Proposed Naomi Park Residences Southview Drive Sudbury

Traffic Impact Study

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July 2017

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1.0 INTRODUCTION AND BACKGROUND

Tranplan Associates ("Tranplan") is pleased to present the results of a traffic impact study dealing with the proposed Naomi Park Residences development on the south side of Southview Drive west of in the City of Greater Sudbury (see **Exhibit 1.1** *Artist's Rendering* and **Exhibit 1.2** *Proposed Site Plan*).

The proposed development consists of two apartment buildings with a total of 64 units. Site access is via a driveway from Southview Drive west of Janmar Court.

The study has focused on the impact of the proposed development on the intersection of Southview Drive with Kelly Lake Road. A special turning movement traffic count was conducted at the intersection to establish base year conditions.

The study looked at a planning horizon year of 2023 with background traffic volumes increased by 1.5% per annum from 2017 to 2023. New traffic from the proposed development was estimated based on the Institute of Transportation Engineers (ITE) Trip Generation Manual trip rates.

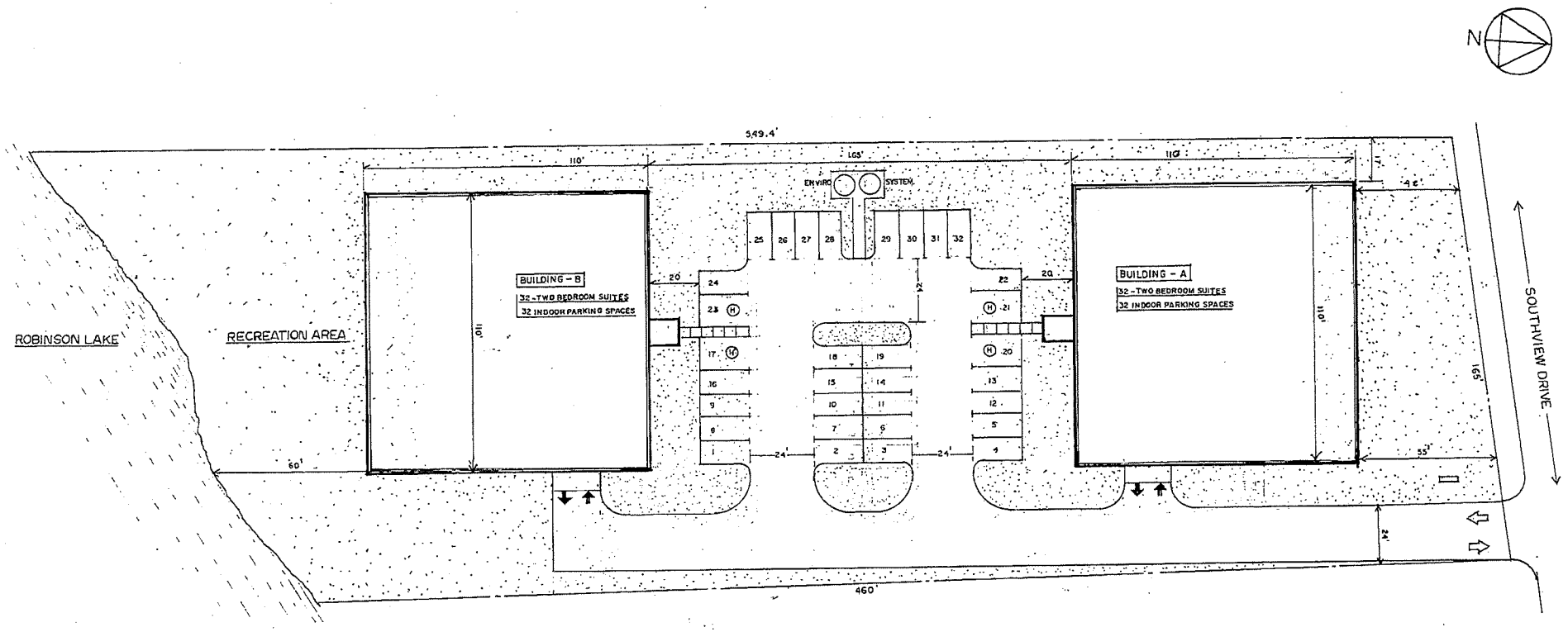
Tranplan was retained by the owners to carry out the traffic study and this report describes the study process and presents the findings. The Principal Findings and Recommendations are presented in the following section.

NAOMI PARK RESIDENCES - SUDBURY

BY

CANADIAN GROUP INC

Exhibit 1.1: Artist's Rendering of Naomi Park Residences



SITE PLAN – PROPOSED 64 SUITE, FOUR STOREY SENIORS RESIDENCE COMPLEX

SCALE - 1" = 40'

LOT - 9 SOUTHVIEW DRIVE, SUDBURY

PCL 7542 SEC SES; PT LT 9 CON 1 McKim as in LT43225; GREATER SUDBURY

DATA – LOT AREA = 87,122 sq ft (8094 sq m) BUILDINGS AREA - (TOTAL) 24,200 sq ft (2248 sq m) RATIO = 28.5 % TOTAL PARKING = 96 SPACES

Naomi Park
PARK LIVING ON A LAKE

Exhibit 1.2: Proposed Site Plan

DON WRIGHT DESIGNS 02/17

2.0 PRINCIPAL FINDINGS AND RECOMMENDATIONS

2.1 The proposed apartment buildings (64 units) are projected to generate 49 vehicle trips (32 in, 17 out) during the afternoon peak hour and 37 vehicle trips (8 in, 29 out) during the morning peak hour. It is estimated that 85% of the site traffic will be oriented towards the east towards Kelly Lake Road with 15% towards the west towards the Highway 17 Bypass (see **Exhibit 3.1c**). The 85% oriented towards the west are expected to be split between Kelly Lake Road (40% of the 85%) and Southview Drive (60% of the 85%)

2.2 The critical movements at the Southview Drive/Kelly Lake Road intersection are the Kelly Lake Road southbound right and left turns which are currently operating at approximately 66% of their capacity during the afternoon peak hour (Level of Service "C" with average delays of 18 seconds – see **Table 5.1**). During the morning peak hour the southbound approach is operating at 39% of its capacity (LOS "B" with average delays of 11 seconds). The eastbound and westbound approaches are at Level of Service "A" during the morning peak and LOS "A" and "B" during the afternoon peak with average delays ranging from nine seconds to 14 seconds.

2.3 By 2023, without the proposed development, the Kelly Lake Road southbound approach is expected to be operating at 75% of its capacity during the afternoon peak hour (Level of Service "C" with average delays of 23 seconds – see **Table 5.1**). During the morning peak hour the southbound approach is projected to operate at 43% of its capacity (LOS "B" with average delays of 12 seconds). The eastbound and westbound approaches are expected to be at Levels of Service "A", "B" and "C" with average delays ranging from 10 seconds to 16 seconds during the morning and afternoon peak hours.

2.4 The addition of the site traffic to the 2023 background traffic has a minor impact

on the Southview Drive/Kelly Lake Road intersection.

- The southbound approach along Kelly Lake Road is expected to experience a small increase in the capacity utilization from 75% to 78% with average delays increasing slightly from 23 seconds to 25 seconds during the afternoon peak hour (see **Table 5.1**). During the morning peak hour the capacity utilization is expected to increase from 43% to 45% with the average delays increasing slightly from 12.1 seconds to 12.4 seconds per vehicle.
- The eastbound approach would experience an increase in average delay from 10.3 seconds to 10.7 seconds at Level of Service "B" during the afternoon peak hour (from 9.7 seconds to 10.2 seconds during the morning peak hour - see **Table 5.1**).
- The westbound approach would experience an increase in average delay from 16.4 seconds to 18.2 seconds at Level of Service "C" during the afternoon peak hour (from 10.0 seconds to 10.2 seconds during the morning peak hour - see **Table 5.1**).

2.5 In summary, the proposed development will have a minimal impact on the Southview Drive/Kelly Lake Road intersection and will not bring about the need for any mitigation measures at the intersection.

2.6 Traffic signals are not warranted at the Southview Drive/Kelly Lake Road intersection at existing traffic levels, at 2023 background traffic levels or in 2023 with the proposed development (see **Table 5.2**). However, conditions may be close enough over the next five/ten years that the City should plan to carry out regular monitoring of the intersection.

2.7 The proposed development will require upgrading of Southview Drive to an urban cross-section with a sidewalk along its frontage.

3.0 EXISTING CONDITIONS

3.1 Southview Drive in the study area is a two-lane Collector Road with a speed limit of 50 km/h. At the development site, it has a rural cross-section with gravel shoulders and no sidewalks. The traffic volumes along this section of Southview Drive are approximately 2,500 vehicles per day. East of the development site, Southview Drive has an urban cross-section with an eight metre wide pavement plus curb and gutter, and a sidewalk along the south side. East of Kelly Lake Road, Southview Drive carries approximately 10,000 vehicles daily.

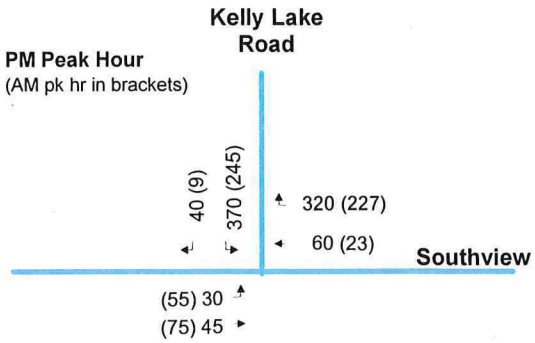
3.2 Kelly Lake Road is a designated Collector Road with a 50 km/h speed limit. In the immediate area north of Southview Drive it has a nine metre wide pavement with an urban cross-section (curb and gutter) and a sidewalk along the east side. The traffic volumes along this section of Kelly Lake Road are approximately 8,000 vehicles per day.

3.3 The existing Southview Drive/Kelly Lake Road intersection is:

- An All-Way STOP T-intersection with a single lane on all approaches, with traffic calming pavement narrowings enforcing a single lane approach.
- The Kelly Lake Road southbound approach is currently operating at approximately 66% of its capacity at Level of Service "C" with average delays of 18 seconds during the afternoon peak hour (LOS "B" with average delays of 11 seconds during the morning peak - see **Table 5.1**). The eastbound and westbound approaches are at Level of Service "A" and "B" with average delays of 9 to 14 seconds.
- Traffic signals are not warranted at the intersection at existing traffic levels (see **Table 5.2**).

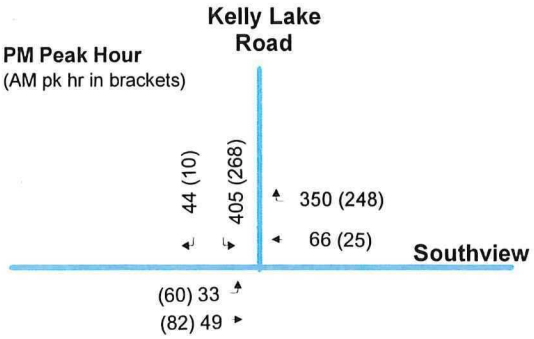
a) Base Year (2017) Traffic Volumes

(see Appendix A for details on the derivation of the 2017 traffic volume estimates).



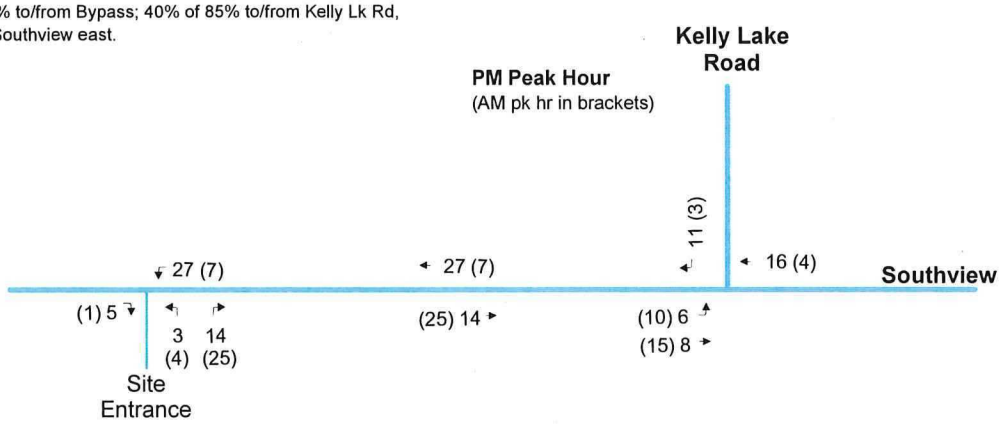
b) 2023 Background Traffic

Assumed growth of 1.5% p.a. from 2017 to 2023.



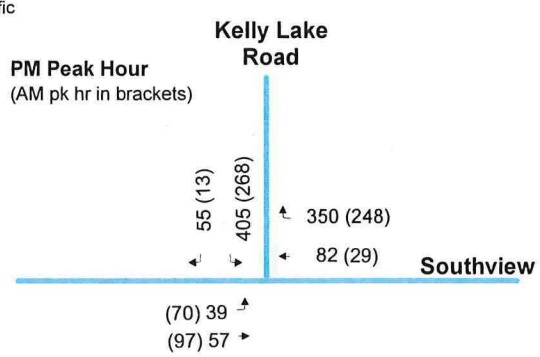
c) Site Traffic

Assumed 15% to/from Bypass; 40% of 85% to/from Kelly Lk Rd, rest to/from Southview east.



d) 2023 Total Traffic

2023 Background Traffic plus Site Traffic



NOTE: Not to scale

Exhibit 3.1

Existing and Projected Traffic Volumes

tranplan associates
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4.0 TRAFFIC FORECASTS

4.1 The traffic volumes at the Southview Drive/Kelly Lake Road intersection were projected to 2023 by increasing the 2017 volumes by 1.5% per annum (i.e. the 2017 through volumes were increased by 9.34% - see **Exhibit 3.1b**).

4.2 The proposed apartments (64 units) are projected to generate 49 vehicle trips (32 in, 17 out) during the afternoon peak hour and 37 vehicle trips (8 in, 29 out) during the morning peak hour (see **Table 4.1**).

4.3 It is estimated that the site traffic orientation will be 85% towards the east towards Kelly Lake Road and 15% towards the west towards Highway 17 (Southwest Bypass). The 85% oriented towards the east are expected to be split between Kelly Lake Road (40% of the 85%) and Southview Drive (60% of the 85%).

4.6 **Exhibit 3.1d** shows the total traffic volumes in 2023 with the site traffic (**Exhibit 3.1c**) added to the 2023 Background traffic (**Exhibit 3.1b**).

Table 4.1: PROJECTED TRIP GENERATION BY NAOMI PLACE

LAND USE		WEEKDAY AM PEAK HOUR				WEEKDAY PM PEAK HOUR			
		Trip Generation Rate (ITE Trip Generation Manual - 8th Edition)	**Vehicle Trips**			**Trip Generation Rate** (ITE Trip Generation Manual - 8th Edition)	**Vehicle Trips**		
			Total	In	Out		Total	In	Out
Apartments (ITE #220)	**64** units	T = 0.49(X) + 3.73 where T = vehicle trips X = no of units	**35**	20% **7**	80% **28**	T = 0.55(X) + 17.65 where T = vehicle trips X = no of units	**53**	65% **34**	35% **18**
Low-Rise Apt. (ITE #221)	**64** units	Ln(T) = 0.82Ln(X)+0.23 where T = vehicle trips X = no of units	**38**	21% **8**	79% **30**	Ln(T) = 0.88Ln(X)+0.16 where T = vehicle trips X = no of units	**46**	65% **30**	35% **16**
AVERAGE	**64** units		**37**	**8**	**29**		**49**	**32**	**17**

Note: Numbers may not add up exactly due to rounding.

5.0 ANALYSIS

5.1 At the 2023 background traffic levels (without the proposed development), the following conditions are expected:

- The southbound approach along Kelly Lake Road is expected to operate at Level of Service "B" during the morning peak hour and at LOS "C" during the afternoon peak hour (see **Table 5.1**); during the afternoon the average projected delays are 23 seconds per vehicle (12 seconds during the morning peak hour).
- The highest projected capacity utilization at the intersection is 0.75 for the southbound approach (see **Table 5.1**).
- Traffic signals are not warranted at the intersection at the projected 2023 background traffic levels (see **Table 5.2**).

5.2 With the site traffic (**Exhibit 3.1c**) added to the 2023 background traffic (**Exhibit 3.1b**) the following conditions are expected:

- The southbound approach along Kelly Lake Road is expected to continue operating at Level of Service "B" during the morning peak hour with the average delays increased from 12.1 to 12.4 seconds per vehicle; during the afternoon peak hour the average delays are projected to increase from 22.8 seconds to 25.3 seconds per vehicle (see **Table 5.1**).
- The highest projected capacity utilization at the intersection is 0.78 for the southbound approach (see **Table 5.1**).
- Traffic signals are not warranted at the intersection at the projected 2023 total traffic levels (see **Table 5.2**).

5.3 The proposed development has minimal impact on the Kelly Lake Road /Southview Drive intersection and will not bring about the need for any mitigation measures at the intersection.

Table 5.1 Summary of Intersection Analysis

Southview Drive at Kelly Lake Road

Synchro Software HCM Reports*

Level of Service, Delay and Capacity Utilization

Approach	Peak Hour	2017 Existing Conditions			2023 Background Traffic			2023 Total Traffic		
		LOS	Delay in sec.	Cap. Utiliz.	LOS	Delay in sec.	Cap. Utiliz.	LOS	Delay in sec.	Cap. Utiliz.
EB	AM	**A**	9.4	0.20	**A**	9.7	0.22	**B**	10.2	0.27
WB	AM	**A**	9.4	0.33	**B**	10.0	0.37	**B**	10.2	0.38
SB	AM	**B**	11.3	0.39	**B**	12.1	0.43	**B**	12.4	0.45
EB	PM	**A**	9.8	0.13	**B**	10.3	0.15	**B**	10.7	0.18
WB	PM	**B**	13.8	0.56	**C**	16.4	0.63	**C**	18.2	0.67
SB	PM	**C**	18.1	0.66	**C**	22.8	0.75	**D**	25.3	0.78

NOTE: * See Appendix B for detailed reports of the capacity/Level of Service analysis.

Table 5.2: Summary of Traffic Signal Warrant Analysis
Southview Drive at Kelly Lake Road

	Warrant 1 Minimum Vehicular Volume		Warrant 2 Delay to Cross Traffic		Combination Warrant		Conclusion
	A Total Volume	B Crossing Volume	A Main Road	B Crossing Road	Justi-fication 1	Justi-fication 2	
1. `Existing Traffic 2017	85%	95%	48%	100%	85%	48%	Not Warranted
2. `2023 Background Traffic	90%	98%	53%	100%	90%	53%	Not Warranted
3. 2023 Background Traffic + New Development Traffic	92%	98%	56%	100%	92%	56%	Not Warranted

Note: See Appendix C for detailed computation of traffic signal warrants.

5.4 The proposed development will require the upgrading of Southview Drive along the frontage of the site from a rural to an urban cross-section including a sidewalk.

APPENDIX A
TRAFFIC COUNTS

Southview Drive at Kelly Lake Road
Date: May 11, 2017

Taken by: Tranplan

TIME				Southview Drive EB			Kelly Lake Rd SB			Southview Drive WB			TOTAL	TOTAL
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	(15 min)	(60 min)
7:00 - 7:15				6	13		48		3		8	72	150	
7:15 - 7:30				8	18		42		3		4	80	155	
7:30 - 7:45				20	21		79		3		9	102	234	
7:45 - 8:00				27	23		99		4		8	109	270	809
8:00 - 8:15				16	30		96		3		8	85	238	897
8:15 - 8:30				8	34		73		1		7	76	199	941
8:30 - 8:45				15	23		92		5		14	67	216	923
8:45 - 9:00				8	24		84		3		10	86	215	868
AM Pk Hr				**71**	**108**		**347**		**11**		**32**	**372**	**7:30 - 8:30 am**	
3:00 - 3:15				9	11		88		13		9	65	195	
3:15 - 3:30				5	14		99		15		19	85	237	
3:30 - 3:45				11	15		120		12		16	90	264	
3:45 - 4:00				12	24		120		10		24	86	276	972
4:00 - 4:15				13	16		146		14		25	115	329	1106
4:15 - 4:30				13	14		151		11		21	111	321	1190
4:30 - 4:45				6	15		151		15		25	84	296	1222
4:45 - 5:00				13	24		135		19		33	93	317	1263
5:00 - 5:15				5	18		181		12		27	124	367	1301
5:15 - 5:30				12	16		111		12		22	97	270	1250
5:30 - 5:45				9	14		119		5		12	103	262	1216
5:45 - 6:00				5	14		92		13		14	110	248	1147
PM Pk Hr			**0**	**45**	**69**		**583**		**59**		**104**	**403**	**4:00 - 5:00 pm**	

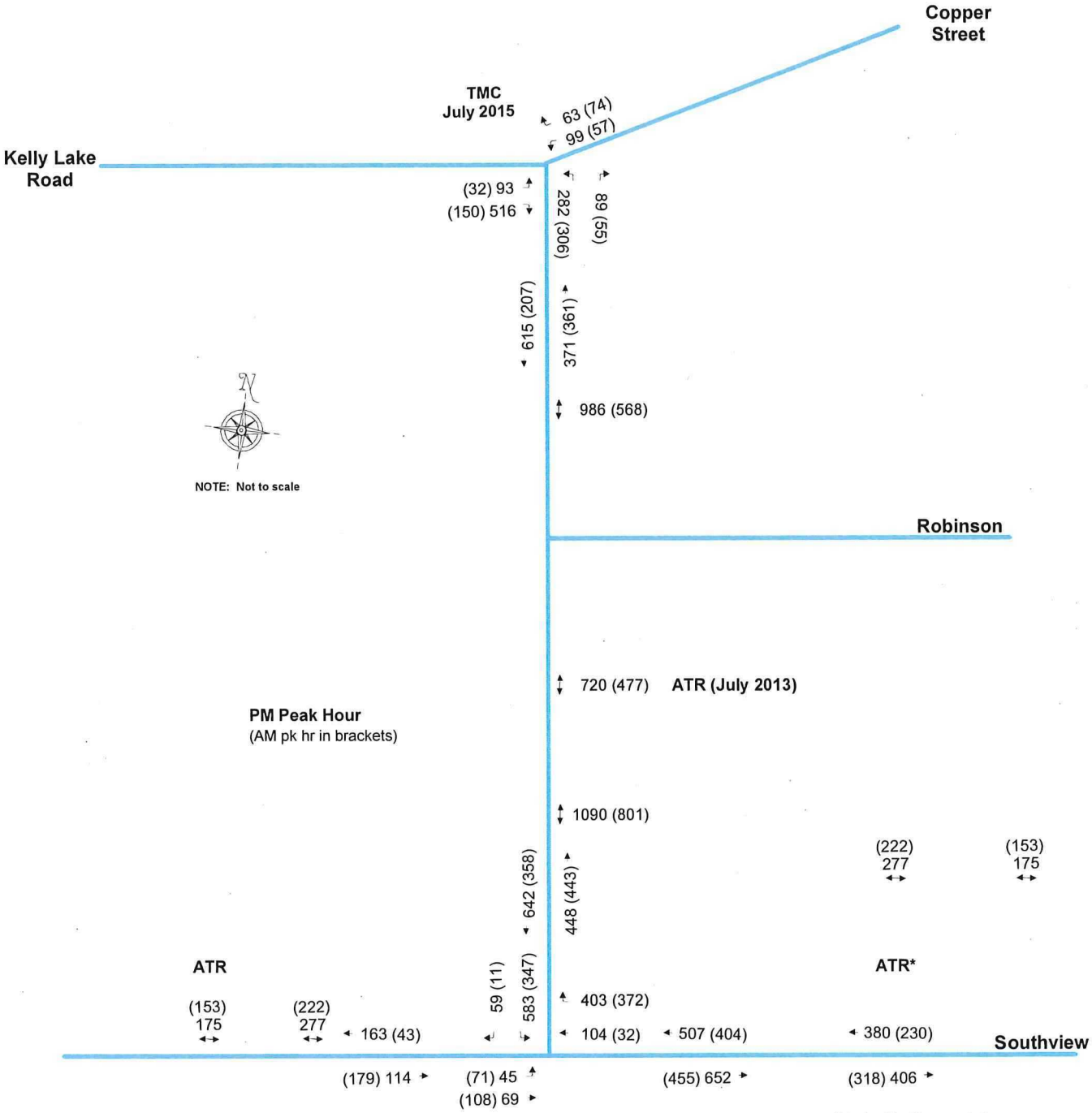
Derivation of 2017 Base Year Traffic Volumes

At the time of the Naomi Park Traffic Study, Lorne Street was being reconstructed with four lanes reduced to two lanes (one in each direction). Traffic patterns in the area were altered significantly by the reduced capacity along Lorne Street and the restrictions on some turning movements in the section under reconstruction. Traffic volumes along Kelly Lake Road and Southview Drive experienced noticeable increases in traffic because of Lorne Street.

The City did not have any recent counts at the Southview Drive/Kelly Lake Road intersection from before the start of the reconstruction along Lorne Street. The City, however, did have a number of current counts in the general area adjacent to the intersection. In discussions with City staff, it was agreed that counts by Tranplan (conducted during the Lorne Street reconstruction) could be adjusted using the nearby City counts to produce 2017 base year traffic volumes at the intersection for study purposes.

Exhibit A attached shows the May 11, 2017 intersection count by Tranplan and the nearby City tube counts plus an intersection count at Kelly Lake Road/Copper Street. The Tranplan PM peak hour counts are approximately 50% higher then the nearby City automatic recorder (tube) count, but individual volumes range from 33% to 76% higher.

The Tranplan count volumes were adjusted to produce the turning movement volumes shown in Exhibit 3.1a in the main body of the report. It is recognized that the 2017 base year traffic volumes are only "best guess" estimates, but they are considered valid for determining how much difference the proposed development will make at the Southview/Kelly Lake Road intersection.



*Note: Earlier peak hours are higher.

May 2017 Count

Counts by Tranplan Associates
May 11, 2017 4:00 - 5:00 pm
May 11, 2017 7:30 - 8:30 am

Exhibit A

Comparison of TMC and ATR Counts

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APPENDIX B
SYNCHRO INTERSECTION CAPACITY ANALYSIS REPORTS

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (vph)	55	75	23	227	245	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	60	82	25	247	266	10

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	141	272	276
Volume Left (vph)	60	0	266
Volume Right (vph)	0	247	10
Hadj (s)	0.12	-0.51	0.21
Departure Headway (s)	5.1	4.3	5.1
Degree Utilization, x	0.20	0.33	0.39
Capacity (veh/h)	657	780	672
Control Delay (s)	9.4	9.4	11.3
Approach Delay (s)	9.4	9.4	11.3
Approach LOS	A	A	B

Intersection Summary			
Delay		10.1	
HCM Level of Service		B	
Intersection Capacity Utilization		46.3%	ICU Level of Service A
Analysis Period (min)		15	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (vph)	30	45	60	320	370	40
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	49	65	348	402	43

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	82	413	446
Volume Left (vph)	33	0	402
Volume Right (vph)	0	348	43
Hadj (s)	0.11	-0.47	0.16
Departure Headway (s)	5.9	4.9	5.3
Degree Utilization, x	0.13	0.56	0.66
Capacity (veh/h)	547	704	648
Control Delay (s)	9.8	13.8	18.1
Approach Delay (s)	9.8	13.8	18.1
Approach LOS	A	B	C

Intersection Summary			
Delay		15.5	
HCM Level of Service		C	
Intersection Capacity Utilization		58.7%	ICU Level of Service B
Analysis Period (min)		15	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (vph)	60	82	25	248	268	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	65	89	27	270	291	11

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	154	297	302
Volume Left (vph)	65	0	291
Volume Right (vph)	0	270	11
Hadj (s)	0.12	-0.51	0.21
Departure Headway (s)	5.2	4.4	5.2
Degree Utilization, x	0.22	0.37	0.43
Capacity (veh/h)	639	760	649
Control Delay (s)	9.7	10.0	12.1
Approach Delay (s)	9.7	10.0	12.1
Approach LOS	A	B	B

Intersection Summary			
Delay	10.8		
HCM Level of Service	B		
Intersection Capacity Utilization	49.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (vph)	33	49	66	350	405	44
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	36	53	72	380	440	48

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	89	452	488
Volume Left (vph)	36	0	440
Volume Right (vph)	0	380	48
Hadj (s)	0.11	-0.47	0.16
Departure Headway (s)	6.2	5.1	5.5
Degree Utilization, x	0.15	0.63	0.75
Capacity (veh/h)	521	680	635
Control Delay (s)	10.3	16.4	22.8
Approach Delay (s)	10.3	16.4	22.8
Approach LOS	B	C	C

Intersection Summary			
Delay		18.9	
HCM Level of Service		C	
Intersection Capacity Utilization		63.7%	ICU Level of Service B
Analysis Period (min)		15	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (vph)	70	97	29	248	268	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	76	105	32	270	291	14

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	182	301	305
Volume Left (vph)	76	0	291
Volume Right (vph)	0	270	14
Hadj (s)	0.12	-0.50	0.20
Departure Headway (s)	5.3	4.5	5.3
Degree Utilization, x	0.27	0.38	0.45
Capacity (veh/h)	637	748	639
Control Delay (s)	10.2	10.2	12.4
Approach Delay (s)	10.2	10.2	12.4
Approach LOS	B	B	B

Intersection Summary			
Delay		11.1	
HCM Level of Service		B	
Intersection Capacity Utilization		51.5%	ICU Level of Service A
Analysis Period (min)		15	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (vph)	39	57	82	350	405	55
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	42	62	89	380	440	60

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	104	470	500
Volume Left (vph)	42	0	440
Volume Right (vph)	0	380	60
Hadj (s)	0.12	-0.45	0.14
Departure Headway (s)	6.3	5.2	5.6
Degree Utilization, x	0.18	0.67	0.78
Capacity (veh/h)	513	667	624
Control Delay (s)	10.7	18.2	25.3
Approach Delay (s)	10.7	18.2	25.3
Approach LOS	B	C	D

Intersection Summary			
Delay	20.8		
HCM Level of Service	C		
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		

APPENDIX C
TRAFFIC SIGNAL
WARRANT ANALYSIS

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision | GO TO Justification:

Intersection: Southview Drive at Kelly Lake Road | Count Date: 2017 Existing Traffic

Justification 1: Minimum Vehicle Volumes

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☑	FREE FLOW ☐	RESTR. FLOW ☐	8:00	9:00	13:00	14:00	16:00	17:00	18:00	19:00		
1A	480	720	600	900	553	618	455	575	795	815	805	530		
	COMPLIANCE %				77	86	63	80	100	100	100	74	679	85
1B	180	255	180	255	208	248	210	270	380	390	390	280		
	COMPLIANCE %				82	97	82	100	100	100	100	100	761	95

Restricted Flow Signal Justification 1:

Both 1A and 1B 100% Fullfilled each of 8 hours — Yes ☐ No ☑

Lesser of 1A or 1B at least 80% fulfilled each of 8 hours — Yes ☑ No ☐

Justification 2: Delay to Cross Traffic

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☑	FREE FLOW ☐	RESTR. FLOW ☐	8:00	9:00	13:00	14:00	16:00	17:00	18:00	19:00		
2A	480	720	600	900	345	370	245	305	415	425	415	250		
	COMPLIANCE %				48	51	34	42	58	59	58	35	385	48
2B	50	75	50	75	201	243	202	252	355	355	352	252		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100

Restricted Flow Signal Justification 2:

Both 2A and 2B 100% Fullfilled each of 8 hours — Yes ☐ No ☑

Lesser of 2A or 2B at least 80% fulfilled each of 8 hours — Yes ☐ No ☑

Justification 3: Combination

Combination Justification 1 and 2

	Justification Satisfied 80% or More			Two Justifications Satisfied 80% or More	
Justification 1	Minimun Vehicular Volume	YES ☑	NO ☐	YES ☐	NO ☑
Justification 2	Delay Cross Traffic	YES ☐	NO ☑		NOT JUSTIFIED

Justification 4: Four Hour Volume

Justification	Time Period	Total Volume of Both Approaches (Main) X	Heaviest Minor Approach Y (actual)	Required Value Y (warrant threshold)	Average % Compliance	Overall % Compliance
Justification 4	9:00	370	248	323	77 %	94 %
	16:00	415	380	301	100 %	
	17:00	425	390	296	100 %	
	18:00	415	390	301	100 %	

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: Southview Drive at Kelly Lake Road

Count Date: 2017 Existing Traffic

Justification 5: Collision Experience

Justification	Preceding Months	% Fulfillment	Overall % Compliance
Justification 5	1-12	0 %	0 %
	13-24	0 %	
	25-36	0 %	

Justification 6: Pedestrian Volume

Pedestrian Volume Analysis

8 Hour Vehicular Volume V_8		Net 8 Hour Pedestrian Volume				
		< 200	200 - 275	276 - 475	476 - 1000	>1000
Justification 6A	< 1440					
	1440 - 2600					Justified
	2601 - 7000					
	> 7000					

Pedestrian Delay Analysis

Net Total 8 Hour Volume of Total Pedestrians		Net Total 8 Hour Volume of Delayed Pedestrians		
		< 75	75 - 130	> 130
Justification 6B	< 200			
	200 - 300			
	> 300	Not Justified		

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision | GO TO Justification:

Intersection: Southview Drive at Kelly Lake Road | Count Date: 2023 Background Traffic

Justification 1: Minimum Vehicle Volumes

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☑	FREE FLOW ☐	RESTR. FLOW ☐	8:00	9:00	13:00	14:00	16:00	17:00	18:00	19:00		
1A	480	720	600	900	608	674	500	632	874	896	885	583		
	COMPLIANCE %				84	94	69	88	100	100	100	81	716	90
1B	180	255	180	255	229	269	231	297	418	429	429	308		
	COMPLIANCE %				90	100	91	100	100	100	100	100	780	98

Restricted Flow Signal Justification 1:

Both 1A and 1B 100% Fullfilled each of 8 hours — Yes ☐ No ☑

Lesser of 1A or 1B at least 80% fulfilled each of 8 hours — Yes ☑ No ☐

Justification 2: Delay to Cross Traffic

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☑	FREE FLOW ☐	RESTR. FLOW ☐	8:00	9:00	13:00	14:00	16:00	17:00	18:00	19:00		
2A	480	720	600	900	379	405	269	335	456	467	456	275		
	COMPLIANCE %				53	56	37	47	63	65	63	38	423	53
2B	50	75	50	75	221	263	222	277	390	390	387	277		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100

Restricted Flow Signal Justification 2:

Both 2A and 2B 100% Fullfilled each of 8 hours — Yes ☐ No ☑

Lesser of 2A or 2B at least 80% fulfilled each of 8 hours — Yes ☐ No ☑

Justification 3: Combination

Combination Justification 1 and 2

	Justification Satisfied 80% or More			Two Justifications Satisfied 80% or More	
Justification 1	Minimun Vehicular Volume	YES ☑	NO ☐	YES ☐	NO ☑
Justification 2	Delay Cross Traffic	YES ☐	NO ☑		NOT JUSTIFIED

Justification 4: Four Hour Volume

Justification	Time Period	Total Volume of Both Approaches (Main) X	Heaviest Minor Approach Y (actual)	Required Value Y (warrant threshold)	Average % Compliance	Overall % Compliance
Justification 4	9:00	405	269	306	88 %	97 %
	16:00	456	418	282	100 %	
	17:00	467	429	277	100 %	
	18:00	456	429	282	100 %	

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: Southview Drive at Kelly Lake Road

Count Date: 2023 Background Traffic

Justification 5: Collision Experience

Justification	Preceding Months	% Fulfillment	Overall % Compliance
Justification 5	1-12	0 %	0 %
	13-24	0 %	
	25-36	0 %	

Justification 6: Pedestrian Volume

Pedestrian Volume Analysis

8 Hour Vehicular Volume V_8		Net 8 Hour Pedestrian Volume				
		< 200	200 - 275	276 - 475	476 - 1000	>1000
Justification 6A	< 1440					
	1440 - 2600					Justified
	2601 - 7000					
	> 7000					

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Net Total 8 Hour Volume of Total Pedestrians		Net Total 8 Hour Volume of Delayed Pedestrians		
		< 75	75 - 130	> 130
Justification 6B	< 200			
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Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision | GO TO Justification:

Intersection: Southview Drive at Kelly Lake Road | Count Date: 2023 Background Traffic

Justification 1: Minimum Vehicle Volumes

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☑	FREE FLOW ☐	RESTR. FLOW ☐	8:00	9:00	13:00	14:00	16:00	17:00	18:00	19:00		
1A	480	720	600	900	632	700	526	658	907	931	921	615		
	COMPLIANCE %				88	97	73	91	100	100	100	85	735	92
1B	180	255	180	255	230	270	236	303	425	437	437	315		
	COMPLIANCE %				90	100	93	100	100	100	100	100	783	98

Restricted Flow Signal Justification 1:	Both 1A and 1B 100% Fullfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 1A or 1B at least 80% fulfilled each of 8 hours	Yes ☑	No ☐

Justification 2: Delay to Cross Traffic

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☑	FREE FLOW ☐	RESTR. FLOW ☐	8:00	9:00	13:00	14:00	16:00	17:00	18:00	19:00		
2A	480	720	600	900	402	430	290	355	482	494	484	300		
	COMPLIANCE %				56	60	40	49	67	69	67	42	450	56
2B	50	75	50	75	221	263	222	277	390	390	387	277		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100

Restricted Flow Signal Justification 2:	Both 2A and 2B 100% Fullfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 2A or 2B at least 80% fulfilled each of 8 hours	Yes ☐	No ☑

Justification 3: Combination

Combination Justification 1 and 2

	Justification Satisfied 80% or More			Two Justifications Satisfied 80% or More	
Justification 1	Minimun Vehicular Volume	YES ☑	NO ☐	YES ☐	NO ☑
Justification 2	Delay Cross Traffic	YES ☐	NO ☑		NOT JUSTIFIED

Justification 4: Four Hour Volume

Justification	Time Period	Total Volume of Both Approaches (Main)	Heaviest Minor Approach	Required Value	Average % Compliance	Overall % Compliance
		X	Y (actual)	Y (warrant threshold)		
Justification 4	9:00	430	270	294	92 %	98 %
	16:00	482	425	270	100 %	
	17:00	494	437	265	100 %	
	18:00	484	437	269	100 %	

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision | GO TO Justification:

Intersection: Southview Drive at Kelly Lake Road | Count Date: 2023 Background Traffic

Justification 5: Collision Experience

Justification	Preceding Months	% Fulfillment	Overall % Compliance
Justification 5	1-12	0 %	0 %
	13-24	0 %	
	25-36	0 %	

Justification 6: Pedestrian Volume

Pedestrian Volume Analysis

8 Hour Vehicular Volume V_8		Net 8 Hour Pedestrian Volume				
		< 200	200 - 275	276 - 475	476 - 1000	>1000
Justification 6A	< 1440					
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Pedestrian Delay Analysis

Net Total 8 Hour Volume of Total Pedestrians		Net Total 8 Hour Volume of Delayed Pedestrians		
		< 75	75 - 130	> 130
Justification 6B	< 200			
	200 - 300			
	> 300	Not Justified		