

SHORELINE CHURCH EXPANSION

Transportation Impact Analysis

9635 Westland Drive

Knoxville, TN 37922

A Transportation Impact Analysis for the Shoreline Church Expansion

Submitted to

Knoxville - Knox County Planning

Revised September 23, 2022

September 9, 2022

FMA Project No. 391.041.1

Submitted By:



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Executive Summary

Shoreline Church, Inc. is proposing a building and parking lot expansion to the existing Shoreline Church located at 9635 Westland Drive in Knox County, TN. The existing church is located east of the intersection of Westland Drive at Pellissippi Parkway (I-140). The building expansion will consist of a new worship center with additional meeting and office space and the existing building will be modified to a smaller worship center with meeting rooms. Construction is proposed to take place this year and this study assumes full build out for the development will occur in 2025.

The Shoreline Church has two existing driveway connections. The main driveway is located on Westland Drive and the secondary driveway is located on Emory Church Road. The existing driveway connection to Emory Church Road is gated and is only used for Sunday church services or special events in order to prevent cut-thru traffic in the parking lot. The Morning Pointe Assisted Living Facility located north of the Shoreline Church shares both driveway connections.

In order to maintain or provide an acceptable level-of-service for each of the intersections studied, some recommendations are presented.

Westland Drive @ Emory Church Road

After the completion of the Shoreline Church Expansion the traffic conditions for the intersection of Westland Drive at Emory Church Road will operate at an acceptable overall LOS C during the Sunday peak hour.

The result of the queue analysis is that the existing storage for the eastbound left turn lane and westbound left turn lane are adequate and the southbound right turn lane will exceed capacity during the Sunday peak 15-minute entering and exiting periods. This will cause right turning traffic to queue past the 200 feet queue storage length and into the thru-left lane during the 15-minute peak periods. The intersection will continue to operate at an acceptable level of service and no additional improvements are necessary in order to accommodate the Shoreline Church Expansion.

Westland Drive @ Shoreline Church Driveway Connection

After the completion of the Shoreline Church Expansion the eastbound left turn movement (Westland Drive) will operate at a LOS E during the Sunday peak 15-minute entering conditions and the southbound approach (Church Driveway) will operate at a LOS F during both the Sunday peak 15-minute entering and exiting conditions.

Based on the HCS7 queue analysis the existing storage at the intersection of Westland Drive at the Shoreline Church driveway connection is inadequate. The eastbound left turn lane is expected to back up into the Westland Drive thru lane during the peak

15-minute entering conditions and a 16 vehicle (320 feet) queue will interfere with the signalized intersection of Westland Drive at the Pellissippi northbound ramp.

There are currently no police officers providing traffic control for Sunday services. FMA recommends that a police officer be placed at the intersection of Westland Drive at the Shoreline Church Driveway during both the entering and exiting peak periods in order to mitigate the expected queues and LOS F operating conditions.

Westland Drive at the existing intersection with the Shoreline Church driveway connection does not have adequate intersection sight distance looking east. The sight distance is partially blocked by the vegetation located within the right-of-way. Trimming the existing vegetation would improve the intersection sight distance. FMA recommends any necessary landscaping that may be involved to comply with Knox County Engineering and Public Works requirements.

The existing stop bar is located approximately 50 feet from the edge of pavement on Westland Drive. During the turning movement count it was observed that vehicles that were queued at the driveway waiting to turn both left and right onto Westland Drive pulled forward past the stop bar and queued at approximately 15 feet from the edge of pavement. An updated site plans shows the stop bar location at 15 feet from the edge of pavement. Any improvements to the intersection of Westland Drive at the Shoreline Church Driveway should be coordinated with Knox County Engineering & Public Works.

FMA recommends that the signs and pavement markings be installed in accordance with the standards provided in the *Manual on Uniform Traffic Control Devices* (MUTCD).

Emory Church Road @ Shoreline Church Driveway Connection

After the completion of the Shoreline Church Expansion the eastbound approach (Church Driveway) and the northbound approach (Emory Church Road) will operate at a LOS B or better during both the Sunday entering and exiting peak 15-minute conditions.

The result of the queue analysis is that the existing storage at the intersection is adequate and there are no recommended improvements to the intersection of Emory Church Road at Shoreline Church driveway connection.

Emory Church Road has adequate intersection sight distance at the intersection with the existing Shoreline Church driveway connection.

1 Introduction

1.1 Project Description

This report provides a summary of a traffic impact study that was performed for the Shoreline Church Expansion. The existing church is located east of the intersection of Westland Drive at Pellissippi Parkway (I-140) at 9635 Westland Drive within the limits of the City of Knoxville. The location of the site is shown in Figure 1.

The full build out of the development will include a building and parking lot expansion. The building expansion will consist of a new worship center with additional meeting and office space and the existing building will be modified to a smaller worship center with meeting rooms. The new proposed parking count will be 503 parking spaces. Construction is proposed to take place this year, and this study assumes full build out for the development will occur in 2025.

The Shoreline Church has two existing driveway connections. The main driveway is located on Westland Drive and the secondary driveway is located on Emory Church Road. The existing driveway connection to Emory Church Road is gated and is only used for Sunday church services or special events in order to prevent cut-thru traffic in the parking lot. The Morning Pointe Assisted Living Facility located north of the Shoreline Church shares both driveway connections. The proposed site layout is shown in Figure 2.

There are no proposed changes to the existing driveway connections. The site circulation will include a proposed connection from the upper parking lot to the lower parking lot and additional parking aisles that are marked one-way to accommodate angled parking. The revised parking lot layout will alter the interior site circulation but the Shoreline Church traffic will continue to enter/exit at both existing driveway connections. There are currently no police officers providing traffic control for Sunday services.

The Shoreline Church schedule for Fall of 2022 has three worship times on Sunday starting at 8:15 a.m., 9:30 a.m. and 11:00 a.m. After the completion of the expansion Sunday services are expected to be reduced to two services with a maximum campus capacity of approximately 1,500 members on site at one time.

The purpose of this study is to evaluate the impacts to the traffic conditions caused by the proposed development.

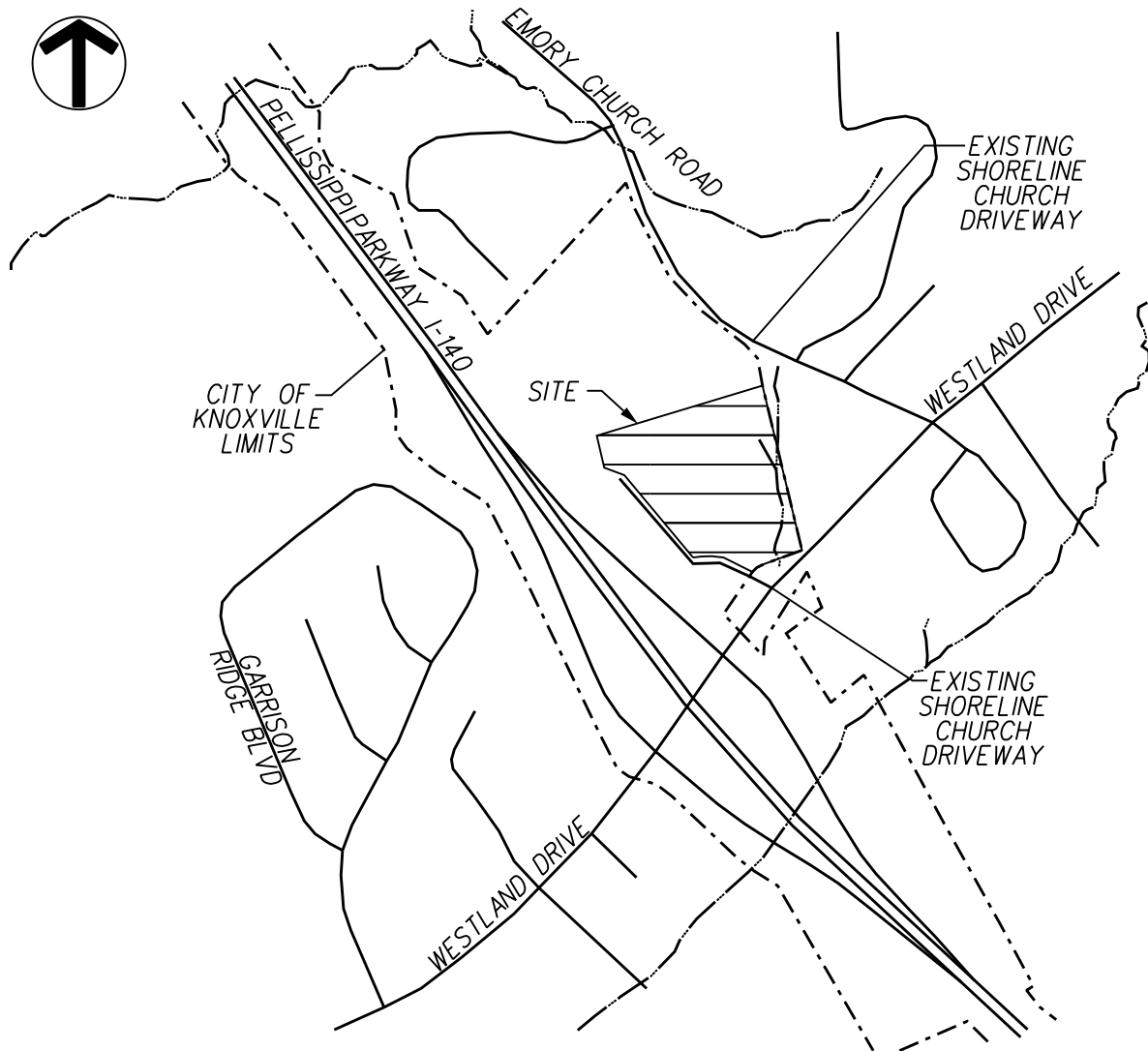


Figure 1: Location Map

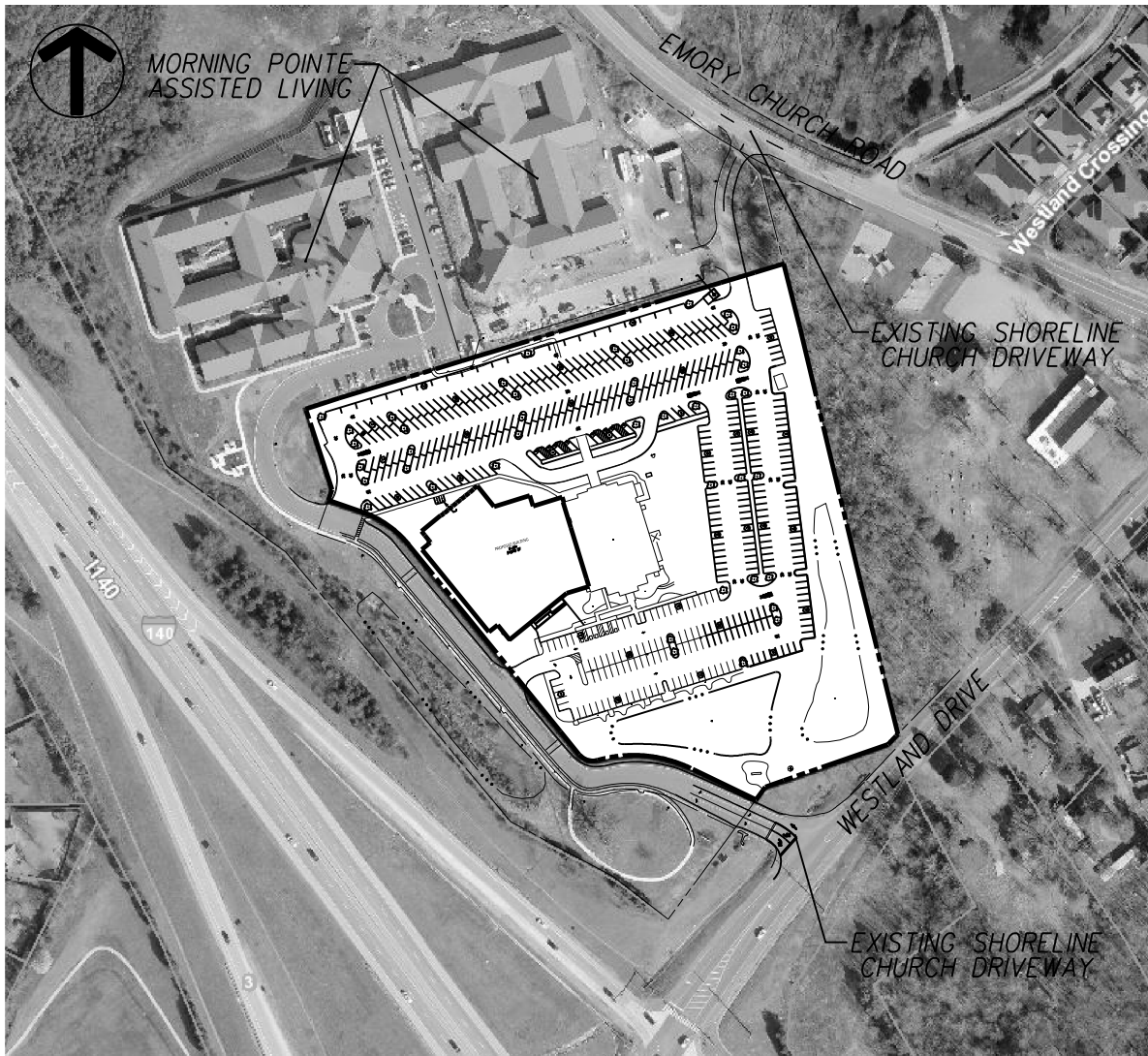


Figure 2: Site Plan

1.2 Existing Site Conditions

Westland Drive is a two-lane road at the existing intersection with the Shoreline Church driveway connection. Knoxville-Knox County Planning classifies Westland Drive as a Minor Arterial with an 88-foot right-of-way per the Major Road Plan. The speed limit on Westland Drive in the vicinity of the project area is 40 mph.

Emory Church Road is a two-lane road at the existing intersection with the Shoreline Church driveway connection. Knoxville-Knox County Planning classifies Emory Church Road as a Minor Collector with a 60-foot right-of-way per the Major Road Plan. The speed limit on Emory Church Road is 30 mph.

The existing driveway connection to Westland Drive is located approximately 350 feet east of the intersection of Westland Drive at Pellissippi Parkway (I-140) northbound ramp and approximately 940 feet west of the signalized intersection of Westland Drive at Emory Church Road / Treymour Way. The driveway connection has a separate right and left turn lane with an approximate storage length of 125 feet for each lane.

The existing driveway connection to Emory Church Road is gated and is only used for Sunday church services or special events in order to prevent cut-thru traffic in the parking lot. The driveway connection is located approximately 210 feet north of the intersection with Henderson Lane and approximately 815 feet north of the signalized intersection at Westland Drive.

Emory Church Road has an existing southbound right turn lane with a 200 foot storage length and Westland Drive has an eastbound left turn lane with a 280 foot storage length and a westbound left turn lane with a 100 foot storage length at the signalized intersection of Emory Church Road at Westland Drive.

Westland Drive has a sidewalk on the south side of the road between the driveway at 9600 Westland Drive and Emory Church Road. Westland Drive has sidewalks on both sides of the road east of the signalized intersection with Emory Church Road. Emory Church Road has a sidewalk on the east side of the road between Westland Drive and Henderson Lane.

The Knoxville Area Transit does not operate in the vicinity of the existing Shoreline Church.

Aerial photos of the existing Shoreline Church driveway connections and the signalized intersection of Westland Drive at Emory Church Road are included in Attachment 1.

2 Existing Traffic Volumes

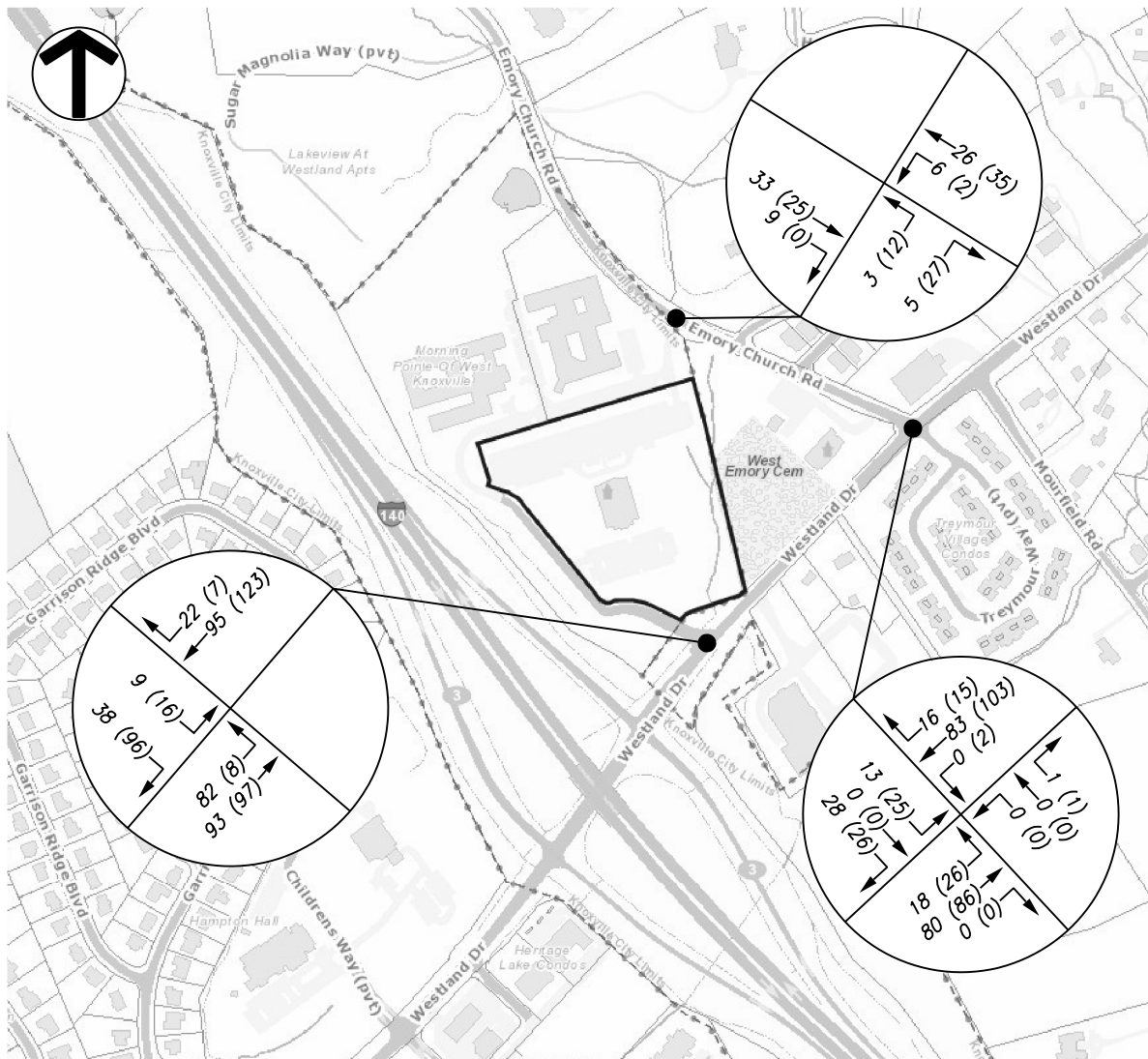
FMA conducted peak hour turning movement counts at the intersections of Westland Drive at Emory Church Road, Westland Drive at the Shoreline Church driveway connection and Emory Church Road at the Shoreline Church driveway connection on Sunday, August 28, 2022.

There were three church services on Sunday August 28th. The first service from 8:15 a.m. to 9:15 a.m., a second service from 9:30 a.m. to 10:30 a.m. and a third service from 11:00 a.m. to 12:15 p.m.

The current Sunday peak 15-minute entering time period occurred at 10:45 a.m. and the Sunday peak 15-minute exiting time period occurred at 12:15 p.m. using the turning movement count that FMA conducted. The Sunday peak hour at all three count locations occurred between 12:00 p.m. and 1:00 p.m. which coincided with the end of the third church service.

The existing volumes including the entering and exiting peak 15-minute traffic volumes at the count location are shown in Figure 3, and the count data collected is included in Attachment 2.

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LEGEND:

← XX (XX)

TURNING MOVEMENT VOLUME SUNDAY PEAK
 ENTERING (EXITING)

Figure 3: 2022 Existing Peak 15-Minute Traffic Volumes

3 Background Growth

The Knoxville Regional Transportation Planning Organization (TPO) maintain count stations in the vicinity of the proposed development.

TPO Count Station ID: 093M268 is located on Emory Church Road north of Westland Drive. The annual growth rate for this station over the last twenty years is approximately 3.21% and the 2021 ADT was 5,300 vehicles per day.

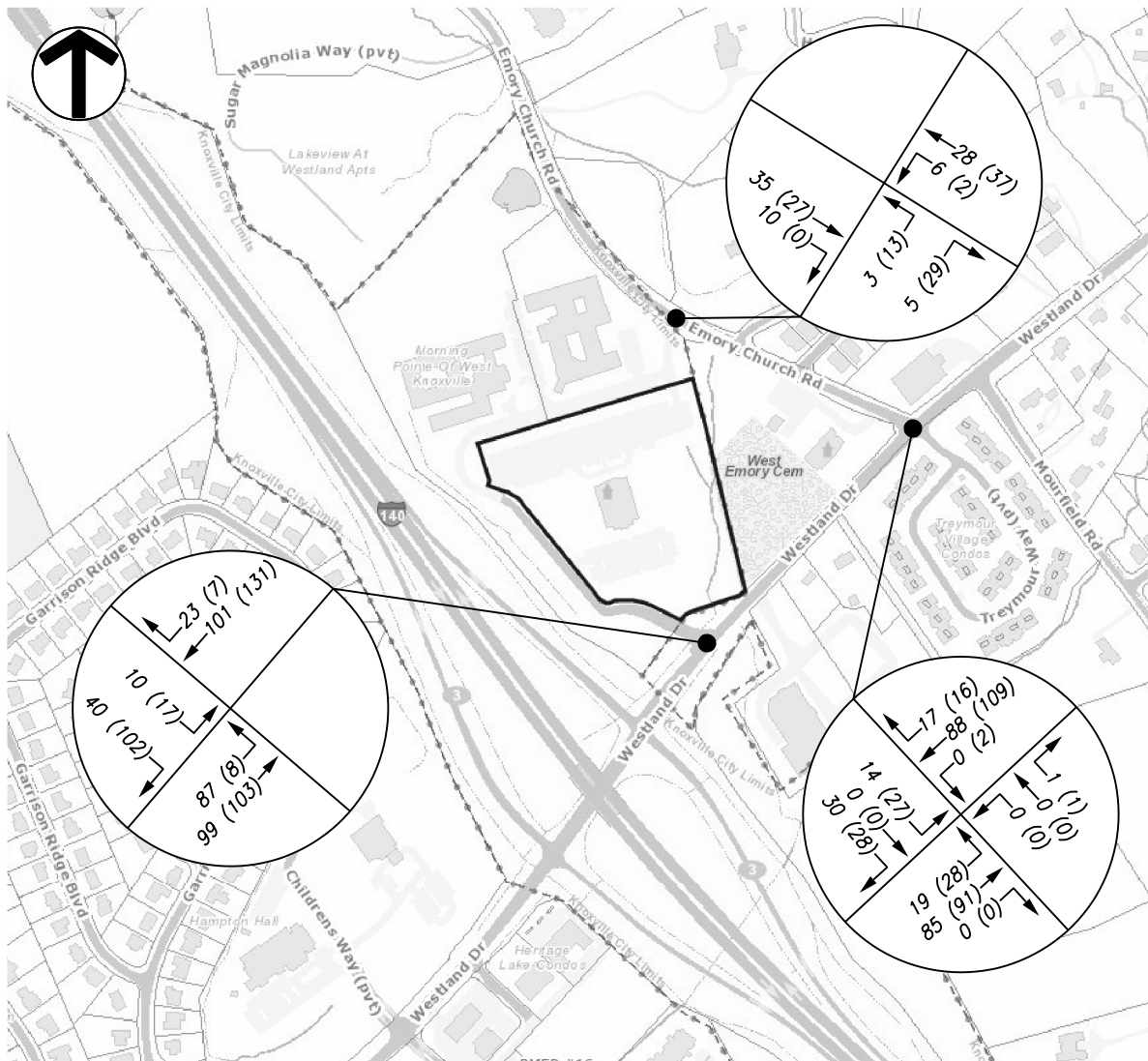
TPO Count Station ID: 093M001 is located on Westland Drive approximately 100 feet east of Clover Hill Lane. The annual growth rate for this station over the last twenty years is approximately 1.77% and the 2021 ADT was 12,310 vehicles per day.

TPO Count Station ID: 093M085 is located on Westland Drive west of Pellissippi Parkway (I-140) near the intersection of Heritage Lake Boulevard. The annual growth rate for this station over the last twenty years is approximately 1.90% and the 2020 ADT was 11,140 vehicles per day.

For the purpose of this study, an annual growth rate of 2.0% was assumed for the traffic at the studied intersections until full occupancy is reached in 2025. Trend line growth charts for TPO count stations are included in Attachment 3.

Figure 4 demonstrates the projected background peak entering and exiting 15-minute volumes at the studied intersections after applying the background growth rate to the existing conditions.

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LEGEND:

← XX (XX)

TURNING MOVEMENT VOLUME SUNDAY PEAK
ENTERING (EXITING)

Figure 4: 2025 Background Peak 15-Minute Traffic Volumes

4 Trip Generation and Trip Distribution

The existing Shoreline Church has a building square footage of 15,100 SF with 450 seats in the worship center. The existing Sunday entering 15-minute peak occurred at 10:45 a.m. with 119 vehicles entering and 55 vehicles exiting. The existing Sunday exiting 15-minute peak occurred at 12:15 p.m. with 17 vehicles entering and 151 vehicles exiting.

After the completion of the Shoreline Church Expansion the proposed building will have 47,040 SF with 1,243 seats in the new worship center. In order to calculate the trip generation for the proposed church expansion a factor of 2.76 (1243 seats/450 seats) was applied to the existing entering / exiting peak 15-minute traffic volumes to simulate a worst case scenario.

The trip generation worksheet is included in Attachment 4.

The estimated 15-minute peak and hourly volumes for the Sunday peak entering and exiting volumes are included in the trip generation summary and shown in Table 4-1.

**Table 4 – Shoreline Church Expansion
Trip Generation Summary**

Land Use	Daily Trips	Entering Peak		Exiting Peak	
		Enter	Exit	Enter	Exit
Existing Shoreline Church					
Church – Sunday	450 Seats				
15-Minute Peak		119	55	17	151
Hourly Volume		476	220	68	604
Proposed Shoreline Church Expansion					
Church – Sunday	1,243 Seats				
15-Minute Peak		329	152	47	417
Hourly Volume		1314	607	188	1667

The existing distribution of traffic on Westland Drive at the intersection with Emory Church Road is approximately 50% eastbound and 50% westbound during the Sunday peak hour.

The existing directional distribution of the traffic generated by the Shoreline Church was determined using the existing traffic volumes at the intersections of Westland

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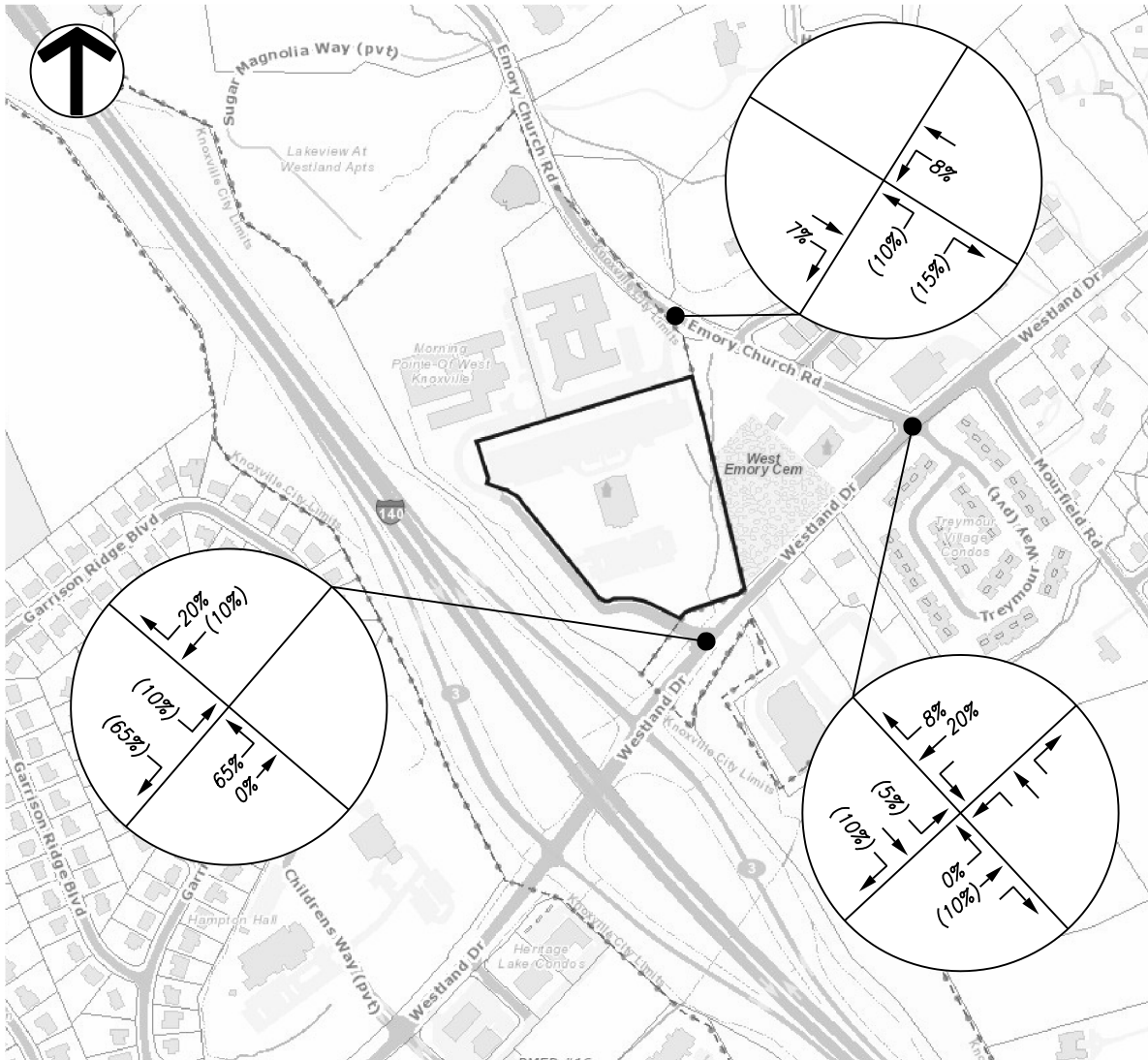
Drive at the Shoreline Church driveway connection, Westland Drive at Emory Church Road and Emory Church Road at the Shoreline Church driveway connection.

Morning Pointe Assisted Living Facility shares the Westland Drive and Emory Church Road driveway connections. Based on the existing turning movement counts there was negligible traffic travelling to/from the Morning Pointe Assisted Living during the Sunday peak entering and exiting 15-minute periods; therefore, no volume was removed or directly attributed to the Morning Pointe Assisted Living Facility.

Figure 5 shows the existing peak hour trip distribution for the Shoreline Church during the Sunday peak periods.

Figure 6 shows the background Sunday peak 15-minute site trips generated by the existing Shoreline Church and Figure 7 shows the full buildout Sunday hourly site trips generated by the proposed Shoreline Church Expansion.

Figure 8 shows the 2025 full buildout Sunday peak hourly volumes of traffic including the background traffic data combined with the additional site trips from the Shoreline Church Expansion.

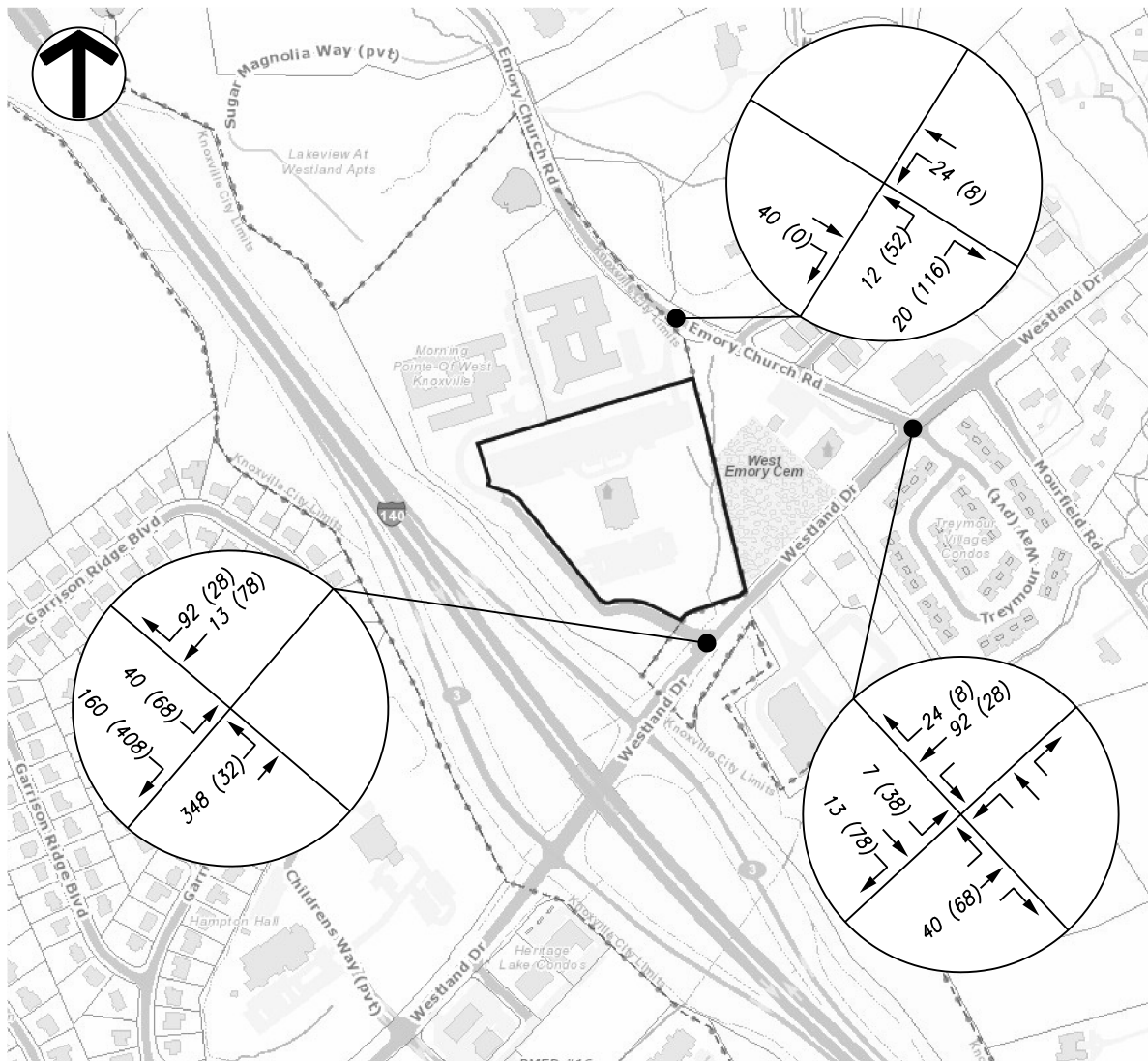


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← 50% (50%) TRIP DISTRIBUTION ENTERING (EXITING)

Figure 5: Peak Hour Trip Distribution

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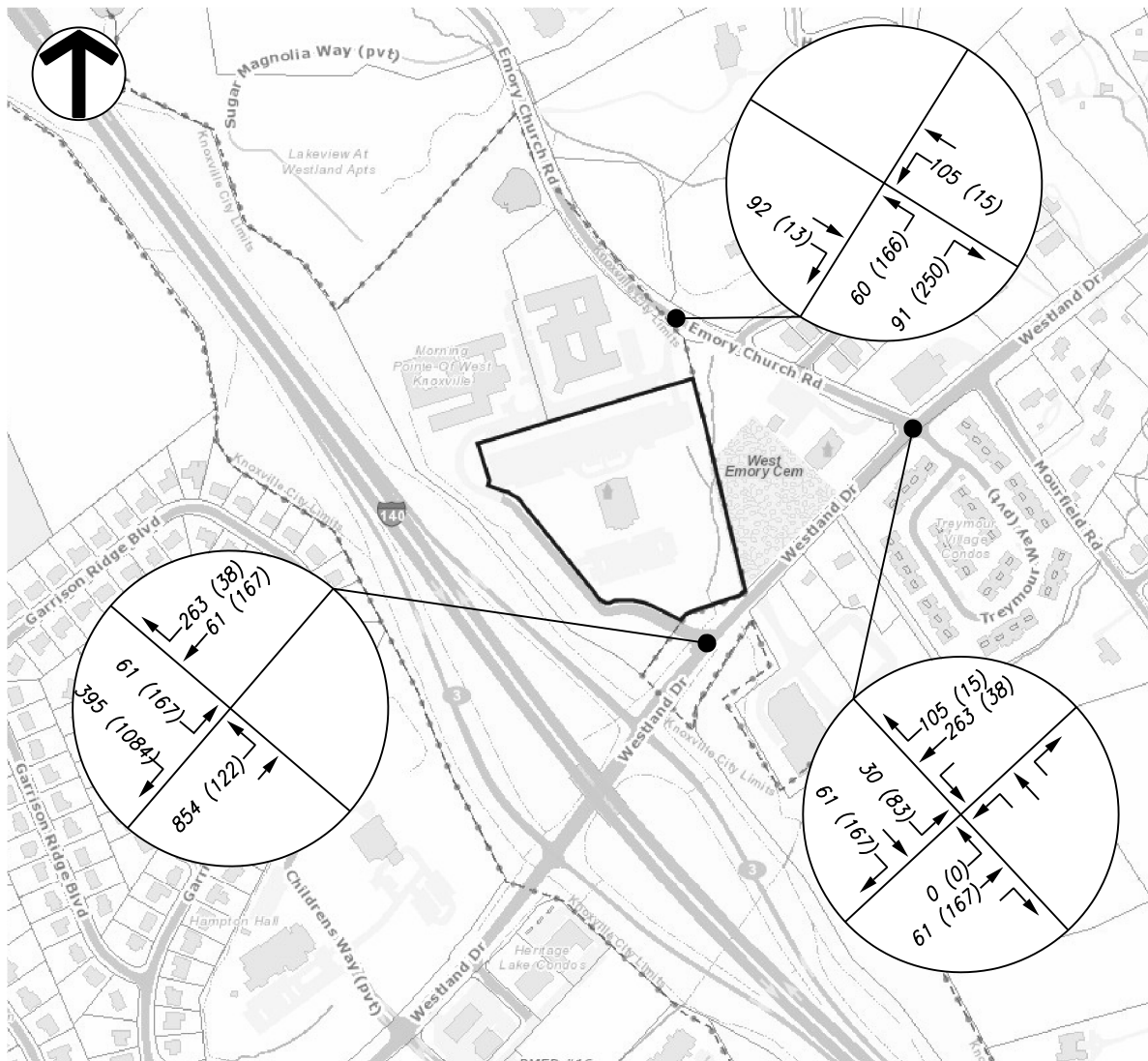
LEGEND:

← 5 (16)

TURNING MOVEMENT VOLUME ENTERING (EXITING)

**Figure 6: Shoreline Church Expansion
 Background Sunday Peak Hour Site Trips**

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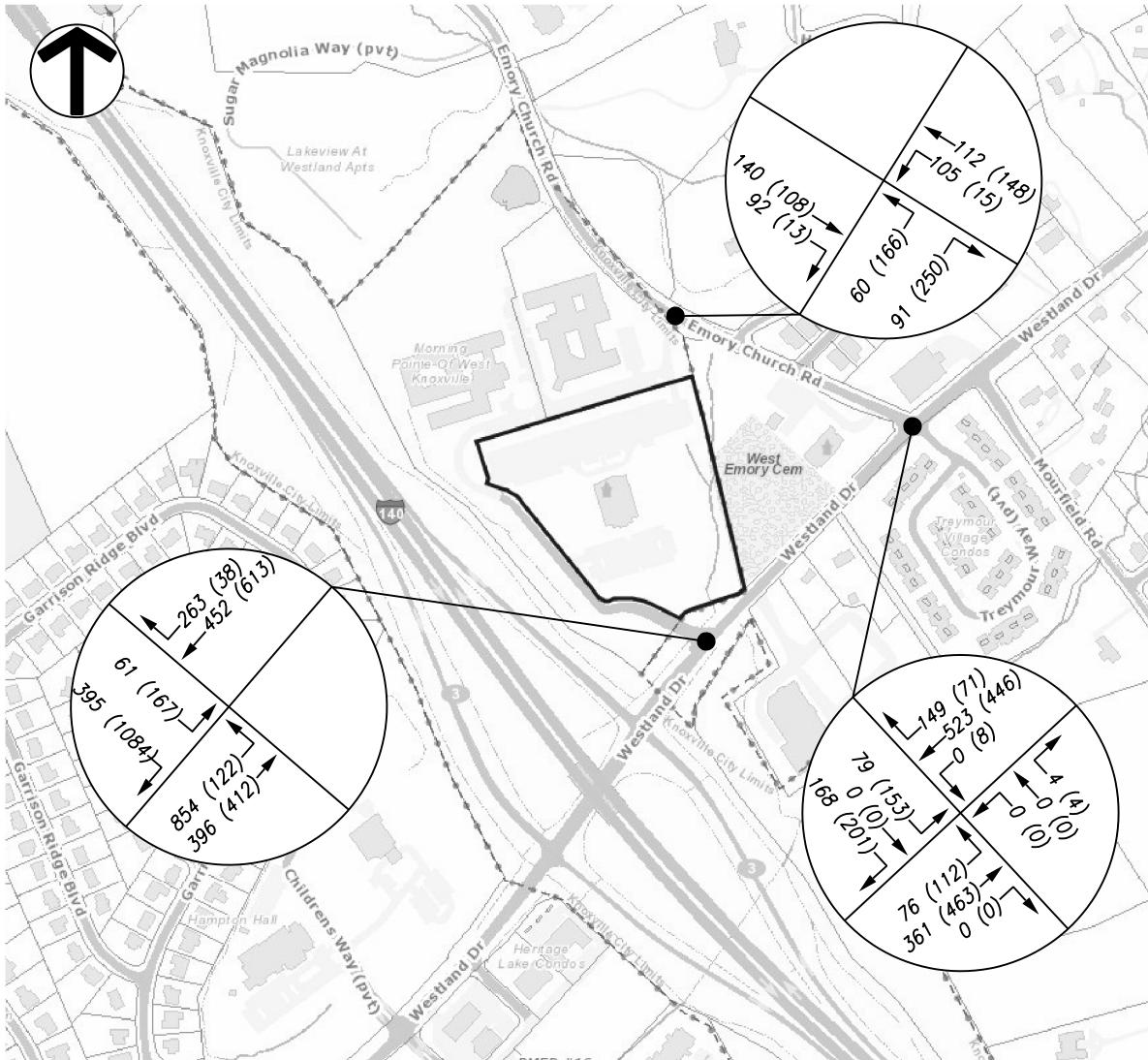
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← 5 (16)

TURNING MOVEMENT VOLUME ENTERING (EXITING)

**Figure 7: Shoreline Church Expansion
 Sunday Peak Hour Site Trips**

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LEGEND:

← 5 (16)

TURNING MOVEMENT VOLUME ENTERING (EXITING)

Figure 8: 2025 Full Buildout Sunday Peak Hour Site Traffic

5 Projected Capacity and Level of Service

The existing intersections of Westland Drive and Emory Church Road at the Shoreline Church driveway connections are stop-controlled with stop signs located at the driveway connections. The existing intersection of Westland Drive at Emory Church Road is signalized.

Signalized intersection capacity analyses were performed using the Highway Capacity Software (HCS7) at the intersection of Westland Drive at Emory Church Road for the existing, background and full buildout Sunday peak hour. The existing signal timing was provided by the Knox County Engineering and is included in Attachment 5.

Unsignalized intersection capacity analyses were performed using the Highway Capacity Software (HCS7) for the Sunday peak hour to evaluate the existing, background and full buildout conditions at the existing intersections of Westland Drive at the Shoreline Church driveway connection and Emory Church Road at the Shoreline Church driveway connection.

The results from the analyses are expressed with a term “level of service” (LOS), which is based on the amount of delay experienced at the intersection. The LOS index ranges from LOS A, indicating excellent traffic conditions with minimal delay, to LOS F indicating very congested conditions with excessive delay. LOS D generally is considered the minimum acceptable condition in urban areas. The HCS7 worksheets are included in Attachments 6, 7 and 8.

Table 5-1 shows the results of the capacity analyses.

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**Table 5-1
Intersection Analysis
Level of Service (LOS) Summary**

Intersection	Time Period	Year 2022 Existing (Delay/LOS)	Year 2025 Background (Delay/LOS)	Year 2025 Full Buildout (Delay/LOS)
Westland Drive @ Emory Church Road	Sunday Peak			
	Entering	18.7 / B	19.5 / B	26.3 / C
	Exiting	19.9 / B	20.8 / C	34.6 / C
Westland Drive @ Driveway Connection	Sunday Peak – Entering			
	EB Left Turn	9.7 / A	10.0 / A	44.0 / E
	SB Approach	31.4 / D	43.9 / E	11529.4 / F
	Sunday Peak – Exiting			
	EB Left Turn	8.6 / A	8.7 / A	9.4 / A
	SB Approach	28.1 / D	35.6 / E	640.0 / F
Emory Church Road @ Driveway Connection	Sunday Peak – Entering			
	EB Approach	9.7 / A	9.8 / A	12.1 / B
	NB Approach	7.6 / A	7.6 / A	7.9 / A
	Sunday Peak – Exiting			
	EB Approach	10.0 / B	10.2 / B	13.8 / B
	NB Approach	7.4 / A	7.4 / A	7.5 / A

6 Conclusions and Recommendations

6.1 Westland Drive @ Emory Church Road

The existing, background and full buildout conditions for the Sunday entering and exiting peak 15-minute conditions at the signalized intersection of Westland Drive at Emory Church Road were analyzed using the Highway Capacity Software (HCS7). The existing signal timing was provided by Knox County Engineering and Public Works.

The existing peak 15-minute entering and exiting traffic conditions for the signalized intersection of Westland Drive at Emory Church Road operates at an overall LOS B during the Sunday entering and exiting peak 15-minute conditions.

The background peak 15-minute entering and exiting traffic conditions for the signalized intersection of Westland Drive at Emory Church Road operates at an overall LOS B during the Sunday entering peak 15-minute conditions and a LOS C during the Sunday exiting peak 15-minute conditions.

After the completion of the Shoreline Church Expansion the traffic conditions for the intersection of Westland Drive at Emory Church Road will operate at an acceptable overall LOS C during the Sunday entering and exiting peak 15-minute conditions.

The 95% queue length is defined as the queue length that has only a 5-percent probability of being exceeded during the analysis time period. The 95% queue length is typically used to determine the length of turning lanes in order to minimize the risk of blockage.

The existing eastbound left turn lane at the intersection of Westland Drive at Emory Church Road has an available storage length of 280 feet. The signalized intersection capacity analysis shows the full buildout 95% queue length for the eastbound left turn lane (Westland Drive) of 30.6 feet (1.2 vehicles) during the Sunday entering peak and 48.1 feet (1.9 vehicles) during the Sunday exiting peak.

The existing westbound left turn lane at the intersection of Westland Drive at Emory Church Road has an available storage length of 100 feet. The signalized intersection capacity analysis shows the full buildout 95% queue length for the westbound left turn lane (Westland Drive) of less than one vehicle during the Sunday entering and exiting peaks.

The existing southbound right turn lane at the intersection of Westland Drive at Emory Church Road has an available storage length of 200 feet. The signalized intersection capacity analysis shows the full buildout 95% queue length for the southbound right

turn lane (Emory Church Road) of 291.9 feet (11.5 vehicles) during the Sunday entering peak and 395.2 feet (15.6 vehicles) during the Sunday exiting peak.

The existing southbound right turn lane (Emory Church Road) will exceed capacity during the Sunday peak 15-minute entering and exiting periods. This will cause right turning traffic to queue past the 200 feet queue storage length and into the thru-left lane. The intersection will continue to operate at an acceptable level of service and no additional improvements are necessary in order to accommodate the Shoreline Church Expansion.

6.2 Westland Drive @ Shoreline Church Driveway Connection

The existing, background and full buildout conditions for the Sunday entering and exiting peak 15-minute conditions at the unsignalized intersection of Westland Drive at Shoreline Church driveway connection were analyzed using the Highway Capacity Software (HCS7).

The existing peak 15-minute traffic entering and exiting conditions for the eastbound left turn movement (Westland Drive) operate at a LOS A during both the Sunday entering and exiting peak and the southbound approach (Church Driveway) operates at a LOS D during both the Sunday entering and exiting peak.

The background peak 15-minute traffic entering and exiting conditions for the eastbound left turn movement (Westland Drive) operate at a LOS A during both the Sunday entering and exiting peak and the southbound approach (Church Driveway) operates at a LOS E during both the Sunday entering and exiting peak.

After the completion of the Shoreline Church Expansion the full buildout traffic conditions for the intersection of Westland Drive at Shoreline Church driveway connection will operate as follows. The eastbound left turn movement (Westland Drive) will operate at a LOS E during the Sunday entering peak and a LOS A during the Sunday exiting peak the southbound approach (Church Driveway) will operate at a LOS F during the both the Sunday entering and exiting peak 15-minute conditions.

The 95% queue length is defined as the queue length that has only a 5-percent probability of being exceeded during the analysis time period. The 95% queue length is typically used to determine the length of turning lanes in order to minimize the risk of blockage.

The existing southbound left turn lane at the intersection of Westland Drive at the Shoreline Church driveway connection has an available storage length of 125 feet. The unsignalized intersection capacity analysis shows the full buildout 95% queue length for the southbound left turn lane (Church Driveway) of 9.9 vehicles during the

Sunday entering peak 15-minute conditions and 12.2 vehicles during the Sunday exiting peak 15-minute conditions.

The existing eastbound left turn lane at the intersection of Westland Drive at the Shoreline Church driveway connection has an available storage length of 150 feet. The unsignalized intersection capacity analysis shows the full buildout 95% queue length for the eastbound left turn lane (Westland Drive) of 16.1 vehicles during the Sunday peak entering 15-minute conditions and less than one vehicle during the Sunday peak exiting 15-minute conditions.

Based on the HCS7 queue analysis the existing storage at the intersection of Westland Drive at the Shoreline Church driveway connection is inadequate. The eastbound left turn lane is expected to back up into the Westland Drive thru lane during the peak 15-minute entering conditions and a 16 vehicle (320 feet) queue will interfere with the signalized intersection of Westland Drive at the Pellissippi northbound ramp.

There are currently no police officers providing traffic control for Sunday services. FMA recommends that a police officer be placed at the intersection of Westland Drive at the Shoreline Church Driveway during both the entering and exiting peak periods in order to mitigate the expected queues.

The minimum required sight distance for a road with a posted speed limit of 40 mph is 400 feet in each direction in accordance with the "Knoxville-Knox County Subdivision Regulations" amended through February 13, 2020. FMA measured the sight distance at the existing intersection of Westland Drive at the Shoreline Church driveway connection in September 2022. At 15 feet from the edge of pavement the sight distance at the proposed intersection is greater than 400 feet looking to the west and approximately 265 feet looking to the east.

The sight distance looking to the east is partially blocked by the existing vegetation located within the right-of-way. Trimming the existing vegetation would improve the intersection sight distance. FMA recommends any necessary landscaping that may be involved to comply with Knox County Engineering and Public Works requirements.

The existing stop bar is located approximately 50 feet from the edge of pavement on Westland Drive. During the turning movement count it was observed that vehicles that were queued at the driveway waiting to turn both left and right onto Westland Drive pulled forward past the stop bar and queued at approximately 15 feet from the edge of pavement. An updated site plans shows the stop bar location at 15 feet from the edge of pavement. Any improvements to the intersection of Westland Drive at the Shoreline Church Driveway should be coordinated with Knox County Engineering & Public Works.

FMA recommends that the signs and pavement markings be installed in accordance with the standards provided in the *Manual on Uniform Traffic Control Devices* (MUTCD).

Included in Attachment 9 are pictures of the existing sight distance at both the stop bar and 15 feet from the edge of pavement and the intersection sight distance triangles.

6.3 Emory Church Road at Shoreline Church Driveway Connection

The existing, background and full buildout conditions for the Sunday entering and exiting peak 15-minute conditions at the unsignalized intersection of Emory Church Road at Shoreline Church driveway connection were analyzed using the Highway Capacity Software (HCS7).

The existing and background peak 15-minute entering and exiting traffic conditions for the eastbound approach (Church Driveway) operate at a LOS A during the Sunday entering peak and a LOS B during the Sunday exiting peak and the northbound approach (Emory Church Road) operates at a LOS A during both the Sunday entering and exiting peak 15-minute conditions.

After the completion of the Shoreline Church Expansion the full buildout traffic conditions for the intersection of Emory Church Road at the Shoreline Church driveway connection will operate as follows. The eastbound approach (Church Driveway) will operate at a LOS B during the Sunday entering and exiting peak 15-minute traffic conditions and the northbound approach (Emory Church Road) will operate at a LOS A during the Sunday entering and exiting peak 15-minute conditions.

The 95% queue length is defined as the queue length that has only a 5-percent probability of being exceeded during the analysis time period. The 95% queue length is typically used to determine the length of turning lanes in order to minimize the risk of blockage.

The unsignalized intersection capacity analysis shows the full buildout 95% queue length for the eastbound approach (Church Driveway) of less than one car length during the Sunday entering peak 15-minute conditions and 2.9 vehicles (60 feet) during the Sunday exiting peak 15-minute conditions. Based on the HCS7 queue analysis the existing storage at the intersection of Emory Church Road at the Shoreline Church driveway connection is adequate and no improvements to the intersection are necessary in order to accommodate the Shoreline Church Expansion.

The minimum required sight distance for a road with a posted speed limit of 30 mph is 300 feet in each direction in accordance with the "Knoxville-Knox County Subdivision Regulations" amended through February 13, 2020. FMA measured the

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sight distance at the existing intersection of Emory Church Road at the Shoreline Church driveway connection in September 2022. At 15 feet from the edge of pavement the sight distance at the existing intersection is greater than 300 feet looking to the north and greater than 300 feet looking to the south. Attachment 9 shows photos of the sight distance at the proposed intersection.

Attachment 1
Aerial Photos

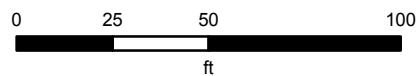


Westland at Emory Church

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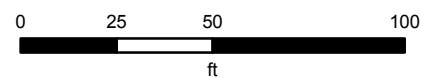


Westland at Driveway

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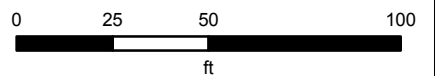


Emory Church at Driveway

Knoxville - Knox County - KUB Geographic Information System



Printed: 8/29/2022 at 3:02:39 PM



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Attachment 2

Traffic Count

Project: Shoreline Church Expansion
Intersection: Westland Drive at Church Driveway
Date Conducted: Sunday August 28, 2022

	Westland Drive Eastbound			Westland Drive Westbound			Church Driveway Southbound			
Start	Left	Thru	Total	Thru	Right	Total	Left	Right	Total	Int. Total
8:00 AM	11	31	42	58	4	62	0	0	0	104
8:15 AM	9	28	37	46	2	48	0	2	2	87
8:30 AM	2	43	45	72	1	73	1	1	2	120
8:45 AM	7	43	50	89	2	91	0	0	0	141
Total	29	145	174	265	9	274	1	3	4	452
9:00 AM	13	47	60	91	5	96	0	1	1	157
9:15 AM	59	41	100	89	32	121	0	16	16	237
9:30 AM	26	50	76	129	11	140	0	3	3	219
9:45 AM	0	81	81	134	0	134	0	3	3	218
Total	98	219	317	443	48	491	0	23	23	831
10:00 AM	4	64	68	106	1	107	0	2	2	177
10:15 AM	7	80	87	106	0	106	0	2	2	195
10:30 AM	23	75	98	119	10	129	10	53	63	290
10:45 AM	82	93	175	95	22	117	9	38	47	339
Total	116	312	428	426	33	459	19	95	114	1001
11:00 PM	29	133	162	98	5	103	3	8	11	276
11:15 PM	4	87	91	109	1	110	1	5	6	207
11:30 PM	3	107	110	125	0	125	0	3	3	238
11:45 PM	1	104	105	123	2	125	1	3	4	234
Total	37	431	468	455	8	463	5	19	24	955
12:00 PM	3	111	114	95	1	96	0	4	4	214
12:15 PM	8	97	105	123	7	130	16	96	112	347
12:30 PM	2	120	122	156	1	157	1	24	25	304
12:45 PM	4	138	142	121	0	121	4	27	31	294
Total	17	466	483	495	9	504	21	151	172	1159
Grand Total	297	1573	1870	2084	107	2191	46	291	337	4398
Approach %	15.9	84.1		95.1	4.9		13.6	86.4		
Total %	7%	36%	43%	47%	2%	50%	1%	7%	8%	

Project: Shoreline Church Expansion
Intersection: Westland Drive at Church Driveway
Date Conducted: Sunday August 28, 2022

Entering Peak Hour	10:15 AM - 11:15 AM	1100
Exiting Peak Hour	12:00 PM - 1:00 PM	1159

	Westland Drive Eastbound			Westland Drive Westbound			Church Driveway Southbound			
Start	Left	Thru	Total	Thru	Right	Total	Left	Right	Total	Int. Total
Peak Hour Analysis from 8:00 AM to 1:00 PM										
Sunday Peak Hour Entering Traffic begins at 10:15 AM										
10:15 AM	7	80	87	106	0	106	0	2	2	195
10:30 AM	23	75	98	119	10	129	10	53	63	290
10:45 AM	82	93	175	95	22	117	9	38	47	339
11:00 AM	29	133	162	98	5	103	3	8	11	276
Total Volume	141	381	522	418	37	455	22	101	123	1100
Future (2% over 3 yrs)	87	99		101	23		10	40		360
PHF	0.43	0.72		0.88	0.42		0.55	0.48		0.81

	Westland Drive Eastbound			Westland Drive Westbound			Church Driveway Southbound			
Start	Left	Thru	Total	Thru	Right	Total	Left	Right	Total	Int. Total
Peak Hour Analysis from 8:00 AM to 1:00 PM										
Sunday Peak Hour Exiting Traffic begins at 12:00 PM										
12:00 PM	3	111	114	95	1	96	0	4	4	214
12:15 PM	8	97	105	123	7	130	16	96	112	347
12:30 PM	2	120	122	156	1	157	1	24	25	304
12:45 PM	4	138	142	121	0	121	4	27	31	294
Total Volume	17	466	483	495	9	504	21	151	172	1159
Future (2% over 3 yrs)	8	103		131	7		17	102		368
PHF	0.53	0.84		0.79	0.32		0.33	0.39		0.84

Project: Shoreline Church Expansion
Intersection: Westland Drive at Emory Church Road
Date Conducted: Sunday August 28, 2022

	Emory Church Road Southbound				Westland Drive Westbound				Tremour Way Northbound				Westland Drive Eastbound				
Start	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Int. Total
8:00 AM	9	0	15	24	1	45	6	52	1	0	0	1	4	27	1	32	109
8:15 AM	0	0	5	5	0	46	3	49	0	0	0	0	4	24	0	28	82
8:30 AM	3	0	15	18	2	57	4	63	1	0	1	2	11	31	0	42	125
8:45 AM	9	0	13	22	0	74	8	82	2	2	0	4	8	36	0	44	152
Total	21	0	48	69	3	222	21	246	4	2	1	7	27	118	1	146	468
9:00 AM	8	0	18	26	0	77	8	85	0	0	0	0	8	39	0	47	158
9:15 AM	9	0	24	33	2	96	15	113	1	0	0	1	8	32	0	40	187
9:30 AM	14	0	25	39	0	108	22	130	2	1	1	4	9	43	0	52	225
9:45 AM	16	0	24	40	1	113	21	135	0	0	0	0	16	60	2	78	253
Total	47	0	91	138	3	394	66	463	3	1	1	5	41	174	2	217	823
10:00 AM	12	0	22	34	0	77	13	90	2	0	0	2	10	55	0	65	191
10:15 AM	18	0	26	44	1	78	13	92	1	0	2	3	25	52	0	77	216
10:30 AM	17	0	27	44	1	101	17	119	1	1	1	3	14	73	2	89	255
10:45 AM	13	0	28	41	0	83	16	99	0	0	1	1	18	80	0	98	239
Total	60	0	103	163	2	339	59	400	4	1	4	9	67	260	2	329	901
11:00 AM	13	0	21	34	0	81	16	97	0	0	0	0	23	111	0	134	265
11:15 AM	14	0	30	44	0	80	17	97	1	0	1	2	15	73	2	90	233
11:30 AM	15	0	25	40	0	99	16	115	0	0	0	0	17	83	1	101	256
11:45 AM	16	0	23	39	0	105	13	118	1	1	1	3	20	88	2	110	270
Total	58	0	99	157	0	365	62	427	2	1	2	5	75	355	5	435	1024
12:00 PM	19	0	12	31	0	79	12	91	0	0	0	0	21	92	0	113	235
12:15 PM	25	0	26	51	2	103	15	120	0	0	1	1	26	86	0	112	284
12:30 PM	10	0	29	39	0	124	19	143	1	0	0	1	21	97	1	119	302
12:45 PM	20	1	19	40	0	102	23	125	0	0	0	0	22	119	0	141	306
Total	74	1	86	161	2	408	69	479	1	0	1	2	90	394	1	485	1127
Grand Total	260	1	427	688	10	1728	277	2015	14	5	9	28	300	1301	11	1612	4343
Approach %	37.8	0.1	62.1		0.5	85.8	13.7		50.0	17.9	32.1		18.6	80.7	0.7		
Total %	6.0	0.0	9.8	15.8	0.2	39.8	6.4	46.4	0.3	0.1	0.2	0.6	6.9	30.0	0.3	37.1	

Project: Shoreline Church Expansion
Intersection: Westland Drive at Emory Church Road
Date Conducted: Sunday August 28, 2022

Entering Peak Hour	10:15 AM - 11:15 AM	975
Exiting Peak Hour	12:00 PM - 1:00 PM	1127

	Emory Church Road Southbound				Westland Drive Westbound				Treymour Way Northbound				Westland Drive Eastbound				
Start	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Int. Total
Peak Hour Analysis from 8:00 AM to 1:00 PM																	
Sunday Peak Hour Entering Traffic begins at 10:15 AM																	
10:15 AM	18	0	26	44	1	78	13	92	1	0	2	3	25	52	0	77	216
10:30 AM	17	0	27	44	1	101	17	119	1	1	1	3	14	73	2	89	255
10:45 AM	13	0	28	41	0	83	16	99	0	0	1	1	18	80	0	98	239
11:00 AM	13	0	21	34	0	81	16	97	0	0	0	0	23	111	0	134	265
Total Volume	61	0	102	163	2	343	62	407	2	1	4	7	80	316	2	398	975
Future (2% over 3 yrs)	14	0	30		0	88	17		0	0	1		19	85	0		254
PHF	0.85	-	0.91		0.50	0.85	0.91		0.50	0.25	0.50		0.80	0.71	0.25		0.92

	Emory Church Road Southbound				Westland Drive Westbound				Treymour Way Northbound				Westland Drive Eastbound				
Start	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Left	Thru	Right	Total	Int. Total
Peak Hour Analysis from 8:00 AM to 1:00 PM																	
Sunday Peak Hour begins at 12:00 PM																	
12:00 PM	19	0	12	31	0	79	12	91	0	0	0	0	21	92	0	113	235
12:15 PM	25	0	26	51	2	103	15	120	0	0	1	1	26	86	0	112	284
12:30 PM	10	0	29	39	0	124	19	143	1	0	0	1	21	97	1	119	302
12:45 PM	20	1	19	40	0	102	23	125	0	0	0	0	22	119	0	141	306
Total Volume	74	1	86	161	2	408	69	479	1	0	1	2	90	394	1	485	1127
Future (2% over 3 yrs)	27	0	28		2	109	16		0	0	1		28	91	0		301
PHF	0.74	0.25	0.74		0.25	0.82	0.75		0.25	-	0.25		0.87	0.83	0.25		0.92

Project: Shoreline Church Expansion**Intersection: Emory Church Road at Church Driveway****Date Conducted: Sunday August 28, 2022**

	Church Driveway Eastbound			Emory Church Road Northbound			Emory Church Road Southbound			
Start	Left	Right	Total	Left	Thru	Total	Thru	Right	Total	Int. Total
8:00 AM	0	0	0	1	10	11	23	2	25	36
8:15 AM	1	0	1	1	6	7	5	1	6	14
8:30 AM	0	0	0	0	14	14	14	1	15	29
8:45 AM	0	0	0	0	17	17	22	0	22	39
Total	1	0	1	2	47	49	64	4	68	118
9:00 AM	0	4	4	4	12	16	22	2	24	44
9:15 AM	2	6	8	5	14	19	29	5	34	61
9:30 AM	2	1	3	4	27	31	37	4	41	75
9:45 AM	0	2	2	1	33	34	35	1	36	72
Total	4	13	17	14	86	100	123	12	135	252
10:00 AM	0	0	0	1	19	20	32	0	32	52
10:15 AM	0	1	1	2	37	39	41	1	42	82
10:30 AM	7	15	22	3	22	25	28	1	29	76
10:45 AM	3	5	8	6	26	32	33	9	42	82
Total	10	21	31	12	104	116	134	11	145	292
11:00 PM	0	4	4	2	36	38	28	2	30	72
11:15 PM	1	1	2	2	29	31	37	0	37	70
11:30 PM	0	2	2	1	32	33	32	0	32	67
11:45 PM	3	2	5	2	32	34	34	3	37	76
Total	4	9	13	7	129	136	131	5	136	285
12:00 PM	1	1	2	0	32	32	30	1	31	65
12:15 PM	12	27	39	2	35	37	25	0	25	101
12:30 PM	3	4	7	1	40	41	36	0	36	84
12:45 PM	0	1	1	0	43	43	38	0	38	82
Total	16	33	49	3	150	153	129	1	130	332
Grand Total	35	76	111	38	516	554	581	33	614	1279
Approach %	31.5	68.5		6.9	93.1		94.6	5.4		
Total %	3%	6%	9%	3%	40%	43%	45%	3%	48%	

Project: Shoreline Church Expansion

Intersection: Emory Church Road at Church Driveway

Date Conducted: Sunday August 28, 2022

Entering Peak Hour	10:15 AM - 11:15 AM	312
Exiting Peak Hour	12:00 PM - 1:00 PM	332

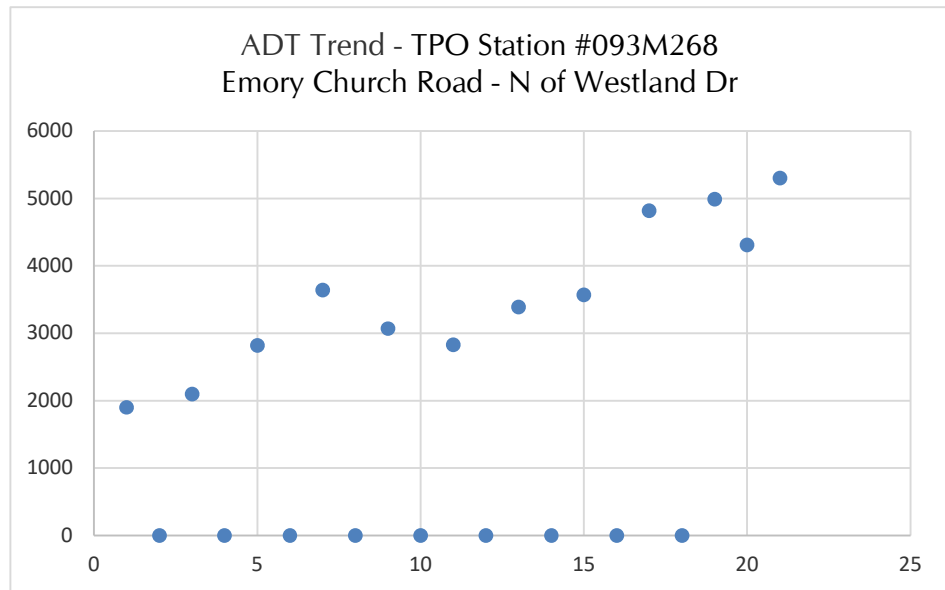
	Church Driveway Eastbound			Emory Church Road Northbound			Emory Church Road Southbound			
Start	Left	Right	Total	Left	Thru	Total	Thru	Right	Total	Int. Total
Peak Hour Analysis from 8:00 AM to 1:00 PM										
Sunday Peak Hour Entering Traffic begins at 12:15 AM										
10:15 PM	0	1	1	2	37	39	41	1	42	82
10:30 PM	7	15	22	3	22	25	28	1	29	76
10:45 PM	3	5	8	6	26	32	33	9	42	82
11:00 PM	0	4	4	2	36	38	28	2	30	72
Total Volume	10	25	35	13	121	134	130	13	143	312
Background (2% over 3 yrs)	3	5		6	28		35	10		87
PHF	0.36	0.42		0.54	0.82		0.79	0.36		0.95

Attachment 3

ADT Trends

Adjusted
Average Daily

Year	Traffic
2001	1900
2002	-
2003	2100
2004	-
2005	2821
2006	-
2007	3640
2008	-
2009	3070
2010	-
2011	2830
2012	-
2013	3390
2014	-
2015	3570
2016	-
2017	4820
2018	-
2019	4990
2020	4310
2021	5300

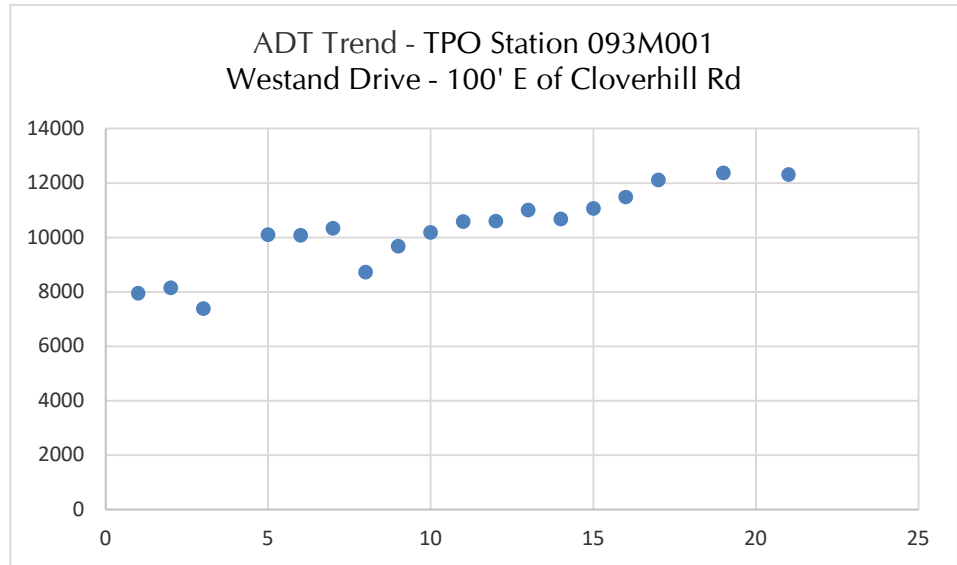


Most Recent Trend Line Growth

Year	ADT
2001	1900
2021	5300

Annual Percent Growth	3.21%
-----------------------	-------

Year	Adjusted Average Daily Traffic
2001	7950
2002	8150
2003	7380
2004	
2005	10094
2006	10080
2007	10330
2008	8730
2009	9670
2010	10190
2011	10580
2012	10600
2013	11010
2014	10680
2015	11070
2016	11480
2017	12110
2018	
2019	12370
2020	
2021	12310



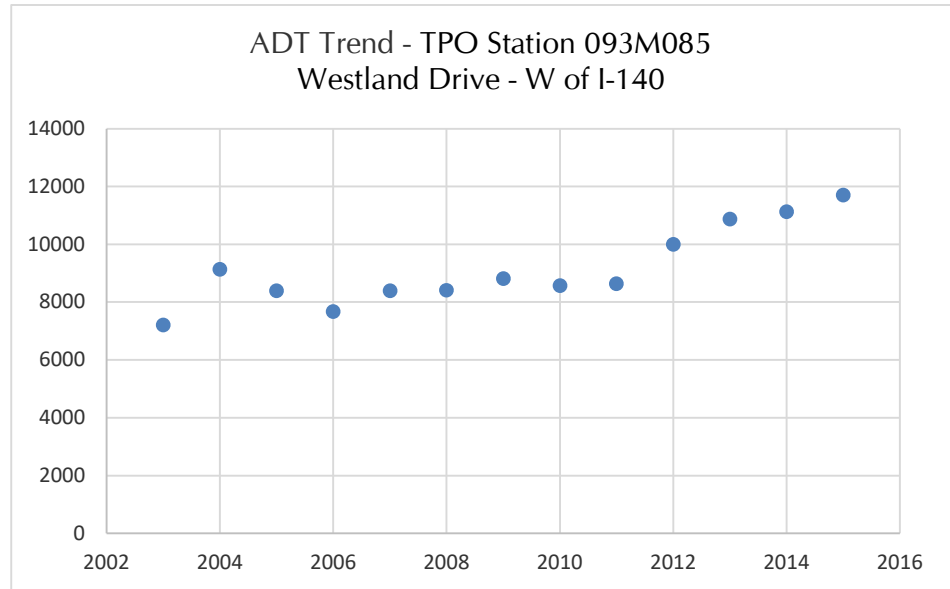
Most Recent Trend Line Growth

Year	ADT
2001	7950
2021	12310

Annual Percent Growth	1.77%
------------------------------	--------------

Adjusted
Average Daily

Year	Traffic
2001	7110
2002	6610
2003	7210
2004	9140
2005	8391
2006	7680
2007	8390
2008	8410
2009	8810
2010	8570
2011	8640
2012	10000
2013	10870
2014	11130
2015	11710
2016	11520
2017	12940
2018	
2019	12900
2020	11140
2021	



Most Recent Trend Line Growth

Year	ADT
2001	7110
2020	11140

Annual Percent Growth	1.90%
-----------------------	-------

Attachment 4
Trip Generation

Shoreline Church Expansion

2022 traffic volumes

Westland Drive driveway				Emory Church Road driveway				Total both driveways		Hourly sum both driveways	
Entering		Exiting		Entering		Exiting		Entering	Exiting	Entering	Exiting
EBLT	WBRT	SBLT	SBRT	NBLT	SBRT	EBLT	EBRT				
8:00	11	4	0	0	1	2	0	0	18	0	
8:15	9	2	0	2	1	1	1	0	13	3	
8:30	2	1	1	1	0	1	0	0	4	2	
8:45	7	2	0	0	0	0	0	0	9	0	44
9:00	13	5	0	1	4	2	0	4	24	5	50
9:15	59	32	0	16	5	5	2	6	101	24	138
9:30	26	11	0	3	4	4	2	1	45	6	179
9:45	0	0	0	3	1	1	0	2	2	5	172
10:00	4	1	0	2	1	0	0	0	6	2	154
10:15	7	0	0	2	2	1	0	1	10	3	63
10:30	23	10	10	53	3	1	7	15	37	85	55
10:45	82	22	9	38	6	9	3	5	119	55	172
11:00	29	5	3	8	2	2	0	4	38	15	204
11:15	4	1	1	5	2	0	1	1	7	8	201
11:30	3	0	0	3	1	0	0	2	4	5	168
11:45	1	2	1	3	2	3	3	2	8	9	57
12:00	3	1	0	4	0	1	1	1	5	6	24
12:15	8	7	16	96	2	0	12	27	17	151	34
12:30	2	1	1	24	1	0	3	4	4	32	34
12:45	4	0	4	27	0	0	0	1	4	32	30
Total	297	107	46	291	38	33	35	76	475	448	

Highest peak entering		Corresponding exiting traffic		Directional split	
Entering	Exiting	Entering	Exiting	Entering	Exiting
10:15	10	3			
10:30	37	85			
10:45	119	55			
11:00	38	15	158	204	158
Proportion of total entering-		43%		56%	44%
		(=204/475)			
Highest peak exiting		Corresponding entering traffic		Directional split	
12:00	6	5		Entering	Exiting
12:15	151	17			
12:30	32	4			
12:45	32	4	30	30	221
Proportion of total exiting-		49%		12%	88%
		(=221/448)			

	Entering	Exiting
Peak 15-Minute Entering Traffic (10:45 AM)	119	55
Expansion factor (1243 seats/450 seats)	2.76	2.76
Account for Expansion & PHF (multiply by 4)	1314	607
Peak 15-Minute Exiting Traffic (10:45 AM)	17	151
Expansion factor (1243 seats/450 seats)	2.76	2.76
Account for Expansion & PHF (multiply by 4)	188	1667

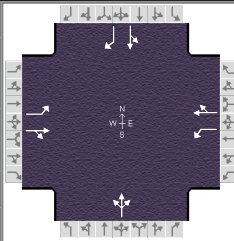
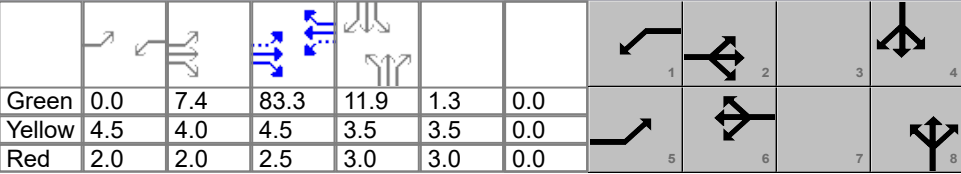
Attachment 5

Signal Timing

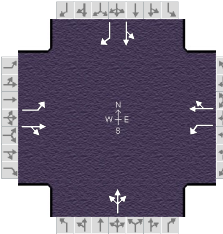
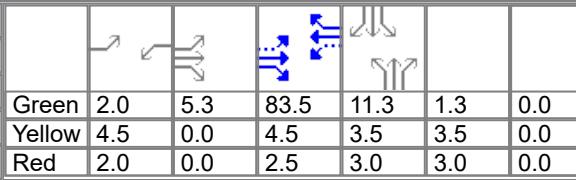
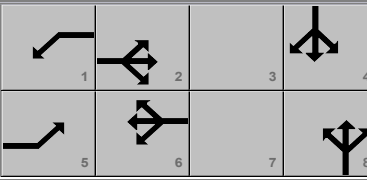
Intersection Name :		Westland Dr. & Emory Church					Id :		754	
Basic Timing (seconds)		Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8	
Movement		WBLT	EB	NB	SB	EBLT	WB			
Min Green		8	10	10	10	8	10			
Gap / Extension		2.0	4.0	2.0	2.0	2.0	4.0			
Max 1		15	30	30	30	15	30			
Max 2										
Yellow Clearance		4.5	4.0	3.5	3.5	4.0	4.5			
Red Clearance		2.0	2.5	3.0	3.0	2.0	2.5			
Walk			7	7						
Pedestrian Clearance			16	14						
Max Recall										
Active (Enable) Phases		X	X	X	X	X	X			
Flashing Yellow Arrow		X				X				
Overlaps (1-4)										
Coordination Timing/(seconds)										
Split #	Coord. Phase	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8	
Split 1	N/A									
Split 2	N/A									
Split 3	2	15	72	19	24	15	72			
Split 4	2	15	93	17	25	28	80			
Split 5										
Split 6										
Pattern Table					Lead / Lag		Fixed / Floating		Fixed FO-PH 3	
Pattern#	Cycle	Offset	Split	Seq. #	Phase #		End / Beginning			
1	N/A	N/A					Intersection ID#		754	
2	N/A	N/A					I/P Address		192.168.85.54	
3	130	117	3				Hub Address			
4	150	28	4				Radio Address			
5							Comm. Type		Radio	
6							Detection		Loops	
Day Plan Events										
Day Plan	HH:MM	Pattern		Day Plan	HH:MM	Pattern				
1	00:00	54		2	11:45	54				
1	06:50	4		2	17:00	54				
1	08:20	54		2	20:00	54				
1	09:00	54		3	00:00	54				
1	16:15	3		3	10:00	54				
1	18:30	54		3	11:30	54				
1	21:00	54		3	14:00	54				
2	00:00	54		3	19:00	54				
2	08:00	54								
Year Plan Scheduler										
Plan	Month of Year: 01 - 12			Day of Month: 01 - 31			Plan			
M - F	01 - 12			01 - 31			1			
SAT	01 - 12			01 - 31			2			
SUN	01 - 12			01 - 31			3			
Notes :										

Attachment 6
Intersection Worksheets – Existing Sunday Peak

HCS7 Signalized Intersection Results Summary

General Information						Intersection Information													
Agency		Ardurra				Duration, h		0.25											
Analyst		Addie Kirkham		Analysis Date		9/7/2022		Area Type		Other									
Jurisdiction		Knox County		Time Period		Existing Sunday Entering Peak		PHF		1.00									
Urban Street		Westland Drive		Analysis Year		2022		Analysis Period		1> 7:00									
Intersection		Westland Drive at Emor...		File Name		Existing Sunday Peak_Westland at Emory Churc...													
Project Description		391.046.1 - Shoreline Church Expansion																	
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h				72	320	0	0	332	64	0	0	4	52	0	112				
Signal Information																			
Cycle, s	130.0	Reference Phase	2																
Offset, s	0	Reference Point	End																
Uncoordinated	No	Simult. Gap E/W	On																
Force Mode	Fixed	Simult. Gap N/S	On																
				Green	0.0	7.4	83.3	11.9	1.3	0.0									
				Yellow	4.5	4.0	4.5	3.5	3.5	0.0									
				Red	2.0	2.0	2.5	3.0	3.0	0.0									
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase				5		2		1		6				8				4	
Case Number				1.1		4.0		1.1		4.0				12.0				11.0	
Phase Duration, s				13.4		103.7		0.0		90.3				7.8				18.4	
Change Period, (Y+R c), s				6.0		7.0		6.5		7.0				6.5				6.5	
Max Allow Headway (MAH), s				3.1		0.0		0.0		0.0				3.3				3.2	
Queue Clearance Time (g s), s				3.6										2.3				11.8	
Green Extension Time (g e), s				0.1		0.0		0.0		0.0				0.0				0.1	
Phase Call Probability				0.93										0.13				1.00	
Max Out Probability				0.00										0.00				0.08	
Movement Group Results				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement				5	2	12	1	6	16	3	8	18	7	4	14				
Adjusted Flow Rate (v), veh/h				72	0		0	396			0			52	112				
Adjusted Saturation Flow Rate (s), veh/h/ln				1781	0		1781	1817			0			1641	1460				
Queue Service Time (g s), s				1.6	0.0		0.0	13.0			0.0			3.9	9.8				
Cycle Queue Clearance Time (g c), s				1.6	0.0		0.0	13.0			0.0			3.9	9.8				
Green Ratio (g/C)				0.71			0.59	0.64						0.09	0.09				
Capacity (c), veh/h				691			736	1165						150	134				
Volume-to-Capacity Ratio (X)				0.104	0.000		0.000	0.340			0.000			0.346	0.837				
Back of Queue (Q), ft/ln (95 th percentile)				24.1	0		0	224.6			0			73.3	184.3				
Back of Queue (Q), veh/ln (95 th percentile)				0.9	0.0		0.0	8.8			0.0			2.9	7.3				
Queue Storage Ratio (RQ) (95 th percentile)				0.09	0.00		0.00	0.00			0.00			0.00	0.92				
Uniform Delay (d 1), s/veh				6.5			0.0	10.7						55.4	58.1				
Incremental Delay (d 2), s/veh				0.0	0.0		0.0	0.8			0.0			0.5	12.3				
Initial Queue Delay (d 3), s/veh				0.0	0.0		0.0	0.0			0.0			0.0	0.0				
Control Delay (d), s/veh				6.5			0.0	11.5						55.9	70.4				
Level of Service (LOS)				A				B						E	E				
Approach Delay, s/veh / LOS				5.7		A		11.5		B		66.6		E		65.8		E	
Intersection Delay, s/veh / LOS				18.7									B						
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.0		B		2.2		B		2.3		B		2.3		B	
Bicycle LOS Score / LOS				1.1		A		1.1		A		0.5		A		0.8		A	

HCS7 Signalized Intersection Results Summary

General Information						Intersection Information													
Agency		Ardurra				Duration, h		0.25											
Analyst		Addie Kirkham		Analysis Date	Sep 19, 2022		Area Type		Other										
Jurisdiction		Knox County		Time Period	Existing Sunday Exiting Peak		PHF		1.00										
Urban Street		Westland Drive		Analysis Year	2022		Analysis Period		1> 7:00										
Intersection		Westland Drive at Emor...		File Name	Existing Sunday Peak_Westland at Emory Churc...														
Project Description		391.046.1 - Shoreline Church Expansion																	
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h				104	344	0	8	412	60	0	0	4	100	0	104				
Signal Information																			
Cycle, s	130.0	Reference Phase	2																
Offset, s	0	Reference Point	End																
Uncoordinated	No	Simult. Gap E/W	On																
Force Mode	Fixed	Simult. Gap N/S	On																
Green	2.0	5.3	83.5	11.3	1.3	0.0													
Yellow	4.5	0.0	4.5	3.5	3.5	0.0													
Red	2.0	0.0	2.5	3.0	3.0	0.0													
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase				5		2		1		6				8				4	
Case Number				1.1		4.0		1.1		4.0				12.0				11.0	
Phase Duration, s				13.8		95.9		8.5		90.5				7.8				17.8	
Change Period, (Y+R c), s				6.0		7.0		6.5		7.0				6.5				6.5	
Max Allow Headway (MAH), s				3.1		0.0		3.1		0.0				3.3				3.2	
Queue Clearance Time (g s), s				4.3				2.2						2.3				11.1	
Green Extension Time (g e), s				0.1		0.0		0.0		0.0				0.0				0.2	
Phase Call Probability				0.98				0.25						0.13				1.00	
Max Out Probability				0.00				0.00						0.00				0.04	
Movement Group Results				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement				5	2	12	1	6	16	3	8	18	7	4	14				
Adjusted Flow Rate (v), veh/h				104	0		8	472			0			100	104				
Adjusted Saturation Flow Rate (s), veh/h/ln				1781	0		1781	1829			0			1641	1460				
Queue Service Time (g s), s				2.3	0.0		0.2	16.2			0.0			7.7	9.1				
Cycle Queue Clearance Time (g c), s				2.3	0.0		0.2	16.2			0.0			7.7	9.1				
Green Ratio (g/C)				0.71			0.66	0.64						0.09	0.09				
Capacity (c), veh/h				640			701	1175						143	127				
Volume-to-Capacity Ratio (X)				0.162	0.000		0.011	0.402			0.000			0.701	0.820				
Back of Queue (Q), ft/ln (95 th percentile)				35.6	0		3.3	269			0			148.6	164.3				
Back of Queue (Q), veh/ln (95 th percentile)				1.4	0.0		0.1	10.6			0.0			5.9	6.5				
Queue Storage Ratio (RQ) (95 th percentile)				0.13	0.00		0.03	0.00			0.00			0.00	0.82				
Uniform Delay (d 1), s/veh				7.0			7.8	11.2						57.7	58.4				
Incremental Delay (d 2), s/veh				0.0	0.0		0.0	1.0			0.0			2.3	7.9				
Initial Queue Delay (d 3), s/veh				0.0	0.0		0.0	0.0			0.0			0.0	0.0				
Control Delay (d), s/veh				7.1			7.8	12.2						60.0	66.2				
Level of Service (LOS)				A			A	B						E	E				
Approach Delay, s/veh / LOS				8.2		A		12.1		B		66.6		E		63.2		E	
Intersection Delay, s/veh / LOS				19.9						B									
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.1		B		2.2		B		2.3		B		2.3		B	
Bicycle LOS Score / LOS				1.2		A		1.3		A		0.5		A		0.8		A	

HCS7 Two-Way Stop-Control Report

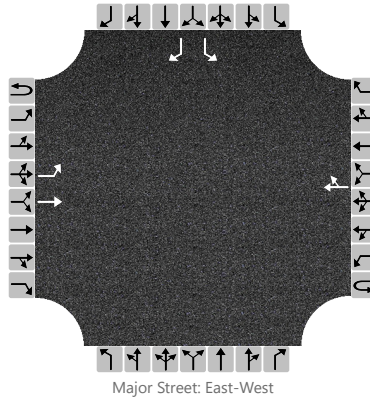
General Information

Analyst	Addie Kirkham
Agency/Co.	Ardurra
Date Performed	9/19/2022
Analysis Year	2022
Time Analyzed	Existing Entering Peak
Intersection Orientation	East-West
Project Description	391.046.1 - Shoreline Church Expansion

Site Information

Intersection	Westland Dr at Driveway
Jurisdiction	Knox County
East/West Street	Westland Drive
North/South Street	Church Driveway
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		1	0	1
Configuration		L	T					TR						L		R
Volume, V (veh/h)		328	372				380	88						36		152
Percent Heavy Vehicles (%)		2												2		2
Proportion Time Blocked																
Percent Grade (%)													5			
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.12												7.42		6.72
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.22												3.52		3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		328												36		152
Capacity, c (veh/h)		1093												67		594
v/c Ratio		0.30												0.54		0.26
95% Queue Length, Q ₉₅ (veh)		1.3												2.2		1.0
Control Delay (s/veh)		9.7												108.4		13.1
Level of Service, LOS		A												F		B
Approach Delay (s/veh)	4.5												31.4			
Approach LOS													D			

HCS7 Two-Way Stop-Control Report

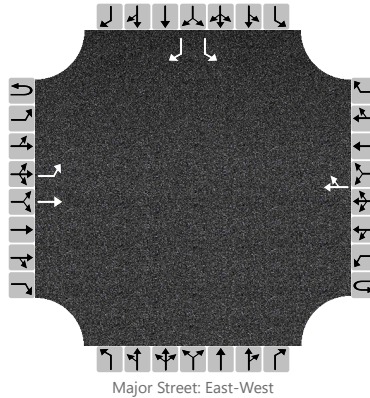
General Information

Analyst	Addie Kirkham
Agency/Co.	Ardurra
Date Performed	9/19/2022
Analysis Year	2022
Time Analyzed	Existing Exiting Peak
Intersection Orientation	East-West
Project Description	391.046.1 - Shoreline Church Expansion

Site Information

Intersection	Westland Dr at Driveway
Jurisdiction	Knox County
East/West Street	Westland Drive
North/South Street	Church Driveway
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		1	0	1
Configuration		L	T					TR						L		R
Volume, V (veh/h)		32	388				492	28						64		384
Percent Heavy Vehicles (%)		2												2		2
Proportion Time Blocked																
Percent Grade (%)													5			
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.12												7.42		6.72
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.22												3.52		3.32

Delay, Queue Length, and Level of Service

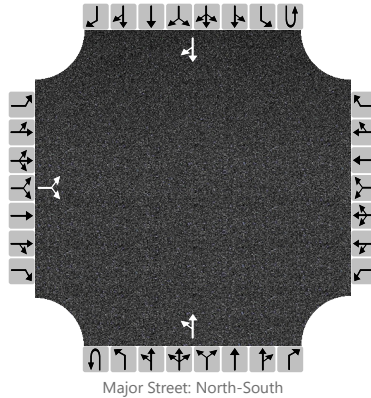
Flow Rate, v (veh/h)		32												64		384
Capacity, c (veh/h)		1046												212		528
v/c Ratio		0.03												0.30		0.73
95% Queue Length, Q ₉₅ (veh)		0.1												1.2		6.0
Control Delay (s/veh)		8.6												29.1		27.9
Level of Service, LOS		A												D		D
Approach Delay (s/veh)	0.7												28.1			
Approach LOS													D			

HCS7 Two-Way Stop-Control Report

General Information

Analyst	Addie Kirkham	Intersection	Emory Church at Driveway
Agency/Co.	Ardurra	Jurisdiction	Knox County
Date Performed	9/19/2022	East/West Street	Church Driveway
Analysis Year	2022	North/South Street	Emory Church Road
Time Analyzed	Existing Peak Entering	Peak Hour Factor	1.00
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	391.046.1 - Shoreline Church Expansion		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume, V (veh/h)		12		20						24	104				132	36
Percent Heavy Vehicles (%)		2		2						2						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.42		6.22						4.12						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

Delay, Queue Length, and Level of Service

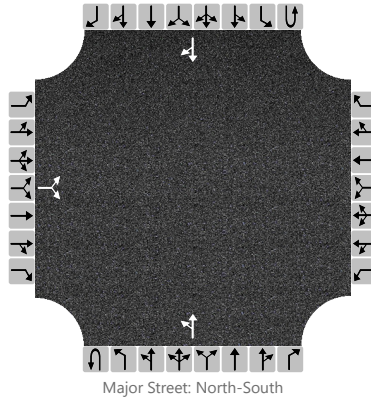
Flow Rate, v (veh/h)			32							24						
Capacity, c (veh/h)			799							1409						
v/c Ratio			0.04							0.02						
95% Queue Length, Q ₉₅ (veh)			0.1							0.1						
Control Delay (s/veh)			9.7							7.6						
Level of Service, LOS			A							A						
Approach Delay (s/veh)	9.7								1.5							
Approach LOS	A															

HCS7 Two-Way Stop-Control Report

General Information

Analyst	Addie Kirkham	Intersection	Emory Church at Driveway
Agency/Co.	Ardurra	Jurisdiction	Knox County
Date Performed	9/19/2022	East/West Street	Church Driveway
Analysis Year	2022	North/South Street	Emory Church Road
Time Analyzed	Existing Peak Exiting	Peak Hour Factor	1.00
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	391.046.1 - Shoreline Church Expansion		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume, V (veh/h)		48		108						8	140				100	0
Percent Heavy Vehicles (%)		2		2						2						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.42		6.22						4.12						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

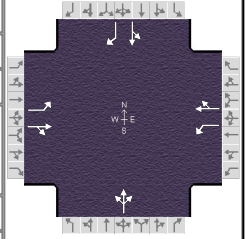
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			156							8						
Capacity, c (veh/h)			872							1491						
v/c Ratio			0.18							0.01						
95% Queue Length, Q ₉₅ (veh)			0.6							0.0						
Control Delay (s/veh)			10.0							7.4						
Level of Service, LOS			B							A						
Approach Delay (s/veh)	10.0								0.4							
Approach LOS	B															

Attachment 7
Intersection Worksheets – Background Sunday Peak


















































































































































































































































































































HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Ardurra			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	Sep 19, 2022	Area Type	Other
Jurisdiction	Knox County	Time Period	Background Sunday Peak Entering	PHF	1.00
Urban Street	Westland Drive	Analysis Year	2025	Analysis Period	1> 7:00
Intersection	Westland Drive at Emor...	File Name	Background Sunday Peak_Westland at Emory Ch...		
Project Description	391.046.1 - Shoreline Church Expansion				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	76	340	0	0	352	68	0	0	4	56	0	120

Signal Information												
Cycle, s	130.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	0.0	7.5	82.5	12.6	1.3	0.0		
				Yellow	4.5	4.0	4.5	3.5	3.5	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.5	3.0	3.0	0.0		

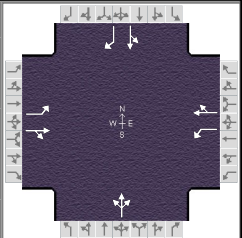
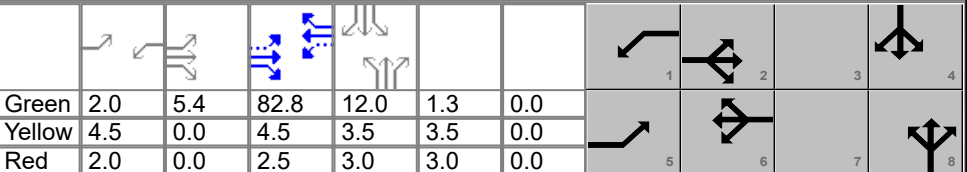
																																																																																																																																																																																																																																																																																																																																																													
																																																																																																																																																																																																																																																																																																																																																													
																																																																																																																																																																																																																																																																																																																																																													
																																																																																																																																																																																																																																																																																																																																																													
																																																																																																																																																																																																																																																																																																																																																													
																																																																																																																																																																																																																																																																																																																																																													
																																																																																																																																																																																																																																																																																																																																																													
																																																																																																																																																																																																																																																																																																																																																													
																																																																																																																																																																																																																																																																																																																																																													
																																																																																																																																																																																																																																																																																																																																																													
																																																																																																																																																																																																																																																																																																																																																													
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Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	4.0	1.1	4.0		12.0		11.0
Phase Duration, s	13.5	103.0	0.0	89.5		7.8		19.1
Change Period, (Y+R c), s	6.0	7.0	6.5	7.0		6.5		6.5
Max Allow Headway (MAH), s	3.1	0.0	0.0	0.0		3.3		3.2
Queue Clearance Time (g s), s	3.7					2.3		12.5
Green Extension Time (g e), s	0.1	0.0	0.0	0.0		0.0		0.1
Phase Call Probability	0.94					0.13		1.00
Max Out Probability	0.00					0.00		0.17

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	76	0		0	420			0			56	120
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	0		1781	1817			0			1641	1460
Queue Service Time (g s), s	1.7	0.0		0.0	14.3			0.0			4.1	10.5
Cycle Queue Clearance Time (g c), s	1.7	0.0		0.0	14.3			0.0			4.1	10.5
Green Ratio (g/C)	0.71			0.58	0.63						0.10	0.10
Capacity (c), veh/h	666			717	1154						159	142
Volume-to-Capacity Ratio (X)	0.114	0.000		0.000	0.364			0.000			0.351	0.846
Back of Queue (Q), ft/ln (95 th percentile)	26.3	0		0	243			0			78.6	201.2
Back of Queue (Q), veh/ln (95 th percentile)	1.0	0.0		0.0	9.6			0.0			3.1	7.9
Queue Storage Ratio (RQ) (95 th percentile)	0.09	0.00		0.00	0.00			0.00			0.00	1.01
Uniform Delay (d 1), s/veh	6.9			0.0	11.3						54.9	57.7
Incremental Delay (d 2), s/veh	0.0	0.0		0.0	0.9			0.0			0.5	16.1
Initial Queue Delay (d 3), s/veh	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Control Delay (d), s/veh	6.9			0.0	12.2						55.3	73.8
Level of Service (LOS)	A				B						E	E
Approach Delay, s/veh / LOS	6.0		A	12.2		B	66.6		E	67.9		E
Intersection Delay, s/veh / LOS	19.5						B					

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.0		B	2.2		B	2.3		B	2.3		B
Bicycle LOS Score / LOS	1.2		A	1.2		A	0.5		A	0.8		A

HCS7 Signalized Intersection Results Summary

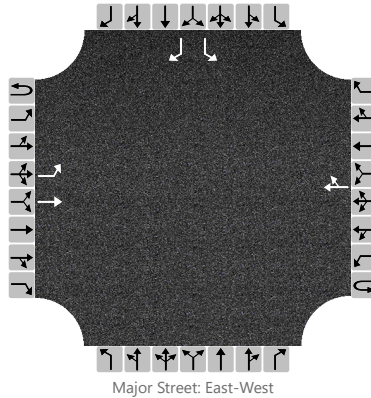
General Information						Intersection Information													
Agency		Ardurra				Duration, h		0.25											
Analyst		Addie Kirkham		Analysis Date		Sep 19, 2022		Area Type		Other									
Jurisdiction		Knox County		Time Period		Background Sunday Peak Exiting		PHF		1.00									
Urban Street		Westland Drive		Analysis Year		2025		Analysis Period		1> 7:00									
Intersection		Westland Drive at Emor...		File Name		Background Sunday Peak_Westland at Emory Ch...													
Project Description		391.046.1 - Shoreline Church Expansion																	
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h				112	364	0	8	436	64	0	0	4	108	0	112				
Signal Information																			
Cycle, s	130.0	Reference Phase	2																
Offset, s	0	Reference Point	End																
Uncoordinated	No	Simult. Gap E/W	On																
Force Mode	Fixed	Simult. Gap N/S	On																
				Green	2.0	5.4	82.8	12.0	1.3	0.0									
				Yellow	4.5	0.0	4.5	3.5	3.5	0.0									
				Red	2.0	0.0	2.5	3.0	3.0	0.0									
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase				5		2		1		6				8				4	
Case Number				1.1		4.0		1.1		4.0				12.0				11.0	
Phase Duration, s				13.9		95.1		8.5		89.8				7.8				18.5	
Change Period, ($Y+R_c$), s				6.0		7.0		6.5		7.0				6.5				6.5	
Max Allow Headway (MAH), s				3.1		0.0		3.1		0.0				3.3				3.2	
Queue Clearance Time (g_s), s				4.5				2.2						2.3				11.8	
Green Extension Time (g_e), s				0.2		0.0		0.0		0.0				0.0				0.2	
Phase Call Probability				0.98				0.25						0.13				1.00	
Max Out Probability				0.00				0.00						0.00				0.09	
Movement Group Results				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement				5	2	12	1	6	16	3	8	18	7	4	14				
Adjusted Flow Rate (v), veh/h				112	0		8	500			0			108	112				
Adjusted Saturation Flow Rate (s), veh/h/ln				1781	0		1781	1828			0			1641	1460				
Queue Service Time (g_s), s				2.5	0.0		0.2	17.8			0.0			8.3	9.8				
Cycle Queue Clearance Time (g_c), s				2.5	0.0		0.2	17.8			0.0			8.3	9.8				
Green Ratio (g/C)				0.71			0.65	0.64						0.09	0.09				
Capacity (c), veh/h				612			678	1164						152	135				
Volume-to-Capacity Ratio (X)				0.183	0.000		0.012	0.429			0.000			0.713	0.831				
Back of Queue (Q), ft/ln (95 th percentile)				39.7	0		3.4	291.7			0			160	183.5				
Back of Queue (Q), veh/ln (95 th percentile)				1.6	0.0		0.1	11.5			0.0			6.3	7.2				
Queue Storage Ratio (RQ) (95 th percentile)				0.14	0.00		0.03	0.00			0.00			0.00	0.92				
Uniform Delay (d_1), s/veh				7.5			8.1	11.8						57.3	58.0				
Incremental Delay (d_2), s/veh				0.1	0.0		0.0	1.2			0.0			2.3	11.8				
Initial Queue Delay (d_3), s/veh				0.0	0.0		0.0	0.0			0.0			0.0	0.0				
Control Delay (d), s/veh				7.6			8.1	13.0						59.6	69.8				
Level of Service (LOS)				A			A	B						E	E				
Approach Delay, s/veh / LOS				8.6		A		12.9		B		66.6		E		64.8		E	
Intersection Delay, s/veh / LOS				20.8						C									
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.1		B		2.2		B		2.3		B		2.3		B	
Bicycle LOS Score / LOS				1.3		A		1.3		A		0.5		A		0.9		A	

HCS7 Two-Way Stop-Control Report

General Information

Analyst	Addie Kirkham	Intersection	Westland Dr at Driveway
Agency/Co.	Ardurra	Jurisdiction	Knox County
Date Performed	9/19/2022	East/West Street	Westland Drive
Analysis Year	2025	North/South Street	Church Driveway
Time Analyzed	Background Peak Entering	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	391.046.1 - Shoreline Church Expansion		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		1	0	1
Configuration		L	T					TR						L		R
Volume, V (veh/h)		348	396				404	92						40		160
Percent Heavy Vehicles (%)		2												2		2
Proportion Time Blocked																
Percent Grade (%)													5			
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.12												7.42		6.72
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.22												3.52		3.32

Delay, Queue Length, and Level of Service

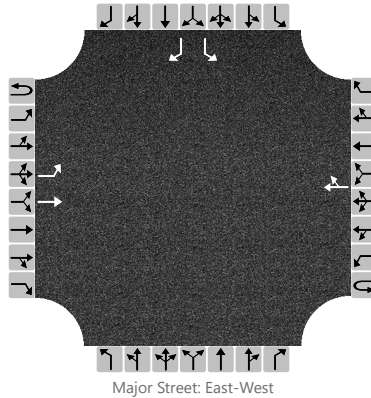
Flow Rate, v (veh/h)		348												40		160
Capacity, c (veh/h)		1067												56		572
v/c Ratio		0.33												0.72		0.28
95% Queue Length, Q ₉₅ (veh)		1.4												3.0		1.1
Control Delay (s/veh)		10.0												164.5		13.7
Level of Service, LOS		A												F		B
Approach Delay (s/veh)	4.7												43.9			
Approach LOS													E			

HCS7 Two-Way Stop-Control Report

General Information

Analyst	Addie Kirkham	Intersection	Westland Dr at Driveway
Agency/Co.	Ardurra	Jurisdiction	Knox County
Date Performed	9/19/2022	East/West Street	Westland Drive
Analysis Year	2025	North/South Street	Church Driveway
Time Analyzed	Background Peak Exiting	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	391.046.1 - Shoreline Church Expansion		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		1	0	1
Configuration		L	T					TR						L		R
Volume, V (veh/h)		32	412				524	28						68		408
Percent Heavy Vehicles (%)		2												2		2
Proportion Time Blocked																
Percent Grade (%)													5			
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.12												7.42		6.72
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.22												3.52		3.32

Delay, Queue Length, and Level of Service

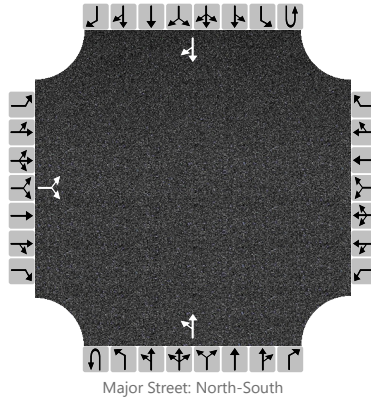
Flow Rate, v (veh/h)		32												68		408
Capacity, c (veh/h)		1017												193		504
v/c Ratio		0.03												0.35		0.81
95% Queue Length, Q ₉₅ (veh)		0.1												1.5		7.7
Control Delay (s/veh)		8.7												33.4		35.9
Level of Service, LOS		A												D		E
Approach Delay (s/veh)	0.6												35.6			
Approach LOS													E			

HCS7 Two-Way Stop-Control Report

General Information

Analyst	Addie Kirkham	Intersection	Emory Church at Driveway
Agency/Co.	Ardurra	Jurisdiction	Knox County
Date Performed	9/19/2022	East/West Street	Church Driveway
Analysis Year	2025	North/South Street	Emory Church Road
Time Analyzed	Background Peak Entering	Peak Hour Factor	1.00
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	391.046.1 - Shoreline Church Expansion		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume, V (veh/h)		12		20						24	112				140	40
Percent Heavy Vehicles (%)		2		2						2						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.42		6.22						4.12						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

Delay, Queue Length, and Level of Service

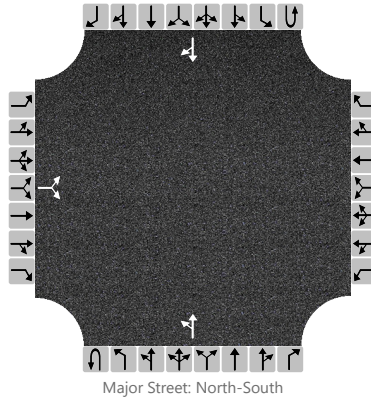
Flow Rate, v (veh/h)			32							24						
Capacity, c (veh/h)			785							1394						
v/c Ratio			0.04							0.02						
95% Queue Length, Q ₉₅ (veh)			0.1							0.1						
Control Delay (s/veh)			9.8							7.6						
Level of Service, LOS			A							A						
Approach Delay (s/veh)	9.8								1.5							
Approach LOS	A															

HCS7 Two-Way Stop-Control Report

General Information

Analyst	Addie Kirkham	Intersection	Emory Church at Driveway
Agency/Co.	Ardurra	Jurisdiction	Knox County
Date Performed	9/19/2022	East/West Street	Church Driveway
Analysis Year	2025	North/South Street	Emory Church Road
Time Analyzed	Background Peak Exiting	Peak Hour Factor	1.00
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	391.046.1 - Shoreline Church Expansion		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume, V (veh/h)		52		116						8	148				108	0
Percent Heavy Vehicles (%)		2		2						2						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.42		6.22						4.12						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

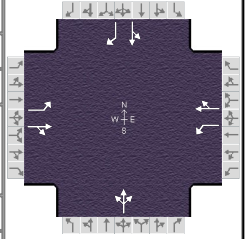
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			168							8						
Capacity, c (veh/h)			859							1481						
v/c Ratio			0.20							0.01						
95% Queue Length, Q ₉₅ (veh)			0.7							0.0						
Control Delay (s/veh)			10.2							7.4						
Level of Service, LOS			B							A						
Approach Delay (s/veh)	10.2								0.4							
Approach LOS	B															























































































































































































































































































































































































Attachment 8
Intersection Worksheets – Full Buildout Sunday Peak

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Ardurra			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	Sep 19, 2022	Area Type	Other
Jurisdiction	Knox County	Time Period	Full Buildout Sunday Peak Entering	PHF	1.00
Urban Street	Westland Drive	Analysis Year	2025	Analysis Period	1> 7:00
Intersection	Westland Drive at Emor...	File Name	Full Buildout Sunday Peak_Westland at Emory C...		
Project Description	391.046.1 - Shoreline Church Expansion				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	76	361	0	0	523	149	0	0	4	79	0	168

Signal Information																		
Cycle, s	130.0	Reference Phase	2															
Offset, s	0	Reference Point	End															
Uncoordinated	No	Simult. Gap E/W	On															
Force Mode	Fixed	Simult. Gap N/S	On															
																		
Green	0.0	7.5	78.4	16.8	1.3	0.0												
Yellow	4.5	4.0	4.5	3.5	3.5	0.0												
Red	2.0	2.0	2.5	3.0	3.0	0.0												
																		
																		
																		
																		
																		
																		
																		
																		
																		
																		
																		
																		
																		
																		
																		
																		
																		
																		
																		
																		
																		
																		
																		
																		

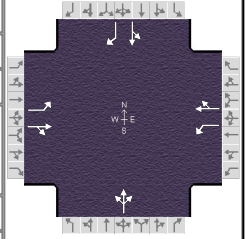
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	4.0	1.1	4.0		12.0		11.0
Phase Duration, s	13.5	98.9	0.0	85.4		7.8		23.3
Change Period, (Y+R c), s	6.0	7.0	6.5	7.0		6.5		6.5
Max Allow Headway (MAH), s	3.1	0.0	0.0	0.0		3.3		3.2
Queue Clearance Time (g s), s	3.9					2.3		16.7
Green Extension Time (g e), s	0.1	0.0	0.0	0.0		0.0		0.0
Phase Call Probability	0.94					0.13		1.00
Max Out Probability	0.00					0.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	76	0		0	672		0			79	0	168
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	0		1781	1799		0			1641	1460	
Queue Service Time (g s), s	1.9	0.0		0.0	30.8		0.0			5.7	14.7	
Cycle Queue Clearance Time (g c), s	1.9	0.0		0.0	30.8		0.0			5.7	14.7	
Green Ratio (g/C)	0.68			0.55	0.60					0.13	0.13	
Capacity (c), veh/h	438			672	1085					212	188	
Volume-to-Capacity Ratio (X)	0.173	0.000		0.000	0.619		0.000			0.373	0.892	
Back of Queue (Q), ft/ln (95 th percentile)	30.6	0		0	467.9		0			107.8	291.9	
Back of Queue (Q), veh/ln (95 th percentile)	1.2	0.0		0.0	18.4		0.0			4.2	11.5	
Queue Storage Ratio (RQ) (95 th percentile)	0.11	0.00		0.00	0.00		0.00			0.00	1.46	
Uniform Delay (d 1), s/veh	11.7			0.0	16.3					51.8	55.7	
Incremental Delay (d 2), s/veh	0.1	0.0		0.0	2.7		0.0			0.4	34.0	
Initial Queue Delay (d 3), s/veh	0.0	0.0		0.0	0.0		0.0			0.0	0.0	
Control Delay (d), s/veh	11.8			0.0	19.0					52.2	89.8	
Level of Service (LOS)	B				B					D	F	
Approach Delay, s/veh / LOS	8.2		A	19.0		B	66.6		E	77.8		E
Intersection Delay, s/veh / LOS	26.3						C					

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.1		B	2.3		B	2.3		B	2.3		B
Bicycle LOS Score / LOS	1.2		A	1.6		B	0.5		A	0.9		A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Ardurra			Duration, h	0.25
Analyst	Addie Kirkham	Analysis Date	Sep 19, 2022	Area Type	Other
Jurisdiction	Knox County	Time Period	Full Buildout Sunday Peak Exiting	PHF	1.00
Urban Street	Westland Drive	Analysis Year	2025	Analysis Period	1> 7:00
Intersection	Westland Drive at Emor...	File Name	Full Buildout Sunday Peak_Westland at Emory C...		
Project Description	391.046.1 - Shoreline Church Expansion				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	112	463	0	8	446	71	0	0	4	153	0	201

Signal Information												
Cycle, s	130.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	2.0	5.4	77.3	17.5	1.3	0.0		
				Yellow	4.5	0.0	4.5	3.5	3.5	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	0.0	2.5	3.0	3.0	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	4.0	1.1	4.0		12.0		11.0
Phase Duration, s	13.9	89.6	8.5	84.3		7.8		24.0
Change Period, ($Y+R_c$), s	6.0	7.0	6.5	7.0		6.5		6.5
Max Allow Headway (MAH), s	3.1	0.0	3.1	0.0		3.3		3.2
Queue Clearance Time (g_s), s	4.9		2.2			2.3		19.5
Green Extension Time (g_e), s	0.1	0.0	0.0	0.0		0.0		0.0
Phase Call Probability	0.98		0.25			0.13		1.00
Max Out Probability	0.00		0.00			0.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	112	0		8	517			0			153	201
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	0		1781	1825			0			1641	1460
Queue Service Time (g_s), s	2.9	0.0		0.2	20.8			0.0			11.6	17.5
Cycle Queue Clearance Time (g_c), s	2.9	0.0		0.2	20.8			0.0			11.6	17.5
Green Ratio (g/C)	0.67			0.61	0.59						0.13	0.13
Capacity (c), veh/h	547			548	1085						221	197
Volume-to-Capacity Ratio (X)	0.205	0.000		0.015	0.476			0.000			0.693	1.023
Back of Queue (Q), ft/ln (95 th percentile)	48.1	0		4	341.4			0			226.1	395.2
Back of Queue (Q), veh/ln (95 th percentile)	1.9	0.0		0.2	13.4			0.0			8.9	15.6
Queue Storage Ratio (RQ) (95 th percentile)	0.17	0.00		0.04	0.00			0.00			0.00	1.98
Uniform Delay (d_1), s/veh	9.9			10.5	14.9						53.7	56.3
Incremental Delay (d_2), s/veh	0.1	0.0		0.0	1.5			0.0			7.6	70.2
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Control Delay (d), s/veh	10.0			10.5	16.4						61.2	126.4
Level of Service (LOS)	B			B	B						E	F
Approach Delay, s/veh / LOS	12.0		B	16.3		B	66.6		E	98.3		F
Intersection Delay, s/veh / LOS	34.6						C					

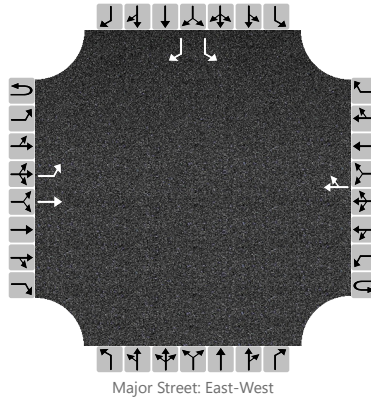
Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.1		B	2.3		B	2.3		B	2.3		B
Bicycle LOS Score / LOS	1.4		A	1.4		A	0.5		A	1.1		A

HCS7 Two-Way Stop-Control Report

General Information

Analyst	Addie Kirkham	Intersection	Westland Dr at Driveway
Agency/Co.	Ardurra	Jurisdiction	Knox County
Date Performed	9/19/2022	East/West Street	Westland Drive
Analysis Year	2025	North/South Street	Church Driveway
Time Analyzed	Full Build Peak Entering	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	391.046.1 - Shoreline Church Expansion		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		1	0	1
Configuration		L	T					TR						L		R
Volume, V (veh/h)		854	396				452	263						61		395
Percent Heavy Vehicles (%)		2												2		2
Proportion Time Blocked																
Percent Grade (%)													5			
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.12												7.42		6.72
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.22												3.52		3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		854												61		395
Capacity, c (veh/h)		885												0		472
v/c Ratio		0.97												153.65		0.84
95% Queue Length, Q ₉₅ (veh)		16.1												9.9		8.3
Control Delay (s/veh)		44.0												85921.7		41.0
Level of Service, LOS		E												F		E
Approach Delay (s/veh)	30.0												11529.4			
Approach LOS													F			

HCS7 Two-Way Stop-Control Report

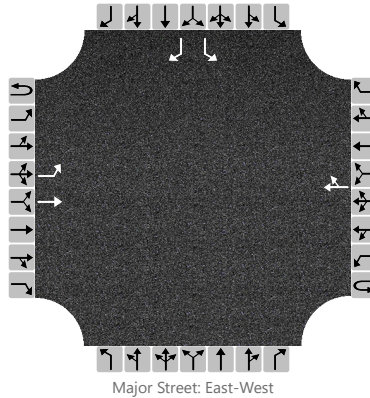
General Information

Analyst	Addie Kirkham
Agency/Co.	Ardurra
Date Performed	9/19/2022
Analysis Year	2025
Time Analyzed	Full Build Peak Exiting
Intersection Orientation	East-West
Project Description	391.046.1 - Shoreline Church Expansion

Site Information

Intersection	Westland Dr at Driveway
Jurisdiction	Knox County
East/West Street	Westland Drive
North/South Street	Church Driveway
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		1	0	1
Configuration		L	T					TR						L		R
Volume, V (veh/h)		122	412				613	38						167		1084
Percent Heavy Vehicles (%)		2												2		2
Proportion Time Blocked																
Percent Grade (%)													5			
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.12												7.42		6.72
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.22												3.52		3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		122												167		1084
Capacity, c (veh/h)		935												110		440
v/c Ratio		0.13												1.52		2.46
95% Queue Length, Q ₉₅ (veh)		0.4												12.2		85.3
Control Delay (s/veh)		9.4												343.9		685.6
Level of Service, LOS		A												F		F
Approach Delay (s/veh)	2.2												640.0			
Approach LOS													F			

HCS7 Two-Way Stop-Control Report

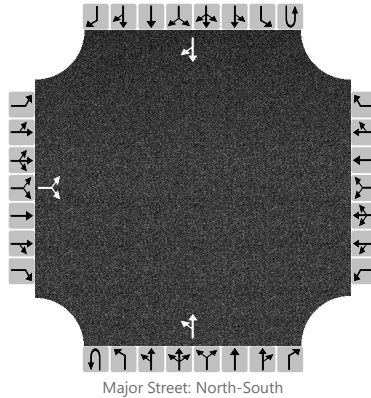
General Information

Analyst	Addie Kirkham
Agency/Co.	Ardurra
Date Performed	9/23/2022
Analysis Year	2025
Time Analyzed	Full Build Peak Entering
Intersection Orientation	North-South
Project Description	391.046.1 - Shoreline Church Expansion

Site Information

Intersection	Emory Church at Driveway
Jurisdiction	Knox County
East/West Street	Church Driveway
North/South Street	Emory Church Road
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume, V (veh/h)		60		91						105	112				140	92
Percent Heavy Vehicles (%)		2		2						2						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.42		6.22						4.12						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

Delay, Queue Length, and Level of Service

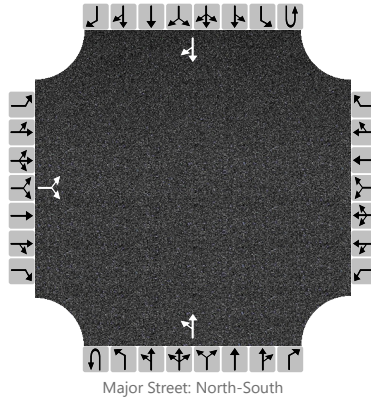
Flow Rate, v (veh/h)			151							105						
Capacity, c (veh/h)			655							1335						
v/c Ratio			0.23							0.08						
95% Queue Length, Q ₉₅ (veh)			0.9							0.3						
Control Delay (s/veh)			12.1							7.9						
Level of Service, LOS			B							A						
Approach Delay (s/veh)	12.1								4.2							
Approach LOS	B															

HCS7 Two-Way Stop-Control Report

General Information

Analyst	Addie Kirkham	Intersection	Emory Church at Driveway
Agency/Co.	Ardurra	Jurisdiction	Knox County
Date Performed	9/23/2022	East/West Street	Church Driveway
Analysis Year	2025	North/South Street	Emory Church Road
Time Analyzed	Full Build Peak Exiting	Peak Hour Factor	1.00
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	391.046.1 - Shoreline Church Expansion		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume, V (veh/h)		166		250						15	148				108	13
Percent Heavy Vehicles (%)		2		2						2						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.42		6.22						4.12						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			416							15						
Capacity, c (veh/h)			821							1465						
v/c Ratio			0.51							0.01						
95% Queue Length, Q ₉₅ (veh)			2.9							0.0						
Control Delay (s/veh)			13.8							7.5						
Level of Service, LOS			B							A						
Approach Delay (s/veh)	13.8								0.8							
Approach LOS	B															

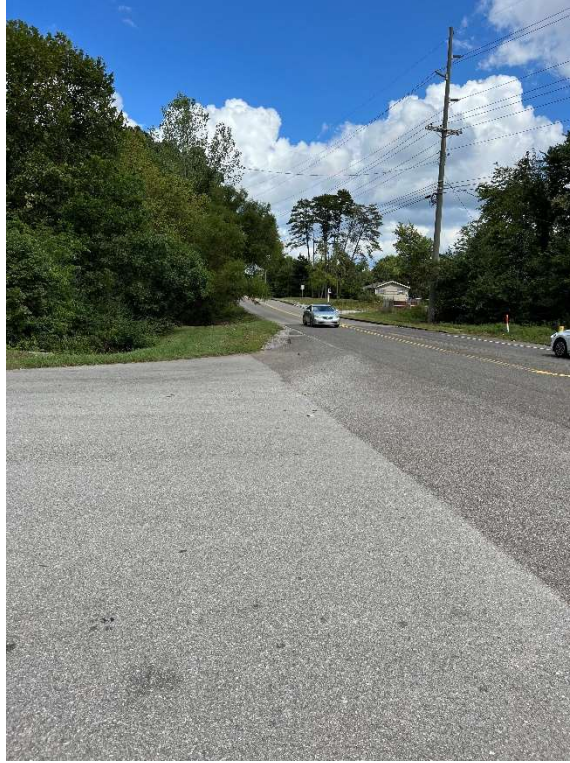
Attachment 9
Sight Distance



Westland Drive at Shoreline Church Driveway (Stop Bar) - looking east



Westland Drive at Shoreline Church Driveway (Stop Bar) - looking west



Westland Drive at Shoreline Church Driveway – looking east



Westland Drive at Shoreline Church Driveway – looking west



Emory Church Road at Shoreline Church Driveway – looking north



Emory Church Road at Shoreline Church Driveway – looking south



Westland Drive at Shoreline Church Driveway - 400 ft Sight Triangle



Westland Drive at Shoreline Church Driveway - 400 ft Sight Triangle



Date: September 19, 2022

Project Name: Shoreline Church Expansion

To: Knoxville-Knox County Planning

Subject: Shoreline Church Expansion TIA Comments (10-B-22-SU)

Dear Knoxville-Knox County Planning staff,

The following comment response document is submitted to address comments dated September 15, 2022:

- 1. Reviewer Comment:** It did not appear that all of the initial comments I sent were addressed so I am pasting them below this message for your reference. In the next version of the TIS please include a comment-response section that shows where and how each comment was addressed in the revised TIS as is usually done.

Response: Included initial comments dated August 25, 2022 in the comment-response letter.

- 2. Reviewer Comment:** The TIS states that there are no proposed changes to the site circulation however that does not appear to be true since additional parking aisles are being provided and appear to be in one-way operation. There was also a question raised during site plan review about the one-way notation on the driveway coming in from the northeast corner and why it was designated as such, please clarify.

Response: Updated the statement in Section 1.1 - Project Description to clarify the changes to the existing site circulation. The one-way notation on the driveway coming from the northeast corner was revised on the site plan to show two-way traffic as the gate will be open during Church events.

- 3. Reviewer Comment:** There was apparently a mis-understanding regarding the previous comment about revising trip generation. We were looking for the actual counts to inform the projected trip generation of the expansion rather than relying on the ITE Trip Generation rates. In reviewing the traffic count data that was provided in the revised TIS it is very clear that there are well-defined peak 15-minute periods of entering and exiting traffic and we would like for the TIS to focus on those periods as a worst-case scenario of peak traffic conditions and their effect on the surrounding roadway network. Attached is a spreadsheet showing the traffic volumes (see yellow highlighting) that we would like to be analyzed instead of what was shown in Table 4 in the TIS. There should be separate analyses for (1) the peak

entering traffic and (2) peak exiting traffic. Note that these volumes have been factored up by 2.76 which is the growth factor calculated by the expansion from 450 to 1,243 seats and also by a factor of 4X since we assumed that HCS does not allow you to input a peak hour factor (PHF) by approach so the 15-minute volumes. This means you can set the PHF to 1.0 in the updated analysis using HCS.

Response: Revised Section 4 – Trip Generation to reflect actual church service peak entering and exiting counts. Updated the Figures and the HCS7 capacity reports to show the existing, background and full buildout conditions based on the revised trip generation.

- 4. Reviewer Comment:** A follow-up to the previous comment and related to an original comment is that no information is provided regarding the other uses, i.e. Morning Pointe Assisted Living, in this area that are utilizing these driveways. You can remove traffic volumes associated with those uses from your future-year analysis if you are able to directly attribute any of the existing volumes to them.

Response: Added the following to Section 4 – Trip Generation. “Based on the turning movement counts there was negligible traffic travelling to/from the Morning Pointe Assisted Living during the Sunday peak entering and exiting 15-minute periods; therefore, no volume was removed or directly attributed to the Morning Pointe Assisted Living Facility.”

- 5. Reviewer Comment:** Please coordinate with the site design engineer and provide a more definitive proposed striping plan showing the recommended stop bar location for the Westland Drive driveway approach. Please also include sight lines on the site plan showing where the required sight triangles are needed to be cleared to achieve the required sight distance.

Response: The site plan was updated with the recommendation to relocate the stop bar to 15 feet from the edge of pavement. Intersection sight triangles were included in Attachment 9 for the intersection of Westland Drive at the Shoreline Church driveway connection.

Previous Comments Dated August 25, 2022

1. **Reviewer Comment:** Conduct traffic counts at both existing access points and the intersection of Westland Dr at Emory Church Rd during the Sunday peak hours coinciding with the current service times. The Sunday before Labor Day needs to be avoided for this data collection as attendance may be lower than usual that day.

Response: Completed

2. **Reviewer Comment:** Use the traffic count data to determine trip distribution and extrapolate it to determine the future trip generation for two services and the additional attendees post-expansion. Not addressed - extrapolate existing counts instead of using ITE rates as described in above new comments.

Response: Updated the Figures to include the recommended entering/exiting 15-minute peak volumes.

3. **Reviewer Comment:** Analyze operations at the access points and intersection of Westland Dr at Emory Church Rd and in particular any potential queue storage issues with the EB left turn lane at the Westland Dr access where it might spill back into the ramp intersection. Re-evaluate based on the new trip generation.

Response: Updated the queue storage analysis using the peak 15-minute entering and exiting volumes.

4. **Reviewer Comment:** Include a site plan that clearly identifies the access points and illustrates the general circulation patterns post-expansion. Expanded site plan showing existing uses should be provided.

Response: Updated the site plan to show access points and include the Morning Pointe Assisted Living Facility.

5. **Reviewer Comment:** Acknowledge the other existing uses on the site and whether any potential conflicts may occur between peak hour operations of each and their traffic circulation interfaces. See previous comment.

Response: See updated response to Comment 4.

6. **Reviewer Comment:** Verify the minimum required sight distance is available at each access point. Review the existing stop bar location at the Westland Dr access that is around 50' from the edge of pavement to determine if it is optimally located for operations and sight distance. Provide a more specific recommendation for the stop bar location and show on site plan along with sight triangles.

Mr. Conger
September 19, 2022
Page 4 of 4

Response: The site plan has been updated to show a revised stop bar location at 15 feet from the edge of pavement and intersection sight triangles for the intersection of Westland Drive at the Shoreline Church Driveway were included in Attachment 9.

Sincerely,



Addie Kirkham, P.E.