The Peninsula Pentecostals

Traffic Impacts Analysis

James City County, Virginia

Prepared on

January 21st, 2015

Prepared for

The Peninsula Pentecostals

Newport News, Virginia

Prepared by

Chris Lawrence, P.E.
3168 Burt Lane
Hayes, VA 23072
804-815-1140

I. Introduction

The Peninsula Pentecostals (TPP) Church is proposing to construct a new church on U.S. Route 60 (Pocahontas Trail) near Greenmount Parkway in James City County. The Church is proposing to initially construct a 1,200 seat facility with a child care facility for 150 children, ultimately the Church is being designed to be able to expand to a 2,400 seat facility (the day care facility will remain the same size). TPP is proposing to rezone land from M2 – General Industrial to MU – Mixed-Use to allow for their proposed church and day care facility. TPP proposes two access points on U.S. Route 60 located approximately ¼ mile west of Greenmount Parkway - one full access driveway and one right-out driveway located to the west of the full access driveway. The proposed site is 40 acres in size and is currently undeveloped. **Figure 1** displays the location of the church. A copy of the conceptual site plan is provided in the Technical Appendix.

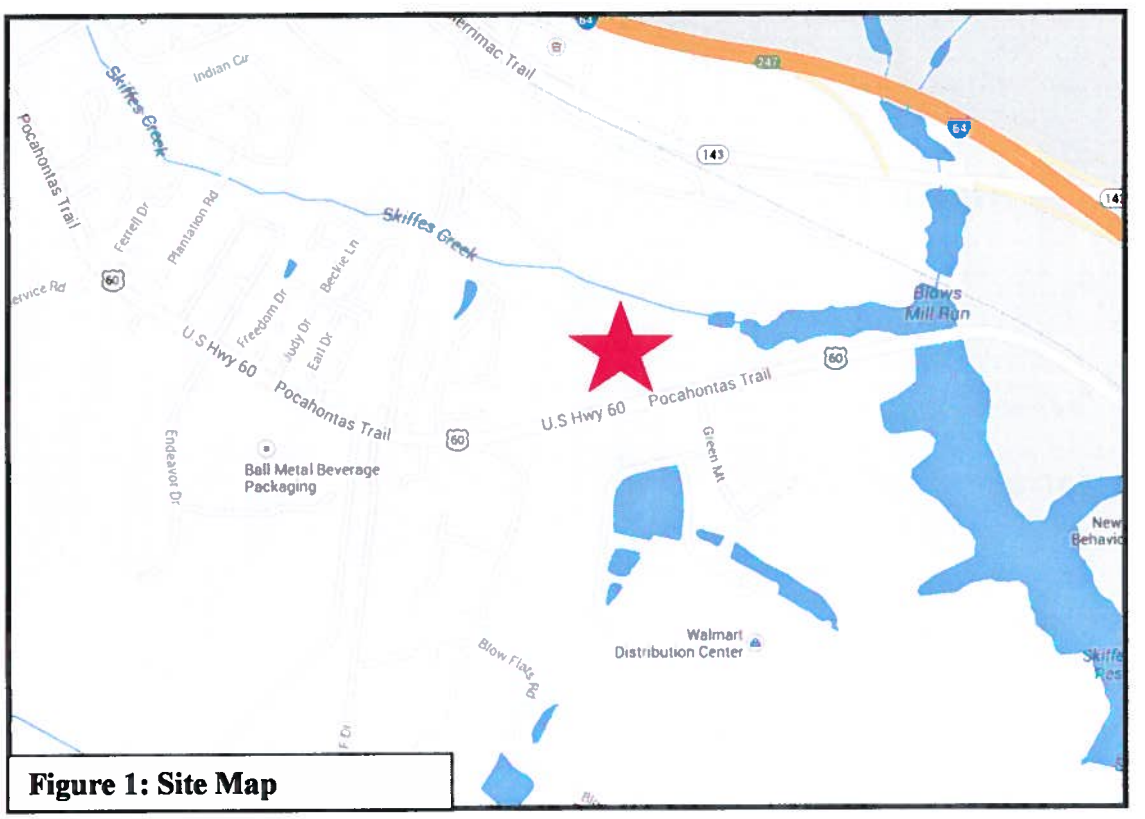


Figure 1: Site Map

II. Existing Conditions

The site is located on the north side of U.S. Route 60 approximately ¼ mile west of Greenmount Parkway. Adjacent to the site U.S. Route 60 is a two-lane undivided urban other principal arterial with a posted speed limit of 45 MPH. U.S. Route 60 provides approximately 24 feet of asphalt pavement with open drainage. There are earthen shoulders on both sides of U.S. Route 60, on the industrial park frontage on the south side of U.S. Route 60 there is an asphalt shoulder.

The study area chosen in consultation with VDOT and James City County includes three existing intersections on U.S. Route 60: James River Elementary School/Colony Drive, Endeavor Drive, and Greenmount Parkway. The limits of the study area spans 1.5 miles along U.S. Route 60. There are several substantial trip generators between the study area intersections which cause the existing conditions traffic counts to be unbalanced. Some of the notable trip generators inside the study area are as follows: Carters Village Multi-family Residential Development, Skiffes Creek Multi-Family Residential Development, Morning Star Baptist Church, and Ball Metal Packaging Plant.

The study will include traditional weekday a.m. and p.m. peak hour traffic analysis. Additionally, there are three Sunday church services that will be analyzed – 10:00 a.m., 11:15 a.m., and 6:30 p.m. Peak hours were chosen to be centered on the start of service. In addition to studying the entering traffic, egress traffic from the 11:15 a.m. service will also be analyzed. The vast majority of the congregation that leaves the morning services does so at the conclusion of the 11:15 a.m. service. Four one-hour turning movement counts were conducted at each of the study area intersection. The Sunday time periods that were counted for inclusion in the analysis include the following:

- 10:00 a.m. service – 9:30-10:30 a.m. (focus on entering traffic)
- 11:15 a.m. service – 10:30-11:30 a.m. (focus on entering traffic)
- 11:15 a.m. service – 12:30-1:30 p.m. (focus on exiting traffic)
- 6:30 p.m. service – 6:00-7:00 p.m. (focus on entering traffic)

Sunday turning movement traffic counts were conducted on September 28, 2014. Weekday peak period (7-9 a.m. and 4-6 p.m.) turning movement traffic counts were conducted between September 30 and October 2. The results of the traffic counts are documented in the Technical Appendix. The existing conditions volumes can be found in **Figures 2-7**.

Figure 2: Existing Conditions Weekday AM Peak Hour Volumes and Lane Configuration

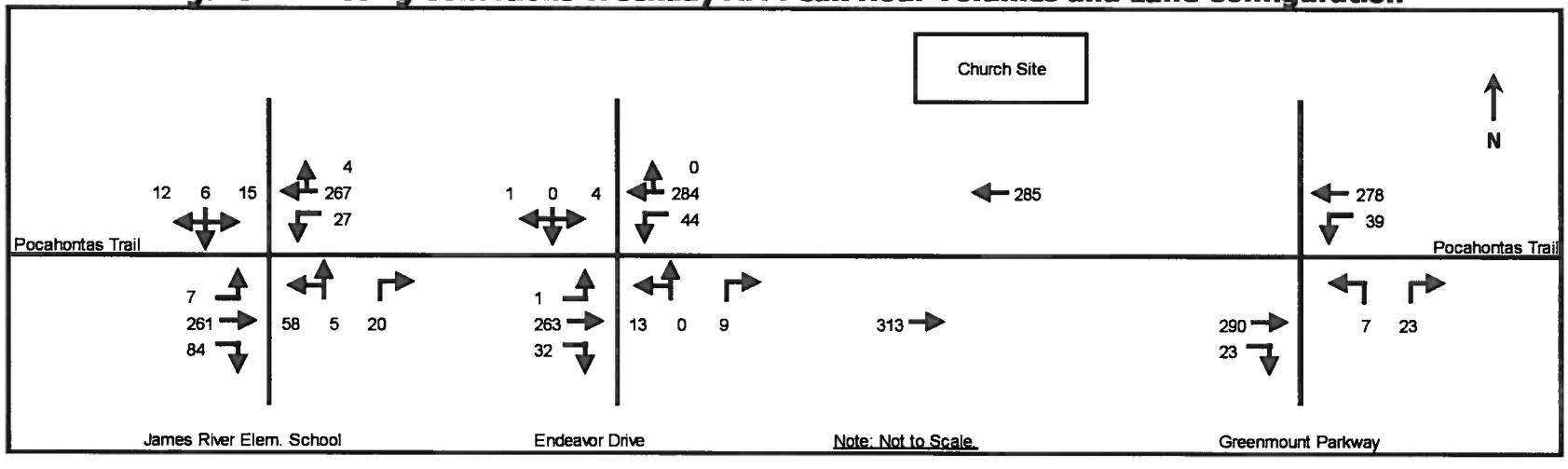


Figure 3: Existing Conditions Weekday PM Peak Hour Volumes and Lane Configuration

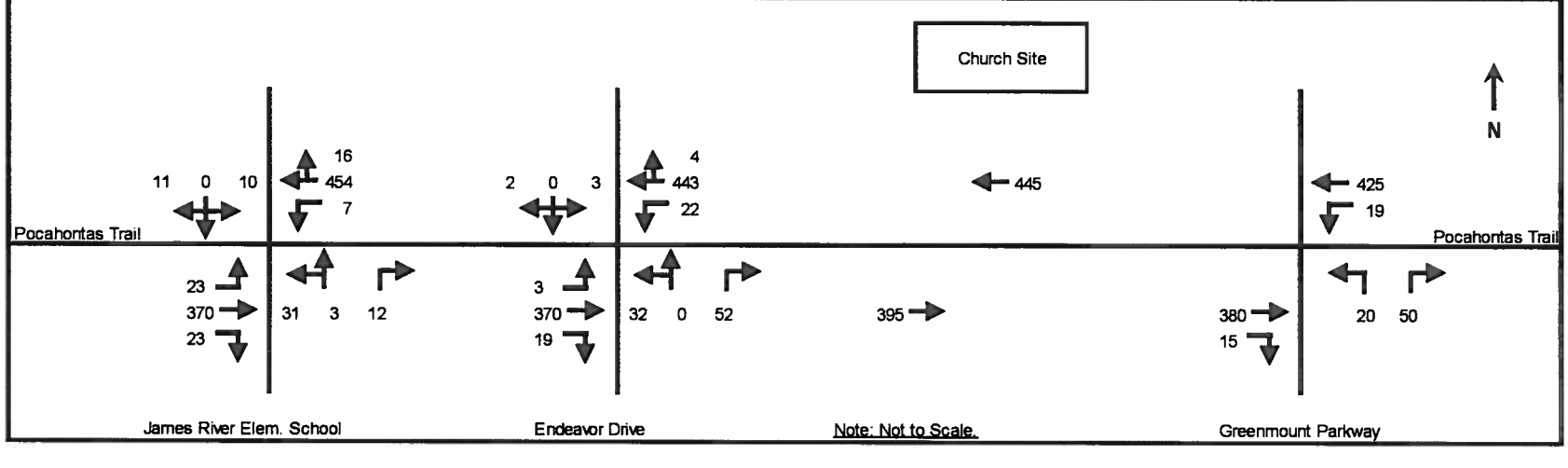


Figure 4: Existing Conditions Sunday 9:30-10:30 AM Peak Hour Volumes and Lane Configuration

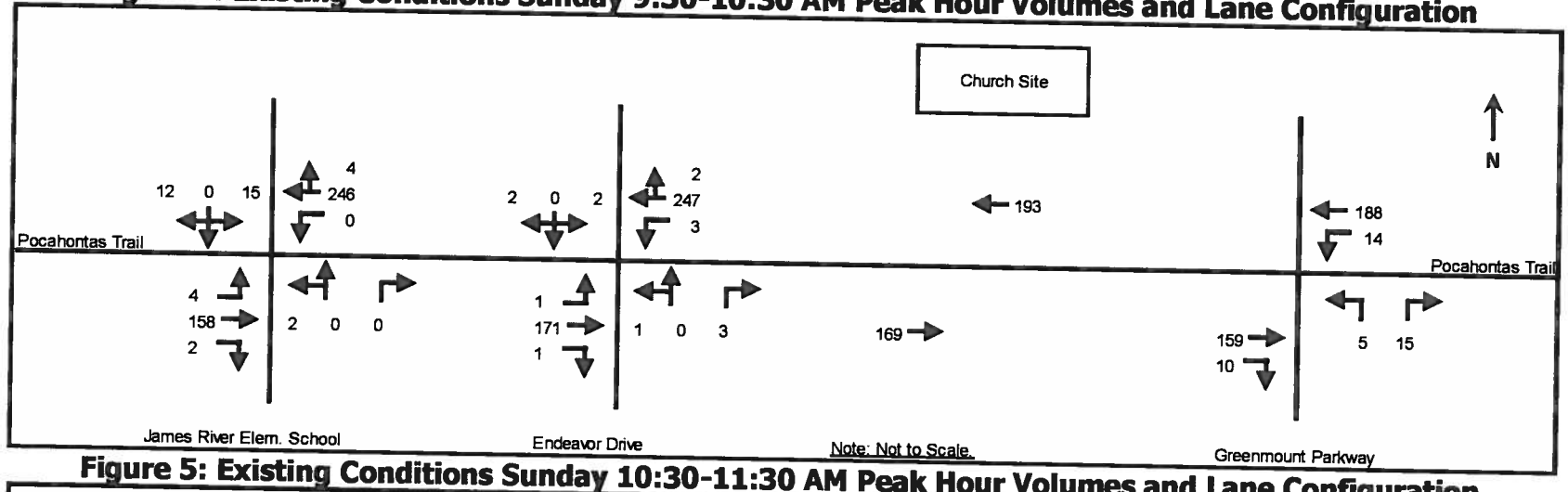


Figure 5: Existing Conditions Sunday 10:30-11:30 AM Peak Hour Volumes and Lane Configuration

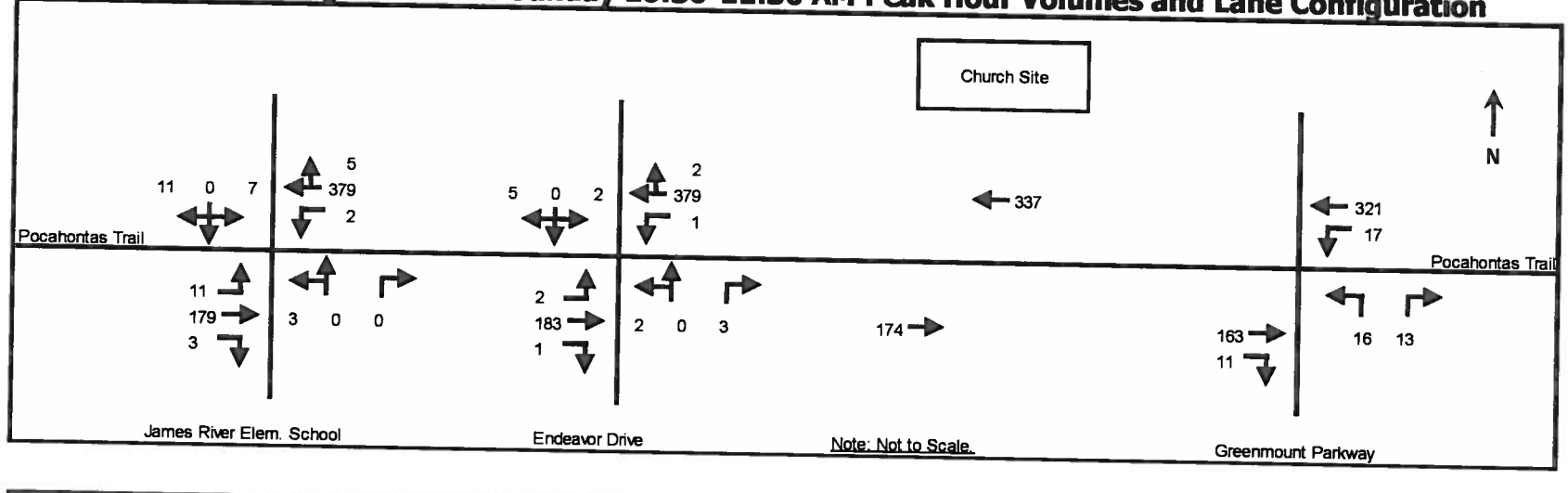


Figure 6: Existing Conditions Sunday 12:30-1:30 PM Peak Hour Volumes and Lane Configuration

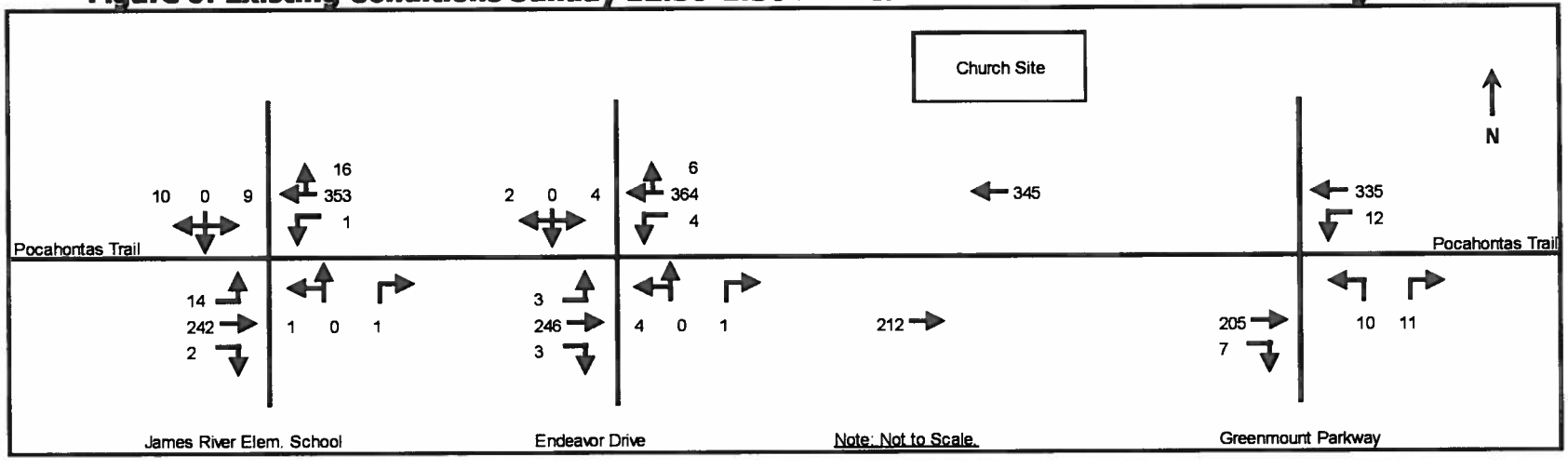
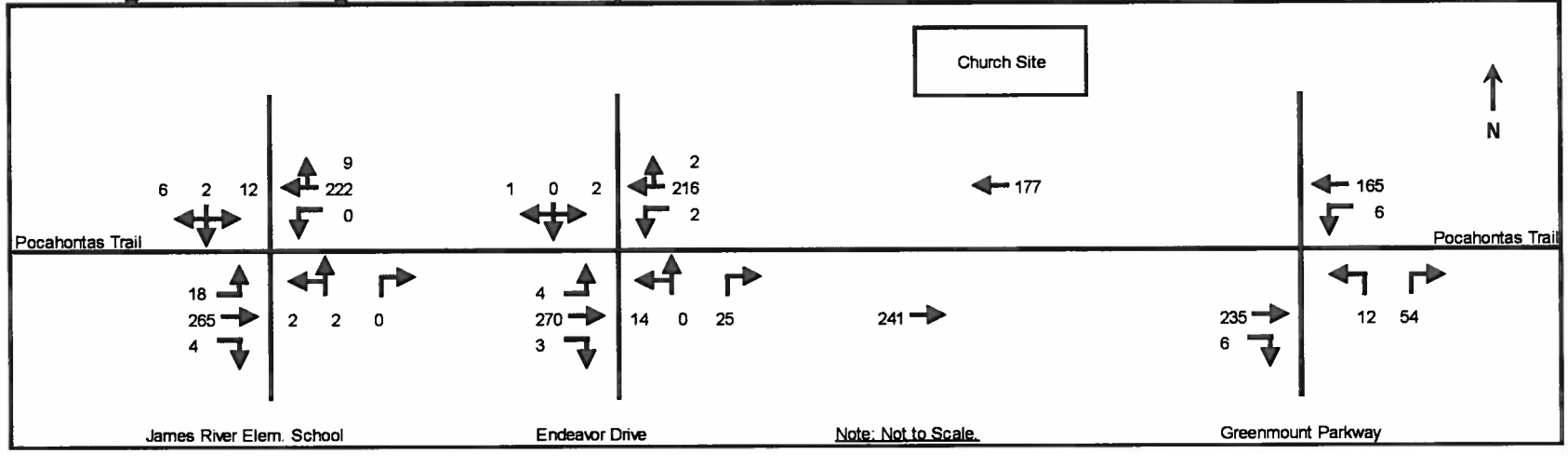


Figure 7: Existing Conditions Sunday 6:00-7:00 PM Peak Hour Volumes and Lane Configuration



A 7-day classification count was conducted on U.S. Route 60 in front of the proposed church site between October 3 and October 9, 2014. The average daily traffic was 8,513, which is very close to VDOT's latest published traffic count of 8,700 in 2013 for U.S. Route 60. A summary of the classification count can be found in **Table 1**.

Table 1: Summary of 7-Day Classification Traffic Count

Day of Week	Date	Passenger Vehicles (Class 1-3)	Trucks (Class 4-14)	Truck %	Total Vehicles
Friday	10/3/14	9,612	608	6%	10,220
Saturday	10/4/14	8,554	202	2%	8,756
Sunday	10/5/14	8,347	175	2%	8,522
Monday	10/6/14	7,132	498	7%	7,630
Tuesday	10/7/14	7,494	547	7%	8,041
Wednesday	10/8/14	7,411	671	8%	8,082
Thursday	10/9/14	7,735	606	7%	8,341
Average		**8,041**	**472**	6%	**8,513**

Traffic analysis was conducted at each of the three study area intersections using the peak hour turning movement counts found in **Figures 2-7**. Traffic analysis was conducted using Synchro 8 using HCM 2010 methodology. A summary of the existing conditions traffic analysis can be found in **Tables 2-4**.

Existing Conditions Weekday Peak Hour Analysis

All three study area intersections are currently operating with adequate service levels (See **Table 2**). Overall intersection service levels at Greenmount Parkway are at LOS A in both peak hours, they are at LOS B at Plantation Road/James River Elementary School, and each movement and Endeavor Drive is at LOS C or better.

Sunday Peak Hour Analysis

Sunday peak hour analysis is summarized in **Tables 3 and 4**. The signalized study area intersections, Greenmount Parkway and Plantation Road/James River Elementary School, operate with no lower than LOS B overall intersection service levels during all four Sunday peak hours. The unsignalized intersection of Endeavor Drive operates with no lower than LOS C conditions at all the individual movements during all four Sunday peak hours.

Table 2
Summary of Existing Conditions Weekday Peak Hour Traffic Analysis
HCM 2010 Methodology

Movement (Type)	AM Peak Hour		PM Peak Hour	
	Delay (sec./veh.)	Level of Service	Delay (sec./veh.)	Level of Service
James River Elem. Sch./Colony Dr. @ Rt. 60				
EB U.S. Route 60 Left	31.0	C	27.3	C
EB U.S. Route 60 Through	12.9	B	9.6	A
EB U.S. Route 60 Right	11.2	B	7.1	A
WB U.S. Route 60 Left	26.2	C	31.7	C
WB U.S. Route 60 Through/Right	12.0	B	11.6	B
NB James River Elem. School Through/Left	21.2	C	23.7	C
NB James River Elem. School Right	19.5	B	22.8	C
SB Colony Drive Left/Through/Right	23.3	C	26.6	C
Overall Intersection	**14.3**	**B**	**12.1**	**B**
Endeavor Drive @ U.S. Route 60				
NB Endeavor Drive Through/Left	17.1	C	21.5	C
NB Endeavor Drive Right	10.1	B	11.0	B
EB U.S. Route 60 Left	7.9	A	8.3	A
WB U.S. Route 60 Left	8.1	A	8.1	A
SB Endeavor Drive Left/Through/Right	15.2	C	16.8	C
Greenmount Parkway @ U.S. Route 60				
EB U.S. Route 60 Through	9.2	A	9.3	A
EB U.S. Route 60 Right	5.8	A	4.6	A
WB U.S. Route 60 Left	5.2	A	5.7	A
WB U.S. Route 60 Through/Right	3.5	A	4.5	A
NB Greenmount Parkway Left	17.8	B	18.0	B
NB Greenmount Parkway Right	22.8	C	19.8	B
Overall Intersection	**7.0**	**A**	**7.7**	**A**

Table 3
Summary of Existing Conditions Sunday Peak Hour Traffic Analysis
HCM 2010 Methodology

Movement (Type)	Sunday 9:30-10:30		Sunday 10:30-11:30	
	Delay (sec./veh.)	Level of Service	Delay (sec./veh.)	Level of Service
James River Elem. Sch./Colony Dr. @ Rt. 60				
EB U.S. Route 60 Left	27.3	C	25.2	C
EB U.S. Route 60 Through	5.1	A	7.3	A
EB U.S. Route 60 Right	4.4	A	6.1	A
WB U.S. Route 60 Left	0.0	A	35.4	D
WB U.S. Route 60 Through/Right	10.2	B	10.3	B
NB James River Elem. School Through/Left	33.8	C	30.8	C
NB James River Elem. School Right	0.0	A	0.0	A
SB Colony Drive Left/Through/Right	17.7	B	23.3	C
Overall Intersection	**9.0**	**A**	**10.2**	**B**
Endeavor Drive @ U.S. Route 60				
NB Endeavor Drive Through/Left	12.3	B	16.3	C
NB Endeavor Drive Right	9.2	A	9.5	A
EB U.S. Route 60 Left	7.8	A	8.4	A
WB U.S. Route 60 Left	7.6	A	7.7	A
SB Endeavor Drive Left/Through/Right	11.0	B	12.8	B
Greenmount Parkway @ U.S. Route 60				
EB U.S. Route 60 Through	6.7	A	7.8	A
EB U.S. Route 60 Right	5.2	A	5.2	A
WB U.S. Route 60 Left	4.5	A	5.0	A
WB U.S. Route 60 Through/Right	3.0	A	4.1	A
NB Greenmount Parkway Left	17.5	B	18.1	B
NB Greenmount Parkway Right	23.0	C	18.1	B
Overall Intersection	**5.5**	**A**	**6.1**	**A**

Table 4
Summary of Existing Conditions Sunday Peak Hour Traffic Analysis
HCM 2010 Methodology

Movement (Type)	Sunday 12:30-1:30		Sunday 6:00-7:00	
	Delay (sec./veh.)	Level of Service	Delay (sec./veh.)	Level of Service
James River Elem. Sch./Colony Dr. @ Rt. 60				
EB U.S. Route 60 Left	22.3	C	20.3	C
EB U.S. Route 60 Through	8.0	A	5.2	A
EB U.S. Route 60 Right	6.5	A	4.0	A
WB U.S. Route 60 Left	27.9	C	0.0	A
WB U.S. Route 60 Through/Right	9.8	A	9.8	A
NB James River Elem. School Through/Left	26.4	C	26.5	C
NB James River Elem. School Right	28.3	C	0.0	A
SB Colony Drive Left/Through/Right	21.0	C	19.4	B
Overall Intersection	**9.8**	**A**	**8.3**	**A**
Endeavor Drive @ U.S. Route 60				
NB Endeavor Drive Through/Left	14.5	B	13.9	B
NB Endeavor Drive Right	9.6	A	10.2	B
EB U.S. Route 60 Left	8.1	A	7.8	A
WB U.S. Route 60 Left	7.7	A	7.9	A
SB Endeavor Drive Left/Through/Right	13.1	B	12.5	B
Greenmount Parkway @ U.S. Route 60				
EB U.S. Route 60 Through	7.0	A	8.5	A
EB U.S. Route 60 Right	5.1	A	4.6	A
WB U.S. Route 60 Left	4.7	A	5.8	A
WB U.S. Route 60 Through/Right	3.5	A	3.9	A
NB Greenmount Parkway Left	17.9	B	15.3	B
NB Greenmount Parkway Right	18.6	B	17.3	B
Overall Intersection	**5.3**	**A**	**8.0**	**A**

Programmed Projects

There are several programmed transportation projects in VDOT's Six-Year Improvement Program that are located in the study area. A Safe Routes to School Project (UPS 97214) at James River Elementary School is currently under construction to provide pedestrian signals and curb ramps within the project limits. Two Regional Surface Transportation Program (RSTP) projects: Relocated Route 60 Project (UPS 13496) and Skiffes Creek Connector Project (UPC 100200) are within the project limits. The Church will coordinate with these projects as the footprints of some of these projects impact the church site.

III. No Build Conditions

No Build conditions are those conditions that would exist in the future without development of proposed church and day care facilities. No Build conditions are studied to provide a comparison to Build conditions to determine the marginal impact on traffic operations. The church and day care facility are anticipated to be opened in the Year 2018, per VDOT regulations, a study of traffic 6 years after opening day is the design year that is studied - 2024.

Forecasting background traffic growth to the Year 2024 was accomplished by reviewing historic VDOT traffic counts on U.S. Route 60 and review of the Hampton Roads travel demand model. Historical traffic counts on U.S. Route 60 displayed a slightly negative growth trend over the last 10+ years. However, the Hampton Roads travel demand model forecasts average annual growth rates exceeding 2% per year. In consultation with VDOT and James City, a 1% average annual growth rate was chosen for this study. The No Build conditions traffic volumes were developed by applying the 1% average annual growth rate uniformly to the study area intersections; the peak hour No Build conditions traffic volumes can be found in **Figures 8-13**.

Figure 8: No Build Conditions Weekday AM Peak Hour Volumes and Lane Configuration

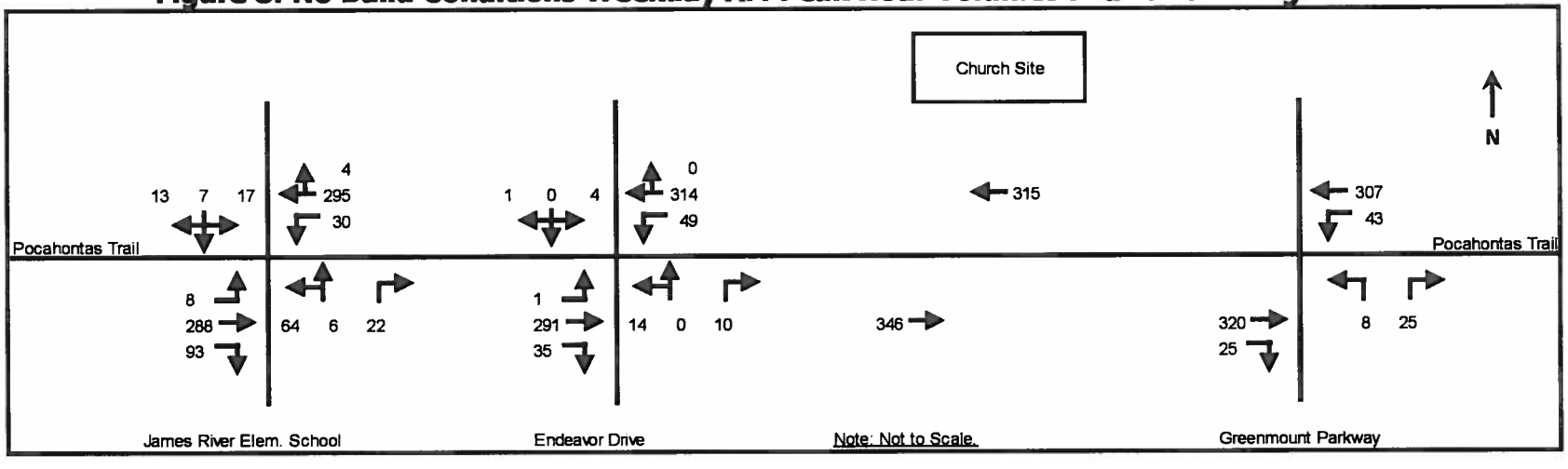


Figure 9: No Build Conditions Weekday PM Peak Hour Volumes and Lane Configuration

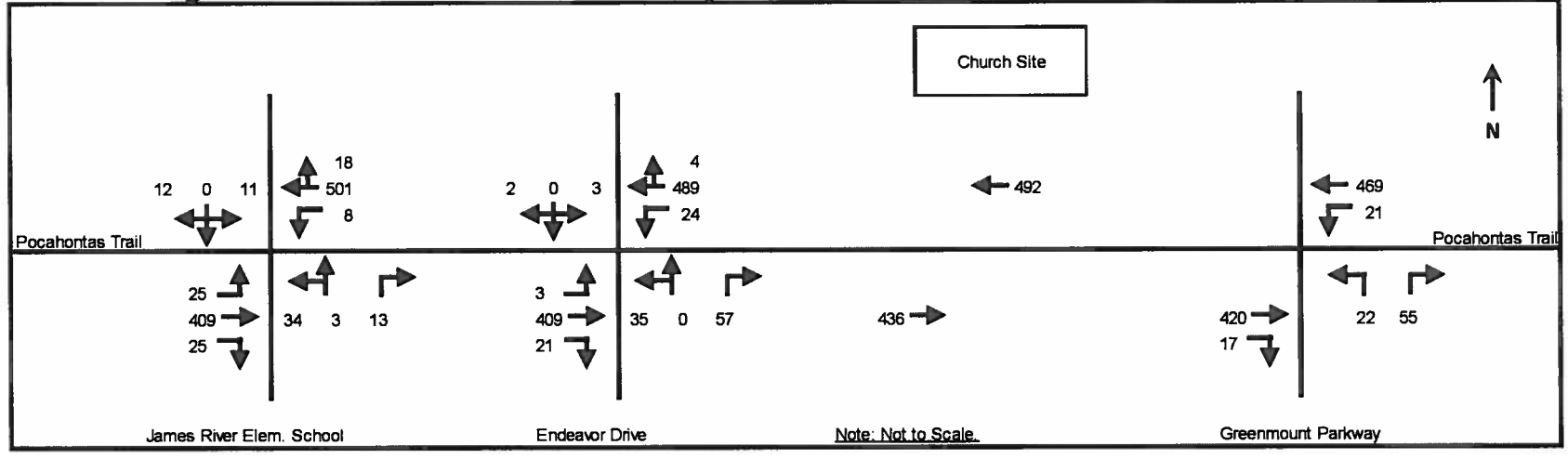


Figure 10: No Build Conditions Sunday 9:30-10:30 AM Peak Hour Volumes and Lane Configuration

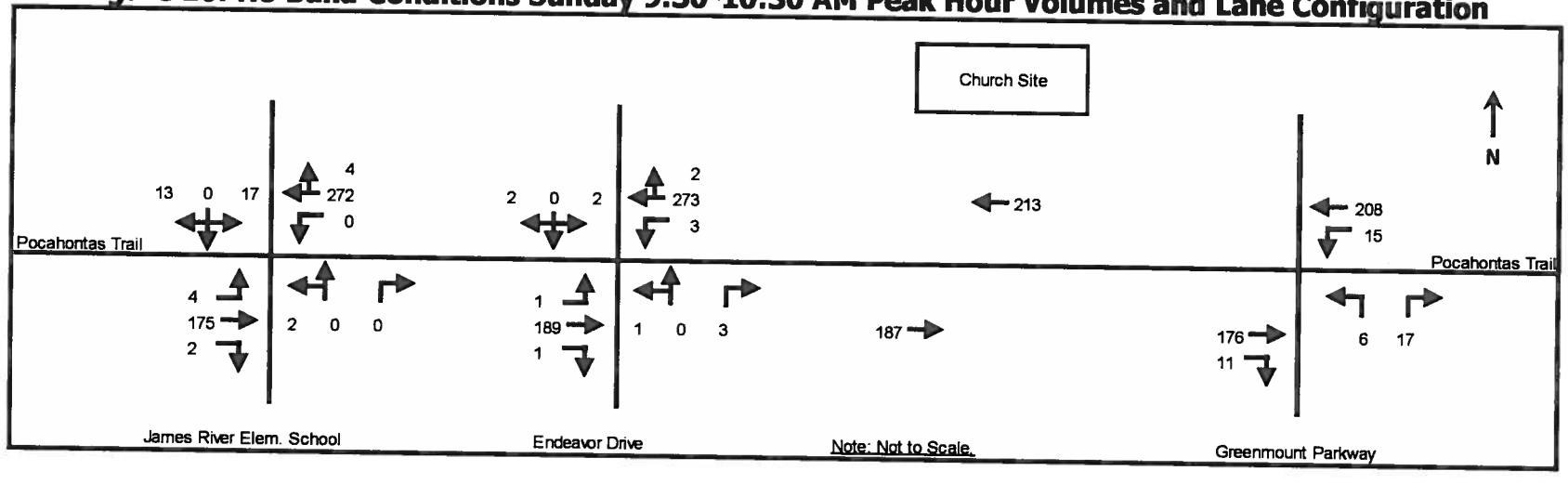


Figure 11: No Build Conditions Sunday 10:30-11:30 AM Peak Hour Volumes and Lane Configuration

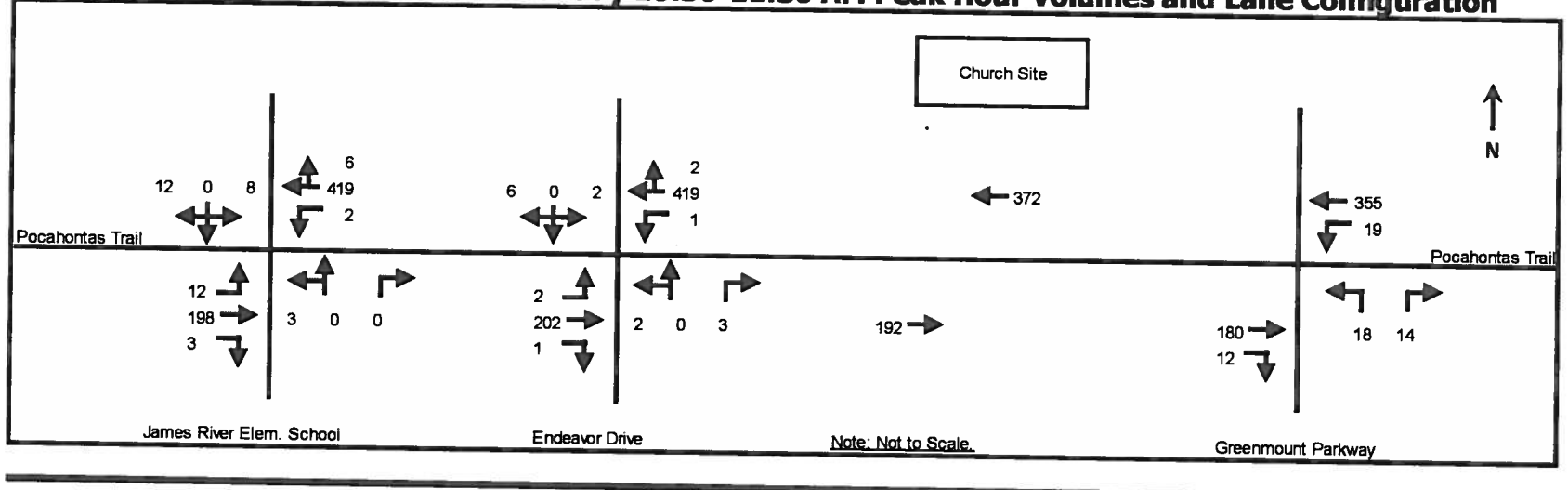


Figure 12: No Build Conditions Sunday 12:30-1:30 PM Peak Hour Volumes and Lane Configuration

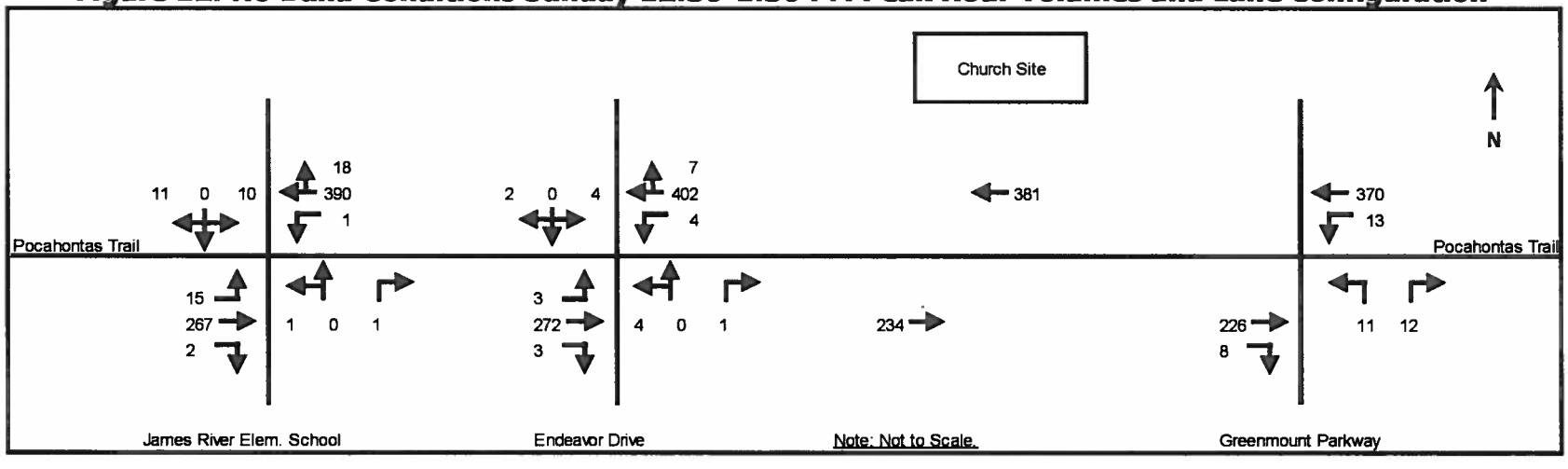
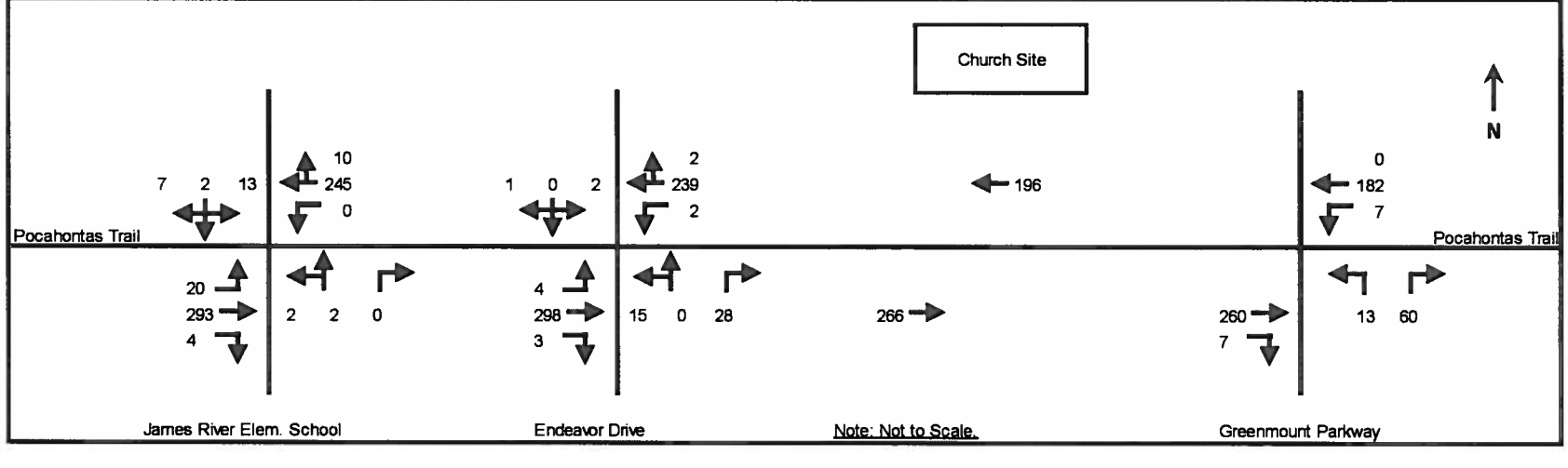


Figure 13: No Build Conditions Sunday 6:00-7:00 PM Peak Hour Volumes and Lane Configuration



No Build traffic analysis was conducted at each of the three study area intersections using the peak hour turning movement counts found in **Figures 8-13**. Traffic analysis was conducted using Synchro 8 using HCM 2010 methodology. A summary of the No Build conditions traffic analysis can be found in **Tables 5-7**.

No Build Conditions Weekday Peak Hour Analysis

All three study area intersections are forecast to operate with adequate service levels in the No Build conditions (see **Table 5**). Overall intersection service levels at Greenmount Parkway are forecasts at LOS A in both peak hours, they are forecasts at LOS B at Plantation Road/James River Elementary School, and each movement and Endeavor Drive is forecasts at LOS C or better.

Sunday Peak Hour Analysis

Sunday peak hour No Build analysis is summarized in **Tables 6 and 7**. The signalized study area intersections, Greenmount Parkway and Plantation Road/James River Elementary School, are forecasts to operate with no lower than LOS B overall intersection service levels during all four Sunday peak hours. The unsignalized intersection of Endeavor Drive is forecast to operate with no lower than LOS C conditions at all the individual movements during all four Sunday peak hours.

Table 5
Summary of No Build Conditions Weekday Peak Hour Traffic Analysis
HCM 2010 Methodology

Movement (Type)	AM Peak Hour		PM Peak Hour	
	Delay (sec./veh.)	Level of Service	Delay (sec./veh.)	Level of Service
James River Elem. Sch./Colony Dr. @ Rt. 60				
EB U.S. Route 60 Left	30.8	C	29.0	C
EB U.S. Route 60 Through	13.1	B	9.8	A
EB U.S. Route 60 Right	11.3	B	7.0	A
WB U.S. Route 60 Left	26.7	C	32.9	C
WB U.S. Route 60 Through/Right	12.2	B	12.0	B
NB James River Elem. School Through/Left	21.8	C	25.2	C
NB James River Elem. School Right	19.9	B	24.3	C
SB Colony Drive Left/Through/Right	23.7	C	28.2	C
Overall Intersection	**14.6**	**B**	**12.6**	**B**
Endeavor Drive @ U.S. Route 60				
NB Endeavor Drive Through/Left	17.6	C	24.9	C
NB Endeavor Drive Right	10.2	B	11.4	B
EB U.S. Route 60 Left	8.0	A	8.4	A
WB U.S. Route 60 Left	8.2	A	8.2	A
SB Endeavor Drive Left/Through/Right	15.6	C	18.5	C
Greenmount Parkway @ U.S. Route 60				
EB U.S. Route 60 Through	9.4	A	9.6	A
EB U.S. Route 60 Right	5.8	A	4.4	A
WB U.S. Route 60 Left	5.2	A	5.8	A
WB U.S. Route 60 Through/Right	3.5	A	4.6	A
NB Greenmount Parkway Left	18.1	B	19.1	B
NB Greenmount Parkway Right	22.8	C	21.1	C
Overall Intersection	**7.1**	**A**	**7.9**	**A**

Table 6
Summary of No Build Conditions Sunday Peak Hour Traffic Analysis
HCM 2010 Methodology

Movement (Type)	Sunday 9:30-10:30		Sunday 10:30-11:30	
	Delay (sec./veh.)	Level of Service	Delay (sec./veh.)	Level of Service
James River Elem. Sch./Colony Dr. @ Rt. 60				
EB U.S. Route 60 Left	27.8	C	24.2	C
EB U.S. Route 60 Through	5.1	A	7.4	A
EB U.S. Route 60 Right	4.3	A	6.3	A
WB U.S. Route 60 Left	0.0	A	40.2	D
WB U.S. Route 60 Through/Right	10.1	B	10.2	B
NB James River Elem. School Through/Left	34.3	C	32.3	C
NB James River Elem. School Right	0.0	A	0.0	A
SB Colony Drive Left/Through/Right	18.0	B	22.2	C
Overall Intersection	**9.0**	**A**	**10.2**	**B**
Endeavor Drive @ U.S. Route 60				
NB Endeavor Drive Through/Left	12.7	B	15.1	C
NB Endeavor Drive Right	9.3	A	9.4	A
EB U.S. Route 60 Left	7.9	A	8.3	A
WB U.S. Route 60 Left	7.6	A	7.7	A
SB Endeavor Drive Left/Through/Right	11.3	B	12.1	B
Greenmount Parkway @ U.S. Route 60				
EB U.S. Route 60 Through	7.0	A	7.4	A
EB U.S. Route 60 Right	5.2	A	5.2	A
WB U.S. Route 60 Left	4.7	A	4.9	A
WB U.S. Route 60 Through/Right	3.1	A	3.8	A
NB Greenmount Parkway Left	17.5	B	18.4	B
NB Greenmount Parkway Right	21.8	C	18.1	B
Overall Intersection	**5.7**	**A**	**5.7**	**A**

Table 7
Summary of No Build Conditions Sunday Peak Hour Traffic Analysis
HCM 2010 Methodology

Movement (Type)	Sunday 12:30-1:30		Sunday 6:00-7:00	
	Delay (sec./veh.)	Level of Service	Delay (sec./veh.)	Level of Service
James River Elem. Sch./Colony Dr. @ Rt. 60				
EB U.S. Route 60 Left	23.1	C	20.4	C
EB U.S. Route 60 Through	7.9	A	5.2	A
EB U.S. Route 60 Right	6.3	A	4.0	A
WB U.S. Route 60 Left	30.0	C	0.0	A
WB U.S. Route 60 Through/Right	9.8	A	9.8	A
NB James River Elem. School Through/Left	27.4	C	26.8	C
NB James River Elem. School Right	29.4	C	0.0	A
SB Colony Drive Left/Through/Right	21.7	C	19.6	B
Overall Intersection	**9.8**	**A**	**8.3**	**A**
Endeavor Drive @ U.S. Route 60				
NB Endeavor Drive Through/Left	15.5	C	14.1	B
NB Endeavor Drive Right	9.7	A	10.2	B
EB U.S. Route 60 Left	8.2	A	7.8	A
WB U.S. Route 60 Left	7.8	A	7.9	A
SB Endeavor Drive Left/Through/Right	13.9	B	12.7	B
Greenmount Parkway @ U.S. Route 60				
EB U.S. Route 60 Through	7.3	A	8.6	A
EB U.S. Route 60 Right	5.1	A	4.7	A
WB U.S. Route 60 Left	4.8	A	5.8	A
WB U.S. Route 60 Through/Right	3.7	A	4.0	A
NB Greenmount Parkway Left	17.8	B	15.3	B
NB Greenmount Parkway Right	18.5	B	17.3	B
Overall Intersection	**5.5**	**A**	**8.1**	**A**

IV. Trip Generation

Phase I of the proposed church will total 58,600 square feet of floor area providing a 1,200 seat sanctuary and the day care facility will provide service to 150 students. Phase I of the church is what will be initially constructed. There are plans for later phases of development, Phase II will bring the church to 80,000 square feet of floor area and provide 1,800 seats in the sanctuary, and Phase III will expand the church to 130,000 square feet of floor area and provide 2,400 seats in the sanctuary. There are no concrete schedules for constructing Phases II and III. The day care facility is to remain the same size throughout the expansion phases of the church. This study evaluates Phase I and Phase III in the Year 2024 based on discussions with VDOT and James City County. Applying rates developed in ITE's *Trip Generation* (Ninth Edition) to the size and type of development, forecasts of daily and peak hour trips have been developed (See **Table 8**). Trip generation values were calculated using trip generation rates. The forecasts of trips have been computed as follows:

TABLE 8
TRIP GENERATION: Proposed Church and Day Care

Land Use (ITE Code)	Size (sq. ft. or students)	Weekday Daily Trips	Weekday AM Peak Hour		Weekday PM Peak Hour		Sunday Daily Trips	Sunday Peak Hour	
			Enter	Exit	Enter	Exit		Enter	Exit
Church (560)	58.6k	534	20	12	15	17	2,264	346	360
Day Care (565)	150	657	64	56	57	64	56	9	8
Phase I Total	**N/A**	**1,191**	**84**	**68**	**72**	**81**	**2,320**	**355**	**368**
Church (560)	130k	1,184	45	28	34	37	5,022	767	798
Day Care (565)	150	657	64	56	57	64	56	9	8
Phase III Total	**N/A**	**1,841**	**109**	**84**	**91**	**101**	**5,078**	**776**	**806**

V. Build Conditions

The forecasted Build conditions traffic volumes are the sum of the No Build conditions traffic volumes plus the forecasted peak hour trips that will be generated by the church and day care. Sunday church (and day care) trips are applied to the road network in a manner that reflects current church service time periods and attendance patterns. Church (and day care) trips are applied in the following manner:

- 10:00 a.m. Sunday School Service (9:30-10:30 a.m. analysis hour) – 100% peak hour entering trips applied, 0% peak hour exiting trips applied
- 11:15 a.m. Worship Service (10:30-11:30 a.m. analysis hour) – 100% peak hour entering trips applied, 25% peak hour exiting trips applied
- 11:15 a.m. Worship Service (12:30-1:30 p.m. analysis hour) – 0% peak hour entering trips applied, 100% peak hour exiting trips applied
- 6:30 p.m. Worship Service (6:00-7:00 p.m. analysis hour) – 100% peak hour entering trips applied, 0% peak hour exiting trips applied

Site trips were distributed 50% to the east on U.S. Route 60 and 50% to the west on U.S. Route 60 for both weekday traffic and Sunday traffic; this was based on discussions with VDOT and James City County. The 50%/50% trip distribution is based on two main reasons - the current church being located to the east in Newport News, which will continue serve most of the current church members; and, new church members are anticipated to be derived from the west throughout James City County and beyond. The trip distribution split between the two church driveways is split evenly for egress trips heading westbound, all other trips will use the main church driveway which provides for full access. Site trip distribution is displayed in **Figure 14**. The forecasted Phase I Build conditions traffic volumes can be found in **Figures 15-20**. The forecasted Phase III Build conditions traffic volumes can be found in **Figures 21-26**. Church site trips are shown in brackets in all the Build conditions figures. The southbound main church driveway provides for two lanes of egress.

Figure 14: Site Trip Distribution

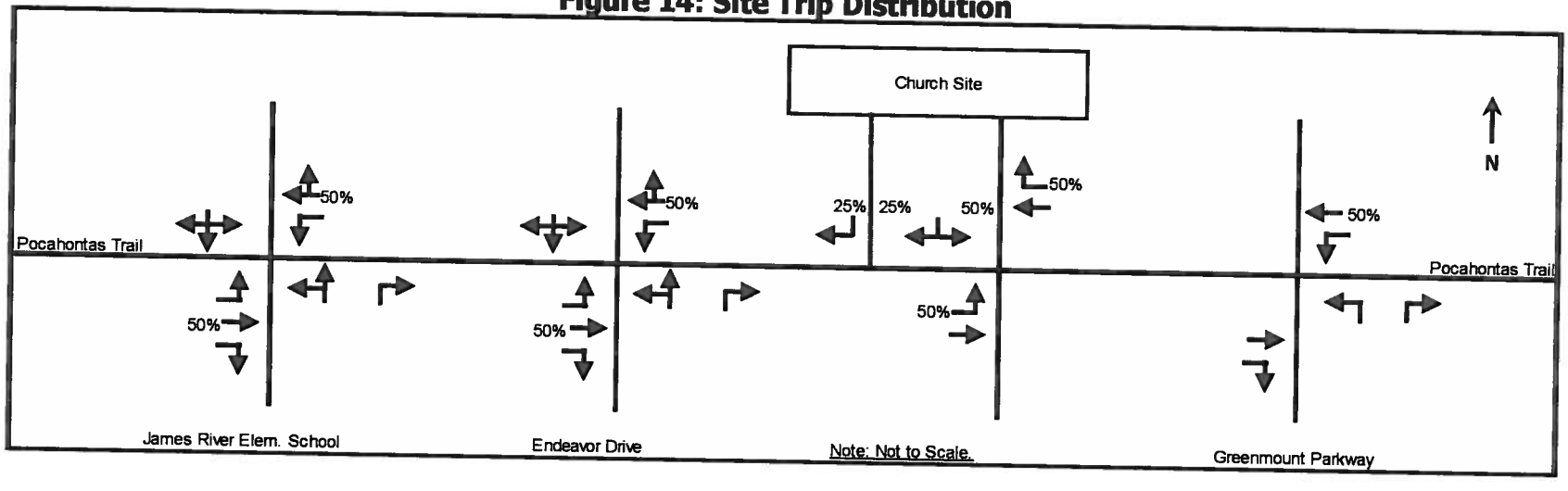


Figure 15: Phase I Build Conditions Weekday AM Peak Hour Volumes and Lane Configuration

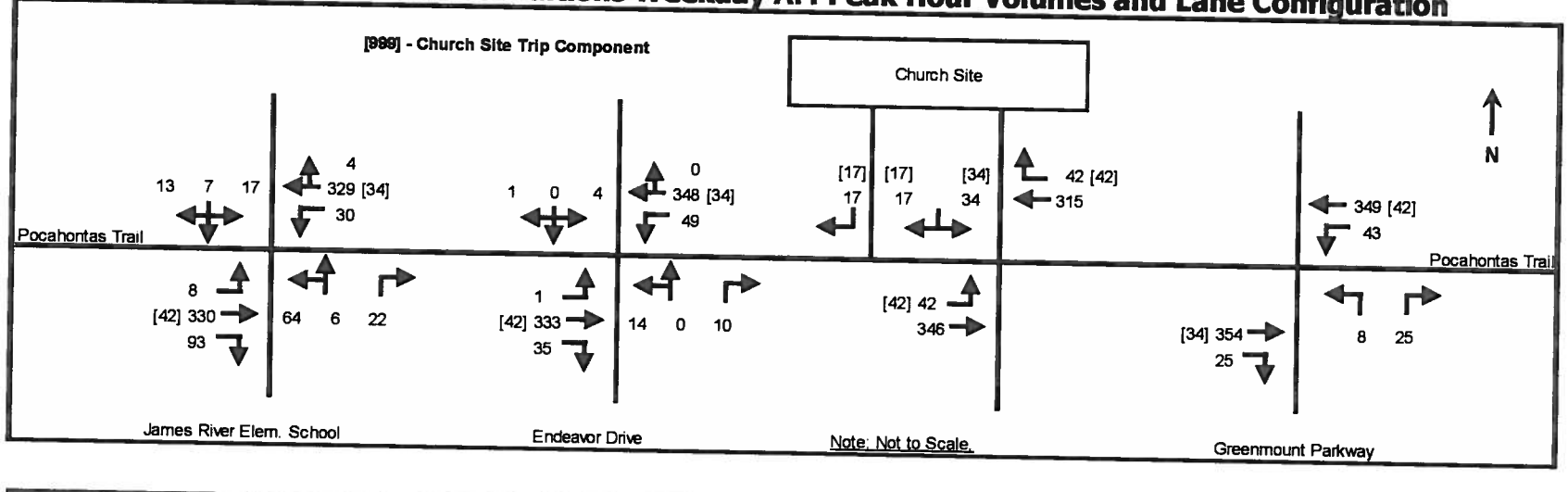


Figure 16: Phase I Build Conditions Weekday PM Peak Hour Volumes and Lane Configuration

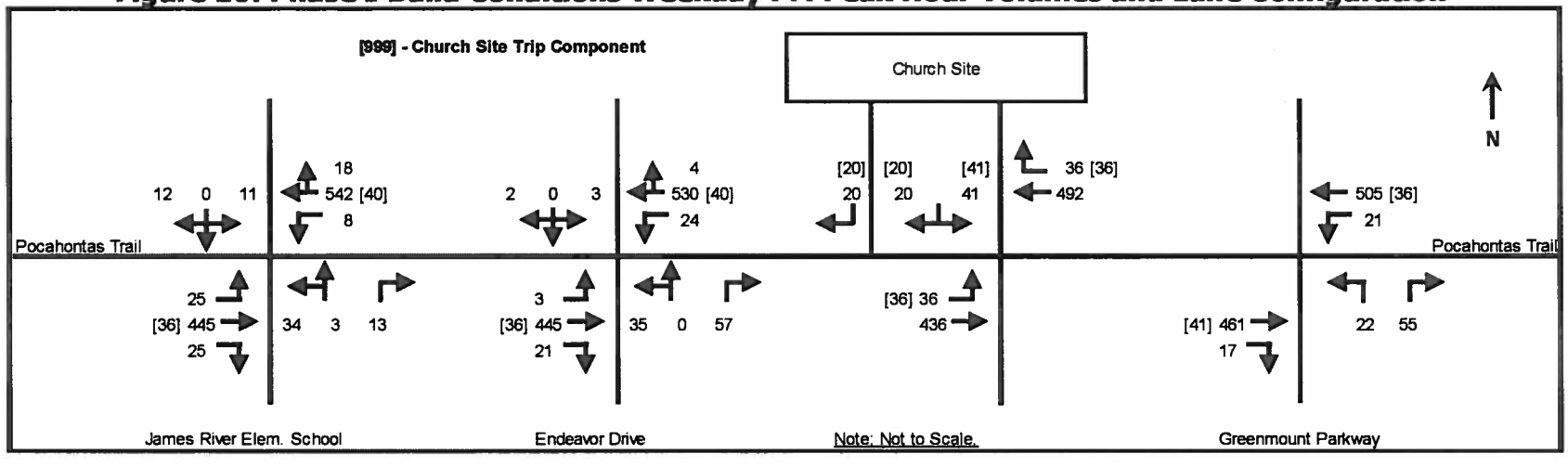


Figure 17: Phase I Build Conditions Sunday 9:30-10:30 AM Peak Hour Volumes and Lane Configuration

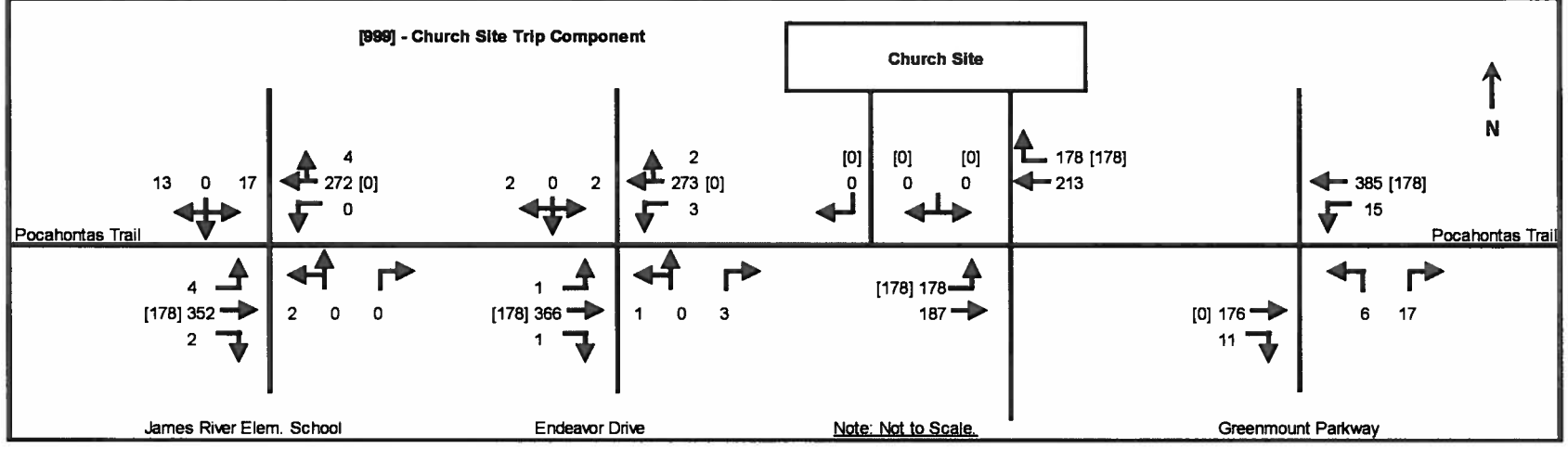


Figure 18: Phase I Build Conditions Sunday 10:30-11:30 AM Peak Hour Volumes and Lane Configuration

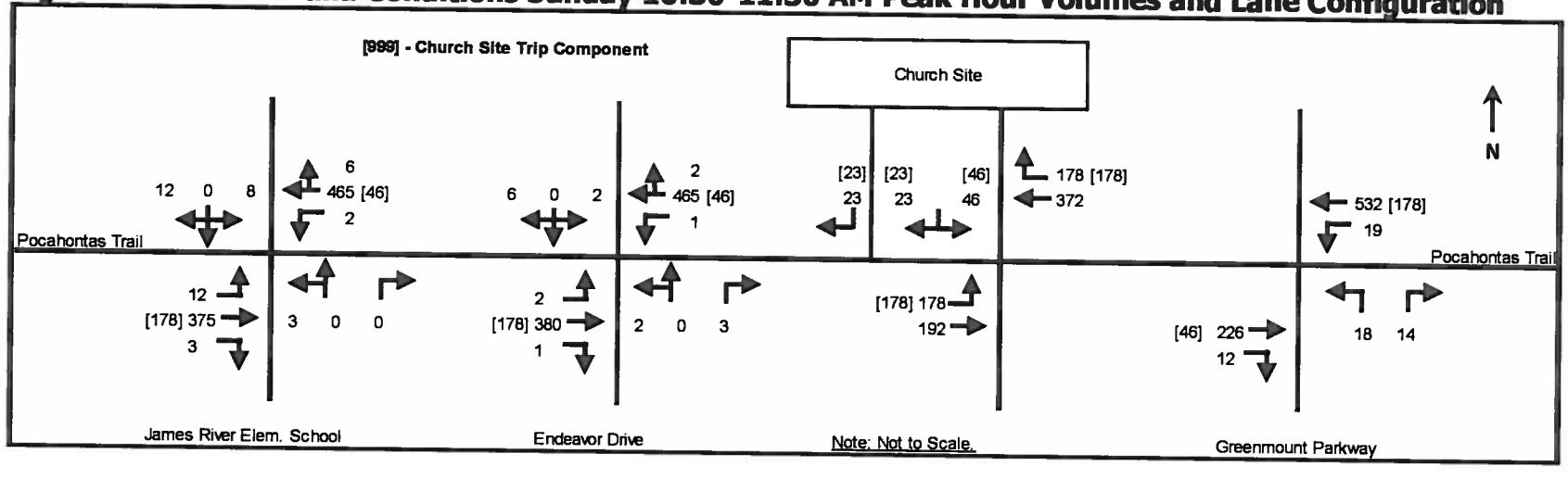


Figure 19: Phase I Build Conditions Sunday 12:30-1:30 PM Peak Hour Volumes and Lane Configuration

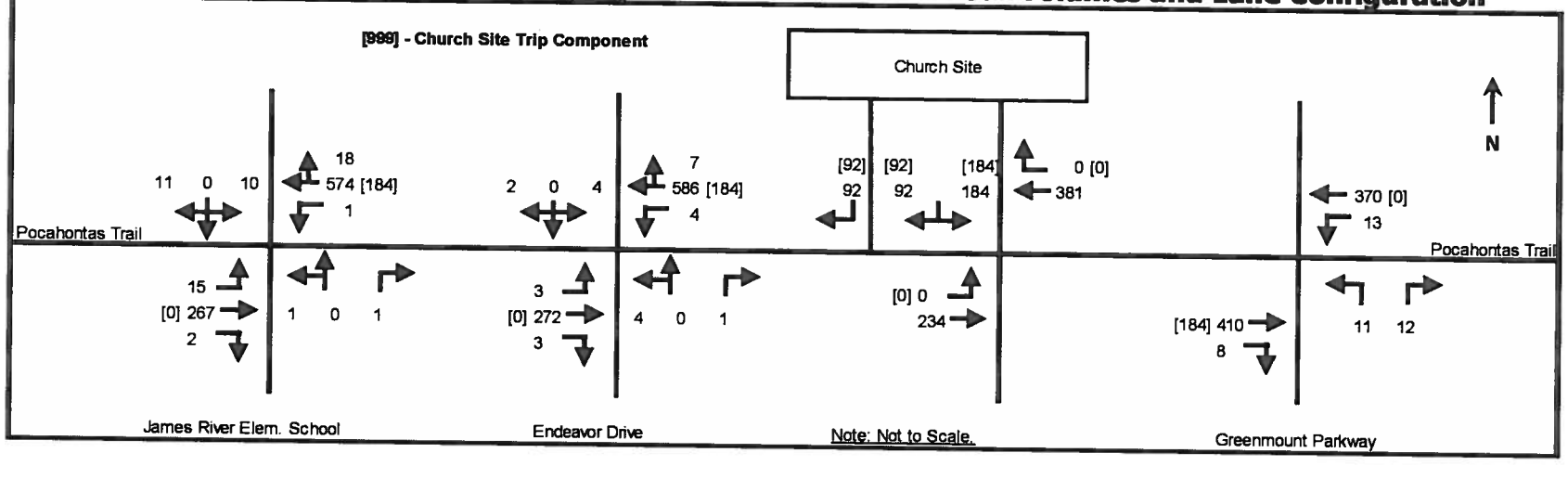


Figure 20: Phase I Build Conditions Sunday 6:00-7:00 PM Peak Hour Volumes and Lane Configuration

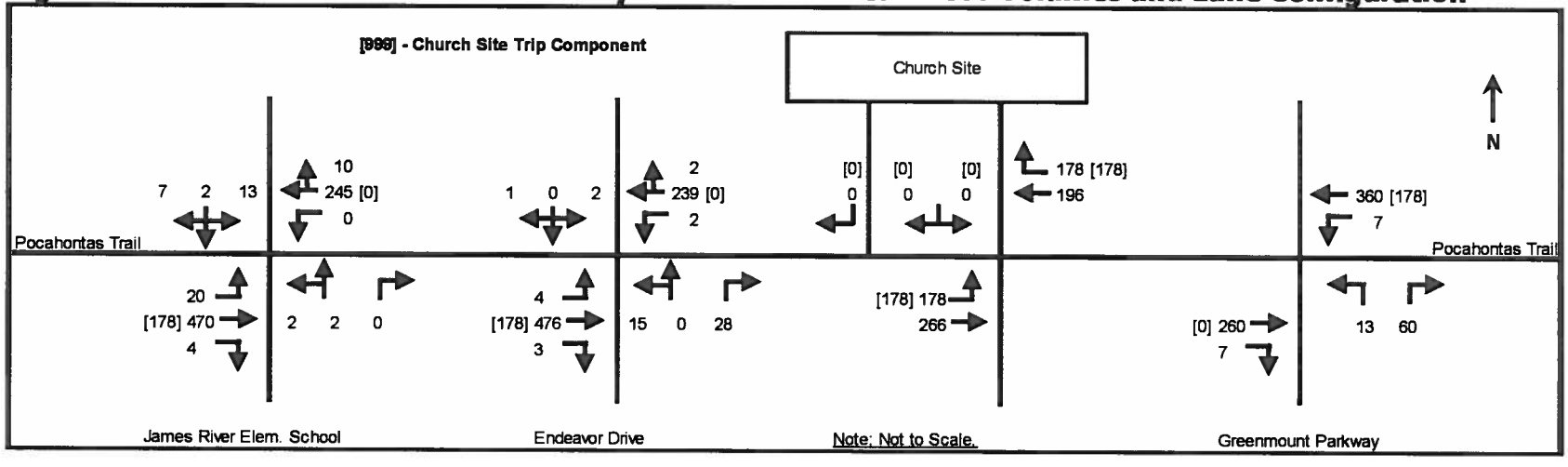


Figure 21: Phase III Build Conditions Weekday AM Peak Hour Volumes and Lane Configuration

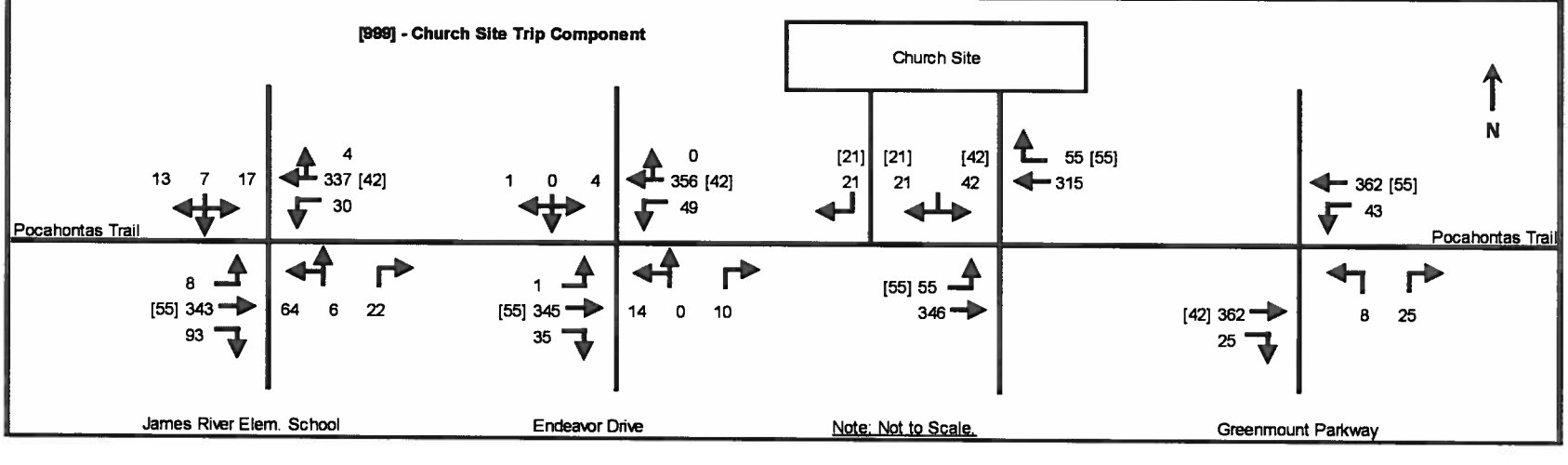


Figure 22: Phase III Build Conditions Weekday PM Peak Hour Volumes and Lane Configuration

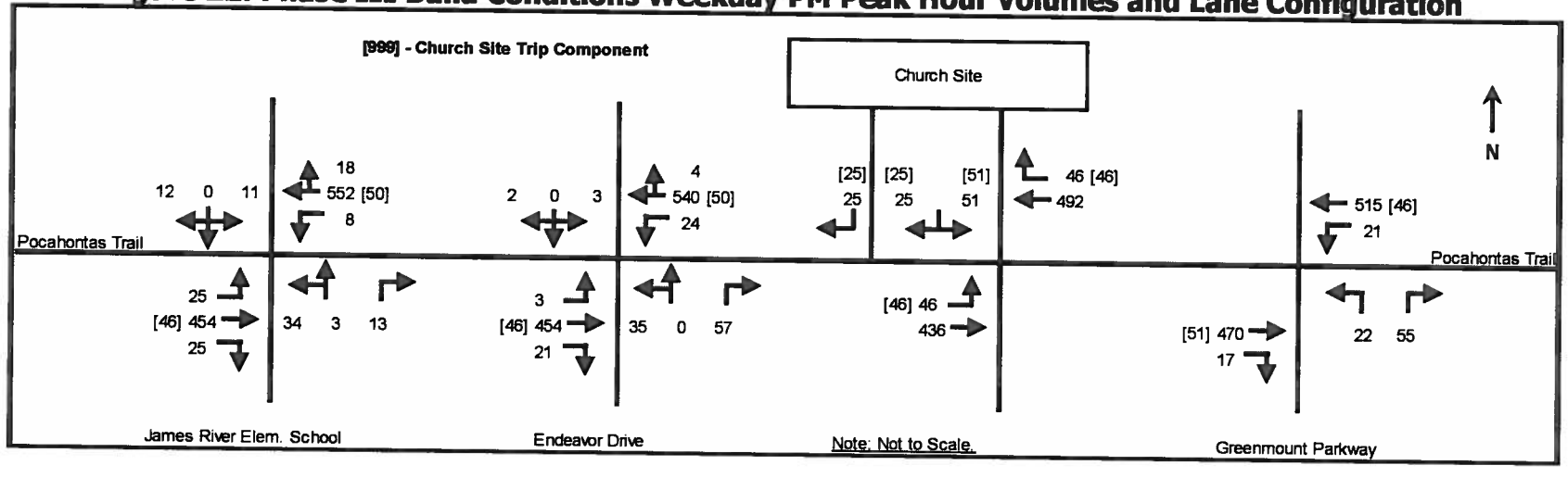


Figure 23: Phase III Build Conditions Sunday 9:30-10:30 AM Peak Hour Volumes and Lane Configuration

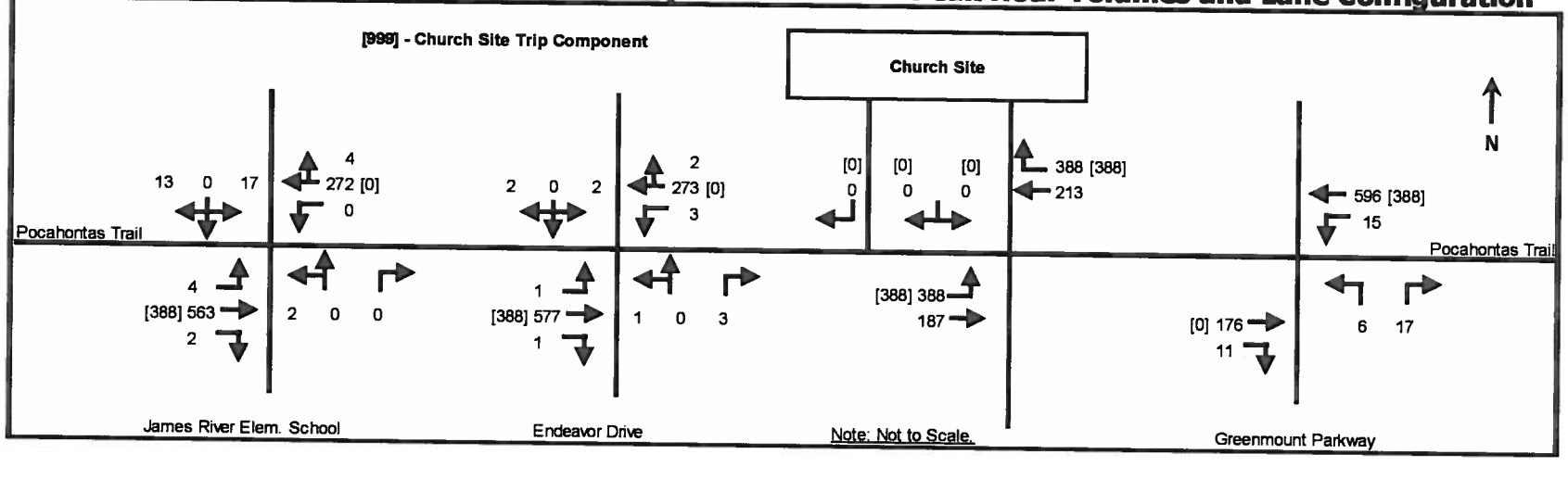


Figure 24: Phase III Build Conditions Sunday 10:30-11:30 AM Peak Hour Volumes and Lane Configuration

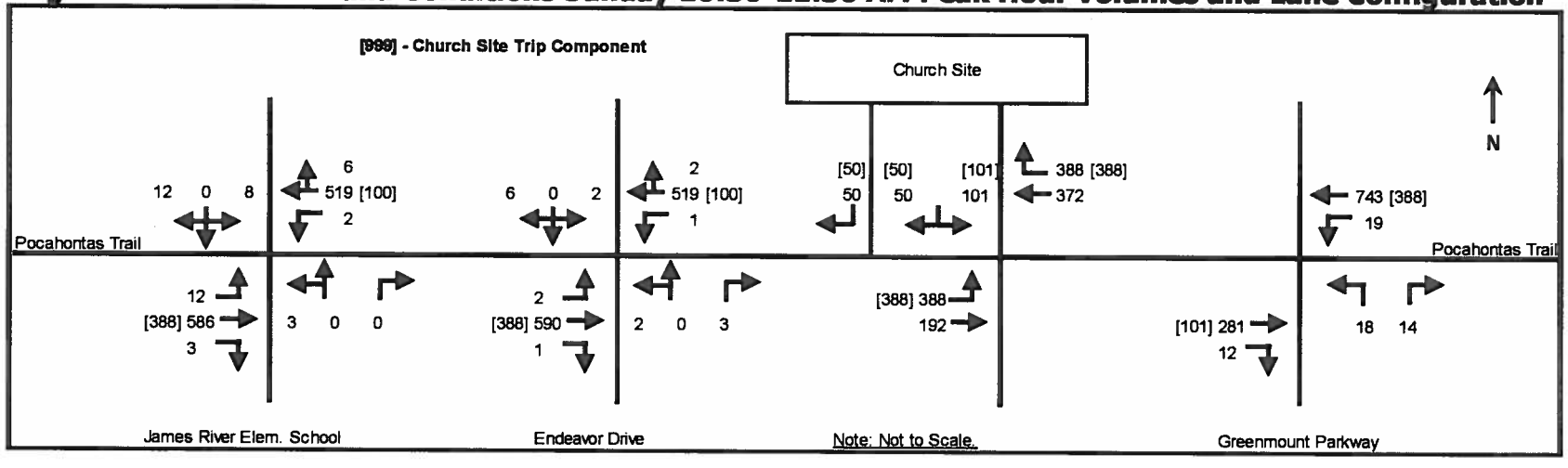


Figure 25: Phase III Build Conditions Sunday 12:30-1:30 PM Peak Hour Volumes and Lane Configuration

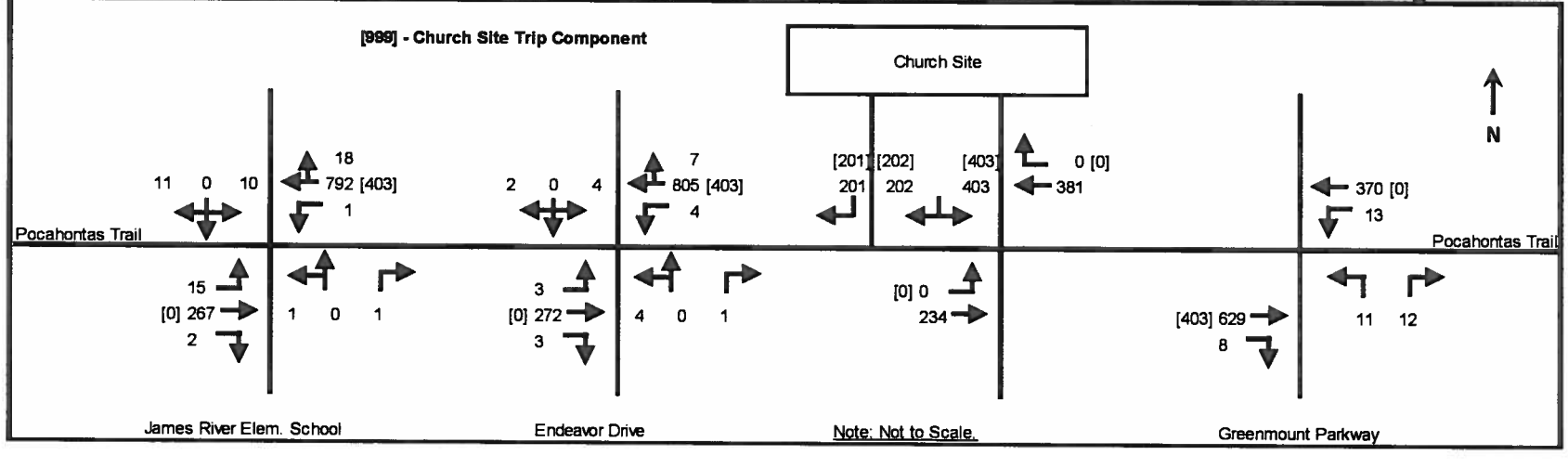
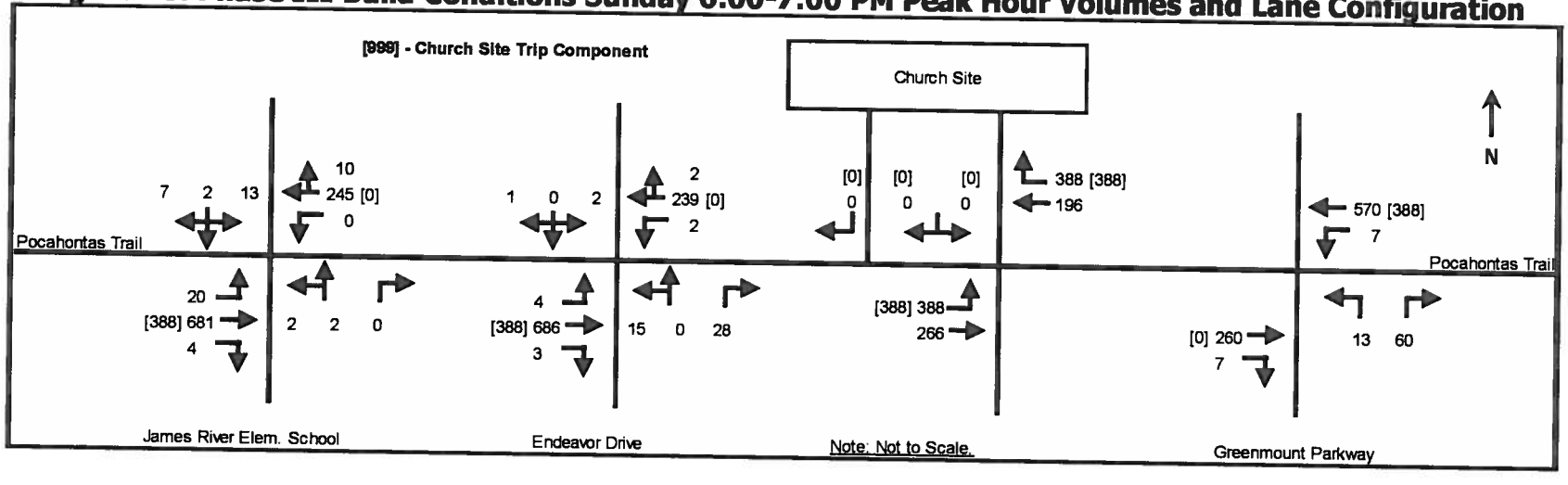


Figure 26: Phase III Build Conditions Sunday 6:00-7:00 PM Peak Hour Volumes and Lane Configuration



Phase I Build Conditions Weekday Peak Hour Analysis

Table 9 summarizes the Phase I Build conditions weekday peak hour analysis. All three study area intersections are forecast to operate with adequate service levels under Phase I Build conditions. Overall intersection service levels at Greenmount Parkway are forecasts at LOS A in both peak hours, they are forecasts at LOS B at Plantation Road/James River Elementary School, and each movement at Endeavor Drive is forecast at LOS D or better. The northbound left turn movement at Endeavor Drive is the only movement forecast to operate with LOS D conditions in the p.m. peak hour, a total of 22 vehicles make this movement in the p.m. peak hour. LOS D is considered adequate by AASHTO in urban settings; Route 60 is classified as an urban other principal arterial. James City County policy defines adequate service levels to be LOS C or better. There are two potential mitigation measures to address the LOS D conditions found at Endeavor Drive in the p.m. peak hour on the northbound through/left turn movement – a traffic signal and widening Route 60. Neither of these mitigation measures are warranted nor are they reasonable improvements to mitigate delay for 22 vehicles in one peak hour. All of the movements at the two proposed church driveway intersections with Route 60 are forecast to operate with LOS C or better service levels.

Phase I Sunday Peak Hour Analysis

Sunday peak hour Build analysis is summarized in **Tables 10 and 11**. The signalized study area intersections, Greenmount Parkway and Plantation Road/James River Elementary School, are forecast to operate with no lower than LOS A overall intersection service levels during all four Sunday peak hours. The unsignalized intersection of Endeavor Drive is forecast to operate with no lower than LOS C conditions at all the individual movements during all four Sunday peak hours. All of the movements at the proposed main church's driveway intersection with Route 60 are forecast to operate with LOS D or better service levels. The southbound left turn movement from the main church's driveway is forecast to experience LOS D conditions during the 10:30-11:30 Sunday hour. Police officer traffic control is a potential mitigation for the lower service levels for egress movements from the church on Sundays. However, conditions during Phase I are not severe enough to require police control in order to ensure reasonable delays during major periods of egress from the church.

Lower service levels for the egress movements from the main church driveway on peak Sunday hours will cause queues to develop; these queues may impede ingress church traffic to the parking lots nearer Route 60 which could potentially spill back to Route 60. This situation is most problematic during the 10:30-11:30 a.m. Sunday hour when there is a large amount of ingress traffic and a fair

amount of egress traffic. SimTraffic analysis of the southbound left turn queue during this hour forecasts a 95th percentile queue length of 53 feet. The throat length of the main driveway is approximately 250 feet long so there should be no influence on Route 60. Other peak hours, such as 12:30-1:30 p.m., may have more egress traffic than the 10:30-11:30 a.m. peak hour and therefore longer southbound queues leaving the church, however there will not be any significant ingress traffic during this hour.

Phase III Build Conditions Weekday Peak Hour Analysis

Table 12 summarizes the Phase III Build Conditions weekday peak hour analysis. All three study area intersections are forecast to operate with adequate service levels under Phase I Build conditions. Overall intersection service levels at Greenmount Parkway are forecast at LOS A in both peak hours, they are forecast at LOS B at Plantation Road/James River Elementary School, and each movement at Endeavor Drive is forecast at LOS D or better. As was stated previously, there are two potential mitigation measures to address the LOS D conditions found at Endeavor Drive in the p.m. peak hour on the northbound through/left turn movement – a traffic signal and widening Route 60. Neither of these mitigation measures is warranted nor are they reasonable improvements to mitigate delay for 22 vehicles in one peak hour. All of the movements at the proposed main church's driveway intersection with Route 60 are forecast to operate with LOS D or better service levels.

Phase III Sunday Peak Hour Analysis

Sunday peak hour No Build analysis is summarized in **Tables 13 and 14**. The signalized study area intersections, Greenmount Parkway and Plantation Road/James River Elementary School, are forecast to operate with no lower than LOS B overall intersection service levels during all four Sunday peak hours. The unsignalized intersection of Endeavor Drive is forecast to operate with no lower than LOS D conditions at all the individual movements during all four Sunday peak hours. LOS D conditions are forecast for the northbound through/left turn movement at Endeavor drive during two of the Sunday peak hours (see the previous paragraph discussion on mitigation of these service levels). All of the movements at the proposed main church's driveway intersection with Route 60 are forecast to operate with LOS D or better service levels with two exceptions, the southbound left turn movement exiting the church is forecast to operate with LOS F conditions during the 10:30-11:30 a.m. hour and the 12:30-1:30 p.m. peak hour. Police officer traffic control is a potential mitigation for the lower service levels for egress movements from the church on Sundays. The church may choose to use Police traffic control or similar measures at a point in time when egress delay becomes extreme (i.e. LOS F).

Lower service levels for the egress movements from the main church driveway on peak Sunday hours will cause queues to develop; these queues may impede ingress church traffic to the parking lots nearer Route 60 which could potentially spill back to Route 60. This situation is most problematic during the 10:30-11:30 a.m. Sunday hour when there is a large amount of ingress traffic and a fair amount of egress traffic. SimTraffic analysis of the southbound left turn queue during this hour forecasts a 95th percentile queue length of 594 feet. The throat of the driveway is approximately 250 feet long so there is certainly the potential to influence Route 60. By Phase III it is evident that the church may need the assistance of police officers to assist with traffic control so that egress during the 10:30-11:30 a.m. and 12:30-1:30 p.m. Sunday peak hours will be only experience reasonable delays (and queue lengths). The church should consider installing "DO NOT BLOCK THE INTERSECTION" signage on the southbound main driveway approach to the southern parking lots to help prevent northbound queues entering the church from causing any impact on Route 60. Another mitigation technique the church could employ would be closing access to the southern parking areas from the main church driveway during peak periods of egress in order to prevent ingress vehicles from attempting to make a left turn to this area during periods when there may be significant opposing queues.

Table 9
Summary of Phase I Build Conditions Weekday Peak Hour Traffic Analysis
HCM 2010 Methodology

Movement (Type)	AM Peak Hour		PM Peak Hour	
	Delay (sec./veh.)	Level of Service	Delay (sec./veh.)	Level of Service
James River Elem. Sch./Colony Dr. @ Rt. 60				
EB U.S. Route 60 Left	32.2	C	30.3	C
EB U.S. Route 60 Through	13.1	B	9.9	A
EB U.S. Route 60 Right	10.9	B	6.8	A
WB U.S. Route 60 Left	28.2	C	34.1	C
WB U.S. Route 60 Through/Right	12.1	B	12.2	B
NB James River Elem. School Through/Left	23.2	C	26.4	C
NB James River Elem. School Right	21.2	C	25.4	C
SB Colony Drive Left/Through/Right	25.1	C	29.4	C
Overall Intersection	**14.6**	**B**	**12.7**	**B**
Endeavor Drive @ U.S. Route 60				
NB Endeavor Drive Through/Left	19.5	C	28.4	D
NB Endeavor Drive Right	10.5	B	11.7	B
EB U.S. Route 60 Left	8.1	A	8.6	A
WB U.S. Route 60 Left	8.3	A	8.4	A
SB Endeavor Drive Left/Through/Right	17.0	C	20.3	C
Main Church Driveway @ U.S. Route 60				
EB U.S. Route 60 Left	8.1	A	8.6	A
SB Church Driveway Left	17.0	C	23.5	C
SB Church Driveway Right	10.3	B	11.8	B
Secondary Church Driveway @ U.S. Route 60				
SB Church Driveway Right	10.4	B	12.1	B
Greenmount Parkway @ U.S. Route 60				
EB U.S. Route 60 Through	9.4	A	9.6	A
EB U.S. Route 60 Right	5.6	A	4.2	A
WB U.S. Route 60 Left	5.2	A	5.9	A
WB U.S. Route 60 Through/Right	3.5	A	4.7	A
NB Greenmount Parkway Left	19.1	B	20.0	C
NB Greenmount Parkway Right	23.9	C	22.2	C
Overall Intersection	**7.0**	**A**	**8.0**	**A**

Table 10
Summary of Phase I Build Conditions Sunday Peak Hour Traffic Analysis
HCM 2010 Methodology

Movement (Type)	Sunday 9:30-10:30		Sunday 10:30-11:30	
	Delay (sec./veh.)	Level of Service	Delay (sec./veh.)	Level of Service
James River Elem. Sch./Colony Dr. @ Rt. 60				
EB U.S. Route 60 Left	29.4	C	26.8	C
EB U.S. Route 60 Through	5.7	A	8.0	A
EB U.S. Route 60 Right	4.0	A	5.7	A
WB U.S. Route 60 Left	0.0	A	42.8	D
WB U.S. Route 60 Through/Right	9.2	A	9.6	A
NB James River Elem. School Through/Left	35.9	D	34.8	C
NB James River Elem. School Right	0.0	A	0.0	A
SB Colony Drive Left/Through/Right	19.5	B	24.7	C
Overall Intersection	**8.0**	**A**	**9.6**	**A**
Endeavor Drive @ U.S. Route 60				
NB Endeavor Drive Through/Left	15.3	C	19.8	C
NB Endeavor Drive Right	10.5	B	10.7	B
EB U.S. Route 60 Left	7.9	A	8.4	A
WB U.S. Route 60 Left	8.1	A	8.1	A
SB Endeavor Drive Left/Through/Right	12.3	B	13.6	B
Main Church Driveway @ U.S. Route 60				
EB U.S. Route 60 Left	8.2	A	8.7	A
SB Church Driveway Left	0.0	A	25.5	D
SB Church Driveway Right	0.0	A	10.8	B
Secondary Church Driveway @ U.S. Route 60				
SB Church Driveway Right	0.0	A	11.0	B
Greenmount Parkway @ U.S. Route 60				
EB U.S. Route 60 Through	7.0	A	7.6	A
EB U.S. Route 60 Right	5.2	A	5.1	A
WB U.S. Route 60 Left	4.7	A	4.9	A
WB U.S. Route 60 Through/Right	3.7	A	4.6	A
NB Greenmount Parkway Left	17.5	B	18.9	B
NB Greenmount Parkway Right	21.5	C	18.7	B
Overall Intersection	**5.4**	**A**	**6.0**	**A**

Table 11
Summary of Phase I Build Conditions Sunday Peak Hour Traffic Analysis
HCM 2010 Methodology

Movement (Type)	Sunday 12:30-1:30		Sunday 6:00-7:00	
	Delay (sec./veh.)	Level of Service	Delay (sec./veh.)	Level of Service
James River Elem. Sch./Colony Dr. @ Rt. 60				
EB U.S. Route 60 Left	26.3	C	22.2	C
EB U.S. Route 60 Through	6.9	A	5.8	A
EB U.S. Route 60 Right	5.5	A	3.7	A
WB U.S. Route 60 Left	36.9	D	0.0	A
WB U.S. Route 60 Through/Right	10.1	B	9.2	A
NB James River Elem. School Through/Left	30.6	C	28.6	C
NB James River Elem. School Right	32.6	C	0.0	A
SB Colony Drive Left/Through/Right	24.8	C	21.3	C
Overall Intersection	**9.8**	**A**	**7.8**	**A**
Endeavor Drive @ U.S. Route 60				
NB Endeavor Drive Through/Left	19.1	C	17.5	C
NB Endeavor Drive Right	9.7	A	11.8	B
EB U.S. Route 60 Left	8.7	A	7.8	A
WB U.S. Route 60 Left	7.8	A	8.4	A
SB Endeavor Drive Left/Through/Right	16.8	C	14.9	B
Main Church Driveway @ U.S. Route 60				
EB U.S. Route 60 Left	0.0	A	8.1	A
SB Church Driveway Left	20.9	C	0.0	A
SB Church Driveway Right	11.7	B	0.0	A
Secondary Church Driveway @ U.S. Route 60				
SB Church Driveway Right	12.8	B	0.0	A
Greenmount Parkway @ U.S. Route 60				
EB U.S. Route 60 Through	8.1	A	8.6	A
EB U.S. Route 60 Right	4.6	A	4.7	A
WB U.S. Route 60 Left	4.9	A	5.8	A
WB U.S. Route 60 Through/Right	3.3	A	4.7	A
NB Greenmount Parkway Left	19.7	B	15.3	B
NB Greenmount Parkway Right	20.4	C	17.3	B
Overall Intersection	**6.2**	**A**	**7.4**	**A**

Table 12
Summary of Phase III Build Conditions Weekday Peak Hour Traffic Analysis
HCM 2010 Methodology

Movement (Type)	AM Peak Hour		PM Peak Hour	
	Delay (sec./veh.)	Level of Service	Delay (sec./veh.)	Level of Service
James River Elem. Sch./Colony Dr. @ Rt. 60				
EB U.S. Route 60 Left	32.6	C	30.6	C
EB U.S. Route 60 Through	13.1	B	9.9	A
EB U.S. Route 60 Right	10.8	B	6.8	A
WB U.S. Route 60 Left	28.6	C	34.4	C
WB U.S. Route 60 Through/Right	12.0	B	12.3	B
NB James River Elem. School Through/Left	23.6	C	26.7	C
NB James River Elem. School Right	21.6	C	25.7	C
SB Colony Drive Left/Through/Right	25.5	C	29.7	C
Overall Intersection	**14.6**	**B**	**12.7**	**B**
Endeavor Drive @ U.S. Route 60				
NB Endeavor Drive Through/Left	20.1	C	29.2	D
NB Endeavor Drive Right	10.6	B	11.8	B
EB U.S. Route 60 Left	8.1	A	8.6	A
WB U.S. Route 60 Left	8.3	A	8.4	A
SB Endeavor Drive Left/Through/Right	17.4	C	20.8	C
Main Church Driveway @ U.S. Route 60				
EB U.S. Route 60 Left	8.1	A	8.6	A
SB Church Driveway Left	18.2	C	25.5	D
SB Church Driveway Right	10.3	B	11.8	B
Secondary Church Driveway @ U.S. Route 60				
SB Church Driveway Right	10.5	B	12.2	B
Greenmount Parkway @ U.S. Route 60				
EB U.S. Route 60 Through	9.3	A	9.7	A
EB U.S. Route 60 Right	5.5	A	4.2	A
WB U.S. Route 60 Left	5.2	A	5.9	A
WB U.S. Route 60 Through/Right	3.6	A	4.7	A
NB Greenmount Parkway Left	19.3	B	20.3	C
NB Greenmount Parkway Right	24.1	C	22.5	C
Overall Intersection	**7.0**	**A**	**8.0**	**A**

Table 13
Summary of Phase III Build Conditions Sunday Peak Hour Traffic Analysis
HCM 2010 Methodology

Movement (Type)	Sunday 9:30-10:30		Sunday 10:30-11:30	
	Delay (sec./veh.)	Level of Service	Delay (sec./veh.)	Level of Service
James River Elem. Sch./Colony Dr. @ Rt. 60				
EB U.S. Route 60 Left	31.7	C	29.8	C
EB U.S. Route 60 Through	6.7	A	9.1	A
EB U.S. Route 60 Right	3.7	A	5.2	A
WB U.S. Route 60 Left	0.0	A	45.8	D
WB U.S. Route 60 Through/Right	8.3	A	9.1	A
NB James River Elem. School Through/Left	38.1	D	37.8	D
NB James River Elem. School Right	0.0	A	0.0	A
SB Colony Drive Left/Through/Right	21.7	C	27.7	C
Overall Intersection	**7.9**	**A**	**9.8**	**A**
Endeavor Drive @ U.S. Route 60				
NB Endeavor Drive Through/Left	19.8	C	28.4	D
NB Endeavor Drive Right	12.5	B	12.6	B
EB U.S. Route 60 Left	7.9	A	8.6	A
WB U.S. Route 60 Left	8.8	A	8.8	A
SB Endeavor Drive Left/Through/Right	14.9	B	16.1	C
Main Church Driveway @ U.S. Route 60				
EB U.S. Route 60 Left	8.9	A	9.9	A
SB Church Driveway Left	0.0	A	244.7	F
SB Church Driveway Right	0.0	A	11.1	B
Secondary Church Driveway @ U.S. Route 60				
SB Church Driveway Right	0.0	A	11.6	B
Greenmount Parkway @ U.S. Route 60				
EB U.S. Route 60 Through	6.8	A	7.0	A
EB U.S. Route 60 Right	5.1	A	4.4	A
WB U.S. Route 60 Left	4.6	A	4.4	A
WB U.S. Route 60 Through/Right	4.8	A	5.6	A
NB Greenmount Parkway Left	17.9	B	22.0	C
NB Greenmount Parkway Right	22.2	C	21.7	C
Overall Intersection	**5.7**	**A**	**6.4**	**A**

Table 14
Summary of Phase III Build Conditions Sunday Peak Hour Traffic Analysis
HCM 2010 Methodology

Movement (Type)	Sunday 12:30-1:30		Sunday 6:00-7:00	
	Delay (sec./veh.)	Level of Service	Delay (sec./veh.)	Level of Service
James River Elem. Sch./Colony Dr. @ Rt. 60				
EB U.S. Route 60 Left	31.5	C	24.8	C
EB U.S. Route 60 Through	5.8	A	6.8	A
EB U.S. Route 60 Right	4.7	A	3.4	A
WB U.S. Route 60 Left	49.5	D	0.0	A
WB U.S. Route 60 Through/Right	12.4	B	8.1	A
NB James River Elem. School Through/Left	35.7	D	31.1	C
NB James River Elem. School Right	37.7	D	0.0	A
SB Colony Drive Left/Through/Right	29.9	C	23.8	C
Overall Intersection	**11.4**	**B**	**8.0**	**A**
Endeavor Drive @ U.S. Route 60				
NB Endeavor Drive Through/Left	25.2	D	23.2	C
NB Endeavor Drive Right	9.7	A	14.4	B
EB U.S. Route 60 Left	9.5	A	7.8	A
WB U.S. Route 60 Left	7.8	A	9.2	A
SB Endeavor Drive Left/Through/Right	21.8	C	18.9	C
Main Church Driveway @ U.S. Route 60				
EB U.S. Route 60 Left	0.0	A	8.8	A
SB Church Driveway Left	85.0	F	0.0	A
SB Church Driveway Right	13.6	B	0.0	A
Secondary Church Driveway @ U.S. Route 60				
SB Church Driveway Right	18.7	C	0.0	A
Greenmount Parkway @ U.S. Route 60				
EB U.S. Route 60 Through	9.0	A	8.0	A
EB U.S. Route 60 Right	3.9	A	4.3	A
WB U.S. Route 60 Left	5.6	A	5.5	A
WB U.S. Route 60 Through/Right	2.9	A	5.7	A
NB Greenmount Parkway Left	23.5	C	16.7	B
NB Greenmount Parkway Right	24.2	C	18.8	B
Overall Intersection	**7.1**	**A**	**7.4**	**A**

VI. Turn Lane Warrant Analysis

Warrant analysis was conducted using nomographs found in VDOT's Road Design Manual Appendix F. Right turn lane warrant analysis was conducted using the forecasted Build volumes found in **Figures 15-20**. **Figure 27** displays the warrant for right turn lanes on a two-lane highway (U.S. Route 60). The main site entrance on U.S. Route 60 meets warrants for a 200 foot full-width turn lane and 200 foot taper for three of the Sunday services in Phase I. A 200 foot left turn lane with 200 feet of taper is warranted during both weekday peak hours (See **Figure 28**) and during 3 peak hours on Sunday in Phase I (See **Figure 29**).

Figure 27: Phase I Build Conditions Right Turn Lane Warrant

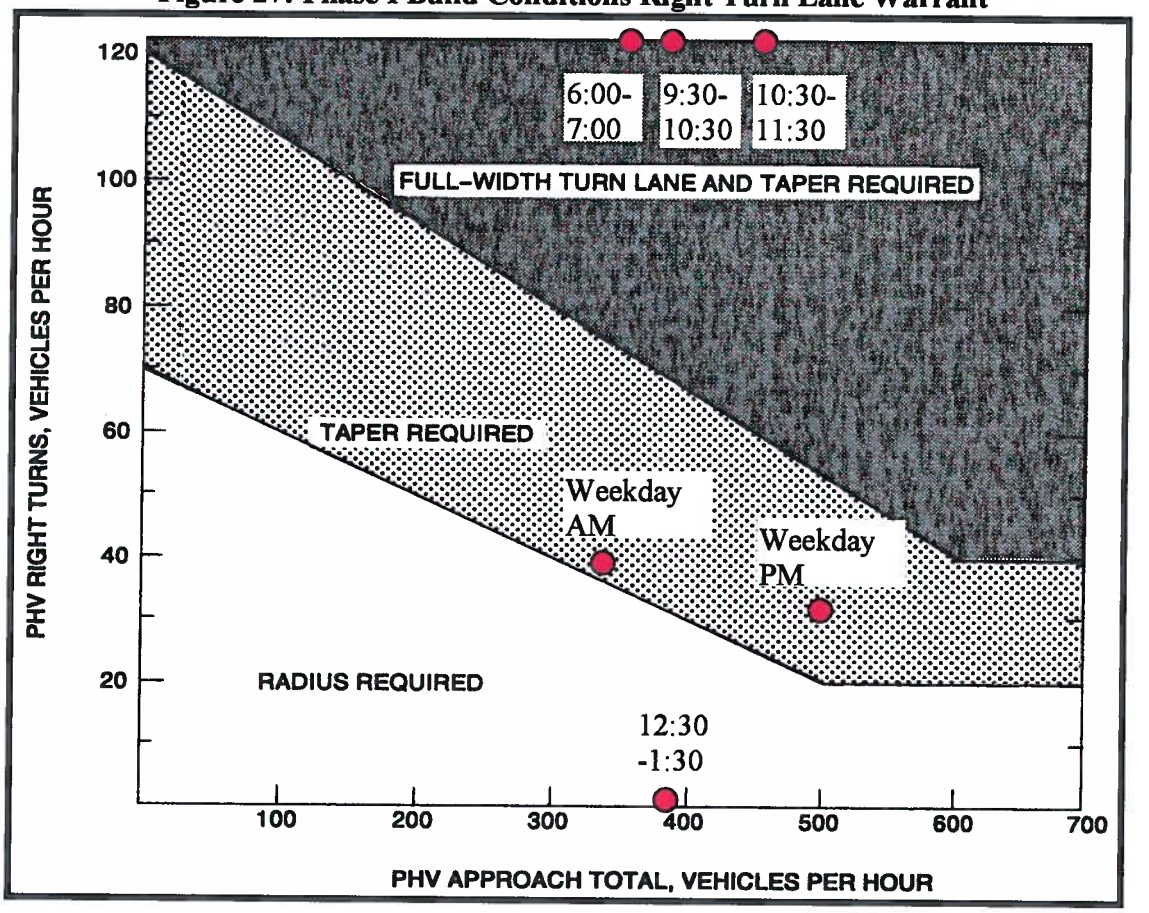


Figure 28: Phase I Build Conditions Left Turn Lane Warrant
Weekday Peak Hours

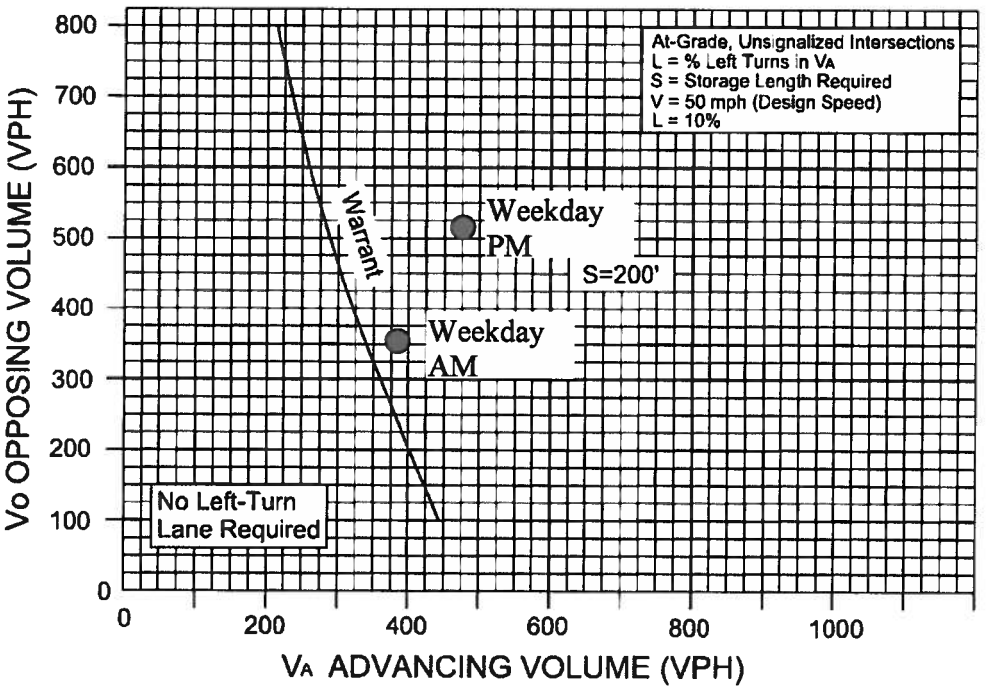


Figure 29: Phase I Build Conditions Left Turn Lane Warrant
Sunday Peak Hours

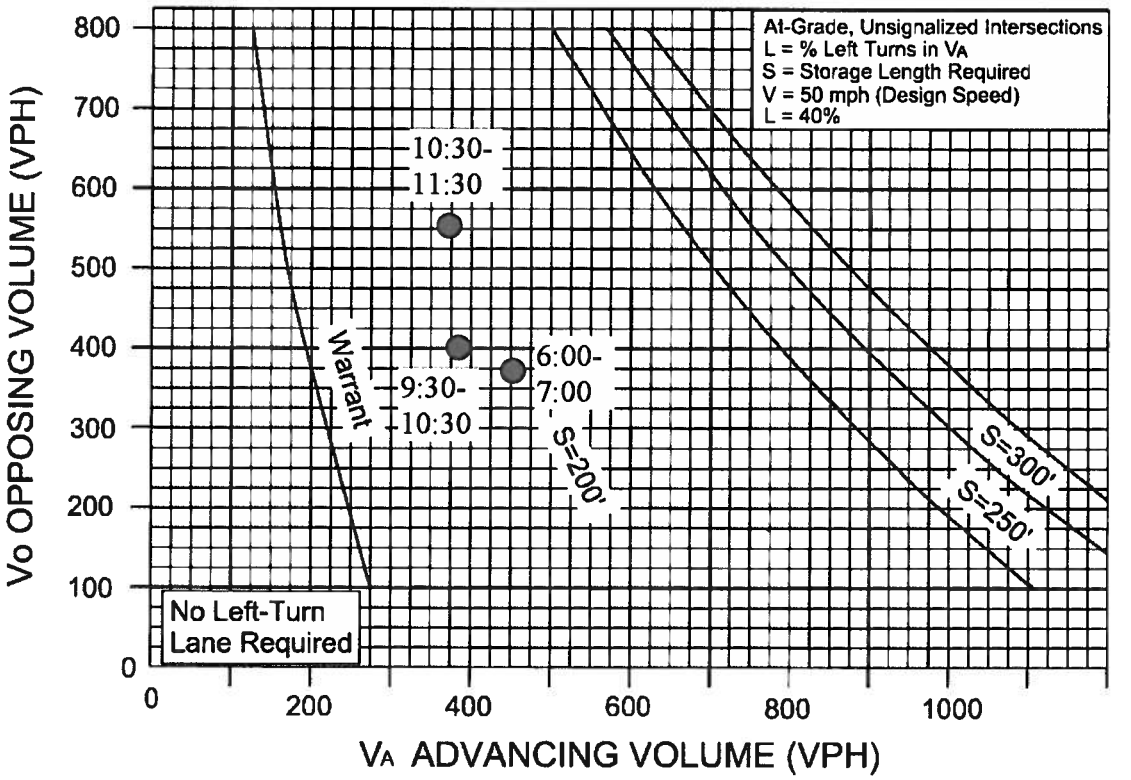


Figure 30 displays the warrant for right turn treatments on two-lane roads (U.S. Route 60) for Phase III Build conditions. A 200 foot right turn lane with 200 feet of taper is warranted for three Sunday hours.

Figure 30: Phase III Build Conditions Right Turn Lane Warrant

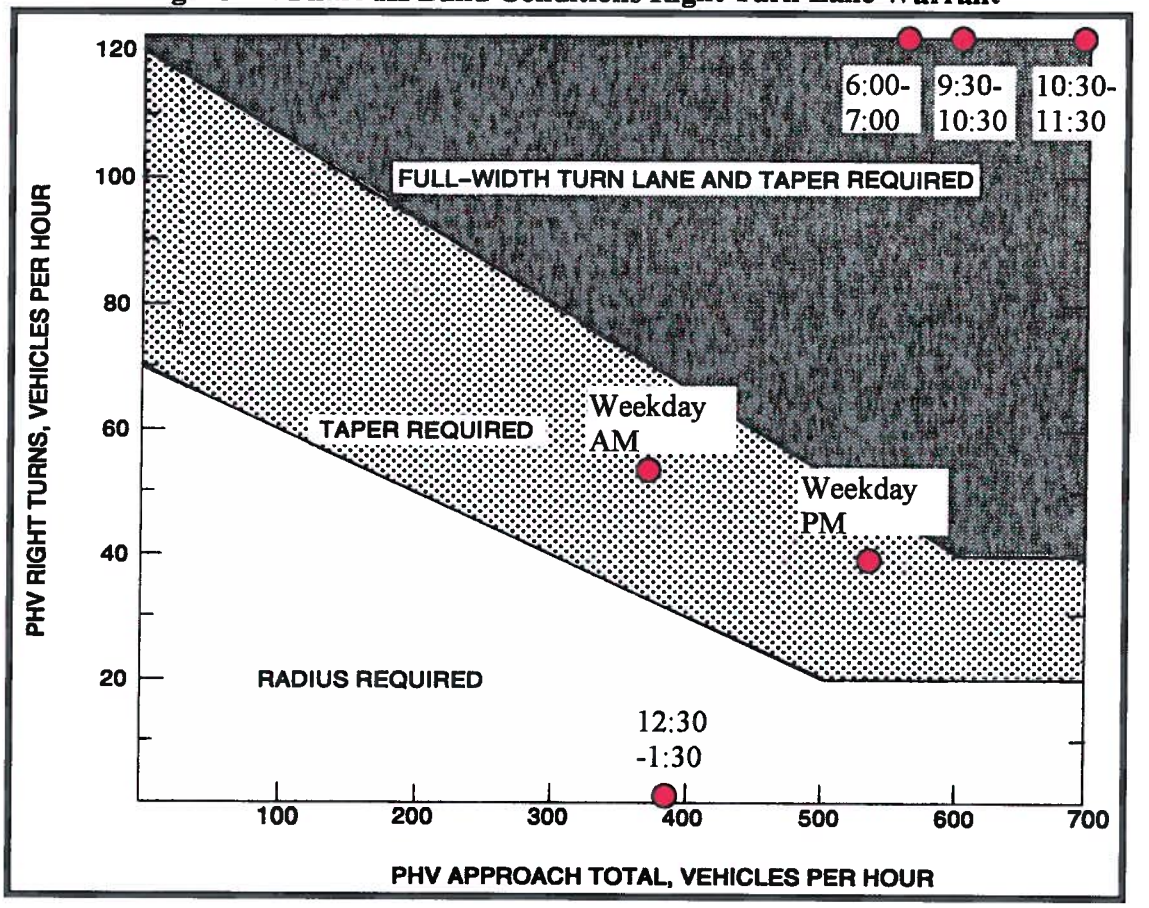


Figure 31 displays the warrants for a left turn lane treatment for Phase III Build conditions during the weekday peak hours. A 200 foot left turn lane with 200 feet of taper is warrant for the a.m. and p.m. weekday peak hours in Phase III Build conditions.

Figure 31: Phase III Build Conditions Left Turn Lane Warrant
Weekday Peak Hours

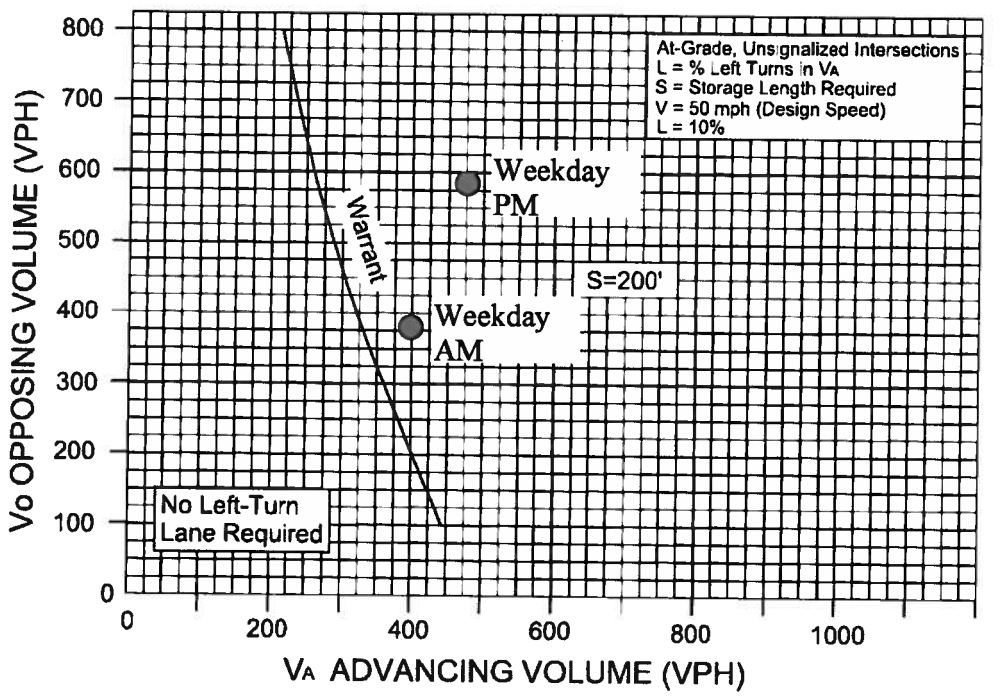
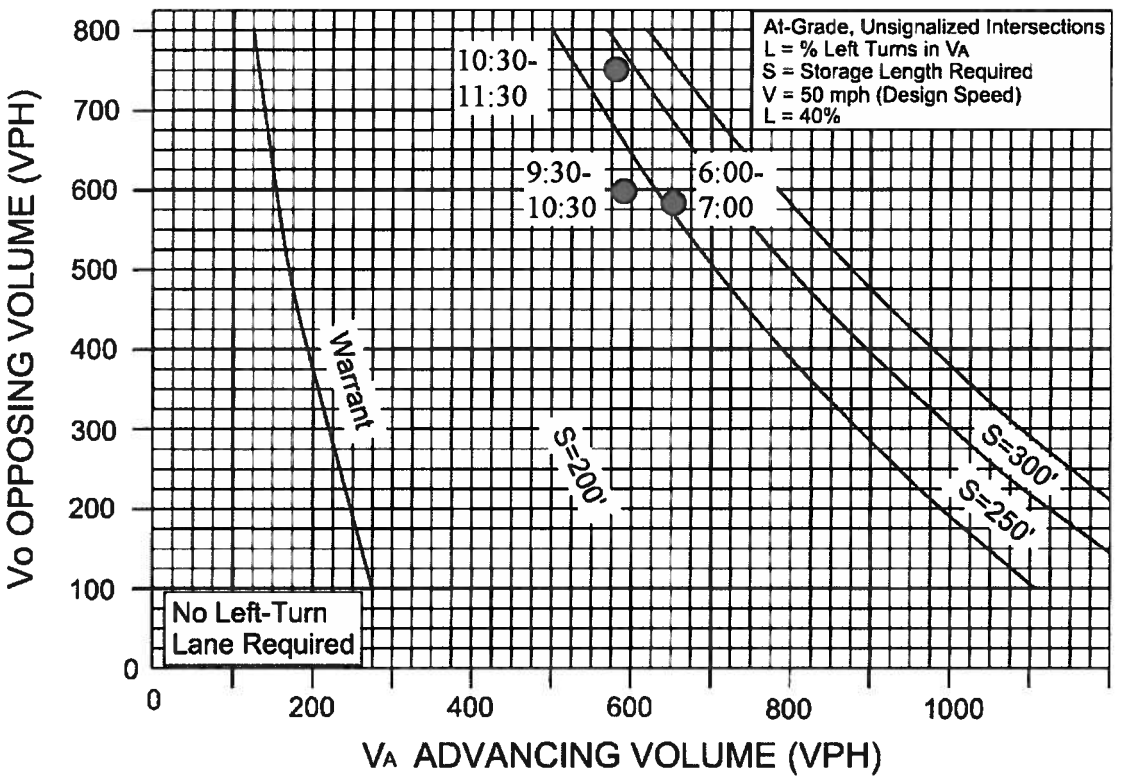


Figure 32 displays the warrants for a left turn lane treatment for Phase III Build conditions during Sunday hours. A 250 foot left turn lane with 200 feet of taper is warranted for two hours in Phase III Build conditions on Sunday.

Figure 32: Phase III Build Conditions Left Turn Lane Warrant
Sunday Peak Hours



An alternative analysis of the left turn lane storage length needs at the site entrance was conducted using SimTraffic microsimulation software. The 10:30-11:30 Sunday hour was specifically chosen as the analysis time period because it experiences the heaviest combination of left turn traffic versus opposing traffic. Simulations were conducted ten times for this Sunday hour under both Phase I and Phase III Build conditions. Average 95th percentile queue lengths for the left turn lane in Phase I Build conditions were 83 feet and they were 219 feet under Phase III Build conditions.

Access Management

VDOT has design standards for entrance locations and types of access known as Access Management Design Standards for Entrances and Intersections for roads maintained by VDOT such as Route 60. These standards apply to "commercial entrances". The design standards are based on two variables, the classification of the road and its speed limit. Route 60 is classified as an urban other principal arterial and it has a posted speed limit of 45 MPH in the vicinity of the church. Based on these variables, the VDOT minimum spacing standards for full access entrances is 565 feet and its minimum spacing for partial access (such as right-out only driveways) is 305 feet. The main church driveway is located approximately 1,000 feet from Greenmount Parkway. The secondary church driveway (right-out only) is located approximately 100 feet east of Morning Star Baptist Church's driveway and approximately 450 feet west of the main church entrance. Morning Star Baptist Church is a very small church that is approximately 2,000 square feet in size. On Sunday, January 18th, 2015 a traffic count was conducted at Morning Star Baptist Church's driveway from 9:30-11:50 a.m. Morning Star Baptist Church advertises its services at 10:00 a.m., 11:00 a.m., and 11:30 a.m. A total of 4 vehicles entered the church during the entire count period and none left. Assuming the 4 entering vehicles left at the conclusion of the 11:30 a.m. service there would have been approximately 8 total trips on that particular Sunday. VDOT defines a commercial entrance as any entrance serving land uses that generate more than 50 vehicular trips per day. Based on the Sunday, January 18th, 2015 traffic count, Moring Star Baptist Church's entrance is not a commercial entrance, nor is it close to generating enough traffic to be considered a commercial entrance. Based on this information the proposed secondary church entrance does not violate the access management standards.

VII. Conclusion

The Peninsula Pentecostals Church is proposing to construct a new church and day care facility on 40 acres of land on Route 60 just west of Greenmount Parkway. This study has analyzed the impacts of the church in Phase I when the church will seat 1,200 members and Phase III when the church expands to 2,400 seats. The day care facility is planned to remain at the 150 student level throughout the expansion phases of the church. The church proposes two points of access on Route 60 – one full access driveway and a right-out only driveway.

Three adjacent intersections on Route 60 were chosen for inclusion in this study based on consultation with James City County and VDOT - James River Elementary School/Colony Drive, Endeavor Drive, and Greenmount Parkway. Study periods included weekday peak hours, a.m. and p.m., and four hours on

Sunday that capture the arrival and departure hours of the current church's worship services. All of the capacity analysis scenarios are summarized in **Table 15**. The Greenmount Parkway intersection is currently operating with overall intersection LOS A conditions during both weekday peak hours and the four Sunday peak hours. The James River Elementary School/Colony Drive intersection is operating with no lower than LOS B overall intersection levels of service in the existing conditions.

The church anticipates opening Phase I in 2018 and VDOT regulations require analysis 6 years after build out which makes the design year 2024. No Build conditions were developed by growing existing conditions traffic volumes by 1% annually for a period of 10 years. The annual growth rate of 1% was derived through discussions with James City County and VDOT. The church has no timetable for construction of Phases II and III.

The three study area intersections were evaluated with 2024 No Build conditions volumes. The Greenmount Parkway intersection is forecast to operate with overall intersection LOS A conditions during both weekday peak hours and the four Sunday peak hours. The James River Elementary School/Colony Drive intersection is forecast to operate with no lower than LOS B overall intersection levels of service in the existing conditions.

Two Build conditions scenarios were evaluated under 2024 traffic volumes, Phases I and III of the proposed church. All three of the study area intersection experience only moderate increases in delay in comparison to the No Build conditions. All levels of service at the three study area intersection are forecast to operate at LOS D or better conditions during both phases of the church. The northbound through/left turn movement at Endeavor Drive experienced minor increases in delay in the weekday p.m. peak hour between the No Build conditions and the Build conditions, the delay increased from 24.9 (LOS C) seconds/vehicle to 28.4 (LOS D) in Phase I and 29.2 (LOS D) in Phase III. By chance the No Build conditions were on the cusp of the LOS C/LOS D delay threshold of 25 seconds/vehicle, therefore any increase in traffic volumes would push the delay into LOS D conditions. LOS D is considered adequate by AASHTO in urban settings; Route 60 is classified as an urban other principal arterial. James City County policy defines adequate service levels to be LOS C or better. There are two potential mitigation measures to address the LOS D conditions found at the northbound through/left turn movement on Endeavor Drive in the p.m. peak hour and on two Sunday hours – a traffic signal and widening Route 60. Neither of these mitigation measures are warranted nor are they reasonable improvements to mitigate delay for between 11 to 22 vehicles per hour for three hours a week.

Southbound left turn egress from the main church driveway is forecast to operate with LOS D conditions during the 10:30-11:30 Sunday hour under Phase I Build conditions. This same movement is forecast to operate with LOS F conditions during the 10:30-11:30 and 12:30-1:30 Sunday hours under Phase III Build Conditions. Police officer traffic control is a potential mitigation for the lower service levels for egress movements from the church on Sundays. The church may choose to employ Police traffic control or similar measures when delay becomes extreme (i.e. LOS F). The church will monitor ingress church traffic patterns in order to keep this traffic from queuing back onto Route 60. Mitigation techniques to prevent ingress queues from spilling onto Route 60 include on-site signage to not block the internal intersection to the southern parking lots or they could include closing the closest internal site intersection to Route 60 with traffic cones.

There are several programmed VDOT projects located in the study area limits that have the potential to impact the church site -Two Regional Surface Transportation Program (RSTP) projects: Relocated Route 60 Project (UPS 13496) and Skiffes Creek Connector Project (UPC 100200) are within the project limits. The church has begun coordination with these projects to minimize the impact of the future development of these projects.

Table 15
Summary of Capacity Analysis
HCM 2010 Methodology

Intersection	Weekday AM Peak	Weekday PM Peak	Sunday 9:30-10:30	Sunday 10:30-11:30	Sunday 12:30-1:30	Sunday 6:00-7:00
Existing Conditions						
James River Elem. Sch./Colony Dr. @ Rt. 60	B	B	A	B	A	A
Endeavor Drive @ Rt. 60*	C	C	B	C	B	B
Greenmount Parkway @ Rt. 60	A	A	A	A	A	A
No Build Conditions						
James River Elem. Sch./Colony Dr. @ Rt. 60	B	B	A	B	A	A
Endeavor Drive @ Rt. 60*	C	C	B	C	C	B
Greenmount Parkway @ Rt. 60	A	A	A	A	A	A
Phase I Build Conditions						
James River Elem. Sch./Colony Dr. @ Rt. 60	B	B	A	A	A	A
Endeavor Drive @ Rt. 60*	C	D	C	C	C	C
Main Church Driveway @ Rt. 60	C	C	A	D	C	A
Secondary Church Driveway @ Rt. 60	B	B	A	B	B	A
Greenmount Parkway @ Rt. 60	A	A	A	A	A	A
Phase III Build Conditions						
James River Elem. Sch./Colony Dr. @ Rt. 60	B	B	A	A	B	A
Endeavor Drive @ Rt. 60*	C	D	C	D	D	C
Church Driveway @ Rt. 60	C	D	A	F	F	A
Secondary Church Driveway @ Rt. 60	B	B	A	B	C	A
Greenmount Parkway @ Rt. 60	A	A	A	A	A	A

*Worst individual movement level of service is shown for unsignalized intersections. This is typically a left turn movement from the minor street.

An evaluation of turn lane warrants at the main site driveway was conducted for both Phase I and Phase III Build conditions using nomographs found in VDOT's Road Design Manual Appendix F. Additional evaluation of the turn lane storage length needs for the left turn lane into the main church entrance was conducted using SimTraffic microsimulation. SimTraffic analysis confirmed the storage lengths required by the standard VDOT nomographs were sufficient to handle 95th percentile traffic conditions (analysis can be found in the Technical Appendix). Based on the analysis conducted in this report the following improvements are recommended to mitigate traffic impacts associated with the development of the proposed church and day care facility:

Phase I - Based on the analysis a 200' right turn lane and a 200' taper should be installed on westbound Route 60 approach the main site entrance and a 200' left turn lane and 200' taper should be installed on the eastbound Route 60 approach to the main site entrance.

Phase III - Based on the analysis a 200' right turn lane and a 200' taper should be installed on westbound Route 60 approach the main site entrance and a 250' left turn lane and 200' taper should be installed on the eastbound Route 60 approach to the main site entrance.