COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION
1601 ORANGE ROAD
CULPEPER, VIRGINIA 22701-3819

Stephen C. Brich, P.E.
COMMISSIONER

August 05, 2020

MEMORANDUM

TO: Joe Costello
Fauquier County Planning

FROM: Kobina Gaituah
VDOT Culpeper District Planning

SUBJECT: SMART SCALE Traffic/Crash Analysis Report
Route 55 (John Marshall Hwy)/Route 709 (Zulla Rd) Intersection
Fauquier County

This study has been prepared to provide a traffic and safety analysis in support of a proposed Smart Scale Application for improvements to the Route 55 (John Marshall Hwy)/Route 709 (Zulla Rd) intersection in Fauquier County, VA. A location of the intersection is provided in the appendix. The intersection has been identified as a location of increased crash incidents in recent years. The study includes a review of the crash data associated with the intersection and an assessment of the intersection operations to determine a preferred alternative solution to address the concerns now and into the future.

Data Collection

Traffic data was collected from various sources that include a previous study of the intersection from the previous round of Smart Scale (Round III), the Traffic Engineering Count Database and the Statewide Planning System (SPS). The counts from the previous study completed in 2018 were updated (factored) to the 2020 (base year) using the annual counts for both years. A future forecast to 2040 was also generated using the historic trends for each leg of the intersection. The counts and references are included in the Appendix. Table 1 shows the turning movements counts used in the analysis and the data processing for the current and future count development.

Route 55 / 709 Intersection

Analysis Summary Table

2018 Count Year 2020 Current Year 2040 Future Year

AM

App. Mov.	Count Volume	TM %	Rec. Mov.	Rec. Vol.	Link	Factors	Current Year	Values	App. Mov.	Analysis Volume	Future Year	Values	App. Mov.	Analysis Volume
NB Left	14	0.107692	WB Left	10	VPD	2456			NB Left	15	GR	1.04%	NB Left	18
NB Thru	109	0.838462	SB Thru	28	DIR	0.706522	VPD	2556	NB Thru	113	VPD	3141	NB Thru	139
NB Right	7	0.053846	EB Right	16	K	0.074919	Seg VPH	191	NB Right	7	Seg VPH	235	NB Right	9
Total	130	1	Total	54	Vol Tot.	184	App VPH	135	Total	135	App VPH	166	Total	166
SB Left	13	0.168831	EB Left	143	VPD	2456			SB Left	14	GR	1.04%	SB Left	17
SB Thru	28	0.363636	NB Thru	109	DIR	0.213296	VPD	2556	SB Thru	29	VPD	3141	SB Thru	36
SB Right	36	0.467532	WB Right	32	K	0.146987	Seg VPH	376	SB Right	37	Seg VPH	462	SB Right	46
Total	77	1	Total	284	Vol Tot.	361	App VPH	80	Total	80	App VPH	99	Total	99
EB Left	143	0.674528	NB Left	14	VPD	5090			EB Left	149	GR	1.36%	EB Left	196
EB Thru	53	0.25	WB Thru	36	DIR	0.711409	VPD	5316	EB Thru	55	VPD	6970	EB Thru	73
EB Right	16	0.075472	SB Right	36	K	0.058546	Seg VPH	311	EB Right	17	Seg VPH	408	EB Right	22
Total	212	1	Total	86	Vol Tot.	298	App VPH	221	Total	221	App VPH	290	Total	291
WB Left	10	0.128205	SB Left	13	VPD	2359			WB Left	10	GR	0.12%	WB Left	11
WB Thru	36	0.461538	EB Thru	53	DIR	0.516556	VPD	2429	WB Thru	37	VPD	2489	WB Thru	38
WB Right	32	0.410256	NB Right	7	K	0.06401	Seg VPH	155	WB Right	33	Seg VPH	159	WB Right	34
Total	78	1	Total	73	Vol Tot.	151	App VPH	80	Total	80	App VPH	82	Total	83

PM

App. Mov.	Count Volume	TM %	Rec. Mov.	Rec. Vol.	Link	Factors	Current Year	Values	App. Mov.	Analysis Volume	Future Year	Values	App. Mov.	Analysis Volume
NB Left	30	0.344828	WB Left	8	VPD	2456			NB Left	31	GR	1.04%	NB Left	38
NB Thru	50	0.574713	SB Thru	92	DIR	0.404651	VPD	2556	NB Thru	52	VPD	3141	NB Thru	64
NB Right	7	0.08046	EB Right	28	K	0.087541	Seg VPH	224	NB Right	7	Seg VPH	275	NB Right	9
Total	87	1	Total	128	Vol Tot.	215	App VPH	91	Total	90	App VPH	111	Total	111
SB Left	39	0.140288	EB Left	55	VPD	2456			SB Left	41	GR	1.04%	SB Left	50
SB Thru	92	0.330935	NB Thru	50	DIR	0.693267	VPD	2556	SB Thru	96	VPD	3141	SB Thru	118
SB Right	147	0.528777	WB Right	18	K	0.163274	Seg VPH	417	SB Right	153	Seg VPH	513	SB Right	188
Total	278	1	Total	123	Vol Tot.	401	App VPH	289	Total	290	App VPH	356	Total	356
EB Left	55	0.357143	NB Left	30	VPD	5090			EB Left	58	GR	1.36%	EB Left	75
EB Thru	71	0.461039	WB Thru	105	DIR	0.353211	VPD	5316	EB Thru	74	VPD	6970	EB Thru	97
EB Right	28	0.181818	SB Right	147	K	0.085658	Seg VPH	455	EB Right	29	Seg VPH	597	EB Right	38
Total	154	1	Total	282	Vol Tot.	436	App VPH	161	Total	161	App VPH	211	Total	210
WB Left	8	0.061069	SB Left	39	VPD	2359			WB Left	8	GR	0.12%	WB Left	8
WB Thru	105	0.801527	EB Thru	71	DIR	0.528226	VPD	2429	WB Thru	108	VPD	2489	WB Thru	111
WB Right	18	0.137405	NB Right	7	K	0.105129	Seg VPH	255	WB Right	19	Seg VPH	262	WB Right	19
Total	131	1	Total	117	Vol Tot.	248	App VPH	135	Total	135	App VPH	138	Total	138

Traffic Analysis

The forecasted turning movement counts were entered into both HCS 7 and SIDRA software for the operational analysis update. The results show that both Northbound and Southbound approaches exhibit the highest delays during the AM scenarios for both existing (2020) and future conditions (2040) without any improvement. The previous study analysis recommended a conversion of the intersection to a single lane roundabout. This improvement reduces the delay for all approaches for the future conditions to attain LOS A on all legs of the intersection. The roundabout improvement will also ensure the intersection capacity is maintained well past the future condition design year. The analysis summary results are shown on Table 2; the AM/PM HCS 7 and SIDRA reports are included in the Appendix.

Crash Analysis

The crash data was pulled from the Road Network System (RNS) for a 300 foot area around the intersection for the period of 2014 to 2018. The crash reports were reviewed and showed that there were 20 crashes within the buffer area of the intersection. Seven (7) of the crashes resulted in 12 injuries and a fatality; angle crashes appear the most prevalent type of crash for either injury or fatality (six out of seven). The prevailing maneuver for the crashes appear to be Southbound and Northbound crossing movements from the minor road (Route 709) at the intersection. Several crash reports stated the minor approach movements had stopped prior to the crash (thus, heed the stop control device) but the subsequent crashes suggest they still did not appear to have the right of way (ROW). The roundabout conversion will significantly reduce the crashes at this intersection by reducing the number of conflict points for the intersection. The Crash Modification Factor for this improvement is expected to show about 82% reduction in injury crashes. In addition, this improvement includes crosswalks that will offer designated locations for pedestrians to safely navigate the intersection and help reduce vehicular-pedestrian conflicts. The results of the Crash Analysis are attached in Appendix.

Recommendation

Based on the evaluation of the intersection this study recommends the conversion of the current two-way stop-controlled intersection to a single lane roundabout with crosswalks across each approach for pedestrian accommodation. A roundabout at this location will provide both better operations for all approaches with significantly less delay and reduction in the number of crashes over the current intersection configuration.

Route 55 / 709 Intersection
Analysis Summary Table

AM

	2020 Existing Condition				2040 Future No Build				2040 Future Build		
Movement	Volume	V/C	Delay	LOS	Volume	V/C	Delay	LOS	V/C	Delay	LOS
NB Left	15				18				0.185	5.5	A
NB Thru	113	0.52	25.7	D	139	0.55	28	D	0.185	5.5	A
NB Right	7				9				0.185	5.5	A
App. Total	135		25.7	D	166		28	D	0.185	5.5	A
SB Left	14				17				0.09	3.7	A
SB Thru	29	0.26	16.1	C	36	0.27	16.9	C	0.09	3.7	A
SB Right	37				46				0.09	3.7	A
App. Total	80		16.1	C	99		16.9	C	0.09	3.7	A
EB Left	149				196				0.259	5.3	A
EB Thru	55	0.13	7.7	A	73	0.14	7.7	A	0.259	5.3	A
EB Right	17				22				0.259	5.3	A
App. Total	221		5.5	A	291		5.6	A	0.259	5.3	A
WB Left	10				11				0.097	4.8	A
WB Thru	37	0.01	7.5	A	38	0.01	7.5	A	0.097	4.8	A
WB Right	33				34				0.097	4.8	A
App. Total	80		1	A	83		1	A	0.097	4.8	A
Int. Total	516		11.8	B	639		12.6	B	0.259	5	A

PM

	2020 Existing Condition				2040 Future No Build				2040 Future Build		
Movement	Volume	V/C	Delay	LOS	Volume	V/C	Delay	LOS	V/C	Delay	LOS
NB Left	31				38				0.117	4.5	A
NB Thru	52	0.22	15.2	C	64	0.32	19.3	C	0.117	4.5	A
NB Right	7				9				0.117	4.5	A
App. Total	90		15.2	C	111		19.3	C	0.117	4.5	A
SB Left	41				50				0.322	6	A
SB Thru	96	0.46	14.9	B	118	0.49	19.9	C	0.322	6	A
SB Right	153				188				0.322	6	A
App. Total	290		14.9	B	356		19.9	C	0.322	6	A
EB Left	58				75				0.211	5.2	A
EB Thru	74	0.04	7.6	A	97	0.06	7.6	A	0.211	5.2	A
EB Right	29				38				0.211	5.2	A
App. Total	161		3	A	210		3	A	0.211	5.2	A
WB Left	8				8				0.037	3.6	A
WB Thru	108	0.01	7.5	A	111	0.01	7.5	A	0.037	3.6	A
WB Right	19				19				0.037	3.6	A
App. Total	135		0.5	A	138		0.5	A	0.037	3.6	A
Int. Total	676		9.2	A	815		12.2	B	0.322	5.4	A

Mr. Costello
Route 55 (John Marshall Hwy)/Route 709 (Zulla Rd) Intersection
Report Appendix

Appendix Includes:

1. Site Location Map
2. AM Analysis Reports
    a. 2020 HCS7 Existing
    b. 2040 HCS7 No Build
    c. 2040 SIDRA Roundabout
3. PM Analysis Reports
    a. 2020 HCS7 Existing
    b. 2040 HCS7 No Build
    c. 2040 SIDRA Roundabout
4. 2014 to 2018 Crash Analysis

Route 55 (John Marshall Hwy)/Route 709 (Zulla Rd) Intersection
Traffic Study Location Map

Fauquier County

HCS7 Two-Way Stop-Control Report

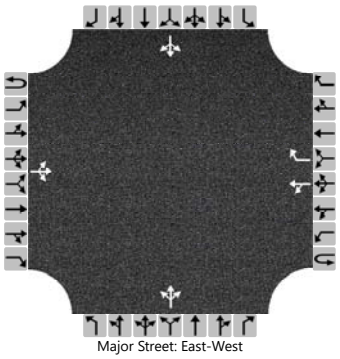
General Information

Analyst	KG
Agency/Co.	VDOT
Date Performed	7/21/2020
Analysis Year	2020
Time Analyzed	AM Existing 2020
Intersection Orientation	East-West
Project Description	Zulla Rd/Belvoir Rd/John Marshall Rd

Site Information

Intersection	Rte. 55/Rte. 709
Jurisdiction	Fauquier County
East/West Street	John Marshall Rd
North/South Street	Zulla Rd/Belvoir Rd
Peak Hour Factor	0.72
Analysis Time Period (hrs)	1.00

Lanes


Major Street: East-West

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	0	1	0	0	0	1	1		0	1	0		0	1	0
Configuration			LTR			LT		R			LTR				LTR	
Volume (veh/h)		149	55	17		10	37	33		15	113	7		14	29	37
Percent Heavy Vehicles (%)		4				4				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized						Yes										
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.14				4.14				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.24				2.24				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		207				14					188				111	
Capacity, c (veh/h)		1542				1480					360				434	
v/c Ratio		0.13				0.01					0.52				0.26	
95% Queue Length, Q_{95} (veh)		0.5				0.0					3.1				1.0	
Control Delay (s/veh)		7.7				7.5					25.7				16.1	
Level of Service (LOS)		A				A					D				C	
Approach Delay (s/veh)	5.5				1.0				25.7				16.1			
Approach LOS									D				C			

HCS7 Two-Way Stop-Control Report

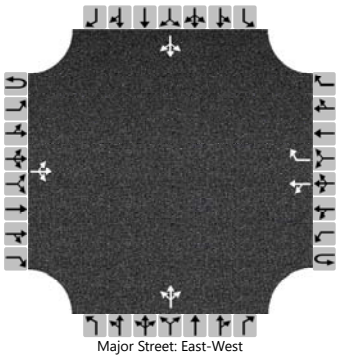
General Information

Analyst	KG
Agency/Co.	VDOT
Date Performed	7/21/2040
Analysis Year	2040
Time Analyzed	AM No-Build 2040
Intersection Orientation	East-West
Project Description	Zulla Rd/Belvoir Rd/John Marshall Rd

Site Information

Intersection	Rte. 55/Rte. 709
Jurisdiction	Fauquier County
East/West Street	John Marshall Rd
North/South Street	Zulla Rd/Belvoir Rd
Peak Hour Factor	0.88
Analysis Time Period (hrs)	1.00

Lanes


Major Street: East-West

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	0	1	0	0	0	1	1		0	1	0		0	1	0
Configuration			LTR			LT		R			LTR				LTR	
Volume (veh/h)		196	73	22		11	38	34		18	139	9		17	36	46
Percent Heavy Vehicles (%)		4				4				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized						Yes										
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.14				4.14				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.24				2.24				3.55	4.05	3.35		3.55	4.05	3.35

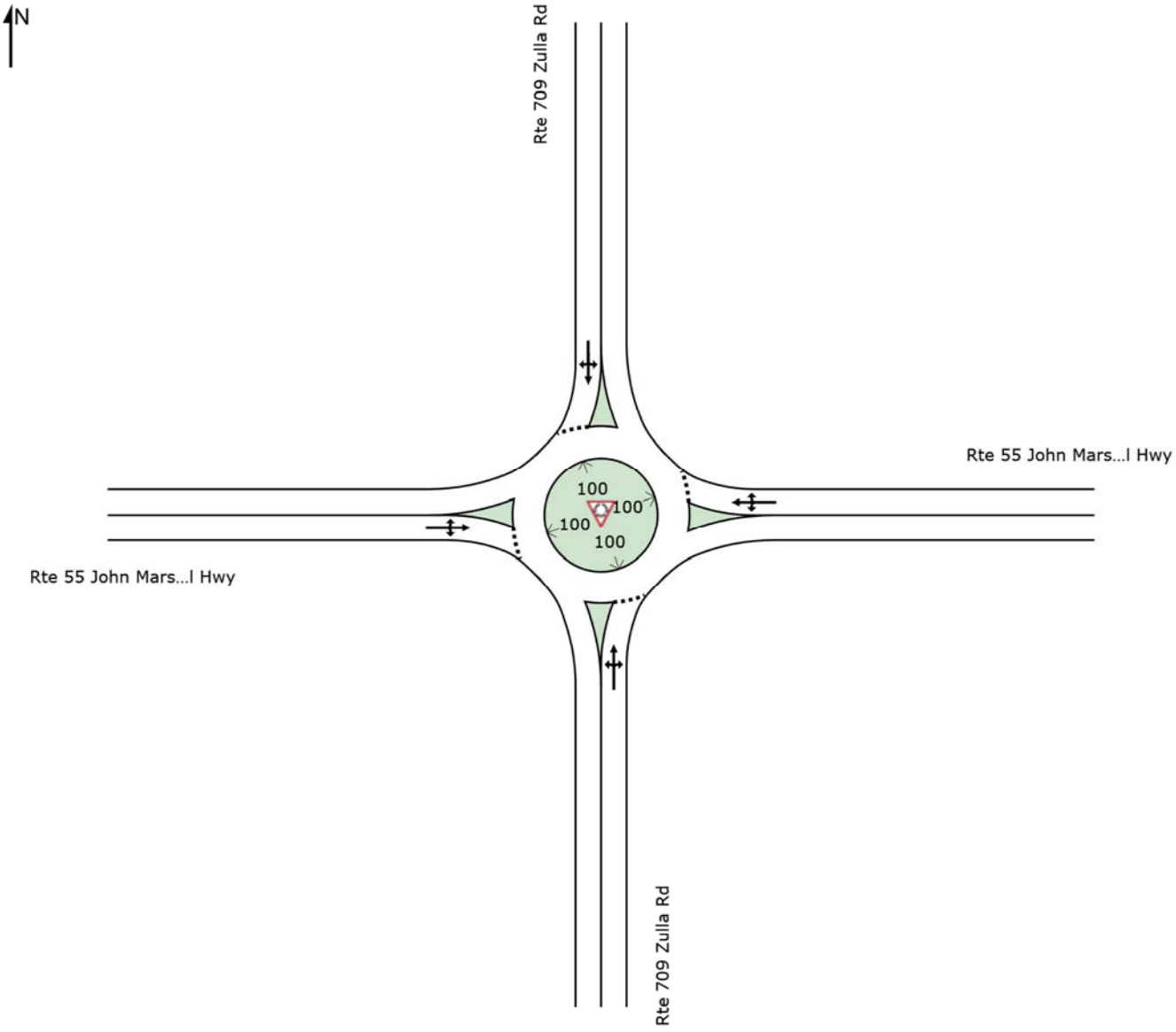
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		223				13					189				113	
Capacity, c (veh/h)		1553				1470					344				415	
v/c Ratio		0.14				0.01					0.55				0.27	
95% Queue Length, Q_{95} (veh)		0.5				0.0					3.5				1.1	
Control Delay (s/veh)		7.7				7.5					28.0				16.9	
Level of Service (LOS)		A				A					D				C	
Approach Delay (s/veh)	5.6				1.0				28.0				16.9			
Approach LOS									D				C			

SITE LAYOUT

Site: [2040 AM Rte 55 and Rte 709]

New Site
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: [2040 AM Rte 55 and Rte 709]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Rte 709 Zulla Rd												
3	L2	20	5.0	0.185	5.5	LOS A	1.0	26.6	0.51	0.37	0.51	34.6
8	T1	151	5.0	0.185	5.5	LOS A	1.0	26.6	0.51	0.37	0.51	34.7
18	R2	10	5.0	0.185	5.5	LOS A	1.0	26.6	0.51	0.37	0.51	33.6
Approach		180	5.0	0.185	5.5	LOS A	1.0	26.6	0.51	0.37	0.51	34.6
East: Rte 55 John Marshall Hwy												
1	L2	12	4.0	0.097	4.8	LOS A	0.5	13.1	0.52	0.38	0.52	34.9
6	T1	41	4.0	0.097	4.8	LOS A	0.5	13.1	0.52	0.38	0.52	34.9
16	R2	37	4.0	0.097	4.8	LOS A	0.5	13.1	0.52	0.38	0.52	33.8
Approach		90	4.0	0.097	4.8	LOS A	0.5	13.1	0.52	0.38	0.52	34.5
North: Rte 709 Zulla Rd												
7	L2	18	5.0	0.090	3.7	LOS A	0.5	12.3	0.24	0.10	0.24	35.3
4	T1	39	5.0	0.090	3.7	LOS A	0.5	12.3	0.24	0.10	0.24	35.3
14	R2	50	5.0	0.090	3.7	LOS A	0.5	12.3	0.24	0.10	0.24	34.2
Approach		108	5.0	0.090	3.7	LOS A	0.5	12.3	0.24	0.10	0.24	34.8
West: Rte 55 John Marshall Hwy												
5	L2	213	4.0	0.259	5.3	LOS A	1.5	39.9	0.26	0.12	0.26	33.1
2	T1	79	4.0	0.259	5.3	LOS A	1.5	39.9	0.26	0.12	0.26	33.1
12	R2	24	4.0	0.259	5.3	LOS A	1.5	39.9	0.26	0.12	0.26	32.2
Approach		316	4.0	0.259	5.3	LOS A	1.5	39.9	0.26	0.12	0.26	33.1
All Vehicles		695	4.4	0.259	5.0	LOS A	1.5	39.9	0.36	0.21	0.36	33.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

HCS7 Two-Way Stop-Control Report

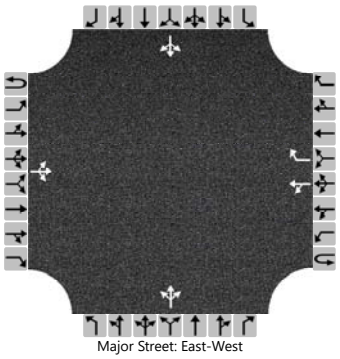
General Information

Analyst	KG
Agency/Co.	VDOT
Date Performed	7/21/2020
Analysis Year	2020
Time Analyzed	PM Existing 2020
Intersection Orientation	East-West
Project Description	Zulla Rd/Belvoir Rd/John Marshall Rd

Site Information

Intersection	Rte. 55/Rte. 709
Jurisdiction	Fauquier County
East/West Street	John Marshall Rd
North/South Street	Zulla Rd/Belvoir Rd
Peak Hour Factor	0.93
Analysis Time Period (hrs)	1.00

Lanes



Major Street: East-West

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	0	1	0	0	0	1	1		0	1	0		0	1	0
Configuration			LTR			LT		R			LTR				LTR	
Volume (veh/h)		58	74	29		8	108	19		31	52	7		41	96	153
Percent Heavy Vehicles (%)		4				4				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized						Yes										
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.14				4.14				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.24				2.24				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		62				9					97				312	
Capacity, c (veh/h)		1460				1467					449				676	
v/c Ratio		0.04				0.01					0.22				0.46	
95% Queue Length, Q_{95} (veh)		0.1				0.0					0.8				2.5	
Control Delay (s/veh)		7.6				7.5					15.2				14.9	
Level of Service (LOS)		A				A					C				B	
Approach Delay (s/veh)	3.0				0.5				15.2				14.9			
Approach LOS									C				B			

HCS7 Two-Way Stop-Control Report

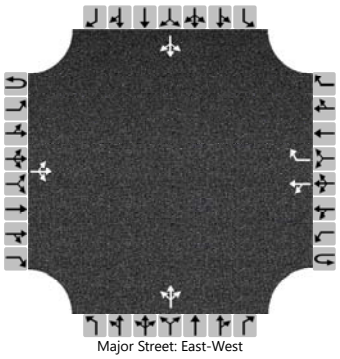
General Information

Analyst	KG
Agency/Co.	VDOT
Date Performed	7/21/2020
Analysis Year	2040
Time Analyzed	PM No-Build 2040
Intersection Orientation	East-West
Project Description	Zulla Rd/Belvoir Rd/John Marshall Rd

Site Information

Intersection	Rte. 55/Rte. 709
Jurisdiction	Fauquier County
East/West Street	John Marshall Rd
North/South Street	Zulla Rd/Belvoir Rd
Peak Hour Factor	0.93
Analysis Time Period (hrs)	1.00

Lanes


Major Street: East-West

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	0	1	0	0	0	1	1		0	1	0		0	1	0
Configuration			LTR			LT		R			LTR				LTR	
Volume (veh/h)		75	97	38		8	111	19		38	64	9		50	118	188
Percent Heavy Vehicles (%)		4				4				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized						Yes										
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.14				4.14				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.24				2.24				3.55	4.05	3.35		3.55	4.05	3.35

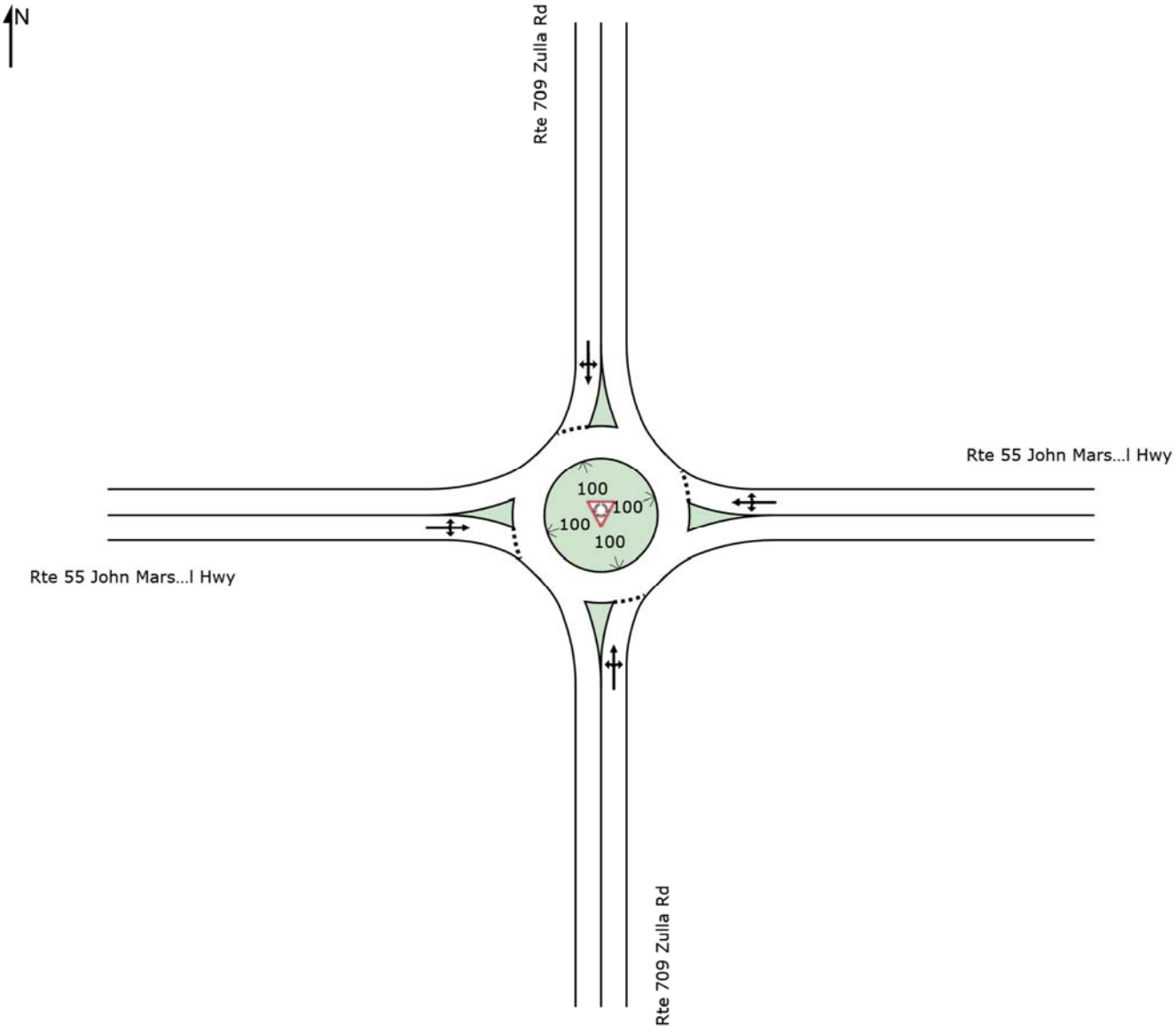
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		81				9					119				383	
Capacity, c (veh/h)		1456				1425					371				622	
v/c Ratio		0.06				0.01					0.32				0.62	
95% Queue Length, Q_{95} (veh)		0.2				0.0					1.4				4.6	
Control Delay (s/veh)		7.6				7.5					19.3				19.9	
Level of Service (LOS)		A				A					C				C	
Approach Delay (s/veh)	3.0				0.5				19.3				19.9			
Approach LOS									C				C			

SITE LAYOUT

Site: [2040 PM Rte 55 and Rte 709]

New Site
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: [2040 PM Rte 55 and Rte 709]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Rte 709 Zulla Rd												
3	L2	41	5.0	0.117	4.5	LOS A	0.6	16.1	0.44	0.28	0.44	34.4
8	T1	70	5.0	0.117	4.5	LOS A	0.6	16.1	0.44	0.28	0.44	34.5
18	R2	10	5.0	0.117	4.5	LOS A	0.6	16.1	0.44	0.28	0.44	33.4
Approach		121	5.0	0.117	4.5	LOS A	0.6	16.1	0.44	0.28	0.44	34.4
East: Rte 55 John Marshall Hwy												
1	L2	17	4.0	0.037	3.6	LOS A	0.2	4.7	0.36	0.19	0.36	34.7
6	T1	17	4.0	0.037	3.6	LOS A	0.2	4.7	0.36	0.19	0.36	34.7
16	R2	5	4.0	0.037	3.6	LOS A	0.2	4.7	0.36	0.19	0.36	33.6
Approach		40	4.0	0.037	3.6	LOS A	0.2	4.7	0.36	0.19	0.36	34.5
North: Rte 709 Zulla Rd												
7	L2	54	5.0	0.322	6.0	LOS A	2.1	53.8	0.29	0.14	0.29	34.2
4	T1	128	5.0	0.322	6.0	LOS A	2.1	53.8	0.29	0.14	0.29	34.2
14	R2	204	5.0	0.322	6.0	LOS A	2.1	53.8	0.29	0.14	0.29	33.2
Approach		387	5.0	0.322	6.0	LOS A	2.1	53.8	0.29	0.14	0.29	33.6
West: Rte 55 John Marshall Hwy												
5	L2	82	4.0	0.211	5.2	LOS A	1.2	30.8	0.43	0.27	0.43	34.0
2	T1	105	4.0	0.211	5.2	LOS A	1.2	30.8	0.43	0.27	0.43	34.0
12	R2	41	4.0	0.211	5.2	LOS A	1.2	30.8	0.43	0.27	0.43	33.0
Approach		228	4.0	0.211	5.2	LOS A	1.2	30.8	0.43	0.27	0.43	33.8
All Vehicles		776	4.7	0.322	5.4	LOS A	2.1	53.8	0.36	0.21	0.36	33.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Rte. 55/709 (Zulla Rd.) Intersection Five Year Crash Data (2014-2018)

Number	Comments	Document Number	Crash Date	Crash Time	Day Of Week	Weather Condition	Light Condition	Roadway Surface Condition	Route Or Street Name	Crash Severity	Non Pedestrian Fatality Count	Non Pedestrian Injury Count	Collision Type	KABCO Severity Code
1	Rte. 709 SB vehicle; no ROW; struck by Rte. 55 EB vehicle	141225159	4/8/2014	18:34	Tue	1. No Adverse Condition (Clear/Cloudy)	2. Daylight	1. Dry	ZULLA RD/RT 709	property damage crash	0	0	16. Other	No Injury (O)
2	Distracted - Rte. 709 SB vehicle; no ROW; struck by Rte. 55 WB vehicle	142095211	7/24/2014	17:00	Thu	1. No Adverse Condition (Clear/Cloudy)	2. Daylight	1. Dry	RT. 55	property damage crash	0	0	2. Angle	No Injury (O)
3	Rte. 709 SB vehicle; no ROW; struck by Rte. 55 EB vehicle	143615075	12/26/2014	13:15	Fri	1. No Adverse Condition (Clear/Cloudy)	2. Daylight	1. Dry	RT 55	injury crash	0	2	2. Angle	Possible Injury (C)
4	Rte. 709 NB vehicle; no ROW; struck Rte. 55 EB vehicle	151115056	4/18/2015	13:26	Sat	1. No Adverse Condition (Clear/Cloudy)	2. Daylight	1. Dry	7300 JOHN MARSHALL HWY / RT 55	injury crash	0	1	2. Angle	Possible Injury (C)
5	Rte. 709 SB vehicle; no ROW; struck by Rte. 55 EB vehicle	153225150	10/29/2015	15:33	Thu	1. No Adverse Condition (Clear/Cloudy)	2. Daylight	1. Dry	RT 55 / JOHN MARSHALL HWY	property damage crash	0	0	2. Angle	No Injury (O)
6	Rte. 55 WBL vehicle, no ROW; struck Rte. 55 EB vehicle	160115089	1/10/2016	12:27	Sun	1. No Adverse Condition (Clear/Cloudy)	2. Daylight	1. Dry	7300 JOHN MARSHALL HWY / RT 55	property damage crash	0	0	2. Angle	No Injury (O)
7	Rte. 709 SB vehicle; no ROW; struck by Rte. 55 EBL vehicle	160345037	2/2/2016	13:39	Tue	1. No Adverse Condition (Clear/Cloudy)	2. Daylight	1. Dry	RT 55 / JOHN MARSHAL HWY	injury crash	0	1	16. Other	Possible Injury (C)
8	Rte. 709 SB vehicle; no ROW; struck by Rte. 55 EB vehicle	160835128	2/23/2016	9:01	Tue	5. Rain	2. Daylight	2. Wet	ZULLA RD / RT 709	property damage crash	0	0	16. Other	No Injury (O)
9	Rte. 709 NB vehicle; no ROW; struck Rte. 55 EB vehicle	161605159	5/6/2016	8:12	Fri	5. Rain	2. Daylight	2. Wet	RT 55 / JOHN MARSHALL HWY	property damage crash	0	0	2. Angle	No Injury (O)
10	Rte. 709 SB vehicle; no ROW; struck by Rte. 55 EB vehicle	161605211	5/21/2016	17:28	Sat	5. Rain	2. Daylight	2. Wet	RT 55 / JOHN MARSHALL HIGHWAY	property damage crash	0	0	2. Angle	No Injury (O)
11	Rte. 709 SB vehicle; no ROW; struck Rte. 55 EB vehicle	162925379	9/30/2016	15:57	Fri	5. Rain	2. Daylight	2. Wet	RT/55 JOHN MARSHALL HWY	injury crash	0	2	2. Angle	Possible Injury (C)

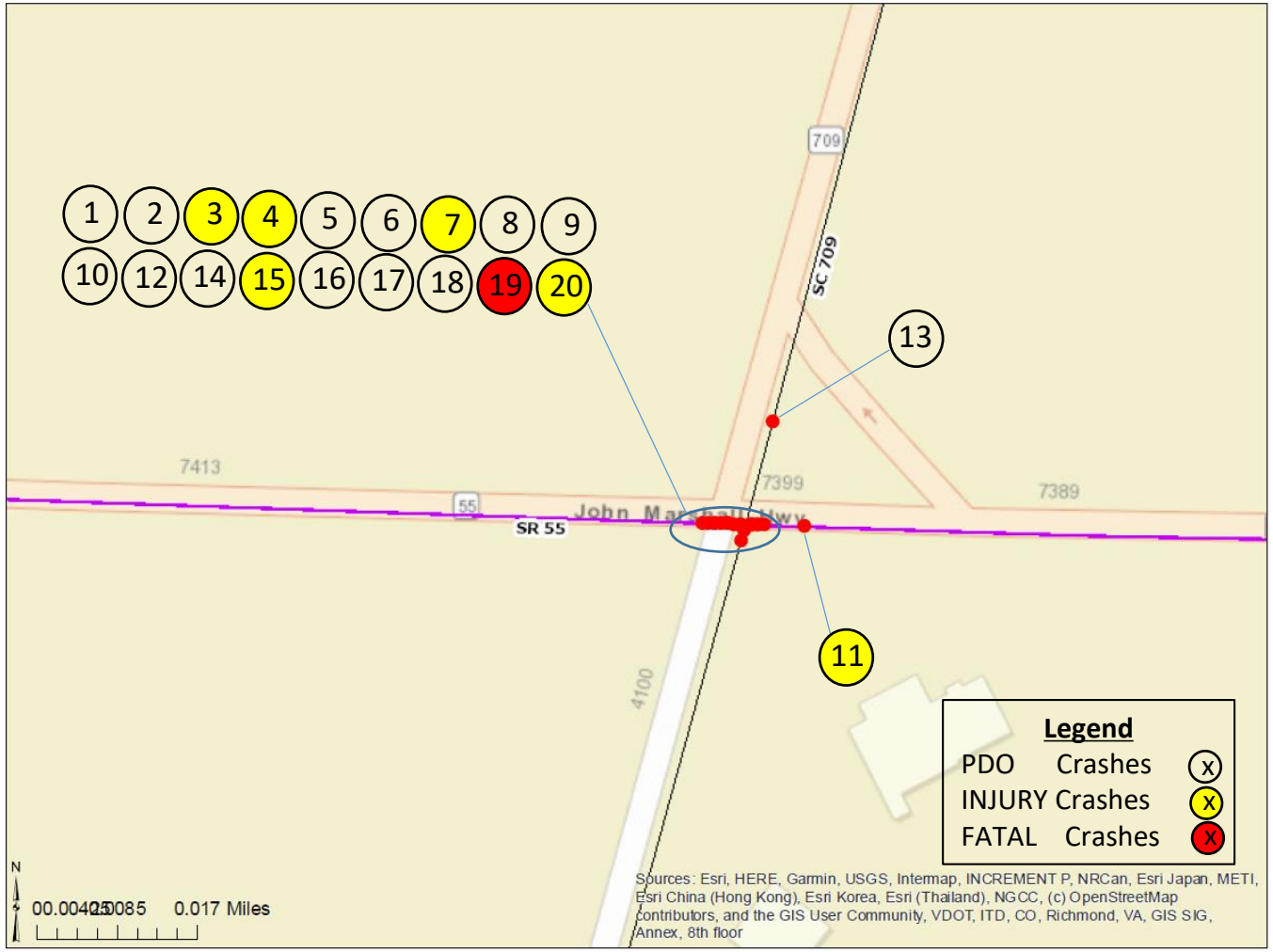
Rte. 55/709 (Zulla Rd.) Intersection Five Year Crash Data (2014-2018)

Number	Comments	Document Number	Crash Date	Crash Time	Day Of Week	Weather Condition	Light Condition	Roadway Surface Condition	Route Or Street Name	Crash Severity	Non Pedestrian Fatality Count	Non Pedestrian Injury Count	Collision Type	KABCO Severity Code
Number	Comments	Document Number	Crash Date	Crash Time	Day Of Week	Weather Condition	Light Condition	Roadway Surface Condition	Route Or Street Name	Crash Severity	Non Pedestrian Fatality Count	Non Pedestrian Injury Count	Collision Type	KABCO Severity Code
12	Rte. 709 SB vehicle; no ROW; struck by Rte. 55 EB vehicle	163235129	10/26/2016	8:57	Wed	1. No Adverse Condition (Clear/Cloudy)	2. Daylight	1. Dry	JOHN MARSHALL HWY	property damage crash	0	0	2. Angle	No Injury (O)
13	Rte. 709 SB vehicle; no ROW; struck by Rte. 55 EB vehicle	172055099	7/23/2017	12:03	Sun	1. No Adverse Condition (Clear/Cloudy)	2. Daylight	1. Dry	JOHN MARSHALL HWY-BLK 7300	property damage crash	0	0	2. Angle	No Injury (O)
14	Rte. 709 NB vehicle; no ROW; struck Rte. 55 EB vehicle	172505023	9/1/2017	17:05	Fri	1. No Adverse Condition (Clear/Cloudy)	2. Daylight	1. Dry	ROUTE 55	property damage crash	0	0	2. Angle	No Injury (O)
15	Rte. 709 NB vehicle; no ROW; struck Rte. 55 WB vehicle	172775115	10/3/2017	11:53	Tue	1. No Adverse Condition (Clear/Cloudy)	2. Daylight	1. Dry	JOHN MARSHALL HWY	injury crash	0	1	2. Angle	Possible Injury (C)
16	Rte. 709 NBL vehicle; no ROW; struck by Rte. 55 EB vehicle	173035155	10/27/2017	17:51	Fri	1. No Adverse Condition (Clear/Cloudy)	2. Daylight	1. Dry	JOHN MARSHALL HWY	property damage crash	0	0	2. Angle	No Injury (O)
~~17~~	Rte. 709 SB vehicle; no ROW; struck by Rte. 55 EB vehicle	173405413	11/20/2017	8:28	Mon	1. No Adverse Condition (Clear/Cloudy)	2. Daylight	1. Dry	RT. 55	property damage crash	0	0	2. Angle	No Injury (O)
18	Rte. 709 SB vehicle; no ROW; struck by Rte. 55 WB vehicle	180045100	12/29/2017	18:42	Fri	1. No Adverse Condition (Clear/Cloudy)	5. Darkness - Road Not Lighted	1. Dry	JOHN MARSHALL HWY	property damage crash	0	0	2. Angle	No Injury (O)
19	Rte. 709 NB vehicle; no ROW; struck by Rte. 55 EB vehicle	182835078	10/9/2018	12:50	Tue	1. No Adverse Condition (Clear/Cloudy)	2. Daylight	1. Dry	RT. 55	fatal crash	1	3	2. Angle	Fatality (K)
20	Rte. 709 NB vehicle; no ROW; struck Rte. 55 WB vehicle	183335282	11/28/2018	17:27	Wed	1. No Adverse Condition (Clear/Cloudy)	5. Darkness - Road Not Lighted	1. Dry	7400 BLOCK JOHN MARSHALL HWY	injury crash	0	2	2. Angle	Non-Incapacitating Injury (B)

Fauquier County

Rte. 55 – Zulla Rd (709) Intersection Improvements (#31 & TSN)

Crash Diagram



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Rte. 55 – Zulla Rd (709) Intersection Improvements (#31 & TSN) (cont.)

- **Crash Analysis Summary**

Collision Type	Number of Crashes	Number of Fatality/Injury
Angle	7	13

- **Summary**
  - 20 crashes within 300ft buffer from the intersection of Rte. 15/29 and Rte. 663
  - 20 crashes categorized as “within” intersection
  - 1 fatal crash, 6 injury crashes, 12 total injuries
  - 2 distracted driving related crashes
  - 20 angle crashes
  - Prevailing maneuver for crashes
    - Maneuver Rte. 55 Eastbound and Rte. 709 Southbound (8 crashes)
    - Maneuver Rte. 55 Westbound and Rte. 709 Northbound (4 crashes)
    - Maneuver Rte. 55 Eastbound and Rte. 709 Northbound (3 crashes)
    - Maneuver Rte. 55 Westbound and Rte. 709 Southbound (2 crashes)