

MEMORANDUM

To: Larry Legg, PE
From: Adam Denney, PE
Mark Meisinger, PE, PTOE
Timothy Adams, EIT
Date: 15 July 2019
RE: Lancaster County Supplemental Analysis – S 68th Street Roadway Improvements

Project Background

In December 2018, Felsburg Holt & Ullevig (FHU) completed a safety analysis for S 68th Street between the intersections of Firth Road and Saltillo Road in Lancaster County, Nebraska. The analysis identified improvements that should be implemented to increase safety and accommodate the future growth and travel within the study area. The completed, *Lancaster County Safety Study – S 68th Street*, report is attached with this memo.

At the request of the Lancaster County Engineer, FHU carried out this supplemental study to assess roadway improvements on S 68th Street at the segments from Princeton Road to Olive Creek Road and Roca Road to Hickman Road, as well as a traffic analysis of the intersection of S 68th Street with Olive Creek Road.

The additional work includes an updated safety analysis of the segments and intersection, turn movement counts at S 68th Street with Olive Creek Road and auxiliary turn lane analysis, and a benefit cost analysis of safety recommendations. This report is based on the comprehensive analysis of over 6 years of crash data from January 1, 2013 to April 4, 2019, provided by Lancaster County.

Roadway Geometrics

S 68th Street is a paved two-lane undivided highway, without shoulders. S 68th Street has a posted speed limit of 55 mph the entire length of the study area. Average daily traffic (ADT), from a 2017 count, was assessed at the segments listed below:

- Princeton Road to Olive Creek Road: (2,260 ADT)
- Roca Road to Hickman Road: (6,100 ADT)

North of Roca Road and South of Hickman Road on S 68th Street shoulders already exist. The proposed improvement to this segment would not improve safety but add continuity as well to the corridor.

S 68th Street with Olive Creek Road is a two-way stop-controlled intersection. Olive Creek Road, running east-west, is a gravel road. S 68th Street, running north-south, is a two-lane undivided highway with a posted speed limit of 55 mph on the north and south approaches. Olive Creek Road does not have a posted speed limit at either approach. S 68th Street is on a grade that crests approximately 680 feet to the south of the intersection, and this may pose a sight distance concern.

The supplemental study called for an additional count at S 68th Street with Olive Creek Road on February 13, 2019. The AM peak hour was determined to be 7:30 AM to 8:30 AM and the PM peak hour was 3:15 PM to 4:15 PM. A detailed report of the traffic count data is attached to this memo.

Average daily traffic was assessed at the intersection during the original study. The daily entering vehicles (DEV) at S 68th Street with Olive Creek Road was 2,500.

Crash History

The crash history for the period of January 1, 2013 to April 4, 2019 was examined for the entire study area segments to assess crash patterns. The statewide average crash rate for rural Nebraska roadways is 0.721 acc/MVMT (accidents per million vehicle miles traveled) for non-shouldered roadways between the years of 2012-2014. Over the 6-year 3-month analysis period, twelve (12) crashes were reported from Princeton Road to Olive Creek Road. This amounts to a crash rate of 2.26 acc/MVMT for Princeton Road to Olive Creek Road, 314% of the state average. During the same analysis period, eighteen (18) crashes were reported from Roca Road to Hickman Road. This amounts to a crash rate of 0.650 acc/MVMT for Roca Road to Hickman Road, 90% of the state average.

The statewide average crash rate for rural Nebraska intersections is 0.235 acc/MEV (accidents per million entering vehicle) for non-shouldered intersections between the years of 2012-2014. Over the 6-year, 3-month analysis period five (5) crashes were reported at S 68th Street with Olive Creek Road. This amounts to a crash rate of 0.879 acc/MEV, 374% of the state average.

Table 1 summarizes the crash history along the segment and intersection by severity over the 6-year, 3-month analysis period. **Table 2** shows the crashes categorized by type.

Table 1. S 68th Street Crash Summary by Type

	Rear End	Side Swipe (Same)	Side Swipe (Opposite)	Right-Angle	Left Turn Leaving	Run Off Road	Animal	Totals
Segment: Princeton Rd - Olive Creek Rd	7	-	-	-	-	2	3	12
Segment: Roca Rd - Hickman Rd	3	1	4	1	3	6	-	18
Intersection: S 68 th St & Olive Creek Rd	3	-	1	-	-	1	-	5

Table 2. S 68th Street Crash Summary by Severity

	Fatal	Injury			N-R	PDO	Totals
		INJ-A	INJ-B	INJ-C			
Segment: Princeton Rd - Olive Creek Rd	1	-	3	2	2	4	12
Segment: Roca Rd - Hickman Rd	-	-	5	6	-	7	18
Intersection: S 68 th St & Olive Creek Rd	-	-	1	2	-	2	5

Figures 1, 2, and 3 graphically display the breakdown of crashes by type and severity over the 6-year, 3-month analysis period.

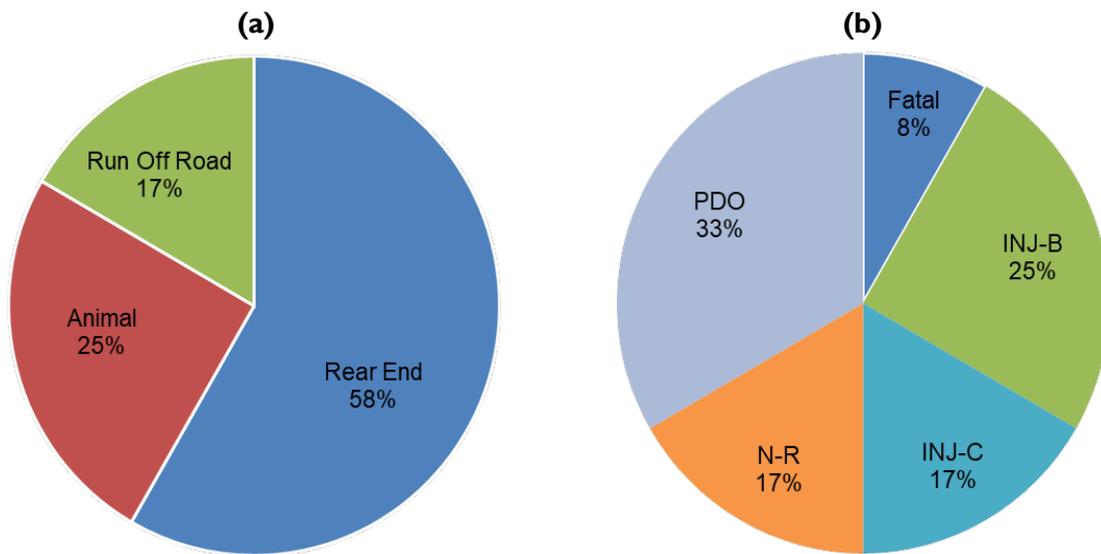


Figure 1. Crashes from Princeton Road to Olive Creek Road by Type (a) and Severity (b)

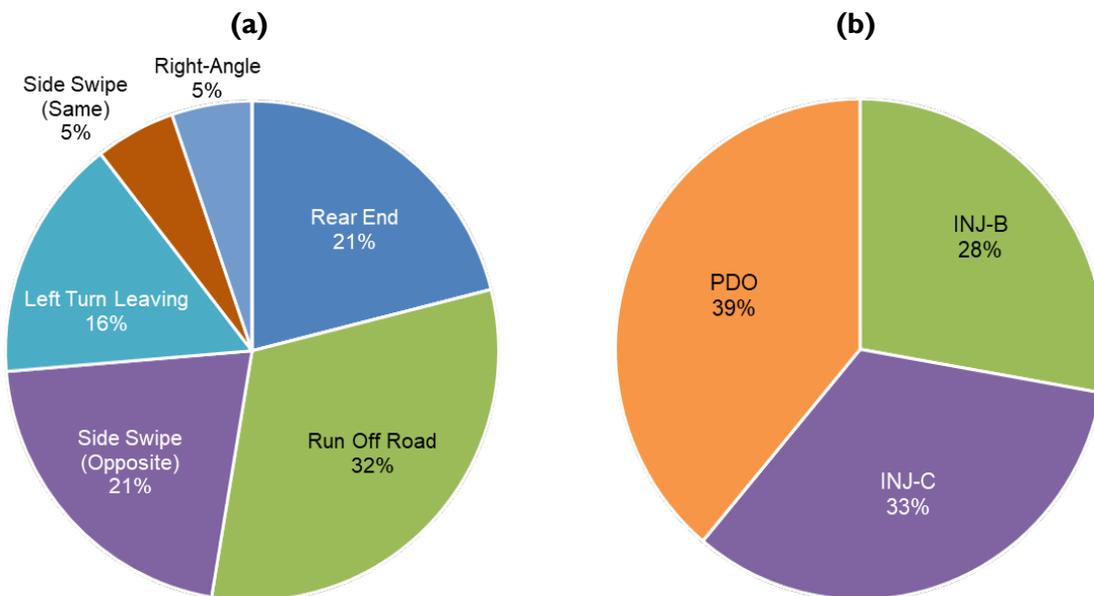


Figure 2. Crashes from Roca Road to Hickman Road by Type (a) and Severity (b)



Figure 3. Crashes at S 68th and Olive Creek Road by Type (a) and Severity (b)

Proposed Improvements

Based on the existing traffic operations and crash patterns along the corridor, countermeasures were developed to improve safety. A detailed description is provided below:

Princeton Road to Olive Creek Road – Widening, Overlay, and Left-turn Lanes Improvement

This countermeasure involves two parts. The segment of S 68th Street from Princeton Road to Olive Creek Road comprises of upgrading narrow unpaved shoulders (< 5 ft) to wide paved shoulders (> 5 ft). Additionally, left turn lanes would be constructed at the intersection with Olive Creek Road.

Roca Road to Hickman Road – Addition of Shoulder Pavement & Shoulder Rumble Strips Improvement

This countermeasure would create a paved shoulder on S 68th Street from Roca Road to Hickman Road, and rumble strips installed on shoulders as well.

Project Costs

Preliminary cost estimates were developed by FHU and Lancaster County for the proposed counter measure. The Princeton Road to Olive Creek Countermeasure is estimated to cost \$548,400 over a 20-year service life. The Roca Road to Hickman Road Countermeasure is estimated to cost \$3,941,850 over a 20-year service life. A detailed breakdown of costs is included at the end of this memo.

Benefits of Project

The observed crash patterns along S 68th Street will be directly addressed with the improvements proposed. Adding a paved shoulder will allow drivers to better remain in control of their vehicle if they depart from the roadway. Additionally, the rumble strips can notify the driver of vehicle departure. The safety benefits associated with this project can have financial benefit, but the greatest return is its ability to reduce crashes and potential fatalities. **Tables 3a, b, and c** show the Federal Highway Administration’s estimated societal cost of crashes by type and severity, for crashes on rural roadways.

Princeton Road to Olive Creek Road – Widening, Overlay, and Left-turn Lanes Improvement

The cost of this countermeasure was estimated at \$548,381 with a project life of 20 years. This includes an initial construction cost of \$456,984 and an operational/maintenance cost of \$4,570 per year. A CMF of 0.230 / CRF of 0.770 was used run-off-road accidents; a CMF of 0.580 / CRF of 0.420 was used for all other crash types and crash severity analysis. At the intersection of S 68th Street with Olive Creek Road, a CMF of 0.520 / CRF of 0.480 was used for both crash type and severity analysis.

Tables 4 and 5 summarize the benefit-cost calculations for the countermeasures by crash type and severity, respectively. Based on the factors discussed above, the project would be expected to provide a benefit-cost ratio of **9.89** and **32.04**.

Table 4. Princeton–Olive Creek Rd Street Countermeasure: B/C Calculation by Crash Type

Average Cost/Mitigated Crash (2013 through 2019 average weighting crash type)	\$246,793
Present Value of Avoided Crashes, BENEFIT	\$5,424,715
Present Value Cost, COST	\$548,381
Crash Type Benefit/Cost Ratio	9.89

Table 5. Princeton–Olive Creek Rd Countermeasure: B/C Calculation by Crash Severity

Average Cost/Mitigated Crash (2013 through 2019 average weighting crash type)	\$739,113
Present Value of Avoided Crashes, BENEFIT	\$17,568,683
Present Value Cost, COST	\$548,381
Crash Severity Benefit/Cost Ratio	32.04

Roca Road to Hickman Road – Addition of Shoulder Pavement & Shoulder Rumble Strips Improvement

The cost of this countermeasure was estimated at \$4,730,220 with a project life of 20 years. This includes an initial construction cost of \$3,941,850 and an operational/maintenance cost of \$39,418 per year. A CMF of 0.351 / CRF of 0.649 was used for both crash type and severity analysis.

Table 6 summarizes the benefit-cost calculations for the countermeasure by crash type and **Table 7** for crash severity. Based on the factors discussed above, the project would be expected to provide a benefit-cost ratio of **2.97** based on crash type and **0.83** for crash severity.

Table 6. Roca–Hickman Rd Countermeasure: Benefit-Cost Calculation by Crash Type

Average Cost/Mitigated Crash (2013 through 2019 average weighting crash type)	\$376,445
Present Value of Avoided Crashes, BENEFIT	\$14,049,952
Present Value Cost, COST	\$4,730,220
Crash Type Benefit/Cost Ratio	2.97

Table 7. Roca–Hickman Rd Countermeasure: Benefit-Cost Calculation by Crash Severity

Average Cost/Mitigated Crash (2013 through 2019 average weighting crash severity)	\$104,954
Present Value of Avoided Crashes, BENEFIT	\$3,917,154
Present Value Cost, COST	\$4,730,220
Crash Type Benefit/Cost Ratio	0.83



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Count Name: 68th St & Olive Creek Rd
Site Code: 68
Start Date: 02/13/2019
Page No: 1

Turning Movement Data

Start Time	Olive Creek Rd Eastbound				Olive Creek Rd Westbound				68th St Northbound				68th St Southbound				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
7:00 AM	1	0	1	2	0	0	1	1	0	34	0	34	0	19	0	19	56
7:15 AM	1	0	2	3	0	0	0	0	1	38	1	40	0	48	1	49	92
7:30 AM	2	0	1	3	0	0	1	1	0	42	0	42	0	73	0	73	119
7:45 AM	1	0	5	6	0	0	1	1	0	41	0	41	0	127	0	127	175
Hourly Total	5	0	9	14	0	0	3	3	1	155	1	157	0	267	1	268	442
8:00 AM	1	0	0	1	0	0	0	0	1	64	0	65	0	159	1	160	226
8:15 AM	1	0	2	3	1	0	0	1	0	93	1	94	1	100	1	102	200
8:30 AM	1	0	0	1	0	0	1	1	0	44	0	44	1	13	0	14	60
8:45 AM	0	0	0	0	0	0	0	0	0	13	0	13	0	14	0	14	27
Hourly Total	3	0	2	5	1	0	1	2	1	214	1	216	2	286	2	290	513
9:00 AM	0	0	1	1	0	0	0	0	0	18	0	18	0	18	1	19	38
9:15 AM	3	0	0	3	0	0	1	1	0	23	0	23	0	16	0	16	43
9:30 AM	0	0	0	0	0	0	0	0	0	27	0	27	0	17	0	17	44
9:45 AM	0	0	1	1	0	0	0	0	0	25	0	25	0	13	0	13	39
Hourly Total	3	0	2	5	0	0	1	1	0	93	0	93	0	64	1	65	164
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2:00 PM	0	0	0	0	0	0	0	0	0	16	0	16	1	16	0	17	33
2:15 PM	2	0	0	2	0	0	3	3	0	14	0	14	1	31	0	32	51
2:30 PM	0	0	0	0	1	0	0	1	0	39	0	39	0	26	2	28	68
2:45 PM	1	0	0	1	0	0	0	0	0	25	0	25	0	36	0	36	62
Hourly Total	3	0	0	3	1	0	3	4	0	94	0	94	2	109	2	113	214
3:00 PM	1	0	1	2	0	0	0	0	0	18	0	18	0	56	0	56	76
3:15 PM	0	0	0	0	0	0	0	0	1	44	0	45	0	80	0	80	125
3:30 PM	0	0	0	0	0	0	0	0	0	198	1	199	0	42	1	43	242
3:45 PM	1	0	0	1	0	0	1	1	0	60	1	61	1	30	0	31	94
Hourly Total	2	0	1	3	0	0	1	1	1	320	2	323	1	208	1	210	537
4:00 PM	0	0	0	0	0	0	1	1	3	81	0	84	0	35	2	37	122
4:15 PM	2	0	0	2	0	0	0	0	1	62	0	63	0	52	0	52	117
4:30 PM	1	0	0	1	0	0	0	0	1	67	0	68	1	44	1	46	115
4:45 PM	2	0	0	2	0	0	0	0	0	57	0	57	0	47	1	48	107
Hourly Total	5	0	0	5	0	0	1	1	5	267	0	272	1	178	4	183	461
5:00 PM	1	0	0	1	0	0	2	2	0	100	0	100	0	45	4	49	152
5:15 PM	1	0	0	1	0	0	0	0	1	50	0	51	0	58	1	59	111
5:30 PM	2	0	0	2	0	0	0	0	0	38	0	38	0	55	1	56	96
5:45 PM	2	0	0	2	0	0	0	0	0	31	0	31	1	42	3	46	79
Hourly Total	6	0	0	6	0	0	2	2	1	219	0	220	1	200	9	210	438
6:00 PM	0	0	0	0	0	0	0	0	0	20	0	20	0	35	2	37	57
6:15 PM	1	0	0	1	0	0	0	0	0	20	0	20	1	47	0	48	69

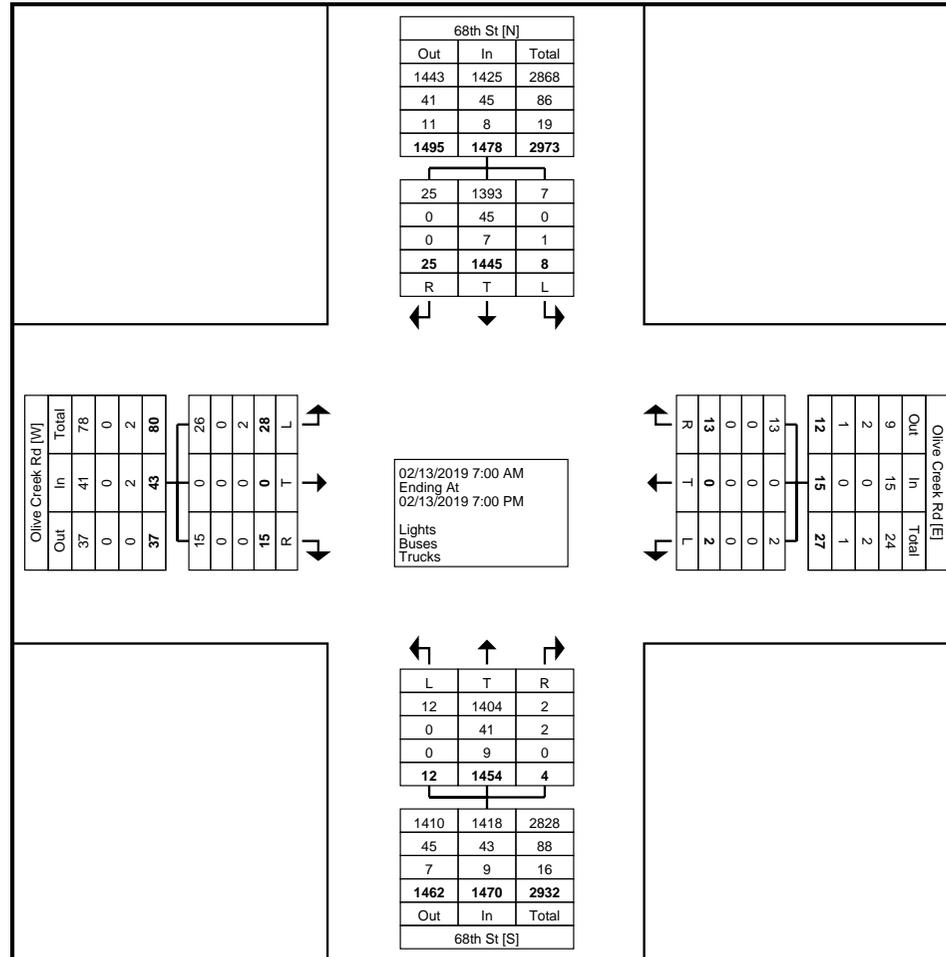
6:30 PM	0	0	1	1	0	0	1	1	0	35	0	35	0	32	2	34	71
6:45 PM	0	0	0	0	0	0	0	0	3	17	0	20	0	19	1	20	40
Hourly Total	1	0	1	2	0	0	1	1	3	92	0	95	1	133	5	139	237
Grand Total	28	0	15	43	2	0	13	15	12	1454	4	1470	8	1445	25	1478	3006
Approach %	65.1	0.0	34.9	-	13.3	0.0	86.7	-	0.8	98.9	0.3	-	0.5	97.8	1.7	-	-
Total %	0.9	0.0	0.5	1.4	0.1	0.0	0.4	0.5	0.4	48.4	0.1	48.9	0.3	48.1	0.8	49.2	-
Lights	26	0	15	41	2	0	13	15	12	1404	2	1418	7	1393	25	1425	2899
% Lights	92.9	-	100.0	95.3	100.0	-	100.0	100.0	100.0	96.6	50.0	96.5	87.5	96.4	100.0	96.4	96.4
Buses	0	0	0	0	0	0	0	0	0	41	2	43	0	45	0	45	88
% Buses	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	2.8	50.0	2.9	0.0	3.1	0.0	3.0	2.9
Trucks	2	0	0	2	0	0	0	0	0	9	0	9	1	7	0	8	19
% Trucks	7.1	-	0.0	4.7	0.0	-	0.0	0.0	0.0	0.6	0.0	0.6	12.5	0.5	0.0	0.5	0.6



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Count Name: 68th St & Olive Creek Rd
Site Code: 68
Start Date: 02/13/2019
Page No: 3



Turning Movement Data Plot



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Count Name: 68th St & Olive Creek Rd
Site Code: 68
Start Date: 02/13/2019
Page No: 4

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Olive Creek Rd Eastbound				Olive Creek Rd Westbound				68th St Northbound				68th St Southbound				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
7:30 AM	2	0	1	3	0	0	1	1	0	42	0	42	0	73	0	73	119
7:45 AM	1	0	5	6	0	0	1	1	0	41	0	41	0	127	0	127	175
8:00 AM	1	0	0	1	0	0	0	0	1	64	0	65	0	159	1	160	226
8:15 AM	1	0	2	3	1	0	0	1	0	93	1	94	1	100	1	102	200
Total	5	0	8	13	1	0	2	3	1	240	1	242	1	459	2	462	720
Approach %	38.5	0.0	61.5	-	33.3	0.0	66.7	-	0.4	99.2	0.4	-	0.2	99.4	0.4	-	-
Total %	0.7	0.0	1.1	1.8	0.1	0.0	0.3	0.4	0.1	33.3	0.1	33.6	0.1	63.8	0.3	64.2	-
PHF	0.625	0.000	0.400	0.542	0.250	0.000	0.500	0.750	0.250	0.645	0.250	0.644	0.250	0.722	0.500	0.722	0.796
Lights	5	0	8	13	1	0	2	3	1	233	1	235	0	439	2	441	692
% Lights	100.0	-	100.0	100.0	100.0	-	100.0	100.0	100.0	97.1	100.0	97.1	0.0	95.6	100.0	95.5	96.1
Buses	0	0	0	0	0	0	0	0	0	6	0	6	0	20	0	20	26
% Buses	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	2.5	0.0	2.5	0.0	4.4	0.0	4.3	3.6
Trucks	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	2
% Trucks	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	0.4	0.0	0.4	100.0	0.0	0.0	0.2	0.3



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Count Name: 68th St & Olive Creek Rd
Site Code: 68
Start Date: 02/13/2019
Page No: 6

Turning Movement Peak Hour Data (3:15 PM)

Start Time	Olive Creek Rd Eastbound				Olive Creek Rd Westbound				68th St Northbound				68th St Southbound				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
3:15 PM	0	0	0	0	0	0	0	0	1	44	0	45	0	80	0	80	125
3:30 PM	0	0	0	0	0	0	0	0	0	198	1	199	0	42	1	43	242
3:45 PM	1	0	0	1	0	0	1	1	0	60	1	61	1	30	0	31	94
4:00 PM	0	0	0	0	0	0	1	1	3	81	0	84	0	35	2	37	122
Total	1	0	0	1	0	0	2	2	4	383	2	389	1	187	3	191	583
Approach %	100.0	0.0	0.0	-	0.0	0.0	100.0	-	1.0	98.5	0.5	-	0.5	97.9	1.6	-	-
Total %	0.2	0.0	0.0	0.2	0.0	0.0	0.3	0.3	0.7	65.7	0.3	66.7	0.2	32.1	0.5	32.8	-
PHF	0.250	0.000	0.000	0.250	0.000	0.000	0.500	0.500	0.333	0.484	0.500	0.489	0.250	0.584	0.375	0.597	0.602
Lights	0	0	0	0	0	0	2	2	4	362	1	367	1	184	3	188	557
% Lights	0.0	-	-	0.0	-	-	100.0	100.0	100.0	94.5	50.0	94.3	100.0	98.4	100.0	98.4	95.5
Buses	0	0	0	0	0	0	0	0	0	19	1	20	0	3	0	3	23
% Buses	0.0	-	-	0.0	-	-	0.0	0.0	0.0	5.0	50.0	5.1	0.0	1.6	0.0	1.6	3.9
Trucks	1	0	0	1	0	0	0	0	0	2	0	2	0	0	0	0	3
% Trucks	100.0	-	-	100.0	-	-	0.0	0.0	0.0	0.5	0.0	0.5	0.0	0.0	0.0	0.0	0.5

B/C Analysis by Crash Severity
Princeton Road to Olive Creek Road
 Supplemental Safety Study



	Unit	
Facility Location		Rural
Service Life	Years	20
Crash History Provided	Years	6.26

Data Entry Required
Data Calculated

Costs		
Construction	Dollars	\$ 456,984.45
Operations & Maint.	Dollars per Year	\$ 4,569.84
Other Capital Costs	Dollars	\$ -
Other Continual Costs	Dollars per Year	\$ -

Improvement:
(1) Shoulder Widening
(2) Addition of Left-turn Lanes

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ADT	Vehicles per Year	2260
Crash Modification Factor (CMF) Average		0.562

Crash Mitigation									
(Enter as many as necessary, However limit to only ONE treatment for any single historical accident)									
	Accident Severity	Facility Type	Number of Crashes	Societal Cost	Treatment	CMF	CMF ID	Number Mitigated	Value Mitigated
	Fatal	Segment	1.0	\$ 11,614,722.78	Shoulder Widening	0.580	5409	1.3	\$ 15,585,251.01
	A-Injury	Segment	0.0	\$ -	Shoulder Widening	0.580	5409	0.0	\$ -
	B-Injury	Segment	3.0	\$ 612,334.61	Shoulder Widening	0.580	5409	4.0	\$ 821,663.05
	C-Injury	Segment	2.0	\$ 258,312.62	Shoulder Widening	0.580	5409	2.7	\$ 346,617.57
	Non Reportable	Segment	2.0	\$ 2,053.85	Shoulder Widening	0.580	5409	2.7	\$ 2,755.96
	Property Damage Only	Segment	4.0	\$ 48,963.77	Shoulder Widening	0.580	5409	5.4	\$ 65,702.18
	Fatal	Intersection	0.0	\$ -	Left-turn Lanes	0.520	268	0.0	\$ -
	A-Injury	Intersection	0.0	\$ -	Left-turn Lanes	0.520	268	0.0	\$ -
	B-Injury	Intersection	1.0	\$ 204,111.54	Left-turn Lanes	0.520	268	1.5	\$ 313,014.50
	C-Injury	Intersection	2.0	\$ 258,312.62	Left-turn Lanes	0.520	268	3.1	\$ 396,134.37
	Non Reportable	Intersection	0.0	\$ -	Left-turn Lanes	0.520	268	0.0	\$ -
	Property Damage Only	Intersection	2.0	\$ 24,481.88	Left-turn Lanes	0.520	268	3.1	\$ 37,544.10

Calculations	
Million Vehicles per Year	0.8249
Crashes Mitigated	23.8
Crashes Mitigated/Year	1.188498403
Crashes Mitigated per Million Vehicles	1.44078
Total Historical Societal Cost	\$ 13,023,294
Total Cost Mitigated Over Service Life	\$ 17,568,683
Average Cost per Mitigated Crash	\$ 739,113
Costs total	\$ 548,381
Benefits total	\$ 17,568,683
B/C	32.04

Item No.	Item	Est. Quantity	Unit	Unit Price	Amount
Group 1 - Grading					
1.	General Clearing And Grubbing	1	Lump Sum	\$ 10,000.00	\$ 10,000.00
2.	Large Tree Removal	10	Each	\$ 300.00	\$ 3,000.00
8.	Earthwork Measured In Embankment	2878	Cu.Yds.	\$ 10.50	\$ 30,219.00
13.	Water	12	M.Gal	\$ 105.00	\$ 1,260.00
20.	Salvaging And Placing Top Soil	1800	Sq.Yds.	\$ 0.80	\$ 1,440.00
23.	Crushed Rock Surface Course	50	Ton	\$ 40.00	\$ 2,000.00
25.	Rental Of Crawler-Mounted Hydraulic Excavator, Fully Operated	10	Hour	\$ 185.00	\$ 1,850.00
26.	Rental Of Front End Loader, Fully Operated	10	Hour	\$ 90.00	\$ 900.00
27.	Rental Of Skid Loader, Fully Operated	10	Hour	\$ 95.00	\$ 950.00
28.	Rental Of Dump Truck, Fully Operated	10	Hour	\$ 115.00	\$ 1,150.00
					\$ 52,769.00
Group 4 - Culverts					
30.	Remove Headwall	4	Each	\$ 400.00	\$ 1,600.00
	Excavation For Pipe, Pipe-Arch Culverts And Headwalls	300	Cu. Yds.	\$ 15.00	\$ 4,500.00
17.	Rock RipRap, Type B	120	Ton	\$ 75.00	\$ 9,000.00
44.	30" Culvert Pipe, Type 3 (1-30"x100' Culverts)	100	Lin. Ft.	\$ 63.00	\$ 6,300.00
45.	48" Culvert Pipe, Type 3 (1-48"x100' Culverts)	100	Lin. Ft.	\$ 96.00	\$ 9,600.00
	30" Metal Headwall	3	Each	\$ 1,400.00	\$ 4,200.00
	48" Metal Headwall	1	Each	\$ 1,900.00	\$ 1,900.00
43.	30" Driveway Culvert Pipe, Type 3 (3 Driveways)	90	Lin. Ft.	\$ 52.00	\$ 4,680.00
					\$ 41,780.00
Group 5 - Landscaping					
53.	Cover Crop Seeding (3 Ac.)	3	Acre	\$ 200.00	\$ 600.00
54.	Seeding, Type "A" (3 Ac.)	3	Acre	\$ 800.00	\$ 2,400.00
57.	Erosion Control, Class 2C	100	Sq. Yds.	\$ 13.00	\$ 1,300.00
58.	Erosion Control, Class 1D	600	Sq. Yds.	\$ 2.50	\$ 1,500.00
60.	Mulch	8	Ton	\$ 250.00	\$ 2,000.00
62.	Temporary Silt Fence	1000	Lin. Ft.	\$ 3.50	\$ 3,500.00
64.	Fabric Silt Fence, High Porosity	100	Lin. Ft.	\$ 4.00	\$ 400.00
65.	Fabric Silt Fence, Low Porosity	1000	Lin. Ft.	\$ 3.00	\$ 3,000.00
66.	Erosion Checks, Type "Wattle"	800	Lin. Ft.	\$ 4.00	\$ 3,200.00
					\$ 17,900.00
Group 9 - Bituminous					
5.	Remove Existing Pavement	570	Sq.Yds.	\$ 5.00	\$ 2,850.00
6.	Saw Cut Pavement	2566	Lin. Ft.	\$ 7.50	\$ 19,245.00
10.	Subgrade Preparation	5654	Sq. Yds.	\$ 1.80	\$ 10,177.20
95.	Preparation Of Intersections	1070	Sq.Yds.	\$ 6.00	\$ 6,420.00
96.	Asphaltic Concrete, Type SPR	2230	Ton	\$ 70.00	\$ 156,100.00
98.	Tack Coat	897	Gal.	\$ 2.25	\$ 2,018.25
	8" Rumble Strip	26	Sta.	\$ 12.50	\$ 325.00
106.	5" White Permanent Pavement Marking Paint	2800	Lin. Ft.	\$ 1.50	\$ 4,200.00
108.	5" Yellow Perm. Pavement Marking Paint (No Passing Zones)	2800	Lin. Ft.	\$ 1.50	\$ 4,200.00
					\$ 205,535.45
Group 10 - General					
100.	Construction Staking And Surveying (4 Days @ \$150.00 hr.)	1	Lump Sum	\$ 4,800.00	\$ 4,800.00
101.	Changeable Message Sign	10	Day	\$ 60.00	\$ 600.00
102.	Barricades, Type III (34 Barricade Plan)	2040	BarrDay	\$ 2.50	\$ 5,100.00
103.	Construction Signs (20 Barricade Plan) (36 Detour Plan)	2800	SignDay	\$ 1.25	\$ 3,500.00
	Utility Relocation	1	Lump Sum	\$ 100,000.00	\$ 100,000.00
113.	Mobilization	1	Lump Sum	\$ 25,000.00	\$ 25,000.00
					\$ 139,000.00
					\$ 456,984.45
	Excavation (Established Quantity)	0	Cu.Yds.		
	Embankment	3000	Cu.Yds.		
	Borrow / Waste	0	Cu.Yds.		
	Balance Factor = 1.35				
	Estimated Time of Completion	40	Work Days		
		60	Calendar Days		



Countermeasure 2
68th Street Shoulder Widening: Roca Road to Hickman Road
FHU Project No. 18-122
Engineer's Opinion of Probable Cost
Monday, July 15, 2019

Grading Items				
	Units	2019 Estimate		
		Qty	Unit Price	Total
GENERAL CLEARING AND GRUBBING	LS	1.00	\$ 40,000.00	\$ 40,000.00
EARTHWORK	CY	25,000.00	\$ 10.00	\$ 250,000.00
REMOVE PAVEMENT	SY	0.00	\$ 7.50	-
Group Total				\$ 290,000.00

Pavement Items				
	Units	2019 Estimate		
		Qty	Unit Price	Total
6" CONCRETE PAVEMENT	SY	13,500	\$ 45.00	\$ 607,500.00
Group Total				\$ 607,500.00

Storm Sewer & Culverts				
	Units	2019 Estimate		
		Qty	Unit Price	Total
DRAINAGE	%	50%	\$	448,750.00
Group Total				\$ 448,750.00

Signing & Striping				
	Units	2019 Estimate		
		Qty	Unit Price	Total
SIGNING	%	5%	\$	30,375.00
STRIPING	%	5%	\$	30,375.00
Group Total				\$ 60,750.00

Project Related Items				
	Units	2019 Estimate		
		Qty	Unit Price	Total
MOBILIZATION	LS	1.00	\$ 112,600.00	\$ 112,600.00
TRAFFIC CONTROL	LS	1.00	\$ 70,400.00	\$ 70,400.00
RIGHT OF WAY (incl. 20' ROW purchase to establish 110')	SF	105,600	\$ 10.00	\$ 1,056,000.00
RIGHT OF WAY DESIGN(TITLE SEARCHES & ACQUISITION)	EA	12	\$ 4,000.00	\$ 48,000.00
UTILITIES	%	5%	\$	44,875.00
Group Total				\$ 1,331,875.00

Project Totals

	Category	Total
	GRADING	\$ 290,000.00
	PAVEMENT	\$ 607,500.00
	STORM SEWER & CULVERTS	\$ 448,750.00
	SIGNING & STRIPING	\$ 60,750.00
	MOBILIZATION	\$ 112,600.00
	TRAFFIC CONTROL	\$ 70,400.00
	RIGHT OF WAY	\$ 1,104,000.00
	UTILITIES	\$ 89,750.00
	Construction Subtotal	\$ 2,783,750.00
	Contingency 20%	\$ 556,800.00
	Survey 0.0%	\$ -
	Engineering Services 10%	\$ 334,100.00
	Construction Services 8%	\$ 267,200.00
	Project Total	\$ 3,941,850.00

Assumptions:

- **This estimate is based on Conceptual Layout**
- Drainage Cost is estimated at 50% of Pavement and Grading includes culverts and channels
- Utility Cost is estimated at 10% of Pavement and Grading
- Contingency of 20% used
- Survey is not estimated and understood to be provided by Sarpy County Public Works Department
- Engineering Services are estimated at 10% of Construction Cost and Contingency
- Construction Services are estimated at 8% of Construction Cost and Contingency



CMF / CRF Details

CMF ID: 268

Provide a left-turn lane on both major-road approaches

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: 0.52

Adjusted Standard Error: 0.04

Unadjusted Standard Error: 0.03

Crash Reduction Factor (CRF)

Value: 48 (*This value indicates a **decrease** in crashes*)

Adjusted Standard Error: 4

Unadjusted Standard Error:

3

Applicability

Crash Type:

All

Crash Severity:

All

Roadway Types:

Not Specified

Number of Lanes:

Road Division Type:

Speed Limit:

Area Type:

Rural

Traffic Volume:

Time of Day:

If countermeasure is intersection-based

Intersection Type:

Roadway/roadway (not interchange related)

Intersection Geometry:

4-leg

Traffic Control:

Stop-controlled

Major Road Traffic Volume:

1500 to 32400 Average Daily Traffic (ADT)

Minor Road Traffic Volume:

50 to 11800 Average Daily Traffic (ADT)

Development Details

Date Range of Data Used:

Municipality:

State:

Country:	
Type of Methodology Used:	Before/after using empirical Bayes or full Bayes
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

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CMF / CRF Details

CMF ID: 5409

Upgrade narrow unpaved shoulder (< 5 ft) to wide paved shoulder (> 5 ft)

Description: Upgrade narrow unpaved shoulder (< 5 ft) to wide paved shoulder (> 5 ft)

Prior Condition: Narrow (< 5 ft) unpaved shoulder

Category: Shoulder treatments

Study: [*Evaluation of Safety Effectiveness of Composite Shoulders, Wide Unpaved Shoulders, and Wide Paved Shoulders in Kansas, Zeng et al., 2013*](#)

Star Quality Rating:



[\[View score details\]](#)

Crash Modification Factor (CMF)

Value: 0.58

Adjusted Standard Error:

Unadjusted Standard Error:

0.054

Crash Reduction Factor (CRF)

Value:	42 (<i>This value indicates a decrease in crashes</i>)
Adjusted Standard Error:	
Unadjusted Standard Error:	5.4

Applicability

Crash Type:	All
Crash Severity:	All
Roadway Types:	Major Collector
Number of Lanes:	2
Road Division Type:	Undivided
Speed Limit:	
Area Type:	Rural
Traffic Volume:	65 to 4950 <i>Average Daily Traffic (ADT)</i>
Time of Day:	All

If countermeasure is intersection-based

Intersection Type:	
Intersection Geometry:	
Traffic Control:	
Major Road Traffic Volume:	

Minor Road Traffic Volume:

Development Details

Date Range of Data Used:

2000 to 2009

Municipality:

State:

KS

Country:

USA

Type of Methodology Used:

Regression cross-section

Sample Size Used:

3135 Crashes

Other Details

Included in Highway Safety Manual?

No

Date Added to Clearinghouse:

Jan-09-2014

Comments:

The cross sectional model compares narrow unpaved shoulders to wide paved shoulders. There are more crashes included in the sample, specifically associated with the category "wide paved shoulders," that wasn't included in the summary statistics.

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CMF / CRF Details

CMF ID: 5411

Upgrade narrow unpaved shoulder (< 5 ft) to wide paved shoulder (> 5 ft)

Description: Upgrade narrow unpaved shoulder (< 5 ft) to wide paved shoulder (> 5 ft)

Prior Condition: Narrow (< 5 ft) unpaved shoulder

Category: Shoulder treatments

Study: [*Evaluation of Safety Effectiveness of Composite Shoulders, Wide Unpaved Shoulders, and Wide Paved Shoulders in Kansas, Zeng et al., 2013*](#)

Star Quality Rating:



[\[View score details\]](#)

Crash Modification Factor (CMF)

Value: 0.23

Adjusted Standard Error:

Unadjusted Standard Error:

0.048

Crash Reduction Factor (CRF)

Value:	77 (This value indicates a decrease in crashes)
Adjusted Standard Error:	
Unadjusted Standard Error:	4.8

Applicability

Crash Type:	Head on,Run off road,Sideswipe
Crash Severity:	All
Roadway Types:	Major Collector
Number of Lanes:	2
Road Division Type:	Undivided
Speed Limit:	
Area Type:	Rural
Traffic Volume:	65 to 4950 <i>Average Daily Traffic (ADT)</i>
Time of Day:	All

If countermeasure is intersection-based

Intersection Type:	
Intersection Geometry:	
Traffic Control:	
Major Road Traffic Volume:	

Minor Road Traffic Volume:

Development Details

Date Range of Data Used:

2000 to 2009

Municipality:

State:

KS

Country:

USA

Type of Methodology Used:

Regression cross-section

Sample Size Used:

430 Crashes

Other Details

Included in Highway Safety Manual?

No

Date Added to Clearinghouse:

Jan-09-2014

Comments:

The cross sectional model compares narrow unpaved shoulders to wide paved shoulders. There are more crashes included in the sample, specifically associated with the category "wide paved shoulders," that wasn't included in the summary statistics.

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CMF / CRF Details

CMF ID: 6669

Install shoulder rumble strips and widen shoulder

Description: Install shoulder rumble strips in combination with widening existing shoulder.

Prior Condition: Original shoulder width 4-6 ft

Category: Shoulder treatments

Study: [Exploration and comparison of crash modification factors for multiple treatments on rural multilane roadways, Park et al., 2014](#)

Star Quality Rating:



[\[View score details\]](#)

Crash Modification Factor (CMF)

Value: 0.351

Adjusted Standard Error:

Unadjusted Standard Error: 0.062

Crash Reduction Factor (CRF)

Value: 64.9 (This value indicates a **decrease** in crashes)

Adjusted Standard Error:

Unadjusted Standard Error:	6.2
-----------------------------------	-----

Applicability

Crash Type:	All
Crash Severity:	All
Roadway Types:	Not specified
Number of Lanes:	multi
Road Division Type:	
Speed Limit:	
Area Type:	Rural
Traffic Volume:	2000 to 50000 <i>Annual Average Daily Traffic (AADT)</i>
Time of Day:	

If countermeasure is intersection-based

Intersection Type:	
Intersection Geometry:	
Traffic Control:	
Major Road Traffic Volume:	
Minor Road Traffic Volume:	

Development Details

Date Range of Data Used:	2003 to 2012
Municipality:	
State:	FL

Country:	
Type of Methodology Used:	Other before/after
Sample Size Used:	

Other Details	
Included in Highway Safety Manual?	No
Date Added to Clearinghouse:	Jun-22-2015
Comments:	Before condition shoulder width between 4-6 ft. Study method was either EB or CG, the authors chose the method that had the lowest SE.

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Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

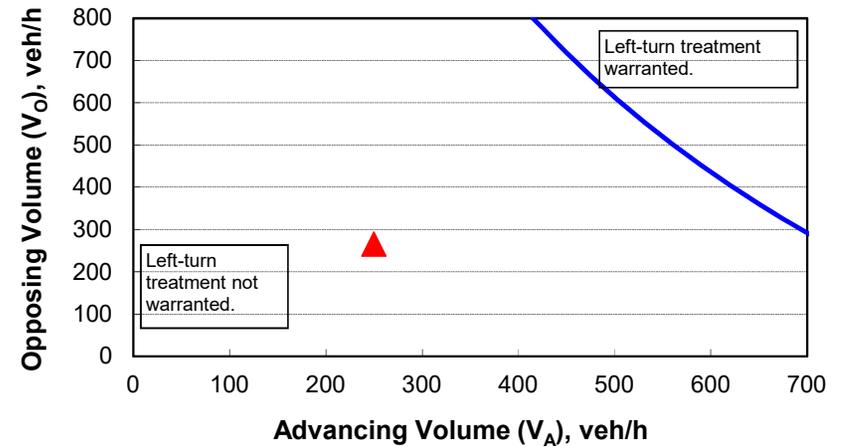
2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	55
Percent of left-turns in advancing volume (V_A), %:	2%
Advancing volume (V_A), veh/h:	250
Opposing volume (V_O), veh/h:	265

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	721
Guidance for determining the need for a major-road left-turn bay:	
	Left-turn treatment NOT warranted.



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

S 68th Street & Olive Creek Road

Northbound - Left Turn
Existing (2019) - AM Peak Hour

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

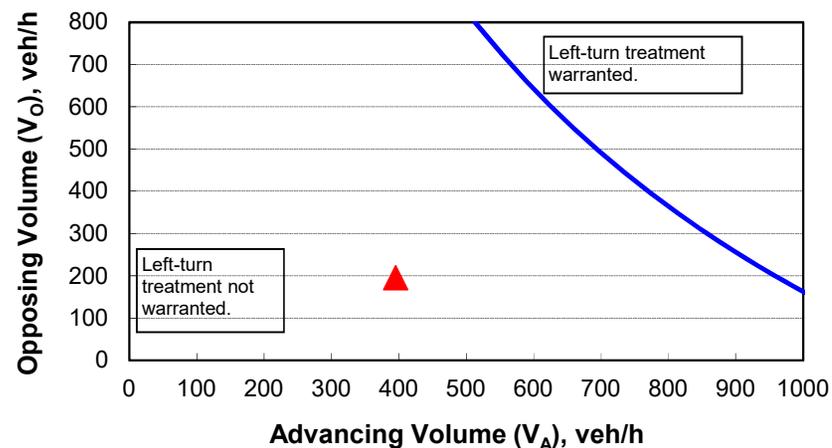
2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	55
Percent of left-turns in advancing volume (V_A), %:	1%
Advancing volume (V_A), veh/h:	395
Opposing volume (V_O), veh/h:	195

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	964
Guidance for determining the need for a major-road left-turn bay:	
	Left-turn treatment NOT warranted.



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

S 68th Street & Olive Creek Road

Northbound - Left Turn
Existing (2019) - PM Peak Hour

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

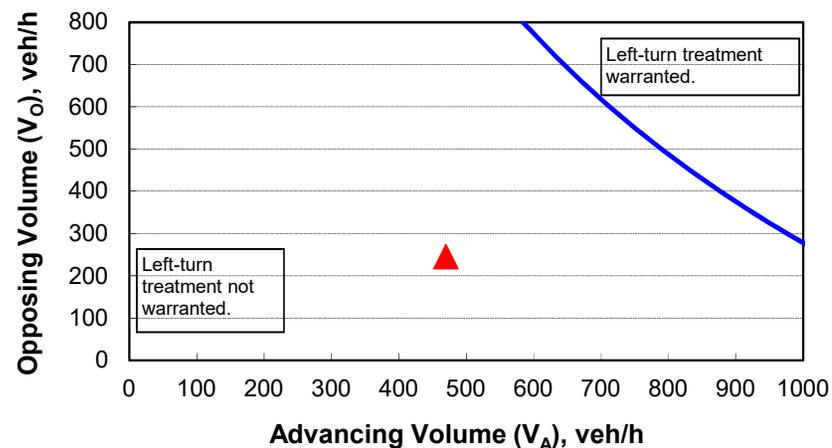
2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	55
Percent of left-turns in advancing volume (V_A), %:	1%
Advancing volume (V_A), veh/h:	470
Opposing volume (V_O), veh/h:	245

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	1037
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

S 68th Street & Olive Creek Road

Southbound - Left Turn
Existing (2019) - AM Peak Hour

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

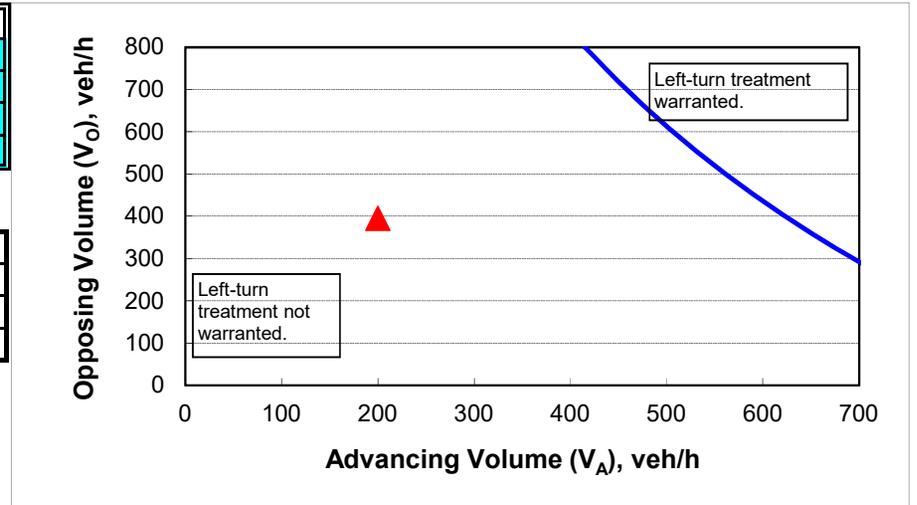
2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	55
Percent of left-turns in advancing volume (V_A), %:	2%
Advancing volume (V_A), veh/h:	200
Opposing volume (V_O), veh/h:	395

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	626
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

S 68th Street & Olive Creek Road

Southbound - Left Turn

Existing (2019) - PM Peak Hour

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	55
Major-road volume (one direction), veh/h:	250
Right-turn volume, veh/h:	5

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	27
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

S 68th Street & Olive Creek Road
 Northbound - Right Turn
 Existing (2019) - AM Peak Hour

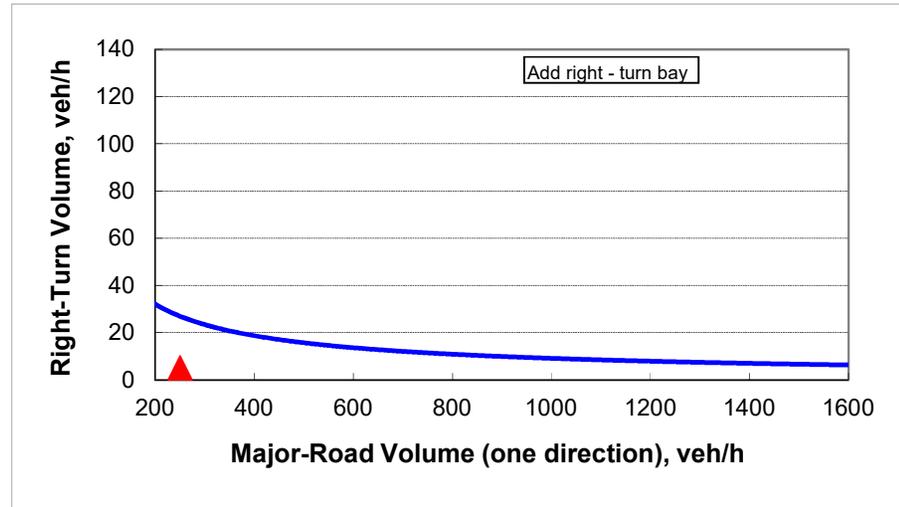


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	55
Major-road volume (one direction), veh/h:	395
Right-turn volume, veh/h:	5

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	19
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

S 68th Street & Olive Creek Road
 Northbound - Right Turn
 Existing (2019) - PM Peak Hour

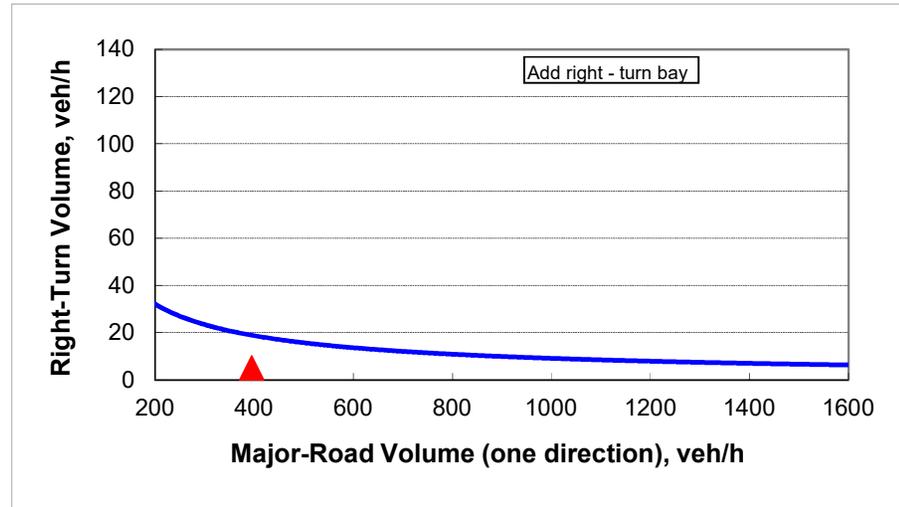


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

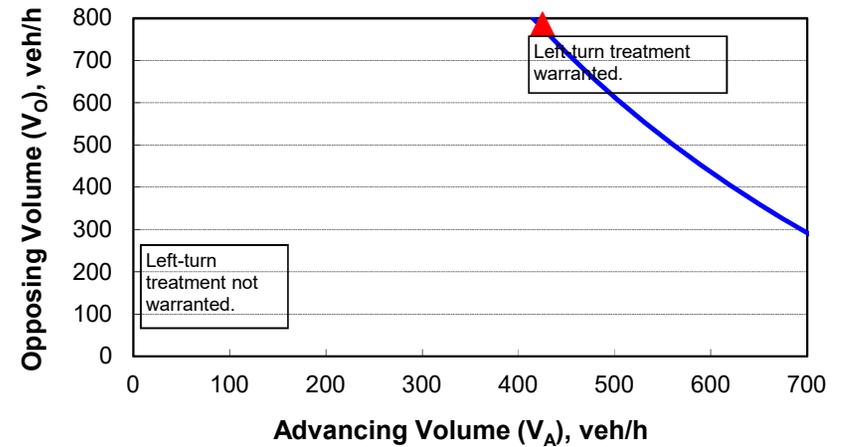
2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	55
Percent of left-turns in advancing volume (V_A), %:	2%
Advancing volume (V_A), veh/h:	425
Opposing volume (V_O), veh/h:	785

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	421
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

S 68th Street & Olive Creek Road

Northbound - Left Turn
 Future Year (2040) - AM Peak Hour

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

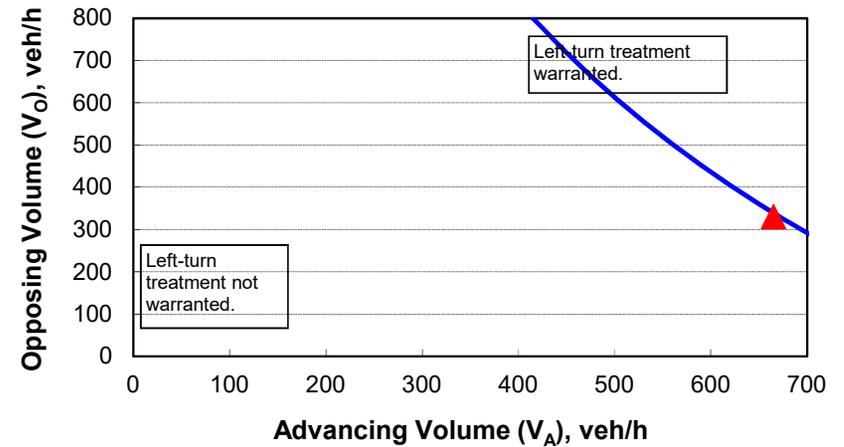
2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	55
Percent of left-turns in advancing volume (V_A), %:	2%
Advancing volume (V_A), veh/h:	665
Opposing volume (V_O), veh/h:	330

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	672
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

S 68th Street & Olive Creek Road

Northbound - Left Turn
 Future Year (2040) - PM Peak Hour

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

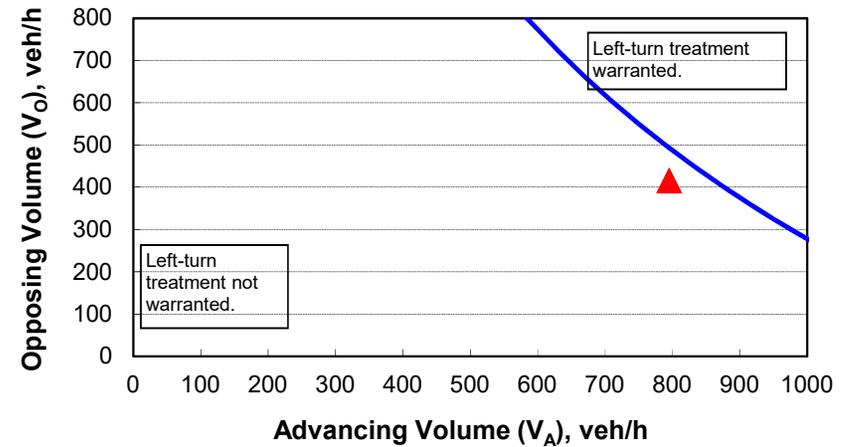
2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	55
Percent of left-turns in advancing volume (V_A), %:	1%
Advancing volume (V_A), veh/h:	795
Opposing volume (V_O), veh/h:	415

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	863
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

S 68th Street & Olive Creek Road

Southbound - Left Turn

Future Year (2040) - AM Peak Hour

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

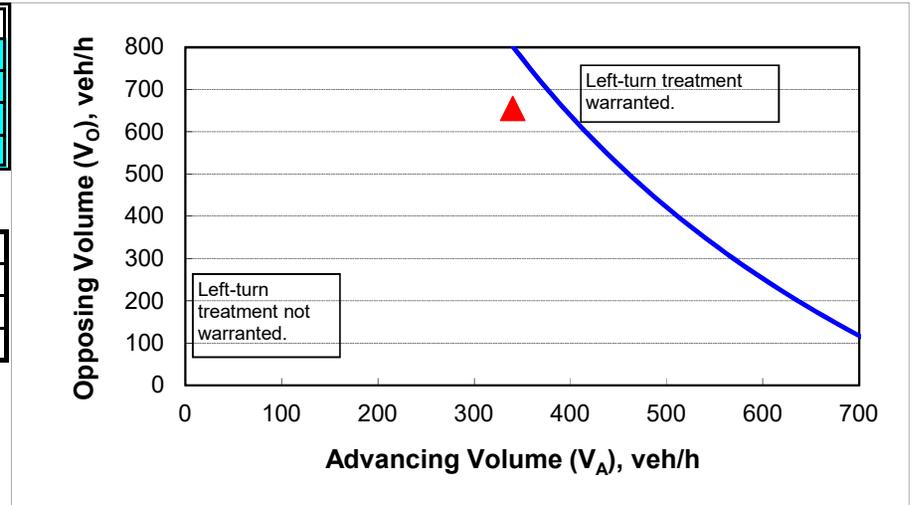
2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	55
Percent of left-turns in advancing volume (V_A), %:	3%
Advancing volume (V_A), veh/h:	340
Opposing volume (V_O), veh/h:	655

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	393
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

S 68th Street & Olive Creek Road

Southbound - Left Turn

Future Year (2040) - PM Peak Hour

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	55
Major-road volume (one direction), veh/h:	425
Right-turn volume, veh/h:	10

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	18
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

S 68th Street & Olive Creek Road
 Northbound - Right Turn
 Future Year (2040) - AM Peak Hour

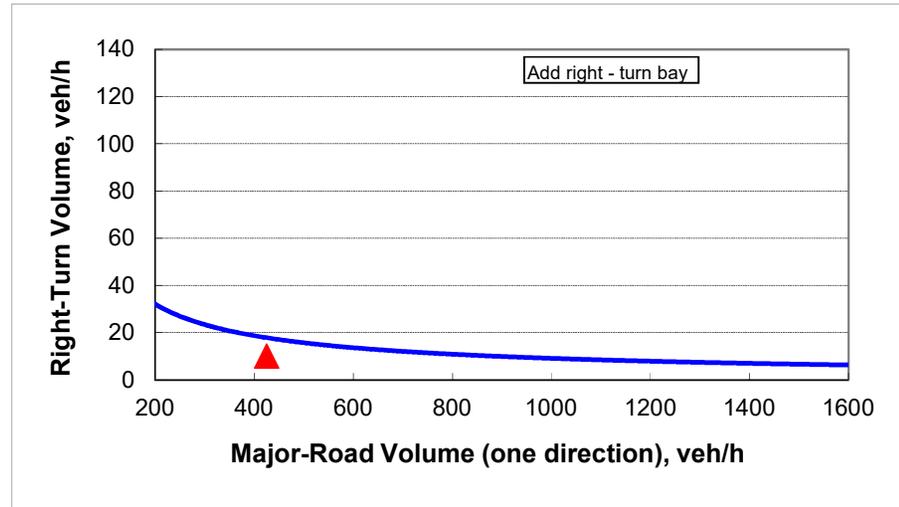


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

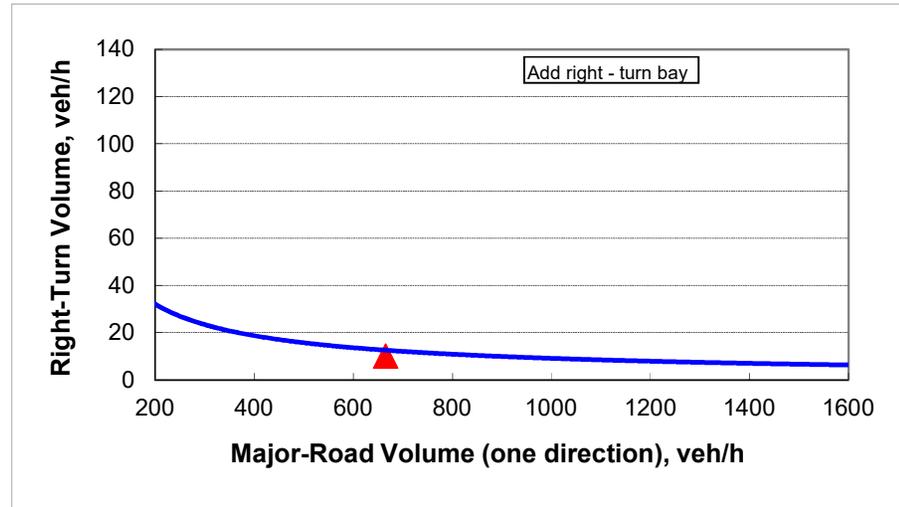
INPUT

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	55
Major-road volume (one direction), veh/h:	665
Right-turn volume, veh/h:	10

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	13
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

S 68th Street & Olive Creek Road
 Northbound - Right Turn
 Future Year (2040) - PM Peak Hour



HCM 6th TWSC
3: 68th St & Olive Creek Rd

04/24/2019

Intersection												
Int Delay, s/veh	0.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	5	10	5	5	5	5	240	5	5	460	5
Future Vol, veh/h	5	5	10	5	5	5	5	240	5	5	460	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	6	6	13	6	6	6	6	300	6	6	575	6

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	911	908	578	915	908	303	581	0	0	306	0	0
Stage 1	590	590	-	315	315	-	-	-	-	-	-	-
Stage 2	321	318	-	600	593	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.11	6.51	6.21	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.509	4.009	3.309	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	256	276	517	254	276	739	998	-	-	1260	-	-
Stage 1	496	497	-	698	657	-	-	-	-	-	-	-
Stage 2	693	655	-	489	495	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	247	272	517	241	272	739	998	-	-	1260	-	-
Mov Cap-2 Maneuver	247	272	-	241	272	-	-	-	-	-	-	-
Stage 1	493	494	-	693	652	-	-	-	-	-	-	-
Stage 2	676	650	-	468	492	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	16.2		16.7		0.2		0.1	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	998	-	-	345	327	1260	-	-
HCM Lane V/C Ratio	0.006	-	-	0.072	0.057	0.005	-	-
HCM Control Delay (s)	8.6	0	-	16.2	16.7	7.9	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.2	0	-	-

HCM 6th TWSC
3: 68th St & Olive Creek Rd

04/24/2019

Intersection												
Int Delay, s/veh	0.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	5	5	5	5	5	5	385	5	5	190	5
Future Vol, veh/h	5	5	5	5	5	5	5	385	5	5	190	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	6	6	6	6	6	6	6	481	6	6	238	6

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	755	752	241	755	752	484	244	0	0	487	0	0
Stage 1	253	253	-	496	496	-	-	-	-	-	-	-
Stage 2	502	499	-	259	256	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.11	6.51	6.21	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.509	4.009	3.309	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	326	340	800	326	340	585	1328	-	-	1081	-	-
Stage 1	754	700	-	558	547	-	-	-	-	-	-	-
Stage 2	553	545	-	748	697	-	-	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	315	336	800	316	336	585	1328	-	-	1081	-	-
Mov Cap-2 Maneuver	315	336	-	316	336	-	-	-	-	-	-	-
Stage 1	749	696	-	555	544	-	-	-	-	-	-	-
Stage 2	538	542	-	731	693	-	-	-	-	-	-	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	14.3			14.9			0.1			0.2		
HCM LOS	B			B								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1328	-	-	405	382	1081	-
HCM Lane V/C Ratio	0.005	-	-	0.046	0.049	0.006	-
HCM Control Delay (s)	7.7	0	-	14.3	14.9	8.3	0
HCM Lane LOS	A	A	-	B	B	A	A
HCM 95th %tile Q(veh)	0	-	-	0.1	0.2	0	-

HCM 6th TWSC
3: 68th St & Olive Creek Rd

04/24/2019

Intersection												
Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	5	10	5	5	5	10	405	10	10	775	10
Future Vol, veh/h	5	5	10	5	5	5	10	405	10	10	775	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	6	6	13	6	6	6	13	506	13	13	969	13

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1547	1547	976	1550	1547	513	982	0	0	519	0	0
Stage 1	1002	1002	-	539	539	-	-	-	-	-	-	-
Stage 2	545	545	-	1011	1008	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.11	6.51	6.21	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.509	4.009	3.309	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	94	115	306	93	115	563	707	-	-	1052	-	-
Stage 1	293	322	-	528	523	-	-	-	-	-	-	-
Stage 2	524	520	-	290	319	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	85	109	306	82	109	563	707	-	-	1052	-	-
Mov Cap-2 Maneuver	85	109	-	82	109	-	-	-	-	-	-	-
Stage 1	285	313	-	514	509	-	-	-	-	-	-	-
Stage 2	499	506	-	265	310	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	34.7		37.3		0.2		0.1	
HCM LOS	D		E					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	707	-	-	146	130	1052	-
HCM Lane V/C Ratio	0.018	-	-	0.171	0.144	0.012	-
HCM Control Delay (s)	10.2	0	-	34.7	37.3	8.5	0
HCM Lane LOS	B	A	-	D	E	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.6	0.5	0	-

HCM 6th TWSC
3: 68th St & Olive Creek Rd

04/24/2019

Intersection												
Int Delay, s/veh	0.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	5	5	5	5	5	10	645	10	10	320	10
Future Vol, veh/h	5	5	5	5	5	5	10	645	10	10	320	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	6	6	6	6	6	6	13	806	13	13	400	13

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1278	1278	407	1278	1278	813	413	0	0	819	0	0
Stage 1	433	433	-	839	839	-	-	-	-	-	-	-
Stage 2	845	845	-	439	439	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.11	6.51	6.21	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.509	4.009	3.309	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	144	167	646	144	167	380	1151	-	-	814	-	-
Stage 1	603	583	-	362	383	-	-	-	-	-	-	-
Stage 2	359	380	-	599	580	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	133	160	646	134	160	380	1151	-	-	814	-	-
Mov Cap-2 Maneuver	133	160	-	134	160	-	-	-	-	-	-	-
Stage 1	590	571	-	354	375	-	-	-	-	-	-	-
Stage 2	340	372	-	574	568	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	25.3		26.8		0.1		0.3	
HCM LOS	D		D					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1151	-	-	196	184	814	-
HCM Lane V/C Ratio	0.011	-	-	0.096	0.102	0.015	-
HCM Control Delay (s)	8.2	0	-	25.3	26.8	9.5	0
HCM Lane LOS	A	A	-	D	D	A	A
HCM 95th %tile Q(veh)	0	-	-	0.3	0.3	0	-