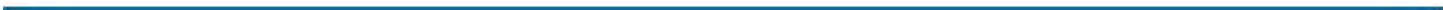




Appendix G – 2045 Build Conditions Traffic Operations Technical Memorandum





Technical Memo

Date: Friday, September 6, 2019

Project: Southern Meade County Corridor Study

To: Study Advisory Team

From: HDR

Subject: 2045 Build Conditions Traffic Operations

Introduction

The purpose of this technical memorandum is to identify minimum build needs and present the associated Build Conditions traffic operations along the proposed east/west corridor between Erickson Ranch Road and 143rd Avenue for the following future-year scenario:

- 2045 Planning Horizon Build Conditions

Primary components of the Build Conditions scenario and this technical memorandum include:

- Traffic operations analysis of Build Conditions at primary intersections and along two-lane highway segments.
- Review of turn lane warrants.
- Recommendations for minimum improvements needed to meet operational goals for this study.

Study Area

The study area is bound by, and includes, the following roadways:

- Elk Creek Road (north boundary)
- 143rd Avenue (east)
- Meade County border (south)
- Erickson Ranch Road (west)

While Elk Vale Road was not part of the original study area, it was included in the traffic forecasts because of its regional importance to connectivity along the eastern edge of the study area. Elk Vale Road provides a direct north/south connection to I-90 (Exit 61) and US16 Bypass.



Build Conditions Roadway Network

The primary difference between the 2045 No-Build and 2045 Build Conditions is the inclusion of a proposed east/west corridor north of the Meade County/Pennington County border that links Erickson Ranch Road, Haines Avenue, and 143rd Avenue. In this study, the corridor was extended over to Elk Vale Road for illustrative purposes as previously described. If the proposed east/west corridor is not extended east to 143rd Avenue, the segment volumes would be applicable to the 224th Street segment between 143rd Avenue and Elk Vale Road.

A series of east/west alignments between Elk Creek Road and the Meade County/Pennington County border were identified in the previous phase of this study. These alignments were narrowed down to three locations, as shown in **Figure 1**, through a comprehensive screening process documented in the May 23, 2019, *Alternatives Development Screening* technical memorandum. Because of the relative close proximity to each other within the overall study area, the same Build Conditions traffic forecasts are applicable to all three of these corridors carried forward for further consideration.

Assumptions used for the proposed east/west corridor operations analysis include:

- Erickson Ranch Road to Haines Avenue: Paved surface (hard surfaced road)
- East of Haines Avenue: Gravel surfacing
- 2-lane highway with 4-foot shoulders
- 30-40% no passing zones due to hilly terrain
- 55 mph design speed (50 mph posted speed)
- Eastbound/westbound approaches on the proposed corridor are stop-controlled
 - Northbound/southbound free movements

Traffic Volume Development

Daily segment volumes and AM and PM peak hour intersection volumes were developed for 2019 Existing Conditions, 2045 No-Build Conditions, and 2045 Build Conditions scenarios.

The 2019 Existing Conditions volume set was developed for the study area using 2019 segment and peak hour counts, factored to a design season (August) to account for seasonal fluctuations. This volume set serves as the foundation for forecasting traffic throughout the study area.

Traffic forecasts for 2045, both Build and No-Build Conditions, were prepared using the most current version of the Rapid City Area MPO travel demand model (year 2040). Methodology used in the development of segment and intersection peak hour forecasts was consistent with *NCHRP 765: Analytical Travel Forecasting Approaches for Project-Level Planning and Design*.

For the forecasting, distribution, and assignment of traffic along the proposed corridor in the 2045 Build Conditions scenario, the following process was used (described further in the *Traffic Forecast* memo dated May 2019):



1. Estimate east/west corridor through trips and add to the potential corridor.
2. Estimate traffic volumes that would access the potential corridor based on travel demand model Transportation Analysis Zone (TAZ)/land use for adjacent TAZs.
3. Estimate traffic distribution throughout study area.
4. Assign TAZ/land use-based traffic to the potential corridor at mid-segments.
5. Estimate north/south through trips at the potential corridor intersections.
6. Estimate east/west corridor through trips and add to the potential corridor.
7. Smooth intersection volumes and balance where applicable.

Analysis traffic volumes for the 2045 Build Conditions are summarized provided in **Figure 2**. The *Traffic Forecasts* technical memorandum presents more details regarding the methodology and process of developing existing conditions and future-year peak hour traffic volumes.

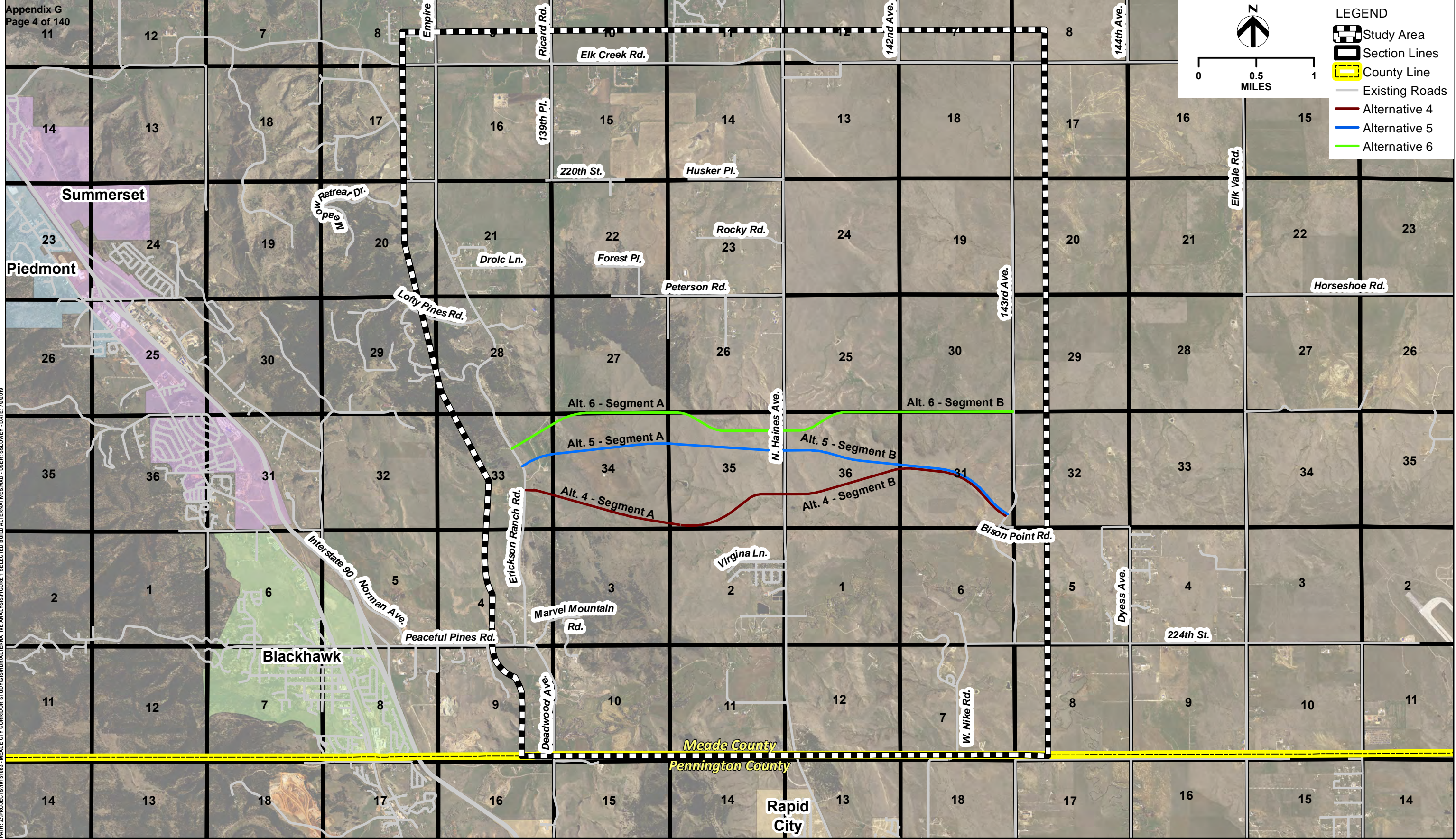
2045 Traffic Forecasts and Proposed East/West Corridor Alternatives

It was found that much of the traffic assigned to the proposed east/west corridor is development driven and destined for an existing north/south route that leads towards Rapid City or an east/west route that leads to I-90. Given the predominant future 2040 land use throughout the study area is rural residential, the east/west travel along the corridor is likely focused on this directional travel to/from home and Rapid City/other areas outside of the study area. Nearly all of the traffic assigned to the east/west corridor comes from this future development identified in the travel demand model.

It would be expected that as the area continues to densify in the future, commercial and other land uses will develop in the area and create a need to accommodate shorter trips contained along the proposed east/west corridor and within the study area.

From a proposed east/west corridor alternative attractiveness standpoint, each of the proposed corridor alternative routes would serve very similar traffic. Each alternative is situated within the Boxelder Creek (and tributaries) valley and would experience similar natural connectivity limitations to development north and south.

Ultimately, the differentiation of future attractiveness between the three corridor alternatives is negligible. The most notable component of localized attractiveness is likely tied to the future location of more dense, urban types of development. Motorists typically seek the shortest/quickest route and do not like to go out of their way (drive past their destination). Therefore, if greater density development (such as an apartment) is constructed north of a proposed corridor route, those trips would likely be more prone to using the east/west corridor than if a similar development is constructed south of the corridor and has alternative access to a north/south route south of the corridor. Therefore, it is recommended that consideration be given to the proximity of natural barriers and that efficient, attractive access to future development is provided along the corridor.



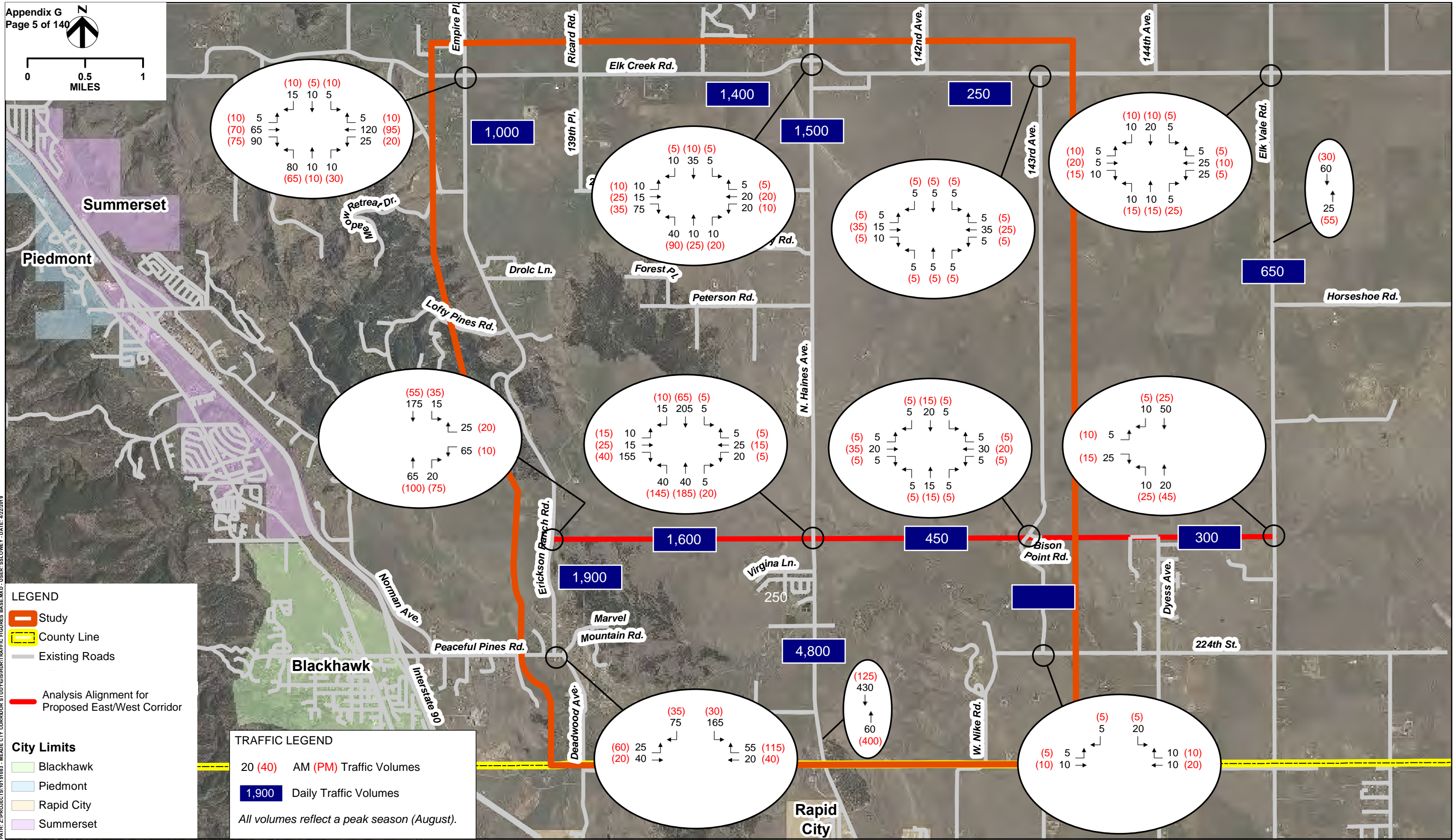
PATH: Z:\PROJECTS\10151083 - MEADE CTY. CORRIDOR STUDY\GIS\DR\ALTERNATIVE ANALYSIS\FIGURE 1 SELECTED BUILD ALTERNATIVES.MXD - USER: SLOWEY - DATE: 7/22/19



**VICINITY MAP
SELECTED STUDY BUILD ALTERNATIVES**

SOUTHERN MEADE COUNTY CORRIDOR STUDY

DATE
7/2/2019
FIGURE
FIGURE 1



PATH: Z:\PROJECTS\10151083 - MEADE CTY. CORRIDOR STUDY\GIS\DR\TRAFFIC FIGURES BASE.MXD - USER: S.SLOWNEY - DATE: 4/22/2019



**2045 BUILD CONDITIONS TRAFFIC FORECASTS
PEAK SEASON**

SOUTHERN MEADE COUNTY CORRIDOR STUDY

DATE
5/6/2019

FIGURE
2



Traffic Operations Analysis Methodology

Intersection peak hour level of service (LOS) was calculated using 6th Edition of the Highway Capacity Manual (HCM6) analysis methodology replicated in Highway Capacity Software version 7.6 (HCS7). HCM6 analysis methods measure average control delay in terms of seconds of delay per vehicle (sec/veh) at intersections and percent time-spent following (PTSF) on two-lane highways. LOS values can be applied to these measures in accordance with thresholds presented in **Table 1**.

Table 1: Level of Service Thresholds

LOS	Intersection Delay per Vehicle (sec/veh)		Two-Lane Highways PTSF
	Signalized Intersections	Two-Way Stop-Control*, All-Way Stop-Control, and Roundabouts	Percent Time-Spent Following (PTSF) Class II Highway
A	≤ 10	≤ 10	≤ 40
B	> 10 – 20	> 10 – 15	> 40 – 55
C	> 20 - 35	> 15 - 25	> 55 – 70
D	> 35 – 55	> 25 – 35	> 70 – 85
E	> 55 – 80	> 35 – 50	> 85
F	Demand exceeds capacity; > 80	Demand exceeds capacity; > 50	Demand exceeds capacity

Source: Transportation Research Board, HCM6.

* Two-way stop-control LOS reflects worst-case stop-controlled approach.

HCS7 modules used for this analysis include:

- Two-Way Stop-Controlled (TWSC) Intersections – HCS7 TWSC Module
- All-Way Stop-Controlled (AWSC) Intersections – HCS7 AWSC Module
- Two-Lane Highway Segments – HCS7 Two-Lane Module

Current HCM6 methodology does not directly analyze yield-control intersections. For this study, all yield-control approaches will be analyzed as stop-control.

Level of Service Goals for Study

The following minimum allowable LOS thresholds have been established for this study:

- Signalized intersections minimum allowable LOS – LOS B
- Two-way stop-controlled intersections LOS – LOS B (worst-case stop-controlled approach)
- Two-lane highways
 - Rural collector LOS – LOS C
 - Rural minor arterial LOS – LOS B



These LOS thresholds were used to guide the development of potential improvements and subsequent evaluation of concepts.

This memorandum focuses on the traffic operations at the following existing study area intersections:

- Elk Creek Road & Erickson Ranch Road
- Elk Creek Road & Haines Avenue
- Elk Creek Road & 143rd Avenue
- Peaceful Pines Road/Deadwood Avenue & Erickson Ranch Road
- 224th Street & 143rd Avenue
- Proposed east/west corridor & Erickson Ranch Road
- Proposed east/west corridor & Haines Avenue
- Proposed east/west corridor & 143rd Avenue

Intersection Traffic Operations Analysis

A summary of 2045 Build Conditions traffic operations analysis at the primary study area intersections is provided in **Table 2**. Each intersection was built-out, as needed, in the HCS7 traffic model to achieve LOS goals for this study. The resulting recommended intersection lane configurations are shown in **Figure 4**. HCS7 analysis reports are provided in **Appendix A**.

Table 2: Study Area Intersections – 2045 Build Conditions

Study Intersection	Intersection Control Type	AM Peak Period		PM Peak Period	
		Avg. Delay (sec/veh)	LOS	Avg. Delay (sec/veh)	LOS
Elk Creek Road & Erickson Ranch Road	TWSC*	13.3	B	12.0	B
Elk Creek Road & Haines Avenue	AWSC	7.7	A	8.1	A
Elk Creek Road & 143 rd Avenue	TWSC*	9.4	A	9.4	A
Peaceful Pines Road/Deadwood Avenue & Erickson Ranch Road	TWSC*	11.1	B	9.7	A
224 th Street & 143 rd Avenue	TWSC*	8.8	A	8.7	A
East/West Corridor & Erickson Ranch Road	TWSC*	11.2	B	9.9	A
East/West Corridor & Haines Avenue	TWSC*	15.2	C	17.1	C
	AWSC	9.8	A	11.5	B
	Roundabout	5.1	A	5.6	A
East/West Corridor & 143 rd Avenue	TWSC*	9.8	A	9.8	A

* Two-way stop-control LOS reflects worst-case stop-controlled approach.



No modifications were needed to achieve LOS goals at any of the existing intersections and thus it can be concluded that the existing intersection configurations are adequate for future-year volumes developed for this study.

Along the proposed corridor, each intersection was initially analyzed with a shared approach lane configuration of shared left/thru/right from a single lane. Locations where lanes were separated to achieve LOS goals are noted in discussion. As stated in the initial assumptions of the proposed east/west corridor, it was assumed that the east/west corridor was stop-controlled and the north/south roadways had free movements.

It was found that the primary location with notable delay in TWSC conditions was at the proposed east/west corridor and Haines Avenue. Worst-case stop-controlled approach delay was measured at LOS C in both the AM and PM peak periods. The greatest delays were measured on the low-volume westbound approach and thus separating left-turn and through traffic provides minimal benefit to this LOS measure. The weighted average intersection delay, which accounts for all measured delay throughout the intersection as well as the operational benefits afforded to the free movements at a TWSC intersection, was less than 7 and 6 seconds for AM and PM peak hours, respectively.

Two other intersection alternatives were analyzed at the proposed east/west corridor and Haines Avenue intersection. Both an AWSC intersection and roundabout result in acceptable LOS for this study and are feasible solutions to address future traffic volumes at this intersection. The roundabout configuration results in the lowest overall intersection delay of the three options.

Two-Lane Highway Traffic Operations Analysis

Two-lane highway segments were analyzed using Existing Conditions and 2045 No-Build Conditions traffic volumes for the following paved highway segments:

- Erickson Ranch Road
- Haines Avenue – north of Virginia Lane
- Haines Avenue – south of Virginia Lane
- Elk Creek Road
- Proposed east/west corridor

The 2045 Build Conditions assumes the same roadway conditions, but updates traffic volumes with the future-year Build forecasts. HCM6 methodology does not currently support analysis of gravel roadway segments, and thus existing gravel roadways were not analyzed as part of this review.

Two-lane highway operational analysis results for the 2045 Build Conditions are summarized in **Table 3**. It was found that all analyzed segments, including the proposed east/west collector, result in a LOS C or better. This meets rural collector LOS goals for this study.



Table 3: Two-Lane Highway Segments – 2045 Build Conditions

Study Two-Lane Highway Segment	Functional Classification	Peak Hour	Peak Direction of Travel	AM Peak Period		PM Peak Period	
				PTSF ¹ (%)	LOS	PTSF ¹ (%)	LOS
Erickson Ranch Rd <i>Elk Creek Rd – Westridge Rd</i>	Rural Collector	AM	SB	46.9	B		
		PM	NB			41.3	B
Erickson Ranch Rd <i>Westridge Rd – East/West Corridor</i>	Rural Collector	AM	SB	59.3	C		
		PM	NB			48.4	B
Erickson Ranch Rd <i>East/West Corridor – Peaceful Pines Rd</i>	Rural Collector	AM	SB	64.9	C		
		PM	NB			58.4	C
Haines Avenue <i>Elk Creek Rd – East/West Corridor</i>	Rural Collector	AM	SB	56.9	C		
		PM	NB			50.1	B
Haines Avenue <i>East/West Corridor – Pennington County</i>	Rural Collector	AM	SB	65.0	C		
		PM	NB			64.5	C
Elk Creek Road <i>Erickson Ranch Rd – Haines Ave</i>	Rural Collector	AM	EB	29.0	A		
		PM	WB			28.1	A
East/West Corridor <i>Erickson Ranch Rd – Haines Ave</i>	Rural Collector	AM	EB	50.7	B		
		PM	WB			49.5	B

¹ PTSF reflects analysis in the peak direction

As found in the previous 2045 No-Build Conditions analysis, segments exhibiting the greatest percentage of time a vehicle spends following another vehicle are located towards the southern study area boundary.

The proposed east/west corridor 2-lane highway cross-section, paved between Erickson Ranch Road and Haines Avenue, is expected to meet LOS goals for this study. The proposed gravel segment between Haines Avenue and 143rd Avenue was not analyzed in HCS7.

Roadway Segment Capacity Assessment

Another method to estimate capacity-related needs is to compare daily segment volume forecasts, as presented in **Figure 2**, to LOS-based roadway segment capacity thresholds (as presented in the *South Dakota Department of Transportation Road Design Manual* Table 15-10). These thresholds, shown in **Table 4**, represent a planning-level guide to cross-sectional needs in terms of through lanes and potential turn lanes based on traffic volumes.



Table 4: Estimated Number of Lanes Based on Daily Traffic Volumes

Total Number of Lanes	Description	Total Design Year ADT ¹	
		Rural Level	Urban
2	1 lane in each direction	< 8,000	< 2,500
3	1 lane in each direction plus center turn lane	²	2,500 to 16,000
4	2 lanes in each direction	8,000 to 20,000 ³	³
5	2 lanes in each direction plus center turn lane	²	16,000 to 30,000
6	3 lanes in each direction	> 20,000 ⁴	> 30,000 ⁴

Source: *South Dakota Department of Transportation Road Design Manual*, Table 15-10 (as of 4/26/19)

- 1 Construction/Reconstruction projects are designed based on a typical 20 year ADT projection beyond the anticipated year of project construction.
- 2 Continuous left turn lanes may be considered based on left turn volumes and/or when intersections and/or approaches are closely spaced together.
- 3 Undivided sections may be used if left turn movements are low and there is no crash history, otherwise consider installing a median or 5 lane section.
- 4 Medians should be used.

All roadways within the study exhibit a 2045 daily traffic volume forecast that is less than the 'Rural Level' threshold of 8,000 for a two-lane roadway.

As Rapid City continues to grow northward and the area becomes more urbanized, particularly for the southern areas of Meade County, a 3-lane urban cross-section may be applicable. This would provide one lane in each direction plus a center turn lane.

Proposed East/West Corridor Intersection Turn Lanes

A turn lane warrant evaluation was conducted using 2045 Build Conditions traffic forecasts for the north/south free movements at the proposed east/west corridor intersections with Erickson Ranch Road, Haines Avenue, and 143rd Avenue. Turn lanes for the proposed east/west corridor stop-controlled approaches are typically dictated by operational (delay) needs, as all vehicles are required to stop at the intersection.

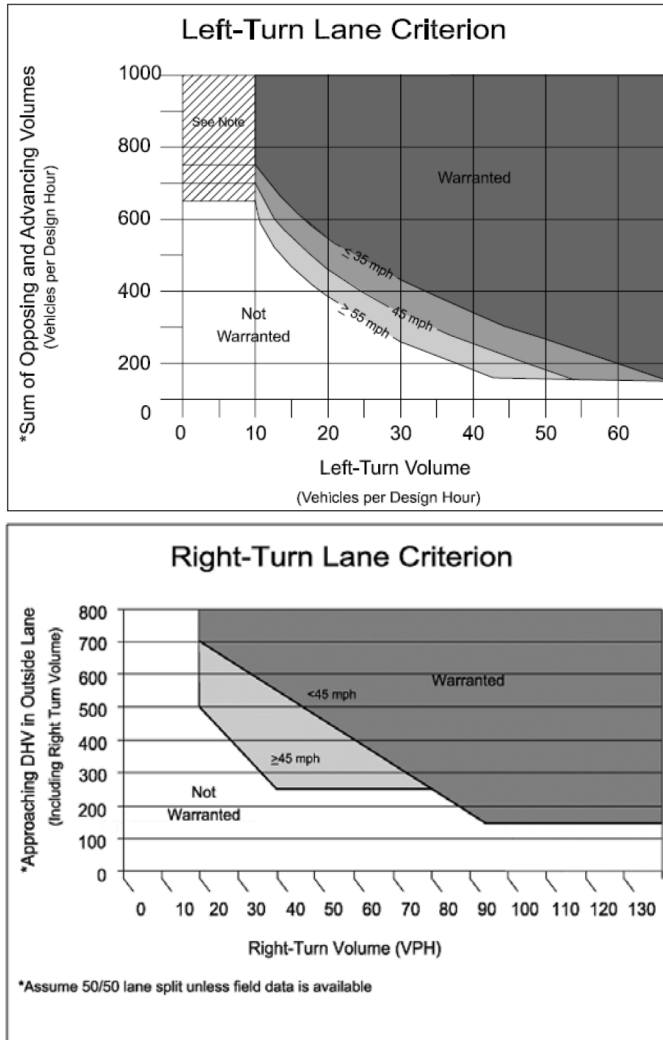
This evaluation serves as a tool to aid conceptual design. Conclusions from this evaluation do not require installation, or non-installation, of a turn lane. Turn lanes to crossroads and driveways provide operational and safety benefits to arterial roadway traffic by minimizing through traffic hazards and interference.

Engineering judgment and other factors such as lane balance, access density, route continuity, and sight distance, contribute to the ultimate determination whether a turn lane is constructed. Additionally, future development intensity, timeframe, and desired access play a role in the level of demand at these future minor street intersections and driveways.



Turn lane warrant criteria for the free intersection movements used in this analysis are based on standards for turn lanes presented in the SDDOT Road Design Manual, shown in **Figure 3**. These standards consider the relationship between traffic volumes, posted (or future) speed limits, and number of lanes on a facility to determine whether a turn lane is warranted.

Figure 3: Turn Lane Volume Warrant Criterion



Source: South Dakota Department of Transportation Road Design Manual, Figures 15-2 and 15-3 (as of 7/11/19); adapted from Oregon DOT Analysis Procedures Manual 2008.

Table 5 presents results of the turn lane analysis for the north/south free movements at proposed intersections with the east/west corridor.

Table 5: Proposed East/West Corridor Intersection Turn Lane Volume Warrant Review



Future East/West Corridor Intersection	Turn Movement	2045 Turn Lane Volume Warrant Satisfied
Erickson Ranch Road	NB RT	No
	SB LT	No
Haines Avenue	NB LT	Yes (AM & PM)
	NB RT	No
	SB LT	No*
143 rd Avenue	SB RT	No
	NB LT	No
	NB RT	No
	SB LT	No
	SB RT	No

Analysis Methodology Source: *South Dakota Department of Transportation Road Design Manual*, Figures 15-2 and 15-3 (as of 7/11/19)

* Consider LT lane when opposing direction includes warranted left-turn lane.

The primary turn lane need based on forecasted volumes for this study is the high volume northbound to westbound left-turn movement at the intersection of the proposed east/west corridor and Haines Avenue. A turn lane at this location would remove left-turning vehicles from the through movement and allow them to wait for a gap in southbound traffic in a turn lane. While not warranted, the complimentary southbound left-turn lane is also recommended to not only remove left-turning traffic from the free through movement but also provides better sight angles when there is a turning vehicle in the opposing left-turn lane.

While turn lanes are not warranted at other locations, further consideration to installation should be given during design due to the operational and safety benefits turn lanes provide.

Recommendations

The following summarizes minimum Build recommendations for the proposed east/west corridor for year 2045. The recommended lane configurations for the proposed east/west corridor are shown in **Figure 4**.

Proposed East/West Corridor Cross-Section

- 2-lane highway section meets LOS goals for this study
- Other cross-sectional elements shall meet current and applicable design standards for the proposed roadway.

Proposed East/West Corridor Intersections

ERICKSON RANCH ROAD

- Turn lanes: LOS goals achieved with shared left/through/right lane configurations.
- Assumes stop-control from proposed east/west corridor approach



HAINES AVENUE

- Two-Way Stop-Control Intersection
 - Worst-case stop-controlled approach does not meet LOS goals for this study, but delay is a low LOS C (less than 20 seconds for low volume westbound approach) and overall intersection delay is less than 7 seconds.
 - Turn Lanes: Northbound left-turn lane warranted; opposing southbound left-turn lane recommended.
 - Assumes stop-control from proposed east/west corridor approach
- All-Way Stop-Control Intersection
 - Turn Lanes: shared left/through/right configuration meets LOS goals for this study
- Roundabout
 - Single-lane roundabout achieves LOS goals for this study and results in the lowest delay of all analyzed intersection configurations.

143RD AVENUE

- Turn lanes: LOS goals achieved with shared left/through/right lane configurations.
- Assumes stop-control from proposed east/west corridor approach

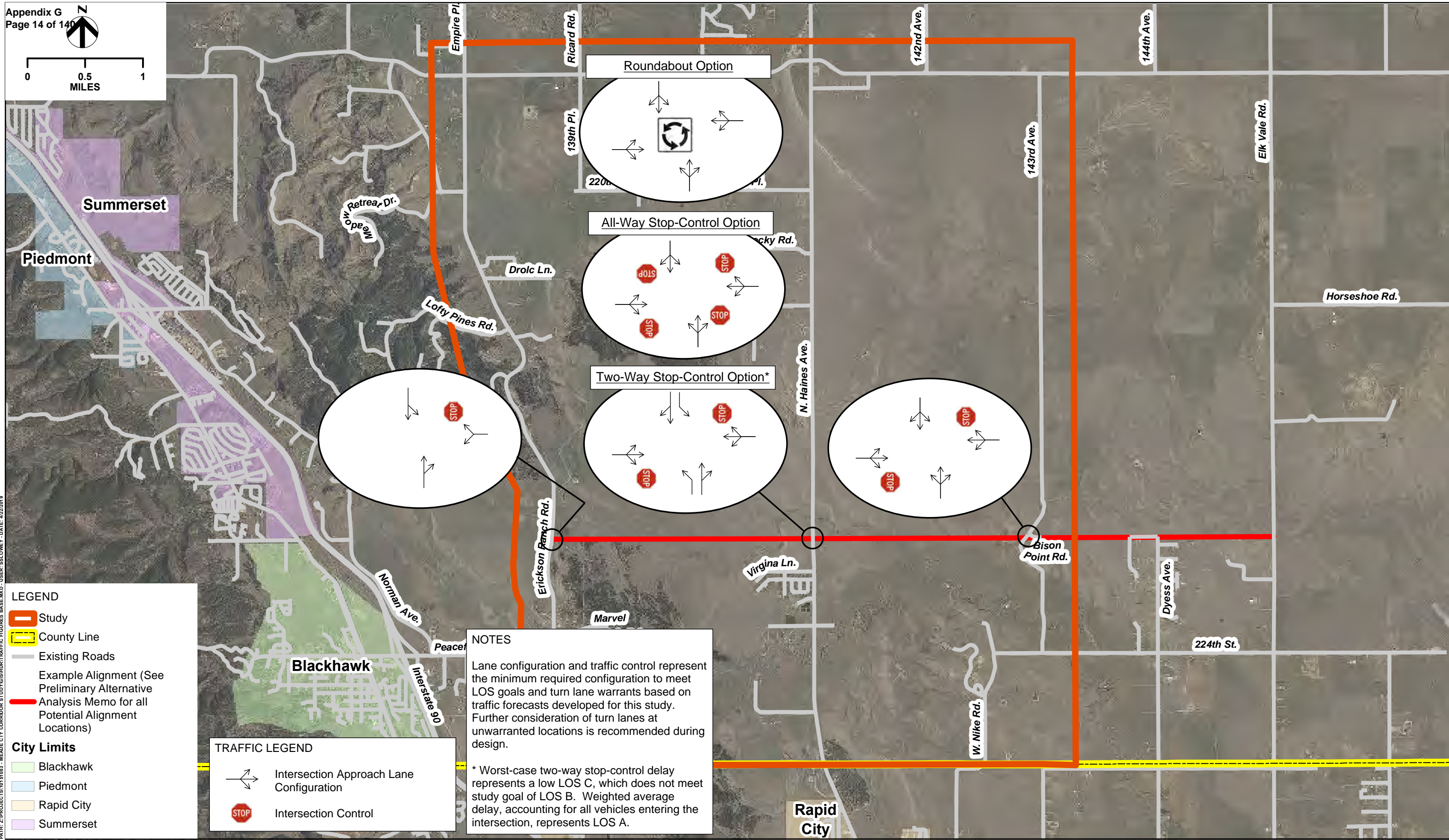
Additional Considerations

TURN LANES

It is recommended that turn lanes be considered at other unwarranted locations based on the operational and safety benefits they provide, particularly when removing turning traffic from high-speed through movements. One example is at the Erickson Ranch Road intersection.

EAST/WEST CORRIDOR ALIGNMENT ALTERNATIVES

Each of the three proposed east/west corridor alignment alternatives are within close proximity to each other from a study area perspective. At the greatest separation, they are still within the same section boundary (one-mile width). From a traffic perspective, each of these three alignments represent the most beneficial location as discussed in the May 23, 2019, *Alternatives Development Screening* technical memorandum. Overall differentiation between these three alignments with regard to traffic volumes is minimal. It will be important to manage access to/from development surrounding the corridor, providing safe and efficient connectivity that maintains the attractiveness and intended function of the corridor.



LEGEND

- Study
- County Line
- Existing Roads
- Example Alignment (See Preliminary Alternative Analysis Memo for all Potential Alignment Locations)

City Limits

- Blackhawk
- Piedmont
- Rapid City
- Summerset

TRAFFIC LEGEND

- Intersection Approach Lane Configuration
- Intersection Control

NOTES

Lane configuration and traffic control represent the minimum required configuration to meet LOS goals and turn lane warrants based on traffic forecasts developed for this study. Further consideration of turn lanes at unwarranted locations is recommended during design.

* Worst-case two-way stop-control delay represents a low LOS C, which does not meet study goal of LOS B. Weighted average delay, accounting for all vehicles entering the intersection, represents LOS A.



MINIMUM REQUIRED LANE CONFIGURATIONS TO MEET STUDY LOS AND TURN LANE WARRANT GOALS

SOUTHERN MEADE COUNTY CORRIDOR STUDY



Appendix

- A. 2045 Build Conditions HCS7 Reports
- B. 2045 Turn Lane Volume Warrant Review



Appendix A – 2045 Build Conditions HCS7 Reports

HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name: 2045-Build_AM_224th-143rd_TWSC.xtw
 Analyst: HDR
 Agency: HDR
 Date Performed: 7/3/2019
 Time Analyzed: AM - 2045 Build Cond.
 Jurisdiction: Meade County
 Analysis Year: 2045
 Project Description: Southern Meade County Corridor Study
 Units: U.S. Customary
 Intersection Name: 224th St & 143rd Ave
 Major Street Direction: East-West
 East/West Street Name: 224th Street
 North/South Street Name: 143rd Avenue
 Analysis Time Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:										
Approach	EastBound					WestBound				
Movement	1U	1	2	3		4U	4	5	6	
	U	L	T	R		U	L	T	R	
Volume		5	10					10	10	
Peak Hour Factor, PHF						0.80				
Hourly Flow Rtae, HFR		6	13					13	13	
Percent Heavy Vehicles		3								
Number of Lanes	0	0	1	0		0	0	1	0	
Lane Configuration		LT							TR	
Median Type	Undivided									
Median Storage										
RT channelized?										
Left-Turn Lane Storage										
Upstream Signal?	Not Present									

Minor Street:										
Approach	NorthBound					SouthBound				
Movement	7	8	9			10	11	12		
	L	T	R			L	T	R		
Volume						20		5		
Peak Hour Factor, PHF						0.80				
Hourly Flow Rtae, HFR						25		6		
Percent Heavy Vehicles						3		3		
Number of Lanes	0	0	0			0	1	0		
Lane Configuration							LR			
RT channelized?										
Flared Approach Storage						No				
Percent Grade							0			

Pedestrian Volumes and Adjustments

Approach	EB	WB	NB	SB
Movement	13	14	15	16
Flow (ped/hr)	0	0		0
Lane width (ft)				
walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach														
Movement	1U	EB	1	4U	WB	4	7	NorthBound	8	9	10	SouthBound	11	12
Lane Configuration			LT										LR	
Flow Rate			6										31	
Lane Capacity			1583										978	
v/c			0.00										0.03	
95% Queue Length			0.0										0.1	
Control Delay			7.3										8.8	
LOS			A										A	
Approach Delay			2.4										8.8	
Approach LOS													A	
Intersction Delay			4.3											

Step 1: MOVEMENT PRIORITIES

Major Street:										
Approach	EastBound					WestBound				
Priority	1U	1	2	3		4U	4	5	6	
Movement	U	L	T	R		U	L	T	R	

Minor Street:

Approach Priority Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street: Approach Movement	1U U	EastBound				4U U	WestBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Volume, V_x		5	10			10	10		
Flow Rate, v_x		6	13			13	13		

Minor Street: Approach Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Volume, V_x						20	5	
Flow Rate, v_x						25	6	

Step 3: CONFLICTING FLOW RATES

Major Street: Approach Movement	1U U	EastBound				4U U	WestBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Flow Rate, v_x		6	13			13	13		
Conflicting Flow, v_c,x		25							

Minor Street: Approach Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Flow Rate, v_x						25	6	
Conflicting Flow, v_c,x						44	19	

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS Approach Movement	1U U	EB 1 L	4U U	WB 4 L	7 L	NorthBound			SouthBound		
						8 T	9 R		10 L	11 T	12 R
t_c,base Single Stage		4.1							7.1		6.2
Stage I											
Stage II											
t_c,HV		1.0							1.0		1.0
P_HV		0.03							0.03		0.03
t_c,G									0.2		0.1
G									0		0
t_3,LT		0.0							0.7		0.0
t_c Single Stage		4.13							6.43		6.23
Stage I											
Stage II											

FOLLOW-UP HEADWAYS Approach Movement	1U U	EB 1 L	4U U	WB 4 L	7 L	NorthBound			SouthBound		
						8 T	9 R		10 L	11 T	12 R
t_f,base		2.2							3.5		3.3
t_f,HV		0.9							0.9		0.9
P_HV		0.03							0.03		0.03
t_f		2.23							3.53		3.33

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT Approach Movement	1U U	EB 1 L	4U U	WB 4 L	7 L	NorthBound			SouthBound		
						8 T	9 R		10 L	11 T	12 R
v_c,x		25							44		19
t_c,x		4.13							6.43		6.23
t_f,x		2.23							3.53		3.33
C_p,x		1583							964		1057

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance Approach	EB	WB	NB	SB
----------------------------------	----	----	----	----

Saturation Flow Rate for Major Street Right-Turn, s_i2
 Delay to Rank 1 Vehicles, d_Rank1

0.0

1700

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS

Approach Movement	1U	EB 1	4U	WB 4	7	NorthBound 8	9	10	SouthBound 11	12
Lane Configuration		LT							LR	
Flow Rate		6							31	
Lane Capacity		1583							978	
v/c		0.00							0.03	
95% Queue Length		0.0							0.1	
Control Delay		7.3							8.8	
LOS		A							A	
Approach Delay		2.4							8.8	
Approach LOS									A	
Intersction Delay		4.3								

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HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name: 2045-Build_AM_EastWestCorridor-143rd_TWSC.xtw
 Analyst: HDR
 Agency: HDR
 Date Performed: 7/3/2019
 Time Analyzed: AM - 2045 Build Cond.
 Jurisdiction: Meade County
 Analysis Year: 2045
 Project Description: Southern Meade County Corridor Study
 Units: U.S. Customary
 Intersection Name: E/W Corridor & 143rd Ave
 Major Street Direction: North-South
 East/West Street Name: East/West Corridor
 North/South Street Name: 143rd Ave
 Analysis Time Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:									
Approach	NorthBound					SouthBound			
Movement	1U	1	2	3		4U	4	5	6
	U	L	T	R		U	L	T	R
Volume		5	15	5			5	20	5
Peak Hour Factor, PHF					0.80				
Hourly Flow Rate, HFR		6	19	6			6	25	6
Percent Heavy Vehicles		20					20		
Number of Lanes	0	0	1	0		0	0	1	0
Lane Configuration			LTR					LTR	
Median Type	Undivided								
Median Storage									
RT channelized?									
Left-Turn Lane Storage									
Upstream Signal?	Not Present								

Minor Street:									
Approach	WestBound					EastBound			
Movement	7	8	9			10	11	12	
	L	T	R			L	T	R	
Volume	5	30	5		0.80	5	20	5	
Peak Hour Factor, PHF									
Hourly Flow Rate, HFR	6	38	6			6	25	6	
Percent Heavy Vehicles	20	20	20			20	20	20	
Number of Lanes	0	1	0			0	1	0	
Lane Configuration		LTR					LTR		
RT channelized?									
Flared Approach Storage	No					No			
Percent Grade		0					0		

Pedestrian Volumes and Adjustments

Approach				
Movement	NB	SB	WB	EB
	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane width (ft)				
walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach														
Movement	1U	NB	1	4U	SB	4	7	westBound	8	9	10	EastBound	11	12
								LTR				LTR		
Lane Configuration								LTR				LTR		
Flow Rate	6		6					50				38		
Lane Capacity	1472		1480					801				808		
v/c	0.00		0.00					0.06				0.05		
95% Queue Length	0.0		0.0					0.2				0.1		
Control Delay	7.5		7.4					9.8				9.7		
LOS	A		A					A				A		
Approach Delay	1.5		1.3					9.8				9.7		
Approach LOS								A				A		
Intersection Delay	6.1													

Step 1: MOVEMENT PRIORITIES

Major Street:									
Approach	NorthBound					SouthBound			
Priority	1U	1	2	3		4U	4	5	6
Movement	U	L	T	R		U	L	T	R
Minor Street:									

Approach Priority Movement	WestBound					EastBound		
	7 L	8 T	9 R			10 L	11 T	12 R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street: Approach Movement	1U U	NorthBound				4U U	SouthBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Volume, V_x		5	15	5		5	20	5	
Flow Rate, v_x		6	19	6		6	25	6	

Minor Street: Approach Movement	WestBound					EastBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Volume, V_x		5	30	5		5	20	5
Flow Rate, v_x		6	38	6		6	25	6

Step 3: CONFLICTING FLOW RATES

Major Street: Approach Movement	1U U	NorthBound				4U U	SouthBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Flow Rate, v_x		6	19	6		6	25	6	
Conflicting Flow, v_c,x		31				25			

Minor Street: Approach Movement	WestBound					EastBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Flow Rate, v_x		6	38	6		6	25	6
Conflicting Flow, v_c,x		91	78	22		97	78	28

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS Approach Movement	1U U	NB		SB		WestBound			EastBound		
		1 L	4U U	4 L	7 L	8 T	9 R	10 L	11 T	12 R	
t_c,base											
Single Stage		4.1		4.1	7.1	6.5	6.2	7.1	6.5	6.2	
Stage I											
Stage II											
t_c,HV		1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	
P_HV		0.20		0.20	0.20	0.20	0.20	0.20	0.20	0.20	
t_c,G					0.2	0.2	0.1	0.2	0.2	0.1	
G					0	0	0	0	0	0	
t_3,LT		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	
t_c											
Single Stage		4.30		4.30	7.30	6.70	6.40	7.30	6.70	6.40	
Stage I											
Stage II											

FOLLOW-UP HEADWAYS Approach Movement	1U U	NB		SB		WestBound			EastBound		
		1 L	4U U	4 L	7 L	8 T	9 R	10 L	11 T	12 R	
t_f,base											
t_f,HV		2.2		2.2	3.5	4.0	3.3	3.5	4.0	3.3	
P_HV		0.9		0.9	0.9	0.9	0.9	0.9	0.9	0.9	
t_f		0.20		0.20	0.20	0.20	0.20	0.20	0.20	0.20	
		2.38		2.38	3.68	4.18	3.48	3.68	4.18	3.48	

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT Approach Movement	1U U	NB		SB		WestBound			EastBound		
		1 L	4U U	4 L	7 L	8 T	9 R	10 L	11 T	12 R	
v_c,x		31		25	91	78	22	97	78	28	
t_c,x		4.30		4.30	7.30	6.70	6.40	7.30	6.70	6.40	
t_f,x		2.38		2.38	3.68	4.18	3.48	3.68	4.18	3.48	
C_p,x		1472		1480	852	779	1006	844	779	997	

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance Approach	NB	SB	WB	EB
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Movement	13	14	15	16
Pedestrian Flow Rate v_x	0	0	0	0
Lane Width, w				
Walking Speed, S_p				
Pedestrian Blockage Factor, f_pb				
Major-Street Left-Turn Movements		1	4	
Conflicting Flow, v_c,x		31	25	
Potential Capacity, c_p,x		1472	1480	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Movement Capacity, c_m,x		1472	1480	
Probability of Queue-free State, p_0,j		0.996	0.996	
Major L-Shared Probability Queue-free State, p*_0,j		0.996	0.996	
Minor-Street Right-Turn Movements		9	12	
Conflicting Flow, v_c,x		22	28	
Potential Capacity, c_p,x		1006	997	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Movement Capacity, c_m,x		1006	997	
Probability of Queue-free State, p_0,j		0.994	0.994	
Major-Street U-Turn Movements		1U	4U	
Conflicting Flow, v_c,x				
Potential Capacity, c_p,x				
Capacity Adjustment Factor, f_x				
Movement Capacity, c_m,x				
Shared L/U Capacity, c_SH				
Probability of Queue-free State, p_0,j				
Minor-Street Through Movements		8	11	
Conflicting Flow, v_c,x		78	78	
Potential Capacity, c_p,x		779	779	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Capacity Adjustment Factor, f_x		0.991	0.991	
Movement Capacity, c_m,x		772	772	
Probability of Queue-free State, p_0,j		0.951	0.968	
Minor-Street Left-Turn Movements		7	10	
Conflicting Flow, v_c,x		91	97	
Potential Capacity, c_p,x		852	844	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Major L, Minor T Adjusted Impedance Factor, p''		0.959	0.943	
Major L, Minor T Impedance Factor, p'		0.969	0.957	
Capacity Adjustment Factor, f_x		0.963	0.951	
Movement Capacity, c_m,x		821	803	

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES							
Approach		westBound				EastBound	
Movement	7	8	9		10	11	12
Lane Configuration		LTR				LTR	
Shared Flow Rate, v_y		50				38	
Movement Capacity, c_m,x	821	772	1006		803	772	997
Shared Capacity, c_SH		801				808	

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS										
Approach		NB		SB		westBound			EastBound	
Movement	1U	1	4U	4	7	8	9	10	11	12
Flow Rate		6		6	6	38	6	6	25	6
Movement Capacity		1472		1480	821	772	1006	803	772	997
Lane Configuration						LTR			LTR	
Shared Capacity						801			808	
Control Delay		7.5		7.4		9.8			9.7	

CONTROL DELAY TO RANK 1 MOVEMENTS			
Approach		NB	SB
Movement		2	5
Number of Major Street Through Lanes, N		1	1
Proportion of Rank 1 vehicles not blocked, p*_0,j		0.996	0.996
Delay to Major Left-turning Vehicles, d_MLT		7.5	7.4
Major Street Through Vehicles in Shared Lane, v_i1		19	25
Major Street Turning Vehicles in Shared Lane, v_i2		13	13
Saturation Flow Rate for Major Street Through, s_i1		1700	1700

Saturation Flow Rate for Major Street Right-Turn, s_i2
 Delay to Rank 1 Vehicles, d_Rank1

1700
 0.0

1700
 0.0

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS											
Approach	NB			SB			WestBound			EastBound	
Movement	1U	1	4U	4	7	8	9	10	11	12	
Lane Configuration							LTR			LTR	
Flow Rate		6		6		50			38		
Lane Capacity		1472		1480		801			808		
v/c		0.00		0.00		0.06			0.05		
95% Queue Length		0.0		0.0		0.2			0.1		
Control Delay		7.5		7.4		9.8			9.7		
LOS		A		A		A			A		
Approach Delay		1.5		1.3		9.8			9.7		
Approach LOS						A			A		
Intersction Delay		6.1									

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HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name: 2045-Build_AM_EastWestCorridor-ElkVale_TWSC.xtw
 Analyst: HDR
 Agency: HDR
 Date Performed: 7/3/2019
 Time Analyzed: AM - 2045 Build Cond.
 Jurisdiction: Meade County
 Analysis Year: 2045
 Project Description: Southern Meade County Corridor Study
 Units: U.S. Customary
 Intersection Name: E/W Corridor & Elk Vale R
 Major Street Direction: North-South
 East/West Street Name: East/West Corridor
 North/South Street Name: Elk Vale Rd
 Analysis Time Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:										
Approach	NorthBound					SouthBound				
Movement	1U	1	2	3		4U	4	5	6	
	U	L	T	R		U	L	T	R	
Volume		10	20					50	10	
Peak Hour Factor, PHF						0.80				
Hourly Flow Rate, HFR		13	25					63	13	
Percent Heavy Vehicles		14								
Number of Lanes	0	0	1	0		0	0	1	0	
Lane Configuration		LT							TR	
Median Type	Undivided									
Median Storage										
RT channelized?										
Left-Turn Lane Storage										
Upstream Signal?	Not Present									

Minor Street:										
Approach	WestBound					EastBound				
Movement	7	8	9		10	11	12			
	L	T	R		L	T	R			
Volume						5		25		
Peak Hour Factor, PHF						0.80				
Hourly Flow Rate, HFR						6		31		
Percent Heavy Vehicles						14		14		
Number of Lanes	0	0	0			0	1	0		
Lane Configuration							LR			
RT channelized?										
Flared Approach Storage						No		0		
Percent Grade										

Pedestrian Volumes and Adjustments

Approach	NB				SB				WB				EB			
Movement	13				14				15				16			
Flow (ped/hr)	0				0								0			
Lane width (ft)																
walking Speed (ft/sec)																
Pedestrian Blockage Factor, f_pb																

Delay, Queue Length, and Level of Service

Approach	Delay, Queue Length, and Level of Service													
Movement	1U	NB	1	4U	SB	4	7	westBound	8	9	10	EastBound	11	12
Lane Configuration			LT										LR	
Flow Rate			13										38	
Lane Capacity			1451										939	
v/c			0.01										0.04	
95% Queue Length			0.0										0.1	
Control Delay			7.5										9.0	
LOS			A										A	
Approach Delay			2.5										9.0	
Approach LOS													A	
Intersection Delay			2.9											

Step 1: MOVEMENT PRIORITIES

Major Street:										
Approach	NorthBound					SouthBound				
Priority	1U	1	2	3		4U	4	5	6	
Movement	U	L	T	R		U	L	T	R	

Minor Street:

Approach	WestBound				EastBound		
Priority	7	8	9		10	11	12
Movement	L	T	R		L	T	R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street:									
Approach	NorthBound				SouthBound				
Movement	1U	1	2	3		4U	4	5	6
	U	L	T	R		U	L	T	R
Volume, V_x		10	20				50	10	
Flow Rate, v_x		13	25				63	13	

Minor Street:									
Approach	WestBound				EastBound				
Movement		7	8	9			10	11	12
		L	T	R			L	T	R
Volume, V_x							5		25
Flow Rate, v_x							6		31

Step 3: CONFLICTING FLOW RATES

Major Street:									
Approach	NorthBound				SouthBound				
Movement	1U	1	2	3		4U	4	5	6
	U	L	T	R		U	L	T	R
Flow Rate, v_x		13	25				63	13	
Conflicting Flow, v_c,x		75							

Minor Street:									
Approach	WestBound				EastBound				
Movement		7	8	9			10	11	12
		L	T	R			L	T	R
Flow Rate, v_x							6		31
Conflicting Flow, v_c,x							119		69

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS											
Approach	NB		SB		WestBound			EastBound			
Movement	1U	1	4U	4	7	8	9	10	11	12	
	U	L	U	L	L	T	R	L	T	R	
t_c,base		4.1						7.1		6.2	
Single Stage											
Stage I											
Stage II											
t_c,HV		1.0						1.0		1.0	
P_HV		0.14						0.14		0.14	
t_c,G								0.2		0.1	
G								0		0	
t_3,LT		0.0						0.7		0.0	
t_c											
Single Stage		4.24						6.54		6.34	
Stage I											
Stage II											

FOLLOW-UP HEADWAYS											
Approach	NB		SB		WestBound			EastBound			
Movement	1U	1	4U	4	7	8	9	10	11	12	
	U	L	U	L	L	T	R	L	T	R	
t_f,base		2.2						3.5		3.3	
t_f,HV		0.9						0.9		0.9	
P_HV		0.14						0.14		0.14	
t_f		2.33						3.63		3.43	

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT											
Approach	NB		SB		WestBound			EastBound			
Movement	1U	1	4U	4	7	8	9	10	11	12	
	U	L	U	L	L	T	R	L	T	R	
v_c,x		75						119		69	
t_c,x		4.24						6.54		6.34	
t_f,x		2.33						3.63		3.43	
C_p,x		1451						849		962	

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance								
Approach	NB		SB		WB		EB	

Movement	13	14	15	16
Pedestrian Flow Rate v_x Lane Width, w Walking Speed, S_p Pedestrian Blockage Factor, f_pb	0	0		0
Major-Street Left-Turn Movements		1	4	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Movement Capacity, c_m,x Probability of Queue-free State, p_0,j Major L-Shared Probability Queue-free State, p*_0,j		75 1451 1.000 1451 0.991 0.991		
Minor-Street Right-Turn Movements		9	12	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Movement Capacity, c_m,x Probability of Queue-free State, p_0,j			69 962 1.000 962 0.968	
Major-Street U-Turn Movements		1U	4U	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Capacity Adjustment Factor, f_x Movement Capacity, c_m,x Shared L/U Capacity, c_SH Probability of Queue-free State, p_0,j				
Minor-Street Through Movements		8	11	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Capacity Adjustment Factor, f_x Movement Capacity, c_m,x Probability of Queue-free State, p_0,j				
Minor-Street Left-Turn Movements		7	10	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Major L, Minor T Adjusted Impedance Factor, p'' Major L, Minor T Impedance Factor, p' Capacity Adjustment Factor, f_x Movement Capacity, c_m,x			119 849 1.000 0.991 842	

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES											
Approach		WestBound				EastBound					
Movement	7	8	9		10	11	12				
Lane Configuration						LR					
Shared Flow Rate, v_y Movement Capacity, c_m,x Shared Capacity, c_SH					842	38 939	962				

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS												
Approach		NB			SB			WestBound			EastBound	
Movement	1U	1	4U	4	7	8	9	10	11	12		
Flow Rate Movement Capacity Lane Configuration Shared Capacity Control Delay		13 1451 LT 7.5						6 842			31 962	
									LR 939 9.0			
CONTROL DELAY TO RANK 1 MOVEMENTS												
Approach						NB		SB				
Movement						2		5				
Number of Major Street Through Lanes, N Proportion of Rank 1 vehicles not blocked, p*_0,j Delay to Major Left-turning Vehicles, d_MLT Major Street Through Vehicles in Shared Lane, v_i1 Major Street Turning Vehicles in Shared Lane, v_i2 Saturation Flow Rate for Major Street Through, s_i1						1 0.991 7.5 25 13 1700		1 1700				

Saturation Flow Rate for Major Street Right-Turn, s_i2
 Delay to Rank 1 Vehicles, d_Rank1

0.1

1700

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS

Approach Movement	1U	NB 1	4U	SB 4	7	WestBound 8	9	10	EastBound 11	12
Lane Configuration		LT							LR	
Flow Rate		13							38	
Lane Capacity		1451							939	
v/c		0.01							0.04	
95% Queue Length		0.0							0.1	
Control Delay		7.5							9.0	
LOS		A							A	
Approach Delay		2.5							9.0	
Approach LOS									A	
Intersction Delay		2.9								

This TWSC text report was created in HCS™ TWSC Version 7.8 on 9/5/2019 2:53:52 PM

HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name: 2045-Build_AM_EastWestCorridor_EricksonRaRd_TWSC.xtw
 Analyst: HDR
 Agency: HDR
 Date Performed: 7/3/2019
 Time Analyzed: AM - 2045 Build Cond.
 Jurisdiction: Meade County
 Analysis Year: 2045
 Project Description: Southern Meade County Corridor Study
 Units: U.S. Customary
 Intersection Name: E/W Corridor & Erickson R
 Major Street Direction: North-South
 East/West Street Name: East/West Corridor
 North/South Street Name: Erickson Ranch Road
 Analysis Time Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	NorthBound				SouthBound			
Approach	1U	2	3	4U	4	5	6	
Movement	U	L T	R	U	L	T	R	
Volume		65	20		15	175		
Peak Hour Factor, PHF				0.80				
Hourly Flow Rtae, HFR		81	25		19	219		
Percent Heavy Vehicles					5			
Number of Lanes	0	0	1	0	0	1	0	
Lane Configuration			TR		LT			
Median Type	Undivided							
Median Storage								
RT channelized?								
Left-Turn Lane Storage								
Upstream Signal?	Not Present							

Minor Street:	WestBound			EastBound		
Approach	7	8	9	10	11	12
Movement	L	T	R	L	T	R
Volume	65		25			
Peak Hour Factor, PHF				0.80		
Hourly Flow Rtae, HFR	81		31			
Percent Heavy Vehicles	5		5			
Number of Lanes	0	1	0	0	0	0
Lane Configuration		LR				
RT channelized?						
Flared Approach Storage	No					
Percent Grade		0				

Pedestrian Volumes and Adjustments

Approach	NB	SB	WB	EB
Movement	13	14	15	16
Flow (ped/hr)	0	0	0	
Lane width (ft)				
walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach	NB	SB	westBound	EastBound
Movement	1	4	7	11
Lane Configuration		LT	LR	
Flow Rate		19	113	
Lane Capacity		1466	697	
v/c		0.01	0.16	
95% Queue Length		0.0	0.6	
Control Delay		7.5	11.2	
LOS		A	B	
Approach Delay		0.7	11.2	
Approach LOS			B	
Intersction Delay	3.1			

Step 1: MOVEMENT PRIORITIES

Major Street:	NorthBound				SouthBound			
Approach	1U	2	3	4U	4	5	6	
Movement	U	L T	R	U	L	T	R	

Minor Street:

Approach	WestBound				EastBound		
Priority	7	8	9		10	11	12
Movement	L	T	R		L	T	R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street:									
Approach	NorthBound					SouthBound			
Movement	1U	1	2	3		4U	4	5	6
	U	L	T	R		U	L	T	R
Volume, V_x		65	20				15	175	
Flow Rate, v_x		81	25				19	219	

Minor Street:									
Approach	WestBound				EastBound				
Movement		7	8	9		10	11	12	
		L	T	R		L	T	R	
Volume, V_x		65		25					
Flow Rate, v_x		81		31					

Step 3: CONFLICTING FLOW RATES

Major Street:									
Approach	NorthBound					SouthBound			
Movement	1U	1	2	3		4U	4	5	6
	U	L	T	R		U	L	T	R
Flow Rate, v_x		81	25				19	219	
Conflicting Flow, v_c,x							106		

Minor Street:									
Approach	WestBound				EastBound				
Movement		7	8	9		10	11	12	
		L	T	R		L	T	R	
Flow Rate, v_x		81		31					
Conflicting Flow, v_c,x		350		94					

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS										
Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_c,base										
Single Stage				4.1	7.1		6.2			
Stage I										
Stage II										
t_c,HV				1.0	1.0		1.0			
P_HV				0.05	0.05		0.05			
t_c,G					0.2		0.1			
G					0		0			
t_3,LT				0.0	0.7		0.0			
t_c										
Single Stage				4.15	6.45		6.25			
Stage I										
Stage II										

FOLLOW-UP HEADWAYS										
Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_f,base				2.2	3.5		3.3			
t_f,HV				0.9	0.9		0.9			
P_HV				0.05	0.05		0.05			
t_f				2.25	3.55		3.35			

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT										
Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
v_c,x				106	350		94			
t_c,x				4.15	6.45		6.25			
t_f,x				2.25	3.55		3.35			
C_p,x				1466	641		955			

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance								
Approach	NB		SB		WB		EB	

Saturation Flow Rate for Major Street Right-Turn, s_i2
 Delay to Rank 1 Vehicles, d_Rank1

1700

0.1

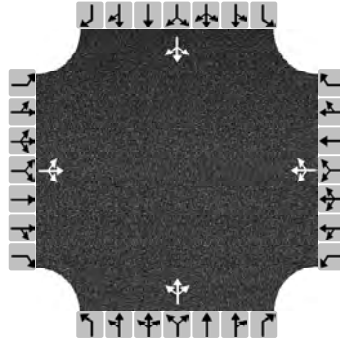
Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS											
Approach Movement	NB		SB		westBound			EastBound			
Lane Configuration	1U	1	4U	4	7	8	9	10	11	12	
				LT		LR					
Flow Rate				19		113					
Lane Capacity				1466		697					
v/c				0.01		0.16					
95% Queue Length				0.0		0.6					
Control Delay				7.5		11.2					
LOS				A		B					
Approach Delay				0.7		11.2					
Approach LOS						B					
Intersction Delay		3.1									

This TWSC text report was created in HCS™ TWSC Version 7.8 on 9/5/2019 2:51:20 PM

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst	HDR	Intersection	E/W Corridor & Haines Ave
Agency/Co.	HDR	Jurisdiction	Meade County
Date Performed	7/11/2019	East/West Street	East/West Corridor
Analysis Year	2045	North/South Street	Haines Avenue
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.80
Time Analyzed	AM - 2045 Build Conditon		
Project Description	Southern Meade County Corridor Study		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Volume	10	15	155	20	25	5	40	40	5	5	205	15
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	225			63			106			281		
Percent Heavy Vehicles	6			6			6			6		


Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.200			0.056			0.094			0.250		
Final Departure Headway, hd (s)	4.57			5.31			5.15			4.83		
Final Degree of Utilization, x	0.286			0.092			0.152			0.377		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	2.57			3.31			3.15			2.83		

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	225			63			106			281		
Capacity	788			678			699			746		
95% Queue Length, Q ₉₅ (veh)	1.2			0.3			0.5			1.8		
Control Delay (s/veh)	9.4			8.9			9.1			10.7		
Level of Service, LOS	A			A			A			B		
Approach Delay (s/veh)	9.4			8.9			9.1			10.7		
Approach LOS	A			A			A			B		
Intersection Delay, s/veh LOS	9.8						A					

HCS7 Roundabouts Report

General Information				Site Information				
Analyst	HDR				Intersection	E/W Corridor & Haines Ave		
Agency or Co.	HDR				E/W Street Name	East/West Corridor		
Date Performed	7/11/2019				N/S Street Name	Haines Avenue		
Analysis Year	2045				Analysis Time Period (hrs)	0.25		
Time Analyzed	AM - 2045 Build Condition				Peak Hour Factor	0.80		
Project Description	Southern Meade County Cor...				Jurisdiction	Meade County		

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment	LTR				LTR				LTR				LTR			
Volume (V), veh/h	0	10	15	155	0	20	25	5	0	40	40	5	0	5	205	15
Percent Heavy Vehicles, %	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Flow Rate (v_{pce}), pc/h	0	13	20	205	0	27	33	7	0	53	53	7	0	7	272	20
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		238			67			113			299	
Entry Volume, veh/h		225			63			107			282	
Circulating Flow (v_c), pc/h	306			119			40			113		
Exiting Flow (v_{ex}), pc/h	34			106			73			504		
Capacity (C_{pce}), pc/h		1010			1222			1325			1230	
Capacity (c), veh/h		953			1153			1250			1160	
v/c Ratio (x)		0.24			0.05			0.09			0.24	

Delay and Level of Service

Approach	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		6.1			3.6			3.6			5.3	
Lane LOS		A			A			A			A	
95% Queue, veh		0.9			0.2			0.3			1.0	
Approach Delay, s/veh	6.1			3.6			3.6			5.3		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	5.1						A					

HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name: 2045-Build_AM_EastWestCorridor_Haines_TWSC.xtw
 Analyst: HDR
 Agency: HDR
 Date Performed: 7/3/2019
 Time Analyzed: AM - 2045 Build Cond.
 Jurisdiction: Meade County
 Analysis Year: 2045
 Project Description: Southern Meade County Corridor Study
 Units: U.S. Customary
 Intersection Name: E/W Corridor & Haines Ave
 Major Street Direction: North-South
 East/West Street Name: East/West Corridor
 North/South Street Name: N. Haines Ave
 Analysis Time Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:									
Approach	NorthBound					SouthBound			
Movement	1U	2	3		4U	4	5	6	
	U	L	T	R		U	L	T	R
Volume		40	40	5			5	205	15
Peak Hour Factor, PHF					0.80				
Hourly Flow Rtae, HFR		50	50	6			6	256	19
Percent Heavy Vehicles		6					6		
Number of Lanes	0	0	1	0		0	0	1	0
Lane Configuration			LTR					LTR	
Median Type	Undivided								
Median Storage									
RT channelized?									
Left-Turn Lane Storage									
Upstream Signal?	Not Present								

Minor Street:									
Approach	WestBound					EastBound			
Movement	7	8	9		10	11	12		
	L	T	R		L	T	R		
Volume	20	25	5		10	15	155		
Peak Hour Factor, PHF				0.80					
Hourly Flow Rtae, HFR	25	31	6		13	19	194		
Percent Heavy Vehicles	6	6	6		6	6	6		
Number of Lanes	0	1	0		0	1	0		
Lane Configuration		LTR				LTR			
RT channelized?									
Flared Approach Storage	No				No				
Percent Grade		0				0			

Pedestrian Volumes and Adjustments

Approach				
Movement	NB	SB	WB	EB
	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane width (ft)				
walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach														
Movement	1U	NB	1	4U	SB	4	7	westBound	8	9	10	EastBound	11	12
Lane Configuration								LTR				LTR		
Flow Rate	50			6				63				225		
Lane Capacity	1265			1523				414				705		
v/c	0.04			0.00				0.15				0.32		
95% Queue Length	0.1			0.0				0.5				1.4		
Control Delay	8.0			7.4				15.2				12.5		
LOS	A			A				C				B		
Approach Delay	3.9			0.2				15.2				12.5		
Approach LOS								C				B		
Intersction Delay	6.3													

Step 1: MOVEMENT PRIORITIES

Major Street:									
Approach	NorthBound					SouthBound			
Priority	1U	2	3		4U	4	5	6	
Movement	U	L	T	R		U	L	T	R
Minor Street:									

Approach Priority Movement	WestBound					EastBound		
	7 L	8 T	9 R			10 L	11 T	12 R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street: Approach Movement	1U U	NorthBound				4U U	SouthBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Volume, V_x		40	40	5		5	205	15	
Flow Rate, v_x		50	50	6		6	256	19	

Minor Street: Approach Movement	WestBound					EastBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Volume, V_x		20	25	5		10	15	155
Flow Rate, v_x		25	31	6		13	19	194

Step 3: CONFLICTING FLOW RATES

Major Street: Approach Movement	1U U	NorthBound				4U U	SouthBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Flow Rate, v_x		50	50	6		6	256	19	
Conflicting Flow, v_c,x		275				56			

Minor Street: Approach Movement	WestBound					EastBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Flow Rate, v_x		25	31	6		13	19	194
Conflicting Flow, v_c,x		538	441	53		450	434	266

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS Approach Movement	1U U	NB		SB		WestBound			EastBound		
		1 L	4U U	4 L	7 L	8 T	9 R	10 L	11 T	12 R	
t_c,base											
Single Stage		4.1		4.1	7.1	6.5	6.2	7.1	6.5	6.2	
Stage I											
Stage II											
t_c,HV		1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	
P_HV		0.06		0.06	0.06	0.06	0.06	0.06	0.06	0.06	
t_c,G					0.2	0.2	0.1	0.2	0.2	0.1	
G					0	0	0	0	0	0	
t_3,LT		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	
t_c											
Single Stage		4.16		4.16	7.16	6.56	6.26	7.16	6.56	6.26	
Stage I											
Stage II											

FOLLOW-UP HEADWAYS Approach Movement	1U U	NB		SB		WestBound			EastBound		
		1 L	4U U	4 L	7 L	8 T	9 R	10 L	11 T	12 R	
t_f,base											
t_f,HV		2.2		2.2	3.5	4.0	3.3	3.5	4.0	3.3	
P_HV		0.9		0.9	0.9	0.9	0.9	0.9	0.9	0.9	
t_f		0.06		0.06	0.06	0.06	0.06	0.06	0.06	0.06	
		2.25		2.25	3.55	4.05	3.35	3.55	4.05	3.35	

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT Approach Movement	1U U	NB		SB		WestBound			EastBound		
		1 L	4U U	4 L	7 L	8 T	9 R	10 L	11 T	12 R	
v_c,x		275		56	538	441	53	450	434	266	
t_c,x		4.16		4.16	7.16	6.56	6.26	7.16	6.56	6.26	
t_f,x		2.25		2.25	3.55	4.05	3.35	3.55	4.05	3.35	
C_p,x		1265		1523	448	505	1003	513	509	763	

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance Approach	NB	SB	WB	EB
----------------------------------	----	----	----	----

Movement	13	14	15	16
Pedestrian Flow Rate v_x	0	0	0	0
Lane Width, w				
Walking Speed, S_p				
Pedestrian Blockage Factor, f_pb				
Major-Street Left-Turn Movements		1	4	
Conflicting Flow, v_c,x		275	56	
Potential Capacity, c_p,x		1265	1523	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Movement Capacity, c_m,x		1265	1523	
Probability of Queue-free State, p_0,j		0.960	0.996	
Major L-Shared Probability Queue-free State, p*_0,j		0.959	0.995	
Minor-Street Right-Turn Movements		9	12	
Conflicting Flow, v_c,x		53	266	
Potential Capacity, c_p,x		1003	763	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Movement Capacity, c_m,x		1003	763	
Probability of Queue-free State, p_0,j		0.994	0.746	
Major-Street U-Turn Movements		1U	4U	
Conflicting Flow, v_c,x				
Potential Capacity, c_p,x				
Capacity Adjustment Factor, f_x				
Movement Capacity, c_m,x				
Shared L/U Capacity, c_SH				
Probability of Queue-free State, p_0,j				
Minor-Street Through Movements		8	11	
Conflicting Flow, v_c,x		441	434	
Potential Capacity, c_p,x		505	509	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Capacity Adjustment Factor, f_x		0.954	0.954	
Movement Capacity, c_m,x		482	486	
Probability of Queue-free State, p_0,j		0.935	0.961	
Minor-Street Left-Turn Movements		7	10	
Conflicting Flow, v_c,x		538	450	
Potential Capacity, c_p,x		448	513	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Major L, Minor T Adjusted Impedance Factor, p''		0.918	0.893	
Major L, Minor T Impedance Factor, p'		0.937	0.918	
Capacity Adjustment Factor, f_x		0.699	0.912	
Movement Capacity, c_m,x		313	467	

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES						
Approach		WestBound			EastBound	
Movement	7	8	9		10	11
Lane Configuration		LTR				LTR
Shared Flow Rate, v_y		63				225
Movement Capacity, c_m,x	313	482	1003		467	486
Shared Capacity, c_SH		414				705

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS												
Approach		NB			SB			WestBound			EastBound	
Movement		1U	1	4U	4	7	8	9	10	11	12	
Flow Rate			50		6	25	31	6	13	19	194	
Movement Capacity			1265		1523	313	482	1003	467	486	763	
Lane Configuration							LTR			LTR		
Shared Capacity							414			705		
Control Delay			8.0		7.4		15.2			12.5		

CONTROL DELAY TO RANK 1 MOVEMENTS			
Approach		NB	SB
Movement		2	5
Number of Major Street Through Lanes, N		1	1
Proportion of Rank 1 vehicles not blocked, p*_0,j		0.959	0.995
Delay to Major Left-turning Vehicles, d_MLT		8.0	7.4
Major Street Through Vehicles in Shared Lane, v_i1		50	256
Major Street Turning Vehicles in Shared Lane, v_i2		56	25
Saturation Flow Rate for Major Street Through, s_i1		1700	1700

Saturation Flow Rate for Major Street Right-Turn, s_i2
 Delay to Rank 1 Vehicles, d_Rank1

1700
 0.3

1700
 0.0

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS											
Approach Movement	NB		SB		westBound			95% QUEUE		LENGTHS	
Lane Configuration	1U	1	4U	4	7	8	9	10	11	12	
Flow Rate	50		6		63			225			
Lane Capacity	1265		1523		414			705			
v/c	0.04		0.00		0.15			0.32			
95% Queue Length	0.1		0.0		0.5			1.4			
Control Delay	8.0		7.4		15.2			12.5			
LOS	A		A		C			B			
Approach Delay	3.9		0.2		15.2			12.5			
Approach LOS					C			B			
Intersction Delay	6.3										

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HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name: 2045-Build_AM_ElkCreek-143rd_TWSC.xtw
 Analyst: HDR
 Agency: HDR
 Date Performed: 7/3/2019
 Time Analyzed: AM - 2045 Build Cond.
 Jurisdiction: Meade County
 Analysis Year: 2045
 Project Description: Southern Meade County Corridor Study
 Units: U.S. Customary
 Intersection Name: Elk Creek & 143rd Ave
 Major Street Direction: East-West
 East/West Street Name: Elk Creek Road
 North/South Street Name: 143rd Avenue
 Analysis Time Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:									
Approach	EastBound					WestBound			
Movement	1U	2	3		4U	4	5	6	
	U	L	T	R		U	L	T	R
Volume		5	15	10			5	35	5
Peak Hour Factor, PHF					0.80				
Hourly Flow Rtae, HFR		6	19	13			6	44	6
Percent Heavy Vehicles		20					20		
Number of Lanes	0	0	1	0		0	0	1	0
Lane Configuration			LTR					LTR	
Median Type	Undivided								
Median Storage									
RT channelized?									
Left-Turn Lane Storage									
Upstream Signal?	Not Present								

Minor Street:									
Approach	NorthBound					SouthBound			
Movement	7	8	9		10	11	12		
	L	T	R		L	T	R		
Volume	5	5	5		5	5	5		
Peak Hour Factor, PHF				0.80					
Hourly Flow Rtae, HFR	6	6	6		6	6	6		
Percent Heavy Vehicles	20	20	20		20	20	20		
Number of Lanes	0	1	0		0	1	0		
Lane Configuration		LTR				LTR			
RT channelized?									
Flared Approach Storage	No				No				
Percent Grade		0				0			

Pedestrian Volumes and Adjustments

Approach	EB	WB	NB	SB
Movement	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane width (ft)				
walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach	EB	WB	NorthBound			SouthBound			
Movement	1	4U	4	7	8	9	10	11	12
Lane Configuration					LTR			LTR	
Flow Rate	6		6		19			19	
Lane Capacity	1449		1472		845			837	
v/c	0.00		0.00		0.02			0.02	
95% Queue Length	0.0		0.0		0.1			0.1	
Control Delay	7.5		7.5		9.4			9.4	
LOS	A		A		A			A	
Approach Delay	1.3		0.9		9.4			9.4	
Approach LOS					A			A	
Intersction Delay	3.4								

Step 1: MOVEMENT PRIORITIES

Major Street:									
Approach	EastBound					WestBound			
Priority	1U	2	3		4U	4	5	6	
Movement	U	L	T	R		U	L	T	R

Minor Street:

Approach Priority Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street: Approach Movement	1U U	EastBound				4U U	WestBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Volume, V_x		5	15	10		5	35	5	
Flow Rate, v_x		6	19	13		6	44	6	

Minor Street: Approach Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Volume, V_x		5	5	5		5	5	5
Flow Rate, v_x		6	6	6		6	6	6

Step 3: CONFLICTING FLOW RATES

Major Street: Approach Movement	1U U	EastBound				4U U	WestBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Flow Rate, v_x		6	19	13		6	44	6	
Conflicting Flow, v_c,x		50				31			

Minor Street: Approach Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Flow Rate, v_x		6	6	6		6	6	6
Conflicting Flow, v_c,x		103	100	25		103	103	47

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS Approach Movement	1U U	EB 1 L	4U U	WB 4 L	NorthBound			SouthBound			
					7 L	8 T	9 R	10 L	11 T	12 R	
t_c,base											
Single Stage		4.1		4.1	7.1	6.5	6.2	7.1	6.5	6.2	
Stage I											
Stage II											
t_c,HV		1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	
P_HV		0.20		0.20	0.20	0.20	0.20	0.20	0.20	0.20	
t_c,G					0.2	0.2	0.1	0.2	0.2	0.1	
G					0	0	0	0	0	0	
t_3,LT		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	
t_c											
Single Stage		4.30		4.30	7.30	6.70	6.40	7.30	6.70	6.40	
Stage I											
Stage II											

FOLLOW-UP HEADWAYS Approach Movement	1U U	EB 1 L	4U U	WB 4 L	NorthBound			SouthBound			
					7 L	8 T	9 R	10 L	11 T	12 R	
t_f,base											
t_f,HV		2.2		2.2	3.5	4.0	3.3	3.5	4.0	3.3	
P_HV		0.9		0.9	0.9	0.9	0.9	0.9	0.9	0.9	
t_f		0.20		0.20	0.20	0.20	0.20	0.20	0.20	0.20	
		2.38		2.38	3.68	4.18	3.48	3.68	4.18	3.48	

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT Approach Movement	1U U	EB 1 L	4U U	WB 4 L	NorthBound			SouthBound		
					7 L	8 T	9 R	10 L	11 T	12 R
v_c,x		50		31	103	100	25	103	103	47
t_c,x		4.30		4.30	7.30	6.70	6.40	7.30	6.70	6.40
t_f,x		2.38		2.38	3.68	4.18	3.48	3.68	4.18	3.48
C_p,x		1449		1472	836	757	1002	836	754	973

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance Approach	EB	WB	NB	SB
----------------------------------	----	----	----	----

Movement	13	14	15	16
Pedestrian Flow Rate v_x Lane Width, w Walking Speed, S_p Pedestrian Blockage Factor, f_pb	0	0	0	0
Major-Street Left-Turn Movements		1	4	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Movement Capacity, c_m,x Probability of Queue-free State, p_0,j Major L-Shared Probability Queue-free State, p*_0,j		50 1449 1.000 1449 0.996 0.996	31 1472 1.000 1472 0.996 0.996	
Minor-Street Right-Turn Movements		9	12	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Movement Capacity, c_m,x Probability of Queue-free State, p_0,j		25 1002 1.000 1002 0.994	47 973 1.000 973 0.994	
Major-Street U-Turn Movements		1U	4U	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Capacity Adjustment Factor, f_x Movement Capacity, c_m,x Shared L/U Capacity, c_SH Probability of Queue-free State, p_0,j				
Minor-Street Through Movements		8	11	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Capacity Adjustment Factor, f_x Movement Capacity, c_m,x Probability of Queue-free State, p_0,j		100 757 1.000 0.991 751 0.992	103 754 1.000 0.991 748 0.992	
Minor-Street Left-Turn Movements		7	10	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Major L, Minor T Adjusted Impedance Factor, p'' Major L, Minor T Impedance Factor, p' Capacity Adjustment Factor, f_x Movement Capacity, c_m,x		103 836 1.000 0.983 0.987 0.981 820	103 836 1.000 0.983 0.987 0.981 820	

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES						
Approach	NorthBound			SouthBound		
Movement	7	8	9	10	11	12
Lane Configuration		LTR			LTR	
Shared Flow Rate, v_y Movement Capacity, c_m,x Shared Capacity, c_SH	820	19 751 845	1002	820	19 748 837	973

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS										
Approach	EB		WB		NorthBound			SouthBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Flow Rate Movement Capacity Lane Configuration Shared Capacity Control Delay		6 1449		6 1472	6 820	6 751	6 1002	6 820	6 748	6 973
						LTR 845			LTR 837	
		7.5		7.5		9.4			9.4	

CONTROL DELAY TO RANK 1 MOVEMENTS		
Approach	EB	WB
Movement	2	5
Number of Major Street Through Lanes, N Proportion of Rank 1 vehicles not blocked, p*_0,j Delay to Major Left-turning Vehicles, d_MLT Major Street Through Vehicles in Shared Lane, v_i1 Major Street Turning Vehicles in Shared Lane, v_i2 Saturation Flow Rate for Major Street Through, s_i1	1 0.996 7.5 19 19 1700	1 0.996 7.5 44 13 1700

Saturation Flow Rate for Major Street Right-Turn, s_i2
 Delay to Rank 1 Vehicles, d_Rank1

1700
 0.0

1700
 0.0

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS											
Approach Movement	1U	EB 1	4U	WB 4	7	NorthBound 8	9	10	SouthBound 11	12	
Lane Configuration						LTR			LTR		
Flow Rate		6		6		19			19		
Lane Capacity		1449		1472		845			837		
v/c		0.00		0.00		0.02			0.02		
95% Queue Length		0.0		0.0		0.1			0.1		
Control Delay		7.5		7.5		9.4			9.4		
LOS		A		A		A			A		
Approach Delay		1.3		0.9		9.4			9.4		
Approach LOS						A			A		
Intersction Delay		3.4									

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HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name: 2045-Build_AM_ElkCreek-ElkVale_TWSC.xtw
 Analyst: HDR
 Agency: HDR
 Date Performed: 7/3/2019
 Time Analyzed: AM - 2045 Build Cond.
 Jurisdiction: Meade County
 Analysis Year: 2045
 Project Description: Southern Meade County Corridor Study
 Units: U.S. Customary
 Intersection Name: Elk Creek & Elk Vale
 Major Street Direction: North-South
 East/West Street Name: Elk Creek Road
 North/South Street Name: Elk Vale Road
 Analysis Time Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:									
Approach	NorthBound					SouthBound			
Movement	1U	2	3		4U	4	5	6	
	U	L	T	R		U	L	T	R
Volume		10	10	5			5	20	10
Peak Hour Factor, PHF					0.80				
Hourly Flow Rate, HFR		13	13	6			6	25	13
Percent Heavy Vehicles		14					14		
Number of Lanes	0	0	1	0		0	0	1	0
Lane Configuration			LTR					LTR	
Median Type	Undivided								
Median Storage									
RT channelized?									
Left-Turn Lane Storage									
Upstream Signal?	Not Present								

Minor Street:									
Approach	WestBound					EastBound			
Movement	7	8	9		10	11	12		
	L	T	R		L	T	R		
Volume	25	25	5			5	5	10	
Peak Hour Factor, PHF					0.80				
Hourly Flow Rate, HFR	31	31	6			6	6	13	
Percent Heavy Vehicles	14	14	14			14	14	14	
Number of Lanes	0	1	0			0	1	0	
Lane Configuration		LTR					LTR		
RT channelized?									
Flared Approach Storage	No					No			
Percent Grade		0					0		

Pedestrian Volumes and Adjustments

Approach				
Movement	NB	SB	WB	EB
	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane width (ft)				
walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach												
Movement	1U	NB	4U	SB	7	westBound	8	9	10	EastBound	11	12
Lane Configuration						LTR				LTR		
Flow Rate	13		6			69				25		
Lane Capacity	1499		1523			817				886		
v/c	0.01		0.00			0.08				0.03		
95% Queue Length	0.0		0.0			0.3				0.1		
Control Delay	7.4		7.4			9.8				9.2		
LOS	A		A			A				A		
Approach Delay	3.0		1.1			9.8				9.2		
Approach LOS						A				A		
Intersection Delay	6.2											

Step 1: MOVEMENT PRIORITIES

Major Street:									
Approach	NorthBound					SouthBound			
Priority	1U	2	3		4U	4	5	6	
Movement	U	L	T	R		U	L	T	R
Minor Street:									

Approach Priority Movement	WestBound					EastBound		
	7 L	8 T	9 R			10 L	11 T	12 R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street: Approach Movement	1U U	NorthBound				4U U	SouthBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Volume, V_x		10	10	5		5	20	10	
Flow Rate, v_x		13	13	6		6	25	13	

Minor Street: Approach Movement	WestBound					EastBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Volume, V_x		25	25	5		5	5	10
Flow Rate, v_x		31	31	6		6	6	13

Step 3: CONFLICTING FLOW RATES

Major Street: Approach Movement	1U U	NorthBound				4U U	SouthBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Flow Rate, v_x		13	13	6		6	25	13	
Conflicting Flow, v_c,x		38				19			

Minor Street: Approach Movement	WestBound					EastBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Flow Rate, v_x		31	31	6		6	6	13
Conflicting Flow, v_c,x		94	91	16		103	88	31

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS Approach Movement	1U U	NB	4U U	SB	4	7	WestBound		9	EastBound	
		1 L					8 T	10 L		11 T	12 R
t_c,base											
Single Stage		4.1			4.1	7.1	6.5	6.2	7.1	6.5	6.2
Stage I											
Stage II											
t_c,HV		1.0			1.0	1.0	1.0	1.0	1.0	1.0	1.0
P_HV		0.14			0.14	0.14	0.14	0.14	0.14	0.14	0.14
t_c,G					0.2	0.2	0.1	0.2	0.2	0.1	0.1
G					0	0	0	0	0	0	0
t_3,LT		0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0
t_c											
Single Stage		4.24			4.24	7.24	6.64	6.34	7.24	6.64	6.34
Stage I											
Stage II											

FOLLOW-UP HEADWAYS Approach Movement	1U U	NB	4U U	SB	4	7	WestBound		9	EastBound	
		1 L					8 T	10 L		11 T	12 R
t_f,base											
t_f,HV		2.2			2.2	3.5	4.0	3.3	3.5	4.0	3.3
P_HV		0.9			0.9	0.9	0.9	0.9	0.9	0.9	0.9
t_f		0.14			0.14	0.14	0.14	0.14	0.14	0.14	0.14
		2.33			2.33	3.63	4.13	3.43	3.63	4.13	3.43

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT Approach Movement	1U U	NB	4U U	SB	4	7	WestBound		9	EastBound	
		1 L					8 T	10 L		11 T	12 R
v_c,x		38			19	94	91	16	103	88	31
t_c,x		4.24			4.24	7.24	6.64	6.34	7.24	6.64	6.34
t_f,x		2.33			2.33	3.63	4.13	3.43	3.63	4.13	3.43
C_p,x		1499			1523	862	777	1030	850	780	1009

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance Approach	NB	SB	WB	EB
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Movement	13	14	15	16
Pedestrian Flow Rate v_x	0	0	0	0
Lane Width, w				
Walking Speed, S_p				
Pedestrian Blockage Factor, f_pb				
Major-Street Left-Turn Movements		1	4	
Conflicting Flow, v_c,x		38	19	
Potential Capacity, c_p,x		1499	1523	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Movement Capacity, c_m,x		1499	1523	
Probability of Queue-free State, p_0,j		0.992	0.996	
Major L-Shared Probability Queue-free State, p*_0,j		0.992	0.996	
Minor-Street Right-Turn Movements		9	12	
Conflicting Flow, v_c,x		16	31	
Potential Capacity, c_p,x		1030	1009	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Movement Capacity, c_m,x		1030	1009	
Probability of Queue-free State, p_0,j		0.994	0.988	
Major-Street U-Turn Movements		1U	4U	
Conflicting Flow, v_c,x				
Potential Capacity, c_p,x				
Capacity Adjustment Factor, f_x				
Movement Capacity, c_m,x				
Shared L/U Capacity, c_SH				
Probability of Queue-free State, p_0,j				
Minor-Street Through Movements		8	11	
Conflicting Flow, v_c,x		91	88	
Potential Capacity, c_p,x		777	780	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Capacity Adjustment Factor, f_x		0.987	0.987	
Movement Capacity, c_m,x		767	771	
Probability of Queue-free State, p_0,j		0.959	0.992	
Minor-Street Left-Turn Movements		7	10	
Conflicting Flow, v_c,x		94	103	
Potential Capacity, c_p,x		862	850	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Major L, Minor T Adjusted Impedance Factor, p''		0.979	0.947	
Major L, Minor T Impedance Factor, p'		0.984	0.960	
Capacity Adjustment Factor, f_x		0.972	0.954	
Movement Capacity, c_m,x		838	810	

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES						
Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
Lane Configuration		LTR			LTR	
Shared Flow Rate, v_y		69			25	
Movement Capacity, c_m,x	838	767	1030	810	771	1009
Shared Capacity, c_SH		817			886	

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS										
Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Flow Rate		13		6	31	31	6	6	6	13
Movement Capacity		1499		1523	838	767	1030	810	771	1009
Lane Configuration						LTR			LTR	
Shared Capacity						817			886	
Control Delay		7.4		7.4		9.8			9.2	

CONTROL DELAY TO RANK 1 MOVEMENTS		
Approach	NB	SB
Movement	2	5
Number of Major Street Through Lanes, N	1	1
Proportion of Rank 1 vehicles not blocked, p*_0,j	0.992	0.996
Delay to Major Left-turning Vehicles, d_MLT	7.4	7.4
Major Street Through Vehicles in Shared Lane, v_i1	13	25
Major Street Turning Vehicles in Shared Lane, v_i2	19	19
Saturation Flow Rate for Major Street Through, s_i1	1700	1700

Saturation Flow Rate for Major Street Right-Turn, s_i2
 Delay to Rank 1 Vehicles, d_Rank1

1700
 0.1

1700
 0.0

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS											
Approach	NB			SB			WestBound			EastBound	
Movement	1U	1	4U	4	7	8	9	10	11	12	
Lane Configuration							LTR			LTR	
Flow Rate		13		6		69				25	
Lane Capacity		1499		1523		817				886	
v/c		0.01		0.00		0.08				0.03	
95% Queue Length		0.0		0.0		0.3				0.1	
Control Delay		7.4		7.4		9.8				9.2	
LOS		A		A		A				A	
Approach Delay		3.0		1.1		9.8				9.2	
Approach LOS						A				A	
Intersction Delay		6.2									

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HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name: 2045-Build_AM_ElkCreek-EricksonRaRd_TWSC.xtw
 Analyst: HDR
 Agency: HDR
 Date Performed: 7/3/2019
 Time Analyzed: AM - 2045 Build Cond.
 Jurisdiction: Meade County
 Analysis Year: 2045
 Project Description: Southern Meade County Corridor Study
 Units: U.S. Customary
 Intersection Name: Elk Creek & Erickson Ra R
 Major Street Direction: East-West
 East/West Street Name: Elk Creek Road
 North/South Street Name: Erickson Ranch Road
 Analysis Time Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:									
Approach	EastBound					WestBound			
Movement	1U	2	3		4U	4	5	6	
	U	L	T	R		U	L	T	R
Volume		5	65	90			25	120	5
Peak Hour Factor, PHF					0.80				
Hourly Flow Rtae, HFR		6	81	113			31	150	6
Percent Heavy Vehicles		5					5		
Number of Lanes	0	0	1	0		0	0	1	0
Lane Configuration			LTR					LTR	
Median Type	Undivided								
Median Storage									
RT channelized?									
Left-Turn Lane Storage									
Upstream Signal?	Not Present								

Minor Street:									
Approach	NorthBound					SouthBound			
Movement	7	8	9		10	11	12		
	L	T	R		L	T	R		
Volume	80	10	10		5	10	15		
Peak Hour Factor, PHF				0.80					
Hourly Flow Rtae, HFR	100	13	13		6	13	19		
Percent Heavy Vehicles	5	5	5		5	5	5		
Number of Lanes	0	1	0		0	1	0		
Lane Configuration		LTR				LTR			
RT channelized?									
Flared Approach Storage	No				No				
Percent Grade		0				0			

Pedestrian Volumes and Adjustments

Approach	EB	WB	NB	SB
Movement	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane width (ft)				
walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach	EB	WB	NorthBound			SouthBound			
Movement	1U	4U	4	7	8	9	10	11	12
Lane Configuration					LTR			LTR	
Flow Rate	6		31		125			38	
Lane Capacity	1404		1362		559			652	
v/c	0.00		0.02		0.22			0.06	
95% Queue Length	0.0		0.1		0.9			0.2	
Control Delay	7.6		7.7		13.3			10.9	
LOS	A		A		B			B	
Approach Delay	0.3		1.4		13.3			10.9	
Approach LOS					B			B	
Intersction Delay	4.4								

Step 1: MOVEMENT PRIORITIES

Major Street:									
Approach	EastBound					WestBound			
Priority	1U	2	3		4U	4	5	6	
Movement	U	L	T	R		U	L	T	R

Minor Street:

Approach Priority Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street: Approach Movement	1U U	EastBound				4U U	WestBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Volume, V_x		5	65	90			25	120	5
Flow Rate, v_x		6	81	113			31	150	6

Minor Street: Approach Movement	NorthBound					SouthBound			
	7 L	8 T	9 R			10 L	11 T	12 R	
Volume, V_x		80	10	10			5	10	15
Flow Rate, v_x		100	13	13			6	13	19

Step 3: CONFLICTING FLOW RATES

Major Street: Approach Movement	1U U	EastBound				4U U	WestBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Flow Rate, v_x		6	81	113			31	150	6
Conflicting Flow, v_c,x		156					194		

Minor Street: Approach Movement	NorthBound					SouthBound			
	7 L	8 T	9 R			10 L	11 T	12 R	
Flow Rate, v_x		100	13	13			6	13	19
Conflicting Flow, v_c,x		381	369	138			378	422	153

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS Approach Movement	1U U	EB 1 L	4U U	WB 4 L	NorthBound			SouthBound		
					7 L	8 T	9 R	10 L	11 T	12 R
t_c,base										
Single Stage		4.1		4.1	7.1	6.5	6.2	7.1	6.5	6.2
Stage I										
Stage II										
t_c,HV		1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0
P_HV		0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05
t_c,G					0.2	0.2	0.1	0.2	0.2	0.1
G					0	0	0	0	0	0
t_3,LT		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
t_c										
Single Stage		4.15		4.15	7.15	6.55	6.25	7.15	6.55	6.25
Stage I										
Stage II										

FOLLOW-UP HEADWAYS Approach Movement	1U U	EB 1 L	4U U	WB 4 L	NorthBound			SouthBound		
					7 L	8 T	9 R	10 L	11 T	12 R
t_f,base										
t_f,HV		2.2		2.2	3.5	4.0	3.3	3.5	4.0	3.3
P_HV		0.9		0.9	0.9	0.9	0.9	0.9	0.9	0.9
t_f		0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05
t_f		2.25		2.25	3.55	4.05	3.35	3.55	4.05	3.35

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT Approach Movement	1U U	EB 1 L	4U U	WB 4 L	NorthBound			SouthBound		
					7 L	8 T	9 R	10 L	11 T	12 R
v_c,x		156		194	381	369	138	378	422	153
t_c,x		4.15		4.15	7.15	6.55	6.25	7.15	6.55	6.25
t_f,x		2.25		2.25	3.55	4.05	3.35	3.55	4.05	3.35
C_p,x		1404		1362	571	556	903	574	519	885

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance Approach	EB	WB	NB	SB
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Movement	13	14	15	16
Pedestrian Flow Rate v_x	0	0	0	0
Lane Width, w				
Walking Speed, S_p				
Pedestrian Blockage Factor, f_pb				
Major-Street Left-Turn Movements		1	4	
Conflicting Flow, v_c,x		156	194	
Potential Capacity, c_p,x		1404	1362	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Movement Capacity, c_m,x		1404	1362	
Probability of Queue-free State, p_0,j		0.996	0.977	
Major L-Shared Probability Queue-free State, p*_0,j		0.995	0.975	
Minor-Street Right-Turn Movements		9	12	
Conflicting Flow, v_c,x		138	153	
Potential Capacity, c_p,x		903	885	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Movement Capacity, c_m,x		903	885	
Probability of Queue-free State, p_0,j		0.986	0.979	
Major-Street U-Turn Movements		1U	4U	
Conflicting Flow, v_c,x				
Potential Capacity, c_p,x				
Capacity Adjustment Factor, f_x				
Movement Capacity, c_m,x				
Shared L/U Capacity, c_SH				
Probability of Queue-free State, p_0,j				
Minor-Street Through Movements		8	11	
Conflicting Flow, v_c,x		369	422	
Potential Capacity, c_p,x		556	519	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Capacity Adjustment Factor, f_x		0.970	0.970	
Movement Capacity, c_m,x		539	503	
Probability of Queue-free State, p_0,j		0.977	0.975	
Minor-Street Left-Turn Movements		7	10	
Conflicting Flow, v_c,x		381	378	
Potential Capacity, c_p,x		571	574	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Major L, Minor T Adjusted Impedance Factor, p''		0.946	0.947	
Major L, Minor T Impedance Factor, p'		0.959	0.960	
Capacity Adjustment Factor, f_x		0.938	0.946	
Movement Capacity, c_m,x		536	543	

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES						
Approach	NorthBound			SouthBound		
Movement	7	8	9	10	11	12
Lane Configuration		LTR			LTR	
Shared Flow Rate, v_y		125			38	
Movement Capacity, c_m,x	536	539	903	543	503	885
Shared Capacity, c_SH		559			652	

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS										
Approach	EB		WB		NorthBound			SouthBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Flow Rate		6		31	100	13	13	6	13	19
Movement Capacity		1404		1362	536	539	903	543	503	885
Lane Configuration						LTR			LTR	
Shared Capacity						559			652	
Control Delay		7.6		7.7		13.3			10.9	

CONTROL DELAY TO RANK 1 MOVEMENTS		
Approach	EB	WB
Movement	2	5
Number of Major Street Through Lanes, N	1	1
Proportion of Rank 1 vehicles not blocked, p*_0,j	0.995	0.975
Delay to Major Left-turning Vehicles, d_MLT	7.6	7.7
Major Street Through Vehicles in Shared Lane, v_i1	81	150
Major Street Turning Vehicles in Shared Lane, v_i2	119	38
Saturation Flow Rate for Major Street Through, s_i1	1700	1700

Saturation Flow Rate for Major Street Right-Turn, s_i2
 Delay to Rank 1 Vehicles, d_Rank1

1700
 0.0

1700
 0.2

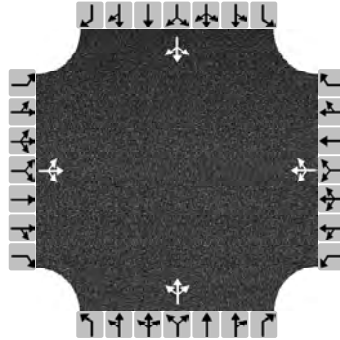
Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS											
Approach Movement	EB		WB		NorthBound			SouthBound			
Lane Configuration	1U	1	4U	4	7	8	9	10	11	12	
						LTR			LTR		
Flow Rate		6		31		125				38	
Lane Capacity		1404		1362		559				652	
v/c		0.00		0.02		0.22				0.06	
95% Queue Length		0.0		0.1		0.9				0.2	
Control Delay		7.6		7.7		13.3				10.9	
LOS		A		A		B				B	
Approach Delay		0.3		1.4		13.3				10.9	
Approach LOS						B				B	
Intersction Delay		4.4									

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HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst	HDR	Intersection	Elk Creek & Haines
Agency/Co.	HDR	Jurisdiction	Meade County
Date Performed	7/3/2019	East/West Street	Elk Creek Road
Analysis Year	2045	North/South Street	Haines Avenue
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.80
Time Analyzed	AM - 2045 Build Cond.		
Project Description	Southern Meade County Corridor Study		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Volume	10	15	75	20	20	5	40	10	10	5	35	10
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	125			56			75			63		
Percent Heavy Vehicles	6			6			6			6		

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.111			0.050			0.067			0.056		
Final Departure Headway, hd (s)	3.95			4.46			4.49			4.37		
Final Degree of Utilization, x	0.137			0.070			0.094			0.076		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	1.95			2.46			2.49			2.37		

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	125			56			75			63		
Capacity	912			807			802			824		
95% Queue Length, Q ₉₅ (veh)	0.5			0.2			0.3			0.2		
Control Delay (s/veh)	7.6			7.8			8.0			7.7		
Level of Service, LOS	A			A			A			A		
Approach Delay (s/veh)	7.6			7.8			8.0			7.7		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	7.7						A					

HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name: 2045-Build_AM_PeacefulPines-EricksonRaRd_TWSC.xtw
 Analyst: HDR
 Agency: HDR
 Date Performed: 7/3/2019
 Time Analyzed: AM - 2045 Build Cond.
 Jurisdiction: Meade County
 Analysis Year: 2045
 Project Description: Southern Meade County Corridor Study
 Units: U.S. Customary
 Intersection Name: Peaceful P & Erickson RaR
 Major Street Direction: East-West
 East/West Street Name: Peaceful Pines Road
 North/South Street Name: Erickson Ranch Road
 Analysis Time Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:										
Approach	EastBound					WestBound				
Movement	1U	1	2	3		4U	4	5	6	
	U	L	T	R		U	L	T	R	
Volume		25	40					20	55	
Peak Hour Factor, PHF						0.80				
Hourly Flow Rtae, HFR		31	50					25	69	
Percent Heavy Vehicles		3								
Number of Lanes	0	1	1	0		0	0	1	1	
Lane Configuration		L	T					T	R	
Median Type	Undivided									
Median Storage										
RT channelized?										
Left-Turn Lane Storage										
Upstream Signal?	Not Present									

Minor Street:										
Approach	NorthBound					SouthBound				
Movement	7	8	9		10	11	12			
	L	T	R		L	T	R			
Volume								165	75	
Peak Hour Factor, PHF						0.80				
Hourly Flow Rtae, HFR								206	94	
Percent Heavy Vehicles								3	3	
Number of Lanes	0	0	0					0	1	0
Lane Configuration									LR	
RT channelized?										
Flared Approach Storage								No		
Percent Grade									0	

Pedestrian Volumes and Adjustments

Approach				
Movement	EB	WB	NB	SB
	13	14	15	16
Flow (ped/hr)	0	0		0
Lane width (ft)				
walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach														
Movement	1U	EB	1	4U	WB	4	7	NorthBound	8	9	10	SouthBound	11	12
Lane Configuration			L										LR	
Flow Rate			31										300	
Lane Capacity			1495										892	
v/c			0.02										0.34	
95% Queue Length			0.1										1.5	
Control Delay			7.5										11.1	
LOS			A										B	
Approach Delay			2.9										11.1	
Approach LOS													B	
Intersction Delay			7.5											

Step 1: MOVEMENT PRIORITIES

Major Street:										
Approach	EastBound					WestBound				
Priority	1U	1	2	3		4U	4	5	6	
Movement	U	L	T	R		U	L	T	R	

Minor Street:

Approach Priority Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street: Approach Movement	1U U	EastBound				4U U	WestBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Volume, V_x		25	40			20	55		
Flow Rate, v_x		31	50			25	69		

Minor Street: Approach Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Volume, V_x						165	75	
Flow Rate, v_x						206	94	

Step 3: CONFLICTING FLOW RATES

Major Street: Approach Movement	1U U	EastBound				4U U	WestBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Flow Rate, v_x		31	50			25	69		
Conflicting Flow, v_c,x		94							

Minor Street: Approach Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Flow Rate, v_x						206	94	
Conflicting Flow, v_c,x						138	25	

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS Approach Movement	1U U	EB 1 L	4U U	WB 4 L	7 L	NorthBound			SouthBound		
						8 T	9 R		10 L	11 T	12 R
t_c,base Single Stage		4.1							7.1		6.2
Stage I											
Stage II											
t_c,HV		1.0							1.0		1.0
P_HV		0.03							0.03		0.03
t_c,G									0.2		0.1
G									0		0
t_3,LT		0.0							0.7		0.0
t_c Single Stage		4.13							6.43		6.23
Stage I											
Stage II											

FOLLOW-UP HEADWAYS Approach Movement	1U U	EB 1 L	4U U	WB 4 L	7 L	NorthBound			SouthBound		
						8 T	9 R		10 L	11 T	12 R
t_f,base		2.2							3.5		3.3
t_f,HV		0.9							0.9		0.9
P_HV		0.03							0.03		0.03
t_f		2.23							3.53		3.33

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT Approach Movement	1U U	EB 1 L	4U U	WB 4 L	7 L	NorthBound			SouthBound		
						8 T	9 R		10 L	11 T	12 R
v_c,x		94							138		25
t_c,x		4.13							6.43		6.23
t_f,x		2.23							3.53		3.33
C_p,x		1495							854		1049

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance Approach	EB	WB	NB	SB
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LOS	A	B
Approach Delay	2.9	11.1
Approach LOS		B
Intersection Delay	7.5	

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HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name: 2045-Build_PM_224th-143rd_TWSC.xtw
 Analyst: HDR
 Agency: HDR
 Date Performed: 7/3/2019
 Time Analyzed: PM - 2045 Build Cond.
 Jurisdiction: Meade County
 Analysis Year: 2045
 Project Description: Southern Meade County Corridor Study
 Units: U.S. Customary
 Intersection Name: 224th St & 143rd Ave
 Major Street Direction: East-West
 East/West Street Name: 224th Street
 North/South Street Name: 143rd Avenue
 Analysis Time Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:										
Approach	EastBound					WestBound				
Movement	1U	1	2	3		4U	4	5	6	
	U	L	T	R		U	L	T	R	
Volume		5	10					20	10	
Peak Hour Factor, PHF						0.80				
Hourly Flow Rtae, HFR		6	13					25	13	
Percent Heavy Vehicles		3								
Number of Lanes	0	0	1	0		0	0	1	0	
Lane Configuration		LT							TR	
Median Type	Undivided									
Median Storage										
RT channelized?										
Left-Turn Lane Storage										
Upstream Signal?	Not Present									

Minor Street:										
Approach	NorthBound					SouthBound				
Movement	7	8	9			10	11	12		
	L	T	R			L	T	R		
Volume						5		5		
Peak Hour Factor, PHF						0.80				
Hourly Flow Rtae, HFR						6		6		
Percent Heavy Vehicles						3		3		
Number of Lanes	0	0	0			0	1	0		
Lane Configuration							LR			
RT channelized?										
Flared Approach Storage						No		0		
Percent Grade										

Pedestrian Volumes and Adjustments

Approach	EB	WB	NB	SB
Movement	13	14	15	16
Flow (ped/hr)	0	0		0
Lane width (ft)				
walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach														
Movement	1U	EB	1	4U	WB	4	7	NorthBound	8	9	10	SouthBound	11	12
Lane Configuration			LT										LR	
Flow Rate			6										13	
Lane Capacity			1566										990	
v/c			0.00										0.01	
95% Queue Length			0.0										0.0	
Control Delay			7.3										8.7	
LOS			A										A	
Approach Delay			2.5										8.7	
Approach LOS													A	
Intersction Delay			2.2											

Step 1: MOVEMENT PRIORITIES

Major Street:										
Approach	EastBound					WestBound				
Priority	1U	1	2	3		4U	4	5	6	
Movement	U	L	T	R		U	L	T	R	

Minor Street:

Approach Priority Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street: Approach Movement	1U U	EastBound				4U U	WestBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Volume, V_x		5	10			20	10		
Flow Rate, v_x		6	13			25	13		

Minor Street: Approach Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Volume, V_x						5	5	
Flow Rate, v_x						6	6	

Step 3: CONFLICTING FLOW RATES

Major Street: Approach Movement	1U U	EastBound				4U U	WestBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Flow Rate, v_x		6	13			25	13		
Conflicting Flow, v_c,x		38							

Minor Street: Approach Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Flow Rate, v_x						6	6	
Conflicting Flow, v_c,x						56	31	

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS Approach Movement	1U U	EB 1 L	4U U	WB 4 L	7 L	NorthBound			SouthBound		
						8 T	9 R		10 L	11 T	12 R
t_c,base Single Stage		4.1							7.1		6.2
Stage I											
Stage II											
t_c,HV		1.0							1.0		1.0
P_HV		0.03							0.03		0.03
t_c,G									0.2		0.1
G									0		0
t_3,LT		0.0							0.7		0.0
t_c Single Stage		4.13							6.43		6.23
Stage I											
Stage II											

FOLLOW-UP HEADWAYS Approach Movement	1U U	EB 1 L	4U U	WB 4 L	7 L	NorthBound			SouthBound		
						8 T	9 R		10 L	11 T	12 R
t_f,base		2.2							3.5		3.3
t_f,HV		0.9							0.9		0.9
P_HV		0.03							0.03		0.03
t_f		2.23							3.53		3.33

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT Approach Movement	1U U	EB 1 L	4U U	WB 4 L	7 L	NorthBound			SouthBound		
						8 T	9 R		10 L	11 T	12 R
v_c,x		38							56		31
t_c,x		4.13							6.43		6.23
t_f,x		2.23							3.53		3.33
C_p,x		1566							949		1040

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance Approach	EB	WB	NB	SB
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Movement	13	14	15	16
Pedestrian Flow Rate v_x Lane Width, w Walking Speed, S_p Pedestrian Blockage Factor, f_pb	0	0		0
Major-Street Left-Turn Movements		1	4	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Movement Capacity, c_m,x Probability of Queue-free State, p_0,j Major L-Shared Probability Queue-free State, p*_0,j		38 1566 1.000 1566 0.996 0.996		
Minor-Street Right-Turn Movements		9	12	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Movement Capacity, c_m,x Probability of Queue-free State, p_0,j			31 1040 1.000 1040 0.994	
Major-Street U-Turn Movements		1U	4U	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Capacity Adjustment Factor, f_x Movement Capacity, c_m,x Shared L/U Capacity, c_SH Probability of Queue-free State, p_0,j				
Minor-Street Through Movements		8	11	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Capacity Adjustment Factor, f_x Movement Capacity, c_m,x Probability of Queue-free State, p_0,j				
Minor-Street Left-Turn Movements		7	10	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Major L, Minor T Adjusted Impedance Factor, p'' Major L, Minor T Impedance Factor, p' Capacity Adjustment Factor, f_x Movement Capacity, c_m,x			56 949 1.000 0.996 945	

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES											
Approach	NorthBound						SouthBound				
Movement	7	8	9				10	11	12		
Lane Configuration								LR			
Shared Flow Rate, v_y Movement Capacity, c_m,x Shared Capacity, c_SH							945	13 990	1040		

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS												
Approach	EB			WB			NorthBound			SouthBound		
Movement	1U	1	4U	4	7	8	9	10	11	12		
Flow Rate Movement Capacity Lane Configuration Shared Capacity Control Delay		6 1566 LT 7.3						6 945		6 1040		
									LR 990 8.7			

CONTROL DELAY TO RANK 1 MOVEMENTS												
Approach							EB			WB		
Movement							2			5		
Number of Major Street Through Lanes, N Proportion of Rank 1 vehicles not blocked, p*_0,j Delay to Major Left-turning Vehicles, d_MLT Major Street Through Vehicles in Shared Lane, v_i1 Major Street Turning Vehicles in Shared Lane, v_i2 Saturation Flow Rate for Major Street Through, s_i1							1 0.996 7.3 13 6 1700			1 1700		

Saturation Flow Rate for Major Street Right-Turn, s_i2
 Delay to Rank 1 Vehicles, d_Rank1

0.0

1700

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS											
Approach	EB		WB		NorthBound			SouthBound			
Movement	1U	1	4U	4	7	8	9	10	11	12	
Lane Configuration		LT							LR		
Flow Rate		6									13
Lane Capacity		1566									990
v/c		0.00									0.01
95% Queue Length		0.0									0.0
Control Delay		7.3									8.7
LOS		A									A
Approach Delay		2.5									8.7
Approach LOS											A
Intersction Delay		2.2									

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HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name: 2045-Build_PM_EastWestCorridor-143rd_TWSC.xtw
 Analyst: HDR
 Agency: HDR
 Date Performed: 7/3/2019
 Time Analyzed: AM - 2045 Build Cond.
 Jurisdiction: Meade County
 Analysis Year: 2045
 Project Description: Southern Meade County Corridor Study
 Units: U.S. Customary
 Intersection Name: E/W Corridor & 143rd Ave
 Major Street Direction: North-South
 East/West Street Name: East/West Corridor
 North/South Street Name: 143rd Ave
 Analysis Time Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:										
Approach	NorthBound					SouthBound				
Movement	1U	1	2	3		4U	4	5	6	
	U	L	T	R		U	L	T	R	
Volume		5	15	5			5	15	5	
Peak Hour Factor, PHF					0.80					
Hourly Flow Rtae, HFR		6	19	6			6	19	6	
Percent Heavy Vehicles		20					20			
Number of Lanes	0	0	1	0		0	0	1	0	
Lane Configuration			LTR					LTR		
Median Type	Undivided									
Median Storage										
RT channelized?										
Left-Turn Lane Storage										
Upstream Signal?	Not Present									

Minor Street:										
Approach	WestBound					EastBound				
Movement	7	8	9		10	11	12			
	L	T	R		L	T	R			
Volume	5	20	5		5	35	5			
Peak Hour Factor, PHF				0.80						
Hourly Flow Rtae, HFR	6	25	6		6	44	6			
Percent Heavy Vehicles	20	20	20		20	20	20			
Number of Lanes	0	1	0		0	1	0			
Lane Configuration		LTR				LTR				
RT channelized?										
Flared Approach Storage	No				No					
Percent Grade		0				0				

Pedestrian Volumes and Adjustments

Approach				
Movement	NB	SB	WB	EB
	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane width (ft)				
walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach														
Movement	1U	NB	1	4U	SB	4	7	westBound	8	9	10	EastBound	11	12
Lane Configuration								LTR				LTR		
Flow Rate	6		6					38				56		
Lane Capacity	1480		1480					813				804		
v/c	0.00		0.00					0.05				0.07		
95% Queue Length	0.0		0.0					0.1				0.2		
Control Delay	7.4		7.4					9.6				9.8		
LOS	A		A					A				A		
Approach Delay	1.5		1.5					9.6				9.8		
Approach LOS								A				A		
Intersction Delay	6.5													

Step 1: MOVEMENT PRIORITIES

Major Street:										
Approach	NorthBound					SouthBound				
Priority	1U	1	2	3		4U	4	5	6	
Movement	U	L	T	R		U	L	T	R	

Minor Street:

Approach Priority Movement	WestBound					EastBound		
	7 L	8 T	9 R			10 L	11 T	12 R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street: Approach Movement	1U U	NorthBound				4U U	SouthBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Volume, V_x		5	15	5		5	15	5	
Flow Rate, v_x		6	19	6		6	19	6	

Minor Street: Approach Movement	WestBound					EastBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Volume, V_x		5	20	5		5	35	5
Flow Rate, v_x		6	25	6		6	44	6

Step 3: CONFLICTING FLOW RATES

Major Street: Approach Movement	1U U	NorthBound				4U U	SouthBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Flow Rate, v_x		6	19	6		6	19	6	
Conflicting Flow, v_c,x		25				25			

Minor Street: Approach Movement	WestBound					EastBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Flow Rate, v_x		6	25	6		6	44	6
Conflicting Flow, v_c,x		94	72	22		84	72	22

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS Approach Movement	1U U	NB		SB		WestBound			EastBound		
		1 L	4U U	4 L	7 L	8 T	9 R	10 L	11 T	12 R	
t_c,base											
Single Stage		4.1		4.1	7.1	6.5	6.2	7.1	6.5	6.2	
Stage I											
Stage II											
t_c,HV		1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	
P_HV		0.20		0.20	0.20	0.20	0.20	0.20	0.20	0.20	
t_c,G					0.2	0.2	0.1	0.2	0.2	0.1	
G					0	0	0	0	0	0	
t_3,LT		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	
t_c											
Single Stage		4.30		4.30	7.30	6.70	6.40	7.30	6.70	6.40	
Stage I											
Stage II											

FOLLOW-UP HEADWAYS Approach Movement	1U U	NB		SB		WestBound			EastBound		
		1 L	4U U	4 L	7 L	8 T	9 R	10 L	11 T	12 R	
t_f,base											
t_f,HV		2.2		2.2	3.5	4.0	3.3	3.5	4.0	3.3	
P_HV		0.9		0.9	0.9	0.9	0.9	0.9	0.9	0.9	
t_f		0.20		0.20	0.20	0.20	0.20	0.20	0.20	0.20	
		2.38		2.38	3.68	4.18	3.48	3.68	4.18	3.48	

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT Approach Movement	1U U	NB		SB		WestBound			EastBound		
		1 L	4U U	4 L	7 L	8 T	9 R	10 L	11 T	12 R	
v_c,x		25		25	94	72	22	84	72	22	
t_c,x		4.30		4.30	7.30	6.70	6.40	7.30	6.70	6.40	
t_f,x		2.38		2.38	3.68	4.18	3.48	3.68	4.18	3.48	
C_p,x		1480		1480	848	785	1006	860	785	1006	

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance Approach	NB	SB	WB	EB
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Movement	13	14	15	16
Pedestrian Flow Rate v_x	0	0	0	0
Lane Width, w				
Walking Speed, S_p				
Pedestrian Blockage Factor, f_pb				
Major-Street Left-Turn Movements		1	4	
Conflicting Flow, v_c,x		25	25	
Potential Capacity, c_p,x		1480	1480	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Movement Capacity, c_m,x		1480	1480	
Probability of Queue-free State, p_0,j		0.996	0.996	
Major L-Shared Probability Queue-free State, p*_0,j		0.996	0.996	
Minor-Street Right-Turn Movements		9	12	
Conflicting Flow, v_c,x		22	22	
Potential Capacity, c_p,x		1006	1006	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Movement Capacity, c_m,x		1006	1006	
Probability of Queue-free State, p_0,j		0.994	0.994	
Major-Street U-Turn Movements		1U	4U	
Conflicting Flow, v_c,x				
Potential Capacity, c_p,x				
Capacity Adjustment Factor, f_x				
Movement Capacity, c_m,x				
Shared L/U Capacity, c_SH				
Probability of Queue-free State, p_0,j				
Minor-Street Through Movements		8	11	
Conflicting Flow, v_c,x		72	72	
Potential Capacity, c_p,x		785	785	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Capacity Adjustment Factor, f_x		0.991	0.991	
Movement Capacity, c_m,x		779	779	
Probability of Queue-free State, p_0,j		0.968	0.944	
Minor-Street Left-Turn Movements		7	10	
Conflicting Flow, v_c,x		94	84	
Potential Capacity, c_p,x		848	860	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Major L, Minor T Adjusted Impedance Factor, p''		0.936	0.960	
Major L, Minor T Impedance Factor, p'		0.951	0.969	
Capacity Adjustment Factor, f_x		0.945	0.963	
Movement Capacity, c_m,x		802	829	

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES						
Approach	westBound			EastBound		
Movement	7	8	9	10	11	12
Lane Configuration		LTR			LTR	
Shared Flow Rate, v_y		38			56	
Movement Capacity, c_m,x	802	779	1006	829	779	1006
Shared Capacity, c_SH		813			804	

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS										
Approach	NB		SB		westBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Flow Rate		6		6	6	25	6	6	44	6
Movement Capacity		1480		1480	802	779	1006	829	779	1006
Lane Configuration						LTR			LTR	
Shared Capacity						813			804	
Control Delay		7.4		7.4		9.6			9.8	

CONTROL DELAY TO RANK 1 MOVEMENTS		
Approach	NB	SB
Movement	2	5
Number of Major Street Through Lanes, N	1	1
Proportion of Rank 1 vehicles not blocked, p*_0,j	0.996	0.996
Delay to Major Left-turning Vehicles, d_MLT	7.4	7.4
Major Street Through Vehicles in Shared Lane, v_i1	19	19
Major Street Turning Vehicles in Shared Lane, v_i2	13	13
Saturation Flow Rate for Major Street Through, s_i1	1700	1700

Saturation Flow Rate for Major Street Right-Turn, s_i2
 Delay to Rank 1 Vehicles, d_Rank1

1700
 0.0

1700
 0.0

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS											
Approach Movement	NB		SB		westBound			95% QUEUE		LENGTHS	
Lane Configuration	1U	1	4U	4	7	8	9	10	11	12	
Flow Rate	6		6		38			56			
Lane Capacity	1480		1480		813			804			
v/c	0.00		0.00		0.05			0.07			
95% Queue Length	0.0		0.0		0.1			0.2			
Control Delay	7.4		7.4		9.6			9.8			
LOS	A		A		A			A			
Approach Delay	1.5		1.5		9.6			9.8			
Approach LOS					A			A			
Intersction Delay	6.5										

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HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name: 2045-Build_PM_EastWestCorridor-ElkVale_TWSC.xtw
 Analyst: HDR
 Agency: HDR
 Date Performed: 7/3/2019
 Time Analyzed: PM - 2045 Build Cond.
 Jurisdiction: Meade County
 Analysis Year: 2045
 Project Description: Southern Meade County Corridor Study
 Units: U.S. Customary
 Intersection Name: E/W Corridor & Elk Vale R
 Major Street Direction: North-South
 East/West Street Name: East/West Corridor
 North/South Street Name: Elk Vale Rd
 Analysis Time Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:									
Approach	NorthBound					SouthBound			
Movement	1U	2	3		4U	4	5	6	
	U	L	T	R		U	L	T	R
Volume		25	45					25	5
Peak Hour Factor, PHF					0.80				
Hourly Flow Rtae, HFR		31	56					31	6
Percent Heavy Vehicles		14							
Number of Lanes	0	0	1	0		0	0	1	0
Lane Configuration		LT							TR
Median Type	Undivided								
Median Storage									
RT channelized?									
Left-Turn Lane Storage									
Upstream Signal?	Not Present								

Minor Street:									
Approach	WestBound					EastBound			
Movement	7	8	9		10	11	12		
	L	T	R		L	T	R		
Volume								10	15
Peak Hour Factor, PHF					0.80				
Hourly Flow Rtae, HFR								13	19
Percent Heavy Vehicles								14	14
Number of Lanes	0	0	0					0	1
Lane Configuration									LR
RT channelized?									
Flared Approach Storage								No	
Percent Grade									0

Pedestrian Volumes and Adjustments

Approach				
Movement	NB	SB	WB	EB
	13	14	15	16
Flow (ped/hr)	0	0		0
Lane width (ft)				
walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach												
Movement	1U	NB	4U	SB	7	westBound	8	9	10	EastBound	11	12
Lane Configuration		LT									LR	
Flow Rate		31									31	
Lane Capacity		1499									908	
v/c		0.02									0.03	
95% Queue Length		0.1									0.1	
Control Delay		7.5									9.1	
LOS		A									A	
Approach Delay		2.8									9.1	
Approach LOS											A	
Intersction Delay		3.4										

Step 1: MOVEMENT PRIORITIES

Major Street:									
Approach	NorthBound					SouthBound			
Priority	1U	2	3		4U	4	5	6	
Movement	U	L	T	R		U	L	T	R

Minor Street:

Approach Priority Movement	WestBound					EastBound		
	7 L	8 T	9 R			10 L	11 T	12 R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street: Approach Movement	1U U	NorthBound				4U U	SouthBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Volume, V_x		25	45				25	5	
Flow Rate, v_x		31	56				31	6	

Minor Street: Approach Movement	WestBound					EastBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Volume, V_x						10	15	
Flow Rate, v_x						13	19	

Step 3: CONFLICTING FLOW RATES

Major Street: Approach Movement	1U U	NorthBound				4U U	SouthBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Flow Rate, v_x		31	56				31	6	
Conflicting Flow, v_c,x		38							

Minor Street: Approach Movement	WestBound					EastBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Flow Rate, v_x						13	19	
Conflicting Flow, v_c,x						153	34	

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS Approach Movement	1U U	NB	4U U	SB	7 L	WestBound		9 R	EastBound		12 R
		1 L		4 L		8 T	10 L		11 T		
t_c,base											
Single Stage		4.1							7.1		6.2
Stage I											
Stage II											
t_c,HV		1.0							1.0		1.0
P_HV		0.14							0.14		0.14
t_c,G									0.2		0.1
G									0		0
t_3,LT		0.0							0.7		0.0
t_c											
Single Stage		4.24							6.54		6.34
Stage I											
Stage II											

FOLLOW-UP HEADWAYS Approach Movement	1U U	NB	4U U	SB	7 L	WestBound		9 R	EastBound		12 R
		1 L		4 L		8 T	10 L		11 T		
t_f,base											
t_f,HV		2.2							3.5		3.3
P_HV		0.9							0.9		0.9
t_f		0.14							0.14		0.14
		2.33							3.63		3.43

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT Approach Movement	1U U	NB	4U U	SB	7 L	WestBound		9 R	EastBound		12 R
		1 L		4 L		8 T	10 L		11 T		
v_c,x		38							153		34
t_c,x		4.24							6.54		6.34
t_f,x		2.33							3.63		3.43
C_p,x		1499							811		1005

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance Approach	NB	SB	WB	EB
----------------------------------	----	----	----	----

Movement	13	14	15	16
Pedestrian Flow Rate v_x Lane Width, w Walking Speed, S_p Pedestrian Blockage Factor, f_pb	0	0		0
Major-Street Left-Turn Movements		1	4	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Movement Capacity, c_m,x Probability of Queue-free State, p_0,j Major L-Shared Probability Queue-free State, p*_0,j		38 1499 1.000 1499 0.979 0.978		
Minor-Street Right-Turn Movements		9	12	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Movement Capacity, c_m,x Probability of Queue-free State, p_0,j			34 1005 1.000 1005 0.981	
Major-Street U-Turn Movements		1U	4U	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Capacity Adjustment Factor, f_x Movement Capacity, c_m,x Shared L/U Capacity, c_SH Probability of Queue-free State, p_0,j				
Minor-Street Through Movements		8	11	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Capacity Adjustment Factor, f_x Movement Capacity, c_m,x Probability of Queue-free State, p_0,j				
Minor-Street Left-Turn Movements		7	10	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Major L, Minor T Adjusted Impedance Factor, p'' Major L, Minor T Impedance Factor, p' Capacity Adjustment Factor, f_x Movement Capacity, c_m,x			153 811 1.000 0.978 794	

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES											
Approach		7	WestBound	8	9		10	EastBound	11	12	
Movement									LR		
Lane Configuration											
Shared Flow Rate, v_y Movement Capacity, c_m,x Shared Capacity, c_SH							794		31 908		1005

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS															
Approach			NB	1	4U	SB	4	7	WestBound	8	9	10	EastBound	11	12
Movement		1U													
Flow Rate Movement Capacity Lane Configuration Shared Capacity Control Delay				31 1499 LT 7.5								13 794			19 1005
													LR 908 9.1		

CONTROL DELAY TO RANK 1 MOVEMENTS															
Approach							NB					SB			
Movement							2					5			
Number of Major Street Through Lanes, N Proportion of Rank 1 vehicles not blocked, p*_0,j Delay to Major Left-turning Vehicles, d_MLT Major Street Through Vehicles in Shared Lane, v_i1 Major Street Turning Vehicles in Shared Lane, v_i2 Saturation Flow Rate for Major Street Through, s_i1													1 0.978 7.5 56 31 1700		1 1700

Saturation Flow Rate for Major Street Right-Turn, s_i2
 Delay to Rank 1 Vehicles, d_Rank1

0.2

1700

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS

Approach Movement	1U	NB 1	4U	SB 4	7	WestBound 8	9	10	EastBound 11	12
Lane Configuration		LT							LR	
Flow Rate		31							31	
Lane Capacity		1499							908	
v/c		0.02							0.03	
95% Queue Length		0.1							0.1	
Control Delay		7.5							9.1	
LOS		A							A	
Approach Delay		2.8							9.1	
Approach LOS									A	
Intersction Delay		3.4								

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HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name: 2045-Build_PM_EastWestCorridor_EricksonRaRd_TWSC.xtw
 Analyst: HDR
 Agency: HDR
 Date Performed: 7/3/2019
 Time Analyzed: PM - 2045 Build Cond.
 Jurisdiction: Meade County
 Analysis Year: 2045
 Project Description: Southern Meade County Corridor Study
 Units: U.S. Customary
 Intersection Name: E/W Corridor & Erickson R
 Major Street Direction: North-South
 East/West Street Name: East/West Corridor
 North/South Street Name: Erickson Ranch Road
 Analysis Time Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	NorthBound				SouthBound			
Approach	1U	2	3	4U	4	5	6	
Movement	U	L T	R	U	L	T	R	
Volume		100	75		35	55		
Peak Hour Factor, PHF				0.80				
Hourly Flow Rtae, HFR		125	94		44	69		
Percent Heavy Vehicles					5			
Number of Lanes	0	0	1	0	0	1	0	
Lane Configuration			TR		LT			
Median Type	Undivided							
Median Storage								
RT channelized?								
Left-Turn Lane Storage								
Upstream Signal?	Not Present							

Minor Street:	WestBound			EastBound		
Approach	7	8	9	10	11	12
Movement	L	T	R	L	T	R
Volume	10		20			
Peak Hour Factor, PHF				0.80		
Hourly Flow Rtae, HFR	13		25			
Percent Heavy Vehicles	5		5			
Number of Lanes	0	1	0	0	0	0
Lane Configuration		LR				
RT channelized?						
Flared Approach Storage	No					
Percent Grade		0				

Pedestrian Volumes and Adjustments

Approach	NB	SB	WB	EB
Movement	13	14	15	16
Flow (ped/hr)	0	0	0	
Lane width (ft)				
walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach	NB	SB	westBound	EastBound
Movement	1U	4U	8	11
Lane Configuration	1	4	LT	LR
Flow Rate		44	38	
Lane Capacity		1333	773	
v/c		0.03	0.05	
95% Queue Length		0.1	0.2	
Control Delay		7.8	9.9	
LOS		A	A	
Approach Delay		3.2	9.9	
Approach LOS			A	
Intersction Delay	2.0			

Step 1: MOVEMENT PRIORITIES

Major Street:	NorthBound				SouthBound			
Approach	1U	2	3	4U	4	5	6	
Priority	U	L T	R	U	L	T	R	

Minor Street:

Approach	WestBound				EastBound		
Priority	7	8	9		10	11	12
Movement	L	T	R		L	T	R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street:									
Approach	NorthBound					SouthBound			
Movement	1U	1	2	3		4U	4	5	6
	U	L	T	R		U	L	T	R
Volume, V_x		100	75			35	55		
Flow Rate, v_x		125	94			44	69		

Minor Street:									
Approach	WestBound				EastBound				
Movement		7	8	9		10	11	12	
		L	T	R		L	T	R	
Volume, V_x		10	20						
Flow Rate, v_x		13	25						

Step 3: CONFLICTING FLOW RATES

Major Street:									
Approach	NorthBound					SouthBound			
Movement	1U	1	2	3		4U	4	5	6
	U	L	T	R		U	L	T	R
Flow Rate, v_x		125	94			44	69		
Conflicting Flow, v_c,x						219			

Minor Street:									
Approach	WestBound				EastBound				
Movement		7	8	9		10	11	12	
		L	T	R		L	T	R	
Flow Rate, v_x		13	25						
Conflicting Flow, v_c,x		328	172						

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS											
Approach	NB		SB		WestBound			EastBound			
Movement	1U	1	4U	4	7	8	9	10	11	12	
	U	L	U	L	L	T	R	L	T	R	
t_c,base											
Single Stage				4.1	7.1		6.2				
Stage I											
Stage II											
t_c,HV				1.0	1.0		1.0				
P_HV				0.05	0.05		0.05				
t_c,G					0.2		0.1				
G					0		0				
t_3,LT				0.0	0.7		0.0				
t_c											
Single Stage				4.15	6.45		6.25				
Stage I											
Stage II											

FOLLOW-UP HEADWAYS											
Approach	NB		SB		WestBound			EastBound			
Movement	1U	1	4U	4	7	8	9	10	11	12	
	U	L	U	L	L	T	R	L	T	R	
t_f,base				2.2	3.5		3.3				
t_f,HV				0.9	0.9		0.9				
P_HV				0.05	0.05		0.05				
t_f				2.25	3.55		3.35				

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT											
Approach	NB		SB		WestBound			EastBound			
Movement	1U	1	4U	4	7	8	9	10	11	12	
	U	L	U	L	L	T	R	L	T	R	
v_c,x				219	328		172				
t_c,x				4.15	6.45		6.25				
t_f,x				2.25	3.55		3.35				
C_p,x				1333	660		864				

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance								
Approach	NB		SB		WB		EB	

Movement	13	14	15	16
Pedestrian Flow Rate v_x Lane Width, w Walking Speed, S_p Pedestrian Blockage Factor, f_pb	0	0	0	
Major-Street Left-Turn Movements		1	4	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Movement Capacity, c_m,x Probability of Queue-free State, p_0,j Major L-Shared Probability Queue-free State, p*_0,j			219 1333 1.000 1333 0.967 0.966	
Minor-Street Right-Turn Movements		9	12	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Movement Capacity, c_m,x Probability of Queue-free State, p_0,j		172 864 1.000 864 0.971		
Major-Street U-Turn Movements		1U	4U	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Capacity Adjustment Factor, f_x Movement Capacity, c_m,x Shared L/U Capacity, c_SH Probability of Queue-free State, p_0,j				
Minor-Street Through Movements		8	11	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Capacity Adjustment Factor, f_x Movement Capacity, c_m,x Probability of Queue-free State, p_0,j				
Minor-Street Left-Turn Movements		7	10	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Major L, Minor T Adjusted Impedance Factor, p'' Major L, Minor T Impedance Factor, p' Capacity Adjustment Factor, f_x Movement Capacity, c_m,x		328 660 1.000 0.966 638		

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES											
Approach		westBound				EastBound					
Movement	7	8	9		10	11	12				
Lane Configuration		LR									
Shared Flow Rate, v_y Movement Capacity, c_m,x Shared Capacity, c_SH	638	38 773	864								

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS												
Approach		NB			SB			westBound			EastBound	
Movement	1U	1	4U	4	7	8	9	10	11	12		
Flow Rate Movement Capacity Lane Configuration Shared Capacity Control Delay	44 1333 LT 7.8	13 638					25 864					
						LR 773 9.9						

CONTROL DELAY TO RANK 1 MOVEMENTS											
Approach		NB			SB						
Movement		2	5								
Number of Major Street Through Lanes, N Proportion of Rank 1 vehicles not blocked, p*_0,j Delay to Major Left-turning Vehicles, d_MLT Major Street Through Vehicles in Shared Lane, v_i1 Major Street Turning Vehicles in Shared Lane, v_i2 Saturation Flow Rate for Major Street Through, s_i1		1	1						0.966 7.8 69 44 1700		

Saturation Flow Rate for Major Street Right-Turn, s_i2
 Delay to Rank 1 Vehicles, d_Rank1

1700

0.3

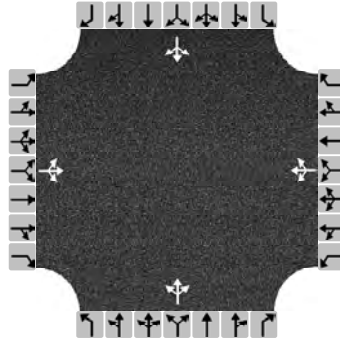
Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS											
Approach	NB		SB		westBound			EastBound			
Movement	1U	1	4U	4	7	8	9	10	11	12	
Lane Configuration				LT		LR					
Flow Rate				44		38					
Lane Capacity				1333		773					
v/c				0.03		0.05					
95% Queue Length				0.1		0.2					
Control Delay				7.8		9.9					
LOS				A		A					
Approach Delay				3.2		9.9					
Approach LOS						A					
Intersction Delay		2.0									

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HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst	HDR	Intersection	E/W Corridor & Haines Ave
Agency/Co.	HDR	Jurisdiction	Meade County
Date Performed	7/11/2019	East/West Street	East/West Corridor
Analysis Year	2045	North/South Street	Haines Avenue
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.80
Time Analyzed	PM - 2045 Build Conditon		
Project Description	Southern Meade County Corridor Study		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Volume	15	25	40	5	15	5	145	185	20	5	65	10
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	100			31			438			100		
Percent Heavy Vehicles	6			6			6			6		


Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.089			0.028			0.389			0.089		
Final Departure Headway, hd (s)	5.06			5.36			4.53			4.79		
Final Degree of Utilization, x	0.141			0.046			0.550			0.133		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	3.06			3.36			2.53			2.79		

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	100			31			438			100		
Capacity	712			672			795			751		
95% Queue Length, Q ₉₅ (veh)	0.5			0.1			3.4			0.5		
Control Delay (s/veh)	8.9			8.6			12.9			8.5		
Level of Service, LOS	A			A			B			A		
Approach Delay (s/veh)	8.9			8.6			12.9			8.5		
Approach LOS	A			A			B			A		
Intersection Delay, s/veh LOS	11.5						B					

HCS7 Roundabouts Report

General Information				Site Information				
Analyst	HDR				Intersection	E/W Corridor & Haines Ave		
Agency or Co.	HDR				E/W Street Name	East/West Corridor		
Date Performed	7/11/2019				N/S Street Name	Haines Avenue		
Analysis Year	2045				Analysis Time Period (hrs)	0.25		
Time Analyzed	PM - 2045 Build Condition				Peak Hour Factor	0.80		
Project Description	Southern Meade County Cor...				Jurisdiction	Meade County		

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment	LTR				LTR				LTR				LTR			
Volume (V), veh/h	0	15	25	40	0	5	15	5	0	145	185	20	0	5	65	10
Percent Heavy Vehicles, %	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Flow Rate (v_{pce}), pc/h	0	20	33	53	0	7	20	7	0	192	245	27	0	7	86	13
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		106			34			464			106	
Entry Volume, veh/h		100			32			438			100	
Circulating Flow (v_c), pc/h		100			457			60			219	
Exiting Flow (v_{ex}), pc/h		67			225			272			146	
Capacity (C_{pce}), pc/h		1246			866			1298			1104	
Capacity (c), veh/h		1176			817			1225			1041	
v/c Ratio (x)		0.09			0.04			0.36			0.10	

Delay and Level of Service

Approach	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.8			4.8			6.4			4.3	
Lane LOS		A			A			A			A	
95% Queue, veh		0.3			0.1			1.6			0.3	
Approach Delay, s/veh		3.8			4.8			6.4			4.3	
Approach LOS		A			A			A			A	
Intersection Delay, s/veh LOS	5.6						A					

HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name: 2045-Build_PM_EastWestCorridor_Haines_TWSC.xtw
 Analyst: HDR
 Agency: HDR
 Date Performed: 7/3/2019
 Time Analyzed: PM - 2045 Build Cond.
 Jurisdiction: Meade County
 Analysis Year: 2045
 Project Description: Southern Meade County Corridor Study
 Units: U.S. Customary
 Intersection Name: E/W Corridor & Haines Ave
 Major Street Direction: North-South
 East/West Street Name: East/West Corridor
 North/South Street Name: N. Haines Ave
 Analysis Time Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:									
Approach	NorthBound					SouthBound			
Movement	1U	2	3		4U	4	5	6	
	U	L	T	R		U	L	T	R
Volume		145	185	20			5	65	10
Peak Hour Factor, PHF					0.80				
Hourly Flow Rtae, HFR		181	231	25			6	81	13
Percent Heavy Vehicles		6					6		
Number of Lanes	0	0	1	0		0	0	1	0
Lane Configuration			LTR					LTR	
Median Type	Undivided								
Median Storage									
RT channelized?									
Left-Turn Lane Storage									
Upstream Signal?	Not Present								

Minor Street:									
Approach	WestBound					EastBound			
Movement	7	8	9		10	11	12		
	L	T	R		L	T	R		
Volume	5	15	5		15	25	40		
Peak Hour Factor, PHF				0.80					
Hourly Flow Rtae, HFR	6	19	6		19	31	50		
Percent Heavy Vehicles	6	6	6		6	6	6		
Number of Lanes	0	1	0		0	1	0		
Lane Configuration		LTR				LTR			
RT channelized?									
Flared Approach Storage	No				No				
Percent Grade		0				0			

Pedestrian Volumes and Adjustments

Approach				
Movement	NB	SB	WB	EB
	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane width (ft)				
walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach												
Movement	1U	NB	4U	SB	7	westBound	8	9	10	EastBound	11	12
Lane Configuration						LTR				LTR		
Flow Rate	181		6			31				100		
Lane Capacity	1476		1286			328				448		
v/c	0.12		0.00			0.10				0.22		
95% Queue Length	0.4		0.0			0.3				0.8		
Control Delay	7.8		7.8			17.1				15.3		
LOS	A		A			C				C		
Approach Delay	3.9		0.5			17.1				15.3		
Approach LOS						C				C		
Intersction Delay	5.7											

Step 1: MOVEMENT PRIORITIES

Major Street:									
Approach	NorthBound					SouthBound			
Priority	1U	2	3		4U	4	5	6	
Movement	U	L	T	R		U	L	T	R
Minor Street:									

Approach Priority Movement	WestBound					EastBound		
	7 L	8 T	9 R			10 L	11 T	12 R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street: Approach Movement	1U U	NorthBound				4U U	SouthBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Volume, V_x		145	185	20			5	65	10
Flow Rate, v_x		181	231	25			6	81	13

Minor Street: Approach Movement	WestBound					EastBound			
	7 L	8 T	9 R			10 L	11 T	12 R	
Volume, V_x		5	15	5			15	25	40
Flow Rate, v_x		6	19	6			19	31	50

Step 3: CONFLICTING FLOW RATES

Major Street: Approach Movement	1U U	NorthBound				4U U	SouthBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Flow Rate, v_x		181	231	25			6	81	13
Conflicting Flow, v_c,x		94					256		

Minor Street: Approach Movement	WestBound					EastBound			
	7 L	8 T	9 R			10 L	11 T	12 R	
Flow Rate, v_x		6	19	6			19	31	50
Conflicting Flow, v_c,x		747	713	244			719	719	88

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS Approach Movement	1U U	NB	4U U	SB	4	7	WestBound		9	10	EastBound	
		1 L					8 T	8 T			11 T	12 R
t_c,base												
Single Stage		4.1		4.1	7.1	6.5	6.2	7.1	6.5	6.2		
Stage I												
Stage II												
t_c,HV		1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0		
P_HV		0.06		0.06	0.06	0.06	0.06	0.06	0.06	0.06		
t_c,G					0.2	0.2	0.1	0.2	0.2	0.1		
G					0	0	0	0	0	0		
t_3,LT		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		
t_c												
Single Stage		4.16		4.16	7.16	6.56	6.26	7.16	6.56	6.26		
Stage I												
Stage II												

FOLLOW-UP HEADWAYS Approach Movement	1U U	NB	4U U	SB	4	7	WestBound		9	10	EastBound	
		1 L					8 T	8 T			11 T	12 R
t_f,base												
t_f,HV		2.2		2.2	3.5	4.0	3.3	3.5	4.0	3.3		
P_HV		0.9		0.9	0.9	0.9	0.9	0.9	0.9	0.9		
t_f		0.06		0.06	0.06	0.06	0.06	0.06	0.06	0.06		
		2.25		2.25	3.55	4.05	3.35	3.55	4.05	3.35		

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT Approach Movement	1U U	NB	4U U	SB	4	7	WestBound		9	10	EastBound	
		1 L					8 T	8 T			11 T	12 R
v_c,x		94		256	747	713	244	719	719	88		
t_c,x		4.16		4.16	7.16	6.56	6.26	7.16	6.56	6.26		
t_f,x		2.25		2.25	3.55	4.05	3.35	3.55	4.05	3.35		
C_p,x		1476		1286	324	353	785	339	350	960		

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance Approach	NB	SB	WB	EB
----------------------------------	----	----	----	----

Movement	13	14	15	16
Pedestrian Flow Rate v_x Lane Width, w Walking Speed, S_p Pedestrian Blockage Factor, f_pb	0	0	0	0
Major-Street Left-Turn Movements		1	4	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Movement Capacity, c_m,x Probability of Queue-free State, p_0,j Major L-Shared Probability Queue-free State, p*_0,j		94 1476 1.000 1476 0.877 0.855	256 1286 1.000 1286 0.995 0.995	
Minor-Street Right-Turn Movements		9	12	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Movement Capacity, c_m,x Probability of Queue-free State, p_0,j		244 785 1.000 785 0.992	88 960 1.000 960 0.948	
Major-Street U-Turn Movements		1U	4U	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Capacity Adjustment Factor, f_x Movement Capacity, c_m,x Shared L/U Capacity, c_SH Probability of Queue-free State, p_0,j				
Minor-Street Through Movements		8	11	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Capacity Adjustment Factor, f_x Movement Capacity, c_m,x Probability of Queue-free State, p_0,j		713 353 1.000 0.851 300 0.937	719 350 1.000 0.851 298 0.895	
Minor-Street Left-Turn Movements		7	10	
Conflicting Flow, v_c,x Potential Capacity, c_p,x Pedestrian Impedance Factor, p_p,x Major L, Minor T Adjusted Impedance Factor, p'' Major L, Minor T Impedance Factor, p' Capacity Adjustment Factor, f_x Movement Capacity, c_m,x		747 324 1.000 0.762 0.816 0.774 251	719 339 1.000 0.798 0.844 0.838 284	

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES						
Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
Lane Configuration		LTR			LTR	
Shared Flow Rate, v_y		31			100	
Movement Capacity, c_m,x	251	300	785	284	298	960
Shared Capacity, c_SH		328			448	

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS										
Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Flow Rate		181		6	6	19	6	19	31	50
Movement Capacity		1476		1286	251	300	785	284	298	960
Lane Configuration						LTR			LTR	
Shared Capacity						328			448	
Control Delay		7.8		7.8		17.1			15.3	

CONTROL DELAY TO RANK 1 MOVEMENTS		
Approach	NB	SB
Movement	2	5
Number of Major Street Through Lanes, N	1	1
Proportion of Rank 1 vehicles not blocked, p*_0,j	0.855	0.995
Delay to Major Left-turning Vehicles, d_MLT	7.8	7.8
Major Street Through Vehicles in Shared Lane, v_i1	231	81
Major Street Turning Vehicles in Shared Lane, v_i2	206	19
Saturation Flow Rate for Major Street Through, s_i1	1700	1700

Saturation Flow Rate for Major Street Right-Turn, s_i2
 Delay to Rank 1 Vehicles, d_Rank1

1700
 1.1

1700
 0.0

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS											
Approach Movement	NB		SB		westBound			95% QUEUE		LENGTHS	
Lane Configuration	1U	1	4U	4	7	8	9	10	11	12	
Flow Rate	181		6		31			100			
Lane Capacity	1476		1286		328			448			
v/c	0.12		0.00		0.10			0.22			
95% Queue Length	0.4		0.0		0.3			0.8			
Control Delay	7.8		7.8		17.1			15.3			
LOS	A		A		C			C			
Approach Delay	3.9		0.5		17.1			15.3			
Approach LOS					C			C			
Intersction Delay	5.7										

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HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name: 2045-Build_PM_ElkCreek-143rd_TWSC.xtw
 Analyst: HDR
 Agency: HDR
 Date Performed: 7/3/2019
 Time Analyzed: PM - 2045 Build Cond.
 Jurisdiction: Meade County
 Analysis Year: 2045
 Project Description: Southern Meade County Corridor Study
 Units: U.S. Customary
 Intersection Name: Elk Creek & 143rd Ave
 Major Street Direction: East-West
 East/West Street Name: Elk Creek Road
 North/South Street Name: 143rd Avenue
 Analysis Time Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:									
Approach	EastBound					WestBound			
Movement	1U	2	3		4U	4	5	6	
	U	L	T	R		U	L	T	R
Volume		5	35	5			5	25	5
Peak Hour Factor, PHF					0.80				
Hourly Flow Rtae, HFR		6	44	6			6	31	6
Percent Heavy Vehicles		20					20		
Number of Lanes	0	0	1	0		0	0	1	0
Lane Configuration			LTR					LTR	
Median Type	Undivided								
Median Storage									
RT channelized?									
Left-Turn Lane Storage									
Upstream Signal?	Not Present								

Minor Street:									
Approach	NorthBound					SouthBound			
Movement	7	8	9		10	11	12		
	L	T	R		L	T	R		
Volume	5	5	5		5	5	5		
Peak Hour Factor, PHF				0.80					
Hourly Flow Rtae, HFR	6	6	6		6	6	6		
Percent Heavy Vehicles	20	20	20		20	20	20		
Number of Lanes	0	1	0		0	1	0		
Lane Configuration		LTR				LTR			
RT channelized?									
Flared Approach Storage	No				No				
Percent Grade		0				0			

Pedestrian Volumes and Adjustments

Approach				
Movement	EB	WB	NB	SB
	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane width (ft)				
walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach														
Movement	1U	EB	1	4U	WB	4	7	NorthBound	8	9	10	SouthBound	11	12
Lane Configuration								LTR				LTR		
Flow Rate	6		6					19				19		
Lane Capacity	1464		1449					830				834		
v/c	0.00		0.00					0.02				0.02		
95% Queue Length	0.0		0.0					0.1				0.1		
Control Delay	7.5		7.5					9.4				9.4		
LOS	A		A					A				A		
Approach Delay	0.9		1.1					9.4				9.4		
Approach LOS								A				A		
Intersction Delay	3.3													

Step 1: MOVEMENT PRIORITIES

Major Street:									
Approach	EastBound					WestBound			
Priority	1U	2	3		4U	4	5	6	
Movement	U	L	T	R		U	L	T	R
Minor Street:									

Approach Priority Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street: Approach Movement	1U U	EastBound				4U U	WestBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Volume, V_x		5	35	5		5	25	5	
Flow Rate, v_x		6	44	6		6	31	6	

Minor Street: Approach Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Volume, V_x		5	5	5		5	5	5
Flow Rate, v_x		6	6	6		6	6	6

Step 3: CONFLICTING FLOW RATES

Major Street: Approach Movement	1U U	EastBound				4U U	WestBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Flow Rate, v_x		6	44	6		6	31	6	
Conflicting Flow, v_c,x		38				50			

Minor Street: Approach Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Flow Rate, v_x		6	6	6		6	6	6
Conflicting Flow, v_c,x		113	109	47		113	109	34

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS Approach Movement	1U U	EB 1 L	4U U	WB 4 L	NorthBound			SouthBound			
					7 L	8 T	9 R	10 L	11 T	12 R	
t_c,base											
Single Stage		4.1		4.1	7.1	6.5	6.2	7.1	6.5	6.2	
Stage I											
Stage II											
t_c,HV		1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	
P_HV		0.20		0.20	0.20	0.20	0.20	0.20	0.20	0.20	
t_c,G					0.2	0.2	0.1	0.2	0.2	0.1	
G					0	0	0	0	0	0	
t_3,LT		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	
t_c											
Single Stage		4.30		4.30	7.30	6.70	6.40	7.30	6.70	6.40	
Stage I											
Stage II											

FOLLOW-UP HEADWAYS Approach Movement	1U U	EB 1 L	4U U	WB 4 L	NorthBound			SouthBound			
					7 L	8 T	9 R	10 L	11 T	12 R	
t_f,base											
t_f,HV		2.2		2.2	3.5	4.0	3.3	3.5	4.0	3.3	
P_HV		0.9		0.9	0.9	0.9	0.9	0.9	0.9	0.9	
t_f		0.20		0.20	0.20	0.20	0.20	0.20	0.20	0.20	
		2.38		2.38	3.68	4.18	3.48	3.68	4.18	3.48	

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT Approach Movement	1U U	EB 1 L	4U U	WB 4 L	NorthBound			SouthBound		
					7 L	8 T	9 R	10 L	11 T	12 R
v_c,x		38		50	113	109	47	113	109	34
t_c,x		4.30		4.30	7.30	6.70	6.40	7.30	6.70	6.40
t_f,x		2.38		2.38	3.68	4.18	3.48	3.68	4.18	3.48
C_p,x		1464		1449	824	748	973	824	748	989

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance Approach	EB	WB	NB	SB
----------------------------------	----	----	----	----

Movement	13	14	15	16
Pedestrian Flow Rate v_x	0	0	0	0
Lane Width, w				
Walking Speed, S_p				
Pedestrian Blockage Factor, f_pb				
Major-Street Left-Turn Movements		1	4	
Conflicting Flow, v_c,x		38	50	
Potential Capacity, c_p,x		1464	1449	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Movement Capacity, c_m,x		1464	1449	
Probability of Queue-free State, p_0,j		0.996	0.996	
Major L-Shared Probability Queue-free State, p*_0,j		0.996	0.996	
Minor-Street Right-Turn Movements		9	12	
Conflicting Flow, v_c,x		47	34	
Potential Capacity, c_p,x		973	989	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Movement Capacity, c_m,x		973	989	
Probability of Queue-free State, p_0,j		0.994	0.994	
Major-Street U-Turn Movements		1U	4U	
Conflicting Flow, v_c,x				
Potential Capacity, c_p,x				
Capacity Adjustment Factor, f_x				
Movement Capacity, c_m,x				
Shared L/U Capacity, c_SH				
Probability of Queue-free State, p_0,j				
Minor-Street Through Movements		8	11	
Conflicting Flow, v_c,x		109	109	
Potential Capacity, c_p,x		748	748	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Capacity Adjustment Factor, f_x		0.991	0.991	
Movement Capacity, c_m,x		742	742	
Probability of Queue-free State, p_0,j		0.992	0.992	
Minor-Street Left-Turn Movements		7	10	
Conflicting Flow, v_c,x		113	113	
Potential Capacity, c_p,x		824	824	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Major L, Minor T Adjusted Impedance Factor, p''		0.983	0.983	
Major L, Minor T Impedance Factor, p'		0.987	0.987	
Capacity Adjustment Factor, f_x		0.981	0.981	
Movement Capacity, c_m,x		808	808	

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES						
Approach	NorthBound			SouthBound		
Movement	7	8	9	10	11	12
Lane Configuration		LTR			LTR	
Shared Flow Rate, v_y		19			19	
Movement Capacity, c_m,x	808	742	973	808	742	989
Shared Capacity, c_SH		830			834	

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS										
Approach	EB		WB		NorthBound			SouthBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Flow Rate		6		6	6	6	6	6	6	6
Movement Capacity		1464		1449	808	742	973	808	742	989
Lane Configuration						LTR			LTR	
Shared Capacity						830			834	
Control Delay		7.5		7.5		9.4			9.4	

CONTROL DELAY TO RANK 1 MOVEMENTS		
Approach	EB	WB
Movement	2	5
Number of Major Street Through Lanes, N	1	1
Proportion of Rank 1 vehicles not blocked, p*_0,j	0.996	0.996
Delay to Major Left-turning Vehicles, d_MLT	7.5	7.5
Major Street Through Vehicles in Shared Lane, v_i1	44	31
Major Street Turning Vehicles in Shared Lane, v_i2	13	13
Saturation Flow Rate for Major Street Through, s_i1	1700	1700

Saturation Flow Rate for Major Street Right-Turn, s_i2
 Delay to Rank 1 Vehicles, d_Rank1

1700
 0.0

1700
 0.0

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS											
Approach Movement	1U	EB 1	4U	WB 4	7	NorthBound 8	9	10	SouthBound 11	12	
Lane Configuration						LTR			LTR		
Flow Rate		6		6		19			19		
Lane Capacity		1464		1449		830			834		
v/c		0.00		0.00		0.02			0.02		
95% Queue Length		0.0		0.0		0.1			0.1		
Control Delay		7.5		7.5		9.4			9.4		
LOS		A		A		A			A		
Approach Delay		0.9		1.1		9.4			9.4		
Approach LOS						A			A		
Intersction Delay		3.3									

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Approach Priority Movement	WestBound					EastBound		
	7 L	8 T	9 R			10 L	11 T	12 R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street: Approach Movement	1U U	NorthBound				4U U	SouthBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Volume, V_x		15	15	25			5	10	10
Flow Rate, v_x		19	19	31			6	13	13

Minor Street: Approach Movement	WestBound					EastBound			
	7 L	8 T	9 R			10 L	11 T	12 R	
Volume, V_x		5	10	5			10	20	15
Flow Rate, v_x		6	13	6			13	25	19

Step 3: CONFLICTING FLOW RATES

Major Street: Approach Movement	1U U	NorthBound				4U U	SouthBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Flow Rate, v_x		19	19	31			6	13	13
Conflicting Flow, v_c,x		25					50		

Minor Street: Approach Movement	WestBound					EastBound			
	7 L	8 T	9 R			10 L	11 T	12 R	
Flow Rate, v_x		6	13	6			13	25	19
Conflicting Flow, v_c,x		125	109	34			113	119	19

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS Approach Movement	1U U	NB	4U U	SB	4	7	WestBound		9	10	EastBound	
		1 L					8 T	8 T			11 T	12 R
t_c,base												
Single Stage		4.1			4.1	7.1	6.5	6.2		7.1	6.5	6.2
Stage I												
Stage II												
t_c,HV		1.0			1.0	1.0	1.0	1.0		1.0	1.0	1.0
P_HV		0.14			0.14	0.14	0.14	0.14		0.14	0.14	0.14
t_c,G						0.2	0.2	0.1		0.2	0.2	0.1
G						0	0	0		0	0	0
t_3,LT		0.0			0.0	0.0	0.0	0.0		0.0	0.0	0.0
t_c												
Single Stage		4.24			4.24	7.24	6.64	6.34		7.24	6.64	6.34
Stage I												
Stage II												

FOLLOW-UP HEADWAYS Approach Movement	1U U	NB	4U U	SB	4	7	WestBound		9	10	EastBound	
		1 L					8 T	8 T			11 T	12 R
t_f,base												
t_f,HV		2.2			2.2	3.5	4.0	3.3		3.5	4.0	3.3
P_HV		0.9			0.9	0.9	0.9	0.9		0.9	0.9	0.9
t_f		0.14			0.14	0.14	0.14	0.14		0.14	0.14	0.14
t_f		2.33			2.33	3.63	4.13	3.43		3.63	4.13	3.43

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT Approach Movement	1U U	NB	4U U	SB	4	7	WestBound		9	10	EastBound	
		1 L					8 T	8 T			11 T	12 R
v_c,x		25			50	125	109	34		113	119	19
t_c,x		4.24			4.24	7.24	6.64	6.34		7.24	6.64	6.34
t_f,x		2.33			2.33	3.63	4.13	3.43		3.63	4.13	3.43
C_p,x		1515			1483	822	759	1005		838	750	1026

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance Approach	NB	SB	WB	EB
----------------------------------	----	----	----	----

Movement	13	14	15	16
Pedestrian Flow Rate v_x	0	0	0	0
Lane Width, w				
Walking Speed, S_p				
Pedestrian Blockage Factor, f_pb				
Major-Street Left-Turn Movements		1	4	
Conflicting Flow, v_c,x		25	50	
Potential Capacity, c_p,x		1515	1483	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Movement Capacity, c_m,x		1515	1483	
Probability of Queue-free State, p_0,j		0.988	0.996	
Major L-Shared Probability Queue-free State, p*_0,j		0.987	0.996	
Minor-Street Right-Turn Movements		9	12	
Conflicting Flow, v_c,x		34	19	
Potential Capacity, c_p,x		1005	1026	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Movement Capacity, c_m,x		1005	1026	
Probability of Queue-free State, p_0,j		0.994	0.982	
Major-Street U-Turn Movements		1U	4U	
Conflicting Flow, v_c,x				
Potential Capacity, c_p,x				
Capacity Adjustment Factor, f_x				
Movement Capacity, c_m,x				
Shared L/U Capacity, c_SH				
Probability of Queue-free State, p_0,j				
Minor-Street Through Movements		8	11	
Conflicting Flow, v_c,x		109	119	
Potential Capacity, c_p,x		759	750	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Capacity Adjustment Factor, f_x		0.983	0.983	
Movement Capacity, c_m,x		746	737	
Probability of Queue-free State, p_0,j		0.983	0.966	
Minor-Street Left-Turn Movements		7	10	
Conflicting Flow, v_c,x		125	113	
Potential Capacity, c_p,x		822	838	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Major L, Minor T Adjusted Impedance Factor, p''		0.950	0.967	
Major L, Minor T Impedance Factor, p'		0.962	0.974	
Capacity Adjustment Factor, f_x		0.944	0.968	
Movement Capacity, c_m,x		776	811	

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES						
Approach	westBound			EastBound		
Movement	7	8	9	10	11	12
Lane Configuration		LTR			LTR	
Shared Flow Rate, v_y		25			56	
Movement Capacity, c_m,x	776	746	1005	811	737	1026
Shared Capacity, c_SH		806			832	

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS										
Approach	NB		SB		westBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Flow Rate		19		6	6	13	6	13	25	19
Movement Capacity		1515		1483	776	746	1005	811	737	1026
Lane Configuration						LTR			LTR	
Shared Capacity						806			832	
Control Delay		7.4		7.4		9.6			9.6	

CONTROL DELAY TO RANK 1 MOVEMENTS		
Approach	NB	SB
Movement	2	5
Number of Major Street Through Lanes, N	1	1
Proportion of Rank 1 vehicles not blocked, p*_0,j	0.987	0.996
Delay to Major Left-turning Vehicles, d_MLT	7.4	7.4
Major Street Through Vehicles in Shared Lane, v_i1	19	13
Major Street Turning Vehicles in Shared Lane, v_i2	50	19
Saturation Flow Rate for Major Street Through, s_i1	1700	1700

Saturation Flow Rate for Major Street Right-Turn, s_i2
 Delay to Rank 1 Vehicles, d_Rank1

1700
 0.1

1700
 0.0

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS											
Approach Movement	NB		SB		westBound			EastBound			
Lane Configuration	1U	1	4U	4	7	8	9	10	11	12	
					LTR			LTR			
Flow Rate	19		6		25			56			
Lane Capacity	1515		1483		806			832			
v/c	0.01		0.00		0.03			0.07			
95% Queue Length	0.0		0.0		0.1			0.2			
Control Delay	7.4		7.4		9.6			9.6			
LOS	A		A		A			A			
Approach Delay	2.1		1.5		9.6			9.6			
Approach LOS					A			A			
Intersction Delay	5.4										

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HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name: 2045-Build_PM_ElkCreek-EricksonRaRd_TWSC.xtw
 Analyst: HDR
 Agency: HDR
 Date Performed: 7/3/2019
 Time Analyzed: PM - 2045 Build Cond.
 Jurisdiction: Meade County
 Analysis Year: 2045
 Project Description: Southern Meade County Corridor Study
 Units: U.S. Customary
 Intersection Name: Elk Creek & Erickson Ra R
 Major Street Direction: East-West
 East/West Street Name: Elk Creek Road
 North/South Street Name: Erickson Ranch Road
 Analysis Time Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:									
Approach	EastBound					WestBound			
Movement	1U	2	3		4U	5	6		
	U	L	T	R	U	L	T	R	
Volume		10	70	75		20	95	10	
Peak Hour Factor, PHF					0.80				
Hourly Flow Rtae, HFR		13	88	94		25	119	13	
Percent Heavy Vehicles		5				5			
Number of Lanes	0	0	1	0	0	0	1	0	
Lane Configuration			LTR				LTR		
Median Type	Undivided								
Median Storage									
RT channelized?									
Left-Turn Lane Storage									
Upstream Signal?	Not Present								

Minor Street:									
Approach	NorthBound					SouthBound			
Movement	7	8	9		10	11	12		
	L	T	R		L	T	R		
Volume	65	10	30		10	5	10		
Peak Hour Factor, PHF					0.80				
Hourly Flow Rtae, HFR	81	13	38		13	6	13		
Percent Heavy Vehicles	5	5	5		5	5	5		
Number of Lanes	0	1	0		0	1	0		
Lane Configuration		LTR				LTR			
RT channelized?									
Flared Approach Storage	No				No				
Percent Grade		0				0			

Pedestrian Volumes and Adjustments

Approach	EB	WB	NB	SB
Movement	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane width (ft)				
walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach	EB	WB	NorthBound			SouthBound			
Movement	1	4U	4	7	8	9	10	11	12
Lane Configuration	U				LTR			LTR	
Flow Rate	13		25		131			31	
Lane Capacity	1434		1376		643			646	
v/c	0.01		0.02		0.20			0.05	
95% Queue Length	0.0		0.1		0.8			0.2	
Control Delay	7.5		7.7		12.0			10.9	
LOS	A		A		B			B	
Approach Delay	0.6		1.4		12.0			10.9	
Approach LOS					B			B	
Intersction Delay	4.4								

Step 1: MOVEMENT PRIORITIES

Major Street:									
Approach	EastBound					WestBound			
Priority	1U	2	3		4U	5	6		
Movement	U	L	T	R	U	L	T	R	

Minor Street:

Approach Priority Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street: Approach Movement	1U U	EastBound				4U U	WestBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Volume, V_x		10	70	75			20	95	10
Flow Rate, v_x		13	88	94			25	119	13

Minor Street: Approach Movement	NorthBound					SouthBound			
	7 L	8 T	9 R			10 L	11 T	12 R	
Volume, V_x		65	10	30			10	5	10
Flow Rate, v_x		81	13	38			13	6	13

Step 3: CONFLICTING FLOW RATES

Major Street: Approach Movement	1U U	EastBound				4U U	WestBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Flow Rate, v_x		13	88	94			25	119	13
Conflicting Flow, v_c,x		131					181		

Minor Street: Approach Movement	NorthBound					SouthBound			
	7 L	8 T	9 R			10 L	11 T	12 R	
Flow Rate, v_x		81	13	38			13	6	13
Conflicting Flow, v_c,x		344	341	134			359	381	125

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS Approach Movement	1U U	EB 1 L	4U U	WB 4 L	NorthBound			SouthBound		
					7 L	8 T	9 R	10 L	11 T	12 R
t_c,base										
Single Stage		4.1		4.1	7.1	6.5	6.2	7.1	6.5	6.2
Stage I										
Stage II										
t_c,HV		1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0
P_HV		0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05
t_c,G					0.2	0.2	0.1	0.2	0.2	0.1
G					0	0	0	0	0	0
t_3,LT		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
t_c										
Single Stage		4.15		4.15	7.15	6.55	6.25	7.15	6.55	6.25
Stage I										
Stage II										

FOLLOW-UP HEADWAYS Approach Movement	1U U	EB 1 L	4U U	WB 4 L	NorthBound			SouthBound		
					7 L	8 T	9 R	10 L	11 T	12 R
t_f,base										
t_f,HV		2.2		2.2	3.5	4.0	3.3	3.5	4.0	3.3
P_HV		0.9		0.9	0.9	0.9	0.9	0.9	0.9	0.9
t_f		0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05
		2.25		2.25	3.55	4.05	3.35	3.55	4.05	3.35

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT Approach Movement	1U U	EB 1 L	4U U	WB 4 L	NorthBound			SouthBound		
					7 L	8 T	9 R	10 L	11 T	12 R
v_c,x		131		181	344	341	134	359	381	125
t_c,x		4.15		4.15	7.15	6.55	6.25	7.15	6.55	6.25
t_f,x		2.25		2.25	3.55	4.05	3.35	3.55	4.05	3.35
C_p,x		1434		1376	605	576	907	591	547	918

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance Approach	EB	WB	NB	SB
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Movement	13	14	15	16
Pedestrian Flow Rate v_x	0	0	0	0
Lane Width, w				
Walking Speed, S_p				
Pedestrian Blockage Factor, f_pb				
Major-Street Left-Turn Movements		1	4	
Conflicting Flow, v_c,x		131	181	
Potential Capacity, c_p,x		1434	1376	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Movement Capacity, c_m,x		1434	1376	
Probability of Queue-free State, p_0,j		0.991	0.982	
Major L-Shared Probability Queue-free State, p*_0,j		0.990	0.980	
Minor-Street Right-Turn Movements		9	12	
Conflicting Flow, v_c,x		134	125	
Potential Capacity, c_p,x		907	918	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Movement Capacity, c_m,x		907	918	
Probability of Queue-free State, p_0,j		0.959	0.986	
Major-Street U-Turn Movements		1U	4U	
Conflicting Flow, v_c,x				
Potential Capacity, c_p,x				
Capacity Adjustment Factor, f_x				
Movement Capacity, c_m,x				
Shared L/U Capacity, c_SH				
Probability of Queue-free State, p_0,j				
Minor-Street Through Movements		8	11	
Conflicting Flow, v_c,x		341	381	
Potential Capacity, c_p,x		576	547	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Capacity Adjustment Factor, f_x		0.971	0.971	
Movement Capacity, c_m,x		559	531	
Probability of Queue-free State, p_0,j		0.978	0.988	
Minor-Street Left-Turn Movements		7	10	
Conflicting Flow, v_c,x		344	359	
Potential Capacity, c_p,x		605	591	
Pedestrian Impedance Factor, p_p,x		1.000	1.000	
Major L, Minor T Adjusted Impedance Factor, p''		0.959	0.949	
Major L, Minor T Impedance Factor, p'		0.969	0.961	
Capacity Adjustment Factor, f_x		0.956	0.921	
Movement Capacity, c_m,x		578	544	

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES						
Approach	NorthBound			SouthBound		
Movement	7	8	9	10	11	12
Lane Configuration		LTR			LTR	
Shared Flow Rate, v_y		131			31	
Movement Capacity, c_m,x	578	559	907	544	531	918
Shared Capacity, c_SH		643			646	

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS										
Approach	EB		WB		NorthBound			SouthBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Flow Rate		13		25	81	13	38	13	6	13
Movement Capacity		1434		1376	578	559	907	544	531	918
Lane Configuration						LTR			LTR	
Shared Capacity						643			646	
Control Delay		7.5		7.7		12.0			10.9	

CONTROL DELAY TO RANK 1 MOVEMENTS		
Approach	EB	WB
Movement	2	5
Number of Major Street Through Lanes, N	1	1
Proportion of Rank 1 vehicles not blocked, p*_0,j	0.990	0.980
Delay to Major Left-turning Vehicles, d_MLT	7.5	7.7
Major Street Through Vehicles in Shared Lane, v_i1	88	119
Major Street Turning Vehicles in Shared Lane, v_i2	106	38
Saturation Flow Rate for Major Street Through, s_i1	1700	1700

Saturation Flow Rate for Major Street Right-Turn, s_i2
 Delay to Rank 1 Vehicles, d_Rank1

1700
 0.1

1700
 0.2

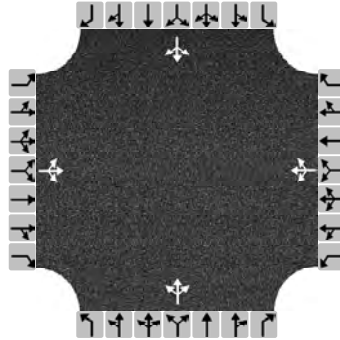
Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS											
Approach Movement	EB		WB		NorthBound			SouthBound			
Lane Configuration	1U	1	4U	4	7	8	9	10	11	12	
						LTR			LTR		
Flow Rate		13		25		131				31	
Lane Capacity		1434		1376		643				646	
v/c		0.01		0.02		0.20				0.05	
95% Queue Length		0.0		0.1		0.8				0.2	
Control Delay		7.5		7.7		12.0				10.9	
LOS		A		A		B				B	
Approach Delay		0.6		1.4		12.0				10.9	
Approach LOS						B				B	
Intersction Delay		4.4									

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HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst	HDR	Intersection	Elk Creek & Haines
Agency/Co.	HDR	Jurisdiction	Meade County
Date Performed	3/7/2019	East/West Street	Elk Creek Road
Analysis Year	2045	North/South Street	Haines Avenue
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.80
Time Analyzed	PM - 2045 Build Cond.		
Project Description	Southern Meade County Corridor Study		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Movement												
Volume	10	25	35	10	20	5	90	25	20	5	10	5
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	88			44			169			25		
Percent Heavy Vehicles	6			6			6			6		

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.078			0.039			0.150			0.022		
Final Departure Headway, hd (s)	4.23			4.51			4.38			4.38		
Final Degree of Utilization, x	0.103			0.055			0.205			0.030		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	2.23			2.51			2.38			2.38		

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	88			44			169			25		
Capacity	852			798			823			821		
95% Queue Length, Q ₉₅ (veh)	0.3			0.2			0.8			0.1		
Control Delay (s/veh)	7.7			7.8			8.5			7.5		
Level of Service, LOS	A			A			A			A		
Approach Delay (s/veh)	7.7			7.8			8.5			7.5		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	8.1						A					

HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name: 2045-Build_PM_PeacefulPines-EricksonRaRd_TWSC.xtw
 Analyst: HDR
 Agency: HDR
 Date Performed: 3/7/2019
 Time Analyzed: PM - 2045 Build Cond.
 Jurisdiction: Meade County
 Analysis Year: 2045
 Project Description: Southern Meade County Corridor Study
 Units: U.S. Customary
 Intersection Name: Peaceful P & Erickson RaR
 Major Street Direction: East-West
 East/West Street Name: Peaceful Pines Road
 North/South Street Name: Erickson Ranch Road
 Analysis Time Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:										
Approach	EastBound					WestBound				
Movement	1U	1	2	3		4U	4	5	6	
	U	L	T	R		U	L	T	R	
Volume		60	20					40	115	
Peak Hour Factor, PHF						0.80				
Hourly Flow Rtae, HFR		75	25					50	144	
Percent Heavy Vehicles		3								
Number of Lanes	0	1	1	0		0	0	1	1	
Lane Configuration		L	T					T	R	
Median Type	Undivided									
Median Storage										
RT channelized?										
Left-Turn Lane Storage										
Upstream Signal?	Not Present									

Minor Street:										
Approach	NorthBound					SouthBound				
Movement	7	8	9		10	11	12			
	L	T	R		L	T	R			
Volume						30		35		
Peak Hour Factor, PHF						0.80				
Hourly Flow Rtae, HFR						38		44		
Percent Heavy Vehicles						3		3		
Number of Lanes	0	0	0			0	1	0		
Lane Configuration							LR			
RT channelized?										
Flared Approach Storage						No		0		
Percent Grade										

Pedestrian Volumes and Adjustments

Approach				
Movement	EB	WB	NB	SB
	13	14	15	16
Flow (ped/hr)	0	0		0
Lane width (ft)				
walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach														
Movement	1U	EB	1	4U	WB	4	7	NorthBound	8	9	10	SouthBound	11	12
Lane Configuration			L										LR	
Flow Rate			75										81	
Lane Capacity			1374										854	
v/c			0.05										0.10	
95% Queue Length			0.2										0.3	
Control Delay			7.8										9.7	
LOS			A										A	
Approach Delay			5.8										9.7	
Approach LOS													A	
Intersction Delay			3.6											

Step 1: MOVEMENT PRIORITIES

Major Street:										
Approach	EastBound					WestBound				
Priority	1U	1	2	3		4U	4	5	6	
Movement	U	L	T	R		U	L	T	R	

Minor Street:

Approach Priority Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street: Approach Movement	1U U	EastBound				4U U	WestBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Volume, V_x		60	20				40	115	
Flow Rate, v_x		75	25				50	144	

Minor Street: Approach Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Volume, V_x							30	35
Flow Rate, v_x							38	44

Step 3: CONFLICTING FLOW RATES

Major Street: Approach Movement	1U U	EastBound				4U U	WestBound		
		1 L	2 T	3 R			4 L	5 T	6 R
Flow Rate, v_x		75	25				50	144	
Conflicting Flow, v_c,x		194							

Minor Street: Approach Movement	NorthBound					SouthBound		
	7 L	8 T	9 R			10 L	11 T	12 R
Flow Rate, v_x							38	44
Conflicting Flow, v_c,x							225	50

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS Approach Movement	1U U	EB 1 L	4U U	WB 4 L	7 L	NorthBound			SouthBound		
						8 T	9 R		10 L	11 T	12 R
t_c,base Single Stage		4.1							7.1		6.2
Stage I											
Stage II											
t_c,HV		1.0							1.0		1.0
P_HV		0.03							0.03		0.03
t_c,G									0.2		0.1
G									0		0
t_3,LT		0.0							0.7		0.0
t_c Single Stage		4.13							6.43		6.23
Stage I											
Stage II											

FOLLOW-UP HEADWAYS Approach Movement	1U U	EB 1 L	4U U	WB 4 L	7 L	NorthBound			SouthBound		
						8 T	9 R		10 L	11 T	12 R
t_f,base		2.2							3.5		3.3
t_f,HV		0.9							0.9		0.9
P_HV		0.03							0.03		0.03
t_f		2.23							3.53		3.33

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT Approach Movement	1U U	EB 1 L	4U U	WB 4 L	7 L	NorthBound			SouthBound		
						8 T	9 R		10 L	11 T	12 R
v_c,x		194							225		50
t_c,x		4.13							6.43		6.23
t_f,x		2.23							3.53		3.33
C_p,x		1374							761		1016

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance Approach	EB	WB	NB	SB
----------------------------------	----	----	----	----

LOS	A	A
Approach Delay	5.8	9.7
Approach LOS		A
Intersection Delay	3.6	

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HCS7: Two-Lane Highways Release 7.2

Phone: _____ Fax: _____
 E-Mail: _____

----- Directional Two-Lane Highway Segment Analysis -----

Analyst HDR
 Agency/Co. HDR
 Date Performed 7/5/2019
 Analysis Time Period 2045 - AM Build Eastbound
 Highway East/West Corridor
 From/To Erickson Ranch to Haines
 Jurisdiction Meade County
 Analysis Year 2045
 Description Southern Meade County Corridor

----- Input Data -----

Highway class	Class 2	Peak hour factor, PHF	0.80	
Shoulder width	4.0 ft	% Trucks and buses	6	%
Lane width	12.0 ft	% Trucks crawling	0.0	%
Segment length	2.3 mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level	% Recreational vehicles	0	%
Grade: Length	- mi	% No-passing zones	40	%
Up/down	- %	Access point density	1	/mi

Analysis direction volume, Vd 180 veh/h
 Opposing direction volume, Vo 80 veh/h

----- Average Travel Speed -----

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.5	1.9
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.971	0.949
Grade adj. factor, (note-1) fg	1.00	1.00
Directional flow rate, (note-2) vi	232 pc/h	105 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM - mi/h
 Observed total demand, (note-3) V - veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS 60.0 mi/h
 Adj. for lane and shoulder width, (note-3) fLS 1.3 mi/h
 Adj. for access point density, (note-3) fA 0.3 mi/h

Free-flow speed, FFSd 58.5 mi/h

Adjustment for no-passing zones, fnp 2.4* mi/h
 Average travel speed, ATSD 53.4 mi/h
 Percent Free Flow Speed, PFFS 91.4 %

-----Percent Time-Spent-Following-----

Direction	Analysis(d)	Opposing (o)	
PCE for trucks, ET	1.1	1.1	
PCE for RVs, ER	1.0	1.0	
Heavy-vehicle adjustment factor, fHV	0.994	0.994	
Grade adjustment factor,(note-1) fg	1.00	1.00	
Directional flow rate,(note-2) vi	226 pc/h	101 pc/h	
Base percent time-spent-following,(note-4) BPTSFD	23.9	%	
Adjustment for no-passing zones, fnp	38.8		
Percent time-spent-following, PTSFD	50.7	%	

-----Level of Service and Other Performance Measures-----

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	129	veh-mi
Peak-hour vehicle-miles of travel, VMT60	414	veh-mi
Peak 15-min total travel time, TT15	2.4	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

-----Passing Lane Analysis-----

Total length of analysis segment, Lt	2.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSD (from above)	53.4	mi/h
Percent time-spent-following, PTSFD (from above)	50.7	
Level of service, LOSd (from above)	B	

-----Average Travel Speed with Passing Lane-----

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

-----Percent Time-Spent-Following with Passing Lane-----

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

-----Level of Service and Other Performance Measures with Passing Lane-----

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

-----Bicycle Level of Service-----

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	225.0
Effective width of outside lane, We	16.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	5.53
Bicycle LOS	F

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i (v_d or v_o) $\geq 1,700$ pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for $v > 200$ veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

HCS7: Two-Lane Highways Release 7.2

Phone: Fax:
E-Mail:

 Directional Two-Lane Highway Segment Analysis

Analyst HDR
 Agency/Co. HDR
 Date Performed 7/5/2019
 Analysis Time Period 2045 - AM Build Eastbound
 Highway Elk Creek Road
 From/To Erickson Ranch to Haines
 Jurisdiction Meade County
 Analysis Year 2045
 Description Southern Meade County Corridor

 Input Data

Highway class	Class 2	Peak hour factor, PHF	0.80	
Shoulder width	0.0 ft	% Trucks and buses	6	%
Lane width	12.0 ft	% Trucks crawling	0.0	%
Segment length	3.0 mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level	% Recreational vehicles	0	%
Grade: Length	- mi	% No-passing zones	14	%
Up/down	- %	Access point density	6	/mi

Analysis direction volume, Vd 100 veh/h
 Opposing direction volume, Vo 70 veh/h

 Average Travel Speed

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.9*	1.9
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.949	0.949
Grade adj. factor, (note-1) fg	1.00	1.00
Directional flow rate, (note-2) vi	132 pc/h	92 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM - mi/h
 Observed total demand, (note-3) V - veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS 60.0 mi/h
 Adj. for lane and shoulder width, (note-3) fLS 4.2 mi/h
 Adj. for access point density, (note-3) fA 1.5 mi/h

Free-flow speed, FFSd 54.3 mi/h

Adjustment for no-passing zones, fnp 2.4* mi/h
 Average travel speed, ATSD 50.2 mi/h
 Percent Free Flow Speed, PFFS 92.4 %

 Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)	
PCE for trucks, ET	1.1	1.1	
PCE for RVs, ER	1.0	1.0	
Heavy-vehicle adjustment factor, fHV	0.994	0.994	
Grade adjustment factor,(note-1) fg	1.00	1.00	
Directional flow rate,(note-2) vi	126 pc/h	88 pc/h	
Base percent time-spent-following,(note-4) BPTSFD	14.3	%	
Adjustment for no-passing zones, fnp	24.9		
Percent time-spent-following, PTSFD	29.0	%	

 Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	94	veh-mi
Peak-hour vehicle-miles of travel, VMT60	300	veh-mi
Peak 15-min total travel time, TT15	1.9	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

 Passing Lane Analysis

Total length of analysis segment, Lt	3.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSD (from above)	50.2	mi/h
Percent time-spent-following, PTSFD (from above)	29.0	
Level of service, LOSd (from above)	A	

 Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

 Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

 Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

 Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	125.0
Effective width of outside lane, We	18.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.90
Bicycle LOS	E

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i (v_d or v_o) $\geq 1,700$ pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for $v > 200$ veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

Phone: _____ Fax: _____
 E-Mail: _____

----- Directional Two-Lane Highway Segment Analysis -----

Analyst HDR
 Agency/Co. HDR
 Date Performed 7/5/2019
 Analysis Time Period 2045 - AM Build Southbound
 Highway Erickson Ranch Road
 From/To East/West Co to Westridge Rd
 Jurisdiction Meade County
 Analysis Year 2045
 Description Southern Meade County Corridor

----- Input Data -----

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	2.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.6	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd 190 veh/h
 Opposing direction volume, Vo 90 veh/h

----- Average Travel Speed -----

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.5	1.9
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.976	0.957
Grade adj. factor, (note-1) fg	1.00	1.00
Directional flow rate, (note-2) vi	243 pc/h	118 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM - mi/h
 Observed total demand, (note-3) V - veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS 60.0 mi/h
 Adj. for lane and shoulder width, (note-3) fLS 2.6 mi/h
 Adj. for access point density, (note-3) fA 1.0 mi/h

Free-flow speed, FFSd 56.4 mi/h

Adjustment for no-passing zones, fnp 3.0 mi/h
 Average travel speed, ATSD 50.6 mi/h
 Percent Free Flow Speed, PFFS 89.7 %

 Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)	
PCE for trucks, ET	1.1	1.1	
PCE for RVs, ER	1.0	1.0	
Heavy-vehicle adjustment factor, fHV	0.995	0.995	
Grade adjustment factor,(note-1) fg	1.00	1.00	
Directional flow rate,(note-2) vi	239 pc/h	113 pc/h	
Base percent time-spent-following,(note-4) BPTSFD	25.1	%	
Adjustment for no-passing zones, fnp	50.3		
Percent time-spent-following, PTSFD	59.3	%	

 Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	95	veh-mi
Peak-hour vehicle-miles of travel, VMT60	304	veh-mi
Peak 15-min total travel time, TT15	1.9	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

 Passing Lane Analysis

Total length of analysis segment, Lt	1.6	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSD (from above)	50.6	mi/h
Percent time-spent-following, PTSFD (from above)	59.3	
Level of service, LOSd (from above)	C	

 Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

 Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

 Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

 Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	237.5
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	5.55
Bicycle LOS	F

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i (v_d or v_o) $\geq 1,700$ pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for $v > 200$ veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS7: Two-Lane Highways Release 7.2

Phone: _____ Fax: _____
 E-Mail: _____

----- Directional Two-Lane Highway Segment Analysis -----

Analyst HDR
 Agency/Co. HDR
 Date Performed 7/5/2019
 Analysis Time Period 2045 - AM Build Southbound
 Highway Erickson Ranch Road
 From/To Westridge to Elk Creek
 Jurisdiction Meade County
 Analysis Year 2045
 Description Southern Meade County Corridor

----- Input Data -----

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	0.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	60	%
Up/down	-	%	Access point density	8	/mi

Analysis direction volume, Vd 125 veh/h
 Opposing direction volume, Vo 100 veh/h

----- Average Travel Speed -----

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.5*	1.9*
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.976	0.957
Grade adj. factor, (note-1) fg	1.00	1.00
Directional flow rate, (note-2) vi	160 pc/h	131 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM - mi/h
 Observed total demand, (note-3) V - veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS 60.0 mi/h
 Adj. for lane and shoulder width, (note-3) fLS 4.2 mi/h
 Adj. for access point density, (note-3) fA 2.0 mi/h

Free-flow speed, FFSd 53.8 mi/h

Adjustment for no-passing zones, fnp 2.5 mi/h
 Average travel speed, ATSD 49.0 mi/h
 Percent Free Flow Speed, PFFS 91.1 %

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)	
PCE for trucks, ET	1.1	1.1	
PCE for RVs, ER	1.0	1.0	
Heavy-vehicle adjustment factor, fHV	0.995	0.995	
Grade adjustment factor,(note-1) fg	1.00	1.00	
Directional flow rate,(note-2) vi	157 pc/h	126 pc/h	
Base percent time-spent-following,(note-4) BPTSFD	17.4	%	
Adjustment for no-passing zones, fnp	53.2		
Percent time-spent-following, PTSFD	46.9	%	

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	109	veh-mi
Peak-hour vehicle-miles of travel, VMT60	350	veh-mi
Peak 15-min total travel time, TT15	2.2	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSD (from above)	49.0	mi/h
Percent time-spent-following, PTSFD (from above)	46.9	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	156.3
Effective width of outside lane, We	16.50
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.95
Bicycle LOS	E

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i (v_d or v_o) $\geq 1,700$ pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for $v > 200$ veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

HCS7: Two-Lane Highways Release 7.2

Phone: _____ Fax: _____
 E-Mail: _____

----- Directional Two-Lane Highway Segment Analysis -----

Analyst HDR
 Agency/Co. HDR
 Date Performed 7/5/2019
 Analysis Time Period 2045 - AM Build Southbound
 Highway Erickson Ranch Road
 From/To Peaceful Pines to East/West Co
 Jurisdiction Meade County
 Analysis Year 2045
 Description Southern Meade County Corridor

----- Input Data -----

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	2.0	ft	% Trucks and buses	3	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	12	/mi

Analysis direction volume, Vd 240 veh/h
 Opposing direction volume, Vo 85 veh/h

----- Average Travel Speed -----

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.4	1.9
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.988	0.974
Grade adj. factor, (note-1) fg	1.00	1.00
Directional flow rate, (note-2) vi	304 pc/h	109 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM - mi/h
 Observed total demand, (note-3) V - veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS 60.0 mi/h
 Adj. for lane and shoulder width, (note-3) fLS 2.6 mi/h
 Adj. for access point density, (note-3) fA 3.0 mi/h

Free-flow speed, FFSd 54.4 mi/h

Adjustment for no-passing zones, fnp 2.8 mi/h
 Average travel speed, ATSD 48.4 mi/h
 Percent Free Flow Speed, PFFS 89.0 %

 Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)	
PCE for trucks, ET	1.1	1.1	
PCE for RVs, ER	1.0	1.0	
Heavy-vehicle adjustment factor, fHV	0.997	0.997	
Grade adjustment factor,(note-1) fg	1.00	1.00	
Directional flow rate,(note-2) vi	301 pc/h	107 pc/h	
Base percent time-spent-following,(note-4) BPTSFD	30.3	%	
Adjustment for no-passing zones, fnp	46.9		
Percent time-spent-following, PTSFD	64.9	%	

 Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	75	veh-mi
Peak-hour vehicle-miles of travel, VMT60	240	veh-mi
Peak 15-min total travel time, TT15	1.5	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

 Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSD (from above)	48.4	mi/h
Percent time-spent-following, PTSFD (from above)	64.9	
Level of service, LOSd (from above)	C	

 Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

 Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

 Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

 Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	300.0
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	5.10
Bicycle LOS	E

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i (v_d or v_o) $\geq 1,700$ pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for $v > 200$ veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Phone: _____ Fax: _____
 E-Mail: _____

----- Directional Two-Lane Highway Segment Analysis -----

Analyst HDR
 Agency/Co. HDR
 Date Performed 7/5/2019
 Analysis Time Period 2045 - AM Build Southbound
 Highway Haines Avenue
 From/To East/West Cor. to Elk Creek Rd
 Jurisdiction Meade County
 Analysis Year 2045
 Description Southern Meade County Corridor

----- Input Data -----

Highway class	Class 2	Peak hour factor, PHF	0.80	
Shoulder width	0.0 ft	% Trucks and buses	6	%
Lane width	12.0 ft	% Trucks crawling	0.0	%
Segment length	4.0 mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level	% Recreational vehicles	0	%
Grade: Length	- mi	% No-passing zones	40	%
Up/down	- %	Access point density	4	/mi

Analysis direction volume, Vd 225 veh/h
 Opposing direction volume, Vo 55 veh/h

----- Average Travel Speed -----

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.4	1.9
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.977	0.949
Grade adj. factor, (note-1) fg	1.00	1.00
Directional flow rate, (note-2) vi	288 pc/h	72 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM - mi/h
 Observed total demand, (note-3) V - veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS 55.0 mi/h
 Adj. for lane and shoulder width, (note-3) fLS 4.2 mi/h
 Adj. for access point density, (note-3) fA 1.0 mi/h

Free-flow speed, FFSd 49.8 mi/h

Adjustment for no-passing zones, fnp 2.4* mi/h
 Average travel speed, ATSD 44.6 mi/h
 Percent Free Flow Speed, PFFS 89.6 %

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)	
PCE for trucks, ET	1.1	1.1	
PCE for RVs, ER	1.0	1.0	
Heavy-vehicle adjustment factor, fHV	0.994	0.994	
Grade adjustment factor,(note-1) fg	1.00	1.00	
Directional flow rate,(note-2) vi	283 pc/h	69 pc/h	
Base percent time-spent-following,(note-4) BPTSFD	28.8	%	
Adjustment for no-passing zones, fnp	34.9		
Percent time-spent-following, PTSFD	56.9	%	

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	281	veh-mi
Peak-hour vehicle-miles of travel, VMT60	900	veh-mi
Peak 15-min total travel time, TT15	6.3	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	4.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSD (from above)	44.6	mi/h
Percent time-spent-following, PTSFD (from above)	56.9	
Level of service, LOSd (from above)	C	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	281.3
Effective width of outside lane, We	12.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	6.21
Bicycle LOS	F

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i (v_d or v_o) $\geq 1,700$ pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for $v > 200$ veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

Phone: Fax:
E-Mail:

----- Directional Two-Lane Highway Segment Analysis -----

Analyst HDR
Agency/Co. HDR
Date Performed 7/5/2019
Analysis Time Period 2045 - AM Build Southbound
Highway Haines Avenue
From/To Pennington Co to E/W Corridor
Jurisdiction Meade County
Analysis Year 2045
Description Southern Meade County Corridor

----- Input Data -----

Highway class	Class 2	Peak hour factor, PHF	0.80	
Shoulder width	2.0 ft	% Trucks and buses	4	%
Lane width	12.0 ft	% Trucks crawling	0.0	%
Segment length	2.0 mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level	% Recreational vehicles	0	%
Grade: Length	- mi	% No-passing zones	27	%
Up/down	- %	Access point density	5	/mi

Analysis direction volume, Vd 430 veh/h
Opposing direction volume, Vo 60 veh/h

----- Average Travel Speed -----

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.2	1.9
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.992	0.965
Grade adj. factor, (note-1) fg	1.00	1.00
Directional flow rate, (note-2) vi	542 pc/h	78 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM - mi/h
Observed total demand, (note-3) V - veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS 60.0 mi/h
Adj. for lane and shoulder width, (note-3) fLS 2.6 mi/h
Adj. for access point density, (note-3) fA 1.3 mi/h

Free-flow speed, FFSd 56.2 mi/h

Adjustment for no-passing zones, fnp 2.4* mi/h
Average travel speed, ATSD 48.9 mi/h
Percent Free Flow Speed, PFFS 87.2 %

 Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)	
PCE for trucks, ET	1.0	1.1	
PCE for RVs, ER	1.0	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	0.996	
Grade adjustment factor,(note-1) fg	1.00	1.00	
Directional flow rate,(note-2) vi	537 pc/h	75 pc/h	
Base percent time-spent-following,(note-4) BPTSFD	47.0	%	
Adjustment for no-passing zones, fnp	20.5		
Percent time-spent-following, PTSFD	65.0	%	

 Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	269	veh-mi
Peak-hour vehicle-miles of travel, VMT60	860	veh-mi
Peak 15-min total travel time, TT15	5.5	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

 Passing Lane Analysis

Total length of analysis segment, Lt	2.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSD (from above)	48.9	mi/h
Percent time-spent-following, PTSFD (from above)	65.0	
Level of service, LOSd (from above)	C	

 Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

 Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

 Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

 Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	537.5
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	5.67
Bicycle LOS	F

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i (v_d or v_o) $\geq 1,700$ pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for $v > 200$ veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

HCS7: Two-Lane Highways Release 7.2

Phone: _____ Fax: _____
 E-Mail: _____

----- Directional Two-Lane Highway Segment Analysis -----

Analyst HDR
 Agency/Co. HDR
 Date Performed 7/5/2019
 Analysis Time Period 2045 - PM Build Northbound
 Highway Erickson Ranch Road
 From/To E/W Corridor to Westridge Rd
 Jurisdiction Meade County
 Analysis Year 2045
 Description Southern Meade County Corridor

----- Input Data -----

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	2.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.6	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd 120 veh/h
 Opposing direction volume, Vo 90 veh/h

----- Average Travel Speed -----

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.5*	1.9
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.976	0.957
Grade adj. factor, (note-1) fg	1.00	1.00
Directional flow rate, (note-2) vi	154 pc/h	118 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM - mi/h
 Observed total demand, (note-3) V - veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFfs 60.0 mi/h
 Adj. for lane and shoulder width, (note-3) fLS 2.6 mi/h
 Adj. for access point density, (note-3) fA 1.0 mi/h

Free-flow speed, FFSd 56.4 mi/h

Adjustment for no-passing zones, fnp 2.4* mi/h
 Average travel speed, ATSD 51.9 mi/h
 Percent Free Flow Speed, PFFS 92.0 %

 Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)	
PCE for trucks, ET	1.1	1.1	
PCE for RVs, ER	1.0	1.0	
Heavy-vehicle adjustment factor, fHV	0.995	0.995	
Grade adjustment factor,(note-1) fg	1.00	1.00	
Directional flow rate,(note-2) vi	151 pc/h	113 pc/h	
Base percent time-spent-following,(note-4) BPTSFD	16.9	%	
Adjustment for no-passing zones, fnp	55.1		
Percent time-spent-following, PTSFD	48.4	%	

 Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	60	veh-mi
Peak-hour vehicle-miles of travel, VMT60	192	veh-mi
Peak 15-min total travel time, TT15	1.2	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

 Passing Lane Analysis

Total length of analysis segment, Lt	1.6	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSD (from above)	51.9	mi/h
Percent time-spent-following, PTSFD (from above)	48.4	
Level of service, LOSd (from above)	B	

 Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

 Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

 Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

 Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	150.0
Effective width of outside lane, We	19.60
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.37
Bicycle LOS	D

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i (v_d or v_o) $\geq 1,700$ pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for $v > 200$ veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

HCS7: Two-Lane Highways Release 7.2

Phone: Fax:
E-Mail:

 Directional Two-Lane Highway Segment Analysis

Analyst HDR
 Agency/Co. HDR
 Date Performed 7/5/2019
 Analysis Time Period 2045 - PM Build Northbound
 Highway Erickson Ranch Road
 From/To Westridge to Elk Creek
 Jurisdiction Meade County
 Analysis Year 2045
 Description Southern Meade County Corridor

 Input Data

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	0.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	56	%
Up/down	-	%	Access point density	8	/mi

Analysis direction volume, Vd 105 veh/h
 Opposing direction volume, Vo 100 veh/h

 Average Travel Speed

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.5*	1.9*
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.976	0.957
Grade adj. factor, (note-1) fg	1.00	1.00
Directional flow rate, (note-2) vi	134 pc/h	131 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM - mi/h
 Observed total demand, (note-3) V - veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS 60.0 mi/h
 Adj. for lane and shoulder width, (note-3) fLS 4.2 mi/h
 Adj. for access point density, (note-3) fA 2.0 mi/h

Free-flow speed, FFSd 53.8 mi/h

Adjustment for no-passing zones, fnp 2.3 mi/h
 Average travel speed, ATSD 49.4 mi/h
 Percent Free Flow Speed, PFFS 91.9 %

 Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)	
PCE for trucks, ET	1.1	1.1	
PCE for RVs, ER	1.0	1.0	
Heavy-vehicle adjustment factor, fHV	0.995	0.995	
Grade adjustment factor,(note-1) fg	1.00	1.00	
Directional flow rate,(note-2) vi	132 pc/h	126 pc/h	
Base percent time-spent-following,(note-4) BPTSFD	15.0	%	
Adjustment for no-passing zones, fnp	51.4		
Percent time-spent-following, PTSFD	41.3	%	

 Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	92	veh-mi
Peak-hour vehicle-miles of travel, VMT60	294	veh-mi
Peak 15-min total travel time, TT15	1.9	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

 Passing Lane Analysis

Total length of analysis segment, Lt	2.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSD (from above)	49.4	mi/h
Percent time-spent-following, PTSFD (from above)	41.3	
Level of service, LOSd (from above)	B	

 Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

 Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

 Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

 Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	131.3
Effective width of outside lane, We	17.70
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.66
Bicycle LOS	E

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i (v_d or v_o) $\geq 1,700$ pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for $v > 200$ veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

Phone: _____ Fax: _____
 E-Mail: _____

----- Directional Two-Lane Highway Segment Analysis -----

Analyst HDR
 Agency/Co. HDR
 Date Performed 7/5/2019
 Analysis Time Period 2045 - PM Build Northbound
 Highway Erickson Ranch Road
 From/To Peaceful Pines to E/W Corridor
 Jurisdiction Meade County
 Analysis Year 2045
 Description Southern Meade County Corridor

----- Input Data -----

Highway class	Class 2	Peak hour factor, PHF	0.80	
Shoulder width	2.0 ft	% Trucks and buses	3	%
Lane width	12.0 ft	% Trucks crawling	0.0	%
Segment length	1.0 mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level	% Recreational vehicles	0	%
Grade: Length	- mi	% No-passing zones	100	%
Up/down	- %	Access point density	12	/mi

Analysis direction volume, Vd 175 veh/h
 Opposing direction volume, Vo 65 veh/h

----- Average Travel Speed -----

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.5	1.9
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.985	0.974
Grade adj. factor, (note-1) fg	1.00	1.00
Directional flow rate, (note-2) vi	222 pc/h	83 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM - mi/h
 Observed total demand, (note-3) V - veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS 60.0 mi/h
 Adj. for lane and shoulder width, (note-3) fLS 2.6 mi/h
 Adj. for access point density, (note-3) fA 3.0 mi/h

Free-flow speed, FFSd 54.4 mi/h

Adjustment for no-passing zones, fnp 2.4* mi/h
 Average travel speed, ATSD 49.6 mi/h
 Percent Free Flow Speed, PFFS 91.2 %

 Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)	
PCE for trucks, ET	1.1	1.1	
PCE for RVs, ER	1.0	1.0	
Heavy-vehicle adjustment factor, fHV	0.997	0.997	
Grade adjustment factor,(note-1) fg	1.00	1.00	
Directional flow rate,(note-2) vi	219 pc/h	81 pc/h	
Base percent time-spent-following,(note-4) BPTSFD	23.3	%	
Adjustment for no-passing zones, fnp	48.1		
Percent time-spent-following, PTSFD	58.4	%	

 Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	55	veh-mi
Peak-hour vehicle-miles of travel, VMT60	175	veh-mi
Peak 15-min total travel time, TT15	1.1	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

 Passing Lane Analysis

Total length of analysis segment, Lt	1.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSD (from above)	49.6	mi/h
Percent time-spent-following, PTSFD (from above)	58.4	
Level of service, LOSd (from above)	C	

 Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

 Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

 Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

 Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	218.8
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.94
Bicycle LOS	E

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i (v_d or v_o) $\geq 1,700$ pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for $v > 200$ veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

HCS7: Two-Lane Highways Release 7.2

Phone: _____ Fax: _____
 E-Mail: _____

----- Directional Two-Lane Highway Segment Analysis -----

Analyst HDR
 Agency/Co. HDR
 Date Performed 7/5/2019
 Analysis Time Period 2045 - PM Build Northbound
 Highway Haines Avenue
 From/To E/W Corridor to Elk Creek Rd
 Jurisdiction Meade County
 Analysis Year 2045
 Description Southern Meade County Corridor

----- Input Data -----

Highway class	Class 2	Peak hour factor, PHF	0.80	
Shoulder width	0.0 ft	% Trucks and buses	6	%
Lane width	12.0 ft	% Trucks crawling	0.0	%
Segment length	4.0 mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level	% Recreational vehicles	0	%
Grade: Length	- mi	% No-passing zones	28	%
Up/down	- %	Access point density	4	/mi

Analysis direction volume, Vd 205 veh/h
 Opposing direction volume, Vo 80 veh/h

----- Average Travel Speed -----

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.4	1.9
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.977	0.949
Grade adj. factor, (note-1) fg	1.00	1.00
Directional flow rate, (note-2) vi	262 pc/h	105 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM - mi/h
 Observed total demand, (note-3) V - veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS 55.0 mi/h
 Adj. for lane and shoulder width, (note-3) fLS 4.2 mi/h
 Adj. for access point density, (note-3) fA 1.0 mi/h

Free-flow speed, FFSd 49.8 mi/h

Adjustment for no-passing zones, fnp 2.4* mi/h
 Average travel speed, ATSD 44.6 mi/h
 Percent Free Flow Speed, PFFS 89.5 %

 Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)	
PCE for trucks, ET	1.1	1.1	
PCE for RVs, ER	1.0	1.0	
Heavy-vehicle adjustment factor, fHV	0.994	0.994	
Grade adjustment factor,(note-1) fg	1.00	1.00	
Directional flow rate,(note-2) vi	258 pc/h	101 pc/h	
Base percent time-spent-following,(note-4) BPTSFD	26.7	%	
Adjustment for no-passing zones, fnp	32.6		
Percent time-spent-following, PTSFD	50.1	%	

 Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	256	veh-mi
Peak-hour vehicle-miles of travel, VMT60	820	veh-mi
Peak 15-min total travel time, TT15	5.7	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

 Passing Lane Analysis

Total length of analysis segment, Lt	4.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSD (from above)	44.6	mi/h
Percent time-spent-following, PTSFD (from above)	50.1	
Level of service, LOSd (from above)	B	

 Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

 Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

 Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

 Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	256.3
Effective width of outside lane, We	12.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	6.16
Bicycle LOS	F

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
 2. If v_i (v_d or v_o) $\geq 1,700$ pc/h, terminate analysis-the LOS is F.
 3. For the analysis direction only and for $v > 200$ veh/h.
 4. For the analysis direction only.
 5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.
- * These items have been entered or edited to override calculated value

Phone: _____ Fax: _____
 E-Mail: _____

----- Directional Two-Lane Highway Segment Analysis -----

Analyst HDR
 Agency/Co. HDR
 Date Performed 7/5/2019
 Analysis Time Period 2045 - PM Build Northbound
 Highway Haines Avenue
 From/To Pennington Co to E/W Corridor
 Jurisdiction Meade County
 Analysis Year 2045
 Description Southern Meade County Corridor

----- Input Data -----

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	0.0	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	23	%
Up/down	-	%	Access point density	5	/mi

Analysis direction volume, Vd 400 veh/h
 Opposing direction volume, Vo 125 veh/h

----- Average Travel Speed -----

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.3*	1.5*
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.979	0.966
Grade adj. factor, (note-1) fg	1.00	1.00
Directional flow rate, (note-2) vi	511 pc/h	162 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM - mi/h
 Observed total demand, (note-3) V - veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFfS 60.0 mi/h
 Adj. for lane and shoulder width, (note-3) fLS 4.2 mi/h
 Adj. for access point density, (note-3) fA 1.3 mi/h

Free-flow speed, FFfSd 54.5 mi/h

Adjustment for no-passing zones, fnp 2.4* mi/h
 Average travel speed, ATfSd 46.9 mi/h
 Percent Free Flow Speed, PFFfS 86.0 %

 Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)	
PCE for trucks, ET	1.0	1.1	
PCE for RVs, ER	1.0	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	0.993	
Grade adjustment factor,(note-1) fg	1.00	1.00	
Directional flow rate,(note-2) vi	500	157	pc/h
Base percent time-spent-following,(note-4) BPTSFD	44.7	%	
Adjustment for no-passing zones, fnp	26.0		
Percent time-spent-following, PTSFD	64.5	%	

 Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	250	veh-mi
Peak-hour vehicle-miles of travel, VMT60	800	veh-mi
Peak 15-min total travel time, TT15	5.3	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

 Passing Lane Analysis

Total length of analysis segment, Lt	2.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSD (from above)	46.9	mi/h
Percent time-spent-following, PTSFD (from above)	64.5	
Level of service, LOSd (from above)	C	

 Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

 Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

 Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

 Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	500.0
Effective width of outside lane, We	12.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	6.83
Bicycle LOS	F

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i (v_d or v_o) $\geq 1,700$ pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for $v > 200$ veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

Phone: Fax:
E-Mail:

----- Directional Two-Lane Highway Segment Analysis -----

Analyst HDR
Agency/Co. HDR
Date Performed 7/5/2019
Analysis Time Period 2045 - PM Build Westbound
Highway East/West Corridor
From/To Erickson Ranch to Haines
Jurisdiction Meade County
Analysis Year 2045
Description Southern Meade County Corridor

----- Input Data -----

Highway class	Class 2	Peak hour factor, PHF	0.80	
Shoulder width	4.0 ft	% Trucks and buses	6	%
Lane width	12.0 ft	% Trucks crawling	0.0	%
Segment length	2.3 mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level	% Recreational vehicles	0	%
Grade: Length	- mi	% No-passing zones	40	%
Up/down	- %	Access point density	1	/mi

Analysis direction volume, Vd 170 veh/h
Opposing direction volume, Vo 80 veh/h

----- Average Travel Speed -----

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.5	1.9
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.971	0.949
Grade adj. factor, (note-1) fg	1.00	1.00
Directional flow rate, (note-2) vi	219 pc/h	105 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM - mi/h
Observed total demand, (note-3) V - veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS 60.0 mi/h
Adj. for lane and shoulder width, (note-3) fLS 1.3 mi/h
Adj. for access point density, (note-3) fA 0.3 mi/h

Free-flow speed, FFSd 58.5 mi/h

Adjustment for no-passing zones, fnp 2.4* mi/h
Average travel speed, ATSD 53.5 mi/h
Percent Free Flow Speed, PFFS 91.6 %

 Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)	
PCE for trucks, ET	1.1	1.1	
PCE for RVs, ER	1.0	1.0	
Heavy-vehicle adjustment factor, fHV	0.994	0.994	
Grade adjustment factor,(note-1) fg	1.00	1.00	
Directional flow rate,(note-2) vi	214 pc/h	101 pc/h	
Base percent time-spent-following,(note-4) BPTSFD	22.8	%	
Adjustment for no-passing zones, fnp	39.3		
Percent time-spent-following, PTSFD	49.5	%	

 Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	122	veh-mi
Peak-hour vehicle-miles of travel, VMT60	391	veh-mi
Peak 15-min total travel time, TT15	2.3	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

 Passing Lane Analysis

Total length of analysis segment, Lt	2.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSD (from above)	53.5	mi/h
Percent time-spent-following, PTSFD (from above)	49.5	
Level of service, LOSd (from above)	B	

 Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

 Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

 Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

 Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	212.5
Effective width of outside lane, We	16.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	5.51
Bicycle LOS	F

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i (v_d or v_o) $\geq 1,700$ pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for $v > 200$ veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

HCS7: Two-Lane Highways Release 7.2

Phone: Fax:
E-Mail:

 Directional Two-Lane Highway Segment Analysis

Analyst HDR
 Agency/Co. HDR
 Date Performed 7/5/2019
 Analysis Time Period 2045 - PM Build Westbound
 Highway Elk Creek Road
 From/To Erickson Ranch to Haines
 Jurisdiction Meade County
 Analysis Year 2045
 Description Southern Meade County Corridor

 Input Data

Highway class	Class 2	Peak hour factor, PHF	0.80	
Shoulder width	0.0 ft	% Trucks and buses	7	%
Lane width	12.0 ft	% Trucks crawling	0.0	%
Segment length	3.0 mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level	% Recreational vehicles	0	%
Grade: Length	- mi	% No-passing zones	7	%
Up/down	- %	Access point density	6	/mi

Analysis direction volume, Vd 125 veh/h
 Opposing direction volume, Vo 110 veh/h

 Average Travel Speed

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.5*	1.5*
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adj. factor, (note-5) fHV	0.966	0.966
Grade adj. factor, (note-1) fg	1.00	1.00
Directional flow rate, (note-2) vi	162 pc/h	142 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM - mi/h
 Observed total demand, (note-3) V - veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS 60.0 mi/h
 Adj. for lane and shoulder width, (note-3) fLS 4.2 mi/h
 Adj. for access point density, (note-3) fA 1.5 mi/h

Free-flow speed, FFSd 54.3 mi/h

Adjustment for no-passing zones, fnp 0.9 mi/h
 Average travel speed, ATSD 51.1 mi/h
 Percent Free Flow Speed, PFFS 94.0 %

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)	
PCE for trucks, ET	1.1	1.1	
PCE for RVs, ER	1.0	1.0	
Heavy-vehicle adjustment factor, fHV	0.993	0.993	
Grade adjustment factor,(note-1) fg	1.00	1.00	
Directional flow rate,(note-2) vi	157 pc/h	138 pc/h	
Base percent time-spent-following,(note-4) BPTSFD	17.4	%	
Adjustment for no-passing zones, fnp	20.1		
Percent time-spent-following, PTSFD	28.1	%	

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	117	veh-mi
Peak-hour vehicle-miles of travel, VMT60	375	veh-mi
Peak 15-min total travel time, TT15	2.3	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	3.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSD (from above)	51.1	mi/h
Percent time-spent-following, PTSFD (from above)	28.1	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	156.3
Effective width of outside lane, We	16.50
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	5.60
Bicycle LOS	F

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i (v_d or v_o) $\geq 1,700$ pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for $v > 200$ veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

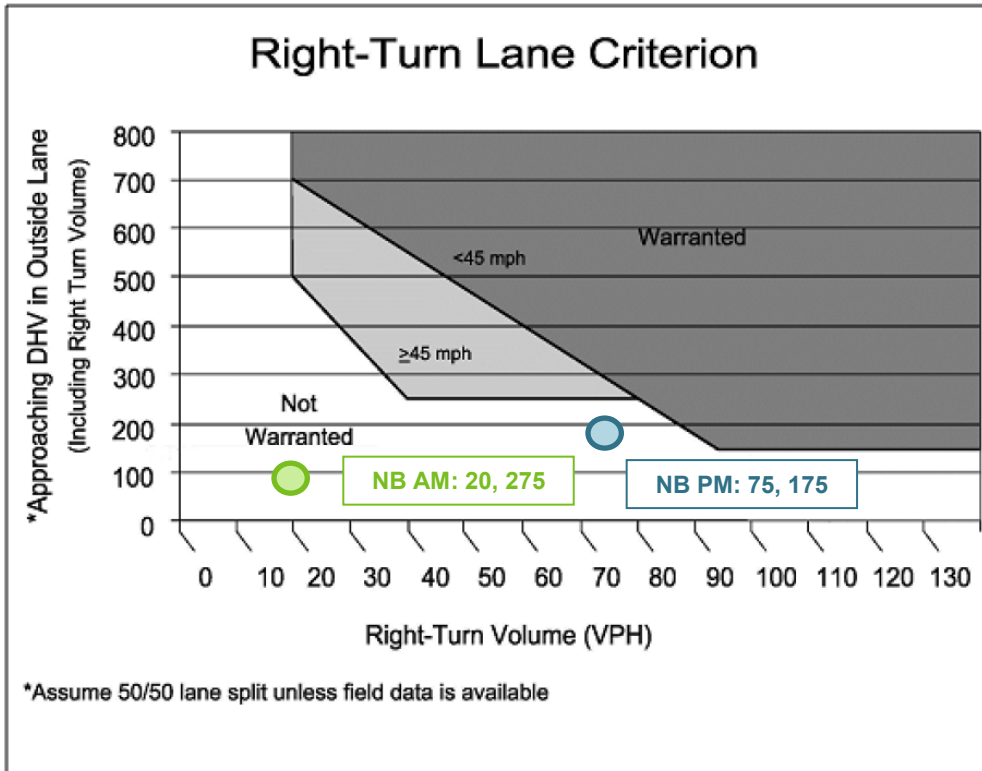
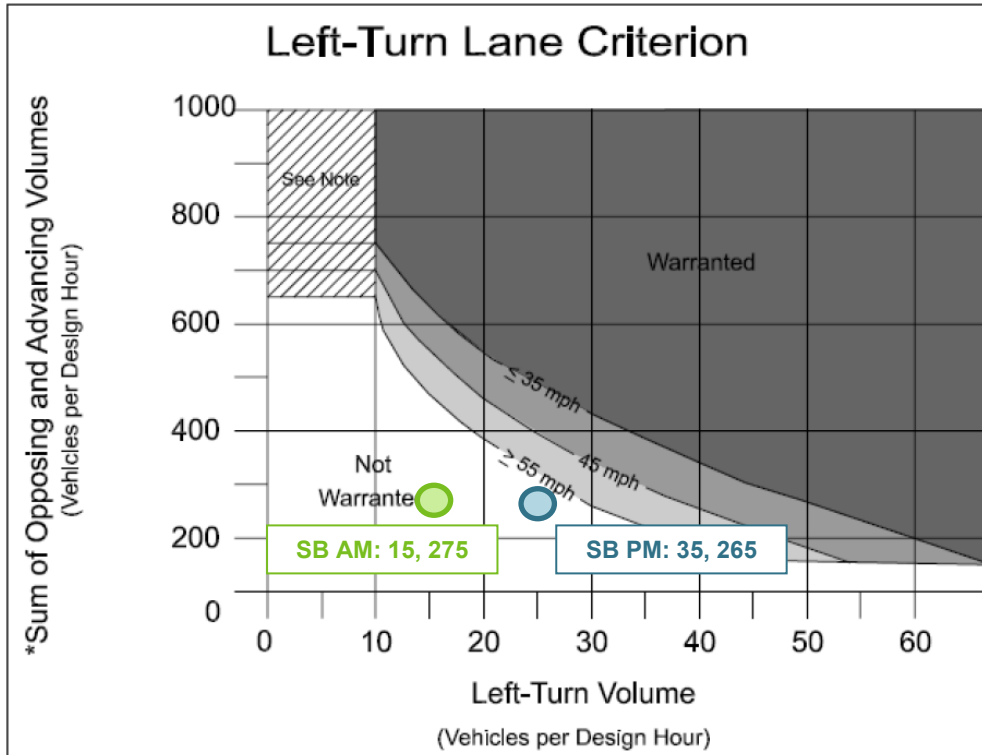
* These items have been entered or edited to override calculated value



Appendix B – 2045 Turn Lane Volume Warrant Review

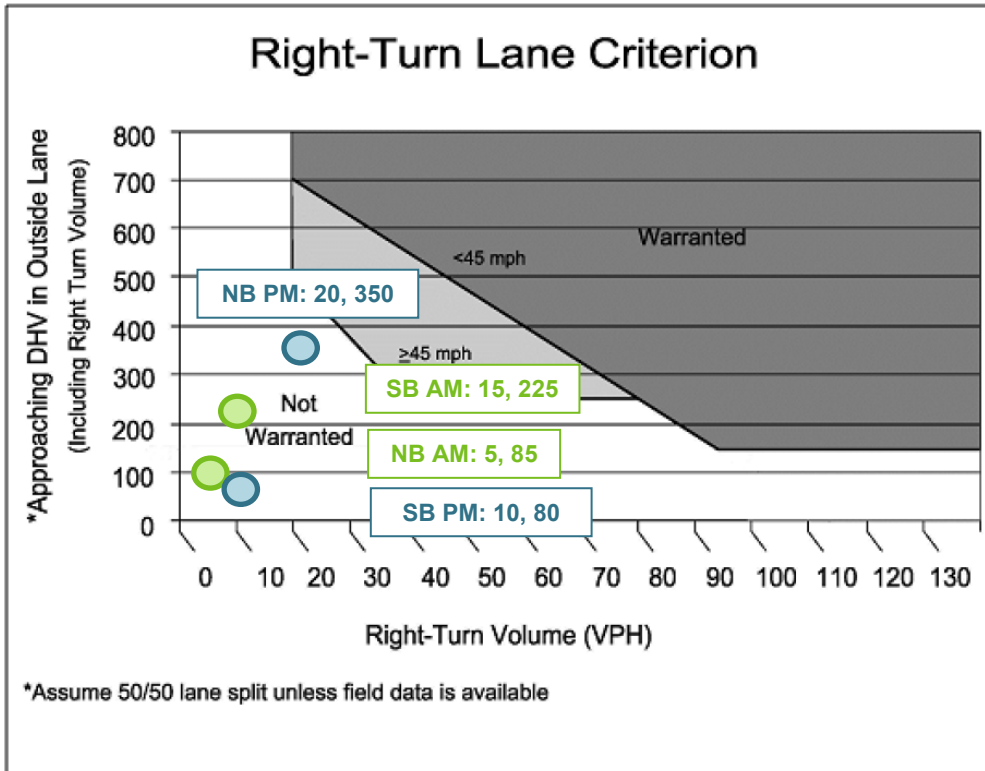
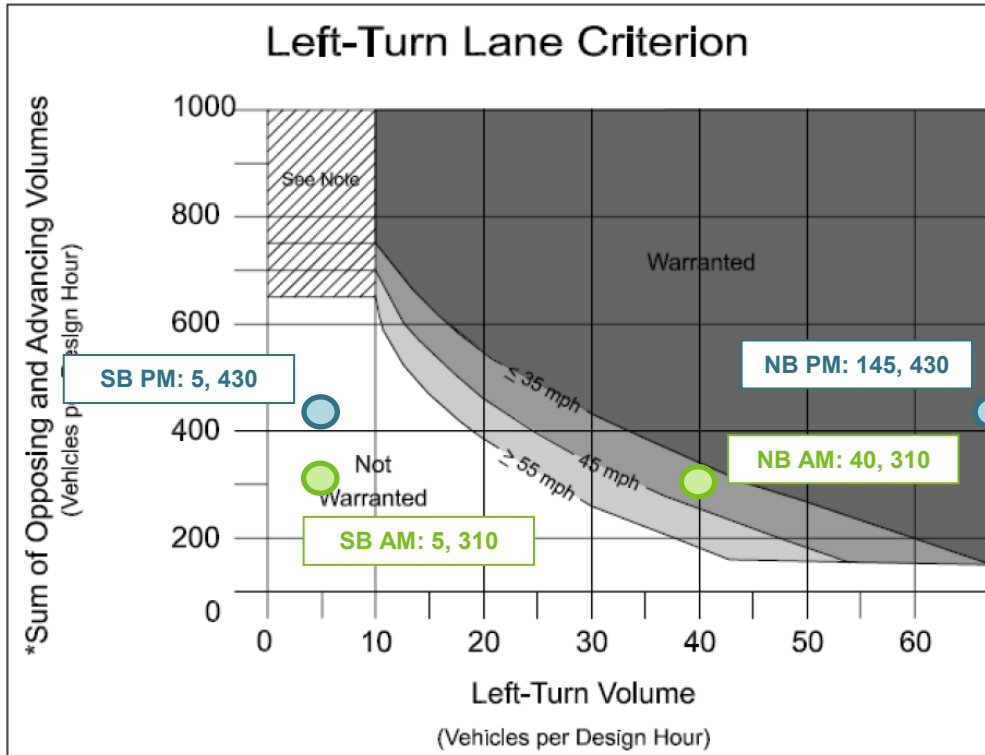


Proposed East/West Corridor and Erickson Ranch Road





Proposed East/West Corridor and Haines Avenue





Proposed East/West Corridor and 143rd Avenue

All forecasted turning movements estimated at 5 vehicles per hour, and thus do not meet volume warrants.