

Site Traffic Analysis

for the

Stonebridge Development

Lake Bluff, Illinois

Prepared for:



Prepared by:



July 17, 2014

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Executive Summary

Kenig, Lindgren, O’Hara, Aboona, Inc.¹ (“KLOA, Inc.”) was retained in an effort to determine the potential traffic impact of The Roanoke Group’s (“TRG”) proposed 98-unit residential community (“Stonebridge”), consisting of 96 detached single family homes and two duplex units at 136 N. Green Bay Road in Lake Bluff, Illinois (“Site”). The site is currently entitled for 85 residential units and TRG is proposing to amend the existing Planned Residential Development (PRD).

The purpose of this study is to assess existing transportation conditions, determine the traffic impact of the proposed development plan, and identify any associated roadway improvements that may be necessary to mitigate these impacts to provide for safe and efficient site access.

The analysis is based on the likely number of trips and impact that would be generated upon completion of the proposed development. Traffic generation estimates were based on the trip generation² rates contained in the *Trip Generation Manual*, 9th Edition, published by the Institute of Transportation Engineers (“ITE”). To validate the ITE trip generation rates, KLOA, Inc. conducted a traffic count at another Lake Bluff subdivision called Tangley Oaks. The trip generation rates from the Tangley Oaks traffic count were consistent with the ITE rates.

The most conservative approach was considered in this study with all home-buyers assumed to be conventional families with conventional work-patterns.

¹ KLOA, Inc. is a traffic and transportation planning and engineering firm founded in 1995 whose staff of engineers and planners has more than 125 years of professional experience. KLOA, Inc.’s clients include communities, municipalities, developers, engineers, and planners throughout the Chicagoland region.

² Trip generation is an estimate of the number of vehicle trips entering and exiting a site at any given time. ITE rates account for type of development, square footage, number of dwelling units, and other factors that impact the generation of traffic.

The analysis of traffic patterns of the surrounding area (considering Stonebridge) has shown the following:

1. **Lower Traffic Volume:** The latest IDOT traffic volume count for Green Bay Road (2011) shows that the average daily (24-hour) traffic volume of 7,150 vehicles per day is 44 percent lower than IDOT's peak traffic count of 12,700 vehicles per day in 2005.
2. **Minimal Impact on Green Bay Road Traffic:** The traffic generated by Stonebridge during the weekday peak commuting hours is moderate (i.e., 1-2 cars per minute, on average) and would constitute only 5-8 percent of the total projected peak hour traffic volume on Green Bay Road. This impact to Green Bay Road represents only a 1-2 percent increase from the approved 85-unit plan that the site is currently entitled for, using the same ITE trip generation rates.
3. **Sufficient Service Levels:** Upon completion of Stonebridge, the stop-controlled movements at the impacted intersections will continue to operate at the same "B-service levels³" during the weekday peak hours as they operate at today. The addition of Stonebridge creates minimal increases in average vehicle delays (i.e., less than one second) at these intersections.
4. **Adequate Traffic Gaps:** The traffic gap study indicates that there are a sufficient number of gaps in the flow of traffic on Green Bay Road to adequately accommodate the projected left-turning volumes from the Stonebridge driveway and W. Witchwood Lane during the weekday morning and afternoon peak hours.

³ B-Service Level means an average vehicle delay of 10-15 seconds for traffic movements under stop sign control.

1.

Introduction

This report presents the results of a Site Traffic Analysis conducted by Kenig, Lindgren, O'Hara, Aboona, Inc. (KLOA, Inc.) for the proposed Stonebridge residential development plan in Lake Bluff, Illinois. The Stonebridge development is located at 136 Green Bay Road on the former site of the Harrison Conference Center. The proposed development plan has been revised and includes 10 fewer dwelling units than the plan previously submitted to the Village in October 2012. The new development plan consists of 98 dwelling units, including 96 single-family homes and two duplex units. Two of the single-family homes and the duplex units are already built as model homes but are unoccupied. This Site Traffic Analysis reflects the reduction in density.

The Stonebridge development was originally entitled as an age-restricted Planned Residential Development (PRD). The age-restriction has since been removed and the Stonebridge community, as currently proposed, will cater to all demographics. As such, KLOA, Inc. has taken the most conservative approach in the traffic analysis by evaluating the impact of the project developed entirely with conventional single-family homes and duplexes (i.e., not age-restricted).

The purpose of this study is to assess existing transportation conditions, determine the traffic impact of the proposed development plan, and identify any associated roadway improvements that may be necessary to mitigate these impacts to provide for safe and efficient site access.

2.

Existing Conditions

Transportation conditions in the site area were inventoried to obtain a database for projecting future conditions. Four general components of existing conditions were considered: (1) the geographical location of the site, (2) the characteristics of the roadways and traffic control devices in the site area, (3) traffic volumes on these roadways, and (4) traffic crash history.

Site Location

The Stonebridge development is located at 136 Green Bay Road on the west side of the road. Figure 1 shows the location of the development in relation to the regional roadway system. Figure 2 shows an aerial view of the site area. The site presently contains four model homes. Land uses in the area are primarily residential to the north, east and south. The Oriole Grove Forest Preserve is located to the west of the site and the Union Pacific Railroad runs along a portion of the site's south property line.

Existing Roadway Characteristics

The principal roadways in the vicinity of the site are Green Bay Road, W. Witchwood Lane, and W. Hawthorne Court. A description of these roadways follows.

Green Bay Road is a north-south two-lane undivided arterial roadway that traverses Lake County. Within the Village limits, Green Bay Road is under the jurisdiction of the Village of Lake Bluff. Green Bay Road carries approximately 7,150 vehicles per day (vpd) in the vicinity of the site. The nearest signalized intersections on Green Bay Road are located ½-mile to the north at IL 176 and 1.6-miles to the south at Deerpath Road. There are dedicated left-turn lanes on Green Bay Road at IL 176 and at Deerpath Road, but no turn lanes on Green Bay Road between these arterial roadways. There is a sidewalk along the west side of Green Bay Road. The posted speed limit on Green Bay Road is 30 mph and parking is not permitted on the roadway.

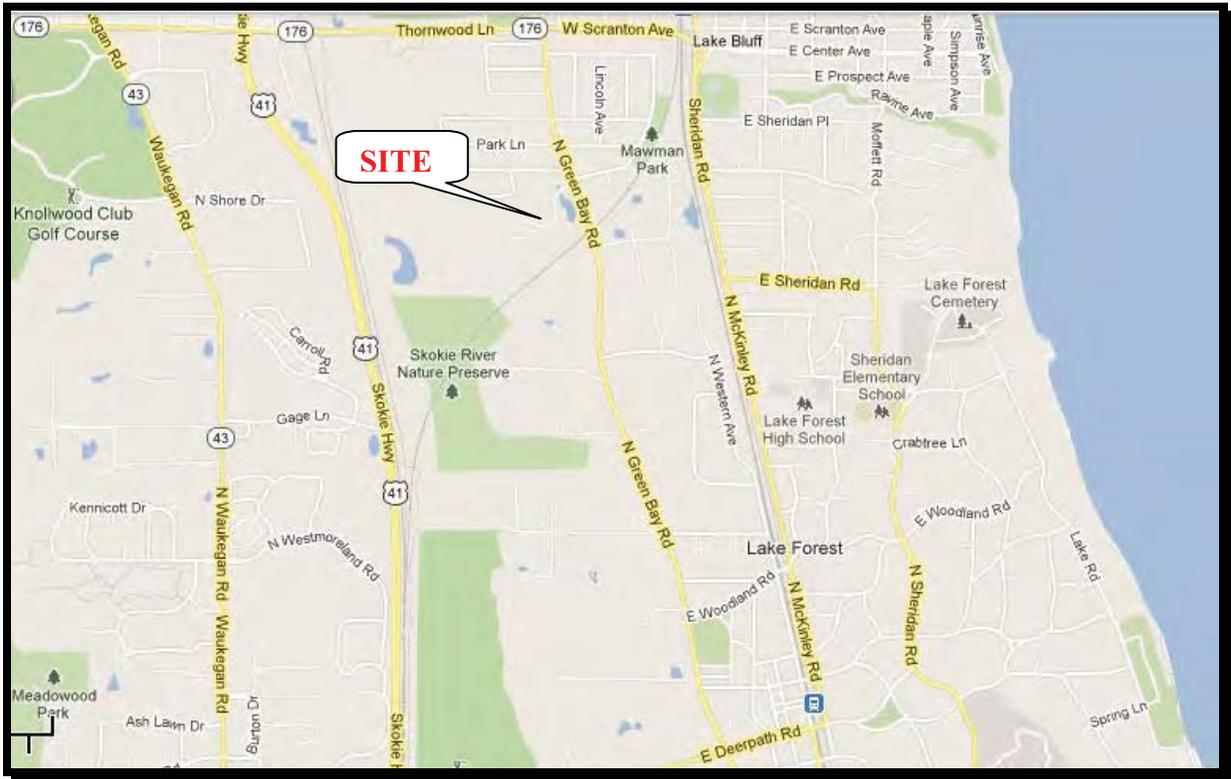


Figure 1
Regional Roadway System

W. Witchwood Lane is an east-west two-lane local roadway that is located opposite the site access driveway to the Stonebridge property. W. Witchwood Lane is under the jurisdiction of the Village of Lake Bluff and its intersection with Green Bay Road is under stop sign control on W. Witchwood Lane and the Stonebridge driveway. The posted speed limit on W. Witchwood Lane is 25 mph and parking is permitted on both sides of the roadway. There is a sidewalk along the north side of W. Witchwood Lane.

W. Hawthorne Court is an east-west two-lane local roadway that intersects Green Bay Road from the west approximately 140 feet north of W. Witchwood Lane. W. Hawthorne Court is also under the jurisdiction of the Village of Lake Bluff and is also under stop sign control at Green Bay Road. The posted speed limit on W. Hawthorne Court is 25 mph and parking is permitted on both sides of the roadway. There are sidewalks along both side of W. Hawthorne Court.

The existing roadway characteristics, including lane configurations and traffic controls at the key intersections in the study area, are shown in Figure 3.

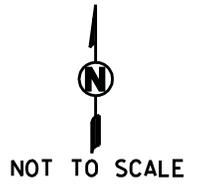


Figure 2
Aerial View of Study Area

Existing Traffic Volumes

Traffic counts were conducted at the intersections of Green Bay Road with W. Witchwood Lane and W. Hawthorne Court on Thursday, April 25, 2013. All schools in Lake Bluff School District 65 and Lake Forest Community High School District 115 were in session on this day.

The traffic counts were conducted during the weekday morning (7:00-9:00 A.M.) and afternoon (4:30-6:30 P.M.) commuter rush hours. The traffic count data indicates that the weekday morning peak hour occurs from 7:30-8:30 A.M. and the weekday afternoon peak hour occurs from 4:30-5:30 P.M. The existing weekday peak-hour traffic volumes are shown in Figure 4. The traffic count summaries are contained in the Appendix of this report.



W. HAWTHORNE
CT

(25)

(25) W. WITCHWOOD
LN

SITE

UNION PACIFIC RAILROAD

(30)

GREEN BAY RD

LEGEND

- - ONE TRAVEL LANE
- - STOP SIGN
- - - - GATE
- (30) - POSTED SPEED LIMIT (MPH)

PROJECT:

STONEBRIDGE DEVELOPMENT
LAKE BLUFF, ILLINOIS

TITLE:

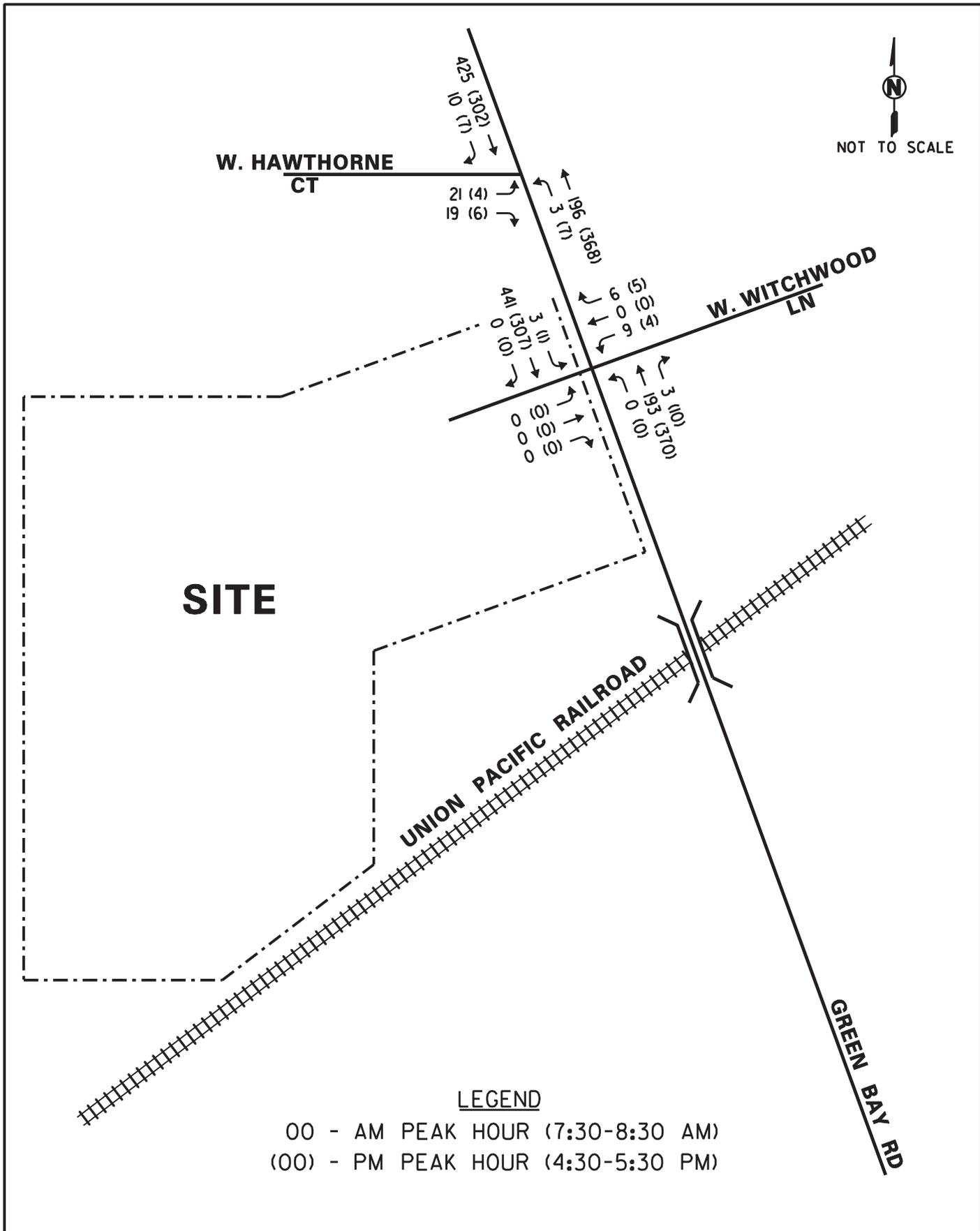
EXISTING ROADWAY CHARACTERISTICS

PROJECT NO:

12-026



FIGURE NO: Page 10



PROJECT: STONEBRIDGE DEVELOPMENT LAKE BLUFF, ILLINOIS	TITLE: EXISTING WEEKDAY TRAFFIC VOLUMES	PROJECT NO: 12-026  FIGURE NO: 4
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Historic traffic volume data for Green Bay Road south of IL 176 was obtained from the Illinois Department of Transportation (IDOT). The data, which is shown in Table 1, indicates that the traffic volumes on Green Bay Road have been gradually declining since the Stonebridge development was originally approved in 2006.

Traffic projections on Green Bay Road for the year 2040 were requested from the Chicago Metropolitan Agency for Planning (CMAP) and indicated an average daily traffic volume of 13,000 vehicles per day. These volumes were developed by CMAP using the historic traffic volumes from Table 1 and the results from the October 2012 CMAP Travel Demand Analysis, which uses 2040 socioeconomic projections and assumes the implementation of the GO TO 2040 Comprehensive Regional Plan for the Northeastern Illinois area. The CMAP 2040 traffic projection letter is contained in the Appendix.

Table 1
HISTORICAL TRAFFIC VOLUME DATA – GREEN BAY ROAD

Year	Average Daily Traffic Volume ¹	Net Change to 2011
2011	7,150 vehicles/day	--
2007	9,300 vehicles/day	-23%
2005	12,700 vehicles/day	-56%
2003	11,400 vehicle/day	-37%

¹ Traffic Volume Data provided by the Illinois Department of Transportation

Traffic Crash History

Five years of collision data (2007-2011) was collected from the Village of Lake Bluff Police Department for the intersections of Green Bay Road with W. Witchwood Lane and W. Hawthorne Court. The data shows that five crashes occurred at this location during this time period for an average of one crash per year. Three of the collisions were with parked cars on either Green Bay Road, W. Hawthorne Court or the Stonebridge driveway. One of the collisions was with a deer on Green Bay Road. The remaining collision was with a fixed object on the side of the road caused by a driver that failed to yield to traffic stopped on Green Bay Road and swerved to avoid a rear-end collision. None of these crashes resulted in personal injury.

3.

Development Traffic Characteristics

In order to evaluate future traffic conditions at the Stonebridge development access driveway on Green Bay Road, it was necessary to understand the site access system, determine the directions from which traffic would approach and depart the site, and estimate the number of peak-hour vehicle trips that would be generated by the project.

Site Accessibility

Vehicular access to the Stonebridge development will be provided from the existing driveway on Green Bay Road located opposite W. Witchwood Lane. The driveway is currently closed with fencing. An emergency access road is presently located on W. Witchwood Lane. This access road is presently gated and will remain gated, only to be opened in the case of an emergency.

Directional Distribution

The directional distribution of site-generated traffic was determined from an analysis of existing traffic movements in the area, as derived from the traffic counts. The estimated directional distribution of Stonebridge development traffic is shown in Table 2.

Table 2
ESTIMATED DIRECTIONAL DISTRIBUTION

Route	Percentage
To and from the north on Green Bay Road	55%
To and from the south on Green Bay Road	45%
Total	100%

Site Traffic Generation

The volume of traffic generated by a development is based on the type of land use and the size of the development. The project was evaluated as if it was developed entirely with conventional single-family homes and duplexes (i.e., not age-restricted) to present the most conservative traffic analysis. As such, the traffic generation estimates for the proposed Stonebridge development were based on trip generation rates contained in the *Trip Generation Manual*, 9th Edition, 2012 published by the Institute of Transportation Engineers (ITE) for conventional single-family detached homes and townhomes.

The ITE trip generation rates were compared with more localized trip rates that were calculated from a recent traffic count conducted by KLOA, Inc. at the entrance to the Tangley Oaks subdivision on Green Bay Road, which is a comparable single-family residential neighborhood in Lake Bluff to that proposed on the Stonebridge property. The trip generation rates from the Tangley Oaks traffic count were similar to the ITE rates, and when applied to the Stonebridge development resulted in slightly more vehicle trips in the morning peak hour (6 more trips) and fewer vehicle trips in the afternoon peak hour (22 fewer trips).

Table 3 shows the estimated weekday peak hour traffic generation from the development to be moderate with 79-103 vehicle trips generated during the morning and afternoon peak hours, respectively. These volumes translate to a peak hour generation of approximately 1-2 cars per minute either entering or exiting the site. In the context of total peak hour traffic on Green Bay Road adjoining the site, the traffic generated by the proposed Stonebridge development would constitute approximately 5-8 percent of the total projected peak hour traffic volume on Green Bay Road.

Table 3
ESTIMATED STONEBRIDGE-GENERATED TRAFFIC VOLUMES¹

Land Use	Size	A.M. Peak Hour			P.M. Peak Hour		
		In	Out	Total	In	Out	Total
Single-Family Detached Homes	96 dus	19	58	77	64	37	101
Duplexes	2 dus	-	2	2	1	1	2
Total	98 dus	19	60	79	65	38	103

¹ Based on trip generation equations contained in ITE's *Trip Generation* publication, 9th Edition, 2012, for Land Use Code 210 (Single-Family Detached Housing) and 230 (Residential Condominium/Townhouse).

Traffic Generation Comparison

Table 4 shows a comparison of the projected weekday peak hour traffic generation from the revised 98-unit development plan and the previously approved 85-unit plan under the conservative assumption that all units are marketed to conventional families using the same ITE trip generation rates. As shown, the revised plan is projected to generate approximately 13 more vehicle trips during the weekday morning peak hour and approximately 24 more vehicle trips during the weekday afternoon peak hour, which reflects approximately one extra car every 3-4 minutes.

In the context of total peak hour traffic on Green Bay Road adjoining the site, the traffic generated by the approved 85-unit plan would constitute approximately 4-6 percent of the total volume on Green Bay Road while the traffic generated by the revised 98-unit plan would constitute approximately 5-8 percent of the total volume. As such, the traffic impact to Green Bay Road from the revised 98-unit plan reflects only a 1-2 percent increase over the approved 85-unit plan.

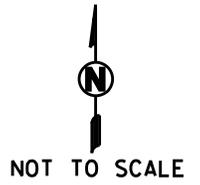
Table 4
TRAFFIC GENERATION COMPARISON¹
Approved vs. Revised Stonebridge Development Plans

Land Use	Density	A.M. Peak Hour			P.M. Peak Hour		
		In	Out	Total	In	Out	Total
Approved Development Plan	85 units ²	15	51	66	51	28	79
Revised Development Plan	98 units	<u>19</u>	<u>60</u>	<u>79</u>	<u>65</u>	<u>38</u>	<u>103</u>
	Difference	+4	+9	+13	+14	+10	+24

¹ Based on trip generation equations contained in ITE's *Trip Generation* publication, 9th Edition, 2012, for Land Use Code 210 (Single-Family Detached Housing) and 230 (Residential Condominium/Townhouse).
² Includes 43 single-family detached units and 42 duplex/condominium units.

Site Traffic Assignment

The peak-hour traffic volumes estimated to be generated by the proposed Stonebridge development plan were assigned to the area roadway system based on directional distribution shown in Table 2. The site-generated traffic assignment is shown in Figure 5.



W. HAWTHORNE
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W. WITCHWOOD
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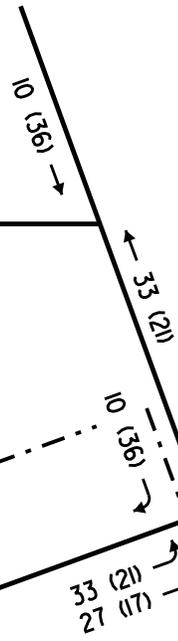
SITE

UNION PACIFIC RAILROAD

GREEN BAY RD

LEGEND

- 00 - AM PEAK HOUR (7:30-8:30 AM)
- (00) - PM PEAK HOUR (4:30-5:30 PM)

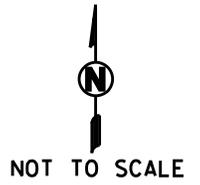


<p>PROJECT: STONEBRIDGE DEVELOPMENT LAKE BLUFF, ILLINOIS</p>	<p>TITLE: SITE GENERATED TRAFFIC VOLUMES</p>	<p>PROJECT NO: 12-026</p> <p>KLOA</p> <p>FIGURE NO: Page 16 5</p>
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4.

Total Projected Traffic Conditions

The total projected traffic volumes were calculated by combining the site-generated traffic volumes for the proposed Stonebridge development (Figure 5) with the existing traffic volumes (Figure 4). The resulting total projected peak hour traffic volumes are shown in Figure 6.



W. HAWTHORNE
CT

435 (338)
10 (11)
229 (389)
3 (11)

21 (4)
19 (6)

W. WITCHWOOD
LN

441 (301)
10 (36)
3 (10)
3 (10)
33 (21)
0 (0)
27 (17)
6 (5)
0 (0)
9 (4)
3 (10)
193 (10)
9 (29)
10 (10)

SITE

UNION PACIFIC RAILROAD

GREEN BAY RD

LEGEND

00 - AM PEAK HOUR (7:30-8:30 AM)
(00) - PM PEAK HOUR (4:30-5:30 PM)

PROJECT:

STONEBRIDGE DEVELOPMENT
LAKE BLUFF, ILLINOIS

TITLE:

TOTAL PROJECTED
TRAFFIC VOLUMES

PROJECT NO:

12-026



FIGURE NO: Page 18

5.

Traffic Analysis

Intersection Capacity Analysis

Capacity analyses were performed for the study area intersections to determine the operation of the existing roadway system, evaluate the impact of the Stonebridge development plan, and determine the ability of the roadway system to accommodate future traffic demands. Analyses were performed for the following weekday morning and afternoon peak-hour traffic conditions:

1. Existing traffic conditions
2. Total projected traffic conditions

The analysis of the study area intersections was accomplished using HCS+ computer software, which is based on the methodologies outlined in the Transportation Research Board's *Highway Capacity Manual*, 2010, which utilize traffic controls, traffic volumes and road characteristics to determine the average control delay and levels of service for vehicles at an intersection.

The ability of an intersection to accommodate traffic flow is expressed in terms of level of service, which is a qualitative term developed to express the operating conditions along roadways and at intersections. Alpha designations from A to F are assigned based on the average control delay experienced by vehicles passing through the intersection. Control delay is that portion of the total delay attributed to the traffic signal or stop sign control operation, and includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay until resumption of free flow speed. Level of Service A is the highest grade (best traffic flow, least delays), Level of Service E represents saturated or at-capacity conditions, and Level of Service F is the lowest grade (oversaturated conditions, extensive delays). For suburban two-way arterials such as Green Bay Road, IDOT geometric criteria (Figure 48-6A from BDE manual) identifies the limit of acceptable delay as level of service C.

For two-way stop controlled (TWSC) intersections such as those analyzed in this study, levels of service are only calculated for the approaches controlled by a stop sign (not for the intersection as a whole). Level of Service F at TWSC intersections occurs when there are not enough suitable gaps in the flow of traffic on the major (uncontrolled) street to allow minor-street traffic to safely enter or cross the major street flow.

The *Highway Capacity Manual* criteria for levels of service and the corresponding control delay for unsignalized intersections are shown in Table 5. Table 6 summarizes the results of the traffic analyses for the existing and total projected weekday peak hour conditions. The capacity analysis worksheets are contained in the Appendix of this report.

Table 5
LEVEL OF SERVICE CRITERIA – UNSIGNALIZED INTERSECTIONS

Level of Service	Average Control Delay (seconds per vehicle)
A	0 – 10
B	> 10 - 15
C	> 15 – 25
D	> 25 – 35
E	> 35 – 50
F	> 50

Source: *Highway Capacity Manual*, 2010.

Table 6
LEVEL OF SERVICE SUMMARY

Intersection	A.M. Peak Hour		P.M. Peak Hour	
	LOS	Delay	LOS	Delay
<u>Existing Conditions</u>				
Green Bay Rd/W. Witchwood Ln/ Stonebridge Access Dr	B ¹	12.9 ¹	B ¹	12.9 ¹
Green Bay Rd/W. Hawthorne Ct	B ²	12.9 ²	B ²	11.8 ²
<u>Future Conditions</u>				
Green Bay Rd/W. Witchwood Ln/ Stonebridge Access Dr	B ¹	13.5 ¹	B ¹	13.8 ¹
	B ³	14.8 ³	C ³	15.1 ³
Green Bay Rd/W. Hawthorne Ct	B ²	13.2 ²	B ²	12.3 ²

LOS - Level of Service Delay - Measured in seconds.

¹ Represents operation of W. Witchwood Lane approach

² Represents operation of W. Hawthorne Court approach

³ Represents operation of Stonebridge Driveway approach

As noted in Table 6, the stop controlled movements at the intersections of Green Bay Road with W. Witchwood Lane and W. Hawthorne Court presently operate at level of service B during the peak weekday commuting hours. Observations of traffic conditions during these peak hours indicated that traffic movements through the intersection operated reasonably well with short delays. On occasion, motorists attempting to turn left from Green Bay Road onto W. Hawthorne Court had wait times of 30-45 seconds for an adequate gap in the flow of traffic to complete the turn. In addition, on occasion, traffic turning left from W. Hawthorne Court experienced delays of 30-45 seconds waiting for an adequate gap in traffic flow on Green Bay Road. There was no significant vehicle queuing (more than two vehicles) observed on Green Bay Road created by through traffic delayed behind left-turning vehicles. Further, there were no significant delays observed by traffic turning to and from W. Witchwood Lane.

The capacity analysis results also indicate that the stop controlled movements at these intersections will continue to operate at satisfactory levels of service upon completion of the revised Stonebridge development with minimal increases in average vehicle delays.

Traffic Gap Study

To evaluate the level of difficulty that vehicles may have turning left from the Stonebridge Driveway or W. Witchwood Lane onto Green Bay Road, the two-way gaps in the flow of traffic on Green Bay Road were recorded on the same day as the traffic count (September 27, 2012) and during the same four-hour period. Two-way gaps reflect the condition when no traffic passes by the Stonebridge Driveway or W. Witchwood Lane in either the northbound or southbound direction on Green Bay Road (or turns onto the two roadways). These gaps are used by traffic that will turn left from the Stonebridge driveway and W. Witchwood Lane onto Green Bay Road. Each two-way gap longer than 7.5 seconds was timed and recorded for this study.

The traffic gap data collected was evaluated based on the Critical Gap and Follow-Up Time methodologies contained in Chapter 19 of the Federal Highway Administration's *Highway Capacity Manual (HCM) 2010*. The critical gap is defined as "the minimum time interval in the major-street traffic stream that allows intersection entry for one minor-street vehicle." The time between the departure of one vehicle from the minor street and the departure of the next vehicle using the same major-street gap is called the follow-up time.

The traffic gap study results are shown in Table 7 and Table 8 for the weekday morning and afternoon, respectively. Table 7 shows that there were 134 two-way gaps in the flow of traffic on Green Bay Road during the morning peak hour (7:30-8:30 A.M.) that were of sufficient length to theoretically allow up to 346 vehicles to turn left from the Stonebridge driveway or W. Witchwood Lane onto Green Bay Road. Since the projected morning peak hour volume of left-turning traffic on the Stonebridge driveway and W. Witchwood Lane is 33 vehicles and 9 vehicles, respectively, there are more than a sufficient number of traffic gaps on Green Bay Road to accommodate the projected left-turning traffic during this time period.

Similarly, Table 8 shows that there were 146 two-way gaps in the flow of traffic on Green Bay Road during the afternoon peak hour (4:30-5:30 P.M.) that were of sufficient length to theoretically allow up to 344 vehicles to turn left from the Stonebridge driveway or W. Witchwood Lane onto Green Bay Road. Since the projected afternoon peak hour volume of left-turning traffic on the Stonebridge driveway and W. Witchwood Lane is 21 vehicles and 4 vehicles, respectively, there again are more than a sufficient number of traffic gaps on Green Bay Road to accommodate the projected left-turning traffic during this time period.

Table 7

GREEN BAY ROAD GAP STUDY RESULTS - Weekday A.M. Peak Hour (7:30-8:30 A.M.)

Gap Length (seconds)	Number of Vehicles Able to Utilize Gap	Number of Combined Gaps	Number of Vehicles Able to Access Green Bay Road
7.1 - 10.6	1	52	52
10.7 - 14.2	2	34	68
14.3 - 17.8	3	14	42
17.9 - 21.4	4	10	40
21.5 - 25.0	5	10	50
25.1 - 28.6	6	4	24
> 28.7	7	<u>10</u>	<u>70</u>
TOTAL		134	346

Table 8

GREEN BAY ROAD GAP STUDY RESULTS - Weekday P.M. Peak Hour (4:30-5:30 P.M.)

Gap Length (seconds)	Number of Vehicles Able to Utilize Gap	Number of Combined Gaps	Number of Vehicles Able to Access Green Bay Road
7.1 - 10.6	1	58	58
10.7 - 14.2	2	41	82
14.3 - 17.8	3	16	48
17.9 - 21.4	4	13	52
21.5 - 25.0	5	8	40
25.1 - 28.6	6	6	36
> 28.7	7	<u>4</u>	<u>28</u>
TOTAL		146	344

6. Site Access Requirements

Green Bay Road is presently a two-lane undivided arterial roadway through the Village of Lake Bluff. While there are several subdivisions that are accessed from Green Bay Road between IL 176 and Deerpath Road, there are presently no dedicated left-turn lanes along this section of Green Bay Road between these arterial roadways.

Green Bay Road, south of IL 176, is under the jurisdiction of the Village of Lake Bluff and any geometric requirements will be guided by the Village. When the Stonebridge development was initially approved by the Village in November 2006, the development agreement required the developer to pay a proportionate share of the cost of construction to install a northbound left-turn lane on Green Bay Road at the Stonebridge Drive/W. Witchwood Lane intersection. The turn lane improvement, which was to be completed by the Village, was never initiated by the Village and no funds were exchanged.

Based on historic traffic data obtained from IDOT, it appears that the traffic volumes on Green Bay Road have declined since 2006. To assist the Village in determining if the previously required improvement to Green Bay Road is still appropriate based on the proposed Stonebridge development plan and the recently collected traffic data, KLOA reviewed the roadway design guidelines of the Lake County Division of Transportation and the Illinois Department of Transportation.

The Lake County Division of Transportation's Highway Access Regulation Ordinance indicates that a dedicated northbound left-turn lane is required on Green Bay Road at the Stonebridge Drive/W. Witchwood Lane intersection. The Ordinance utilizes a graph to determine intersection left-turn treatments on the major roadways based on the peak hour approach volumes (left-turn and through movements) and the volumes opposing the left-turn movement. When the total projected traffic volume data points are plotted on this graph, the results indicate that a dedicated left-turn lane is required for the PM peak hour but not the AM peak hour (see Figure 11.1 in Appendix).

IDOT's Bureau of Design & Environment (BDE) Manual indicates that a dedicated northbound left-turn lane is not required on Green Bay Road at the Stonebridge Drive/W. Witchwood Lane intersection. The BDE Manual also utilizes a graph to determine intersection left-turn treatments major roadways based on the peak hour approach volumes and the volumes opposing the left-turn movement. When the total projected traffic volume data points are plotted on this graph, the results indicate that a dedicated left-turn lane is not required for either peak hour (see Figure 36-3.G in Appendix).

The Stonebridge access driveway should be under stop sign control at Green Bay Road when it is opened to traffic.

7.

Conclusions

Based on the revised Stonebridge development plan and the preceding Site Traffic Analysis, the following conclusions and recommendations are made:

- The development plan includes 98 dwelling units, including 96 single-family homes and 2 duplex units. Two of the single-family homes and the duplex units are already built as model homes but are unoccupied. This reflects a density reduction of 10 dwelling units from the development plan previously submitted to the Village in October 2012.
- The Stonebridge development was originally entitled as an age-restricted Planned Residential Development (PRD). The age-restriction has since been removed and the Stonebridge community, as currently proposed, will cater to all demographics. As such, KLOA, Inc. has taken the most conservative approach in the traffic analysis by evaluating the impact of the project developed entirely with conventional single-family homes and duplexes (i.e., not age-restricted).
- The traffic generated by the proposed Stonebridge development during the peak hours is moderate (i.e., 1-2 cars per minute, on average) and would constitute approximately 5-8 percent of the total projected peak hour traffic volume on Green Bay Road. This impact to Green Bay Road represents only a 1-2 percent increase from the approved 85-unit plan that the site is currently entitled for, using the same ITE trip generation rates.
- The capacity analysis results indicate the stop controlled movements at the intersections of Green Bay Road with W. Witchwood Lane and W. Hawthorne Court presently operate at a satisfactory level of service B during the weekday peak commuting hours. These results are supported by field observations of traffic operations along Green Bay Road.
- Upon completion of the revised Stonebridge development plan, the stop-controlled movements at these intersections will continue to operate at the same satisfactory levels of service during the weekday peak hours with minimal increases in average vehicle delays (i.e., less than one second).

- There were five reported traffic crashes in the study area from 2007-2011 and only one of the incidents appears to have been caused by traffic flow along Green Bay Road. None of the crashes resulted in personal injury.
- The traffic gap study indicates that there are a sufficient number of gaps in the flow of traffic on Green Bay Road to accommodate the projected left-turning volumes from the Stonebridge driveway and W. Witchwood Lane during the morning and afternoon peak hours. Spread over an hour, there are approximately two gaps every minute, on average, that are long enough to allow cars to turn left on Green Bay Road. As such, cars will typically not be delayed for any significant period attempting to turn left. This was also documented in our observations of existing conditions.
- When the Stonebridge development was initially approved by the Village in November 2006, the development agreement required the developer to pay a proportionate share of the cost of construction to install a northbound left-turn lane on Green Bay Road at the Stonebridge drive/W. Witchwood Lane intersection. The turn lane improvement was to be completed by the Village but was never initiated.
- It is questionable as to whether the left-turn lane on Green Bay Road continues to be required based on the (1) lower traffic levels on Green Bay Road, (2) peak hour traffic projections for the revised Stonebridge development, and (3) roadway design standards from the Lake County Division of Transportation and Illinois Department of Transportation. The Roanoke Group should work with the Village of Lake Bluff to reach an equitable decision on whether to move forward with the left-turn lane construction.

APPENDIX

Traffic Counts

Lake Bluff, IL Weather: Cool and Dry
 Green Bay Rd and Witchwood Ln
 Thursday April 25, 2013

04/29/13
 08:01:30

URNS/TEAPAC[Ver 3.61.12] - 60-Minute Volumes: by Movement

Intersection # 3 greenbay/witchwood

Begin Time	N-Approach			E-Approach			S-Approach			W-Approach			Int Total
	RT	TH	LT										
700	0	0	5	6	0	6	2	0	0	0	0	0	19
715	0	0	3	8	0	6	2	0	0	0	0	0	19
730	0	0	3	6	0	9	3	0	0	0	0	0	21
745	0	0	3	3	0	9	2	0	0	0	0	0	17
800	0	0	1	4	0	8	5	0	0	0	0	0	18
815	0	0	1	2	0	6	4	0	0	0	0	0	13*
830	0	0	1	1	0	3	3	0	0	0	0	0	8*
845	0	0	0	1	0	2	3	0	0	0	0	0	6*
1630	0	0	1	5	0	4	10	0	0	0	0	0	20
1645	0	0	2	7	0	4	11	0	0	0	0	0	24
1700	0	0	2	6	0	2	14	0	0	0	0	0	24
1715	0	0	5	5	0	2	10	0	0	0	0	0	22
1730	0	0	7	3	0	4	7	0	0	0	0	0	21
1745	0	0	6	1	0	4	5	0	0	0	0	0	16*
1800	0	0	6	0	0	4	1	0	0	0	0	0	11*
1815	0	0	3	0	0	2	0	0	0	0	0	0	5*

URNS/TEAPAC[Ver 3.61.12] - 60-Minute Volumes: Appr/Exit Totals

Intersection # 3 greenbay/witchwood

Begin Time	Approach Totals				Exit Totals				Int Total
	N	E	S	W	N	E	S	W	
700	5	12	2	0	6	7	6	0	19
715	3	14	2	0	8	5	6	0	19
730	3	15	3	0	6	6	9	0	21
745	3	12	2	0	3	5	9	0	17
800	1	12	5	0	4	6	8	0	18
815	1	8	4	0	2	5	6	0	13*
830	1	4	3	0	1	4	3	0	8*
845	0	3	3	0	1	3	2	0	6*
1630	1	9	10	0	5	11	4	0	20
1645	2	11	11	0	7	13	4	0	24
1700	2	8	14	0	6	16	2	0	24
1715	5	7	10	0	5	15	2	0	22
1730	7	7	7	0	3	14	4	0	21
1745	6	5	5	0	1	11	4	0	16*
1800	6	4	1	0	0	7	4	0	11*
1815	3	2	0	0	0	3	2	0	5*

Lake Bluff, IL Weather: Cool and Dry
 Green Bay Rd and Hawthorne
 Thursday April 25, 2013

04/29/13
 07:59:33

URNS/TEAPAC[Ver 3.61.12] - 60-Minute Volumes: by Movement

Intersection # 2 greenbay/hawthorne

Begin Time	N-Approach			E-Approach			S-Approach			W-Approach			Int Total
	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT	
700	14	383	0	0	0	0	0	167	3	21	0	21	609
715	14	414	0	0	0	0	0	187	3	21	0	21	660
730	10	425	0	0	0	0	0	196	0	19	0	21	671
745	6	405	0	0	0	0	0	197	0	12	0	13	633
800	5	382	0	0	0	0	0	198	0	7	0	8	600
815	2	278	0	0	0	0	0	146	0	4	0	5	435*
830	2	172	0	0	0	0	0	99	0	0	0	4	277*
845	2	86	0	0	0	0	0	44	0	0	0	1	133*
1630	7	302	0	0	0	0	0	368	7	6	0	4	694
1645	8	280	0	0	0	0	0	358	12	4	0	3	665
1700	8	257	0	0	0	0	0	352	14	2	0	3	636
1715	12	240	0	0	0	0	0	339	14	2	0	4	611
1730	13	235	0	0	0	0	0	316	14	7	0	5	590
1745	12	180	0	0	0	0	0	233	8	7	0	5	445*
1800	9	121	0	0	0	0	0	157	5	7	0	4	303*
1815	4	64	0	0	0	0	0	72	2	6	0	2	150*

URNS/TEAPAC[Ver 3.61.12] - 60-Minute Volumes: Appr/Exit Totals

Intersection # 2 greenbay/hawthorne

Begin Time	Approach Totals				Exit Totals				Int Total
	N	E	S	W	N	E	S	W	
700	397	0	170	42	188	0	404	17	609
715	428	0	190	42	208	0	435	17	660
730	435	0	196	40	217	0	444	10	671
745	411	0	197	25	210	0	417	6	633
800	387	0	198	15	206	0	389	5	600
815	280	0	146	9	151	0	282	2	435*
830	174	0	99	4	103	0	172	2	277*
845	88	0	44	1	45	0	86	2	133*
1630	309	0	375	10	372	0	308	14	694
1645	288	0	370	7	361	0	284	20	665
1700	265	0	366	5	355	0	259	22	636
1715	252	0	353	6	343	0	242	26	611
1730	248	0	330	12	321	0	242	27	590
1745	192	0	241	12	238	0	187	20	445*
1800	130	0	162	11	161	0	128	14	303*
1815	68	0	74	8	74	0	70	6	150*

CMAP 2040 Traffic Projection



Chicago Metropolitan
Agency for Planning

233 South Wacker Drive
Suite 800
Chicago, Illinois 60606

312 454 0400
www.cmap.illinois.gov

November 21, 2012

Eric D. Russell, P.E.
Principal
Kenig, Lindgren, O'Hare and Aboona
9575 West Higgins Road
Suite 400
Rosemont, IL 60018

Subject: Green Bay Rd south of IL 176
Village of Lake Bluff

Dear Mr. Russell:

In response to a request made on your behalf and dated November 21, 2012, we have developed a year 2040 average daily traffic (ADT) projection of 13,000 for the subject location.

Traffic projections are developed using existing ADT data provided in the request letter and the results from the October 2012 CMAP Travel Demand Analysis. The regional travel model uses CMAP 2040 socioeconomic projections and assumes the implementation of the GO TO 2040 Comprehensive Regional Plan for the Northeastern Illinois area.

If you have any questions, please call Jose Rodriguez at (312) 386-8806.

Sincerely,

A handwritten signature in black ink that reads "Donald P. Kopec".

Donald P. Kopec
Deputy Director for Planning and Programming

cc: Russell (Village of Lake Bluff)
M:\proj\lceb\forecasts\2012 Response\la-29-12.docx

Capacity Analysis Worksheets

Existing Traffic Conditions

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	MKS			Intersection	Witchwood and Green Bay			
Agency/Co.	KLOA			Jurisdiction	Lake Bluff			
Date Performed	9/17/13			Analysis Year	2013			
Analysis Time Period	AM							
Project Description 12-026								
East/West Street: Witchwood Lane				North/South Street: Green Bay Road				
Intersection Orientation: North-South				Study Period (hrs): 1.00				
Vehicle Volumes and Adjustments								
Major Street	Northbound			Southbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	0	193	3	3	441	0		
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95		
Hourly Flow Rate, HFR (veh/h)	0	203	3	3	464	0		
Percent Heavy Vehicles	2	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration	LTR			LTR				
Upstream Signal		0			0			
Minor Street	Eastbound			Westbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)	0	0	0	9	0	6		
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95		
Hourly Flow Rate, HFR (veh/h)	0	0	0	9	0	6		
Percent Heavy Vehicles	2	2	2	2	2	2		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration		LTR			LTR			
Delay, Queue Length, and Level of Service								
Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LTR	LTR	LTR			LTR		
v (veh/h)	0	3	15			0		
C (m) (veh/h)	1097	1377	473					
v/c	0.00	0.00	0.03					
95% queue length	0.00	0.01	0.10					
Control Delay (s/veh)	8.3	7.6	12.9					
LOS	A	A	B					
Approach Delay (s/veh)	--	--	12.9					
Approach LOS	--	--	B					

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	MKS			Intersection	Witchwood and Green Bay			
Agency/Co.	KLOA			Jurisdiction	Lake Bluff			
Date Performed	9/17/13			Analysis Year	2013			
Analysis Time Period	PM							
Project Description 12-026								
East/West Street: Witchwood Lane				North/South Street: Green Bay Road				
Intersection Orientation: North-South				Study Period (hrs): 1.00				
Vehicle Volumes and Adjustments								
Major Street	Northbound			Southbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	0	370	10	1	307	0		
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95		
Hourly Flow Rate, HFR (veh/h)	0	389	10	1	323	0		
Percent Heavy Vehicles	2	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration	LTR			LTR				
Upstream Signal		0			0			
Minor Street	Eastbound			Westbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)	0	0	0	4	0	5		
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95		
Hourly Flow Rate, HFR (veh/h)	0	0	0	4	0	5		
Percent Heavy Vehicles	2	2	2	2	2	2		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration		LTR			LTR			
Delay, Queue Length, and Level of Service								
Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LTR	LTR		LTR			LTR	
v (veh/h)	0	1		9			0	
C (m) (veh/h)	1237	1171		467				
v/c	0.00	0.00		0.02				
95% queue length	0.00	0.00		0.06				
Control Delay (s/veh)	7.9	8.1		12.9				
LOS	A	A		B				
Approach Delay (s/veh)	--	--		12.9				
Approach LOS	--	--		B				

TWO-WAY STOP CONTROL SUMMARY								
General Information			Site Information					
Analyst	MKS		Intersection	Hawthorne and Green Bay				
Agency/Co.	KLOA		Jurisdiction	Lake Bluff				
Date Performed	9/17/13		Analysis Year	2013				
Analysis Time Period	AM							
Project Description 12-026								
East/West Street: Hawthorne Court			North/South Street: Green Bay					
Intersection Orientation: North-South			Study Period (hrs): 1.00					
Vehicle Volumes and Adjustments								
Major Street	Northbound			Southbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	3	196			425	10		
Peak-Hour Factor, PHF	0.95	0.95	1.00	1.00	0.95	0.95		
Hourly Flow Rate, HFR (veh/h)	3	206	0	0	447	10		
Percent Heavy Vehicles	2	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration	LT					TR		
Upstream Signal		0			0			
Minor Street	Eastbound			Westbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)	21		19					
Peak-Hour Factor, PHF	0.95	0.95	0.95	1.00	1.00	1.00		
Hourly Flow Rate, HFR (veh/h)	22	0	20	0	0	0		
Percent Heavy Vehicles	2	2	2	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						
Delay, Queue Length, and Level of Service								
Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT						LR	
v (veh/h)	3						42	
C (m) (veh/h)	1104						496	
v/c	0.00						0.08	
95% queue length	0.01						0.28	
Control Delay (s/veh)	8.3						12.9	
LOS	A						B	
Approach Delay (s/veh)	--	--					12.9	
Approach LOS	--	--					B	

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	MKS			Intersection	Hawthorne and Green Bay			
Agency/Co.	KLOA			Jurisdiction	Lake Bluff			
Date Performed	9/17/13			Analysis Year				
Analysis Time Period	PM							
Project Description 12-026								
East/West Street: Hawthorne Court				North/South Street: Green Bay				
Intersection Orientation: North-South				Study Period (hrs): 1.00				
Vehicle Volumes and Adjustments								
Major Street	Northbound			Southbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	7	368			302	7		
Peak-Hour Factor, PHF	0.95	0.95	1.00	1.00	0.95	0.95		
Hourly Flow Rate, HFR (veh/h)	7	387	0	0	317	7		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration	LT			TR				
Upstream Signal		0			0			
Minor Street	Eastbound			Westbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)	4		6					
Peak-Hour Factor, PHF	0.95	0.95	0.95	1.00	1.00	1.00		
Hourly Flow Rate, HFR (veh/h)	4	0	6	0	0	0		
Percent Heavy Vehicles	2	2	2	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						
Delay, Queue Length, and Level of Service								
Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT						LR	
v (veh/h)	7						10	
C (m) (veh/h)	1247						540	
v/c	0.01						0.02	
95% queue length	0.02						0.06	
Control Delay (s/veh)	7.9						11.8	
LOS	A						B	
Approach Delay (s/veh)	--	--					11.8	
Approach LOS	--	--					B	

Capacity Analysis Worksheets

Total Projected Traffic Conditions

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	MKS			Intersection	Witchwood/ Green Bay/ Site			
Agency/Co.	KLOA			Jurisdiction				
Date Performed	7/16/2014			Analysis Year	Future			
Analysis Time Period	AM							
Project Description 12-026								
East/West Street: Witchwood Lane				North/South Street: Green Bay Road				
Intersection Orientation: North-South				Study Period (hrs): 1.00				
Vehicle Volumes and Adjustments								
Major Street	Northbound			Southbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	9	193	3	3	441	10		
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95		
Hourly Flow Rate, HFR (veh/h)	9	203	3	3	464	10		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration	LTR			LTR				
Upstream Signal		0			0			
Minor Street	Eastbound			Westbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)	33	0	27	9	0	6		
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95		
Hourly Flow Rate, HFR (veh/h)	34	0	28	9	0	6		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration		LTR			LTR			
Delay, Queue Length, and Level of Service								
Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LTR	LTR	LTR			LTR		
v (veh/h)	9	3	15			62		
C (m) (veh/h)	1099	1377	437			431		
v/c	0.01	0.00	0.03			0.14		
95% queue length	0.02	0.01	0.11			0.50		
Control Delay (s/veh)	8.3	7.6	13.5			14.8		
LOS	A	A	B			B		
Approach Delay (s/veh)	--	--	13.5			14.8		
Approach LOS	--	--	B			B		

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	MKS			Intersection	Witchwood/ Green Bay/ Site			
Agency/Co.	KLOA			Jurisdiction				
Date Performed	7/16/2014			Analysis Year	Future			
Analysis Time Period	PM							
Project Description 12-026								
East/West Street: Witchwood Lane				North/South Street: Green Bay Road				
Intersection Orientation: North-South				Study Period (hrs): 1.00				
Vehicle Volumes and Adjustments								
Major Street	Northbound			Southbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	29	370	10	1	307	36		
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95		
Hourly Flow Rate, HFR (veh/h)	30	389	10	1	323	37		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration	LTR			LTR				
Upstream Signal		0			0			
Minor Street	Eastbound			Westbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)	21	0	17	4	0	5		
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95		
Hourly Flow Rate, HFR (veh/h)	22	0	17	4	0	5		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration		LTR			LTR			
Delay, Queue Length, and Level of Service								
Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LTR	LTR	LTR			LTR		
v (veh/h)	30	1	9			39		
C (m) (veh/h)	1210	1171	419			396		
v/c	0.02	0.00	0.02			0.10		
95% queue length	0.08	0.00	0.07			0.33		
Control Delay (s/veh)	8.1	8.1	13.8			15.1		
LOS	A	A	B			C		
Approach Delay (s/veh)	--	--	13.8			15.1		
Approach LOS	--	--	B			C		

TWO-WAY STOP CONTROL SUMMARY								
General Information			Site Information					
Analyst	MKS		Intersection	Hawthorne and Green Bay				
Agency/Co.	KLOA		Jurisdiction					
Date Performed	7/16/2014		Analysis Year	Future				
Analysis Time Period	AM							
Project Description 12-026								
East/West Street: Hawthorne Court			North/South Street: Green Bay					
Intersection Orientation: North-South			Study Period (hrs): 1.00					
Vehicle Volumes and Adjustments								
Major Street	Northbound			Southbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	3	229			435	10		
Peak-Hour Factor, PHF	0.95	0.95	1.00	1.00	0.95	0.95		
Hourly Flow Rate, HFR (veh/h)	3	241	0	0	457	10		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration	LT					TR		
Upstream Signal		0			0			
Minor Street	Eastbound			Westbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)	21		19					
Peak-Hour Factor, PHF	0.95	0.95	0.95	1.00	1.00	1.00		
Hourly Flow Rate, HFR (veh/h)	22	0	20	0	0	0		
Percent Heavy Vehicles	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						
Delay, Queue Length, and Level of Service								
Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT						LR	
v (veh/h)	3						42	
C (m) (veh/h)	1105						479	
v/c	0.00						0.09	
95% queue length	0.01						0.29	
Control Delay (s/veh)	8.3						13.2	
LOS	A						B	
Approach Delay (s/veh)	--	--					13.2	
Approach LOS	--	--					B	

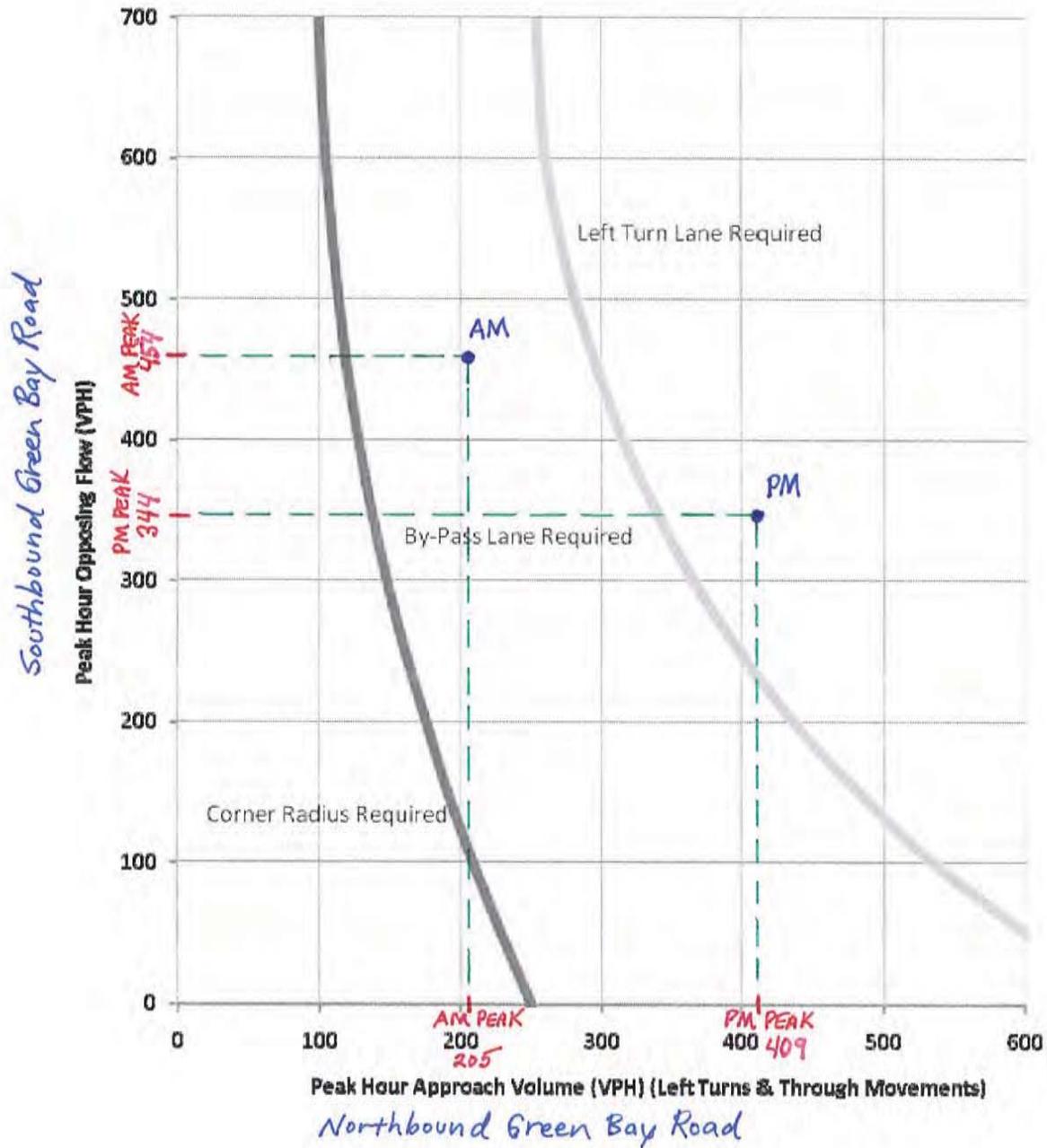
TWO-WAY STOP CONTROL SUMMARY							
General Information				Site Information			
Analyst	MKS			Intersection	Hawthorne and Green Bay		
Agency/Co.	KLOA			Jurisdiction			
Date Performed	7/16/2014			Analysis Year	Future		
Analysis Time Period	PM						
Project Description 12-026							
East/West Street: Hawthorne Court				North/South Street: Green Bay			
Intersection Orientation: North-South				Study Period (hrs): 1.00			
Vehicle Volumes and Adjustments							
Major Street	Northbound			Southbound			
Movement	1	2	3	4	5	6	
	L	T	R	L	T	R	
Volume (veh/h)	7	389			338	7	
Peak-Hour Factor, PHF	0.95	0.95	1.00	1.00	0.95	0.95	
Hourly Flow Rate, HFR (veh/h)	7	409	0	0	355	7	
Percent Heavy Vehicles	2	--	--	0	--	--	
Median Type	Undivided						
RT Channelized			0				0
Lanes	0	1	0	0	1	0	
Configuration	LT						TR
Upstream Signal		0			0		
Minor Street	Eastbound			Westbound			
Movement	7	8	9	10	11	12	
	L	T	R	L	T	R	
Volume (veh/h)	4		6				
Peak-Hour Factor, PHF	0.95	0.95	0.95	1.00	1.00	1.00	
Hourly Flow Rate, HFR (veh/h)	4	0	6	0	0	0	
Percent Heavy Vehicles	2	0	2	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					
Delay, Queue Length, and Level of Service							
Approach	Northbound	Southbound	Westbound			Eastbound	
Movement	1	4	7	8	9	10	11 12
Lane Configuration	LT						LR
v (veh/h)	7						10
C (m) (veh/h)	1197						504
v/c	0.01						0.02
95% queue length	0.02						0.06
Control Delay (s/veh)	8.0						12.3
LOS	A						B
Approach Delay (s/veh)	--	--					12.3
Approach LOS	--	--					B

Lake County Division of Transportation
Highway Access Regulation Ordinance
Left-Turn Lane Guidelines

Figure 11.1

Lake County Division of Transportation
Highway Access Regulation Ordinance

Left Turn Treatments For Various Volumes

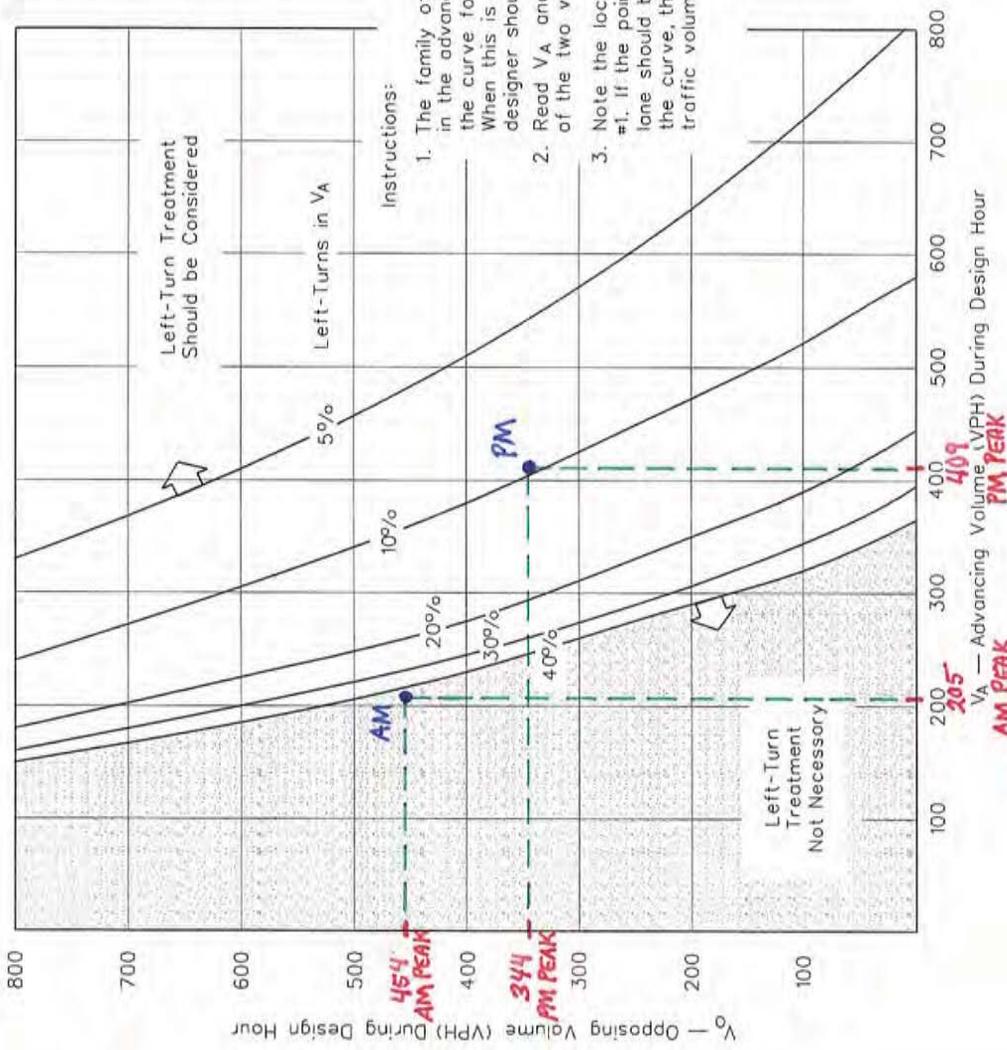


Illinois Department of Transportation
Bureau of Design & Environment Manual-2010
Left-Turn Lane Guidelines

Illinois Department of Transportation
Bureau of Design & Environment Manual

V_A = Total advancing traffic volume which includes all turning traffic

V_0 = Total opposing traffic volume which includes all turning traffic



Instructions:

1. The family of curves represent the percent of left turns in the advancing volume (V_A). The designer should locate the curve for the actual percentage of left turns. When this is not an even increment of five, the designer should estimate where the curve lies.
2. Read V_A and V_0 into the chart and locate the intersection of the two volumes.
3. Note the location of the point in #2 relative to the curve in #1. If the point is to the right of the curve, then a left-turn lane should be considered. If the point is to the left of the curve, then a left-turn lane is not warranted based on traffic volumes.

VOLUME GUIDELINES FOR LEFT-TURN LANES AT UNSIGNALIZED INTERSECTIONS ON TWO-LANE HIGHWAYS (40 mph Design Speed)

Figure 36-3.G

% Left-Turns
in V_A

AM	4.4%
PM	7.1%