

March 12, 2019

Ms. Sue Pruchnicki, FAIA, LEED AP ID+C
Bond Architects
222 South Central Avenue, Suite 100
St. Louis, Missouri 63105

RE: Traffic Impact Study
Proposed Miriam Academy – B’Nai El Congregation Site
1411 North Forty Drive
Frontenac and Westwood, Missouri
CBB Job Number 12-19

Dear Ms. Pruchnicki:

In accordance with your request, CBB has completed a traffic impact study for the proposed Miriam Academy, a school for special needs students, in Frontenac and Westwood, Missouri. The site is located at 1411 North Forty Drive, between Tamaron Place and Highfield Lane, as shown in **Figure 1**. It is our understanding the school is projected to have a capacity of 120 students with approximately ten full-time and five part-time staff members.



Figure 1: Site Location



Access for the school is proposed on North Forty Drive at the same two drives currently serving the existing B’Nai El Congregation. The two access drives are spaced about 300 feet apart. The eastern drive is an entrance only driveway to serve as a pick-up/drop-off lane to the front door, while the west access is two-way and serves the main parking lot for the school.

School renovations are expected to start mid-2019 with an anticipated opening in August of 2020. The school hours are expected to be from 8:30 a.m. to 5:00 p.m. The morning bell is at 8:45 a.m. with the dismissal bell at 3:30 p.m., but nearly all students stay for after-school activities and leave around 5:00 p.m. It is our understanding that all students are expected to be picked up and dropped off by parents with no buses and minimal carpooling.

The purpose of this traffic impact study was to determine the number of additional trips that would be generated by the proposed school, evaluate the impact on the operating conditions for the adjacent roadways, and determine the ability of motorists to safely enter and exit the site. Where necessary, roadway improvements (lane additions and/or traffic control modifications) were recommended to mitigate the impact of the development trips. The focus of our analysis was the AM and PM peak hours of a typical weekday.



EXISTING CONDITIONS

Area Roadway System: Interstate 64 (I-64), also locally known as Highway 40, is a freeway which runs east-west through the greater St. Louis area and beyond. I-64 is owned and maintained by the Missouri Department of Transportation (MoDOT). In the study area, I-64 provides four through lanes in each direction as well as additional lanes where applicable at access ramps.

North Forty Drive is a local road which runs east-west along the north side of I-64. The road provides two lanes, one in each direction. The posted speed limit along North Forty Drive is 35 mph.

Spoede Road is a major collector road which runs north-south. The road generally provides two lanes with auxiliary turn lanes at the major intersections. The posted speed limit along Spoede Road is 30 mph.

The intersection of North Forty Drive with the I-64 westbound ramps is controlled by a single-lane roundabout. All approaches provide one lane. All vehicles must use this roundabout intersection for access between Spoede Road and westbound I-64.

The intersection of Spoede Road and North Forty Drive is controlled by a side-street stop. The eastbound approach provides one left-turn lane and one right-turn lane. The northbound approach provides one left-turn lane and one through lane. The southbound approach provides one shared through/right-turn lane.

Existing Traffic Volumes: CBB collected video turning movement counts in February 2019 at the following intersections during the weekday AM peak period (7:00 - 9:00 a.m.) and weekday PM peak period (3:00 - 6:00 p.m.):

- Spoede Road at North Forty Drive (unsignalized); and
- North Forty Drive at I-64 On/Off Ramps (roundabout).

Based on the existing counts, the morning peak hour occurred between 7:15 and 8:15 a.m. and the PM peak hour occurred between 4:45 and 5:45 p.m. The existing AM and PM peak hour traffic volumes are summarized in **Exhibit 1**.

Given the traffic characteristics in the area and the anticipated trip generation for the proposed school, the weekday AM and PM peak periods hours would likely represent a “worst-case scenario” with regards to the traffic impact. If traffic operations are acceptable during these peak periods, it can be reasoned that conditions would be acceptable throughout the remainder of the day.



Exhibit 1: Existing Traffic Volumes



PROPOSED SITE

Proposed Land Use: Miriam Academy is a new high school for students with special needs proposed on the north side of North Forty Drive, east of Tamaron Place and west of Highfield Lane. The proposed school would have a maximum capacity of 120 students with approximately ten full-time and five part-time staff members.

The school hours are expected to be from 8:30 a.m. to 5:00 p.m. The morning bell is at 8:45 a.m. with the dismissal bell at 3:30 p.m., but nearly all students stay for after-school activities and leave around 5:00 p.m. It is our understanding that all students are expected to be picked up and dropped off by parents with no buses and minimal carpooling.

Site Access: Based upon the concept plan provided and shown in **Exhibit 2**, access for the school is proposed on North Forty Drive at the same two drives currently serving the existing B’Nai El Congregation. The two access drives are spaced about 300 feet apart. The eastern drive is an entrance only driveway to serve as a pick-up/drop-off lane to the front door, while the west access is two-way and serves the main parking lot for the school. The existing east (entrance) driveway is approximately 25 feet wide. The existing west driveway is approximately 23 feet wide.

Intersection Sight Distance: Based on guidelines published in *A Policy on Geometric Design of Highways and Streets* published by the American Association of State Highway and Transportation Officials (AASHTO) often referred to as the *Green Book*, the intersection sight distance requirement for the proposed drives along North Forty Drive is 445 feet (assuming a 35 mph posted speed limit and 40 mph design speed). It is recommended that the proposed drives along North Forty Drive provide a minimum of 445 feet of sight distance. Note that the sight distance was not measured in the field to evaluate the available sight distance at the proposed site drives. CBB recommends the site designer show the appropriate sight triangles on the site plan.

Furthermore, careful consideration should be given to sight distance obstructions when planning any future aesthetic enhancements, such as berms, signs, fencing and landscaping, at any of the site entrances to ensure that these improvements do not obstruct the view of entering and exiting traffic at the site intersections with the public roads. It is generally recommended that all improvements wider than two inches (posts, tree trunks, etc.) and higher than three feet above the elevation of the nearest pavement edge be held back at least 20 feet from the traveled roadway.

Trip Generation: Traffic forecasts were prepared to estimate the amount of traffic the proposed Miriam Academy would generate during the weekday AM and PM peak hours. Since the school is different from most high schools in size, population, and hours, CBB believes a custom trip generation is more appropriate than typical ITE forecasts for Miriam Academy.

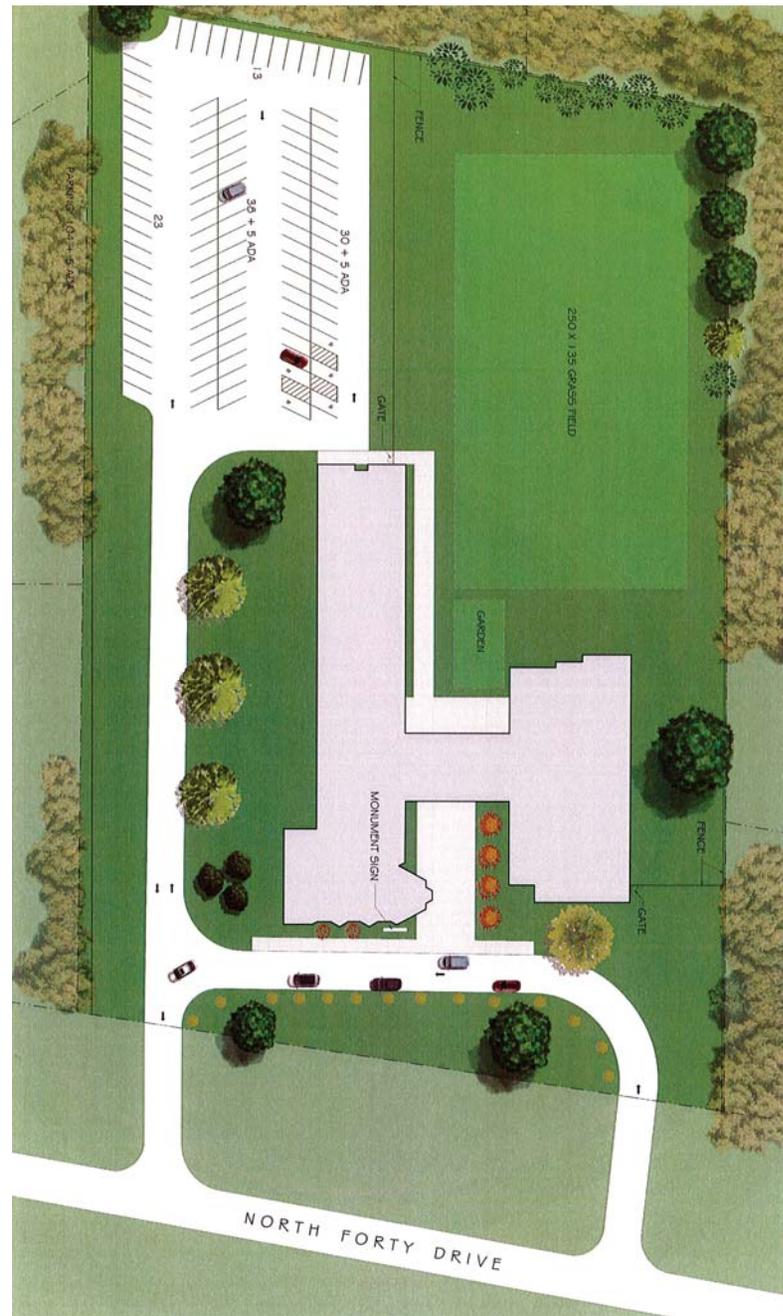


Exhibit 2: Preliminary Site Plan (provided by others)



CBB will conservatively assume that each individual student generates a pick-up/drop-off trip during each peak hour with some faculty and staff arriving/leaving at the same time. As previously noted, the school’s traffic is expected to peak at the same time as the AM and PM commuter peak hour. Therefore, the school traffic will be assigned to the AM and PM commuter peak hour traffic volumes.

Table 1 summarizes the trip generation derived from the assumptions. At full capacity, Miriam Academy expects to generate a total of 250 trips during the weekday AM peak hour and 250 trips during the weekday PM peak hour.

Table 1: Trip Generation Estimate – Miriam Academy

LAND USE	SIZE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Miriam Academy	120 Students (10-15 Staff)	130	120	250	120	130	250

* Trips rounded to nearest 5

Trip Distribution: Directional distribution assumptions were made based on the general locations of student residences provided by the school to assign traffic to the adjacent roadways. Based on the information provided by the school, it is anticipated that the distribution of site-generated trips for the proposed school would be as summarized in **Table 2**.

Table 2: Anticipated Directional Distribution of School Trips

DIRECTION OF TRAVEL	PERCENTAGE OF SITE-GENERATED TRIPS
To/from the west on I-64	60%
To/from the east on I-64	33%
To/from the north on Spuede Road	5%
To/from the south on Spuede Road	2%

The trip distribution was applied to the site-generated traffic volumes and assigned to the adjacent roadways, as shown in **Exhibit 3**. The site-generated traffic (Exhibit 3) was added to the existing traffic volumes (Exhibit 1) to reflect the 2020 Build Traffic Volumes for the weekday AM and PM peak hours, as shown in **Exhibit 4**.



Exhibit 3: Site-Generated Traffic Volumes



Exhibit 4: 2020 Build Traffic Volumes (Existing plus Proposed School Trips)



KNOWN PROJECTS/ROADWAY IMPROVEMENTS

A new library administration and genealogy building is proposed on the east side of Spuede Road, opposite the eastbound I-64 ramps, between I-64 and Clayton Road.

Since a Technical Memorandum for the library project documenting the trip generation and anticipated directional distribution is not yet available, forecasts were prepared to estimate the amount of traffic the proposed library administration building would generate during the weekday AM and PM peak hours. These forecasts were based upon information provided in the *Trip Generation Manual*, 10th Edition, published by the Institute of Transportation Engineers (ITE). This manual, which is a standard resource for transportation engineers, is based on a compilation of nationwide studies documenting the characteristics of various land uses.

Specifically, ITE Code 710 – General Office Building was utilized for the proposed library administration and genealogy building with an estimated 180 employees. **Table 3** summarizes the trip generation derived from the ITE data. Based on the ITE data, the proposed library building would generate a total of 75 trips during the AM and PM peak hours.

Table 3: Trip Generation ITE Estimate – County Library Building

LAND USE	SIZE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		IN	OUT	TOTAL	IN	OUT	TOTAL
General Office Building (Land Use 710)	180 Employees	60	15	75	15	60	75

* Trips rounded to nearest 5

The following directional distribution was assumed for the library administration and genealogy building:

- 35% to/from the east on I-64 (partially not in this project study area);
- 35% to/from the west on I-64 (partially not in this project study area);
- 15% to/from the north on Spuede Road; and
- 15% to/from the south on Spuede Road (not in this project study area).

The trips associated with the proposed library building were added to the 2020 Build traffic volumes to form a “Future Build” condition. The Future Build AM and PM peak hour volumes are summarized in **Exhibit 5**.



Exhibit 5: Future Build Traffic Volumes (2020 Build plus Library Building Trips)



2020 TRAFFIC ANALYSIS

Study Procedures: The existing and forecasted operating conditions were analyzed using SYNCHRO 10, a macro-level analytical traffic flow model. SYNCHRO is based on study procedures outlined in the *Highway Capacity Manual*, published by the Transportation Research Board. This manual, which is used universally by traffic engineers to measure roadway capacity, establishes six levels of traffic service: Level A ("Free Flow"), to Level F ("Fully Saturated"). Levels of service (LOS) are measures of traffic flow, which consider such factors as speed, delay, traffic interruptions, safety, driver comfort, and convenience. Level C, which is normally used for highway design, represents a roadway with volumes ranging from 70% to 80% of its capacity. However, Level D is often considered acceptable for peak period conditions in urban and suburban areas.

The thresholds that define level of service at an intersection are based upon the type of control used (i.e., whether it is signalized or unsignalized) and the calculated delay. For signalized and all-way stop intersections, the average control delay per vehicle is estimated for each movement and aggregated for each approach and then the intersection as a whole. At intersections with partial (side-street) stop control, delay is calculated for the minor movements only since motorists on the main road are not required to stop.

Level of service is directly related to control delay. At signalized intersections, the level of service criteria differs from that at unsignalized intersections primarily because varying transportation facilities create different driver expectations. The expectation is that a signalized intersection is designed to carry higher traffic volumes, and consequently may experience greater delay than an unsignalized intersection. **Table 4** summarizes the thresholds used in the analysis for signalized and unsignalized intersections.

Table 4: Level of Service Thresholds

LEVEL OF SERVICE (LOS)	CONTROL DELAY PER VEHICLE (SEC/VEH)	
	SIGNALIZED INTERSECTIONS	UNSIGNALIZED INTERSECTIONS
A	≤ 10	0-10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50



Operating Conditions: The study intersections were evaluated using the methodologies described above. **Table 5** summarizes the results of the Existing, 2020 Build, and Future Build operating conditions during the weekday AM and PM peak hours at the side-street stop study intersections. The 95th percentile queue lengths are also listed for the eastbound approach of North Forty Drive at the Spoeede Road intersection.

Table 5: Existing and Build Operating Conditions

INTERSECTION / APPROACH	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
	EXISTING CONDITION	2020 BUILD CONDITION	FUTURE BUILD CONDITION	EXISTING CONDITION	2020 BUILD CONDITION	FUTURE BUILD CONDITION
Spoeede Road at North Forty Drive (Side-Street Stop)						
Eastbound North Forty Drive Left-Turn	E (42.0)*	F (86.3) **	F (106.0) **	F (54.3)	F (130.3) **	F (177.9) **
95 th Percentile Queue	60'	105'	125'	65'	115'	135'
Eastbound North Forty Drive Right-Turn	B (12.4)*	B (13.3)**	B (14.0)**	D (29.4)*	E (40.4)**	E (43.1)**
95 th Percentile Queue	20'	30'	35'	110'	165'	175'
Northbound Spoeede Road Left-Turn	A (8.9)	A (9.4)	A (9.5)	B (10.8)	B (11.7)	B (12.1)
North Forty Drive at Miriam Academy West Driveway (Side-Street STOP)						
Eastbound North Forty Drive Approach		A (<1.0)	A (<1.0)		A (<1.0)	A (<1.0)
Southbound Site Driveway Approach		A (9.2)	A (9.4)		A (9.2)	A (9.4)

X (XX.X) - Level of Service (Vehicular delay in seconds per vehicle)

* Observations of existing traffic indicate significantly lower delays

** Based on the existing observations, forecasted delays are also expected to be shorter than those calculated by Synchro

The roundabout at the intersection of North Forty Drive and the I-64 Westbound Ramps was also evaluated. The traffic volumes were analyzed using the SIDRA 6 intersection software, which is the most widely recognized tool available for evaluating roundabouts. This software package calculates vehicular delay times and operational LOS that are consistent with methods supported by the HCM, volume to capacity ratios (v/c) and 95th percentile queue estimates.

It should be noted that direct comparisons of LOS and delay reported by Synchro and SIDRA should not be made between a side-street stop control intersection and an all-way stop, traffic signal, or a roundabout, since the side-street stop only requires the minor approaches to make a complete stop, while the other controls require multiple approaches to yield and/or stop. **Table 6** summarizes the results of the 2020 Existing, 2020 Build, and Future Build roundabout operating conditions during the weekday AM and PM peak hours for the intersection of North Forty Drive and the I-64 westbound ramps.



Table 6: Existing and Build Roundabout Operating Conditions

Intersection / Approach	Weekday AM Peak Hour			Weekday PM Peak Hour		
	Existing Conditions	2020 Build Conditions	Future Build Conditions	Existing Conditions	2020 Build Conditions	Future Build Conditions
North Forty Drive at I-64 Westbound Ramps (Roundabout)						
Eastbound North Forty Drive Approach	A (4.3)	A (6.6)	A (6.7)	A (4.6)	A (7.6)	A (7.9)
Westbound North Forty Drive Approach	A (5.3)	A (7.1)	A (7.2)	A (5.9)	A (7.9)	A (8.3)
I-64 Westbound Off-Ramps Approach	A (5.0)	A (6.1)	A (6.4)	A (6.2)	A (7.8)	A (7.9)
Overall	A (5.1)	A (6.7)	A (6.8)	A (6.0)	A (7.8)	A (8.0)

X (XX.X) - Level of Service (Vehicular delay in seconds per vehicle)

Under the Existing conditions, the study intersections operate at acceptable levels of service (LOS D or better overall) during both peak hours with the exception of the eastbound North Forty Drive left-turn movement at Spoede Road, which operates at LOS E during the AM peak hour and LOS F during the PM peak hour.

While LOS F is generally considered less than desirable, the all-way stop at the intersection of Spoede Road and Lynnbrook Road/Frontenac Estates Drive, approximately 400 feet to the north, meters traffic at the North Forty Drive intersection to provide artificial gaps for vehicles making the eastbound left and right turns. This was confirmed in the field, where it was observed that the eastbound turning movements experienced approximately one third the delay that the Synchro analysis estimated under existing conditions during the PM peak hour.

Under 2020 Build Conditions, the proposed site driveways would operate acceptably, and the I-64 eastbound ramps roundabout would continue to operate acceptably during both peak hours. However, the eastbound North Forty Drive right-turn movement at Spoede Road would degrade from LOS E to LOS F during the AM peak hour and remain at LOS F with more delay during the PM peak hour. Only five (5) vehicles are added to the eastbound North Forty Drive left-turn movement at Spoede Road during the peak hours. Based on existing observations, the forecasted delays are also expected to be shorter than those calculated by Synchro.

Under the Future Build Conditions, with the additional volume on Spoede Road, the eastbound North Forty Drive left and right-turn movements at Spoede Road would degrade further during both peak hours. Again, based on existing observations, the future delays are also expected to be shorter than those calculated by Synchro.



Traffic Signal: Given the poor level of service for the eastbound North Forty Drive approach at Spoede Road in the analyses, the need for a traffic signal at Spoede Road and North Forty Drive was evaluated using criteria outlined in the MUTCD. Chapter Four of the MUTCD provides nine different warrants for signalization that are based on hourly traffic volumes, traffic operations, pedestrian volumes or crash experience. The Manual further states that a traffic signal should not be installed unless one or more warrants are satisfied, an engineering study indicates that the installation will improve the overall safety and/or operation of the intersection, and that a traffic signal will not seriously disrupt progressive traffic flow.

Warrant 1A (Minimum Vehicular Volume) requires hourly two-way approach volumes of at least 500 vehicles per hour (vph) on a major street with one lane per direction for any eight hours of a typical day. During those same eight hours, the volume of traffic entering from the higher volume approach of the minor street must exceed 150 vph assuming a one lane approach on the minor street. When a left-turn lane is provided on the minor street, CBB generally considers only the left-turn lane and left-turn volumes for the minor street approach since right-turns are more easily accommodated by existing gaps and only conflict with one direction of traffic on the major street.

Warrant 1B (Interruption of Continuous Traffic) requires two-way approach volumes of at least 750 vph on major streets with one lane per direction. During those same eight hours, the higher volume approach of the minor street volume must exceed 75 vph for a one lane approach.

A summary of the volume requirements for Signal Warrants 1A and 1B are shown in **Table 7**.

Table 7: MUTCD Warrants 1A and 1B: Eight-Hour Vehicular Volumes

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

Since full-day counts were unavailable, 55% of the peak hour volume was used to determine the estimated volume for the eighth-highest hour. Reviewing the existing PM peak hour traffic volumes, the major street has a peak hour total of 905 vph, and 55% of that volume is 498 vph. The eastbound left-turn movement has a peak hour volume of 65 vph, and 55% of that volume



is 35 vph. Based on the estimated eighth hour volumes, a traffic signal at the Spoede Road and North Forty Drive intersection would not meet Warrant 1A or Warrant 1B.

If the eastbound right-turns are also included, the volumes would then be compared to the warrants for one major street lane and two minor street lanes. Including eastbound right-turns, the minor street would have a volume of 280 vph, and 55% of that volume is 155 vph. Similarly, based on the estimated eighth hour volumes, a traffic signal at the Spoede Road and North Forty Drive intersection would still not meet Warrant 1A or Warrant 1B including the right-turns.

Under 2020 Build conditions, the major street would have a peak hour total of 910 vph, and 55% of that volume is 500 vph. The minor street left-turn movement would have a volume of 70 vph, and 55% of that volume is 40 vph. Based on the estimated eighth hour volumes in the 2020 Build conditions, a traffic signal at the Spoede Road and North Forty Drive intersection would still not meet Warrant 1A or Warrant 1B.

Including eastbound right-turns, the minor street would have a volume of 330 vph, and 55% of that volume is 180 vph. Based on the estimated eighth hour volumes, a traffic signal at the Spoede Road and North Forty Drive intersection would still not meet Warrant 1A or Warrant 1B including the right-turns.

Under Future Build conditions, the major street would have a peak hour total of 925 vph, and 55% of that volume is 510 vph. The minor street left-turn would have a volume of 70 vph, and 55% of that volume is 40 vph. Based on the estimated eighth hour volumes in the Future Build conditions, a traffic signal at the Spoede Road and North Forty Drive intersection would not meet Warrant 1A or Warrant 1B.

Including eastbound right-turns, the minor street would have a volume of 335 vph, and 55% of that volume is 185 vph. Based on the estimated eighth hour volumes, a traffic signal at the Spoede Road and North Forty Drive intersection would still not meet Warrant 1A or Warrant 1B including the right-turns.

Since a traffic signal is not warranted in any of the above scenarios, a traffic signal is not recommended.

If a traffic signal were installed at the intersection, the delay for the eastbound left-turn movement exiting North Forty Drive (approximately 70 – 85 vehicles in the peak hours) would improve; however, the delay for the 985 to 1,115 vehicles traveling on Spoede Road during the peak hours that currently do not have to stop would increase. Stopping traffic along Spoede Road with a traffic signal would create long southbound queues that would extend into the intersection of Spoede Road and Lynnbrook Road/Frontenac Estates Drive intersection. Based on visual inspection, it appears that the all-way stop is installed at Lynnbrook Road/Frontenac



Estates Drive due to a lack of adequate sight distance. Again, given the Spoede Road and North Forty Drive intersection does not meet the signal warrant criteria, it is not recommended that a traffic signal be installed.

Traffic Control Alternatives: An all-way stop and roundabout alternative was also considered at the intersection of North Forty Drive and Spoede Road. An all-way stop would improve the poor level of service for the eastbound approach, but it would have significant negative impact on the north-south Spoede Road through traffic, causing the southbound approach to operate at LOS E during the AM peak hour and LOS F during the PM peak hour with long queues that would extend into the intersection of Spoede Road and Lynnbrook Road/Frontenac Estates Drive.

A roundabout alternative was also evaluated at the intersection of North Forty Drive and Spoede Road. A single-lane roundabout would operate at an overall LOS E with the southbound approach operating at LOS F during the PM peak hour with expected queues that would extend into the intersection of Spoede Road and Lynnbrook Road/Frontenac Estates Drive.

Separate left- and right-turn lanes are already provided on North Forty Drive to minimize the delay for the side-street approach. Consequently, there are not any further improvements, short of a traffic signal or roundabout (which is not recommended or warranted at this time), that would lessen the delay for motorists desiring to turn left from North Forty Drive onto Spoede Road.

Based on the above analyses and the observed side-street delay being much less than the Synchro estimated delay, CBB suggests leaving the intersection of Spoede Road and North Forty Drive as side-street stop. The proposed Miriam Academy would add very few vehicles (five or less per hour) to the left-turn movement, which is the more difficult turning movement to make. Furthermore, the proposed school's traffic would only increase average delay for the right-turn movement to increase by only eleven seconds per vehicle with the 95th percentile queue increasing by two vehicles.

Bicycle and Pedestrian Accommodations: Based on the school's location and its population of special needs students, very few bicycle and pedestrian trips are expected to access the site. Because of this, CBB does not foresee a need to implement bicycle and pedestrian accommodations on site or to/from the adjacent roadway.



SUMMARY

CBB completed the preceding study to address the traffic impacts associated with the proposed Miriam Academy in Frontenac and Westwood, Missouri. The following summary is provided:

- Access for the site is proposed via the existing site driveways, one full-access driveway to the west and one ingress-only driveway to the east.
- The proposed school building would have a capacity of 120 students and 15 staff members in the new building.
- The proposed school is estimated to generate 250 new trips during the AM and PM peak hours.
- All intersection approaches currently operate at acceptable levels (LOS D or better) under Existing Conditions, with the exception of the eastbound North Forty Drive left-turn movement at Spoede Road. However, the observed eastbound delays were scientifically lower than the Synchro estimated delays.
- All intersections are expected to continue to operate at acceptable levels (LOS D or better) overall under 2020 Build Conditions during both peak hours with the exception of the eastbound North Forty Drive left turn movement at Spoede Road, which would operate at LOS F during both peak hours and the eastbound right-turn movement which would operate at LOS E during the PM peak hour. Based on the existing observations, the forecasted delays are also expected to be shorter than those calculated by Synchro.
- All intersections are expected to continue to operate at acceptable levels (LOS D or better) overall under Future Conditions (2020 Build plus proposed Library building trips) during both peak hours except for the eastbound North Forty Drive left turn movement at Spoede Road, which would operate at LOS F during both peak hours and the eastbound right-turn movement which would operate at LOS E during the PM peak hour. Based on the existing observations, the forecasted delays are also expected to be shorter than those calculated by Synchro.
- A traffic signal is not warranted at the intersection of Spoede Road and North Forty Drive in any scenario and even if installed would generate queues that would impact the intersection of Spoede Road at Lynnbrook Road/Frontenac Estates Drive. As such, a traffic signal is not warranted or recommended.
- All-way stop control at Spoede Road and North Forty Drive would improve the delays for the eastbound approach, but would result in poor operations for the heavy north-south approaches and southbound queues that would impact the intersection of Spoede Road at Lynnbrook Road/Frontenac Estates Drive. As such, an all-way stop controlled intersection is not recommended.
- A single lane roundabout at Spoede Road and North Forty Drive would improve the delay for the eastbound approach, but would provide poor operations for the



intersection overall as well as for the heavy southbound approach. The southbound queues would impact the intersection of Spoede Road at Lynnbrook Road/Frontenac Estates Drive. As such, a single lane roundabout is not recommended.

- Based on the above analyses and the observed side-street delay being much less than the Synchro estimated delay, CBB suggest leaving the intersection of Spoede Road and North Forty Drive as side-street stop.
 - The observed eastbound delays were approximately thirty-three percent lower than the Synchro estimated delays during the PM peak.
 - Miriam Academy would add very few vehicles (five or less per hour) to the left-turn movement.
 - The proposed school's traffic would only increase average delay for the right-turn movement by eleven seconds per vehicle with the 95th percentile queue increasing by two vehicles.
- No bicycle or pedestrian facilities are necessary to accommodate the school based on their unique operations.

We trust that you will find the information presented in this report useful in evaluating the traffic impacts associated with the proposed Miriam Academy. Please contact me via email at brensing@cbbtraffic.com or by phone at 314-449-9569 should you have any questions or comments concerning this material.

Sincerely,

Brian Rensing, PE, PTOE, RSP
Associate – Senior Transportation Engineer