ENGINEERS
PLANNERS
ECONOMISTS

WilburSmith
ASSOCIATES

February 15, 2007

Mr. Garry Tucker
Robert G. Campbell and Associates
7523 Taggart Lane
Knoxville, Tennessee 37938

RE: HIGDON DRIVE TRAFFIC IMPACT STUDY

Dear Mr. Tucker:

Wilbur Smith Associates (WSA) is pleased to submit this letter report pertaining to the anticipated traffic impacts of a proposed residential subdivision to be located on the south side of Higdon Drive in northwest Knox County, Tennessee. Figure 1 presents the general site location. Figure 2 presents the proposed conceptual site plan. The scope of this study was defined by the Knox County Department of Engineering and Public Works and the Regional Metropolitan Transportation Planning Organization (TPO) to address geometric conditions and intersection capacity at the site access point and at the intersections of Higdon Drive (east) and Higdon Drive (west) with Oak Ridge Highway (SR 62).

Data Collection and General Site Description   90 ?

The proposed development will consist of 118 condominium units. The proposed access is a single driveway on the south side of Higdon Drive approximately 450 feet west of the Oak Ridge Highway and Higdon Drive (east) intersection. Build out and full occupancy is expected to occur within two years, or by 2009.

WSA conducted a field investigation in the environs of the proposed development to note any existing or potential geometric deficiencies. Higdon Drive is a local roadway with no posted speed limit that varies in width from 16 to 18 feet and is sloped from east to west at a grade of approximately 5%. Oak Ridge Highway is a two-lane State Highway with 12 foot travel lanes and paved shoulders six feet wide. The posted speed limit is 55 MPH. The available intersection sight distance at the proposed site driveway location is approximately 450 feet to Oak Ridge Highway on the east and approximately 1,300 feet to a vertical curve on the west.

The recommended alignment of SR 475 is expected to cross Oak Ridge Highway between the two Higdon Drive intersections. However, impacts to the proposed development should be minimal or nonexistent. It is expected that an overpass will be constructed as part of the SR 475 project that will span Oak Ridge Highway, Higdon Drive, and a set of railroad tracks. Therefore, it was assumed that full access will be maintained in the area around the site.

WSA conducted turning movement counts at the intersections of Oak Ridge Highway with Higdon Drive (west) and Higdon Drive (east) on Tuesday, February 6, 2007 and Thursday, February 8, 2007 respectively. The counts were conducted to determine existing traffic volumes and directional distribution in the proposed site vicinity. Figure 3 shows the existing AM and PM peak hour traffic volumes at the count locations. The peak hour was determined to be 7:00-8:00 AM and 4:45-5:45 PM based on the Higdon Drive (east) intersection.

Background Growth of Traffic Volumes

The Tennessee Department of Transportation (TDOT) maintains a count station on Oak Ridge Highway in the study area. Station #364 is located approximately 0.5 miles west of the Higdon Drive (west) intersection. Annual traffic growth has remained fairly constant during the past twenty years. Recent growth at station #364 has been less than 2%, while a trend line representing traffic growth at the station over the past twenty years results in a growth rate of 2.5% per year. For study purposes, a growth rate of 2.5% per year was used. This annual growth rate was applied to the observed traffic volumes. Figure 4 presents the projected 2009 peak hour traffic at the intersections of Oak Ridge Highway with Higdon Drive (east) and Higdon Drive (west) assuming this background traffic growth.

Trip Generation and Trip Distribution of Site Traffic

Table 1 shows the daily, AM peak hour, and PM peak hour traffic expected to be generated by the proposed residential development. The procedures of *Trip Generation, 7th Edition*, published by the Institute of Transportation Engineers, were used to estimate these volumes based on locally gathered trip generation data. The TPO published a memorandum ("Local Trip Generation Rates for Multi-Family Residential Uses", August 14, 2000, contained in Appendix) instructing traffic impact study preparers to use the locally obtained data for all multi-family residential developments including apartments, condominiums, and the like.

	Table 1 Higdon Drive TIS Trip Generation Summary				
Time Period	Total Trips	Percent		Number	
		Enter	Exit	Enter	Exit
Weekday (24 hours) ✓	1,107	50%	50%	554	554
AM Peak Hour ✓	62	22%	78%	14	49
PM Peak Hour ✓	89	55%	45%	49	40

The directional distribution of traffic generated by the proposed Higdon Drive subdivision was assumed based on the existing traffic patterns evident in the turning movement counts at the intersections of Oak Ridge Highway with Higdon Drive (east) and Higdon Drive (west). The typical pattern is for traffic to be heavier in one direction in the morning and in the opposite direction in the evening as commuters travel to and return from work. Based on the cited traffic counts, traffic near the proposed site is more heavily oriented (approximately 65% in the AM and 70% in the PM) to and from the west. For study purposes it was assumed that 65% of the proposed subdivision traffic would depart to the west in the morning and 70% would return from the west in the evening. To the east via Oak Ridge Highway, 35% was assigned in the morning and 30% from the east in the evening. Figure 5 shows the directional splits applied to the generated traffic for the proposed subdivision. It should be noted that the eastern and western intersections of Higdon Drive with Oak Ridge Highway generally function as one intersection. Existing traffic counts show that with the exception of a very low number of vehicles, traffic that accesses Higdon Drive going to and from the east uses the eastern intersection and traffic traveling to and from the west uses the western intersection. Therefore, distribution of site related traffic for the purpose of the study maintained this existing traffic pattern.

Traffic Conditions

Unsignalized intersection capacity analyses were performed for the AM and PM peak hours to evaluate the traffic conditions at the intersections of Oak Ridge Highway with Higdon Drive (east) and Higdon Drive (west) and also at Higdon Drive and the site driveway. The capacity analysis reports are contained in the Appendix. The methodology of the *2000 Highway Capacity Manual* as contained in the *Highway Capacity Software (version 5.1)* was used. One of the measures employed in such analyses is "level of service" (LOS), a qualitative statement of the acceptability of traffic conditions based on delay. The LOS index ranges from LOS A, indicating excellent traffic conditions with minimal delay, to LOS F indicating very congested conditions with excessive delay. LOS D generally is considered the minimum acceptable condition in urban areas.

Based on capacity analyses using the volumes of Figure 3, Oak Ridge Highway drivers currently experience LOS A (AM peak hour) to LOS B (PM peak hour) conditions. With future background traffic growth plus the proposed Higdon Drive subdivision traffic (Figure 6), those conditions are projected to remain at LOS A and B, respectively. Westbound traffic on Oak Ridge Highway will be impeded by vehicles turning left onto Higdon Drive, but their delay will be minimal under all scenarios. Northbound traffic at Higdon Drive (east) and Oak Ridge Highway currently experiences LOS B during the AM peak hour and LOS C during the PM peak hour. These LOS B and LOS C conditions are expected to remain at the completion of the project. Northbound traffic at Higdon Drive (west) and Oak Ridge Highway currently experience LOS C during both the AM and PM peak hours. With the addition of background and site traffic, the intersection is expected to operate at LOS D. However, delays are expected to be minimal and not exceed 33 seconds. Upon site build-out (Figure 6), traffic conditions at the site entrance are projected to be LOS A for drivers during both peak hours. Capacity analysis is summarized in Tables 2, 3, and 4 below.

Table 2				
Higdon Drive TIS Capacity Analysis Summary				
Oak Ridge Highway and Higdon Drive (east)				
Scenario	AM Peak-Hour		PM Peak-Hour	
	WB (LOS/Delay)	NB (LOS/Delay)	WB (LOS/Delay)	NB (LOS/Delay)
Existing	A / 8.1 sec	B / 10.6 sec	B / 10.2 sec	C / 17.7 sec
Background	A / 8.2 sec	B / 10.8 sec	B / 10.5 sec	C / 18.6 sec
Build-out	A / 8.2 sec	B / 11.0 sec	B / 10.6 sec	C / 19.4 sec

Table 3				
Higdon Drive TIS Capacity Analysis Summary				
Oak Ridge Highway and Higdon Drive (west)				
Scenario	AM Peak-Hour		PM Peak-Hour	
	WB (LOS/Delay)	NB (LOS/Delay)	WB (LOS/Delay)	NB (LOS/Delay)
Existing	A / 8.0 sec	C / 21.0 sec	B / 10.3 sec	C / 22.9 sec
Background	A / 8.1 sec	C / 22.5 sec	B / 10.6 sec	C / 24.8 sec
Build-out	A / 8.1 sec	D / 26.5 sec	B / 10.8 sec	D / 38.8 sec

Table 4 Higdon Drive TIS Capacity Analysis Summary Higdon Drive and Site Driveway				
Scenario	AM Peak-Hour		PM Peak-Hour	
	WB (LOS/Delay)	NB (LOS/Delay)	WB (LOS/Delay)	NB (LOS/Delay)
Build-out	A / 7.3 sec	A / 8.8 sec	A / 7.3 sec	A / 8.9 sec

Evaluation of Signal Warrants

The need for signalization of the intersections of Oak Ridge Highway with Higdon Drive (east) and Higdon Drive (west) was evaluated. Warrants for traffic signals are set forth in the *2003 Manual on Uniform Traffic Control Devices* (MUTCD) published by the FHWA. Three volume-based warrants are defined in the MUTCD as follows:

- Warrant 1: Eight-Hour Vehicular Volume,
- Warrant 2: Four-Hour Vehicular Volume, and
- Warrant 3: Peak Hour.

Warrant 1 is subdivided into three conditions. Condition A (Minimum Vehicular Volume) is applicable where a large volume of intersecting traffic is the principal reason for signalization. Condition B (Interruption of Continuous Traffic) is applicable where major street traffic volumes are so heavy that minor street drivers suffer excessive delay or conflict entering or crossing the major street. The third condition provides for a combination of Conditions A and B.

Due to the fact that Higdon Drive distributes traffic to Oak Ridge Highway at two separate intersections, neither intersection receives enough traffic to warrant a traffic signal. At full build-out, the maximum number of vehicles expected to exit either Higdon Drive intersection onto Oak Ridge Highway during one hour is 39. This volume is well below the threshold set by the MUTCD for the warrant of a traffic signal. Therefore, signalization will not be necessary as a result of this project's construction.

Evaluation of Turn Lane Warrants

The need for auxiliary turn lanes at the intersections of Oak Ridge Highway with Higdon Drive (east), Higdon Drive (west), and at the proposed site access point was evaluated. The criteria for such turn-lane warrants are contained in Knox County's *Access Control and Driveway Design Policy*. The evaluation worksheets are contained in the Appendix.

Based on these evaluations, a westbound left-turn lane on Oak Ridge Highway at Higdon Drive (east) is expected to be warranted at project build-out. In addition, an eastbound right-turn lane on Oak Ridge Highway at Higdon Drive (west) is expected to be warranted at project build-out. Both of these turn lanes are primarily warranted due to the high volume of traffic traveling Oak Ridge Highway and not the volume of turning traffic onto Higdon Drive at either intersection. Turn lanes on Higdon Drive at the site driveway are not expected to be warranted.

Conclusions and Recommendations

Based on the analyses and evaluations reported herein, WSA reached the following conclusions and makes the recommendations set forth below.

- *Sight distance*
  - Discussion: The minimum required sight distance based on the assumed speed limit of 30 MPH on Higdon Drive is 300 feet. Thus, the available sight distance at the proposed driveway location (450 feet plus in both directions) is expected to be more than adequate, even if actual operating speeds exceed the posted limit slightly.
  - Recommendation: Site grading and landscaping should be accomplished to maintain the available sight distance.

- *Intersection spacing*
  - Discussion: The nearest public road intersection to the site driveway is the Oak Ridge Highway and Higdon Drive (east) intersection. This intersection is approximately 450 feet from the proposed access, which exceeds the Knox County minimum separation standard
  - Recommendation: None

- *Higdon Drive roadway width*
  - Discussion: Higdon Drive is a local roadway that varies in width from 16 to 18 feet.
  - Recommendation: At least some portion of Higdon Drive should be widened in order to be brought up to Knox County standards.

- *Auxiliary lanes (Oak Ridge Highway at Higdon Drive (east))*
  - Discussion: A westbound left-turn lane from Oak Ridge Highway into Higdon Drive (east) is marginally warranted primarily due to the high volume of through traffic on Oak Ridge Highway and not the volume of turning traffic. The projected level of service for westbound drivers is LOS B upon project build-out.
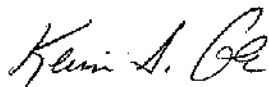
    o <u>Recommendation</u>: Given the very good projected level of service for Oak Ridge Highway drivers, it is recommended that construction of a westbound left-turn lane at this intersection be considered but with due regard to Knox County's overall intersection improvement priorities. Crash experience should be monitored to anticipate a demonstrated need for the turn lane.

- *Auxiliary lanes (Oak Ridge Highway at Higdon Drive (west))*

    o <u>Discussion</u>: An eastbound right-turn lane from Oak Ridge Highway onto Higdon Drive (west) is warranted in the PM peak hour primarily due to the high volume of through traffic on Oak Ridge Highway and not the volume of turning traffic. The projected level of service for eastbound drivers is LOS A.

    o <u>Recommendation</u>: Given the very good projected level of service for Oak Ridge Highway drivers, it is recommended that construction of a eastbound right-turn lane at this intersection be considered but with due regard to Knox County's overall intersection improvement priorities. Crash experience should be monitored to anticipate a demonstrated need for the turn lane.

Please find enclosed the supporting figures and appendix items cited herein. Do not hesitate to call if you have any questions or wish to discuss this report.

Sincerely,

WILBUR SMITH ASSOCIATES

Kevin A. Cole, PE

Senior Transportation Engineer

Enclosures:

<u>FIGURES</u>
Figure 1: Location Map
Figure 2: Site Plan
Figure 3: Year 2007 Peak Hour Traffic
Figure 4: Year 2009 Peak Hour Traffic Without Development
Figure 5: Year 2009 Peak Hour Site Generated Traffic
Figure 6: Year 2009 Peak Hour Traffic With Development

<u>APPENDIX</u>

FIGURES

LOCATION MAP
Proposed Higdon Drive Subdivision
Knox County, Tennessee

N

SITE LOCATION

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ASSOCIATES

Figure 1

SITE PLAN
Proposed Higdon Drive Subdivision
Knox County, Tennessee

WilburSmith
ASSOCIATES

Figure 2
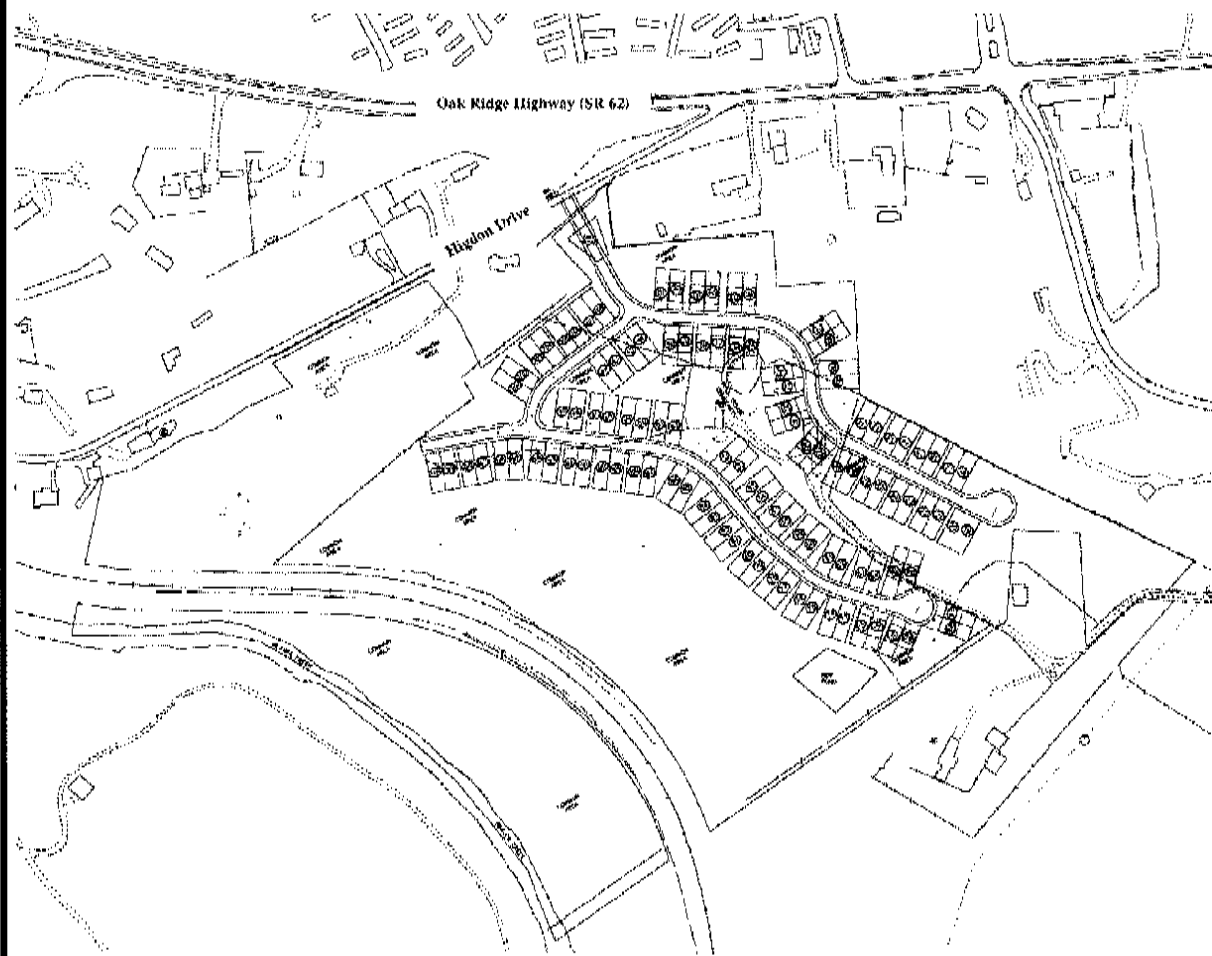
YEAR 2007 PEAK HOUR TRAFFIC
Proposed Higdon Drive Subdivision
Knox County, Tennessee
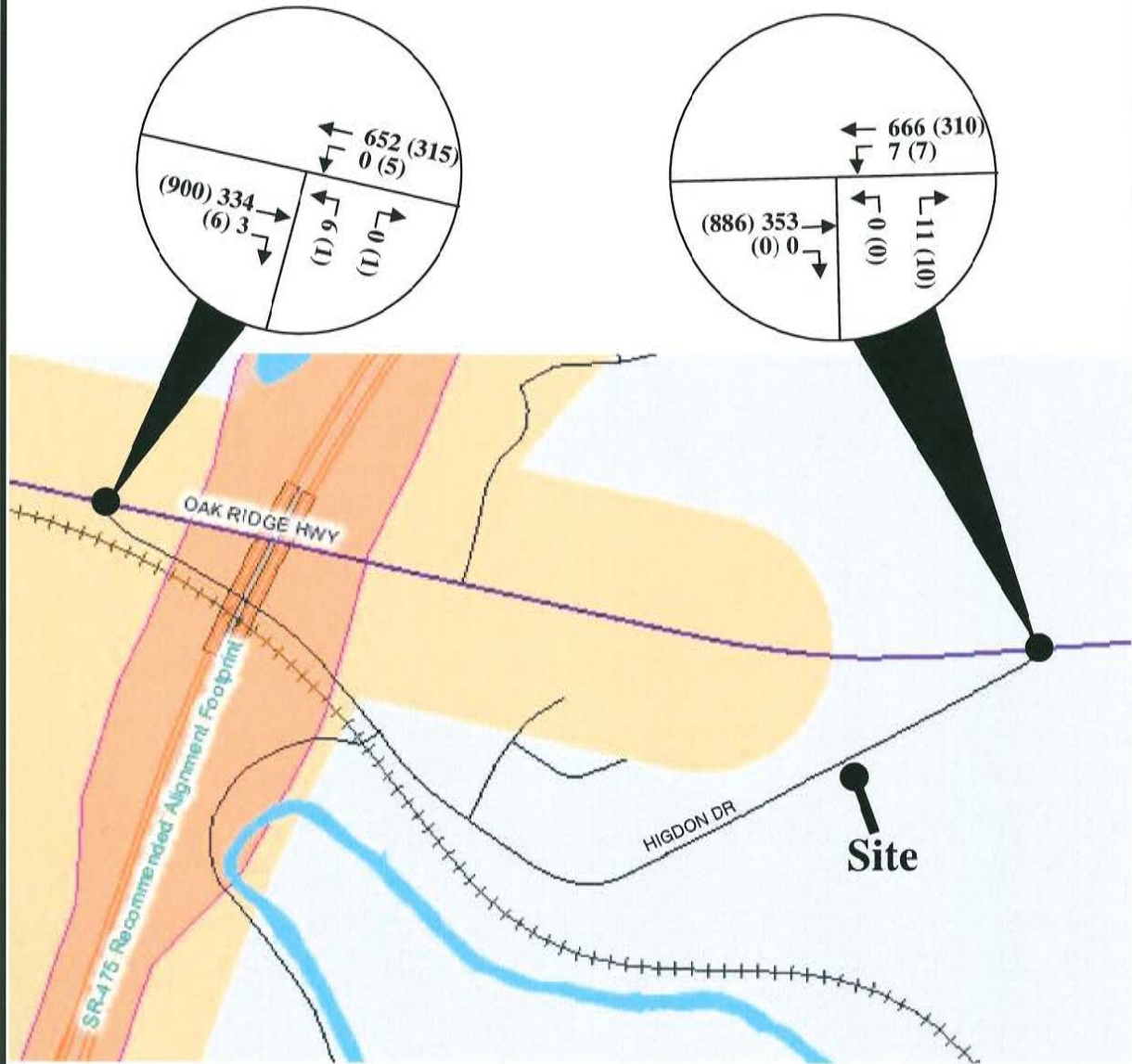
N

652 (315)
0 (5)
(900) 334
(6) 3
6 (1)
0 (1)

666 (310)
7 (7)
(886) 353
(0) 0
0 (0)
11 (10)

OAK RIDGE HWY

SR-475 Recommended Alignment Footprint

HIGDON DR

Site

LEGEND

10(10)   Turning Movement Volume AM(PM)

Figure 3

YEAR 2009 PEAK HOUR TRAFFIC
WITHOUT DEVELOPMENT
Proposed Higdon Drive Subdivision
Knox County, Tennessee

N

685 (331)
0 (6)
(945) 351
(7) 4
7 (2)
0 (2)

700 (326)
8 (8)
(931) 371
(0) 0
0 (0)
12 (11)

OAK RIDGE HWY

SR-475 Recommended Alignment Footprint

HIGDON DR

Site

LEGEND

10(10)   Turning Movement Volume AM(PM)

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Figure 4

YEAR 2009 PEAK HOUR
SITE GENERATED TRAFFIC
Proposed Higdon Drive Subdivision
Knox County, Tennessee
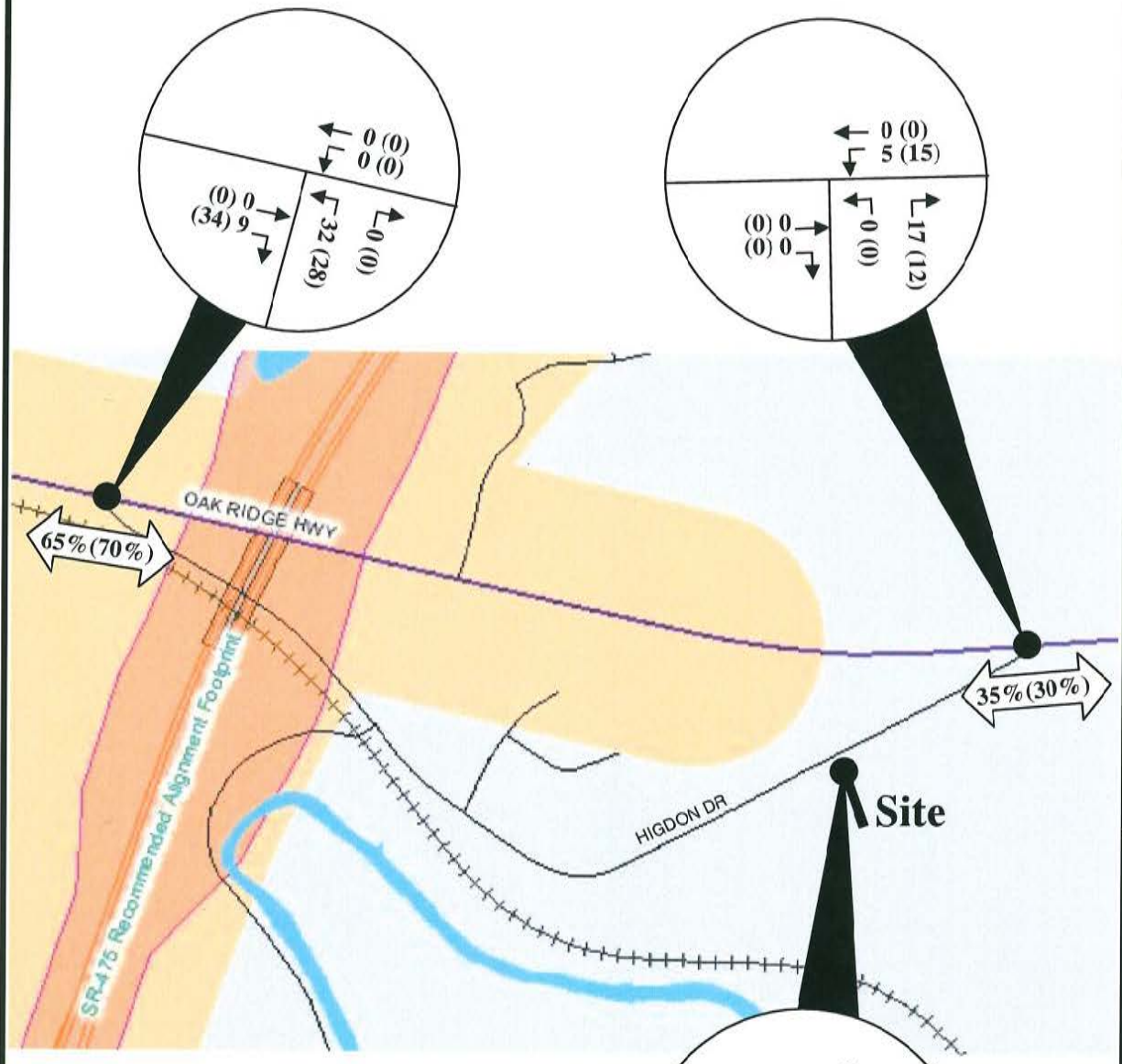
LEGEND

10(10) Turning Movement Volume AM(PM)

AM%(PM%) Distribution AM%(PM%)
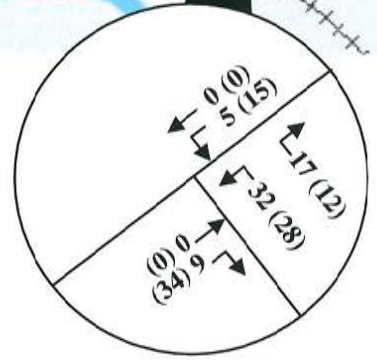
WilburSmith
A S S O C I A T E S

Figure 5

YEAR 2009 PEAK HOUR TRAFFIC WITH DEVELOPMENT
Proposed Higdon Drive Subdivision
Knox County, Tennessee

N

685 (331)
0 (6)
(945) 351
(41) 13
39 (30)
0 (2)

700 (326)
13 (23)
(931) 371
(0) 0
0 (0)
29 (23)

OAK RIDGE HWY

HIGDON DR

Site

8 (8)
5 (15)
17 (12)
32 (28)
(11) 12
(34) 9

LEGEND

→
10(10)   Turning Movement Volume AM(PM)

WilburSmith
A S S O C I A T E S
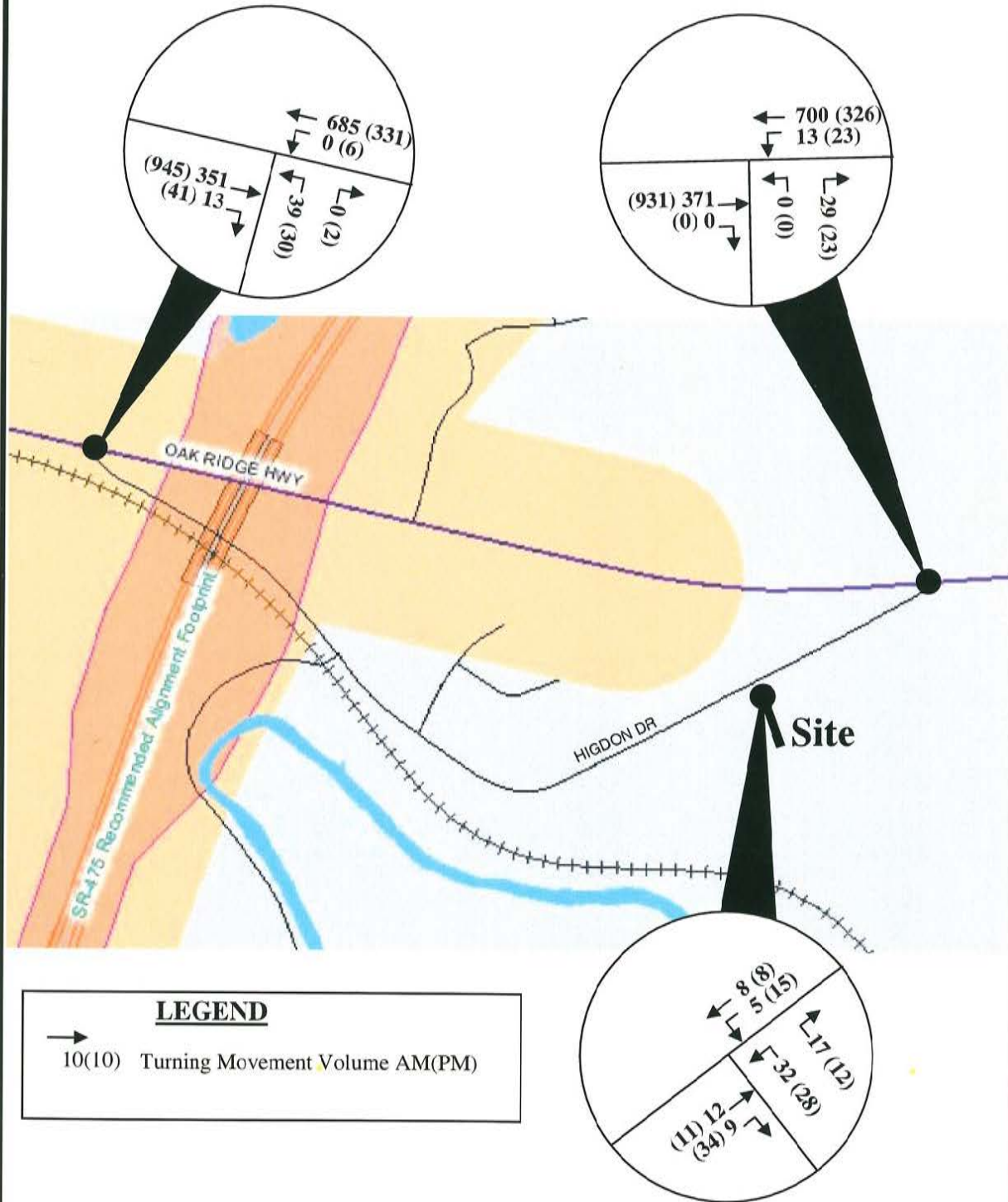
Figure 6

APPENDIX

HISTORICAL ADT'S

Station #	County	Location	Route#	Route Name	Station Out
364	Knox	NEAR ANDERSON CO LINE	SR062	SR 62	N

Rec	Year	Adjusted Average Daily Traffic	Remarks
21	1986	7578	1ST YR COUNT
20	1987	7231	
19	1988	8091	
18	1989	9165	
17	1990	9213	
16	1991	9513	
15	1992	9909	
14	1993	9667	
13	1994	9705	
12	1995	11363	
11	1996	14849	
10	1997	10560	STA 64 ALSO DOW N
9	1998	9896	
8	1999	10096	
7	2000	10544	
6	2001	10012	EST
5	2002	10038	
4	2003	10920	
3	2004	11666	EST
2	2005	12497	
1	2006	12201	
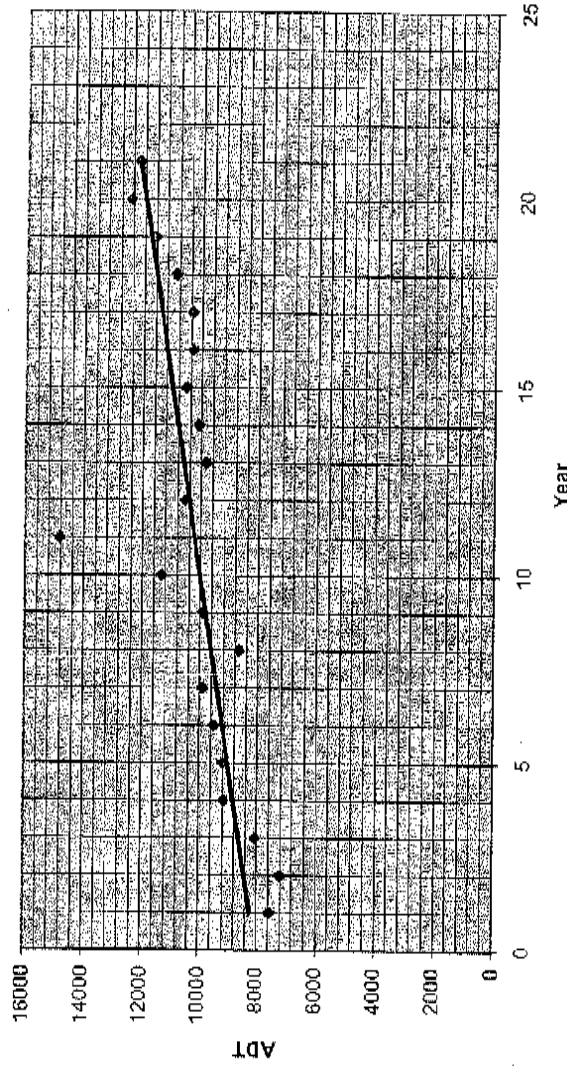
Most Recent Trend Line Growth

Year	ADT
2005	11979
2006	12175

Annual Percent Growth   1.64%

Future ADTs per Trend Line

Year	ADT
2007	12371
2012	13353
2017	14334
2027	16298
2032	17279

TRIP GENERATION

M P C

METROPOLITAN
PLANNING
COMMISSION
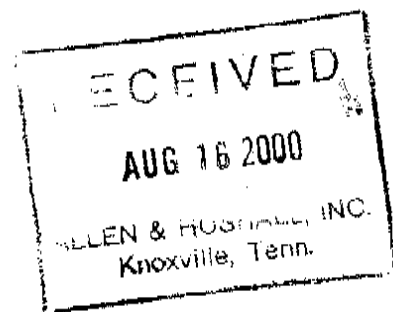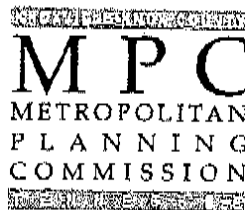
MEMORANDUM

To: Traffic Impact Study Reviewers and Preparers (see attached list)

From: Mike Conger

Date: August 14, 2000

Subject: Local Trip Generation Rates for Multi-Family Residential Uses

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Attached please find a summary of the final report with data plots for the Knox County
Local Apartment Trip Generation Study. As you will recall, this report was discussed
when the traffic impact study group last convened this past February. A consensus was
reached at that meeting that the trip generation rates developed in the local study should
be used for new apartment complexes <u>and</u> any other "multi-family" residential uses that
are being proposed.

The MPC voted at its July 2000 meeting to officially amend the Traffic Impact Study
Guidelines with language which reads that "trip generation rates for proposed uses shall
be calculated using the latest edition of the ITE Trip Generation Manual, or using local
data when it is available". This amendment allows the full implementation of the new
rates, and they should be used for future proposed multi-family developments unless it
can be demonstrated otherwise.

Thanks for your assistance and cooperation in this matter, if there are any questions or
comments, please let me know.

Local Apartment
Trip Generation Study

Average Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday**

Number of Studies:	13
Average Number of Dwelling Units:	193
Directional Distribution:	50% entering, 50% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
9.03	6.59 - 17.41	2.47

Data Plot and Equation
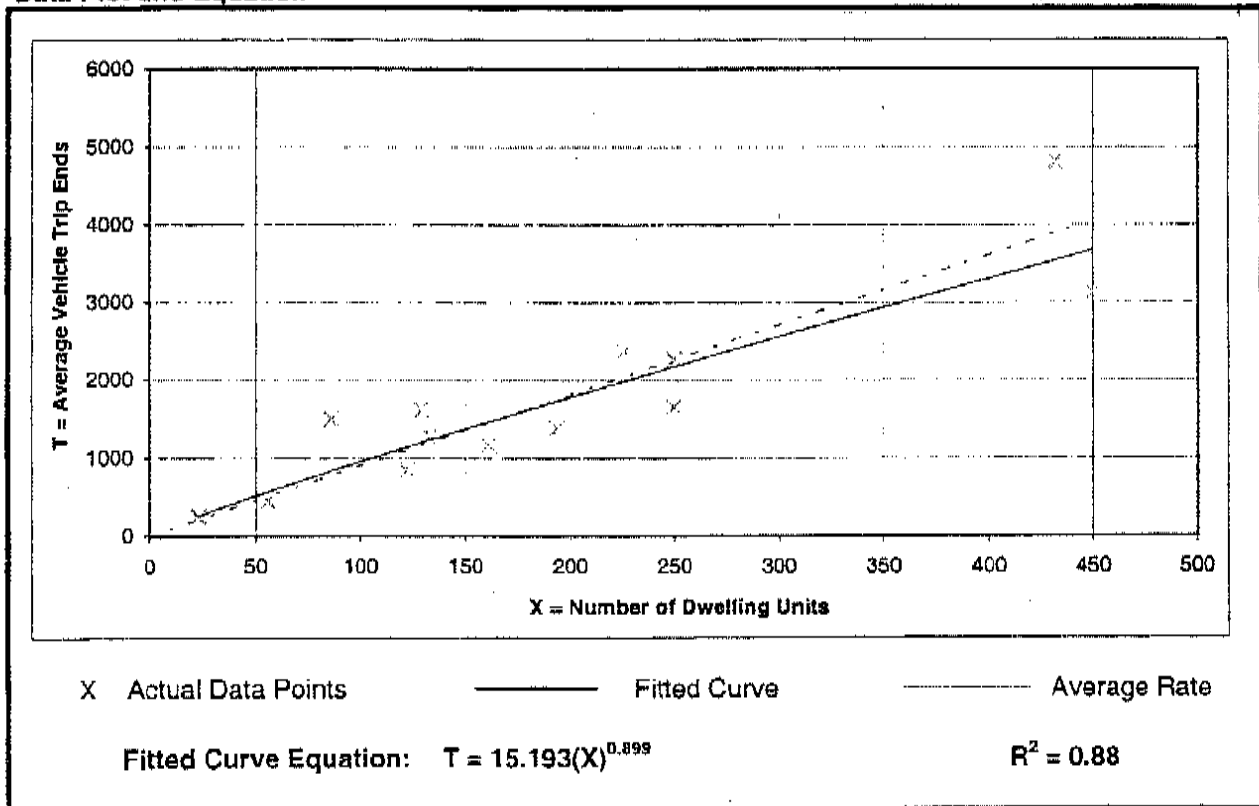
X Actual Data Points   ——————— Fitted Curve   - - - - - - - Average Rate

Fitted Curve Equation: $T = 15.193(X)^{0.899}$ $R^2 = 0.88$

Local Apartment
Trip Generation Study

Average Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: **13**
Average Number of Dwelling Units: **193**
Directional Distribution: **22% entering, 78% exiting**

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
0.55	0.14 - 0.78	0.18

Data Plot and Equation
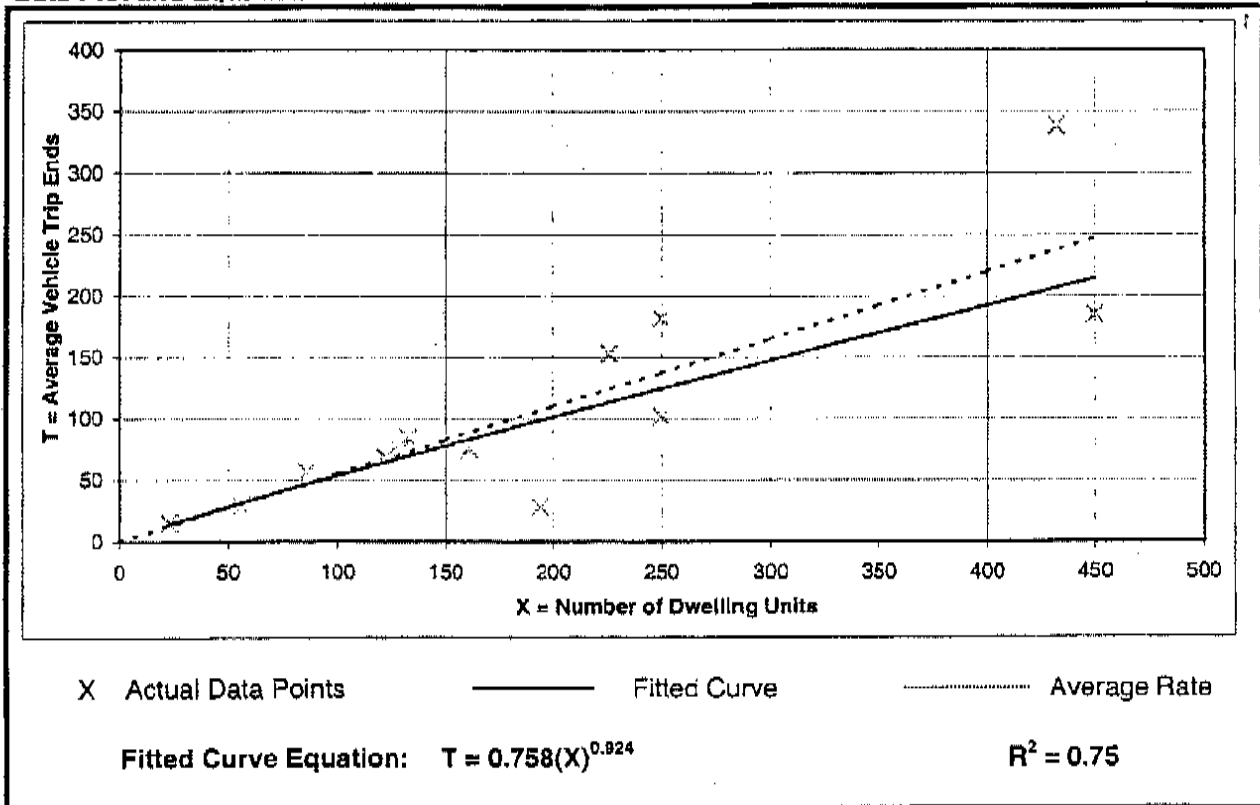
X   Actual Data Points   ———— Fitted Curve   ·········· Average Rate

Fitted Curve Equation: $T = 0.758(X)^{0.924}$ $R^2 = 0.75$

Local Apartment
Trip Generation Study

Average Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.

Number of Studies:	13
Average Number of Dwelling Units:	193
Directional Distribution:	55% entering, 45% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
0.72	0.32 - 1.66	0.25

Data Plot and Equation

X Actual Data Points	———— Fitted Curve	·············· Average Rate

Fitted Curve Equation: $T = 0.669(X) + 10.069$ $R^2 = 0.79$
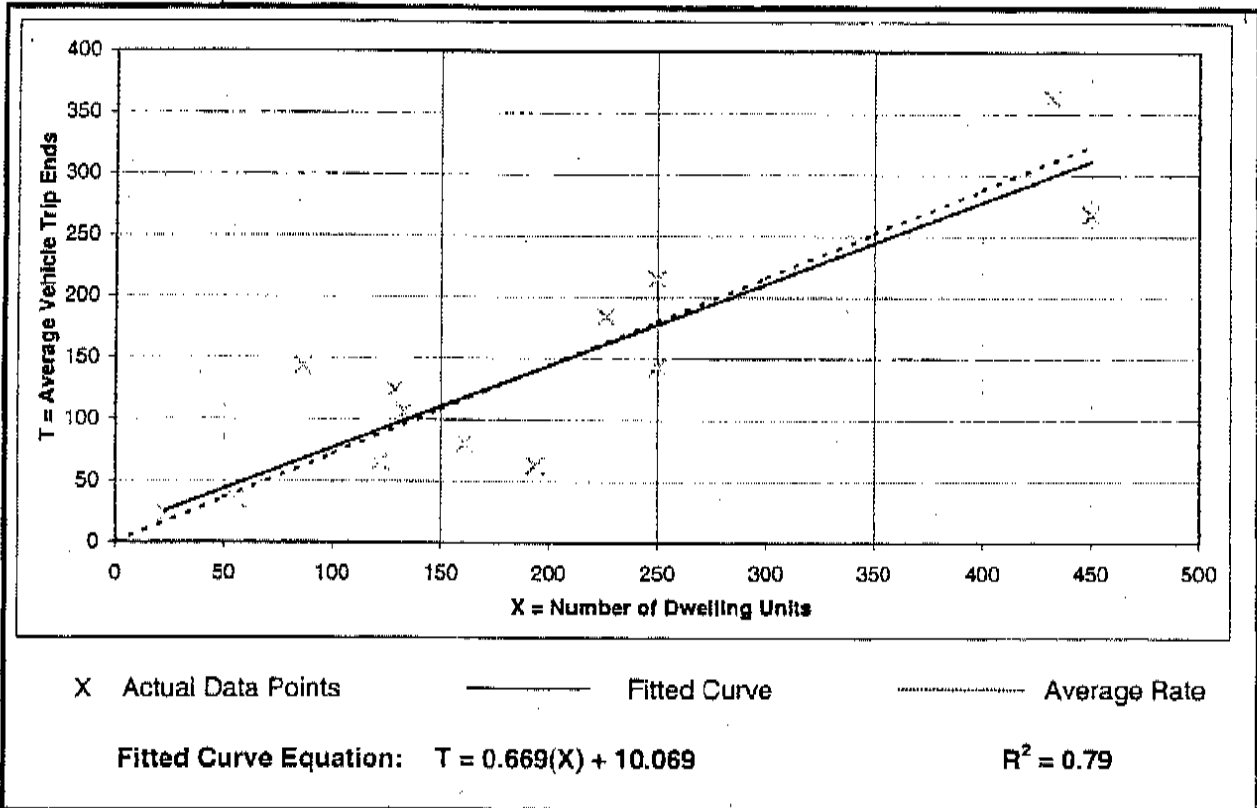
Local Apartment/ Condominium*	
Dwelling Units =	118
Average Weekday	
Total =	1,107
Entering =	50%
Exiting =	50%
Entering Traffic =	554
Exiting Traffic =	554
AM Peak - Adjacent Street	
Total =	62
Entering =	22%
Exiting =	78%
Entering Traffic =	14
Exiting Traffic =	49
PM Peak - Adjacent Street	
Total =	89
Entering =	55%
Exiting =	45%
Entering Traffic =	49
Exiting Traffic =	40

*Trip gen study conducted by
the Knoxville MPC

TRAFFIC COUNTS

Wilbur Smith Associates, Inc.

1100 Marion Street, Suite 200
Knoxville, TN 37931

Counted by DWS
WSA count board D4-2607

File Name : OR Hwy-Higdon Dr east
Site Code : 00000000
Start Date : 2/8/2007
Page No : 1

Groups Printed- Unshifted

Start Time	Higdon Drive (east) Southbound				Oak Ridge Hwy Westbound				Higdon Drive (east) Northbound				Oak Ridge Hwy Eastbound				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
07:00 AM	0	0	0	0	2	128	0	130	0	0	5	5	0	97	0	97	232
07:15 AM	0	0	0	0	0	168	0	168	0	0	2	2	0	95	0	95	265
07:30 AM	0	0	0	0	0	174	0	174	0	0	1	1	0	71	0	71	246
07:45 AM	0	0	0	0	5	196	0	201	0	0	3	3	0	90	0	90	294
Total	0	0	0	0	7	666	0	673	0	0	11	11	0	353	0	353	1037
08:00 AM	0	0	0	0	1	131	0	132	0	0	2	2	0	80	0	80	214
08:15 AM	0	0	0	0	1	113	0	114	0	0	2	2	0	68	0	68	184
08:30 AM	0	0	0	0	4	106	0	110	0	0	1	1	0	56	0	56	167
08:45 AM	0	0	0	0	0	90	0	90	0	0	0	0	0	50	0	50	140
Total	0	0	0	0	6	440	0	446	0	0	5	5	0	254	0	254	705

*** BREAK***

	Higdon Drive (east) Southbound				Oak Ridge Hwy Westbound				Higdon Drive (east) Northbound				Oak Ridge Hwy Eastbound				Int. Total
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
03:00 PM	0	0	0	0	1	70	0	71	0	0	2	2	0	92	0	92	165
03:15 PM	0	0	0	0	2	49	0	51	0	0	1	1	0	130	0	130	182
03:30 PM	0	0	0	0	2	75	0	77	0	0	3	3	0	173	0	173	253
03:45 PM	0	0	0	0	6	78	0	84	0	0	4	4	0	196	0	196	284
Total	0	0	0	0	11	272	0	283	0	0	10	10	0	591	0	591	864
04:00 PM	0	0	0	0	3	86	0	89	0	0	1	1	0	130	0	130	220
04:15 PM	0	0	0	0	1	83	0	84	0	0	5	5	0	132	0	132	221
04:30 PM	0	0	0	0	3	66	0	69	0	0	2	2	0	175	0	175	246
04:45 PM	0	0	0	0	1	86	0	87	0	0	4	4	0	199	0	199	290
Total	0	0	0	0	8	321	0	329	0	0	12	12	0	636	0	636	977
05:00 PM	0	0	0	0	3	74	0	77	0	0	2	2	0	219	0	219	298
05:15 PM	0	0	0	0	0	80	0	80	0	0	2	2	0	256	0	256	338
05:30 PM	0	0	0	0	3	70	0	73	0	0	2	2	0	212	0	212	287
05:45 PM	0	0	0	0	1	64	0	65	0	0	0	0	0	214	0	214	279
Total	0	0	0	0	7	288	0	295	0	0	6	6	0	901	0	901	1202
Grand Total	0	0	0	0	39	1987	0	2026	0	0	44	44	0	2735	0	2735	4805
Apprch %	0	0	0		1.9	98.1	0		0	0	100		0	100	0		
Total %	0	0	0	0	0.8	41.4	0	42.2	0	0	0.9	0.9	0	56.9	0	56.9	

Start Time	Higdon Drive (east) Southbound				Oak Ridge Hwy Westbound				Higdon Drive (east) Northbound				Oak Ridge Hwy Eastbound				Int. Total
	Left	Thru	Right	App Total	Left	Thru	Right	App Total	Left	Thru	Right	App Total	Left	Thru	Right	App Total	

Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 07:00 AM

	Left	Thru	Right		Left	Thru	Right		Left	Thru	Right		Left	Thru	Right		
07:00 AM	0	0	0	0	2	128	0	130	0	0	5	5	0	97	0	97	232
07:15 AM	0	0	0	0	0	168	0	168	0	0	2	2	0	95	0	95	265
07:30 AM	0	0	0	0	0	174	0	174	0	0	1	1	0	71	0	71	246
07:45 AM	0	0	0	0	5	196	0	201	0	0	3	3	0	90	0	90	294
Total Volume	0	0	0	0	7	666	0	673	0	0	11	11	0	353	0	353	1037
% App. Total	0	0	0		1	99	0		0	0	100		0	100	0		
PHF	.000	.000	.000	.000	.350	.849	.000	.837	.000	.000	.550	.550	.000	.910	.000	.910	.882

Wilbur Smith Associates, Inc.

Counted by DWS
WSA count board D4-2607

Start Time	Higdon Drive (east) Southbound				Oak Ridge Hwy Westbound				Higdon Drive (east) Northbound				Oak Ridge Hwy Eastbound				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	0	0	0	0	1	86	0	87	0	0	4	4	0	199	0	199	290
05:00 PM	0	0	0	0	3	74	0	77	0	0	2	2	0	219	0	219	298
05:15 PM	0	0	0	0	0	80	0	80	0	0	2	2	0	256	0	256	338
05:30 PM	0	0	0	0	3	70	0	73	0	0	2	2	0	212	0	212	287
Total Volume	0	0	0	0	7	310	0	317	0	0	10	10	0	886	0	886	1213
% App. Total	0	0	0		2.2	97.8	0		0	0	100		0	100	0		
PHF	.000	.000	.000	.000	.583	.901	.000	.911	.000	.000	.625	.625	.000	.865	.000	.865	.897

Wilbur Smith Associates, Inc.

1100 Marion Street, Suite 200
Knoxville, TN 37931

Counted by DWS
WSA count board D4-2607

File Name : OR Hwy-Higdon Dr west
Site Code : 00000000
Start Date : 2/6/2007
Page No : 1

Groups Printed- Unshifted

Start Time	Higdon Drive (west) Southbound				Oak Ridge Hwy Westbound				Higdon Drive (west) Northbound				Oak Ridge Hwy Eastbound				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
07:00 AM	0	0	0	0	0	135	0	135	1	0	0	1	0	87	0	87	223
07:15 AM	0	0	0	0	0	156	0	156	2	0	0	2	0	87	1	88	246
07:30 AM	0	0	0	0	0	163	0	163	2	0	0	2	0	78	0	78	243
07:45 AM	0	0	0	0	0	198	0	198	1	0	0	1	0	82	2	84	283
Total	0	0	0	0	0	652	0	652	6	0	0	6	0	334	3	337	995
08:00 AM	0	0	0	0	1	154	0	155	1	0	1	2	0	70	0	70	227
08:15 AM	0	0	0	0	0	130	0	130	0	0	0	0	0	74	0	74	204
08:30 AM	0	0	0	0	0	107	0	107	2	0	0	2	0	48	0	48	157
08:45 AM	0	0	0	0	0	89	0	89	1	0	0	1	0	62	0	62	152
Total	0	0	0	0	1	480	0	481	4	0	1	5	0	254	0	254	740
03:00 PM	0	0	0	0	1	62	0	63	0	0	0	0	0	118	2	120	183
03:15 PM	0	0	0	0	0	64	0	64	0	0	0	0	0	142	0	142	206
03:30 PM	0	0	0	0	0	62	0	62	0	0	0	0	0	197	3	200	262
03:45 PM	0	0	0	0	0	62	0	62	0	0	0	0	0	155	0	155	217
Total	0	0	0	0	1	250	0	251	0	0	0	0	0	612	5	617	868
04:00 PM	0	0	0	0	0	100	0	100	1	0	0	1	0	133	2	135	236
04:15 PM	0	0	0	0	0	73	0	73	0	0	0	0	0	163	1	164	237
04:30 PM	0	0	0	0	0	68	0	68	0	0	0	0	0	216	1	217	285
04:45 PM	0	0	0	0	2	90	0	92	0	0	0	0	0	205	2	207	299
Total	0	0	0	0	2	331	0	333	1	0	0	1	0	717	6	723	1057
05:00 PM	0	0	0	0	1	75	0	76	0	0	0	0	0	241	1	242	318
05:15 PM	0	0	0	0	2	96	0	98	0	0	0	0	0	257	2	259	357
05:30 PM	0	0	0	0	0	54	0	54	1	0	1	2	0	197	1	198	254
05:45 PM	0	0	0	0	1	113	0	114	0	0	0	0	0	166	0	166	280
Total	0	0	0	0	4	338	0	342	1	0	1	2	0	861	4	865	1209
Grand Total	0	0	0	0	8	2051	0	2059	12	0	2	14	0	2778	18	2796	4869
Apprch %	0	0	0		0.4	99.6	0		85.7	0	14.3		0	99.4	0.6		
Total %	0	0	0	0	0.2	42.1	0	42.3	0.2	0	0	0.3	0	57.1	0.4	57.4	

Start Time	Higdon Drive (west) Southbound				Oak Ridge Hwy Westbound				Higdon Drive (west) Northbound				Oak Ridge Hwy Eastbound				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	

Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 07:15 AM

Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:15 AM	0	0	0	0	0	156	0	156	2	0	0	2	0	87	1	88	246
07:30 AM	0	0	0	0	0	163	0	163	2	0	0	2	0	78	0	78	243
07:45 AM	0	0	0	0	0	198	0	198	1	0	0	1	0	82	2	84	283
08:00 AM	0	0	0	0	1	154	0	155	1	0	1	2	0	70	0	70	227
Total Volume	0	0	0	0	1	671	0	672	6	0	1	7	0	317	3	320	999
% App. Total	0	0	0		0.1	99.9	0		85.7	0	14.3		0	99.1	0.9		
PHF	.000	.000	.000	.000	.250	.847	.000	.848	.750	.000	.250	.875	.000	.911	.375	.909	.883

Wilbur Smith Associates, Inc.

1100 Marion Street, Suite 200
Knoxville, TN 37931

Start Time	Higdon Drive (west) Southbound				Oak Ridge Hwy Westbound				Higdon Drive (west) Northbound				Oak Ridge Hwy Eastbound				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	0	0	0	0	0	68	0	68	0	0	0	0	0	216	1	217	285
04:45 PM	0	0	0	0	2	90	0	92	0	0	0	0	0	205	2	207	299
05:00 PM	0	0	0	0	1	75	0	76	0	0	0	0	0	241	1	242	318
05:15 PM	0	0	0	0	2	96	0	98	0	0	0	0	0	257	2	259	357
Total Volume	0	0	0	0	5	329	0	334	0	0	0	0	0	919	6	925	1259
% App. Total	0	0	0		1.5	98.5	0		0	0	0		0	99.4	0.6		
PHF	.000	.000	.000	.000	.625	.857	.000	.852	.000	.000	.000	.000	.000	.894	.750	.893	.882

HIGHWAY CAPACITY ANALYSES

2007 EXISTING

TRAFFIC CONDITIONS

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	JMC
Agency/Co.	Wilbur Smith
Date Performed	2/12/2007
Analysis Time Period	AM Peak

Site Information

Intersection	Oak Ridge / Higdon
Jurisdiction	
Analysis Year	2007

Project Description   Existing Conditions

East/West Street: Oak Ridge Hwy (east)	North/South Street: Higdon Dr
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	353	0	7	666	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	401	0	7	756	0
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	11	0	0	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	0	12	0	0	0
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
Volume, v (vph)		7		12				
Capacity, c_m (vph)		1169		653				
v/c ratio		0.01		0.02				
Queue length (95%)		0.02		0.06				
Control Delay (s/veh)		8.1		10.6				
LOS		A		B				
Approach delay (s/veh)	--	--		10.6				
Approach LOS	--	--		B				

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	JMC	Intersection	Oak Ridge / Higdon
Agency/Co.	Wilbur Smith	Jurisdiction	
Date Performed	2/12/2007	Analysis Year	2007
Analysis Time Period	PM Peak		
Project Description	Existing Conditions		
East/West Street:	Oak Ridge Hwy (east)	North/South Street:	Higdon Dr
Intersection Orientation:	East-West	Study Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	886	0	7	310	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	1006	0	7	352	0
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type			Undivided			
RT Channelized?			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	10	0	0	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	0	11	0	0	0
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
Volume, v (vph)		7		11				
Capacity, c_m (vph)		697		295				
v/c ratio		0.01		0.04				
Queue length (95%)		0.03		0.12				
Control Delay (s/veh)		10.2		17.7				
LOS		B		C				
Approach delay (s/veh)	--	--		17.7				
Approach LOS	--	--		C				

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	JMC
Agency/Co.	Wilbur Smith
Date Performed	2/12/2007
Analysis Time Period	AM Peak

Site Information

Intersection	Oak Ridge / Higdon
Jurisdiction	
Analysis Year	2007

Project Description   Existing Conditions

East/West Street: Oak Ridge Hwy (west)	North/South Street: Higdon Dr
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	334	3	0	652	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	379	3	0	740	0
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type			Undivided			
RT Channelized?			0			0
Lanes	0	1	0	0	1	0
Configuration		TR		LT		
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	6	0	0	0	0	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	6	0	0	0	0	0
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
Volume, v (vph)		0		6				
Capacity, c_m (vph)		1188		231				
v/c ratio		0.00		0.03				
Queue length (95%)		0.00		0.08				
Control Delay (s/veh)		8.0		21.0				
LOS		A		C				
Approach delay (s/veh)	--	--		21.0				
Approach LOS	--	--		C				

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	JMC
Agency/Co.	Wilbur Smith
Date Performed	2/12/2007
Analysis Time Period	PM Peak

Site Information

Intersection	Oak Ridge / Higdon
Jurisdiction	
Analysis Year	2007

Project Description   Existing Conditions

East/West Street: Oak Ridge Hwy (west)   North/South Street: Higdon Dr

Intersection Orientation: East-West   Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	900	6	5	315	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	1022	6	5	357	0
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type			Undivided			
RT Channelized?			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	1	0	1	0	0	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	1	0	1	0	0	0
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
Volume, v (vph)		.5		2				
Capacity, c_m (vph)		683		203				
v/c ratio		0.01		0.01				
Queue length (95%)		0.02		0.03				
Control Delay (s/veh)		10.3		22.9				
LOS		B		C				
Approach delay (s/veh)	--	--		22.9				
Approach LOS	--	--		C				

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2009 BACKGROUND

TRAFFIC CONDITIONS

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	JMC
Agency/Co.	Wilbur Smith
Date Performed	2/12/2007
Analysis Time Period	AM Peak

Site Information

Intersection	Oak Ridge / Higdon
Jurisdiction	
Analysis Year	2009

Project Description   Background Conditions

East/West Street: Oak Ridge Hwy (east)

North/South Street: Higdon Dr

Intersection Orientation: East-West

Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	371	0	8	700	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	421	0	9	795	0
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type			Undivided			
RT Channelized?			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	12	0	0	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	0	13	0	0	0
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
Volume, v (vph)		9		13				
Capacity, c_m (vph)		1149		637				
v/c ratio		0.01		0.02				
Queue length (95%)		0.02		0.06				
Control Delay (s/veh)		8.2		10.8				
LOS		A		B				
Approach delay (s/veh)	--	--		10.8				
Approach LOS	--	--		B				

TWO-WAY STOP CONTROL SUMMARY

General Information

		Site Information	
Analyst	JMC	Intersection	Oak Ridge / Higdon
Agency/Co.	Wilbur Smith	Jurisdiction	
Date Performed	2/12/2007	Analysis Year	2009
Analysis Time Period	PM Peak		

Project Description Background Conditions

East/West Street: Oak Ridge Hwy (east)	North/South Street: Higdon Dr
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	931	0	8	326	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	1057	0	9	370	0
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	11	0	0	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	0	12	0	0	0
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
Volume, v (vph)		9		12				
Capacity, c_m (vph)		667		276				
v/c ratio		0.01		0.04				
Queue length (95%)		0.04		0.14				
Control Delay (s/veh)		10.5		18.6				
LOS		B		C				
Approach delay (s/veh)	--	--		18.6				
Approach LOS	--	--		C				

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	JMC
Agency/Co.	Wilbur Smith
Date Performed	2/12/2007
Analysis Time Period	AM Peak

Site Information

Intersection	Oak Ridge / Higdon
Jurisdiction	
Analysis Year	2009

Project Description *Background Conditions*

East/West Street: Oak Ridge Hwy (west)	North/South Street: Higdon Dr
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	351	4	0	685	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	398	4	0	778	0
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	7	0	0	0	0	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	7	0	0	0	0	0
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
Volume, v (vph)		0		7				
Capacity, c_m (vph)		1168		213				
v/c ratio		0.00		0.03				
Queue length (95%)		0.00		0.10				
Control Delay (s/veh)		8.1		22.5				
LOS		A		C				
Approach delay (s/veh)	--	--		22.5				
Approach LOS	--	--		C				

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TWO-WAY STOP CONTROL SUMMARY

General Information

		Site Information	
Analyst	JMC	Intersection	Oak Ridge / Higdon
Agency/Co.	Wilbur Smith	Jurisdiction	
Date Performed	2/12/2007	Analysis Year	2009
Analysis Time Period	PM Peak		

Project Description   Background Conditions

East/West Street: Oak Ridge Hwy (west)	North/South Street: Higdon Dr
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	945	7	6	331	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	1073	7	6	376	0
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	2	0	2	0	0	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	2	0	2	0	0	0
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
Volume, v (vph)		6		4				
Capacity, c_m (vph)		653		186				
v/c ratio		0.01		0.02				
Queue length (95%)		0.03		0.07				
Control Delay (s/veh)		10.6		24.8				
LOS		B		C				
Approach delay (s/veh)	--	--		24.8				
Approach LOS	--	--		C				

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2009 PROJECTED

TRAFFIC CONDITIONS

WITH PROPOSED DEVELOPMENT

TWO-WAY STOP CONTROL SUMMARY

General Information

		## Site Information	
Analyst	JMC	Intersection	Oak Ridge / Higdon
Agency/Co.	Wilbur Smith	Jurisdiction	
Date Performed	2/12/2007	Analysis Year	2009
Analysis Time Period	AM Peak		

Project Description *Buid-out Conditions*

East/West Street:	Oak Ridge Hwy (east)	North/South Street:	Higdon Dr
Intersection Orientation:	East-West	Study Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	371	0	17	700	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	421	0	19	795	0
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	29	0	0	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	0	32	0	0	0
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
Volume, v (vph)		19		32				
Capacity, c_m (vph)		1149		637				
v/c ratio		0.02		0.05				
Queue length (95%)		0.05		0.16				
Control Delay (s/veh)		8.2		11.0				
LOS		A		B				
Approach delay (s/veh)	--	--		11.0				
Approach LOS	--	--		B				

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	JMC
Agency/Co.	Wilbur Smith
Date Performed	2/12/2007
Analysis Time Period	PM Peak

Site Information

Intersection	Oak Ridge / Higdon
Jurisdiction	
Analysis Year	2009

Project Description   Build-out Conditions

East/West Street: Oak Ridge Hwy (east)	North/South Street: Higdon Dr
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	931	0	23	326	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	1057	0	26	370	0
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type			Undivided			
RT Channelized?			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	0	0	23	0	0	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	0	26	0	0	0
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
Volume, v (vph)		26		26				
Capacity, c_m (vph)		667		276				
v/c ratio		0.04		0.09				
Queue length (95%)		0.12		0.31				
Control Delay (s/veh)		10.6		19.4				
LOS		B		C				
Approach delay (s/veh)	--	--		19.4				
Approach LOS	--	--		C				

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	JMC
Agency/Co.	Wilbur Smith
Date Performed	2/12/2007
Analysis Time Period	AM Peak

Site Information

Intersection	Oak Ridge / Higdon
Jurisdiction	
Analysis Year	2009

Project Description *Build-out Conditions*

East/West Street: Oak Ridge Hwy (west)	North/South Street: Higdon Dr
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	351	13	0	685	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	398	14	0	778	0
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	39	0	0	0	0	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	44	0	0	0	0	0
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
Volume, v (vph)		0		44				
Capacity, c_m (vph)		1158		211				
v/c ratio		0.00		0.21				
Queue length (95%)		0.00		0.76				
Control Delay (s/veh)		8.1		26.5				
LOS		A		D				
Approach delay (s/veh)	--	--		26.5				
Approach LOS	--	--		D				

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	JMC
Agency/Co.	Wilbur Smith
Date Performed	2/12/2007
Analysis Time Period	PM Peak

Site Information

Intersection	Oak Ridge / Higdon
Jurisdiction	
Analysis Year	2009

Project Description Build-out Conditions

East/West Street: Oak Ridge Hwy (west)	North/South Street: Higdon Dr
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	945	41	6	331	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	1073	46	6	376	0
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	30	0	2	0	0	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	34	0	2	0	0	0
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
Volume, v (vph)		6		36				
Capacity, c_m (vph)		632		142				
v/c ratio		0.01		0.25				
Queue length (95%)		0.03		0.95				
Control Delay (s/veh)		10.8		38.8				
LOS		B		E				
Approach delay (s/veh)	--	--		38.8				
Approach LOS	--	--		E				

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	JMC
Agency/Co.	Wilbur Smith
Date Performed	2/13/2007
Analysis Time Period	AM Peak

Site Information

Intersection	Higdon / Site
Jurisdiction	
Analysis Year	2009

Project Description _Build-out Conditions_

East/West Street: Higdon Dr

North/South Street: Site Driveway

Intersection Orientation: East-West

Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	12	9	5	8	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	13	10	5	9	0
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	32	0	17	0	0	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	36	0	19	0	0	0
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
Volume, v (vph)		5		55				
Capacity, c_m (vph)		1605		1007				
v/c ratio		0.00		0.05				
Queue length (95%)		0.01		0.17				
Control Delay (s/veh)		7.3		8.8				
LOS		A		A				
Approach delay (s/veh)	--	--		8.8				
Approach LOS	--	--		A				

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	JMC
Agency/Co.	Wilbur Smith
Date Performed	2/13/2007
Analysis Time Period	PM Peak

Site Information

Intersection	Higdon / Site
Jurisdiction	
Analysis Year	2009

Project Description Build-out Conditions

East/West Street: Higdon Dr	North/South Street: Site Driveway
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	0	11	34	15	8	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	0	12	38	17	9	0
Proportion of heavy vehicles, P_{HV}	0	--	--	0	--	--
Median type	Undivided					
RT Channelized?			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	28	0	12	0	0	0
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate (veh/h)	31	0	13	0	0	0
Proportion of heavy vehicles, P_{HV}	0	0	0	0	0	0
Percent grade (%)		0			0	
Flared approach		N			N	
Storage		0			0	
RT Channelized?			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Control Delay, Queue Length, Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
Volume, v (vph)		17		44				
Capacity, c_m (vph)		1570		958				
v/c ratio		0.01		0.05				
Queue length (95%)		0.03		0.14				
Control Delay (s/veh)		7.3		8.9				
LOS		A		A				
Approach delay (s/veh)	--	--		8.9				
Approach LOS	--	--		A				

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SIGNAL WARRANTS

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume										
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1................	1................	500	400	350	280	150	120	105	84
2 or more ...	1................	600	480	420	336	150	120	105	84
2 or more ...	2 or more ...	600	480	420	336	200	160	140	112
1................	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic										
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1................	1................	750	600	525	420	75	60	53	42
2 or more ...	1................	900	720	630	504	75	60	53	42
2 or more ...	2 or more ...	900	720	630	504	100	80	70	56
1................	2 or more	750	600	525	420	100	80	70	56

[a] Basic minimum hourly volume.
[b] Used for combination of Conditions A and B after adequate trial of other remedial measures.
[c] May be used when the major-street speed exceeds 70 km/h or exceeds 40 mph or in an isolated community with a population of less than 10,000.
[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 70 km/h or exceeds 40 mph or in an isolated community with a population of less than 10,000.
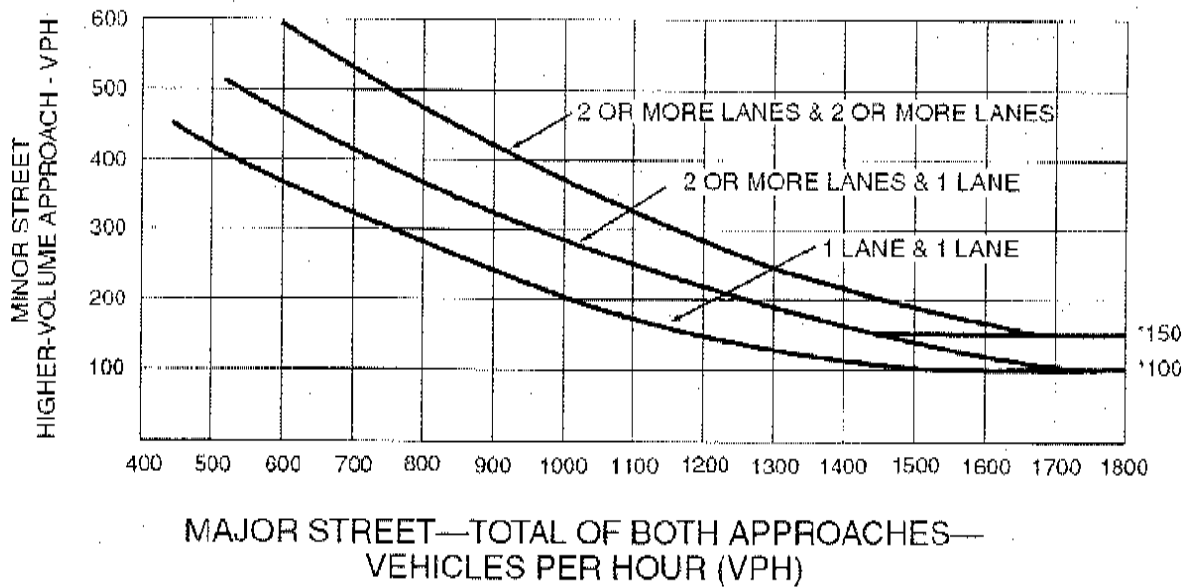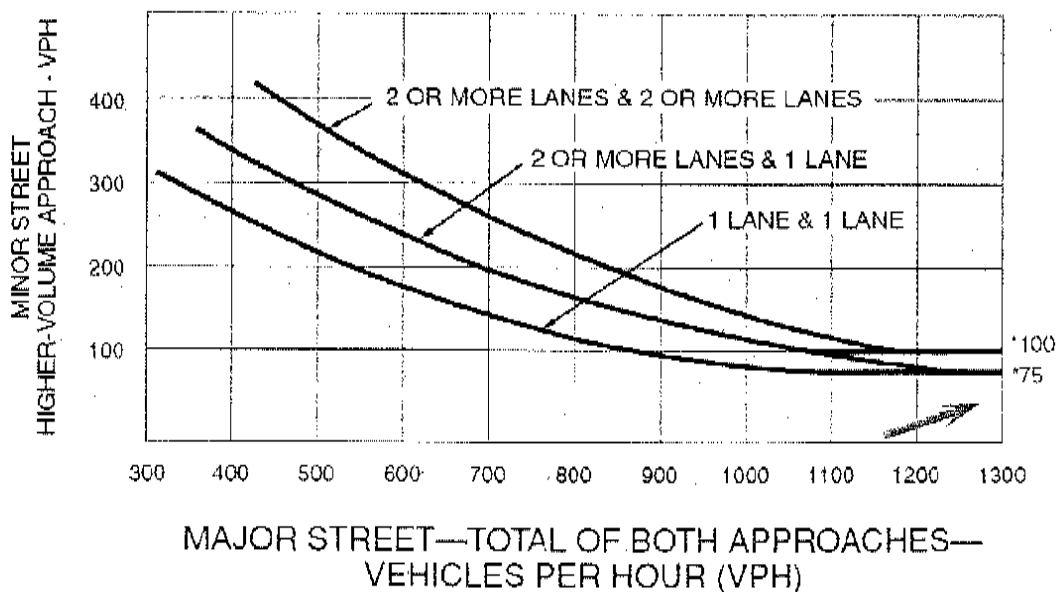
Figure 4C-3. Warrant 3, Peak Hour

MAJOR STREET—TOTAL OF BOTH APPROACHES— VEHICLES PER HOUR (VPH)

*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h OR ABOVE 40 mph ON MAJOR STREET)

MAJOR STREET—TOTAL OF BOTH APPROACHES— VEHICLES PER HOUR (VPH)

*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

TURN-LANE WARRANTS

TABLE 7A

LEFT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 56 MPH OR OVER

(If the left-turn volume exceeds the table value a left-turn lane is needed)

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149	150	75	60	45	35	30
150 - 199	110	65	55	40	35	30
200 - 249	85	60	50	35	30	30
250 - 299	70	55	45	35	30	30
300 - 349	60	50	40	30	25	25
350 - 399	55	45	35	30	325	25
400 - 449	50	40	30	25	20	20
450 - 499	45	35	30	25	20	20
500 - 549	40	30	25	20	20	20
550 - 599	40	25	20	20	20	20
600 - 649	35	20	20	20	20	15
650 - 699	35	20	20	20	15	15
700 - 749	30	20	20	15	15	15
750 or More	30	20	15	15	(15)	15

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	=/ > 600
100 - 149	30	25	25	20	20	20
150 - 199	30	25	25	20	20	20
200 - 249	30	25	25	20	20	15
250 - 299	30	25	25	20	20	15
300 - 349	25	25	20	20	15	15
350 - 399	25	25	20	20	15	(15)
400 - 449	20	20	20	15	15	15
450 - 499	20	20	20	15	15	15
500 - 549	20	20	15	15	15	15
550 - 599	20	15	15	15	15	15
600 - 649	15	15	15	15	15	15
650 - 699	15	15	15	15	15	15
700 - 749	15	15	15	15	15	15
750 or More	15	15	15	15	15	15

* Or through volume only if a right-turn lane exists.

TABLE 7B

RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 56 MPH OR OVER

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	< 100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25						
25 - 49						
50 - 99						
100 - 149						Yes
150 - 199					Yes	Yes
200 - 249				Yes	Yes	Yes
250 - 299			Yes	Yes	Yes	Yes
300 - 349		Yes	Yes	Yes	Yes	Yes
350 - 399	Yes	Yes	Yes	Yes	Yes	Yes
400 - 449	Yes	Yes	Yes	Yes	Yes	Yes
450 - 499	Yes	Yes	Yes	Yes	Yes	Yes
500 - 549	Yes	Yes	Yes	Yes	Yes	Yes
550 - 599	Yes	Yes	Yes	Yes	Yes	Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25	(circled)					
25 - 49			Yes	Yes	Yes	(circled) Yes
50 - 99		Yes	Yes	Yes	Yes	Yes
100 - 149	Yes	Yes	Yes	Yes	Yes	Yes
150 - 199	Yes	Yes	Yes	Yes	Yes	Yes
200 - 249	Yes	Yes	Yes	Yes	Yes	Yes
250 - 299	Yes	Yes	Yes	Yes	Yes	Yes
300 - 349	Yes	Yes	Yes	Yes	Yes	Yes
350 - 399	Yes	Yes	Yes	Yes	Yes	Yes
400 - 449	Yes	Yes	Yes	Yes	Yes	Yes
450 - 499	Yes	Yes	Yes	Yes	Yes	Yes
500 - 549	Yes	Yes	Yes	Yes	Yes	Yes
550 - 599	Yes	Yes	Yes	Yes	Yes	Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

* Or through volume only if a left-turn lane exists.