Technical Memo

Date:	Friday, August 16, 2019
Project:	US14-US14 Bypass Corridor Study
To:	Study Advisory Team
From:	HDR
Subject:	Future No-Build Conditions Traffic Operations

Introduction

This memorandum presents the Future No-Build Conditions traffic operations analysis along the US14B corridor. The analysis period evaluated in this memorandum is for the forecasted years 2024 and 2050.

The purpose of this memorandum is to identify traffic operational needs along the study corridor. Methodology used for development of traffic volumes used in this analysis are provided in the Traffic Forecasts Memo. As mentioned in the referenced memo, the 2019 Existing Conditions volume sets were used as the baseline.

Traffic Data

Heavy vehicle percentages used in the analysis were obtained from the peak hour intersection turning movement counts. Peak hour factors (PHF) were adjusted to 0.90 within the Brookings urban boundary (Brookings city limits) and 0.80 outside of the Brookings urban boundary.

Traffic Volume Development

ADTS were developed for 2024 and 2050 using the baseline 2019 peak hour traffic volumes and application of growth factors. Summaries of traffic volumes developed for 2024 and 2050 Future No-Build Conditions are provided in **Figures 1 through 4**. These figures were also included in the Forecasting Memo.

Figure 1: 2024 Future No-Build Conditions Traffic Volumes (1 of 2)

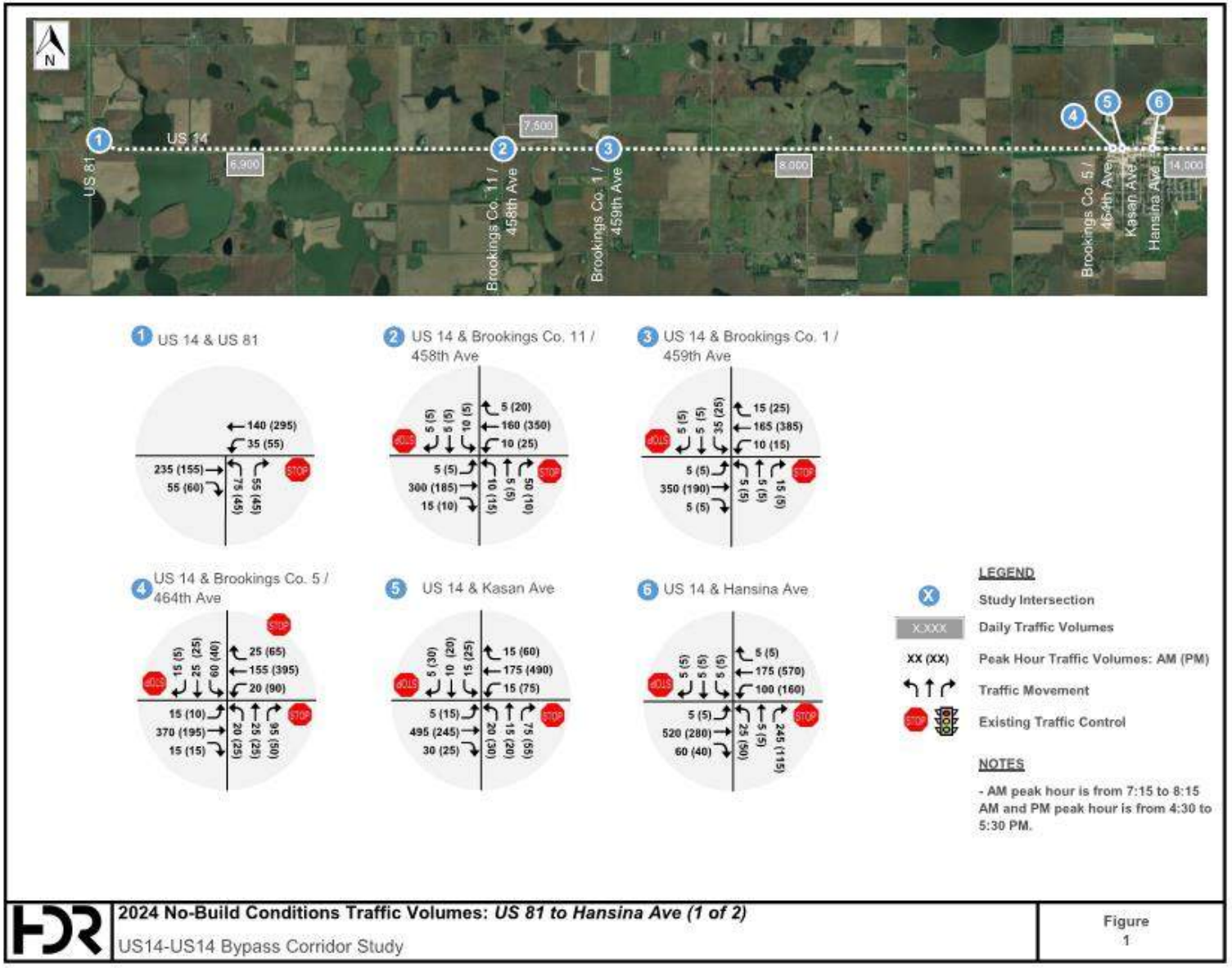


Figure 2: 2024 Future No-Build Conditions Traffic Volumes (2 of 2)

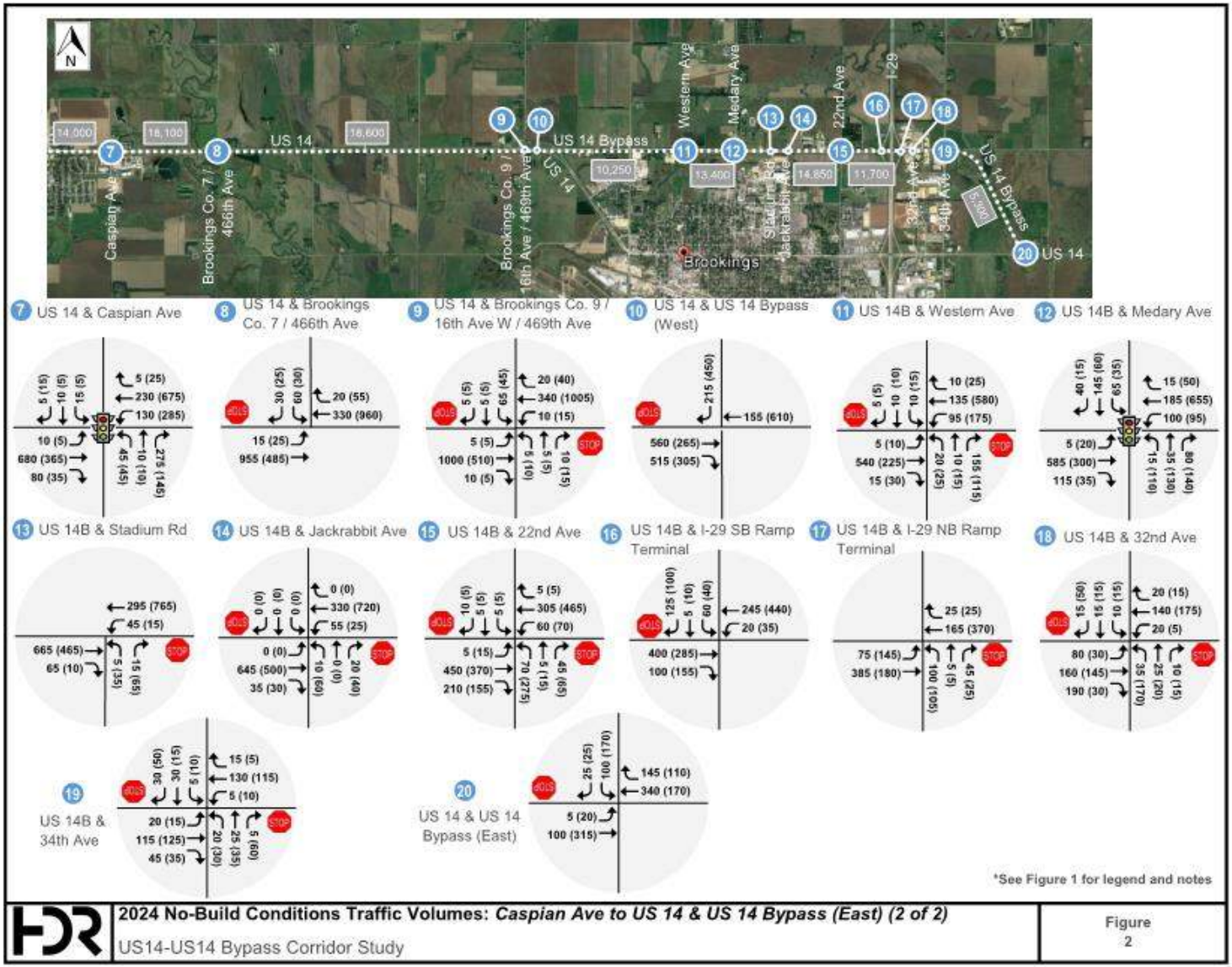


Figure 3: 2050 Future No-Build Conditions Traffic Volumes (1 of 2)

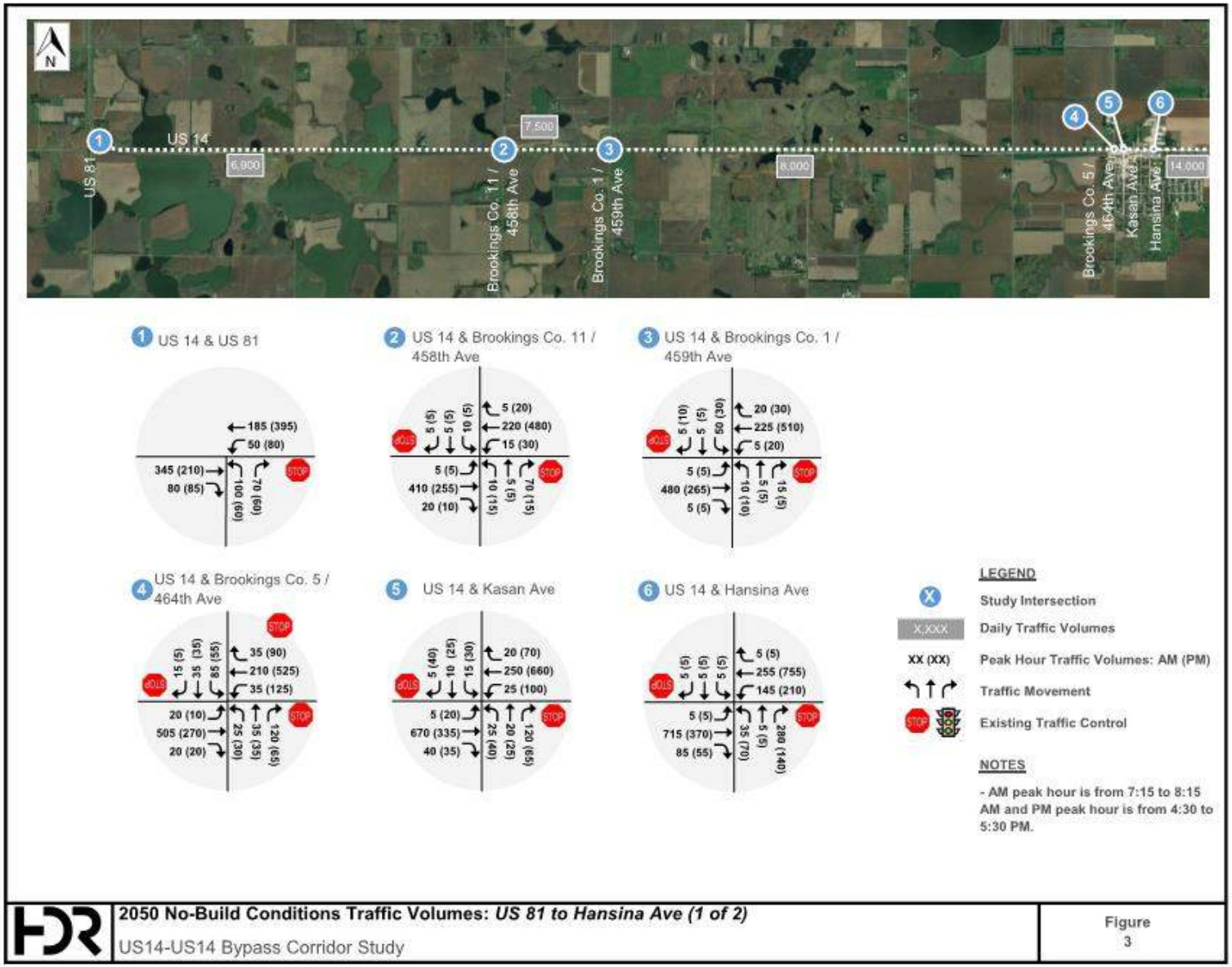
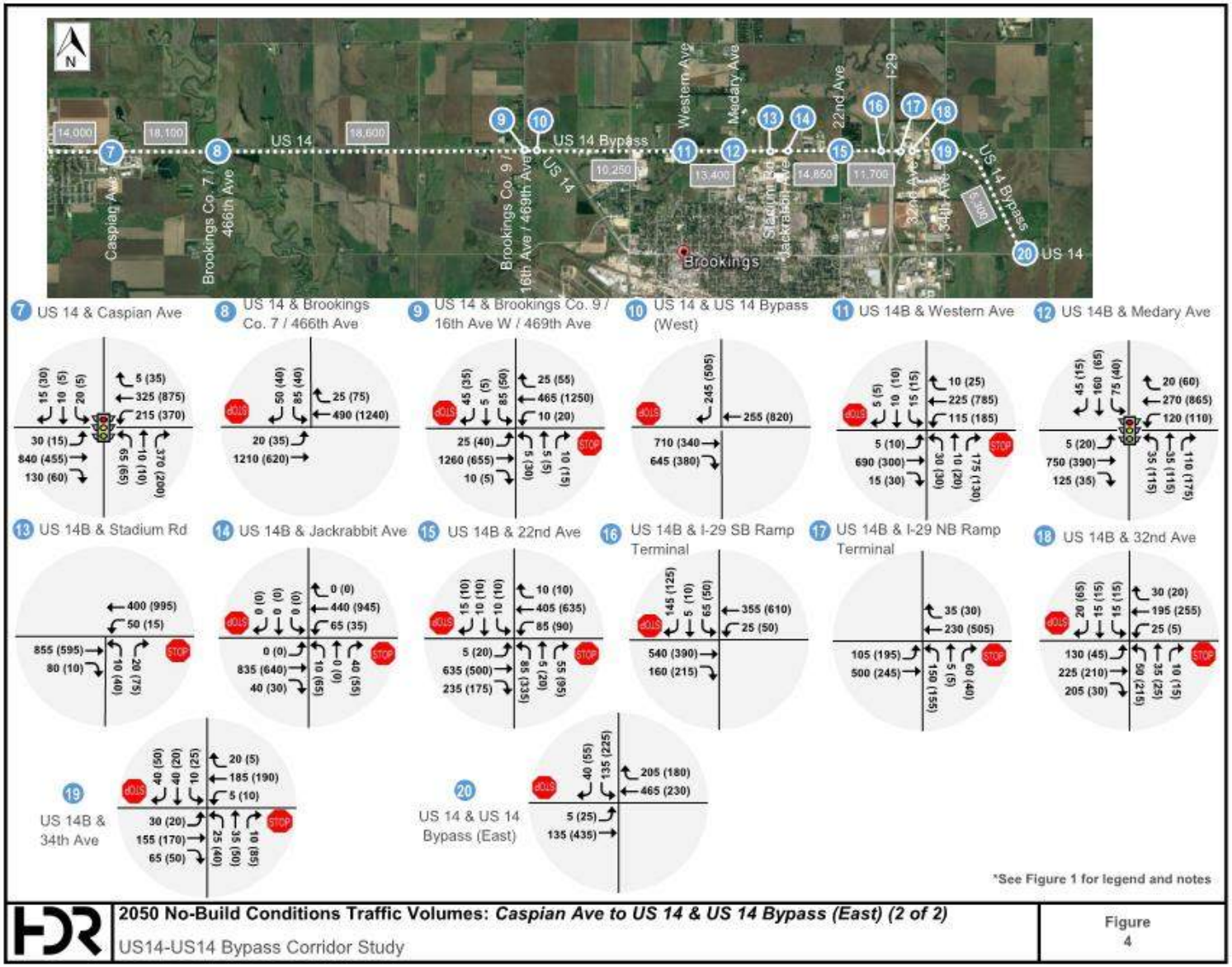


Figure 4: 2050 Future No-Build Conditions Traffic Volumes (2 of 2)



Traffic Operations - Methodology

Peak hour level of service (LOS) was calculated for the 20 analysis intersections and 19 analysis segments using Highway Capacity Software, Version 7 (HCS7) and methodology described in the 6th Edition of the Highway Capacity Manual (HCM6). This is the same methodology that was utilized for analyzing the 2019 Existing Conditions.

Level of Service Thresholds for Intersections

HCM6 analysis methods measure intersection average control delay in terms of seconds of delay per vehicle (sec/veh) and applies a LOS value in accordance with thresholds presented in **Table 1**.

Table 1: Intersection Level of Service Thresholds

LOS	Intersection Delay per Vehicle (sec/veh)	
	Signalized Intersections	Two-Way Stop-Control*, All-Way Stop-Control, and Roundabouts
A	≤ 10	≤ 10
B	> 10 – 20	> 10 – 15
C	> 20 - 35	> 15 - 25
D	> 35 – 55	> 25 – 35
E	> 55 – 80	> 35 – 50
F	Demand exceeds capacity; > 80	Demand exceeds capacity; > 50

Source: Transportation Research Board, HCM6.

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

Weighted intersection delay was also calculated to present a second average delay measure for intersections. This method accounts for the operational benefits afforded to the major, high volume through movements that are not stop or signal-controlled at intersections. HCM6 reporting in HCS provides an average approach delay value that reflects the weighted average delay of all vehicles entering each approach. A LOS measure is applied to this average intersection delay value using HCM6 All-Way Stop-Control LOS thresholds.

Level of Service Thresholds for Highway Segments

For two-lane highway segments designated as Class I[1], HCM6 analysis methods measure average travel speed in terms of miles per hour (mph), as well as percent time spent following and applies a LOS value in accordance with thresholds presented in

[1] Class I two-lane highways are those where motorists are expected to travel at relatively high speeds. See Chapter 15 of HCM6 for additional information.

Table 2.

Table 2: Level of Service Criteria for Two-Lane Highway Segments (Class I Highways)

LOS	Average Travel Speed (mph)	Percent Time Spent Following (%)
A	>55	≤35
B	>50-55	>35-50
C	>45-50	>50-65
D	>40-45	>65-80
E	≤40	>80
F	Demand exceeds capacity	

Source: Transportation Research Board, HCM6.

For multi-lane highway segments, HCM6 analysis methods measure lane density in terms of passenger cars per mile per lane (pc/mi/ln) and applies a LOS value in accordance with thresholds presented in **Table 3**.

Table 3: Level of Service Criteria for Multilane Highway Segments

LOS	Density (pc/mi/ln)
A	≥11
B	>11-18
C	>18-26
D	>26-35
E	>35-45
F	Demand exceeds capacity OR density >45

Source: Transportation Research Board, HCM6.

Level of Service Goals for Study

Minimum allowable LOS thresholds established for this study are shown in **Table 4**.

Table 4: Level of Service Goals by Facility and Area Type

Facility Type	Rural Areas	Urban Areas	General Notes
Signalized Intersections	Minimum allowable LOS: B	Minimum allowable LOS: D	Individual movements allowed to operate at LOS E, but the overall intersection shall be LOS D or better.
Two-Way Stop Controlled Intersections	Minimum allowable LOS: B	Minimum allowable LOS: C	Intersection LOS is based on weighted average intersection delay; the worst case stop-controlled approach delay and LOS may be lower than the minimum allowable LOS.
Ramp Terminal Intersections	Minimum allowable LOS: B	Minimum allowable LOS: C	Individual movements allowed to operate at LOS D, but the overall intersection shall be LOS C or better.
Two-Lane Highways	Minimum allowable LOS: B	Minimum allowable LOS: C, LOS B or better is desirable	
Multi-Lane Highways	Minimum allowable LOS: B	Minimum allowable LOS: C, LOS B or better is desirable	

These LOS thresholds will be used to identify areas of operational needs along the corridor. In Future Build Conditions operational analysis memoranda, these thresholds will be used to guide the development of potential improvements and subsequent evaluation of concepts.

Study Intersections and Segments

The same intersections and segments analyzed as part of the Existing Conditions were included in this Future No-Build Traffic Operations Analysis.

2024 Future No-Build Traffic Operations Analysis

Intersection Operations

The 2024 Future No-Build Conditions for the study area intersections are summarized in **Table 5.** The HCS results are available in **Appendix A**.

Table 5. Intersections – 2024 Future No-Build Conditions

		2024 (AM)			*2024 (PM)*		
Intersection	**Approach**	**Control Delay (s/veh)**	**LOS**	**95% Queue (Veh)***	**Control Delay (s/veh)**	**LOS**	**95% Queue (Veh)***
1. US 14 & US 81 ***(Stop Controlled, Rural)***	**Overall**	**2.9**	**A**	**0.6**	**2.2**	**A**	**0.3**
	EB	0	A	0	0	A	0
	WB	1.7	A	0.1	1.3	A	0.2
	NB	11.1	B	0.6	10.6	B	0.3
2. US 14 & Brookings County 11 / 458th Avenue ***(Stop Controlled, Rural)***	**Overall**	**2.1**	**A**	**0.5**	**1.6**	**A**	**0.3**
	EB	0.2	A	0	0.3	A	0
	WB	0.5	A	0	0.7	A	0.1
	NB	12.5	B	0.5	15.3	C	0.3
	SB	14	B	0.2	15.1	C	0.2
3. US 14 & Brookings County 1 / 459th Avenue ***(Stop Controlled, Rural)***	**Overall**	**2**	**A**	**0.5**	**1.6**	**A**	**0.5**
	EB	0.1	A	0	0.3	A	0
	WB	0.5	A	0	0.4	A	0
	NB	13.1	B	0.2	14.9	B	0.1
	SB	16.7	C	0.5	18.5	C	0.5
4. US 14 & Brookings County 5 / 464th Avenue ***(Stop Controlled, Rural)***	**Overall**	**7.3**	**E**	**2.6**	**7.3**	**F**	**2.8**
	EB	0.3	A	0	0.4	A	0
	WB	0.9	A	0.1	1.3	A	0.3
	NB	17.9	C	1.8	23.6	C	1.8
	SB	33.2	D	2.6	52.6	F	2.8

Intersection	Approach	*2024 (AM)*			*2024 (PM)*		
		Control Delay (s/veh)	LOS	95% Queue (Veh)*	Control Delay (s/veh)	LOS	95% Queue (Veh)*
5. US 14 & Kasan Avenue ***(Stop Controlled, Rural)***	**Overall**	**2.8**	**A**	**1.2**	**4.4**	**B**	**1.7**
	EB	0.1	A	0	0.5	A	0.1
	WB	0.7	A	0.1	1	A	0.2
	NB	16.1	C	1.2	20.9	C	1.7
	SB	15.8	C	0.3	25	C	1.5
6. US 14 & Hasina Avenue ***(Stop Controlled, Rural)***	**Overall**	**6.5**	**C**	**4.4**	**4.6**	**C**	**2.9**
	EB	0.1	A	0	0.1	A	0
	WB	3.5	A	0.5	1.9	A	0.6
	NB	22.4	C	4.4	22.8	C	2.9
	SB	22.5	C	0.3	30.1	D	0.4
7. US 14 & Caspian Avenue ***(Signalized, Rural)***	**Overall**	**33.1**	**C**	**18.7**	**17.3**	**C**	**8.1**
	EB	31.3	C	15.8	19	B	5.8
	WB	17.4	B	3.6	13.4	B	8
	NB	55	D	18.7	32.3	C	8.1
	SB	27.9	C	1.3	26.6	C	1.6
8. US 14 & Brookings County 7 / 466th Avenue ***(Stop Controlled, Rural)***	**Overall**	**1**	**A**	**0.9**	**1**	**A**	**1**
	EB	0.1	A	0.1	0.6	A	0.2
	WB	0	A		0	A	0
	NB	0	A		0	A	0
	SB	14.7	B	0.9	22.9	C	1
9. US 14 & Brookings County 9 / 469th Avenue ***(Stop Controlled, Rural)***	**Overall**	**1.5**	**B**	**1.2**	**1.8**	**A**	**1.8**
	EB	0.1	A	0	0.2	A	0
	WB	0.3	A	0.1	0.1	A	0.1
	NB	20.3	C	0.3	16	C	0.3
	SB	20.5	C	1.2	40.9	E	1.8
10. US 14 & US 14 Bypass - West ***(Stop Controlled, Rural)***	**Overall**	**1.5**	**A**	**1**	**7**	**A**	**7**
	EB	0	A	0	0	A	
	WB	0	A	0	0	A	
	SB	10	B	1	25.5	D	7
11. US 14 Bypass & Western Avenue ***(Stop Controlled, Urban)***	**Overall**	**5.4**	**A**	**2.5**	**4.9**	**A**	**2.4**
	EB	0.1	A	0	0.3	A	0
	WB	3.7	A	0.4	1.9	A	0.5
	NB	21	C	2.5	22.8	C	2.4
	SB	23.2	C	0.4	32.7	D	0.8

Intersection	Approach	*2024 (AM)*			*2024 (PM)*		
		Control Delay (s/veh)	LOS	95% Queue (Veh)*	Control Delay (s/veh)	LOS	95% Queue (Veh)*
12. US 14 Bypass & Medary Avenue ***(Signalized, Urban)***	**Overall**	**13.3**	**B**	**4.4**	**11**	**B**	**3**
	EB	9.2	B	4.4	6.2	A	1.1
	WB	9.6	B	2.4	8.1	A	3
	NB	22	C	2.2	19.2	B	2.6
	SB	24.7	C	2.7	18.8	B	0.7
13. US 14 Bypass & Stadium Road ***(Stop Controlled, Urban)***	**Overall**	**0.7**	**A**	**0.2**	**1.4**	**A**	**1.1**
	EB	0	A	0	0	A	0
	WB	1.3	A	0.2	0.2	A	0.1
	NB	14.8	B	0.2	16.8	C	1.1
14. US 14 Bypass & Jackrabbit Avenue ***(Stop Controlled, Urban)***	**Overall**	**0.9**	**A**	**0.4**	**3.1**	**A**	**1.4**
	EB	0	A	0	0	A	0
	WB	1.4	A	0.2	3	A	0.1
	NB	15.5	C	0.3	20.7	C	1.4
	SB	5	A	0	5	A	0
15. US 14 Bypass & 22nd Avenue ***(Stop Controlled, Urban)***	**Overall**	**2.8**	**A**	**1.5**	**47.9**	**F**	**19.2**
	EB	0.1	A	0	0.2	A	0
	WB	1.5	A	0.2	1.2	A	0.3
	NB	19.4	C	1.5	192.9	F	19.2
	SB	15.3	C	0.2	19.3	C	0.2
16. US 14 Bypass & I-29 SB Ramp Terminal ***(Stop Controlled, Urban)***	**Overall**	**3.4**	**A**	**1.8**	**3.3**	**A**	**2**
	EB	0	A	0	0	A	0
	WB	0.9	A	0.1	1.1	A	0.1
	SB	15.8	C	1.8	19.9	C	2
17. US 14 Bypass & I-29 NB Ramp Terminal ***(Stop Controlled, Urban)***	**Overall**	**5**	**A**	**2.1**	**6.2**	**D**	**2.6**
	EB	1.8	A	0.2	4.7	A	0.5
	WB	0	A	0	0	A	0
	NB	21.1	C	2.1	28	D	2.6
18. US 14 Bypass & 32nd Avenue ***(Stop Controlled, Urban)***	**Overall**	**3.3**	**A**	**0.4**	**6.8**	**B**	**2**
	EB	1.5	A	0.2	1.1	A	0.1
	WB	0.9	A	0.1	0.2	A	0
	NB	15.1	C	0.4	17	C	2
	SB	13.5	B	0.3	11.3	B	0.5
19. US 14 Bypass & 34th Avenue ***(Stop Controlled, Urban)***	**Overall**	**3.5**	**A**	**0.4**	**4.7**	**A**	**0.5**
	EB	0.9	A	0.1	0.7	A	0
	WB	0.3	A	0	0.6	A	0
	NB	12.4	B	0.2	11.4	B	0.5
	SB	11.5	B	0.4	10.3	B	0.4

Intersection	Approach	*2024 (AM)*			*2024 (PM)*		
		Control Delay (s/veh)	LOS	95% Queue (Veh)*	Control Delay (s/veh)	LOS	95% Queue (Veh)*
20. US 14 & US 14 Bypass - East ***(Stop Controlled, Rural)***	**Overall**	**2.6**	**A**	**0.9**	**4.3**	**A**	**2**
	EB	0.4	A	0	0.5	A	0
	WB	0	A	0	0	A	0
	SB	14.3	B	0.9	17	C	2

*Overall intersection control delay results represent the weighted average of each approach and overall intersection 95th% queues reported are the maximum of the approaches.

Highway Segment Operations

The 2024 Future No-Build Conditions highway segment operations are summarized in **Table 6**. HCS analysis reports are provided in **Appendix B**.

Table 6. Highway Segments – 2024 Future No-Build Conditions

						2024 Segment LOS			
						AM		PM	
Seg. No.	Mainline	From	To	Length (miles)	Type	EB	WB	EB	WB
1	US 14	Project Beginning MP MRM 402.94	US 81	0.15	4-Ln, Divided	A	A	A	A
2	US 14	US 81	Brookings CR 11 / 458th Ave	3.96	Mostly 4-Ln, Divided	A	A	A	A
3	US 14	Brookings CR 11 / 458th Ave	Brookings CR 1 / 459th Ave	1.04	2-lane Undivided	C	B	B	C
4	US 14	Brookings CR 1 / 459th Ave	Brookings CR 5 / 464th Ave	4.90	2-lane Undivided	C	B	B	C
5	US 14	Brookings CR 5 / 464th Ave	Kasan Ave	0.09	5-lane Undivided	A	A	A	A
6	US 14	Kasan Ave	Hansina Ave	0.27	5-lane Undivided	A	A	A	A
7	US 14	Hansina Ave	Caspian Ave	0.63	5-lane Undivided	B	A	A	B
8	US 14	Caspian Ave	Brookings CR 7 / 466th Ave	1.19	Mostly 4-Ln, Divided	A	A	A	A
9	US 14	Brookings CR 7 / 466th Ave	Brookings CR 9 / 16th Ave W / 469th Ave	2.93	4-Ln, Divided	B	A	A	B
10	US 14	Brookings CR 9 / 16th Ave W / 469th Ave	US 14 B (west)	0.09	4-Ln, Divided	B	A	A	B
11	US 14	US 14 B (west)	Western Ave	0.77	2-Ln, Undivided	D	C	D	D
12	US 14 B	Western Ave	Medary Ave	0.97	2-Ln, Undivided	D	D	E	E

Seg. No.	Mainline	From	To	Length (miles)	Type	2024 Segment LOS			
						AM		PM	
						EB	WB	EB	WB
13	US 14 B	Medary Ave	Jackrabbit Ave	0.49	2-Ln, Undivided	E	D	E	E
14	US 14 B	Jackrabbit Ave	22nd Ave	0.41	2-Ln, Undivided	E	E	E	E
15	US 14 B	22nd Ave	I-29 SB Ramp Terminal	0.39	2-Ln, Undivided	E	E	E	E
16	US 14 B	I-29 SB Ramp Terminal	I-29 NB Ramp Terminal	0.19	2-Ln, Undivided	E	D	D	D
17	US 14 B	I-29 NB Ramp Terminal	32nd Ave	0.20	2-Ln, Undivided	D	D	D	D
18	US 14 B	32nd Ave	34th Ave	0.22	2-Ln, Undivided	C	C	C	C
19	US 14 B	34th Ave	US 14 B (east) MRM 423.24	1.41	2-Ln, Undivided	B	B	B	B

2050 Future No-Build Traffic Operations Analysis

Intersection Operations

The 2050 Future No-Build Conditions intersection operations are summarized in the following table. HCS analysis reports are provided in **Appendix C**.

Table 7: Intersections – 2050 Future No-Build Conditions

Intersection	Approach	*2050 (AM)* Control Delay (s/veh)	*2050 (AM)* LOS	*2050 (AM)* 95% Queue (Veh)*	*2050 (PM)* Control Delay (s/veh)	*2050 (PM)* LOS	*2050 (PM)* 95% Queue (Veh)*
1. US 14 & US 81 ***(Stop Controlled, Rural)***	**Overall**	**3.2**	**A**	**1**	**6.4**	**A**	**0.6**
	EB	0	A	0	0	A	
	WB	1.9	A	0.2	8.3	A	0.3
	NB	13.1	B	1	14.3	B	0.6
2. US 14 & Brookings County 11 / 458th Avenue ***(Stop Controlled, Rural)***	**Overall**	**2.4**	**A**	**0.9**	**1.7**	**A**	**0.5**
	EB	0.1	A	0	0.2	A	0
	WB	0.7	A	0.1	0.8	A	0.1
	NB	15.2	C	0.9	19.4	C	0.5
	SB	18.4	C	0.3	20	C	0.2

Intersection	Approach	*2050 (AM)*			*2050 (PM)*		
		Control Delay (s/veh)	LOS	95% Queue (Veh)*	Control Delay (s/veh)	LOS	95% Queue (Veh)*
3. US 14 & Brookings County 1 / 459th Avenue ***(Stop Controlled, Rural)***	**Overall**	**2.5**	**A**	**1.2**	**2.3**	**A**	**3**
	EB	0.1	A	0	0.2	A	0
	WB	0.2	A	0	0.6	A	0.1
	NB	17	C	0.4	21.7	C	3
	SB	25.1	D	1.2	27.8	D	1
4. US 14 & Brookings County 5 / 464th Avenue ***(Stop Controlled, Rural)***	**Overall**	**44.8**	**E**	**12**	**51.4**	**F**	**10.8**
	EB	0.3	A	0.1	0.3	A	0.1
	WB	1.3	A	0.2	1.5	A	0.5
	NB	42.8	E	5.4	105.7	F	7.2
	SB	317.6	F	12	527.4	F	10.8
5. US 14 & Kasan Avenue ***(Stop Controlled, Rural)***	**Overall**	**4.8**	**A**	**3.6**	**11.7**	**B**	**5.6**
	EB	0.1	A	0	0.5	A	0.1
	WB	0.8	A	0.1	1	A	0.4
	NB	28.8	D	3.6	68.5	F	5.6
	SB	23.6	C	0.6	73.2	F	4.6
6. US 14 & Hasina Avenue ***(Stop Controlled, Rural)***	**Overall**	**18.8**	**C**	**12.8**	**16.1**	**C**	**10.6**
	EB	0	A	0	0.1	A	0
	WB	4.4	A	1.1	2.1	A	1
	NB	85	F	12.8	107.8	F	10.6
	SB	0	A	0	62.9	F	0.8
7. US 14 & Caspian Avenue ***(Signalized, Rural)***	**Overall**	**88.1**	**F**	**45.8**	**33.7**	**C**	**15.9**
	EB	69	E	30	36.2	D	11.8
	WB	40	D	10.7	30.4	C	15.9
	NB	195.2	F	45.8	44.9	D	14
	SB	34.3	C	2.3	28.9	C	1.6
8. US 14 & Brookings County 7 / 466th Avenue ***(Stop Controlled, Rural)***	**Overall**	**1.7**	**A**	**2.2**	**2.1**	**A**	**2.9**
	EB	0.2	A	0.1	0.8	A	0.4
	WB	0	A		0	A	
	NB	0	A		0	A	
	SB	21.5	C	2.2	47.3	E	2.9
9. US 14 & Brookings County 9 / 469th Avenue ***(Stop Controlled, Rural)***	**Overall**	**10.9**	**B**	**0.1**	**6.1**	**A**	**5.4**
	EB	16.3	A	0.1	2.5	A	0.4
	WB	0.3	A	0.1	0.1	A	0.1
	NB	0	A		36	E	1.5
	SB	0	A		106.3	F	5.4

Intersection	Approach	*2050 (AM)*			*2050 (PM)*		
		Control Delay (s/veh)	LOS	95% Queue (Veh)*	Control Delay (s/veh)	LOS	95% Queue (Veh)*
10. US 14 & US 14 Bypass - West ***(Stop Controlled, Rural)***	**Overall**	**1.4**	**A**	**1.3**	**17**	**A**	**14.9**
	EB	0	A		0	A	
	WB	0	A		0	A	
	SB	10.9	B	1.3	68.7	F	14.9
11. US 14 Bypass & Western Avenue ***(Stop Controlled, Urban)***	**Overall**	**10**	**A**	**5.6**	**9.2**	**A**	**6**
	EB	0.1	A	0	0.3	A	0
	WB	3.4	A	0.6	1.6	A	0.6
	NB	42.5	E	5.6	59	F	6
	SB	89.7	F	1.9	61	F	1.4
12. US 14 Bypass & Medary Avenue ***(Signalized, Urban)***	**Overall**	**12.9**	**B**	**8.3**	**10**	**A**	**5.6**
	EB	11.4	B	8.3	7	A	1.9
	WB	14.5	B	5.7	10.2	B	5.6
	NB	29.8	C	3.7	22.2	C	4.2
	SB	33.4	C	4.4	22	C	1
13. US 14 Bypass & Stadium Road ***(Stop Controlled, Urban)***	**Overall**	**0.8**	**A**	**0.4**	**1.6**	**A**	**1.8**
	EB	0	A		0	A	
	WB	1.2	A	0.3	0.1	A	0.1
	NB	18.8	C	0.4	23.2	C	1.8
14. US 14 Bypass & Jackrabbit Avenue ***(Stop Controlled, Urban)***	**Overall**	**1.1**	**A**	**0.4**	**2.2**	**A**	**2.4**
	EB	0	A	0	0	A	0
	WB	1.3	A	0.3	0.3	A	0.1
	NB	23.8	C	0.7	32	D	2.4
	SB	5	A		5	A	
15. US 14 Bypass & 22nd Avenue ***(Stop Controlled, Urban)***	**Overall**	**3.8**	**A**	**3.1**	**133.8**	**F**	**36.9**
	EB	0.1	A	0	0.3	A	0.1
	WB	1	A	0.2	0.7	A	0.2
	NB	30.9	D	3.1	569.5	F	36.9
	SB	19.1	C	0.4	26.3	D	0.5
16. US 14 Bypass & I-29 SB Ramp Terminal ***(Stop Controlled, Urban)***	**Overall**	**3.9**	**A**	**2.8**	**5.9**	**A**	**4.7**
	EB	0	A	0	0	A	
	WB	1.2	A	0.1	1.7	A	0.2
	SB	21.7	C	2.8	41.8	E	4.7

Intersection	Approach	*2050 (AM)*			*2050 (PM)*		
		Control Delay (s/veh)	LOS	95% Queue (Veh)*	Control Delay (s/veh)	LOS	95% Queue (Veh)*
17. US 14 Bypass & I-29 NB Ramp Terminal ***(Stop Controlled, Urban)***	**Overall**	**9.6**	**A**	**5.3**	**26**	**D**	**9.8**
	EB	2.4	A	0.3	6.2	A	1
	WB	0	A	0	0	A	
	NB	46.9	E	5.3	155.1	F	9.8
18. US 14 Bypass & 32nd Avenue ***(Stop Controlled, Urban)***	**Overall**	**4.7**	**A**	**1**	**12.4**	**B**	**5.6**
	EB	1.9	A	0.4	1.3	A	0.1
	WB	0.8	A	0.1	0.1	A	0
	NB	23.7	C	1	37.9	E	5.6
	SB	18.7	C	0.6	13.1	B	0.7
19. US 14 Bypass & 34th Avenue ***(Stop Controlled, Urban)***	**Overall**	**4**	**A**	**0.7**	**5.3**	**A**	**0.9**
	EB	1	A	0.1	0.6	A	0
	WB	0.2	A	0	0.4	A	0
	NB	14.4	B	0.4	13.3	B	0.9
	SB	13.3	B	0.7	12.7	B	0.7
20. US 14 & US 14 Bypass - East ***(Stop Controlled, Rural)***	**Overall**	**3.5**	**A**	**2**	**8.3**	**A**	**5.5**
	EB	0.3	A	0	0.4	A	0.1
	WB	0	A		0	A	
	SB	19.7	C	2	33.3	D	5.5

*Overall intersection control delay results represent the weighted average of each approach and overall intersection 95th% queues reported are the maximum of the approaches.

Highway Segment Operations

The 2050 Future No-Build Conditions highway segment operations are summarized in the following table. HCS analysis reports are provided in **Appendix D**.

Table 8: Highway Segments – 2050 Future No-Build Conditions

						2050 Segment LOS			
						AM		PM	
Seg. No.	Mainline	From	To	Length (miles)	Type	EB	WB	EB	WB
1	US 14	Project Beginning MP MRM 402.94	US 81	0.15	4-Ln, Divided	A	A	A	A
2	US 14	US 81	Brookings CR 11 / 458th Ave	3.96	Mostly 4-Ln, Divided	A	A	A	A
3	US 14	Brookings CR 11 / 458th Ave	Brookings CR 1 / 459th Ave	1.04	2-lane Undivided	B	B	B	D
4	US 14	Brookings CR 1 / 459th Ave	Brookings CR 5 / 464th Ave	4.90	2-lane Undivided	D	B	B	D
5	US 14	Brookings CR 5 / 464th Ave	Kasan Ave	0.09	5-lane Undivided	B	A	A	B
6	US 14	Kasan Ave	Hansina Ave	0.27	5-lane Undivided	B	A	A	B
7	US 14	Hansina Ave	Caspian Ave	0.63	5-lane Undivided	B	A	A	B
8	US 14	Caspian Ave	Brookings CR 7 / 466th Ave	1.19	Mostly 4-Ln, Divided	B	A	A	B
9	US 14	Brookings CR 7 / 466th Ave	Brookings CR 9 / 16th Ave W / 469th Ave	2.93	4-Ln, Divided	B	A	A	B
10	US 14	Brookings CR 9 / 16th Ave W / 469th Ave	US 14 B (west)	0.09	4-Ln, Divided	B	A	A	B
11	US 14	US 14 B (west)	Western Ave	0.77	2-Ln, Undivided	E	C	E	E
12	US 14 B	Western Ave	Medary Ave	0.97	2-Ln, Undivided	E	E	E	E
13	US 14 B	Medary Ave	Jackrabbit Ave	0.49	2-Ln, Undivided	E	E	E	E
14	US 14 B	Jackrabbit Ave	22nd Ave	0.41	2-Ln, Undivided	E	E	E	E
15	US 14 B	22nd Ave	I-29 SB Ramp Terminal	0.39	2-Ln, Undivided	E	E	E	E
16	US 14 B	I-29 SB Ramp Terminal	I-29 NB Ramp Terminal	0.19	2-Ln, Undivided	E	E	E	E
17	US 14 B	I-29 NB Ramp Terminal	32nd Ave	0.20	2-Ln, Undivided	D	D	D	D
18	US 14 B	32nd Ave	34th Ave	0.22	2-Ln, Undivided	D	D	D	D
19	US 14 B	34th Ave	US 14 B (east) MRM 423.24	1.41	2-Ln, Undivided	C	C	C	C

Summary and Conclusions

Based on the traffic operations analysis, multiple intersections are expected to experience failing LOS under the forecasted year 2050 No-Build Conditions. Locations that depict the most signification deterioration in LOS are noted below:

- **US 14 & Brookings County Road 5** experiences an overall intersection LOF F during the PM peak for both the 2024 and 2050 forecasted years, compared to LOS A during the 2019 Existing Conditions. LOS E and F occur in the northbound and southbound directions during the 2050 AM peak hour. During the PM peak hour, the intersection experiences LOS F for the northbound and southbound approaches as well.
- **US 14 & Caspian Avenue** is a signalized intersection and operates at an overall LOS F in the AM peak hour under the 2050 forecasted conditions. In 2050 during the AM peak, every approach at this intersection is expected to experience LOS D, E or F except for the south bound approach (LOS C). The minimum allowable threshold for signalized rural intersections (LOS B). During the 2050 AM peak, the eastbound and westbound approaches experience delay ranging from 40 to 69 seconds per vehicle, however the northbound approach experiences the most delay (195.2 seconds/vehicle) with LOS F and a queue length of approximately 46 vehicles. The intersection has an overall LOS C during the 2024 and 2050 PM peaks, as well as the 2024 AM peak.
- **US 14 Bypass & 22nd Avenue** operates at an overall LOS F in the PM peak hour for both forecasted years 2024 and 2050, largely due to excessive delay and the longest queue of all the study intersections (42 vehicles) in the northbound approach in 2050.

Many intersections were shown to have one or multiple approaches that experience a decrease in LOS to E or F or excessive queuing, but the overall weighted delay is such that overall intersection operations are acceptable. Queue lengths at most intersections were noticeably longer than what was experienced in the 2019 Existing Conditions Analysis. In general, the northbound and southbound approaches experience the lowest LOS along the corridor, and vehicles traveling west are expected to experience more delay and longer queues as well.

Similar to the 2019 Existing Conditions analysis, segments west of the US 14 and US 14 Bypass split (west of Brookings) experiences acceptable LOS during both the AM and PM peak hours. There was however some reduction in LOS between County Road 11 and County Road 5 specifically, decreasing from LOS A in the westbound direction during the PM peak to LOS C.

Most segments east of the split experienced deterioration in LOS during both AM and PM peak hours under the 2050 forecasted conditions. The segment between the I-29 Southbound and Northbound Ramp Terminals experienced the most significant reduction from LOS D to LOS E for both directions during both Peak Hours. The segment between 32nd Avenue and 34th Avenue shows a decrease from LOS C in both AM and PM peak hour directions to LOS D for both AM and PM peak hour directions.

Measured LOS in the forecasted 2050 conditions was considered equally poor for both eastbound and westbound directions in both peak hours.

Appendix

A. 2024 Future No-Build Conditions HCS Reports – Intersections
B. 2024 Future No-Build Conditions HCS Reports – Highway Segments
C. 2050 Future No-Build Conditions HCS Reports – Intersections
D. 2050 Future No-Build Conditions HCS Reports – Highway Segments