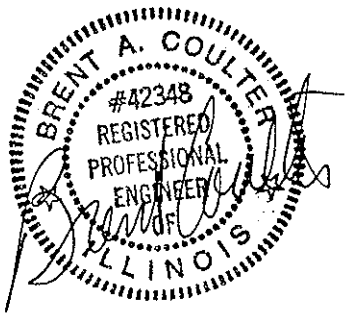
WHEATON BIBLE CHURCH
(DUPAGE COUNTY, ILLINOIS)

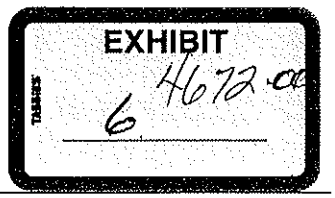
TRAFFIC IMPACT STUDY

May 25, 2000



Prepared for
Wheaton Bible Church

Prepared by
Brent Coulter, P.E.
CEMCON, Ltd.
1N131 Countyfarm Road
Winfield, IL 60190
ph: (630)-653-1030
fax: (630)-653-0652



I. BACKGROUND/OVERVIEW

The Wheaton Bible Church, now located in downtown Wheaton, proposes to construct a new worship facility on approximately 47 acres at the northwest corner of Morton Road and North Avenue (Illinois 64) in unincorporated DuPage County near the Village of Carol Stream (see Figure 1). The Church is applying to DuPage County for a Conditional Use to construct a church in the existing R-3 District. The proposed Church building facility will consist of 200,000 square feet of worship, ministry and office area and will have a maximum occupancy of 5,225 persons. A combination of surface and structure parking is proposed. The anticipated opening of the proposed Church would be in three to five years.

The proposed use will be a minimal weekday peak hour traffic generator but will generate a significant amount of traffic during the Sunday morning worship period (typically 8:00 a.m. to 12:30 p.m.). Accordingly, and at the request of the Church, CEMCON, Ltd. has prepared a Traffic Impact Analysis for the project. This traffic study follows the general traffic impact analysis guidelines of the Illinois Section of the Institute of Transportation Engineers and addresses the following specific development issues:

- Preparation of Sunday peak hour site traffic assignments and background traffic flow projections for the year 2010 design horizon.
- Assess off-site traffic impacts and potential mitigation at Church driveways on Morton Road and at critical North Avenue intersections with Morton Road and County Farm Road.
- Assess site traffic impact and potential mitigation on Morton Road and intersecting residential streets north of the proposed site.

II. AREA LAND USE AND TRANSPORTATION NETWORK

A. Adjacent Land Use

Land to the east of the site is developed with large-lot residential with some direct residential driveway access on Morton Road. A single-family residential neighborhood lies north of the site centered on Birchbark Trail. A small commercial/contractor building is located opposite the site at the northeast corner of Morton Road and North Avenue. The Carol Stream Park District is constructing McCaslin Park, a mulit-use athletic field and indoor sports complex immediately to the west of the site. Land along the south side of North Avenue opposite the site consists of scattered commercial uses and undeveloped lots. Although the subject site is zoned "R-3" in DuPage County, it is designated on the recently updated Village of Carol Stream Comprehensive Plan as Office-Research-Industrial (ORI).

B. Transportation Network

North Avenue (Illinois Rte. 64)

North Avenue is a Strategic Regional Arterial (SRA) under the jurisdiction of the State of Illinois Department of Transportation (IDOT). North Avenue presently consists of a four-lane undivided highway (with isolated left-turn lane channelization) on a 200 foot right-of-way. IDOT has recently let a contract to improve North Avenue to a 6-lane wide median cross-section from Illinois Rte. 59 on the west to Gary Avenue on the east. Utility relocation is currently in progress and the road widening is expected to be completed by the Fall of 2001 or the Spring of 2002. North Avenue presently carries approximately 30,000 vehicles per day past the subject site. Signalized intersections exist at Fair Oaks Road (to the west) and County Farm Road (to the east).

As part of the North Avenue improvement, median openings, with left-turn channelization will be constructed at Morton Road and at the proposed entrance to McCaslin Park west of the Morton Road. In addition, St. Charles Road south of North Avenue will realigned opposite the Park entrance. IDOT has stated that traffic signals will not be installed at these two intersections as part of the current road widening project. Traffic signals may be permitted at a later date by others subject to IDOT's SRA signal warrants being met.

County Farm Road

County Farm Road is a four-lane undivided Principal Arterial highway under the jurisdiction of the DuPage County Division of Transportation, which carries an average of 20,000 vehicles per day. County Farm Road extends from Illinois Rte. 38 on the south to Lake Street on the north (where it continues north as Barrington Road). The intersection of County Farm Road and North Avenue is signalized, with left-turn lanes on all approaches.

Morton Road

Morton Road is a two lane, open drainage roadway under the jurisdiction of Wayne Township and extends from St. Charles Road on the south to Lies Road on the north. The existing ADT on this route is estimated at approximately 5,000 vehicles per day. The intersection of Rte. 72 and Big Timber Road is under multiway stop control with a single lane (i.e. combined left-, through, and right-turn movements) on each approach.

Birchbark Trail

Birchbark Trail, which is north of and not contiguous to the subject site, is a two-lane subdivision collector extending from west of Morton Road to east of County Farm Road. The intersection of Birchbark Trail and

Morton Road is under multiway stop control and left-turn lanes exist on both the north and south approaches.

Mardon Road

Mardon Road is a two-lane local residential street under the jurisdiction of Wayne Township that extends from Morton Road, several hundred feet north of the subject site to County Farm Road near North Avenue. This road serves an isolated low-density single-family residential subdivision in DuPage County.

C. Existing and Projected Background Traffic

Existing Traffic Counts

Sunday peak period turning movement counts in the immediate study area were taken during the month of May, 2000, between the hours of 10:30 a.m. and 12:30 p.m. Existing peak hour turning movements are summarized in Figure 2.

Projected Background Traffic

Existing traffic was inflated by 3% (non-compounded) per year for ten years to derive a Year 2010 traffic forecast as shown in Figure 3. This 10-year assignment assumes the realignment of St. Charles Road opposite McCaslin Park and the diversion of some northbound left-turn traffic from County Farm Road at North Avenue to St. Charles Road.

III. SITE ACCESS

A conceptual site plan (Figure 1) is attached and shows the preliminary location of proposed access serving the future Wheaton Bible Church as described below.

Morton Road

Three access points are proposed as follows (all dimensions are referenced to the future north edge of pavement widening on North Avenue as shown on IDOT plans):

- South Access Drive - +/- 450 feet north of North Avenue
- Central Access Drive - +/- 870 feet north of North Avenue
- North Access Drive - +/- 1,500 feet north of North Avenue and approximately 200 feet south of a proposed new residential street (by Keim) to the north.

North Avenue

A right-turn only driveway is proposed approximately 600 feet west of Morton Road. Left-turns would be controlled by a wide curbed median barrier on the improved North Avenue. This driveway, and a possible right-turn deceleration lane, has been reviewed and conceptually approved by IDOT.

Roadway Connection to McCaslin Park

The southerly interior access road on the Church site will be extended west for a possible future connection to McCaslin Park. It is anticipated that this road connection will be gated or otherwise secured but will be available for emergency vehicle use or for mutually agreed upon (Church/Carol Stream Park District) special events.

IV. VEHICULAR TRIP GENERATION

Trip generation for the proposed church was divided into two typical time periods; (1) weekday morning, evening and daily traffic and (2) Sunday peak hour generation. Weekday trips were based on observations of the existing church in downtown Wheaton, review of materials furnished by the Church describing daily staffing and activities and review of ITE Trip Generation Manual rates. Weekday trip-making is relatively light during the morning and evening peak hours and throughout the middle of the day. Church activity and resultant trip generation increases, but is still light, between the hours of 6:30 p.m. and 9:30 p.m.. Weekday trip generation is summarized in Table 1.

It is not appropriate to apply trip rates from the Institute of Transportation Engineer's (ITE) Trip Generation Manual to the proposed Church since the seating capacity and square foot area of the proposed church exceeds the range over which ITE trip rates were calculated. As a result, Sunday peak hour trip generation was derived by extrapolating existing tripmaking behavior at the Wheaton church (with has an 1100 person worship center seating capacity) to the projected seating capacity of the proposed Morton Road site (see Appendix Table A2). For purposes of trip generation a standard auto occupancy for this type of event of 3.0 persons per vehicle was utilized. The maximum hourly volume of trip generation (total of arriving and departing vehicles) on Sunday occurs during the roughly one-hour period between the start of the last service on Sunday (typically 11:15 or so) and the end of the preceding service. The Sunday trip generation analysis assumes three (3) worship services within the period between (approximately) 8:00 a.m. and 12:30 p.m..

Weekday trip generation was based on anticipated staffing and administrative functions and evening ministry and social activities which typically occur between 6:30 p.m. and 9:00 p.m. Church traffic generation is summarized in Table 1..

For comparison purposes, trip generation for an alternative ORI use of the subject site (as included on the Village of Carol Stream Comprehensive Plan) is shown in Table 2. This type of development would generate nearly ten (10) times the volume of weekday daily traffic and twenty (20) times the volume of weekday peak hour traffic as the proposed church and would create significant potential for cut-through and speeding traffic on residential streets to the north.

Table 1. Wheaton Bible Church (Morton Road) Trip Generation

		Weekday Peak Weekday Hour Trip Generation (Vehicles per Hour)						
Time Period	Activity	AM In	AM Out	PM In	PM Out	Evening In	Evening Out	Daily (In & Out)
Weekday	Administrative	20	17	18	16			
Evening Peak	Bible Study					80	60	
Total Daily								600

		Sunday Maximum Trip Generation (Vehicles per Hour) Inter-Service Period (11A-12P)			
Time Period	Activity	In	Out		Sunday Total (In & Out)
Sunday	*Worship & Child. Ministry*	*843*	*779*		*3190*

Note: Projected maximum Church trip generation effectively means a 100% to 200% increase in congregation size. This may or may not be attainable. Existing Sunday (total) trip generation at the downtown Wheaton church is +/- 1600 vehicles.

TABLE 2. SITE TRIP GENERATION COMPARISON

Land Use	1,000 GFA	Vehicle Trips Weekday AM Peak Hour In	Out	PM Peak Hour In	Out	Weekday Daily In & Out	Sunday Daily In & Out
Wheaton Bible Church	200	20	17	18	16	600	390
Research and Development Center (ITE 760)	716	632	132	103	582	5176	795

Source: ITE Trip Generation Manual (6th Edition)

V. SITE TRAFFIC DISTRIBUTION AND ASSIGNMENT

The existing pattern of residence location for the Wheaton Bible Church congregation is shown in Appendix Table 1. Church representatives expect that Wheaton area membership, presently over 50%, will continue to remain strong. However, because of the accessibility afforded by the proposed new location, they anticipate increased membership from the Carol Stream and surrounding areas to the north, presently only 7.5% or so of total membership. As a result, the relative distribution of membership was adjusted to reflect an increase in the percentage of Church members coming from north of North Avenue. Site traffic was assumed to be distributed on the surrounding street and highway network as shown in Table 3., below, based on observations of existing traffic flow and the general land use patterns and street layout in the area. No traffic was assigned to Mardon Road, a local street connecting Morton Road to County Farm Road due to its circuitous nature and the fact that its orientation with respect to proposed

TABLE 3. DIRECTION OF APPROACH	
To/From the (via):	Percentage
North on Morton Rd.	5%
Northeast on Birchbark	10%
North on County Farm	5%
South on County Farm	15%
East on North Avenue	35%
West on North Avenue	30%
	100%

Using these direction of approach percentages, Church traffic was assigned to the area street and highway network as shown in Figure 4. The Total Traffic Assignment (site plus Year 2010 background traffic) is shown in Figure 5, and was used in subsequent capacity and operational analysis.

VI. TRAFFIC IMPACT ANALYSIS

A. New Traffic Generation

The proposed Wheaton Bible Church is a "major" traffic generator on Sunday mornings and will add 1500 peak hour trips through the North Avenue/Morton Road intersection during the maximum Sunday peak hour. Weekday peak hour trip generation is far below the ITE threshold for warranting a traffic impact study.

B. Impact of Church Traffic on Nearby Residential Neighborhoods

A maximum hourly increase of 240 vehicles is projected during that Sunday peak hour on Morton Road at Birchbark Trail (through the residential area to the north). The total maximum addition of traffic through this intersection on Sunday morning (8:00 a.m. to 12:30 p.m.) is estimated at 580 vehicles. This volume of traffic is consistent with the functional classification of those streets and will not create adverse capacity or operational problems. Weekday traffic generation on these streets through the residential area will be negligible.

An alternative ORI development of the subject property would generate nearly ten (10) times the volume of weekday daily traffic and twenty (20) times the volume of weekday peak hour traffic as the proposed Church and would create significant potential for cut-through and speeding traffic on residential streets to the north.

C. Capacity Analysis

The impact of site traffic on the capacity and operation of key off-site intersections (signalized and unsignalized) for the Year 2010 with Church site traffic was evaluated using the HCS-3 software implementation of the Highway Capacity Manual procedures for signalized and unsignalized intersections. Findings are summarized in Table 4. and discussed below. For purposes of capacity analysis a peak-hour factor was derived assuming that consecutive 15-minute trip flow during the peak hour would be 15%, 15%, 35% and 35% respectively (this results in a peak-hour factor of .7).

1. Off-Site Traffic Impact Analysis

a. Morton Road at North Avenue

This intersection will operate at "Under Capacity" for the maximum Sunday peak hour. Capacity analysis assumed signal (or police officer traffic control), and a single southbound left-turn lane and a combined left-right turn lane on Morton Road.

b. County Farm Road at North Avenue

This intersection is projected to operate under capacity during the Sunday maximum peak hour. No significant queuing or stacking problems are anticipated.

c. Morton Road at Birchbark Trail

This multiway stop intersection is projected to operate at Level of Service (LOS) A during the Sunday maximum peak hour.

d. Central Church Drive on Morton Road

This intersection will operate at an overall LOS C during the Sunday maximum peak hour. Sometimes lengthy delays will occur to outbound left-turns, and therefore two separate outbound lanes (left- and right-turn) are recommended.

Table 4. Intersection Traffic Impact Analysis Summary

Location	Traffic Control Lane Geometry	Development Status	Time/ Movement	Level of Service (v/c or delay)
Morton Road @ North AVenue	Signalized and/or manual police traffic control.	Year 2010 + Church traffic	Sunday Max. Peak Hour Intersection (all)	Under Capacity (.81)
County Farm Rd. @ North Avenue	Signalized	Year 2010 + Church traffic	Sunday Max. Peak Hour Intersection (all)	Under Capacity (.72)
Morton Rd. @ Birchbark Trail	Multiway Stop	Year 2010 + Church traffic	Sunday Max. Peak Hour Intersection (all)	LOS A (9.0 sec/veh)
Church's Central Drive at Morton Road	Unsignalized	Year 2010 + Church traffic	AM Peak Hour Intersection (all)	LOS A (23.8 sec/veh)

Note: All unsignalized capacity analysis was performed using HCS-3. Signalized capacity analysis used SIGNAL97. Intersection Level of Service measurement is analogous to report card grades, with LOS A representing excellent conditions with little or no delay and LOS C representing moderate and tolerable delay. LOS D is typically considered a desirable design capacity/level of service target.

D. Intersection Sight Distance Analysis

The proposed central access drive is located near the crest of a vertical curve on Morton Road and affords good sight lines to and from the north and south. However, sight lines appear to be somewhat restricted for the north and south driveways due to that same vertical profile. As a result a segment of Morton Road centered on the crest vertical curve at the central access drive may need to be reconstructed in order to provide Minimum Stopping Sight Distance. As engineering progresses a vertical profile based on an actual centerline survey should be prepared to determine the extent of any reconstruction. The addition of left-turn lanes on Morton Road as recommended later in this report would also typically be considered as partial mitigation for intersection sight distance limitations.

E. Parking Analysis

The proposed parking supply provided on-site in the form of surface parking and structure parking is 2,174 spaces. This exceeds both the DuPage County Zoning Ordinance parking requirement for "churches" and a derived requirement based on industry standards. The parking analysis is summarized in Table 5., below.

Table 5. Church Parking Analysis

Church Use / Building	Occupancy	Area	Employees	Total Parking
Worship Center	2,500	35,000		
Chapel	200	4,000		
Music Center		5,000		
Hispanic Ministry	500	12,000		
Children's Ministry/Educ.	2,000	80,000		
Sports Ministry		12,000		
Church Offices		7,000	25	
Non-Programmable		45,000		
Total	5,225	200,000		
Parking Spaces Req'd by County (1 per 4 seats & 1 per employee)	1,306		25	1,331
Parking Spaces Req'd assuming (1 per 2.5 seats at 85% occupancy & 1 per employee)	1776		25	1801
Proposed Parking Supply				**2,174**

VII. CONCLUSIONS

The proposed Wheaton Bible Church is a significant Sunday morning peak generator. However, sufficient capacity exists on the future improved North Avenue to adequately carry Church traffic, and no adverse off-site capacity or level-of-service impacts are projected subject to certain roadway and access improvements as discussed in Section VIII. Traffic signal or police traffic control will be required on Sunday mornings at the intersection of Morton Road and North Avenue. The proposed Church is a minimal weekday traffic generator, especially during the peak hours. The alternative ORI land use, as shown on the Carol Stream Comprehensive Plan, would generate approximately 700 trips during each weekday peak hour compared to 35 for the proposed Church, and over 5,000 vehicles per day. Potential for significant adverse traffic impact (speeding, cut-through traffic) on the surrounding residential neighborhoods would occur with that time of business/commercial use 20 times the peak hour volume

Improvements will be made to Morton Road as part of Church development that will improve sight-distance and overall safety for all motorists. Other improvements are also recommended to help maximize the safety of Church operations, particularly on Sunday mornings as listed below.

VIII. RECOMMENDATIONS

- Our preliminary analysis indicates that inbound left-turn storage is desirable on Morton Road at each of these driveway locations. Consequently, we are recommending that Morton Road be widened and resurfaced between North Avenue and approximately 200 feet north of the North Access Drive to a three-lane cross-section consisting of one through lane each direction and a striped median. We understand that it is Wayne Township's preference that the roadway remain open drainage (i.e. shoulders and drainage swales/no curb and gutter). construction plans for Morton Road will be furnished to the Township for review. Pavement design and all storm drain pipe and structures will conform to Township standards or requirements.

- As the use of the new Church facilities occurs, traffic patterns should be monitored for instances of extreme overlap of arriving and departing vehicles. It may be possible to adjust or fine-tune Sunday worship service times to minimize overlap between arriving and departing traffic.

- The Church should work with the Illinois Department of Transportation and the road construction contractor (Kuhn) awarded the North Avenue improvement project to increase eastbound left-turn storage from the IDOT-proposed 250 feet to a minimum of 300 feet. The Church may be required to submit North Avenue roadway plan modifications to IDOT and will be responsible for any increase in cost.

- Two outbound lanes (separate left- and right-turn lanes) should be provided at each site access driveway approach to Morton Road.

- The Church should discuss the potential for traffic signal installation at the intersection of Morton Road and North Avenue with IDOT, even though it does not appear that SRA warrants would be met at the time the Church opens. IDOT may still want to implement "special event" signal timing for the Sunday morning worship period for adjacent signals to the east and west of Morton Road (i.e. provide for an increase in maximum green for North Avenue through and selected turn movements).

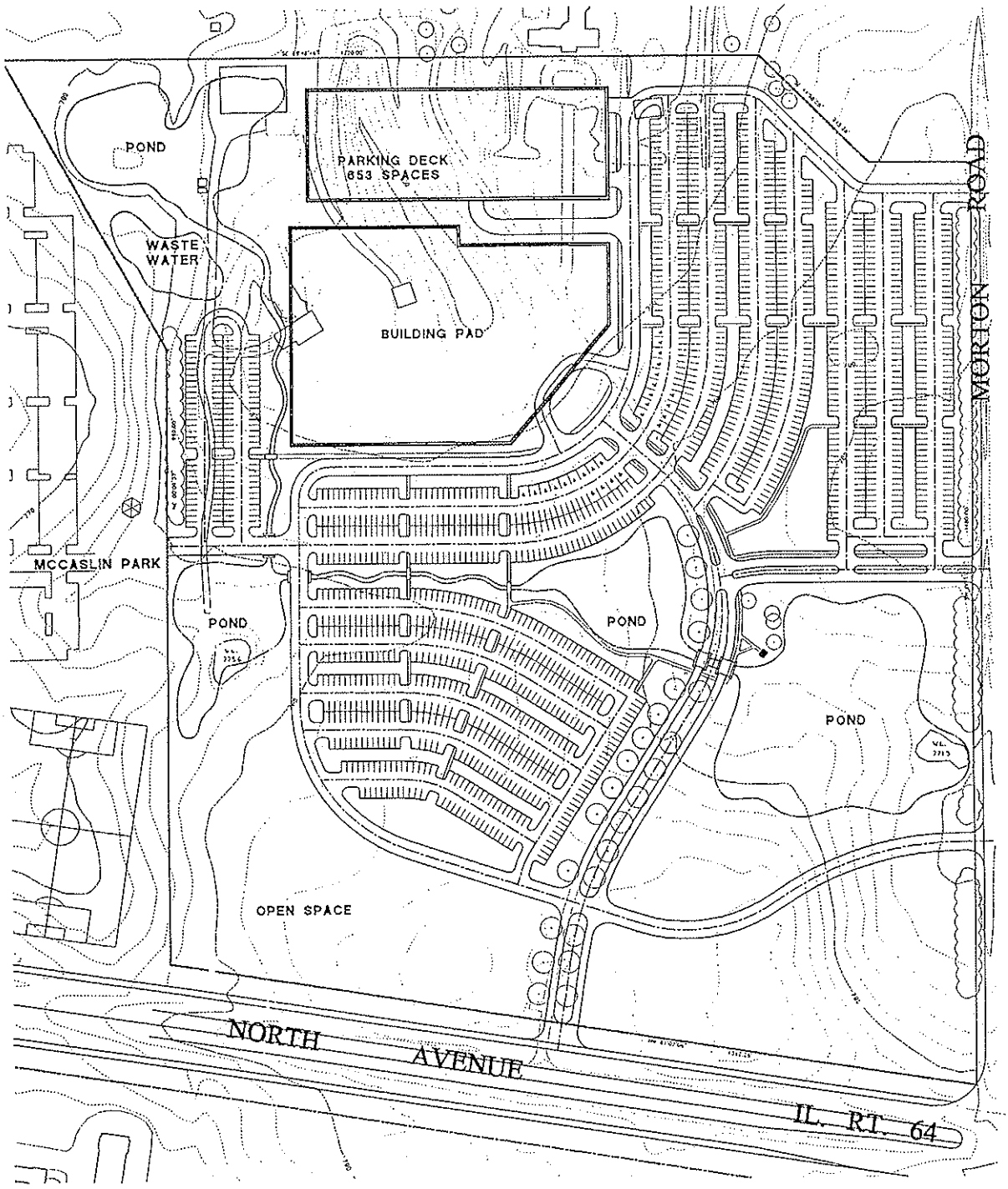
- In the event that traffic signals are not installed, and perhaps even with them, police officer traffic control will be required at the intersection of Morton Road and North Avenue during the Sunday morning worship services. For the safety of traffic control officers and the motoring public, we would recommend installation of advance intersection warning signs with time-programmable flashing beacons on North Avenue east and west of Morton Road. A supplemental sign plaque should read "Be Prepared to Stop When Flashing".

- Under police traffic control, supplemental removable signing may be required on Morton Road so that both southbound lanes provided in the IDOT improvement can serve left-turns (i.e. the inner lane left-turn only and the outer lane left- and right-turns). Note that under unsignalized conditions, this type of lane operation can occur only with police traffic control.

- In general, we would recommend that the south access on Morton Road drive be open for use only when the far south surface parking lot is heavily used.

- With the future realignment and potential signalization of St. Charles Road opposite the Carol Stream Park District's access on North Avenue, the need to maintain the short section of Morton Road between North Avenue and St. Charles Road is greatly diminished. In fact, overall traffic operations at Morton Road and North Avenue may be improved if that south leg of the intersection is eliminated. We would suggest that the Township at least consider the desirability of this closure and possible roadway vacation.

- Some congregation members living to the north of the site may walk to church. We recommend that the Church construct a sidewalk on Morton Road from at least their north property line to the North Access, with an interior path or walk from this point to the Church building entrance(s).
- An interior intersection traffic control plan should be prepared as part of final site engineering.



ILLUSTRATIVE SITE PLAN
WHEATON BIBLE CHURCH

FIGURE 1. CONCEPTUAL SITE PLAN

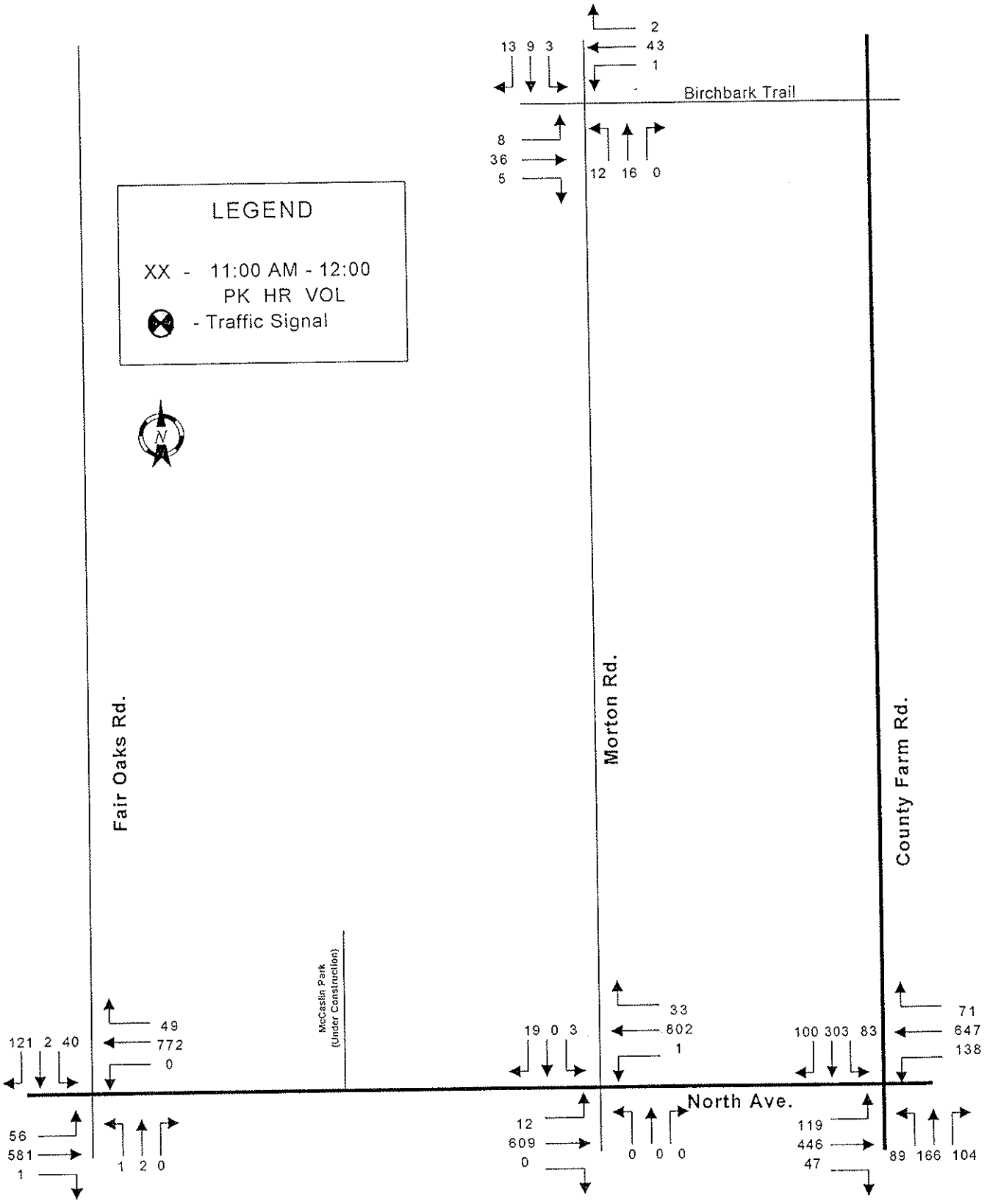


FIGURE 2. Existing Sunday Peak Hour Traffic

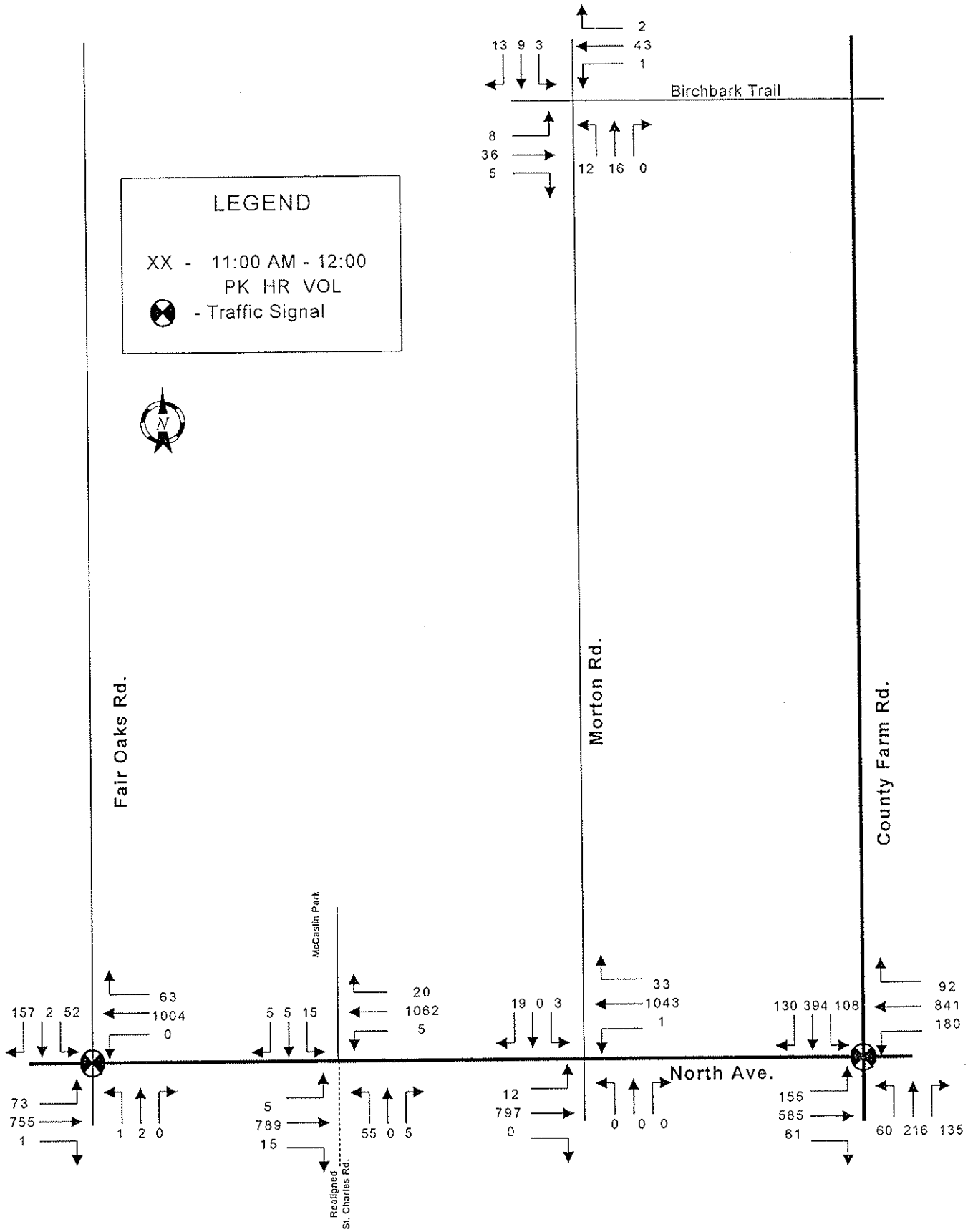


FIGURE 3. Year 2010 Sunday Peak Hour BackgroundTraffic

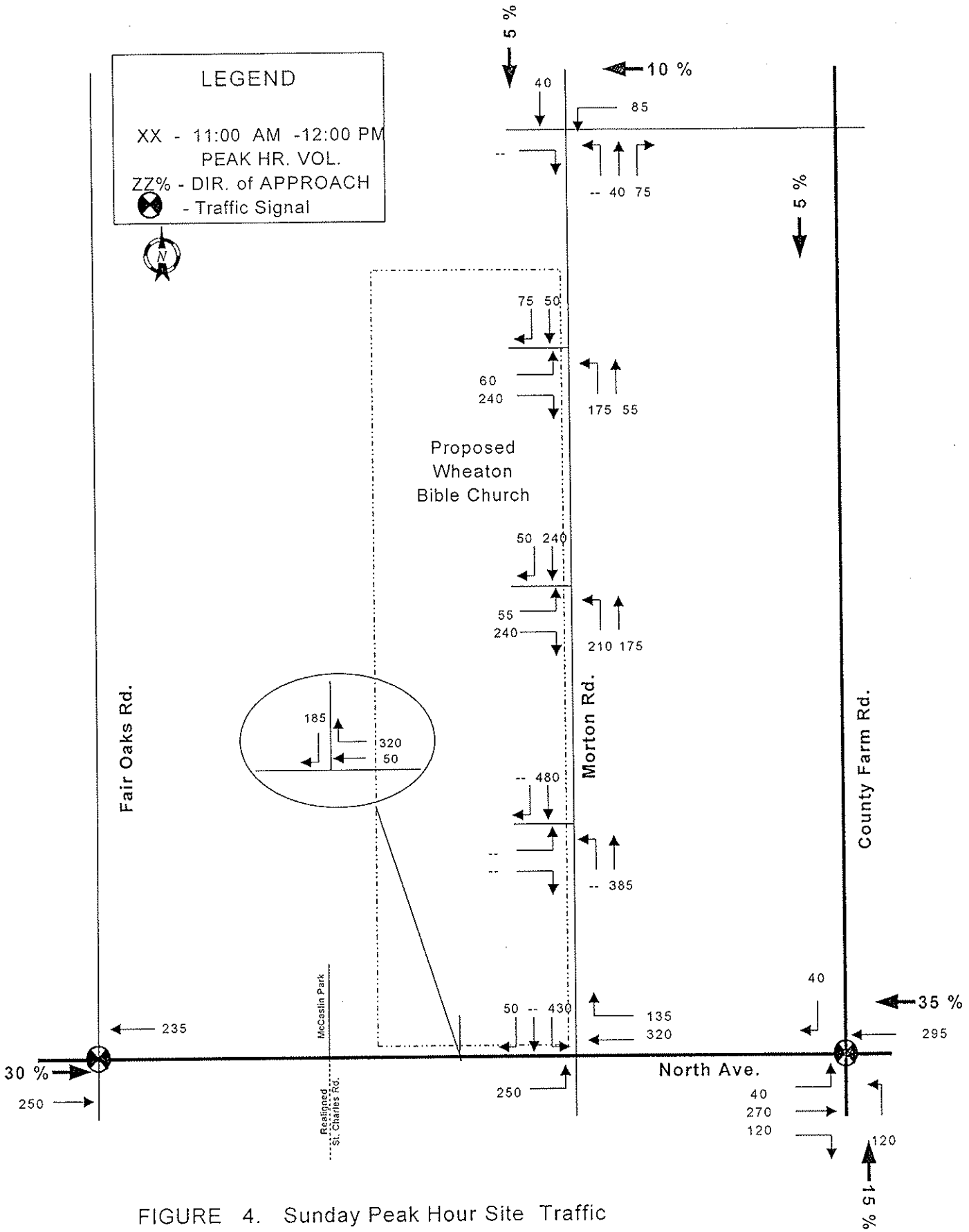


FIGURE 4. Sunday Peak Hour Site Traffic

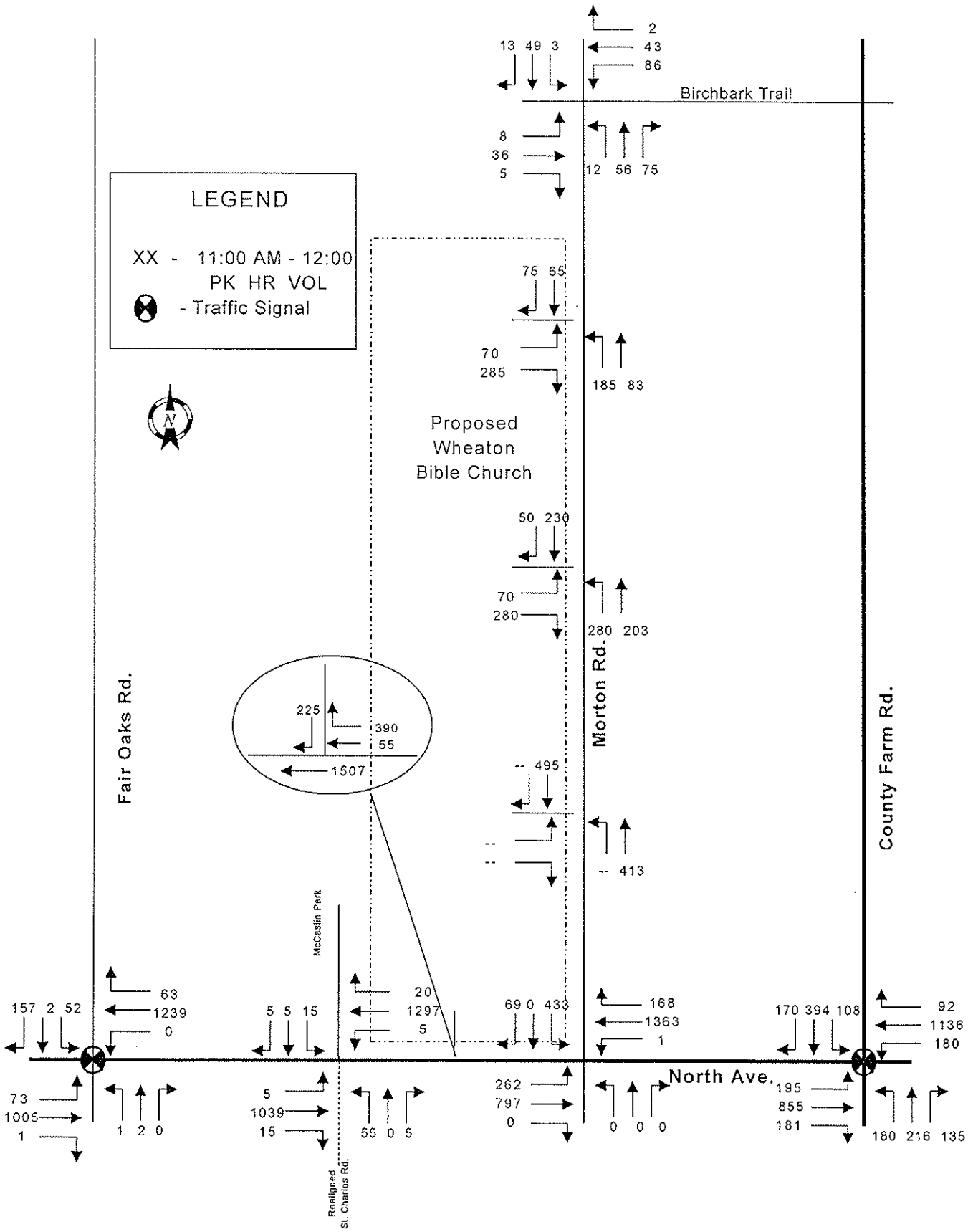


FIGURE 5. Year 2010 Sunday Site + Background Peak Hour Traffic

TECHNICAL APPENDIX

(Technical Documentation Provided Only in Staff Packets)

Table A1. Derivation of Projected Sunday Peak Hour Church Trip Generation

Activity	Penultimate Service Attendance Existing (Wheaton)	Penultimate Service Attendance Projected (Morton Rd.)		Departing Vehicles	Arriving Vehicles	Last Service Attendance Existing (Wheaton)	Last Service Attendance Projected (Morton Rd.)	
Worship	600	738		779	843	900	1750	(2)
Child/Educ.	1300	1600	(1)			400	778	
Total		2338					2528	

(1) = 80% of Children/Education Capacity of 2,000 seats
(2) = 70% of Worship Center Capacity of 2,500 seats
Note: Avg. Auto Occupancy = 3.0 persons/vehicle

Table A2. Derivation of Approach Splits

Community Area	Member Total	Direction of Approach to/from Site											
		%	North via Morton	%	Northeast via Birchbark	%	East via North Ave.	%	NE via County Fa	%	SE via County Fa	%	West via North Ave.
Wheaton	1407	0	0	0	0	65	915	0	0	35	492	0	0
Carol Stream	229	25	57	50	115	5	11	20	46	0	0	0	0
Glen Ellyn	189	0	0	0	0	100	189	0	0	0	0	0	0
Glendale Hts.	62	0	0	25	16	55	34	20	12	0	0	0	0
Downers/Lisle	34	0	0	0	0	100	34	0	0	0	0	0	0
Schaumb, Elgin	20	0	0	10	2	80	16	10	2	0	0	0	0
Addison/Blooming.	82	5	4	25	21	55	45	15	12	0	0	0	0
Elmhurst /LaGrange	64	0	0	0	0	100	64	0	0	0	0	0	0
Villa Park/Lom.	54	0	0	0	0	100	54	0	0	0	0	0	0
Naperville	79	0	0	0	0	40	32	0	0	35	28	25	20
St. Char/Batavia/Geneva	64	0	0	0	0	0	0	0	0	0	0	100	64
West Chicago	116	0	0	0	0	0	0	0	0	0	0	100	116
Winfield	134	0	0	0	0	0	0	0	0	25	34	75	101
Warrenville	54	0	0	0	0	0	0	0	0	55	30	45	24
Aurora/Plain.	50	0	0	0	0	0	0	0	0	0	0	100	50
Wayne/ Sycamore	11	35	4	0	0	0	0	0	0	0	0	65	7
Arlington Hts./Palatine	19	0	0	10	2	75	14	15	3	0	0	0	0
Other 86	0	0	0	0	0	0	0	0	0	0	0	0	0
	2668		65.2		154.4		1408.05		75.35		583.3		381.7
	100.0%		2.4%		5.8%		52.8%		2.8%		21.9%		14.3%
For New Church Location on Morton Road Use:	**100.0%**		**5.0%**		**10.0%**		**35.0%**		**5.0%**		**15.0%**		**30.0%**

Source: Wheaton Bible Church

HCS: Unsignalized Intersections Release 3.1c

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: BAC
Intersection: Bible Central Dr. @ Morton
Count Date: Sunday 2010
Time Period: 11A-12P

Intersection Orientation: North-South Major St.

Vehicle Volume Data:

Movements:	1	2	5	6	10	12
Volume:	210	203	255	50	55	240
HFR:	300	290	364	71	79	343
PHF:	0.70	0.70	0.70	0.70	0.70	0.70
PHV:	0.00	0.00	0.00	0.00	0.00	0.00

Worksheet 6 Impedance and capacity equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		400
Potential Capacity		654
Pedestrian Impedance Factor		1.00
Movement Capacity		654
Probability of Queue free St.		0.48

Step 2: LT from Major St.	4	1
Conflicting Flows		436
Potential Capacity		1135
Pedestrian Impedance Factor		1.00
Movement Capacity		1135
Probability of Queue free St.		0.74

Step 4: LT from Minor St.	7	10
Conflicting Flows		1290
Potential Capacity		182
Pedestrian Impedance Factor		1.00
Maj. L, Min T Impedance factor		0.74
Maj. L, Min T Adj. Imp Factor.		0.80
Cap. Adj. factor due to Impeding mvmnt		0.80
Movement Capacity		145

Worksheet 10 delay,queue length, and LOS

Movement	1	4	7	8	9	10	11	12
			|			||------		------|
v(vph)	300					79		343
C m(vph)	1135					145		654
v/c	0.26					0.54		0.52
95% queue length								
Control Delay	9.3					55.9		16.4
LOS	A					F		C
Approach Delay							23.8	
Approach LOS							C	

HCS: Unsignalized Intersections Release 3.1c

ALL-WAY STOP CONTROL(AWSC) ANALYSIS

Worksheet 1 - Basic Intersection Information

1. Analyst:	BAC
2. Intersection:	Morton Road at Birchbark Trail
3. Count Date:	2010 Sunday with Wheaton Bible Church
4. Time Period:	11A-12P

Worksheet 2 - Volume Adjustments and Site Characteristics

	North Bound		South Bound		East Bound	West Bound
	L1	L2	L1	L2	L1	L1
1. LT Volume:	12	0	3	0	8	86
2. TH Volume:	0	56	0	49	36	43
3. RT Volume:	0	75	0	13	5	2
4. Peak Hour Factor:	1.00	0.70	1.00	0.70	1.00	0.70
5. Flow Rate LT:	12	0	3	0	8	122
6. Flow Rate TH:	0	80	0	70	36	61
7. Flow Rate RT:	0	107	0	18	5	2
8. Flow Rate Total:	12	187	3	88	49	187
9. Prop. Heavy Vehicle:	0.00	0.00	0.00	0.00	0.00	0.00
10. Subject Approach	2	2	2	2	1	1
11. Opposing Approach	2	2	2	2	1	1
12. Conflicting Approach	1	1	1	1	2	2
13. Geometry Group	5	5	5	5	2	2
14. T (Time in Hours):	0.250					

Worksheet 3 - Saturation Headway Adjustment Worksheet

	North Bound		South Bound		East Bound	West Bound
	L1	L2	L1	L2	L1	L1
1. Flow Rate Total:	12	187	3	88	49	187
2. Flow Rate LT:	12	0	3	0	8	122
3. Flow Rate RT:	0	107	0	18	5	2
4. Prop LT in lane:	1.00	0.00	1.00	0.00	0.16	0.66
5. Prop RT in lane:	0.00	0.57	0.00	0.21	0.10	0.02
6. Prop. Heavy Vehicle:	0.00	0.00	0.00	0.00	0.00	0.00
7. Geometry Group	5	5	5	5	2	2
8. hLT-adj by Table 10-18	0.50	0.50	0.50	0.50	0.20	0.20
9. hRT-adj by Table 10-18	-0.70	-0.70	-0.70	-0.70	-0.60	-0.60
10. hHV-adj Table 10-18	1.70	1.70	1.70	1.70	1.70	1.70
11. hadj	0.50	-0.40	0.50	-0.15	-0.03	0.12

Worksheet 4 - Departure Headway and Service Time

	North Bound		South Bound		East Bound	West Bound
	L1	L2	L1	L2	L1	L1
1. Total lane flow rate	12	187	3	88	49	187
2. hd, initial value	3.2	3.2	3.2	3.2	3.2	3.2
3. x, initial	0.01	0.17	0.00	0.08	0.04	0.17
4. hd, final value	5.7	4.8	5.8	5.2	4.8	4.8
5. x, final value	0.02	0.25	0.00	0.13	0.07	0.25
6. Move-up time, m	2.3	2.3	2.3	2.3	2.0	2.0
7. Service Time	3.4	2.5	3.5	2.9	2.8	2.8

Worksheet 5 - Capacity and Level of Service

	North Bound		South Bound		East Bound	West Bound
	L1	L2	L1	L2	L1	L1
1. Total lane flow rate	12	187	3	88	49	187
2. Service Time	3.4	2.5	3.5	2.9	2.8	2.8
3. Degree Utilization, x	0.02	0.25	0.00	0.13	0.07	0.25
4. Departure headway, hd	5.7	4.8	5.8	5.2	4.8	4.8
5. Capacity	612	724	596	669	702	721
6. Delay	8.5	9.1	8.5	8.6	8.1	9.4
7. Level Of Service	A	A	A	A	A	A
8. Delay Approach	9.1		8.6		8.1	9.4
9. LOS, approach	A		A		A	A
10. Delay, Intersection	9.0					
11. LOS, Intersection	A					

HCS: Signalized Intersections Release 3.1c

Brent Coulter
CEMCON, Ltd.

Phone: Fax:
E-Mail:

PLANNING ANALYSIS

Intersection:	County Farm Rd. @ North Ave.
Project No:	
City/State:	Carol Stream
Time Period Analyzed:	2010 Sunday 11AM-12PM
Analyst:	BAC
Date:	5/24/00
East/West Street Name:	North Ave.
North/South Street Name:	County Farm Rd.

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Num. Lanes	1	3	1	1	3	1	1	2	1	1	2	1
Volume	195	855	181	180	1136	92	180	216	135	108	394	170
Parking		N			N			N			N	
Coord.		N			N			N			N	
LT Treat.	+			+			+			+		

Peak hour factor: 0.80 Area Type: All other areas

LANE VOLUME WORKSHEET

	EAST BOUND	WEST BOUND	NORTH BOUND	SOUTH BOUND
LEFT TURN MOVEMENT				
1. LT volume	195	180	180	108
2. Opposing mainline volume	1228	1036	564	351
3. Number of exclusive LT lanes	1	1	1	1
Cross Product [2] * [1]	239460	186480	101520	37908
Left Lane Configuration (E=Excl, S=Shrd):	E	E	E	E
Left Turn Treatment Type:	P	P	P	P
4. LT adjustment factor	0.950	0.950	0.950	0.950
5. LT lane vol	205	189	189	114
RIGHT TURN MOVEMENT				
Right Lane Configuration (E=Excl, S=Shrd)	E	E	E	E
6. RT volume	181	92	135	170
7. Exclusive lanes	1	1	1	1
8. RT adjustment factor	0.850	0.850	0.850	0.850
9. Exclusive RT lane volume	213	108	159	200
10. Shared lane vol				
THROUGH MOVEMENT				
11. Thru volume	855	1136	216	394
12. Parking adjustment factor	1.00	1.00	1.00	1.00
13. No. of thru lanes including shared	3	3	2	2
14. Total approach volume	855	1136	216	394
15. Prop. of left turns in lane group	0.00	0.00	0.00	0.00
16. Left turn equivalence				
17. LT adj. factor:				
18. Through lane volume	285	379	108	197
19. Critical lane volume	285	379	159	200

Left Turn Check (if [16] > 8)

20. Permitted left turn sneaker capacity:
    7200/Cmax

SIGNAL OPERATIONS WORKSHEET

	EAST BOUND	WEST BOUND	NORTH BOUND	SOUTH BOUND
Phase Plan Selection from Lane Volume Worksheet				
Critical through-RT vol: [19]	285	379	159	200
LT lane vol: [5]	205	189	189	114
Left turn protection: (P/U/N)	P	P	P	P
Dominant left turn: (Indicate by '<')	<		<	

Selection Criteria based on the specified left turn protection

< Indicates the dominant left turn for each opposing pair

Plan 1:	U	U	U	U
Plan 2a:	U	P	U	P
Plan 2b:	P	U	P	U
Plan 3a:	<P	P	<P	P
Plan 3b:	P	<P	P	<P
Plan 4:	N	N	N	N

Phase plan selected (1 to 4) 3a 3a

Min. cycle (Cmin) 60 Max. cycle (Cmax) 150

Timing Plan	Value	EAST-WEST Ph 1	EAST-WEST Ph 2	EAST-WEST Ph 3	NORTH-SOUTH Ph 1	NORTH-SOUTH Ph 2	NORTH-SOUTH Ph 3
Movement codes		EWL	ETL	EWT	NSL	NTL	NST
Critical phase vol [CV]		189	16	379	114	75	200
Critical sum [CS]	973						
CBD adjustment [CBD]	1.00						
Reference sum [RS]	1368						
Lost time/phase [PL]		4	0	4	4	0	4
Lost time/cycle [TL]	16						
Cycle length [CYC]	60.0						
Phase time		12.5	0.7	21.1	9.2	3.4	13.0
Critical v/c Ratio [Xcm]	0.72						
Status	Under capacity						

HCS: Signalized Intersections Release 3.1c

Brent Coulter
CEMCON, Ltd.

Phone:
E-Mail:
Fax:

PLANNING ANALYSIS

Intersection:	Morton Road @ North Ave.
Project No:	
City/State:	Carol Stream
Time Period Analyzed:	Sunday (2010) - 11AM-12PM
Analyst:	BAC
Date:	5/24/00
East/West Street Name:	North Ave.
North/South Street Name:	Morton Rd.

VOLUME DATA

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Num. Lanes	1	3	1	1	3	1	1	1	0	2	0	1
Volume	262	797	0	1	1363	168	0	0	0	433		69
Parking		N			N			N			N	
Coord.		N			N			N			N	
LT Treat.	+			+			+			P		

Peak hour factor: 0.70

Area Type: All other areas

LANE VOLUME WORKSHEET

	EAST BOUND	WEST BOUND	NORTH BOUND	SOUTH BOUND
LEFT TURN MOVEMENT				
1. LT volume	262	1	0	433
2. Opposing mainline volume	1531	797	69	0
3. Number of exclusive LT lanes	1	1	1	2
Cross Product [2] * [1]	401122	797	0	0
Left Lane Configuration (E=Excl, S=Shrd):	E	E	E	E
Left Turn Treatment Type:	P	P	P	P
4. LT adjustment factor	0.950	0.950	0.950	0.920
5. LT lane vol	276	1	0	235
RIGHT TURN MOVEMENT				
Right Lane Configuration (E=Excl, S=Shrd)	E	E	S	E
6. RT volume	0	168	0	69
7. Exclusive lanes	1	1	0	1
8. RT adjustment factor	0.850	0.850	0.850	0.850
9. Exclusive RT lane volume	0	198		81
10. Shared lane vol			0	
THROUGH MOVEMENT				
11. Thru volume	797	1363	0	0
12. Parking adjustment factor	1.00	1.00	1.00	1.00
13. No. of thru lanes including shared	3	3	1	0
14. Total approach volume	797	1363	0	0
15. Prop. of left turns in lane group	0.00	0.00	0.00	0.00
16. Left turn equivalence				
17. LT adj. factor:				
18. Through lane volume	266	454	0	0
19. Critical lane volume	266	454	0	81

Left Turn Check (if [16] > 8)

20. Permitted left turn sneaker capacity:
    7200/Cmax

SIGNAL OPERATIONS WORKSHEET

	EAST BOUND	WEST BOUND	NORTH BOUND	SOUTH BOUND
Phase Plan Selection from Lane Volume Worksheet				
Critical through-RT vol: [19]	266	454	0	81
LT lane vol: [5]	276	1	0	235
Left turn protection: (P/U/N)	P	P	P	P
Dominant left turn: (Indicate by '<')	<			

Selection Criteria based on the specified left turn protection

< Indicates the dominant left turn for each opposing pair

Plan 1:	U	U	U	U
Plan 2a:	U	P	U	P
Plan 2b:	P	U	P	U
Plan 3a:	<P	P	<P	P
Plan 3b:	P	<P	P	<P
Plan 4:	N	N	N	N

Phase plan selected (1 to 4) 3a 2a

Min. cycle (Cmin) 60 Max. cycle (Cmax) 150

Timing Plan	Value	EAST-WEST Ph 1	EAST-WEST Ph 2	EAST-WEST Ph 3	NORTH-SOUTH Ph 1	NORTH-SOUTH Ph 2	NORTH-SOUTH Ph 3
Movement codes		EWL	ETL	EWT	STL	NST	
Critical phase vol [CV]		1	275	454	235	0	0
Critical sum [CS]	965						
CBD adjustment [CBD]	1.00						
Reference sum [RS]	1197						
Lost time/phase [PL]		4	0	4	4	4	0
Lost time/cycle [TL]	16						
Cycle length [CYC]	82.6						
Phase time		4.1	19.0	35.3	20.2	4.0	0.0
Critical v/c Ratio [Xcm]	0.81						
Status	Under capacity						