



To: Steve Raugh (Timmons Group)  
From: W. Scott Dunn  
Date: November 28, 2011  
Re: Moncure Elementary School Relocation – Traffic Assessment  
Copy: Jennifer DeVaughn (Timmons Group)

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### **Background Information**

Moncure Elementary School is located in Stafford County on Juggins Road, south of the Juggins Road/Doc Stone Road intersection. Access to the site is currently provided at two (2) locations –

1. Parent, teacher, and faculty access is provided via Juggins Road, through the Juggins Road/Doc Stone Drive intersection. Juggins Road dead ends just past the elementary school parking lot.
2. Bus loop access is provided through the existing commuter/park and ride lot (which is scheduled to be expanded). Access to this facility is provided from Staffordboro Boulevard via three driveways; one (1) signalized and two (2) unsignalized.

The current plan proposes relocating the existing 700-student elementary school from its current location to a new site north on Juggins Road. The relocated elementary school will have an ultimate capacity of 950-students; a 250-student increase over the existing school.

Figure 1 provides an aerial of the area that identifies the aforementioned points of interest.

### **Existing Traffic**

Existing average daily traffic (ADT) volumes for Juggins Road and other facilities in the immediate area are summarized on Figure 2. This volume data was obtained from the Virginia Department of Transportation (VDOT) 2010 count book.

The northernmost section of Juggins Road, which will eventually provide access to the proposed school site, carries approximately 140 vehicle trips per day. These trips are associated primarily with the eight (8) existing single family residences located off of Juggins Road and Smith Lake Drive. There is limited residential development potential within the area due to the remaining developable lot count and the urban service area boundary.

### **Scheduled Transportation Improvements**

The only transportation improvements scheduled within the area are associated with the proposed 1,000-space expansion of the Staffordboro Commuter Lot. This lot expansion will occur to the north of the existing lot and include three (3) new access points –

1. A proposed signalized driveway on Staffordboro Boulevard north of Woodstream Boulevard;
2. A new connection to Juggins way, immediately north of the current Moncure Elementary School site; and
3. A fourth leg at the existing Juggins Road/Doc Stone Road intersection.

Lastly, in conjunction with item #3 above, a roundabout is also being proposed.

A traffic impact study for the proposed commuter lot expansion is currently being performed by VDOT in accordance with the requirements of the National Environmental Policy Act (NEPA) and other federal and state laws.

Figures 3a and 3b illustrate the proposed commuter lot expansion, in addition to the intersections that are being analyzed as part of the traffic impact study.

### **Proposed Relocation**

As shown in Figure 1, the existing Moncure Elementary School is proposed to be relocated and expanded on a site located further north along Juggins Road. This relocation will move the existing school from an R-1 Suburban Residential area to an A-1 Agricultural area (see Figure 4). In addition, the proposed relocation moves the elementary school from an area designated as Suburban in Stafford's Future Land Use Plan to an Agricultural area outside the urban service area (see Figure 5).

Following the relocation, the facility will continue to be served by a same local road network (see Figure 6) that it is today.

### **Trip Generation**

Based on the ITE *Trip Generation Manual, 8<sup>th</sup> Edition*, the existing 700-student elementary school generates 903 daily trips, 273 AM peak hour trips (150 enter, 123 exit) and 185 PM peak hour trips (83 enter, 102 exit).

The relocated/expanded 950-student elementary school will generate 1,226 daily trips, 386 AM peak hour trips (212 enter, 174 exit) and 258 PM peak hour trips (116 enter, 142 exit).

The net increase of traffic due to the proposed expansion is 323 daily trips, 85 AM peak hour trips, and

The trip generation information from the previous page is summarized in Table 1:

**Table 1  
Trip Generation Comparison**

LAND USE	ITE CODE	AMOUNT	UNITS	ADT	AM PEAK HOUR			PM PEAK HOUR		
					IN	OUT	TOTAL	IN	OUT	TOTAL
Elementary School	520	700	Students	903	150	123	273	83	102	185
Elementary School	520	950	Students	1,226	212	174	386	116	142	258
<i>Net Increase</i>				<i>323</i>	<i>62</i>	<i>51</i>	<i>114</i>	<i>33</i>	<i>40</i>	<i>73</i>

With respect to bus traffic, the 700-student Moncure Elementary School is currently served by 15 busses. This number is expected to increase to approximately 20 busses to accommodate the anticipated 950-students.

The aforementioned traffic estimates were shared with both the Virginia Department of Transportation (VDOT) and Stafford County prior to preparation of this memorandum. Representatives from each agency concurred with the aforementioned trip estimates and have indicated that a full traffic impact study (TIS) is not warranted; this determination applies to both VDOT's Chapter 527 requirements and the County's TIS requirements associated with a comprehensive plan amendment.

#### **Site Access**

Based on preliminary layouts, two (2) driveways will serve the proposed elementary school. While exact locations for these driveways have not been determined, it is anticipated that one (1) driveway will serve bus traffic, while a second will serve faculty, staff, and parent drop off.

As with most schools, these driveways will operate independently of one another and traffic will be directed accordingly.

It should be noted that the portion of Juggins Road that is adjacent to the proposed school site is an unpaved facility. This is currently acceptable given that the road only serves several single family residences. The addition/relocation of the school and associated traffic will require that Juggins Road be paved from the terminus of the current paved section along the frontage of the school site to the final driveway serving the school; this is necessary to provide a safe environment for both school patrons as well as residents.

Given a projected ADT of approximately 2,000, combined with the presence of busses, it is recommended that the Juggins Road be designed as a 2-lane facility with 12' travel lanes. Also, additional consideration should be given to extending the existing sidewalk network from within the adjacent residential area (to the south) to the proposed school site.

### **Turn Lane Warrant Analysis**

While a TIA is not required, VDOT has indicated that turn lane warrant analyses are necessary and will be reviewed as part of the entrance permit process.

Turn lane warrant analyses were completed using peak hour volume projections for the proposed 950-student elementary school in conjunction with peak hour estimates for the residential development located to the north along Juggins Road and Smith Lake Drive (see Figure 7). These volumes were used in conjunction with the turn lane nomographs contained in Appendix F of the VDOT *Road Design Manual*.

Results of the turn lane warrant analysis indicate the following:

- No auxiliary turn lanes are warranted at the proposed bus entrance; and
- A northbound right turn lane is warranted at the proposed staff/parent entrance.

Although the VDOT guidelines indicate the need for a northbound right turn lane on Juggins Road at the proposed staff/student entrance, a turn lane is not recommended given that a majority of the approach volume is turning right into the site with minimal traffic proceeding north. Based on the capacity analyses, the intersection will operate at a level of service B or better with the northbound approach as a shared through-right lane.

For your convenience, copies of the turn lane nomographs and capacity analyses are included in the Appendix.

### **Conclusions**

The proposed relocation/expansion of Moncure Elementary School will result in minimal increases to overall traffic. This assertion has been acknowledged by both VDOT and Stafford County; both agencies have agreed that the additional site-generated traffic is below their respective thresholds for a traffic impact analysis and a study is not required.

That being noted, the above memorandum provides an overview of existing and anticipated traffic conditions along the Juggins Road Corridor. Based on this review, the following is offered:

- The relocation of Moncure Elementary School will require that the northern section of Juggins Road be improved (i.e. paved) to an acceptable width to accommodate traffic increases related to the school.
- Auxiliary turn lanes are not recommended at either of the two (2) proposed entrances to the relocated elementary school due to the minimal amount of through traffic along the northern section of Juggins Road.
- Consideration should be given to extending the existing pedestrian network from the residential area to the south to the proposed elementary school site.

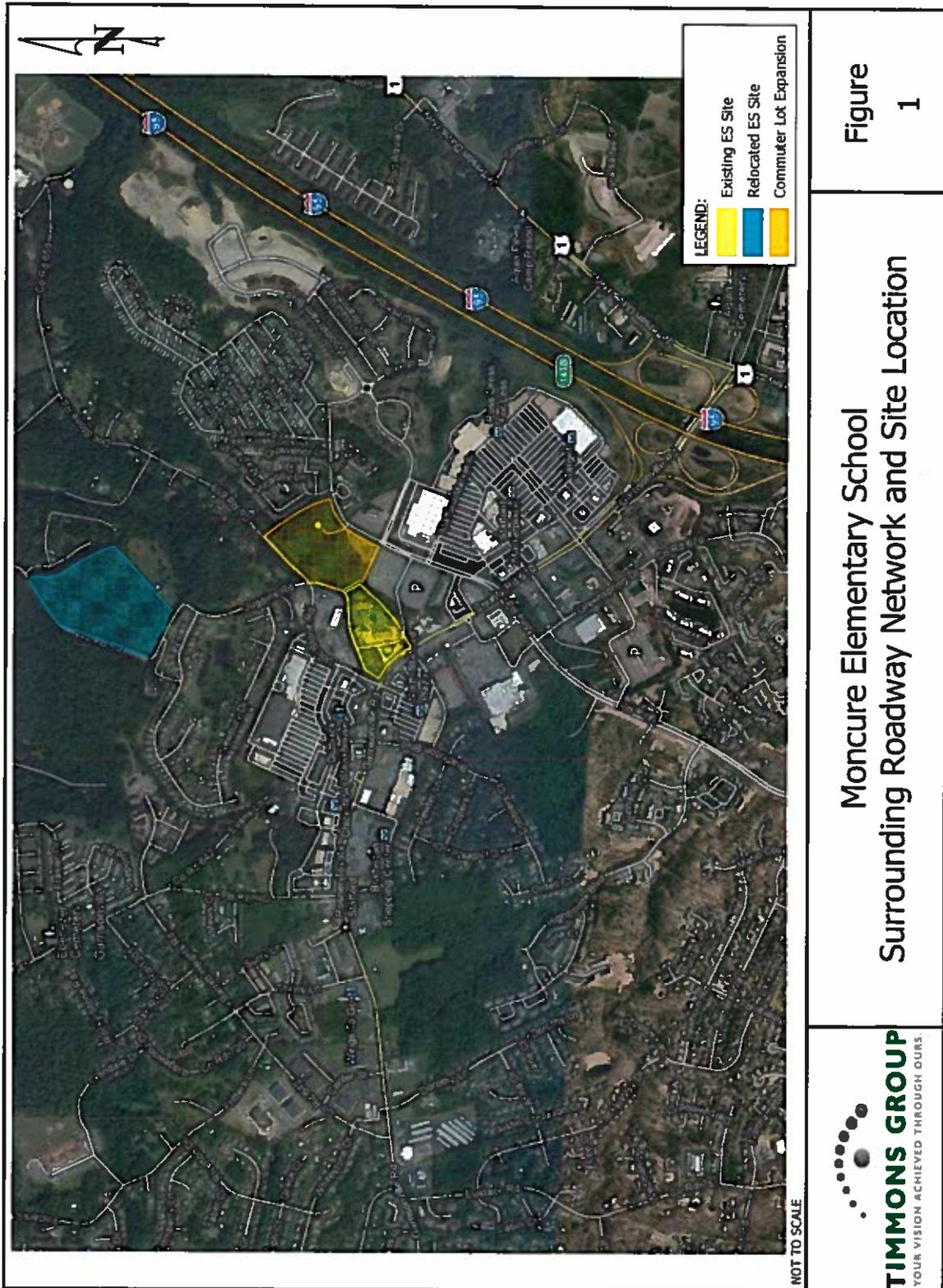
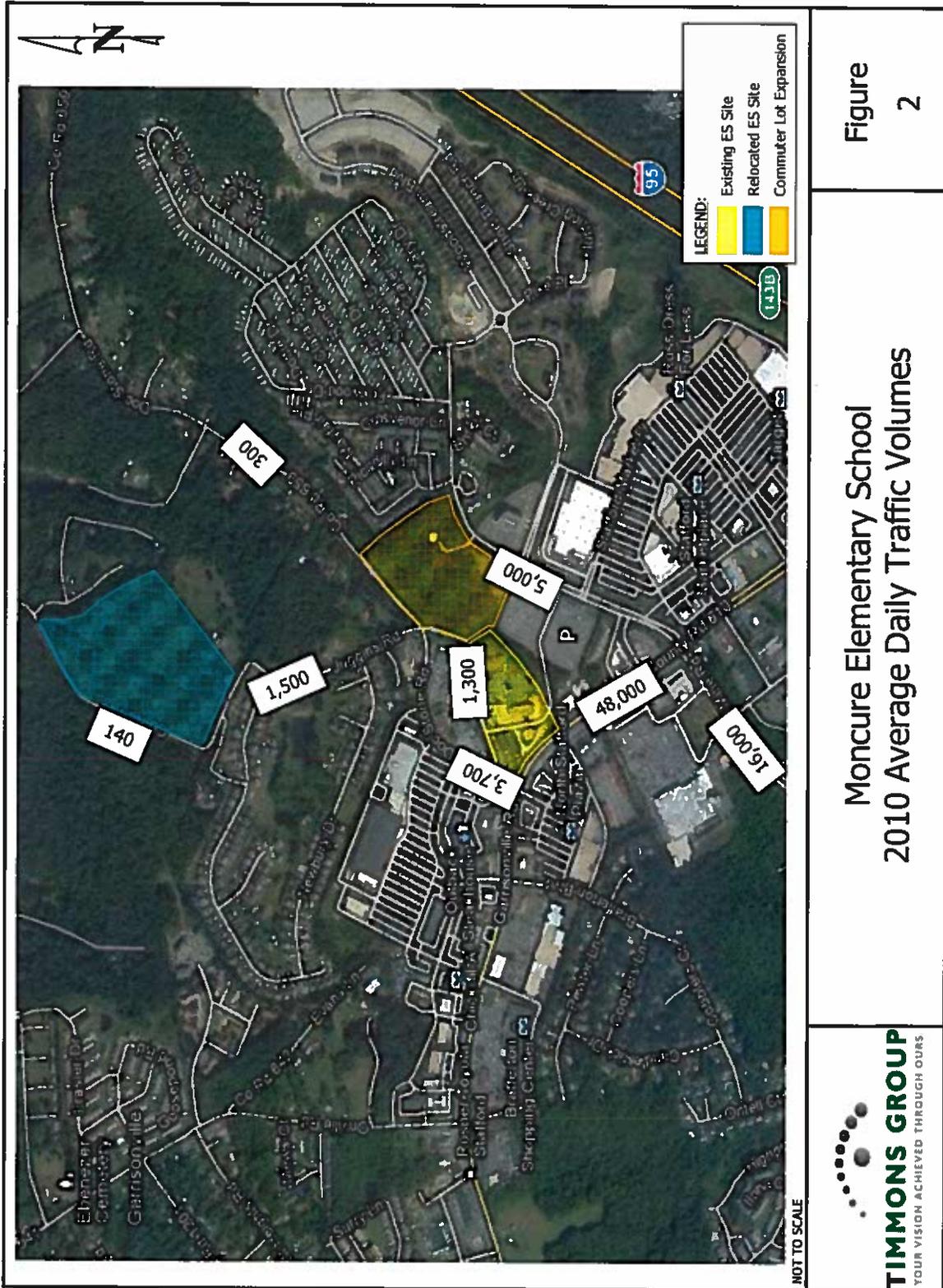
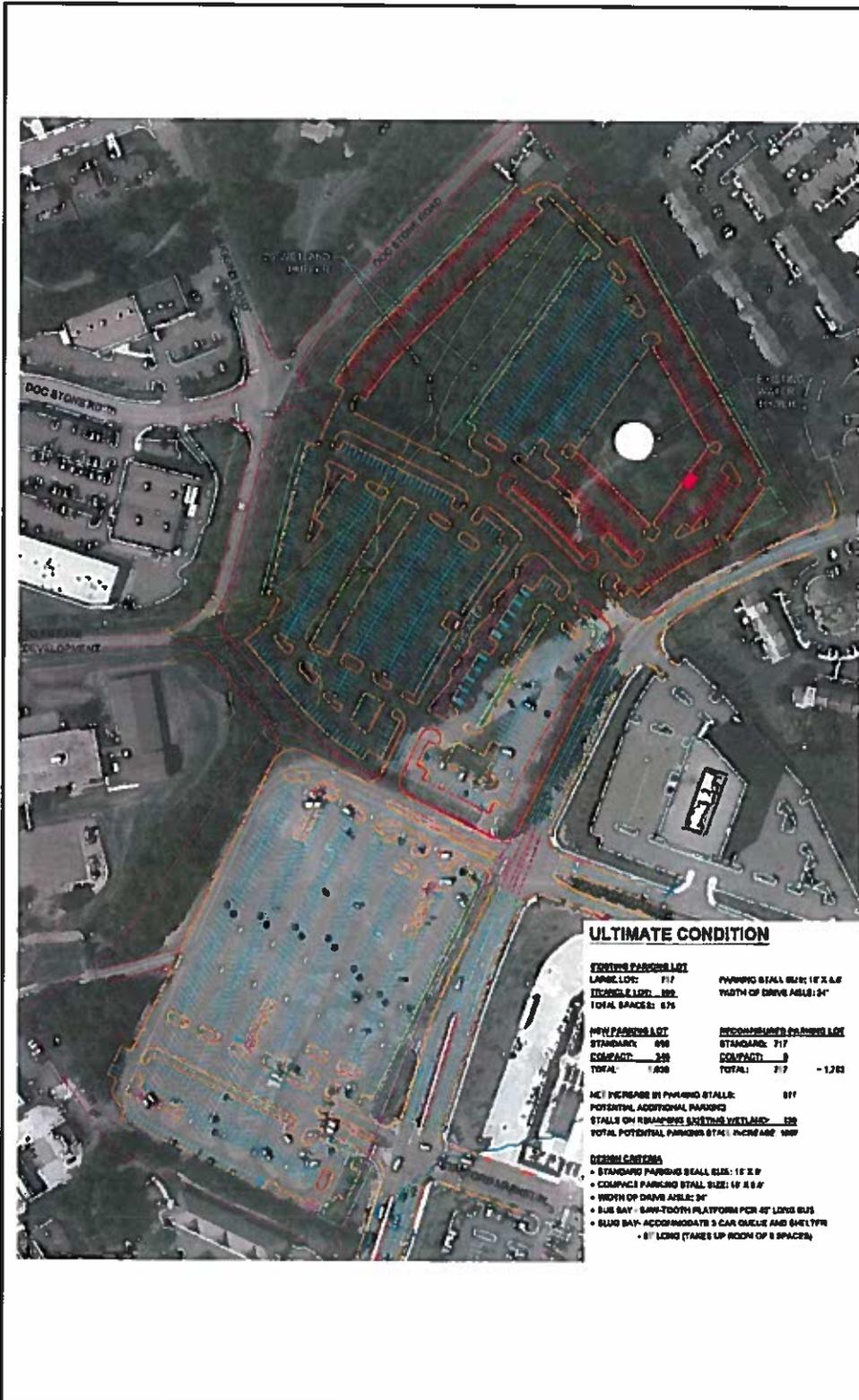


Figure  
1

Moncure Elementary School  
Surrounding Roadway Network and Site Location





**ULTIMATE CONDITION**

**EXISTING PARKING LOT**  
 LANE LOT: 717  
 STANDARD LOT: 899  
 TOTAL SPACES: 616

PARKING STALL SIZE: 16' X 8' 6"  
 WIDTH OF DRIVE AISLE: 24'

**NEW PARKING LOT**  
 STANDARD: 899  
 COMPACT: 299  
 TOTAL: 1,198

**RECOMMENDED PARKING LOT**  
 STANDARD: 717  
 COMPACT: 0  
 TOTAL: 717 - 1,281

NET INCREASE BY PARKING STALLS: 817  
 POTENTIAL ADDITIONAL PARKING  
 STALLS ON REMAINING AVAILABLE YIELD AREA: 199  
 TOTAL POTENTIAL PARKING STALLS INCREASE: 1016

**DESIGN CRITERIA**

- STANDARD PARKING STALL SIZE: 16' X 8' 6"
- COMPACT PARKING STALL SIZE: 14' X 8' 6"
- WIDTH OF DRIVE AISLE: 24'
- BUS BAY: SHUTTLE PLATFORM PER 40' LONG BUS
- BUS BAY: ACCOMMODATE 3 CAR CIRCLES AND ONE TRUCK
- 8' LONG (TAKES UP ROOM OF 8 SPACES)

NOT TO SCALE

Figure  
 3a

Moncure Elementary School  
 Staffordboro Commuter Lot Expansion



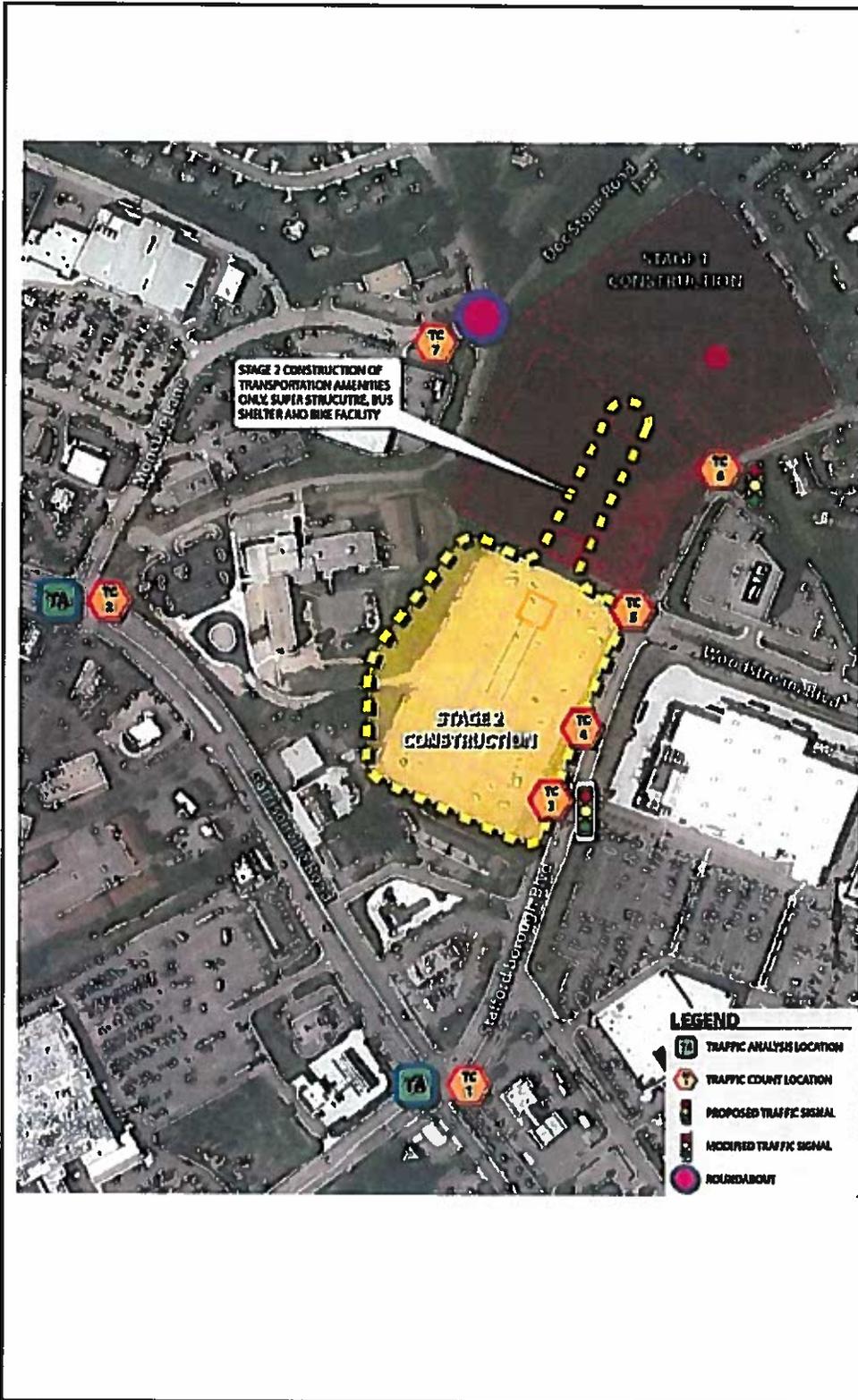


Figure  
3b

Moncure Elementary School  
Staffordboro Commuter Lot Expansion

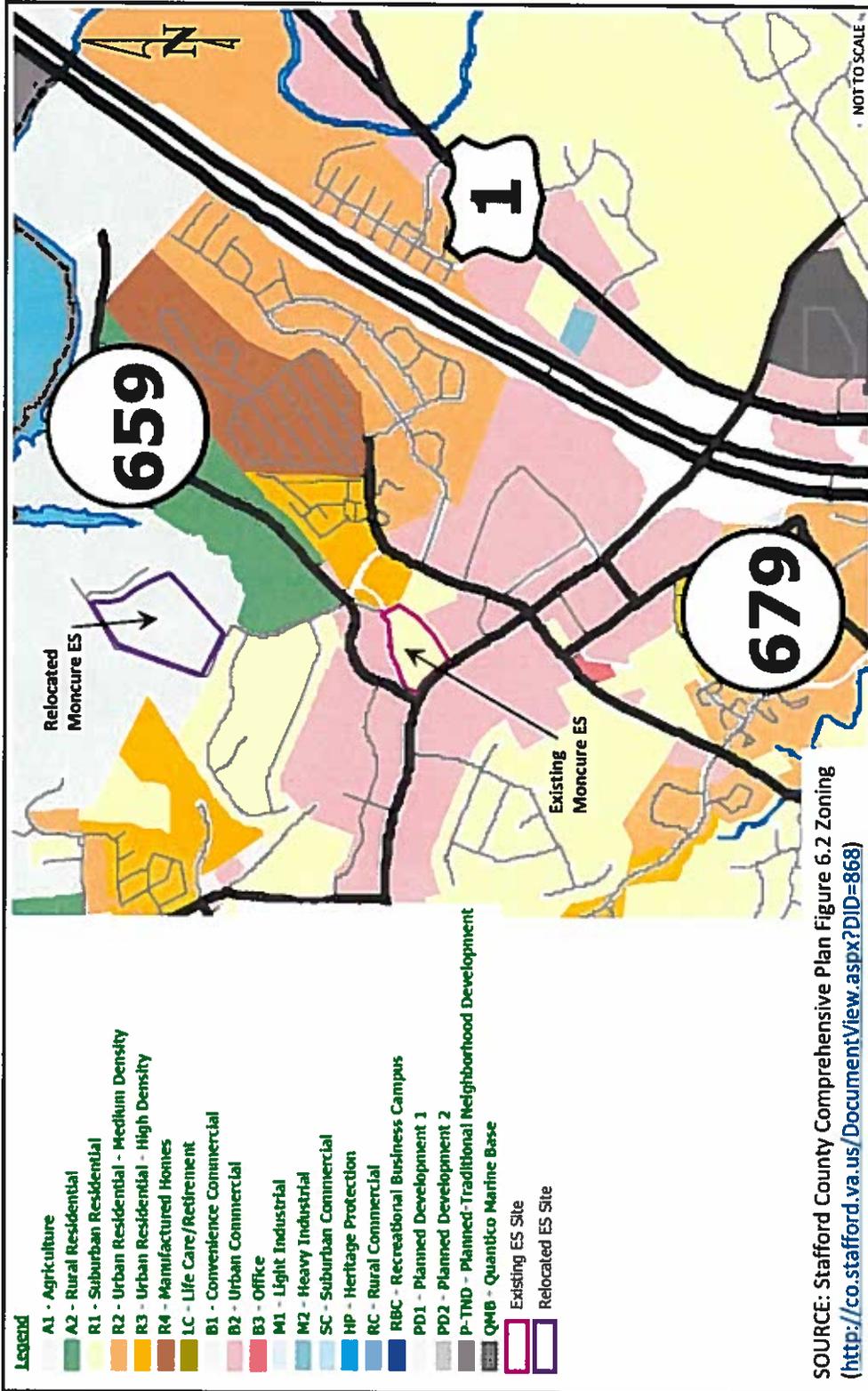
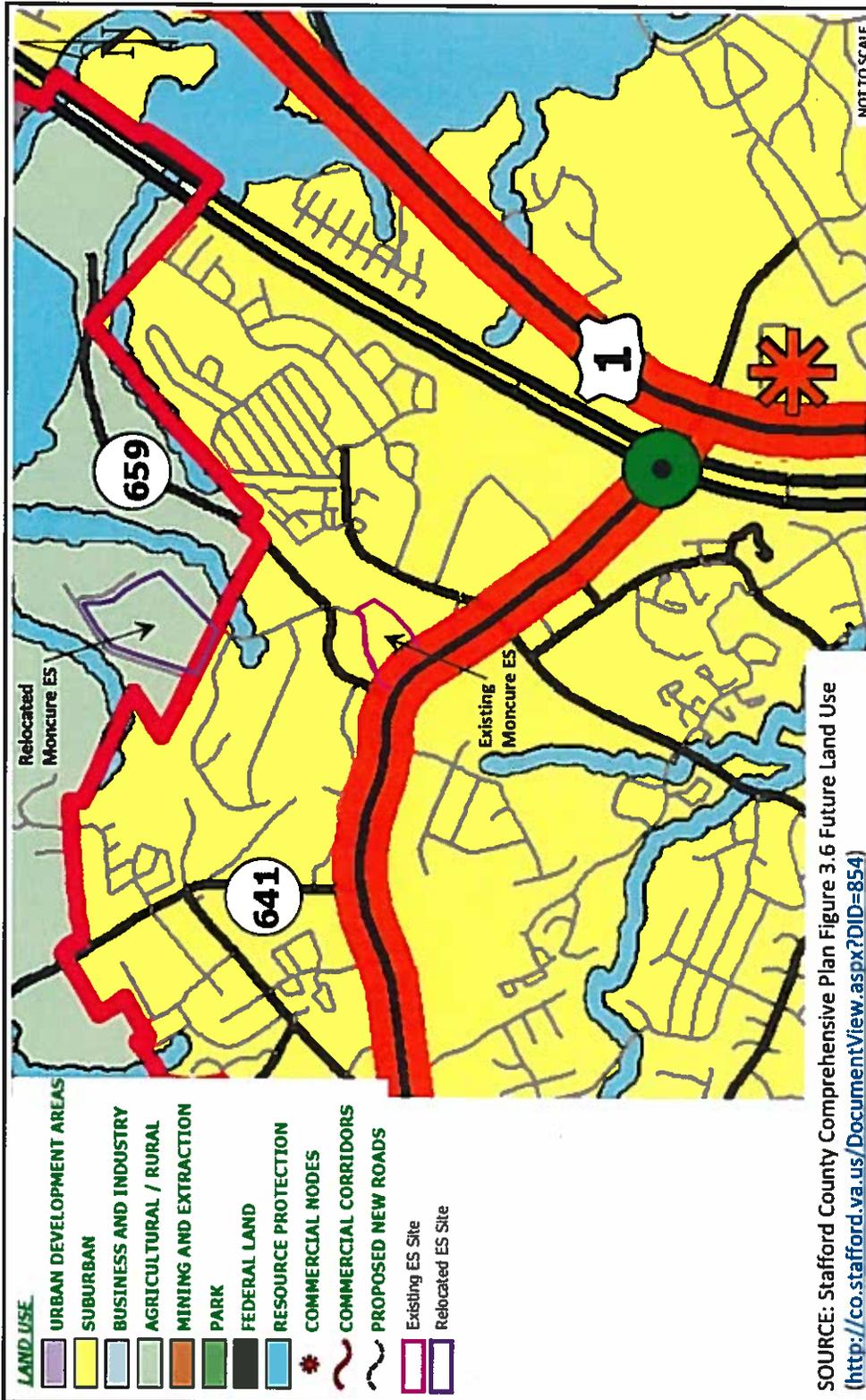


Figure  
4

Moncure Elementary School  
Existing Zoning





SOURCE: Stafford County Comprehensive Plan Figure 3.6 Future Land Use  
 (<http://co.stafford.va.us/DocumentView.aspx?DID=854>)

Figure 5

Montcure Elementary School  
 Future Land Uses



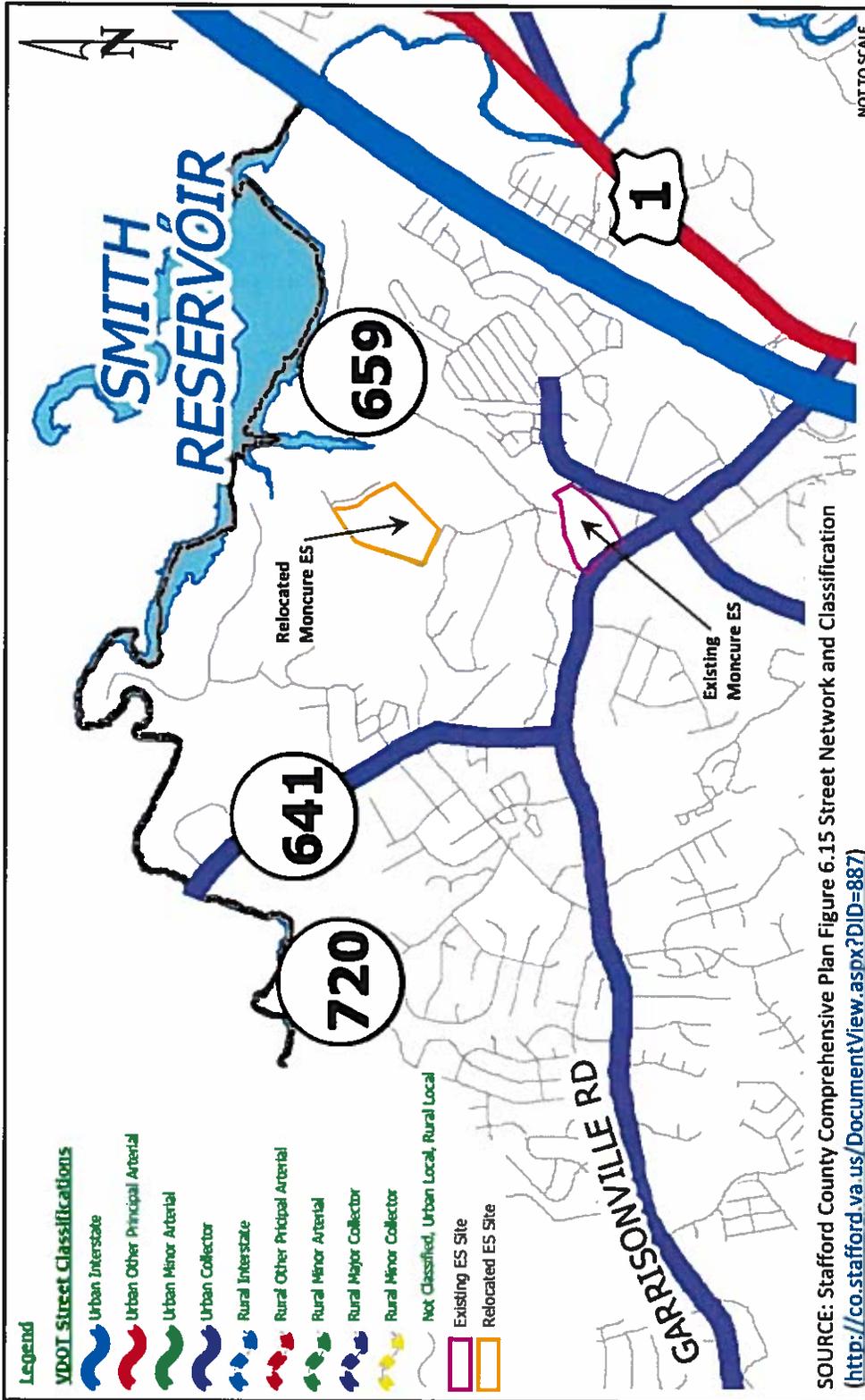


Figure 6

Montcure Elementary School  
 Street Network and Classification



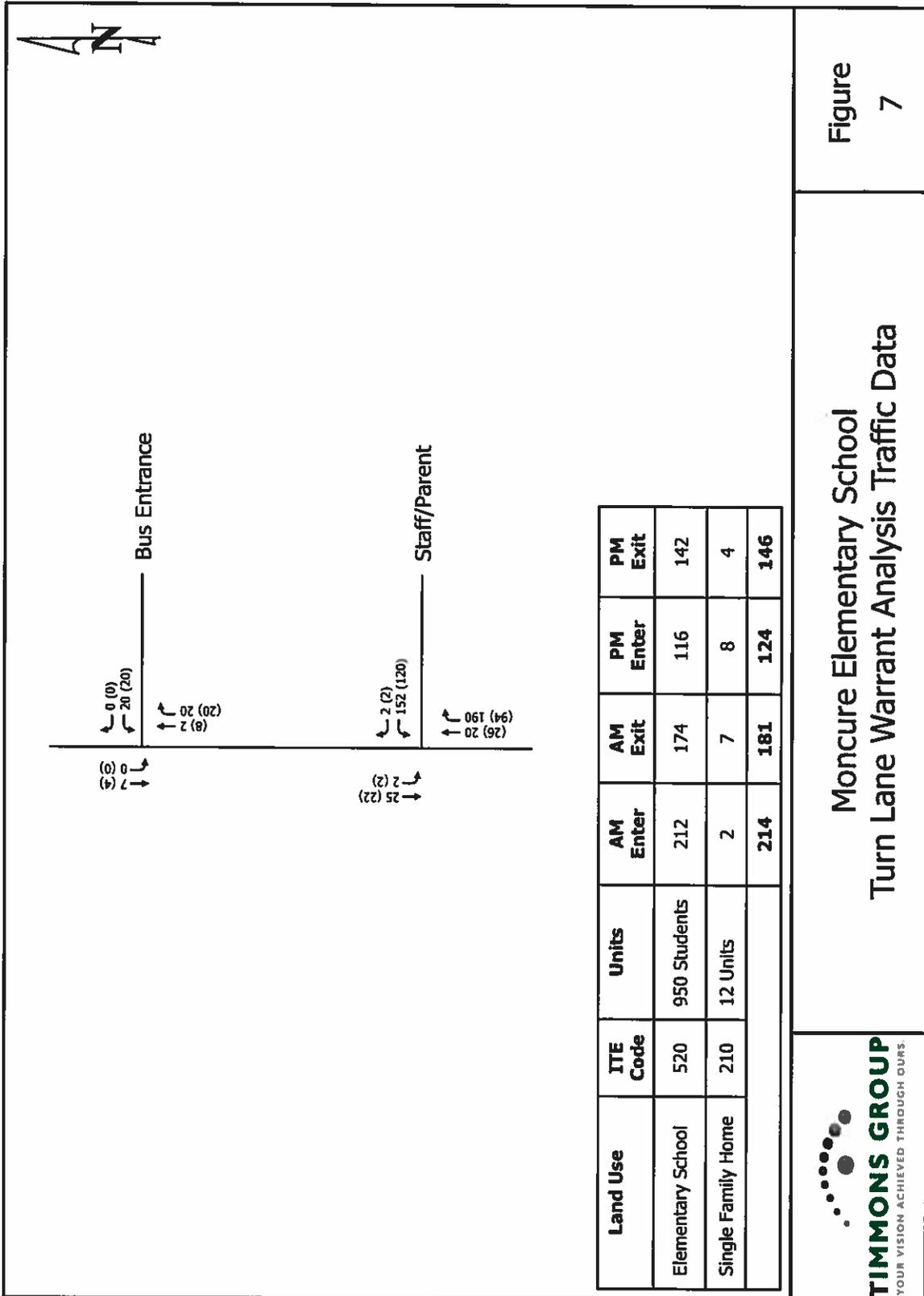


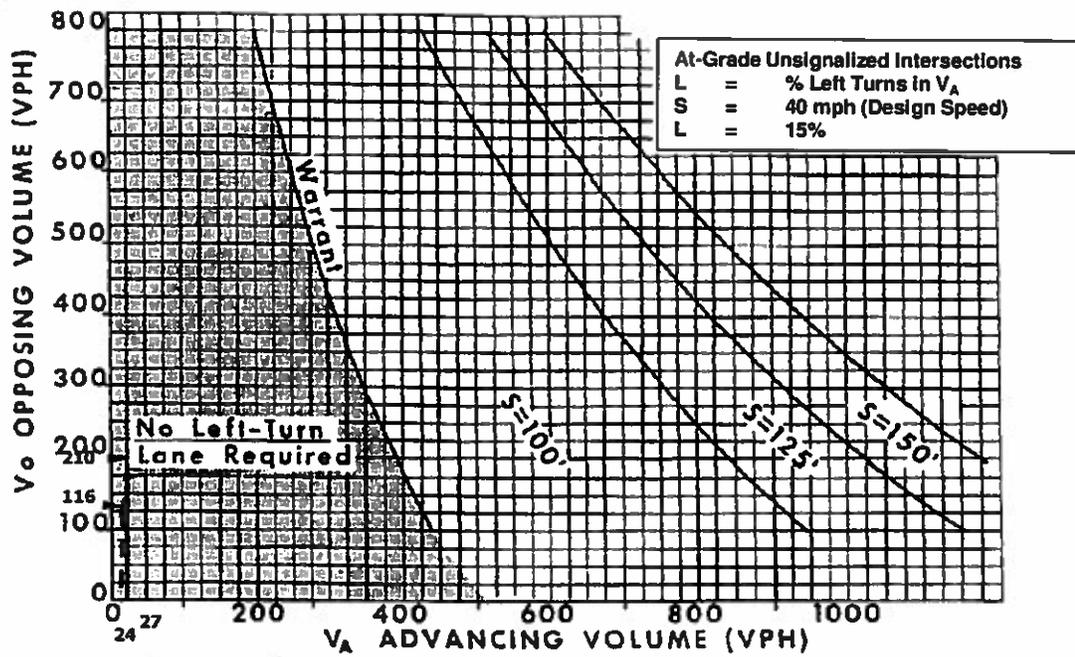
Figure  
7

Moncure Elementary School  
Turn Lane Warrant Analysis Traffic Data



# **Appendix**

WARRANT FOR LEFT-TURN STORAGE LANES  
 ON TWO-LANE HIGHWAYS (40 MPH)  
 FIGURE 3-7 VDOT ROAD DESIGN MANUAL APPENDIX F



**LEGEND**  
 — AM Peak Hour  
 - - - PM Peak Hour

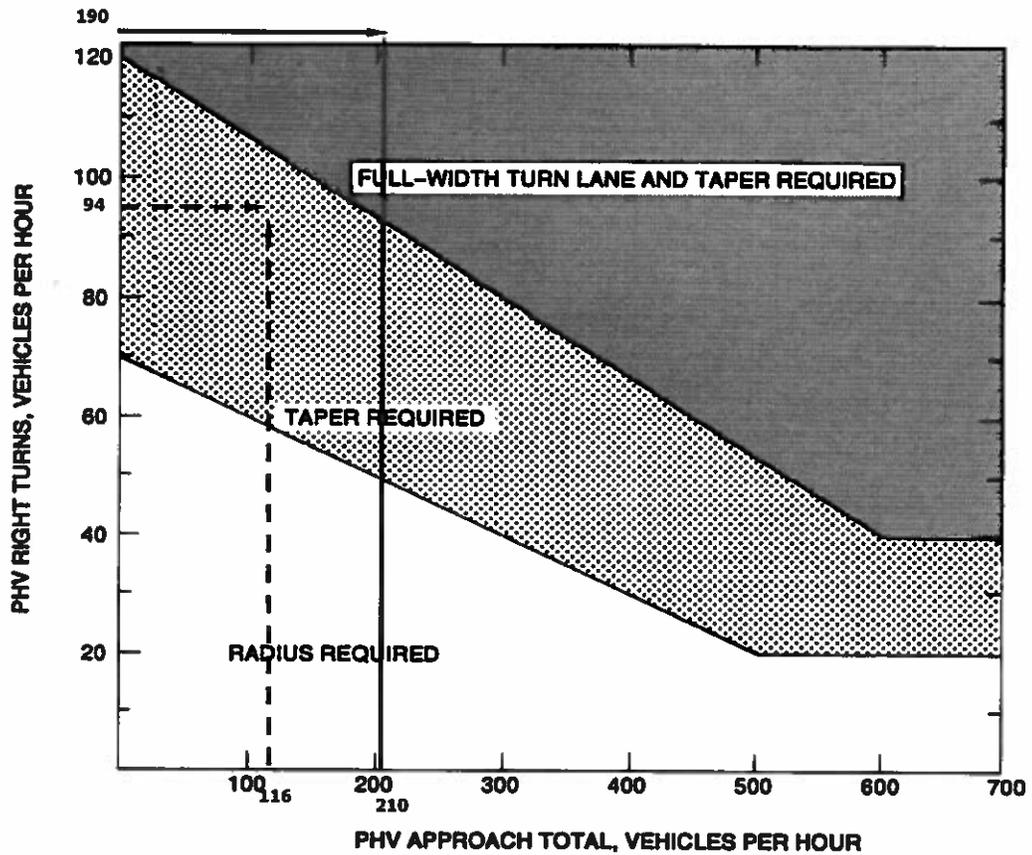
NO LEFT TURN LANE REQUIRED



Left-Turn Lane Warrant  
 Moncure Elementary School  
 Staff/Parent Entrance

Figure  
 X-1

GUIDELINES FOR RIGHT TURN TREATMENT (2-LANE HIGHWAY)  
 FIGURE 3-26 VDOT ROAD DESIGN MANUAL APPENDIX F



**LEGEND**  
 — AM Peak Hour  
 - - - PM Peak Hour

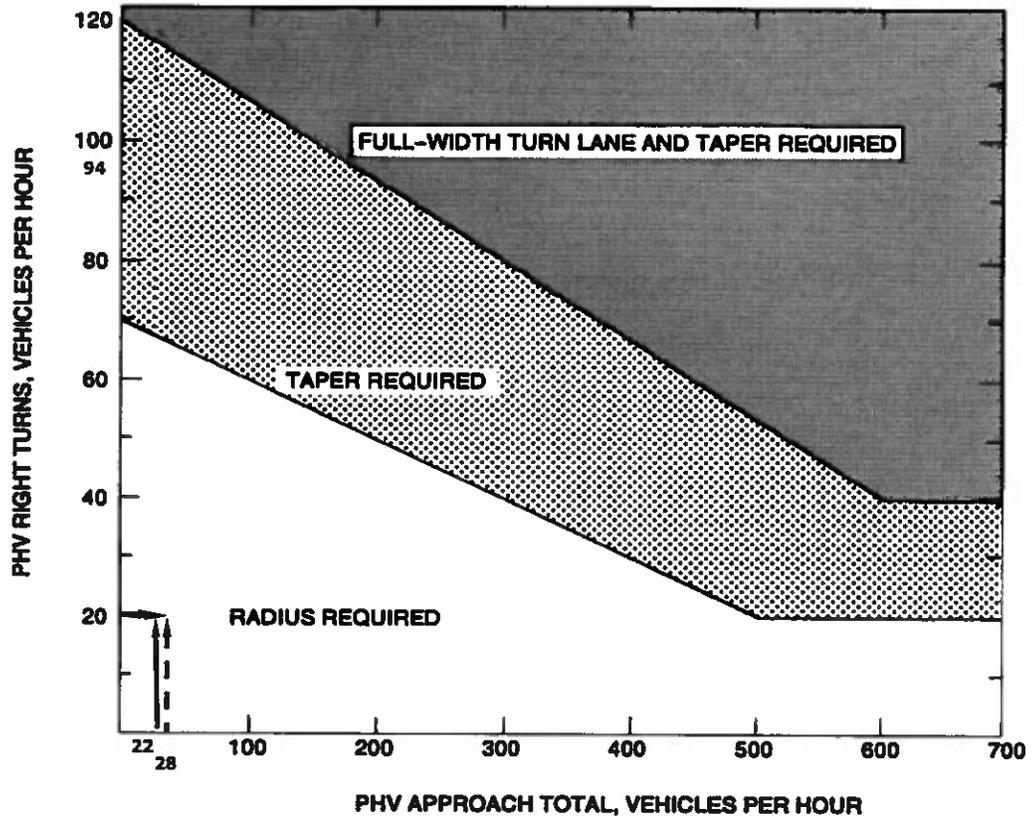
**RIGHT TURN LANE REQUIRED**  
*(not recommended; see text of report)*



Right-Turn Lane Guideline  
 Moncure Elementary School  
 Staff/Parent Entrance

Figure  
 X-2

GUIDELINES FOR RIGHT TURN TREATMENT (2-LANE HIGHWAY)  
 FIGURE 3-26 VDOT ROAD DESIGN MANUAL APPENDIX F



**LEGEND**  
 — AM Peak Hour  
 - - - PM Peak Hour

NO RIGHT TURN LANE REQUIRED



Right-Turn Lane Guideline  
 Moncure Elementary School  
 Bus Entrance

Figure  
 X-3

TWO-WAY STOP CONTROL SUMMARY							
General Information			Site Information				
Analyst	Scott Dunn		Intersection	Juggins/Staff-Student			
Agency/Co.	Timmons Group		Jurisdiction	Stafford County			
Date Performed	11/29/2011		Analysis Year				
Analysis Time Period	AM Peak						
Project Description: Moncure Elementary School							
East/West Street: Staff/Student Entrance			North/South Street: Juggins Road				
Intersection Orientation: North-South			Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments							
Major Street	Northbound			Southbound			
Movement	1	2	3	4	5	6	
	L	T	R	L	T	R	
Volume (veh/h)		20	190	2	25		
Peak-Hour Factor, PHF	1.00	0.50	0.50	0.50	0.50	1.00	
Hourly Flow Rate, HFR (veh/h)	0	40	380	4	50	0	
Percent Heavy Vehicles	0	--	--	0	--	--	
Median Type	Undivided						
RT Channelized			0			0	
Lanes	0	1	0	0	1	0	
Configuration			TR	LT			
Upstream Signal		0			0		
Minor Street	Eastbound			Westbound			
Movement	7	8	9	10	11	12	
	L	T	R	L	T	R	
Volume (veh/h)				152		2	
Peak-Hour Factor, PHF	1.00	1.00	1.00	0.50	1.00	0.50	
Hourly Flow Rate, HFR (veh/h)	0	0	0	304	0	4	
Percent Heavy Vehicles	0	0	0	0	0	0	
Percent Grade (%)		0			0		
Flared Approach		N			N		
Storage		0			0		
RT Channelized			0			0	
Lanes	0	0	0	0	0	0	
Configuration					LR		
Delay, Queue Length, and Level of Service							
Approach	Northbound	Southbound	Westbound			Eastbound	
Movement	1	4	7	8	9	10	11
Lane Configuration		LT		LR			
v (veh/h)		4		308			
C (m) (veh/h)		1150		706			
v/c		0.00		0.44			
95% queue length		0.01		2.22			
Control Delay (s/veh)		8.1		14.0			
LOS		A		B			
Approach Delay (s/veh)	--	--		14.0			
Approach LOS	--	--		B			

Moncure Elementary School – Transportation Assessment  
November 28, 2011

TWO-WAY STOP CONTROL SUMMARY								
<b>General Information</b>				<b>Site Information</b>				
Analyst	Scott Dunn			Intersection	Juggins/Staff-Student			
Agency/Co.	Timmons Group			Jurisdiction	Stafford County			
Date Performed	11/29/2011			Analysis Year				
Analysis Time Period	PM Peak							
Project Description: Moncure Elementary School								
East/West Street: Staff/Student Entrance				North/South Street: Juggins Road				
Intersection Orientation: North-South				Study Period (hrs): 0.25				
<b>Vehicle Volumes and Adjustments</b>								
<b>Major Street</b>	Northbound			Southbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)		26	94	2	22			
Peak-Hour Factor, PHF	1.00	0.50	0.50	0.50	0.50	1.00		
Hourly Flow Rate, HFR (veh/h)	0	52	188	4	44	0		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration			TR	LT				
Upstream Signal		0			0			
<b>Minor Street</b>	Eastbound			Westbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)				120		2		
Peak-Hour Factor, PHF	1.00	1.00	1.00	0.50	1.00	0.50		
Hourly Flow Rate, HFR (veh/h)	0	0	0	240	0	4		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)		0			0			
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	0	0		
Configuration					LR			
<b>Delay, Queue Length, and Level of Service</b>								
Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
v (veh/h)		4		244				
C (m) (veh/h)		1339		795				
v/c		0.00		0.31				
95% queue length		0.01		1.30				
Control Delay (s/veh)		7.7		11.5				
LOS		A		B				
Approach Delay (s/veh)	--	--	11.5					
Approach LOS	--	--	B					