

Report to CITY OF VERNON



On

TRAFFIC IMPACT OF PROPOSED BELLA VISTA HEIGHTS DEVELOPMENT ALEXIS PARK DRIVE/30 AVENUE



- Traffic Impact
- Parking
- Transportation Planning
- Corridor Studies

- Traffic Operations
- Transit
- Trucking
- Network Modelling
- Bicycles/Pedestrians

December 29, 2004

New Town Planning Services
1450 Pandosy Street
Kelowna, BC V1Y 1P3

Attn: Keith Funk

Dear Keith:

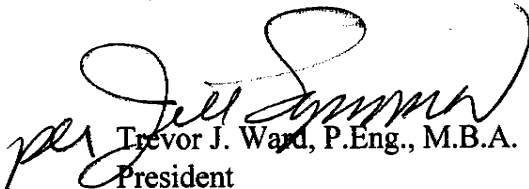
Re: Traffic Impact of Proposed Bella Vista Heights Development

In response to your request, we have now undertaken a study to determine the traffic impact of the proposed Turtle Mountain development to be located west of Alexis Park Drive and north of 30 Avenue in the City of Vernon. The study has also addressed the issue of determining how much development in the broader Bella Vista Heights area is able to be served by 39A Avenue which serves as the primary access to the development area and connects to Alexis Park Drive.

The attached report presents a summary of our work, findings, and conclusions. I trust that it provides the information you require at this time in order to address the issues raised by the City's Engineering Department. Please do not hesitate to call if you have any further questions.

Yours truly,

T.J. WARD CONSULTING GROUP INC.


Trevor J. Ward, P.Eng., M.B.A.
President

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1.0 INTRODUCTION

DC Properties Ltd. is proposing to develop a large block of land referred as the Turtle Mountain Development for residential purposes. When completed, it will ultimately consist of 530 units, with a mixture of both single and multi-family units. This will be Phase I. The development is to be located a short distance west of Alexis Park Drive and north of the line of 35 Avenue. There is the potential for further residential developments in the future to the north and west of this block and this will result in a total of 1,898 units in the Bella Vista Highlands area. The location of the site in the broader area is shown in Exhibit 2.1.

On the current plan for the development, the only access proposed to the site was via 39A Avenue which intersects Alexis Park Drive. There is a secondary access to 35 Avenue which will serve only 23 townhouse units in the new development.

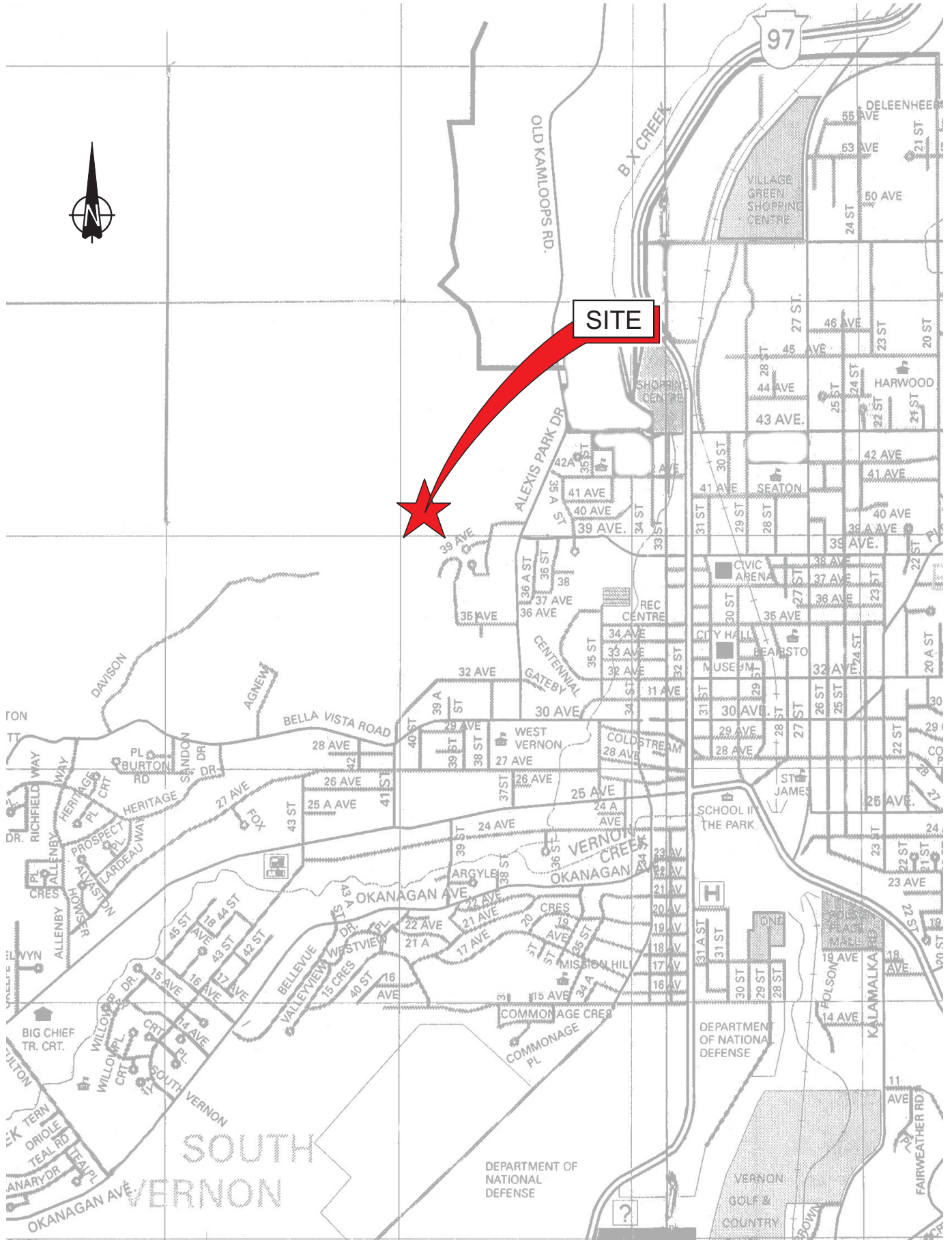
The City requested that a traffic impact study be undertaken to determine the impact of traffic generated by the proposed development on the adjacent roads and assess what improvements if any, are required. The study also sought to address how much of the total development could be served by the proposed 39A Avenue access.

2.0 BACKGROUND CONDITIONS

2.1 Road Network

The primary roads of interest in this study are as follows:

- (a) Alexis Park Drive - This is designated by the City as a major arterial road (based on Plan Vernon) and runs in a north-south direction commencing at 30 Avenue and continuing north past 43 Avenue (as Old Kamloops Highway) into the Regional District. It has one travel lane in each direction and on-street parking is permitted along both sides. In the vicinity of 35 Avenue, it has a wide pavement width of approximately 15.5 metres but tapers both north and south of here. It has curb and gutter and sidewalks along both sides. Traffic using Alexis Park Drive has the right-of-way at all intersections except at its southern terminal point at 30 Avenue which is controlled by traffic signals. Between 30 Avenue and the line of 37 Avenue it has a grade of approximately 4% - 5.5%. This road is actually 37 Street at the very south end south of 32 Avenue.
- (b) 30 Avenue - This is also designated by the City as a major arterial road east of Alexis Park Drive/37 Street and a minor arterial road west of Alexis Park Drive/37 Street, and runs in an east-west direction. It has one travel lane each way with on-street parking permitted and a signalized intersection with Alexis Park Drive. It has two lanes on each approach at this intersection with a dedicated right turn lane for vehicles arriving from the east and a centre left turn lane for vehicles arriving from the west. It has a signalized intersection with Highway 97/32 Street to the east. At its west end, it turns south as 41 Street and Bella Vista Road continues west from this point.



- (c) 35 Avenue - This collector road commences at Alexis Park Drive and travels west for approximately 200 metres. It then makes a 90° right hand turn and goes north as 39 Street. It has a pavement width of 8.3 metres with curb and gutter and sidewalk along both sides. Although only wide enough for one travel lane in each direction, on-street parking is not prohibited. It has a grade of approximately 7% and flattens slightly to 5.5% as it approaches Alexis Park Drive.
- (d) 39 Avenue – This minor arterial road runs from Alexis Park Road in the west to Black Rock Road. There is one travel lane in each direction.
- (e) 39A Avenue – This is a local road that serves a small enclave of single family homes on the west side of Alexis Park Drive.
- (f) 43 Avenue - This is another four lane major arterial road that connects Alexis Park Drive at its west end, crosses 32 Avenue/Highway 97, and then continues east beyond 27 Street and Pleasant Valley Road. It has signalized intersections at Highway 97 and Alexis Park Drive.
- (g) Bella Vista Road – This road, which is designated as a minor arterial road, has a rural cross-section and runs west from the 30 Avenue/41 Street intersection to serve the scattered residential communities of West Vernon along the north side of Okanagan Lake.
- (h) Davison Road – This is a rural local road that commences at Bella Vista Road and then extends north and north-west serving only a few farm houses. It has no curb and gutter or sidewalk.

2.2 Traffic Controls

The only traffic signals within this study area are at the intersections of 30 Avenue and 43 Avenue on Alexis Park Drive. Both 43 Avenue and 30 Avenue also have traffic signals at their intersections with Highway 97/32 Street further to the east. All other streets that intersect Alexis Park Drive, 30 Avenue and Bella Vista Road are stop-controlled.

The channelization of each of the intersections requested to be analyzed in this study are given in Table 2.1.

Table 2.1
Existing Intersection Laning Configuration

E-W Street	N-S Street	EB			WB			NB			SB			Sig-nal?	Prior-ity
		L	T	R	L	T	R	L	T	R	L	T	R		
30 Avenue	Alexis Park Dr	1	1	n/a	n/a	1	1	n/a	n/a	n/a	1	n/a	1	Y	--
35 Avenue	Alexis Park Dr	-	n/a	-	n/a	n/a	n/a	-	1	n/a	n/a	1	-	N	N/S
39 Avenue	Alexis Park Dr	n/a	n/a	n/a	-	n/a	-	n/a	1	-	-	1	n/a	N	N/S
39A Avenue	Alexis Park Dr	-	n/a	-	n/a	n/a	n/a	-	1	n/a	n/a	1	-	N	N/S
Bella Vista Rd	Davison Rd	-	1	n/a	n/a	1	-	n/a	n/a	n/a	-	n/a	-	N	E/W
30 Ave	41 St	-	1	-	-	1	-	-	1	1	-	1	1	N	W

Note: - or - means no dedicated left or right turn lane but shared with the adjacent through lane
n/a - means movement not appropriate

2.3 Traffic Volumes

New traffic volumes were recorded at five intersections, these being 30 Avenue, 39 Avenue, and 39A Avenue on Alexis Park Drive as well as Bella Vista Road/Davison Road and 30 Avenue/41 Street in the morning and afternoon peak periods in 2004 as part of this study. The resultant 2004 volumes are shown in Exhibit 2.2. The traffic count data for 35 Avenue was based on a previous study and factored up. The traffic volumes show that there are approximately 1,040 vehicles on Alexis Park Drive in the p.m. peak hour of which 480 or 46% are northbound and 560 or 54% are southbound. On 30 Avenue east of Alexis Park Drive, the two-way volume is 990 with 430 or 43% being eastbound and 560 or 57% being westbound. At the intersection of Alexis Park Drive and 30 Avenue, the heaviest turning movements are the eastbound left turn with 310 veh/h and the southbound right turn with 400 veh/h.

Existing volumes on 35 Avenue and 39A Avenue are very minimal because of their short lengths and the small amount of development that they serve. The traffic volumes at the east end of 35 Avenue were recorded at 95 two-way in the p.m. peak hour of which 55 were westbound and 50 eastbound. Volumes on 39 Avenue are higher at 280 with 170 westbound and 110 eastbound.

2.4 Road Network

The City's Major Road Network indicates that the only changes proposed to the road network in this area is to connect 30 Avenue to 32 Avenue in the vicinity of 35 Street and designate this as a major arterial road. In the currently drafted version of Plan Vernon, 35 Avenue is shown as being upgraded to a collector road classification from Alexis Park Drive to the west through to the lands covered by the proposed development. The City has also indicated that there is the potential for a bypass of the City located to the northwest of the development. This is considered very long term.

2.5 Future Background Traffic Volumes

Existing volumes in the vicinity of the site were factored up by 3% per annum to represent future volumes at the desired horizon years of 2005, 2010 and 2015. These factored up volumes were then used as the background volumes prior to superimposing the traffic generated by the proposed development on top. These are shown in Exhibits 2.3, 2.4, and 2.5.

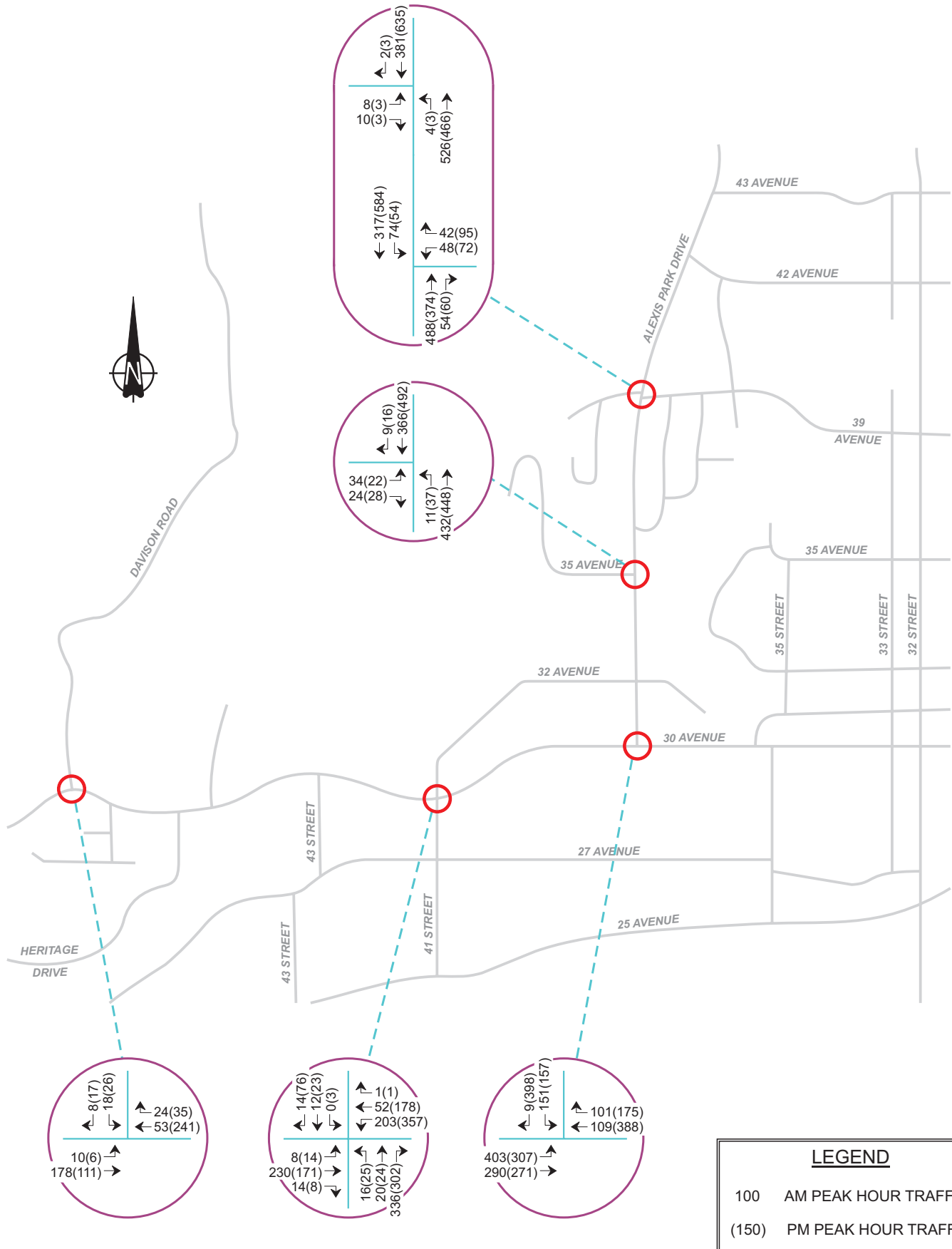
2.6 Transit

There is transit service currently running along Alexis Park Drive - Route #3 with a 30 minute headway Monday to Saturday. This route connects Village Green Mall to Downtown Vernon.

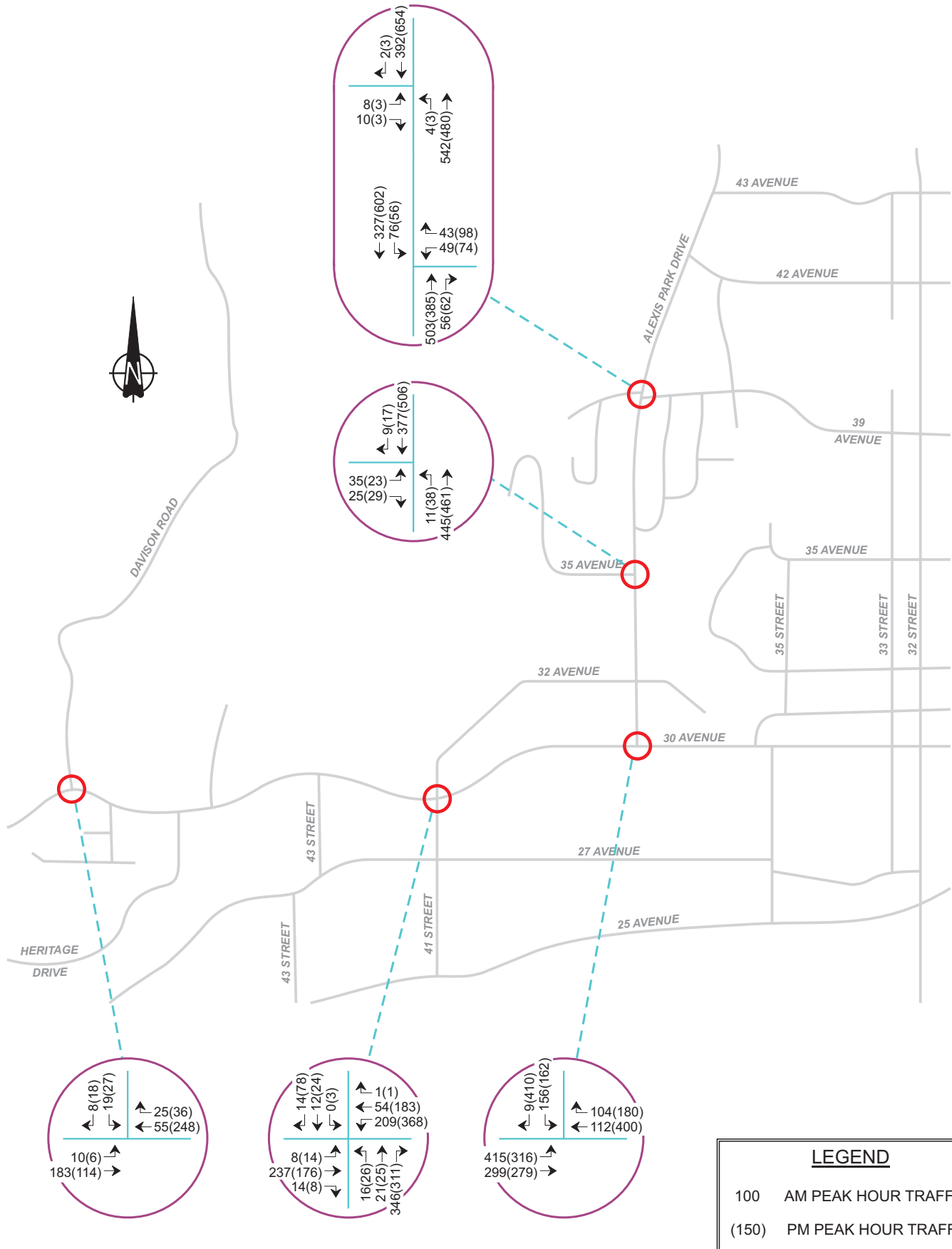
2.7 Land Uses

Most of the land on both sides of Alexis Park Drive are single family. However, in the vicinity of 30

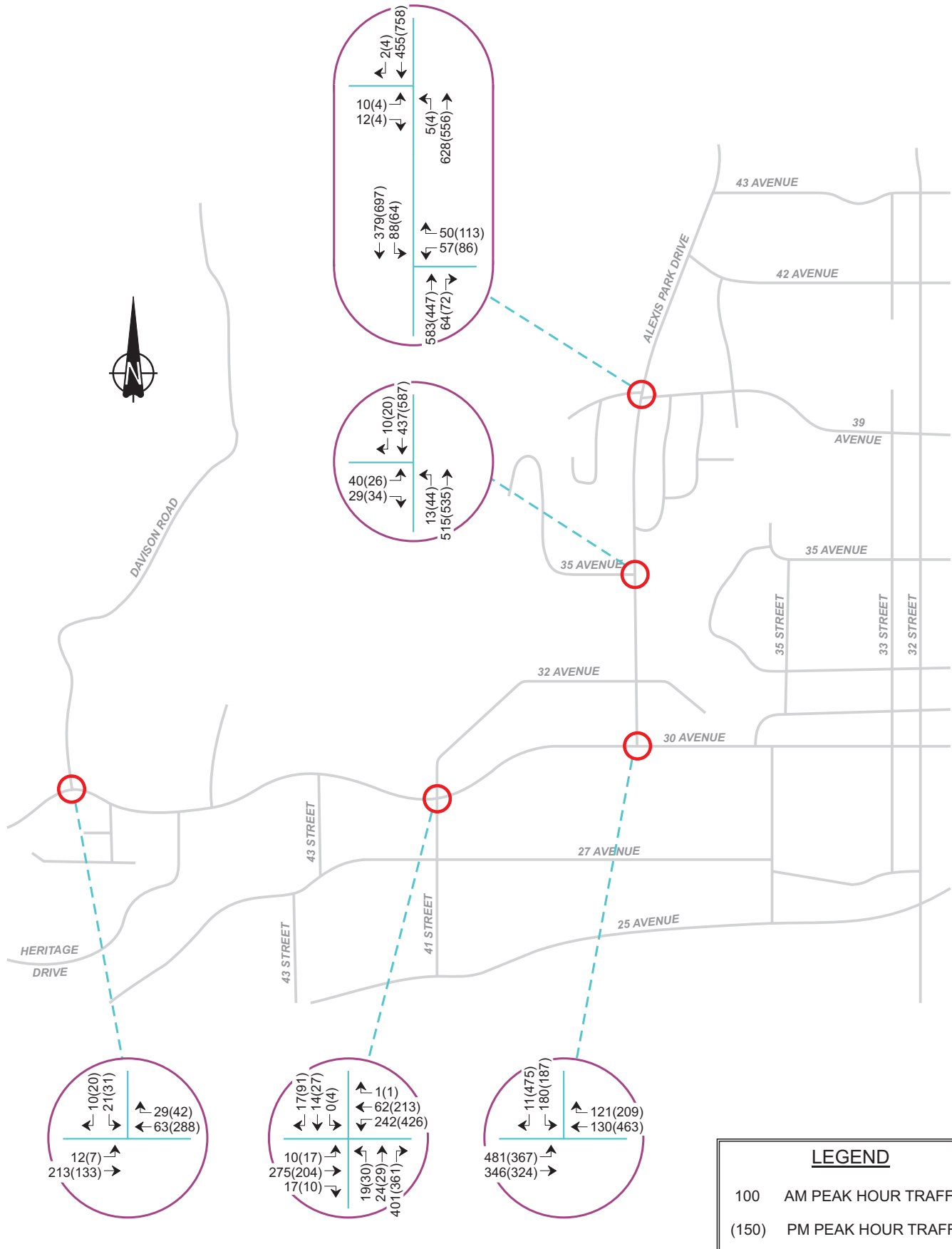
2004 EXISTING TRAFFIC VOLUMES



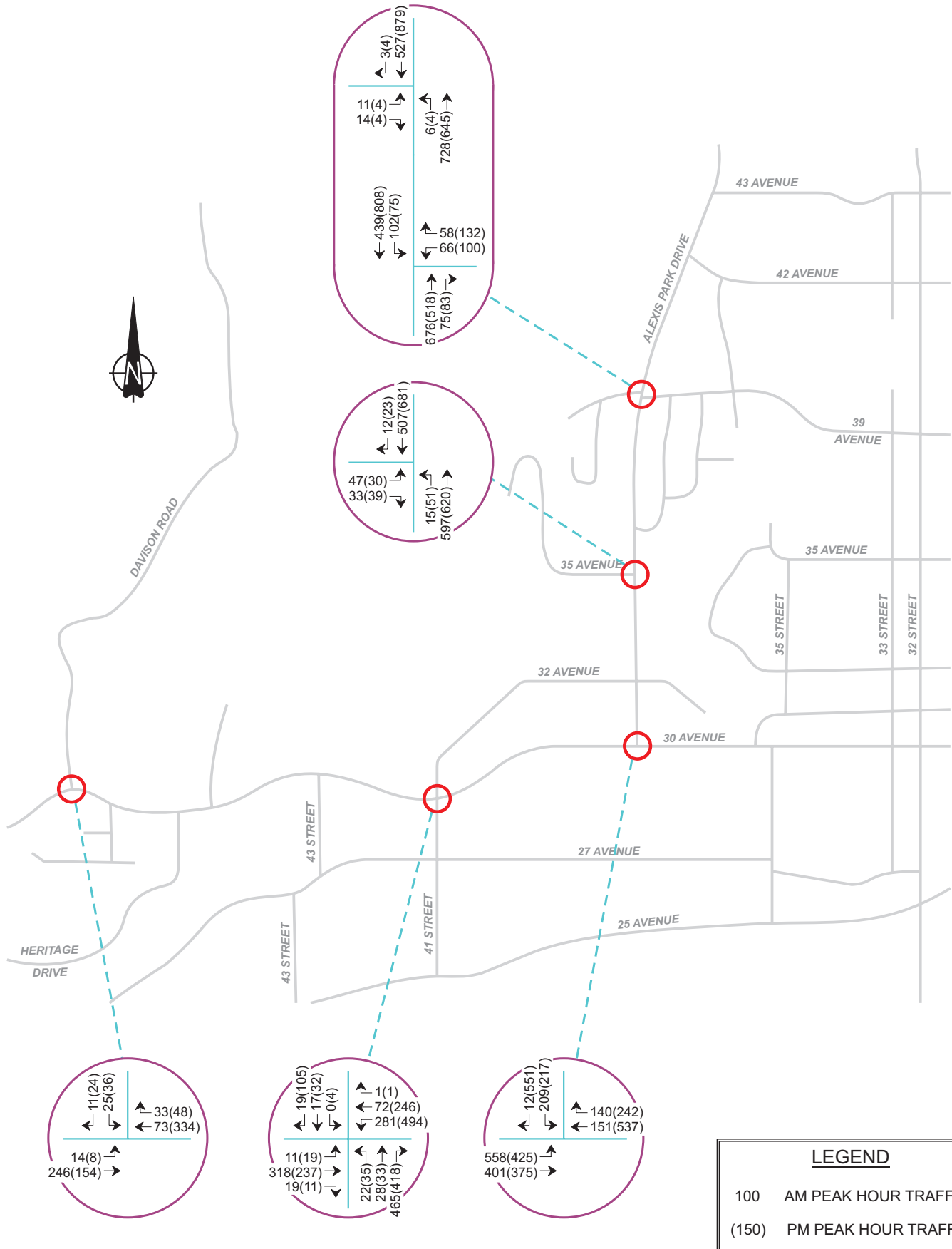
2005 BACKGROUND TRAFFIC VOLUMES



2010 BACKGROUND TRAFFIC VOLUMES



2015 BACKGROUND TRAFFIC VOLUMES



Avenue there are a number of multi-family developments. There is a large block of vacant land on the east side of Alexis Park Drive in the vicinity of its intersection with 35 Avenue. The subject property is presently vacant as, are for all practical purposes, the adjacent lands to the south, west and north.

2.8 Intersection Performance

The level of service at the key intersections were analyzed using the Highway Capacity Manual methods using SYNCHRO6. For signalized intersections, the operational analysis methodology gives three indicators for the overall performance of an intersection and for the individual turning movements. The first is the volume to capacity ratio (v/c) where the volume is the number of vehicles wishing to make a certain movement, and capacity is the maximum number of vehicles that can be accommodated in an hour. This takes into account the number of lanes available for the movement, whether the movement is protected or permitted, conflicting traffic, the cycle length, and the amount of green time the movement receives. The higher the v/c ratio, the more congested the intersection becomes. When the v/c ratio is greater than 1.00, this indicates that more vehicles wish to make a given movement than are able to, due to the limited capacity. The second measure, the average delay per vehicle, is based on the cycle length, the green time for each movement and the v/c ratios. The third measure is the level of service which is established from the average delay. The larger the average delay - and the higher the v/c ratio - the worse is the level of service. Table 2.2 shows the relationship between level of service, delay and v/c ratio.

Table 2.2
Volume/Capacity, Reserve Capacity vs. Level of Service

LoS	Signalized Intersection	Delays	Unsignalized Intersection
	Stopped Delay/Vehicle (s/veh)		Avg. Ttl Delay
A	≤ 10.0	Little or no delay	≤ 10
B	> 10.0 and ≤ 20.0	Short traffic delays	> 10 and ≤ 15
C	> 20.0 and ≤ 35.0	Average traffic delays	> 15 and ≤ 25
D	> 35.0 and ≤ 55.0	Long traffic delays	> 25 and ≤ 35
E	> 55.0 and ≤ 80.0	Very long traffic delays	> 35 and ≤ 50
F	> 80.0	Failure	> 50

The generally accepted guidelines for determining whether or not a signalized intersection needs to be upgraded is that all individual movements should operate with a v/c ratio of 0.90 or less. If this threshold is not achieved, any signal changes required to achieve these levels should be identified.

These cover changes to signal timings and phasing, for example adding advanced phases for left turn movements and possible elimination of certain turning movements, but not the provision of additional capacity with extra through or turn lanes. When traffic generated by a development is added to an intersection and the v/c ratio of a specific movement that was less than 0.90 under background conditions is now greater than 0.90, then improvements must be identified to allow the intersection to operate at the 0.90 value. If the intersection was above 0.90 under background conditions, then the original v/c ratios must not be exceeded, i.e., the operation of the intersection

must be no worse as a result of the development.

The performance of unsignalized intersections was also reviewed using the methodology for such intersections in the *Highway Capacity Manual*. The methodology estimates the capacity of each movement based on the conflicting pedestrian and traffic volumes. An operational level of service is assigned to the movement based on the volume and capacity and the relationship between the two was included in Table 2.2.

While the overall level of service and delay for an unsignalized intersection provide a measure of overall performance, it is commonly turning movements at such intersections which are the primary focus of interest. With only low turning volumes from the minor road and high through volumes on the main road, delays to turning vehicles can become excessive. As delays increase, turning vehicles will attempt to turn across unacceptable gaps which can present safety concerns.

The key intersections in the vicinity the site were analyzed under the 2005, 2010 and 2015 background conditions using the standard HCS methodology as implemented in SYNCHRO06 and the results are given in Tables 2.3 to 2.8 and are summarized below.

- (a) 30 Avenue/Alexis Park Drive – This intersection will operate as an acceptable level of service under background conditions through to 2010 horizon year. By 2015, an eastbound advanced green phase will be needed since without this phase, the intersection will operate at a v/c ratio of 0.95 in the p.m. peak hour.
- (b) 35 Avenue/Alexis Park Drive - At this unsignalized intersection, the eastbound left and right turn movements on 35 Avenue, which share a common single lane as they approach Alexis Park Drive, will operate at no worse than Level of Service D through to 2015 in both peak hours and this is certainly considered acceptable for traffic exiting from a local road at an unsignalized intersection. The maximum v/c ratio is 0.38.
- (c) 39 Avenue/Alexis Park Drive – In the 2005 and 2010 horizon year this intersection will operate at an acceptable level. The critical time period will be the 2010 p.m. peak hour when 39 Avenue traffic will operate at a v/c ratio of 0.89 and Level of Service F in the p.m. peak hour. By 2015 the v/c ratio will be greater than 1.00. This indicates that shortly after 2010 improvements will be required and a signal is recommended.
- (d) 39A Avenue/Alexis Park Drive – The intersection will operate well through to 2015. No improvements are needed. The maximum v/c ratio will be 0.06 in the p.m. peak hour of 2015 and the Level of service will be D.
- (e) Bella Vista Road/Davison Road – This intersection will also operate well through to 2015 with the maximum v/c ratio being 0.12 and the Level of Service B.
- (f) 30 Avenue/41 Street – This four leg intersection is stop controlled for all legs except the east leg which has priority. Since SYNCHRO cannot analyze such an intersection, the intersection was analyzed with only north-south traffic facing a stop sign. Under these assumptions the intersection will operate well in the a.m. peak hour through to 2015. In the

p.m. peak hour a separate northbound left turn lane is recommended by 2010 to reduce v/c ratios; however, delays would still be long. Only a signal would rectify this. By 2015 the intersection will need to be signalized with eastbound and westbound left turn lanes as well as a westbound advanced green phase.

Table 2.3
Intersection Analysis
30 Avenue/Alexis Park Drive

		Eastbound		Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R
Background													
2005 am	v/c	0.55	0.27		0.10	0.11				0.38	0.02		0.55
	delay	9.7	6.0		5.3	1.7				14.9	8.3		8.2
	LoS	A	A		A	A				B	A		A
2010 am	v/c	0.69	0.33		0.12	0.13				0.43	0.03		0.69
	delay	14.0	6.7		5.5	1.7				16.8	8.3		10.3
	LoS	B	A		A	A				B	A		B
2015 am	v/c	0.81	0.38		0.14	0.15				0.49	0.03		0.81
	delay	21.6	7.4		5.8	1.7				18.7	8.1		13.7
	LoS	C	A		A	A				B	A		B
2005 pm	v/c	0.77	0.30		0.43	0.21				0.34	0.60		0.77
	delay	18.6	6.5		7.5	1.6				16.2	5.7		9.1
	LoS	B	A		A	A				B	A		A
2010 pm	v/c	0.87	0.31		0.44	0.22				0.44	0.74		0.87
	delay	25.8	6.3		7.4	1.4				22.3	11.4		12.3
	LoS	C	A		A	A				C	B		B
2015 pm	v/c	0.95	0.32		0.46	0.22				0.59	0.93		0.95
	delay	38.1	5.7		6.9	1.0				37.1	32.8		20.7
	LoS	D	A		A	A				D	C		C
add EB adv grn	v/c	0.82	0.32		0.86	0.35				0.59	0.79		0.86
	delay	29.9	6.0		33.5	3.9				31.3	12.4		20.2
	LoS	C	A		C	A				C	B		C
Combined													
2005 am	v/c	0.58	0.28		0.10	0.13				0.50	0.08		0.58
	delay	11.1	6.8		6.1	1.8				16.3	6.1		9.5
	LoS	B	A		A	A				B	A		A
2010 am	v/c	0.75	0.35		0.13	0.16				0.55	0.08		0.75
	delay	16.8	7.6		6.3	1.8				18.4	6.0		12.0
	LoS	B	A		A	A				B	A		B
2015 am	v/c	0.85	0.39		0.15	0.17				0.63	0.09		0.85
	delay	22.1	7.8		6.1	1.6				23.1	6.6		14.8
	LoS	C	A		A	A				C	A		B
2005 pm	v/c	0.83	0.29		0.42	0.28				0.43	0.62		0.83
	delay	23.6	6.9		7.9	1.7				17.6	6.4		10.4
	LoS	C	A		A	A				B	A		B
2010 pm	v/c	0.90	0.30		0.43	0.29				0.56	0.76		0.90
	delay	27.5	6.2		7.3	1.3				26.4	13.0		13.3
	LoS	C	A		A	A				C	B		B
2015 pm	v/c	0.98	0.31		0.44	0.29				0.74	0.97		0.98
	delay	52.7	5.7		7.0	1.1				46.5	43.9		26.7
	LoS	D	A		A	A				D	D		C
EB adv grn	v/c	0.84	0.32		0.89	0.45				0.70	0.79		0.89
	delay	32.3	6.2		38.3	4.2				35.0	12.7		21.9
	LoS	C	A		D	A				D	B		C

v/c = volume to capacity ratio; delay = average delay per vehicle in seconds; LoS = Level of Service

Table 2.4
Intersection Analysis
35 Avenue/Alexis Park Drive

		Eastbound			Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R	
Background														
2005 am	v/c	0.17						0.01						
	delay	16.4						8.2						
	LoS	C						A						
2010 am	v/c	0.23						0.01						
	delay	19.6						8.4						
	LoS	C						A						
2015 am	v/c	0.34						0.02						
	delay	25.8						8.6						
	LoS	C						A						
2005 pm	v/c	0.18						0.04						
	delay	18.7						8.7						
	LoS	C						A						
2010 pm	v/c	0.25						0.05						
	delay	23.6						9.1						
	LoS	C						A						
2015 pm	v/c	0.38						0.07						
	delay	33.7						9.5						
	LoS	D						A						
Combined														
2005 am	v/c	0.25						0.01						
	delay	20.2						8.5						
	LoS	C						A						
2010 am	v/c	0.34						0.02						
	delay	25.3						8.7						
	LoS	D						A						
2015 am	v/c	0.48						0.02						
	delay	36.1						9.0						
	LoS	E						A						
2005 pm	v/c	0.25						0.05						
	delay	23.8						9.0						
	LoS	C						A						
2010 pm	v/c	0.36						0.06						
	delay	32.6						9.4						
	LoS	D						A						
2015 pm	v/c	0.54						0.08						
	delay	52.5						9.9						
	LoS	F						A						

v/c = volume to capacity ratio; delay = average delay per vehicle in seconds; LoS = Level of Service

Table 2.5
Intersection Analysis
39 Avenue/Alexis Park Drive

		Eastbound			Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R	
Background														
2005 am	v/c				0.34						0.09			
	delay				23.2						9.1			
	LoS				C						A			
2010 am	v/c				0.49						0.11			
	delay				34.3						9.5			

		Eastbound			Westbound			Northbound			Southbound			Over
		L	T	R	L	T	R	L	T	R	L	T	R	all
2015 am	LoS				D						A			
	v/c				0.75						0.14			
	delay				69.5						10.1			
2005 pm	LoS				F						B			
	v/c				0.61						0.06			
	delay				33.4						8.5			
2010 pm	LoS				D						A			
	v/c				0.89						0.07			
	delay				76.4						8.8			
2015 pm	LoS				F						A			
	v/c				1.38						0.09			
	delay				252						9.2			
signal	LoS				F						A			
	v/c				0.60		-	0.52	-	-	-	0.86		0.86
	delay				19.1		-	7.3	-	-	-	18.4		14.6
	LoS				B		-	A	-	-	-	B		B
Combined 2005 am	v/c				0.59		-				0.18			
	delay				43.5		-				9.7			
	LoS				E		-				A			
2010 am	v/c				0.87		-				0.21			
	delay				94.4		-				10.3			
	LoS				F		-				B			
2015 am	v/c				1.35		-				0.26			
	delay				270		-				11.2			
	LoS				F		-				B			
signal SBL	v/c				0.44		-	0.65	-	0.76	0.44			0.76
	delay				14.5		-	8.8	-	30.2	5.9			10.7
	LoS				B		-	A	-	C	A			B
2005 pm	v/c				1.12		-				0.12			
	delay				135		-				9.2			
	LoS				F		-				A			
2 WB lanes 2010 pm	v/c				0.73		0.39				0.12			
	delay				92.9		16.3				9.2			
	LoS				F		C				A			
2010 pm	v/c				1.60		-				0.13			
	delay				336		-				9.6			
	LoS				F		-				A			
signal SBL	v/c				0.55		-	0.63	-	0.44	0.75			0.75
	delay				8.8		-	9.4	-	12.0	12.6			10.8
	LoS				B		-	A	-	B	B			B
2015 pm	v/c				2.44		-				0.16			
	delay				717		-				10.1			
	LoS				F		-				B			
signal SBL	v/c				0.62		-	0.70	-	0.63	0.84			0.84
	delay				11.2		-	11.6	-	25.5	17.7			15.0
	LoS				B		-	B	-	C	B			B

v/c = volume to capacity ratio; delay = average delay per vehicle in seconds; LoS = Level of Service

Table 2.6
Intersection Analysis
39A Avenue/Alexis Park Drive

		Eastbound			Westbound			Northbound		Southbound			Over	
		L	T	R	L	T	R	L	T	R	L	T	R	all
Background														
2005 am	v/c	0.05						0.00						
	delay	14.9						8.2						

		Eastbound			Westbound			Northbound			Southbound			Over	
		L	T	R	L	T	R	L	T		R	L	T	R	all
	LoS	B							A						
2010 am	v/c	0.08							0.01						
	delay	17.3							8.4						
	LoS	B							A						
2015 am	v/c	0.10							0.01						
	delay	20.5							8.6						
	LoS	C							A						
2005 pm	v/c	0.02							0.00						
	delay	18.9							9.1						
	LoS	C							A						
2010 pm	v/c	0.04							0.01						
	delay	22.9							9.5						
	LoS	C							A						
2015 pm	v/c	0.06							0.01						
	delay	29.2							10.1						
	LoS	D							B						
Combined															
2005 am	v/c	0.73		-					0.06						
	delay	35.7		-					8.4						
	LoS	E		-					A						
2010 am	v/c	0.88		-					0.06						
	delay	60.0		-					8.7						
	LoS	F		-					A						
2015 am	v/c	1.10		-					0.07						
	delay	126		-					8.9						
	LoS	F		-					A						
2 EB lanes	v/c	0.69		0.41					0.07						
	delay	82.2		16.9					8.9						
	LoS	F		C					A						
2005 pm	v/c	0.91		-					0.26						
	delay	97.9		-					10.9						
	LoS	F		-					B						
2 EB lanes	v/c	0.62		0.29					0.26						
	delay	114		17.4					10.9						
	LoS	F		C					B						
2010 pm	v/c	1.22		-					0.29						
	delay	210		-					11.8						
	LoS	F		-					B						
2 EB lanes	v/c	0.88		0.34					0.29						
	delay	211		20.4					11.8						
	LoS	F		C					B						
2015 pm	v/c	1.70		-					0.33						
	delay	430		-					13.0						
	LoS	F		-					B						
signal, NBL,	v/c	0.46		-				0.67	0.47			0.84		0.08	0.84
NB adv grn,	delay	13.2		-				29.2	5.1			20.9		2.3	15.2
SBR	LoS	B		-				C	A			C		A	B

v/c = volume to capacity ratio; delay = average delay per vehicle in seconds; LoS = Level of Service

Table 2.7
Intersection Analysis
Bella Vista/Davidson Avenue

		Eastbound			Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R	
Background														
2005 am	v/c	0.01									0.04		-	
	delay	7.4									9.9		-	

		Eastbound			Westbound			Northbound			Southbound			Overall
		L	T	R	L	T	R	L	T	R	L	T	R	
2010 am	LoS	A									A			-
	v/c	0.01									0.05			-
	delay	7.4									10.2			-
2015 am	LoS	A									B			-
	v/c	0.01									0.06			-
	delay	7.5									10.6			-
2005 pm	LoS	A									B			-
	v/c	0.01									0.08			-
	delay	7.9									11.1			-
2010 pm	LoS	A									B			-
	v/c	0.01									0.09			-
	delay	8.0									11.8			-
2015 pm	LoS	A									B			-
	v/c	0.01									0.12			-
	delay	8.2									12.6			-
Combined 2005 am	LoS	A									B			-
	v/c	0.01									0.04			-
	delay	7.4									10.1			-
2010 am	LoS	A									B			-
	v/c	0.01									0.05			-
	delay	7.5									10.3			-
2015 am	LoS	A									B			-
	v/c	0.01									0.06			-
	delay	7.5									10.8			-
2005 pm	LoS	A									B			-
	v/c	0.01									0.08			-
	delay	7.9									11.3			-
2010 pm	LoS	A									B			-
	v/c	0.01									0.10			-
	delay	8.0									12.0			-
2015 pm	LoS	A									B			-
	v/c	0.01									0.13			-
	delay	8.2									12.9			-
	LoS	A									B			-

v/c = volume to capacity ratio; delay = average delay per vehicle in seconds; LoS = Level of Service

Table 2.8
Intersection Analysis
30 Avenue (Bella Vista)/41 Street

		Eastbound			Westbound			Northbound			Southbound			Over all
		L	T	R	L	T	R	L	T	R	L	T	R	
Background														
2005 am	v/c	0.01			0.18			-	0.16	0.49	-	0.07	0.02	
	delay	7.3			8.4			-	22.0	14.0	-	23.0	8.6	
	LoS	A			A			-	C	B	-	C	A	
2010 am	v/c	0.01			0.21			-	0.24	0.60	-	0.10	0.02	
	delay	7.4			8.7			-	28.6	16.9	-	30.0	8.7	
	LoS	A			A			-	D	C	-	D	A	
2015 am	v/c	0.01			0.26			-	0.36	0.73	-	0.18	0.02	
	delay	7.4			9.1			-	42.1	23.3	-	46.2	8.7	
	LoS	A			A			-	E	C	-	E	A	
2005 pm	v/c	0.01			0.29			-	0.58	0.40	-	0.30	0.10	
	delay	7.7			8.7			-	85.2	12.1	-	57.9	9.8	
	LoS	A			A			-	F	B	-	F	A	
2010 pm	v/c	0.01			0.35			-	1.08	0.48	-	0.61	0.12	
	delay	7.7			9.1			-	256	13.5	-	141	10.1	
	LoS	A			A			-	F	B	-	F	B	

		Eastbound			Westbound			Northbound			Southbound			Over all
		L	T	R	L	T	R	L	T	R	L	T	R	
add NBL	v/c	0.01			0.35			0.72	0.36	0.48	-	0.61	0.12	
	delay	7.7			9.1			194	67.6	13.5	-	141	10.1	
	LoS	A			A			F	F	B	-	F	B	
2015 pm	v/c	0.02			0.41			-	2.57	0.59	-	1.43	0.15	
	delay	7.8			9.7			-	1005	16.0	-	541	10.5	
	LoS	A			A			-	F	C	-	F	B	
Sig, EBL, WBL, WB adv gm	v/c	0.06	0.46	-	0.71	0.21	-	-	0.19	0.45	-	0.09	0.24	0.71
	delay	13.0	15.1	-	14.4	5.2	-	-	15.4	3.0	-	14.6	4.7	9.6
	LoS	B	B	-	B	A	-	-	B	A	-	B	A	A
Combined														
2005 am	v/c	0.01			0.19			-	0.17	0.49	-	0.07	0.02	
	delay	7.4			8.4			-	23.5	14.2	-	24.6	8.7	
	LoS	A			A			-	C	B	-	C	A	
2010 am	v/c	0.01			0.22			-	0.25	0.60	-	0.11	0.02	
	delay	7.4			8.7			-	31.2	17.2	-	32.6	8.8	
	LoS	A			A			-	D	C	-	D	A	
2015 am	v/c	0.01			0.27			-	0.39	0.74	-	0.20	0.02	
	delay	7.4			9.1			-	47.0	24.0	-	51.5	8.8	
	LoS	A			A			-	E	C	-	F	A	
2005 pm	v/c	0.01			0.30			-	0.63	0.42	-	0.34	0.10	
	delay	7.7			8.8			-	98.8	12.5	-	65.6	9.8	
	LoS	A			A			-	F	B	-	F	A	
2010 pm	v/c	0.01			0.36			-	1.19	0.51	-	0.68	0.12	
	delay	7.8			9.3			-	307	14.2	-	173	10.2	
	LoS	A			A			-	F	B	-	F	B	
add NBL	v/c	0.01			0.36			0.80	0.39	0.51	-	0.68	0.12	
	delay	7.8			9.3			232	74.9	14.2	-	173	10.2	
	LoS	A			A			F	F	B	-	F	B	
2015 pm	v/c	0.02			0.43			-	2.98	0.62	-	1.73	0.15	
	delay	7.8			9.9			-	1223	17.1	-	718	10.6	
	LoS	A			A			-	F	B	-	F	B	
add NBL, SBL	v/c	0.02			0.43			2.30	0.68	0.62	1.07	0.66	0.15	
	delay	7.8			9.9			1073	163	17.1	1557	160	10.6	
	LoS	A			A			F	F	B	F	F	B	

v/c = volume to capacity ratio; delay = average delay per vehicle in seconds; LoS = Level of Service

Table 2.9
Intersection Analysis
39 Avenue/39A Avenue/Alexis Park Drive
(as a reconfigured intersection)

		Eastbound			Westbound			Northbound			Southbound			Over all
		L	T	R	L	T	R	L	T	R	L	T	R	
Background														
2005 am	v/c	-	0.08	-	-	0.40	-	0.00				0.08		
	delay	-	21.3	-	-	28.6	-	8.0				9.0		
	LoS	-	C	-	-	D	-	A				A		
2010 am	v/c	-	0.13	-	-	0.61	-	0.00				0.10		
	delay	-	27.9	-	-	47.7	-	8.1				9.5		
	LoS	-	D	-	-	E	-	A				A		
2015 am w WBR	v/c	-	0.22	-	-	0.82	0.16	0.00				0.13		
	delay	-	41.7	-	-	132	15.6	8.3				10.1		
	LoS	-	E	-	-	F	B	A				B		
2005 pm	v/c	-	0.05	-	-	0.73	-	0.00				0.06		
	delay	-	27.5	-	-	49.5	-	8.9				8.5		
	LoS	-	D	-	-	E	-	A				A		
2010 pm	v/c	-	0.08	-	-	0.90	0.22	0.00				0.07		

		Eastbound			Westbound			Northbound			Southbound			Over
		L	T	R	L	T	R	L	T	R	L	T	R	all
w WBR	delay	-	41.5	-	-	137	13.3	9.2			8.8			
	LoS	-	E	-	-	F	B	A			A			
2015 pm	v/c	-	0.03	-	-	0.63	-	-	0.54	-	-	0.86	-	0.86
	delay	-	17.1	-	-	20.2	-	-	7.9	-	-	18.2	-	14.9
	LoS	-	B	-	-	C	-	-	A	-	-	B	-	B
Combined														
2005 am	v/c	-	0.57	-	-	0.28	-	-	0.58	-	-	0.47	-	0.58
	delay	-	14.4	-	-	10.6	-	-	10.0	-	-	8.8	-	10.6
	LoS	-	B	-	-	B	-	-	B	-	-	A	-	B
2010 am	v/c	-	0.59	-	-	0.32	-	-	0.74	-	-	0.61	-	0.74
	delay	-	15.5	-	-	11.4	-	-	13.2	-	-	11.2	-	12.8
	LoS	-	B	-	-	B	-	-	B	-	-	B	-	B
2015 am	v/c	-	0.61	-	-	0.38	-	-	0.82	-	-	0.73	-	0.82
	delay	-	17.0	-	-	12.7	-	-	18.0	-	-	15.6	-	16.6
	LoS	-	B	-	-	B	-	-	B	-	-	B	-	B
add LT	v/c	0.27	0.42	-	0.28	0.20	-	0.08	0.72	-	0.59	0.43	-	0.72
lanes	delay	16.4	9.0	-	16.7	7.7	-	5.6	11.9	-	24.4	7.0	-	11.1
	LoS	B	A	-	B	A	-	A	B	-	C	A	-	B
2005 pm	v/c	-	0.34	-	-	0.59	-	-	0.75	-	-	0.80	-	0.80
	delay	-	11.7	-	-	16.6	-	-	15.9	-	-	16.7	-	16.0
	LoS	-	B	-	-	B	-	-	B	-	-	B	-	B
2010 pm	v/c	-	0.37	-	-	0.69	-	-	0.81	-	-	0.89	-	0.89
	delay	-	14.8	-	-	22.4	-	-	19.2	-	-	22.7	-	20.9
	LoS	-	B	-	-	C	-	-	B	-	-	C	-	C
2015 pm	v/c	-	0.45	-	-	0.91	-	0.86	0.51	-	-	0.95	-	0.95
	delay	-	24.0	-	-	56.3	-	21.5	7.3	-	-	30.0	-	30.7
	LoS	-	C	-	-	E	-	C	A	-	-	C	-	C
add LT	v/c	0.25	0.28	-	0.40	0.54	-	0.71	0.54	-	0.20	0.79	-	0.79
lanes	delay	23.7	12.2	-	24.3	16.0	-	31.6	7.4	-	6.2	12.7	-	13.1
	LoS	C	B	-	C	B	-	C	A	-	A	B	-	B

v/c = volume to capacity ratio; delay = average delay per vehicle in seconds; LoS = Level of Service

2.9 39A Avenue/39 Avenue/Alexis Park Drive

At this intersection, 39A Avenue is offset from 39 Avenue, with 39A Avenue on the west side of Alexis Park Drive being north of 39 Avenue on the east side of Alexis Park Drive. This makes left turn movements from Alexis Park Drive into either leg difficult, since the two left turn paths overlap.

The limited distance between the two intersections, 36 metres centre to centre, limits the amount of left turn storage that can occur between the two intersections. The background traffic volume turning left into 39 Avenue is currently 74 veh/h in the a.m. peak hour and 54 veh/h in the p.m. peak hour. These volumes require approximately 18 metres and 14 metres of storage, respectively. There is approximately 25 metres of storage space available between the two intersections. Under background conditions, a signal will be needed at the 39 Avenue intersection just after 2010, and at this time it is recommended that the 39A Avenue leg of the intersection be moved south to align with 39 Avenue. Prior to re-alignment and signalization, two westbound lanes are recommended to provide sufficient capacity. The operation of the reconfigured intersection is shown in Table 2.9.

3.0 PROPOSED DEVELOPMENT

3.1 Size and Mix

Based on the information provided, the proposed ultimate development is to consist of 1,898 residential units covering a variety of different types of residential units when the ultimate build out occurs. Phase I of the development on the lands owned by DC Properties Ltd. will consist of 530 units and the main focus of this report. The current concept plan for the entire development is given in Exhibit 3.1.

3.2 Access

Access to the site will initially be taken via an extension of 39A Avenue west of Alexis Park Drive. If the proposed bypass of Vernon is built, there is a possibility of an access to this from Alexis Park Drive north of 43 Avenue; however, this will be well into the future.

As the site develops, the current offset intersections of 39A Avenue and 39 Avenue will need to be rebuilt to form a standard four legged intersection and signalized to increase its capacity and improve operations. As development further proceeds, an additional access will be needed.

Another existing road, 35 Avenue, will serve approximately 23 units of townhouses, and will not initially be connected to the remainder of the development.

3.3 Trip Generation

As is already noted, the development is to consist of a mixture of single-family, two-family, low and medium density multiple family (assumed to be townhouses) and a mixed use town centre with condominium units. The standard trip generation rates in the ITE's *Trip Generation Manual* were applied to these unit numbers by type in order to determine the amount of traffic expected to be generated by the development in the a.m. and p.m. peak hour. Trip generation rates given are based on the ITE equations which take into account internal trips within the development. For larger developments, the equation rates are considered to be more appropriate as they allow the per unit rate to decrease as the size of the development increases, reflecting the fact that some residents will visit friends, go to school, or do shopping within a larger development since there is more likelihood of having these types of facilities in a larger development. The commercial component of the development in the town centre was considered to primarily serve the development, and therefore will not generate any external trips. The trip generation shown in Tables 3.1 and 3.2 applies to external trip only, and thus the commercial component is not included.

It is noted that the proposed development with 530 residential units is expected to generate 337 trips two-way in the morning peak hour and 432 trips in the afternoon peak hour. The majority of morning trips leave the development, while the majority of afternoon trips arrive at the development. With the full development of 1,898 units, 1,129 a.m. peak hour and 1,343 p.m. peak hour trips will be generated by the development.

BELLA VISTA HIGHLANDS LAND USE PLAN

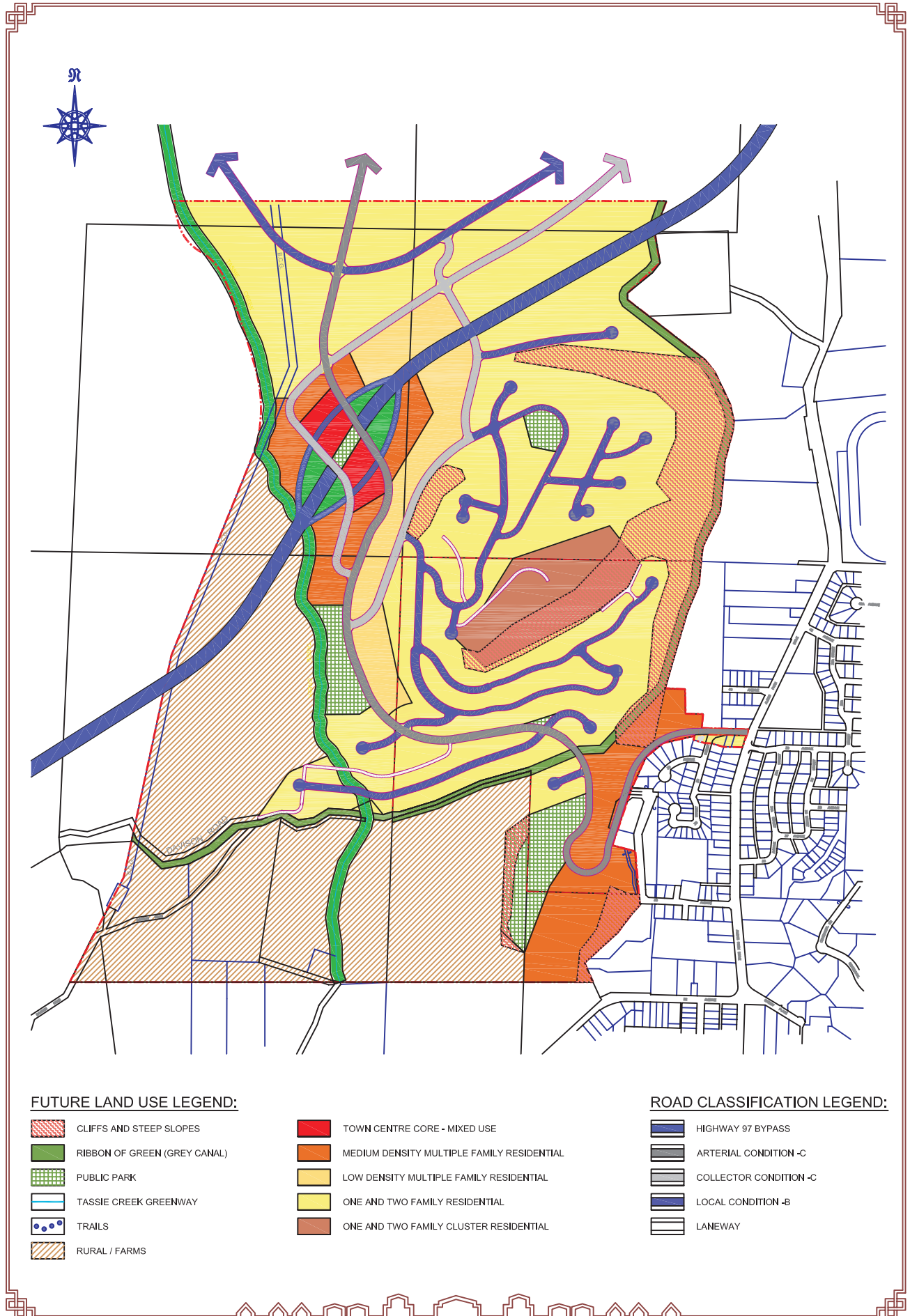


Table 3.1
Trip Generation – Phase I

Component	Units	a.m. peak			In	Out	p.m. peak			In	Out
		Rate	Total	%in			Rate	Total	%in		
Single Family	282	0.73	207	25	52	155	0.97	273	65	177	96
Apartment	225	0.51	114	20	23	91	0.63	141	65	92	49
Townhouse (35 Ave)	23	0.69	16	17	3	13	0.78	18	67	12	6
Total	530		337		78	259		432		281	151

rates are based on ITE equations

Table 3.2
Trip Generation – Build Out

Component	Units	a.m. peak			In	Out	p.m. peak			In	Out
		Rate	Total	%in			Rate	Total	%in		
Single Family	912	0.71	648	25	162	486	0.86	784	65	510	274
Townhouse	219	0.44	97	17	17	80	0.52	114	67	76	38
Apartment	744	0.50	368	20	73	295	0.57	427	65	278	149
Townhouse (35 Ave)	23	0.69	16	17	3	13	0.78	18	67	12	6
Total	1898		1129		255	874		1343		876	467

rates are based on ITE equations

3.4 Trip Distribution

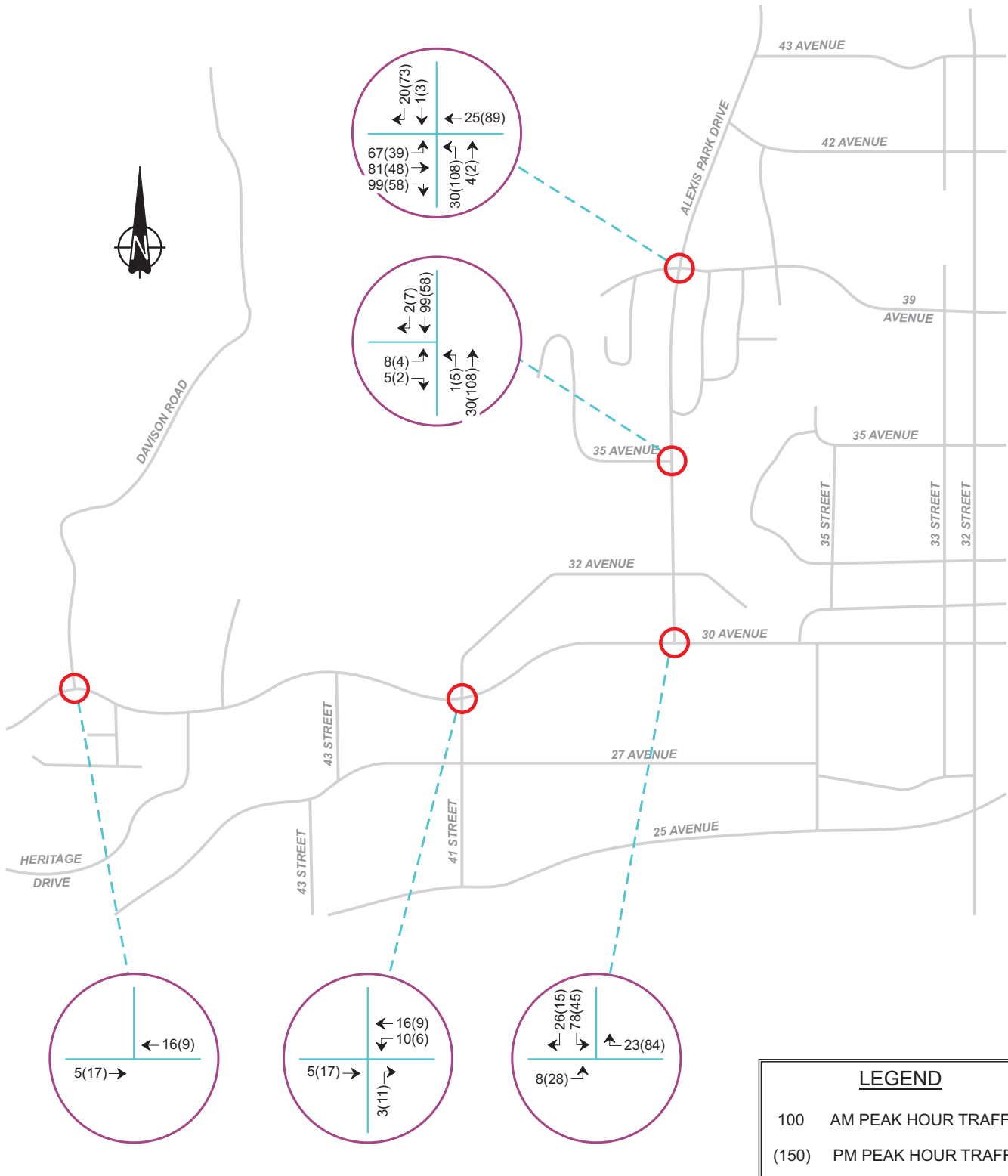
The trips estimated to be generated by the development were distributed to the road network based on 39A Avenue being the only access route serving this site, except for the 23 townhouses which will access 35 Avenue. All trips were assigned to this route and then distributed to the north and to the south on Alexis Park Drive and to the east on 39 Avenue, depending on what part of the municipality they were oriented to. Since this is to be primarily a residential development, it was assumed that the majority of the trips are oriented to and from places of employment and, therefore, particularly to the downtown. The resultant distribution is given in Table 4.4.

Table 4.4
Trip Distribution

Direction	Percentage
North on Old Kamloops via Alexis Park	3%
East on 43 Avenue via Alexis Park	24%
East on 39 Avenue	33%
West on 30 Avenue/Bella Vista	6%
South on 41 Street	4%
East on 30 Avenue	30%

3.5 Trip Assignment

Based on the trip generation and distribution shown above, the site traffic was assigned to the road network. This assignment is shown in Exhibit 3.2 for the Phase I development.



4.0 IMPACT OF DEVELOPMENT

4.1 Combined Volumes – Turtle Mountain

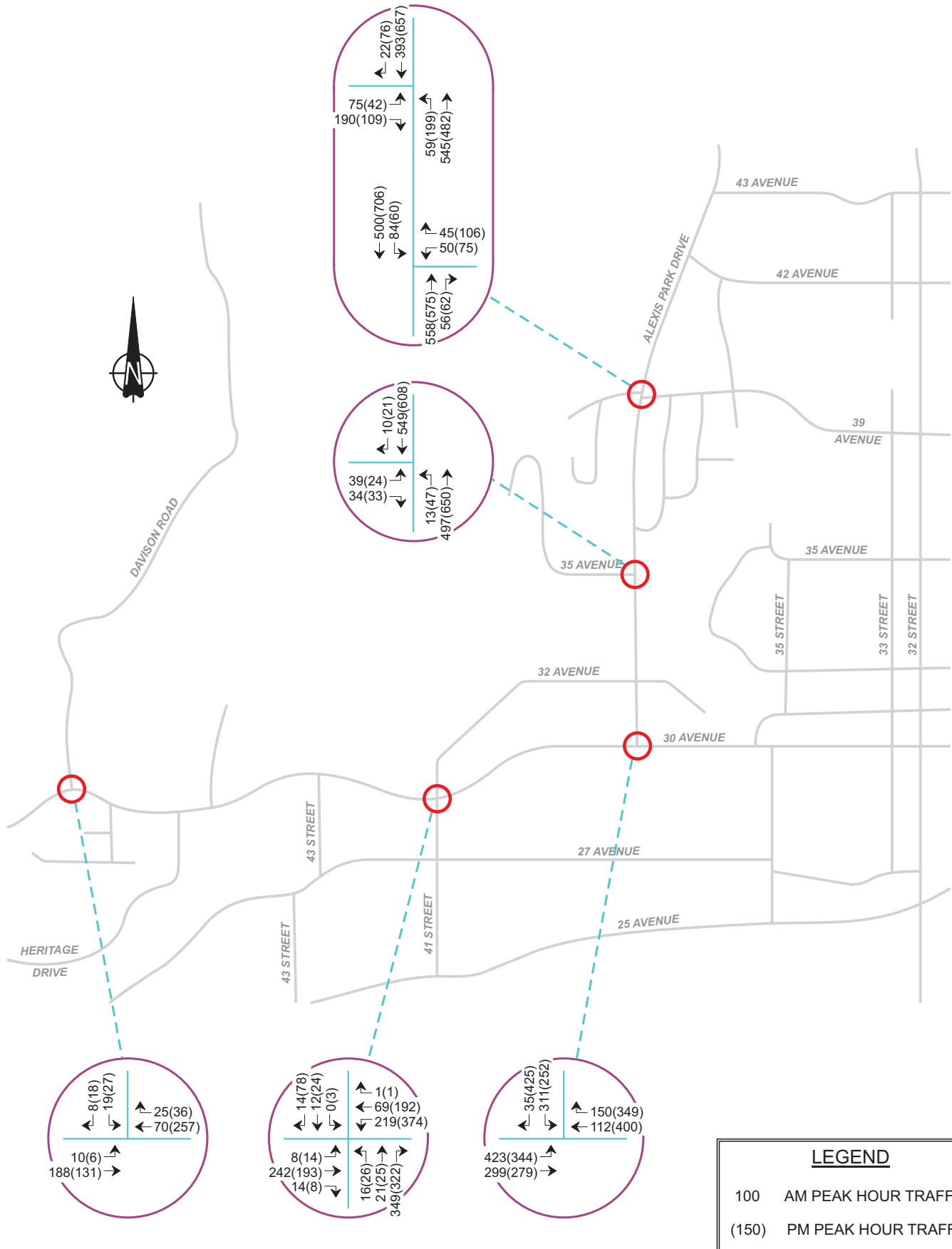
The trips generated by the proposed 530 unit development and assigned to the road network were then superimposed on the projected background traffic at the 2005, 2010 and 2015 horizon years and combined volumes are given in Exhibits 4.1, 4.2 and 4.3 respectively for the Phase I development.

4.2 Intersection Analysis

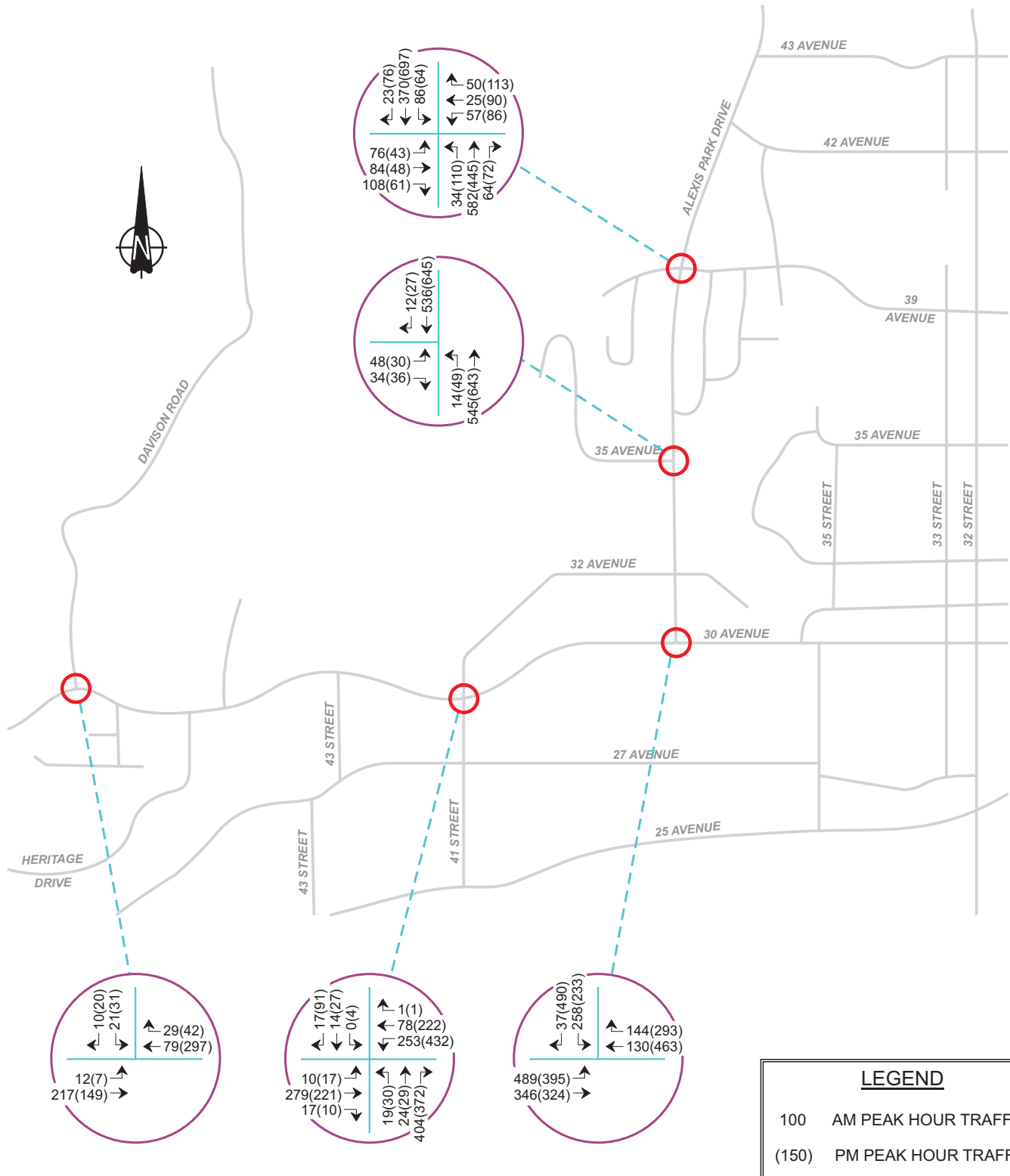
The key intersections were again analyzed and results are discussed below. Results are detailed in the second half of Tables 2.3 to 2.9.

- (a) 30 Avenue/Alexis Park Drive – With the site traffic in place, this intersection will operate well in 2005 and 2010; however by 2015 an eastbound advanced green phase is recommended due to the high volume of eastbound left turning traffic. This was the case with background traffic volumes.
- (b) 35 Avenue/Alexis Park Drive – With the development in place, the delay to the eastbound movements out of 35 Avenue will be increased. In both the a.m. and p.m. peak hours, the v/c ratios will remain below 0.90 through to 2015 and no improvements are needed. The critical time period is the p.m. peak hour when the eastbound movements will operate at Level of Service F and a v/c ratio of 0.54 in the 2015 horizon year.
- (c) 39 Avenue/Alexis Park Drive – A second westbound lane is recommended by 2005 to separate left turns and right turns and in turn increase the capacity for the westbound movements. By the 2010 horizon year a signal and a southbound left turn lane would be needed to reduce v/c ratios to acceptable levels due to p.m. peak hour conditions. These results assume that the intersection is an isolated intersection, and not in close proximity to the 39A Avenue intersection. Section 4.3 gives a further discussion of this and the 39A Avenue intersection.
- (d) 39A Avenue/Alexis Park Drive – With the site traffic in place, a second eastbound lane is recommended to increase the capacity for eastbound movements. By 2015 a traffic signal, northbound left turn lane, southbound right turn lane and a northbound advanced green phase will be needed. The critical time period at this intersection is the p.m. peak hour. These results assume that the intersection is an isolated intersection, and not in close proximity to the 39A Avenue intersection. Section 4.3 gives a further discussion of this and the 39A Avenue intersection.
- (e) Bella Vista/Davidson – With the site traffic in place, this intersection will continue to operate well, and no improvements are required.
- (f) 30 Avenue/41 Street – This intersection will need upgrading by 2010 due to p.m. peak hour

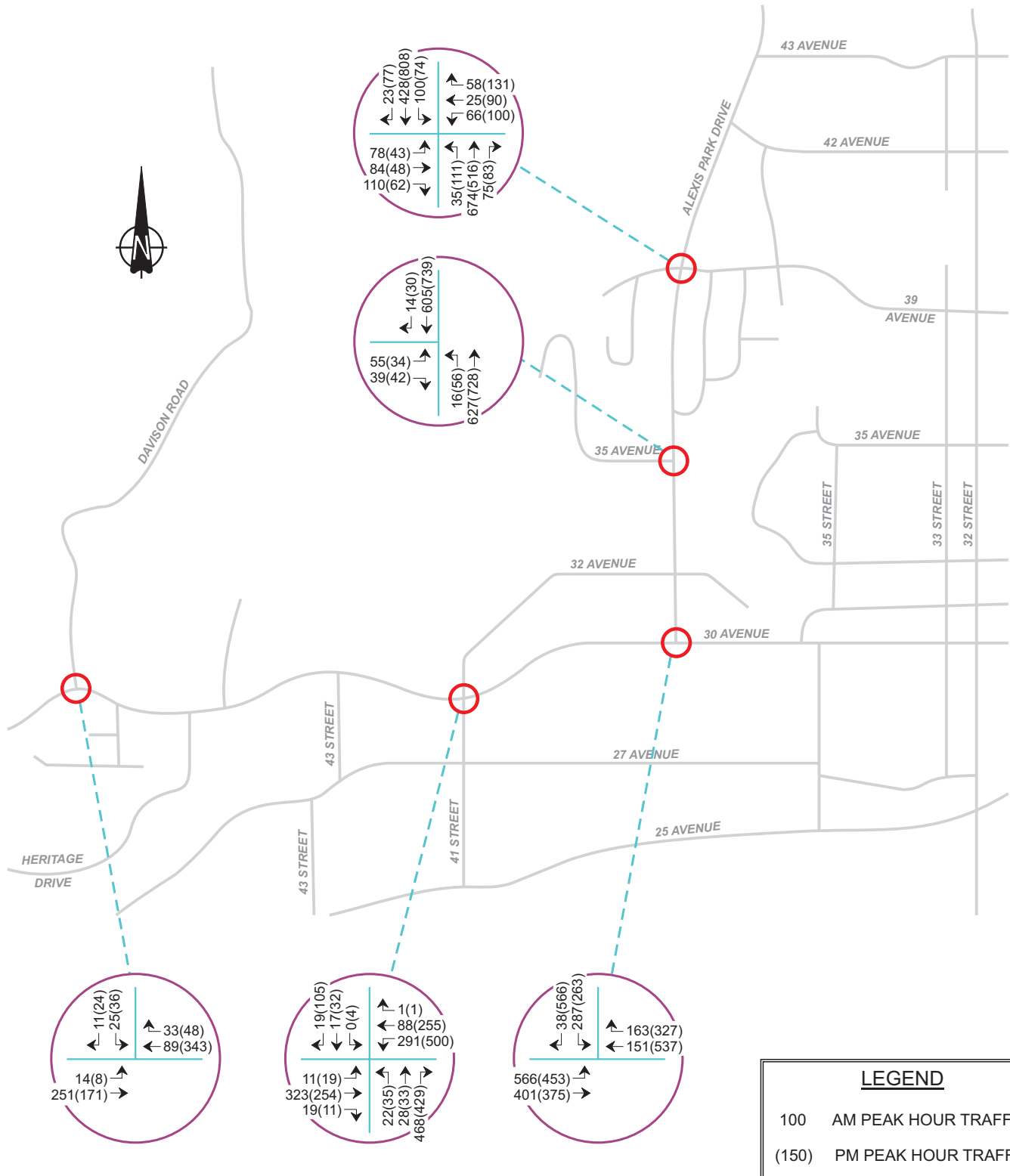
2005 COMBINED TRAFFIC VOLUMES



2010 COMBINED TRAFFIC VOLUMES



2015 COMBINED TRAFFIC VOLUMES



conditions, as was the case with background traffic. Adding a northbound left turn lane would meet the v/c requirements; however, delays would still be long. A signal would be needed to reduce delays. By 2015, a southbound left turn lane will also be needed in order to meet the v/c requirements.

4.3 39A Avenue/39 Avenue/Alexis Park Drive

As detailed under background conditions, the 39 Avenue leg and the 39A Avenue leg of this intersection are offset by a distance of 36 metres, centre to centre. There is approximately 25 metres of storage space available between the two intersections. With the Phase I site traffic in place, there will be approximately 200 vehicles per hour making the northbound left turn movement from Alexis Park Drive at 39A Avenue requiring 50 metres of storage, significantly more than is available. As a result of this volume combined with the southbound left turning volume, it is recommended that this intersection be realigned when approximately 100 units have been built and occupied. Beyond this level, left turn conflicts will become significant and storage will be a problem. A signal will be needed shortly after this to ensure traffic can exit from 39 Avenue/39A Avenue to Alexis Park Drive, and realigning and signalizing the intersection at the same time would be desirable. Table 2.9 shows intersection analysis assuming that the intersection is signalized. When this intersection is rebuilt, left turn lanes should be provided as they will be needed in the future. Right turn lanes should also be allowed for when the site expands further.

4.4 39A Avenue

The west approach of 39 Avenue to Alexis Park Drive is steep, with a proposed grade of 12% reducing to 0% at the Alexis Park Drive intersection. At 65 metres from the intersection (equivalent to the Stopping Sight Distance) the slope is approximately 10%, while at 35 metres from the intersection (equivalent to the braking distance) the grade is approximately 6%.

Transportation Association of Canada (TAC) guidelines for grade for a 50 km/h design speed are 8% for an urban collector and 6% for an urban arterial. In mountainous terrain, these values increase to 15% and 10% respectively. Therefore the 12% grade away from the intersection meets the mountainous collector road guidelines. TAC's recommended K values are 6 for an illuminated road, and this is provided for in the latest design.

TAC guidelines for a minor road crossing a major road state that for 20 metres on the approach to the intersection the grade of the minor road should typically be 2%. On 39A Avenue the average grade will be approximately 2.5% (an a maximum of 4.1%), slightly over the recommended. Additional flattening would be desirable. In fact, the ideal according to TAC is a flat approach for a signalized intersection. TAC also recommends that the vehicle storage area be as flat as possible. Based on Phase I of the development, and assuming left turn lanes on all legs of the Alexis Park Drive intersection, the estimated eastbound queues will reach 20 metres, the same distance as above. With 60% of the ultimate development in place and full intersection channelization, including right turn lanes on all legs, the queues would reach 30 to 35 metres, where the average grade would be 3.7% and a maximum of 6.6%

4.5 Ultimate Build Out

With the ultimate build out in place, the signalized 39 Avenue/39A Avenue intersection, even assuming full channelization, will be unable to handle the traffic delivered to it. This intersection could handle approximately 60% of the full development of 1,900 units. When further development proceeds, then an additional access will be needed. A summary of the operation of the 39 Avenue/39A Avenue/Alexis Park Drive intersection is shown in Table 4.1 for various levels of development (40%, 50%, 60%, and 70% of the full development) both as a stop controlled intersection and as a signalized intersection. This intersection clearly cannot function as an unsignalized intersection. As can be seen from the table, the critical time period is the p.m. peak hour. At 60% development the v/c ratio is 0.76, approaching the 0.90 threshold, while at the 70% level the v/c ratio has increased to 0.91, indicating that further upgrades or another access route is needed, with the latter being preferred.

In the past Ward Consulting Group has recommended that any residential development with more than 350 units should have more than one access route because of concerns over the necessity for emergency vehicles to access the development should there be a closure of some form. It is acknowledged that there is no technical literature supporting this position. It can therefore only be regarded as desirable, not essential.

A second access is potentially possible at the northeast corner of the development to Alexis Park Drive/Old Kamloops Road (at approximately Haney Road north of 43 Avenue) which would provide access to Highway 97 via 43 Avenue or a future extension of 48 Avenue.

Table 4.1
Intersection Analysis
39 Avenue/39A Avenue/Alexis Park Drive

		Eastbound			Westbound			Northbound			Southbound			Over
		L	T	R	L	T	R	L	T	R	L	T	R	all
Combined														
2015 am		1.04		0.59				0.09						
40%														
39A Ave		168		21.7				9.1						
		F		C				A						
w signal	v/c	0.33	0.27	0.31	0.22	0.08	0.14	0.11	0.66	0.08	0.48	0.42	0.04	0.66
	delay	15.5	14.5	4.1	14.9	13.7	5.3	6.1	10.3	1.9	14.8	7.2	2.5	9.4
	LoS	B	B	A	B	B	A	A	B	A	B	A	A	A
50%		1.38		0.79				0.11						
		294		33.8				9.2						
		F		D				A						
w signal	v/c	0.40	0.33	0.36	0.23	0.10	0.14	0.13	0.61	0.08	0.44	0.39	0.04	0.61
	delay	16.0	14.7	4.0	15.1	13.8	5.2	6.5	9.8	2.0	14.1	7.1	2.4	9.3
	LoS	B	B	A	B	B	A	A	A	A	B	A	A	A
60%		1.76		0.86				0.13						
		458		42.2				9.3						
		F		E				A						
w signal	v/c	0.43	0.36	0.39	0.23	0.10	0.13	0.15	0.62	0.08	0.45	0.39	0.05	0.62
	delay	16.5	15.0	3.9	15.0	13.6	5.1	7.2	10.6	2.1	15.6	7.7	2.5	9.8
	LoS	B	B	A	B	B	A	A	B	A	B	A	A	A
70%		0.45	0.38	0.40	0.22	0.11	0.12	0.21	0.74	0.09	0.54	0.47	0.06	0.74
w signal	v/c													
	delay	17.0	15.3	3.8	15.1	13.6	5.0	7.9	12.7	2.2	18.0	8.8	2.5	10.9

		Eastbound			Westbound			Northbound			Southbound			Over
		L	T	R	L	T	R	L	T	R	L	T	R	all
2015 pm 40%	LoS	B	B	A	B	B	A	A	B	A	B	A	A	B
		2.95		0.57										
		1249		32.6										
w signal		F		D										
	v/c	0.26	0.19	0.23	0.41	0.36	0.33	0.73	0.41	0.08	0.16	0.65	0.10	0.73
	delay	21.8	20.4	6.1	22.8	21.3	5.5	31.7	6.1	1.5	5.6	9.5	1.4	10.9
50%	LoS	C	C	A	C	C	A	C	A	A	A	A	A	B
		5.59		0.70				0.58						
		*		42.9				18.3						
w signal		F		E				C						
	v/c	0.39	0.25	0.29	0.44	0.47	0.34	0.73	0.41	0.08	0.15	0.63	0.12	0.73
	delay	27.6	24.2	6.7	27.2	25.8	6.4	26.1	5.6	1.2	4.9	8.6	1.1	11.3
60%	LoS	C	C	A	C	C	A	C	A	A	A	A	A	B
		11.1		0.84				0.70						
		*		60.2				23.1						
w signal		F		F				C						
	v/c	0.53	0.29	0.32	0.46	0.55	0.34	0.74	0.40	0.07	0.14	0.62	0.13	0.76
	delay	36.8	28.9	7.4	32.6	31.3	7.3	26.7	5.6	1.1	4.9	8.4	1.0	12.8
70%	LoS	D	C	A	C	C	A	C	A	A	A	A	A	B
	v/c	0.66	0.32	0.34	0.47	0.60	0.33	0.78	0.42	0.08	0.18	0.91	0.21	0.91
	delay	47.5	31.6	7.4	36.0	36.2	7.4	37.6	6.3	1.1	12.3	29.5	2.3	22.0
w signal	LoS	D	C	A	D	D	A	D	A	A	B	C	A	C

v/c = volume to capacity ratio; delay = average delay per vehicle in seconds; LoS = Level of Service

4.5 Access Road Cross Section

If 39A Avenue is the sole access for the development it will need to accommodate over 13,000 vehicles per day. At this volume, the road will need to be classified as a Minor Arterial Road. A right of way width of at least 25 to 30 metres will be needed. As a result, 39A Avenue will need to be upgraded to a Minor Arterial standard with:

- a minimum pavement width of 14.8 metres to accommodate four lanes with no parking,
- wider pavement width and lanes on curves,
- sidewalks and boulevards should be provided, and
- a design speed of 50 to 60 km/h.

If another access road is provided, then 39A Avenue can be expected to carry significantly less traffic. The actual volume will depend on the location and capacity of the second access. If it is assumed that traffic will be reduced by 50%, then this road will need to handle 6,000 to 7,000 vehicles per day. A collector road could potentially handle this volume.

5.0 SUMMARY OF CONCLUSIONS

5.1 Background Traffic Conditions

- Based on background traffic conditions, the signalized intersection of 30 Avenue/Alexis Park Drive will need to have an eastbound advanced green phase added by 2015.

- (b) The intersection of 39 Avenue/Alexis Park Drive will need to be signalized by 2015 in order to meet capacity requirements.
- (c) At the intersection of Bella Vista/41 Street will need a northbound left turn lane by 2010 to reduce v/c ratios and a signal to reduce delays. By 2015 the intersection will need to be signalized with eastbound and westbound turn lanes as well as a westbound advanced green phase.
- (d) The other intersections analyzed operate well and no further improvements are required.

5.2 Combined Traffic Conditions

- (a) The proposed Phase I development of 530 units is estimated to generate a total of 337 trips in the p.m. peak hour and 432 trips in the p.m. peak hour. The full development of almost 1,900 units will generate 1,129 a.m. peak hour trips and 1,343 p.m. peak hour trips.
- (b) The existing 39 Avenue/39A Avenue can accommodate only a limited amount of traffic due to the offset between the two. As a result, this intersection should be rebuilt when approximately 100 units of the development have been build to provide for a standard four leg intersection with left turn lanes. The western approach to this intersection should be made as flat as possible to allow vehicle storage to occur off of any significant grade. Signalization with left turn lanes will be needed at the same time or very shortly thereafter. With a signal in place, this intersection, if fully channelized, could handle the site traffic of up to 60% of the ultimate 1,900 units. At this point, a second site access will be needed.
- (b) At the signalized intersection of 30 Avenue/Alexis Park Drive, an eastbound advanced green phase will be needed by 2015 as was the case under background conditions.
- (d) At the intersection of Bella Vista Road/41 Street a northbound left turn lane is recommended by 2010 and a southbound lane is also recommended by 2015 as a result of increased site traffic.