

4.0 Traffic Analysis

4.1 74 STREET INTERSECTION CAPACITY ANALYSIS

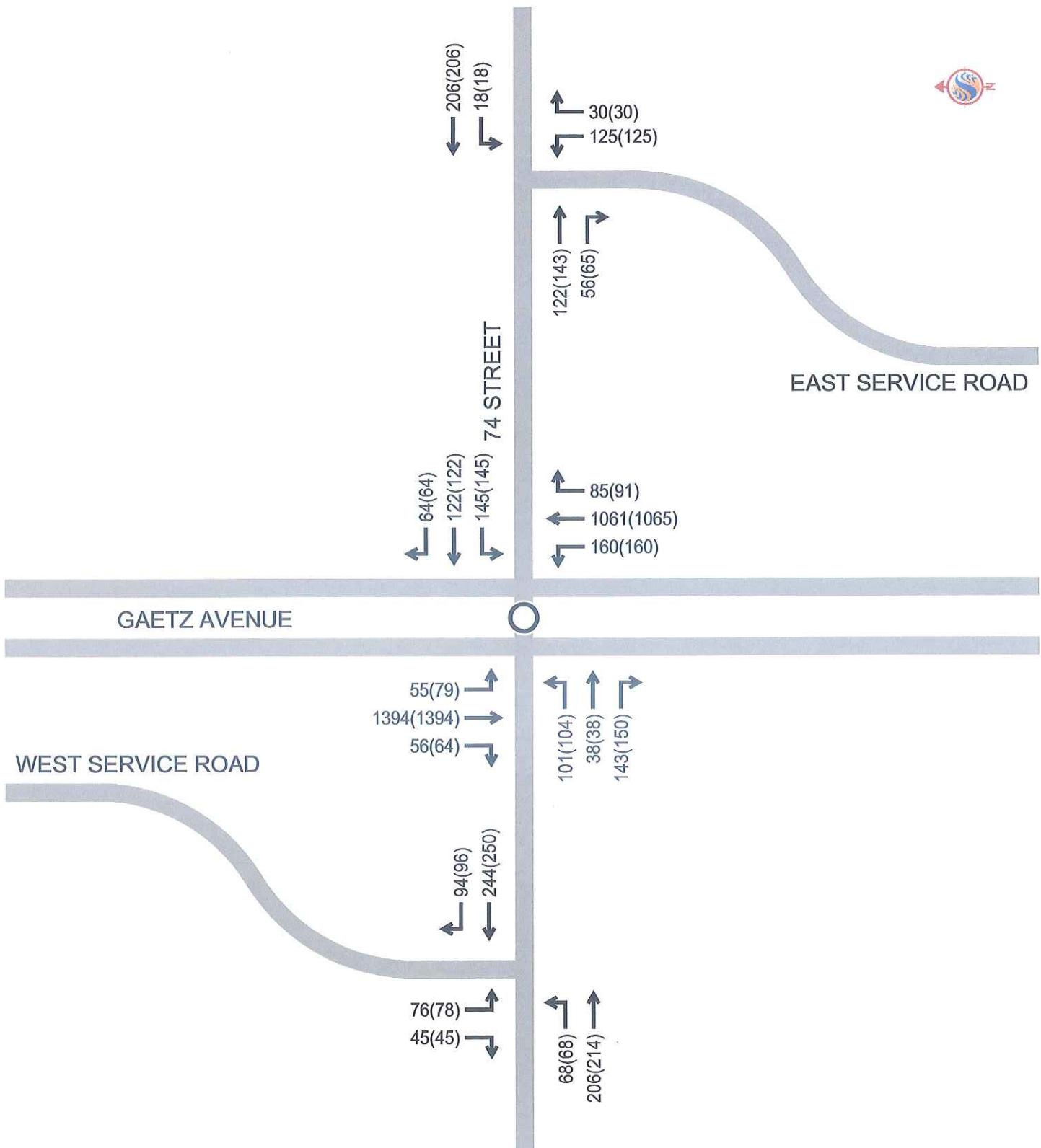
The purpose of this analysis is to establish whether a small bulb or a large bulb is needed on the service roads east and west of the Gaetz Avenue / 74 Street intersection in order to obtain an overall acceptable level of service. Currently, the east and west service roads are located very close to the Gaetz Avenue / 74 Street intersection. The proximity of the east and west service roads to this intersection creates large queues of vehicles on the service roads as there are a significant number of vehicles on 74 Street. The Gaetz Avenue / 74 Street intersection was analyzed in conjunction with the service road intersections as all three intersections impact each other. The specific objectives of this report are as follows:

- analyze whether a small bulb or a large bulb is needed on the east and west service roads;
- model the results in SimTraffic to obtain the delay per vehicle and the average queue;
- recommend the most suitable alternative from a traffic point of view.

Analysis of the east and west service roads were conducted at the Gaetz Avenue / 74 Street intersection. The 85,000 and 115,000 population horizon volumes were derived from the VISUM model, and obtained from the City of Red Deer's 2003/2004 Transportation Plan Update. Three scenarios were analyzed: existing horizon (72,000 population horizon), 85,000 population horizon and 115,000 population horizon. In order to project the future volumes, the volume growth between the existing horizon and the future horizons from the VISUM model were added to the existing traffic counts at the 74 Street / Gaetz Avenue intersection. The 85,000 and 115,000 population horizons were forecasted according to the proposed future geometry. The resultant volumes along with the proposed geometry are shown in Figure 4.1. As can be seen, there is a minimal amount of difference in the traffic volumes between the 85,000 and 115,000 population horizons. This is due to the fact that this area is fully developed. For this reason, we have only analyzed the 115,000 population horizon.

To determine the level of service of the small and large bulbs at the 115,000 population horizon, intersection capacity calculations were performed. Intersection capacity calculations are based on the methodology outlined in the 2000 Highway Capacity Manual (*Transportation Research Board*) and were performed using Trafficware SimTraffic (Version 6), a traffic simulation software, to calculate the delay per vehicle and average queue length.

For stop-controlled at-grade intersections, the level of service is defined as a function of the total elapsed time from when a vehicle stops at the end of a queue until the vehicle departs from the stop line. This includes the time required for the vehicle to travel from the last-in-queue to the front-in-queue position. For signalized intersections, the level of service is defined as the average delay per vehicle. The LOS for both signalized and un-signalized intersections are summarized in Table 4.1.



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GAETZ AVENUE
REDEVELOPMENT PLAN

Figure No.

4.1

Title
**Afternoon Peak Hour Traffic
Volumes (85,000 and
115,000 Population Horizons)**



Traffic Signals

← 1061(1065) 85,000 Population Horizon (115,000 Population Horizon) Afternoon Peak Hour Traffic Volumes

Table 4.1: Level of Service (LOS) Criteria for Signalized and Un-signalized Intersections

Level of Service	Average Control Delay (Seconds/Vehicle)		Comment
	Signalized Intersection	Unsignalized Intersection	
A	10.0 or less	10.0 or less	Very good operation
B	10.1 to 20.0	10.1 to 15.0	Good operation
C	20.1 to 35.0	15.1 to 25.0	Acceptable operation
D	35.1 to 55.0	25.1 to 35.0	Congestion
E	55.1 to 80.0	35.1 to 50.0	Significant congestion
F	More than 80.0	More than 50.0	Unacceptable operation
Breakdown	Very high	Very high	Conditions so poor that capacity calculations are meaningless

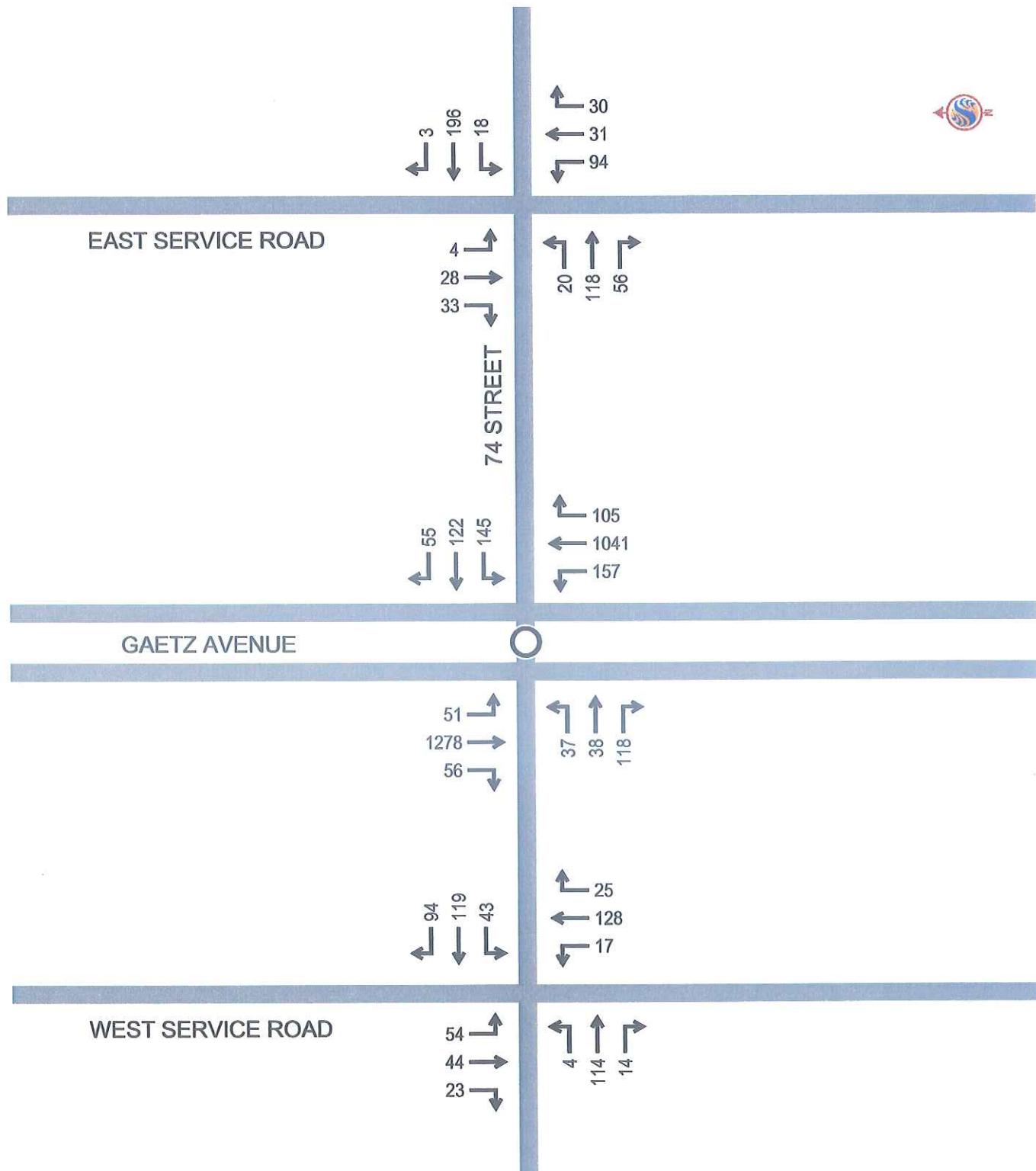
The operational efficiency of the east and west service roads, as well as the Gaetz Avenue and 74 Street intersection was also determined by the average queue length. The average queue length is the average number of vehicles queued that do not clear the intersection during a given time interval.

4.2 ANALYSIS OF TRAFFIC VOLUMES – GAETZ AVENUE AND 74TH STREET

4.2.1 Intersection Capacity Analysis

The existing conditions were first analyzed in Trafficware Synchro, a traffic signal coordination software, to set up the geometric configuration and traffic volumes for the three intersections. Subsequently, SimTraffic was then utilized to determine the delay per vehicle as well as the average queue length. The existing volumes are shown in Figure 4.2.

Results for the existing conditions are shown in Table 4.2. As can be seen, both the east and west service roads have a low level of service in the northbound and southbound directions. The level of service for the northbound and southbound movements is F, with the delays being greater than 200 seconds. An increased level of service is needed for the intersections at both the east and west service roads.



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Figure No.

4.2

Title: **Existing (2003)
Traffic Volumes**

Table 4.2 Intersection Capacity Analysis Summary for the Existing Traffic Volumes

Existing Population	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio by Movement												Overall	
		Eastbound			Westbound			Northbound			Southbound				
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right		
Afternoon Peak Hour Traffic Volumes															
Gaetz Avenue / 74 Street	Delay / Veh (s)	38.90	18.50	3.80	20.70	17.80	6.00	29.10	19.90	17.40	19.70	24.10	18.90	21.3	
	Ave Queue (m)	10.1	10.1	10.1	11.3	11.3	11.3	19.8	69.5	67.5	8.3	93.0	86.4		
	LOS	D	B	A	C	B	A	C	B	B	C	B	C		
Gaetz Avenue / East Service Road	Delay / Veh (s)	3.10	0.90	0.60	70.50	69.20	38.80	*	*	*	*	*	*	128.7	
	Ave Queue (m)	3.2	3.2	3.2	49.3	49.3	49.3	95.0	95.0	95.0	25.4	25.4	25.4		
	LOS	A	A	F	F	F	E	F	F	F	F	F	F		
Gaetz Avenue / West Service Road	Delay / Veh (s)	24.50	15.20	1.40	1.10	1.10	0.60	103.60	56.10	88.00	102.80	61.90	60.60	34.7	
	Ave Queue (m)	19.9	19.9	19.9	1.5	1.5	1.5	37.4	37.4	37.4	32.4	32.4	32.4		
	LOS	C	C	A	A	A	A	F	F	F	F	F	D		

* denotes delay > 200 seconds

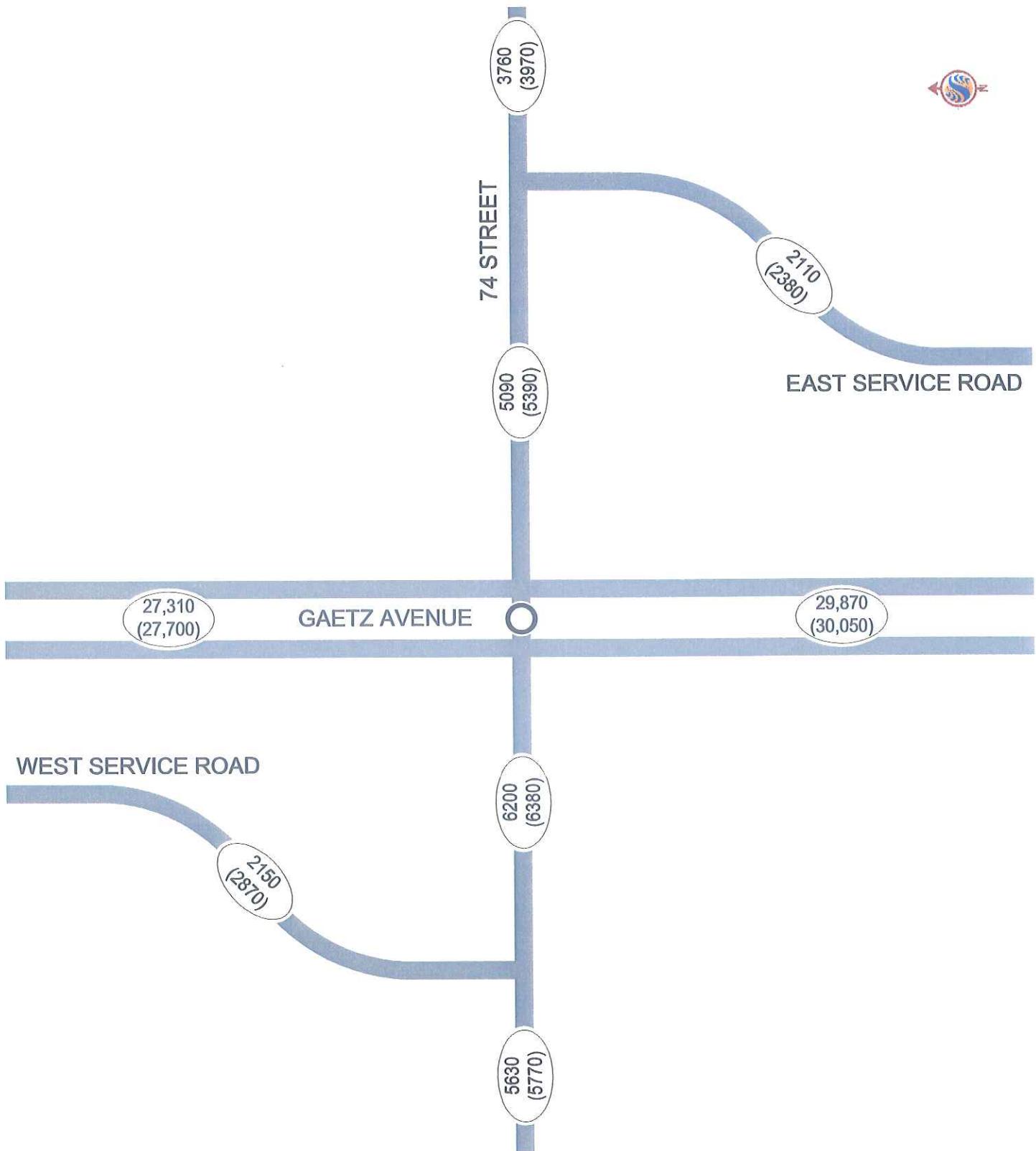
The conditions for the 115,000 population horizon were then analyzed. The large bulbs and small bulbs were analyzed at both the east and west service roads. According to TAC standards, a small bulb has a 24.0 meter bulb separation and a large bulb has a 45.0 meter bulb separation. The Gaetz Avenue / 74 Street intersection is a signalized intersection; therefore a small bulb is recommended when the vehicles per day on 74 Street are less than 2,000, while a large bulb is recommended when the vehicles per day on 74 Street are greater than 5,000. When the daily volumes are between 2,000 and 5,000, a small bulb is recommended with a median. This option was not considered, as it would prevent vehicles on the service road from turning left onto 74 Street. The daily volumes for both the 85,000 population horizon and the 115,000 population horizon are shown in Figure 4.3. 74 Street, at both the 85,000 and 115,000 population horizons have daily volumes over 5,000. Therefore, according to TAC standards, a large bulb is recommended at both the east and west service roads. Figure 4.4 illustrates both the small bulb and the large bulb, according to TAC standards.

In addition to analyzing both the small and large bulbs, different lane configurations were analyzed for 74 Street in order to optimize the performance of the intersection. For both the small and large bulb, the following lane configurations for 74 Street, shown in Figure 4.5, were analyzed:

- Alternative 1: 74 Street is 1 lane throughout, with a dedicated left turn lane and a shared through and right turn lane at Gaetz Avenue
- Alternative 2: 74 Street is 2 lanes approaching the service road intersections, with a dedicated left turn lane and a shared through and right turn lane at Gaetz Avenue
- Alternative 3: 74 Street is 2 lanes approaching the service road intersections, with dual left turn lanes and a shared through and right turn lane at Gaetz Avenue
- Alternative 4: 74 Street is 2 lanes approaching the service road intersections, with a shared left and through lane and a shared through and right lane at Gaetz Avenue

Split phasing was also evaluated at the Gaetz Avenue / 74 Street intersection for Alternatives 2 and 3. As well, for Alternative 2, the queues on the service roads were cleared through Gaetz Avenue within one cycle length to determine what effect it would have on the Gaetz Avenue / 74 Street intersection. Both of these alternatives were dismissed though due to poor level of service.

The results for the small bulb at the 115,000 population horizon are presented in Table 4.3 while the results for the large bulb at the 115,000 population horizon are presented in Table 4.4. Both of these tables illustrate the results from SimTraffic, including the delay per vehicle, average queue length, and level of service.



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Legend:



Traffic Signals

29,870
(30,050)

85,000 Population Horizon
(115,000 Population Horizon)
Daily Traffic Volumes

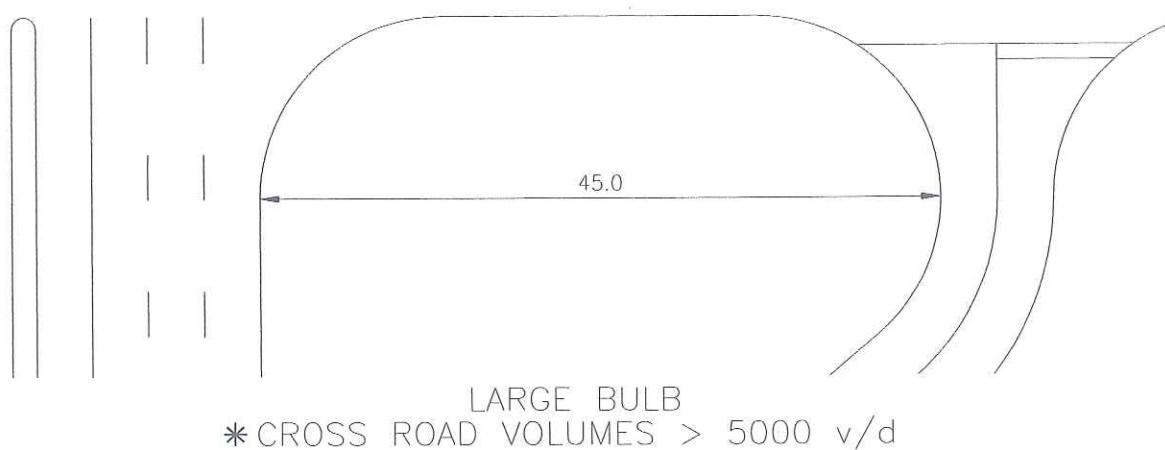
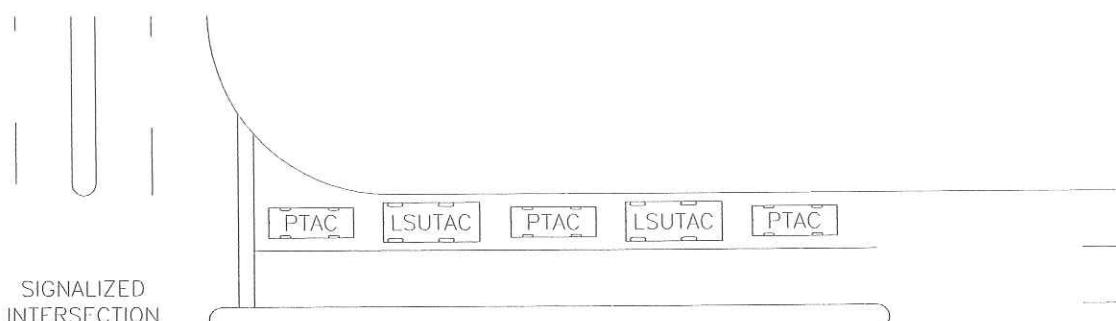
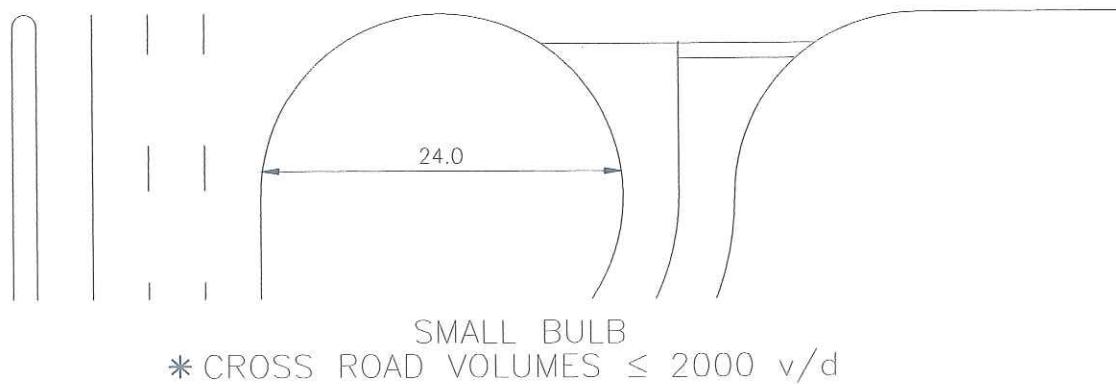
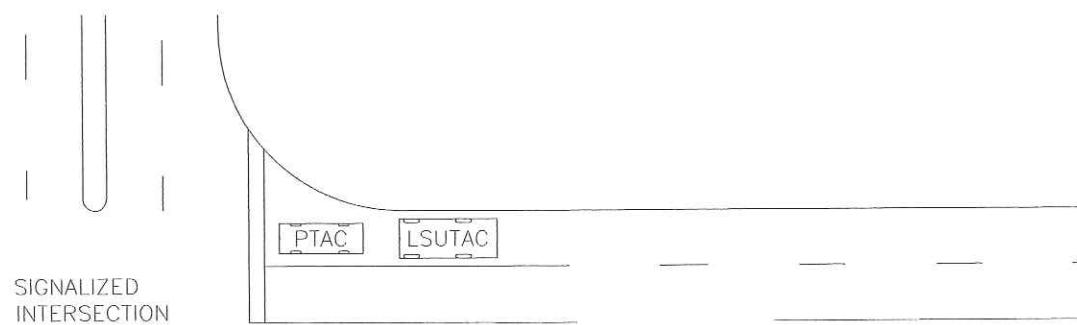
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Figure No.

4.3

Title
**Daily Traffic Volumes
(85,000 and 115,000
Population Horizons)**



* AS PER TAC STANDARDS

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REDEVELOPMENT PLAN

Figure No.

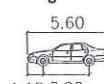
4.4

Title
**Small & Large Bulb
As Per TAC Standards**

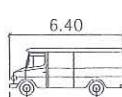


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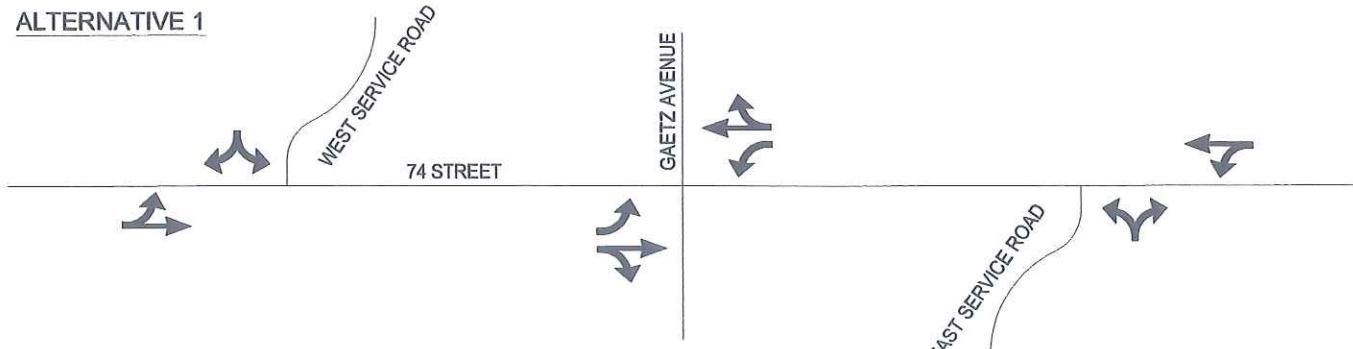


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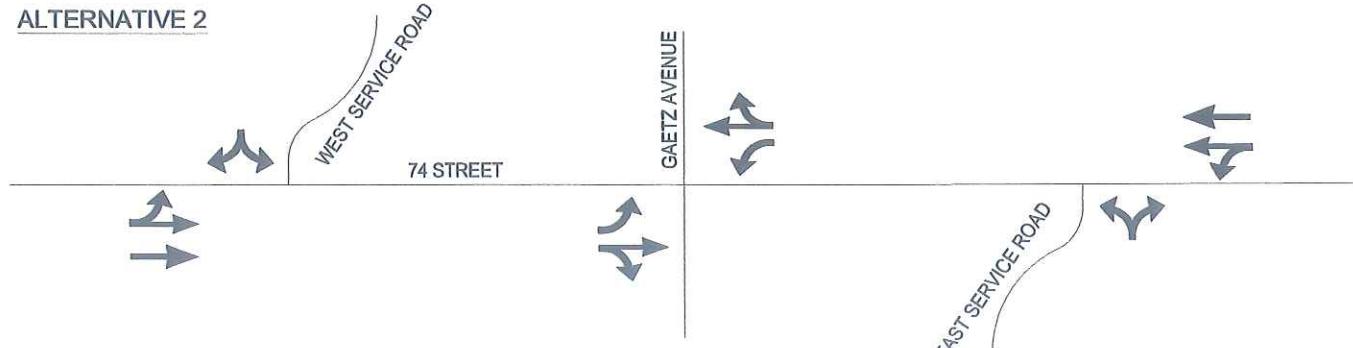


LSUTAC
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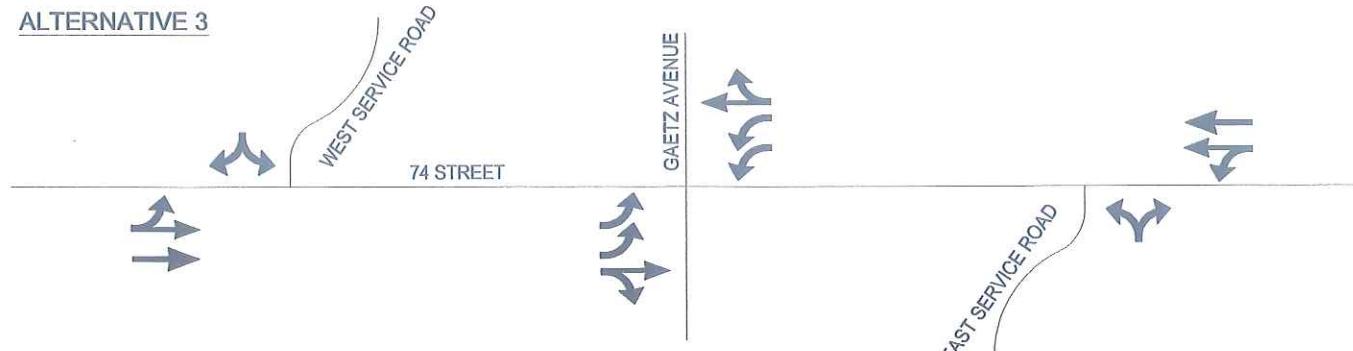
ALTERNATIVE 1



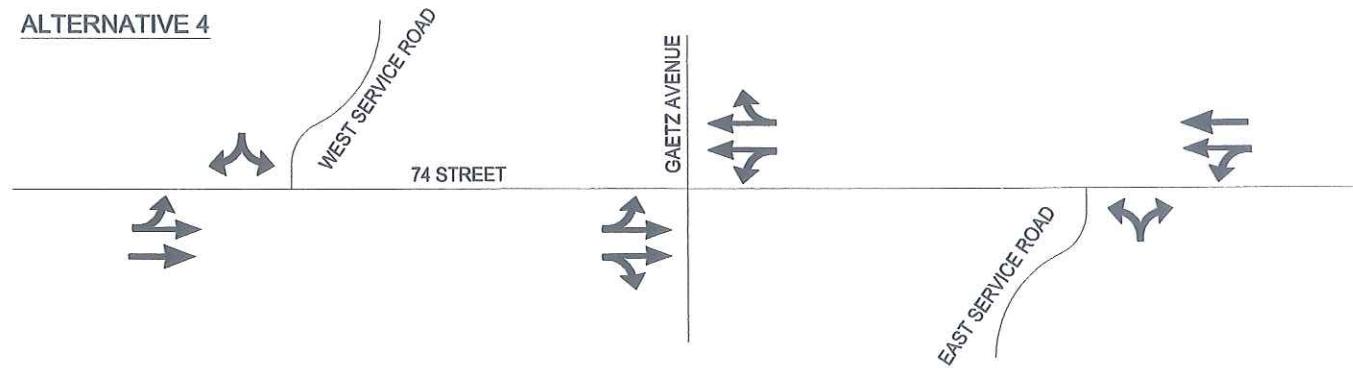
ALTERNATIVE 2



ALTERNATIVE 3



ALTERNATIVE 4



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Figure No.

4.5

Title

Lane Configurations
for Alternative 1 - 4



Stantec

Table 4.3
Intersection Analysis Summary for 115,000 Population Horizon Traffic Volumes at Gaetz Avenue 74 Street (Small Bulbs)

115,000 population	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio ⁽²⁾ by Movement												Overall	
		Eastbound			Westbound			Northbound			Southbound				
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right		
Afternoon Peak Hour Traffic Volumes															
74 Street / Gaetz Avenue	Delay / Veh (s)	27.6	40.0	10.0	23.4	33.0	10.3	37.1	22.3	14.0	20.2	31.4	20.5	26.4	
	Ave Queue (m)	12.0	14.1	14.1	13.1	14.2	14.2	24.7	55.5	50.1	8.1	83.0	74.5		
	LOS	C	D	A	C	C	B	D	C	B	C	C	C		
74 Street / East Service Road	Delay / Veh (s)		1.1	0.5	19.6	23.2		109.0		78.5					36.3
	Ave Queue (m)		1.5	1.5	14.1	14.1		41.2		41.2					
	LOS		A	A	C	C		F		F					E
74 Street / West Service Road	Delay / Veh (s)	8.5	14.4			1.3	0.7				64.3		32.0		13.2
	Ave Queue (m)	11.7	13.8			3.2	3.2				51.0		13.5		
	LOS	A	B			A	A				F		D		B
115,000 population	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio ⁽²⁾ by Movement												Overall	
		Eastbound			Westbound			Northbound			Southbound				
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right		
Afternoon Peak Hour Traffic Volumes															
74 Street / Gaetz Avenue	Delay / Veh (s)	26.4	36.8	4.3	22.4	25.7	3.7	44.0	20.7	17.2	30.6	28.8	20.6	25.0	
	Ave Queue (m)	7.7	9.3	9.3	7.6	8.7	8.7	24.7	52.2	42.6	13.7	79.0	73.8		
	LOS	C	D	A	C	C	A	D	C	B	C	C	C		
74 Street / East Service Road	Delay / Veh (s)		1.0	0.7	19.1	37.3		*		*					87.8
	Ave Queue (m)		1.4	1.4	17.7	19.3		90.5		90.5					
	LOS		A	A	C	E		F		F					F
74 Street / West Service Road	Delay / Veh (s)	15.1	25.3			1.7	0.6				98.7		100.8		26.4
	Ave Queue (m)	20.6	14.1			2.7	2.7				36.0		36.0		
	LOS	C	D			A	A				F		F		D
115,000 population	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio ⁽²⁾ by Movement												Overall	
		Eastbound			Westbound			Northbound			Southbound				
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right		
Afternoon Peak Hour Traffic Volumes															
74 Street / Gaetz Avenue	Delay / Veh (s)	63.0	37.0	7.7	50.0	21.8	4.7	35.9	22.0	18.0	27.8	32.5	21.8	28.1	
	Ave Queue (m)	10.4	13.8	13.8	9.8	10.1	10.1	20.8	57.5	61.2	9.7	80.8	74.3		
	LOS	E	D	A	D	C	A	D	C	B	C	C	C		
74 Street / East Service Road	Delay / Veh (s)		0.9	0.8	8.4	35.4		148.9		130.2					44.8
	Ave Queue (m)		1.2	1.2	12.1	23.6		43.6		43.6					E
	LOS		A	A	A	E		F		F					
74 Street / West Service Road	Delay / Veh (s)	6.6	14.1			1.3	0.6				59.8		52.3		15.5
	Ave Queue (m)	7.4	16.7			1.9	1.9				26.5		26.5		
	LOS	A	B			A	A				F		F		C
115,000 population	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio ⁽²⁾ by Movement												Overall	
		Eastbound			Westbound			Northbound			Southbound				
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right		
Afternoon Peak Hour Traffic Volumes															
74 Street / Gaetz Avenue	Delay / Veh (s)	42.2	19.4	5.7	20.5	19.3	3.2	37.7	20.7	12.9	22.2	28.2	19.1	23.9	
	Ave Queue (m)	12.7	10.7	10.7	10.9	11.2	11.2	23.5	56.9	59.4	10.6	80.6	70.9		
	LOS	D	B	A	C	B	A	D	C	B	C	C	B	C	
74 Street / East Service Road	Delay / Veh (s)		0.7	0.6	33.0	30.0		156.6		136.6					45.5
	Ave Queue (m)		0.8	0.8	21.4	15.4		44.8		44.8					E
	LOS		A	A	D	D		F		F					
74 Street / West Service Road	Delay / Veh (s)	22.0	18.6			1.1	0.6				159.9		116.0		27.2
	Ave Queue (m)	22.7	5.6			0.6	0.7				35.8		35.8		
	LOS	C	C			A	A				F		F		D

* denotes delay > 200 seconds

Notes:

Hatched areas indicate shared lane.

Highlighted areas indicate v/c > 0.80

Table 4.4
Intersection Analysis Summary for 115,000 Population Horizon Traffic Volumes at Gaetz Avenue 74 Street (Large Bulbs)

115,000 population Alternative 1	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio ⁽²⁾ by Movement												Overall	
		Eastbound			Westbound			Northbound			Southbound				
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right		
Afternoon Peak Hour Traffic Volumes															
74 Street / Gaetz Avenue	Delay / Veh (s)	39.4	22.9	14.2	42.7	49.8	24.3	39.6	21.1	12.2	26.8	34.8	25.6	29.4	
	Ave Queue (m)	19.9	25.4	25.4	25.2	31.1	31.1	25.0	49.4	43.5	12.3	85.0	76.4		
	LOS	D	C	B	D	D	C	D	C	B	C	C	C	C	
74 Street / East Service Road	Delay / Veh (s)		1.6	2.0	10.6	21.6		27.2		9.2				13.9	
	Ave Queue (m)		2.0	2.0	29.5	29.5		19.0		19.0					
	LOS		A	A	B	C		D		A				B	
74 Street / West Service Road	Delay / Veh (s)	6.5	9.2			2.0	0.9				10.7		6.1	5.5	
	Ave Queue (m)	20.6	20.6			0.6	0.6				15.1		15.1		
	LOS	A	A			A	A				B		A	A	
115,000 population Alternative 2	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio ⁽²⁾ by Movement												Overall	
		Eastbound			Westbound			Northbound			Southbound				
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right		
Afternoon Peak Hour Traffic Volumes															
74 Street / Gaetz Avenue	Delay / Veh (s)	39.8	31.2	16.3	33.6	40.0	23.7	39.4	21.1	13.5	24.1	33.1	22.2	28.0	
	Ave Queue (m)	20.2	22.0	22.0	23.3	24.2	24.2	25.2	50.9	43.5	12.5	79.7	73.1		
	LOS	D	C	B	C	D	C	D	C	B	C	C	C	C	
74 Street / East Service Road	Delay / Veh (s)		1.3	0.5	2.8	9.5		19.7		10.4				8.4	
	Ave Queue (m)		0.6	0.6	7.1	9.4		18.8		18.8				A	
	LOS		A	A	A	A		C		B				A	
74 Street / West Service Road	Delay / Veh (s)	4.3	6.4			2.1	0.9				18.0		11.2	5.6	
	Ave Queue (m)	8.2	9.2			1.1	1.1				16.5		16.5		
	LOS	A	A			A	A				C		B	A	
115,000 population Alternative 3	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio ⁽²⁾ by Movement												Overall	
		Eastbound			Westbound			Northbound			Southbound				
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right		
Afternoon Peak Hour Traffic Volumes															
74 Street / Gaetz Avenue	Delay / Veh (s)	39.7	45.7	21.4	34.9	34.9	20.3	41.1	20.6	15.8	30.3	34.4	23.1	29.0	
	Ave Queue (m)	9.9	22.3	22.3	15.3	23.5	23.5	24.7	48.9	42.6	11.7	82.3	71.7		
	LOS	D	D	C	C	C	C	D	C	B	C	C	C	C	
74 Street / East Service Road	Delay / Veh (s)		1.2	0.9	3.3	5.8		17.3		6.2				6.3	
	Ave Queue (m)		2.3	2.3	1.7	11.2		16.0		16.0				A	
	LOS		A	A	A	A		C		A				A	
74 Street / West Service Road	Delay / Veh (s)	4.6	7.0			2.0	0.9				30.2		24.8	8.6	
	Ave Queue (m)	7.3	8.2			0.9	0.9				18.7		18.7		
	LOS	A	A			A	A				D		C	A	
115,000 population Alternative 4	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio ⁽²⁾ by Movement												Overall	
		Eastbound			Westbound			Northbound			Southbound				
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right		
Afternoon Peak Hour Traffic Volumes															
74 Street / Gaetz Avenue	Delay / Veh (s)	41.9	38.1	11.0	39.6	40.7	23.6	35.5	21.2	13.3	20.4	29.0	20.7	26.7	
	Ave Queue (m)	20.3	19.3	19.3	27.7	22.9	22.9	25.5	55.7	51.2	10.3	81.1	74.6		
	LOS	D	D	B	D	D	C	D	C	B	C	C	C	C	
74 Street / East Service Road	Delay / Veh (s)		1.0	0.6	10.4	10.7		48.3		31.2				15.4	
	Ave Queue (m)		0.7	0.7	14.1	1.1		27.6		27.6				C	
	LOS		A	A	B	B		E		D				C	
74 Street / West Service Road	Delay / Veh (s)	5.4	3.5			1.5	0.9				12.0		8.7	3.9	
	Ave Queue (m)	7.8	1.2			1.3	1.3				13.4		13.4		
	LOS	A	A			A	A				B		A	A	

Notes:

Hatched areas indicate shared lane.
Highlighted areas indicate v/c > 0.80

4.3 74 STREET INTERSECTION CAPACITY ANALYSIS RESULTS

4.3.1 115,000 Population Horizon

In comparing Table 4.3 with Table 4.4, the overall level of service increases drastically when a large bulb is placed at the service roads versus a small bulb as illustrated in Alternative 2 below. A higher level of service also results in a lower delay per vehicle as well as a shorter queue length. Both of these variables are also shown in Tables 4.3 and 4.4.

Alternative 1 was modeled with one lane approaching the service road intersections, with a dedicated left turn lane and a shared through and right turn lane at Gaetz Avenue. With this alternative, the level of service at the Gaetz Avenue / 74 Street intersection was C when the east and west service roads had either large or small bulbs. At the east service road intersection, the level of service was E with a small bulb and B with a large bulb. At the west service road intersection, the level of service was B with a small bulb and A with a large bulb.

In modeling Alternative 2, which had two lanes approaching the service road intersections, with one dedicated left turn lane and one shared through and right turn lane at Gaetz Avenue, the overall delay per vehicle decreased at both the east and west service roads. A small bulb at both the east and west service roads results in a level of service C at the Gaetz Avenue / 74 Street intersection. At the east service road, with a small bulb, the level of service is F, while at the west service road, the level of service is D. With a large bulb at both the east and west service roads, the level of service improves. At the Gaetz Avenue / 74 Street intersection the level of service remains at C, while at both the east and west service road, the level of service drastically improves to A. Since there are a large number of vehicles turning left from 74 Street onto Gaetz Avenue, a dedicated left turn lane decreases both the delay per vehicle and the average queue length at both the east and west service roads, while maintaining a sufficient level of service at the Gaetz Avenue / 74 Street intersection.

Alternative 3 was modeled with two lanes approaching the service road intersections. Dual dedicated left turning lanes as well as a shared through and right turn lane approach the Gaetz Avenue / 74 Street intersection. The overall level of service is C at the Gaetz Avenue / 74 Street intersection when both small and large bulbs are located at the east and west service roads. The east service road has a level of service C with the small bulb and a level of service A with a large bulb. The west service road has a level of service E with the small bulb and a level of service A with a large bulb.

Alternative 4 was also modeled with two lanes approaching the service road intersections. At the Gaetz Avenue / 74 Street intersection though, two lanes travel both eastbound and westbound through Gaetz Avenue. There is a shared through and left turn lane and a shared through and right turn lane at this intersection. When the east and west service roads have either small or large bulbs, this intersection has a level of service C. The east service road has levels of service E and C for the small and large bulb respectively, while the west service road has levels of service D and A for the small and large bulb respectively.

With the small bulb in Alternatives 2, 3, and 4, vehicles trying to make a left turn from the service roads onto 74 Street have to travel across more lanes, making a difficult movement. If the vehicle is turning left from the service road and then right onto Gaetz Avenue, the short distance between the service road and Gaetz Avenue makes this movement even more difficult. A larger queue and a longer delay per vehicle are created as a result of the short distance between the service road and Gaetz Avenue.

Overall, the small bulb did improve conditions when compared to the existing conditions, but the large bulb improved the level of service quite significantly over the small bulb. At the 115,000 population horizon, 5,390 vehicles per day travel on 74 Street east of the intersection, while 6,380 vehicles per day travel on 74 Street west of the intersection. As previously mentioned, the TAC standards suggest the utilization of a large bulb when the vehicles per day are greater than 5,000 on the cross street. SimTraffic verifies this statement, clearly demonstrating that a large bulb is desirable over a small bulb for the large volume of traffic traveling on 74 Street. With the large bulb, in almost all instances, the level of service on both the east and west service roads is greatly reduced as is the delay per vehicle and the queue length. As well, an acceptable level of service at the Gaetz Avenue / 74 Street intersection is still maintained.

However, the installation of a large bulb has, in most instances, significant impacts to adjacent lands and buildings. Although the large bulbs do drastically improve the intersection operations, the installation of a small bulb is an improvement over the current conditions. In addition, the installation of small bulbs ensures that all three intersections never function at an overall level of service worse than D.

4.4 74 STREET INTERSECTION RECOMMENDATIONS

A large bulb is desirable on both the east and west service roads to maintain the optimal level of service. This is consistent with the TAC standards. However, a small bulb does decrease the amount of delay in comparison to the existing conditions. Therefore, if the City of Red Deer is restricted in any way to providing a large bulb at these locations, a small bulb will improve conditions over the existing ones. Stantec recognized there is a balance between traffic operations and land/business impacts. Therefore, a large bulb is recommended, but where not feasible, a small bulb will improve the current operations and will result in overall intersection LOS no less than D, up to the 115,000 population horizon. Furthermore, the City of Red Deer should, as a policy, protect for a large bulb any future developments similar in nature. They should also place a caveat on all parcels that would be operated by a large bulb, such that should those parcels ever become available for purchase or redevelopment, the necessary lands can be acquired to accommodate the large bulb.

It is also necessary to have a dedicated left turn lane on 74 Street, as there are a significant number of vehicles turning left at 74 Street onto Gaetz Avenue. While dual dedicated left turn lanes decrease the delay and average queue length, when compared to one dedicated left turn lane, the two alternatives are quite similar in terms of delay and average queue length. Because of this similarity, it is not feasible, nor is it necessary to have dual dedicated left turn lanes from 74 Street onto Gaetz Avenue. The volumes of traffic turning left here do warrant a

dedicated left turn lane, but the volumes are not large enough to warrant dual dedicated left turn lanes.

It is also desirable to have two lanes on 74 Street approaching the intersection, but only one lane is needed to travel through the intersection. When modeling 74 Street with two lanes traveling through the Gaetz Avenue / 74 Street intersection, the queues on the east and west service roads were larger than if two lanes approached this intersection, with only one lane traveling through it. Vehicles traveling from the service roads turning left onto 74 Street have to cross more lanes of traffic when two lanes continue through the intersection, increasing both the delay and the queue. There are not enough vehicles traveling through the intersection on 74 Street to warrant two through lanes, therefore, one through lane is the optimal alternative.

In conclusion, the optimal solution at this intersection is to construct a large bulb at both the east and west service roads. Alternative 2 contains the optimal lane configuration with two lanes approaching the service roads on 74 Street. On 74 Street, at the Gaetz Avenue intersection, there should be one dedicated left turn lane, with one shared through and right turn lane. This alternative will minimize the delay per vehicle as well as the queue at both the east and west service roads, while maintaining the level of service on Gaetz Avenue. It also requires minimal widening on 74 Street at the Gaetz Avenue intersection.

As previously mentioned, Alternative 2 is the most favorable solution, however Alternative 1 is also an acceptable solution. This design is the same as Alternative 2, with only one lane approaching the service road on 74 Street. Alternative 1 will not require any additional widening of 74 Street prior to the service roads, whereas Alternative 2 will require the addition of a lane eastbound and a lane westbound. The east service road in Alternative 1, with the large bulb, has more delay than Alternative 2, but not significantly more. The LOS for Alternative 1 is within acceptable standards, as it is for Alternative 2.

4.5 INTERSECTION CAPACITY ANALYSIS FOR GAETZ AVENUE

Along Gaetz Avenue, various other intersections were analyzed for different reports. The Gaetz Avenue / Highway 11A intersection and the Gaetz Avenue / 77 Street intersection were analyzed for the Gaetz Avenue North Functional Report. As well, the Gaetz Avenue / 32 Street was analyzed for the Gaetz Avenue Functional Planning Study, while the Gaetz Avenue / 19 Street intersection was analyzed for the Gaetz Avenue Functional Planning Study report. The following section summarizes the results from the traffic analysis completed for each intersection.

4.5.1 Highway 11A Intersection

The existing traffic movements using the existing geometry at this intersection all have a V/C ratio of below the desired 0.80. The northbound left movement has the worst V/C ratio at 0.70. It is expected that this V/C ratio will become undesirable with future traffic volumes. A dual left turn bay is proposed to accommodate this future northbound left traffic volume. Improvements to the intersection will be required due to the future construction of Northlands Drive, the

upgrading of Highway 11A and improvements to Highway 2a. Significant to the design is a vertical alignment that will accommodate a railway overpass on Highway 11A and a level railway crossing east of the intersection before crossing the Red Deer River.

4.5.2 77 Street Intersection

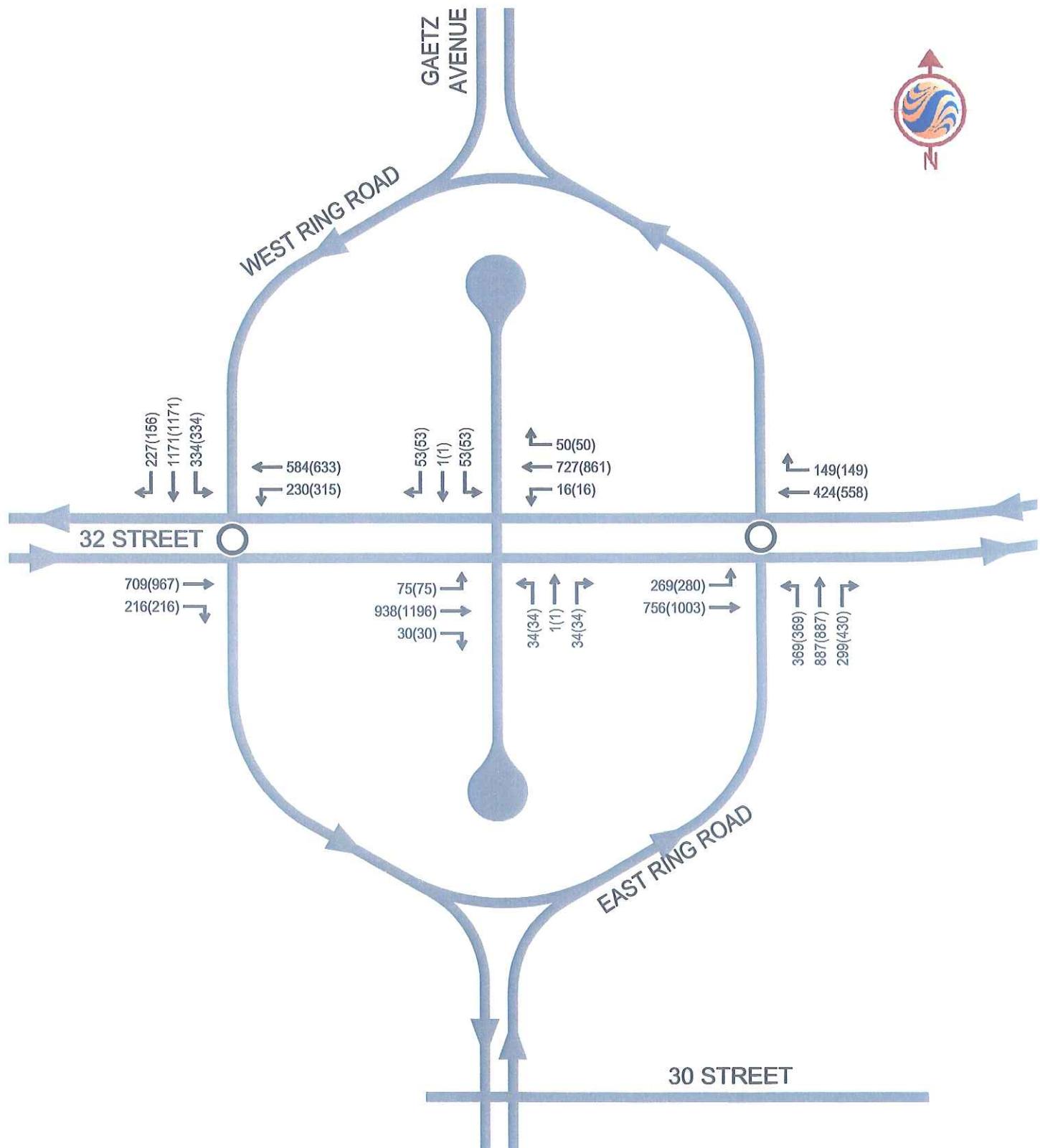
The traffic analysis for this intersection was completed as part of the Gaetz Avenue Widening and Highway 11A Functional Plan dated January 2004. Using a desired 0.80 maximum V/C ratio, the intersection meets capacity during the morning peak. The northbound through and southbound through movements have the highest V/C ratio with both movements at 0.78. The north bound left movement has a V/C ration of 0.69. In the afternoon however, the northbound left and the southbound through movements have a V/C ratio of 1.00. As expected, future volumes using the existing intersection geometry accentuate the problem movements. The new geometry with the 85,000 population horizon volumes lowers the V/C ratios below the desired 0.80. An additional north bound dual left turn lane and three lanes through the intersection in the north/south directions drop the V/C ratio to 0.72 for the northbound left and 0.73 for both the north bound and south bound through movements. Significant increases in traffic volumes are not expected from the 85,000 to 115,000 population horizons. For the purpose of the analysis, the design volumes do not reflect the future construction of a new Northlands Drive river crossing at the horizon year of 2011. It is anticipated that once Northlands Drive is constructed the through-volumes on Gaetz Avenue may decrease slightly. Therefore analyzing this intersection with Northlands Drive not being connected represents the worst-case scenario in terms of traffic volume forecasts.

4.5.3 32 Street Intersection

The primary purpose of this report was to determine the most favorable forecasted geometric design for the Gaetz Avenue / 32 Street intersection. Five designs were created, with two proving to be more favorable. Figure 4.6 shows the volumes for both the 85,000 and 115,000 population horizons for Option 4, while Figure 4.7 shows these volumes for Option 5.

Option 4 is favorable because through traffic will travel on the East and West Ring Roads, while Gaetz Avenue will only provide access for the commercial businesses located within the ring roads. With this option, 32 Street can remain four lanes while still providing sufficient level of service for all movements. There is resistance from the businesses along Gaetz Avenue though because taking traffic away from Gaetz Avenue potentially takes away customers from their business. Traffic will travel behind their business rather than the front where the signing is directed. This option is also pedestrian friendly as 32 Street will remain four lanes. As well, the ring road is one-way, making it easier for pedestrians to see oncoming vehicles.

Option 5 is favorable for the businesses surrounding the West Ring Road because this option removes the West Ring Road. With the removal of this ring road, the Capri Hotel can now combine their hotel and parking lot without the interruption of a service road between them. This is a tremendous improvement for the safety of pedestrians as it will eliminate them having to cross at the 32 Street / West Ring Road intersection. The Pike Wheaton Chevrolet



Plotted: 2005-05-06 12:38AM By: brmcculcheon

Not to Scale

May 2005
112870826

Client/Project

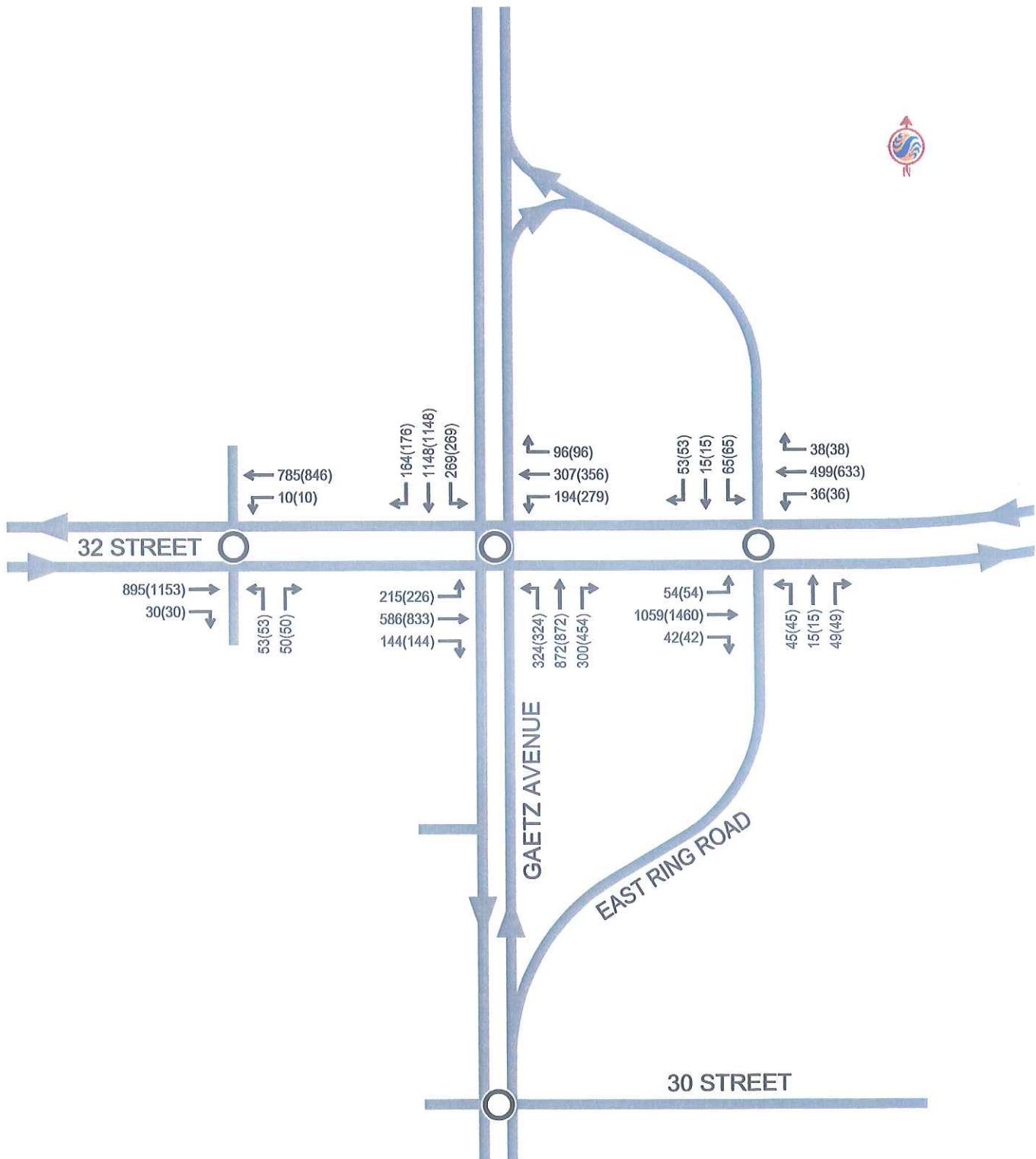
THE CITY OF RED DEER
GAETZ AVENUE
REDEVELOPMENT PLAN

Figure No.

4.6

Title

Option 4
Afternoon Peak Hour
Traffic Volumes



Plotted: 2005-05-03 09:54AM By: thilton
W:\active\70826 - Gaetz Avenue Scobock Study\07 - reports and Studies\Final report\32nd Street Final Report\70826_opt5-vols\fig47.dwg

Not to Scale

May 2005
112870826

Legend:



Traffic Signals

← 310(450)

85,000 Population (115,000 Population)
Afternoon Peak Hour Traffic Volumes

Client/Project

THE CITY OF RED DEER
GAETZ AVENUE
REDEVELOPMENT PLAN

Figure No.

4.7

Title

Option 5
Afternoon Peak Hour
Traffic Volumes

Oldsmobile dealership would like to have an access road remain into their site. They would also like to see a left turn access lane from 32 Street westbound turning into their site with the potential for a signalized intersection at this location.

Tables 4.5 and 4.6 illustrate the intersection capacity analysis results for the 85,000 and 115,000 population horizons respectively. As shown in Table 4.5, Option 4 has all movements operating with a v/c ratio < 0.80, indicating all movements are operating below capacity at the 85,000 population horizon. The southbound left turn movement at the 32 Street / West Ring Road intersection operates at the highest capacity, with a v/c ratio of 0.77. The delay for this movement is 37.9 seconds. The highest delay is 52.7 seconds for the eastbound through movement.

Option 5 does not have any movements exceeding a v/c ratio of 0.80, but the northbound left turn movement at the Gaetz Avenue / 32 Street intersection has a v/c ratio of 0.80, indicating this movement is operating at capacity at the 85,000 population horizon. As well, the cycle length at this intersection is 135 seconds to accommodate a v/c ratio no greater than 0.80. Overall, there are four movements at the Gaetz Avenue / 32 Street intersection (eastbound left turn, westbound left turn, northbound left turn, and southbound left turn) operating with a delay of 60 seconds or more. The highest delay of 71.1 seconds coincides with the highest v/c ratio of 0.80, mentioned above.

As shown in Table 4.6, no movement in Option 4 at the 115,000 population horizon operates with a v/c ratio greater than 0.80, indicating all movements do not exceed capacity. The eastbound through and southbound through movements operate with a v/c ratio of 0.80, implying these movements are operating at capacity. The highest delay occurs at the 32 Street / West Ring Road intersection; the westbound left turn has a delay of 63.7 seconds. A cycle length of 130 seconds was used at both ring road intersections on 32 Street to ensure a v/c ratio not greater than 0.80.

Option 5, at the 115,000 population horizon, does not have any movements exceeding a v/c ratio of 0.80, indicating the movements are not exceeding capacity. At the Gaetz Avenue / 32 Street intersection however, the northbound left turn movement is operating at capacity, with a v/c ratio of 0.80. To obtain v/c ratios that were not greater than 0.80, a cycle length of 135 seconds was used at this intersection. The highest delay occurred at the 32 Street / Gaetz Avenue intersection. The westbound left turn and northbound left turn operate with a delay of 70.0 seconds.

Initially, the City of Red Deer required a v/c ratio of 0.80 or less. As well, a cycle length of 120 seconds was desirable although a cycle length of up to 144 seconds would be considered. As can be seen in the previous section, to obtain a v/c ratio of 0.80 or less, cycle lengths greater than 120 seconds have been utilized. In discussions with the City of Red Deer, it was extremely desirable to have all cycle lengths 120 seconds or less. In order to attain a cycle length of 120 seconds for particular intersections though, it was understood by staff at the City of Red Deer that a v/c ratio of 0.80 or less would not be attainable. It was therefore concluded that v/c ratios of 0.90 or less would be considered if the cycle lengths were 120 seconds.

Table 4.5- Intersection Analysis Summary for Forecast 85,000 Population Traffic Volumes

32 Street & Gaetz Avenue 85,000 pop	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio ⁽²⁾ by Movement												Overall I/S LOS	Cycle Length (s)		
		Eastbound			Westbound			Northbound			Southbound						
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right				
Afternoon Peak Hour Traffic Volumes																	
Option 1	V/C Ratio	0.74	0.79	0.32	0.48	0.46	0.25	0.75	0.60	0.36	0.58	0.79	0.09				
	Total Delay	73.6	68.5	7.5	60.7	48.8	9.1	73.1	41.9	5.9	64.4	47.4	15.0				
	Movement LOS	E	E	A	E	D	A	E	D	A	E	D	B				
	Overall LOS		E			D			D			D		D	144		
Option 2	V/C Ratio	0.66	0.79	0.30	0.70	0.56	0.20		0.66	0.30		0.80	0.07				
	Total Delay	46.6	18.4	9.9	55.4	22.4	13.3		29.0	4.8		36.9	9.1				
	Movement LOS	D	B	A	E	C	B		C	A		D	A				
	Overall LOS		C			C			C			D		C	120		
Option 4	V/C Ratio	0.30	0.54		0.08	0.44			0.10			0.15					
	Total Delay	6.2	10.0		3.8	7.4			16.3			15.7					
	Movement LOS	A	A		A	A			B			B					
	Overall LOS		A			A			B			B		A	120		
Option 5	V/C Ratio	0.59	0.76	0.34	0.53	0.40	0.24	0.80	0.60	0.49	0.66	0.79	0.32				
	Total Delay	61.8	56.0	9.9	60.0	43.1	8.4	71.1	38.9	8.3	78.6	44.7	11.0				
	Movement LOS	E	E	A	E	D	A	E	D	A	E	D	B				
	Overall LOS		E			D			D			D		D	135		

32 Street & West Ring Road 85,000 pop	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio ⁽²⁾ by Movement												Overall I/S LOS	Cycle Length (s)		
		Eastbound			Westbound			Northbound			Southbound						
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right				
Afternoon Peak Hour Traffic Volumes																	
Option 1	V/C Ratio	0.14	0.58		0.01	0.41			0.16	0.09		0.12	0.23				
	Total Delay	12.7	16.5		10.5	13.9			19.0	5.6		18.6	4.2				
	Movement LOS	B	B		B	B			B	A		B	A				
	Overall LOS		B		B				B			A		B	90		
Option 2	V/C Ratio	0.10	0.54	0.06	0.01	0.39	0.03		0.02	0.41		0.01	0.23				
	Total Delay	13.7	31.0	8.2	3.5	6.4	0.3		22.5	4.6		22.4	4.7				
	Movement LOS	B	C	A	A	A	A		C	A		C	A				
	Overall LOS		C		A				A			A		B	120		
Option 4	V/C Ratio		0.74	0.46	0.39	0.34						0.68	0.77	0.47			
	Total Delay		41.3	22.0	44.0	23.0						40.4	37.9	25.9			
	Movement LOS	D	C	D	C							D	D	C			
	Overall LOS		D		C							D		C	120		
Option 5	V/C Ratio	0.15	0.53		0.05	0.47			0.29			0.36					
	Total Delay	11.2	13.5		9.6	13.1			17.0			9.3					
	Movement LOS	B	B		A	B			B			A		B	90		
	Overall LOS		B		B				B			A		B	90		

32 Street & East Ring Road 85,000 pop	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio ⁽²⁾ by Movement												Overall I/S LOS	Cycle Length (s)		
		Eastbound			Westbound			Northbound			Southbound						
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right				
Afternoon Peak Hour Traffic Volumes																	
Option 1	V/C Ratio	0.15	0.55		0.20	0.30			0.17	0.12		0.23	0.13				
	Total Delay	8.7	12.6		10.8	8.6			24.7	7.5		25.7	7.4				
	Movement LOS	A	B		B	A			C	A		C	A				
	Overall LOS		B		A				B			B		B	90		
Option 2	V/C Ratio	0.14	0.51	0.08	0.14	0.27	0.07		0.01	0.10		0.01	0.49				
	Total Delay	3.2	5.3	0.2	12.9	21.6	6.0		24.3	7.2		24.3	5.6				
	Movement LOS	A	A	A	B	C	A		C	A		C	A				
	Overall LOS		A		C				B			A		A	120		
Option 4	V/C Ratio	0.47	0.52			0.57	0.40	0.61	0.47	0.49							
	Total Delay	45.7	52.7			42.7	20.2	30.5	24.6	18.6							
	Movement LOS	D	D			D	C	C	C	B				D	120		
	Overall LOS		D		D				C			B		B	90		
Option 5	V/C Ratio	0.16	0.65		0.26	0.32			0.25			0.32					
	Total Delay	10.3	16.9		15.1	10.1			13.5			18.4					
	Movement LOS	B	B		B	B			B			B		B			
	Overall LOS		B		B				B			B		B	90		

Notes:

Hatched areas indicate shared lane.

Highlighted areas indicate v/c > 0.80

Table 4.6 - Intersection Analysis Summary for Forecast 115,000 Population Traffic Volumes

32 Street & Gaetz Avenue 115,000 pop	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio ⁽²⁾ by Movement												Overall I/S LOS	Cycle Length (s)		
		Eastbound			Westbound			Northbound			Southbound						
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right				
Afternoon Peak Hour Traffic Volumes																	
Option 1	V/C Ratio	0.78	0.78	0.33	0.66	0.35	0.25	0.75	0.60	0.63	0.58	0.79	0.11				
	Total Delay	77.5	58.8	7.7	65.4	46.1	9.1	73.1	41.9	12.6	64.4	47.4	14.1				
	Movement LOS	E	E	A	E	D	A	E	D	B	E	D	B				
	Overall LOS													D	144		
Option 2	V/C Ratio	0.56	0.79	0.32	0.80	0.46	0.16		0.66	0.34		0.80	0.07				
	Total Delay	61.7	72.4	31.5	74.3	35.3	17.2		31.9	5.4		49.0	10.4				
	Movement LOS	E	E	C	E	D	B		C	A		D	B				
	Overall LOS													D	135		
Option 4	V/C Ratio	0.33	0.64		0.11	0.48			0.11			0.17					
	Total Delay	13.7	23.7		10.1	13.2			18.4			17.7					
	Movement LOS	B	C		B	B			B			B					
	Overall LOS													B	120		
Option 5	V/C Ratio	0.62	0.75	0.34	0.77	0.32	0.24	0.80	0.60	0.75	0.66	0.79	0.34				
	Total Delay	62.9	52.0	9.6	70.0	41.3	8.4	70.0	38.9	25.3	68.9	44.7	11.0				
	Movement LOS	E	D	A	E	D	A	E	D	C	E	D	B				
	Overall LOS													D	135		

32 Street & West Ring Road 115,000 pop	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio ⁽²⁾ by Movement												Overall I/S LOS	Cycle Length (s)		
		Eastbound			Westbound			Northbound			Southbound						
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right				
Afternoon Peak Hour Traffic Volumes																	
Option 1	V/C Ratio	0.14	0.52		0.01	0.30			0.16	0.10		0.12	0.23				
	Total Delay	12.7	15.0		11.0	12.5			19.0	7.7		18.6	4.2				
	Movement LOS	B	B		B	B			B	A		B	A				
	Overall LOS											A	B	90			
Option 2	V/C Ratio	0.10	0.70	0.06	0.01	0.44	0.03		0.02	0.58		0.01	0.23				
	Total Delay	13.7	34.9	8.2	12.5	29.1	10.5		22.5	14.5		22.4	4.7				
	Movement LOS	B	C	A	B	C	B		C	B		C	A				
	Overall LOS		C		C				B			A	C	120			
Option 4	V/C Ratio		0.80	0.41	0.75	0.36						0.71	0.80	0.34			
	Total Delay		47.7	34.8	63.7	15.4						46.6	42.8	27.0			
	Movement LOS	D	C	E	B							D	D	C			
	Overall LOS		D		C							D		D	130		
Option 5	V/C Ratio	0.17	0.51		0.08	0.37			0.26			0.35					
	Total Delay	13.2	14.3		12.1	12.7			14.4			10.8					
	Movement LOS	B	B		B	B			B			B					
	Overall LOS		B		B				B			B		B	90		

32 Street & East Ring Road 115,000 pop	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio ⁽²⁾ by Movement												Overall I/S LOS	Cycle Length (s)		
		Eastbound			Westbound			Northbound			Southbound						
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right				
Afternoon Peak Hour Traffic Volumes																	
Option 1	V/C Ratio	0.17	0.56		0.34	0.26			0.17	0.12		0.23	0.13				
	Total Delay	9.3	11.9		18.9	8.1			24.7	12.5		25.8	7.4				
	Movement LOS	A	B		B	A			C	B		C	A				
	Overall LOS		B		A				B			B		B	90		
Option 2	V/C Ratio	0.16	0.78	0.08	0.20	0.34	0.07		0.01	0.10		0.01	0.67				
	Total Delay	12.9	68.0	5.9	14.2	22.6	6.0		24.3	7.2		24.3	16.9				
	Movement LOS	B	E	A	B	C	A		C	A		C	B				
	Overall LOS		E		C				B			B		D	120		
Option 4	V/C Ratio	0.60	0.63		0.56	0.33		0.68	0.52	0.46							
	Total Delay	55.7	38.1		48.7	31.9	39.1	30.8	23.2								
	Movement LOS	E	D		D	C	D	C	C					D	130		
	Overall LOS		D		D				C					B	90		
Option 5	V/C Ratio	0.16	0.61		0.41	0.22			0.26			0.32					
	Total Delay	10.1	14.5		26.8	9.1			17.9			18.3					
	Movement LOS	B	B		C	A			B			B		B			
	Overall LOS		B		B				B			B		B	90		

Notes:

Hatched areas indicate shared lane.
Highlighted areas indicate v/c > 0.80

Therefore, at the 85,000 population horizon, Option 5 was re-analyzed with a 120 second cycle length. As illustrated in Table 4.7, a cycle length of 120 seconds for this option results in the southbound through movement having a v/c ratio of 0.83. This is the only movement with a v/c ratio greater than 0.80.

As well, at the 115,000 population horizon, Options 4 and 5 were re-analyzed with cycle lengths of 120 seconds. As illustrated in Table 4.7, Option 4 has 120 second cycle lengths at all intersections. As a result though, at the Gaetz Avenue / West Ring Road intersection, the eastbound through and southbound through movements have v/c ratios of 0.82 and 0.83 respectively. Option 5 was also re-analyzed with a cycle length of 120 seconds at the Gaetz Avenue / 32 Street intersection. A 120 second cycle length at this intersection yields v/c ratios greater than 0.80. The westbound left turn, northbound left turn, northbound right turn and southbound through movements all have v/c ratios greater than 0.80, but less than 0.90.

Based on the above discussions, from a traffic standpoint, Option 4 is superior to Option 5 in terms of capacity and delay. Overall, for both the 85,000 and 115,000 population horizons, Option 4 has less delay and lower capacity. Option 4 is also more favorable from a safety standpoint. The level of safety is a major component in determining the optimal option. In Option 4, there are six through lanes of traffic on Gaetz Avenue, but only four on 32 Street, whereas in Option 5, there are six through lanes of traffic on both Gaetz Avenue and 32 Street. In addition, the ring roads in Option 4 are only one-way, resulting in a higher level of safety for pedestrians than in Option 5, which has traffic traveling in both directions on the ring road. Overall, Option 4 functions more efficiently, from a traffic standpoint, with no concern of failure in the future.

Access to area property within the vicinity of 32 Street was reviewed extensively with business owners. The design plan addresses the majority of the concerns expressed from the business community during the consultation process.

Slotted left turn access is shown north and south of 32 Street at the Gaetz Avenue intersections for 51 Avenue and 49 Avenue. The north left turn access accommodates the requirements of the Capri Hotel and Southside Village. The south left turn provides linkage to the 51 Avenue service road adjacent to Pike Wheaton Chevrolet Olds.

The existing left turn tapers at the 32 Street intersection vary in design radius. For example the eastbound left turn bay taper at 49 Avenue is 35 meters, westbound 32 Street is 50 meters, northbound on Gaetz Avenue is 150 meters (the proper standard). The northbound left turn bay taper into the Capri Hotel currently has a 25-meter taper. The southbound left turn bay at 32 Street is also 25 meters.

The tapers illustrated for the slotted lefts north and south of 32 Street are 25 meter radii and represent a compromise to the TAC guideline standard of 150 meters.

Table 4.7 - Intersection Analysis Alternatives for Forecast Population Traffic Volumes

85,000 Population Horizon																	
OPTION 5	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio ⁽²⁾ by Movement												Overall I/S LOS	Cycle Length (s)		
		Eastbound			Westbound			Northbound			Southbound						
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right				
Afternoon Peak Hour Traffic Volumes																	
Gaetz Avenue & 32 Street	V/C Ratio	0.79	0.68	0.30	0.71	0.36	0.22	0.79	0.63	0.54	0.65	0.83	0.32				
	Total Delay	72.0	43.0	6.6	66.2	34.9	7.2	63.1	36.7	14.3	62.2	43.2	9.1				
	Movement LOS	E	D	A	E	C	A	E	D	B	E	D	A				
	Overall LOS	D			D			D			D			D	120		
Gaetz Avenue & West Ring Road	V/C Ratio	0.15	0.53		0.05	0.47			0.29			0.36					
	Total Delay	11.2	13.4		9.6	13.1			17.0			9.2					
	Movement LOS	B	B		A	B			B			A					
	Overall LOS	B			B			B			A			B	90		
Gaetz Avenue & East Ring Road	V/C Ratio	0.16	0.65		0.26	0.32			0.25			0.32					
	Total Delay	10.3	16.9		15.1	10.1			13.5			18.4					
	Movement LOS	B	B		B	B			B			B					
	Overall LOS	B			B			B			B			B	90		

115,000 Population Horizon																	
OPTION 4	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio ⁽²⁾ by Movement												Overall I/S LOS	Cycle Length (s)		
		Eastbound			Westbound			Northbound			Southbound						
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right				
Afternoon Peak Hour Traffic Volumes																	
32 Street & Center Service Road	V/C Ratio	0.33	0.65		0.11	0.48			0.11			0.17					
	Total Delay	6.1	20.3		3.9	8.2			18.0			17.4					
	Movement LOS	A	C		A	A			B			B					
	Overall LOS	B			A			B			B			B	120		
Gaetz Avenue & West Ring Road	V/C Ratio		0.82	0.42	0.69	0.36					0.73	0.83	0.35				
	Total Delay		45.0	25.7	56.0	15.9					45.4	42.3	25.8				
	Movement LOS	D	C	E	B						D	D	C				
	Overall LOS	D			C						D			D	120		
Gaetz Avenue & East Ring Road	V/C Ratio	0.53	0.62		0.58	0.33	0.70	0.54	0.48								
	Total Delay	45.2	51.1		36.4	20.1	39.2	30.2	22.0								
	Movement LOS	D	D		D	C	D	C	C								
	Overall LOS	D			C			C						D	120		

OPTION 5	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio ⁽²⁾ by Movement												Overall I/S LOS	Cycle Length (s)		
		Eastbound			Westbound			Northbound			Southbound						
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right				
Afternoon Peak Hour Traffic Volumes																	
Gaetz Avenue & 32 Street	V/C Ratio	0.66	0.67	0.30	0.81	0.29	0.22	0.84	0.66	0.82	0.69	0.88	0.36				
	Total Delay	59.4	40.9	6.6	69.1	33.6	7.2	68.2	38.8	32.6	61.8	47.4	10.0				
	Movement LOS	E	D	A	E	C	A	E	D	C	E	D	B				
	Overall LOS	D			D			D			D			D	120		
Gaetz Avenue & West Ring Road	V/C Ratio	0.17	0.51		0.08	0.37			0.26			0.35					
	Total Delay	13.2	14.3		12.1	12.7			14.4			10.8					
	Movement LOS	B	B		B	B			B			B					
	Overall LOS	B			B			B			B			B	90		
Gaetz Avenue & East Ring Road	V/C Ratio	0.16	0.61		0.41	0.22			0.26			0.32					
	Total Delay	10.1	14.5		26.8	9.1			17.9			18.3					
	Movement LOS	B	B		C	A			B			B					
	Overall LOS	B			B			B			B			B	90		

Notes:

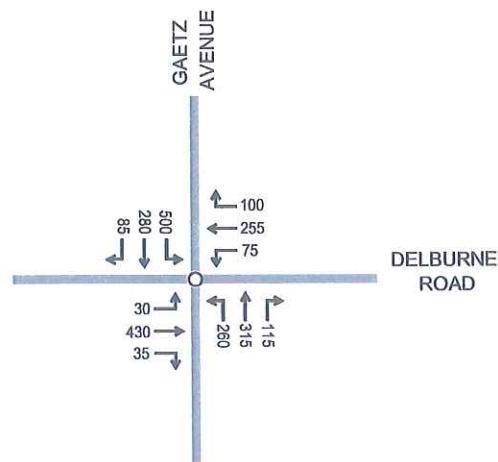
Hatched areas indicate shared lane.

Highlighted areas indicate v/c > 0.80

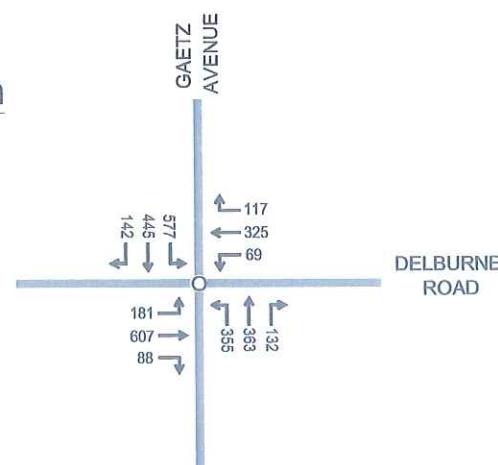
**Table 4.8 - Intersection Analysis Summary for Forecast Traffic Volumes at
Gaetz Avenue & Delburne Road**

Gaetz Avenue & Delburne Road	Measure of Effectiveness	Level of Service (LOS) / V/C Ratio by Movement								Overall I/S LOS	Cycle Length (s)	
		Eastbound		Westbound		Northbound		Southbound				
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through
Afternoon Peak Hour Traffic Volumes												
85,000 Population	V/C Ratio	0.68	0.67	0.29	0.39	0.65	0.38	0.57	0.44	0.33	0.90	0.53
	Total Delay	42.5	43.2	17.2	32.8	47.1	8.6	43.7	37.5	16.6	52.1	37.0
	Movement LOS	D	D	B	C	D	A	D	D	B	D	B
	Overall LOS	D	D	D	D	D	D	D	D	D	D	D
115,000 Population	V/C Ratio	0.80	0.71	0.32	0.49	0.71	0.41	0.56	0.57	0.41	0.90	0.65
	Total Delay	57.4	45.7	20.3	38.6	49.2	9.1	40.2	42.4	21.2	49.1	41.4
	Movement LOS	E	D	C	D	D	A	D	C	D	D	B
	Overall LOS	D	D	D	D	D	D	D	D	D	D	D

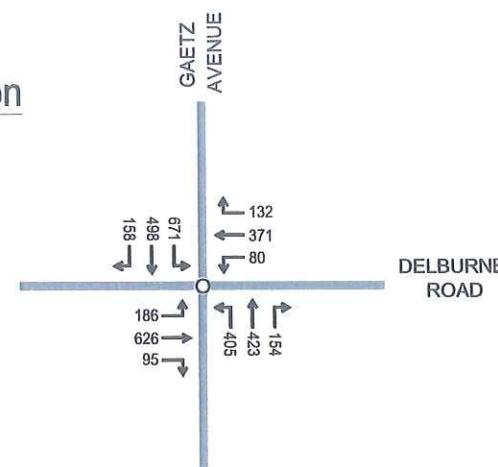
Existing Peak
Hour Traffic Volumes



85,000 Population Horizon



115,000 Population Horizon



Plotted: 2005-05-03 09:57AM By: lhilton
W:\lhd\112870826-Gaetz Ave Setback Study\dwg\Report\Final Report\70826-Gaetz Ave Report.Fig.dwg

Not to Scale

May 2005
112870826

Client/Project

THE CITY OF RED DEER
GAETZ AVENUE/ DELBURNIE ROAD
FUNCTIONAL PLAN

Figure No.

4.8

Title
**Peak PM Traffic Volumes for
85,000 and 115,000
Population Horizons**

Legend:



Traffic Signals



PM Peak Hour Traffic Volumes



Plotted: 2005-05-03 09:57AM By: Thilken
W:_ldd\112870826-Gaetz Ave Setback Study\dwg\Report\Final Report\70826-Gaetz Ave Report.Fig.dwg

Not to Scale

May 2005
112870826

Legend:

← Direction of Flow



Client/Project

THE CITY OF RED DEER
GAETZ AVENUE/ DELBURN ROAD
FUNCTIONAL PLAN

Figure No.

4.9

Title

**Lane Requirements for
85,000 and 115,000
Population Horizons**

4.5.4 19 Street Intersection

The principal purpose of this report was to determine if any improvements are required to accommodate the 85,000 and 115,000 population horizons. Figure 4.8 shows the volumes for the existing, the 85,000, and 115,000 population horizons.

A review of the Synchro analysis, summarized in Table 4.8, indicates that all of the traffic movements, as shown on Figure 4.9, operate with a v/c ratio ≤ 0.80 at the 85,000 and 115,000 population horizons with the exception of the left turn from southbound Gaetz Avenue to eastbound Delburne Road. This left turn is forecast to operate with a v/c ratio of 0.90. In this instance though, the southbound left turn movement is extremely heavy, and after a discussion with staff at the City of Red Deer, it was accepted that this movement could perform sufficiently with a v/c ratio of 0.90 or less. Thus the number and configuration of traffic lanes can accommodate the afternoon peak hour traffic volume forecasts at the City's 85,000 and 115,000 population horizons.