

Table of Contents

Chapter 1 – Executive Summary	1-1
Background	
Existing and Future Conditions	
Alternatives Analysis	
Recommendations	1-2
Chapter 2 – Existing Conditions	2-1
Introduction	2-1
Study Area	2-1
Objective	2-4
Previous Studies	2-4
Known Issues	2-5
Planned Improvements	2-6
Existing Conditions	2-7
Corridor Characteristics	2-7
Traffic Volumes	2-16
Traffic Patterns	2-20
Crash Analysis	2-21
Capacity Analysis and Demand	2-30
Intersection Capacity Analysis	2-30
Summary	2-34
Corridor Characteristics	2-34
Safety	2-34
Traffic Volumes	2-35
Capacity Analysis	2-35
Chapter 3 – Future Conditions	3-1
Future Volumes	3-1
Annual Growth Rate	3-1
Future Development	3-2

Future Volumes	3-4
Capacity Analysis and Demand	3-6
Intersection Capacity Analysis	3-6
Signal Warrant Analysis	
Summary	3-10
Traffic Volumes	3-10
Capacity Analysis	3-10
Signal Warrant Analysis	3-10
Chapter 4 – Alternatives Analysis	4-1
Interim Alternatives	4-1
Alternatives Development	4-1
Highway 1416 and Liberty Boulevard	4-2
Highway 1416 and S Ellsworth Road	4-2
Highway 1416 and Radar Hill Road	4-3
Alternatives Summary	4-3
Crash Modification Factors	4-5
Capacity Analysis and Demand	4-6
Intersection Capacity Analysis	4-6
Highway 1416 and Liberty Boulevard	4-7
Highway 1416 and S Ellsworth Road	4-7
Highway 1416 and Radar Hill Road	4-9
Design	4-10
Right-of-Way Impacts	4-10
Anticipated Cost	4-10
Recommendations	4-11
Summary	4-12
Interim Alternatives	4-12
Alternatives	4-12
Capacity Analysis	4-12
Recommendations	<i>1</i> _13

List of Figures

Figure 2-1 – Study Area	2-3
Figure 2-2 – Road Functional Classifications	2-8
Figure 2-3 – Land Use	2-9
Figure 2-4 – Cross-Sections	2-11
Figure 2-5 – Speed Limit	2-12
Figure 2-6 – Shoulder Width	2-17
Figure 2-7 – 2022 Daily Traffic Volumes	2-18
Figure 2-8 – Peak Hour Turning Movement Counts	2-20
Figure 2-9 – Crash Density (Year 2013-2022)	2-23
Figure 2-10 — Highway 1416 Ten-Year Crash Summary (Year 2013-2022)	2-24
Figure 2-11 – Highway 1416 Crashes by Month (Years 2013-2022)	2-25
Figure 2-12 — Radar Hill Road Ten-Year Crash Summary (Years 2013-2022)	2-25
Figure 2-13 – Radar Hill Road Crashes by Month (Years 2013-2022)	2-26
Figure 2-14 – Intersection Crashes by Collision Type (Ten-Year Crashes from 2013-2022)	2-28
List of Tables	
Table 2-1 – Access Management Results	2-13
Table 2-2 – Minority and Low-Income Populations	2-15
Table 2-3 – Turning Movement Counts (AM Peak)	2-19
Table 2-4 – Turning Movement Counts (PM Peak)	2-19
Table 2-5 – Crashes at Study Intersections	2-21
Table 2-6 – Non-Junction Related Crashes	2-22
Table 2-7 – Non-Junction Related Crashes by Collision Types	2-27
Table 2-8 – Non-Junction Related Crashes by Lighting Conditions	2-30
Table 2-9 – Intersection Level of Service Thresholds	2-31
Table 2-10 – Existing Intersection Vehicular Capacity Analysis	2-32
Table 2-11 – PLOS and BLOS Scoring Thresholds	2-33
Table 2-12 – Existing Pedestrian LOS (PLOS) and Bicycle LOS (BLOS) Results	2-33

Table 3-1 – Annual Growth Rate by Movement	3-2
Table 3-2 – Box Elder High School – Additional Trips	3-3
Table 3-3 – Multi-Family Housing Development – Additional Trips	3-3
Table 3-4 – Douglas School District Elementary School – Additional Trips	3-4
Table 3-5 – Projected Volumes – 2030 (AM Peak)	3-4
Table 3-6 – Projected Volumes – 2030 (PM Peak)	3-5
Table 3-7 – Projected Volumes – 2050 (AM Peak)	3-5
Table 3-8 – Projected Volumes – 2050 (PM Peak)	3-5
Table 3-9 — Future Intersection Vehicular Capacity Analysis Results (2030)	3-6
Table 3-10 – Future Intersection Vehicular Capacity Analysis Results (2050)	3-7
Table 3-11 – Signal Warrant Analysis Results (2030)	3-9
Table 3-12 – Signal Warrant Analysis Results (2050)	3-9
Table 4-1 – Interim Alternative Results	4-1
Table 4-2 — Highway 1416 Crash Modification Factors	4-5
Table 4-3 – Intersection Level of Service Thresholds	4-6
Table 4-4 — Highway 1416 and Liberty Boulevard Alternatives Analysis Results	4-7
Table 4-5 — Highway 1416 and S Ellsworth Road Alternatives Analysis Results	4-8
Table 4-6 — Highway 1416 and Radar Hill Road Alternatives Analysis Results	4-9
Table 4-7 - Preliminary Cost Estimates	4-11
Table 4-8 – Recommended Alternatives	4-13
Appendix	
Appendix A: Raw Traffic Counts	А
Appendix B: Vehicular Level of Service (VLOS) Results – Existing	В
Appendix C: Pedestrian Level of Service (PLOS) and Bicycle Level of Service (BLOS) Results	С
Appendix D: Vehicular Level of Service (VLOS) Results - Future No-Build	D
Appendix E: Signal Warrant Analysis Results	Е
Appendix F: Alternative Concepts	F
Appendix G: Vehicular Level of Service (VLOS) Results – Alternatives	G

Chapter 1 - EXECUTIVE SUMMARY

Background

Highway 1416 is an east/west corridor running parallel and to the south of I-90 through Box Elder, SD. Radar Hill Road runs north/south from its intersection with Highway 1416 to the north, to its intersection with Highway 44 to the south. Expansion at the nearby Ellsworth Air Force Base is expected to occur and will lead to considerable development in the areas surrounding these roadways, leading to shifts in traffic patterns. A corridor analysis study was prepared to analyze these changes and provide recommendations to mitigate any deficiencies.

Existing and Future Conditions

The study area consists of two main corridors (Highway 1416 and Radar Hill Road) and includes six study intersections. Existing conditions regarding within the study area were analyzed, as well as future conditions, using projections to 2030 (build year) and 2050 (forecast). Lack of turn lanes, operational deficiencies, safety, future development, and a lack of pedestrian and bicycle facilities were identified as corridor issues prior to the beginning of this study. Several study intersections were found to operate at unacceptable delay and Level of Service, and conditions are anticipated to worsen with continued development and the expansion of the Ellsworth Air Force Base. Safety, capacity, and access management were identified as primary corridor issues to be addressed through alternative design.

Alternatives Analysis

Due to the severity of existing capacity deficiencies, an interim alternative was proposed and implemented at the intersections of Highway 1416 and S Ellsworth Road, and Highway 1416 and Radar Hill Road. This interim alternative includes all-way stop-control at these intersections. While all-way stop-control is not expected to bring the intersections to acceptable operations, the delay and Level of Service is expected to improve in the short term.

Alternative designs were analyzed for the intersections of Highway 1416 and Liberty Boulevard, Highway 1416 and S Ellsworth Road, and Highway 1416 and Radar Hill Road. It was determined that the intersections of Highway 1416 and 151st Avenue, Radar Hill Road and Long View Road, and Radar Hill Road and Highway 44 are expected to operate under acceptable conditions in the projected future years, and therefore no alternatives were developed for these intersections.

The alternative designs included signalization, single- and multi-lane roundabouts, as well as a displaced left intersection to accommodate high left-turning volumes at Highway 1416 and S Ellsworth Road. Each of the proposed alternatives are anticipated to improve delay and Level of Service at the study

intersections. Final recommendations were made based on level of anticipated improvement, anticipated safety improvements, anticipated cost, and available right-of-way.

Recommendations

After analyzing each alternative, the following improvements are ultimately recommended at the study intersections:

- » Highway 1416 and Liberty Boulevard: Maintaining two-way-stop-control is recommended for now. Intersection signalization may eventually be needed for this intersection, due to the possible need for improvements regarding delay and Level of Service, and right-of-way constraints with proximity to the adjacent railroad, utilities, and wetlands making a roundabout difficult to design.
- » Highway 1416 and S Ellsworth Road: A hybrid roundabout, including an additional dedicated eastbound left-turn lane to accommodate for high volumes, with two circulating lanes at the northbound approach. This design also includes an uncontrolled channelized southbound right-turn lane. This alternative is recommended due to anticipated improvements regarding safety, delay, and Level of Service.
- Highway 1416 and Radar Hill Road: A 2x1 roundabout with a yield-controlled channelized northbound right is recommended for this intersection, due to anticipated improvements regarding safety, delay, and Level of Service. The inclusion of the northbound right-turn lane accounts for high volumes completing this movement. This design would also include closing access to Gumbo Drive on the north.

Chapter 2 – Existing Conditions

Introduction

Highway 1416 is an east/west corridor running parallel and to the south of I-90 through Box Elder, SD. Radar Hill Road runs north/south from its intersection with Highway 1416 to the north, to its intersection with Highway 44 to the south. Expansion at the nearby Ellsworth Air Force Base is expected to occur and will lead to considerable development in the areas surrounding these roadways, leading to shifts in traffic patterns. A corridor analysis study was prepared to analyze these changes and provide recommendations to mitigate any deficiencies. This section of the corridor analysis study will address existing traffic conditions, including roadway characteristics, safety, operations, and capacity.

Study Area

Key intersections were selected for detailed analysis within the corridor study. Intersections that were identified for analysis are listed below.

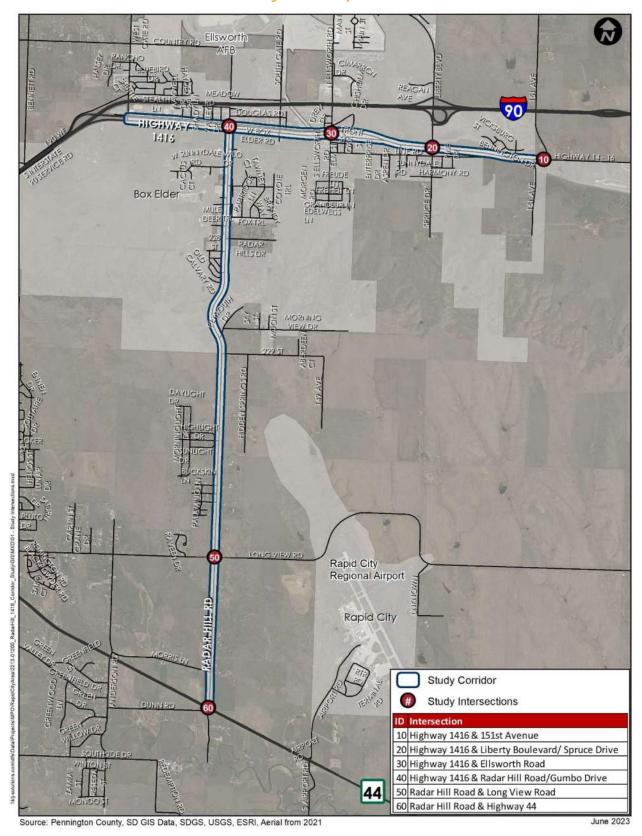
- » Highway 1416 & 151st Avenue
- » Highway 1416 & Liberty Boulevard/Spruce Drive
- » Highway 1416 & S Ellsworth Road
- » Highway 1416 & Radar Hill Road/Gumbo Drive
- » Radar Hill Road & Long View Road
- » Radar Hill Road & Highway 44

At the start of the study, all intersections were two-way or all-way stop controlled. The intersection of Highway 1416 and Radar Hill Road/Gumbo Drive had additional stop-control in the eastbound direction on Highway 1416. Additional stop-control in the westbound direction on Highway 1416 existed at the intersections with Commercial Gate Road, S Ellsworth Road, and W Gate Road.

All northbound and southbound approaches along Highway 1416 (including the medians) were stop-controlled, except at westbound Highway 1416 and S Ellsworth Road where the northbound approach was a free movement, and the southbound approach was yield controlled. The control noted at these four intersections were atypical designs and could result in driver confusion especially with those unfamiliar with the area.

The study area and labeled intersections are shown in Figure 2-1.

Figure 2-1 – Study Area



Radar Hill - 1416 Corridor Study

Objective

The objective of this report is to collect, analyze, and document existing conditions along the Highway 1416 and Radar Hill Road corridors and present any deficiencies regarding safety, operations, and/or capacity. This section of the study will focus on the analysis of existing no-build conditions and present issues currently being experienced to be used for alternatives development and a basis of comparison for the analysis of the alternatives.

Previous Studies

There have been several previous planning efforts and studies completed in Box Elder along the study segments. These documents provide important background information to support the development of this planning study.

RAPID CITY METROPOLITAN TRANSPORTATION PLAN (2020)

The Rapid City Metropolitan Transportation Plan (MTP) is the Rapid City Area Metropolitan Planning Organization's (MPO) long range plan for the regional transportation system. Growth projections and the regional travel demand model generated as part of the MPO's planning process were used as primary components in establishing traffic projections for this corridor study. The MTP provides mid-term (2026-2030) recommendations to improve the Exit 63 interchange.

BOX ELDER COMPREHENSIVE PLAN (2014 REVISION)

The Box Elder Comprehensive Plan provides a long-term vision for the city. The intersections of Highway 1416 and W Gate Road, Radar Hill Road, S Ellsworth Road, and Liberty Boulevard are identified as needing safety and mobility improvements. The discussion of future land use identifies Highway 1416 from Exit 63 to Liberty Boulevard and Radar Hill Road extending to Highway 1416 as potential locations for an entry corridor overlay. This involves coordination with SDDOT and the consistent application of aesthetic standards and design elements. Natural drainages along Highway 1416 that contain floodway, and 100-and 500-year floodplain are recognized as constraints that will need to be addressed in new development. Elevated crash occurrence and traffic congestion along Highway 1416 is identified as a top-priority transportation issue.

BOX ELDER STRATEGIC TRANSPORTATION PLAN (2014)

The Box Elder Strategic Transportation Plan was created to address a series of desired planning outcomes and transportation objectives, including the alignment of the built environment with regional and local goals, the enhancement of livability within the Box Elder community, and the identification of priorities among future transportation improvement projects. The existing traffic operations analysis includes five intersections along Highway 1416, at W Gate Road, Radar Hill Road, Commercial Gate Drive, S Ellsworth Road, and Liberty Boulevard. It is concluded that the intersection of westbound Highway 1416 with Ellsworth Road operates at LOS F during peak hours, with all other intersections operating at LOS C. Highway 1416 intersections with W Gate Road, Radar Hill Road, and S Ellsworth Road are anticipated to require signalized or roundabout control in order to operate at LOS C or better in the year 2035. The provision of a shared-use path from W Gate Road to S Ellsworth Road along Highway 1416 is identified as a high-priority pedestrian and bicycle project. The conversion of Highway 1416 from a four-lane divided

highway to a two-lane undivided roadway with a center left turn lane is identified as a near-term priority included in the contemporaneous statewide transportation improvement plan (STIP). The construction of a side path along Radar Hill Road is identified as a low-priority pedestrian and bicycle project.

HIGHWAY 1416 CORRIDOR STUDY (2010)

The *Highway 1416 Corridor Study* was commissioned by the Rapid City Area Metropolitan Planning Organization (RCAMPO) and the City of Box Elder in order to access existing traffic safety and operations along the corridor and develop recommendations for improvements. It was found that the current four-lane configuration of Highway 1416 has excess traffic-carrying capacity, providing an opportunity for reconfiguration into a non-divided city street that would improve accessibility, traffic circulation, and motorist safety. Several recommendations are made in this study, including the addition of right- and left-turn lanes at several intersections, widening of the northbound approach of the Radar Hill Road intersection, addition of pedestrian facilities where appropriate, and the development of a network model to allow for comparative analysis.

RAPID CITY AREA TRANSPORTATION IMPROVEMENT PROGRAM (2022)

The Rapid City Area Transportation Improvement Program for fiscal years 2023-2026 provides a priority listing and financial plan for highway and transit projects. This document includes the design and reconstruction of Radar Hill Road at Highway 1416 to a three-lane configuration.

Known Issues

CONGESTION AND INTERSECTION DELAY

Recent and continuing development in the study area vicinity has shifted traffic patterns and resulted in erratic lane usage, congestion from turning movements, and intersection delay along the study corridors. Median storage can also become congested furthering delay by impeding movements upstream.

FUTURE DEVELOPMENT

Ellsworth Airforce Base, a major economic driver in the Box Elder region, is anticipated to experience rapid growth in the coming years and will likely have an influence on travel patterns along and near Highway 1416 and Radar Hill Road. Two new schools are also anticipated to be constructed near the study area, as well as a public park south of Highway 1416.

CRASH HISTORY

As noted in the *Box Elder Strategic Transportation Plan*, multiple intersections along Highway 1416 are configured with a split between the eastbound and westbound directions, creating unusual intersection geometry and traffic control that is counter-intuitive. Elevated crash rates are exhibited as a result, with angle and rear-end crashes particularly prominent at these intersections.

CORRIDOR CONSTRAINTS

Box Elder Road runs parallel to westbound Highway 1416 from east of S Ellsworth Road to west of W Gate Road. The median ditch separating the two roadways is approximately 45 feet, considerably closer than the 120-foot median ditch separating eastbound and westbound Highway 1416. Box Elder Road is meant to operate as a frontage road to Highway 1416, providing access to businesses and homes. The narrow

median has very limited storage, and though the northbound approaches onto Box Elder Road are uncontrolled, vehicles attempting to turn left onto Box Elder Road can cause queueing in the narrow median spilling over to the westbound approach of Highway 1416.

To the south, a single railroad track runs parallel to eastbound Highway 1416 throughout the study area, separated by a median ditch approximately 60 feet wide. The railroad restricts right-of-way along the south edge of the study area. Of the three study intersections that intersect at-grade with the railroad tracks (Liberty Boulevard, S Ellsworth Road, and Radar Hill Road), only the Radar Hill Road crossing has flashing-light signals and gate arms. The crossings at S Ellsworth Road and Liberty Boulevard are yield-controlled. The proximity of Highway 1416 to the railroad tracks leads to severe safety concerns regarding vehicle-rail collisions and can lead to operational concerns with queueing on Highway 1416.

LACK OF PEDESTRIAN FACILITIES

No dedicated sidewalks, paths, or trails exist within the study area. There are also no dedicated or marked crossing locations on Highway 1416 or Radar Hill Road within the study area.

LACK OF BICYCLE FACILITIES

As noted in the *Rapid City Area Bicycle and Pedestrian Master Plan*, very limited bicycle facilities exist in Box Elder. Major streets connecting the area to surrounding jurisdictions have high speeds and volumes that make reduce safety for cycling.

Planned Improvements

The City of Box Elder plans to complete an active transportation plan by the spring of 2024. A recent assessment of walking and biking routes was completed in conjunction with the USDOT Safe Streets and Roads for All (SS4A) grant.

The I-90 interchange connecting to Highway 1416 (Exit 63) is also planned to be reconstructed. The proposed design is a diverging diamond interchange, with construction expected to begin in 2027 (depending on federal funding availability). The interchange reconstruction was spurred by issues regarding safety, congestion, capacity, accessibility and connectivity, and a lack of pedestrian facilities. This project also recommends consolidating the Highway 1416 and W Gate Road intersection into one signalized intersection.

General road repairs are expected to take place during the summer of 2023 along Radar Hill Road between Highway 1416 and Long View Road. The repairs are expected to address issues of severe degradation and potholes along this section of the corridor.

The City of Box Elder Active Transportation Recommendations document also provides the following recommendations within the study area:

- » Installing sidewalks along Highway 1416 from W Gate Road to Liberty Boulevard, and along Radar Hill Road from Highway 1416 to Box Elder city limits.
- » Implementing multimodal connection nodes on Highway 1416 at the I-90 interchange, Radar Hill Road, and Liberty Boulevard.
- » Converting the intersection of Highway 1416 and Liberty Boulevard to a roundabout and installing a traffic signal and dedicated crosswalks at Highway 1416 and S Ellsworth Road.

- » Creating a Farmers' Market or city park near the I-90 interchange.
- » Extending Cheyenne Road to connect to Radar Hill Road (with a connection point at the 228th Street intersection).

Existing Conditions

Corridor Characteristics

FUNCTIONAL CLASSIFICATIONS

Highway 1416 is classified as an Urban Minor Arterial within the study area. Radar Hill Road is classified as a Rural Local Road between Highway 1416 and 229th Street. From 229th Street to Long View Road, Radar Hill Road is classified as an Urban Collector. From Long View Road to Highway 44, Radar Hill Road is classified as a Rural Major Collector. The functional classifications for roadways within the study area are shown in **Figure 2-2**.

LAND USE

Several land use categories are present adjacent to Highway 1416 and Radar Hill Road within the study area. The land along the north side of Highway 1416 is primarily industrial, high-density residential, and open space and park land. A large parcel north of Highway 1416 between Hillview Drive and Liberty Boulevard is classified as highway service land. The south side of Highway 1416 is bounded by the railroad.

Land surrounding Radar Hill Road is primarily low-, mid-, and high-density residential, as well as industrial and highway service. There are small parcels dedicated to industrial space near Mule Deer Trail, Fox Trail, and Plymouth Drive. The remaining area surrounding the study area is primarily agricultural.

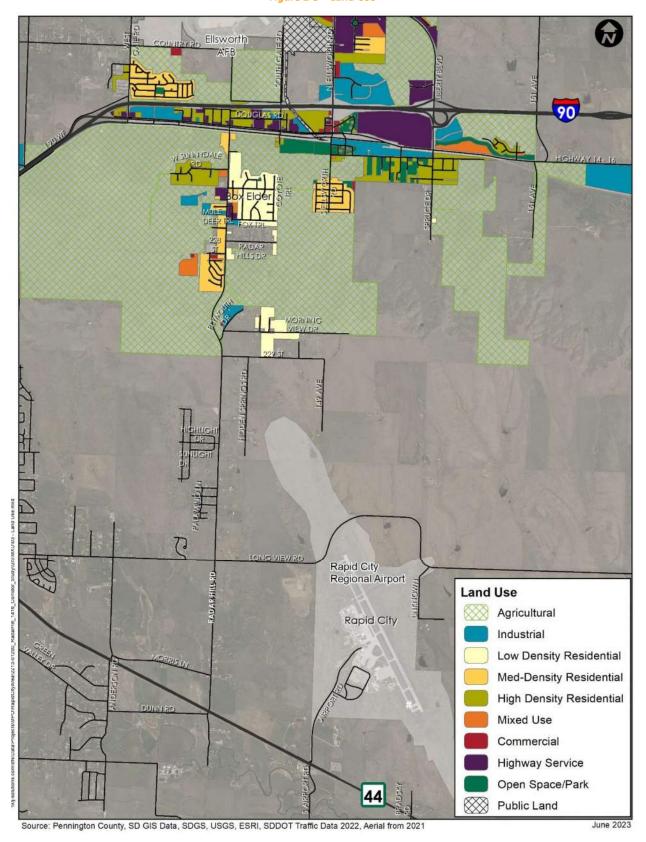
Box Elder city limits end near Old Cavalry Road. The areas adjacent to Radar Hill Road between 229th Street and Highway 44 are under Pennington County jurisdiction. This land is primarily residential and agricultural.

Land use is presented in Figure 2-3, using data provided by Pennington County.

COULTRY HO Ellsworth Rapid City Regional Airport Rapid City Study Corridor **Functional Class** Rural Local Road Rural Major Collector Rural Minor Collector Urban Local Street Urban Collector Urban Minor Arterial June 2023 Source: Pennington County, SD GIS Data, SDGS, USGS, ESRI, SDDOT Traffic Data 2022, Aerial from 2021

Figure 2-2 – Road Functional Classifications

Figure 2-3 – Land Use



RIGHT-OF-WAY (ROW)

Right-of-way (ROW) is the available space owned by the County on which its roads and highways reside. ROW is often the constraining factor in developing alternatives, because acquiring additional ROW can be costly, increase project delivery deadlines, or stop a project altogether. ROW widths vary along the corridor, depending on the location. ROW information will need to be verified through the project development, as the widths shown were obtained from publicly available GIS information.

Highway 1416

- » W Gate Road to Radar Hill Road Generally ranges from 300 to 320 ft.
- » From Radar Hill Road to S Ellsworth Road Generally ranges from 300 to 350 ft.
- » From S Ellsworth Road to End of divided roadway Generally ranges from 200 ft to 400 ft.
- Start of undivided roadway to 151st Avenue Generally ranges from 90 ft to 120 ft.

Radar Hill Road

- » Highway 1416 to Creekside Drive Generally ranges from 70 to 120 ft.
- » Creekside Drive to 228th Street Generally ranges from 66 to 90 ft.
- » 228th Street to 229th Street Generally 100 ft
- 229th Street to Long View Road Generally ranges from 85 ft to 110 ft.
- » Long View Road to Hwy 44 Generally ranges from 66 to 85 ft.

SPEED

Figure 2-5 shows the posted speed limits in the study area.

Highway 1416

Highway 1416 has a posted speed limit of 65 miles per hour (mph) between 151st Avenue and east of Liberty Boulevard. Between Liberty Boulevard and S Ellsworth Road, the speed limit drops to 50 mph. West of S Ellsworth Road, the speed limit is 55 mph through the remainder of the study area to W Gate Road.

Radar Hill Road

Radar Hill Road has a posted speed limit of 45 mph between Highway 1416 and 229th Street. Between 229th Street and Highway 44, Radar Hill Road has a posted speed limit of 50 mph.

Figure 2-4 – Cross-Sections

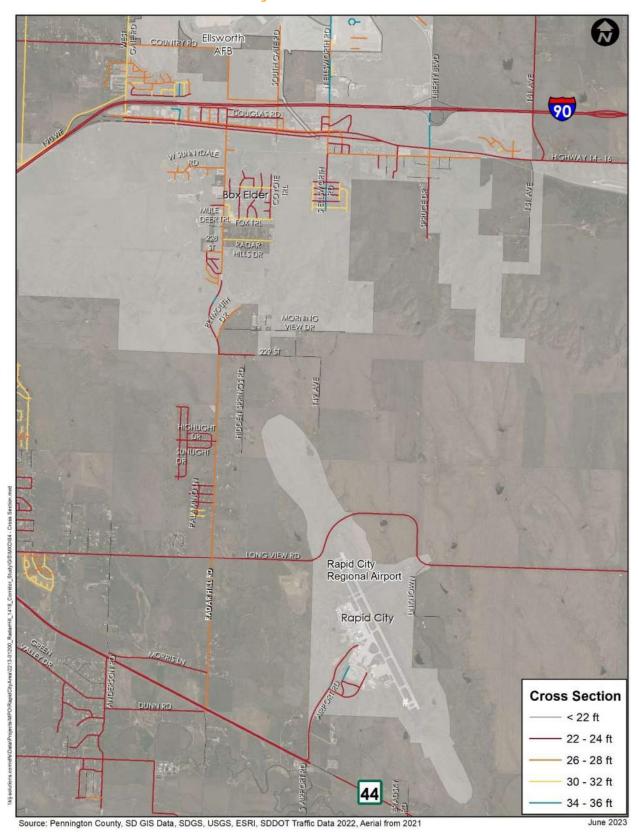
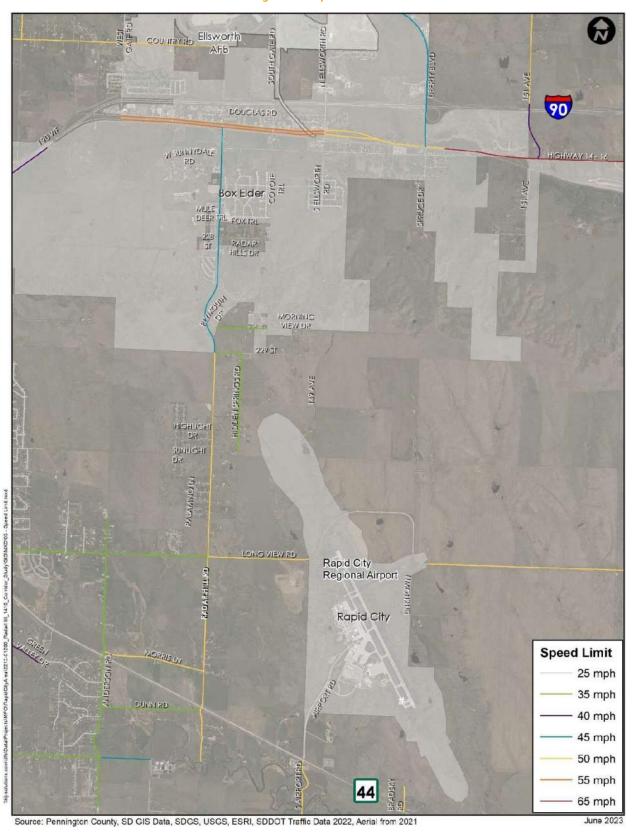


Figure 2-5 – Speed Limit



ACCESS MANAGEMENT

Access management is the process of balancing the competing needs of mobility and land access. Access locations introduce conflict points into the traffic stream. Allowing dense, uncontrolled access spacing results in safety, operational, and aesthetic deficiencies.

SDDOT's *Road Design Manual* (Chapter 17 – Access Management) states the minimum desirable spacing of access points in both Urban Fringe and Rural areas is **five accesses per side per mile**. Along the Highway 1416 and Radar Hill Road study corridors, the number of intersection and driveway accesses along each side of the roadway were calculated. Highway 1416 was split into three distinct segments: the undivided segment between 151st Avenue and the directional split, westbound Highway 1416 to W Gate Road, and eastbound Highway 1416 to the directional split. Radar Hill Road was analyzed as a single segment. For each segment, the average number of accesses per side per mile was calculated and compared to the SDDOT threshold of five accesses per side per mile. Access management results are shown in **Table 2-1**.

Segment	Length (mi)	Side	Intersection Accesses	Driveway Accesses	Total Accesses	Total Accesses (per side per mile)	Intersection Accesses (per side per mile)
Hwy 1416 151 st Ave to	1 50	North	4	3	7	4.4	2.5
EB/WB split	1.58	South	3	2	5	3.2	1.9
WB Hwy 1416	2.54	North	8	0	8	3.1	3.1
EB/WB split to W Gate Rd	2.54	South	7	0	7	2.8	2.8
EB Hwy 1416	2.50	North	7	0	7	2.8	2.8
W Gate Rd to EB/WB split	2.50	South	5	0	5	2.0	2.0
Radar Hill Rd	F 42	West	17	17	34	6.3	3.1
Hwy 1416 to Hwy 44	5.43	East	15	31	46	8.5	2.8

Table 2-1 – Access Management Results

Existing accesses along Highway 1416 meet SDDOT standards. Accesses along Radar Hill Road do not meet SDDOT standards, particularly on the east side of the roadway. Intersection access spacing does meet requirements along Radar Hill Road.

The southbound approach of EB Highway 1416 and S Ellsworth Road is also offset from the northbound approach. This intersection is classified as a negative offset, as defined by the SDDOT *Road Design Manual*. This offset poses a safety risk for several movements, therefore geometric realignment should be considered.

LIGHTING

Highway 1416

Overhead lighting is present at the following intersections along Highway 1416:

- » Trenton Lane single pole in the northeast corner of the intersection
- » Liberty Boulevard three poles illuminating the southbound, eastbound, and westbound approaches
- » S Ellsworth Road four poles illuminating the southbound, eastbound, and westbound approaches, as well as the median
- » Radar Hill Road four poles illuminating the southbound, eastbound, and westbound approaches, as well as the median
- » W Gate Road four poles illuminating the southbound, eastbound, and westbound approaches, as well as the median

No other intersections are lit. No segments along the Highway 1416 study corridor are lit.

Radar Hill Road

Overhead lighting is present at the following intersections along Radar Hill Road:

- » Highway 1416 four poles illuminating the southbound, eastbound, and westbound approaches, as well as the median
- » Wilo Drive single overhead light mounted on a telephone pole in the northeast corner of the intersection
- » Mule Deer Trail single pole in the southeast corner of the intersection
- » Fox Trail single pole in the northeast corner of the intersection
- » Flying Eagle Drive single overhead light mounted on a telephone pole in the northwest corner of the intersection
- » Radar Hills Drive single overhead light mounted on a telephone pole in the northeast corner of the intersection
- » 228th Street single pole in the southwest corner of the intersection
- Old Cavalry Road single overhead light mounted on a telephone pole in the southeast corner of the intersection

No other intersections are lit. No segments along the Radar Hill Road study corridor are lit.

ENVIRONMENTAL JUSTICE OVERVIEW

The US Environmental Protection Agency's (EPA) Environmental Justice Screening and Mapping tool (i.e., EJSCREEN) was used to review the presence of readily identifiable low-income and minority populations by evaluating their percentages. The Environmental Justice (EJ) study area for this review included the project roadways: Highway 1416 and Radar Hill Road in Box Elder, Pennington County, South Dakota and a 0.25-mile buffer surrounding the roadways. Data obtained from EJSCREEN and US Census Bureau were used to determine percentages of low-income and minority populations within the EJ study area and the City of Box Elder. This limited analysis did not include investigating the presence of community facilities in the EJ study area that serve minority and low-income populations, or businesses in the EJ study area that are owned by, employ, and serve minority and low-income populations.

For the purposes of this review, the smallest unit of geography (i.e., city) was used for comparison with the EJ study area. An EJ population is identified when:

- 1. The minority or low-income population of a study area exceeds 50 percent, or
- 2. The minority or low-income population percentage is at least 10 percentage points higher than the city average.

As shown in Table 2-2, the minority and low-income populations in the entire study area do not exceed 50 percent and are not at least 10 percentage points higher than the average for the City of Box Elder. Therefore, an EJ population is not present in the EJ study area.

DemographicStudy AreaCity of Box ElderMinority Population21%22%Low-Income Population23%28%

Table 2-2 – Minority and Low-Income Populations

MULTIMODAL FACILITY

No dedicated sidewalks, paths, or trails exist within the study area. There are also no dedicated or marked crossing locations on Highway 1416 or Radar Hill Road within the study area.

The South Dakota Road Design Manual (Chapter 7 – Cross Sections; Chapter 16 – Miscellaneous) states that shoulders considered to be bikeable should be paved and a minimum of four feet in width. There is an unpaved shoulder along the north edge of westbound Highway 1416, between the median split near Cottonwood Drive and the I-90 on-ramp. This shoulder is a six-foot unpaved shoulder that does not meet design requirements for bikeability. There is no shoulder serving the eastbound direction of Highway 1416.

Radar Hill Road has a six-foot paved shoulder on the east and west sides of the roadway, between Wilo Drive and Creekside Drive. There is also a 10-foot paved shoulder on both sides of Radar Hill Road between 228th Street and 229th Street.

Though some existing shoulders within the Radar Hill Road corridor meet bicycle lane design requirements, there are sections of both the Highway 1416 corridor and the Radar Hill Road corridor that are not accessible via non-motorized modes of travel. Highway 1416 and Radar Hill Road are also high-speed corridors, with vehicular speed limits ranging from 45 to 65 miles per hour, which reduces safety for bicyclists and pedestrians utilizing the shoulders.

Pedestrian Level of Service (PLOS) and Bicycle Level of Service (BLOS) analyses were conducted and are discussed later in this report. Shoulder widths throughout the study area (paved and unpaved) are shown in **Figure 2-6**.

ADJACENT FACILITIES

There are parallel facilities on either side of Highway 1416. South of Highway 1416 is an active railroad line. The distance between the edge of roadway and the rail line can vary from 65 to 210 feet. In areas where the distance between facilities is lesser, as it is at the Radar Hill Road and Ellsworth Drive intersections, queueing in the northbound direction can cross the railroad creating a potential safety risk.

Box Elder Road runs parallel to Highway 1416 on the north side of the roadway. The roadways are separated by a 50-foot grass median. Due to the short distance between the roadways, southbound queues at the Highway 1416 intersections can create potential operational and safety deficiencies at the adjacent Box Elder Road intersections.

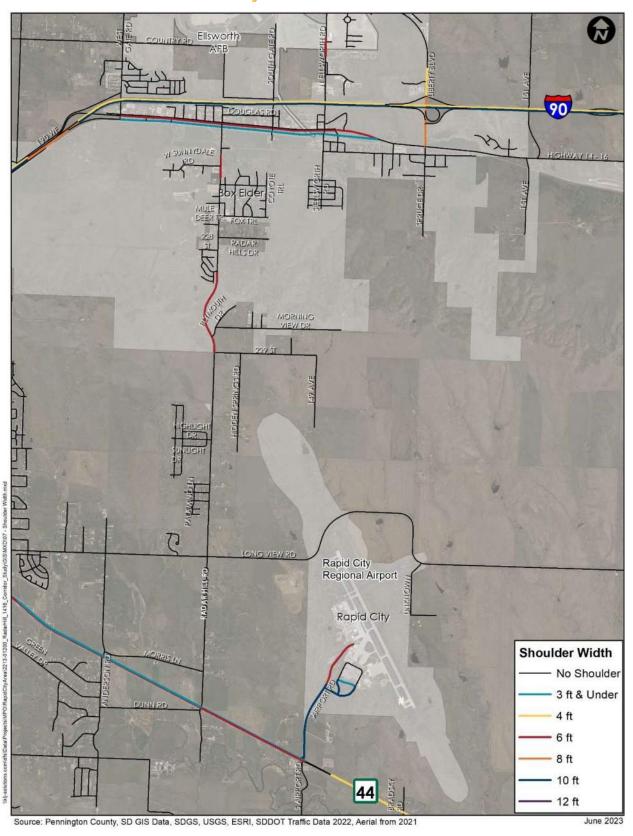
Traffic Volumes

Traffic volumes were collected by KLJ at five of the six study intersections on Tuesday, May 9, 2023, and traffic volumes at Highway 1416 and 151st Avenue were collected on Tuesday, May 23, 2023. Volumes were collected for a 13-hour period and included pedestrian and bicycle movements.

The intersections of Highway 1416 and S Ellsworth Road, and Highway 1416 and Radar Hill Road/Gumbo Drive were modeled with the westbound and eastbound directions of Highway 1416 separately. There is a large median (approximately 120 feet) separating the eastbound and westbound directions, with additional stop control at the northbound and southbound approaches between the two highway movements. The volumes were collected with each eastbound and westbound intersection operating as one and were balanced appropriately as distinct eastbound and westbound intersections.

The 2022 Average Daily Traffic (ADT) volumes are shown in **Figure 2-7** and they were collected by Pennington County. The AM and PM peak turning movement counts are shown in **Table 2-3** and **Table 2-4**, respectively. Raw traffic volume counts can be found in **Appendix A**.

Figure 2-6 – Shoulder Width



Ellsworth WI SUMMITTED ALE HORBY AWHOL Box Elder Rapid City Regional Airport Rapid City XXX Daily Traffic Study Intersections 10 Highway 1416 & 151st Avenue 20 Highway 1416 & Liberty Boulevard/ Spruce Drive 30 Highway 1416 & Ellsworth Road 40 Highway 1416 & Radar Hill Road/Gumbo Drive 50 Radar Hill Road & Long View Road 44 60 Radar Hill Road & Highway 44 June 2023 Source: Pennington County SD GIS Data SDGS LISGS FSRI SDDOT Traffic Data 2022 Aerial from 2021

Figure 2-7 – 2022 Daily Traffic Volumes

Table 2-3 – Turning Movement Counts (AM Peak)

Intersection	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Highway 1416 and 151st Ave	-	-	-	5	-	34	7	38	-	-	94	8
Highway 1416 and Liberty Blvd	3	32	2	20	8	28	134	23	2	1	15	139
Highway 1416 and S Ellsworth Rd*	86	56	7	10	16	194	618	115	15	0	44	13
Highway 1416 and Radar Hill Rd*	167	1	236	8	9	16	4	527	55	79	334	5
Radar Hill Rd and Long View Rd	1	24	3	3	38	102	70	6	1	5	16	9
Radar Hill Rd and Highway 44	4	0	1	19	2	10	15	217	5	2	207	17

^{*}Intersection split between eastbound and westbound Highway 1416. See split counts below.

NB - Northbound; SB - Southbound; EB - Eastbound; WB - Westbound

L – Left; T – Through; R – Right

Table 2-3a – Turning Movement Counts (AM Peak)

3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3												
Intersection		NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
WB Highway 1416 and S Ellsworth Rd	86	674	-	-	26	194	-	-	-	0	44	13
EB Highway 1416 and S Ellsworth Rd	-	142	7	10	16	-	618	115	15	-	-	-
WB Highway 1416 and Radar Hill Rd	167	5	-	-	17	16	-	-	-	79	334	5
EB Highway 1416 and Radar Hill Rd	-	168	236	8	88	-	4	527	55	_	-	-

NB - Northbound; SB - Southbound; EB - Eastbound; WB - Westbound

L – Left; T – Through; R – Right

Table 2-4 – Turning Movement Counts (PM Peak)

Intersection		NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Highway 1416 and 151st Ave	-	-	-	3	-	15	36	84	-	-	50	1
Highway 1416 and Liberty Blvd	7	10	0	110	20	54	37	42	12	3	27	54
Highway 1416 and S Ellsworth Rd*	36	37	6	6	59	256	291	79	143	14	71	6
Highway 1416 and Radar Hill Rd*	112	9	116	4	9	10	19	401	193	184	531	3
Radar Hill Rd and Long View Rd	1	46	4	7	37	107	127	10	1	2	6	4
Radar Hill Rd and Highway 44	6	1	0	23	7	24	39	132	12	1	221	24

^{*}Intersection split between eastbound and westbound Highway 1416. See split counts below.

NB - Northbound; SB - Southbound; EB - Eastbound; WB - Westbound

L – Left; T – Through; R – Right

Table 2-4a – Turning Movement Inputs for Operations Analysis (PM Peak)

Intersection		NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
WB Highway 1416 and S Ellsworth Rd	36	328	-	-	65	256	-	-	-	14	71	6
EB Highway 1416 and S Ellsworth Rd	-	73	6	6	73	-	291	79	143	-	-	-
WB Highway 1416 and Radar Hill Rd	112	28	-	-	13	10	-	-	-	184	531	3
EB Highway 1416 and Radar Hill Rd	-	121	116	4	193	-	19	401	193	-	-	-

NB - Northbound; SB - Southbound; EB - Eastbound; WB - Westbound

L – Left; T – Through; R – Right

Traffic Patterns

13-hour counts were collected from 5:30 AM to 6:30 PM. The AM peak in vehicular volume was determined to begin at approximately 7:00 AM, and the PM peak begins at approximately 4:30 PM. The peak hours determined from KLJ's data collection and analysis was validated using StreetLight. The intersections of Highway 1416 and S Ellsworth Road, and Highway 1416 and Radar Hill Road experienced the highest volumes out of all study intersections. The AM and PM peak turning movement counts are shown in Figure 2-8.

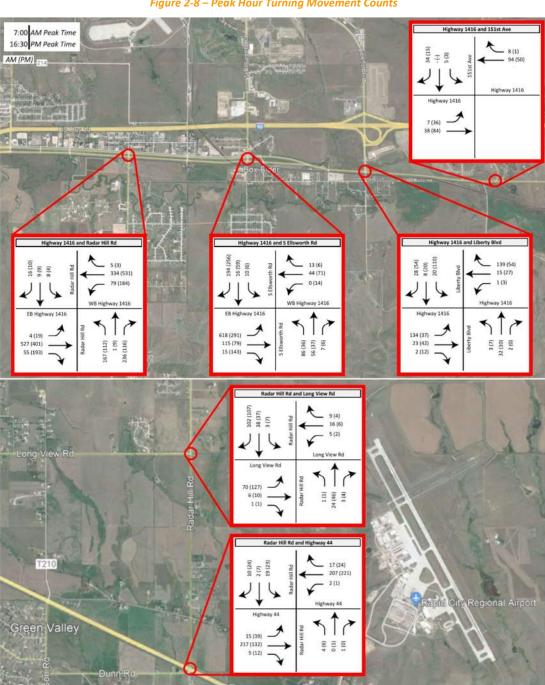


Figure 2-8 – Peak Hour Turning Movement Counts

Crash Analysis

Reviewing historic crash information can help identify existing deficiencies that can be addressed through this study. Ten years of crash records from January 1, 2013, through December 31, 2022, were requested from SDDOT. There were 357 crashes reported during the analysis period in the study area. The density of crashes along the study area and the location of crash events are shown in **Figure 2-9**. The frequency of crashes was generally high along the intersections of Highway 1416 with W Gate Road, Radar Hill Road, Commercial Gate Road, and S Ellsworth Road. The summary of crashes for study intersections only are shown in **Table 2-5**.

Table 2-5 - Crashes at Study Intersections

Tuble 2-5 - Crushes at Study Intersections											
Intersection with Highway 1416	Incapacitating	Non- Incapacitating	Possible Injury	Non-Injury	TOTAL						
151st Ave	-	-	1	1	2						
Liberty Blvd / Spruce Dr	1	-	2	5	8						
S Ellsworth Rd	1	1	6	17	25						
Commercial Gate Rd*	-	4	3	19	26						
Radar Hill Rd	7	23	18	53	101						
W Gate Rd*	1	3	6	17	27						
TOTAL	10	31	36	112	189						
Intersection with Radar Hill Road	Incapacitating	Non- Incapacitating	Possible Injury	Non-Injury	тот						
Long View Rd	-	-	-	-	0						
Hwy 44	1	-	-	4	5						
TOTAL	1	0	0	4	5						

^{*}Not among the intersections for study but added for statistics and reporting purposes.

The corridor was divided into the following analysis segments based on engineering judgement and local knowledge:

- » Crash Segment A: Highway 1416 From 151st Avenue to west of Cottonwood Drive
- » Crash Segment B: Highway 1416 From west of Cottonwood Drive to Radar Hill Road
- » Crash Segment C: Highway 1416 From Radar Hill Road to W Gate Road
- » Crash Segment D: Radar Hill Road From Highway 1416 to 229th Street
- » Crash Segment E: Radar Hill Road From 229th Street to Long View Road
- » Crash Segment F: Radar Hill Road From Long View Road to Highway 44

The summary of non-junction related crashes for crash segments are shown in **Table 2-6**.

Table 2-6 – Non-Junction Related Crashes

Crash Segment ID	Fatal injury	Incapacitating	Non- incapacitating	Possible Injury	No injury	Wild animal hit	тот
Α	1	3	3	4	7	3	21
В	1	-	5	4	11	7	27
С	1	2	6	2	23	-	34
D	-	1	5	4	14	3	27
E	1	3	-	2	14	2	21
F	-		-	2	1	4	7
TOTAL	2	9	19	18	70	19	137

- » There were 82 non-junction related crashes reported along Highway 1416 during the analysis period, which corresponds to 8.2 crashes per year.
- » There were 55 non-junction related crashes reported along Radar Hill Road during the analysis period, which corresponds to 5.5 crashes per year.

Ellsworth AFB Box Elder Rapid City Regional Airport Rapid City **Crash Density** (2013-2022) DUNN RD High Low 44 Crash Incidents

Figure 2-9 – Crash Density (Year 2013-2022)

Source: Pennington County. SD GIS Data. SDGS. USGS. ESRI. Aerial from 2021

May 2023

CRASH TRENDS AND PATTERNS

The trend and pattern of corridor crashes by year and month were analyzed from crash records.

Highway 1416

There were 177 crashes reported in the Highway 1416 segments of the study area during the analysis period. This corresponds to 17.7 crashes per year. The ten-year crash summary at Highway 1416 roadway is shown in **Figure 2-10**.

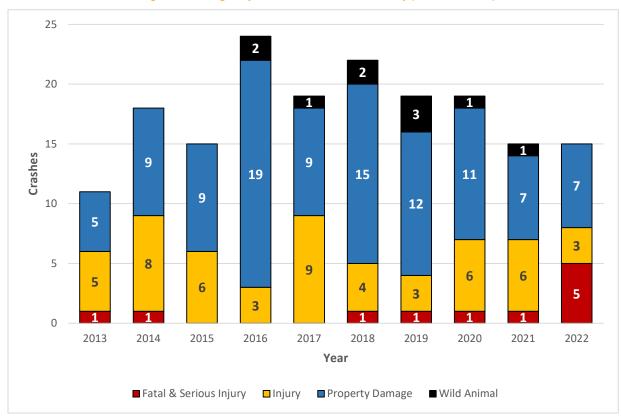


Figure 2-10 – Highway 1416 Ten-Year Crash Summary (Year 2013-2022)

The number of crashes has varied during the analysis period. The total crashes peaked in 2014, and recently there has been a modest drop in crashes. This may be attributed to recent improvements made on the Highway 1416 corridor with stop signs added to the main line in a single direction at the intersections of West Gate Road, Radar Hill Road, and S Ellsworth Road. The number of fatal and incapacitating crashes have been highest in 2022, with two fatal and three incapacitating crashes.

The trends of crashes by months of the year are shown in **Figure 2-11**. Frequency of crashes were generally high from October through February. This timeframe coincides with the typical winter months and snowy/icy roadways.

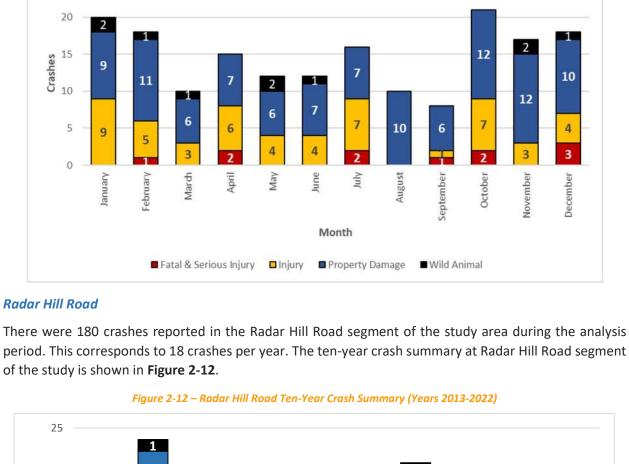
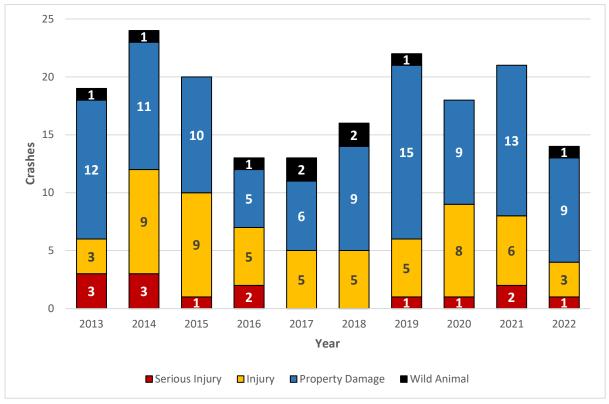


Figure 2-11 – Highway 1416 Crashes by Month (Years 2013-2022)

25

period. This corresponds to 18 crashes per year. The ten-year crash summary at Radar Hill Road segment of the study is shown in Figure 2-12.



The number of crashes has varied during the analysis period. There were no fatal crashes reported during the analysis period on the Radar Hill Road corridor.

The trends of crashes by months of the year are shown in **Figure 2-13**. Frequency of crashes were generally high from September through January.

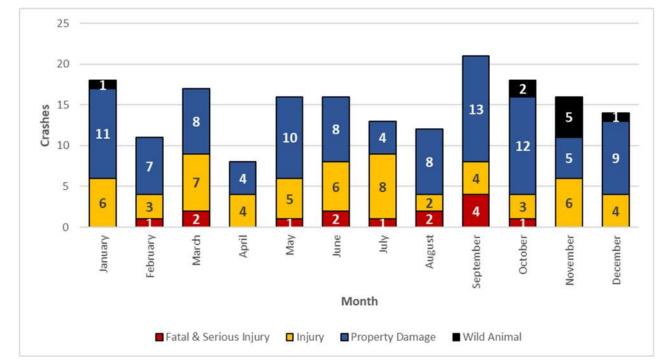


Figure 2-13 – Radar Hill Road Crashes by Month (Years 2013-2022)

FATAL CRASHES ON BOTH CORRIDORS

There were two (2) fatal and twenty (20) incapacitating injury crashes reported in the study area during the analysis period. The first fatal crash incident, which was reported in September 2014 took place at the intersection of Highway 1416 with Cottonwood Drive. The incident involved the collision of a motorist with an oncoming train. The railroad crossing at Cottonwood Drive near Highway 1416 is yield controlled. The second fatal crash incident, which was reported in February 2018 took place at the intersection of Eastbound Highway 1416 with Radar Hill Road. The incident involved a pedestrian and a motorist under the influence which occurred during dark conditions and the intersection was not well illuminated.

CRASHES INVOLVING PEDESTRIAN/BICYCLIST

There was one pedestrian- and three bicyclist-involved crashes reported during the analysis period. The only pedestrian crash incident was a fatal crash that was described previously in the report.

The first crash involving a bicyclist was reported in July 2014 near the intersection of Radar Hill Road with 229th Street. The incident involved the collision of a bicyclist with a lightweight truck and occurred under dark conditions with no streetlight illumination. The bicyclist experienced an incapacitating injury.

The second crash involving a bicyclist was reported in September 2016 at the intersection of Highway 1416 and Radar Hill Road. The incident involved the collision of a bicyclist traveling northbound to cross

Highway 1416 with an oncoming vehicle traveling westbound. The bicyclist experienced an incapacitating injury.

The third crash involving a bicyclist was reported in November 2020 at the intersection of Highway 1416 with W Gate Road. The incident involved the collision of a bicyclist traveling southbound to cross Highway 1416 with an oncoming vehicle traveling westbound. The bicyclist experienced a possible injury.

CRASHES WITH TRAIN

There were five crashes reported that involved collision of a vehicle with an oncoming train. There were three crashes reported for the intersection of Highway 1416 with Radar Hill Road, of which two resulted in non-incapacitating and one non-injury crashes. The major contributing factor for the crashes were failure to yield. The railroad crossing at Radar Hill Road is controlled by flashing lights and lowering arms. There were two crashes reported at the railroad crossing near the intersection of Highway 1416 with 151st Avenue, of which one resulted in a fatality and the other resulted in no injury. The major contributing factor for the crashes were failure to yield. The railroad crossing at 151st Avenue is controlled by a yield sign at each approach.

CRASH COLLISION TYPES

Identifying crash types at roadways assists in developing countermeasures to mitigate or minimize the crash type. Angle (120 crashes) and rear-end (43 crashes) were the most typical crash types at the study intersections along Highway 1416. **Figure 2-14** on the following page shows the crashes by crash type at the study intersections during the analysis period. The larger the pie chart, the more crashes that occurred at the corresponding intersection.

The non-junction related crashes by collision types are summarized in **Table 2-7**.

Manner of Collision Crash Wild **Total** Single-Head-Rear-Segment ID Angle **Sideswipe** Vehicle End On **Animal** 18 1 2 21 В 21 3 1 1 1 27 C 18 12 1 2 34 1 D 15 9 1 1 1 27 Ε 17 1 1 1 1 21 6 1 7 **TOTAL** 4 95 26 5 137

Table 2-7 – Non-Junction Related Crashes by Collision Types

- » Crash Segment A: Highway 1416 From 151st Avenue to west of Cottonwood Drive
- » Crash Segment B: Highway 1416 From west of Cottonwood Drive to Radar Hill Road
- » Crash Segment C: Highway 1416 From Radar Hill Road to W Gate Road
- » Crash Segment D: Radar Hill Road From Highway 1416 to 229th Street
- Crash Segment E: Radar Hill Road From 229th Street to Long View Road
- » Crash Segment F: Radar Hill Road From Long View Road to Highway 44.

Most (95 crashes, or 69 percent) of the non-junction related crashes involved a single-vehicle (i.e., run-off-road, rollover, etc.).

Ellsworth AFB Commercial Gate Rd -26 Crashes Hwy 1416 and Radar Hill Rd -West Gate Rd 27 Crashes 102 Crashes Ellsworth Rd 25 Crashes Liberty Blvd/ Spruce Dr -151st Ave -8 Crashes 2 Crashes Box Elder WOSHING VIEW DR LONG VIEW RD Rapid City Regional Airport Rapid City Hwy 44 -Intersection Crashes (2013-2022) 5 Crashes DUNN RD Rear End Angle Single Vehicle 44 Sideswipe

Figure 2-14 – Intersection Crashes by Collision Type (Ten-Year Crashes from 2013-2022)

Source: Pennington County, SD GIS Data, SDGS, USGS, ESRI, Aerial from 2021

June 2023

CRASH HOTSPOTS

Using the trends identified earlier, additional analysis and evaluation was completed in the study area for the intersections and segments that experienced a high frequency of crashes. This crash hotspot analysis is used to identify specific combinations of crash type and direction to further understand the specific issues at the study intersections and segments.

Highway 1416 and Radar Hill Road

The intersection of Highway 1416 and Radar Hill Road experienced the highest number of crashes during the analysis period with 102 crashes. Angle crashes were the most predominant type of crashes (77 crashes, or 75.5 percent) at the intersection. The intersection of Highway 1416 with Radar Hill Road is a divided intersection where the eastbound and westbound approaches of Highway 1416 operate as independent intersections with Radar Hill Road due to the large median (approximately 120 feet) between them.

The intersection of eastbound Highway 1416 and Radar Hill Road experienced 36 angle crashes during the ten-year analysis period. The intersection was converted to an all-way stop-control (AWSC) intersection in 2020. Prior to that, the intersection operated as a side-street stop-controlled intersection with stops on the northbound and southbound approaches. Between 2013 and 2019, the intersection experienced 30 angle crashes, which corresponds to 4.3 angle crashes per year. The major contributing factor to the angle crashes was failure to yield. The number of crashes involving eastbound- and northbound-traveling vehicles, and eastbound- and southbound-traveling vehicles were equal. The rate of angle crashes reduced between 2020 and 2022 (while operating as an AWSC intersection), with the intersection experiencing six angle crashes that corresponds to two angle crashes per year. However, the rate of rearend crashes went up from six crashes in seven years between 2013 and 2019 (0.9 rear-end crashes per year) to six crashes in three years between 2020 and 2022 (two rear-end crashes per year). Rear-end crashes generally occurred along the eastbound approach and northbound approach.

The intersection of westbound Highway 1416 and Radar Hill Road experienced 41 angle crashes. The major contributing factor to the angle crashes was failure to yield. The intersection operates as a side-street stop-controlled intersection with stops on the northbound and southbound approaches. Most of the angle crashes involved vehicles traveling northbound and westbound (20 crashes).

Highway 1416 and S Ellsworth Road

There were 25 crashes reported at the intersection of Highway 1416 and S Ellsworth Road during the analysis period. Angle crashes were the most prominent type of crashes (20 crashes, or 80-percent) at the intersection. The intersection of Highway 1416 with S Ellsworth Road is a divided intersection, with a median of approximately 150 feet. Due to the large median, the westbound and eastbound approaches of Highway 1416 are controlled as independent intersections with S Ellsworth Road.

The intersection of eastbound Highway 1416 and S Ellsworth Road experienced 12 crashes, with 10 angle crashes. The number of crashes involving eastbound- and northbound-traveling vehicles, and eastbound- and southbound-traveling vehicles were equal. The major contributing factors to the angle crashes were failure to yield. The northbound approach of the intersection has a negative offset which creates additional conflict points for motorists and increases the crash potential due to poor driver visual cognition of conflicting traffic.

The intersection of westbound Highway 1416 and S Ellsworth Road experienced 13 crashes, with 10 angle crashes. There were seven angle crashes involving northbound- and westbound-traveling vehicles. The intersection is controlled by side-street stop signs. The stop signs were moved from the S Ellsworth Rd approaches to the westbound approach of Highway 1416 in 2020. The northbound approach is uncontrolled, and the southbound approach is yield-controlled. The number of crashes were reduced from 10 crashes between 2013 and 2018 (1.4 crashes per year) to three crashes between 2020 to 2022 (one crash per year).

Segment Lighting

The segments of Highway 1416 and Radar Hill Road within the study area do not currently have continuous lighting. The non-junction related crashes by lighting conditions in the study area are summarized in **Table 2-8**.

Table 2-8 – Non-Junction Related Crashes by Lighting Conditions

Segment	Dark conditions with No street Lighting	Day conditions or dark conditions with some street lighting	Total
Α	12	9	21
В	12	15	27
С	13	21	34
D	7	20	27
Е	10	11	21
F	5	2	7
TOTAL	59	78	137

- » Crash Segment A: Highway 1416 From 151st Avenue to west of Cottonwood Drive
- » Crash Segment B: Highway 1416 From west of Cottonwood Drive to Radar Hill Road
- » Crash Segment C: Highway 1416 From Radar Hill Road to W Gate Road
- » Crash Segment D: Radar Hill Road From Highway 1416 to 229th Street
- » Crash Segment E: Radar Hill Road From 229th Street to Long View Road
- » Crash Segment F: Radar Hill Road From Long View Road to Highway 44

There were 59, or 43-percent, non-junction related crashes reported during the analysis period. There were 95 single-vehicle non-junction crashes reported for the study area during the analysis period. This includes 41, or 43 percent, single-vehicle non-junction related crashes that occurred during dark conditions where street lighting was minimum to non-existent.

Capacity Analysis and Demand

Intersection Capacity Analysis

Intersection capacity analysis was conducted using HCS 2023 software for each of the study intersections, using both AM and PM peak vehicular and pedestrian volumes. Intersection performance was measured based on delay and Level of Service (LOS). The methodology for vehicular and pedestrian LOS is described in the following sections.

VEHICULAR LEVEL OF SERVICE (VLOS)

Vehicular Level of Service (VLOS) is a function of average delay per vehicle. LOS "A" represents free-flow traffic, whereas LOS "F" represents unacceptable delay. LOS "D" or better is considered acceptable for Minor Arterials and Collectors, in accordance with SDDOT standards. LOS delay thresholds are presented in **Table 2-9**.

Table 2-9 – Intersection Level of Service Thresholds

	Average Delay / Vehicle											
Level of	Stop, Yield, and Roundabout	Signalized										
Service	Intersections	Intersections										
Α	< 10 seconds	< 10 seconds										
В	10 to 15 seconds	10 to 20 seconds										
С	15 to 25 seconds	20 to 35 seconds										
D	25 to 35 seconds	35 to 55 seconds										
Е	35 to 50 seconds	55 to 80 seconds										
F	> 50 seconds	> 80 seconds										

LOS for two-way stop controlled (TWSC) intersections is currently undefined by the Highway Capacity Manual (HCM). Major roadway through and right-turn movements generally experience no delay, as they are uncontrolled and do not need to yield to any conflicting movements. However, vehicles turning left or crossing the major street can experience significant delay. For this reason, LOS assigned to TWSC intersections in this study were determined based on the delay experienced by side street approaches and left-turning movements, weighted by movement volume. All-way stop controlled (AWSC) intersection LOS was determined based on methodology presented in the HCM. None of the study intersections are currently signalized or roundabout controlled.

The intersections of Highway 1416 and S Ellsworth Road, and Highway 1416 and Radar Hill Road were modeled as separate intersections due to large median separation between eastbound and westbound approaches, as well as differences in stop-control in each approach. The intersection delay and LOS were measured as a weighted average of all approaches experiencing delay by the volume of each approach.

Vehicular LOS results for each intersection are shown in **Table 2-10**. The intersection delay is presented based on methodology described above. The corresponding LOS value for the intersection delay is shown, as well as the LOS value for the worst approach. Detailed Vehicular Level of Service results can be found in **Appendix B**.

Table 2-10 – Existing Intersection Vehicular Capacity Analysis

	AM Pea	ak	PM Pe	ak
Intersection	Delay (sec/veh)	LOS*	Delay (sec/veh)	LOS*
Highway 1416 and 151st Ave	9.1	A/A	8.0	A/A
Highway 1416 and Liberty Blvd	9.8	A/B	10.2	B/B
Highway 1416 and S Ellsworth Rd	677.2	F/F	13.5	B/E
Highway 1416 and Radar Hill Rd	26.9	D/E	32.8	D/F
Radar Hill Rd and Long View Rd	8.4	A/A	8.8	A/A
Radar Hill Rd and Highway 44	10.5	B/B	2.6	A/B

*[Intersection LOS] / [Worst approach LOS]

AM Peak

During the AM peak, it was determined that the intersection of Highway 1416 and S Ellsworth Road experiences severely unacceptable delay and LOS, with both the intersection and worst approach reaching LOS F. The unacceptable conditions are primarily caused by a significant number of eastbound vehicles making a left turn at the intersection. On the recorded day, this uncontrolled movement had 618 vehicles during the peak hour. This equates to approximately one vehicle every 6 seconds for the entire hour leaving few gaps for all other movements.

The intersection of Highway 1416 and Radar Hill Road also experiences severely unacceptable delay and LOS, with the worst approach reaching LOS E. The worst approach at this intersection is the northbound approach of the eastbound portion of Highway 1416 (south of the median). The unacceptable delay at this approach is the result of the minimal storage space in the median separating eastbound and westbound Highway 1416 being exceeded by queueing vehicles, which causes queueing and delays for vehicles attempting to enter the median.

All other intersections operate under acceptable delay and LOS during the AM peak.

PM Peak

During the PM peak, it was determined that the intersection of Highway 1416 and S Ellsworth Road experiences unacceptable delay and LOS, with the worst approach reaching LOS E. The worst approach at this intersection is the southbound approach of the eastbound portion of Highway 1416 (south of the median). High eastbound volumes at this intersection make it difficult for drivers to find acceptable gaps to cross or merge onto the highway. This intersection also experiences higher southbound volumes during the PM peak as vehicles travel away from the Ellsworth Air Force Base.

The Highway 1416 and Radar Hill Road intersection also experiences severely unacceptable delay and LOS, with the worst approach reaching LOS F. The worst approaches at this intersection are the northbound and eastbound left/thru approaches of the eastbound portion of Highway 1416 (south of the median). Minimal median storage causes significant queueing and delays for vehicles attempting to enter the median.

All other intersections operate under acceptable delay and LOS during the PM peak.

PEDESTRIAN AND BICYCLE LEVEL OF SERVICE (PLOS/BLOS)

Pedestrian Level of Service (PLOS) and Bicycle Level of Service (BLOS) are measures of a segment's walkability and bikeability. The *Highway Capacity Manual* provides a PLOS and BLOS calculation for segments, incorporating roadway design, adjacent vehicular volume, presence of parking and other buffers, and existing pedestrian and bicycle facilities. The segments are scored with LOS A through F, with LOS A representing satisfactory facilities for bicycles and pedestrians, and LOS F representing a facility that is unsuitable for bicycles and pedestrians. A score value that corresponds to PLOS and BLOS characteristics within a given system is shown in **Table 2-11**.

Score Range	PLOS or BLOS
≤ 1.50	А
≥1.51 and ≤2.50	В
≥2.51 and ≤3.50	С
≥3.51 and ≤4.50	D
≥4.51 and ≤5.50	E
>5.51	F

Table 2-11 – PLOS and BLOS Scoring Thresholds

The study area was split into eight segments for the PLOS and BLOS analysis, due to difference in directional ADT, speed limit changes, and the presence and width of shoulders. The segment descriptions and PLOS and BLOS results are shown in **Table 2-12**. Detailed PLOS and BLOS results can be found in **Appendix C.**

Table 2-12 – Existing Pedestrian LOS (PLOS) and Bicycle LOS ((BLOS) Results
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Comment	PLC	S	BLC)S
Segment	Score	LOS	Score	LOS
Highway 1416 151st Ave to Liberty Blvd	4.92	E	4.20	D
WB Highway 1416 Liberty Blvd to S Ellsworth Rd	4.08	D	4.08	D
WB Highway 1416 S Ellsworth Rd to W Gate Rd	4.55	E	4.87	Ш
EB Highway 1416 Liberty Blvd to S Ellsworth Rd	4.06	D	4.89	Е
EB Highway 1416 S Ellsworth Rd to W Gate Rd	4.57	E	4.90	E
Radar Hill Rd Highway 1416 to 228th St	4.02	D	4.26	D
Radar Hill Rd 228th St to 229th St	3.07	С	1.50	А
Radar Hill Rd 229th St to Highway 44	3.92	D	3.81	D

PLOS and BLOS scores are generally unfavorable throughout the study area. This is primarily due to a lack of walkable and bikeable facilities. The Radar Hill Road segment from 228th Street to 229th Street has a ten-foot shoulder on both sides of the roadway, which contributes to the increased PLOS, and the satisfactory BLOS.

Providing adequate pedestrian and bicycle facilities along Highway 1416 and Radar Hill Road is expected to increase the PLOS and BLOS.

Summary

Corridor Characteristics

- The access management analysis determined that Radar Hill Road exceeds SDDOT standards of five accesses per side per mile between Highway 1416 and Highway 44, with an average of 6.3 and 8.5 accesses per mile, on the west and east sides, respectively.
- » A negative offset exists on S Ellsworth Road at the intersection with eastbound Highway 1416. Realignment of this intersection to remove the negative offset should be considered.
- The only existing multimodal facilities within the study area consists of a ten-foot shoulder on both sides of Radar Hill Road between 228th Street and 229th Street. No dedicated sidewalks or bike lanes exist within the study area.
- » Proximity to Box Elder Road to the north and the railroad tracks to the south limits available right-of-way for Highway 1416. The proximity also leads to safety and operational concerns at the intersections along Box Elder Road and the railroad.
- » The northbound queues entering Highway 1416 at Radar Hill Road and Ellsworth Drive can extend to the railroad tracks causing safety concerns. Likewise, the southbound approaches onto Highway 1416 can extend across Box Elder Road causing delays and safety concerns with the intersections of the frontage road.
- » The atypical traffic control at Highway 1416's intersections with Radar Hill Road, Commercial Gate Road, and Ellsworth Drive could lead to driver confusion and become a potential safety hazard.

Safety

- » There were 357 crashes reported during the 10-year analysis period in the study area.
- » There were 177 crashes reported in the Highway 1416 segments of the study area.
- » There were 180 crashes reported in the Radar Hill Road segment of the study area.
- » There were two (2) fatal and twenty (20) incapacitating injury crashes reported.
- There was one pedestrian-related crash and three crashes involving bicyclists reported.
- » The frequency of crashes was generally high along the intersections of Highway 1416 with W Gate Road, Radar Hill Road, Commercial Gate Road, and S Ellsworth Road.
- » Angle (120 crashes) and rear-end (43 crashes) were the most typical crash types at the study intersections along Highway 1416.

- » Most (95 crashes, or 69 percent) of the non-junction related crashes were single-vehicle related, like run-off-road, roll over, etc. This includes 41, or 43 percent, single-vehicle non-junction related crashes that occurred during dark conditions where street lighting were minimum to non-existent.
- The intersection of Highway 1416 and Radar Hill Road experienced the highest number of crashes during the analysis period, with 102 crashes. Angle crashes were the most prominent type of crashes (77 crashes, or 75.5 percent) at the intersection.
- » There were 25 crashes reported at the Highway 1416 and S Ellsworth Road intersection during the analysis period. Angle crashes were the most prominent type of crashes (20 crashes, or 80 percent) at the intersection.

Traffic Volumes

- » KLJ collected traffic volumes at six study intersections on May 9 and May 23, 2023.
- The AM peak was determined to be 7:00 AM, and the PM peak was determined to be 4:30 PM. These peak times were validated using StreetLight data.

Capacity Analysis

- » Highway 1416 and S Ellsworth Road operates at LOS F during the AM peak, and LOS E during the PM peak.
- » Highway 1416 and Radar Hill Road operates at LOS E during the AM peak, and LOS F during the PM peak, brought on by queueing in the median.
- » All other study intersections operate under acceptable delay and LOS during the AM and PM peaks.
- » The majority of the segments within the study area operate under unacceptable Pedestrian LOS (PLOS) and Bicycle LOS (BLOS), due to a lack of dedicated pedestrian and bicycle facilities.

Chapter 3 - FUTURE CONDITIONS

Future Volumes

Existing traffic counts were collected by KLJ in May of 2023 at the six study intersections. These volumes were projected to the 2030 and 2050 analysis years. The basis of the growth was derived from the Rapid City Area MPO regional model. However, the model does not currently account for some planned developments in the study area. The projection for the general background growth was adjusted to account for anticipated growth due to expansion of the Ellsworth Air Force Base. Annual growth rates were estimated using the Rapid City Area MPO regional model. Furthermore, additional traffic due to the development of two new schools and a multi-family housing development directly adjacent to the study area were also incorporated into the future volume counts. The methodology for the development of the volumes used in the analysis is included in this section.

Annual Growth Rate

Annual growth rates by movement at each of the study intersections were developed using Average Daily Traffic (ADT) values within the study area, and accounting for additional growth expected from the Ellsworth Air Force Base. ADTs for the years 2018 and 2045 were provided by the Rapid City Area MPO along the relevant segments of the Highway 1416 and Radar Hill Road corridors. The Ellsworth Air Force Base is expected to expand by approximately 4,000 people by the year 2030, which represents a population growth of 2.30% in the City of Box Elder. This growth rate was applied to the anticipated growth between the 2018 and 2045 ADTs to develop an annual growth rate using **Equation 1**.

Annual Growth Rate =
$$(\frac{ADT2045 * (1 + 2.30\%)}{ADT2018})^{\frac{1}{2045 - 2018}} - 1$$

This equation provided annual growth rate by approach, which was then averaged between relevant movements to determine annual growth rate by movement, as ADT is bi-directional (e.g., the annual growth rate applied to northbound left movements was an average of the *northbound* annual growth rate and the *eastbound* annual growth rate). The annual growth rates by movement are presented in **Table 3-1**.

Table 3-1 – Annual Growth Rate by Movement

	No	orthbou	nd	So	uthbou	nd	Ea	astbour	ıd	W	estbou	nd
	L	Т	R	L	Т	R	L	Т	R	L	Т	R
Highway 1416 and 151st Ave	-	-	-	0.61%	-	0.61%	0.61%	0.45%	-	-	0.45%	0.61%
Highway 1416 and Liberty Blvd	0.30%	0.19%	0.30%	0.24%	0.19%	0.24%	0.24%	0.30%	0.30%	0.30%	0.30%	0.24%
WB Highway 1416 and S Ellsworth Rd	0.61%	0.76%	-	-	0.76%	0.91%	-	-	-	0.75%	0.89%	0.90%
EB Highway 1416 and S Ellsworth Rd	-	0.61%	0.89%	0.61%	0.61%	ı	0.71%	0.81%	0.81%	ı	-	-
WB Highway 1416 and Radar Hill Rd	0.62%	0.62%	-	-	0.62%	0.61%	-	1	-	0.69%	0.77%	0.77%
EB Highway 1416 and Radar Hill Rd	-	0.62%	0.77%	0.62%	0.62%	ı	0.69%	0.77%	0.77%	ı	-	-
Radar Hill Rd and Long View Rd	1.67%	1.01%	0.78%	0.92%	1.01%	1.82%	1.82%	1.58%	1.67%	0.78%	1.58%	0.92%
Radar Hill Rd and Highway 44	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%

L-Left; T-Through; R-Right

The annual growth rates were then applied to the existing (2023) volumes and projected to design years 2030 and 2050 for the AM and PM peaks.

Future Development

There have been two Traffic Impact Studies (TISs) completed that are expected to have measurable impact on the study intersections before the 2030 analysis year. One TIS discussed impacts from two different developments (Box Elder High School and Multi-Family Housing). These TISs were reviewed, and the additional trips expected due to the new developments were included in the projected traffic volumes for this study.

BOX ELDER HIGH SCHOOL (2021)

A new high school is proposed to be constructed on a 60-acre site between 151st Avenue and Liberty Boulevard, north of Highway 1416. This school is anticipated have 1,400 students and generate 728 trips during the AM peak, and 196 trips during the PM peak.

The additional volumes anticipated at each of the study intersections during the AM and PM peaks is shown in **Table 3-2**. The afternoon school peak does not fall during the network PM peak; therefore, additional trips were added based on the PM peak of adjacent traffic. No additional trips are expected at the intersections of Radar Hill Road and Long View Drive, or Radar Hill Road and Highway 44.

Table 3-2 – Box Elder High School – Additional Trips

	No	Northbound			ıthboı	ınd	Ea	stbou	nd	Westbound		
	L	Т	R	L	T	R	٦	T	R	L	T	R
Highway 1416 and 151st Ave				5		89	165	1			1	9
Tilgilway 1410 and 1313t Ave				(1)		(36)	(32)					(2)
Highway 1416 and Liberty Blyd		17	7	37	8	89	182	121		4	59	24
Highway 1416 and Liberty Blvd		(3)	(1)	(8)	(4)	(38)	(35)	(24)		(2)	(26)	(8)
WP Highway 1416 and S Ellowarth Pd					49					24	100	24
WB Highway 1416 and S Ellsworth Rd					(9)					(10)	(43)	(10)
CD Highway 141C and C Ellawarth Dd			49	49	24			205				
EB Highway 1416 and S Ellsworth Rd			(9)	(9)	(10)			(39)				
M/D Highway 1416 and Dadar Hill Dd										19	80	1
WB Highway 1416 and Radar Hill Rd										(11)	(32)	
ED History 141C and Dade Hill Dd	·		63	2				140	·			
EB Highway 1416 and Radar Hill Rd			(9)					(30)				

L – Left; T – Through; R – Right AM (PM)

MULTI-FAMILY HOUSING

A new multi-family housing development is expected to be constructed before the 2030 analysis year. The additional trips generated by this development were included in the TIS for the Box Elder High School. The multi-family housing development is anticipated to be developed south of the High School, north of Highway 1416, and between Liberty Boulevard and 151st Avenue. The development is expected to have 200 dwelling units and generate 80 trips during the AM peak, and 102 trips during the PM Peak.

The additional volumes anticipated at each of the study intersections during the AM and PM peaks is shown in **Table 3-3**. No additional trips are expected at the intersections of Radar Hill Road and Long View Drive, or Radar Hill Road and Highway 44.

Table 3-3 – Multi-Family Housing Development – Additional Trips

	No	rthbou	ınd	Sou	ıthboı	ınd	Ea	stboui	nd	Westbound		
	L	Т	R	L	Т	R	L	T	R	L	T	R
Highway 1416 and 151st Ave				(1)		21 (13)	6 (22)					1 (1)
Highway 1416 and Liberty Blvd		1 (2)	(1)	2 (5)	2 (1)	23 (14)	7 (24)	5 (16)		1 (1)	15 (10)	5 (3)
WB Highway 1416 and S Ellsworth Rd					2 (6)					6 (4)	26 (16)	6 (4)
EB Highway 1416 and S Ellsworth Rd			2 (6)	2 (6)	6 (4)			8 (27)				
WB Highway 1416 and Radar Hill Rd										5 (4)	21 (12)	
EB Highway 1416 and Radar Hill Rd			2 (6)	1				5 (21)				

L-Left; T-Through; R-RightAM (PM)

DOUGLAS SCHOOL DISTRICT (2022)

A new elementary school is anticipated to be constructed on a site along Creekside Drive between Coyote Trail and Morgen Road. This school is anticipated have 600 students and generate 450 trips during the AM peak, and 96 trips during the PM peak.

The additional volumes anticipated at each of the study intersections during the AM and PM peaks is shown in **Table 3-4**. The afternoon school peak does not fall during the network PM peak; therefore, additional trips were added based on the PM peak of adjacent traffic. No additional trips are expected at the intersections of Radar Hill Road and Long View Drive, or Radar Hill Road and Highway 44.

	Northbound		ı	South	oound		East	bound		Westbound		
	L	Т	R	L	Т	R	L	Т	R	٦	Т	R
Highway 1416 and 151st Ave												
Highway 1416 and Liberty Blvd												
WB Highway 1416 and S Ellsworth Rd		41			49							
WB Highway 1410 and 3 Elisworth Na		(10)			(9)							
EB Highway 1416 and S Ellsworth Rd		41			49							
LB Highway 1410 and 3 Elisworth Na		(10)			(9)							
WB Highway 1416 and Radar Hill Rd	4	22			19							
WB mgmway 1410 and Nadar min Nd	(1)	(4)			(4)							
ED Highway 1416 and Padar Hill Dd		21			19				5			
EB Highway 1416 and Radar Hill Rd		(5)			(4)				(1)			

Table 3-4 – Douglas School District Elementary School – Additional Trips

L – Left; T – Through; R – Right AM (PM)

Future Volumes

The future volumes for the analysis years 2030 and 2050 were determined by applying the annual growth rates (**Table 3-1**) to the existing 2023 turning movement counts and adding the expected volumes due to the three new developments described above (**Table 3-2**, **Table 3-3**, and **Table 3-4**). The projected volumes for the AM and PM peaks of the build year 2030 are shown in **Table 3-5** and **Table 3-6**, respectively.

2030 No-Build Volumes	Northbound			Southbound			Ea	stbou	nd	Westbound		
AM Peak – 7:00	L	Т	R	L	Т	R	L	Т	R	L	Т	R
Highway 1416 and 151st Ave	-	-	-	11	-	146	179	41	ı	-	99	19
Highway 1416 and Liberty Blvd	4	51	10	60	19	141	326	150	3	7	90	171
WB Highway 1416 and S Ellsworth Rd	90	752	-	-	128	207	1	1	ı	30	173	44
EB Highway 1416 and S Ellsworth Rd	-	190	59	62	96	-	650	335	16	-	-	
WB Highway 1416 and Radar Hill Rd	179	28	-	-	37	17	-	-	-	107	454	7
EB Highway 1416 and Radar Hill Rd	-	197	314	12	111	-	5	702	64	-	-	-
Radar Hill Rd and Long View Rd	2	26	4	4	41	116	80	7	2	6	18	10
Radar Hill Rd and Highway 44	5	2	2	21	3	11	16	232	6	3	221	19

Table 3-5 – Projected Volumes – 2030 (AM Peak)

L − Left; T − Through; R − Right

Table 3-6 – Projected Volumes – 2030 (PM Peak)

2030 No-Build Volumes	Northbound			Sou	Southbound			stbou	nd	Westbound		
PM Peak – 16:30	L	Т	R	٦	Т	R	٦	Т	R	L	Т	R
Highway 1416 and 151st Ave	-	ı	ı	6	-	65	92	87	-	1	52	5
Highway 1416 and Liberty Blvd	8	16	2	125	26	107	97	83	13	7	64	66
WB Highway 1416 and S Ellsworth Rd	38	356	ı	1	93	273	ı	-	-	29	135	21
EB Highway 1416 and S Ellsworth Rd	-	87	22	22	100	-	306	150	152	-	-	-
WB Highway 1416 and Radar Hill Rd	118	34	1	1	18	11	ı	-	-	209	605	4
EB Highway 1416 and Radar Hill Rd	-	132	138	5	206	1	20	475	205	1	ı	-
Radar Hill Rd and Long View Rd	2	50	5	8	40	122	145	12	2	3	7	5
Radar Hill Rd and Highway 44	7	2	2	25	8	26	42	141	13	2	236	26

L − Left; T − Through; R − Right

The projected volumes for the AM and PM peaks of the design year 2050 are shown in **Table 3-7** and **Table 3-8**, respectively.

Table 3-7 – Projected Volumes – 2050 (AM Peak)

2050 No-Build Volumes	Northbound			Soi	Southbound			stbou	nd	Westbound		
AM Peak – 7:00	L	Т	R	L	Т	R	L	Т	R	L	Т	R
Highway 1416 and 151st Ave	-	-	-	11	-	151	180	44	-	-	108	20
Highway 1416 and Liberty Blvd	4	52	10	61	19	142	333	151	3	7	91	178
WB Highway 1416 and S Ellsworth Rd	102	868	-	-	132	248	-	-	-	30	182	47
EB Highway 1416 and S Ellsworth Rd	-	209	60	63	98	-	748	356	19	-	-	-
WB Highway 1416 and Radar Hill Rd	202	28	-	-	40	19	-	-	-	120	512	8
EB Highway 1416 and Radar Hill Rd	-	220	356	13	123	-	5	794	73	-	-	-
Radar Hill Rd and Long View Rd	2	32	4	4	50	166	114	10	2	7	25	12
Radar Hill Rd and Highway 44	6	2	2	25	3	13	20	278	7	3	265	22

L − Left; T − Through; R − Right

Table 3-8 – Projected Volumes – 2050 (PM Peak)

2050 No-Build Volumes	No	rthbou	ınd	Sou	uthbou	ınd	Ea	stbou	nd	Westbound		
PM Peak – 16:30	L	Т	R	L	Т	R	L	Т	R	L	T	R
Highway 1416 and 151st Ave	-	-	-	6	-	67	97	95	-	-	57	5
Highway 1416 and Liberty Blvd	8	16	2	131	27	110	99	86	13	7	66	69
WB Highway 1416 and S Ellsworth Rd	43	413	-	-	104	327	-	-	-	32	150	22
EB Highway 1416 and S Ellsworth Rd	-	96	23	23	109	-	352	165	178	1	1	-
WB Highway 1416 and Radar Hill Rd	134	38	-	-	20	12	-	-	-	237	697	4
EB Highway 1416 and Radar Hill Rd	-	148	158	5	232	-	23	545	239	-	1	-
Radar Hill Rd and Long View Rd	2	61	5	9	49	174	207	16	2	3	10	6
Radar Hill Rd and Highway 44	8	2	2	30	9	31	50	169	16	2	283	31

L – Left; T – Through; R – Right

Capacity Analysis and Demand

Intersection Capacity Analysis

Intersection capacity analysis was conducted using HCS 2023 software for each of the study intersections, using both AM and PM peak vehicular volumes. Intersection performance was measured based on delay and Level of Service (LOS). The vehicular Level of Service was determined using the methodology described in Existing Conditions. Detailed Vehicular Level of Service results can be found in **Appendix D.**

LEVEL OF SERVICE RESULTS – 2030

The LOS results under 2030 projected conditions are presented in **Table 3-9**.

	AM Pea	ak	PM Peak			
Intersection	Delay (sec/veh)	LOS*	Delay (sec/veh)	LOS*		
Highway 1416 and 151st Ave	9.0	A/B	6.5	A/A		
Highway 1416 and Liberty Blvd	116.5	F/F	12.7	B/C		
Highway 1416 and S Ellsworth Rd	4493.0	F/F	90.6	F/F		
Highway 1416 and Radar Hill Rd	66.5	F/F	68.7	F/F		
Radar Hill Rd and Long View Rd	8.6	A/A	9.1	A/A		
Radar Hill Rd and Highway 44	11.0	B/B	2.8	A/B		

Table 3-9 – Future Intersection Vehicular Capacity Analysis Results (2030)

AM Peak

During the AM peak under forecasted 2030 conditions, it was determined that the Intersection of Highway 1416 and Liberty Boulevard is expected to experience unacceptable delay and LOS, with both the intersection and worst approach reaching LOS F. The unacceptable conditions are due to northbound and southbound vehicles experiencing significant delay, as they are unable to find an acceptable gap in the high eastbound and westbound volumes.

The intersection of Highway 1416 and S Ellsworth Road is also expected to experience severely unacceptable delay and LOS during the AM peak in 2030, with both the intersection and worst approach reaching LOS F. These conditions were reached under existing conditions as well. The unacceptable conditions are primarily caused by a significant number of eastbound vehicles making a left turn, causing severe queueing in the median separating eastbound and westbound Highway 1416. The eastbound approach at this intersection is free flowing (i.e., there is no stop control at this approach). However, some delay is still experienced, as the high volume of left-turning vehicles exceeds the capacity of a single lane. This queueing causes spillback for eastbound movements, as well as northbound vehicles along S Ellsworth Road.

The intersection of Highway 1416 and Radar Hill Road is also expected to experience unacceptable delay and LOS during the AM peak in 2030, with both the intersection and worst approach reaching LOS F. These conditions were reached under existing conditions as well. The unacceptable conditions are primarily

^{*[}Intersection LOS] / [Worst approach LOS]

caused by a high northbound volume, and vehicles being unable to find an acceptable gap to cross or enter Highway 1416 due to high eastbound and westbound volumes. Minimal storage space in the median separating eastbound and westbound Highway 1416 also causes significant queuing and spillback affecting the northbound movements, as well as eastbound vehicles attempting to turn left.

All other study intersections are expected to operate under acceptable delay and LOS during the AM peak in 2030.

PM Peak

During the PM peak under projected 2030 conditions, it was determined that the intersection of Highway 1416 and S Ellsworth Road is expected to experience unacceptable delay and LOS, with the intersection reaching LOS C, and the worst approach reaching LOS F. The worst approach at this intersection during the PM peak is the southbound approach of the eastbound portion of Highway 1416 (south of the median). High eastbound volumes at this intersection make it difficult for southbound vehicles to find acceptable gaps to cross or enter Highway 1416, causing significant queueing and delay that impacts the southbound and westbound vehicles. This intersection also experiences higher southbound volumes during the PM peak as vehicles travel away from the Ellsworth Air Force Base.

The intersection of Highway 1416 and Radar Hill Road is also expected to experience unacceptable delay and LOS during the PM peak in 2030, with the intersection reaching LOS E and the worst approach reaching LOS F. The worst approaches at this intersection during the PM peak are the northbound and eastbound approaches of the eastbound portion of Highway 1416 (south of the median). Minimal storage space in the median and high eastbound left volumes cause significant queueing and delay that affects eastbound and northbound vehicles.

All other study intersections are expected to operate under acceptable delay and LOS during the PM peak in 2030.

LEVEL OF SERVICE RESULTS – 2050

The LOS results under 2050 projected conditions are presented in **Table 3-10**.

AM Peak PM Peak Intersection Delay Delay LOS* LOS* (sec/veh) (sec/veh) Highway 1416 and 151st Ave 9.8 A/B 8.4 A/AHighway 1416 and Liberty Blvd F/F B/C 152.5 13.1 Highway 1416 and S Ellsworth Rd F/F 15432.5 F/F166.1 Highway 1416 and Radar Hill Rd 202.5 F/F 359.3 F/FRadar Hill Rd and Long View Rd 9.4 A/A13.3 B/C Radar Hill Rd and Highway 44 B/B 2.9

Table 3-10 – Future Intersection Vehicular Capacity Analysis Results (2050)

11.9

A/B

^{*[}Intersection LOS] / [Worst approach LOS]

AM Peak

During the AM peak under projected 2050 conditions, it was determined that the intersection of Highway 1416 and Liberty Boulevard is expected to experience unacceptable delay and LOS, with both the intersection and worst approach reaching LOS F. These conditions were met under 2030 conditions and are expected to worsen with continued growth in the surrounding network.

The intersection of Highway 1416 and S Ellsworth Road is also expected to experience severely unacceptable delay and LOS during the AM peak in 2050, with both the intersection and worst approach reaching LOS F. These conditions were reached under existing conditions, as well as projected 2030 conditions, and are expected to worsen with continued growth in the surrounding network.

The intersection of Highway 1416 and Radar Hill Road is also expected to experience severely unacceptable delay and LOS during the AM peak in 2050, with both the intersection and worst approach reaching LOS F. Unacceptable conditions were reached under existing conditions, as well as projected 2030 conditions, and are expected to worsen with continued growth in the surrounding network.

All other study intersections are expected to operate under acceptable delay and LOS during the AM peak in 2050.

PM Peak

During the PM peak under projected 2050 conditions, it was determined that the inter section of Highway 1416 and S Ellsworth Road is expected to experience unacceptable delay and LOS, with the intersection reaching LOS D, and the worst approach reaching LOS F. Unacceptable conditions were reached under existing conditions, as well as projected 2030 conditions, and are expected to worsen with continued growth in the surrounding network.

The intersection of Highway 1416 and Radar Hill Road is also expected to experience severely unacceptable delay and LOS during the PM peak in 2050, with both the intersection and worst approach reaching LOS F. Unacceptable conditions were reached under existing conditions, as well as projected 2030 conditions, and are expected to worsen with continued growth in the surrounding network.

All other study intersections are expected to operate under acceptable delay and LOS during the PM peak in 2050.

Signal Warrant Analysis

The Manual on Uniform Traffic Control Devices (MUTCD) provides guidance and standards for the installation of traffic control methods. Intersection control warrant analysis was conducted at the intersections of Highway 1416 and Liberty Boulevard, Highway 1416 and S Ellsworth Road, and Highway 1416 and Radar Hill Road. Warrants are met based on the number of hours volume criteria are met. The 13-hour volume was projected to 2030 and 2050 using the annual growth rates presented in Table 3-1, with additional volumes added during the AM and school peaks due to the anticipated school developments.

The most commonly analyzed signal warrants are the following:

- Warrant 1: Eight-Hour Vehicular Volume Specific volume thresholds must be met for at least eight hours of an average day.
 - Warrant 1a This warrant applies to locations where a large volume of intersecting traffic is the primary reason for installing a traffic signal.
 - Warrant 1b This warrant applies to locations where Warrant 1a is not met, and where volumes on the major road is so heavy that minor road traffic is unable to enter or cross the major road.
- » Warrant 2: Four-Hour Vehicular Volume Specific volume thresholds must be met for at least four hours of an average day. This warrant applies to locations where the volume of intersecting traffic is the primary reason for installing a traffic signal.
- Warrant 3: Peak Hour Specific volume thresholds must be met during a peak hour of an average day. This warrant applies to locations that have higher-than-average volumes during peak hours, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.
- Warrant 7: Crash Experience Specific volume thresholds (similar to Warrants 1a and 1b) must be met for at least eight hours of an average day, and five or more reported crashes of types susceptible to correction by a traffic signal have occurred within one year.
- » MWSA: Multi-Way Stop Application This warrant is to determine if the implementation of a multi-way stop control is warranted at an intersection. Specific volume thresholds must be met for at least eight hours of an average day, or five or more reported crashes of types susceptible to correction by a multi-way stop installation have occurred within one year. This warrant applies to locations where the volume of traffic on the intersecting roads is approximately equal.

The signal warrant analysis results for 2030 and 2050 are presented in **Table 3-11** and **Table 3-12**, respectively. Detailed Signal Warrant Analysis results can be found in **Appendix E**.

1b 2 3 **MWSA** 1a No-Build (2030) 1/4 Highway 1416 and Liberty Blvd 1/8 1/8 0/1 1/8 4/8 Highway 1416 and S Ellsworth Rd 7/8 4/8 7/4 4/1 7/8 14/8 Highway 1416 and Radar Hill Rd 13/8 11 / 4 6/1 9/8 9/8 6/8

Table 3-11 – Signal Warrant Analysis Results (2030)

Table 3-12 – Signal Warrant Analysis Results (2050)

No-Build (2050)	1a	1b	2	3	7	MWSA
Highway 1416 and Liberty Blvd	1/8	1/8	1/4	0/1	1/8	4/8
Highway 1416 and S Ellsworth Rd	10/8	5/8	9 / 4	5/1	8/8	15 / 8
Highway 1416 and Radar Hill Rd	13 / 8	13 / 8	13 / 4	8/1	11 / 8	9/8

A signal is warranted at the intersections of Highway 1416 and S Ellsworth Road, and Highway 1416 and Radar Hill Road under 2030 and 2050 projected conditions.

Standard signal warrants are not met at the intersection of Highway 1416 and Liberty Boulevard. However, MUTCD **Signal Warrant 9: Intersection Near a Grade Crossing** is met at this intersection. This warrant is intended to apply to locations near an at-grade railroad crossing that is currently stop- or yield-controlled and is within 140 feet of the intersection stop line. Specific volume thresholds must be met, and the thresholds vary based on the railroad crossing distance from the intersection stop line. If a traffic signal is installed at an intersection due to this warrant, the MUTCD recommends that the signal shall have actuation on the minor street, preemption control shall be provided, and the railroad crossing shall have flashing-light signals. The intersection of Highway 1416 and Liberty Boulevard was also very close to meeting **Signal Warrant 3: Peak Hour** under projected 2050 no-build conditions. This intersection will have to be monitored and reevaluated periodically to determine if intersection control is warranted after the area around it continues to develop.

Summary

Traffic Volumes

- » Traffic volumes collected in 2023 were projected to design years 2030 and 2050 using growth rates developed from ADT data provided by the Rapid City Area MPO, accounting for additional growth due to anticipated expansion of the Ellsworth Air Force Base.
- » Additional trips generated by three new developments near the study area were added to the projected AM and PM peak volumes. Two of the new developments are schools, and the afternoon peaks do not occur during the network PM peak, so additional trips were conservatively added based on the PM peak of adjacent traffic.

Capacity Analysis

- » Highway 1416 and Liberty Boulevard is expected to operate at LOS F during the AM peak under 2030 and 2050 projected no-build conditions.
- » Highway 1416 and S Ellsworth Road is expected to operate at LOS F during both the AM and PM peak under 2030 and 2050 projected no-build conditions.
- » Highway 1416 and Radar Hill Road is expected to operate at LOS F during both the AM and PM peak under 2030 and 2050 projected no-build conditions.
- » Delay and LOS at these intersections are expected to worsen with continued growth in the surrounding network.
- » All other study intersections are expected to operate under acceptable delay and LOS during the AM and PM peaks under 2030 and 2050 projected no-build conditions.

Signal Warrant Analysis

- » A signal is warranted at the intersections of Highway 1416 and S Ellsworth Road, and Highway 1416 and Radar Hill Road under 2030 and 2050 projected no-build conditions.
- » The intersection of Highway 1416 and Liberty Boulevard meets the requirements of Signal Warrant 9 due to its proximity to an at-grade railroad crossing. This intersection was very close to meeting Signal Warrant 3 under projected 2050 no-build conditions.

Chapter 4 - ALTERNATIVES ANALYSIS

Interim Alternatives

Due to severe deficiencies in vehicular Level of Service found in the existing 2023 analysis, interim alternatives were analyzed to provide short-term relief as more permanent solutions continue to develop. The intersections of Highway 1416 and S Ellsworth Road and Highway 1416 and Radar Hill Road were analyzed assuming all-way stop control for the interim scenario. The results of this analysis, along with existing no-build results for comparison, are shown in **Table 4-1**.

Existing - 2023 **Future - 2030 AM Peak PM Peak AM Peak PM Peak** Intersection Scenario Delay Delay Delay Delay LOS* LOS* LOS* LOS* (s/veh) (s/veh) (s/veh) (s/veh) No-Build 598.3 4493.0 F/F10.1 B/E F/F90.6 F/F Highway 1416 and S Ellsworth Rd 347.5 928.4 F Interim F 12.0 В 15.0 В No-Build 26.9 D/E 32.8 D/F Highway 1416 and 66.5 F/F68.7 F/FRadar Hill Rd Interim 19.2 С 17.5 С 38.8 Ε 22.0 C

Table 4-1 – Interim Alternative Results

While all-way stop control at the intersections listed above is not expected to bring the intersections to acceptable operations, the delay and Level of Service is expected to improve significantly. At the time of this report, all-way stop control has been implemented as a short-term solution for the intersections of Highway 1416 and S Ellsworth Road, and Highway 1416 and Radar Hill Drive, while more permanent and effective alternatives are analyzed, funded, and implemented.

Alternatives Development

Based on Future Conditions results, it was determined that the intersections of Highway 1416 and 151st Avenue, and Radar Hill Road and Long View Road, and Radar Hill Road and Highway 44 are expected to operate under acceptable conditions in the projected 2030 build year and 2050 design year, and therefore no intersection alternatives are proposed for these locations other than the TWLTL being added to the Radar Hill Road corridor.

Bicycle and Pedestrian Level of Service (LOS) was determined for segments along Highway 1416 and Radar Hill Road in the Existing Conditions Report for this study. Bicycle and Pedestrian LOS was determined to be inadequate for the majority of the segments along both corridors, aside from a portion of Radar Hill Road between 228th Street and 229th Street, where ten-foot shoulders are present on both sides of the roadway. Though no intersection alternatives are proposed along the Radar Hill Road corridor, the

^{*[}Intersection LOS] / [Worst approach LOS] (for TWSC)

implementation of a shared-use path along Highway 1416 and the city owned portion of Radar Hill Road as well as widened shoulders on the remainder of Radar Hill Road are expected to greatly improve the Bicycle and Pedestrian LOS.

The intersections of Highway 1416 and Liberty Boulevard, Highway 1416 and S Ellsworth Road, and Highway 1416 and Radar Hill Road are expected to operate under unacceptable conditions for both the build year and design year. For this reason, alternative designs for each intersection were proposed to mitigate these deficiencies.

The Highway 1416 corridor is proposed to be converted to a semi-urban corridor to remove the large median separating eastbound and westbound travel. The median area occupies otherwise developable land and the two-stage crossing required perpendicular to Highway 1416 causes severe deficiencies in queueing and delay. It is recommended that Highway 1416 be converted to a combination of a three-lane and five-lane urban corridor, with the centerline aligning more closely with the current westbound travel lanes of Highway 1416 to provide more distance from the adjacent railroad.

Due to existing travel patterns and volumes, all alternatives assume that Highway 1416 is a two-lane rural corridor from 151st Avenue to S Ellsworth Road with dedicated left-turn lanes at the Liberty Boulevard intersection. West of the intersection with S Ellsworth Road, Highway 1416 becomes a four-lane semi-urban corridor.

Conceptual designs for each alternative can be found in **Appendix F**. The development of alternatives for each intersection is discussed in the following paragraphs.

Highway 1416 and Liberty Boulevard

As determined in the Future Conditions chapter of this study, the intersection of Highway 1416 and Liberty Boulevard did not meet signal warrant thresholds for the 2030 build year or 2050 design year. However, **Signal Warrant 9: Intersection Near a Grade Crossing** was met, due to high volumes and its proximity to a railroad crossing that is currently yield-controlled. The alternatives selected for this intersection included a traffic signal, and a single-lane roundabout. The Box Elder Comprehensive Plan (2014) also identifies this intersection as needing safety and mobility improvements.

Capacity analysis results showed that this intersection is expected to operate at LOS F during the AM peak by 2030 under no-build conditions. This is primarily due to significant queueing in the northbound and southbound approaches, as the eastbound and westbound movements experience high volumes and high speeds. Recent development near this intersection is also expected to generate additional trips traveling through this intersection. A traffic signal or roundabout can be reasonably expected to mitigate these deficiencies, if either is shown to be both warranted and feasible.

Highway 1416 and S Ellsworth Road

The intersection of Highway 1416 and S Ellsworth Road met criteria for three signal warrants, as well as the multi-way stop application warrant, in both the build year and design year. This intersection experiences high volumes making eastbound left-turn movements, particularly during the AM peak, and high southbound right-turn movements, as vehicles travel to and from the Ellsworth Air Force Base north of the study area. Current roadway geometry requires left-turning movements to occur in two stages,

with additional stopping and delay at the median separating eastbound and westbound travel along Highway 1416. This configuration paired with exceptionally high eastbound left-turn movements results in Level of Service failure during the AM and PM peaks. Intersection signalization was considered, with dual left-turn lanes at the eastbound approach to accommodate the high volumes, and a single eastbound through lane. A single-lane roundabout and hybrid roundabout were also analyzed. A fourth alternative was also developed for this intersection that includes a displaced left-turn at the eastbound approach, where eastbound left-turning vehicles cross conflicting westbound through traffic at a signalized crossing before making a left turn onto S Ellsworth Road.

All alternatives developed at the intersection of Highway 1416 and S Ellsworth Road assume that Highway 1416 is a three-lane corridor east of this intersection, and a five-lane corridor west of the intersection.

Highway 1416 and Radar Hill Road

The intersection of Highway 1416 and Radar Hill Road met criteria for all signal warrants analyzed in both 2030 and 2050. This intersection experiences high volumes in the northbound approach. Minimal storage space in the median separating eastbound and westbound Highway 1416 causes significant queueing and spillback affecting the northbound movements, as well as eastbound vehicles attempting to turn left. A signalized alternative was analyzed, with dedicated left-turn lanes added to all approaches.

Multiple roundabout alternatives were also considered. The first roundabout alternative included a 2x1 design, with two lanes at the eastbound and westbound approaches, and single lanes at the northbound and southbound approaches. The second roundabout was a 2x1 design, with a channelized northbound right lane to accommodate high volumes making this movement during the AM and PM peaks. The third roundabout design included a two-lane westbound approach, and a single-lane eastbound approach, to better align with the off-ramp design of the I-90 interchange to the west. This design also includes a channelized northbound right.

Alternatives Summary

The final alternatives selected for analysis for each of the study intersections are described below.

HIGHWAY 1416 AND LIBERTY BOULEVARD

- » No Build: TWSC This alternative includes the intersection remain a stop controlled on the Liberty Boulevard approaches for the time being with the addition of a dedicated left-turn lane for the westbound approach.
- » Alternative 1: Signalized Intersection This alternative includes the implementation of a traffic signal at the intersection, as well as the addition of dedicated left-turn lanes to all approaches. Additional signal timing optimization may be needed should this alternative be ultimately selected.
- » Alternative 2: Single-Lane Roundabout This alternative includes the implementation of a single-lane roundabout.

HIGHWAY 1416 AND S ELLSWORTH ROAD

S Ellsworth Road is the intersection where Highway 1416 is proposed to transition from a three-lane to a five-lane urban corridor. All alternatives analyzed have a single-lane approach in each direction on the

east side of the intersection, and a two-lane approach in each direction on the west side of the intersection.

- » Alternative 1: Signalized Intersection This alternative includes the implementation of a traffic signal at the intersection, as well as the addition of dedicated left-turn lanes to all approaches, as well as dual eastbound left-turn lanes and a single eastbound through lane.
- » Alternative 2: Single-Lane Roundabout This alternative includes the implementation of a single-lane roundabout.
- » Alternative 3: Hybrid Roundabout This alternative includes the implementation of a hybrid 2x1 roundabout. The roundabout has an additional dedicated eastbound left-turn lane to accommodate for high volumes, with two circulating lanes at the eastbound and northbound approaches. This design also includes a yield-controlled channelized southbound right-turn lane.
- » Alternative 4: Displaced Eastbound Left This alternative includes the implementation of a displaced eastbound left-turn movement. This alternative design includes the eastbound left-turn lane crossing the westbound through traffic at a signalized location west of the intersection with S Ellsworth Road. The eastbound left-turning traffic would then make the left-turning movement at another signal located at S Ellsworth Road.

HIGHWAY 1416 AND RADAR HILL ROAD

- » Alternative 1: Signalized Intersection This alternative includes the implementation of a traffic signal at the intersection, as well as the addition of dedicated left-turn lanes to all approaches.
- » Alternative 2: 2x1 Roundabout This alternative includes the implementation of a 2x1 roundabout, with two lanes in the eastbound and westbound directions, and one lane in the northbound and southbound directions.
- » Alternative 3: 2x1 Roundabout with Channelized NBR This alternative includes the implementation of a 2x1 roundabout with two lanes in the eastbound and westbound directions. The northbound approach includes a single lane for through and left-turning traffic, and a channelized right turn lane to accommodate high volumes. The southbound approach at Gumbo Drive is closed allowing for safer movement on Box Elder Road.
- Alternative 4: Hybrid Roundabout This alternative includes the implementation of a roundabout with two lanes in westbound direction, and a single lane in the eastbound direction. The northbound approach includes a single lane for through and left-turning traffic, and a channelized right turn lane to accommodate high volumes. The southbound approach at Gumbo Drive is closed allowing for safer movement on Box Elder Road.

Crash Modification Factors

Crash modification factors (CMFs) are an effective tool for analyzing alternative designs and estimating their respective safety benefit. CMFs are a multiplicative factor that indicates the proportion of crashes that would be expected after implementing a countermeasure. CMFs with a value less than 1.0 indicate a decrease in expected crashes, and CMFs greater than 1.0 indicate an increase in expected crashes. The Federal Highway Administration (FHWA)'s CMF Clearinghouse provides a toolbox of CMF values determined through extensive research based on crash data. The CMF Clearinghouse presents each CMF, along with the quality (a measure of research reliability, rated on a scale of one (worst) to five (best)), as well as crash types, crash severities, and area types that the CMF can reasonably be applied to.

CMFs for each of the proposed intersection alternatives are shown in Table 4-2.

Table 4-2 – Highway 1416 Crash Modification Factors

Countermeasure	CMF	Crash Type	Crash Severity	Area Type	Quality
Signalized Intersection	0.95 (CMF ID: 322)	All	All	Urban	3/5
Install a traffic signal (major road speed limit at least 40	0.33 (CMF ID: 323)	Angle	All	Urban	4/5
mph)	2.43 (CMF ID: 324)	Rear-End	All	Urban	4/5
	0.28 (CMF ID: 206)	All	All	Urban	4/5
Single-Lane Roundabout Conversion of stop-controlled	0.42 (CMF ID: 207)	All	All	Rural	4/5
intersection into single-lane roundabout	0.12 (CMF ID: 210)	All	A, B, C	Urban	4/5
canadodi	0.18 (CMF ID: 211)	All	A, B, C	Rural	4/5
	0.95 (CMF ID: 208)	All	All	Urban	4/5
2x1 Roundabout Conversion of stop-controlled	0.004 (CMF ID: 6159)	All	K, A, B, C	Not specified	2/5
intersection into multi-lane roundabout	2.073 (CMF ID: 6158)	All	All	Not specified	2/5
	6.016 (CMF ID: 6160)	All	0	Not specified	2/5
Changelined Bight Town Lane	0.734 (CMF ID: 11154)	All	All	Not specified	3/5
Provide Right Turn	0.616 (CMF ID: 11152)	All	K, A, B, C	Not specified	3/5
hannelization -	0.786 (CMF ID: 11153)	All	0	Not specified	2/5
Displaced Left	1.112 (CMF ID: 10889)	All	All	Urban and suburban	2/5

Countermeasure	СМЕ	Crash Type	Crash Severity	Area Type	Quality
Convert intersection to a	1.224	All	K, A, B, C	Urban and	2/5
displaced left turn intersection	(CMF ID: 10890)	7 (11	κ, π, Β, ε	suburban	2/3
	1.069	All	0	Urban and	2/5
	(CMF ID: 10891)	All	U	suburban	2/5
	1.244	Angle	All	Urban and	2/5
	(CMF ID: 10894)	Aligie	AII	suburban	2/3
	0.946	Rear-end	All	Urban and	2/5
	(CMF ID: 10895)	Real-ellu	All	suburban	2/5
	0.713	Head-on	All	Urban and	2/5
	(CMF ID: 10896)	пеац-оп	All	suburban	2/5
	1.519	Single vehicle	All	Urban and	2/5
	(CMF ID: 10892)	Single verticle	All	suburban	2/5
	0.612	Other	All	Urban and	2/5
	(CMF ID: 10893)	Other	All	suburban	2/3

Crash Severity: K – Fatality; A – Serious injury; B – Minor injury; C – Possible injury; O – Property damage only

Capacity Analysis and Demand

Intersection Capacity Analysis

Intersection capacity analysis was conducted using HCS 2023 software for each of the alternatives described previously, using both AM and PM peak vehicular volumes under 2030 and 2050 scenarios. Intersection performance was measured based on delay and Level of Service (LOS). The methodology for vehicular LOS is described in the following section.

VEHICULAR LEVEL OF SERVICE (VLOS)

Vehicular Level of Service (VLOS) is a function of average delay per vehicle. LOS "A" represents free-flow traffic, whereas LOS "F" represents unacceptable delay. LOS "D" or better is considered acceptable for Minor Arterials and Collectors, in accordance with SDDOT standards. LOS delay thresholds are presented in **Table 4-3**.

Table 4-3 – Intersection Level of Service Thresholds

	Average De	lay / Vehicle
Level of Service	Stop, Yield, and Roundabout Intersections	Signalized Intersections
А	< 10 seconds	< 10 seconds
В	10 to 15 seconds	10 to 20 seconds
С	15 to 25 seconds	20 to 35 seconds
D	25 to 35 seconds	35 to 55 seconds
E	35 to 50 seconds	55 to 80 seconds
F	> 50 seconds	> 80 seconds

Vehicular LOS results for each intersection are presented and discussed in the following section. The intersection delay is presented based on methodology described above. The corresponding LOS value for the intersection delay is shown, as well as the LOS value for the worst approach. Detailed Vehicular Level of Service results can be found in **Appendix G**.

Highway 1416 and Liberty Boulevard

The LOS results for alternatives at Highway 1416 and Liberty Boulevard, under 2030 and 2050 conditions, are presented in **Table 4-4**.

		20	30		20	50			
	AM Pea	ak	PM Pea	ak	AM Pea	ık	PM Peak		
Alternative	Delay (s/veh) LOS*		Delay (s/veh)	· ///*		LOS*	Delay (s/veh)	LOS*	
No-Build: TWSC	116.5	F/F	12.7	B/C	152.5	F/F	13.1	B/C	
Alt 1: Signal	17.0	В	8.8	Α	17.4	В	9.8	Α	
Alt 2: 1x1 RAB	8.2	Α	5.3	Α	8.4	Α	5.4	Α	

Table 4-4 – Highway 1416 and Liberty Boulevard Alternatives Analysis Results

ALTERNATIVE 1

Delay and LOS results for Alternative 1: Signalized Intersection show that the implementation of a traffic signal at the intersection of Highway 1416 and Liberty Boulevard is expected to mitigate delay and LOS deficiencies expected during the AM and PM peaks, under both 2030 and 2050 scenarios. The intersection is expected to operate at LOS C during the AM and PM peaks in 2030 and 2050 with the implementation of a traffic signal. Additional traffic timing optimization could further improve LOS results.

ALTERNATIVE 2

Delay and LOS results for Alternative 2: Single-Lane Roundabout show that the implementation of a single-lane roundabout at the intersection of Highway 1416 and Liberty Boulevard is expected to mitigate delay and LOS deficiencies expected during the AM and PM peaks, under both 2030 and 2050 scenarios. The intersection is expected to operate at LOS A during the AM and PM peaks in 2030 and 2050 with the implementation of a single-lane roundabout.

Highway 1416 and S Ellsworth Road

The LOS results for alternatives at Highway 1416 and S Ellsworth Road, under 2030 and 2050 conditions, are presented in **Table 4-5**.

^{*[}Intersection LOS] / [Worst approach LOS] (for TWSC)

	_	•			· ·							
		20	30	2050								
	AM Pe	ak	PM Pe	ak	AM Pe	ak	PM Peak					
Alternative	=, 100*		Delay (s/veh)	LOS*	Delay (s/veh)	LOS*	Delay (s/veh)	LOS*				
No-Build: TWSC	4493.0	F/F	90.6	F/F	15432.5	F/F	166.1	F/F				
Alt 1: Signal, dual EBL	19.9	В	17.5	В	39.4	D	20.1	С				
Alt 2: 1x1 RAB	133.3	F	9.0	Α	287.3	F	11.0	В				
Alt 3: Hybrid RAB	11.8	В	5.7	Α	15.8	С	6.4	Α				
Alt 4: Displaced EDI	12.6	D	7.4	۸	12.0	D	7.0	۸				

Table 4-5 – Highway 1416 and S Ellsworth Road Alternatives Analysis Results

ALTERNATIVE 1

Delay and LOS results for Alternative 1: Signalized Intersection show that the implementation of a traffic signal at the intersection of Highway 1416 and S Ellsworth Road is expected to mitigate delay and LOS deficiencies expected during the AM and PM peaks, under both 2030 and 2050 scenarios. The intersection is expected to operate at LOS C during the AM and PM peaks in 2030 and the AM peak of 2050, and it is expected to operate at LOS D during the PM Peak in 2050, with the implementation of a traffic signal. Additional traffic timing optimization could further improve LOS results.

ALTERNATIVE 2

Delay and LOS results for Alternative 2: Single-Lane Roundabout show that the implementation of a single-lane roundabout at the intersection of Highway 1416 and S Ellsworth Road is not expected to mitigate delay and LOS deficiencies expected during the AM and PM peaks, under 2030 and 2050 scenarios. The intersection is expected to operate at LOS F during the AM peak in 2030 and 2050 with the implementation of a single-lane roundabout. Based on this analysis, it was determined that a single-lane roundabout is not expected to have the capacity to support the high volumes traveling to and from the Ellsworth Air Force Base.

ALTERNATIVE 3

Delay and LOS results for Alternative 3: Hybrid Roundabout show that the implementation of a hybrid roundabout at the intersection of Highway 1416 and S Ellsworth Road, with additional capacity supporting eastbound left-turning volumes, is expected to mitigate delay and LOS deficiencies expected during the AM and PM peaks, under 2030 and 2050 scenarios. The intersection is expected to operate at LOS B during the AM peak in 2030 and 2050, and LOS A during the PM peak in 2030 and 2050 with the implementation of a hybrid roundabout.

ALTERNATIVE 4

Delay and LOS results for Alternative 4: Displaced Eastbound Left show that the implementation of a signalized displaced left-turn in the eastbound approach of Highway 1416 and S Ellsworth Road is expected to mitigate delay and LOS deficiencies expected during the AM and PM peaks, under 2030 and 2050 scenarios. The intersection is expected to operate at LOS B during the AM peaks and LOS A during the PM peaks in both 2030 and 2050 with the implementation of a displaced eastbound left-turn lane.

^{*[}Intersection LOS] / [Worst approach LOS] (for TWSC)

Highway 1416 and Radar Hill Road

The LOS results for alternatives at Highway 1416 and Radar Hill Road, under 2030 and 2050 conditions, are presented in **Table 4-6**.

	2030 2050										
	AM Pe	ak	PM Pe	ak	AM Pe	ak	PM Pe	ak			
Alternative	Delay (s/veh)		Delay (s/veh)	LOS*	Delay (s/veh)	LOS*	Delay (s/veh)	LOS*			
No-Build: TWSC	66.5	F/F	68.7	F/F	202.5	F/F	359.3	F/F			
Alt 1: Signal	20.9	С	18.8	В	26.2	С	19.9	В			
Alt 2: 2x1 RAB	16.4	С	7.0	Α	63.8	F	8.1	Α			
Alt 3: 2x1 RAB (ch. NBR)	9.2 A 6.7		Α	13.1	В	7.7	Α				
Alt 4: Hybrid RAB	14.0	В	10.4	В	24.2	С	16.1	С			

Table 4-6 - Highway 1416 and Radar Hill Road Alternatives Analysis Results

ALTERNATIVE 1

Delay and LOS results for Alternative 1: Signalized Intersection show that the implementation of a traffic signal at the intersection of Highway 1416 and Radar Hill Road is expected to mitigate delay and LOS deficiencies expected during the AM and PM peaks, under 2030 and 2050 scenarios. The intersection is expected to operate at LOS C during the AM peaks and LOS B during the PM peaks in both 2030 and 2050 with the implementation of a traffic signal. Additional traffic timing optimization could further improve LOS results.

ALTERNATIVE 2

Delay and LOS results for Alternative 2: 2x1 Roundabout show that the implementation of a 2x1 roundabout at the intersection of Highway 1416 and Radar Hill Road, with two lanes in the eastbound and westbound directions, is expected to mitigate delay and LOS deficiencies during the AM and PM peaks under 2030 scenarios, but the intersection is expected to remain at LOS F during the AM peak in 2050. High northbound left and right volumes contribute significantly to this deficiency.

ALTERNATIVE 3

Delay and LOS results for Alternative 3: 2x1 Roundabout with Channelized NBR show that the implementation of a 2x1 roundabout, along with a channelized northbound right-turn lane at the intersection of Highway 1416 and Radar Hill Road is expected to mitigate delay and LOS deficiencies during the AM and PM peaks under 2030 and 2050 scenarios. The intersection is expected to operate at LOS A during the AM and PM peaks in 2030, at LOS B during the AM peak in 2050, and LOS A during the PM peak in 2050.

^{*[}Intersection LOS] / [Worst approach LOS] (for TWSC)

ALTERNATIVE 4

Delay and LOS results for Alternative 4: Hybrid Roundabout show that the implementation of a hybrid roundabout, with single lanes in the eastbound and southbound approaches, two lanes in the westbound approach, and a channelized northbound right-turn lane at the intersection of Highway 1416 and Radar Hill Road is expected to mitigate delay and LOS deficiencies during the AM and PM peaks, under 2030 and 2050 scenarios. The intersection is expected to operate at LOS B during the AM and PM peaks in 2030, and LOS C during the AM and PM peaks in 2050.

Design

Right-of-Way Impacts

Right-of-way was evaluated based on GIS data provided by the city of Rapid City and Pennington County. Based on this data, it is anticipated that this project would have minimal impact on the ROW. However, the data provided is not official, and land survey of property lines would need to be completed to confirm this.

Currently, the Radar Hill Road 3 lane alternative shows minimal property impacts at maximum of 4' based on available data. If those impacts are still present in preliminary design after a property survey is done, alignment tapering can be done to avoid the impacts to the properties if desired by the governing jurisdiction.

Anticipated Cost

An anticipated preliminary cost comparison analysis was completed. The results are shown in **Table 4-7**. The cost estimates assumed 3% annual inflation, a 20% contingency, and an asphalt concrete depth of 8 inches on 14 inches of aggregate base. The city cost estimates shown on the Highway 1416 corridor stem from improvements to approaches on city owned roadways at study intersections. As shown, the cheapest alternative for Highway 1416 is Alternative 3 with roundabouts at the Radar Hill Road and Ellsworth Road intersections. Situationally, signals can be more expensive than roundabouts. In this situation, the signal alternatives have an increased pavement area with turn lanes and a large, paved intersection. Additionally, in this case both a signal and roundabout will require significant grading since the existing intersection does not match the area needed for a signal, which is not common when comparing a signal to roundabout for cost analysis. With there not being existing signal facilities at the location it will require new systems and finding sources of power, fiber for the signal controls, and other misc. items that are required for the signals to function properly. These items all increase the signal system costs.

Table 4-7 - Preliminary Cost Estimates

	Preliminary Cost Estimate Su	ummary		
Highway 1416 / Radar Hill	Alternative Costs	Est. County	Est. City	Total Cost
Road Alternatives	(Const. Engineering + Const.)	Cost	Cost	
	ay 1416			
Alternative 1 – Signalized Intersections at Radar	2023 Construction Costs	\$16,537,466	\$2,993,825	\$19,531,291
Hill & Ellsworth, ¾ at Commercial Gate, TWSC at Liberty	2030 Construction Costs	\$21,002,582	\$3,802,158	\$24,804,740
Alternative 2 – Signalized Intersections at Radar Hill, Displaced Left at Ellsworth, ¾	2023 Construction Costs	\$17,936,716	\$2,793,684	\$20,730,400
at Commercial Gate, TWSC at Liberty	2030 Construction Costs	\$22,779,630	\$3,547,978	\$26,327,608
Alternative 3 – Roundabouts at Radar Hill &	2023 Construction Costs	\$16,128,683	\$2,871,958	\$19,000,641
Ellsworth, ¾ at Commercial Gate, TWSC at Liberty	2030 Construction Costs	\$20,483,427	\$3,647,387	\$24,130,814
Cost At Liberty to Add a Signal	2023 Construction Costs	\$315,000	\$105,000	\$420,000
(When Warrants are Met)	2030 Construction Costs	\$400,050	\$133,350	\$533,400
Radar I	Hill Road			
Alternative 1 -	2023 Construction Costs	\$7,351,400	\$5,253,409	\$12,604,809
2 Lane Urban with Walk	2030 Construction Costs	\$9,336,278	\$6,671,830	\$16,008,108
Alternative 2 –	2023 Construction Costs	\$7,365,795	\$5,849,960	\$13,215,755
3 Lane Urban with Walk	2030 Construction Costs	\$9,354,559	\$7,429,450	\$16,784,009
Alternative 3 –	2023 Construction Costs	\$6,091,419	\$2,220,414	\$8,311,833
Pavement Reconstruction	2030 Construction Costs	\$7,736,102	\$2,819,926	\$10,556,028

Recommendations

Based on the capacity results discussed in this report, safety considerations analyzed for the Existing Conditions chapter, and preliminary cost estimates, the following recommendations were developed for each of the study intersections that require improvement:

- Safety and capacity issues are present now, and they are expected to become worse as traffic increases. Efforts to correct these deficiencies should be undertaken as soon as adequate funding can be found.
- » Highway 1416 and Liberty Boulevard once warranted, the implementation of a traffic signal is recommended at this intersection, due to significant improvements in delay and LOS. Spatial constraints due to the proximity to the BNSF railroad, utilities, and wetlands made it difficult to implement the single-lane roundabout alternative.
- » Highway 1416 and S Ellsworth Road the implementation of a hybrid roundabout is recommended at this intersection, due to significant improvements in delay and LOS. High cost, spatial constraints, public opinion, and construction impacts made the displaced eastbound left-turn alternative a less desirable option. The hybrid roundabout alternative was also shown to be more cost effective and expected to be more efficient and safer than the signalized alternative.

» Highway 1416 and Radar Hill Road – the implementation of a 2x1 roundabout with a channelized northbound right-turn lane is recommended at this intersection, due to significant improvements in delay and LOS. The roundabout alternative was also shown to be more cost effective and expected to be safer than the signalized alternative.

Summary

Interim Alternatives

» All-way stop control is recommended (and has been implemented) as a short-term solution for the intersections of Highway 1416 and S Ellsworth Road, and Highway 1416 and Radar Hill Drive, while more permanent and effective alternatives are analyzed, funded, and implemented.

Alternatives

- » Alternatives developed and analyzed at Highway 1416 and Liberty Boulevard included the following:
 - Alternative 1 signalized intersection, with left-turn lanes at each approach
 - Alternative 2 single-lane roundabout
- » Alternatives developed and analyzed at Highway 1416 and S Ellsworth Road included the following:
 - Alternative 1 signalized intersection, with left-turn lanes at each approach, and a dual left-turn at the eastbound approach
 - o Alternative 2 single-lane roundabout
 - o Alternative 3 hybrid roundabout, with a dedicated eastbound left-turn lane
 - Alternative 4 displaced eastbound left, with signalization at the intersection, as well as the eastbound left crossing
- » Alternatives developed and analyzed at **Highway 1416 and Radar Hill Road** included the following:
 - Alternative 1 signalized intersection, with left-turn lanes at each approach
 - Alternative 2 2x1 roundabout, with two travel lanes at the eastbound and westbound approaches
 - Alternative 3 − 2x1 roundabout, with two travel lanes at the eastbound and westbound approaches, and a channelized northbound right-turn lane
 - Alternative 4 hybrid roundabout, with a single-lane at the eastbound approach, two travel lanes in the westbound approach, and a channelized northbound right-turn lane
- » No alternatives were proposed or analyzed at the intersections of Highway 1416 and 151st Avenue, Radar Hill Road and Long View Drive, or Radar Hill Road and Highway 44, as these intersections are expected to operate under acceptable conditions in 2050 with no geometric improvements.

Capacity Analysis

- The following alternatives are expected to operate under unacceptable delay and LOS in the projected scenarios:
 - Highway 1416 and S Ellsworth Road Alternative 2: 1x1 Roundabout is expected to operate at LOS F during the AM peaks in 2030 and 2050.

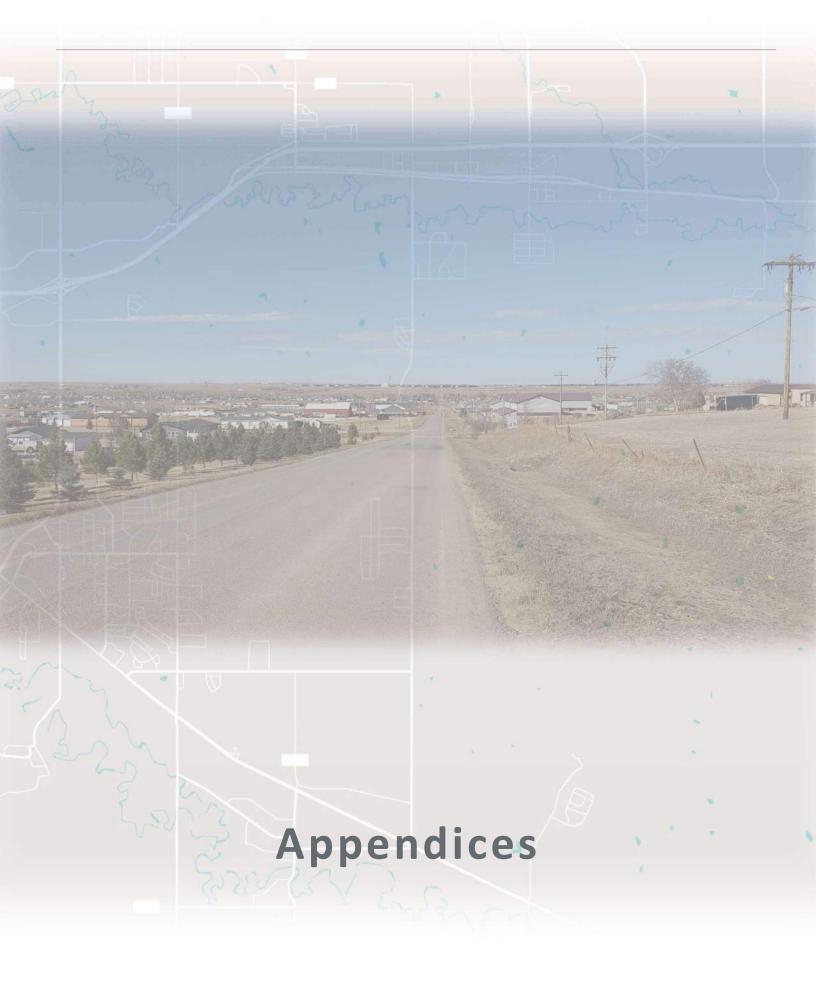
- Highway 1416 and Radar Hill Road Alternative 2: 2x1 Roundabout is expected to operate at LOS F during the AM peak in 2050.
- » All other alternatives presented in this report are expected to operate under acceptable delay and LOS and are expected to improve delay and LOS conditions as compared to the no-build scenarios.

Recommendations

» Recommended alternatives for each intersection are shown below in **Table 4-8**.

Table 4-8 – Recommended Alternatives

Intersection	Recommended Alternative
Hwy 1416 and Liberty Blvd	Alternative 1: Signalized Intersection (once warranted)
Hwy 1416 and S Ellsworth Rd	Alternative 3: Hybrid Roundabout
Hwy 1416 and Radar Hill Rd	Alternative 3: 2x1 Roundabout with Channelized NBR



Appendix A: Raw Traffic Counts

Time	NB Utm	NB Left	NB Thru	NB Right	EB Ped & Bikes	WB Ped & Bikes	SB Utrn	SB Left	SB Thru	SB Right	EB Ped & Bikes	WB Ped & Bikes	EB Utrn	EB Left	EB Thru	EB Right	NB Ped & Bikes	SB Ped & Bikes	WB Utrn	WB Left	WB Thru	WB Right	NB Ped & Bikes	SB Ped & Bikes
		NBL	NBT	NBR				SBL	SBT	SBR				EBL	EBT	EBR				WBL	WBT	WBR		
00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	0	0	0	0	0	0	1	0	11	0	0	0	4	4	0	0	0	0	0	12	0	0	0
06:00	0	0	0	0	0	0	0	5	0	22	0	0	0	4	8	0	0	0	0	0	56	1	0	0
07:00	0	0	0	0	0	0	0	5	0	34	0	0	0	7	38	0	0	0	0	0	94	8	0	0
08:00	0	0	0	0	0	0	0	2	0	16	0	0	0	15	30	0	0	0	0	0	40	3	0	0
09:00	0	0	0	0	0	0	0	2	0	16	0	0	0	7	21	0	0	0	0	0	41	3	0	0
10:00	0	0	0	0	0	0	0	3	0	13	0	0	0	12	35	0	0	0	1	0	30	1	0	0
11:00	0	0	0	0	0	0	0	2	0	16	0	0	0	13	36	0	0	0	0	0	34	2	0	0
12:00	0	0	0	0	0	0	0	3	0	23	0	0	0	24	41	0	0	0	0	0	31	2	0	0
13:00	0	0	0	0	0	0	0	4	0	13	0	0	0	16	32	0	0	0	1	0	31	3	0	0
14:00	0	0	0	0	0	0	0	4	0	12	0	0	0	19	45	0	0	0	0	0	33	4	0	0
15:00	0	0	0	0	0	0	0	2	0	10	0	0	0	12	59	0	0	0	0	0	27	3	0	0
16:00	0	0	0	0	0	0	0	3	0	14	0	0	1	33	82	0	0	0	0	0	34	1	0	0
17:00	0	0	0	0	0	0	0	2	0	19	0	0	0	30	75	0	0	0	0	0	55	2	0	0
18:00	0	0	0	0	0	0	0	3	0	8	0	0	0	15	24	0	0	0	0	0	16	2	0	0
19:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Time	NB Utm	NB Left	NB Thru	NB Right	EB Ped & Bikes	WB Ped & Bikes	SB Utrn	SB Left	SB Thru	SB Right	EB Ped & Bikes	WB Ped & Bikes	EB Utrn	EB Left	EB Thru	EB Right	NB Ped & Bikes	SB Ped & Bikes	WB Utrn	WB Left	WB Thru	WB Right	NB Ped & Bikes	SB Ped & Bikes
		NBL	NBT	NBR				SBL	SBT	SBR				EBL	EBT	EBR				WBL	WBT	WBR		
00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	1	7	0	0	0	0	10	1	5	0	0	0	13	3	1	0	0	0	0	3	23	0	0
06:00	0	1	18	0	0	0	0	21	6	19	0	0	0	61	10	2	0	0	0	0	8	100	0	0
07:00	0	5	33	3	0	0	1	23	9	39	0	0	0	124	21	1	0	0	0	2	15	126	0	0
08:00	0	2	13	1	0	0	0	20	8	26	0	0	0	26	13	1	0	0	0	2	16	59	0	0
09:00	0	4	14	0	0	0	0	25	10	23	0	0	0	35	11	4	0	0	0	0	9	39	0	0
10:00	0	2	9	0	0	0	2	17	6	17	0	0	0	14	8	4	0	0	0	1	1	22	0	0
11:00	0	3	10	1	0	0	1	27	9	27	0	0	0	28	22	7	0	0	0	3	12	35	0	0
12:00	0	3	7	0	0	0	0	33	7	28	0	0	0	46	23	2	0	0	0	1	11	39	0	0
13:00	0	4	14	2	0	0	0	54	12	35	0	0	0	37	25	3	0	1	0	0	16	37	0	0
14:00	0	6	16	0	0	0	0	39	15	30	0	0	0	37	19	6	1	0	0	1	16	35	0	0
15:00	0	4	18	3	0	0	1	71	20	65	0	0	0	46	33	2	0	0	0	1	14	51	0	0
16:00	0	0	15	1	0	0	0	82	22	49	0	0	0	44	42	12	0	0	0	3	19	47	0	0
17:00	0	8	15	1	0	0	2	92	24	51	0	0	0	39	46	9	0	2	0	4	25	51	0	0
18:00	0	0	11	1	0	0	0	26	8	13	0	0	0	13	18	3	2	0	0	1	4	17	0	0
19:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Time	NB Utm	NB Left	NB Thru	NB Right	EB Ped & Bikes	WB Ped & Bikes	SB Utrn	SB Left	SB Thru	SB Right	EB Ped & Bikes	WB Ped & Bikes	EB Utrn	EB Left	EB Thru	EB Right	NB Ped & Bikes	SB Ped & Bikes	WB Utrn	WB Left	WB Thru	WB Right	NB Ped & Bikes	SB Ped & Bikes
		NBL	NBT	NBR				SBL	SBT	SBR				EBL	EBT	EBR				WBL	WBT	WBR		
00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	16	7	2	0	0	0	1	1	31	0	0	0	154	15	2	0	0	0	0	10	0	0	0
06:00	0	46	35	7	0	0	0	3	3	85	0	0	0	621	66	8	0	0	0	2	16	7	0	0
07:00	0	86	56	7	0	0	0	10	16	194	0	0	0	618	115	15	0	0	0	0	44	13	0	0
08:00	0	36	15	5	0	0	0	4	9	130	0	0	1	263	29	10	0	0	0	4	33	7	0	0
09:00	0	24	18	2	0	0	0	8	14	134	0	0	0	212	39	16	0	0	0	2	24	8	0	0
10:00	0	21	11	4	0	0	0	10	14	138	0	0	0	197	42	15	0	0	0	6	36	6	0	0
11:00	0	23	9	2	0	0	0	5	18	156	0	0	0	217	50	26	0	0	0	0	37	3	0	0
12:00	0	22	15	7	0	0	0	13	25	175	0	0	0	279	55	35	0	0	0	3	38	10	0	0
13:00	0	27	19	7	0	0	0	3	10	150	0	0	0	252	62	18	0	0	0	5	40	7	1	0
14:00	0	23	20	3	0	0	0	4	23	170	0	0	0	280	58	32	0	0	0	1	49	13	0	0
15:00	0	28	21	7	0	0	0	9	47	334	0	0	0	263	61	48	0	0	0	6	62	13	0	0
16:00	0	30	26	6	0	0	0	9	45	300	0	0	0	286	78	75	0	1	0	6	63	7	1	1
17:00	0	42	32	4	0	0	0	7	72	237	0	0	1	257	82	152	0	1	0	17	65	3	0	0
18:00	0	25	8	0	0	0	0	0	13	111	0	0	0	85	31	43	0	0	0	2	14	1	0	0
19:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

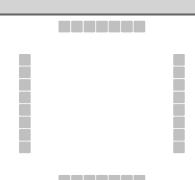
Time	NB Utm	NB Left	NB Thru	NB Right	EB Ped & Bikes	WB Ped & Bikes	SB Utrn	SB Left	SB Thru	SB Right	EB Ped & Bikes	WB Ped & Bikes	EB Utrn	EB Left	EB Thru	EB Right	NB Ped & Bikes	SB Ped & Bikes	WB Utrn	WB Left	WB Thru	WB Right	NB Ped & Bikes	SB Ped & Bikes
		NBL	NBT	NBR				SBL	SBT	SBR				EBL	EBT	EBR				WBL	WBT	WBR		
00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	47	1	36	0	0	0	1	2	8	0	0	0	1	143	11	0	0	0	13	48	1	0	0
06:00	0	116	0	170	0	0	0	2	2	14	0	0	0	2	524	32	0	0	0	32	137	5	0	0
07:00	0	167	1	236	0	0	0	8	9	16	0	0	0	4	527	55	0	0	0	79	334	5	0	0
08:00	0	81	7	56	0	0	0	3	9	26	0	0	2	7	243	49	0	0	0	51	202	7	0	0
09:00	0	68	8	59	0	0	0	6	4	10	0	0	1	15	223	46	0	0	0	46	196	2	0	0
10:00	0	64	3	62	0	0	0	3	2	9	0	0	1	9	201	55	0	0	0	55	234	3	0	0
11:00	0	57	3	50	0	0	0	2	3	12	0	0	0	16	250	69	0	0	0	76	295	3	0	0
12:00	0	56	9	88	0	0	0	5	5	20	0	0	0	12	294	75	0	0	0	66	227	2	0	0
13:00	0	68	6	61	0	0	0	1	8	18	0	0	1	16	288	73	0	0	0	65	230	4	0	0
14:00	0	66	2	87	0	0	0	5	9	16	0	0	0	23	292	87	0	0	0	74	316	8	0	0
15:00	0	69	7	82	0	0	0	3	3	10	0	0	0	17	291	104	0	0	0	195	509	5	0	0
16:00	0	89	9	101	0	0	0	5	5	11	0	0	0	19	357	162	0	0	0	182	627	7	0	0
17:00	0	117	8	125	0	0	0	3	8	9	0	0	0	25	377	185	0	0	0	136	437	2	0	0
18:00	0	31	3	26	0	0	0	1	4	6	0	0	0	7	131	70	0	0	0	29	124	4	0	0
19:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Time	NB Utm	NB Left	NB Thru	NB Right	EB Ped & Bikes	WB Ped & Bikes	SB Utrn	SB Left	SB Thru	SB Right	EB Ped & Bikes	WB Ped & Bikes	EB Utrn	EB Left	EB Thru	EB Right	NB Ped & Bikes	SB Ped & Bikes	WB Utrn	WB Left	WB Thru	WB Right	NB Ped & Bikes	SB Ped & Bikes
		NBL	NBT	NBR				SBL	SBT	SBR				EBL	EBT	EBR				WBL	WBT	WBR		
00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	0	11	3	0	0	0	0	12	21	0	0	0	14	0	1	0	0	0	0	1	1	0	0
06:00	0	0	32	2	0	0	0	3	30	73	0	0	0	64	2	2	0	0	0	3	8	6	0	0
07:00	0	1	16	3	0	0	0	4	42	105	0	0	0	65	5	0	0	0	0	3	16	8	0	0
08:00	0	0	11	6	0	0	0	7	27	55	0	0	0	46	7	1	0	0	0	7	8	8	0	0
09:00	0	2	23	7	0	0	0	6	27	49	0	0	0	40	11	4	0	0	0	8	10	6	0	0
10:00	0	1	27	5	0	0	0	6	26	53	0	0	0	32	7	0	0	0	0	4	9	7	0	0
11:00	0	1	23	5	0	0	0	8	32	48	0	0	0	50	6	3	0	0	0	6	7	6	0	0
12:00	1	1	30	6	0	0	0	6	23	47	0	0	0	57	5	4	0	0	0	5	5	8	0	0
13:00	0	0	20	4	0	0	0	7	20	59	0	0	0	49	4	0	0	0	0	6	9	8	0	0
14:00	0	0	26	6	0	0	0	9	29	72	0	0	0	47	3	1	0	0	0	7	4	6	0	0
15:00	0	2	34	7	0	0	0	4	40	87	0	0	0	80	8	0	0	0	0	4	5	8	0	0
16:00	0	1	44	7	0	0	0	8	40	94	0	0	0	118	8	1	0	0	0	4	9	5	0	0
17:00	0	3	43	2	0	0	0	6	36	93	0	0	0	102	9	1	0	0	0	1	4	3	0	0
18:00	0	2	13	1	0	0	0	3	14	22	0	0	0	43	3	2	0	0	0	1	1	1	0	0
19:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Time	NB Utrn	NB Left	NB Thru	NB Right	EB Ped & Bikes	WB Ped & Bikes	SB Utrn	SB Left	SB Thru	SB Right	EB Ped & Bikes	WB Ped & Bikes	EB Utm	EB Left	EB Thru	EB Right	NB Ped & Bikes	SB Ped & Bikes	WB Utrn	WB Left	WB Thru	WB Right	NB Ped & Bikes	SB Ped & Bikes
		NBL	NBT	NBR				SBL	SBT	SBR				EBL	EBT	EBR				WBL	WBT	WBR		
00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	1	1	1	0	0	0	7	3	3	0	0	0	7	60	0	0	0	0	0	42	6	0	0
06:00	0	5	6	3	0	0	0	11	5	17	0	0	0	12	159	3	0	0	0	0	107	12	0	0
07:00	0	11	1	2	0	0	0	9	5	25	0	0	0	15	170	4	0	0	0	2	150	4	0	0
08:00	0	6	4	3	0	0	0	16	0	20	0	0	0	15	147	3	0	0	0	3	103	2	0	0
09:00	0	2	2	1	0	0	0	17	3	23	0	0	0	17	177	5	0	0	0	5	135	16	0	0
10:00	0	4	0	3	0	0	0	20	2	10	0	0	0	15	202	8	0	0	0	2	228	15	0	0
11:00	0	7	0	2	0	0	0	21	2	17	0	0	0	24	164	2	0	0	0	4	192	10	0	0
12:00	0	5	3	2	0	0	0	15	6	21	0	0	0	21	168	7	0	0	0	3	253	14	0	0
13:00	0	1	2	5	0	0	0	6	4	14	0	0	0	20	121	4	0	0	0	0	155	6	0	0
14:00	0	8	2	1	0	0	0	10	8	22	0	0	0	18	145	3	0	0	0	1	138	11	0	0
15:00	0	5	1	3	0	0	0	15	6	24	0	0	0	32	170	7	0	0	0	0	193	12	0	0
16:00	0	7	2	0	0	0	0	19	6	24	0	0	0	38	127	11	0	0	0	2	179	18	0	0
17:00	0	7	4	2	0	0	0	12	3	25	0	0	0	29	153	7	0	0	0	2	171	13	0	0
18:00	0	1	1	0	0	0	0	3	4	5	0	0	0	7	68	4	0	0	0	0	62	5	0	0
19:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix B: Vehicular Level of Service (VLOS) Results - Existing

	HCS Two-Way Stop	-Control Report							
General Information		Site Information							
Analyst	Emma Myers-Verhage	Intersection	Highway 1416 and 151st Ave						
Agency/Co.		Jurisdiction	Box Elder SD						
Date Performed	6/2/2023	East/West Street	Highway 1416						
Analysis Year	2023	North/South Street	151st Ave						
Time Analyzed	AM peak	Peak Hour Factor	0.76						
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00						
Project Description	Radar Hill 1416 Corridor Study								



Major Street: East-West

Approach		Eastb	ound		Westbound			Northbound				Southbound				
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	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	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		7	38				94	8						5		34
Percent Heavy Vehicles (%)		9												16		16
Proportion Time Blocked																
Percent Grade (%)															0	
Right Turn Channelized																
Median Type Storage				Undi	Jndivided											

v/c Ratio

95% Queue Length, Q₉₅ (veh)

Control Delay (s/veh)

Level of Service (LOS)

Approach LOS

Approach Delay (s/veh)

Critical and Follow-up He	auwa	ys									
Base Critical Headway (sec)		4.1							7.1		6.2
Critical Headway (sec)		4.19							6.56		6.36
Base Follow-Up Headway (sec)		2.2							3.5		3.3
Follow-Up Headway (sec)		2.28							3.64		3.44
Delay, Queue Length, and	l Leve	l of Se	ervice								
Flow Rate, v (veh/h)		9								51	
Capacity, c (veh/h)		1409								866	

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0.01

0.0

7.6

Α

1.2

Α

0.1

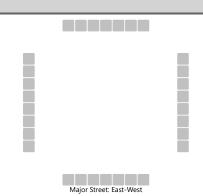
Α

9.4

0.06

0.2

	HCS Two-Way Stop	-Control Report							
General Information		Site Information							
Analyst	Emma Myers-Verhage	Intersection	Highway 1416 and 151st Ave						
Agency/Co.		Jurisdiction	Box Elder SD						
Date Performed	6/2/2023	East/West Street	Highway 1416						
Analysis Year	2023	North/South Street	151st Ave						
Time Analyzed	PM Peak	Peak Hour Factor	0.83						
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00						
Project Description	Radar Hill 1416 Corridor Study								



Vehicle Volumes and Adjustments

Approach		Eastb	ound			Westk	oound		Northbound				Southbound			
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	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	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		36	84				50	1						3		15
Percent Heavy Vehicles (%)		9												16		16
Proportion Time Blocked																
Percent Grade (%)														(0	
Right Turn Channelized																
Median Type Storage				Undi	vided											
Critical and Follow-up He	adwa	ys														
Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.19												6.56		6.36
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.28												3.64		3.44
Delay, Queue Length, and	l Leve	l of Se	ervice													
Flow Rate, v (veh/h)		43													22	
Capacity, c (veh/h)		1498													905	

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0.03

0.1

7.5

Α

2.4

Α

0.2

Α

v/c Ratio

95% Queue Length, Q₉₅ (veh)

Control Delay (s/veh)

Level of Service (LOS)

Approach Delay (s/veh)

Approach LOS

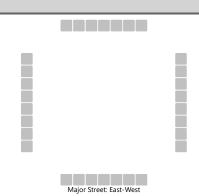
9.1

0.02

0.1

Α

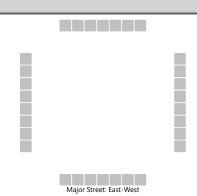
	HCS Two-Wa	y Stop-	-Control Report								
General Information			Site Information								
Analyst	Emma Myers-Verhage		Intersection	Highway 1416 and Liberty Blvd							
Agency/Co.			Jurisdiction	Box Elder SD							
Date Performed	6/2/2023		East/West Street	Highway 1416							
Analysis Year	2023		North/South Street	Liberty Blvd							
Time Analyzed	AM Peak		Peak Hour Factor	0.84							
Intersection Orientation	East-West		Analysis Time Period (hrs)	1.00							
Project Description	Radar Hill 1416 Corridor Study										



Major Street

Vehicle Volumes and Ad	justme	nts														
Approach	Т	Eastb	ound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	1	0		0	1	1
Configuration		L		TR			LTR				LTR			LT		R
Volume (veh/h)		134	23	2		1	15	139		3	32	2		20	8	28
Percent Heavy Vehicles (%)		8				7				2	2	2		9	9	9
Proportion Time Blocked																
Percent Grade (%)										(0				0	
Right Turn Channelized														Υ	es	
Median Type Storage				Undi	vided											
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.18				4.17				7.12	6.52	6.22		7.19	6.59	6.29
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)		2.27				2.26				3.52	4.02	3.32		3.58	4.08	3.38
Delay, Queue Length, an	d Leve	l of Se	ervice													
Flow Rate, v (veh/h)	Т	160				1					44			33		33
Capacity, c (veh/h)		1356				1551					414			406		936
v/c Ratio		0.12				0.00					0.11			0.08		0.04
95% Queue Length, Q ₉₅ (veh)		0.4				0.0					0.4			0.3		0.1
Control Delay (s/veh)		8.0	0.1	0.1		7.3	0.0	0.0			14.7			14.7		9.0
Level of Service (LOS)		А	Α	Α		А	А	Α			В			В		А
Approach Delay (s/veh)		6	.8	-		0	.1	•	14.7				11.8			
Approach LOS		A					A			В В			В			

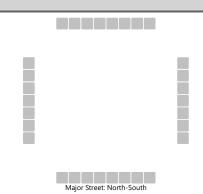
	HCS Two-Way Stop	-Control Report								
General Information		Site Information								
Analyst	Emma Myers-Verhage	Intersection	Highway 1416 and Liberty Blvd							
Agency/Co.		Jurisdiction	Box Elder SD							
Date Performed	6/2/2023	East/West Street	Highway 1416							
Analysis Year	2023	North/South Street	Liberty Blvd							
Time Analyzed	PM Peak	Peak Hour Factor	0.84							
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00							
Project Description	Radar Hill 1416 Corridor Study									



Vehicle	Volumes	and Ad	justments
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Approach		Eastb	ound			Westl	oound			North	bound		Southbound			
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	1	0		0	1	1
Configuration		L		TR			LTR				LTR			LT		R
Volume (veh/h)		37	42	12		3	27	54		7	10	0		110	20	54
Percent Heavy Vehicles (%)		8				7				2	2	2		9	9	9
Proportion Time Blocked																
Percent Grade (%)										()				0	
Right Turn Channelized														Υ	es	
Median Type Storage				Undi	vided											
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)	T	4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.18				4.17				7.12	6.52	6.22		7.19	6.59	6.29
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)		2.27				2.26				3.52	4.02	3.32		3.58	4.08	3.38
Delay, Queue Length, an	d Leve	l of S	ervice													
Flow Rate, v (veh/h)	T	44				4					20			155		64
Capacity, c (veh/h)		1460				1507					620			676		981
v/c Ratio		0.03				0.00					0.03			0.23		0.07
95% Queue Length, Q ₉₅ (veh)		0.1				0.0					0.1			0.9		0.2
Control Delay (s/veh)		7.5	0.1	0.1		7.4	0.0	0.0			11.0			11.9		8.9
Level of Service (LOS)		А	Α	А		Α	А	А			В			В		А
Approach Delay (s/veh)		3	.1			0	.3		11.0				11.0			
Approach LOS		A A						ВВВ								

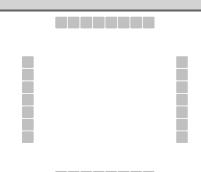
	HCS Two-Way Stop	-Control Report	
General Information		Site Information	
Analyst	Emma Myers-Verhage	Intersection	WB Highway 1416 and S Ellsworth Rd
Agency/Co.		Jurisdiction	Box Elder SD
Date Performed	6/12/2023	East/West Street	WB Highway 1416
Analysis Year	2023	North/South Street	S Ellsworth Rd
Time Analyzed	AM Peak	Peak Hour Factor	0.84
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	Radar Hill 1416 Corridor Study		



Vehicle Volumes and Adjustments

Approach		Eastb	ound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	2	0	0	0	1	0	0	0	1	1
Configuration						LT		TR		LT					Т	R
Volume (veh/h)						0	44	13		86	674				26	194
Percent Heavy Vehicles (%)						10	10	10		1						
Proportion Time Blocked																
Percent Grade (%)						(0									
Right Turn Channelized														Y	es	
Median Type Storage				Undi	vided											
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)						7.1	6.5	6.2		4.1						
Critical Headway (sec)						7.20	6.60	6.30		4.11						
Base Follow-Up Headway (sec)						3.5	4.0	3.3		2.2						
Follow-Up Headway (sec)						3.59	4.09	3.39		2.21						
Delay, Queue Length, an	d Leve	l of Se	ervice													
Flow Rate, v (veh/h)						26		42		102						
Capacity, c (veh/h)						197		239		1588						
v/c Ratio						0.13		0.17		0.06						
95% Queue Length, Q ₉₅ (veh)						0.5		0.6		0.2						
Control Delay (s/veh)						26.1		23.3		7.4	0.9					
Level of Service (LOS)						D		С		А	А					
Approach Delay (s/veh)					24.4			1.6								
Approach LOS					С			A								

	HCS Two-Way Stop	-Control Report	
General Information		Site Information	
Analyst	Emma Myers-Verhage	Intersection	WB Highway 1416 and S Ellsworth Rd
Agency/Co.		Jurisdiction	Box Elder SD
Date Performed	6/12/2023	East/West Street	WB Highway 1416
Analysis Year	2023	North/South Street	S Ellsworth Rd
Time Analyzed	PM Peak	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	Radar Hill 1416 Corridor Study		



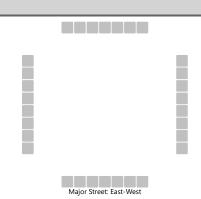
Major Street: North-South

Approach		Eastb	ound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	2	0	0	0	1	0	0	0	1	1
Configuration						LT		TR		LT					Т	R
Volume (veh/h)						14	71	6		36	328				65	256
Percent Heavy Vehicles (%)						10	10	10		1						
Proportion Time Blocked																
Percent Grade (%)						()									
Right Turn Channelized														Υ	es	
Median Type Storage				Undi	vided											
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)						7.1	6.5	6.2		4.1						
Critical Headway (sec)						7.20	6.60	6.30		4.11						
Base Follow-Up Headway (sec)						3.5	4.0	3.3		2.2						
Follow-Up Headway (sec)						3.59	4.09	3.39		2.21						
Delay, Queue Length, an	d Leve	l of S	ervice	•												
Flow Rate, v (veh/h)						55		46		40						
Capacity, c (veh/h)						438		459		1534						
v/c Ratio						0.13		0.10		0.03						
95% Queue Length, Q ₉₅ (veh)						0.4		0.3		0.1						
Control Delay (s/veh)						14.4		13.7		7.4	0.2					
						_										
Level of Service (LOS)						В		В		Α	Α					

Approach LOS

Α

	HCS Two-Way Stop	-Control Report	
General Information		Site Information	
Analyst	Emma Myers-Verhage	Intersection	EB Highway 1416 and S Ellsworth Rd
Agency/Co.		Jurisdiction	Box Elder SD
Date Performed	6/4/2023	East/West Street	EB Highway 1416
Analysis Year	2023	North/South Street	S Ellsworth Rd
Time Analyzed	AM Peak	Peak Hour Factor	0.84
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00
Project Description	Radar Hill 1416 Corridor Study		



Vehicle Volumes and Adj	ustme	nts														
Approach		Eastb	ound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	0	0		0	1	0		0	1	0
Configuration		LT		TR								TR		LT		
Volume (veh/h)		618	115	15							142	7		10	16	
Percent Heavy Vehicles (%)		4									1	1		5	5	
Proportion Time Blocked																
Percent Grade (%)										(0			()	
Right Turn Channelized																
Median Type Storage				Undi	vided											
Critical and Follow-up Ho	eadwa	ys														
Base Critical Headway (sec)		5.3									6.5	6.9		7.5	6.5	
Critical Headway (sec)		5.38									6.52	6.92		7.60	6.60	
Base Follow-Up Headway (sec)		3.1									4.0	3.3		3.5	4.0	
Follow-Up Headway (sec)		3.14									4.01	3.31		3.55	4.05	
Delay, Queue Length, and	d Leve	l of Se	ervice													
Flow Rate, v (veh/h)		736										177		31		
Capacity, c (veh/h)		1146										36		34		
v/c Ratio		0.64										4.98		0.92		
95% Queue Length, Q ₉₅ (veh)		5.2										74.4		6.2		
Control Delay (s/veh)		13.7	0.8									7390.1		468.7		
Level of Service (LOS)		В	Α									F		F		

11.5

Approach Delay (s/veh)

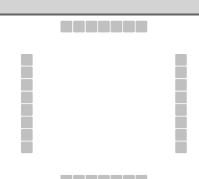
Approach LOS

468.7

7390.1

F

	HCS Two-Way Stop	-Control Report	
General Information		Site Information	
Analyst	Emma Myers-Verhage	Intersection	EB Highway 1416 and S Ellsworth Rd
Agency/Co.		Jurisdiction	Box Elder SD
Date Performed	6/4/2023	East/West Street	EB Highway 1416
Analysis Year	2023	North/South Street	S Ellsworth Rd
Time Analyzed	PM Peak	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00
Project Description	Radar Hill 1416 Corridor Study		



Major Street: East-West

Approach		Eastb	ound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	0	0		0	1	0		0	1	0
Configuration		LT		TR								TR		LT		
Volume (veh/h)		291	79	143							73	6		6	73	
Percent Heavy Vehicles (%)		4									1	1		5	5	
Proportion Time Blocked																
Percent Grade (%)										()			(0	

Percent Grade (%)								()		(0	
Right Turn Channelized													
Median Type Storage				Undi	vided								
Critical and Follow-up He	adwa	ys											
Base Critical Headway (sec)		5.3							6.5	6.9	7.5	6.5	
Critical Headway (sec)		5.38							6.52	6.92	7.60	6.60	
Base Follow-Up Headway (sec)		3.1							4.0	3.3	3.5	4.0	
Follow-Up Headway (sec)		3.14							4.01	3.31	3.55	4.05	
Delay, Queue Length, and	l Leve	l of Se	ervice										
Flow Rate, v (veh/h)		323								88	88		
Capacity, c (veh/h)		1146								231	184		
v/c Ratio		0.28								0.38	0.48		
95% Queue Length, Q ₉₅ (veh)		1.2								1.8	2.6		
Control Delay (s/veh)		9.4	0.3							30.0	42.0		
Level of Service (LOS)		Α	Α							D	E		

5.4

Α

Approach Delay (s/veh)

Approach LOS

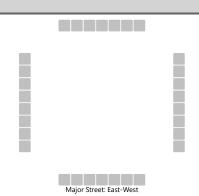
Vehicle Volumes and Adjustments

30.0

D

42.0

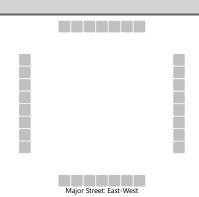
	HCS Two-Way Stop	-Control Report	
General Information		Site Information	
Analyst	Emma Myers-Verhage	Intersection	WB Highway 1416 and Radar Hill Rd
Agency/Co.		Jurisdiction	Box Elder SD
Date Performed	6/4/2023	East/West Street	WB Highway 1416
Analysis Year	2023	North/South Street	Radar Hill Rd
Time Analyzed	AM Peak	Peak Hour Factor	0.88
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00
Project Description	Radar Hill 1416 Corridor Study		



Vehi	cle	Vo	lumes	and	Ad	justm	ents
------	-----	----	-------	-----	----	-------	------

Approach	Eastbound Westbound									North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	0	0	0	0	2	0		0	1	0		0	1	0
Configuration						LT		TR		LT						TR
Volume (veh/h)						79	334	5		167	5				17	16
Percent Heavy Vehicles (%)						5				4	4				3	3
Proportion Time Blocked																
Percent Grade (%)										(0				0	
Right Turn Channelized																
Median Type Storage				Undi	vided											
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)						5.3				7.5	6.5				6.5	6.9
Critical Headway (sec)						5.40				7.58	6.58				6.56	6.96
Base Follow-Up Headway (sec)						3.1				3.5	4.0				4.0	3.3
Follow-Up Headway (sec)						3.15				3.54	4.04				4.03	3.33
Delay, Queue Length, an	d Leve	l of Se	ervice													
Flow Rate, v (veh/h)	T					90				195						38
Capacity, c (veh/h)						1143				462						525
v/c Ratio						0.08				0.42						0.07
95% Queue Length, Q ₉₅ (veh)						0.3				2.2						0.2
Control Delay (s/veh)						8.4	0.5			18.5						12.4
Level of Service (LOS)						А	А			С						В
Approach Delay (s/veh)					2.0			18.5				12.4				
Approach LOS					A			С				В				

	HCS Two-Way Stop	-Control Report	
General Information		Site Information	
Analyst	Emma Myers-Verhage	Intersection	WB Highway 1416 and Radar Hill Rd
Agency/Co.		Jurisdiction	Box Elder SD
Date Performed	6/4/2023	East/West Street	WB Highway 1416
Analysis Year	2023	North/South Street	Radar Hill Rd
Time Analyzed	PM Peak	Peak Hour Factor	0.94
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00
Project Description	Radar Hill 1416 Corridor Study		



Vehicle Volumes and Adjustments

Approach		Eastbound				Westl	oound			North	bound		Southbound			
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	0	0	0	0	2	0		0	1	0		0	1	0
Configuration						LT		TR		LT						TR
Volume (veh/h)						184	531	3		112	28				13	10
Percent Heavy Vehicles (%)						5				4	4				3	3
Proportion Time Blocked																
Percent Grade (%)										()				0	
Right Turn Channelized																
Median Type Storage				Undi	vided											
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)	T					5.3				7.5	6.5				6.5	6.9
Critical Headway (sec)						5.40				7.58	6.58				6.56	6.96
Base Follow-Up Headway (sec)						3.1				3.5	4.0				4.0	3.3
Follow-Up Headway (sec)						3.15				3.54	4.04				4.03	3.33
Delay, Queue Length, an	d Leve	l of Se	ervice													
Flow Rate, v (veh/h)	Т					196				149						24
Capacity, c (veh/h)						1143				235						293
v/c Ratio						0.17				0.63						0.08
95% Queue Length, Q ₉₅ (veh)						0.6				4.7						0.3
Control Delay (s/veh)						8.8	1.1			45.8						18.4
Level of Service (LOS)						Α	А			Е						С

Approach Delay (s/veh)

Approach LOS

18.4

3.0

Α

45.8

Ε

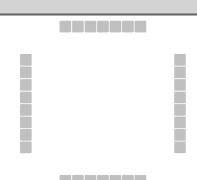
		HCS	All-W	ay Sto	p Con	trol Re	eport					
General and Site Information	on				Lanes							
Analyst	Emma N	/lyers-Verh	age									
Agency/Co.					1							
Date Performed	6/4/202	3			1							
Analysis Year	2023				1							
Analysis Time Period (hrs)	1.00				1							
Time Analyzed	AM Pea	k			1							
Project Description	Radar H	ill 1416 Co	rridor Stud	у	1							
Intersection	EB High	way 1416 a	and Radar I	Hill Rd	1							
Jurisdiction	Box Elde	er SD			1							
East/West Street	EB High	way 1416			1							
North/South Street	Radar H	ill Rd			1							
Peak Hour Factor	0.88				1							
Turning Movement Deman	d Volum	nes										
Approach	Τ	Eastbound	l		Westbound	d l	ı	Northboun	d	9	Southboun	d
Movement	L	Т	R	L	Т	R	L	Т	R	L	Т	R
Volume (veh/h)	4	527	55					168	236	8	88	
% Thrus in Shared Lane	50		50									
Lane Flow Rate and Adjusti	nents											
Approach	Т	Eastbound	l		Westbound	t l	ı	Northboun	d	9	Southboun	d
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT	TR					TR			LT		
Flow Rate, v (veh/h)	304	362					459			109		
Percent Heavy Vehicles	4	4					4			3		
Initial Departure Headway, hd (s)	3.20	3.20					3.20			3.20		
Initial Degree of Utilization, x	0.270	0.322					0.408			0.097		
Final Departure Headway, hd (s)	6.19	6.06					5.39			6.36		
Final Degree of Utilization, x	0.523	0.609					0.688			0.193		
Move-Up Time, m (s)	2.3	2.3					2.0			2.0		
Service Time, t₅ (s)	3.89	3.76					3.39			4.36		
Capacity, Delay and Level o	f Servic	e										
Approach	Т	Eastbound	l		Westbound	d	ı	Vorthboun	d	9	Southboun	d
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT	TR					TR			LT		
Flow Rate, v (veh/h)	304	362					459			109		
Capacity (veh/h)	582	594					667			566		
95% Queue Length, Q ₉₅ (veh)	3.2	4.5					6.2			0.7		
Control Delay (s/veh)	15.6	18.1					20.0			10.9		
Level of Service, LOS	С	С					С			В		
Approach Delay (s/veh) LOS	17.0		С				20.0		С	10.9		В
Intersection Delay (s/veh) LOS			17	7.6	C				C	'		

		HCS	All-W	ay Stc	p Con	trol Re	eport					
General and Site Informati	on				Lanes							
Analyst	Emma N	Лyers-Verh	age									
Agency/Co.					1							
Date Performed	6/4/202	3			1							
Analysis Year	2023				1							
Analysis Time Period (hrs)	1.00				1							
Time Analyzed	PM Pea	k			1							
Project Description	Radar H	lill 1416 Co	rridor Stud	у	1							
Intersection	EB High	way 1416 a	and Radar I	Hill Rd	1							
Jurisdiction	Box Elde	er SD			1							
East/West Street	EB High	way 1416			1							
North/South Street	Radar H	ill Rd			1							
Peak Hour Factor	0.94				1							
Turning Movement Demar	d Volum	nes										
Approach		Eastbound	l		Westbound	t	ı	Northboun	d	9	Southboun	d
Movement	L	Т	R	L	Т	R	L	Т	R	L	Т	R
Volume (veh/h)	19	401	193					121	116	4	193	
% Thrus in Shared Lane	50		50									
Lane Flow Rate and Adjust	ments											
Approach	T	Eastbound	i		Westbound	d t	1	Northboun	d	9	Southboun	d
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT	TR					TR			LT		
Flow Rate, v (veh/h)	234	419					252			210		
Percent Heavy Vehicles	4	4					4			3		
Initial Departure Headway, h₄ (s)	3.20	3.20					3.20			3.20		
Initial Degree of Utilization, x	0.208	0.372					0.224			0.186		
Final Departure Headway, hd (s)	5.94	5.55					5.57			5.91		
Final Degree of Utilization, x	0.385	0.645					0.390			0.344		
Move-Up Time, m (s)	2.3	2.3					2.0			2.0		
Service Time, t₅ (s)	3.64	3.25					3.57			3.91		
Capacity, Delay and Level	of Servic	e										
Approach	Т	Eastbound	l		Westbound	d		Northboun	d	9	Southboun	d
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT	TR					TR			LT		
Flow Rate, v (veh/h)	234	419					252			210		
Capacity (veh/h)	606	649					646			609		
95% Queue Length, Q ₉₅ (veh)	1.9	5.2					1.9			1.6		
Control Delay (s/veh)	12.3	18.2					12.1			12.0		
Level of Service, LOS	В	С					В			В		
Approach Delay (s/veh) LOS	16.1		С				12.1		В	12.0		В
Intersection Delay (s/veh) LOS			14	1.4	В							

		HCS	All-W	ay Sto	p Con	trol Re	eport					
General and Site Information	on				Lanes							
Analyst	Emma N	Лyers-Verh	age									
Agency/Co.												
Date Performed	6/4/202	3										
Analysis Year	2023											
Analysis Time Period (hrs)	1.00											
Time Analyzed	AM Pea	k										
Project Description	Radar H	lill 1416 Co	rridor Stud	у								
Intersection	Radar H	lill Rd and I	ong View	Rd								
Jurisdiction	Box Elde	er SD										
East/West Street	Long Vi	ew Rd										
North/South Street	Radar H	ill Rd										
Peak Hour Factor	0.90											
Turning Movement Deman	d Volum	nes										
Approach	Τ	Eastbound	l		Westbound	d l	1	Northboun	d	9	Southboun	d
Movement	L	T	R	L	Т	R	L	Т	R	L	Т	R
Volume (veh/h)	70	6	1	5	16	9	1	24	3	3	38	102
% Thrus in Shared Lane												
Lane Flow Rate and Adjust	nents											
Approach	Т	Eastbound	l		Westbound	t l	ı	Northboun	d	9	Southboun	d
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	L	TR		L	TR		L	TR		L	TR	
Flow Rate, v (veh/h)	78	8		6	28		1	30		3	156	
Percent Heavy Vehicles	3	3		49	49		14	14		5	5	
Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20		3.20	3.20	
Initial Degree of Utilization, x	0.069	0.007		0.005	0.025		0.001	0.027		0.003	0.138	
Final Departure Headway, hd (s)	5.52	4.92		6.35	5.60		5.69	5.11		5.44	4.43	
Final Degree of Utilization, x	0.119	0.011		0.010	0.043		0.002	0.043		0.005	0.191	
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.3	2.3	
Service Time, ts (s)	3.22	2.62		4.05	3.30		3.39	2.81		3.14	2.13	
Capacity, Delay and Level o	f Servic	e										
Approach	Т	Eastbound	l		Westbound	d t	1	Northboun	d	9	Southboun	d
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	L	TR		L	TR		L	TR		L	TR	
Flow Rate, v (veh/h)	78	8		6	28		1	30		3	156	
Capacity (veh/h)	652	732		567	643		633	705		662	812	
95% Queue Length, Q ₉₅ (veh)	0.4	0.0		0.0	0.1		0.0	0.1		0.0	0.7	
Control Delay (s/veh)	9.0	7.7		9.1	8.6		8.4	8.0		8.2	8.2	
Level of Service, LOS	А	А		Α	Α		Α	А		Α	Α	
Approach Delay (s/veh) LOS	8.8		Α	8.6		Α	8.0		Α	8.2		А
Intersection Delay (s/veh) LOS			8	.4	A							

		HCS	All-W	ay Sto	p Con	trol Re	eport					
General and Site Information	on				Lanes							
Analyst	Emma N	Лyers-Verh	age									
Agency/Co.					1							
Date Performed	6/4/202	3			1							
Analysis Year	2023				1							
Analysis Time Period (hrs)	1.00				1							
Time Analyzed	PM Pea	<			1							
Project Description	Radar H	ill 1416 Co	rridor Stud	у	1							
Intersection	Radar H	ill Rd and I	Long View	Rd	1							
Jurisdiction	Box Elde	er SD			1							
East/West Street	Long Vi	ew Rd			1							
North/South Street	Radar H	ill Rd			1							
Peak Hour Factor	0.95				1							
Turning Movement Deman	d Volum	nes										
Approach	Τ	Eastbound	l		Westbound	d	ı	Northboun	d	9	Southboun	d
Movement	L	Т	R	L	Т	R	L	Т	R	L	Т	R
Volume (veh/h)	127	10	1	2	6	4	1	46	4	7	37	107
% Thrus in Shared Lane												
Lane Flow Rate and Adjust	ments											
Approach	Т	Eastbound	İ		Westbound	d		Northboun	d	9	Southboun	d
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	L	TR		L	TR		L	TR		L	TR	
Flow Rate, v (veh/h)	134	12		2	11		1	53		7	152	
Percent Heavy Vehicles	3	3		49	49		14	14		5	5	
Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20		3.20	3.20	
Initial Degree of Utilization, x	0.119	0.010		0.002	0.009		0.001	0.047		0.007	0.135	
Final Departure Headway, hd (s)	5.57	5.00		6.48	5.70		5.81	5.25		5.57	4.55	
Final Degree of Utilization, x	0.207	0.016		0.004	0.017		0.002	0.077		0.011	0.192	
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.3	2.3	
Service Time, t₅ (s)	3.27	2.70		4.18	3.40		3.51	2.95		3.27	2.25	
Capacity, Delay and Level o	f Servic	e										
Approach	Π	Eastbound	ł		Westbound	d		Northboun	d	9	Southboun	d
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	L	TR		L	TR		L	TR		L	TR	
Flow Rate, v (veh/h)	134	12		2	11		1	53		7	152	
Capacity (veh/h)	647	719		555	631		620	686		646	790	
95% Queue Length, Q ₉₅ (veh)	0.8	0.0		0.0	0.1		0.0	0.2		0.0	0.7	
Control Delay (s/veh)	9.7	7.8		9.2	8.5		8.5	8.4		8.3	8.3	
Level of Service, LOS	А	Α		А	А		А	А		Α	Α	
Approach Delay (s/veh) LOS	9.6		А	8.6		Α	8.4		Α	8.3		А
Intersection Delay (s/veh) LOS			8	.8	A							

	HCS Two-Way Stop-Control Report											
General Information		Site Information										
Analyst	Emma Myers-Verhage	Intersection	Radar Hill Rd and Highway 44									
Agency/Co.		Jurisdiction	Box Elder SD									
Date Performed	6/4/2023	East/West Street	Highway 44									
Analysis Year	2023	North/South Street	Radar Hill Rd									
Time Analyzed	AM Peak	Peak Hour Factor	0.86									
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00									
Project Description	Radar Hill 1416 Corridor Study											



Major Street: East-West

Vehicle	Volumes	and	Adju	stments	
Approach				F	_ a

Approach		Eastbound Westbound						North	bound		Southbound					
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	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		0	1	0		0	1	0
Configuration		L	Т	TR		L	Т	TR			LTR				LTR	
Volume (veh/h)	0	15	217	5	0	2	207	17		4	0	1		19	2	10
Percent Heavy Vehicles (%)	5	5			3	3				6	6	6		10	10	10
Proportion Time Blocked																
Percent Grade (%)										()			(0	
Right Turn Channelized																
Median Type Storage				Undi	vided											
Critical and Follow-up Ho	eadwa	ys														
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				4.16				7.62	6.62	7.02		7.70	6.70	7.10
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				2.23				3.56	4.06	3.36		3.60	4.10	3.40
Delay, Queue Length, an	d Leve	l of Se	ervice													
Flow Rate, v (veh/h)		17				2					6				36	
Capacity, c (veh/h)		1279				1296					534				564	
v/c Ratio		0.01				0.00					0.01				0.06	
95% Queue Length, Q ₉₅ (veh)		0.0				0.0					0.0				0.2	

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7.9

Α

0.5

Α

Control Delay (s/veh)

Level of Service (LOS)

Approach LOS

Approach Delay (s/veh)

11.8

11.8

В

11.8

В

11.8

В

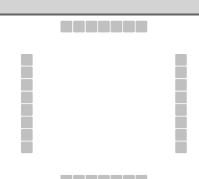
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Α

7.8

Α

	HCS Two-Way Stop	-Control Report	
General Information		Site Information	
Analyst	Emma Myers-Verhage	Intersection	Radar Hill Rd and Highway 44
Agency/Co.		Jurisdiction	Box Elder SD
Date Performed	6/4/2023	East/West Street	Highway 44
Analysis Year	2023	North/South Street	Radar Hill Rd
Time Analyzed	PM Peak	Peak Hour Factor	0.85
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00
Project Description	Radar Hill 1416 Corridor Study		



Major Street: East-West

Vehicle Volumes and Adju	stments
Approach	Ea

Approach		Eastb	ound			Westl	oound			North	bound		Southbound			
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	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		0	1	0		0	1	0
Configuration		L	Т	TR		L	Т	TR			LTR				LTR	
Volume (veh/h)	0	39	132	12	0	1	221	24		6	1	0		23	7	24
Percent Heavy Vehicles (%)	5	5			3	3				6	6	6		10	10	10
Proportion Time Blocked																
Percent Grade (%)										()			(0	
Right Turn Channelized																
Median Type Storage				Undi	vided											
Critical and Follow-up He	adwa	lways														
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				4.16				7.62	6.62	7.02		7.70	6.70	7.10
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				2.23				3.56	4.06	3.36		3.60	4.10	3.40
Delay, Queue Length, and	l Leve	l of Se	ervice													
Flow Rate, v (veh/h)		46				1					8				64	
Capacity, c (veh/h)		1249				1398					467				564	
v/c Ratio		0.04				0.00					0.02				0.11	
95% Queue Length, Q ₉₅ (veh)		0.1				0.0					0.1				0.4	
Control Delay (s/veh)		8.0				7.6					12.9				12.2	
Level of Service (LOS)		А				А					В				В	
Approach Delay (s/veh)		1.7			0.0				12.9				12.2			

Α

Approach LOS

В

Α

Appendix C: Pedestrian Level of Service (PLOS) and Bicycle Level of Service (BLOS) Results

Lanes per direction:	2
Outside lane width:	12 ft
Paved shoulder/bike lane/marked parking width:	0 ft
Bidirectional ADT traffic volume:	3943 (veh/day)
Posted speed limit:	65 mph
Heavy vehicle percentage:	3%
FHWA's pavement condition rating:	3
% of segment with occupied parking:	0%
% of segment with sidewalks:	0%

Score Level-of-service Compatibility Level BLOS: 4.2 D (3.51-4.50) Moderately Low PLOS: 4.92 E (4.51-5.50) Very Low

Highway 1416 151st Avenue to Liberty Blvd

Lanes per direction:	2
Outside lane width:	12 ft
Paved shoulder/bike lane/marked parking width:	0 ft
Bidirectional ADT traffic volume:	1469 (veh/day)
Posted speed limit:	50 mph
Heavy vehicle percentage:	5%
FHWA's pavement condition rating:	3
% of segment with occupied parking:	0%
% of segment with sidewalks:	0%

	Score	Level-of-service	Compatibility Level
BLOS:	4.08	D (3.51-4.50)	Moderately Low
PLOS:	4.08	D (3.51-4.50)	Moderately Low

WB Highway 1416 Liberty Blvd to S Ellsworth Rd

Lanes per direction:	2
Outside lane width:	12 ft
Paved shoulder/bike lane/marked parking width:	0 ft
Bidirectional ADT traffic volume:	5878 (veh/day)
Posted speed limit:	55 mph
Heavy vehicle percentage:	5%
FHWA's pavement condition rating:	3
% of segment with occupied parking:	0%
% of segment with sidewalks:	0%

Compatibility Level Level-of-service Score

Very Low BLOS: 4.87 E (4.51-5.50) PLOS: E (4.51-5.50) Very Low 4.55

WB Highway 1416 S Ellsworth Rd to W Gate Rd

Lanes per direction:	2
Outside lane width:	12 ft
Paved shoulder/bike lane/marked parking width:	0 ft
Bidirectional ADT traffic volume:	1080 (veh/day)
Posted speed limit:	50 mph
Heavy vehicle percentage:	8%
FHWA's pavement condition rating:	3
% of segment with occupied parking:	0%
% of segment with sidewalks:	0%

	Score	Level-of-service	Compatibility Level
BLOS:	4.89	E (4.51-5.50)	Very Low
PLOS:	4.06	D (3.51-4.50)	Moderately Low

EB Highway 1416 Liberty Blvd to S Ellsworth Rd

Lanes per direction:	2
Outside lane width:	12 ft
Paved shoulder/bike lane/marked parking width:	0 ft
Bidirectional ADT traffic volume:	6290 (veh/day)
Posted speed limit:	55 mph
Heavy vehicle percentage:	5%
FHWA's pavement condition rating:	3
% of segment with occupied parking:	0%
% of segment with sidewalks:	0%

Score Level-of-service Compatibility Level

BLOS: 4.9 E (4.51-5.50) Very Low E (4.51-5.50) PLOS: 4.57 Very Low

EB Highway 1416 S Ellsworth Rd to W Gate Rd

Lanes per direction:	2
Outside lane width:	13 ft
Paved shoulder/bike lane/marked parking width:	0 ft
Bidirectional ADT traffic volume:	5385 (veh/day)
Posted speed limit:	45 mph
Heavy vehicle percentage:	4%
FHWA's pavement condition rating:	3
% of segment with occupied parking:	0%
% of segment with sidewalks:	0%

	Score	Level-of-service	Compatibility Level
BLOS:	4.26	D (3.51-4.50)	Moderately Low
PLOS:	4.02	D (3.51-4.50)	Moderately Low

Radar Hill Rd Highway 1416 to 228th St

Lanes per direction:	2
Outside lane width:	13 ft
Paved shoulder/bike lane/marked parking width:	10 ft
Bidirectional ADT traffic volume:	1052 (veh/day)
Posted speed limit:	45 mph
Heavy vehicle percentage:	12%
FHWA's pavement condition rating:	3
% of segment with occupied parking:	0%
% of segment with sidewalks:	0%

Score Level-of-service Compatibility Level BLOS: 1.5 A (below 1.50) Extremely High PLOS: 3.07 C (2.51-3.50) Moderately High

Radar Hill Rd 228th St to 229th St

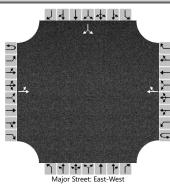
Lanes per direction:	2
Outside lane width:	13 ft
Paved shoulder/bike lane/marked parking width:	0 ft
Bidirectional ADT traffic volume:	320 (veh/day)
Posted speed limit:	50 mph
Heavy vehicle percentage:	7%
FHWA's pavement condition rating:	3
% of segment with occupied parking:	0%
% of segment with sidewalks:	0%

	Score	Level-of-service	Compatibility Level
BLOS:	3.81	D (3.51-4.50)	Moderately Low
PLOS:	3.92	D (3.51-4.50)	Moderately Low

Radar Hill Rd 229th St to Highway 44

Appendix D: Vehicular Level of Service (VLOS) Results - Future No-Build

HCS Two-Way Stop-Control Report										
General Information		Site Information								
Analyst	Emma Myers-Verhage	Intersection	Highway 1416 and 151st Ave							
Agency/Co.		Jurisdiction	Box Elder, SD							
Date Performed	7/28/2023	East/West Street	Highway 1416							
Analysis Year	2030	North/South Street	151st Ave							
Time Analyzed	AM Peak	Peak Hour Factor	0.76							
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00							
Project Description Radar Hill 1416 Corridor Study										

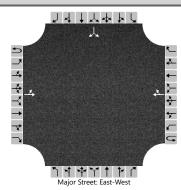


	Major Street: East-West															
Vehicle Volumes and Adj	ustme	nts														
Approach	T	Eastb	ound			Westl	oound		Northbound					South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		179	41				99	19						11		146
Percent Heavy Vehicles (%)		9												16		16
Proportion Time Blocked																
Percent Grade (%)														(0	
Right Turn Channelized																
Median Type Storage				Undi	vided											
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.19												6.56		6.36
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.28												3.64		3.44
Delay, Queue Length, an	d Leve	l of S	ervice													
Flow Rate, v (veh/h)		236													207	
Capacity, c (veh/h)		1383													780	
v/c Ratio		0.17													0.26	
95% Queue Length, Q ₉₅ (veh)		0.6													1.1	
Control Delay (s/veh)		8.1	1.4												11.3	
Level of Service (LOS)		А	А												В	
Approach Delay (s/veh)		6	.9										11.3			
Approach LOS		А											В			

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HCS Two-Way Stop-Control Report **General Information** Site Information Analyst Emma Myers-Verhage Highway 1416 and 151st Ave Intersection Agency/Co. Box Elder, SD Jurisdiction Date Performed 7/28/2023 East/West Street Highway 1416 2030 **Analysis Year** North/South Street 151st Ave Time Analyzed PM Peak 0.83 Peak Hour Factor Analysis Time Period (hrs) Intersection Orientation East-West 1.00 **Project Description** Radar Hill 1416 Corridor Study

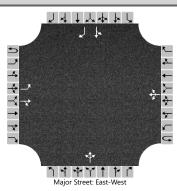
Lanes



Vehicle Volumes and Ad	ustme	nts														
Approach		Eastb	oound		Westbound				Northbound					South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	10	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	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		92	87				52	5						6		65
Percent Heavy Vehicles (%)		9												16		16
Proportion Time Blocked																
Percent Grade (%)														(0	
Right Turn Channelized																
Median Type Storage		Undivided														
Critical and Follow-up H	eadwa	adways														
Base Critical Headway (sec)	<u> </u>	4.1												7.1		6.2
Critical Headway (sec)		4.19												6.56		6.36
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.28												3.64		3.44
Delay, Queue Length, an	d Leve	l of S	ervice													
Flow Rate, v (veh/h)	<u> </u>	111													86	
Capacity, c (veh/h)		1489													901	
v/c Ratio		0.07													0.09	
95% Queue Length, Q ₉₅ (veh)		0.2						Ì			Ì		Ì		0.3	
Control Delay (s/veh)		7.6	0.6												9.4	
Level of Service (LOS)		А	А												А	
Approach Delay (s/veh)		4.2											9.4			
Approach LOS		A							A			A				

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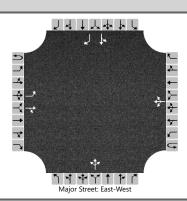
HCS Two-Way Stop-Control Report										
General Information										
Analyst	Emma Myers-Verhage	Intersection	Highway 1416 and Liberty Blvd							
Agency/Co.		Jurisdiction	Box Elder, SD							
Date Performed	7/28/2023	East/West Street	Highway 1416							
Analysis Year	2030	North/South Street	Liberty Blvd							
Time Analyzed	AM Peak	Peak Hour Factor	0.84							
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00							
Project Description	Project Description Radar Hill 1416 Corridor Study									



Vehicle Volumes and Ad	justme	nts														
Approach		Eastb	ound			Westl	oound		Northbound					Southl	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	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	0	0	0	1	0		0	1	0		0	1	1
Configuration		L		TR			LTR				LTR			LT		R
Volume (veh/h)		326	150	3		7	90	171		4	51	10		60	19	141
Percent Heavy Vehicles (%)		8				7				2	2	2		9	9	9
Proportion Time Blocked																
Percent Grade (%))			()	
Right Turn Channelized									Yes							
Median Type Storage		Undivided														
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.18				4.17				7.12	6.52	6.22		7.19	6.59	6.29
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)		2.27				2.26				3.52	4.02	3.32		3.58	4.08	3.38
Delay, Queue Length, an	d Leve	l of Se	ervice													
Flow Rate, v (veh/h)	Т	388				8					77			94		168
Capacity, c (veh/h)		1216				1363					123			65		814
v/c Ratio		0.32				0.01					0.63			1.46		0.21
95% Queue Length, Q ₉₅ (veh)		1.4				0.0					4.3			21.3		0.8
Control Delay (s/veh)		9.3				7.7	0.1	0.1			81.0			1032.9		10.6
Level of Service (LOS)		A				А	А	А			F			F		В
Approach Delay (s/veh)		6.4 0.3						•	81.0				377.7			
Approach LOS		,	Ą			,	4		F				F			

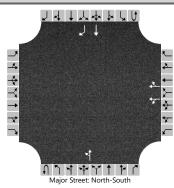
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HCS Two-Way Stop-Control Report										
General Information										
Analyst	Emma Myers-Verhage	Intersection	Highway 1416 and Liberty Blvd							
Agency/Co.		Jurisdiction	Box Elder, SD							
Date Performed	7/28/2023	East/West Street	Highway 1416							
Analysis Year	2030	North/South Street	Liberty Blvd							
Time Analyzed	PM Peak	Peak Hour Factor	0.84							
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00							
Project Description Radar Hill 1416 Corridor Study										



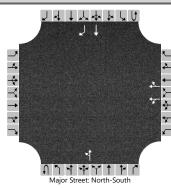
Vehicle Volumes and Ad	justme	nts															
Approach	T	Eastb	ound			Westl	oound			North	bound			South	bound		
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12	
Number of Lanes	0	1	1	0	0	0	1	0		0	1	0		0	1	1	
Configuration		L		TR			LTR				LTR			LT		R	
Volume (veh/h)		97	83	13		7	64	66		8	16	2		125	26	107	
Percent Heavy Vehicles (%)		8				7				2	2	2		9	9	9	
Proportion Time Blocked																	
Percent Grade (%)											0				0		
Right Turn Channelized														Υ	es		
Median Type Storage				Undi	vided				·								
Critical and Follow-up H	eadwa	ys															
Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2	
Critical Headway (sec)		4.18				4.17				7.12	6.52	6.22		7.19	6.59	6.29	
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)		2.27				2.26				3.52	4.02	3.32		3.58	4.08	3.38	
Delay, Queue Length, an	d Leve	l of S	ervice														
Flow Rate, v (veh/h)	T	115				8					31			180		127	
Capacity, c (veh/h)		1390				1444					405			424		918	
v/c Ratio		0.08				0.01					0.08			0.42		0.14	
95% Queue Length, Q ₉₅ (veh)		0.3				0.0					0.2			2.2		0.5	
Control Delay (s/veh)		7.8				7.5	0.0	0.0			14.6			19.7		9.6	
Level of Service (LOS)		А			A A A			В					С		А		
Approach Delay (s/veh)		3.9 0.4						14.6				15.5					
Approach LOS		A A						В С									

HCS Two-Way Stop-Control Report										
General Information Site Information										
Analyst	Emma Myers-Verhage	Intersection	WB Highway 1416 and S Ellsworth Rd							
Agency/Co.		Jurisdiction	Box Elder, SD							
Date Performed	7/28/2023	East/West Street	WB Highway 1416							
Analysis Year	2030	North/South Street	S Ellsworth Rd							
Time Analyzed	AM Peak	Peak Hour Factor	0.84							
Intersection Orientation North-South Analysis Time Period (hrs) 1.00										
Project Description Radar Hill 1416 Corridor Study										



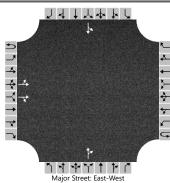
					iviajo	Jueet. Noi	tii-30utii										
Vehicle Volumes and Ad	justme	nts															
Approach		Eastb	ound			Westl	oound		Northbound					Southbound			
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	0	0		0	2	0	0	0	1	0	0	0	1	1	
Configuration						LT		TR		LT					Т	R	
Volume (veh/h)						30	173	44		90	752				128	207	
Percent Heavy Vehicles (%)						10	10	10		1							
Proportion Time Blocked																	
Percent Grade (%)						(0										
Right Turn Channelized									Yes								
Median Type Storage		Undivided															
Critical and Follow-up H	eadwa	adways															
Base Critical Headway (sec)						7.1	6.5	6.2		4.1							
Critical Headway (sec)						7.20	6.60	6.30		4.11							
Base Follow-Up Headway (sec)						3.5	4.0	3.3		2.2							
Follow-Up Headway (sec)						3.59	4.09	3.39		2.21							
Delay, Queue Length, an	d Leve	l of S	ervice														
Flow Rate, v (veh/h)	T					139		155		107							
Capacity, c (veh/h)						133		172		1434							
v/c Ratio						1.04		0.90		0.07							
95% Queue Length, Q ₉₅ (veh)						15.8		11.6		0.2							
Control Delay (s/veh)						295.8		141.5		7.7	1.2						
Level of Service (LOS)						F		F		А	А						
Approach Delay (s/veh)						21	4.3		1.9								
Approach LOS						F			A								

HCS Two-Way Stop-Control Report										
General Information	Site Information									
Analyst	Emma Myers-Verhage	Intersection	WB Highway 1416 and S Ellsworth Rd							
Agency/Co.		Jurisdiction	Box Elder, SD							
Date Performed	7/28/2023	East/West Street	WB Highway 1416							
Analysis Year	2030	North/South Street	S Ellsworth Rd							
Time Analyzed	PM Peak	Peak Hour Factor	0.84							
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00							
Project Description Radar Hill 1416 Corridor Study										



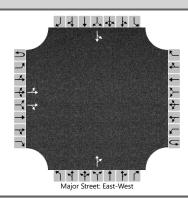
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Vehicle Volumes and Ad	justme	nts														
Approach		Eastb	ound			Westl	oound		Northbound				Southbound			
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	2	0	0	0	1	0	0	0	1	1
Configuration						LT		TR		LT					Т	R
Volume (veh/h)						29	135	21		38	356				93	273
Percent Heavy Vehicles (%)						10	10	10		1						
Proportion Time Blocked																
Percent Grade (%)							0									
Right Turn Channelized									Yes							
Median Type Storage		Undivided														
Critical and Follow-up H	eadwa	adways														
Base Critical Headway (sec)						7.1	6.5	6.2		4.1						
Critical Headway (sec)						7.20	6.60	6.30		4.11						
Base Follow-Up Headway (sec)						3.5	4.0	3.3		2.2						
Follow-Up Headway (sec)						3.59	4.09	3.39		2.21						
Delay, Queue Length, an	d Leve	l of S	ervice													
Flow Rate, v (veh/h)	T					115		105		45						
Capacity, c (veh/h)						374		413		1486						
v/c Ratio						0.31		0.25		0.03						
95% Queue Length, Q ₉₅ (veh)						1.3		1.0	Ì	0.1						
Control Delay (s/veh)						18.9		16.7		7.5	0.3					
Level of Service (LOS)						С		С		А	А					
Approach Delay (s/veh)						17.8			1.0							
Approach LOS						С			A							

HCS Two-Way Stop-Control Report										
General Information		Site Information								
Analyst	Emma Myers-Verhage	Intersection	EB Highway 1416 and S Ellsworth Rd							
Agency/Co.		Jurisdiction	Box Elder, SD							
Date Performed	7/28/2023	East/West Street	EB Highway 1416							
Analysis Year	2030	North/South Street	S Ellsworth Rd							
Time Analyzed	AM Peak	Peak Hour Factor	0.84							
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00							
Project Description Radar Hill 1416 Corridor Study										



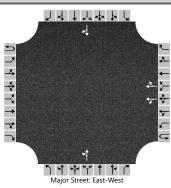
					Maj	or Street: Ea	st-West											
Vehicle Volumes and Ad	justme	nts																
Approach	Eastbound					Westl	bound			North	bound		Southbound					
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R		
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12		
Number of Lanes	0	0	2	0	0	0	0	0		0	1	0		0	1	0		
Configuration		LT		TR								TR		LT				
Volume (veh/h)		650	335	16							190	59		62	96			
Percent Heavy Vehicles (%)		4									1	1		5	5			
Proportion Time Blocked																		
Percent Grade (%)											0		0					
Right Turn Channelized																		
Median Type Storage				Undi	vided													
Critical and Follow-up H	eadwa	ys																
Base Critical Headway (sec)	T	5.3									6.5	6.9		7.5	6.5			
Critical Headway (sec)		5.38									6.52	6.92		7.60	6.60			
Base Follow-Up Headway (sec)		3.1									4.0	3.3		3.5	4.0			
Follow-Up Headway (sec)		3.14									4.01	3.31		3.55	4.05			
Delay, Queue Length, an	d Leve	l of Se	ervice															
Flow Rate, v (veh/h)	Т	774										296		188				
Capacity, c (veh/h)		1146										19		13				
v/c Ratio		0.67										15.26		14.20				
95% Queue Length, Q ₉₅ (veh)		6.0										141.6		90.5				
Control Delay (s/veh)		14.6	2.3									26052. 6		24320. 7				
Level of Service (LOS)		В	А									F		F				
Approach Delay (s/veh)		1(0.2							260	52.6		24320.7					
Approach LOS		В									F		F					

HCS Two-Way Stop-Control Report **General Information** Site Information Analyst Emma Myers-Verhage EB Highway 1416 and S Ellsworth Rd Intersection Agency/Co. Box Elder, SD Jurisdiction Date Performed 7/28/2023 East/West Street EB Highway 1416 S Ellsworth Rd Analysis Year 2030 North/South Street Time Analyzed PM Peak Peak Hour Factor 0.84 Analysis Time Period (hrs) Intersection Orientation East-West 1.00 **Project Description** Radar Hill 1416 Corridor Study



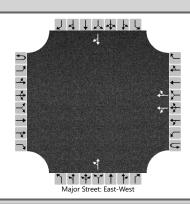
Vehicle Volumes and Adju	ıstme	nts															
Approach		Eastb	ound			Westl	oound			North	bound		Southbound				
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12	
Number of Lanes	0	0	2	0	0	0	0	0		0	1	0		0	1	0	
Configuration		LT		TR								TR		LT			
Volume (veh/h)		306	150	152							87	22		22	100		
Percent Heavy Vehicles (%)		4									1	1		5	5		
Proportion Time Blocked																	
Percent Grade (%)										(0		0				
Right Turn Channelized	i																
Median Type Storage				Undi	vided												
Critical and Follow-up He	adwa	ys															
Base Critical Headway (sec)		5.3									6.5	6.9		7.5	6.5		
Critical Headway (sec)		5.38									6.52	6.92		7.60	6.60		
Base Follow-Up Headway (sec)		3.1									4.0	3.3		3.5	4.0		
Follow-Up Headway (sec)		3.14									4.01	3.31		3.55	4.05		
Delay, Queue Length, and	Leve	of Se	ervice														
Flow Rate, v (veh/h)		364										130		145			
Capacity, c (veh/h)		1146										189		109			
v/c Ratio		0.32										0.69		1.33			
95% Queue Length, Q ₉₅ (veh)		1.4										5.6		26.4			
Control Delay (s/veh)		9.6	0.7									63.5		747.2			
Level of Service (LOS)		Α	А									F		F			
Approach Delay (s/veh)	5.0								63.5				747.2				
Approach LOS	А									F		F					

HCS Two-Way Stop-Control Report											
General Information		Site Information									
Analyst	Emma Myers-Verhage	Intersection	WB Highway 1416 and Radar Hill Rd								
Agency/Co.		Jurisdiction	Box Elder, SD								
Date Performed	7/28/2023	East/West Street	WB Highway 1416								
Analysis Year	2030	North/South Street	Radar Hill Rd								
Time Analyzed	AM Peak	Peak Hour Factor	0.88								
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00								
Project Description	Radar Hill 1416 Corridor Study										



					iviaj	or street. La	31-AAC31										
Vehicle Volumes and Ad	justme	nts															
Approach		Eastl	oound			Westl	oound			North	bound		Southbound				
Movement	U	L	Т	R	U	L	Т	R	U	L	T	R	U	L	Т	R	
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12	
Number of Lanes	0	0	0	0	0	0	2	0		0	1	0		0	1	0	
Configuration						LT		TR		LT						TR	
Volume (veh/h)						107	454	7		179	28				37	17	
Percent Heavy Vehicles (%)						5				4	4				3	3	
Proportion Time Blocked																	
Percent Grade (%)										()		0				
Right Turn Channelized																	
Median Type Storage				Undi	vided												
Critical and Follow-up H	eadwa	ys															
Base Critical Headway (sec)						5.3				7.5	6.5				6.5	6.9	
Critical Headway (sec)						5.40				7.58	6.58				6.56	6.96	
Base Follow-Up Headway (sec)						3.1				3.5	4.0				4.0	3.3	
Follow-Up Headway (sec)						3.15				3.54	4.04				4.03	3.33	
Delay, Queue Length, an	d Leve	l of S	ervice														
Flow Rate, v (veh/h)						122				235						61	
Capacity, c (veh/h)						1143				314						358	
v/c Ratio						0.11				0.75						0.17	
95% Queue Length, Q ₉₅ (veh)						0.4				7.5						0.6	
Control Delay (s/veh)						8.5	0.7			48.4						17.2	
Level of Service (LOS)						А	А			E						С	
Approach Delay (s/veh)		•	•		2.2				48.4					17.2			
Approach LOS						,	Α		E				(С			

HCS Two-Way Stop-Control Report **General Information** Site Information Analyst Emma Myers-Verhage WB Highway 1416 and Radar Hill Rd Intersection Agency/Co. Box Elder, SD Jurisdiction Date Performed 7/28/2023 East/West Street WB Highway 1416 2030 Radar Hill Rd **Analysis Year** North/South Street Time Analyzed PM Peak 0.94 Peak Hour Factor Analysis Time Period (hrs) Intersection Orientation East-West 1.00 **Project Description** Radar Hill 1416 Corridor Study



Approach		Eastb	ound		Í	Westl	oound			North	bound		Southbound			
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	0	0	0	0	2	0		0	1	0		0	1	0
Configuration						LT		TR		LT						TR
Volume (veh/h)						209	605	4		118	34				18	11
Percent Heavy Vehicles (%)						5				4	4				3	3
Proportion Time Blocked																
Percent Grade (%)										()		0			
Right Turn Channelized																
Median Type Storage				Undi	vided											
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)	T					5.3				7.5	6.5				6.5	6.9
Critical Headway (sec)						5.40				7.58	6.58				6.56	6.96
Base Follow-Up Headway (sec)						3.1				3.5	4.0				4.0	3.3
Follow-Up Headway (sec)						3.15				3.54	4.04				4.03	3.33
Delay, Queue Length, an	d Leve	l of S	ervice													
Flow Rate, v (veh/h)						222				162						31
Capacity, c (veh/h)						1143				184						227
v/c Ratio						0.19				0.88						0.14
95% Queue Length, Q ₉₅ (veh)						0.7				11.0						0.5
Control Delay (s/veh)						8.9	1.3			123.8						23.4
Level of Service (LOS)						А	А			F						С
Approach Delay (s/veh)						3	.2		123.8				23.4			
Approach LOS		A A					F				С					

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. **Date Performed** 7/28/2023 2030 Analysis Year Analysis Time Period (hrs) 1.00 Time Analyzed AM Peak Radar Hill 1416 Corridor Study **Project Description** EB Highway 1416 and Radar Hill Rd Intersection Jurisdiction Box Elder, SD East/West Street EB Highway 1416 Radar Hill Rd North/South Street Peak Hour Factor 0.88 Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 5 314 Volume (veh/h) 702 64 197 12 111 % Thrus in Shared Lane 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L3 L1 L2 L3 L2 L3 L1 L2 L3 11 12 11 Lane LT Configuration TR TR LT Flow Rate, v (veh/h) 405 472 581 140 Percent Heavy Vehicles 4 4 4 3 3.20 3.20 3.20 3.20 Initial Departure Headway, hd (s) Initial Degree of Utilization, x 0.360 0.419 0.516 0.124 Final Departure Headway, hd (s) 6.73 6.61 5.79 7.02 Final Degree of Utilization, x 0.756 0.866 0.934 0.273 2.3 2.0 23 20 Move-Up Time, m (s) Service Time, ts (s) 4.43 4.31 3.79 5.02 Capacity, Delay and Level of Service Eastbound Northbound Southbound Approach Westbound L1 L2 L3 L1 12 L3 L1 12 L3 L1 12 L3 Configuration LT TR TR LT 405 472 581 140 Flow Rate, v (veh/h) 535 544 622 513 Capacity (veh/h) 95% Queue Length, Q95 (veh) 8.3 14.0 20.9 1.1 Control Delay (s/veh) 29.4 46.4 64.3 12.7 Level of Service, LOS D Ε F В Approach Delay (s/veh) | LOS 38.6 Ε 64.3 F 12.7 В

Intersection Delay (s/veh) | LOS

45.7

Ε

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. **Date Performed** 7/28/2023 2030 Analysis Year Analysis Time Period (hrs) 1.00 Time Analyzed PM Peak Radar Hill 1416 Corridor Study **Project Description** EB Highway 1416 and Radar Hill Rd Intersection Jurisdiction Box Elder, SD East/West Street EB Highway 1416 Radar Hill Rd North/South Street Peak Hour Factor 0.94 Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 475 205 5 Volume (veh/h) 20 132 138 206 % Thrus in Shared Lane 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L3 L1 L2 L3 L2 L3 L1 L2 L3 11 12 11 Lane LT Configuration TR TR LT Flow Rate, v (veh/h) 274 471 287 224 Percent Heavy Vehicles 4 4 4 3 3.20 3.20 3.20 3.20 Initial Departure Headway, hd (s) Initial Degree of Utilization, x 0.243 0.418 0.255 0.200 Final Departure Headway, hd (s) 6.12 5.75 5.79 6.18 Final Degree of Utilization, x 0.466 0.752 0.462 0.385 2.3 2.3 2.0 20 Move-Up Time, m (s) Service Time, ts (s) 3.82 3.45 3.79 4.18 Capacity, Delay and Level of Service Southbound Eastbound Northbound Approach Westbound L1 L2 L3 L1 12 L3 L1 12 L3 L1 12 L3 Configuration LT TR TR LT 274 471 287 224 Flow Rate, v (veh/h) 588 626 622 582 Capacity (veh/h) 95% Queue Length, Q95 (veh) 2.6 8.2 2.5 1.9 Control Delay (s/veh) 14.1 25.3 13.7 13.0 Level of Service, LOS В D В В Approach Delay (s/veh) | LOS 21.2 C 13.7 В 13.0 В

Intersection Delay (s/veh) | LOS

18.0

C

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. **Date Performed** 7/28/2023 Analysis Year 2030 Analysis Time Period (hrs) 1.00 Time Analyzed AM Peak Radar Hill 1416 Corridor Study **Project Description** Intersection Radar Hill Rd and Long View Dr Jurisdiction Box Elder, SD Radar Hill Rd East/West Street North/South Street Long View Dr 0.90 Peak Hour Factor Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 2 4 Volume (veh/h) 7 2 6 18 10 26 4 41 116 % Thrus in Shared Lane Lane Flow Rate and Adjustments Southbound Approach Eastbound Westbound Northbound L3 L1 L2 L3 L3 L1 L2 L3 11 12 11 12 Lane L TR Configuration L TR L TR ı TR Flow Rate, v (veh/h) 89 10 7 31 2 33 4 174 Percent Heavy Vehicles 3 3 49 49 14 14 5 5 3.20 3.20 3.20 3.20 3.20 Initial Departure Headway, hd (s) 3 20 3.20 3 20 Initial Degree of Utilization, x 0.079 0.009 0.006 0.028 0.002 0.030 0.004 0.155 Final Departure Headway, hd (s) 5.59 4.93 6.43 5.68 5.76 5.16 5.50 4.48 Final Degree of Utilization, x 0.138 0.014 0.012 0.049 0.004 0.048 0.007 0.217 2.3 2.3 2.3 2.3 2.3 23 23 23 Move-Up Time, m (s) Service Time, ts (s) 3.29 2.63 4.13 3.38 3.46 2.86 3.20 2.18 Capacity, Delay and Level of Service Eastbound Northbound Southbound Approach Westbound L1 L2 L3 L1 L2 L3 L1 12 L3 L1 L2 L3 Configuration L TR L TR L TR TR 89 10 7 31 2 33 4 174 Flow Rate, v (veh/h) 803 644 730 560 634 625 697 655 Capacity (veh/h) 95% Queue Length, Q95 (veh) 0.5 0.0 0.0 0.2 0.0 0.2 0.0 0.8 Control Delay (s/veh) 9.2 7.7 9.2 8.7 8.5 8.1 8.2 8.4 Level of Service, LOS Α Α Α Α Α Α Α Α Approach Delay (s/veh) | LOS 9.0 Α 8.8 Α 8.1 Α 8.4 Α

Intersection Delay (s/veh) | LOS

8.6

Α

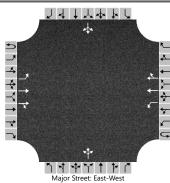
HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. **Date Performed** 7/28/2023 Analysis Year 2030 Analysis Time Period (hrs) 1.00 Time Analyzed PM Peak Radar Hill 1416 Corridor Study **Project Description** Intersection Radar Hill Rd and Long View Dr Jurisdiction Box Elder, SD Radar Hill Rd East/West Street North/South Street Long View Dr Peak Hour Factor Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 2 3 7 5 2 5 Volume (veh/h) 145 12 50 8 40 122 % Thrus in Shared Lane Lane Flow Rate and Adjustments Southbound Approach Eastbound Westbound Northbound L3 L1 L2 L3 L3 L1 L2 L3 11 12 11 12 Lane L TR Configuration L TR L TR ı TR Flow Rate, v (veh/h) 153 15 3 13 2 58 8 171 Percent Heavy Vehicles 3 3 49 49 14 14 5 5 3.20 3.20 3.20 3.20 3.20 Initial Departure Headway, hd (s) 3 20 3.20 3.20 Initial Degree of Utilization, x 0.136 0.013 0.003 0.011 0.002 0.051 0.007 0.152 Final Departure Headway, hd (s) 5.64 5.04 6.58 5.79 5.91 5.34 4.63 Final Degree of Utilization, x 0.239 0.021 0.006 0.020 0.003 0.086 0.013 0.219 2.3 2.3 2.3 2.3 2.3 23 23 23 Move-Up Time, m (s) Service Time, ts (s) 3.34 2.74 4.28 3.49 3.61 3.04 3.36 2.33 Capacity, Delay and Level of Service Eastbound Northbound Southbound Approach Westbound L1 L2 L3 L1 L2 L3 L1 12 L3 L1 L2 L3 Configuration L TR L TR L TR TR 153 15 3 13 2 58 8 171 Flow Rate, v (veh/h) 622 638 714 547 610 674 636 777 Capacity (veh/h) 95% Queue Length, Q95 (veh) 0.9 0.1 0.0 0.1 0.0 0.3 0.0 0.8 Control Delay (s/veh) 10.1 7.8 9.3 8.6 8.6 8.5 8.4 8.6 Level of Service, LOS В Α Α Α Α Α Α Α Approach Delay (s/veh) | LOS 9.9 Α 8.8 Α 8.5 Α 8.6 Α

Intersection Delay (s/veh) | LOS

9.1

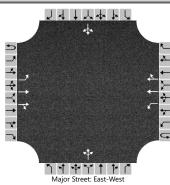
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HCS Two-Way Stop-Control Report									
General Information		Site Information							
Analyst	Emma Myers-Verhage	Intersection	Radar Hill Rd and Highway 44						
Agency/Co.		Jurisdiction	Box Elder, SD						
Date Performed	7/28/2023	East/West Street	Highway 44						
Analysis Year	2030	North/South Street	Radar Hill Rd						
Time Analyzed	AM Peak	Peak Hour Factor	0.86						
Intersection Orientation	East-West Analysis Time Period (hrs) 1.00								
Project Description	roject Description Radar Hill 1416 Corridor Study								



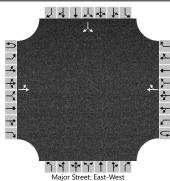
Major Street: East-West																
Vehicle Volumes and Ad	justme	nts														
Approach		Eastb	ound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	Т	TR		L	Т	TR			LTR				LTR	
Volume (veh/h)	0	16	232	6	0	3	221	19		5	2	2		21	3	11
Percent Heavy Vehicles (%)	5	5			3	3				6	6	6		10	10	10
Proportion Time Blocked																
Percent Grade (%)										()		0			
Right Turn Channelized																
Median Type Storage		Undivided														
Critical and Follow-up H	eadwa	ys														
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				4.16				7.62	6.62	7.02		7.70	6.70	7.10
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				2.23				3.56	4.06	3.36		3.60	4.10	3.40
Delay, Queue Length, an	d Leve	l of S	ervice													
Flow Rate, v (veh/h)	T	19				3					10				41	
Capacity, c (veh/h)		1259				1276					494				531	
v/c Ratio		0.01				0.00					0.02				0.08	
95% Queue Length, Q ₉₅ (veh)		0.0				0.0					0.1				0.2	
Control Delay (s/veh)		7.9				7.8					12.5				12.3	
Level of Service (LOS)		A				A			В						В	
Approach Delay (s/veh)		0	.5			0	.1		12.5				12.3			
Approach LOS		A A						В				В				

HCS Two-Way Stop-Control Report									
General Information		Site Information							
Analyst	Emma Myers-Verhage	Intersection	Radar Hill Rd and Highway 44						
Agency/Co.		Jurisdiction	Box Elder, SD						
Date Performed	7/28/2023	East/West Street	Highway 44						
Analysis Year	2030	North/South Street	Radar Hill Rd						
Time Analyzed	PM Peak	Peak Hour Factor	0.85						
Intersection Orientation	East-West Analysis Time Period (hrs) 1.00								
Project Description	Radar Hill 1416 Corridor Study								



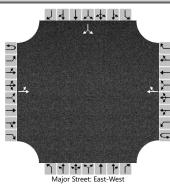
Major Street: East-West																
Vehicle Volumes and Adj	ustme	nts														
Approach	T	Eastb	ound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		0	1	0		0	1	0
Configuration		L	Т	TR		L	Т	TR			LTR				LTR	
Volume (veh/h)	0	42	141	13	0	2	236	26		7	2	2		25	8	26
Percent Heavy Vehicles (%)	5	5			3	3				6	6	6		10	10	10
Proportion Time Blocked																
Percent Grade (%)										()		0			
Right Turn Channelized																
Median Type Storage		Undivided														
Critical and Follow-up Ho	eadwa	ys														
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				4.16				7.62	6.62	7.02		7.70	6.70	7.10
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				2.23				3.56	4.06	3.36		3.60	4.10	3.40
Delay, Queue Length, and	d Leve	l of S	ervice													
Flow Rate, v (veh/h)		49				2					13				69	
Capacity, c (veh/h)		1228				1384					481				534	
v/c Ratio		0.04				0.00					0.03				0.13	
95% Queue Length, Q ₉₅ (veh)		0.1				0.0					0.1				0.4	
Control Delay (s/veh)		8.1				7.6					12.7				12.8	
Level of Service (LOS)		A				A			В						В	
Approach Delay (s/veh)		1.7 0.1 12.7 12.8														
Approach LOS		A A B							I	3						

HCS Two-Way Stop-Control Report									
General Information		Site Information							
Analyst	Emma Myers-Verhage	Intersection	Highway 1416 and 151st Ave						
Agency/Co.		Jurisdiction	Box Elder, SD						
Date Performed	7/30/2023	East/West Street	Highway 1416						
Analysis Year	2050	North/South Street	151st Ave						
Time Analyzed	AM Peak	Peak Hour Factor	0.76						
Intersection Orientation	East-West Analysis Time Period (hrs) 1.00								
Project Description	Radar Hill 1416 Corridor Study								



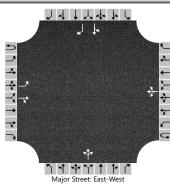
Major Street: East-West																
Vehicle Volumes and Adj	ustme	nts														
Approach	T	Eastb	ound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		180	44				108	20						11		151
Percent Heavy Vehicles (%)		9												16		16
Proportion Time Blocked																
Percent Grade (%)														(0	
Right Turn Channelized																
Median Type Storage				Undi	vided											
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.19												6.56		6.36
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.28												3.64		3.44
Delay, Queue Length, an	d Leve	l of S	ervice													
Flow Rate, v (veh/h)		237													213	
Capacity, c (veh/h)		1368													769	
v/c Ratio		0.17													0.28	
95% Queue Length, Q ₉₅ (veh)		0.6													1.1	
Control Delay (s/veh)		8.2	1.5												11.5	
Level of Service (LOS)		A A													В	
Approach Delay (s/veh)		6.9											11.5			
Approach LOS		А											В			

HCS Two-Way Stop-Control Report									
General Information		Site Information							
Analyst	Emma Myers-Verhage	Intersection	Highway 1416 and 151st Ave						
Agency/Co.		Jurisdiction	Box Elder, SD						
Date Performed	7/30/2023	East/West Street	Highway 1416						
Analysis Year	2050	North/South Street	151st Ave						
Time Analyzed	PM Peak	Peak Hour Factor	0.83						
Intersection Orientation	East-West	1.00							
Project Description	Radar Hill 1416 Corridor Study								



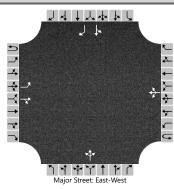
Major Street: East-West																
Vehicle Volumes and Adj	ustme	nts														
Approach	Τ	Eastb	ound			Westl	bound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		97	95				57	5						6		67
Percent Heavy Vehicles (%)		9												16		16
Proportion Time Blocked																
Percent Grade (%)														(0	
Right Turn Channelized																
Median Type Storage		Undivided														
Critical and Follow-up Ho	eadwa	ys														
Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.19												6.56		6.36
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.28												3.64		3.44
Delay, Queue Length, and	d Leve	l of S	ervice													
Flow Rate, v (veh/h)		117													88	
Capacity, c (veh/h)		1481													891	
v/c Ratio		0.08													0.10	
95% Queue Length, Q ₉₅ (veh)		0.3													0.3	
Control Delay (s/veh)		7.6	0.6												9.5	
Level of Service (LOS)		A A													А	
Approach Delay (s/veh)		4	.2									9.5				
Approach LOS		А											A			

HCS Two-Way Stop-Control Report									
General Information		Site Information							
Analyst	Emma Myers-Verhage	Intersection	Highway 1416 and Liberty Blvd						
Agency/Co.		Jurisdiction	Box Elder, SD						
Date Performed	7/30/2023	East/West Street	Highway 1416						
Analysis Year	2050	North/South Street	Liberty Blvd						
Time Analyzed	AM Peak	Peak Hour Factor	0.84						
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00						
Project Description	Radar Hill 1416 Corridor Study								



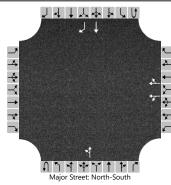
				iviaji	or street, Ea	st-west									
Vehicle Volumes and Adjustments															
	Eastb	ound			Westl	oound		Northbound				Southbound			
U	L	Т	R	U	L	Т	R	U	L	T	R	U	L	Т	R
1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
0	1	1	0	0	0	1	0		0	1	0		0	1	1
	L		TR			LTR				LTR			LT		R
	333	151	3		7	91	178		4	52	10		61	19	142
	8				7				2	2	2		9	9	9
									()		0			
								Yes							
			Undi	vided											
adwa	adways														
	4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
	4.18				4.17				7.12	6.52	6.22		7.19	6.59	6.29
	2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
	2.27				2.26				3.52	4.02	3.32		3.58	4.08	3.38
l Leve	l of Se	ervice													
П	396				8					79			95		169
	1207				1362					116			58		808
	0.33				0.01					0.67			1.65		0.21
	1.5				0.0					4.9			24.6		0.8
	9.4				7.7	0.1	0.1			94.3			1387.3		10.6
	A				A A A			F					F		В
6.5 0.3				.3		94.3				506.7					
А			A			F				F					
	0 1U 0	Easth U L 1U 1 0 1 L 333 8 8 4.1 4.18 2.2 2.27 Level of Se 396 1207 0.33 1.5 9.4 A	Eastbound U L T 1U 1 2 0 1 1 L 333 151 8 8 A1 4.1 4.18 2.2 2.27 2.27 396 1207 0.33 1.5 9.4 A 6.5	Eastbound U L T R 1U 1 2 3 0 1 1 0 L TR 333 151 3 8	Eastbound	Eastbound Westle U	Eastbound U L T R U L T 1U 1 2 3 4U 4 5 0 1 1 0 0 0 1 L TR LTR 333 151 3 7 91 8 7 91 8 7 91 Undivided Padways 4.1 4.18 4.17 2.2 2.2 2.26 396 8 8 1207 1362 0.33 0.01 1.5 0.0 9.4 7.7 0.1 A A A A	Eastbound Westbound U	Eastbound Westbound	Eastbound Westbound North	Eastbound Westbound Northbound	Eastbound Westbound Northbound	Eastbound Westbound Northbound U	Eastbound Westbound Northbound South	Southwest Sout

HCS Two-Way Stop-Control Report									
General Information		Site Information							
Analyst	Emma Myers-Verhage	Intersection	Highway 1416 and Liberty Blvd						
Agency/Co.		Jurisdiction	Box Elder, SD						
Date Performed	7/30/2023	East/West Street	Highway 1416						
Analysis Year	2050	North/South Street	Liberty Blvd						
Time Analyzed	PM Peak	Peak Hour Factor	0.84						
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00						
Project Description	Radar Hill 1416 Corridor Study								



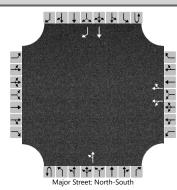
					iviaj	or Street. La	st west									
Vehicle Volumes and Adj	ustme	nts														
Approach		Eastb	ound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	1	0		0	1	1
Configuration		L		TR			LTR				LTR			LT		R
Volume (veh/h)		99	86	13		7	66	69		8	16	2		131	27	110
Percent Heavy Vehicles (%)		8				7				2	2	2		9	9	9
Proportion Time Blocked																
Percent Grade (%)										()			()	
Right Turn Channelized														Ye	es	
Median Type Storage		Undivided														
Critical and Follow-up He	adways															
Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.18				4.17				7.12	6.52	6.22		7.19	6.59	6.29
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)		2.27				2.26				3.52	4.02	3.32		3.58	4.08	3.38
Delay, Queue Length, an	d Leve	l of S	ervice													
Flow Rate, v (veh/h)		118				8					31			188		131
Capacity, c (veh/h)		1383				1440					395			415		913
v/c Ratio		0.09				0.01					0.08			0.45		0.14
95% Queue Length, Q ₉₅ (veh)		0.3				0.0					0.3			2.4		0.5
Control Delay (s/veh)		7.8				7.5	0.0	0.0			14.9			20.8		9.6
Level of Service (LOS)		А			Ì	А	А	А			В			С		Α
Approach Delay (s/veh)		3.9				0	.4			14	1.9			16	5.2	
Approach LOS		Α				,	Α			ı	В			(2	

	HCS Two-Way Stop	-Control Report	
General Information		Site Information	
Analyst	Emma Myers-Verhage	Intersection	WB Highway 1416 and S Ellsworth Rd
Agency/Co.		Jurisdiction	Box Elder, SD
Date Performed	7/30/2023	East/West Street	WB Highway 1416
Analysis Year	2050	North/South Street	S Ellsworth Rd
Time Analyzed	AM Peak	Peak Hour Factor	0.84
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	Radar Hill 1416 Corridor Study		



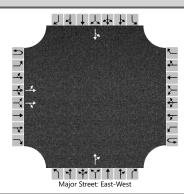
	Misjor Street, North-South															
Vehicle Volumes and Ad	justme	nts														
Approach		Eastk	ound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	2	0	0	0	1	0	0	0	1	1
Configuration						LT		TR		LT					Т	R
Volume (veh/h)						30	182	47		102	868				132	248
Percent Heavy Vehicles (%)						10	10	10		1						
Proportion Time Blocked																
Percent Grade (%)						()									
Right Turn Channelized														Υ	'es	
Median Type Storage				Undi	vided											
Critical and Follow-up H	eadwa	adways														
Base Critical Headway (sec)						7.1	6.5	6.2		4.1						
Critical Headway (sec)						7.20	6.60	6.30		4.11						
Base Follow-Up Headway (sec)						3.5	4.0	3.3		2.2						
Follow-Up Headway (sec)						3.59	4.09	3.39		2.21						
Delay, Queue Length, an	d Leve	l of S	ervice													
Flow Rate, v (veh/h)	T					144		164		121						
Capacity, c (veh/h)						97		130		1429						
v/c Ratio						1.48		1.27		0.08						
95% Queue Length, Q ₉₅ (veh)						30.5		26.6		0.3						
Control Delay (s/veh)						1010.7		620.4		7.8	1.6					
Level of Service (LOS)						F		F		А	А					
Approach Delay (s/veh)						80	2.8			2	.3					
Approach LOS							F			,	Ą					

HCS Two-Way Stop-Control Report **General Information** Site Information Analyst Emma Myers-Verhage WB Highway 1416 and S Ellsworth Rd Intersection Agency/Co. Box Elder, SD Jurisdiction Date Performed 7/30/2023 East/West Street WB Highway 1416 2050 S Ellsworth Rd Analysis Year North/South Street Time Analyzed PM Peak 0.90 Peak Hour Factor Analysis Time Period (hrs) Intersection Orientation North-South 1.00 **Project Description** Radar Hill 1416 Corridor Study



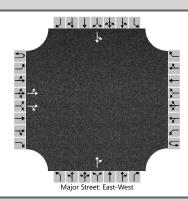
	Eastbound				Westl	oound			North	bound		l .	South	bound	
U	I	Т	R	U	1	Т	R	U	1	Т	R	U		Т	R
					7							_	4		6
-			_												1
╄	U	U	0		-		-	0	-		0	0	0	<u> </u>	
 						450				442					R
 										413				104	327
-					10	10	10		1						
<u> </u>															
						0									
													Y	es	
<u> </u>	Undivided														
eadwa	ys														
					7.1	6.5	6.2		4.1						
1					7.20	6.60	6.30		4.11						
1					3.5	4.0	3.3		2.2						
1					3.59	4.09	3.39		2.21						
d Leve	l of Se	ervice)												
1					119		108		48						
1					350		387		1480						
					0.34		0.28		0.03						
					1.5		1.1		0.1						
1					20.6		17.9		7.5	0.3					
					С		С		А	Α					
	eadwa	eadways	10 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	10 11 12 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1	10 11 12 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1	10 11 12 7 7 1 1 1 1 1 1 1 1	10	10	10	10	10	10	10	10	10

HCS Two-Way Stop-Control Report **General Information** Site Information Analyst EB Highway 1416 and S Ellsworth Rd Emma Myers-Verhage Intersection Agency/Co. Box Elder, SD Jurisdiction Date Performed 7/30/2023 East/West Street EB Highway 1416 Analysis Year 2050 North/South Street S Ellsworth Rd Time Analyzed AM Peak Peak Hour Factor 0.84 Analysis Time Period (hrs) Intersection Orientation East-West 1.00 **Project Description** Radar Hill 1416 Corridor Study



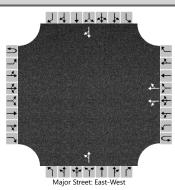
<u> </u>																
Vehicle Volumes and Adju	ıstme	nts														
Approach		Eastb	ound			Westl	bound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	0	0		0	1	0		0	1	0
Configuration		LT		TR								TR		LT		
Volume (veh/h)		748	356	19							209	60		63	98	
Percent Heavy Vehicles (%)		4									1	1		5	5	
Proportion Time Blocked																
Percent Grade (%)										()			()	
Right Turn Channelized																
Median Type Storage		Und														
Critical and Follow-up He																
Base Critical Headway (sec)		5.3									6.5	6.9		7.5	6.5	
Critical Headway (sec)		5.38									6.52	6.92		7.60	6.60	
Base Follow-Up Headway (sec)		3.1									4.0	3.3		3.5	4.0	
Follow-Up Headway (sec)		3.14									4.01	3.31		3.55	4.05	
Delay, Queue Length, and	l Leve	l of Se	ervice													
Flow Rate, v (veh/h)	1	890										320		192		
Capacity, c (veh/h)		1146										6		4		
v/c Ratio		0.78										51.91		50.64		
95% Queue Length, Q ₉₅ (veh)	Ì	9.7										160.0		96.9		
Control Delay (s/veh)		18.8	3.2									92815. 6		91259. 1		
Level of Service (LOS)	1	С	А									F		F		
Approach Delay (s/veh)	13.5								928	15.6			912	59.1		
Approach LOS		B									F				F	

HCS Two-Way Stop-Control Report **General Information** Site Information Analyst Emma Myers-Verhage EB Highway 1416 and S Ellsworth Rd Intersection Agency/Co. Box Elder, SD Jurisdiction Date Performed 7/30/2023 East/West Street EB Highway 1416 2050 S Ellsworth Rd Analysis Year North/South Street Time Analyzed PM Peak 0.90 Peak Hour Factor Analysis Time Period (hrs) Intersection Orientation East-West 1.00 **Project Description** Radar Hill 1416 Corridor Study



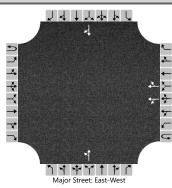
Vehicle Volumes and Adju	ıstme	nts														
Approach		Eastb	ound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	0	0		0	1	0		0	1	0
Configuration		LT		TR								TR		LT		
Volume (veh/h)		352	165	178							96	23		23	109	
Percent Heavy Vehicles (%)		4									1	1		5	5	
Proportion Time Blocked																
Percent Grade (%)	1									()			(0	
Right Turn Channelized																
Median Type Storage		Undivided														
Critical and Follow-up He	adwa	lways														
Base Critical Headway (sec)		5.3									6.5	6.9		7.5	6.5	
Critical Headway (sec)		5.38									6.52	6.92		7.60	6.60	
Base Follow-Up Headway (sec)		3.1									4.0	3.3		3.5	4.0	
Follow-Up Headway (sec)		3.14									4.01	3.31		3.55	4.05	
Delay, Queue Length, and	l Leve	l of Se	ervice													
Flow Rate, v (veh/h)	1	391										132		147		
Capacity, c (veh/h)		1146										164		83		
v/c Ratio		0.34										0.81		1.76		
95% Queue Length, Q ₉₅ (veh)		1.5										8.2		37.6		
Control Delay (s/veh)	1	9.8	0.7									102.1		1513.9		
Level of Service (LOS)	1	А	Α									F		F		
Approach Delay (s/veh)	1	5.1								10	2.1			151	13.9	
Approach LOS	1	A A									F			ı	F	

	HCS Two-Way Stop	-Control Report	
General Information		Site Information	
Analyst	Emma Myers-Verhage	Intersection	WB Highway 1416 and Radar Hill Rd
Agency/Co.		Jurisdiction	Box Elder, SD
Date Performed	7/30/2023	East/West Street	WB Highway 1416
Analysis Year	2050	North/South Street	Radar Hill Rd
Time Analyzed	AM Peak	Peak Hour Factor	0.88
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00
Project Description	Radar Hill 1416 Corridor Study		



Vehicle Volumes and Ad	justme	nts														
Approach		Eastk	oound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	T	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	0	0	0	0	2	0		0	1	0		0	1	0
Configuration						LT		TR		LT						TR
Volume (veh/h)						120	512	8		202	28				40	19
Percent Heavy Vehicles (%)						5				4	4				3	3
Proportion Time Blocked																
Percent Grade (%)										()				0	
Right Turn Channelized																
Median Type Storage		Undivided														
Critical and Follow-up H	eadwa	adways														
Base Critical Headway (sec)	T					5.3				7.5	6.5				6.5	6.9
Critical Headway (sec)						5.40				7.58	6.58				6.56	6.96
Base Follow-Up Headway (sec)						3.1				3.5	4.0				4.0	3.3
Follow-Up Headway (sec)						3.15				3.54	4.04				4.03	3.33
Delay, Queue Length, an	d Leve	l of S	ervice													
Flow Rate, v (veh/h)	T					136				261						67
Capacity, c (veh/h)						1143				266						314
v/c Ratio						0.12				0.98						0.21
95% Queue Length, Q ₉₅ (veh)						0.4				18.6						0.8
Control Delay (s/veh)						8.6	0.8			158.0						19.6
Level of Service (LOS)						А	А			F						С
Approach Delay (s/veh)						2	.3			15	8.0			19	9.6	
Approach LOS						,	Α				=				С	

	HCS Two-Way Stop	-Control Report	
General Information		Site Information	
Analyst	Emma Myers-Verhage	Intersection	WB Highway 1416 and Radar Hill Rd
Agency/Co.		Jurisdiction	Box Elder, SD
Date Performed	7/30/2023	East/West Street	WB Highway 1416
Analysis Year	2050	North/South Street	Radar Hill Rd
Time Analyzed	PM Peak	Peak Hour Factor	0.94
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00
Project Description	Radar Hill 1416 Corridor Study		



	Major Street: East-West															
Vehicle Volumes and Ad	justme	nts														
Approach	T	Eastk	ound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	0	0	0	0	2	0		0	1	0		0	1	0
Configuration						LT		TR		LT						TR
Volume (veh/h)						237	697	4		134	38				20	12
Percent Heavy Vehicles (%)						5				4	4				3	3
Proportion Time Blocked																
Percent Grade (%)										(0				0	
Right Turn Channelized																
Median Type Storage		Undivided														
Critical and Follow-up H	eadwa	adways														
Base Critical Headway (sec)	T					5.3				7.5	6.5				6.5	6.9
Critical Headway (sec)						5.40				7.58	6.58				6.56	6.96
Base Follow-Up Headway (sec)						3.1				3.5	4.0				4.0	3.3
Follow-Up Headway (sec)						3.15				3.54	4.04				4.03	3.33
Delay, Queue Length, an	d Leve	l of S	ervice													
Flow Rate, v (veh/h)	Т					252				183						34
Capacity, c (veh/h)						1143				138						176
v/c Ratio						0.22				1.32						0.19
95% Queue Length, Q ₉₅ (veh)						0.8				31.1						0.7
Control Delay (s/veh)						9.0	1.5			703.8						30.4
Level of Service (LOS)						А	А			F						D
Approach Delay (s/veh)						3	.4			70	3.8			3(0.4	
Approach LOS						,	4				F				D	

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. **Date Performed** 7/30/2023 2050 Analysis Year Analysis Time Period (hrs) 1.00 Time Analyzed AM Peak Radar Hill 1416 Corridor Study **Project Description** EB Highway 1416 and Radar Hill Rd Intersection Jurisdiction Box Elder, SD East/West Street EB Highway 1416 Radar Hill Rd North/South Street Peak Hour Factor 0.86 Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 5 794 73 356 Volume (veh/h) 220 13 123 % Thrus in Shared Lane 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L3 L1 L2 L3 L2 L3 L1 L2 L3 11 12 11 Lane LT Configuration TR TR LT Flow Rate, v (veh/h) 467 547 670 158 Percent Heavy Vehicles 3 3 4 3 3.20 3.20 3.20 3.20 Initial Departure Headway, hd (s) Initial Degree of Utilization, x 0.416 0.486 0.595 0.141 Final Departure Headway, hd (s) 6.81 6.69 5.83 7.04 Final Degree of Utilization, x 0.884 1.016 1.084 0.309 2.3 2.3 2.0 20 Move-Up Time, m (s) Service Time, ts (s) 4.51 4.39 3.83 5.04 Capacity, Delay and Level of Service Eastbound Northbound Southbound Approach Westbound L1 L2 L3 L1 12 L3 L1 12 L3 L1 12 L3 Configuration LT TR TR LT 467 547 670 158 Flow Rate, v (veh/h) 529 538 618 511 Capacity (veh/h) 95% Queue Length, Q95 (veh) 15.2 30.8 47.3 1.3 Control Delay (s/veh) 52.4 135.1 215.6 13.2 Level of Service, LOS F F F В Approach Delay (s/veh) | LOS 97.0 F 215.6 F 13.2 В

Intersection Delay (s/veh) | LOS

132.9

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. **Date Performed** 7/30/2023 2050 Analysis Year Analysis Time Period (hrs) 1.00 Time Analyzed PM Peak Radar Hill 1416 Corridor Study **Project Description** EB Highway 1416 and Radar Hill Rd Intersection Jurisdiction Box Elder, SD East/West Street EB Highway 1416 Radar Hill Rd North/South Street Peak Hour Factor 0.85 Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 23 239 148 158 5 Volume (veh/h) 545 232 % Thrus in Shared Lane 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L3 L1 L2 L3 L2 L3 L1 L2 L3 11 12 11 Lane LT TR Configuration TR LT Flow Rate, v (veh/h) 348 602 360 279 Percent Heavy Vehicles 3 3 4 3 3.20 3.20 3.20 3.20 Initial Departure Headway, hd (s) Initial Degree of Utilization, x 0.309 0.535 0.320 0.248 Final Departure Headway, hd (s) 6.58 6.21 6.14 6.57 Final Degree of Utilization, x 0.636 1.038 0.614 0.509 2.3 2.3 2.0 20 Move-Up Time, m (s) Service Time, ts (s) 4.28 3.91 4.14 4.57 Capacity, Delay and Level of Service Southbound Eastbound Northbound Approach Westbound L1 L2 L3 L1 12 L3 L1 12 L3 L1 L2 L3 Configuration LT TR TR LT 348 602 360 279 Flow Rate, v (veh/h) 547 579 586 548 Capacity (veh/h) 95% Queue Length, Q95 (veh) 5.0 36.1 4.6 3.0 Control Delay (s/veh) 20.6 156.7 18.8 16.3 Level of Service, LOS C F C C Approach Delay (s/veh) | LOS 106.9 F 18.8 C 16.3 C

Intersection Delay (s/veh) | LOS

71.0

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. **Date Performed** 7/30/2023 Analysis Year 2050 Analysis Time Period (hrs) 1.00 Time Analyzed AM Peak Radar Hill 1416 Corridor Study **Project Description** Intersection Radar Hill Rd and Long View Dr Jurisdiction Box Elder, SD East/West Street Long View Dr Radar Hill Rd North/South Street 0.90 Peak Hour Factor Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 2 7 2 4 Volume (veh/h) 114 10 25 12 32 4 50 166 % Thrus in Shared Lane Lane Flow Rate and Adjustments Southbound Approach Eastbound Westbound Northbound L3 L2 L3 L3 L1 L2 L3 11 12 11 11 12 Lane L TR TR Configuration L TR L TR ı Flow Rate, v (veh/h) 127 13 8 41 2 40 4 240 Percent Heavy Vehicles 3 3 49 49 14 14 5 5 3.20 3.20 3.20 3.20 3.20 Initial Departure Headway, hd (s) 3 20 3.20 3.20 Initial Degree of Utilization, x 0.113 0.012 0.007 0.037 0.002 0.036 0.004 0.213 Final Departure Headway, hd (s) 5.79 5.17 6.67 5.94 5.99 5.41 4.63 Final Degree of Utilization, x 0.204 0.019 0.014 0.068 0.004 0.060 0.007 0.309 2.3 2.3 2.3 2.3 2.3 23 23 23 Move-Up Time, m (s) Service Time, ts (s) 3.49 2.87 4.37 3.64 3.69 3.11 3.37 2.33 Capacity, Delay and Level of Service Eastbound Northbound Southbound Approach Westbound L1 L2 L3 L1 L2 L3 L1 12 L3 L1 L2 L3 Configuration L TR L TR L TR TR 127 13 8 41 2 40 4 240 Flow Rate, v (veh/h) 622 696 540 606 601 665 635 778 Capacity (veh/h) 95% Queue Length, Q95 (veh) 8.0 0.1 0.0 0.2 0.0 0.2 0.0 1.3 Control Delay (s/veh) 10.0 8.0 9.5 9.1 8.7 8.5 8.4 9.4 Level of Service, LOS Α Α Α Α Α Α Α Α Approach Delay (s/veh) | LOS 9.8 Α 9.1 Α 8.5 Α 9.4 Α

Intersection Delay (s/veh) | LOS

9.4

Α

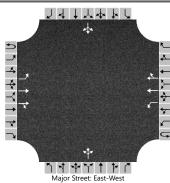
HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. **Date Performed** 7/30/2023 Analysis Year 2050 Analysis Time Period (hrs) 1.00 Time Analyzed PM Peak Radar Hill 1416 Corridor Study **Project Description** Intersection Radar Hill Rd and Long View Dr Jurisdiction Box Elder, SD East/West Street Long View Dr Radar Hill Rd North/South Street 0.85 Peak Hour Factor Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 2 Volume (veh/h) 169 16 283 31 8 2 2 30 9 31 % Thrus in Shared Lane Lane Flow Rate and Adjustments Southbound Approach Eastbound Westbound Northbound L3 L1 L2 L3 L3 L1 L2 L3 11 12 11 12 Lane TR L Configuration TR L TR L TR L Flow Rate, v (veh/h) 59 218 2 369 9 5 35 47 Percent Heavy Vehicles 3 3 49 49 14 14 5 5 3.20 3.20 3.20 3.20 3.20 Initial Departure Headway, hd (s) 3 20 3.20 3 20 0.052 Initial Degree of Utilization, x 0.193 0.002 0.328 0.008 0.004 0.031 0.042 Final Departure Headway, hd (s) 5.70 5.14 6.38 5.81 7.01 6.16 6.74 5.70 Final Degree of Utilization, x 0.093 0.311 0.004 0.596 0.018 0.008 0.066 0.074 2.3 2.3 2.3 2.3 2.3 2.3 23 23 Move-Up Time, m (s) Service Time, ts (s) 3.40 2.84 4.08 3.51 4.71 3.86 4.44 3.40 Capacity, Delay and Level of Service Eastbound Northbound Southbound Approach Westbound L1 L2 L3 L1 L2 L3 L1 12 L3 L1 L2 L3 Configuration L TR L TR L TR TR 59 218 2 369 9 5 35 47 Flow Rate, v (veh/h) 584 632 701 565 620 513 534 632 Capacity (veh/h) 95% Queue Length, Q95 (veh) 0.3 1.3 0.0 4.3 0.1 0.0 0.2 0.2 Control Delay (s/veh) 9.0 10.1 9.1 17.0 9.8 8.9 9.9 8.9 Level of Service, LOS Α В Α C Α Α Α Α 9.3 Approach Delay (s/veh) | LOS 9.9 Α 16.9 C 9.5 Α Α

Intersection Delay (s/veh) | LOS

13.3

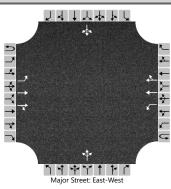
В

	HCS Two-Way Stop	-Control Report	
General Information		Site Information	
Analyst	Emma Myers-Verhage	Intersection	Radar Hill Rd and Highway 44
Agency/Co.		Jurisdiction	Box Elder, SD
Date Performed	7/30/2023	East/West Street	Highway 44
Analysis Year	2050	North/South Street	Radar Hill Rd
Time Analyzed	AM Peak	Peak Hour Factor	0.86
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00
Project Description	Radar Hill 1416 Corridor Study		



					Maj	or Street: Ea	st-West									
Vehicle Volumes and Ad	justme	nts														
Approach		Eastb	ound			Westl	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	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		0	1	0		0	1	0
Configuration		L	Т	TR		L	Т	TR			LTR				LTR	
Volume (veh/h)	0	20	278	7	0	3	265	22		6	2	2		25	3	13
Percent Heavy Vehicles (%)	5	5			3	3				6	6	6		10	10	10
Proportion Time Blocked																
Percent Grade (%)										()			(0	
Right Turn Channelized																
Median Type Storage		Undivided														
Critical and Follow-up H	eadwa	ys														
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				4.16				7.62	6.62	7.02		7.70	6.70	7.10
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				2.23				3.56	4.06	3.36		3.60	4.10	3.40
Delay, Queue Length, an	d Leve	l of S	ervice													
Flow Rate, v (veh/h)		23				3					12				48	
Capacity, c (veh/h)		1201				1218					422				465	
v/c Ratio		0.02				0.00					0.03				0.10	
95% Queue Length, Q ₉₅ (veh)		0.1				0.0					0.1				0.3	
Control Delay (s/veh)		8.1				8.0					13.8				13.6	
Level of Service (LOS)		А				А					В				В	
Approach Delay (s/veh)		0	.5			0	.1			13	3.8			13	3.6	
Approach LOS			Ą			,	Α				3				В	

	HCS Two-Way Stop-Control Report										
General Information		Site Information									
Analyst	Emma Myers-Verhage	Intersection	Radar Hill Rd and Highway 44								
Agency/Co.		Jurisdiction	Box Elder, SD								
Date Performed	7/30/2023	East/West Street	Highway 44								
Analysis Year	2050	North/South Street	Radar Hill Rd								
Time Analyzed	PM Peak	Peak Hour Factor	0.85								
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00								
Project Description Radar Hill 1416 Corridor Study											



					iviaj	or street. La	31-VVC31									
Vehicle Volumes and Adj	ustme	nts														
Approach	T	Eastb	ound			Westl	bound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	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		0	1	0		0	1	0
Configuration		L	Т	TR		L	Т	TR			LTR				LTR	
Volume (veh/h)	0	50	169	16	0	2	283	31		8	2	2		30	9	31
Percent Heavy Vehicles (%)	5	5			3	3				6	6	6		10	10	10
Proportion Time Blocked																
Percent Grade (%)									0 0)				
Right Turn Channelized																
Median Type Storage				Undi	vided											
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)	Τ	4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.20				4.16				7.62	6.62	7.02		7.70	6.70	7.10
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				2.23				3.56	4.06	3.36		3.60	4.10	3.40
Delay, Queue Length, an	d Leve	l of Se	ervice													
Flow Rate, v (veh/h)	Т	59				2					14				82	
Capacity, c (veh/h)		1164				1342					409				466	
v/c Ratio		0.05				0.00					0.03				0.18	
95% Queue Length, Q ₉₅ (veh)		0.2				0.0					0.1				0.6	
Control Delay (s/veh)		8.3				7.7					14.1				14.4	
Level of Service (LOS)		А		Ì		А	Ì				В				В	
Approach Delay (s/veh)	1.8				0.0			14.1			14.4					
Approach LOS		,	A			,	A		В В			3				

Appendix E: Signal Warrant Analysis Results

No-Build (2030)



City/County: Box Elder, SD Intersection: Hwy 1416 and Liberty Blvd

Ţ	3	Date:	8/25/2023	Approach	Speed	Lanes	RT %
Į te	5 1	Population < 10,000:	No	Major 1: EB Highway 1416	50	2	100%
1 >		Existing Signal:	No	Major 3: WB Highway 1416	50	2	100%
3	5	0.70 Factor Used:	Yes	Minor 2: NB Liberty Blvd	25	1	100%
5	5	0.80 Factor Used:	No	Minor 4: SB Liberty Blvd	45	2	100%

	Time of Day	Major #1	Major #3	Total 1+3	Major 1A/1B 420/630	Minor #2	Minor #2 1A/1B 140/070	Minor #4	Minor #4 1A/1B 140/070	Both Met 1A/1B	Crash Warrant	MWSA Warrant
	6:00 - 7:00	89	117	206	/	20	/	50	/	/		
	7:00 - 8:00	485	247	732	X/X	68	/	213	X/X	X/X	Х	х
	8:00 - 9:00	66	89	155	/	17	/	60	/	/		
Analysis	9:00 - 10:00	70	57	127	/	19	/	63	/	/		
<u>a</u>	10:00 - 11:00	46	33	79	/	12	/	47	/	/		
₽	11:00 - 12:00	82	62	144	/	15	/	70	/	/		
	12:00 - 1:00	100	64	164	/	12	/	74	/X	/		
ä	1:00 - 2:00	91	65	156	/	21	/	108	/X	/		
Warrants	2:00 - 3:00	94	66	160	/	24	/	92	/X	/		
l ≊	3:00 - 4:00	177	119	296	/	31	/	217	X/X	/		Х
	4:00 - 5:00	134	85	219	/	18	/	163	X/X	/		Х
	5:00 - 6:00	132	96	228	/	26	/	179	X/X	/		Х
	6:00 - 7:00	63	34	97	/	14	/	53	/	/		
	7:00 - 8:00	66	52	118	/	14	/	60	/	/		
	8:00 - 9:00	48	37	85	/	10	/	43	/	/		
	9:00 - 10:00	31	24	55	/	7	/	28	/	/		

	Criteria	Hours Met	Hours Required	Warrants Met
y,	Warrant 1a: Minimum Vehicular Volume	1	8	Not Met
	Warrant 1b: Interruption of Continuous Traffic	1	8	Not Met
es	Warrant 2: Four-Hour Vehicular Volume	1	4	Not Met
~	Warrant 7: Crash Experience	1	8	Not Met
	Multi-way Stop Applications (MWSA)	4	8	Not Met

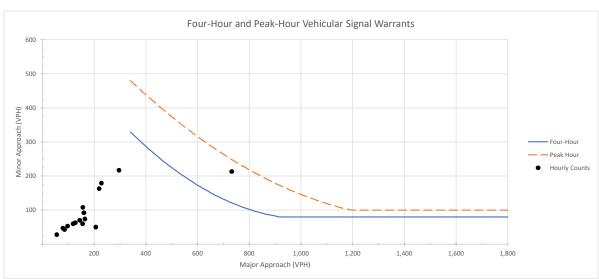
Radar Hill 1416 Corridor Study

City/County: Box Elder, SD

Intersection: Hwy 1416 and Liberty Blvd



ata	Date:	8/25/2023	Approach	Speed	Lanes	RT %
a,	Population < 10,000:	No	Major 1: EB Highway 1416	50	2	100%
_ ≥	Existing Signal:	No	Major 3: WB Highway 1416	50	2	100%
<u> </u>	0.70 Factor Used:	Yes	Minor 2: NB Liberty Blvd	25	1	100%
St	0.80 Factor Used:	No	Minor 4: SB Liberty Blvd	45	2	100%



*Note: For data outside of the graph range, check the minor street volume against the lower thresholds

	Criteria	Hours Met	Hours Required	Warrants Met
Results	Warrant 2: Four-Hour Vehicular Volume	1	4	Not Met
	Warrant 3: Peak Hour	0	1	Not Met

No-Build (2050)

o ≪KLJ

City/County: Box Elder, SD Intersection: Hwy 1416 and Liberty Blvd

Ţ	3	Date:	8/25/2023	Approach	Speed	Lanes	RT %
Į te	5 1	Population < 10,000:	No	Major 1: EB Highway 1416	50	2	100%
1 >		Existing Signal:	No	Major 3: WB Highway 1416	50	2	100%
3	5	0.70 Factor Used:	Yes	Minor 2: NB Liberty Blvd	25	1	100%
5	5	0.80 Factor Used:	No	Minor 4: SB Liberty Blvd	45	2	100%

	Time of Day	Major #1	Major #3	Total 1+3	Major 1A/1B 420/630	Minor #2	Minor #2 1A/1B 140/070	Minor #4	Minor #4 1A/1B 140/070	Both Met 1A/1B	Crash Warrant	MWSA Warrant
	6:00 - 7:00	93	123	216	/	21	/	52	/	/		
	7:00 - 8:00	493	254	747	X/X	70	/	217	X/X	X/X	Х	х
	8:00 - 9:00	68	94	162	/	18	/	63	/	/		
Analysis	9:00 - 10:00	73	59	132	/	20	/	66	/	/		
a le	10:00 - 11:00	48	35	83	/	13	/	49	/	/		
₽	11:00 - 12:00	85	65	150	/	16	/	74	/X	/		
	12:00 - 1:00	104	67	171	/	13	/	78	/X	/		
ä	1:00 - 2:00	95	68	163	/	22	/	113	/X	/		
Warrants	2:00 - 3:00	97	69	166	/	26	/	96	/X	/		
l ≊	3:00 - 4:00	182	123	305	/	33	/	225	X/X	/		Х
	4:00 - 5:00	139	89	228	/	19	/	171	X/X	/		Х
	5:00 - 6:00	137	101	238	/	28	/	188	X/X	/		Х
	6:00 - 7:00	64	36	100	/	15	/	55	/	/		
	7:00 - 8:00	68	55	123	/	14	/	63	/	/		
	8:00 - 9:00	49	39	88	/	11	/	45	/	/		
	9:00 - 10:00	33	25	58	/	7	/	30	/	/		

	Criteria	Hours Met	Hours Required	Warrants Met
y,	Warrant 1a: Minimum Vehicular Volume	1	8	Not Met
	Warrant 1b: Interruption of Continuous Traffic	1	8	Not Met
es	Warrant 2: Four-Hour Vehicular Volume	1	4	Not Met
~	Warrant 7: Crash Experience	1	8	Not Met
	Multi-way Stop Applications (MWSA)	4	8	Not Met

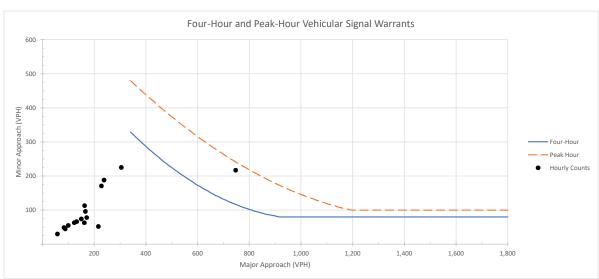
Radar Hill 1416 Corridor Study

City/County: Box Elder, SD

Intersection: Hwy 1416 and Liberty Blvd



ata	Date:	8/25/2023	Approach	Speed	Lanes	RT %
a,	Population < 10,000:	No	Major 1: EB Highway 1416	50	2	100%
_ ≥	Existing Signal:	No	Major 3: WB Highway 1416	50	2	100%
<u> </u>	0.70 Factor Used:	Yes	Minor 2: NB Liberty Blvd	25	1	100%
St	0.80 Factor Used:	No	Minor 4: SB Liberty Blvd	45	2	100%



*Note: For data outside of the graph range, check the minor street volume against the lower thresholds

	Criteria	Hours Met	Hours Required	Warrants Met
Results	Warrant 2: Four-Hour Vehicular Volume	1	4	Not Met
	Warrant 3: Peak Hour	0	1	Not Met

No-Build (2030)

KLJ

City/County: Box Elder, SD Intersection: Hwy 1416 and S Ellsworth Rd

t e	Date:	8/25/2023	Approach	Speed	Lanes	RT %
Dat	Population < 10,000:	No	Major 1: EB Highway 1416	55	2	100%
I <u>></u>	Existing Signal:	No	Major 3: WB Highway 1416	50	2	100%
] 3	0.70 Factor Used:	Yes	Minor 2: NB S Ellsworth Rd	25	1	100%
25	0.80 Factor Used:	No	Minor 4: SB S Ellsworth Rd	35	1	100%

	Time of Day	Major #1	Major #3	Total 1+3	Major 1A/1B 420/630	Minor #2	Minor #2 1A/1B 105/053	Minor #4	Minor #4 1A/1B 105/053	Both Met 1A/1B	Crash Warrant	MWSA Warrant
	6:00 - 7:00	741	39	780	X/X	93	/X	101	/X	/X	Х	Х
	7:00 - 8:00	1013	236	1249	X/X	247	X/X	364	X/X	X/X	Х	Х
	8:00 - 9:00	336	67	403	/	59	/X	158	X/X	/		Х
Analysis	9:00 - 10:00	294	52	346	/	46	/	170	X/X	/		х
<u>a</u>	10:00 - 11:00	281	67	348	/	38	/	177	X/X	/		Х
F F	11:00 - 12:00	324	62	386	/	36	/	196	X/X	/		Х
	12:00 - 1:00	407	78	485	X/	46	/	233	X/X	X/	Х	Х
Warrants	1:00 - 2:00	366	76	442	X/	56	/X	179	X/X	X/		Х
Ë	2:00 - 3:00	410	92	502	X/	48	/	217	X/X	X/	Х	Х
l s	3:00 - 4:00	454	178	632	X/X	78	/X	450	X/X	X/X	Х	Х
	4:00 - 5:00	484	109	593	X/	65	/X	383	X/X	X/	Х	Х
	5:00 - 6:00	541	119	660	X/X	82	/X	343	X/X	X/X	Х	Х
	6:00 - 7:00	186	41	227	/	35	/	139	X/X	/		Х
	7:00 - 8:00	285	52	337	/	41	/	148	X/X	/		Х
	8:00 - 9:00	204	37	241	/	30	/	106	X/X	/		
	9:00 - 10:00	134	25	159	/	19	/	69	/X	/		

	Criteria	Hours Met	Hours Required	Warrants Met
y,	Warrant 1a: Minimum Vehicular Volume	7	8	Not Met
1 = =	Warrant 1b: Interruption of Continuous Traffic	4	8	Not Met
es	Warrant 2: Four-Hour Vehicular Volume	7	4	Met
_ ~	Warrant 7: Crash Experience	7	8	Not Met
	Multi-way Stop Applications (MWSA)	14	8	Met

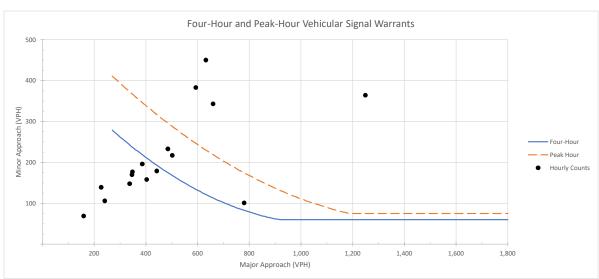
Radar Hill 1416 Corridor Study

City/County: Box Elder, SD

Intersection: Hwy 1416 and S Ellsworth Rd



ata	Date:	8/25/2023	Approach	Speed	Lanes	RT %
a l	Population < 10,000:	No	Major 1: EB Highway 1416	55	2	100%
<u> </u>	Existing Signal:	No	Major 3: WB Highway 1416	50	2	100%
3	0.70 Factor Used:	Yes	Minor 2: NB S Ellsworth Rd	25	1	100%
St	0.80 Factor Used:	No	Minor 4: SB S Ellsworth Rd	35	1	100%



*Note: For data outside of the graph range, check the minor street volume against the lower thresholds

	Criteria	Hours Met	Hours Required	Warrants Met
Results	Warrant 2: Four-Hour Vehicular Volume	7	4	Met
	Warrant 3: Peak Hour	4	1	Met

No-Build (2050)

KLJ

City/County: Box Elder, SD Intersection: Hwy 1416 and S Ellsworth Rd

. ta	Date:	8/25/2023	Approach	Speed	Lanes	RT %
Dat	Population < 10,000:	No	Major 1: EB Highway 1416	55	2	100%
l <u>-</u>	Existing Signal:	No	Major 3: WB Highway 1416	50	2	100%
] 3	0.70 Factor Used:	Yes	Minor 2: NB S Ellsworth Rd	25	1	100%
₹	0.80 Factor Used:	No	Minor 4: SB S Ellsworth Rd	35	1	100%

	Time of Day	Major #1	Major #3	Total 1+3	Major 1A/1B 420/630	Minor #2	Minor #2 1A/1B 105/053	Minor #4	Minor #4 1A/1B 105/053	Both Met 1A/1B	Crash Warrant	MWSA Warrant
	6:00 - 7:00	853	43	896	X/X	107	X/X	115	X/X	X/X	Х	Х
	7:00 - 8:00	1134	245	1379	X/X	271	X/X	400	X/X	X/X	Х	Х
	8:00 - 9:00	384	74	458	X/	68	/X	181	X/X	X/		Х
Analysis	9:00 - 10:00	337	57	394	/	53	/	195	X/X	/		Х
<u> </u>	10:00 - 11:00	322	75	397	/	44	/	203	X/X	/		Х
¥	11:00 - 12:00	371	68	439	X/	41	/	225	X/X	X/		Х
	12:00 - 1:00	466	86	552	X/	53	/	267	X/X	X/	Х	Х
Warrants	1:00 - 2:00	419	84	503	X/	64	/X	206	X/X	X/	Х	Х
Ē	2:00 - 3:00	470	102	572	X/	56	/X	249	X/X	X/	Х	Х
Š	3:00 - 4:00	514	191	705	X/X	87	/X	513	X/X	X/X	Х	Х
	4:00 - 5:00	555	121	676	X/X	75	/X	440	X/X	X/X	Х	Х
	5:00 - 6:00	620	133	753	X/X	95	/X	394	X/X	X/X	Х	Х
	6:00 - 7:00	212	44	256	/	40	/	159	X/X	/		Х
	7:00 - 8:00	327	58	385	/	48	/	170	X/X	/		х
	8:00 - 9:00	233	41	274	/	34	/	121	X/X	/		Х
	9:00 - 10:00	154	27	181	/	22	/	79	/X	/		

	Criteria	Hours Met	Hours Required	Warrants Met
y,	Warrant 1a: Minimum Vehicular Volume	10	8	Met
1 = =	Warrant 1b: Interruption of Continuous Traffic	5	8	Not Met
es	Warrant 2: Four-Hour Vehicular Volume	9	4	Met
_ ~	Warrant 7: Crash Experience	8	8	Met - Check Crash Rate
	Multi-way Stop Applications (MWSA)	15	8	Met

Radar Hill 1416 Corridor Study

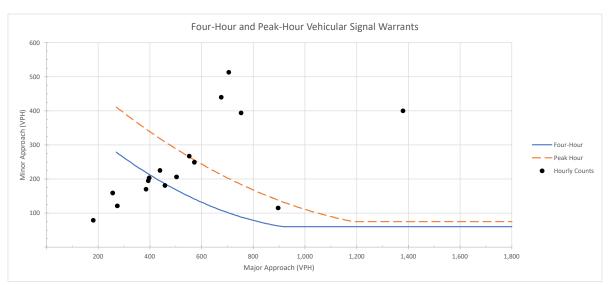
City/County: Box Elder, SD

Intersection: Hwy 1416 and S Ellsworth Rd

No-Build (2050)



Ē	Date:	8/25/2023	Approach	Speed	Lanes	RT %
a.	Population < 10,000:	No	Major 1: EB Highway 1416	55	2	100%
<u> </u>	Existing Signal:	No	Major 3: WB Highway 1416	50	2	100%
	0.70 Factor Used:	Yes	Minor 2: NB S Ellsworth Rd	25	1	100%
5	0.80 Factor Used:	No	Minor 4: SB S Ellsworth Rd	35	1	100%



 $\hbox{*Note: For data outside of the graph range, check the minor street volume against the lower thresholds}$

	Criteria	Hours Met	Hours Required	Warrants Met
Results	Warrant 2: Four-Hour Vehicular Volume	9	4	Met
	Warrant 3: Peak Hour	5	1	Met

No-Build (2030)

2030) **KLJ**

City/County: Box Elder, SD Intersection: Hwy 1416 and Radar Hill Rd

ata	Date:	8/25/2023	Approach	Speed	Lanes	RT %
a a	Population < 10,000:	No	Major 1: EB Highway 1416	55	2	100%
	Existing Signal:	No	Major 3: WB Highway 1416	55	2	100%
3	0.70 Factor Used:	Yes	Minor 2: NB Radar Hill Rd	45	1	100%
Ş	0.80 Factor Used:	No	Minor 4: SB Gumbo Dr	25	1	100%

	Time of Day	Major #1	Major #3	Total 1+3	Major 1A/1B 420/630	Minor #2	Minor #2 1A/1B 105/053	Minor #4	Minor #4 1A/1B 105/053	Both Met 1A/1B	Crash Warrant	MWSA Warrant
	6:00 - 7:00	591	192	783	X/X	299	X/X	19	/	X/X	Х	Х
	7:00 - 8:00	774	560	1334	X/X	512	X/X	56	/X	X/X	Х	х
	8:00 - 9:00	328	289	617	X/	151	X/X	40	/	X/		х
Analysis	9:00 - 10:00	307	268	575	X/	141	X/X	21	/	X/		
a le	10:00 - 11:00	288	320	608	X/	135	X/X	15	/	X/		
F F	11:00 - 12:00	363	407	770	X/X	115	X/X	18	/	X/X	Х	
	12:00 - 1:00	413	328	741	X/X	160	X/X	31	/	X/X	Х	
ä	1:00 - 2:00	408	330	738	X/X	141	X/X	28	/	X/X	Х	
Warrants	2:00 - 3:00	436	438	874	X/X	162	X/X	31	/	X/X	Х	
l s	3:00 - 4:00	480	809	1289	X/X	179	X/X	21	/	X/X	Х	х
	4:00 - 5:00	580	877	1457	X/X	208	X/X	22	/	X/X	Х	Х
	5:00 - 6:00	631	626	1257	X/X	262	X/X	21	/	X/X	Х	х
	6:00 - 7:00	232	183	415	/	63	/X	12	/	/		
	7:00 - 8:00	287	274	561	X/	123	X/X	16	/	X/		
	8:00 - 9:00	205	196	401	/	88	/X	11	/	/		
	9:00 - 10:00	135	128	263	/	58	/X	7	/	/		

	Criteria	Hours Met	Hours Required	Warrants Met
ν	Warrant 1a: Minimum Vehicular Volume	13	8	Met
=	Warrant 1b: Interruption of Continuous Traffic	9	8	Met
es	Warrant 2: Four-Hour Vehicular Volume	11	4	Met
l ~	Warrant 7: Crash Experience	9	8	Met - Check Crash Rate
	Multi-way Stop Applications (MWSA)	6	8	Not Met

Radar Hill 1416 Corridor Study

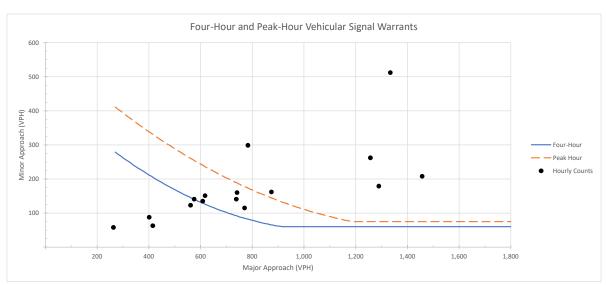
City/County: Box Elder, SD

Intersection: Hwy 1416 and Radar Hill Rd

No-Build (2030)



ata	Date:	8/25/2023	Approach	Speed	Lanes	RT %
a l	Population < 10,000:	No	Major 1: EB Highway 1416	55	2	100%
<u> </u>	Existing Signal:	No	Major 3: WB Highway 1416	55	2	100%
3	0.70 Factor Used:	Yes	Minor 2: NB Radar Hill Rd	45	1	100%
St	0.80 Factor Used:	No	Minor 4: SB Gumbo Dr	25	1	100%



 $\hbox{*Note: For data outside of the graph range, check the minor street volume against the lower thresholds}$

	Criteria	Hours Met	Hours Required	Warrants Met
Results	Warrant 2: Four-Hour Vehicular Volume	11	4	Met
	Warrant 3: Peak Hour	6	1	Met

No-Build (2050)

· <mark>《《K</mark>LJ

City/County: Box Elder, SD Intersection: Hwy 1416 and Radar Hill Rd

ta	Date:	8/25/2023	Approach	Speed	Lanes	RT %
Dat	Population < 10,000:	No	Major 1: EB Highway 1416	55	2	100%
I <u>></u>	Existing Signal:	No	Major 3: WB Highway 1416	55	2	100%
] B	0.70 Factor Used:	Yes	Minor 2: NB Radar Hill Rd	45	1	100%
St	0.80 Factor Used:	No	Minor 4: SB Gumbo Dr	25	1	100%

	Time of Day	Major #1	Major #3	Total 1+3	Major 1A/1B 420/630	Minor #2	Minor #2 1A/1B 105/053	Minor #4	Minor #4 1A/1B 105/053	Both Met 1A/1B	Crash Warrant	MWSA Warrant
	6:00 - 7:00	672	217	889	X/X	341	X/X	21	/	X/X	Х	Х
	7:00 - 8:00	860	620	1480	X/X	571	X/X	60	/X	X/X	Х	х
	8:00 - 9:00	372	327	699	X/X	172	X/X	45	/	X/X	Х	х
Analysis	9:00 - 10:00	349	304	653	X/X	161	X/X	24	/	X/X	Х	
a le	10:00 - 11:00	327	362	689	X/X	154	X/X	17	/	X/X		
F F	11:00 - 12:00	411	462	873	X/X	131	X/X	20	/	X/X	Х	
	12:00 - 1:00	468	371	839	X/X	182	X/X	36	/	X/X	Х	х
ä	1:00 - 2:00	463	374	837	X/X	161	X/X	32	/	X/X	Х	
Warrants	2:00 - 3:00	494	496	990	X/X	185	X/X	36	/	X/X	Х	Х
l %	3:00 - 4:00	540	912	1452	X/X	202	X/X	23	/	X/X	х	х
	4:00 - 5:00	658	996	1654	X/X	237	X/X	25	/	X/X	Х	х
	5:00 - 6:00	717	710	1427	X/X	298	X/X	24	/	X/X	Х	х
	6:00 - 7:00	262	206	468	X/	72	/X	13	/	/		
	7:00 - 8:00	325	310	635	X/X	140	X/X	18	/	X/X		х
	8:00 - 9:00	232	222	454	X/	100	/X	13	/	/		
	9:00 - 10:00	153	145	298	/	66	/X	8	/	/		

	Criteria	Hours Met	Hours Required	Warrants Met
ν	Warrant 1a: Minimum Vehicular Volume	13	8	Met
1 = =	Warrant 1b: Interruption of Continuous Traffic	13	8	Met
es	Warrant 2: Four-Hour Vehicular Volume	13	4	Met
_ ~	Warrant 7: Crash Experience	11	8	Met - Check Crash Rate
	Multi-way Stop Applications (MWSA)	9	8	Met

Radar Hill 1416 Corridor Study

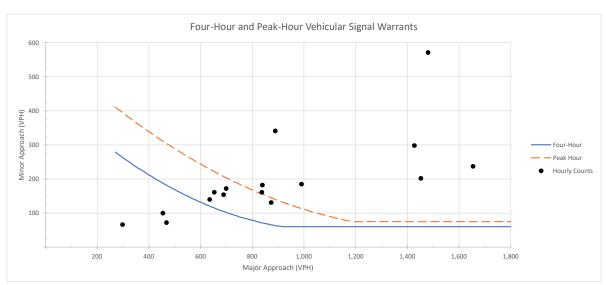
City/County: Box Elder, SD

Intersection: Hwy 1416 and Radar Hill Rd

No-Build (2050)



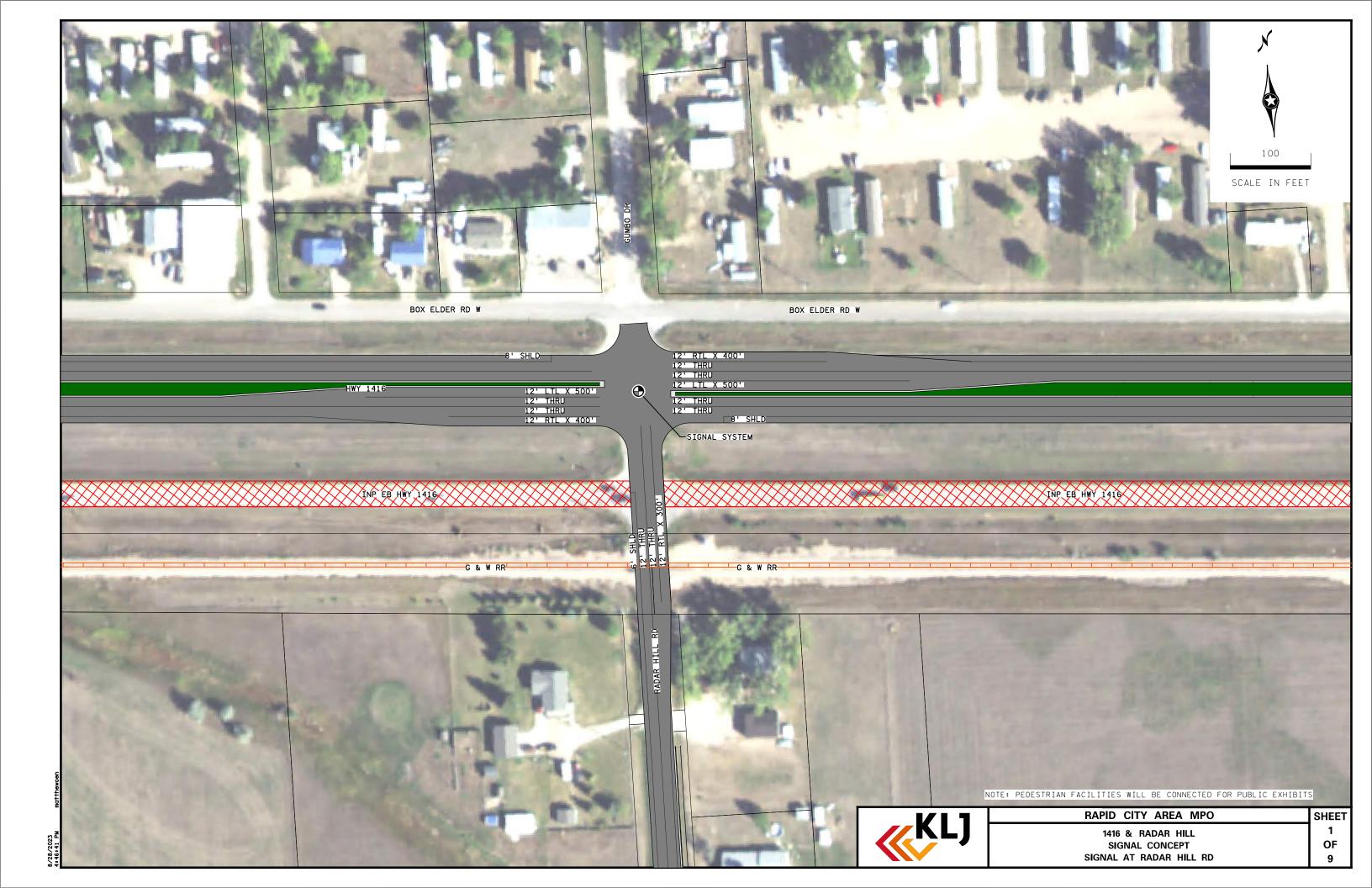
ta	Date:	8/25/2023	Approach	Speed	Lanes	RT %
Da	Population < 10,000:	No	Major 1: EB Highway 1416	55	2	100%
<u> </u>	Existing Signal:	No	Major 3: WB Highway 1416	55	2	100%
] 3	0.70 Factor Used:	Yes	Minor 2: NB Radar Hill Rd	45	1	100%
St	0.80 Factor Used:	No	Minor 4: SB Gumbo Dr	25	1	100%

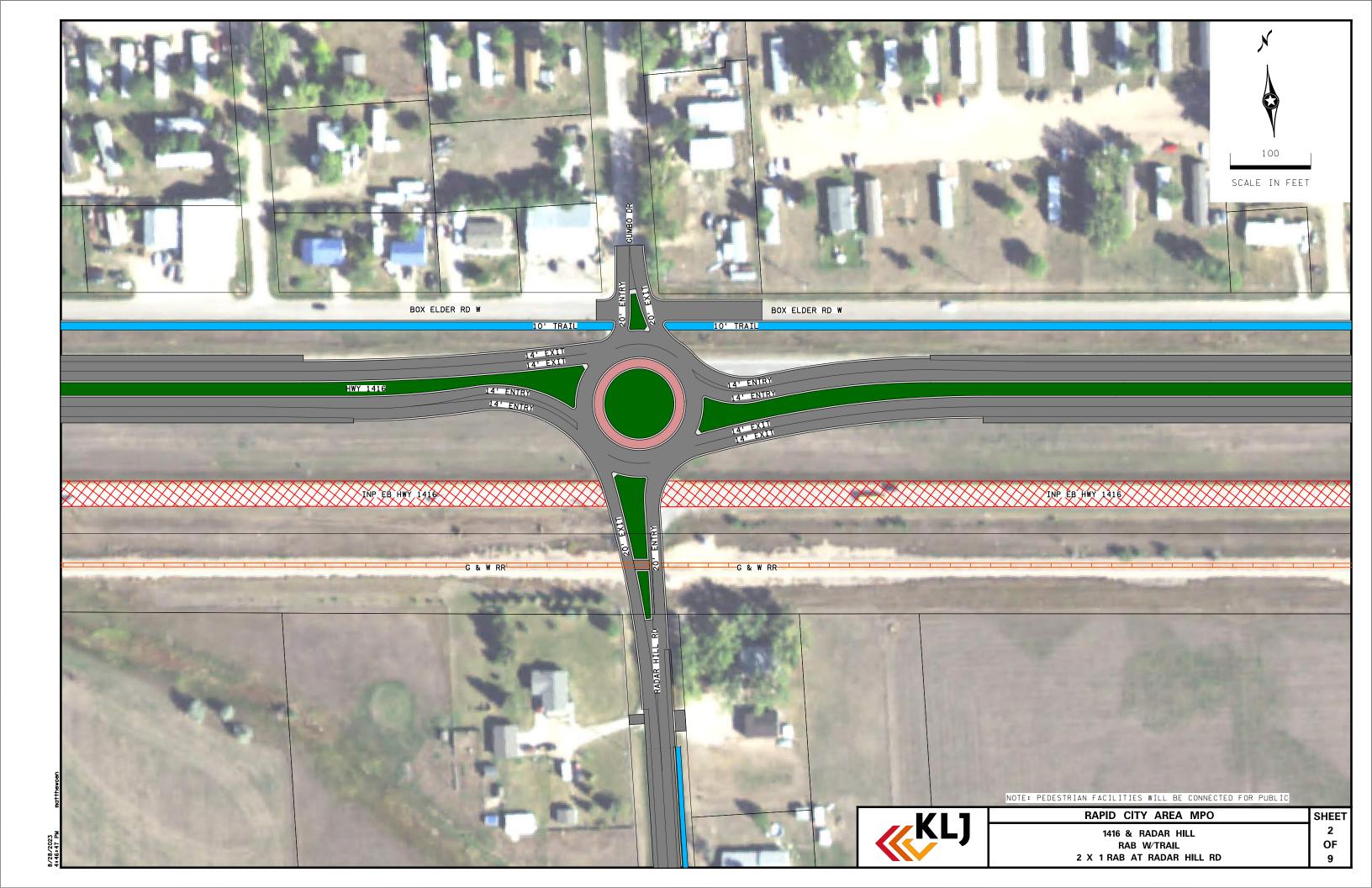


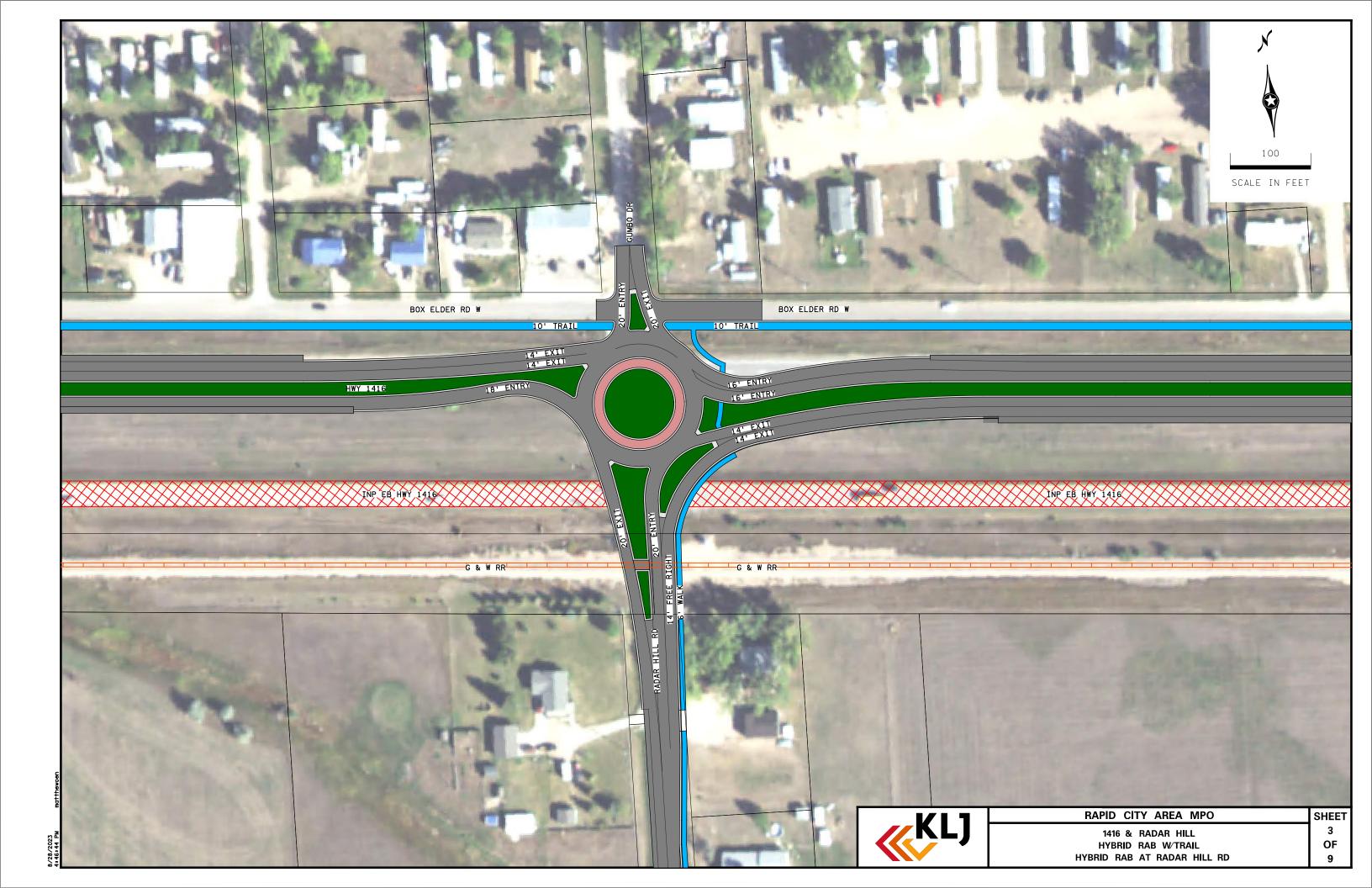
 $\hbox{*Note: For data outside of the graph range, check the minor street volume against the lower thresholds}$

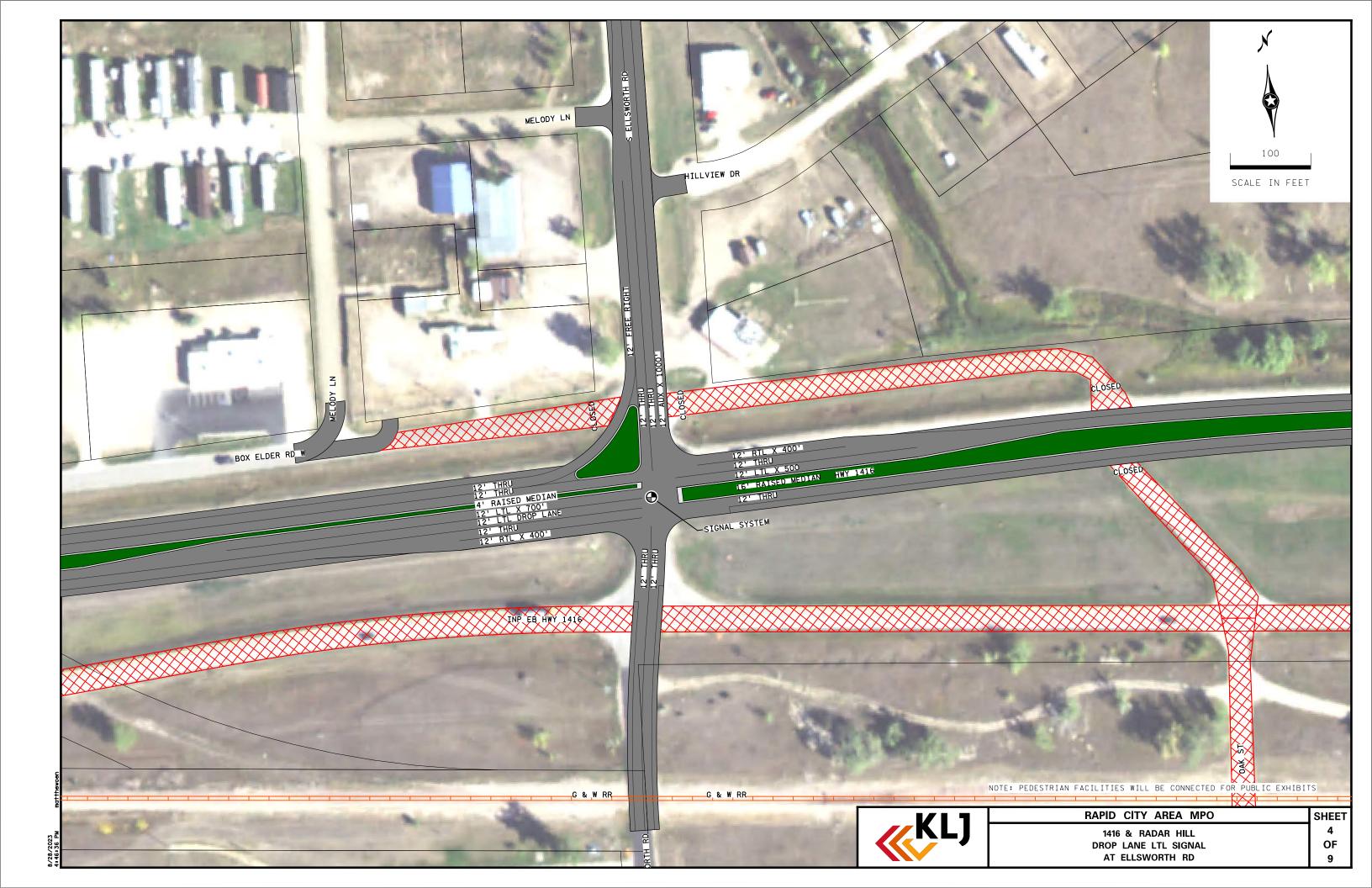
	Criteria	Hours Met	Hours Required	Warrants Met
Results	Warrant 2: Four-Hour Vehicular Volume	13	4	Met
	Warrant 3: Peak Hour	8	1	Met

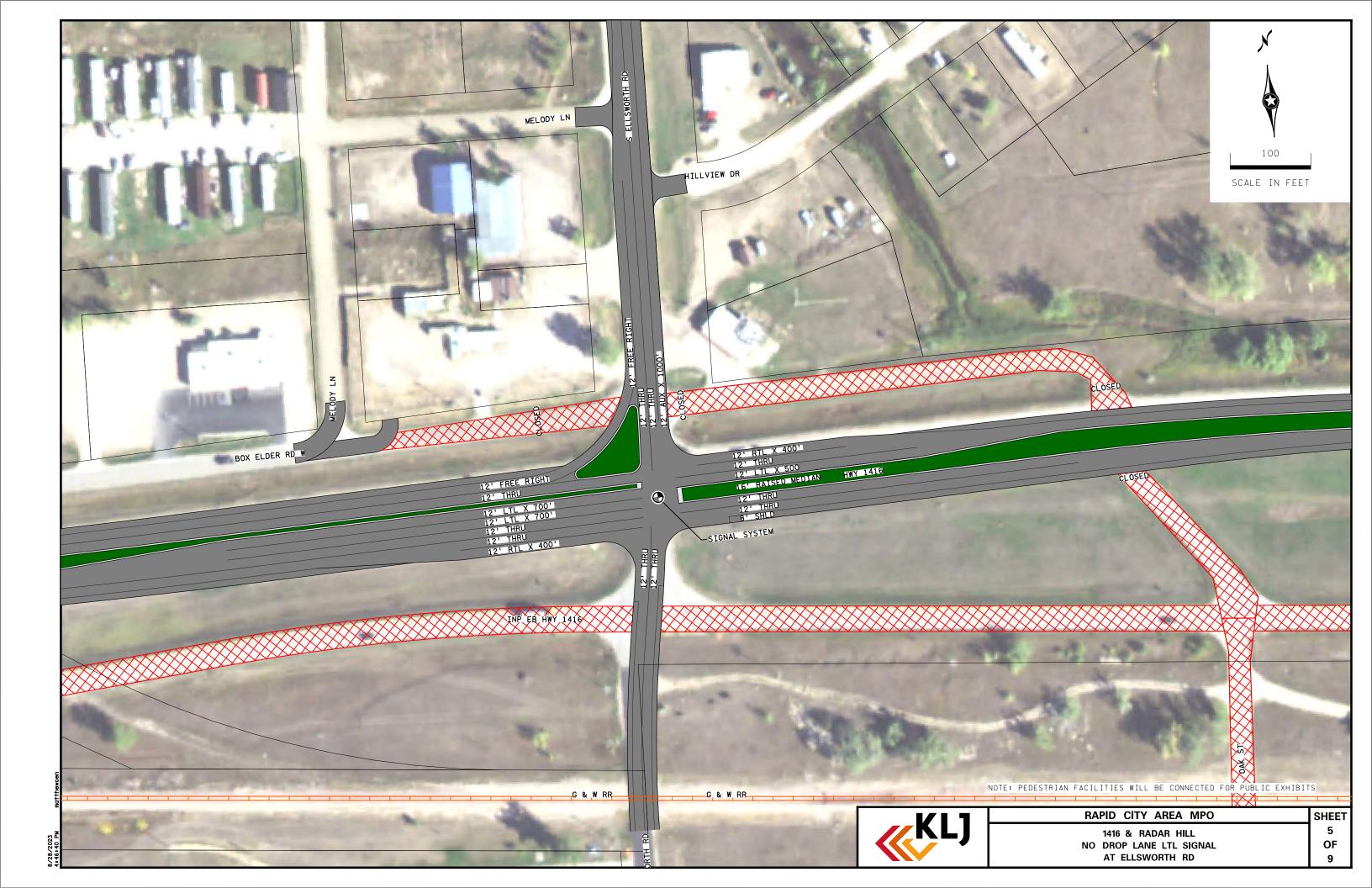
Appendix F: Alternative Concepts

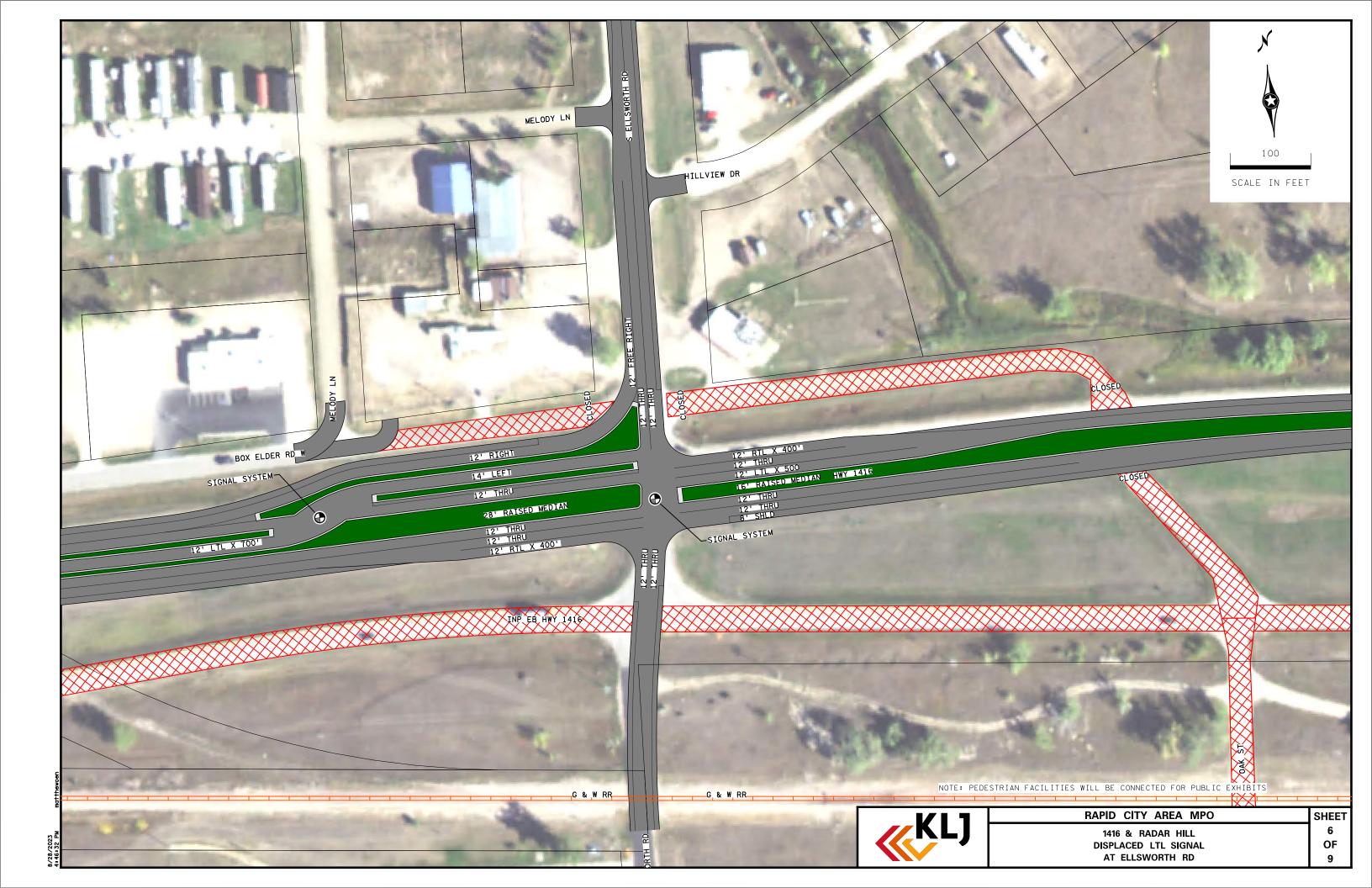


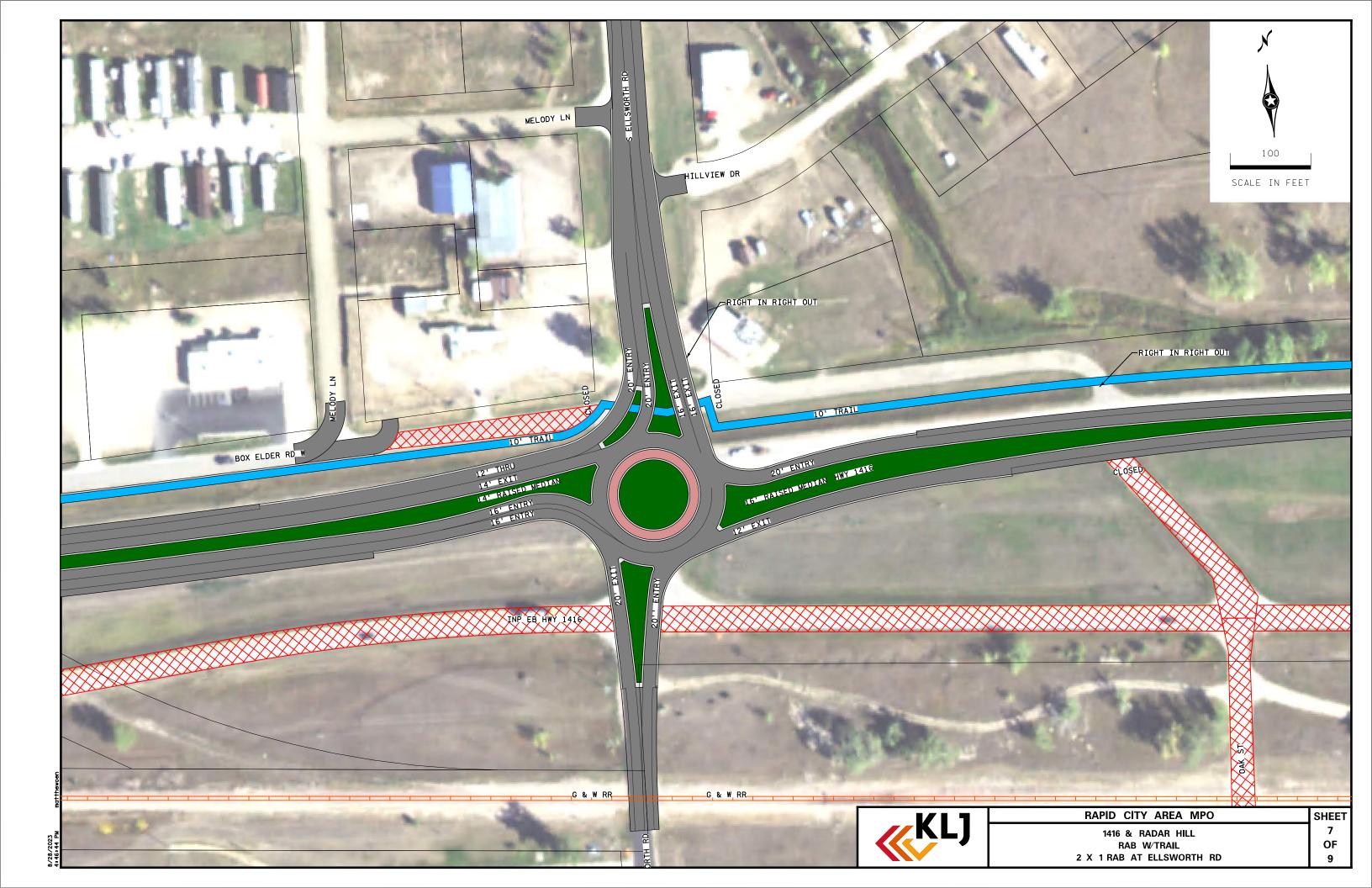


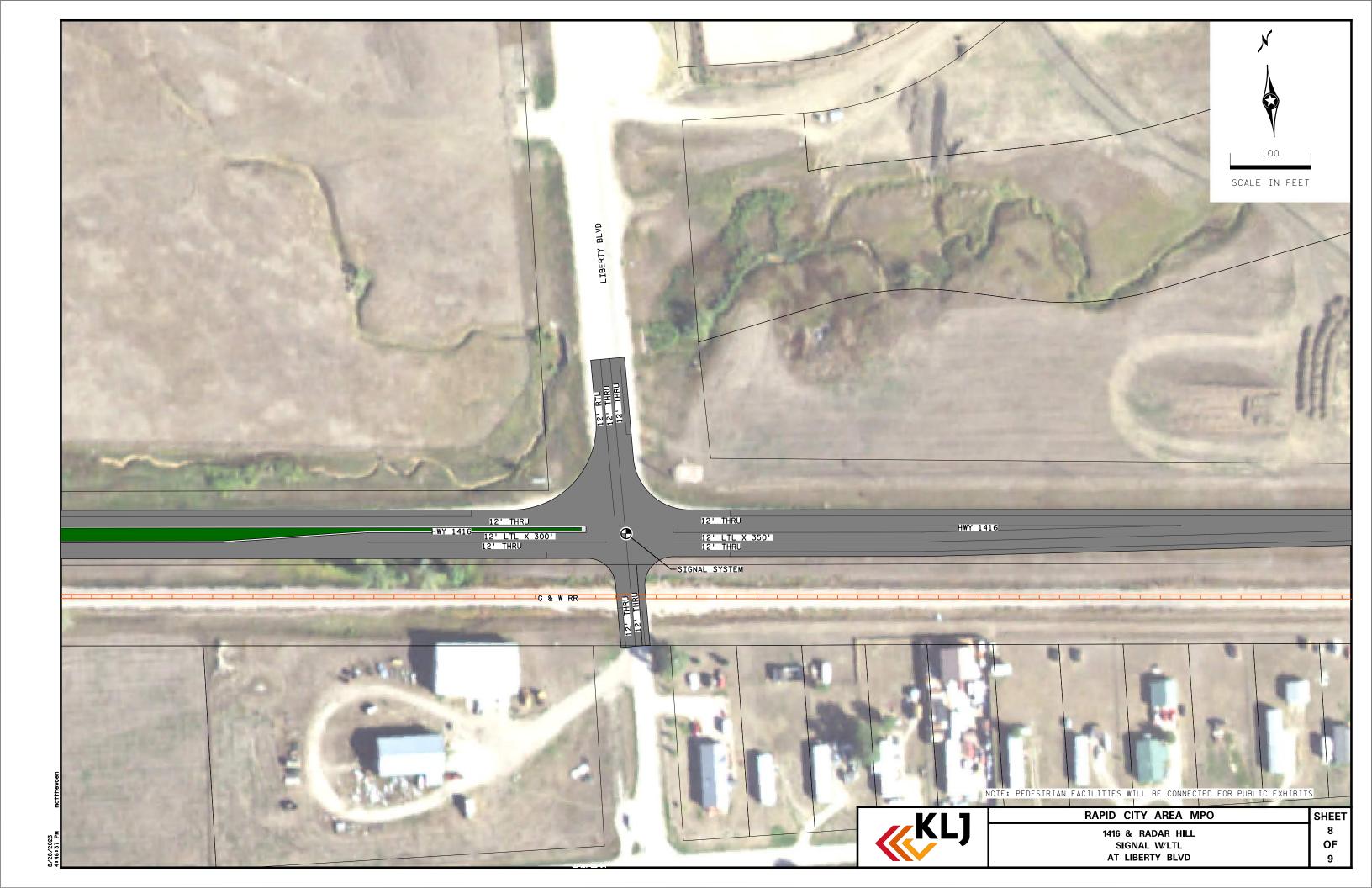


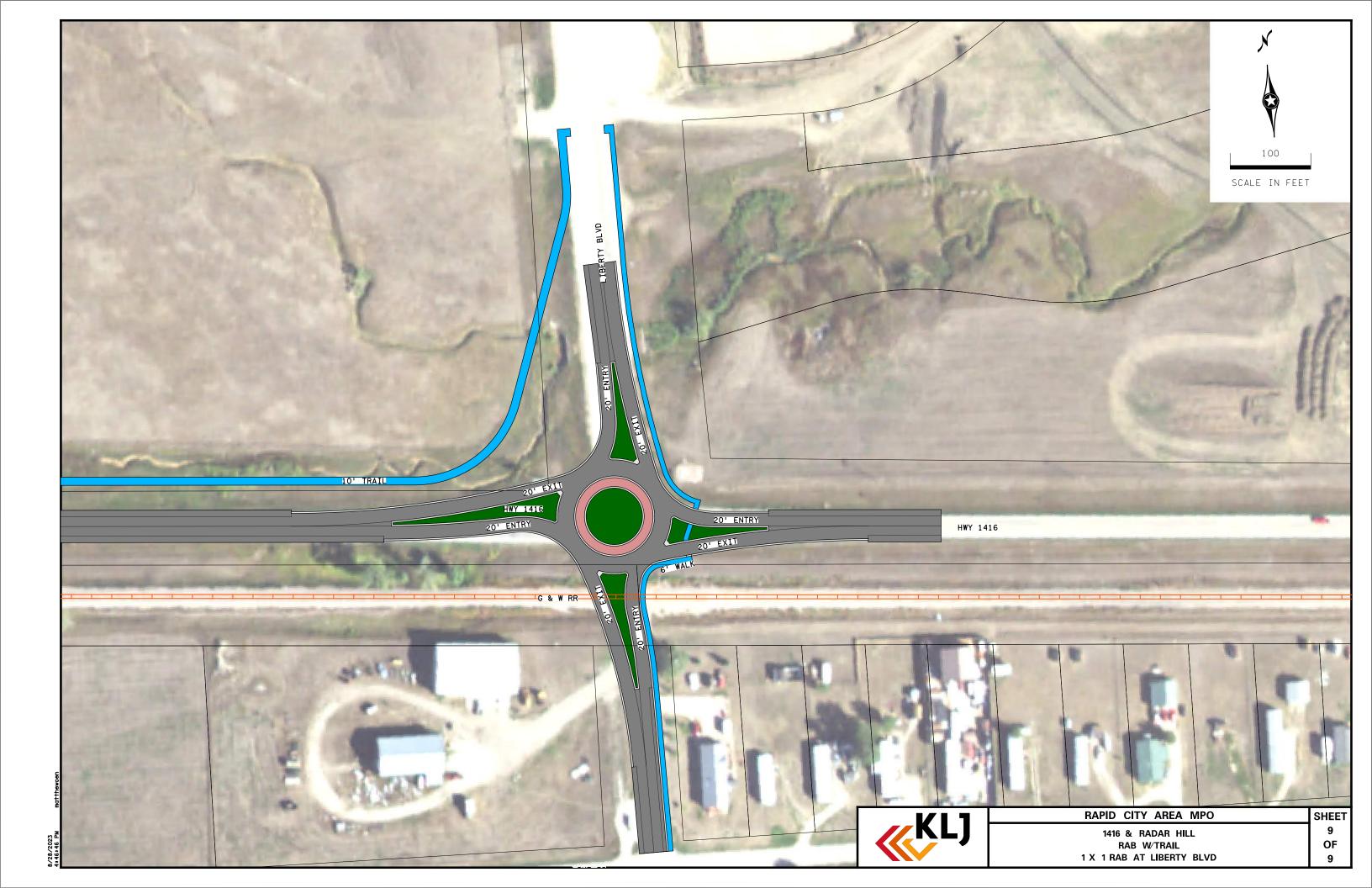












Appendix G: Vehicular Level of Service (VLOS) Results – Alternatives

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. Date Performed 6/26/2023 Analysis Year 2023 Analysis Time Period (hrs) 1.00 Time Analyzed AM Peak Radar Hill 1416 Corridor Study - Interim **Project Description** WB Highway 1416 and S Ellsworth Road Intersection Jurisdiction Box Elder, SD East/West Street WB Highway 1416 S Ellsworth Rd North/South Street 0.84 Peak Hour Factor Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 44 674 194 Volume (veh/h) 0 13 86 26 % Thrus in Shared Lane 50 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L2 L3 L2 L3 L2 L3 L2 L3 11 11 11 11 Lane Configuration LT TR LT Τ R Flow Rate, v (veh/h) 26 42 905 31 231 Percent Heavy Vehicles 10 10 1 5 5 3.20 3.20 3.20 Initial Departure Headway, hd (s) 3.20 3.20 Initial Degree of Utilization, x 0.023 0.037 0.804 0.028 0.205 Final Departure Headway, hd (s) 6.94 6.68 4.86 5.39 4.69 Final Degree of Utilization, x 0.050 0.077 1.222 0.046 0.301 2.3 2.0 2.3 2.3 23 Move-Up Time, m (s) Service Time, ts (s) 4.64 4.38 2.86 3 09 2.39 Capacity, Delay and Level of Service Northbound Southbound Approach Eastbound Westbound L1 12 L3 L1 L2 L3 L1 12 L3 L1 L2 L3 Configuration LT TR LT Τ R 26 42 905 31 231 Flow Rate, v (veh/h) 519 539 740 668 767 Capacity (veh/h) 95% Queue Length, Q95 (veh) 0.2 0.3 96.3 0.1 1.3 Control Delay (s/veh) 10.0 9.9 432.7 8.4 9.4 Level of Service, LOS В Α F Α Α Approach Delay (s/veh) | LOS 10.0 Α 432.7 F 9.3 Α

Intersection Delay (s/veh) | LOS

319.7

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. Date Performed 6/26/2023 Analysis Year 2023 Analysis Time Period (hrs) 1.00 Time Analyzed PM Peak Radar Hill 1416 Corridor Study - Interim **Project Description** WB Highway 1416 and S Ellsworth Rd Intersection Jurisdiction Box Elder, SD East/West Street WB Highway 1416 S Ellsworth Rd North/South Street 0.90 Peak Hour Factor Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 71 Volume (veh/h) 14 6 36 328 65 256 % Thrus in Shared Lane 50 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L2 L3 L2 L3 L2 L3 L2 L3 11 11 11 11 Lane Configuration LT TR LT Τ R Flow Rate, v (veh/h) 55 46 404 72 284 Percent Heavy Vehicles 10 10 1 5 5 3.20 3.20 3.20 Initial Departure Headway, hd (s) 3.20 3.20 Initial Degree of Utilization, x 0.049 0.041 0.360 0.064 0.253 Final Departure Headway, hd (s) 6.55 6.30 5.04 5.29 4.58 Final Degree of Utilization, x 0.100 0.081 0.566 0.106 0.362 2.3 2.3 2.3 23 20 Move-Up Time, m (s) Service Time, ts (s) 4.25 4.00 3.04 2 99 2.28 Capacity, Delay and Level of Service Northbound Southbound Approach Eastbound Westbound L1 12 L3 L1 L2 L3 L1 12 L3 L1 L2 L3 Configuration LT TR LT Τ R 46 404 72 284 Flow Rate, v (veh/h) 55 550 571 714 681 785 Capacity (veh/h) 95% Queue Length, Q95 (veh) 0.3 0.3 3.8 0.4 1.7 Control Delay (s/veh) 10.0 9.6 14.6 8.6 9.9 Level of Service, LOS Α Α В Α Α Approach Delay (s/veh) | LOS 9.8 Α 14.6 В 9.6 Α

Intersection Delay (s/veh) | LOS

12.0

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. Date Performed 6/26/2023 Analysis Year 2030 Analysis Time Period (hrs) 1.00 Time Analyzed AM Peak Radar Hill 1416 Corridor Study - Interim **Project Description** WB Highway 1416 and S Ellsworth Road Intersection Jurisdiction Box Elder, SD East/West Street WB Highway 1416 S Ellsworth Rd North/South Street 0.84 Peak Hour Factor Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 90 Volume (veh/h) 30 173 44 752 128 207 % Thrus in Shared Lane 50 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L2 L3 L2 L3 L2 L3 L2 L3 11 11 11 11 Lane Configuration LT TR LT Τ R Flow Rate, v (veh/h) 139 155 1002 152 246 Percent Heavy Vehicles 10 10 1 5 5 3.20 3.20 3.20 Initial Departure Headway, hd (s) 3 20 3.20 Initial Degree of Utilization, x 0.138 0.891 0.135 0.219 0.123 Final Departure Headway, hd (s) 7.34 6.98 5.87 5.67 Final Degree of Utilization, x 0.283 0.301 1.633 0.270 0.388 2.3 2.3 2.3 23 20 Move-Up Time, m (s) Service Time, ts (s) 5.04 4.68 3.87 4.07 3.37 Capacity, Delay and Level of Service Northbound Southbound Approach Eastbound Westbound L1 12 L3 L1 L2 L3 L1 12 L3 L1 L2 L3 Configuration LT TR LT Τ R 139 155 1002 152 246 Flow Rate, v (veh/h) 490 516 614 565 635 Capacity (veh/h) 95% Queue Length, Q95 (veh) 1.2 1.3 201.8 1.1 1.9 Control Delay (s/veh) 12.9 12.7 1163.9 11.4 12.0 Level of Service, LOS В В F В В Approach Delay (s/veh) | LOS 12.8 В 1163.9 F 11.8 В

Intersection Delay (s/veh) | LOS

693.2

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. Date Performed 6/26/2023 Analysis Year 2030 Analysis Time Period (hrs) 1.00 Time Analyzed PM Peak Radar Hill 1416 Corridor Study - Interim **Project Description** WB Highway 1416 and S Ellsworth Rd Intersection Jurisdiction Box Elder, SD East/West Street WB Highway 1416 S Ellsworth Rd North/South Street 0.90 Peak Hour Factor Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L Volume (veh/h) 29 135 21 38 356 93 273 % Thrus in Shared Lane 50 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L2 L3 L2 L3 L2 L3 L2 L3 11 11 11 11 Lane Configuration LT TR LT Τ R Flow Rate, v (veh/h) 107 98 438 103 303 Percent Heavy Vehicles 10 10 1 5 5 3.20 3.20 Initial Departure Headway, hd (s) 3.20 3.20 3 20 Initial Degree of Utilization, x 0.087 0.389 0.092 0.270 0.095 Final Departure Headway, hd (s) 6.90 6.58 5.51 5.80 5.09 Final Degree of Utilization, x 0.205 0.180 0.670 0.167 0.429 2.3 2.0 2.3 2.3 23 Move-Up Time, m (s) Service Time, ts (s) 4.60 4.28 3.51 3.50 2.79 Capacity, Delay and Level of Service Southbound Northbound Approach Eastbound Westbound L1 12 L3 L1 L2 L3 L1 12 L3 L1 L2 L3 Configuration LT TR LT Τ R 107 98 438 103 303 Flow Rate, v (veh/h) 707 522 547 653 620 Capacity (veh/h) 95% Queue Length, Q95 (veh) 0.8 0.7 5.8 0.6 2.2 Control Delay (s/veh) 11.4 10.7 19.5 9.7 11.6 Level of Service, LOS В В C Α В Approach Delay (s/veh) | LOS 11.1 В 19.5 C 11.1 В

Intersection Delay (s/veh) | LOS

14.6

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. **Date Performed** 6/26/2023 Analysis Year 2023 Analysis Time Period (hrs) 1.00 Time Analyzed AM Peak Radar Hill 1416 Corridor Study - Interim **Project Description** EB Highway 1416 and S Ellsworth Rd Intersection Jurisdiction Box Elder, SD East/West Street EB Highway 1416 S Ellsworth Rd North/South Street Peak Hour Factor 0.84 Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 618 Volume (veh/h) 115 15 142 7 10 16 % Thrus in Shared Lane 50 Lane Flow Rate and Adjustments Approach Southbound Eastbound Westbound Northbound L3 L1 L2 L3 L2 L3 L1 L2 L3 11 12 11 Lane LT TR LT Configuration TR Flow Rate, v (veh/h) 804 86 177 31 Percent Heavy Vehicles 4 4 1 5 3.20 3.20 3.20 3.20 Initial Departure Headway, hd (s) Initial Degree of Utilization, x 0.715 0.077 0.158 0.028 Final Departure Headway, hd (s) 5.67 5.07 5.80 6.26 Final Degree of Utilization, x 1.267 0.121 0.286 0.054 2.3 2.3 2.0 20 Move-Up Time, m (s) Service Time, ts (s) 3.37 2.77 3.80 4.26 Capacity, Delay and Level of Service Northbound Eastbound Southbound Approach Westbound L1 L2 L3 L1 12 L3 L1 12 L3 L1 12 L3 Configuration LT TR TR LT 804 86 177 31 Flow Rate, v (veh/h) Capacity (veh/h) 635 711 621 575 95% Queue Length, Q95 (veh) 97.1 0.4 1.2 0.2 Control Delay (s/veh) 514.0 8.5 11.1 9.6 Level of Service, LOS F Α В Α Approach Delay (s/veh) | LOS 465.0 F 11.1 В 9.6

Intersection Delay (s/veh) | LOS

378.9

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. **Date Performed** 6/26/2023 Analysis Year 2023 Analysis Time Period (hrs) 1.00 Time Analyzed PM Peak Radar Hill 1416 Corridor Study - Interim **Project Description** EB Highway 1416 and S Ellsworth Rd Intersection Jurisdiction Box Elder, SD East/West Street EB Highway 1416 S Ellsworth Rd North/South Street Peak Hour Factor 0.90 Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 291 143 Volume (veh/h) 79 73 6 6 73 % Thrus in Shared Lane 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L3 L1 L2 L3 L2 L3 L1 L2 L3 11 12 11 Lane LT LT Configuration TR TR Flow Rate, v (veh/h) 367 203 88 88 Percent Heavy Vehicles 4 4 1 5 3.20 3.20 3.20 3.20 Initial Departure Headway, hd (s) Initial Degree of Utilization, x 0.326 0.180 0.078 0.078 Final Departure Headway, hd (s) 5.50 4.51 5.30 5.42 Final Degree of Utilization, x 0.561 0.254 0.129 0.132 2.3 2.3 2.0 20 Move-Up Time, m (s) Service Time, ts (s) 3.20 2.21 3.30 3.42 Capacity, Delay and Level of Service Northbound Eastbound Southbound Approach Westbound L1 L2 L3 L1 12 L3 L1 12 L3 L1 12 L3 Configuration LT TR TR LT 367 203 88 88 Flow Rate, v (veh/h) Capacity (veh/h) 655 799 680 664 95% Queue Length, Q95 (veh) 3.7 1.0 0.4 0.5 Control Delay (s/veh) 15.2 8.7 9.1 9.2 Level of Service, LOS C Α Α Α Approach Delay (s/veh) | LOS 129 В 9.1 Α 9.2

Intersection Delay (s/veh) | LOS

12.0

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. **Date Performed** 6/26/2023 Analysis Year 2030 Analysis Time Period (hrs) 1.00 Time Analyzed AM Peak Radar Hill 1416 Corridor Study - Interim **Project Description** EB Highway 1416 and S Ellsworth Rd Intersection Jurisdiction Box Elder, SD East/West Street EB Highway 1416 S Ellsworth Rd North/South Street Peak Hour Factor 0.84 Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 650 Volume (veh/h) 335 16 190 59 62 96 % Thrus in Shared Lane 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L3 L1 L2 L3 L2 L3 L1 L2 L3 11 12 11 Lane LT Configuration TR TR LT Flow Rate, v (veh/h) 973 218 296 188 Percent Heavy Vehicles 4 4 1 5 3.20 3.20 3.20 3.20 Initial Departure Headway, hd (s) 0.167 Initial Degree of Utilization, x 0.865 0.194 0.263 Final Departure Headway, hd (s) 6.47 6.01 6.04 6.52 Final Degree of Utilization, x 1.750 0.365 0.497 0.341 2.3 2.3 2.0 20 Move-Up Time, m (s) Service Time, ts (s) 4.17 3.71 4.04 4.52 Capacity, Delay and Level of Service Northbound Eastbound Southbound Approach Westbound L1 L2 L3 L1 12 L3 L1 12 L3 L1 12 L3 Configuration LT TR TR LT 973 218 296 188 Flow Rate, v (veh/h) Capacity (veh/h) 556 599 596 552 95% Queue Length, Q95 (veh) 215.4 1.7 2.9 1.5 Control Delay (s/veh) 1374.5 12.2 15.0 12.9 Level of Service, LOS F В В В Approach Delay (s/veh) | LOS 1124.8 F 15.0 В 12.9 В

Intersection Delay (s/veh) | LOS

803.7

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. **Date Performed** 6/26/2023 Analysis Year 2030 Analysis Time Period (hrs) 1.00 Time Analyzed PM Peak Radar Hill 1416 Corridor Study - Interim **Project Description** EB Highway 1416 and S Ellsworth Rd Intersection Jurisdiction Box Elder, SD East/West Street EB Highway 1416 S Ellsworth Rd North/South Street Peak Hour Factor 0.90 Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 306 Volume (veh/h) 150 152 87 22 22 100 % Thrus in Shared Lane 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L3 L1 L2 L3 L2 L3 L1 L2 L3 11 12 11 Lane LT Configuration TR TR LT Flow Rate, v (veh/h) 423 252 121 136 Percent Heavy Vehicles 4 4 1 5 3.20 3.20 3.20 3.20 Initial Departure Headway, hd (s) Initial Degree of Utilization, x 0.376 0.224 0.108 0.120 Final Departure Headway, hd (s) 5.71 4.84 5.53 5.72 Final Degree of Utilization, x 0.672 0.339 0.186 0.216 2.3 2.0 23 20 Move-Up Time, m (s) Service Time, ts (s) 3.41 2.54 3.53 3.72 Capacity, Delay and Level of Service Northbound Eastbound Southbound Approach Westbound L1 L2 L3 L1 12 L3 L1 12 L3 L1 12 L3 Configuration LT TR TR LT 423 252 121 136 Flow Rate, v (veh/h) Capacity (veh/h) 630 744 651 629 95% Queue Length, Q95 (veh) 5.8 1.5 0.7 0.8 Control Delay (s/veh) 19.9 10.0 9.8 10.3 Level of Service, LOS C В В Α Approach Delay (s/veh) | LOS 16.2 C 9.8 Α 10.3 В

Intersection Delay (s/veh) | LOS

14.5

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. Date Performed 6/26/2023 Analysis Year 2023 Analysis Time Period (hrs) 1.00 Time Analyzed AM Peak Radar Hill 1416 Corridor Study - Interim **Project Description** WB Highway 1416 and Radar Hill Rd Intersection Jurisdiction Box Elder, SD East/West Street WB Highway 1416 Radar Hill Rd North/South Street Peak Hour Factor 0.88 Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 79 5 5 Volume (veh/h) 334 167 17 16 % Thrus in Shared Lane 50 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L2 L3 L2 L3 L2 L3 L2 L3 11 11 11 11 Lane TR Configuration LT TR LT Flow Rate, v (veh/h) 280 195 195 38 Percent Heavy Vehicles 5 5 4 3 3.20 3.20 3.20 Initial Departure Headway, hd (s) 3.20 0.033 Initial Degree of Utilization, x 0.248 0.174 0.174 Final Departure Headway, hd (s) 5.39 5.21 5.33 5.08 Final Degree of Utilization, x 0.419 0.283 0.289 0.053 2.3 2.0 23 20 Move-Up Time, m (s) Service Time, ts (s) 3.09 2.91 3.33 3.08 Capacity, Delay and Level of Service Northbound Southbound Approach Eastbound Westbound L1 12 L3 L1 L2 L3 L1 12 L3 L1 L2 L3 Configuration LT TR LT TR 280 195 195 38 Flow Rate, v (veh/h) 668 691 676 709 Capacity (veh/h) 95% Queue Length, Q95 (veh) 2.1 1.2 1.2 0.2 Control Delay (s/veh) 12.0 10.0 10.5 8.4 Level of Service, LOS В Α В Α Approach Delay (s/veh) | LOS 11.1 В 10.5 В 8.4

Intersection Delay (s/veh) | LOS

10.8

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. Date Performed 6/26/2023 Analysis Year 2023 Analysis Time Period (hrs) 1.00 Time Analyzed PM Peak Radar Hill 1416 Corridor Study - Interim **Project Description** Intersection WB Highway 1416 and Radar Hill Rd Jurisdiction Box Elder, SD East/West Street WB Highway 1416 Radar Hill Rd North/South Street 0.94 Peak Hour Factor Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 10 Volume (veh/h) 184 531 3 112 28 13 % Thrus in Shared Lane 50 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L2 L3 L2 L3 L2 L3 L2 L3 11 11 11 11 Lane TR Configuration LT TR LT Flow Rate, v (veh/h) 478 286 149 24 4 Percent Heavy Vehicles 5 5 3 3.20 3.20 3.20 Initial Departure Headway, hd (s) 3.20 Initial Degree of Utilization, x 0.425 0.254 0.132 0.022 Final Departure Headway, hd (s) 5.31 5.10 5.74 5.54 Final Degree of Utilization, x 0.705 0.404 0.237 0.038 2.3 2.0 23 20 Move-Up Time, m (s) Service Time, ts (s) 3.01 2.80 3.74 3.54 Capacity, Delay and Level of Service Northbound Southbound Approach Eastbound Westbound L1 12 L3 L1 L2 L3 L1 12 L3 L1 L2 L3 Configuration LT TR LT TR 478 286 149 24 Flow Rate, v (veh/h) 678 706 627 650 Capacity (veh/h) 95% Queue Length, Q95 (veh) 6.7 2.0 0.9 0.1 Control Delay (s/veh) 20.4 11.2 10.5 8.8 Level of Service, LOS C В В Α Approach Delay (s/veh) | LOS 17.0 C 10.5 В 8.8

Intersection Delay (s/veh) | LOS

15.8

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. Date Performed 6/26/2023 Analysis Year 2030 Analysis Time Period (hrs) 1.00 Time Analyzed AM Peak Radar Hill 1416 Corridor Study - Interim **Project Description** WB Highway 1416 and Radar Hill Rd Intersection Jurisdiction Box Elder, SD East/West Street WB Highway 1416 Radar Hill Rd North/South Street Peak Hour Factor 0.88 Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 454 7 179 17 Volume (veh/h) 107 28 37 % Thrus in Shared Lane 50 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L2 L3 L2 L3 L2 L3 L2 L3 11 11 11 11 Lane TR Configuration LT TR LT Flow Rate, v (veh/h) 380 266 235 61 Percent Heavy Vehicles 5 5 4 3 3.20 3.20 3.20 Initial Departure Headway, hd (s) 3.20 Initial Degree of Utilization, x 0.236 0.209 0.055 0.337 Final Departure Headway, hd (s) 5.61 5.43 5.68 5.63 Final Degree of Utilization, x 0.592 0.401 0.371 0.096 2.3 2.0 2.0 23 Move-Up Time, m (s) Service Time, ts (s) 3.31 3.13 3.68 3.63 Capacity, Delay and Level of Service Northbound Eastbound Southbound Approach Westbound L1 12 L3 L1 L2 L3 L1 12 L3 L1 L2 L3 Configuration LT TR LT TR 380 266 235 61 Flow Rate, v (veh/h) 641 663 633 640 Capacity (veh/h) 95% Queue Length, Q95 (veh) 4.2 2.0 1.8 0.3 Control Delay (s/veh) 16.4 11.8 12.0 9.2 Level of Service, LOS C В В Α Approach Delay (s/veh) | LOS 14.5 В 12.0 В 9.2

Intersection Delay (s/veh) | LOS

13.5

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. Date Performed 6/26/2023 Analysis Year 2030 Analysis Time Period (hrs) 1.00 Time Analyzed PM Peak Radar Hill 1416 Corridor Study - Interim **Project Description** WB Highway 1416 and Radar Hill Rd Intersection Jurisdiction Box Elder, SD East/West Street WB Highway 1416 Radar Hill Rd North/South Street Peak Hour Factor 0.94 Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 605 118 34 Volume (veh/h) 209 4 18 11 % Thrus in Shared Lane 50 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L2 L3 L2 L3 L2 L3 L2 L3 11 11 11 11 Lane TR Configuration LT TR LT Flow Rate, v (veh/h) 544 326 162 31 Percent Heavy Vehicles 5 5 4 3 3.20 3.20 3.20 Initial Departure Headway, hd (s) 3 20 Initial Degree of Utilization, x 0.484 0.290 0.144 0.027 Final Departure Headway, hd (s) 5.38 5.17 5.90 5.76 Final Degree of Utilization, x 0.814 0.468 0.265 0.049 2.3 2.0 23 20 Move-Up Time, m (s) Service Time, ts (s) 3.08 2.87 3.90 3.76 Capacity, Delay and Level of Service Northbound Southbound Approach Eastbound Westbound L1 12 L3 L1 L2 L3 L1 12 L3 L1 L2 L3 Configuration LT TR LT TR 544 326 162 31 Flow Rate, v (veh/h) 669 697 611 625 Capacity (veh/h) 1.1 95% Queue Length, Q95 (veh) 11.1 2.6 0.2 Control Delay (s/veh) 30.1 12.4 11.0 9.1 Level of Service, LOS D В В Α Approach Delay (s/veh) | LOS 23.5 C 11.0 В 9.1

Intersection Delay (s/veh) | LOS

21.2

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. **Date Performed** 6/26/2023 Analysis Year 2023 Analysis Time Period (hrs) 1.00 Time Analyzed AM Peak Radar Hill 1416 Corridor Study -Interim **Project Description** EB Highway 1416 and Radar Hill Rd Intersection Jurisdiction Box Elder, SD East/West Street EB Highway 1416 Radar Hill Rd North/South Street Peak Hour Factor 0.88 Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 4 55 Volume (veh/h) 527 168 236 8 88 % Thrus in Shared Lane 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L3 L1 L2 L3 L2 L3 L1 L2 L3 11 12 11 Lane LT Configuration TR TR LT Flow Rate, v (veh/h) 304 362 459 109 Percent Heavy Vehicles 4 4 4 3 3.20 3.20 3.20 3.20 Initial Departure Headway, hd (s) Initial Degree of Utilization, x 0.270 0.322 0.408 0.097 Final Departure Headway, hd (s) 6.19 6.06 5.39 6.36 Final Degree of Utilization, x 0.523 0.609 0.688 0.193 2.3 2.0 23 20 Move-Up Time, m (s) Service Time, ts (s) 3.89 3.76 3.39 4.36 Capacity, Delay and Level of Service Northbound Eastbound Southbound Approach Westbound L1 L2 L3 L1 12 L3 L1 12 L3 L1 L2 L3 Configuration LT TR TR LT 304 362 459 109 Flow Rate, v (veh/h) Capacity (veh/h) 582 594 667 566 95% Queue Length, Q95 (veh) 3.2 4.5 6.2 0.7 Control Delay (s/veh) 15.6 18.1 20.0 10.9 Level of Service, LOS C C C В Approach Delay (s/veh) | LOS 17.0 C 20.0 C 10.9 В

Intersection Delay (s/veh) | LOS

17.6

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. **Date Performed** 6/26/2023 Analysis Year 2023 Analysis Time Period (hrs) 1.00 Time Analyzed PM Peak Radar Hill 1416 Corridor Study - Interim **Project Description** Intersection EB Highway 1416 and Radar Hill Rd Jurisdiction Box Elder, SD East/West Street EB Highway 1416 Radar Hill Rd North/South Street Peak Hour Factor 0.94 Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 19 193 116 4 Volume (veh/h) 401 121 193 % Thrus in Shared Lane 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L3 L1 L2 L3 L2 L3 L1 L2 L3 11 12 11 Lane LT Configuration TR TR LT Flow Rate, v (veh/h) 234 419 252 210 Percent Heavy Vehicles 4 4 4 3 3.20 3.20 3.20 3.20 Initial Departure Headway, hd (s) Initial Degree of Utilization, x 0.208 0.372 0.224 0.186 Final Departure Headway, hd (s) 5.94 5.55 5.57 5.91 Final Degree of Utilization, x 0.385 0.645 0.390 0.344 2.3 2.0 23 20 Move-Up Time, m (s) Service Time, ts (s) 3.64 3.25 3.57 3.91 Capacity, Delay and Level of Service Northbound Eastbound Southbound Approach Westbound L1 L2 L3 L1 12 L3 L1 12 L3 L1 12 L3 Configuration LT TR TR LT 234 419 252 210 Flow Rate, v (veh/h) 606 649 646 609 Capacity (veh/h) 95% Queue Length, Q95 (veh) 1.9 5.2 1.9 1.6 Control Delay (s/veh) 12.3 18.2 12.1 12.0 Level of Service, LOS В C В В Approach Delay (s/veh) | LOS 16.1 C 12.1 В 12.0 В

Intersection Delay (s/veh) | LOS

14.4

HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. **Date Performed** 6/26/2023 Analysis Year 2030 Analysis Time Period (hrs) 1.00 Time Analyzed AM Peak Radar Hill 1416 Corridor Study - Interim **Project Description** Intersection EB Highway 1416 and Radar Hill Rd Jurisdiction Box Elder, SD East/West Street EB Highway 1416 Radar Hill Rd North/South Street Peak Hour Factor 0.88 Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 5 314 Volume (veh/h) 702 64 197 12 111 % Thrus in Shared Lane 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L3 L1 L2 L3 L2 L3 L1 L2 L3 11 12 11 Lane LT Configuration TR TR LT Flow Rate, v (veh/h) 405 472 581 140 Percent Heavy Vehicles 4 4 4 3 3.20 3.20 3.20 3.20 Initial Departure Headway, hd (s) Initial Degree of Utilization, x 0.360 0.419 0.516 0.124 Final Departure Headway, hd (s) 6.73 6.61 5.79 7.02 Final Degree of Utilization, x 0.756 0.866 0.934 0.273 2.3 2.0 23 20 Move-Up Time, m (s) Service Time, ts (s) 4.43 4.31 3.79 5.02 Capacity, Delay and Level of Service Northbound Eastbound Southbound Approach Westbound L1 L2 L3 L1 12 L3 L1 12 L3 L1 12 L3 Configuration LT TR TR LT 405 472 581 140 Flow Rate, v (veh/h) Capacity (veh/h) 535 544 622 513 95% Queue Length, Q95 (veh) 8.3 14.0 20.9 1.1 Control Delay (s/veh) 29.4 46.4 64.3 12.7 Level of Service, LOS D Ε F В Approach Delay (s/veh) | LOS 38.6 Ε 64.3 F 12.7 В

Intersection Delay (s/veh) | LOS

45.7

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HCS All-Way Stop Control Report General and Site Information Lanes Analyst Emma Myers-Verhage Agency/Co. **Date Performed** 6/26/2023 Analysis Year 2030 Analysis Time Period (hrs) 1.00 Time Analyzed PM Peak Radar Hill 1416 Corridor Study - Interim **Project Description** Intersection EB Highway 1416 and Radar Hill Rd Jurisdiction Box Elder, SD East/West Street EB Highway 1416 Radar Hill Rd North/South Street Peak Hour Factor 0.94 Turning Movement Demand Volumes Approach Eastbound Westbound Northbound Southbound Movement L 475 205 5 Volume (veh/h) 20 132 138 206 % Thrus in Shared Lane 50 Lane Flow Rate and Adjustments Approach Eastbound Westbound Northbound Southbound L3 L1 L2 L3 L2 L3 L1 L2 L3 11 12 11 Lane LT Configuration TR TR LT Flow Rate, v (veh/h) 274 471 287 224 Percent Heavy Vehicles 4 4 4 3 3.20 3.20 3.20 3.20 Initial Departure Headway, hd (s) Initial Degree of Utilization, x 0.243 0.418 0.255 0.200 Final Departure Headway, hd (s) 6.12 5.75 5.79 6.18 Final Degree of Utilization, x 0.466 0.752 0.462 0.385 2.3 2.3 2.0 20 Move-Up Time, m (s) Service Time, ts (s) 3.82 3.45 3.79 4.18 Capacity, Delay and Level of Service Northbound Eastbound Southbound Approach Westbound L1 L2 L3 L1 12 L3 L1 12 L3 L1 12 L3 Configuration LT TR TR LT 274 471 287 224 Flow Rate, v (veh/h) 588 626 622 582 Capacity (veh/h) 95% Queue Length, Q95 (veh) 2.6 8.2 2.5 1.9 Control Delay (s/veh) 14.1 25.3 13.7 13.0 Level of Service, LOS В D В В Approach Delay (s/veh) | LOS 21.2 C 13.7 В 13.0 В

Intersection Delay (s/veh) | LOS

18.0

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Jurisdiction		Box Elder, Sd		Time F		AM Pe	eak		PHF		1.00			w∳t	→ #
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Intersection		Hwy 1416 and Libe		IL	ame	Hwy1	416-Lib	erty_A	It1_AMP	eak2030).xus			*	
Project Descrip	tion	Radar Hill 1416 Co	rridor St	udy									2		新 (F
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Signal Informa		D (D)	_	-		12 }	크센塚					<u> </u>	,		кŤж
Cycle, s	58.0	Reference Phase	2	1	R		T:	2				1	♦ 2	3	4
Offset, s	0	Reference Point	End	Green		12.5	22.5	0.0		0.0			<u> </u>		T
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Force Mode	ce Mode Fixed Simult. Gap N/S O					1.0	1.0	0.0	0.0	0.0		5	6	7	8
Timer Results				EBI		EBT	WB	ı	WBT	NBI		NBT	SB		SBT
Assigned Phase						2	1		6			4			8
Case Number	•					4.0	0.0		14.0			8.0			7.0
Phase Duration						31.0	0.0		17.0		_	27.0			27.0
Change Period,		,) s		14.0 4.5	_	4.5	3.5		4.5			4.5			4.5
Max Allow Head				3.0	_	3.0	0.0	_	3.0		_	3.2			3.2
Queue Clearan				10.6		5.1	0.0		11.8			3.5			5.8
Green Extensio		, = ,		0.0	_	0.7	0.0	_	0.7		_	0.5		_	0.5
Phase Call Prol		(g e), 3		0.99	-	1.00	0.0		1.00			1.00	1		1.00
Max Out Proba				1.00	_	0.00			0.00		_	0.00			0.00
Wax Gut Foba	Jiirty			1.00		0.00			0.00			0.00			0.00
Movement Gro	up Res	sults			EB			WB			NB			SB	
Approach Move	ment			L	Т	R	L	Т	R	L	Т	R	L	Т	R
Assigned Move	ment			5	2	12	1	6	16	7	4	14	3	8	18
Adjusted Flow F	Rate (v), veh/h		326	153			268			65			79	141
Adjusted Satura	ation Flo	ow Rate (s), veh/h/l	n	1615	1689			1508			1643			1414	1448
Queue Service	Time (g	g s), S		8.6	3.1			5.0			0.0			0.5	3.8
Cycle Queue C	learance	e Time (<i>g c</i>), s		8.6	3.1			9.8			1.5			2.0	3.8
Green Ratio (g	/C)			0.41	0.46			0.22			0.39			0.39	0.39
Capacity (c), v	eh/h			440	772			426			703			658	562
Volume-to-Capa	acity Ra	tio (X)		0.742	0.198			0.629)		0.092			0.120	0.251
Back of Queue	(Q), ft	/In (95 th percentile)	141.4	39.1			137.3	3		25			27.3	53
Back of Queue	(Q), ve	eh/ln (95 th percenti	le)	5.5	1.5			5.3			1.0			1.1	2.1
Queue Storage	Ratio (RQ) (95 th percent	tile)	0.00	0.00			0.00			0.00			0.00	0.00
Uniform Delay ((d 1), s	/veh		14.1	9.4			21.7			11.3			11.4	12.0
Incremental De	lay (d 2), s/veh		6.1	0.0			0.6			0.3			0.4	1.1
Initial Queue De	elay (d	з), s/veh		0.0	0.0			0.0			0.0			0.0	0.0
Control Delay (d), s/ve	eh		20.2	9.4			22.3			11.6			11.8	13.1
Level of Service	(LOS)			С	Α			С			В			В	В
Approach Delay	Approach Delay, s/veh / LOS					В	22.3	3	С	11.6	6	В	12.	7	В
Intersection De	Intersection Delay, s/veh / LOS					17	7.0						В		
Multimodal Pa	Multimodal Results							WB			NB			SB	
	Pedestrian LOS Score / LOS					В	1.91		В	1.67		В	1.89		В
Bicycle LOS Sc				1.66		A	0.93	-	A	0.59		A	0.8		A
Dicycle LOS 30	JIG / LC	,,,		1.20	,	А	0.93		^	0.38	,		0.0		А

Control Information			HCS	Sigr	alize	d Inte	ersect	ion R	esul	ts Sum	mary	•				
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Demand Information		ion	<u> </u>	•		ame	∥⊓wy i-	4 10-LID	erty_A	ILI_AIVIPE	eakzuot).xus			ararahan ∳*	8188
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Demand (v), veh/h	Demand Inform	nation				EB		Т	WI	3	1	NB			SB	
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Signal Information	• •				326	146	_	6	76	3 173	4	51	10	59	17	119
Cycle, s 60.9 Reference Priss 2 2 2 6 6 9 9 18.1 19.4 0.0																
Offiser S	Signal Information	tion				2	2 6	크세.					_	_		\mathbf{L}
Offiser S	Cycle, s	60.9	Reference Phase	2		Ħ		T 54	2			×		♦ ,)]	5 †3
Discordinated Yes Simult. Gap E/M On Red 1.0 3.5 3.5 3.5 0.0	Offset, s	0	Reference Point	End	Green	9.9		- :1		0.0	0.0			K.	1	7
Timer Results	Uncoordinated	Yes	Simult. Gap E/W	On					_				/	₹		ND.
Assigned Phase 5 2 1 6 3 8 7 4 Case Number 1.1 4.0 0.0 14.0 11.0 14.2 14.0 13.3 Phase Duration, s 14.4 37.0 0.0 22.6 0.0 23.9 0.0 23.9 Change Period, (Y+R c), s 4.5 4.5 4.0 4.5 4.0 4.5 4.0 4.5 4.5 4.5 4.0 3.2 0.0 3.2 0.0 3.2 0.0 3.2 0.0 3.2 0.0 3.2 0.0 3.2 0.0 3.2 0.0<	Force Mode	rce Mode Fixed Simult. Gap N/S C					1.0	1.0	0.0	0.0	0.0		5	6	7	8
Assigned Phase 5 2 1 6 3 8 7 4 Case Number 1.1 4.0 0.0 14.0 11.0 14.2 14.0 13.3 Phase Duration, s 14.4 37.0 0.0 22.6 0.0 23.9 0.0 23.9 Change Period, (Y+R c), s 4.5 4.5 4.0 4.5 4.0 4.5 4.0 4.5 4.5 4.5 4.0 3.2 0.0 3.2 0.0 3.2 0.0 3.2 0.0 3.2 0.0 3.2 0.0 3.2 0.0 3.2 0.0<														11		
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Phase Duration, s 14.4 37.0 0.0 22.6 0.0 23.9 0.0 23.9 Change Period, (YFR c), s 4.5 4.5 4.0 4.5 4.0 4.5 4.5 4.5 4.5 4.0 4.5 4.5 4.5 4.5 4.5 4.0 4.5 4.5 4.5 4.5 4.0 4.5 4.5 4.5 4.5 4.5 4.0 4.5 4.5 4.5 4.5 4.0 3.0 0.0 3.2 0.0 3.2 0.0 3.2 0.0 3.2 0.0 8.2 Green Extension Time (g s), s 9.5 4.7 0.6 0.0 1.00	_	signed Phase							_	_	_			_		
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Max Allow Headway (MAH), s 3.0 8.2 3.0 8.2 3.0		se Duration, s						_	-	_		-				
Queue Clearance Time (g s), s 9.5 4.7 0.6 0.0 0.0 0.0 0.0 0.1 0.0 0		•				_			_						_	
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Movement Group Results LB UB UB UB T R L T L D D D<						_			_			_				
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Approach Movement L T R L T Q 14 14 14 14 14 14 14 14 14 14 14 14 14 14 14 14 14 15	Movement Gree	un Pos	sulte			ED			\//D			NR			S.B.	
Assigned Movement			suits		-		Р		Tr.	_	1		P		1	P
Adjusted Flow Rate (v), veh/h 326 149 255 65 65 76 119 Adjusted Saturation Flow Rate (s), veh/h/ln 1667 1744 757 1698 508 508 Queue Service Time (g s), s 7.5 2.7 5.0 1.7 1698 0.0 0.0 0.0 Cycle Queue Clearance Time (g s), s 7.5 2.7 18.1 1.7 1.7 6.2 0.0 0.2 1.7 0.2 6.2 1.7 0.32 0.										\rightarrow			-	_		_
Adjusted Saturation Flow Rate (s), veh/h/ln 1667 1744 757 1698 508) veh/h				12	-			3	_	10			
Queue Service Time (g_s), s 7.5 2.7 B.0 1.7 1.7 0.0 0.0 Cycle Queue Clearance Time (g_c), s 7.5 2.7 18.1 1.7 0.32 0.33 0.33 0.33 0.33 0.33 0.33 0.33 0.33 0.34 0.34 0.34 0.34 0.34 0.34 0.34 0.34 0.34 0.34 0.34 0.34 0.34 0.34 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 <td></td> <td></td> <td>,</td> <td>,</td> <td></td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>110</td>			,	,					-							110
Cycle Queue Clearance Time (g c), s 7.5 2.7 Image: Composition of the properties of the proper			· , ,							_						
Green Ratio (g/C) 0.49 0.53 0.30 0.32 0.33 0.31 0.31 0.31 0.31 0.31 0.31 0.31 0.32 0.32 0.32 0.32 0.33 0.32 0.31 0.31 0.32 0.33 0.32 0.33 <th< td=""><td></td><td></td><td>- ,</td><td></td><td></td><td></td><td></td><td></td><td>_</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>			- ,						_							
Capacity (c), veh/h 389 931 313 615 267 Volume-to-Capacity Ratio (X) 0.837 0.160 0.816 0.106 0.285 Back of Queue (Q), ft/ln (95 th percentile) 96 30.3 173.8 29.4 39.9 Back of Queue (Q), veh/ln (95 th percentile) 3.8 1.2 7.0 1.2 1.6 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 13.1 7.2 18.7 14.7 15.8 15.8 Incremental Delay (d 2), s/veh 1.9 0.0 16.1 0.3 2.7 1.6 Initial Queue Delay (d 3), s/veh 0.0 0			c mic (g :), 3													
Volume-to-Capacity Ratio (X) 0.837 0.160 0.816 0.816 0.106 0.285 0.285 Back of Queue (Q), flyin (95 th percentile) 96 30.3 173.8 29.4 39.9 39.9 18.7 1.2 1.2 1.6 38.9 1.6 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>_</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>										_						
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Multimodal Results EB WB NB SB Pedestrian LOS Score / LOS 1.65 B 1.91 B 1.71 B 1.90 B							В	34 9		C	15.0	_	В	7 2		
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					1.65	5	В	1.9	1	В	1.71		В	1.90		В
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General Inform	nation	Y							Intersec		1			J. J.	
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Analyst		Emma Myers-Verha	age			e Aug 8	<u> </u>		Area Typ	е	Othe	r			2. 2.
Jurisdiction		Box Elder, SD		Time F		PM P	eak		PHF		1.00		<u></u>	w∯t	→
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Intersection		Hwy 1416 and Libe		IL	ame	Hwy1	416-Lib	erty_A	lt1_PMP	eak2030	O.xus			*	
Project Descrip	tion	Radar Hill 1416 Co	rridor St	udy									3		1611年
Demand Inform	nation				EB			W	В		NB			SB	
Approach Move	ement			L	Т	R	L	Т	R	L	T	R	L	Т	R
Demand (v), v	eh/h			38	43	13	4	28	3 55	8	11	2	112	21	55
Signal Informa	tion				1										
Cycle, s	37.5	Reference Phase	2	-	12		날씨					<u> </u>	\mathbf{z}	\	本
Offset, s	0	Reference Point	End	1	R			7				1	7 2	3	4
Uncoordinated	Yes	Simult. Gap E/W	On	Green		3.9	18.5	0.0		0.0		_	A		
		·		Yellow	-	3.5	3.5	0.0		0.0			×	7	Ψ.
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.0	1.0	1.0	0.0	0.0	0.0		5	6	1	8
Timer Results				EBI		EBT	WB	L	WBT	NB	L	NBT	SB	L	SBT
Assigned Phase	е			5		2	1		6	3		8	7		4
Case Number	-					4.0	0.0		14.0	11.0)	14.2	14.0	0	13.3
Phase Duration						14.5	0.0		8.4	0.0		23.0	0.0		23.0
Change Period,	, (Y+R	c), S		4.5		4.5	4.5	5	4.5	4.5		4.5	4.5	,	4.5
Max Allow Head	dway (<i>N</i>	<i>MAH</i>), s		3.0		3.1	0.0		3.1	0.0		3.2	0.0		3.0
Queue Clearan		· · · · · · · · · · · · · · · · · · ·		2.7		2.9			4.0			2.2			5.2
Green Extensio	n Time	(g e), s		0.0		0.2	0.0	,	0.2	0.0		0.0	0.0		0.2
Phase Call Prol	bability	, <u> </u>		0.33	3	0.85			0.77			1.00	1		1.00
Max Out Proba	bility			1.00)	0.00			0.00			0.00			0.00
M	D							\A/D			ND			OD	
Movement Gro		SUITS		-	EB	Ι.		WB	_		NB			SB	Τ.
Approach Move				L	T	R	L	Т	R	L	T	R	L	T	R
Assigned Move		\ I- /I-		5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow F		,		38	56			87			21		-	133	55
		ow Rate (s), veh/h/l	n	1667	1680		-	157		-	1605		-	831	
Queue Service	, -			0.7	0.9		-	2.0	+	-	0.2		-	0.0	
Cycle Queue C		e fille (g_c) , s		0.7	0.9		-	0.10		-	0.2	-	-	0.49	-
Green Ratio (g	· ·			0.20	448			281	_		926		-	587	
		tio (V)						_					-		+
Volume-to-Capa		Itio (X) In (95 th percentile)	0.114 8.1	0.125 10.3			0.31			0.023			0.227	
		eh/In (95 th percenti		0.3	0.4			0.9			0.1			0.7	
		RQ) (95 th percent		0.00	0.00			0.00			0.00			0.00	
Uniform Delay ((d 1), s	/veh		12.5	10.4			16.0			4.9			5.5	
Incremental De	lay (d 2), s/veh		0.1	0.0			0.2			0.0			0.9	
Initial Queue De	- '	•		0.0	0.0			0.0			0.0			0.0	
Control Delay (d), s/ve	eh		12.5	10.5			16.2			4.9			6.4	0.0
Level of Service	e (LOS)			В	В			В			Α			Α	А
Approach Delay				11.3	3	В	16.2	2	В	4.9		Α	4.6		Α
Intersection De	Intersection Delay, s/veh / LOS					8	8.8						Α		
Multimodal Po	Multimodal Results							WB			NB			SB	
	Pedestrian LOS Score / LOS					В	1.9		В	1.69	-	В	1.86		В
Bicycle LOS Sc				1.66 0.64		A	0.63		A	0.52		A	0.80		A
, 5 200 00				3.5			3.5			3.02			3.50		

		HCS	S Sigr	nalize	d Int	ersect	ion R	esu	lts	Sum	mary	•				
															MATERIA SA STATE	erani i i i i i i i i i i i i i i i i i i
General Inform	nation	Y										ormati				130134
Agency						1				ration,		1.000				\$ 1 P
Analyst		Emma Myers-Verha	age	<u> </u>		e Aug 8				еа Туре	;	Othe	r			2. 2.
Jurisdiction		Box Elder, SD		Time F		PM Pe	eak		PHI			1.00			w∄t	→ 33
Urban Street		Alternative 1		Analys						alysis F		1> 7:	00			90 60
Intersection		Hwy 1416 and Libe			ame	Hwy1	416-Lib	erty_A	\lt1_	_PMPe	ak2050).xus		\sqcup \neg	*	
Project Descrip	tion	Radar Hill 1416 Co	rridor St	udy												136 後
Demand Inform	nation				EB			W	'B			NB			SB	
Approach Move	ement			L	Т	R	L	T	Г	R	L	Т	R	L	Т	R
Demand (v), v	eh/h			40	46	13	4	3	0	58	8	11	2	118	22	58
															"	
Signal Informa		1	Г -	1	La	2 5	크센도						_		Κ.	人
Cycle, s	42.5	Reference Phase	2		R		50	2					1	↔ 2	3	4
Offset, s	0	Reference Point	End	Green	1.9	4.2	23.0	0.0)	0.0	0.0			Ā	1	
Uncoordinated		Simult. Gap E/W	On	Yellow Red	3.5	3.5	3.5	0.0		0.0	0.0		/		\	V
Force Mode	ce Mode Fixed Simult. Gap N/S O					1.0	1.0	0.0)	0.0	0.0		5	6	7	8
Timer Results	ner Results					EBT	WB	L	W	ВТ	NBI		NBT	SE	BL	SBT
Assigned Phase						2	1	\neg	6	6	3	\neg	8	7		4
Case Number						4.0	0.0		14	1.0	11.0)	14.2	0.0)	13.3
	e Number se Duration, s					15.0	0.0	_	8.	_	0.0	_	27.5	0.0		27.5
Change Period,		c). S		6.4 4.5		4.5	4.5	_	4.	_	4.5	_	4.5	4.:		4.5
Max Allow Head	•	<u>, </u>		3.0		3.1	0.0	_	3.	\rightarrow	0.0	_	3.2	0.0		3.0
Queue Clearan				2.8		3.2	0.0		4.	_	0.0		2.2	0.0		5.7
Green Extensio		, = ,		0.0		0.2	0.0		0.	_	0.0		0.0	0.0)	0.3
Phase Call Prol		(90),0		0.38	3	0.90	0.0	_	3.0	\rightarrow	0.0		1.00	0		1.00
Max Out Proba				1.00	_	0.00		\neg	0.0	_		\neg	0.00			0.00
Movement Gro	up Res	sults			EB			WE	3			NB			SB	
Approach Move	ement			L	T	R	L	T		R	L	T	R	L	T	R
Assigned Move	ment			5	2	12	1	6		16	3	8	18	7	4	14
Adjusted Flow F	Rate(<i>v</i>), veh/h		40	59			92				21			140	58
		ow Rate (s), veh/h/l	ln	1667	1683			157	-			1600		_	794	
Queue Service		- /·		0.8	1.2			2.4	_			0.2			0.0	
Cycle Queue C		e Time (<i>g c</i>), s		0.8	1.2			2.4	\rightarrow			0.2			3.7	
Green Ratio (g				0.19	0.25			0.10)			0.54			0.54	
Capacity (c), v				299	417			259	_			984		_	585	
Volume-to-Capa		· ,		0.134	0.141			0.35	5			0.021		_	0.239	
		t/In (95 th percentile		10.9	14.3			31	_	_		3.1		-	20.2	-
		eh/ln (95 th percent	-	0.4	0.6		_	1.2	\rightarrow	_		0.1		-	0.8	-
		RQ) (95 th percent	tile)	0.00	0.00		_	0.00	_	_		0.00		+	0.00	+
Uniform Delay (` '			14.6	12.5		_	18.4	_	_		4.5		-	5.2	-
Incremental De				0.1	0.1			0.3	_			0.0			1.0	
Initial Queue De				0.0 14.6	0.0 12.5			0.0	_	_		0.0			0.0	0.0
	Control Delay (d), s/veh evel of Service (LOS)							18.7	/			4.6			6.2	0.0
	Approach Delay, s/veh / LOS					P	40.7	B			4.0	A	^	4	A A	A
		13.4		В	18.7 .8		E		4.6		Α	A 4.4	+	Α		
microconon De	Intersection Delay, s/veh / LOS					9										
Multimodal Re	Multimodal Results							WE	3			NB			SB	
Pedestrian LOS	Pedestrian LOS Score / LOS					В	1.91	1	Е	3	1.69)	В	1.8	6	В
Bicycle LOS Sc	cycle LOS Score / LOS					Α	0.64	1	Α	4	0.52	2	Α	0.8	1	Α

					НС	S Rou	ında	bοι	ıts	Rep	ort								
General Information		_	_				_	_			natio	n	_	Т	_	_		_	
Analyst	Emma	Myers-	Verhag	je			4		A .		Inters	section			П	Highw	ay 14	.16 and l	iberty Bl
Agency or Co.									h		E/W S	Street Na	me			Highw	ay 14	16	
Date Performed	8/3/2	023								4	N/S S	Street Na	me			Liberty	Blvd		
Analysis Year	2030					K +	W	† E S		1 >	Analy	sis Time	Period,	hrs		1.00			
Time Analyzed	AM P	eak				*					Peak	Hour Fac	tor			0.84			
Project Description	Alterr	native 1						→ V *	1		Juriso	diction				Box Eld	der, S	D	
Volume Adjustments	and S	ite Cl	narac	teri	istic	:s													
Approach		E	В				٧	VB				Ν	IB					SB	
Movement	U	L	Т		R	U	L	Т		R	U	L	Т	П	R	U	L	Т	R
Number of Lanes (N)	0	0	1		0	0	0	1		0	0	0	1		0	0	0	1	0
Lane Assignment				LTR					LTR				L	.TR					LTR
Volume (V), veh/h										171	0	4	51		10	0	60	19	141
Percent Heavy Vehicles, %	8	8	8		8	7	7	7		7	2	2	2	T	2	9	9	9	9
Flow Rate (VPCE), pc/h							9	115	5	218	0	5	62		12	0	78	25	183
Right-Turn Bypass	No	one				N	one				No	ne				ı	None		
Conflicting Lanes													1					1	
Pedestrians Crossing, p/h			0					0				()					0	
Proportion of CAVs										(0								
Critical and Follow-U	р Неа	dway	Adju	ustn	nen	t													
Approach	Т	E	B				٧	VB				N	IB		Т			SB	
Lane	Left	Ri	ght	Вур	ass	Left	Ri	ght	Ву	pass	Left	Rig	ght	Вур	oass	Left		Right	Bypass
Critical Headway, s		4.9	763				4.9	763				4.9	763				4	1.9763	
Follow-Up Headway, s		2.6	087				2.6	5087				2.6	087				2	2.6087	
Flow Computations,	Capaci	ity an	d v/c	: Ra	tio	5													
Approach	Π	E	В				٧	VB				N	IB					SB	
Lane	Left	Ri	ght	Вур	ass	Left	Ri	ght	Вуј	pass	Left	Rig	ght	Вур	oass	Left		Right	Bypass
Entry Flow (v _e), pc/h		6	16				3	42				7	9					286	
Entry Volume, veh/h		5	70				3	20				7	7					262	
Circulating Flow (v _c), pc/h		1	12				4	86				69	90					129	
Exiting Flow (vex), pc/h		2	83				3	03				69	99					38	
Capacity (c _{pce}), pc/h		12	231				8	41				68	33				Т	1210	
Capacity (c), veh/h	· · · ·						7	86				60	59					1110	
v/c Ratio (x)	0.	50				0	.41				0.	12				Т	0.24		
Delay and Level of Se	ervice																		
Approach					EB		Т		W	'B			NB			Т		SB	
Lane			Left	F	Right	Bypas	ss L	eft	Rig	jht l	Bypass	Left	Righ	nt	Bypass	Le	ft	Right	Bypass
Lane Control Delay (d), s/veh					8.8				9.8	8			6.7					5.4	
Lane LOS					Α				А				А					А	
95% Queue, veh					3.0				2.0	0			0.4					0.9	
Approach Delay, s/veh LOS		8.	.8		А		9.8			A	6.7			А		5.4		Α	
Intersection Delay, s/veh LOS	5						8.2									A			

					НС	S Rou	ında	bou	ıts R	Rep	ort								
General Information		_	_				_	_			natio	n	_		_	_			
Analyst	Emma	Myers-	Verhag	ge			4				Inters	ection			 -	lighway	1416	and L	iberty Bl
Agency or Co.									À.		E/W S	Street Na	ime		F	lighway	1416		
Date Performed	8/3/2	023						N		\ }	N/S S	treet Na	me		L	iberty Bl	vd		
Analysis Year	2050					K + 1	W	Η E S	1	H	Analy	sis Time	Period,	hrs	1	.00			
Time Analyzed	AM P	eak				*			1		Peak	Hour Fac	tor		0	.84			
Project Description	Alterr	native 1						→ V *			Juriso	liction			В	ox Elder	, SD		
Volume Adjustments	and S	ite Cl	narac	ter	istic	:s													
Approach		E	В				١	VΒ				N	IB				SI	3	
Movement	U	L	Т	Τ	R	U	L	Т	1	R	U	L	Т	F	2	U	L	Т	R
Number of Lanes (N)	0	0	1	Т	0	0	0	1	(0	0	0	1	C	0	0	0	1	0
Lane Assignment				LTR					LTR				L	TR					LTR
Volume (V), veh/h	0	151		3	0	7	91	1	78	0	4	52	1	0	0 (51	19	142	
Percent Heavy Vehicles, %								7		7	2	2	2	2	2	9	9	9	9
Flow Rate (VPCE), pc/h	428	194		4	0	9	116	5 22	27	0	5	63	1.	2	0 7	79	25	184	
Right-Turn Bypass	one				N	one				No	ne				No	ne			
Conflicting Lanes													1				1		
Pedestrians Crossing, p/h		-	0					0				()				0		
Proportion of CAVs										()								
Critical and Follow-U	р Неа	dway	Adju	ıstr	men	t													
Approach	Π	E	B				١	VB				N	IB		\top		SI	3	
Lane	Left	Rie	ght	Вур	oass	Left	Ri	ight	Вура	ass	Left	Rig	ght	Вура	iss	Left	Rig	ht	Bypass
Critical Headway, s		4.9	763				4.9	9763				4.9	763				4.97	63	
Follow-Up Headway, s		2.6	087				2.6	5087				2.6	087				2.60	87	
Flow Computations,	Capaci	ity an	d v/c	c Ra	atios	5													
Approach	Т	E	B				١	VΒ				N	IB		\top		SI	3	
Lane	Left	Rie	ght	Вур	oass	Left	Ri	ight	Вура	ass	Left	Rig	ght	Вура	iss	Left	Rig	ht	Bypass
Entry Flow (v _e), pc/h		6	26				3	52				8	0				28	8	
Entry Volume, veh/h		5	80				3	29				7	8				26	4	
Circulating Flow (vc), pc/h		1	13				4	196				70	01				13	0	
Exiting Flow (vex), pc/h		2	85				3	05				7	18				38	3	
Capacity (c _{pce}), pc/h		12	230				8	32				6	75				120	09	
Capacity (c), veh/h	· · · · · · · · · · · · · · · · · · ·						7	78				60	52				110	09	
v/c Ratio (x)	51				0	.42				0.	12				0.2	24			
Delay and Level of Se	ervice																		
Approach					EB				WB				NB					SB	
Lane			Left		Right	Bypas	s L	.eft	Right	t I	Bypass	Left	Righ	t l	Bypass	Left	R	ight	Bypass
Lane Control Delay (d), s/veh					9.0				10.1				6.8					5.5	
Lane LOS					Α				В				А					Α	
95% Queue, veh					3.1				2.2				0.4					0.9	
Approach Delay, s/veh LOS	9.	.0		А		10.1			В	6.8		,	A	5.	5		А		
Intersection Delay, s/veh LOS	5						8.4								,	4			

				НС	S Ro	und	abou	ıts R	ер	ort							
General Information	_			_			_	_		natio	1	_					_
Analyst	Emma	Myers-	Verha	ge		4				Inters	ection		П	High	way 14	16 and	Liberty Bl
Agency or Co.					1		+ `			E/W S	Street Na	me		High	way 14	16	
Date Performed	8/3/2	023							♦	N/S S	treet Na	me		Libe	ty Blvd	l	
Analysis Year	2030				 		# E	1		Analy	sis Time	Period, h	rs	1.00			
Time Analyzed	PM Pe	eak			*					Peak	Hour Fac	tor		0.84			
Project Description	Alterr	native 1					→ V •			Juriso	liction			Вох	Elder, S	D	
Volume Adjustments	and S	ite Cl	narac	teristic	cs	MARKET	NAME AND ADDRESS OF THE PARTY O										
Approach		E	В				WB				N	IB				SB	
Movement	U	L	Т	R	U	L	Т	R	1	U	L	Т	R	U	L	Т	R
Number of Lanes (N)	0	0	1	0	0	0	1	C		0	0	1	0	0	0	1	0
Lane Assignment				LTR				LTR				LT	R				LTR
Volume (V), veh/h	0	97	83	13	0	7	64	60	6	0	8	16	2	0	125	26	107
Percent Heavy Vehicles, %	8	8	8	8	7	7	7	7		2	2	2	2	9	9	9	9
Flow Rate (VPCE), pc/h	0	125	107	17	0	9	82	84	4	0	10	19	2	0	162	34	139
Right-Turn Bypass		No	one				None				No	ne				None	
Conflicting Lanes			1				1					1				1	
Pedestrians Crossing, p/h			0				0				()	Ì			0	
Proportion of CAVs									C)			•				
Critical and Follow-U	р Неа	dway	Adj	ustmer	ıt												
Approach	П	E	В				WB		\Box		N	IB				SB	
Lane	Left	Ri	ght	Bypass	Left	F	Right	Вура	ss	Left	Rig	ght B	ypass	Left	:	Right	Bypass
Critical Headway, s		4.9	763			4	.9763				4.9	763			4	1.9763	
Follow-Up Headway, s		2.6	087			2	.6087				2.6	087			2	2.6087	
Flow Computations,	Capaci	ity an	d v/	c Ratio	s												
Approach		E	В				WB				N	IB				SB	
Lane	Left	Ri	ght	Bypass	Left	F	Right	Вура	ss	Left	Rig	ght B	ypass	Left	:	Right	Bypass
Entry Flow (v _e), pc/h		2	49				175				3	1				335	
Entry Volume, veh/h		2	31				164				3	0				307	
Circulating Flow (vc), pc/h		2	05				154				39	94				101	
Exiting Flow (vex), pc/h		2	71				231				22	28				60	
Capacity (c _{pce}), pc/h		11	120			-	1179				92	23				1245	
Capacity (c), veh/h		10)37				1102				90	05				1142	
v/c Ratio (x)		0.	22				0.15				0.0	03				0.27	
Delay and Level of Se	ervice																
Approach				EB				WB				NB				SB	
Lane			Left	Right	Вура	iss	Left	Right	E	Bypass	Left	Right	Вура	ss	Left	Right	Bypass
Lane Control Delay (d), s/veh				5.6				4.6				4.3				5.7	
Lane LOS				А				Α				А				А	
95% Queue, veh				0.9				0.5				0.1				1.1	
Approach Delay, s/veh LOS			5	.6	Α		4.6		,	A	4.3		Α		5.7		Α
Intersection Delay, s/veh LOS	3					5.3								A			

				НС	S Ro	unda	abou	ıts Re	ер	ort							
General Information		_	_			_	_	e Info	_	_	n			_		_	
Analyst	Emma	a Myers-	Verhag	je		*			П	Inters	ection			Highw	ay 141	6 and L	iberty Bl
Agency or Co.					1		-		ľ	E/W S	Street Na	me		Highw	ay 141	6	
Date Performed	8/3/2	023					7		÷	N/S S	treet Na	me		Liberty	Blvd		
Analysis Year	2050				!		# E S) † [Analy	sis Time	Period, hr	s	1.00			
Time Analyzed	PM Pe	eak			*					Peak	Hour Fac	tor		0.84			
Project Description	Altern	native 1					→ ▼ *			Juriso	liction			Box Eld	der, SI)	
Volume Adjustments	and S	ite Cl	narac	teristi	cs												
Approach		E	В				WB				N	IB				SB	
Movement	U	L	Т	R	U	L	Т	R		U	L	Т	R	U	L	Т	R
Number of Lanes (N)	0	0	1	0	0	0	1	0		0	0	1	0	0	0	1	0
Lane Assignment				LTR				LTR				LTF	1				LTR
Volume (V), veh/h	0	99	86	13	0	7	66	69		0	8	16	2	0	131	27	110
Percent Heavy Vehicles, %	8	8	8	8	7	7	7	7		2	2	2	2	9	9	9	9
Flow Rate (VPCE), pc/h	127	111	17	0	9	84	88		0	10	19	2	0	170	35	143	
Right-Turn Bypass		No	one			N	lone				No	ne			Ν	lone	
Conflicting Lanes			1				1					1				1	
Pedestrians Crossing, p/h			0				0				()				0	
Proportion of CAVs									0)							
Critical and Follow-U	р Неа	dway	Adju	ıstmer	nt												
Approach		E	В				WB		П		N	IB				SB	
Lane	Left	Ri	ght	Bypass	Left	R	ight	Bypas	s	Left	Rig	ght By	/pass	Left	R	ight	Bypass
Critical Headway, s		4.9	763			4.	9763				4.9	763			4.	9763	
Follow-Up Headway, s		2.6	087			2.	6087				2.6	087			2.	6087	
Flow Computations,	Capaci	ity an	d v/c	Ratio	s												
Approach		E	В				WB		П		N	IB				SB	
Lane	Left	Ri	ght	Bypass	Left	R	ight	Bypas	s	Left	Rig	ght By	/pass	Left	R	ight	Bypass
Entry Flow (v _e), pc/h		2	55				181				3	1				348	
Entry Volume, veh/h		2	36				169				3	0				319	
Circulating Flow (v₀), pc/h		2	14				156				40	08				103	
Exiting Flow (vex), pc/h		2	83				237				23	34				61	
Capacity (c _{pce}), pc/h		11	109			1	177				9	10			1	242	
Capacity (c), veh/h	· · · · ·					1	100				89	92			1	140	
v/c Ratio (x)	23			(0.15				0.0	03			(0.28			
Delay and Level of Se	rvice																
Approach				EB				WB				NB				SB	
Lane			Left	Righ	t Bypa	iss	Left	Right	В	Bypass	Left	Right	Bypas	s Le	ft	Right	Bypass
Lane Control Delay (d), s/veh				5.7				4.6				4.3				5.8	
Lane LOS				А				Α				А				Α	
95% Queue, veh				0.9				0.5	Γ			0.1				1.2	
Approach Delay, s/veh LOS			5.	7	Α		4.6		P	Α	4.3		Α		5.8		Α
Intersection Delay, s/veh LOS						5.4								Α			

		нся	S Sigr	nalize	d Int	ersect	ion R	esu	lts S	Sum	mary	,				
									• .						######################################	OZZES
General Inform	nation	Y									ion Info	- V				99 (52)
Agency										ation,		1.000				
Analyst		Emma Myers-Verha	age	<u> </u>		e Aug 8				Туре	9	Other	•			
Jurisdiction				Time F		AM P	eak		PHF			1.00			w∳t	√
Urban Street		Alternative 1		Analys							Period	1> 7:0				20
Intersection		Hwy 1416 and S EI			ame	Hwy1	416-Ells	worth	nRd_A	\lt1_/	AMPeal	(2030.x	cus		7 1	
Project Descrip	tion	Radar Hill 1416 Co	rridor St	udy	_	_	_				_	_	_			新 源
Demand Inform	nation				EB			W	'B			NB			SB	
Approach Move	ement			L	Т	R	L	7		R	L	Т	R	L	T	R
Demand (v), v	eh/h			650	327	16	24	14	17	38	90	100	57	60	66	207
Signal Informa	tion						5									
1	61.1	Reference Phase	2	-		ا جالہ			2	211				7	~	▲□
Cycle, s Offset, s	0	Reference Point	End	1	Ι΄	R	R'	´ '	1		57		1	2	3	4
Uncoordinated	-	Simult. Gap E/W		Green		4.3	9.1	3.9		1.1	18.5			A		
Force Mode	Yes	<u> </u>	On On	Yellow	1.0	3.5	3.5	3.5		0.0	3.5		^ _	Y .	7	Ψ.
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.0	1.0	1.0	1.0)	0.0	1.0		5	6	1	8
Timer Results				EBI		EBT	WB	L	WB	Т	NBL	.	NBT	SBI	L	SBT
Assigned Phase	е			5		2	1		6		3		8	7		4
Case Number				1.1		4.0	1.1		4.0		1.1		4.0	1.1		4.0
Phase Duration	i, S			15.0		22.4	6.2		13.6	6	8.4		23.0	9.5		24.1
Change Period,	, (Y+R	c), S		4.5		4.5	4.5		4.5	5	4.5		4.5	4.5		4.5
Max Allow Head	dway (<i>I</i>	<i>MAH</i>), s		2.9		2.9	2.9		2.9	9	2.9		3.1	2.9		3.1
Queue Clearan	ce Time	e (g s), s		11.9)	12.6	2.7		8.4	1	4.2		6.5	3.4		10.9
Green Extensio	n Time	(g e), s		0.0		0.7	0.0		0.7	7	0.0		0.7	0.0		0.5
Phase Call Prol	bability			1.00)	1.00	0.33	3	1.00	0	0.78		1.00	1.00)	1.00
Max Out Proba	bility			1.00)	0.01	1.00)	0.0	1	1.00		0.00	1.00)	0.05
Movement Gro	un Pos	sulte			EB			WE	<u> </u>			NB			SB	
Approach Move	-	suits			Т	R	L	T		R	L	T	R	L	T	R
Assigned Move				5	2	12	1	6		16	3	8	18	7	4	14
Adjusted Flow F) veh/h		650	343	12	24	185	_	10	90	157	10	60	273	17
		ow Rate (s), veh/h/l	In	1618	1735		1667	168	_		1667	1643		1667	1540	
Queue Service		· · · · ·		9.9	10.6		0.7	6.4	_		2.2	4.5		1.4	8.9	
Cycle Queue C		- ,		9.9	10.6	_	0.7	6.4	_		2.2	4.5		1.4	8.9	
Green Ratio (g		- /o (g c), 0		0.35	0.29		0.18	0.1			0.37	0.30		0.38	0.32	
Capacity (c), v				899	509		255	251	_		384	498		541	494	
Volume-to-Capa		atio (X)		0.723	0.674		0.094	0.73	_		0.235	0.316		0.111	0.553	
		In (95 th percentile	e)	141.1	158		11.1	102.	_		29.2	71.2		20.7	139.6	
		eh/In (95 th percenti		5.6	6.3		0.4	4.1	_		1.2	2.8		0.8	5.6	
		RQ) (95 th percent		0.00	0.00		0.00	0.00	_		0.00	0.00		0.00	0.00	
Uniform Delay (•	, , .		16.8	19.0		21.2	24.9	9		13.8	16.4		12.2	17.1	
Incremental De	lay (d 2), s/veh		2.5	0.8		0.1	1.6			0.1	1.7		0.4	4.5	
Initial Queue De	elay (d	з), s/veh		0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0	
Control Delay (d), s/ve	eh		19.3	19.8		21.2	26.	5		13.9	18.1		12.6	21.6	
Level of Service	e (LOS)			В	В		С	С			В	В		В	С	
Approach Delay		19.5	5	В	25.9	9	С		16.6		В	20.0)	В		
Intersection De				19	9.9							В				
Multimodal Re			EB			WE	3			NB			SB			
		1.91		В	2.1		В		1.91	-	В	2.09		В		
	Pedestrian LOS Score / LOS Bicycle LOS Score / LOS					В	0.83	_	A	$\overline{}$	0.90		A	1.04		A
Dioyolo LOO 30	.515 / LC	,,,		2.13		J	0.00				0.90		, ,	1.04		71

		HCS	S Sigr	alize	d Inte	ersect	ion R	esu	lts	Sum	mary	7				
General Inform	nation	v							Inte	ersect	ion Inf	ormatio	on			基 键
Agency									Dur	ration,	h	1.000			7 7	
Analyst		Emma Myers-Verha	age	Analys	is Date	e Aug 8	, 2023		Are	а Тур	Э	Other				. 6
Jurisdiction		Box Elder, SD		Time F	Period	AM P	eak		PHI	F		1.00			w ∳ t	√
Urban Street		Alternative 1		Analys	is Yea	r 2050			Ana	alysis l	Period	1> 7:0	00			200 P
Intersection		Hwy 1416 and S El	lswor	File Na	ame	Hwy1	416-Ells	worth	nRd_	_Alt1_A	AMPea	k2050.x	cus		7 7	
Project Descrip	tion	Radar Hill 1416 Co	rridor St	udy										5		好很
Demand Inform	nation				EB			W	B			NB			SB	
Approach Move	ement			L	Т	R	L	7	Г	R	L	Т	R	L	Т	R
Demand (v), v	eh/h			748	348	19	24	15	6	41	102	107	58	61	69	248
Signal Informa	tion						5									
Cycle, s	83.4	Reference Phase	2	-		جها	2		7				<u> </u>	ж	~	本
Offset, s	03.4	Reference Point	End	ł	'	R	R'	´ '	1	<u> </u> "∏	7		1	Y 2	3	4
Uncoordinated	-	Simult. Gap E/W		Green		11.1	11.7	18		18.0	0.0		_	<u> </u>		
Force Mode	Yes Fixed	<u> </u>	On	Yellow	-	3.5 1.0	3.5	3.5		3.5	0.0		^ _	Y	7	Y
Force Mode	rixea	Simult. Gap N/S	On	Red	1.0	1.0	1.0	1.0	,	1.0	0.0	-	5	6	1	8
Timer Results				EBI	-	EBT	WB	L	WI	ВТ	NBI	_	NBT	SBI	_	SBT
Assigned Phase						2	1		6	3	3		8	7		4
Case Number	se Number					4.0	1.1		4.	.0	1.1		4.0	1.1		4.0
Phase Duration	ase Duration, s					31.8	6.6		16	5.2	22.5	5	22.5	22.5	5	22.5
Change Period,	(Y+R	c), S		4.5		4.5	4.5		4.	.5	4.5		4.5	4.5		4.5
Max Allow Head	•	<u>, </u>		2.9		2.9	2.9	_	2.	-	2.9	-	3.1	2.9	_	3.1
Queue Clearan		· · · · · · · · · · · · · · · · · · ·		17.6	3	17.1	3.0	-	11	-	5.1		9.3	3.8	_	19.0
Green Extensio		, - ,		0.1		0.1	0.0	_	0.	_	0.1		0.7	0.1	_	0.0
Phase Call Prol		(0),		1.00		1.00	0.43	3	1.0	00	1.00)	1.00	1.00)	1.00
Max Out Proba	•			1.00	,	1.00	0.00)	0.1	10	0.00		0.03	0.00		1.00
	_	•														
Movement Gro	-	sults			EB			WE	3			NB		-	SB	
Approach Move				L	T	R	L	T	+	R	L	T	R	L	T	R
Assigned Move		\ 1.0		5	2	12	1	6		16	3	8	18	7	4	14
Adjusted Flow F		,-		748	367	-	24	197	_	_	102	165		61	317	₩
		ow Rate (s), veh/h/l	n	1618	1734	-	1667	168	-	-	1667	1646		1667	1534	-
Queue Service				15.6	15.1	-	1.0	9.5	_	_	3.1	7.3		1.8	17.0	
Cycle Queue C		e Time (gε), s		15.6	15.1	-	1.0	9.5	\rightarrow	_	3.1	7.3		1.8	17.0	₩
Green Ratio (g				0.38	0.33		0.17	0.14	_	_	0.43	0.22		0.43	0.22	
Capacity (c), v		r () ()		924	567		255	236	_		446	355		575	331	
Volume-to-Capa			\	0.809	0.647		0.094	0.83	_	_	0.229	0.465		0.106	0.958	_
		In 95 th percentile		241	240.8		17	176.	_		51.4	136.2		28.7	433.7	
		eh/ln (95 th percenti		9.6	9.6		0.7	7.1	\rightarrow	_	2.1	5.4		1.1	17.3	
		RQ) (95 th percent	iie)	0.00	0.00		0.00	0.00	_		0.00	0.00		0.00	0.00	
Uniform Delay (` ,			22.1	24.0		29.5	34.9	_	_	16.3	28.5		14.5	32.3	
Incremental De				5.1	2.0		0.1	5.8	_		1.2	4.4		0.4	66.0	
Initial Queue De		,		0.0	0.0		0.0	0.0	_	_	0.0	0.0		0.0	0.0	
Control Delay (27.2	26.0		29.5	40.7	/		17.5	32.9		14.9	98.4	
Level of Service				С	С		С	D			В	С		В	F	
Approach Delay		26.8	3	С	39.5	5)	27.0)	С	84.9	9	F		
Intersection De				39	9.4							D				
Multimodal Re			EB			WE	3			NB			SB			
		1.92	-	В	2.13	_	E	3	1.93		В	2.12		В		
	Pedestrian LOS Score / LOS				3	В	0.85	_		-	0.93		A	1.11		A
210,010 200 00	ycle LOS Score / LOS						0.00			•	0.50		, ,	1.1		, ,

		HCS	S Sigr	nalize	d Inte	ersect	ion R	esul	ts Sur	nmary	7				
General Inform	nation								Intersec	tion Inf	ormatio	on		######################################	お経
Agency									Duration	i, h	1.000)		7 4	ALC: NO.
Analyst		Emma Myers-Verha	age	Analys	is Dat	e Aug 8	, 2023		Area Typ	ре	Other	ſ			
Jurisdiction		Box Elder, SD		Time F	Period	PM P	eak		PHF		1.00			w∳t	
Urban Street		Alternative 1		Analys	is Yea	r 2030			Analysis	Period	1> 16	6:45			2
Intersection		Hwy 1416 and S El	lswor	File Na	ame	Hwy1	416-Ells	worth	Rd_Alt1_	_PMPea	k2030.>	(us		ጎ ቱ	
Project Descrip	tion	Radar Hill 1416 Co	rridor St	udy									5		5 66
Demand Inform	nation				EB			W	В		NB			SB	
Approach Move	ement			L	Т	R	L	T	R	L	T	R	L	Т	R
Demand (v), v	eh/h			306	84	152	15	76	5 7	38	39	7	7	62	273
Signal Informa	ntion														
Cycle, s	52.4	Reference Phase	2	1	10 L	4		∄ .	2 KA3	- 1			Z	\	4
Offset, s	0	Reference Point	End			<u></u>		^				1	2	3	4
Uncoordinated	Yes	Simult. Gap E/W	On	Green Yellow		4.1 0.0	5.8 3.5	2.1 3.5		18.5 3.5	<u> </u>	,	→		
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.0	0.0	1.0	1.0		1.0		5	6	7	Y
										1					
Timer Results				EBL 5	-	EBT	WB	L	WBT	NB	_	NBT	SBI	-	SBT
Assigned Phase	<u> </u>					2	1	_	6	3	_	8	7	_	4
Case Number						4.0	1.1	-	4.0	1.1		4.0	1.1		4.0
	se Duration, s					14.4	5.5	_	10.3	6.6		23.0	9.5		25.9
Change Period,		<u>, </u>		4.5	_	4.5	4.5	_	4.5	4.5	_	4.5	4.5		4.5
Max Allow Head		· · · · · · · · · · · · · · · · · · ·		2.9	_	3.0	3.0	_	3.0	3.3	_	3.4	3.3		3.4
Queue Clearan		, - ,		6.2	+	9.5	2.4	_	4.4	2.7		2.9	2.1		10.7
Green Extensio		(<i>g</i> e), s		0.0		1.00	0.0	-	0.5	0.0	_	1.00	0.0 1.00	_	1.00
Phase Call Prol	•							_		-			_		
Max Out Proba	DIIILY			1.00		0.01	1.00)	0.00	1.00	,	0.00	1.00	,	0.07
Movement Gro	oup Res	sults			EB			WB			NB			SB	
Approach Move				L	T	R	L	Т	R	L	Т	R	L	T	R
Assigned Move	ment			5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow F		,-		306	236		15	83		38	46		7	335	
		ow Rate (s), veh/h/l	n	1618	1568		1667	1724	1	1667	1703		1667	1526	
Queue Service				4.2	7.5		0.4	2.4		0.7	0.9		0.1	8.7	
Cycle Queue C		e Time (<i>g c</i>), s		4.2	7.5		0.4	2.4		0.7	0.9		0.1	8.7	
Green Ratio (g				0.24	0.19		0.13	0.11	_	0.39	0.35		0.46	0.41	
Capacity (c), v				766	297		178	191		421	601		759	622	
Volume-to-Capa				0.399	0.795		0.084	0.43		0.090	0.077		0.009	0.538	
	, ,	/In (95 th percentile	_	54.2	104		6.2	37.3		10.9	16.2		1.9	141.3	
	, ,	eh/In (95 th percenti		2.2	4.2		0.2	1.5	_	0.4	0.6		0.1	5.7	
		RQ) (95 th percent	tile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Uniform Delay (`			16.9	20.3		20.3	21.8		10.5	11.3		7.8	11.8	
Incremental De	- 1	,		0.1	1.9		0.1	0.6		0.0	0.2		0.0	3.4	
Initial Queue De	- '	<u>, </u>		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (,			17.1	22.1		20.4	22.3		10.5	11.5		7.8	15.1	
Level of Service	_ `			B 19.3	С		С	С		В	В		Α	В	
	Approach Delay, s/veh / LOS					В	22.0)	С	11.1		В	15.0)	В
Intersection De				17	7.5						В				
Multimodal Re	Multimodal Results							WB			NB			SB	
Pedestrian LOS		1.91	EB	В	2.11		В	1.89	-	В	2.08		В		
	Sicycle LOS Score / LOS					A	0.65	_	A	0.63		A	1.05		A

		HCS	S Sigr	nalize	d Inte	ersect	ion R	esul	ts Su	nmary	/				
General Inform	nation	v							Interse	ction In	ormati	on			掛鍵
Agency									Duration	ո, h	1.000)		* *	
Analyst		Emma Myers-Verha	age	Analys	is Dat	e Aug 1	0, 2023		Area Ty	ре	Othe	r			. 6
Jurisdiction		Box Elder, SD		Time F	Period	PM P	eak		PHF		1.00			w i t	~
Urban Street		Alternative 1		Analys	is Yea	r 2050			Analysis	s Period	1> 16	3:45			2
Intersection		Highway 1416 and	S EII	File Na	ame	Hwy1	416-Ells	worth	Rd_Alt1	_PMPea	k2050.	xus		7 1	
Project Descript	tion	Radar Hill 1416 Co	rridor St	udy									5		5 (T
Demand Inform	nation				EB			W	В		NB			SB	
Approach Move	ment			L	Т	R	L	T	R	L	Т	R	L	T	R
Demand (v), v	eh/h			352	99	178	18	9	1 8	43	43	8	8	72	327
Signal Informa	tion									<u>. </u>					
Cycle, s	54.6	Reference Phase	2	1		42	-23		2 54				λ	\	Δ
Offset, s	0	Reference Point	End			-3					12	1	2	3	4
Uncoordinated	Yes	Simult. Gap E/W	On	Green		3.9	8.0	2.4					A		
Force Mode	Fixed	Simult. Gap E/W	On	Yellow Red	1.0	0.0	3.5	3.5 1.0				5	6	7	Y
. 5.55 111040			0.1			, 5.5			, 0.0	1.0					
Timer Results				EBL	-	EBT	WB	L	WBT	NB	L	NBT	SBI	L	SBT
Assigned Phase						2	1		6	3		8	7		4
Case Number						4.0	1.1		4.0	1.1		4.0	1.1		4.0
Phase Duration	se Duration, s					16.5	5.7		12.5	6.9)	23.0	9.5		25.6
Change Period,	(Y+R	c), S		4.5		4.5	4.5		4.5	4.5	5	4.5	4.5		4.5
Max Allow Head	dway (<i>I</i>	<i>MAH</i>), s		2.9		3.0	3.0		3.0	3.3	3	3.4	3.3		3.4
Queue Clearan	ce Time	e (g s), s		7.1		11.5	2.5		5.1	2.9)	3.1	2.2		14.5
Green Extensio	n Time	(g e), s		0.0		0.4	0.0		0.6	0.0)	1.0	0.0		0.5
Phase Call Prob	bability			1.00)	1.00	0.24	4	1.00	0.4	8	1.00	1.00)	1.00
Max Out Probal	bility			1.00)	0.05	1.00)	0.00	1.0	0	0.00	1.00)	0.75
Movement Gro	up Res	sults			EB			WB	<u> </u>		NB			SB	
Approach Move	-			L	Т	R	L	Т	R	L	Т	R	L	Т	R
Assigned Move				5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow F), veh/h		352	277		18	99		43	51		8	399	
,		ow Rate (s), veh/h/l	n	1568	1520		1537	1590		1654	1689		1602	1466	
Queue Service				5.1	9.5		0.5	3.1		0.9	1.1		0.2	12.5	
Cycle Queue Cl				5.1	9.5		0.5	3.1		0.9	1.1		0.2	12.5	
Green Ratio (g		(3 -), -		0.27	0.22		0.17	0.15	5	0.38	0.34		0.43	0.39	
Capacity (c), v				788	332		174	234		323	572		698	566	
Volume-to-Capa		atio (X)		0.447	0.833		0.104	0.42		0.133	_		0.011	0.705	
		In (95 th percentile)	66.1	140.6		8	48.3	_	13.7	19.8		2.5	219.1	
	· ,	eh/ln (95 th percenti		2.6	5.4	1	0.3	1.8		0.5	0.8		0.1	8.4	
	. ,	RQ) (95 th percent		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Uniform Delay (,	16.8	20.4		19.6	21.2		12.1	12.3		8.9	14.1	
Incremental Del				0.1	4.0		0.1	0.5		0.1	0.3		0.0	7.5	
Initial Queue De		,		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (<u>, </u>		16.9	24.4		19.7	21.6		12.1	12.6		8.9	21.6	
Level of Service				В	С	1	В	С		В	В		А	С	1
	Approach Delay, s/veh / LOS					С	21.3		С	12.		В	21.4		С
Intersection Del		20.2			0.1						С				
Multimodal Re		1.91	EB			WB			NB			SB	_		
	Pedestrian LOS Score / LOS					В	2.11	_	В	1.9		В	2.08		В
Bicycle LOS Sc	ore / LC	28		1.53	5	В	0.68	3	Α	0.6	4	Α	1.16)	Α

				ŀ	HCS	S Rou	nda	bou	ts Re	ep	ort										
General Information	_				_	_		_			natio	n		_			_		_		
Analyst	Emma	Emma Myers-Verhage					4		Inters	ection			F	Highway 1416 and S Ells							
Agency or Co.												E/W Street Name					141				
Date Performed	8/7/2	8/7/2023					N → N,						N/S Street Name					t l			
Analysis Year	2030					Anal						sis Time	Period,	hrs	1	.00					
Time Analyzed	AM Peak					Pea						Hour Fac	О	0.84							
Project Description	Alternative 2					Juriso						liction			В	Box Elder, SD					
Volume Adjustments	and S	ite Ch	narac	teris	tic	s															
Approach		E	В				V	√B				N	IB			SB					
Movement	U	L	Т	R		U	L	Т	R		U	L	Т	F	R	U	L T		R		
Number of Lanes (N)	0	0	1	0		0	0	1	0		0	0	1	(0	0	0	1	0		
Lane Assignment	LTR							LTR					L	TR	П	·			LTR		
Volume (V), veh/h	0	650	335	16	5	0	30	173	44	ı	0	90	100	5	i9	0	62	66	207		
Percent Heavy Vehicles, %	4	4	4	4		10	10	10	10)	1	1	1		1	5	5	5	5		
Flow Rate (VPCE), pc/h	0	805	415	20)	0	39	227	58	3	0	108	120	7	'1	0	78	82	259		
Right-Turn Bypass		No	one				None					None					None				
Conflicting Lanes		1					1						1			1					
Pedestrians Crossing, p/h		0				0						0					0				
Proportion of CAVs										C)										
Critical and Follow-U	р Неа	dway	Adju	stm	ent	t															
Approach	П	EB					WB					NB					SB				
Lane	Left	Rig	ght	Bypas	ss	Left		ght	Bypass		Left	t Right		Вура	iss	Left Ri		ght	Bypass		
Critical Headway, s		4.9	763				4.9763					4.9763				4.9		763			
Follow-Up Headway, s		2.6	087			2.6087				2.6087					2.6087						
Flow Computations,	Capaci	ity an	d v/c	Rat	ios																
Approach	Π	E	B		П		V	√B		П		N	IB		Т		9	SB			
Lane	Left	Rie	ght	Bypas	SS	Left	Rig	Right Byp		s	Left Rig		ght Bypass		iss	Left	Right		Bypass		
Entry Flow (v _e), pc/h		12	240				37	324				299				4		19			
Entry Volume, veh/h		11	192			295					296					399					
Circulating Flow (v _c), pc/h		1:	99			1033						1298					374				
Exiting Flow (vex), pc/h		5	64			594						98	33					141			
Capacity (c _{pce}), pc/h		11	126			481						367				9		42			
Capacity (c), veh/h		10	083			437					364				89		97				
v/c Ratio (x)		1.10						0.67				0.	81			0.44		44			
Delay and Level of Se	ervice																				
Approach				Е	В		T		WB				NB					SB			
Lane			Left	Ri	ght	Bypas	s Le	eft	Right	E	Bypass	Left	Righ	t	Bypass	Left		Right	Bypass		
Lane Control Delay (d), s/veh	Lane Control Delay (d), s/veh			22	20.7				28.1				52.9					9.4			
Lane LOS					F				D				F					Α			
95% Queue, veh				7	7.6				5.7				10.1					2.4			
Approach Delay, s/veh LOS			220).7		F		28.1		- [D	52.9	9		F	9	.4		А		
Intersection Delay, s/veh LOS	5						133.3									F					

				Н	CS R	oun	ndab	out	:s Re	port										
General Information					Site Information															
Analyst	Emma	Myers-	Verhag	je		A	*			Inter	section			Hi	S Ellswor					
Agency or Co.							_	. `		E/W	Street Na		Highway 1416							
Date Performed	8/7/2023					→ N						me		S Ellsworth Rd						
Analysis Year	2050					W + E 1 A						Period, l	nrs	1.0	00					
Time Analyzed	AM Peak										Hour Fac		0.84							
Project Description	Alternative 2					Juris vir								Box Elder, SD						
Volume Adjustments	and S	ite Cł	narac	terist	ics															
Approach	EB										N	IB			SB					
Movement	U	L	Т	R	U		L	. T R		U	L	Т	R	U	J	L 1	- R			
Number of Lanes (N)	0	0	1	0	0	\top	0	1	0	0	0	1	0	0) () 1	0			
Lane Assignment		LTR						LTR				Ľ	ΓR				LTR			
Volume (V), veh/h	0	748	356	19	0		30	182	47	0	102	107	60	0) 6	3 6	9 248			
Percent Heavy Vehicles, %	4	4	4	4	10	Т	10	10	10	1	1	1	1	5	5 !	5 5	5 5			
Flow Rate (VPCE), pc/h	0	926	441	24	0		39	238	62	0	123	129	72	0) 7	9 8	6 310			
Right-Turn Bypass		No	one				Non	ne			None					None				
Conflicting Lanes	1						1					1		1						
Pedestrians Crossing, p/h	ans Crossing, p/h 0						0				()		0						
Proportion of CAVs										0										
Critical and Follow-U	р Неа	dway	Adju	ıstme	nt															
Approach		E	B		Т	WB					NB					SB				
Lane	Left	Rig	ght	Bypass	Le	Left F		ht	Bypass	Left	t Right		Bypass	L	_eft	Right	Bypass			
Critical Headway, s		4.9	763			4.9763		63			4.9	763				4.9763				
Follow-Up Headway, s		2.6	087		2.6087						2.6			2.6087						
Flow Computations, (Capaci	ty an	d v/c	Ratio	os															
Approach		E	:B				WE	3			N	IB				SB				
Lane	Left	Rig	ght	Bypass	Le	Left		Right Byp		Left	Rig	ght I	Bypass	L	_eft	Right	Bypass			
Entry Flow (v _e), pc/h		13	91					339			32	24				475				
Entry Volume, veh/h		13	38			308					32		21			452				
Circulating Flow (v _c), pc/h		2	04				117	'8			14	46		400						
Exiting Flow (vex), pc/h		5	92				671	1			11	17								
Capacity (cp.s.), pc/h		11	21			415					3	316				918				
Capacity (c), veh/h		10	1078			377		7			313					874				
v/c Ratio (x)	1.24					0.82	.82			1.0)3			0.52					
Delay and Level of Se	rvice																			
Approach			EB									NB	NB			SB				
Lane			Left	Left Right		pass	Lef	ft	Right	Bypass	Left	Righ	t Вура	ass	Left	Right	Bypass			
Lane Control Delay (d), s/veh				458	.9				51.8			187.8	3			11.1				
Lane LOS				F					F			F				В				
95% Queue, veh				143	.9				10.3			24.1				3.2				
Approach Delay, s/veh LOS			458	3.9	F		5	51.8		F	187.	8	F		11.	1	В			
Intersection Delay, s/veh LOS				28	37.3				F Congrated: 9/22/2022 4:07:27 DN											

				Н	CS R	our	ndab	oout	ts Re	port										
General Information		_	_	_	_					matio	n	_		_	_		_			
Analyst	Emma	a Myers-	Verhag	e			4			Inter	section			 -	Highway 1416 and S Ellsw					
Agency or Co.							<u></u>			E/W	Street Na	ime		F	lighway	1416	j			
Date Performed	8/7/2	8/7/2023				1 4						me		S	Ellswor	th Rd				
Analysis Year	2030					Ana Ana						Period,	hrs	1	.00					
Time Analyzed	PM Peak					Pea						tor		0	.90					
Project Description	Alternative 2					Juris								В	Box Elder, SD					
Volume Adjustments	and S	ite Ch	narac	terist	ics															
Approach		E	В				WE	3			N	IB				S	В			
Movement	U	L	Т	R	U		L	Т	R	U	L	Т	F	2	U	L	L T			
Number of Lanes (N)	0	0	1	0	0		0	1	0	0	0	1	(0	0	0	1	0		
Lane Assignment				LTR				LTR				Ľ	TR				LTR			
Volume (V), veh/h	0	306	150	152	0		29	135	21	0	38	49	2	2	0	22	71	273		
Percent Heavy Vehicles, %	4	4	4	4	10		10	10	10	1	1	1		1	5	5	5	5		
Flow Rate (VPCE), pc/h	0	354	173	176	0		35	165	26	0	43	55	2	5	0 :	26	83	318		
Right-Turn Bypass		No	one			None					No	ne								
Conflicting Lanes		1					1				1					1				
Pedestrians Crossing, p/h		0				0					0					0				
Proportion of CAVs										0										
Critical and Follow-U	р Неа	dway	Αdjι	ıstme	nt															
Approach	П	EB					WB					NB					SB			
Lane	Left	Rie	ght	Bypass	Le	Left Ri		ht	Bypass	Lef	t Right		Вура	iss	Left	Rig	ght	Bypass		
Critical Headway, s		4.9	763				4.97	9763			4.9	763			4.9		763			
Follow-Up Headway, s		2.6	087			2.6087					2.6087				2.6087					
Flow Computations,	Capaci	ity an	d v/c	Ratio	os															
Approach	Т	E	B		Т		WE	3		Т	N	IB		Т		S	В			
Lane	Left	Rie	ght	Bypass	s Left		Righ	Right B		Lef	: Ri	ght	Вура	iss	Left R		ght	Bypass		
Entry Flow (v _e), pc/h		7	03				226				123				4		27			
Entry Volume, veh/h		6	76			205					122					407				
Circulating Flow (v _c), pc/h		1.	44				452	2			553					243				
Exiting Flow (vex), pc/h		2	24			526					4		294							
Capacity (c _{pce}), pc/h		11	191			870					785				10		77			
Capacity (c), veh/h		1146				791				77		77			1026					
v/c Ratio (x)	0.59					0.20	0.26			0.16				0.40		40				
Delay and Level of Se	ervice																			
Approach				EE					WB			NB					SB			
Lane			Left	Rig	nt By	pass	Lef	ft	Right	Bypass	Left	Righ	t	Bypass	Left	F	Right	Bypass		
Lane Control Delay (d), s/veh				10.	6				7.4			6.3					7.8			
Lane LOS				В					Α			А					Α			
95% Queue, veh				4.2	2				1.0			0.6					2.0			
Approach Delay, s/veh LOS			10	.6	В			7.4		Α	6.3			A	7.	8		А		
Intersection Delay, s/veh LOS	5					ç	9.0								A					

				Н	CS Ro	unda	abou	uts	Rep	ort								
General Information							_	_	_	natio	n							
Analyst	Emma	Myers-	Verhag	je		4		A		Inters	section			Н	lighway	1416	and S	Ellswor
Agency or Co.					1		-			E/W S	Street Na	me		Н	lighway	1416		
Date Performed	8/7/20	023							4	N/S S	Street Na	me		S	Ellswor	th Rd		
Analysis Year	2050				 		# E		1 >	Analy	sis Time	Period,	nrs	1.	.00			
Time Analyzed	PM Pe	eak			*					Peak	Hour Fac	tor		0.	.90			
Project Description	Altern	ative 2					→ ▼ †	1		Juriso	diction			В	ox Elder	, SD		
Volume Adjustments	and S	ite Cl	narac	teristi	cs													
Approach		E	В				WB				N	В				SI	В	
Movement	U	L	Т	R	U	L	Т		R	U	L	Т	R	ı	J	L	Т	R
Number of Lanes (N)	0	0	1	0	0	0	1		0	0	0	1	0	1	0	0	1	0
Lane Assignment				LTR				LTF	₹			Ľ	ΓR					LTR
Volume (V), veh/h	0	352	165	178	0	32	15	0	22	0	43	53	23	(0 2	23	81	327
Percent Heavy Vehicles, %	4	4	4	4	10	10	10)	10	1	1	1	1	!	5	5	5	5
Flow Rate (VPCE), pc/h	0	407	191	206	0	39	18	3	27	0	48	59	26	(0 7	27	94	382
Right-Turn Bypass		No	one				lone				No	ne		Ì		No	ne	
Conflicting Lanes			1				1				,					1		
Pedestrians Crossing, p/h 0							0				()				C)	
Proportion of CAVs	3/1/									0								
Critical and Follow-U	and Follow-Up Headway Adjustme																	
Approach		E	:B		Т		WB				N	В		Т		SI	В	
Lane	Left	Ri	ght	Bypass	Left	F	Right	Ву	/pass	Left	Rig	ght	Bypass		Left	Rig	ht	Bypass
Critical Headway, s		4.9	763			4.	.9763				4.9	763				4.97	763	
Follow-Up Headway, s		2.6	087			2.	.6087				2.6	087				2.60	087	
Flow Computations, (Capaci	ity an	d v/c	Ratio	s													
Approach		E	:B		Τ		WB				N	В		Т		SI	В	
Lane	Left	Ri	ght	Bypass	Left	F	Right	Ву	/pass	Left	Rig	ght	Bypass		Left	Rig	ht	Bypass
Entry Flow (v _e), pc/h		8	04				249				13	33				50	3	
Entry Volume, veh/h		7	73				226				13	32				47	'9	
Circulating Flow (v₅), pc/h		1	60				514				62	25				27	'0	
Exiting Flow (vex), pc/h		2	44				613				49	93				33	9	
Capacity (c _{pce}), pc/h		11	72				817				72	29				104	48	
Capacity (c), veh/h		11	27				743				72	22				99	8	
v/c Ratio (x) 0.69							0.30				0.	18				0.4	18	
Delay and Level of Se																		
Approach				EB		Т		V	/B			NB					SB	
Lane			Left	Righ	t Bypa	iss	Left	Rig	ght	Bypass	Left	Righ	Вур	oass	Left	R	light	Bypass
Lane Control Delay (d), s/veh								8	.5			7.0					9.3	
Lane LOS								,	A			А					Α	
95% Queue, veh				6.3				1	.3			0.7					2.7	
Approach Delay, s/veh LOS				.5	В		8.5			А	7.0		Α		9.	3		А
Intersection Delay, s/veh LOS				11.0								E	3					

				НС	:S Roι	ınd	abou	ıts Re	ро	ort							
General Information							Sit	e Info	rma	atior	1						
Analyst	Emma	Myers-	Verhag	ge	, J	1		1	Т	Inters	ection		П	Hwy	1416 a	nd S Ells	worth Rd
Agency or Co.					1./					E/W S	treet Na	me		High	way 14	16	
Date Performed	8/4/20)23							}	N/S S	treet Nar	me		S Ells	worth	Rd	
Analysis Year	2030				, ↓		V TE) † †)		Analy	sis Time	Period, h	rs	1.00			
Time Analyzed	AM Pe	eak			*					Peak I	Hour Fac	tor		0.84			
Project Description	Altern	ative 3					→ ▼ *			Jurisd	iction			Box E	lder, S	D	
Volume Adjustments	and S	ite Cł	narac	teristic	CS												
Approach		E	В				WB		Т		N	В				SB	
Movement	U	L	Т	R	U	L	Т	R		U	L	Т	R	U	L	Т	R
Number of Lanes (N)	0	1	1	0	0	0	1	0	T	0	0	1	0	0	0	1	0
Lane Assignment	L	-		LTR				LTR				LT	R				LT
Volume (V), veh/h	0	650	335	16	0	30	173	3 44		0	90	100	59	0	62	66	207
Percent Heavy Vehicles, %	4	4	4	4	10	10	10	10		1	1	1	1	5	5	5	5
Flow Rate (VPCE), pc/h	0	805	415	20	0	39	227	7 58	T	0	108	120	71	0	78	82	259
Right-Turn Bypass		No	one			1	Vone	'			No	ne			Yi	elding	
Conflicting Lanes			1				2		T		2	2				1	
Pedestrians Crossing, p/h				0				C)				0				
Proportion of CAVs									1								
Critical and Follow-U	p Head	dway	Adjı	ustmer	ıt												
Approach		E	В				WB		Τ		N	В				SB	
Lane	Left	Rig	ght	Bypass	Left	F	Right	Bypass		Left	Rig	ıht B	ypass	Left		Right	Bypass
Critical Headway, s	4.5436	4.5	436			4	.3276				4.32	276			4	.9763	4.9763
Follow-Up Headway, s	2.5352	2.5	352			2	.5352		Τ		2.53	352			2	.6087	2.6087
Flow Computations, (Capaci	ty an	d v/	c Ratio	s												
Approach		E	В				WB		Τ		N	В				SB	
Lane	Left	Rie	ght	Bypass	Left	F	Right	Bypass		Left	Rig	ıht B	ypass	Left		Right	Bypass
Entry Flow (v _e), pc/h	657	5	83				324				29	9				160	259
Entry Volume, veh/h	632	5	60				295				29)6				152	247
Circulating Flow (v _c), pc/h		1:	99				1033				12	98				374	
Exiting Flow (vex), pc/h		5	64				335				98	33				141	
Capacity (Cadj,pce), pc/h	1187	11	187				591		Τ		47	'2				944	981
Capacity (c), veh/h	1142	11	142				537		Τ		46	57				899	934
v/c Ratio (x) 0.55 0.49							0.55		Τ		0.6	53				0.17	0.26
Delay and Level of Se	lay and Level of Service																
Approach				EB		Т		WB				NB				SB	
Lane			Left	Right	Вура	ss	Left	Right	Ву	/pass	Left	Right	Bypas	ss l	.eft	Right	Bypass
Lane Control Delay (d), s/veh			9.8	8.6				17.5				23.9				5.7	6.6
Lane LOS			Α	А				С				С				Α	А
95% Queue, veh			3.7	2.9				3.5				4.9				0.6	1.1
Approach Delay, s/veh LOS							17.5		С		23.9)	С		6.2		А
Intersection Delay, s/veh LOS		/ed		11.8	Rounda						(-	В					

				НС	:S Roι	ında	abou	ıts Re	port								
General Information							Site	e Info	mati	on							
Analyst	Emma	Myers-	Verhag	ge	, J	 			Int	ersec	ction			Hwy	1416 a	nd S Ells	worth Rd
Agency or Co.					1./				E/\	N Str	eet Na	me		High	way 14	16	
Date Performed	8/4/20)23					N. T.		N/	S Stre	eet Nar	ne		S Ells	worth	Rd	
Analysis Year	2050				≸ ↓	((# E	1 1>	An	alysis	s Time	Period, h	rs	1.00			
Time Analyzed	AM Pe	eak			4				Pe	ak Ho	our Fac	tor		0.84			
Project Description	Altern	ative 3					→ ▼ *		Jur	isdict	tion			Box E	lder, S	D	
Volume Adjustments	and S	ite Ch	narac	teristi	cs												
Approach		E	B				WB		Т		N	В	T			SB	
Movement	U	L	Т	R	U	L	Т	R	U		L	Т	R	U	L	Т	R
Number of Lanes (N)	0	1	1	0	0	0	1	0	0	Т	0	1	0	0	0	1	0
Lane Assignment	L			LTR				LTR				LT	₹				LT
Volume (V), veh/h	0	748	356	19	0	30	182	2 47	0	Т	102	107	60	0	63	69	248
Percent Heavy Vehicles, %	4	4	4	4	10	10	10	10	1		1	1	1	5	5	5	5
Flow Rate (VPCE), pc/h	0	926	441	24	0	39	238	62	0		123	129	72	0	79	86	310
Right-Turn Bypass		No	one			N	lone				No	ne			Yi	elding	
Conflicting Lanes			1				2				2	!				1	
Pedestrians Crossing, p/h				0				0)				0				
Proportion of CAVs									1								
Critical and Follow-U	p Hea	dway	Adjı	ustmer	it												
Approach		E	B				WB		Т		N	В	\Box			SB	
Lane	Left	Rig	ght	Bypass	Left	R	Right	Bypass	Le	eft	Rig	ht B	ypass	Left		Right	Bypass
Critical Headway, s	4.5436	4.5	436			4.	3276				4.32	276			4	.9763	4.9763
Follow-Up Headway, s	2.5352	2.5	352			2.	5352				2.53	352			2	.6087	2.6087
Flow Computations, (Capaci	ty an	d v/c	Ratio	s												
Approach		E	B				WB		Т		N	В	П			SB	
Lane	Left	Rig	ght	Bypass	Left	R	Right	Bypass	Le	eft	Rig	ht B	ypass	Left		Right	Bypass
Entry Flow (v _e), pc/h	737	6	54				339				32	4				165	310
Entry Volume, veh/h	709	6	29				308				32	1				157	295
Circulating Flow (v _c), pc/h		20	04			1	1178				144	46				400	
Exiting Flow (vex), pc/h		59	92				361				11	17				149	
Capacity (Cadj,pce), pc/h	1182	11	82				523				41	6				920	955
Capacity (c), veh/h	1137	11	37				475				41	2				876	909
v/c Ratio (x) 0.62 0.55						(0.65				0.7	78				0.18	0.32
Delay and Level of Se																	
Approach				EB				WB		Т		NB		Т		SB	
Lane			Left	Right	Вура	SS	Left	Right	Bypas	s	Left	Right	Вурая	s L	.eft	Right	Bypass
Lane Control Delay (d), s/veh			11.5	9.8				24.5				41.3				5.9	7.5
Lane LOS			В	А				С				Е				Α	А
95% Queue, veh			4.9	3.7				5.2				8.8				0.7	1.4
Approach Delay, s/veh LOS).7	В		24.5		С		41.3		E		6.9		Α			
Intersection Delay, s/veh LOS				15.8								С					

				НС	S Roi	unda	bou	ts Re	port							
General Information	_			_			_	Infor		n	_	_				_
Analyst	Emma	a Myers-	Verhag	je	Ļ	11			Inter	section		Т	Hwy 14 ²	16 and	I S Ells	worth Rd
Agency or Co.					1./		- `		E/W	Street Na	ime		Highway	y 1416	5	
Date Performed	8/4/2	023					N	+	N/S	Street Na	me		S Ellswo	rth Rd		
Analysis Year	2030				_ ↓	((† I	† † >	Anal	ysis Time	Period, hr	S	1.00			
Time Analyzed	PM Pe	eak			*				Peak	Hour Fac	tor		0.90			
Project Description	Altern	native 3					→ → ▼ † /		Juris	diction			Box Elde	er, SD		
Volume Adjustments	and S	ite Cl	narac	teristi	:s											
Approach		E	В			١	VΒ			Ν	IB			S	В	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	T	R
Number of Lanes (N)	0	1	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment	ı	L		LTR				LTR			LTR		<u> </u>			LT
Volume (V), veh/h	0	306	150	152	0	29	135	21	0	38	49	22	0	22	71	273
Percent Heavy Vehicles, %	4	4	4	4	10	10	10	10	1	1	1	1	5	5	5	5
Flow Rate (VPCE), pc/h	0	354	173	176	0	35	165	26	0	43	55	25	0	26	83	318
Right-Turn Bypass		No	one			N	one			No	ne			Yield	ding	
Conflicting Lanes			1				2				2			,	1	
Pedestrians Crossing, p/h				0			()			()				
Proportion of CAVs								1								
Critical and Follow-U	p Hea	dway	Adju	ıstmen	ıt											
Approach		E	В			١	WB			N	IB			S	В	
Lane	Left	Ri	ght	Bypass	Left	R	ight	Bypass	Lef	: Ri	ght By	pass	Left	Rig	ght	Bypass
Critical Headway, s	4.5436	6 4.5	436			4.3	3276			4.3	276			4.9	763	4.9763
Follow-Up Headway, s	2.5352	2 2.5	352			2.5	352			2.5	352			2.60	087	2.6087
Flow Computations,	Capaci	ity an	d v/c	Ratio	s											
Approach		E	В			١	VΒ			٨	IB			S	В	
Lane	Left	Ri	ght	Bypass	Left	R	ight	Bypass	Lef	: Ri	ght By	pass	Left	Rig	ght	Bypass
Entry Flow (v _e), pc/h	373	3	30			2	226			1.	23			10	09	318
Entry Volume, veh/h	358	3	18			2	205			1:	22			10	04	303
Circulating Flow (v _c), pc/h		1-	44			4	152			5	53			24	43	
Exiting Flow (vex), pc/h		2	24			2	208			4.	35			29	94	
Capacity (dadj,pce), pc/h	1248	12	248			g	68			8	39			10	79	1116
Capacity (c), veh/h	1200	12	200			8	880			8	30			10	28	1063
v/c Ratio (x) 0.30 0.26						0	.23			0.	14			0.	10	0.28
Delay and Level of Se																
Approach				EB				WB			NB				SB	
Lane			Left	Right	Вура	ss L	.eft	Right	Bypass	Left	Right	Bypass	Left	: F	Right	Bypass
Lane Control Delay (d), s/veh 5.8 5								6.5			5.4				4.4	6.2
Lane LOS A								Α			А				А	А
95% Queue, veh 1.3				1.1				0.9			0.5				0.3	1.2
Approach Delay, s/veh LOS				6	А		6.5		А	5.4		А	5	5.7		А
Intersection Delay, s/veh LOS					5.7							Α				

				НС	S Roi	ında	bou [.]	ts Re	port						
General Information	_			_	_				matio	n	_	_	_	_	_
Analyst	Emma	a Myers-	Verhag	je	لِ	11			Inter	section		Т	Hwy 141	6 and S E	Isworth Rd
Agency or Co.					1./	V .	- `		E/W	Street Na	ime		Highway	1416	
Date Performed	8/4/2	023						7	N/S	Street Na	me		S Ellswor	th Rd	
Analysis Year	2050				⋠⋾	W.	f I	† †	Anal	ysis Time	Period, hr	S	1.00		
Time Analyzed	PM Pe	eak			*		A		Peak	Hour Fac	tor		0.90		
Project Description	Alterr	native 3					· • •		Juris	diction			Box Eldei	, SD	
Volume Adjustments	and S	ite Cl	narac	teristic	:s										
Approach		E	В			V	VB			N	IB			SB	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L .	r R
Number of Lanes (N)	0	1	1	0	0	0	1	0	0	0	1	0	0	0	0
Lane Assignment		L		LTR				LTR			LTR				LT
Volume (V), veh/h	0	352	165	178	0	32	150	22	0	43	53	23	0	23 8	1 327
Percent Heavy Vehicles, %	4	4	4	4	10	10	10	10	1	1	1	1	5	5	5 5
Flow Rate (VPCE), pc/h	0	407	191	206	0	39	183	27	0	48	59	26	0	27 9	4 382
Right-Turn Bypass		No	one			No	one			No	ne			Yielding	
Conflicting Lanes	-						2			7	2			1	
Pedestrians Crossing, p/h				0			()			0				
Proportion of CAVs									1						
Critical and Follow-U	p Hea	dway	Adjı	ıstmen	it										
Approach		E	В			٧	VB		Т	N	IB			SB	
Lane	Left	Ri	ght	Bypass	Left	Ri	ght	Bypass	Left	Rig	ght By	pass	Left	Right	Bypass
Critical Headway, s	4.5436	6 4.5	436			4.3	276			4.3	276			4.9763	4.9763
Follow-Up Headway, s	2.5352	2 2.5	352			2.5	352			2.5	352			2.6087	2.6087
Flow Computations,	Capaci	ity an	d v/c	Ratio	s										
Approach		E	B			V	VB		Τ	N	IB	Т		SB	
Lane	Left	Ri	ght	Bypass	Left	Ri	ght	Bypass	Left	Rig	ght By	pass	Left	Right	Bypass
Entry Flow (v _e), pc/h	426	3	78			2	49			13	33			121	382
Entry Volume, veh/h	410	3	63			2	26			13	32			115	364
Circulating Flow (v _c), pc/h		1	60			5	14			62	25			270	
Exiting Flow (vex), pc/h		2	44			2	31			49	93			339	
Capacity (c _{adj,pce}), pc/h	1230	12	230			9	19			83	36			1050	1090
Capacity (c), veh/h	1183	11	183			8	35			82	28			1000	1038
v/c Ratio (x) 0.35 0.31						0.	27			0.	16			0.12	0.35
Delay and Level of Se															
Approach				EB		Т		WB			NB			SB	
Lane			Left	Right	Вура	ss L	eft	Right	Bypass	Left	Right	Bypass	Left	Righ	Bypass
Lane Control Delay (d), s/veh			6.4	5.9				7.3			6.0			4.6	7.1
Lane LOS			А	А				А			А			А	А
95% Queue, veh 1.6				1.3				1.1			0.6			0.4	1.6
Approach Delay, s/veh LOS				2	Α		7.3		Α	6.0		А	6.	5	А
Intersection Delay, s/veh LOS			od		6.4			cion 202				Α		2 4.22.2E DN	

Assigned Phase 5 2 6 Case Number 2.0 4.0 8.3 Phase Duration, s 18.7 30.5 11.9 Change Period, (Y+R c), s 4.5 4.5 4.5 Max Allow Headway (MAH), s 2.9 2.8 2.8 Queue Clearance Time (g e), s 13.0 2.5 5.9 Green Extension Time (g e), s 1.2 1.6 1.4 Phase Call Probability 1.00 1.00 1.00 Max Out Probability 0.00 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 L T R L T R L T R L T R L T R L T R L T R L T R L T R L			HCS	S Sigr	nalized	d Inte	ersect	ion R	esul	ts	Sum	mary						
Ageincy																Construc		
Analysis	General Inform	nation								Inte	ersecti	on Info				214	法条件	
Jurisdiction	Agency									Dur	ation, l	h	1.000					All Districts
Urban Street	Analyst		Emma Myers-Verha	age	Analys	is Date	8/16/2	2023		Are	а Туре	:	Other					
Intersection	Jurisdiction		Box Elder, SD		Time F	Period	AM P	eak		PHF	F		1.00		#		w∯t	
Project Description	Urban Street		Alternative 4.1 - no	EBL	Analys	is Yea	2030			Ana	ılysis F	Period	1> 7:0	00	W			
Demand Information	Intersection		Hwy 1416 Displace	d EBL	File Na	ame	Hwy1	416-Ells	worth	Rd_	Alt4.1_	_AMPea	ak2030	.xus				
Approach Movement	Project Descrip	tion	Radar Hill 1416 Co	rridor St	tudy											5 4		6 後
Demand (v), v > h Demand (v), v > h	Demand Inform	nation				EB			W	В			NB				SB	
Signal Information	Approach Move	ment			L	Т	R	L	Т		R	L	Т	R	L	-	Т	R
Cycle, s 30.5 Reference Phase 2 2 3 3 3 3 3 3 3 3	Demand (v), v	eh/h			650	343			23	7					\bot			
Cycle, s 30.5 Reference Phase 2 Offset, s 0 Reference Point End Uncoordinated Yes Green 14.2 7.4 0.0	Signal Informa	tion																
Offset, s 0 Reference Point Duncoordinated Yes Simult. Gap RW On Yellow 3.5 3.5 0.0	1		Reference Phase	2	1	B	\vdash	┨										
Uncoordinated Yes Simult Gap E/W On Yellow 3.5 3.5 0.0						1110	-							1	2		3	4
Force Mode		Yes	Simult, Gap E/W	On									-	,	←			
Assigned Phase 5 2 6 6 6 Case Number 2.0 4.0 8.3 11.9 18.7 Phase Duration, s 18.7 30.5 11.9 18.7 18.7 Change Period, (Y+R c), s 4.5 4.6 4.1 4.4 4.1 4.1 4.1 4.1 4.1 4.1 4.1 4.1 4.1 4.	Force Mode		<u> </u>			-		_	_					5	6		7	8
Assigned Phase 5 2 6 6 6 Case Number 2.0 4.0 8.3 11.9 18.7 Phase Duration, s 18.7 30.5 11.9 18.7 18.7 Change Period, (Y+R c), s 4.5 4.6 4.1 4.4 4.1 4.1 4.1 4.1 4.1 4.1 4.1 4.1 4.1 4.	Time on Decoults				EDI	_	EDT	NA/D		١٨/٢	DT	NIDI	_	NDT		·DI		CDT
Case Number 2.0 4.0 8.3						-		WB	<u> </u>		-	NBL	-	NR I	S	BL	+	SBT
Phase Duration, s 18.7 30.5 4.5						_		_	+		\rightarrow		_		+		+	
Change Period, (Y+R c), s 4.5 </td <td></td> <td colspan="5"></td> <td></td> <td></td> <td>-</td> <td></td> <td>_</td> <td></td> <td>_</td> <td></td> <td>+</td> <td></td> <td>+</td> <td></td>									-		_		_		+		+	
Max Allow Headway (MAH), s 2.9 2.8 2.8 2.8 3.0 2.8 3.0 2.8 3.0 3.0 3.0 3.0 3.5 5.9 3.0 3.		<u> </u>						_	_		_		_		₩		+	
Queue Clearance Time (g s), s 13.0 2.5 5.9 S		nange Period, (Y+R c), s							-		-		_		╄		+-	
Second Extension Time (g o), s 1.2 1.6 1.4 1.00 1.			· · · · · · · · · · · · · · · · · · ·						_		-		_		₩		+	
Phase Call Probability			, - ,			<u> </u>			-		_		-		╄		+	
Movement Group Results EB WB SB Approach Movement L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T A L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T T T T T			(<i>g</i> _e), s						-		-		_		+		_	
Movement Group Results EB WB NB SB Approach Movement L T R L Y R R R <td></td> <td></td> <td></td> <td></td> <td>_</td> <td>_</td> <td></td> <td></td> <td>-</td> <td></td> <td>-</td> <td></td> <td>_</td> <td></td> <td>₩</td> <td></td> <td>+</td> <td></td>					_	_			-		-		_		₩		+	
Approach Movement L T R L T R L T R L T R L T R L T R L T R R R R R R R R R	Max Out Proba	bility			0.00		0.00		_	0.0	00		_		_		_	
Assigned Movement	Movement Gro	up Res	sults			EB			WB	3	П		NB				SB	
Adjusted Flow Rate (v), veh/h 650 343 444	Approach Move	ment			L	Т	R	L	Т		R	L	Т	R	L		Т	R
Adjusted Saturation Flow Rate (s), veh/h/ln Queue Service Time (g s), s 11.0	Assigned Move	ment			5	2			6									
Queue Service Time (g s), s 11.0 0.5 3.9	Adjusted Flow F	Rate (v), veh/h		650	343			444									
Cycle Queue Clearance Time (g ∘), s 11.0 0.5 3.9 ■ <td< td=""><td>Adjusted Satura</td><td>ation Flo</td><td>ow Rate (s), veh/h/l</td><td>n</td><td>1615</td><td>1614</td><td></td><td></td><td>1536</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td>T</td><td></td><td></td></td<>	Adjusted Satura	ation Flo	ow Rate (s), veh/h/l	n	1615	1614			1536	3						T		
Green Ratio (g/C) 0.46 0.85 0.24 □ <t< td=""><td>Queue Service</td><td>Time (</td><td>g s), S</td><td></td><td>11.0</td><td>0.5</td><td></td><td></td><td>3.9</td><td></td><td></td><td></td><td></td><td></td><td>Т</td><td></td><td></td><td></td></t<>	Queue Service	Time (g s), S		11.0	0.5			3.9						Т			
Capacity (c), veh/h 750 2753 740 0 <t< td=""><td>Cycle Queue C</td><td>learanc</td><td>e Time (<i>g c</i>), s</td><td></td><td>11.0</td><td>0.5</td><td></td><td></td><td>3.9</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Cycle Queue C	learanc	e Time (<i>g c</i>), s		11.0	0.5			3.9									
Volume-to-Capacity Ratio (X) 0.866 0.125 0.600	Green Ratio (g	/C)			0.46	0.85			0.24						\Box			
Back of Queue (Q), rt/ln (95 th percentile) 38.8 0.1 32.3	Capacity (c), v	eh/h			750	2753			740									
Back of Queue (Q), veh/ln (95 th percentile) 1.5 0.0 1.2 ■	Volume-to-Capa	acity Ra	itio (X)		0.866	0.125			0.60	0					\Box			
Queue Storage Ratio (RQ) (95 th percentile) 0.00			<u> </u>	:)	38.8	0.1			32.3	3								
Uniform Delay (d 1), s/veh 7.3 0.4 10.3		· ,			1.5	0.0			1.2									
Uniform Delay (d 1), s/veh 7.3 0.4 10.3	Queue Storage	Ratio (RQ) (95 th percent	tile)	0.00	0.00			0.00)								
Incremental Delay (d 2), s/veh 1.2 0.0 0.3 0.3 0.0					7.3	0.4			10.3	3								
Initial Queue Delay (d 3), s/veh 0.0 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>\top</td> <td></td> <td></td>									0.3							\top		
Control Delay (d), s/veh 8.6 0.4 10.6 Image: control Delay (d), s/veh Image: control Delay (d),		- · · · · · · · · · · · · · · · · · · ·							0.0									
Level of Service (LOS) A A B D <td></td> <td colspan="5">· · · ·</td> <td></td> <td></td> <td>10.6</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>\top</td> <td></td> <td></td>		· · · ·							10.6	3						\top		
Approach Delay, s/veh / LOS 5.7 A 10.6 B 0.0 0.0 Intersection Delay, s/veh / LOS 7.2 A Multimodal Results EB WB NB SB																		
Intersection Delay, s/veh / LOS 7.2 A Multimodal Results EB WB NB SB		• • • • • • • • • • • • • • • • • • • •					Α	10.6	5	В	3	0.0			0	0.0		
		Intersection Delay, s/veh / LOS						.2										
	Multimodal Po	Multimodal Results				ER			\//P				NR				SB	
Pedestrian LOS Score / LOS		Pedestrian LOS Score / LOS					A	1.37	-	, A		2.10	140	В	2	27		В
Bicycle LOS Score / LOS 1.31 A 0.68 A						_		_	_		-	۷. ۱۷			+-	1	+	

		HCS	S Sigr	nalize	d Inte	ersect	ion R	esul	ts S	Sum	mary						
General Inform	nation								Inte	rsecti	on Info				34	1141	
Agency									Dura	ation, l	h	1.000		337			A)
Analyst		Emma Myers-Verha	age	Analys	is Date	e 8/16/2	2023		Area	а Туре	:	Other			JI.		
Jurisdiction		Box Elder, SD		Time F	Period	AM P	eak		PHF	=		1.00		· · · · · · · · · · · · · · · · · · ·	:	w ∯ t	
Urban Street		Alternative 4.1 - no	EBL	Analys	is Yea	r 2050			Ana	lysis F	Period	1> 7:0	00	52			2
Intersection		Hwy 1416 Displace	d EBL	File Na	ame	Hwy1	416-Ells	worth	Rd_/	Alt4.1_	_AMPea	ak2050	.xus				
Project Descrip	tion	Radar Hill 1416 Co	rridor St	udy											59		新 德
Demand Inform	nation				EB			W	В			NB				SB	
Approach Move	ement			L	Т	R	L	Т		R	L	Т	R		L	Т	R
Demand (v), v	eh/h			748	367			25	8					\perp			
Signal Informa	ition						7										
Cycle, s	35.6	Reference Phase	2		B	L	\dashv										
Offset, s	0	Reference Point	End		'			\perp			\perp		1		2	3	4
Uncoordinated	Yes	Simult. Gap E/W	On	Green		8.2	0.0	0.0		0.0	0.0	_		←			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow Red	1.0	3.5 1.0	0.0	0.0		0.0	0.0	_	5		6	7	8
I Gree Wede	TIXOG	Cimale: Cap 14/C	OII	rtou	1.0	1.0	10.0	70.0		0.0	10.0						
Timer Results				EBL	-	EBT	WBI	L	WE	3T	NBL	\top	NBT		SBL		SBT
Assigned Phase	е			5		2			6								
Case Number				2.0		4.0			8.3	3							
Phase Duration	nase Duration, s					35.6			12.	.7							
Change Period,	nange Period, (Y+R c), s					4.5			4.	5							
Max Allow Head	nange Period, (Y+R c), s ax Allow Headway (<i>MAH</i>), s					2.8			2.8	8							
Queue Clearan	ce Time	e (g s), s		16.9		2.6			6.7	7							
Green Extensio	n Time	(g _e), s		1.5		1.7			1.	5							
Phase Call Prob	bability			1.00		1.00			1.0	00							
Max Out Probal	bility			0.00		0.00			0.0)1				<u> </u>	_		
Movement Gro	up Res	sults			EB			WB	1	$\overline{}$		NB		\top		SB	
Approach Move	-			L	Т	R	L	Т	Т	R	L	Т	R	L	\top	Т	R
Assigned Move				5	2			6	\top						\neg		
Adjusted Flow F), veh/h		748	367			453	T	\neg				\top	\neg		$\overline{}$
		ow Rate (s), veh/h/l	n	1615	1614			1536	_								
Queue Service				14.9	0.6			4.7	_	_				-	\neg		
Cycle Queue C		· '		14.9	0.6			4.7	_								
Green Ratio (g		(3 -),		0.52	0.87			0.23	_	_				_	\neg		
Capacity (c), v				834	2821			710	_								
Volume-to-Capa		itio (X)		0.897	0.130			0.63	\rightarrow						\neg		
		/In (95 th percentile	e)	68	0.1			48.4	\rightarrow						\dashv		
		eh/ln (95 th percenti		2.6	0.0			1.8	_						7		
	, ,	RQ) (95 th percent		0.00	0.00			0.00	_						\neg		
			,	7.8	0.3			12.4		\neg	\neg			\top	\neg		
	Jniform Delay (d 1), s/veh							0.3	_								
	nitial Queue Delay (d 3), s/veh							0.0	_						\neg		
	Control Delay (<i>d</i>), s/veh							12.7	_						\Box		
Level of Service				Α	Α			В									
Approach Delay	Approach Delay, s/veh / LOS					Α	12.7	7	В		0.0				0.0		
Intersection Del				8	.2							Α					
Multimodal Da	Multimodal Results				EB			\ \ \D				ND				SB	
						A	1.38	WB			2.10	NB	В	-	2.27	٥٥	В
	edestrian LOS Score / LOS icycle LOS Score / LOS			0.60	_		0.70	_	A	-	2.10		D	+-	<u> </u>		D
bicycle LOS SC	ole / LC	<i>J</i> O		1.41		Α	U.7C	,	Α								

		HCS	Sigr	nalized	d Inte	ersect	ion R	esul	ts	Sum	mary						
														_			
General Inform	nation								Inte	ersecti	on Info				24	1141	
Agency									Dur	ation,	h	1.000		200			A)
Analyst		Emma Myers-Verha	age	Analys	is Dat	e 8/16/2	2023		Are	а Туре		Other			_*		
Jurisdiction		Box Elder, SD		Time F	Period	PM P	eak		PHF	F		1.00		*	:	w i t	
Urban Street		Alternative 4.1 - no	EBL	Analys	is Yea	r 2030			Ana	alysis F	Period	1> 16	:45				2
Intersection		Hwy 1416 Displace	d EBL	File Na	ame	Hwy1	416-Ells	worth	Rd_	Alt4.1	_PMPea	ak2030).xus				
Project Descrip	tion	Radar Hill 1416 Co	rridor St	udy											Si		新 德
Demand Inform	nation				EB			W	В			NB				SB	
Approach Move	ment			L	Т	R	L	T		R	L	Т	R		L	Т	R
Demand (v), v	eh/h			306	236			11	4								
Signal Informa	tion					_					_						
Cycle, s	18.5	Reference Phase	2		B	L	\dashv										
Offset, s	0	Reference Point	End				4	1			1		1		2	3	4
Uncoordinated	Yes	Simult. Gap E/W	On	Green		5.1	0.0	0.0		0.0	0.0		,	←			
Force Mode	Fixed	Simult. Gap L/W	On	Yellow Red	1.0	3.5 1.0	0.0	0.0		0.0	0.0		5		6	7	8
I Gree Wede	TIXOG	Cimale: Cap 14/C	OII	rtou	1.0	1.0	0.0	0.0		10.0	10.0						
Timer Results				EBL	-	EBT	WB	L	WE	ВТ	NBL		NBT		SBL		SBT
Assigned Phase	e			5		2			6	3				┸			
Case Number						4.0			8.	.3							
Phase Duration	nase Duration, s					18.5			9.	.6							
Change Period,	nange Period, (Y+R c), s					4.5			4.	.5							
Max Allow Head	dway(<i>I</i>	<i>MAH</i>), s		2.9		2.8			2.	.8							
Queue Clearan	ce Time	e (g s), s		5.3		2.4			3.	.9							
Green Extensio	n Time	(g _e), s		0.3		1.2			1.	.1							
Phase Call Prob	bability			0.79		1.00			1.0	00							
Max Out Probal	bility			0.02	2	0.00			0.0	00							
Movement Gro	up Res	sults			EB			WB	3			NB		т		SB	
Approach Move	-			L	Т	R	L	Т	Т	R	L	T	R	ı	L	T	R
Assigned Move				5	2			6									
Adjusted Flow F), veh/h		306	236			387		\neg	$\overline{}$			-	\neg		$\overline{}$
		ow Rate (s), veh/h/l	n	1615	1614			1536	_								
Queue Service				3.3	0.4			1.9	\rightarrow	_				1	\neg		
Cycle Queue C		- ,		3.3	0.4			1.9	_								
Green Ratio (g		(3 - /, -		0.24	0.76			0.27	\rightarrow						\neg		
Capacity (c), v				389	2445			842	_								
Volume-to-Capa		itio (X)		0.786				0.46	_						\neg		
		/In (95 th percentile	:)	6.8	0.1			0.8	_								
	· ,	eh/ln (95 th percenti	_	0.3	0.0			0.0	_						\neg		
	. ,	RQ) (95 th percent		0.00	0.00			0.00	_	_					\neg		
Uniform Delay (,	6.6	0.6			5.6	Т	\neg	\neg			-	\neg		
Incremental De				1.4	0.0			0.1							\dashv		
	nitial Queue Delay (d 3), s/veh							0.0							\neg		
	Control Delay (<i>d</i>), s/veh							5.7							\neg		
Level of Service				8.0 A	0.6 A			Α		\neg					\neg		
	Approach Delay, s/veh / LOS					Α	5.7		Α	1	0.0				0.0		
	Intersection Delay, s/veh / LOS						.2							Α			
Multimadal D	Multimodal Results				ED			14/5				NID				CD	
					EB	^	4.04	WB			2.00	NB	D		2.25	SB	D
	edestrian LOS Score / LOS)	A	1.34	_	Α	-	2.08		В		2.25		В
Bicycle LOS Sc	ore / LC	J3		0.93		Α	0.58)	А	١							

		HCS	Sigr	nalized	d Inte	ersect	ion R	esul	ts	Sum	mary						
														_			
General Inform	nation								Inte	ersecti	on Info				211	1.7.整生	
Agency									Dur	ation, l	h	1.000		200			
Analyst		Emma Myers-Verha	age	Analys	is Date	e 8/16/2	2023		Are	а Туре	:	Other			_*		<u>.</u>
Jurisdiction		Box Elder, SD		Time F	Period	PM P	eak		PHF	F		1.00		*	÷	w i t	→
Urban Street		Alternative 4.1 - no	EBL	Analys	is Yea	r 2050			Ana	ılysis F	Period	1> 16	:45				200 P
Intersection		Hwy 1416 Displace	d EBL	File Na	ame	Hwy1	416-Ells	worth	Rd_	Alt4.1_	_PMPea	ak2050	.xus				
Project Descrip	tion	Radar Hill 1416 Co	rridor St	udy											類	411144	持续
Demand Inform	nation				EB			W	В			NB				SB	
Approach Move	ment			L	Т	R	L	T		R	L	Т	R		L	Т	R
Demand (v), v	eh/h			352	277			13	4								
Signal Informa	tion							T									
Cycle, s	20.7	Reference Phase	2		\bowtie	L	\dashv										
Offset, s	0	Reference Point	End		'		4	1					1		2	3	4
Uncoordinated	Yes	Simult. Gap E/W	On	Green Yellow		5.9 3.5	0.0	0.0		0.0	0.0		, l	←			
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.0	1.0	0.0	0.0		0.0	0.0		5		6	7	8
							10.0				1 2 1 2	'			ı		
Timer Results				EBL	-	EBT	WB	L	WE	-	NBL		NBT		SBL		SBT
Assigned Phase	9			5 2.0		2			6	j				╨			
Case Number						4.0			8.	3							
Phase Duration	nase Duration, s					20.7			10	.4							
Change Period,	nange Period, (Y+R c), s					4.5			4.	5				┸			
Max Allow Head	dway (<i>I</i>	<i>MAH</i>), s		2.9		2.8			2.	8							
Queue Clearan	ce Time	e (g s), s		6.2		2.4			4.	6				\perp			
Green Extensio		(<i>g</i> _e), s		0.5		1.5			1.	-				┸			
Phase Call Prob	pability			0.87		1.00			0.9	99				┸			
Max Out Probal	bility			0.00		0.00			0.0	00							
Movement Gro	up Res	sults			EB			WB	3			NB		т		SB	
Approach Move	-			L	Т	R	L	Т	Т	R	L	T	R	ı		T	R
Assigned Move				5	2			6									
Adjusted Flow F), veh/h		352	277			461	т					-			-
,		ow Rate (s), veh/h/l	n	1615	1614			1536	_								
Queue Service		. , , ,		4.2	0.4			2.6	\rightarrow	_				1			_
Cycle Queue C		- ,		4.2	0.4			2.6	_								
Green Ratio (g		(3 -),		0.28	0.78			0.29	\rightarrow					_			_
Capacity (c), v				451	2525			876	_								
Volume-to-Capa		atio (X)		0.780	0.110			0.52	_								
		In (95 th percentile	:)	8.9	0.1			1.9	_								
	<u> </u>	eh/ln (95 th percenti	_	0.3	0.0			0.1							7		
	• ,	RQ) (95 th percent		0.00	0.00			0.00									
Uniform Delay (,	6.9	0.5			6.2	_								
				1.1	0.0			0.2	_								
	ncremental Delay (d 2), s/veh nitial Queue Delay (d 3), s/veh							0.0	_						\neg		
	Control Delay (d), s/veh							6.4									
Level of Service				8.0 A	0.5 A			Α									
	Approach Delay, s/veh / LOS					Α	6.4		Α	\ <u> </u>	0.0				0.0		
Intersection Del				5	.4							Α					
Multime - del D	Multimodal Results				E0			10/0				ND				CD	
	Multimodal Results				EB	^	4.00	WB			2.00	NB	D		2.25	SB	D
	edestrian LOS Score / LOS)	A	1.35	_	Α	-	2.08		В		2.25		В
Bicycle LOS Sc	ore / LC	J0		1.01		Α	0.60	,	А	١							

	HCS	Sign	alize	d Inte	rsect	ion R	esult	ts Sum	mary	•				
General Information								Intersect	ion Inf	ormatic	'n	54	1112450	###
Agency								Duration,		1.000	711		11	
Analyst	Emma Myers-Verha	70	Analye	sic Data	8/16/2	0033				Other				
Jurisdiction	Box Elder, SD	Je	Time I		AM P		_	Area Typ PHF	U	1.00			w‡ı	~ #
Urban Street	Alternative 4.1 - no E	-DI		sis Year		зак		Analysis	Dariad	1> 7:0	20			←
Intersection			File N			44C EU-		Rd Alt4.1						
	Hwy 1416 and S Ells		<u> </u>	ame	∥⊓wy i4	4 10-EllS	WOLLIL	τα_Απ4. i	_AIVIPE	akzusu	.xus		Ý Edicial	CHA
Project Description	Radar Hill 1416 Cori	iuoi Si	uuy		_	_		_				100	to car all late at r	20 80
Demand Information				EB			WE	3	T	NB			SB	
Approach Movement			L	T	R	1	T	R		T	R	L	T	R
Demand (v), veh/h			_	327	16	24	147	_	90	100	57	60	66	207
Bernana (v), verim				OZ.						100				201
Signal Information				5										
Cycle, s 19.5	Reference Phase	2		ightharpoons	 \$⊕?	a						\leftrightarrow	1	A)
Offset, s 0	Reference Point	End	Green	5.0	5.5	0.0	0.0	0.0	0.0		1	2	3	4
Uncoordinated Yes	Simult. Gap E/W	On	Yellow		3.5	0.0	0.0	0.0	0.0	-		\rightarrow		ĸtz
Force Mode Fixed	Simult. Gap N/S	On	Red	1.0	1.0	0.0	0.0	0.0	0.0		5	6	7	8
						"					,		ŧ.	
Timer Results			EBI	_	EBT	WB	L	WBT	NBI	_	NBT	SBI	L	SBT
Assigned Phase					2			6			8			4
Case Number					7.0			5.0			8.0			7.0
Phase Duration, s					9.5			9.5			10.0			10.0
Change Period, (Y+R	;), s				4.5			4.5			4.5			4.5
Max Allow Headway (A	·				2.9		\neg	2.9			3.3			3.3
Queue Clearance Time	· · · · · · · · · · · · · · · · · · ·				3.6			4.0			4.6			4.4
Green Extension Time	, - ,				1.0			1.0			1.1			1.1
Phase Call Probability	(3 -),				1.00			1.00			0.96			0.96
Max Out Probability				_	0.00			0.00			0.01			0.01
Movement Group Res	ults			EB			WB			NB			SB	
Approach Movement			L	Т	R	L	Т	R	L	Т	R	L	Т	R
Assigned Movement				2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h			327	16	24	147	38		247			126	207
Adjusted Saturation Flo	ow Rate (s), veh/h/lr	ı		1614	1437	986	1536	1367		1546			1495	
Queue Service Time (g	g s), S			1.6	0.2	0.4	0.7	0.4		1.4			0.0	
Cycle Queue Clearance	e Time (<i>g c</i>), s			1.6	0.2	2.0	0.7	0.4		2.6			1.1	
Green Ratio (g/C)				0.26	0.26	0.26	0.26	0.26		0.28			0.28	
Capacity (c), veh/h				833	371	541	793	353		685			691	
Volume-to-Capacity Ra	tio (X)			0.392	0.043	0.044	0.185	0.108		0.361			0.182	
Back of Queue (Q), ft	In (95 th percentile)			0.8	0.1	0.9	1.1	0.7		5.7			8.3	
Back of Queue (Q), ve	eh/ln (95 th percentil	e)		0.0	0.0	0.0	0.0	0.0		0.2			0.3	
Queue Storage Ratio (RQ) (95 th percenti	le)		0.00	0.00	0.00	0.00	0.00		0.00			0.00	
Uniform Delay (d 1), s/	, ,			6.0	5.4	6.8	5.6	5.5		6.0			5.5	
Incremental Delay (d 2				0.1	0.0	0.0	0.0	0.0		0.1			0.0	
	nitial Queue Delay (d ₃), s/veh					0.0	0.0	0.0		0.0			0.0	
Control Delay (d), s/ve				6.1	5.4	6.8	5.7	5.6		6.1			5.5	0.0
Level of Service (LOS)				Α	Α	Α	Α	Α		Α			Α	Α
Approach Delay, s/veh	/LOS		6.0		Α	5.8		Α	6.1		Α	2.1		Α
	ntersection Delay, s/veh / LOS					.8						A		
Multimodal Results							WB			NB			SB	
Pedestrian LOS Score	Pedestrian LOS Score / LOS					1.86	3	В	2.38	3	В	2.22	2	В
Bicycle LOS Score / LO)S		0.77	7	Α	0.66	6	А	0.90)	Α	1.04	4	Α

		HCS	Sigr	nalize	d Inte	ersect	ion R	esul	ts Sum	ımary	1				
General Inform	ation								Intersect	tion Inf	ormatic	\n		in and	9484
Agency	iation							_	Duration,		1.000			1	
Analyst		Emma Myers-Verha		Analy	nio Doto	8/16/2	2022	_	Area Typ		Other				
Jurisdiction		Box Elder, SD	age .	Time f		AM P		_	PHF	<u> </u>	1.00			w‡t	~ ~ .
Urban Street		Alternative 4.1 - no	EDI		sis Year		eak		Analysis	Dorind	1> 7:0	20			
Intersection		Hwy 1416 and S El		File N			416 Ella		Rd Alt4.1						
Project Descrip	tion	Radar Hill 1416 Co			ame	mwy i	4 10-EIIS	worth	Ru_Ait4. i	_AIVIPE	akzubu	J.XuS	- 4	Ý Edin Jel	CHICA
Project Descrip	lion	Radai Filli 1410 Co	illuoi Si	.uuy		-	-		-			-	120		45 90
Demand Inform	nation				EB			WI	3		NB			SB	
Approach Move	ement			L	T	R	L	Т	R	L	T	R	L	T	R
Demand (v), v	eh/h				348	19	24	15	6 41	90	100	57	60	66	207
															_
Signal Informa	tion	v.			2	4215									\downarrow
Cycle, s	19.8	Reference Phase	2		R	T 540	2					1	₹ ,	3	x1x
Offset, s	0	Reference Point	End	Green	5.3	5.5	0.0	0.0	0.0	0.0			<u>x</u>		
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow		3.5	0.0	0.0	0.0	0.0			₹		W
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.0	1.0	0.0	0.0	0.0	0.0		5	6	7	8
				EBI											
Timer Results	mer Results ssigned Phase					EBT	WB	L	WBT	NBI	L	NBT	SBI	_	SBT
_	e 					2			6			8	_		4
Case Number					_	7.0	_	-	5.0		_	8.0	_	_	7.0
Phase Duration	·	`				9.8	_	_	9.8			10.0	_	_	10.0
Change Period,		,			_	4.5	_	_	4.5			4.5	_		4.5
Max Allow Head					_	2.9	<u> </u>	_	2.9		_	3.3	_	_	3.3
Queue Clearan		, = ,			_	3.8		_	4.2		_	4.6		_	4.4
Green Extensio		(<i>g</i> _e), s			_	1.1		_	1.1		_	1.1		_	1.1
Phase Call Prol					_	1.00		_	1.00			0.96		_	0.96
Max Out Proba	bility					0.00			0.00			0.01			0.01
Movement Gro	un Res	ulte			EB			WB			NB			SB	
Approach Move		Juito		L	T	R		Т	R	L	T	R	L	T	R
Assigned Move					2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow F) veh/h			348	19	24	156	_	-	247	10	<u> </u>	126	207
		ow Rate (s), veh/h/l	n		1614	1437	967	1536			1546			1495	201
Queue Service		· · · · · · · · · · · · · · · · · · ·			1.8	0.2	0.4	0.8	0.4		1.5			0.0	
Cycle Queue C		· /·			1.8	0.2	2.2	0.8	0.4		2.6			1.2	
Green Ratio (g		(90),0			0.27	0.27	0.27	0.27	_		0.28			0.28	
Capacity (c), v					860	383	535	818	_		679			685	
Volume-to-Capa		tio (X)			0.405	_	0.045	0.19			0.364			0.184	
		/In (95 th percentile)		0.9	0.1	0.9	1.2	0.7		6			8.6	
	` ,	eh/ln (95 th percenti	_		0.0	0.0	0.0	0.0	0.0		0.2			0.3	
	• , ,	· · · · · · · · · · · · · · · · · · ·	,		0.00	0.00	0.00	0.00	_		0.00			0.00	
Uniform Delay (Queue Storage Ratio (RQ) (95 th percentile) Uniform Delay (d 1), s/veh					5.4	6.9	5.6	5.5		6.1			5.6	
Incremental De	ncremental Delay (d 2), s/veh					0.0	0.0	0.0	0.1		0.1			0.0	
Initial Queue De					0.1	0.0	0.0	0.0	0.0		0.0			0.0	
Control Delay (·			6.1	5.4	6.9	5.6	5.5		6.2			5.6	0.0
Level of Service					Α	Α	Α	Α	Α		Α			Α	Α
Approach Delay				6.0		Α	5.8		Α	6.2		Α	2.1		Α
	ntersection Delay, s/veh / LOS						.9						A		
	ultimodal Results							WB			NB			SB	
	edestrian LOS Score / LOS				1	В	1.86	3	В	2.38		В	2.22	2	В
Bicycle LOS Sc	ore / LC	OS		0.79	9	Α	0.67	7	Α	0.90)	Α	1.04	1	Α

HCS Sig	ınalize	d Inte	rsect	ion R	esult	ts Sum	mary					
General Information						Intersect	ion Inf	ormatic	'n	54	i a passar	###
Agency						Duration,		1.000	711		11	
Analyst Emma Myers-Verhage	Analy	sis Data	8/16/2	0022				Other				
Jurisdiction Box Elder, SD		Period	PM P		_	Area Typ PHF	U	1.00			w‡ı	~ #
Urban Street Alternative 4.1 - no EBL		sis Year		еак		Analysis	Dariad	1> 16	.15			~ #
				446 511-								
Intersection Hwy 1416 and S Ellswor.		ame	HWy I	4 10-EIIS	SWOTTI	Rd_Alt4.1	_PIVIPE	eak2U3U	.xus	- 4	† Eustad	03/60
Project Description Radar Hill 1416 Corridor	Study									12	(alwasan)atsiatsi	20 S[V]
Demand Information	$\overline{}$	EB			WE	3	Т	NB			SB	
Approach Movement	L	Т	R	L	Т	R	L	Т	R	L	Т	R
Demand (v), veh/h		84	152	15	76	_	38	39	7	7	62	273
Signal Information		2	- ₩									\downarrow
Cycle, s 19.5 Reference Phase 2	_	\Rightarrow	s₩	2						₹ ,	3	KT2I
Offset, s 0 Reference Point End	Greer	5.0	5.5	0.0	0.0	0.0	0.0		- '	K	3	*
Uncoordinated Yes Simult. Gap E/W On	Yellov		3.5	0.0	0.0	0.0	0.0			→		KÎZ
Force Mode Fixed Simult. Gap N/S On	Red	1.0	1.0	0.0	0.0	0.0	0.0		5	- 6	7	8
Timer Results	EB	L	EBT	WB	L	WBT	NBI		NBT	SBI	L	SBT
Assigned Phase	-		2		_	6			8			4
Case Number	-		7.0		_	5.0			8.0			7.0
Phase Duration, s			9.5			9.5			10.0			10.0
Change Period, (Y+Rc), s			4.5		_	4.5			4.5			4.5
Max Allow Headway (<i>MAH</i>), s			3.0		_	3.0			3.4			3.4
Queue Clearance Time (g s), s			3.7			2.6			2.7			5.3
Green Extension Time (g e), s			0.6			0.6			0.9			8.0
Phase Call Probability			1.00			1.00			0.90			0.90
Max Out Probability			0.00			0.00			0.00			0.00
Movement Group Results		EB			WB			NB			SB	
Approach Movement		Т	R		T	R		T	R		T	R
Assigned Movement	+-	_	12	1	6	16	L 3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	+	84	152	15	76	7	<u> </u>	84	10		69	273
Adjusted Flow Rate (v), ven/n	+	1614	1437	1231	1536	-		1586			1662	213
Queue Service Time (g s), s	-	0.4	1.7	0.2	0.4	0.1		0.0			0.0	
Cycle Queue Clearance Time ($g \circ s$), s	+	0.4	1.7	0.2	0.4	0.1		0.7			0.6	
Green Ratio (g/C)	+	0.4	0.26	0.0	0.4			0.7			0.0	
Capacity (c), veh/h	+	826	368	659	786	350		717			674	
Volume-to-Capacity Ratio (X)	+	0.102									_	
Back of Queue (Q), ft/ln (95 th percentile)		0.102	0.413 1.5	0.023	0.097	0.020		0.117 1.5			0.102 4.3	
Back of Queue (Q), refin (95 th percentile)	1	0.2	0.1	0.0	0.0	0.0		0.1			0.2	
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	_	5.6	6.0	5.8	5.5	5.4		5.3			5.2	
Incremental Delay (d 2), s/veh		0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Initial Queue Delay (d 3), s/veh		0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Control Delay (d), s/veh		5.6	6.3	5.8	5.6	5.4		5.3			5.3	0.0
Level of Service (LOS)		A	A	A	A	A		A			A	A
Approach Delay, s/veh / LOS	6.1		A	5.6		A	5.3		A	1.1		A
Intersection Delay, s/veh / LOS	0.1			.7		, \	3.0			A 1.1		
Multimodal Results		EB			WB			NB			SB	
Pedestrian LOS Score / LOS	1.6	4	В	1.87	7	В	2.37	7	В	2.22	2	В
Bicycle LOS Score / LOS	0.6	3	Α	0.57	7	Α	0.63	3	Α	1.05	5	Α

	HCS	Sigr	alize	d Inte	rsect	ion R	esult	ts Sum	mary	1				
General Information								Intersect	ion Inf	ormatic	'n		i a passar	R E
								Duration,		1.000	711		الم ل	
Agency	Emma Myora Varha	~~	A naly	sia Data	8/16/2	0000	_							
Analyst Jurisdiction	Emma Myers-Verha Box Elder, SD	ge	Time f		PM P		_	Area Typ PHF	e	Other 1.00			w‡ı	~ #
Urban Street	Alternative 4.1 - no			sis Year		зак		Analysis	Dariad	1> 16	.15			
Intersection	Hwy 1416 and S Ell		File N			416 FII.		Rd Alt4.1						i i i
	<u> </u>		IL	ame	HWy I	4 10-EIIS	worth	Ka_Aii4. i	_PIVIPE	eak2U5U	i.xus		† Eustad	6170
Project Description	Radar Hill 1416 Cor	nuor Si	uuy		_	_		_		_		19	ds ear an late at h	10 sts
Demand Information				EB			WE	3	T	NB			SB	
Approach Movement			L	Т	R	L	Т	R	L	Т	R	L	Т	R
Demand (v), veh/h				99	178	18	91	8	43	43	8	8	72	327
Signal Information				2	- ₩									\downarrow
Cycle, s 20.8	Reference Phase	2		R	T 547	2						₹ ,	3	sta 1
Offset, s 0	Reference Point	End	Green	5.0	6.8	0.0	0.0	0.0	0.0			K.	- J	~
Uncoordinated Yes	Simult. Gap E/W	On	Yellow		3.5	0.0	0.0	0.0	0.0			₹		ND.
Force Mode Fixed	Simult. Gap N/S	On	Red	1.0	1.0	0.0	0.0	0.0	0.0		5	6	7	8
				_										
Timer Results			EBI	-	EBT	WB	L	WBT	NBI		NBT	SB	L	SBT
Assigned Phase					2		_	6			8			4
Case Number					7.0	_	_	5.0		_	8.0			7.0
Phase Duration, s					9.5		_	9.5		_	11.3			11.3
Change Period, (Y+R	• • •				4.5		_	4.5			4.5			4.5
	(Allow Headway (MAH), s				3.0		_	3.0			3.4			3.4
	eue Clearance Time (g s), s				4.2		_	2.7			2.8			6.2
Green Extension Time	(g e), s				0.7		_	0.7			1.1			1.0
Phase Call Probability					1.00		_	1.00		_	0.94			0.94
Max Out Probability					0.00			0.00			0.00			0.01
Movement Group Res	eulte			EB			WB			NB			SB	
Approach Movement	suits		L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v	/ \ veh/h			99	178	18	91	8	<u> </u>	94	10		80	327
Adjusted Saturation Flo		1		1614	1437	1214	1536	_		1570			1664	UZI
Queue Service Time (· '			0.5	2.2	0.2	0.5	0.1		0.0			0.0	
Cycle Queue Clearance	<u> </u>			0.5	2.2	0.7	0.5	0.1		0.8			0.7	
Green Ratio (g/C)	σ τιπο (g ε), σ			0.24	0.24	0.24	0.24	_		0.33			0.33	
Capacity (c), veh/h				778	346	611	740	329		764			733	
Volume-to-Capacity Ra	atio (X)			0.127	0.514	0.029	0.123			0.123			0.109	
Back of Queue (Q), f)		1	5.2	0.023	1.4	0.3		1.7			5.1	
Back of Queue (Q), v				0.0	0.2	0.0	0.1	0.0		0.1			0.2	
Queue Storage Ratio (·			0.00	0.00	0.00	0.00	_		0.00			0.00	
Uniform Delay (d 1), s	· , ,	,		6.2	6.8	6.5	6.2	6.0		5.0			5.0	
Incremental Delay (d :				0.0	0.4	0.0	0.0	0.0		0.0			0.0	
Initial Queue Delay (d	·			0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Control Delay (d), s/v				6.2	7.3	6.5	6.2	6.0		5.0			5.0	0.0
Level of Service (LOS)				A	A	A	A	A		A			A	A
	Approach Delay, s/veh / LOS				Α	6.2		Α	5.0		Α	1.0		Α
	Intersection Delay, s/veh / LOS					.9						A		
Multimodal Results				EB			WB			NB			SB	
Pedestrian LOS Score	/LOS		1.64	1	В	1.87	7	В	2.37	7	В	2.22	2	В
Bicycle LOS Score / Lo	OS		0.72	2	Α	0.58	3	Α	0.64	1	Α	1.16	6	Α

		HCS	Sigr	nalize	d Inte	ersect	ion R	esu	lts Sur	nmary					
General Inform	nation								Intersec	tion Inf	ormatic	n			SHE
Agency	iation								Duration		1.000	,,,		7 }	
Analyst		Emma Myers-Verha	nde	Analys	sis Date	8/16/2	023		Area Typ	<u>, </u>	Other				
Jurisdiction		Box Elder, SD	igo	Time F		AM Pe			PHF		1.00			w∮t	<u> </u>
Urban Street		Alternative 4.2 - no	WRT		sis Year		Jak		Analysis	Period	1> 7:0)()			* *
Intersection		Hwy 1416 and S El		File Na			116_FIIe	wort	hRd Alt4.						
Project Descrip	tion	Radar Hill 1416 Co			апс	I IVV y I	+10-Lii3	WOIL	III.u/	Z_AIVII C	Jakzood		55		持續
Demand Inform								١,	VD.		ND			CD	
				-	EB T	R		-	VB T R	-	NB T	R	+ -	SB T	R
Approach Move				L CEO	_		L 24	+	_						
Demand (v), v	en/n	_		650	327	16	24	-	38	90	100	57	60	66	207
Signal Informa	ition				15	1215	Т	Т	\top	\top					
Cycle, s	49.8	Reference Phase	2		<u></u>		₂						A	1	4
Offset, s	0	Reference Point	End		3	105			0 00			1	2	3	4
Uncoordinated	Yes	Simult. Gap E/W	On	Green Yellow		18.5 3.5	0.0	0.		0.0	_		>		кŤж
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.0	1.0	0.0	0.		0.0		5	6	7	8
Timer Results				EBI	-	EBT	WBI	L	WBT	NB	L L	NBT	SBI	L	SBT
Assigned Phase	е					2		_	6			8			4
Case Number						5.0		_	5.0			8.0			7.0
Phase Duration						26.8			26.8			23.0			23.0
Change Period		· ·				4.5			4.5		_	4.5			4.5
Max Allow Head		· · · · · · · · · · · · · · · · · · ·				2.9		_	2.9			3.3			3.3
Queue Clearan						20.5			5.9			7.7			7.3
Green Extension	n Time	(g e), s				1.8		_	2.0			1.0			1.0
Phase Call Pro	bability					1.00			1.00			1.00			1.00
Max Out Proba	bility					0.03			0.00			0.02			0.02
Movement Gro	un Pos	eulte			EB			W	R		NB			SB	
Approach Move		buits		L	T	R		T	1	L	T	R	L	T	R
Assigned Move				5	2	12	1	<u> </u>	16	3	8	18	7	4	14
Adjusted Flow F) veh/h		650	327	16	24		38	3	247	10	-	126	207
		ow Rate (s), veh/h/l	n	1615	1614	1437	986		1367		1542			1444	201
Queue Service		· , , ,	11	18.5	3.1	0.3	0.8		0.8	-	2.3			0.0	
Cycle Queue C		- ,		18.5	3.1	0.3	3.9		0.8		5.7			2.6	
Green Ratio (g		c mic (g c), 3		0.45	0.45	0.45	0.45		0.45		0.37			0.37	
Capacity (c), v	· ·			868	1446	644	525		613		671			643	
Volume-to-Capa		atio (X)		0.749	0.226	_	0.046		0.062		0.368			0.196	
		In (95 th percentile)	193.8	30.6	2.8	5.7		7.4		80.7			44.2	
	• •	eh/In (95 th percenti	_	7.5	1.2	0.1	0.2		0.3		3.2			1.7	
		RQ) (95 th percent		0.00	0.00	0.00	0.00		0.00		0.00			0.00	
Uniform Delay	(d 1), s	/veh		12.7	8.4	7.7	9.6		7.8		11.6			10.6	
Incremental De	lay (d 2), s/veh		1.0	0.0	0.0	0.0		0.0		1.6			0.7	
Initial Queue De	elay (d	з), s/veh		0.0	0.0	0.0	0.0		0.0		0.0			0.0	
Control Delay (d), s/ve	eh		13.7	8.5	7.7	9.6		7.8		13.1			11.3	0.0
Level of Service	e (LOS)			В	Α	Α	Α		А		В			В	Α
Approach Delay	Approach Delay, s/veh / LOS			11.9)	В	8.5		Α	13.1	1	В	4.3		Α
Intersection De	Intersection Delay, s/veh / LOS					10).4						В		
Multimodal Po	Iultimodal Results				EB			W	B		NB			SB	
	estrian LOS Score / LOS			1.65		В	1.88	_	В	2.08		В	2.25		В
Bicycle LOS So				1.31	-	A	1.00		F	0.90	_	A	1.04	_	A
, 200 00	,			1.5					•	0.50			1.5		

		HCS	Sigr	nalize	d Inte	ersect	ion R	esu	lts S	umi	mary					
General Inform	nation								Inters	secti	on Info	rmatio	n		11.4.64	814
Agency	iution								Durat			1.000	••		1 1	
Analyst		Emma Myers-Verha	nde	Analys	sis Date	8/16/2	023		Area			Other				
Jurisdiction		Box Elder, SD	igo	Time F		AM Pe			PHF	туро		1.00			w‡t	
Urban Street		Alternative 4.2 - no	WRT		sis Year		Jak		Analy	/sis P	Period	1> 7:0	n			* 3
Intersection		Hwy 1416 and S Ell		File Na			416-Ells	wort								
Project Descrip	tion	Radar Hill 1416 Cor			апс	I IVV y I	+10-Lii3	WOIL	ilitu_A	<u>.</u>	_AIVII C	aK2000	.xus	3	Y Kanada	新作
Demand Inforr	4:							١,	VD.			ND			CD	
					EB T	R	+ -	-	VB T	R		NB T	T D	+ .	SB	R
Approach Move				740	_		L 07	+	_	_	100	<u> </u>	R	C4	_	
Demand (v), v	en/n	_		748	348	19	27	-	4	41	102	107	58	61	69	248
Signal Informa	ition				15	1215		Т	т		т					1
Cycle, s	38.9	Reference Phase	2	1	<u>₽</u> 3 €		a							4		4
Offset, s	0	Reference Point	End		20.4	:11	0.0			2.0	-		1	2	3	4
Uncoordinated	Yes	Simult. Gap E/W	On	Green Yellow		9.5	0.0	0.		0.0	0.0			>		кŤх
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.0	1.0	0.0	0.		0.0	0.0		5	6	7	8
Timer Results				EBI	-	EBT	WB	L	WB1	Т	NBL	.	NBT	SBI		SBT
Assigned Phase	e				_	2		_	6	_			8		\rightarrow	4
Case Number					_	5.0	_	_	5.0	\rightarrow		_	8.0			7.0
Phase Duration						24.9		_	24.9	•		_	14.0			14.0
Change Period						4.5	_	_	4.5	_		_	4.5		_	4.5
Max Allow Head						2.9	\vdash	_	2.9	_		_	3.3		-	3.3
Queue Clearan		,				18.0		_	4.7	_		_	8.1			8.2
Green Extension		(g e), s				2.3	\vdash	_	2.3	_			1.3			1.3
Phase Call Pro						1.00		4	1.00	_			1.00		_	1.00
Max Out Proba	bility					0.00			0.00)	_	(0.01			0.01
Movement Gro	un Res	sults			EB			W	B	т		NB			SB	
Approach Move				L	T	R		Т		2	L	T	R	L	T	R
Assigned Move				5	2	12	1	-	10	_	3	8	18	7	4	14
Adjusted Flow F), veh/h		748	348	19	27		4	-		267		_	130	248
		ow Rate (<i>s</i>), veh/h/l	n	1615	1614	1437	967		_	67		1543			1471	2.0
Queue Service				16.0	2.2	0.2	0.6		0.	_		3.6			0.0	
Cycle Queue C		- ,		16.0	2.2	0.2	2.7		0.	_		6.1			2.5	
Green Ratio (g		- · · · · · · · · · · · · · · · · · · ·		0.52	0.52	0.52	0.52		_	52		0.24			0.24	
Capacity (c), v	· ·			1031	1693	753	640		71	_		505			496	
Volume-to-Capa		itio (X)		0.725	0.206	_	0.042		0.0	_		0.528			0.262	
		In (95 th percentile)	79.2	10.6	1.1	2.7		2.	-		69.3			37	
	` ,	eh/ln (95 th percenti	_	3.1	0.4	0.0	0.1		0.	-		2.7			1.4	
		RQ) (95 th percent		0.00	0.00	0.00	0.00		0.0	00		0.00			0.00	
Uniform Delay	(d 1), s	/veh		8.2	4.9	4.5	5.6		4.	.5		13.3			12.1	
Incremental De	lay (d 2), s/veh		0.4	0.0	0.0	0.0		0.	.0		0.3			0.1	
Initial Queue De	elay (d	з), s/veh		0.0	0.0	0.0	0.0		0.	.0		0.0			0.0	
Control Delay (d), s/ve	eh		8.6	5.0	4.5	5.6		4.	.6		13.7			12.2	0.0
Level of Service	evel of Service (LOS)			Α	Α	Α	Α		A	١ ا		В			В	Α
Approach Delay	Approach Delay, s/veh / LOS			7.4		Α	5.0		Α		13.7		В	4.2		Α
Intersection De	Intersection Delay, s/veh / LOS					7	.6							A		
Multimodal Po	Multimodal Results							W	B			NB			SB	
	ultimodal Results edestrian LOS Score / LOS			1.63	EB	В	1.86	_	В		2.08		В	2.25	-	В
Bicycle LOS So				1.41	_	A	1.00		F	-	0.93	_	A	1.11		A
Dioyole LOG 30	JIO / LC	,,,		1.4		71					0.93		7.	1.1		/ \

			HCS	Sigr	alize	d Inte	ersect	ion R	esu	Its Su	mmai	ry				
Agency	Gonoral Informa	ation								Intoreo	ction l	oformat	ion		111251	###
Analyst		ation										V				
Litrastication			Emma Myara Varha		Analys	io Dota	0/46/5	2022								
Unban Street				ige	-		_				pe	_			wī.	<u> </u>
Intersection			·	MDT				еак			Dorio	_				✓ /
Project Description								44C Ella								
Demand Information					IL	ame	Hwy I	4 10-EIIS	worti	1Ka_All4	.Z_PIVII	eak203	ou.xus	_	Measuretii	03/60
Approach Movement	Project Description	on	Radar Hill 1416 Cor	ridor Si	uay					_			_		95 - 201 - 201 201 - 120 - 120 - 1	20 30
Demand (v), veh/h 306 84 142 15 7 38 39 7 7 62 27	Demand Inform	ation				EB		Т	V	/B		NE	3		SB	
Demand (v), veh/h 306 84 142 15 7 38 39 7 7 62 27	Approach Moven	nent			L	Т	R	L	Т-	T R	l	. Т	R	L	Т	R
Cycle, s 21.3 Reference Phase 2 Offset, s 0 Reference Point End Uncoordinated Yes Simult. Gap EW On Force Mode Fixed Simult. Gap EW On Force Mode Fixed Simult. Gap N/S On Red 1.0 1.0 0.0 0.0 0.0 0.0 Timer Results EBL EBL EBT WBL WBT NBL NBT SBL SBT Assigned Phase 2 6 8 4 4 2 6 8 4 4 Case Number 5.0 5.0 5.0 8.0 7.0 10.4 10.4 10.4 10.4 10.4 10.4 10.4 10.4 10.4 10.4 10.4 4.5	Demand (v), ve	h/h			306	84	142	15		7	38	3 39	7	7	62	273
Cycle, s 21.3 Reference Phase 2 Offset, s 0 Reference Point End Uncoordinated Yes Simult. Gap EW On Force Mode Fixed Simult. Gap EW On Force Mode Fixed Simult. Gap N/S On Red 1.0 1.0 0.0 0.0 0.0 0.0 Timer Results EBL EBL EBT WBL WBT NBL NBT SBL SBT Assigned Phase 2 6 8 4 4 2 6 8 4 4 Case Number 5.0 5.0 5.0 8.0 7.0 10.4 10.4 10.4 10.4 10.4 10.4 10.4 10.4 10.4 10.4 10.4 4.5																
Offise S	Signal Informati	ion				3 6	4215									人
Uncoordinated Ves Simult. Gap E/W On Perion Series 9.3 3.9 0.0 0.0 0.0 0.0 Force Mode Fixed Simult. Gap N/S On Red 1.0 1.0 0.0	Cycle, s	21.3	Reference Phase	2		Ħ º	T 50	2					1	♦ ,	2	KT2I
Uncoordinated Yes Simult. Gap E/W On Force Mode Fixed Simult. Gap N/S On Red 1.0 1.0 0.0	Offset, s	0	Reference Point	End	Green	6.3	5.9	0.0	0.	0.0	0.	0		X.		~
Timer Results EBL EBT WBL WBT NBL NBT SBL SBT Assigned Phase 2 6 8 4 Case Number 5.0 5.0 8.0 7.0 Phase Duration, s 10.8 10.8 10.4 10.4 Change Period, (Y+Rc), s 4.5 4.5 4.5 4.5 Max Allow Headway (MAH), s 2.9 2.9 3.4 3.4 Queue Clearance Time (gs), s 5.5 2.6 2.8 5.6 Green Extension Time (ge), s 0.8 0.9 0.9 0.9 0.8 Phase Call Probability 1.00 1.00 0.92 0.92 0.92 Max Out Probability 0.00 0.00 0.00 0.00 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 Apigusted Satu	Uncoordinated	Yes	Simult. Gap E/W	On										—		ND.
Assigned Phase 2 6 8 4 Case Number 5.0 5.0 8.0 7.0 Phase Duration, s 10.8 10.8 10.4 10.4 Change Period, (Y+R c), s 4.5 4.5 4.5 4.5 4.5 Max Allow Headway (MAH), s 2.9 2.9 3.4 3.4 Queue Clearance Time (g s), s 5.5 2.6 2.8 5.6 Green Extension Time (g e), s 0.8 0.9 0.9 0.9 0.8 Phase Call Probability 1.00 1.00 0.92 0.92 Max Out Probability 0.00 0.00 0.00 0.00 0.00 Movement Group Results EB WB NB SB Approach Movement L T R L T R L T R Adjusted Flow Rate (v), veh/h 306 84 142 15 7 84 69 27 Adjusted Saturation Flow Rate (s), veh/h/ln 1615 1614 1437 1231 1231 1583 1663	Force Mode	Fixed	Simult. Gap N/S	On	Red	1.0	1.0	0.0	0.	0.0	0.	0	5	6	7	8
Assigned Phase 2 6 8 4 Case Number 5.0 5.0 8.0 7.0 Phase Duration, s 10.8 10.8 10.4 10.4 Change Period, (Y+Rc), s 4.5 4.5 4.5 4.5 4.5 Max Allow Headway (MAH), s 2.9 2.9 3.4 3.4 Queue Clearance Time (gs), s 5.5 2.6 2.8 5.6 Green Extension Time (ge), s 0.8 0.9 0.9 0.9 0.9 Max Out Probability 1.00 1.00 0.92 0.92 Max Out Probability 0.00 0.00 0.00 0.00 0.00 Movement Group Results EB WB NB SB Approach Movement L T R L T R L T R Adjusted Flow Rate (v), veh/h 306 84 142 15 7 84 69 27 Adjusted Saturation Flow Rate (s), veh/h/ln 1615 1614 1437 1231 1231 1583 1663 Queue											_			11		
Case Number 5.0 5.0 8.0 7.0 Phase Duration, s 10.8 10.8 10.4 10.4 Change Period, (Y+R c), s 4.5 4.5 4.5 4.5 Max Allow Headway (MAH), s 2.9 2.9 3.4 3.4 Queue Clearance Time (g s), s 5.5 2.6 2.8 5.6 Green Extension Time (g s), s 0.8 0.9 0.9 0.9 Max Out Probability 1.00 1.00 0.00 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 L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L <t< td=""><td></td><td></td><td></td><td></td><td>EBI</td><td>-</td><td></td><td>WB</td><td>ᅡ</td><td></td><td>N</td><td>BL </td><td></td><td>SB</td><td>L</td><td></td></t<>					EBI	-		WB	ᅡ		N	BL		SB	L	
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Change Period, (Y+R c), s 4.5 4.5 4.5 4.5 Max Allow Headway (MAH), s 2.9 2.9 3.4 3.4 Queue Clearance Time (g s), s 5.5 2.6 2.8 5.6 Green Extension Time (g s), s 0.8 0.9 0.9 0.9 0.9 Phase Call Probability 1.00 1.00 0.92 0.92 Max Out Probability 0.00 0.00 0.00 0.00 Movement Group Results EB WB NB NB Approach Movement L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R A 14 14 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>_</td> <td></td> <td>-</td> <td></td> <td></td> <td>-</td> <td></td> <td></td>									_		-			-		
Max Allow Headway (MAH), s 2.9 2.9 3.4 3.4 Queue Clearance Time ($g s$), s 5.5 2.6 2.8 5.6 Green Extension Time ($g e$), s 0.8 0.9 0.9 0.9 0.8 Phase Call Probability 1.00 1.00 0.92 0.92 0.92 Max Out Probability 0.00 0.00 0.00 0.00 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 L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R L T R						_			_		_			╄		
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Green Extension Time ($g \cdot e$), s 0.8 0.9 0.9 0.8 Phase Call Probability 1.00 1.00 0.92 0.92 Max Out Probability 0.00 0.00 0.00 0.00 0.00 Movement Group Results EB WB NB SB Approach Movement L T R		· · · · · · · · · · · · · · · · · · ·							_		_			ـــــــ		-
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Max Out Probability 0.00 0.00 0.00 0.00 0.00 Movement Group Results EB WB NB SB Approach Movement L T R L 14			(<i>g</i> _e), s						_		\perp					
Movement Group Results EB WB NB SB Approach Movement L T R L T							1.00		_	1.00			0.92			0.92
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Max Out Probabi	ility					0.00			0.00			0.00			0.00
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Movement Grou	ın Bos	ulte			ED			۱۸/۱	2		NID			Q.D.	
Assigned Movement 5 2 12 1 16 3 8 18 7 4 14 Adjusted Flow Rate (v), veh/h 306 84 142 15 7 84 69 273 Adjusted Saturation Flow Rate (s), veh/h/ln 1615 1614 1437 1231 1231 1583 1663 Queue Service Time (g s), s 3.5 0.4 1.6 0.2 0.1 0.0 0.0 Cycle Queue Clearance Time (g c), s 3.5 0.4 1.6 0.6 0.1 0.8 0.7 Green Ratio (g/C) 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.			uits				Гр		ır		٠.	-	В		1	Ь
Adjusted Flow Rate (v), veh/h 306 84 142 15 7 84 69 273 Adjusted Saturation Flow Rate (s), veh/h/ln 1615 1614 1437 1231 1231 1583 1663 Queue Service Time (g s), s 3.5 0.4 1.6 0.2 0.1 0.0 0.0 Cycle Queue Clearance Time (g c), s 3.5 0.4 1.6 0.6 0.1 0.8 0.7 Green Ratio (g/C) 0.30 0.30 0.30 0.30 0.30 0.28 0.28 Capacity (c), veh/h 820 963 428 683 367 688 651 Volume-to-Capacity Ratio (X) 0.373 0.087 0.331 0.022 0.019 0.122 0.106 Back of Queue (Q), ft/in (95 th percentile) 3.5 0.4 1.8 0.4 0.2 3 5.6 Back of Queue (Q), veh/ln (95 th percentile) 0.1 0.0 0.0 0.0 0.0 0.0 0.0 Queue Storage Ratio (RQ) (95 th percentile) 0.0 0.0 0.0 0.0 0.0 0.										_	_			-	_	_
Adjusted Saturation Flow Rate (s), veh/h/ln 1615 1614 1437 1231 1231 1583 1663 Queue Service Time (g_s), s 3.5 0.4 1.6 0.2 0.1 0.0 0.0 0.0 Cycle Queue Clearance Time (g_c), s 3.5 0.4 1.6 0.6 0.1 0.8 0.7 Green Ratio (g/C) 0.30 0.30 0.30 0.30 0.30 0.30 0.28 0.28 0.28 Capacity (c), veh/h 820 963 428 683 367 688 651 Volume-to-Capacity Ratio (X) 0.373 0.087 0.331 0.022 0.019 0.122 0.106 Back of Queue (Q), f/R 95 th percentile) 3.5 0.4 1.8 0.4 0.2 3 5.6 Back of Queue (Q), veh/ln (95 th percentile) 0.1 0.0 0.1 0.0 0.0 0.0 0.1 0.2 Queue Storage Ratio (RQ) (95 th percentile) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.			\ , \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \								1 3		10	-		
Queue Service Time ($g s$), s 3.5 0.4 1.6 0.2 0.1 0.0 0.0 Cycle Queue Clearance Time ($g c$), s 3.5 0.4 1.6 0.6 0.1 0.8 0.7 Green Ratio (g/C) 0.30 0.30 0.30 0.30 0.30 0.28 0.28 Capacity (c), veh/h 820 963 428 683 367 688 651 Volume-to-Capacity Ratio (X) 0.373 0.087 0.331 0.022 0.019 0.122 0.106 Back of Queue (Q), rtl/In (95 th percentile) 3.5 0.4 1.8 0.4 0.2 3 5.6 Back of Queue (Q), veh/ln (95 th percentile) 0.1 0.0 0.1 0.0 0.0 0.1 0.2 Queue Storage Ratio (RQ) (95 th percentile) 0.0 0.00 0.00 0.00 0.00 0.00 0.00 Uniform Delay (d 1), s/veh 6.5 5.4 5.8 5.6 5.3 5.8 5.8 Incremental Delay (d 2), s/veh 0.0 0.0 0.0 0.0 0.0 0.0 0.0 <td></td> <td></td> <td>,.</td> <td>n</td> <td></td> <td></td> <td>_</td> <td></td> <td></td> <td>_</td> <td>+</td> <td></td> <td></td> <td>-</td> <td>_</td> <td>213</td>			,.	n			_			_	+			-	_	213
Cycle Queue Clearance Time (g c), s 3.5 0.4 1.6 0.6 0.1 0.8 0.7 Green Ratio (g/C) 0.30 0.30 0.30 0.30 0.30 0.28 0.28 Capacity (c), veh/h 820 963 428 683 367 688 651 Volume-to-Capacity Ratio (X) 0.373 0.087 0.331 0.022 0.019 0.122 0.106 Back of Queue (Q), ft/in (95 th percentile) 3.5 0.4 1.8 0.4 0.2 3 5.6 Back of Queue (Q), veh/ln (95 th percentile) 0.1 0.0 0.1 0.0 0.0 0.0 0.1 0.2 Queue Storage Ratio (RQ) (95 th percentile) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 Uniform Delay (d 1), s/veh 6.5 5.4 5.8 5.6 5.3 5.8 5.8 Incremental Delay (d 2), s/veh 0.0 0.0 0.0 0.0 0.0 0.0			· //	11		_	_				+-			_		
Green Ratio (g/C) 0.30 0.30 0.30 0.30 0.28 0.28 Capacity (c), veh/h 820 963 428 683 367 688 651 Volume-to-Capacity Ratio (X) 0.373 0.087 0.331 0.022 0.019 0.122 0.106 Back of Queue (Q), ft√ln (95 th percentile) 3.5 0.4 1.8 0.4 0.2 3 5.6 Back of Queue (Q), veh/ln (95 th percentile) 0.1 0.0 0.1 0.0 0.0 0.1 0.2 Queue Storage Ratio (RQ) (95 th percentile) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0 0			· ,				_			_	-			-	_	
Capacity (c), veh/h 820 963 428 683 367 688 651 Volume-to-Capacity Ratio (X) 0.373 0.087 0.331 0.022 0.019 0.122 0.106 Back of Queue (Q), ft/In (95 th percentile) 3.5 0.4 1.8 0.4 0.2 3 5.6 Back of Queue (Q), veh/ln (95 th percentile) 0.1 0.0 0.1 0.0 0.0 0.1 0.2 Queue Storage Ratio (RQ) (95 th percentile) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 Uniform Delay (d 1), s/veh 6.5 5.4 5.8 5.6 5.3 5.8 5.8 Incremental Delay (d 2), s/veh 0.1 0.0 0.0 0.0 0.0 0.0 0.0 Initial Queue Delay (d 3), s/veh 0.0 0.0 0.0 0.0 0.0 0.0 0.0 Control Delay (d), s/veh 6.6 5.4 6.0 5.6 5.3 5.8 5.8 5.8			e fille (<i>g c)</i> , s				_				+				_	
Volume-to-Capacity Ratio (X) 0.373 0.087 0.331 0.022 0.019 0.122 0.106 Back of Queue (Q), ft/in (95 th percentile) 3.5 0.4 1.8 0.4 0.2 3 5.6 Back of Queue (Q), veh/ln (95 th percentile) 0.1 0.0 0.1 0.0 0.0 0.0 0.1 0.2 Queue Storage Ratio (RQ) (95 th percentile) 0.00 <											-					
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Back of Queue (Q), veh/ln (95 th percentile) 0.1 0.0 0.1 0.0 0.1 0.2 Queue Storage Ratio (RQ) (95 th percentile) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 Uniform Delay (d 1), s/veh 6.5 5.4 5.8 5.6 5.3 5.8 5.8 Incremental Delay (d 2), s/veh 0.1 0.0 0.2 0.0 0.0 0.0 0.0 Initial Queue Delay (d 3), s/veh 0.0 0.0 0.0 0.0 0.0 0.0 Control Delay (d), s/veh 6.6 5.4 6.0 5.6 5.3 5.8 5.8)		_	_			_						
Queue Storage Ratio (RQ) (95 th percentile) 0.00																
Uniform Delay (d 1), s/veh 6.5 5.4 5.8 5.6 5.3 5.8 5.8 Incremental Delay (d 2), s/veh 0.1 0.0 0.2 0.0 0.0 0.0 0.0 Initial Queue Delay (d 3), s/veh 0.0 0.0 0.0 0.0 0.0 0.0 Control Delay (d), s/veh 6.6 5.4 6.0 5.6 5.3 5.8 5.8			•	,			_			_					_	
Incremental Delay (d 2), s/veh 0.1 0.0 0.2 0.0 0.0 0.0 0.0 Initial Queue Delay (d 3), s/veh 0.0 0.0 0.0 0.0 0.0 0.0 0.0 Control Delay (d), s/veh 6.6 5.4 6.0 5.6 5.3 5.8 5.8 0.0																
Initial Queue Delay (d 3), s/veh 0.0						_	_			_					_	
Control Delay (d), s/veh 6.6 5.4 6.0 5.6 5.3 5.8 5.8 0.0							+			_						
			,				_								_	0.0
			A11				+			_					_	_
Approach Delay, s/veh / LOS 6.2 A 5.5 A 5.8 A 1.2 A		·	/LOS								5		Δ	1.3		
		Intersection Delay, s/veh / LOS								7.			, \			, ,
T.T	miorocollon Dela	.y, 5/ V C												**		
Multimodal Results EB WB NB SB	Multimodal Res	ults				EB			WI	3		NB			SB	
Pedestrian LOS Score / LOS 1.64 B 1.86 B 2.06 B 2.23 B	Pedestrian LOS						В	1.86	3	В	2.	06	В	2.2	3	В
Bicycle LOS Score / LOS 0.93 A F 0.63 A 1.05 A	Bicycle LOS Sco	re / LC)S		0.93	3	Α			F	0.	63	Α	1.0	5	Α

		HCS	Sigr	nalize	d Inte	ersect	ion R	esu	lts Sun	nmary	1				
General Inform	ation								Intersec	tion Inf	ormatic	\n		i a passar	R E
	iation								Duration		1.000			4 4	
Agency		Emma Myora Varha		Analye	sia Data	8/16/2	0000				Other				
Analyst Jurisdiction		Emma Myers-Verha Box Elder, SD	ige	Time F		PM P			Area Typ PHF	e	1.00			w‡t	.
Urban Street		Alternative 4.2 - no	M/DT		sis Year		зак		Analysis	Dariad	1> 7:0	20			
							416 FII0	worth							i i i
Intersection	t:	Hwy 1416 and S Ell		File Na	ame	Hwy	4 10-EIIS	wortr	nRd_Alt4.2	2_PIVIPE	eak2050	.xus	- 4	† Eustad	6.75
Project Descript	lion	Radar Hill 1416 Cor	ridor Si	uay					_					da care sun l'atte l'attel	20 352
Demand Inforn	nation				EB			W	/B		NB			SB	
Approach Move	ment			L	Т	R	L	T	Г В	L	Т	R	L	Т	R
Demand (v), v				352	99	178	18		8	43	43	8	8	72	327
,,,															-1
Signal Informa	tion				3 5	-25									\mathbf{L}
Cycle, s	24.3	Reference Phase	2		Ħ°	T 50	a						♣ .	1	stzi İ
Offset, s	0	Reference Point	End	Green	7.7	7.7	0.0	0.0	0.0	0.0		1	X Z	3	4
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow		3.5	0.0	0.0		0.0					KD2
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.0	1.0	0.0	0.0	0.0	0.0		5	6	7	8
Timer Results				EBI	-	EBT	WB	L	WBT	NB	L L	NBT	SB	L	SBT
Assigned Phase	-				_	2		_	6			8			4
Case Number						5.0		_	5.0			8.0			7.0
Phase Duration						12.2		_	12.2			12.2			12.2
Change Period,	•					4.5		_	4.5			4.5			4.5
	low Headway (<i>MAH</i>), s					3.0		_	3.0			3.4			3.4
Queue Clearan	e Clearance Time (g s), s					6.6		_	2.8			3.0			7.0
Green Extensio		(g e), s				1.0			1.1			1.1			1.0
Phase Call Prob	oability					1.00			1.00			0.97			0.97
Max Out Probal	bility					0.01		\perp	0.00			0.00			0.02
Mayamant Cra					- ED			١٨/٢	,		ND			CD	
Movement Gro		SuitS			EB T	R		WE	R	-	NB T	R		SB T	В
Approach Move Assigned Move				5	2	12	1	1	16	3	8	18	7	4	R 14
Adjusted Flow F) vob/b		352		178	18		8	<u> </u>	94	10	-	80	
_		ow Rate (s), veh/h/l	n	1615	99 1614	1437	1214		1367		1565			1666	327
Queue Service			11	4.6	0.5	2.4	0.3		0.1		0.0			0.0	
Cycle Queue Cl		- , .		4.6	0.5	2.4	0.8		0.1		1.0			0.8	
Green Ratio (g		e Tillie (<i>g c)</i> , s		0.31	0.31	0.31	0.8		0.1		0.31			0.8	
Capacity (c), v				805	1017	453	653		431		709			688	
Volume-to-Capa		atio (X)		0.438	0.097	_			0.019		0.133			0.116	
		In (95 th percentile)	14.2	1.5	6.9	0.028		0.019		5			7.9	
	· /·	eh/In (95 th percenti		0.5	0.1	0.3	0.0		0.0		0.2		-	0.3	
	• ,	RQ) (95 th percent	,	0.00	0.00	0.00	0.00		0.00		0.2			0.00	
Uniform Delay (, ,		7.3	5.9	6.5	6.1		5.7		6.0			6.0	
Incremental Del				0.1	0.0	0.3	0.0		0.0		0.0			0.0	
				0.0	0.0	0.2	0.0		0.0		0.0			0.0	
	itial Queue Delay (d ɜ), s/veh ontrol Delay (d), s/veh				5.9	6.7	6.2		5.7		6.1			6.0	0.0
Level of Service				7.4 A	3.9 A	A	A		3.7 A		A			A	0.0 A
	Approach Delay, s/veh / LOS					A	6.0		A	6.1		A	1.2		A
	Intersection Delay, s/veh / LOS						.9		^	0.1			A		Λ
microection Del	ay, s/ve	лі / LOO				4	.5						/1		
Multimodal Re	sults				EB			WE	3		NB			SB	
	edestrian LOS Score / LOS					В	1.87	-	В	2.06		В	2.23		В
Bicycle LOS Sc				1.6 ⁴	-	Α			F	0.64		Α	1.16	_	Α

		HCS	S Sigr	nalized	d Inte	ersect	ion R	esul	ts Sun	nmary	<u> </u>				
General Inform	nation	v							Intersec	tion Inf	ormatio	on			掛鍵
Agency									Duration	, h	1.000	1		* *	
Analyst		Emma Myers-Verha	age	Analys	is Date	e 8/14/2	2023		Area Typ	е	Other				<u> </u>
Jurisdiction		Box Elder, SD		Time F	Period	AM P	eak		PHF		1.00			w∳t	
Urban Street		Alternative 1		Analys	is Yea	2030			Analysis	Period	1> 7:0	00			- F
Intersection		Hwy 1416 and Rad	ar Hil	File Na	ame	Hwy1	416-Rad	darHill	_Alt1_AN	/IPeak20	030.xus			7 1	
Project Descrip	tion	Radar Hill 1416 Co	rridor St	udy									5		新 德
Demand Inform	nation				EB			WI	3		NB			SB	
Approach Move	ment			L	Т	R	L	Т	R	L	Т	R	L	Т	R
Demand (v), v	eh/h			5	697	64	102	43	3 7	179	18	312	11	26	17
Signal Informa	tion					5									
Cycle, s	61.1	Reference Phase	2	1	12 6	- 2	7.3	7	, E	- 1			A	\	4
Offset, s	0	Reference Point	End		ļ.,		- 6					1	2	3	4
Uncoordinated	Yes	Simult. Gap E/W	On	Green Yellow		3.7 0.0	15.0 3.5	0.9		18.9 3.5	1	,			
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.0	0.0	1.0	1.0	_	1.0		5	6	7	Y
T D				EDI		EDT	NA/P		MDT	NIDI		NDT	ODI		ODT
Timer Results				EBL	-	EBT	WB	L	WBT	NBI		NBT	SBI	_	SBT
Assigned Phase				5	_	2	1	_	6	3	_	8	7	_	4
Case Number				1.1	_	3.0	1.1	-	3.0	1.1		4.0	1.1		4.0
Phase Duration				4.9	_	19.5	8.6	_	23.2	9.6		27.6	5.4		23.4
Change Period,	•	,		4.5 2.9	_	4.5	4.5	_	4.5	4.5		4.5	4.5	_	4.5
	ax Allow Headway (<i>MAH</i>), s					2.9	2.9	_	2.9	3.0	_	3.3	3.3		3.3
	ueue Clearance Time (g_s), s reen Extension Time (g_e), s					14.2	4.7		8.3	6.3		12.8	2.3		3.1
Phase Call Prol		(<i>g</i> e), S		0.0		1.00	0.0	_	1.00	0.0		0.5 1.00	0.0		1.00
Max Out Proba				1.00	_	0.70	1.00		0.08	1.00		0.14	1.00		0.00
IVIAX OUL PIODA	Dility			1.00		0.70	1.00		0.06	1.00	,	0.14	1.00	,	0.00
Movement Gro	up Res	ults			EB			WB			NB			SB	
Approach Move				L	Т	R	L	Т	R	L	Т	R	L	T	R
Assigned Move	ment			5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow F		<u>, </u>		5	697	64	102	433	7	179	330		11	43	
		ow Rate (s), veh/h/l	n	1667	1666	1483	1667	1666		1667	1495		1667	1634	
Queue Service		- ,		0.1	12.2	2.1	2.7	6.3	0.2	4.3	10.8		0.3	1.1	
Cycle Queue C		e Time (<i>g c</i>), s		0.1	12.2	2.1	2.7	6.3	0.2	4.3	10.8		0.3	1.1	
Green Ratio (g				0.25	0.25	0.25	0.33	0.31		0.42	0.38		0.32	0.31	
Capacity (c), v				294	819	365	265	1021		659	566		322	505	
Volume-to-Capa				0.017	0.851	0.176	0.385	0.424	_	0.272	0.583		0.034	0.085	
	· /·	/In (95 th percentile		2	200.7	26.8	36.8	87.5		57.1	164.5		4.5	20.1	
	· · /·	eh/ln (95 th percenti		0.1	8.0	1.1	1.5	3.5	0.1	2.3	6.6		0.2	0.8	
		RQ) (95 th percent	ile)	0.00 17.3	0.00 22.0	0.00	0.00	0.00		0.00	0.00		0.00	0.00	
	Jniform Delay (d 1), s/veh					18.2	16.2	16.9		11.6	15.2		14.7	15.0	
Incremental De		0.0	5.7 0.0	0.1	0.3	0.1	0.0	0.1	4.4		0.0	0.3	-		
	Initial Queue Delay (<i>d</i> ₃), s/veh Control Delay (<i>d</i>), s/veh					0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
				17.3	27.7	18.3	16.5	17.0		11.6	19.6		14.7	15.3	
Level of Service Approach Delay				B 26.0	С	C B	B 16.9	B	B B	B 16.9	В	В	B 15.2	В	В
Intersection Delay		26.9).9	7	D	16.8)	D	C 15.2		D		
De	.ay, 5/ v C					20									
Multimodal Re	sults				EB			WB			NB			SB	
Pedestrian LOS				1.91	_	В	1.91	1	В	2.41	1	В	2.42	2	В
Bicycle LOS Sc	ore / LC	os		1.12		Α	0.93	3	Α	1.33	3	Α	0.58	3	Α

	HCS	S Sigr	alize	d Inte	ersect	ion R	esul	lts Sun	nmary	/				
												1 00		50.100
General Information	1							Intersec	tion Inf	ormatio	on			
Agency								Duration		1.000)		7 7	A
Analyst	Emma Myers-Verha	age	Analys	is Date	8/17/2	2023		Area Typ	ре	Other	-			~
Jurisdiction	Box Elder, SD		Time F	Period	AM P	eak		PHF		1.00			w∯t	
Urban Street	Alternative 1		Analys	is Year	2050			Analysis	Period	1> 7:0	00			√ 20 20 20
Intersection	Hwy 1416 and Rad	ar Hil…	File Na	ame	Hwy1	416-Rad	darHil	I_Alt1_Al	лРeak20	050.xus	i		7 7	
Project Description	Radar Hill 1416 Co	rridor St	udy									5		818
Demand Informatio	n			EB			W	В		NB			SB	
Approach Movement			L	Т	R	L	T	R	L	Т	R	L	Т	R
Demand (v), veh/h			5	789	73	115	49	1 8	202	18	354	12	28	19
Signal Information					5	1 5								
	Reference Phase	2		L ,	- }	∄? }		7	- 1			ж	~	▲□
Cycle, s 66.6	_	End	ł	"		R'	· •	\ \ \ \ \ \	171		1	Y 2	3	4
Offset, s 0 Uncoordinated Yes	Reference Point		Green		4.2	18.5	5.1					A		
Uncoordinated Yes Force Mode Fixe		On On	Yellow Red	1.0	0.0	3.5	3.5		0.0			Y	7	Ψ
Force wode Fixe	u Simuit. Gap iv/S	On	Reu	1.0	10.0	1.0	1.0	1.0	0.0		5	6	1	
Timer Results			EBL		EBT	WB	L	WBT	NB	L	NBT	SBI	_	SBT
Assigned Phase			5		2	1		6	3		8	7		4
Case Number			1.1		3.0	1.1		3.0	1.1		4.0	1.1		4.0
Phase Duration, s			4.9		23.0	9.1		27.2	9.6		25.0	9.5		24.9
Change Period, (Y+	<i>R c</i>), s		4.5		4.5	4.5		4.5	4.5		4.5	4.5		4.5
Max Allow Headway			2.9		2.9	2.9	-	2.9	3.0	_	3.3	3.3	_	3.3
Queue Clearance Tir	· ,		2.1		17.6	5.2	-	10.0	7.1		17.9	2.3	_	3.4
Green Extension Tim	, - ,		0.0		0.9	0.0	_	2.6	0.0	_	0.3	0.0	_	0.8
Phase Call Probabilit	· - /		0.09		1.00	0.88	3	1.00	0.98	3	1.00	1.00)	1.00
Max Out Probability			1.00		0.71	1.00)	0.06	1.00)	1.00	1.00)	0.00
Movement Group R				EB		<u> </u>	WE		.	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 (<u> </u>	l	5	789	73	115	491		202	372		12	47	
	Flow Rate (s), veh/h/l	ın	1615	1614	1437	1602	160		1615	1447		1628	1593	
Queue Service Time			0.1	15.6	2.6	3.2	8.0	_	5.1	15.9		0.3	1.4	
Crosp Ratio (g/C)	ice Time (g c), s		0.1	15.6	2.6	3.2	8.0	_	5.1	15.9		0.3	1.4	
Green Ratio (g/C)			0.28	0.28	0.28	0.37	0.34		0.38	0.31		0.38	0.31	
Capacity (c), veh/h	Potio (V)		289	896	399	249	109		613	445		269	488	
Volume-to-Capacity I	Ratio (X) ft√ln (95 th percentile	,)	0.017 2.2	0.880 253.9	_	0.463 45.6	0.45		0.330 85.1	0.835		0.045	0.096 25.2	
. , ,	veh/ln (95 th percent	,	0.1	9.8	1.3	1.8	4.3		3.3	11.3		0.2	1.0	
(' / '	(RQ) (95 th percent		0.00	0.00	0.00	0.00	0.00	_	0.00	0.00		0.2	0.00	
Uniform Delay (d 1)		tiio)	17.4	23.0	18.3	16.8	17.1		14.7	21.5		15.3	16.5	
Incremental Delay (0.0	7.9	0.1	0.5	0.1	_	0.1	19.2		0.3	0.4	
Initial Queue Delay (·		0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.4	
Control Delay (d), s	·		17.4	30.9	18.4	17.3	17.2		14.8	40.7		15.6	16.9	
Level of Service (LO			B	C	B	17.3 B	17.2 B	B	B	40.7 D		13.0 B	B	
Approach Delay, s/ve			29.7		С	17.2		В	31.6		С	16.6		В
Intersection Delay, s/			20.1			6.2			51.0			C		
												سن		
Multimodal Results				EB			WE	3		NB			SB	
Pedestrian LOS Sco	re / LOS		1.91		В	1.90)	В	2.42	2	В	2.42	2	В
Bicycle LOS Score /	LOS		1.20		Α	0.99	9	Α	1.43	3	Α	0.58	3	Α

		HCS	Sigr	alize	d Inte	ersect	ion R	esul	ts Sun	nmary	'				
													1 00	VIV 11.12	eventure.
General Informa	tion								Intersec		N .				新城
Agency				0					Duration	, h	1.000			* *	
Analyst		Emma Myers-Verha	ige	Analys	is Date	8/14/2			Area Typ	е	Other	-			<u> </u>
Jurisdiction		Box Elder, SD		Time F	Period	AM P	eak		PHF		1.00			w∳t	
Urban Street		Alternative 1		Analys	is Yea	2030			Analysis	Period	1> 16	3:45			
Intersection		Hwy 1416 and Rada	ar Hil	File Na	ame	Hwy1	416-Ra	darHill	_Alt1_PN	/IPeak20)30.xus	i		ጎ ት	
Project Description	on	Radar Hill 1416 Cor	ridor St	udy									5		F (7)
Demand Informa	ation				EB			WI	3		NB			SB	
Approach Movem	nent			L	Т	R	L	Т	R	L	Т	R	L	Т	R
Demand (v), veh	h/h			20	424	204	194	56	1 4	117	10	123	5	9	11
Signal Information	on					5					,				1
T I	57.8	Reference Phase	2	1	P 2	7 2	743	- F	S E			_	A	5	4
Offset, s	0	Reference Point	End		4.4	1 1	44.0	1 "				1	2	3	4
	Yes	Simult. Gap E/W	On	Green Yellow		4.1 0.0	11.6 3.5	0.4 3.5		18.5 3.5		,	→		ĸ+×
	Fixed	Simult. Gap N/S	On	Red	1.0	0.0	1.0	1.0		1.0		5	6	7	Y
Timer Results				EBL		EBT	WB		WBT	NBI		NBT	SBI		SBT
				5	-	2	1	L	6	3	-		7	-	4
Assigned Phase					_		<u> </u>	_				8	_		
Case Number				1.1	-	3.0	1.1	_	3.0	1.1	_	4.0	1.1	_	4.0
Phase Duration, s		`		5.9	_	16.1	10.0	_	20.2	8.7		26.9	4.9	_	23.0
Change Period, (,		4.5	-	4.5	4.5	_	4.5	4.5	_	4.5	4.5	_	4.5
Max Allow Headw		· · · · · · · · · · · · · · · · · · ·		2.9 2.6	_	2.9	2.9	_	2.9	3.0		3.3	3.3	_	3.3
	ueue Clearance Time (g_s), s reen Extension Time (g_e), s					9.7	7.4	_	10.9	4.6	-	5.6	2.1	-	2.5
Phase Call Proba		(<i>g e</i>), s		0.0 0.27		1.00	0.0	_	1.9	0.0		1.00	0.0		1.00
Max Out Probabil				1.00	_	0.14	1.00	_	0.18	1.00		0.00	1.00	_	0.00
Max Out 1 Tobabii	пту			1.00		0.14	1.00		0.10	1.00		0.00	1.00		0.00
Movement Grou	-	ults			EB			WB			NB			SB	
Approach Movem				L	T	R	L	T	R	L	T	R	L	Т	R
Assigned Movem				5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Ra		<u>,</u>		20	424	204	194	561	4	117	133		5	20	
		w Rate (s), veh/h/l	n	1615	1614	1437	1602	1601		1615	1453		1628	1555	
Queue Service Ti	` -	•		0.6	7.0	7.7	5.4	8.9	0.1	2.6	3.6		0.1	0.5	
Cycle Queue Cle		e Time (<i>g c</i>), s		0.6	7.0	7.7	5.4	8.9	0.1	2.6	3.6		0.1	0.5	
Green Ratio (g/C				0.22	0.20	0.20	0.32	0.27	_	0.42	0.39		0.33	0.32	
Capacity (c), vel				232	648	288	352	871	388	669	562		497	497	
Volume-to-Capac				0.086	0.655		0.551	0.644	_	0.175	0.237		0.010	0.040	
,		/In (95 th percentile		8.1	101.9	_	75.4	126.		34.4	49.7		1.9	8.7	
<u> </u>	. , .	eh/In (95 th percenti		0.3	3.9	3.9	2.9	4.8	0.1	1.3	1.9		0.1	0.3	
		RQ) (95 th percent	ile)	0.00 18.0	0.00 21.3	0.00	0.00	0.00	_	0.00	0.00		0.00	0.00	
- ,	Uniform Delay (d 1), s/veh					21.5	15.9	18.6		10.7	12.0		13.2	13.6	
Incremental Dela		0.1	0.4	1.2	1.1	0.6	0.0	0.0	1.0		0.0	0.2			
Initial Queue Dela		,		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (d		eh		18.1	21.7	22.7	17.0	19.2		10.7	13.0		13.2	13.7	
Level of Service (` '	/ 1 00		В	С	С	В	В	B	В	В		B	В	
Approach Delay,		21.9		С	18.6	0	В	11.9		В	13.6)	В		
Intersection Delay	y, s/ve	h / LOS				18	3.8						В		
Multimodal Resu	ults				EB			WB			NB			SB	
Pedestrian LOS S	Score	/ LOS		1.91		В	1.9 ²	1	В	2.41		В	2.41	1	В
Bicycle LOS Scor	re / LC	S		1.02		Α	1.11	1	Α	0.90)	Α	0.53	3	Α

Agency			HCS	S Sigr	nalize	d Inte	ersect	ion R	esul	ts Sun	nmary	<i>'</i>				
Agency																
Agency	General Inform	nation	v							Intersec	tion Inf	ormatio	on		The state of the s	B 12
Mariaglicition	Agency									Duration	, h	1.000)		* *	
Urban Street	Analyst		Emma Myers-Verha	age	Analys	is Date	e 8/17/2	2023		Area Typ	е	Other	٢			<u> </u>
Intersection	Jurisdiction		Box Elder, SD		Time F	Period	PM P	eak		PHF		1.00			w∯t	
Project Description Radar Hill 1416 Corridor Substitution Project Description Radar Hill 1416 Corridor Substitution Project Description Radar Hill 1416 Corridor Substitution Project Description Radar Hill 1416 Corridor Substitution Radar Hill 1416 Corridor Substituti	Urban Street		Alternative 1		Analys	is Yea	2050			Analysis	Period	1> 16	3:30			•
Demand Information	Intersection		Hwy 1416 and Rad	ar Hil…	File Na	ame	Hwy1	416-Ra	darHill	_Alt1_PN	1Peak20)50.xus	•		ጎ ቱ	
Approach Movement	Project Descrip	tion	Radar Hill 1416 Co	rridor St	udy									5		另 很
Demand (Demand Inform	nation				EB			WE	3		NB			SB	
Signal Information	Approach Move	ment			L	Т	R	L	Т	R	L	T	R	L	Т	R
Cycle S Go.0 Reference Phase 2 Offset S Os Reference Phase 2 Offset S Os Reference Phase 2 Os Os S Os Os Os Os Os	Demand (v), v	eh/h			23	494	238	222	65	3 4	133	10	143	5	11	12
Cycle S Go.0 Reference Phase 2 Offset S Os Reference Phase 2 Offset S Os Reference Phase 2 Os Os S Os Os Os Os Os	Signal Informa	tion					18									
Offset, s 0 Reference Point End Uncoordinated Yes Simult. Gap EWI On Point Flore Mode of Fixed Simult. Gap EWI On Point Flore Mode of Fixed Simult. Gap EWI On Point Flore Mode of Fixed Simult. Gap EWI On Point Flore Mode of Fixed Simult. Gap EWI On Point Flore Mode of Fixed Simult. Gap EWI On Point Flore Mode of Fixed Simult. Gap EWI On Point Flore Mode of Fixed Simult. Gap EWI Vision Flore Mode of Fixed Simult. Gap EWI Wilt. On Dividing Flore Wilt. NBL NBL SBL SBL SBT Time Results 5 2 1.1 3.0 1.1 4.0 1.1 4.0 1.1 4.0 4.1 4.0 4.1 4.0 </td <td></td> <td></td> <td>Reference Phase</td> <td>2</td> <td>1</td> <td>12 6</td> <td>- 2</td> <td>743</td> <td></td> <td>S 150</td> <td></td> <td></td> <td></td> <td>Z </td> <td>~</td> <td>4</td>			Reference Phase	2	1	12 6	- 2	743		S 150				Z	~	4
Number Number							1	3					1	2	3	4
Force Mode													,			
Assigned Phase			·			-	_	_	-				5	6	7	Y
Assigned Phase	T' D				EDI		EDT	14/D		WDT	NDI		NDT	ODI		ODT
Case Number 1.1 → Raise Duration, s 1.1 → Raise Duration, s<						-			L			-			-	
Phase Duration, s 6.1 4.5		2			_	_					_			-	_	
Change Period, (Y+R₂), s 4.5 </td <td></td> <td></td> <td></td> <td></td> <td>_</td> <td>_</td> <td></td> <td></td> <td>_</td> <td></td> <td></td> <td></td> <td></td> <td>-</td> <td>_</td> <td></td>					_	_			_					-	_	
Max Allow Headway (MAH), s 2.9 2.9 1.3 3.9 3.9 3.9 3.0 3.0 3.3						_		_						_		
Queue Clearance Time (g ₂), s 2.7 11.3 7.9 12.8 5.2 6.4 2.1 2.6 Green Extension Time (g ₂), s 0.0 2.1 0.0 2.0 0.0 0.3 0.0 0.3 Phase Call Probability 0.32 1.00 0.98 1.00 0.89 1.00 0.08 1.00 0.00 1.00 0.00 1.00 0.00 1.00 0.00 1.00 0.00 1.00 0.00 1.00 0.00 1.00 0.00 1.00 0.00			<u> </u>			_			_			_			_	
Green Extension Time (g ∘), s 0.0 ∪ 0.32 ∪ 1.00 0.98 ∪ 1.00 0.98 ∪ 1.00 0.89 ∪ 1.00 0.89 ∪ 1.00 0.08 ∪ 1.00 0.08 ∪ 1.00 0.08 ∪ 1.00 0.08 ∪ 1.00 0.08 ∪ 1.00 0.08 ∪ 1.00 0.08 ∪ 1.00 0.00		· · · · · · · · · · · · · · · · · · ·							_			_		_		
Phase Call Probability 0.3 2 bit 1.00 bit		, - ,													_	
Movement Group Results Temperature of the color of the c			(<i>g</i> e), S						_			_				
Movement Group Results LB FB L DT R DT R D L DT R D DT						_		_	_		_			_	_	
Approach Movement IL T R L L L L L L	Max Out Probai	DIIILY			1.00		0.31	1.00	J	0.38	1.00	,	0.00	1.00	,	0.00
Assigned Movement	Movement Gro	up Res	sults			EB			WB			NB			SB	
Adjusted Flow Rate (v), veh/h 23	Approach Move	ment			L	T	R	L	T	R	L	T	R	L	Т	R
Adjusted Saturation Flow Rate (\$s\$), veh/h/ln 1615 1614 1437 1602 1601 1425 1615 1451 1628 1562 2000 2	Assigned Move	ment			5	2	12	1	6	16	3	8	18	7	4	14
Queue Service Time (g s), s 0.7 8.4 9.3 5.9 10.8 0.1 3.2 4.4 0.1 0.6 Cycle Queue Clearance Time (g c), s 0.7 8.4 9.3 5.9 10.8 0.1 3.2 4.4 0.1 0.6 Image: Control of the proper time (g c), s 0.7 8.4 9.3 5.9 10.8 0.1 3.2 4.4 0.1 0.6 Image: Control of the proper time (g c), s 0.7 8.4 9.3 5.9 10.8 0.1 3.2 4.4 0.1 0.6 0.3 0.3 0.3 0.2 9.4 4.8 0.3 5.9 10.8 0.1 0.3 0.3 0.3 0.3 0.3 0.2 0.2 0.4 0.3 0.3 0.3 0.3 0.3 0.2 0.2 0.3 0.3 0.3 0.2 0.2 0.3 0.3 0.3 0.2 0.2 0.2 0.3 0.3 0.3 0.2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Adjusted Flow F	Rate(<i>v</i>), veh/h		23	494	238	222	653	4	133	153		5	23	
Cycle Queue Clearance Time (g c), s 0.7 8.4 9.3 5.9 10.8 0.1 3.2 4.4 0.1 0.5 0.30 0.41 0.37 0.31 0.30 0.30 0.30 0.30 0.30 0.41 0.37 0.41 0.37 0.41 0.30 0.00	Adjusted Satura	ation Flo	ow Rate (s), veh/h/l	n	1615	1614	1437	1602	1601	1425	1615	1451		1628	1562	
Green Ratio (g/C) 0.25 0.22 0.22 0.29 0.29 0.41 0.37 0.31 0.30 □ Capacity (c), veh/h 224 718 320 350 942 419 643 540 455 472 □ Capacity (c), veh/h Volume-to-Capacity Ratio (X) 0.102 0.688 0.745 0.634 0.693 0.010 0.207 0.283 0.011 0.049 □ 0.049 □ Description (2), veh/ln (95 th percentile) 9.4 123.6 129.7 94.9 157.8 1.5 42.7 63.8 2.1 10.8 0.011 0.049 □ 0.04 4.8 5.0 3.7 6.1 0.1 1.7 2.5 0.1 0.4 4.8 5.0 3.7 6.1 0.1 1.7 2.5 0.1 0.4 4.8 5.0 3.7 6.1 0.1 1.7 2.5 0.1 0.4 4.8 5.0 3.7 6.1 0.1 1.7 2.5 0.1 0.1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Queue Service	Time (g s), s		0.7	8.4	9.3	5.9	10.8	0.1	3.2	4.4		0.1	0.6	
Capacity (c), veh/h 224 718 320 350 94∠ 419 643 540 455 472 Volume-to-Capacity Ratio (X) 0.102 0.688 0.745 0.634 0.693 0.010 0.207 0.283 0.011 0.049 □ Back of Queue (Q), ft/ln (95 th percentile) 9.4 123.6 129.7 94.9 157.8 1.5 42.7 63.8 2.1 10.8 Back of Queue (Q), veh/ln (95 th percentile) 0.4 4.8 5.0 3.7 6.1 0.1 1.7 2.5 0.1 0.4 Queue Storage Ratio (RQ) (95 th percentile) 0.00	Cycle Queue C	learanc	e Time ($g c$), s		0.7	8.4	9.3	5.9	10.8	0.1	3.2	4.4		0.1	0.6	
Volume-to-Capacity Ratio (X) 0.688 0.745 0.634 0.693 0.010 0.207 0.283 0.011 0.49 0.49 123.6 129.7 94.9 157.8 1.5 42.7 63.8 0.011 0.049 10.8 2.1 2.1	, , ,				0.25	0.22	0.22	0.35	0.29	0.29	0.41	0.37		0.31	0.30	
Back of Queue (Q), ft/in (95 th percentile) 9.4 123.6 129.7 94.9 157.8 1.5 42.7 63.8 2.1 10.8 Back of Queue (Q), veh/ln (95 th percentile) 0.4 4.8 5.0 3.7 6.1 0.1 1.7 2.5 0.1 0.4 0.4 4.8 5.0 3.7 6.1 0.1 1.7 2.5 0.1 0.4 0.4 4.8 5.0 3.7 6.1 0.1 1.7 2.5 0.1 0.4 0.4 4.8 5.0 3.7 6.1 0.1 1.7 2.5 0.1 0.1 0.4 1.8 1.8 1.8 1.5 0.0 0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0 1.5	Capacity (c), v	eh/h			224	718	320	350	942	419	643	540		455	472	
Back of Queue (Q), veh/ln (95 th percentile) 0.4 4.8 5.0 3.7 6.1 0.1 1.7 2.5 0.1 0.4 4.8 5.0 3.7 6.1 0.1 1.7 2.5 0.1 0.4 4.8 1.0 0.00					0.102	0.688	0.745	0.634	0.693	0.010	0.207	0.283		0.011	0.049	
Queue Storage Ratio (RQ) (95 th percentile) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	Back of Queue	(Q), f	/In (95 th percentile	:)	9.4	123.6	129.7	94.9	157.8	1.5	42.7	63.8		2.1	10.8	
Uniform Delay ($d alpha$), s/veh 17.8 $2 overline{1}{14}$ 21.7 16.3 18.8 15.0 11.5 13.2 14.4 14.8 14.8 Incremental Delay ($d alpha$), s/veh 0.1 0.5 2.9 2.9 1.5 0.0 0.1 1.3 0.0 0.0 0.2 Initial Queue Delay ($d alpha$), s/veh 0.0		· · /·	<u>'</u>		0.4	4.8	5.0	3.7	6.1	0.1	1.7	2.5		0.1	0.4	
Incremental Delay ($d \ 2$), s/veh $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Queue Storage	Ratio (RQ) (95 th percent	tile)		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Initial Queue Delay (d ₃), s/veh 0.0 <td>Uniform Delay (</td> <td colspan="5"></td> <td>21.7</td> <td>16.3</td> <td>18.8</td> <td>15.0</td> <td>11.5</td> <td>13.2</td> <td></td> <td>14.4</td> <td>14.8</td> <td></td>	Uniform Delay (21.7	16.3	18.8	15.0	11.5	13.2		14.4	14.8	
Control Delay (d), s/veh	Incremental De		0.1	0.5	2.9	2.9	1.5	0.0	0.1	1.3		0.0	0.2			
Level of Service (LOS) B C C B C B <td>Initial Queue De</td> <td colspan="5">· ; ;</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td></td> <td>0.0</td> <td>0.0</td> <td></td>	Initial Queue De	· ; ;					0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Approach Delay, s/veh / LOS 22.7 C 20.0 B 13.1 B 14.9 B Intersection Delay, s/veh / LOS 19.9 B Multimodal Results EB WB NB SB Pedestrian LOS Score / LOS 1.91 B 1.91 B 2.41 B 2.42 B					17.9			19.3	20.3	15.0	11.6	14.5		14.4	15.0	
Multimodal Results EB WB NB SB Pedestrian LOS Score / LOS 1.91 B 1.91 B 2.41 B 2.42 B					-			_								
Multimodal Results EB WB NB SB Pedestrian LOS Score / LOS 1.91 B 1.91 B 2.41 B 2.42 B			22.7)	В	13.1		В	14.9	9	В		
Pedestrian LOS Score / LOS 1.91 B 1.91 B 2.41 B 2.42 B	Intersection Del	lay, s/ve	eh / LOS				19	9.9						В		
Pedestrian LOS Score / LOS 1.91 B 1.91 B 2.41 B 2.42 B	Multimodal Re	sults				EB			WB			NB			SB	
							В	1.9	-		2.41	-	В	2.42		В
,					1.11	_	Α		_	Α			Α	_		Α

				НС	:S Rou	ındal	bou	ıts Re	port								
General Information				_	_				rmatio	n	_	_		_			
Analyst	Emma	Myers	-Verhag	e		4			Inter	section		Т	Highw	ay 141	6 and F	Radar Hil	
Agency or Co.						•			E/W	Street Na	ime		Highw	ay 141	6		
Date Performed	8/17/2	2023							N/S	Street Na	me		Radar	Hill Rd			
Analysis Year	2030				₹ ↓	W		1	Anal	ysis Time	Period, h	rs	1.00				
Time Analyzed	AM Pe	eak			X.				Peak	Hour Fac	tor		0.88				
Project Description	Radar Study	Hill 14	16 Corri	dor			• • •		Juris	diction			Box Eld	der, SE)		
Volume Adjustments	and S	ite Cl	narac	teristi	cs												
Approach		I	ЕΒ			W	/B			Ν	IB				SB		
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0	
Lane Assignment	Ľ	Т		TR	Lī	Г		TR			LTI	₹				LTR	
Volume (V), veh/h	0	5	702	64	0	107	454	. 7	0	179	18	314	0	12	25	17	
Percent Heavy Vehicles, %	4	4	4	4	5	5	5	5	4	4	4	4	3	3	3	3	
Flow Rate (VPCE), pc/h	0	6	830	76	0	128	542	8	0	212	21	371	0	14	29	20	
Right-Turn Bypass		N	one			No	ne			No	ne			N	one		
Conflicting Lanes			1			1	1				2				2		
Pedestrians Crossing, p/h			0			()			(0				0		
Proportion of CAVs									0								
Proportion of CAVs 0 Critical and Follow-Up Headway Adjustment																	
Approach		-	ΞB			W	/B		T	Ν	IB				SB		
Lane	Left	Ri	ght	Bypass	Left	Rig	ght	Bypass	Lef	: Ri	ght B	ypass	Left	R	ight	Bypass	
Critical Headway, s	4.5436	4.5	436		4.5436	4.54	436			4.3	276			4.	3276		
Follow-Up Headway, s	2.5352	2.5	352		2.5352	2.53	352			2.5	352			2.	5352		
Flow Computations,	Capaci	ty an	d v/c	Ratio	s												
Approach		ı	EB			W	/B		\Box	Ν	IB				SB		
Lane	Left	Ri	ght	Bypass	Left	Rig	ght	Bypass	Lef	: Ri	ght B	ypass	Left	R	ight	Bypass	
Entry Flow (v _e), pc/h	429	4	83		319	35	59			6	04				63		
Entry Volume, veh/h	412	4	65		303	34	42			5	81				61		
Circulating Flow (v₅), pc/h		1	71			23	39			8	50				382		
Exiting Flow (vex), pc/h		12	215			77	74			3	5			á	233		
Capacity (c _{pce}), pc/h	1215	12	215		1142	11	42			6	89			(571		
Capacity (c), veh/h	1169	1	169		1088	10	88			6	63			(551		
v/c Ratio (x)	0.35	0	.40		0.28	0.3	31			0.	88		0.09				
Delay and Level of Se	rvice																
Approach				EB		\top		WB		П	NB		Т		SB		
Lane			Left	Right	Вурая	ss Le	eft	Right	Bypass	Left	Right	Bypass	Le	ft	Right	Bypass	
Lane Control Delay (d), s/veh			6.5	7.1		6.	.0	6.4			43.2				6.6		
Lane LOS			Α	А		A	Δ .	А			Е				А		
95% Queue, veh			1.6	2.0		1.	.2	1.4			15.4				0.3		
Approach Delay, s/veh LOS			6.	8	Α		6.2		Α	43.	2	Е		6.6		Α	
Intersection Delay, s/veh LOS						16.4							С				

				НС	S Rou	ındal	bou	ts Re	port								
General Information		_	_						matio	n			_		_		
Analyst	Emma	Myers-	-Verhag	je		4			Inter	section		Т	Highwa	ay 141	6 and F	Radar Hil	
Agency or Co.						+	- -		E/W	Street Na	me		Highwa	ay 141	6		
Date Performed	8/17/2	2023							N/S	Street Na	me		Radar I	Hill Rd			
Analysis Year	2050				₹ \ ↓	W	D	1 >	Analy	sis Time	Period, hi	s	1.00				
Time Analyzed	AM Pe	eak			¥ \				Peak	Hour Fac	tor		0.88				
Project Description	Radar Study	Hill 14	16 Corri	dor			· · ·		Juriso	diction			Box Eld	er, SD			
Volume Adjustments	and S	ite Cl	narac	teristi	CS												
Approach		E	ΞВ			W	/B			N	IB			:	SB		
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0	
Lane Assignment	Ľ	Т		TR	Lī	-		TR			LTF	2				LTR	
Volume (V), veh/h	0	5	794	73	0	120	512	8	0	202	18	356	0	13	27	19	
Percent Heavy Vehicles, %	4	4	4	4	5	5	5	5	4	4	4	4	3	3	3	3	
Flow Rate (VPCE), pc/h	0	6	938	86	0	143	611	10	0	239	21	421	0	15	32	22	
Right-Turn Bypass		N	one			No	ne			No	ne			N	one		
Conflicting Lanes			1			1	1			2	2				2		
Pedestrians Crossing, p/h			0			C)			()				0		
Proportion of CAVs									0			<u> </u>					
Critical and Follow-U	р Неа	dway	Adju	ıstmen	ıt												
Approach		I	ΞB			W	/B		T	N	IB	\Box			SB		
Lane	Left	Ri	ght	Bypass	Left	Rig	ght	Bypass	Left	Rig	ght By	/pass	Left	Ri	ight	Bypass	
Critical Headway, s	4.5436	4.5	436		4.5436	4.54	436			4.3	276			4.3	3276		
Follow-Up Headway, s	2.5352	2.5	352		2.5352	2.53	352			2.5	352			2.5	5352		
Flow Computations,	Capaci	ty an	d v/c	Ratio	s												
Approach		[ΕB			W	/B		T	N	IB			:	SB		
Lane	Left	Ri	ght	Bypass	Left	Rig	ght	Bypass	Left	Rig	ght By	/pass	Left	Ri	ight	Bypass	
Entry Flow (v _e), pc/h	484	5	46		359	40)5			68	31				69		
Entry Volume, veh/h	465	5	25		342	38	36			6	55				67		
Circulating Flow (v₅), pc/h		1	90			26	56			9!	59			g	93		
Exiting Flow (vex), pc/h		13	374			87	72			3	7			2	261		
Capacity (c _{pce}), pc/h	1195	1	195		1115	11	15			62	28			6	511		
Capacity (c), veh/h	1149	1	149		1062	10	62			60	04			5	93		
v/c Ratio (x)	0.41	0	.46		0.32	0.3	36			1.	08		0.11				
Delay and Level of Se	rvice																
Approach				EB		\top		WB			NB		Т		SB		
Lane			Left	Right	Bypas	s Le	eft	Right	Bypass	Left	Right	Bypass	Lef	t	Right	Bypass	
Lane Control Delay (d), s/veh			7.3	8.0		6.	.6	7.1			217.7				7.4		
Lane LOS			Α	А		A	4	Α			F				Α		
95% Queue, veh			2.0	2.5		1.	.4	1.7			46.4				0.4		
Approach Delay, s/veh LOS			7.	7	А		6.9		A	217.	7	F		7.4		Α	
Intersection Delay, s/veh LOS						63.8		•			1		F				

				НС	S Rou	ındak	oou	ıts Re	port							
General Information			_				Site	Infor	matio	n			_	_	_	
Analyst	Emma	a Myers-	-Verhag	e		4			Inter	section		Ti	Highway	/ 1416	and R	Radar Hil
Agency or Co.						/ ←	- -		E/W	Street Na	me		Highway	/ 1416		
Date Performed	8/17/	2023							N/S S	Street Na	me		Radar H	ill Rd		
Analysis Year	2030				∡ ↓	w †	9	1 >		sis Time	Period, hr	s ·	1.00			
Time Analyzed	PM Pe	eak			₹\		1		Peak	Hour Fac	tor	(0.94			
Project Description	Radar Study	· Hill 141	16 Corri	dor			•		Juriso	diction		1	Box Elde	er, SD		
Volume Adjustments	and S	ite Cl	narac	teristi	cs											
Approach			В			W	В		\top	N	IB			S	В	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	L	.T		TR	LT			TR			LTR					LTR
Volume (V), veh/h	0	20	475	205	0	209	605	4	0	118	14	138	0	5	13	11
Percent Heavy Vehicles, %	4	4	4	4	5	5	5	5	4	4	4	4	3	3	3	3
Flow Rate (VPCE), pc/h	0	22	526	227	0	233	676	4	0	131	15	153	0	5	14	12
Right-Turn Bypass		No	one			Noi	ne			No	ne			No	ne	
Conflicting Lanes			1			1				7	2			á	2	
Pedestrians Crossing, p/h			0			0)			()			()	
Proportion of CAVs									0							
Critical and Follow-U	р Неа	dway	Adju	stmer	nt											
Approach		E	B			W	В		Τ	N	IB			S	В	
Lane	Left	Ri	ght	Bypass	Left	Rig	ht	Bypass	Left	Rig	ght By	pass	Left	Rig	ght	Bypass
Critical Headway, s	4.5436	6 4.5	436		4.5436	4.54	136			4.3	276			4.3	276	
Follow-Up Headway, s	2.5352	2 2.5	352		2.5352	2.53	352			2.5	352			2.5	352	
Flow Computations,	Capaci	ity an	d v/c	Ratio	s											
Approach		E	В			W	В		\top	N	IB			S	В	
Lane	Left	Ri	ght	Bypass	Left	Rig	ht	Bypass	Left	Rig	ght By	pass	Left	Rig	ght	Bypass
Entry Flow (v _e), pc/h	364	4	11		429	48	34			25	99			3	1	
Entry Volume, veh/h	350	3	95		409	46	51			28	38			3	0	
Circulating Flow (v _c), pc/h		2	52			16	8			5:	53			10	40	
Exiting Flow (vex), pc/h		6	84			81	9			4	1			47	74	
Capacity (c _{pce}), pc/h	1129	1	129		1219	121	19			88	37			58	37	
Capacity (c), veh/h	1086	10	086		1161	116	61			8:	53			57	70	
v/c Ratio (x)	0.32	0.	.36		0.35	0.4	10			0.	34			0.0	05	
Delay and Level of Se	rvice															
Approach				EB		T		WB			NB				SB	
Lane			Left	Righ	t Bypas	s Let	ft	Right	Bypass	Left	Right	Bypass	Left	F	Right	Bypass
Lane Control Delay (d), s/veh			6.5	7.0		6.5	5	7.1			8.0				6.9	
Lane LOS			Α	А		А		Α			А				А	
95% Queue, veh			1.4	1.7		1.6	6	2.0			1.5				0.2	
Approach Delay, s/veh LOS			6.	3	Α		6.9		А	8.0		Α	6	5.9		Α
Intersection Delay, s/veh LOS						7.0							A			

				НС	S Ro	unda	aboı	uts F	Rep	ort							
General Information		_	_			_	_	_		natio	n			_		_	
Analyst	Emma	Myers	-Verhag	je		4		l l		Inters	ection		Т	Highw	ay 141	6 and F	Radar Hil
Agency or Co.							† †	À		E/W S	Street Na	me		Highw	ay 141	6	
Date Performed	8/17/	2023							1	N/S S	treet Na	me		Radar	Hill Ro	<u> </u>	
Analysis Year	2050				★ ↓		V T E	1	Ž	Analy	rsis Time	Period, hr	S	1.00			
Time Analyzed	PM Pe	eak			¥					Peak	Hour Fac	tor		0.94			
Project Description	Radar Study	Hill 14	16 Corr	idor			→ ▼ *		×	Jurisc	liction			Box Eld	der, SE)	
Volume Adjustments	and S	ite Cl	narac	teristi	cs												
Approach		[ΕB				WB				N	IB				SB	
Movement	U	L	Т	R	U	L	Т		R	U	L	Т	R	U	L	Т	R
Number of Lanes (N)	0	0	2	0	0	0	2		0	0	0	1	0	0	0	1	0
Lane Assignment	L	.T		TR	ı	.T		TR				LTF				1	LTR
Volume (V), veh/h	0	23	545	239	0	237	69	7	4	0	134	14	158	0	5	15	12
Percent Heavy Vehicles, %	4	4	4	4	5	5	5		5	4	4	4	4	3	3	3	3
Flow Rate (VPCE), pc/h	0	25	603	264	0	265	779	9	4	0	148	15	175	0	5	16	13
Right-Turn Bypass		N	one	•		١	None				No	ne			Ν	lone	
Conflicting Lanes			1				1				Ź	2				2	
Pedestrians Crossing, p/h			0				0				()				0	
Proportion of CAVs)							
Critical and Follow-U	p Hea	dway	Adjı	ıstmer	nt												
Approach		[ΞB				WB				N	IB	Т			SB	
Lane	Left	Ri	ght	Bypass	Left	F	Right	Вура	ass	Left	Rig	ght By	pass	Left	R	ight	Bypass
Critical Headway, s	4.5436	6 4.5	436		4.543	6 4.	.5436				4.3	276			4.	3276	
Follow-Up Headway, s	2.5352	2 2.5	352		2.535	2 2.	.5352				2.5	352			2.	5352	
Flow Computations,	Capaci	ity an	d v/c	Ratio	S												
Approach		[ΞB				WB				N	IB	Т			SB	
Lane	Left	Ri	ght	Bypass	Left	F	Right	Вура	ass	Left	Rig	ght By	pass	Left	R	ight	Bypass
Entry Flow (v _e), pc/h	419	4	73		493		555				33	38				34	
Entry Volume, veh/h	403	4	55		469		529				32	25				33	
Circulating Flow (v₀), pc/h		2	86				188				63	33			1	192	
Exiting Flow (vex), pc/h		7	83				940				4	4			į	545	
Capacity (coce), pc/h	1095	10	095		1197		1197				82	29			1	516	
Capacity (c), veh/h	1053	10	053		1140	-	1140				79	97				501	
v/c Ratio (x)	0.38	0	.43		0.41		0.46				0.4	41			(0.07	
Delay and Level of Se	rvice																
Approach				EB		T		WB				NB		T		SB	
Lane			Left	Right	t Вура	iss	Left	Righ	nt E	Bypass	Left	Right	Bypass	. Le	ft	Right	Bypass
Lane Control Delay (d), s/veh		8.2			7.4	8.2				9.7				8.0			
Lane LOS	A A						Α	Α				А				Α	
95% Queue, veh			1.9	2.3			2.1	2.6				2.0				0.2	
Approach Delay, s/veh LOS			7	.8	Α		7.8		,	A	9.7		А		8.0		Α
Intersection Delay, s/veh LOS	5					8.1								A			
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				НС	S Rou	ındak	oou	ts Re	port							
General Information	_			_	_		_		matio	n	_					
Analyst	Emma	Myers	-Verhag	e		4			Inter	section		Т	Highv	vay 14	16 and I	Radar Hil
Agency or Co.						✓ ←	- -		E/W	Street Na	ime		Highv	vay 14	16	
Date Performed	8/17/	2023							N/S S	Street Na	me		Radar	Hill R	d	
Analysis Year	2030				₹ ↓	w f	D) † >	Analy	sis Time	Period, hı	s	1.00			
Time Analyzed	AM Pe	eak			¥ \			/	Peak	Hour Fac	tor		0.88			
Project Description	Radar Study		16 Corri	dor				1	Juriso	diction			Box E	der, SI	D	
Volume Adjustments	and S	ite Cl	harac	teristi	cs											
Approach			EB			W	В			N	IB				SB	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	L	T		TR	LT			TR			LT					LTR
Volume (V), veh/h	0	5	702	64	0	107	454	7	0	179	18	314	0	12	25	17
Percent Heavy Vehicles, %	4	4	4	4	5	5	5	5	4	4	4	4	3	3	3	3
Flow Rate (VPCE), pc/h	0	6	830	76	0	128	542	8	0	212	21	371	0	14	29	20
Right-Turn Bypass		N	one			No	ne			Yiel	ding			1	None	
Conflicting Lanes			1			1				2	2				2	
Pedestrians Crossing, p/h			0			0)			()				0	
Proportion of CAVs									0							
Critical and Follow-U	p Hea	dway	Adju	stmer	ıt											
Approach			EB			W	В			N	IB				SB	
Lane	Left	Ri	ght	Bypass	Left	Rig	ıht	Bypass	Left	Rig	ght By	/pass	Left	F	Right	Bypass
Critical Headway, s	4.5436	5 4.5	5436		4.5436	4.54	136			4.3	276 4.	9763		4	.3276	
Follow-Up Headway, s	2.5352	2 2.5	352		2.5352	2.53	352			2.5	352 2.	6087		2	.5352	
Flow Computations,	Capaci	ity an	d v/c	Ratio	s											
Approach			EB			W	В			Ν	IB				SB	
Lane	Left	Ri	ght	Bypass	Left	Rig	ht	Bypass	Left	Rig	ght By	/pass	Left	F	Right	Bypass
Entry Flow (v _e), pc/h	429	4	.83		319	35	9			2:	33	371			63	
Entry Volume, veh/h	412	4	65		303	34	2			22	24	357			61	
Circulating Flow (v _c), pc/h		1	71			23	9			8!	50				882	
Exiting Flow (vex), pc/h		8	44			77	'4			3	5				233	
Capacity (Cpce), pc/h	1215	1.	215		1142	114	42			68	39	583			671	
Capacity (c), veh/h	1169	1	169		1088	108	88			60	63	561			651	
v/c Ratio (x)	0.35	0	.40		0.28	0.3	31			0.	34 (0.64			0.09	
Delay and Level of Se	rvice															
Approach				EB				WB			NB				SB	
Lane			Left	Right	Bypas	s Le	ft	Right	Bypass	Left	Right	Bypas	s L	eft	Right	Bypass
Lane Control Delay (d), s/veh	6.5 7.1					6.0	0	6.4			9.9	20.6			6.6	
Lane LOS	A A					А	(Α			А	С			А	
95% Queue, veh	5% Queue, veh 1.6 2.					1.2	2	1.4			1.5	5.0			0.3	
Approach Delay, s/veh LOS	Approach Delay, s/veh LOS				Α		6.2		Α	16.	5	С		6.6		A
Intersection Delay, s/veh LOS	5					9.2							A			

				НС	:S Rou	ındak	oou	ts Re	port							
General Information	_			_	_		_		matio	n	_			_		
Analyst	Emma	Myers	-Verhag	je		4			Inter	section		Т	Highw	/ay 14	16 and I	Radar Hil
Agency or Co.						✓ ←	- -		E/W	Street Na	me		Highw	/ay 14	16	
Date Performed	8/17/2	2023							N/S S	Street Na	me		Radar	Hill R	d	
Analysis Year	2050				₹ ↓	w †	D) † >	Analy	sis Time	Period, h	rs	1.00			
Time Analyzed	AM Pe	eak			¥ \			/	Peak	Hour Fac	tor		0.88			
Project Description	Radar Study	Hill 14	16 Corri	dor			· 	1	Juriso	diction			Box El	der, S	D	
Volume Adjustments	and S	ite Cl	harac	teristi	cs											
Approach			EB			W	В			N	IB				SB	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	Ľ	Т		TR	LT			TR			LT					LTR
Volume (V), veh/h	0	5	794	73	0	120	512	8	0	202	18	356	0	13	27	19
Percent Heavy Vehicles, %	4	4	4	4	5	5	5	5	4	4	4	4	3	3	3	3
Flow Rate (VPCE), pc/h	0	6	938	86	0	143	611	10	0	239	21	421	0	15	32	22
Right-Turn Bypass		N	one			Noi	ne			Yield	ding			1	None	
Conflicting Lanes			1			1				ã	2				2	
Pedestrians Crossing, p/h			0			0)			()				0	
Proportion of CAVs									0							
Critical and Follow-U	р Неа	dway	Adju	ıstmen	it											
Approach			EB			W	В		Т	N	IB				SB	
Lane	Left	Ri	ight	Bypass	Left	Rig	ht	Bypass	Left	Rig	ght B	/pass	Left	ı	Right	Bypass
Critical Headway, s	4.5436	5 4.5	5436		4.5436	4.54	136			4.3	276 4.	9763		4	.3276	
Follow-Up Headway, s	2.5352	2.5	5352		2.5352	2.53	352			2.5	352 2.	6087		2	.5352	
Flow Computations,	Capaci	ity an	d v/c	Ratio	s											
Approach			EB			W	В			N	IB				SB	
Lane	Left	Ri	ight	Bypass	Left	Rig	ıht	Bypass	Left	Rig	ght B	/pass	Left	1	Right	Bypass
Entry Flow (v _e), pc/h	484	5	46		359	40)5			26	50	421			69	
Entry Volume, veh/h	465	5	25		342	38	86			25	50	405			67	
Circulating Flow (v _c), pc/h		1	90			26	66			9!	59				993	
Exiting Flow (vex), pc/h		g	53			87	'2			3	7				261	
Capacity (Cpce), pc/h	1195	1	195		1115	111	15			62	28	522			611	
Capacity (c), veh/h	1149	1	149		1062	106	62			60)4	502			593	
v/c Ratio (x)	0.41	0	.46		0.32	0.3	36			0.4	41	0.81			0.11	
Delay and Level of Se	rvice															
Approach				EB		Т		WB			NB		Т		SB	
Lane			Left	Right	Bypas	s Let	ft	Right	Bypass	Left	Right	Bypas	s Le	eft	Right	Bypass
Lane Control Delay (d), s/veh						6.6	6	7.1			12.2	38.9			7.4	
Lane LOS	A A					А		Α			В	Е			Α	
95% Queue, veh	Queue, veh 2.0 2.					1.4	4	1.7			2.1	10.3			0.4	
Approach Delay, s/veh LOS			7.	7	Α		6.9		Α	28.7	7	D		7.4		Α
Intersection Delay, s/veh LOS	7.7					13.1		•					В			

				НС	:S Rou	ındab	oou	ts Re	port							
General Information		_	_				_		matio	n			_		_	
Analyst	Emma	Myers	-Verhag	e		*			Inter	section			Highwa	y 141	6 and F	Radar Hil
Agency or Co.						✓ ←			E/W	Street Na	me		Highwa	y 141	6	
Date Performed	8/17/	2023						7	N/S S	Street Na	me		Radar H	ill Rd		
Analysis Year	2030				₹ ↓	w ÷	1) † >	4	sis Time	Period, h	rs .	1.00			
Time Analyzed	PM Pe	eak			7		4	/	Peak	Hour Fac	tor		0.94			
Project Description	Radar Study		16 Corri	dor			· 	1	Juriso	diction			Box Elde	er, SD		
Volume Adjustments	and S	ite Cl	narac	teristi	cs											
Approach		E	ΞB			WE	3			Ν	IB				SB	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	L	.T		TR	LT			TR			LT					LTR
Volume (V), veh/h	0	20	475	205	0	209	605	4	0	118	14	138	0	5	13	11
Percent Heavy Vehicles, %	4	4	4	4	5	5	5	5	4	4	4	4	3	3	3	3
Flow Rate (VPCE), pc/h	0	22	526	227	0	233	676	4	0	131	15	153	0	5	14	12
Right-Turn Bypass		N	one			Nor	ne			Yiel	ding			N	one	
Conflicting Lanes			1			1				2	2				2	
Pedestrians Crossing, p/h			0			0				()				0	
Proportion of CAVs									0							
Critical and Follow-U	р Неа	dway	Adju	stmen	ıt											
Approach		E	ΞB			WE	3			N	IB				SB	
Lane	Left	Ri	ght	Bypass	Left	Righ	ht	Bypass	Left	Rig	ght B	/pass	Left	R	ight	Bypass
Critical Headway, s	4.5436	5 4.5	436		4.5436	4.54	36			4.3	276 4.	9763		4.3	3276	
Follow-Up Headway, s	2.5352	2 2.5	352		2.5352	2.53	52			2.5	352 2.	6087		2.5	5352	
Flow Computations,	Capaci	ity an	d v/c	Ratio	s											
Approach		E	ΞB			WE	3			Ν	IB				SB	
Lane	Left	Ri	ght	Bypass	Left	Righ	ht	Bypass	Left	Rig	ght B	/pass	Left	R	ight	Bypass
Entry Flow (v _e), pc/h	364	4	11		429	484	4			14	46	153			31	
Entry Volume, veh/h	350	3	95		409	46	1			14	40	147			30	
Circulating Flow (v _c), pc/h		2	52			168	8			5!	53			1	040	
Exiting Flow (vex), pc/h		5	31			819	9			4	1			2	174	
Capacity (cpce), pc/h	1129	1	129		1219	121	9			88	37	803		5	87	
Capacity (c), veh/h	1086	10	086		1161	116	51			8:	53	772		5	70	
v/c Ratio (x)	0.32	0	.36		0.35	0.40	0			0.	16	0.19		С	.05	
Delay and Level of Se	ervice															
Approach				EB				WB			NB				SB	
Lane		Left Righ				s Lef	ft	Right	Bypass	Left	Right	Bypass	Left		Right	Bypass
Lane Control Delay (d), s/veh			6.5	7.0		6.5	5	7.1			5.9	6.7			6.9	
Lane LOS	A A					А		А			А	А			Α	
95% Queue, veh	95% Queue, veh 1.4					1.6	5	2.0			0.6	0.7			0.2	
Approach Delay, s/veh LOS				3	Α		6.9		А	6.3		Α	(5.9		Α
Intersection Delay, s/veh LOS	5					6.7		_					Α			

				НС	S Ro	unda	bou	uts	Rep	ort								
General Information				_			_	_	_	natio	n					_		_
Analyst	Emma	Myers	-Verhag	je		4		l l		Inters	ection			-	Highway	/ 141	6 and F	Radar Hil
Agency or Co.								À		E/W S	Street Na	ime		F	Highway	/ 141	6	
Date Performed	8/17/	2023					N		7	N/S S	treet Na	me		R	Radar H	ill Rd		
Analysis Year	2050				₹ ↓	W	† E 5			Analy	sis Time	Period,	nrs	1	.00			
Time Analyzed	PM Pe	eak			T.				/	Peak	Hour Fac	tor		0).94			
Project Description	Radar Study	Hill 14	16 Corri	idor			→ → ▼ 1	1 <u>r</u>		Jurisc	liction			В	Box Elde	er, SD)	
Volume Adjustments	and S	ite Cl	narac	teristi	cs													
Approach		i	ΞB			٧	VB				N	IB					SB	
Movement	U	L	Т	R	U	L	Т		R	U	L	Т	F	R	U	L	Т	R
Number of Lanes (N)	0	0	2	0	0	0	2		0	0	0	1	(0	0	0	1	0
Lane Assignment	L	T		TR	L	T		TR				ı	т.					LTR
Volume (V), veh/h	0	23	545	239	0	237	69	7	4	0	134	14	15	58	0	5	15	12
Percent Heavy Vehicles, %	4	4	4	5	5	5		5	4	4	4	4	4	3	3	3	3	
Flow Rate (VPCE), pc/h	0	25	603	264	0	265	779	9	4	0	148	15	17	75	0	5	16	13
Right-Turn Bypass		N	one			N	one				Yiel	ding				N	one	
Conflicting Lanes			1				1				2	2					2	
Pedestrians Crossing, p/h			0			0				()					0		
Proportion of CAVs					•				(0								
Critical and Follow-U	р Неа	dway	Adju	ıstmer	nt													
Approach		ı	ΞB			٧	VB				N	IB		Т			SB	
Lane	Left	Ri	ght	Bypass	Left	Ri	ght	Вуј	pass	Left	Rig	ght	Вура	iss	Left	R	ight	Bypass
Critical Headway, s	4.5436	5 4.5	436		4.5436	5 4.5	436				4.3	276	4.976	63		4.:	3276	
Follow-Up Headway, s	2.5352	2 2.5	352		2.5352	2 2.5	352				2.5	352	2.608	87		2.:	5352	
Flow Computations,	Capaci	ity an	d v/c	Ratio	S													
Approach			ΞB			٧	VB				N	IB		\top			SB	
Lane	Left	Ri	ght	Bypass	Left	Ri	ght	Вуј	pass	Left	Rig	ght	Вура	iss	Left	R	ight	Bypass
Entry Flow (v _e), pc/h	419	4	73		493	5	55				16	63	175	5			34	
Entry Volume, veh/h	403	4	55		469	5	29				1!	57	168	3			33	
Circulating Flow (v _c), pc/h		2	86			1	88				63	33				1	192	
Exiting Flow (vex), pc/h		6	08			9	40				4	4				į	545	
Capacity (coe), pc/h	1095	10	095		1197	1	197				82	29	742	2			516	
Capacity (c), veh/h	1053	10	053		1140	1	140				79	97	714	4		į	501	
v/c Ratio (x)	0.38	0	.43		0.41	0	.46				0.	20	0.24	4		C	0.07	
Delay and Level of Se	rvice							_			_					_		
Approach							W	В			NB					SB		
Lane	Left Right				t Вура	ss L	eft	Rig	ht I	Bypass	Left	Righ	t	Bypass	Left		Right	Bypass
Lane Control Delay (d), s/veh	3						7.4	8.2	2			6.6	1	7.8			8.0	
Lane LOS	A A					A	A				А	1	Α			Α		
95% Queue, veh	1.9 2.3				2	2.1	2.0	6			0.7		0.9		1	0.2		
Approach Delay, s/veh LOS	Approach Delay, s/veh LOS 7.8			8	Α		7.8			A	7.2			A	8	3.0		Α
Intersection Delay, s/veh LOS	ntersection Delay, s/veh LOS					7.7								,	A			

				НС	S Rou	ndab	oui	ts Rej	port							
General Information		_	_				_		matio	n			_		_	
Analyst	Emma	Myers	-Verhage	9		*			Inters	section		Т	Highwa	y 141	6 and F	Radar Hil
Agency or Co.						/ ← ←			E/W	Street Na	me		Highwa	y 141	6	
Date Performed	8/17/	2023						7.	N/S S	Street Na	me		Radar H	Iill Rd		
Analysis Year	2030				 	w † s	E	1 >	4	sis Time	Period, hı	s	1.00			
Time Analyzed	AM P	eak			*			/	Peak	Hour Fac	tor		0.88			
Project Description	Radar Study		16 Corrid	lor			1/	1	Juriso	diction			Box Eld	er, SD		
Volume Adjustments	and S	ite Cl	naract	eristi	cs											
Approach		[ΞB			WB				N	IB				SB	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Number of Lanes (N)	0	0	1	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment			ı	.TR	LT			TR			LT					LTR
Volume (V), veh/h	0	5	702	64	0	107	454	7	0	179	18	314	0	12	25	17
Percent Heavy Vehicles, %	4	4	4	4	5	5	5	5	4	4	4	4	3	3	3	3
Flow Rate (VPCE), pc/h	0	6	830	76	0	128	542	8	0	212	21	371	0	14	29	20
Right-Turn Bypass		N	one			Non	e			Yield	ding			N	one	
Conflicting Lanes			1			1				í	2				2	
Pedestrians Crossing, p/h			0			0				()				0	
Proportion of CAVs									0							
Critical and Follow-U	р Неа	dway	Adju	stmen	nt											
Approach			ΕB			WB				N	IB	\Box			SB	
Lane	Left	Ri	ght	Bypass	Left	Righ	nt	Bypass	Left	Rig	ght By	/pass	Left	Ri	ght	Bypass
Critical Headway, s		4.9	763		4.5436	4.543	36			4.3	276 4.	9763		4.3	3276	
Follow-Up Headway, s		2.6	087		2.5352	2.535	52			2.5	352 2.	6087		2.5	352	
Flow Computations,	Capaci	ity an	d v/c	Ratio	s											
Approach		E	ΞB			WB				N	IB			:	SB	
Lane	Left	Ri	ght	Bypass	Left	Righ	nt	Bypass	Left	Rig	ght By	/pass	Left	Ri	ght	Bypass
Entry Flow (v _e), pc/h		9	12		319	359	,			23	33	371			63	
Entry Volume, veh/h		8	77		303	342	:			22	24	357			61	
Circulating Flow (v₀), pc/h		1	71			239)			8!	50			8	82	
Exiting Flow (vex), pc/h		8	44			774	ļ			3	5			2	:33	
Capacity (c _{pce}), pc/h		1	159		1142	1142	2		1	68	39	583		6	571	
Capacity (c), veh/h		1	115		1088	1088	8			66	53	561		6	551	
v/c Ratio (x)		0	.79		0.28	0.31				0.3	34 (0.64		0	.09	
Delay and Level of Se	rvice															
Approach				EB		\top		WB			NB		T		SB	
Lane		Left Righ				s Left	t	Right	Bypass	Left	Right	Bypass	Lef	t	Right	Bypass
Lane Control Delay (d), s/veh				18.7		6.0		6.4			9.9	20.6			6.6	
Lane LOS		С				А	\dagger	Α			А	С			Α	
95% Queue, veh	veh 10.					1.2	1	1.4			1.5	5.0			0.3	
Approach Delay, s/veh LOS				7	С	6	5.2		A	16.5	5	С	(5.6		Α
Intersection Delay, s/veh LOS						14.0							В			

				НС	S Rou	ndab	ou [·]	ts Rej	port							
General Information		_	_				_		matio	n			_		_	
Analyst	Emma	Myers-	-Verhage	9		4			Inters	section		Т	Highw	ay 14	16 and F	Radar Hil
Agency or Co.						/ ← ←			E/W	Street Na	ime		Highw	ay 14	16	
Date Performed	8/17/	2023				N		7.	N/S S	Street Na	me		Radar	Hill R	d	
Analysis Year	2050				 	w j s	E	1		sis Time	Period, hi	's	1.00			
Time Analyzed	AM P	eak			*		A	/	Peak	Hour Fac	tor		0.88			
Project Description	Radar Study		16 Corric	lor			1	1	Juriso	diction			Box Eld	der, SI)	
Volume Adjustments	and S	ite Cl	naract	eristi	cs											
Approach		E	В			WB	3			N	IB				SB	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Number of Lanes (N)	0	0	1	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment			L	TR.	LT			TR			LT				Т	LTR
Volume (V), veh/h	0	5	794	73	0	120	512	8	0	202	18	356	0	13	27	19
Percent Heavy Vehicles, %	4	4	4	4	5	5	5	5	4	4	4	4	3	3	3	3
Flow Rate (VPCE), pc/h	0	6	938	86	0	143	611	10	0	239	21	421	0	15	32	22
Right-Turn Bypass		No	one			Non	ne			Yield	ding			1	None	
Conflicting Lanes			1			1				í	2				2	
Pedestrians Crossing, p/h			0			0				()				0	
Proportion of CAVs									0							
Critical and Follow-U	р Неа	dway	Adju	stmen	nt											
Approach		E	В			WB	3			N	IB				SB	
Lane	Left	Ri	ght	Bypass	Left	Righ	nt	Bypass	Left	Rig	ght By	/pass	Left	F	Right	Bypass
Critical Headway, s		4.9	763		4.5436	4.543	36			4.3	276 4.	9763		4	.3276	
Follow-Up Headway, s		2.6	087		2.5352	2.535	52			2.5	352 2.	6087		2	.5352	
Flow Computations,	Capaci	ity an	d v/c	Ratio	s											
Approach		E	В			WB	3			N	IB				SB	
Lane	Left	Ri	ght	Bypass	Left	Righ	nt	Bypass	Left	Rig	ght By	/pass	Left	F	Right	Bypass
Entry Flow (v _e), pc/h		10	030		359	405	5			26	60	421			69	
Entry Volume, veh/h		9	90		342	386	5			25	50	405			67	
Circulating Flow (v _c), pc/h		1	90			266	5			9!	59				993	
Exiting Flow (vex), pc/h		9	53			872	2			3	7				261	
Capacity (cpce), pc/h		11	137		1115	111	5			62	28	522			611	
Capacity (c), veh/h		10	093		1062	106	2			60	04	502		Т	593	
v/c Ratio (x)		0.	.91		0.32	0.36	6			0.4	41 (0.81			0.11	
Delay and Level of Se	rvice															
Approach				EB		T		WB			NB				SB	
Lane	Left Righ				Bypass	s Left	t	Right	Bypass	Left	Right	Bypass	Le	ft	Right	Bypass
Lane Control Delay (d), s/veh		35.1				6.6	5	7.1			12.2	38.9			7.4	
Lane LOS	E					А		А			В	Е			Α	
95% Queue, veh	95% Queue, veh					1.4		1.7			2.1	10.3			0.4	
Approach Delay, s/veh LOS	Approach Delay, s/veh LOS			1	E	(6.9		А	28.7	7	D		7.4		Α
Intersection Delay, s/veh LOS	5					24.2							С			

				НС	:S Rou	ndab	oou	ts Re	port							
General Information		_	_	_			_		matio	n			_			
Analyst	Emma	Myers	-Verhage	<u> </u>		4			Inters	section			Highway	1416	and F	Radar Hil
Agency or Co.						/ ← ←			E/W	Street Na	ime	1	Highway	1416	5	
Date Performed	8/17/	2023				N		7	N/S S	Street Na	me	1	Radar Hi	II Rd		
Analysis Year	2030				 	w j s) † >	4 1	sis Time	Period, hi	s	1.00			
Time Analyzed	PM Pe	eak			*		4	/	Peak	Hour Fac	tor	(0.94			
Project Description	Radar Study		16 Corric	lor			· 1	1	Juriso	diction		1	Box Elde	r, SD		
Volume Adjustments	and S	ite Cl	naract	eristi	cs											
Approach		E	В			WB	3			N	IB			S	В	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Number of Lanes (N)	0	0	1	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment			L	TR	LT			TR			LT					LTR
Volume (V), veh/h	0	20	475	205	0	209	605	4	0	118	14	138	0	5	13	11
Percent Heavy Vehicles, %	4	4	4	4	5	5	5	5	4	4	4	4	3	3	3	3
Flow Rate (VPCE), pc/h	0	22	526	227	0	233	676	4	0	131	15	153	0	5	14	12
Right-Turn Bypass		N	one			Non	ne			Yield	ding			No	ne	
Conflicting Lanes			1			1				2	2			2	2	
Pedestrians Crossing, p/h			0			0				()			()	
Proportion of CAVs									0							
Critical and Follow-U	р Неа	dway	Adju	stmen	ıt											
Approach		E	B			WB	3		Τ	N	IB			S	В	
Lane	Left	Ri	ght	Bypass	Left	Righ	ht	Bypass	Left	Rig	ght By	/pass	Left	Rig	ght	Bypass
Critical Headway, s		4.9	763		4.5436	4.543	36			4.3	276 4.	9763		4.3	276	
Follow-Up Headway, s		2.6	087		2.5352	2.535	52			2.5	352 2.	6087		2.5	352	
Flow Computations,	Capaci	ity an	d v/c	Ratio	s											
Approach		I	В			WB	3			N	IB			S	В	
Lane	Left	Ri	ght	Bypass	Left	Righ	ht	Bypass	Left	Rig	ght By	/pass	Left	Rig	ght	Bypass
Entry Flow (v _e), pc/h		7	75		429	484	4			14	46	153		3	1	
Entry Volume, veh/h		7	45		409	461	1			14	40	147		3	0	
Circulating Flow (v _c), pc/h		2	52			168	8			5!	53			10	40	
Exiting Flow (vex), pc/h		5	31			819	9			4	.1			47	74	
Capacity (c _{pce}), pc/h		10	067		1219	121	9			88	37	803		58	37	
Capacity (c), veh/h		10	026		1161	116	51			85	53	772		57	70	
v/c Ratio (x)		0	.73		0.35	0.40	0			0.	16 (0.19		0.0	05	
Delay and Level of Se	rvice				<u> </u>											
Approach				EB		Т		WB			NB		П		SB	
Lane			Left	Right	Bypass	s Left	t	Right	Bypass	Left	Right	Bypass	Left	F	Right	Bypass
Lane Control Delay (d), s/veh				16.3		6.5	5	7.1			5.9	6.7			6.9	
Lane LOS		С				А		Α			А	А			Α	
95% Queue, veh	7.6					1.6	5	2.0			0.6	0.7			0.2	
Approach Delay, s/veh LOS	Approach Delay, s/veh LOS 16.				С	(6.9		Α	6.3		Α	6	.9		Α
Intersection Delay, s/veh LOS						10.4							В			

				НС	S Rou	ında	bou	ıts Re	port							
General Information			_				1		rmatio	n			_	_		
Analyst	Emma	Myers-	Verhag	e		4			Inter	section		Т	Highw	ay 141	16 and F	Radar Hil
Agency or Co.									E/W	Street Na	ime		Highw	ay 141	16	
Date Performed	8/17/	2023					7		N/S	Street Na	me		Radar	Hill Ro	d	
Analysis Year	2050				!	(()	† E S	1 >		ysis Time	Period, h	rs	1.00			
Time Analyzed	PM Pe	eak			*			/	Peak	Hour Fac	tor		0.94			
Project Description	Radar Study	Hill 141	6 Corri	dor			→ ▼ 1	1r	Juris	diction			Box Ele	der, SI)	
Volume Adjustments	and S	ite Cl	narac	teristi	cs											
Approach		E	В			V	VB			Ν	IB				SB	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Number of Lanes (N)	0	0	1	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment				_TR	Ľ	Γ		TR			LT					LTR
Volume (V), veh/h	0	23	545	239	0	237	697	4	0	134	14	158	0	5	15	12
Percent Heavy Vehicles, %	4	4	4	4	5	5	5	5	4	4	4	4	3	3	3	3
Flow Rate (VPCE), pc/h	0	25	603	264	0	265	779	4	0	148	15	175	0	5	16	13
Right-Turn Bypass		No	one	•		No	one	•		Yiel	ding			Ν	lone	•
Conflicting Lanes			1				1			;	2				2	
Pedestrians Crossing, p/h			0				0			()				0	
Proportion of CAVs									0							
Critical and Follow-U	р Неа	dway	Adju	stmer	nt											
Approach		E	B			V	VB		\top	N	IB	$\neg \neg$			SB	
Lane	Left	Ri	ght	Bypass	Left	Ri	ght	Bypass	Lef	: Ri	ght B	ypass	Left	R	Right	Bypass
Critical Headway, s		4.9	763		4.5436	4.5	436			4.3	276 4	.9763		4.	3276	
Follow-Up Headway, s		2.6	087		2.5352	2.5	352			2.5	352 2	6087		2.	5352	
Flow Computations, (Capaci	ity an	d v/c	Ratio	s											
Approach		E	EB			V	VB		T	٨	IB	T			SB	
Lane	Left	Ri	ght	Bypass	Left	Ri	ght	Bypass	Lef	: Ri	ght B	ypass	Left	R	Right	Bypass
Entry Flow (v _e), pc/h		8	92		493	5	55			10	63	175			34	
Entry Volume, veh/h		8	58		469	5	29			1.	57	168			33	
Circulating Flow (v₅), pc/h		2	86			1	88			6.	33			1	192	
Exiting Flow (vex), pc/h		6	08			9.	40			4	4				545	
Capacity (c _{pce}), pc/h		10)31		1197	11	197			83	29	742			516	
Capacity (c), veh/h		9	91		1140	11	140			7:	97	714			501	
v/c Ratio (x)		0.	87		0.41	0.	.46			0.	20	0.24		(0.07	
Delay and Level of Se	rvice															
Approach				EB		Т		WB		П	NB		Т		SB	
Lane		Left Right				ss L	eft	Right	Bypass	Left	Right	Bypas	s Le	ft	Right	Bypass
Lane Control Delay (d), s/veh		29.4				7	'.4	8.2			6.6	7.8			8.0	
Lane LOS	D						А	Α			А	А			Α	
95% Queue, veh	15.6					2	2.1	2.6			0.7	0.9			0.2	
Approach Delay, s/veh LOS 29.4				.4	D		7.8		Α	7.2		Α		8.0		Α
Intersection Delay, s/veh LOS						16.1							С			