

BUT-747-5.49

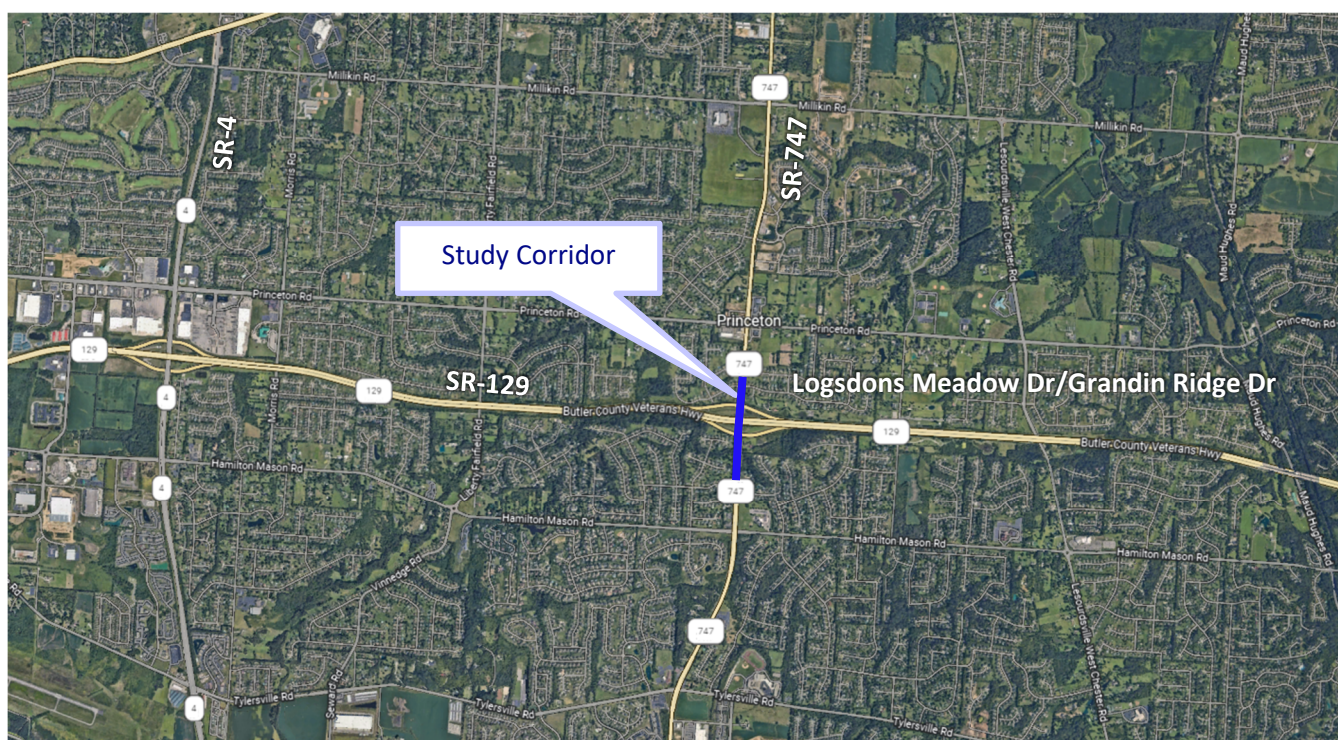
Safety Study

SR-747 and SR-129 Interchange

SR-747 and Logsdons Meadow Dr/Grandin Ridge Dr

Liberty Township | Butler County

Crash Data (2018-2020)



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1.0 Purpose and Need

The study area is along the corridor of SR-747 (Princeton Glendale Road) in Liberty Township, within Butler County. It includes the intersection of SR-747 at Grandin Ridge Drive (east leg) and Logsdons Meadow Drive (west leg), in addition to the eastbound and westbound ramp signalized intersections at SR-129 (Butler County Veterans Highway) interchange. The intersection of SR-747 at Logsdon Meadow Drive/Grandin Ridge Drive has routinely appeared on ODOT's Highway Safety Improvement Program's (HSIP) Priority Locations list, ranking #458 on the 2020 suburban intersection list. The interchange at SR-747 at SR-129 also appeared on the HSIP list, ranking #1521 on the 2020 urban freeway list.

The purpose of this study is to analyze the existing safety performance of the corridor and to identify potential countermeasures to reduce crashes and to improve overall safety.

2.0 Existing Conditions

SR-747 and Logsdons Meadow Drive/Grandin Ridge Drive

The intersection of SR-747 and Logsdons Meadow Drive/Grandin Ridge Drive is unsignalized with traffic operating free flow along SR-747 (northbound/southbound) and stop controlled along Logsdon Meadow Drive/Grandin Ridge Drive (eastbound/westbound). SR-747 is a relatively flat, five-lane road with left turn lanes. The speed limit along SR-747 is 55 mph. The existing travel lanes are approximately 12 feet wide with paved shoulders on both sides. There are no pedestrian facilities such as sidewalks, curb ramps, or crosswalks present at the intersection. The cross street, Logsdon Meadow Drive/Grandin Ridge Drive, is one lane in each direction and it has sidewalks present on both legs that terminate short of the intersection. The speed limit on Grandin Ridge Drive is 25 mph. The lanes on Grandin Ridge Drive are approximately 12 feet wide. There are luminaires present throughout this corridor.

SR-747 is classified as a minor arterial at its intersection with Logsdons Meadow Drive/Grandin Ridge Drive, which is a local road. On both the eastbound and westbound approaches of the intersection, there are dual stop signs with "Cross Traffic Does Not Stop." Pavement and pavement markings on SR-747 and Logsdons Meadow Drive/Grandin Ridge Drive are in very good condition. Based on ODOT's Transportation Information Management Systems (TIMS), the Pavement Condition Rating (PCR) is between 96-98 on SR-747, which is in very good condition. There is no PCR data for Grandin Ridge Drive.

SR-747 and SR-129 Westbound Ramp

The intersection of SR-747 and SR-129 westbound ramp is signalized with protected/permitted left turn phasing in a box span arrangement. The westbound off-ramp approach consists of a dedicated right turn lane and a shared right-left turn lane. Northbound and southbound SR-747 have two through lanes, with dedicated left-turn lanes on the northbound approach. The existing travel lanes are approximately 12 feet wide with nearly 10 foot wide paved shoulders adjacent to the road, that narrow to three feet on the exit ramps. On SR-129, there are rumble strips located adjacent to the road edge lines, that terminate on the ramp itself, approximately 1200 feet from the stop bar.

At the westbound SR-129 ramp, the north leg of SR-747 is a minor arterial, while the south leg of SR-747 is classified as a principal arterial other, a non-interstate freeway or expressway. The westbound SR-129 exit ramp is a principal arterial freeway and has Lane Control Signs located approximately 260 feet east of the stop bars. Additionally, there are overhead Lane Control Signs on the box span on the westbound approach. The pavement and pavement markings at this intersection is in very good condition, as the PCR is between 97-98 for all legs.

SR-747 and SR-129 Eastbound Ramp

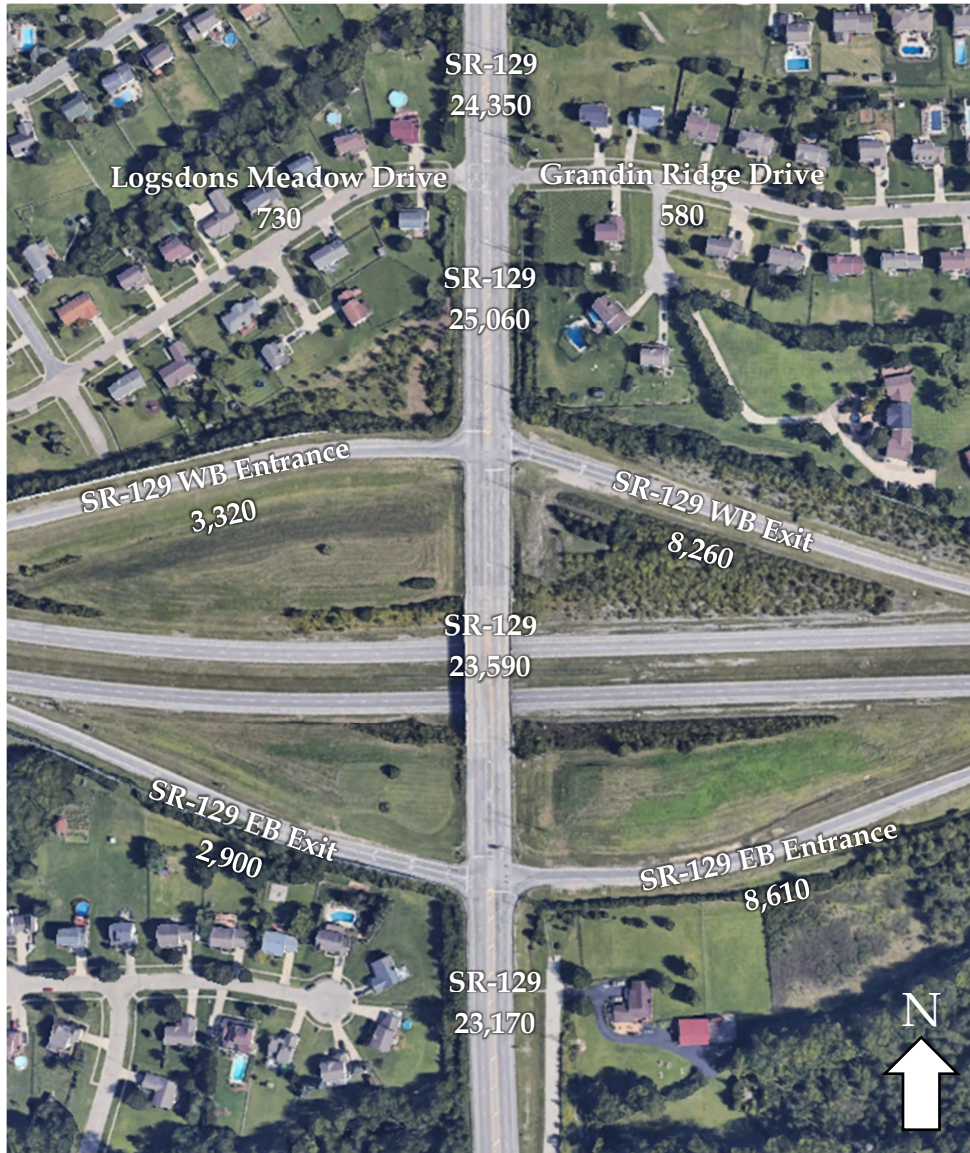
The SR-129 eastbound ramp intersection is signalized with protected/permitted left turn phasing in a box span arrangement. The eastbound off-ramp approach consists of a dedicated right turn lane and a dedicated left turn lane. Northbound and southbound SR-747 has two through lanes, with a dedicated left-turn lane on the southbound approach. In the same manner as the westbound ramp, the travel lanes are approximately 12 feet wide with nearly 10 foot wide paved shoulders adjacent to the road, that narrow to three feet on the exit ramps. The rumble strips on SR-129 terminate on the ramp, approximately 1100 feet from the stop bar.

At the eastbound SR-129 ramp, both the north and south legs of SR-747 are principal arterial other, a non-interstate freeway or expressway. The eastbound SR-129 exit ramp is classified as a principal arterial freeway. It does not have Lane Control Signs, but there are overhead Lane Control Signs at the eastbound approach to the intersection. Pavement and pavement markings on SR-747 and SR-129 are in very good condition, as the PCR is between 97-98 for all legs.

The study area is suburban in nature due to being surrounded by numerous residential neighborhoods. There is existing lighting at the interchange, using HPS cobra head style luminaires on light poles (not high/low mast poles). Approximately one-third of a mile north of Grandin Ridge Drive the roadway services commercial businesses and developments.

Figure 1 shows the study area with AADT's calculated from the count data.

Figure 1: Study Area



A field review was conducted on July 8, 2022. Below is a summary of observations:

- There is a significant left turn queueing along southbound SR-747, backing up from the SR-129 eastbound ramp through the westbound ramp signal, and at times past Grandin Ridge intersection. Existing volume counts show over 660 vehicles in the AM, and over 430 vehicles in the PM, attempting this movement. These volumes far exceed the existing capacity of the southbound left-turn lane, and the extensive queueing causes significant sight distance issues, additional rear ends, and left turn crashes as drivers try to turn during gaps in northbound traffic.

Photo 1: SR-747 Southbound Queue North of Bridge (PM Peak)



Photo 2: SR-747 Southbound Queue on Bridge (PM Peak)



- The SR-747 northbound approach to the interchange includes a sag curve (approximately 3.5% downgrade), which may contribute to northbound vehicles' excessive speeds heading to the SR-129 eastbound ramp signal, further increasing the potential of rear end and left-tun crashes. While the posted speed limit is 55 MPH, field observations indicated vehicles typically exceeded the posted speed limit on the northbound approach to the interchange.
- The two ramp signals are not coordinated to the signal south of the interchange (Hamilton Mason Road, 2,500 feet south) or to the north of the interchange (Princeton Road, 2,100 feet north). Platoons were metered by both these signals, however, vehicles appeared to arrive sporadically during the cycle.

Photo 3: SR-747 Hill South of the Interchange



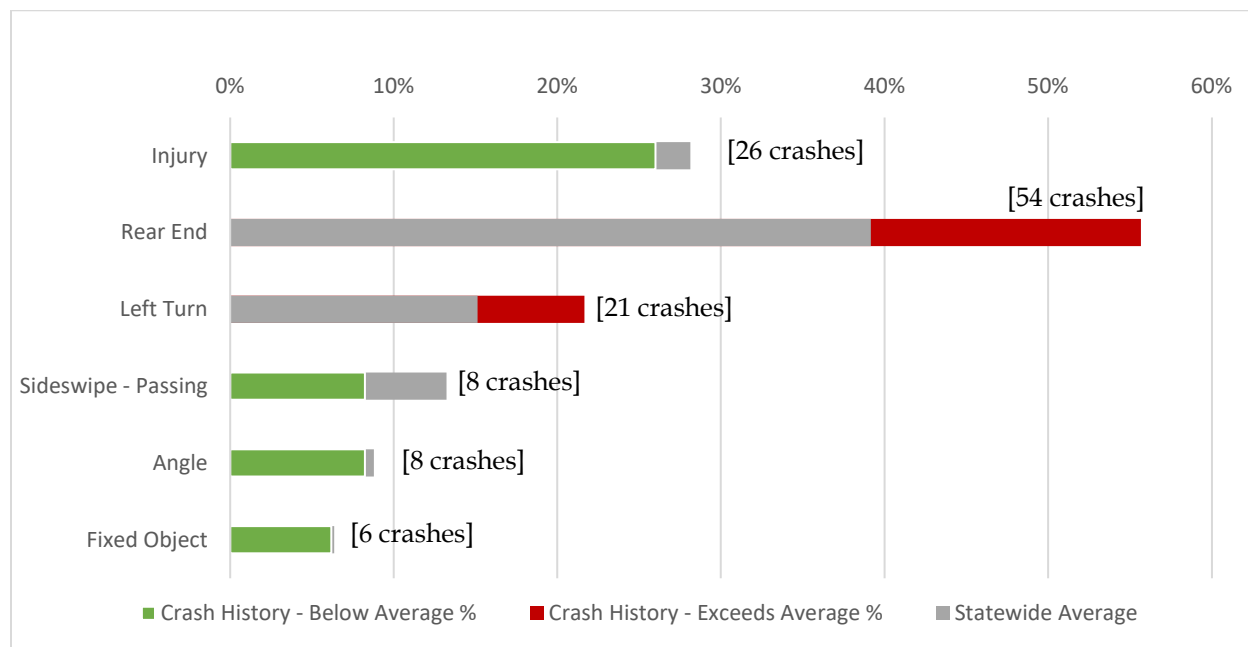
Turning movement counts were collected at the study intersection on June 16, 2022, from 7 AM - 7 PM. Using the count data, the peak hours were determined to be 7:15-8:15 AM and 5:00-6:00 PM for the corridor. At the intersection of SR-747 at Grandin Ridge Drive, daily heavy vehicle traffic accounts for about 4% of the traffic on SR-747, 1.4% on westbound Grandin Ridge Drive, and 2.4% on eastbound Logsdons Meadow Drive. A design hour factor of 1.11 was applied to the AM and PM peak hours to determine the peak design hours for SR-747 (northbound and southbound). For the eastbound and westbound approaches, a design hour factor of 1.11 was applied to Grandin Ridge Drive, while 1.07 was applied to SR-129. Annual Growth Rates of 0.7% were obtained from ODOT District 8 and applied to all legs of this corridor. Count data is provided in **Appendix A**.

3.0 Crash Data

Crash data between 2018 and 2020 was obtained using ODOT's TIMS website. A total of 100 crashes occurred within the study area with three involving serious injuries, thirteen

involving minor injuries, and ten involving possible injuries. **Graph 1** shows the frequency per crash type for the intersection compared to the statewide average for a multilane undivided segment. Crash frequencies higher than the statewide average are in red, and those lower than the statewide average are in green.

Graph 1: Percentage of Crashes by Type Versus Statewide Averages



The graph shows that rear end and left turn crashes happen more frequently in the study area than is typical. **Table 1** shows notable crash statistics and **Appendix B** contains the full crash data from the CAM tool. Crash diagrams for the corridor are shown in **Figures 2-6**. Crashes were higher on weekdays, especially on Monday (19%) and Tuesday (18%) and were most common between 2 PM and 7 PM. Following Too Closely/ACDA (Assured Clear Distance Ahead) was the highest contributing factor (54%) of crashes. Failure to Yield was the next most common contributing factor (23%), with six from angle crashes and 17 from left turn crashes indicating drivers were unable to properly select an appropriate gap in traffic. Pavement friction is likely not a significant contributing factor since 68% of the crashes occurred on dry pavement.

Table 1: Crash Statistics

Hour of Day	Number	%
2	1	1
4	2	2
5	1	1
6	4	4
7	5	5
8	7	7
9	4	4
10	7	7
11	5	5
12	6	6
13	6	6
14	10	10
15	9	9
16	8	8
17	9	9
18	10	10
19	2	2
20	3	3
21	1	1

Crash Month	Number	%
January	9	9
February	8	8
March	6	6
April	5	5
May	3	3
August	6	6
September	11	11
October	9	9
November	9	9
December	11	11

Day of Week	Number	%
Sunday	8	8
Monday	19	19
Tuesday	18	18
Wednesday	15	15
Thursday	13	13
Friday	16	16
Saturday	11	11

Light Condition	Number	%
Daylight	77	77
Dark - Lighted Roadway	14	14
Dawn/Dusk	7	7
Dark - Roadway Not Lighted	2	2

Estimated Speed (mph)	Number	%
<15	48	48
15-19	13	13
20-24	5	5
25-29	6	6
30-34	1	1
35-39	6	6
40-44	3	3
45-49	9	9
50-54	2	2
55-59	5	5
65-70	1	1
>70	1	1

Road Condition	Number	%
Dry	68	68
Wet	30	30
Snow	2	2

Contributing Factor	Number	%
Following Too Closely/ACDA	54	54
Failure to Yield	23	23
Failure to Control	10	10
Improper Lane Change	6	6
Ran Red Light	4	4
Improper Passing	1	1
Unsafe Speed	1	1
Improper Turn	1	1

747

11-25-19 / 06 / N / W / P / IMP

01-29-20 / 07 / DW / D / P / ACD

01-06-20 / 07 / DW / D / P / FTY
07-13-20 / 16 / D / D / P / FTY

05-12-19 / 09 / D / W / P / FTY
09-04-20 / 06 / N / D / I / FTY
12-15-20 / 18 / N / D / P / FTY

08-28-20 / 15 / D / W / I / FTY

09-11-20 / 14 / D / D / I / FTY

02-15-18 / 14 / D / W / P / ACD
02-19-18 / 16 / D / D / P / ACD
06-06-18 / 17 / D / D / P / ACD

03-12-19 / 09 / D / D / I / IMP

ANGLE CRASH		<u>CONTRIBUTING FACTOR</u>
LEFT TURN CRASH		ACD = ASSURED CLEAR DISTANCE
REAR END CRASH		OVN = OPERATING IN NEGLIGENT MANNER
SIDESWIPE - PASSING		FTC = FAILURE TO CONTROL
SIDESWIPE - MEETING		FTY = FAILURE TO YIELD
FIXED OBJECT / PARKED VEHICLE		IMP = IMPROPER MOVEMENT
BACKING		RRL = RAN RED LIGHT
PEDESTRIAN		RSS = RAN STOP SIGN
RAN OFF ROAD		LOC = LEFT OF CENTER
ANIMAL		SPD = UNSAFE SPEED
<u>SEVERITY</u>		OTH = OTHER
P = PROPERTY	<u>YEAR</u>	UNK = UNKNOWN
DAMAGE ONLY	2018	
I = INJURY	2019	<u>LIGHT</u>
F = FATALITY	2020	D = DAY
		N = NIGHT
		DW = DAWN
		DK = DUSK
		<u>ROADWAY</u>
		D = DRY
		W = WET
		S = SNOW
		I = ICE
DATE / HOUR / LIGHT / ROAD / SEVERITY / CONTR FACTOR		



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SR-747 AT SR-129
LP 5.49
FIGURE 2

ANGLE CRASH		<u>CONTRIBUTING FACTOR</u>	
LEFT TURN CRASH		ACD = ASSURED CLEAR DISTANCE	
REAR END CRASH		OVN = OPERATING IN NEGLIGENT MANNER	
SIDESWIPE - PASSING		FTC = FAILURE TO CONTROL	
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PEDESTRIAN		RSS = RAN STOP SIGN	
RAN OFF ROAD		LOC = LEFT OF CENTER	
ANIMAL		SPD = UNSAFE SPEED	
		OTH = OTHER	
		UNK = UNKNOWN	
<u>SEVERITY</u>		<u>YEAR</u>	<u>LIGHT</u>
P = PROPERTY		2018	D = DAY
DAMAGE ONLY		2019	N = NIGHT
I = INJURY		2020	DW = DAWN
F = FATALITY			DK = DUSK
			I = ICE
<u>ROADWAY</u>			
		D = DRY	
		W = WET	
		S = SNOW	
		I = ICE	
DATE / HOUR / LIGHT / ROAD / SEVERITY / CONTR FACTOR			

03-23-18 / 11 / D / D / P / ACD
 02-23-19 / 10 / D / D / P / ACD
 12-02-19 / 10 / D / W / P / ACD
 06-19-20 / 10 / D / D / P / ACD
 07-18-20 / 17 / D / D / P / ACD
 11-27-20 / 11 / D / D / P / ACD

02-13-18 / 15 / D / D / I / ACD

12-19-19 / 15 / D / D / P / IMP

03-21-18 / 17 / D / D / P / ACD
 06-22-18 / 08 / D / W / P / ACD
 08-04-18 / 15 / D / D / P / ACD
 02-06-19 / 10 / D / W / I / ACD
 10-21-19 / 12 / D / W / P / ACD
 06-18-20 / 14 / D / D / P / ACD

SR-129 WB ENTRANCE RAMP

SR-129 WB EXIT RAMP

08-01-19 / 10 / D / D / P / SPD

01-04-19 / 15 / D / D / I / FTY
 05-25-19 / 21 / N / D / I / FTY
 07-24-19 / 04 / N / D / P / FTY
 11-21-19 / 15 / D / W / P / FTY
 11-27-19 / 14 / D / D / I / RRL
 12-12-19 / 18 / N / D / P / FTY
 01-18-20 / 14 / D / W / I / FTY
 02-19-20 / 15 / D / D / I / FTY
 09-14-20 / 06 / N / D / P / FTY
 10-20-20 / 20 / N / W / I / FTY

07-24-20 / 19 / D / D / I / ACD

07-18-18 / 15 / D / D / P / ACD
 12-02-18 / 14 / D / D / P / ACD
 12-18-18 / 16 / D / D / P / ACD
 01-16-19 / 18 / N / D / I / ACD
 04-29-19 / 16 / D / D / P / ACD

01-05-18 / 17 / D / D / P / IMP



09-27-18 / 14 / D / W / P / IMP

09-03-18 / 19 / D / W / P / ACD
07-15-19 / 16 / D / W / P / ACD
08-30-19 / 10 / D / D / P / ACD
11-27-19 / 08 / D / W / P / ACD
06-21-20 / 13 / D / D / P / ACD
11-21-20 / 17 / DK / W / P / ACD
12-19-20 / 11 / D / D / I / ACD

01-18-18 / 08 / D / D / I / FTC
12-16-19 / 04 / N / S / I / FTC

04-03-18 / 16 / D / W / P / RRL
06-24-18 / 14 / D / D / I / FTY
07-28-18 / 12 / D / D / I / FTY
10-02-18 / 13 / D / D / I / FTY
07-07-19 / 11 / D / D / I / RRL
10-31-19 / 12 / D / W / P / FTY
12-15-19 / 15 / D / D / P / FTY
02-24-20 / 20 / N / W / P / FTY
03-03-20 / 18 / D / D / I / FTY
11-14-20 / 17 / N / D / P / RRL

10-20-20 / 18 / N / W / P / FTC
10-24-20 / 05 / N / D / I / FTC

08-20-18 / 18 / D / W / P / ACD
09-12-18 / 07 / D / D / P / ACD
10-23-18 / 12 / D / D / P / ACD
05-10-19 / 06 / DW / D / P / ACD
09-27-19 / 09 / D / D / P / ACD
07-07-20 / 13 / D / D / P / ACD

11-26-20 / 10 / D / W / P / FTC

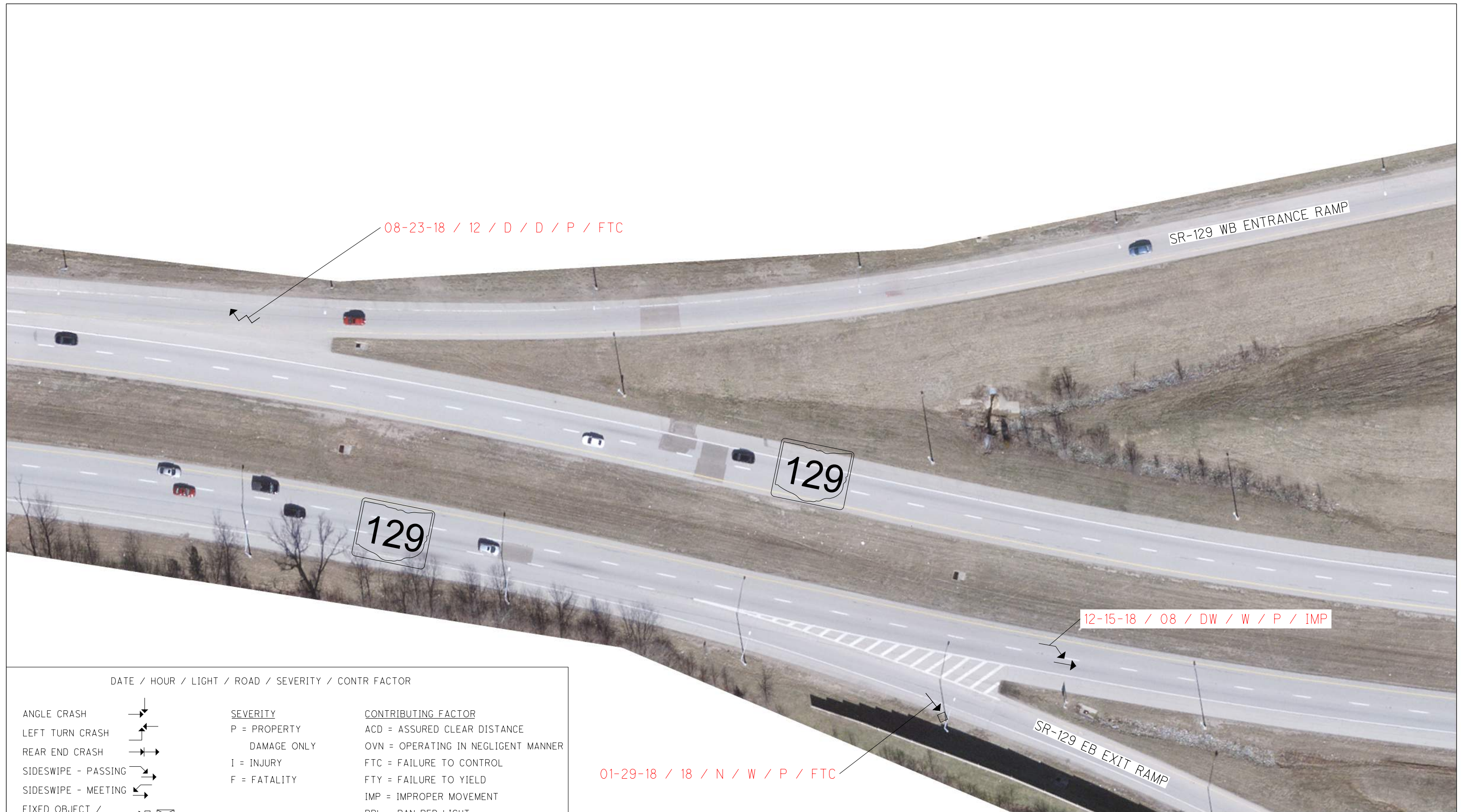
03-08-18 / 12 / D / D / P / ACD
04-24-18 / 18 / D / W / P / ACD
08-07-18 / 18 / D / D / P / ACD
10-26-18 / 14 / D / W / P / ACD
11-18-19 / 07 / D / D / P / ACD
04-23-20 / 13 / D / W / I / ACD
09-21-20 / 08 / D / D / P / ACD
10-09-20 / 14 / D / D / P / ACD
12-02-20 / 13 / D / D / P / ACD
12-15-20 / 07 / DW / D / I / ACD

01-29-20 / 09 / D / W / P / IMP

ANGLE CRASH		<u>CONTRIBUTING FACTOR</u>	
LEFT TURN CRASH		ACD = ASSURED CLEAR DISTANCE	
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		OTH = OTHER	
		UNK = UNKNOWN	
<u>SEVERITY</u>			
P = PROPERTY	<u>YEAR</u>	<u>LIGHT</u>	<u>ROADWAY</u>
DAMAGE ONLY	2018	D = DAY	D = DRY
I = INJURY	2019	N = NIGHT	W = WET
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DATE / HOUR / LIGHT / ROAD / SEVERITY / CONTR FACTOR			



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FIGURE 4



08-23-18 / 12 / D / D / P / FTC

SR-129 WB ENTRANCE RAMP

129

129

12-15-18 / 08 / DW / W / P / IMP

SR-129 EB EXIT RAMP

01-29-18 / 18 / N / W / P / FTC

DATE / HOUR / LIGHT / ROAD / SEVERITY / CONTR FACTOR

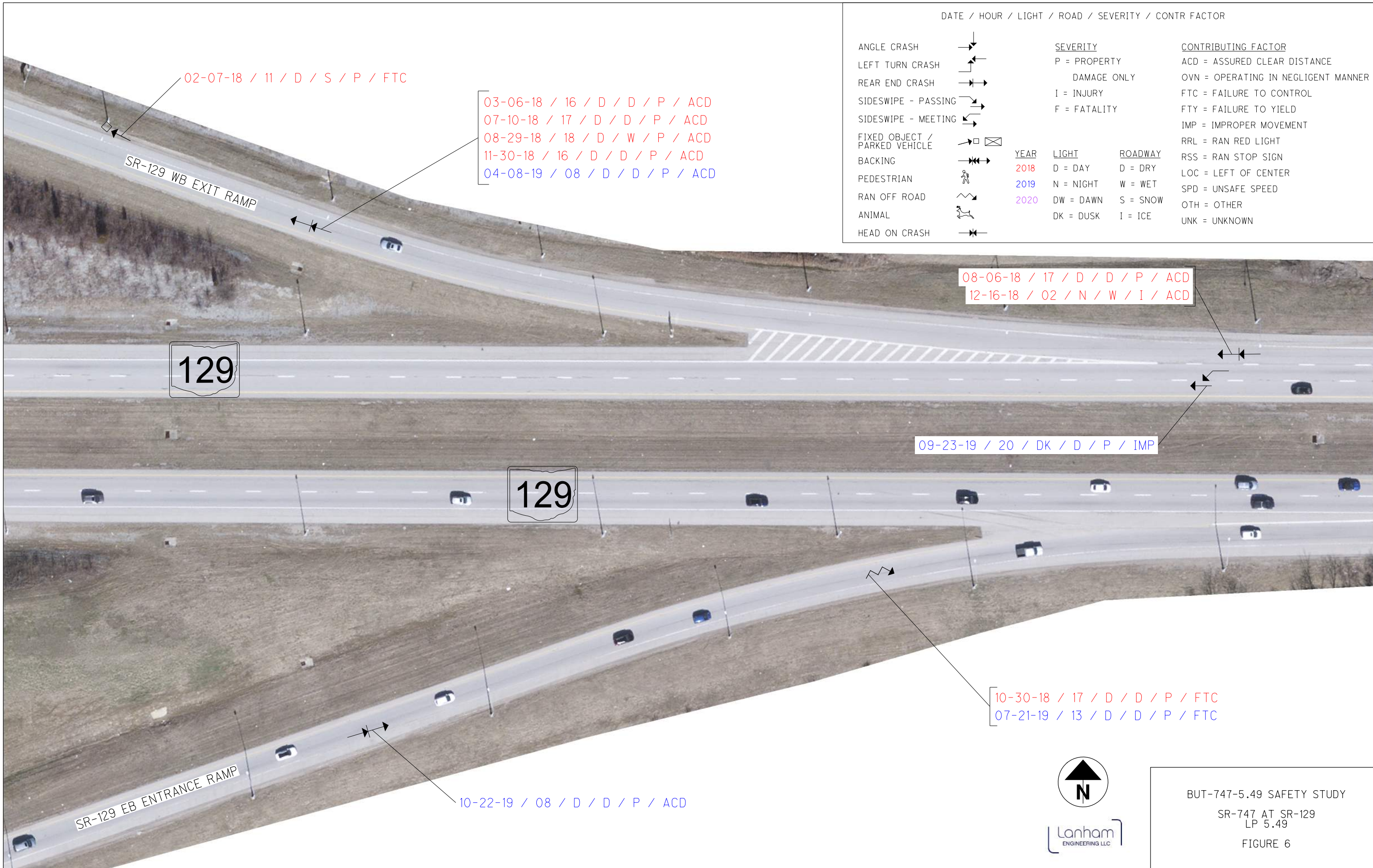
ANGLE CRASH				
LEFT TURN CRASH				
REAR END CRASH				
SIDESWIPE - PASSING				
SIDESWIPE - MEETING				
FIXED OBJECT / PARKED VEHICLE				
BACKING				
PEDESTRIAN				
RAN OFF ROAD				
ANIMAL				
HEAD ON CRASH				

SEVERITY	CONTRIBUTING FACTOR
P = PROPERTY DAMAGE ONLY	ACD = ASSURED CLEAR DISTANCE
I = INJURY	OVN = OPERATING IN NEGLIGENT MANNER
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	LOC = LEFT OF CENTER
	SPD = UNSAFE SPEED
	OTH = OTHER
	UNK = UNKNOWN

YEAR	LIGHT	ROADWAY
2018	D = DAY	D = DRY
2019	N = NIGHT	W = WET
2020	DW = DAWN	S = SNOW
	DK = DUSK	I = ICE



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 FIGURE 5



DATE / HOUR / LIGHT / ROAD / SEVERITY / CONTR FACTOR

ANGLE CRASH					
LEFT TURN CRASH					
REAR END CRASH					
SIDESWIPE - PASSING					
SIDESWIPE - MEETING					
FIXED OBJECT / PARKED VEHICLE					
BACKING					
PEDESTRIAN					
RAN OFF ROAD					
ANIMAL					
HEAD ON CRASH					

SEVERITY	YEAR	LIGHT	ROADWAY
P = PROPERTY DAMAGE ONLY	2018	D = DAY	D = DRY
I = INJURY	2019	N = NIGHT	W = WET
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CONTRIBUTING FACTOR
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OVN = OPERATING IN NEGLIGENT MANNER
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FTY = FAILURE TO YIELD
IMP = IMPROPER MOVEMENT
RRL = RAN RED LIGHT
RSS = RAN STOP SIGN
LOC = LEFT OF CENTER
SPD = UNSAFE SPEED
OTH = OTHER
UNK = UNKNOWN

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 FIGURE 6



4.0 Existing Transportation Analysis

Capacity Analysis

Capacity analysis for the existing conditions was performed in *HCS Version 2022* for the unsignalized and signalized intersections. **Tables 2-3** below show the level of service (LOS) thresholds for unsignalized and signalized intersections as published in the *Highway Capacity Manual*.

Table 2: LOS Criteria for Unsignalized Intersections

Level of Service	Unsignalized Intersection
	Delay (Seconds)
A	≤ 10
B	> 10 - 15
C	> 15 - 25
D	> 25 - 35
E	> 35 - 50
F	> 50 or V/C ratio > 1.00

Table 3: LOS Criteria for Signalized Intersections

Level of Service	Signalized Intersection
	Delay (Seconds)
A	≤ 10
B	> 10 - 20
C	> 20 - 35
D	> 35 - 55
E	> 55 - 80
F	> 80 or V/C ratio > 1.00

Tables 4-5 show the results of the existing 2022 capacity analysis for the study intersections for the AM and PM peak hours.

Table 4: 2022 Existing Conditions Results - SR-747 at Logsdon Meadow/Grandin Ridge Dr.

Movement		AM Peak				PM Peak			
		LOS	Delay (sec)	V/C	95 th % Queue (feet)	LOS	Delay (sec)	V/C	95 th % Queue (feet)
SR-747 @ Logsdon/ Grandin Ridge	EB	C	20.9	0.15	3.75	C	19.9	0.14	12.5
	WB	D	34.0	0.11	2.75	F	82.9	0.25	22.5
	NB	B	0.1	13.0	0.25	B	10.1	0.05	5.0
	SB	A	0.0	8.6	0.00	B	13.2	0.01	0.0

Table 5: 2022 Existing Conditions Results - SR-747 at SR-129

Movement		AM Peak				PM Peak			
		LOS	Delay (sec)	V/C	95 th % Queue (feet)	LOS	Delay (sec)	V/C	95 th % Queue (feet)
SR-747 @ SR-129 EB Ramp	EBLT	D	43.0	0.153	52.5	D	52.6	0.366	100
	EBR	F	81.5	0.903	360	E	74.1	0.793	235
	NBT	E	58.3	0.882	520	C	31.7	0.793	625
	NBTR	E	58.9	0.884	515	C	33.0	0.810	627.5
	SBL	D	47.8	0.938	712.5*	D	46.7	0.912	457.5*
	SBT	A	8.5	0.406	202.5	A	4.5	0.308	97.5
	Overall	D	39.9			C	29.3		
SR-747 @ SR-129 WB Ramp	WBLTR	E	55.3	0.879	362.5	D	51.4	0.845	565
	WBR	D	42.9	0.521	205	D	50.3	0.909	597.5*
	NBL	D	38.0	0.777	105	C	34.5	0.865	187.5
	NBT	B	11.0	0.337	120	B	10.6	0.492	172.5
	SBT	C	23.0	0.736	520	D	37.7	0.736	467.5
	SBTR	C	22.4	0.730	555	D	37.0	0.732	495
	Overall	C	26.9			C	33.7		

*Queue shown (distance) exceeds storage; Queue Storage Ratio (QSR) exceeds 1.

The unsignalized intersection functions poorly on the minor street, Logsdons/Grandin Ridge (westbound fails during the PM Peak), but functions well on the major street, SR-747. The SR-129 EB ramp signal operates poorly during the AM peak, with several movements underperforming (LOS E/F). Additionally, the southbound left-turn movement shows LOS D, however, the 95% queue exceeds the existing storage. During the PM peak, this trend occurs again for the southbound left, while the rest of the intersection operates functionally (except the WB right-turn, with LOS E). The SR-129 WB ramp signal operates well during the AM peak and in the PM peak hours, except the WB approach during the AM Peak (LOS E), and the 95% queue exceeds the existing storage in the PM peak. Full capacity analysis printouts are in **Appendix C**.

Tables 6-9 show the 2030 and 2050 No Build capacity analysis results for the AM and PM peak hours.

Table 6: 2030 No Build Results - SR-747 at Logsdon Meadow Dr./Grandin Ridge Dr.

Movement		AM Peak				PM Peak			
		LOS	Delay (sec)	V/C	95 th % Queue (feet)	LOS	Delay (sec)	V/C	95 th % Queue (feet)
SR-747 @ Logsdon/Grandin Ridge	EB	C	22.6	0.17	15	C	21.5	0.15	12.5
	WB	E	38.4	0.13	10	F	104.4	0.30	25
	NB	B	13.6	0.01	0.0	B	10.3	0.05	5.0
	SB	A	8.7	0.0	0.0	B	13.8	0.01	0.0

Table 7: 2050 No Build Results - SR-747 at Logsdon Meadow Dr./Grandin Ridge Dr.

Movement		AM Peak				PM Peak			
		LOS	Delay (sec)	V/C	95 th % Queue (feet)	LOS	Delay (sec)	V/C	95 th % Queue (feet)
SR-747 @ Logsdon/Grandin Ridge	EB	D	31.9	0.27	27.5	D	31.5	0.25	22.5
	WB	F	55.2	0.21	17.5	F	218.7	0.55	45
	NB	C	15.2	0.02	2.5	B	11.0	0.07	5.0
	SB	A	9.0	0.0	0.0	C	15.6	0.02	2.5

The unsignalized intersection functions poorly on the minor street, Logsdons/Grandin Ridge, but functions well on the major street, SR-747.

Table 8: 2030 No Build Results for SR-747 at SR-129

Movement		AM Peak				PM Peak			
		LOS	Delay (sec)	V/C	95 th % Queue (feet)	LOS	Delay (sec)	V/C	95 th % Queue (feet)
SR-747 @ SR-129 EB Ramp	EBLT	D	40.6	0.142	52.5	D	50.2	0.342	102.5
	EBR	E	65.8	0.839	340	E	66.0	0.739	232.5
	NBT	E	61.2	0.885	507.5	D	40.3	0.877	737.5
	NBTR	E	62.2	0.888	497.5	D	43.3	0.900	752.5
	SBL	E	58.1	0.985	795*	D	45.2	0.914	462.5*
	SBT	B	10.6	0.439	247.5	C	22.0	0.618	420
	Overall	D	42.0			D	38.2		
SR-747 @ SR-129 WB Ramp	WBLTR	D	54.7	0.882	377.5	D	49.3	0.844	582.5
	WBR	D	42.0	0.522	212.5	D	46.8	0.905	607.5*
	NBL	D	43.3	0.810	167.5	D	43.2	0.883	227.5
	NBT	B	12.3	0.379	130	B	12.5	0.534	192.5
	SBT	C	27.2	0.794	597.5	D	48.5	0.848	552.5
	SBTR	C	26.3	0.789	637.5	D	47.2	0.842	580
	Overall	C	29.7			D	37.3		

*Queue shown (distance) exceeds storage; Queue Storage Ratio (QSR) exceeds 1.

Table 9: 2050 No Build Results for SR-747 at SR-129

Movement		AM Peak				PM Peak			
		LOS	Delay (sec)	V/C	95 th % Queue (feet)	LOS	Delay (sec)	V/C	95 th % Queue (feet)
SR-747 @ SR-129 EB Ramp	EBLT	D	40.1	0.156	57.5	D	49.9	0.364	115
	EBR	E	76.2	0.906	402.5	E	69.3	0.793	260
	NBT	E	70.3	0.950	600	E	57.0	0.980	957.5
	NBTR	E	71.4	0.952	587.5	F	67.9	1.021	1042.5*
	SBL	F	133.6	1.191	1242.5*	F	74.0	1.024	610
	SBT	B	11.3	0.494	262.5	C	23.0	0.621	450
	Overall	E	64.2			D	53.2		
SR-747 @ SR-129 WB Ramp	WBLTR	D	53.1	0.890	412.5	E	61.1	0.914	707.5
	WBR	D	39.9	0.526	227.5	E	63.9	0.973	780*
	NBL	D	43.0	0.823	177.5	F	105.1	1.118	317.5*
	NBT	B	13.9	0.413	140	B	13.0	0.608	192.5
	SBT	D	43.8	0.937	845	E	63.4	0.953	697.5
	SBTR	D	44.4	0.947	927.5	E	61.0	0.946	727.5
	Overall	D	40.3			D	51.4		

*Queue shown (distance) exceeds storage; Queue Storage Ratio (QSR) exceeds 1.

The signalized ramp intersections operate poorly over all time periods, with several movements underperforming (LOS E/F) and 95% queues exceeding existing storage.

Signal Warrant Analysis

Signal warrant analyses was performed at the study intersections using the standards outlined in the OMUTCD Chapter 4 to investigate if a traffic signal is warranted. Warrant 1 (eight-hour volume threshold), Warrant 2 (four-hour volume threshold), and Warrant 7 (crash experience) were evaluated using the existing volumes and crash data. All other warrants outlined in the OMUTCD are not applicable to the study area. Right turn reduction was not applied to the count volumes for SR-747 at Grandin Ridge Drive, however, it was applied to the volumes for SR-747 at SR-129.

For the intersection of SR-747 at Grandin Ridge Drive, Warrant 1 is based on 8 hours of traffic meeting the prescribed volume thresholds set out in the OMUTCD. This warrant can be met if either Condition A or Condition B are satisfied (using the 70% of minimum volumes based on the major-street speed exceeding 40 MPH) or if 56% of Condition A and Condition B are satisfied. Condition A requires that SR-747 has a minimum volume of 420 vehicles per hour and Grandin Ridge Drive has a minimum volume of 105 vehicles for at least 8 hours. Condition B requires that SR-747 has a minimum volume of 630 vehicles per hour and Grandin Ridge Drive has a minimum volume of 53 vehicles for at

least 8 hours. None of the volumes met or exceeded the requirements for either condition, therefore Warrant 1 was not met.

Warrant 2 is based on 4 hours of traffic meeting the volume thresholds shown on Figure 4C-2 of the OMUTCD. Utilizing the 70% volume requirements due to the speed limit being above 40 mph on the major street, the minimum volume on the major street is 200 vehicles per hour. For the four highest volume hours on SR-747, Grandin Ridge Drive would need a minimum of approximately 220 vehicles for each of those four hours. None of those four hours met the criteria set in Figure 4C-2 of the OMUTCD, therefore the signal warrant is not met.

Warrant 7 (Crash Experience) signal warrant conditions are intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal. There were more than five crashes that would be correctable by the installation of a traffic signal, however, this warrant also requires that the 70% volumes listed in Warrant 1 Conditions A and B for the major and side streets are met for an 8-hour period. The volumes at this intersection do not meet the requirements from Warrant 1, therefore, this warrant was not met.

Applying the same conditions for Warrant 1 as SR-747 and Grandin Ridge Drive, both Condition B (70%) and the Combination A and B (56%) were met for the SR-129 eastbound ramp intersection. Therefore, the eastbound SR-129 ramp signal is warranted. For the SR-129 westbound ramp intersection, both Condition A (70%) and Condition B (70%) and the Combination A and B (56%) were met; thus, the westbound SR-129 ramp signal is warranted. For Warrant 2, the minimum volume requirements for both the eastbound and westbound SR-129 ramps were met. Therefore, the signal warrant is met.

SR-747 at both the SR-129 ramp intersections met the threshold for crashes as stated in Warrant 7. It also met the minimum 70% volumes listed in Warrant 1 Conditions A and B for the major and side streets are met for an 8-hour period. The volumes at SR-747 at the eastbound ramp and westbound ramp both meet the requirements from Warrant 1; therefore, this warrant was met. Detailed signal warrant analysis is in **Appendix D**.

5.0 Probable Causes

The major crash patterns within the study area are described below:

- **Rear End:** Rear end crashes are most prominent type of crash that occurred in the SR-747 corridor, with a total of 54 crashes during the three-year study period. At the intersection of SR-747 and Grandin Ridge Drive, there were four total rear end crashes, with three occurring in the northbound direction and one in the

southbound direction. At the intersection of SR-747 and SR-129 westbound ramps, there were a total of 18 rear end crashes. Among the crashes approaching the intersection, four were in the northbound direction, six were in the southbound direction, and six were in the westbound direction. There were also rear end crashes found departing the intersection: one crash each in the northbound direction and southbound direction. At the intersection of SR-747 and SR-129 eastbound ramps, there were a total of 24 rear end crashes, with 11 headed northbound, seven headed southbound, and six headed eastbound. All rear end crashes at SR-129 eastbound were approaching the intersection. The remaining eight rear end crashes occurred on the SR-129 ramps. Seven occurred on the westbound exit ramp and one occurred on the eastbound entrance ramp.

- **Left Turn:** Left turn crashes are the next most common crash type that occurred along the SR-747 corridor, with a total of 21 crashes during the three-year study period. At the intersection of SR-747 and Grandin Ridge Drive, there was one left turn movement crash in the northbound direction. At the intersection of SR-747 and SR-129 westbound ramps, there were ten northbound left turn crashes. All but one cited Failure to Yield as a contributing factor. There was one crash that was due to the vehicle running the red signal. The signal has protected/permitted left turn phasing; however, the cause of these crashes is most likely due to sight distance issues caused by the long queue from the SR-129 Eastbound ramp signal left-turn movement, which backs up to Grandin Ridge Drive consistently in the inside southbound travel lane. Southbound vehicles in this inside travel lane are stopped/unable to proceed southbound, and northbound left-turning vehicles proceed to turn left on the permitted green ball. These drivers' view of the outside southbound travel lane is blocked from the queue, which contributes to the left-turn crashes. At the intersection of SR-747 and SR-129 eastbound ramp, there were 10 southbound left turn crashes. Seven crashes listed Failure to Yield as a contributing factor, and the remaining three crashes involved a vehicle running the red signal. While this intersection also has protected/permitted left turn phasing, these crashes most likely occurred due to driver frustration of waiting to turn left and/or inability to identify an appropriate gap from northbound vehicles' excessive speeds.

6.0 Countermeasures

Rear end and left turn crashes are the most prominent crash types throughout the corridor, so countermeasures should focus on mitigating these crash types. The following

section suggests potential improvements that may reduce the potential for the most common crash types.

Short Term

- Update change and clearance intervals to meet current TEM standards.
- Replace protected/permitted left turn phasing on SR-747 with protected only left turn phasing at the SR-129 ramp signals.

Clearance and Change Intervals

Clearance and change intervals were calculated according to ODOT’s TEM and compared to the existing to ensure that current standards are met. **Tables 10-11** below shows the existing and calculated timings:

Table 10: SR-747 at SR-129 Eastbound Ramp Clearance and Change Intervals

Movement	Existing Change Interval (sec)	Calculated Change Interval (sec)	Existing Clearance Interval (sec)	Calculated Clearance Interval (sec)
EBLT	4.0	5.7	2.0	1.0
EBR	4.0	5.7	2.0	1.0
NBT	4.6	5.4	2.0	1.0
NBR	4.6	5.4	2.0	1.0
SBL	3.0	5.4	2.0	1.0
SBT	4.5	5.4	2.0	1.0

Table 11: SR-747 at SR-129 Westbound Ramp Clearance and Change Intervals

Movement	Existing Change Interval (sec)	Calculated Change Interval (sec)	Existing Clearance Interval (sec)	Calculated Clearance Interval (sec)
WBLTR	4.0	5.7	2.0	1.0
WBR	4.0	5.7	2.0	1.0
NBL	3.0	5.4	2.0	1.0
NBT	4.5	5.4	2.0	1.0
SBT	4.5	5.4	2.0	1.0
SBR	4.5	5.4	2.0	1.0

The tables show that the clearance and change intervals differ from the calculated values and are likely to have an impact on crashes. Clearance and change calculations are included in **Appendix D**.

Capacity Analysis

Capacity analysis for protected left turn phasing is shown in **Table 12**.

Table 12: 2030 Protected Left Turns

Movement		AM Peak				PM Peak			
		LOS	Delay (sec)	V/C	95 th % Queue (feet)	LOS	Delay (sec)	V/C	95 th % Queue (feet)
SR-747 @ SR-129 EB Ramp	EBLT	D	42.0	0.152	52.5	D	50.2	0.341	102.5
	EBR	E	78.4	0.898	367.5	E	65.8	0.737	232.5
	NBT	E	67.0	0.916	527.5	D	52.7	0.946	835
	NBR	E	68.2	0.919	517.5	E	58.2	0.970	865
	SBL	F	87.5	1.057	902.5*	D	48.2	0.914	437.5*
	SBT	A	9.8	0.431	227.5	C	22.9	0.617	412.5
	Overall	D	51.6			D	45.7		
SR-747 @ SR-129 WB Ramp	WBLTR	D	54.7	0.882	377.5	D	49.3	0.844	582.5
	WBR	D	42.0	0.522	212.5	D	46.8	0.905	607.5*
	NBL	E	62.7	0.811	170	E	67.8	0.899	315*
	NBT	B	12.5	0.391	127.5	B	13.3	0.534	195
	SBT	C	33.6	0.849	667.5	E	75.4	0.982	677.5
	SBR	C	32.4	0.842	712.5	E	72.5	0.976	707.5
	Overall	C	34.5			D	47.6		

*Queue shown (distance) exceeds storage; Queue Storage Ratio (QSR) exceeds 1.

Although the overall LOS is acceptable for both the AM and PM peaks, several individual movements are not acceptable, showing a LOS below D. The worst movement occurs during the AM peak hour at the SR-129 eastbound ramp intersection, with the southbound left-turn V/C ratio exceeding 1.0 and the 95th Percentile Queue exceeding existing storage.

Long Term

- **Alternative 1** - Convert the inside southbound through lane to an additional left turn lane to provide dual left turn lanes at the SR-129 eastbound ramp. This alternative includes widening the SR-129 eastbound on-ramp to two lanes, tapering back to one lane ahead of the gore. Additionally, Alternative 1 incorporates a southbound right turn lane at the SR-129 westbound ramp intersection, and a northbound right turn lane at the SR-129 eastbound ramp intersection.
- **Alternative 2** - Convert the interchange to a Diverging Diamond Interchange (DDI).

Capacity analysis for Alternative 1 is shown in **Table 13**.

Table 13: 2050 Alternative 1 (SB Dual Lefts to SR-129 EB & Right-Turn Lanes)

Movement		AM Peak				PM Peak			
		LOS	Delay (sec)	V/C	95 th % Queue (feet)	LOS	Delay (sec)	V/C	95 th % Queue (feet)
SR-747 @ SR-129 EB Ramp	EBLT	D	38.6	0.148	57.5	D	52.7	0.458	142.5
	EBR	E	63.1	0.844	367.5	E	65.6	0.738	235
	NBT	C	32.1	0.496	262.5	C	20.7	0.651	452.5
	NBR	D	37.9	0.643	365*	B	18.3	0.469	282.5*
	SBL	E	56.0	0.843	405	D	50.0	0.844	227.5
	SBT	C	25.1	0.915	827.5*	B	17.9	0.734	595
	Overall	D	38.8			C	26.8		
SR-747 @ SR-129 WB Ramp	WBLTR	D	54.6	0.898	412.5	F	93.9	1.065	895
	WBR	D	40.1	0.529	227.5	E	72.0	0.991	772.5*
	NBL	E	66.4	0.822	222.5	E	63.2	0.907	367.5
	NBT	B	12.5	0.360	150	B	11.4	0.576	215
	SBT	D	47.8	0.984	872.5	F	87.3	1.063	767.5
	SBR	B	17.2	0.157	85	C	31.3	0.188	92.5D
	Overall	D	42.4			E	60.8		

*Queue shown (distance) exceeds storage; Queue Storage Ratio (QSR) exceeds 1.

During the AM peak, at the SR-129 Eastbound ramp signal, both the southbound left turn and the eastbound right turn movements operate at an LOS E. Also, the southbound through's 95th% queue exceeds the available storage. The SR-129 westbound ramp signal operates with an acceptable LOS, although the southbound through volume-to-capacity (v/c) ratio is close to 1.0 (0.984). Any increase to the southbound through traffic volume will cause the signal to be over capacity and fail. During the PM peak, the SR-129 westbound ramp signal operates poorly with an overall LOS of E. Several movements indicate LOS of E or F, and some v/c ratios are close to or exceed 1.0. The SR-129 eastbound ramp signal operates significantly better, with only the eastbound right movement with an LOS E.

Capacity analysis for Long Term Alternative 2 is shown in **Table 14**.

Table 14: 2050 Alternative 2 (Diverging Diamond Interchange)

Movement		AM Peak				PM Peak			
		LOS	Delay (sec)	V/C	95 th % Queue (feet)	LOS	Delay (sec)	V/C	95 th % Queue (feet)
SR-747 @ SR-129 EB Ramp	EBR	C	33.3	0.536	272.5	C	22.4	0.265	140
	WBR	B	12.8	0.060	27.5	B	18.7	0.120	60
	NBT	C	33.3	0.513	265	D	51.9	0.972	720
	NBR	A	0.0	-		A	0.0	-	
	SBL	C	27.5	0.861	567.5	C	34.8	0.889	545
	SBT	C	20.1	0.652	357.5	C	31.2	0.856	497.5
	Overall	C	22.9			C	34.7		
SR-747 @ SR-129 WB Ramp	EBR	C	32.2	0.526	265	C	31.0	0.518	257.5
	WBR	B	15.3	0.313	175	B	15.5	0.318	175
	NBL	C	29.5	0.279	140	C	33.5	0.644	267.5
	NBT	C	31.0	0.411	210	D	43.6	0.948	462.5
	SBT	D	35.3	0.935	762.5	D	37.6	0.949	775
	SBR	A	0.0	-		A	0.0	-	
	Overall	C	30.7			D	35.6		

All movements for both the AM and PM peak hours show acceptable levels of service (LOS D or better) in the design year. Furthermore, all V/C ratios are under 1.0, and all 95th Percentile Queues are within the existing/proposed storage lengths. Full capacity results for the short-term and long-term countermeasures are in **Appendix E**.

7.0 Safety Benefits

The Highway Safety Manual (HSM) is used to determine how a corridor is performing compared to similar corridors and to assess the safety benefit of countermeasures. ODOT’s Economic Crash Analysis Tool (ECAT) was used to evaluate both the existing corridor and the proposed short-term and long-term countermeasures.

Crash modification factors (CMF) are used in ECAT to calculate the reduction in crashes for each countermeasure. For example, a CMF of 0.85 reduces crashes by 15%. Not all countermeasures have been studied adequately enough to provide a CMF value. The CMF values used for each scenario are listed below. To avoid overestimating the value of the combined countermeasures, ODOT recommends that no more than four CMF values should be used per scenario.

Short Term

- Modification of the yellow change and all red clearance times: The CMF for this varies by crash type and is accounted for in the ECAT. It is based on Table 14-27 of the HSM and varies between 0.63 and 1.08.
- Replace protected/permited left turn phasing with protected only left turn phasing at both SR-129 ramp signals. This involves swapping out or adding traffic signal heads, any new wiring/cables, signage, and reusing the existing signal poles (SWISS calculations need to be investigated to determine if the existing pole arrangement can support the additional loads). The CMF for this is applied in the SPF Section of the ECAT Tool. The normal intersection CMFs come from Table 12-25 of the HSM, which shows a CMF of 0.94 for revising the left-turn phasing to protected only (the base condition in the HSM is permitted or protected/permited phasing which both ramp signals currently employ). For a ramp terminal signal, the CMF is significantly different; the CMF applied is an equation based on the number of lanes crossed and the AADT of all approaches. The resultant is a CMF of 0.58 for fatal/injury and 0.71 for PDO crashes. For this site, since the existing signal is currently protected/permited, the results from the HSM for providing a protected only phase seemed to overestimate the expected benefit. To be conservative, a CMF of 0.94, which is in line with a typical suburban intersection, was used.

Long Term Alternative 1

- Repurpose the inside southbound through travel lane into an additional southbound left-turn lane to the SR-129 eastbound on-ramp (providing dual lefts to SR-129 EB). There is no formal CMF for this improvement/treatment, however, we expect some safety benefits by doubling the capacity for the left-turn movement, which will reduce congestion.
- Add a southbound right turn lane at the SR-129 westbound: The CMF for this is 0.91. This CMF applies to all crash types and severities that include injury (fatal, serious injury, minor injury, and possible injury) in all area types. This CMF does not apply to property damage only crashes. It is found in the study *Safety Effectiveness of Intersection Left- and Right-Turn Lanes* by Hardwood et al, 2002, on the CMF Clearinghouse website.
- Add a northbound right turn lane at the SR-129 eastbound ramp: The CMF for this is 0.91. This CMF applies to all crash types and severities that include injury (fatal, serious injury, minor injury, and possible injury) in all area types. This CMF does

not apply to property damage only crashes. It is found in the study *Safety Effectiveness of Intersection Left- and Right-Turn Lanes* by Hardwood et al, 2002, on the CMF Clearinghouse website.

Long Term Alternative 2

- Convert the interchange to a DDI: The CMF for this countermeasure is valid for all crash types and crash severity levels with a CMF of 0.67 applied. These were taken from the *Convert a Diamond Interchange to a Diverging Diamond Interchange (DDI) or a Double Crossover Diamond (DCD)* by Hummer et al, 2016, on the CMF Clearinghouse website.

Table 15 shows how the existing corridor ($N_{\text{expected_existing}}$) compares to similar corridors ($N_{\text{predicted_existing}}$) and the proposed conditions ($N_{\text{predicted_proposed}}$). From the table, the study area is functioning worse than its peers and has potential for improvement. For the proposed scenarios, only the CMFs listed for each scenario above are used, i.e. the long-term predicted crashes do not include CMFs for the short-term countermeasures. Full HSM results and details of the CMF studies from the CMF Clearinghouse website are included in **Appendix G**.

Table 15: HSM Results Summary

	KA	B	C	O	Total
$N_{\text{predicted}}$ - Existing Conditions	0.4849	1.9639	2.9813	14.0863	19.5164
N_{expected} - Existing Conditions	0.5222	2.1368	3.2578	18.3668	24.2836
$N_{\text{potential for improvement}}$ - Existing Conditions	0.0373	0.1729	0.2765	4.2805	4.7672
N_{expected} - Proposed Conditions, Short Term	0.4497	1.8461	2.8811	13.7475	18.9244
N_{expected} - Proposed Conditions, Alt. 1 Long Term	0.3566	1.4564	2.2597	12.9233	16.9960
N_{expected} - Proposed Conditions, Alt. 2 Long Term	0.3464	1.4201	2.2084	12.4259	16.4008

Based on the ECAT calculations, the short-term countermeasures are expected to reduce the number of crashes per year compared to the existing conditions by five crashes per year. The long-term Alternative 1 countermeasures are expected to reduce the number of crashes per year by seven compared to the existing conditions. The long-term Alternative 2 countermeasures are expected to reduce the number of crashes per year by approximately eight.

8.0 Conclusions and Recommendations

A benefit cost analysis was prepared using the ECAT tool to compare the estimated cost of the short-term and long-term countermeasures to their respective safety benefit. Benefit cost ratios greater than 1.00 indicate a positive return on the investment. The results of the benefit cost analysis are shown in **Table 16**. Full calculations and detailed cost estimates are in **Appendix G**.

Table 16: Benefit Cost Analysis

	Short Term	Long Term Alt. 1	Long Term Alt. 2
Expected Annual Crash Adjustment	-0.592	-2.520	-3.116
Net Present Value of Project	\$60,000	\$954,425	\$6,119,139
Net Present Value of Safety Benefit	\$377,081	\$1,680,379	\$1,806,629
Benefit Cost Ratio	6.28	1.76	0.30

The benefit-cost ratio for both the short-term and Long Term Alternative 1 countermeasures is favorable since they are above the threshold value of 1.00. The cost shown for Short Term countermeasures assumes reusing the existing signal poles/spans. SWISS calculations need ran to determine if the poles can handle the additional loading.

Based on the findings of this study, we recommend that the Short Term countermeasure for updating the clearance intervals/revising signal timings at each signal be implemented, and Long Term Alternative 2 (DDI) be studied further to determine feasibility. This short term countermeasure can be installed quickly and at a low cost while potential options improving both capacity and safety can be further analyzed. Although revising the operations for protected-only lefts is expected to improve safety by significantly reducing left turn crashes, the failing operations and extensive queue lengths deem it not feasible.

Long Term Alternative 1 is not recommended for implementation even though the calculated B/C ratio is greater than 1.0 due to providing poor operations in the design year (several movements operate with LOS E or F). Further improvements are necessary to increase capacity by the design year for this option, such as widening SR-747 which increases costs significantly, making Long Term Alternative 1 less attractive.

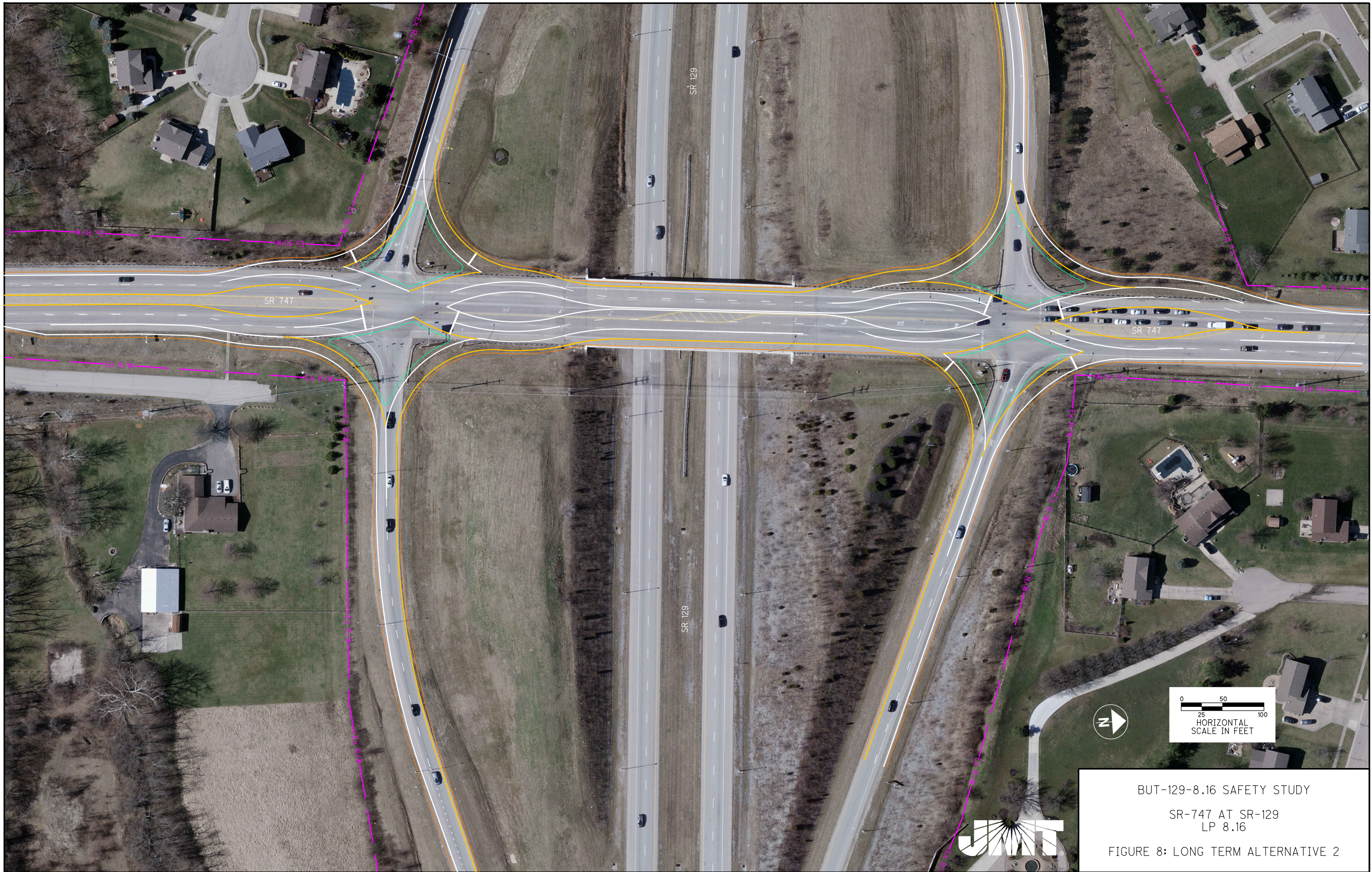
The DDI does not have a favorable B/C ratio, but it is expected to both improve safety by removing left turning movements at the interchange and improve capacity which would also be expected to reduce rear-end crashes. This alternative should be further studied to determine its feasibility and if cost saving measures could be implemented through



design exceptions to increase the B/C ratio. See **Figures 7 and 8** for the recommended improvements.



BUT-129-8.16 SAFETY STUDY
SR-747 AT SR-129
LP 8.16
FIGURE 7: LONG TERM ALTERNATIVE 1



BUT-129-8.16 SAFETY STUDY

SR-747 AT SR-129
LP 8.16

FIGURE 8: LONG TERM ALTERNATIVE 2



ODOT Highway Safety Program
BUT-747-5.49

Appendix A
Count Data

Leg Direction	SR 747 Southbound						Grandin Ridge Dr Westbound						SR 747 Northbound						Logsdons Meadow Dr Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
6:15PM	3	159	3	0	165	0	2	0	3	0	5	0	7	292	6	0	305	0	3	0	0	0	3	0	478
6:30PM	2	212	2	0	216	0	3	0	0	0	3	0	4	246	11	0	261	0	7	0	2	0	9	0	489
6:45PM	3	181	2	0	186	0	3	0	1	0	4	0	10	237	3	0	250	0	5	0	3	0	8	0	448
Hourly Total	10	741	9	0	760	0	10	0	6	0	16	0	34	1045	32	0	1111	0	24	0	8	0	32	0	1919
Total	100	10355	47	3	10505	1	73	3	132	1	209	0	267	10887	216	1	11371	0	283	3	53	0	339	2	22424
% Approach	1.0%	98.6%	0.4%	0%	-	-	34.9%	1.4%	63.2%	0.5%	-	-	2.3%	95.7%	1.9%	0%	-	-	83.5%	0.9%	15.6%	0%	-	-	-
% Total	0.4%	46.2%	0.2%	0%	46.8%	-	0.3%	0%	0.6%	0%	0.9%	-	1.2%	48.6%	1.0%	0%	50.7%	-	1.3%	0%	0.2%	0%	1.5%	-	-
Lights	97	9938	44	3	10082	-	71	2	132	1	206	-	263	10430	211	1	10905	-	278	3	50	0	331	-	21524
% Lights	97.0%	96.0%	93.6%	100%	96.0%	-	97.3%	66.7%	100%	100%	98.6%	-	98.5%	95.8%	97.7%	100%	95.9%	-	98.2%	100%	94.3%	0%	97.6%	-	96.0%
Articulated Trucks	0	145	0	0	145	-	0	0	0	0	0	-	0	128	1	0	129	-	2	0	0	0	2	-	276
% Articulated Trucks	0%	1.4%	0%	0%	1.4%	-	0%	0%	0%	0%	0%	-	0%	1.2%	0.5%	0%	1.1%	-	0.7%	0%	0%	0%	0.6%	-	1.2%
Buses and Single-Unit Trucks	3	272	3	0	278	-	2	1	0	0	3	-	4	329	4	0	337	-	3	0	3	0	6	-	624
% Buses and Single-Unit Trucks	3.0%	2.6%	6.4%	0%	2.6%	-	2.7%	33.3%	0%	0%	1.4%	-	1.5%	3.0%	1.9%	0%	3.0%	-	1.1%	0%	5.7%	0%	1.8%	-	2.8%
Pedestrians	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	-	2
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

SR 747 & Grandin Ridge Dr/Logsdons Meadow Dr - TMC

Thu Jun 16, 2022

Full Length (7 AM-7 PM)

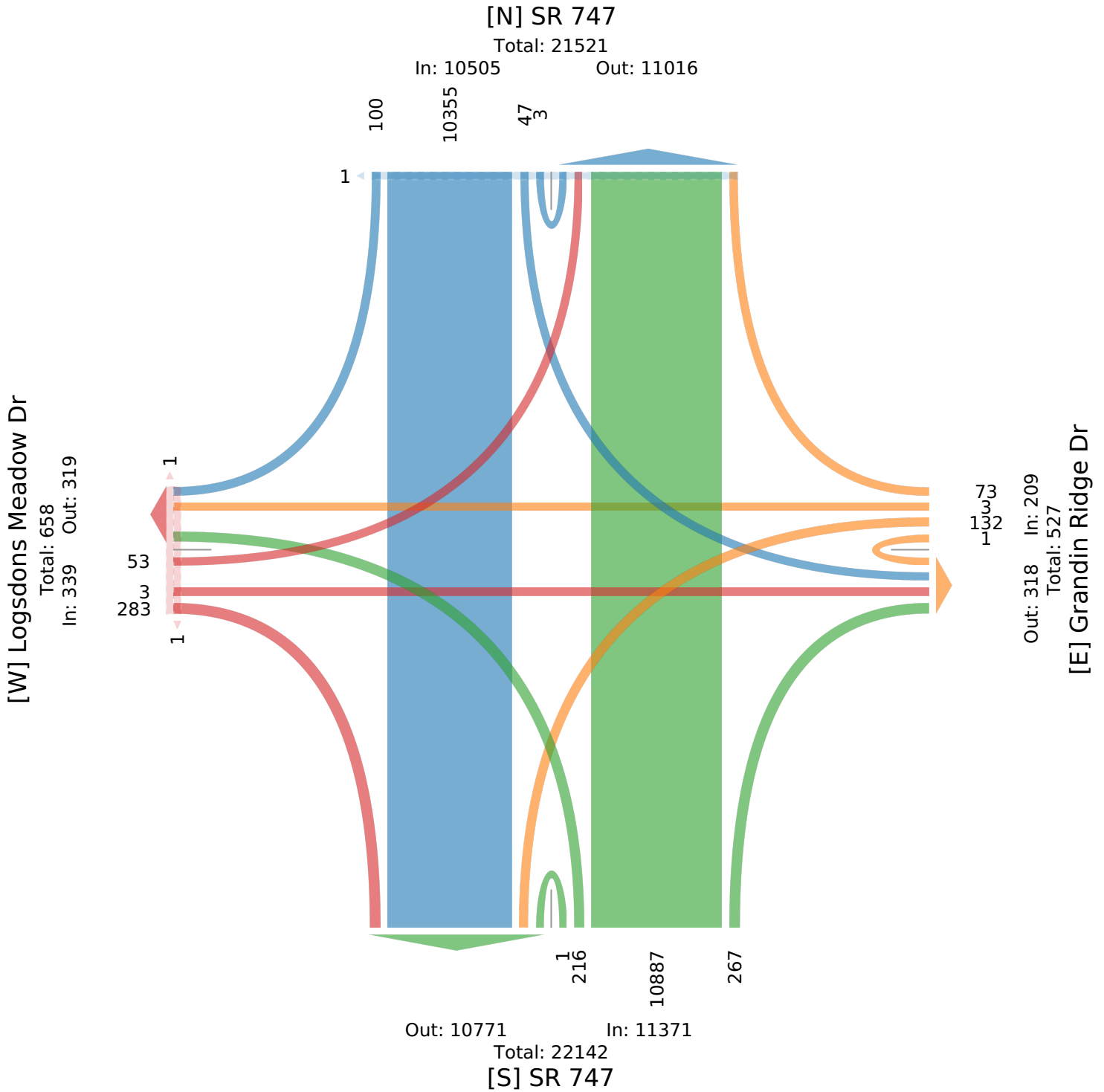
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964460, Location: 39.383898, -84.454347



Provided by: Burgess & Niple
5085 Reed Rd, Columbus, OH, 43220, US



SR 747 & Grandin Ridge Dr/Logsdons Meadow Dr - TMC

Thu Jun 16, 2022

AM Peak (7:15 AM - 8:15 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964460, Location: 39.383898, -84.454347



Provided by: Burgess & Niple
5085 Reed Rd, Columbus, OH, 43220, US

Leg Direction	SR 747 Southbound						Grandin Ridge Dr Westbound						SR 747 Northbound						Logsdons Meadow Dr Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2022-06-16 7:15AM	2	351	0	0	353	0	1	0	4	0	5	0	2	127	1	0	130	0	13	0	0	0	13	0	501
7:30AM	0	347	0	0	347	0	1	1	1	0	3	0	0	131	0	0	131	0	9	0	1	0	10	0	491
7:45AM	2	318	0	0	320	0	2	0	1	0	3	0	3	133	2	0	138	0	6	0	1	0	7	0	468
8:00AM	0	317	0	0	317	0	1	0	3	0	4	0	3	143	2	0	148	0	9	0	1	0	10	0	479
Total	4	1333	0	0	1337	0	5	1	9	0	15	0	8	534	5	0	547	0	37	0	3	0	40	0	1939
% Approach	0.3%	99.7%	0%	0%	-	-	33.3%	6.7%	60.0%	0%	-	-	1.5%	97.6%	0.9%	0%	-	-	92.5%	0%	7.5%	0%	-	-	-
% Total	0.2%	68.7%	0%	0%	69.0%	-	0.3%	0.1%	0.5%	0%	0.8%	-	0.4%	27.5%	0.3%	0%	28.2%	-	1.9%	0%	0.2%	0%	2.1%	-	-
PHF	0.500	0.949	-	-	0.947	-	0.625	0.250	0.563	-	0.750	-	0.667	0.934	0.625	-	0.924	-	0.712	-	0.750	-	0.769	-	0.968
Lights	4	1285	0	0	1289	-	5	0	9	0	14	-	6	490	4	0	500	-	36	0	2	0	38	-	1841
% Lights	100%	96.4%	0%	0%	96.4%	-	100%	0%	100%	0%	93.3%	-	75.0%	91.8%	80.0%	0%	91.4%	-	97.3%	0%	66.7%	0%	95.0%	-	94.9%
Articulated Trucks	0	18	0	0	18	-	0	0	0	0	0	-	0	14	0	0	14	-	0	0	0	0	0	-	32
% Articulated Trucks	0%	1.4%	0%	0%	1.3%	-	0%	0%	0%	0%	0%	-	0%	2.6%	0%	0%	2.6%	-	0%	0%	0%	0%	0%	-	1.7%
Buses and Single-Unit Trucks	0	30	0	0	30	-	0	1	0	0	1	-	2	30	1	0	33	-	1	0	1	0	2	-	66
% Buses and Single-Unit Trucks	0%	2.3%	0%	0%	2.2%	-	0%	100%	0%	0%	6.7%	-	25.0%	5.6%	20.0%	0%	6.0%	-	2.7%	0%	33.3%	0%	5.0%	-	3.4%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

SR 747 & Grandin Ridge Dr/Logsdons Meadow Dr - TMC

Thu Jun 16, 2022

AM Peak (7:15 AM - 8:15 AM)

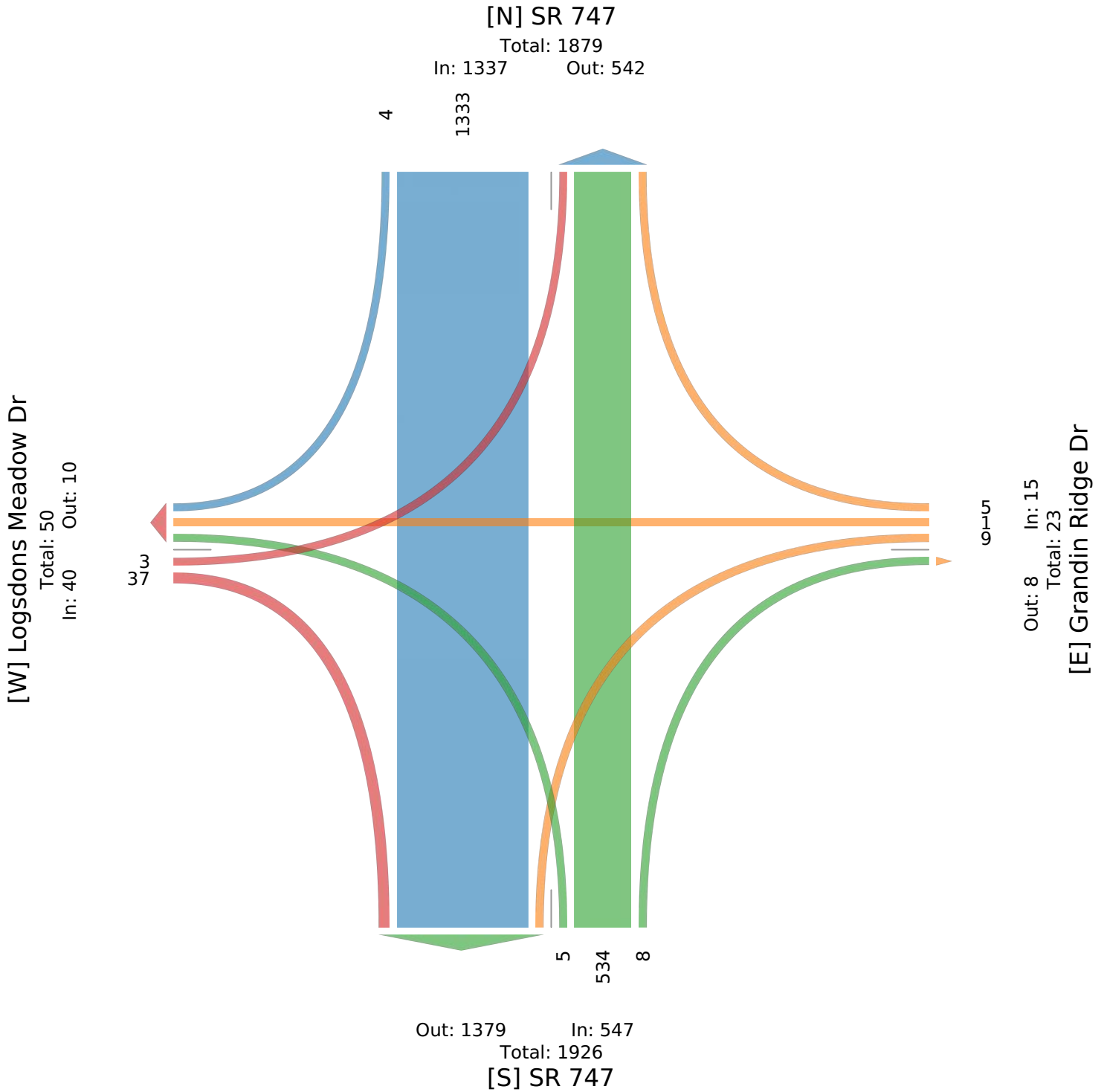
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964460, Location: 39.383898, -84.454347



Provided by: Burgess & Niple
5085 Reed Rd, Columbus, OH, 43220, US



SR 747 & Grandin Ridge Dr/Logsdons Meadow Dr - TMC

Thu Jun 16, 2022

Midday Peak (12 PM - 1 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964460, Location: 39.383898, -84.454347



Provided by: Burgess & Niple
5085 Reed Rd, Columbus, OH, 43220, US

Leg Direction	SR 747 Southbound						Grandin Ridge Dr Westbound						SR 747 Northbound						Logsdons Meadow Dr Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2022-06-16 12:00PM	1	181	0	0	182	0	1	1	2	0	4	0	7	200	3	0	210	0	3	0	2	0	5	2	401
12:15PM	3	184	0	0	187	0	0	0	2	0	2	0	6	221	9	0	236	0	10	0	0	0	10	0	435
12:30PM	0	210	2	0	212	0	1	0	4	0	5	0	7	196	3	0	206	0	5	0	1	0	6	0	429
12:45PM	3	219	1	1	224	0	0	0	5	0	5	0	5	224	2	0	231	0	4	0	1	0	5	0	465
Total	7	794	3	1	805	0	2	1	13	0	16	0	25	841	17	0	883	0	22	0	4	0	26	2	1730
% Approach	0.9%	98.6%	0.4%	0.1%	-	-	12.5%	6.3%	81.3%	0%	-	-	2.8%	95.2%	1.9%	0%	-	-	84.6%	0%	15.4%	0%	-	-	-
% Total	0.4%	45.9%	0.2%	0.1%	46.5%	-	0.1%	0.1%	0.8%	0%	0.9%	-	1.4%	48.6%	1.0%	0%	51.0%	-	1.3%	0%	0.2%	0%	1.5%	-	-
PHF	0.583	0.906	0.375	0.250	0.898	-	0.500	0.250	0.650	-	0.800	-	0.893	0.939	0.472	-	0.935	-	0.550	-	0.500	-	0.650	-	0.930
Lights	7	757	3	1	768	-	1	1	13	0	15	-	25	794	17	0	836	-	22	0	4	0	26	-	1645
% Lights	100%	95.3%	100%	100%	95.4%	-	50.0%	100%	100%	0%	93.8%	-	100%	94.4%	100%	0%	94.7%	-	100%	0%	100%	0%	100%	-	95.1%
Articulated Trucks	0	12	0	0	12	-	0	0	0	0	0	-	0	16	0	0	16	-	0	0	0	0	0	-	28
% Articulated Trucks	0%	1.5%	0%	0%	1.5%	-	0%	0%	0%	0%	0%	-	0%	1.9%	0%	0%	1.8%	-	0%	0%	0%	0%	0%	-	1.6%
Buses and Single-Unit Trucks	0	25	0	0	25	-	1	0	0	0	1	-	0	31	0	0	31	-	0	0	0	0	0	-	57
% Buses and Single-Unit Trucks	0%	3.1%	0%	0%	3.1%	-	50.0%	0%	0%	0%	6.3%	-	0%	3.7%	0%	0%	3.5%	-	0%	0%	0%	0%	0%	-	3.3%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	2	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-100%	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

SR 747 & Grandin Ridge Dr/Logsdons Meadow Dr - TMC

Thu Jun 16, 2022

Midday Peak (12 PM - 1 PM)

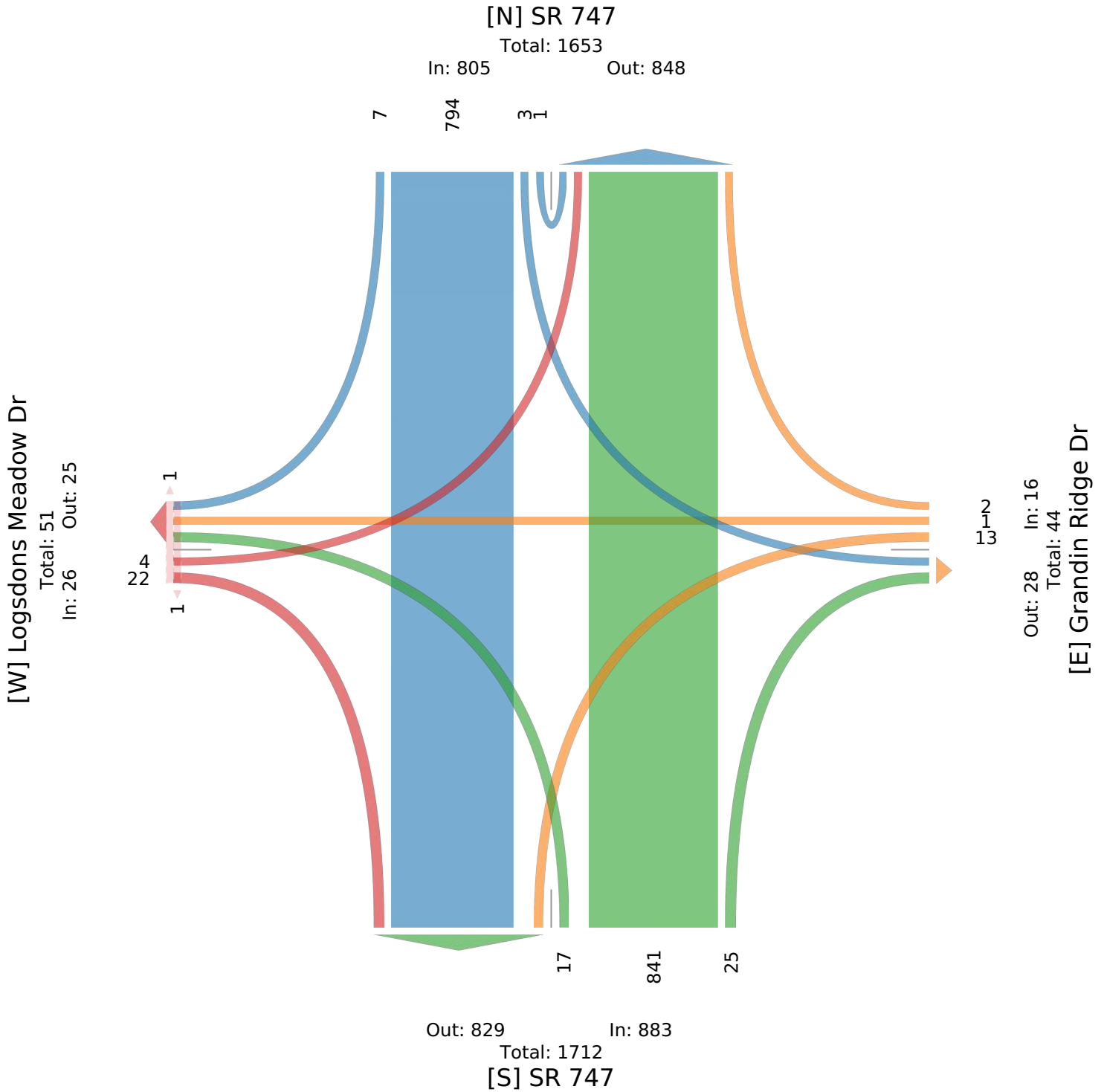
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964460, Location: 39.383898, -84.454347



Provided by: Burgess & Niple
5085 Reed Rd, Columbus, OH, 43220, US



SR 747 & Grandin Ridge Dr/Logsdons Meadow Dr - TMC

Thu Jun 16, 2022

PM Peak (5 PM - 6 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964460, Location: 39.383898, -84.454347



Provided by: Burgess & Niple

5085 Reed Rd, Columbus, OH, 43220, US

Leg Direction	SR 747 Southbound						Grandin Ridge Dr Westbound						SR 747 Northbound						Logsdons Meadow Dr Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2022-06-16 5:00PM	5	235	2	0	242	0	0	0	3	0	3	0	7	379	4	0	390	0	8	0	0	0	8	0	643
5:15PM	3	232	1	0	236	0	2	0	1	0	3	0	5	355	13	0	373	0	5	0	2	0	7	0	619
5:30PM	7	213	1	0	221	0	1	0	0	0	1	0	15	353	12	0	380	0	10	0	0	0	10	0	612
5:45PM	4	209	2	0	215	0	5	0	3	0	8	0	11	363	8	0	382	0	11	0	2	0	13	0	618
Total	19	889	6	0	914	0	8	0	7	0	15	0	38	1450	37	0	1525	0	34	0	4	0	38	0	2492
% Approach	2.1%	97.3%	0.7%	0%	-	-	53.3%	0%	46.7%	0%	-	-	2.5%	95.1%	2.4%	0%	-	-	89.5%	0%	10.5%	0%	-	-	-
% Total	0.8%	35.7%	0.2%	0%	36.7%	-	0.3%	0%	0.3%	0%	0.6%	-	1.5%	58.2%	1.5%	0%	61.2%	-	1.4%	0%	0.2%	0%	1.5%	-	-
PHF	0.679	0.946	0.750	-	0.944	-	0.400	-	0.583	-	0.469	-	0.633	0.956	0.712	-	0.978	-	0.773	-	0.500	-	0.731	-	0.969
Lights	19	870	6	0	895	-	8	0	7	0	15	-	38	1436	37	0	1511	-	32	0	4	0	36	-	2457
% Lights	100%	97.9%	100%	0%	97.9%	-	100%	0%	100%	0%	100%	-	100%	99.0%	100%	0%	99.1%	-	94.1%	0%	100%	0%	94.7%	-	98.6%
Articulated Trucks	0	3	0	0	3	-	0	0	0	0	0	-	0	3	0	0	3	-	2	0	0	0	2	-	8
% Articulated Trucks	0%	0.3%	0%	0%	0.3%	-	0%	0%	0%	0%	0%	-	0%	0.2%	0%	0%	0.2%	-	5.9%	0%	0%	0%	5.3%	-	0.3%
Buses and Single-Unit Trucks	0	16	0	0	16	-	0	0	0	0	0	-	0	11	0	0	11	-	0	0	0	0	0	-	27
% Buses and Single-Unit Trucks	0%	1.8%	0%	0%	1.8%	-	0%	0%	0%	0%	0%	-	0%	0.8%	0%	0%	0.7%	-	0%	0%	0%	0%	0%	-	1.1%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

SR 747 & Grandin Ridge Dr/Logsdons Meadow Dr - TMC

Thu Jun 16, 2022

PM Peak (5 PM - 6 PM) - Overall Peak Hour

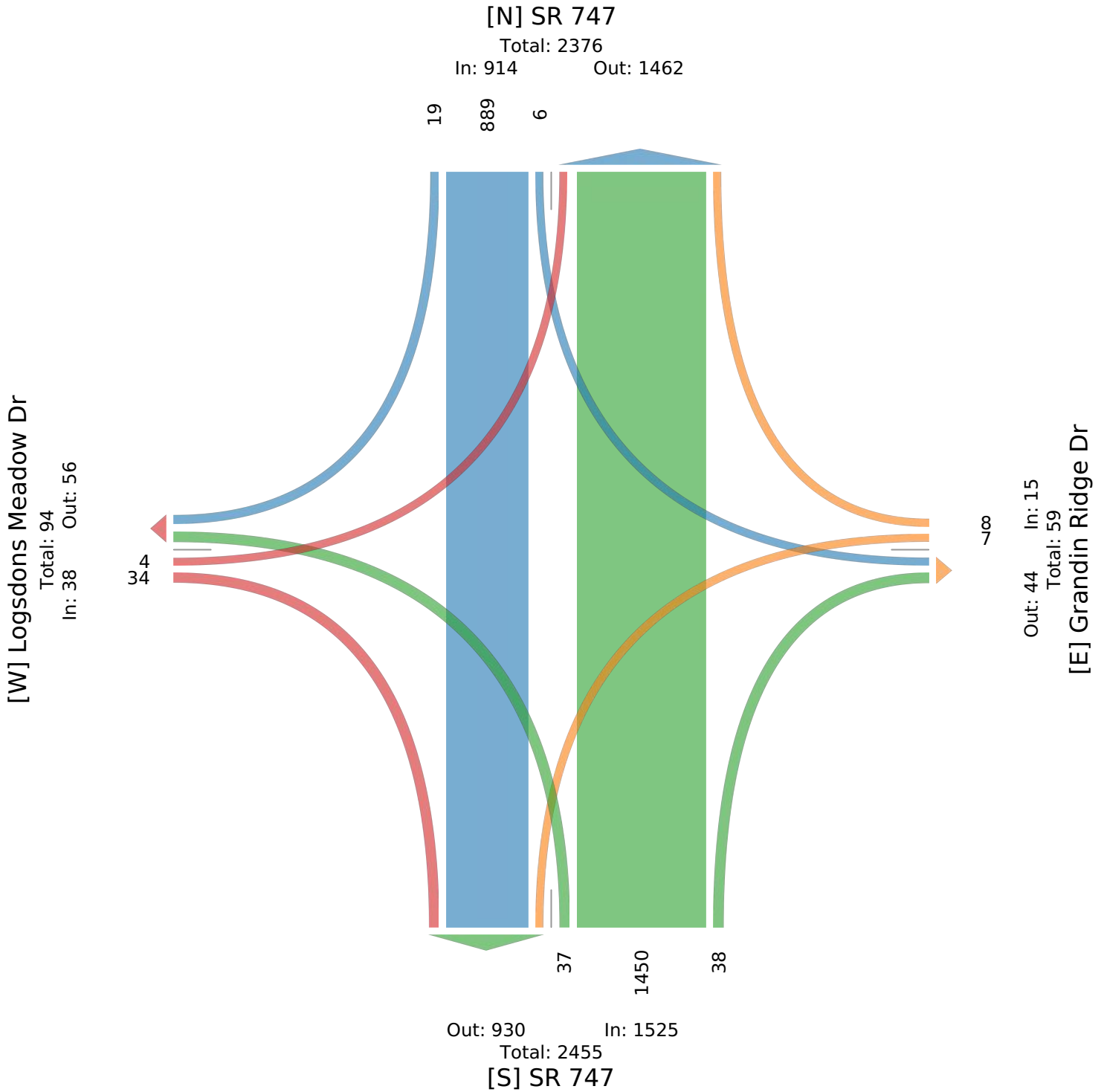
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964460, Location: 39.383898, -84.454347



Provided by: Burgess & Niple
5085 Reed Rd, Columbus, OH, 43220, US



SR 747 & SR 129 EB Ramps - TMC

Thu Jun 16, 2022

Full Length (7 AM-7 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964458, Location: 39.380497, -84.454724



Provided by: Burgess & Niple

5085 Reed Rd, Columbus, OH, 43220, US

Leg Direction	SR 747 Southbound						SR 129 EB On-ramp Westbound						SR 747 Northbound						SR 129 EB Off-ramp Eastbound						Int
	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	
2022-06-16 7:00AM	0	175	157	0	332	0	0	0	0	0	0	67	56	0	0	123	0	56	0	8	0	64	0	519	
7:15AM	0	239	151	0	390	0	0	0	0	0	0	79	92	0	0	171	0	58	0	8	0	66	0	627	
7:30AM	0	235	162	0	397	0	0	0	0	0	0	72	89	0	0	161	0	72	0	10	0	82	0	640	
7:45AM	0	228	143	0	371	0	0	0	0	0	0	64	118	0	0	182	0	47	0	9	0	56	0	609	
Hourly Total	0	877	613	0	1490	0	0	0	0	0	0	282	355	0	0	637	0	233	0	35	0	268	0	2395	
8:00AM	0	208	140	0	348	0	0	0	0	0	0	60	93	0	0	153	0	42	0	12	0	54	0	555	
8:15AM	0	181	162	1	344	0	0	0	0	0	0	66	124	0	0	190	0	38	0	7	0	45	0	579	
8:30AM	0	180	140	0	320	0	0	0	0	0	0	86	105	0	0	191	0	35	0	14	0	49	0	560	
8:45AM	0	201	144	0	345	0	0	0	0	0	0	70	122	0	0	192	0	59	0	14	0	73	0	610	
Hourly Total	0	770	586	1	1357	0	0	0	0	0	0	282	444	0	0	726	0	174	0	47	0	221	0	2304	
9:00AM	0	142	78	0	220	0	0	0	0	0	0	49	104	0	0	153	0	35	0	12	0	47	0	420	
9:15AM	0	139	89	0	228	0	0	0	0	0	0	55	118	0	0	173	0	42	0	13	0	55	0	456	
9:30AM	0	141	90	0	231	0	0	0	0	0	0	61	121	0	0	182	0	51	0	8	0	59	0	472	
9:45AM	0	137	96	0	233	0	0	0	0	0	0	57	98	0	0	155	0	43	0	12	0	55	0	443	
Hourly Total	0	559	353	0	912	0	0	0	0	0	0	222	441	0	0	663	0	171	0	45	0	216	0	1791	
10:00AM	0	119	101	0	220	0	0	0	0	0	0	49	132	0	0	181	0	43	0	8	0	51	0	452	
10:15AM	0	121	83	0	204	0	0	0	0	0	0	44	123	0	0	167	0	40	0	10	0	50	0	421	
10:30AM	0	120	93	0	213	0	0	0	0	0	0	56	104	0	0	160	0	29	0	11	0	40	0	413	
10:45AM	0	137	79	0	216	0	0	0	0	0	0	52	116	0	0	168	0	29	0	17	0	46	0	430	
Hourly Total	0	497	356	0	853	0	0	0	0	0	0	201	475	0	0	676	0	141	0	46	0	187	0	1716	
11:00AM	0	150	82	0	232	0	0	0	0	0	0	27	122	0	0	149	0	46	0	7	0	53	0	434	
11:15AM	0	126	85	0	211	0	0	0	0	0	0	50	133	0	0	183	0	37	0	20	0	57	0	451	
11:30AM	0	154	89	0	243	0	0	0	0	0	0	65	135	0	0	200	0	33	0	12	0	45	0	488	
11:45AM	0	155	107	0	262	0	0	0	0	0	0	59	134	0	0	193	0	48	0	11	0	59	0	514	
Hourly Total	0	585	363	0	948	0	0	0	0	0	0	201	524	0	0	725	0	164	0	50	0	214	0	1887	
12:00PM	0	145	69	0	214	0	0	0	0	0	0	54	150	0	0	204	0	34	0	13	0	47	0	465	
12:15PM	0	142	83	0	225	0	0	0	0	0	0	49	150	0	0	199	0	33	0	10	0	43	0	467	
12:30PM	0	151	84	0	235	0	0	0	0	0	0	49	171	0	0	220	0	31	0	9	0	40	0	495	
12:45PM	0	166	94	0	260	0	0	0	0	0	0	48	147	0	0	195	0	39	0	12	0	51	0	506	
Hourly Total	0	604	330	0	934	0	0	0	0	0	0	200	618	0	0	818	0	137	0	44	0	181	0	1933	
1:00PM	0	133	76	0	209	0	0	0	0	0	0	42	173	0	0	215	0	46	0	6	0	52	0	476	
1:15PM	0	125	79	0	204	0	0	0	0	0	0	28	143	0	0	171	0	49	0	14	0	63	0	438	
1:30PM	0	133	84	0	217	0	0	0	0	0	0	40	154	0	0	194	0	37	0	9	0	46	0	457	
1:45PM	0	147	84	0	231	0	0	0	0	0	0	40	170	0	0	210	0	49	0	14	0	63	0	504	
Hourly Total	0	538	323	0	861	0	0	0	0	0	0	150	640	0	0	790	0	181	0	43	0	224	0	1875	
2:00PM	0	129	83	0	212	0	0	0	0	0	0	44	173	0	0	217	0	30	0	8	0	38	0	467	
2:15PM	0	132	70	1	203	0	0	0	0	0	0	42	152	0	0	194	0	48	0	20	0	68	0	465	
2:30PM	0	143	76	0	219	0	0	0	0	0	0	55	182	0	0	237	0	28	0	7	0	35	0	491	
2:45PM	0	158	86	0	244	0	0	0	0	0	0	54	212	0	0	266	0	35	0	13	0	48	0	558	
Hourly Total	0	562	315	1	878	0	0	0	0	0	0	195	719	0	0	914	0	141	0	48	0	189	0	1981	
3:00PM	0	145	80	0	225	0	0	0	0	0	0	62	204	0	0	266	0	26	0	16	0	42	0	533	
3:15PM	0	125	84	0	209	0	0	0	0	0	0	66	223	0	0	289	0	37	0	16	0	53	0	551	
3:30PM	0	140	97	0	237	0	0	0	0	0	0	66	222	0	0	288	0	34	0	12	0	46	0	571	
3:45PM	0	156	72	0	228	0	0	0	0	0	0	71	222	0	0	293	0	34	0	24	0	58	0	579	
Hourly Total	0	566	333	0	899	0	0	0	0	0	0	265	871	0	0	1136	0	131	0	68	0	199	0	2234	
4:00PM	0	143	82	0	225	0	0	0	0	0	0	71	208	0	0	279	0	44	0	20	0	64	0	568	
4:15PM	0	191	76	0	267	0	0	0	0	0	0	88	255	0	0	343	0	49	0	18	0	67	0	677	
4:30PM	0	198	90	0	288	0	0	0	0	0	0	68	269	0	0	337	0	44	0	19	0	63	0	688	
4:45PM	0	149	102	0	251	0	0	0	0	0	0	82	239	0	0	321	0	42	0	23	0	65	0	637	
Hourly Total	0	681	350	0	1031	0	0	0	0	0	0	309	971	0	0	1280	0	179	0	80	0	259	0	2570	
5:00PM	0	196	101	0	297	0	0	0	0	0	0	80	241	0	0	321	0	28	0	18	0	46	0	664	
5:15PM	0	196	95	0	291	0	0	0	0	0	0	84	244	0	0	328	0	37	0	20	0	57	0	676	
5:30PM	0	189	88	0	277	0	0	0	0	0	0	81	273	0	0	354	0	40	1	16	0	57	0	688	
5:45PM	0	170	106	0	276	0	0	0	0	0	0	76	238	0	0	314	0	34	0	14	0	48	0	638	

Leg Direction	SR 747 Southbound						SR 129 EB On-ramp Westbound						SR 747 Northbound						SR 129 EB Off-ramp Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
Hourly Total	0	751	390	0	1141	0	0	0	0	0	0	0	321	996	0	0	1317	0	139	1	68	0	208	0	2666
6:00PM	0	126	86	0	212	0	0	0	0	0	0	0	73	207	0	0	280	0	27	0	24	0	51	0	543
6:15PM	0	108	91	0	199	0	0	0	0	0	0	0	68	182	0	0	250	0	34	0	15	0	49	0	498
6:30PM	0	126	66	0	192	0	0	0	0	0	0	0	56	195	0	0	251	0	32	0	9	0	41	0	484
6:45PM	0	151	78	0	229	0	0	0	0	0	0	0	44	155	0	0	199	0	18	0	7	0	25	0	453
Hourly Total	0	511	321	0	832	0	0	0	0	0	0	0	241	739	0	0	980	0	111	0	55	0	166	0	1978
Total	0	7501	4633	2	12136	0	0	0	0	0	0	0	2869	7793	0	0	10662	0	1902	1	629	0	2532	0	25330
% Approach	0%	61.8%	38.2%	0%	-	-	0%	0%	0%	0%	-	-	26.9%	73.1%	0%	0%	-	-	75.1%	0%	24.8%	0%	-	-	-
% Total	0%	29.6%	18.3%	0%	47.9%	-	0%	0%	0%	0%	0%	-	11.3%	30.8%	0%	0%	42.1%	-	7.5%	0%	2.5%	0%	10.0%	-	-
Lights	0	7160	4479	2	11641	-	0	0	0	0	0	-	2737	7463	0	0	10200	-	1845	1	614	0	2460	-	24301
% Lights	0%	95.5%	96.7%	100%	95.9%	-	0%	0%	0%	0%	-	-	95.4%	95.8%	0%	0%	95.7%	-	97.0%	100%	97.6%	0%	97.2%	-	95.9%
Articulated Trucks	0	117	48	0	165	-	0	0	0	0	0	-	66	82	0	0	148	-	25	0	3	0	28	-	341
% Articulated Trucks	0%	1.6%	1.0%	0%	1.4%	-	0%	0%	0%	0%	-	-	2.3%	1.1%	0%	0%	1.4%	-	1.3%	0%	0.5%	0%	1.1%	-	1.3%
Buses and Single-Unit Trucks	0	224	106	0	330	-	0	0	0	0	0	-	66	248	0	0	314	-	32	0	12	0	44	-	688
% Buses and Single-Unit Trucks	0%	3.0%	2.3%	0%	2.7%	-	0%	0%	0%	0%	-	-	2.3%	3.2%	0%	0%	2.9%	-	1.7%	0%	1.9%	0%	1.7%	-	2.7%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

SR 747 & SR 129 EB Ramps - TMC

Thu Jun 16, 2022

Full Length (7 AM-7 PM)

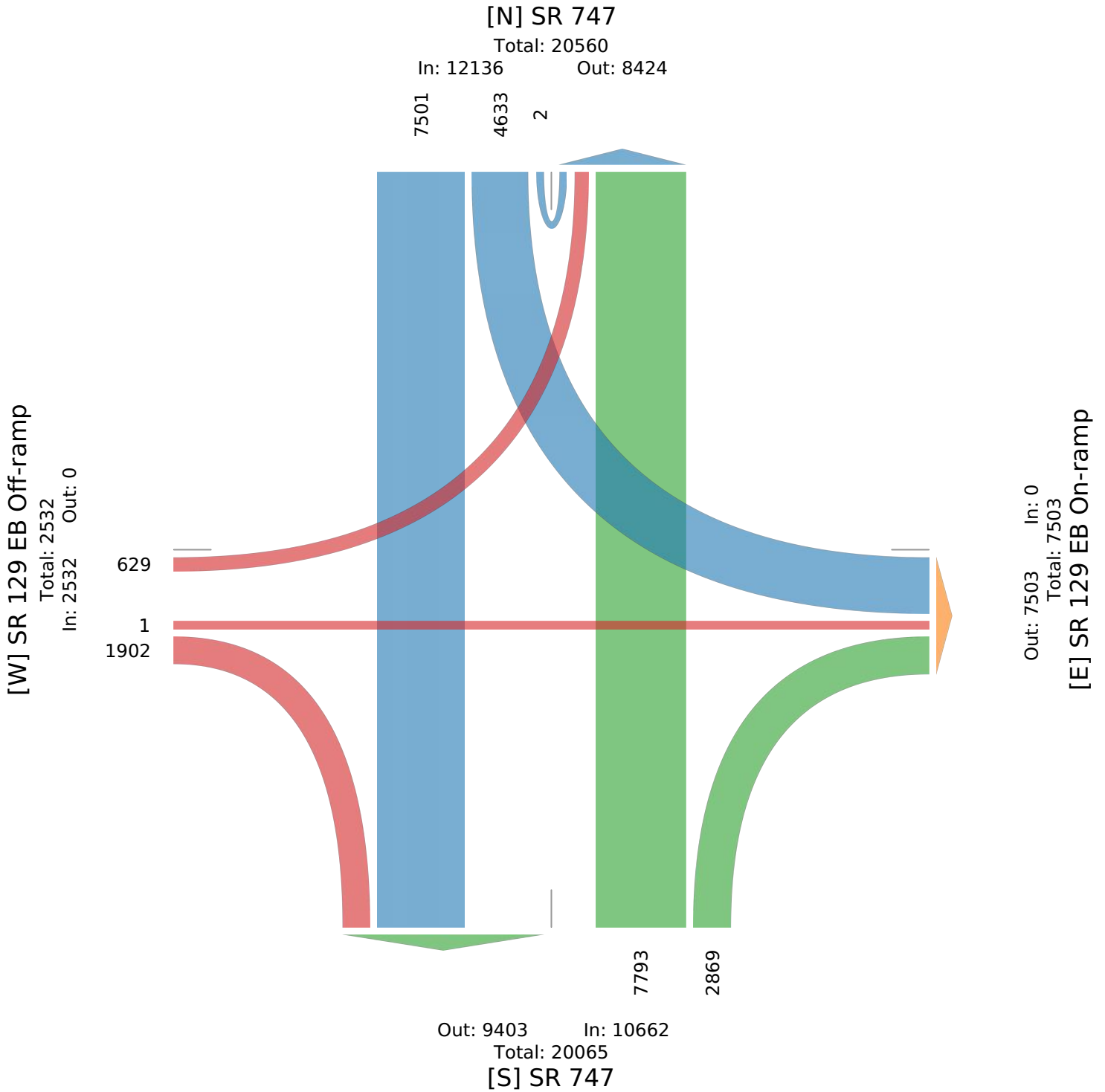
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964458, Location: 39.380497, -84.454724



Provided by: Burgess & Niple
5085 Reed Rd, Columbus, OH, 43220, US



SR 747 & SR 129 EB Ramps - TMC

Thu Jun 16, 2022

AM Peak (7:15 AM - 8:15 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964458, Location: 39.380497, -84.454724



Provided by: Burgess & Niple

5085 Reed Rd, Columbus, OH, 43220, US

Leg Direction	SR 747 Southbound						SR 129 EB On-ramp Westbound						SR 747 Northbound						SR 129 EB Off-ramp Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2022-06-16 7:15AM	0	239	151	0	390	0	0	0	0	0	0	0	79	92	0	0	171	0	58	0	8	0	66	0	627
7:30AM	0	235	162	0	397	0	0	0	0	0	0	0	72	89	0	0	161	0	72	0	10	0	82	0	640
7:45AM	0	228	143	0	371	0	0	0	0	0	0	0	64	118	0	0	182	0	47	0	9	0	56	0	609
8:00AM	0	208	140	0	348	0	0	0	0	0	0	0	60	93	0	0	153	0	42	0	12	0	54	0	555
Total	0	910	596	0	1506	0	0	0	0	0	0	0	275	392	0	0	667	0	219	0	39	0	258	0	2431
% Approach	0%	60.4%	39.6%	0%	-	-	0%	0%	0%	0%	-	-	41.2%	58.8%	0%	0%	-	-	84.9%	0%	15.1%	0%	-	-	-
% Total	0%	37.4%	24.5%	0%	61.9%	-	0%	0%	0%	0%	0%	-	11.3%	16.1%	0%	0%	27.4%	-	9.0%	0%	1.6%	0%	10.6%	-	-
PHF	-	0.952	0.920	-	0.948	-	-	-	-	-	-	-	0.870	0.831	-	-	0.916	-	0.760	-	0.813	-	0.787	-	0.950
Lights	0	872	580	0	1452	-	0	0	0	0	0	-	254	362	0	0	616	-	217	0	36	0	253	-	2321
% Lights	0%	95.8%	97.3%	0%	96.4%	-	0%	0%	0%	0%	-	-	92.4%	92.3%	0%	0%	92.4%	-	99.1%	0%	92.3%	0%	98.1%	-	95.5%
Articulated Trucks	0	10	4	0	14	-	0	0	0	0	0	-	8	5	0	0	13	-	0	0	1	0	1	-	28
% Articulated Trucks	0%	1.1%	0.7%	0%	0.9%	-	0%	0%	0%	0%	-	-	2.9%	1.3%	0%	0%	1.9%	-	0%	0%	2.6%	0%	0.4%	-	1.2%
Buses and Single-Unit Trucks	0	28	12	0	40	-	0	0	0	0	0	-	13	25	0	0	38	-	2	0	2	0	4	-	82
% Buses and Single-Unit Trucks	0%	3.1%	2.0%	0%	2.7%	-	0%	0%	0%	0%	-	-	4.7%	6.4%	0%	0%	5.7%	-	0.9%	0%	5.1%	0%	1.6%	-	3.4%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

SR 747 & SR 129 EB Ramps - TMC

Thu Jun 16, 2022

AM Peak (7:15 AM - 8:15 AM)

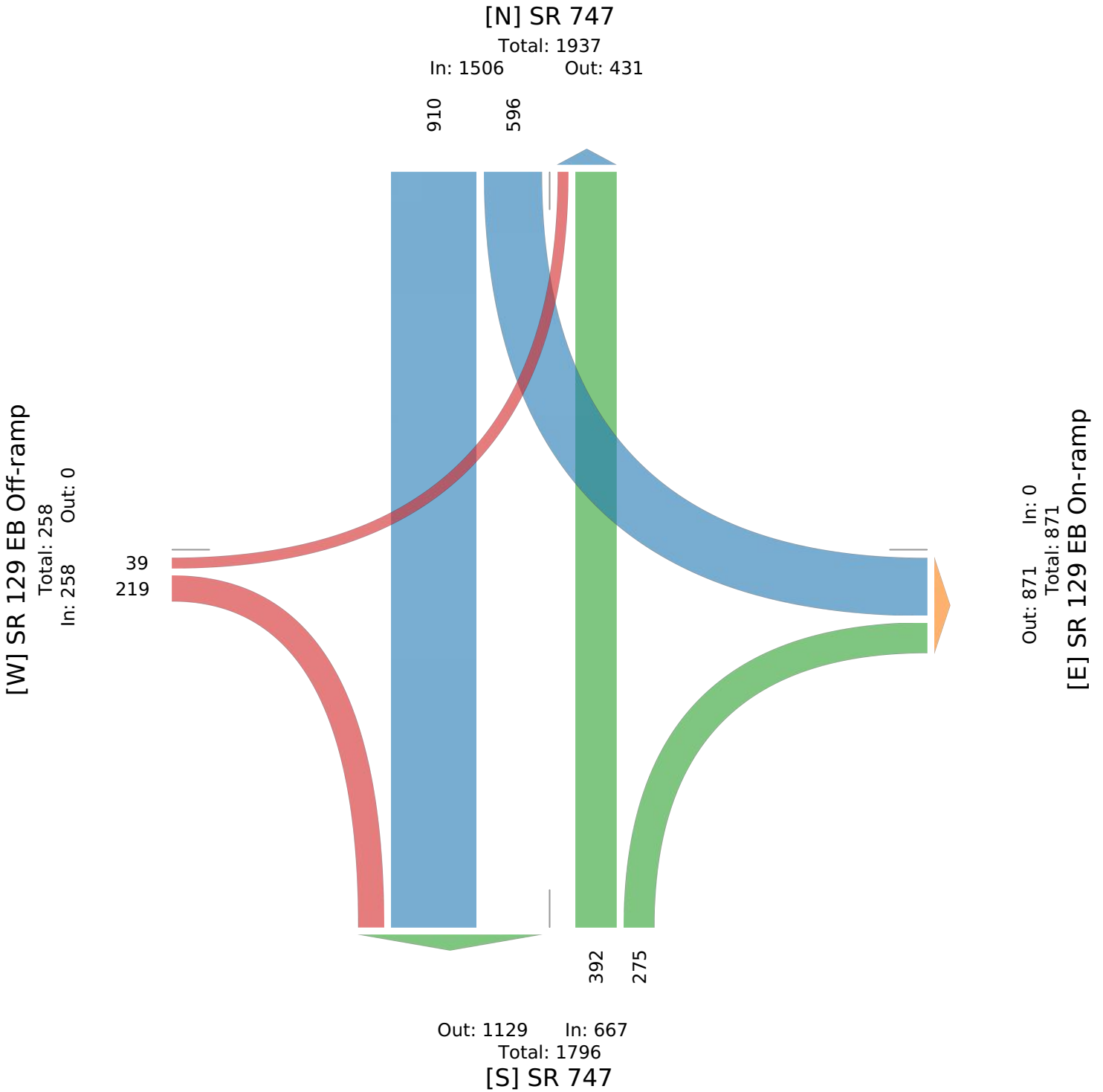
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964458, Location: 39.380497, -84.454724



Provided by: Burgess & Niple
5085 Reed Rd, Columbus, OH, 43220, US



SR 747 & SR 129 EB Ramps - TMC

Thu Jun 16, 2022

Midday Peak (12:15 PM - 1:15 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964458, Location: 39.380497, -84.454724



Provided by: Burgess & Niple

5085 Reed Rd, Columbus, OH, 43220, US

Leg Direction	SR 747 Southbound						SR 129 EB On-ramp Westbound						SR 747 Northbound						SR 129 EB Off-ramp Eastbound						Int
	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	
2022-06-16 12:15PM	0	142	83	0	225	0	0	0	0	0	0	0	49	150	0	0	199	0	33	0	10	0	43	0	467
12:30PM	0	151	84	0	235	0	0	0	0	0	0	0	49	171	0	0	220	0	31	0	9	0	40	0	495
12:45PM	0	166	94	0	260	0	0	0	0	0	0	0	48	147	0	0	195	0	39	0	12	0	51	0	506
1:00PM	0	133	76	0	209	0	0	0	0	0	0	0	42	173	0	0	215	0	46	0	6	0	52	0	476
Total	0	592	337	0	929	0	0	0	0	0	0	0	188	641	0	0	829	0	149	0	37	0	186	0	1944
% Approach	0%	63.7%	36.3%	0%	-	-	0%	0%	0%	0%	-	-	22.7%	77.3%	0%	0%	-	-	80.1%	0%	19.9%	0%	-	-	-
% Total	0%	30.5%	17.3%	0%	47.8%	-	0%	0%	0%	0%	0%	-	9.7%	33.0%	0%	0%	42.6%	-	7.7%	0%	1.9%	0%	9.6%	-	-
PHF	-	0.892	0.896	-	0.893	-	-	-	-	-	-	-	0.959	0.926	-	-	0.942	-	0.810	-	0.771	-	0.894	-	0.960
Lights	0	565	320	0	885	-	0	0	0	0	0	-	174	615	0	0	789	-	139	0	34	0	173	-	1847
% Lights	0%	95.4%	95.0%	0%	95.3%	-	0%	0%	0%	0%	-	-	92.6%	95.9%	0%	0%	95.2%	-	93.3%	0%	91.9%	0%	93.0%	-	95.0%
Articulated Trucks	0	12	8	0	20	-	0	0	0	0	0	-	8	4	0	0	12	-	6	0	0	0	6	-	38
% Articulated Trucks	0%	2.0%	2.4%	0%	2.2%	-	0%	0%	0%	0%	-	-	4.3%	0.6%	0%	0%	1.4%	-	4.0%	0%	0%	0%	3.2%	-	2.0%
Buses and Single-Unit Trucks	0	15	9	0	24	-	0	0	0	0	0	-	6	22	0	0	28	-	4	0	3	0	7	-	59
% Buses and Single-Unit Trucks	0%	2.5%	2.7%	0%	2.6%	-	0%	0%	0%	0%	-	-	3.2%	3.4%	0%	0%	3.4%	-	2.7%	0%	8.1%	0%	3.8%	-	3.0%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

SR 747 & SR 129 EB Ramps - TMC

Thu Jun 16, 2022

Midday Peak (12:15 PM - 1:15 PM)

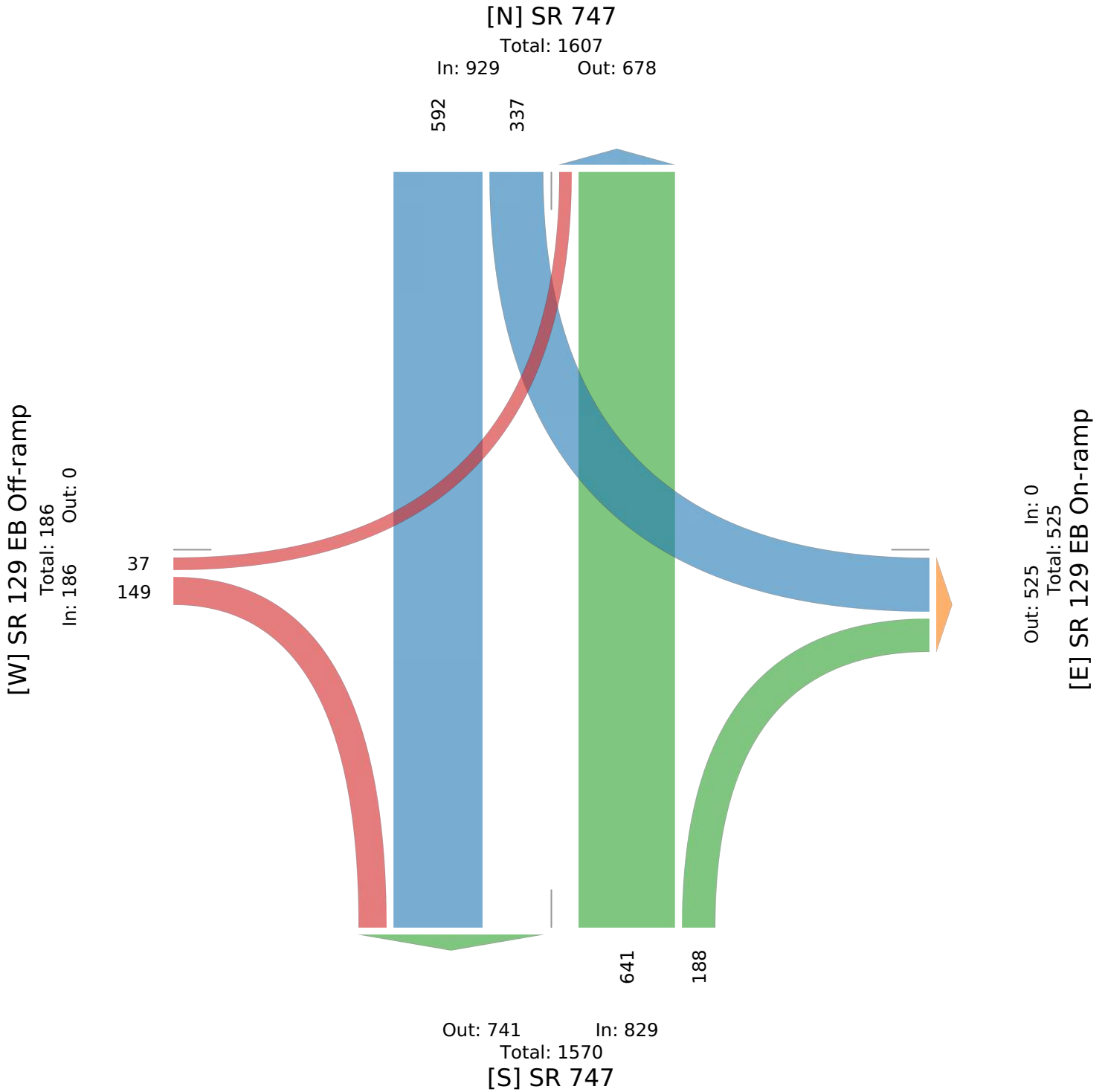
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964458, Location: 39.380497, -84.454724



Provided by: Burgess & Niple
5085 Reed Rd, Columbus, OH, 43220, US



SR 747 & SR 129 EB Ramps - TMC

Thu Jun 16, 2022

PM Peak (4:15 PM - 5:15 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964458, Location: 39.380497, -84.454724



Provided by: Burgess & Niple

5085 Reed Rd, Columbus, OH, 43220, US

Leg Direction	SR 747 Southbound						SR 129 EB On-ramp Westbound						SR 747 Northbound						SR 129 EB Off-ramp Eastbound						Int
	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	
2022-06-16 4:15PM	0	191	76	0	267	0	0	0	0	0	0	0	88	255	0	0	343	0	49	0	18	0	67	0	677
4:30PM	0	198	90	0	288	0	0	0	0	0	0	0	68	269	0	0	337	0	44	0	19	0	63	0	688
4:45PM	0	149	102	0	251	0	0	0	0	0	0	0	82	239	0	0	321	0	42	0	23	0	65	0	637
5:00PM	0	196	101	0	297	0	0	0	0	0	0	0	80	241	0	0	321	0	28	0	18	0	46	0	664
Total	0	734	369	0	1103	0	0	0	0	0	0	0	318	1004	0	0	1322	0	163	0	78	0	241	0	2666
% Approach	0%	66.5%	33.5%	0%	-	-	0%	0%	0%	0%	-	-	24.1%	75.9%	0%	0%	-	-	67.6%	0%	32.4%	0%	-	-	-
% Total	0%	27.5%	13.8%	0%	41.4%	-	0%	0%	0%	0%	0%	-	11.9%	37.7%	0%	0%	49.6%	-	6.1%	0%	2.9%	0%	9.0%	-	-
PHF	-	0.927	0.904	-	0.928	-	-	-	-	-	-	-	0.903	0.933	-	-	0.964	-	0.832	-	0.848	-	0.899	-	0.969
Lights	0	719	359	0	1078	-	0	0	0	0	0	-	313	991	0	0	1304	-	159	0	77	0	236	-	2618
% Lights	0%	98.0%	97.3%	0%	97.7%	-	0%	0%	0%	0%	-	-	98.4%	98.7%	0%	0%	98.6%	-	97.5%	0%	98.7%	0%	97.9%	-	98.2%
Articulated Trucks	0	5	3	0	8	-	0	0	0	0	0	-	4	3	0	0	7	-	3	0	0	0	3	-	18
% Articulated Trucks	0%	0.7%	0.8%	0%	0.7%	-	0%	0%	0%	0%	-	-	1.3%	0.3%	0%	0%	0.5%	-	1.8%	0%	0%	0%	1.2%	-	0.7%
Buses and Single-Unit Trucks	0	10	7	0	17	-	0	0	0	0	0	-	1	10	0	0	11	-	1	0	1	0	2	-	30
% Buses and Single-Unit Trucks	0%	1.4%	1.9%	0%	1.5%	-	0%	0%	0%	0%	-	-	0.3%	1.0%	0%	0%	0.8%	-	0.6%	0%	1.3%	0%	0.8%	-	1.1%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

SR 747 & SR 129 EB Ramps - TMC

Thu Jun 16, 2022

PM Peak (4:15 PM - 5:15 PM) - Overall Peak Hour

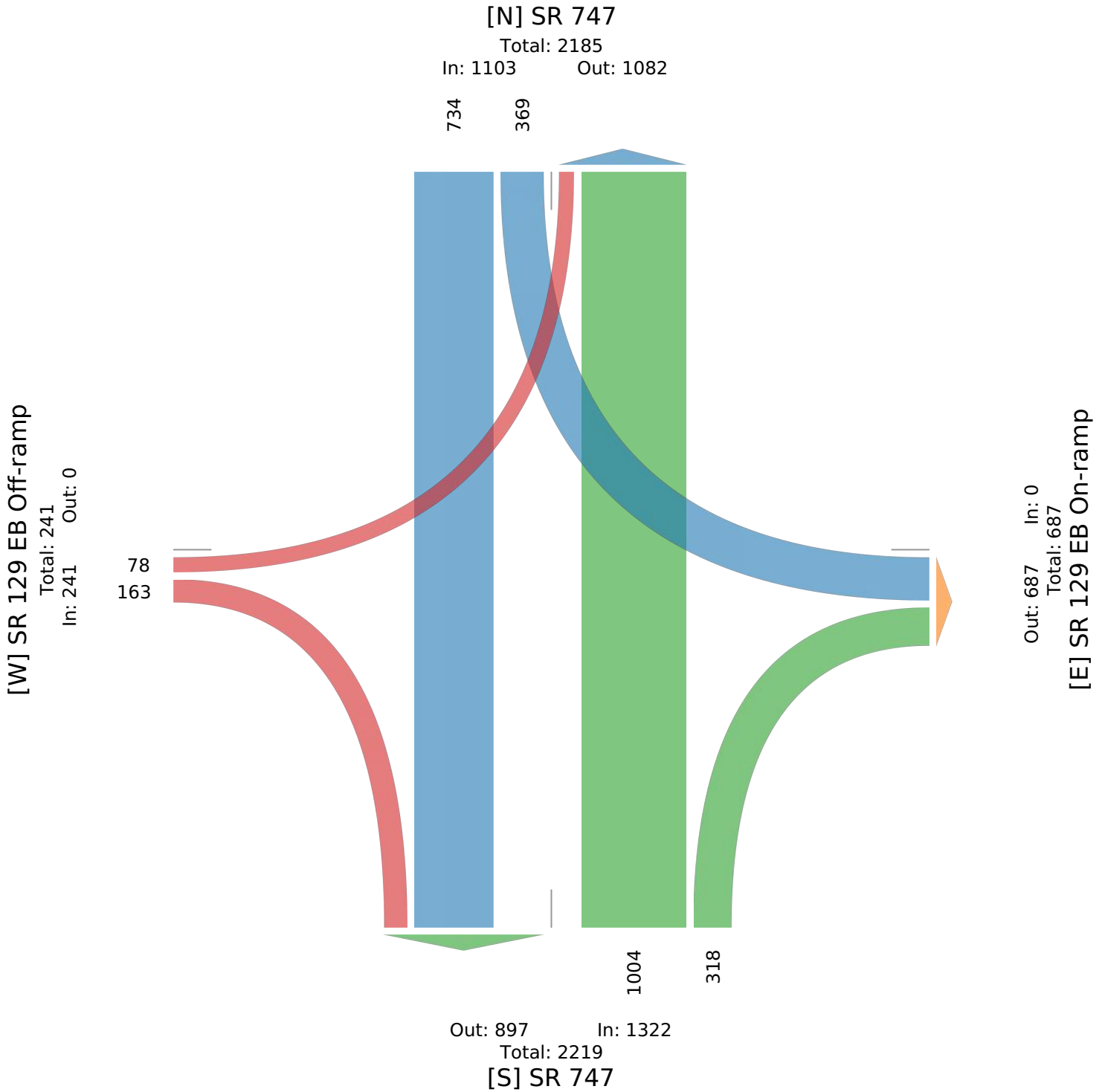
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964458, Location: 39.380497, -84.454724



Provided by: Burgess & Niple
5085 Reed Rd, Columbus, OH, 43220, US



Leg Direction	SR 747 Southbound						SR 129 WB Off-ramp Westbound						SR 747 Northbound						SR 129 WB On-ramp Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
Hourly Total	71	852	0	0	923	0	689	0	286	0	975	0	0	836	228	0	1064	0	0	0	0	0	0	0	2962
6:00PM	14	169	0	0	183	0	139	0	55	0	194	0	0	165	49	0	214	0	0	0	0	0	0	0	591
6:15PM	17	166	0	0	183	0	122	0	41	0	163	0	0	169	44	0	213	0	0	0	0	0	0	0	559
6:30PM	22	169	0	0	191	0	119	0	56	0	175	0	0	152	43	0	195	0	0	0	0	0	0	0	561
6:45PM	14	171	0	0	185	0	117	0	37	0	154	0	0	147	37	0	184	0	0	0	0	0	0	0	523
Hourly Total	67	675	0	0	742	0	497	0	189	0	686	0	0	633	173	0	806	0	0	0	0	0	0	0	2234
Total	824	9754	0	0	10578	0	4933	11	2244	0	7188	0	0	6455	2027	0	8482	0	2	0	0	0	2	0	26250
% Approach	7.8%	92.2%	0%	0%	-	-	68.6%	0.2%	31.2%	0%	-	-	0%	76.1%	23.9%	0%	-	-	100%	0%	0%	0%	-	-	-
% Total	3.1%	37.2%	0%	0%	40.3%	-	18.8%	0%	8.5%	0%	27.4%	-	0%	24.6%	7.7%	0%	32.3%	-	0%	0%	0%	0%	0%	-	-
Lights	800	9362	0	0	10162	-	4763	11	2135	0	6909	-	0	6161	1969	0	8130	-	2	0	0	0	2	-	25203
% Lights	97.1%	96.0%	0%	0%	96.1%	-	96.6%	100%	95.1%	0%	96.1%	-	0%	95.4%	97.1%	0%	95.9%	-	100%	0%	0%	0%	100%	-	96.0%
Articulated Trucks	5	112	0	0	117	-	52	0	56	0	108	-	0	66	17	0	83	-	0	0	0	0	0	-	308
% Articulated Trucks	0.6%	1.1%	0%	0%	1.1%	-	1.1%	0%	2.5%	0%	1.5%	-	0%	1.0%	0.8%	0%	1.0%	-	0%	0%	0%	0%	0%	-	1.2%
Buses and Single-Unit Trucks	19	280	0	0	299	-	118	0	53	0	171	-	0	228	41	0	269	-	0	0	0	0	0	-	739
% Buses and Single-Unit Trucks	2.3%	2.9%	0%	0%	2.8%	-	2.4%	0%	2.4%	0%	2.4%	-	0%	3.5%	2.0%	0%	3.2%	-	0%	0%	0%	0%	0%	-	2.8%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

SR 747 & SR 129 WB Ramps - TMC

Thu Jun 16, 2022

Full Length (7 AM-7 PM)

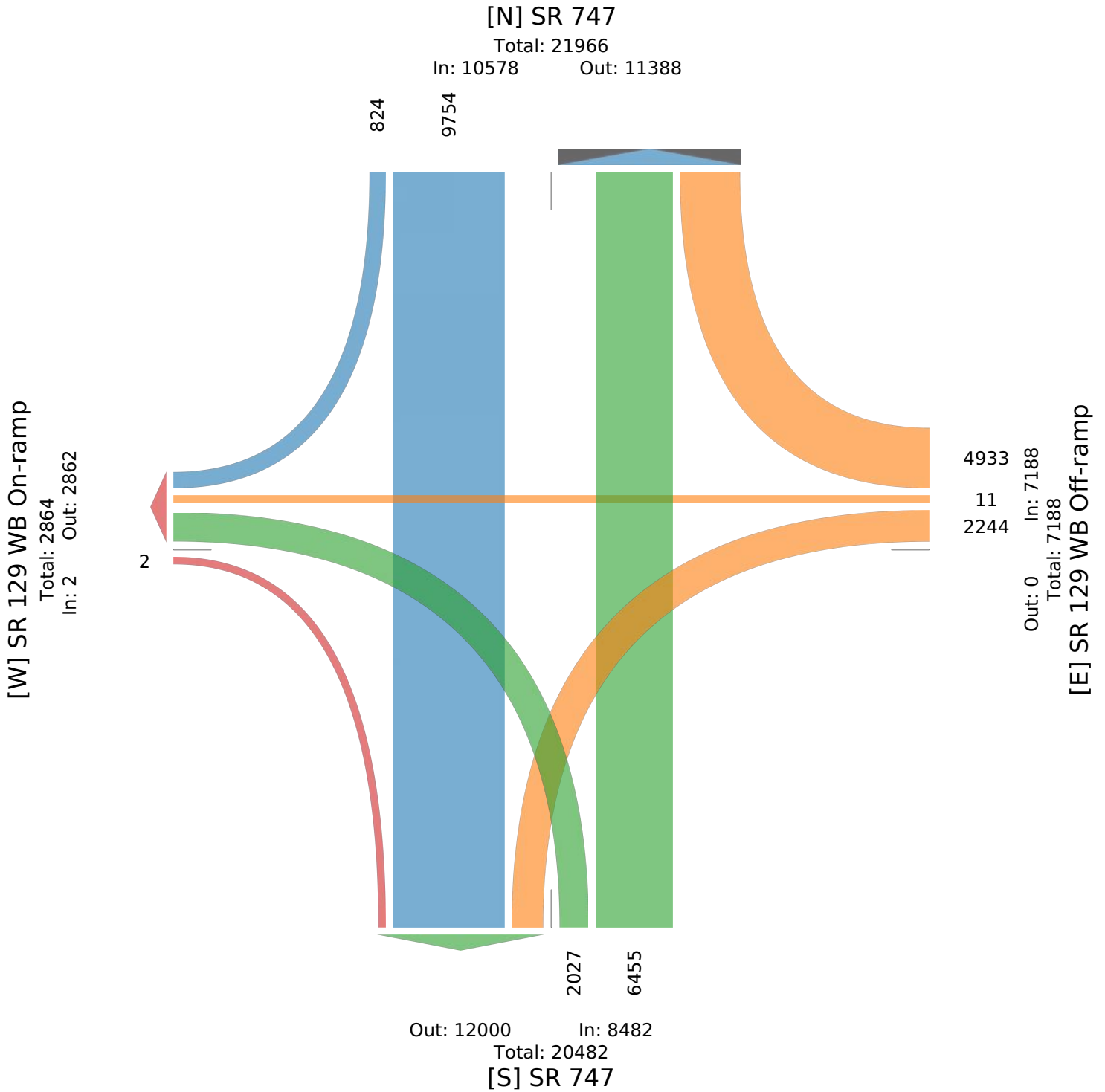
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964459, Location: 39.382545, -84.4545



Provided by: Burgess & Niple
5085 Reed Rd, Columbus, OH, 43220, US



SR 747 & SR 129 WB Ramps - TMC

Thu Jun 16, 2022

AM Peak (7:15 AM - 8:15 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964459, Location: 39.382545, -84.4545



Provided by: Burgess & Niple

5085 Reed Rd, Columbus, OH, 43220, US

Leg Direction	SR 747 Southbound						SR 129 WB Off-ramp Westbound						SR 747 Northbound						SR 129 WB On-ramp Eastbound						Int
	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	
2022-06-16 7:15AM	22	338	0	0	360	0	55	0	62	0	117	0	0	68	30	0	98	0	0	0	0	0	0	0	575
7:30AM	28	325	0	0	353	0	54	0	59	0	113	0	0	74	30	0	104	0	0	0	0	0	0	0	570
7:45AM	26	309	0	0	335	0	53	0	49	0	102	0	0	102	26	0	128	0	0	0	0	0	0	0	565
8:00AM	17	268	0	0	285	0	46	0	50	0	96	0	0	80	26	0	106	0	1	0	0	0	1	0	488
Total	93	1240	0	0	1333	0	208	0	220	0	428	0	0	324	112	0	436	0	1	0	0	0	1	0	2198
% Approach	7.0%	93.0%	0%	0%	-	-	48.6%	0%	51.4%	0%	-	-	0%	74.3%	25.7%	0%	-	-	100%	0%	0%	0%	-	-	-
% Total	4.2%	56.4%	0%	0%	60.6%	-	9.5%	0%	10.0%	0%	19.5%	-	0%	14.7%	5.1%	0%	19.8%	-	0%	0%	0%	0%	0%	-	-
PHF	0.830	0.917	-	-	0.926	-	0.945	-	0.887	-	0.915	-	-	0.794	0.933	-	0.852	-	0.250	-	-	-	0.250	-	0.956
Lights	93	1197	0	0	1290	-	191	0	208	0	399	-	0	297	109	0	406	-	1	0	0	0	1	-	2096
% Lights	100%	96.5%	0%	0%	96.8%	-	91.8%	0%	94.5%	0%	93.2%	-	0%	91.7%	97.3%	0%	93.1%	-	100%	0%	0%	0%	100%	-	95.4%
Articulated Trucks	0	9	0	0	9	-	7	0	7	0	14	-	0	6	0	0	6	-	0	0	0	0	0	-	29
% Articulated Trucks	0%	0.7%	0%	0%	0.7%	-	3.4%	0%	3.2%	0%	3.3%	-	0%	1.9%	0%	0%	1.4%	-	0%	0%	0%	0%	0%	-	1.3%
Buses and Single-Unit Trucks	0	34	0	0	34	-	10	0	5	0	15	-	0	21	3	0	24	-	0	0	0	0	0	-	73
% Buses and Single-Unit Trucks	0%	2.7%	0%	0%	2.6%	-	4.8%	0%	2.3%	0%	3.5%	-	0%	6.5%	2.7%	0%	5.5%	-	0%	0%	0%	0%	0%	-	3.3%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

SR 747 & SR 129 WB Ramps - TMC

Thu Jun 16, 2022

AM Peak (7:15 AM - 8:15 AM)

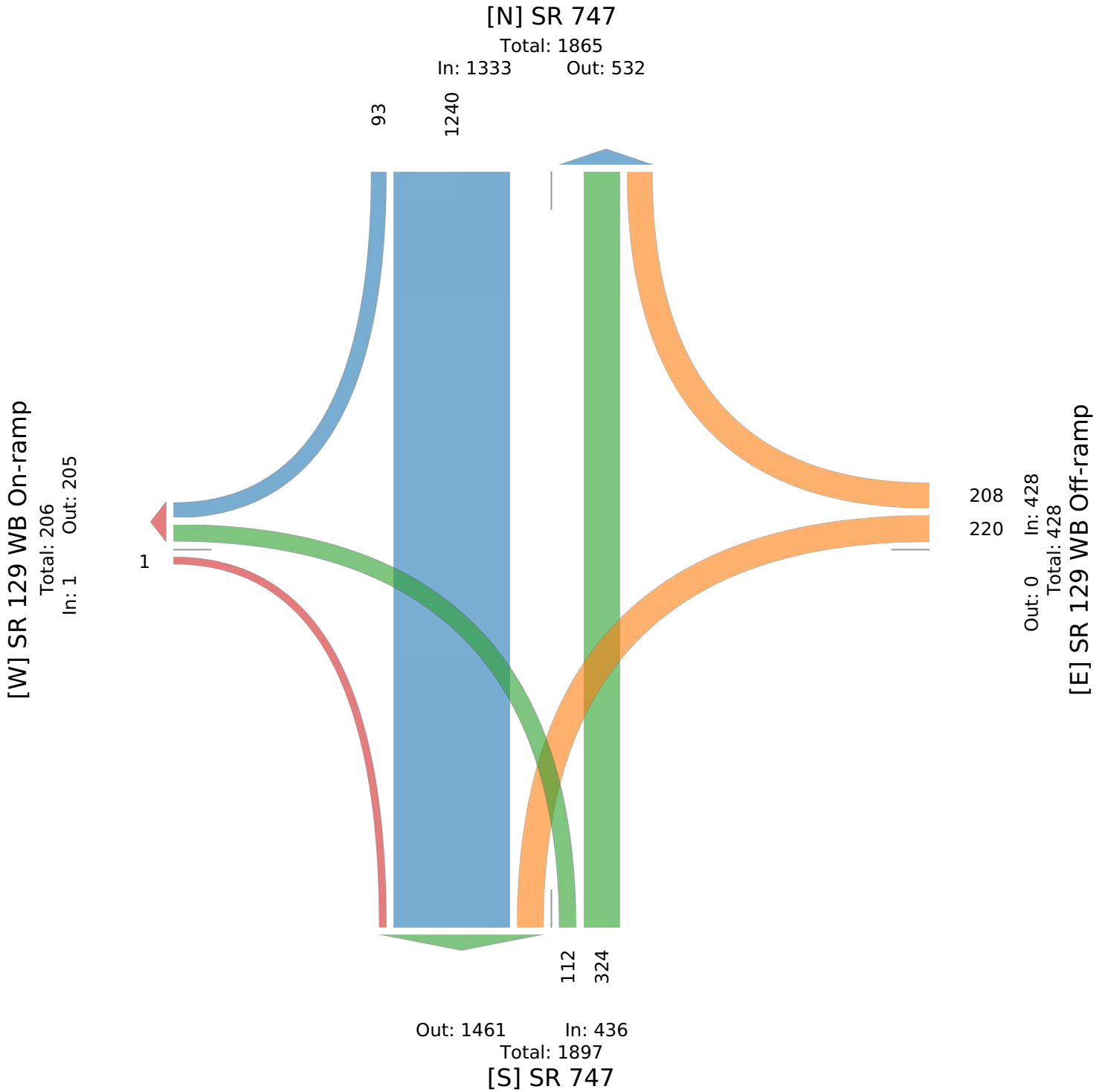
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964459, Location: 39.382545, -84.4545



Provided by: Burgess & Niple
5085 Reed Rd, Columbus, OH, 43220, US



SR 747 & SR 129 WB Ramps - TMC

Thu Jun 16, 2022

Midday Peak (12:15 PM - 1:15 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964459, Location: 39.382545, -84.4545



Provided by: Burgess & Niple

5085 Reed Rd, Columbus, OH, 43220, US

Leg Direction	SR 747 Southbound						SR 129 WB Off-ramp Westbound						SR 747 Northbound						SR 129 WB On-ramp Eastbound						Int
	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	
2022-06-16 12:15PM	16	178	0	0	194	0	92	0	50	0	142	0	0	145	33	0	178	0	0	0	0	0	0	0	514
12:30PM	14	191	0	0	205	0	84	0	45	0	129	0	0	115	49	0	164	0	0	0	0	0	0	0	498
12:45PM	18	220	0	0	238	0	100	0	43	0	143	0	0	135	35	0	170	0	0	0	0	0	0	0	551
1:00PM	19	160	0	0	179	0	87	0	45	0	132	0	0	133	33	0	166	0	0	0	0	0	0	0	477
Total	67	749	0	0	816	0	363	0	183	0	546	0	0	528	150	0	678	0	0	0	0	0	0	0	2040
% Approach	8.2%	91.8%	0%	0%	-	-	66.5%	0%	33.5%	0%	-	-	0%	77.9%	22.1%	0%	-	-	0%	0%	0%	0%	-	-	-
% Total	3.3%	36.7%	0%	0%	40.0%	-	17.8%	0%	9.0%	0%	26.8%	-	0%	25.9%	7.4%	0%	33.2%	-	0%	0%	0%	0%	0%	-	-
PHF	0.882	0.851	-	-	0.857	-	0.908	-	0.915	-	0.955	-	-	0.910	0.765	-	0.952	-	-	-	-	-	-	-	0.926
Lights	65	718	0	0	783	-	350	0	169	0	519	-	0	504	145	0	649	-	0	0	0	0	0	0	1951
% Lights	97.0%	95.9%	0%	0%	96.0%	-	96.4%	0%	92.3%	0%	95.1%	-	0%	95.5%	96.7%	0%	95.7%	-	0%	0%	0%	0%	-	-	95.6%
Articulated Trucks	0	13	0	0	13	-	3	0	7	0	10	-	0	5	0	0	5	-	0	0	0	0	0	0	28
% Articulated Trucks	0%	1.7%	0%	0%	1.6%	-	0.8%	0%	3.8%	0%	1.8%	-	0%	0.9%	0%	0%	0.7%	-	0%	0%	0%	0%	-	-	1.4%
Buses and Single-Unit Trucks	2	18	0	0	20	-	10	0	7	0	17	-	0	19	5	0	24	-	0	0	0	0	0	0	61
% Buses and Single-Unit Trucks	3.0%	2.4%	0%	0%	2.5%	-	2.8%	0%	3.8%	0%	3.1%	-	0%	3.6%	3.3%	0%	3.5%	-	0%	0%	0%	0%	-	-	3.0%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

SR 747 & SR 129 WB Ramps - TMC

Thu Jun 16, 2022

Midday Peak (12:15 PM - 1:15 PM)

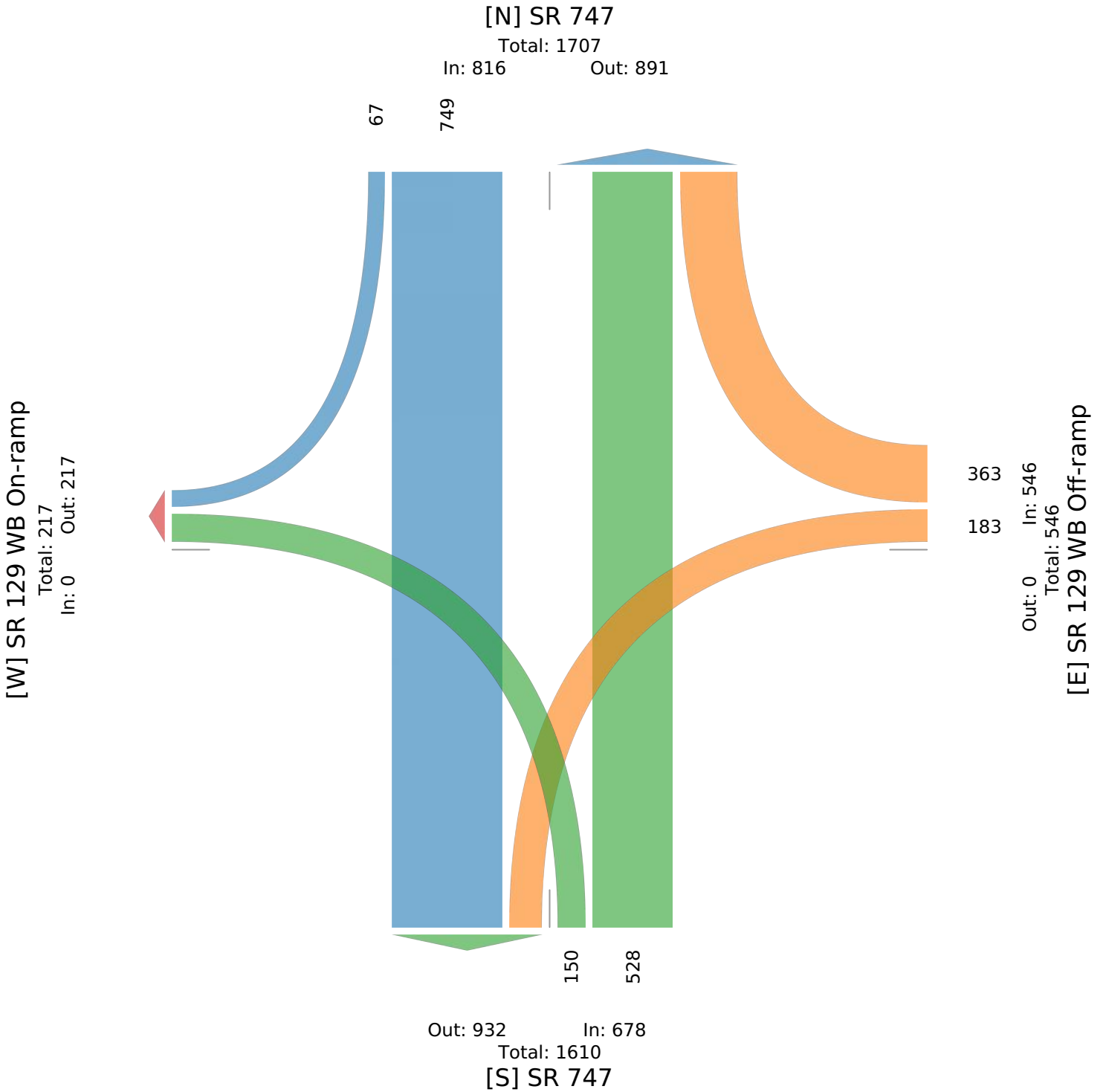
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964459, Location: 39.382545, -84.4545



Provided by: Burgess & Niple
5085 Reed Rd, Columbus, OH, 43220, US



SR 747 & SR 129 WB Ramps - TMC

Thu Jun 16, 2022

PM Peak (4:15 PM - 5:15 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964459, Location: 39.382545, -84.4545



Provided by: Burgess & Niple
5085 Reed Rd, Columbus, OH, 43220, US

Leg Direction	SR 747 Southbound						SR 129 WB Off-ramp Westbound						SR 747 Northbound						SR 129 WB On-ramp Eastbound						Int
	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	
2022-06-16 4:15PM	15	196	0	0	211	0	207	0	62	0	269	0	0	225	57	0	282	0	0	0	0	0	0	0	762
4:30PM	18	181	0	0	199	0	171	0	85	0	256	0	0	218	62	0	280	0	0	0	0	0	0	0	735
4:45PM	18	198	0	0	216	0	186	1	58	0	245	0	0	207	62	0	269	0	0	0	0	0	0	0	730
5:00PM	18	223	0	0	241	0	192	0	78	0	270	0	0	188	62	0	250	0	0	0	0	0	0	0	761
Total	69	798	0	0	867	0	756	1	283	0	1040	0	0	838	243	0	1081	0	0	0	0	0	0	0	2988
% Approach	8.0%	92.0%	0%	0%	-	-	72.7%	0.1%	27.2%	0%	-	-	0%	77.5%	22.5%	0%	-	-	0%	0%	0%	0%	-	-	-
% Total	2.3%	26.7%	0%	0%	29.0%	-	25.3%	0%	9.5%	0%	34.8%	-	0%	28.0%	8.1%	0%	36.2%	-	0%	0%	0%	0%	0%	-	-
PHF	0.958	0.895	-	-	0.899	-	0.913	0.250	0.832	-	0.963	-	-	0.931	0.980	-	0.958	-	-	-	-	-	-	-	0.980
Lights	69	777	0	0	846	-	746	1	275	0	1022	-	0	826	240	0	1066	-	0	0	0	0	0	-	2934
% Lights	100%	97.4%	0%	0%	97.6%	-	98.7%	100%	97.2%	0%	98.3%	-	0%	98.6%	98.8%	0%	98.6%	-	0%	0%	0%	0%	-	-	98.2%
Articulated Trucks	0	5	0	0	5	-	2	0	5	0	7	-	0	2	1	0	3	-	0	0	0	0	0	-	15
% Articulated Trucks	0%	0.6%	0%	0%	0.6%	-	0.3%	0%	1.8%	0%	0.7%	-	0%	0.2%	0.4%	0%	0.3%	-	0%	0%	0%	0%	-	-	0.5%
Buses and Single-Unit Trucks	0	16	0	0	16	-	8	0	3	0	11	-	0	10	2	0	12	-	0	0	0	0	0	-	39
% Buses and Single-Unit Trucks	0%	2.0%	0%	0%	1.8%	-	1.1%	0%	1.1%	0%	1.1%	-	0%	1.2%	0.8%	0%	1.1%	-	0%	0%	0%	0%	-	-	1.3%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	0
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

SR 747 & SR 129 WB Ramps - TMC

Thu Jun 16, 2022

PM Peak (4:15 PM - 5:15 PM) - Overall Peak Hour

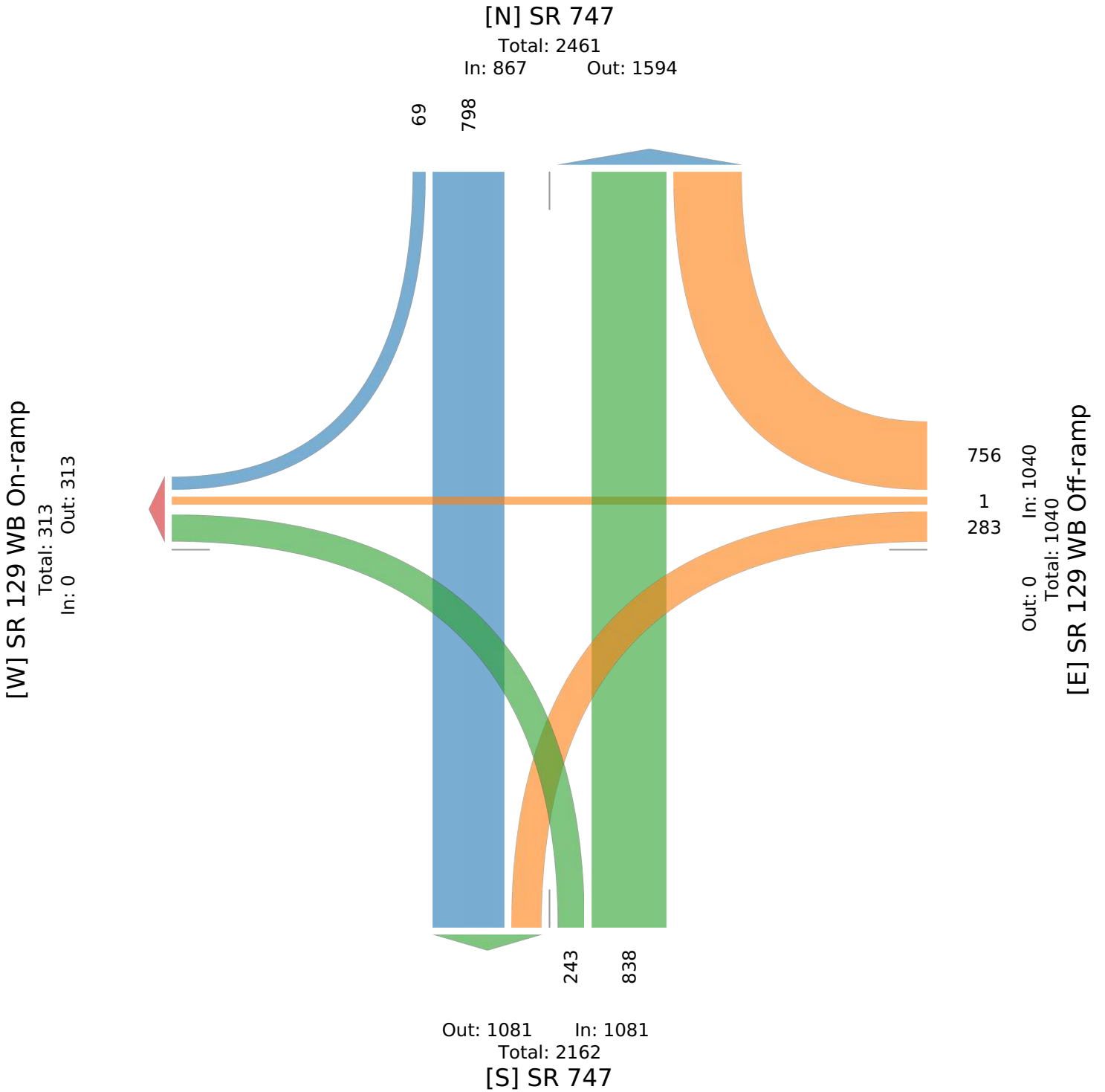
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 964459, Location: 39.382545, -84.4545



Provided by: Burgess & Niple
5085 Reed Rd, Columbus, OH, 43220, US





ODOT Highway Safety Program
BUT-747-5.49

Appendix B
Crash Data

SR-747 at SR-129 Crash Summary Sheet

Fatalities	0
Total Serious Injuries	5
Total Non-Serious & Possible Injuries	43

Crash Severity	Crashes	%
(2) Serious Injury Suspected	3	3.00%
(3) Minor Injury Suspected	13	13.00%
(4) Injury Possible	10	10.00%
(5) PDO/No Injury	74	74.00%
Grand Total	100	100.00%

Day of Week	Crashes	%
(1) Sunday	8	8.00%
(2) Monday	19	19.00%
(3) Tuesday	18	18.00%
(4) Wednesday	15	15.00%
(5) Thursday	13	13.00%
(6) Friday	16	16.00%
(7) Saturday	11	11.00%
Grand Total	100	100.00%

Hour of Day	Crashes	%
2	1	1.00%
4	2	2.00%
5	1	1.00%
6	4	4.00%
7	5	5.00%
8	7	7.00%
9	4	4.00%
10	7	7.00%
11	5	5.00%
12	6	6.00%
13	6	6.00%
14	10	10.00%
15	9	9.00%
16	8	8.00%
17	9	9.00%
18	10	10.00%
19	2	2.00%
20	3	3.00%
21	1	1.00%
Grand Total	100	100.00%

Weather Condition	Crashes	%
Clear	52	52.00%
Cloudy	32	32.00%
Rain	14	14.00%
Snow	2	2.00%
Grand Total	100	100.00%

Light Condition	Crashes	%
Daylight	77	77.00%
Dark - Lighted Roadway	14	14.00%
Dawn/Dusk	7	7.00%
Dark - Roadway Not Lighted	2	2.00%
Grand Total	100	100.00%

Crashes Per Year	33.33
Fatal and All Injury Crashes	26
Percent Injury	26.0%
Equivalent PDO Index Value	3.77

Year	Crashes	%
2018	37	37.00%
2019	31	31.00%
2020	32	32.00%
Grand Total	100	100.00%

Crash Type	Crashes	%
Rear End	54	54.00%
Left Turn	21	21.00%
Angle	8	8.00%
Sideswipe - Passing	8	8.00%
Fixed Object	6	6.00%
Ran Off Road	3	3.00%
Grand Total	100	100.00%

Month	Crashes	%
1	9	9.00%
2	8	8.00%
3	6	6.00%
4	5	5.00%
5	3	3.00%
6	6	6.00%
7	11	11.00%
8	9	9.00%
9	9	9.00%
10	11	11.00%
11	10	10.00%
12	13	13.00%
Grand Total	100	100.00%

Road Condition	Crashes	%
Dry	68	68.00%
Wet	30	30.00%
Snow	2	2.00%
Grand Total	100	100.00%

Number of Units	Crashes	%
2	83	83.00%
1	9	9.00%
3	7	7.00%
4	1	1.00%
Grand Total	100	100.00%

SR-747 at SR-129
Crash Summary Sheet

ODOT Location	Crashes	%
Not An Intersection	38	38.00%
5 Or More Point Intersection	23	23.00%
Four-Way Intersection	15	15.00%
T-Intersection	9	9.00%
Off Ramp	9	9.00%
On Ramp	6	6.00%
Grand Total	100	100.00%

Contour	Crashes	%
Curve Grade	1	1.00%
Curve Level	1	1.00%
Straight Grade	41	41.00%
Straight Level	57	57.00%
Grand Total	100	100.00%

Roadway Departure	Crashes	%
No	89	89.00%
Yes	11	11.00%
Grand Total	100	100.00%

Intersection Related	Crashes	%
Yes	65	65.00%
No	35	35.00%
Grand Total	100	100.00%

Speed Related	Crashes	%
No	97	97.00%
Yes	3	3.00%
Grand Total	100	100.00%

Work Zone Related	Crashes	%
No	98	98.00%
Yes	2	2.00%
Grand Total	100	100.00%

Alcohol Related	Crashes	%
No	98	98.00%
Yes	2	2.00%
Grand Total	100	100.00%

Drug Related (Inc. Marijuana)	Crashes	%
No	100	100.00%
Grand Total	100	100.00%

Marijuana Related	Crashes	%
No	100	100.00%
Grand Total	100	100.00%

Older Driver (65+)	Crashes	%
No	81	81.00%
Yes	19	19.00%
Grand Total	100	100.00%

Young Driver (15-25)	Crashes	%
No	54	54.00%
Yes	46	46.00%
Grand Total	100	100.00%

Motorcycle Involved	Crashes	%
No	100	100.00%
Grand Total	100	100.00%

SR-747 at SR-129
Crash Summary Sheet
Unit 1 Summary

Unit 1 Pre-Crash Action	Crashes	%
Straight Ahead	62	62.00%
Making Left Turn	23	23.00%
Slowing or Stopped In Traffic	6	6.00%
Making Right Turn	4	4.00%
Changing Lanes	3	3.00%
Negotiating a Curve	1	1.00%
Entering Traffic Lane	1	1.00%
Grand Total	100	100.00%

Unit 1 Object Struck	Crashes	%
Nothing Struck	90	90.00%
Guardrail Face	4	4.00%
Tree	2	2.00%
Fence	1	1.00%
Other Post, Pole Or Support	1	1.00%
Embankment	1	1.00%
Light/Luminaries Support	1	1.00%
Grand Total	100	100.00%

Unit 1 Direction From	Crashes	%
South	40	40.00%
North	26	26.00%
East	19	19.00%
West	14	14.00%
Unknown	1	1.00%
Grand Total	100	100.00%

Unit 1 Type	Crashes	%
Passenger Car	56	56.00%
Sport Utility Vehicle	25	25.00%
Pick up	11	11.00%
Passenger Van (minivan)	5	5.00%
Cargo Van	2	2.00%
Semi-Tractor	1	1.00%
Grand Total	100	100.00%

Unit 1 Contributing Factor	Crashes	%
Following Too Closely/ACDA	54	54.00%
Failure to Yield	23	23.00%
Failure to Control	10	10.00%
Improper Lane Change	6	6.00%
Ran Red Light	4	4.00%
Unsafe Speed	1	1.00%
Improper Turn	1	1.00%
Improper Passing	1	1.00%
Grand Total	100	100.00%

Unit 1 Traffic Control	Crashes	%
Signal	50	50.00%
No Control	44	44.00%
Stop Sign	6	6.00%
Grand Total	100	100.00%

Unit 1 Posted Speed	Crashes	%
0	1	1.00%
5	1	1.00%
25	2	2.00%
35	1	1.00%
45	7	7.00%
50	1	1.00%
55	65	65.00%
60	1	1.00%
65	21	21.00%
Grand Total	100	100.00%

Unit 1 Direction To	Crashes	%
North	31	31.00%
South	24	24.00%
West	21	21.00%
East	17	17.00%
Unknown	5	5.00%
Northeast	1	1.00%
Southwest	1	1.00%
Grand Total	100	100.00%

Unit 1 Special Function	Crashes	%
None	98	98.00%
Taxi	1	1.00%
Other / Unknown	1	1.00%
Grand Total	100	100.00%

SR-747 at SR-129
Crash Summary Sheet

Unit 2 Summary

Unit 2 Pre-Crash Action	Crashes	%
Slowing or Stopped In Traffic	48	48.00%
Straight Ahead	35	35.00%
N/A	9	9.00%
Making Left Turn	5	5.00%
Making Right Turn	3	3.00%
Grand Total	100	100.00%

Unit 2 Contributing Factor	Crashes	%
None	85	85.00%
N/A	9	9.00%
Other Improper Action	2	2.00%
Not Discernible	2	2.00%
Failure to Yield	1	1.00%
Following Too Closely/ACDA	1	1.00%
Grand Total	100	100.00%

Unit 2 Direction From	Crashes	%
East	15	15.00%
North	33	33.00%
South	31	31.00%
West	11	11.00%
N/A	10	10.00%
Grand Total	100	100.00%

Unit 2 Direction To	Crashes	%
East	14	14.00%
North	33	33.00%
South	31	31.00%
Unknown	1	1.00%
West	11	11.00%
N/A	10	10.00%
Grand Total	100	100.00%

Unit 2 Type	Crashes	%
Passenger Car	54	54.00%
Passenger Van (minivan)	4	4.00%
Pick up	5	5.00%
Sport Utility Vehicle	28	28.00%
N/A	9	9.00%
Grand Total	100	100.00%

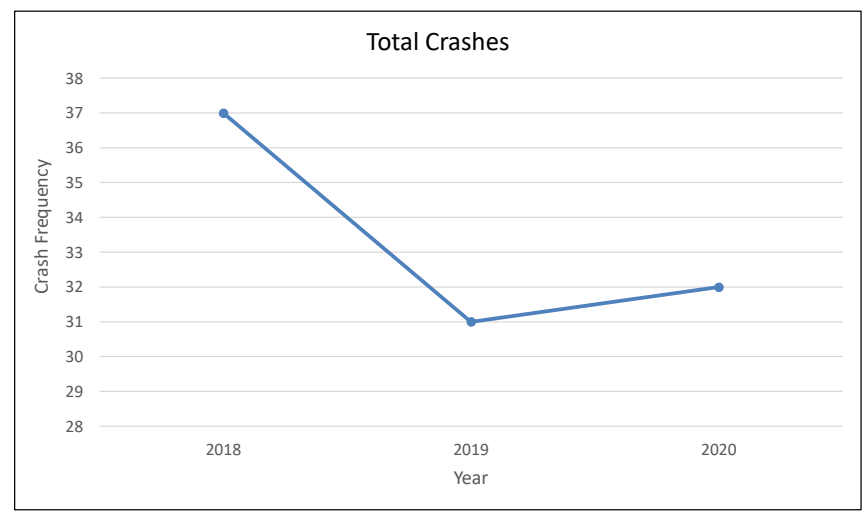
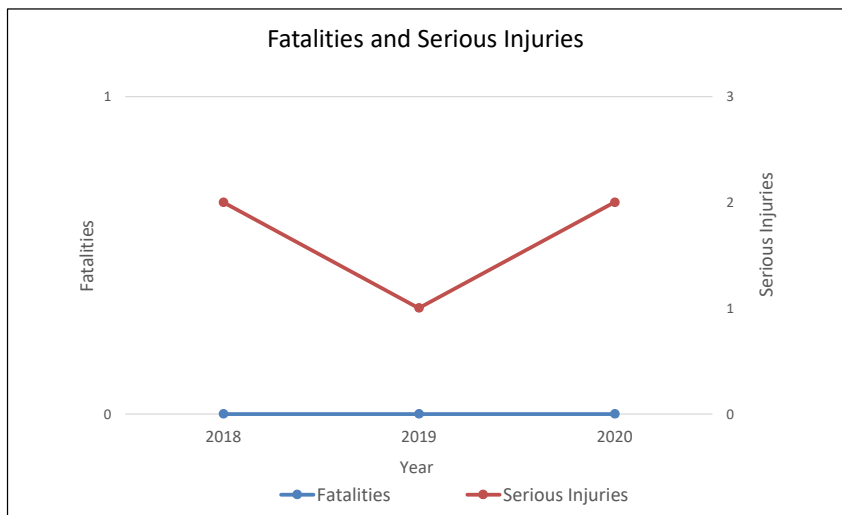
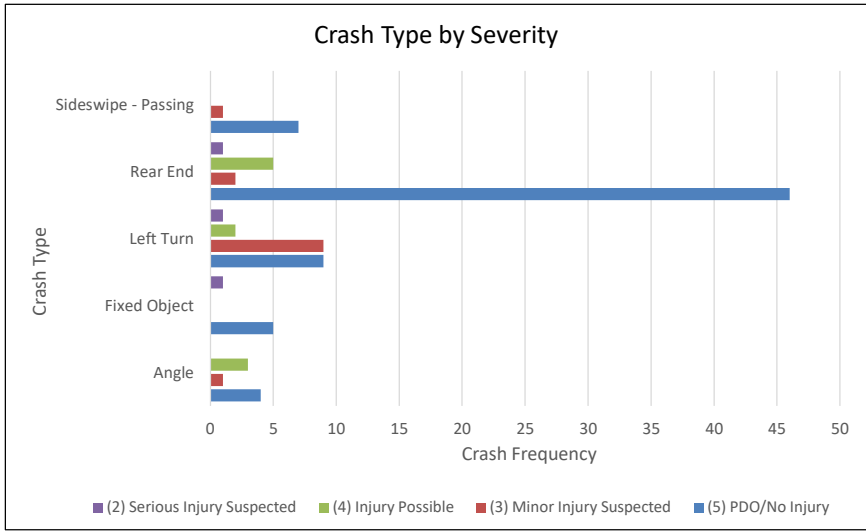
Unit 2 Special Function	Crashes	%
None	91	91.00%
N/A	9	9.00%
Grand Total	100	100.00%

SR-747 at SR-129
Crash Summary Sheet

Crashes Per Year 33.33 **Percent Injury** 26.0% **EPDO** 3.77

Year	Total Crashes	Fatalities	Serious Injuries
2018	37	0	2
2019	31	0	1
2020	32	0	2
Grand Total	100	0	5

Crash Type	Injury Level					Grand Total
	(2) Serious Inju	(3) Minor Injury	(4) Injury Possi	(5) PDO/No Inju		
Rear End	1	2	5	46	54	
Left Turn	1	9	2	9	21	
Angle	0	1	3	4	8	
Sideswipe - Passing	0	1	0	7	8	
Fixed Object	1	0	0	5	6	
Ran Off Road	0	0	0	3	3	
Grand Total	3	13	10	74	100	



SR-747 at SR-129
Crash Summary Sheet

Crashes Per Year	33.33	Percent Injury	26.0%	EPDO	3.77
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Road Condition	Total Crashes	Fatalities	Serious Injuries
Dry	68	0	3
Snow	2	0	0
Wet	30	0	2
Grand Total	100	0	5

Weather	Total Crashes	Fatalities	Serious Injuries
Clear	52	0	1
Cloudy	32	0	2
Rain	14	0	2
Snow	2	0	0
Grand Total	100	0	5

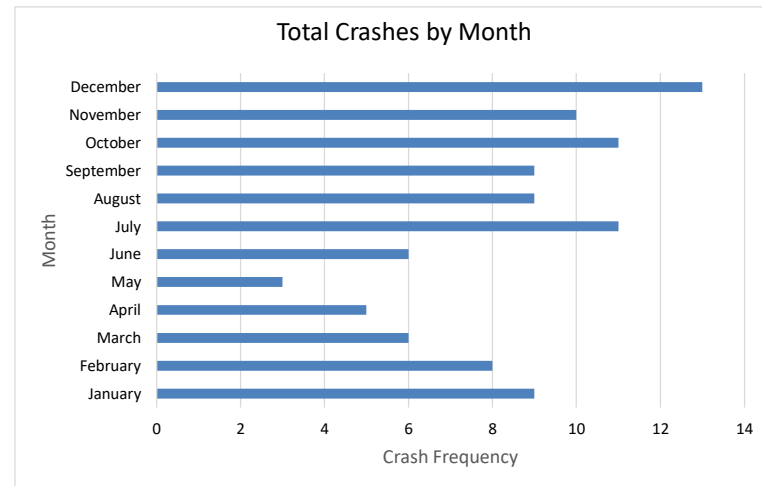
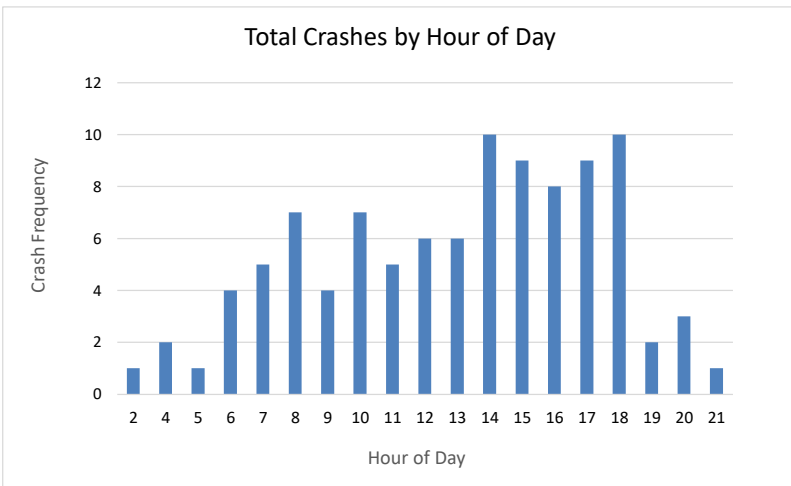
Crash Location	Total Crashes	Fatalities	Serious Injuries
5 Or More Point Intersection	23	0	0
Four-Way Intersection	15	0	1
Not An Intersection	38	0	2
T-Intersection	9	0	0
Off Ramp	9	0	0
Grand Total	94	0	3

Roadway Contour	Total Crashes	Fatalities	Serious Injuries
Straight Level	57	0	1
Straight Grade	41	0	4
Curve Grade	1	0	0
Curve Level	1	0	0
Grand Total	100	0	5

Hour of Day	Total Crashes
2	1
4	2
5	1
6	4
7	5
8	7
9	4
10	7
11	5
12	6
13	6
14	10
15	9
16	8
17	9
18	10
19	2
20	3
21	1
Grand Total	100

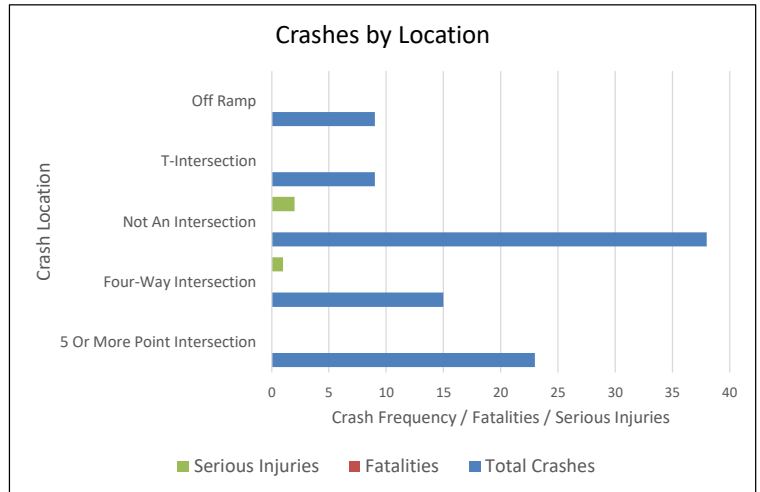
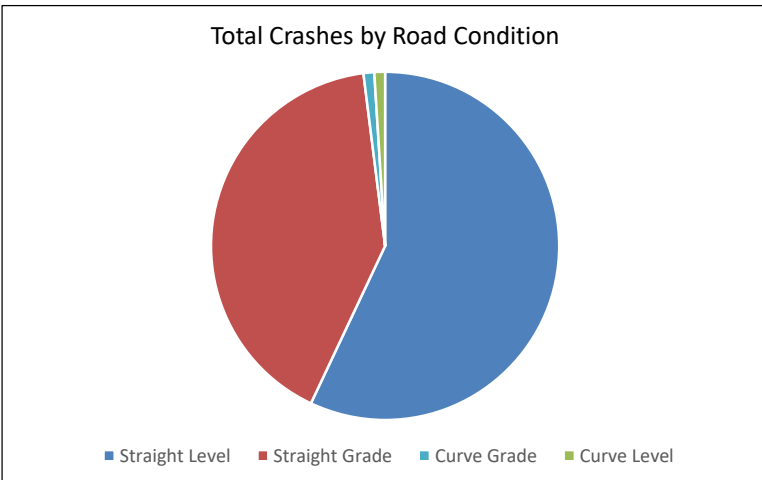
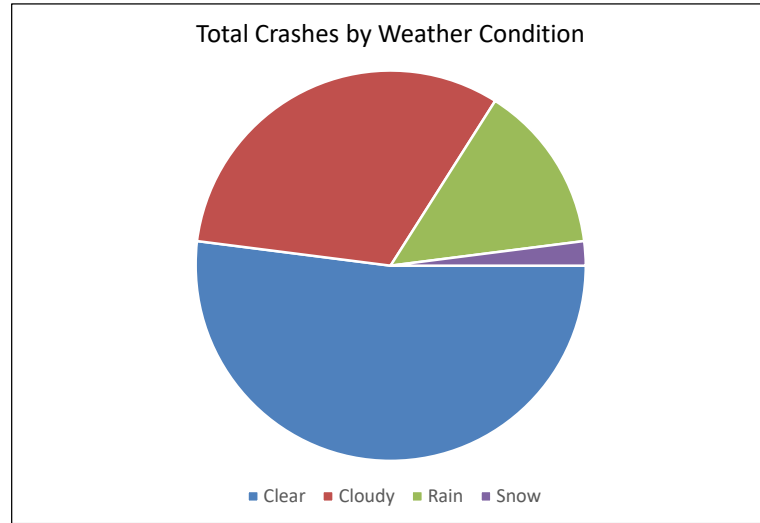
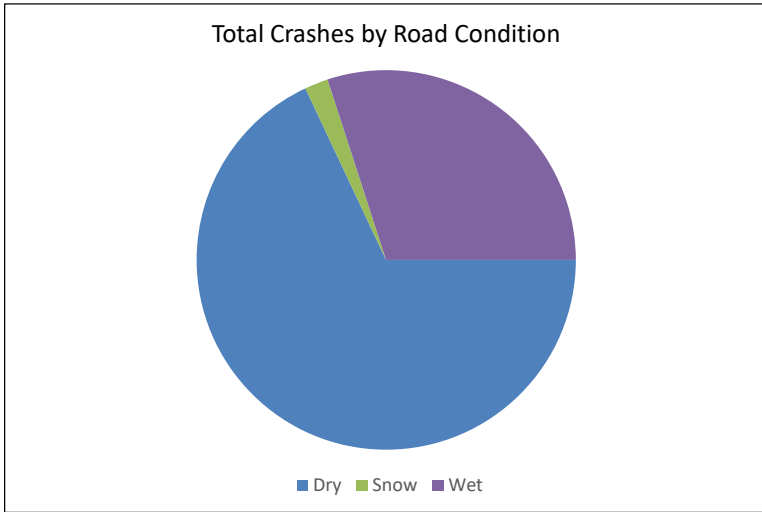
Month	Total Crashes
January	9
February	8
March	6
April	5
May	3
June	6
July	11
August	9
September	9
October	11
November	10
December	13
Grand Total	100

Day in Week	Total Crashes
(1) Sunday	8
(2) Monday	19
(3) Tuesday	18
(4) Wednesday	15
(5) Thursday	13
(6) Friday	16
(7) Saturday	11
Grand Total	100



SR-747 at SR-129
Crash Summary Sheet

Crashes Per Year	33.33	Percent Injury	26.0%	EPDO	3.77
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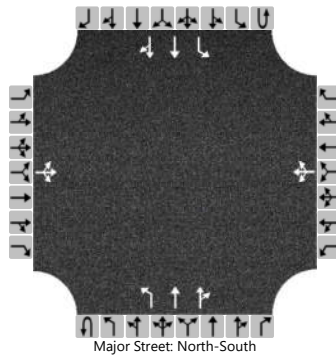
ODOT Highway Safety Program
BUT-747-5.49

Appendix C
Existing and No Build Capacity Analysis

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	MJB			Intersection	SR-747/Grandin Ridge/Logsdons Meadow D...		
Agency/Co.	Lanham Engineering			Jurisdiction	ODOT D8		
Date Performed	7/11/2022			East/West Street	Grandin Ridge/Logsdons Meadow Drive		
Analysis Year	2022			North/South Street	SR-747		
Time Analyzed	AM Peak Hour			Peak Hour Factor	0.97		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	BUT-747-5.49						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	2	0	0	1	2	0
Configuration			LTR				LTR			L	T	TR		L	T	TR
Volume (veh/h)		3	0	37		9	1	5	0	5	538	8	0	0	1344	4
Percent Heavy Vehicles (%)		5	5	5		7	7	7	9	9			4	4		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

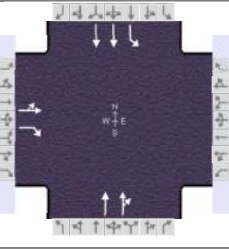
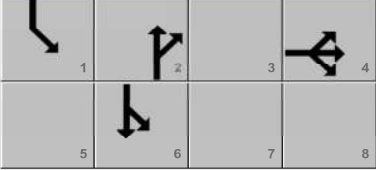
Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.60	6.60	7.00		7.64	6.64	7.04		4.28				4.18		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.55	4.05	3.35		3.57	4.07	3.37		2.29				2.24		

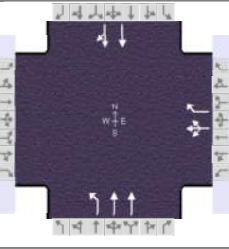
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			41				15			5				0		
Capacity, c (veh/h)			268				139			454				991		
v/c Ratio			0.15				0.11			0.01				0.00		
95% Queue Length, Q ₉₅ (veh)			0.5				0.4			0.0				0.0		
Control Delay (s/veh)			20.9				34.0			13.0				8.6		
Level of Service (LOS)			C				D			B				A		
Approach Delay (s/veh)	20.9				34.0				0.1				0.0			
Approach LOS	C				D				A				A			

HCS Signalized Intersection Results Summary

General Information					Intersection Information												
Agency	Lanham Engineering				Duration, h	0.250											
Analyst	DKA		Analysis Date	7/13/2022		Area Type	Other										
Jurisdiction	ODOT D8		Time Period	AM Peak Hour		PHF	0.95										
Urban Street	SR-747		Analysis Year	2022		Analysis Period	1 > 7:00										
Intersection	SR-747 at SR-129 EB R...		File Name	SR-129 2022 AM Peak Hour - Existing.xus													
Project Description	BUT-747-5.49 Safety Study - Existing																
Demand Information					EB			WB			NB			SB			
Approach Movement					L	T	R	L	T	R	L	T	R	L	T	R	
Demand (v), veh/h					42	0	234				457	395		662	1001		
Signal Information																	
Cycle, s	120.0	Reference Phase	2		Green	44.1	37.5	20.8	0.0	0.0	0.0						
Offset, s	0	Reference Point	End		Yellow	3.0	4.6	4.0	0.0	0.0	0.0						
Uncoordinated	No	Simult. Gap E/W	On		Red	2.0	2.0	2.0	0.0	0.0	0.0						
Force Mode	Fixed	Simult. Gap N/S	On														
Timer Results					EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT					
Assigned Phase						4				2	1	6					
Case Number						11.0				8.3	1.0	4.0					
Phase Duration, s						26.8				44.1	49.1	93.2					
Change Period, (Y+R _c), s						6.0				6.6	5.0	6.6					
Max Allow Headway (MAH), s						7.0				0.0	3.9	0.0					
Queue Clearance Time (g _s), s						20.4					41.9						
Green Extension Time (g _e), s						0.4				0.0	2.3	0.0					
Phase Call Probability						1.00					1.00						
Max Out Probability						1.00					0.09						
Movement Group Results					EB			WB			NB			SB			
Approach Movement					L	T	R	L	T	R	L	T	R	L	T	R	
Assigned Movement					7	4	14				2	12	1	6			
Adjusted Flow Rate (v), veh/h						44	246				453	444	690	1043			
Adjusted Saturation Flow Rate (s), veh/h/ln						1665	1572				1643	1604	1753	1778			
Queue Service Time (g _s), s						2.7	18.4				31.4	31.5	39.9	16.1			
Cycle Queue Clearance Time (g _c), s						2.7	18.4				31.4	31.5	39.9	16.1			
Green Ratio (g/C)						0.17	0.17				0.31	0.31	0.70	0.72			
Capacity (c), veh/h						289	273				514	502	735	2566			
Volume-to-Capacity Ratio (X)						0.153	0.903				0.882	0.884	0.938	0.406			
Back of Queue (Q), ft/ln (95 th percentile)																	
Back of Queue (Q), veh/ln (95 th percentile)						2.1	14.4				20.8	20.6	28.5	8.1			
Queue Storage Ratio (RQ) (95 th percentile)						0.06	0.87				0.37	0.36	2.26	0.31			
Uniform Delay (d ₁), s/veh						42.1	48.6				39.1	39.2	37.0	8.2			
Incremental Delay (d ₂), s/veh						0.9	32.9				19.2	19.8	10.7	0.3			
Initial Queue Delay (d ₃), s/veh						0.0	0.0				0.0	0.0	0.0	0.0			
Control Delay (d), s/veh						43.0	81.5				58.3	58.9	47.8	8.5			
Level of Service (LOS)						D	F				E	E	D	A			
Approach Delay, s/veh / LOS					75.7	E	0.0			58.6	E	24.1	C				
Intersection Delay, s/veh / LOS					39.9			D									
Multimodal Results					EB			WB			NB			SB			
Pedestrian LOS Score / LOS					2.15	B	2.32	B	1.41	A	1.63	B					
Bicycle LOS Score / LOS					0.97	A			1.23	A	1.93	B					

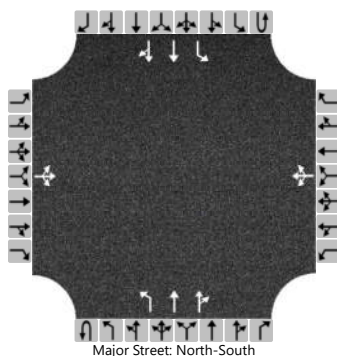
HCS Signalized Intersection Results Summary

General Information						Intersection Information									
Agency		Lanham Engineering				Duration, h		0.250							
Analyst		DKA		Analysis Date		7/13/2022		Area Type		Other					
Jurisdiction		ODOT D8		Time Period		AM Peak Hour		PHF		0.96					
Urban Street		SR-747		Analysis Year		2022		Analysis Period		1 > 7:00					
Intersection		SR-747 at SR-129 WB...		File Name		SR-129 2022 AM Peak Hour - Existing.xus									
Project Description		BUT-747-5.49 Safety Study - Existing													
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h							235	0	233	124	375			1428	103
Signal Information															
Cycle, s		120.0	Reference Phase	2											
Offset, s		0	Reference Point	End											
Uncoordinated		No	Simult. Gap E/W	On		Green	6.9	69.8	25.7	0.0	0.0	0.0			
Force Mode		Fixed	Simult. Gap N/S	On		Yellow	3.0	4.5	4.0	0.0	0.0	0.0			
						Red	2.0	2.0	2.0	0.0	0.0	0.0			
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase							4	1	6		2				
Case Number							11.0	1.0	4.0		8.3				
Phase Duration, s							31.7	11.9	88.3		76.3				
Change Period, (Y+R _c), s							6.0	5.0	6.5		6.5				
Max Allow Headway (MAH), s							4.0	4.0	0.0		0.0				
Queue Clearance Time (g _s), s							24.1	6.5							
Green Extension Time (g _e), s							1.7	0.4	0.0		0.0				
Phase Call Probability							1.00	0.99							
Max Out Probability							0.00	0.00							
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement							7	4	14	1	6		2	12	
Adjusted Flow Rate (v), veh/h							305	182	135	408		761	834		
Adjusted Saturation Flow Rate (s), veh/h/ln							1620	1629	1663	1649		1776	1962		
Queue Service Time (g _s), s							22.1	11.9	4.5	8.5		65.1	37.1		
Cycle Queue Clearance Time (g _c), s							22.1	11.9	4.5	8.5		65.1	37.1		
Green Ratio (g/C)							0.21	0.21	0.66	0.36		0.58	0.58		
Capacity (c), veh/h							348	349	168	1177		1033	1142		
Volume-to-Capacity Ratio (X)							0.879	0.521	0.802	0.346		0.736	0.730		
Back of Queue (Q), ft/ln (95 th percentile)															
Back of Queue (Q), veh/ln (95 th percentile)							14.5	8.2	4.2	4.8		20.8	22.2		
Queue Storage Ratio (RQ) (95 th percentile)							0.32	0.72	0.37	0.18		0.27	0.28		
Uniform Delay (d ₁), s/veh							48.2	41.7	35.3	10.8		18.4	18.2		
Incremental Delay (d ₂), s/veh							7.2	1.2	4.0	0.4		4.7	4.1		
Initial Queue Delay (d ₃), s/veh							0.0	0.0	0.0	0.0		0.0	0.0		
Control Delay (d), s/veh							55.3	42.9	39.2	11.1		23.0	22.4		
Level of Service (LOS)							E	D	D	B		C	C		
Approach Delay, s/veh / LOS				0.0		50.7	D	18.1		B	22.7		C		
Intersection Delay, s/veh / LOS				26.9			C								
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				2.32		B	2.15		B	1.64		B	1.37		A
Bicycle LOS Score / LOS				1.29			A	0.92		A	1.80		B		

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	MJB			Intersection	SR-747/Grandin Ridge/Logsdons Meadow D...		
Agency/Co.	Lanham Engineering			Jurisdiction	ODOT D8		
Date Performed	7/11/2022			East/West Street	Grandin Ridge/Logsdons Meadow Drive		
Analysis Year	2022			North/South Street	SR-747		
Time Analyzed	PM Peak Hour			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	BUT-747-5.49						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	2	0	0	1	2	0
Configuration			LTR				LTR			L	T	TR		L	T	TR
Volume (veh/h)		4	0	34		7	0	8	0	37	1461	38	0	6	896	19
Percent Heavy Vehicles (%)		0	0	0		0	0	0	1	1			2	2		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

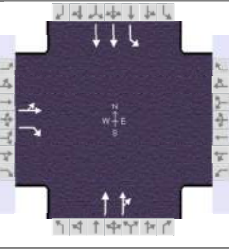
Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.50	6.50	6.90		7.50	6.50	6.90		4.12				4.14		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.00	3.30		2.21				2.22		

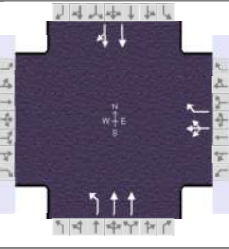
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			38				15			37				6		
Capacity, c (veh/h)			280				61			747				443		
v/c Ratio			0.14				0.25			0.05				0.01		
95% Queue Length, Q ₉₅ (veh)			0.5				0.9			0.2				0.0		
Control Delay (s/veh)			19.9				82.9			10.1				13.2		
Level of Service (LOS)			C				F			B				B		
Approach Delay (s/veh)	19.9				82.9				0.2				0.1			
Approach LOS	C				F				A				A			

HCS Signalized Intersection Results Summary

General Information					Intersection Information											
Agency	Lanham Engineering				Duration, h	0.250										
Analyst	DKA		Analysis Date	7/13/2022		Area Type	Other									
Jurisdiction	ODOT D8		Time Period	PM Peak Hour		PHF	0.97									
Urban Street	SR-747		Analysis Year	2022		Analysis Period	1 > 7:00									
Intersection	SR-747 at SR-129 EB R...		File Name	SR-129 2022 PM Peak Hour - Existing.xus												
Project Description	BUT-747-5.49 Safety Study - Existing															
Demand Information					EB			WB			NB			SB		
Approach Movement					L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h					73	1	149				1124	356		433	834	
Signal Information																
Cycle, s	120.0	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	No	Simult. Gap E/W	On		Green	28.6	59.5	14.3	0.0	0.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On		Yellow	3.0	4.6	4.0	0.0	0.0	0.0					
					Red	2.0	2.0	2.0	0.0	0.0	0.0					
Timer Results					EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase						4				2	1	6				
Case Number						11.0				8.3	1.0	4.0				
Phase Duration, s						20.3				66.1	33.6	99.7				
Change Period, ($Y+R_c$), s						6.0				6.6	5.0	6.6				
Max Allow Headway (MAH), s						7.0				0.0	3.9	0.0				
Queue Clearance Time (g_s), s						13.0					27.0					
Green Extension Time (g_e), s						1.3				0.0	1.6	0.0				
Phase Call Probability						1.00					1.00					
Max Out Probability						0.56					0.00					
Movement Group Results					EB			WB			NB			SB		
Approach Movement					L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement					7	4	14				2	12	1	6		
Adjusted Flow Rate (v), veh/h						76	154				771	754	442	851		
Adjusted Saturation Flow Rate (s), veh/h/ln						1748	1627				1962	1879	1781	1779		
Queue Service Time (g_s), s						4.8	11.0				65.0	40.6	25.0	9.0		
Cycle Queue Clearance Time (g_c), s						4.8	11.0				65.0	40.6	25.0	9.0		
Green Ratio (g/C)						0.12	0.12				0.50	0.50	0.75	0.78		
Capacity (c), veh/h						208	194				973	932	485	2760		
Volume-to-Capacity Ratio (X)						0.366	0.793				0.793	0.810	0.912	0.308		
Back of Queue (Q), ft/ln (95 th percentile)																
Back of Queue (Q), veh/ln (95 th percentile)						4.0	9.4				25.0	25.1	18.3	3.9		
Queue Storage Ratio (RQ) (95 th percentile)						0.11	0.54				0.42	0.42	1.43	0.15		
Uniform Delay (d_1), s/veh						48.7	51.4				25.1	25.5	41.8	4.3		
Incremental Delay (d_2), s/veh						3.9	22.7				6.6	7.5	4.9	0.2		
Initial Queue Delay (d_3), s/veh						0.0	0.0				0.0	0.0	0.0	0.0		
Control Delay (d), s/veh						52.6	74.1				31.7	33.0	46.7	4.5		
Level of Service (LOS)						D	E				C	C	D	A		
Approach Delay, s/veh / LOS					67.0		E	0.0			32.4		C	18.9		B
Intersection Delay, s/veh / LOS					29.3			C								
Multimodal Results					EB			WB			NB			SB		
Pedestrian LOS Score / LOS					2.15		B	2.32		B	1.39		A	1.62		B
Bicycle LOS Score / LOS					0.87		A				1.75		B	1.57		B

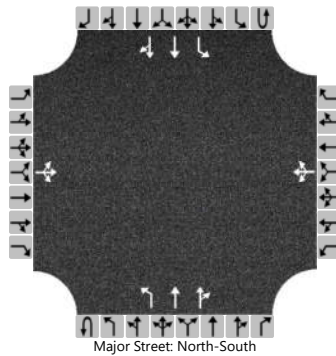
HCS Signalized Intersection Results Summary

General Information						Intersection Information											
Agency	Lanham Engineering					Duration, h	0.250										
Analyst	DKA		Analysis Date	7/13/2022		Area Type	Other										
Jurisdiction	ODOT D8		Time Period	PM Peak Hour		PHF	0.98										
Urban Street	SR-747		Analysis Year	2022		Analysis Period	1 > 7:00										
Intersection	SR-747 at SR-129 WB...		File Name	SR-129 2022 PM Peak Hour - Existing.xus													
Project Description	BUT-747-5.49 Safety Study - Existing																
Demand Information				EB			WB			NB			SB				
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R		
Demand (v), veh/h							313	0	749	253	944			954	79		
Signal Information																	
Cycle, s	120.0	Reference Phase	2														
Offset, s	0	Reference Point	End														
Uncoordinated	No	Simult. Gap E/W	On	Green	12.9	47.7	41.9	0.0	0.0	0.0							
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.0	4.5	4.0	0.0	0.0	0.0							
				Red	2.0	2.0	2.0	0.0	0.0	0.0							
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT						
Assigned Phase							4	1	6								
Case Number							11.0	1.0	4.0						8.3		
Phase Duration, s							47.9	17.9	72.1						54.2		
Change Period, (Y+R _c), s							6.0	5.0	6.5						6.5		
Max Allow Headway (MAH), s							4.0	4.0	0.0						0.0		
Queue Clearance Time (g _s), s							38.3	12.1									
Green Extension Time (g _e), s							3.6	0.8	0.0						0.0		
Phase Call Probability							1.00	1.00									
Max Out Probability							0.21	0.00									
Movement Group Results				EB			WB			NB			SB				
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R		
Assigned Movement							7	4	14	1	6		2	12			
Adjusted Flow Rate (v), veh/h							510	573	261	973		508	546				
Adjusted Saturation Flow Rate (s), veh/h/ln							1730	1806	1746	1811		1737	1881				
Queue Service Time (g _s), s							33.9	36.3	10.1	14.5		35.8	29.6				
Cycle Queue Clearance Time (g _c), s							33.9	36.3	10.1	14.5		35.8	29.6				
Green Ratio (g/C)							0.35	0.35	0.52	0.55		0.40	0.40				
Capacity (c), veh/h							604	631	301	1979		690	747				
Volume-to-Capacity Ratio (X)							0.845	0.909	0.865	0.492		0.736	0.732				
Back of Queue (Q), ft/ln (95 th percentile)																	
Back of Queue (Q), veh/ln (95 th percentile)							22.6	23.9	7.5	6.9		18.7	19.8				
Queue Storage Ratio (RQ) (95 th percentile)							0.48	2.02	0.63	0.26		0.24	0.25				
Uniform Delay (d ₁), s/veh							43.8	37.2	30.3	10.1		30.8	30.7				
Incremental Delay (d ₂), s/veh							7.6	13.0	4.2	0.5		6.9	6.2				
Initial Queue Delay (d ₃), s/veh							0.0	0.0	0.0	0.0		0.0	0.0				
Control Delay (d), s/veh							51.4	50.3	34.5	10.6		37.7	37.0				
Level of Service (LOS)							D	D	C	B		D	D				
Approach Delay, s/veh / LOS				0.0			50.8	D	15.7	B		37.3	D				
Intersection Delay, s/veh / LOS							33.7					C					
Multimodal Results				EB			WB			NB			SB				
Pedestrian LOS Score / LOS				2.32	B		2.15	B		1.67	B		1.40	A			
Bicycle LOS Score / LOS							2.28	B		1.50	A		1.36	A			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	MJB			Intersection	SR-747/Grandin Ridge/Logsdons Meadow D...		
Agency/Co.	Lanham Engineering			Jurisdiction	ODOT D8		
Date Performed	7/11/2022			East/West Street	Grandin Ridge/Logsdons Meadow Drive		
Analysis Year	2030			North/South Street	SR-747		
Time Analyzed	AM Peak Hour			Peak Hour Factor	0.97		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	BUT-747-5.49						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	2	0	0	1	2	0
Configuration			LTR				LTR			L	T	TR		L	T	TR
Volume (veh/h)		3	0	39		9	1	5	0	5	566	8	0	0	1415	4
Percent Heavy Vehicles (%)		5	5	5		7	7	7	9	9			4	4		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

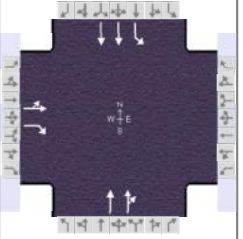
Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.60	6.60	7.00		7.64	6.64	7.04		4.28				4.18		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.55	4.05	3.35		3.57	4.07	3.37		2.29				2.24		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			43				15			5				0		
Capacity, c (veh/h)			248				123			424				966		
v/c Ratio			0.17				0.13			0.01				0.00		
95% Queue Length, Q ₉₅ (veh)			0.6				0.4			0.0				0.0		
Control Delay (s/veh)			22.6				38.4			13.6				8.7		
Level of Service (LOS)			C				E			B				A		
Approach Delay (s/veh)	22.6				38.4				0.1				0.0			
Approach LOS	C				E				A				A			

HCS Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Lanham Engineering			Duration, h	0.250		
Analyst	DKA	Analysis Date	7/13/2022	Area Type	Other		
Jurisdiction	ODOT D8	Time Period	AM Peak Hour	PHF	0.95		
Urban Street	SR-747	Analysis Year	2030	Analysis Period	1 > 7:00		
Intersection	SR-747 at SR-129 EB R...	File Name	SR-129 2030 AM Peak Hour - No Build.xus				
Project Description	BUT-747-5.49 Safety Study - 2030 No Build						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	44	0	246					481	321	697	1054	

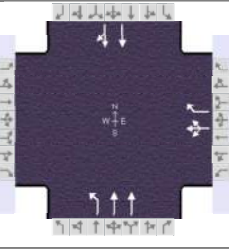
Signal Information													
Cycle, s	120.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	No	Simult. Gap E/W	On	Green	44.3	34.6	23.5	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.0	4.5	4.0	0.0	0.0	0.0			
				Red	2.0	2.0	2.0	0.0	0.0	0.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4				2	1	6
Case Number		11.0				8.3	1.0	4.0
Phase Duration, s		29.5				41.1	49.3	90.5
Change Period, (Y+R _c), s		6.0				6.5	5.0	6.5
Max Allow Headway (MAH), s		7.0				0.0	3.9	0.0
Queue Clearance Time (g _s), s		21.0					45.2	
Green Extension Time (g _e), s		2.5				0.0	0.0	0.0
Phase Call Probability		1.00					1.00	
Max Out Probability		0.16					1.00	

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14					2	12	1	6	
Adjusted Flow Rate (v), veh/h		46	259					429	416	726	1098	
Adjusted Saturation Flow Rate (s), veh/h/ln		1665	1575					1675	1619	1753	1786	
Queue Service Time (g _s), s		2.8	19.0					27.0	29.5	43.2	19.0	
Cycle Queue Clearance Time (g _c), s		2.8	19.0					27.0	29.5	43.2	19.0	
Green Ratio (g/C)		0.20	0.20					0.29	0.29	0.68	0.70	
Capacity (c), veh/h		326	309					484	468	737	2500	
Volume-to-Capacity Ratio (X)		0.142	0.839					0.885	0.888	0.985	0.439	
Back of Queue (Q), ft/ln (95 th percentile)												
Back of Queue (Q), veh/ln (95 th percentile)		2.1	13.6					20.3	19.9	31.8	9.9	
Queue Storage Ratio (RQ) (95 th percentile)		0.06	0.82					0.36	0.35	2.52	0.38	
Uniform Delay (d ₁), s/veh		39.9	46.4					40.7	40.8	37.6	10.3	
Incremental Delay (d ₂), s/veh		0.7	19.4					20.5	21.4	20.5	0.3	
Initial Queue Delay (d ₃), s/veh		0.0	0.0					0.0	0.0	0.0	0.0	
Control Delay (d), s/veh		40.6	65.8					61.2	62.2	58.1	10.6	
Level of Service (LOS)		D	E					E	E	E	B	
Approach Delay, s/veh / LOS	62.0	E		0.0			61.7	E		29.5	C	
Intersection Delay, s/veh / LOS	42.0						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.15	B	2.32	B	1.42	A	1.64	B
Bicycle LOS Score / LOS	0.99	A			1.18	A	2.01	B

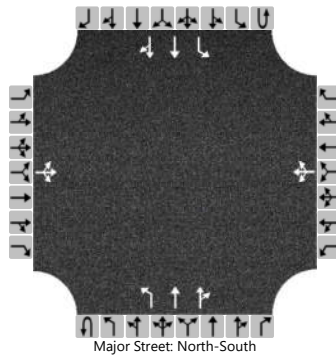
HCS Signalized Intersection Results Summary

General Information						Intersection Information										
Agency	Lanham Engineering					Duration, h	0.250									
Analyst	DKA		Analysis Date	7/13/2022		Area Type	Other									
Jurisdiction	ODOT D8		Time Period	AM Peak Hour		PHF	0.96									
Urban Street	SR-747		Analysis Year	2030		Analysis Period	1 > 7:00									
Intersection	SR-747 at SR-129 WB...		File Name	SR-129 2030 AM Peak Hour - No Build.xus												
Project Description	BUT-747-5.49 Safety Study - 2030 No Build															
Demand Information				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Demand (v), veh/h							247	0	245	131	394			1504	108	
Signal Information																
Cycle, s	120.0	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	No	Simult. Gap E/W	On	Green	7.9	67.6	27.0	0.0	0.0	0.0						
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.0	4.5	4.0	0.0	0.0	0.0						
				Red	2.0	2.0	2.0	0.0	0.0	0.0						
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT					
Assigned Phase							4	1	6							
Case Number							11.0	1.0	4.0							
Phase Duration, s							33.0	12.9	87.0							
Change Period, (Y+R _c), s							6.0	5.0	6.5							
Max Allow Headway (MAH), s							4.0	4.0	0.0							
Queue Clearance Time (g _s), s							25.2	7.6								
Green Extension Time (g _e), s							1.8	0.4	0.0							
Phase Call Probability							1.00	0.99								
Max Out Probability							0.00	0.00								
Movement Group Results				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Assigned Movement							7	4	14	1	6		2	12		
Adjusted Flow Rate (v), veh/h							321	191	138	415		801	878			
Adjusted Saturation Flow Rate (s), veh/h/ln							1621	1631	1663	1650		1790	1977			
Queue Service Time (g _s), s							23.2	12.4	5.6	9.3		68.0	41.9			
Cycle Queue Clearance Time (g _c), s							23.2	12.4	5.6	9.3		68.0	41.9			
Green Ratio (g/C)							0.22	0.22	0.65	0.33		0.56	0.56			
Capacity (c), veh/h							364	366	170	1094		1008	1114			
Volume-to-Capacity Ratio (X)							0.882	0.522	0.810	0.379		0.794	0.789			
Back of Queue (Q), ft/ln (95 th percentile)																
Back of Queue (Q), veh/ln (95 th percentile)							15.1	8.5	6.7	5.2		23.9	25.5			
Queue Storage Ratio (RQ) (95 th percentile)							0.33	0.74	0.59	0.20		0.31	0.33			
Uniform Delay (d ₁), s/veh							47.6	40.9	39.0	11.9		20.7	20.6			
Incremental Delay (d ₂), s/veh							7.0	1.2	4.3	0.5		6.5	5.7			
Initial Queue Delay (d ₃), s/veh							0.0	0.0	0.0	0.0		0.0	0.0			
Control Delay (d), s/veh							54.7	42.0	43.3	12.3		27.2	26.3			
Level of Service (LOS)							D	D	D	B		C	C			
Approach Delay, s/veh / LOS				0.0			49.9	D	20.1	C		26.7	C			
Intersection Delay, s/veh / LOS				29.7					C							
Multimodal Results				EB			WB			NB			SB			
Pedestrian LOS Score / LOS				2.32	B		2.15	B		1.65	B		1.38	A		
Bicycle LOS Score / LOS							1.33	A		0.94	A		1.87	B		

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	MJB			Intersection	SR-747/Grandin Ridge/Logsdons Meadow D...		
Agency/Co.	Lanham Engineering			Jurisdiction	ODOT D8		
Date Performed	7/11/2022			East/West Street	Grandin Ridge/Logsdons Meadow Drive		
Analysis Year	2030			North/South Street	SR-747		
Time Analyzed	PM Peak Hour			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	BUT-747-5.49						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	2	0	0	1	2	0
Configuration			LTR				LTR			L	T	TR		L	T	TR
Volume (veh/h)		4	0	36		7	0	8	0	39	1538	40	0	6	943	20
Percent Heavy Vehicles (%)		0	0	0		0	0	0	1	1			2	2		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

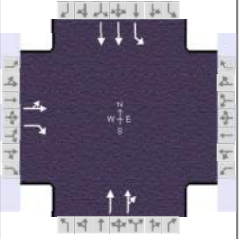
Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.50	6.50	6.90		7.50	6.50	6.90		4.12				4.14		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.00	3.30		2.21				2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			40				15			39				6		
Capacity, c (veh/h)			258				50			717				413		
v/c Ratio			0.15				0.30			0.05				0.01		
95% Queue Length, Q ₉₅ (veh)			0.5				1.0			0.2				0.0		
Control Delay (s/veh)			21.5				104.4			10.3				13.8		
Level of Service (LOS)			C				F			B				B		
Approach Delay (s/veh)	21.5				104.4				0.2				0.1			
Approach LOS	C				F				A				A			

HCS Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Lanham Engineering			Duration, h	0.250		
Analyst	DKA	Analysis Date	7/13/2022	Area Type	Other		
Jurisdiction	ODOT D8	Time Period	PM Peak Hour	PHF	0.97		
Urban Street	SR-747	Analysis Year	2030	Analysis Period	1 > 7:00		
Intersection	SR-747 at SR-129 EB R...	File Name	SR-129 2030 PM Peak Hour - No Build.xus				
Project Description	BUT-747-5.49 Safety Study - 2030 No Build						



Demand Information	EB			WB			NB			SB			
	L	T	R	L	T	R	L	T	R	L	T	R	
Approach Movement													
Demand (v), veh/h	77	1	157							1183	375	456	878

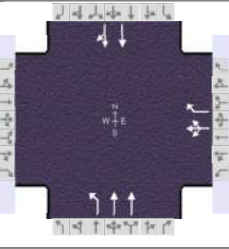

Signal Information													
Cycle, s	120.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	No	Simult. Gap E/W	On	Green	30.2	56.1	16.1	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.0	4.5	4.0	0.0	0.0	0.0			
				Red	2.0	2.0	2.0	0.0	0.0	0.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4				2	1	6
Case Number		11.0				8.3	1.0	4.0
Phase Duration, s		22.1				62.6	35.2	97.9
Change Period, (Y+R _c), s		6.0				6.5	5.0	6.5
Max Allow Headway (MAH), s		7.0				0.0	3.9	0.0
Queue Clearance Time (g _s), s		13.5					28.6	
Green Extension Time (g _e), s		2.7				0.0	1.7	0.0
Phase Call Probability		1.00					1.00	
Max Out Probability		0.00					0.00	

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14					2	12	1	6	
Adjusted Flow Rate (v), veh/h		80	162					809	797	465	896	
Adjusted Saturation Flow Rate (s), veh/h/ln		1748	1629					1974	1893	1781	1785	
Queue Service Time (g _s), s		5.0	11.5					74.0	46.4	26.6	27.1	
Cycle Queue Clearance Time (g _c), s		5.0	11.5					74.0	46.4	26.6	27.1	
Green Ratio (g/C)		0.13	0.13					0.47	0.47	0.74	0.41	
Capacity (c), veh/h		235	219					923	885	509	1451	
Volume-to-Capacity Ratio (X)		0.342	0.739					0.877	0.900	0.914	0.618	
Back of Queue (Q), ft/ln (95 th percentile)												
Back of Queue (Q), veh/ln (95 th percentile)		4.1	9.3					29.5	30.1	18.5	16.8	
Queue Storage Ratio (RQ) (95 th percentile)		0.11	0.54					0.50	0.51	1.45	0.63	
Uniform Delay (d ₁), s/veh		47.1	49.9					28.8	29.4	41.1	20.9	
Incremental Delay (d ₂), s/veh		3.1	16.1					11.5	13.9	4.1	1.1	
Initial Queue Delay (d ₃), s/veh		0.0	0.0					0.0	0.0	0.0	0.0	
Control Delay (d), s/veh		50.2	66.0					40.3	43.3	45.2	22.0	
Level of Service (LOS)		D	E					D	D	D	C	
Approach Delay, s/veh / LOS	60.8	E		0.0			41.8	D		29.9	C	
Intersection Delay, s/veh / LOS		38.2						D				

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.15	B	2.32	B	1.39	A	1.62	B
Bicycle LOS Score / LOS	0.89	A			1.81	B	1.62	B

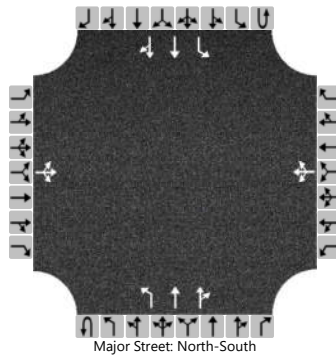
HCS Signalized Intersection Results Summary

General Information						Intersection Information									
Agency	Lanham Engineering					Duration, h	0.250								
Analyst	DKA		Analysis Date	7/13/2022		Area Type	Other								
Jurisdiction	ODOT D8		Time Period	PM Peak Hour		PHF	0.98								
Urban Street	SR-747		Analysis Year	2030		Analysis Period	1 > 7:00								
Intersection	SR-747 at SR-129 WB...		File Name	SR-129 2030 PM Peak Hour - No Build.xus											
Project Description	BUT-747-5.49 Safety Study - 2030 No Build														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h							330	0	789	266	994			1004	83
Signal Information															
Cycle, s	120.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	On	Green	15.1	43.3	44.1	0.0	0.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.0	4.5	4.0	0.0	0.0	0.0					
				Red	2.0	2.0	2.0	0.0	0.0	0.0					
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase							4	1	6			2			
Case Number							11.0	1.0	4.0			8.3			
Phase Duration, s							50.1	20.1	69.9			49.8			
Change Period, (Y+R _c), s							6.0	5.0	6.5			6.5			
Max Allow Headway (MAH), s							4.0	4.0	0.0			0.0			
Queue Clearance Time (g _s), s							39.8	14.5							
Green Extension Time (g _e), s							4.3	0.6	0.0			0.0			
Phase Call Probability							1.00	1.00							
Max Out Probability							0.11	0.07							
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement							7	4	14	1	6		2	12	
Adjusted Flow Rate (v), veh/h							538	604	274	1025		534	575		
Adjusted Saturation Flow Rate (s), veh/h/ln							1734	1815	1746	1818		1745	1890		
Queue Service Time (g _s), s							35.6	37.8	12.5	17.3		35.9	33.5		
Cycle Queue Clearance Time (g _c), s							35.6	37.8	12.5	17.3		35.9	33.5		
Green Ratio (g/C)							0.37	0.37	0.50	0.53		0.36	0.36		
Capacity (c), veh/h							638	667	311	1920		631	683		
Volume-to-Capacity Ratio (X)							0.844	0.905	0.883	0.534		0.848	0.842		
Back of Queue (Q), ft/ln (95 th percentile)															
Back of Queue (Q), veh/ln (95 th percentile)							23.3	24.3	9.1	7.7		22.1	23.2		
Queue Storage Ratio (RQ) (95 th percentile)							0.49	2.06	0.77	0.29		0.28	0.30		
Uniform Delay (d ₁), s/veh							42.9	35.9	36.2	12.1		35.3	35.2		
Incremental Delay (d ₂), s/veh							6.4	10.8	7.0	0.4		13.3	12.0		
Initial Queue Delay (d ₃), s/veh							0.0	0.0	0.0	0.0		0.0	0.0		
Control Delay (d), s/veh							49.3	46.8	43.2	12.5		48.6	47.2		
Level of Service (LOS)							D	D	D	B		D	D		
Approach Delay, s/veh / LOS				0.0			48.0	D	19.0	B		47.9	D		
Intersection Delay, s/veh / LOS				37.3						D					
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				2.32	B		2.15	B		1.68	B		1.41	A	
Bicycle LOS Score / LOS							2.37	B		1.55	B		1.40	A	

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	MJB			Intersection	SR-747/Grandin Ridge/Logsdons Meadow D...		
Agency/Co.	Lanham Engineering			Jurisdiction	ODOT D8		
Date Performed	7/11/2022			East/West Street	Grandin Ridge/Logsdons Meadow Drive		
Analysis Year	2050			North/South Street	SR-747		
Time Analyzed	AM Peak Hour			Peak Hour Factor	0.97		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	BUT-747-5.49						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	2	0	0	1	2	0
Configuration			LTR				LTR			L	T	TR		L	T	TR
Volume (veh/h)		4	0	44		11	1	6	0	6	637	9	0	0	1593	5
Percent Heavy Vehicles (%)		5	5	5		7	7	7	9	9			4	4		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

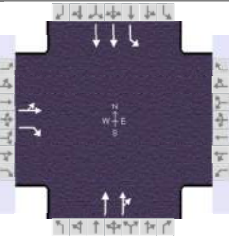
Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.60	6.60	7.00		7.64	6.64	7.04		4.28				4.18		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.55	4.05	3.35		3.57	4.07	3.37		2.29				2.24		

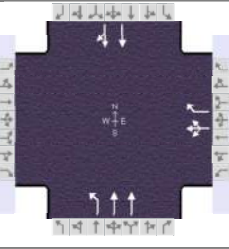
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			49				19			6				0		
Capacity, c (veh/h)			182				90			358				906		
v/c Ratio			0.27				0.21			0.02				0.00		
95% Queue Length, Q ₉₅ (veh)			1.1				0.7			0.1				0.0		
Control Delay (s/veh)			31.9				55.2			15.2				9.0		
Level of Service (LOS)			D				F			C				A		
Approach Delay (s/veh)	31.9				55.2				0.1				0.0			
Approach LOS	D				F				A				A			

HCS Signalized Intersection Results Summary

General Information					Intersection Information											
Agency	Lanham Engineering				Duration, h	0.250										
Analyst	DKA		Analysis Date	7/13/2022		Area Type	Other									
Jurisdiction	ODOT D8		Time Period	AM Peak Hour		PHF	0.95									
Urban Street	SR-747		Analysis Year	2050		Analysis Period	1 > 7:00									
Intersection	SR-747 at SR-129 EB R...		File Name	SR-129 2050 AM Peak Hour - No Build.xus												
Project Description	BUT-747-5.49 Safety Study - 2050 No Build															
Demand Information					EB			WB			NB			SB		
Approach Movement					L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h					50	0	277				542	361		784	1186	
Signal Information																
Cycle, s	120.0	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	No	Simult. Gap E/W	On		Green	42.0	36.1	24.4	0.0	0.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On		Yellow	3.0	4.5	4.0	0.0	0.0	0.0					
					Red	2.0	2.0	2.0	0.0	0.0	0.0					
Timer Results					EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase						4				2	1	6				
Case Number						11.0				8.3	1.0	4.0				
Phase Duration, s						30.4				42.6	47.0	89.6				
Change Period, (Y+R _c), s						6.0				6.5	5.0	6.5				
Max Allow Headway (MAH), s						7.0				0.0	3.9	0.0				
Queue Clearance Time (g _s), s						23.6					44.0					
Green Extension Time (g _e), s						0.8				0.0	0.0	0.0				
Phase Call Probability						1.00					1.00					
Max Out Probability						1.00					1.00					
Movement Group Results					EB			WB			NB			SB		
Approach Movement					L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement					7	4	14				2	12	1	6		
Adjusted Flow Rate (v), veh/h						53	292				483	468	817	1235		
Adjusted Saturation Flow Rate (s), veh/h/ln						1665	1583				1689	1633	1753	1807		
Queue Service Time (g _s), s						3.1	21.6				31.1	33.7	42.0	22.3		
Cycle Queue Clearance Time (g _c), s						3.1	21.6				31.1	33.7	42.0	22.3		
Green Ratio (g/C)						0.20	0.20				0.30	0.30	0.67	0.69		
Capacity (c), veh/h						338	322				508	491	686	2503		
Volume-to-Capacity Ratio (X)						0.156	0.906				0.950	0.952	1.191	0.494		
Back of Queue (Q), ft/ln (95 th percentile)																
Back of Queue (Q), veh/ln (95 th percentile)						2.3	16.1				24.0	23.5	49.7	10.5		
Queue Storage Ratio (RQ) (95 th percentile)						0.07	0.97				0.43	0.42	3.95	0.40		
Uniform Delay (d ₁), s/veh						39.3	46.7				41.1	41.1	43.0	11.1		
Incremental Delay (d ₂), s/veh						0.8	29.5				29.2	30.3	90.6	0.2		
Initial Queue Delay (d ₃), s/veh						0.0	0.0				0.0	0.0	0.0	0.0		
Control Delay (d), s/veh						40.1	76.2				70.3	71.4	133.6	11.3		
Level of Service (LOS)						D	E				E	E	F	B		
Approach Delay, s/veh / LOS					70.7	E	0.0			70.8	E	60.0	E			
Intersection Delay, s/veh / LOS					64.2			E								
Multimodal Results					EB			WB			NB			SB		
Pedestrian LOS Score / LOS					2.15	B	2.32	B	1.42	A	1.64	B				
Bicycle LOS Score / LOS					1.06	A			1.27	A	2.20	B				

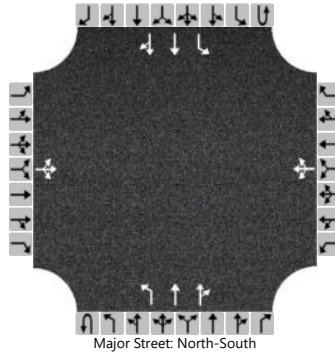
HCS Signalized Intersection Results Summary

General Information						Intersection Information										
Agency	Lanham Engineering					Duration, h	0.250									
Analyst	DKA		Analysis Date	7/13/2022		Area Type	Other									
Jurisdiction	ODOT D8		Time Period	AM Peak Hour		PHF	0.96									
Urban Street	SR-747		Analysis Year	2050		Analysis Period	1 > 7:00									
Intersection	SR-747 at SR-129 WB...		File Name	SR-129 2050 AM Peak Hour - No Build.xus												
Project Description	BUT-747-5.49 Safety Study - 2050 No Build															
Demand Information				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Demand (v), veh/h							278	0	276	147	445			1692	123	
Signal Information																
Cycle, s	120.0	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	No	Simult. Gap E/W	On	Green	9.2	63.2	30.1	0.0	0.0	0.0						
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.0	4.5	4.0	0.0	0.0	0.0						
				Red	2.0	2.0	2.0	0.0	0.0	0.0						
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT					
Assigned Phase							4	1	6			2				
Case Number							11.0	1.0	4.0			8.3				
Phase Duration, s							36.1	14.2	83.9			69.7				
Change Period, (Y+R _c), s							6.0	5.0	6.5			6.5				
Max Allow Headway (MAH), s							4.0	4.0	0.0			0.0				
Queue Clearance Time (g _s), s							28.0	8.8								
Green Extension Time (g _e), s							2.0	0.5	0.0			0.0				
Phase Call Probability							1.00	0.99								
Max Out Probability							0.00	0.00								
Movement Group Results				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Assigned Movement							7	4	14	1	6		2	12		
Adjusted Flow Rate (v), veh/h							361	216	155	468		901	990			
Adjusted Saturation Flow Rate (s), veh/h/ln							1622	1637	1663	1657		1826	1985			
Queue Service Time (g _s), s							26.0	13.6	6.8	10.9		85.6	56.5			
Cycle Queue Clearance Time (g _c), s							26.0	13.6	6.8	10.9		85.6	56.5			
Green Ratio (g/C)							0.25	0.25	0.62	0.34		0.53	0.53			
Capacity (c), veh/h							406	410	188	1135		962	1045			
Volume-to-Capacity Ratio (X)							0.890	0.526	0.823	0.413		0.937	0.947			
Back of Queue (Q), ft/ln (95 th percentile)																
Back of Queue (Q), veh/ln (95 th percentile)							16.5	9.1	7.1	5.6		33.8	37.1			
Queue Storage Ratio (RQ) (95 th percentile)							0.36	0.80	0.62	0.22		0.43	0.47			
Uniform Delay (d ₁), s/veh							46.3	38.8	39.8	13.5		26.5	26.8			
Incremental Delay (d ₂), s/veh							6.8	1.0	3.2	0.4		17.3	17.6			
Initial Queue Delay (d ₃), s/veh							0.0	0.0	0.0	0.0		0.0	0.0			
Control Delay (d), s/veh							53.1	39.9	43.0	13.9		43.8	44.4			
Level of Service (LOS)							D	D	D	B		D	D			
Approach Delay, s/veh / LOS				0.0			48.2	D	21.1	C		44.1	D			
Intersection Delay, s/veh / LOS				40.3					D							
Multimodal Results				EB			WB			NB			SB			
Pedestrian LOS Score / LOS				2.32	B		2.15	B		1.65	B		1.38	A		
Bicycle LOS Score / LOS							1.44	A		1.00	A		2.05	B		

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	MJB			Intersection	SR-747/Grandin Ridge/Logsdons Meadow D...		
Agency/Co.	Lanham Engineering			Jurisdiction	ODOT D8		
Date Performed	7/11/2022			East/West Street	Grandin Ridge/Logsdons Meadow Drive		
Analysis Year	2050			North/South Street	SR-747		
Time Analyzed	PM Peak Hour			Peak Hour Factor	1.00		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	BUT-747-5.49						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	2	0	0	1	2	0
Configuration			LTR				LTR			L	T	TR		L	T	TR
Volume (veh/h)		5	0	40		8	0	9	0	44	1731	45	0	7	1062	23
Percent Heavy Vehicles (%)		0	0	0		0	0	0	1	1			2	2		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

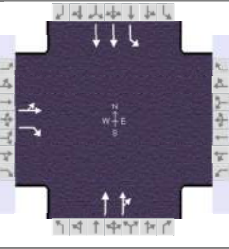
Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.50	6.50	6.90		7.50	6.50	6.90		4.12				4.14		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.00	3.30		2.21				2.22		

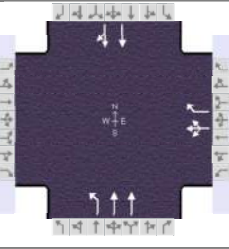
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			45				17			44				7		
Capacity, c (veh/h)			180				31			645				346		
v/c Ratio			0.25				0.55			0.07				0.02		
95% Queue Length, Q ₉₅ (veh)			0.9				1.8			0.2				0.1		
Control Delay (s/veh)			31.5				218.7			11.0				15.6		
Level of Service (LOS)			D				F			B				C		
Approach Delay (s/veh)	31.5				218.7				0.3				0.1			
Approach LOS	D				F				A				A			

HCS Signalized Intersection Results Summary

General Information					Intersection Information											
Agency	Lanham Engineering				Duration, h	0.250										
Analyst	DKA		Analysis Date	7/13/2022		Area Type	Other									
Jurisdiction	ODOT D8		Time Period	PM Peak Hour		PHF	0.97									
Urban Street	SR-747		Analysis Year	2050		Analysis Period	1 > 5:00									
Intersection	SR-747 at SR-129 EB R...		File Name	SR-129 2050 PM Peak Hour - No Build.xus												
Project Description	BUT-747-5.49 Safety Study - 2050 No Build															
Demand Information					EB			WB			NB			SB		
Approach Movement					L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h					86	1	177				1333	422		513	988	
Signal Information																
Cycle, s	120.0	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	No	Simult. Gap E/W	On		Green	30.4	55.2	16.9	0.0	0.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On		Yellow	3.0	4.5	4.0	0.0	0.0	0.0					
					Red	2.0	2.0	2.0	0.0	0.0	0.0					
Timer Results					EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase						4				2	1	6				
Case Number						11.0				8.3	1.0	4.0				
Phase Duration, s						22.9				61.7	35.4	97.1				
Change Period, (Y+R _c), s						6.0				6.5	5.0	6.5				
Max Allow Headway (MAH), s						7.0				0.0	3.9	0.0				
Queue Clearance Time (g _s), s						15.0					32.4					
Green Extension Time (g _e), s						1.9				0.0	0.0	0.0				
Phase Call Probability						1.00					1.00					
Max Out Probability						0.25					1.00					
Movement Group Results					EB			WB			NB			SB		
Approach Movement					L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement					7	4	14				2	12	1	6		
Adjusted Flow Rate (v), veh/h						90	182				903	906	523	1008		
Adjusted Saturation Flow Rate (s), veh/h/ln						1748	1634				2004	1929	1781	1802		
Queue Service Time (g _s), s						5.6	13.0				62.0	55.2	30.4	30.2		
Cycle Queue Clearance Time (g _c), s						5.6	13.0				62.0	55.2	30.4	30.2		
Green Ratio (g/C)						0.14	0.14				0.46	0.46	0.73	0.45		
Capacity (c), veh/h						246	230				922	888	511	1624		
Volume-to-Capacity Ratio (X)						0.364	0.793				0.980	1.021	1.024	0.621		
Back of Queue (Q), ft/ln (95 th percentile)																
Back of Queue (Q), veh/ln (95 th percentile)						4.6	10.4				38.3	41.7	24.4	18.0		
Queue Storage Ratio (RQ) (95 th percentile)						0.13	0.60				0.64	0.70	1.91	0.67		
Uniform Delay (d ₁), s/veh						46.7	49.9				31.8	32.4	42.5	22.3		
Incremental Delay (d ₂), s/veh						3.3	19.5				25.1	35.6	31.6	0.7		
Initial Queue Delay (d ₃), s/veh						0.0	0.0				0.0	0.0	0.0	0.0		
Control Delay (d), s/veh						49.9	69.3				57.0	67.9	74.0	23.0		
Level of Service (LOS)						D	E				E	F	F	C		
Approach Delay, s/veh / LOS					63.0	E	0.0			62.5	E	40.5	D			
Intersection Delay, s/veh / LOS					53.2					D						
Multimodal Results					EB			WB			NB			SB		
Pedestrian LOS Score / LOS					2.15	B	2.32	B	1.40	A	1.62	B				
Bicycle LOS Score / LOS					0.94	A			1.98	B	1.76	B				

HCS Signalized Intersection Results Summary

General Information						Intersection Information											
Agency	Lanham Engineering					Duration, h	0.250										
Analyst	DKA		Analysis Date	7/13/2022		Area Type	Other										
Jurisdiction	ODOT D8		Time Period	PM Peak Hour		PHF	0.98										
Urban Street	SR-747		Analysis Year	2050		Analysis Period	1 > 5:00										
Intersection	SR-747 at SR-129 WB...		File Name	SR-129 2050 PM Peak Hour - No Build.xus													
Project Description	BUT-747-5.49 Safety Study - 2050 No Build																
Demand Information				EB			WB			NB			SB				
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R		
Demand (v), veh/h							371	0	888	300	1119			1130	94		
Signal Information																	
Cycle, s	120.0	Reference Phase	2														
Offset, s	0	Reference Point	End														
Uncoordinated	No	Simult. Gap E/W	On	Green	14.0	42.9	45.6	0.0	0.0	0.0							
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.0	4.5	4.0	0.0	0.0	0.0							
				Red	2.0	2.0	2.0	0.0	0.0	0.0							
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT						
Assigned Phase							4	1	6								
Case Number							11.0	1.0	4.0								
Phase Duration, s							51.6	19.0	68.4								
Change Period, (Y+R _c), s							6.0	5.0	6.5								
Max Allow Headway (MAH), s							4.0	4.0	0.0								
Queue Clearance Time (g _s), s							45.6	16.0									
Green Extension Time (g _e), s							0.0	0.0	0.0								
Phase Call Probability							1.00	1.00									
Max Out Probability							1.00	1.00									
Movement Group Results				EB			WB			NB			SB				
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R		
Assigned Movement							7	4	14	1	6		2	12			
Adjusted Flow Rate (v), veh/h							605	680	309	1154		602	647				
Adjusted Saturation Flow Rate (s), veh/h/ln							1742	1838	1746	1838		1768	1912				
Queue Service Time (g _s), s							40.6	43.6	14.0	20.7		39.0	39.4				
Cycle Queue Clearance Time (g _c), s							40.6	43.6	14.0	20.7		39.0	39.4				
Green Ratio (g/C)							0.38	0.38	0.49	0.52		0.36	0.36				
Capacity (c), veh/h							662	699	277	1896		632	684				
Volume-to-Capacity Ratio (X)							0.914	0.973	1.118	0.608		0.953	0.946				
Back of Queue (Q), ft/ln (95 th percentile)																	
Back of Queue (Q), veh/ln (95 th percentile)							28.3	31.2	12.7	7.7		27.9	29.1				
Queue Storage Ratio (RQ) (95 th percentile)							0.60	2.64	1.07	0.29		0.35	0.37				
Uniform Delay (d ₁), s/veh							43.8	36.6	41.9	12.7		37.6	37.4				
Incremental Delay (d ₂), s/veh							17.3	27.3	63.2	0.3		25.9	23.5				
Initial Queue Delay (d ₃), s/veh							0.0	0.0	0.0	0.0		0.0	0.0				
Control Delay (d), s/veh							61.1	63.9	105.1	13.0		63.4	61.0				
Level of Service (LOS)							E	E	F	B		E	E				
Approach Delay, s/veh / LOS				0.0			62.6	E	32.5	C		62.1	E				
Intersection Delay, s/veh / LOS				51.4					D								
Multimodal Results				EB			WB			NB			SB				
Pedestrian LOS Score / LOS				2.32	B		2.15	B		1.68	B		1.41	A			
Bicycle LOS Score / LOS							2.61	C		1.68	B		1.52	B			



ODOT Highway Safety Program
BUT-747-5.49

Appendix D
Signal and Geometric Analysis

STUDY AND ANALYSIS INFORMATION

Municipality:	Liberty Township	Traffic Volumes Obtained By:	Burgess & Niple
County:	Butler	Analysis Date:	6/29/2022
ODOT Engineering District:	8	Agency/ Company Name Performing Warrant Analysis:	Lanham Engineering, LLC
Google map link:	R-747/Grandin Ridge		

Analysis Information

Data Collection Date: 6/16/2022
Day of the Week: Thursday

Is the intersection in a built-up area of an isolated community of <10,000 population? No

Existing Traffic Signal at intersection: No

Total Number of Approaches at Intersection: 4

Major Street Information

Major Street Name and Route Number: Princeton Glendale Rd, SR-747

Major Street Approach Direction: N-Bound
S-Bound

Number of Thru Lanes on Each Major Street Approach: 2 LANE(S)

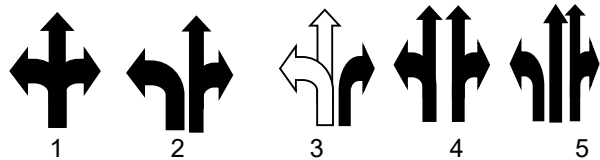
Speed Limit or 85th Percentile Speed on the Major Street*: 55 MPH
*Unknown assumes below 45 mph

Minor Street Information

Minor Street Name and Route Number: Logsdons Meadow Dr/Grandin Ridge Dr

Minor Street Approach Configuration:

1	E-Bound
1	W-Bound



Number of Thru Lanes on Each Minor Street Approach: 1 LANE(S)
 Apply Right Turn Lane Reduction*: No

*Right Turn Lane Reduction Shall be used for Warrants 1, 2, & 3 for New ODOT Signals. Please refer to TEM 402-3.2 for clarification and criteria under which Right Turn Reduction is not required.

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Warrant		Notes and Comments:			
	Applicable?	Satisfied?				
Warrant 1, Eight-Hour Vehicular Volume	Yes	No				
Warrant 2, Four-Hour Vehicular Volume	Yes	No				
Warrant 3, Peak Hour	No		Signals installed under Warrant 3 should be traffic actuated. <table border="1" style="float: right;"> <tr><td>Peak Hour</td></tr> <tr><td>5:15 PM</td></tr> <tr><td>6:15 PM</td></tr> </table>	Peak Hour	5:15 PM	6:15 PM
Peak Hour						
5:15 PM						
6:15 PM						
For Warrants 1-3, new ODOT signals must be based off of 100% volume thresholds (TEM 402-3.2)						
Warrant 4, Pedestrian Volume	No		If this warrant is met, and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4E of the OMUTCD. <table border="1" style="float: right;"> <tr><td>Peak Hour</td></tr> <tr><td>2:30 PM</td></tr> <tr><td>3:30 PM</td></tr> </table>	Peak Hour	2:30 PM	3:30 PM
Peak Hour						
2:30 PM						
3:30 PM						
Warrant 5, School Crossing	No		N/A			
Warrant 6, Coordinated Signal System	No		(Shall not be used as the sole warrant in the analysis)			
Warrant 7, Crash Experience	Yes	No	If this is the sole warrant, signal must be semi-actuated with control devices which provide proper coordination if installed at an intersection within a coordinated system and normally should be fully traffic actuated if installed at an isolated intersection.			
Warrant 8, Roadway Network	No		(Shall not be used as the sole warrant in the analysis)			
Warrant 9, Intersection Near a Grade Crossing	No		Figure 4C-9			
Multi-Way Stop Warrant	No		May be used as an interim measure if traffic signal warrants are satisfied.			

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

- If no warrants are satisfied, additional options may be considered:
1. An engineering study, performed by a firm prequalified by ODOT for signal design, if approved by the ODOT district, may be used to justify a new signal installation or retention of an existing signal that otherwise does not meet the published warrants. An example of such an instance is a traffic signal in proximity to a railroad crossing that serves to reduce queuing across the tracks.
 2. According to TEM 402-2, If the actual turning movement counts fail to satisfy a signal warrant, it may be acceptable to use traffic volumes projected to the second year after project completion. The **Modeling and Forecasting Section** should provide the projected traffic volumes.
 3. A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants (see Chapter 4C of TEM) or at a location that meets traffic signal warrants under Sections 4C.05 and/or 4C.06 but a decision is made to not install a traffic control signal. **Please fill inputs on PHB Score Sheet and submit to ODOT.**

Considerations such as geometrics and lack of sight distance generally have not been accepted in lieu of satisfying signal warrants. These considerations may allow an otherwise unwarranted traffic signal to be retained at **100 percent** local cost. Please review TEM 402-4 for details.

Conclusion: **Do Not Install New Traffic Signal**

Notes:

OMUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	2 or More Lanes
Minor Street:	1 Lane

Build up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? **Yes**

*Only applicable after an adequate trial of other alternatives (See section 4C.02.06 of the 2012 OMUTCD)

Lanes Major/ Minor	Adjusted Volumes		Condition A				Condition B				Combination A/B*							
			100%		70%		100%		70%		80%		80%		56%		56%	
	Major	Minor	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.
1 / 1			500	150	350	105	750	75	525	53	400	120	600	60	280	84	420	42
2+ / 1	X		600	150	420	105	900	75	630	53	480	120	720	60	336	84	504	42
2+ / 2+			600	200	420	140	900	100	630	70	480	160	720	80	336	112	504	56
1 / 2+			500	200	350	140	750	100	525	70	400	160	600	80	280	112	420	56
12:00 AM	0	0																
12:15 AM	0	0																
12:30 AM	0	0																
12:45 AM	0	0																
1:00 AM	0	0																
1:15 AM	0	0																
1:30 AM	0	0																
1:45 AM	0	0																
2:00 AM	0	0																
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5:00 AM	0	0																
5:15 AM	0	0																
5:30 AM	0	0																
5:45 AM	0	0																
6:00 AM	0	0																
6:15 AM	389	7													1			
6:30 AM	872	20	1		1				1		1		1				1	
6:45 AM	1350	30					1											
7:00 AM	1808	37																
7:15 AM	1884	40													1			
7:30 AM	1827	35	1		1				1		1		1				1	
7:45 AM	1805	33					1											
8:00 AM	1764	32																
8:15 AM	1631	34													1			
8:30 AM	1578	34	1		1				1		1		1				1	
8:45 AM	1489	35					1											
9:00 AM	1455	34																
9:15 AM	1462	27													1			
9:30 AM	1429	24	1		1				1		1		1				1	
9:45 AM	1403	23					1											
10:00 AM	1399	19																
10:15 AM	1445	19													1			

BUT-747 Signal Warrant Grandin Ridge Dr

10:30 AM	1448	22	1		1			1		1		1			1	
10:45 AM	1510	22				1										
11:00 AM	1561	26														
11:15 AM	1568	26											1			
11:30 AM	1648	27	1		1			1		1		1			1	
11:45 AM	1663	27				1										
12:00 PM	1688	26														
12:15 PM	1686	24											1			
12:30 PM	1670	19	1		1			1		1		1			1	
12:45 PM	1637	20				1										
1:00 PM	1638	24														
1:15 PM	1669	25											1			
1:30 PM	1704	26	1		1			1		1		1			1	
1:45 PM	1806	25				1										
2:00 PM	1808	21														
2:15 PM	1898	23											1			
2:30 PM	1986	22	1		1			1		1		1			1	
2:45 PM	2019	20				1										
3:00 PM	2120	23														
3:15 PM	2156	25											1			
3:30 PM	2230	28	1		1			1		1		1			1	
3:45 PM	2303	27				1										
4:00 PM	2325	30														
4:15 PM	2410	31											1			
4:30 PM	2415	32	1		1			1		1		1			1	
4:45 PM	2423	34				1										
5:00 PM	2439	38														
5:15 PM	2295	42											1			
5:30 PM	2156	38	1		1			1		1		1			1	
5:45 PM	2032	37				1										
6:00 PM	1871	32														
6:15 PM	1383	20											1			
6:30 PM	913	17	1		1			1		1		1			1	
6:45 PM	436	8														
7:00 PM	0	0														
7:15 PM	0	0														
7:30 PM	0	0														
7:45 PM	0	0														
8:00 PM	0	0														
8:15 PM	0	0														
8:30 PM	0	0														
8:45 PM	0	0														
9:00 PM	0	0														
9:15 PM	0	0														
9:30 PM	0	0														
9:45 PM	0	0														
HOURS MET			13	0	13	0	12	0	13	0	13	0	13	0	13	0
WARRANT SATISFIED?			NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Warrant Met: **No**

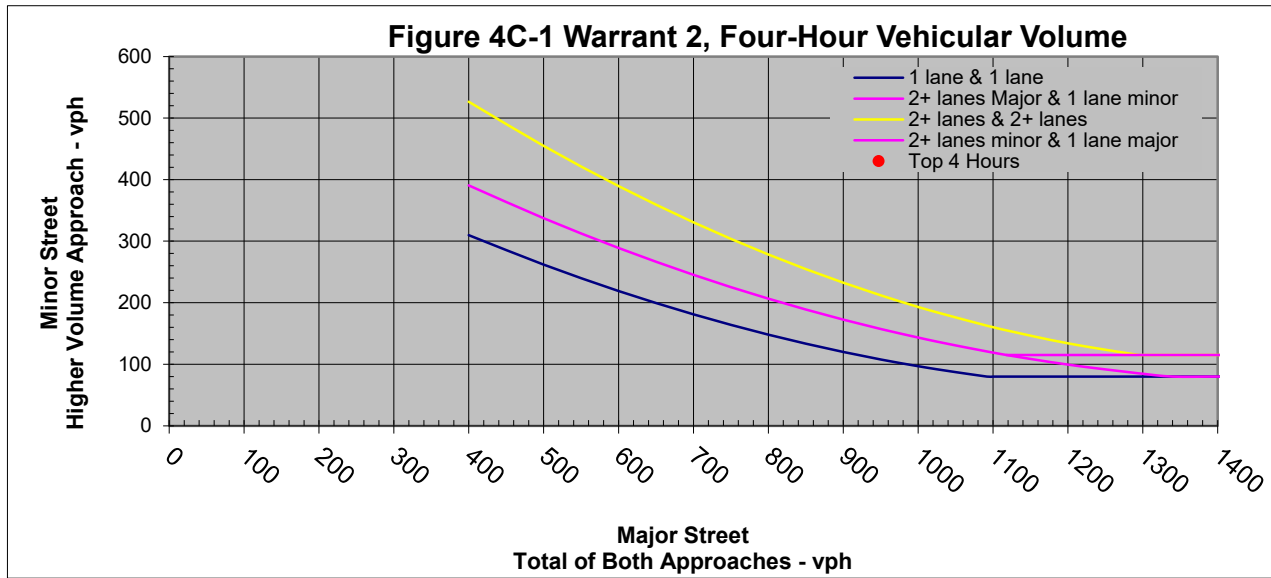
Notes:

OMUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	Total Number of Unique Hours Met on Figure 4C-1	0
Major street: 2 or More Lanes	Total Number of Unique Hours Met on Figure 4C-2 (70% Factor)	0
Minor Street: 1 Lane		

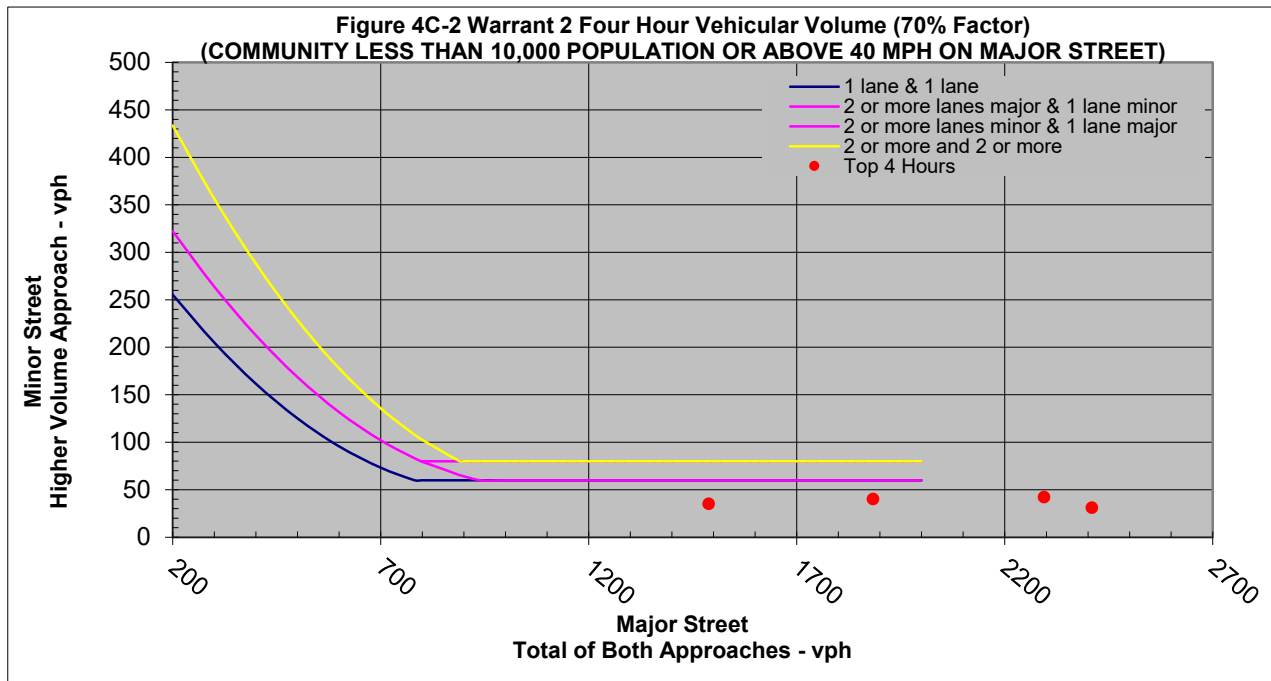
Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? Yes

Hour Interval Beginning At	Raw Traffic Counts				Total Major Approach Volumes	Highest Actual Minor Street Approach Volumes	Hour Met?	Hour Met? (70% Factor)
	Major - Princeton Glendale Rd, SR-7		Logsdons Meadow Dr/Grandin R					
	N-Bound	S-Bound	W-Bound	E-Bound				
6:00 AM	0	0	0	0	0	0		
6:15 AM	86	303	4	7	389	7		
6:30 AM	216	656	9	20	872	20		
6:45 AM	347	1003	12	30	1350	30		
7:00 AM	485	1323	15	37	1808	37		
7:15 AM	547	1337	15	40	1884	40		
7:30 AM	555	1272	17	35	1827	35		
7:45 AM	566	1239	15	33	1805	33		
8:00 AM	586	1178	20	32	1764	32		
8:15 AM	585	1046	21	34	1631	34		
8:30 AM	617	961	17	34	1578	34		
8:45 AM	613	876	20	35	1489	35		
9:00 AM	618	837	16	34	1455	34		
9:15 AM	617	845	18	27	1462	27		
9:30 AM	605	824	22	24	1429	24		
9:45 AM	614	789	23	21	1403	23		
10:00 AM	619	780	19	18	1399	19		
10:15 AM	654	791	19	18	1445	19		
10:30 AM	660	788	19	22	1448	22		
10:45 AM	697	813	18	22	1510	22		
11:00 AM	736	825	26	26	1561	26		
11:15 AM	765	803	23	26	1568	26		
11:30 AM	837	811	18	27	1648	27		
11:45 AM	859	804	19	27	1663	27		
12:00 PM	883	805	16	26	1688	26		
12:15 PM	892	794	16	24	1686	24		
12:30 PM	872	798	18	19	1670	19		
12:45 PM	859	778	16	20	1637	20		
1:00 PM	893	745	17	24	1638	24		
1:15 PM	911	758	16	25	1669	25		
1:30 PM	956	748	17	26	1704	26		
1:45 PM	1042	764	22	25	1806	25		
2:00 PM	1050	758	21	19	1808	21		
2:15 PM	1116	782	23	20	1898	23		
2:30 PM	1194	792	22	17	1986	22		
2:45 PM	1233	786	16	20	2019	20		
3:00 PM	1316	804	11	23	2120	23		
3:15 PM	1386	770	9	25	2156	25		
3:30 PM	1462	768	11	28	2230	28		
3:45 PM	1519	784	13	27	2303	27		
4:00 PM	1549	776	17	30	2325	30		
4:15 PM	1566	844	17	31	2410	31		
4:30 PM	1524	891	14	32	2415	32		
4:45 PM	1529	894	11	34	2423	34		
5:00 PM	1525	914	15	38	2439	38		
5:15 PM	1430	865	16	42	2295	42		
5:30 PM	1362	794	18	38	2156	38		
5:45 PM	1243	789	20	37	2032	37		
6:00 PM	1111	760	16	32	1871	32		
6:15 PM	816	567	12	20	1383	20		
6:30 PM	511	402	7	17	913	17		
6:45 PM	250	186	4	8	436	8		
7:00 PM	0	0	0	0	0	0		
7:15 PM	0	0	0	0	0	0		
7:30 PM	0	0	0	0	0	0		
7:45 PM	0	0	0	0	0	0		
8:00 PM	0	0	0	0	0	0		



Top Hours for Figure 4C-1				
	Start Time	End Time	Major Street	Minor Street
Top Hour	5:15 PM	6:15 PM	2295	42
2nd Highest Hour	7:15 AM	8:15 AM	1884	40
3rd Highest Hour	8:45 AM	9:45 AM	1489	35
4th Highest Hour	4:15 PM	5:15 PM	2410	31

Top Hours for Figure 4C-2				
	Start Time	End Time	Major Street	Minor Street
Top Hour	5:15 PM	6:15 PM	2295	42
2nd Highest Hour	7:15 AM	8:15 AM	1884	40
3rd Highest Hour	8:45 AM	9:45 AM	1489	35
4th Highest Hour	4:15 PM	5:15 PM	2410	31



Are the requirements for Warrant 2 met?:

OMUTCD WARRANT 7, CRASH EXPERIENCE

Built-up Isolated Community With Less Than 10,000 Population or Above 40 mph on Major Street?: Yes

Number of Lanes for Moving Traffic on Each Approach

Major Street: 2 or More Lanes
Minor Street: 1 Lane

Has adequate trial of alternative with satisfactory observance and enforcement failed to reduce the crash frequency? Yes

Five or more reportable and/ or non-reportable crashes, of types susceptible to correction by a traffic control signal have occurred within a 12-month period during the most recent 3 years of available crash data.* Yes
**If applicable attach a summary of the crash data analysis used for this criterion*

For each of any 8 hours of an average day, the vehicles per hour given in both the 80% columns of Condition A in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, if in a built-up isolated community with less than 10,000 population or above 40 mph on major street, the 56% columns may be used. No

For each of any 8 hours of an average day, the vehicles per hour given in both the 80% columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, if in a built-up isolated community with less than 10,000 population or above 40 mph on major street, the 56% columns may be used. No

The volume of pedestrian traffic is 80% or more of the requirements specified in Warrant 4, the Pedestrian Volume warrant.*
**If applicable, attach all supporting calculations and documentation*

Are the requirements for Warrant 7 met?: No

OMUTCD WARRANT 8, ROADWAY NETWORK*

Does the intersection have a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2, and 3, during the average weekday?

Does the intersection have a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non-normal business day (Saturday or Sunday)?

Is the major street part of the street or highway system that serves as the principal roadway network for through traffic flow?

Does the major street include rural or suburban highways outside, entering, or traversing a city?

Does the major street appear as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study?

**Refer to Section 4.3 of ODOT Publication 46 (Traffic Engineering Manual) for additional Department documentation requirements to justify the installation of a signal under Warrant 8. Attach all supplementary documentation and calculations, especially those relating to traffic volume projections and subsequent Warrant analyses.*

Are the requirements for Warrant 8 met?: No

STUDY AND ANALYSIS INFORMATION

Municipality:	Liberty Township	Traffic Volumes Obtained By:	Burgess & Niple
County:	Butler	Analysis Date:	6/29/2022
ODOT Engineering District:	8	Agency/ Company Name Performing Warrant Analysis:	Lanham Engineering, LLC
Google map link:	SR-747/SR-129 EB		

Analysis Information

Data Collection Date: 6/16/2022
Day of the Week: Thursday

Is the intersection in a built-up area of an isolated community of <10,000 population? No

Existing Traffic Signal at intersection: Yes

Total Number of Approaches at Intersection: 4

Major Street Information

Major Street Name and Route Number: Princeton Glendale Rd, SR-747

Major Street Approach Direction: N-Bound
S-Bound

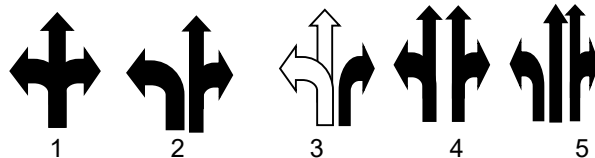
Number of Thru Lanes on Each Major Street Approach: 2 LANE(S)

Speed Limit or 85th Percentile Speed on the Major Street*: 55 MPH
*Unknown assumes below 45 mph

Minor Street Information

Minor Street Name and Route Number: Butler County Veterans Hwy EB, SR-129

Minor Street Approach Configuration: 2 E-Bound
W-Bound



Number of Thru Lanes on Each Minor Street Approach: 0 LANE(S)
 Apply Right Turn Lane Reduction*: Yes

*Right Turn Lane Reduction Shall be used for Warrants 1, 2, & 3 for New ODOT Signals. Please refer to TEM 402-3.2 for clarification and criteria under which Right Turn Reduction is not required.

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Warrant		Notes and Comments:			
	Applicable?	Satisfied?				
Warrant 1, Eight-Hour Vehicular Volume	Yes	Yes	Condition B was met. Condition B (70%) was met. Combination of A/B (56%) was met.*			
Warrant 2, Four-Hour Vehicular Volume	Yes	Yes	Figure 4C-1 (100%)			
Warrant 3, Peak Hour	No		Signals installed under Warrant 3 should be traffic actuated. <table border="1" style="float: right; margin-top: 5px;"> <tr><td style="text-align: center;">Peak Hour</td></tr> <tr><td style="text-align: center;">7:00 AM</td></tr> <tr><td style="text-align: center;">8:00 AM</td></tr> </table>	Peak Hour	7:00 AM	8:00 AM
Peak Hour						
7:00 AM						
8:00 AM						
For Warrants 1-3, new ODOT signals must be based off of 100% volume thresholds (TEM 402-3.2)						
Warrant 4, Pedestrian Volume	No		If this warrant is met, and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4E of the OMUTCD. <table border="1" style="float: right; margin-top: 5px;"> <tr><td style="text-align: center;">Peak Hour</td></tr> <tr><td style="text-align: center;">3:15 PM</td></tr> <tr><td style="text-align: center;">4:15 PM</td></tr> </table>	Peak Hour	3:15 PM	4:15 PM
Peak Hour						
3:15 PM						
4:15 PM						
Warrant 5, School Crossing	No		N/A			
Warrant 6, Coordinated Signal System	No		(Shall not be used as the sole warrant in the analysis)			
Warrant 7, Crash Experience	Yes	Yes	If this is the sole warrant, signal must be semi-actuated with control devices which provide proper coordination if installed at an intersection within a coordinated system and normally should be fully traffic actuated if installed at an isolated intersection.			
Warrant 8, Roadway Network	No		(Shall not be used as the sole warrant in the analysis)			
Warrant 9, Intersection Near a Grade Crossing	No					
Multi-Way Stop Warrant	No		May be used as an interim measure if traffic signal warrants are satisfied.			

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

<p>If no warrants are satisfied, additional options may be considered:</p> <ol style="list-style-type: none"> 1. An engineering study, performed by a firm prequalified by ODOT for signal design, if approved by the ODOT district, may be used to justify a new signal installation or retention of an existing signal that otherwise does not meet the published warrants. An example of such an instance is a traffic signal in proximity to a railroad crossing that serves to reduce queuing across the tracks. 2. According to TEM 402-2, If the actual turning movement counts fail to satisfy a signal warrant, it may be acceptable to use traffic volumes projected to the second year after project completion. The Modeling and Forecasting Section should provide the projected traffic volumes. 3. A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants (see Chapter 4C of TEM) or at a location that meets traffic signal warrants under Sections 4C.05 and/or 4C.06 but a decision is made to not install a traffic control signal. Please fill inputs on PHB Score Sheet and submit to ODOT.
--

Considerations such as geometrics and lack of sight distance generally have not been accepted in lieu of satisfying signal warrants. These considerations may allow an otherwise unwarranted traffic signal to be retained at **100 percent** local cost. Please review TEM 402-4 for details.

Conclusion: Retain Existing Traffic Signal

Notes:

OMUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	2 or More Lanes
Minor Street:	2 or More Lanes

Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? Yes

**Only applicable after an adequate trial of other alternatives (See section 4C.02.06 of the 2012 OMUTCD)*

Lanes Major/ Minor	Adjusted Volumes		Condition A				Condition B				Combination A/B*							
			100%		70%		100%		70%		80%		80%		56%		56%	
	Major	Minor	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.
1 / 1			500	150	350	105	750	75	525	53	400	120	600	60	280	84	420	42
2+ / 1			600	150	420	105	900	75	630	53	480	120	720	60	336	84	504	42
2+ / 2+		X	600	200	420	140	900	100	630	70	480	160	720	80	336	112	504	56
1 / 2+			500	200	350	140	750	100	525	70	400	160	600	80	280	112	420	56
12:00 AM	0	0																
12:15 AM	0	0																
12:30 AM	0	0																
12:45 AM	0	0																
1:00 AM	0	0																
1:15 AM	0	0																
1:30 AM	0	0																
1:45 AM	0	0																
2:00 AM	0	0																
2:15 AM	0	0																
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4:30 AM	0	0																
4:45 AM	0	0																
5:00 AM	0	0																
5:15 AM	0	0																
5:30 AM	0	0																
5:45 AM	0	0																
6:00 AM	0	0																
6:15 AM	455	31			1									1				
6:30 AM	1016	73	1				1		1	1	1		1				1	1
6:45 AM	1574	138																
7:00 AM	2127	210																
7:15 AM	2173	204			1	1								1	1			
7:30 AM	2146	188	1				1	1	1	1	1	1	1				1	1
7:45 AM	2099	156																
8:00 AM	2083	169																
8:15 AM	1955	156			1	1								1	1			
8:30 AM	1822	156	1				1	1	1	1	1		1	1			1	1
8:45 AM	1724	160																
9:00 AM	1575	140																
9:15 AM	1603	140			1	1								1	1			
9:30 AM	1573	136	1				1	1	1	1	1		1	1			1	1
9:45 AM	1533	127																
10:00 AM	1529	124																
10:15 AM	1509	125			1									1	1			

BUT-747 Signal Warrant SR-129 EB

10:30 AM	1532	133	1					1	1	1	1	1		1	1			1	1
10:45 AM	1602	136																	
11:00 AM	1673	141																	
11:15 AM	1710	140			1	1									1	1			
11:30 AM	1740	128	1					1	1	1	1	1		1	1			1	1
11:45 AM	1752	124																	
12:00 PM	1752	120																	
12:15 PM	1758	119			1										1	1			
12:30 PM	1709	132	1					1	1	1	1	1		1	1			1	1
12:45 PM	1665	136																	
1:00 PM	1651	134																	
1:15 PM	1656	128			1										1	1			
1:30 PM	1678	133	1					1	1	1	1	1		1	1			1	1
1:45 PM	1723	127																	
2:00 PM	1792	119																	
2:15 PM	1854	132			1										1	1			
2:30 PM	1955	122	1					1	1	1	1	1		1	1			1	1
2:45 PM	2024	130																	
3:00 PM	2035	141																	
3:15 PM	2048	154			1	1									1	1			
3:30 PM	2160	163	1					1	1	1	1	1	1	1	1	1		1	1
3:45 PM	2260	176																	
4:00 PM	2311	179																	
4:15 PM	2425	176			1	1									1	1			
4:30 PM	2434	171	1					1	1	1	1	1	1	1	1	1		1	1
4:45 PM	2440	167																	
5:00 PM	2458	153																	
5:15 PM	2332	158			1	1									1	1			
5:30 PM	2162	145	1					1	1	1	1	1		1	1			1	1
5:45 PM	1974	132																	
6:00 PM	1812	111																	
6:15 PM	1320	69			1										1				
6:30 PM	871	36	1							1	1			1				1	
6:45 PM	428	15																	
7:00 PM	0	0																	
7:15 PM	0	0																	
7:30 PM	0	0																	
7:45 PM	0	0																	
8:00 PM	0	0																	
8:15 PM	0	0																	
8:30 PM	0	0																	
8:45 PM	0	0																	
9:00 PM	0	0																	
9:15 PM	0	0																	
9:30 PM	0	0																	
9:45 PM	0	0																	
HOURS MET			13	0	13	7	12	11	13	12	13	3	13	11	13	11	13	12	
WARRANT SATISFIED?			NO	NO	YES	YES	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Warrant Met: **Yes**

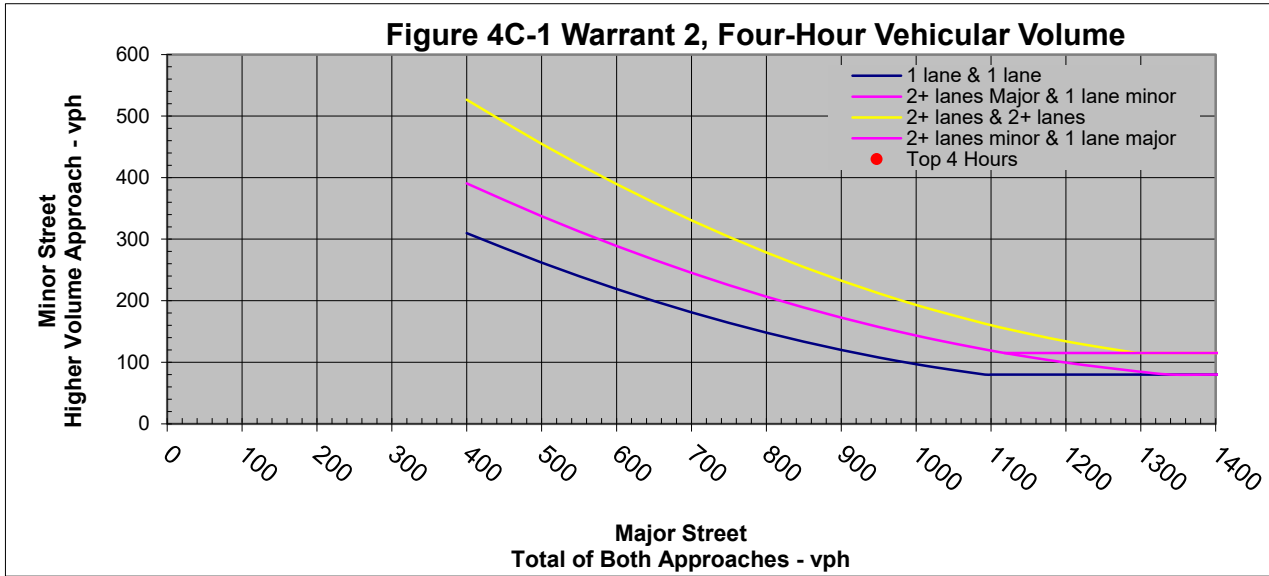
Notes: Condition B was met. Condition B (70%) was met. Combination of A/B (56%) was met.*

OMUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	Total Number of Unique Hours Met on Figure 4C-1	12
Major street: 2 or More Lanes	Total Number of Unique Hours Met on Figure 4C-2 (70% Factor)	12
Minor Street: 2 or More Lanes		
Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street?		Yes

Hour Interval Beginning At	Raw Traffic Counts				Total Major Approach Volumes	Highest Actual Minor Street Approach Volumes	Hour Met?	Hour Met? (70% Factor)
	Major - Princeton Glendale Rd, SR-7	Butler County Veterans Hwy EB,	N-Bound	S-Bound				
6:00 AM	0	0	0	0	0	0		
6:15 AM	123	332	0	31	455	31		
6:30 AM	294	722	0	73	1016	73		
6:45 AM	455	1119	0	138	1574	138	Met	Met
7:00 AM	637	1490	0	210	2127	210		
7:15 AM	667	1506	0	204	2173	204		
7:30 AM	686	1460	0	188	2146	188		
7:45 AM	716	1383	0	156	2099	156	Met	Met
8:00 AM	726	1357	0	169	2083	169		
8:15 AM	726	1229	0	156	1955	156		
8:30 AM	709	1113	0	156	1822	156		
8:45 AM	700	1024	0	160	1724	160	Met	Met
9:00 AM	663	912	0	140	1575	140		
9:15 AM	691	912	0	140	1603	140		
9:30 AM	685	888	0	136	1573	136		
9:45 AM	663	870	0	127	1533	127	Met	Met
10:00 AM	676	853	0	124	1529	124		
10:15 AM	644	865	0	125	1509	125		
10:30 AM	660	872	0	133	1532	133		
10:45 AM	700	902	0	136	1602	136	Met	Met
11:00 AM	725	948	0	141	1673	141		
11:15 AM	780	930	0	140	1710	140		
11:30 AM	796	944	0	128	1740	128		
11:45 AM	816	936	0	124	1752	124	Met	Met
12:00 PM	818	934	0	120	1752	120		
12:15 PM	829	929	0	119	1758	119		
12:30 PM	801	908	0	132	1709	132		
12:45 PM	775	890	0	136	1665	136	Met	Met
1:00 PM	790	861	0	134	1651	134		
1:15 PM	792	864	0	128	1656	128		
1:30 PM	815	863	0	133	1678	133		
1:45 PM	858	865	0	127	1723	127	Met	Met
2:00 PM	914	878	0	119	1792	119		
2:15 PM	963	891	0	132	1854	132		
2:30 PM	1058	897	0	122	1955	122		
2:45 PM	1109	915	0	130	2024	130	Met	Met
3:00 PM	1136	899	0	141	2035	141		
3:15 PM	1149	899	0	154	2048	154		
3:30 PM	1203	957	0	163	2160	163		
3:45 PM	1252	1008	0	176	2260	176	Met	Met
4:00 PM	1280	1031	0	179	2311	179		
4:15 PM	1322	1103	0	176	2425	176		
4:30 PM	1307	1127	0	171	2434	171		
4:45 PM	1324	1116	0	167	2440	167	Met	Met
5:00 PM	1317	1141	0	153	2458	153		
5:15 PM	1276	1056	0	158	2332	158		
5:30 PM	1198	964	0	145	2162	145		
5:45 PM	1095	879	0	132	1974	132	Met	Met
6:00 PM	980	832	0	111	1812	111		
6:15 PM	700	620	0	69	1320	69		
6:30 PM	450	421	0	36	871	36		
6:45 PM	199	229	0	15	428	15		
7:00 PM	0	0	0	0	0	0		
7:15 PM	0	0	0	0	0	0		
7:30 PM	0	0	0	0	0	0		
7:45 PM	0	0	0	0	0	0		
8:00 PM	0	0	0	0	0	0		

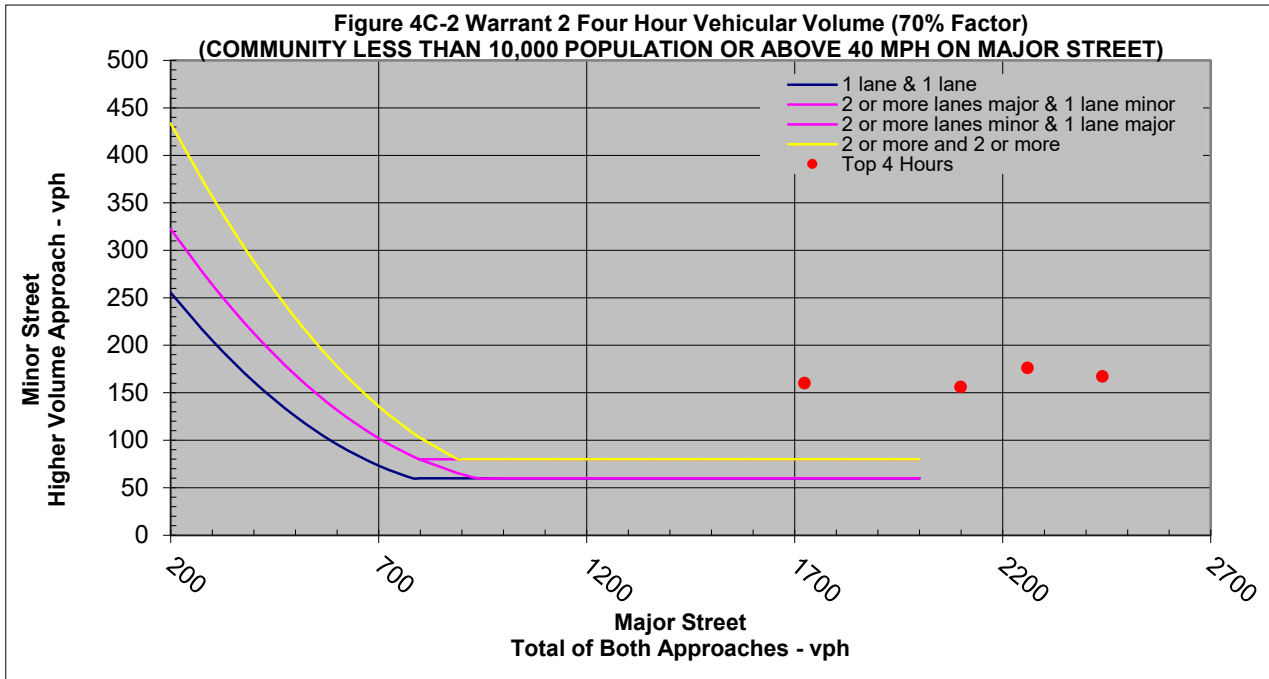
Figure 4C-1 Warrant 2, Four-Hour Vehicular Volume



Top Hours for Figure 4C-1				
	Start Time	End Time	Major Street	Minor Street
Top Hour	3:45 PM	4:45 PM	2260	176
2nd Highest Hour	4:45 PM	5:45 PM	2440	167
3rd Highest Hour	8:45 AM	9:45 AM	1724	160
4th Highest Hour	7:45 AM	8:45 AM	2099	156

Top Hours for Figure 4C-2				
	Start Time	End Time	Major Street	Minor Street
Top Hour	3:45 PM	4:45 PM	2260	176
2nd Highest Hour	4:45 PM	5:45 PM	2440	167
3rd Highest Hour	8:45 AM	9:45 AM	1724	160
4th Highest Hour	7:45 AM	8:45 AM	2099	156

**Figure 4C-2 Warrant 2 Four Hour Vehicular Volume (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)**



Are the requirements for Warrant 2 met?: Yes

OMUTCD WARRANT 7, CRASH EXPERIENCE

Built-up Isolated Community With Less Than 10,000 Population or Above 40 mph on Major Street?: Yes

Number of Lanes for Moving Traffic on Each Approach

Major Street: 2 or More Lanes

Minor Street: 2 or More Lanes

Has adequate trial of alternative with satisfactory observance and enforcement failed to reduce the crash frequency? Yes

Five or more reportable and/ or non-reportable crashes, of types susceptible to correction by a traffic control signal have occurred within a 12-month period during the most recent 3 years of available crash data.* Yes
**If applicable attach a summary of the crash data analysis used for this criterion*

For each of any 8 hours of an average day, the vehicles per hour given in both the 80% columns of Condition A in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, if in a built-up isolated community with less than 10,000 population or above 40 mph on major street, the 56% columns may be used. Yes

For each of any 8 hours of an average day, the vehicles per hour given in both the 80% columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, if in a built-up isolated community with less than 10,000 population or above 40 mph on major street, the 56% columns may be used. Yes

The volume of pedestrian traffic is 80% or more of the requirements specified in Warrant 4, the Pedestrian Volume warrant.*
**If applicable, attach all supporting calculations and documentation*

Are the requirements for Warrant 7 met?: Yes

OMUTCD WARRANT 8, ROADWAY NETWORK*

Does the intersection have a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2, and 3, during the average weekday?

Does the intersection have a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non-normal business day (Saturday or Sunday)?

Is the major street part of the street or highway system that serves as the principal roadway network for through traffic flow?

Does the major street include rural or suburban highways outside, entering, or traversing a city?

Does the major street appear as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study?

**Refer to Section 4.3 of ODOT Publication 46 (Traffic Engineering Manual) for additional Department documentation requirements to justify the installation of a signal under Warrant 8. Attach all supplementary documentation and calculations, especially those relating to traffic volume projections and subsequent Warrant analyses.*

Are the requirements for Warrant 8 met?: No

STUDY AND ANALYSIS INFORMATION

Municipality: County: ODOT Engineering District: Google map link:	Liberty Township Butler 8 SR-747/SR-129 WB	Traffic Volumes Obtained By: Analysis Date: Agency/ Company Name Performing Warrant Analysis:	Burgess & Niple 6/28/2022 Lanham Engineering, LLC
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Analysis Information

Data Collection Date: 6/16/2022
 Day of the Week: Thursday

Is the intersection in a built-up area of an isolated community of <10,000 population? No

Existing Traffic Signal at intersection: Yes

Total Number of Approaches at Intersection: 4

Major Street Information

Major Street Name and Route Number: Princeton Glendale Rd, SR-747

Major Street Approach Direction: N-Bound
S-Bound

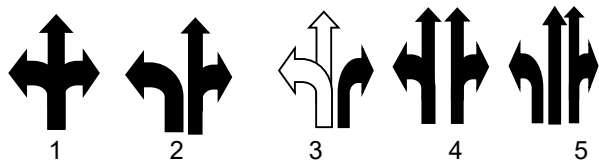
Number of Thru Lanes on Each Major Street Approach: 2 LANE(S)

Speed Limit or 85th Percentile Speed on the Major Street*: 55 MPH
*Unknown assumes below 45 mph

Minor Street Information

Minor Street Name and Route Number: Butler County Veterans Hwy WB Ramp, SR-129

Minor Street Approach Configuration: 2 E-Bound
W-Bound



Number of Thru Lanes on Each Minor Street Approach: 0 LANE(S)
 Apply Right Turn Lane Reduction*: Yes

*Right Turn Lane Reduction Shall be used for Warrants 1, 2, & 3 for New ODOT Signals. Please refer to TEM 402-3.2 for clarification and criteria under which Right Turn Reduction is not required.

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Warrant		Notes and Comments:			
	Applicable?	Satisfied?				
Warrant 1, Eight-Hour Vehicular Volume	Yes	Yes	Condition A was met. Condition B was met. Condition A (70%) was met. Condition B (70%) was met. Combination of A/B (80%) was met.*Combination of A/B (56%) was met.*			
Warrant 2, Four-Hour Vehicular Volume	Yes	Yes	Figure 4C-1 (100%)			
Warrant 3, Peak Hour	No		Signals installed under Warrant 3 should be traffic actuated.			
			<table border="1"> <tr> <td>Peak Hour</td> </tr> <tr> <td>4:15 PM</td> </tr> <tr> <td>5:15 PM</td> </tr> </table>	Peak Hour	4:15 PM	5:15 PM
Peak Hour						
4:15 PM						
5:15 PM						
For Warrants 1-3, new ODOT signals must be based off of 100% volume thresholds (TEM 402-3.2)						
Warrant 4, Pedestrian Volume	No		If this warrant is met, and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4E of the OMUTCD.			
			<table border="1"> <tr> <td>Peak Hour</td> </tr> <tr> <td>5:00 PM</td> </tr> <tr> <td>6:00 PM</td> </tr> </table>	Peak Hour	5:00 PM	6:00 PM
Peak Hour						
5:00 PM						
6:00 PM						
Warrant 5, School Crossing	No		N/A			
Warrant 6, Coordinated Signal System	No		(Shall not be used as the sole warrant in the analysis)			
Warrant 7, Crash Experience	Yes	Yes	If this is the sole warrant, signal must be semi-actuated with control devices which provide proper coordination if installed at an intersection within a coordinated system and normally should be fully traffic actuated if installed at an isolated intersection.			
Warrant 8, Roadway Network	No		(Shall not be used as the sole warrant in the analysis)			
Warrant 9, Intersection Near a Grade Crossing	No					
Multi-Way Stop Warrant	No		May be used as an interim measure if traffic signal warrants are satisfied.			

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

If no warrants are satisfied, additional options may be considered:
1. An engineering study, performed by a firm prequalified by ODOT for signal design, if approved by the ODOT district, may be used to justify a new signal installation or retention of an existing signal that otherwise does not meet the published warrants. An example of such an instance is a traffic signal in proximity to a railroad crossing that serves to reduce queuing across the tracks.
2. According to TEM 402-2, If the actual turning movement counts fail to satisfy a signal warrant, it may be acceptable to use traffic volumes projected to the second year after project completion. The Modeling and Forecasting Section should provide the projected traffic volumes.
3. A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants (see Chapter 4C of TEM) or at a location that meets traffic signal warrants under Sections 4C.05 and/or 4C.06 but a decision is made to not install a traffic control signal. Please fill inputs on PHB Score Sheet and submit to ODOT.

Considerations such as geometrics and lack of sight distance generally have not been accepted in lieu of satisfying signal warrants. These considerations may allow an otherwise unwarranted traffic signal to be retained at **100 percent** local cost. Please review TEM 402-4 for details.

Conclusion: **Retain Existing Traffic Signal**

Notes:

OMUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	2 or More Lanes
Minor Street:	2 or More Lanes

Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? Yes

*Only applicable after an adequate trial of other alternatives (See section 4C.02.06 of the 2012 OMUTCD)

Lanes Major/ Minor	Adjusted Volumes		Condition A				Condition B				Combination A/B*							
			100%		70%		100%		70%		Cond. A		Cond. B		Cond. A		Cond. B	
	Major	Minor	80%		80%		56%		56%		Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.
			Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.								
1 / 1			500	150	350	105	750	75	525	53	400	120	600	60	280	84	420	42
2+ / 1			600	150	420	105	900	75	630	53	480	120	720	60	336	84	504	42
2+ / 2+		X	600	200	420	140	900	100	630	70	480	160	720	80	336	112	504	56
1 / 2+			500	200	350	140	750	100	525	70	400	160	600	80	280	112	420	56
12:00 AM	0	0																
12:15 AM	0	0																
12:30 AM	0	0																
12:45 AM	0	0																
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5:15 AM	0	0																
5:30 AM	0	0																
5:45 AM	0	0																
6:00 AM	0	0																
6:15 AM	360	53													1			
6:30 AM	818	137	1		1				1	1	1		1	1			1	1
6:45 AM	1275	217					1	1										
7:00 AM	1738	288																
7:15 AM	1769	304													1	1		
7:30 AM	1763	292	1	1	1	1			1	1	1	1	1	1			1	1
7:45 AM	1742	271					1	1										
8:00 AM	1701	272																
8:15 AM	1618	268													1	1		
8:30 AM	1516	253	1	1	1	1			1	1	1	1	1	1			1	1
8:45 AM	1415	260					1	1										
9:00 AM	1341	247																
9:15 AM	1372	243													1	1		
9:30 AM	1348	236	1	1	1	1			1	1	1	1	1	1			1	1
9:45 AM	1302	232					1	1										
10:00 AM	1279	234																
10:15 AM	1259	246													1	1		

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10:30 AM	1294	248	1	1	1	1			1	1	1	1	1	1			1	1
10:45 AM	1349	254					1	1										
11:00 AM	1422	254																
11:15 AM	1425	277												1	1			
11:30 AM	1436	311	1	1	1	1			1	1	1	1	1	1			1	1
11:45 AM	1461	322					1	1										
12:00 PM	1471	362																
12:15 PM	1494	347												1	1			
12:30 PM	1468	337	1	1	1	1			1	1	1	1	1	1			1	1
12:45 PM	1456	325					1	1										
1:00 PM	1436	326																
1:15 PM	1461	326												1	1			
1:30 PM	1492	324	1	1	1	1			1	1	1	1	1	1			1	1
1:45 PM	1508	370					1	1										
2:00 PM	1538	372																
2:15 PM	1580	381												1	1			
2:30 PM	1634	443	1	1	1	1			1	1	1	1	1	1			1	1
2:45 PM	1700	450					1	1										
3:00 PM	1738	486																
3:15 PM	1730	571												1	1			
3:30 PM	1792	614	1	1	1	1			1	1	1	1	1	1			1	1
3:45 PM	1832	656					1	1										
4:00 PM	1861	675																
4:15 PM	1948	700												1	1			
4:30 PM	1953	692	1	1	1	1			1	1	1	1	1	1			1	1
4:45 PM	1975	682					1	1										
5:00 PM	1987	665																
5:15 PM	1893	613												1	1			
5:30 PM	1791	524	1	1	1	1			1	1	1	1	1	1			1	1
5:45 PM	1676	479					1	1										
6:00 PM	1548	413																
6:15 PM	1151	278												1	1			
6:30 PM	755	188	1		1	1			1	1	1	1	1	1			1	1
6:45 PM	369	84																
7:00 PM	0	0																
7:15 PM	0	0																
7:30 PM	0	0																
7:45 PM	0	0																
8:00 PM	0	0																
8:15 PM	0	0																
8:30 PM	0	0																
8:45 PM	0	0																
9:00 PM	0	0																
9:15 PM	0	0																
9:30 PM	0	0																
9:45 PM	0	0																
HOURS MET			13	11	13	12	12	12	13	13	13	12	13	13	13	12	13	13
WARRANT SATISFIED?			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Warrant Met: **Yes**

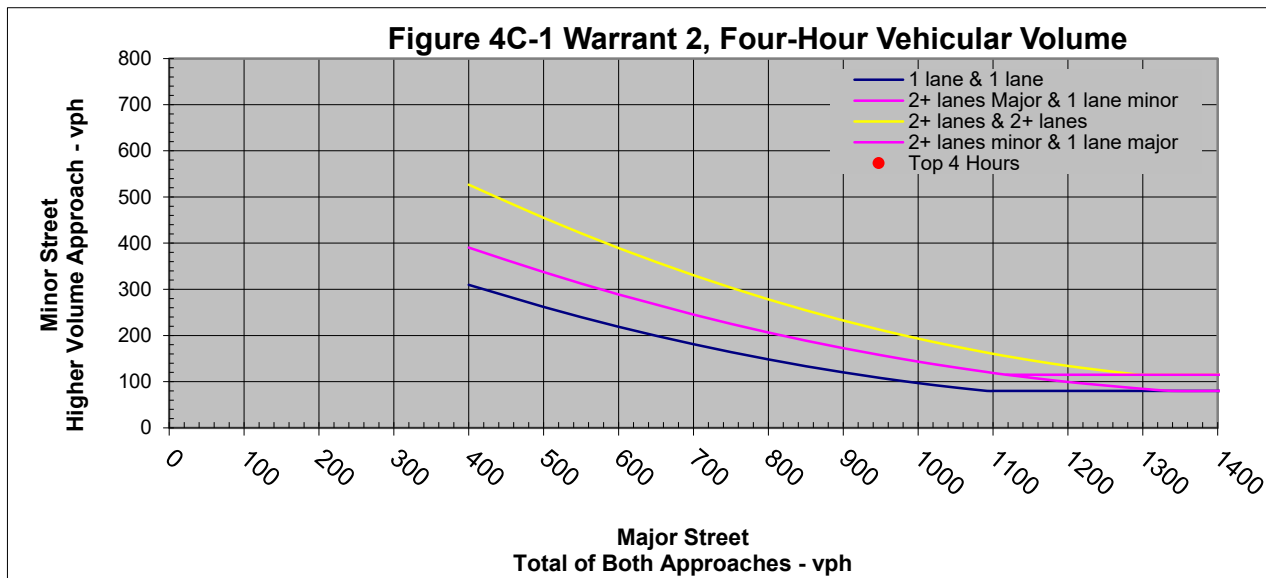
Notes: Condition A was met. Condition B was met. Condition A (70%) was met. Condition B (70%) was met. Combination of A/B (80%) was met.*Combination of A/B (56%) was met.*

OMUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	Total Number of Unique Hours Met on Figure 4C-1	12
Major street: 2 or More Lanes	Total Number of Unique Hours Met on Figure 4C-2 (70% Factor)	13
Minor Street: 2 or More Lanes		

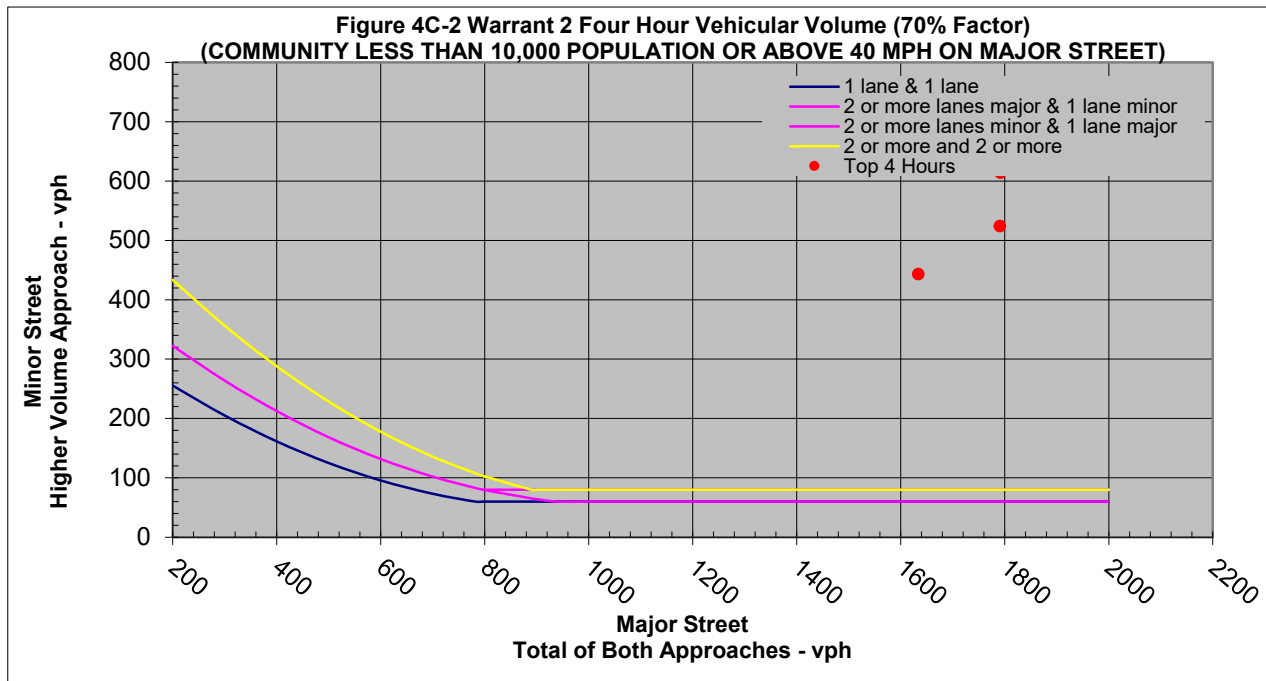
Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street?	Yes
--	------------

Hour Interval Beginning At	Raw Traffic Counts				Total Major Approach Volumes	Highest Actual Minor Street Approach Volumes	Hour Met?	Hour Met? (70% Factor)
	N-Bound	S-Bound	W-Bound	E-Bound				
6:00 AM	0	0	0	0	0	0		
6:15 AM	67	293	53	0	360	53		
6:30 AM	165	653	137	0	818	137		Met
6:45 AM	269	1006	217	0	1275	217	Met	
7:00 AM	397	1341	288	0	1738	288		
7:15 AM	436	1333	304	1	1769	304		
7:30 AM	479	1284	292	1	1763	292		Met
7:45 AM	501	1241	271	1	1742	271	Met	
8:00 AM	511	1190	272	1	1701	272		
8:15 AM	523	1095	268	0	1618	268		
8:30 AM	523	993	253	0	1516	253		Met
8:45 AM	512	903	260	0	1415	260	Met	
9:00 AM	487	854	247	0	1341	247		
9:15 AM	511	861	243	0	1372	243		
9:30 AM	506	842	236	0	1348	236		Met
9:45 AM	503	799	232	0	1302	232	Met	
10:00 AM	523	756	234	0	1279	234		
10:15 AM	506	753	246	0	1259	246		
10:30 AM	535	759	248	0	1294	248		Met
10:45 AM	568	781	254	1	1349	254	Met	
11:00 AM	592	830	254	1	1422	254		
11:15 AM	615	810	277	1	1425	277		
11:30 AM	628	808	311	1	1436	311		Met
11:45 AM	647	814	322	0	1461	322	Met	
12:00 PM	660	811	362	0	1471	362		
12:15 PM	678	816	347	0	1494	347		
12:30 PM	661	807	337	0	1468	337		Met
12:45 PM	657	799	325	0	1456	325	Met	
1:00 PM	671	765	326	0	1436	326		
1:15 PM	687	774	326	0	1461	326		
1:30 PM	716	776	324	0	1492	324		Met
1:45 PM	729	779	370	0	1508	370	Met	
2:00 PM	764	774	372	0	1538	372		
2:15 PM	797	783	381	0	1580	381		
2:30 PM	848	786	443	0	1634	443		Met
2:45 PM	910	790	450	0	1700	450	Met	
3:00 PM	940	798	486	0	1738	486		
3:15 PM	961	769	571	0	1730	571		
3:30 PM	1002	790	614	0	1792	614		Met
3:45 PM	1047	785	656	0	1832	656	Met	
4:00 PM	1067	794	675	0	1861	675		
4:15 PM	1081	867	700	0	1948	700		
4:30 PM	1077	876	692	0	1953	692		Met
4:45 PM	1070	905	682	0	1975	682	Met	
5:00 PM	1064	923	665	0	1987	665		
5:15 PM	1028	865	613	0	1893	613		
5:30 PM	963	828	524	0	1791	524		Met
5:45 PM	885	791	479	0	1676	479	Met	
6:00 PM	806	742	413	0	1548	413		
6:15 PM	592	559	278	0	1151	278		
6:30 PM	379	376	188	0	755	188		Met
6:45 PM	184	185	84	0	369	84		
7:00 PM	0	0	0	0	0	0		
7:15 PM	0	0	0	0	0	0		
7:30 PM	0	0	0	0	0	0		
7:45 PM	0	0	0	0	0	0		
8:00 PM	0	0	0	0	0	0		



Top Hours for Figure 4C-1				
	Start Time	End Time	Major Street	Minor Street
Top Hour	4:45 PM	5:45 PM	1975	682
2nd Highest Hour	3:45 PM	4:45 PM	1832	656
3rd Highest Hour	5:45 PM	6:45 PM	1676	479
4th Highest Hour	2:45 PM	3:45 PM	1700	450

Top Hours for Figure 4C-2				
	Start Time	End Time	Major Street	Minor Street
Top Hour	4:30 PM	5:30 PM	1953	692
2nd Highest Hour	3:30 PM	4:30 PM	1792	614
3rd Highest Hour	5:30 PM	6:30 PM	1791	524
4th Highest Hour	2:30 PM	3:30 PM	1634	443



Are the requirements for Warrant 2 met?: Yes

OMUTCD WARRANT 7, CRASH EXPERIENCE

Built-up Isolated Community With Less Than 10,000 Population or Above 40 mph on Major Street?: Yes

Number of Lanes for Moving Traffic on Each Approach

Major Street: 2 or More Lanes
 Minor Street: 2 or More Lanes

Has adequate trial of alternative with satisfactory observance and enforcement failed to reduce the crash frequency? Yes

Five or more reportable and/ or non-reportable crashes, of types susceptible to correction by a traffic control signal have occurred within a 12-month period during the most recent 3 years of available crash data.* Yes
**If applicable attach a summary of the crash data analysis used for this criterion*

For each of any 8 hours of an average day, the vehicles per hour given in both the 80% columns of Condition A in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, if in a built-up isolated community with less than 10,000 population or above 40 mph on major street, the 56% columns may be used. Yes

For each of any 8 hours of an average day, the vehicles per hour given in both the 80% columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, if in a built-up isolated community with less than 10,000 population or above 40 mph on major street, the 56% columns may be used. Yes

The volume of pedestrian traffic is 80% or more of the requirements specified in Warrant 4, the Pedestrian Volume warrant.*
**If applicable, attach all supporting calculations and documentation*

Are the requirements for Warrant 7 met?: Yes

OMUTCD WARRANT 8, ROADWAY NETWORK*

Does the intersection have a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2, and 3, during the average weekday?

Does the intersection have a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non-normal business day (Saturday or Sunday)?

Is the major street part of the street or highway system that serves as the principal roadway network for through traffic flow?

Does the major street include rural or suburban highways outside, entering, or traversing a city?

Does the major street appear as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study?

**Refer to Section 4.3 of ODOT Publication 46 (Traffic Engineering Manual) for additional Department documentation requirements to justify the installation of a signal under Warrant 8. Attach all supplementary documentation and calculations, especially those relating to traffic volume projections and subsequent Warrant analyses.*

Are the requirements for Warrant 8 met?: No

ASSOCIATED PHASE	DIRECTION	MOVEMENT	TRAFFIC SIGNAL													PEDESTRIAN																				
			FACTORS *(TEM 403-2)							CALCULATED (TEM 403-2)			FINAL CLEARANCE			PED MOVEMENT	ASSOCIATED PHASE	CROSSWALK LENGTH	PUSHBUTTON PROVIDED	DISTANCE TO PUSHBUTTON FROM CURB (furthest of the two corners)	OMUTCD 4E.06-12	OMUTCD 4E.06-07	3 fps CHECKS (OMUTCD 4E.06, 01-14)				FINAL PED TIMING									
			POSTED SPEED LIMIT	PERCEPTION/REACTION TIME (1s TYP)	YELLOW CHANGE APPROACH SPEED*	RED APPROACH SPEED*	DECELERATION RATE (10 fps TYP)	WIDTH OF INTERSECTION*	LENGTH OF VEHICLE (20 ft TYP)	APPROACH GRADE	YELLOW	RED	Y + R	YELLOW	RED						Y + R	WALK INTERVAL (4-7s TYP)	CALCULATED PED CLEARANCE	PED CHANGE INTERVAL (FDW)	(L+P)/(3 fps) (NOTE: P=6 IF NO PUSHBUTTON)	WALK + PED CHANGE INTERVALS + YELLOW	IS Y>=X?	ADDITIONAL WALK INTERVAL REQUIRED	FINAL WALK INTERVAL	FINAL PED CHANGE INTERVAL (FDW)						
				t	V _y	V _r	a	W	L	g	Y	R	TOTAL	Y (3-6s TYP)	R (1-6s TYP)						TOTAL										P	= 3.5 fps WALK TIME	= 3.5 fps WALK TIME - YELLOW	X	Y	SEC
MPH	SEC	MPH	MPH	FPS	FT	FT	%	SEC	SEC	SEC	SEC	SEC	SEC	FT	FT	SEC	SEC	SEC	SEC	SEC	SEC	SEC	SEC													
1	SB LT	LEFT TURN	55	1	50	25	10	60	20	-1	4.8	1.2	6.0	5.4	1	6.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2	NB	THROUGH/RT	55	1	62	62	10	60	20	2	5.3	-0.1	5.2	5.4	1	6.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3	-	-	-	1	-	-	10	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
4	EB	THROUGH/RT	65	1	72	72	10	70	20	3.8	5.7	-0.1	5.6	5.7	1	6.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	1	-	-	10	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	SB	THROUGH/RT	55	1	62	62	10	60	20	-1	5.7	-0.1	5.6	5.4	1	6.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	1	-	-	10	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	1	-	-	10	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

ASSOCIATED PHASE	DIRECTION	MOVEMENT	TRAFFIC SIGNAL													PEDESTRIAN																								
			FACTORS *(TEM 403-2)								CALCULATED (TEM 403-2)			FINAL CLEARANCE		PED MOVEMENT	ASSOCIATED PHASE	CROSSWALK LENGTH	PUSHBUTTON PROVIDED	DISTANCE TO PUSHBUTTON FROM CURB (furthest of the two corners)	OMUTCD 4E.06-12	OMUTCD 4E.06-07	3 fps CHECKS (OMUTCD 4E.06, 01-14)				FINAL PED TIMING													
			POSTED SPEED LIMIT	PERCEPTION/REACTION TIME (1s TYP)	YELLOW CHANGE APPROACH SPEED*	RED APPROACH SPEED*	DECELERATION RATE (10 fps TYP)	WIDTH OF INTERSECTION*	LENGTH OF VEHICLE (20 ft TYP)	APPROACH GRADE	YELLOW	RED	Y + R	YELLOW	RED						Y + R	WALK INTERVAL (4-7s TYP)	CALCULATED PED CLEARANCE	PED CHANGE INTERVAL (FDW)	(L+P)/(3 fps) (NOTE: P=6 IF NO PUSHBUTTON)	WALK + PED CHANGE INTERVALS + YELLOW	IS Y>=X?	ADDITIONAL WALK INTERVAL REQUIRED	FINAL WALK INTERVAL	FINAL PED CHANGE INTERVAL (FDW)										
				t	V _y	V _r	a	W	L	g	Y	R	TOTAL	Y (3-6s TYP)	R (1-6s TYP)						TOTAL	P	= 3.5 fps WALK TIME	= 3.5 fps WALK TIME - YELLOW	X	Y					SEC	SEC								
MPH	SEC	MPH	MPH	FPS	FT	FT	%	SEC	SEC	SEC	SEC	SEC	SEC	SEC	SEC	SEC	SEC	SEC	SEC	SEC	SEC	SEC	SEC	SEC																
1	SB LT	LEFT TURN	55	1	50	25	10	60	20	1.3	4.5	1.2	5.7	5.4	1	6.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
2	NB	THROUGH/RT	55	1	62	62	10	70	20	2	5.3	0.0	5.3	5.4	1	6.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
3	-	-	-	1	-	-	10	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
4	WB	THROUGH/RT	65	1	72	72	10	80	20	0.8	6.2	-0.1	6.1	5.7	1	6.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
5	-	-	-	1	-	-	10	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
6	SB	THROUGH/RT	55	1	62	62	10	70	20	1.3	5.4	0.0	5.4	5.4	1	6.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
7	-	-	-	1	-	-	10	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
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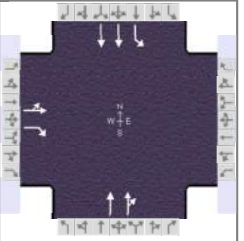


ODOT Highway Safety Program
BUT-747-5.49

Appendix E
Proposed Capacity Analysis

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Lanham Engineering			Duration, h	0.250
Analyst	DKA	Analysis Date	7/13/2022	Area Type	Other
Jurisdiction	ODOT D8	Time Period	AM Peak Hour	PHF	0.95
Urban Street	SR-747	Analysis Year	2030	Analysis Period	1 > 7:00
Intersection	SR-747 at SR-129 EB R...	File Name	SR-129 2030 AM Peak Hour - Protected Lefts.xus		
Project Description	BUT-747-5.49 Safety Study - 2030 Prot Left&Rt Turn				



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	44	0	246					481	321	697	1054	

Signal Information													
Cycle, s	120.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	No	Simult. Gap E/W	On	Green	47.0	33.5	22.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.0	4.5	4.0	0.0	0.0	0.0			
				Red	2.0	2.0	2.0	0.0	0.0	0.0			

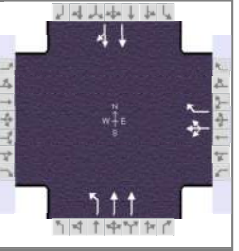
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4				2	1	6
Case Number		11.0				8.3	2.0	4.0
Phase Duration, s		28.0				40.0	52.0	92.0
Change Period, (Y+R _c), s		6.0				6.5	5.0	6.5
Max Allow Headway (MAH), s		7.0				0.0	3.9	0.0
Queue Clearance Time (g _s), s		21.3					49.0	
Green Extension Time (g _e), s		0.7				0.0	0.0	0.0
Phase Call Probability		1.00					1.00	
Max Out Probability		1.00					1.00	

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14					2	12	1	6	
Adjusted Flow Rate (v), veh/h		46	259					429	416	726	1098	
Adjusted Saturation Flow Rate (s), veh/h/ln		1665	1575					1675	1619	1753	1786	
Queue Service Time (g _s), s		2.8	19.3					27.4	29.9	47.0	18.4	
Cycle Queue Clearance Time (g _c), s		2.8	19.3					27.4	29.9	47.0	18.4	
Green Ratio (g/C)		0.18	0.18					0.28	0.28	0.99	0.71	
Capacity (c), veh/h		305	288					469	453	686	2546	
Volume-to-Capacity Ratio (X)		0.152	0.898					0.915	0.918	1.058	0.431	
Back of Queue (Q), ft/ln (95 th percentile)												
Back of Queue (Q), veh/ln (95 th percentile)		2.1	14.7					21.1	20.7	36.2	9.1	
Queue Storage Ratio (RQ) (95 th percentile)		0.06	0.89					0.37	0.37	2.87	0.35	
Uniform Delay (d ₁), s/veh		41.2	47.9					41.8	41.9	47.6	9.5	
Incremental Delay (d ₂), s/veh		0.8	30.5					25.0	26.1	40.2	0.2	
Initial Queue Delay (d ₃), s/veh		0.0	0.0					0.0	0.0	0.0	0.0	
Control Delay (d), s/veh		42.0	78.4					66.8	68.0	87.8	9.8	
Level of Service (LOS)		D	E					E	E	F	A	
Approach Delay, s/veh / LOS	72.9	E		0.0			67.4	E		40.8	D	
Intersection Delay, s/veh / LOS	51.7						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.15	B	2.32	B	1.42	A	1.64	B
Bicycle LOS Score / LOS	0.99	A			1.18	A	2.01	B

HCS Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Lanham Engineering			Duration, h	0.250		
Analyst	DKA	Analysis Date	7/13/2022	Area Type	Other		
Jurisdiction	ODOT D8	Time Period	AM Peak Hour	PHF	0.96		
Urban Street	SR-747	Analysis Year	2030	Analysis Period	1 > 7:00		
Intersection	SR-747 at SR-129 WB...	File Name	SR-129 2030 AM Peak Hour - Protected Lefts.xus				
Project Description	BUT-747-5.49 Safety Study - 2030 Prot Left&Rt Turn						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h				247	0	245	131	394			1504	108

Signal Information														
Cycle, s	120.0	Reference Phase	2											
Offset, s	0	Reference Point	End											
Uncoordinated	No	Simult. Gap E/W	On	Green	12.3	63.3	27.0	0.0	0.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.0	4.5	4.0	0.0	0.0	0.0				
				Red	2.0	2.0	2.0	0.0	0.0	0.0				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				4	1	6		2
Case Number				11.0	2.0	4.0		8.3
Phase Duration, s				33.0	17.3	87.0		69.8
Change Period, (Y+R _c), s				6.0	5.0	6.5		6.5
Max Allow Headway (MAH), s				4.0	4.0	0.0		0.0
Queue Clearance Time (g _s), s				25.2	11.9			
Green Extension Time (g _e), s				1.8	0.4	0.0		0.0
Phase Call Probability				1.00	0.99			
Max Out Probability				0.00	0.00			

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				7	4	14	1	6		2	12	
Adjusted Flow Rate (v), veh/h				321	191	138	415			801	878	
Adjusted Saturation Flow Rate (s), veh/h/ln				1621	1631	1663	1650			1790	1977	
Queue Service Time (g _s), s				23.2	12.4	9.9	9.4			80.6	45.3	
Cycle Queue Clearance Time (g _c), s				23.2	12.4	9.9	9.4			80.6	45.3	
Green Ratio (g/C)				0.22	0.22	0.55	0.32			0.53	0.53	
Capacity (c), veh/h				364	366	170	1062			944	1043	
Volume-to-Capacity Ratio (X)				0.882	0.522	0.811	0.391			0.849	0.842	
Back of Queue (Q), ft/ln (95 th percentile)												
Back of Queue (Q), veh/ln (95 th percentile)				15.1	8.5	6.8	5.1			26.7	28.5	
Queue Storage Ratio (RQ) (95 th percentile)				0.33	0.74	0.60	0.20			0.34	0.36	
Uniform Delay (d ₁), s/veh				47.6	40.9	58.8	12.1			24.3	24.1	
Incremental Delay (d ₂), s/veh				7.0	1.2	3.8	0.4			9.4	8.3	
Initial Queue Delay (d ₃), s/veh				0.0	0.0	0.0	0.0			0.0	0.0	
Control Delay (d), s/veh				54.7	42.0	62.7	12.5			33.7	32.4	
Level of Service (LOS)					D	D	E	B			C	C
Approach Delay, s/veh / LOS	0.0			49.9		D	25.0		C	33.0		C
Intersection Delay, s/veh / LOS				34.6						C		

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.32	B	2.15	B	1.65	B	1.38	A
Bicycle LOS Score / LOS			1.33	A	0.94	A	1.87	B

HCS Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	Lanham Engineering			Duration, h	0.250	
Analyst	DKA	Analysis Date	7/13/2022	Area Type	Other	
Jurisdiction	ODOT D8	Time Period	PM Peak Hour	PHF	0.97	
Urban Street	SR-747	Analysis Year	2030	Analysis Period	1 > 7:00	
Intersection	SR-747 at SR-129 EB R...	File Name	SR-129 2030 PM Peak Hour - Protected Lefts.xus			
Project Description	BUT-747-5.49 Safety Study - 2030 Prot Lts&Rt Turn					

Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	77	1	157					1183	375	456	878	

Signal Information														
Cycle, s	120.0	Reference Phase	2	Green	34.3	52.0	16.2	0.0	0.0	0.0				
Offset, s	0	Reference Point	End	Yellow	3.0	4.5	4.0	0.0	0.0	0.0				
Uncoordinated	No	Simult. Gap E/W	On	Red	2.0	2.0	2.0	0.0	0.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	On											

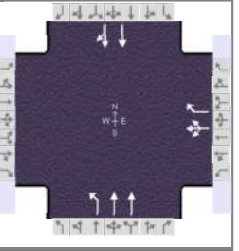
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4				2	1	6
Case Number		11.0				8.3	2.0	4.0
Phase Duration, s		22.2				58.5	39.3	97.8
Change Period, ($Y+R_c$), s		6.0				6.5	5.0	6.5
Max Allow Headway (MAH), s		7.0				0.0	3.9	0.0
Queue Clearance Time (g_s), s		13.5					32.6	
Green Extension Time (g_e), s		2.7				0.0	1.7	0.0
Phase Call Probability		1.00					1.00	
Max Out Probability		0.00					0.00	

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	7	4	14				2	12	1	6		
Adjusted Flow Rate (v), veh/h		80	162				809	797	465	896		
Adjusted Saturation Flow Rate (s), veh/h/ln		1748	1629				1974	1893	1781	1785		
Queue Service Time (g_s), s		5.0	11.5				76.3	49.4	30.6	27.6		
Cycle Queue Clearance Time (g_c), s		5.0	11.5				76.3	49.4	30.6	27.6		
Green Ratio (g/C)		0.13	0.13				0.43	0.43	0.77	0.41		
Capacity (c), veh/h		236	220				856	821	509	1452		
Volume-to-Capacity Ratio (X)		0.341	0.737				0.946	0.970	0.914	0.617		
Back of Queue (Q), ft/ln (95 th percentile)												
Back of Queue (Q), veh/ln (95 th percentile)		4.1	9.3				33.4	34.6	17.5	16.5		
Queue Storage Ratio (RQ) (95 th percentile)		0.11	0.53				0.56	0.58	1.37	0.62		
Uniform Delay (d_1), s/veh		47.1	49.9				32.6	33.2	45.3	22.2		
Incremental Delay (d_2), s/veh		3.1	15.9				20.1	25.0	2.9	0.8		
Initial Queue Delay (d_3), s/veh		0.0	0.0				0.0	0.0	0.0	0.0		
Control Delay (d), s/veh		50.2	65.8				52.7	58.2	48.2	22.9		
Level of Service (LOS)		D	E				D	E	D	C		
Approach Delay, s/veh / LOS	60.6	E		0.0			55.4	E	31.6	C		
Intersection Delay, s/veh / LOS		45.7						D				

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.15	B	2.32	B	1.40	A	1.62	B
Bicycle LOS Score / LOS	0.89	A			1.81	B	1.62	B

HCS Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Lanham Engineering			Duration, h	0.250		
Analyst	DKA	Analysis Date	7/13/2022	Area Type	Other		
Jurisdiction	ODOT D8	Time Period	PM Peak Hour	PHF	0.98		
Urban Street	SR-747	Analysis Year	2030	Analysis Period	1 > 7:00		
Intersection	SR-747 at SR-129 WB...	File Name	SR-129 2030 PM Peak Hour - Protected Lefts.xus				
Project Description	BUT-747-5.49 Safety Study - 2030 Prot Lts&Rt Turn						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h				330	0	789	266	994			1004	83

Signal Information													
Cycle, s	120.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	No	Simult. Gap E/W	On	Green	21.0	37.4	44.1	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.0	4.5	4.0	0.0	0.0	0.0			
				Red	2.0	2.0	2.0	0.0	0.0	0.0			

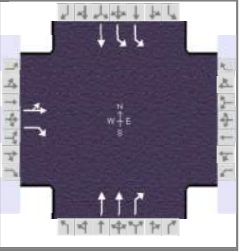
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				4	1	6		2
Case Number				11.0	2.0	4.0		8.3
Phase Duration, s				50.1	26.0	69.9		43.9
Change Period, (Y+R _c), s				6.0	5.0	6.5		6.5
Max Allow Headway (MAH), s				4.0	4.0	0.0		0.0
Queue Clearance Time (g _s), s				39.8	20.9			
Green Extension Time (g _e), s				4.3	0.2	0.0		0.0
Phase Call Probability				1.00	1.00			
Max Out Probability				0.11	1.00			

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				7	4	14	1	6		2	12	
Adjusted Flow Rate (v), veh/h				538	604	274	1025			534	575	
Adjusted Saturation Flow Rate (s), veh/h/ln				1734	1815	1746	1818			1745	1890	
Queue Service Time (g _s), s				35.6	37.8	18.9	18.1			35.9	36.1	
Cycle Queue Clearance Time (g _c), s				35.6	37.8	18.9	18.1			35.9	36.1	
Green Ratio (g/C)				0.37	0.37	0.60	0.53			0.31	0.31	
Capacity (c), veh/h				638	667	305	1920			544	589	
Volume-to-Capacity Ratio (X)				0.844	0.905	0.899	0.534			0.982	0.976	
Back of Queue (Q), ft/ln (95 th percentile)												
Back of Queue (Q), veh/ln (95 th percentile)				23.3	24.3	12.6	7.8			27.1	28.3	
Queue Storage Ratio (RQ) (95 th percentile)				0.49	2.06	1.06	0.29			0.34	0.36	
Uniform Delay (d ₁), s/veh				42.9	35.9	58.9	13.0			41.0	40.9	
Incremental Delay (d ₂), s/veh				6.4	10.8	8.9	0.3			34.5	31.6	
Initial Queue Delay (d ₃), s/veh				0.0	0.0	0.0	0.0			0.0	0.0	
Control Delay (d), s/veh				49.3	46.8	67.8	13.3			75.4	72.5	
Level of Service (LOS)					D	D	E	B			E	E
Approach Delay, s/veh / LOS	0.0			48.0		D	24.8		C	73.9		E
Intersection Delay, s/veh / LOS				47.6			D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.32	B	2.15	B	1.68	B	1.41	A
Bicycle LOS Score / LOS			2.37	B	1.55	B	1.40	A

HCS Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Lanham Engineering			Duration, h	0.250		
Analyst	DKA	Analysis Date	7/13/2022	Area Type	Other		
Jurisdiction	ODOT D8	Time Period	AM Peak Hour	PHF	0.95		
Urban Street	SR-747	Analysis Year	2050	Analysis Period	1 > 7:00		
Intersection	SR-747 at SR-129 EB R...	File Name	SR-129 2050 AM Peak Hour - SB Dual Lefts & Ri...				
Project Description	2050 - SB Dual Left & Right Turn Lanes						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h	50	1	277					542	361	784	1186	

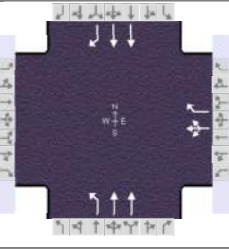
Signal Information				Phase Diagram								
Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									
		Green	34.2	42.1	26.2	0.0	0.0	0.0				
		Yellow	3.0	4.5	4.0	0.0	0.0	0.0				
		Red	2.0	2.0	2.0	0.0	0.0	0.0				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4				2	1	6
Case Number		11.0				7.3	2.0	4.0
Phase Duration, s		32.2				48.6	39.2	87.8
Change Period, ($Y+R_c$), s		6.0				6.5	5.0	6.5
Max Allow Headway (MAH), s		7.0				0.0	3.9	0.0
Queue Clearance Time (g_s), s		23.2					30.6	
Green Extension Time (g_e), s		3.0				0.0	3.5	0.0
Phase Call Probability		1.00					1.00	
Max Out Probability		0.16					0.00	

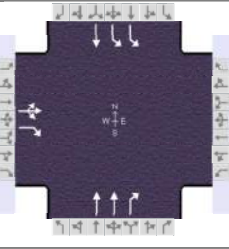
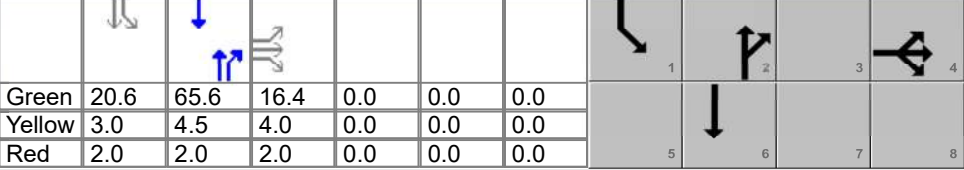
Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14				2	12	1	6		
Adjusted Flow Rate (v), veh/h		54	292				571	380	817	1235		
Adjusted Saturation Flow Rate (s), veh/h/ln		1665	1583				1637	1682	1702	1992		
Queue Service Time (g_s), s		3.1	21.2				16.4	22.7	28.6	66.7		
Cycle Queue Clearance Time (g_c), s		3.1	21.2				16.4	22.7	28.6	66.7		
Green Ratio (g/C)		0.22	0.22				0.35	0.35	0.28	0.68		
Capacity (c), veh/h		363	346				1150	591	969	1349		
Volume-to-Capacity Ratio (X)		0.148	0.844				0.496	0.643	0.843	0.915		
Back of Queue (Q), ft/ln (95 th percentile)												
Back of Queue (Q), veh/ln (95 th percentile)		2.3	14.7				10.5	14.6	16.2	33.1		
Queue Storage Ratio (RQ) (95 th percentile)		0.07	0.89				0.19	1.82	0.84	1.25		
Uniform Delay (d_1), s/veh		37.9	44.9				30.6	32.6	55.5	22.2		
Incremental Delay (d_2), s/veh		0.7	18.2				1.5	5.3	0.5	2.9		
Initial Queue Delay (d_3), s/veh		0.0	0.0				0.0	0.0	0.0	0.0		
Control Delay (d), s/veh		38.6	63.1				32.1	37.9	56.0	25.1		
Level of Service (LOS)		D	E				C	D	E	C		
Approach Delay, s/veh / LOS	59.3	E		0.0			34.4	C	37.4	D		
Intersection Delay, s/veh / LOS		38.8					D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.15	B	2.32	B	1.70	B	1.65	B
Bicycle LOS Score / LOS	1.06	A			1.27	A	3.91	D

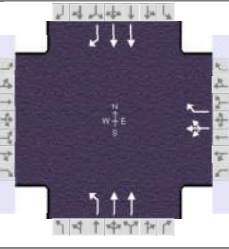
HCS Signalized Intersection Results Summary

General Information						Intersection Information													
Agency		Lanham Engineering				Duration, h		0.250											
Analyst		DKA		Analysis Date		7/13/2022		Area Type		Other									
Jurisdiction		ODOT D8		Time Period		AM Peak Hour		PHF		0.96									
Urban Street		SR-747		Analysis Year		2050		Analysis Period		1 > 7:00									
Intersection		SR-747 at SR-129 WB...		File Name		SR-129 2050 AM Peak Hour - SB Dual Lefts & Ri...													
Project Description		2050 - SB Dual Left & Right Turn Lanes																	
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h							278	1	276	147	445		1692	123					
Signal Information																			
Cycle, s		120.0		Reference Phase		6													
Offset, s		0		Reference Point		End													
Uncoordinated		No		Simult. Gap E/W		On		Green			13.6			59.1					
Force Mode		Fixed		Simult. Gap N/S		On		Yellow			3.0			4.5					
								Red			2.0			2.0					
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase										4		1		6				2	
Case Number										11.0		2.0		4.0				7.3	
Phase Duration, s										35.9		18.6		84.1				65.6	
Change Period, (Y+R _c), s										6.0		5.0		6.5				6.5	
Max Allow Headway (MAH), s										4.0		4.0		0.0				0.0	
Queue Clearance Time (g _s), s										27.9		13.2							
Green Extension Time (g _e), s										1.9		0.5		0.0				0.0	
Phase Call Probability										1.00		0.99							
Max Out Probability										0.01		0.00							
Movement Group Results				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement							7	4	14	1	6			2	12				
Adjusted Flow Rate (v), veh/h							363	216	155	468			1763	128					
Adjusted Saturation Flow Rate (s), veh/h/ln							1623	1637	1663	1657			1820	1661					
Queue Service Time (g _s), s							25.9	13.7	11.2	9.7			57.2	5.1					
Cycle Queue Clearance Time (g _c), s							25.9	13.7	11.2	9.7			57.2	5.1					
Green Ratio (g/C)							0.25	0.25	0.11	0.39			0.49	0.49					
Capacity (c), veh/h							404	407	188	1302			1791	818					
Volume-to-Capacity Ratio (X)							0.898	0.529	0.822	0.360			0.984	0.157					
Back of Queue (Q), ft/ln (95 th percentile)																			
Back of Queue (Q), veh/ln (95 th percentile)							16.5	9.1	8.9	6.0			34.9	3.4					
Queue Storage Ratio (RQ) (95 th percentile)							0.36	0.80	0.47	0.23			0.45	0.42					
Uniform Delay (d ₁), s/veh							43.6	39.0	58.7	11.8			30.0	16.8					
Incremental Delay (d ₂), s/veh							11.0	1.1	7.7	0.7			17.8	0.4					
Initial Queue Delay (d ₃), s/veh							0.0	0.0	0.0	0.0			0.0	0.0					
Control Delay (d), s/veh							54.6	40.1	66.4	12.5			47.8	17.2					
Level of Service (LOS)							D	D	E	B			D	B					
Approach Delay, s/veh / LOS				0.0		49.2		D		25.9		C		45.7		D			
Intersection Delay, s/veh / LOS				42.4						D									
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.32		B		2.32		B		1.65		B		1.39		A	
Bicycle LOS Score / LOS								1.44		A		1.00		A		2.05		B	

HCS Signalized Intersection Results Summary

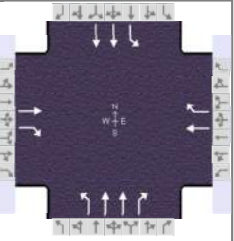
General Information					Intersection Information											
Agency	Lanham Engineering				Duration, h	0.250										
Analyst	DKA		Analysis Date	7/13/2022		Area Type	Other									
Jurisdiction	ODOT D8		Time Period	PM Peak Hour		PHF	0.97									
Urban Street	SR-747		Analysis Year	2050		Analysis Period	1 > 5:00									
Intersection	SR-747 at SR-129 EB R...		File Name	SR-129 2050 PM Peak Hour - SB Dual Lefts & Ri...												
Project Description	2050 - SB Dual Lefts & Right Turn Lanes															
Demand Information					EB			WB			NB			SB		
Approach Movement					L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h					86	1	177				1333	422		513	988	
Signal Information																
Cycle, s	120.0	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	No	Simult. Gap E/W	On													
Force Mode					Fixed	Simult. Gap N/S	On									
Green					20.6	65.6	16.4	0.0	0.0	0.0						
Yellow					3.0	4.5	4.0	0.0	0.0	0.0						
Red					2.0	2.0	2.0	0.0	0.0	0.0						
Timer Results					EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase						4				2	1	6				
Case Number						11.0				7.3	2.0	4.0				
Phase Duration, s						22.4				72.1	25.6	97.6				
Change Period, (Y+R _c), s						6.0				6.5	5.0	6.5				
Max Allow Headway (MAH), s						7.0				0.0	3.9	0.0				
Queue Clearance Time (g _s), s						13.6					18.9					
Green Extension Time (g _e), s						2.8				0.0	1.7	0.0				
Phase Call Probability						1.00					1.00					
Max Out Probability						0.01					0.01					
Movement Group Results					EB			WB			NB			SB		
Approach Movement					L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement					7	4	14				2	12	1	6		
Adjusted Flow Rate (v), veh/h						108	164				1374	435	500	963		
Adjusted Saturation Flow Rate (s), veh/h/ln						1728	1630				1932	1697	1730	2024		
Queue Service Time (g _s), s						6.9	11.6				30.1	18.8	16.9	44.7		
Cycle Queue Clearance Time (g _c), s						6.9	11.6				30.1	18.8	16.9	44.7		
Green Ratio (g/C)						0.14	0.14				0.55	0.55	0.17	0.65		
Capacity (c), veh/h						236	222				2111	927	593	1313		
Volume-to-Capacity Ratio (X)						0.458	0.738				0.651	0.469	0.844	0.734		
Back of Queue (Q), ft/ln (95 th percentile)																
Back of Queue (Q), veh/ln (95 th percentile)						5.7	9.4				18.1	11.3	9.1	23.8		
Queue Storage Ratio (RQ) (95 th percentile)						0.16	0.54				0.30	1.41	0.46	0.89		
Uniform Delay (d ₁), s/veh						47.7	49.8				19.2	16.6	49.2	17.1		
Incremental Delay (d ₂), s/veh						5.0	15.8				1.6	1.7	0.9	0.7		
Initial Queue Delay (d ₃), s/veh						0.0	0.0				0.0	0.0	0.0	0.0		
Control Delay (d), s/veh						52.7	65.6				20.7	18.3	50.0	17.9		
Level of Service (LOS)						D	E				C	B	D	B		
Approach Delay, s/veh / LOS					60.5	E	0.0			20.2	C	28.9	C			
Intersection Delay, s/veh / LOS					26.8			C								
Multimodal Results					EB			WB			NB			SB		
Pedestrian LOS Score / LOS					2.15	B	2.32	B	1.67	B	1.62	B				
Bicycle LOS Score / LOS					0.94	A			1.98	B	3.04	C				

HCS Signalized Intersection Results Summary

General Information						Intersection Information										
Agency	Lanham Engineering					Duration, h	0.250									
Analyst	DKA		Analysis Date	7/13/2022		Area Type	Other									
Jurisdiction	ODOT D8		Time Period	PM Peak Hour		PHF	0.98									
Urban Street	SR-747		Analysis Year	2050		Analysis Period	1 > 5:00									
Intersection	SR-747 at SR-129 WB...		File Name	SR-129 2050 PM Peak Hour - SB Dual Lefts & Ri...												
Project Description	2050 - SB Dual Lefts & Right Turn Lanes															
Demand Information				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Demand (v), veh/h							371	1	888	300	1119			1130	94	
Signal Information																
Cycle, s	120.0	Reference Phase	6													
Offset, s	0	Reference Point	End													
Uncoordinated	No	Simult. Gap E/W	On	Green	23.4	37.0	42.1	0.0	0.0	0.0						
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.0	4.5	4.0	0.0	0.0	0.0						
				Red	2.0	2.0	2.0	0.0	0.0	0.0						
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT					
Assigned Phase							4	1	6							
Case Number							11.0	2.0	4.0							
Phase Duration, s							48.1	28.4	71.9							
Change Period, (Y+R _c), s							6.0	5.0	6.5							
Max Allow Headway (MAH), s							4.0	4.0	0.0							
Queue Clearance Time (g _s), s							44.1	22.8								
Green Extension Time (g _e), s							0.0	0.6	0.0							
Phase Call Probability							1.00	1.00								
Max Out Probability							1.00	0.17								
Movement Group Results				EB			WB			NB			SB			
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R	
Assigned Movement							7	4	14	1	6		2	12		
Adjusted Flow Rate (v), veh/h							651	634	309	1154		1153	96			
Adjusted Saturation Flow Rate (s), veh/h/ln							1744	1824	1746	1838		1761	1653			
Queue Service Time (g _s), s							42.1	41.5	20.8	18.4		37.0	5.1			
Cycle Queue Clearance Time (g _c), s							42.1	41.5	20.8	18.4		37.0	5.1			
Green Ratio (g/C)							0.35	0.35	0.20	0.55		0.31	0.31			
Capacity (c), veh/h							612	640	341	2003		1085	509			
Volume-to-Capacity Ratio (X)							1.065	0.991	0.907	0.576		1.063	0.188			
Back of Queue (Q), ft/ln (95 th percentile)																
Back of Queue (Q), veh/ln (95 th percentile)							35.8	30.9	14.7	8.6		30.7	3.7			
Queue Storage Ratio (RQ) (95 th percentile)							0.76	2.62	1.23	0.32		0.39	0.46			
Uniform Delay (d ₁), s/veh							39.0	38.8	48.2	10.5		41.5	30.5			
Incremental Delay (d ₂), s/veh							54.9	33.2	15.0	0.9		45.8	0.8			
Initial Queue Delay (d ₃), s/veh							0.0	0.0	0.0	0.0		0.0	0.0			
Control Delay (d), s/veh							93.9	72.0	63.2	11.4		87.3	31.3			
Level of Service (LOS)							F	E	E	B		F	C			
Approach Delay, s/veh / LOS				0.0			83.1	F	22.4	C		83.0	F			
Intersection Delay, s/veh / LOS							60.8					E				
Multimodal Results				EB			WB			NB			SB			
Pedestrian LOS Score / LOS				2.32	B		2.32	B		1.67	B		1.42	A		
Bicycle LOS Score / LOS							2.61	C		1.68	B		1.52	B		

HCS Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Lanham Engineering			Duration, h	0.250		
Analyst	DKA	Analysis Date	7/13/2022	Area Type	Other		
Jurisdiction	ODOT D8	Time Period	AM Peak Hour	PHF	0.95		
Urban Street	SR-747	Analysis Year	2050	Analysis Period	1 > 7:00		
Intersection	SR-747 at SR-129 EB R...	File Name	SR-129 2050 AM Peak Hour - DDI.xus				
Project Description	BUT-747-5.49 Safety Study - 2050 DDI						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h		0	277		0	50	0	542	361	784	1186	

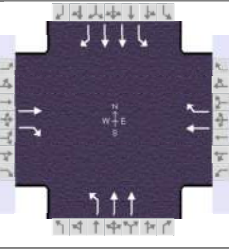

Signal Information													
Cycle, s	122.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	66.0	40.0	1.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	5.5	5.5	0.0	0.0	0.0	0.0			
				Red	2.0	2.0	0.0	0.0	0.0	0.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		7.0		7.0	1.3	3.0	2.0	4.0
Phase Duration, s		1.0		1.0	47.5	47.5	73.5	73.5
Change Period, (Y+R _c), s		0.0		0.0	7.5	7.5	7.5	7.5
Max Allow Headway (MAH), s		3.1		3.1	0.0	2.9	2.9	2.8
Queue Clearance Time (g _s), s		3.0		3.0		25.7	50.8	32.5
Green Extension Time (g _e), s		0.0		0.0	0.0	1.8	1.6	3.0
Phase Call Probability		1.00		1.00		1.00	1.00	1.00
Max Out Probability		1.00		1.00		0.01	0.01	0.00

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement		4	14		8	18	5	2	12	1	6	
Adjusted Flow Rate (v), veh/h		0	292		0	53	0	571	380	817	1235	
Adjusted Saturation Flow Rate (s), veh/h/ln		1781	1619		1900	1610	1810	1696		1753	1752	
Queue Service Time (g _s), s		0.0	1.0		0.0	1.0	0.0	16.6		48.8	30.5	
Cycle Queue Clearance Time (g _c), s		0.0	1.0		0.0	1.0	0.0	16.6		48.8	30.5	
Green Ratio (g/C)		0.01	0.34		0.01	0.55	0.33	0.33		0.54	0.54	
Capacity (c), veh/h		15	544		16	884	652	1112		948	1896	
Volume-to-Capacity Ratio (X)		0.000	0.536		0.000	0.060	0.000	0.513		0.861	0.652	
Back of Queue (Q), ft/ln (95 th percentile)												
Back of Queue (Q), veh/ln (95 th percentile)		0.0	10.9		0.0	1.1	0.0	10.6		23.1	14.6	
Queue Storage Ratio (RQ) (95 th percentile)		0.00	0.66		0.00	0.00	0.00	0.19		1.00	0.55	
Uniform Delay (d ₁), s/veh		0.0	32.8		0.0	12.8	0.0	33.1		24.1	19.8	
Incremental Delay (d ₂), s/veh		0.0	0.6		0.0	0.0	0.0	0.2		3.5	0.3	
Initial Queue Delay (d ₃), s/veh		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (d), s/veh		0.0	33.3		0.0	12.8	0.0	33.3	0.0	27.5	20.1	
Level of Service (LOS)			C			B		C	A	C	C	
Approach Delay, s/veh / LOS	33.3		C	12.8		B	20.0		B	23.1		C
Intersection Delay, s/veh / LOS	22.9						C					

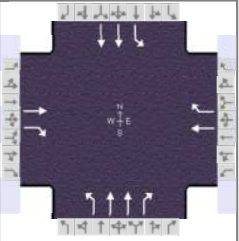
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.47	B	2.32	B	1.93	B	1.93	B
Bicycle LOS Score / LOS	0.97	A	0.57	A	1.27	A	2.20	B

HCS Signalized Intersection Results Summary

General Information						Intersection Information									
Agency		Lanham Engineering				Duration, h		0.250							
Analyst		DKA		Analysis Date		7/13/2022		Area Type		Other					
Jurisdiction		ODOT D8		Time Period		AM Peak Hour		PHF		0.96					
Urban Street		SR-747		Analysis Year		2050		Analysis Period		1 > 7:00					
Intersection		SR-747 at SR-129 WB...		File Name		SR-129 2050 AM Peak Hour - DDI.xus									
Project Description		BUT-747-5.49 Safety Study - 2050 DDI													
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h					0	278		0	276	147	445		0	1692	123
Signal Information															
Cycle, s		120.0		Reference Phase		2									
Offset, s		0		Reference Point		End									
Uncoordinated		Yes		Simult. Gap E/W		On									
Force Mode		Fixed		Simult. Gap N/S		On									
				Green	40.0	64.0	1.0	0.0	0.0	0.0					
				Yellow	5.5	5.5	0.0	0.0	0.0	0.0					
				Red	2.0	2.0	0.0	0.0	0.0	0.0					
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase					8		4	1	6	5	2				
Case Number					7.0		7.0	2.0	4.0	1.3	3.0				
Phase Duration, s					1.0		1.0	47.5	47.5	71.5	71.5				
Change Period, (Y+R _c), s					0.0		0.0	7.5	7.5	7.5	7.5				
Max Allow Headway (MAH), s					3.1		3.1	3.0	2.8	0.0	2.8				
Queue Clearance Time (g _s), s					3.0		3.0	10.2	14.7		57.7				
Green Extension Time (g _e), s					0.0		0.0	0.2	0.9	0.0	3.0				
Phase Call Probability					1.00		1.00	1.00	1.00		1.00				
Max Out Probability					1.00		1.00	0.00	0.00		0.53				
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement					8	18		4	14	1	6		5	2	12
Adjusted Flow Rate (v), veh/h					0	290		0	288	155	468		0	1763	128
Adjusted Saturation Flow Rate (s), veh/h/ln					1900	1610		1796	1695	1663	1710		1810	1766	
Queue Service Time (g _s), s					0.0	1.0		0.0	1.0	8.2	12.7		0.0	55.7	
Cycle Queue Clearance Time (g _c), s					0.0	1.0		0.0	1.0	8.2	12.7		0.0	55.7	
Green Ratio (g/C)					0.01	0.34		0.01	0.54	0.33	0.33		0.53	0.53	
Capacity (c), veh/h					16	550		15	918	554	1140		1025	1884	
Volume-to-Capacity Ratio (X)					0.000	0.526		0.000	0.313	0.279	0.411		0.000	0.935	
Back of Queue (Q), ft/ln (95 th percentile)															
Back of Queue (Q), veh/ln (95 th percentile)					0.0	10.6		0.0	7.0	5.6	8.4		0.0	30.5	
Queue Storage Ratio (RQ) (95 th percentile)					0.00	0.00		0.00	0.62	0.49	0.33		0.00	0.39	
Uniform Delay (d ₁), s/veh					0.0	31.7		0.0	15.2	29.4	30.9		0.0	26.1	
Incremental Delay (d ₂), s/veh					0.0	0.5		0.0	0.1	0.1	0.1		0.0	9.2	
Initial Queue Delay (d ₃), s/veh					0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (d), s/veh					0.0	32.2		0.0	15.3	29.5	31.0		0.0	35.3	0.0
Level of Service (LOS)						C			B	C	C			D	A
Approach Delay, s/veh / LOS				32.2		C	15.3		B	30.6		C	32.9		C
Intersection Delay, s/veh / LOS				30.7						C					
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				2.32		B	2.47		B	1.90		B	1.90		B
Bicycle LOS Score / LOS				0.97		A	0.96		A	1.00		A	2.05		B

HCS Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Lanham Engineering			Duration, h	0.250		
Analyst	DKA	Analysis Date	7/13/2022	Area Type	Other		
Jurisdiction	ODOT D8	Time Period	PM Peak Hour	PHF	0.97		
Urban Street	SR-747	Analysis Year	2050	Analysis Period	1 > 5:00		
Intersection	SR-747 at SR-129 EB R...	File Name	SR-129 2050 PM Peak Hour - DDI.xus				
Project Description	BUT-747-5.49 Safety Study - 2050 DDI						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v), veh/h		0	177		0	86		0	1333	422	513	988

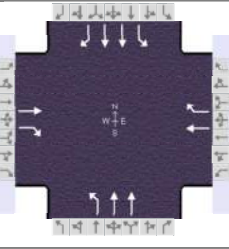
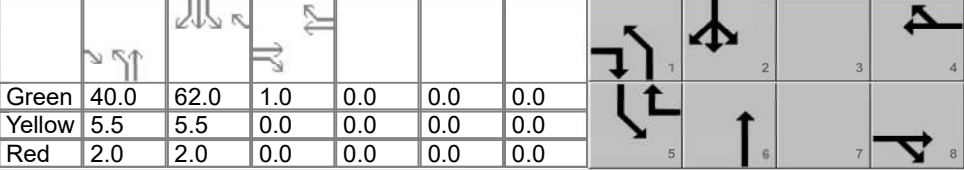
Signal Information													
Cycle, s	120.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	54.0	50.0	1.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	5.5	5.5	0.0	0.0	0.0	0.0			
				Red	2.0	2.0	0.0	0.0	0.0	0.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		7.0		7.0	1.3	3.0	2.0	4.0
Phase Duration, s		1.0		1.0	57.5	57.5	61.5	61.5
Change Period, (Y+R _c), s		0.0		0.0	7.5	7.5	7.5	7.5
Max Allow Headway (MAH), s		3.1		3.1	0.0	2.9	2.9	2.8
Queue Clearance Time (g _s), s		3.0		3.0		49.7	46.0	43.4
Green Extension Time (g _e), s		0.0		0.0	0.0	0.2	1.0	2.8
Phase Call Probability		1.00		1.00		1.00	1.00	1.00
Max Out Probability		1.00		1.00		1.00	0.09	0.09

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement		4	14		8	18	5	2	12	1	6	
Adjusted Flow Rate (v), veh/h		0	182		0	89	0	1374	435	701	1351	
Adjusted Saturation Flow Rate (s), veh/h/ln		1781	1619		1900	1610	1810	1696		1753	1752	
Queue Service Time (g _s), s		0.0	1.0		0.0	1.0	0.0	47.7		44.0	41.4	
Cycle Queue Clearance Time (g _c), s		0.0	1.0		0.0	1.0	0.0	47.7		44.0	41.4	
Green Ratio (g/C)		0.01	0.43		0.01	0.46	0.42	0.42		0.45	0.45	
Capacity (c), veh/h		15	688		16	738	814	1413		789	1577	
Volume-to-Capacity Ratio (X)		0.000	0.265		0.000	0.120	0.000	0.972		0.889	0.856	
Back of Queue (Q), ft/ln (95 th percentile)												
Back of Queue (Q), veh/ln (95 th percentile)		0.0	5.6		0.0	2.4	0.0	28.8		21.8	19.9	
Queue Storage Ratio (RQ) (95 th percentile)		0.00	0.34		0.00	0.14	0.00	0.51		0.94	0.76	
Uniform Delay (d ₁), s/veh		0.0	22.4		0.0	18.6	0.0	34.3		30.3	29.5	
Incremental Delay (d ₂), s/veh		0.0	0.1		0.0	0.0	0.0	17.6		4.5	1.6	
Initial Queue Delay (d ₃), s/veh		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (d), s/veh		0.0	22.4		0.0	18.7	0.0	51.9	0.0	34.8	31.2	
Level of Service (LOS)			C			B		D	A	C	C	
Approach Delay, s/veh / LOS	22.4		C	18.7		B	39.4		D	32.4		C
Intersection Delay, s/veh / LOS	34.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.47	B	2.32	B	1.92	B	1.92	B
Bicycle LOS Score / LOS	0.79	A	0.63	A	1.98	B	1.76	B

HCS Signalized Intersection Results Summary

General Information					Intersection Information												
Agency	Lanham Engineering				Duration, h	0.250											
Analyst	DKA		Analysis Date	7/13/2022		Area Type	Other										
Jurisdiction	ODOT D8		Time Period	PM Peak Hour		PHF	0.96										
Urban Street	SR-747		Analysis Year	2050		Analysis Period	1 > 5:00										
Intersection	SR-747 at SR-129 WB...		File Name	SR-129 2050 PM Peak Hour - DDI.xus													
Project Description	BUT-747-5.49 Safety Study - 2050 DDI																
Demand Information					EB			WB			NB			SB			
Approach Movement					L	T	R	L	T	R	L	T	R	L	T	R	
Demand (v), veh/h						0	278		0	276	147	445		0	1692	123	
Signal Information										Cycle, s		118.0		Reference Phase	2		
Offset, s		0		Reference Point						End							
Uncoordinated	Yes		Simult. Gap E/W	On													
Force Mode	Fixed		Simult. Gap N/S	On													
Green										40.0	62.0	1.0	0.0	0.0	0.0	0.0	
Yellow					5.5	5.5	0.0	0.0	0.0	0.0	0.0						
Red					2.0	2.0	0.0	0.0	0.0	0.0	0.0						
Timer Results					EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT					
Assigned Phase						8		4	1	6	5	2					
Case Number						7.0		7.0	2.0	4.0	1.3	3.0					
Phase Duration, s						1.0		1.0	47.5	47.5	69.5	69.5					
Change Period, (Y+R _c), s						0.0		0.0	7.5	7.5	7.5	7.5					
Max Allow Headway (MAH), s						3.1		3.1	3.0	2.8	0.0	2.8					
Queue Clearance Time (g _s), s						3.0		3.0	23.8	39.0		57.7					
Green Extension Time (g _e), s						0.0		0.0	0.6	0.4	0.0	2.3					
Phase Call Probability						1.00		1.00	1.00	1.00		1.00					
Max Out Probability						1.00		1.00	0.00	1.00		0.77					
Movement Group Results					EB			WB			NB			SB			
Approach Movement					L	T	R	L	T	R	L	T	R	L	T	R	
Assigned Movement						8	18		4	14	1	6		5	2	12	
Adjusted Flow Rate (v), veh/h						0	290		0	288	363	1100		0	1763	128	
Adjusted Saturation Flow Rate (s), veh/h/ln						1900	1610		1796	1695	1663	1710		1810	1766		
Queue Service Time (g _s), s						0.0	1.0		0.0	1.0	21.8	37.0		0.0	55.7		
Cycle Queue Clearance Time (g _c), s						0.0	1.0		0.0	1.0	21.8	37.0		0.0	55.7		
Green Ratio (g/C)						0.01	0.35		0.01	0.53	0.34	0.34		0.53	0.53		
Capacity (c), veh/h						16	559		15	905	564	1159		1012	1856		
Volume-to-Capacity Ratio (X)						0.000	0.518		0.000	0.318	0.644	0.948		0.000	0.949		
Back of Queue (Q), ft/ln (95 th percentile)																	
Back of Queue (Q), veh/ln (95 th percentile)						0.0	10.3		0.0	7.0	10.7	18.5		0.0	31.0		
Queue Storage Ratio (RQ) (95 th percentile)						0.00	0.00		0.00	0.62	0.95	0.72		0.00	0.40		
Uniform Delay (d ₁), s/veh						0.0	30.6		0.0	15.4	33.0	38.0		0.0	26.5		
Incremental Delay (d ₂), s/veh						0.0	0.4		0.0	0.1	0.5	5.6		0.0	11.1		
Initial Queue Delay (d ₃), s/veh						0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0		
Control Delay (d), s/veh						0.0	31.0		0.0	15.5	33.5	43.6		0.0	37.6	0.0	
Level of Service (LOS)							C			B	C	D			D	A	
Approach Delay, s/veh / LOS					31.0		C	15.5		B	41.1		D	35.1		D	
Intersection Delay, s/veh / LOS					35.6					D							
Multimodal Results					EB			WB			NB			SB			
Pedestrian LOS Score / LOS					2.32		B	2.47		B	1.90		B	1.90		B	
Bicycle LOS Score / LOS					0.97		A	0.96		A	1.00		A	2.05		B	



ODOT Highway Safety Program
BUT-747-5.49

Appendix F
Cost Estimates

ESTIMATED PROJECT COSTS - SR 747 AND SR 129 INTERCHANGE
Long Term Alternative 1

ITEM	ITEM EXTENSION	DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT COST	TOTAL
ROADWAY						
201	11000	CLEARING AND GRUBBING	1	LS	\$ 5,000.00	\$ 5,000
202	23000	PAVEMENT REMOVED	1978	SY	\$ 11.25	\$ 22,250
202	98000	REMOVAL, MISC.: EXISTING DRAINAGE REMOVAL	1	LS	\$ 5,000.00	\$ 5,000
202	38000	GUARDRAIL REMOVED	500	FT	\$ 3.00	\$ 1,500
203	10000	EXCAVATION	2000	CY	\$ 16.50	\$ 33,000
203	20000	EMBANKMENT	3000	CY	\$ 12.00	\$ 36,000
204	10000	SUBGRADE COMPACTION	2223	SY	\$ 2.50	\$ 5,558
204	45000	PROOF ROLLING	2	HOURL	\$ 200.00	\$ 400
606	15050	GUARDRAIL, TYPE MGS	500	FT	\$ 23.50	\$ 11,750
606	26000	ANCHOR ASSEMBLY, MGS TYPE B	2	EACH	\$ 2,200.00	\$ 4,400
606	26550	ANCHOR ASSEMBLY, MGS TYPE T	2	EACH	\$ 1,150.00	\$ 2,300
606	26150	ANCHOR ASSEMBLY, MGS TYPE E	2	EACH	\$ 2,780.00	\$ 5,560
ROADWAY SUBTOTAL						\$ 132,718
EROSION CONTROL						
659	00300	TOPSOIL	555	CY	\$ 28.00	\$ 15,540
659	10000	SEEDING AND MULCHING	5000	SY	\$ 1.50	\$ 7,500
659	14000	REPAIR SEEDING AND MULCHING	250	SY	\$ 1.10	\$ 275
659	15000	INTER-SEEDING	250	SY	\$ 0.70	\$ 175
659	20000	COMMERCIAL FERTILIZER	1	TON	\$ 650.00	\$ 731
659	31000	LIME	1	ACRE	\$ 100.00	\$ 103
659	35000	WATER	56	MGAL	\$ 3.00	\$ 168
832	30000	EROSION CONTROL	5000	EACH	\$ 1.30	\$ 6,500
EROSION CONTROL SUBTOTAL						\$ 30,992
DRAINAGE						
601	21050	TIED CONCRETE BLOCK MAT WITH TYPE 1 UNDERLAYMENT	8	SY	\$ 150.00	\$ 1,200
605	14020	6" BASE PIPE UNDERDRAINS WITH GEOTEXTILE FABRIC	700	FT	\$ 14.00	\$ 9,800
605	00510	6" CONDUIT, TYPE F FOR UNDERDRAIN OUTLETS	100	FT	\$ 24.00	\$ 2,400
605	99710	PRECAST REINFORCED CONCRETE OUTLET	4	EACH	\$ 300.00	\$ 1,200
611	97800	SPECIAL - DRAINAGE (CONTINGENCY FOR DRAINAGE REPLACEMENT)	1	LS	\$ 25,000.00	\$ 25,000
DRAINAGE SUBTOTAL						\$ 39,600
PAVEMENT						
255	01000	PAVEMENT PLANING, ASPHALT CONCRETE	16700	SY	\$ 3.00	\$ 50,100
255	20000	FULL DEPTH PAVEMENT SAWING	340	FT	\$ 4.00	\$ 1,360
302	46000	ASPHALT CONCRETE BASE, PG64-22	346	CY	\$ 110.00	\$ 38,094
304	20000	AGGREGATE BASE	371	CY	\$ 72.00	\$ 26,679
407	20000	NON-TRACKING TACK COAT	218	GAL	\$ 3.50	\$ 762
441	50000	ASPHALT CONCRETE SURFACE COURSE, TYPE 1, (448), PG64-22	995	CY	\$ 198.00	\$ 196,938
441	50300	ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 2, (448)	206	CY	\$ 213.00	\$ 43,907
PAVEMENT SUBTOTAL						\$ 307,740
TRAFFIC SIGNAL						
632	90300	SIGNALIZATION, MISC.	1	LS	\$ 50,000.00	\$ 50,000
TRAFFIC SIGNAL SUBTOTAL						\$ 50,000

ITEM	ITEM EXTENSION	DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT COST	TOTAL
TRAFFIC CONTROL						
630	03100	GROUND MOUNTED SUPPORT, NO. 3 POST	52	FT	\$ 16.00	\$ 832
630	80100	SIGN, FLAT SHEET	30	SF	\$ 24.00	\$ 720
630	84900	REMOVAL OF GROUND MOUNTED SIGN AND DISPOSAL	4	EA	\$ 16.73	\$ 67
630	86002	REMOVAL OF GROUND MOUNTED POST SUPPORT AND DISPOSAL	4	EA	\$ 20.48	\$ 82
644	00104	EDGE LINE, 6"	1.4	MILE	\$ 5,000.00	\$ 7,000
644	00204	LANE LINE, 6"	0.4	MILE	\$ 2,750.00	\$ 1,100
644	00300	CENTER LINE	0.4	MILE	\$ 8,000.00	\$ 3,200
644	00404	CHANNELIZING LINE, 12"	2100	FT	\$ 2.00	\$ 4,200
644	00500	STOP LINE	200	FT	\$ 8.00	\$ 1,600
644	01300	LANE ARROW	30	EACH	\$ 101.50	\$ 3,045
644	01350	LANE REDUCTION ARROW	2	EACH	\$ 266.00	\$ 532
644	01510	DOTTED LINE, 6"	140	FT	\$ 2.25	\$ 315
TRAFFIC CONTROL SUBTOTAL						\$ 22,693
LIGHTING						
625	00450	CONNECTION, FUSED PULL APART	6	EACH	\$ 114.99	\$ 690
625	00480	CONNECTION, UNFUSED PERMANENT	6	EACH	\$ 117.11	\$ 703
625	02501	TRANSFORMER BASE, TYPE AT-A, AS PER PLAN	6	EACH	\$ 475.00	\$ 2,850
625	10500	LIGHT POLE, MISC.:23'6" ROUND TAPERED ALUMINUM POLE WITH 10' DAVIT ARM	6	EACH	\$ 3,500.00	\$ 21,000
625	14501	LIGHT POLE FOUNDATION, AS PER PLAN	6	EACH	\$ 1,750.00	\$ 10,500
625	23200	NO. 4 AWG 2400 VOLT DISTRIBUTION CABLE	1200	FT	\$ 3.30	\$ 3,960
625	23400	NO. 10 AWG POLE AND BRACKET CABLE	200	FT	\$ 1.67	\$ 334
625	25402	CONDUIT, 2", 725.05	1200	FT	\$ 5.83	\$ 6,996
625	26253	LUMINAIRE, CONVENTIONAL, SOLID STATE (LED)	6	EACH	\$ 479.73	\$ 2,878
625	29002	TRENCH, 24" DEEP	1200	FT	\$ 9.09	\$ 10,908
625	30510	PULL BOX, 725.08, 32"	6	EACH	\$ 2,371.08	\$ 14,226
625	30710	GROUND ROD	6	EACH	\$ 290.34	\$ 1,742
LIGHTING SUBTOTAL						\$ 76,788
INCIDENTALS						
103	05000	PREMIUM FOR CONTRACT PERFORMANCE BOND AND FOR PAYMENT BOND	1	LS	\$ 7,500.00	\$ 7,500
614	11000	MAINTAINING TRAFFIC	1	LS	\$ 15,000.00	\$ 15,000
614	12420	DETOUR SIGNING	1	LS	\$ 5,000.00	\$ 5,000
619	16010	FIELD OFFICE, TYPE B	6	MNTH	\$ 1,800.00	\$ 10,800
623	10000	CONSTRUCTION LAYOUT STAKES AND SURVEYING	1	LS	\$ 7,500.00	\$ 7,500
624	10000	MOBILIZATION	1	LS	\$ 20,000.00	\$ 20,000
INCIDENTALS SUBTOTAL						\$ 65,800
ESTIMATED CONSTRUCTION COST TOTAL						\$ 726,330
ESTIMATED RIGHT-OF-WAY COST						\$ -
ESTIMATED ENGINEERING AND R/W COST						\$ 108,950
ESTIMATED INFLATION (14.8%)						\$ 107,497
CONTINGENCY (20%)						\$ 145,266
ESTIMATED PROJECT TOTAL COST						\$ 1,088,043

Unit costs based on average award price from ODOT

Inflation assumes construction occurs in 2026

Utility relocation costs are not included in the estimate

ESTIMATED PROJECT COSTS - SR 747 AND SR 129 DIVERGING DIAMOND INTERCHANGE
Long Term Alternative 2

ITEM	ITEM EXTENSION	DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT COST	TOTAL
ROADWAY						
201	11000	CLEARING AND GRUBBING	1	LS	\$ 5,000.00	\$ 5,000
202	23000	PAVEMENT REMOVED	23722	SY	\$ 7.00	\$ 166,056
202	98000	REMOVAL, MISC.: EXISTING DRAINAGE REMOVAL	1	LS	\$ 10,000.00	\$ 10,000
202	38000	GUARDRAIL REMOVED	2425	FT	\$ 2.50	\$ 6,063
202	98000	REMOVAL, MISC.: EXISTING NOISE BARRIER REMOVED	1	LS	\$ 40,000.00	\$ 40,000
203	10000	EXCAVATION	5000	CY	\$ 15.00	\$ 75,000
203	20000	EMBANKMENT	9000	CY	\$ 10.00	\$ 90,000
204	10000	SUBGRADE COMPACTION	35815	SY	\$ 1.50	\$ 53,722
204	45000	PROOF ROLLING	18	HOUR	\$ 250.00	\$ 4,500
606	15050	GUARDRAIL, TYPE MGS	2425	FT	\$ 21.00	\$ 50,925
606	35000	BRIDGE TERMINAL ASSEMBLY, TYPE 1	5	EACH	\$ 1,800.00	\$ 9,000
606	26000	ANCHOR ASSEMBLY, MGS TYPE B	4	EACH	\$ 2,200.00	\$ 8,800
606	26550	ANCHOR ASSEMBLY, MGS TYPE T	8	EACH	\$ 1,150.00	\$ 9,200
606	26150	ANCHOR ASSEMBLY, MGS TYPE E	4	EACH	\$ 2,780.00	\$ 11,120
ROADWAY SUBTOTAL						\$ 539,385
EROSION CONTROL						
659	00300	TOPSOIL	3330	CY	\$ 25.00	\$ 83,250
659	10000	SEEDING AND MULCHING	30000	SY	\$ 1.10	\$ 33,000
659	14000	REPAIR SEEDING AND MULCHING	1500	SY	\$ 0.80	\$ 1,200
659	15000	INTER-SEEDING	1500	SY	\$ 0.50	\$ 750
659	20000	COMMERCIAL FERTILIZER	7	TON	\$ 600.00	\$ 4,049
659	31000	LIME	6	ACRE	\$ 100.00	\$ 620
659	35000	WATER	170	MGAL	\$ 3.00	\$ 510
832	30000	EROSION CONTROL	10000	EACH	\$ 1.00	\$ 10,000
EROSION CONTROL SUBTOTAL						\$ 133,378
DRAINAGE						
601	21050	TIED CONCRETE BLOCK MAT WITH TYPE 1 UNDERLAYMENT	500	SY	\$ 65.00	\$ 32,500
605	14020	6" BASE PIPE UNDERDRAINS WITH GEOTEXTILE FABRIC	8500	FT	\$ 12.50	\$ 106,250
605	00510	6" CONDUIT, TYPE F FOR UNDERDRAIN OUTLETS	250	FT	\$ 24.00	\$ 6,000
605	99710	PRECAST REINFORCED CONCRETE OUTLET	8	EACH	\$ 300.00	\$ 2,400
611	97800	SPECIAL - DRAINAGE (CONTINGENCY FOR DRAINAGE REPLACEMENT)	1	LS	\$ 50,000.00	\$ 50,000
DRAINAGE SUBTOTAL						\$ 197,150
PAVEMENT						
255	20000	FULL DEPTH PAVEMENT SAWING	300	FT	\$ 3.00	\$ 900
302	46000	ASPHALT CONCRETE BASE, PG64-22	5579	CY	\$ 110.00	\$ 613,647
304	20000	AGGREGATE BASE	5969	CY	\$ 51.00	\$ 304,425
407	20000	NON-TRACKING TACK COAT	3507	GAL	\$ 3.00	\$ 10,520
441	50000	ASPHALT CONCRETE SURFACE COURSE, TYPE 1, (448), PG64-22	1107	CY	\$ 195.00	\$ 215,839
441	50300	ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 2, (448)	1550	CY	\$ 153.00	\$ 237,091
609	54000	6" CONCRETE TRAFFIC ISLAND	2864	SY	\$ 70.00	\$ 200,464
PAVEMENT SUBTOTAL						\$ 1,582,886
TRAFFIC SIGNAL						
632	90300	SIGNALIZATION, MISC.	2	LS	\$ 250,000.00	\$ 500,000
632	62830	INTERCONNECT, MISC.	1	LS	\$ 30,000.00	\$ 30,000
TRAFFIC SIGNAL SUBTOTAL						\$ 530,000

ITEM	ITEM EXTENSION	DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT COST	TOTAL
TRAFFIC CONTROL						
630	02100	GROUND MOUNTED SUPPORT, NO. 2 POST	250	FT	\$ 10.61	\$ 2,653
630	03100	GROUND MOUNTED SUPPORT, NO. 3 POST	550	FT	\$ 12.12	\$ 6,666
630	04100	GROUND MOUNTED SUPPORT, NO. 4 POST	50	FT	\$ 15.75	\$ 788
630	80100	SIGN, FLAT SHEET	500	SF	\$ 19.02	\$ 9,510
630	80224	SIGN, OVERHEAD EXTRUSHEET	1900	SF	\$ 21.70	\$ 41,230
630	08600	SIGN POST REFLECTOR	50	EA	\$ 43.64	\$ 2,182
630	25600	COMBINATION OVERHEAD SIGN SUPPORT, TYPE TC-12.30, DESIGN 6	1	EA	\$ 15,000.00	\$ 15,000
630	72420	OVERHEAD SIGN SUPPORT, TYPE TC-15.116, DESIGN 2	8	EA	\$ 15,000.00	\$ 120,000
630	72540	OVERHEAD SIGN SUPPORT, TYPE TC-16.22, DESIGN 12	1	EA	\$ 14,000.00	\$ 14,000
630	75000	SIGN ATTACHMENT ASSEMBLY	8	EA	\$ 548.90	\$ 4,391
630	79200	SIGN ATTACHMENT ASSEMBLY, MAST ARM	8	EA	\$ 463.20	\$ 3,706
630	84510	RIGID OVERHEAD SIGN SUPPORT FOUNDATION	8	EA	\$ 5,942.56	\$ 47,540
630	84900	REMOVAL OF GROUND MOUNTED SIGN AND DISPOSAL	50	EA	\$ 16.73	\$ 837
630	86002	REMOVAL OF GROUND MOUNTED POST SUPPORT AND DISPOSAL	50	EA	\$ 20.48	\$ 1,024
630	87400	REMOVAL OF OVERHEAD MOUNTED SIGN AND DISPOSAL	4	EA	\$ 201.65	\$ 807
630	89702	REMOVAL OF OVERHEAD SIGN SUPPORT AND DISPOSAL	2	EA	\$ 1,866.74	\$ 3,733
644	00104	EDGE LINE, 6"	3.5	MILE	\$ 4,030.35	\$ 14,106
644	00204	LANE LINE, 6"	1.75	MILE	\$ 2,055.27	\$ 3,597
644	00300	CENTER LINE	0.1	MILE	\$ 10,795.50	\$ 1,080
644	00404	CHANNELIZING LINE, 12"	3500	FT	\$ 1.88	\$ 6,580
644	00500	STOP LINE	300	FT	\$ 7.21	\$ 2,163
644	00630	CROSSWALK LINE, 24"	300	FT	\$ 7.00	\$ 2,100
644	01300	LANE ARROW	30	EACH	\$ 101.28	\$ 3,038
644	01350	LANE REDUCTION ARROW	2	EACH	\$ 265.81	\$ 532
644	01510	DOTTED LINE, 6"	2000	FT	\$ 1.37	\$ 2,740
644	30030	REMOVAL OF PAVEMENT MARKING	0.25	MILE	\$ 5,974.49	\$ 1,494
TRAFFIC CONTROL SUBTOTAL						\$ 311,495
LIGHTING						
625	00450	CONNECTION, FUSED PULL APART	16	EACH	\$ 114.99	\$ 1,840
625	00480	CONNECTION, UNFUSED PERMANENT	21	EACH	\$ 117.11	\$ 2,459
625	02501	TRANSFORMER BASE, TYPE AT-A, AS PER PLAN	8	EACH	\$ 475.00	\$ 3,800
625	10500	LIGHT POLE, MISC.:23'6" ROUND TAPERED ALUMINUM POLE WITH 10' DAVIT ARM	8	EACH	\$ 3,500.00	\$ 28,000
625	14501	LIGHT POLE FOUNDATION, AS PER PLAN	8	EACH	\$ 1,750.00	\$ 14,000
625	23200	NO. 4 AWG 2400 VOLT DISTRIBUTION CABLE	3000	FT	\$ 3.30	\$ 9,900
625	23400	NO. 10 AWG POLE AND BRACKET CABLE	1300	FT	\$ 1.67	\$ 2,171
625	25402	CONDUIT, 2", 725.05	2750	FT	\$ 5.83	\$ 16,033
625	25502	CONDUIT, 3", 725.05	500	FT	\$ 11.94	\$ 5,970
625	26253	LUMINAIRE, CONVENTIONAL, SOLID STATE (LED)	50	EACH	\$ 479.73	\$ 23,987
625	27402	LUMINAIRE, POST TOP, SOLID STATE (LED)	20	EACH	\$ 580.00	\$ 11,600
625	29002	TRENCH, 24" DEEP	3000	FT	\$ 9.09	\$ 27,270
625	30510	PULL BOX, 725.08, 32"	50	EACH	\$ 2,371.08	\$ 118,554
625	30710	GROUND ROD	40	EACH	\$ 290.34	\$ 11,614
625	33000	STRUCTURE GROUNDING SYSTEM	2	EACH	\$ 6,704.93	\$ 13,410
625	34000	POWER SERVICE	1	EACH	\$ 3,767.83	\$ 3,768
625	10480	LIGHT POLE, DECORATIVE	20	EACH	\$ 1,750.00	\$ 35,000
625	14000	LIGHT POLE FOUNDATION, 24" X 6' DEEP	20	EACH	\$ 1,502.59	\$ 30,052
625	34450	CONTROL CENTER CABINET, COMPLETE	2	EACH	\$ 4,500.00	\$ 9,000
LIGHTING SUBTOTAL						\$ 368,426
NOISE BARRIERS						
606	10900	SPECIAL - NOISE BARRIER	1	LS	\$ 150,000.00	\$ 150,000
NOISE BARRIER SUBTOTAL						\$ 150,000
INCIDENTALS						
103	05000	PREMIUM FOR CONTRACT PERFORMANCE BOND AND FOR PAYMENT BOND	1	LS	\$ 45,000.00	\$ 45,000
614	11000	MAINTAINING TRAFFIC	1	LS	\$ 550,000.00	\$ 550,000
614	12420	DETOUR SIGNING	1	LS	\$ 50,000.00	\$ 50,000
619	16010	FIELD OFFICE, TYPE B	18	MNTH	\$ 1,800.00	\$ 32,400
623	10000	CONSTRUCTION LAYOUT STAKES AND SURVEYING	1	LS	\$ 50,000.00	\$ 50,000
624	10000	MOBILIZATION	1	LS	\$ 100,000.00	\$ 100,000
INCIDENTALS SUBTOTAL						\$ 827,400
ESTIMATED CONSTRUCTION COST TOTAL						\$ 4,640,121
ESTIMATED RIGHT-OF-WAY COST						\$ 25,000
ESTIMATED ENGINEERING AND R/W COST						\$ 696,018
ESTIMATED INFLATION (14.8%)						\$ 686,738
CONTINGENCY (20%)						\$ 928,024
ESTIMATED PROJECT TOTAL COST						\$ 6,975,901

Unit costs based on average award price from ODOT

Inflation assumes construction occurs in 2026

Utility relocation costs are not included in the estimate



ODOT Highway Safety Program
BUT-747-5.49

Appendix G
Cost Estimates and Benefit Cost Analysis

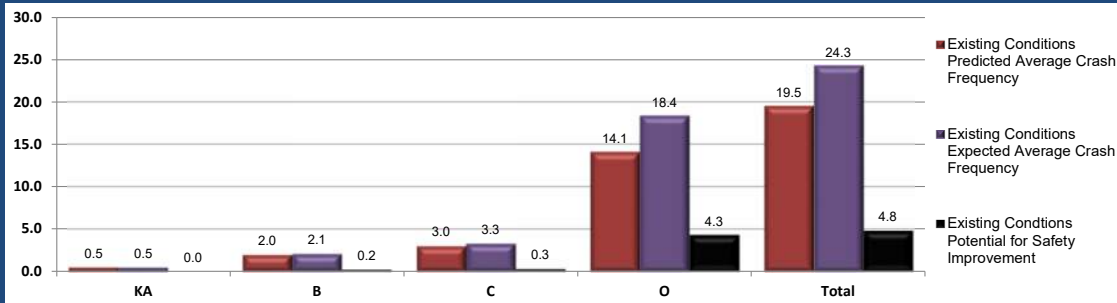


Project Safety Performance Report

General Information

Project Name	SR-747 at SR-129 Interchanges and Grandin	Contact Email	kristi@lanhamengineering.com
Project Description	SR-747-5.49 Safety Study: Existing	Contact Phone	309-269-0238
Reference Number		Date Performed	6/30/2022
Analyst	KMN	Analysis Year	2018-2020
Agency/Company	Lanham Engineering, LLC		

Summary of Anticipated Safety Performance of the Project (average crashes/year)



Project Summary Results (Without Animal Crashes)

	KA	B	C	O	Total
N_{predicted} - Existing Conditions	0.4849	1.9639	2.9813	14.0863	19.5164
N_{expected} - Existing Conditions	0.5222	2.1368	3.2578	18.3668	24.2836
N_{potential for improvement} - Existing Conditions	0.0373	0.1729	0.2765	4.2805	4.7672

Existing Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR747: 5.43-5.56	SR-747	0.0128	0.0319	0.0301	0.2211	0.2959
SR747: 5.56-5.65	SR-747	0.01	0.025	0.0236	0.1756	0.2342
SR747: 5.43	SR-747 at SR-129 EB Ramps	0.2061	0.8491	1.312	6.5005	8.8677
SR747: 5.56	SR-747 at SR-129 WB Ramps	0.2201	0.9062	1.4	6.296	8.8223
SR747: 5.65	SR-747 at Grandin Ridge Dr	0.0359	0.1517	0.2156	0.8931	1.2963

Existing Conditions Project Element Expected Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR747: 5.43-5.56	SR-747	0.0154	0.0386	0.0365	0.1827	0.2732
SR747: 5.56-5.65	SR-747	0.0096	0.024	0.0227	0.2008	0.2571
SR747: 5.43	SR-747 at SR-129 EB Ramps	0.2304	0.9491	1.4662	8.0016	10.6473
SR747: 5.56	SR-747 at SR-129 WB Ramps	0.2276	0.9369	1.4474	8.7997	11.4116
SR747: 5.65	SR-747 at Grandin Ridge Dr	0.0392	0.1882	0.285	1.182	1.6944

Existing Conditions Project Element Potential for Safety Improvement Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				
		KA	B	C	O	Total
SR747: 5.43-5.56	SR-747	0.0026	0.0067	0.0064	-0.0384	-0.0227
SR747: 5.56-5.65	SR-747	-0.0004	-0.001	-0.0009	0.0262	0.0229
SR747: 5.43	SR-747 at SR-129 EB Ramps	0.0243	0.1	0.1542	1.5011	1.7796
SR747: 5.56	SR-747 at SR-129 WB Ramps	0.0075	0.0307	0.0474	2.5037	2.5893
SR747: 5.65	SR-747 at Grandin Ridge Dr	0.0033	0.0365	0.0694	0.2889	0.3981

Summary by Crash Type

Crash Type	Existing		PSI	Proposed Expected Crash Frequency
	Predicted Crash Frequency	Expected Crash Frequency		
Unknown	0.0124	0.0153	0.0029	
Head On	0.0563	0.0712	0.0149	
Rear End	6.7854	9.6470	2.8615	
Backing	0.1987	0.2894	0.0907	
Sideswipe - Meeting	0.1405	0.1810	0.0405	
Sideswipe - Passing	1.6229	2.3425	0.7196	
Angle	2.5632	3.5655	1.0023	
Parked Vehicle	0.2106	0.2902	0.0796	
Pedestrian	0.0818	0.0648	-0.0170	
Animal	0.0360	0.0350	-0.0010	
Train	0.0001	0.0001	0.0000	
Pedalcycles	0.0990	0.1180	0.0190	
Other Non-Vehicle	0.0000	0.0000	0.0000	
Fixed Object	0.7035	0.9797	0.2762	
Other Object	0.0295	0.0407	0.0112	
Overturning	0.0624	0.0832	0.0208	
Other Non-Collision	0.0914	0.1296	0.0382	
Left Turn	1.1161	1.5333	0.4172	
Right Turn	0.0000	0.0000	0.0000	

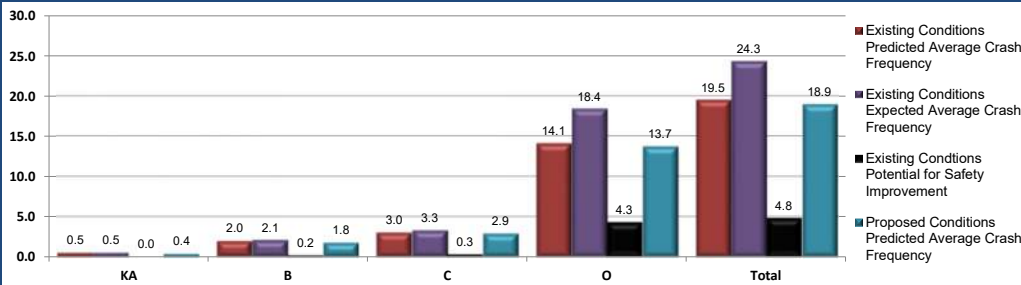


Project Safety Performance Report

General Information

Project Name	SR-747 at SR-129 Interchanges and Grandin	Contact Email	kristi@lanhamengineering.com
Project Description	SR-747-5.49 Safety Study: Short Term	Contact Phone	309-269-0238
Reference Number		Date Performed	8/17/2022
Analyst	VHD	Analysis Year	2018-2020
Agency/Company	Lanham Engineering, LLC		

Summary of Anticipated Safety Performance of the Project (average crashes/year)



Project Summary Results (Without Animal Crashes)

	KA	B	C	O	Total
N_{predicted} - Existing Conditions	0.4849	1.9639	2.9813	14.0863	19.5164
N_{expected} - Existing Conditions	0.5222	2.1368	3.2578	18.3668	24.2836
N_{potential for improvement} - Existing Conditions	0.0373	0.1729	0.2765	4.2805	4.7672
N_{expected} - Proposed Conditions	0.4497	1.8461	2.8811	13.7475	18.9244

Existing Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level					Total
		KA	B	C	O		
SR747: 5.43-5.56	SR-747	0.0128	0.0319	0.0301	0.2211		0.2959
SR747: 5.56-5.65	SR-747	0.01	0.025	0.0236	0.1756		0.2342
SR747: 5.43	SR-747 at SR-129 EB Ramps	0.2061	0.8491	1.312	6.5005		8.8677
SR747: 5.56	SR-747 at SR-129 WB Ramps	0.2201	0.9062	1.4	6.296		8.8223
SR747: 5.65	SR-747 at Grandin Ridge Dr	0.0359	0.1517	0.2156	0.8931		1.2963

Existing Conditions Project Element Expected Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level					Total
		KA	B	C	O		
SR747: 5.43-5.56	SR-747	0.0154	0.0386	0.0365	0.1827		0.2732
SR747: 5.56-5.65	SR-747	0.0096	0.024	0.0227	0.2008		0.2571
SR747: 5.43	SR-747 at SR-129 EB Ramps	0.2304	0.9491	1.4662	8.0016		10.6473
SR747: 5.56	SR-747 at SR-129 WB Ramps	0.2276	0.9369	1.4474	8.7997		11.4116
SR747: 5.65	SR-747 at Grandin Ridge Dr	0.0392	0.1882	0.285	1.182		1.6944

Existing Conditions Project Element Potential for Safety Improvement Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level					Total
		KA	B	C	O		
SR747: 5.43-5.56	SR-747	0.0026	0.0087	0.0064	-0.0384		-0.0227
SR747: 5.56-5.65	SR-747	-0.0004	-0.001	-0.0009	0.0252		0.0229
SR747: 5.43	SR-747 at SR-129 EB Ramps	0.0243	0.1	0.1542	1.5011		1.7796
SR747: 5.56	SR-747 at SR-129 WB Ramps	0.0075	0.0307	0.0474	2.5037		2.5893
SR747: 5.65	SR-747 at Grandin Ridge Dr	0.0033	0.0365	0.0694	0.2889		0.3981

Proposed Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level					Total
		KA	B	C	O		
SR747: 5.43	SR-747 at SR-129 EB Ramps	0.1891	0.7921	1.2635	6.3284		8.5731
SR747: 5.56	SR-747 at SR-129 WB Ramps	0.2019	0.8454	1.3483	6.1293		8.5249
SR747: 5.65	SR-747 at Grandin Ridge Dr	0.0359	0.1517	0.2156	0.8931		1.2963
SR747: 5.43-5.56	SR-747	0.0128	0.0319	0.0301	0.2211		0.2959
SR747: 5.56-5.65	SR-747	0.01	0.025	0.0236	0.1756		0.2342

Summary by Crash Type

Crash Type	Existing		PSI	Proposed Predicted Crash Frequency
	Predicted Crash Frequency	Expected Crash Frequency		
Unknown	0.0124	0.0153	0.0029	0.0062
Head On	0.0563	0.0712	0.0149	0.0311
Rear End	6.7854	9.6470	2.8615	4.2188
Backing	0.1987	0.2894	0.0907	0.1179
Sideswipe - Meeting	0.1405	0.1810	0.0405	0.1026
Sideswipe - Passing	1.6229	2.3425	0.7196	0.9153
Angle	2.5632	3.5655	1.0023	1.4193
Parked Vehicle	0.2106	0.2902	0.0796	0.1194
Pedestrian	0.0818	0.0648	-0.0170	0.0446
Animal	0.0360	0.0350	-0.0010	0.0360
Train	0.0001	0.0001	0.0000	0.0001
Pedalcycles	0.0990	0.1180	0.0190	0.0390
Other Non-Vehicle	0.0000	0.0000	0.0000	0.0000
Fixed Object	0.7035	0.9797	0.2762	0.3713
Other Object	0.0295	0.0407	0.0112	0.0156
Overturning	0.0624	0.0832	0.0208	0.0310
Other Non-Collision	0.0914	0.1296	0.0382	0.0486
Left Turn	1.1161	1.5333	0.4172	0.5979
Right Turn	0.0000	0.0000	0.0000	0.0000

Project Cost Estimate

Project Name	SR-747 at SR-129 Interchanges and Grandin Ridge	Contact Email	kristi@lanhamengineering.com
Project Description	SR-747-5.49 Safety Study: Short Term	Contact Phone	309-269-0238
Reference Number		Date Performed	8/17/2022
Analyst	VHD	Analysis Year	2018-2020
Agency/Company	Lanham Engineering, LLC		

Engineering Design %	
Contingency %	

Countermeasures	Construction Costs	Right of Way Costs	Engineering Design Costs	Contingency Amount	Total Cost of Countermeasure	Annual Maintenance & Energy Costs	Salvage Value
Site Characteristic Improvements (i.e. Lane widening)					\$0.00		
Site Characteristic Improvements (i.e. Lighting)					\$0.00		
Site Characteristic Improvements (i.e. Signal Phasing)					\$0.00		
Site Characteristic Improvements (i.e. Added Right Turn Lane)					\$0.00		
CMF 1 - Modify change plus clearance interval to ITE 1985 Proposed Recommended Practice (4-leg signalized)	\$25,000.00			\$5,000.00	\$30,000.00		
CMF 2 - Change from Permitted/Protected to Protected Only Left Turn Phasing					\$0.00		
					\$0.00		
					\$0.00		
					\$0.00		
					\$0.00		
					\$0.00		
					\$0.00		
					\$0.00		
					\$0.00		
Totals	\$25,000.00	\$0.00	\$0.00	\$5,000.00	\$30,000.00	\$0.00	\$0.00

Inflation % 10%

Final Construction Cost:	\$33,000.00
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*Final construction cost should match the Project Cost Estimate



Safety Benefit - Cost Analysis

General Information

Project Name	SR-747 at SR-129 Interchanges and Grandin Ridge Drive/Logsdons Meadow Drive	Contact Email	kristi@lanhamengineering.com
Project Description	SR-747-5.49 Safety Study: Short Term	Contact Phone	309-269-0238
Reference Number		Date Performed	8/17/2022
Analyst	VHD	Analysis Year	2018-2020
Agency/Company	Lanham Engineering, LLC		

Select Site Types to be used in Benefit-Cost Analysis:

All Sites

Comments:

Countermeasure Service Lives, Costs, and Safety Benefits

Countermeasures	Service Life (Years)	Initial Cost of Countermeasure	Annual Maintenance & Energy Costs	Salvage Value	Net Present Cost of Countermeasure	Total Cost of Countermeasures	Summary of Annual Crash Modifications	Net Present Value of Safety Benefits
Site Characteristic Improvements (i.e. Lane widening)		\$0.00			\$0.00	\$0.00	0.000	\$0
Site Characteristic Improvements (i.e. Lighting)		\$0.00			\$0.00	\$0.00		
Site Characteristic Improvements (i.e. Signal Phasing)		\$0.00			\$0.00	\$0.00		
Site Characteristic Improvements (i.e. Added Right Turn Lane)		\$0.00			\$0.00	\$0.00		
CMF 1 - Modify change plus clearance interval to ITE 1985 Proposed Recommended Practice (4-leg signalized)	10	\$30,000.00			\$60,000.00	\$74,407.33	0.500	\$27,188
CMF 2 - Change from Permitted/Protected to Protected Only Left Turn Phasing	20	\$0.00			\$0.00	\$0.00	-1.092	\$349,893
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
Totals		\$30,000.00	\$0.00	\$0.00	\$60,000.00	\$74,407.33	-0.592	\$377,081



Safety Benefit - Cost Analysis

General Information

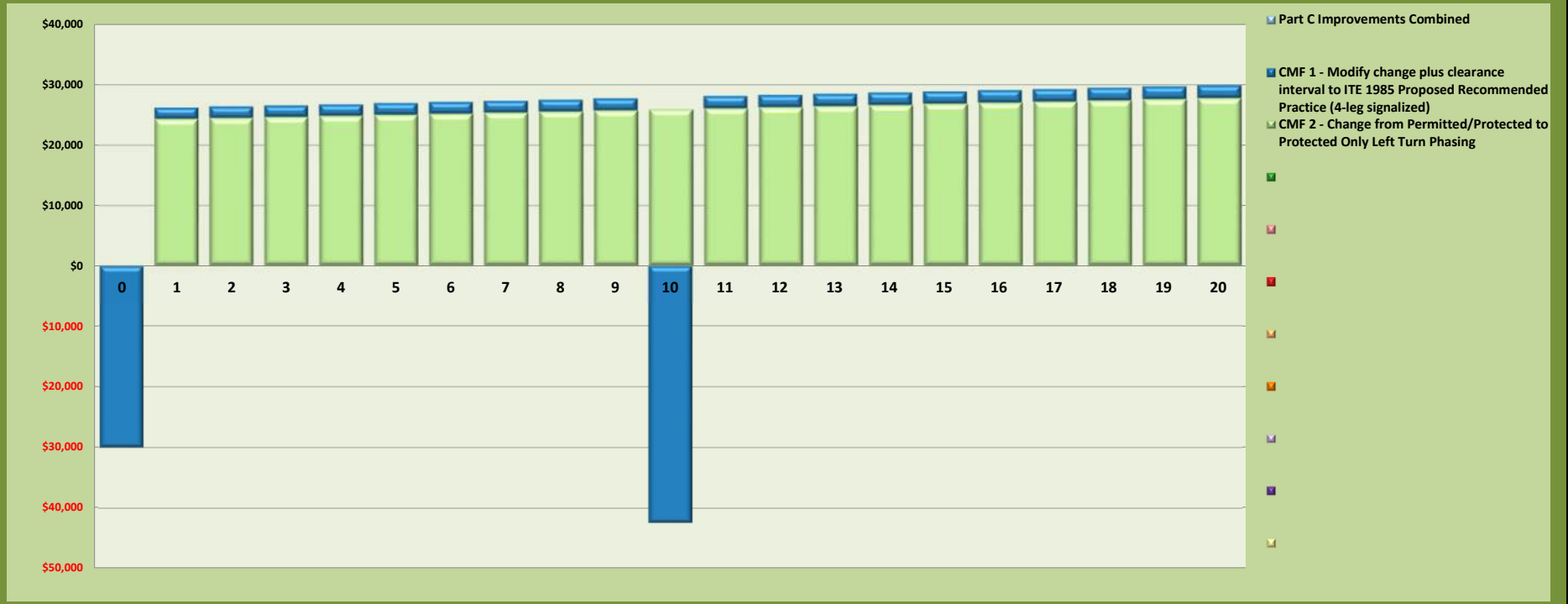
Project Name	SR-747 at SR-129 Interchanges and Grandin Ridge Drive/Logsdons Meadow Drive	Contact Email	kristi@lanhamengineering.com
Project Description	SR-747-5.49 Safety Study: Short Term	Contact Phone	309-269-0238
Reference Number		Date Performed	8/17/2022
Analyst	VHD	Analysis Year	2018-2020
Agency/Company	Lanham Engineering, LLC		

Benefit - Cost Calculator	
Net Present Value of Project	\$60,000.00
Net Present Value of Safety Benefits	\$377,081.21
Net Benefit	\$317,081.21
Benefit / Cost Ratio	6.28

Expected Annual Crash Adjustment	
Number of Fatal & Incapacitating Injury Crashes	-0.035
Number of Injury Crashes	-0.253
Number of Total Crashes	-0.592

Comments:

Safety Benefits and Project Costs Combined Cash Flows By Countermeasure Per Year



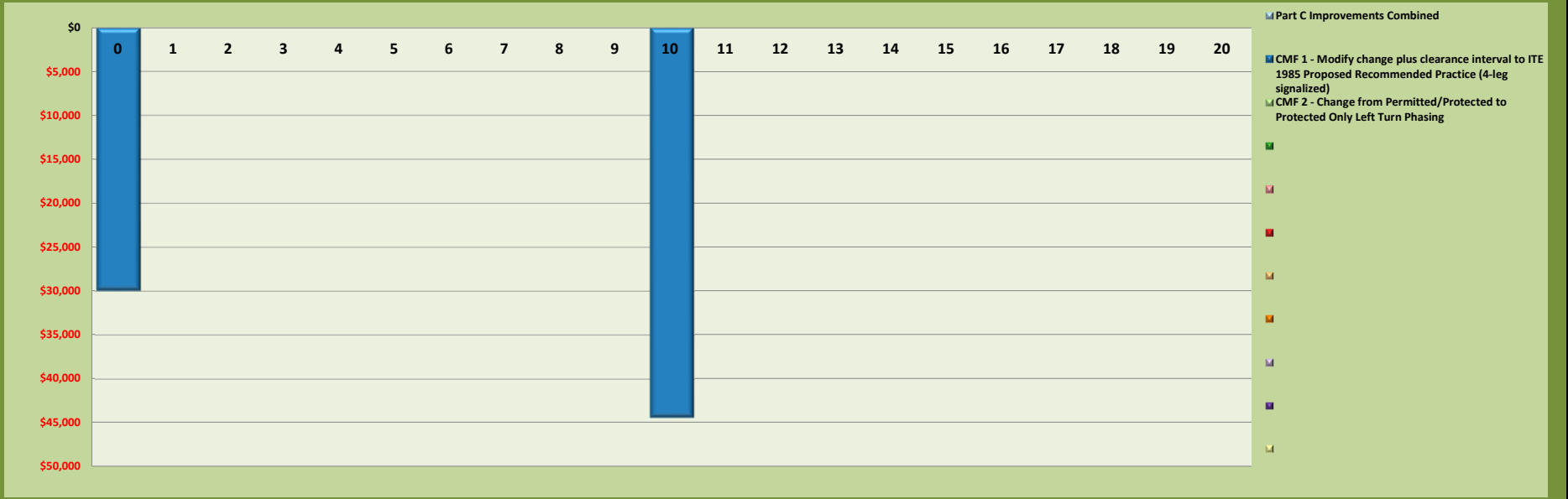


Safety Benefit - Cost Analysis

General Information

Project Name	SR-747 at SR-129 Interchanges and Grandin Ridge Drive/Logsdons Meadow Drive	Contact Email	kristi@lanhamengineering.com
Project Description	SR-747-5.49 Safety Study: Short Term	Contact Phone	309-269-0238
Reference Number		Date Performed	8/17/2022
Analyst	VHD	Analysis Year	2018-2020
Agency/Company	Lanham Engineering, LLC		

Project Costs Only Cash Flows By Countermeasure Per Year



Return on Investment (Safety Benefits and Project Investments)



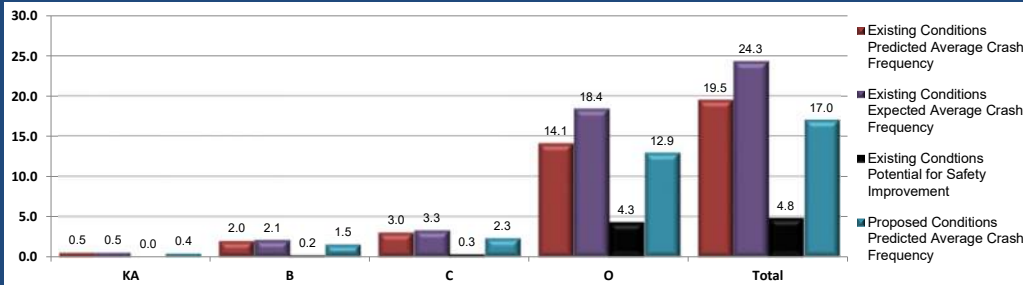


Project Safety Performance Report

General Information

Project Name	SR-747 at SR-129 Interchanges and Grandin	Contact Email	kristi@lanhamengineering.com
Project Description	SR-747-5.49 Safety Study: Long Term Alt 1	Contact Phone	309-269-0238
Reference Number		Date Performed	8/17/2022
Analyst	VHD	Analysis Year	2018-2020
Agency/Company	Lanham Engineering, LLC		

Summary of Anticipated Safety Performance of the Project (average crashes/year)



Project Summary Results (Without Animal Crashes)

	KA	B	C	O	Total
N_{predicted} - Existing Conditions	0.4849	1.9639	2.9813	14.0863	19.5164
N_{expected} - Existing Conditions	0.5222	2.1368	3.2578	18.3668	24.2836
N_{potential for improvement} - Existing Conditions	0.0373	0.1729	0.2765	4.2805	4.7672
N_{expected} - Proposed Conditions	0.3566	1.4564	2.2597	12.9233	16.9960

Existing Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level					Total
		KA	B	C	O		
SR747: 5.43-5.56	SR-747	0.0128	0.0319	0.0301	0.2211		0.2959
SR747: 5.56-5.65	SR-747	0.01	0.025	0.0236	0.1756		0.2342
SR747: 5.43	SR-747 at SR-129 EB Ramps	0.2061	0.8491	1.312	6.5005		8.8677
SR747: 5.56	SR-747 at SR-129 WB Ramps	0.2201	0.9062	1.4	6.296		8.8223
SR747: 5.65	SR-747 at Grandin Ridge Dr	0.0359	0.1517	0.2156	0.8931		1.2963

Existing Conditions Project Element Expected Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level					Total
		KA	B	C	O		
SR747: 5.43-5.56	SR-747	0.0154	0.0386	0.0365	0.1827		0.2732
SR747: 5.56-5.65	SR-747	0.0096	0.024	0.0227	0.2008		0.2571
SR747: 5.43	SR-747 at SR-129 EB Ramps	0.2304	0.9491	1.4662	8.0016		10.6473
SR747: 5.56	SR-747 at SR-129 WB Ramps	0.2276	0.9369	1.4474	8.7997		11.4116
SR747: 5.65	SR-747 at Grandin Ridge Dr	0.0392	0.1882	0.285	1.182		1.6944

Existing Conditions Project Element Potential for Safety Improvement Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level					Total
		KA	B	C	O		
SR747: 5.43-5.56	SR-747	0.0026	0.0067	0.0064	-0.0384		-0.0227
SR747: 5.56-5.65	SR-747	-0.0004	-0.001	-0.0009	0.0252		0.0229
SR747: 5.43	SR-747 at SR-129 EB Ramps	0.0243	0.1	0.1542	1.5011		1.7796
SR747: 5.56	SR-747 at SR-129 WB Ramps	0.0075	0.0307	0.0474	2.5037		2.5893
SR747: 5.65	SR-747 at Grandin Ridge Dr	0.0033	0.0365	0.0694	0.2689		0.3981

Proposed Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level					Total
		KA	B	C	O		
SR747: 5.43	SR-747 at SR-129 EB Ramps	0.1326	0.5555	0.8863	5.657		7.2314
SR747: 5.56	SR-747 at SR-129 WB Ramps	0.1653	0.6922	1.104	5.9757		7.9372
SR747: 5.65	SR-747 at Grandin Ridge Dr	0.0359	0.1517	0.2156	0.8931		1.2963
SR747: 5.43-5.56	SR-747	0.0128	0.0319	0.0301	0.2211		0.2959
SR747: 5.56-5.65	SR-747	0.01	0.0251	0.0237	0.1764		0.2352

Summary by Crash Type

Crash Type	Existing		PSI	Proposed Predicted Crash Frequency
	Predicted Crash Frequency	Expected Crash Frequency		
Unknown	0.0124	0.0153	0.0029	0.0059
Head On	0.0563	0.0712	0.0149	0.0291
Rear End	6.7854	9.6470	2.8615	3.8905
Backing	0.1987	0.2894	0.0907	0.1107
Sideswipe - Meeting	0.1405	0.1810	0.0405	0.0992
Sideswipe - Passing	1.6229	2.3425	0.7196	0.8501
Angle	2.5632	3.5655	1.0023	1.3071
Parked Vehicle	0.2106	0.2902	0.0796	0.1116
Pedestrian	0.0818	0.0648	-0.0170	0.0429
Animal	0.0360	0.0350	-0.0010	0.0360
Train	0.0001	0.0001	0.0000	0.0001
Pedalcycles	0.0990	0.1180	0.0190	0.0363
Other Non-Vehicle	0.0000	0.0000	0.0000	0.0000
Fixed Object	0.7035	0.9797	0.2762	0.3431
Other Object	0.0295	0.0407	0.0112	0.0144
Overturning	0.0624	0.0832	0.0208	0.0284
Other Non-Collision	0.0914	0.1296	0.0382	0.0449
Left Turn	1.1161	1.5333	0.4172	0.5527
Right Turn	0.0000	0.0000	0.0000	0.0000

Project Cost Estimate

Project Name	SR-747 at SR-129 Interchanges and Grandin Ridge	Contact Email	kristi@lanhamengineering.com
Project Description	SR-747-5.49 Safety Study: Long Term Alt 1	Contact Phone	309-269-0238
Reference Number		Date Performed	8/17/2022
Analyst	VHD	Analysis Year	2018-2020
Agency/Company	Lanham Engineering, LLC		

Engineering Design %	
Contingency %	

Countermeasures	Construction Costs	Right of Way Costs	Engineering Design Costs	Contingency Amount	Total Cost of Countermeasure	Annual Maintenance & Energy Costs	Salvage Value
Site Characteristic Improvements (i.e. Lane widening)					\$0.00		
Site Characteristic Improvements (i.e. Lighting)					\$0.00		
Site Characteristic Improvements (i.e. Signal Phasing)					\$0.00		
Site Characteristic Improvements (i.e. Added Right Turn Lane)					\$0.00		
CMF 1 - Modify change plus clearance interval to ITE 1985 Proposed Recommended Practice (4-leg signalized)					\$0.00		
CMF 2 - Provide a right-turn lane on ONE major road approach	\$726,330.00		\$108,850.00	\$119,245.00	\$954,425.00		
CMF 3 - Change from Permitted/Protected to Protected Only Left Turn Phasing					\$0.00		
					\$0.00		
					\$0.00		
					\$0.00		
					\$0.00		
					\$0.00		
					\$0.00		
					\$0.00		
Totals	\$726,330.00	\$0.00	\$108,850.00	\$119,245.00	\$954,425.00	\$0.00	\$0.00

Inflation % 14%

Final Construction Cost:	\$1,088,044.50
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*Final construction cost should match the Project Cost Estimate



Safety Benefit - Cost Analysis

General Information

Project Name	SR-747 at SR-129 Interchanges and Grandin Ridge Drive/Logsdons Meadow Drive	Contact Email	kristi@lanhamengineering.com
Project Description	SR-747-5.49 Safety Study: Long Term Alt 1	Contact Phone	309-269-0238
Reference Number		Date Performed	8/17/2022
Analyst	VHD	Analysis Year	2018-2020
Agency/Company	Lanham Engineering, LLC		

<p>Select Site Types to be used in Benefit-Cost Analysis:</p> <div style="border: 1px solid black; background-color: #e0e0e0; padding: 2px; width: 100%;">All Sites</div>	<p>Comments:</p> <div style="border: 1px solid black; height: 40px;"></div>
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Countermeasure Service Lives, Costs, and Safety Benefits

Countermeasures	Service Life (Years)	Initial Cost of Countermeasure	Annual Maintenance & Energy Costs	Salvage Value	Net Present Cost of Countermeasure	Total Cost of Countermeasures	Summary of Annual Crash Modifications	Net Present Value of Safety Benefits
Site Characteristic Improvements (i.e. Lane widening)	20	\$0.00			\$0.00	\$0.00	-1.642	\$951,536
Site Characteristic Improvements (i.e. Lighting)		\$0.00			\$0.00	\$0.00		
Site Characteristic Improvements (i.e. Signal Phasing)		\$0.00			\$0.00	\$0.00		
Site Characteristic Improvements (i.e. Added Right Turn Lane)		\$0.00			\$0.00	\$0.00		
CMF 1 - Modify change plus clearance interval to ITE 1985 Proposed Recommended Practice (4-leg signalized)	5	\$0.00			\$0.00	\$0.00	0.462	\$22,519
CMF 2 - Provide a right-turn lane on ONE major road approach	20	\$954,425.00			\$954,425.00	\$954,425.00	-0.372	\$439,405
CMF 3 - Change from Permitted/Protected to Protected Only Left Turn Phasing	20	\$0.00			\$0.00	\$0.00	-0.968	\$266,920
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
Totals		\$954,425.00	\$0.00	\$0.00	\$954,425.00	\$954,425.00	-2.520	\$1,680,380



Safety Benefit - Cost Analysis

General Information

Project Name	SR-747 at SR-129 Interchanges and Grandin Ridge Drive/Logsdons Meadow Drive	Contact Email	kristi@lanhamengineering.com
Project Description	SR-747-5.49 Safety Study: Long Term Alt 1	Contact Phone	309-269-0238
Reference Number		Date Performed	8/17/2022
Analyst	VHD	Analysis Year	2018-2020
Agency/Company	Lanham Engineering, LLC		

Benefit - Cost Calculator

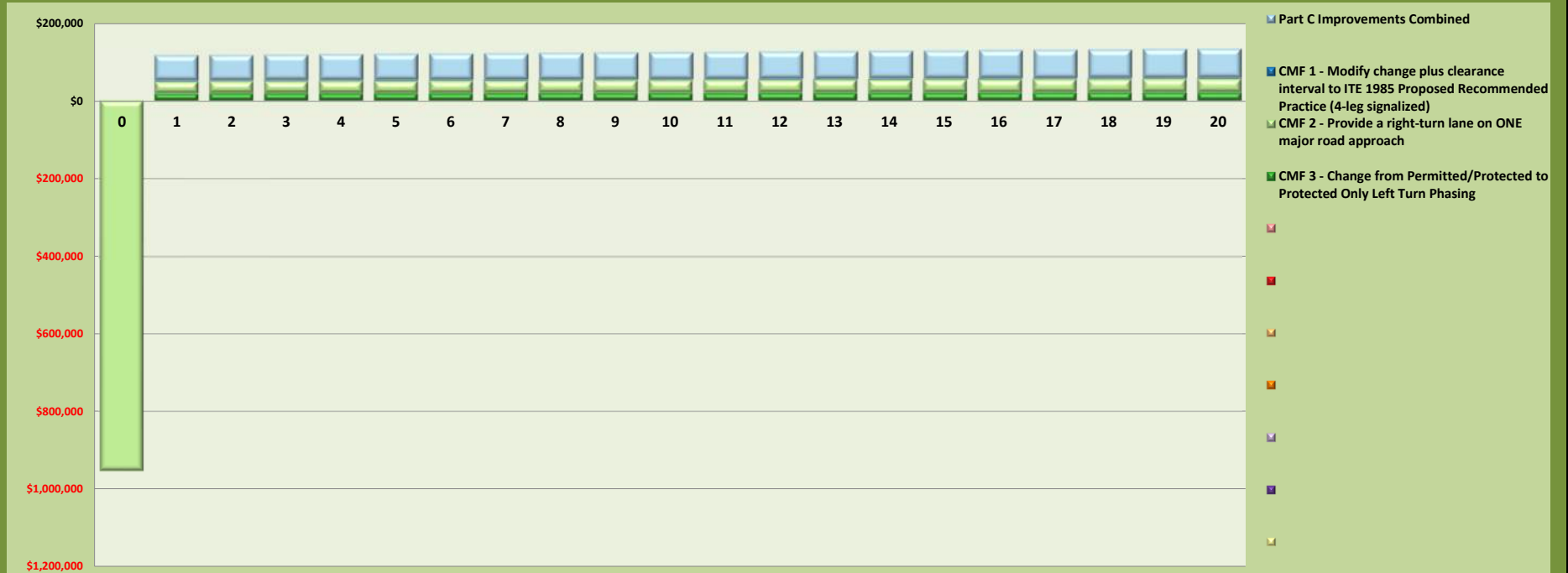
Net Present Value of Project	\$954,425.00
Net Present Value of Safety Benefits	\$1,680,379.62
Net Benefit	\$725,954.62
Benefit / Cost Ratio	1.76

Expected Annual Crash Adjustment

Number of Fatal & Incapacitating Injury Crashes	-0.128
Number of Injury Crashes	-1.357
Number of Total Crashes	-2.520

Comments:

Safety Benefits and Project Costs Combined Cash Flows By Countermeasure Per Year





Safety Benefit - Cost Analysis

General Information

Project Name	SR-747 at SR-129 Interchanges and Grandin Ridge Drive/Logsdons Meadow Drive	Contact Email	kristi@lanhamengineering.com
Project Description	SR-747-5.49 Safety Study: Long Term Alt 1	Contact Phone	309-269-0238
Reference Number		Date Performed	8/17/2022
Analyst	VHD	Analysis Year	2018-2020
Agency/Company	Lanham Engineering, LLC		

Project Costs Only Cash Flows By Countermeasure Per Year



Return on Investment (Safety Benefits and Project Investments)



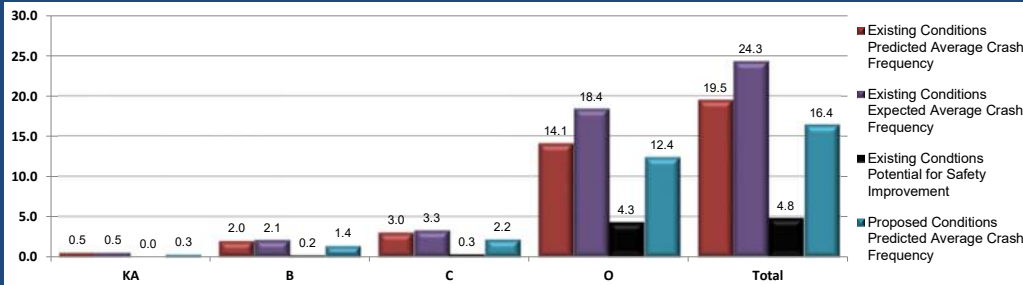


Project Safety Performance Report

General Information

Project Name	SR-747 at SR-129 Interchanges and Grandin	Contact Email	kristi@lanhamengineering.com
Project Description	SR-747-5.49 Safety Study: Long Term Alt 2	Contact Phone	309-269-0238
Reference Number		Date Performed	8/17/2022
Analyst	VHD	Analysis Year	2018-2020
Agency/Company	Lanham Engineering, LLC		

Summary of Anticipated Safety Performance of the Project (average crashes/year)



Project Summary Results (Without Animal Crashes)

	KA	B	C	O	Total
N_{predicted} - Existing Conditions	0.4849	1.9639	2.9813	14.0863	19.5164
N_{expected} - Existing Conditions	0.5222	2.1368	3.2578	18.3668	24.2836
N_{potential for improvement} - Existing Conditions	0.0373	0.1729	0.2765	4.2805	4.7672
N_{expected} - Proposed Conditions	0.3464	1.4201	2.2084	12.4259	16.4008

Existing Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level					Total
		KA	B	C	O		
SR747: 5.43-5.56	SR-747	0.0128	0.0319	0.0301	0.2211		0.2959
SR747: 5.56-5.65	SR-747	0.01	0.025	0.0236	0.1756		0.2342
SR747: 5.43	SR-747 at SR-129 EB Ramps	0.2061	0.8491	1.312	6.5005		8.8677
SR747: 5.56	SR-747 at SR-129 WB Ramps	0.2201	0.9062	1.4	6.296		8.8223
SR747: 5.65	SR-747 at Grandin Ridge Dr	0.0359	0.1517	0.2156	0.8931		1.2963

Existing Conditions Project Element Expected Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level					Total
		KA	B	C	O		
SR747: 5.43-5.56	SR-747	0.0154	0.0386	0.0365	0.1827		0.2732
SR747: 5.56-5.65	SR-747	0.0096	0.024	0.0227	0.2008		0.2571
SR747: 5.43	SR-747 at SR-129 EB Ramps	0.2304	0.9491	1.4662	8.0016		10.6473
SR747: 5.56	SR-747 at SR-129 WB Ramps	0.2276	0.9369	1.4474	8.7997		11.4116
SR747: 5.65	SR-747 at Grandin Ridge Dr	0.0392	0.1882	0.285	1.182		1.6944

Existing Conditions Project Element Potential for Safety Improvement Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level					Total
		KA	B	C	O		
SR747: 5.43-5.56	SR-747	0.0028	0.0087	0.0864	-0.0384		-0.0227
SR747: 5.56-5.65	SR-747	-0.0004	-0.001	-0.0009	0.0252		0.0229
SR747: 5.43	SR-747 at SR-129 EB Ramps	0.0243	0.1	0.1542	1.5011		1.7796
SR747: 5.56	SR-747 at SR-129 WB Ramps	0.0075	0.0307	0.0474	2.5037		2.5893
SR747: 5.65	SR-747 at Grandin Ridge Dr	0.0033	0.0365	0.0694	0.2889		0.3981

Proposed Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level					Total
		KA	B	C	O		
SR747: 5.43	SR-747 at SR-129 EB Ramps	0.1324	0.5539	0.8833	5.0986		6.6682
SR747: 5.56	SR-747 at SR-129 WB Ramps	0.1595	0.668	1.0656	6.1096		8.0027
SR747: 5.65	SR-747 at Grandin Ridge Dr	0.0359	0.1517	0.2156	0.8931		1.2963
SR747: 5.43-5.56	SR-747	0.0086	0.0214	0.0202	0.1482		0.1984
SR747: 5.56-5.65	SR-747	0.01	0.0251	0.0237	0.1764		0.2352

Summary by Crash Type

Crash Type	Existing		PSI	Proposed Predicted Crash Frequency
	Predicted Crash Frequency	Expected Crash Frequency		
Unknown	0.0124	0.0153	0.0029	0.0092
Head On	0.0563	0.0712	0.0149	0.0369
Rear End	6.7854	9.6470	2.8615	5.4791
Backing	0.1987	0.2894	0.0907	0.1771
Sideswipe - Meeting	0.1405	0.1810	0.0405	0.1246
Sideswipe - Passing	1.6229	2.3425	0.7196	1.3782
Angle	2.5632	3.5655	1.0023	1.9572
Parked Vehicle	0.2106	0.2902	0.0796	0.1777
Pedestrian	0.0818	0.0648	-0.0170	0.0556
Animal	0.0360	0.0350	-0.0010	0.0360
Train	0.0001	0.0001	0.0000	0.0001
Pedalcycles	0.0990	0.1180	0.0190	0.0582
Other Non-Vehicle	0.0000	0.0000	0.0000	0.0000
Fixed Object	0.7035	0.9797	0.2762	0.5684
Other Object	0.0295	0.0407	0.0112	0.0235
Overturning	0.0624	0.0832	0.0208	0.0447
Other Non-Collision	0.0914	0.1296	0.0382	0.0764
Left Turn	1.1161	1.5333	0.4172	0.8275
Right Turn	0.0000	0.0000	0.0000	0.0000

Project Cost Estimate

Project Name	SR-747 at SR-129 Interchanges and Grandin Ridge	Contact Email	kristi@lanhamengineering.com
Project Description	SR-747-5.49 Safety Study: Long Term Alt 2	Contact Phone	309-269-0238
Reference Number		Date Performed	8/17/2022
Analyst	VHD	Analysis Year	2018-2020
Agency/Company	Lanham Engineering, LLC		

Engineering Design %	
Contingency %	

Countermeasures	Construction Costs	Right of Way Costs	Engineering Design Costs	Contingency Amount	Total Cost of Countermeasure	Annual Maintenance & Energy Costs	Salvage Value
Site Characteristic Improvements (i.e. Lane widening)					\$0.00		
Site Characteristic Improvements (i.e. Lighting)					\$0.00		
Site Characteristic Improvements (i.e. Signal Phasing)					\$0.00		
Site Characteristic Improvements (i.e. Added Right Turn Lane)					\$0.00		
CMF 1 - Modify change plus clearance interval to ITE 1985 Proposed Recommended Practice (4-leg signalized)					\$0.00		
CMF 2 - Convert a diamond interchange to a diverging diamond interchange (DDI) or a double crossover diamond	\$4,640,121.00	\$25,000.00	\$671,018.00	\$783,000.00	\$6,119,139.00		
					\$0.00		
					\$0.00		
					\$0.00		
					\$0.00		
					\$0.00		
					\$0.00		
					\$0.00		
					\$0.00		
Totals	\$4,640,121.00	\$25,000.00	\$671,018.00	\$783,000.00	\$6,119,139.00	\$0.00	\$0.00

Inflation %	14%
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Final Construction Cost:	\$6,975,818.46
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*Final construction cost should match the Project Cost Estimate



Safety Benefit - Cost Analysis

General Information

Project Name	SR-747 at SR-129 Interchanges and Grandin Ridge Drive/Logsdons Meadow Drive	Contact Email	kristi@lanhamengineering.com
Project Description	SR-747-5.49 Safety Study: Long Term Alt 2	Contact Phone	309-269-0238
Reference Number		Date Performed	8/17/2022
Analyst	VHD	Analysis Year	2018-2020
Agency/Company	Lanham Engineering, LLC		

Comments:

Select Site Types to be used in Benefit-Cost Analysis:

All Sites

Countermeasure Service Lives, Costs, and Safety Benefits

Countermeasures	Service Life (Years)	Initial Cost of Countermeasure	Annual Maintenance & Energy Costs	Salvage Value	Net Present Cost of Countermeasure	Total Cost of Countermeasures	Summary of Annual Crash Modifications	Net Present Value of Safety Benefits
Site Characteristic Improvements (i.e. Lane widening)		\$0.00			\$0.00	\$0.00	3.587	(\$276,339)
Site Characteristic Improvements (i.e. Lighting)		\$0.00			\$0.00	\$0.00		
Site Characteristic Improvements (i.e. Signal Phasing)		\$0.00			\$0.00	\$0.00		
Site Characteristic Improvements (i.e. Added Right Turn Lane)		\$0.00			\$0.00	\$0.00		
CMF 1 - Modify change plus clearance interval to ITE 1985 Proposed Recommended Practice (4-leg signalized)	5	\$0.00			\$0.00	\$0.00	0.621	\$29,151
CMF 2 - Convert a diamond interchange to a diverging diamond interchange (DDI) or a double crossover diamond (DCD)	20	\$6,119,139.00			\$6,119,139.00	\$6,119,139.00	-7.323	\$2,053,817
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
		\$0.00			\$0.00	\$0.00	0.000	\$0
Totals		\$6,119,139.00	\$0.00	\$0.00	\$6,119,139.00	\$6,119,139.00	-3.116	\$1,806,629



Safety Benefit - Cost Analysis

General Information

Project Name	SR-747 at SR-129 Interchanges and Grandin Ridge Drive/Logsdons Meadow Drive	Contact Email	kristi@lanhamengineering.com
Project Description	SR-747-5.49 Safety Study: Long Term Alt 2	Contact Phone	309-269-0238
Reference Number		Date Performed	8/17/2022
Analyst	VHD	Analysis Year	2018-2020
Agency/Company	Lanham Engineering, LLC		

Benefit - Cost Calculator

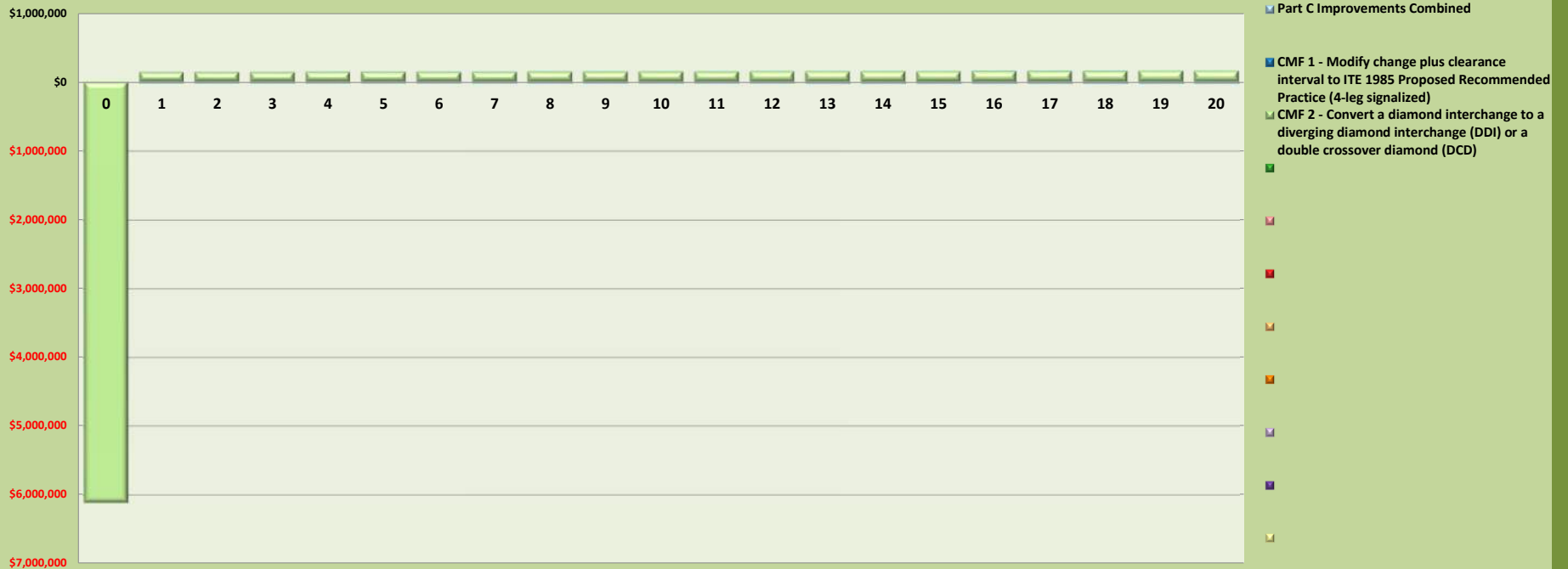
Net Present Value of Project	\$6,119,139.00
Net Present Value of Safety Benefits	\$1,806,629.22
Net Benefit	(\$4,312,509.78)
Benefit / Cost Ratio	0.30

Expected Annual Crash Adjustment

Number of Fatal & Incapacitating Injury Crashes	-0.139
Number of Injury Crashes	-1.455
Number of Total Crashes	-3.116

Comments:

Safety Benefits and Project Costs Combined Cash Flows By Countermeasure Per Year





Safety Benefit - Cost Analysis

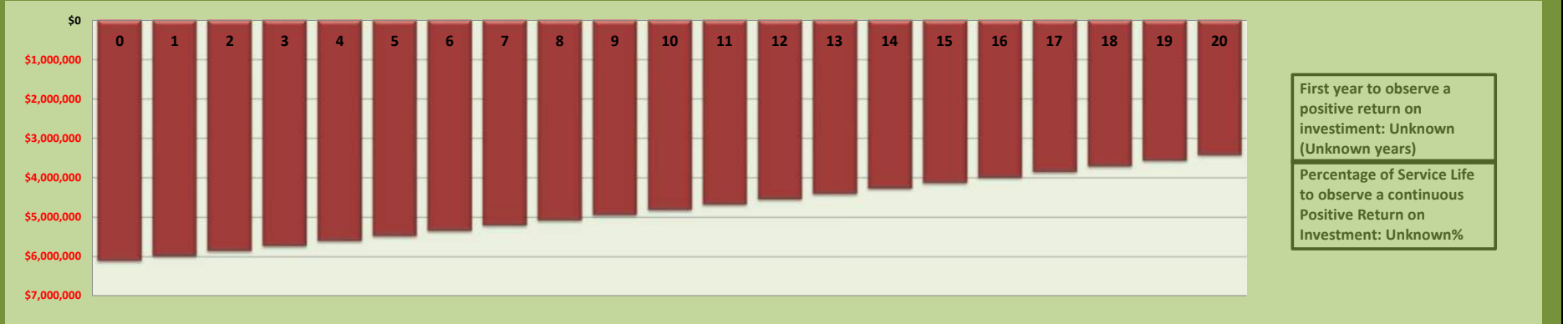
General Information

Project Name	SR-747 at SR-129 Interchanges and Grandin Ridge Drive/Logsdons Meadow Drive	Contact Email	kristi@lanhamengineering.com
Project Description	SR-747-5.49 Safety Study: Long Term Alt 2	Contact Phone	309-269-0238
Reference Number		Date Performed	8/17/2022
Analyst	VHD	Analysis Year	2018-2020
Agency/Company	Lanham Engineering, LLC		

Project Costs Only Cash Flows By Countermeasure Per Year



Return on Investment (Safety Benefits and Project Investments)





CMF / CRF Details

CMF ID: 288

Provide a right-turn lane on one major-road approach

Description:

Prior Condition: *No Prior Condition(s)*

Category: Intersection geometry

Study: [*Safety Effectiveness of Intersection Left- and Right-Turn Lanes, Harwood et al., 2002*](#)

Star Quality Rating:



Crash Modification Factor (CMF)

Value: 0.91

Adjusted Standard Error: 0.04

Unadjusted Standard Error: 0.03

Crash Reduction Factor (CRF)

Value: 9 (This value indicates a **decrease** in crashes)

Adjusted Standard Error: 4

Unadjusted Standard Error:

3

Applicability

Crash Type:

All

Crash Severity:

K (fatal),A (serious injury),B (minor injury),C (possible injury)

Roadway Types:

Not Specified

Number of Lanes:

Road Division Type:

Speed Limit:

Area Type:

All

Traffic Volume:

Time of Day:

If countermeasure is intersection-based

Intersection Type:

Roadway/roadway (not interchange related)

Intersection Geometry:

3-leg,4-leg

Traffic Control:

Signalized

Major Road Traffic Volume:

7200 to 55100 Average Daily Traffic (ADT)

Minor Road Traffic Volume:

550 to 8400 Average Daily Traffic (ADT)

Development Details

Date Range of Data Used:

Municipality:

State:

Country:	
Type of Methodology Used:	2
Sample Size Used:	

Other Details	
Included in Highway Safety Manual?	Yes. HSM lists this CMF in bold font to indicate that it has the highest reliability since it has an adjusted standard error of 0.1 or less.
Date Added to Clearinghouse:	Dec-01-2009
Comments:	Countermeasure name changed to match HSM The number of crashes in the after period were not reported in this study, however, they have been recorded as 300 to give 10 points as a benefit of doubt for one or more of the following: (1) number of miles/sites in the reference/treatment group, (2) number of crashes in the references/treatment group, (3) reporting AADTs for the aggregate dataset but not for the disaggregate dataset used for CMF development.

This site is funded by the U.S. Department of Transportation Federal Highway Administration and maintained by the University of North Carolina Highway Safety Research Center

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CMF / CRF DETAILS

CMF ID: 8258

CONVERT DIAMOND INTERCHANGE TO DIVERGING DIAMOND INTERCHANGE (DDI) OR DOUBLE CROSSOVER DIAMOND (DCD)

DESCRIPTION: CONVERT A DIAMOND INTERCHANGE TO A DIVERGING DIAMOND INTERCHANGE (DDI) OR A DOUBLE CROSSOVER DIAMOND (DCD)

PRIOR CONDITION: DIAMOND INTERCHANGE

CATEGORY: INTERCHANGE DESIGN

STUDY: [SAFETY EVALUATION OF SEVEN OF THE EARLIEST DIVERGING DIAMOND INTERCHANGES INSTALLED IN THE US, HUMMER ET AL., 2016](#)

Star Quality Rating: [VIEW SCORE DETAILS]

Rating Points Total: 80

Crash Modification Factor (CMF)

Value: 0.67

Adjusted Standard Error:

Unadjusted Standard Error: 0.04

Crash Reduction Factor (CRF)

Value: 33 (This value indicates a *decrease* in crashes)

Adjusted Standard Error:

Unadjusted Standard Error: 4

Applicability

Crash Type: All

Crash Severity: All

Roadway Types: Principal Arterial Other Freeways and Expressways

Street Type:

Minimum Number of Lanes: 3

Maximum Number of Lanes: 6

Number of Lanes Direction:

Number of Lanes Comment:

Crash Weather: Not specified

Road Division Type: Divided by Median

Minimum Speed Limit: 40

Maximum Speed Limit: 45

Speed Unit: mph

Speed Limit Comment:	
Area Type:	Suburban
Traffic Volume:	
Average Traffic Volume:	28168 Annual Average Daily Traffic (AADT)
Time of Day:	All
<i>If countermeasure is intersection-based</i>	
Intersection Type:	
Intersection Geometry:	
Traffic Control:	
Major Road Traffic Volume:	
Minor Road Traffic Volume:	
Average Major Road Volume :	
Average Minor Road Volume :	
Development Details	
Date Range of Data Used:	
Municipality:	
State:	KY, MO, NY, TN
Country:	USA
Type of Methodology Used:	Before/after using comparison group
Sample Size (crashes):	1551 crashes before, 712 crashes after
Sample Size (sites):	6 sites before, 6 sites after
Other Details	
Included in Highway Safety Manual?	No
Date Added to Clearinghouse:	Jan-17-2017
Comments:	The volume here is the crossover volume. CMFs of six interchanges in MO, KY, NY, and TN.

[VIEW THE FULL STUDY DETAILS](#)

[EXPORT DETAIL PAGE AS A PDF](#)

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For more information, contact Karen Scurry at karen.scurry@dot.gov

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