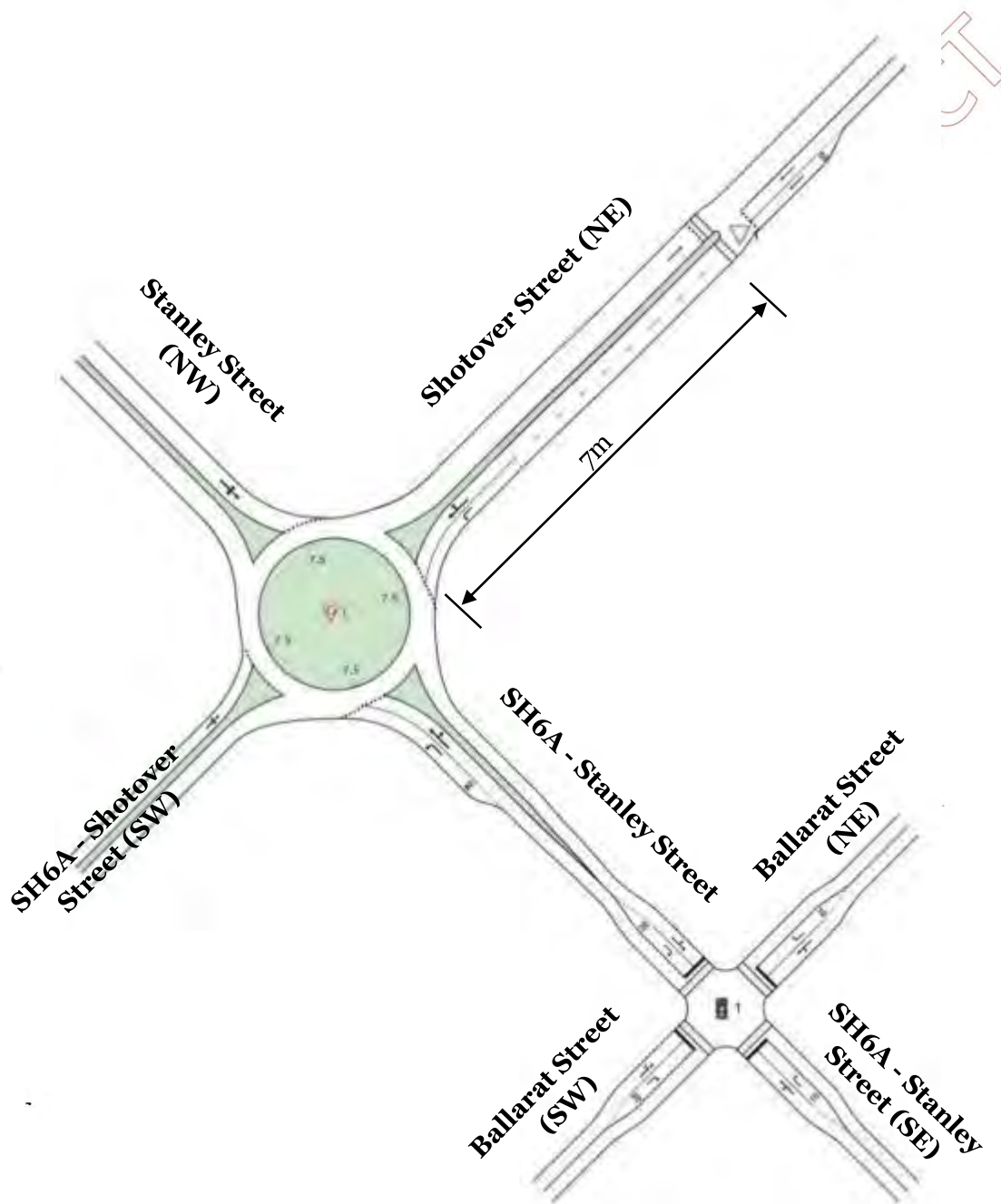


Figure 15 – Stanley Street network model – roundabout and signals (not to scale)

The existing network of 2 roundabouts was also modelled for comparison. The previous chapter of this report described the results of modelling a network of two signalised intersections. These results are repeated below for comparison. The three scenarios being compared are therefore:

- Network of 2 roundabouts;
- Network of 1 roundabout (Shotover Street) and 1 signalised intersection (Ballarat Street); and
- Network of 2 signalised intersections.

The results are summarised in Tables 10, 11, 12 and 13, with detailed results included in Appendix F. The results for the existing roundabout layouts and the two signalised intersections are also included for ease of comparison.

Table 10 – Interim network results - 2018 AM

	Both Intersections Roundabouts		Shotover Roundabout and Ballarat Signalised		Both Intersections Signalised	
	Shotover Roundabout	Ballarat Roundabout	Shotover Roundabout	Ballarat (2 Phase)	Shotover (4 Phase)	Ballarat (2 Phase)
Cycle Time	-	-	-	80	80	80
Average Vehicle LoS	F	F	F	C	C	C
Average Vehicle Delay (s)	303	98	94	27	26	24
Average Pedestrian LoS	-	-	-	C	D	C
Average Pedestrian Delay (s)	-	-	-	27	32	27
SE Approach 95% Queue (m)	91	486	81	267	83	271
NE Approach 95% Queue (m)	201	12	166	13	74	13
NW Approach 95% Queue (m)	24	311	13	100	48	8
SW Approach 95% Queue (m)	1527	185	702	87	105	87

Table 11 – Interim network results - 2018 PM

	Both Intersections Roundabouts		Shotover Roundabout and Ballarat Signalised		Both Intersections Signalised	
	Shotover Roundabout	Ballarat Roundabout	Shotover Roundabout	Ballarat Signalised	Shotover Signalised	Ballarat Signalised)
Cycle Time	-	-	-	70	55	55
Average Vehicle LoS	F	F	F	C	B	B
Average Vehicle Delay (s)	131	271	83	21	17	11
Average Pedestrian LoS	-	-	-	B	B	B
Average Pedestrian Delay (s)	-	-	-	19	16	16
SE Approach 95% Queue (m)	109	152	93	99	26	97
NE Approach 95% Queue (m)	443	15	443	14	58	11
NW Approach 95% Queue (m)	41	311	31	178	23	21
SW Approach 95% Queue (m)	814	37	579	78	81	54

Table 12 – Interim network results - 2028 AM

	Both Intersections Roundabouts		Shotover Roundabout and Ballarat Signalised		Both Intersections Signalised	
	Shotover Roundabout	Ballarat Roundabout	Shotover Roundabout	Ballarat Signalised)	Shotover Signalised	Ballarat Signalised
Cycle Time	-	-	-	120	75	75
Average Vehicle LoS	F	F	F	F	E	F
Average Vehicle Delay (s)	495	181	313	158	57	182
Average Pedestrian LoS	-	-	-	D	D	C
Average Pedestrian Delay (s)	-	-	-	32	32	21
SE Approach 95% Queue (m)	146	1187	170	1167	99	1322
NE Approach 95% Queue (m)	362	15	982	24	95	14
NW Approach 95% Queue (m)	39	311	23	153	60	23
SW Approach 95% Queue (m)	2302	491	1889	333	339	116

Table 13 – Interim network results - 2028 PM

	Both Intersections Roundabouts		Shotover Roundabout and Ballarat Signalised		Both Intersections Signalised	
	Shotover Roundabout	Ballarat Roundabout	Shotover Roundabout	Ballarat Signalised	Shotover Signalised	Ballarat Signalised
Cycle Time	-	-	-	120	75	75
Average Vehicle LoS	F	F	F	F	E	D
Average Vehicle Delay (s)	294	488	280	268	57	36
Average Pedestrian LoS	-	-	-	C	B	B
Average Pedestrian Delay (s)	-	-	-	25	18	19
SE Approach 95% Queue (m)	311	662	278	757	119	282
NE Approach 95% Queue (m)	669	22	669	27	96	18
NW Approach 95% Queue (m)	77	311	78	204	43	103
SW Approach 95% Queue (m)	1552	591	1531	391	359	156

Important points to note are:

- In all peak periods the two signalised intersections would provide the highest LoS.
- In all peak periods the two roundabouts would provide the lowest LoS.
- In all peak periods the roundabout and signalised intersection combination would provide a LoS in between the other 2 scenarios.
- In the roundabout-signals combination network, the Stanley Street/Shotover Street intersection would experience some benefits from the signalisation of the adjacent intersection. This is due to reduced queues at the adjacent intersection, as well as a higher degree of platooning in arriving traffic.
- In the roundabout-signals combination network, the Stanley Street/Shotover Street intersection would operate at LoS F and E in the AM and PM peak periods respectively in 2018.
- In the roundabout-signals combination network, the Stanley Street/Shotover Street intersection would operate at LoS F in both peak periods in 2028.
- In the 2018 AM and PM peak periods, 95th percentile queues from the Stanley Street/Shotover Street intersection will not extend into the Stanley Street/Ballararat Street intersection under any of the 3 scenarios.
- In the 2028 AM and PM peak periods, 95th percentile queues from the Stanley Street/Shotover Street intersection will not extend into the Stanley Street/Ballararat Street intersection if both intersections are signalised, but will if the Stanley Street/Shotover Street intersection remains a roundabout.

6 Conclusion

The existing roundabout is operating at low levels of service with long queues and delays, which will increase as the volume of traffic using the intersection increases in future. A concept layout of a signalised intersection has been prepared. It can be accommodated within the existing road reserve.

The table below summarises the performance of the existing roundabout and proposed signalised intersection at 2018 and 2028.

Table 14 - Summary of Results for Do Minimum and Signalised Intersection

	Do Minimum				Signalised Intersection			
	2018		2028		2018		2028	
	AM	PM	AM	PM	AM	PM	AM	PM
Intersection LoS	F	E	F	F	C	B	E	D
Average Vehicle Delay (s)	92	46	255	149	24	15	58	52
Worst 95 th Percentile Queue Length (m)	740	313	1848	971	95	55	358	331

The signalised intersection would perform significantly better than the existing roundabout in all peak periods. In 2018 it would operate at LoS C in the AM peak period and LoS B in the PM peak period, compared to the existing roundabout which would operate at LoS F in the AM peak period and LoS E in the PM peak period. In 2028 it would operate at LoS E in the AM peak period and LoS D in the PM peak period, compared to the existing roundabout, which would operate at LoS F in both peak periods.

A separate proposal to signalise the nearby Stanley Street/Ballarat Street intersection was modelled in a network with the Stanley Street/Shotover Street intersection. This showed that the intersections will have some interaction with each other. In the 2018 AM and PM peak periods, and the 2028 PM peak period, these interactions are small, with average delays increasing by 6 seconds or less when the intersections are modelled together in a network. In the 2028 AM peak period the interactions are more substantial, with average delays at the Stanley Street/Ballarat Street intersection increasing from 126 seconds to 182 seconds when the intersections are modelled together in a network.

Modelling was undertaken to assess the impact if the Stanley Street/Ballarat Street intersection was signalised and the Stanley Street/Shotover Street intersection roundabout was retained. The modelling showed that the roundabout would experience some benefits, but would still operate at LoS E or F in all peak periods.

It is recommended that the signalised intersection layout is investigated further based on the significant improvement in intersection performance.



Appendix A – Queue Length Photograph Diagrams

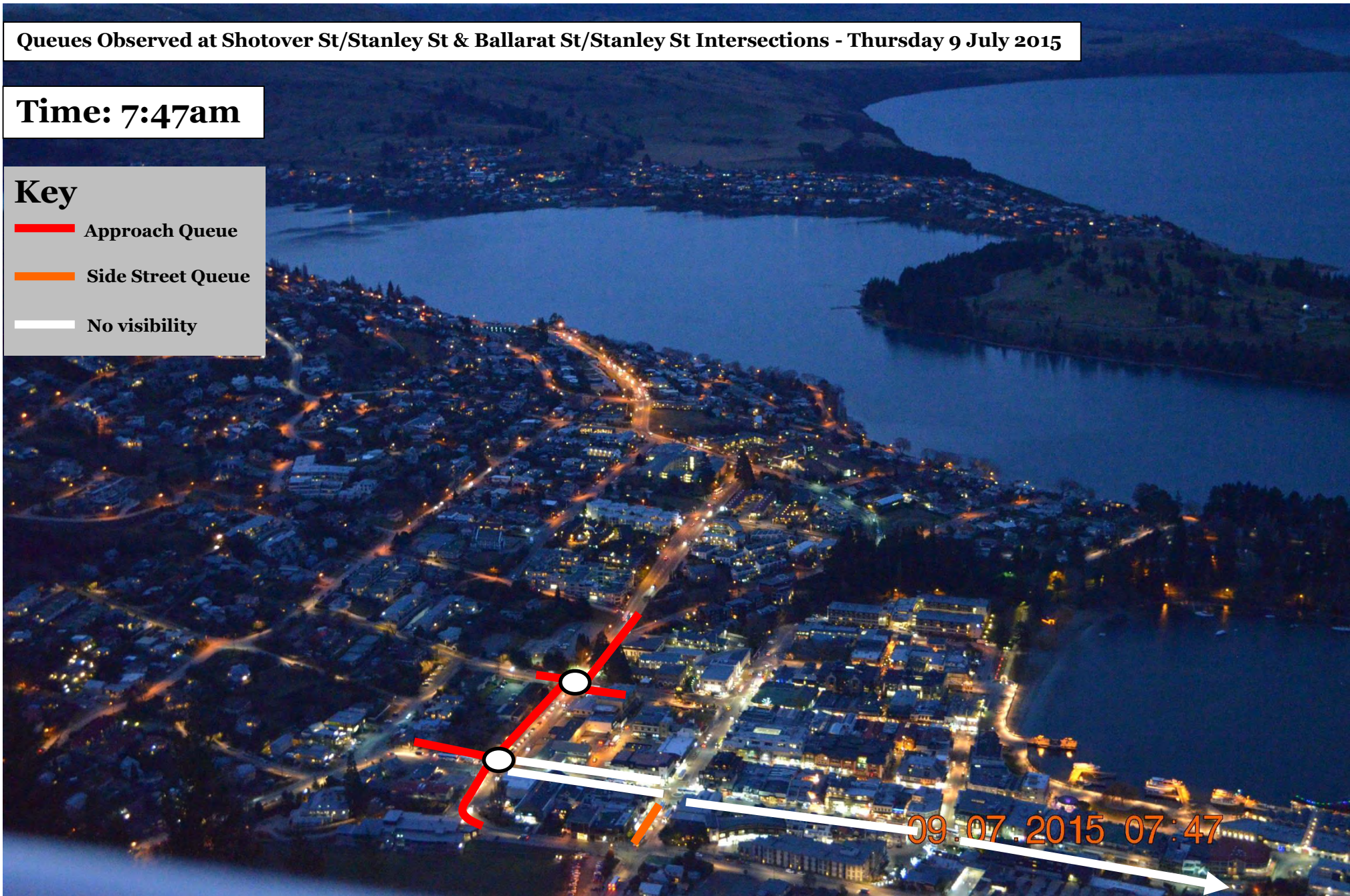
RELEASED UNDER THE
OFFICIAL INFORMATION ACT

Queues Observed at Shotover St/Stanley St & Ballarat St/Stanley St Intersections - Thursday 9 July 2015

Time: 7:47am

Key




-  Approach Queue
-  Side Street Queue
-  No visibility



Queues Observed at Shotover St/Stanley St & Ballarat St/Stanley St Intersections - Thursday 9 July 2015

Time: 7:58am

Key

-  Approach Queue
-  Side Street Queue
-  No visibility



Queues Observed at Shotover St/Stanley St & Ballarat St/Stanley St Intersections - Thursday 9 July 2015

Time: 8:13am

Key




- Approach Queue
- Side Street Queue
- No visibility



Queues Observed at Shotover St/Stanley St & Ballarat St/Stanley St Intersections - Thursday 9 July 2015

Time: 8:39am

Key

-  Approach Queue
-  Side Street Queue
-  No visibility

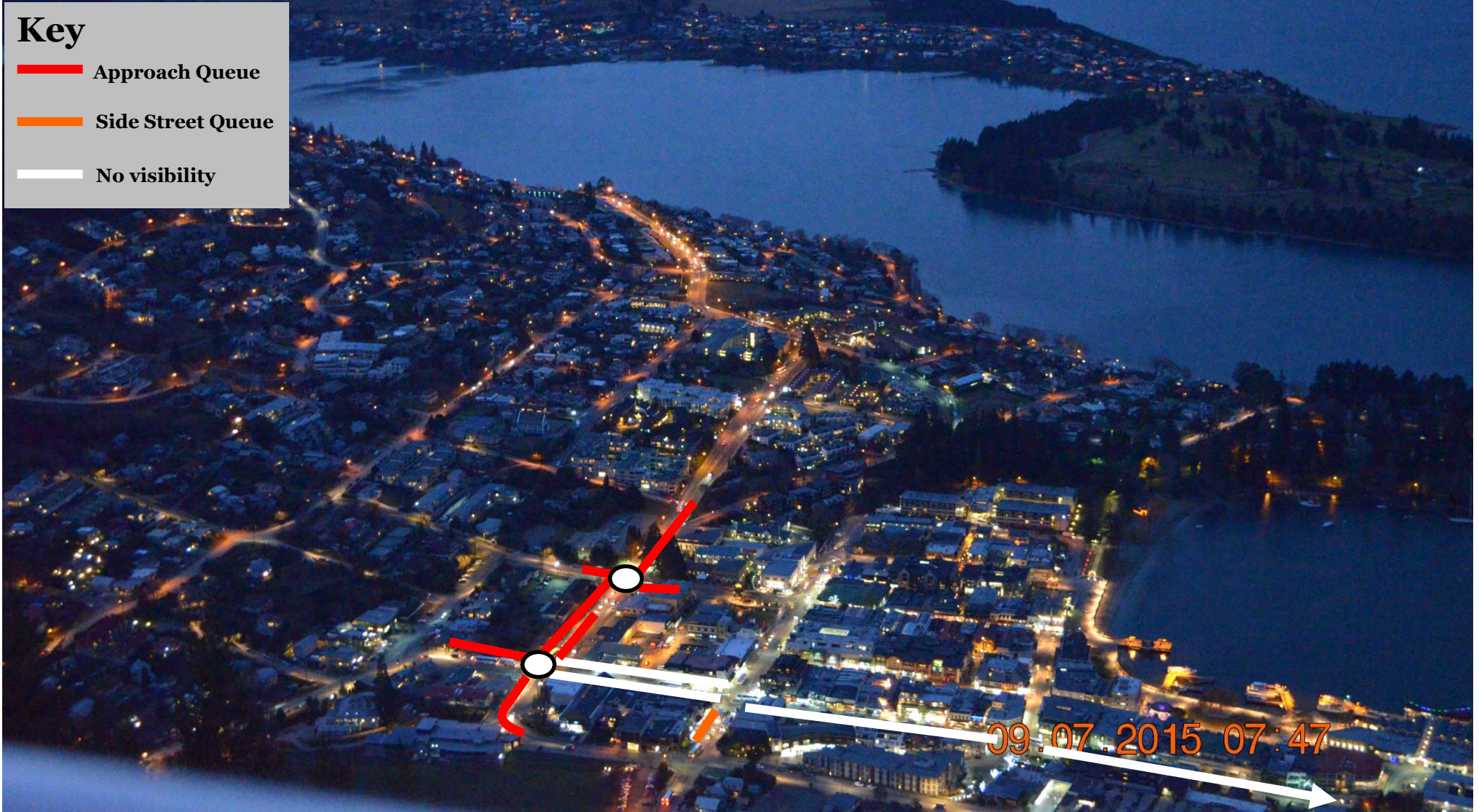


Queues Observed at Shotover St/Stanley St & Ballarat St/Stanley St Intersections - Thursday 9 July 2015

Overview of worst cases: 7:47am to 8:39am

Key

-  Approach Queue
-  Side Street Queue
-  No visibility





Queues Observed at Shotover St/Stanley St & Ballarat St/Stanley St Intersections - Thursday 9 July 2015

(Queues on Shotover Street were assessed from additional photographs taken from Queenstown Hill during the PM peak period)

Time: 4:46pm

Key

-  Approach Queue
-  Side Street Queue
-  No visibility






Queues Observed at Shotover St/Stanley St & Ballarat St/Stanley St Intersections - Thursday 9 July 2015

(Queues on Shotover Street were assessed from additional photographs taken from Queenstown Hill during the PM peak period)

Time: 4:58pm

Key

-  Approach Queue
-  Side Street Queue
-  No visibility






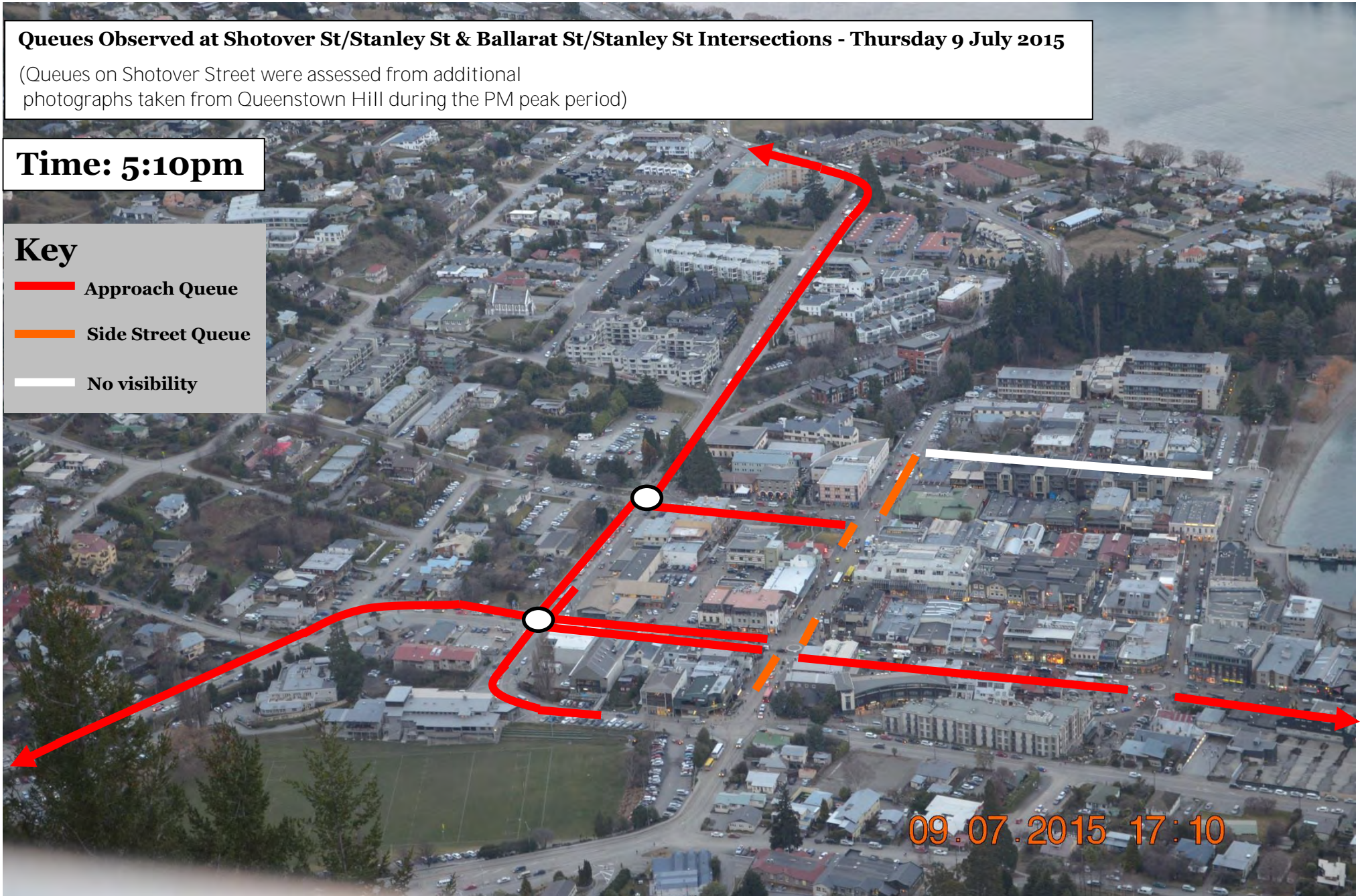
Queues Observed at Shotover St/Stanley St & Ballarat St/Stanley St Intersections - Thursday 9 July 2015

(Queues on Shotover Street were assessed from additional photographs taken from Queenstown Hill during the PM peak period)

Time: 5:10pm

Key

-  Approach Queue
-  Side Street Queue
-  No visibility






Queues Observed at Shotover St/Stanley St & Ballarat St/Stanley St Intersections - Thursday 9 July 2015

(Queues on Shotover Street were assessed from additional photographs taken from Queenstown Hill during the PM peak period)

Time: 5:22pm

Key

-  Approach Queue
-  Side Street Queue
-  No visibility




Queues Observed at Shotover St/Stanley St & Ballarat St/Stanley St Intersections - Thursday 9 July 2015

(Queues on Shotover Street were assessed from additional photographs taken from Queenstown Hill during the PM peak period)

Overview of worst cases: 4:46pm to 5:22pm

Key

-  Approach Queue
-  Side Street Queue
-  No visibility



Appendix B – Detailed SIDRA Outputs for Existing Roundabout

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

NETWORK SUMMARY

Network: AM Peak - 2018

New Network

Network Performance - Hourly Values			
Performance Measure	Vehicles	Per Unit Distance	Persons
Network Level of Service (LOS)	LOS F		
Travel Time Index	1.00		
Speed Efficiency	0.19		
Congestion Coefficient	5.27		
Travel Speed (Average)	9.5 km/h		9.5 km/h
Travel Distance (Total)	829.8 veh-km/h		995.7 pers-km/h
Travel Time (Total)	87.4 veh-h/h		104.9 pers-h/h
Desired Speed	50.0 km/h		
Demand Flows (Total)	2780 veh/h		3302 pers/h
Arrival Flows (Total)	2752 veh/h		3302 pers/h
Percent Heavy Vehicles (Demand)	3.6 %		
Percent Heavy Vehicles (Arrival)	3.6 %		
Degree of Saturation	1.245		
Control Delay (Total)	70.47 veh-h/h		84.57 pers-h/h
Control Delay (Average)	92.2 sec		92.2 sec
Control Delay (Worst Lane)	285.0 sec		
Control Delay (Worst Movement)	286.0 sec		286.0 sec
Geometric Delay (Average)	3.7 sec		
Stop-Line Delay (Average)	88.5 sec		
Queue Storage Ratio (Worst Lane)	2.98		
Total Effective Stops	3864 veh/h		4637 pers/h
Effective Stop Rate	1.40 per veh	4.7 per km	1.40 per pers
Proportion Queued	0.77		0.77
Performance Index	404.0		404.0
Cost (Total)	2406.06 \$/h	2.90 \$/km	2406.06 \$/h
Fuel Consumption (Total)	202.9 L/h	244.6 mL/km	
Fuel Economy	24.5 L/100km		
Carbon Dioxide (Total)	480.1 kg/h	578.6 g/km	
Hydrocarbons (Total)	0.114 kg/h	0.138 g/km	
Carbon Monoxide (Total)	0.881 kg/h	1.062 g/km	
NOx (Total)	0.734 kg/h	0.884 g/km	

Network Model Accuracy Level (largest change in degree of saturation for any lane): 1.5 %

Number of Iterations: 10

Network Level of Service (LOS) Method: SIDRA Speed Efficiency.

Model used: New Zealand.

Network Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1,334,400 veh/y	1,584,981 pers/y
Delay	33,828 veh-h/y	40,593 pers-h/y
Effective Stops	1,854,804 veh/y	2,225,764 pers/y
Travel Distance	398,282 veh-km/y	477,938 pers-km/y
Travel Time	41,959 veh-h/y	50,351 pers-h/y
Cost	1,154,911 \$/y	1,154,911 \$/y
Fuel Consumption	97,404 L/y	
Carbon Dioxide	230,439 kg/y	
Hydrocarbons	55 kg/y	
Carbon Monoxide	423 kg/y	
NOx	352 kg/y	

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Monday, 3 August 2015 4:40:23 p.m.

Project: G:\NZTA\Reg 1316-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St Only\Shotover Street_Stanley Street Model.sip6

MOVEMENT SUMMARY

Site: Base Model - AM Peak - 2018

Network: AM Peak - 2018

Shotover Street/ Stanley Street Intersection
Roundabout

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: SH6A - Stanley Street (SE)													
4	L2	241	0.4	241	0.4	0.266	6.2	LOS A	1.7	12.0	0.54	0.62	34.3
5	T1	202	0.5	202	0.5	0.661	34.5	LOS C	13.3	95.0	1.00	0.78	18.6
6	R2	277	4.2	277	4.2	0.661	37.7	LOS D	13.3	95.0	1.00	0.78	11.4
Approach		720	1.9	720	1.9	0.661	26.3	LOS C	13.3	95.0	0.84	0.72	18.6
NorthEast: Shotover Street (NE)													
7	L2	209	2.0	209	2.0	0.260	5.0	LOS A	1.8	12.9	0.73	0.71	30.6
8	T1	182	4.0	182	4.0	0.251	4.7	LOS A	1.8	13.0	0.72	0.69	32.1
9	R2	36	14.7	36	14.7	0.251	7.4	LOS A	1.8	13.0	0.72	0.69	33.0
Approach		427	3.9	427	3.9	0.260	5.1	LOS A	1.8	13.0	0.72	0.70	31.4
NorthWest: Stanley Street (NW)													
10	L2	18	5.9	18	5.9	0.264	11.1	LOS B	1.6	12.2	0.81	0.85	26.4
11	T1	124	7.6	124	7.6	0.264	10.9	LOS B	1.6	12.2	0.81	0.85	32.6
12	R2	1	0.0	1	0.0	0.264	13.6	LOS B	1.6	12.2	0.81	0.85	31.8
Approach		143	7.4	143	7.4	0.264	10.9	LOS B	1.6	12.2	0.81	0.85	32.1
SouthWest: SH6A - Shotover Street (SW)													
1	L2	13	8.3	13	8.3	1.245	283.4	LOS F	101.9	740.3	1.00	4.43	3.2
2	T1	174	1.8	174	1.8	1.245	282.6	LOS F	101.9	740.3	1.00	4.43	1.5
3	R2	407	5.4	407	5.4	1.245	286.0	LOS F	101.9	740.3	1.00	4.43	3.0
Approach		594	4.4	594	4.4	1.245	285.0	LOS F	101.9	740.3	1.00	4.43	2.6
All Vehicles		1884	3.6	1884	3.6	1.245	101.8	LOS F	101.9	740.3	0.86	1.90	6.3

Level of Service (LOS) Method: Delay (HCM 2000).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Monday, 3 August 2015 4:40:23 p.m.

Project: G:\NZTA\Reg 13\6-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St Only\Shotover Street_Stanley Street Model.sip6

MOVEMENT SUMMARY

Site: Base Model - AM Peak - 2018

Network: AM Peak - 2018

Unsignalised pedestrian (Zebra) crossing across two-way road
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Shotover Street Continuation (NE)													
8	T1	427	3.9	427	3.9	0.364	143.6	LOS F	22.3	161.0	1.00	0.29	10.2
Approach		427	3.9	427	3.9	0.364	143.6	LOS F	22.3	161.0	1.00	0.29	10.2
SouthWest: Shotover Street (From NE Leg)													
2	T1	468	3.4	440	3.5	0.470	1.2	LOS A	2.4	17.4	0.14	0.37	47.6
Approach		468	3.4	440 ^{N1}	3.5	0.470	1.2	LOS A	2.4	17.4	0.14	0.37	47.6
All Vehicles		896	3.6	867 ^{N1}	3.8	0.470	71.3	NA	22.3	161.0	0.57	0.33	17.0

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: Akçelik M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^{N1} Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Monday, 3 August 2015 4:40:23 p.m.

Project: G:\NZTA\Reg 13\6-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St Only\Shotover Street_Stanley Street Model.sip6

RELEASED UNDER THE OFFICIAL INFORMATION ACT

NETWORK SUMMARY

Network: PM Peak - 2018

New Network

Network Performance - Hourly Values			
Performance Measure	Vehicles	Per Unit Distance	Persons
Network Level of Service (LOS)	LOS E		
Travel Time Index	2.45		
Speed Efficiency	0.32		
Congestion Coefficient	3.12		
Travel Speed (Average)	16.0 km/h		16.0 km/h
Travel Distance (Total)	902.1 veh-km/h		1082.5 pers-km/h
Travel Time (Total)	56.2 veh-h/h		67.5 pers-h/h
Desired Speed	50.0 km/h		
Demand Flows (Total)	2964 veh/h		3557 pers/h
Arrival Flows (Total)	2964 veh/h		3557 pers/h
Percent Heavy Vehicles (Demand)	3.2 %		
Percent Heavy Vehicles (Arrival)	3.2 %		
Degree of Saturation	0.975		
Control Delay (Total)	37.79 veh-h/h		45.35 pers-h/h
Control Delay (Average)	45.9 sec		45.9 sec
Control Delay (Worst Lane)	136.4 sec		
Control Delay (Worst Movement)	108.8 sec		108.8 sec
Geometric Delay (Average)	3.5 sec		
Stop-Line Delay (Average)	42.4 sec		
Queue Storage Ratio (Worst Lane)	1.00		
Total Effective Stops	3674 veh/h		4408 pers/h
Effective Stop Rate	1.24 per veh	4.1 per km	1.24 per pers
Proportion Queued	0.83		0.83
Performance Index	214.9		214.9
Cost (Total)	1632.85 \$/h	1.81 \$/km	1632.85 \$/h
Fuel Consumption (Total)	165.1 L/h	183.0 mL/km	
Fuel Economy	18.3 L/100km		
Carbon Dioxide (Total)	390.3 kg/h	432.7 g/km	
Hydrocarbons (Total)	0.107 kg/h	0.119 g/km	
Carbon Monoxide (Total)	0.851 kg/h	0.943 g/km	
NOx (Total)	0.634 kg/h	0.702 g/km	

Network Model Accuracy Level (largest change in degree of saturation for any lane): 2.0 %

Number of Iterations: 10

Network Level of Service (LOS) Method: SIDRA Speed Efficiency.

Model used: New Zealand.

Network Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1,422,821 veh/y	1,707,385 pers/y
Delay	18,141 veh-h/y	21,769 pers-h/y
Effective Stops	1,763,354 veh/y	2,116,024 pers/y
Travel Distance	433,006 veh-km/y	519,607 pers-km/y
Travel Time	26,983 veh-h/y	32,380 pers-h/y
Cost	783,767 \$/y	783,767 \$/y
Fuel Consumption	79,244 L/y	
Carbon Dioxide	187,363 kg/y	
Hydrocarbons	51 kg/y	
Carbon Monoxide	408 kg/y	
NOx	304 kg/y	

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Monday, 3 August 2015 4:40:08 p.m.

Project: G:\NZTA\Reg 1316-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St Only\Shotover Street_Stanley Street Model.sip6

MOVEMENT SUMMARY

Site: Base Model - PM Peak - 2018

Network: PM Peak - 2018

Shotover Street/ Stanley Street Intersection
Roundabout

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Arrival Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: SH6A - Stanley Street (SE)													
4	L2	334	2.8	334	2.8	0.421	7.4	LOS A	2.8	19.9	0.70	0.74	32.8
5	T1	264	4.8	264	4.8	0.718	39.8	LOS D	15.9	114.8	1.00	1.29	17.1
6	R2	195	2.2	195	2.2	0.718	42.7	LOS D	15.9	114.8	1.00	1.29	10.3
Approach		793	3.3	793	3.3	0.718	26.9	LOS C	15.9	114.8	0.87	1.05	19.0
NorthEast: Shotover Street (NE)													
7	L2	233	3.2	233	3.2	0.306	5.4	LOS A	2.1	15.1	0.73	0.73	29.8
8	T1	279	3.0	279	3.0	0.382	4.9	LOS A	2.4	17.4	0.75	0.73	31.6
9	R2	69	0.0	69	0.0	0.382	7.2	LOS A	2.4	17.4	0.75	0.73	34.9
Approach		581	2.7	581	2.7	0.382	5.4	LOS A	2.4	17.4	0.75	0.73	31.3
NorthWest: Stanley Street (NW)													
10	L2	51	2.1	51	2.1	0.366	12.6	LOS B	2.6	18.3	0.85	0.86	24.5
11	T1	147	2.9	147	2.9	0.366	12.3	LOS B	2.6	18.3	0.85	0.86	31.3
12	R2	17	0.0	17	0.0	0.366	15.2	LOS B	2.6	18.3	0.85	0.86	30.1
Approach		215	2.5	215	2.5	0.366	12.6	LOS B	2.6	18.3	0.85	0.86	29.9
SouthWest: SH6A - Shotover Street (SW)													
1	L2	18	0.0	18	0.0	0.975	103.5	LOS F	32.8	240.1	1.00	2.38	7.8
2	T1	128	2.5	128	2.5	0.975	103.6	LOS F	32.8	240.1	1.00	2.38	3.9
3	R2	275	7.3	275	7.3	0.975	107.2	LOS F	32.8	240.1	1.00	2.38	7.2
Approach		421	5.5	421	5.5	0.975	105.9	LOS F	32.8	240.1	1.00	2.38	6.3
All Vehicles		2009	3.5	2009	3.5	0.975	35.7	LOS D	32.8	240.1	0.86	1.22	14.5

Level of Service (LOS) Method: Delay (HCM 2000).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Monday, 3 August 2015 4:40:08 p.m.

Project: G:\NZTA\Reg 13\6-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St Only\Shotover Street_Stanley Street Model.sip6

MOVEMENT SUMMARY

Site: Base Model - PM Peak - 2018

Network: PM Peak - 2018

Unsignalised pedestrian (Zebra) crossing across two-way road
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows		Arrival Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %	Total veh/h	HV %								
NorthEast: Shotover Street Continuation (NE)													
8	T1	581	2.7	581	2.7	0.638	108.8	LOS F	43.7	313.3	1.00	1.77	12.6
Approach		581	2.7	581	2.7	0.638	108.8	LOS F	43.7	313.3	1.00	1.77	12.6
SouthWest: Shotover Street (From NE Leg)													
2	T1	374	2.3	374	2.3	0.462	2.9	LOS A	2.4	17.4	0.44	0.53	45.6
Approach		374	2.3	374	2.3	0.462	2.9	LOS A	2.4	17.4	0.44	0.53	45.6
All Vehicles		955	2.5	955	2.5	0.638	67.4	NA	43.7	313.3	0.78	1.28	17.7

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: Akçelik M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Monday, 3 August 2015 4:40:08 p.m.

Project: G:\NZTA\Reg 1316-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St Only\Shotover Street_Stanley Street Model.sip6

RELEASED UNDER THE OFFICIAL INFORMATION ACT

NETWORK SUMMARY

Network: AM Peak - 2028

New Network

Network Performance - Hourly Values			
Performance Measure	Vehicles	Per Unit Distance	Persons
Network Level of Service (LOS)	LOS F		
Travel Time Index	0.00		
Speed Efficiency	0.08		
Congestion Coefficient	12.92		
Travel Speed (Average)	3.9 km/h		3.9 km/h
Travel Distance (Total)	1024.1 veh-km/h		1228.9 pers-km/h
Travel Time (Total)	264.5 veh-h/h		317.4 pers-h/h
Desired Speed	50.0 km/h		
Demand Flows (Total)	3546 veh/h		4132 pers/h
Arrival Flows (Total)	3443 veh/h		4132 pers/h
Percent Heavy Vehicles (Demand)	3.6 %		
Percent Heavy Vehicles (Arrival)	3.7 %		
Degree of Saturation	1.944		
Control Delay (Total)	243.64 veh-h/h		292.37 pers-h/h
Control Delay (Average)	254.7 sec		254.7 sec
Control Delay (Worst Lane)	893.3 sec		
Control Delay (Worst Movement)	894.3 sec		894.3 sec
Geometric Delay (Average)	3.8 sec		
Stop-Line Delay (Average)	251.0 sec		
Queue Storage Ratio (Worst Lane)	7.43		
Total Effective Stops	8033 veh/h		9640 pers/h
Effective Stop Rate	2.33 per veh	7.8 per km	2.33 per pers
Proportion Queued	0.80		0.80
Performance Index	1058.4		1058.4
Cost (Total)	6987.21 \$/h	6.82 \$/km	6987.21 \$/h
Fuel Consumption (Total)	464.7 L/h	453.7 mL/km	
Fuel Economy	45.4 L/100km		
Carbon Dioxide (Total)	1098.4 kg/h	1072.6 g/km	
Hydrocarbons (Total)	0.244 kg/h	0.239 g/km	
Carbon Monoxide (Total)	1.632 kg/h	1.593 g/km	
NOx (Total)	1.372 kg/h	1.339 g/km	

Network Model Accuracy Level (largest change in degree of saturation for any lane): 2.5 %

Number of Iterations: 10

Network Level of Service (LOS) Method: SIDRA Speed Efficiency.

Model used: New Zealand.

Network Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1,702,231 veh/y	1,983,332 pers/y
Delay	116,948 veh-h/y	140,338 pers-h/y
Effective Stops	3,855,953 veh/y	4,627,144 pers/y
Travel Distance	491,569 veh-km/y	589,883 pers-km/y
Travel Time	126,976 veh-h/y	152,372 pers-h/y
Cost	3,353,862 \$/y	3,353,862 \$/y
Fuel Consumption	223,048 L/y	
Carbon Dioxide	527,241 kg/y	
Hydrocarbons	117 kg/y	
Carbon Monoxide	783 kg/y	
NOx	658 kg/y	

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Monday, 3 August 2015 4:39:39 p.m.

Project: G:\NZTA\Reg 1316-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St Only\Shotover Street_Stanley Street Model.sip6

MOVEMENT SUMMARY

Site: Base Model - AM Peak - 2028

Network: AM Peak - 2028

Shotover Street/ Stanley Street Intersection
Roundabout

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Arrival Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: SH6A - Stanley Street (SE)													
4	L2	307	0.3	307	0.3	0.364	6.9	LOS A	2.5	17.3	0.63	0.69	33.6
5	T1	257	0.4	257	0.4	0.895	105.9	LOS F	53.8	384.9	1.00	1.97	8.3
6	R2	353	4.2	353	4.2	0.895	109.2	LOS F	53.8	384.9	1.00	1.97	4.5
Approach		917	1.8	917	1.8	0.895	74.0	LOS E	53.8	384.9	0.88	1.54	8.8
NorthEast: Shotover Street (NE)													
7	L2	268	2.4	268	2.4	0.320	5.0	LOS A	2.3	16.2	0.72	0.71	30.6
8	T1	231	3.7	231	3.7	0.308	4.6	LOS A	2.2	16.2	0.71	0.70	32.2
9	R2	47	15.6	47	15.6	0.308	7.3	LOS A	2.2	16.2	0.71	0.70	32.9
Approach		546	4.0	546	4.0	0.320	5.0	LOS A	2.3	16.2	0.72	0.70	31.5
NorthWest: Stanley Street (NW)													
10	L2	23	4.5	23	4.5	0.323	11.3	LOS B	2.0	14.9	0.82	0.87	26.1
11	T1	158	7.3	158	7.3	0.323	11.1	LOS B	2.0	14.9	0.82	0.87	32.4
12	R2	1	0.0	1	0.0	0.323	13.8	LOS B	2.0	14.9	0.82	0.87	31.6
Approach		182	6.9	182	6.9	0.323	11.1	LOS B	2.0	14.9	0.82	0.87	31.8
SouthWest: SH6A - Shotover Street (SW)													
1	L2	16	6.7	16	6.7	1.944	891.5	LOS F	254.5	1847.7	1.00	7.54	1.1
2	T1	222	1.9	222	1.9	1.944	890.9	LOS F	254.5	1847.7	1.00	7.54	0.5
3	R2	519	5.3	519	5.3	1.944	894.3	LOS F	254.5	1847.7	1.00	7.54	1.0
Approach		757	4.3	757	4.3	1.944	893.3	LOS F	254.5	1847.7	1.00	7.54	0.8
All Vehicles		2402	3.5	2402	3.5	1.944	311.7	LOS F	254.5	1847.7	0.87	3.19	2.2

Level of Service (LOS) Method: Delay (HCM 2000).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Monday, 3 August 2015 4:39:39 p.m.

Project: G:\NZTA\Reg 13\6-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St Only\Shotover Street_Stanley Street Model.sip6

MOVEMENT SUMMARY

Site: Base Model - AM Peak - 2028

Network: AM Peak - 2028

Unsignalised pedestrian (Zebra) crossing across two-way road
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Shotover Street Continuation (NE)													
8	T1	546	4.0	546	4.0	0.896	234.0	LOS F	43.9	317.6	1.00	0.34	6.8
Approach		546	4.0	546	4.0	0.896	234.0	LOS F	43.9	317.6	1.00	0.34	6.8
SouthWest: Shotover Street (From NE Leg)													
2	T1	598	3.3	495	3.6	0.532	1.3	LOS A	2.4	17.4	0.19	0.37	47.5
Approach		598	3.3	495 ^{N1}	3.6	0.532	1.3	LOS A	2.4	17.4	0.19	0.37	47.5
All Vehicles		1144	3.7	1041 ^{N1}	4.0	0.896	123.4	NA	43.9	317.6	0.61	0.36	11.5

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: Akçelik M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^{N1} Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Monday, 3 August 2015 4:39:39 p.m.

Project: G:\NZTA\Reg 13\6-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St Only\Shotover Street_Stanley Street Model.sip6

RELEASED UNDER THE OFFICIAL INFORMATION ACT

NETWORK SUMMARY

Network: PM Peak - 2028

New Network

Network Performance - Hourly Values			
Performance Measure	Vehicles	Per Unit Distance	Persons
Network Level of Service (LOS)	LOS F		
Travel Time Index	0.30		
Speed Efficiency	0.13		
Congestion Coefficient	7.87		
Travel Speed (Average)	6.4 km/h		6.4 km/h
Travel Distance (Total)	1124.6 veh-km/h		1349.5 pers-km/h
Travel Time (Total)	177.0 veh-h/h		212.3 pers-h/h
Desired Speed	50.0 km/h		
Demand Flows (Total)	3782 veh/h		4477 pers/h
Arrival Flows (Total)	3731 veh/h		4477 pers/h
Percent Heavy Vehicles (Demand)	3.2 %		
Percent Heavy Vehicles (Arrival)	3.2 %		
Degree of Saturation	1.495		
Control Delay (Total)	153.99 veh-h/h		184.79 pers-h/h
Control Delay (Average)	148.6 sec		148.6 sec
Control Delay (Worst Lane)	503.0 sec		
Control Delay (Worst Movement)	504.3 sec		504.3 sec
Geometric Delay (Average)	3.5 sec		
Stop-Line Delay (Average)	145.1 sec		
Queue Storage Ratio (Worst Lane)	3.91		
Total Effective Stops	8899 veh/h		10679 pers/h
Effective Stop Rate	2.39 per veh	7.9 per km	2.39 per pers
Proportion Queued	0.88		0.88
Performance Index	678.0		678.0
Cost (Total)	4816.45 \$/h	4.28 \$/km	4816.45 \$/h
Fuel Consumption (Total)	365.1 L/h	324.7 mL/km	
Fuel Economy	32.5 L/100km		
Carbon Dioxide (Total)	862.9 kg/h	767.3 g/km	
Hydrocarbons (Total)	0.256 kg/h	0.227 g/km	
Carbon Monoxide (Total)	1.670 kg/h	1.485 g/km	
NOx (Total)	1.250 kg/h	1.111 g/km	

Network Model Accuracy Level (largest change in degree of saturation for any lane): 2.5 %

Number of Iterations: 10

Network Level of Service (LOS) Method: SIDRA Speed Efficiency.

Model used: New Zealand.

Network Performance - Annual Values		
Performance Measure	Vehicles	Persons
Demand Flows (Total)	1,815,410 veh/y	2,149,036 pers/y
Delay	73,917 veh-h/y	88,700 pers-h/y
Effective Stops	4,271,456 veh/y	5,125,748 pers/y
Travel Distance	539,804 veh-km/y	647,765 pers-km/y
Travel Time	84,939 veh-h/y	101,927 pers-h/y
Cost	2,311,898 \$/y	2,311,898 \$/y
Fuel Consumption	175,252 L/y	
Carbon Dioxide	414,193 kg/y	
Hydrocarbons	123 kg/y	
Carbon Monoxide	802 kg/y	
NOx	600 kg/y	

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Monday, 3 August 2015 4:39:54 p.m.

Project: G:\NZTA\Reg 1316-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St Only\Shotover Street_Stanley Street Model.sip6

MOVEMENT SUMMARY

Site: Base Model - PM Peak - 2028

Network: PM Peak - 2028

Shotover Street/ Stanley Street Intersection
Roundabout

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Arrival Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: SH6A - Stanley Street (SE)													
4	L2	425	2.7	425	2.7	0.603	10.9	LOS B	5.3	38.3	0.85	0.93	28.8
5	T1	336	4.7	336	4.7	1.018	133.7	LOS F	56.9	411.6	1.00	2.97	6.8
6	R2	249	2.5	249	2.5	1.018	136.5	LOS F	56.9	411.6	1.00	2.97	3.7
Approach		1011	3.3	1011	3.3	1.018	82.7	LOS F	56.9	411.6	0.94	2.11	8.4
NorthEast: Shotover Street (NE)													
7	L2	295	2.9	295	2.9	0.386	5.7	LOS A	2.4	17.4	0.76	0.76	29.2
8	T1	356	3.0	356	3.0	0.486	5.5	LOS A	2.4	17.4	0.80	0.78	30.4
9	R2	89	0.0	89	0.0	0.486	7.8	LOS A	2.4	17.4	0.80	0.78	33.8
Approach		740	2.6	740	2.6	0.486	5.9	LOS A	2.4	17.4	0.78	0.77	30.4
NorthWest: Stanley Street (NW)													
10	L2	64	1.6	64	1.6	0.463	14.6	LOS B	3.7	26.5	0.87	0.95	22.7
11	T1	189	3.3	189	3.3	0.463	14.3	LOS B	3.7	26.5	0.87	0.95	29.5
12	R2	22	0.0	22	0.0	0.463	17.2	LOS B	3.7	26.5	0.87	0.95	28.3
Approach		276	2.7	276	2.7	0.463	14.6	LOS B	3.7	26.5	0.87	0.95	28.1
SouthWest: SH6A - Shotover Street (SW)													
1	L2	23	0.0	23	0.0	1.495	500.4	LOS F	132.5	971.0	1.00	5.66	1.9
2	T1	164	2.6	164	2.6	1.495	500.7	LOS F	132.5	971.0	1.00	5.66	0.9
3	R2	351	7.2	351	7.2	1.495	504.3	LOS F	132.5	971.0	1.00	5.66	1.7
Approach		538	5.5	538	5.5	1.495	503.0	LOS F	132.5	971.0	1.00	5.66	1.5
All Vehicles		2564	3.5	2564	3.5	1.495	141.4	LOS F	132.5	971.0	0.90	2.34	4.7

Level of Service (LOS) Method: Delay (HCM 2000).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Monday, 3 August 2015 4:39:54 p.m.

Project: G:\NZTA\Reg 13\6-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St Only\Shotover Street_Stanley Street Model.sip6

MOVEMENT SUMMARY

Site: Base Model - PM Peak - 2028

Network: PM Peak - 2028

Unsignalised pedestrian (Zebra) crossing across two-way road
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Shotover Street Continuation (NE)													
8	T1	740	2.6	740	2.6	0.962	256.6	LOS F	93.5	669.0	1.00	3.52	6.3
Approach		740	2.6	740	2.6	0.962	256.6	LOS F	93.5	669.0	1.00	3.52	6.3
SouthWest: Shotover Street (From NE Leg)													
2	T1	478	2.4	427	2.4	0.555	4.7	LOS A	2.4	17.4	0.55	0.68	43.7
Approach		478	2.4	427 ^{N1}	2.4	0.555	4.7	LOS A	2.4	17.4	0.55	0.68	43.7
All Vehicles		1218	2.5	1167 ^{N1}	2.6	0.962	164.4	NA	93.5	669.0	0.83	2.48	9.2

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: Akçelik M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

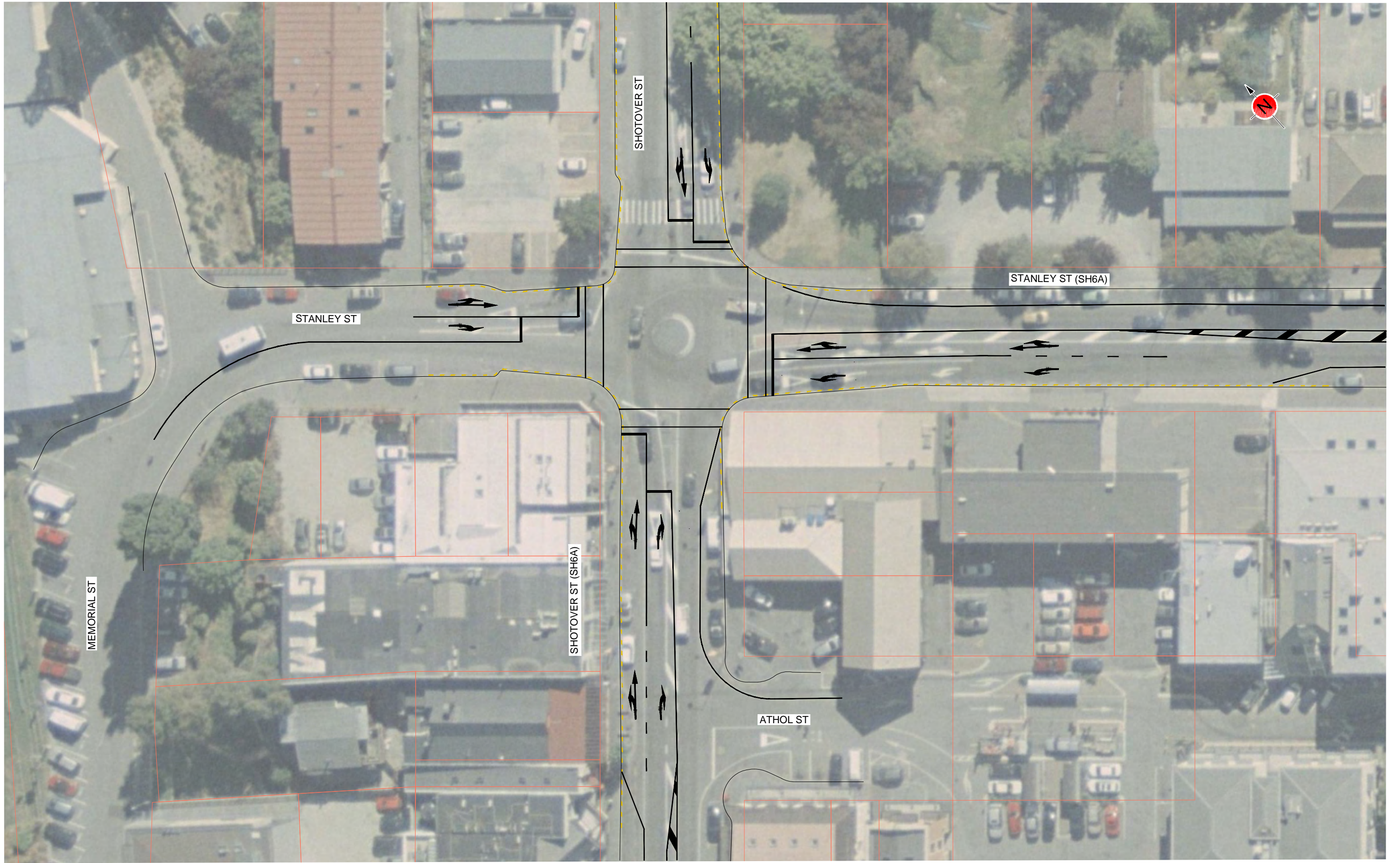
Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Monday, 3 August 2015 4:39:54 p.m.

Project: G:\NZTA\Reg 13\6-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St Only\Shotover Street_Stanley Street Model.sip6

RELEASED UNDER THE OFFICIAL INFORMATION ACT

Appendix C – Concept Layout Plans

RELEASED UNDER THE
OFFICIAL INFORMATION ACT



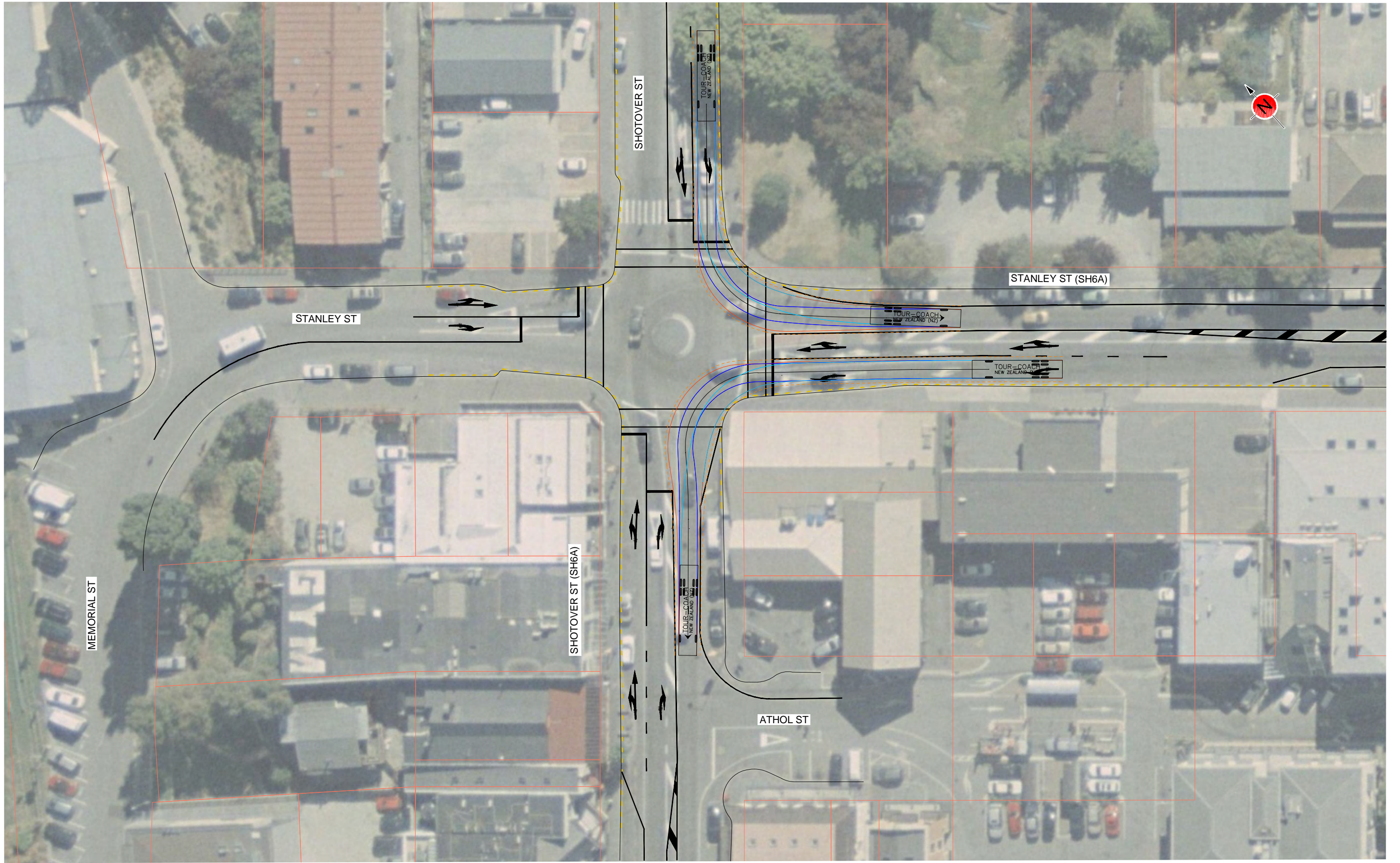
Revision	Amendment	Approved	Revision Date
A	CONCEPT LAYOUT PLAN		13/8/2015



PO Box 1482
Christchurch 8140
New Zealand

Project			SH6A SHOTOVER ST/ STANLEY ST INTERSECTION UPGRADE	
Designed			C. Morahan	
Approved			J. Denney	
Approved Date			13/08/2015	
Drawn			Scales	
J.Elder			1:250 @ A1	
Project No.			6-XT177.629 (305_01)	
Sheet No.	1		Revision	A

1:500 @ A1
1:1000 @ A3



300 mm
200
100
50
10 mm
0

1:500 @ A1
1:1000 @ A3

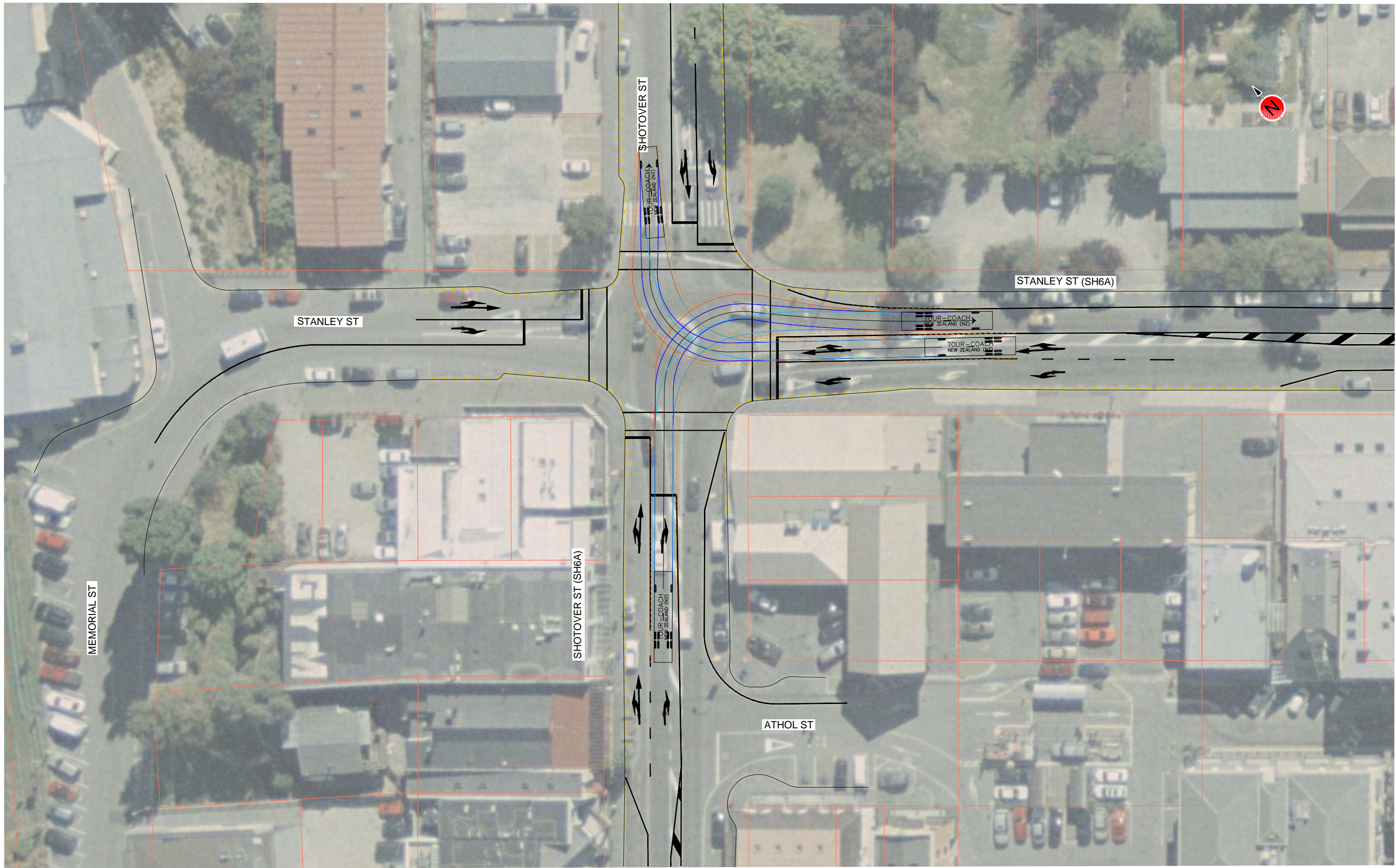
Revision	Amendment	Approved	Revision Date
A	CONCEPT LAYOUT PLAN		13/8/2015



PO Box 1482
Christchurch 8140
New Zealand

Project		SH6A SHOTOVER ST/ STANLEY ST INTERSECTION UPGRADE
Sheet		CONCEPT LAYOUT PLAN OPTION 1 - LEFT TURNING COACH
Designed	Approved	Approved Date
C. Morahan	J. Denney	13/08/2015
Drawn	Scale	Project No.
J. Elder	1:250 @ A1	6-XT177.629 (305_01)
Sheet No.	Revision	
1	A	

300 mm
200
100
50
10 mm
0



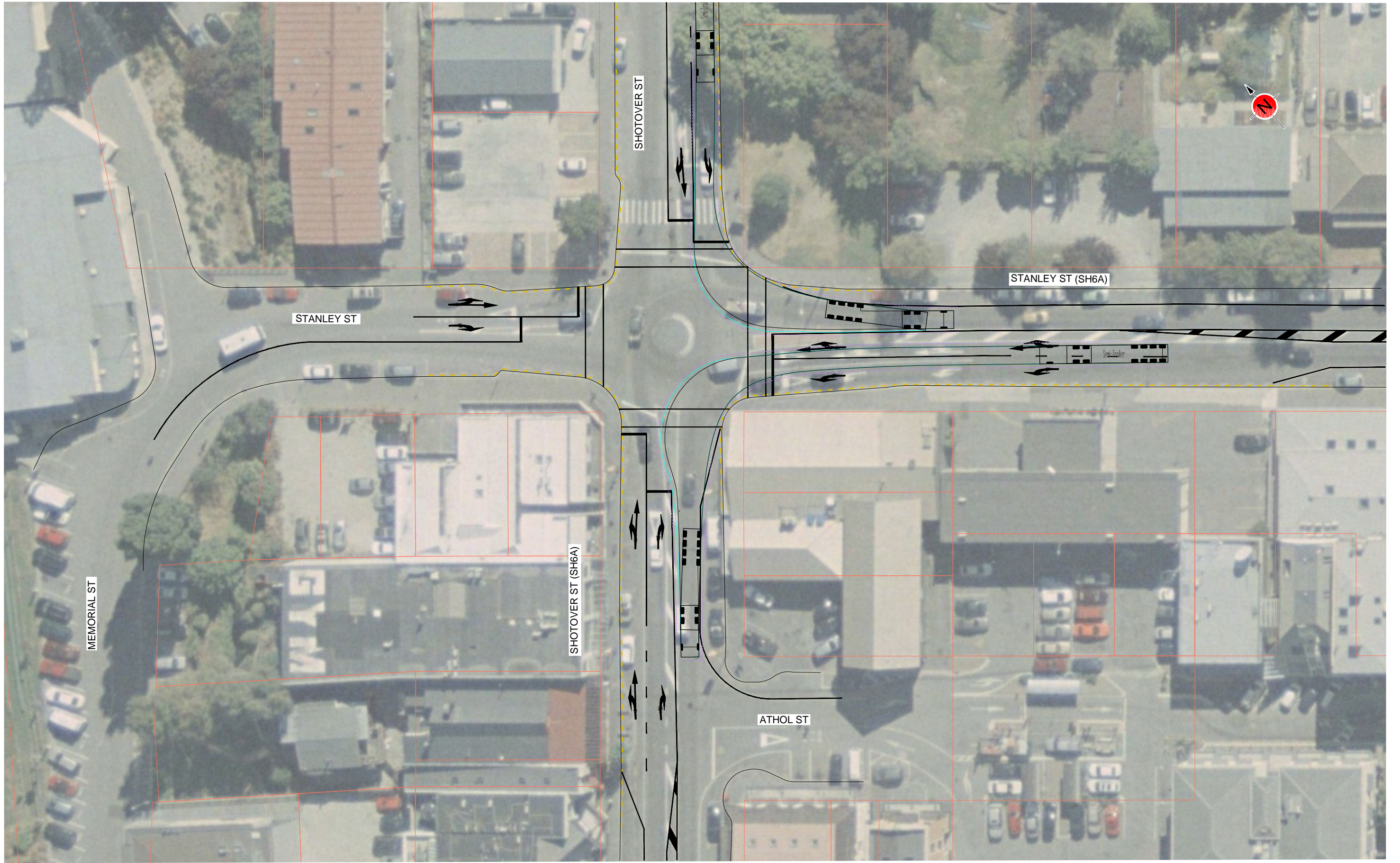
Revision	Amendment	Approved	Revision Date
A	CONCEPT LAYOUT PLAN		13/8/2015



PO Box 1482
Christchurch 8140
New Zealand

Project		SH6A SHOTOVER ST/ STANLEY ST INTERSECTION UPGRADE	
Designed		Approved	
C. Morahan		J. Denney	
Drawn		Approved Date	
J. Elder		13/08/2015	
Scales		Project No.	
1:250 @ A1		6-XT177.629 (305_01)	
Sheet No.	Revision		
1	A		

1:500 @ A1
1:1000 @ A3

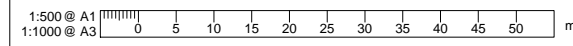


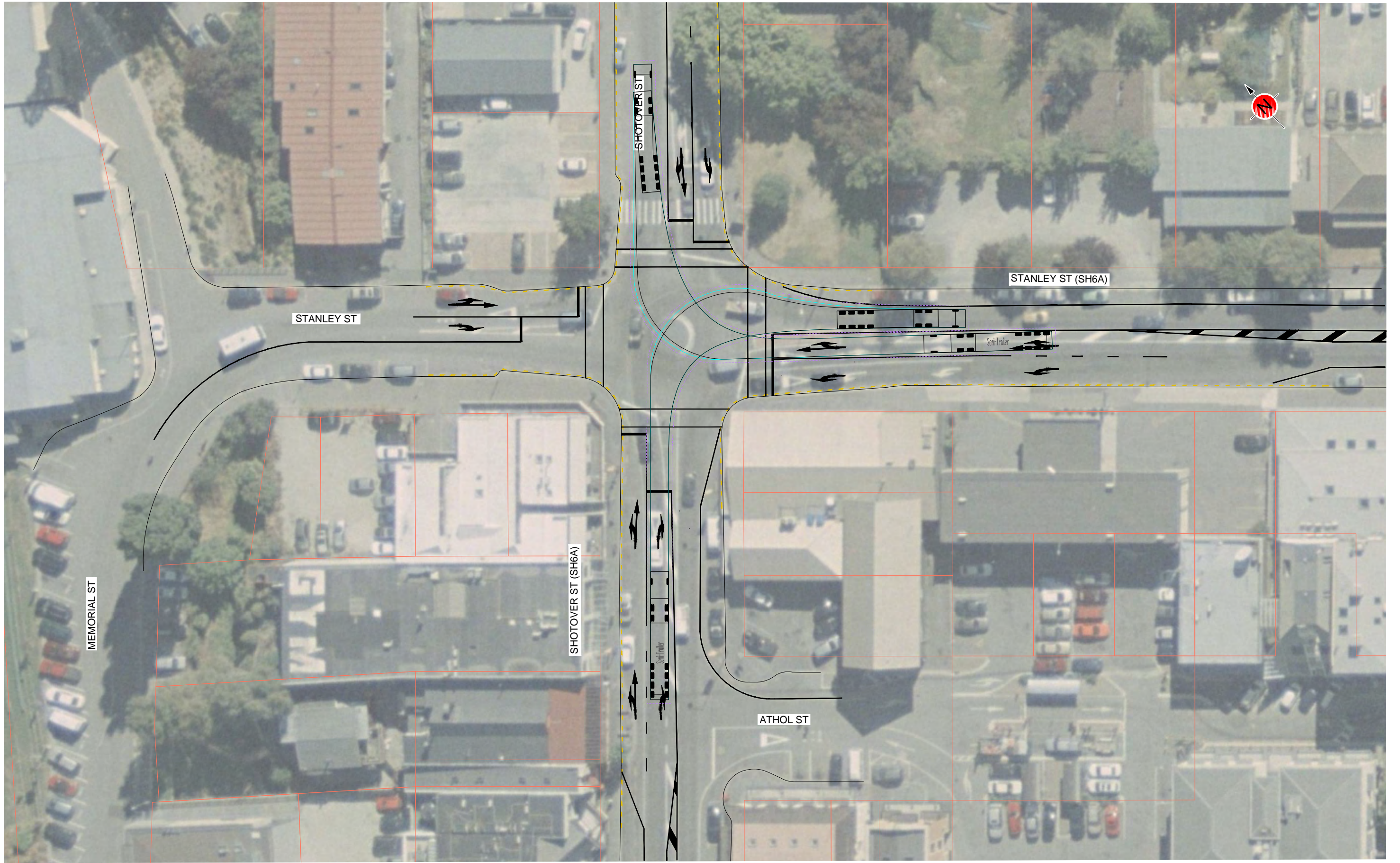
Revision	Amendment	Approved	Revision Date
A	CONCEPT LAYOUT PLAN		13/8/2015
B	TRACKING PATHS AMENDED		08/09/15



PO Box 1482
Christchurch 8140
New Zealand

Project		SH6A SHOTOVER ST/ STANLEY ST INTERSECTION UPGRADE
Sheet		CONCEPT LAYOUT PLAN OPTION 1 - LEFT TURNING SEMI-TRAILER
Designed	Approved	Approved Date
C. Morahan	J. Denney	13/08/2015
Drawn	Scales	Project No.
J.Elder	1:250 @ A1	6-XT177.629 (305_01)
Sheet No.	Revision	
1	B	





300 mm
200
100
50
10 mm
0

MEMORIAL ST

STANLEY ST

STANLEY ST (SH6A)

SHOTOVER ST

SHOTOVER ST (SH6A)

ATHOL ST

Semi-Trailer

Revision	Amendment	Approved	Revision Date
A	CONCEPT LAYOUT PLAN		13/8/2015
B	TRACKING PATHS AMENDED		08/09/15



PO Box 1482
Christchurch 8140
New Zealand

Project		SH6A SHOTOVER ST/ STANLEY ST INTERSECTION UPGRADE	
Designed		C. Morahan	
Approved		J. Denney	
Approved Date		13/08/2015	
Drawn		Scales	
J.Elder		1:250 @ A1	
Project No.		6-XT177.629 (305_01)	
Sheet No.	1	Revision	B

1:500 @ A1
1:1000 @ A3

Appendix D – Detailed SIDRA Outputs for Signalised Intersection

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

MOVEMENT SUMMARY

 **Site: Base Model - AM Peak - 2018**

Shotover Street/ Stanley Street Intersection

Signals - Fixed Time Coordinated Cycle Time = 65 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
SouthEast: SH6A - Stanley Street (SE)											
4	L2	241	0.4	0.190	4.8	LOS A	0.2	1.3	0.03	0.54	37.8
5	T1	202	0.5	0.895	17.4	LOS B	12.2	87.6	0.91	1.05	25.6
6	R2	277	4.2	0.895	22.0	LOS C	12.2	87.6	0.91	1.05	34.6
Approach		720	1.9	0.895	14.9	LOS B	12.2	87.6	0.62	0.88	32.9
NorthEast: Shotover Street (NE)											
7	L2	209	2.0	0.247	16.7	LOS B	4.2	29.6	0.66	0.73	36.2
8	T1	182	4.0	0.841	36.4	LOS D	8.0	58.8	1.00	1.04	27.2
9	R2	36	14.7	0.841	41.1	LOS D	8.0	58.8	1.00	1.04	27.6
Approach		427	3.9	0.841	27.1	LOS C	8.0	58.8	0.83	0.89	31.1
NorthWest: Stanley Street (NW)											
10	L2	18	5.9	0.824	42.4	LOS D	5.2	38.5	1.00	0.98	27.5
11	T1	124	7.6	0.824	37.7	LOS D	5.2	38.5	1.00	0.98	17.7
12	R2	1	0.0	0.007	36.5	LOS D	0.0	0.2	0.95	0.57	17.1
Approach		143	7.4	0.824	38.3	LOS D	5.2	38.5	1.00	0.98	19.4
SouthWest: SH6A - Shotover Street (SW)											
1	L2	13	8.3	0.224	17.2	LOS B	3.7	26.7	0.67	0.56	28.6
2	T1	174	1.8	0.224	12.6	LOS B	3.7	26.7	0.67	0.56	38.7
3	R2	407	5.4	0.871	38.4	LOS D	13.0	94.9	1.00	1.16	15.3
Approach		594	4.4	0.871	30.4	LOS C	13.0	94.9	0.90	0.98	22.4
All Vehicles		1884	3.6	0.895	24.4	LOS C	13.0	94.9	0.78	0.92	27.9

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue		Prop. Queued	Effective Stop Rate per ped	
					Pedestrian ped	Distance m			
P2	SouthEast Full Crossing	28	26.8	LOS C	0.0	0.0	0.91	0.91	
P3	NorthEast Full Crossing	24	26.8	LOS C	0.0	0.0	0.91	0.91	
P4	NorthWest Full Crossing	102	26.9	LOS C	0.2	0.2	0.91	0.91	
P1	SouthWest Full Crossing	74	26.9	LOS C	0.1	0.1	0.91	0.91	
All Pedestrians		228	26.9	LOS C			0.91	0.91	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Thursday, 27 August 2015 11:18:38 a.m.

Project: G:\NZTA\Reg 13\6-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St Only\Shotover Street_Stanley Street Model.sip6

MOVEMENT SUMMARY

 **Site: Base Model - PM Peak - 2018**

Shotover Street/ Stanley Street Intersection

Signals - Fixed Time Coordinated Cycle Time = 35 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
SouthEast: SH6A - Stanley Street (SE)											
4	L2	334	2.8	0.476	8.5	LOS A	2.4	17.1	0.42	0.66	32.5
5	T1	264	4.8	0.765	5.3	LOS A	5.2	37.8	0.63	0.67	37.2
6	R2	195	2.2	0.765	9.8	LOS A	5.2	37.8	0.63	0.67	42.8
Approach		793	3.3	0.765	7.7	LOS A	5.2	37.8	0.55	0.66	37.9
NorthEast: Shotover Street (NE)											
7	L2	233	3.2	0.433	16.2	LOS B	3.4	24.7	0.86	0.78	36.5
8	T1	279	3.0	0.686	13.9	LOS B	6.0	42.7	0.94	0.87	37.5
9	R2	69	0.0	0.686	18.5	LOS B	6.0	42.7	0.94	0.87	37.9
Approach		581	2.7	0.686	15.4	LOS B	6.0	42.7	0.91	0.84	37.1
NorthWest: Stanley Street (NW)											
10	L2	51	2.1	0.279	13.2	LOS B	2.5	17.7	0.74	0.64	41.0
11	T1	147	2.9	0.279	8.6	LOS A	2.5	17.7	0.74	0.64	34.0
12	R2	17	0.0	0.040	14.7	LOS B	0.2	1.5	0.75	0.66	27.8
Approach		215	2.5	0.279	10.2	LOS B	2.5	17.7	0.74	0.64	36.1
SouthWest: SH6A - Shotover Street (SW)											
1	L2	18	0.0	0.265	15.5	LOS B	2.0	14.5	0.81	0.66	30.5
2	T1	128	2.5	0.265	10.9	LOS B	2.0	14.5	0.81	0.66	39.7
3	R2	275	7.3	0.944	36.8	LOS D	7.4	55.1	1.00	1.37	15.7
Approach		421	5.5	0.944	28.0	LOS C	7.4	55.1	0.93	1.12	23.6
All Vehicles		2009	3.5	0.944	14.5	LOS B	7.4	55.1	0.75	0.81	33.9

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue		Prop. Queued	Effective Stop Rate per ped	
					Pedestrian ped	Distance m			
P2	SouthEast Full Crossing	120	12.1	LOS B	0.1	0.1	0.83	0.83	
P3	NorthEast Full Crossing	201	12.1	LOS B	0.2	0.2	0.84	0.84	
P4	NorthWest Full Crossing	119	12.1	LOS B	0.1	0.1	0.83	0.83	
P1	SouthWest Full Crossing	300	12.2	LOS B	0.3	0.3	0.84	0.84	
All Pedestrians		740	12.1	LOS B			0.84	0.84	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Thursday, 13 August 2015 11:51:43 a.m.

Project: G:\NZTA\Reg 13\6-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St Only\Shotover Street_Stanley Street Model.sip6

MOVEMENT SUMMARY

 **Site: Base Model - AM Peak - 2028**

Shotover Street/ Stanley Street Intersection

Signals - Fixed Time Coordinated Cycle Time = 110 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m		per veh	km/h
SouthEast: SH6A - Stanley Street (SE)											
4	L2	307	0.3	0.229	5.0	LOS A	0.4	2.9	0.03	0.54	37.6
5	T1	257	0.4	0.969	32.8	LOS C	32.1	229.6	1.00	1.20	18.6
6	R2	353	4.2	0.969	37.4	LOS D	32.1	229.6	1.00	1.20	28.1
Approach		917	1.8	0.969	25.2	LOS C	32.1	229.6	0.67	0.98	26.7
NorthEast: Shotover Street (NE)											
7	L2	268	2.4	0.269	19.8	LOS B	7.8	55.8	0.59	0.72	34.6
8	T1	231	3.7	0.980	85.8	LOS F	20.8	152.6	1.00	1.29	16.9
9	R2	47	15.6	0.980	90.5	LOS F	20.8	152.6	1.00	1.29	17.6
Approach		546	4.0	0.980	53.8	LOS D	20.8	152.6	0.80	1.01	22.8
NorthWest: Stanley Street (NW)											
10	L2	23	4.5	0.967	85.4	LOS F	12.7	94.3	1.00	1.20	18.4
11	T1	158	7.3	0.967	80.8	LOS F	12.7	94.3	1.00	1.20	10.2
12	R2	1	0.0	0.006	54.8	LOS D	0.1	0.4	0.94	0.59	12.9
Approach		182	6.9	0.967	81.3	LOS F	12.7	94.3	1.00	1.20	11.5
SouthWest: SH6A - Shotover Street (SW)											
1	L2	16	6.7	0.270	24.4	LOS C	7.8	55.9	0.66	0.57	23.6
2	T1	222	1.9	0.270	19.8	LOS B	7.8	55.9	0.66	0.57	34.4
3	R2	519	5.3	1.092	128.6	LOS F	48.9	357.5	1.00	1.35	5.9
Approach		757	4.3	1.092	94.5	LOS F	48.9	357.5	0.89	1.10	10.5
All Vehicles		2402	3.5	1.092	57.8	LOS E	48.9	357.5	0.80	1.04	17.5

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

The results of iterative calculations indicate a somewhat unstable solution. See the Diagnostics section in the Detailed Output report.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue		Prop. Queued	Effective Stop Rate	
		ped/h	sec		Pedestrian ped	Distance m		per ped	per ped
P2	SouthEast Full Crossing	36	44.6	LOS E	0.1	0.1	0.90	0.90	
P3	NorthEast Full Crossing	32	49.2	LOS E	0.1	0.1	0.95	0.95	
P4	NorthWest Full Crossing	131	42.1	LOS E	0.4	0.4	0.88	0.88	
P1	SouthWest Full Crossing	94	34.5	LOS D	0.2	0.2	0.79	0.79	
All Pedestrians		292	40.8	LOS E			0.86	0.86	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

 Site: Base Model - PM Peak - 2028

Shotover Street/ Stanley Street Intersection

Signals - Fixed Time Coordinated Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
SouthEast: SH6A - Stanley Street (SE)											
4	L2	425	2.7	0.526	8.6	LOS A	3.8	27.3	0.28	0.62	32.4
5	T1	336	4.7	0.925	14.3	LOS B	18.7	135.2	0.86	0.89	28.2
6	R2	249	2.5	0.925	18.9	LOS B	18.7	135.2	0.86	0.89	36.7
Approach		1011	3.3	0.925	13.0	LOS B	18.7	135.2	0.61	0.78	32.7
NorthEast: Shotover Street (NE)											
7	L2	295	2.9	0.391	20.8	LOS C	7.2	51.8	0.76	0.77	34.0
8	T1	356	3.0	0.633	19.1	LOS B	12.6	89.7	0.87	0.77	34.4
9	R2	89	0.0	0.633	23.7	LOS C	12.6	89.7	0.87	0.77	35.0
Approach		740	2.6	0.633	20.3	LOS C	12.6	89.7	0.82	0.77	34.3
NorthWest: Stanley Street (NW)											
10	L2	64	1.6	0.310	18.8	LOS B	5.7	41.2	0.70	0.63	37.4
11	T1	189	3.3	0.310	14.3	LOS B	5.7	41.2	0.70	0.63	28.8
12	R2	22	0.0	0.080	26.6	LOS C	0.6	4.2	0.79	0.69	20.7
Approach		276	2.7	0.310	16.3	LOS B	5.7	41.2	0.71	0.64	31.0
SouthWest: SH6A - Shotover Street (SW)											
1	L2	23	0.0	0.243	19.7	LOS B	4.3	30.5	0.70	0.60	26.9
2	T1	164	2.6	0.243	15.1	LOS B	4.3	30.5	0.70	0.60	36.9
3	R2	351	7.2	1.250	279.7	LOS F	44.5	330.8	1.00	2.31	2.9
Approach		538	5.5	1.250	187.7	LOS F	44.5	330.8	0.90	1.72	6.0
All Vehicles		2564	3.5	1.250	52.1	LOS D	44.5	330.8	0.74	0.96	18.7

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue		Prop. Queued	Effective Stop Rate per ped	
					Pedestrian ped	Distance m			
P2	SouthEast Full Crossing	152	19.4	LOS B	0.2	0.2	0.75	0.75	
P3	NorthEast Full Crossing	256	18.0	LOS B	0.4	0.4	0.72	0.72	
P4	NorthWest Full Crossing	153	18.7	LOS B	0.2	0.2	0.73	0.73	
P1	SouthWest Full Crossing	382	16.7	LOS B	0.5	0.5	0.70	0.70	
All Pedestrians		942	17.8	LOS B			0.72	0.72	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Thursday, 13 August 2015 11:51:56 a.m.

Project: G:\NZTA\Reg 13\6-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St Only\Shotover Street_Stanley Street Model.sip6

Appendix E – Detailed SIDRA Outputs for Networked Signalised Intersections

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

MOVEMENT SUMMARY

Site: Shotover_Stanley Base Option - AM Peak - 2018

Network: Base Options - 2018 - AM Peak

Shotover Street/ Stanley Street Intersection

Signals - Fixed Time Coordinated Cycle Time = 80 seconds (Network Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: SH6A - Stanley Street (SE)													
4	L2	241	0.4	241	0.4	0.179	4.9	LOS A	0.2	1.6	0.03	0.54	37.8
5	T1	202	0.5	202	0.5	0.796	14.7	LOS B	11.6	83.0	0.75	0.92	27.4
6	R2	277	4.2	277	4.2	0.796	19.3	LOS B	11.6	83.0	0.75	0.92	36.1
Approach		720	1.9	720	1.9	0.796	13.2	LOS B	11.6	83.0	0.51	0.79	34.2
NorthEast: Shotover Street (NE)													
7	L2	209	2.0	209	2.0	0.232	17.9	LOS B	4.8	34.2	0.63	0.72	33.8
8	T1	182	4.0	182	4.0	0.872	46.3	LOS D	10.0	73.6	1.00	1.07	24.3
9	R2	36	14.7	36	14.7	0.872	51.0	LOS D	10.0	73.6	1.00	1.07	24.8
Approach		427	3.9	427	3.9	0.872	32.8	LOS C	10.0	73.6	0.82	0.90	27.8
NorthWest: Stanley Street (NW)													
10	L2	18	5.9	18	5.9	0.870	52.7	LOS D	6.5	48.2	1.00	1.03	24.6
11	T1	124	7.6	124	7.6	0.870	48.1	LOS D	6.5	48.2	1.00	1.03	9.8
12	R2	1	0.0	1	0.0	0.008	43.4	LOS D	0.0	0.3	0.95	0.58	15.2
Approach		143	7.4	143	7.4	0.870	48.7	LOS D	6.5	48.2	1.00	1.03	12.6
SouthWest: SH6A - Shotover Street (SW)													
1	L2	13	8.3	13	8.3	0.220	19.7	LOS B	4.5	32.2	0.66	0.56	26.6
2	T1	174	1.8	174	1.8	0.220	15.0	LOS B	4.5	32.2	0.66	0.56	37.2
3	R2	407	5.4	407	5.4	0.817	39.8	LOS D	14.4	105.2	0.99	1.11	8.7
Approach		594	4.4	594	4.4	0.817	32.1	LOS C	14.4	105.2	0.89	0.93	18.7
All Vehicles		1884	3.6	1884	3.6	0.872	26.3	LOS C	14.4	105.2	0.74	0.88	25.6

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P2	SouthEast Full Crossing	28	34.3	LOS D	0.1	0.1	0.93	0.93	
P3	NorthEast Full Crossing	24	34.3	LOS D	0.1	0.1	0.93	0.93	
P4	NorthWest Full Crossing	102	32.5	LOS D	0.2	0.2	0.90	0.90	
P1	SouthWest Full Crossing	74	29.0	LOS C	0.1	0.1	0.85	0.85	
All Pedestrians		228	31.8	LOS D			0.89	0.89	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Stanley_Ballarat Base Option - AM Peak - 2018

Network: Base Options - 2018 - AM Peak

New Site

Signals - Fixed Time Coordinated Cycle Time = 80 seconds (Network Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: SH6A - Stanley Street (SE)													
1	L2	287	3.7	287	3.7	0.904	33.9	LOS C	38.0	271.3	0.85	0.97	29.2
2	T1	616	1.7	616	1.7	0.904	29.3	LOS C	38.0	271.3	0.85	0.97	27.3
3	R2	59	1.8	59	1.8	0.107	13.4	LOS B	1.1	7.7	0.49	0.67	39.1
Approach		962	2.3	962	2.3	0.904	29.7	LOS C	38.0	271.3	0.83	0.95	28.6
NorthEast: Ballarat Street (NE)													
4	L2	34	0.0	34	0.0	0.159	34.6	LOS C	1.8	12.6	0.87	0.71	30.3
5	T1	20	0.0	20	0.0	0.159	30.0	LOS C	1.8	12.6	0.87	0.71	20.4
6	R2	32	0.0	32	0.0	0.101	35.1	LOS D	1.1	7.4	0.87	0.71	15.3
Approach		85	0.0	85	0.0	0.159	33.7	LOS C	1.8	12.6	0.87	0.71	24.0
NorthWest: SH6A - Stanley Street (NW)													
7	L2	40	0.0	40	0.0	0.569	5.1	LOS A	1.1	8.1	0.05	0.08	47.0
8	T1	608	1.7	608	1.7	0.569	0.5	LOS A	1.1	8.1	0.05	0.08	49.1
9	R2	41	10.3	41	10.3	0.223	25.2	LOS C	1.0	7.9	0.64	0.69	19.6
Approach		689	2.1	689	2.1	0.569	2.3	LOS A	1.1	8.1	0.08	0.11	47.4
SouthWest: Ballarat Street (SW)													
10	L2	98	0.0	98	0.0	0.369	36.1	LOS D	4.5	31.3	0.92	0.77	9.6
11	T1	29	0.0	29	0.0	0.369	31.5	LOS C	4.5	31.3	0.92	0.77	19.7
12	R2	269	1.2	269	1.2	0.875	49.6	LOS D	12.2	86.6	1.00	1.01	23.3
Approach		397	0.8	397	0.8	0.875	44.9	LOS D	12.2	86.6	0.97	0.93	21.3
All Vehicles		2134	1.9	2134	1.9	0.904	23.8	LOS C	38.0	271.3	0.62	0.67	31.0

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	SouthEast Full Crossing	373	28.5	LOS C	0.7	0.7	0.85	0.85	
P2	NorthEast Full Crossing	48	10.5	LOS B	0.1	0.1	0.51	0.51	
P3	NorthWest Full Crossing	166	28.3	LOS C	0.3	0.3	0.84	0.84	
P4	SouthWest Full Crossing	13	10.5	LOS B	0.0	0.0	0.51	0.51	
All Pedestrians		600	26.6	LOS C			0.81	0.81	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Thursday, 27 August 2015 2:01:17 p.m.

Project: G:\NZTA\Reg 1316-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotver St_Stanley St & Stanley St_Ballarad St Network\Shotover St_Stanley St & Stanley St_Ballarad St Network - Signals.sip6

MOVEMENT SUMMARY

Site: Shotover_Stanley Base Option - PM Peak - 2018

Network: Base Options - 2018 - PM Peak

Shotover Street/ Stanley Street Intersection

Signals - Fixed Time Coordinated Cycle Time = 55 seconds (Network Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Arrival Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: SH6A - Stanley Street (SE)													
4	L2	334	2.8	334	2.8	0.389	6.4	LOS A	1.3	9.2	0.15	0.58	35.3
5	T1	264	4.8	264	4.8	0.624	3.0	LOS A	3.5	25.5	0.30	0.42	40.5
6	R2	195	2.2	195	2.2	0.624	7.6	LOS A	3.5	25.5	0.30	0.42	44.7
Approach		793	3.3	793	3.3	0.624	5.6	LOS A	3.5	25.5	0.24	0.49	40.5
NorthEast: Shotover Street (NE)													
7	L2	233	3.2	233	3.2	0.378	20.3	LOS C	4.9	35.4	0.81	0.77	32.3
8	T1	279	3.0	279	3.0	0.599	17.2	LOS B	8.1	57.8	0.89	0.77	35.5
9	R2	69	0.0	69	0.0	0.599	21.8	LOS C	8.1	57.8	0.89	0.77	36.0
Approach		581	2.7	581	2.7	0.599	19.0	LOS B	8.1	57.8	0.86	0.77	34.4
NorthWest: Stanley Street (NW)													
10	L2	51	2.1	51	2.1	0.228	14.5	LOS B	3.3	23.4	0.64	0.58	40.1
11	T1	147	2.9	147	2.9	0.228	9.9	LOS A	3.3	23.4	0.64	0.58	25.9
12	R2	17	0.0	17	0.0	0.035	15.6	LOS B	0.3	2.0	0.63	0.65	27.1
Approach		215	2.5	215	2.5	0.228	11.4	LOS B	3.3	23.4	0.64	0.59	32.1
SouthWest: SH6A - Shotover Street (SW)													
1	L2	18	0.0	18	0.0	0.231	19.4	LOS B	2.9	20.8	0.77	0.63	27.2
2	T1	128	2.5	128	2.5	0.231	14.8	LOS B	2.9	20.8	0.77	0.63	37.1
3	R2	275	7.3	275	7.3	0.934	48.2	LOS D	10.9	80.7	1.00	1.26	7.4
Approach		421	5.5	421	5.5	0.934	36.8	LOS D	10.9	80.7	0.92	1.04	17.5
All Vehicles		2009	3.5	2009	3.5	0.934	16.6	LOS B	10.9	80.7	0.60	0.70	31.5

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians										
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped		
P2	SouthEast Full Crossing	120	20.2	LOS C	0.2	0.2	0.86	0.86		
P3	NorthEast Full Crossing	201	14.7	LOS B	0.2	0.2	0.73	0.73		
P4	NorthWest Full Crossing	119	19.3	LOS B	0.2	0.2	0.84	0.84		
P1	SouthWest Full Crossing	300	13.3	LOS B	0.3	0.3	0.70	0.70		
All Pedestrians		740	15.8	LOS B			0.76	0.76		

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Wednesday, 19 August 2015 3:56:33 p.m.

Project: G:\NZTA\Reg 1316-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St & Stanley St_Ballarat St Network\Shotover St_Stanley St & Stanley St_Ballarat St Network - Signals.sip6

MOVEMENT SUMMARY

Site: Stanley_Ballarat Base Option - PM Peak - 2018

Network: Base Options - 2018 - PM Peak

New Site

Signals - Fixed Time Coordinated Cycle Time = 55 seconds (Network Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: SH6A - Stanley Street (SE)													
1	L2	24	8.7	24	8.7	0.723	15.2	LOS B	13.5	97.0	0.76	0.71	39.4
2	T1	652	2.7	652	2.7	0.723	10.5	LOS B	13.5	97.0	0.76	0.71	38.8
3	R2	43	0.0	43	0.0	0.097	12.3	LOS B	0.6	4.3	0.54	0.67	39.7
Approach		719	2.8	719	2.8	0.723	10.8	LOS B	13.5	97.0	0.74	0.71	38.9
NorthEast: Ballarat Street (NE)													
4	L2	43	0.0	43	0.0	0.163	24.0	LOS C	1.5	10.5	0.85	0.70	34.5
5	T1	23	0.0	23	0.0	0.163	19.4	LOS B	1.5	10.5	0.85	0.70	25.2
6	R2	25	0.0	25	0.0	0.123	29.9	LOS C	0.7	4.6	0.93	0.70	17.0
Approach		92	0.0	92	0.0	0.163	24.5	LOS C	1.5	10.5	0.87	0.70	29.0
NorthWest: SH6A - Stanley Street (NW)													
7	L2	58	0.0	58	0.0	0.783	5.7	LOS A	2.4	17.0	0.09	0.13	45.9
8	T1	765	2.3	765	2.3	0.783	1.1	LOS A	2.4	17.0	0.09	0.13	48.5
9	R2	179	2.4	179	2.4	0.524	14.5	LOS B	2.9	20.6	0.60	0.71	26.3
Approach		1002	2.2	1002	2.2	0.783	3.8	LOS A	2.9	20.6	0.18	0.24	45.4
SouthWest: Ballarat Street (SW)													
10	L2	225	0.5	225	0.5	0.758	30.7	LOS C	7.7	54.4	1.00	0.94	10.8
11	T1	43	2.4	43	2.4	0.758	26.1	LOS C	7.7	54.4	1.00	0.94	21.5
12	R2	54	0.0	54	0.0	0.144	24.8	LOS C	1.2	8.6	0.86	0.72	31.6
Approach		322	0.7	322	0.7	0.758	29.1	LOS C	7.7	54.4	0.97	0.91	17.8
All Vehicles		2135	2.1	2135	2.1	0.783	10.8	LOS B	13.5	97.0	0.52	0.52	38.1

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	SouthEast Full Crossing	75	21.9	LOS C	0.1	0.1	0.89	0.89	
P2	NorthEast Full Crossing	64	9.9	LOS A	0.1	0.1	0.60	0.60	
P3	NorthWest Full Crossing	181	22.0	LOS C	0.3	0.3	0.90	0.90	
P4	SouthWest Full Crossing	186	10.0	LOS A	0.2	0.2	0.60	0.60	
All Pedestrians		506	16.0	LOS B			0.75	0.75	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Shotover_Stanley Base Option - AM Peak - 2028

Network: Base Options - 2028 - AM Peak

Shotover Street/ Stanley Street Intersection

Signals - Fixed Time Coordinated Cycle Time = 75 seconds (Network Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: SH6A - Stanley Street (SE)													
4	L2	307	0.3	234	0.3	0.187	4.9	LOS A	0.2	1.5	0.03	0.54	37.8
5	T1	257	0.4	196	0.4	0.894	20.7	LOS C	13.8	98.9	0.93	1.07	23.7
6	R2	353	4.2	268	4.2	0.894	25.3	LOS C	13.8	98.9	0.93	1.07	33.0
Approach		917	1.8	698 ^{N1}	1.8	0.894	17.2	LOS B	13.8	98.9	0.62	0.89	31.3
NorthEast: Shotover Street (NE)													
7	L2	268	2.4	268	2.4	0.304	18.0	LOS B	6.1	43.6	0.66	0.74	33.7
8	T1	231	3.7	231	3.7	0.917	48.7	LOS D	13.0	95.3	1.00	1.18	23.7
9	R2	47	15.6	47	15.6	0.917	53.4	LOS D	13.0	95.3	1.00	1.18	24.2
Approach		546	4.0	546	4.0	0.917	34.0	LOS C	13.0	95.3	0.83	0.96	27.3
NorthWest: Stanley Street (NW)													
10	L2	23	4.5	23	4.5	0.907	52.9	LOS D	8.1	60.3	1.00	1.12	24.5
11	T1	158	7.3	158	7.3	0.907	48.3	LOS D	8.1	60.3	1.00	1.12	9.8
12	R2	1	0.0	1	0.0	0.006	39.4	LOS D	0.0	0.3	0.94	0.58	16.2
Approach		182	6.9	182	6.9	0.907	48.8	LOS D	8.1	60.3	1.00	1.11	12.6
SouthWest: SH6A - Shotover Street (SW)													
1	L2	16	6.7	16	6.7	0.271	18.4	LOS B	5.4	38.7	0.66	0.57	27.7
2	T1	222	1.9	222	1.9	0.271	13.7	LOS B	5.4	38.7	0.66	0.57	38.0
3	R2	519	5.3	519	5.3	1.134	156.7	LOS F	46.4	339.2	1.00	1.65	2.5
Approach		757	4.3	757	4.3	1.134	111.9	LOS F	46.4	339.2	0.89	1.31	7.3
All Vehicles		2402	3.5	2183 ^{N1}	3.9	1.134	56.9	LOS E	46.4	339.2	0.80	1.07	16.4

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

The results of iterative calculations indicate a somewhat unstable solution. See the Diagnostics section in the Detailed Output report.

^{N1} Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	of Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P2	SouthEast Full Crossing	36	31.8	LOS D	0.1	0.1	0.92	0.92	
P3	NorthEast Full Crossing	32	31.8	LOS D	0.1	0.1	0.92	0.92	
P4	NorthWest Full Crossing	131	31.9	LOS D	0.3	0.3	0.93	0.93	
P1	SouthWest Full Crossing	94	30.9	LOS D	0.2	0.2	0.91	0.91	
All Pedestrians		292	31.6	LOS D			0.92	0.92	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Stanley_Ballarat Base Option - AM Peak - 2028

Network: Base Options - 2028 - AM Peak

New Site

Signals - Fixed Time Coordinated Cycle Time = 75 seconds (Network Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows		Arrival Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		Total	HV %	Total	HV %	v/c	sec		Vehicles	Distance		per veh	km/h
		veh/h		veh/h					veh	m			
SouthEast: SH6A - Stanley Street (SE)													
1	L2	365	3.7	365	3.7	1.386	398.0	LOS F	185.0	1321.7	1.00	3.39	5.0
2	T1	780	1.8	780	1.8	1.386	393.4	LOS F	185.0	1321.7	1.00	3.39	4.3
3	R2	75	1.4	75	1.4	0.185	17.5	LOS B	1.6	11.6	0.61	0.71	36.8
Approach		1220	2.3	1220	2.3	1.386	371.8	LOS F	185.0	1321.7	0.98	3.23	4.9
NorthEast: Ballarat Street (NE)													
4	L2	43	0.0	43	0.0	0.167	30.2	LOS C	2.1	14.4	0.84	0.70	31.9
5	T1	25	0.0	25	0.0	0.167	25.6	LOS C	2.1	14.4	0.84	0.70	22.2
6	R2	40	0.0	40	0.0	0.094	28.8	LOS C	1.2	8.1	0.81	0.71	17.4
Approach		108	0.0	108	0.0	0.167	28.6	LOS C	2.1	14.4	0.83	0.70	26.1
NorthWest: SH6A - Stanley Street (NW)													
7	L2	51	0.0	47	0.0	0.805	6.0	LOS A	3.2	22.7	0.10	0.14	45.4
8	T1	772	1.8	722	1.8	0.805	1.4	LOS A	3.2	22.7	0.10	0.14	48.2
9	R2	53	12.0	49	11.9	0.485	44.7	LOS D	1.9	14.6	0.99	0.72	13.6
Approach		875	2.3	818 ^{N1}	2.3	0.805	4.3	LOS A	3.2	22.7	0.16	0.17	45.3
SouthWest: Ballarat Street (SW)													
10	L2	124	0.0	124	0.0	0.345	29.8	LOS C	5.0	34.7	0.86	0.76	11.2
11	T1	38	0.0	38	0.0	0.345	25.2	LOS C	5.0	34.7	0.86	0.76	22.1
12	R2	342	1.2	342	1.2	0.928	54.2	LOS D	16.4	115.9	1.00	1.11	22.2
Approach		504	0.8	504	0.8	0.928	46.0	LOS D	16.4	115.9	0.96	1.00	21.0
All Vehicles		2707	1.9	2651 ^{N1}	2.0	1.386	182.3	LOS F	185.0	1321.7	0.71	1.76	8.9

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

The results of iterative calculations indicate a somewhat unstable solution. See the Diagnostics section in the Detailed Output report.

^{N1} Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue	Prop. Queued	Effective Stop Rate		
		ped/h	sec		Pedestrian		per ped		
					ped	Distance			
						m			
P1	SouthEast Full Crossing	473	22.1	LOS C	0.8	0.8	0.78		
P2	NorthEast Full Crossing	61	14.1	LOS B	0.1	0.1	0.61		
P3	NorthWest Full Crossing	211	21.9	LOS C	0.3	0.3	0.77		
P4	SouthWest Full Crossing	17	14.1	LOS B	0.0	0.0	0.61		
All Pedestrians		761	21.2	LOS C			0.76		

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Shotover_Stanley Base Option - PM Peak - 2028

Network: Base Options - 2028 - PM Peak

Shotover Street/ Stanley Street Intersection

Signals - Fixed Time Coordinated Cycle Time = 75 seconds (Network Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: SH6A - Stanley Street (SE)													
4	L2	425	2.7	421	2.7	0.507	8.1	LOS A	3.4	24.1	0.23	0.61	33.0
5	T1	336	4.7	333	4.7	0.888	11.2	LOS B	16.4	118.9	0.74	0.78	30.8
6	R2	249	2.5	247	2.6	0.888	15.7	LOS B	16.4	118.9	0.74	0.78	38.6
Approach		1011	3.3	1002 ^{N1}	3.4	0.888	11.0	LOS B	16.4	118.9	0.53	0.71	34.5
NorthEast: Shotover Street (NE)													
7	L2	295	2.9	295	2.9	0.391	21.9	LOS C	7.7	55.4	0.76	0.77	31.4
8	T1	356	3.0	356	3.0	0.633	20.4	LOS C	13.4	95.8	0.87	0.77	33.8
9	R2	89	0.0	89	0.0	0.633	24.9	LOS C	13.4	95.8	0.87	0.77	34.4
Approach		740	2.6	740	2.6	0.633	21.5	LOS C	13.4	95.8	0.82	0.77	33.0
NorthWest: Stanley Street (NW)													
10	L2	64	1.6	64	1.6	0.302	19.2	LOS B	6.0	43.1	0.69	0.62	37.2
11	T1	189	3.3	189	3.3	0.302	14.6	LOS B	6.0	43.1	0.69	0.62	21.5
12	R2	22	0.0	22	0.0	0.073	26.6	LOS C	0.6	4.3	0.76	0.69	20.7
Approach		276	2.7	276	2.7	0.302	16.6	LOS B	6.0	43.1	0.69	0.63	27.7
SouthWest: SH6A - Shotover Street (SW)													
1	L2	23	0.0	23	0.0	0.243	20.7	LOS C	4.6	32.6	0.70	0.60	26.2
2	T1	164	2.6	164	2.6	0.243	16.1	LOS B	4.6	32.6	0.70	0.60	36.3
3	R2	351	7.2	351	7.2	1.284	312.7	LOS F	48.3	359.1	1.00	2.33	1.3
Approach		538	5.5	538	5.5	1.284	209.6	LOS F	48.3	359.1	0.90	1.73	4.3
All Vehicles		2564	3.5	2555 ^{N1}	3.5	1.284	56.5	LOS E	48.3	359.1	0.71	0.93	16.8

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^{N1} Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P2	SouthEast Full Crossing	152	20.3	LOS C	0.2	0.2	0.74	0.74	
P3	NorthEast Full Crossing	256	18.2	LOS B	0.4	0.4	0.70	0.70	
P4	NorthWest Full Crossing	153	19.6	LOS B	0.2	0.2	0.72	0.72	
P1	SouthWest Full Crossing	382	16.9	LOS B	0.6	0.6	0.68	0.68	
All Pedestrians		942	18.3	LOS B			0.70	0.70	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Stanley_Ballarat Base Option - PM Peak - 2028

Network: Base Options - 2028 - PM Peak

New Site

Signals - Fixed Time Coordinated Cycle Time = 75 seconds (Network Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: SH6A - Stanley Street (SE)													
1	L2	31	10.3	31	10.3	0.936	43.1	LOS D	39.3	282.1	0.85	1.09	26.3
2	T1	831	2.8	831	2.8	0.936	38.4	LOS D	39.3	282.1	0.85	1.09	24.5
3	R2	56	0.0	56	0.0	0.174	16.4	LOS B	1.2	8.2	0.58	0.69	37.4
Approach		917	2.9	917	2.9	0.936	37.2	LOS D	39.3	282.1	0.84	1.06	25.3
NorthEast: Ballarat Street (NE)													
4	L2	56	0.0	56	0.0	0.199	30.3	LOS C	2.6	18.0	0.85	0.72	31.8
5	T1	29	0.0	29	0.0	0.199	25.8	LOS C	2.6	18.0	0.85	0.72	22.0
6	R2	33	0.0	33	0.0	0.182	41.1	LOS D	1.2	8.2	0.97	0.71	13.6
Approach		118	0.0	118	0.0	0.199	32.2	LOS C	2.6	18.0	0.88	0.71	25.7
NorthWest: SH6A - Stanley Street (NW)													
7	L2	74	0.0	69	0.0	0.894	8.5	LOS A	8.3	59.4	0.17	0.24	41.6
8	T1	976	2.4	918	2.2	0.894	3.9	LOS A	8.3	59.4	0.17	0.24	45.8
9	R2	228	2.8	215	2.5	1.057	93.3	LOS F	14.5	103.4	1.00	1.30	7.7
Approach		1278	2.3	1202 ^{N1}	2.1	1.057	20.1	LOS C	14.5	103.4	0.32	0.43	33.0
SouthWest: Ballarat Street (SW)													
10	L2	286	0.4	286	0.4	1.021	92.5	LOS F	22.2	156.2	1.00	1.44	4.2
11	T1	55	1.9	55	1.9	1.021	88.0	LOS F	22.2	156.2	1.00	1.44	9.9
12	R2	68	0.0	68	0.0	0.179	31.2	LOS C	2.1	14.7	0.85	0.74	29.0
Approach		409	0.5	409	0.5	1.021	81.7	LOS F	22.2	156.2	0.98	1.32	8.3
All Vehicles		2722	2.1	2646 ^{N1}	2.2	1.057	36.1	LOS D	39.3	282.1	0.63	0.80	24.6

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^{N1} Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	of Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	SouthEast Full Crossing	95	26.6	LOS C	0.2	0.2	0.84	0.84	
P2	NorthEast Full Crossing	82	10.7	LOS B	0.1	0.1	0.54	0.54	
P3	NorthWest Full Crossing	232	26.7	LOS C	0.4	0.4	0.85	0.85	
P4	SouthWest Full Crossing	237	10.8	LOS B	0.3	0.3	0.54	0.54	
All Pedestrians		645	18.8	LOS B			0.69	0.69	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Appendix F – Detailed SIDRA Outputs for Networked Signalised Intersection and Roundabout

RELEASED UNDER THE
OFFICIAL INFORMATION ACT

MOVEMENT SUMMARY

Site: Stanley_Shotover - AM Peak - 2018

Network: Shotover
Roundabout_Ballarat Signals -
AM Peak - 2018

Shotover Street/ Stanley Street Intersection
Roundabout

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: SH6A - Stanley Street (SE)													
4	L2	241	0.4	241	0.4	0.266	6.2	LOS A	1.5	10.2	0.39	0.60	34.5
5	T1	202	0.5	202	0.5	0.661	33.4	LOS C	11.3	81.1	0.91	0.74	19.0
6	R2	277	4.2	277	4.2	0.661	36.6	LOS D	11.3	81.1	0.91	0.74	11.7
Approach		720	1.9	720	1.9	0.661	25.5	LOS C	11.3	81.1	0.73	0.70	19.0
NorthEast: Shotover Street (NE)													
7	L2	209	2.0	209	2.0	0.263	5.1	LOS A	1.8	13.0	0.73	0.72	9.7
8	T1	182	4.0	182	4.0	0.254	4.8	LOS A	1.8	13.2	0.72	0.70	31.9
9	R2	36	14.7	36	14.7	0.254	7.4	LOS A	1.8	13.2	0.72	0.70	32.8
Approach		427	3.9	427	3.9	0.263	5.2	LOS A	1.8	13.2	0.73	0.71	25.7
NorthWest: Stanley Street (NW)													
10	L2	18	5.9	18	5.9	0.268	11.4	LOS B	1.7	12.7	0.83	0.86	26.1
11	T1	124	7.6	124	7.6	0.268	11.1	LOS B	1.7	12.7	0.83	0.86	26.1
12	R2	1	0.0	1	0.0	0.268	13.8	LOS B	1.7	12.7	0.83	0.86	31.5
Approach		143	7.4	143	7.4	0.268	11.2	LOS B	1.7	12.7	0.83	0.86	26.1
SouthWest: SH6A - Shotover Street (SW)													
1	L2	13	8.3	13	8.3	1.213	260.5	LOS F	96.6	702.1	1.00	4.17	3.5
2	T1	174	1.8	174	1.8	1.213	259.7	LOS F	96.6	702.1	1.00	4.17	1.7
3	R2	407	5.4	407	5.4	1.213	263.2	LOS F	96.6	702.1	1.00	4.17	1.7
Approach		594	4.4	594	4.4	1.213	262.1	LOS F	96.6	702.1	1.00	4.17	1.7
All Vehicles		1884	3.6	1884	3.6	1.213	94.4	LOS F	96.6	702.1	0.82	1.81	5.3

Level of Service (LOS) Method: Delay (HCM 2000).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Wednesday, 19 August 2015 4:22:34 p.m.

Project: G:\NZTA\Reg 13\6-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St & Stanley St_Ballarat St Network\Shotover St_Stanley St & Stanley St_Ballarat St Network - Mixed.sip6

MOVEMENT SUMMARY

Site: Stanley_Shotover - AM Peak - 2018

Network: Shotover
Roundabout_Ballarat Signals -
AM Peak - 2018

Unsignalised pedestrian (Zebra) crossing across two-way road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Shotover Street Continuation (NE)													
8	T1	427	3.9	427	3.9	0.394	151.9	LOS F	23.1	166.8	1.00	0.29	9.7
Approach		427	3.9	427	3.9	0.394	151.9	LOS F	23.1	166.8	1.00	0.29	9.7
SouthWest: Shotover Street (From NE Leg)													
2	T1	468	3.4	447	3.4	0.477	1.2	LOSA	2.4	17.4	0.15	0.37	47.6
Approach		468	3.4	447 ^{N1}	3.4	0.477	1.2	LOSA	2.4	17.4	0.15	0.37	47.6
All Vehicles		896	3.6	874 ^{N1}	3.7	0.477	74.8	NA	23.1	166.8	0.56	0.33	16.5

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: Akçelik M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^{N1} Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Wednesday, 19 August 2015 4:22:34 p.m.

Project: G:\NZTA\Reg 13\6-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St & Stanley St_Ballarat St Network\Shotover St_Stanley St & Stanley St_Ballarat St Network - Mixed.sip6

MOVEMENT SUMMARY

Site: Stanley_Ballarat Base Option - AM Peak - 2018

Network: Shotover Roundabout_Ballarat Signals - AM Peak - 2018

New Site

Signals - Fixed Time Isolated Cycle Time = 80 seconds (Practical Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Arrival Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: SH6A - Stanley Street (SE)													
1	L2	287	3.7	287	3.7	0.899	32.7	LOS C	37.3	266.6	0.85	0.96	29.6
2	T1	616	1.7	616	1.7	0.899	28.1	LOS C	37.3	266.6	0.85	0.96	27.8
3	R2	59	1.8	59	1.8	0.136	20.6	LOS C	1.5	10.4	0.65	0.70	35.2
Approach		962	2.3	962	2.3	0.899	29.0	LOS C	37.3	266.6	0.84	0.94	28.9
NorthEast: Ballarat Street (NE)													
4	L2	34	0.0	34	0.0	0.159	34.6	LOS C	1.8	12.6	0.87	0.71	30.3
5	T1	20	0.0	20	0.0	0.159	30.0	LOS C	1.8	12.6	0.87	0.71	20.4
6	R2	32	0.0	32	0.0	0.101	35.1	LOS D	1.1	7.4	0.87	0.71	15.3
Approach		85	0.0	85	0.0	0.159	33.7	LOS C	1.8	12.6	0.87	0.71	24.0
NorthWest: SH6A - Stanley Street (NW)													
7	L2	40	0.0	37	0.0	0.595	15.2	LOS B	14.1	99.9	0.65	0.59	33.9
8	T1	608	1.7	567	1.7	0.595	10.6	LOS B	14.1	99.9	0.65	0.59	40.4
9	R2	41	10.3	38	10.2	0.207	33.5	LOS C	1.3	9.8	0.85	0.73	16.5
Approach		689	2.1	643 ^{N1}	2.1	0.595	12.2	LOS B	14.1	99.9	0.66	0.60	38.9
SouthWest: Ballarat Street (SW)													
10	L2	98	0.0	98	0.0	0.369	36.1	LOS D	4.5	31.3	0.92	0.77	9.6
11	T1	29	0.0	29	0.0	0.369	31.5	LOS C	4.5	31.3	0.92	0.77	19.7
12	R2	269	1.2	269	1.2	0.875	49.6	LOS D	12.2	86.6	1.00	1.01	23.3
Approach		397	0.8	397	0.8	0.875	44.9	LOS D	12.2	86.6	0.97	0.93	21.3
All Vehicles		2134	1.9	2087 ^{N1}	1.9	0.899	27.1	LOS C	37.3	266.6	0.81	0.83	29.5

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^{N1} Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	SouthEast Full Crossing	373	28.5	LOS C	0.7	0.7	0.85	0.85	
P2	NorthEast Full Crossing	48	10.5	LOS B	0.1	0.1	0.51	0.51	
P3	NorthWest Full Crossing	166	28.3	LOS C	0.3	0.3	0.84	0.84	
P4	SouthWest Full Crossing	13	10.5	LOS B	0.0	0.0	0.51	0.51	
All Pedestrians		600	26.6	LOS C			0.81	0.81	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Stanley_Shotover - PM Peak - 2018

Network: Shotover
Roundabout_Ballarat Signals -
PM Peak - 2018

Shotover Street/ Stanley Street Intersection
Roundabout

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: SH6A - Stanley Street (SE)													
4	L2	334	2.8	334	2.8	0.419	7.4	LOS A	2.4	16.9	0.53	0.69	32.8
5	T1	264	4.8	264	4.8	0.715	35.1	LOS D	12.9	93.0	0.86	1.13	18.5
6	R2	195	2.2	195	2.2	0.715	38.0	LOS D	12.9	93.0	0.86	1.13	11.3
Approach		793	3.3	793	3.3	0.715	24.1	LOS C	12.9	93.0	0.72	0.95	20.2
NorthEast: Shotover Street (NE)													
7	L2	233	3.2	233	3.2	0.458	22.3	LOS C	2.4	17.4	1.00	0.85	2.6
8	T1	279	3.0	279	3.0	0.362	4.5	LOS A	2.4	17.4	0.71	0.69	32.6
9	R2	69	0.0	69	0.0	0.362	6.8	LOS A	2.4	17.4	0.71	0.69	35.7
Approach		581	2.7	581	2.7	0.458	11.9	LOS B	2.4	17.4	0.82	0.76	17.6
NorthWest: Stanley Street (NW)													
10	L2	51	2.1	51	2.1	0.449	23.9	LOS C	4.3	30.5	1.00	0.97	16.8
11	T1	147	2.9	147	2.9	0.449	23.6	LOS C	4.3	30.5	1.00	0.97	16.8
12	R2	17	0.0	17	0.0	0.449	26.5	LOS C	4.3	30.5	1.00	0.97	22.3
Approach		215	2.5	215	2.5	0.449	23.9	LOS C	4.3	30.5	1.00	0.97	17.3
SouthWest: SH6A - Shotover Street (SW)													
1	L2	18	0.0	18	0.0	1.219	317.8	LOS F	79.0	578.7	1.00	3.84	2.9
2	T1	128	2.5	128	2.5	1.219	318.1	LOS F	79.0	578.7	1.00	3.84	1.4
3	R2	275	7.3	275	7.3	1.219	321.8	LOS F	79.0	578.7	1.00	3.84	1.4
Approach		421	5.5	421	5.5	1.219	320.5	LOS F	79.0	578.7	1.00	3.84	1.4
All Vehicles		2009	3.5	2009	3.5	1.219	82.7	LOS F	79.0	578.7	0.84	1.50	6.3

Level of Service (LOS) Method: Delay (HCM 2000).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Wednesday, 19 August 2015 4:23:00 p.m.

Project: G:\NZTA\Reg 13\6-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St & Stanley St_Ballarat St Network\Shotover St_Stanley St & Stanley St_Ballarat St Network - Mixed.sip6

MOVEMENT SUMMARY

Site: Stanley_Shotover - PM Peak - 2018

Network: Shotover
Roundabout_Ballarat Signals -
PM Peak - 2018

Unsignalised pedestrian (Zebra) crossing across two-way road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Shotover Street Continuation (NE)													
8	T1	581	2.7	581	2.7	0.720	173.9	LOS F	61.8	443.0	1.00	2.27	8.7
Approach		581	2.7	581	2.7	0.720	173.9	LOS F	61.8	443.0	1.00	2.27	8.7
SouthWest: Shotover Street (From NE Leg)													
2	T1	374	2.3	352	2.2	0.436	2.7	LOSA	2.4	17.4	0.42	0.51	45.8
Approach		374	2.3	352 ^{N1}	2.2	0.436	2.7	LOSA	2.4	17.4	0.42	0.51	45.8
All Vehicles		955	2.5	933 ^{N1}	2.6	0.720	109.3	NA	61.8	443.0	0.78	1.61	12.6

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: Akçelik M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^{N1} Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Wednesday, 19 August 2015 4:23:00 p.m.

Project: G:\NZTA\Reg 13\6-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St & Stanley St_Ballarat St Network\Shotover St_Stanley St & Stanley St_Ballarat St Network - Mixed.sip6

MOVEMENT SUMMARY

Site: Stanley_Ballarat Base Option - PM Peak - 2018

Network: Shotover Roundabout_Ballarat Signals - PM Peak - 2018

New Site

Signals - Fixed Time Isolated Cycle Time = 70 seconds (Practical Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	Arrival Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h		
SouthEast: SH6A - Stanley Street (SE)													
1	L2	24	8.7	24	8.7	0.644	13.3	LOS B	13.8	99.0	0.64	0.59	40.8
2	T1	652	2.7	652	2.7	0.644	8.7	LOS A	13.8	99.0	0.64	0.59	40.4
3	R2	43	0.0	43	0.0	0.131	21.5	LOS C	1.0	7.2	0.71	0.71	34.8
Approach		719	2.8	719	2.8	0.644	9.6	LOS A	13.8	99.0	0.65	0.59	39.9
NorthEast: Ballarat Street (NE)													
4	L2	43	0.0	43	0.0	0.190	31.3	LOS C	2.0	13.8	0.88	0.72	31.4
5	T1	23	0.0	23	0.0	0.190	26.7	LOS C	2.0	13.8	0.88	0.72	21.7
6	R2	25	0.0	25	0.0	0.163	39.6	LOS D	0.9	6.1	0.97	0.70	14.0
Approach		92	0.0	92	0.0	0.190	32.4	LOS C	2.0	13.8	0.91	0.71	25.6
NorthWest: SH6A - Stanley Street (NW)													
7	L2	58	0.0	55	0.0	0.878	26.6	LOS C	25.0	177.9	0.70	0.83	25.7
8	T1	765	2.3	731	2.2	0.878	22.1	LOS C	25.0	177.9	0.70	0.83	33.6
9	R2	179	2.4	171	2.2	0.420	20.9	LOS C	4.3	30.7	0.75	0.77	22.0
Approach		1002	2.2	958 ^{N1}	2.1	0.878	22.1	LOS C	25.0	177.9	0.71	0.82	32.0
SouthWest: Ballarat Street (SW)													
10	L2	225	0.5	225	0.5	0.879	45.5	LOS D	11.0	77.5	1.00	1.08	7.8
11	T1	43	2.4	43	2.4	0.879	40.9	LOS D	11.0	77.5	1.00	1.08	16.8
12	R2	54	0.0	54	0.0	0.162	32.0	LOS C	1.6	11.3	0.89	0.73	28.6
Approach		322	0.7	322	0.7	0.879	42.6	LOS D	11.0	77.5	0.98	1.02	13.7
All Vehicles		2135	2.1	2090 ^{N1}	2.1	0.879	21.4	LOS C	25.0	177.9	0.74	0.77	31.0

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^{N1} Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	SouthEast Full Crossing	75	28.4	LOS C	0.1	0.1	0.90	0.90	
P2	NorthEast Full Crossing	64	8.8	LOS A	0.1	0.1	0.50	0.50	
P3	NorthWest Full Crossing	181	28.6	LOS C	0.3	0.3	0.91	0.91	
P4	SouthWest Full Crossing	186	8.8	LOS A	0.2	0.2	0.50	0.50	
All Pedestrians		506	18.8	LOS B			0.71	0.71	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Stanley_Shotover - AM Peak - 2028

Network: Shotover
Roundabout_Ballarat Signals -
AM Peak - 2028

Shotover Street/ Stanley Street Intersection
Roundabout

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows		Arrival Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		Total veh/h	HV %	Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m	per veh	km/h	
SouthEast: SH6A - Stanley Street (SE)													
4	L2	307	0.3	270	0.3	0.320	6.8	LOS A	1.8	12.5	0.40	0.63	33.7
5	T1	257	0.4	226	0.4	0.791	55.5	LOS E	23.8	170.0	0.84	1.20	13.7
6	R2	353	4.2	310	4.2	0.791	58.8	LOS E	23.8	170.0	0.84	1.20	7.9
Approach		917	1.8	806 ^{N1}	1.8	0.791	40.4	LOS D	23.8	170.0	0.69	1.01	14.0
NorthEast: Shotover Street (NE)													
7	L2	268	2.4	268	2.4	0.429	14.5	LOS B	2.4	17.4	0.98	0.84	3.9
8	T1	231	3.7	231	3.7	0.309	4.6	LOS A	2.2	16.3	0.72	0.70	32.2
9	R2	47	15.6	47	15.6	0.309	7.4	LOS A	2.2	16.3	0.72	0.70	32.9
Approach		546	4.0	546	4.0	0.429	9.7	LOS A	2.4	17.4	0.85	0.77	18.1
NorthWest: Stanley Street (NW)													
10	L2	23	4.5	23	4.5	0.393	18.3	LOS B	3.0	22.6	0.95	0.94	20.1
11	T1	158	7.3	158	7.3	0.393	18.1	LOS B	3.0	22.6	0.95	0.94	20.1
12	R2	1	0.0	1	0.0	0.393	20.7	LOS C	3.0	22.6	0.95	0.94	25.7
Approach		182	6.9	182	6.9	0.393	18.1	LOS B	3.0	22.6	0.95	0.94	20.1
SouthWest: SH6A - Shotover Street (SW)													
1	L2	16	6.7	16	6.7	1.920	892.1	LOS F	260.3	1889.2	1.00	6.81	1.1
2	T1	222	1.9	222	1.9	1.920	891.5	LOS F	260.3	1889.2	1.00	6.81	0.5
3	R2	519	5.3	519	5.3	1.920	894.9	LOS F	260.3	1889.2	1.00	6.81	0.5
Approach		757	4.3	757	4.3	1.920	893.9	LOS F	260.3	1889.2	1.00	6.81	0.5
All Vehicles		2402	3.5	2291 ^{N1}	3.7	1.920	313.3	LOS F	260.3	1889.2	0.85	2.86	1.7

Level of Service (LOS) Method: Delay (HCM 2000).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^{N1} Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Wednesday, 19 August 2015 4:23:26 p.m.

Project: G:\NZTA\Reg 13\6-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St & Stanley St_Ballarat St Network\Shotover St_Stanley St & Stanley St_Ballarat St Network - Mixed.sip6

MOVEMENT SUMMARY

Site: Stanley_Shotover - AM Peak - 2028

Network: Shotover Roundabout_Ballarat Signals - AM Peak - 2028

Unsignalised pedestrian (Zebra) crossing across two-way road
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Shotover Street Continuation (NE)													
8	T1	546	4.0	546	4.0	0.957	476.7	LOS F	135.6	982.3	1.00	0.66	3.6
Approach		546	4.0	546	4.0	0.957	476.7	LOS F	135.6	982.3	1.00	0.66	3.6
SouthWest: Shotover Street (From NE Leg)													
2	T1	598	3.3	453 ^{N1}	3.6	0.487	1.3	LOSA	2.4	17.4	0.17	0.37	47.5
Approach		598	3.3	453 ^{N1}	3.6	0.487	1.3	LOSA	2.4	17.4	0.17	0.37	47.5
All Vehicles		1144	3.7	999 ^{N1}	4.2	0.957	261.2	NA	135.6	982.3	0.63	0.53	6.2

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: Akçelik M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^{N1} Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Wednesday, 19 August 2015 4:23:26 p.m.

Project: G:\NZTA\Reg 13\6-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St & Stanley St_Ballarat St Network\Shotover St_Stanley St & Stanley St_Ballarat St Network - Mixed.sip6

MOVEMENT SUMMARY

Site: Stanley_Ballarat Base Option - AM Peak - 2028

Network: Shotover Roundabout_Ballarat Signals - AM Peak - 2028

New Site

Signals - Fixed Time Isolated Cycle Time = 120 seconds (Practical Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	Arrival Flows HV %	Arrival Flows Total veh/h	Arrival Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: SH6A - Stanley Street (SE)													
1	L2	365	3.7	365	3.7	1.191	239.0	LOS F	163.4	1167.2	1.00	1.91	7.9
2	T1	780	1.8	780	1.8	1.191	234.4	LOS F	163.4	1167.2	1.00	1.91	6.8
3	R2	75	1.4	75	1.4	0.936	94.0	LOS F	5.4	38.4	0.69	1.07	17.6
Approach		1220	2.3	1220	2.3	1.191	227.2	LOS F	163.4	1167.2	0.98	1.86	7.5
NorthEast: Ballarat Street (NE)													
4	L2	43	0.0	43	0.0	0.238	49.7	LOS D	3.4	24.0	0.89	0.72	25.7
5	T1	25	0.0	25	0.0	0.238	45.1	LOS D	3.4	24.0	0.89	0.72	16.0
6	R2	40	0.0	40	0.0	0.114	46.2	LOS D	1.9	13.3	0.85	0.72	12.5
Approach		108	0.0	108	0.0	0.238	47.3	LOS D	3.4	24.0	0.87	0.72	19.9
NorthWest: SH6A - Stanley Street (NW)													
7	L2	51	0.0	38	0.0	0.567	20.7	LOS C	21.6	153.0	0.66	0.61	29.4
8	T1	772	1.8	576	1.7	0.567	16.1	LOS B	21.6	153.0	0.66	0.61	36.8
9	R2	53	12.0	39	11.6	0.617	73.4	LOS E	2.5	19.2	1.00	0.76	9.3
Approach		875	2.3	653 ^{N1}	2.2	0.617	19.8	LOS B	21.6	153.0	0.68	0.62	34.1
SouthWest: Ballarat Street (SW)													
10	L2	124	0.0	124	0.0	0.417	48.6	LOS D	8.3	57.8	0.91	0.78	7.4
11	T1	38	0.0	38	0.0	0.417	44.0	LOS D	8.3	57.8	0.91	0.78	16.2
12	R2	342	1.2	342	1.2	1.198	260.1	LOS F	47.0	332.6	1.00	1.57	7.2
Approach		504	0.8	504	0.8	1.198	191.7	LOS F	47.0	332.6	0.97	1.31	7.5
All Vehicles		2707	1.9	2485 ^{N1}	2.1	1.198	157.7	LOS F	163.4	1167.2	0.90	1.37	9.9

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^{N1} Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	SouthEast Full Crossing	473	34.4	LOS D	1.2	1.2	0.77	0.77	
P2	NorthEast Full Crossing	61	14.1	LOS B	0.1	0.1	0.48	0.48	
P3	NorthWest Full Crossing	211	34.0	LOS D	0.5	0.5	0.76	0.76	
P4	SouthWest Full Crossing	17	14.0	LOS B	0.0	0.0	0.48	0.48	
All Pedestrians		761	32.2	LOS D			0.73	0.73	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Stanley_Shotover - PM Peak - 2028

Network: Shotover
Roundabout_Ballarat Signals -
PM Peak - 2028

Shotover Street/ Stanley Street Intersection
Roundabout

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows		Arrival Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		Total veh/h	HV %	Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m	per veh	km/h	
SouthEast: SH6A - Stanley Street (SE)													
4	L2	425	2.7	409	2.8	0.576	9.9	LOS A	4.1	29.2	0.62	0.81	29.9
5	T1	336	4.7	323	4.9	0.974	92.1	LOS F	38.4	278.0	0.93	2.28	9.3
6	R2	249	2.5	240	2.6	0.974	95.0	LOS F	38.4	278.0	0.93	2.28	5.1
Approach		1011	3.3	972 ^{N1}	3.4	0.974	58.2	LOS E	38.4	278.0	0.80	1.66	11.1
NorthEast: Shotover Street (NE)													
7	L2	295	2.9	295	2.9	0.713	82.6	LOS F	2.4	17.4	1.00	1.46	0.7
8	T1	356	3.0	356	3.0	0.454	4.6	LOS A	2.4	17.4	0.74	0.71	32.3
9	R2	89	0.0	89	0.0	0.454	6.9	LOS A	2.4	17.4	0.74	0.71	35.4
Approach		740	2.6	740	2.6	0.713	36.0	LOS D	2.4	17.4	0.84	1.01	7.6
NorthWest: Stanley Street (NW)													
10	L2	64	1.6	64	1.6	0.644	52.9	LOS D	10.9	78.2	1.00	1.37	9.3
11	T1	189	3.3	189	3.3	0.644	52.7	LOS D	10.9	78.2	1.00	1.37	9.3
12	R2	22	0.0	22	0.0	0.644	55.5	LOS E	10.9	78.2	1.00	1.37	13.3
Approach		276	2.7	276	2.7	0.644	53.0	LOS D	10.9	78.2	1.00	1.37	9.6
SouthWest: SH6A - Shotover Street (SW)													
1	L2	23	0.0	23	0.0	2.156	1132.1	LOS F	208.9	1530.9	1.00	6.01	0.9
2	T1	164	2.6	164	2.6	2.156	1132.5	LOS F	208.9	1530.9	1.00	6.01	0.4
3	R2	351	7.2	351	7.2	2.156	1136.4	LOS F	208.9	1530.9	1.00	6.01	0.4
Approach		538	5.5	538	5.5	2.156	1135.0	LOS F	208.9	1530.9	1.00	6.01	0.4
All Vehicles		2564	3.5	2526 ^{N1}	3.5	2.156	280.4	LOS F	208.9	1530.9	0.88	2.36	2.0

Level of Service (LOS) Method: Delay (HCM 2000).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^{N1} Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Wednesday, 19 August 2015 4:23:52 p.m.

Project: G:\NZTA\Reg 13\6-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St & Stanley St_Ballarat St Network\Shotover St_Stanley St & Stanley St_Ballarat St Network - Mixed.sip6

MOVEMENT SUMMARY

Site: Stanley_Shotover - PM Peak - 2028

Network: Shotover Roundabout_Ballarat Signals - PM Peak - 2028

Unsignalised pedestrian (Zebra) crossing across two-way road
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Shotover Street Continuation (NE)													
8	T1	740	2.6	740	2.6	0.962	256.6	LOS F	93.5	669.0	1.00	3.52	6.3
Approach		740	2.6	740	2.6	0.962	256.6	LOS F	93.5	669.0	1.00	3.52	6.3
SouthWest: Shotover Street (From NE Leg)													
2	T1	478	2.4	393	2.4	0.511	4.2	LOS A	2.4	17.4	0.51	0.64	44.2
Approach		478	2.4	393 ^{N1}	2.4	0.511	4.2	LOS A	2.4	17.4	0.51	0.64	44.2
All Vehicles		1218	2.5	1133 ^{N1}	2.7	0.962	169.1	NA	93.5	669.0	0.83	2.52	8.9

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: Akçelik M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^{N1} Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: OPUS INTERNATIONAL CONSULTANTS | Processed: Wednesday, 19 August 2015 4:23:52 p.m.

Project: G:\NZTA\Reg 13\6-XT177.62.305DC SH6A Shotover St Intersection\500 Technical\SIDRA Modelling\Shotover St_Stanley St & Stanley St_Ballarat St Network\Shotover St_Stanley St & Stanley St_Ballarat St Network - Mixed.sip6

RELEASED UNDER OFFICIAL INFORMATION ACT

MOVEMENT SUMMARY

Site: Stanley_Ballarat Base Option - PM Peak - 2028

Network: Shotover Roundabout_Ballarat Signals - PM Peak - 2028

New Site

Signals - Fixed Time Isolated Cycle Time = 120 seconds (Practical Cycle Time)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows		Arrival Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total veh/h	HV %	Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m		per veh	km/h
SouthEast: SH6A - Stanley Street (SE)													
1	L2	31	10.3	31	10.3	1.106	171.2	LOS F	105.4	756.8	1.00	1.73	10.4
2	T1	831	2.8	831	2.8	1.106	166.6	LOS F	105.4	756.8	1.00	1.73	9.1
3	R2	56	0.0	56	0.0	0.936	96.9	LOS F	4.2	29.7	0.84	1.08	17.2
Approach		917	2.9	917	2.9	1.106	162.5	LOS F	105.4	756.8	0.99	1.69	9.5
NorthEast: Ballarat Street (NE)													
4	L2	56	0.0	56	0.0	0.210	42.5	LOS D	3.9	27.4	0.82	0.71	27.6
5	T1	29	0.0	29	0.0	0.210	37.9	LOS D	3.9	27.4	0.82	0.71	17.8
6	R2	33	0.0	33	0.0	0.194	58.9	LOS E	1.8	12.6	0.95	0.73	10.4
Approach		118	0.0	118	0.0	0.210	45.9	LOS D	3.9	27.4	0.86	0.72	21.3
NorthWest: SH6A - Stanley Street (NW)													
7	L2	74	0.0	65	0.0	0.893	33.6	LOS C	28.7	204.0	0.81	0.84	22.4
8	T1	976	2.4	853	1.9	0.893	29.0	LOS C	28.7	204.0	0.81	0.84	30.5
9	R2	228	2.8	199	2.2	3.046	1920.7	LOS F	28.6	204.0	1.00	2.70	0.4
Approach		1278	2.3	1117 ^{N1}	1.9	3.046	367.1	LOS F	28.7	204.0	0.85	1.17	4.9
SouthWest: Ballarat Street (SW)													
10	L2	286	0.4	286	0.4	1.297	345.7	LOS F	55.6	391.4	1.00	1.91	1.2
11	T1	55	1.9	55	1.9	1.297	341.1	LOS F	55.6	391.4	1.00	1.91	3.1
12	R2	68	0.0	68	0.0	0.159	43.2	LOS D	3.2	22.1	0.83	0.74	25.0
Approach		409	0.5	409	0.5	1.297	294.5	LOS F	55.6	391.4	0.97	1.72	2.6
All Vehicles		2722	2.1	2561 ^{N1}	2.3	3.046	267.5	LOS F	105.4	756.8	0.92	1.42	5.8

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^{N1} Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue	Prop. Queued	Effective Stop Rate		
		ped/h	sec		Pedestrian ped	Distance m	per ped		
P1	SouthEast Full Crossing	95	36.2	LOS D	0.3	0.3	0.78	0.78	
P2	NorthEast Full Crossing	82	12.6	LOS B	0.1	0.1	0.46	0.46	
P3	NorthWest Full Crossing	232	36.4	LOS D	0.6	0.6	0.78	0.78	
P4	SouthWest Full Crossing	237	12.7	LOS B	0.4	0.4	0.46	0.46	
All Pedestrians		645	24.7	LOS C			0.62	0.62	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

RELEASED UNDER THE
OFFICIAL INFORMATION ACT



Opus International Consultants Ltd

20 Moorhouse Avenue
PO Box 1482, Christchurch Mail Centre,
Christchurch 8140
New Zealand

t: +64 3 363 5400
f: +64 3 365 7858
w: www.opus.co.nz