Traffic Impact Study

Proposed Parkway South Early Childhood Center
Manchester, Missouri

Prepared for:

Ms. Rebecca Kleba
Bond Architects, Inc.

CBB Job Number:

118-23

Date:

March 4, 2024

Submitted by:

CBB TRANSPORTATION ENGINEERS+PLANNERS

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March 4, 2024

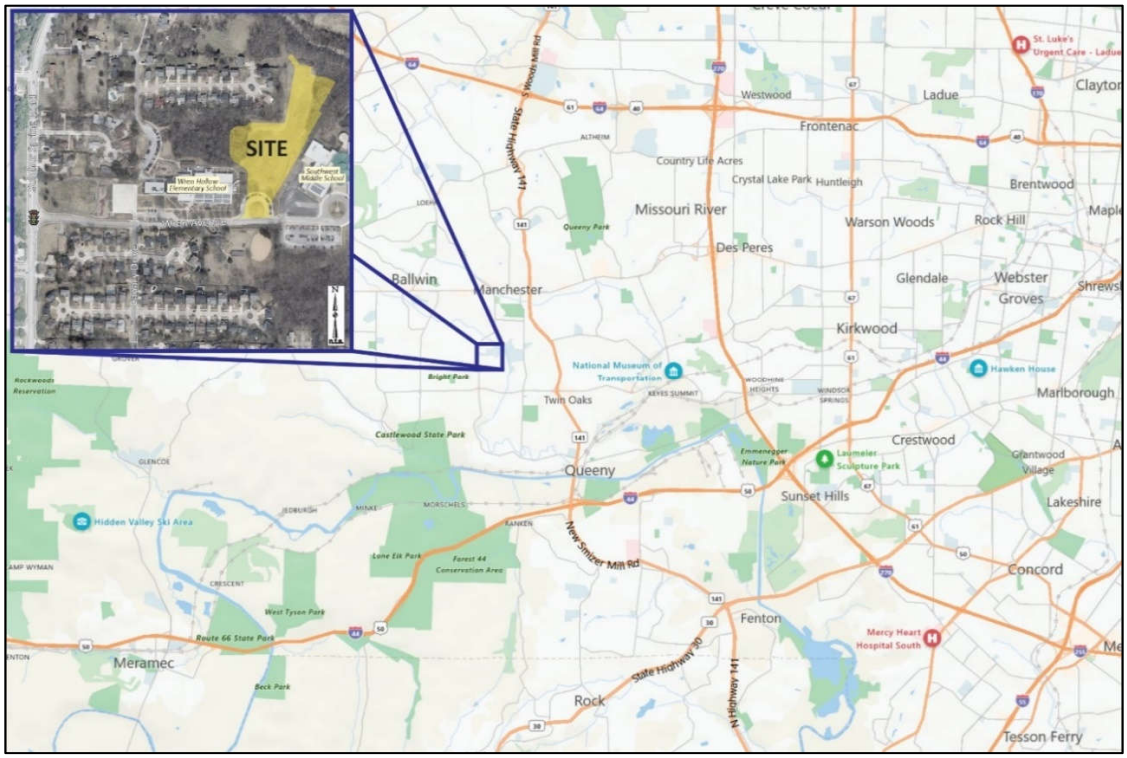
Ms. Rebecca Kleba
Principal/Project Manager
Bond Architects, Inc.
222 S Central Avenue, Suite 501
St. Louis, Missouri 63105

RE: Traffic Impact Study
Proposed Parkway South Early Childhood Center
Manchester, Missouri
CBB Job No. 118-23

Dear Ms. Kleba:

As requested, CBB has completed a traffic impact study pertaining to the proposed Parkway Early Childhood Center (ECC) for the South area of Parkway School District in Manchester, Missouri. The selected site is generally located between the two existing schools on Wren Avenue, east of Wren Hollow Elementary School and to the west of Southwest Middle School. The location of the site is depicted in **Figure 1**.

Figure 1: Early Childhood Center Site Location



The purpose of this study was to determine the number of additional trips that would be generated by the proposed development, assign the trips to the adjoining roadways, evaluate the impact of the additional trips on the operating conditions for the adjacent roadways, and determine the ability of motorists to safely enter and exit the site. If necessary, roadway improvements (lane additions and/or traffic control modifications) would be recommended to mitigate the impact of the proposed development and to accommodate the additional traffic. The focus of this study was the morning arrival and afternoon dismissal peak hours of a typical school day at Wren Hollow Elementary School and Southwest Middle School. It should be noted that a parking study was not conducted within the scope of this project.

It is our understanding that Parkway School District plans to construct a new Early Childhood Center (ECC) building and parking lot between the existing Wren Hollow Elementary School and Southwest Middle School. The proposed parking lot is intended to be built north of the existing circle drive between the elementary school and middle school buildings. The Parkway ECC plans to follow a 12-classroom model with eight classrooms intended to accommodate 18 students each and four classrooms intended to accommodate ten students each. The total enrollment for the 12-classroom model is expected to be 184 students. There is the potential a thirteenth classroom could host specialty courses, like a cooking class, for 12 parents and 12 students to take together. This course option would not be offered every day and would only include the addition of 12 vehicles entering the site at the beginning of the class and exiting at the end of the class. The site is also expected to be supported by 65-70 staff members. A schematic of the most current concept plan provided by you is shown in **Exhibit 1**.

An in-person coordination meeting was held at Southwest Middle School on Thursday, September 14, 2023. CBB met with representatives of the School District, Parkway Early Childhood Center, the Southwest Middle School Principal, and the civil site designers to discuss the proposed site plan, current operations, and identify known issues of concern. A field visit was made to inventory the existing road conditions and observe arrival and dismissal traffic patterns and flow levels. CBB used this information to identify concerns and provide recommendations to improve safety and traffic flow during arrival and dismissal peak hours for both existing schools as well as the proposed ECC.

Prior to field observations, CBB discussed school operations and enrollment numbers via phone calls with the Southwest Middle School Principal and Wren Hollow Elementary School Principal. CBB also contacted city public works staff to discuss their concerns related to the proposal. This study was prepared in order to address those issues and provide recommendations for safe and efficient traffic flow for all users – parent vehicles, school buses, the general motoring public and children walking and biking to/from school.

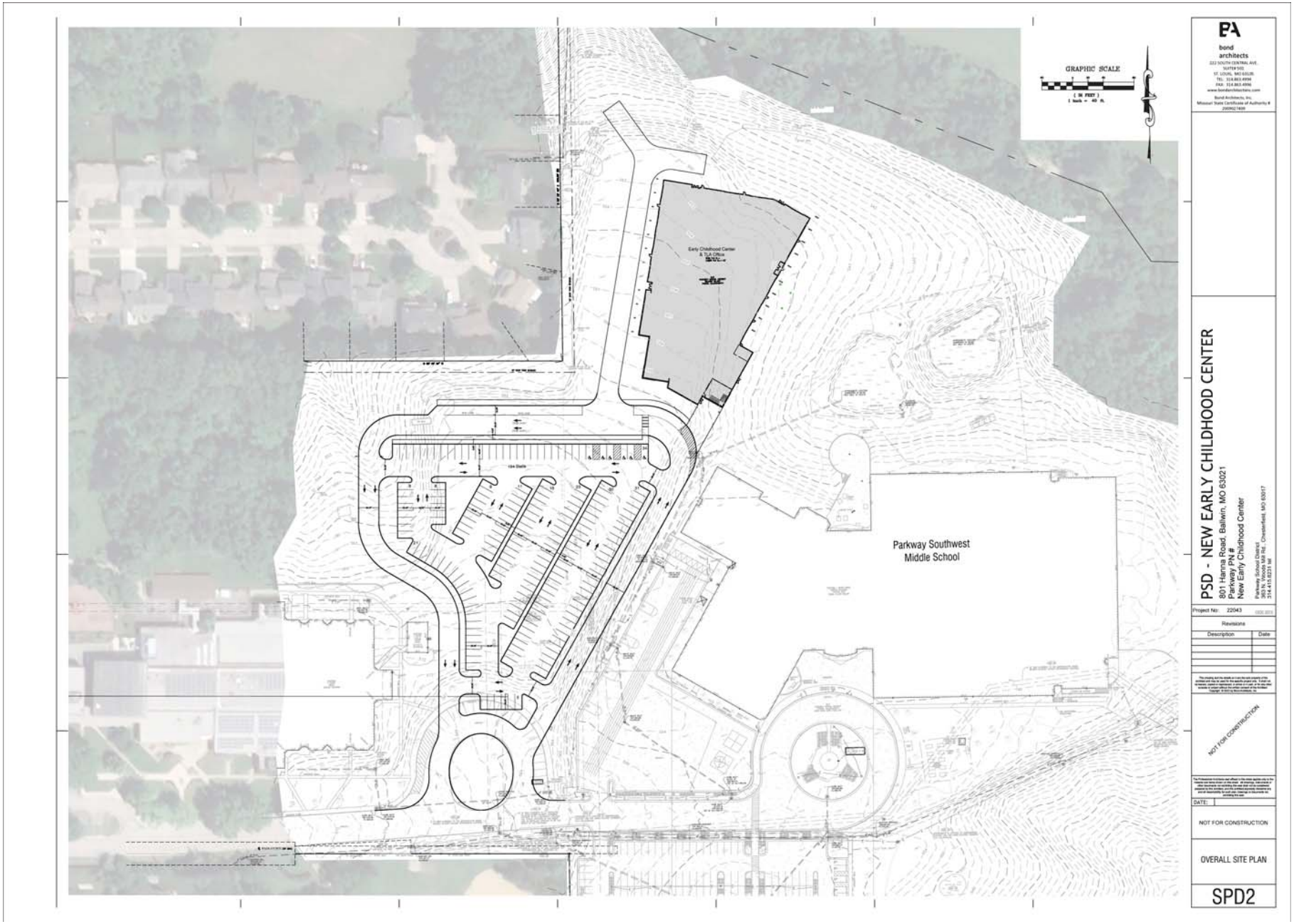


Exhibit 1: Preliminary Site Plan (provided by others)

EXISTING CONDITIONS

Area Roadway System: Wren Avenue is an east-west, two-lane roadway with one lane in each direction. It has a posted speed limit of 25 miles per hour (mph) and provides access to Wren Hollow Elementary School, Southwest Middle School and several single-family homes. There are sidewalks along both sides of the roadway. On-street parking is not allowed. From Sulphur Spring Road to Canary Drive, Wren Avenue is owned and maintained by the City of Manchester. There is a transitional segment between Canary Drive and a driveway opposite Wren Hollow Elementary School where the school district owns the northern part of the right-of-way, and the City of Manchester maintains the southern part of the right-of-way. East of this driveway, the school district owns and maintains the entire pavement.

Sulphur Spring Road is a north-south minor arterial owned and maintained by St. Louis County Department of Transportation (SLCDOT). Within the study area, Sulphur Spring Road provides one lane in each direction and a two-way left-turn lane (TWLTL). It has a posted speed limit of 35 miles per hour (mph) and provides residential access. When flashing, school speed limit signs indicate the posted speed limit is reduced to 25-mph when school traffic is arriving or departing. There are sidewalks provided along both sides of the roadway.

Canary Drive is a north-south local road owned and maintained by the City of Manchester. Canary Drive is a two-lane roadway with one lane in each direction. It has a posted speed limit of 25-mph and provides residential access. There are sidewalks along both sides of the roadway. On-street parking is not provided.

The intersection of Wren Avenue and Sulphur Spring Road operates under electric signal control. The northbound approach provides a shared through/right-turn lane. The southbound approach provides a separate left-turn lane and one through lane. The westbound approach provides separate left-turn and right-turn lanes.

The intersection of Wren Avenue and Canary Drive operates under all-way stop control. All approaches provide a single shared left-turn/through/right-turn lane. All other intersections included in this study operate under side-street stop control.

Existing Schools: Wren Hollow Elementary School and Southwest Middle School are both located on the north side of Wren Avenue. Wren Hollow Elementary School has a current enrollment of approximately 450 students and approximately XX staff members, while Southwest Middle School has a current enrollment of 750 students and approximately 75 staff members. The Southwest Middle School principal indicated that the middle school's enrollment has the physical capacity to increase in the coming years.

Existing Operations: Classroom sessions at Southwest Middle School begin at 8:15 a.m., and the dismissal bell rings at 3:15 p.m. Doors open for students to enter the building no earlier than 8:00

a.m. Parents dropping students off in the morning are supposed to line up in dual lanes in the parking lot/student loading zone west of the school. Drivers are expected to enter the middle school's student loading zone and circulate along the east curb in a counterclockwise manner. Cones are used to indicate two lanes along the north edge of the lot where vehicles are directed to pull up before letting students out.

During the afternoon dismissal period for Southwest Middle School, parents line up in the parking lot/student loading zone adjacent to the school. The lines wrap around the edge of the lot in three lanes. A school resource officer helps direct traffic at Wren Avenue. The circle drive in front of the school is reserved for bus parking and bus student loading at dismissal.

Parents are notified of these operations at the beginning of each school year. A video is provided to inform parents of these operations, and the cones are used as a source of guidance from the start of the year. Five newsletters are sent to parents and guardians with reminders of these operations throughout the year. As noted below, CBB's observations found that parents generally follow the school's safe loading plan.

Classroom sessions at Wren Hollow Elementary School begin with the first bell at 9:05 a.m. and dismissal at 3:53 p.m. Parents dropping students off in the mornings line up in a single file line in the one-way parking lot, the curb in front of the school, the circle drive to the east, or park in the neighborhoods south of the school to walk their child over. During the PM dismissal period for Wren Hollow Elementary School, parents line up along the curb south of the elementary school in a single file line and queues extend into the half-circle drive and sometimes reach the middle school's circle drive. Some parents/guardians will park in the neighborhood south of the school and walk to the crosswalk to pick up their student. A crossing guard is stationed at the Canary Drive intersection to help coordinate vehicular traffic with pedestrian crossings.

The school buses have different operations for both schools. For morning drop-off at Southwest Middle School, the buses drop off students along the circle drive in front of the school. For the afternoon dismissal period, buses pick-up students along the same circle drive, and the school resource officer stops all traffic so the buses can leave without interruption. For morning drop-off at Wren Hollow Elementary School, a teacher opens a gate to the playground area west of the elementary school for buses to drop-off students. For the afternoon dismissal period, buses load students in the same playground area west of the school.

Existing Traffic Volumes: To establish base traffic volumes, CBB conducted video traffic counts during the school weekday morning arrival (7:00 - 10:00 a.m.) and afternoon dismissal (2:00 - 5:00 p.m.) peak periods on Thursday, December 14, 2023. Counts were collected at the following intersections:

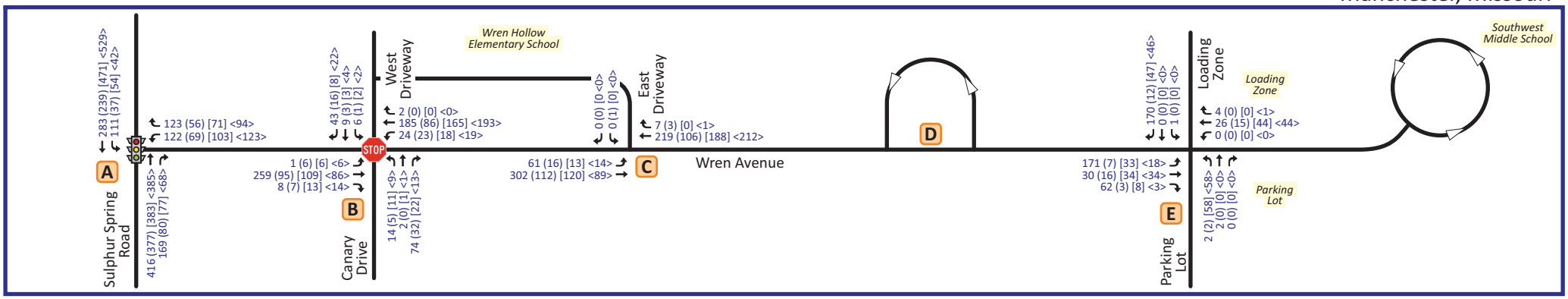
- Wren Avenue and Sulphur Spring Road (signalized);
- Wren Avenue and Canary Drive/Wren Hollow Elementary West Driveway (side-street stop);
- Wren Avenue and Wren Hollow Elementary School West Driveway (side-street stop); and

- Wren Avenue and Southwest Middle School Student Loading Zone/Parking Lot.

The 2024 Existing Traffic Volumes from the CBB counts on December 14, 2023 are summarized in **Exhibit 2**. Based on the traffic data collected and the focus of the use during the school morning arrival and afternoon dismissal periods, the following peak hours were identified for evaluation in this study:

- Southwest Middle School morning arrival peak hour: **7:30 – 8:30 a.m.**
- Wren Hollow Elementary School morning arrival peak hour: **8:15 – 9:15 a.m.**
- Southwest Middle School afternoon dismissal peak hour: **3:00 – 4:00 p.m.**
- Wren Hollow Elementary School afternoon dismissal peak hour: **3:15 – 4:15 p.m.**

It should be noted that these periods overlap based on the offset of start/end times for the adjacent schools, but our study is intended to be comprehensive with respect to traffic impacts.



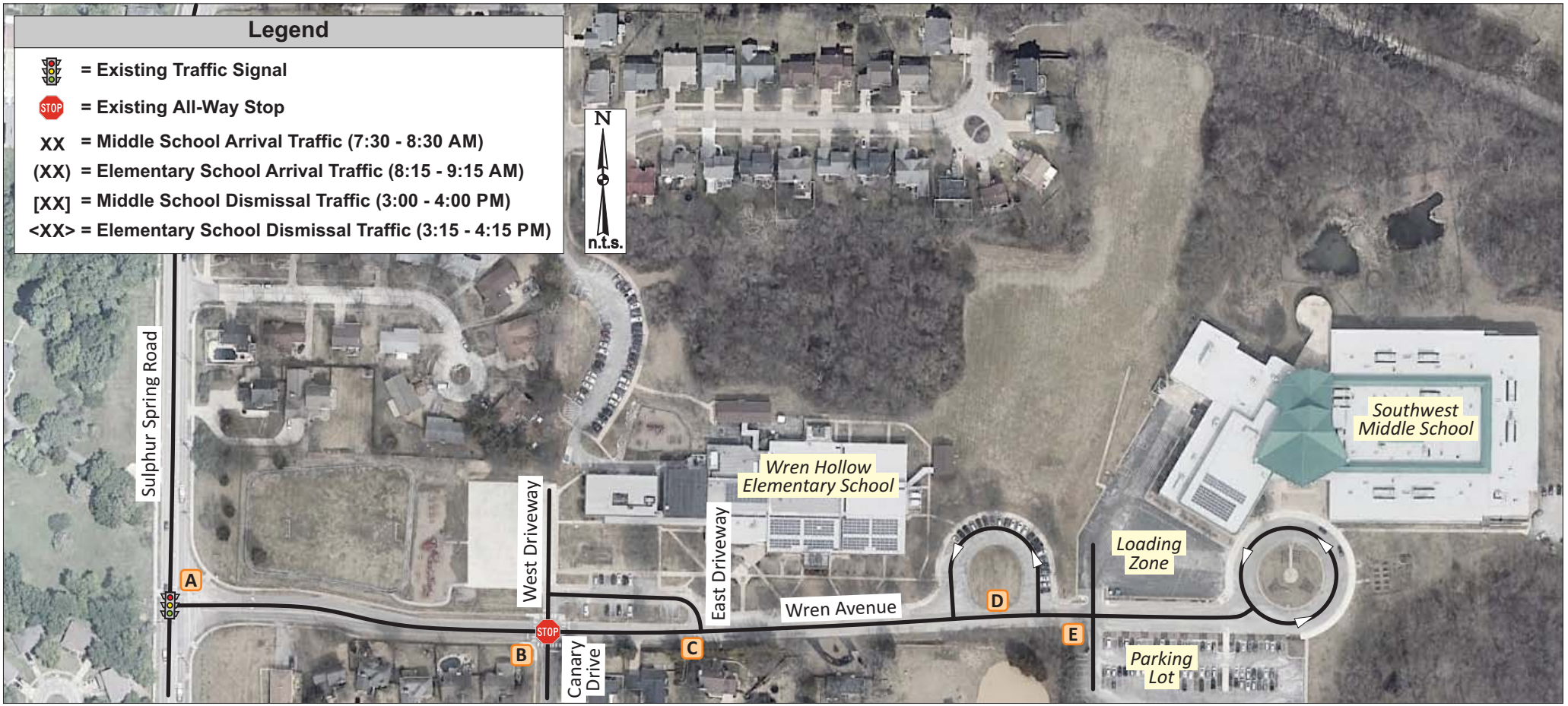


Exhibit 2: 2024 Existing Traffic Volumes

Job# 118-23
03/01/2024

CBB TRANSPORTATION ENGINEERS+PLANNERS

OBSERVATIONS

CBB conducted a field study during the weekday morning arrival and afternoon dismissal periods on Thursday, December 14, 2023 at Southwest Middle School and Wren Hollow Elementary School. CBB staff verified information discussed in the scoping meeting, took inventory of the existing facilities and documented operations discussed earlier in this report.

Morning Arrival Observations at Southwest Middle School

As shown in **Table 1**, a total of 205 vehicles circulated through the parent drop-off area between the times of 7:45 a.m. and 8:35 a.m. Most vehicles arriving prior to 8:00 a.m. dropped students off in the student loading zone next to the middle school and left the students to wait outside the school. A maximum queue of five cars was recorded before 8:00 a.m. The cars in this queue waited with students inside their cars until the school opened doors for students to enter the building at 8:00 a.m.

Table 1: Southwest Middle School Morning Vehicle Drop-Off

Five Minute Interval	Number of Vehicles Through Drop-Off
Before 8:00 a.m.	44
8:00 – 8:05 a.m.	44
8:05 – 8:10 a.m.	51
8:10 – 8:15 a.m.	36
8:15 – 8:20 a.m.	16
8:20 – 8:25 a.m.	5
8:25 – 8:30 a.m.	4
After 8:30 a.m.	5
Total	**205**

**First bell at 8:15 a.m.*

The intended drop-off procedure is for drivers to enter the middle school's student loading zone and circulate along the east curb in a counterclockwise manner. Cones are used to indicate two lanes along the north edge of the lot where vehicles are directed to pull up before letting students out. During observations, drivers often stopped to let students out before reaching the cones, and the second lane was rarely used. This caused queues to occasionally reach the entrance to the lot and spill back onto Wren Avenue. Despite drivers failing to utilize the entire drop-off area to its full effectiveness, traffic flowed relatively well.

During the peak five-minute interval from 8:05 a.m. – 8:10 a.m., a westbound queue formed on Wren Avenue that backed up to the middle school student loading zone. The queue was brief

and appeared to back up from the all-way stop at Canary Drive due to some competing traffic from the elementary school drop-off operations.

After 8:15 a.m., drivers began to ignore the "Do Not Enter – Buses Only" sign and started to utilize the circle drive in front of the school for dropping off students. After 8:20 a.m., all drop-offs took place in the circle drive in front of the school. There were no queues at this point.

Figure 2: Southwest Middle School Morning Operations

Buses began to arrive at 7:45 a.m. The two buses that arrived prior to 8:00 a.m. waited with students on board in the circle drive in front of the school until the doors opened at approximately 8:00 a.m. After 8:00 a.m., the buses arrived periodically and used the circle drive in front of the school. At peak, the frontage of the circle drive was full; however, no buses had to wait to unload. Buses generally unloaded quickly, and there were no major queues of buses waiting to unload.

A group of ten students walked to school through the woods on a trail that connects the southern parking lot to a subdivision further south. The circle drive located between Southwest Middle School and Wren Hollow Elementary School provides sidewalks along the perimeter that were rarely used by pedestrians. Students typically walked parallel to Wren Avenue and cut across the grassy area at the center of the circle drive, creating conflicts with vehicular traffic when crossing the roadway and posing safety concerns. Along with students walking to school, a few students rode bicycles to school and mostly rode on the sidewalks wherever these facilities were available. There is a bicycle rack located in front of the school to the east of the circle drive, as shown in **Figure 3**.

Figure 3: Southwest Middle School Bicycle Facilities

Morning Arrival Observations at Wren Hollow Elementary School

Table 2 shows that a total of 79 vehicles circulated through the drop-off area between the times of 8:40 a.m. and 9:05 a.m. The official policy for drop-off is for vehicles to pass the school on Wren Avenue and use the circle driveway to the east to turn around and drop students off in the drop-off zone. The drop-off zone is located between the circle drive to the east and the small lot at the southwest corner of the school. Vehicles began to arrive at 8:35 a.m. and waited several minutes before allowing students out of the car to enter the school at 8:40 a.m.

Table 2: Wren Hollow Elementary Morning Vehicle Drop-Off

Five Minute Interval	Number of Vehicles Through Drop-Off
Before 8:40 a.m.	4
8:40 – 8:45 a.m.	14
8:45 – 8:50 a.m.	17
8:50 – 8:55 a.m.	21
8:55 – 9:00 a.m.	12
9:00 – 9:05 a.m.	8
After 9:05 a.m.	3
Total	**79**

**First bell at 9:05 a.m.*

Buses begin to arrive at approximately 8:40 a.m. in the southwest parking lot. A crossing guard was located at the all-way stop at Canary Drive, just south of the school. Two staff members assisted the students with getting from their cars to the front of the school. Fifteen to twenty students walked across the all-way stop intersection to get to school between 8:45 and 8:55 a.m. At the peak drop-off time (8:50 – 8:55 a.m.), the entire frontage of the drop off zone was full;

although, the queue never extended into the east circle drive. Overall, the elementary school had less congestion than the middle school, and traffic operations were smoother.

Afternoon Dismissal Observations at Southwest Middle School

The general pick-up procedure is located in the same location as the morning arrival operations. Vehicles queue into three lanes wrapping around the edge of the lot where the vehicles pull into the lanes from the outside to inside. Students make their way out of the main doors to either the buses or parent pick-up area at approximately 3:15 p.m. A school resource officer helps direct traffic at the intersection of Wren Avenue and the loading zone/parking lot.

Table 3: Southwest Middle School Afternoon Vehicle Pick-Up

Five Minute Interval	Number of Vehicles Through Pick-Up
Before 3:15 p.m.	30
3:15 – 3:20 p.m.	33
3:20 – 3:25 p.m.	21
3:25 – 3:30 p.m.	19
Total	**103**

**Final bell at 3:15 p.m.*

The first vehicle showed up to the pick-up site at 2:41 p.m. Prior to 2:55 p.m., 5-10 vehicles were waiting in the half circle lot between the schools. Around 3:10 p.m., a queue in the half circle started to form, leading to a peak queue of 19 vehicles. When students were dismissed at 3:15 p.m., some students walked to vehicles in the half circle to be picked up. Around 3:20 p.m., the three pickup lines were released, and pick-up traffic started to move out.

The first bus arrived at 2:41 p.m. All fourteen buses departed at 3:22 p.m. This procedure consists of the SRO stopping all other traffic to let the buses through and then allowing the southern parking lot traffic to leave followed by the parent pick-up lot traffic. A queue from the all-way stop intersection formed as the buses merged in with the traffic that picked up in the half circle. When the buses were dismissed from the circular drive, it caused a stack up of about 13 vehicles at the pick-up lot entrance. At 3:35 p.m., two buses for special education students arrived for pick-up. The homeowner that lives in the house on Wren Avenue directly across from Wren Hollow Elementary mentioned to the CBB observer that his driveway occasionally gets blocked after 3:00 p.m. during the middle school's dismissal period.

Most pedestrians walking home at school dismissal continue along Wren Avenue west of the middle school. Ten to fifteen students used the same trail south of the school that was mentioned previously to walk home.

Afternoon Dismissal Observations at Wren Hollow Elementary School

Students were dismissed from school at 3:53 p.m., and all were assisted to the pick-up area by staff members from the school. The queue for pick-up before dismissal stacked up to the circular drive located in front of Southwest Middle School. The system for pick-up starts with a staff member with a megaphone calling student names corresponding to each car in the drop-off line. Students found their way to their car, and the car would either wait for the queue in front of them to start moving before leaving, or the car would pull out of the queue and merge onto Wren Avenue.

Table 4: Wren Hollow Elementary School Afternoon Vehicle Pick-Up

Five Minute Interval	Number of Vehicles Through Pick-Up
Before 3:53 p.m.	43
3:53 – 3:58 p.m.	27
3:58 – 4:03 p.m.	23
After 4:03 p.m.	0
Total	**93**

**Final bell at 3:53 p.m.*

The buses line up in the same lot west of the school as they do in the morning. There were six total buses recorded with the following arrival times: three at 3:48 p.m., one at 3:50 p.m., one at 3:51 p.m., and one at 3:53 p.m. At dismissal, teachers led groups of students to the buses and to the Wren Avenue/Canary Drive intersection to meet parents. At 4:03 p.m., the buses departed from the loading zone together as a group.

Parents at the intersection waited in the northeast quadrant. At 3:49 p.m., pedestrian parents arrived near the all-way stop to accompany their children on the walk home. At 3:50 p.m., a crossing guard wearing personal protective equipment (high visibility vest, inc.) arrived at the east crossing of the Wren Avenue and Canary Drive intersection. At 3:55 p.m., groups of walking students are led to parents near the all-way stop intersection, and most of these students continued to the neighborhood to the south.

It is noted that what appeared to be a daycare center for afterschool care had some pickups taking place during this time in the lot north of the school. The crossing guard also “directed traffic” when there were no pedestrians crossing. The guard waved westbound traffic through the intersection; thus, vehicles were not observing the stop sign and continued full speed through the intersection as directed. This practice reduces congestion, but it should be clarified with the city police department whether or not the guard has this authority, verified with the employer of the guard that they have the appropriate training and equipment, and considered with the risk management/safety team at the school district with respect to potential liability.

A neighbor noted that there are more severe queues for pick-up when the weather is more extreme due to students not wanting to walk home from school.

PROPOSED PARKWAY SOUTH EARLY CHILDHOOD CENTER

Proposed Land Use

It is our understanding that the school district intends to build a new Early Childhood Center (ECC) between the existing Wren Hollow Elementary School and Southwest Middle School. The Parkway ECC plans to follow a 12-classroom model with eight classrooms intended to accommodate 18 students each and four classrooms intended to accommodate ten students each. The total enrollment for the 12-classroom model is expected to be 184 students. There is the potential that a thirteenth classroom could host specialty courses, like a cooking class, for 12 parents and 12 kids to take together. This course option would not be offered every day and would only be expected to include the addition of 12 vehicles entering the site at the beginning of the class and exiting at the end of the class. The site is also expected to be supported by 65-70 staff members.

Site Access

Access to the proposed parking lot is intended to connect to the existing circle drive between the elementary school and middle school buildings. The internal road around the proposed parking lot maintains the one-way flow of the existing traffic circle, which will allow Wren Hollow Elementary School to continue to use its existing drop-off and pick-up operations with additional roadway length available for queues, if needed. Modifications to these operations may be needed to prevent queues from blocking access to and from the Parkway ECC site. Since the parking lot on the Parkway ECC site allows for directional travel, CBB recommends restricted movement signage be posted at all access points where two-way travel transitions to the one-way counterclockwise flow.

Sight Distance

Adequate sight distance is necessary at intersections to allow drivers to perceive potentially conflicting vehicles and allow those motorists sufficient time to adjust their speed to avoid a collision or make a choice of when to cross or enter the mainline traffic flow. All drivers approaching or stopped at the intersection should have an unobstructed view of the entire intersection so that potential collisions can be avoided.

Intersection sight distance should be provided based on the guidelines published in *A Policy on Geometric Design of Highways and Streets* published by the American Association of State Highway and Transportation Officials (AASHTO), commonly referred to as the *Green Book.* The *Green Book* method incorporates the design speed of the major road and the required gap time for a minor road vehicle to enter or cross the major road to define the minimum safe distance for entrance visibility. The design speed is generally assumed to be the posted speed limit plus five mph, unless detailed speed study data is available. Based on the *Green Book* method, the intersection sight distance (ISD) is computed according to the following formula:

$$ISD = 1.47 * \text{Design Speed (mph)} * \text{Design Gap (sec)}$$

As more detailed plans are developed, it is recommended that the site civil engineer illustrate the minimum sight distance triangle requirements on the plans at each proposed access point to ensure that adequate sight distance can be achieved within the clear area of the right-of-way or road corridor where on private property. Furthermore, careful consideration should be given to sight distance obstructions when designing the intersections or planning any future aesthetic enhancements, such as signage, berms, fencing and landscaping to ensure that these improvements do not obstruct the view of entering and exiting traffic at the intersections with the public roads. It is generally recommended that all improvements wider than two inches (posts, tree trunks, etc.) and higher than 3.5 feet above the elevation of the nearest pavement edge be held back at least 20 feet from the traveled roadway.

Trip Generation

As a primary step in this analysis, traffic forecasts were developed using the *Trip Generation Manual*, Eleventh Edition, published by the Institute of Transportation Engineers (ITE) to determine the anticipated number of trips for the proposed development. The ITE manual, which is a standard resource for transportation engineers, is based on a compilation of nationwide studies documenting the trip generation characteristics of various land uses. Forecasts were prepared to estimate the amount of traffic that the proposed early childhood center would generate during the weekday morning and weekday afternoon peak hours, see **Table 5**. ITE does not provide trip estimates for a preschool or early childhood center. The most similar trip generator from the *Trip Generation Manual*, although different, would be the Day Care Center land use. Specifically, ITE Code 565 (Day Care Center) was investigated to develop trip generation estimates as a comparison to the other method detailed later.

Table 5: ITE Trip Generation Estimate – Day Care Center

ITE Code	Land Use	Size	Weekday Morning Peak Hour			Weekday Afternoon Peak Hour		
			In	Out	Total	In	Out	Total
565	Day Care Center	184 Students	60	55	115	55	60	115

Based on ITE trip generation forecasts, a day care center with 184 students is estimated to generate 115 new trips during the weekday morning peak hour and 115 new trips during the weekday afternoon peak hour. Under trip estimates from ITE, a day care center for 184 students is estimated to produce 0.63 trips per student during the morning peak hour and 0.63 trips per student during the afternoon peak hour. It is important to note that most data points from the 70+ studies used to generate these estimates served 20-120 students. The trips produced during the peak hours by the generators with a higher number of students varied widely. The operations of a day care center are typically different than that of an early childhood center or preschool and may not produce comparable trip estimates.

Therefore, due to the unique nature of the proposed use and its proximity to the existing schools, CBB created separate trip estimates to account for the operations of this specific site, which are shown in **Table 6**.

Table 6: Parkway South Early Childhood Center Trip Generation Calculations

Land Use	Trip Description	Weekday AM Peak Hour			Weekday PM Peak Hour		
		In	Out	Total	In	Out	Total
Early Childhood Center	Parent Drop-Off/Pick-Up	105	105	210	105	105	210
	Staff Member	15	0	15	0	15	15
	Total	120	105	225	105	120	225

Given the proximity of Wren Hollow Elementary School and Southwest Middle School, it is reasonable to assume a vehicle traveling to the new Parkway ECC could also be transporting a sibling to one of the existing schools adjacent to the site or have multiple students enrolled at the ECC. In CBB's trip estimates for the Parkway ECC, it was assumed that one in three vehicles could be transporting more than one student. Thus, a 75% factor was applied to the enrollment to assume three trips in and out for every four Parkway ECC students.

Due to staggered drop-off and pick-up times, representatives from the Parkway ECC indicated that families trickle in at different times, unlike the strict start and end times of the adjacent elementary and middle schools. It was assumed that 75% of the expected total parent trips will drop-off during the morning peak hour, and 75% of total parent trips will pick-up during the afternoon peak hour.

It is anticipated that most staff members would arrive prior to students in the morning and depart after students in the afternoon; however, there could still be some overlap of staff members arriving or departing during the same peak hours identified in this study. Therefore, it was assumed that approximately 25% of total staff would arrive during the morning peak hour, and 25% of total staff would depart during the afternoon dismissal peak hour.

The potential thirteenth classroom for hosting specialty courses, like a cooking class for 12 parents and 12 kids to take together, was considered when preparing these trip generation estimates. No trips from this classroom were included in the estimated peak hour trip generation, since this course option would not be offered every day, likely to begin and end during the off-peak hours in the middle of the day and produce few trips.

The proposed Parkway ECC is estimated to generate 210 new parent drop-off trips during the morning school arrival peak hour and 210 new pick-up trips during the afternoon dismissal peak hour. It was also assumed that staff members would contribute approximately 15 new trips

entering during the morning arrival peak hour and 15 new trips exiting during the afternoon dismissal peak hour.

Trip Distribution

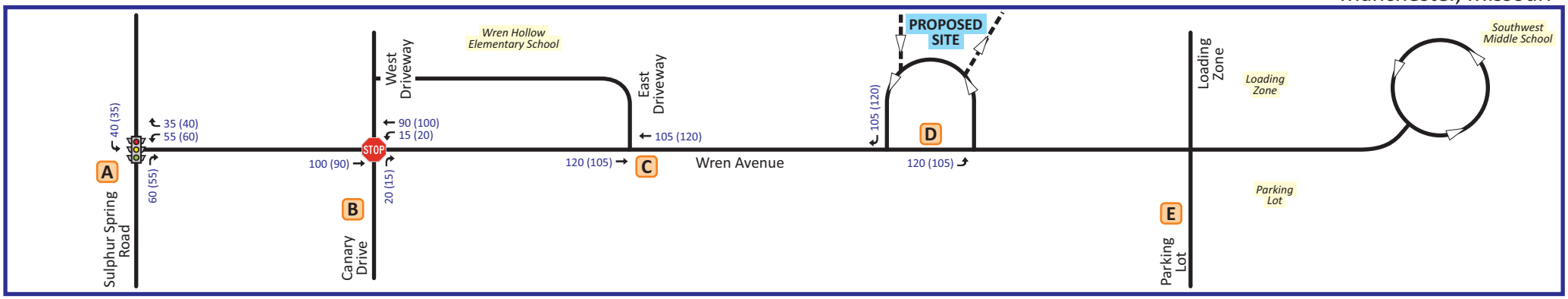
The new site-generated trips for the proposed Parkway ECC were assigned into and out of the site based upon an estimated directional distribution as shown in **Table 7**. The estimated directional distributions were based on the existing traffic counts at the Sulphur Spring Road intersection during the arrival and dismissal peak hours of both schools for traffic to/from the north or south. We noted that current counts show a noticeable number of vehicles use Canary Drive for ingress from the neighborhoods to the southeast, especially in the morning arrival, but fewer vehicles use that route for afternoon ingress and morning/afternoon egress.

Table 7: Directional Distribution Assignments

Direction	***Distribution***
To/from the north on Sulphur Spring Road	35%
To/from the south on Sulphur Spring Road	50%
To/from the south on Canary Drive	15%

The Parkway ECC site-generated trips for the weekday morning arrival and afternoon dismissal peak hours are shown in **Exhibit 3**.

2024 Build Traffic Volumes: The total site-generated trips (Exhibit 3) for the proposed Parkway ECC were added to the 2024 Existing Traffic Volumes (Exhibit 2) to determine the total volumes in the 2024 Build scenario. The 2024 Build Traffic Volumes for the weekday morning arrival and afternoon dismissal peak hours are shown in **Exhibit 4**.



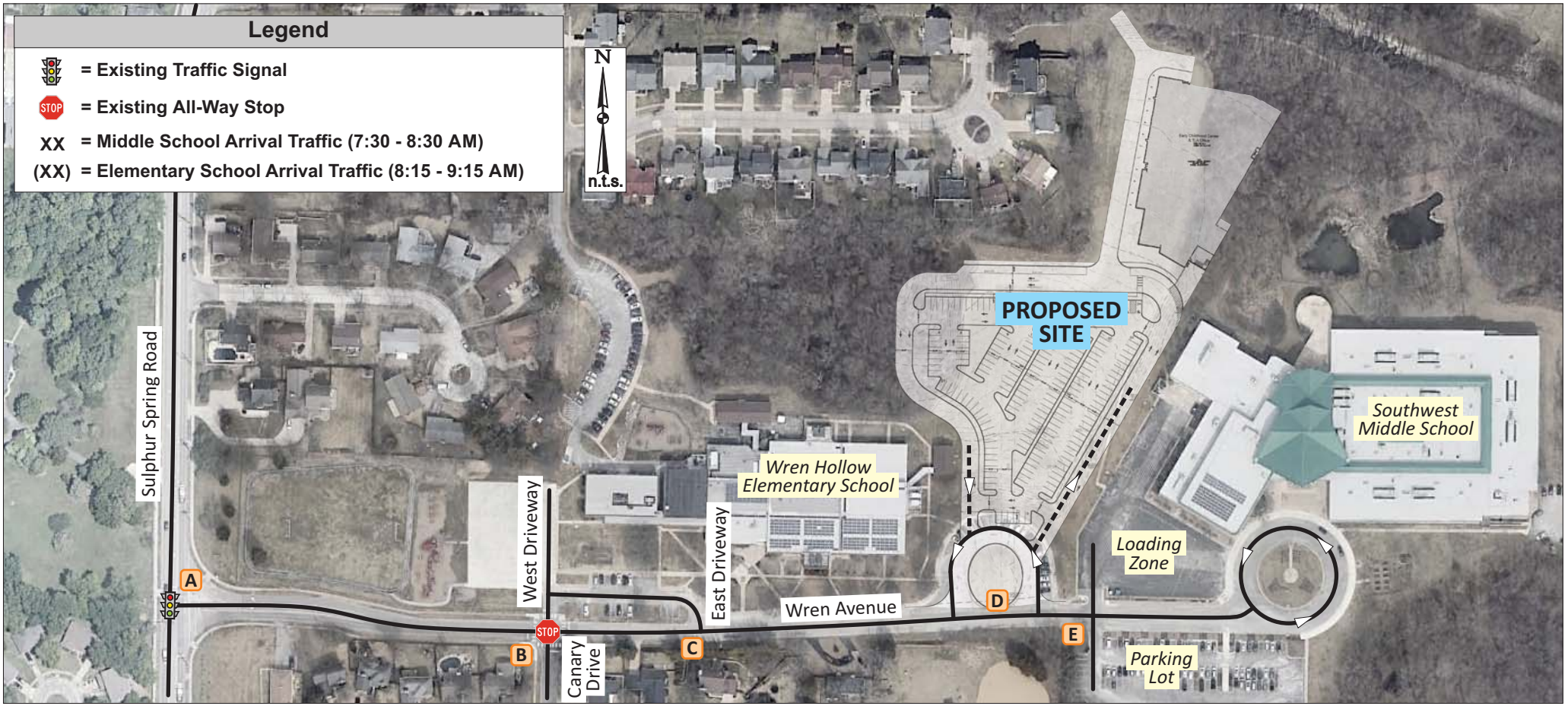


Exhibit 3: Total Site-Generated Trips - Parkway South ECC

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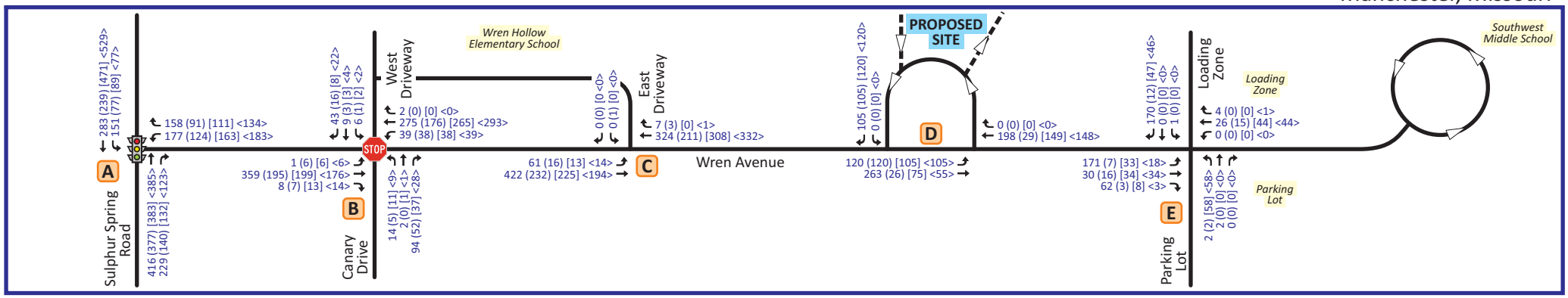

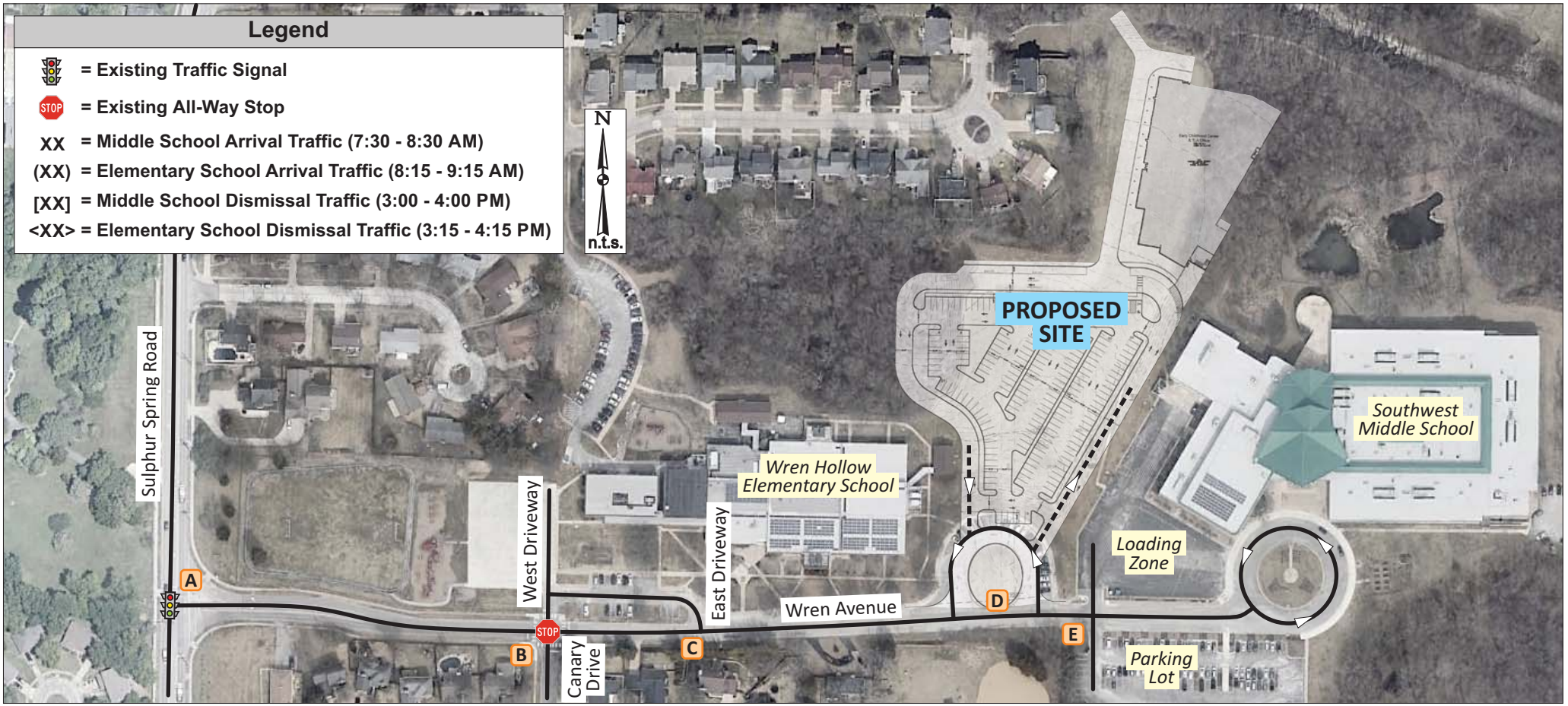

Exhibit 4: 2024 Build Traffic Volumes

Job# 118-23
03/01/2024

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TRAFFIC ANALYSIS

Analysis Procedures: The operating conditions for the existing and proposed scenarios were analyzed using SYNCHRO 11, 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 of service 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 8** summarizes the thresholds used in these analyses for signalized and unsignalized intersections.

Table 8: 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

2024 Operating Conditions: The public street intersections were evaluated using the methodologies described above. It should be noted that school operations typically have short peak activity times, often 20-30 minutes. Our analyses reflect the worst 30 minutes using peak

hour factors derived from the 15-minute intervals of the video traffic counts. Thus, the conditions reflected below do not occur for the full hour, but for approximately 30 minutes (total of both schools' impacts) in each the morning and afternoon. **Wren** Avenue, the overall intersection is expected to degrade from LOS D to LOS F. The westbound left-turn movement is expected to degrade from LOS D to E with an increase in delay of approximately twelve seconds. The northbound approach is expected to degrade from LOS E to LOS F with significant delay and see the 95th percentile queue length increased from 675-feet to 835-feet. The westbound approach at the intersection of Canary Drive and Wren Avenue is expected to continue to operate at LOS F with increased delays as well.

Table 9 summarizes the results of these analyses, which reflect the 2024 Existing and 2024 Build operating conditions during the weekday morning arrival and afternoon dismissal peak hours for Wren Hollow Elementary School.

Table 10 summarizes the results of the 2024 Existing and 2024 Build operating conditions during the weekday morning arrival and afternoon dismissal peak hours for Southwest Middle School.

All approaches and individual movements operate very well under 2024 Existing conditions during the morning arrival and afternoon dismissal for the elementary school and the afternoon dismissal for the middle school, all at LOS C or better. During the morning arrival under 2024 existing conditions for the middle school, the intersection of Sulphur Spring Road and Wren Avenue operates at LOS D overall. The northbound approach at the signalized intersection operates at LOS E and produces a 95th percentile queue length of 675-feet. The westbound approach at the intersection of Canary Drive and Wren Avenue operates at LOS F under the 2024 Existing conditions during the morning arrival peak hour for the middle school.

Under the 2024 Build traffic volumes during the elementary school peak hours, the morning arrival and afternoon dismissal are expected to operate similar to the 2024 Existing conditions with minor increases in delay. All movements and approaches are expected to operate at LOS D or better.

During the middle school peak hours for the 2024 Build scenario, increased delays and queues are expected at some movements for the short periods of arrival and dismissal times. The afternoon dismissal operates similar to the 2024 Existing conditions with minor increases in delay overall and most movements operating acceptably at LOS D or better. At the intersection of Canary Drive and Wren Avenue, the westbound Wren Avenue approach is expected to degrade from LOS B to LOS E with an increase in delay of approximately 25 seconds.

During the middle school morning arrival peak hour, the 2024 Build traffic volumes are expected to degrade multiple movements without mitigation measures. At the intersection of Sulphur Spring Road and Wren Avenue, the overall intersection is expected to degrade from LOS D to LOS F. The westbound left-turn movement is expected to degrade from LOS D to E with an increase in delay of approximately twelve seconds. The northbound approach is expected to degrade from LOS E to LOS F with significant delay and see the 95th percentile queue length increased from 675-feet to 835-feet. The westbound approach at the intersection of Canary Drive and Wren Avenue is expected to continue to operate at LOS F with increased delays as well.

Table 9: Wren Hollow Elementary School Peak Hour Traffic Operating Conditions – 2024 Existing and 2024 Build Traffic Volumes

Intersection/Approach	Elementary School Morning Arrival Peak Hour		Elementary School Afternoon Dismissal Peak Hour	
	2024 Existing	2024 Build	2024 Existing	2024 Build
Wren Avenue and Sulphur Spring Road (Signalized)				
Westbound Wren Avenue Approach	C (20.6)	C (25.1)	C (21.1)	C (25.6)
Westbound Left-Turn	*C (30.7)*	*D (39.6)*	*C (30.6)*	*D (38.5)*
Northbound Sulphur Spring Road Approach	B (13.5)	C (20.2)	B (17.6)	C (26.2)
95th Percentile Queue Length	*250'*	*410'*	*300'*	*450'*
Southbound Sulphur Spring Road Approach	A (4.7)	A (5.9)	B (11.5)	B (13.8)
Southbound Left-Turn	*A (4.2)*	*A (6.6)*	*A (6.6)*	*A (9.8)*
Overall	***B (12.1)***	***B (17.3)***	***B (15.6)***	***C (20.8)***
Wren Avenue and Canary Drive/Wren Hollow Elementary School West Driveway (All Way STOP)				
Eastbound Wren Avenue Approach	A (9.0)	B (12.8)	A (9.1)	B (12.1)
Westbound Wren Avenue Approach	A (9.3)	B (14.7)	B (12.1)	D (29.4)
Northbound Canary Drive Approach	A (7.9)	A (9.6)	A (8.5)	A (9.8)
Southbound West Driveway Approach	A (8.4)	A (9.7)	A (9.0)	B (10.3)
Wren Avenue and Wren Hollow Elementary School East Driveway (Side-Street STOP)				
Eastbound Wren Avenue Approach	A (1.0)	A (<1.0)	A (2.0)	A (1.4)
Westbound Wren Avenue Approach	Free Flow	Free Flow	Free Flow	Free Flow
Southbound East Driveway Approach	B (11.5)	C (16.3)	A (<1.0)	A (<1.0)
Wren Avenue and Circle Drive/Parkway ECC Driveway (Side-Street STOP)				
Eastbound Wren Avenue Approach		A (6.4)		A (6.2)
Westbound Wren Avenue Approach		Free Flow		Free Flow
Southbound Circle Drive/Parkway ECC Driveway Approach		A (9.3)		B (11.5)

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

Table 10: Southwest Middle School Peak Hour Traffic Operating Conditions – 2024 Existing and 2024 Build Traffic Volumes

Intersection/Approach	Middle School Morning Arrival Peak Hour		Middle School Afternoon Dismissal Peak Hour	
	2024 Existing	2024 Build	2024 Existing	2024 Build
Wren Avenue and Sulphur Spring Road (Signalized)				
Westbound Wren Avenue Approach	C (26.0)	C (33.2)	C (23.0)	C (28.4)
Westbound Left-Turn	*D (44.6)*	*E (56.4)*	*C (33.5)*	*D (43.4)*
Northbound Sulphur Spring Road Approach	E (60.5)	F (164.8)	B (19.7)	C (30.5)
95th Percentile Queue Length	*675'*	*835'*	*310'*	*505'*
Southbound Sulphur Spring Road Approach	B (13.8)	C (21.3)	A (9.0)	B (11.9)
Southbound Left-Turn	C (24.4)	D (36.4)	A (6.9)	B (11.7)
Overall	***D (38.1)***	***F (84.7)***	***B (15.9)***	***C (22.7)***
Wren Avenue and Canary Drive/Wren Hollow Elementary School West Driveway (All Way STOP)				
Eastbound Wren Avenue Approach	C (23.4)	F (71.7)	A (9.6)	B (13.8)
Westbound Wren Avenue Approach	F (66.4)	F (>200)	B (12.1)	E (36.5)
Northbound Canary Drive Approach	B (13.3)	C (16.1)	A (8.5)	B (10.2)
Southbound West Driveway Approach	B (12.4)	B (13.7)	A (8.6)	A (10.0)
Wren Avenue and Wren Hollow Elementary School East Driveway (Side-Street STOP)				
Eastbound Wren Avenue Approach	A (3.2)	A (4.3)	A (1.4)	A (1.1)
Westbound Wren Avenue Approach	Free Flow	Free Flow	Free Flow	Free Flow
Southbound East Driveway Approach	A (<1.0)	A (<1.0)	A (<1.0)	A (<1.0)
Wren Avenue and Circle Drive/Parkway ECC Driveway (Side-Street STOP)				
Eastbound Wren Avenue Approach		A (4.5)		A (5.4)
Westbound Wren Avenue Approach		Free Flow		Free Flow
Southbound Circle Drive/Parkway ECC Driveway Approach		B (14.4)		B (11.9)

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

2024 Alternative Operating Conditions: In order to accommodate the additional traffic volumes from the Parkway South ECC, mitigation measures were considered as 2024 Build Alternatives for the signalized intersection at Sulphur Spring Road and Wren Avenue, as well as the unsignalized intersection of Canary Drive and Wren Avenue.

At the intersection of Sulphur Spring Road and Wren Avenue, the addition of a northbound right-turn lane was explored. At the intersection Canary Drive and Wren Avenue, the transition from an all-way stop to side-street stop control was considered.

The results of these alternatives were compared to the 2024 Existing and 2024 Build traffic volumes. **Table 11** shows the results for the morning arrival and afternoon dismissal peak hours of Wren Hollow Elementary School. **Table 12** provides the results for the morning arrival and afternoon dismissal peak hours for Southwest Middle School.

The addition of a northbound right-turn lane at the signalized intersection is expected to improve operations at the intersection for the morning arrival and afternoon dismissal of the elementary school and middle school peak hours. During the elementary school peak hours, all movements are expected to operate at LOS C or better. During the middle school peak hours, all movements are expected to operate at LOS D or better with improved 95th percentile queue lengths.

The consideration of side-street stop control for the intersection of Canary Drive and Wren Avenue, operates acceptably during both elementary school peak hours. During the middle school morning arrival peak hour, the eastbound and westbound Wren Avenue approaches improve to LOS A; however, the northbound and southbound approaches degrade to LOS F. During the middle school afternoon dismissal, the eastbound and westbound approaches improve to LOS A, while the northbound and southbound approaches operate acceptably at LOS C.

Table 11: Wren Hollow Elementary School Peak Hour Traffic Operating Conditions – 2024 Existing and 2024 Build Traffic Volumes Compared to Alternatives

Intersection/Approach	Elementary School Morning Arrival Peak Hour			Elementary School Afternoon Dismissal Peak Hour		
	2024 Existing	**2024 Build**	**2024 Build Alt**	**2024 Existing**	**2024 Build**	**2024 Build Alt**
Wren Avenue and Sulphur Spring Road (Signalized) – Northbound Right-Turn Lane Alternative						
Westbound Wren Avenue Approach	C (20.6)	C (25.1)	C (20.4)	C (21.1)	C (25.6)	C (22.9)
Westbound Left-Turn	*C (30.7)*	*D (39.6)*	*C (31.4)*	*C (30.6)*	*D (38.5)*	*C (34.2)*
Northbound Sulphur Spring Road Approach	B (13.5)	C (20.2)	B (12.6)	B (17.6)	C (26.2)	B (17.6)
95th Percentile Queue Length	*250'*	*410'*	*225'*	*300'*	*450'*	*290'*
Southbound Sulphur Spring Road Approach	A (4.7)	A (5.9)	A (6.4)	B (11.5)	B (13.8)	B (14.4)
Southbound Left-Turn	*A (4.2)*	*A (6.6)*	A (6.4)	*A (6.6)*	*A (9.8)*	A (9.4)
Overall	***B (12.1)***	***B (17.3)***	***B (12.7)***	***B (15.6)***	***C (20.8)***	***B (17.7)***
Wren Avenue and Canary Drive/Wren Hollow Elementary School West Driveway (All Way STOP/Side-Street Stop Alternative)						
Eastbound Wren Avenue Approach	A (9.0)	B (12.8)	A (<1.0)	A (9.1)	B (12.1)	A (<1.0)
Westbound Wren Avenue Approach	A (9.3)	B (14.7)	A (3.1)	B (12.1)	D (29.4)	A (1.7)
Northbound Canary Drive Approach	A (7.9)	A (9.6)	B (12.3)	A (8.5)	A (9.8)	C (16.4)
Southbound West Driveway Approach	A (8.4)	A (9.7)	B (13.5)	A (9.0)	B (10.3)	C (16.3)

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

Table 12: Southwest Middle School Peak Hour Traffic Operating Conditions – 2024 Existing and 2024 Build Traffic Volumes Compared to Alternatives

Intersection/Approach	Middle School Morning Arrival Peak Hour			Middle School Afternoon Dismissal Peak Hour		
	2024 Existing	2024 Build	2024 Build Alt	2024 Existing	2024 Build	2024 Build Alt
Wren Avenue and Sulphur Spring Road (Signalized) – Northbound Right-Turn Lane Alternative						
Westbound Wren Avenue Approach	C (26.0)	C (33.2)	C (29.0)	C (23.0)	C (28.4)	C (25.2)
Westbound Left-Turn	*D (44.6)*	*E (56.4)*	*D (48.8)*	*C (33.5)*	*D (43.4)*	*D (38.1)*
Northbound Sulphur Spring Road Approach	E (60.5)	F (164.8)	C (23.6)	B (19.7)	C (30.5)	C (24.3)
95th Percentile Queue Length	*675'*	*835'*	*350'*	*310'*	*505'*	*300'*
Southbound Sulphur Spring Road Approach	B (13.8)	C (21.3)	B (13.3)	A (9.0)	B (11.9)	B (12.0)
Southbound Left-Turn	C (24.4)	D (36.4)	B (17.0)	A (6.9)	B (11.7)	B (10.3)
Overall	***D (38.1)***	***F (84.7)***	***C (23.0)***	***B (15.9)***	***C (22.7)***	***B (18.2)***
Wren Avenue and Canary Drive/Wren Hollow Elementary School West Driveway (All Way STOP/Side-Street Stop Alternative)						
Eastbound Wren Avenue Approach	C (23.4)	F (71.7)	A (<1.0)	A (9.6)	B (13.8)	A (<1.0)
Westbound Wren Avenue Approach	F (66.4)	F (>200)	A (2.9)	B (12.1)	E (36.5)	A (1.8)
Northbound Canary Drive Approach	B (13.3)	C (16.1)	F (77.7)	A (8.5)	B (10.2)	C (16.2)
Southbound West Driveway Approach	B (12.4)	B (13.7)	F (140.9)	A (8.6)	A (10.0)	C (19.4)

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

Auxiliary Right-Turn Lane Warrants: The need for a northbound right-turn lane on Sulphur Spring Road at the signalized intersection with Wren Avenue was evaluated using MoDOT's *Access Management Guidelines* (AMG). Since the nomographs provided in the MoDOT AMG are not applicable to a signalized intersection, the general criteria outlined in the MoDOT AMG and capacity analyses were utilized to determine the need for a northbound right-turn lane. As shown in the traffic analyses previously described, the traffic volumes for a single northbound through/right-turn lane result in poor level of service and significant queues during the morning arrival peak hour for Southwest Middle School. The addition of a separate right-turn lane improves the level of service results with additional capacity available. <u>It was determined a separate right-turn lane is warranted for 2024 Existing traffic counts.</u>

Again, school operations typically have short peak activity times, and our analyses reflect the worst-case scenario based on peak hour factors derived from the 15-minute intervals of the video traffic counts and do not occur for the full hour in each morning and afternoon. Should acquisition of right-of-way be unattainable and hinder the feasibility of constructing a northbound right-turn lane, signal timing adjustments could be made to accommodate the additional traffic produced by the ECC. Timing adjustments intended to improve operations on Sulphur Spring Road could increase westbound turning movement delays for parent drop-off

traffic from Wren Avenue. Although not popular, increased delays near a school zone can promote slower speeds and increase driver awareness, resulting in a natural form of traffic calming during specific peak hours related to school traffic.

RECOMMENDATIONS

In order to enhance the operations of the proposed Parkway ECC with the existing schools on Wren Avenue, CBB provides the following list of recommendations to improve the traffic operations and safety in the vicinity of the schools.

- Although the crossing guard was equipped with PPE, any staff members directing traffic within the drop-off/pick-up areas or helping students cross between sidewalks should have proper attire for safety. All staff members involved in these functions should also be trained with recurring refresher safety training.
- A northbound right-turn lane is warranted at the signalized intersection of Sulphur Spring Road and Wren Avenue.
- CBB recommends that the site civil engineer illustrate the necessary intersection sight distance triangles over a copy of the site plan for the intersections. These areas should be kept clear of all obstructions to provide adequate visibility for safe operations.
- Careful consideration should be given to sight distance obstructions when planning future aesthetics enhancements, such as signs, berms, fencing and landscaping, to ensure that these improvements do not obstruct the view of entering and exiting traffic at the proposed site drives on the public roadways. It is generally recommended that all improvements higher than 3 ½ feet above the elevation of the nearest pavement edge be held back at least 20 feet from the traveled roadway.
- The schools should continue to educate the parents and students regarding the way they are expected to drop-off and pick-up their children using methods that may already be in place (distribution of printed materials at the beginning of each school year and continued reminders throughout the year). Use of the existing crosswalks should also be promoted for walkers and bikers.
- Modifications to the crosswalk across Wren Avenue should be considered to provide additional safety measures. On school days, a school crossing guard is available to assist students and parents during the arrival and dismissal timeframes; however, this safety measure does not address pedestrian crossings outside of school hours/days. Further consideration should be given to installing a safety measure like a Pedestrian Rapid Rectangular Flashing Beacon to enhance the visibility of pedestrian crossings on Wren Avenue at all times of the day.

THE 3-E'S OF TRAFFIC SAFETY

With respect to any roadway safety issue, it is important to address the 3-E's of Traffic Safety: Engineering, Education and Enforcement. All three E's must be engaged for a successful safety program.

Engineering – With a thorough understanding of the issues, traffic engineers attempt to identify problems, needs and opportunities and then use targeted strategies to address them. Detailed studies are used to better define the problem(s) and help point towards a focused, and thus more effective, solution. The physical improvements and changes to traffic controls recommended herein represent the engineering portion of the overall solution.

Education – With the addition of another educational facility on Wren Avenue, adjustments to the current operations at both existing schools may be necessary. Once a plan is established, it is critical that the users understand what is expected of them. The school should provide information to parents and students regarding the new way they are expected to drop-off and pick-up their children, if modified. There are several steps to this education which the school may already be following:

- At the beginning of each school year, all parents should be informed in writing of the typical procedures to be used for various modes of access to and from the campus; i.e., what is expected of bus riders, parent riders, walkers and bicyclers. A simple drawing can also be helpful as a supplement. This can be distributed electronically as well.
- Parents should be reminded in writing and/or postings at the school at various times throughout the year through various methods.
- During the first few weeks of school, parents should be informed and/or reminded directly by the supervising staff at the loading area(s), if they are no following the safety plan
- As needed, certain parents may need to be reminded directly by the supervising staff at the loading area(s). This could be considered "soft" enforcement which will be required on a continuing basis.

Enforcement – Daily "soft" enforcement by the supervising staff at the loading areas is extremely important to the safety and efficiency of the loading area(s). This is where education and enforcement overlap to some degree, as the supervising staff attempt to maintain control of the loading area while focused on the safety of the children at or near the roadway/travel lane(s).

In some cases, law enforcement may be required to address specific issues. For example, issuing tickets for illegal activities such as parking in a restricted area or during restricted times, unloading in a travel lane and/or excessive speeding along the adjacent roadway. It should be noted that while increased enforcement often appears to be a simple answer to control speeding, illegal parking and other violations of the law, police department resources are often difficult to allocate to select locations over a long period of time. Furthermore, any benefits realized solely by increased enforcement are generally lost once police enforcement returns to normal levels.

For posted regulations to self-regulate, the traveling public must accept them as reasonable. Contacting the school resource officer (SRO) is recommended as a first step where certain issues must be addressed.

SUMMARY OF FINDINGS AND CONCLUSIONS

CBB completed the preceding study to address the potential traffic impacts pertaining to the proposed Parkway South Early Childhood Center in Manchester, Missouri. In summary, the following findings and improvements should be considered in conjunction with the proposed design:

- Based on the most current site plan provided by you, Parkway School District plans to construct a new Early Childhood Center (ECC) building and parking lot between the existing Wren Hollow Elementary School and Southwest Middle School. The proposed parking lot is intended to be built north of the existing circle drive between the elementary school and middle school buildings. The site is expected to support a total enrollment of 184 students and 65-70 staff members.
- Under 2024 Existing conditions, all approaches and movements operate very well at LOS C or better during the elementary school arrival and dismissal peak hours, as well as the middle school afternoon dismissal peak hour. During the middle school's morning arrival peak hour, the intersection of Sulphur Spring Road and Wren Avenue operates at LOS D overall. The northbound approach at the signalized intersection operates at LOS E and produces a 95th percentile queue length of 675-feet. The westbound approach at the intersection of Canary Drive and Wren Avenue operates at LOS F during the morning arrival peak hour for the middle school.
- Under the 2024 Build conditions, all movements and approaches are expected to operate at LOS D or better during the elementary school peak hours. During the middle school afternoon dismissal peak hour, the westbound Wren Avenue approach at Canary Drive is expected to degrade from LOS B to LOS E with an increase in delay of approximately 25 seconds. Under the middle school morning arrival peak hour conditions, the signalized intersection of Sulphur Spring Road at Wren Avenue degrades to LOS F overall. The westbound left-turn is expected to operate at LOS E, the northbound approach is expected to degrade to LOS F, and the 95th percentile queue length expected to increase from 675-feet to 835-feet. The westbound approach at the intersection of Canary Drive and Wren Avenue is expected to continue to operate at LOS F with increased delays as well.
- At the intersection of Sulphur Spring Road and Wren Avenue, the addition of a northbound right-turn lane was explored. All movements are expected to operate at LOS D or better with improved 95th percentile queue lengths for the morning arrival and afternoon dismissal peak hours for the elementary and middle schools.

- At the intersection Canary Drive and Wren Avenue, the transition from an all-way stop to side-street stop control was considered. During the middle school morning arrival peak hour, the eastbound and westbound Wren Avenue approaches improve to LOS A; however, the northbound and southbound approaches degrade to LOS F. During the middle school afternoon dismissal, the eastbound and westbound approaches improve to LOS A, while the northbound and southbound approaches operate acceptably at LOS C.
- A northbound right-turn lane is warranted at the signalized intersection of Sulphur Spring Road and Wren Avenue.
- As identified in the recommendations section above, all staff members involved in traffic operations should be equipped with proper attire and equipment. These staff members should also be given recurring safety training.
- CBB recommends that the site civil engineer illustrate the necessary intersection sight distance triangles over a copy of the site plan for the intersections. These areas should be kept clear of all obstructions to provide adequate visibility for safe operations.
- Careful consideration should be given to sight distance obstructions when planning future aesthetics enhancements, such as signs, berms, fencing and landscaping, to ensure that these improvements do not obstruct the view of entering and exiting traffic at the proposed site drives on the public roadways. It is generally recommended that all improvements higher than 3 ½ feet above the elevation of the nearest pavement edge be held back at least 20 feet from the traveled roadway.
- The school should continue to educate the parents and students regarding the way they are expected to drop-off and pick-up their children using methods that may already be in place (distribution of printed materials at the beginning of each school year and continued reminders throughout the year). Use of the existing crosswalks should also be promoted for walkers and bikers.
- Modifications to the crosswalk across Wren Avenue should be considered to provide additional safety measures, such as a Pedestrian Rapid Rectangular Flashing Beacon to enhance the visibility of pedestrian crossings on Wren Avenue at all times of the day.

We trust that this traffic access study adequately describes the forecasted traffic conditions that should be expected in the vicinity of the proposed Parkway South Early Childhood Center in Manchester, Missouri. If additional information is desired, please contact me at 314-308-6547 or LCannon@cbbtraffic.com.

Sincerely,

Lee Cannon, P.E., PTOE
Principal – Traffic Engineer

EXPERT | TRUSTED ADVISOR | FRIEND

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