Future Year No-Build Traffic Conditions Technical Memorandum

I-229 Benson Road Interchange Modification Study

Sioux Falls, South Dakota

May 16, 2018

City of Sioux Falls
SOUTH DAKOTA

SouthDakota DOT
Connecting South Dakota and the Nation

This memorandum provides the results of no-build operations analysis for the year 2023 and 2045 traffic conditions in the project study area (Figure 1). The analysis was prepared using the procedures and inputs specified in the approved Methods and Assumptions document for this study. Analysis output documents are provided in the appendix to this memorandum.

1.0 Traffic Volume Development

Traffic counts on the Interstate roadway segments were gathered by SDDOT in 2017. Traffic counts on the arterial street system were available in City of Sioux Falls and HDR files. Count data were assembled and balanced to produce a representation of peak hour traffic flows through the study area. Peak hour traffic volumes for Benson Road, Rice Street, and I-229 for year 2023 and 2045 are shown in Figures 13, 14, 17, 18,19, and 22.

Traffic forecasts for 2023 and 2045 were prepared using the regional travel demand model maintained by the City of Sioux Falls and the Sioux Falls Metropolitan Planning Organization. The forecasts were based on the latest land development information and modeling updated from the 2035 model used in the I-229 Major Investment Study.

It is assumed in the 2023 volume projections that a Benson Road extension, east to Rice Street, will not occur prior to 2023.

2.0 Traffic Operations

Level of service on Interstate 229 was calculated for mainline, ramp merge-diverge, and weave areas for peak hours under 2023 and 2045 conditions. The level of service results are shown in Figures 17 and 22. Note that several Interstate mainline segments were analyzed both as regular mainline segments and weaving segments. If it was determined that the segment satisfied the conditions for weaving, the weaving level of service was reported and indicated by an asterisk (*) next to the level of service result.

Intersection turning volumes and level of service for peak hours under 2023 and 2045 conditions are shown in Figures 13,14, 18, and 19 for Benson Road and Rice Street. Multimodal levels of service for the Benson Road and Rice Street arterial corridors are shown in Figures 15, 16, 20, and 21.

2.1 2023 Traffic Conditions

The 2023 conditions analysis shows that Interstate facilities within the study area operate at an acceptable level of service, LOS C or better (Figure 17).

The arterial street system experiences peak hour congestion (LOS E or worse) at the following locations during the 2023 conditions analysis:

- Benson Road/Potsdam Avenue (AM/PM)
- Benson Road/I-229 Southbound (AM)
- Benson Road/I-229 Northbound (AM)
- Benson Road/Hall Avenue (PM)
- Rice Street/Bahnson Avenue (PM)

Certain movements experienced low levels of service or queues that exceeded the length of the available storage during particular peak hours. The southbound left turn during the PM peak hour at Rice Street/Cliff Avenue is an example of this characteristic, with the left turn queue extending through the Bennett Street/Cliff Avenue intersection. The southbound left turn queues at Rice Street/I-229 SB Ramp exceeded the length of the available storage during the PM peak hour extending onto the interstate. The northbound left turn queues at Benson Road/I-229 NB Ramp exceeded the length of the available storage during the AM peak hour extending onto the interstate.

Multimodal level of service varies widely throughout the Benson Road and Rice Street corridors. The lowest levels of service are related to locations with the absence of specific facilities for pedestrians and bicyclists in these corridors.

2.2 2045 Traffic Conditions

The 2045 conditions analysis shows that Interstate facilities within the study area operate at an acceptable level of service, LOS C or better (Figure 22). The arterial street system experiences peak hour congestion (LOS E or worse) at the following locations during the 2045 conditions analysis:

- Benson Road/Potsdam Avenue (AM/PM)
- Benson Road/I-229 Southbound (AM/PM)
- Benson Road/I-229 Northbound (AM)
- Benson Road/Hall Avenue (AM/PM)
- Rice Street/Cliff Avenue (PM)
- Rice Street/I-229 SB (PM)
- Rice Street/I-229 NB (AM/PM)
- Rice Street/Bahnson Avenue (AM/PM)

Certain movements experienced low levels of service or queues that exceeded the length of the available storage during particular peak hours. The southbound left turn and thru movement during the PM peak hour at Rice Street/Cliff Avenue is an example of this characteristic, with the left turn and thru queue extending through the Bennett Street/Cliff Avenue intersection. The southbound left turn queues at Rice Street/I-229 SB Ramp exceed the length of the available storage during the PM peak hour extending onto the interstate. The eastbound left turn queues at Rice Street/I-229 SB Ramp exceed the length of the available storage during the PM peak hour extending through the Rice Street/Lowell Avenue intersection. The southbound left turn queues at Rice Street/I-229 NB Ramp exceed the length of the available storage during the PM peak hour extending onto the interstate. The eastbound thru queues at Rice Street/I-229 NB Ramp exceed the length of the available storage during the PM peak hour extending through the Rice Street/I-229 SB Ramp intersection. The northbound left turn queues at Benson Road/I-229 NB Ramp exceed the length of the available storage during the AM peak hour extending onto the interstate.

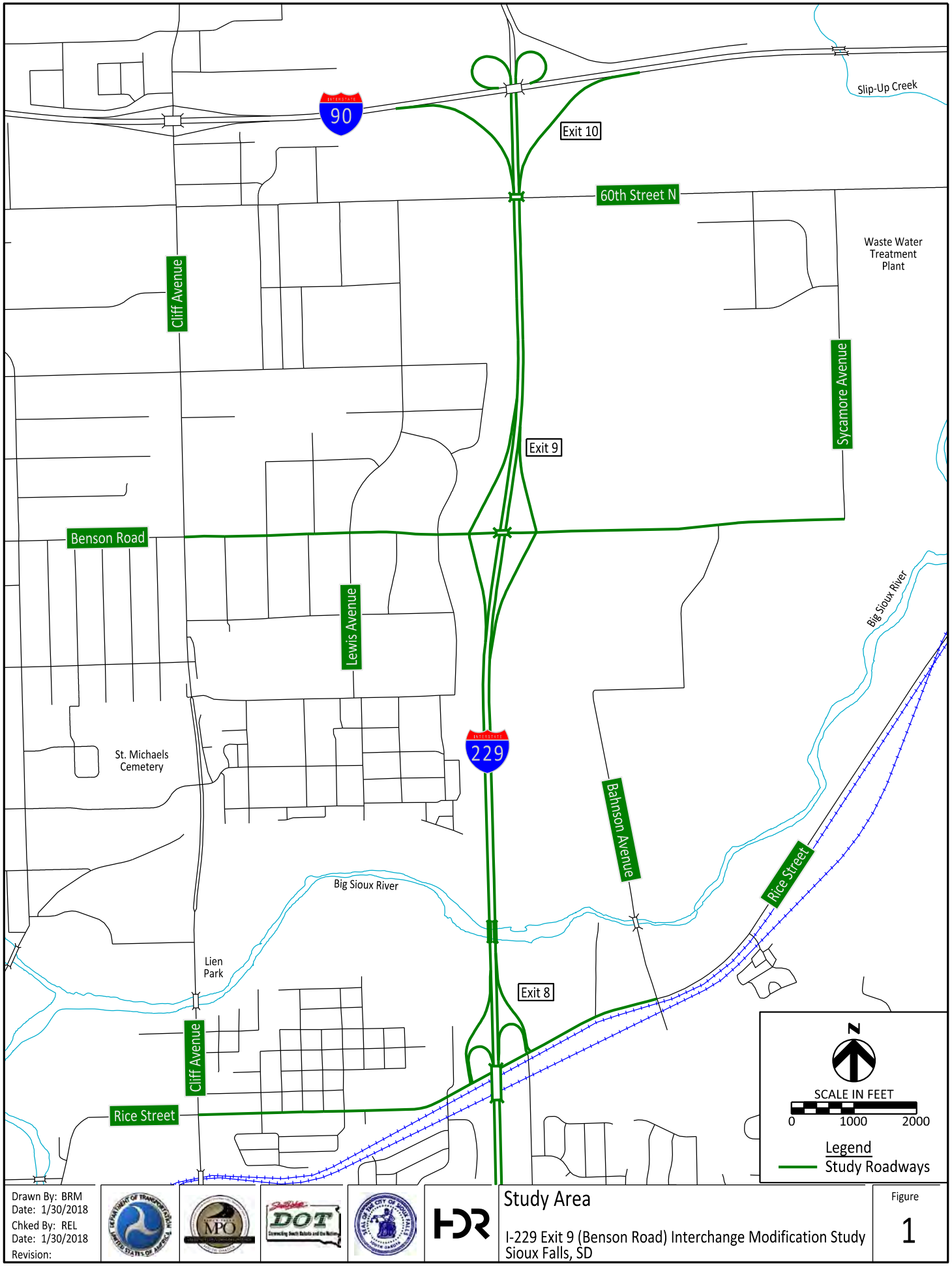
Multimodal level of service varies widely throughout the Benson Road and Rice Street corridors. The lowest levels of service are related to locations with the absence of specific facilities for pedestrians and bicyclists in these corridors.

2.3 Additional Access Points

There are additional access points within the arterial corridors that serve as sources and sinks of traffic for traffic volume balancing, but were not required to be analyzed. These locations appear in the traffic analysis files as intermediate access points and appear in the alternative arterial layouts:

- Benson Road/National Avenue
- Benson Road/Sanford driveway (formerly HSBC)
- Rice Street/Lowell Avenue

Another access point has been identified in the alternative arterial layouts for Benson Road, located half-way between I-229 and Hall Avenue. While this access point may play a role in future development, traffic forecast for the surrounding area has been routed through the Benson/Hall intersection to account for all potential future volumes through the specified analysis intersections.

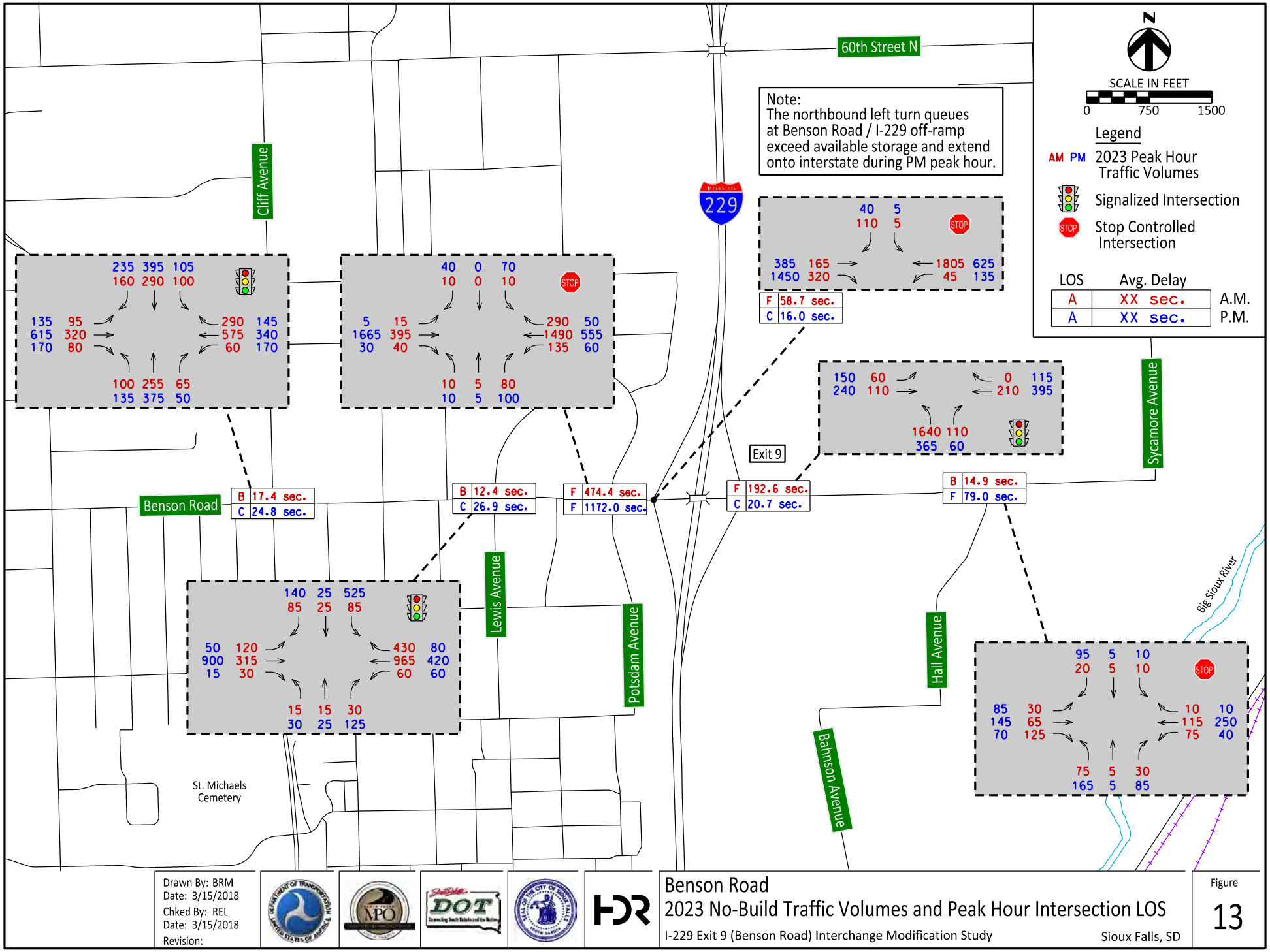


Drawn By: BRM
Date: 1/30/2018
Chked By: REL
Date: 1/30/2018
Revision:

Study Area

I-229 Exit 9 (Benson Road) Interchange Modification Study
Sioux Falls, SD

Figure 1



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Date: 3/15/2018
Chked By: REL
Date: 3/15/2018
Revision:

Benson Road
2023 No-Build Traffic Volumes and Peak Hour Intersection LOS

I-229 Exit 9 (Benson Road) Interchange Modification Study

Sioux Falls, SD

Figure 13

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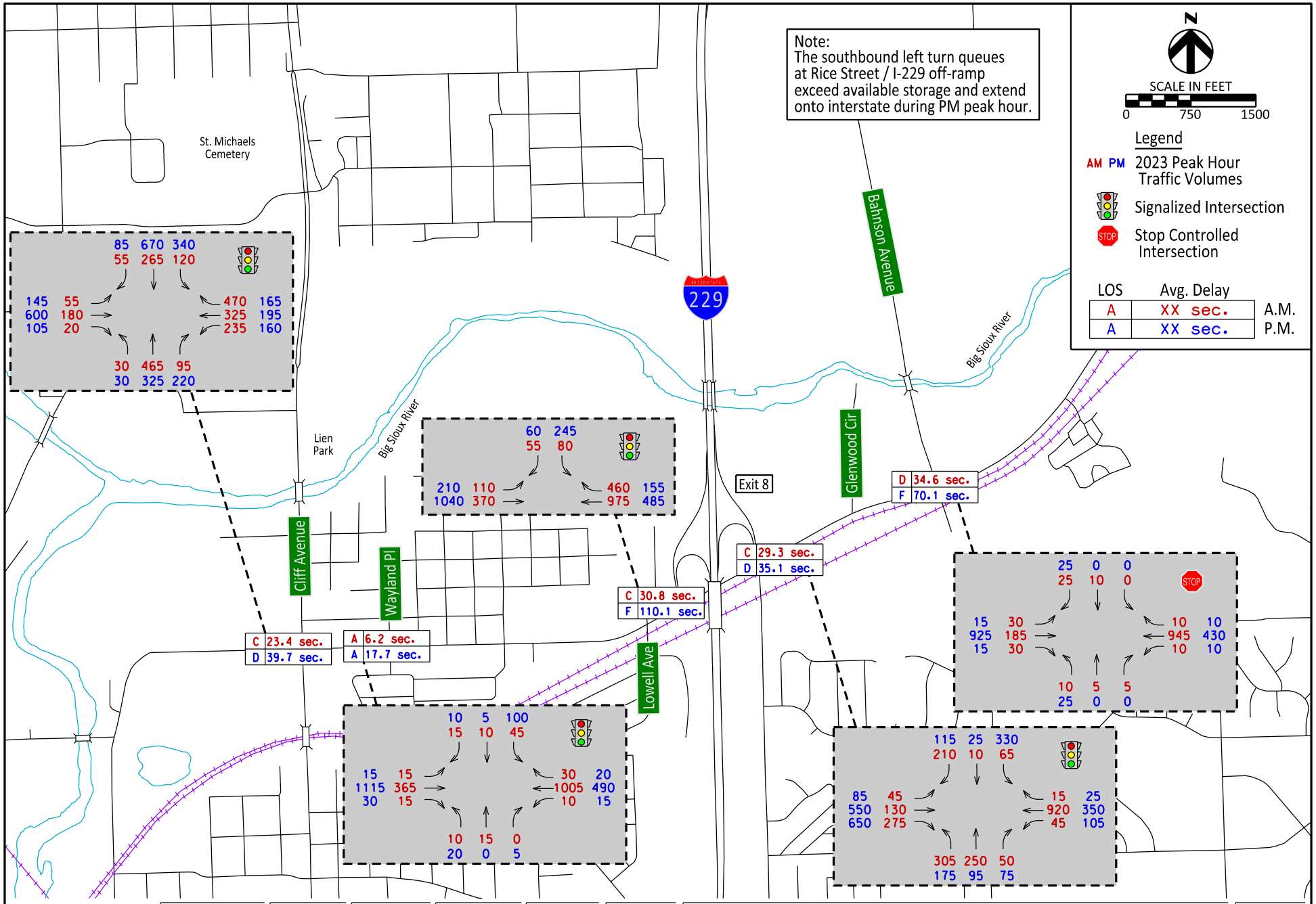
PLOTTING DATE: 05-08-2018



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Date: 3/15/2018
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Date: 3/15/2018
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Rice Street
2023 No-Build Traffic Volumes and Peak Hour Intersection LOS

I-229 Exit 9 (Benson Road) Interchange Modification Study

Sioux Falls, SD

Figure 14

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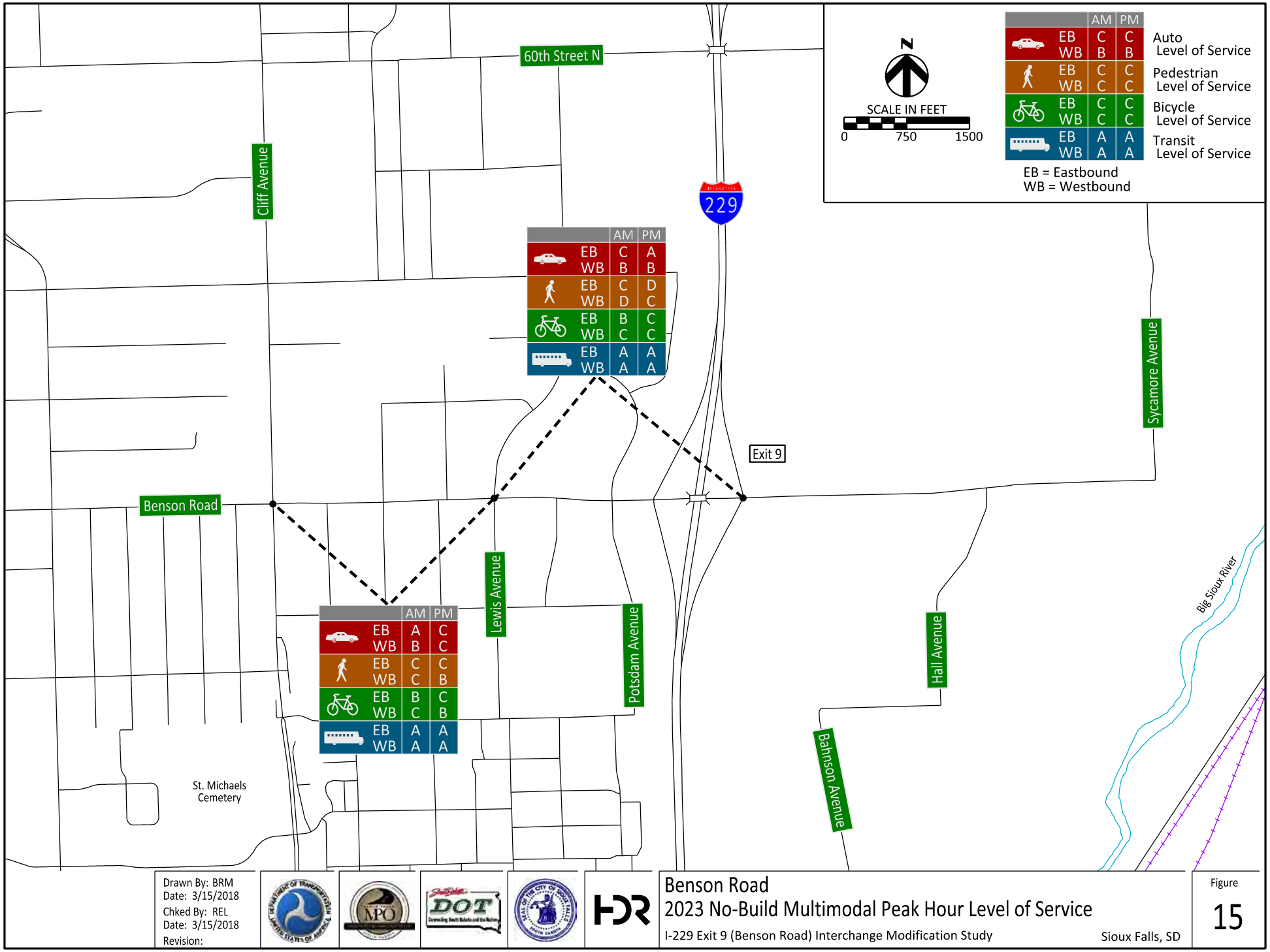

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Date: 3/15/2018
Chked By: REL
Date: 3/15/2018
Revision:

Benson Road
2023 No-Build Multimodal Peak Hour Level of Service

I-229 Exit 9 (Benson Road) Interchange Modification Study

Sioux Falls, SD

Figure 15

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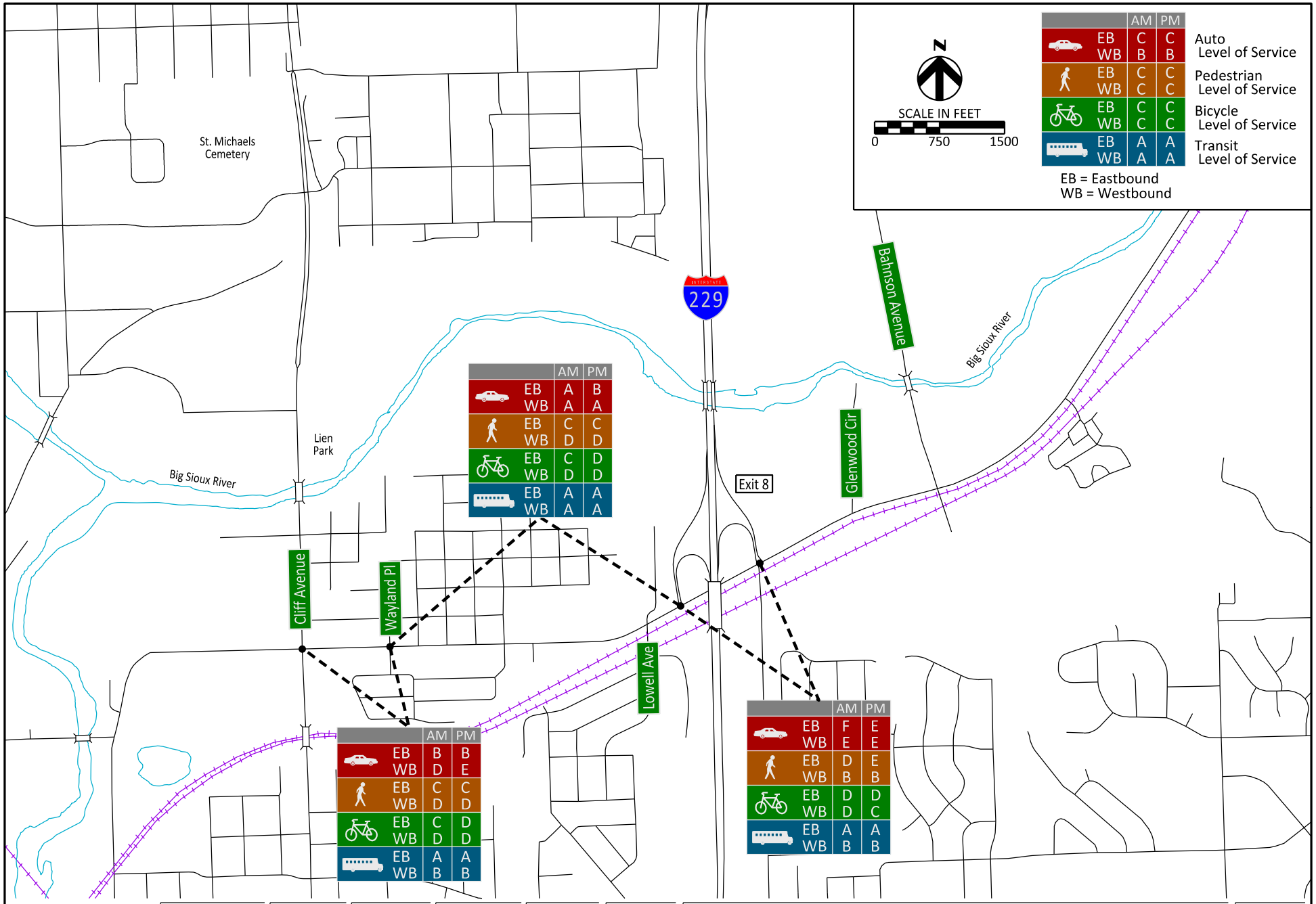

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Date: 3/15/2018
Chked By: REL
Date: 3/15/2018
Revision:

Rice Street
2023 No-Build Multimodal Peak Hour Level of Service

I-229 Exit 9 (Benson Road) Interchange Modification Study

Sioux Falls, SD

Figure 16

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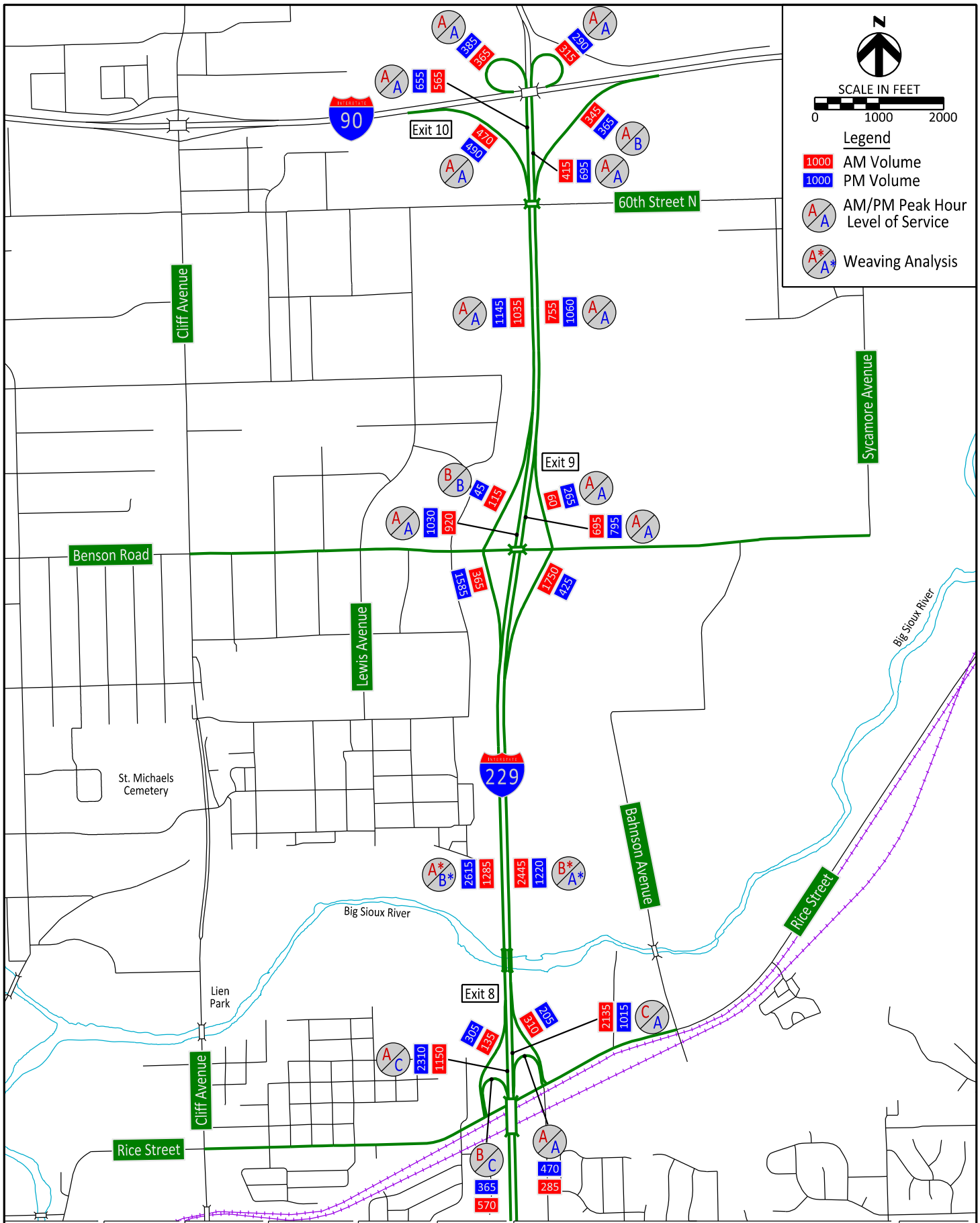

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PLOTTING DATE: 05-11-2018

Drawn By: BRM
Date: 3/15/2018
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Date: 3/15/2018
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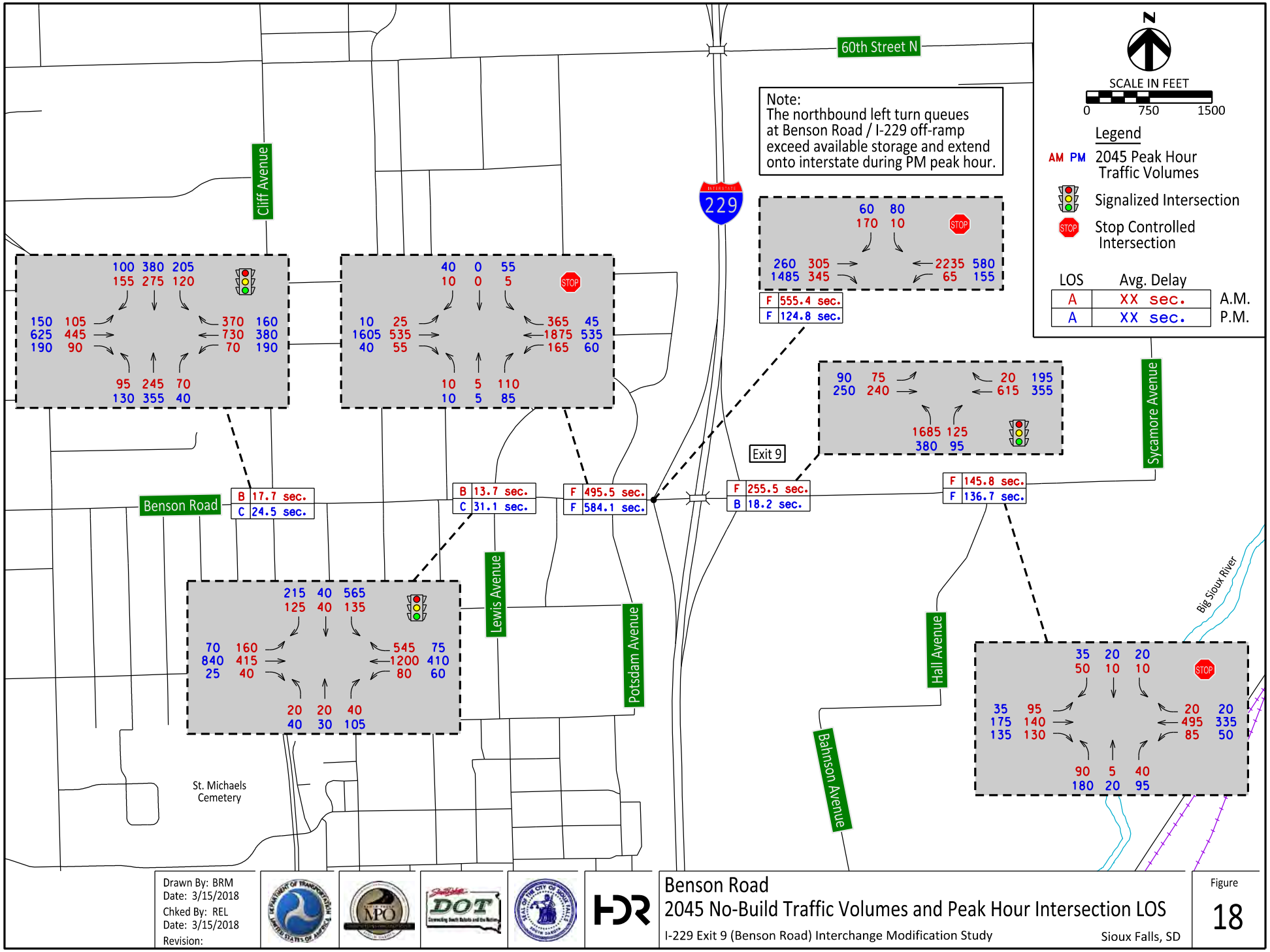
2023 No-Build Peak Hour Balanced Traffic Volumes and Level of Service

I-229 Exit 9 (Benson Road) Interchange Modification Study
Sioux Falls, SD

Figure 17


60th Street N
Cliff Avenue
Benson Road
Lewis Avenue
Potsdam Avenue
Exit 9
Sycamore Avenue
Hall Avenue
Bahnson Avenue
Big Sioux River
St. Michaels Cemetery
229
Note:
The northbound left turn queues at Benson Road / I-229 off-ramp exceed available storage and extend onto interstate during PM peak hour.
SCALE IN FEET
0 750 1500
Legend
AM PM 2045 Peak Hour Traffic Volumes
Signalized Intersection
Stop Controlled Intersection
LOS Avg. Delay
A XX sec. A.M.
A XX sec. P.M.
100 380 205
155 275 120
150 105
625 445
190 90
370 160
730 380
70 190
95 245 70
130 355 40
40 0 55
10 0 5
10 25
1605 535
40 55
365 45
1875 535
165 60
10 5 110
10 5 85
60 80
170 10
260 305
1485 345
2235 580
65 155
F 555.4 sec.
F 124.8 sec.
90 75
250 240
20 195
615 355
1685 125
380 95
B 17.7 sec.
C 24.5 sec.
B 13.7 sec.
C 31.1 sec.
F 495.5 sec.
F 584.1 sec.
F 255.5 sec.
B 18.2 sec.
F 145.8 sec.
F 136.7 sec.
215 40 565
125 40 135
70 160
840 415
25 40
545 75
1200 410
80 60
20 20 40
40 30 105
35 20 20
50 10 10
35 95
175 140
135 130
20 20
495 335
85 50
90 5 40
180 20 95
Drawn By: BRM
Date: 3/15/2018
Chked By: REL
Date: 3/15/2018
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Benson Road
2045 No-Build Traffic Volumes and Peak Hour Intersection LOS
I-229 Exit 9 (Benson Road) Interchange Modification Study
Sioux Falls, SD
Figure
18
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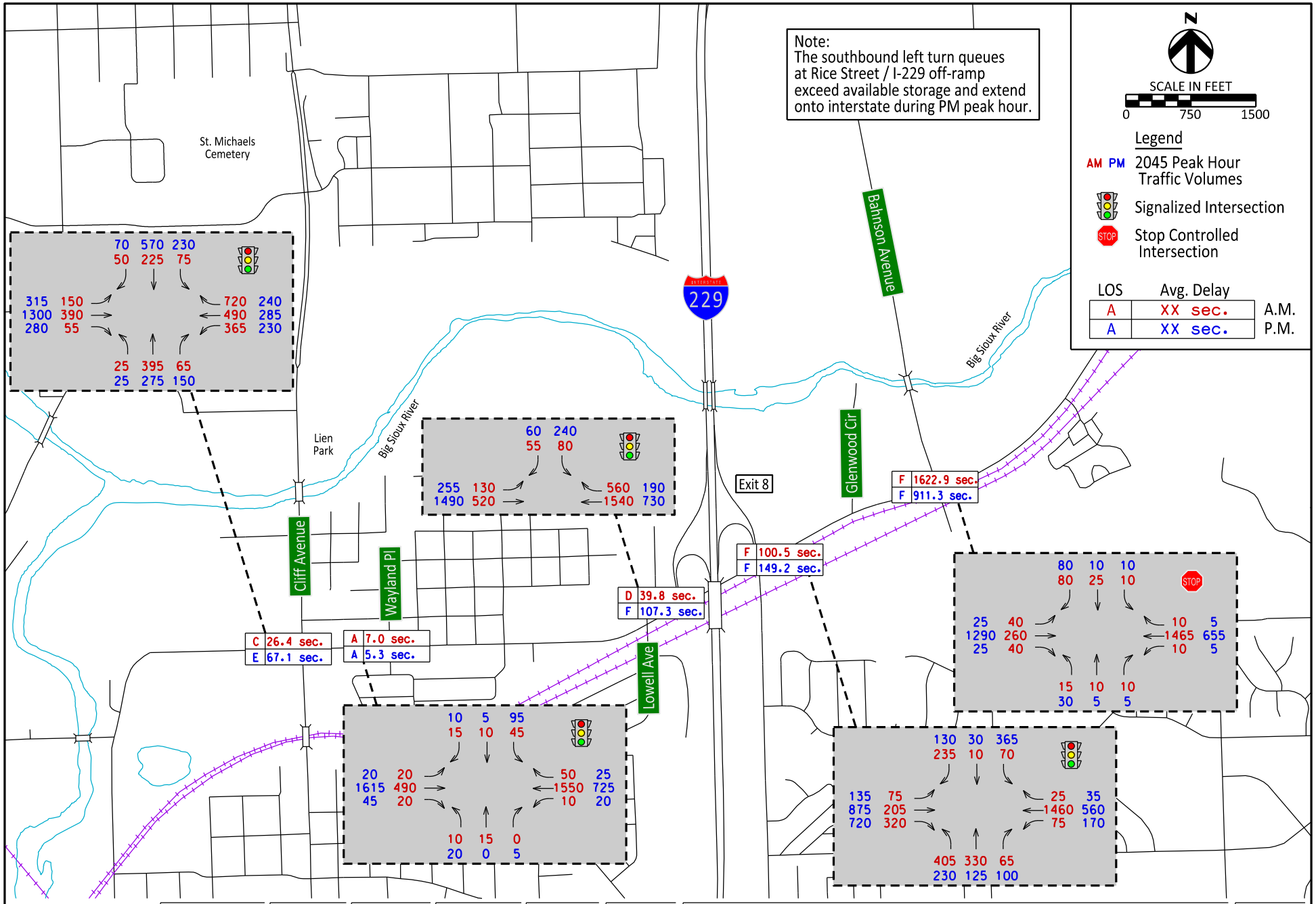

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Date: 3/15/2018
Chked By: REL
Date: 3/15/2018
Revision:

Rice Street
2045 No-Build Traffic Volumes and Peak Hour Intersection LOS

I-229 Exit 9 (Benson Road) Interchange Modification Study

Sioux Falls, SD

Figure 19

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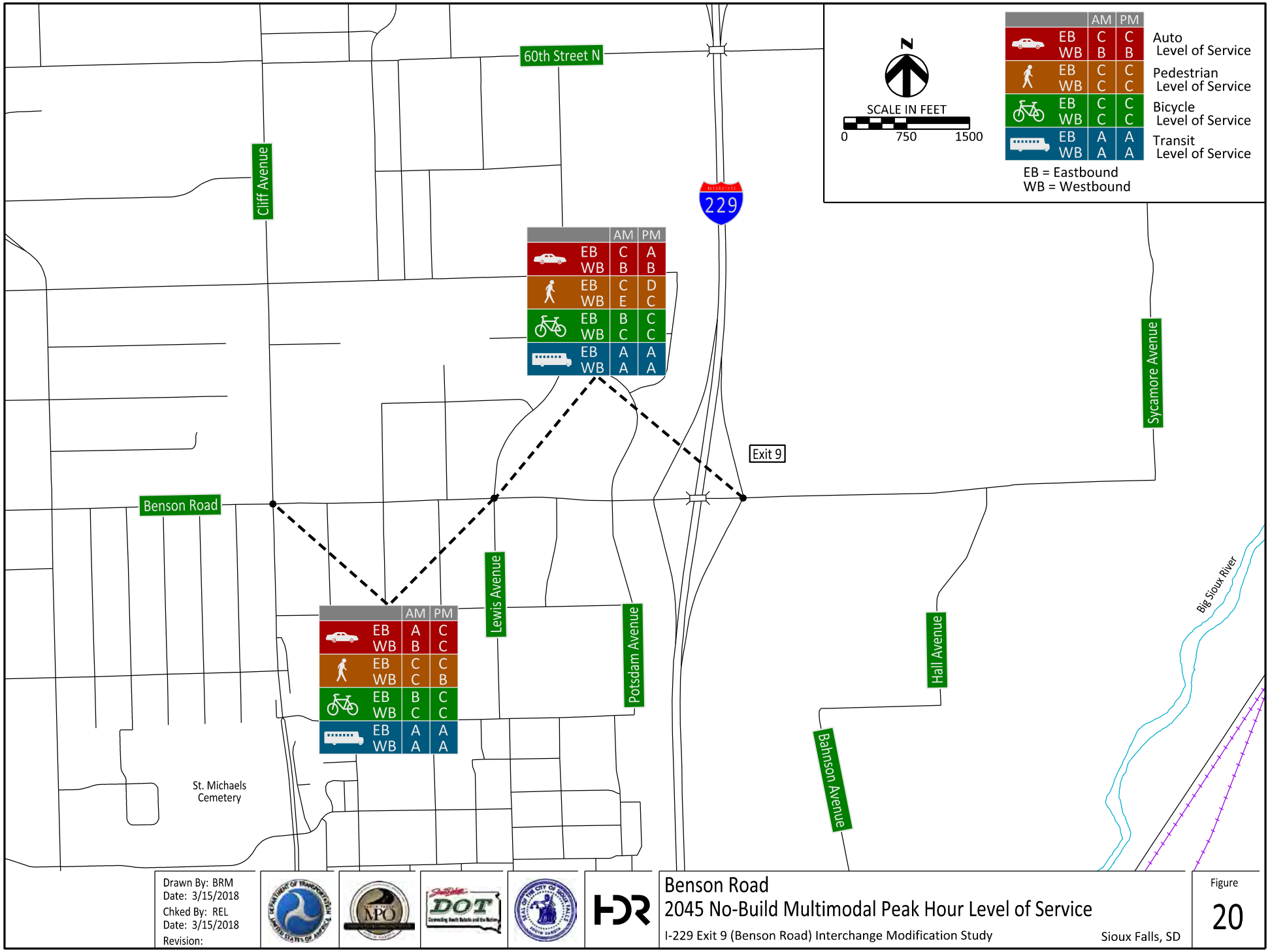

Drawn By: BRM
Date: 3/15/2018
Chked By: REL
Date: 3/15/2018
Revision:

Benson Road
2045 No-Build Multimodal Peak Hour Level of Service

I-229 Exit 9 (Benson Road) Interchange Modification Study

Sioux Falls, SD

Figure 20

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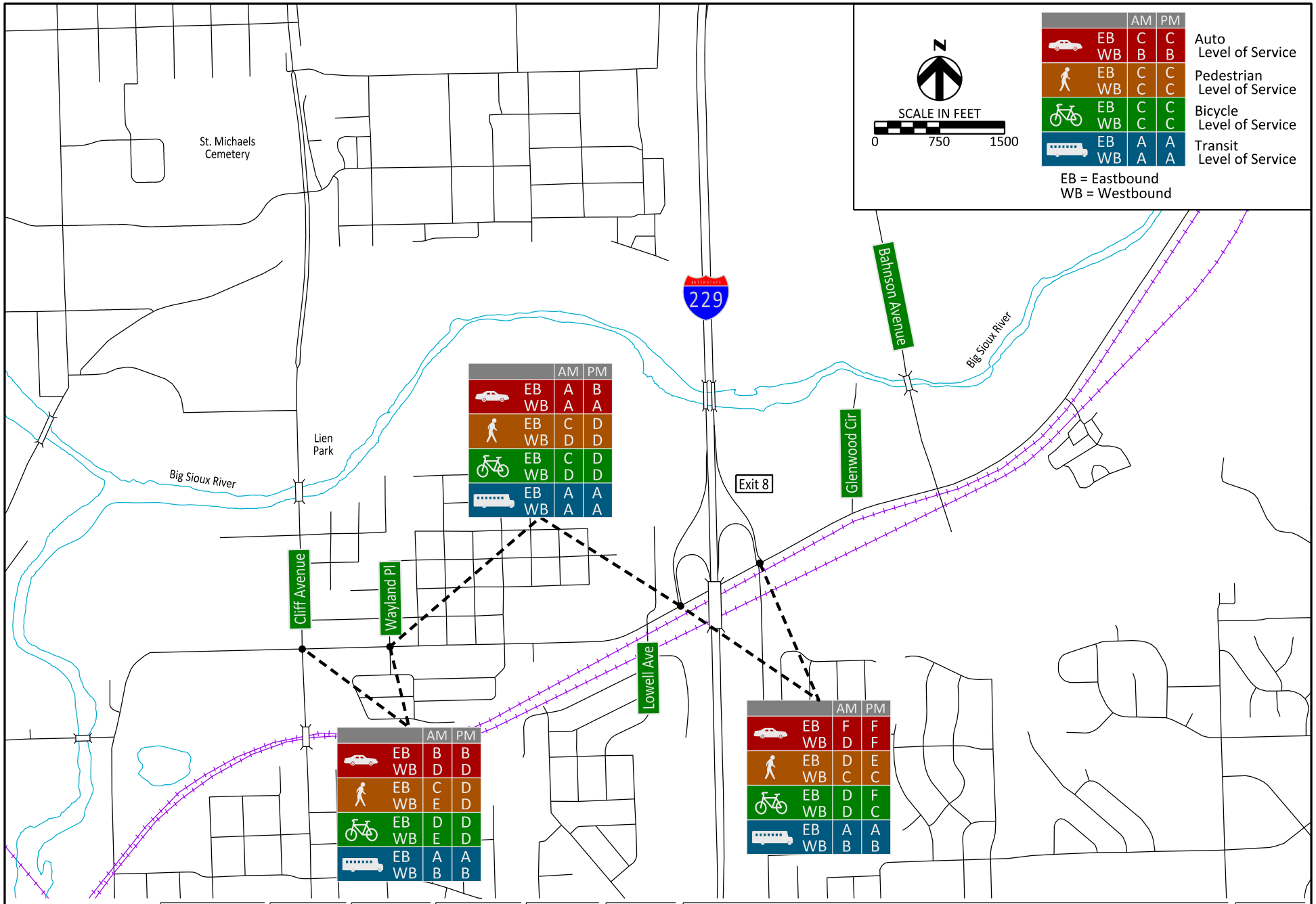

Drawn By: BRM
Date: 3/15/2018
Chked By: REL
Date: 3/15/2018
Revision:

Rice Street
2045 No-Build Multimodal Peak Hour Level of Service
I-229 Exit 9 (Benson Road) Interchange Modification Study
Sioux Falls, SD

Figure 21

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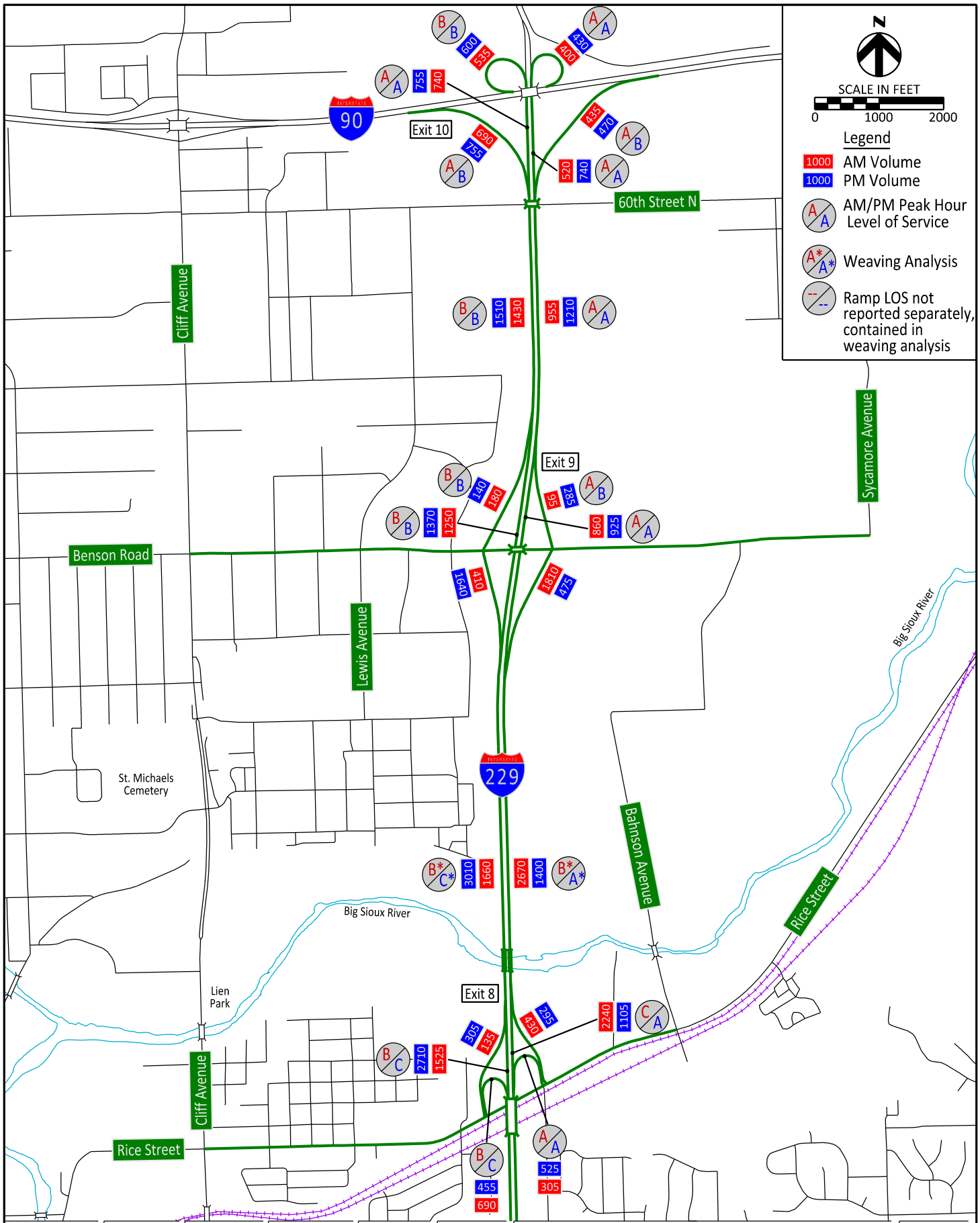

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PLOTTING DATE: 05-11-2018

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Date: 3/15/2018
Chked By: REL
Date: 3/15/2018
Revision:

2045 No-Build Peak Hour Balanced Traffic Volumes and Level of Service

I-229 Exit 9 (Benson Road) Interchange Modification Study
Sioux Falls, SD

Figure 22

APPENDIX

I. 2023 Freeway Analysis – Mainline
II. 2023 Freeway Analysis – Ramps
III. 2023 Freeway Analysis – Weaving
IV. 2023 Arterial Analysis
V. 2045 Freeway Analysis – Mainline
VI. 2045 Freeway Analysis – Ramps
VII. 2045 Freeway Analysis – Weaving
VIII. 2045 Arterial Analysis

I. 2023 Freeway Analysis – Mainline

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Volume (V), veh/h	565	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.90	Flow Rate (v_p), pc/h/ln	346
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.15
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	5.1
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	1035	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	632
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.28
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	9.4
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	920	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	562
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.24
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	8.4
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	1285	Heavy Vehicle Adjustment Factor (f_{HV})	0.935
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	509
Total Trucks, %	7.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.22
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	7.6
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	1150	Heavy Vehicle Adjustment Factor (f_{HV})	0.935
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	684
Total Trucks, %	7.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.30
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	10.2
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	2135	Heavy Vehicle Adjustment Factor (f_{HV})	0.935
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	1268
Total Trucks, %	7.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.55
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	18.8
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

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Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	2445	Heavy Vehicle Adjustment Factor (f_{HV})	0.935
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	969
Total Trucks, %	7.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.42
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	14.4
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	695	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	425
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.19
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	6.3
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	755	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	462
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.20
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	6.9
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Volume (V), veh/h	415	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.90	Flow Rate (v_p), pc/h/ln	254
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.11
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	3.8
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Volume (V), veh/h	655	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.90	Flow Rate (v_p), pc/h/ln	400
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.17
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	5.9
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	1145	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	700
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.30
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	10.4
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	1030	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	630
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.27
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	9.4
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	2615	Heavy Vehicle Adjustment Factor (f_{HV})	0.935
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	1036
Total Trucks, %	7.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.45
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	15.4
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	2310	Heavy Vehicle Adjustment Factor (f_{HV})	0.935
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	1372
Total Trucks, %	7.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.60
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.0
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	20.5
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	1015	Heavy Vehicle Adjustment Factor (f_{HV})	0.935
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	603
Total Trucks, %	7.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.26
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	9.0
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	1220	Heavy Vehicle Adjustment Factor (f_{HV})	0.935
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	483
Total Trucks, %	7.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.21
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	7.2
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	795	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	486
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.21
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	7.2
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	1060	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	648
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.28
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	9.6
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Volume (V), veh/h	695	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.90	Flow Rate (v_p), pc/h/ln	425
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.19
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	6.3
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

II. 2023 Freeway Analysis – Ramps

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Acceleration Length (L_A), ft	3655	1500
Terrain Type	Rolling	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	920	365
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	20.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.714	0.833
Flow Rate (v_i), pc/h	1432	487
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.42	0.24

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	10.9
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.216
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	61.8
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1432	Ramp Junction Speed (S), mi/h	61.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1919	Average Density (D), pc/mi/ln	15.5
Level of Service (LOS)	B		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2018
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	5705	1500
Terrain Type	Rolling	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	1285	135
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.877	0.877
Flow Rate (v_i), pc/h	1628	171
Capacity (c), pc/h	6824	2033
Volume-to-Capacity Ratio (v/c)	0.24	0.08

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	1.1
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.328
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	421
Distance to Downstream Ramp (L_{DOWN}), ft	10000	Off-Ramp Influence Area Speed (S_R), mi/h	59.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	0.711	Outer Lanes Freeway Speed (S_O), mi/h	73.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	1207	Ramp Junction Speed (S), mi/h	62.2
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	8.7
Level of Service (LOS)	A		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1080	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

	Freeway	Ramp
Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

	Freeway	Ramp
Demand Volume (V_i), veh/h	1150	570
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	1367	722
Capacity (c), pc/h	4550	1936
Volume-to-Capacity Ratio (v/c)	0.46	0.37

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	12.1
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.250
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	61.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1367	Ramp Junction Speed (S), mi/h	61.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2089	Average Density (D), pc/mi/ln	17.1
Level of Service (LOS)	B		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	5500	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

	Freeway	Ramp
Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

	Freeway	Ramp
Demand Volume (V_i), veh/h	2420	285
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.833
Flow Rate (v_i), pc/h	2876	380
Capacity (c), pc/h	6824	2033
Volume-to-Capacity Ratio (v/c)	0.42	0.19

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	8.4
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.347
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	821
Distance to Downstream Ramp (L_{DOWN}), ft	10000	Off-Ramp Influence Area Speed (S_R), mi/h	58.5
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	0.671	Outer Lanes Freeway Speed (S_O), mi/h	73.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	2055	Ramp Junction Speed (S), mi/h	62.2
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	15.4
Level of Service (LOS)	A		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Acceleration Length (L_A), ft	1000	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

	Freeway	Ramp
Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

	Freeway	Ramp
Demand Volume (V_i), veh/h	2135	310
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	2537	393
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.64	0.19

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	18.8
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.262
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	60.7
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2537	Ramp Junction Speed (S), mi/h	60.7
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2930	Average Density (D), pc/mi/ln	24.1
Level of Service (LOS)	B		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	2
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	5195	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2445	1750
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	2906	2217
Capacity (c), pc/h	6824	4066
Volume-to-Capacity Ratio (v/c)	0.43	0.55

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	12.5
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.512
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	379
Distance to Downstream Ramp (L_{DOWN}), ft	10000	Off-Ramp Influence Area Speed (S_R), mi/h	54.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	0.450	Outer Lanes Freeway Speed (S_O), mi/h	73.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	2527	Ramp Junction Speed (S), mi/h	56.2
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	17.2
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Acceleration Length (L_A), ft	3445	1050
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	695	60
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	850	73
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.20	0.04

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	6.1
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.239
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	61.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	850	Ramp Junction Speed (S), mi/h	61.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	923	Average Density (D), pc/mi/ln	7.5
Level of Service (LOS)	A		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	4075	550
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	755	345
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	923	422
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.20	0.21

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	7.2
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.350
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	10000	Off-Ramp Influence Area Speed (S_R), mi/h	58.4
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	923	Ramp Junction Speed (S), mi/h	58.4
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	7.9
Level of Service (LOS)	A		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1885	1500
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	415	315
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	507	385
Capacity (c), pc/h	4550	1936
Volume-to-Capacity Ratio (v/c)	0.11	0.20

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	0.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.474
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	55.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	507	Ramp Junction Speed (S), mi/h	55.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	4.6
Level of Service (LOS)	A		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1750	250
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	200	365
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	2.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.980	0.909
Flow Rate (v_i), pc/h	227	446
Capacity (c), pc/h	4550	1936
Volume-to-Capacity Ratio (v/c)	0.15	0.23

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	9.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.312
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	59.4
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	227	Ramp Junction Speed (S), mi/h	59.4
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	673	Average Density (D), pc/mi/ln	5.7
Level of Service (LOS)	A		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	1500
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	565	470
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	691	575
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.28	0.28

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	5.8
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.203
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	62.2
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	691	Ramp Junction Speed (S), mi/h	62.2
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1266	Average Density (D), pc/mi/ln	10.2
Level of Service (LOS)	A		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2018
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	3620	280
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	1035	115
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	1265	141
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.28	0.07

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	12.6
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.325
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	59.1
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1265	Ramp Junction Speed (S), mi/h	59.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	10.7
Level of Service (LOS)	B		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	5705	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

	Freeway	Ramp
Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

	Freeway	Ramp
Demand Volume (V_i), veh/h	2615	305
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	3108	386
Capacity (c), pc/h	6824	2033
Volume-to-Capacity Ratio (v/c)	0.46	0.19

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	9.6
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.347
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	912
Distance to Downstream Ramp (L_{DOWN}), ft	10000	Off-Ramp Influence Area Speed (S_R), mi/h	58.5
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	0.665	Outer Lanes Freeway Speed (S_O), mi/h	73.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	2196	Ramp Junction Speed (S), mi/h	62.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	16.6
Level of Service (LOS)	A		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1080	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

	Freeway	Ramp
Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

	Freeway	Ramp
Demand Volume (V_i), veh/h	2310	365
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	2745	462
Capacity (c), pc/h	4550	1936
Volume-to-Capacity Ratio (v/c)	0.70	0.24

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	20.9
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.315
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	59.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2745	Ramp Junction Speed (S), mi/h	59.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3207	Average Density (D), pc/mi/ln	27.0
Level of Service (LOS)	C		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	5500	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

	Freeway	Ramp
Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

	Freeway	Ramp
Demand Volume (V_i), veh/h	1485	470
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	1765	595
Capacity (c), pc/h	6824	2033
Volume-to-Capacity Ratio (v/c)	0.26	0.29

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	2.8
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.366
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	364
Distance to Downstream Ramp (L_{DOWN}), ft	10000	Off-Ramp Influence Area Speed (S_R), mi/h	58.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	0.689	Outer Lanes Freeway Speed (S_O), mi/h	73.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	1401	Ramp Junction Speed (S), mi/h	60.7
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	9.7
Level of Service (LOS)	A		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Acceleration Length (L_A), ft	1000	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

	Freeway	Ramp
Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

	Freeway	Ramp
Demand Volume (V_i), veh/h	1015	205
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	1206	260
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.32	0.13

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	7.5
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.206
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	62.1
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1206	Ramp Junction Speed (S), mi/h	62.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1466	Average Density (D), pc/mi/ln	11.8
Level of Service (LOS)	A		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	2
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	5195	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	1220	425
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	1450	538
Capacity (c), pc/h	6824	4066
Volume-to-Capacity Ratio (v/c)	0.21	0.13

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	0.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.361
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	502
Distance to Downstream Ramp (L_{DOWN}), ft	10000	Off-Ramp Influence Area Speed (S_R), mi/h	58.2
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	0.450	Outer Lanes Freeway Speed (S_O), mi/h	73.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	948	Ramp Junction Speed (S), mi/h	62.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	7.7
Level of Service (LOS)	A		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Acceleration Length (L_A), ft	3445	1050
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	795	265
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	972	324
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.28	0.16

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	8.9
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.243
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	61.2
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	972	Ramp Junction Speed (S), mi/h	61.2
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1296	Average Density (D), pc/mi/ln	10.6
Level of Service (LOS)	A		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	4075	550
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	1060	365
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	1296	446
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.28	0.22

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	10.4
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.352
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	10000	Off-Ramp Influence Area Speed (S_R), mi/h	58.4
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1296	Ramp Junction Speed (S), mi/h	58.4
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	11.1
Level of Service (LOS)	B		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1885	1500
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	695	290
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	850	354
Capacity (c), pc/h	4550	1936
Volume-to-Capacity Ratio (v/c)	0.19	0.18

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	0.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.472
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	55.4
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	850	Ramp Junction Speed (S), mi/h	55.4
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	7.7
Level of Service (LOS)	A		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1750	250
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	270	385
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	2.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.980	0.909
Flow Rate (v_i), pc/h	306	471
Capacity (c), pc/h	4550	1936
Volume-to-Capacity Ratio (v/c)	0.17	0.24

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	9.8
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.312
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	59.4
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	306	Ramp Junction Speed (S), mi/h	59.4
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	777	Average Density (D), pc/mi/ln	6.5
Level of Service (LOS)	A		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	1500
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	655	490
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	801	599
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.31	0.29

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	6.8
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.205
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	62.1
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	801	Ramp Junction Speed (S), mi/h	62.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1400	Average Density (D), pc/mi/ln	11.3
Level of Service (LOS)	A		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	3620	280
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

	Freeway	Ramp
Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

	Freeway	Ramp
Demand Volume (V_i), veh/h	1145	45
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	1400	55
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.31	0.03

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	13.8
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.317
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	59.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1400	Ramp Junction Speed (S), mi/h	59.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	11.8
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Acceleration Length (L_A), ft	3655	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

	Freeway	Ramp
Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

	Freeway	Ramp
Demand Volume (V_i), veh/h	1030	1585
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.833
Flow Rate (v_i), pc/h	1259	2114
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.74	1.04

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	21.5
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	59.6
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1259	Ramp Junction Speed (S), mi/h	-
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3373	Average Density (D), pc/mi/ln	-
Level of Service (LOS)	F		

III. 2023 Freeway Analysis – Weaving

HCS7 Freeway Weaving Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

Number of Lanes (N), ln	3	Segment Type	Freeway
Short Length (L_S), ft	5705	Number of Maneuver Lanes (N_{WL}), ln	2
Weaving Configuration	One-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	0
Interchange Density (ID), int/mi	0.66	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	800	350	15	120
Peak Hour Factor (PHF)	0.90	0.90	0.90	0.90
Total Trucks, %	7.00	7.00	7.00	7.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877	0.877	0.877
Flow Rate (v_i), pc/h	951	443	19	152

Weaving Flow Rate (v_w), pc/h	595	Freeway Max Capacity (c_{IFL}), pc/h/ln	2373
Non-Weaving Flow Rate (v_{NW}), pc/h	970	Density-Based Capacity (c_{IWL}), pc/h/ln	2315
Total Flow Rate (v), pc/h	1565	Demand Flow-Based Capacity (c_{IW}), pc/h	6316
Volume Ratio (VR)	0.380	Weaving Segment Capacity (c_W), veh/h	5905
Minimum Lane Change Rate (LC_{MIN}), lc/h	595	Adjusted Weaving Area Capacity, pc/h	6265
Maximum Weaving Length (L_{MAX}), ft	6458	Volume-to-Capacity Ratio (v/c)	0.25

Speed and Density

Non-Weaving Vehicle Index (I_{NW})	365	Average Weaving Speed (S_W), mi/h	61.2
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	1905	Average Non-Weaving Speed (S_{NW}), mi/h	60.5
Weaving Lane Change Rate (LC_W), lc/h	982	Average Speed (S), mi/h	60.8
Total Lane Change Rate (LC_{All}), lc/h	2887	Density (D), pc/mi/ln	8.6
Weaving Intensity Factor (W)	0.132	Level of Service (LOS)	A

HCS7 Freeway Weaving Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

Number of Lanes (N), ln	3	Segment Type	Freeway
Short Length (L_S), ft	5705	Number of Maneuver Lanes (N_{WL}), ln	2
Weaving Configuration	One-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	0
Interchange Density (ID), int/mi	0.66	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	755	1555	30	275
Peak Hour Factor (PHF)	0.90	0.90	0.90	0.90
Total Trucks, %	7.00	7.00	7.00	7.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877	0.877	0.877
Flow Rate (v_i), pc/h	897	1970	38	348

Weaving Flow Rate (v_w), pc/h	2318	Freeway Max Capacity (c_{IFL}), pc/h/ln	2373
Non-Weaving Flow Rate (v_{NW}), pc/h	935	Density-Based Capacity (c_{IWL}), pc/h/ln	2012
Total Flow Rate (v), pc/h	3253	Demand Flow-Based Capacity (c_{IW}), pc/h	3366
Volume Ratio (VR)	0.713	Weaving Segment Capacity (c_W), veh/h	3147
Minimum Lane Change Rate (LC_{MIN}), lc/h	2318	Adjusted Weaving Area Capacity, pc/h	3410
Maximum Weaving Length (L_{MAX}), ft	10420	Volume-to-Capacity Ratio (v/c)	0.95

Speed and Density

Non-Weaving Vehicle Index (I_{NW})	352	Average Weaving Speed (S_W), mi/h	58.9
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	1898	Average Non-Weaving Speed (S_{NW}), mi/h	45.4
Weaving Lane Change Rate (LC_W), lc/h	2705	Average Speed (S), mi/h	54.3
Total Lane Change Rate (LC_{All}), lc/h	4603	Density (D), pc/mi/ln	20.0
Weaving Intensity Factor (W)	0.191	Level of Service (LOS)	B

HCS7 Freeway Weaving Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

Number of Lanes (N), ln	3	Segment Type	Freeway
Short Length (L_S), ft	4820	Number of Maneuver Lanes (N_{WL}), ln	2
Weaving Configuration	One-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	0
Interchange Density (ID), int/mi	0.66	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	510	185	125	1625
Peak Hour Factor (PHF)	0.90	0.90	0.90	0.90
Total Trucks, %	7.00	7.00	7.00	7.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877	0.877	0.877
Flow Rate (v_i), pc/h	606	234	158	2059

Weaving Flow Rate (v_w), pc/h	2293	Freeway Max Capacity (c_{IFL}), pc/h/ln	2373
Non-Weaving Flow Rate (v_{NW}), pc/h	764	Density-Based Capacity (c_{IWL}), pc/h/ln	1908
Total Flow Rate (v), pc/h	3057	Demand Flow-Based Capacity (c_{IW}), pc/h	3200
Volume Ratio (VR)	0.750	Weaving Segment Capacity (c_W), veh/h	2992
Minimum Lane Change Rate (LC_{MIN}), lc/h	2293	Adjusted Weaving Area Capacity, pc/h	3259
Maximum Weaving Length (L_{MAX}), ft	10892	Volume-to-Capacity Ratio (v/c)	0.94

Speed and Density

Non-Weaving Vehicle Index (I_{NW})	243	Average Weaving Speed (S_W), mi/h	58.1
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	1859	Average Non-Weaving Speed (S_{NW}), mi/h	45.9
Weaving Lane Change Rate (LC_W), lc/h	2647	Average Speed (S), mi/h	54.5
Total Lane Change Rate (LC_{All}), lc/h	4506	Density (D), pc/mi/ln	18.7
Weaving Intensity Factor (W)	0.214	Level of Service (LOS)	B

HCS7 Freeway Weaving Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2023
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

Number of Lanes (N), ln	3	Segment Type	Freeway
Short Length (L_S), ft	4820	Number of Maneuver Lanes (N_{WL}), ln	2
Weaving Configuration	One-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	0
Interchange Density (ID), int/mi	0.66	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	670	125	80	345
Peak Hour Factor (PHF)	0.90	0.90	0.90	0.90
Total Trucks, %	7.00	7.00	7.00	7.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877	0.877	0.877
Flow Rate (v_i), pc/h	796	158	101	437

Weaving Flow Rate (v_w), pc/h	595	Freeway Max Capacity (c_{IFL}), pc/h/ln	2373
Non-Weaving Flow Rate (v_{NW}), pc/h	897	Density-Based Capacity (c_{IWL}), pc/h/ln	2231
Total Flow Rate (v), pc/h	1492	Demand Flow-Based Capacity (c_{IW}), pc/h	6015
Volume Ratio (VR)	0.399	Weaving Segment Capacity (c_W), veh/h	5624
Minimum Lane Change Rate (LC_{MIN}), lc/h	595	Adjusted Weaving Area Capacity, pc/h	5992
Maximum Weaving Length (L_{MAX}), ft	6670	Volume-to-Capacity Ratio (v/c)	0.25

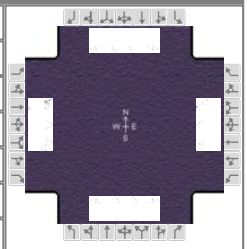
Speed and Density

Non-Weaving Vehicle Index (I_{NW})	285	Average Weaving Speed (S_W), mi/h	60.5
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	1889	Average Non-Weaving Speed (S_{NW}), mi/h	60.6
Weaving Lane Change Rate (LC_W), lc/h	949	Average Speed (S), mi/h	60.6
Total Lane Change Rate (LC_{All}), lc/h	2838	Density (D), pc/mi/ln	8.2
Weaving Intensity Factor (W)	0.149	Level of Service (LOS)	A

IV. 2023 Arterial Analysis

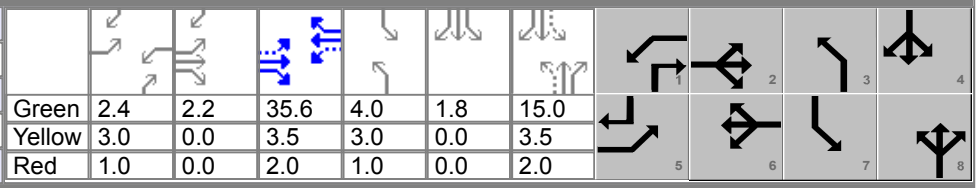
HCS 2010 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 7, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	AM PEAK	PHF	0.90
Urban Street	BENSON ROAD	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	CLIFF AVENUE	File Name	BENSON AM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	95	320	80	60	575	290	100	255	65	100	290	160

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	2.4	2.2	35.6	4.0	1.8	15.0						
Yellow	3.0	0.0	3.5	3.0	0.0	3.5						
Red	1.0	0.0	2.0	1.0	0.0	2.0						

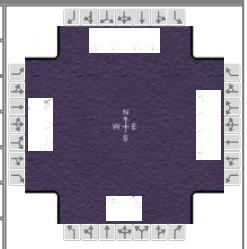
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	3.0	1.1	3.0
Phase Duration, s	8.6	43.3	6.4	41.1	8.0	20.5	9.8	22.3
Change Period, ($Y+R_c$), s	4.0	5.5	4.0	5.5	4.0	5.5	4.0	5.5
Max Allow Headway (*MAH*), s	5.1	0.0	5.1	0.0	5.1	1.0	5.1	1.0
Queue Clearance Time (g_s), s	4.7		3.1		6.0	8.2	6.3	8.9
Green Extension Time (g_e), s	0.4	0.0	0.1	0.0	0.0	0.1	0.0	0.1
Phase Call Probability	0.90		0.60		0.92	1.00	0.92	1.00
Max Out Probability	0.00		0.00		1.00	0.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	106	209	202	41	264	247	111	283	44	111	322	106
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1633	1714	1634	1633	1714	1577	1633	1632	1453	1633	1632	1453
Queue Service Time (g_s), s	2.7	5.9	6.0	1.1	5.9	5.5	4.0	6.2	2.0	4.3	6.9	4.6
Cycle Queue Clearance Time (g_c), s	2.7	5.9	6.0	1.1	5.9	5.5	4.0	6.2	2.0	4.3	6.9	4.6
Green Ratio (*g/C*)	0.51	0.47	0.47	0.47	0.44	0.44	0.24	0.19	0.22	0.26	0.21	0.27
Capacity (*c*), veh/h	504	810	772	490	762	701	273	612	316	326	686	389
Volume-to-Capacity Ratio (*X*)	0.210	0.258	0.262	0.083	0.346	0.352	0.408	0.463	0.141	0.341	0.470	0.271
Back of Queue (*Q*), ft/ln (95 th percentile)	42	101	94.9	17.3	94.5	78.3	80.5	107.6	29.2	76.5	119.8	66.8
Back of Queue (*Q*), veh/ln (95 th percentile)	1.6	3.9	3.8	0.7	3.6	3.1	3.1	4.1	1.2	2.9	4.6	2.7
Queue Storage Ratio (*RQ*) (95 th percentile)	0.22	0.00	0.00	0.12	0.00	0.00	0.27	0.00	0.13	0.21	0.00	0.22
Uniform Delay (d_1), s/veh	10.7	12.7	12.7	11.8	9.4	8.4	25.9	28.9	25.3	23.8	27.7	23.1
Incremental Delay (d_2), s/veh	0.3	0.8	0.8	0.1	1.2	1.3	1.4	0.2	0.1	0.9	0.2	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	11.0	13.4	13.5	11.9	10.5	9.7	27.3	29.1	25.3	24.6	27.9	23.3
Level of Service (LOS)	B	B	B	B	B	A	C	C	C	C	C	C
Approach Delay, s/veh / LOS	13.0	B		10.3	B		28.3	C		26.3	C	
Intersection Delay, s/veh / LOS	19.0						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.1	C	3.3	C	3.3	C	3.1	C
Bicycle LOS Score / LOS	2.7	B	3.0	C	2.7	B	2.8	C

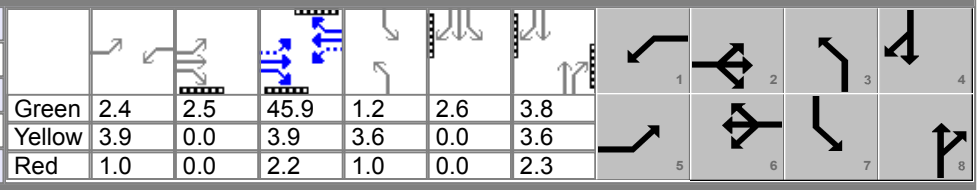
HCS 2010 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 7, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	AM PEAK	PHF	0.90
Urban Street	BENSON ROAD	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	LEWIS AVENUE	File Name	BENSON AM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	120	315	30	60	965	430	15	15	30	85	25	85

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	2.4	2.5		45.9	1.2	2.6	3.8					
Yellow	3.9	0.0		3.9	3.6	0.0	3.6					
Red	1.0	0.0		2.2	1.0	0.0	2.3					

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	3.0	2.0	4.0	2.0	3.0
Phase Duration, s	9.9	54.5	7.3	52.0	5.8	9.7	8.4	12.3
Change Period, ($Y+R_c$), s	4.9	6.1	4.9	6.1	4.6	5.9	4.6	5.9
Max Allow Headway (*MAH*), s	5.1	0.0	5.1	0.0	5.1	1.3	5.1	1.3
Queue Clearance Time (g_s), s	4.8		2.8		2.8	4.0	4.3	4.9
Green Extension Time (g_e), s	0.5	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Phase Call Probability	0.95		0.60		0.31	0.95	0.88	0.99
Max Out Probability	0.00		0.00		1.00	0.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	133	187	185	42	671	191	17	39		94	28	56
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1633	1714	1678	1633	1632	1453	1633	1554		1585	1714	1453
Queue Service Time (g_s), s	2.8	4.0	4.1	0.8	9.8	5.8	0.8	2.0		2.3	1.2	2.9
Cycle Queue Clearance Time (g_c), s	2.8	4.0	4.1	0.8	9.8	5.8	0.8	2.0		2.3	1.2	2.9
Green Ratio (*g/C*)	0.64	0.61	0.61	0.60	0.57	0.57	0.02	0.05		0.05	0.08	0.08
Capacity (*c*), veh/h	525	1037	1016	657	1871	833	25	74		153	138	117
Volume-to-Capacity Ratio (*X*)	0.254	0.181	0.182	0.064	0.359	0.230	0.660	0.524		0.619	0.202	0.476
Back of Queue (*Q*), ft/ln (95 th percentile)	29.4	60	58.1	10.9	103.3	56.9	26.2	34.3		46.7	23.4	46.6
Back of Queue (*Q*), veh/ln (95 th percentile)	1.1	2.3	2.3	0.4	4.0	2.3	1.0	1.4		1.8	0.9	1.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.15	0.00	0.00	0.16	0.00	0.31	0.65	0.00		0.17	0.00	0.00
Uniform Delay (d_1), s/veh	5.6	7.2	7.3	6.5	10.7	9.8	39.2	37.2		37.4	34.4	35.2
Incremental Delay (d_2), s/veh	0.3	0.4	0.4	0.0	0.0	0.1	34.6	2.1		5.7	0.3	1.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	5.9	7.6	7.7	6.5	10.8	0.0	73.8	39.3		43.1	34.7	36.3
Level of Service (LOS)	A	A	A	A	B	A	E	D		D	C	D
Approach Delay, s/veh / LOS	7.2	A		8.3	A		49.7	D		39.6	D	
Intersection Delay, s/veh / LOS	12.8						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.3	B	2.9	C	3.5	C	3.1	C
Bicycle LOS Score / LOS	2.7	B	3.5	C	2.0	B	2.4	B

HCS7 Two-Way Stop-Control Report

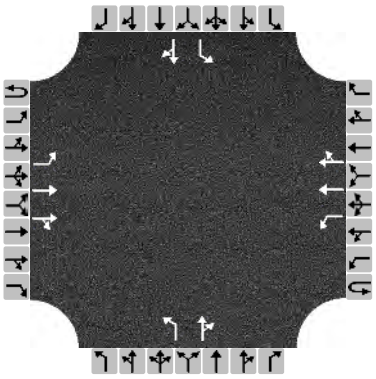
General Information

Analyst	RL
Agency/Co.	HDR
Date Performed	3/7/2018
Analysis Year	2023
Time Analyzed	PM PEAK
Intersection Orientation	East-West
Project Description	I-229/BENSON IMJR

Site Information

Intersection	BENSON/POTSDAM
Jurisdiction	CITY OF SIOUX FALLS
East/West Street	BENSON ROAD
North/South Street	POTSDAM AVENUE
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		1	1	0		1	1	0
Configuration		L	T	TR		L	T	TR		L		TR		L		TR
Volume, V (veh/h)		5	1665	30		60	555	50		10	5	100		70	0	40
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.20				4.20				7.60	6.60	7.00		7.60	6.60	7.00
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.25				2.25				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		6				67				11		117		78		44
Capacity, c (veh/h)		894				303				15		145		19		651
v/c Ratio		0.01				0.22				0.74		0.81		4.14		0.07
95% Queue Length, Q_{95} (veh)		0.0				0.8				1.8		5.1		10.2		0.2
Control Delay (s/veh)		9.1				20.2				480.9		90.9		1826.9		10.9
Level of Service, LOS		A				C				F		F		F		B
Approach Delay (s/veh)		0.0				1.8				124.4				1172.0		
Approach LOS										F				F		

HCS 2010 Two-Way Stop Control Summary Report

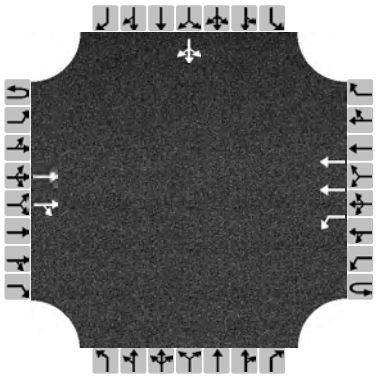
General Information

Analyst	RL
Agency/Co.	HDR
Date Performed	3/7/2018
Analysis Year	2023
Time Analyzed	AM PEAK
Intersection Orientation	East-West
Project Description	I-229/BENSON IMJR

Site Information

Intersection	BENSON/I-229 SB
Jurisdiction	CITY OF SIOUX FALLS
East/West Street	BENSON ROAD
North/South Street	I-229 SB
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

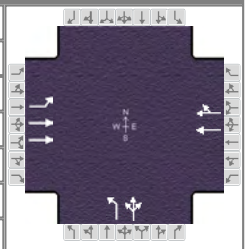
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	1	2	0		0	0	0		0	1	0
Configuration			T	TR		L	T								LTR	
Volume (veh/h)			165	320		45	1805							5	0	110
Percent Heavy Vehicles						5								5	5	5
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)						50									128	
Capacity						1005									186	
v/c Ratio						0.05									0.69	
95% Queue Length						0.2									4.2	
Control Delay (s/veh)						8.8									58.7	
Level of Service (LOS)						A									F	
Approach Delay (s/veh)					0.2								58.7			
Approach LOS													F			

HCS 2010 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 7, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	AM PEAK	PHF	0.90
Urban Street	BENSON ROAD	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	I-229 NB	File Name	BENSON AM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	60	110			210	0	1640	0	110			

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

								1	2	3	4
Green	9.5	59.5	0.0	0.0	0.0	0.0					
Yellow	3.5	3.5	0.0	0.0	0.0	0.0					
Red	2.0	2.0	0.0	0.0	0.0	0.0	5	6	7	8	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		
Case Number		6.0		8.0		10.0		
Phase Duration, s		15.0		15.0		65.0		
Change Period, (*Y+R c*), s		5.5		5.5		5.5		
Max Allow Headway (*MAH*), s		0.0		0.0		5.0		
Queue Clearance Time (*g s*), s						61.5		
Green Extension Time (*g e*), s		0.0		0.0		0.0		
Phase Call Probability						1.00		
Max Out Probability						1.00		

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16	3	8	18			
Adjusted Flow Rate (*v*), veh/h	65	119			233	0	1822	117				
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1110	1534			1621	0	1633	1374				
Queue Service Time (*g s*), s	4.0	2.8			5.5	0.0	59.5	1.9				
Cycle Queue Clearance Time (*g c*), s	9.5	2.8			5.5	0.0	59.5	1.9				
Green Ratio (*g/C*)	0.12	0.12			0.12		0.74	0.74				
Capacity (*c*), veh/h	146	364			385		1214	1022				
Volume-to-Capacity Ratio (*X*)	0.446	0.327			0.606	0.000	1.501	0.114				
Back of Queue (*Q*), ft/ln (95 th percentile)	70.9	52.1			112.7	0	3557.5	13.1				
Back of Queue (*Q*), veh/ln (95 th percentile)	2.7	2.0			4.3	0.0	136.8	0.5				
Queue Storage Ratio (*RQ*) (95 th percentile)	0.71	0.00			0.00	0.00	0.00	0.00				
Uniform Delay (*d 1*), s/veh	35.9	32.0			33.5		10.3	2.9				
Incremental Delay (*d 2*), s/veh	9.3	2.3			6.9	0.0	229.7	0.1				
Initial Queue Delay (*d 3*), s/veh	0.0	0.0			0.0	0.0	0.0	0.0				
Control Delay (*d*), s/veh	45.1	34.3			40.4		239.9	2.9				
Level of Service (LOS)	D	C			D		F	A				
Approach Delay, s/veh / LOS	38.1	D		40.4	D		225.6	F		0.0		
Intersection Delay, s/veh / LOS	192.6						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.1	C	1.9	A	2.8	C	3.2	C
Bicycle LOS Score / LOS	2.6	B	2.7	B	5.4	F		

HCS 2010 Two-Way Stop Control Summary Report

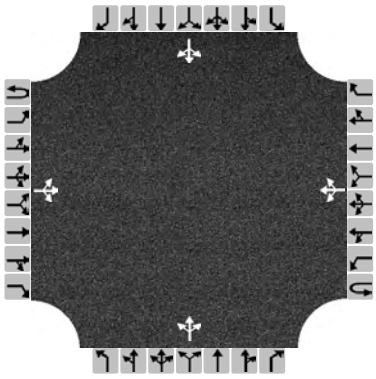
General Information

Analyst	RL
Agency/Co.	HDR
Date Performed	3/7/2018
Analysis Year	2023
Time Analyzed	AM PEAK
Intersection Orientation	East-West
Project Description	I-229/BENSON IMJR

Site Information

Intersection	BENSON/HALL
Jurisdiction	CITY OF SIOUX FALLS
East/West Street	BENSON ROAD
North/South Street	HALL AVENUE
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		30	65	125		75	115	10		75	5	30		10	5	20
Percent Heavy Vehicles		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		33				83					122				39	
Capacity		1429				1345					485				583	
v/c Ratio		0.02				0.06					0.25				0.07	
95% Queue Length		0.1				0.2					1.0				0.2	
Control Delay (s/veh)		7.6				7.9					14.9				11.6	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	1.2				3.3				14.9				11.6			
Approach LOS									B				B			

File Name: BENSON AM.xus
Analyst: RL
Agency/Co.: HDR
Analysis Date: Mar 7, 2018
Time Period: AM PEAK
Jurisdiction: CITY OF SIOUX FALLS
Analysis Year: 2023
Project Description: I-229/BENSON IMJR
Urban Street: BENSON ROAD
Analysis Period: 1> 7:00

Input

URBAN STREET PARAMETERS

Number of Intersections	3
Number of Segments	2
Analysis period duration, h	0.25
System cycle length, s	80
Urban street forward direction	EB
Sneakers per cycle, veh	2
Saturation flow rate, veh/h/ln	1900
Stored vehicle lane length, ft	25
Detected vehicle length, ft	17
Queue length percent	95
Critical merge gap, s	3.7
Stop threshold speed, mph	5
Acceleration rate, ft/s/s	3.5
Decel. rate (signal), ft/s/s	4
Minimum headway in a platoon, s/veh	1.5
Maximum headway in a platoon, s/veh	3.6
Number of iterations	15
Length of left-turn bay (access pt.), ft	250
Decel. rate (access pt.), ft/s/s	6.7
Right-turn speed (access pt.), ft/s	20
Critical gap from major left (access pt.), s	4.1
Follow-up time from major left (access pt.), s	2.2
Right-turn equivalency factor (access pt.)	2.2
Stored heavy vehicle lane length, ft	45
Proportion of peds who push button	0.51
Critical gap for permissive left-turn, s	4.5
Follow-up time for permissive left-turn, s	2.5
Calibration factor for platoon dispersion	0.14
Average ratio of speed limit to free-flow speed	0.9

BASIC SEGMENT INFORMATION

Seg	Spd Lmt		TH Lanes		Seg Len		IntWid		LenRM		PctCurb		Other Dly	
Num	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
1	40	40	2	2	2645	2645	50	50	0	0	70	70	0	0
2	40	40	2	2	2955	2955	50	50	0	0	70	70	0	0

ORIGIN-DESTINATION SEED PROPORTIONS - Forward Direction

	Cross LT	Major TH	Cross RT	MidEntry
Downstream Left	0.02	0.1	0.05	0.02
Downstream Thru	0.91	0.78	0.92	0.97
Downstream Right	0.05	0.1	0.02	0.01
Mid-segment Exit	0.02	0.02	0.01	0

ORIGIN-DESTINATION SEED PROPORTIONS - Reverse Direction

	Cross LT	Major TH	Cross RT	MidEntry
Downstream Left	0.02	0.1	0.05	0.02
Downstream Thru	0.91	0.78	0.92	0.97
Downstream Right	0.05	0.1	0.02	0.01
Mid-segment Exit	0.02	0.02	0.01	0

ACCESS POINT DATA

SEGMENT 1

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	465	20	0	925	140	0	0	0	0	0	0
1: Lanes	1	2	0	1	2	0	0	1	0	0	1	0
1: Location, ft	1320											
1: Peak Hour Factor	1											

Number of access points: 1

SEGMENT 2

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	430	0	0	1455	55	0	0	0	20	0	0
1: Lanes	1	2	0	0	2	0	0	0	0	1	0	1
1: Location, ft	700											
1: Peak Hour Factor	1											
2: Volume, veh/h	15	395	40	135	1490	290	10	5	80	10	0	10
2: Lanes	1	2	0	1	2	0	1	1	0	0	1	0
2: Location, ft	1420											
2: Peak Hour Factor	1											
3: Volume, veh/h	0	165	320	10	1805	0	0	0	0	5	0	110
3: Lanes	0	2	0	1	2	0	0	0	0	0	1	0
3: Location, ft	1910											
3: Peak Hour Factor	1											

Number of access points: 3

Global Output

SEGMENT DATA

Seg.No.	Movement	EB LT 5	EB TH 2	EB RT 12	WB LT 1	WB TH 6	WB RT 16
1	Bay/Lane Spillback Time, h	999	999	999	999	999	999
1	ShrdLane Spillback Time, h	999			999		
1	Base Free-Flow Speed, mph		44.07			44.07	
1	Running Time, s		43.09			43.51	
1	Running Speed, mph		41.85			41.45	
1	Through Delay, s/veh		7.67			10.2	
1	Travel Speed, mph		35.53			33.57	
1	Stop Rate, stops/veh		0.31			0.33	
1	Spatial Stop Rate, stops/mi		0.62			0.65	
1	Through vol/cap ratio		0.18			0.39	
1	Percent of Base FFS		80.62			76.18	
1	Level of Service		A			B	
1	Automobile Perception Score		2.23			2.24	
2	Bay/Lane Spillback Time, h	999	999	999	999	999	999
2	ShrdLane Spillback Time, h	999			999		999
2	Base Free-Flow Speed, mph		44.07			44.07	
2	Running Time, s		47.72			49.21	
2	Running Speed, mph		42.22			40.94	
2	Through Delay, s/veh		34.19			11.59	
2	Travel Speed, mph		24.6			33.14	
2	Stop Rate, stops/veh		0.84			0.45	
2	Spatial Stop Rate, stops/mi		1.5			0.81	
2	Through vol/cap ratio		0.32			0.4	
2	Percent of Base FFS		55.81			75.19	
2	Level of Service		C			B	
2	Automobile Perception Score		2.42			2.36	

Facility Travel Time, s	132.67	114.52
Facility Travel Speed, mph	28.78	33.34
Facility Spatial Stop Rate, stops/mi	1.08	0.73
Facility Base Free Flow Speed, mph	44.07	44.07
Facility Percent Base Free Flow Speed	65.3	75.65
Facility Level of Service	C	B
Facility Automobile Perception Score	2.33	2.3
Facility Pedestrian Space	∞	∞
Facility Pedestrian Travel Speed	4.26	4.26
Facility Pedestrian LOS Score	2.98	3.67
Facility Pedestrian LOS	C	D
Facility Bicycle Travel Speed	14.03	13.04
Facility Bicycle LOS Score	2.62	2.97
Facility Bicycle LOS	C	C
Facility Transit Travel Speed	35.58	33.42
Facility Transit LOS Score	0.95	0.81
Facility Transit LOS	A	A

SPILLBACK TIME, h 999

Multimodal Results

1	Average Pedestrian Space, ft2/p	∞	∞
1	Pedestrian Travel Speed, ft/s	4.15	4.15
1	Ped LOS Score for Intersection	1.97	2.86
1	Cross-section Adjustment Factor	-4.74	-4.74
1	Volume Adjustment Factor	0.61	0.99
1	Speed Adjustment Factor	0.7	0.69
1	Ped LOS Score for Link	2.62	2.98
1	Ped Link LOS	C	C
1	Roadway Crossing Difficulty Factor	1.08	1.03
1	Ped LOS Score for Segment	2.96	3.17
1	Ped Segment LOS	C	C
1	Bicycle Travel Speed	13.72	14.15
1	Bicycle LOS Score for Intersection	2.68	3.01
1	Cross-section Adjustment Factor	-1.28	-1.28
1	Volume Adjustment Factor	2.13	2.38
1	Speed Adjustment Factor	0.85	0.84
1	Pavement Adjustment Factor	0.58	0.58
1	Bicycle LOS Score for Link	3.04	3.28
1	Bicycle Link LOS	C	C
1	Number of access point approaches	0	0
1	Segment Length, ft	2645	2645
1	Unsignalized Conflicts Factor	-0.7	-0.7
1	Bicycle LOS Score for Segment	2.65	2.82
1	Bicycle Segment LOS	B	C
1	Transit Running Speed, mi/h	41.85	41.45
1	g/C Ratio	0.6	0.45
1	Transit Running Time, s	43.09	43.51
1	Delay at Intersection, s/veh	7.6	10.46
1	Transit Travel Speed, mi/h	35.58	33.42
1	Transit Wait-Ride Score	3.88	3.8
1	Ped LOS Score for Link	2.62	2.98
1	Transit LOS Score for Segment	0.57	0.75
1	Transit Segment LOS	A	A
2	Average Pedestrian Space, ft2/p	∞	∞
2	Pedestrian Travel Speed, ft/s	4.36	4.35
2	Ped LOS Score for Intersection	3.14	2.59
2	Cross-section Adjustment Factor	-4.74	-4.74
2	Volume Adjustment Factor	0.54	1.66
2	Speed Adjustment Factor	0.71	0.67
2	Ped LOS Score for Link	2.56	3.64
2	Ped Link LOS	C	D
2	Roadway Crossing Difficulty Factor	1.1	1.19
2	Ped LOS Score for Segment	2.99	4.11
2	Ped Segment LOS	C	D
2	Bicycle Travel Speed	14.33	12.18
2	Bicycle LOS Score for Intersection	2.63	3.45
2	Cross-section Adjustment Factor	-1.28	-1.28
2	Volume Adjustment Factor	2.07	2.64
2	Speed Adjustment Factor	0.85	0.84
2	Pavement Adjustment Factor	0.58	0.58
2	Bicycle LOS Score for Link	2.98	3.54
2	Bicycle Link LOS	C	D
2	Number of access point approaches	0	0
2	Segment Length, ft	2955	2955
2	Unsignalized Conflicts Factor	-0.7	-0.7
2	Bicycle LOS Score for Segment	2.6	3.1
2	Bicycle Segment LOS	B	C
2	Transit Running Speed, mi/h	42.22	40.94
2	g/C Ratio	0.12	0.57
2	Transit Running Time, s	47.72	49.21
2	Delay at Intersection, s/veh	34.19	11.59
2	Transit Travel Speed, mi/h	24.6	33.14
2	Transit Wait-Ride Score	3.4	3.79
2	Ped LOS Score for Link	2.56	3.64
2	Transit LOS Score for Segment	1.29	0.86
2	Transit Segment LOS	A	A

ACCESS POINT DATA

SEGMENT 1

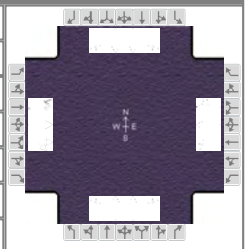
	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	517	22.2	0	752	114	0	0	0	0	0	0
1: Lanes	1	2	0	1	2	0	0	1	0	0	1	0
1: Prop blocked	0.14	0	0	0.02	0	0	0.16	0.16	0.02	0.16	0.16	0.14
1: Thru veh delay		0.02			0.06							
1: Prob inside blk		0			0							
1: Dist to upstream signal	1320											

SEGMENT 2

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	478	0	0	1189	44.9	0	0	0	20	0	0
1: Lanes	1	2	0	0	2	0	0	0	0	1	0	1
1: Prop blocked	0	0	0	0.02	0	0	0.02	0.02	0.02	0.02	0.02	0
1: Thru veh delay		0			0.04							
1: Prob inside blk		0			0							
1: Dist to upstream signal	700											
2: Volume, veh/h	16.6	437	44.2	110	1213	236	10	5	80	10	0	10
2: Lanes	1	2	0	1	2	0	1	1	0	0	1	0
2: Prop blocked	0	0	0	0	0	0	0	0	0	0	0	0
2: Thru veh delay		0.03			0.14							
2: Prob inside blk		0			0							
2: Dist to upstream signal	1420											
3: Volume, veh/h	0	179	348	8.03	1450	0	0	0	0	5	0	110
3: Lanes	0	2	0	1	2	0	0	0	0	0	1	0
3: Prop blocked	0	0	0	0	0	0	0	0	0	0	0	0
3: Thru veh delay		0			0							
3: Prob inside blk		0			0							
3: Dist to upstream signal	1910											

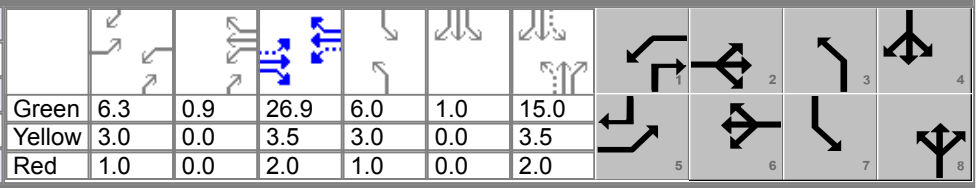
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 7, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	PM PEAK	PHF	0.90
Urban Street	BENSON ROAD	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	CLIFF AVENUE	File Name	BENSON PM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	135	615	170	170	340	145	135	375	50	235	395	105

Signal Information			
Cycle, s	75.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	6.3	0.9	26.9	6.0	1.0	15.0
Yellow	3.0	0.0	3.5	3.0	0.0	3.5
Red	1.0	0.0	2.0	1.0	0.0	2.0

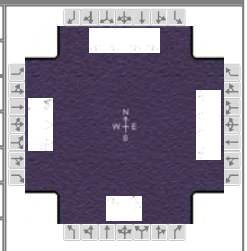
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	3.0	1.1	3.0
Phase Duration, s	10.3	32.4	11.1	33.2	10.0	20.5	11.0	21.5
Change Period, ($Y+R_c$), s	4.0	5.5	4.0	5.5	4.0	5.5	4.0	5.5
Max Allow Headway (*MAH*), s	5.1	0.0	5.1	0.0	5.1	1.0	5.1	1.0
Queue Clearance Time (g_s), s	6.2		7.0		7.4	10.7	9.0	11.1
Green Extension Time (g_e), s	0.4	0.0	0.3	0.0	0.0	0.1	0.0	0.1
Phase Call Probability	0.96		0.98		0.96	1.00	1.00	1.00
Max Out Probability	0.26		1.00		1.00	0.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	150	407	388	180	231	219	150	417	33	261	439	72
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1647	1730	1645	1647	1730	1611	1647	1647	1466	1647	1647	1466
Queue Service Time (g_s), s	4.2	14.8	14.8	5.0	7.3	7.1	5.4	8.7	1.2	7.0	9.1	2.7
Cycle Queue Clearance Time (g_c), s	4.2	14.8	14.8	5.0	7.3	7.1	5.4	8.7	1.2	7.0	9.1	2.7
Green Ratio (*g/C*)	0.44	0.36	0.36	0.45	0.37	0.37	0.28	0.20	0.30	0.29	0.21	0.30
Capacity (*c*), veh/h	460	620	589	360	640	596	289	659	433	329	703	435
Volume-to-Capacity Ratio (*X*)	0.326	0.657	0.658	0.501	0.361	0.368	0.519	0.633	0.077	0.793	0.625	0.166
Back of Queue (*Q*), ft/ln (95 th percentile)	67.3	269.8	251	88.4	134.1	115.5	97.9	150.3	18.2	114.4	156.2	40.6
Back of Queue (*Q*), veh/ln (95 th percentile)	2.6	10.4	10.0	3.4	5.2	4.6	3.8	5.8	0.7	4.4	6.0	1.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.34	0.00	0.00	0.63	0.00	0.00	0.33	0.00	0.08	0.31	0.00	0.13
Uniform Delay (d_1), s/veh	13.4	20.2	20.2	15.6	17.2	16.0	22.2	27.5	19.1	25.6	26.8	19.5
Incremental Delay (d_2), s/veh	0.6	5.4	5.7	1.5	1.5	1.7	2.2	0.4	0.0	13.1	0.3	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	14.0	25.6	25.9	17.0	18.7	17.7	24.4	27.9	19.1	38.7	27.1	19.6
Level of Service (LOS)	B	C	C	B	B	B	C	C	B	D	C	B
Approach Delay, s/veh / LOS	23.8	C		17.8	B		26.5	C		30.3	C	
Intersection Delay, s/veh / LOS	24.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	3.3	C	3.3	C	3.2	C
Bicycle LOS Score / LOS	3.0	C	2.8	C	2.9	C	3.0	C

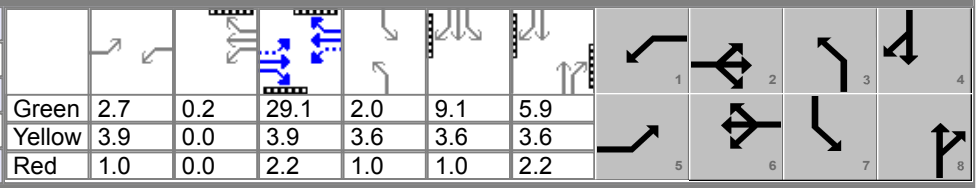
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 7, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	PM PEAK	PHF	0.90
Urban Street	BENSON ROAD	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	LEWIS AVENUE	File Name	BENSON PM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	50	900	15	60	420	80	30	25	125	525	25	140

Signal Information			
Cycle, s	75.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	2.7	0.2	29.1	2.0	9.1	5.9
Yellow	3.9	0.0	3.9	3.6	3.6	3.6
Red	1.0	0.0	2.2	1.0	1.0	2.2

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	3.0	2.0	4.0	2.0	3.0
Phase Duration, s	7.6	35.2	7.8	35.4	6.6	11.7	20.3	25.4
Change Period, ($Y+R_c$), s	4.9	6.1	4.9	6.1	4.6	5.8	4.6	5.8
Max Allow Headway (*MAH*), s	5.1	0.0	5.1	0.0	5.1	1.3	5.1	1.3
Queue Clearance Time (g_s), s	3.5		3.7		3.5	7.4	15.2	5.8
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
Phase Call Probability	0.68		0.73		0.50	1.00	1.00	1.00
Max Out Probability	1.00		1.00		1.00	1.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	55	502	500	63	443	63	33	111		583	28	94
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1647	1730	1723	1647	1647		1647	1524		1600	1730	1466
Queue Service Time (g_s), s	1.5	17.6	17.6	1.7	4.8		1.5	5.4		13.2	0.9	3.8
Cycle Queue Clearance Time (g_c), s	1.5	17.6	17.6	1.7	4.8		1.5	5.4		13.2	0.9	3.8
Green Ratio (*g/C*)	0.42	0.39	0.39	0.43	0.39		0.03	0.08		0.21	0.26	0.26
Capacity (*c*), veh/h	432	670	668	244	1285		44	120		669	452	383
Volume-to-Capacity Ratio (*X*)	0.127	0.749	0.749	0.259	0.345		0.758	0.925		0.872	0.061	0.247
Back of Queue (*Q*), ft/ln (95 th percentile)	22.1	251	240.5	28.2	70		44.9	181.1		255.6	16.4	58.6
Back of Queue (*Q*), veh/ln (95 th percentile)	0.8	9.7	9.6	1.1	2.7		1.7	7.0		9.8	0.6	2.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.11	0.00	0.00	0.40	0.00		1.12	0.00		0.95	0.00	0.00
Uniform Delay (d_1), s/veh	12.3	16.4	16.4	15.0	9.5		36.3	34.3		28.7	20.8	21.9
Incremental Delay (d_2), s/veh	0.1	5.2	5.3	0.6	0.6		30.7	58.3		11.7	0.0	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	12.4	21.7	21.7	15.7	10.1	0.0	67.0	92.6		40.4	20.8	22.0
Level of Service (LOS)	B	C	C	B	B	A	E	F		D	C	C
Approach Delay, s/veh / LOS	21.2	C		9.6	A		86.7	F		37.2	D	
Intersection Delay, s/veh / LOS	26.9						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.4	B	2.9	C	3.4	C	3.1	C
Bicycle LOS Score / LOS	3.1	C	2.8	C	2.2	B	3.2	C

HCS7 Two-Way Stop-Control Report

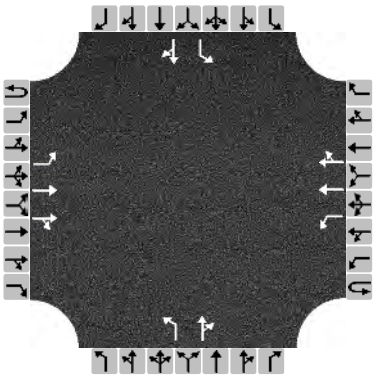
General Information

Analyst	RL
Agency/Co.	HDR
Date Performed	3/7/2018
Analysis Year	2023
Time Analyzed	PM PEAK
Intersection Orientation	East-West
Project Description	I-229/BENSON IMJR

Site Information

Intersection	BENSON/POTSDAM
Jurisdiction	CITY OF SIOUX FALLS
East/West Street	BENSON ROAD
North/South Street	POTSDAM AVENUE
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		1	1	0		1	1	0
Configuration		L	T	TR		L	T	TR		L		TR		L		TR
Volume, V (veh/h)		5	1665	30		60	555	50		10	5	100		70	0	40
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.20				4.20				7.60	6.60	7.00		7.60	6.60	7.00
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.25				2.25				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		6				67				11		117		78		44
Capacity, c (veh/h)		894				303				15		145		19		651
v/c Ratio		0.01				0.22				0.74		0.81		4.14		0.07
95% Queue Length, Q_{95} (veh)		0.0				0.8				1.8		5.1		10.2		0.2
Control Delay (s/veh)		9.1				20.2				480.9		90.9		1826.9		10.9
Level of Service, LOS		A				C				F		F		F		B
Approach Delay (s/veh)		0.0				1.8				124.4				1172.0		
Approach LOS										F				F		

HCS 2010 Two-Way Stop Control Summary Report

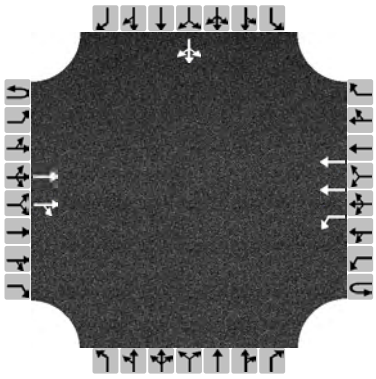
General Information

Analyst	RL
Agency/Co.	HDR
Date Performed	03/07/2018
Analysis Year	2023
Time Analyzed	PM PEAK
Intersection Orientation	East-West
Project Description	I-229/BENSON IMJR

Site Information

Intersection	BENSON/I-229 SB
Jurisdiction	CITY OF SIOUX FALLS
East/West Street	BENSON ROAD
North/South Street	I-229 SB
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

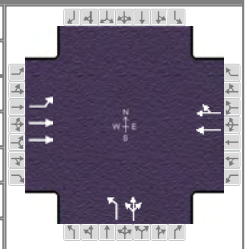
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	1	2	0		0	0	0		0	1	0
Configuration			T	TR		L	T								LTR	
Volume (veh/h)			385	1450		135	625							5	0	40
Percent Heavy Vehicles						5								5	5	5
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)						150									50	
Capacity						262									376	
v/c Ratio						0.57									0.13	
95% Queue Length						3.3									0.5	
Control Delay (s/veh)						35.6									16.0	
Level of Service (LOS)						E									C	
Approach Delay (s/veh)					6.3								16.0			
Approach LOS													C			

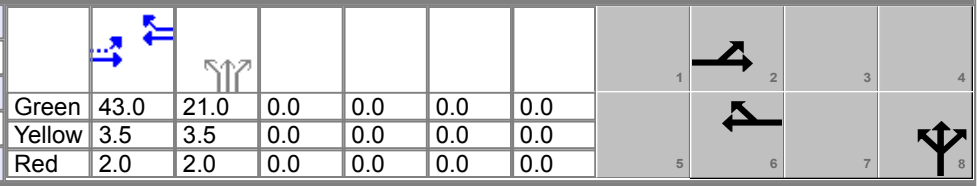
HCS 2010 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 7, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	PM PEAK	PHF	0.90
Urban Street	BENSON ROAD	Analysis Year	2023	Analysis Period	1> 7:00
Intersection	I-229 NB	File Name	BENSON PM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	150	240			395	115	365	0	60			

Signal Information			
Cycle, s	75.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	43.0	21.0	0.0	0.0	0.0	0.0						
Yellow	3.5	3.5	0.0	0.0	0.0	0.0						
Red	2.0	2.0	0.0	0.0	0.0	0.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		
Case Number		6.0		8.0		10.0		
Phase Duration, s		48.5		48.5		26.5		
Change Period, ($Y+R_c$), s		5.5		5.5		5.5		
Max Allow Headway (*MAH*), s		0.0		0.0		5.1		
Queue Clearance Time (g_s), s						19.9		
Green Extension Time (g_e), s		0.0		0.0		1.1		
Phase Call Probability						1.00		
Max Out Probability						1.00		

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16	3	8	18			
Adjusted Flow Rate (*v*), veh/h	81	129			264	253	406	56				
Adjusted Saturation Flow Rate (*s*), veh/h/ln	856	1535			1643	1555	1633	1365				
Queue Service Time (g_s), s	4.0	1.4			6.5	6.2	17.9	2.3				
Cycle Queue Clearance Time (g_c), s	10.5	1.4			6.5	6.2	17.9	2.3				
Green Ratio (*g/C*)	0.57	0.57			0.57	0.57	0.28	0.28				
Capacity (*c*), veh/h	513	1761			943	892	456	382				
Volume-to-Capacity Ratio (*X*)	0.157	0.073			0.280	0.283	0.889	0.146				
Back of Queue (*Q*), ft/ln (95 th percentile)	32.7	17.9			90.7	84.1	335.6	31				
Back of Queue (*Q*), veh/ln (95 th percentile)	1.3	0.7			3.5	3.4	12.9	1.2				
Queue Storage Ratio (*RQ*) (95 th percentile)	0.33	0.00			0.00	0.00	0.00	0.00				
Uniform Delay (d_1), s/veh	10.9	7.1			8.1	8.1	25.9	20.3				
Incremental Delay (d_2), s/veh	0.3	0.0			0.7	0.8	16.0	0.2				
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0	0.0	0.0				
Control Delay (*d*), s/veh	11.2	7.2			8.9	8.9	41.9	20.5				
Level of Service (LOS)	B	A			A	A	D	C				
Approach Delay, s/veh / LOS	8.7	A		8.9	A		39.3	D		0.0		
Intersection Delay, s/veh / LOS	20.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.0	B	1.9	A	2.9	C	3.1	C
Bicycle LOS Score / LOS	2.8	C	2.9	C	2.9	C		

HCS 2010 Two-Way Stop Control Summary Report

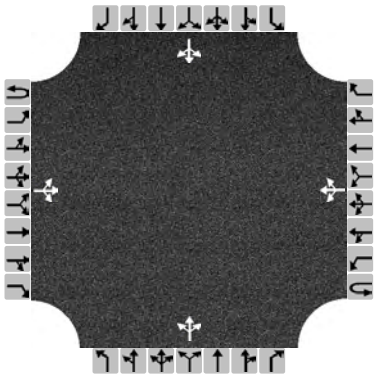
General Information

Analyst	RL
Agency/Co.	HDR
Date Performed	03/07/2018
Analysis Year	2023
Time Analyzed	PM PEAK
Intersection Orientation	East-West
Project Description	I-229/BENSON IMJR

Site Information

Intersection	BENSON/HALL
Jurisdiction	CITY OF SIOUX FALLS
East/West Street	BENSON ROAD
North/South Street	HALL AVENUE
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		85	145	70		40	250	10		165	5	85		10	5	95
Percent Heavy Vehicles		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		94				44					283				123	
Capacity		1259				1313					297				585	
v/c Ratio		0.07				0.03					0.95				0.21	
95% Queue Length		0.2				0.1					9.4				0.8	
Control Delay (s/veh)		8.1				7.8					79.0				12.8	
Level of Service (LOS)		A				A					F				B	
Approach Delay (s/veh)	2.8				1.3				79.0				12.8			
Approach LOS									F				B			

File Name: BENSON PM.xus
Analyst: RL
Agency/Co.: HDR
Analysis Date: Mar 7, 2018
Time Period: PM PEAK
Jurisdiction: CITY OF SIOUX FALLS
Analysis Year: 2023
Project Description: I-229/BENSON IMJR
Urban Street: BENSON ROAD
Analysis Period: 1> 7:00

Input

URBAN STREET PARAMETERS

Number of Intersections	3
Number of Segments	2
Analysis period duration, h	0.25
System cycle length, s	75
Urban street forward direction	EB
Sneakers per cycle, veh	2
Saturation flow rate, veh/h/ln	1900
Stored vehicle lane length, ft	25
Detected vehicle length, ft	17
Queue length percent	95
Critical merge gap, s	3.7
Stop threshold speed, mph	5
Acceleration rate, ft/s/s	3.5
Decel. rate (signal), ft/s/s	4
Minimum headway in a platoon, s/veh	1.5
Maximum headway in a platoon, s/veh	3.6
Number of iterations	15
Length of left-turn bay (access pt.), ft	250
Decel. rate (access pt.), ft/s/s	6.7
Right-turn speed (access pt.), ft/s	20
Critical gap from major left (access pt.), s	4.1
Follow-up time from major left (access pt.), s	2.2
Right-turn equivalency factor (access pt.)	2.2
Stored heavy vehicle lane length, ft	45
Proportion of peds who push button	0.51
Critical gap for permissive left-turn, s	4.5
Follow-up time for permissive left-turn, s	2.5
Calibration factor for platoon dispersion	0.14
Average ratio of speed limit to free-flow speed	0.9

BASIC SEGMENT INFORMATION

Seg	Spd Lmt		TH Lanes		Seg Len		IntWid		LenRM		PctCurb		Other Dly	
Num	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
1	40	40	2	2	2610	2610	50	50	0	0	70	70	0	0
2	40	40	2	2	2990	2990	50	50	0	0	70	70	0	0

ORIGIN-DESTINATION SEED PROPORTIONS - Forward Direction

	Cross LT	Major TH	Cross RT	MidEntry
Downstream Left	0.02	0.1	0.05	0.02
Downstream Thru	0.91	0.78	0.92	0.97
Downstream Right	0.05	0.1	0.02	0.01
Mid-segment Exit	0.02	0.02	0.01	0

ORIGIN-DESTINATION SEED PROPORTIONS - Reverse Direction

	Cross LT	Major TH	Cross RT	MidEntry
Downstream Left	0.02	0.1	0.05	0.02
Downstream Thru	0.91	0.78	0.92	0.97
Downstream Right	0.05	0.1	0.02	0.01
Mid-segment Exit	0.02	0.02	0.01	0

ACCESS POINT DATA

SEGMENT 1

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	880	20	0	590	0	30	0	45	40	0	35
1: Lanes	1	2	0	1	2	0	0	1	0	0	1	0
1: Location, ft	1320											
1: Peak Hour Factor	1											

Number of access points: 1

SEGMENT 2

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	1335	0	0	360	30	0	0	0	130	0	0
1: Lanes	1	2	0	0	2	0	0	0	0	1	0	1
1: Location, ft	700											
1: Peak Hour Factor	1											
2: Volume, veh/h	5	1435	25	40	340	30	10	5	95	70	0	40
2: Lanes	1	2	0	1	2	0	1	1	0	0	1	0
2: Location, ft	1410											
2: Peak Hour Factor	1											
3: Volume, veh/h	0	170	1430	25	380	0	0	0	0	0	0	30
3: Lanes	0	2	0	1	2	0	0	0	0	0	1	0
3: Location, ft	1920											
3: Peak Hour Factor	1											

Number of access points: 3

Global Output

SEGMENT DATA

Seg.No.	Movement	EB LT 5	EB TH 2	EB RT 12	WB LT 1	WB TH 6	WB RT 16
1	Bay/Lane Spillback Time, h	999	999	999	999	999	999
1	ShrdLane Spillback Time, h	999			999		
1	Base Free-Flow Speed, mph		44.07			44.07	
1	Running Time, s		43.1			42.65	
1	Running Speed, mph		41.29			41.73	
1	Through Delay, s/veh		21.66			18.29	
1	Travel Speed, mph		27.48			29.2	
1	Stop Rate, stops/veh		0.6			0.58	
1	Spatial Stop Rate, stops/mi		1.21			1.18	
1	Through vol/cap ratio		0.75			0.36	
1	Percent of Base FFS		62.36			66.26	
1	Level of Service		C			C	
1	Automobile Perception Score		2.32			2.32	
2	Bay/Lane Spillback Time, h	999	999	999	999	999	999
2	ShrdLane Spillback Time, h	999			999		999
2	Base Free-Flow Speed, mph		44.07			44.07	
2	Running Time, s		50.04			48.6	
2	Running Speed, mph		40.74			41.95	
2	Through Delay, s/veh		7.1			10.08	
2	Travel Speed, mph		35.68			34.74	
2	Stop Rate, stops/veh		0.28			0.32	
2	Spatial Stop Rate, stops/mi		0.5			0.57	
2	Through vol/cap ratio		0.07			0.34	
2	Percent of Base FFS		80.96			78.82	
2	Level of Service		A			B	
2	Automobile Perception Score		2.27			2.33	

Facility Travel Time, s	121.89	119.62
Facility Travel Speed, mph	31.32	31.92
Facility Spatial Stop Rate, stops/mi	0.83	0.86
Facility Base Free Flow Speed, mph	44.07	44.07
Facility Percent Base Free Flow Speed	71.08	72.42
Facility Level of Service	B	B
Facility Automobile Perception Score	2.29	2.32
Facility Pedestrian Space	∞	∞
Facility Pedestrian Travel Speed	4.24	4.24
Facility Pedestrian LOS Score	3.5	3.06
Facility Pedestrian LOS	C	C
Facility Bicycle Travel Speed	13.44	13.87
Facility Bicycle LOS Score	2.98	2.74
Facility Bicycle LOS	C	C
Facility Transit Travel Speed	27.48	29.03
Facility Transit LOS Score	0.95	0.81
Facility Transit LOS	A	A

SPILLBACK TIME, h 999

Multimodal Results

1	Average Pedestrian Space, ft2/p	∞	∞
1	Pedestrian Travel Speed, ft/s	4.16	4.16
1	Ped LOS Score for Intersection	2.1	2.88
1	Cross-section Adjustment Factor	-4.74	-4.74
1	Volume Adjustment Factor	1.14	0.72
1	Speed Adjustment Factor	0.68	0.7
1	Ped LOS Score for Link	3.13	2.72
1	Ped Link LOS	C	C
1	Roadway Crossing Difficulty Factor	1.02	0.87
1	Ped LOS Score for Segment	3.23	2.66
1	Ped Segment LOS	C	B
1	Bicycle Travel Speed	13.27	13.42
1	Bicycle LOS Score for Intersection	3.14	2.81
1	Cross-section Adjustment Factor	-1.28	-1.28
1	Volume Adjustment Factor	2.45	2.22
1	Speed Adjustment Factor	0.84	0.85
1	Pavement Adjustment Factor	0.58	0.58
1	Bicycle LOS Score for Link	3.35	3.12
1	Bicycle Link LOS	C	C
1	Number of access point approaches	0	0
1	Segment Length, ft	2610	2610
1	Unsignalized Conflicts Factor	-0.7	-0.7
1	Bicycle LOS Score for Segment	2.91	2.72
1	Bicycle Segment LOS	C	B
1	Transit Running Speed, mi/h	41.29	41.73
1	g/C Ratio	0.39	0.37
1	Transit Running Time, s	43.1	42.65
1	Delay at Intersection, s/veh	21.66	18.65
1	Transit Travel Speed, mi/h	27.48	29.03
1	Transit Wait-Ride Score	3.54	3.61
1	Ped LOS Score for Link	3.13	2.72
1	Transit LOS Score for Segment	1.16	0.99
1	Transit Segment LOS	A	A
2	Average Pedestrian Space, ft2/p	∞	∞
2	Pedestrian Travel Speed, ft/s	4.31	4.31
2	Ped LOS Score for Intersection	1.97	2.64
2	Cross-section Adjustment Factor	-4.74	-4.74
2	Volume Adjustment Factor	1.95	0.83
2	Speed Adjustment Factor	0.66	0.7
2	Ped LOS Score for Link	3.92	2.84
2	Ped Link LOS	D	C
2	Roadway Crossing Difficulty Factor	0.98	1.19
2	Ped LOS Score for Segment	3.74	3.4
2	Ped Segment LOS	D	C
2	Bicycle Travel Speed	13.59	14.29
2	Bicycle LOS Score for Intersection	2.84	2.76
2	Cross-section Adjustment Factor	-1.28	-1.28
2	Volume Adjustment Factor	2.72	2.29
2	Speed Adjustment Factor	0.84	0.85
2	Pavement Adjustment Factor	0.58	0.58
2	Bicycle LOS Score for Link	3.61	3.19
2	Bicycle Link LOS	D	C
2	Number of access point approaches	0	0
2	Segment Length, ft	2990	2990
2	Unsignalized Conflicts Factor	-0.7	-0.7
2	Bicycle LOS Score for Segment	3.05	2.75
2	Bicycle Segment LOS	C	C
2	Transit Running Speed, mi/h	40.74	41.95
2	g/C Ratio	0.58	0.39
2	Transit Running Time, s	50.04	48.6
2	Delay at Intersection, s/veh	7.1	10.08
2	Transit Travel Speed, mi/h	35.68	34.74
2	Transit Wait-Ride Score	3.89	3.85
2	Ped LOS Score for Link	3.92	2.84
2	Transit LOS Score for Segment	0.76	0.65
2	Transit Segment LOS	A	A

ACCESS POINT DATA

SEGMENT 1

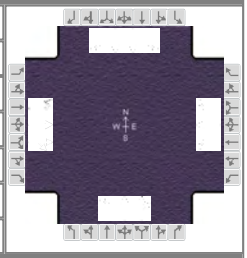
	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	978	22.2	0	632	0	30	0	45	40	0	35
1: Lanes	1	2	0	1	2	0	0	1	0	0	1	0
1: Prop blocked	0.04	0	0	0.15	0	0	0.19	0.19	0.15	0.19	0.19	0.04
1: Thru veh delay		0.02			0							
1: Prob inside blk		0			0							
1: Dist to upstream signal	1320											

SEGMENT 2

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	1713	0	0	591	49.3	0	0	0	130	0	0
1: Lanes	1	2	0	0	2	0	0	0	0	1	0	1
1: Prop blocked	0	0	0	0.41	0	0	0.41	0.41	0.41	0.41	0.41	0
1: Thru veh delay		0			0.03							
1: Prob inside blk		0			0							
1: Dist to upstream signal	700											
2: Volume, veh/h	6.29	1806	31.5	69.5	590	52.1	10	5	95	70	0	40
2: Lanes	1	2	0	1	2	0	1	1	0	0	1	0
2: Prop blocked	0	0	0	0.43	0	0	0.43	0.43	0.43	0.43	0.43	0
2: Thru veh delay		0.04			0.04							
2: Prob inside blk		0			0							
2: Dist to upstream signal	1410											
3: Volume, veh/h	0	209	1761	44.9	682	0	0	0	0	0	0	30
3: Lanes	0	2	0	1	2	0	0	0	0	0	1	0
3: Prop blocked	0	0	0	0.48	0	0	0.48	0.48	0.48	0.48	0.48	0
3: Thru veh delay		0			0							
3: Prob inside blk		0			0							
3: Dist to upstream signal	1920											

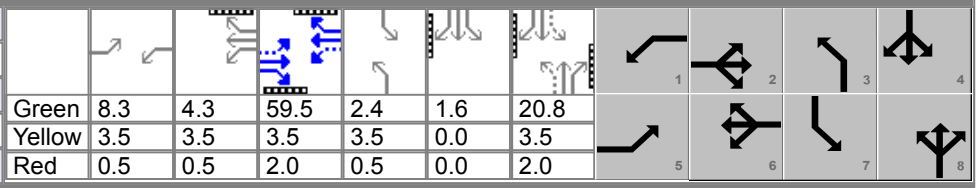
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	AM	PHF	0.90
Urban Street	RICE STREET	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	CLIFF AVENUE	File Name	RICE AM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	150	390	55	365	490	720	25	395	65	75	225	50

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	8.3	4.3	59.5	2.4	1.6	20.8
Yellow	3.5	3.5	3.5	3.5	0.0	3.5
Red	0.5	0.5	2.0	0.5	0.0	2.0

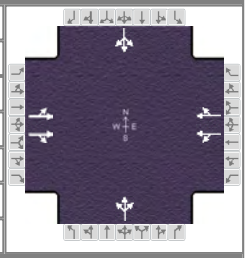
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	3.0
Phase Duration, s	12.3	65.0	20.7	73.4	6.4	26.3	8.0	27.9
Change Period, ($Y+R_c$), s	4.0	5.5	4.0	5.5	4.0	5.5	4.0	5.5
Max Allow Headway (*MAH*), s	4.1	0.0	4.1	0.0	4.1	4.1	4.1	4.1
Queue Clearance Time (g_s), s	8.1		15.3		3.7	18.5	6.0	10.0
Green Extension Time (g_e), s	0.3	0.0	1.4	0.0	0.0	2.3	0.0	2.8
Phase Call Probability	1.00		1.00		0.60	1.00	0.94	1.00
Max Out Probability	0.15		0.00		1.00	0.14	1.00	0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	167	239	234	386	519	455	28	245	239	83	250	28
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1594	1674	1625	1594	1674	1418	1647	1730	1674	1647	1647	
Queue Service Time (g_s), s	6.1	10.1	10.1	13.3	22.4	23.6	1.7	16.3	16.5	4.0	8.0	
Cycle Queue Clearance Time (g_c), s	6.1	10.1	10.1	13.3	22.4	23.6	1.7	16.3	16.5	4.0	8.0	
Green Ratio (*g/C*)	0.57	0.50	0.50	0.65	0.57	0.57	0.19	0.17	0.17	0.21	0.19	
Capacity (*c*), veh/h	472	831	806	640	947	802	207	300	290	147	614	
Volume-to-Capacity Ratio (*X*)	0.353	0.287	0.290	0.604	0.548	0.567	0.134	0.817	0.823	0.568	0.407	
Back of Queue (*Q*), ft/ln (95 th percentile)	104.5	193.6	177	200.1	334.1	303.7	32.2	316.8	300.6	40	153.8	
Back of Queue (*Q*), veh/ln (95 th percentile)	3.9	7.2	7.1	7.5	12.5	11.3	1.2	12.2	12.0	1.5	5.9	
Queue Storage Ratio (*RQ*) (95 th percentile)	1.04	0.00	0.00	1.25	0.00	0.00	0.29	0.00	0.00	0.27	0.00	
Uniform Delay (d_1), s/veh	14.0	17.8	17.8	10.8	15.2	15.4	40.0	47.8	47.8	44.2	43.0	
Incremental Delay (d_2), s/veh	0.4	0.9	0.9	0.7	1.7	2.2	0.3	8.1	8.9	5.1	0.4	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	14.4	18.6	18.7	11.5	16.9	17.5	40.3	55.9	56.7	49.3	43.4	0.0
Level of Service (LOS)	B	B	B	B	B	B	D	E	E	D	D	A
Approach Delay, s/veh / LOS	17.6	B		15.6	B		55.4	E		41.4	D	
Intersection Delay, s/veh / LOS	26.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.1	C	3.2	C	3.6	D	2.7	C
Bicycle LOS Score / LOS	2.5	B	4.6	E	2.7	C	2.6	C

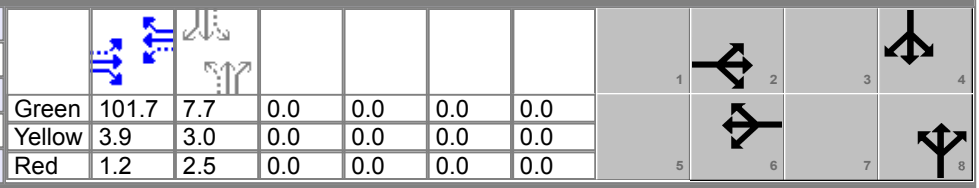
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	AM	PHF	0.90
Urban Street	RICE STREET	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	WAYLAND AVE	File Name	RICE AM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	20	490	20	10	1550	50	10	15	0	45	10	15

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	101.7	7.7	0.0	0.0	0.0	0.0						
Yellow	3.9	3.0	0.0	0.0	0.0	0.0						
Red	1.2	2.5	0.0	0.0	0.0	0.0						

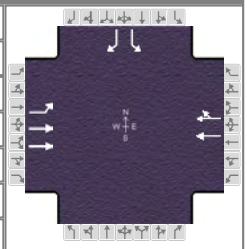
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		106.8		106.8		13.2		13.2
Change Period, ($Y+R_c$), s		5.1		5.1		5.5		5.5
Max Allow Headway (*MAH*), s		0.0		0.0		4.2		4.2
Queue Clearance Time (g_s), s						3.8		7.7
Green Extension Time (g_e), s		0.0		0.0		0.3		0.3
Phase Call Probability						0.96		0.96
Max Out Probability						0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	270		308	889		808		28			72	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1228		1513	1666		1512		1655			1478	
Queue Service Time (g_s), s	1.7		2.5	0.0		27.1		0.0			4.0	
Cycle Queue Clearance Time (g_c), s	28.9		2.5	26.8		27.1		1.8			5.7	
Green Ratio (*g/C*)	0.85		0.85	0.85		0.85		0.06			0.06	
Capacity (*c*), veh/h	1073		1282	1442		1281		148			146	
Volume-to-Capacity Ratio (*X*)	0.252		0.240	0.617		0.631		0.187			0.495	
Back of Queue (*Q*), ft/ln (95 th percentile)	20.2		22.5	279.4		261.8		37.9			103.7	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.8		0.9	11.2		10.5		1.5			4.1	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00	0.00		0.00		0.00			0.00	
Uniform Delay (d_1), s/veh	0.9		0.8	4.8		4.8		53.4			55.2	
Incremental Delay (d_2), s/veh	0.5		0.4	1.1		1.3		0.6			2.6	
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0		0.0			0.0	
Control Delay (*d*), s/veh	1.5		1.2	5.9		6.1		54.0			57.8	
Level of Service (LOS)	A		A	A		A		D			E	
Approach Delay, s/veh / LOS	1.3	A		6.0	A		54.0	D		57.8	E	
Intersection Delay, s/veh / LOS	7.0						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.2	B	2.2	B	3.1	C	3.1	C
Bicycle LOS Score / LOS	2.6	C	3.6	D	2.7	C	2.8	C

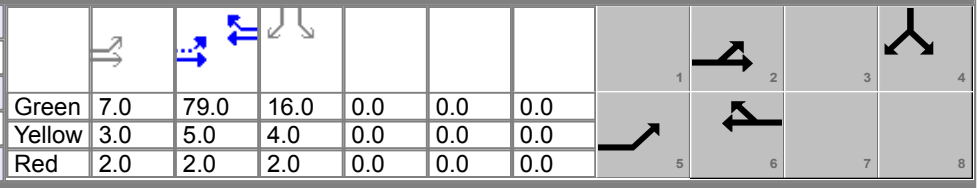
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	AM	PHF	0.90
Urban Street	RICE STREET	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	I-229 SB	File Name	RICE AM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	130	520			1540	560				80		55

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	75	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	7.0	79.0	16.0	0.0	0.0	0.0						
Yellow	3.0	5.0	4.0	0.0	0.0	0.0						
Red	2.0	2.0	2.0	0.0	0.0	0.0						

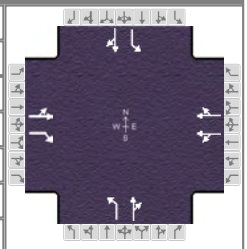
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	1.0	4.0		8.3				9.0
Phase Duration, s	12.0	98.0		86.0				22.0
Change Period, (*Y+R c*), s	5.0	7.0		7.0				6.0
Max Allow Headway (*MAH*), s	4.1	0.0		0.0				4.2
Queue Clearance Time (*g s*), s	9.0							18.0
Green Extension Time (*g e*), s	0.0	0.0		0.0				0.0
Phase Call Probability	0.99							0.99
Max Out Probability	1.00							1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16				7		14
Adjusted Flow Rate (*v*), veh/h	142	566			1002	1002				89		61
Adjusted Saturation Flow Rate (*s*), veh/h/ln	645	1673			1948	1830				377		1439
Queue Service Time (*g s*), s	7.0	6.6			59.7	52.9				16.0		4.6
Cycle Queue Clearance Time (*g c*), s	7.0	6.6			59.7	52.9				16.0		4.6
Green Ratio (*g/C*)	0.73	0.76			0.66	0.66				0.13		0.13
Capacity (*c*), veh/h	111	2538			1282	1205				50		192
Volume-to-Capacity Ratio (*X*)	1.277	0.223			0.781	0.831				1.768		0.319
Back of Queue (*Q*), ft/ln (95 th percentile)	527.8	91.5			534.8	601.7				589.7		76.3
Back of Queue (*Q*), veh/ln (95 th percentile)	12.9	3.7			21.4	24.1				13.1		3.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00			0.00	0.00				0.00		0.00
Uniform Delay (*d 1*), s/veh	31.6	4.9			16.5	19.3				52.0		47.1
Incremental Delay (*d 2*), s/veh	176.5	0.2			0.5	0.7				414.2		0.9
Initial Queue Delay (*d 3*), s/veh	0.0	0.0			0.0	0.0				0.0		0.0
Control Delay (*d*), s/veh	208.0	5.1			17.0	20.0				466.2		48.0
Level of Service (LOS)	F	A			B	C				F		D
Approach Delay, s/veh / LOS	45.7	D		18.5	B		0.0			295.8	F	
Intersection Delay, s/veh / LOS	39.8						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	0.6	A	2.2	B	3.1	C	2.9	C
Bicycle LOS Score / LOS	1.1	A	2.2	B				F

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	AM	PHF	0.90
Urban Street	RICE STREET	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	I-229 NB	File Name	RICE AM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	75	205	320	75	1460	25	405	330	65	70	10	235

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4
Green	66.0	4.0	32.0	0.0	0.0	0.0	5	6	7	8
Yellow	4.0	4.0	4.0	0.0	0.0	0.0				
Red	2.0	2.0	2.0	0.0	0.0	0.0				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8	7	4
Case Number		7.0		8.0		6.3	1.0	4.0
Phase Duration, s		72.0		72.0		38.0	10.0	48.0
Change Period, ($Y+R_c$), s		6.0		6.0		6.0	6.0	6.0
Max Allow Headway (*MAH*), s		0.0		0.0		6.4	6.0	6.4
Queue Clearance Time (g_s), s						34.0	6.0	12.8
Green Extension Time (g_e), s		0.0		0.0		0.0	0.0	11.1
Phase Call Probability						1.00	0.93	1.00
Max Out Probability						1.00	1.00	0.22

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h		281	191	866		856	450	411		78	167	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		208	1365	1484		1630	1190	1691		1594	1374	
Queue Service Time (g_s), s		6.3	9.9	0.0		59.7	31.2	28.3		4.0	10.8	
Cycle Queue Clearance Time (g_c), s		66.0	9.9	66.0		59.7	32.0	28.3		4.0	10.8	
Green Ratio (*g/C*)		0.55	0.55	0.55		0.55	0.27	0.27		0.32	0.35	
Capacity (*c*), veh/h		153	751	849		896	370	451		142	481	
Volume-to-Capacity Ratio (*X*)		1.844	0.254	1.021		0.955	1.217	0.912		0.549	0.347	
Back of Queue (*Q*), ft/ln (95 th percentile)		938.6	157.9	1027.1		877.3	914.1	543.9		90.1	171.4	
Back of Queue (*Q*), veh/ln (95 th percentile)		35.0	5.9	41.1		35.1	35.2	20.9		3.4	6.4	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00	0.00		0.00	6.09	0.00		0.90	0.00	
Uniform Delay (d_1), s/veh		33.7	16.6	26.5		27.0	46.9	42.6		34.7	28.9	
Incremental Delay (d_2), s/veh		401.7	0.7	36.2		20.9	120.0	23.4		7.7	0.9	
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh		435.3	17.3	62.7		47.9	166.9	66.1		42.4	29.8	
Level of Service (LOS)		F	B	F		D	F	E		D	C	
Approach Delay, s/veh / LOS	266.3	F		55.4	E		118.8	F		33.8	C	
Intersection Delay, s/veh / LOS	100.5						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.6	C	2.7	C	2.8	C	3.7	D
Bicycle LOS Score / LOS	3.2	C	2.0	B	3.6	D	2.6	C

HCS7 Two-Way Stop-Control Report

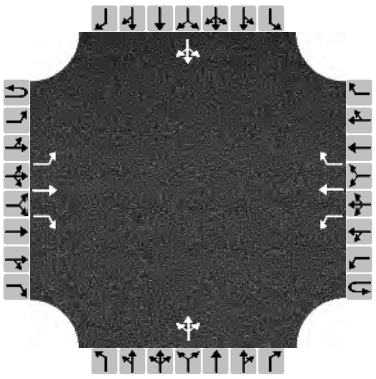
General Information

Analyst	RL
Agency/Co.	HDR
Date Performed	3/8/2018
Analysis Year	2045
Time Analyzed	AM PEAK
Intersection Orientation	East-West
Project Description	I-229/BENSON IMJR

Site Information

Intersection	BAHNSON AVENUE
Jurisdiction	CITY OF SIOUX FALLS
East/West Street	RICE STREET
North/South Street	BAHNSON AVENUE
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	1	0	1	1	1		0	1	0		0	1	0
Configuration		L	T	R		L	T	R			LTR				LTR	
Volume, V (veh/h)		40	260	40		10	1465	10		15	10	10		10	25	80
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		44				11					39				128	
Capacity, c (veh/h)		392				1219					12				79	
v/c Ratio		0.11				0.01					3.21				1.62	
95% Queue Length, Q_{95} (veh)		0.4				0.0					5.9				10.6	
Control Delay (s/veh)		15.3				8.0					1622.9				420.2	
Level of Service, LOS		C				A					F				F	
Approach Delay (s/veh)		1.8				0.1				1622.9				420.2		
Approach LOS										F				F		

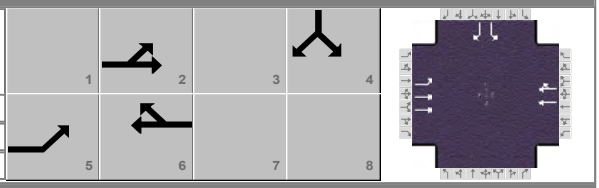
HCS7 Interchanges Results Summary

General Information				Interchange Information	
Agency	HDR			Interchange Type	Parclo AB-2Q
Analyst	RL	Analysis Date	Mar 8, 2018	Segment Distance, ft	1020
Jurisdiction	CITY OF SIOUX FALLS	Duration, h	0.25	Freeway Direction	North-South
Intersection	I-229 NB	PHF	0.90	Arterial Direction	East-West
File Name	RICE AM.xus				
Project Description	I-229/BENSON IMJR				

Demand	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection One Demand (*v*), veh/h	130	520			1540	560				80		55
Intersection Two Demand (*v*), veh/h	75	205	320	75	1460	25	405	330	65	70	10	235

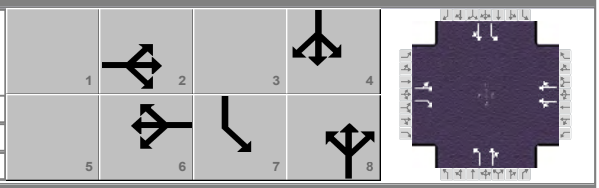
Signal One Information	
Cycle, s	120.0
Offset, s	0
Uncoordinated	No
Force Mode	Fixed

Green	7.0	79.0	16.0	0.0	0.0	0.0
Yellow	3.0	5.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



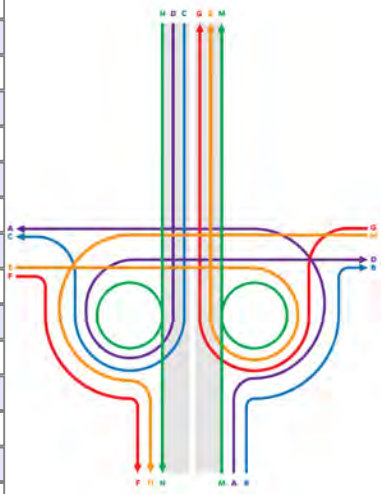
Signal Two Information	
Cycle, s	120.0
Offset, s	0
Uncoordinated	No
Force Mode	Fixed

Green	66.0	4.0	32.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Interchange Results

O-D	Demand (veh/h)	Delay (s)	EDTT	ETT	v/c > 1 ?	R_Q > 1 ?	LOS
A	120	183.9	0.0	183.9	Yes	Yes	F
B	44	66.1	0.0	66.1	No	No	D
C	0	0.0	5.0	5.0	No	No	A
D	0	0.0	5.0	5.0	No	No	A
E	191	22.4	5.0	27.4	Yes	No	B
F	0	5.1	0.0	5.1	No	No	A
G	83	62.7	5.0	67.7	Yes	No	F
H	0	0.0	0.0	0.0	No	No	A
I	536	5.1	0.0	5.1	Yes	No	A
J	1195	17.0	0.0	17.0	No	No	B
K	-	-	0.0	-	-	-	-
L	-	-	0.0	-	-	-	-
M	330	-	0.0	-	-	-	-
N	0	-	0.0	-	-	-	-



Signalized Intersection One Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Control Delay (*d*) , s/veh	208.0	5.1			17.0	20.0				466.2		48.0
Level of Service (LOS)	F	A			B	C				F		D
Approach Delay, s/veh / LOS	45.7	D		18.5	B		0.0			295.8	F	
Intersection Delay, s/veh / LOS	39.8						D					

Signalized Intersection Two Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Control Delay (*d*) , s/veh		435.3	17.3	62.7		47.9	166.9	66.1		42.4	29.8	
Level of Service (LOS)		F	B	F		D	F	E		D	C	
Approach Delay, s/veh / LOS	266.3	F		55.4	E		118.8	F		33.8	C	
Intersection Delay, s/veh / LOS	100.5						F					

This Urban Streets text report was created on March 12, 2018 at 10:26:54

Period number = 1

Input

URBAN STREET PARAMETERS

Number of Intersections	4
Number of Segments	3
Analysis period duration, h	0.25
System cycle length, s	120
Urban street forward direction	EB
Sneakers per cycle, veh	2
Saturation flow rate, veh/h/ln	1900
Stored vehicle lane length, ft	25
Detected vehicle length, ft	17
Queue length percent	95
Critical merge gap, s	3.7
Stop threshold speed, mph	5
Acceleration rate, ft/s/s	3.5
Decel. rate (signal), ft/s/s	4
Minimum headway in a platoon, s/veh	1.5
Maximum headway in a platoon, s/veh	3.6
Number of iterations	15
Length of left-turn bay (access pt.), ft	250
Decel. rate (access pt.), ft/s/s	6.7
Right-turn speed (access pt.), ft/s	20
Critical gap from major left (access pt.), s	4.1
Follow-up time from major left (access pt.), s	2.2
Right-turn equivalency factor (access pt.)	2.2
Stored heavy vehicle lane length, ft	45
Proportion of peds who push button	0.51
Critical gap for permissive left-turn, s	4.5
Follow-up time for permissive left-turn, s	2.5
Calibration factor for platoon dispersion	0.14
Average ratio of speed limit to free-flow speed	0.9

BASIC SEGMENT INFORMATION

Seg	Spd Lmt		TH Lanes		Seg Len		IntWid		LenRM		PctCurb		Other Dly	
Num	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
1	35	35	2	1	1020	1020	50	50	0	0	70	70	0	0
2	35	35	2	2	3460	3460	50	50	0	0	70	70	0	0
3	35	35	1	2	1020	1020	50	50	0	0	70	70	0	0

ORIGIN-DESTINATION SEED PROPORTIONS - Forward Direction

	Cross LT	Major TH	Cross RT	MidEntry
Downstream Left	0.02	0.1	0.05	0.02
Downstream Thru	0.91	0.78	0.92	0.97
Downstream Right	0.05	0.1	0.02	0.01
Mid-segment Exit	0.02	0.02	0.01	0

ORIGIN-DESTINATION SEED PROPORTIONS - Reverse Direction

	Cross LT	Major TH	Cross RT	MidEntry
Downstream Left	0.02	0.1	0.05	0.02
Downstream Thru	0.91	0.78	0.92	0.97
Downstream Right	0.05	0.1	0.02	0.01
Mid-segment Exit	0.02	0.02	0.01	0

ACCESS POINT DATA

SEGMENT 1

Number of access points: 0

SEGMENT 2

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	520	15	20	1575	0	35	0	130	0	0	0
1: Lanes	0	2	0	1	2	0	0	1	0	0	0	0
1: Location, ft	3030											
1: Peak Hour Factor	1											

Number of access points: 1

SEGMENT 3

Number of access points: 0

Global Output

SEGMENT DATA

Seg.No.	Movement	EB LT 5	EB TH 2	EB RT 12	WB LT 1	WB TH 6	WB RT 16
1	Bay/Lane Spillback Time, h	999	999	999	999	999	999
1	ShrdLane Spillback Time, h				999.27		
1	Base Free-Flow Speed, mph		41.72			41.72	
1	Running Time, s		20.03			23.1	
1	Running Speed, mph		34.71			30.1	
1	Through Delay, s/veh		1.33			16.88	
1	Travel Speed, mph		32.55			17.39	
1	Stop Rate, stops/veh		0.05			0.48	
1	Spatial Stop Rate, stops/mi		0.26			2.51	
1	Through vol/cap ratio		0.25			0.55	
1	Percent of Base FFS		78.01			41.69	
1	Level of Service		B			D	
1	Automobile Perception Score		2.38			2.76	
2	Bay/Lane Spillback Time, h	0	999	999	999	999	999
2	ShrdLane Spillback Time, h						
2	Base Free-Flow Speed, mph		41.72			41.72	
2	Running Time, s		58.48			60.56	
2	Running Speed, mph		40.34			38.95	
2	Through Delay, s/veh		5.08			5.97	
2	Travel Speed, mph		37.11			35.46	
2	Stop Rate, stops/veh		0.22			0.21	
2	Spatial Stop Rate, stops/mi		0.33			0.33	
2	Through vol/cap ratio		0.22			0.62	
2	Percent of Base FFS		88.96			84.99	
2	Level of Service		A			A	
2	Automobile Perception Score		2.29			2.29	
3	Bay/Lane Spillback Time, h	0	0.38	999	999	999	999
3	ShrdLane Spillback Time, h						
3	Base Free-Flow Speed, mph		41.72			41.72	
3	Running Time, s		20.43			21.28	
3	Running Speed, mph		34.04			32.67	
3	Through Delay, s/veh		435.33			18.17	
3	Travel Speed, mph		1.53			17.63	
3	Stop Rate, stops/veh		2.58			0.6	
3	Spatial Stop Rate, stops/mi		13.33			3.12	
3	Through vol/cap ratio		1.84			0.8	
3	Percent of Base FFS		3.66			42.25	
3	Level of Service		F			D	
3	Automobile Perception Score		4.82			2.87	
Facility Travel Time, s			540.69			145.97	
Facility Travel Speed, mph			6.94			25.69	
Facility Spatial Stop Rate, veh/mi			2.73			1.25	
Facility Base Free Flow Speed, mph			41.72			41.72	
Facility Percent Base Free Flow Speed			16.62			61.58	
Facility Level of Service			F			C	
Facility Automobile Perception Score			2.56			2.46	
Facility Pedestrian Space			Infinity			Infinity	
Facility Pedestrian Travel Speed			4.4			4.4	
Facility Pedestrian LOS Score			3.3			3.97	
Facility Pedestrian LOS			C			D	
Facility Bicycle Travel Speed			13.88			13.86	
Facility Bicycle LOS Score			3.49			3.97	
Facility Bicycle LOS			C			D	
Facility Transit Travel Speed			34.04			18.17	
Facility Transit LOS Score			0.56			1.2	
Facility Transit LOS			A			A	
SPILLBACK TIME, h			0.38				

Multimodal Results

1	Roadway crossing difficulty factor	1.2	1.2
1	Ped LOS Score for Link	2.47	5.51
1	Ped LOS Score for Intersection	2.16	3.23
1	Ped LOS Score for Segment	3.44	4.88
1	Ped Segment LOS	C	E
1	Bicycle LOS Score for Link	3.3	4.1
1	Indicator Variable	1	1
1	Bicycle LOS Score for Intersection	2.65	4.62
1	Number of access point approaches	0	0
1	Segment Length, ft	1020	1020
1	Bicycle LOS Score for Segment	3.53	4.62
1	Bicycle Segment LOS	D	E
1	Transit Wait-Ride Score	3.85	2.97
1	Ped LOS Score for Link	2.47	5.51
1	Transit LOS Score for Segment	0.6	2.38
1	Transit Segment LOS	A	B
2	Roadway crossing difficulty factor	1.2	1.2
2	Ped LOS Score for Link	2.65	3.87
2	Ped LOS Score for Intersection	0.65	2.19
2	Ped LOS Score for Segment	3.11	3.98
2	Ped Segment LOS	C	D
2	Bicycle LOS Score for Link	3.37	3.89
2	Indicator Variable	1	1
2	Bicycle LOS Score for Intersection	1.08	3.63
2	Number of access point approaches	0	0
2	Segment Length, ft	3460	3460
2	Bicycle LOS Score for Segment	3.42	3.89
2	Bicycle Segment LOS	C	D
2	Transit Wait-Ride Score	3.94	4
2	Ped LOS Score for Link	2.65	3.87
2	Transit LOS Score for Segment	0.49	0.58
2	Transit Segment LOS	A	A
3	Roadway crossing difficulty factor	1.2	0.86
3	Ped LOS Score for Link	3.19	4.31
3	Ped LOS Score for Intersection	2.59	2.24
3	Ped LOS Score for Segment	3.83	2.99
3	Ped Segment LOS	D	C
3	Bicycle LOS Score for Link	3.66	3.94
3	Indicator Variable	1	1
3	Bicycle LOS Score for Intersection	3.19	2.21
3	Number of access point approaches	0	0
3	Segment Length, ft	1020	1020
3	Bicycle LOS Score for Segment	3.7	3.58
3	Bicycle Segment LOS	D	D
3	Transit Wait-Ride Score	3.82	3.02
3	Ped LOS Score for Link	3.19	4.31
3	Transit LOS Score for Segment	0.74	2.12
3	Transit Segment LOS	A	B

ACCESS POINT DATA

SEGMENT 1

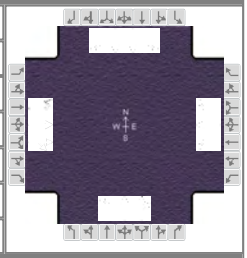
SEGMENT 2

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	578	16.7	21.4	1685	0	35	0	130	0	0	0
1: Lanes	0	2	0	1	2	0	0	1	0	0	0	0
1: Prop blocked	0	0	0	0	0	0	0	0	0	0	0	0
1: Thru veh delay		0.01			0							
1: Prob inside blk		0			0							
1: Dist to upstream signal	3030											

SEGMENT 3

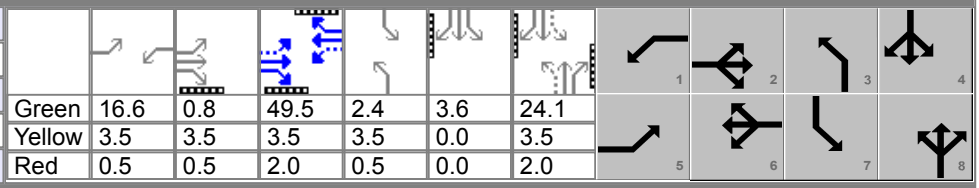
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	PM	PHF	0.90
Urban Street	RICE STREET	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	CLIFF AVENUE	File Name	RICE PM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	395	1300	280	230	285	240	25	275	150	230	570	70

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	16.6	0.8	49.5	2.4	3.6	24.1
Yellow	3.5	3.5	3.5	3.5	0.0	3.5
Red	0.5	0.5	2.0	0.5	0.0	2.0

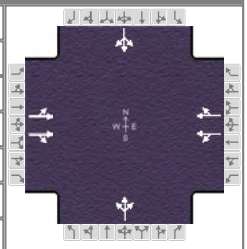
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	3.0
Phase Duration, s	25.4	59.8	20.6	55.0	6.4	29.6	10.0	33.2
Change Period, ($Y+R_c$), s	4.0	5.5	4.0	5.5	4.0	5.5	4.0	5.5
Max Allow Headway (*MAH*), s	4.1	0.0	4.1	0.0	4.1	4.1	4.1	4.1
Queue Clearance Time (g_s), s	19.9		16.4		3.6	15.6	8.0	24.0
Green Extension Time (g_e), s	1.5	0.0	0.2	0.0	0.0	4.2	0.0	3.7
Phase Call Probability	1.00		1.00		0.60	1.00	1.00	1.00
Max Out Probability	0.01		1.00		1.00	0.08	1.00	0.21

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	439	826	807	253	314	160	28	209	197	256	633	50
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1594	1674	1606	1594	1674	1418	1647	1730	1585	1647	1647	
Queue Service Time (g_s), s	17.9	54.3	54.3	14.4	13.5	7.1	1.6	13.2	13.6	6.0	22.0	
Cycle Queue Clearance Time (g_c), s	17.9	54.3	54.3	14.4	13.5	7.1	1.6	13.2	13.6	6.0	22.0	
Green Ratio (*g/C*)	0.61	0.45	0.45	0.55	0.41	0.41	0.22	0.20	0.20	0.26	0.23	
Capacity (*c*), veh/h	646	758	727	280	691	585	117	347	318	226	760	
Volume-to-Capacity Ratio (*X*)	0.679	1.090	1.111	0.903	0.455	0.273	0.237	0.601	0.619	1.131	0.834	
Back of Queue (*Q*), ft/ln (95 th percentile)	278.9	1231.2	1171.7	406.9	230	110.5	31.8	251.8	232.5	421.4	373.6	
Back of Queue (*Q*), veh/ln (95 th percentile)	10.4	45.9	46.9	15.2	8.6	4.1	1.2	9.7	9.3	16.2	14.4	
Queue Storage Ratio (*RQ*) (95 th percentile)	2.79	0.00	0.00	2.54	0.00	0.00	0.29	0.00	0.00	2.81	0.00	
Uniform Delay (d_1), s/veh	14.5	32.8	32.8	41.3	18.9	17.3	38.8	43.6	43.8	47.6	44.0	
Incremental Delay (d_2), s/veh	1.5	60.0	68.0	26.2	2.0	1.1	1.0	1.7	2.0	99.6	4.9	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	16.0	92.8	100.9	67.5	20.9	18.4	39.9	45.3	45.7	147.2	48.8	0.0
Level of Service (LOS)	B	F	F	E	C	B	D	D	D	F	D	A
Approach Delay, s/veh / LOS	79.7	E		36.6	D		45.1	D		73.0	E	
Intersection Delay, s/veh / LOS	67.1						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	3.3	C	3.4	C	2.9	C
Bicycle LOS Score / LOS	3.7	D	3.5	C	2.6	C	3.0	C

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	PM	PHF	0.90
Urban Street	RICE STREET	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	WAYLAND AVE	File Name	RICE PM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	20	1615	45	20	725	25	20	0	5	95	5	10

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4
Green	97.5	11.9	0.0	0.0	0.0	0.0	5	6	7	8
Yellow	3.9	3.0	0.0	0.0	0.0	0.0				
Red	1.2	2.5	0.0	0.0	0.0	0.0				

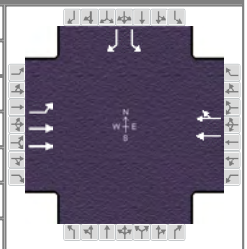
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		102.6		102.6		17.4		17.4
Change Period, ($Y+R_c$), s		5.1		5.1		5.5		5.5
Max Allow Headway (*MAH*), s		0.0		0.0		4.2		4.2
Queue Clearance Time (g_s), s						4.0		11.6
Green Extension Time (g_e), s		0.0		0.0		0.4		0.4
Phase Call Probability						0.99		0.99
Max Out Probability						0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	880		805	409		428		28			117	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1643		1514	1440		1513		1467			1430	
Queue Service Time (g_s), s	0.0		14.8	0.0		8.6		0.0			7.6	
Cycle Queue Clearance Time (g_c), s	14.5		14.8	7.1		8.6		2.0			9.6	
Green Ratio (*g/C*)	0.81		0.81	0.81		0.81		0.10			0.10	
Capacity (*c*), veh/h	1366		1231	1202		1229		199			199	
Volume-to-Capacity Ratio (*X*)	0.644		0.654	0.341		0.348		0.140			0.587	
Back of Queue (*Q*), ft/ln (95 th percentile)	67.2		62.2	82.5		89.6		36.2			165.8	
Back of Queue (*Q*), veh/ln (95 th percentile)	2.7		2.5	3.3		3.6		1.4			6.5	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00	0.00		0.00		0.00			0.00	
Uniform Delay (d_1), s/veh	1.8		1.8	2.7		2.8		49.6			53.0	
Incremental Delay (d_2), s/veh	0.2		0.2	0.6		0.6		0.3			2.7	
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0		0.0			0.0	
Control Delay (*d*), s/veh	2.0		2.0	3.3		3.4		49.9			55.8	
Level of Service (LOS)	A		A	A		A		D			E	
Approach Delay, s/veh / LOS	2.0		A	3.3		A	49.9		D	55.8		E
Intersection Delay, s/veh / LOS	5.3						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.2	B	2.2	B	3.2	C	3.2	C
Bicycle LOS Score / LOS	3.7	D	2.9	C	2.7	C	2.9	C

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	PM	PHF	0.90
Urban Street	RICE STREET	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	I-229 SB	File Name	RICE PM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	255	1490			730	190				240		60

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	65	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4
Green	23.0	49.0	30.0	0.0	0.0	0.0	5	6	7	8
Yellow	3.0	5.0	4.0	0.0	0.0	0.0				
Red	2.0	2.0	2.0	0.0	0.0	0.0				

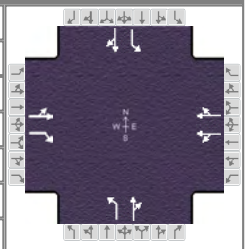
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	1.0	4.0		8.3				9.0
Phase Duration, s	28.0	84.0		56.0				36.0
Change Period, ($Y+R_c$), s	5.0	7.0		7.0				6.0
Max Allow Headway (*MAH*), s	4.1	0.0		0.0				4.2
Queue Clearance Time (g_s), s	25.0							32.0
Green Extension Time (g_e), s	0.0	0.0		0.0				0.0
Phase Call Probability	1.00							1.00
Max Out Probability	1.00							1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16				7		14
Adjusted Flow Rate (*v*), veh/h	260	1520			481	458				267		67
Adjusted Saturation Flow Rate (*s*), veh/h/ln	645	1810			1814	1721				377		1440
Queue Service Time (g_s), s	23.0	29.6			25.7	27.7				30.0		4.4
Cycle Queue Clearance Time (g_c), s	23.0	29.6			25.7	27.7				30.0		4.4
Green Ratio (*g/C*)	0.62	0.64			0.41	0.41				0.25		0.25
Capacity (*c*), veh/h	224	2322			741	703				94		360
Volume-to-Capacity Ratio (*X*)	1.161	0.654			0.649	0.652				2.828		0.185
Back of Queue (*Q*), ft/ln (95 th percentile)	612.5	384.7			423.4	426.4				1965.8		69.9
Back of Queue (*Q*), veh/ln (95 th percentile)	14.9	15.4			16.9	17.1				43.7		2.8
Queue Storage Ratio (*RQ*) (95 th percentile)	7.66	0.00			0.00	0.00				19.66		0.00
Uniform Delay (d_1), s/veh	23.7	12.0			31.8	34.3				45.0		35.4
Incremental Delay (d_2), s/veh	102.1	1.0			2.7	2.9				851.3		0.2
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0				0.0		0.0
Control Delay (*d*), s/veh	125.8	13.0			34.5	37.3				896.3		35.6
Level of Service (LOS)	F	B			C	D				F		D
Approach Delay, s/veh / LOS	29.5	C		35.9	D		0.0			724.1	F	
Intersection Delay, s/veh / LOS	107.3						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	0.7	A	2.3	B	2.9	C	2.9	C
Bicycle LOS Score / LOS	2.1	B	1.3	A				F

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	PM	PHF	0.90
Urban Street	RICE STREET	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	I-229 NB	File Name	RICE PM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	135	875	720	170	560	35	230	125	100	365	30	130

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4		
Green	72.0	10.0	20.0	0.0	0.0	0.0	5	6	7	8		
Yellow	4.0	4.0	4.0	0.0	0.0	0.0						
Red	2.0	2.0	2.0	0.0	0.0	0.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8	7	4
Case Number		7.0		8.0		6.3	1.0	4.0
Phase Duration, s		78.0		78.0		26.0	16.0	42.0
Change Period, ($Y+R_c$), s		6.0		6.0		6.0	6.0	6.0
Max Allow Headway (*MAH*), s		0.0		0.0		6.3	6.0	6.3
Queue Clearance Time (g_s), s						22.0	12.0	10.0
Green Extension Time (g_e), s		0.0		0.0		0.0	0.0	5.3
Phase Call Probability						1.00	1.00	1.00
Max Out Probability						1.00	1.00	0.05

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h		906	386	189		644	256	206		406	122	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		955	1408	445		1568	1239	1577		1594	1409	
Queue Service Time (g_s), s		38.5	23.9	0.0		33.5	20.0	15.0		10.0	8.0	
Cycle Queue Clearance Time (g_c), s		72.0	23.9	35.4		33.5	20.0	15.0		10.0	8.0	
Green Ratio (*g/C*)		0.60	0.60	0.60		0.60	0.17	0.17		0.27	0.30	
Capacity (*c*), veh/h		607	845	327		941	266	263		239	423	
Volume-to-Capacity Ratio (*X*)		1.494	0.457	0.578		0.685	0.959	0.782		1.695	0.289	
Back of Queue (*Q*), ft/ln (95 th percentile)		2171.6	287.7	181		449.1	429.3	296.9		1026.3	131.9	
Back of Queue (*Q*), veh/ln (95 th percentile)		81.0	10.7	7.2		18.0	16.5	11.4		38.3	4.9	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00	0.00		0.00	2.86	0.00		10.26	0.00	
Uniform Delay (d_1), s/veh		46.5	21.3	16.7		16.7	51.9	47.9		44.5	32.2	
Incremental Delay (d_2), s/veh		223.4	0.3	7.3		4.0	44.4	16.2		330.4	0.8	
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh		269.9	21.6	23.9		20.8	96.3	64.1		374.9	33.0	
Level of Service (LOS)		F	C	C		C	F	E		F	C	
Approach Delay, s/veh / LOS	195.8	F		21.5	C		81.9	F		295.7	F	
Intersection Delay, s/veh / LOS	149.2						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.6	C	2.6	C	2.9	C	3.9	D
Bicycle LOS Score / LOS	5.0	E	1.3	A	2.9	C	3.0	C

HCS7 Two-Way Stop-Control Report

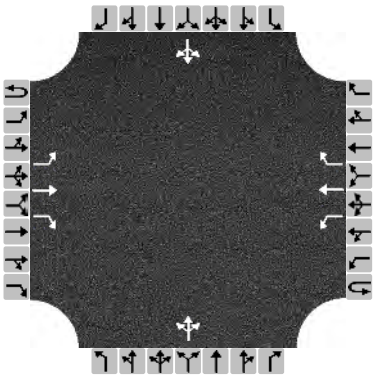
General Information

Analyst	RL
Agency/Co.	HDR
Date Performed	3/8/2018
Analysis Year	2045
Time Analyzed	PM PEAK
Intersection Orientation	East-West
Project Description	I-229/BENSON IMJR

Site Information

Intersection	BAHNSON AVENUE
Jurisdiction	CITY OF SIOUX FALLS
East/West Street	RICE STREET
North/South Street	BAHNSON AVENUE
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	1	0	1	1	1		0	1	0		0	1	0
Configuration		L	T	R		L	T	R			LTR				LTR	
Volume, V (veh/h)		25	1290	25		5	655	5		30	5	5		10	10	80
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		28				6					45				111	
Capacity, c (veh/h)		866				459					21				120	
v/c Ratio		0.03				0.01					2.14				0.92	
95% Queue Length, Q_{95} (veh)		0.1				0.0					5.9				5.9	
Control Delay (s/veh)		9.3				12.9					911.3				130.8	
Level of Service, LOS		A				B					F				F	
Approach Delay (s/veh)		0.2				0.1				911.3				130.8		
Approach LOS										F				F		

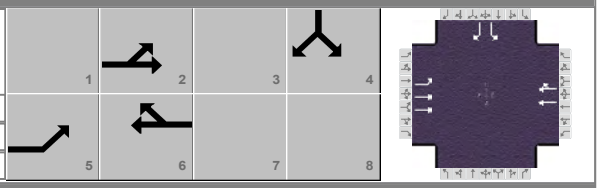
HCS7 Interchanges Results Summary

General Information				Interchange Information	
Agency	HDR			Interchange Type	Parclo AB-2Q
Analyst	RL	Analysis Date	Mar 8, 2018	Segment Distance, ft	1020
Jurisdiction	CITY OF SIOUX FALLS	Duration, h	0.25	Freeway Direction	North-South
Intersection	I-229 NB	PHF	0.90	Arterial Direction	East-West
File Name	RICE PM.xus				
Project Description	I-229/BENSON IMJR				

Demand	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection One Demand (*v*), veh/h	255	1490			730	190				240		60
Intersection Two Demand (*v*), veh/h	135	875	720	170	560	35	230	125	100	365	30	130

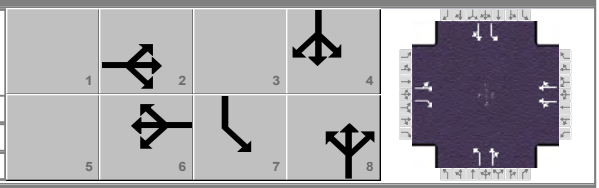
Signal One Information	
Cycle, s	120.0
Offset, s	0
Uncoordinated	No
Force Mode	Fixed

Green	23.0	49.0	30.0	0.0	0.0	0.0
Yellow	3.0	5.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



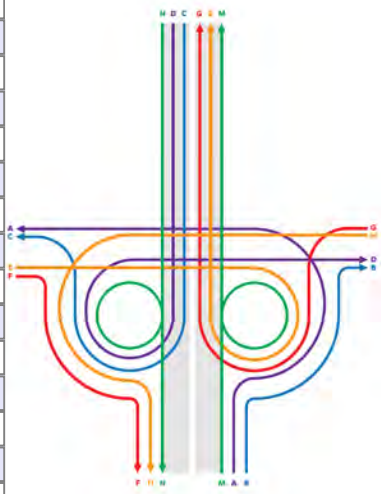
Signal Two Information	
Cycle, s	120.0
Offset, s	0
Uncoordinated	No
Force Mode	Fixed

Green	72.0	10.0	20.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Interchange Results

O-D	Demand (veh/h)	Delay (s)	EDTT	ETT	v/c > 1 ?	R_Q > 1 ?	LOS
A	131	130.8	0.0	130.8	No	Yes	F
B	67	64.1	0.0	64.1	No	No	D
C	0	0.0	5.0	5.0	No	No	A
D	0	0.0	5.0	5.0	No	No	A
E	386	34.6	5.0	39.6	Yes	No	C
F	0	13.0	0.0	13.0	No	No	A
G	189	23.9	5.0	28.9	No	No	B
H	0	0.0	0.0	0.0	No	No	A
I	910	13.0	0.0	13.0	Yes	No	A
J	556	34.5	0.0	34.5	No	No	C
K	-	-	0.0	-	-	-	-
L	-	-	0.0	-	-	-	-
M	125	-	0.0	-	-	-	-
N	0	-	0.0	-	-	-	-



Signalized Intersection One Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Control Delay (*d*) , s/veh	125.8	13.0			34.5	37.3				896.3		35.6
Level of Service (LOS)	F	B			C	D				F		D
Approach Delay, s/veh / LOS	29.5	C		35.9	D		0.0			724.1	F	
Intersection Delay, s/veh / LOS	107.3						F					

Signalized Intersection Two Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Control Delay (*d*) , s/veh		269.9	21.6	23.9		20.8	96.3	64.1		374.9	33.0	
Level of Service (LOS)		F	C	C		C	F	E		F	C	
Approach Delay, s/veh / LOS	195.8	F		21.5	C		81.9	F		295.7	F	
Intersection Delay, s/veh / LOS	149.2						F					

This Urban Streets text report was created on March 12, 2018 at 10:31:40

Period number = 1

Input

URBAN STREET PARAMETERS

Number of Intersections	4
Number of Segments	3
Analysis period duration, h	0.25
System cycle length, s	120
Urban street forward direction	EB
Sneakers per cycle, veh	2
Saturation flow rate, veh/h/ln	1900
Stored vehicle lane length, ft	25
Detected vehicle length, ft	17
Queue length percent	95
Critical merge gap, s	3.7
Stop threshold speed, mph	5
Acceleration rate, ft/s/s	3.5
Decel. rate (signal), ft/s/s	4
Minimum headway in a platoon, s/veh	1.5
Maximum headway in a platoon, s/veh	3.6
Number of iterations	15
Length of left-turn bay (access pt.), ft	250
Decel. rate (access pt.), ft/s/s	6.7
Right-turn speed (access pt.), ft/s	20
Critical gap from major left (access pt.), s	4.1
Follow-up time from major left (access pt.), s	2.2
Right-turn equivalency factor (access pt.)	2.2
Stored heavy vehicle lane length, ft	45
Proportion of peds who push button	0.51
Critical gap for permissive left-turn, s	4.5
Follow-up time for permissive left-turn, s	2.5
Calibration factor for platoon dispersion	0.14
Average ratio of speed limit to free-flow speed	0.9

BASIC SEGMENT INFORMATION

Seg	Spd Lmt		TH Lanes		Seg Len		IntWid		LenRM		PctCurb		Other Dly	
Num	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
1	35	35	2	1	1020	1020	50	50	0	0	70	70	0	0
2	35	35	2	2	3460	3460	50	50	0	0	70	70	0	0
3	35	35	1	2	1020	1020	50	50	0	0	70	70	0	0

ORIGIN-DESTINATION SEED PROPORTIONS - Forward Direction

	Cross LT	Major TH	Cross RT	MidEntry
Downstream Left	0.02	0.1	0.05	0.02
Downstream Thru	0.91	0.78	0.92	0.97
Downstream Right	0.05	0.1	0.02	0.01
Mid-segment Exit	0.02	0.02	0.01	0

ORIGIN-DESTINATION SEED PROPORTIONS - Reverse Direction

	Cross LT	Major TH	Cross RT	MidEntry
Downstream Left	0.02	0.1	0.05	0.02
Downstream Thru	0.91	0.78	0.92	0.97
Downstream Right	0.05	0.1	0.02	0.01
Mid-segment Exit	0.02	0.02	0.01	0

ACCESS POINT DATA

SEGMENT 1

Number of access points: 0

SEGMENT 2

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	1700	15	80	710	0	60	0	45	0	0	0
1: Lanes	0	2	0	1	2	0	0	1	0	0	0	0
1: Location, ft	3030											
1: Peak Hour Factor	1											

Number of access points: 1

SEGMENT 3

Number of access points: 0

Global Output

SEGMENT DATA

Seg.No.	Movement	EB LT 5	EB TH 2	EB RT 12	WB LT 1	WB TH 6	WB RT 16
1	Bay/Lane Spillback Time, h	999	999	999	999	999	999
1	ShrdLane Spillback Time, h				999.22		
1	Base Free-Flow Speed, mph		41.72			41.72	
1	Running Time, s		20.78			20.75	
1	Running Speed, mph		33.47			33.52	
1	Through Delay, s/veh		1.99			20.91	
1	Travel Speed, mph		30.54			16.7	
1	Stop Rate, stops/veh		0.07			0.48	
1	Spatial Stop Rate, stops/mi		0.34			2.48	
1	Through vol/cap ratio		0.65			0.45	
1	Percent of Base FFS		73.21			40.02	
1	Level of Service		B			D	
1	Automobile Perception Score		2.4			2.76	
2	Bay/Lane Spillback Time, h	0.09	999	999	999	999	999
2	ShrdLane Spillback Time, h	2.85					
2	Base Free-Flow Speed, mph		41.72			41.72	
2	Running Time, s		60.68			58.94	
2	Running Speed, mph		38.88			40.03	
2	Through Delay, s/veh		13.04			3.35	
2	Travel Speed, mph		32			37.88	
2	Stop Rate, stops/veh		0.43			0.14	
2	Spatial Stop Rate, stops/mi		0.65			0.21	
2	Through vol/cap ratio		0.65			0.34	
2	Percent of Base FFS		76.7			90.78	
2	Level of Service		B			A	
2	Automobile Perception Score		2.34			2.27	
3	Bay/Lane Spillback Time, h	0	0.14	999	999	999	999
3	ShrdLane Spillback Time, h						
3	Base Free-Flow Speed, mph		41.72			41.72	
3	Running Time, s		22.76			20.29	
3	Running Speed, mph		30.55			34.28	
3	Through Delay, s/veh		269.93			35.64	
3	Travel Speed, mph		2.38			12.43	
3	Stop Rate, stops/veh		2.04			0.79	
3	Spatial Stop Rate, stops/mi		10.58			4.1	
3	Through vol/cap ratio		1.49			0.65	
3	Percent of Base FFS		5.7			29.8	
3	Level of Service		F			F	
3	Automobile Perception Score		4.32			3.05	
Facility Travel Time, s			389.18			159.87	
Facility Travel Speed, mph			9.64			23.46	
Facility Spatial Stop Rate, veh/mi			2.44			1.35	
Facility Base Free Flow Speed, mph			41.72			41.72	
Facility Percent Base Free Flow Speed			23.1			56.22	
Facility Level of Service			F			C	
Facility Automobile Perception Score			2.57			2.47	
Facility Pedestrian Space			Infinity			Infinity	
Facility Pedestrian Travel Speed			4.4			4.4	
Facility Pedestrian LOS Score			3.86			3.61	
Facility Pedestrian LOS			D			D	
Facility Bicycle Travel Speed			13.5			13.26	
Facility Bicycle LOS Score			3.91			3.62	
Facility Bicycle LOS			D			D	
Facility Transit Travel Speed			30.55			12.69	
Facility Transit LOS Score			1.01			1.11	
Facility Transit LOS			A			A	
SPILLBACK TIME, h			0.14				

Multimodal Results

1	Roadway crossing difficulty factor	1.2	1.2
1	Ped LOS Score for Link	3.71	3.66
1	Ped LOS Score for Intersection	2.17	3.27
1	Ped LOS Score for Segment	3.9	4.19
1	Ped Segment LOS	D	D
1	Bicycle LOS Score for Link	3.82	3.8
1	Indicator Variable	1	1
1	Bicycle LOS Score for Intersection	3.69	3.47
1	Number of access point approaches	0	0
1	Segment Length, ft	1020	1020
1	Bicycle LOS Score for Segment	3.9	3.81
1	Bicycle Segment LOS	D	D
1	Transit Wait-Ride Score	3.8	2.92
1	Ped LOS Score for Link	3.71	3.66
1	Transit LOS Score for Segment	0.86	2.17
1	Transit Segment LOS	A	B
2	Roadway crossing difficulty factor	1.2	1.2
2	Ped LOS Score for Link	3.92	2.96
2	Ped LOS Score for Intersection	0.68	2.19
2	Ped LOS Score for Segment	3.6	3.63
2	Ped Segment LOS	D	D
2	Bicycle LOS Score for Link	3.9	3.57
2	Indicator Variable	1	1
2	Bicycle LOS Score for Intersection	2.09	2.87
2	Number of access point approaches	0	0
2	Segment Length, ft	3460	3460
2	Bicycle LOS Score for Segment	3.56	3.61
2	Bicycle Segment LOS	D	D
2	Transit Wait-Ride Score	3.74	4.04
2	Ped LOS Score for Link	3.92	2.96
2	Transit LOS Score for Segment	0.98	0.39
2	Transit Segment LOS	A	A
3	Roadway crossing difficulty factor	1.2	0.98
3	Ped LOS Score for Link	5.37	2.95
3	Ped LOS Score for Intersection	2.64	2.28
3	Ped LOS Score for Segment	4.67	2.97
3	Ped Segment LOS	E	C
3	Bicycle LOS Score for Link	4.09	3.57
3	Indicator Variable	1	1
3	Bicycle LOS Score for Intersection	4.96	1.26
3	Number of access point approaches	0	0
3	Segment Length, ft	1020	1020
3	Bicycle LOS Score for Segment	5.08	3.46
3	Bicycle Segment LOS	F	C
3	Transit Wait-Ride Score	3.68	2.61
3	Ped LOS Score for Link	5.37	2.95
3	Transit LOS Score for Segment	1.29	2.52
3	Transit Segment LOS	A	B

ACCESS POINT DATA

SEGMENT 1

SEGMENT 2

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	1735	15.3	88.9	789	0	60	0	45	0	0	0
1: Lanes	0	2	0	1	2	0	0	1	0	0	0	0
1: Prop blocked	0	0	0	0.15	0	0	0.15	0.15	0.15	0.15	0.15	0
1: Thru veh delay		0.02			0							
1: Prob inside blk		0			0							
1: Dist to upstream signal	3030											

SEGMENT 3

V. 2045 Freeway Analysis – Mainline

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Volume (V), veh/h	740	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.90	Flow Rate (v_p), pc/h/ln	452
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.20
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	6.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	1430	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	874
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.38
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	13.0
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	1250	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	764
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.33
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	11.4
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	1660	Heavy Vehicle Adjustment Factor (f_{HV})	0.935
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	658
Total Trucks, %	7.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.29
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	9.8
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	1525	Heavy Vehicle Adjustment Factor (f_{HV})	0.935
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	906
Total Trucks, %	7.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.39
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	13.5
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	2240	Heavy Vehicle Adjustment Factor (f_{HV})	0.935
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	1331
Total Trucks, %	7.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.58
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.1
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	19.8
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

HCS7 Basic Freeway Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	2670	Heavy Vehicle Adjustment Factor (f_{HV})	0.935
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	1058
Total Trucks, %	7.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.46
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	15.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

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Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	860	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	526
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.23
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	7.8
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

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Project Information

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Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	955	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	584
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.25
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	8.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

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Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	520	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	318
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.14
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	4.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

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Project Information

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Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	1370	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	838
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.36
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	12.5
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

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Project Information

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Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	3010	Heavy Vehicle Adjustment Factor (f_{HV})	0.935
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	1192
Total Trucks, %	7.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.52
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	17.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

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Project Information

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Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	2710	Heavy Vehicle Adjustment Factor (f_{HV})	0.935
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	1610
Total Trucks, %	7.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.70
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	65.2
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	24.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	C
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

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Project Information

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Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	1105	Heavy Vehicle Adjustment Factor (f_{HV})	0.935
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	656
Total Trucks, %	7.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.29
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	9.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

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Project Information

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Geometric Data

Number of Lanes, ln	3	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	1400	Heavy Vehicle Adjustment Factor (f_{HV})	0.935
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	555
Total Trucks, %	7.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.24
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	8.2
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

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Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	925	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	566
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.25
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	8.4
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

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Project Information

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Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	1210	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	740
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.32
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	11.0
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

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Project Information

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Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	740	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	452
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.20
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	6.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

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Project Information

Analyst	RL	Date	5/03/2018
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Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	755	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	462
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.20
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	6.9
Total Ramp Density Adjustment	-	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

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Project Information

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Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON ROAD IMJR		

Geometric Data

Number of Lanes, ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Measured	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	69.0	Total Ramp Density (TRD), ramps/mi	-
Lane Width, ft	-	Free-Flow Speed (FFS), mi/h	69.0
Right-Side Lateral Clearance, ft	-		

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	1510	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor	0.90	Flow Rate (V_p), pc/h/ln	923
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2373
Single-Unit Trucks (SUT), %	-	Adjusted Cpacity (c_{adj}), pc/h/ln	2297
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.40
Passenger Car Equivalent (E_T)	2.000		

Speed and Density

Lane Width Adjustment (f_{LW})	-	Average Speed (S), mi/h	67.3
Right-Side Lateral Clearance Adj. (f_{RLC})	-	Density (D), pc/mi/ln	13.7
Total Ramp Density Adjustment	-	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.3		

VI. 2045 Freeway Analysis – Ramps

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1750	250
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	155	600
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	2.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.980	0.909
Flow Rate (v_i), pc/h	176	733
Capacity (c), pc/h	4550	1936
Volume-to-Capacity Ratio (v/c)	0.20	0.38

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	10.7
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.314
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	59.4
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	176	Ramp Junction Speed (S), mi/h	59.4
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	909	Average Density (D), pc/mi/ln	7.7
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	1500
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Volume (V_i), veh/h	740	690
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	905	843
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.38	0.41

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	9.4
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.212
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	61.9
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	905	Ramp Junction Speed (S), mi/h	61.9
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1748	Average Density (D), pc/mi/ln	14.1
Level of Service (LOS)	A		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	3620	280
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	1430	180
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	1748	220
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.38	0.11

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	16.8
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.332
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	58.9
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1748	Ramp Junction Speed (S), mi/h	58.9
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	14.8
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Acceleration Length (L_A), ft	3655	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

	Freeway	Ramp
Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

	Freeway	Ramp
Demand Volume (V_i), veh/h	1250	410
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	1485	519
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.44	0.26

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	11.5
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.218
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	61.8
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1485	Ramp Junction Speed (S), mi/h	61.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2004	Average Density (D), pc/mi/ln	16.2
Level of Service (LOS)	B		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	5705	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

	Freeway	Ramp
Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

	Freeway	Ramp
Demand Volume (V_i), veh/h	1660	135
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	1973	171
Capacity (c), pc/h	6824	2033
Volume-to-Capacity Ratio (v/c)	0.29	0.08

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	3.1
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.328
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	535
Distance to Downstream Ramp (L_{DOWN}), ft	10000	Off-Ramp Influence Area Speed (S_R), mi/h	59.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	0.703	Outer Lanes Freeway Speed (S_O), mi/h	73.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	1438	Ramp Junction Speed (S), mi/h	62.4
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	10.5
Level of Service (LOS)	A		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1080	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

	Freeway	Ramp
Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

	Freeway	Ramp
Demand Volume (V_i), veh/h	1525	690
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	1812	874
Capacity (c), pc/h	4550	1936
Volume-to-Capacity Ratio (v/c)	0.59	0.45

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	16.7
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.276
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	60.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1812	Ramp Junction Speed (S), mi/h	60.3
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	2686	Average Density (D), pc/mi/ln	22.3
Level of Service (LOS)	B		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	5500	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

	Freeway	Ramp
Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

	Freeway	Ramp
Demand Volume (V_i), veh/h	2545	305
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	3024	386
Capacity (c), pc/h	6824	2033
Volume-to-Capacity Ratio (v/c)	0.44	0.19

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	9.2
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.347
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	878
Distance to Downstream Ramp (L_{DOWN}), ft	10000	Off-Ramp Influence Area Speed (S_R), mi/h	58.5
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	0.667	Outer Lanes Freeway Speed (S_O), mi/h	73.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	2146	Ramp Junction Speed (S), mi/h	62.2
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	16.2
Level of Service (LOS)	A		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Acceleration Length (L_A), ft	1000	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

	Freeway	Ramp
Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

	Freeway	Ramp
Demand Volume (V_i), veh/h	2240	430
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	2662	545
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.70	0.27

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	20.9
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.286
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	60.1
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	2662	Ramp Junction Speed (S), mi/h	60.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3207	Average Density (D), pc/mi/ln	26.7
Level of Service (LOS)	C		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	2
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	5195	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	2670	1810
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	3173	2293
Capacity (c), pc/h	6824	4066
Volume-to-Capacity Ratio (v/c)	0.46	0.56

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	13.9
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.519
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	484
Distance to Downstream Ramp (L_{DOWN}), ft	10000	Off-Ramp Influence Area Speed (S_R), mi/h	54.2
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	0.450	Outer Lanes Freeway Speed (S_O), mi/h	73.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	2689	Ramp Junction Speed (S), mi/h	56.5
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	18.7
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Acceleration Length (L_A), ft	3445	1050
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	860	95
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	1051	116
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.26	0.06

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	8.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.241
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	61.2
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1051	Ramp Junction Speed (S), mi/h	61.2
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1167	Average Density (D), pc/mi/ln	9.5
Level of Service (LOS)	A		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	5/11/2018
Agency	HDR	Analysis Year	2018
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229 BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	1500	550
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	955	435
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	1167	532
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.26	0.26

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	9.3
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.360
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	58.2
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1167	Ramp Junction Speed (S), mi/h	58.2
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	10.0
Level of Service (LOS)	A		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1885	1500
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	520	400
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	636	489
Capacity (c), pc/h	4550	1936
Volume-to-Capacity Ratio (v/c)	0.14	0.25

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	0.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.484
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	55.1
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	636	Ramp Junction Speed (S), mi/h	55.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	5.8
Level of Service (LOS)	A		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1750	250
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	155	600
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	2.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.980	0.909
Flow Rate (v_i), pc/h	176	733
Capacity (c), pc/h	4550	1936
Volume-to-Capacity Ratio (v/c)	0.20	0.38

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	10.7
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.314
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	59.4
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	176	Ramp Junction Speed (S), mi/h	59.4
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	909	Average Density (D), pc/mi/ln	7.7
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	1500
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	755	755
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	923	923
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.41	0.45

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	10.1
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.214
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	61.9
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	923	Ramp Junction Speed (S), mi/h	61.9
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1846	Average Density (D), pc/mi/ln	14.9
Level of Service (LOS)	B		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	3620	280
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	1510	140
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	1846	171
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.41	0.08

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	17.6
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.328
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	59.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1846	Ramp Junction Speed (S), mi/h	59.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	15.6
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Acceleration Length (L_A), ft	3655	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

	Freeway	Ramp
Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

	Freeway	Ramp
Demand Volume (V_i), veh/h	1370	1640
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	1628	2078
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.81	1.02

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	24.1
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	-
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	58.5
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1628	Ramp Junction Speed (S), mi/h	-
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3706	Average Density (D), pc/mi/ln	-
Level of Service (LOS)	F		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	5705	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

	Freeway	Ramp
Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

	Freeway	Ramp
Demand Volume (V_i), veh/h	3010	305
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	3577	386
Capacity (c), pc/h	6824	2033
Volume-to-Capacity Ratio (v/c)	0.52	0.19

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	12.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.347
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	1107
Distance to Downstream Ramp (L_{DOWN}), ft	10000	Off-Ramp Influence Area Speed (S_R), mi/h	58.5
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	0.653	Outer Lanes Freeway Speed (S_O), mi/h	73.4
Flow in Lanes 1 and 2 (v_{12}), pc/h	2470	Ramp Junction Speed (S), mi/h	62.4
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	19.1
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1080	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

	Freeway	Ramp
Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

	Freeway	Ramp
Demand Volume (V_i), veh/h	2710	455
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	3220	576
Capacity (c), pc/h	4550	1936
Volume-to-Capacity Ratio (v/c)	0.83	0.30

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	25.5
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.392
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	57.4
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	3220	Ramp Junction Speed (S), mi/h	57.4
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	3796	Average Density (D), pc/mi/ln	33.1
Level of Service (LOS)	C		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	5500	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	1630	525
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	1937	665
Capacity (c), pc/h	6824	2033
Volume-to-Capacity Ratio (v/c)	0.28	0.33

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	3.9
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.372
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	406
Distance to Downstream Ramp (L_{DOWN}), ft	10000	Off-Ramp Influence Area Speed (S_R), mi/h	57.9
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	0.681	Outer Lanes Freeway Speed (S_O), mi/h	73.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	1531	Ramp Junction Speed (S), mi/h	60.6
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	10.7
Level of Service (LOS)	A		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	2/26/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Acceleration Length (L_A), ft	1000	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

	Freeway	Ramp
Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

	Freeway	Ramp
Demand Volume (V_i), veh/h	1105	295
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	1313	374
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.37	0.18

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	9.1
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.210
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	62.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1313	Ramp Junction Speed (S), mi/h	62.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1687	Average Density (D), pc/mi/ln	13.6
Level of Service (LOS)	A		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	3	2
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	5195	1500
Terrain Type	Level	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	1400	475
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	7.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877
Flow Rate (v_i), pc/h	1664	602
Capacity (c), pc/h	6824	4066
Volume-to-Capacity Ratio (v/c)	0.24	0.15

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	0.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.366
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	584
Distance to Downstream Ramp (L_{DOWN}), ft	10000	Off-Ramp Influence Area Speed (S_R), mi/h	58.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	0.450	Outer Lanes Freeway Speed (S_O), mi/h	73.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	1080	Ramp Junction Speed (S), mi/h	62.7
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	8.8
Level of Service (LOS)	A		

HCS7 Freeway Merge Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Acceleration Length (L_A), ft	3445	1050
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	925	285
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	1131	348
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.33	0.17

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	10.3
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.246
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	61.1
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1131	Ramp Junction Speed (S), mi/h	61.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1479	Average Density (D), pc/mi/ln	12.1
Level of Service (LOS)	B		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	45.0
Segment Length (L) / Deceleration Length (L_D), ft	4075	550
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	1210	470
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	1479	575
Capacity (c), pc/h	4550	2033
Volume-to-Capacity Ratio (v/c)	0.33	0.28

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	12.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.364
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	10000	Off-Ramp Influence Area Speed (S_R), mi/h	58.1
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	1479	Ramp Junction Speed (S), mi/h	58.1
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	12.7
Level of Service (LOS)	B		

HCS7 Freeway Diverge Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

	Freeway	Ramp
Number of Lanes (N)	2	1
Free-Flow Speed (FFS), mi/h	69.0	35.0
Segment Length (L) / Deceleration Length (L_D), ft	1885	1500
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors

Driver Population	Mostly Familiar	Mostly Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	0.975	0.975
Final Capacity Adjustment Factor (CAF)	0.968	0.968
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	740	430
Peak Hour Factor (PHF)	0.90	0.90
Total Trucks, %	10.00	10.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.909	0.909
Flow Rate (v_i), pc/h	905	526
Capacity (c), pc/h	4550	1936
Volume-to-Capacity Ratio (v/c)	0.20	0.27

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Density in Ramp Influence Area (D_R), pc/mi/ln	0.0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.487
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	55.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	-
Flow in Lanes 1 and 2 (v_{12}), pc/h	905	Ramp Junction Speed (S), mi/h	55.0
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	8.2
Level of Service (LOS)	A		

VII. 2045 Freeway Analysis – Weaving

HCS7 Freeway Weaving Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

Number of Lanes (N), ln	3	Segment Type	Freeway
Short Length (L_S), ft	5705	Number of Maneuver Lanes (N_{WL}), ln	2
Weaving Configuration	One-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	0
Interchange Density (ID), int/mi	0.66	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	1130	395	15	120
Peak Hour Factor (PHF)	0.90	0.90	0.90	0.90
Total Trucks, %	7.00	7.00	7.00	7.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877	0.877	0.877
Flow Rate (v_i), pc/h	1343	500	19	152

Weaving Flow Rate (v_w), pc/h	652	Freeway Max Capacity (c_{IFL}), pc/h/ln	2373
Non-Weaving Flow Rate (v_{NW}), pc/h	1362	Density-Based Capacity (c_{IWL}), pc/h/ln	2362
Total Flow Rate (v), pc/h	2014	Demand Flow-Based Capacity (c_{IW}), pc/h	7407
Volume Ratio (VR)	0.324	Weaving Segment Capacity (c_W), veh/h	6625
Minimum Lane Change Rate (LC_{MIN}), lc/h	652	Adjusted Weaving Area Capacity, pc/h	7003
Maximum Weaving Length (L_{MAX}), ft	5843	Volume-to-Capacity Ratio (v/c)	0.29

Speed and Density

Non-Weaving Vehicle Index (I_{NW})	513	Average Weaving Speed (S_W), mi/h	61.0
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	1993	Average Non-Weaving Speed (S_{NW}), mi/h	59.4
Weaving Lane Change Rate (LC_W), lc/h	1039	Average Speed (S), mi/h	59.9
Total Lane Change Rate (LC_{All}), lc/h	3032	Density (D), pc/mi/ln	11.2
Weaving Intensity Factor (W)	0.137	Level of Service (LOS)	B

HCS7 Freeway Weaving Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

Number of Lanes (N), ln	3	Segment Type	Freeway
Short Length (L_S), ft	5705	Number of Maneuver Lanes (N_{WL}), ln	2
Weaving Configuration	One-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	0
Interchange Density (ID), int/mi	0.66	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	1100	1610	30	270
Peak Hour Factor (PHF)	0.90	0.90	0.90	0.90
Total Trucks, %	7.00	7.00	7.00	7.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877	0.877	0.877
Flow Rate (v_i), pc/h	1307	2040	38	342

Weaving Flow Rate (v_w), pc/h	2382	Freeway Max Capacity (c_{IFL}), pc/h/ln	2373
Non-Weaving Flow Rate (v_{NW}), pc/h	1345	Density-Based Capacity (c_{IWL}), pc/h/ln	2083
Total Flow Rate (v), pc/h	3727	Demand Flow-Based Capacity (c_{IW}), pc/h	3756
Volume Ratio (VR)	0.639	Weaving Segment Capacity (c_W), veh/h	3512
Minimum Lane Change Rate (LC_{MIN}), lc/h	2382	Adjusted Weaving Area Capacity, pc/h	3789
Maximum Weaving Length (L_{MAX}), ft	9496	Volume-to-Capacity Ratio (v/c)	0.98

Speed and Density

Non-Weaving Vehicle Index (I_{NW})	506	Average Weaving Speed (S_W), mi/h	58.7
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	1989	Average Non-Weaving Speed (S_{NW}), mi/h	44.2
Weaving Lane Change Rate (LC_W), lc/h	2769	Average Speed (S), mi/h	52.5
Total Lane Change Rate (LC_{All}), lc/h	4758	Density (D), pc/mi/ln	23.7
Weaving Intensity Factor (W)	0.196	Level of Service (LOS)	C

HCS7 Freeway Weaving Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	AM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

Number of Lanes (N), ln	3	Segment Type	Freeway
Short Length (L_S), ft	4820	Number of Maneuver Lanes (N_{WL}), ln	2
Weaving Configuration	One-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	0
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	0
Interchange Density (ID), int/mi	0.66	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	605	255	175	1635
Peak Hour Factor (PHF)	0.90	0.90	0.90	0.90
Total Trucks, %	7.00	7.00	7.00	7.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877	0.877	0.877
Flow Rate (v_i), pc/h	719	323	222	2071

Weaving Flow Rate (v_w), pc/h	2394	Freeway Max Capacity (c_{IFL}), pc/h/ln	2373
Non-Weaving Flow Rate (v_{NW}), pc/h	941	Density-Based Capacity (c_{IWL}), pc/h/ln	1940
Total Flow Rate (v), pc/h	3335	Demand Flow-Based Capacity (c_{IW}), pc/h	3343
Volume Ratio (VR)	0.718	Weaving Segment Capacity (c_W), veh/h	3125
Minimum Lane Change Rate (LC_{MIN}), lc/h	323	Adjusted Weaving Area Capacity, pc/h	3401
Maximum Weaving Length (L_{MAX}), ft	10484	Volume-to-Capacity Ratio (v/c)	0.98

Speed and Density

Non-Weaving Vehicle Index (I_{NW})	299	Average Weaving Speed (S_W), mi/h	61.0
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	1899	Average Non-Weaving Speed (S_{NW}), mi/h	59.6
Weaving Lane Change Rate (LC_W), lc/h	677	Average Speed (S), mi/h	60.6
Total Lane Change Rate (LC_{All}), lc/h	2576	Density (D), pc/mi/ln	18.3
Weaving Intensity Factor (W)	0.138	Level of Service (LOS)	B

HCS7 Freeway Weaving Report

Project Information

Analyst	RL	Date	5/03/2018
Agency	HDR	Analysis Year	2045
Jurisdiction	SDDOT	Time Period Analyzed	PM PEAK
Project Description	I-229/BENSON IMJR		

Geometric Data

Number of Lanes (N), ln	3	Segment Type	Freeway
Short Length (L_S), ft	4820	Number of Maneuver Lanes (N_{WL}), ln	2
Weaving Configuration	One-Sided	Ramp-to-Freeway Lane Changes (LC_{RF}), lc	1
Terrain Type	Level	Freeway-to-Ramp Lane Changes (LC_{FR}), lc	1
Percent Grade, %	-	Ramp-to-Ramp Lane Changes (LC_{RR}), lc	0
Interchange Density (ID), int/mi	0.66	Cross Weaving Managed Lane	No

Adjustment Factors

Driver Population	Mostly Familiar	Final Speed Adjustment Factor (SAF)	0.975
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

	FF	RF	RR	FR
Demand Volume (V_i), veh/h	750	175	120	355
Peak Hour Factor (PHF)	0.90	0.90	0.90	0.90
Total Trucks, %	7.00	7.00	7.00	7.00
Heavy Vehicle Adjustment Factor (f_{HV})	0.935	0.877	0.877	0.877
Flow Rate (v_i), pc/h	891	222	152	450

Weaving Flow Rate (v_w), pc/h	672	Freeway Max Capacity (c_{IFL}), pc/h/ln	2373
Non-Weaving Flow Rate (v_{NW}), pc/h	1043	Density-Based Capacity (c_{IWL}), pc/h/ln	2237
Total Flow Rate (v), pc/h	1715	Demand Flow-Based Capacity (c_{IW}), pc/h	6122
Volume Ratio (VR)	0.392	Weaving Segment Capacity (c_W), veh/h	5724
Minimum Lane Change Rate (LC_{MIN}), lc/h	672	Adjusted Weaving Area Capacity, pc/h	6109
Maximum Weaving Length (L_{MAX}), ft	6592	Volume-to-Capacity Ratio (v/c)	0.28

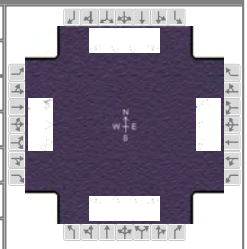
Speed and Density

Non-Weaving Vehicle Index (I_{NW})	332	Average Weaving Speed (S_W), mi/h	60.4
Non-Weaving Lane Change Rate (LC_{NW}), lc/h	1922	Average Non-Weaving Speed (S_{NW}), mi/h	59.7
Weaving Lane Change Rate (LC_W), lc/h	1026	Average Speed (S), mi/h	60.0
Total Lane Change Rate (LC_{All}), lc/h	2948	Density (D), pc/mi/ln	9.5
Weaving Intensity Factor (W)	0.153	Level of Service (LOS)	A

VIII. 2045 Arterial Analysis

HCS7 Signalized Intersection Results Summary

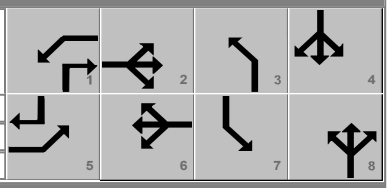
General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	AM PEAK	PHF	0.90
Urban Street	BENSON ROAD	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	CLIFF AVENUE	File Name	BENSON AM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	105	445	90	70	730	370	95	245	70	120	275	155

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	2.7	2.0	37.3	4.0	15.0	0.0						
Yellow	3.0	0.0	3.5	3.0	3.5	0.0						
Red	1.0	0.0	2.0	1.0	2.0	0.0						



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	1.1	3.0	1.1	3.0
Phase Duration, s	8.7	44.8	6.7	42.8	8.0	20.5	8.0	20.5
Change Period, ($Y+R_c$), s	4.0	5.5	4.0	5.5	4.0	5.5	4.0	5.5
Max Allow Headway (*MAH*), s	5.1	0.0	5.1	0.0	5.1	1.0	5.1	1.0
Queue Clearance Time (g_s), s	4.9		3.3		6.0	7.9	6.0	8.6
Green Extension Time (g_e), s	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.1
Phase Call Probability	0.93		0.67		0.90	1.00	0.95	1.00
Max Out Probability	1.00		1.00		1.00	0.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	117	282	273	50	351	325	106	272	44	133	306	106
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1647	1730	1663	1647	1730	1592	1647	1647	1466	1647	1647	1466
Queue Service Time (g_s), s	2.9	7.9	8.0	1.3	6.5	5.6	4.0	5.9	1.9	4.0	6.6	4.7
Cycle Queue Clearance Time (g_c), s	2.9	7.9	8.0	1.3	6.5	5.6	4.0	5.9	1.9	4.0	6.6	4.7
Green Ratio (*g/C*)	0.53	0.49	0.49	0.50	0.47	0.47	0.24	0.19	0.22	0.24	0.19	0.25
Capacity (*c*), veh/h	473	850	817	450	807	743	256	618	324	269	618	361
Volume-to-Capacity Ratio (*X*)	0.247	0.332	0.334	0.111	0.435	0.438	0.413	0.441	0.137	0.496	0.495	0.293
Back of Queue (*Q*), ft/ln (95 th percentile)	44.5	136.7	128.4	20	95.5	72	76.5	102.7	30.2	29.7	116.7	72.1
Back of Queue (*Q*), veh/ln (95 th percentile)	1.7	5.3	5.1	0.8	3.7	2.9	2.9	3.9	1.2	1.1	4.5	2.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.23	0.00	0.00	0.14	0.00	0.00	0.26	0.00	0.13	0.08	0.00	0.23
Uniform Delay (d_1), s/veh	10.0	12.4	12.4	11.1	6.8	5.4	25.7	28.8	25.0	27.6	29.1	24.5
Incremental Delay (d_2), s/veh	0.4	1.0	1.1	0.1	1.5	1.6	1.5	0.2	0.1	2.0	0.2	0.2
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	10.4	13.4	13.5	11.2	8.2	7.0	27.2	29.0	25.1	29.6	29.3	24.7
Level of Service (LOS)	B	B	B	B	A	A	C	C	C	C	C	C
Approach Delay, s/veh / LOS	12.9	B		7.9	A		28.1	C		28.5	C	
Intersection Delay, s/veh / LOS	17.7						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.1	C	3.3	C	3.4	C	3.2	C
Bicycle LOS Score / LOS	2.8	C	3.2	C	2.7	C	2.8	C

HCS7 Two-Way Stop-Control Report

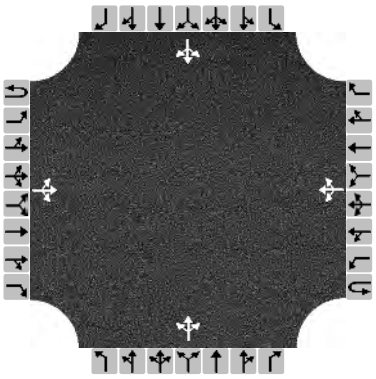
General Information

Analyst	RL
Agency/Co.	HDR
Date Performed	3/8/2018
Analysis Year	2045
Time Analyzed	AM PEAK
Intersection Orientation	East-West
Project Description	I-229/BENSON IMJR

Site Information

Intersection	BENSON/HALL
Jurisdiction	CITY OF SIOUX FALLS
East/West Street	BENSON ROAD
North/South Street	HALL AVENUE
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		95	140	20		20	495	20		30	5	10		10	10	50
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.15				4.15				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.24				2.24				3.54	4.04	3.34		3.54	4.04	3.34

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		106				22					50				78	
Capacity, c (veh/h)		988				1383					205				359	
v/c Ratio		0.11				0.02					0.24				0.22	
95% Queue Length, Q_{95} (veh)		0.4				0.0					0.9				0.8	
Control Delay (s/veh)		9.1				7.6					28.1				17.8	
Level of Service, LOS		A				A					D				C	
Approach Delay (s/veh)		4.1				0.5				28.1				17.8		
Approach LOS										D				C		

HCS7 Two-Way Stop-Control Report

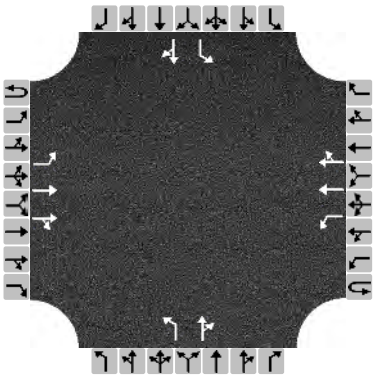
General Information

Analyst	RL
Agency/Co.	HDR
Date Performed	3/8/2018
Analysis Year	2045
Time Analyzed	AM PEAK
Intersection Orientation	East-West
Project Description	I-229/BENSON IMJR

Site Information

Intersection	BENSON/POTSDAM
Jurisdiction	CITY OF SIOUX FALLS
East/West Street	BENSON ROAD
North/South Street	POTSDAM AVENUE
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		1	1	0		1	1	0
Configuration		L	T	TR		L	T	TR		L		TR		L		TR
Volume, V (veh/h)		25	535	55		165	1875	365		10	5	110		5	0	10
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.20				4.20				7.60	6.60	7.00		7.60	6.60	7.00
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.25				2.25				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		28				183				11		128		6		11
Capacity, c (veh/h)		173				908				20		71		0		162
v/c Ratio		0.16				0.20				0.54		1.81				0.07
95% Queue Length, Q_{95} (veh)		0.6				0.8				1.5		11.4				0.2
Control Delay (s/veh)		29.8				10.0				313.4		511.6				28.9
Level of Service, LOS		D				A				F		F				D
Approach Delay (s/veh)		1.2				0.7				495.9						
Approach LOS										F						

HCS 2010 Two-Way Stop Control Summary Report

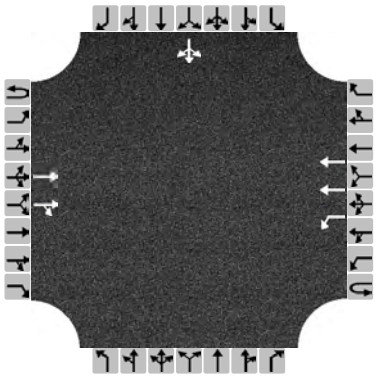
General Information

Analyst	RL
Agency/Co.	HDR
Date Performed	3/8/2018
Analysis Year	2045
Time Analyzed	AM PEAK
Intersection Orientation	East-West
Project Description	I-229/BENSON IMJR

Site Information

Intersection	BENSON/I-229 SB
Jurisdiction	CITY OF SIOUX FALLS
East/West Street	BENSON ROAD
North/South Street	I-229 SB
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

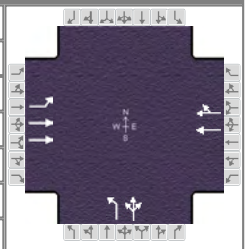
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	1	2	0		0	0	0		0	1	0
Configuration			T	TR		L	T								LTR	
Volume (veh/h)			305	345		65	2235							10	0	170
Percent Heavy Vehicles						5								5	5	5
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)						72									200	
Capacity						856									100	
v/c Ratio						0.08									2.00	
95% Queue Length						0.3									16.9	
Control Delay (s/veh)						9.6									555.4	
Level of Service (LOS)						A									F	
Approach Delay (s/veh)					0.3								555.4			
Approach LOS													F			

HCS 2010 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	AM PEAK	PHF	0.90
Urban Street	BENSON ROAD	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	I-229 NB	File Name	BENSON AM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	75	240			615	20	1685	0	125			

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

								1	2	3	4	
Green	18.5	50.5	0.0	0.0	0.0	0.0						
Yellow	3.5	3.5	0.0	0.0	0.0	0.0						
Red	2.0	2.0	0.0	0.0	0.0	0.0	5	6	7	8		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		
Case Number		6.0		8.0		10.0		
Phase Duration, s		24.0		24.0		56.0		
Change Period, ($Y+R_c$), s		5.5		5.5		5.5		
Max Allow Headway (*MAH*), s		0.0		0.0		5.0		
Queue Clearance Time (g_s), s						52.5		
Green Extension Time (g_e), s		0.0		0.0		0.0		
Phase Call Probability						1.00		
Max Out Probability						1.00		

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16	3	8	18			
Adjusted Flow Rate (*v*), veh/h	81	260			351	349	1872	133				
Adjusted Saturation Flow Rate (*s*), veh/h/ln	722	1546			1661	1646	1633	1376				
Queue Service Time (g_s), s	2.0	5.8			15.9	16.5	50.5	3.2				
Cycle Queue Clearance Time (g_c), s	18.5	5.8			15.9	16.5	50.5	3.2				
Green Ratio (*g/C*)	0.23	0.23			0.23	0.23	0.63	0.63				
Capacity (*c*), veh/h	108	715			384	381	1031	869				
Volume-to-Capacity Ratio (*X*)	0.754	0.364			0.915	0.916	1.817	0.153				
Back of Queue (*Q*), ft/ln (95 th percentile)	126	102			367.8	352.6	5014.1	31.9				
Back of Queue (*Q*), veh/ln (95 th percentile)	4.8	3.9			14.1	14.1	192.8	1.3				
Queue Storage Ratio (*RQ*) (95 th percentile)	1.26	0.00			0.00	0.00	0.00	0.00				
Uniform Delay (d_1), s/veh	42.3	27.0			30.0	30.0	14.8	6.0				
Incremental Delay (d_2), s/veh	36.2	1.3			28.7	29.1	371.3	0.1				
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0	0.0	0.0				
Control Delay (*d*), s/veh	78.5	28.4			58.7	59.1	386.1	6.1				
Level of Service (LOS)	E	C			E	E	F	A				
Approach Delay, s/veh / LOS	40.3	D		58.9	E		360.8	F		0.0		
Intersection Delay, s/veh / LOS	255.5						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	1.9	A	2.9	C	3.3	C
Bicycle LOS Score / LOS	2.8	C	3.1	C	5.5	F		

HCS 2010 Two-Way Stop Control Summary Report

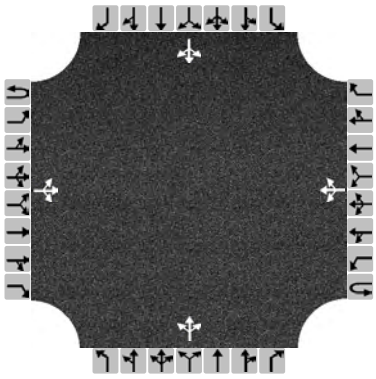
General Information

Analyst	RL
Agency/Co.	HDR
Date Performed	3/8/2018
Analysis Year	2045
Time Analyzed	AM PEAK
Intersection Orientation	East-West
Project Description	I-229/BENSON IMJR

Site Information

Intersection	BENSON/HALL
Jurisdiction	CITY OF SIOUX FALLS
East/West Street	BENSON ROAD
North/South Street	HALL AVENUE
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		95	140	130		85	495	20		90	5	40		10	10	50
Percent Heavy Vehicles		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		106				94					150				78	
Capacity		988				1247					145				273	
v/c Ratio		0.11				0.08					1.04				0.29	
95% Queue Length		0.4				0.2					7.8				1.1	
Control Delay (s/veh)		9.1				8.1					145.8				23.3	
Level of Service (LOS)		A				A					F				C	
Approach Delay (s/veh)	3.3				1.9				145.8				23.3			
Approach LOS									F				C			

HCS7 Streets Text Report

File Name:	BENSON AM.xus
Analyst:	RL
Agency/Co.:	HDR
Analysis Date:	Mar 8, 2018
Time Period:	AM PEAK
Jurisdiction:	CITY OF SIOUX FALLS
Analysis Year:	2045
Project Description:	I-229/BENSON IMJR
Urban Street:	BENSON ROAD
Analysis Period:	1> 7:00

Input

URBAN STREET PARAMETERS

Number of Intersections	3
Number of Segments	2
Analysis period duration, h	0.25
System cycle length, s	80
Urban street forward direction	EB
Sneakers per cycle, veh	2
Saturation flow rate, veh/h/ln	1900
Stored vehicle lane length, ft	25
Detected vehicle length, ft	17
Queue length percent	95
Critical merge gap, s	3.7
Stop threshold speed, mph	5
Acceleration rate, ft/s/s	3.5
Decel. rate (signal), ft/s/s	4
Minimum headway in a platoon, s/veh	1.5
Maximum headway in a platoon, s/veh	3.6
Number of iterations	15
Length of left-turn bay (access pt.), ft	250
Decel. rate (access pt.), ft/s/s	6.7
Right-turn speed (access pt.), ft/s	20
Critical gap from major left (access pt.), s	4.1
Follow-up time from major left (access pt.), s	2.2
Right-turn equivalency factor (access pt.)	2.2
Stored heavy vehicle lane length, ft	45
Proportion of peds who push button	0.51
Critical gap for permissive left-turn, s	4.5
Follow-up time for permissive left-turn, s	2.5
Calibration factor for platoon dispersion	0.14
Average ratio of speed limit to free-flow speed	0.9

BASIC SEGMENT INFORMATION

Seg	Spd Lmt		TH Lanes		Seg Len		IntWid		LenRM		PctCurb		Other Dly	
Num	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
1	40	40	2	2	2645	2645	50	50	0	0	70	70	0	0
2	40	40	2	2	2955	2955	50	50	0	0	70	70	0	0

ORIGIN-DESTINATION SEED PROPORTIONS - Forward Direction

	Cross LT	Major TH	Cross RT	MidEntry
Downstream Left	0.02	0.1	0.05	0.02
Downstream Thru	0.91	0.78	0.92	0.97
Downstream Right	0.05	0.1	0.02	0.01
Mid-segment Exit	0.02	0.02	0.01	0

ORIGIN-DESTINATION SEED PROPORTIONS - Reverse Direction

	Cross LT	Major TH	Cross RT	MidEntry
Downstream Left	0.02	0.1	0.05	0.02
Downstream Thru	0.91	0.78	0.92	0.97
Downstream Right	0.05	0.1	0.02	0.01
Mid-segment Exit	0.02	0.02	0.01	0

ACCESS POINT DATA

SEGMENT 1

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	615	20	0	1170	175	0	0	0	0	0	0
1: Lanes	1	2	0	1	2	0	0	1	0	0	1	0
1: Location, ft	1320											
1: Peak Hour Factor	1											

Number of access points: 1

SEGMENT 2

Movement	EB LT 1	EB TH 2	EB RT 3	WB LT 4	WB TH 5	WB RT 6	NB LT 7	NB TH 8	NB RT 9	SB LT 10	SB TH 11	SB RT 12
1: Volume, veh/h	0	590	0	0	1825	70	0	0	0	25	0	0
1: Lanes	1	2	0	0	2	0	0	0	0	1	0	1
1: Location, ft	700											
1: Peak Hour Factor	1											
2: Volume, veh/h	25	535	55	165	1875	365	10	5	110	5	0	10
2: Lanes	1	2	0	1	2	0	1	1	0	0	1	0
2: Location, ft	1420											
2: Peak Hour Factor	1											
3: Volume, veh/h	0	305	345	15	2235	0	0	0	0	10	0	170
3: Lanes	0	2	0	1	2	0	0	0	0	0	1	0
3: Location, ft	1910											
3: Peak Hour Factor	1											

Number of access points: 3

Global Output

SEGMENT DATA

Seg.No.	Movement	EB LT 5	EB TH 2	EB RT 12	WB LT 1	WB TH 6	WB RT 16
1	Bay/Lane Spillback Time, h	999	999	999	999	999	999
1	ShrdLane Spillback Time, h	999			999		
1	Base Free-Flow Speed, mph		44.07			44.07	
1	Running Time, s		43.28			43.78	
1	Running Speed, mph		41.67			41.2	
1	Through Delay, s/veh		6.69			7.85	
1	Travel Speed, mph		36.1			34.93	
1	Stop Rate, stops/veh		0.26			0.25	
1	Spatial Stop Rate, stops/mi		0.51			0.49	
1	Through vol/cap ratio		0.25			0.46	
1	Percent of Base FFS		81.9			79.26	
1	Level of Service		A			B	
1	Automobile Perception Score		2.22			2.21	
2	Bay/Lane Spillback Time, h	999	999	999	999	999	999
2	ShrdLane Spillback Time, h	999			999		999
2	Base Free-Flow Speed, mph		44.07			44.07	
2	Running Time, s		47.95			49.74	
2	Running Speed, mph		42.02			40.51	
2	Through Delay, s/veh		28.36			12.98	
2	Travel Speed, mph		26.41			32.13	
2	Stop Rate, stops/veh		0.75			0.47	
2	Spatial Stop Rate, stops/mi		1.34			0.85	
2	Through vol/cap ratio		0.36			0.52	
2	Percent of Base FFS		59.91			72.9	
2	Level of Service		C			B	
2	Automobile Perception Score		2.4			2.37	

Facility Travel Time, s	126.27	114.34
Facility Travel Speed, mph	30.24	33.39
Facility Spatial Stop Rate, stops/mi	0.95	0.68
Facility Base Free Flow Speed, mph	44.07	44.07
Facility Percent Base Free Flow Speed	68.62	75.77
Facility Level of Service	B	B
Facility Automobile Perception Score	2.31	2.29
Facility Pedestrian Space	∞	∞
Facility Pedestrian Travel Speed	4.25	4.25
Facility Pedestrian LOS Score	3.1	3.82
Facility Pedestrian LOS	C	D
Facility Bicycle Travel Speed	14.02	13.3
Facility Bicycle LOS Score	2.73	3.05
Facility Bicycle LOS	C	C
Facility Transit Travel Speed	35.99	34.67
Facility Transit LOS Score	0.9	0.85
Facility Transit LOS	A	A

SPILLBACK TIME, h 999

Multimodal Results

1	Average Pedestrian Space, ft2/p	∞	∞
1	Pedestrian Travel Speed, ft/s	4.15	4.15
1	Ped LOS Score for Intersection	2.01	2.87
1	Cross-section Adjustment Factor	-4.74	-4.74
1	Volume Adjustment Factor	0.8	1.21
1	Speed Adjustment Factor	0.69	0.68
1	Ped LOS Score for Link	2.8	3.2
1	Ped Link LOS	C	C
1	Roadway Crossing Difficulty Factor	1.07	1
1	Ped LOS Score for Segment	3.09	3.25
1	Ped Segment LOS	C	C
1	Bicycle Travel Speed	13.81	13.97
1	Bicycle LOS Score for Intersection	2.81	3.2
1	Cross-section Adjustment Factor	-1.28	-1.28
1	Volume Adjustment Factor	2.27	2.48
1	Speed Adjustment Factor	0.85	0.84
1	Pavement Adjustment Factor	0.58	0.58
1	Bicycle LOS Score for Link	3.17	3.38
1	Bicycle Link LOS	C	C
1	Number of access point approaches	0	0
1	Segment Length, ft	2645	2645
1	Unsignalized Conflicts Factor	-0.7	-0.7
1	Bicycle LOS Score for Segment	2.75	2.91
1	Bicycle Segment LOS	B	C
1	Transit Running Speed, mi/h	41.67	41.2
1	g/C Ratio	0.57	0.47
1	Transit Running Time, s	43.28	43.78
1	Delay at Intersection, s/veh	6.82	8.23
1	Transit Travel Speed, mi/h	35.99	34.67
1	Transit Wait-Ride Score	3.9	3.85
1	Ped LOS Score for Link	2.8	3.2
1	Transit LOS Score for Segment	0.57	0.71
1	Transit Segment LOS	A	A
2	Average Pedestrian Space, ft2/p	∞	∞
2	Pedestrian Travel Speed, ft/s	4.35	4.34
2	Ped LOS Score for Intersection	3.18	2.64
2	Cross-section Adjustment Factor	-4.74	-4.74
2	Volume Adjustment Factor	0.75	1.96
2	Speed Adjustment Factor	0.71	0.66
2	Ped LOS Score for Link	2.76	3.92
2	Ped Link LOS	C	D
2	Roadway Crossing Difficulty Factor	1.09	1.18
2	Ped LOS Score for Segment	3.12	4.33
2	Ped Segment LOS	C	E
2	Bicycle Travel Speed	14.22	12.76
2	Bicycle LOS Score for Intersection	2.77	3.79
2	Cross-section Adjustment Factor	-1.28	-1.28
2	Volume Adjustment Factor	2.23	2.72
2	Speed Adjustment Factor	0.85	0.83
2	Pavement Adjustment Factor	0.58	0.58
2	Bicycle LOS Score for Link	3.14	3.62
2	Bicycle Link LOS	C	D
2	Number of access point approaches	0	0
2	Segment Length, ft	2955	2955
2	Unsignalized Conflicts Factor	-0.7	-0.7
2	Bicycle LOS Score for Segment	2.72	3.17
2	Bicycle Segment LOS	B	C
2	Transit Running Speed, mi/h	42.02	40.51
2	g/C Ratio	0.23	0.53
2	Transit Running Time, s	47.95	49.74
2	Delay at Intersection, s/veh	28.36	12.98
2	Transit Travel Speed, mi/h	26.41	32.13
2	Transit Wait-Ride Score	3.49	3.75
2	Ped LOS Score for Link	2.76	3.92
2	Transit LOS Score for Segment	1.18	0.97
2	Transit Segment LOS	A	A

ACCESS POINT DATA

SEGMENT 1

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	683	22.2	0	928	139	0	0	0	0	0	0
1: Lanes	1	2	0	1	2	0	0	1	0	0	1	0
1: Prop blocked	0.18	0	0	0.06	0	0	0.24	0.24	0.06	0.24	0.24	0.18
1: Thru veh delay		0.02			0.08							
1: Prob inside blk		0			0							
1: Dist to upstream signal	1320											

SEGMENT 2

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	656	0	0	1431	54.9	0	0	0	25	0	0
1: Lanes	1	2	0	0	2	0	0	0	0	1	0	1
1: Prop blocked	0	0	0	0.08	0	0	0.08	0.08	0.08	0.08	0.08	0
1: Thru veh delay		0			0.06							
1: Prob inside blk		0			0							
1: Dist to upstream signal	700											
2: Volume, veh/h	27.7	592	60.9	129	1466	285	10	5	110	5	0	10
2: Lanes	1	2	0	1	2	0	1	1	0	0	1	0
2: Prop blocked	0	0	0	0.02	0	0	0.02	0.02	0.02	0.02	0.02	0
2: Thru veh delay		0.04			0.22							
2: Prob inside blk		0			0							
2: Dist to upstream signal	1420											
3: Volume, veh/h	0	332	375	11.5	1711	0	0	0	0	10	0	170
3: Lanes	0	2	0	1	2	0	0	0	0	0	1	0
3: Prop blocked	0	0	0	0	0	0	0	0	0	0	0	0
3: Thru veh delay		0			0							
3: Prob inside blk		0			0							
3: Dist to upstream signal	1910											

HCS7 Two-Way Stop-Control Report

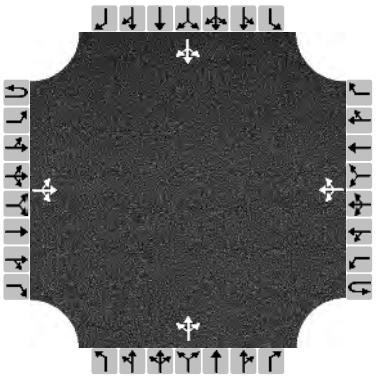
General Information

Analyst	RL
Agency/Co.	HDR
Date Performed	3/7/2018
Analysis Year	2045
Time Analyzed	PM PEAK
Intersection Orientation	East-West
Project Description	I-229/BENSON IMJR

Site Information

Intersection	BENSON/HALL
Jurisdiction	CITY OF SIOUX FALLS
East/West Street	BENSON ROAD
North/South Street	HALL AVENUE
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		35	65	95		20	335	20		30	20	30		20	20	35
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

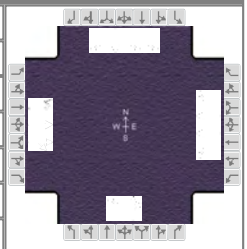
Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.15				4.15				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.24				2.24				3.54	4.04	3.34		3.54	4.04	3.34

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		39				22					88				83	
Capacity, c (veh/h)		1151				1383					442				438	
v/c Ratio		0.03				0.02					0.20				0.19	
95% Queue Length, Q_{95} (veh)		0.1				0.0					0.7				0.7	
Control Delay (s/veh)		8.2				7.6					15.2				15.1	
Level of Service, LOS		A				A					C				C	
Approach Delay (s/veh)		1.7				0.6				15.2				15.1		
Approach LOS										C				C		

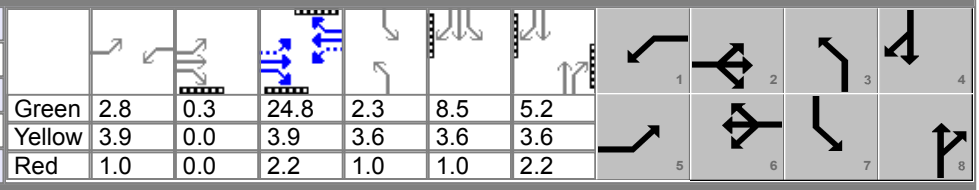
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	PM PEAK	PHF	0.90
Urban Street	BENSON ROAD	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	LEWIS AVENUE	File Name	BENSON PM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	70	840	25	60	410	75	40	30	105	565	40	215

Signal Information			
Cycle, s	70.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	2.8	0.3	24.8	2.3	8.5	5.2	
Yellow	3.9	0.0	3.9	3.6	3.6	3.6	
Red	1.0	0.0	2.2	1.0	1.0	2.2	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	3.0	2.0	4.0	2.0	3.0
Phase Duration, s	8.1	31.3	7.7	30.9	6.9	11.0	20.0	24.1
Change Period, ($Y+R_c$), s	4.9	6.1	4.9	6.1	4.6	5.8	4.6	5.8
Max Allow Headway (*MAH*), s	5.1	0.0	5.1	0.0	5.1	1.3	5.1	1.3
Queue Clearance Time (g_s), s	4.1		3.7		3.9	6.8	15.3	7.7
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Phase Call Probability	0.78		0.70		0.58	1.00	1.00	1.00
Max Out Probability	1.00		1.00		1.00	1.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	77	472	469	63	427	57	44	106		628	44	144
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1647	1730	1719	1647	1647		1647	1540		1600	1730	1466
Queue Service Time (g_s), s	2.1	17.9	18.0	1.7	5.9		1.9	4.8		13.3	1.4	5.7
Cycle Queue Clearance Time (g_c), s	2.1	17.9	18.0	1.7	5.9		1.9	4.8		13.3	1.4	5.7
Green Ratio (*g/C*)	0.40	0.36	0.36	0.40	0.35		0.03	0.07		0.22	0.26	0.26
Capacity (*c*), veh/h	431	622	618	212	1169		54	115		702	452	383
Volume-to-Capacity Ratio (*X*)	0.179	0.759	0.759	0.294	0.366		0.816	0.916		0.894	0.098	0.377
Back of Queue (*Q*), ft/ln (95 th percentile)	32.7	319.9	307	27.6	90.8		56.5	164.8		263.9	24.2	85.4
Back of Queue (*Q*), veh/ln (95 th percentile)	1.3	12.3	12.3	1.1	3.5		2.2	6.3		10.1	0.9	3.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.16	0.00	0.00	0.39	0.00		1.41	0.00		0.98	0.00	0.00
Uniform Delay (d_1), s/veh	13.6	24.8	24.9	16.3	13.7		33.6	32.2		26.5	19.6	21.2
Incremental Delay (d_2), s/veh	0.2	5.5	5.5	0.8	0.7		32.4	57.4		14.2	0.0	0.2
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	13.8	30.3	30.4	17.1	14.4	0.0	66.0	89.6		40.7	19.6	21.4
Level of Service (LOS)	B	C	C	B	B	A	E	F		D	B	C
Approach Delay, s/veh / LOS	29.1	C		13.2	B		82.6	F		36.1	D	
Intersection Delay, s/veh / LOS	31.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.4	B	3.0	C	3.4	C	3.1	C
Bicycle LOS Score / LOS	3.1	C	2.7	C	2.2	B	3.4	C

HCS7 Two-Way Stop-Control Report

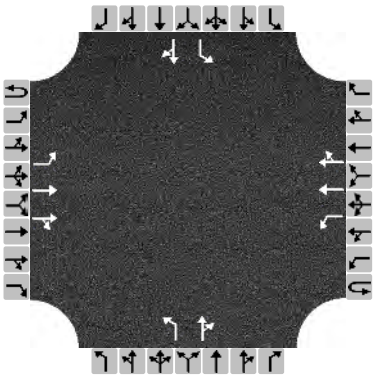
General Information

Analyst	RL
Agency/Co.	HDR
Date Performed	3/7/2018
Analysis Year	2045
Time Analyzed	PM PEAK
Intersection Orientation	East-West
Project Description	I-229/BENSON IMJR

Site Information

Intersection	BENSON/POTSDAM
Jurisdiction	CITY OF SIOUX FALLS
East/West Street	BENSON ROAD
North/South Street	POTSDAM AVENUE
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		1	1	0		1	1	0
Configuration		L	T	TR		L	T	TR		L		TR		L		TR
Volume, V (veh/h)		10	1605	40		60	535	45		10	5	85		55	0	40
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.20				4.20				7.60	6.60	7.00		7.60	6.60	7.00
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.25				2.25				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		11				67				11		100		61		44
Capacity, c (veh/h)		917				319				17		147		25		665
v/c Ratio		0.01				0.21				0.66		0.68		2.46		0.07
95% Queue Length, Q_{95} (veh)		0.0				0.8				1.7		3.8		7.6		0.2
Control Delay (s/veh)		9.0				19.3				407.6		70.0		997.6		10.8
Level of Service, LOS		A				C				F		F		F		B
Approach Delay (s/veh)		0.1				1.8				103.4				584.1		
Approach LOS										F				F		

HCS 2010 Two-Way Stop Control Summary Report

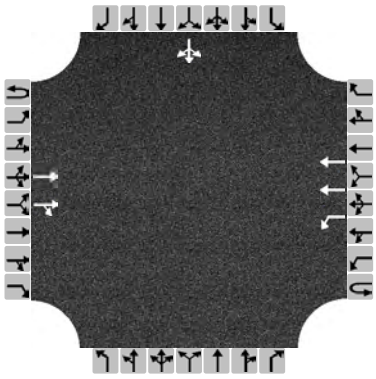
General Information

Analyst	RL
Agency/Co.	HDR
Date Performed	3/7/2018
Analysis Year	2045
Time Analyzed	PM PEAK
Intersection Orientation	East-West
Project Description	I-229/BENSON IMJR

Site Information

Intersection	BENSON/I-229 SB
Jurisdiction	CITY OF SIOUX FALLS
East/West Street	BENSON ROAD
North/South Street	I-229 SB
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

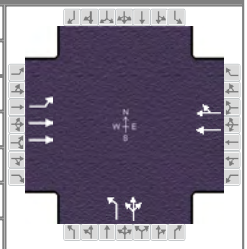
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	1	2	0		0	0	0		0	1	0
Configuration			T	TR		L	T								LTR	
Volume (veh/h)			260	1485		155	580							80	0	60
Percent Heavy Vehicles						5								5	5	5
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)						172									156	
Capacity						288									158	
v/c Ratio						0.60									0.98	
95% Queue Length						3.6									7.5	
Control Delay (s/veh)						34.6									124.8	
Level of Service (LOS)						D									F	
Approach Delay (s/veh)					7.3								124.8			
Approach LOS													F			

HCS 2010 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	PM PEAK	PHF	0.90
Urban Street	BENSON ROAD	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	I-229 NB	File Name	BENSON PM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	90	250			355	195	380	0	95			

Signal Information			
Cycle, s	70.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

								1	2	3	4	
Green	38.0	21.0	0.0	0.0	0.0	0.0						
Yellow	3.5	3.5	0.0	0.0	0.0	0.0						
Red	2.0	2.0	0.0	0.0	0.0	0.0	5	6	7	8		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		
Case Number		6.0		8.0		10.0		
Phase Duration, s		43.5		43.5		26.5		
Change Period, ($Y+R_c$), s		5.5		5.5		5.5		
Max Allow Headway (*MAH*), s		0.0		0.0		5.1		
Queue Clearance Time (g_s), s						19.1		
Green Extension Time (g_e), s		0.0		0.0		2.0		
Phase Call Probability						1.00		
Max Out Probability						0.42		

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16	3	8	18			
Adjusted Flow Rate (*v*), veh/h	55	152			280	259	422	100				
Adjusted Saturation Flow Rate (*s*), veh/h/ln	838	1536			1643	1490	1633	1370				
Queue Service Time (g_s), s	2.7	1.7			7.4	6.7	17.1	3.9				
Cycle Queue Clearance Time (g_c), s	10.2	1.7			7.4	6.7	17.1	3.9				
Green Ratio (*g/C*)	0.54	0.54			0.54	0.54	0.30	0.30				
Capacity (*c*), veh/h	469	1666			891	808	491	412				
Volume-to-Capacity Ratio (*X*)	0.117	0.091			0.314	0.320	0.861	0.243				
Back of Queue (*Q*), ft/ln (95 th percentile)	22.2	21.2			98.4	89.3	298.6	51				
Back of Queue (*Q*), veh/ln (95 th percentile)	0.9	0.8			3.8	3.6	11.5	2.0				
Queue Storage Ratio (*RQ*) (95 th percentile)	0.22	0.00			0.00	0.00	0.00	0.00				
Uniform Delay (d_1), s/veh	11.9	7.7			8.8	8.9	23.1	18.5				
Incremental Delay (d_2), s/veh	0.2	0.0			0.9	1.0	10.3	0.4				
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0	0.0	0.0				
Control Delay (*d*), s/veh	12.1	7.8			9.8	9.9	33.4	18.9				
Level of Service (LOS)	B	A			A	A	C	B				
Approach Delay, s/veh / LOS	8.9	A		9.8	A		30.6	C		0.0		
Intersection Delay, s/veh / LOS	18.2						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.0	B	1.9	A	3.0	C	3.1	C
Bicycle LOS Score / LOS	2.8	C	2.9	C	3.0	C		

HCS 2010 Two-Way Stop Control Summary Report

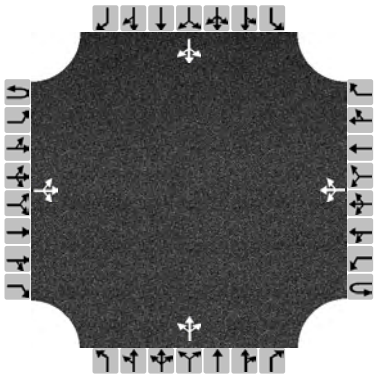
General Information

Analyst	RL
Agency/Co.	HDR
Date Performed	3/7/2018
Analysis Year	2045
Time Analyzed	PM PEAK
Intersection Orientation	East-West
Project Description	I-229/BENSON IMJR

Site Information

Intersection	BENSON/HALL
Jurisdiction	CITY OF SIOUX FALLS
East/West Street	BENSON ROAD
North/South Street	HALL AVENUE
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		35	175	135		50	335	20		180	20	95		20	20	35
Percent Heavy Vehicles		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		39				56					328				83	
Capacity		1151				1201					287				312	
v/c Ratio		0.03				0.05					1.14				0.27	
95% Queue Length		0.1				0.1					14.0				1.0	
Control Delay (s/veh)		8.2				8.1					136.7				20.7	
Level of Service (LOS)		A				A					F				C	
Approach Delay (s/veh)	1.2				1.4				136.7				20.7			
Approach LOS									F				C			

HCS7 Streets Text Report

File Name:	BENSON PM.xus
Analyst:	RL
Agency/Co.:	HDR
Analysis Date:	Mar 8, 2018
Time Period:	PM PEAK
Jurisdiction:	CITY OF SIOUX FALLS
Analysis Year:	2045
Project Description:	I-229/BENSON IMJR
Urban Street:	BENSON ROAD
Analysis Period:	1> 7:00

Input

URBAN STREET PARAMETERS

Number of Intersections	3
Number of Segments	2
Analysis period duration, h	0.25
System cycle length, s	70
Urban street forward direction	EB
Sneakers per cycle, veh	2
Saturation flow rate, veh/h/ln	1900
Stored vehicle lane length, ft	25
Detected vehicle length, ft	17
Queue length percent	95
Critical merge gap, s	3.7
Stop threshold speed, mph	5
Acceleration rate, ft/s/s	3.5
Decel. rate (signal), ft/s/s	4
Minimum headway in a platoon, s/veh	1.5
Maximum headway in a platoon, s/veh	3.6
Number of iterations	15
Length of left-turn bay (access pt.), ft	250
Decel. rate (access pt.), ft/s/s	6.7
Right-turn speed (access pt.), ft/s	20
Critical gap from major left (access pt.), s	4.1
Follow-up time from major left (access pt.), s	2.2
Right-turn equivalency factor (access pt.)	2.2
Stored heavy vehicle lane length, ft	45
Proportion of peds who push button	0.51
Critical gap for permissive left-turn, s	4.5
Follow-up time for permissive left-turn, s	2.5
Calibration factor for platoon dispersion	0.14
Average ratio of speed limit to free-flow speed	0.9

BASIC SEGMENT INFORMATION

Seg	Spd Lmt		TH Lanes		Seg Len		IntWid		LenRM		PctCurb		Other Dly	
Num	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
1	40	40	2	2	2610	2610	50	50	0	0	70	70	0	0
2	40	40	2	2	2990	2990	50	50	0	0	70	70	0	0

ORIGIN-DESTINATION SEED PROPORTIONS - Forward Direction

	Cross LT	Major TH	Cross RT	MidEntry
Downstream Left	0.02	0.1	0.05	0.02
Downstream Thru	0.91	0.78	0.92	0.97
Downstream Right	0.05	0.1	0.02	0.01
Mid-segment Exit	0.02	0.02	0.01	0

ORIGIN-DESTINATION SEED PROPORTIONS - Reverse Direction

	Cross LT	Major TH	Cross RT	MidEntry
Downstream Left	0.02	0.1	0.05	0.02
Downstream Thru	0.91	0.78	0.92	0.97
Downstream Right	0.05	0.1	0.02	0.01
Mid-segment Exit	0.02	0.02	0.01	0

ACCESS POINT DATA

SEGMENT 1

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	850	20	0	665	0	30	0	45	40	0	35
1: Lanes	1	2	0	1	2	0	0	1	0	0	1	0
1: Location, ft	1320											
1: Peak Hour Factor	1											

Number of access points: 1

SEGMENT 2

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	1510	0	0	545	40	0	0	0	145	0	0
1: Lanes	1	2	0	0	2	0	0	0	0	1	0	1
1: Location, ft	700											
1: Peak Hour Factor	1											
2: Volume, veh/h	5	1435	25	40	340	30	10	5	95	70	0	40
2: Lanes	1	2	0	1	2	0	1	1	0	0	1	0
2: Location, ft	1410											
2: Peak Hour Factor	1											
3: Volume, veh/h	0	170	1430	25	380	0	0	0	0	0	0	30
3: Lanes	0	2	0	1	2	0	0	0	0	0	1	0
3: Location, ft	1920											
3: Peak Hour Factor	1											

Number of access points: 3

Global Output

SEGMENT DATA

Seg.No.	Movement	EB LT 5	EB TH 2	EB RT 12	WB LT 1	WB TH 6	WB RT 16
1	Bay/Lane Spillback Time, h	999	999	999	999	999	999
1	ShrdLane Spillback Time, h	999			999		
1	Base Free-Flow Speed, mph		44.07			44.07	
1	Running Time, s		43.05			42.82	
1	Running Speed, mph		41.33			41.56	
1	Through Delay, s/veh		30.42			20.44	
1	Travel Speed, mph		24.22			28.13	
1	Stop Rate, stops/veh		0.92			0.67	
1	Spatial Stop Rate, stops/mi		1.87			1.36	
1	Through vol/cap ratio		0.77			0.45	
1	Percent of Base FFS		54.96			63.83	
1	Level of Service		C			C	
1	Automobile Perception Score		2.43			2.35	
2	Bay/Lane Spillback Time, h	999	999	999	999	999	999
2	ShrdLane Spillback Time, h	999			999		999
2	Base Free-Flow Speed, mph		44.07			44.07	
2	Running Time, s		49.96			48.72	
2	Running Speed, mph		40.81			41.84	
2	Through Delay, s/veh		7.47			16.04	
2	Travel Speed, mph		35.5			31.48	
2	Stop Rate, stops/veh		0.3			0.52	
2	Spatial Stop Rate, stops/mi		0.52			0.91	
2	Through vol/cap ratio		0.09			0.43	
2	Percent of Base FFS		80.56			71.43	
2	Level of Service		A			B	
2	Automobile Perception Score		2.27			2.38	

Facility Travel Time, s	130.89	128.02
Facility Travel Speed, mph	29.17	29.83
Facility Spatial Stop Rate, stops/mi	1.15	1.12
Facility Base Free Flow Speed, mph	44.07	44.07
Facility Percent Base Free Flow Speed	66.19	67.67
Facility Level of Service	C	B
Facility Automobile Perception Score	2.34	2.36
Facility Pedestrian Space	∞	∞
Facility Pedestrian Travel Speed	4.25	4.25
Facility Pedestrian LOS Score	3.4	3.08
Facility Pedestrian LOS	C	C
Facility Bicycle Travel Speed	13.44	13.81
Facility Bicycle LOS Score	2.97	2.79
Facility Bicycle LOS	C	C
Facility Transit Travel Speed	24.25	28.52
Facility Transit LOS Score	1.06	0.95
Facility Transit LOS	A	A

SPILLBACK TIME, h 999

Multimodal Results

1	Average Pedestrian Space, ft2/p	∞	∞
1	Pedestrian Travel Speed, ft/s	4.18	4.18
1	Ped LOS Score for Intersection	2.1	2.87
1	Cross-section Adjustment Factor	-4.74	-4.74
1	Volume Adjustment Factor	1.1	0.89
1	Speed Adjustment Factor	0.68	0.69
1	Ped LOS Score for Link	3.09	2.89
1	Ped Link LOS	C	C
1	Roadway Crossing Difficulty Factor	0.99	0.84
1	Ped LOS Score for Segment	3.13	2.71
1	Ped Segment LOS	C	B
1	Bicycle Travel Speed	13.3	13.36
1	Bicycle LOS Score for Intersection	3.11	2.87
1	Cross-section Adjustment Factor	-1.28	-1.28
1	Volume Adjustment Factor	2.43	2.32
1	Speed Adjustment Factor	0.84	0.85
1	Pavement Adjustment Factor	0.58	0.58
1	Bicycle LOS Score for Link	3.33	3.23
1	Bicycle Link LOS	C	C
1	Number of access point approaches	0	0
1	Segment Length, ft	2610	2610
1	Unsignalized Conflicts Factor	-0.7	-0.7
1	Bicycle LOS Score for Segment	2.89	2.8
1	Bicycle Segment LOS	C	C
1	Transit Running Speed, mi/h	41.33	41.56
1	g/C Ratio	0.36	0.37
1	Transit Running Time, s	43.05	42.82
1	Delay at Intersection, s/veh	30.34	19.57
1	Transit Travel Speed, mi/h	24.25	28.52
1	Transit Wait-Ride Score	3.38	3.59
1	Ped LOS Score for Link	3.09	2.89
1	Transit LOS Score for Segment	1.4	1.05
1	Transit Segment LOS	A	A
2	Average Pedestrian Space, ft2/p	∞	∞
2	Pedestrian Travel Speed, ft/s	4.31	4.31
2	Ped LOS Score for Intersection	2.04	2.7
2	Cross-section Adjustment Factor	-4.74	-4.74
2	Volume Adjustment Factor	1.9	0.93
2	Speed Adjustment Factor	0.67	0.7
2	Ped LOS Score for Link	3.87	2.94
2	Ped Link LOS	D	C
2	Roadway Crossing Difficulty Factor	0.96	1.16
2	Ped LOS Score for Segment	3.64	3.41
2	Ped Segment LOS	D	C
2	Bicycle Travel Speed	13.56	14.24
2	Bicycle LOS Score for Intersection	2.79	2.74
2	Cross-section Adjustment Factor	-1.28	-1.28
2	Volume Adjustment Factor	2.71	2.35
2	Speed Adjustment Factor	0.84	0.85
2	Pavement Adjustment Factor	0.58	0.58
2	Bicycle LOS Score for Link	3.6	3.25
2	Bicycle Link LOS	D	C
2	Number of access point approaches	0	0
2	Segment Length, ft	2990	2990
2	Unsignalized Conflicts Factor	-0.7	-0.7
2	Bicycle LOS Score for Segment	3.04	2.79
2	Bicycle Segment LOS	C	C
2	Transit Running Speed, mi/h	40.81	41.84
2	g/C Ratio	0.54	0.35
2	Transit Running Time, s	49.96	48.72
2	Delay at Intersection, s/veh	7.47	16.04
2	Transit Travel Speed, mi/h	35.5	31.48
2	Transit Wait-Ride Score	3.88	3.72
2	Ped LOS Score for Link	3.87	2.94
2	Transit LOS Score for Segment	0.76	0.86
2	Transit Segment LOS	A	A

ACCESS POINT DATA

SEGMENT 1

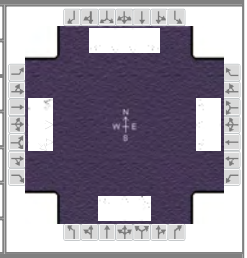
	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	944	22.2	0	783	0	30	0	45	40	0	35
1: Lanes	1	2	0	1	2	0	0	1	0	0	1	0
1: Prop blocked	0.1	0	0	0.17	0	0	0.17	0.17	0.17	0.17	0.17	0.1
1: Thru veh delay		0.02			0							
1: Prob inside blk		0			0							
1: Dist to upstream signal	1320											

SEGMENT 2

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	1669	0	0	661	48.5	0	0	0	145	0	0
1: Lanes	1	2	0	0	2	0	0	0	0	1	0	1
1: Prop blocked	0	0	0	0.41	0	0	0.41	0.41	0.41	0.41	0.41	0
1: Thru veh delay		0			0.04							
1: Prob inside blk		0			0							
1: Dist to upstream signal	700											
2: Volume, veh/h	6.19	1777	31	77.6	660	58.2	10	5	95	70	0	40
2: Lanes	1	2	0	1	2	0	1	1	0	0	1	0
2: Prop blocked	0	0	0	0.43	0	0	0.43	0.43	0.43	0.43	0.43	0
2: Thru veh delay		0.04			0.04							
2: Prob inside blk		0			0							
2: Dist to upstream signal	1410											
3: Volume, veh/h	0	206	1736	50.3	765	0	0	0	0	0	0	30
3: Lanes	0	2	0	1	2	0	0	0	0	0	1	0
3: Prop blocked	0	0	0	0.46	0	0	0.46	0.46	0.46	0.46	0.46	0
3: Thru veh delay		0			0							
3: Prob inside blk		0			0							
3: Dist to upstream signal	1920											

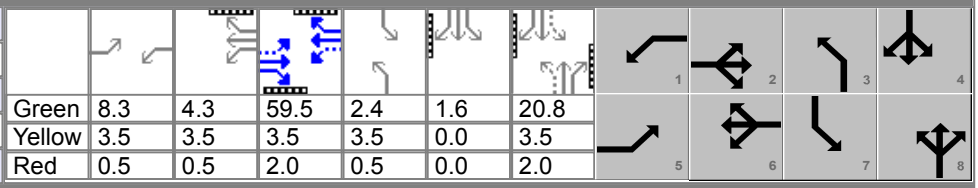
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	AM	PHF	0.90
Urban Street	RICE STREET	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	CLIFF AVENUE	File Name	RICE AM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	150	390	55	365	490	720	25	395	65	75	225	50

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	8.3	4.3	59.5	2.4	1.6	20.8
Yellow	3.5	3.5	3.5	3.5	0.0	3.5
Red	0.5	0.5	2.0	0.5	0.0	2.0

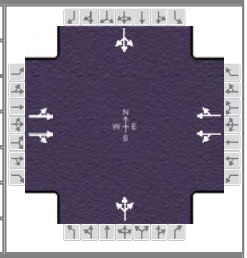
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	3.0
Phase Duration, s	12.3	65.0	20.7	73.4	6.4	26.3	8.0	27.9
Change Period, ($Y+R_c$), s	4.0	5.5	4.0	5.5	4.0	5.5	4.0	5.5
Max Allow Headway (*MAH*), s	4.1	0.0	4.1	0.0	4.1	4.1	4.1	4.1
Queue Clearance Time (g_s), s	8.1		15.3		3.7	18.5	6.0	10.0
Green Extension Time (g_e), s	0.3	0.0	1.4	0.0	0.0	2.3	0.0	2.8
Phase Call Probability	1.00		1.00		0.60	1.00	0.94	1.00
Max Out Probability	0.15		0.00		1.00	0.14	1.00	0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	167	239	234	386	519	455	28	245	239	83	250	28
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1594	1674	1625	1594	1674	1418	1647	1730	1674	1647	1647	
Queue Service Time (g_s), s	6.1	10.1	10.1	13.3	22.4	23.6	1.7	16.3	16.5	4.0	8.0	
Cycle Queue Clearance Time (g_c), s	6.1	10.1	10.1	13.3	22.4	23.6	1.7	16.3	16.5	4.0	8.0	
Green Ratio (*g/C*)	0.57	0.50	0.50	0.65	0.57	0.57	0.19	0.17	0.17	0.21	0.19	
Capacity (*c*), veh/h	472	831	806	640	947	802	207	300	290	147	614	
Volume-to-Capacity Ratio (*X*)	0.353	0.287	0.290	0.604	0.548	0.567	0.134	0.817	0.823	0.568	0.407	
Back of Queue (*Q*), ft/ln (95 th percentile)	104.5	193.6	177	200.1	334.1	303.7	32.2	316.8	300.6	40	153.8	
Back of Queue (*Q*), veh/ln (95 th percentile)	3.9	7.2	7.1	7.5	12.5	11.3	1.2	12.2	12.0	1.5	5.9	
Queue Storage Ratio (*RQ*) (95 th percentile)	1.04	0.00	0.00	1.25	0.00	0.00	0.29	0.00	0.00	0.27	0.00	
Uniform Delay (d_1), s/veh	14.0	17.8	17.8	10.8	15.2	15.4	40.0	47.8	47.8	44.2	43.0	
Incremental Delay (d_2), s/veh	0.4	0.9	0.9	0.7	1.7	2.2	0.3	8.1	8.9	5.1	0.4	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	14.4	18.6	18.7	11.5	16.9	17.5	40.3	55.9	56.7	49.3	43.4	0.0
Level of Service (LOS)	B	B	B	B	B	B	D	E	E	D	D	A
Approach Delay, s/veh / LOS	17.6	B		15.6	B		55.4	E		41.4	D	
Intersection Delay, s/veh / LOS	26.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.1	C	3.2	C	3.6	D	2.7	C
Bicycle LOS Score / LOS	2.5	B	4.6	E	2.7	C	2.6	C

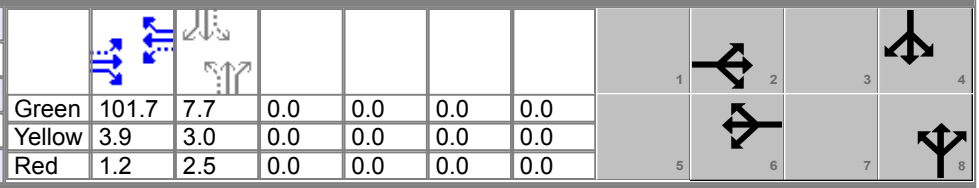
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	AM	PHF	0.90
Urban Street	RICE STREET	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	WAYLAND AVE	File Name	RICE AM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	20	490	20	10	1550	50	10	15	0	45	10	15

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	101.7	7.7	0.0	0.0	0.0	0.0						
Yellow	3.9	3.0	0.0	0.0	0.0	0.0						
Red	1.2	2.5	0.0	0.0	0.0	0.0						

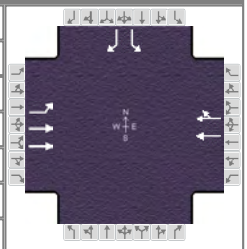
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		106.8		106.8		13.2		13.2
Change Period, ($Y+R_c$), s		5.1		5.1		5.5		5.5
Max Allow Headway (*MAH*), s		0.0		0.0		4.2		4.2
Queue Clearance Time (g_s), s						3.8		7.7
Green Extension Time (g_e), s		0.0		0.0		0.3		0.3
Phase Call Probability						0.96		0.96
Max Out Probability						0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	270		308	889		808		28			72	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1228		1513	1666		1512		1655			1478	
Queue Service Time (g_s), s	1.7		2.5	0.0		27.1		0.0			4.0	
Cycle Queue Clearance Time (g_c), s	28.9		2.5	26.8		27.1		1.8			5.7	
Green Ratio (*g/C*)	0.85		0.85	0.85		0.85		0.06			0.06	
Capacity (*c*), veh/h	1073		1282	1442		1281		148			146	
Volume-to-Capacity Ratio (*X*)	0.252		0.240	0.617		0.631		0.187			0.495	
Back of Queue (*Q*), ft/ln (95 th percentile)	20.2		22.5	279.4		261.8		37.9			103.7	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.8		0.9	11.2		10.5		1.5			4.1	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00	0.00		0.00		0.00			0.00	
Uniform Delay (d_1), s/veh	0.9		0.8	4.8		4.8		53.4			55.2	
Incremental Delay (d_2), s/veh	0.5		0.4	1.1		1.3		0.6			2.6	
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0		0.0			0.0	
Control Delay (*d*), s/veh	1.5		1.2	5.9		6.1		54.0			57.8	
Level of Service (LOS)	A		A	A		A		D			E	
Approach Delay, s/veh / LOS	1.3	A		6.0	A		54.0	D		57.8	E	
Intersection Delay, s/veh / LOS	7.0						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.2	B	2.2	B	3.1	C	3.1	C
Bicycle LOS Score / LOS	2.6	C	3.6	D	2.7	C	2.8	C

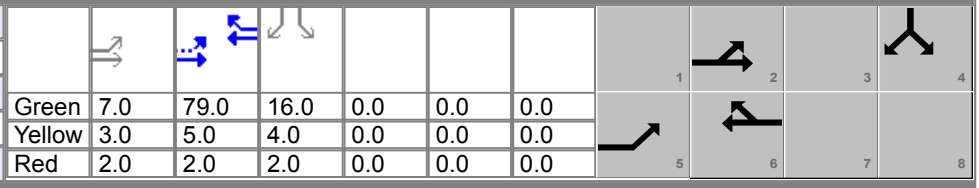
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	AM	PHF	0.90
Urban Street	RICE STREET	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	I-229 SB	File Name	RICE AM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	130	520			1540	560				80		55

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	75	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	7.0	79.0	16.0	0.0	0.0	0.0						
Yellow	3.0	5.0	4.0	0.0	0.0	0.0						
Red	2.0	2.0	2.0	0.0	0.0	0.0						

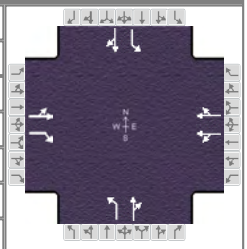
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	1.0	4.0		8.3				9.0
Phase Duration, s	12.0	98.0		86.0				22.0
Change Period, (*Y+R c*), s	5.0	7.0		7.0				6.0
Max Allow Headway (*MAH*), s	4.1	0.0		0.0				4.2
Queue Clearance Time (*g s*), s	9.0							18.0
Green Extension Time (*g e*), s	0.0	0.0		0.0				0.0
Phase Call Probability	0.99							0.99
Max Out Probability	1.00							1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16				7		14
Adjusted Flow Rate (*v*), veh/h	142	566			1002	1002				89		61
Adjusted Saturation Flow Rate (*s*), veh/h/ln	645	1673			1948	1830				377		1439
Queue Service Time (*g s*), s	7.0	6.6			59.7	52.9				16.0		4.6
Cycle Queue Clearance Time (*g c*), s	7.0	6.6			59.7	52.9				16.0		4.6
Green Ratio (*g/C*)	0.73	0.76			0.66	0.66				0.13		0.13
Capacity (*c*), veh/h	111	2538			1282	1205				50		192
Volume-to-Capacity Ratio (*X*)	1.277	0.223			0.781	0.831				1.768		0.319
Back of Queue (*Q*), ft/ln (95 th percentile)	527.8	91.5			534.8	601.7				589.7		76.3
Back of Queue (*Q*), veh/ln (95 th percentile)	12.9	3.7			21.4	24.1				13.1		3.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00			0.00	0.00				0.00		0.00
Uniform Delay (*d 1*), s/veh	31.6	4.9			16.5	19.3				52.0		47.1
Incremental Delay (*d 2*), s/veh	176.5	0.2			0.5	0.7				414.2		0.9
Initial Queue Delay (*d 3*), s/veh	0.0	0.0			0.0	0.0				0.0		0.0
Control Delay (*d*), s/veh	208.0	5.1			17.0	20.0				466.2		48.0
Level of Service (LOS)	F	A			B	C				F		D
Approach Delay, s/veh / LOS	45.7	D		18.5	B		0.0			295.8	F	
Intersection Delay, s/veh / LOS	39.8						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	0.6	A	2.2	B	3.1	C	2.9	C
Bicycle LOS Score / LOS	1.1	A	2.2	B				F

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	AM	PHF	0.90
Urban Street	RICE STREET	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	I-229 NB	File Name	RICE AM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	75	205	320	75	1460	25	405	330	65	70	10	235

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4
Green	66.0	4.0	32.0	0.0	0.0	0.0	5	6	7	8
Yellow	4.0	4.0	4.0	0.0	0.0	0.0				
Red	2.0	2.0	2.0	0.0	0.0	0.0				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8	7	4
Case Number		7.0		8.0		6.3	1.0	4.0
Phase Duration, s		72.0		72.0		38.0	10.0	48.0
Change Period, ($Y+R_c$), s		6.0		6.0		6.0	6.0	6.0
Max Allow Headway (*MAH*), s		0.0		0.0		6.4	6.0	6.4
Queue Clearance Time (g_s), s						34.0	6.0	12.8
Green Extension Time (g_e), s		0.0		0.0		0.0	0.0	11.1
Phase Call Probability						1.00	0.93	1.00
Max Out Probability						1.00	1.00	0.22

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h		281	191	866		856	450	411		78	167	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		208	1365	1484		1630	1190	1691		1594	1374	
Queue Service Time (g_s), s		6.3	9.9	0.0		59.7	31.2	28.3		4.0	10.8	
Cycle Queue Clearance Time (g_c), s		66.0	9.9	66.0		59.7	32.0	28.3		4.0	10.8	
Green Ratio (*g/C*)		0.55	0.55	0.55		0.55	0.27	0.27		0.32	0.35	
Capacity (*c*), veh/h		153	751	849		896	370	451		142	481	
Volume-to-Capacity Ratio (*X*)		1.844	0.254	1.021		0.955	1.217	0.912		0.549	0.347	
Back of Queue (*Q*), ft/ln (95 th percentile)		938.6	157.9	1027.1		877.3	914.1	543.9		90.1	171.4	
Back of Queue (*Q*), veh/ln (95 th percentile)		35.0	5.9	41.1		35.1	35.2	20.9		3.4	6.4	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00	0.00		0.00	6.09	0.00		0.90	0.00	
Uniform Delay (d_1), s/veh		33.7	16.6	26.5		27.0	46.9	42.6		34.7	28.9	
Incremental Delay (d_2), s/veh		401.7	0.7	36.2		20.9	120.0	23.4		7.7	0.9	
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh		435.3	17.3	62.7		47.9	166.9	66.1		42.4	29.8	
Level of Service (LOS)		F	B	F		D	F	E		D	C	
Approach Delay, s/veh / LOS	266.3	F		55.4	E		118.8	F		33.8	C	
Intersection Delay, s/veh / LOS	100.5						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.6	C	2.7	C	2.8	C	3.7	D
Bicycle LOS Score / LOS	3.2	C	2.0	B	3.6	D	2.6	C

HCS7 Two-Way Stop-Control Report

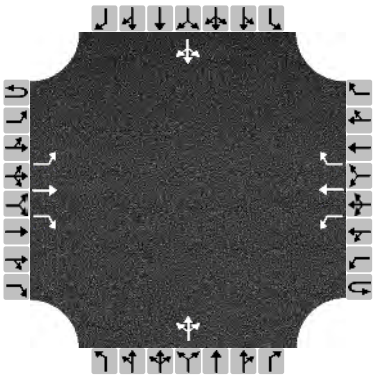
General Information

Analyst	RL
Agency/Co.	HDR
Date Performed	3/8/2018
Analysis Year	2045
Time Analyzed	AM PEAK
Intersection Orientation	East-West
Project Description	I-229/BENSON IMJR

Site Information

Intersection	BAHNSON AVENUE
Jurisdiction	CITY OF SIOUX FALLS
East/West Street	RICE STREET
North/South Street	BAHNSON AVENUE
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	1	0	1	1	1		0	1	0		0	1	0
Configuration		L	T	R		L	T	R			LTR				LTR	
Volume, V (veh/h)		40	260	40		10	1465	10		15	10	10		10	25	80
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		44				11					39				128	
Capacity, c (veh/h)		392				1219					12				79	
v/c Ratio		0.11				0.01					3.21				1.62	
95% Queue Length, Q_{95} (veh)		0.4				0.0					5.9				10.6	
Control Delay (s/veh)		15.3				8.0					1622.9				420.2	
Level of Service, LOS		C				A					F				F	
Approach Delay (s/veh)		1.8				0.1				1622.9				420.2		
Approach LOS										F				F		

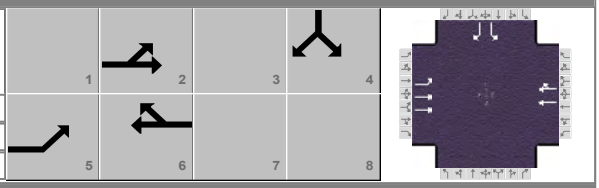
HCS7 Interchanges Results Summary

General Information				Interchange Information	
Agency	HDR			Interchange Type	Parclo AB-2Q
Analyst	RL	Analysis Date	Mar 8, 2018	Segment Distance, ft	1020
Jurisdiction	CITY OF SIOUX FALLS	Duration, h	0.25	Freeway Direction	North-South
Intersection	I-229 NB	PHF	0.90	Arterial Direction	East-West
File Name	RICE AM.xus				
Project Description	I-229/BENSON IMJR				

Demand	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection One Demand (*v*), veh/h	130	520			1540	560				80		55
Intersection Two Demand (*v*), veh/h	75	205	320	75	1460	25	405	330	65	70	10	235

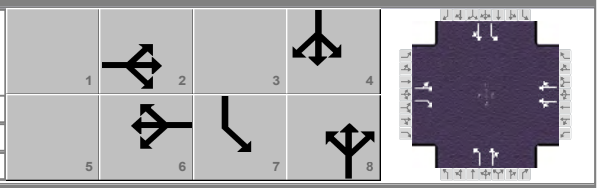
Signal One Information	
Cycle, s	120.0
Offset, s	0
Uncoordinated	No
Force Mode	Fixed

Green	7.0	79.0	16.0	0.0	0.0	0.0
Yellow	3.0	5.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



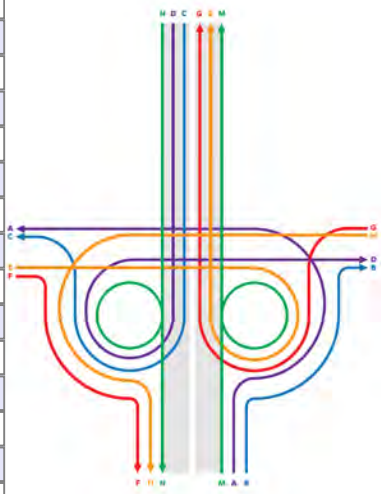
Signal Two Information	
Cycle, s	120.0
Offset, s	0
Uncoordinated	No
Force Mode	Fixed

Green	66.0	4.0	32.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Interchange Results

O-D	Demand (veh/h)	Delay (s)	EDTT	ETT	v/c > 1 ?	R_Q > 1 ?	LOS
A	120	183.9	0.0	183.9	Yes	Yes	F
B	44	66.1	0.0	66.1	No	No	D
C	0	0.0	5.0	5.0	No	No	A
D	0	0.0	5.0	5.0	No	No	A
E	191	22.4	5.0	27.4	Yes	No	B
F	0	5.1	0.0	5.1	No	No	A
G	83	62.7	5.0	67.7	Yes	No	F
H	0	0.0	0.0	0.0	No	No	A
I	536	5.1	0.0	5.1	Yes	No	A
J	1195	17.0	0.0	17.0	No	No	B
K	-	-	0.0	-	-	-	-
L	-	-	0.0	-	-	-	-
M	330	-	0.0	-	-	-	-
N	0	-	0.0	-	-	-	-



Signalized Intersection One Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Control Delay (*d*) , s/veh	208.0	5.1			17.0	20.0				466.2		48.0
Level of Service (LOS)	F	A			B	C				F		D
Approach Delay, s/veh / LOS	45.7	D		18.5	B		0.0			295.8	F	
Intersection Delay, s/veh / LOS	39.8						D					

Signalized Intersection Two Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Control Delay (*d*) , s/veh		435.3	17.3	62.7		47.9	166.9	66.1		42.4	29.8	
Level of Service (LOS)		F	B	F		D	F	E		D	C	
Approach Delay, s/veh / LOS	266.3	F		55.4	E		118.8	F		33.8	C	
Intersection Delay, s/veh / LOS	100.5						F					

This Urban Streets text report was created on March 12, 2018 at 10:26:54

Period number = 1

Input

URBAN STREET PARAMETERS

Number of Intersections	4
Number of Segments	3
Analysis period duration, h	0.25
System cycle length, s	120
Urban street forward direction	EB
Sneakers per cycle, veh	2
Saturation flow rate, veh/h/ln	1900
Stored vehicle lane length, ft	25
Detected vehicle length, ft	17
Queue length percent	95
Critical merge gap, s	3.7
Stop threshold speed, mph	5
Acceleration rate, ft/s/s	3.5
Decel. rate (signal), ft/s/s	4
Minimum headway in a platoon, s/veh	1.5
Maximum headway in a platoon, s/veh	3.6
Number of iterations	15
Length of left-turn bay (access pt.), ft	250
Decel. rate (access pt.), ft/s/s	6.7
Right-turn speed (access pt.), ft/s	20
Critical gap from major left (access pt.), s	4.1
Follow-up time from major left (access pt.), s	2.2
Right-turn equivalency factor (access pt.)	2.2
Stored heavy vehicle lane length, ft	45
Proportion of peds who push button	0.51
Critical gap for permissive left-turn, s	4.5
Follow-up time for permissive left-turn, s	2.5
Calibration factor for platoon dispersion	0.14
Average ratio of speed limit to free-flow speed	0.9

BASIC SEGMENT INFORMATION

Seg	Spd Lmt		TH Lanes		Seg Len		IntWid		LenRM		PctCurb		Other Dly	
Num	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
1	35	35	2	1	1020	1020	50	50	0	0	70	70	0	0
2	35	35	2	2	3460	3460	50	50	0	0	70	70	0	0
3	35	35	1	2	1020	1020	50	50	0	0	70	70	0	0

ORIGIN-DESTINATION SEED PROPORTIONS - Forward Direction

	Cross LT	Major TH	Cross RT	MidEntry
Downstream Left	0.02	0.1	0.05	0.02
Downstream Thru	0.91	0.78	0.92	0.97
Downstream Right	0.05	0.1	0.02	0.01
Mid-segment Exit	0.02	0.02	0.01	0

ORIGIN-DESTINATION SEED PROPORTIONS - Reverse Direction

	Cross LT	Major TH	Cross RT	MidEntry
Downstream Left	0.02	0.1	0.05	0.02
Downstream Thru	0.91	0.78	0.92	0.97
Downstream Right	0.05	0.1	0.02	0.01
Mid-segment Exit	0.02	0.02	0.01	0

ACCESS POINT DATA

SEGMENT 1

Number of access points: 0

SEGMENT 2

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	520	15	20	1575	0	35	0	130	0	0	0
1: Lanes	0	2	0	1	2	0	0	1	0	0	0	0
1: Location, ft	3030											
1: Peak Hour Factor	1											

Number of access points: 1

SEGMENT 3

Number of access points: 0

Global Output

SEGMENT DATA

Seg.No.	Movement	EB LT 5	EB TH 2	EB RT 12	WB LT 1	WB TH 6	WB RT 16
1	Bay/Lane Spillback Time, h	999	999	999	999	999	999
1	ShrdLane Spillback Time, h				999.27		
1	Base Free-Flow Speed, mph		41.72			41.72	
1	Running Time, s		20.03			23.1	
1	Running Speed, mph		34.71			30.1	
1	Through Delay, s/veh		1.33			16.88	
1	Travel Speed, mph		32.55			17.39	
1	Stop Rate, stops/veh		0.05			0.48	
1	Spatial Stop Rate, stops/mi		0.26			2.51	
1	Through vol/cap ratio		0.25			0.55	
1	Percent of Base FFS		78.01			41.69	
1	Level of Service		B			D	
1	Automobile Perception Score		2.38			2.76	
2	Bay/Lane Spillback Time, h	0	999	999	999	999	999
2	ShrdLane Spillback Time, h						
2	Base Free-Flow Speed, mph		41.72			41.72	
2	Running Time, s		58.48			60.56	
2	Running Speed, mph		40.34			38.95	
2	Through Delay, s/veh		5.08			5.97	
2	Travel Speed, mph		37.11			35.46	
2	Stop Rate, stops/veh		0.22			0.21	
2	Spatial Stop Rate, stops/mi		0.33			0.33	
2	Through vol/cap ratio		0.22			0.62	
2	Percent of Base FFS		88.96			84.99	
2	Level of Service		A			A	
2	Automobile Perception Score		2.29			2.29	
3	Bay/Lane Spillback Time, h	0	0.38	999	999	999	999
3	ShrdLane Spillback Time, h						
3	Base Free-Flow Speed, mph		41.72			41.72	
3	Running Time, s		20.43			21.28	
3	Running Speed, mph		34.04			32.67	
3	Through Delay, s/veh		435.33			18.17	
3	Travel Speed, mph		1.53			17.63	
3	Stop Rate, stops/veh		2.58			0.6	
3	Spatial Stop Rate, stops/mi		13.33			3.12	
3	Through vol/cap ratio		1.84			0.8	
3	Percent of Base FFS		3.66			42.25	
3	Level of Service		F			D	
3	Automobile Perception Score		4.82			2.87	
Facility Travel Time, s			540.69			145.97	
Facility Travel Speed, mph			6.94			25.69	
Facility Spatial Stop Rate, veh/mi			2.73			1.25	
Facility Base Free Flow Speed, mph			41.72			41.72	
Facility Percent Base Free Flow Speed			16.62			61.58	
Facility Level of Service			F			C	
Facility Automobile Perception Score			2.56			2.46	
Facility Pedestrian Space			Infinity			Infinity	
Facility Pedestrian Travel Speed			4.4			4.4	
Facility Pedestrian LOS Score			3.3			3.97	
Facility Pedestrian LOS			C			D	
Facility Bicycle Travel Speed			13.88			13.86	
Facility Bicycle LOS Score			3.49			3.97	
Facility Bicycle LOS			C			D	
Facility Transit Travel Speed			34.04			18.17	
Facility Transit LOS Score			0.56			1.2	
Facility Transit LOS			A			A	
SPILLBACK TIME, h			0.38				

Multimodal Results

1	Roadway crossing difficulty factor	1.2	1.2
1	Ped LOS Score for Link	2.47	5.51
1	Ped LOS Score for Intersection	2.16	3.23
1	Ped LOS Score for Segment	3.44	4.88
1	Ped Segment LOS	C	E
1	Bicycle LOS Score for Link	3.3	4.1
1	Indicator Variable	1	1
1	Bicycle LOS Score for Intersection	2.65	4.62
1	Number of access point approaches	0	0
1	Segment Length, ft	1020	1020
1	Bicycle LOS Score for Segment	3.53	4.62
1	Bicycle Segment LOS	D	E
1	Transit Wait-Ride Score	3.85	2.97
1	Ped LOS Score for Link	2.47	5.51
1	Transit LOS Score for Segment	0.6	2.38
1	Transit Segment LOS	A	B
2	Roadway crossing difficulty factor	1.2	1.2
2	Ped LOS Score for Link	2.65	3.87
2	Ped LOS Score for Intersection	0.65	2.19
2	Ped LOS Score for Segment	3.11	3.98
2	Ped Segment LOS	C	D
2	Bicycle LOS Score for Link	3.37	3.89
2	Indicator Variable	1	1
2	Bicycle LOS Score for Intersection	1.08	3.63
2	Number of access point approaches	0	0
2	Segment Length, ft	3460	3460
2	Bicycle LOS Score for Segment	3.42	3.89
2	Bicycle Segment LOS	C	D
2	Transit Wait-Ride Score	3.94	4
2	Ped LOS Score for Link	2.65	3.87
2	Transit LOS Score for Segment	0.49	0.58
2	Transit Segment LOS	A	A
3	Roadway crossing difficulty factor	1.2	0.86
3	Ped LOS Score for Link	3.19	4.31
3	Ped LOS Score for Intersection	2.59	2.24
3	Ped LOS Score for Segment	3.83	2.99
3	Ped Segment LOS	D	C
3	Bicycle LOS Score for Link	3.66	3.94
3	Indicator Variable	1	1
3	Bicycle LOS Score for Intersection	3.19	2.21
3	Number of access point approaches	0	0
3	Segment Length, ft	1020	1020
3	Bicycle LOS Score for Segment	3.7	3.58
3	Bicycle Segment LOS	D	D
3	Transit Wait-Ride Score	3.82	3.02
3	Ped LOS Score for Link	3.19	4.31
3	Transit LOS Score for Segment	0.74	2.12
3	Transit Segment LOS	A	B

ACCESS POINT DATA

SEGMENT 1

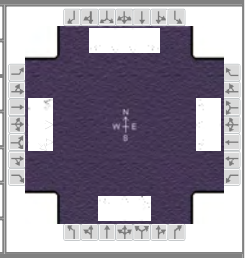
SEGMENT 2

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	578	16.7	21.4	1685	0	35	0	130	0	0	0
1: Lanes	0	2	0	1	2	0	0	1	0	0	0	0
1: Prop blocked	0	0	0	0	0	0	0	0	0	0	0	0
1: Thru veh delay		0.01			0							
1: Prob inside blk		0			0							
1: Dist to upstream signal	3030											

SEGMENT 3

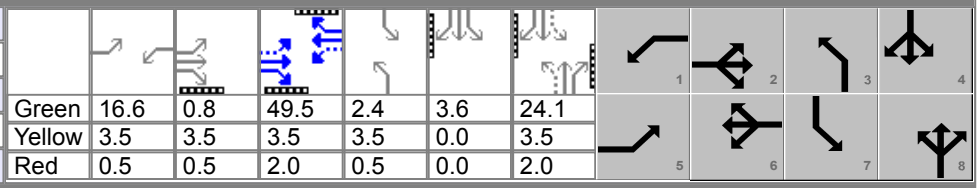
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	PM	PHF	0.90
Urban Street	RICE STREET	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	CLIFF AVENUE	File Name	RICE PM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	395	1300	280	230	285	240	25	275	150	230	570	70

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	16.6	0.8	49.5	2.4	3.6	24.1
Yellow	3.5	3.5	3.5	3.5	0.0	3.5
Red	0.5	0.5	2.0	0.5	0.0	2.0

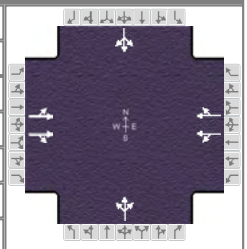
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	3.0	1.1	4.0	1.1	3.0
Phase Duration, s	25.4	59.8	20.6	55.0	6.4	29.6	10.0	33.2
Change Period, ($Y+R_c$), s	4.0	5.5	4.0	5.5	4.0	5.5	4.0	5.5
Max Allow Headway (*MAH*), s	4.1	0.0	4.1	0.0	4.1	4.1	4.1	4.1
Queue Clearance Time (g_s), s	19.9		16.4		3.6	15.6	8.0	24.0
Green Extension Time (g_e), s	1.5	0.0	0.2	0.0	0.0	4.2	0.0	3.7
Phase Call Probability	1.00		1.00		0.60	1.00	1.00	1.00
Max Out Probability	0.01		1.00		1.00	0.08	1.00	0.21

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	439	826	807	253	314	160	28	209	197	256	633	50
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1594	1674	1606	1594	1674	1418	1647	1730	1585	1647	1647	
Queue Service Time (g_s), s	17.9	54.3	54.3	14.4	13.5	7.1	1.6	13.2	13.6	6.0	22.0	
Cycle Queue Clearance Time (g_c), s	17.9	54.3	54.3	14.4	13.5	7.1	1.6	13.2	13.6	6.0	22.0	
Green Ratio (*g/C*)	0.61	0.45	0.45	0.55	0.41	0.41	0.22	0.20	0.20	0.26	0.23	
Capacity (*c*), veh/h	646	758	727	280	691	585	117	347	318	226	760	
Volume-to-Capacity Ratio (*X*)	0.679	1.090	1.111	0.903	0.455	0.273	0.237	0.601	0.619	1.131	0.834	
Back of Queue (*Q*), ft/ln (95 th percentile)	278.9	1231.2	1171.7	406.9	230	110.5	31.8	251.8	232.5	421.4	373.6	
Back of Queue (*Q*), veh/ln (95 th percentile)	10.4	45.9	46.9	15.2	8.6	4.1	1.2	9.7	9.3	16.2	14.4	
Queue Storage Ratio (*RQ*) (95 th percentile)	2.79	0.00	0.00	2.54	0.00	0.00	0.29	0.00	0.00	2.81	0.00	
Uniform Delay (d_1), s/veh	14.5	32.8	32.8	41.3	18.9	17.3	38.8	43.6	43.8	47.6	44.0	
Incremental Delay (d_2), s/veh	1.5	60.0	68.0	26.2	2.0	1.1	1.0	1.7	2.0	99.6	4.9	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	16.0	92.8	100.9	67.5	20.9	18.4	39.9	45.3	45.7	147.2	48.8	0.0
Level of Service (LOS)	B	F	F	E	C	B	D	D	D	F	D	A
Approach Delay, s/veh / LOS	79.7	E		36.6	D		45.1	D		73.0	E	
Intersection Delay, s/veh / LOS	67.1						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.2	C	3.3	C	3.4	C	2.9	C
Bicycle LOS Score / LOS	3.7	D	3.5	C	2.6	C	3.0	C

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	PM	PHF	0.90
Urban Street	RICE STREET	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	WAYLAND AVE	File Name	RICE PM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	20	1615	45	20	725	25	20	0	5	95	5	10

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4
Green	97.5	11.9	0.0	0.0	0.0	0.0	5	6	7	8
Yellow	3.9	3.0	0.0	0.0	0.0	0.0				
Red	1.2	2.5	0.0	0.0	0.0	0.0				

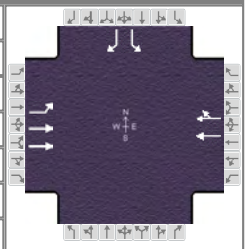
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		102.6		102.6		17.4		17.4
Change Period, ($Y+R_c$), s		5.1		5.1		5.5		5.5
Max Allow Headway (*MAH*), s		0.0		0.0		4.2		4.2
Queue Clearance Time (g_s), s						4.0		11.6
Green Extension Time (g_e), s		0.0		0.0		0.4		0.4
Phase Call Probability						0.99		0.99
Max Out Probability						0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	880		805	409		428		28			117	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1643		1514	1440		1513		1467			1430	
Queue Service Time (g_s), s	0.0		14.8	0.0		8.6		0.0			7.6	
Cycle Queue Clearance Time (g_c), s	14.5		14.8	7.1		8.6		2.0			9.6	
Green Ratio (*g/C*)	0.81		0.81	0.81		0.81		0.10			0.10	
Capacity (*c*), veh/h	1366		1231	1202		1229		199			199	
Volume-to-Capacity Ratio (*X*)	0.644		0.654	0.341		0.348		0.140			0.587	
Back of Queue (*Q*), ft/ln (95 th percentile)	67.2		62.2	82.5		89.6		36.2			165.8	
Back of Queue (*Q*), veh/ln (95 th percentile)	2.7		2.5	3.3		3.6		1.4			6.5	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00	0.00		0.00		0.00			0.00	
Uniform Delay (d_1), s/veh	1.8		1.8	2.7		2.8		49.6			53.0	
Incremental Delay (d_2), s/veh	0.2		0.2	0.6		0.6		0.3			2.7	
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0		0.0			0.0	
Control Delay (*d*), s/veh	2.0		2.0	3.3		3.4		49.9			55.8	
Level of Service (LOS)	A		A	A		A		D			E	
Approach Delay, s/veh / LOS	2.0		A	3.3		A	49.9		D	55.8		E
Intersection Delay, s/veh / LOS	5.3						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.2	B	2.2	B	3.2	C	3.2	C
Bicycle LOS Score / LOS	3.7	D	2.9	C	2.7	C	2.9	C

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	PM	PHF	0.90
Urban Street	RICE STREET	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	I-229 SB	File Name	RICE PM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	255	1490			730	190				240		60

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	65	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4
Green	23.0	49.0	30.0	0.0	0.0	0.0	5	6	7	8
Yellow	3.0	5.0	4.0	0.0	0.0	0.0				
Red	2.0	2.0	2.0	0.0	0.0	0.0				

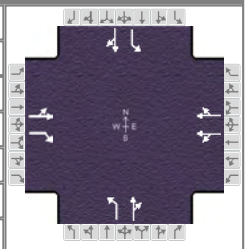
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	1.0	4.0		8.3				9.0
Phase Duration, s	28.0	84.0		56.0				36.0
Change Period, ($Y+R_c$), s	5.0	7.0		7.0				6.0
Max Allow Headway (*MAH*), s	4.1	0.0		0.0				4.2
Queue Clearance Time (g_s), s	25.0							32.0
Green Extension Time (g_e), s	0.0	0.0		0.0				0.0
Phase Call Probability	1.00							1.00
Max Out Probability	1.00							1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16				7		14
Adjusted Flow Rate (*v*), veh/h	260	1520			481	458				267		67
Adjusted Saturation Flow Rate (*s*), veh/h/ln	645	1810			1814	1721				377		1440
Queue Service Time (g_s), s	23.0	29.6			25.7	27.7				30.0		4.4
Cycle Queue Clearance Time (g_c), s	23.0	29.6			25.7	27.7				30.0		4.4
Green Ratio (*g/C*)	0.62	0.64			0.41	0.41				0.25		0.25
Capacity (*c*), veh/h	224	2322			741	703				94		360
Volume-to-Capacity Ratio (*X*)	1.161	0.654			0.649	0.652				2.828		0.185
Back of Queue (*Q*), ft/ln (95 th percentile)	612.5	384.7			423.4	426.4				1965.8		69.9
Back of Queue (*Q*), veh/ln (95 th percentile)	14.9	15.4			16.9	17.1				43.7		2.8
Queue Storage Ratio (*RQ*) (95 th percentile)	7.66	0.00			0.00	0.00				19.66		0.00
Uniform Delay (d_1), s/veh	23.7	12.0			31.8	34.3				45.0		35.4
Incremental Delay (d_2), s/veh	102.1	1.0			2.7	2.9				851.3		0.2
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0				0.0		0.0
Control Delay (*d*), s/veh	125.8	13.0			34.5	37.3				896.3		35.6
Level of Service (LOS)	F	B			C	D				F		D
Approach Delay, s/veh / LOS	29.5	C		35.9	D		0.0			724.1	F	
Intersection Delay, s/veh / LOS	107.3						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	0.7	A	2.3	B	2.9	C	2.9	C
Bicycle LOS Score / LOS	2.1	B	1.3	A				F

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Mar 8, 2018	Area Type	Other
Jurisdiction	CITY OF SIOUX FALLS	Time Period	PM	PHF	0.90
Urban Street	RICE STREET	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	I-229 NB	File Name	RICE PM.xus		
Project Description	I-229/BENSON IMJR				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	135	875	720	170	560	35	230	125	100	365	30	130

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4		
Green	72.0	10.0	20.0	0.0	0.0	0.0	5	6	7	8		
Yellow	4.0	4.0	4.0	0.0	0.0	0.0						
Red	2.0	2.0	2.0	0.0	0.0	0.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8	7	4
Case Number		7.0		8.0		6.3	1.0	4.0
Phase Duration, s		78.0		78.0		26.0	16.0	42.0
Change Period, ($Y+R_c$), s		6.0		6.0		6.0	6.0	6.0
Max Allow Headway (*MAH*), s		0.0		0.0		6.3	6.0	6.3
Queue Clearance Time (g_s), s						22.0	12.0	10.0
Green Extension Time (g_e), s		0.0		0.0		0.0	0.0	5.3
Phase Call Probability						1.00	1.00	1.00
Max Out Probability						1.00	1.00	0.05

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h		906	386	189		644	256	206		406	122	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		955	1408	445		1568	1239	1577		1594	1409	
Queue Service Time (g_s), s		38.5	23.9	0.0		33.5	20.0	15.0		10.0	8.0	
Cycle Queue Clearance Time (g_c), s		72.0	23.9	35.4		33.5	20.0	15.0		10.0	8.0	
Green Ratio (*g/C*)		0.60	0.60	0.60		0.60	0.17	0.17		0.27	0.30	
Capacity (*c*), veh/h		607	845	327		941	266	263		239	423	
Volume-to-Capacity Ratio (*X*)		1.494	0.457	0.578		0.685	0.959	0.782		1.695	0.289	
Back of Queue (*Q*), ft/ln (95 th percentile)		2171.6	287.7	181		449.1	429.3	296.9		1026.3	131.9	
Back of Queue (*Q*), veh/ln (95 th percentile)		81.0	10.7	7.2		18.0	16.5	11.4		38.3	4.9	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00	0.00		0.00	2.86	0.00		10.26	0.00	
Uniform Delay (d_1), s/veh		46.5	21.3	16.7		16.7	51.9	47.9		44.5	32.2	
Incremental Delay (d_2), s/veh		223.4	0.3	7.3		4.0	44.4	16.2		330.4	0.8	
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh		269.9	21.6	23.9		20.8	96.3	64.1		374.9	33.0	
Level of Service (LOS)		F	C	C		C	F	E		F	C	
Approach Delay, s/veh / LOS	195.8	F		21.5	C		81.9	F		295.7	F	
Intersection Delay, s/veh / LOS	149.2						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.6	C	2.6	C	2.9	C	3.9	D
Bicycle LOS Score / LOS	5.0	E	1.3	A	2.9	C	3.0	C

HCS7 Two-Way Stop-Control Report

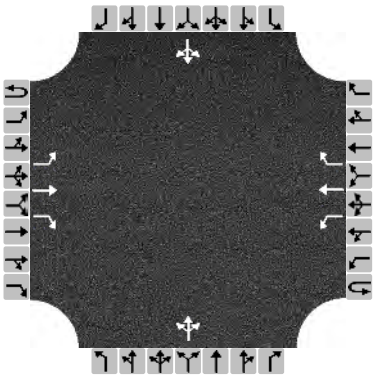
General Information

Analyst	RL
Agency/Co.	HDR
Date Performed	3/8/2018
Analysis Year	2045
Time Analyzed	PM PEAK
Intersection Orientation	East-West
Project Description	I-229/BENSON IMJR

Site Information

Intersection	BAHNSON AVENUE
Jurisdiction	CITY OF SIOUX FALLS
East/West Street	RICE STREET
North/South Street	BAHNSON AVENUE
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	1	0	1	1	1		0	1	0		0	1	0
Configuration		L	T	R		L	T	R			LTR				LTR	
Volume, V (veh/h)		25	1290	25		5	655	5		30	5	5		10	10	80
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		28				6					45				111	
Capacity, c (veh/h)		866				459					21				120	
v/c Ratio		0.03				0.01					2.14				0.92	
95% Queue Length, Q_{95} (veh)		0.1				0.0					5.9				5.9	
Control Delay (s/veh)		9.3				12.9					911.3				130.8	
Level of Service, LOS		A				B					F				F	
Approach Delay (s/veh)		0.2				0.1				911.3				130.8		
Approach LOS										F				F		

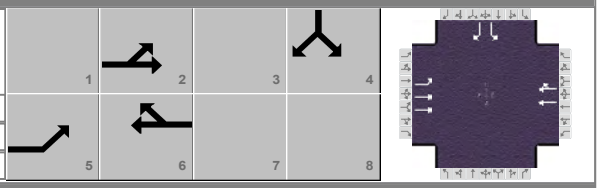
HCS7 Interchanges Results Summary

General Information				Interchange Information	
Agency	HDR			Interchange Type	Parclo AB-2Q
Analyst	RL	Analysis Date	Mar 8, 2018	Segment Distance, ft	1020
Jurisdiction	CITY OF SIOUX FALLS	Duration, h	0.25	Freeway Direction	North-South
Intersection	I-229 NB	PHF	0.90	Arterial Direction	East-West
File Name	RICE PM.xus				
Project Description	I-229/BENSON IMJR				

Demand	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Intersection One Demand (*v*), veh/h	255	1490			730	190				240		60
Intersection Two Demand (*v*), veh/h	135	875	720	170	560	35	230	125	100	365	30	130

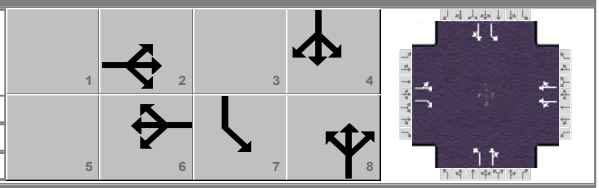
Signal One Information	
Cycle, s	120.0
Offset, s	0
Uncoordinated	No
Force Mode	Fixed

Green	23.0	49.0	30.0	0.0	0.0	0.0
Yellow	3.0	5.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



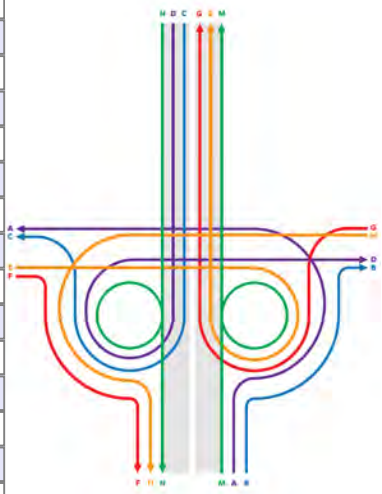
Signal Two Information	
Cycle, s	120.0
Offset, s	0
Uncoordinated	No
Force Mode	Fixed

Green	72.0	10.0	20.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Interchange Results

O-D	Demand (veh/h)	Delay (s)	EDTT	ETT	v/c > 1 ?	R_Q > 1 ?	LOS
A	131	130.8	0.0	130.8	No	Yes	F
B	67	64.1	0.0	64.1	No	No	D
C	0	0.0	5.0	5.0	No	No	A
D	0	0.0	5.0	5.0	No	No	A
E	386	34.6	5.0	39.6	Yes	No	C
F	0	13.0	0.0	13.0	No	No	A
G	189	23.9	5.0	28.9	No	No	B
H	0	0.0	0.0	0.0	No	No	A
I	910	13.0	0.0	13.0	Yes	No	A
J	556	34.5	0.0	34.5	No	No	C
K	-	-	0.0	-	-	-	-
L	-	-	0.0	-	-	-	-
M	125	-	0.0	-	-	-	-
N	0	-	0.0	-	-	-	-



Signalized Intersection One Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Control Delay (*d*) , s/veh	125.8	13.0			34.5	37.3				896.3		35.6
Level of Service (LOS)	F	B			C	D				F		D
Approach Delay, s/veh / LOS	29.5	C		35.9	D		0.0			724.1	F	
Intersection Delay, s/veh / LOS	107.3						F					

Signalized Intersection Two Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Control Delay (*d*) , s/veh		269.9	21.6	23.9		20.8	96.3	64.1		374.9	33.0	
Level of Service (LOS)		F	C	C		C	F	E		F	C	
Approach Delay, s/veh / LOS	195.8	F		21.5	C		81.9	F		295.7	F	
Intersection Delay, s/veh / LOS	149.2						F					

This Urban Streets text report was created on March 12, 2018 at 10:31:40

Period number = 1

Input

URBAN STREET PARAMETERS

Number of Intersections	4
Number of Segments	3
Analysis period duration, h	0.25
System cycle length, s	120
Urban street forward direction	EB
Sneakers per cycle, veh	2
Saturation flow rate, veh/h/ln	1900
Stored vehicle lane length, ft	25
Detected vehicle length, ft	17
Queue length percent	95
Critical merge gap, s	3.7
Stop threshold speed, mph	5
Acceleration rate, ft/s/s	3.5
Decel. rate (signal), ft/s/s	4
Minimum headway in a platoon, s/veh	1.5
Maximum headway in a platoon, s/veh	3.6
Number of iterations	15
Length of left-turn bay (access pt.), ft	250
Decel. rate (access pt.), ft/s/s	6.7
Right-turn speed (access pt.), ft/s	20
Critical gap from major left (access pt.), s	4.1
Follow-up time from major left (access pt.), s	2.2
Right-turn equivalency factor (access pt.)	2.2
Stored heavy vehicle lane length, ft	45
Proportion of peds who push button	0.51
Critical gap for permissive left-turn, s	4.5
Follow-up time for permissive left-turn, s	2.5
Calibration factor for platoon dispersion	0.14
Average ratio of speed limit to free-flow speed	0.9

BASIC SEGMENT INFORMATION

Seg	Spd Lmt		TH Lanes		Seg Len		IntWid		LenRM		PctCurb		Other Dly	
Num	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
1	35	35	2	1	1020	1020	50	50	0	0	70	70	0	0
2	35	35	2	2	3460	3460	50	50	0	0	70	70	0	0
3	35	35	1	2	1020	1020	50	50	0	0	70	70	0	0

ORIGIN-DESTINATION SEED PROPORTIONS - Forward Direction

	Cross LT	Major TH	Cross RT	MidEntry
Downstream Left	0.02	0.1	0.05	0.02
Downstream Thru	0.91	0.78	0.92	0.97
Downstream Right	0.05	0.1	0.02	0.01
Mid-segment Exit	0.02	0.02	0.01	0

ORIGIN-DESTINATION SEED PROPORTIONS - Reverse Direction

	Cross LT	Major TH	Cross RT	MidEntry
Downstream Left	0.02	0.1	0.05	0.02
Downstream Thru	0.91	0.78	0.92	0.97
Downstream Right	0.05	0.1	0.02	0.01
Mid-segment Exit	0.02	0.02	0.01	0

ACCESS POINT DATA

SEGMENT 1

Number of access points: 0

SEGMENT 2

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	1700	15	80	710	0	60	0	45	0	0	0
1: Lanes	0	2	0	1	2	0	0	1	0	0	0	0
1: Location, ft	3030											
1: Peak Hour Factor	1											

Number of access points: 1

SEGMENT 3

Number of access points: 0

Global Output

SEGMENT DATA

Seg.No.	Movement	EB LT 5	EB TH 2	EB RT 12	WB LT 1	WB TH 6	WB RT 16
1	Bay/Lane Spillback Time, h	999	999	999	999	999	999
1	ShrdLane Spillback Time, h				999.22		
1	Base Free-Flow Speed, mph		41.72			41.72	
1	Running Time, s		20.78			20.75	
1	Running Speed, mph		33.47			33.52	
1	Through Delay, s/veh		1.99			20.91	
1	Travel Speed, mph		30.54			16.7	
1	Stop Rate, stops/veh		0.07			0.48	
1	Spatial Stop Rate, stops/mi		0.34			2.48	
1	Through vol/cap ratio		0.65			0.45	
1	Percent of Base FFS		73.21			40.02	
1	Level of Service		B			D	
1	Automobile Perception Score		2.4			2.76	
2	Bay/Lane Spillback Time, h	0.09	999	999	999	999	999
2	ShrdLane Spillback Time, h	2.85					
2	Base Free-Flow Speed, mph		41.72			41.72	
2	Running Time, s		60.68			58.94	
2	Running Speed, mph		38.88			40.03	
2	Through Delay, s/veh		13.04			3.35	
2	Travel Speed, mph		32			37.88	
2	Stop Rate, stops/veh		0.43			0.14	
2	Spatial Stop Rate, stops/mi		0.65			0.21	
2	Through vol/cap ratio		0.65			0.34	
2	Percent of Base FFS		76.7			90.78	
2	Level of Service		B			A	
2	Automobile Perception Score		2.34			2.27	
3	Bay/Lane Spillback Time, h	0	0.14	999	999	999	999
3	ShrdLane Spillback Time, h						
3	Base Free-Flow Speed, mph		41.72			41.72	
3	Running Time, s		22.76			20.29	
3	Running Speed, mph		30.55			34.28	
3	Through Delay, s/veh		269.93			35.64	
3	Travel Speed, mph		2.38			12.43	
3	Stop Rate, stops/veh		2.04			0.79	
3	Spatial Stop Rate, stops/mi		10.58			4.1	
3	Through vol/cap ratio		1.49			0.65	
3	Percent of Base FFS		5.7			29.8	
3	Level of Service		F			F	
3	Automobile Perception Score		4.32			3.05	
Facility Travel Time, s			389.18			159.87	
Facility Travel Speed, mph			9.64			23.46	
Facility Spatial Stop Rate, veh/mi			2.44			1.35	
Facility Base Free Flow Speed, mph			41.72			41.72	
Facility Percent Base Free Flow Speed			23.1			56.22	
Facility Level of Service			F			C	
Facility Automobile Perception Score			2.57			2.47	
Facility Pedestrian Space			Infinity			Infinity	
Facility Pedestrian Travel Speed			4.4			4.4	
Facility Pedestrian LOS Score			3.86			3.61	
Facility Pedestrian LOS			D			D	
Facility Bicycle Travel Speed			13.5			13.26	
Facility Bicycle LOS Score			3.91			3.62	
Facility Bicycle LOS			D			D	
Facility Transit Travel Speed			30.55			12.69	
Facility Transit LOS Score			1.01			1.11	
Facility Transit LOS			A			A	
SPILLBACK TIME, h			0.14				

Multimodal Results

1	Roadway crossing difficulty factor	1.2	1.2
1	Ped LOS Score for Link	3.71	3.66
1	Ped LOS Score for Intersection	2.17	3.27
1	Ped LOS Score for Segment	3.9	4.19
1	Ped Segment LOS	D	D
1	Bicycle LOS Score for Link	3.82	3.8
1	Indicator Variable	1	1
1	Bicycle LOS Score for Intersection	3.69	3.47
1	Number of access point approaches	0	0
1	Segment Length, ft	1020	1020
1	Bicycle LOS Score for Segment	3.9	3.81
1	Bicycle Segment LOS	D	D
1	Transit Wait-Ride Score	3.8	2.92
1	Ped LOS Score for Link	3.71	3.66
1	Transit LOS Score for Segment	0.86	2.17
1	Transit Segment LOS	A	B
2	Roadway crossing difficulty factor	1.2	1.2
2	Ped LOS Score for Link	3.92	2.96
2	Ped LOS Score for Intersection	0.68	2.19
2	Ped LOS Score for Segment	3.6	3.63
2	Ped Segment LOS	D	D
2	Bicycle LOS Score for Link	3.9	3.57
2	Indicator Variable	1	1
2	Bicycle LOS Score for Intersection	2.09	2.87
2	Number of access point approaches	0	0
2	Segment Length, ft	3460	3460
2	Bicycle LOS Score for Segment	3.56	3.61
2	Bicycle Segment LOS	D	D
2	Transit Wait-Ride Score	3.74	4.04
2	Ped LOS Score for Link	3.92	2.96
2	Transit LOS Score for Segment	0.98	0.39
2	Transit Segment LOS	A	A
3	Roadway crossing difficulty factor	1.2	0.98
3	Ped LOS Score for Link	5.37	2.95
3	Ped LOS Score for Intersection	2.64	2.28
3	Ped LOS Score for Segment	4.67	2.97
3	Ped Segment LOS	E	C
3	Bicycle LOS Score for Link	4.09	3.57
3	Indicator Variable	1	1
3	Bicycle LOS Score for Intersection	4.96	1.26
3	Number of access point approaches	0	0
3	Segment Length, ft	1020	1020
3	Bicycle LOS Score for Segment	5.08	3.46
3	Bicycle Segment LOS	F	C
3	Transit Wait-Ride Score	3.68	2.61
3	Ped LOS Score for Link	5.37	2.95
3	Transit LOS Score for Segment	1.29	2.52
3	Transit Segment LOS	A	B

ACCESS POINT DATA

SEGMENT 1

SEGMENT 2

	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
Movement	1	2	3	4	5	6	7	8	9	10	11	12
1: Volume, veh/h	0	1735	15.3	88.9	789	0	60	0	45	0	0	0
1: Lanes	0	2	0	1	2	0	0	1	0	0	0	0
1: Prop blocked	0	0	0	0.15	0	0	0.15	0.15	0.15	0.15	0.15	0
1: Thru veh delay		0.02			0							
1: Prob inside blk		0			0							
1: Dist to upstream signal	3030											

SEGMENT 3