

US Highway 16

CORRIDOR STUDY

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# US16 Corridor Study Technical Report

Pennington County, South Dakota

July 14, 2021

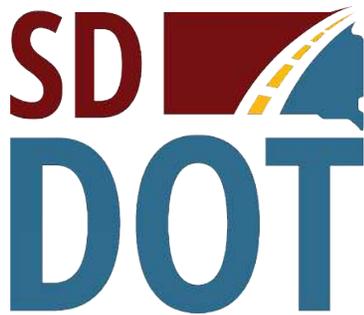


# US16 Corridor Study Technical Report

Pennington County, South Dakota

July 14, 2021

Prepared for:



South Dakota Department of Transportation

Office of Project Development

700 E. Broadway Avenue

Pierre, SD

Prepared by:

HDR

703 Main St, Suite 200

Rapid City, SD 57701

In conjunction with:

Ferber Engineering Company, Inc.

729 East Watertown St

Rapid City, SD 57701

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## Abbreviations

AASHTO	American Association of State Highway Transportation Officials
BCA	Benefit-Cost Analysis
DLT	Displaced Left Turn
ETT	Experienced Travel Time
FHWA	Federal Highway Administration
F+I	Fatal and Injury Crashes
FY	Fiscal Year (typically refers to State of South Dakota fiscal year)
HCM6	6 <sup>th</sup> Edition of Highway Capacity Manual
HCS	Highway Capacity Software
HSM	Highway Safety Manual
IHSDM	Interactive Highway Safety Design Module
LOS	Level of Service
MEV	Million Entering Vehicles
LT / T / RT	Left turn lane / Through lane / Right turn lane
MOT	Maintenance of Traffic
MUT	Median U-Turn
MVMT	Million Vehicle Miles Traveled
NEPA	National Environmental Policy Act
NB/SB/EB/WB	Northbound / Southbound / Eastbound / Westbound
PDO	Property Damage Only Crash
RCAMPO	Rapid City Area Metropolitan Planning Organization
RCI	Reduced Conflict Intersection
RIRO	Right-in right-out
ROW	Right of Way
SDDOT	South Dakota Department of Transportation
SPI	Single Point Interchange
STIP	Statewide Transportation Improvement Program
WCSC	Worst-Case Stop-Control

## 1.0 Executive Summary

In 2019, the South Dakota Department of Transportation (SDDOT) initiated a study with the Federal Highway Administration (FHWA), Rapid City Area Metropolitan Planning Organization (RCAMPO), City of Rapid City, and Pennington County to develop a long-range plan for over 16 miles of the US16 corridor. Study limits entail:

- **US16** from the Keystone Wye (US16/US16 Alternate intersection) to Cathedral Drive/Fairmont Boulevard in Rapid City
- **Catron Boulevard** (also US16B east of US16) from Les Hollers Way to Wellington Drive
- **US16 service roads**
- **US16 ramps and local roads** in the Rockerville area

Following a corridor-wide identification of existing and future-year transportation issues and needs, the corridor study focused on addressing three main objectives:

- **US16/US16B/Catron Boulevard intersection:** determine recommendation of most technically feasible alternative for a planned FY 2026 project (PCN 6874)
- **US16/Neck Yoke Road intersection:** determine recommendation of most technically feasible alternative for improvements as part of FY 2025 planned project (PCN 078D)
- **Overall corridor:** determine conceptual improvements throughout the corridor for consideration in future project planning

The study process encompassed four primary steps, each with Study Advisory Team (SAT), stakeholder, and public involvement to help guide the study and provide feedback at key milestones:

### Step 1: Identify Transportation Issues and Needs

- Public/stakeholder meetings #1 - gather feedback on issues and needs

### Step 2: Develop Concepts

- SAT workshop #1 - concept brainstorming
- Public/stakeholder meetings #2 - present concepts for feedback

### Step 3: Develop Feasible Solutions for Potential Projects

- SAT workshop #2 - corridor scenario development
- Public/stakeholder meetings #3 - present corridor scenarios and US16/US16B/Catron Boulevard and US16/Neck Yoke Road intersection consultant recommendations of most technically feasible alternative for feedback

### Step 4: Develop Recommendations

- Based on SAT, public, and stakeholder feedback from the previous steps

This report documents the four-step process to support long-range corridor recommendations contained herein. The following tables and figure present a summary of recommended short-term and long-range capital improvements, generalized timeline, and planning-level costs as identified in this study. Opportunistic and interim improvements are also recommended to support continued access management and the long-range vision of the corridor.

**Table ES-1: Recommendations and Planning Timelines (to Year 2040)**

Planning Timeline	Improvement	Corridor Segment	Long-Range Segment Scenario	US16 Cross-Section	Construction & ROW Cost (\$mil)
2025 - 2026	US16/Neck Yoke Rd RCI *	US16/Neck Yoke Road Sub-Area	Option 1.1d or 1.1e	4-lane divided rural (modified)	\$10.8 - \$11.2
	RCI at US16/Strato Rim Dr, US16/Busted Five Ln, and US16/Wilderness Canyon Rd **	Busted Five/Wilderness Canyon Area	Scenario 1	4-lane divided rural	\$2.9
	RCI at US16/Bear Country Exit **	Bear Country/Croell Quarry Area	Scenario 1	4-lane divided rural (modified)	\$1.0
	RCI at US16/Rushmore Candy Company **	Bear Country/Croell Quarry Area	Scenario 1	4-lane divided rural (modified)	\$2.2
2026 - 2027	<b>US16/US16B/Catron Blvd SPI ***</b> <i>US16 intersection improvements:</i> <ul style="list-style-type: none"> <li>• Section Line Rd (RIRO)</li> <li>• Addison Ave (closed)</li> <li>• Tucker St (closed)</li> <li>• Promise Rd (signalized)</li> <li>• Tablerock Rd/Fox Rd (¾)</li> </ul> <i>US16B/Catron Blvd improvements:</i> <ul style="list-style-type: none"> <li>• Les Hollers Way (signalized)</li> <li>• Healing Way (signalized)</li> <li>• Wellington Drive (RIRO west, ¾ east)</li> </ul>	US16/US16B/Catron Blvd Sub-Area	SPI 1.1a with modifications	4-lane divided w/40' raised median (suburban) - shifted east	\$49.8
2028 - 2040	<b>US16 Urban Area corridor reconstruction, north of SPI project limits (Tablerock Rd/Fox Rd) ****</b> <i>Shift Enchantment Rd north to align with Highwood Rd and construct RCI</i> <i>Maintain ¾ access at Echo Ridge Dr</i>	US16 Urban Area (North)	Scenario 2	4-lane divided w/40' raised median (suburban) - shifted east; 4-lane divided with variable (12' to 28') raised median (urban)	\$18.2
	<b>US16/Moon Meadows Drive intersection and US16 corridor reconstruction south of SPI project limits</b>	US16 Urban Area (South)	Scenarios 1 or 2	4-lane divided w/40' raised median (suburban) - shifted east	\$16.1

2022-2025 SDDOT STIP: \* PCN 06X3 \*\* PCN 07Y6  
 2026-2029 SDDOT Developmental STIP: \*\*\* PCN 6874 \*\*\*\* PCN 078D

**Table ES-2: Recommendations and Planning Timelines (Opportunistic & Interim Improvements to Support Access Management)**

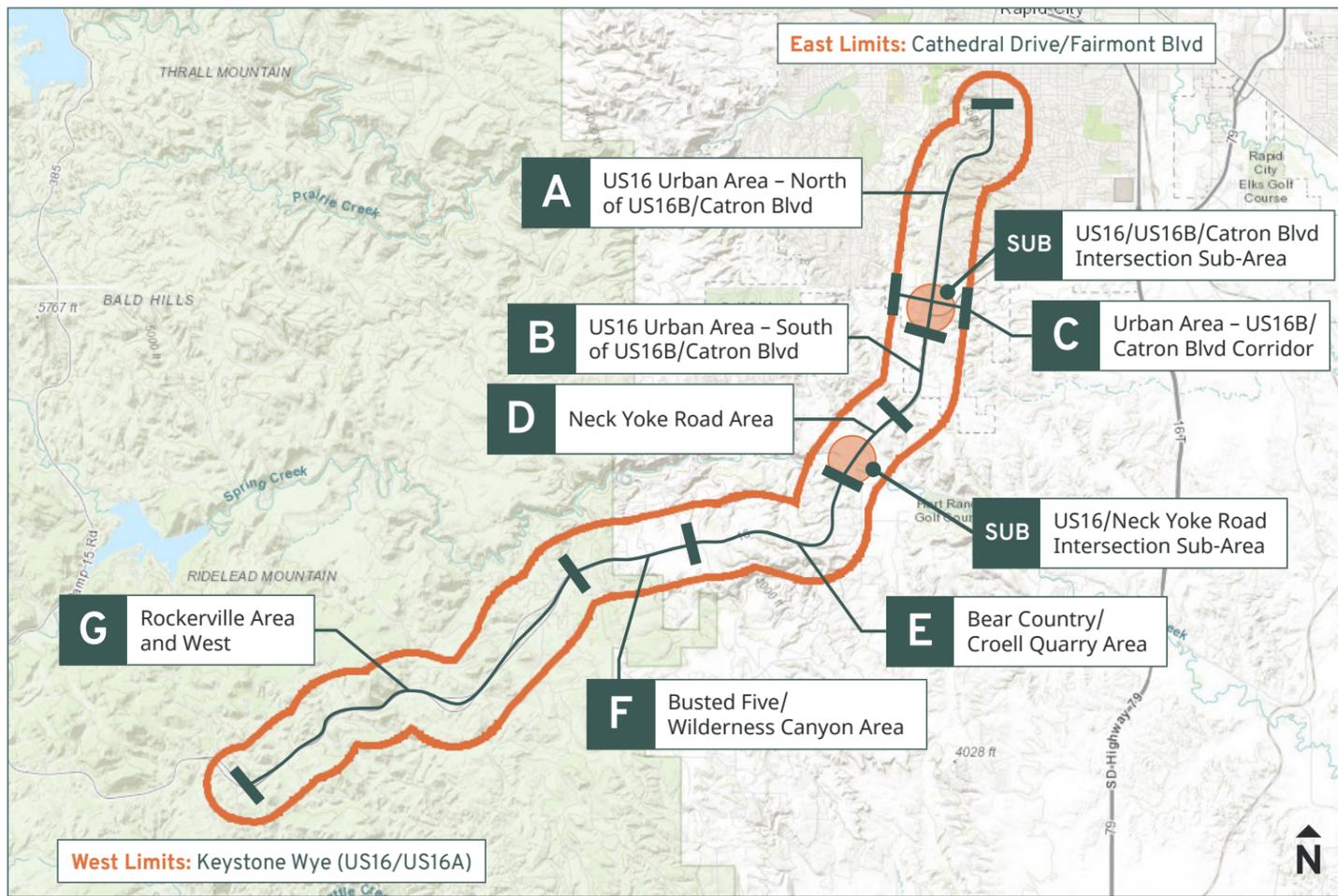
Planning Timeline	Improvement	Corridor Segment	Construction & ROW Cost (\$mil)
Dependent on need and timeline of future projects, development, and other opportunities to implement improvements	Fort Hays to Moon Meadows Dr rearage road (west of US16)	US16 Urban Area (South)	\$0.7
	Tower Rd (south) to Enchantment Rd local network connections (east of US16)	US16 Urban Area (North)	\$1.4
	Sitting Bull Crystal Caverns to US16/Wilderness Canyon Rd local network connection; access management at existing full access intersections	Busted Five/ Wilderness Canyon Area	\$1.9
	American Buffalo Resort area access management and intersection improvements	Bear Country/ Croell Quarry Area	\$1.0 - \$3.2
	Close US16 ramps 1a. <ul style="list-style-type: none"> <li>Remove second US16 WB off-ramp</li> <li>Remove US16 EB off-ramp</li> </ul> 1b. <ul style="list-style-type: none"> <li>Remove US16 WB on-ramp. Consider ‘Wrong-Way Travel Mitigation’ option to realign Pine Haven Drive w/ 2-way travel</li> </ul> 2. <ul style="list-style-type: none"> <li>Remove first US16 WB off-ramp following US16 WB/Rockerville Road improvements</li> <li>Remove US16 EB on-ramp in conjunction with removal of corresponding first US16 WB off-ramp</li> </ul>	Rockerville Area	1a - \$0.1 1b - \$0.5 2 - \$0.1

Projects identified in this table do not have a specific planning timeline. Future development/redevelopment, coordination with local agencies, property owners, and other area projects, and changing conditions will dictate timeline.

**Table ES-3: Recommendations and Planning Timelines (Long Range, Beyond Year 2040)**

Planning Timeline	Improvement	Corridor Segment	Long-Range Segment Scenario	US16 Cross-Section	Construction & ROW Cost (\$mil)
Long- Range (Beyond 2040)	US16/Moon Meadows Dr interchange	US16 Urban Area (South)	Supports Scenarios 1 and 2	4-lane divided w/40' raised median (suburban) - shifted east	Interchange only: \$17.9
	Section Line Road overpass at US16	US16 Urban Area (South)	Supports Scenarios 1 and 2	4-lane divided w/40' raised median (suburban) - shifted east	\$4.2
	Reconstruct US16 to north side of Rockerville	Rockerville Area	Scenario 2	4-Lane Divided Rural	\$14.9

# US16 Corridor Study – Recommendations and Planning Timeline



Improvement	Corridor Segment
<b>Long-Range Project Improvements</b>	
US16/Moon Meadows Dr interchange	<b>B</b> US16 Urban Area (South)
Section Line Rd overpass at US16	<b>B</b> US16 Urban Area (South)
Reconstruct US16 to north side of Rockerville	<b>G</b> Rockerville Area
<b>Interim Project Improvements</b>	
Fort Hays to Moon Meadows Dr rearage road (west of US16)	<b>B</b> US16 Urban Area (South)
Tower Rd (south) to Enchantment Rd local network connections (east of US16)	<b>A</b> US16 Urban Area (North)
Sitting Bull Crystal Caverns to US16/Wilderness Canyon Rd local network connection; access management at existing full access intersections	<b>F</b> Busted Five/Wilderness Canyon Area
American Buffalo Resort area access management and intersection improvements	<b>E</b> Bear Country / Croell Quarry Area
US16 ramp closures: 1a. • Remove second US16 WB off-ramp • Remove US16 EB off-ramp 1b. • Remove US16 WB on-ramp. Consider 'Wrong-Way Travel Mitigation' option to realign Pine Haven Dr w/ 2-way travel 2. • Remove first US16 WB off-ramp following US16 WB/Rockerville Road improvements • Remove US16 EB on-ramp in conjunction with removal of corresponding first US16 WB off-ramp	<b>G</b> Rockerville Area

Planning Timeline	Improvement	Corridor Segment	Long-Range Segment Scenario	US16 Cross-Section
2025 - 2026	US16/Neck Yoke Rd RCI	<b>SUB</b> US16/Neck Yoke Rd Sub-Area	Option 1.1d or 1.1e	4-lane divided rural ( <i>modified</i> )
	RCI at US16/Strato Rim Dr, US16/Busted Five Ln, and US16/Wilderness Canyon Rd	<b>F</b> Busted Five/Wilderness Canyon Area	Scenario 1	4-lane divided rural
	RCI at US16/Bear Country Exit	<b>E</b> Bear Country/Croell Quarry Area	Scenario 1	4-lane divided rural ( <i>modified</i> )
	RCI at US16/Rushmore Candy Company access	<b>E</b> Bear Country/Croell Quarry Area	Scenario 1	4-lane divided rural ( <i>modified</i> )
2026 - 2027	US16/US16B/Catron Blvd SPI: US16 intersection improvements • Section Line Rd (RIRO) • Addison Ave (closed) • Tucker St (closed) • Promise Rd (signalized) • Tablerock Rd/Fox Rd (¾) US16B/Catron Blvd improvements • Les Hollers Way (signalized) • Healing Way (signalized) • Wellington Dr (RIRO west, ¾ east)	<b>SUB</b> US16/US16B/ Catron Blvd Sub-Area	SPI 1.1a with modifications	4-lane divided ( <i>suburban</i> ) – shifted east
2028 - 2040	US16 Urban Area corridor reconstruction, north of SPI project limits (Tablerock Rd/Fox Rd)	<b>A</b> US16 Urban Area ( <i>North</i> )	Scenario 2	4-lane divided ( <i>suburban</i> ) – shifted east; 4-lane divided ( <i>urban</i> )
	US16/Moon Meadows Dr intersection and US16 corridor reconstruction south of SPI project limits	<b>B</b> US16 Urban Area ( <i>South</i> )	Scenarios 1 or 2	4-lane divided ( <i>suburban</i> ) – shifted east

**US16 CORRIDOR LONG-RANGE PLAN SUMMARY**  
**US16 CORRIDOR STUDY**  
 FIGURE ES-1

## 2.0 Introduction

### 2.1 Background

In 2019, the South Dakota Department of Transportation (SDDOT) initiated a study with the Federal Highway Administration (FHWA), Rapid City Area Metropolitan Planning Organization (RCAMPO), City of Rapid City, and Pennington County to develop a long-range plan for over 16 miles of the US16 corridor. The study focused on US16 between the Keystone Wye (US16A) and Cathedral Drive/Fairmont Boulevard in Rapid City, as well as adjacent service roads, ramps in the Rockerville area, and US16B/Catron Boulevard between Les Hollers Way and Wellington Drive (east).

The current multilane corridor was constructed in the late 1950's/early 1960's and has served the area well. However, traffic volumes have continued to increase with development and tourism along the corridor and throughout the Black Hills. This has created operational and safety challenges throughout the corridor that are anticipated to be magnified as volumes increase. At the pace to which the corridor is being developed, this study is the opportune time to establish long-range access planning, size and type of intersections, how improvements will be constructed, and timeline.

The US16 corridor serves a wide variety of trip purposes, ranging from recurring commuter and regional traffic to the high tourist volumes during the summer months. Further, the type of vehicles using the corridor is diverse, from large combination commercial trucks using US16 for regional distribution of goods, to high volumes of motorcycles and campers/recreational vehicles in the summer months. The corridor is part of the key connection between I-90/Rapid City and Mt. Rushmore and the greater Black Hills.

The US16/US16B/Catron Boulevard intersection is an important high-volume intersection, serving as the key intersection to distribute regional traffic throughout the area. As the driving reason for the overarching corridor study, the intersection has experienced congestion and safety challenges. While incremental improvements over the last few years have addressed some of the current needs, future traffic growth is expected to quickly exceed available capacity and the SDDOT is looking to identify a long-range solution for the intersection and surrounding area.

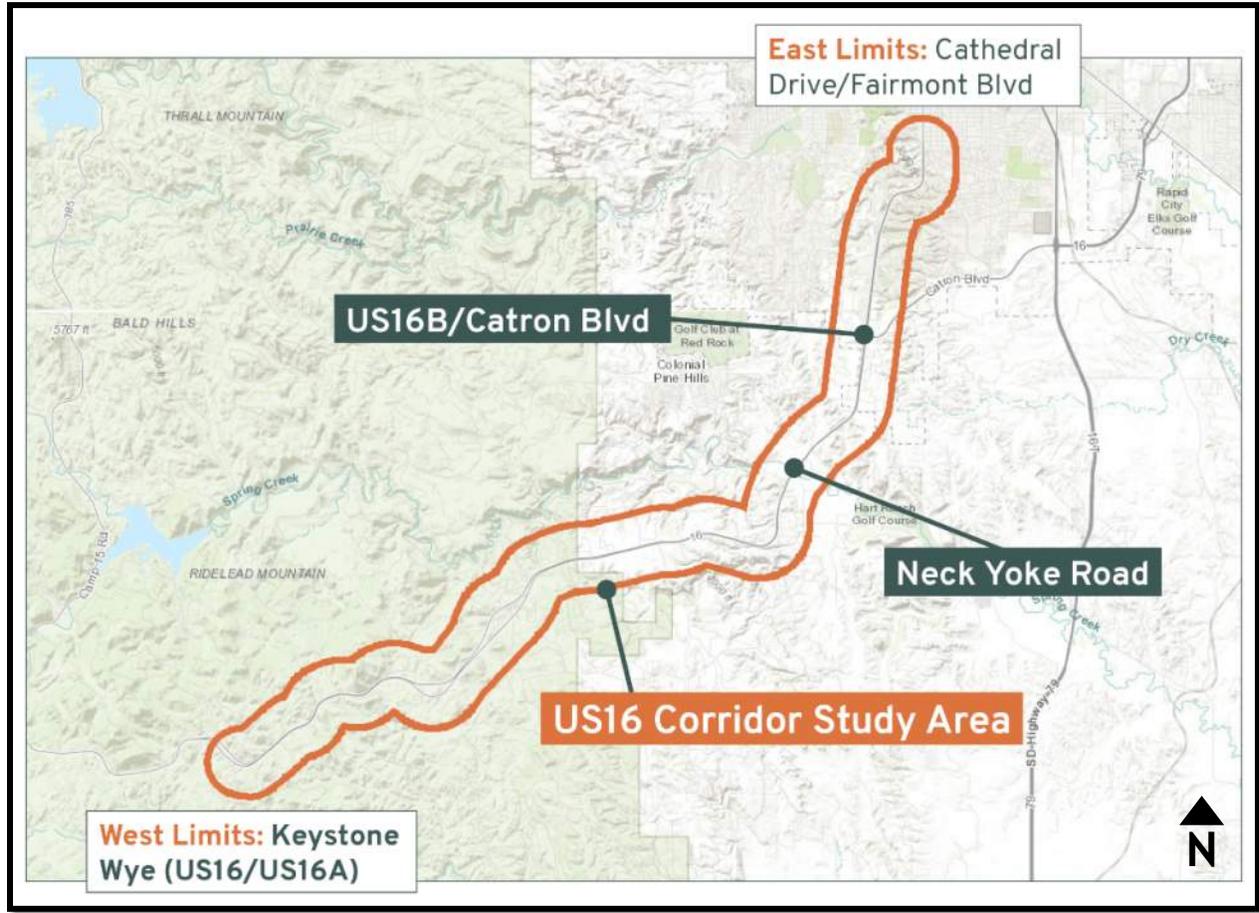
The overarching goal of this report is to present a corridor-wide long-range plan for future projects that address anticipated transportation needs through the 2050 Planning Horizon. The purpose of this report is to document the process and support recommendations, from concept development to feasible scenario refinement, analysis, evaluation, and public involvement. Recommendations from this corridor study will aid the SDDOT in planning future projects throughout the corridor.

### 2.2 Study Area

Study limits for the overarching US16 Corridor Study entail the following roadway segments and intersections (**Figure 1**):

- **US16** from the Keystone Wye (US16/US16 Alternate intersection) to Cathedral Drive/Fairmont Boulevard in Rapid City
- **US16 service roads**
- **US16 ramps and local roads** in the Rockerville area

- **Catron Boulevard** (also designated as US16B east of US16) from Les Hollers Way to Wellington Drive (east)
- **37 intersections** within the above corridor segments



**Figure 1: US16 Corridor Study Area**

Within the overarching corridor study, two sub-study areas were identified for additional analysis and refinement of options in preparation for planned projects:

- US16/US16B/Catron Boulevard intersection area
- US16/Neck Yoke Road intersection area

Limits of these two sub-areas are shown in **Figure 2**.

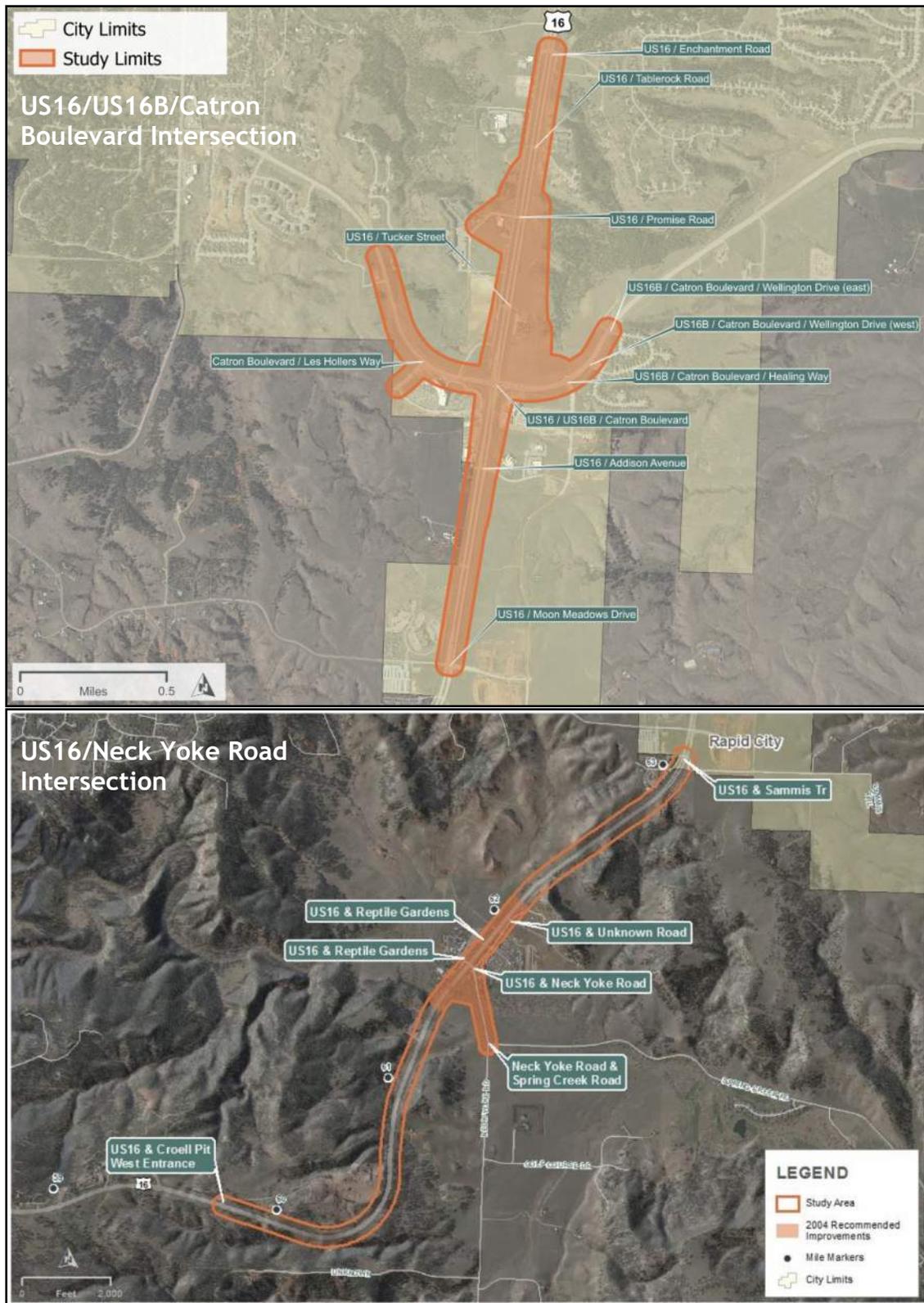


Figure 2: Intersection Sub-Areas

The FHWA approved urbanized boundary for Rapid City and the RCAMPO planning boundary are shown in **Figure 3**.



Source: SDDOT figure

**Figure 3: Rapid City Urbanized Boundary and Rapid City Area MPO Boundary**

## 2.3 Methods and Assumptions

A *Methods and Assumptions Document* (M&A document) was prepared at the onset of this study to serve as a historical record of the study process and methodologies, dates, and decisions made by study team representatives for the US16 Corridor Study. The most recent, amended version of the M&A document is provided in **Appendix A**.

## 2.4 Planning and Prior Studies

The following historical planning documents were referenced to support efforts completed to date and regional transportation goals throughout the corridor’s various jurisdictions and planning areas.

- *US16 Corridor Study (2004)*
- *US16/US16B/Catron Boulevard Intersection Alternatives Study (2016)*
- *Rapid City Comprehensive Plan (April 2014)*
- *City of Rapid City Major Streets Plan (2018)*
- *RapidTRIP Long Range Transportation Plan (2015)*
- *Rapid Trip 2045 Metropolitan Transportation Plan (2020)*
- *Rapid City Area Bicycle and Pedestrian Master Plan (2011)*
- *Rapid City Area Bicycle and Pedestrian Master Plan Update (2020)*
- *Various traffic impact studies (TIS) within the study area*
- *View to 2040, Pennington County Comprehensive Plan (2020)*

The 2022-2025 South Dakota Statewide Transportation Improvement Program (STIP) has identified the following projects within the 8-year development program (includes 2026-2029 developmental STIP):

- US16/US16B/Catron Boulevard intersection (PCN 6874)
- US16 corridor between Catron Boulevard and Tower Road overpass (PCN 078D)
- US16/Neck Yoke Road intersection area (PCN 06X3)
- US16 corridor intersection safety improvements between Rockerville and Reptile Gardens (PCN 07Y6)

Several improvements were also completed while the study was underway, including:

- US16/Cosmos Road intersection: westbound left turn lane
- US16/Promise Road: northbound left turn lane
- US16/Tablerock Road: northbound and southbound left turn lanes
- US16/Enchantment Road: increased offset of northbound and southbound left turn lanes
- US16B/Catron Boulevard/Healing Way: signalized intersection

### 3.0 Study Process

This study used the following four-step process to develop long-range planning recommendations. Study Advisory Team (SAT), public, and stakeholder involvement were all instrumental in a process that included two SAT workshops, three sets of public meetings, and two sets of stakeholder meetings. A summary of the four steps and relationship to chapters in this report is provided in **Table 1**.

**Table 1: Study Process**

Step	Components	Applicable Chapters
1	<u>Identify Transportation Issues and Needs</u> Data collection Analysis of existing and future No Build conditions Begin environmental review of corridor Public/stakeholder meetings #1 - gather feedback on issues and needs	Chapters 4 - 9
2	<u>Develop Concepts</u> SAT workshop #1 - concept brainstorming Develop, analyze, and refine concepts Public/stakeholder meetings #2 - present concepts for feedback	Chapter 10
3	<u>Develop Feasible Solutions for Potential Projects</u> SAT workshop #2 - corridor scenario development Develop, analyze, and refine corridor scenarios Develop supporting corridor plans Public meeting #3 - present corridor scenarios for feedback	Chapters 11 - 21
4	<u>Develop Recommendations</u> Identify future project recommendations and timelines for implementation Develop corridor study report Develop environmental overview report	Chapters 11 - 25

## 4.0 Existing Conditions

### 4.1 Existing Road Conditions

A summary of existing roadway segment, intersection, and structure information is shown in **Figure 4**. While US16 maintains a 4-lane divided cross-section throughout the study corridor, several features are variable such as design speeds, median width, and grade. Additional information regarding the relationships between design speeds and horizontal/vertical curvature along the corridor is included in **Appendix B**.

### 4.2 Existing Access

The SDDOT has established access classification criteria, shown in **Table 2**, to help guide access management along state highway corridors. Current SDDOT access classification varies throughout the study corridor and is summarized in **Figure 4**. These criteria were used as a baseline to identify access management needs, develop potential improvements, and gauge whether the segment is properly classified.

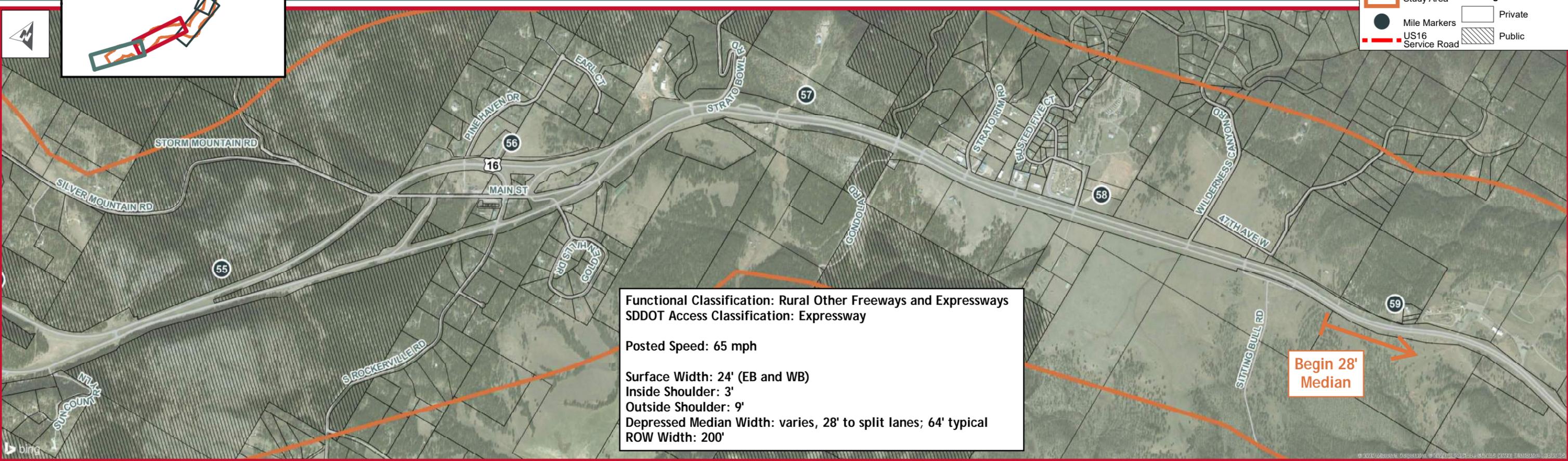
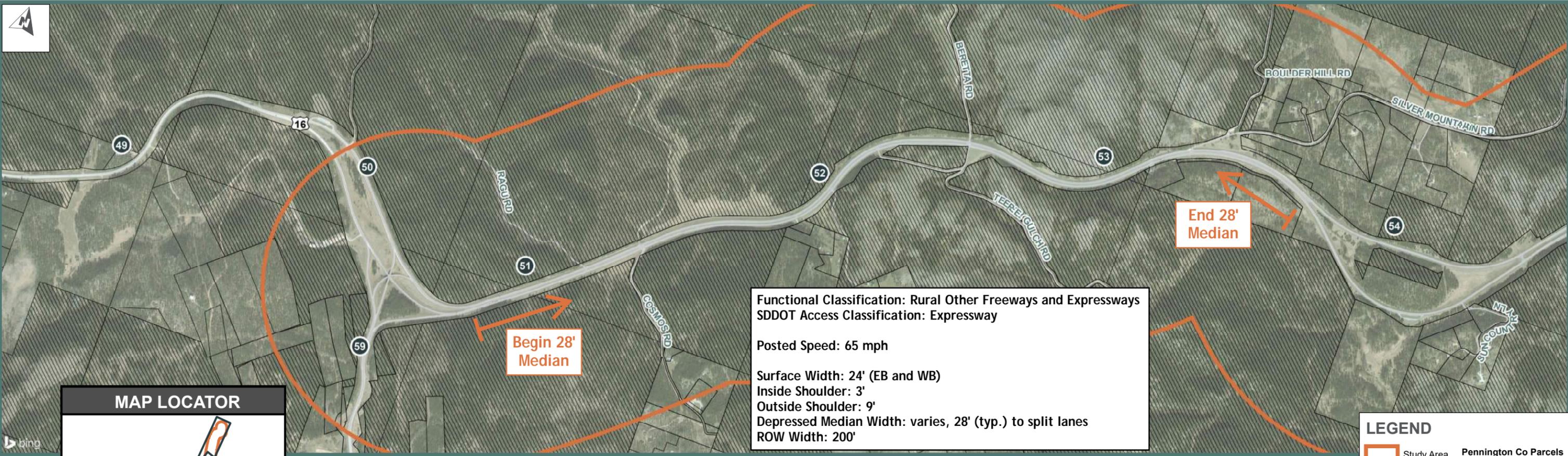
**Table 2: SDDOT Access Classification Criteria**

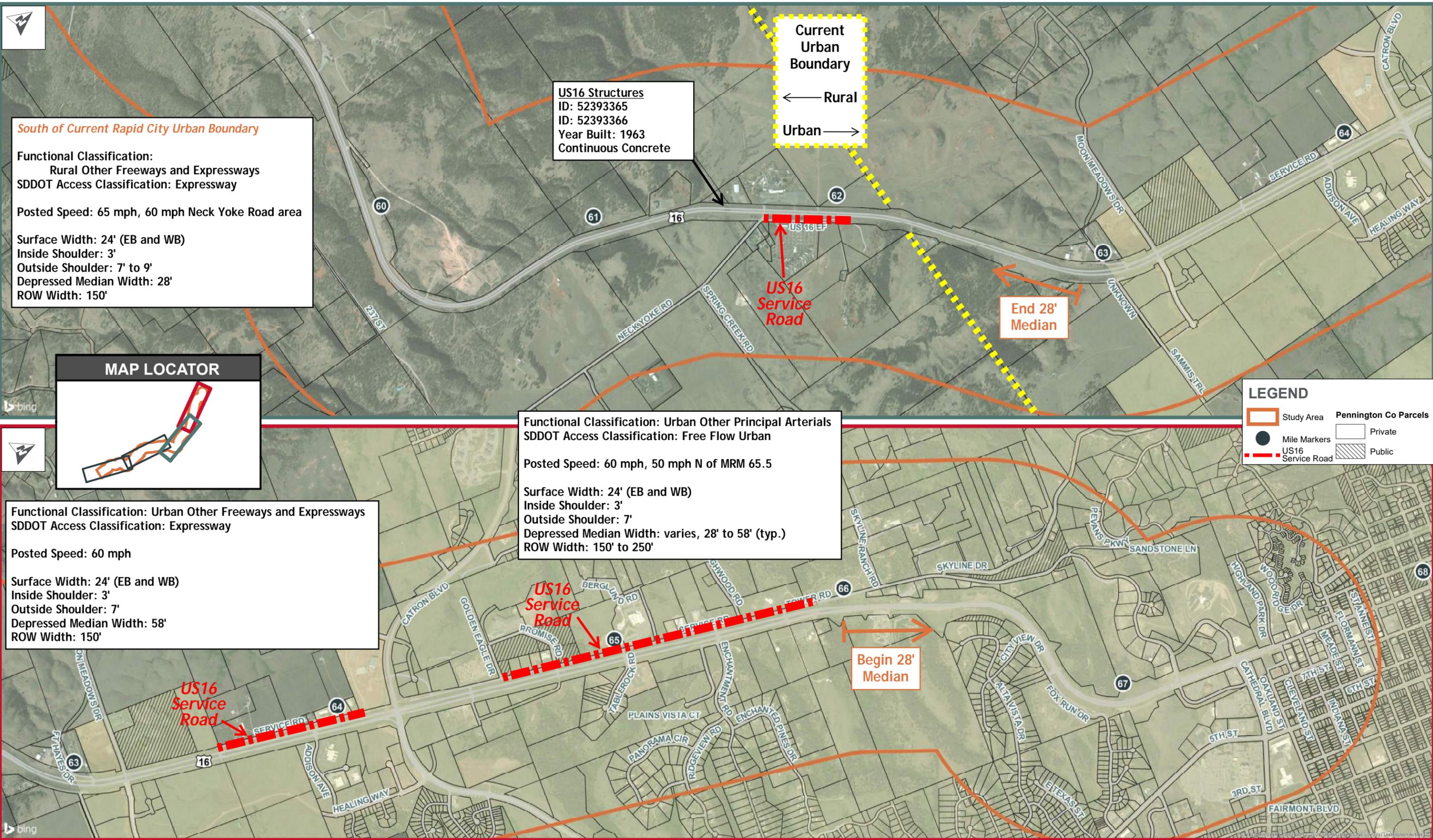
Access Classification	Signal Spacing Distance (mile)	Median Opening Spacing (mile)	Minimum Unsignalized Access Spacing (feet)	Access Density	Denial of Direct Access When Other Available
Interstate	N/A	N/A	N/A	N/A	Yes
Expressway	1/2	1/2 F, 1/2 D	2640	at half-mile increments	Yes
Free Flow Urban	1/2	1/2 F, 1/4 D	1320	at quarter-mile increments	Yes
Intermediate Urban	1/2	1/2 F, 1/4 D	660	1 access/block face, right in/right out preferred	Yes
Urban Developed	1/4	1/4	100	2 accesses/block face	Yes
Urban Fringe	1/4	1/4	1000	5 accesses/side/mile	Yes
Rural	N/A	N/A	1000	5 accesses/side/mile	Yes

**Notes:**

1. Access to the Interstate system is governed by SDDOT interchange policy. No access shall be provided on non-interstate routes within the following distance of interstate ramp terminals: 1/8 mile directional access, 1/4 mile full access
2. N/A = Not Applicable, F = Full Movement – all turns and through movements provided, D = Directional Only – certain turning and through movements not provided.
3. SDDOT may defer to stricter local standards.
4. SDDOT will seek opportunities to reduce access density wherever possible.
5. Rural class minimum unsignalized access spacing may be reduced to 660' by the Area Engineer, based on results of an engineering study as described in 70:09:01:02
6. Unsignalized access spacing also is subject to corner clearance analysis.

Source: Figure 17-4, *SDDOT Road Design Manual* (accessed 1/20/2020)





**South of Current Rapid City Urban Boundary**

Functional Classification:  
Rural Other Freeways and Expressways  
SDDOT Access Classification: Expressway

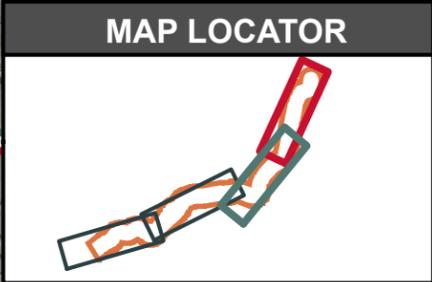
Posted Speed: 65 mph, 60 mph Neck Yoke Road area

Surface Width: 24' (EB and WB)  
Inside Shoulder: 3'  
Outside Shoulder: 7' to 9'  
Depressed Median Width: 28'  
ROW Width: 150'

**US16 Structures**  
ID: 52393365  
ID: 52393366  
Year Built: 1963  
Continuous Concrete

Current Urban Boundary  
← Rural  
Urban →

End 28' Median



**LEGEND**

- Study Area
- Mile Markers
- US16 Service Road
- Pennington Co Parcels
  - Private
  - Public

Functional Classification: Urban Other Principal Arterials  
SDDOT Access Classification: Free Flow Urban

Posted Speed: 60 mph, 50 mph N of MRM 65.5

Surface Width: 24' (EB and WB)  
Inside Shoulder: 3'  
Outside Shoulder: 7'  
Depressed Median Width: varies, 28' to 58' (typ.)  
ROW Width: 150' to 250'

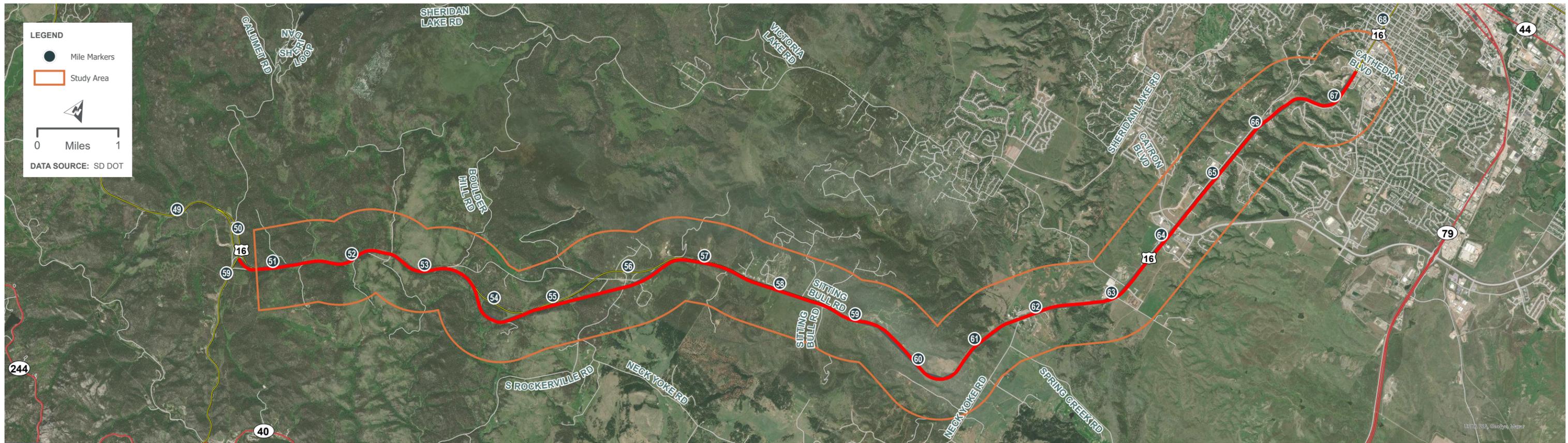
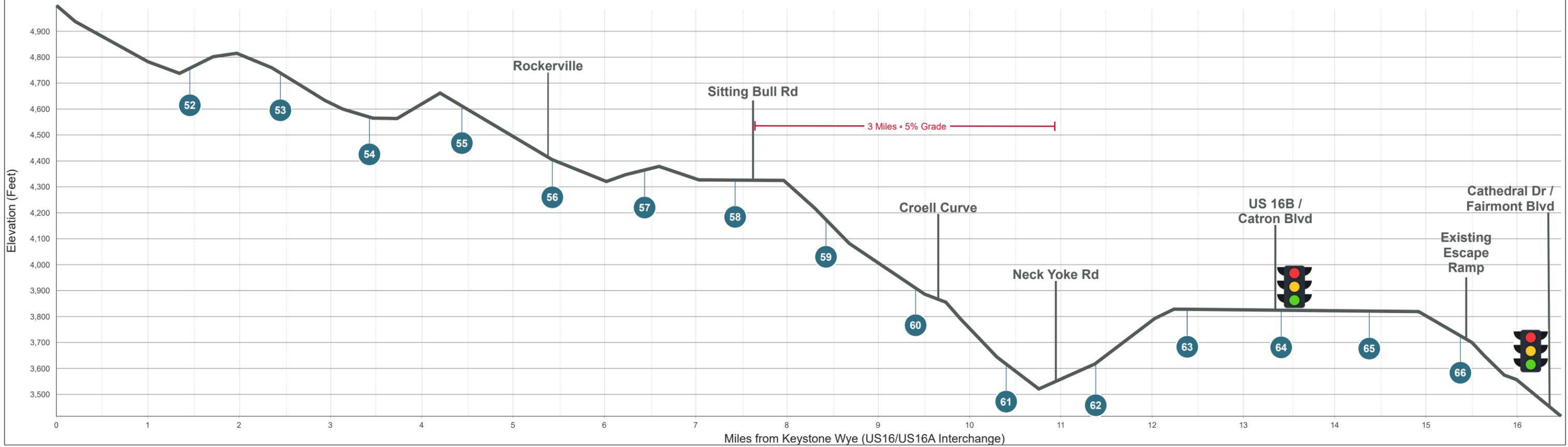
Functional Classification: Urban Other Freeways and Expressways  
SDDOT Access Classification: Expressway

Posted Speed: 60 mph

Surface Width: 24' (EB and WB)  
Inside Shoulder: 3'  
Outside Shoulder: 7'  
Depressed Median Width: 58'  
ROW Width: 150'

Begin 28' Median

US16 Corridor Elevation Profile



**LEGEND**

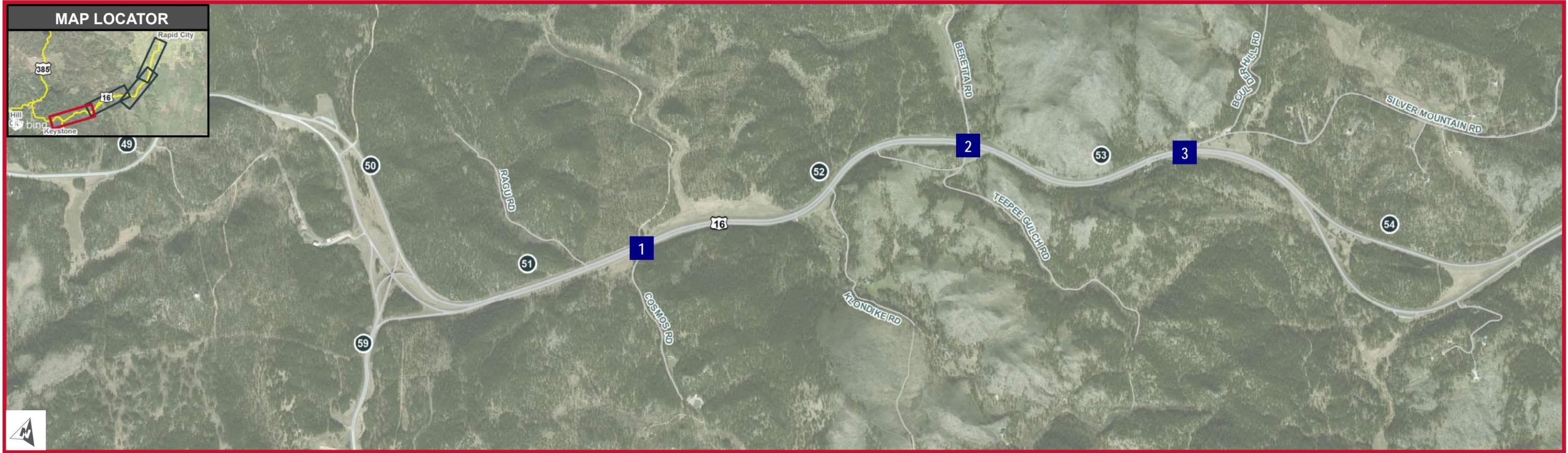
- Mile Markers
- ▭ Study Area

0 Miles 1

DATA SOURCE: SD DOT

EXISTING ROAD AND STRUCTURE CONDITIONS

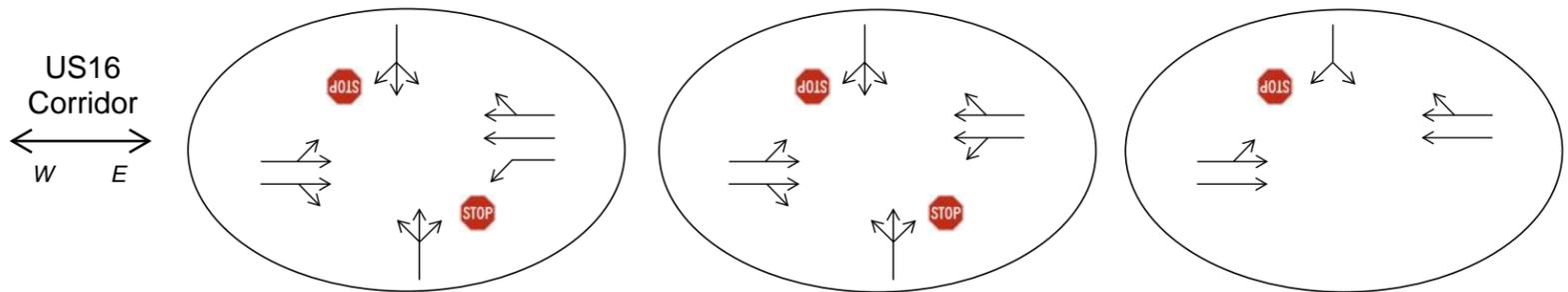




1. US16 & Cosmos Road

2. US16 & Beretta Road

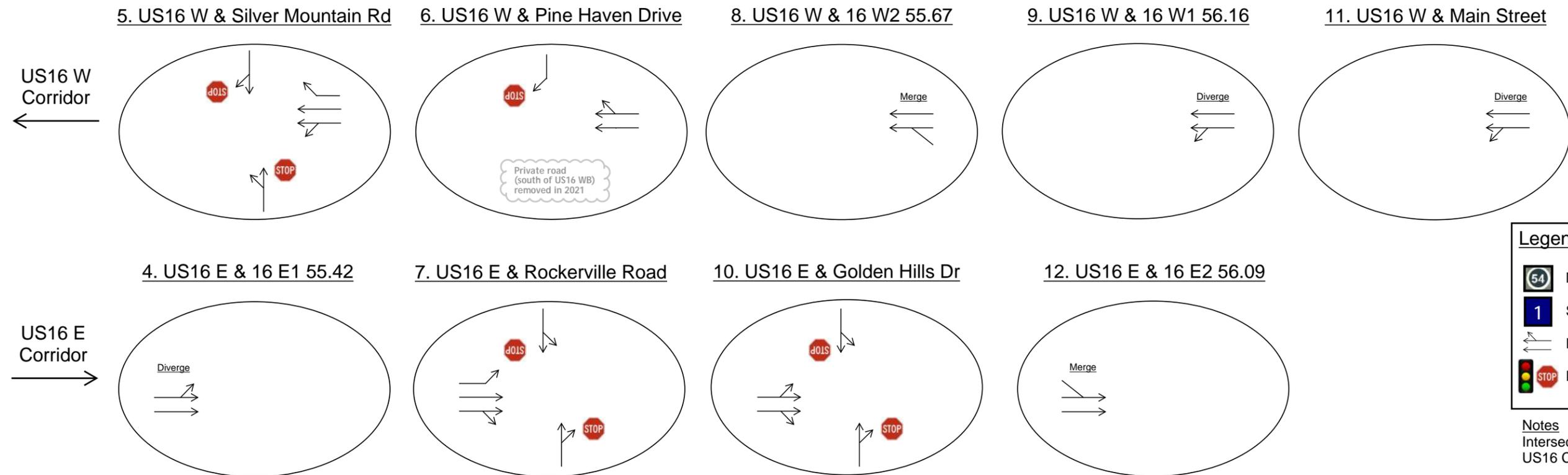
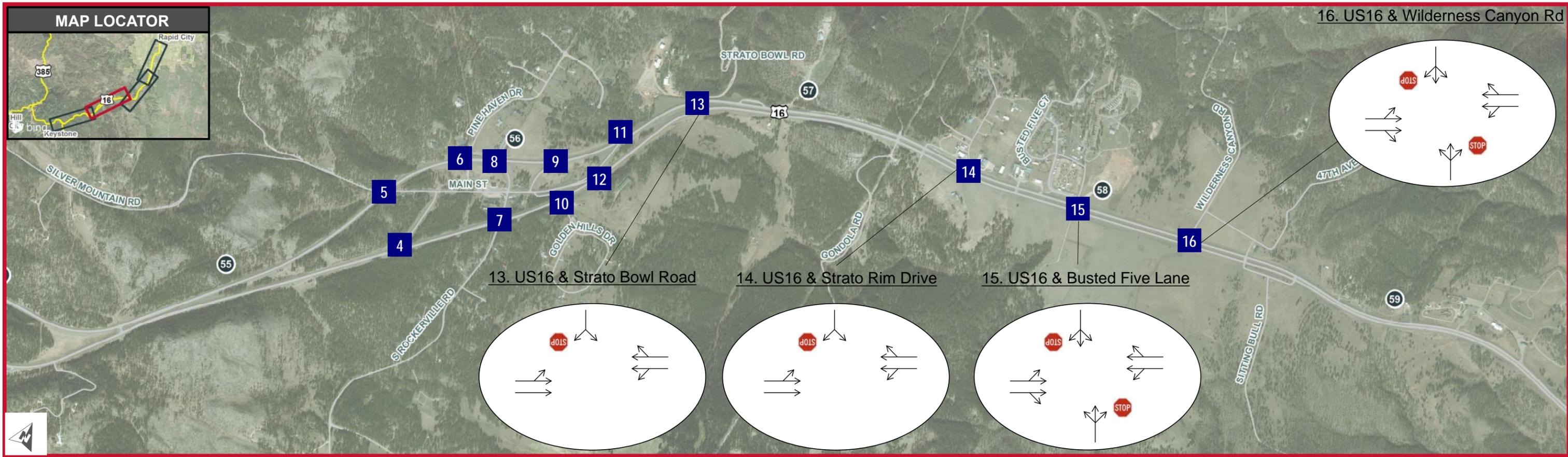
3. US16 & Silver Mountain Road



**Legend**

- Mileage Reference Marker (MRM)
- Study Intersection
- Existing Intersection Lane Configuration
- Existing Intersection Traffic Control

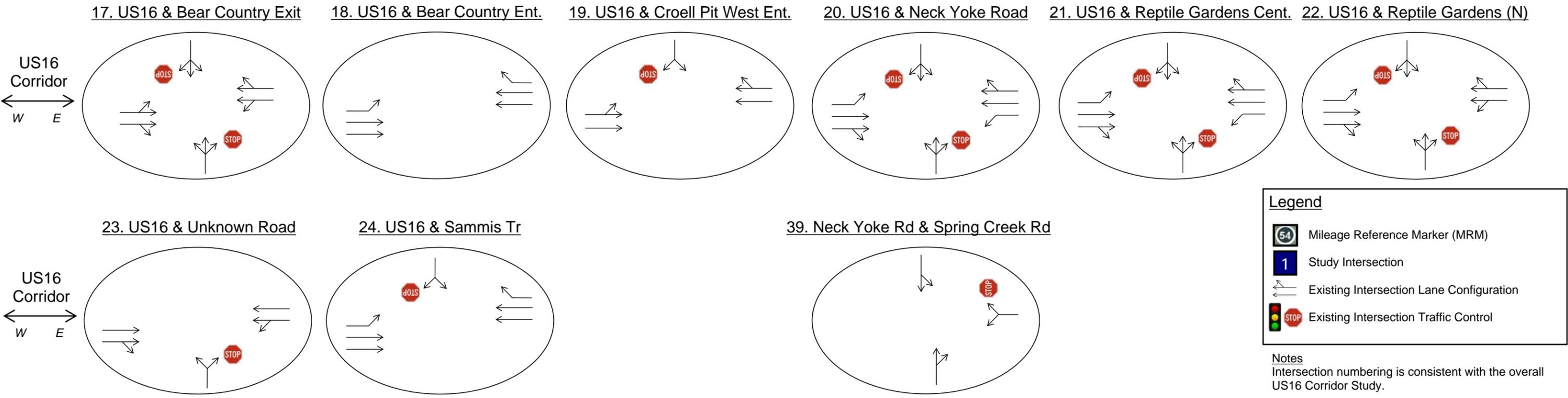
**Notes**  
 Intersection numbering is consistent with the overall US16 Corridor Study.

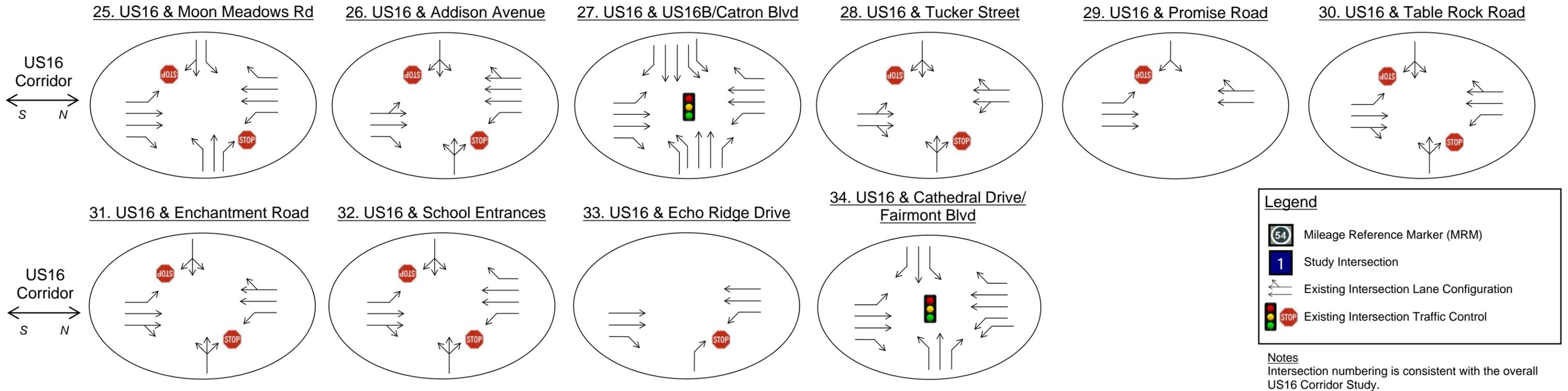
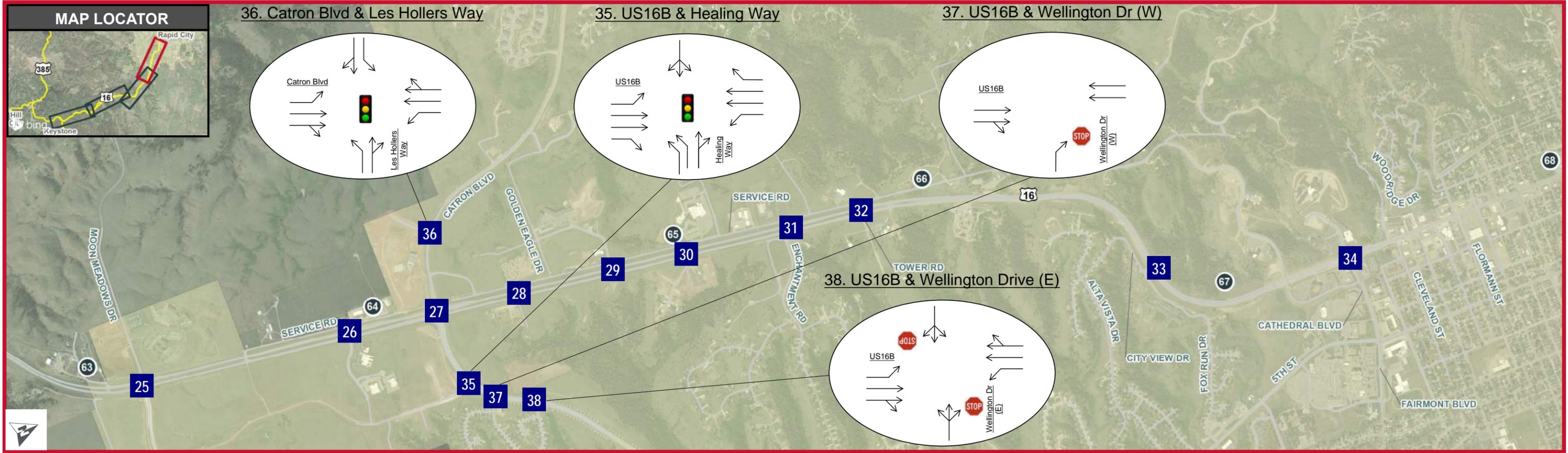


**Legend**

- Mileage Reference Marker (MRM)
- Study Intersection
- Existing Intersection Lane Configuration
- Existing Intersection Traffic Control

**Notes**  
 Intersection numbering is consistent with the overall US16 Corridor Study.





### 4.3 Existing Traffic Volumes

Existing Condition (Year 2019) traffic volumes, shown in **Figure 5**, were based on the following daily and peak hour traffic counts collected as part of the study.

#### 12-hour peak hour intersection turning movement counts

- Collected on Thursday, May 30, 2019
- Provided peak hour intersection turning movement volumes, peak hour factors, and heavy vehicle percentages broken out by trucks, RVs, and passenger vehicles pulling boats/campers/trailers over 12 continuous hours (7 a.m. to 7 p.m.)
- Reflects morning and afternoon/evening commute periods

#### 24-hour roadway segment counts

- Collected on Thursday, May 30, 2019
- Provided daily and peak hour segment volumes, heavy vehicle percentages, and speeds

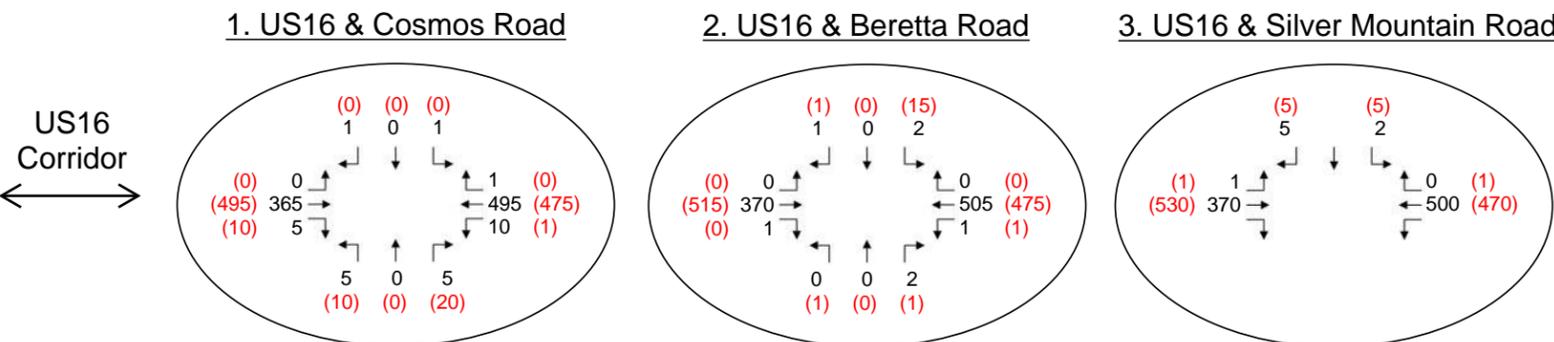
All volumes were adjusted to reflect a June 'design season' to account for higher corridor traffic volumes occurring during the summer tourist season.

### 4.4 Existing Traffic Patterns

Historically, the US16 corridor has primarily served regional traffic, with key origin-destination centers between Rapid City, I-90, Mount Rushmore, and communities and tourist destinations in the greater Black Hills. Due to the directness of US16 to popular Black Hills destinations and lack of alternative routes in the area, US16 is the primary tourist route heading south out of Rapid City to Mount Rushmore, Keystone, Hill City, etc. Corridor traffic volumes are highly seasonal, with the peak tourist season months of June, July, and August exhibiting notably higher volumes than what occurs in the winter months.

Local commuter traffic is directional with morning commute traffic heading north into Rapid City and afternoon commute traffic heading back to the south. During the tourist season, however, volumes become more balanced with a reverse commute from Rapid City to the Black Hills starting in the mid-morning and back in the evening. Higher volumes are also much more sustained throughout the day in the peak season with high tourist volumes beginning in mid-morning.

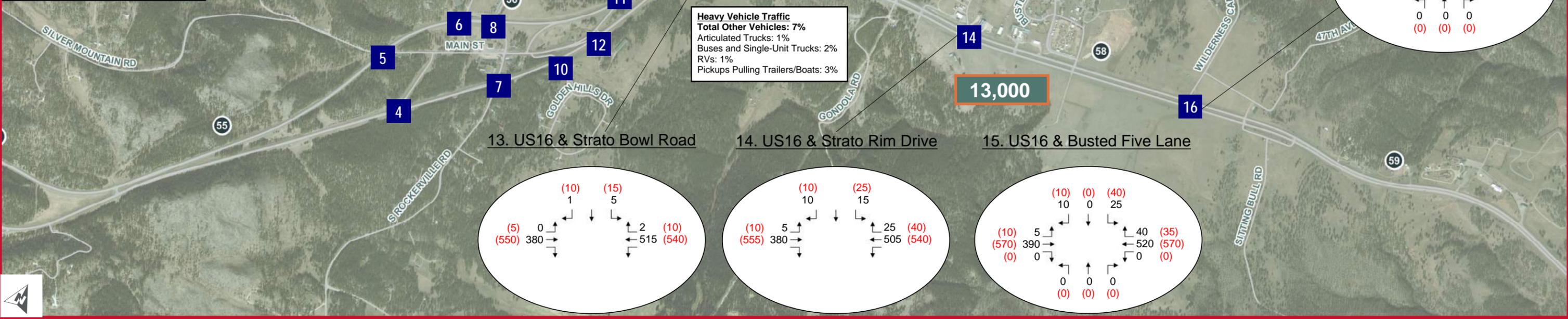
Future development along the corridor is expected to expedite a changing dynamic to traffic patterns, particularly in the urban area from Moon Meadows Drive northward. A recent example is the completion of Black Hills Energy Corporation headquarters, which brings traffic out of the Rapid City core on US16 from the north. This results in a more balanced flow in commute traffic and adds to the complexity in providing adequate, long-term capacity at the urban area intersections. This is particularly noteworthy at the high-demand US16/US16B/Catron Boulevard intersection, where more balanced flow during peak hours intensifies operational and safety challenges at the existing at-grade intersection.



### Legend

- Mileage Reference Marker (MRM)
- Study Intersection
- 2019 Daily Traffic Volumes\*
- 2019 Peak Hour Traffic Volumes\*

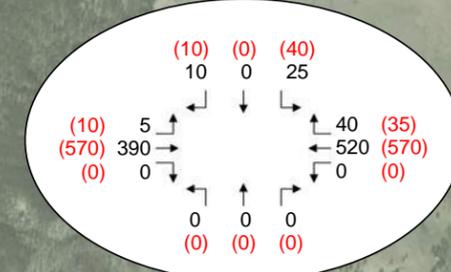
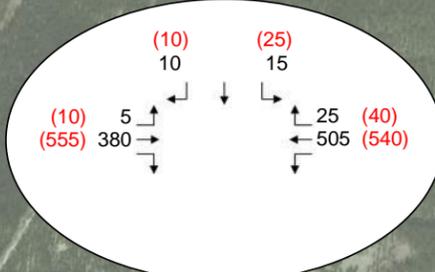
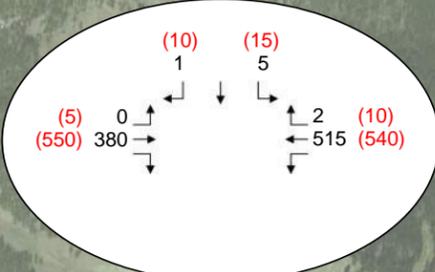
*Notes:*  
 \* Volumes reflect June design season  
 Stop-controlled intersections are two-way stop-control unless noted.



13. US16 & Strato Bowl Road

14. US16 & Strato Rim Drive

15. US16 & Busted Five Lane



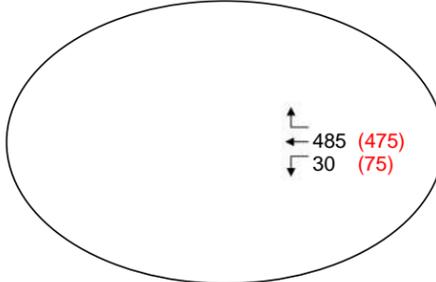
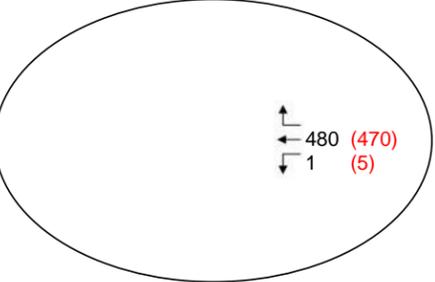
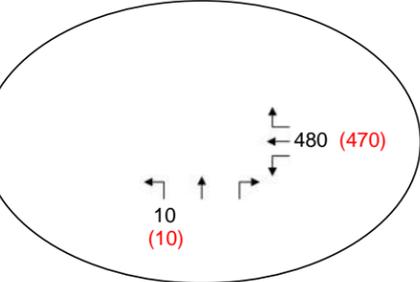
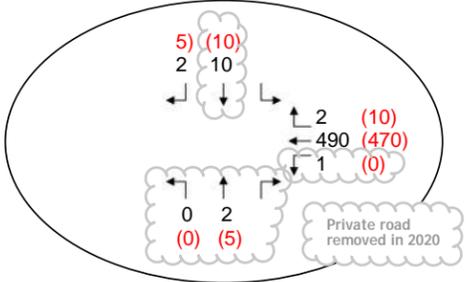
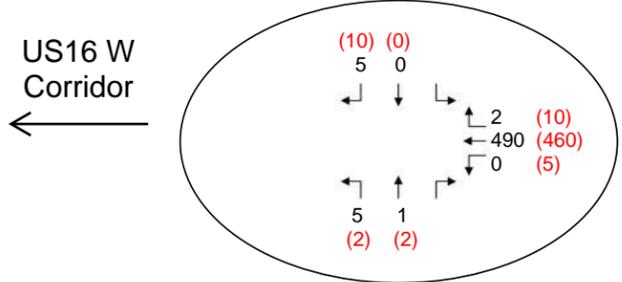
5. US16 W & Silver Mountain Rd

6. US16 W & Pine Haven Drive

8. US16 W & 16 W2 55.67

9. US16 W & 16 W1 56.16

11. US16 W & Main Street

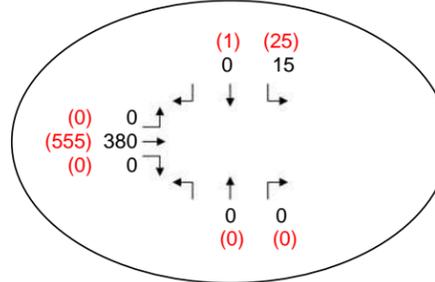
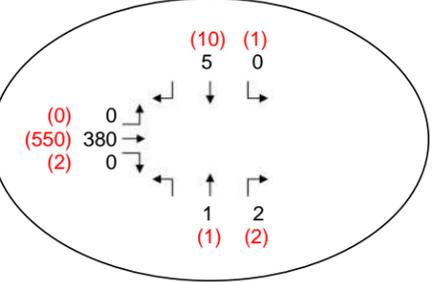
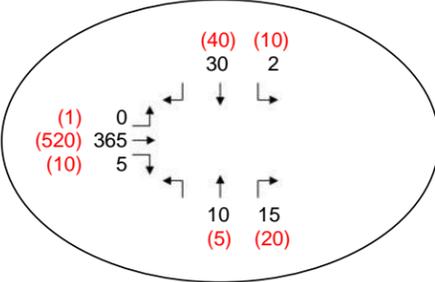
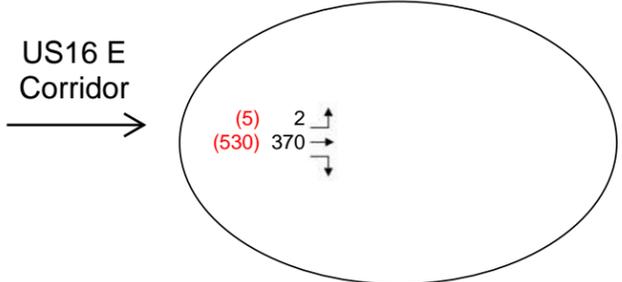


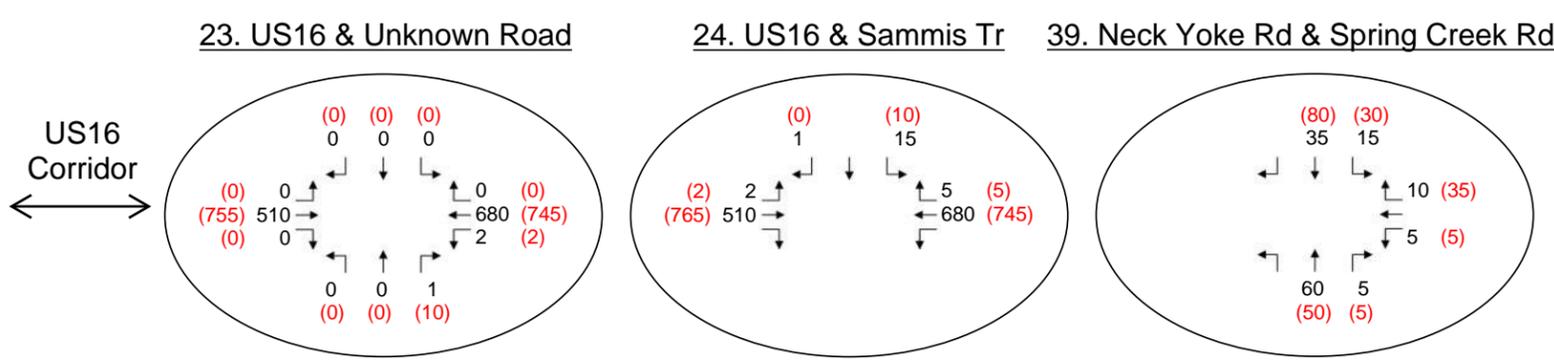
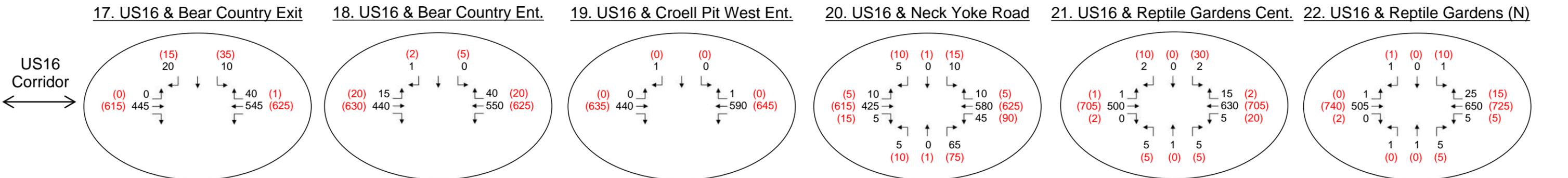
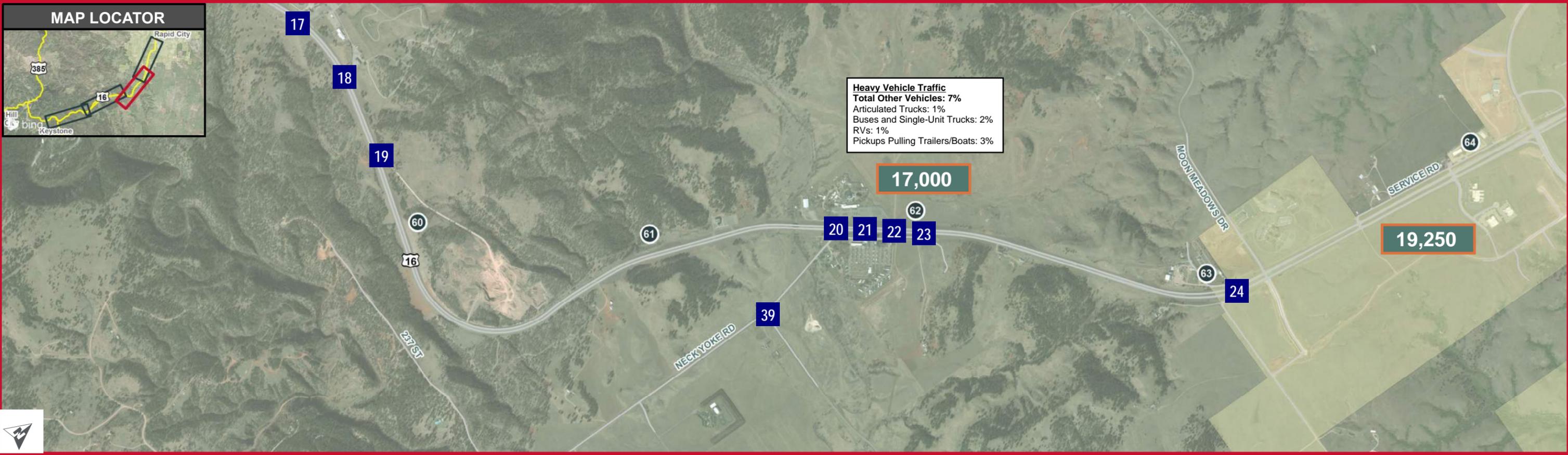
4. US16 E & 16 E1 55.42

7. US16 E & Rockerville Road

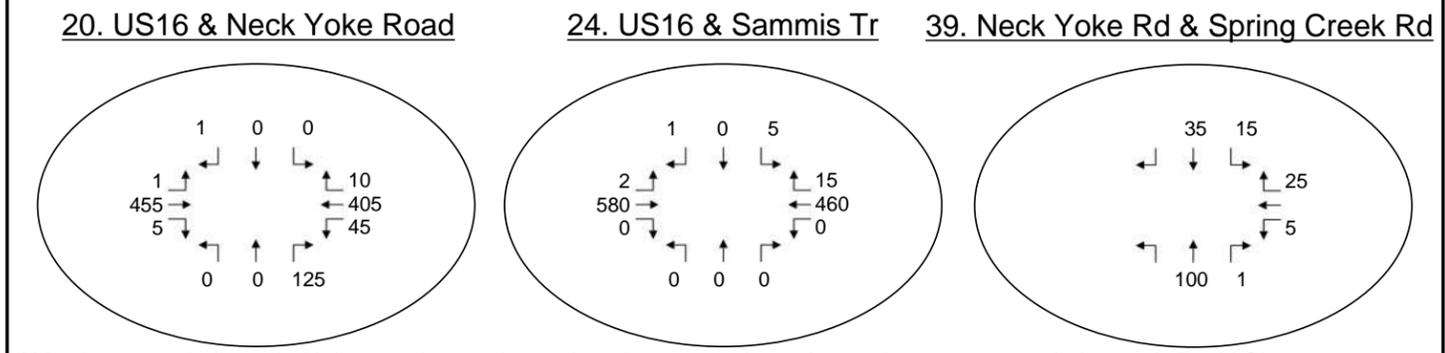
10. US16 E & Golden Hills Dr

12. US16 E & 16 E2 56.09

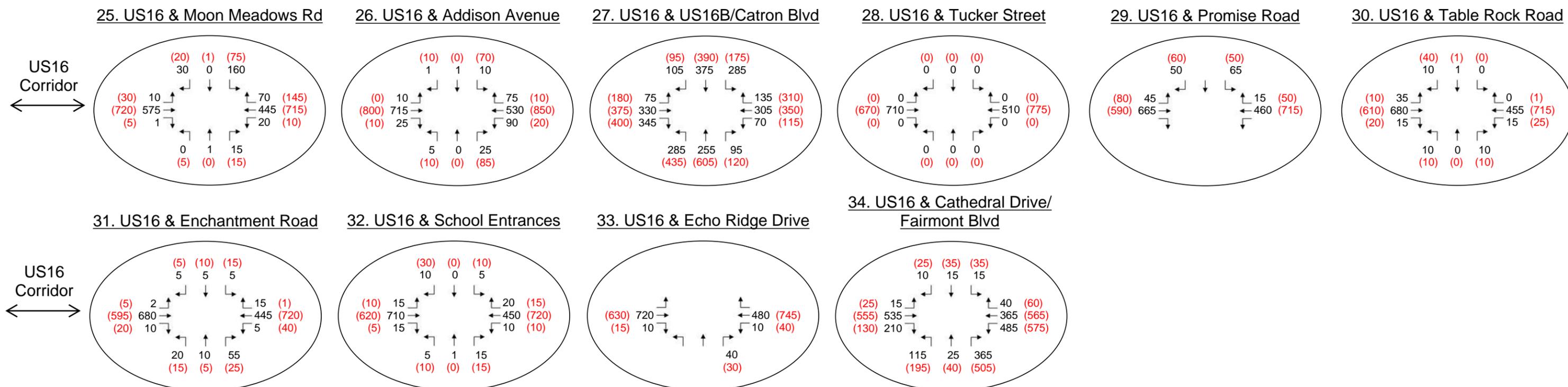
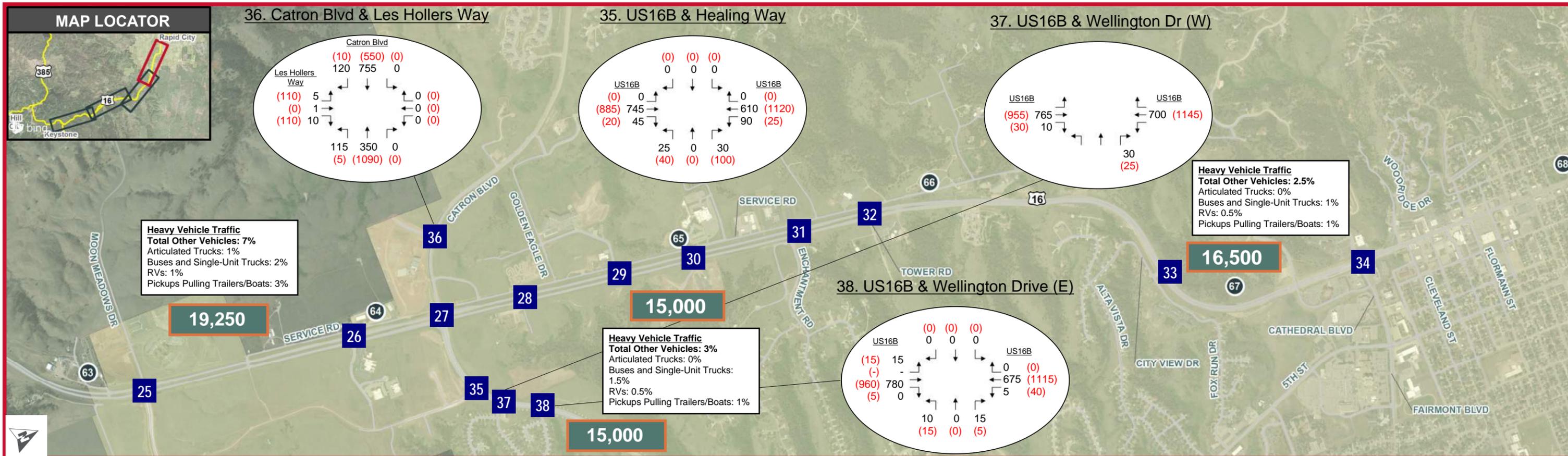




**AM - Early Morning Commute (Directional to Rapid City)**



AM volumes are balanced with intersections to the north and represent the early morning commute period towards Rapid City.



## 4.5 Crash History Review

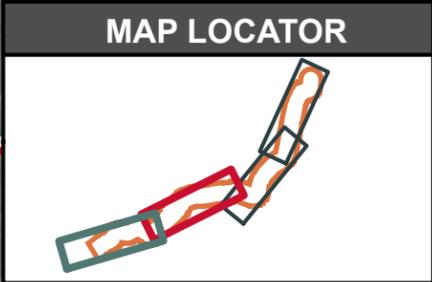
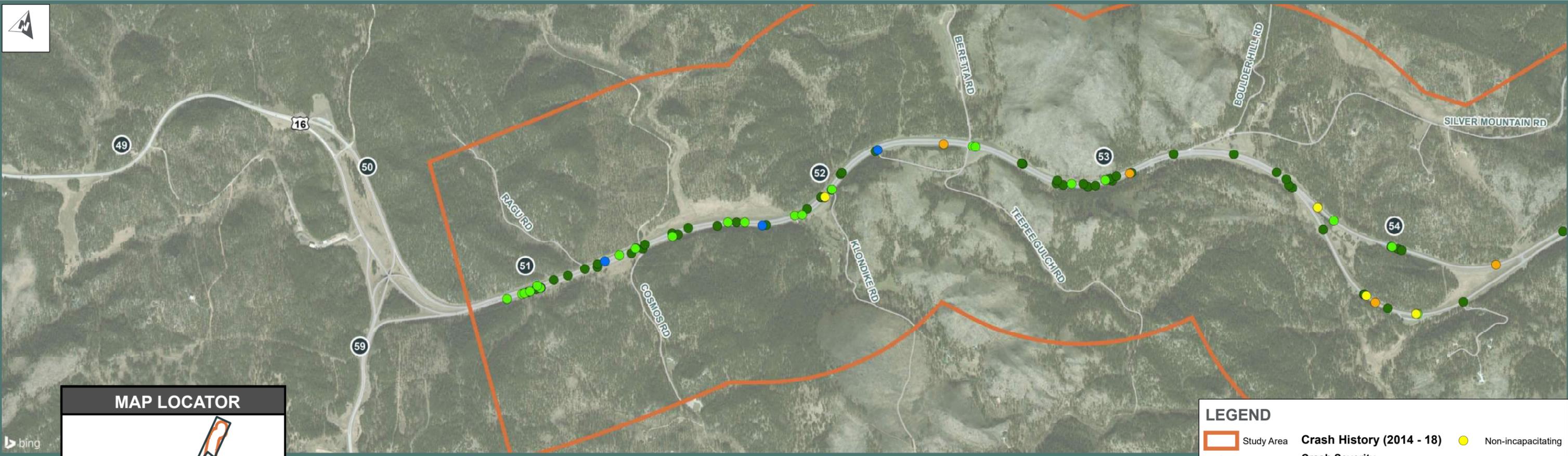
Crash data for years 2014 through 2018 was provided by the SDDOT through a GIS geodatabase. Records of reported crashes were reviewed throughout the US16 Corridor Study area to identify any historical crash trends or high frequency areas to help develop potential crash mitigation measures for consideration in design. **Figure 6** graphically depicts the location and injury severity of each reported crash.

Crash rates and critical crash rates were calculated for both intersections and roadway segments. Intersection crash rates were calculated in terms of crashes per million entering vehicles (crashes/MEV). Roadway segment crash rates were calculated in terms of million vehicle miles traveled (crashes/MVMT).

Critical crash rates were calculated based on the statistical populations for each crash location (intersection or segment), using methods presented in the *Highway Safety Manual* (HSM, American Association of State Highway and Transportation Officials (AASHTO), 2010). A critical crash rate accounts for a desired level of confidence, vehicle exposure, and similar facility types. Intersections and segments where the crash rate exceeds the critical rate should be investigated further.

Weighted crash rates were also calculated for corridor segments by weighting each crash in accordance with its severity: fatal crash (12), injury crash (3), and property damage crash (1). Weights were assigned to each crash in accordance with methodology used by the SDDOT in determining statewide average crash rates. This method differs from the calculation of an average crash rate in that the weighted crash rate accounts for injury and fatal crashes through the weighting process. An average crash rate calculation reflects total crash frequency, regardless of injury severity.

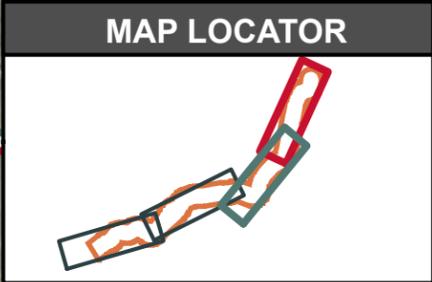
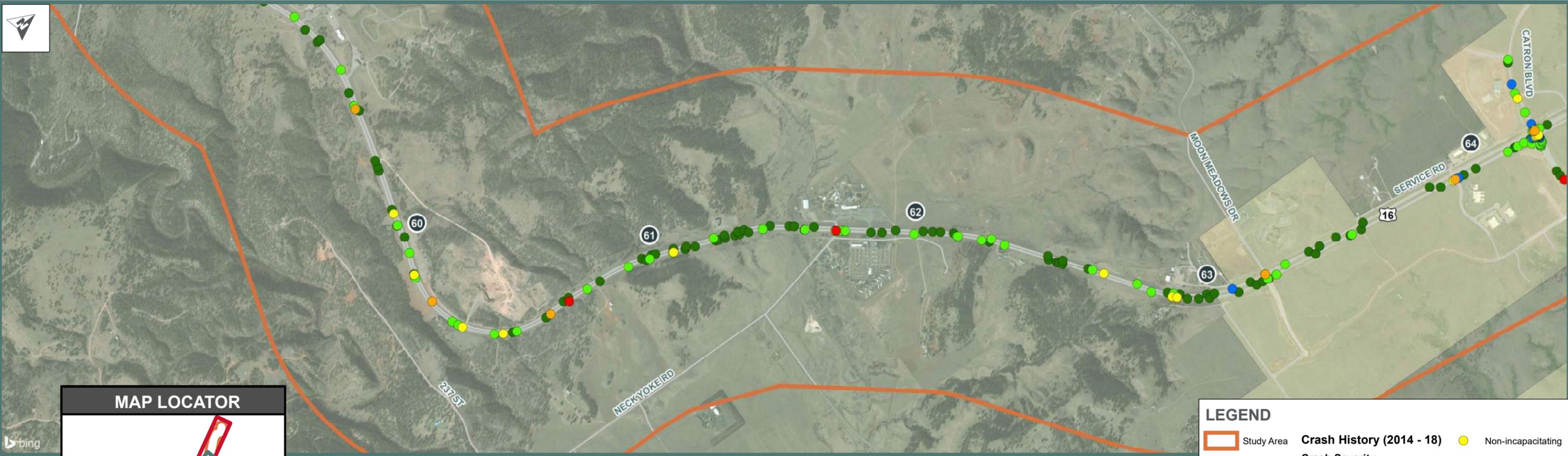
The following sections identify intersections and highway segments exhibiting safety-related transportation needs. These locations were carried forward for additional review and development of conceptual improvements. Further discussion regarding crash trends at each location, as well as additional corridor-wide crash information and figures, is presented in the *US16 Crash History Review* report in **Appendix C**.



**LEGEND**

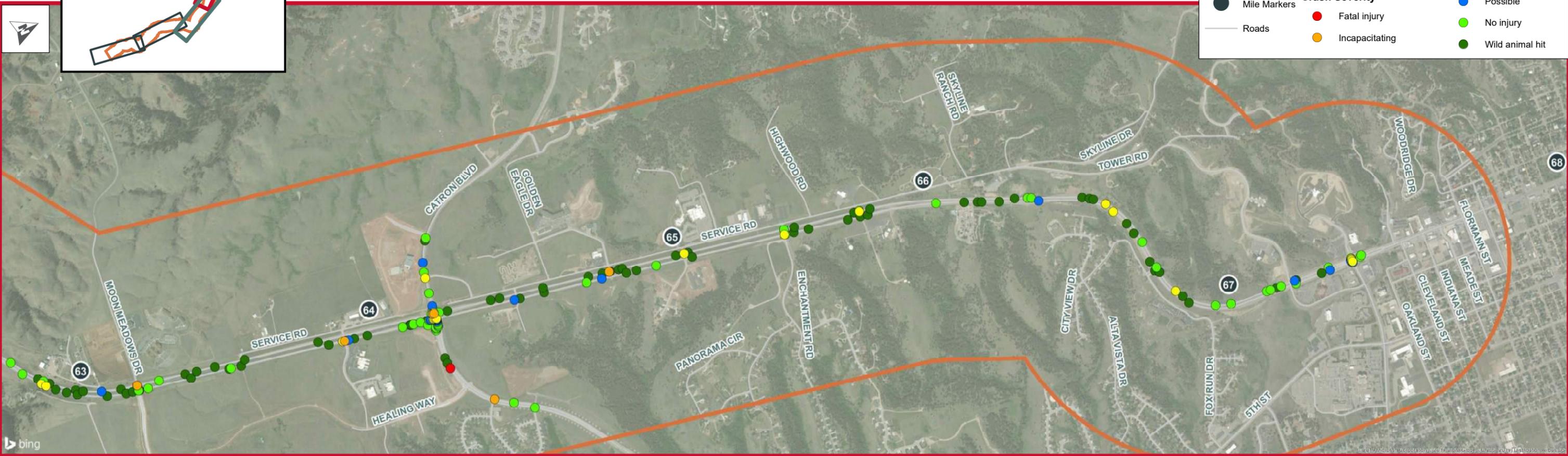
Study Area	<b>Crash History (2014 - 18)</b>	Non-incapacitating
Mile Markers	<b>Crash Severity</b>	Possible
Roads	Fatal injury	No injury
	Incapacitating	Wild animal hit





**LEGEND**

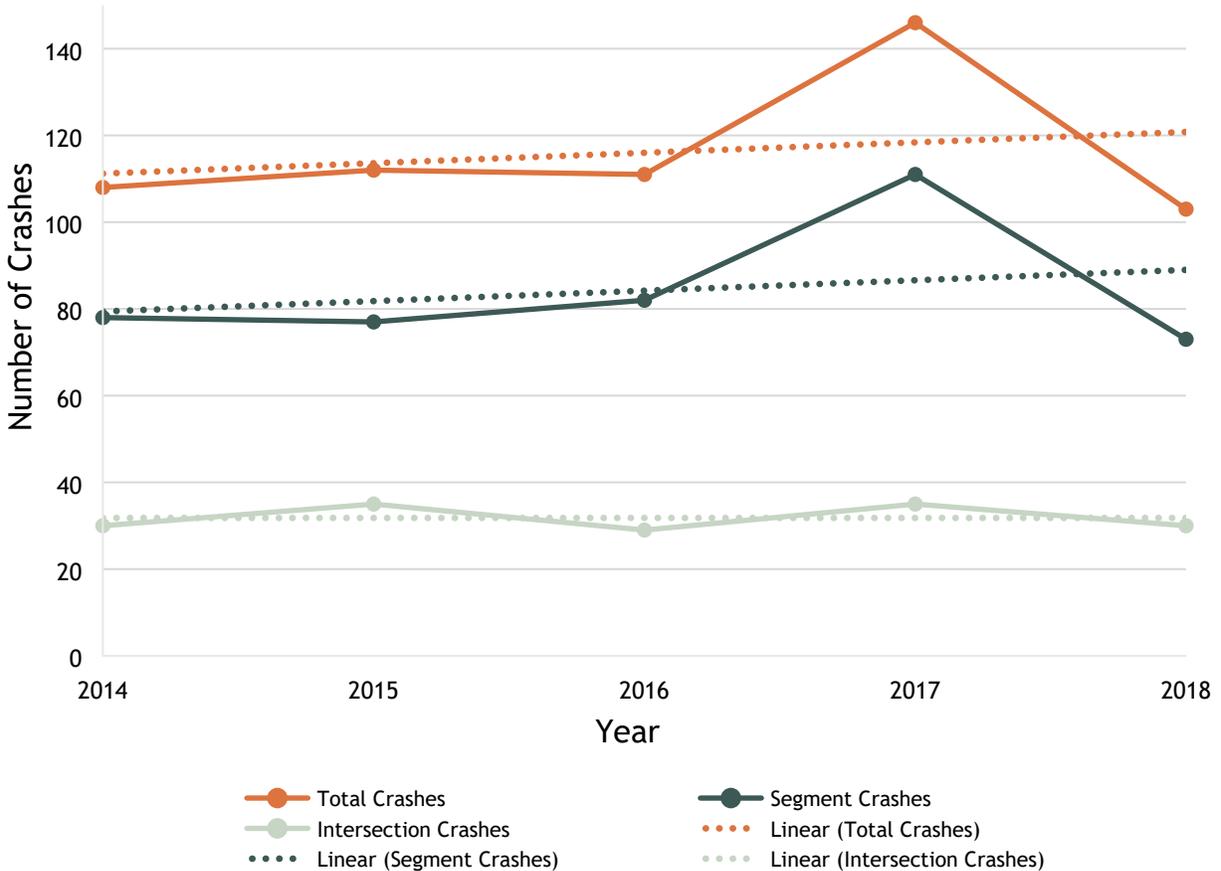
Study Area	<b>Crash History (2014 - 18)</b>	Non-incapacitating
Mile Markers	<b>Crash Severity</b>	Possible
Roads	Fatal injury	No injury
	Incapacitating	Wild animal hit



**CRASH HISTORY (2014-2018)**  
**US16 CORRIDOR STUDY**  
 FIGURE 6, PAGE 2 OF 2

### 4.5.1 US16 Corridor Summary

A total of 580 crashes were reported along the US16 corridor between 2014 and 2018. Of those, 159 were identified as intersection crashes and the remaining 421 segment rashes. Corridor-wide crash frequency, shown in **Figure 7**, reflects a slight upward trend for total and segment crashes across the five years of data, while intersection crashes have remained flat.



**Figure 7: US16 Corridor Segment and Intersection Crashes by Year (2014-2018)**

A breakdown of corridor-wide crashes by injury severity and manner of collision are shown in **Table 3** and **Table 4**. Overall, nearly 22 percent of all crashes result in injury along the corridor. Specific to intersection crashes, nearly 43 percent result in injury. Severe injury crashes are shown spatially in **Figure 8**.

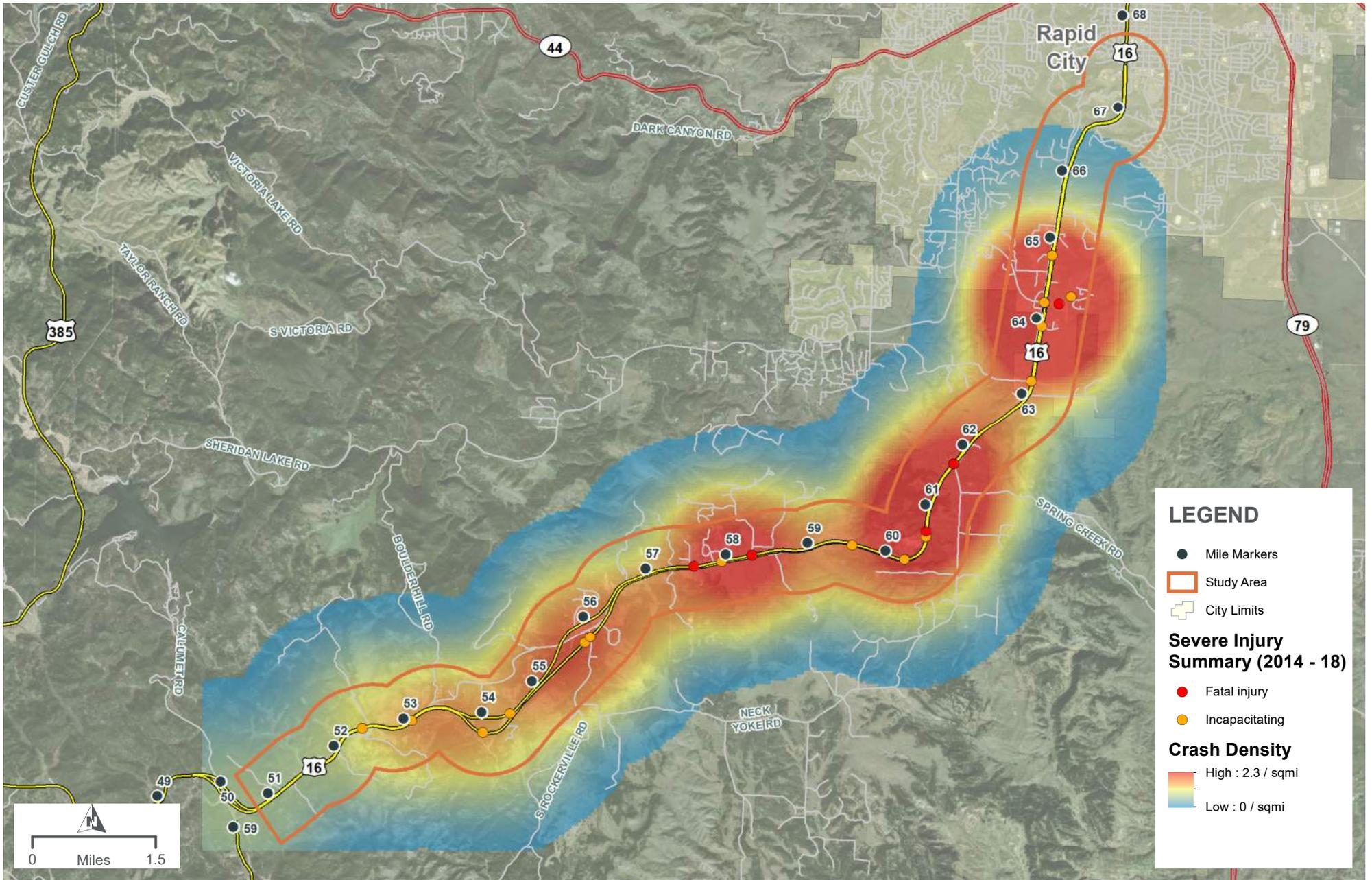
Vehicle-animal crashes are the most frequently occurring manner of collision, representing nearly 50 percent of all crashes along the corridor. Angle crashes, which exhibit a propensity for high injury severity are most common at intersections. Single vehicle roadway departure crashes are most common along highway segments.

**Table 3: US16 Corridor Crash Summary - Injury Severity (2014-2018)**

Injury Severity	Segments		Intersections		Corridor (Total)	
	Total # Crashes	% of Segment Total	Total # Crashes	% of Intersection Total	Total # Crashes	% of Corridor Total
Fatal Crash	2	0.5%	2	1%	4	1%
Injury Crash						
<i>Incapacitating</i>	9	2%	11	7%	20	3.5%
<i>Non-Incapacitating</i>	31	7.5%	22	14%	53	9%
<i>Possible</i>	14	3.5%	33	21%	47	8%
No Injury Crash (PDO)						
<i>Vehicle Only</i>	89	21%	91	57%	180	31%
<i>Vehicle-Animal</i>	276	65.5%	0	0%	276	47.5%
<b>Total</b>	<b>421</b>	<b>100%</b>	<b>159</b>	<b>100%</b>	<b>580</b>	<b>100%</b>

**Table 4: US16 Corridor Crash Summary - Manner of Collision (2014-2018)**

Manner of Collision	Segments		Intersections		Corridor (Total)	
	Total # Crashes	% of Segment Total	Total # Crashes	% of Intersection Total	Total # Crashes	% of Corridor Total
Rear-End	14	3.5%	42	26.5%	56	9.5%
Head On	0	0%	1	0.5%	1	<0.5%
Angle	13	3%	101	63.5%	114	20%
Side Swipe	10	2.5%	4	2.5%	14	2.5%
No Collision btw 2 Vehicles						
<i>Single Vehicle</i>	104	24.5%	11	7%	115	20%
<i>Animal</i>	280	66.5%	0	0%	280	48%
<b>Total</b>	<b>421</b>	<b>100%</b>	<b>159</b>	<b>100%</b>	<b>580</b>	<b>100%</b>



**SEVERE INJURY SUMMARY (2014-2018)**

**US16 CORRIDOR STUDY**



## 4.5.2 US16 Intersection Summary

A summary of US16 Corridor Study intersection-related crashes occurring within the study area is presented in **Table 5**. Intersections with zero reported crashes within the 5-year review period are not shown. **Orange Bold** text signifies intersections with a crash rate exceeding the critical crash rate or where the weighted crash rate is the greatest.

**Table 5: US16 Corridor Intersections - Crash Rates (2014-2018)**

Mainline	Crossroad	Total # of Crashes	Weighted Crash Rate		Critical Crash Rate	
			Weighted Crash Rate	Rank	Crash Rate	Critical Crash Rate
US16	US16 Service Road (N of Highwood Rd)	2	0.18		0.09	0.29
US16	Enchantment Road	4	0.17		0.17	0.28
US16	Tablerock Road	1	0.12		0.04	0.28
US16	Promise Road	4	0.31		0.15	0.27
US16	Tucker Street	1	0.12		0.04	0.28
US16	Skyline Drive / Addison Avenue	1	0.09		0.03	0.25
US16	Moon Meadows Drive	8	0.41	<b>8</b>	0.23	0.25
US16	Ft Hays/Sammis Trail	2	0.13		0.06	0.26
US16	Neck Yoke Road	4	0.74	<b>6</b>	0.16	0.27
US16	Sitting Bull Road	1	0.06		0.06	0.32
US16	Wilderness Canyon Road	5	1.23	<b>3</b>	0.31	0.32
US16	Busted Five Lane	6	0.97	<b>5</b>	<b>0.37</b>	0.32
US16	Strato Rim Drive	1	0.19		0.06	0.32
US16 WB	Silver Mountain Road / Main Street	1	0.13		0.13	0.41
US16 EB	Golden Hills Drive	1	0.12		0.12	0.41
US16 EB	Rockerville Road	5	1.40	<b>2</b>	<b>0.54</b>	0.39
US16	Cathedral Drive / Fairmont Blvd	23	1.12	<b>4</b>	0.66	**
US16	US16B/Catron Blvd	88	2.96	<b>1</b>	1.67	**
US16B/Catron Blvd	Healing Way	1	0.45	<b>7</b>	0.04	0.27
US16B/Catron Blvd	Wellington Drive (east)	1	0.04		0.04	0.28
Neck Yoke Road	Spring Creek Road	2	0.39		0.39	0.50
Main Street	Rockerville Road	1	***	***	***	***
US16 Service Road	Promise Road	4	***	***	***	***

Crash rates that exceed the critical crash rate are noted in **Orange Bold** text. \*\*\* No traffic counts available.

\*\* Critical crash rate not calculated for signalized intersections due to low sample size (three intersections).

Fatal injury crashes occurred at the following intersections:

- US16 and Wilderness Canyon
- US16 and Neck Yoke Road
- US16B/Catron Boulevard and Healing Way

The following six intersections exhibit a crash rate exceeding the critical crash rate and/or a high weighed crash rate ranking.

- US16 and Wilderness Canyon Road intersection
- US16 and Moon Meadows Drive intersection
- US16 and Neck Yoke Road intersection
- US16 and Busted Five Lane Intersection
- US16 EB and Rockerville Road intersection
- US16 and US16B/Catron Boulevard intersection
- US16B/Catron Boulevard and Healing Way

### 4.5.3 Corridor Segments Summary

Table 6 and Table 7 summarizes US16 corridor segment crash rates in terms of critical rates and weighted crash rates. **Orange Bold** text signifies intersections with a crash rate exceeding the critical crash rate or where the weighted crash rate exceeds the statewide average weighted rate.

Fatal injury crashes occurred along the following two segments:

- Horizontal Curve (west end) to Horizontal Curve (east end) (Segment 13)
- Strato Rim Drive to Busted Five Lane (Segment 17)

**Table 6: US16 Corridor Segments - Urban Area Crash Rates (2014-2018)**

#	From	To	Total # of Crashes	Weighted Crash Rate		Critical Crash Rate	
				Weighted Crash Rate	State Rate	Crash Rate	Critical Crash Rate
1	Echo Ridge Drive	Cathedral Blvd	16	1.39	2.0	1.00	2.06
2	Service Road	Echo Ridge Drive	25	1.29	2.0	1.00	1.94
3	Enchantment Road	Service Road	6	1.03	2.0	1.00	2.44
4	Tablerock Road	Enchantment Road	3	0.64	2.0	0.40	2.31
5	Promise Road	Tablerock Road	7	1.25	2.0	1.20	2.47
6	US16B/Catron Blvd	Promise Road	10	1.09	2.0	0.90	2.18
7	Skyline Drive/ Addison Ave	US16B/Catron Blvd	8	<b>1.93</b>	1.71	1.50	2.51
8	Moon Meadows Drive	Skyline Drive/ Addison Ave	13	0.97	1.71	0.80	2.07
9	Ft Hays/Sammis Trail	Moon Meadows Drive	6	<b>2.32</b>	1.71	2.30	2.97
10	Unknown road	Ft Hays/ Sammis Trail	33	1.37	1.71	1.20	1.92

Crash rates that exceed the critical crash or statewide average crash rate are noted in **Orange Bold** text. Statewide average crash rate based on Functional Classification.

**Table 7: US16 Corridor Segments - Crash Rates North of Neck Yoke Road (2014-2018)**

#	From	To	Total # of Crashes	Weighted Crash Rate		Critical Crash Rate	
				Weighted Crash Rate	State Rate	Crash Rate	Critical Crash Rate
11	Neck Yoke Road	Unknown road	8	<b>2.27</b>	1.45	1.80	2.60
12	Curve (east)	Neck Yoke Road	32	<b>2.41</b>	1.45	<b>2.30</b>	2.10
13	Curve (west)	Curve (east)	18	<b>4.01</b>	1.45	1.80	2.22
14	Sitting Bull Road (east)	Curve (west)	37	<b>2.14</b>	1.45	1.70	1.98
15	Wilderness Canyon Road	Sitting Bull Road (east)	5	<b>1.64</b>	1.45	0.90	2.48
16	Busted Five Lane	Wilderness Canyon Road	7	<b>1.55</b>	1.45	1.20	2.45
17	Strato Rim Drive	Busted Five Lane	19	<b>8.37</b>	1.45	<b>3.50</b>	2.48
18	Rockerville east ramp	Strato Rim Drive	32	<b>1.99</b>	1.45	1.80	2.03
19	Pine Haven Drive	Rockerville east ramp	5	1.27	1.45	1.30	2.67
20	Main Street	Pine Haven Drive	6	<b>2.83</b>	1.45	2.80	3.15
21	Golden Hills Drive	Rockerville east (WB) ramp	0	0.00	1.45	0.00	3.15
22	Rockerville Road	Golden Hills Drive	9	<b>6.37</b>	1.45	<b>6.40</b>	3.58
23	Rockerville west ramp	Rockerville Road	9	<b>4.73</b>	1.45	<b>3.30</b>	2.93
24	Curve/split (east)	Rockerville west ramps	18	<b>1.61</b>	1.45	1.30	2.11
25	Silver Mountain Road	Curve/split (east)	10	<b>1.49</b>	1.45	1.10	2.23
26	Silver Mountain Road	Curve/split (east)	12	<b>1.64</b>	1.45	1.10	2.18
27	Beretta Road	Silver Mountain Road	20	<b>1.87</b>	1.45	1.70	2.15
28	Klondike Road	Beretta Road	6	1.33	1.45	0.80	2.33
29	Cosmos Road	Klondike Road	19	<b>2.25</b>	1.45	1.90	2.20
30	North of Keystone Wye	Cosmos Road	22	<b>2.55</b>	1.45	<b>2.30</b>	2.23

Crash rates that exceed the critical crash or statewide average crash rate are noted in **Orange Bold** text. Statewide average crash rate based on Functional Classification.

Overall, the following seven segments were identified where the crash rate exceeded the critical crash rate and/or the intersection exhibited a weighed crash rate in the top 25 percent of all segments.

- Horizontal Curve (east end) to Neck Yoke Road (segment 12)
- Horizontal Curve (west end) to Horizontal Curve (east end) (Segment 13)
- Strato Rim Drive to Busted Five Lane (Segment 17)
- US16 W Main Street/Silver Mountain Road (16WV 55.70) to Pine Haven Drive (Segment 20)
- US16 E Rockerville Road to Golden Hills Drive (Segment 22)
- US16 E Rockerville West Ramp (16 E1 55.42) to Rockerville Road (16 EF 55.78) (Segment 23)
- North of Keystone Wye to Cosmos Road (Segment 30)

Given the high frequency of vehicle-animal crashes throughout most of the study area, a supplemental critical crash rate analysis was run without vehicle-animal crashes. It was found that the following segments exhibited crash rates that exceeded the critical rate when vehicle-animal crashes were removed:

- Horizontal curve (west end) to horizontal curve (east end) (Segment 13)
- Strato Rim Drive to Busted Five Lane (Segment 17)
- North of Keystone Wye to Cosmos Road (Segment 30)

#### 4.5.4 Weather Summary

Sixty-eight crashes were related to winter weather road conditions (snow, ice, or slush) throughout the corridor as shown in **Figure 9**. Clusters occurred at three primary locations:

- US16/US16B/Catron Boulevard intersection
- US16 horizontal curve and steep grade between MRM 60 and 61
- US16 horizontal curves north of the Keystone Wye between MRM 51 and 52

Discussions with the SAT and SDDOT Rapid City Area maintenance staff confirmed these locations as problematic during winter weather from a maintenance perspective. Blowing snow is one of the challenges, where snow and ice accumulates on the roadway between maintenance passes or overnight, which leads to (often unexpected) slippery road conditions. Strato Bowl Road to Bear County is another area experiencing blowing snow challenges.

Another weather-related issue was fog, particularly within the US16/US16B/Catron Boulevard intersection area. Overall, twenty crashes noted fog as a contributing factor throughout the corridor. Twelve of those occurred at intersections.

#### 4.5.5 Median Crash Summary

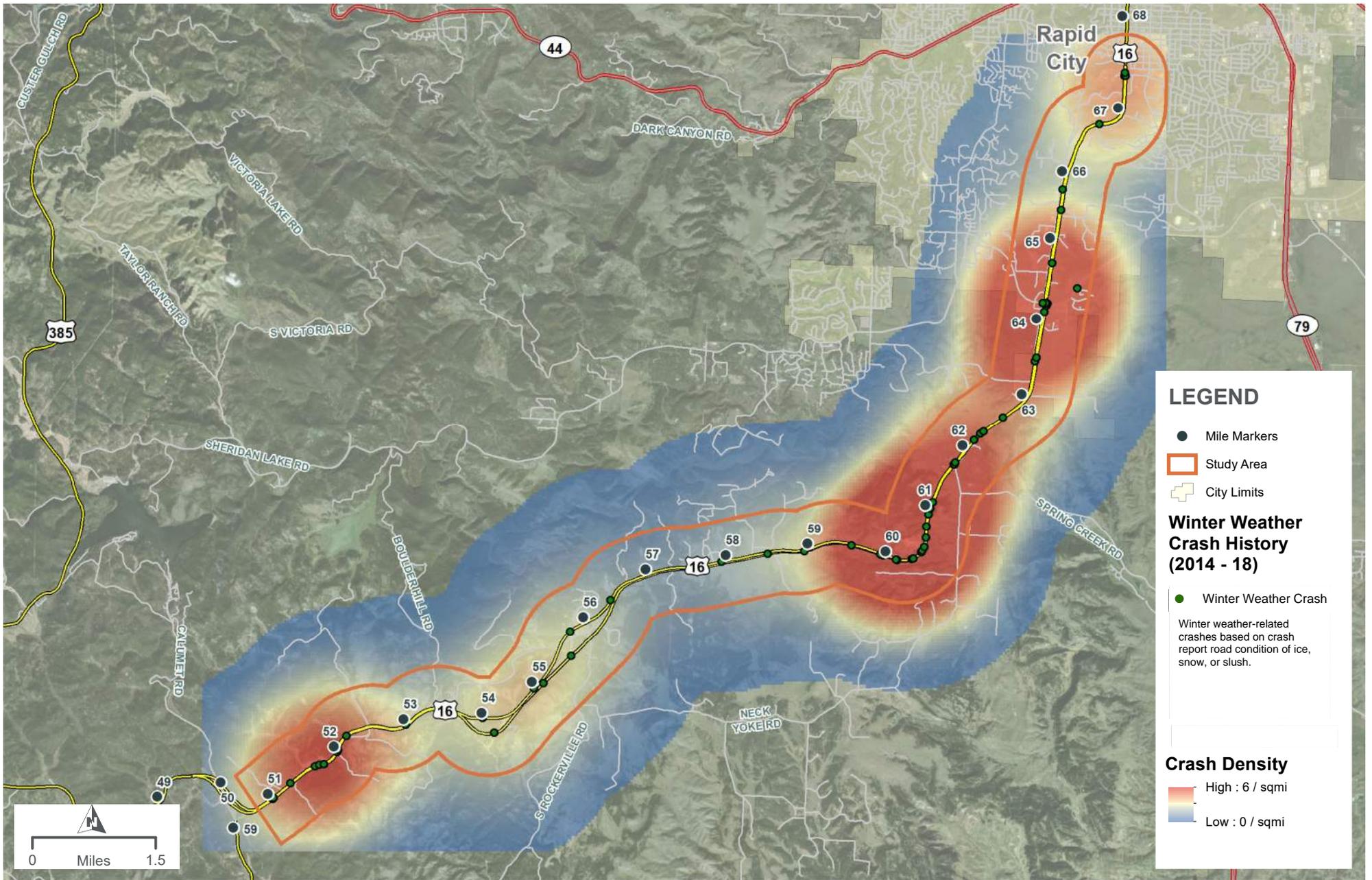
Eighteen crashes involved a vehicle crossing the median or centerline, shown in **Figure 10**, resulting in three incapacitating injury and six non-incapacitating or possible injury crashes. Twelve of the 18 crashes occurred with wet, ice, snow, or slush roadway conditions.

Nine of the 18 crashes occurred along a 3-mile stretch between MRM 59 and 62. Five additional crashes occurred just north of the Keystone Wye between MRM 51 and 52. Both US16 segments include a narrower cross-section with a depressed, paved 26-foot wide median and correspond with winter weather-related crash cluster locations.

#### 4.5.6 Motorcycle Crash Summary

Motorcycle use is high along the US16 corridor, particularly during the summer tourist months. Over the five analysis years, there were 26 reported crashes involving a motorcycle, 22 of which resulted in an injury.

- Segments: 14 of 17 resulting in injury
  - 1 fatal, 3 incapacitating, 8 non-incapacitating, and 2 possible
- Intersections: 8 of 9 resulting in injury
  - 2 fatal, 3 incapacitating, 1 non-incapacitating, and 2 possible
- Total: 22 of 26 resulting in injury (85 percent)
  - 9 of 26 resulting in fatality or serious injury (35 percent)

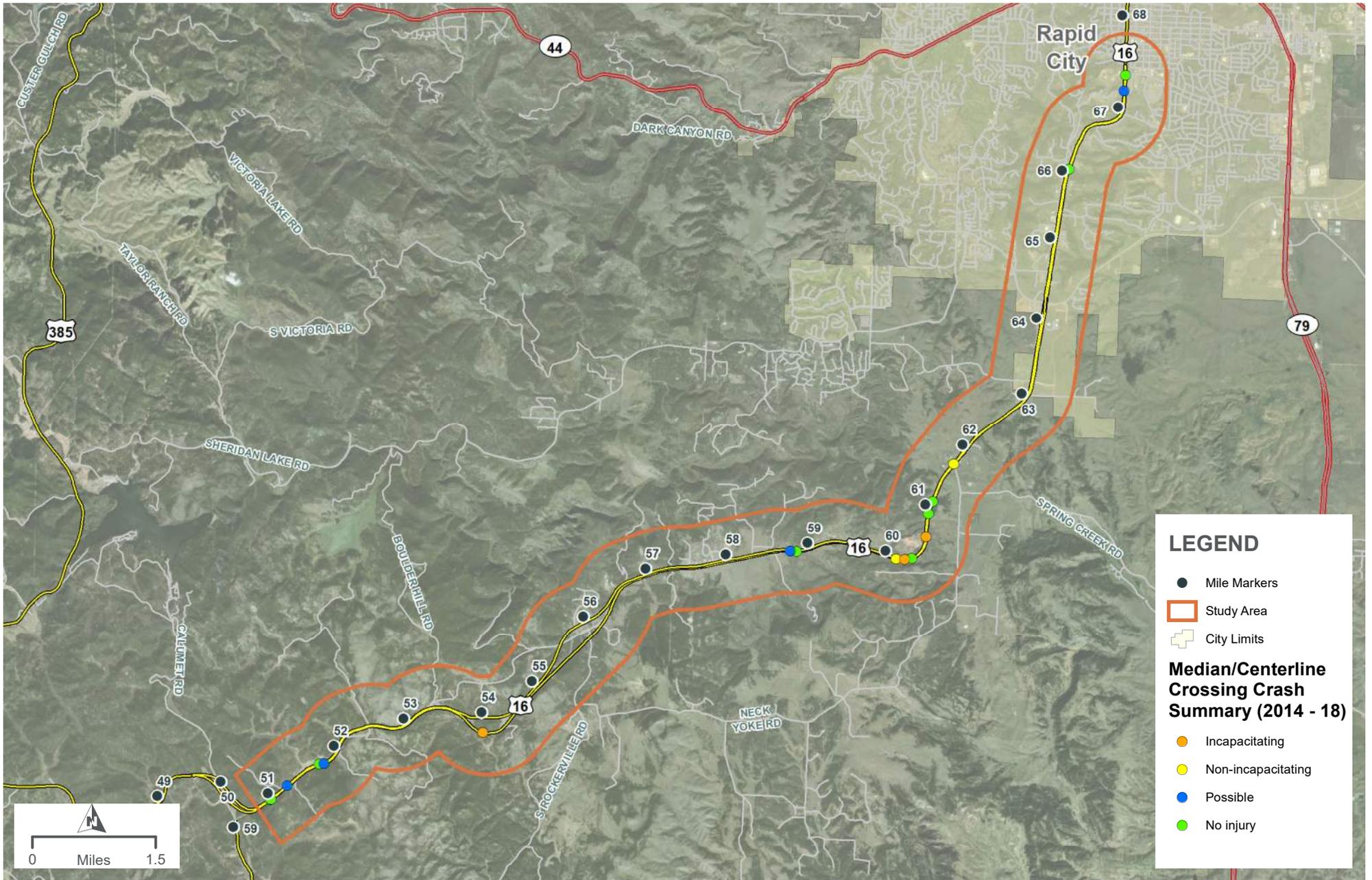


WINTER WEATHER CRASH SUMMARY (2014-2018)

US16 CORRIDOR STUDY

FIGURE 9, PAGE 1 OF 1





**CROSSING MEDIAN/CENTERLINE CRASH SUMMARY (2014-2018)**



## 4.6 Truck Escape Ramp Review

The eastbound, downhill direction of US16 was reviewed for truck safety and the need for escape ramps. This involves assessing existing roadway conditions, heavy vehicle/truck volume conditions, and historical crash patterns. Generally, the need for a truck escape ramp is associated with the potential of larger combination commercial vehicles' brakes overheating due to long, steep sustained downgrades. The existing US16 corridor profile, crash history, and points where a truck may need to stop is summarized in **Figure 11**.

Findings and conclusions from the assessment, **Appendix D**, are as follows:

### Corridor Considerations

- Truck volumes are relatively low, less than 100 combination commercial vehicles per day in eastbound direction (based on study counts)
- US16 drops from approximately 5,000 feet to approximately 3,4000 feet along the study corridor. There is undulation throughout this drop with upgrades and sustained flat areas.
- Four of the 10 truck crashes involved combination commercial vehicles
  - All four occurred at intersections
  - None of the crashes were of a type that would be susceptible to correction by the presence of a truck escape ramp

### Keystone Wye (MRM 51) to Sitting Bull Road (MRM 58)

- Average grade of -1.5% over 7.5 miles
- 1 truck-related crash (intersection)

*Conclusion: truck escape ramp not warranted based on a manageable average downgrade, low truck volumes, and history of few truck-related crashes.*

### Sitting Bull Road (MRM 58) to Neck Yoke Road Area (MRM 62)

- Average grade of -5.0% over 4 miles
- Section is followed by 4 miles of uphill (over 5%) and level terrain
- 1 truck-related crash

#### *Conclusions:*

*Truck escape ramp not warranted based on length of downgrade, a four-mile section of uphill and level terrain following the downgrade, low combination commercial truck volumes, and history of few truck related crashes.*

*Due to large trucks being most susceptible to stopping distance issues on the downgrade and acceleration issues (from a stop condition) on the upgrade, it is recommended that stops on US16 be minimized. A traffic signal is discouraged at the US16/Neck Yoke Road intersection as it contributes to both issues.*

### Existing Truck Escape Ramp Near Echo Ridge Drive Intersection (MRM 67)

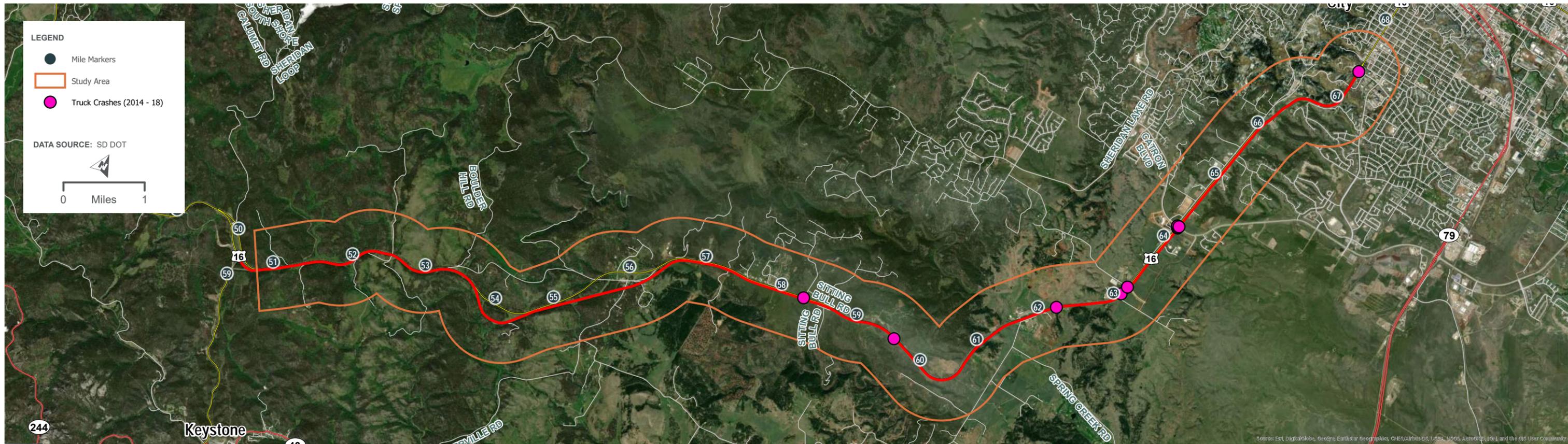
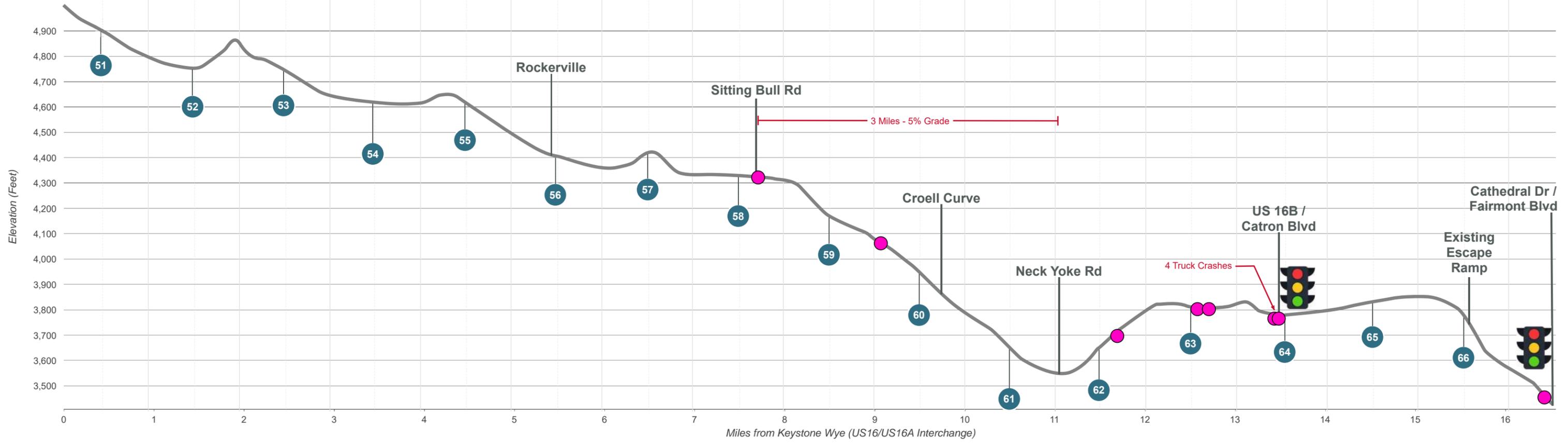
- US16 is not a designated truck route through this segment
  - Nearly 95% of all eastbound US16 trucks turn right at US16B (designated truck route)
- SDDOT Rapid City Area Maintenance staff has no knowledge or record of truck ramp ever being used
- Downgrade follows approximately 1.5 miles of a 1% uphill grade
- Average grade of -6.0% for approximately 1 mile
- 1 truck-related crash (intersection)

#### *Conclusions:*

*Truck escape ramp not warranted based on the sustained uphill grade prior to the escape ramp, US16 not being a designated truck route on this segment, low truck volumes, and history of few truck-related crashes. If a truck had a condition of overheated or failing brakes, the benefit of an escape ramp would have occurred before entering the urban area.*

*Removal of the existing truck escape ramp is recommended when costs to maintain exceed cost of removal.*

US16 Corridor Elevation Profile and Heavy Vehicle Conditions



US16 CORRIDOR ELEVATION PROFILE AND TRUCK CONDITIONS



## 4.7 US16 Corridor Reliability

US16 corridor reliability was evaluated in terms of travel time variability, speed, and potential sources of congestion, with the following findings and conclusions. A full year of historical INRIX traffic data (2018) was obtained for the analysis. Additional information can be found in the *Traffic and Reliability Analysis* memo in **Appendix E**.

### Analysis Findings (US16 Corridor - Keystone Wye to Cathedral Drive/Fairmont Boulevard)

- Travel time: typical weekday travel times exhibit wide variability throughout the corridor, ranging between 13 and 38 minutes
  - Average travel time is approximately 18 minutes
  - ‘Worst weekday each month’ for travel time is approximately 25 minutes
  - Trips with urgency for on-time (fixed) arrival must account for this variability
  - Travel time fluctuation is most visible in the urban area
  - US16/US16B/Catron Boulevard intersection delay is a notable contributor to travel time variability
- Conditions: snow events exhibit the greatest likelihood of increasing travel times (compared to rain and crash events)
- Urban area speed profile: wide range in speeds between 80<sup>th</sup> percentile and 20<sup>th</sup> percentile (approximately 10-15 mph) reflects a level of unreliability that can occur at any point throughout the day
- Rural area speed profile: tighter speed profile represents less impact to reliability due to recurring factors

### Conclusions

- *US16 segment: US16B/Catron Boulevard to Cathedral Drive/Fairmont Boulevard*
  - *Segment would benefit most from improved capacity at US16/US16B/Catron Boulevard intersection*
- *US16 overall corridor*
  - *Review demonstrates a growing need for trip planning information due to range in variability measures*
    - *Greatest impact to travel time due to snow conditions*
    - *Least impact to travel time due to crashes*
  - *ITS tools such as enhancements to traveler information and weather management likely to provide greatest benefit*

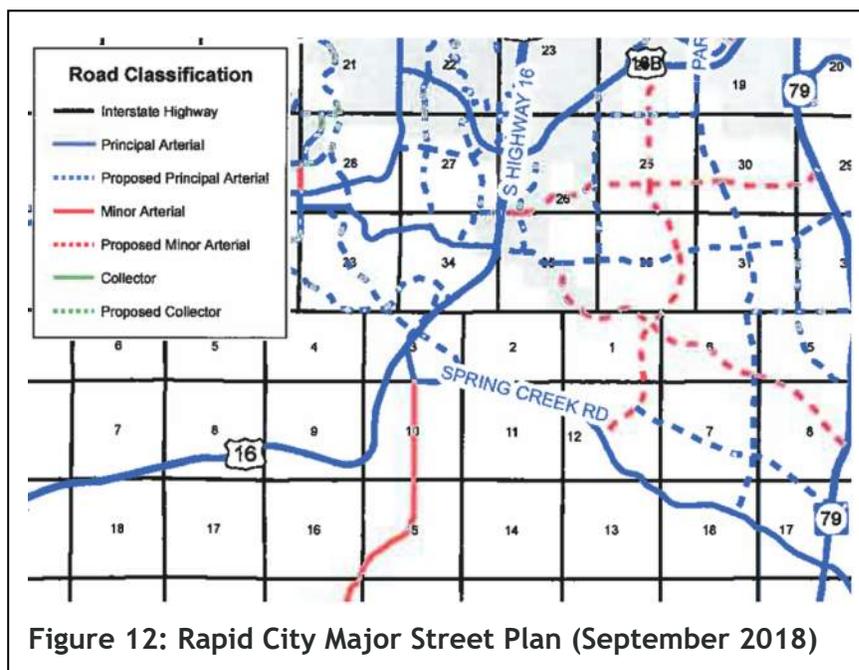
## 5.0 Future Land Use

Future land use plans were reviewed to aid in the development and assignment of traffic forecasts throughout the US16 study corridor. Several resources were available for reference, with a couple being developed and adopted as the US16 Corridor Study was being conducted.

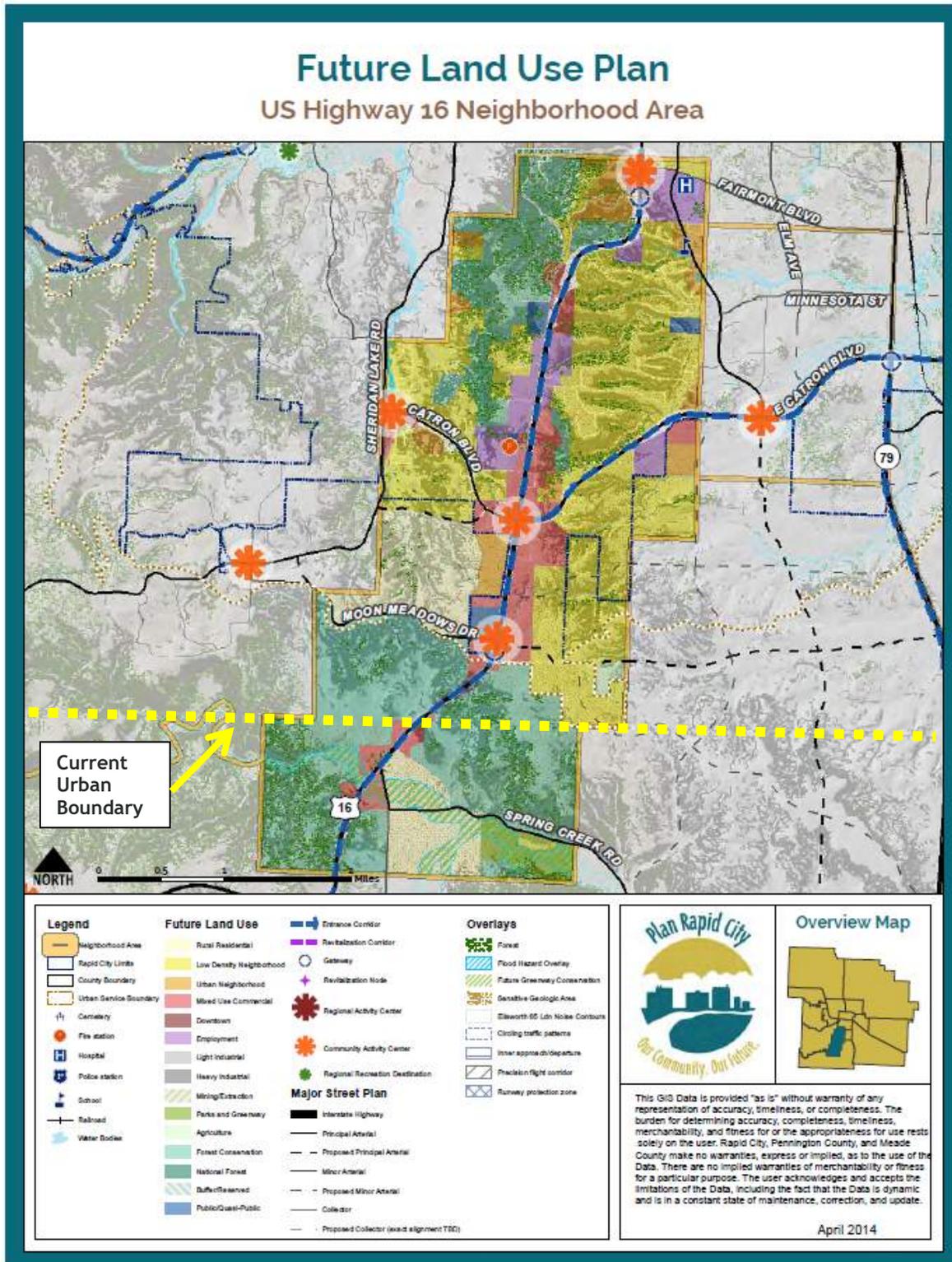
The *Rapid City Comprehensive Plan* (April 2014) includes a Future Land Use Plan to guide future zoning changes, development, infrastructure improvements, investment, and reinvestment within the Rapid City planning area. This future land use, shown in **Figure 13**, is identified within the City of Rapid City's 3-mile platting jurisdiction and looks out over the next 10 to 20 years. The Future Land Use Plan supports the City's Urban Services Boundary and Major Street Plan (see **Figure 12** inset), for 'a more compact, efficient, and interconnected pattern of development' (*Rapid City Comprehensive Plan* page 87).

The comprehensive plan subdivides the Rapid City planning area into 16 'neighborhoods' to provide focused information on specific areas. Two neighborhoods of interest to the US16 Corridor Study include the rapidly changing 'US Hwy 16' neighborhood, shown in **Figure 14**, and the more rural 'Spring Creek' neighborhood, shown in **Figure 15**. Much of the development areas in both neighborhoods are identified as mixed-use, reflecting a mix of residential, commercial, and other employment.

The 'US Hwy 16' neighborhood, particularly north of Moon Meadows Drive, encompasses one of the fastest growing areas in Rapid City and provides an extensive amount of developable land. The area north of the Urban Services Boundary (yellow dashed line added to **Figure 14**) is identified as the primary growth area within the neighborhood through Year 2040. The 'Spring Creek' neighborhood is much more rural, with most of the future land use identified as Forest Conservation with areas of National Forest.





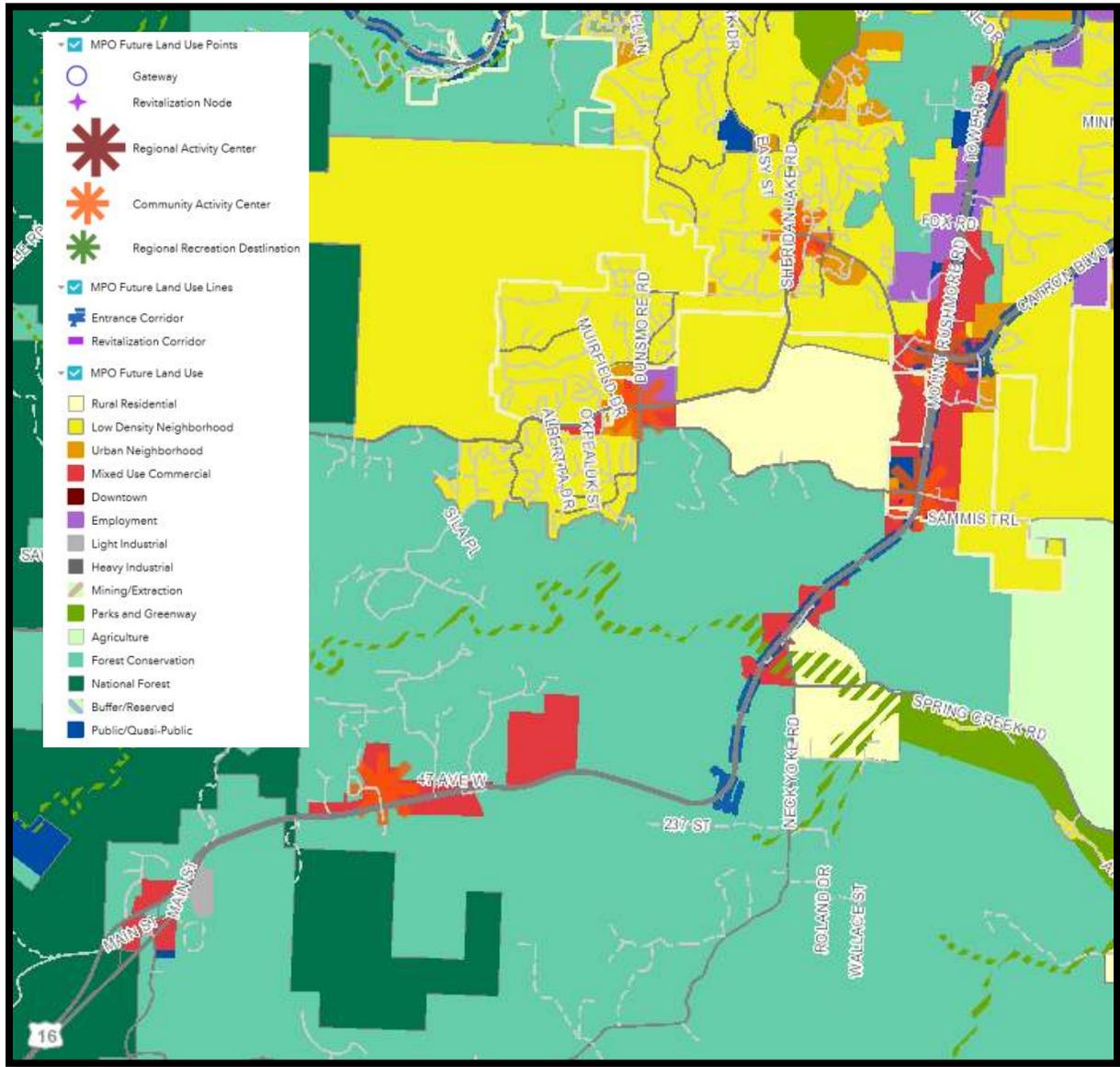


Source: Rapid City Comprehensive Plan, April 2014. Page 173.

Figure 14: Rapid City Comprehensive Plan - US Hwy 16 Neighborhood Area



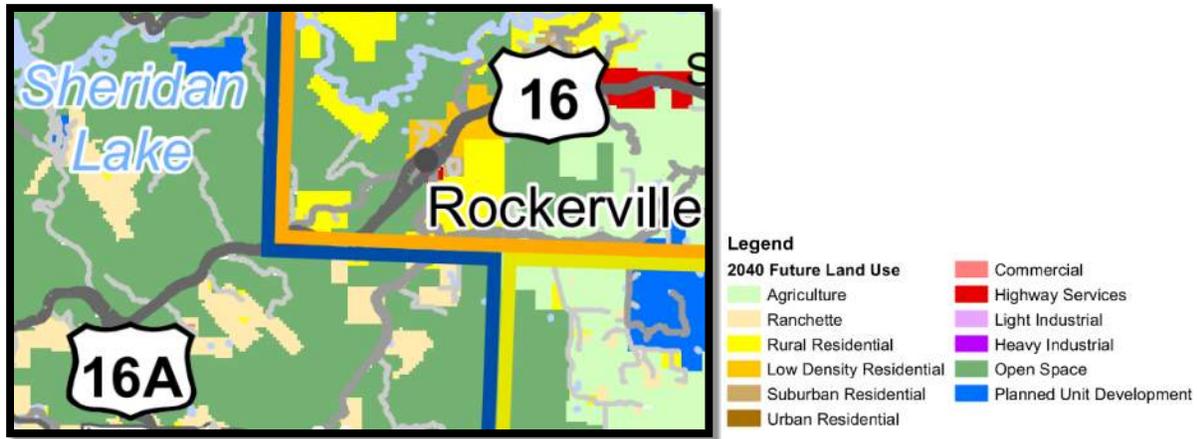
The current RCAMPO future land use map, shown in **Figure 16**, reflects the latest future land use within the RCAMPO planning area. It builds upon the *Rapid City Comprehensive Plan* future land use and is the basis for land use-based traffic forecasts within the RCAMPO Travel Demand Model (TDM).



Source: RCAMPO

**Figure 16: RCAMPO Future Land Use Map**

The *View to 2040 Pennington County Comprehensive Plan* provides land-use planning beyond the RCAMPO planning area. Along US16, much of the future land use is identified Open Space or low-density Ranchette and Rural Residential development as shown in **Figure 17**.



Source: View to 2040 Pennington County Comprehensive Plan, May 2020. Page 3-15.

**Figure 17: Pennington County Comprehensive Plan Future Land Use**

## 6.0 Traffic Forecasts

Traffic forecasts help assess future-year capacity and operational needs throughout the study area due to growth in traffic demand and/or changes in traffic patterns. For this study, forecast years include:

- Year 2026 - First Possible Year of Project Completion
- Year 2050 - Planning Horizon Year

The traffic forecast development process followed methodologies outlined in *NCHRP 765: Analytical Travel Forecasting Approaches for Project-Level Planning and Design*. The RCAMPO travel demand model (TDM) was the source of growth rates, based on the following model scenarios:

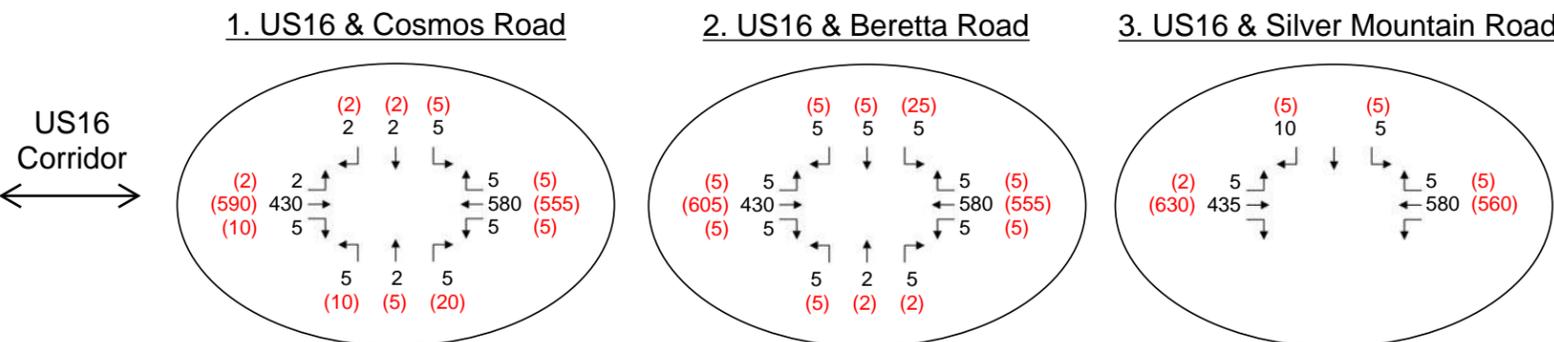
- 2013 - travel demand model base year
- 2040 - travel demand model planning horizon

Where there were gaps in the model's estimation of future development, development-generated traffic was assigned to the network based on an estimation of future development occurring within the planning horizon.

Year 2026 No Build condition traffic volumes were developed from a straight-line interpolation between the 2019 Existing conditions volume set and the 2050 No Build conditions volume set. Peak hour intersection turning movement volumes were smoothed and balanced throughout the study corridor for all volume sets.

Year 2026 and Year 2050 No Build condition traffic volumes are provided in **Figure 18** and **Figure 19**, respectively. These volumes are the basis for Build condition traffic volumes.

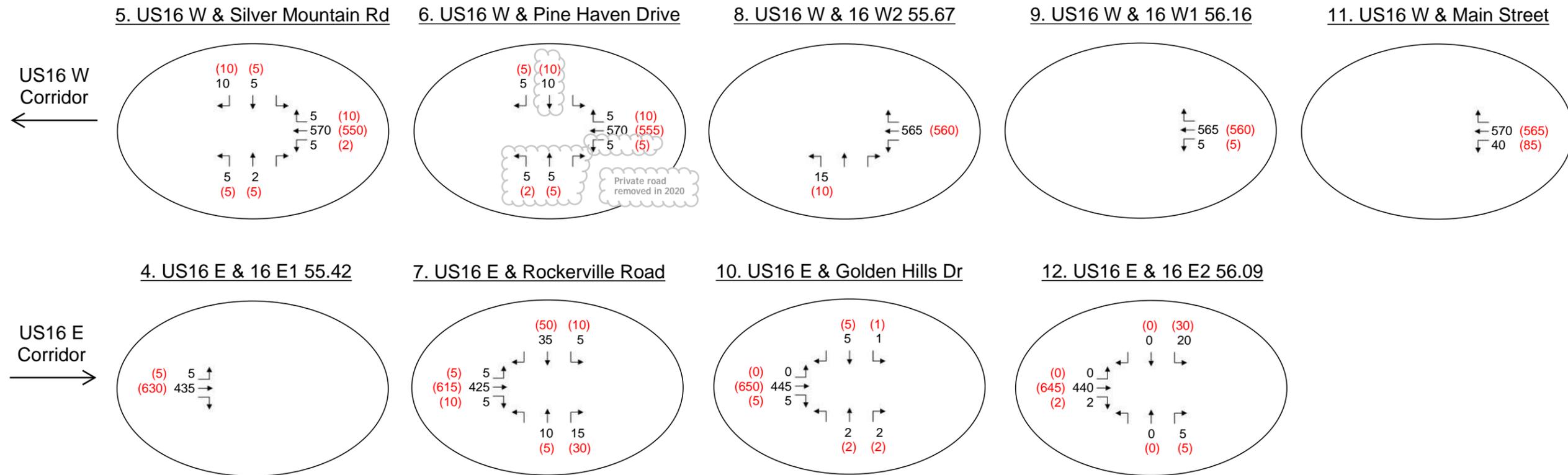
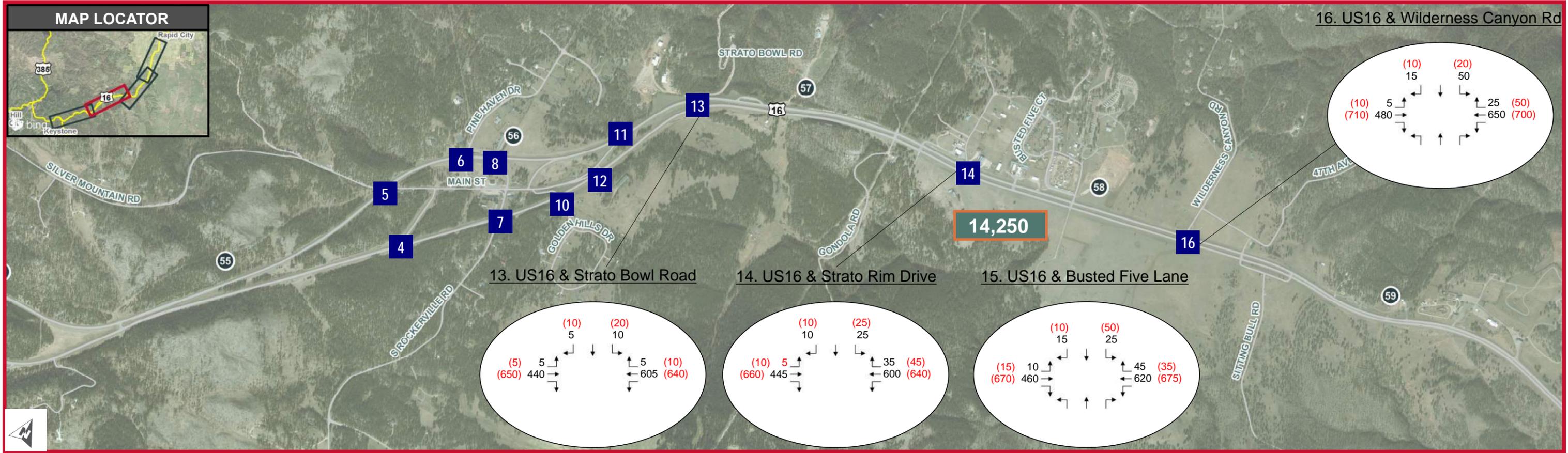
Additional information regarding the overall traffic forecasting process, a project-level review of the travel demand model, and considerations of previous studies completed to date in the area is provided in the *US16 Corridor Study Traffic Forecasts* technical memo provided in **Appendix F**.

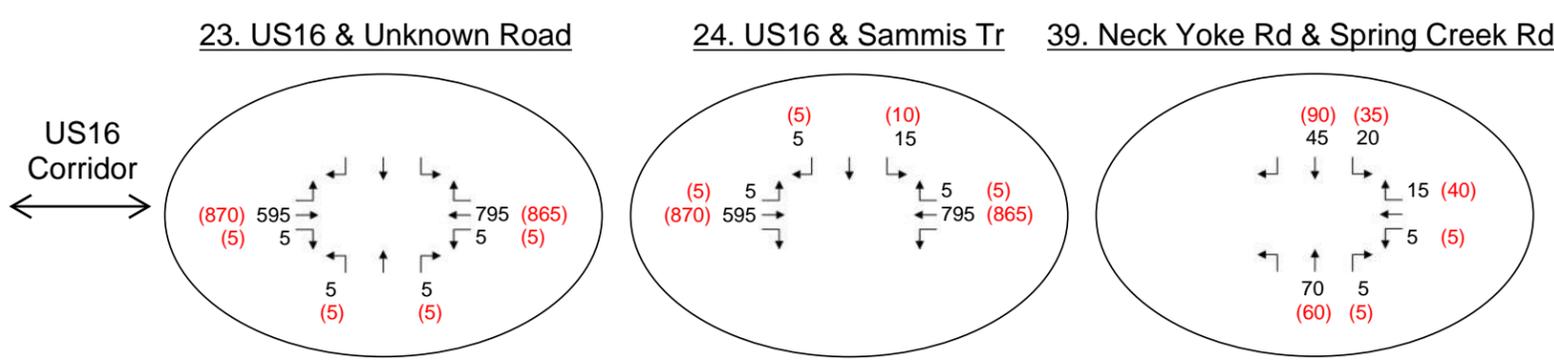
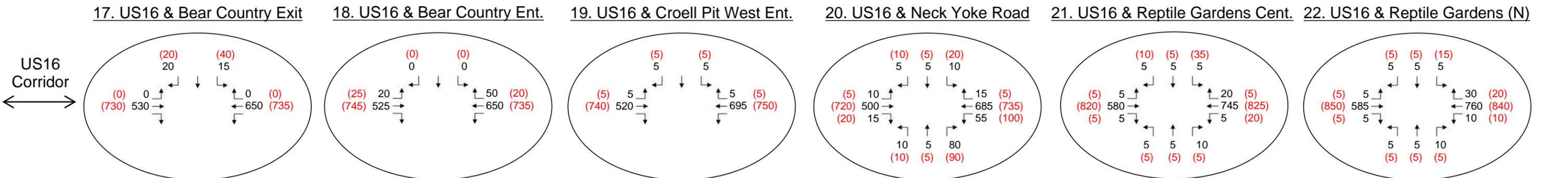


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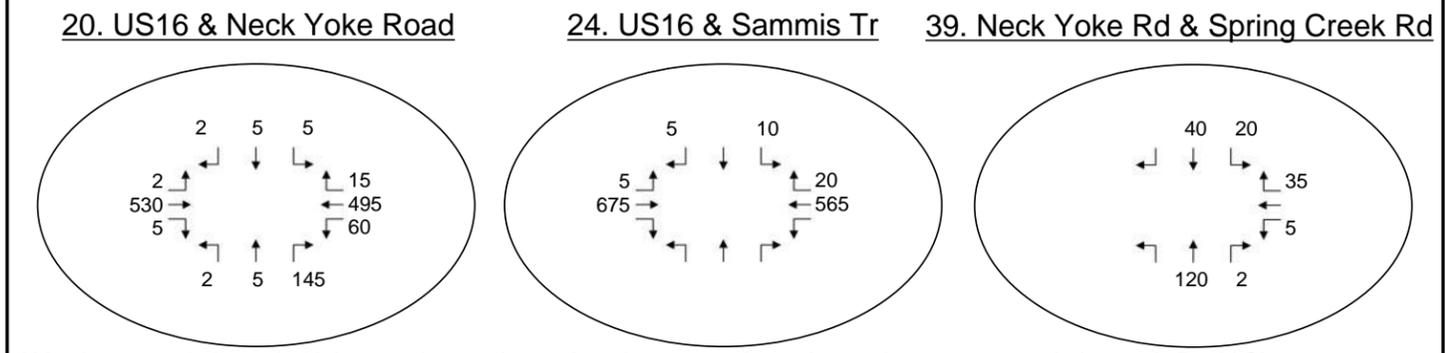
- Mileage Reference Marker (MRM)
- Study Intersection
- 2026 Daily Traffic Volumes\*
- AM (PM) 2026 Peak Hour Traffic Volumes\*

Notes:  
\* Volumes reflect June design season

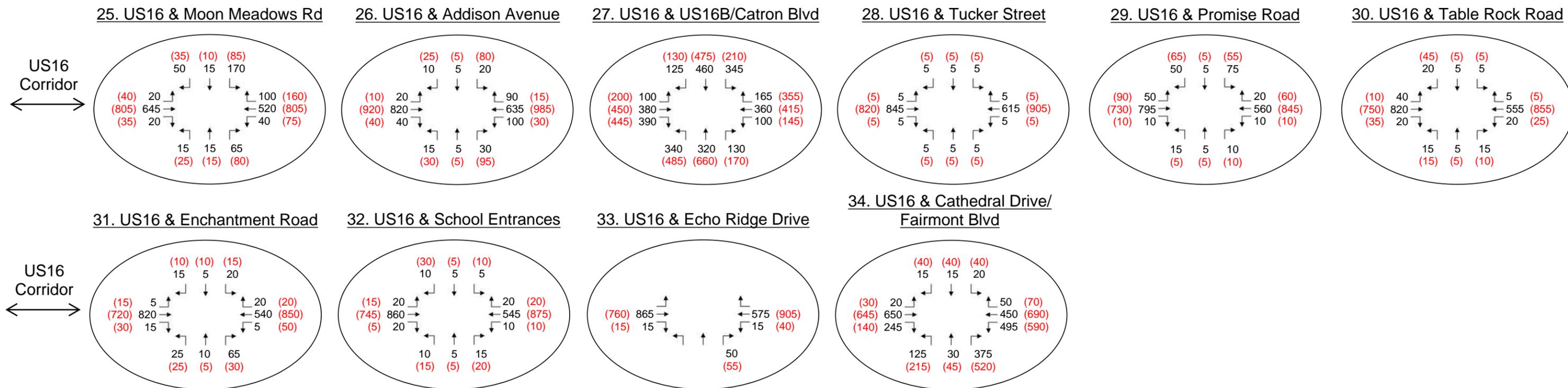
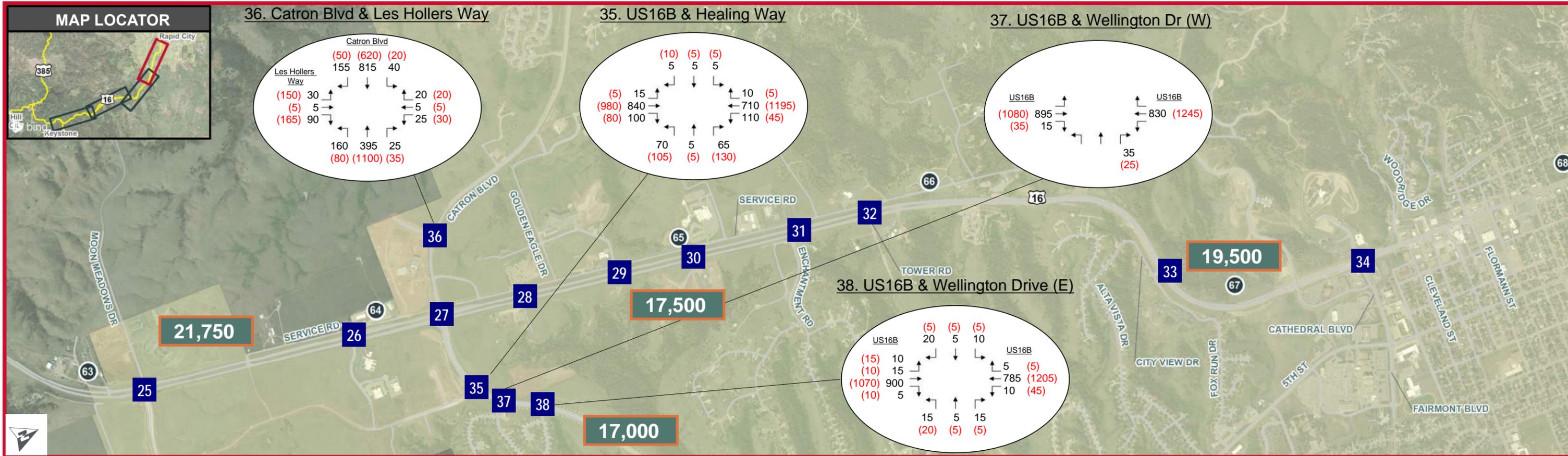


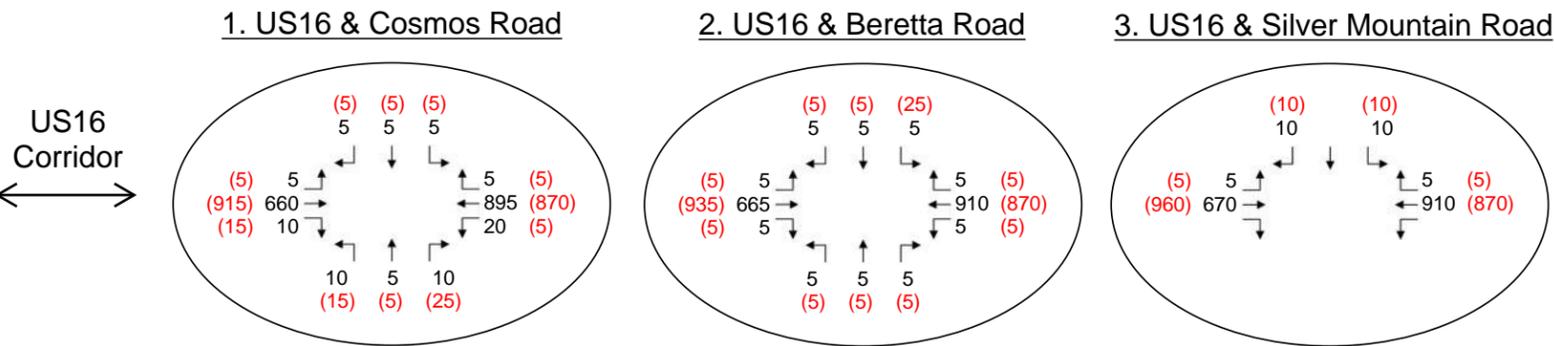
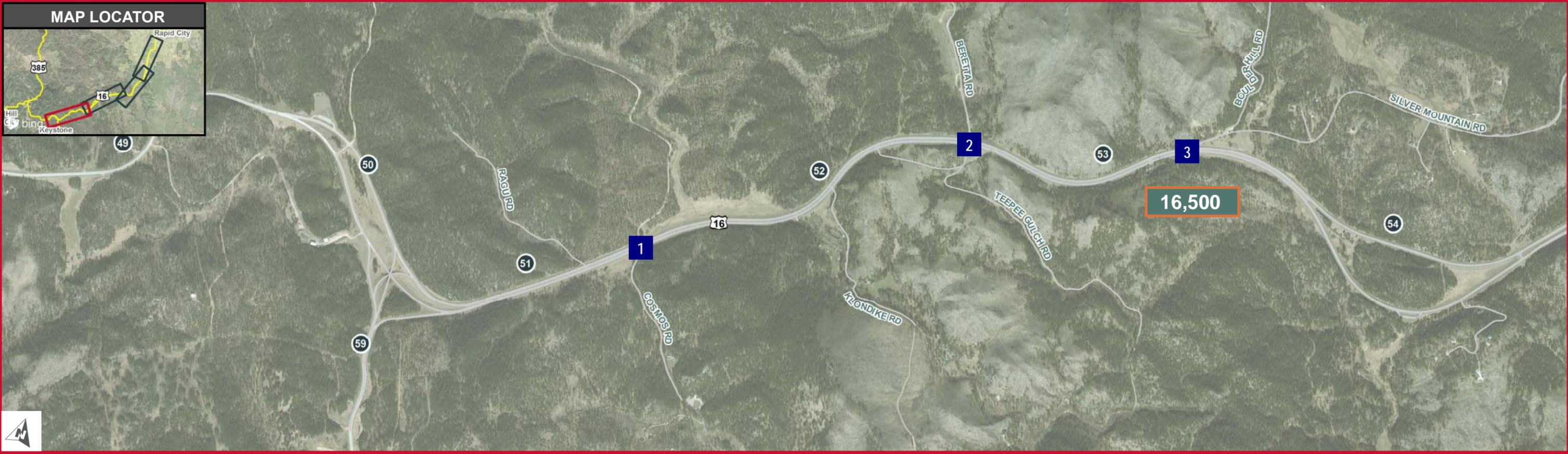


**AM - Early Morning Commute (Directional to Rapid City)**



AM volumes are balanced with intersections to the north and represent the early morning commute period towards Rapid City.





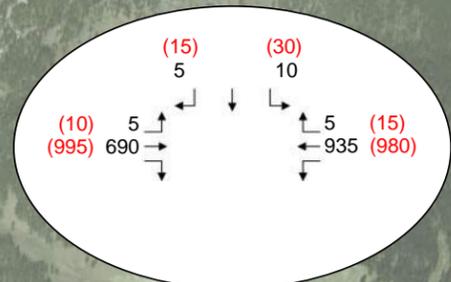
### Legend

- Mileage Reference Marker (MRM)
- Study Intersection
- 2050 Daily Traffic Volumes\*
- AM (PM) 2050 Peak Hour Traffic Volumes\*

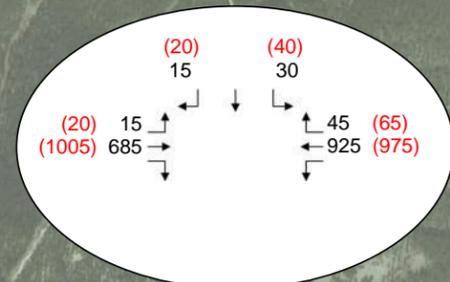
*Notes:*  
 \* Volumes reflect June design season  
 Stop-controlled intersections are two-way stop-control unless noted.



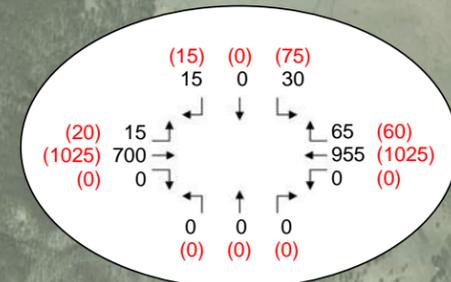
13. US16 & Strato Bowl Road



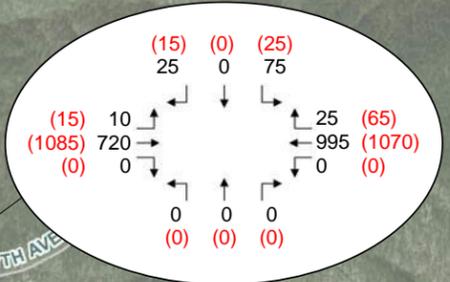
14. US16 & Strato Rim Drive



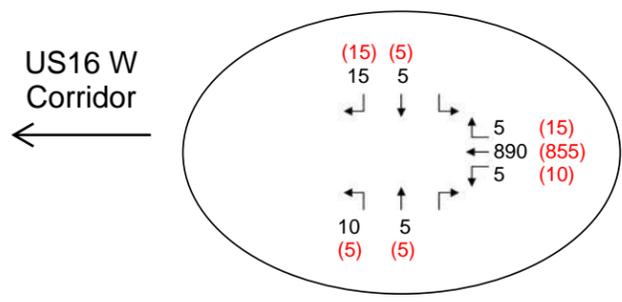
15. US16 & Busted Five Lane



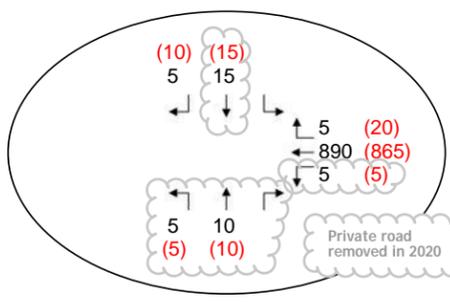
16. US16 & Wilderness Canyon Rd



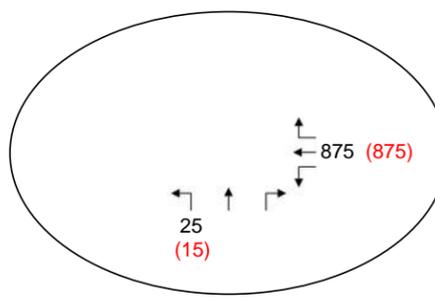
5. US16 W & Silver Mountain Rd



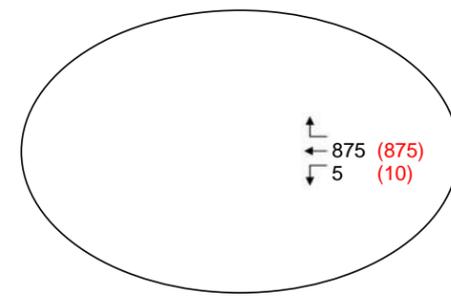
6. US16 W & Pine Haven Drive



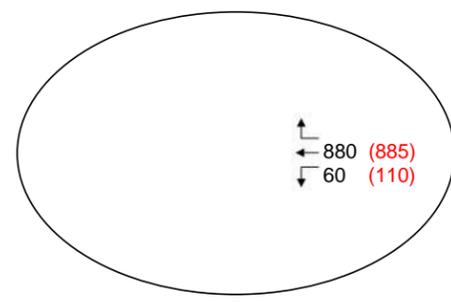
8. US16 W & 16 W2 55.67



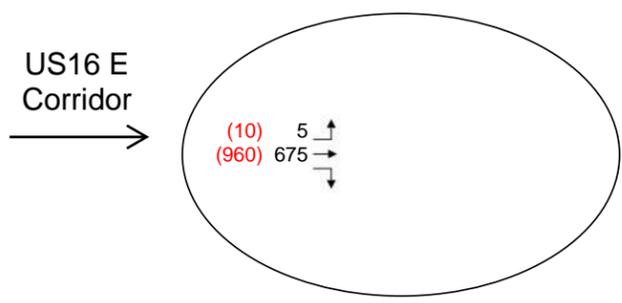
9. US16 W & 16 W1 56.16



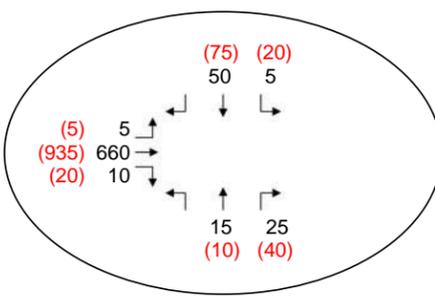
11. US16 W & Main Street



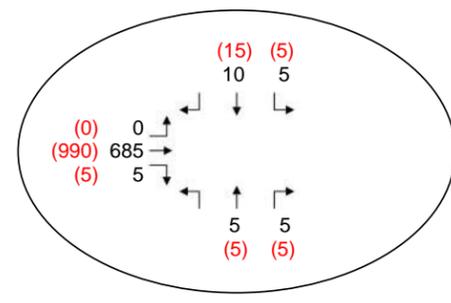
4. US16 E & 16 E1 55.42



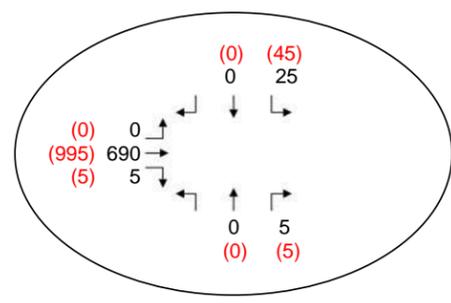
7. US16 E & Rockerville Road

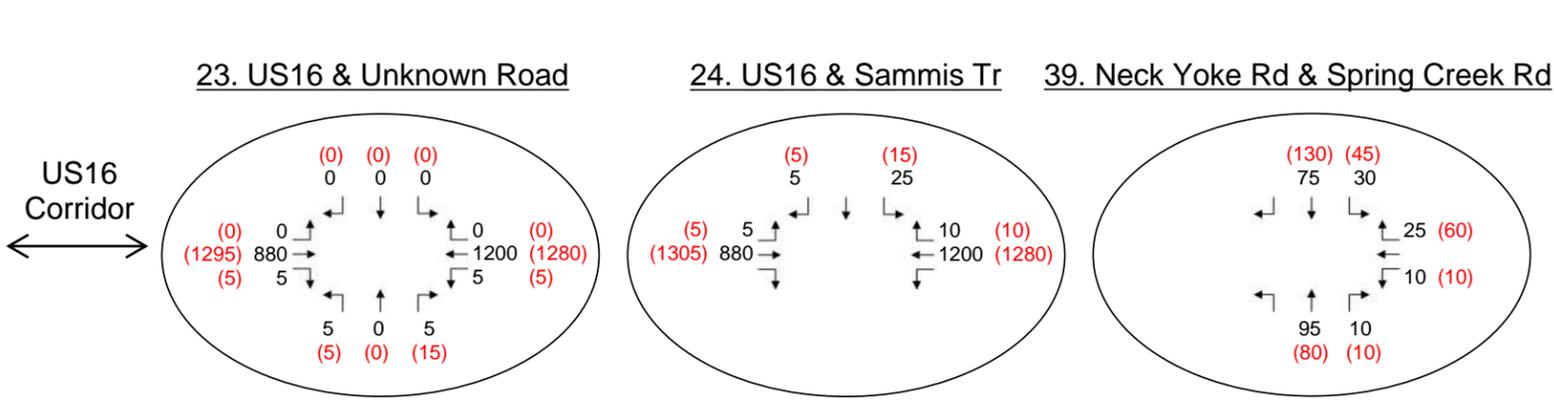
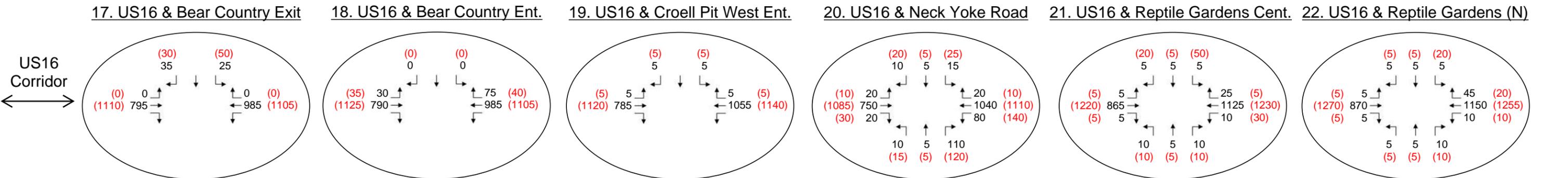


10. US16 E & Golden Hills Dr

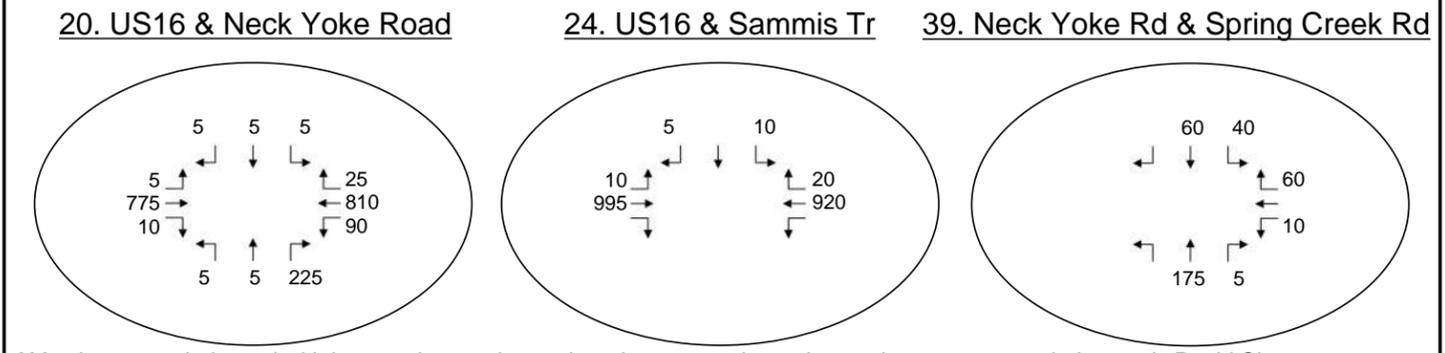


12. US16 E & 16 E2 56.09

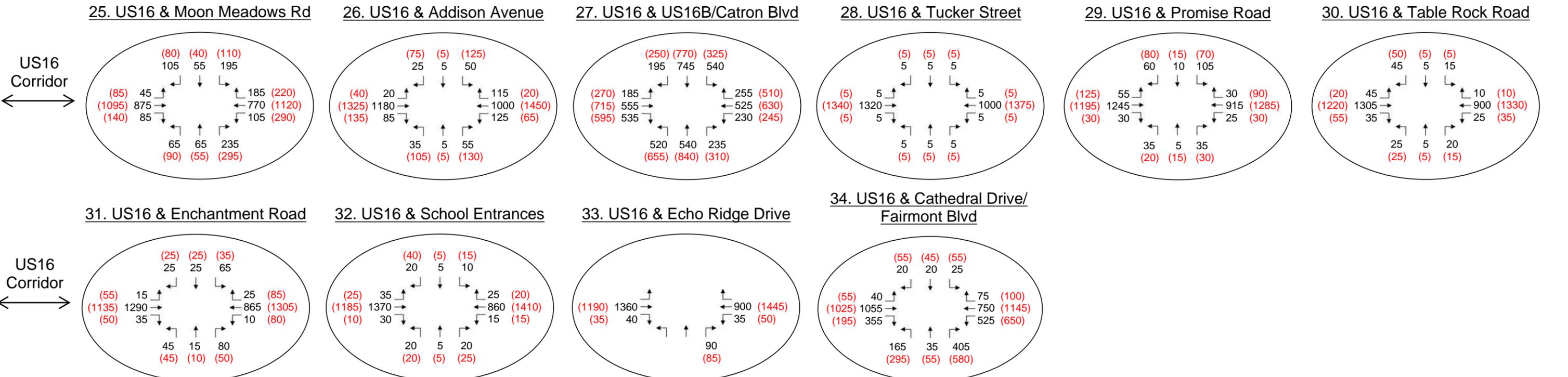
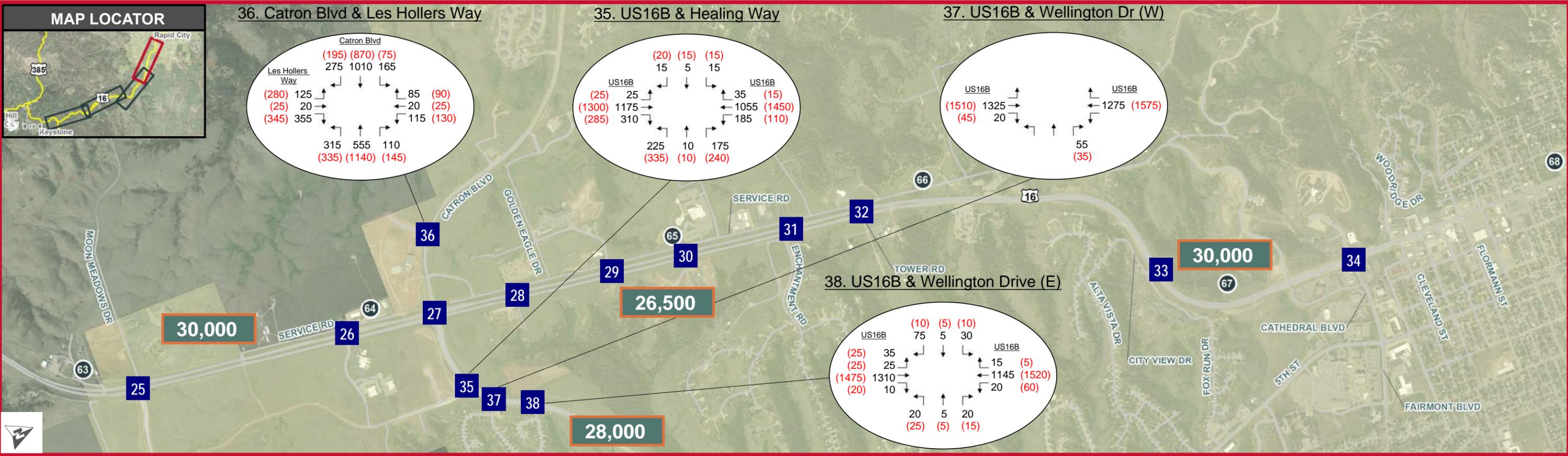




**AM - Early Morning Commute (Directional to Rapid City)**



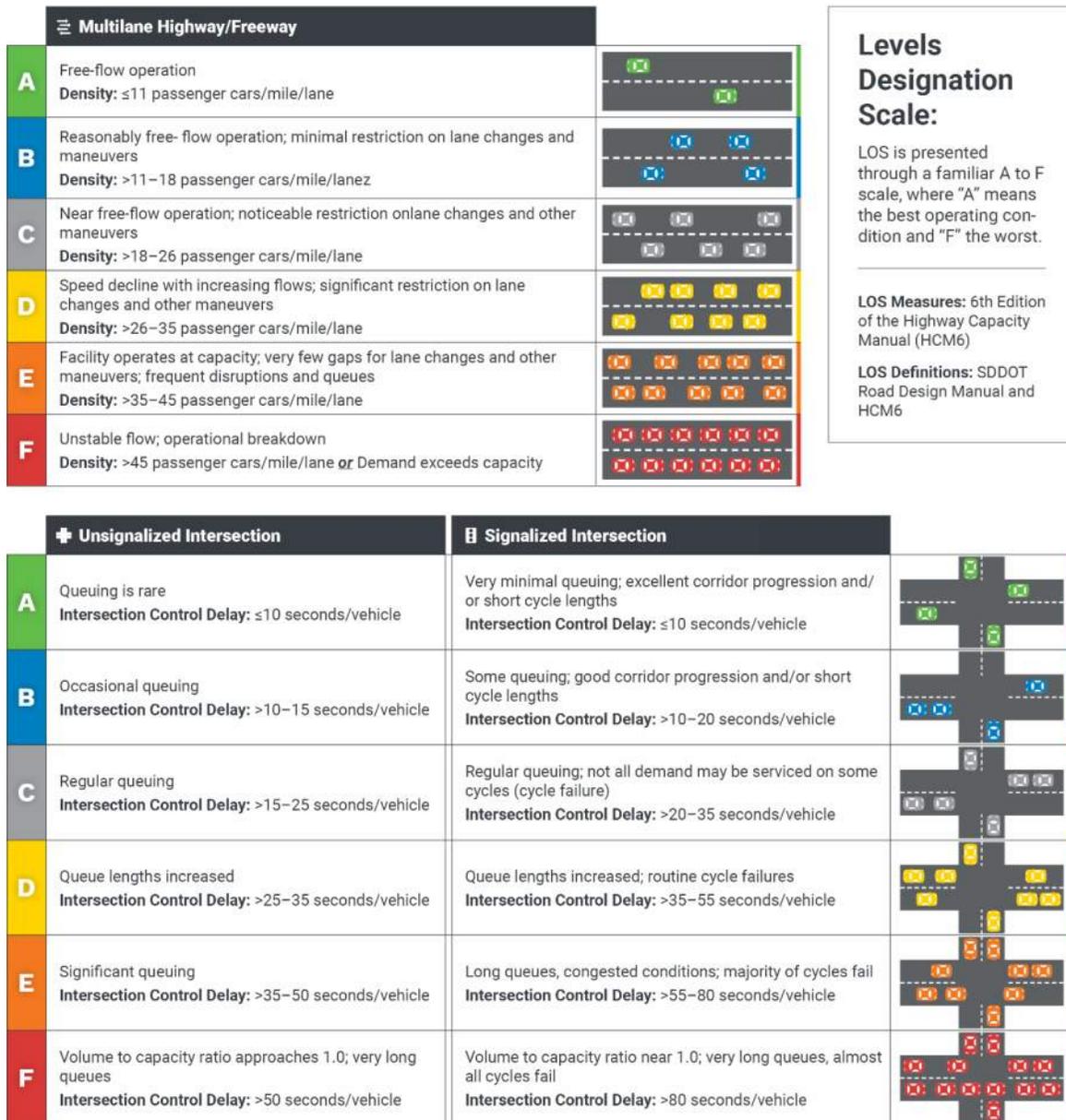
AM volumes are balanced with intersections to the north and represent the early morning commute period towards Rapid City.



## 7.0 Traffic Operations Analysis Methodology

### 7.1 Traffic Operations Analysis

Operational performance of highways and intersections is evaluated in terms of the quality of service, which describes how well a transportation facility operates from the traveler’s perspective. Quality of Service is usually measured with “Level of Service” (LOS), a letter grade like those used in school. A summary of LOS measures for different roadway facilities pertinent to this study are provided in **Figure 20**.



Note: Unsignalized intersection control delay shown in figure for overall (or weighted) intersection delay. Two-way stop-control delay (TWSC) is measured from the worst-case stop-controlled approach with the same average delay (seconds/vehicle) thresholds.

**Figure 20: Level of Service Descriptions**

Peak hour LOS was calculated for study area intersections and roadway segments using Highway Capacity Software (HCS), Version 7 and methodology described in the *6<sup>th</sup> Edition of the Highway Capacity Manual (HCM6)*. **Table 8** identifies primary and supporting (secondary) operational measures used in this study. LOS threshold tables specific to each measure is provided in **Appendix G**.

**Table 8: Level of Service Measures**

Roadway Feature	LOS Measure	Supporting Measures
Intersections	<ul style="list-style-type: none"> <li>Total (overall) intersection delay</li> </ul>	<ul style="list-style-type: none"> <li>95<sup>th</sup> percentile queues.</li> <li>TWSC intersections: worst-case stop-control delay</li> </ul>
Interchange ramp terminal intersections	<ul style="list-style-type: none"> <li>Signalized intersections: total (overall) intersection delay</li> <li>TWSC intersections: worst-case stop-control delay</li> <li>Overall interchange: experienced travel time (ETT)</li> </ul>	<ul style="list-style-type: none"> <li>95<sup>th</sup> percentile queues.</li> </ul>
Urban street segments	<ul style="list-style-type: none"> <li>Travel speed as a percentage of base free flow speed</li> </ul>	<ul style="list-style-type: none"> <li>Travel time</li> </ul>
Multilane highway segments	<ul style="list-style-type: none"> <li>Vehicle density</li> </ul>	
Freeway segments	<ul style="list-style-type: none"> <li>Vehicle density</li> </ul>	

Two-way stop-control delay (TWSC)

For the US16/US16B/Catron Boulevard intersection, Vissim microsimulation software was also used to provide a more holistic ‘proof of concept’ analysis of the intersection sub-area to further analyze the relationship between interchange/alternative intersection options and surrounding intersections. Vissim reports similar measures as those identified in **Table 8**, however, Vissim output is never compared to HCS output as the methods and assumptions to create these measures are different.

## 7.2 Level of Service Goals

Study LOS goals differ depending on whether the intersection or roadway segment is in an urban or rural area. Typically, intersections and roadway segments in the FHWA-designated urbanized area are analyzed with urban LOS goals while areas outside of the urbanized area are analyzed with rural LOS goals. The current urbanized boundary is located along the section line just north of the unknown road (between Neck Yoke Road and Moon Meadows Drive).

A review was conducted of the Neck Yoke Road area to determine whether an urban or rural LOS goal was more applicable within the study’s 2050 Planning Horizon. Based on terrain, challenges to utility extensions, and planned development density, the *Urban or Rural Classification Review* memo (**Appendix H**) recommended that the study continues to analyze US16 intersections corridor segments consistent with the current urban boundary.

The following minimum allowable LOS thresholds in **Table 9** have been established for this study.

**Table 9: Minimum Allowable Level of Service by Facility**

Facility Type	Minimum Allowable LOS		Notes
	Rural Area	Urban Area	
Signalized Intersections	LOS B	LOS C	Individual movements allowed to operate at LOS D in urban areas.
Two-Way Stop-Controlled Intersections	LOS B	LOS C	TWSC intersection LOS is based on weighted average intersection delay. The worst-cast stop-controlled approach delay and LOS may be lower than the minimum allowable LOS.
Freeway Segments and Multilane Highways	LOS B	LOS C	LOS B or better is desirable in urban areas.
Urban Street Segments	n/a	LOS C	Applies to urban signalized corridors.

### 7.3 Predictive Safety Analysis

A predictive safety analysis was completed for the No Build conditions and each Build condition corridor scenario using the HSM method to evaluate expected safety of proposed intersection and roadway modifications. As stated in the HSM, “*The predictive method provides a quantitative measure of expected crash frequency under both existing conditions and conditions which have not yet occurred. This allows proposed roadway conditions to be quantitatively assessed...*” (HSM, 2010 version).

FHWA’s Interactive Highway Safety Design Model (IHSDM) was the tool used to evaluate safety in the No Build and Build scenario conditions. Output includes the predicted average annual crash frequency over the analyzed timeframe (2026 - 2050). Crashes are categorized as fatal and injury crashes (F+I) and property damage only (PDO) crashes for both intersections and roadway segments.

## 8.0 Existing and Future No Build Conditions Traffic Operations

An existing and future No Build condition traffic analysis was conducted to aid in the identification of long-range traffic operational needs within the intersection. Locations that do not meet LOS goals outlined for this study area are noted in **Bold Orange** text in the table. Additional information for these analyses can be found in the following reports included in the Appendix:

- 2019 Existing Conditions Traffic Operations technical memo (Appendix I)
- 2026 No Build Conditions Traffic Operations technical memo (Appendix J)
- 2050 No Build Conditions Traffic Operations technical memo (Appendix K)

### 8.1 Intersections

The following tables present a summary of overall intersection operations for the Existing, 2026 No Build, and 2050 No Build conditions.

**Table 10: Intersection Operations - Rural Area Existing and Future No Build Conditions**

	Intersection	Intersection Control	Existing LOS AM / PM	2026 No Build LOS AM / PM	2050 No Build LOS AM / PM
US16	Unknown Road	TWSC	A / A	A / A	A* / A*
	Reptile Gardens (N)	TWSC	A / A	A* / A*	A* / <b>E</b>
	Reptile Gardens (C)	TWSC	A / A	A* / A*	B* / <b>E</b>
	Neck Yoke Road/ Reptile Gardens (S)	TWSC	A / A	A* / A*	<b>C / F</b>
	Croell Pit West/ Main Entrance	TWSC	A / A	A / A	A* / A*
	Bear Country Entrance	TWSC	A / A	A / A	A / A
	Bear Country Exit	TWSC	A / A	A / A*	A / B*
	Wilderness Canyon Road	TWSC	A / A	A / A	A* / A*
	Busted Five Lane	TWSC	A / A	A / A	A / A*
	Strato Rim Drive	TWSC	A / A	A / A	A / A
	Strato Bowl Road	TWSC	A / A	A / A	A / A
US16 EB	Golden Hills Drive	TWSC	A / A	A / A	A / A
	Rockerville Road	TWSC	A / A	A / A	A / A*
US16 WB	Pine Haven Drive	TWSC	A / A	A / A	A / A
	Silver Mountain Road/ Main Street	TWSC	A / A	A / A	A / A
US16	Beretta Road	TWSC	A / A	A / A	A* / A*
	Cosmos Road	TWSC	A / A	A / A	A* / A*
Neck Yoke	Spring Creek Road	TWSC	A / A	A / A	A / A

LOS reflects the overall intersection delay. **Bold Orange**: does not meet LOS goal.

\* Overall intersection meets LOS goal but at least one stop-controlled approach measures LOS E or F.

**Table 11: Intersection Operations - Urban Area Existing and Future No Build Conditions**

	Intersection	Intersection Control	Existing LOS AM / PM	2026 No Build LOS AM / PM	2050 No Build LOS AM / PM
US16	Cathedral Drive/ Fairmont Blvd	Signal	C / C	C / C	C / C
	Echo Ridge Drive	TWSC	A / A	A / A	A / A
	Tower Road (south)	TWSC	A / A	A / A	A* / A*
	Enchantment Road	TWSC	A / A	A / A	B* / C*
	Tablerock Road	TWSC	A / A	A / A	A* / A*
	Promise Road	TWSC	A / A	A / A*	C* / <u>F</u>
	Tucker Street	TWSC	A / A	A / A	A / A
	US16B/Catron Blvd	Signal	<u>D / D</u>	<u>D / E</u>	<u>E / F</u>
	Addison Avenue	TWSC	A / A	A / A*	<u>D / F</u>
	Moon Meadows Drive	TWSC	A / A	A* / A*	<u>F / F</u>
Fort Hays	TWSC	A / A	A / A	A / A	
US16B / Catron Blvd	Les Hollers Way	Signal	A / A	B / B	<u>E / D</u>
	Healing Way	Signal	A / B	B / B	C / C
	Wellington Drive (W)	TWSC	A / A	A / A	A / A
	Wellington Drive (E)	TWSC	A / A*	A* / A*	<u>F / F</u>

LOS reflects the overall intersection delay. **Bold Orange**: does not meet LOS goal.

\* Overall intersection meets LOS goal but at least one stop-controlled approach measures LOS E or F.

## 8.2 Highway Segments

The US16 corridor was segmented in accordance with HCM6 methodology, with segment break points typically reflective of change in grade. Each segment was analyzed based on ‘level’ or ‘rolling’ terrain or a specific grade for segments where long, steep grades were present (typically for segments longer than 0.25 miles and with grades of 3 percent or greater). Summaries of highway segment operations for the Existing, 2026 No Build, and 2050 No Build conditions are provided in the following tables.

**Table 12: US16 Multilane Highway Operations - Rural Area Existing Conditions**

Seg. #	Mainline	Approximate Limits		Length (mi)*	Analysis Grade (%)	AM LOS		PM LOS	
		From	To			EB	WB	EB	WB
1 - 2	US16	Project Beginning MRM 50.75	Cosmos Road	0.5	4.5	A	A	A	A
3	US16	Cosmos Road	MRM 52.00	0.6	Rolling	A	A	A	A
4	US16	MRM 52.00	MRM 52.50	0.5	4.0	A	A	A	A
5	US16	MRM 52.50	MRM 52.75	0.25	3.9	A	A	A	A
6	US16	MRM 52.75	MRM 53.00	0.2	Level	A	A	A	A
7	US16	MRM 53.00	Silver Mountain Rd	0.3	5.0	A	A	A	A
8	US16	Silver Mountain Rd	MRM 54.00 (EB) / MRM 53.75 (WB)	0.7 / 0.6	3.1	A	A	A	A
9	US16 (EB)	MRM 54.00	MRM 54.25	0.54	Rolling	A	-	A	-
10	US16 (WB)	MRM 53.75	MRM 54.25	0.4	-3.5	-	A	-	A
11	US16 (EB)	MRM 54.00	MRM 54.25	0.25	4.8	-	A	-	A
12	US16	MRM 54.25	MRM 54.50	0.3	6.0	A	A	A	A
13	US16	MRM 54.50	MRM 55.00	0.3	6.0	A	A	A	A
14	US16 (EB)	MRM 55.00	MRM 55.25	0.25	Level	A	-	A	-
15	US16 (WB)	MRM 55.00	MRM 55.25	0.25	4.0	-	A	-	A
16	US16	MRM 55.25	MRM 55.75 (EB) / Silver Mtn Rd (WB)	0.4 / 0.3	6.0	A	A	A	A
17	US16 (WB)	Silver Mountain Rd	Pine Haven Dr	0.2	3.2	-	A	-	A
18	US16	MRM 55.75 (EB) / Pine Haven Rd (WB)	Golden Hills Dr (EB) / MRM 56.00 (WB)	0.3 / 0.2	Level	A	A	A	A
19	US16 (EB)	Golden Hills Dr	MRM 56.50	0.3	-5.7	A	-	A	-
20	US16 (WB)	MRM 56.00	Strato Bowl Rd	0.5	3.0	-	A	-	A
21	US16	MRM 56.50 (EB) / Strato Bowl Rd (WB)	MRM 57.00	0.5 / 0.3	Rolling	A	A	A	A
22	US16	MRM 57.00	MRM 57.25	0.25	4.6	A	A	A	A
23	US16	MRM 57.25	MRM 57.50	0.25	6.0	A	A	A	A
24	US16	MRM 57.50	MRM 58.75	1.2	Level	A	A	A	A
25	US16	MRM 58.75	MRM 59.25	0.7	6.0	A	A	A	A
26	US16	MRM 59.25	Croell Pit West Entrance	0.35	Level	A	A	A	A
27 - 31	US16	Croell Pit West Entrance	MRM 61.50	1.8	6.0	A	A	A	A
32	US16	MRM 61.50	MRM 62.00	0.4	Level	A	A	A	A
33 - 34	US16	MRM 62.00	MRM 63.00	1.0	6.5	A	A	A	A

\* Where multiple grades shown, first length reflects EB direction and second length reflects WB direction. Limits and length are approximate and thus may not align due to rounding and approximation of MRM locations. **Orange**: does not meet LOS goal.

**Table 13: US16 Multilane Highway Operations - Rural Area 2026 No Build Conditions**

Seg. #	Mainline	Approximate Limits		Length (mi)*	Analysis Grade (%)	AM LOS		PM LOS	
		From	To			EB	WB	EB	WB
1 - 2	US16	Project Beginning MRM 50.75	Cosmos Road	0.5	4.5	A	A	A	A
3	US16	Cosmos Road	MRM 52.00	0.6	Rolling	A	A	A	A
4	US16	MRM 52.00	MRM 52.50	0.5	4.0	A	A	A	A
5	US16	MRM 52.50	MRM 52.75	0.25	3.9	A	A	A	A
6	US16	MRM 52.75	MRM 53.00	0.2	Level	A	A	A	A
7	US16	MRM 53.00	Silver Mountain Rd	0.3	5.0	A	A	A	A
8	US16	Silver Mountain Rd	MRM 54.00 (EB) / MRM 53.75 (WB)	0.7 / 0.6	3.1	A	A	A	A
9	US16 (EB)	MRM 54.00	MRM 54.25	0.54	Rolling	A	-	A	-
10	US16 (WB)	MRM 53.75	MRM 54.25	0.4	-3.5	-	A	-	A
11	US16 (EB)	MRM 54.00	MRM 54.25	0.25	4.8	-	A	-	A
12	US16	MRM 54.25	MRM 54.50	0.3	6.0	A	A	A	A
13	US16	MRM 54.50	MRM 55.00	0.3	6.0	A	A	A	A
14	US16 (EB)	MRM 55.00	MRM 55.25	0.25	Level	A	-	A	-
15	US16 (WB)	MRM 55.00	MRM 55.25	0.25	4.0	-	A	-	A
16	US16	MRM 55.25	MRM 55.75 (EB) / Silver Mtn Rd (WB)	0.4 / 0.3	6.0	A	A	A	A
17	US16 (WB)	Silver Mountain Rd	Pine Haven Dr	0.2	3.2	-	A	-	A
18	US16	MRM 55.75 (EB) / Pine Haven Rd (WB)	Golden Hills Dr (EB) / MRM 56.00 (WB)	0.3 / 0.2	Level	A	A	A	A
19	US16 (EB)	Golden Hills Dr	MRM 56.50	0.3	-5.7	A	-	A	-
20	US16 (WB)	MRM 56.00	Strato Bowl Rd	0.5	3.0	-	A	-	A
21	US16	MRM 56.50 (EB) / Strato Bowl Rd (WB)	MRM 57.00	0.5 / 0.3	Rolling	A	A	A	A
22	US16	MRM 57.00	MRM 57.25	0.25	4.6	A	A	A	A
23	US16	MRM 57.25	MRM 57.50	0.25	6.0	A	A	A	A
24	US16	MRM 57.50	MRM 58.75	1.2	Level	A	A	A	A
25	US16	MRM 58.75	MRM 59.25	0.7	6.0	A	A	A	A
26	US16	MRM 59.25	Croell Pit West Entrance	0.35	Level	A	A	A	A
27 - 31	US16	Croell Pit West Entrance	MRM 61.50	1.8	6.0	A	A	A	A
32	US16	MRM 61.50	MRM 62.00	0.4	Level	A	A	A	A
33 - 34	US16	MRM 62.00	MRM 63.00	1.0	6.5	A	A	A	A

\* Where multiple grades shown, first length reflects EB direction and second length reflects WB direction. Limits and length are approximate and thus may not align due to rounding and approximation of MRM locations. **Orange**: does not meet LOS goal.

**Table 14: US16 Multilane Highway Operations - Rural Area 2050 No Build Conditions**

Seg. #	Mainline	Approximate Limits		Length (mi)*	Analysis Grade (%)	AM LOS		PM LOS	
		From	To			EB	WB	EB	WB
1 - 2	US16	Project Beginning MRM 50.75	Cosmos Road	0.5	4.5	A	A	A	A
3	US16	Cosmos Road	MRM 52.00	0.6	Rolling	A	B	B	A
4	US16	MRM 52.00	MRM 52.50	0.5	4.0	A	A	B	A
5	US16	MRM 52.50	MRM 52.75	0.25	3.9	A	A	A	A
6	US16	MRM 52.75	MRM 53.00	0.2	Level	A	A	A	A
7	US16	MRM 53.00	Silver Mountain Rd	0.3	5.0	A	A	A	A
8	US16	Silver Mountain Rd	MRM 54.00 (EB) / MRM 53.75 (WB)	0.7 / 0.6	3.1	A	A	A	A
9	US16 (EB)	MRM 54.00	MRM 54.25	0.54	Rolling	A	-	B	-
10	US16 (WB)	MRM 53.75	MRM 54.25	0.4	-3.5	-	A	-	A
11	US16 (EB)	MRM 54.00	MRM 54.25	0.25	4.8	-	A	-	A
12	US16	MRM 54.25	MRM 54.50	0.3	6.0	A	A	B	A
13	US16	MRM 54.50	MRM 55.00	0.3	6.0	A	A	A	A
14	US16 (EB)	MRM 55.00	MRM 55.25	0.25	Level	A	-	A	-
15	US16 (WB)	MRM 55.00	MRM 55.25	0.25	4.0	-	A	-	A
16	US16	MRM 55.25	MRM 55.75 (EB) / Silver Mtn Rd (WB)	0.4 / 0.3	6.0	A	A	A	A
17	US16 (WB)	Silver Mountain Rd	Pine Haven Dr	0.2	3.2	-	A	-	A
18	US16	MRM 55.75 (EB) / Pine Haven Rd (WB)	Golden Hills Dr (EB) / MRM 56.00 (WB)	0.3 / 0.2	Level	A	A	A	A
19	US16 (EB)	Golden Hills Dr	MRM 56.50	0.3	-5.7	A	-	A	-
20	US16 (WB)	MRM 56.00	Strato Bowl Rd	0.5	3.0	-	A	-	B
21	US16	MRM 56.50 (EB) / Strato Bowl Rd (WB)	MRM 57.00	0.5 / 0.3	Rolling	A	B	B	A
22	US16	MRM 57.00	MRM 57.25	0.25	4.6	A	A	B	B
23	US16	MRM 57.25	MRM 57.50	0.25	6.0	A	B	B	B
24	US16	MRM 57.50	MRM 58.75	1.2	Level	A	B	B	B
25	US16	MRM 58.75	MRM 59.25	0.7	6.0	A	B	B	B
26	US16	MRM 59.25	Croell Pit West Entrance	0.35	Level	A	B	B	B
27 - 31	US16	Croell Pit West Entrance	MRM 61.50	1.8	6.0	A	B	B	B
32	US16	MRM 61.50	MRM 62.00	0.4	Level	A	B	B	B
33 - 34	US16	MRM 62.00	MRM 63.00	1.0	6.5	A	B	B	B

\* Where multiple grades shown, first length reflects EB direction and second length reflects WB direction. Limits and length are approximate and thus may not align due to rounding and approximation of MRM locations. **Orange**: does not meet LOS goal.

**Table 15: US16 Multilane Highway Operations - Urban Area Existing Conditions**

Seg. #	Mainline	Approximate Limits		Approx. Length (miles)	Analysis Grade (%)	AM LOS		PM LOS	
		From	To			NB	SB	NB	SB
35	US16	MRM 63.00	Addison Ave	0.8	Rolling	A	A	A	A
36	US16	Addison Ave	US16B/ Catron Blvd	0.3	5.2	A	A	A	A
37	US16	US16B/ Catron Blvd	MRM 66.00	1.5	Rolling	A	A	A	A
38 - 39	US16	MRM 66.00	Cathedral Dr/ Fairmont Blvd	1.4	5.9	A	A	A	A

Limits and length are approximate and thus may not align due to rounding and approximation of MRM locations. **Bold Orange**: does not meet LOS goal.

**Table 16: US16 Multilane Highway Operations - Urban Area 2026 No Build Conditions**

Seg. #	Mainline	Approximate Limits		Approx. Length (miles)	Analysis Grade (%)	AM LOS		PM LOS	
		From	To			NB	SB	NB	SB
35	US16	MRM 63.00	Addison Ave	0.8	Rolling	A	A	A	A
36	US16	Addison Ave	US16B/ Catron Blvd	0.3	5.2	A	A	B	A
37	US16	US16B/ Catron Blvd	MRM 66.00	1.5	Rolling	A	A	A	A
38 - 39	US16	MRM 66.00	Cathedral Dr/ Fairmont Blvd	1.4	5.9	A	A	A	B

Limits and length are approximate and thus may not align due to rounding and approximation of MRM locations. **Bold Orange**: does not meet LOS goal.

**Table 17: US16 Multilane Highway Operations - Urban Area 2050 No Build Conditions**

Seg. #	Mainline	Approximate Limits		Approx. Length (miles)	Analysis Grade (%)	AM LOS		PM LOS	
		From	To			NB	SB	NB	SB
35	US16	MRM 63.00	Addison Ave	0.8	Rolling	B	B	B	B
36	US16	Addison Ave	US16B/ Catron Blvd	0.3	5.2	B	A	B	B
37	US16	US16B/ Catron Blvd	MRM 66.00	1.5	Rolling	B	A	B	B
38 - 39	US16	MRM 66.00	Cathedral Dr/ Fairmont Blvd	1.4	5.9	B	B	B	C

Limits and length are approximate and thus may not align due to rounding and approximation of MRM locations. **Bold Orange**: does not meet LOS goal.

**Table 18: Rockerville Area Ramp Operations - Existing and Future No Build Conditions**

Merge / Diverge Location	Segment Type	Existing LOS AM / PM	2026 No Build LOS AM / PM	2050 No Build LOS AM / PM
US16 E & 16 E1 55.42 <i>Off-ramp to Rockerville</i>	Diverge	A / A	A / A	A / B
US16 W & 16 W2 55.67 <i>On-ramp to Rockerville</i>	Merge	A / A	A / A	B / B
US16 W & WB 55.70 / Main Street <i>Off-ramp to Rockerville</i>	Diverge	A / A	A / A	B / B
US16 E & 16 E2 56.09 <i>On-ramp to Rockerville</i>	Merge	A / A	A / A	A / B
US16 W & 16 W1 56.15 <i>Off-ramp to Rockerville</i>	Diverge	A / A	A / A	B / B

### 8.3 Planning-Level Unsignalized Intersection Turn Lane Warrants

Future-year peak hour traffic volumes were reviewed to identify planning-level timeframes for if/when turn lanes may be warranted at unsignalized intersections. Methodology for this review followed the vehicular volume criterion outlined in Chapter 15 of the *SDDOT Road Design Manual*. This review does not necessitate installation of a new turn lane or removal of an existing turn lane as there are additional criterion and considerations that ultimately factor into the decision.

The following tables identify turn lanes that may be warranted within the 2050 Planning Horizon as well as a planning-level year of need to help guide timelines for future improvements. Turn lanes shown to be warranted by year 2026, representing a potential short-term need, are highlighted in green. Additional information on this review is provided in **Appendix L**.

**Table 19: Unsignalized Intersection Turn Lane Volume Warrants - Urban Area**

US16 Intersection	Posted Speed Limit	Eastbound		Westbound	
		Left Turn	Right Turn	Left Turn	Right Turn
Echo Ridge Drive	50	-	Existing	Existing	-
Tower Road (south)	60	Existing	<u>Meets Criterion</u>	Existing	Existing
Enchantment Road	60	Existing	<u>Meets Criterion</u>	Existing	<u>Meets Criterion</u>
Tablerock Road	60	Existing	<u>Meets Criterion</u>	Existing	Does Not Meet
Promise Road	60	Existing	<u>Meets Criterion</u>	<u>Meets Criterion</u>	<u>Meets Criterion</u>
Tucker Street	60	**	Does Not Meet	**	Does Not Meet
Addison Avenue	60	<u>Meets Criterion</u>	Existing	Existing	<u>Meets Criterion</u>
Moon Meadows Drive	60	Existing	Existing	Existing	Existing
Wellington Drive (W)	45	-	<u>Meets Criterion</u>	-	-
Wellington Drive (E)	45	Existing	<u>Meets Criterion</u>	Existing	Does Not Meet

**Orange Bold** text identifies warrant met by Year 2050.

Green shading identifies warrant by Year 2026.

\*\* Volume warrant not met, but volumes fall in special consideration area by Year 2050.

**Table 20: Unsignalized Intersection Turn Lane Volume Warrants - Rural Area**

US16 Intersection	Posted Speed Limit	Eastbound		Westbound	
		Left Turn	Right Turn	Left Turn	Right Turn
Cosmos Road	65	**	Does Not Meet	Existing	Does Not Meet
Beretta Road	65	**	Does Not Meet	**	Does Not Meet
Silver Mountain Road	65	**	-	-	Does Not Meet
Silver Mountain Road / Main Street	65	-	-	Does Not Meet	Existing
Pine Haven Drive	65	-	-	Does Not Meet	Does Not Meet
Rockerville Road	65	Existing	<u>Meets Criterion</u>	-	-
Golden Hills Drive	65	Does Not Meet	Does Not Meet	-	-
Strato Bowl Road	65	**	-	-	Does Not Meet
Strato Rim Drive	65	<u>Meets Criterion</u>	-	-	<u>Meets Criterion</u>
Busted Five Lane	65	<u>Meets Criterion</u>	-	-	<u>Meets Criterion</u>
Wilderness Canyon Road	65	<u>Meets Criterion</u>	-	-	<u>Meets Criterion</u>
Bear County Exit	65	Does Not Meet	-	-	Does Not Meet
Bear Country Entrance	65	Existing	-	-	Existing
Croell Pit West / Main Entrance	65	**	-	-	Does Not Meet
Neck Yoke Road / Reptile Gardens S	60	Existing	<u>Meets Criterion</u>	Existing	<u>Meets Criterion</u>
Reptile Gardens Center	60	Existing	Does Not Meet	Existing	<u>Meets Criterion</u>
Reptile Gardens N	60	Existing	Does Not Meet	<u>Meets Criterion</u>	<u>Meets Criterion</u>
Unknown Road	60	-	Does Not Meet	**	-

**Orange Bold** text: warrant met by Year 2050.

Green shading: warrant by Year 2026.

\*\* Volume warrant not met, but volumes fall in special consideration area by Year 2050.

## 8.4 Planning-Level No Build Condition Traffic Signal Warrants

A planning-level traffic signal warrant review was conducted for intersections in the US16 urban area and periphery to identify approximate timeframes for when traffic volumes may warrant a traffic signal. This traffic signal warrant review uses guidelines presented in Chapter 4C of the *2009 Manual on Uniform Traffic Control Devices (MUTCD)*. Similar to the turn lane warrant review, findings from this review do not necessitate installation. Typically, signals are installed after counted, existing traffic volumes meet a qualifying warrant threshold(s) and other improvements are evaluated.

Hourly planning-level traffic volumes were developed to review Warrant 1 (eight-hour vehicular volumes) and Warrant 2 (four-hour vehicular volume). Warrant 3 (peak hour) was not considered as special conditions required for the warrant were not found along the corridor. Hourly traffic volumes collected in 2019 were forecasted to years 2026 and 2050 based on growth factors reflected in the 2026 and 2050 peak hour No Build condition traffic volumes.

**Table 21** summarizes findings from the 2026 and 2050 No Build condition warrant review. Intersections shown to reach warrant thresholds in by year 2026 represent short-term needs for potential changes in traffic control, lane configurations, or other improvements. An intersection not meeting warrant thresholds until later in the 2050 Planning Horizon represent long-range considerations. It is important to note several of the intersections shown to meet warrants exhibit a side-street single, shared-lane approach. Splitting left turn and right turn traffic into separate lanes is a common first step to improving intersection operations and mitigating a need for signalization. Additional information regarding the warrant review process and findings is presented in **Appendix M**.

**Table 21: Unsignalized Intersection No Build Condition Traffic Signal Warrants**

Intersection	Traffic Signal Warrant Met	
	2026	2050
US16 & Tower Road (south)		
US16 & Enchantment Road		X
US16 & Enchantment Road + Tower Road (south)	X	X
US16 & Promise Road	X	X
US16 & Addison Avenue	X	X
US16 & Moon Meadows Drive	X	X
US16 & Neck Yoke Road	X	X
US16B/Catron Blvd & Wellington Drive (east)		

Warrant 3 Peak Hour not considered in this summary.  
 No Build warrant review based on existing lane configurations.  
 Meeting a planning-level warrant does not necessitate installation of a traffic signal.

## 9.0 Identification of Transportation Issues and Needs

The culmination of study process Step 1 was the first set of public and stakeholder meetings. Three daytime stakeholder meetings with local landowners, business owners, and local organization representatives and an evening public meeting were held in Rapid City on July 23, 2019. The focus of these meetings was to present data-driven transportation needs identified through preliminary analyses, review intersection/interchange concepts carried forward from the 2016 US16/Catron Boulevard intersection study, and gather feedback from the public and stakeholders on what they see as existing and long-range issues throughout the corridor. A summary of these meetings is provided in **Appendix N**. Supplemental meetings were also held with the Mount Rushmore Road Group and Zion Lutheran Church, School, and Preschool to provide additional opportunities for informal discussion and feedback.

A second component to the first set of public involvement meetings was conducting tourist and commuter surveys along the corridor during and after the Sturgis Motorcycle Rally. A sampling of questions/topics on the surveys, with responses differentiated by tourist or commuter respondents. Additional information on the travel surveys is also provided in **Appendix N**.

**Table 22: Travel Survey Summary**

Question/Topic	Tourist Survey	Commuter Survey
Feel safe traveling on US16?	Yes: 95% No: 5%	Yes: 59% No: 41%
Current posted speeds?	Just right: 87% Too fast: 6% Too slow: 7%	Just right: 58% Too fast: 36% Too slow: 6%
How to improve travel experience along US16?	Additional turn lanes (7) Better signage (7) 19 other categories (1 or 2)	Lower speeds (9) Additional turn lanes (8) Better signage (6) New traffic signals (5) 5 other categories (3 or less)
Specific locations where you don't feel safe?	Not asked	Catron to Fairmont Blvd (61) Neck Yoke Road (53) Moon Meadows Dr (19) US16B/Catron Blvd (18)
Total responses:	120	200

Overarching transportation issues and needs identified by study stakeholders, public, SAT, and analysis completed in Step 1 are summarized in **Figure 21**.



- 1-1: MRM 51 - MRM 53: crash history
- 1-2: Access turn lanes
- 1-3: Rest area

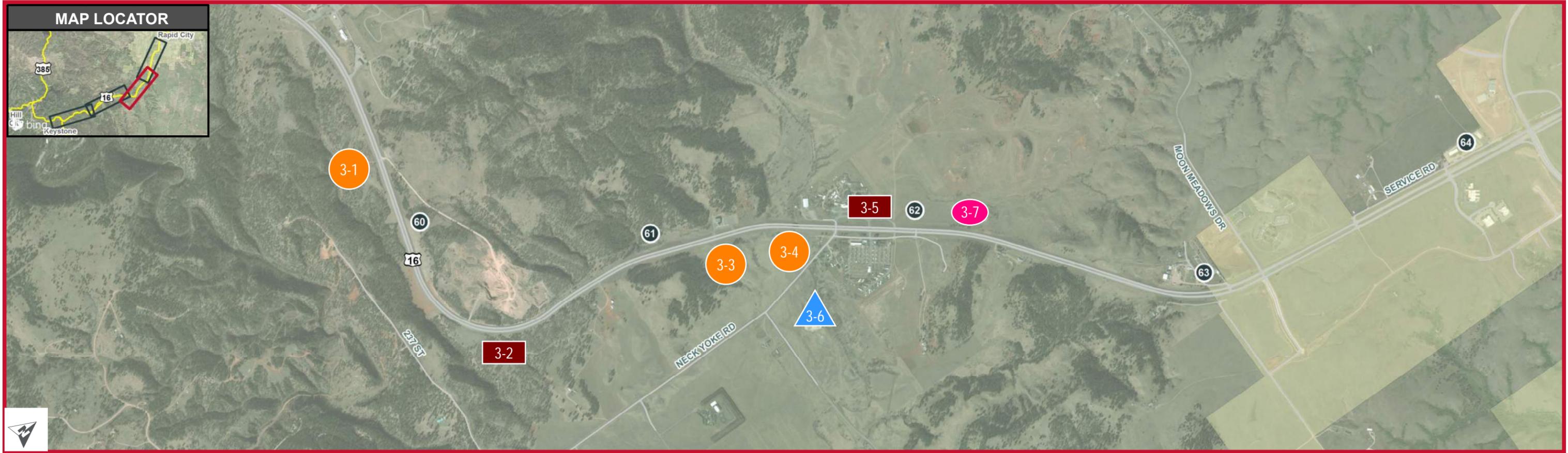
**LEGEND**

- Intersection
- Roadway Segment
- ▲ Future Development
- Other



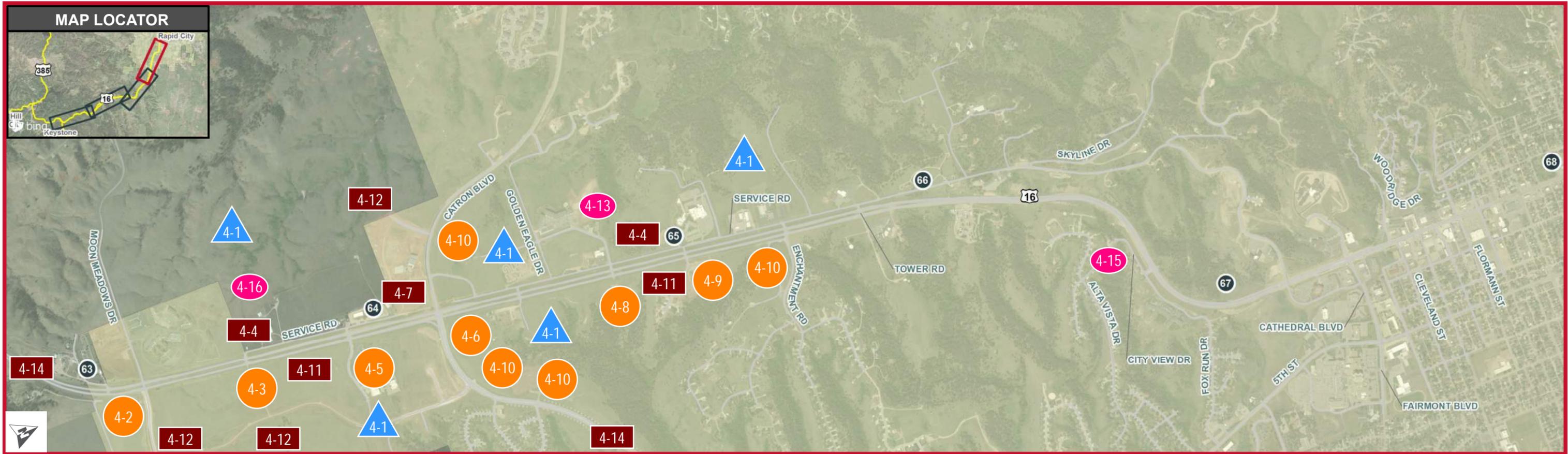
- 2-1: US16 WB/Main Street/Silver Mountain Road intersection skew
- 2-2: US16 EB/Rockerville Road intersection crash history
- 2-3: Future development (multiple locations)
- 2-4: Redundant US16 ramps throughout Rockerville Area
- 2-5: Split US16 eastbound and westbound
- 2-6: Busted Five Lane intersection crash history, future-year traffic operations, and turn lane needs
- 2-7: Wilderness Canyon Road crash history and turn lane needs
- 2-8: US16 segment between Busted Five Lane to Gondola Road access density, median width, recreational vehicles, turn lane needs, and crash history
- 2-9: US16 access density from Sitting Bull Road to MRM 59
- 2-10: Bear Country exit safety
- 2-11: Bear Country entrance spillback and safety
- 2-12: Trail head parking
- 2-13: Blowing snow

LEGEND	
	Intersection
	Roadway Segment
	Future Development
	Other



- 3-1: Croell Quarry main intersection turn lanes
- 3-2: Horizontal curve/steep grade crash history
- 3-3: Access turn lanes
- 3-4: Neck Yoke Road intersection crash history and traffic operations
- 3-5: Neck Yoke Road area intersection density, turn lane lengths, and crash history
- 3-6: Future development throughout Spring Creek valley
- 3-7: Crosswind

LEGEND	
	Intersection
	Roadway Segment
	Future Development
	Other



4-1: Future development (throughout urban area)

4-2: Moon Meadows Drive intersection traffic operations and safety

4-3: Section Line Road long-range plan

4-4: US16 service road spacing with US16 (north and south of Catron Blvd)

4-5: Addison Avenue intersection traffic operations and safety

4-6: US16/US16B/Catron Blvd intersection operations and safety

4-7: US16 grade into/out of US16/US16B/Catron Blvd intersection related to inclement weather conditions

4-8: Promise Road future intersection operations and safety

4-9: Tablerock Road future intersection operations and safety

4-10: Enchantment Road future intersection operations and safety

4-11: Future vision of corridor:

- Cross-section
- Route functionality, access, and speeds
- Bicycle and pedestrian facility connectivity

4-12: Potential changes to traffic patterns due to future connections:

- Les Hollers Way extension to Sheridan Lake Road
- Section Line Road connection to SD79
- Moon Meadows Drive extension to SD79

4-13: Rapid City Fire Department access to US16

4-14: Long-term functionality of regionally important US16-US16B route

4-15: Truck escape ramp

4-16: Blowing snow

**LEGEND**

- Intersection
- Roadway Segment
- ▲ Future Development
- Other

## 10.0 Concept Development

Study process Step 2 began with the first SAT workshop on August 28-29, 2019, to brainstorm potential concepts. Discussions were geared towards a holistic view of the corridor, not only looking at potential solutions for corridor segment and intersection needs, but also changes in roadway alignment, local network connectivity, locations of potential future interchanges, and alternative intersection types.

### 10.1 US16 Corridor Concepts

The US16 corridor was subdivided into the following segments for the concept development:

#### *US16 Urban Area Corridor*

- A. US16 north (from US16B/Catron Boulevard north to Cathedral Drive/Fairmont Boulevard)
- B. US16 south (from US16B/Catron Boulevard south through Moon Meadows Drive)
- C. US16B/Catron Boulevard (Less Hollers Way to Wellington Drive (east))

#### *US16 Rural Area Corridor*

- D. Neck Yoke Road area
- E. Bear Country/Croell Quarry area
- F. Busted Five/Wilderness Canyon area
- G. Rockerville area and west to Keystone Wye

Potential typical sections with different urban and rural elements, such as median widths, curbs, and roadside ditches where applicable, were identified for the various segments to establish a framework for concept development. Each intersection concept included warranted turn lanes and other features to meet study LOS goals. At this stage, preliminary costs were considered illustrative given the different corridor cross-sections each could be paired with in a larger corridor scenario.

A full set of conceptual layouts, representative of the milestone prior to the next step in the study process, is presented in the *US16 Corridor Study Concepts* memo in **Appendix O**.

### 10.2 Intersection Sub-Areas

The detailed analysis of two intersection sub-areas, US16/US16B/Catron Boulevard intersection and US16/Neck Yoke Road intersection, were accelerated within the study schedule. Both intersections helped drive the long-range vision of the corridor and provided an early transition into the NEPA process in preparation for two programmed SDDOT projects.

The US16/US16B/Catron Boulevard intersection sub-area analysis carried two concepts forward from the 2016 *US16/US16B/Catron Boulevard Intersection Alternatives Study*: Single Point Interchange (SPI) and Displaced Left Turn (DLT) intersection.

The US16/Neck Yoke Road intersection sub-area analysis started with a long-range look at intersection, grade-separation, and local network connectivity/alignment needs. Through this process, two at-grade intersection options were carried forward for refinement and evaluation of location within the Neck Yoke Road area: reduced conflict intersection (RCI) and signalized intersection.

### 10.3 US16 Urban Area Intersection Control Evaluation (ICE)

An Intersection Control Evaluation (ICE) was conducted to explore the operational feasibility of alternative intersection concepts at US16 urban area intersections with Moon Meadows Drive, Promise Road, and Enchantment Road. It was found that there were operational and safety benefits associated with alternative intersection types and thus the following were carried forward:

- Traditional intersection to be signalized when warranted
- Signalized and unsignalized RCI
- Signalized median U-turn (MUT) intersection

Findings from the *US16 Urban Area Intersection Control Evaluation* report are included in **Appendix P** and summarized in this report.

### 10.4 Public and Stakeholder Meetings No. 2

Study process Step 2 concluded with the second set of stakeholder and public meetings, where conceptual layouts were presented for feedback. A supplemental meeting was also held with the Mount Rushmore Road Group. Feedback from these meetings aided further refinement and evaluation in preparation for the development of corridor scenarios. A comprehensive summary of these meetings is provided in **Appendix N**.

## 11.0 Corridor Scenario Development

Study process Step 3 began with the second SAT workshop on June 2-3, 2020, to develop feasible corridor scenarios reflective of potential future projects. Key considerations included preliminary traffic operations and safety analysis, public and stakeholder feedback, preliminary assessments of cost, constructability, and feasibility as well as input from the SAT and others within the SDDOT. Workshop meeting minutes, including reasons for eliminating certain concepts from further consideration, are included in **Appendix Q**.

The seven corridor scenario segments are shown in **Figure 22**. A compiled list of all scenarios with layouts is provided in the *US16 Corridor Scenarios* memo in **Appendix Q**.

Supporting analysis documentation for each of the corridor scenarios is provided in the following technical memos and reports:

- *Build Condition Traffic Operations Summary* technical memo (**Appendix R**)
- *Predictive Safety Analysis - Corridor Scenarios* technical memo (**Appendix S**)
- *US16/US16B/Catron Boulevard Intersection Study Area Design Considerations* technical memo and *SPI Constructability Discussion with Utah DOT* meeting minutes (**Appendix T**)
- *US16 Urban Area Alternative Intersection Design Notes* technical memo (**Appendix U**)
- *US16/US16B/Catron Boulevard Intersection Sub-Area Build Option Minor Road Access Evaluation* memo (**Appendix V**)
- *Public Meeting No. 3 Summary* report (**Appendix N**)

Traffic operations and predictive safety analysis of the US16/Neck Yoke Road and US16/US16B/Catron Boulevard intersections is provided in the respective intersection technical report.

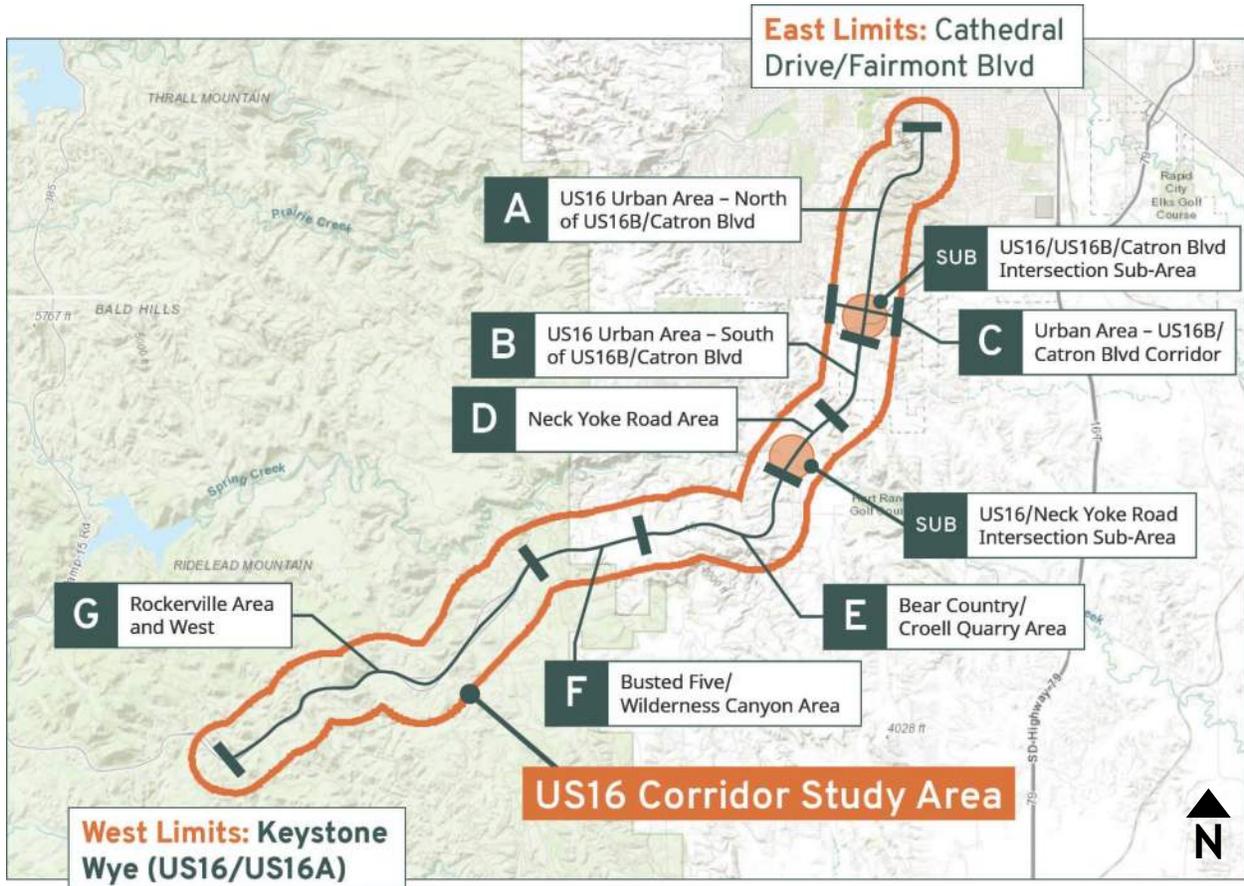


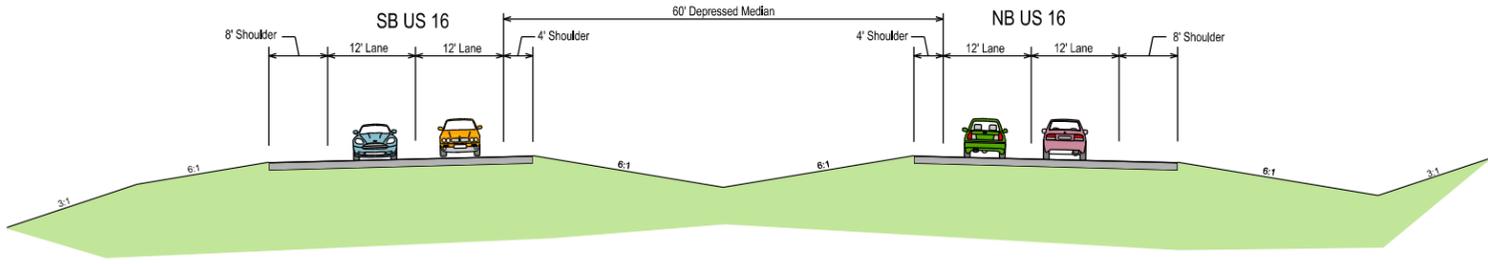
Figure 22: US16 Corridor Scenario Segments

## 12.0 Typical Sections

US16 corridor typical sections incorporated into the corridor scenarios are shown in Figure 23. Primary differences include:

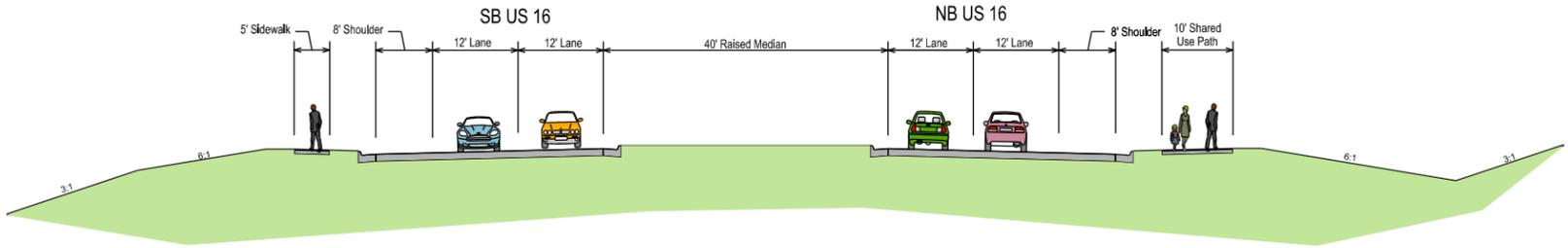
- Median width and type (raised or depressed)
- Outer curb and gutter or rural ditch section
- Multimodal features

The US16 Rural 4-Lane Divided corridor reflects the typical section with a wider 60-foot depressed median. There are areas along the corridor with a narrower 28-foot depressed paved median. In these narrower segments, the median width may need to be widened to accommodate the potential improvements within the respective scenario.



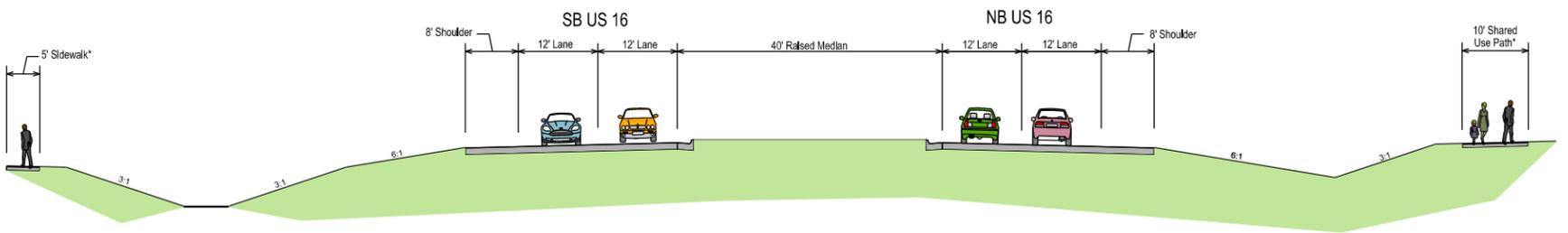
EXISTING 4-LANE DIVIDED WITH 60' DEPRESSED MEDIAN (RURAL)

LOOKING NORTH



4-LANE DIVIDED WITH 40' RAISED MEDIAN (URBAN)

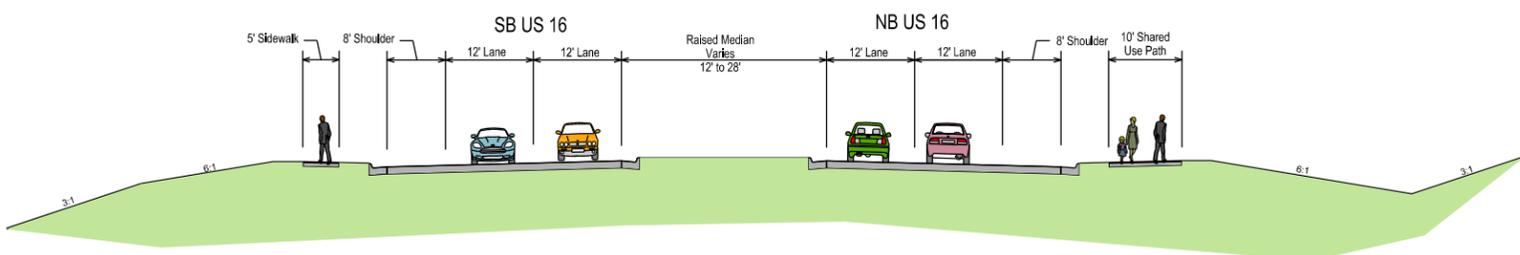
LOOKING NORTH



4-LANE DIVIDED WITH 40' RAISED MEDIAN (SUBURBAN)

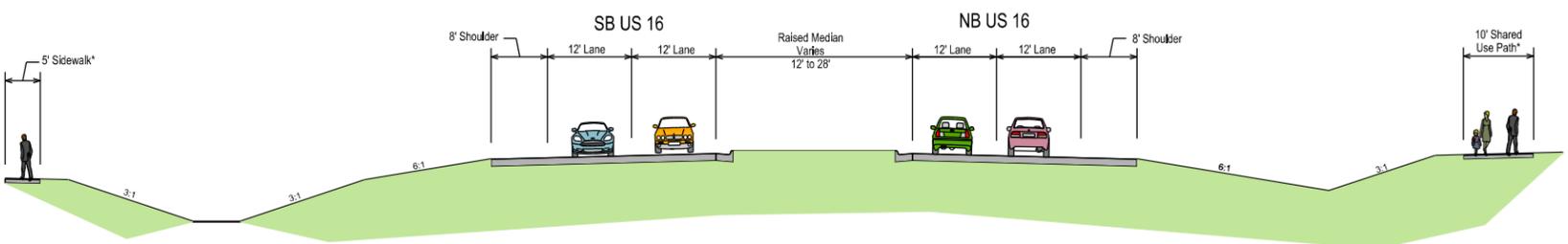
LOOKING NORTH

\*Sidewalk and Shared Use Path location varies greatly throughout the corridor



4-LANE DIVIDED WITH VARIABLE (12' TO 28') RAISED MEDIAN (URBAN)

LOOKING NORTH



4-LANE DIVIDED WITH VARIABLE (12' TO 28') RAISED MEDIAN (SUBURBAN)

LOOKING NORTH

\*Sidewalk and Shared Use Path location varies greatly throughout the corridor



## 13.0 US16/US16B/Catron Boulevard Intersection

The primary driver for the US16 Corridor Study was to identify future improvements at the US16/US16B/Catron Boulevard intersection as part of a planned project in the SDDOT's developmental STIP. Previous SDDOT studies established the foundation for recommendations presented in this report. A 2004 study recommended an interchange at the US16/US16B/Catron Boulevard intersection. A 2016 study evaluated several different interchange and intersection types, ultimately recommending a Single Point Interchange (SPI) and Displaced Left Turn (DLT) at-grade intersection concept to be carried forward to this study for further analysis and refinement.

This section provides a summary of the technical analysis and evaluation of intersection Build Options. All information is provided in greater detail in the following documents:

- *US16/US16BCatron Boulevard Intersection Build Option Technical Report (Appendix W)*
- *US16/US16B/Catron Boulevard Intersection Build Option Evaluation Report (Appendix X)*

### 13.1 Summary of Intersection Needs

The purpose of a future project is to improve traffic operations and safety at the US16/US16B/Catron Boulevard intersection, and with the goal of supporting the planned mix use urban development that is occurring in the area.

#### Poor traffic operations

- Intersection expected to operate at LOS F by Year 2050 without additional improvements
- Intersection is important to both regional and local networks
  - Two key commuter routes
  - Two key tourist routes, which sees notable increases in traffic during the summer tourist season

#### High crash rates

- 88 reported intersection crashes between 2014 and 2018
  - Thirty-four of the 88 resulted in an injury
  - Weighted crash rate nearly 2.5 times higher than the next highest intersection weighted crash rate within the sub-area
- Crash rate, types, and locations consistent with intersection congestion, unexpected queue lengths, and road conditions affected by weather

#### Rapidly urbanizing land use

- US16 corridor within the study area is one of the fastest growing areas within the RCAMPO area
- Future development expected to generate considerable amount of traffic and alter traffic patterns

## 13.2 Intersection Sub-Study Relationship to US16 Corridor Study

At the onset of the study, it was determined that addressing long-term capacity and safety needs at the US16/US16B/Catron Boulevard intersection was crucial to the success of the overall US16 corridor. As the convergence of two important regional routes, the intersection needs to efficiently, safely, and reliably accommodate high levels of traffic that fluctuates greatly throughout the year.

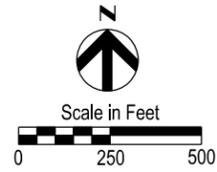
The SDDOT designated this intersection as a sub-study to the overall US16 Corridor Study in order to develop Build recommendations for the upcoming planned project. This also provided an opportunity for intersection recommendations to help shape the long-range vision of the US16 Urban Area. Recommendations for the US16/US16B/Catron Boulevard intersection join with the US16 Corridor Study recommendations and collectively represent a complete, long-range vision with specific future projects, concepts, and strategies to address corridor needs through the 2050 Planning Horizon.

## 13.3 Build Options

This study developed eight different Build Options, three variations of an SPI and five variations of a DLT intersection (referred to as a CFI in the 2016 study). Turn lane type and intersection traffic control were the primary differences across each intersection type shown in **Figure 24** through **Figure 31**.

- 1.1a: SPI - Free NB/SB Right Turn Lanes
- 1.1b: SPI - Free NB/SB Right Turn Lanes
  - With eastbound right turn lane at Healing Way
- 1.2: SPI - Signalized NB/SB Dual Right Turn Lanes
- 2.1a: DLT - Free NB/SB Right Turn Lanes
- 2.1b: DLT - Free Right Turn Lanes (all Quadrants)
- 2.2a: DLT - Signalized Right Turn Lanes (all quadrants)
  - NB/SB signalized at crossover intersections
- 2.2b: DLT - Signalized NB/SB Right Turn Lanes
  - NB/SB signalized at crossover intersections
- 2.3: DLT - Unseparated, Signalized Right Turn Lanes at Main Intersection

The SPI Build Options require closure of US16/Addison Avenue and US16/Tucker Street intersections due to the access being located within the interchange ramps. For the DLT Build Options, analysis scenarios were developed to evaluate different US16/Addison Avenue and US16/Tucker Street intersection access treatments.

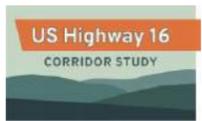
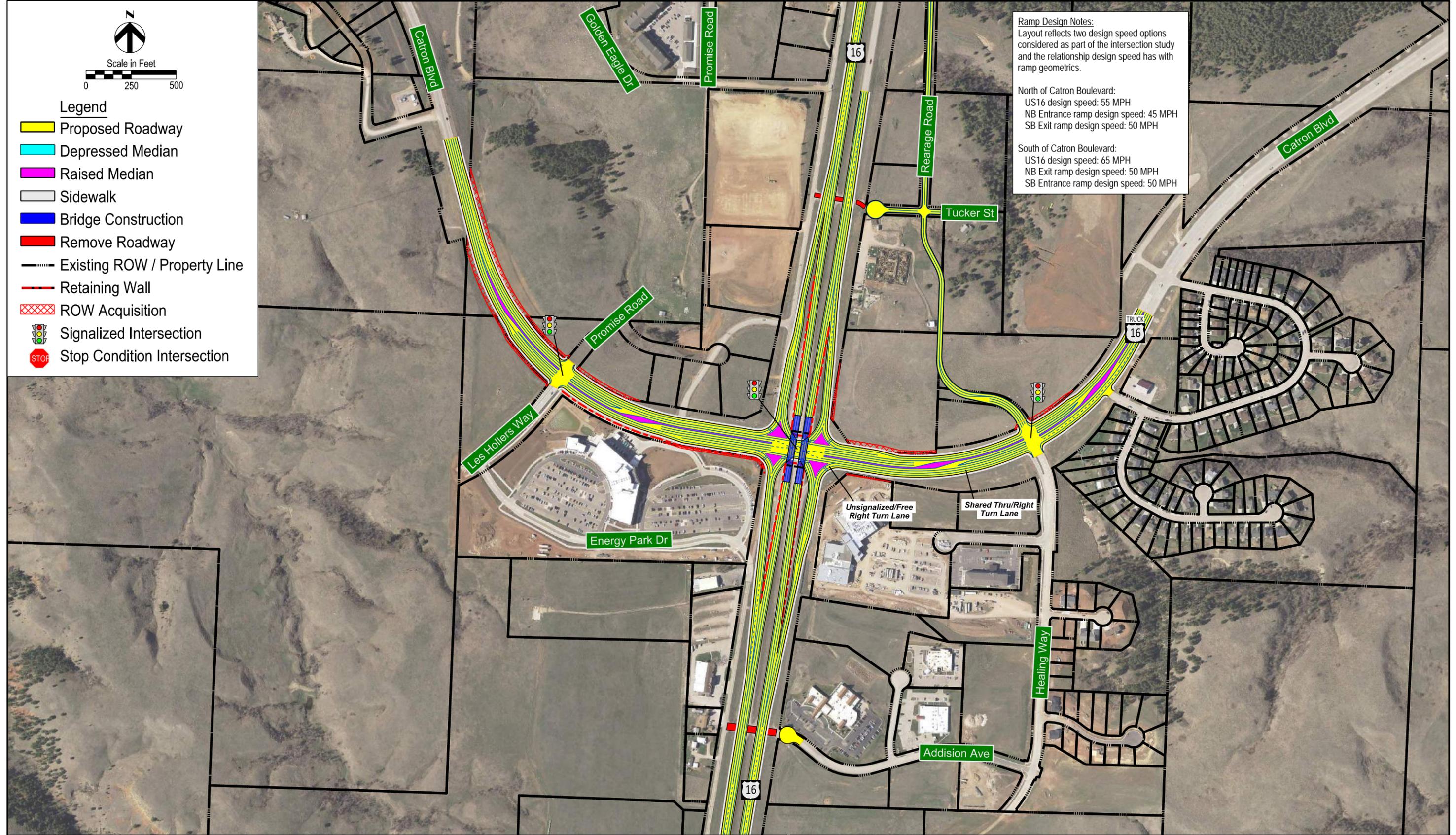


- Legend**
- Proposed Roadway
  - Depressed Median
  - Raised Median
  - Sidewalk
  - Bridge Construction
  - Remove Roadway
  - Existing ROW / Property Line
  - Retaining Wall
  - ROW Acquisition
  - Signalized Intersection
  - Stop Condition Intersection

**Ramp Design Notes:**  
 Layout reflects two design speed options considered as part of the intersection study and the relationship design speed has with ramp geometrics.

North of Catron Boulevard:  
 US16 design speed: 55 MPH  
 NB Entrance ramp design speed: 45 MPH  
 SB Exit ramp design speed: 50 MPH

South of Catron Boulevard:  
 US16 design speed: 65 MPH  
 NB Exit ramp design speed: 50 MPH  
 SB Entrance ramp design speed: 50 MPH



Alternative 1.1a  
 SPI with Separated, Free NB and SB Right Turn Lanes  
 US16 Corridor Study



Scale in Feet  
0 250 500

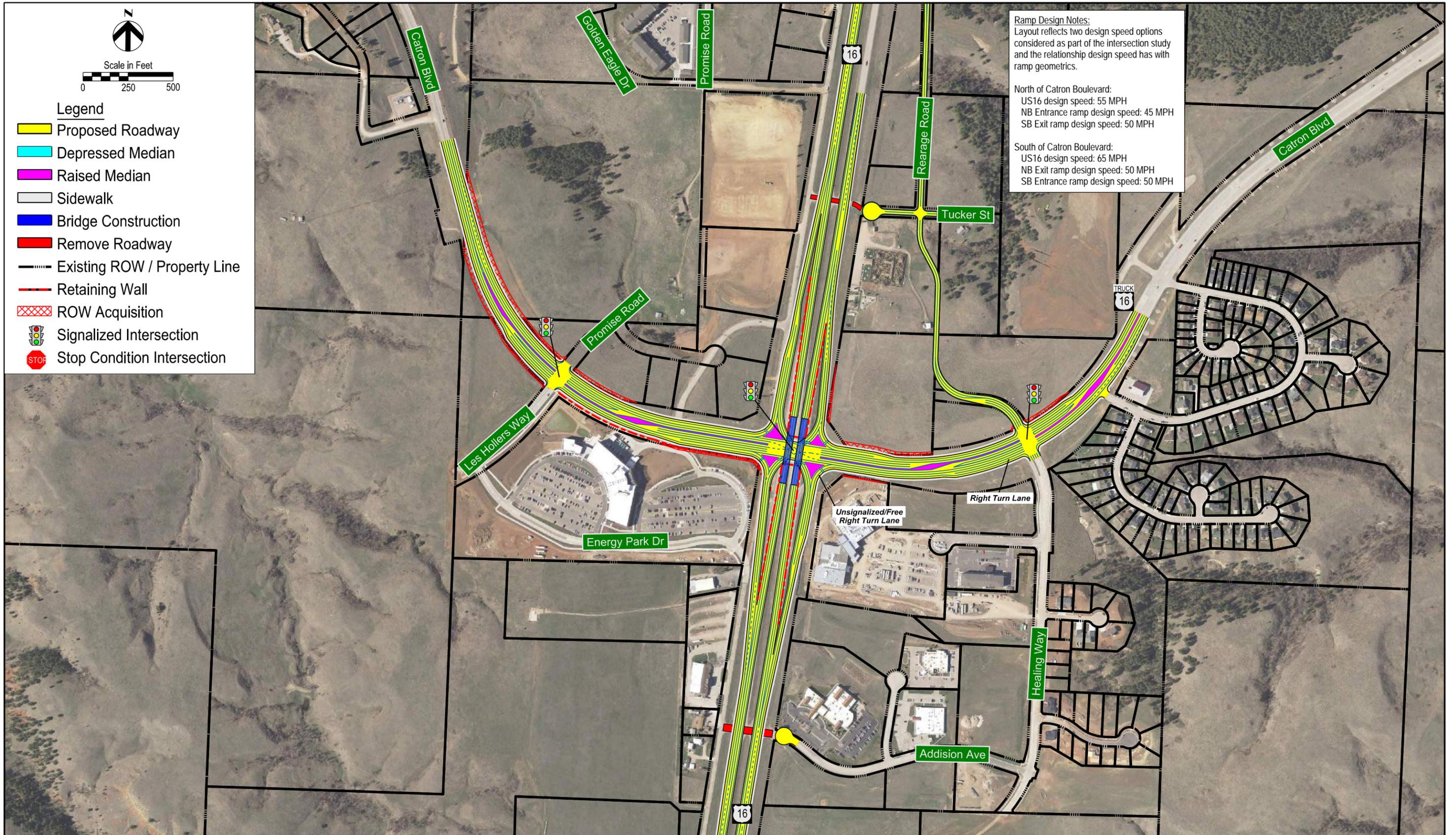
Legend

- Proposed Roadway
- Depressed Median
- Raised Median
- Sidewalk
- Bridge Construction
- Remove Roadway
- Existing ROW / Property Line
- Retaining Wall
- ROW Acquisition
- Signalized Intersection
- Stop Condition Intersection

**Ramp Design Notes:**  
Layout reflects two design speed options considered as part of the intersection study and the relationship design speed has with ramp geometrics.

North of Catron Boulevard:  
US16 design speed: 55 MPH  
NB Entrance ramp design speed: 45 MPH  
SB Exit ramp design speed: 50 MPH

South of Catron Boulevard:  
US16 design speed: 65 MPH  
NB Exit ramp design speed: 50 MPH  
SB Entrance ramp design speed: 50 MPH



Alternative 1.1b  
SPI with Separated, Free NB and SB Right Turn Lanes with EB Right Turn Lane at Healing Way  
US16 Corridor Study

Figure

25

Rapid City, SD



Scale in Feet  
0 250 500

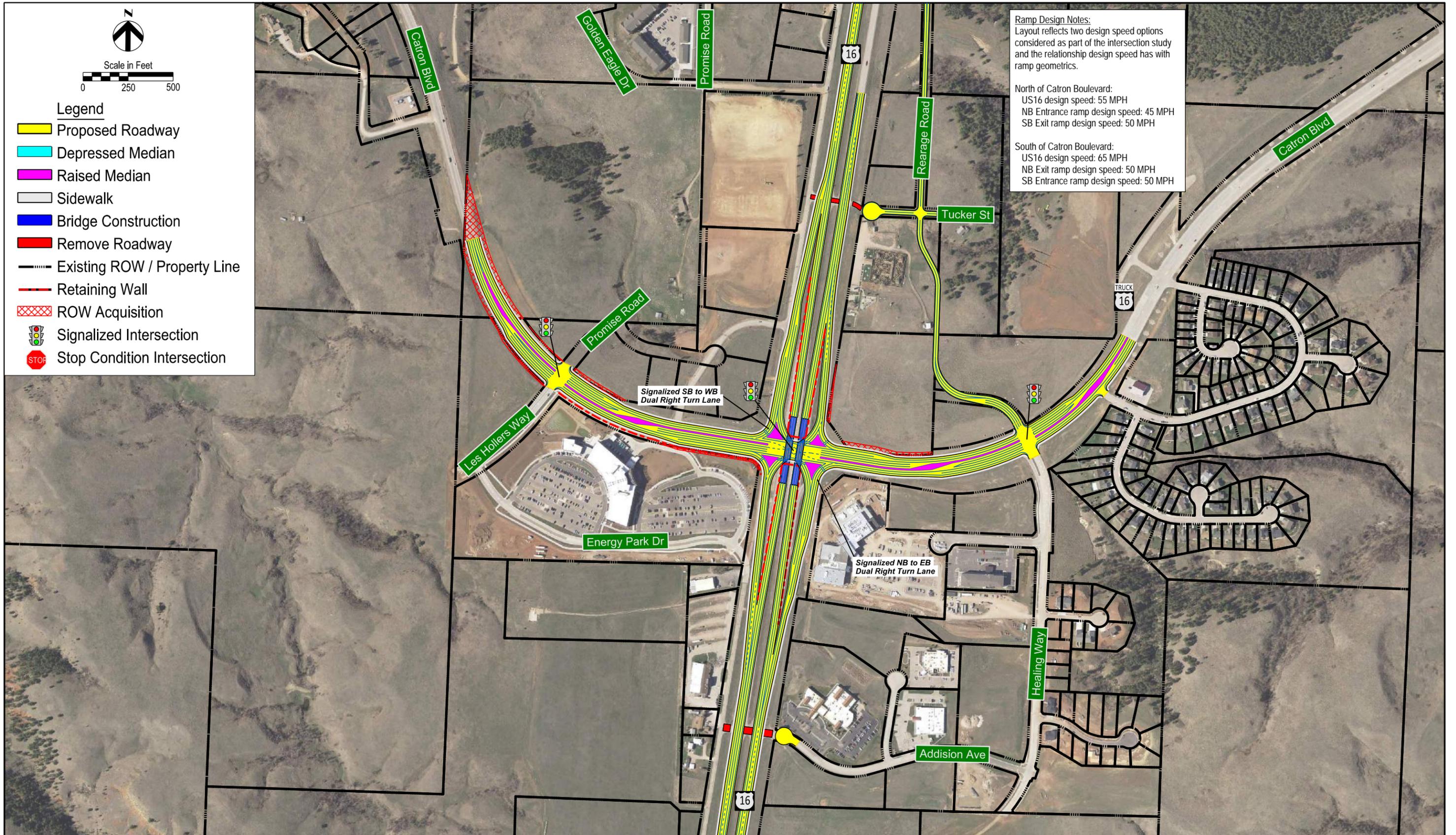
Legend

- Proposed Roadway
- Depressed Median
- Raised Median
- Sidewalk
- Bridge Construction
- Remove Roadway
- Existing ROW / Property Line
- Retaining Wall
- ROW Acquisition
- Signalized Intersection
- Stop Condition Intersection

**Ramp Design Notes:**  
Layout reflects two design speed options considered as part of the intersection study and the relationship design speed has with ramp geometrics.

North of Catron Boulevard:  
US16 design speed: 55 MPH  
NB Entrance ramp design speed: 45 MPH  
SB Exit ramp design speed: 50 MPH

South of Catron Boulevard:  
US16 design speed: 65 MPH  
NB Exit ramp design speed: 50 MPH  
SB Entrance ramp design speed: 50 MPH



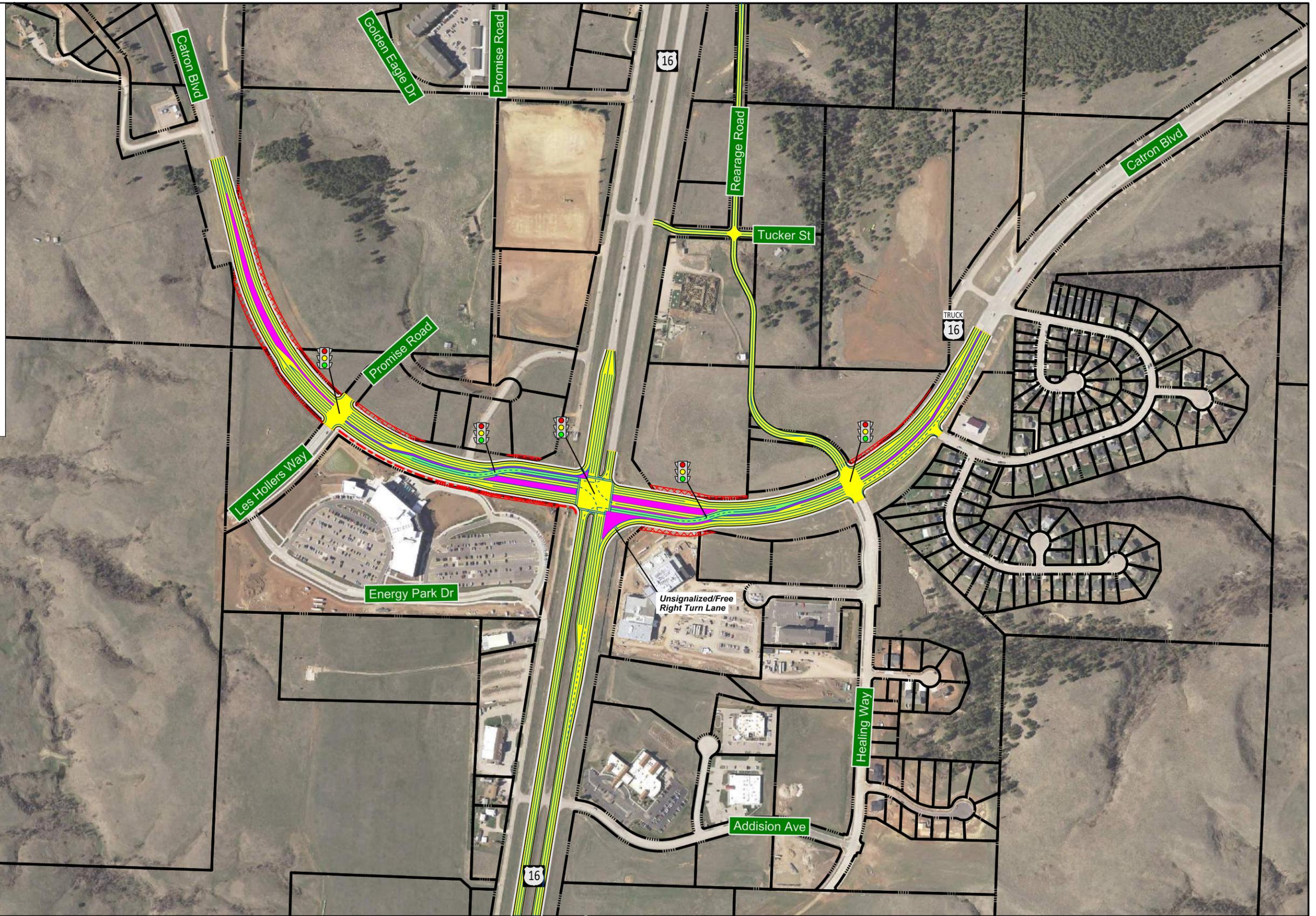
Alternative Scenario 1.2  
SPI with Signalized NB and SB Dual Right Turn Lanes and EB Right Turn Lane at Healing Way  
US16 Corridor Study



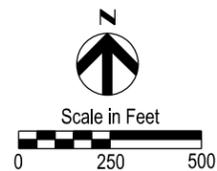
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Legend

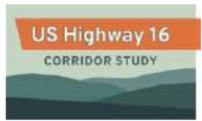
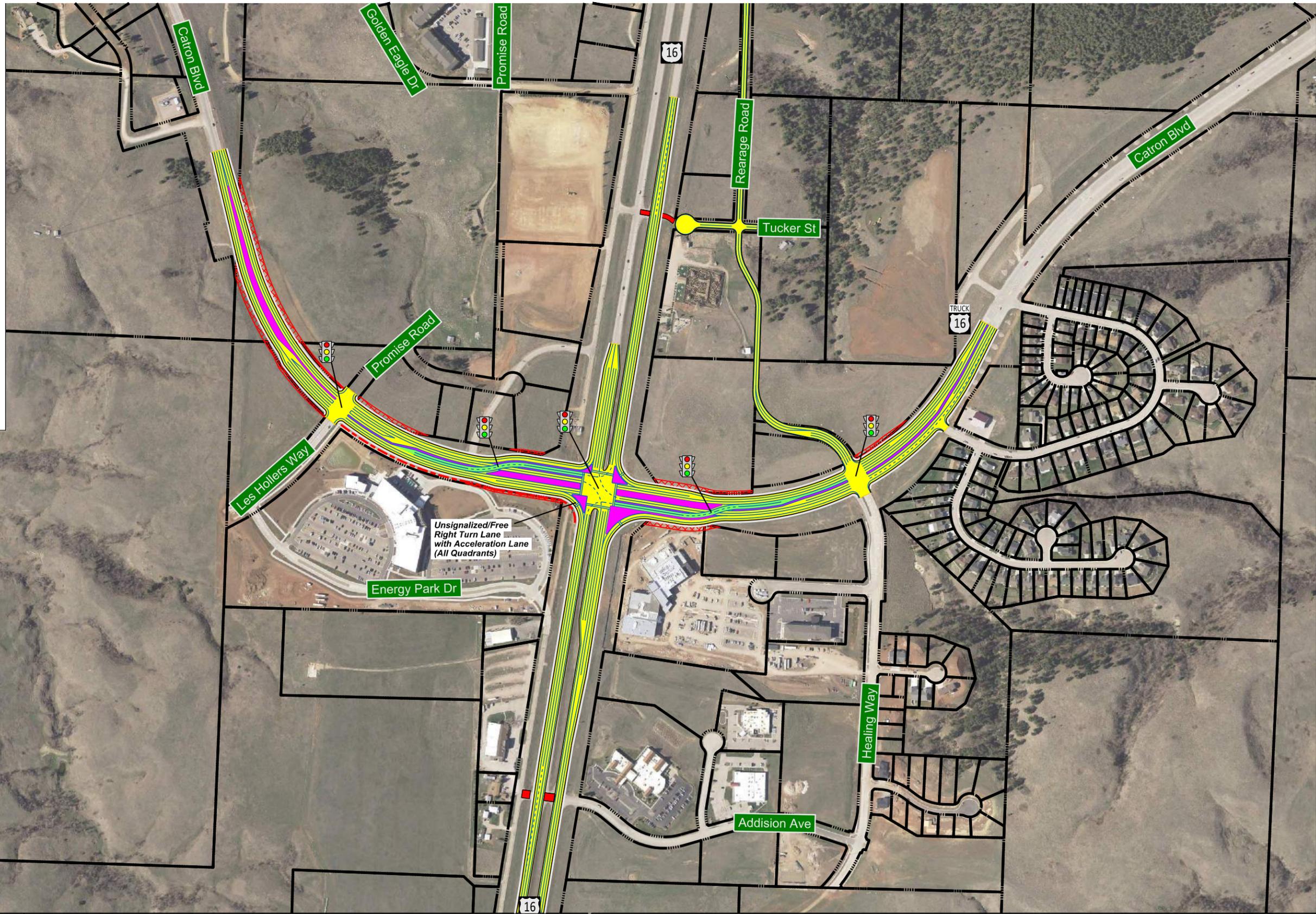
-  Proposed Roadway
-  Displaced Left
-  Depressed Median
-  Raised Median
-  Sidewalk
-  Bridge Construction
-  Remove Roadway
-  Existing ROW / Property Line
-  Retaining Wall
-  ROW Acquisition
-  Signalized Intersection
-  Stop Condition Intersection



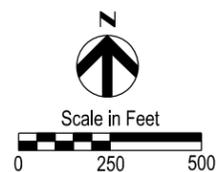
Alternative 2.1a  
DLT with Separated, Free NB and SB Right Turn Lanes  
US16 Corridor Study



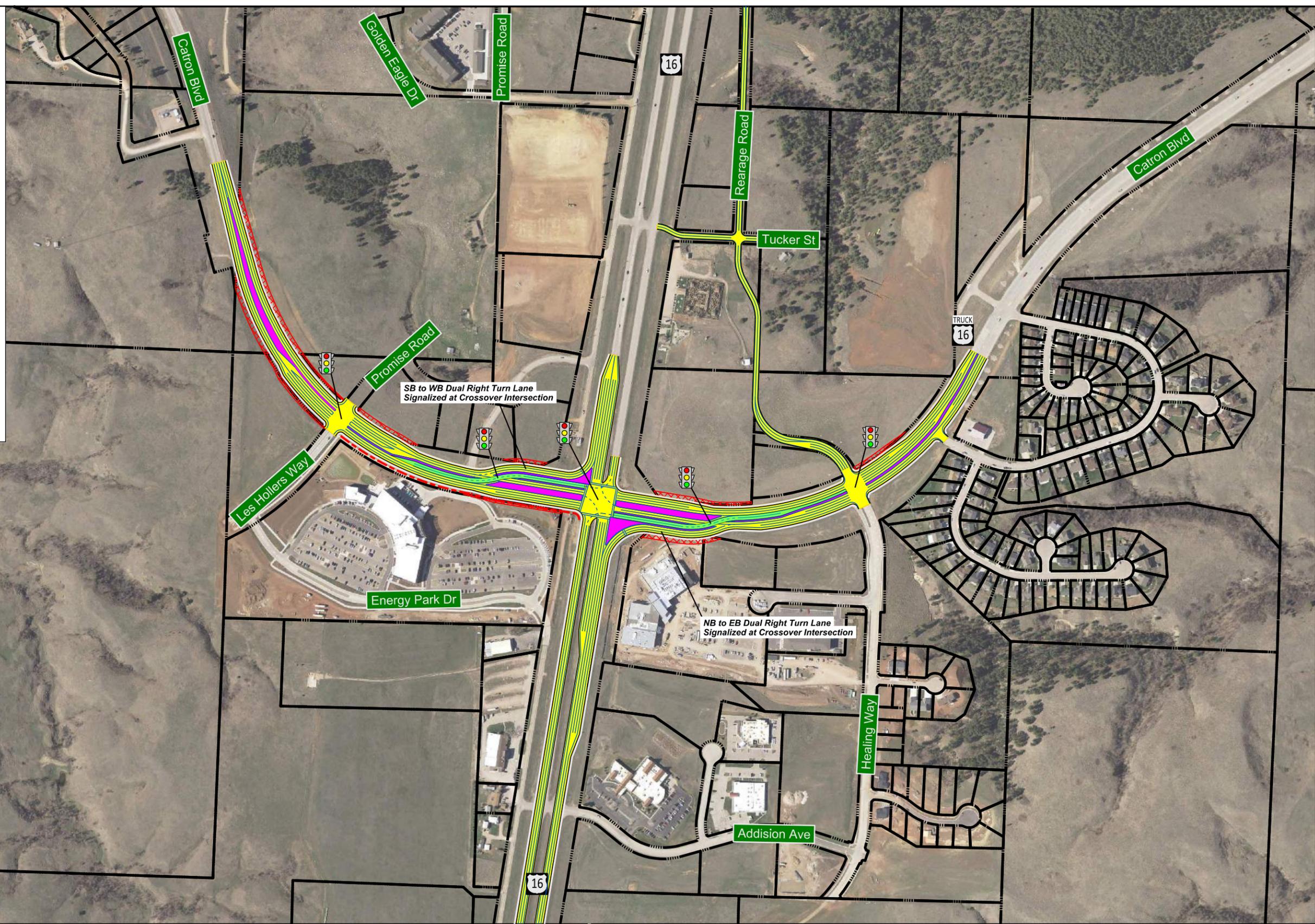
- Legend**
- Proposed Roadway
  - Displaced Left
  - Depressed Median
  - Raised Median
  - Sidewalk
  - Bridge Construction
  - Remove Roadway
  - Existing ROW / Property Line
  - Retaining Wall
  - ROW Acquisition
  - Signalized Intersection
  - Stop Condition Intersection



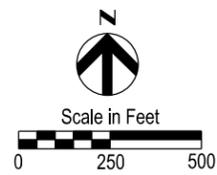
Alternative 2.1b  
 DLT with Separated, Free Right Turn Lanes at Main Intersection (all Quadrants)  
 US16 Corridor Study



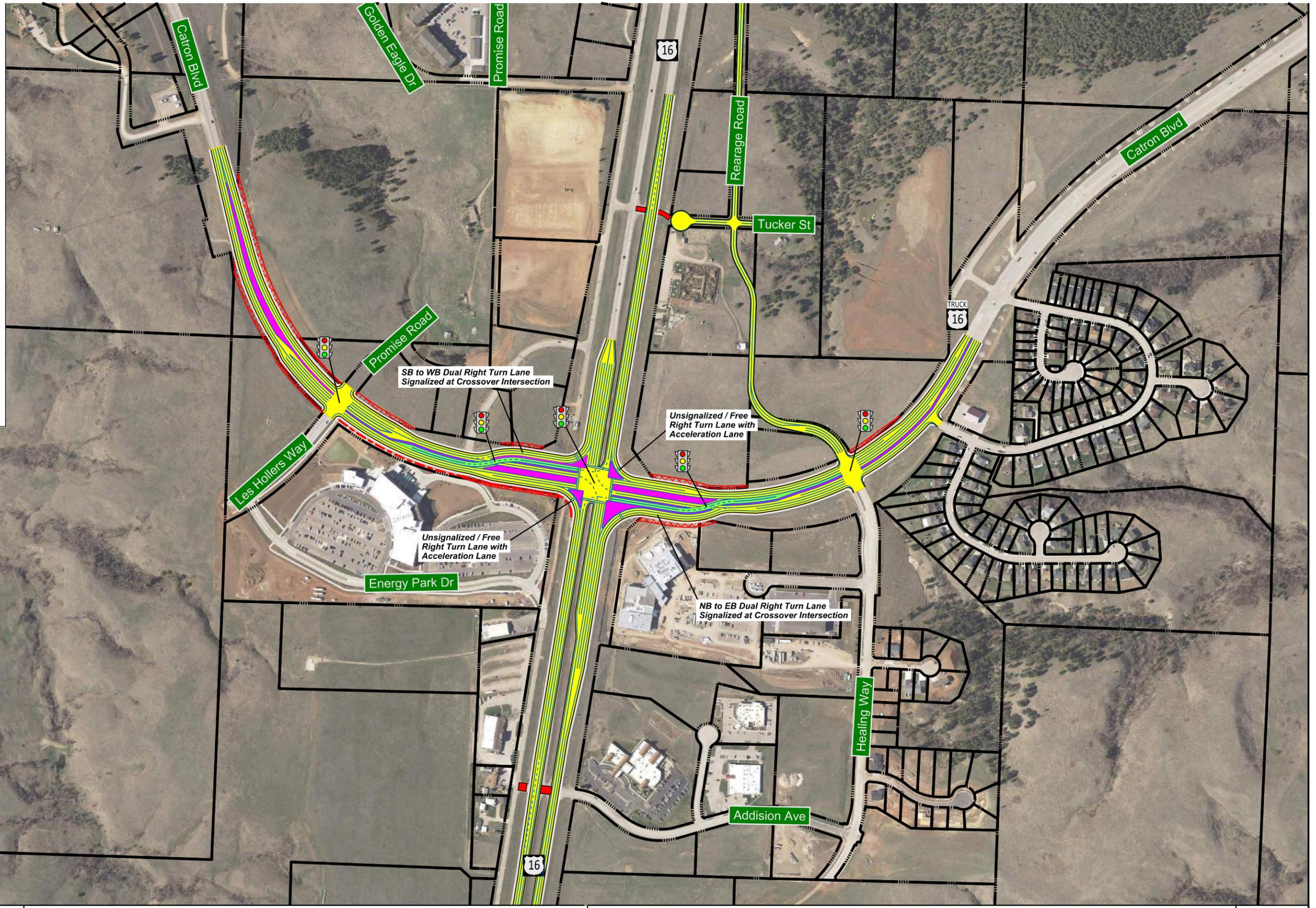
- Legend**
- Proposed Roadway
  - Displaced Left
  - Depressed Median
  - Raised Median
  - Sidewalk
  - Bridge Construction
  - Remove Roadway
  - Existing ROW / Property Line
  - Retaining Wall
  - ROW Acquisition
  - Signalized Intersection
  - Stop Condition Intersection



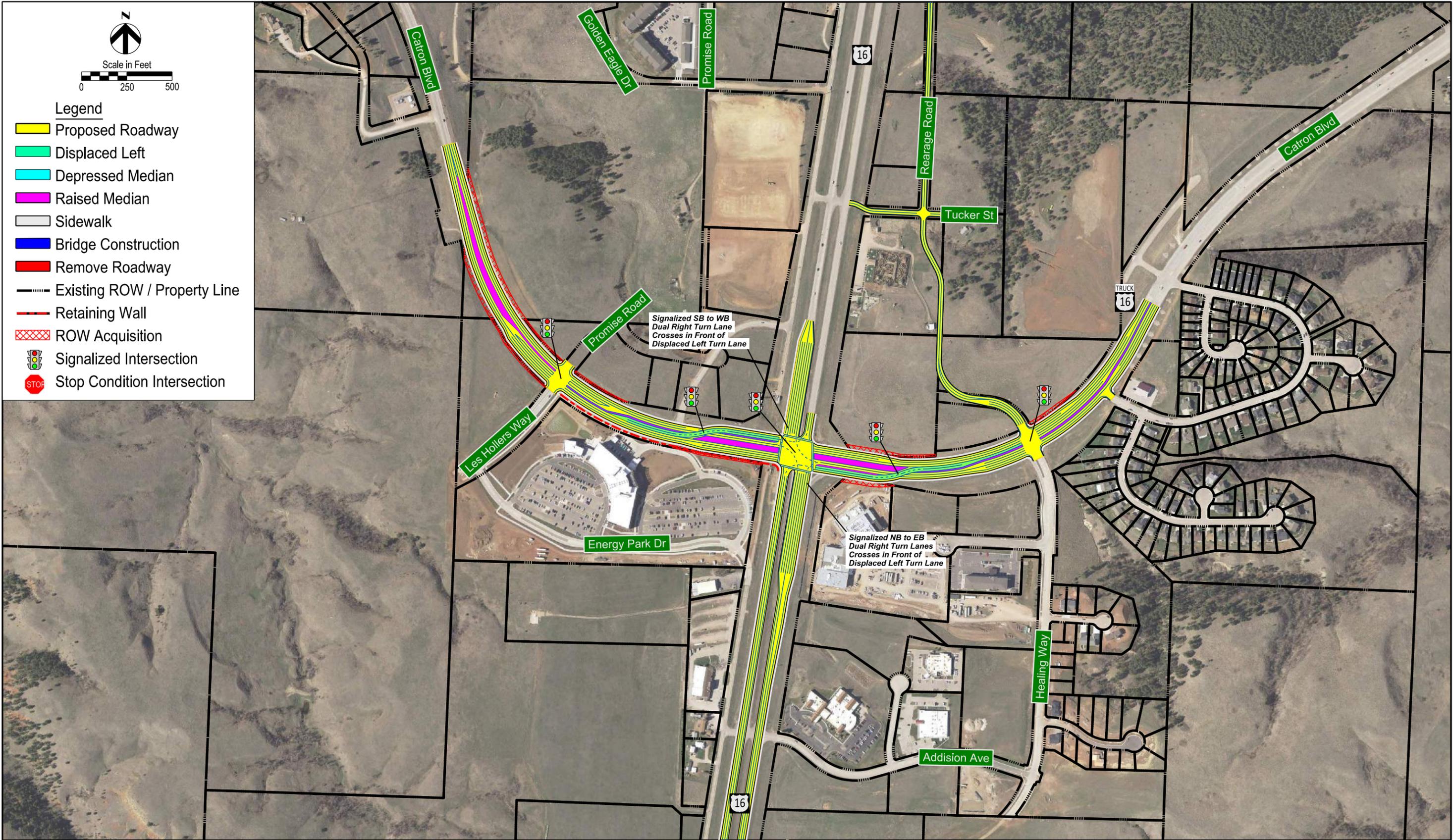
Alternative 2.2a  
 DLT with Signalized Right Turn Lanes at Main Intersection (all Quadrants)  
 US16 Corridor Study



- Legend**
- Proposed Roadway
  - Displaced Left
  - Depressed Median
  - Raised Median
  - Sidewalk
  - Bridge Construction
  - Remove Roadway
  - Existing ROW / Property Line
  - Retaining Wall
  - ROW Acquisition
  - Signalized Intersection
  - Stop Condition Intersection



Alternative 2.2b  
 DLT with NB and SB Signalized Right Turn Lanes, Free EB and WB Right Turn Lanes  
 US16 Corridor Study



## 13.4 Public Involvement

Stakeholder and public feedback included:

- Support for both SPI and DLT intersection Build Options. However, comments regarding benefits and drawbacks of each Build Option resulted in opposing views of the mobility and access spectrum.
- Support for SPI Build Options focused on traffic operations, safety, tourist traffic and seasonal volume fluctuations, driver familiarity, maintaining through traffic as a free movement and a high level of mobility on US16, route reliability, addressing weather-related concerns and the downgrade into a signalized intersection, and accounting for planning efforts completed to date.
- Concerns regarding the SPI Build Options focused on cost and the closure of US16 intersections with Tucker Street and Addison Avenue due to the SPI ramps.
- Support for the DLT intersection Build Options focused on the availability to maintain US16 intersections with Addison Avenue and Tucker Street, lower construction costs, and a desire to create a more urban, slower speed/greater access US16 corridor.
- Concerns for the DLT intersection focused on the inability to provide the long-term traffic operations and safety benefits afforded by the SPI Build Options.

## 13.5 Intersection Evaluation Summary

### 13.5.1 Evaluation Methodology

The following evaluation categories were used to compare US16/US16B/Catron Boulevard intersection Build Options and assess feasibility, benefits, and drawbacks of each.

- Meets Purpose and Need
- Traffic Safety
- Traffic
- Right of Way Needs and Total Costs
- Benefit-Cost Ratio
- Construction, Maintenance, and Operations
- Public Input
- Bicycle and Pedestrian

**Table 23** presents the evaluation matrix with color coding based on:

- **Bold Green** text indicates a Build Option measure was favorable compared to the other Build Options in a category
- Black text indicates a Build Option measure was in the middle compared to other Build Options in a category
- **Bold Red** text indicates a Build Option measure was unfavorable compared to the other Build Options in a category or the measure does not meet study goals



### 13.5.2 Screening Summary

Build Option screening followed a 3-step process to compare and eliminate Build Options from further consideration:

1. **Intersection type:** SPI Build Options vs. DLT Build Options
2. **US16 northbound/southbound right turn lane treatment at US16B/Catron Boulevard:** free, single right turn lane or signalized, dual right turn lanes
3. **Sub-option review:** to determine if any can be screened out

#### *Step 1: Intersection Type Summary*

The first step compares the two overarching intersection types, the SPI and DLT Build Options. It was found that the SPI Build Option best meets the project purpose and need. It provides the best traffic operations, greatest predicted reduction in crashes, and better accommodates urbanizing land use through providing the greatest amount of capacity to accommodate growth in traffic volumes and seasonal and daily traffic fluctuations. Further, the SPI Build Option provides the greatest benefit in nearly all the remaining measures analyzed as part of this study.

The primary drawback to the SPI was cost. However, the BCA found that an SPI project was equally as feasible as a DLT project. Further, there are several unquantifiable measures not accounted for in the BCA that are notably important to the long-term operations and safety that support an SPI. Based on these findings, it was recommended that the three SPI Build Options be carried forward and all DLT Build Options be eliminated from further consideration.

#### *Step 2: US16 Northbound/Southbound Right Turn Lane Treatment at US16/Catron Boulevard Intersection Summary*

The second step of the screening process focuses on US16 northbound/southbound right turn lane treatment at US16B/Catron Boulevard single point intersection. Based on a review of traffic operations throughout the planning horizon, it was determined that:

- SPI Build Option 1.1a provides the best long-term traffic operations and was therefore the desired Build Option.
- Towards the end of the 2050 planning horizon, the PM peak hour experiences longer queues and greater number of stops on the US16 northbound/southbound right turn lanes. Therefore, it was desired that grading for dual right turn lanes shown in SPI 1.2 be incorporated to the final Build Option. This will allow for a quick conversion to signalized, dual right turn lanes at the off-ramps when volumes reach a point where it benefits overall operations and safety.

#### *Step 3: Initial Sub-Option Review*

The third step of the screening process focused on the eastbound US16B/Catron Boulevard right turn lane at Healing Way shown in SPI 1.1b. It was determined that the right turn lane be incorporated for the following reasons:

- Separates accelerating traffic from traffic slowing to turn right
- Allows right turn overlap phasing within traffic signal

- Driver expectancy of right turn lane at major intersection and existing right turn lane

Based on the overarching operational and safety benefits of SPI 1.1a, the recommended technically feasible alternative that best meets the established transportation needs is: **SPI 1.1a with the following modifications:**

- **Northbound/southbound US16 off-ramp grading to accommodate future dual right turn lanes (in SPI 1.2)**
- **Eastbound US16B/Catron Boulevard right turn lane at Healing Way (in SPI 1.1b)**

## 13.6 US16/US16B/Catron Boulevard Intersection Sub-Study Recommendations

The recommended technically feasible alternative that best meets the established transportation needs of the US16/US16B/Catron Boulevard intersection is Build Option 1.1a, SPI with separated, free northbound and southbound right turn lanes. Key benefits and differentiators of this Build Option include:

- Lowest overall interchange/intersection delay
  - LOS B in 2050 Planning Horizon AM and PM peak hours
  - Greatest available capacity to accommodate traffic growth and fluctuations within interchange/intersection
- Shortest US16 corridor travel time
- Shortest US16B/Catron Boulevard corridor travel time
- Greatest expected reduction in crashes from the No Build condition:
  - Fatal and injury crashes: 33% reduction
  - Total crashes: 27% reduction
- Provides the greatest separation between US16 and next adjacent US16B/Catron Boulevard signalized intersections
  - Best addresses weave and queue spillback concerns without degrading overall intersection/interchange operations
- Best addresses public and stakeholder support for long-term traffic operations and safety benefits
- Provides familiarity for driver expectancy, construction, maintenance, and operation
- Areas affected by access closures will be accommodated through frontage and rearage roads, consistent with local network planning completed to date
- BCA ratio greater than 1.0 showing that benefits are expected to exceed costs

Due to the operational benefits afforded to US16 northbound/southbound right turning traffic towards the end of the Planning Horizon, it is also recommended that grading for dual right turn lanes shown in SPI 1.2 be incorporated into SPI 1.1a for an easy transition to signalized, dual right turn lanes when needed to meet operational goals for the intersection. An eastbound US16B/Catron Boulevard right turn lane, shown in SPI 1.1b, is also recommended at Healing Way to separate accelerating and slowing/turning traffic approaching the intersection.

## 14.0 US16 Urban Area

The US16 corridor within the Rapid City urban area is rapidly developing and expected to generate several transportation needs for improvements within the 2050 Planning Horizon. Overarching needs align with those identified for the US16/US16B/Catron Boulevard intersection sub-study and include:

- Traffic operations due to traffic growth
- Safety
- Rapidly urbanizing land use

Ancillary to these needs, other items to address along the corridor include:

- Identify long-range corridor framework to guide future corridor improvements, network connectivity, and development/redevelopment access
- Improve spacing between US16 and US16 service road
- Improve multimodal mobility, safety, and connectivity along the corridor

With consideration to these needs and building upon the SPI recommendation from the US16/US16B/Catron Boulevard intersection sub-study, the following sub-sections present the development, analysis, and evaluation of US16 Urban Area corridor scenarios.

### 14.1 Common Corridor Scenario Features

#### 14.1.1 US16 Service Road

A US16 service road extends along the west side of US16 both north and south of US16B/Catron Boulevard. Spacing from the US16 mainline is approximately 85-90 feet, not conducive for long-range corridor operations and safety and far short of the SDDOT's 150-foot minimum and 250-foot desired spacing (*SDDOT Road Design Manual*) and AASHTO's recommended 300-foot spacing in high volume areas (*A Policy on Geometric Design of Highways and Streets*). Greater separation reduces the risk of traffic blocking turns onto the US16 service road and subsequent spillback onto the US16 mainline.

Through discussions with the SAT, it was determined that the existing US16 service road be maintained both north and south of US16B/Catron Boulevard in its current location with modifications to address long-range needs.

#### US16 service road benefits

- Maintains existing access to parcels and minimizes costs associated with relocating existing parcel access to other roadways
- Minimizes construction (cost) of new frontage/local network roadways to replace gaps if service road removed
- Maintains local network connectivity to the benefit of US16 corridor operations and safety
  - Gaps in service road connectivity would require short trips on US16, which in turn increases US16 turning movements at the expense of intersection operations and safety

### US16 service road needs to address

- Increase spacing with US16 to provide the minimum 150-foot separation and strive for the 250-foot separation desired by the SDDOT
- Provide a framework to identify future ownership and maintenance responsibilities as the service road will transition to more of a local network roadway

## 14.1.2 US16 Cross-Section and Alignment

### *Cross-Section 'Type'*

While the existing rural corridor cross-section provides high levels of mobility, long-range planning has recognized the area will become more urban and thus a rural corridor does not fit with future land use. It was determined that a suburban cross-section best met the goals for the US16 Urban Area, with an option to transition to an urban section when needed, based on the following benefits (refer to **Figure 23** for typical sections).

#### Suburban cross-section benefits

- Incorporates infrastructure that helps calm traffic volumes (curb and gutter, raised medians, narrower medians, more of an 'urban feel', etc.)
- Narrower median provides more compact, urban intersections. This is beneficial to intersection vehicular and multimodal operations due to shorter distances through the intersection.
- Outer ditch, instead of curb and gutter, provides desired snow storage to the outside of the travel way and shoulder. In an urban section, snow storage would occur on the shoulder and the windrow would reduce the effective width of the shoulder. In a suburban section, snow can be pushed into the ditch to maintain full shoulder width.
- Ample ROW width available to accommodate both roadside ditches and shared-use path/sidewalk within existing ROW
- Facilitates easy transition to urban cross-section at intersections to minimize ROW impacts and bring sidewalks/shared-use paths in tight with the intersection

### *Median width*

Two median widths, 40-foot and a narrower variable 12 to 28-foot, were deemed applicable along this corridor segment.

#### 40-foot median width benefits (through primary intersection areas south of Tower Road)

- Provides beneficial approach angles and opposing left turn offset at  $\frac{3}{4}$  access points
- Provides for offset left turn lanes at full access intersections (safety benefit)
- Provides flexibility for dual left turn lanes
- Limits the need for continual widening and narrowing of the corridor at intersections

### 12 to 28-foot median width benefits (through steep grade areas north of Tower Road)

- Narrows overall footprint of the corridor elements
  - Area has slope stability issues, so minimizing cut and fill impacts is desired
- Few intersections along the steeper segments, so there is minimal widening/narrowing needs to accommodate intersection turn lanes

### Alignment

Three primary alignment options were reviewed: 1) shifted west, 2) existing, and 3) shifted east. It was determined that a shifted east alignment best met goals for the corridor by providing the following benefits.

#### Shifted east alignment benefits

- Provides greater separation with US16 service road, with the following target minimum distances
  - 250 feet from signalized US16 intersections
  - 150 feet from unsignalized US16 intersections
- Improves constructability with work area being separate from existing lanes
- Maintains traffic on existing roadway during construction of new lanes
- Fewer utility impacts: existing utilities primarily located on west side

### Design Speed

It was desired that safety and mobility be prioritized along the US16 Urban Area corridor due to existing and anticipated travel patterns, the importance of the corridor to regional travel, and future functionality of the corridor. US16 Urban Area design speeds identified for concept development are:

- North of US16B/Catron Boulevard: 60 mph
- South of US16B/Catron Boulevard: 65 mph

### 14.1.3 Local Network

Construction of local network roadways along the corridor are typically driven by development. As areas are developed, the roadway network is constructed with tie points to existing infrastructure. To date, City of Rapid City, RCAMPO, and SDDOT area planning has provided the framework for the future local roadway network through the *Rapid City Major Streets Plan*.

The updated long-range local roadway network plan surrounding the US16/US16B/Catron Boulevard intersection is shown in **Figure 32**. This figure represents a long-range access and local network connectivity plan for the urban area surrounding the US16/US16B/Catron Boulevard intersection. It is recommended that subsequent updates of the *Rapid City Major Streets Plan* consider potential future roadways identified in this figure.



## 14.2 Corridor Scenarios

Two overarching corridor scenarios were developed for the US16 Urban Area. Both exhibit several consistent elements:

- SPI at US16/US16B/Catron Boulevard
- Promise Road and Tablerock Road shifted north
- US16 service road shifted south
- US16 alignment shifted east
- Shared-use path (east side) and sidewalk (west side)

The primary differences between the two scenarios focus on intersection type. The first scenario exhibits more traditional, familiar intersection types and the second incorporates alternative intersections at Moon Meadow Drive, Promise Road, and Enchantment Road.

### Scenario 1: 4-Lane Divided (Shifted East) with Intersection Improvements

- Includes traditional intersection types

### Scenario 2: 4-Lane Divided (Shifted East) with Intersection Improvements

- Includes alternative intersection types:
  - Unsignalized and signalized RCIs
  - Unsignalized and signalized MUTs

Scenario 1 and 2 elements are summarized in **Table 24** and **Figure 33** through **Figure 35**.

**Table 24: US16 Urban Area Corridor Scenario Intersection Option Matrix**

Corridor	Intersection	Scenario 1	Scenario 2
US16	Fort Hays access	¾ Access, RIRO, Closure	RIRO, Closure
	Moon Meadows Drive	Full Access - signalize when warranted	RCI, MUT
	Section Line Road	RIRO + NB LT, RIRO, Closure, Overpass	RIRO + NB LT, RIRO, Closure, Overpass
	Addison Avenue	Closed	Closed
	US16B/Catron Blvd	SPI	SPI
	Tucker Street	Closed	Closed
	Promise Road	Full Access - signalize when warranted	RCI
	Tablerock Road	¾ Access	¾ Access
	Enchantment Road	Full Access - signalize when warranted	RCI
	Tower Road	¾ Access, RIRO, Closure	RIRO, Closure
	Echo Road	¾ Access	¾ Access
	Cathedral Drive	No change	No change
US16B/ Catron Blvd	Les Hollers Way	Full Access - maintain signal	Full Access - maintain signal
	Healing Way	Full Access - maintain signal	Full Access - maintain signal
	Wellington Drive (west)	RIRO	RIRO
	Wellington Drive (east)	Full Access, ¾ Access	Full Access, ¾ Access



Scale in Feet  
0 225 450

Legend

- Proposed Roadway
- Raised Median
- Remove Roadway
- Existing ROW / Property Line
- Signalized Intersection (When Warranted)

US16/Moon Meadows Drive (MMD) Intersection Options

US16/Fort Hays Drive (Fort Hays) Intersection Options

US16/Section Line Road (SLR) Intersection Options

Refer to US16/US16B/Catron Boulevard Intersection Sub-Area for discussion of SPI consultant recommendation.

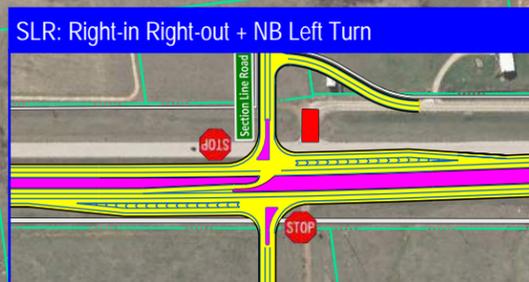
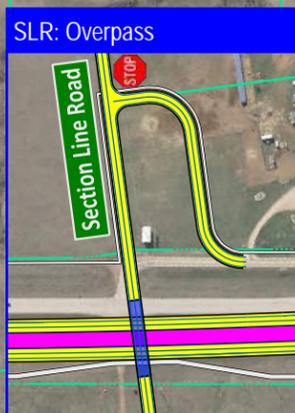
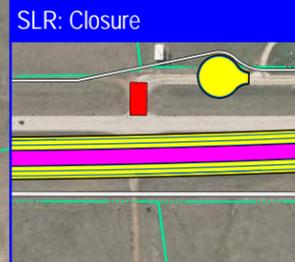
Fort Hays Access road is applicable to all access options.

Fort Hays Access

Moon Meadows Drive

MMD: Full Access Intersection - Signalize when Warranted

Fort Hays: Right-in Right-out



Sidewalk

Shared-use Path

Section Line Road

Addison Avenue

Catron Boulevard

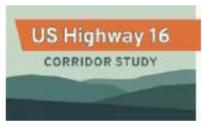
Healing Way

Signalized at Opening

16

US16 Urban (South)  
**Scenario 1**

Concepts Carried Forward  
Corridor: B (40' raised median) shifted east  
Intersections: MMD-1, FH-1-3 SLR-1-4



US16 Corridor Urban Area - South of US16B/Catron Boulevard  
Scenario 1: 4-Lane Divided (Shifted East) with Intersection Improvements  
US16 Corridor Study

Rapid City, SD

Figure  
**33**

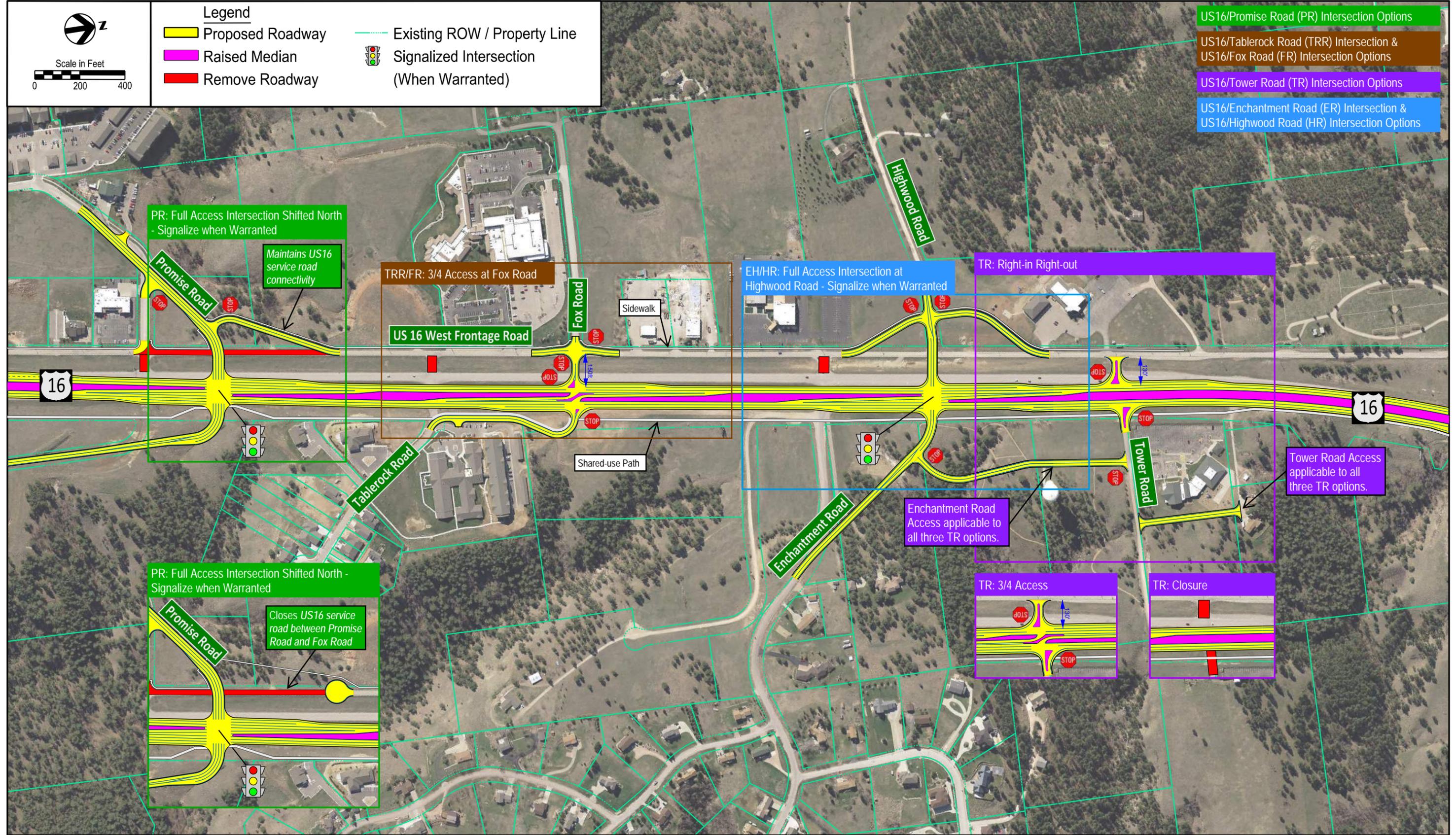


Scale in Feet  
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**Legend**

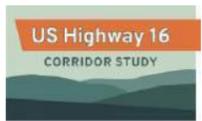
- Proposed Roadway
- Raised Median
- Remove Roadway
- Existing ROW / Property Line
- Signalized Intersection (When Warranted)

- US16/Promise Road (PR) Intersection Options
- US16/Tablerock Road (TRR) Intersection & US16/Fox Road (FR) Intersection Options
- US16/Tower Road (TR) Intersection Options
- US16/Enchantment Road (ER) Intersection & US16/Highwood Road (HR) Intersection Options



US16 Urban (North)  
**Scenario 1**

Concepts Carried Forward  
Corridor: B (40' raised median) shifted east  
Intersections: PR-1-2, TRR-2, ER/HR-1



US16 Corridor Urban Area - North of US16B/Catron Boulevard  
Scenario 1: 4-Lane Divided (Shifted East) with Intersection Improvements  
US16 Corridor Study

Rapid City, SD

Figure  
**33**



Scale in Feet  
0 225 450

Legend

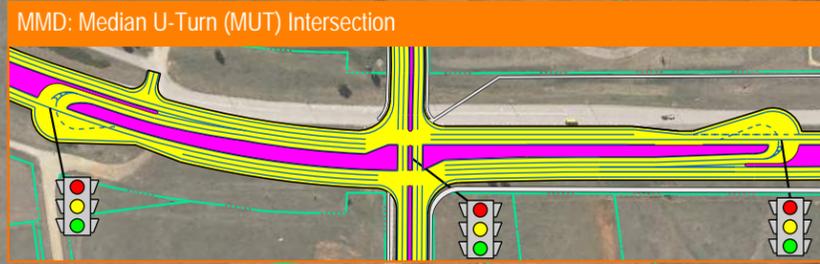
- Proposed Roadway
- Raised Median
- Remove Roadway
- Existing ROW / Property Line
- Signalized Intersection (When Warranted)

US16 & Moon Meadows Drive (MMD) Intersection Options

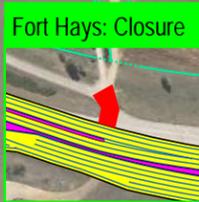
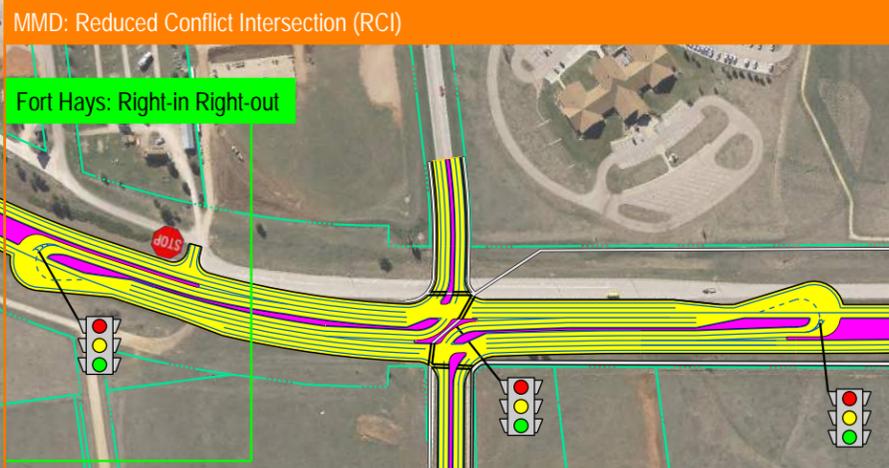
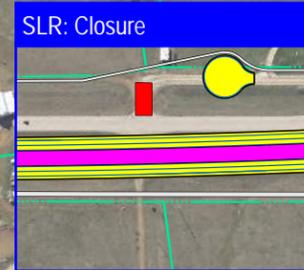
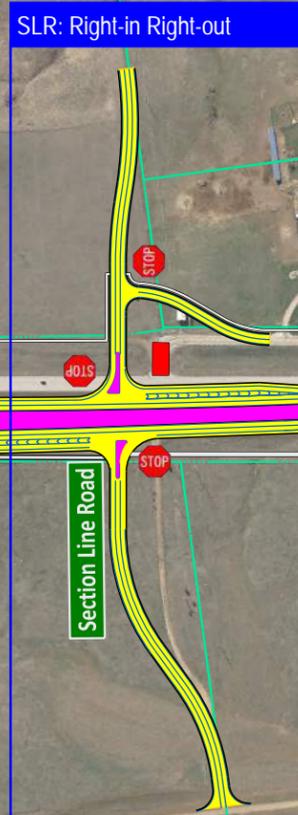
US16 & Fort Hays Drive (Fort Hays) Intersection Options

US16 & Section Line Road (SLR) Intersection Options

Refer to US16/US16B/Catron Blvd Intersection Sub-Area for further discussion of SPI consultant recommendation:



MMD RCI and MUT Intersection Options  
A: Phased Approach - Open Unsignalized, Signalize when Warranted  
B: Signalize at Opening (shown in figure)



Fort Hays Access road is applicable to all access options.

Fort Hays Access

Moon Meadows Drive

MMD: Reduced Conflict Intersection (RCI)

Fort Hays: Right-in Right-out

16

Section Line Road

Shared-use Path

Addison Avenue

Healing Way

Catron Boulevard

Signalized at Opening

US16 Urban (South)  
Scenario 2

Concepts Carried Forward  
Corridor: B (40' raised median) shifted east  
Intersections: MMD-2-5, FH-1-2 SLR-1-4



US16 Corridor Urban Area - South of US16B/Catron Boulevard  
Scenario 2: 4-Lane Divided (Shifted East) with Alternative Intersection Improvements  
US16 Corridor Study

Rapid City, SD

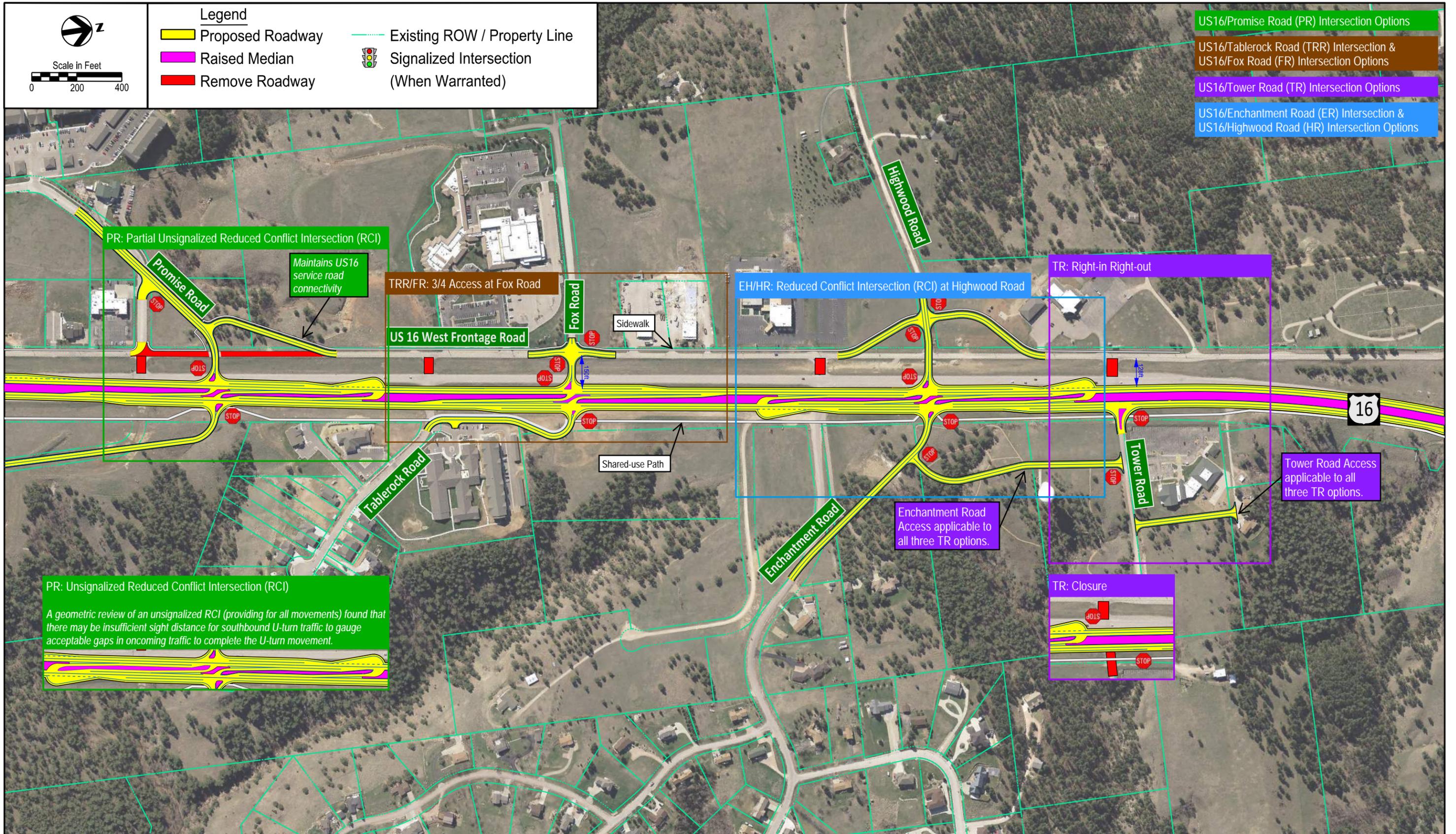


Scale in Feet  
0 200 400

Legend

- Proposed Roadway
- Raised Median
- Remove Roadway
- Existing ROW / Property Line
- Signalized Intersection (When Warranted)

- US16/Promise Road (PR) Intersection Options
- US16/Tablerock Road (TRR) Intersection & US16/Fox Road (FR) Intersection Options
- US16/Tower Road (TR) Intersection Options
- US16/Enchantment Road (ER) Intersection & US16/Highwood Road (HR) Intersection Options



PR: Partial Unsignalized Reduced Conflict Intersection (RCI)

Maintains US16 service road connectivity

TRR/FR: 3/4 Access at Fox Road

EH/HR: Reduced Conflict Intersection (RCI) at Highwood Road

TR: Right-in Right-out

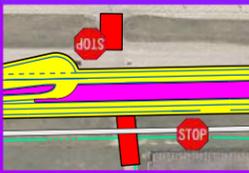
Tower Road Access applicable to all three TR options.

Enchantment Road Access applicable to all three TR options.

PR: Unsignalized Reduced Conflict Intersection (RCI)

A geometric review of an unsignalized RCI (providing for all movements) found that there may be insufficient sight distance for southbound U-turn traffic to gauge acceptable gaps in oncoming traffic to complete the U-turn movement.

TR: Closure



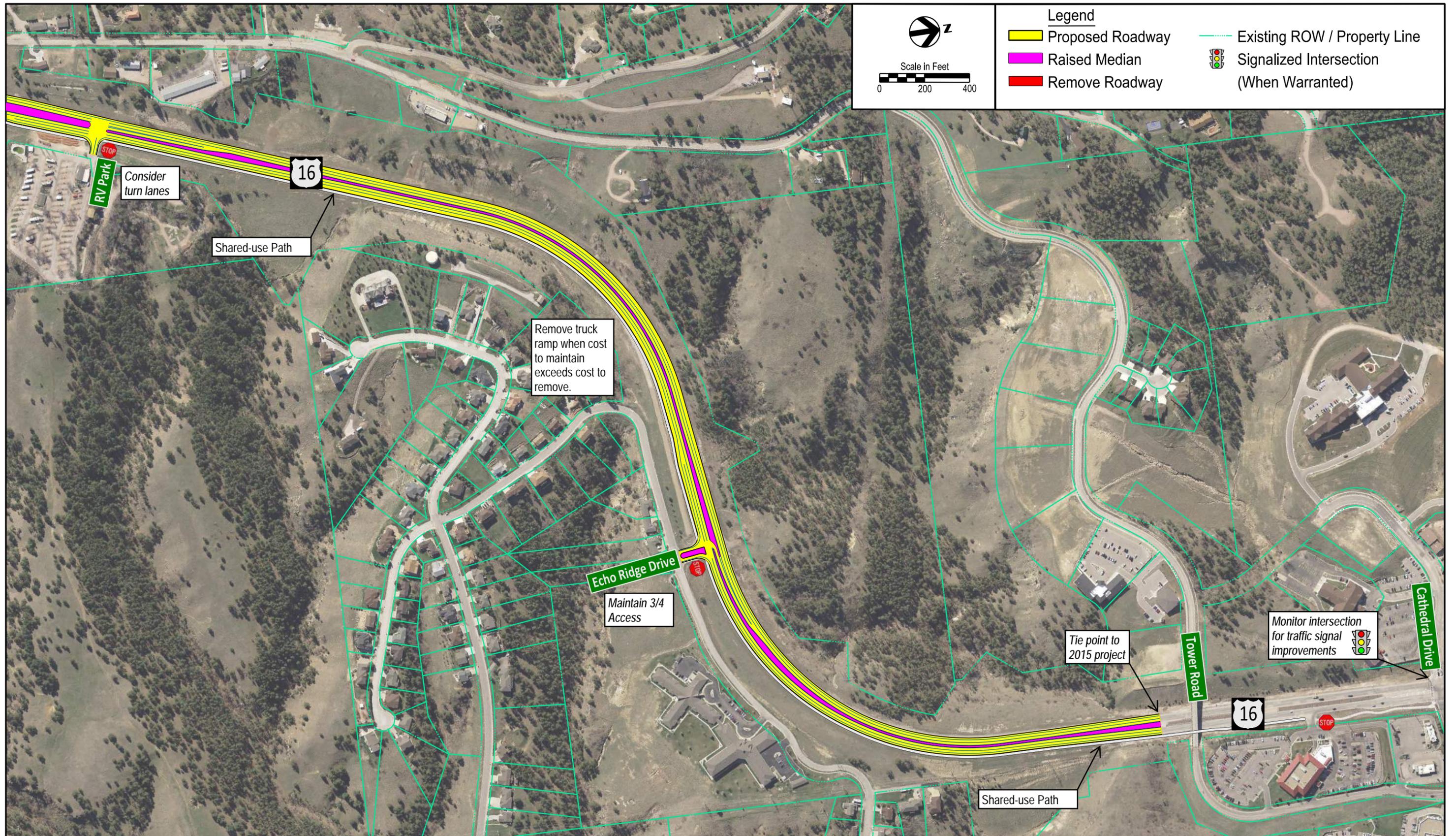
# US16 Urban (North) Scenario 2

Concepts Carried Forward  
Corridor: B (40' raised median) shifted east  
Intersections: PR-3-5, TRR/FR-2, ER/HR-2, TR-3-4



US16 Corridor Urban Area - North of US16B/Catron Boulevard  
Scenario 2: 4-Lane Divided (Shifted East) with Alternative Intersection Improvements  
US16 Corridor Study

Rapid City, SD



## 14.3 Intersection Design Considerations

The following summarizes important design considerations, such as terrain, existing development, and intersection spacing, related to the feasibility of proposed options.

### Fort Hays Access

- Northbound left turn into Fort Hays not feasible due to location of Moon Meadows Drive RCI or MUT southern U-turn intersection

### Moon Meadows Drive

- Unsignalized RCI and MUT intersection options
  - South U-turn located approximately 1,030 feet south of main intersection to provide U-turn movement sight distance due to crest vertical curve
    - Typical spacing is 800 feet for rural RCIs and as short as 600 feet for urban RCIs
- Northbound US16 grade at signalized intersection
  - Estimated grade at 2050 Build condition back of 95th percentile queues shown in **Figure 36**.

### Section Line Road

- Unsignalized RIRO access needs to shift 100 feet south to fit within intersection functional area window of opportunity.
  - No window available for signalized intersection (overlapping functional areas)
  - Insufficient spacing/weave distance between southbound entrance ramp and a potential southbound left turn lane
  - Insufficient sight distance for eastbound/westbound left turn and through movements
- US16 service road needs to intersect Section Line Road further west to provide desired spacing between US16 mainline and first adjacent intersection

### Promise Road

- Terrain (steep ravines) and existing development around Tablerock Road limits the extent Promise Road intersection can be moved north.
  - Intersection spacing limitations represent a ceiling to feasible design speeds north of US16B/Catron Boulevard
- Traditional, signalized intersection
  - Shift approximately 320 feet north for 60 mph design speed
  - Location reflects furthest north intersection can be located without significant impacts, thus used as location for all intersection options
- Signalized RCI at 60 mph design speed
  - Insufficient signalized intersection functional area between northbound entrance ramp and signalized south U-turn intersection

- Unsignalized RCI at 60 mph design speed
  - Insufficient southbound U-turn sight distance with northbound entrance ramp traffic
- US16 service road needs to intersect Promise Road further west to provide 250-foot desired spacing between US16 mainline and first adjacent intersection

#### **Tablerock Road**

- Needs to shift north with relocation of Promise Road intersection
  - Proposed location ties in with Fox Road
- US16 service road needs shift slightly west to provide 150-foot minimum separation from US16 mainline

#### **Enchantment Road**

- No major constraints to intersection spacing or design within SDDOT ROW.
- Enchantment Road and Highwood Road currently offset.
  - One (or both) will need to be realigned to incorporate direct Highwood Road access to US16
    - Proposed location reflected in the layouts is shifted north to Highwood Road. Location feasibility is subject to future ROW availability, property impacts, and future development.
- US16 service road needs to be moved west to provide 250-foot desired separation between US16 mainline and first adjacent intersection
  - Greater flexibility to shift west at Highwood Road than at existing Enchantment Road intersection

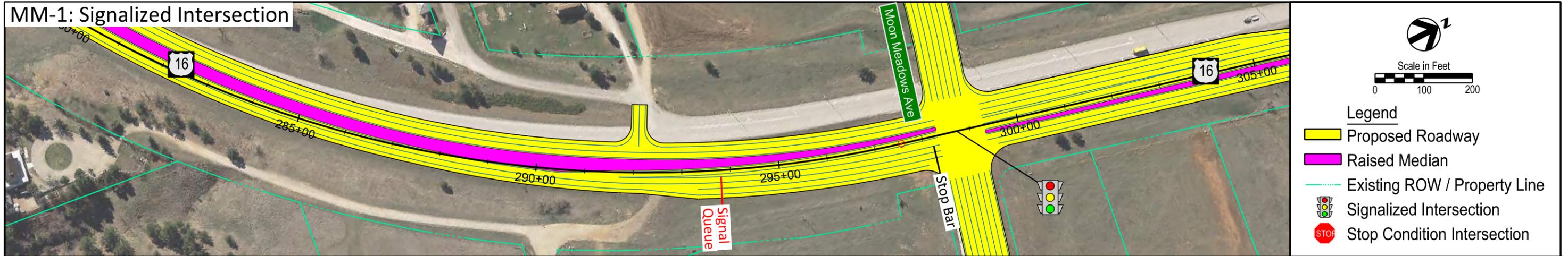
#### **Tower Road (south)**

- US16 service road does not provide desired separation at current location
  - Existing development limits options to shift US16 service road west
- Access closure would require a local network/frontage connection to Enchantment Road on east side

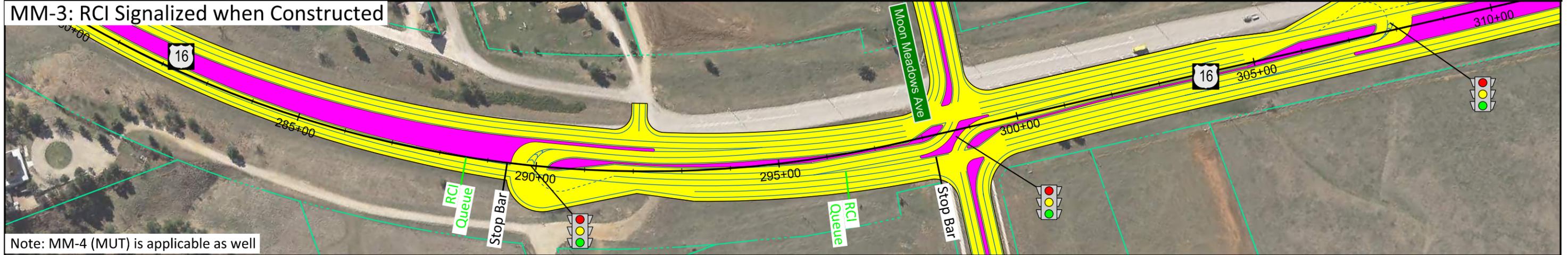
#### **US16B/Catron Boulevard Corridor Intersections**

- Locations and intersection traffic control have been established
- Eastbound US16/Catron Boulevard outer lane taper anticipated through Wellington Drive (west) intersection
- Westbound Healing Way left turn lane extends through Wellington Drive (west) intersection and thus RIRO maintained at Wellington Drive (west)

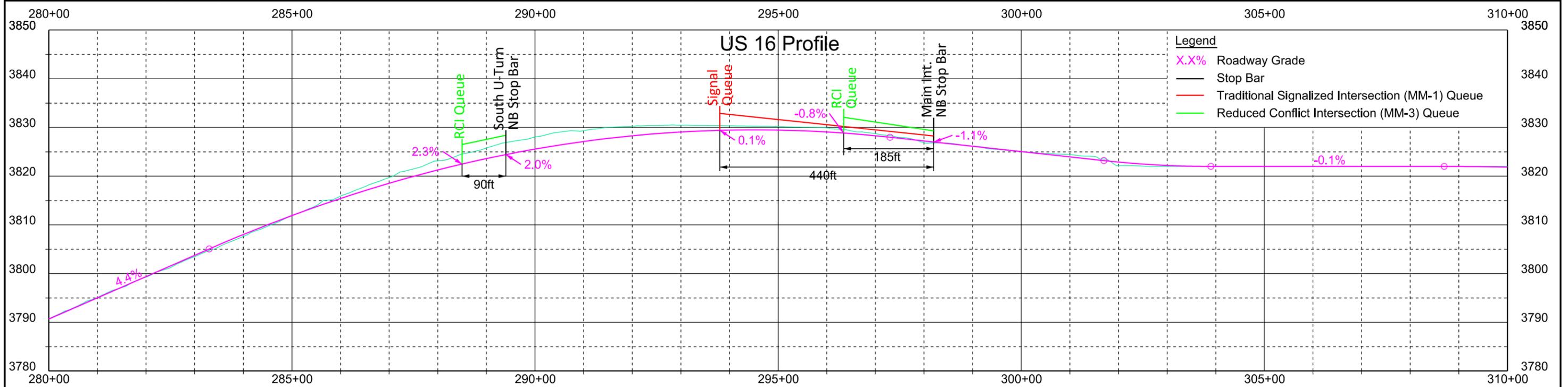
MM-1: Signalized Intersection



MM-3: RCI Signalized when Constructed



Note: MM-4 (MUT) is applicable as well



US16 Corridor Urban Area  
 US16/Moon Meadows Drive Intersection Back of Queue Points and Grade  
 US16 Corridor Study

Rapid City, SD

Figure

36

## 14.4 US16 Corridor Traffic Operations

The following sections present traffic operations findings related to different intersection treatments, multimodal corridor measures, and US16 mainline through movement operations.

### 14.4.1 Intersection Operations

Table 25 and Table 26 summarize individual intersection operations with Year 2050 traffic volumes across the analyzed options. Additional information is provided in the *US16 Urban Area Intersection Control Evaluation* technical memo.

**Table 25: Scenario 1 Major Intersection Operations (2050 Build)**

US16 Intersection	Intersection Type	Measure	AM Measure / LOS	PM Measure / LOS
Moon Meadows Drive	Traffic Signal	Intersection Delay	25.5 / C	32.4 / C
US16 Over US16B/Catron Blvd	SPI	ETT	Free	Free
Promise Road	Traffic Signal	Intersection Delay	13.5 / B	15.1 / B
Enchantment Road	Traffic Signal	Intersection Delay	11.1 / B	12.8 / B
Cathedral Drive	Traffic Signal	Intersection Delay	23.0 / C	34.2 / C

ETT and delay measured in seconds/vehicle.

**Table 26: Scenario 2 Major Intersection Operations (2050 Build)**

US16 Intersection	Intersection Type	Measure	AM Measure / LOS	PM Measure / LOS
Moon Meadows Drive	Signalized RCI or MUT	ETT	24.0 / C	24.9 / C
US16 Over US16B/Catron Blvd	SPI	ETT	Free	Free
Promise Road	Unsignalized RCI	ETT	4.6 / A	4.5 / A
	Signalized RCI	ETT	14.8 / B	13.5 / B
Enchantment Road	Unsignalized RCI	ETT	4.0 / A	3.2 / A
	Signalized RCI	ETT	12.8 / B	11.4 / B
Cathedral Drive	Traffic Signal	Intersection Delay	23.0 / C	34.2 / C

ETT and delay measured in seconds/vehicle.

Alternative intersection configurations, when applied to scale of intersection traffic volumes, generally exhibit less overall intersection delay/ETT than a traditional signalized intersection. The primary benefit is associated with less delay for the high volume US16 through movements, whether it is zero delay through free movements in an unsignalized RCI or minor delay through a two-phase signal operation in a signalized RCI or MUT.

Signalized alternative intersections do not always lead to improved overall intersection operational results. An example is the Promise Road and Enchantment Road intersections, where an unsignalized RCI exhibits ample capacity for the forecasted traffic volumes. When the RCI is signalized in the analysis, it results in greater overall delay than a traditional signalized intersection. The RCI’s two-phase signal efficiencies are less pronounced because the traditional intersection also provides minimal delay for the US16 mainline. The extra

travel time associated with an RCI is more apparent and ultimately leads to greater delay for the signalized RCI at low traffic volumes.

At the minor intersections, shown in **Table 27**, there are minimal differences in delay between a ¾ and RIRO access. Both restrict the higher-delay left or through movements from the side-street and redirect traffic to a right turn that experiences less conflict. All options presented in the table are feasible from an operations standpoint.

**Table 27: Scenario 1 and 2 Minor Intersection Operations (2050 Build)**

US16 Intersection	Intersection Type	Measure	AM Measure / LOS	PM Measure / LOS
Fort Hays Access	RIRO	Overall: (WCSC Delay):	0.1 / A (15.1 / B)	0.1 / A (15.1 / B)
	¾ Access	Overall: (WCSC Delay):	0.1 / A (12.3 / B)	0.1 / A (12.3 / B)
Section Line Road *	RIRO	Overall: (WCSC Delay):	0.5 / A (16.1 / C)	1.4 / A (23.1 / C)
	RIRO + NB LT	Overall: (WCSC Delay):	0.7 / A (15.6 / C)	1.5 / A (22.1 / C)
Tablerock Road	¾ Access	Overall: (WCSC Delay):	1.0 / A (16.4 / C)	0.9 / A (17.1 / C)
Tower Road	RIRO	Overall: (WCSC Delay):	0.7 / A (16.9 / C)	0.9 / A (18.1 / C)
	¾ Access	Overall: (WCSC Delay):	0.5 / A (17.3 / C)	0.7 / A (18.3 / C)
Echo Ridge Drive	¾ Access	Overall: (WCSC Delay):	0.9 / A (19.1 / C)	0.7 / A (16.4 / C)

ETT and delay measured in seconds/vehicle.

Section Line Road\* - not an analysis intersection. Traffic volumes reflect a sensitivity estimate of 50% closed Addison Avenue redistribution.

### 14.4.2 Corridor Multimodal Operations

Corridor multimodal LOS was reviewed from a holistic view due to HCS limitations with alternative intersections and off-site pedestrian/bicycle features. The following results were obtained from the Scenario 1 HCS Streets module and establish a representative baseline for the proposed improvements. It is estimated that conversion of Scenario 1 traditional signalized intersections to Scenario 2 alternative intersections would maintain or improve LOS measures.

**Table 28: Scenario 1 US16 Corridor Multimodal LOS - 2050 Build Conditions**

Multimodal Measure	AM LOS NB / SB	PM LOS NB / SB
Vehicular Facility LOS	A / A	A / A
Pedestrian Facility LOS	C / C	C / C
Bicycle Facility LOS	A / A	A / A

Key corridor features contributing to favorable multimodal facility LOS scores include:

- Vehicular
  - US16 mainline free movement over the US16B/Catron Boulevard single point intersection removes the most significant element of corridor delay and congestion
  - The bulk of the forecasted turning movements to/from the US16 urban corridor occurs at the SPI
    - Enter/exit US16 via merge and diverge ramp junctions.
  - Low traffic signal density with ½-mile or greater spacing of signalized intersections
- Multimodal
  - Continuous shared-use path and sidewalk along corridor
  - Outside shoulders on US16 for bicycles
  - Few signalized intersections or stop-controlled access points for vehicular-bike/ped conflicts and delay

### 14.4.3 US16 Mainline Operations

To further illustrate the operational benefits or drawbacks of each major intersection option, the following tables were developed to look at US16 mainline through movement metrics from both the individual intersection and overall corridor perspectives.

#### *US16 Individual Intersection Through Movement Comparison*

Table 29 through Table 31 further illustrate US16 through movement measures at the three major intersections:

- US16 mainline delay: control delay for the US16 through movements
- Percent US16 northbound/southbound through phase duration: range of US16 through movement traffic signal phase time (green + yellow + all red)
- US16 northbound/southbound approach stops: range of US16 through movement average number of stops per vehicle

**Table 29: US16 Through Movement Operations at Moon Meadows Drive Intersection (2050 Build)**

Scenario	Intersection Option	AM US16 Mainline Delay SB / NB	PM US16 Mainline Delay SB / NB	% US16 NB/SB Thru Phase Duration (range)	US16 NB/SB Approach Stops (stops/veh, range)
1	Signalized Intersection	24 / 28	30 / 35	40-45%	0.52 - 0.62
2	Signalized RCI	12 / 14	16 / 19	70-80%	0.11 - 0.37
	Unsignalized-Signalized RCI	12 / 14	16 / 19	70-80%	0.11 - 0.37
	Signalized MUT	12 / 14	16 / 19	70-80%	0.11 - 0.37

Delay measured in seconds/vehicle.

**Table 30: US16 Through Movement Operations at Promise Road Intersection (2050 Build)**

Scenario	Intersection Option	AM US16 Mainline Delay SB / NB	PM US16 Mainline Delay SB / NB	% US16 NB/SB Thru Phase Duration (range)	US16 NB/SB Approach Stops (stops/veh, range)
1	Signalized Intersection	11 / 10	9 / 15	65-70%	0.25 - 0.41
2	Unsignalized RCI	0 / 0	0 / 0	n/a - 100%	0
	Signalized RCI	9 / 9	10 / 9	75-85%	0.04 - 0.17

Delay measured in seconds/vehicle.

**Table 31: US16 Through Movement Operations at Enchantment Road Intersection (2050 Build)**

Scenario	Intersection Option	AM US16 Mainline Delay SB / NB	PM US16 Mainline Delay SB / NB	% US16 NB/SB Thru Phase Duration (range)	US16 NB/SB Approach Stops (stops/veh, range)
1	Signalized Intersection	7 / 9	10 / 10	70-75%	0.26 - 0.35
2	Unsignalized RCI	0 / 0	0 / 0	n/a - 100%	0
	Signalized RCI	6 / 9	8 / 7	80-85%	0.05 - 0.1

Delay measured in seconds/vehicle.

Generally, the higher the traffic volumes on the side streets, the greater the benefit of alternative intersections from a US16 mainline operations standpoint. Moon Meadows Drive intersection shows the greatest difference between a signalized traditional and alternative intersection (RCI or MUT). A traditional intersection requires considerably more green time to serve side-street and US16 left turning traffic demand. This results in only 40-45 percent of the cycle being devoted to the high volume US16 through volume. Over half of the northbound US16 traffic will need to stop at the traffic signal. For a signalized RCI or MUT, 70-80 percent of the traffic signal cycle can be devoted to US16 through traffic. This reduces mainline delay by half and results in approximately 1/3 or less of all entering US16 through traffic needing to stop at a signal.

At Promise Road and Enchantment Road, an unsignalized RCI stands out due to the free US16 through movements. However, a signalized RCI results in similar US16 mainline delay as a traditional signalized intersection because a traditional intersection can accommodate side-street traffic volumes with a similar amount of green time as an alternative intersection.

### *US16 Corridor Through Movement Travel Time Comparison*

To illustrate operational benefits and drawbacks from the corridor perspective, corridor through movement travel times were calculated to reflect the time it would take for a motorist to traverse through the entire urban area. This analysis is an adaption of HCS Streets module corridor segment output and Scenario 2 travel times are estimated using Scenario 1 running time plus through delay at each respective alternative intersection.

Overall, US16 mainline through movement corridor travel time is approximately 20 to 38 seconds less in Scenario 2 when compared to Scenario 1, as shown in **Table 32**. Total travel time generally ranges between 5 and 6.5 minutes and thus the alternative intersections provide a 5-10 percent reduction in travel time.

**Table 32: US16 Urban Corridor Travel Times (2050 Build)**

Scenario	AM Travel Time (sec) NB / SB	PM Travel Time (sec) NB / SB
Scenario 1	369 / 344	388 / 367
Scenario 2	349 / 318	354 / 329
<i>Travel time savings in Scenario 2</i>	<i>-20 / -26</i>	<i>-35 / -38</i>

Scenario 1: traditional signalized intersections at Moon Meadows Drive, Promise Road, and Enchantment Road  
Scenario 2: signalized RCI at Moon Meadows Drive and unsignalized RCI at Promise Road and Enchantment Road

## 14.5 US16B/Catron Boulevard Corridor Traffic Operations

US16B/Catron Boulevard corridor operations are interchangeable with the two US16 corridor scenarios. Save for the Wellington Drive intersections, the other intersections were analyzed in detail as part of the US16/US16B/Catron Boulevard intersection sub-area analysis. The following table summarizes findings presented in that analysis as well as operational measures at the two Wellington Drive intersections.

**Table 33: US16B/Catron Boulevard Corridor Intersection Operations (2050 Build)**

US16B/Catron Blvd Intersection	Intersection Type	Measure	AM Measure / LOS	PM Measure / LOS
Les Hollers Way	Traffic Signal	Intersection Delay	23.6 / C	31.3 / C
US16B/Catron Blvd - SPI Build Option 1.1a	SPI	Signalized Intersection ETT*	26.5 / B	22.7 / B
Healing Way	Traffic Signal	Intersection Delay	20.3 / C	22.7 / C
Wellington Drive (West)	RIRO	Overall: (WCSC Delay):	0.4 / A (17.0 / C)	0.2 / A (18.7 / C)
Wellington Drive (East)	¾ Access	Overall: (WCSC Delay):	1.7 / A 17.0 / C	1.3 / A (18.2 / C)**
	Full Access, TWSC	Overall: (WCSC Delay):	<b>43.1 / E</b> (1508.8 / F)	<b>- / F</b> ( - / F)

ETT and delay measured in seconds/vehicle.

\* SPI ETT LOS measures based on ramp terminal intersection O-D LOS thresholds.

\*\* EB LT delay: 36.0 / E

The impact of increasing US16B/Catron Boulevard traffic volumes is evident in the TWSC full access option at the Wellington Drive (East) intersection. It will become increasingly difficult for side-street motorists to find an adequate gap to cross or turn left. Internal connectivity to the Healing Way traffic signal or providing good U-turn opportunities will be important to providing safe access at the Wellington Drive intersections.

Corridor multimodal measures were also analyzed in HCS between the two signalized intersections, shown in **Table 34**. Given the importance of the segment's intersections in managing US16/US16B/Catron Boulevard traffic volumes as well as distributing traffic to/from the local network, the corridor is shown to manage multimodal travel well along the short analysis segment. The maximized spacing between the SPI signalized intersection and adjacent signalized intersections is a notable benefit to overall corridor operations.

**Table 34: US16B/Catron Boulevard Corridor Multimodal LOS (2050 Build)**

US16 Urban Area Segment	AM LOS EB / WB	PM LOS EB / WB
Vehicle Facility LOS	D / D	D / D
Pedestrian Facility LOS	D / D	C / D
Bicycle Facility LOS	C / C	C / C

Vehicular facility LOS based on percent of base free-flow speed.

For a given direction of travel along the segment, link and downstream point performance measures are combined for overall segment performance.

## 14.6 Predictive Safety

Baseline IHSDM predictive safety analysis results for the two US16 urban corridor scenarios are shown in **Table 35**. These results highlight the overarching predicted safety benefits associated with corridor-wide improvements on US16 when compared to the No Build condition.

**Table 35: US16 Urban Area Corridor Predicted Crashes (2026-2050)**

Scenario	F&I Crashes +/- from baseline	% Increase / Decrease	Total Crashes +/- from baseline	% Increase / Decrease
No Build (baseline)	440	-	1323	-
Scenario 1	-107	-24%	-323	-24%
Scenario 2	-137	-31%	-390	-29%

Scenario 1: reflects IHSDM scenario 1-2.

Scenario 2: reflects IHSDM scenario 2-5.

The most notable benefit of the two corridor scenarios is the proposed SPI and associated corridor improvements, which is discussed further in the US16/US16B/Catron Boulevard sub-area analysis reports. Beyond the SPI, there are several other corridor improvements beneficial to safety at both the intersection and corridor-segment levels.

Major intersection improvements play a notable role to the reduction in predicted crashes. The following three tables compare the different intersection types carried forward from the ICE analysis for Moon Meadows Drive, Promise Road, and Enchantment Road intersections. At all three interactions, the signalized intersection provides a modest predicted reduction in crashes. The most notable improvement occurs at Promise Road with the addition of turn lanes in conjunction with a traffic signal.

One of the primary benefits of the alternative intersection configurations is the removal of select left turn and through movements from the side-street approaches. Angle crashes are more common with these movements and often result in high severity injuries due to the vehicle speeds on the highway mainline. Redirecting these movements as right turns to a downstream U-turn has shown significant benefit in reducing high-severity crashes and is reflected in the safety analysis.

**Table 36: US16/Moon Meadows Drive Predicted Crashes (2026-2050)**

Scenario	Intersection Option	F&I Crashes +/- from baseline	% Increase / Decrease	Total Crashes +/- from baseline	% Increase / Decrease
No Build	No Build (baseline)	29	-	84	-
1	Signalized Intersection	-2	-7%	-6	-7%
2	Signalized RCI	-5	-17%	-2	-2%
	Unsignalized RCI - Signalized RCI	-10	-35%	-19	-23%
	Signalized MUT	-7	-24%	-4	-5%

**Table 37: US16/Promise Road Predicted Crashes (2026-2050)**

Scenario	Intersection Option	F&I Crashes +/- from baseline	% Increase / Decrease	Total Crashes +/- from baseline	% Increase / Decrease
No Build	No Build (baseline)	32	-	77	-
1	Signalized Intersection	-12	-37%	-18	-23%
2	Unsignalized RCI	-27	-84%	-57	-75%

**Table 38: US16/Enchantment Road Predicted Crashes (2026-2050)**

Scenario	Intersection Option	F&I Crashes +/- from baseline	% Increase / Decrease	Total Crashes +/- from baseline	% Increase / Decrease
No Build	No Build (baseline)	25	-	60	-
1	Signalized Intersection	-5	-21%	-4	-7%
2	Unsignalized RCI	-20	-82%	-43	-71%

Minor road intersections also exhibit an opportunity to improve safety and reduce expected crashes along the corridor. The beneficial elements are similar to those in the alternative intersections, including the elimination of direct through and left turn movements from the stop-controlled side street approach.

**Table 39: US16 Urban Area Minor Intersection Predicted Crashes (2026-2050)**

US16 Intersection	Intersection Option	F&I Crashes +/- % from baseline	Total Crashes +/- % from baseline
Fort Hays Access	Full Access - Baseline, No Build	18	44
	¾ Access	-49%	-52%
	RIRO*	-66%	-67%
	Closed	-100%	-100%
Section Line Road	Full Access - Baseline, No Build	20	50
	RIRO + NB LT	-69%	-69%
	RIRO*	-78%	-78%
	Closed	-100%	-100%
Tablerock Road	Full Access - Baseline, No Build	18	83
	¾ Access	-20%	-58%
Tower Road (south)	Full Access - Baseline, No Build	14	34
	¾ Access	-23%	-24%
	RIRO*	-47%	-48%
	Closed	-100%	-100%

\* Reflects option used in US16 Urban Area Corridor scenario predictive safety analysis

## 14.7 Long Range Considerations

The following long-range regional connections identified in the *Rapid City Major Streets Plan* may have an impact on traffic patterns and timing and should be considered when prioritizing improvements:

### Les Hollers Way extension to Sheridan Lake Road

- RCAMPO travel demand model shows this connection may pull a notable amount of east/west traffic, west of US16, from Moon Meadows Drive.
- Expected impact on study area traffic volumes when constructed:
  - Increase in traffic along Catron Boulevard at Les Hollers Way and SPI intersections
  - Decrease in traffic along Moon Meadows Drive at US16 intersection
- Incorporated in study traffic forecasts: Yes

### Moon Meadows Drive extension east to SD79

- RCAMPO travel demand model shows low to moderate volumes on this connection until the southern urban area is more significantly developed.
- Expected impact on study area traffic volumes when constructed:
  - Increase on east/west corridor through volumes at US16/Moon Meadows Drive intersection
- Incorporated in study traffic forecasts: No, travel demand model used in the forecast development does not include Moon Meadows Drive volumes to SD79

### Section Line Road extension east to SD79

- US16/Section Line Road connection was not analyzed in this corridor study. Previous planning studies have identified an overpass with US16 corridor.
- Expected impact on traffic volumes when constructed:
  - Likely see some traffic diverted from US16B/Catron Boulevard corridor
- Incorporated in study traffic forecasts: No, travel demand model used in the forecast development does not include Section Line Road volumes to SD79

## 14.8 Future Pavement Needs Summary

Upcoming investment needs along the corridor segment include (*SDDOT Needs Book* timeline):

- US16 south of Catron Boulevard
  - Mill and overlay (2030-2035)
  - Pavement (PCCP) reconstruction within US16B/Catron Boulevard intersection area (2025-2030)
- US16 north of Catron Boulevard
  - Pavement (PCCP) reconstruction (2025-2030)
  - Corridor improvements, to be determined based on recommendations from this study, 2025-2028 developmental STIP
- US16B/Catron Boulevard east of US16
  - Pavement restoration (2035-2040)

Currently, the *SDDOT Needs Book* shows a need to reconstruct US16 north of US16B/Catron Boulevard in the 2025-2030 planning window. This would be an opportune time to provide long-term improvements and tie into the planned US16/US16B/Catron Boulevard SPI project.

## 14.9 Public Comment Summary

Public and stakeholder comments primarily focused on the US16/US16B/Catron Boulevard intersection Build Options. Beyond that intersection, comments from the third public meeting included:

- Several comments supporting traditional intersection (signalized) at US16/Moon Meadows Drive over the RCI configuration
- Questions regarding potential impacts to access, and timing, at Tablerock Road, Enchantment Road, and Section Line Road
- Lower speed limit on US16; opinion that current speeds are too high
- Difficult to turn out of Wellington Drive intersection(s)

## 14.10 Evaluation Summary and Recommendations

**Table 40** through **Table 43** summarizes intersection components, evaluation measures, and benefits/drawbacks for each of the major intersections within the US16 Urban Area.

**Table 40: US16/Moon Meadows Drive Intersection Summary (Components, Matrix, and Benefits/Drawbacks)**

1. Signalized Intersection (Full Access - Signalize when Warranted)	2. Signalized Reduced Conflict Intersection (RCI)	3. Signalized Median U-Turn (MUT) Intersection
<ul style="list-style-type: none"> <li>Dual left turn lanes on all quadrants (phased implementation)</li> <li>Single right turn lanes</li> <li>Signalize intersection (when warranted)</li> </ul>	<ul style="list-style-type: none"> <li>US16 left turns to Moon Meadows Drive located at main intersection</li> <li>Moon Meadows Drive through traffic rerouted to U-turns</li> <li>Dual US16 left turn lanes and U-turns (phased implementation)</li> <li>Dual Moon Meadows Drive right turn lanes (phased implementation)</li> <li>Signalize south U-turn upon opening due to sight distance</li> <li>Option to open as unsignalized and signalize when warranted</li> </ul>	<ul style="list-style-type: none"> <li>US16 left turns to Moon Meadows Drive rerouted to U-turns</li> <li>Moon Meadows Drive through traffic accommodated at main intersection</li> <li>Dual US16 left turn lanes and U-turns (phased implementation)</li> <li>Dual Moon Meadows Drive right turn lanes (phased implementation)</li> <li>Signalize south U-turn upon opening due to sight distance</li> <li>Unsignalized to Signalized MUT option also applicable (similar to RCI)</li> </ul>
<ul style="list-style-type: none"> <li>Planning-level traffic signal warrants: met by 2026</li> <li>All Scenarios require modification of Fort Hays access due to future turn lane lengths and include a rearage connection to Moon Meadows Drive</li> </ul>		

Option	2050 Traffic Operations					Safety (2026 - 2050)		ICE B/C Ratio	Geometrics US16 NB Signalized Approach Grade (%)	Access Fort Hays Access Impact	Costs ROW & Construction Costs (\$mil)
	Overall Intersection LOS AM / PM	AM US16 Mainline Delay (sec/veh) SB / NB	PM US16 Mainline Delay (sec/veh) SB / NB	% US16 NB/SB Thru Phase Duration (range)	US16 NB/SB Approach Stops (stops/veh, range)	F&I Crashes (+/- from baseline)	Total Crashes (+/- from baseline)				
No Build	<b>F / F</b>	0 / 0	0 / 0	100%	0 / 0	29	84	-		-	-
Signalized Intersection	C / C	24 / 28	30 / 35	40-45%	0.52 - 0.62	-7%	-7%	<b>1.39</b>	<b>Flat or downgrade</b>	RIRO or closed	<b>\$5.9</b>
Signalized RCI	C / C	<b>12 / 14</b>	<b>16 / 19</b>	<b>70-80%</b>	<b>0.11 - 0.37</b>	<b>-17%</b>	-2%	<b>1.27</b>	2.8% at U-turn	RIRO or closed	\$6.9
Signalized MUT	C / C	<b>12 / 14</b>	<b>16 / 19</b>	<b>70-80%</b>	<b>0.11 - 0.37</b>	<b>-24%</b>	-5%	<b>1.28</b>	2.8% at U-turn	RIRO or closed	\$6.9

Signalized MUT calculations not supported in HCS. Anticipated to be similar to signalized RCI.

Favorable measures indicated in **Bold Green**. Unfavorable measures indicated in **Bold Orange**. Black text indicates measure that was in the middle when compared to other options.

Intersection Option	Benefits	Drawbacks
Signalized Intersection	<ul style="list-style-type: none"> <li>7% predicted reduction in F&amp;I crashes</li> <li>All movements provided at main intersection</li> <li>Driver familiarity</li> <li>Intersection queue storage areas on flat grade</li> <li>Highest B/C ratio (1.39)</li> </ul>	<ul style="list-style-type: none"> <li>Greater US16 mainline delay and average number of stops for northbound/southbound through movements at signal</li> </ul>
Signalized RCI	<ul style="list-style-type: none"> <li>17% predicted reduction in F&amp;I crashes</li> <li>Better overall intersection operations compared to signalized intersection</li> <li>Lower US16 mainline delay and fewer stops for NB/SB through movements at signals</li> <li>Direct US16 left turns to Moon Meadows Drive</li> <li>Potential to open as unsignalized RCI and convert to signalized RCI</li> <li>B/C ratio greater than 1 (1.27)</li> </ul>	<ul style="list-style-type: none"> <li>Out of the way travel for EB/WB Moon Meadows Drive thru and left turn movements</li> <li>Higher cost due to additional pavement and signals</li> <li>3% grade through south U-turn</li> </ul>
Signalized MUT	<ul style="list-style-type: none"> <li>24% predicted reduction in F&amp;I crashes</li> <li>Better overall intersection operations compared to signalized intersection</li> <li>Lower US16 mainline delay and fewer stops for NB/SB through movements at signals</li> <li>EB/WB Moon Meadows Drive thru movements at main intersection</li> <li>B/C ratio greater than 1 (1.28)</li> </ul>	<ul style="list-style-type: none"> <li>Out of the way travel for inbound/outbound Moon Meadows Drive left turn movements (predominant Moon Meadows Drive movements through 2050 Planning Horizon)</li> <li>Higher cost due to additional pavement and signals</li> <li>3% grade through south U-turn</li> </ul>

**Table 41: US16/Section Line Road Intersection Summary (Components, Matrix, and Benefits/Drawbacks)**

1. Overpass (direct access to US16 closed)	2. Right-in Right-Out (RIRO)	3. RIRO + Northbound Left Turn
<ul style="list-style-type: none"> <li>Section line road grade separation (over or under) US16</li> <li>No direct access to US16</li> </ul>	<ul style="list-style-type: none"> <li>US16 right turns to Section Line Road</li> <li>Section Line Road right turns to US16</li> <li>All left turns and Section Line Road through movements restricted</li> </ul>	<ul style="list-style-type: none"> <li>Includes elements of RIRO option plus a northbound US16 left turn</li> </ul>

Intersection Option	2050 Traffic Operations	Predicted Safety (2026 - 2050)		ROW & Construction Costs
		Overall Intersection LOS * AM / PM	F&I Crashes (+/- from baseline)	Total Crashes (+/- from baseline)
No Change (full access)	A / <b>E</b>	20	50	Baseline
Overpass (direct access to US16 closed)	- / -	<b>-100%</b>	<b>-100%</b>	<b>Significantly greater than at-grade intersection</b>
RIRO	A / A	<b>-78%</b>	<b>-78%</b>	Negligible cost difference from full access intersection
RIRO + NB LT	A / A	<b>-69%</b>	<b>-69%</b>	Negligible cost difference from full access intersection

\* Assumes full redistribution of forecasted Addison Avenue traffic volumes to Section Line Road.

Favorable measures indicated in **Bold Green**. Unfavorable measures indicated in **Bold Orange**. Black text indicates measure that was in the middle when compared to other options.

Intersection Option	Benefits	Drawbacks
Overpass (direct access to US16 closed)	<ul style="list-style-type: none"> <li>Best safety performance</li> <li>All traffic routed to major intersections</li> </ul>	<ul style="list-style-type: none"> <li>High cost</li> <li>May require some out of the way travel for US16 access until local network built out</li> </ul>
RIRO	<ul style="list-style-type: none"> <li>Minimal cost for local network improvements with project.</li> <li>78% reduction in predicted crashes compared to full access intersection; greatest safety benefits of at-grade intersection options</li> </ul>	<ul style="list-style-type: none"> <li>Conflict points on US16, but no cross-traffic angle crash conflicts that have a propensity for higher severity</li> </ul>
RIRO + NB Left Turn	<ul style="list-style-type: none"> <li>Minimal cost for local network improvements with project</li> <li>69% reduction in predicted crashes compared to full access intersection</li> </ul>	<ul style="list-style-type: none"> <li>Includes NB LT cross-traffic angle crash conflict, which is a crash type that has a propensity for higher injury severity</li> </ul>

**Table 42: US16/Promise Road Intersection Summary (Components, Matrix, and Benefits/Drawbacks)**

1. Signalized Intersection	2. Unsignalized Reduced Conflict Intersection (RCI)	3. Signalized Reduced Conflict Intersection (RCI)
<ul style="list-style-type: none"> <li>Single left turn lanes on all approaches</li> <li>US16 NB/SB right turn lanes</li> <li>Signalize intersection (when warranted)</li> </ul>	<ul style="list-style-type: none"> <li>US16 left turns to Promise Road located at main intersection</li> <li>Single left, right, and U-turn lanes</li> <li>Option to convert to signalized RCI (when warranted)</li> <li><i>Due to SB unsignalized U-turn sight distance constraints with NB SPI entrance ramp, southern U-turn not incorporated in intersection option.</i></li> </ul>	<ul style="list-style-type: none"> <li>US16 left turns to Promise Road located at main intersection</li> <li>Single left, right, and U-turn lanes</li> <li><i>Due to the signalized southern U-turn intersection functional area overlap into the NB SPI entrance ramp, southern U-turn not incorporated in intersection option</i></li> </ul>
<ul style="list-style-type: none"> <li>Planning-level traffic signal warrants: met between 2026-2028</li> </ul>		

Intersection Option	Redirected Movements		2050 Traffic Operations			Predicted Safety (2026 - 2050)		B/C Ratio	Costs
	Movements Redirected to U-turns	Movements Not Provided by Intersection	Overall Intersection LOS AM / PM	US16 NB/SB Through Movement Delay at Signal (sec/veh)	US16 NB/SB Through Movement Stops at Signal (stops/veh, range)	F&I Crashes (+/- from baseline)	Total Crashes (+/- from baseline)	Ratio	ROW & Construction Costs (\$mil)
No Build	None	None	<b>D / F</b>	0	0	32	77	-	-
Signalized Intersection	None	None	B / B	9 - 15	0.25 - 0.41	<b>-37%</b>	<b>-23%</b>	<b>1.67</b>	\$3.3
Unsignalized RCI	WB: LT, T	EB: LT, T	<b>A / A</b>	<b>0</b>	<b>0</b>	<b>-84%</b>	<b>-75%</b>	<b>2.22</b>	\$3.3
Signalized RCI	WB: LT, T	EB: LT, T	B / B	<b>9 - 9</b>	0.04 - 0.17	<b>-52% (est.)</b>	<b>-75% (est.)</b>	<b>1.49</b>	\$3.9

Favorable measures indicated in **Bold Green**. Unfavorable measures indicated in **Bold Orange**. Black text indicates measure that was in the middle when compared to other options.

Intersection Option	Benefits	Drawbacks
Signalized Intersection	<ul style="list-style-type: none"> <li>37% predicted reduction in F&amp;I crashes</li> <li>All movements provided at main intersection</li> <li>Driver familiarity</li> <li>Provides greatest separation between SPI ramps and first conflict point</li> <li>No intersection functional area overlap with SPI ramps.</li> <li>B/C ratio greater than 1 (1.67)</li> </ul>	<ul style="list-style-type: none"> <li>Greater US16 mainline delay and average number of stops for NB/SB US16 through movements at signal</li> </ul>
Unsignalized RCI	<ul style="list-style-type: none"> <li>84% predicted reduction in F&amp;I crashes</li> <li>Best overall intersection traffic operations (LOS A)</li> <li>Zero US16 mainline delay due to unsignalized (free) movements</li> <li>Highest B/C ratio (2.22)</li> </ul>	<ul style="list-style-type: none"> <li><i>Due to SB U-turn sight distance constraints with NB SPI entrance ramp, southern U-turn not incorporated in intersection option</i></li> </ul>
Signalized RCI	<ul style="list-style-type: none"> <li>52% (estimated) predicted reduction in F&amp;I crashes</li> <li>Slightly less US16 mainline delay than traditional signalized intersection</li> <li>B/C ratio greater than 1 (1.49)</li> </ul>	<ul style="list-style-type: none"> <li>Higher cost due to additional pavement and signals</li> <li><i>Due to the signalized southern U-turn intersection functional area overlap into the NB SPI entrance ramp, southern U-turn not incorporated in intersection option</i></li> </ul>

**Table 43: US16/Enchantment Road Intersection Summary (Components, Matrix, and Benefits/Drawbacks)**

1. Signalized Intersection	2. TWSC Intersection	3. Unsignalized Conflict Intersection (RCI)
<ul style="list-style-type: none"> <li>Single left turn lanes on all approaches</li> <li>US16 NB/SB right turn lanes</li> <li>Signalize intersection (when warranted)</li> </ul>	<ul style="list-style-type: none"> <li>Reflects similar intersection configuration as signalized intersection</li> <li>Single left turn lanes on all approaches</li> <li>US16 NB/SB right turn lanes</li> <li>Median width to provide 2-stage crossing</li> <li>Option to convert to signalized intersection (when warranted)</li> </ul>	<ul style="list-style-type: none"> <li>US16 left turns to Moon Meadows Drive located at main intersection</li> <li>Single left, right, and U-turn lanes</li> <li>Option to convert to signalized RCI (when warranted)</li> </ul>
<ul style="list-style-type: none"> <li>Planning-level traffic signal warrants: met beyond 2050 with just Enchantment Road/Highwood Road traffic; by 2042 if Tower Road (church/school access) traffic relocated to Enchantment Road/Highwood Road intersection</li> </ul>		

Intersection Option	2050 Traffic Operations			Predicted Safety (2026 - 2050)		B/C Ratio	Costs
	Overall Intersection LOS AM / PM	US16 NB/SB Through Movement Delay at Signal (sec/veh)	US16 NB/SB Through Movement Stops at Signal (stops/veh, range)	F&I Crashes (+/- from baseline)	Total Crashes (+/- from baseline)	Ratio	ROW & Construction Costs (\$mil)
No Build	B / <b>E</b>	0	0	Baseline	Baseline	-	-
Signalized Intersection	B / B	7 - 10	0.26 - 0.35	-21%	-7%	0.41	\$3.4
TWSC Intersection	<b>A / A</b>	<b>0</b>	<b>0</b>	-33% (est.)	-32% (est.)	0.76	\$3.2
Unsignalized RCI	<b>A / A</b>	<b>0</b>	<b>0</b>	<b>-82%</b>	<b>-71%</b>	0.88	\$3.4

Favorable measures indicated in **Bold Green**. Unfavorable measures indicated in **Bold Orange**. Black text indicates measure that was in the middle when compared to other options.

Intersection Option	Benefits	Drawbacks
Signalized Intersection	<ul style="list-style-type: none"> <li>21% predicted reduction in F&amp;I crashes</li> <li>Improves traffic operations when volumes exhibit a need for signalization</li> <li>Driver familiarity</li> <li>Easy transition from TWSC to signalized intersection</li> </ul>	<ul style="list-style-type: none"> <li>Greater US16 mainline delay and average number of stops for NB/SB US16 through movements at signal</li> <li>Signal not shown to be warranted until end of 2050 Planning Horizon</li> </ul>
TWSC Intersection	<ul style="list-style-type: none"> <li>33% (estimated) predicted reduction in F&amp;I crashes</li> <li>TWSC may suffice for several years before signal is warranted</li> <li>Driver familiarity</li> <li>Zero US16 mainline delay due to unsignalized (free) movements</li> <li>Easy conversion to signalized intersection</li> </ul>	<ul style="list-style-type: none"> <li><b>Median must be wide enough for 2-stage crossing.</b> <ul style="list-style-type: none"> <li>Single-stage crossing results in overall intersection LOS F</li> </ul> </li> <li>LOF F delay on side streets during 2050 peak hours</li> </ul>
Unsignalized RCI	<ul style="list-style-type: none"> <li>82% predicted reduction in F&amp;I crashes</li> <li>Best overall intersection traffic operations (LOS A)</li> <li>Zero US16 mainline delay due to unsignalized (free) movements</li> <li>Convert to signalized RCI when warranted</li> <li>Highest B-C ratio (0.88)</li> </ul>	

### 14.10.1 US16/Moon Meadows Drive Intersection Recommendations

The timeframe for US16/Moon Meadows Drive intersection improvements is driven by development along the Moon Meadows Drive corridor and availability of local connectivity to Les Hollers Way or Healing Way. Because of the isolated nature of development along Moon Meadows Drive, future US16/Moon Meadows Drive intersection improvements are likely independent from planned improvements at the US16/US16B/Catron Boulevard intersection from both a pavement and traffic/safety need.

Intersection options were developed to address possible traffic patterns within the 2050 Planning Horizon. Currently, and anticipated in the foreseeable future, Moon Meadows Drive traffic is typically turning to/from US16. A signalized intersection or signalized RCI best accommodates current traffic patterns by maintaining the higher volume movements at the main intersection. Long-range, Moon Meadows Drive is planned to extend to the east and may exhibit much higher through demand. This pattern may be more conducive to an MUT where Moon Meadows Drive through movements are accommodated within the main intersection.

Access modifications to the US16/Fort Hays access will be required due to left turn lane extensions or alternative intersection loons. A rearage connection to Moon Meadows drive is recommended regardless of future intersection option and timeline.

#### US16/Moon Meadows Drive Intersection Recommendations

**2050 Planning Horizon Intersection:** continue to consider Full Access Intersection - Signalize when Warranted, Signalized RCI, and Signalized MUT. Evaluate intersection operations with updated information prior to design.

**2050 Planning Horizon Corridor:** 4-Lane Divided w/ 40' Raised Median (Suburban) - Shifted East

**Long-range Planning:** consider interchange when:

- 1) Traffic volumes reach a point to where they are creating safety and/or operational issues at the intersection or
- 2) Moon Meadows Drive is constructed to SD79 and Moon Meadows Drive reflects a high-volume east/west corridor along the southern edge of Rapid City.

#### **Timeline:**

**2028 - 2035:**

- Construct '2050 Planning Horizon Intersection & Corridor' recommendations
  - May be accelerated due to development

**Beyond 2040 (long range):**

- Consider 'Long-range Planning' recommendation (interchange)

**Interim:**

- Construct rearage road between Moon Meadows Drive and Fort Hays

### 14.10.2 US16/Section Line Road Intersection Recommendations

Historical planning documents have shown modified access at the US16/Section Line Road intersection, including RIRO (short-term) and grade separation with an overpass (long-term). Maintaining a partial access was desired due to distance between Moon Meadows Drive and Catron Boulevard and limited local network connectivity to the east or west of US16 within this area.

A RIRO is the recommended partial access with the following considerations:

- Restricting left turns and side-street through movements provided the best safety benefits of all at-grade intersection options
- Northbound US16 left turn was not desired due to the safety impacts and limited need stated by stakeholders and public
- Southbound US16 left turn was not desired due to the safety impacts and traffic impacts created by southbound US16 traffic through on-ramp to left turn weave movements
- The recommended SPI provides a safer alternative to accommodate US16 turning traffic via ramps (merge and diverge areas) and the signalized single point intersection
  - The recommended SPI is a safer alternative to accommodate US16 turning traffic via ramps and the signalized single point intersection
  - Traffic would then be routed via the local network to local destinations
- Restricting movements as part of the SPI project was determined to be a good incremental modification towards a future grade separation (overpass) and closure of the at-grade intersection
- Key safety benefits could be implemented without needing to reconstruct US16 mainline

Through this study, it was found that modifications will be required as part of the planned US16/US16B/Catron Boulevard intersection SPI project to:

- Shift intersection south approximately 100 feet to fit within an unsignalized intersection ‘window of opportunity’ for access and provide full separation from the SPI ramps
- Southbound right turn lane separates US16 mainline traffic from slowing/stopped right turn traffic
- Establishes access for future development and local network connectivity
- Eliminates high-severity angle crash conflicts
- Addresses redistribution of Addison Avenue traffic

### **US16/Section Line Road Intersection Recommendations**

#### **SPI Project: unsignalized RIRO**

- Shift intersection south
- Limit to RIRO movements (close median)
- Add SB RT lane
- Construct Section Line Road/US16 service road improvements
- Maintain existing US16 mainline pavement through intersection

#### **2050 Planning Horizon Intersection (Segment Reconstruction): unsignalized RIRO with the following new elements from 'SPI Project' recommendation:**

- Construct with US16 shifted east alignment and suburban section
- Reflects long-range RIRO intersection
- Maintain shifted south intersection location
- Maintain Section Line Road/US16 service road intersection (spacing)

#### **2050 Planning Horizon Corridor: 4-Lane Divided w/ 40' Raised Median (Suburban) - Shifted East**

#### **Long-range Planning: consider overpass when:**

- 1) Traffic volumes are creating safety and/or operational issues at the intersection,
- 2) Local roadway connectivity is built-out to provide full N/S connectivity between Moon Meadows Drive and Catron Boulevard and/or Section Line Road is extended to SD79, or
- 3) An interchange is to be constructed at US16/Moon Meadows Drive

#### **Timeline:**

##### *2026 SPI Project:*

- Construct 'SPI Project' recommendation

##### *2030 - 2035:*

- Construct '2050 Planning Horizon Intersection & Corridor' recommendations
- Consider 'Long-range Planning' overpass recommendation

##### *Beyond 2040 (long range):*

- Consider 'Long-range Planning' overpass recommendation

### 14.10.3 US16/Promise Road Intersection Recommendations

The US16/Promise Road intersection is a primary access point for the quickly developing northwest and northeast quadrants of the US16/US16B/Catron Boulevard intersection. The intersection also provides access for Rapid City Fire Station 6. It is anticipated the intersection will meet traffic signal warrants by the 2026-2028 timeframe, or sooner, due to the pace of development. Reconstruction of this intersection is recommended in conjunction with the US16/US16B/Catron Boulevard SPI project to shift the main intersection north and provide full signalized (when warranted) intersection functional area for approaching traffic.

Regardless of intersection type, spacing between adjacent US16 and Promise Road intersections and ramp junctions were key considerations when assessing feasibility of the options. Along US16, the traditional signalized intersection location was optimized to provide full functional area and fit within existing topography and development constraints. Along Promise Road, increased spacing between US16 mainline and the first adjacent Promise Road/US16 service road intersection provides long-term operations and safety benefits. This same methodology applies on the east side where the first local network access along the new Tucker Street connection should not occur within 250 feet of US16 mainline.

While an unsignalized RCI provides beneficial traffic operations and safety performance at the intersection since mainline US16 through traffic does not need to stop, the overall footprint was not feasible for implementation due to:

- Limited sight distance for U-turn traffic with approaching SPI on-ramp traffic
- Limited distance for northbound SPI on-ramp traffic to safely merge onto US16 mainline and complete desired maneuvers prior to reaching slow/stopped vehicles at a signalized southern U-turn intersection

Existing terrain and development constraints limited how far north the intersection could be shifted north and thus the RCI concepts do not reflect a full access intersection because the southern U-turn could not be accommodated. A secondary impact of no southern U-turn is that all Tablerock/Fox Road intersection U-turns, due to a potential future partial access, would be accommodated at the RCI main intersection. This is generally not desired at higher volume locations due to conflicts between U-turning traffic and side-street right turn traffic.

**US16/Promise Road Intersection Recommendations**

**2050 Planning Horizon Intersection: signalized intersection (Scenario 1)**

- Shift intersection north
- Prepare for signalization and signalize upon opening
- Construct with US16 shifted east alignment and suburban section
- Reconstruct US16 service road to provide 250’ desired spacing upon opening with signalized intersection at US16/Promise Road intersection
- Construct Tucker Street connection to US16/Promise Road intersection

**2050 Planning Horizon Corridor: 4-Lane Divided with 40’ Raised Median (Suburban) - Shifted East**

**Timeline:**

*2026 SPI Project:*

- Construct ‘2050 Planning Horizon Intersection & Corridor’ recommendations

**14.10.4 US16/Tablerock Road Intersection Recommendations**

The northward shift of US16/Promise Road intersection decreases spacing with the existing US16/Tablerock Road intersection to 930 feet. Relocating the US16/Tablerock Road intersection north to align with Fox Road increases spacing to 1550 feet and improves local network continuity on the US16 service road.

The study is recommending US16/Promise Road and US16/Enchantment Road intersections be the major intersections north of Catron Boulevard and thus a full access intersection at US16/Tablerock Road/Fox Road is not required. The recommended ¾ partial access provides operational and safety benefits to the US16 corridor while still accommodating local traffic turning movements.

With a partial access intersection, U-turn opportunities should be provided at the US16/Promise Road and US16/Enchantment Road intersections.

**US16/Tablerock Road Intersection Recommendations**

**2050 Planning Horizon Intersection: unsignalized ¾ access**

- Shift intersection north and tie into Fox Road
- Construct with US16 shifted east alignment and suburban section
- Strive for 150’ spacing between US16 and Fox Road/US16 Service Road intersection

**2050 Planning Horizon Corridor: 4-Lane Divided w/ 40’ Raised Median (Suburban) - Shifted East**

**Timeline:**

*2026 SPI Project:*

- Construct ‘2050 Planning Horizon Intersection & Corridor’ recommendations

### 14.10.5 US16/Enchantment Road Intersection Recommendations

Both Urban Area scenarios relocate the US16/Enchantment Road intersection north to align with Highwood Road and provide a single full access intersection. Benefits of this include:

- Connectivity with Highwood Road and limits turning movements (conflicts) on US16 service road and US16 mainline
- 250-foot spacing between US16 mainline and US16 service road (SDDOT desired spacing)

Alignment of Enchantment Road should be optimized in future design to balance cut/fill impacts and ROW availability. One option would be to locate the alignment closer to the existing US16 ROW line to minimize these impacts.

Intersection reconstruction is not required with the future US16/US16B/Catron Boulevard SPI project. The US16 shifted east alignment through Promise Road and Tablerock Road can transition back to the existing Enchantment Road intersection at the desired 60 mph design speed.

Pavement condition is likely the driving consideration for implementation timeline. The anticipated timeframe for signalization is beyond Year 2040 and highly dependent on development and local network connectivity to a single consolidated US16/Enchantment Road intersection. Therefore, solutions that incorporate unsignalized intersection elements are advantageous at this location to span the timeframe until signal warrants are met. The unsignalized RCI provides the best safety and operational benefits of the analyzed options.

Local connectivity on the east side will be an important element to manage minor access north of Highwood Road. The northbound to southbound RCI U-turn extends up to an existing full access intersection at Tower Road and would necessitate closure of several movements. Providing connectivity southward to Enchantment Road provides a safer, full access unsignalized RCI access to US16 and benefits overall US16 operations and safety.

#### US16/Enchantment Road Intersection Recommendations

##### **2050 Planning Horizon Intersection: unsignalized RCI (Scenario 2)**

- Combine US16/Enchantment Road/Highwood Road intersections
- Modify Tower Road intersection access to RIRO on east side only

##### **2050 Planning Horizon Corridor: 4-Lane Divided with 40' Raised Median (Suburban) - Shifted East**

##### **Timeline:**

##### **2025 - 2035:**

- Construct '2050 Planning Horizon Intersection & Corridor' recommendations\*\*\*

##### **Interim:**

- Maintain existing TWSC intersection
- Encourage local connectivity improvements to Enchantment Road east of US16

### 14.10.6 Other US16 Corridor Intersection Recommendations

To the north of Enchantment Road/Highwood Road, US16 transportation needs are tied to pavement condition. Steep grade through this segment limits feasibility and desire for full access intersections. When time for reconstruction, the recommended corridor includes a narrower median to accommodate width for a shared-use path. It is desired to minimize cut/fill impacts through this segment due to side slope stability and erosion issues.

#### Other US16 Corridor Intersection Recommendations

**2050 Planning Horizon Intersections:** as reflected in both Scenario 1 and 2

**2050 Planning Horizon Corridor:** 4-Lane Divided with Variable (12' to 28') Raised Median (Urban)

- Center w/in ROW to minimize slope impacts
- Transition to Suburban section outside of these areas

#### **Timeline:**

**2025 - 2035:**

- Construct '2050 Planning Horizon Intersection & Corridor' recommendations

#### *Intersection Notes:*

- Echo Ridge Drive: maintain  $\frac{3}{4}$  access with corridor improvements
- Cathedral Drive/Fairmont Boulevard: monitor traffic volumes and update traffic signal timing/phasing to manage queues and delay

### 14.10.7 US16B/Catron Boulevard Corridor Intersection Recommendations

Recommended improvements at the Les Hollers Way and Healing Way intersections were determined through the US16/US16B/Catron Boulevard intersection sub-area analysis. It was found that the overall configurations did not require significant adjustment outside of adding a northbound right turn lane on Les Hollers Way. The overall extent of reconstruction and pavement replacement can be investigated further during design.

Local connectivity between Wellington Drive and Healing Way in the northeast and southwest quadrants is an important element in area safety and operations. This connectivity will access to the signalized US16B/Catron Boulevard/Healing Way intersection and address future operational and safety concerns at the existing Wellington Drive intersections. While the connection in the northeast quadrant can be accommodated through future development, the southeast quadrant is limited by existing development and topography and thus any future connection is likely only feasible if an opportunity arises.

A traffic signal was not desired at the Wellington Drive intersections due to intersection spacing with Healing Way and existing grade. Further, the future year No Build conditions does not show a signal being warranted by traffic volumes in the near future, particularly with a local network connection to Healing Way in the northeast quadrant. Therefore, access treatments that incorporate elements of an RCI provide an option that incorporates safety benefits of an RCI and maintains all turning movements within the Wellington Drive intersections and does not redirect U-turn movements down the steep grade to the east.

#### US16B/Catron Boulevard Corridor Intersection Recommendations

##### 2050 Planning Horizon Les Hollers Way Intersection:

- Add NB RT lane
- Incorporate 'SPI Project' modifications

##### 2050 Planning Horizon Healing Way Intersection:

- Incorporate 'SPI Project' modifications

##### 2050 Planning Horizon Wellington Drive Intersections:

- West intersection: maintain RIRO, TWSC
  - Extend EB LT lane back to RIRO to incorporate a RCI element
- East intersection:  $\frac{3}{4}$  access, TWSC
- Incorporate 'SPI Project' modifications

2050 Planning Horizon Corridor: varies to accommodate turn lanes

##### Timeline:

##### 2026 SPI Project:

- Construct '2050 Planning Horizon Intersection & Corridor' recommendations

### 14.10.8 US16/US16B/Catron Boulevard Intersection Recommendations

The *US16/US16B/Catron Boulevard Intersection* technical report recommended an SPI be constructed as part of the SDDOT's planned US16/US16B/Catron Boulevard intersection project. The overall US16 Corridor Study determined several elements recommended for incorporation into the project as shown in **Figure 37**. Potential phasing between the SPI project footprint and potential future US16 Urban Area projects are shown in **Figure 38**.

#### US16/US16B/Catron Boulevard Intersection Recommendations

##### **2050 Planning Horizon Intersections: US16/US16B/Catron Boulevard SPI 1.1a with modifications**

Other intersection modifications as part of the project include (see individual intersection recommendations):

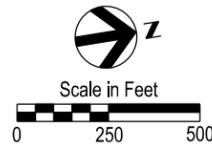
- US16/Section Line Road
- US16/Addison Avenue and US16/Tucker Street (closed)
- US16/Promise Road
- US16/Tablerock Road
- Catron Boulevard/Les Hollers Way
- US16B/Catron Boulevard/Healing Way
- US16B/Catron Boulevard/Wellington Drive (east and west)

##### **2050 Planning Horizon Corridor: 4-Lane Divided w/ 40' Raised Median (Suburban)**

##### **Timeline:**

##### *2026 SPI Project:*

- Construct '2050 Planning Horizon Intersection & Corridor' recommendations



**US16/US16B/Catron Boulevard Intersection Recommendation**  
 Intersection Project: Single Point Interchange (SPI)  
 Corridor: 4-Lane Divided with 40-foot Raised Median (Suburban) - Shifted East

- Legend**
- Proposed Roadway
  - Depressed Median
  - Raised Median
  - Sidewalk
  - Bridge Construction
  - Remove Roadway
  - Existing ROW / Property Line
  - Retaining Wall
  - ROW Acquisition
  - Signalized Intersection
  - Stop Condition Intersection

**US16/Addison Avenue Intersection**  
 - Close due to conflict with SPI ramps  
 - Maintain existing US16 service road connections to:  
 - Les Hollers Way (via Energy Park Drive) and  
 - Section Line Road  
 - Maintain existing east connection to Healing Way

**US16/Tucker Street Intersection**  
 - Close due to conflict with SPI ramps  
 - Construct rearage road to Promise Road intersection

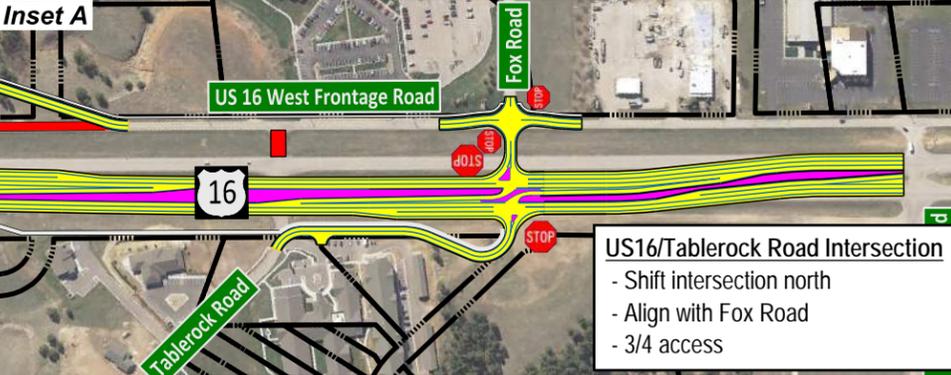
**US16/Promise Road Intersection**  
 - Shift intersection north  
 - Prepare for signalization (need anticipated around opening year)  
 - Reconstruct US16 service road to provide 250-foot intersection spacing from US16 mainline

Prepare for signalization at opening

See Inset A

**US16/Section Line Road**  
 - Shift intersection south  
 - RIRO access  
 - Construct Section Line Road/US16 service road intersection  
 - Maintain existing US16 mainline pavement through intersection

**NOTE:**  
 US16 Design Speed (North of US-16B) = 60 MPH  
 US16 Design Speed (South of US-16B) = 65 MPH  
 NB Entrance Ramp Design Speed = 45 MPH  
 SB Ramps and NB Exit Ramp Design Speed = 50 MPH



**US16/Tablerock Road Intersection**  
 - Shift intersection north  
 - Align with Fox Road  
 - 3/4 access

**US16/Wellington Drive Intersections**  
 - West: maintain RIRO access  
 - East: 3/4 access  
 - Extend EB LT lane back to RIRO access to provide direct movement into LT lane for downstream U-turn

Build Option:  
**SPI 1.1a**



US16/US16B/Catron Boulevard Intersection Recommendation  
 Single Point Interchange (SPI) Build Option 1.1a  
 US16 Corridor Study



Scale in Feet  
0 150 300

**Legend**

- Proposed Roadway
- Raised Median
- Remove Roadway
- Existing ROW / Property Line
- Pavement Previously Constructed

# US16/US16B/Catron Boulevard Intersection SPI Project

These figures show the recommended phasing of the planned US16/US16B/Catron Boulevard intersection SPI Project and a separate US16/Moon Meadows Drive intersection and US16 mainline project scenario.



Section Line Road

- US16/Section Line Road**
- Shift intersection south
  - RIRO access
  - Construct Section Line Road/US16 service road intersection
  - Maintain existing US16 mainline pavement through intersection

Addison Avenue

Energy Park Drive

# US16/Moon Meadows Drive Intersection and US16 Mainline Project Scenario

Moon Meadows Drive



- US16/Moon Meadows Drive**
- Reconstruct intersection
  - Traditional intersection shown for illustrative purposes
  - Reconstruct US16 mainline to incorporate eastward alignment shift and tie into new SPI Project pavement

Section Line Road

- US16/Section Line Road**
- Reconstruct RIRO intersection
  - Reconstruct US16 mainline to incorporate eastward alignment shift and tie into new SPI pavement
  - Maintain Section Line Road/US16 service road intersection

Addison Avenue



Potential Phasing Between Interchange and Corridor Projects  
Moon Meadows Drive to Section Line Road  
US16 Corridor Study



Scale in Feet  
0 200 400

**Legend**

- Proposed Roadway
- Raised Median
- Remove Roadway
- Existing ROW / Property Line
- Pavement Previously Constructed

# US16/US16B/Catron Boulevard Intersection SPI Project

These figures show the recommended phasing of the planned US16/US16B/Catron Boulevard intersection SPI Project and a separate US16/Enchantment Road/Highwood Road intersection and US16 mainline project scenario.

**US16/Promise Road Intersection**

- Shift intersection north
- Prepare for signalization (need anticipated around opening year)
- Reconstruct US16 service road to provide 250-foot intersection spacing from US16 mainline

**Transition:**

- Transition pavement between new US16/Tablerock Road/Fox Road intersection and existing US16/Enchantment Road intersection

**US16/Tablerock Road Intersection**

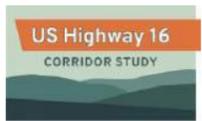
- Shift intersection north
- Align with Fox Road
- 3/4 access

# US16/Moon Meadows Drive Intersection and US16 Mainline Project Scenario

**US16/Enchantment Road/Highwood Road Intersection**

- Unsignalized RCI
- Align Enchantment Road with Highwood Road
- Reconstruct US16 mainline to incorporate eastward alignment shift and tie into new SPI Project pavement

Scale in Feet  
0 150 300



Potential Phasing Between Interchange and Corridor Projects  
Tablerock Road/Fox Road to Enchantment Road  
US16 Corridor Study

Rapid City, SD

## 15.0 Neck Yoke Road Area

The US16/Neck Yoke Road intersection is located along US16, south of the Rapid City urban area. The intersection is located amongst several access points through the Spring Creek valley and is important to local access and network connectivity. Area traffic volumes peak during the summer tourist season due to surrounding tourist destinations and its proximity along a key connector between I-90/Rapid City and the Black Hills/Mount Rushmore area. It is anticipated that this traffic demand will continue to grow, particularly daily traffic as Rapid City and Black Hills-area development continues to expand south of Rapid City.

This section provides a summary of the detailed analysis and evaluation of the proposed improvements at the US16/Neck Yoke Road intersection. All information is provided in greater detail in the following documents:

- *US16/Neck Yoke Road Intersection Build Option Technical Report (Appendix Y)*
- *US16/Neck Yoke Road Intersection Build Option Evaluation Report (Appendix Z)*

### 15.1 Summary of Intersection Transportation Needs

The purpose of a future project is to improve safety and access management at the US16/Neck Yoke Road intersection and adjacent US16 access intersections. This purpose is to address the following needs:

#### High severity crash rate

- 4 reported intersection crashes between 2014 and 2018
  - 1 fatal crash and 2 serious injury crashes
  - All four were angle crashes
- ‘Weighted’ crash rate in top five of US16 Corridor Study intersections

#### Multiple access points

- Current access spacing is less than 600 feet, which is less than the recommended minimums for SDDOT expressway access classification
- Existing turn lanes do not meet recommend lengths, requiring traffic to complete more of their deceleration in the US16 through lane instead of within the turn lane
- Not all access points include turn lanes, which requires motorists to fully decelerate and potentially stop in a US16 through lane to complete some movements
- Each access point provides for all movements, leading to numerous points of conflict for turning and through traffic

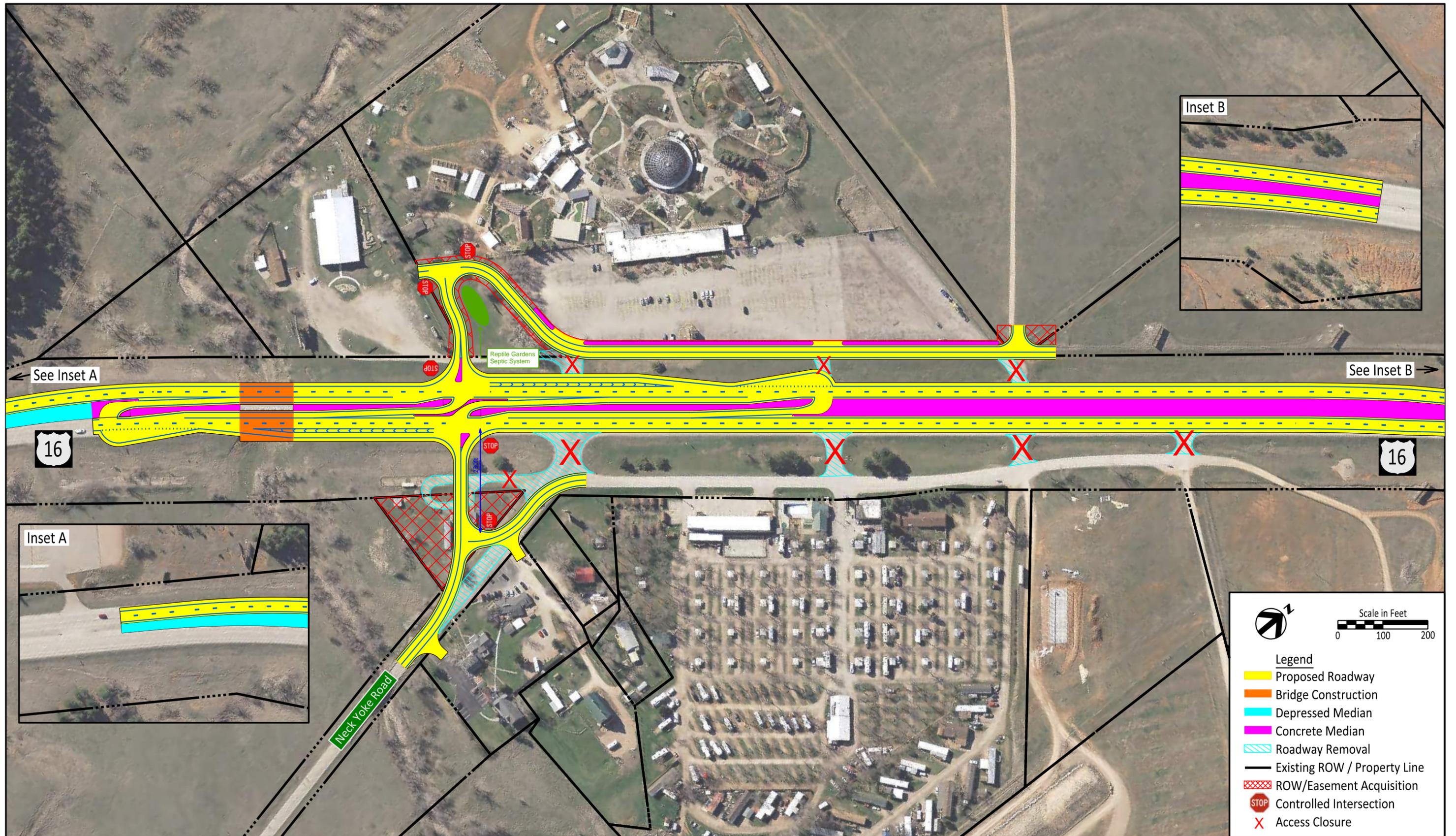
### 15.2 Build Options

This study developed 13 different Build Options, nine variations of an RCI and 4 variations of a signalized intersection. The primary differences across the variations focused on intersection control, where the main intersection was located, and whether there were one or two access points.

- 1.1a: RCI at Neck Yoke Road
- 1.1b: RCI at Neck Yoke Road plus Northern  $\frac{3}{4}$  Access

- 1.1c: RCI at Neck Yoke Road plus Northern Partial Access
- 1.1d: RCI at Neck Yoke Road (West)
- 1.1e: RCI at Neck Yoke Road (West) plus Central Partial Access
- 1.2a: RCI at Central Driveway
- 1.2b: RCI at Central Driveway plus Northern  $\frac{3}{4}$  Access
- 1.3a: RCI at Central Driveway with US16 Realignment
- 1.3b: RCI at Central Driveway with US16 Realignment plus Northern  $\frac{3}{4}$  Access
- 2.1a: Signalized Intersection at Neck Yoke Road
- 2.1b: Signalized Intersection at Neck Yoke Road plus Northern  $\frac{3}{4}$  Access
- 2.2a: Signalized Intersection at Central Driveway
- 2.2b: Signalized Intersection at Central Driveway plus Northern  $\frac{3}{4}$  Access

Prior to the third public meeting, the SAT narrowed the 13 Build Options down to two, 1.1d and 1.1e as finalist Build Options for public review and comment. These two Build Options are shown in **Figure 39** and **Figure 40**. All other Build Options are provided in the intersection technical reports in the **Appendices X and Y**.



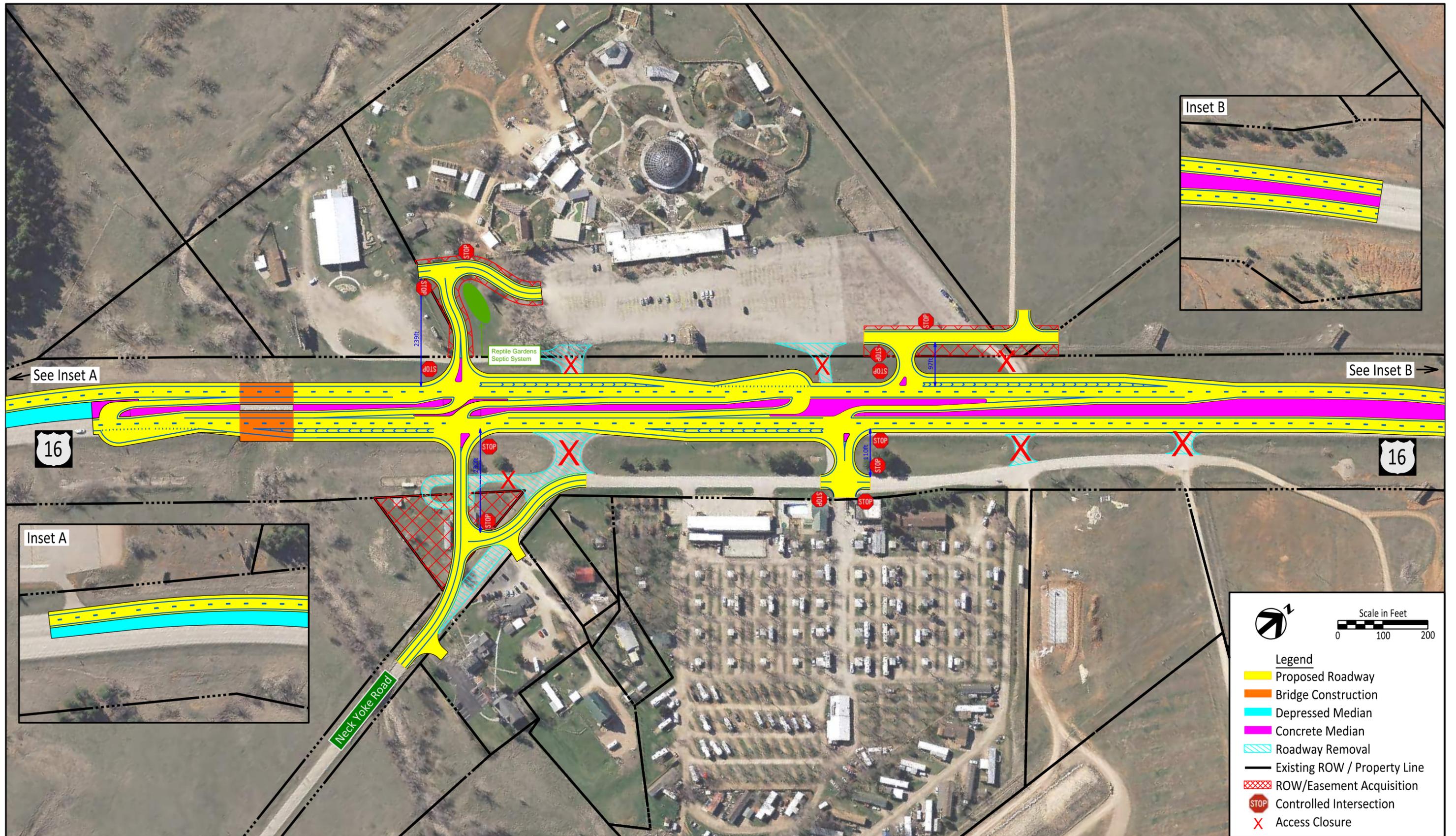
Build Option  
1.d



Neck Yoke Road  
Reduced Conflict Intersection (RCI) - Neck Yoke Road  
US16 Corridor Study

Rapid City, SD

Figure  
39



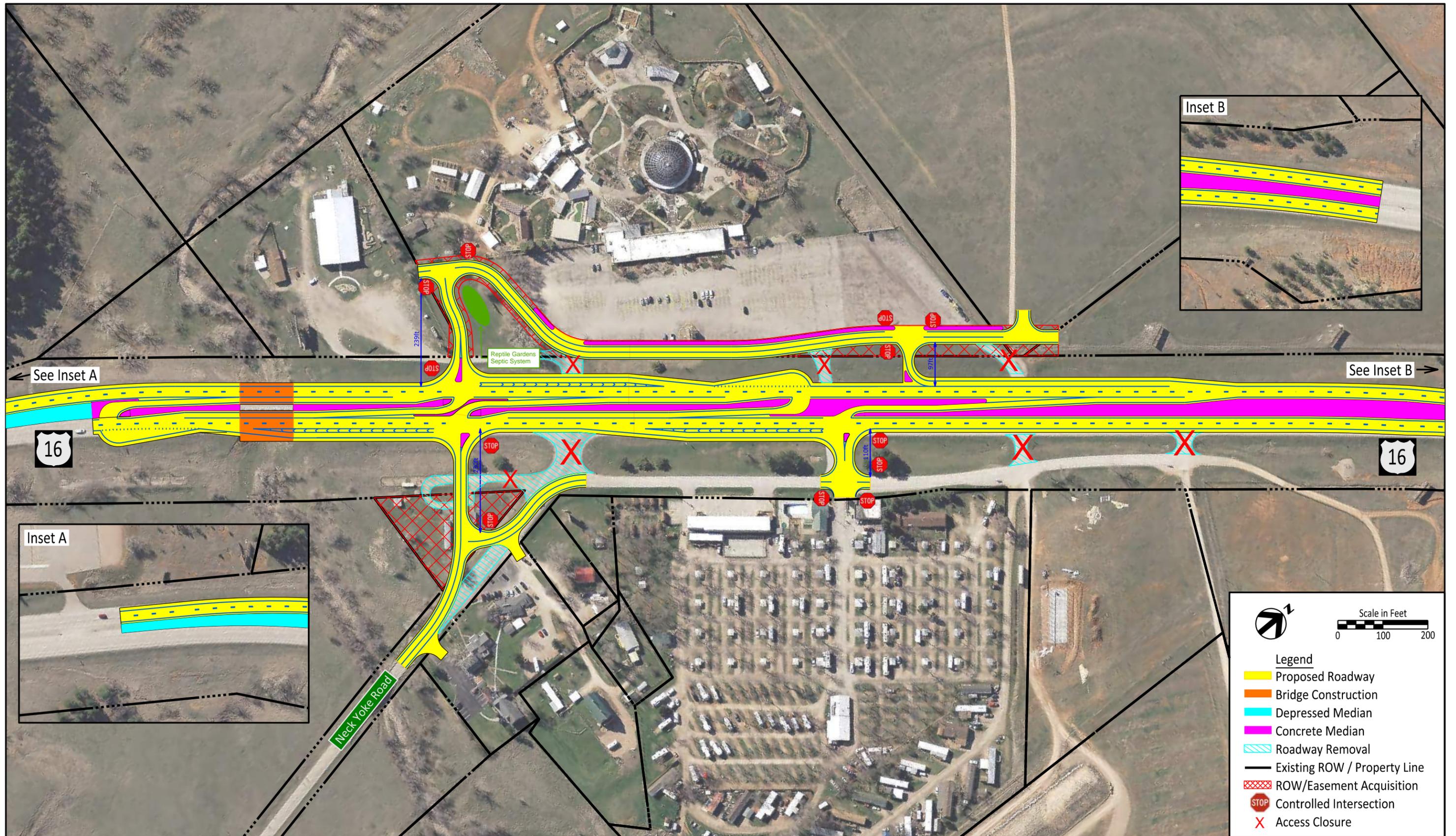
Build Option  
1.e



Neck Yoke Road  
Reduced Conflict Intersection (RCI) - Neck Yoke Road  
US16 Corridor Study

Rapid City, SD

Figure  
40



Build Option  
1.e

Frontage  
Road  
Option



Neck Yoke Road  
Reduced Conflict Intersection (RCI) - Neck Yoke Road  
US16 Corridor Study

Rapid City, SD

Figure  
40

### 15.3 Public Involvement

The second public meeting presented several options for each intersection type, signalized intersection vs. unsignalized RCI, for public feedback. Overarching themes in the comments and discussion included:

- Traffic signals were generally not desired due to the operational and safety concerns of a signal at the bottom of steep grades
- South Dakota trucking representatives were opposed to all options that would require US16 through movement trucks to stop at the bottom of the hill
- Stakeholders noted many of them already turn right out of an access point and make a U-turn at a downstream median break
- Reptile Gardens and other stakeholders supported a secondary partial access to the north
- Stakeholders on the west side supported concepts that minimized parking lot impacts
- There was concern noted about conflicts turning between US16 and US16 service road east of US16 due to high tourist demand and large vehicles frequenting the RV park/campground
  - Stakeholders supported a second access to help alleviate this concern.

The third public meeting focused on the finalist RCI Build Options and received the following feedback:

- Support for all southbound turn lanes to be located on the flatter grade of the valley and not on the 6.5 percent downgrade
- Support for a second partial access to be located at the central driveway access
- Discussion of potential impacts such as daily operations crossing US16, area septic systems, signing, and displacements

### 15.4 Future Pavement and Structure Needs Summary

A summary of upcoming investment needs along the corridor segment includes:

- Structures
  - Eastbound and westbound Spring Creek structures west of Neck Yoke Road: constructed 1963 (58 years)
  - Structures proposed to be included with US16/Neck Yoke Road intersection improvements (2025-2028 developmental STIP)
- Roadway pavement (*SDDOT Needs Book* timeline)
  - Mill and Overlay (2030-2035)
  - US16/Neck Yoke Road intersection improvements (2025-2028 developmental STIP)

The SDDOT has typically been replacing continuous concrete bridges between 50 and 80 years of age.

## 15.5 Intersection Evaluation Summary

### 15.5.1 Evaluation Methodology

The following evaluation categories were used to compare US16/Neck Yoke Road intersection Build Options and assess feasibility, benefits, and drawbacks of each.

- Meets Purpose and Need
- Traffic Operations
- Traffic Safety
- Local Network
- Right of Way Needs and Total Costs
- Constructability
- Public Input
- Potential Environmental Impacts

**Table 44** presents the evaluation matrix with color coding based on:

- **Bold Green** text indicates a Build Option measure was favorable compared to the other Build Options in a category
- Black text indicates a Build Option measure was in the middle compared to other Build Options in a category
- **Bold Red** text indicates a Build Option measure was unfavorable compared to the other Build Options in a category or the measure does not meet study goals

### 15.5.2 Screening Summary

The screening process followed a 3-step process to compare and eliminate Build Options from further consideration:

- **Intersection type:** RCI Build Options vs. signalized intersection Build Options
- **Main intersection location:** Neck Yoke Road vs. central driveway
- **Number of access points:** one main intersection or one main intersection plus a partial northern access

### 15.5.3 Step 1: Intersection Type

Overall, the signalized intersection Build Options did not perform well in comparison to the RCI across most categories. The most notable being the traffic operations and predicted safety. Therefore, all signalized intersection Build Options were eliminated from consideration when comparing intersection types (RCI vs. signalized intersection).

**Table 44: US16/Neck Yoke Road Intersection Build Option Evaluation Matrix**

Build Option	Description	Meets Purpose and Need		2050 Planning Horizon Traffic Operations			Safety (2026 Year of Opening to 2050 Planning Horizon)		Local Network		ROW Needs	Total Costs		Public Input	Potential Environmental Impacts	
		Improves Safety	Improves Access Management	US16 Main Intersection LOS	US16 Main Intersection Delay (**ETT)	Does US16 Through Traffic Need to Stop at Intersection?	Total Crashes	Fatal and Injury Crashes	Do Analysis Side Street Queues Block Access to US16 Service Road?	Intersection Geometry and Driver Expectancy	ROW Acquisition	Construction + ROW Costs + Contingency	Constructability	Build Option Support based on Stakeholder & Public Feedback	Wetlands / Floodplains	Socioeconomics
				AM/PM	AM/PM		+ increase - decrease from No Build	+ increase - decrease from No Build	Yes/No	5 - Best 3 - Middle 1 - Poor	Acre	\$ mil	5 - Best 3 - Middle 1 - Poor	5 - Greatest 3 - Middle 1 - Least	Wetlands and 100-yr floodplain along Spring Creek	
1.1a	RCI at Neck Yoke Road	Yes	Yes	A / A	3.8 / 8.1	No	-207	-105	Yes	3	1.8	8.7	4	3	Potential impact to Spring Creek	Loss of direct access for business and residential/agricultural use. Parking alterations for Reptile Gardens
1.1b	RCI at Neck Yoke Road + Northern ¾ Access	Yes	Yes	A / A	3.3 / 5.7	No	-180	-93	No	3	0.8	9.4	4	3	Potential impact to Spring Creek	Loss of direct access for business but northern access for residential/agricultural use retained.
1.1c	RCI at Neck Yoke Road + Northern Partial Access	Yes	Yes	A / A	3.8 / 6.1	No	-180	-93	No	3	0.8	9.4	4	3	Potential impact to Spring Creek	Loss of direct access for business but northern access for residential/agricultural use retained.
1.1d	RCI at Neck Yoke Road (West)	Yes	Yes	A / A	3.8 / 8.1	No	-235	-118	No	4	2.7	10.8	4	3	Potential impact to Spring Creek	Displacement of one parcel. Loss of direct access for business and residential/agricultural use. Parking alterations for Reptile Gardens
1.1e	RCI at Neck Yoke Road (West) + Central Partial Access	Yes	Yes	A / A	3.8 / 6.1	No	-190	-103	No	4	2.3	10.8	4	5	Potential impact to Spring Creek	Displacement of one parcel. Loss of direct access for business but northern access for agricultural use on west side of US16 retained. Retain direct access for business but loss of direct access for residential/agricultural use on east side of US16.
1.2a	RCI at Central Driveway	Yes	Yes	A / A	3.8 / 8.1	No	-207	-105	Yes	2	1.8	8.4	4	2	Potential impact to Spring Creek	Loss of multiple accesses for business and residential but maintain direct access for Happy Holidays. Loss of parking for Reptile Gardens.
1.2b	RCI at Central Driveway + Northern ¾ Access	Yes	Yes	A / A	3.3 / 5.7	No	-180	-93	No	2	1.8	9.1	4	3	Potential impact to Spring Creek	Loss of multiple accesses for business and residential but maintains direct access for Happy Holidays. Parking alterations for Reptile Gardens. Northern access for agricultural use.
1.3a	RCI at Central Driveway with US16 Realignment	Yes	Yes	A / A	3.8 / 8.1	No	-207	-105	Yes	2	1.8	10.0	3	2	Potential impact to Spring Creek	Loss of multiple accesses for business but maintains direct access for Happy Holidays. Loss of parking for Reptile Gardens.
1.3b	RCI at Central Driveway with US16 Realignment + Northern ¾ Access	Yes	Yes	A / A	3.3 / 5.5	No	-180	-93	No	3	1.6	10.2	3	3	Potential impact to Spring Creek	Loss of multiple accesses for business but maintains direct access for Happy Holidays. Parking alterations for Reptile Gardens. Northern access for agricultural use.
2.1a	Signalized Intersection at Neck Yoke Road	Yes	Yes	B / B	16.6 / 19.8	Yes	-170	-90	Yes	2	2.0	10.8	2	1	Potential impact to Spring Creek	Loss of direct access for business and residential/agricultural use. Loss of parking for Reptile Gardens
2.1b	Signalized Intersection at Neck Yoke Road + Northern ¾ Access	Yes	Yes	B / B	14.5 / 17.2	Yes	-137	-78	Yes	2	1.0	11.4	2	2	Potential impact to Spring Creek	Loss of direct access for business but northern access for residential/agricultural use. Least amount of parking impacts to Reptile Gardens
2.2a	Signalized Intersection at Central Driveway	Yes	Yes	B / B	16.6 / 19.8	Yes	-170	-90	Yes	1	1.9	10.8	2	1	Potential impact to Spring Creek	Loss of multiple access for business and residential but maintains direct access for Happy Holidays. Loss of parking for Reptile Gardens.
2.2b	Signalized Intersection at Central Driveway + Northern ¾ Access	Yes	Yes	B / B	14.5 / 17.2	Yes	-137	-78	Yes	1	1.8	11.9	2	2	Potential impact to Spring Creek	Loss of multiple access for business and residential but maintains direct access for Happy Holidays. Parking alterations for Reptile Gardens. Northern access for agricultural use.
No Build	No Build	No	No	C / F	22.8 / 590.7	No	370 (baseline)	168 (baseline)	Yes	1	0	0	n/a	1	No Impacts	Access remains

### 15.5.4 Step 2: Main Intersection Location

The second step of the screening process involved a comparison of RCI Build Options regarding main intersection location. RCI Build Options at the central driveway resulted in an undesirable configuration on the east side of US16 due to limited space and several access points. Ultimately, the US16 intersection blended into a large intersection with the US16 service road led to concerns for traffic operations and safety within the intersection area. A head-to-head comparison of a Neck Yoke Road RCI vs. a central driveway RCI favored the RCI being located in the vicinity of Neck Yoke Road. Thus, all RCI Build Options with the main RCI at the central driveway were eliminated from further consideration.

### 15.5.5 Step 3: Number of Access Points

Build Options carried forward into the third step include two single RCI Build Options, 1.1a and 1.1d, and three multiple access RCI Build Options, 1.1b, 1.1c, and 1.1e. These Build Options provided the best traffic operations, showed notable safety benefits, and were supported by the public and stakeholders.

In comparison of the two single RCI Build Options, 1.1a vs. 1.1d, 1.1d was carried forward as a finalist Build Option due to:

- Greatest predicted reduction in crashes of all Build Options
  - 1.1d reflected nearly 15 percent greater reduction in F&I crashes when compared to 1.1b
- 230 feet separation on Neck Yoke Road between US16 mainline and US16 service road
  - 1.1a did not improve separation between intersections and exhibited measured queue spillback impacts by Year 2050

In comparison of the three multi-access RCI configurations, it was determined that 1.1e be carried forward as a finalist Build Options due to:

- Further reduction in overall number of conflict points in comparison to 1.1b
  - 1.1c and 1.1e provided the same key movement supported by stakeholders as 1.1b, but both reduced the number of conflict points by eliminating a redundant eastbound to westbound U-turn movement that provides little benefit to main intersection operations.
- 1.1e incorporates all turn lanes on the flatter grade, while 1.1c starts turn lanes on the steep downgrade
- 1.1e provides  $\frac{3}{4}$  access at the central access, which was favored by local stakeholders

The two finalist RCIs in step three include 1.1d, and 1.1e. A summary of key differentiating technical considerations is provided in the following tables.

**Table 45: Finalist RCI Build Option Comparison Summary**

Measure	1.1d	1.1e
No. of Access Points	1	2
Safety <i>Reduction in F&amp;I crashes from No Build</i>	-118 (-70%)	-103 (-61%)
Traffic Operations	LOS A 1 intersection	LOS A Provides 2 <sup>nd</sup> option for peaks
Intersection Spacing <i>Distance along Neck Yoke Road between US16 mainline and US16 service road at main RCI</i>	230'	230'
US16 Grade within Southbound Turn Lanes	Main RCI: -1.5%	Main RCI: -1.5% North access: -1.5%
Environmental <i>No. of full acquisitions</i>	1	1
B/C ratio	4.5	4.1
Total Cost <i>Construction + ROW + Contingency</i>	\$10.8M	\$10.8M \$11.2M w/ frontage road

**Table 46: Finalist RCI Build Option Main Intersection Traffic Operations Comparison**

Measure	1.1d AM / PM	1.1e AM / PM
NB RT Delay	16.7 / 38.9	15.8 / 30.6
NB to WB ETT	52.1 / 77.1	50.5 / 67.9
NB Approach ETT	25.6 / 48.3	30.4 / 37.3
SB RT Delay	17.0 / 22.7	16.9 / 21.0
SB to EB ETT	50.1 / 61.4	50.1 / 59.7
SB Approach ETT	39.1 / 50.2	43.2 / 53.8

ETT and delay measured in seconds/vehicle.

NB to WB ETT: NB LT traditional intersection movement

- NB RT to downstream U-turn to WB T and back through intersection (i.e. Neck Yoke Road to Black Hills)

SB to EB ETT: NB LT traditional intersection movement

- SB RT to downstream U-turn to EB T and back through intersection (i.e. Reptile Gardens to Rapid City)

Overall, the side-street operations are generally better for the multiple access RCI Build Options when comparing right turn delay and ETT of a left turn-equivalent movement. RCI 1.1e generally shows less delay and ETT in the range of 1-10 seconds per vehicle.

## 15.6 US16/Neck Yoke Road Intersection Sub-Study Recommendations

Based on the analysis contained within this report, the recommended technically feasible alternative that best meets the established transportation needs of the US16/Neck Yoke Road intersection is **Build Option 1.1d, RCI at Neck Yoke Road (west)**. Key elements include:

- US16 through traffic does not need to stop through the intersection (free movement)
- Safety benefits:

- 70 percent reduction in fatal and injury crashes compared to No Build condition
- 64 percent reduction in total crashes compared to No Build condition
- Overall intersection operations of LOS A in Year 2050
- Increases Neck Yoke Road intersection spacing between US16 and US16 service road to 230 feet
  - Measured 95<sup>th</sup> percentile queue 140 feet in Year 2050 AM peak hour, 90 feet less than the available 230 feet
- Frontage roads on west and east side distributes local traffic to access points and provides local connectivity for area parcels
- Public/stakeholder support for Build Options:
  - Improved local network access via frontage roads, better intersection spacing, and internal connectivity
  - US16 through traffic does not need to stop at the bottom of the valley
  - All turn lanes located entirely on the flatter 1.5 percent grade
- Benefit-cost ratio of 4.5, the greatest of all RCI finalist Build Options

A project’s success is often predicated on the support of proposed improvements by local stakeholders, elected officials, and the traveling public. Based on feedback received during the second and third public meetings, it was evident that local stakeholders and elected officials support the multiple access points in RCI 1.1e over the single access point in RCI 1.1d. As shown in this technical analysis, RCI 1.1e also provides notable benefit to the area with a benefit-cost ratio of 4.1. The tradeoff with multiple access points centers on the predicted increase in crashes versus a higher level of access and less delay at each individual intersection. Both Build Options satisfy the purpose and need and are considerably better than the No Build option.

The State of South Dakota access policy provides for opportunities to weigh benefits and drawbacks on the merits of each individual access. The intersection technical report presents those benefits and drawbacks for further consideration as part of the NEPA, preliminary design, and final design processes.

**US16/Neck Yoke Road Intersection Recommendations**

**2050 Planning Horizon Intersection:** US16/Neck Yoke Road Build Option 1.1d, RCI at Neck Yoke Road (west) with consideration of RCI 1.1e per the process provided in the State of South Dakota access policy

**2050 Planning Horizon Corridor:** 4-Lane Divided w/ 40’ Raised Median (Suburban)

**Timeline:**

**2025 RCI Project:**

- Construct ‘2050 Planning Horizon Intersection & Corridor’ recommendations

## 16.0 Bear Country/Croell Quarry Area

Transportation improvements associated through this area focus on both short and long-term intersection safety and access density needs. While the crash history does not flag any notable intersection crash history, the needs associated with this segment include corridor elements that may have a higher risk of crashes, long-range planning for growing volumes and redevelopment. This area also includes the long horizontal curve and steep grade along the south side of the quarry that has experienced safety issues.

Three scenarios were developed for the American Buffalo Resort area, shown in **Figure 41**, focusing on reducing US16 access points and improving intersection safety.

### *Scenario 1: Single Full Access Intersection and Main Entrance*

- Full access main resort entrance
- Eastbound left turn lane extension
- Median through or closure of all other access points
- Frontage road

### *Scenario 2: Frontage Road to 47<sup>th</sup> Avenue*

- Median through or closure of all other access points
- Frontage road to 47<sup>th</sup> Avenue West
- RIRO at east end to provide circulation

### *Scenario 3: RCI at Main Entrance*

- RCI (full access) at main resort entrance
- Eastbound left turn lane extension
- Median through or closure of all other access points
- Frontage road

One scenario was developed for the Bear Country/Croell Quarry intersection area, **Figure 42**, focusing on intersection improvements at the Bear Country entry and exit intersections and the Croell Quarry main intersection.

### *Scenario 1: Intersection Improvements*

- Bear Country Entrance (1.a)
  - Maintain eastbound left turn lane
  - Westbound right turn lane extension
- Bear Country Exit (1.b)
  - Median U-turn intersection
- Croell Quarry Main Intersection (1.c)
  - Eastbound left turn lane (2020 project)
  - Southbound to eastbound acceleration lane (2020 project)

Based on crash history along the horizontal curve/steep grade to the south and east of the Croell Quarry, the horizontal curve section was identified for high-friction surface treatment. This improvement was installed for the eastbound direction in Fall 2019.

Further to the east, an intersection option was also developed for the planned Rushmore Candy Company commercial property to address safety concerns (**Figure 43**).

### **Scenario 1: Modified RCI**

- RCI at west access
  - Adds eastbound left turn lane with deceleration commensurate with down grade
- RIRO at east access

## **16.1 Design Notes**

RCI layouts were developed to accommodate either a right turn + weave maneuver or a direct right turn maneuver across the two travel lanes into the downstream U-turn lane.

- 800 feet provided between main intersection and downstream U-turn intersection
- U-turn lane extended to main RCI intersection

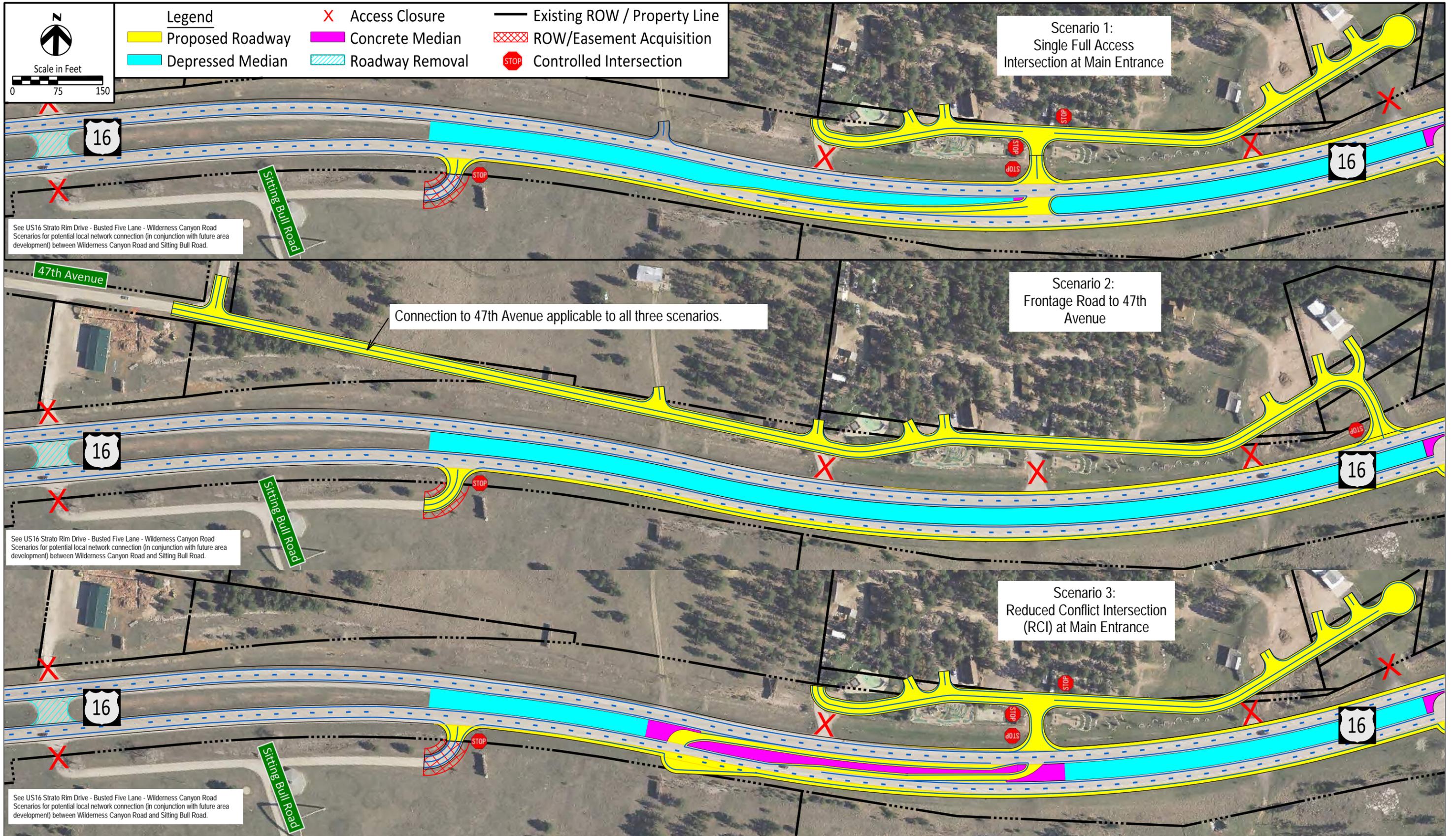
The Croell Quarry main intersection option layout reflects what was constructed in 2020.

American Buffalo Resort scenarios 1 and 3 show cul-de-sacs to the east and west of the main entrance. An extension west to 47<sup>th</sup> Avenue and/or RIRO access to the east are applicable considerations to provide increased internal continuity.

The US16 grade through the American Buffalo Resort access points is a 6 percent downgrade in the eastbound direction. Modifications to the eastbound left turn lane includes extended deceleration distance to account for this grade.

Sight distance was reviewed for median U-turns in the proximity of the crest vertical curve near Sitting Bull Road. All layouts meet sight distance based on AASHTO's Case B2 - Right Turn from the Minor Road.

Summer 2021 is the first tourist season for the Rushmore Candy Company and will be the first opportunity to gauge improvement needs at the access point. No operations analysis was conducted at this intersection as part of the US16 Corridor Study.

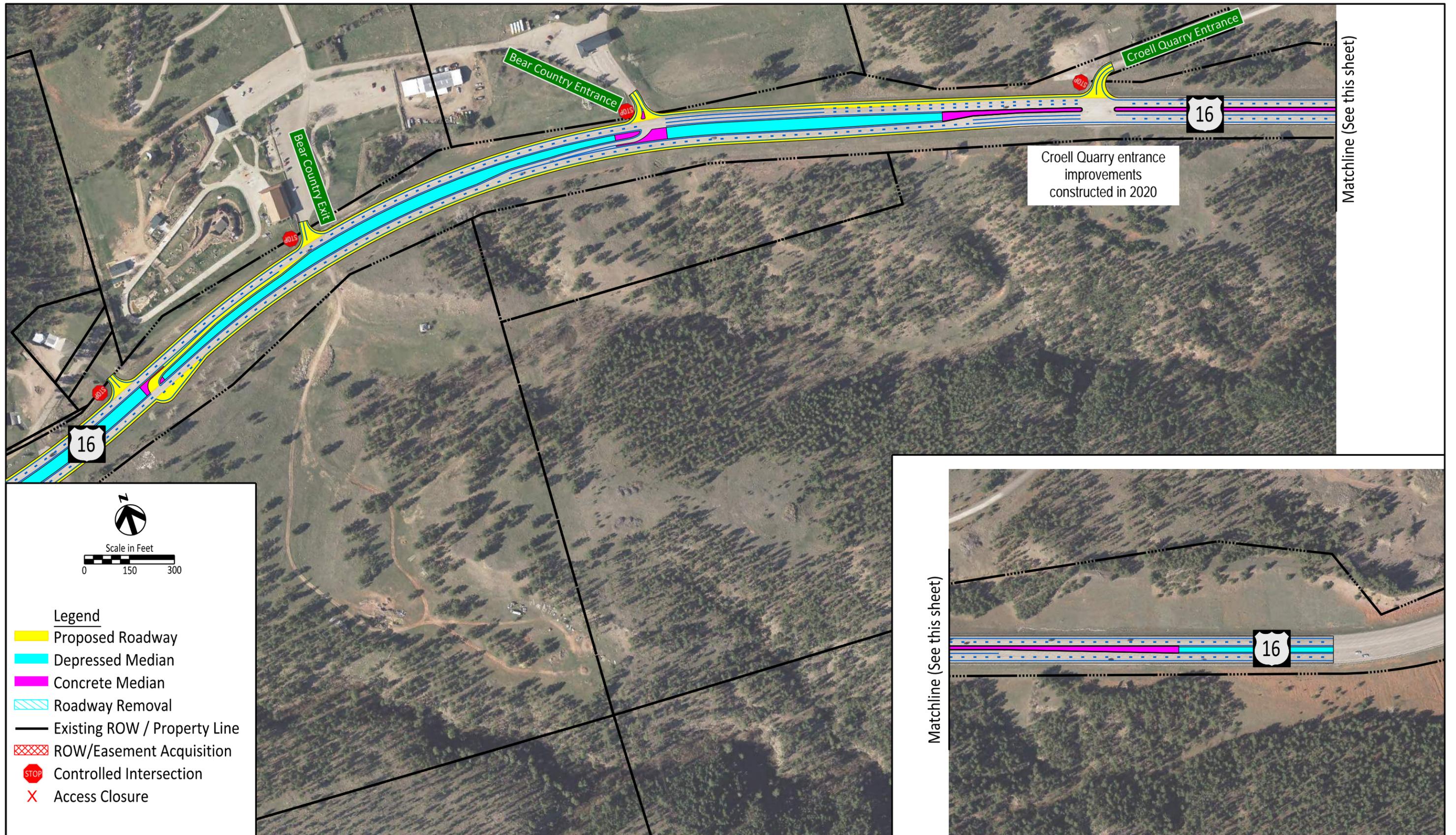


ABR  
Scenarios 1-3

Concepts Carried Forward  
Corridor/Intersections: ABR-1, 2, and 3



US16 American Buffalo Resort Area  
Scenarios 1, 2, and 3: Access Management  
US16 Corridor Study



BC-CQ  
**Scenario 1**

Concepts Carried Forward  
 Corridor/Intersections: BC-1 and CP-1

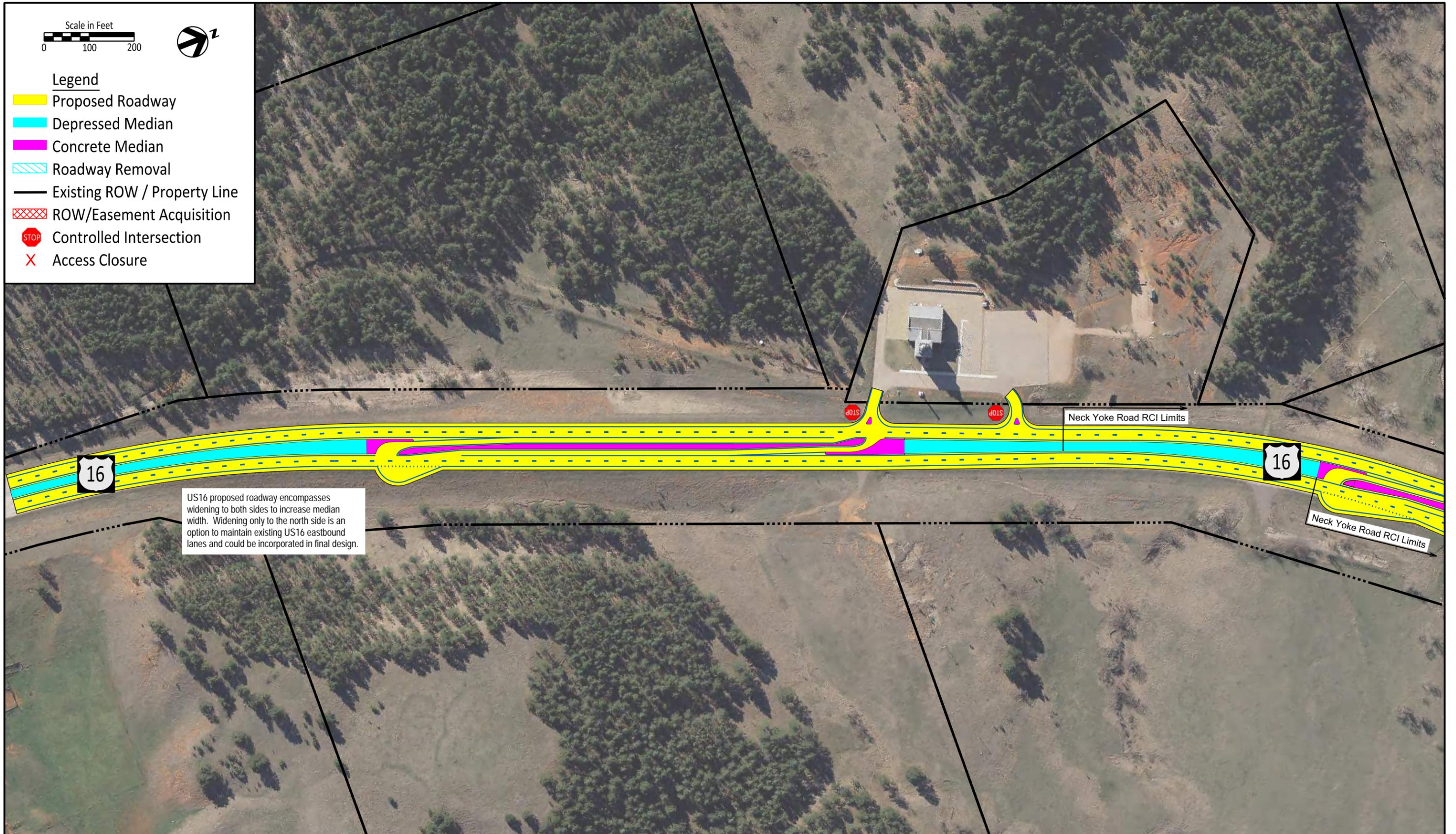


US16 Bear Country - Croell Pit Area  
 Scenario 1: Reduced Conflict Intersections (RCI) and 2020 Croell Intersection Improvements  
 US16 Corridor Study



**Legend**

- Proposed Roadway
- Depressed Median
- Concrete Median
- Roadway Removal
- Existing ROW / Property Line
- ROW/Easement Acquisition
- STOP Controlled Intersection
- X Access Closure



RCC  
Scenario 1



US16 Rushmore Candy Company  
Scenario 1 - Modified Reduced Conflict Intersection (RCI)  
US16 Corridor Study

Rapid City, SD

Figure  
43

## 16.2 Traffic Operations Analysis

Analysis intersections through this segment included the two Bear Country access points and the main Croell Quarry access point. The American Buffalo Resort access points were considered low-volume access points with seasonal peaks, and thus not analyzed.

Results from the traffic operations analysis are summarized in **Table 47**. All three intersections are expected to operate with acceptable LOS through the 2050 Planning Horizon. The quarry trucks' need for larger gaps in traffic is reflected by the higher side-street delay at the Croell Quarry main intersection. While side-street volumes are considerably higher at the Bear Country exit, the ETT to turn right, complete the U-turn and travel back to the main intersection is considerably less than the existing traditional stop-controlled intersection.

**Table 47: Bear Country/Croell Quarry Area Intersection Operations (2050 Build)**

	Intersection	Intersection Control	Measure	AM Measure / LOS	AM Measure / LOS
Scenario 1	Bear Country Exit	Median U-turn	MUT ETT: (WCSC Delay):	0.9 / A (14.9 / B)	1.3 / A (17.3 / C)
	Bear Country Entrance	TWSC w/Turn Lanes	Overall Delay: (WCSC Delay):	0.2 / A (13.2 / B)	0.2 / A (14.2 / B)
	Croell Quarry Main Intersection	TWSC w/Turn and Accel. Lanes	Overall Delay: (WCSC Delay):	0.2 / A (29.0 / D)	0.2 / A (34.4 / D)

ETT and delay measured in seconds/vehicle.

## 16.3 Predictive Safety Analysis

**Table 48** and **Table 49** presents IHSDM predictive safety results for the American Buffalo Resort area and Bear Country/Croell Quarry area scenarios, respectively. For the Bear Country/Croell Quarry intersection area, the No Build conditions includes the Croell Quarry main intersection improvements constructed in 2020.

**Table 48: American Buffalo Resort Area Predicted Crashes (2026-2050)**

Scenario	F&I Crashes +/- from baseline	% Increase / Decrease	Total Crashes +/- from baseline	% Increase / Decrease
No Build (baseline)	20	-	45	-
Scenario 1	0	0%	-2	-4%
Scenario 2	-2	-10%	-7	-16%
Scenario 3	-2	-10%	-7	-16%

**Table 49: Bear County/Croell Quarry Area Predicted Crashes (2026-2050)**

Scenario	F&I Crashes +/- from baseline	% Increase / Decrease	Total Crashes +/- from baseline	% Increase / Decrease
No Build (baseline)	57	-	130	-
Scenario 1	-8	-14%	-19	-15%

No Build condition includes 2020 intersection improvements at Croell Quarry main intersection. Reduction in crashes primarily associated with modifications at Bear Country Entrance and Exit intersections.

The greatest predicted reduction in crashes is associated with intersection options that restrict left turns out of the side-street access points. This is evident with the crash predicted crash reductions for American Buffalo Resort Scenarios 1 and 2 and the Bear Country Exit median U-turn conversion.

### 16.4 Future Pavement Needs Summary

A summary of upcoming investment needs along the corridor segment includes:

- Roadway pavement (*SDDOT Needs Book* timeline)
  - Mill and Overlay (2030-2035)

### 16.5 Public Comment Summary

Feedback received during the third public meeting was supportive of safety improvements throughout the area with mixed support across the different options.

### 16.6 Benefit-Cost Analysis

‘New pavement only’ and ‘full reconstruction’ option construction costs were calculated for each scenario. A benefit-cost ratio was conducted for each of the scenarios and is presented in **Table 50** and **Table 51**. Because modifications to the Bear Country Exit reflect the greatest predictive safety benefit in that scenario, a ‘Bear Country Exit only’ option BCA was also calculated.

**Table 50: American Buffalo Resort Area BCA**

Scenario	Construction Option	Costs	Benefit-Cost Ratio
No Build (baseline)	-	\$0	-
Scenario 1	<i>New pavement only</i>	\$1.0	0.06
	<i>Full reconstruction</i>	\$2.9	-
Scenario 2	<i>New pavement only</i>	\$1.4	0.13
	<i>Full reconstruction</i>	\$3.2	-
Scenario 3	<i>New pavement only</i>	\$1.3	0.19
	<i>Full reconstruction</i>	\$3.1	-

**Table 51: Bear Country/Croell Quarry Area BCA**

Scenario	Construction Option	Costs	Benefit-Cost Ratio
No Build (baseline)	-	\$0	-
Scenario 1	<i>Bear Country Exit only</i>	\$0.5	1.72
	<i>New pavement only</i>	\$1.3	0.66
	<i>Full reconstruction</i>	\$3.2	0.27

### 16.7 Evaluation Summary and Recommendations

**Table 52** and **Table 53** summarize scenario components, measures, and drawbacks.

**Table 52: American Buffalo Resort Area Summary (Components, Matrix, and Benefits/Drawbacks)**

1. Single Full Access Intersection at Main Entrance	2. Frontage Road to 47 <sup>th</sup> Avenue	3. Reduced Conflict Intersection (RCI) at Main Entrance
<ul style="list-style-type: none"> <li>Maintains full access main resort entrance. Extends EB left turn lane deceleration distance</li> <li>Close or extend raised median through all other access points</li> <li>Frontage road</li> </ul>	<ul style="list-style-type: none"> <li>Median through all access points</li> <li>Frontage road to 47<sup>th</sup> Avenue West</li> <li>RIRO at east end to provide circulation</li> </ul>	<ul style="list-style-type: none"> <li>RCI (full access) at main resort entrance</li> <li>Close or extend raised median through all other access points</li> <li>Frontage road</li> </ul>

Scenario	Traffic Operations		Safety (2026 - 2050)		ROW	Costs		Benefit-Cost Ratio
	Extra Travel Distance	Route Continuity	F&I Crashes (+/- from baseline)	Total Crashes (+/- from baseline)	ROW Needed (acres)	US16 Mainline Construction Option	ROW & Construction Costs (\$mil)	Ratio**
No Build	No change	No change	20	45	0		\$0	
1. Single Full Access Intersection at Main Entrance	<b>Minimal</b>	East & west dead-ends*	0	-4%	< 0.5	New pavement only Full reconstruction	\$1.0 \$2.9	0.06 -
2. Frontage Road to 47 <sup>th</sup> Avenue	Yes - Exiting LT to Rapid City rerouted via 47 <sup>th</sup> Ave	<b>Continuous</b>	<b>-10%</b>	<b>-16%</b>	< 0.5	New pavement only Full reconstruction	\$1.4 \$3.2	0.13 -
3. Reduced Conflict Intersection (RCI) at Main Entrance	<b>Minimal</b>	East & west dead-ends*	<b>-10%</b>	<b>-16%</b>	< 0.5	New pavement only Full reconstruction	\$1.3 \$3.1	0.19 -

Favorable measures indicated in **Bold Green**. Unfavorable measures indicated in **Bold Orange**. Black text indicates measure that was in the middle when compared to other options.

\* RIRO to US16 (similar to Scenario 2) would eliminate east dead end.

\*\* Not an analysis intersection, no traffic volumes or delay calculated. B-C ratio based on safety performance and cost.

Scenario	Benefits	Drawbacks
1. Single Full Access Intersection at Main Entrance	<ul style="list-style-type: none"> <li>Extends EB left turn lane deceleration length</li> </ul>	<ul style="list-style-type: none"> <li>Does not eliminate angle conflicts for left turns out of main entrance</li> <li>EB US16 left turn on 6% down grade</li> <li>Frontage road divides existing resort features</li> </ul>
2. Frontage Road to 47 <sup>th</sup> Avenue	<ul style="list-style-type: none"> <li>Greatest reduction of conflict points</li> <li>10% reduction in predicted F&amp;I crashes</li> <li>Eliminates right angle conflict for left turns out of all existing access points</li> <li>Removes EB US16 left turn from 6% down grade</li> <li>Greatest separation between US16 and first frontage driveway access</li> </ul>	<ul style="list-style-type: none"> <li>Highest cost</li> <li>Wilderness Canyon Road approximately 0.6 miles from main entrance</li> <li>Signing/wayfinding will be important for eastbound traffic as resort is not visible from Wilderness Canyon Road intersection</li> <li>Frontage road divides existing resort features</li> </ul>
3. Reduced Conflict Intersection (RCI) at Main Entrance	<ul style="list-style-type: none"> <li>10% reduction in predicted F&amp;I crashes</li> <li>Eliminates right angle conflict for left turns out of all existing access points</li> </ul>	<ul style="list-style-type: none"> <li>EB US16 left turn on 6% down grade</li> <li>Frontage road divides existing resort features</li> </ul>
All Scenarios	<ul style="list-style-type: none"> <li>Reduces total number of conflict points</li> <li>Reduces number of left turn angle conflicts out of access points</li> <li>Provides access framework for future development</li> </ul>	

**Table 53: Bear Country Summary (Components, Matrix, and Benefits/Drawbacks)**

1a. Bear Country Entrance	1b. Bear Country Exit	1c. Croell Quarry Main Intersection Improvements
<ul style="list-style-type: none"> <li>Maintains eastbound left turn at entrance</li> <li>Westbound right turn lane extension</li> </ul>	<ul style="list-style-type: none"> <li>Median U-turn intersection</li> </ul>	<ul style="list-style-type: none"> <li>Eastbound left turn (2020 project)</li> <li>Southbound to eastbound acceleration lane (2020 project)</li> </ul>

Scenario	2050 Traffic Operations			Predicted Safety (2026 - 2050)		ROW Needed (acres)	Costs		Benefit-Cost Ratio
	Bear Country Entrance Intersection LOS AM / PM	Bear Country Entrance Intersection LOS AM / PM	Croell Quarry Main Intersection LOS AM / PM	F&I Crashes (+/- from baseline)	Total Crashes (+/- from baseline)		US16 Mainline Construction Scenario	ROW & Construction Costs (\$mil)	
No Build	A / A	A / A	A / A	57	130	0		\$0	
1. Bear Country (1.a, 1.b, 1.c)	A / A	A / A	A / A	-14%	-15%	0	Bear Country Exit only	\$0.5	1.72
							New pavement only	\$1.3	0.66
							Full reconstruction	\$3.2	0.27

Favorable measures indicated in **Bold Green**. Unfavorable measures indicated in **Bold Orange**. Black text indicates measure that was in the middle when compared to other options.

Scenario 1 Intersection Options	Benefits	Drawbacks
<b>1a. Bear Country Entrance Intersection Improvements</b>	<ul style="list-style-type: none"> <li>WB right turn lane extension provides additional room for queued/slow right turn traffic during peak events</li> <li>WB right turn lane can also function as an acceleration lane for large trucks</li> </ul>	• -
<b>1b. Bear Country Exit Median U-turn Intersection</b>	<ul style="list-style-type: none"> <li>Reduces high-severity conflict by redirecting exit left turn as right turn to downstream U-turn</li> <li>14% reduction in predicted F&amp;I crashes</li> </ul>	• -
<b>1c. Croell Quarry Main Intersection Improvements</b>	<ul style="list-style-type: none"> <li>Acceleration lane provides 1-stage crossing for exiting large trucks (2020 project)</li> <li>EB left turn lane removes turning traffic from high-speed through lanes (2020 project)</li> </ul>	• -

US16 Bear Country/Croell Quarry Area scenario recommendations and planning level timeline are as follows:

**US16 Bear Country/Croell Quarry Area Recommendations**

**2050 Planning Horizon ABR:** Consider all presented scenarios (Scenarios 1-3)

**2050 Planning Horizon Bear Country:** Intersection Improvements (Scenario 1)

**2050 Planning Horizon Rushmore Candy Company:** RCI (Scenario 1)

**2050 Planning Horizon Corridor:** 4-Lane Divided Rural (median width varies)

- Existing 28-foot median widened by proposed improvements where applicable

**Timeline:**

**2025 - 2030:**

- Construct ‘**2050 Planning Horizon Bear Country**’ recommendations
  - Consider tying with future Strato Rim - Busted Five - Wilderness Canyon intersection recommendations
- Construct ‘**2050 Planning Horizon Rushmore Candy Company**’ recommendations
  - Consider constructing with US16/NYR Project
  - Consider an initial Build condition that adds EB LT lane and modifies the alignment through the access points to widen median and accommodate a future RCI

**Interim:**

- Consider ‘**2050 Planning Horizon ABR**’ recommendations through future redevelopment, as part of adjacent projects, or when access locations become a crash issue

## 17.0 Busted Five/Wilderness Canyon Area

Transportation needs along this segment primarily center on intersection safety. There have been several high-severity crashes at segment intersections as well as operational impacts from larger vehicles and growing traffic demand. These needs are magnified during the tourist season with higher volumes and a diverse mix of vehicles such as RVs with trailers and motorcycles. Long-range planning of future access points and local network connectivity is also needed to help guide future development and redevelopment in the area.

Based on these needs, the following three scenarios were developed through this segment (shown in **Figure 44** through **Figure 46**):

### *Scenario 1: Reduced Conflict Intersections (RCIs) on Existing Alignment*

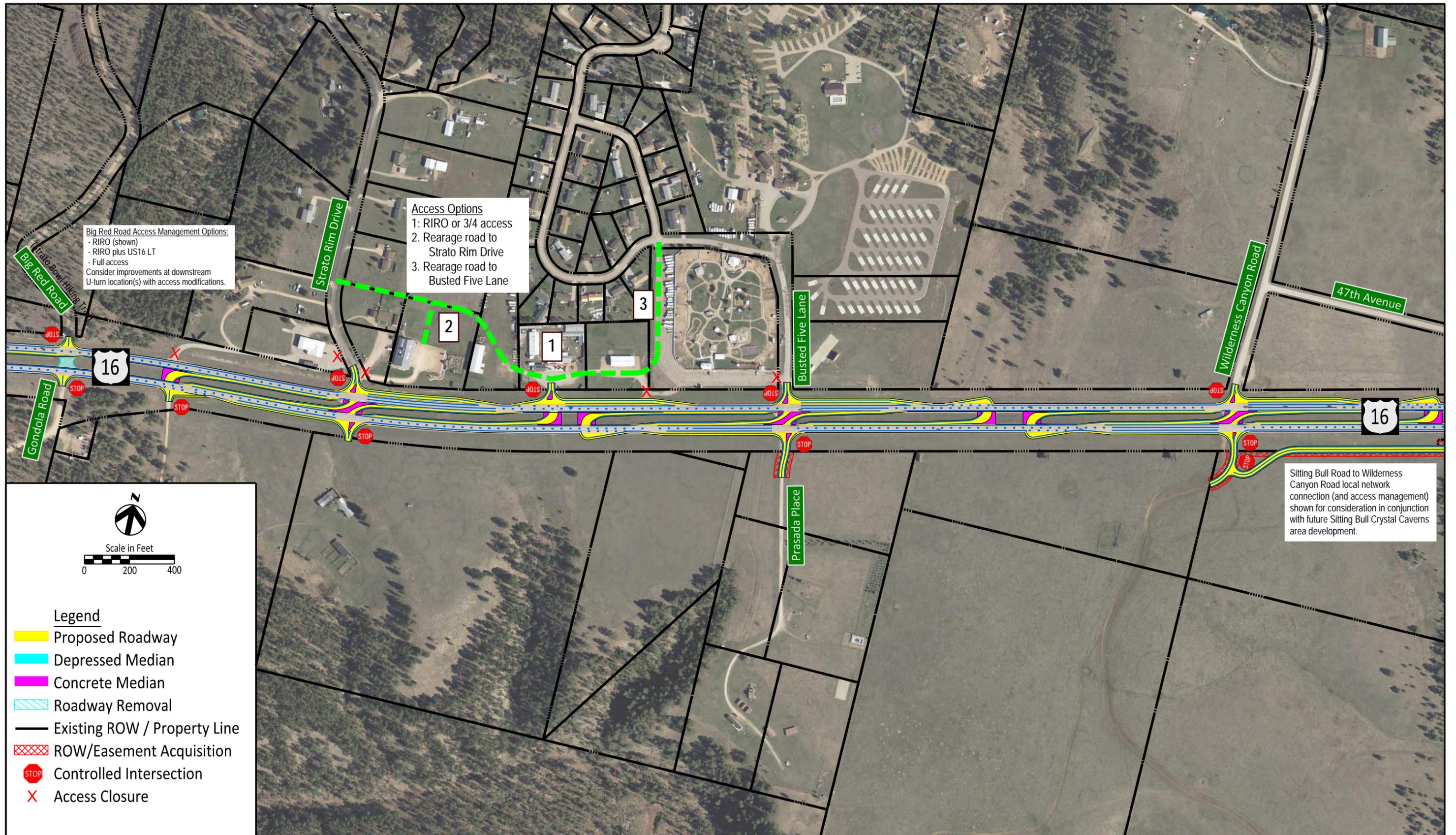
- RCIs at Wilderness Canyon Road, Busted Five Lane, and Strato Rim Drive
- Christmas Store (and surrounding parcels) access options:
  - RIRO,  $\frac{3}{4}$ , or rearage connections to Strato Rim Drive or Busted Five Lane

### *Scenario 2: Full Access Intersection Improvements on Existing Alignment*

- Wilderness Canyon Road, Busted Five Lane, and Strato Rim Drive intersection improvements
  - Southbound to eastbound left turn acceleration lane
  - Warranted turn lanes
- Christmas Store (and surrounding parcels) RIRO access

### *Scenario 3: Reduced Conflict Intersections (RCIs) on Shifted South Alignment*

- New US16 alignment shifted south
  - Rural cross-section
  - 250-foot separation between US16 and first side-street driveway or intersection
- Strato Rim Drive/Busted Five Lane combined RCI at 0.5-mile spacing from Wilderness Canyon Road
- RCI at Wilderness Canyon Road



SR-BF-WC  
**Scenario 1**

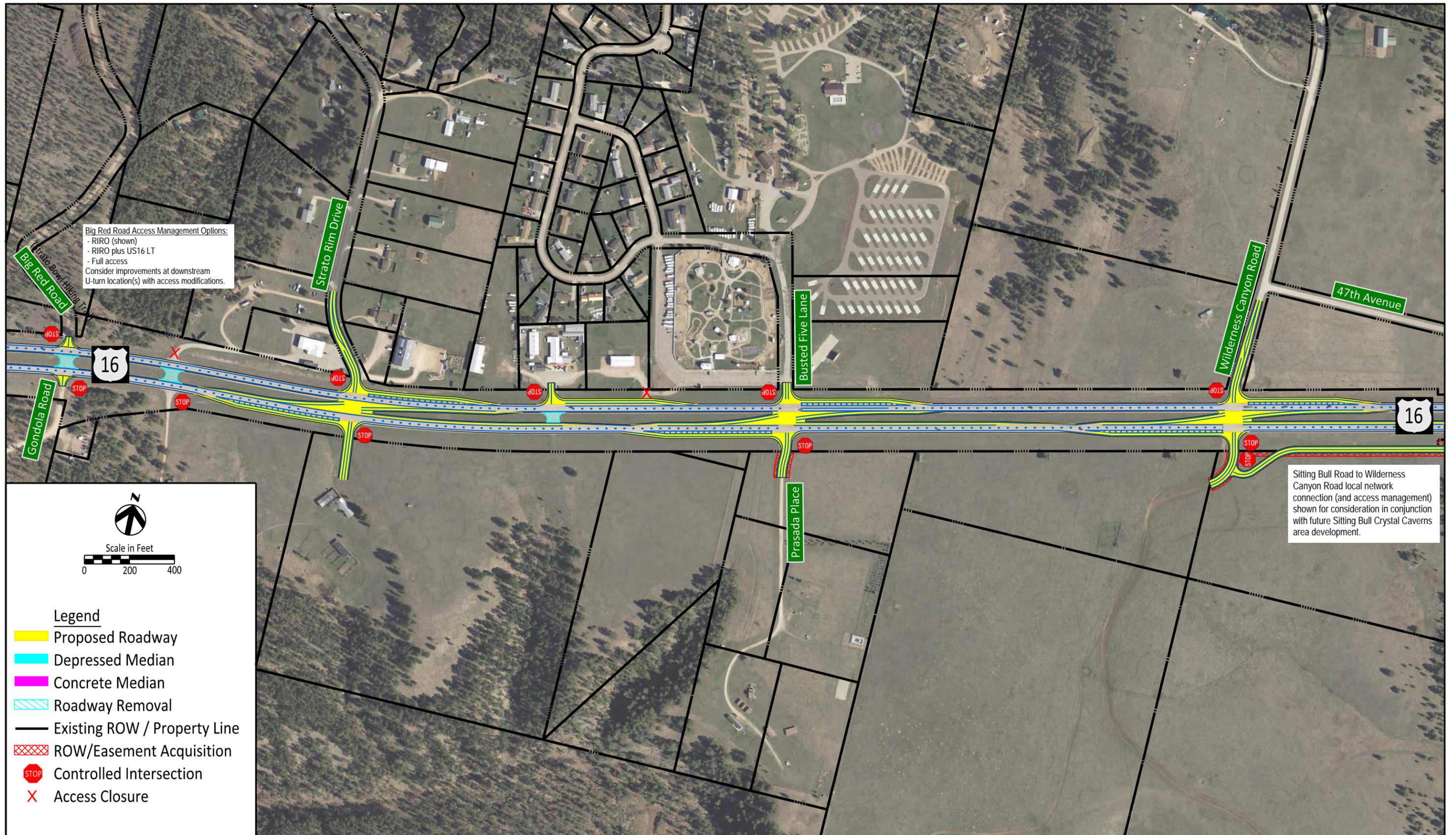
Concepts Carried Forward  
 Corridor/Intersections: BF-1 and WC-1  
 Central Access Options 1, 2, and 3



US16 Strato Rim Drive - Busted Five Lane - Wilderness Canyon Road Area  
 Scenario 1: Reduced Conflict Intersections (RCIs) on Existing Alignment  
 US16 Corridor Study

Rapid City, SD

Figure  
**44**



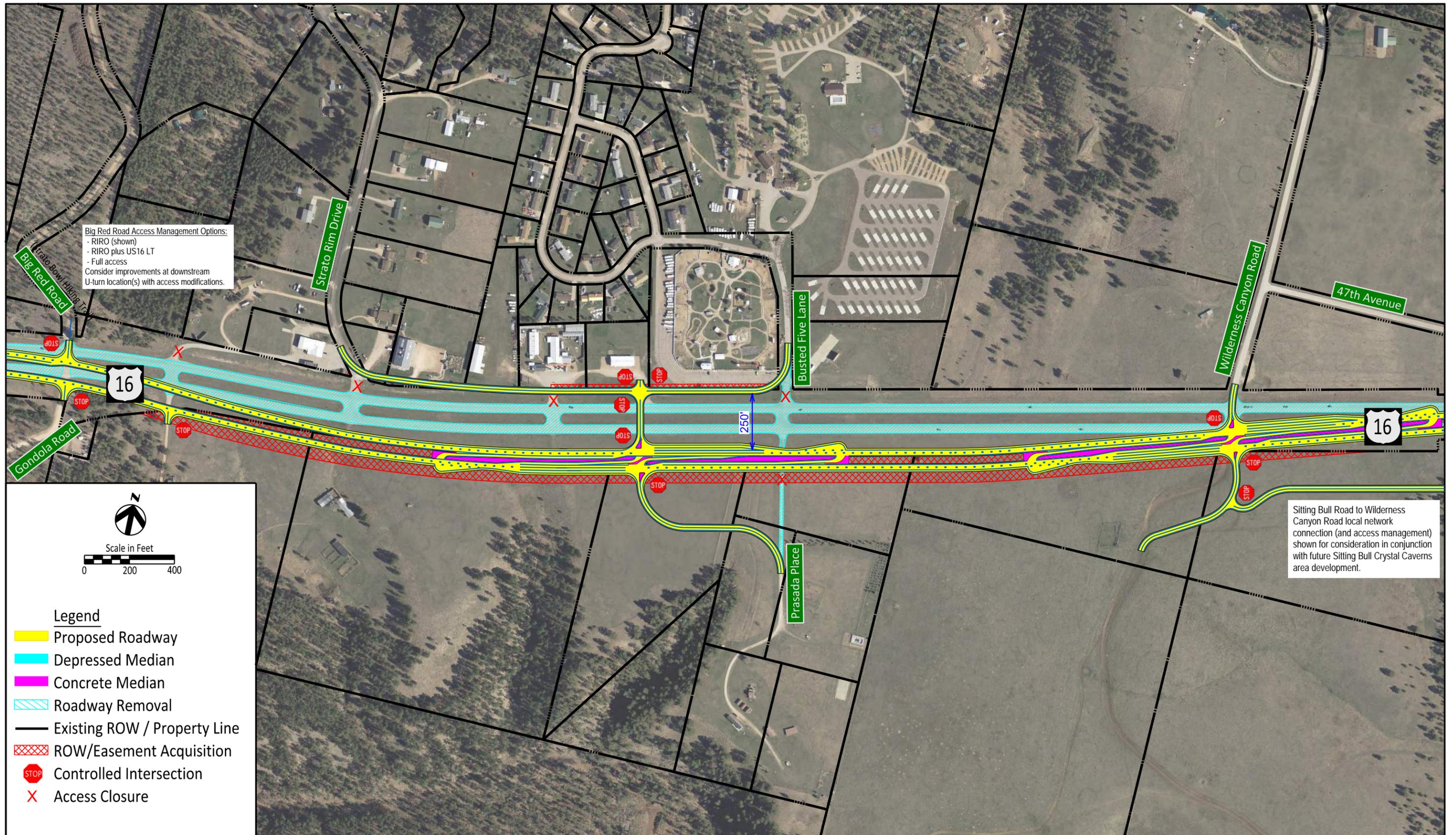
SR-BF-WC  
**Scenario 2**

Concepts Carried Forward  
 Corridor/Intersections: BF-3 and WC-3  
 Central access Options 1 (RIRO)



US16 Strato Rim Drive - Busted Five Lane - Wilderness Canyon Road Area  
 Scenario 2: Full Access Intersection Improvements on Existing Alignment  
 US16 Corridor Study

Rapid City, SD  
 Figure  
**45**

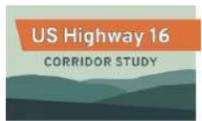


Big Red Road Access Management Options:  
 - RIRO (shown)  
 - RIRO plus US16 LT  
 - Full access  
 Consider improvements at downstream U-turn location(s) with access modifications.

Sitting Bull Road to Wilderness Canyon Road local network connection (and access management) shown for consideration in conjunction with future Sitting Bull Crystal Caverns area development.

SR-BF-WC  
**Scenario 3**

Concepts Carried Forward  
 Corridor/Intersections: BF-5 and WC-2



US16 Strato Rim Drive - Busted Five Lane - Wilderness Canyon Road Area  
 Scenario 3: Reduced Conflict Intersections (RCIs) on Shifted South Alignment  
 US16 Corridor Study

Rapid City, SD

## 17.1 Design Notes

RCI layouts were developed to accommodate either a right turn + weave maneuver or a direct right turn maneuver across the two travel lanes into the downstream U-turn lane.

- 800 feet provided between main intersection and downstream U-turn intersection
- U-turn lane extended to main RCI intersection

All intersections incorporate parallel offset right turn lanes. A tapered offset right turn lane is also applicable.

All RCI layouts meet sight distance based on AASHTO’s Case B2 - Right Turn from the Minor Road.

Primary access for future development to the south is reflected in each of the layouts. Local network connectivity will be an important consideration with any future development.

Scenarios 1 and 2 were developed to fit within existing cross-section and provides options for both short-term, low-cost implementation of just the auxiliary lanes or full reconstruction of US16 corridor. Scenario 3 is only applicable with full reconstruction.

In Scenario 3, the US16 corridor is shifted south to achieve 250 feet of separation between US16 mainline and the first local/local intersection. This meets the desired separation outlined in the *SDDOT Road Design Manual*.

All scenarios include additional access management along the corridor to eliminate access points or restrict individual movements.

## 17.2 Traffic Operations Analysis

Year 2050 intersection operations are shown in Table 54.

**Table 54: Busted Five/Wilderness Canyon Area Intersection Operations (2050 Build)**

	Intersection	Intersection Control	Measure	AM Measure / LOS	PM Measure / LOS
Scenario 1	Strato Rim Dr	RCI	ETT: (WCSC Delay):	1.0 / A (13.8 / B)	1.1 / A (14.8 / B)
	Busted Five Ln	RCI	ETT: (WCSC Delay):	0.9 / A (14.1 / B)	1.9 / A (16.6 / C)
	Wilderness Canyon Rd	RCI	ETT: (WCSC Delay):	2.1 / A (16.6 / C)	0.7 / A (15.1 / C)
Scenario 2	Strato Rim Dr	TWSC w/Turn and Accel. Lanes	Overall: (WCSC Delay):	0.8 / A (26.8 / D)	1.1 / A (35.5 / E)
	Busted Five Ln	TWSC w/Turn and Accel. Lanes	Overall: (WCSC Delay):	0.8 / A (28.2 / D)	2.4 / A (79.0 / F)
	Wilderness Canyon Rd	TWSC w/Turn and Accel. Lanes	Overall: (WCSC Delay):	2.9 / A (52.9 / F)	0.7 / A (34.7 / D)
Scenario 3	Combined Strato Rim Dr & Busted Five Ln	RCI	ETT: (WCSC Delay):	1.9 / A (15.0 / C)	3.2 / A (18.6 / C)
	Wilderness Canyon Rd	RCI	ETT: (WCSC Delay):	2.1 / A (16.6 / C)	0.7 / A (15.1 / C)

ETT and delay measured in seconds/vehicle.

Each of the three scenarios provide operational improvements to the three intersections. One of the primary benefits consistent across all three scenarios is that the high volume US16 through movements are free movements and thus experience zero delay.

The primary difference across the three scenarios is side-street delay. As volumes continue to grow, acceptable gaps in US16 mainline traffic will decrease for left turning side-street traffic. This results in greater delay and contributes to safety issues as motorists become impatient and attempt riskier maneuvers. To compound the issue, the lack of local network connectivity between Strato Rim Drive, Busted Five Lane, and Wilderness Canyon Road limits redistribution opportunities to adjacent intersections if one becomes congested.

RCIs benefit stop-controlled side-street delay by redirecting all left turn (and future through) movements to a right turn and downstream U-turn. Scenario 2 acceleration lanes also provide operational benefits by removing the far side turn conflict as motorists can turn directly into the acceleration lane. However, research such as a 2002 Minnesota Department of Transportation *Median Acceleration Lane Study Report* noted mixed compliance/use turning into a median acceleration lane and notes there are still elements of median delay and far-side angle crash risk exhibited in these configurations.

A common concern with RCIs is the additional time it takes for a side-street ‘left turn’ motorist to complete the right turn/U-turn/travel back to the main intersection. **Table 55** summarizes a comparison between this movement’s experienced travel time in an RCI (Scenarios 1 and 3) and a main intersection left turn across near-side traffic (Scenario 2). During the higher-volume conditions, the overall time to complete the RCI southbound ‘left turn’ movement is notably less than the delay experienced by a southbound vehicle trying to make a direct left turn onto eastbound US16.

**Table 55: Busted Five/Wilderness Canyon Area Intersection Southbound Left Turn Experienced Travel Time (2050 Build Options)**

	Intersection	Intersection Control	Measure	AM Measure	PM Measure
Scenario 1	Strato Rim Dr	RCI	SB Left Turn ETT	41.3	45.3
	Busted Five Ln	RCI	SB Left Turn ETT	41.7	48.5
	Wilderness Canyon Rd	RCI	SB Left Turn ETT	44.9	46.1
Scenario 2	Strato Rim Dr	TWSC w/Turn and Accel. Lanes	SB Left Turn Delay	26.8	35.5
	Busted Five Ln	TWSC w/Turn and Accel. Lanes	SB Left Turn Delay	28.2	79.0
	Wilderness Canyon Rd	TWSC w/Turn and Accel. Lanes	SB Left Turn Delay	52.9	34.7
Scenario 3	Combined Strato Rim Dr & Busted Five Ln	RCI	SB Left Turn ETT	42.9	51.8
	Wilderness Canyon Rd	RCI	SB Left Turn ETT	44.9	46.1

ETT and delay measured in seconds/vehicle.

SB Left Turn ETT: delay and extra distance travel time (sec/veh) for rerouted SB ‘left turn traffic’ to complete a right turn, downstream U-turn and travel back to the main RCI intersection.

SB Left Turn Delay: delay (sec/veh) experienced by SB traffic to complete a left turn movement to EB US16.

### 17.3 Predictive Safety Analysis

The IHSDM predictive safety analysis shown in **Table 56** demonstrates the safety benefits provided by RCIs, particularly for the more serious F&I crashes. It is expected that nearly 1/3 of all F&I crashes in this area could be eliminated over a 25-year period with intersection conversions to RCIs. Relocating side-street left and through movements to the downstream U-turn, via a right turn from the stop-controlled approach, eliminates the high severity angle crash conflict turning across the high-speed, high-volume US16 movement.

**Table 56: Busted Five/Wilderness Canyon Area Predicted Crashes (2026-2050)**

Intersection	F&I Crashes +/- from baseline	% Increase / Decrease	Total Crashes +/- from baseline	% Increase / Decrease
No Build (baseline)	159	-	330	-
Scenario 1	-49	-31%	-72	-22%
Scenario 2	-21	-13%	-40	-12%
Scenario 3	-51	-32%	-96	-29%

Scenario 2 turn lanes plus acceleration lanes for southbound to eastbound left turn movements also exhibits safety benefits, but not at a level near Scenarios 1 and 3. This is primarily due to the near-side angle conflict of left-turning vehicles with high-speed, high-volume approaching traffic. Further, varying levels of compliance with far side acceleration lanes still presents issues with far-side angle crashes.

### 17.4 Future Pavement Needs Summary

A summary of upcoming investment needs along the corridor segment includes:

- Roadway pavement (*SDDOT Needs Book* timeline)
  - Mill and Overlay (2030-2035)

### 17.5 Public Comment Summary

Comments provided in the third public meeting were mixed across the RCI and traditional intersection options. RCI concerns primarily centered on large vehicle turning movements, driver inconvenience, and safety.

### 17.6 Local Network Connectivity and Future Development

Currently, there is no local network connectivity between Strato Rim Drive, Busted Five Lane, and Wilderness Canyon Road. It is encouraged this be addressed through future development and partnerships amongst road districts and local agencies to not only minimize short-distance trips on US16, but also improve emergency/evacuation response which was a concern stated through the public comments. Removing short-distance trips on US16 eliminates the high-speed conflicts associated with that traffic. Further, it decreases side-street demand and thus reduces delay during peak periods.

Local network connectivity would also benefit access points between Strato Rim Drive and Busted Five Lane. Currently, the only public access for several parcels is via US16. It is encouraged this be revisited as part of future improvements in the area to investigate potential frontage/rearage roads or access easements. From a feasibility standpoint, discussions with local stakeholders noted that a rearage connection to Strato Rim Drive is likely not feasible due to development and impacts to residential parcels.

Each of the three scenarios establish the long-term access plan for the area to help guide future development's connectivity with US16. It is recommended that future development provides internal connectivity between roadways to help create internal network redundancy and minimize short-distance trips on US16.

Each of the three scenarios include a local network connection between Sitting Bull Crystal Caverns and Wilderness Canyon Road. It is recommended that this connection be implemented as part of future development at Sitting Bull Crystal Caverns to provide access to future improvements at the Wilderness Canyon Road and further manage access by eliminating conflict points.

## 17.7 Benefit-Cost Analysis

Construction costs were calculated for each of the three scenarios. For comparison and planning purposes, 'new pavement only' and 'full reconstruction' options were calculated. The 'new pavement only' option for Scenario 3 is illustrative to identify benefits associated with just the intersection modification elements.

A BCA was conducted for each the three scenarios to provide a comparative analysis of benefits and costs.

**Table 57: Busted Five/Wilderness Canyon Area BCA**

Intersection	Construction Option	Costs	Benefit-Cost Ratio
No Build (baseline)	-	\$0	-
Scenario 1	<i>New pavement only</i>	\$3.6	2.10
	<i>Full reconstruction</i>	\$9.2	0.82
Scenario 2	<i>New pavement only</i>	\$3.5	0.98
	<i>Full reconstruction</i>	\$9.1	0.38
Scenario 3	<i>Full reconstruction</i>	\$12.2	0.67
	<i>Improvements only**</i>	\$6.2	1.32

\*\*Assumes US16 reconstructed regardless of scenario. Includes \$3.6 for new RCI pavement from Scenario 1 + additional cost for new alignment (Scenario 1 Full Reconstruction - Scenario 2 Full Reconstruction). This is comparable to the 'new pavement only' options within each scenario.

## 17.8 Evaluation Summary and Recommendations

Table 58 summarizes scenario components, measures, and drawbacks.

**Table 58: Busted Five/Wilderness Canyon Area (Components, Matrix, and Benefits/Drawbacks)**

1. Reduced Conflict Intersections (RCIs) on Existing Alignment	2. Full Access Intersection Improvements on Existing Alignment	3. Reduced Conflict Intersections (RCIs) on Shifted South Alignment
<ul style="list-style-type: none"> <li>Wilderness Canyon Road RCI</li> <li>Busted Five Lane RCI</li> <li>Strato Rim Drive RCI</li> <li>Access/frontage/rearage options for Christmas Store access</li> </ul>	<ul style="list-style-type: none"> <li>Wilderness Canyon Road, Busted Five Lane, and Strato Rim Drive intersection improvements:                             <ul style="list-style-type: none"> <li>SB to EB left turn acceleration lane</li> <li>Warranted US16 turn lanes</li> </ul> </li> <li>Christmas Store access RIRO (w/downstream U-turns)</li> </ul>	<ul style="list-style-type: none"> <li>Shifts US16 alignment south with new rural cross-section to provide 250 feet separation between US16 and frontage road</li> <li>Strato Rim Drive/Busted Five Lane combined RCI at ½-mile spacing from Wilderness Canyon Road</li> <li>Wilderness Canyon Road RCI</li> </ul>

Scenario	2050 Traffic Operations				Predicted Safety (2026 - 2050)		ROW	Costs		Benefit-Cost Ratio
	Strato Rim Dr Intersection LOS AM / PM	Busted Five Ln Intersection LOS AM / PM	Wilderness Canyon Rd Intersection LOS AM / PM	All Stop-Controlled Approach LOS C or Better? Yes / No (Intersection Peak Hour: LOS)	F&I Crashes (+/- from baseline)	Total Crashes (+/- from baseline)		ROW Needed (acres)	US16 Mainline Construction Option	
No Build	A / A	A / A	A / A	No	159	330	0		\$0	
1. Reduced Conflict Intersections (RCIs) on Existing Alignment	A / A	A / A	A / A	Yes	-31%	-22%	1.3	New pavement only Full reconstruction	\$3.6 \$9.2	2.10 0.82
2. Full Access Intersection Improvements on Existing Alignment	A / A	A / A	A / A	No	-13%	-12%	1.2	New pavement only Full reconstruction	\$3.5 \$9.1	0.98 0.38
3. Reduced Conflict Intersections (RCIs) on Shifted South Alignment	- / -	A / A	A / A	Yes	-32%	-29%	14.4	Full reconstruction Improvements only**	\$12.2 \$6.2	0.67 1.32

Favorable measures indicated in **Bold Green**. Unfavorable measures indicated in **Bold Orange**. Black text indicates measure that was in the middle when compared to other options.

\*\*Assumes US16 reconstructed regardless of scenario for comparison to the 'new pavement only' options.

Scenario	Benefits	Drawbacks
1. Reduced Conflict Intersections (RCIs) on Existing Alignment	<ul style="list-style-type: none"> <li>31% predicted reduction in F&amp;I crashes</li> <li>All intersection approach delay LOS C or better</li> <li>Greatest B/C ratio (2.10)</li> </ul>	<ul style="list-style-type: none"> <li>Some U-turns may line up with existing access points, which creates new turning conflicts (mitigation possible)</li> <li>Frontage/rearage connections could add to cost</li> </ul>
2. Full Access Intersection Improvements on Existing Alignment	<ul style="list-style-type: none"> <li>13% predicted reduction in F&amp;I crashes</li> <li>Facilitates single-stage side-street left turn movement (left turn into acceleration lane)</li> </ul>	<ul style="list-style-type: none"> <li>Greatest stop-controlled delay at all three intersections</li> <li>Least safety benefit of corridor scenarios</li> </ul>
3. Reduced Conflict Intersections (RCIs) on Shifted South Alignment	<ul style="list-style-type: none"> <li>Greatest reduction in total number of conflict points</li> <li>32% predicted reduction in F&amp;I crashes</li> <li>All intersection approach delay LOS C or better</li> <li>Greatest separation between US16 and first crossroad intersection</li> </ul>	<ul style="list-style-type: none"> <li>Requires reconstruction of US16</li> <li>Greatest cost and ROW need</li> </ul>
All Scenarios	<ul style="list-style-type: none"> <li>Improves intersection traffic operations</li> <li>Improves predicted safety</li> <li>Reduces total number of conflict points</li> <li>Provides access framework for future development</li> </ul>	

US16 Busted Five / Wilderness Canyon Area scenario recommendations and planning level timeline are as follows:

**US16 Busted Five / Wilderness Canyon Road Area Recommendations**

**2050 Planning Horizon Scenario:** RCI on Existing Alignment (Scenario 1)

**2050 Planning Horizon Corridor:** 4-Lane Divided Rural

**Timeline:**

**2025 - 2030:**

- Construct '2050 Planning Horizon Scenario' recommendation

**Interim:**

- Sitting Bull Crystal Caverns property: work with development to tie into US16/Wilderness Canyon intersection and remove existing full access points.

## 18.0 Rockerville Area and West

Traffic volumes through the Rockerville area and west were the lowest of all segments within the US16 corridor study area and do not pose significant capacity issues. However, transportation needs within this area were diverse and often correlated with increasing traffic volumes magnifying existing issues, including:

- Intersection safety
- Redundant entrance and exit ramps with low traffic volumes
- Local route connectivity
- Future development

One of the goals of a long-range plan through this area is to support incremental adjustments as the area develops and existing roadway infrastructure needs reconstruction. Considerations of whether US16 should be combined to one side of the Rockerville area is a significant expense and thus incremental improvements are likely most feasible.

Within the Rockerville area, three scenarios were developed (**Figure 47** through **Figure 49**):

### *Scenario 1: Maintain Split US16 EB and WB Lanes with Area Improvements*

- Maintains existing US16 alignment
- Removes redundant ramps
- Pine Haven Drive extension to Rockerville Road
- US16 EB/Rockerville Road intersection improvements (skew)
- US16 WB/Main Street intersection improvements (skew and sight distance)

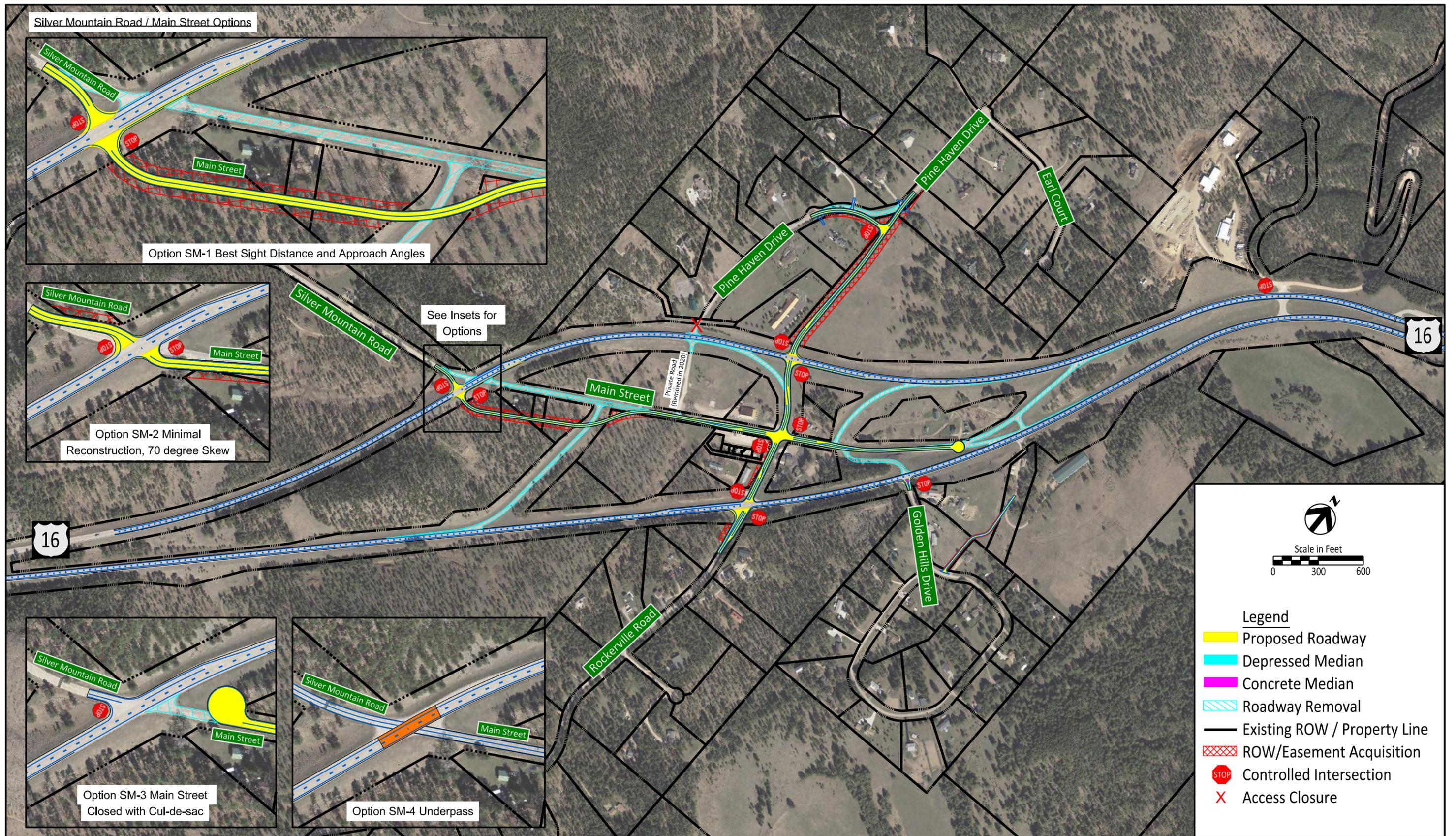
### *Scenario 2: Combine US16 EB and WB Lanes on North Side with Area Improvements*

- Reconstructs US16 north of Rockerville (existing US16 WB ROW)
- Removes all ramps
- Pine Haven Drive extension to Rockerville Road
- US16 Intersection improvements (RCIs)

### *Scenario 3: Combine US16 EB and WB Lanes on South Side with Area Improvements*

- Reconstructs US16 south of Rockerville (existing US16 EB ROW)
- Removes all ramps
- Pine Haven Drive extension to Rockerville Road (two options)
- US16 Intersection improvements (RCIs)

To the west of Rockerville, transportation needs primarily focus on intersection and roadway segment safety. An intersection option for turn lanes between the Hillside Cabins and Silver Mountain Road intersections was developed from stakeholder feedback (**Figure 50**).



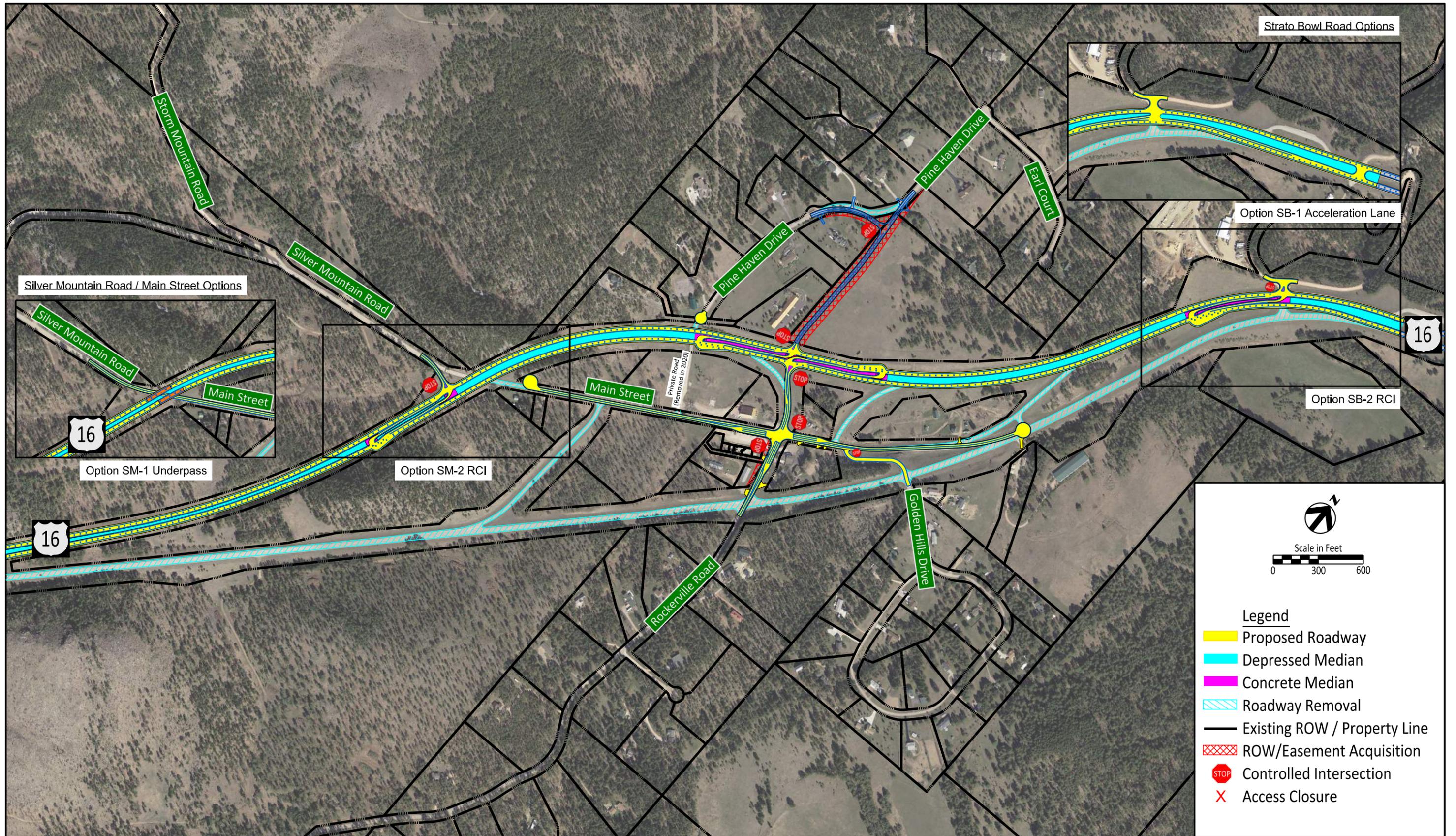
Rockerville  
**Scenario 1a**

Concepts Carried Forward  
 Corridor: A  
 Intersections: RR-PHD-1; SM-1, 2, and 3



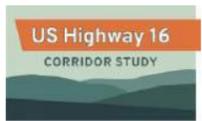
US16 Rockerville Area  
 Scenario 1: Maintain Split US16 EB and WB Lanes with Area Improvements  
 US16 Corridor Study

Rapid City, SD

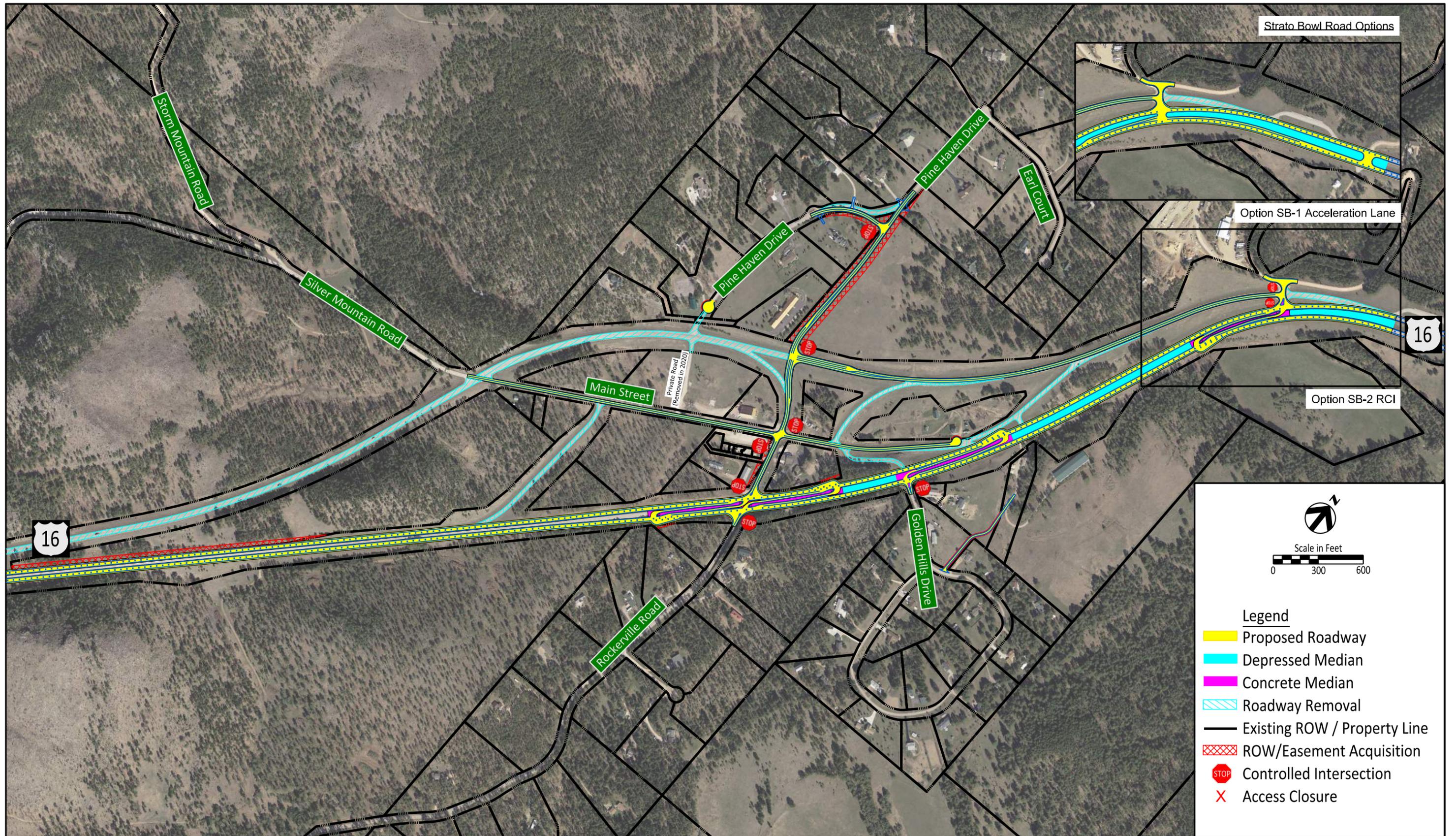


Rockerville  
**Scenario 2**

Concepts Carried Forward  
 Corridor: B  
 Intersections: RR-PHD-1

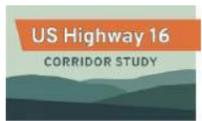


US16 Rockerville Area  
 Scenario 2: Combine US16 EB and WB Lanes on North Side with Area Improvements  
 US16 Corridor Study



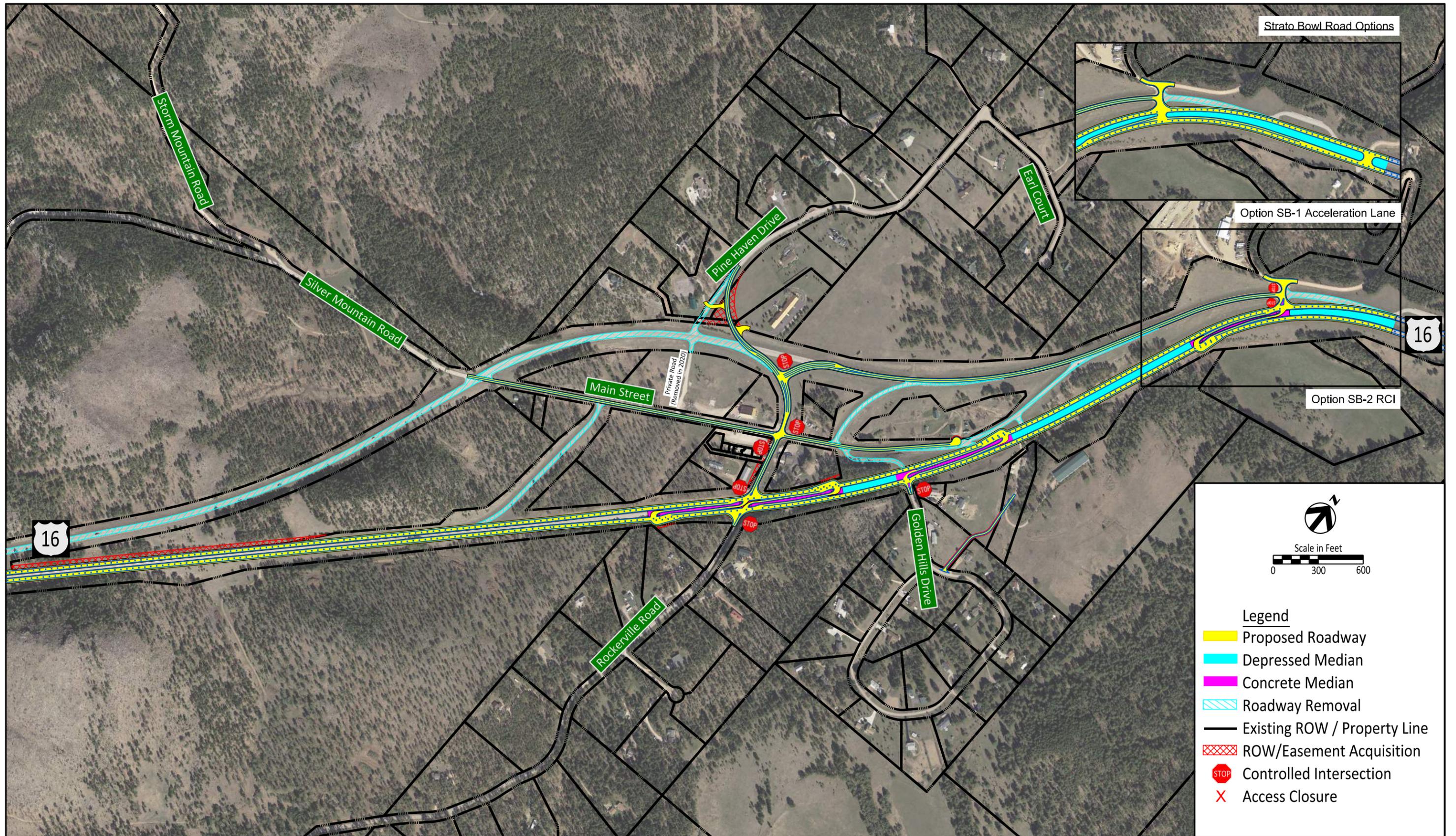
Rockerville  
**Scenario 3a**

Concepts Carried Forward  
 Corridor: C  
 Intersections: RR-PHD-1



US16 Rockerville Area  
 Scenario 3a: Combine US16 EB and WB Lanes on South Side with Area Improvements  
 US16 Corridor Study

Rapid City, SD  
 Figure  
**49**



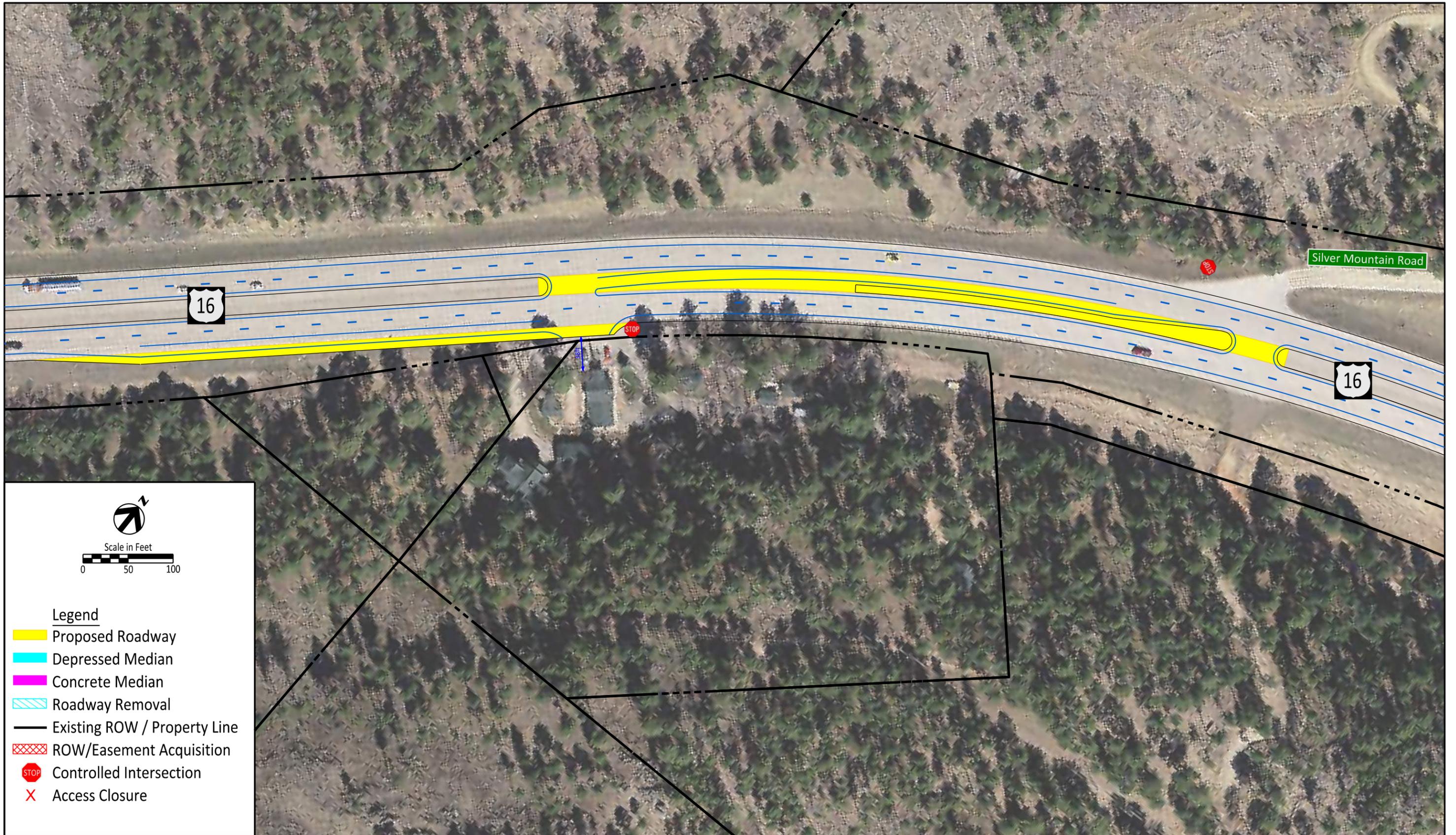
Rockerville  
**Scenario 3b**

Concepts Carried Forward  
 Corridor: C  
 Intersections: RR-PHD-2



US16 Rockerville Area  
 Scenario 3b: Combine US16 EB and WB Lanes on South Side with Area Improvements  
 US16 Corridor Study

Figure  
**49**  
 Rapid City, SD



Scale in Feet  
0 50 100

**Legend**

- Proposed Roadway
- Depressed Median
- Concrete Median
- Roadway Removal
- Existing ROW / Property Line
- ROW/Easement Acquisition
- STOP Controlled Intersection
- X Access Closure

HCC  
**Scenario 1**



US16 Hillside Country Cabins Access and Silver Mountain Road Intersection  
Scenario 1 - Intersection Improvements  
US16 Corridor Study

Rapid City, SD

Figure  
**50**

## 18.1 Design Notes

US16/Rockerville Road intersection skew shown in Scenarios 1 and 3 is 70 degrees, reflecting the minimum skew per *SDDOT Road Design Manual* guidelines. A Rockerville Road realignment closer to a 90-degree angle with US16 would likely lead to ROW impacts and rock excavation.

The Main Street/Rockerville Road intersection is shown as stop-control with a single lane in each direction in all scenarios. The intersection type and number of lanes would need to be analyzed prior to reconstruction.

US16 WB/Main Street/Silver Mountain Road sight triangle was estimated based on aerial imagery and Google StreetView. It appears the Main Street approach sight line skirts the edge of ROW and that a 70-mph sight line might fall within the backslope area. This intersection should be reviewed with future intersection improvements.

The US16 alignment in Scenarios 2 and 3 are shown centered within existing ROW. The risk for rock excavation outside of the ROW is significant, particularly for Scenario 3, and an important consideration when assessing alignment feasibility.

The US16/Silver Mountain Road/Main Street grade separation option shows US16 going over Silver Mountain Road/Main Street due to terrain, connectivity, and potential property impacts east of US16.

The 'Private Road' connection between Pine Haven Drive and Main Street was closed in 2020 due to development.

RCI layouts were developed to accommodate either a right turn + weave maneuver or a direct right turn maneuver across the two travel lanes into the downstream U-turn lane.

- 800 feet provided between main intersection and downstream U-turn intersection
- U-turn lane extended to main RCI intersection

All RCI layouts meet sight distance based on AASHTO's Case B2 - Right Turn from the Minor Road.

Intersections incorporate parallel offset right turn lanes. A tapered offset right turn lane is also applicable.

## 18.2 Traffic Operations

Rockerville area analysis intersections, shown in **Table 59**, achieve overall intersection LOS A in all scenarios. Side-street delay was higher in Scenario 1 intersections where left turn and through movements are accommodated within the main intersection.

**Table 59: Rockerville Area Intersection Operations (2050 Build)**

	Intersection	Intersection Control	Measure	AM Measure / LOS	PM Measure / LOS
Scenario 1	US16 WB / Pine Haven Drive	TWSC w/Turn Lanes	Overall: (WCSC Delay):	2.1 / A (26.6 / C)	2.6 / A (30.5 / D)
	US16 WB / Silver Mountain Road	TWSC w/Turn Lanes	Overall: (WCSC Delay):	0.6 / A (18.0 / C)	0.6 / A (17.6 / C)
	US16 EB / Rockerville Road	TWSC w/Turn Lanes	Overall: (WCSC Delay):	3.0 / A (17.6 / C)	5.6 / A (34.6 / D)
	US16 EB / Golden Hills Drive	TWSC	Overall: (WCSC Delay):	0.2 / A (11.4 / B)	0.1 / A (13.7 / B)
Scenario 2	US16 / Pine Haven Drive	RCI	ETT: (WCSC Delay):	3.2 / A (13.7 / B)	3.7 / A (18.1 / C)
	US16 / Silver Mountain Road / Main Street	RCI	ETT: (WCSC Delay):	0.2 / A (13.1 / B)	0.2 / A (12.8 / B)
Scenario 3	US16 / Rockerville Road	RCI	ETT: (WCSC Delay):	2.7 / A (15.4 / C)	3.5 / A (17.0 / C)
	US16 / Golden Hills Drive	RCI	ETT: (WCSC Delay):	0.1 / A (11.4 / B)	0.2 / A (13.6 / B)

ETT and delay measured in seconds/vehicle.

## 18.3 Rockerville Ramps

Rockerville ramps were reviewed as part of this corridor study to determine whether there was a transportation benefit to maintaining or removing the respective ramp. Maintenance of these ramps does reflect a cost, both from a pavement preservation and a winter maintenance standpoint. If ramps are removed, resources could be devoted to other areas within the SDDOT Rapid City Region.

A summary of traffic volumes on roadways entering/exiting the Rockerville median area are shown in **Figure 51**. Notable considerations in the area also include:

### Westbound US16

- First westbound off-ramp
  - Highest volume of all ramps
  - Use as primary WB US16 access to Rockerville area
- Second westbound off-ramp
  - Lowest volume of all ramps (less than 15 vehicles per day)
  - Redundant with first off-ramp.

- Rockerville Road westbound on-ramp
  - Low volume ramp
  - Provides Main Street connectivity to Pine Haven Drive through a merge and weave movement to right turn Pine Haven Drive
  - Several redundant movements with US16 WB/Main Street/Silver Street intersection

#### **Eastbound US16**

- Off-ramp
  - Low volume ramp (75 vehicles per day)
  - Redundant with similar movements accommodated at US16 EB/Rockerville Road intersection
- On-ramp
  - Highest volume on-ramp, but considerably lower volumes than corresponding US16 WB off-ramp
  - Redundant with similar movements accommodated at US16 EB/Rockerville Road intersection
  - Local access and roadway connections within the ramp junction area

The Build condition traffic analysis accounted for removal of all ramps and implementation of at-grade intersection improvements. The operational impact on maintained intersections was minimal and all intersections maintained LOS goals.

A potential volume-based prioritization plan for ramp adjustments are as follows:

#### **Priority Tier 1a**

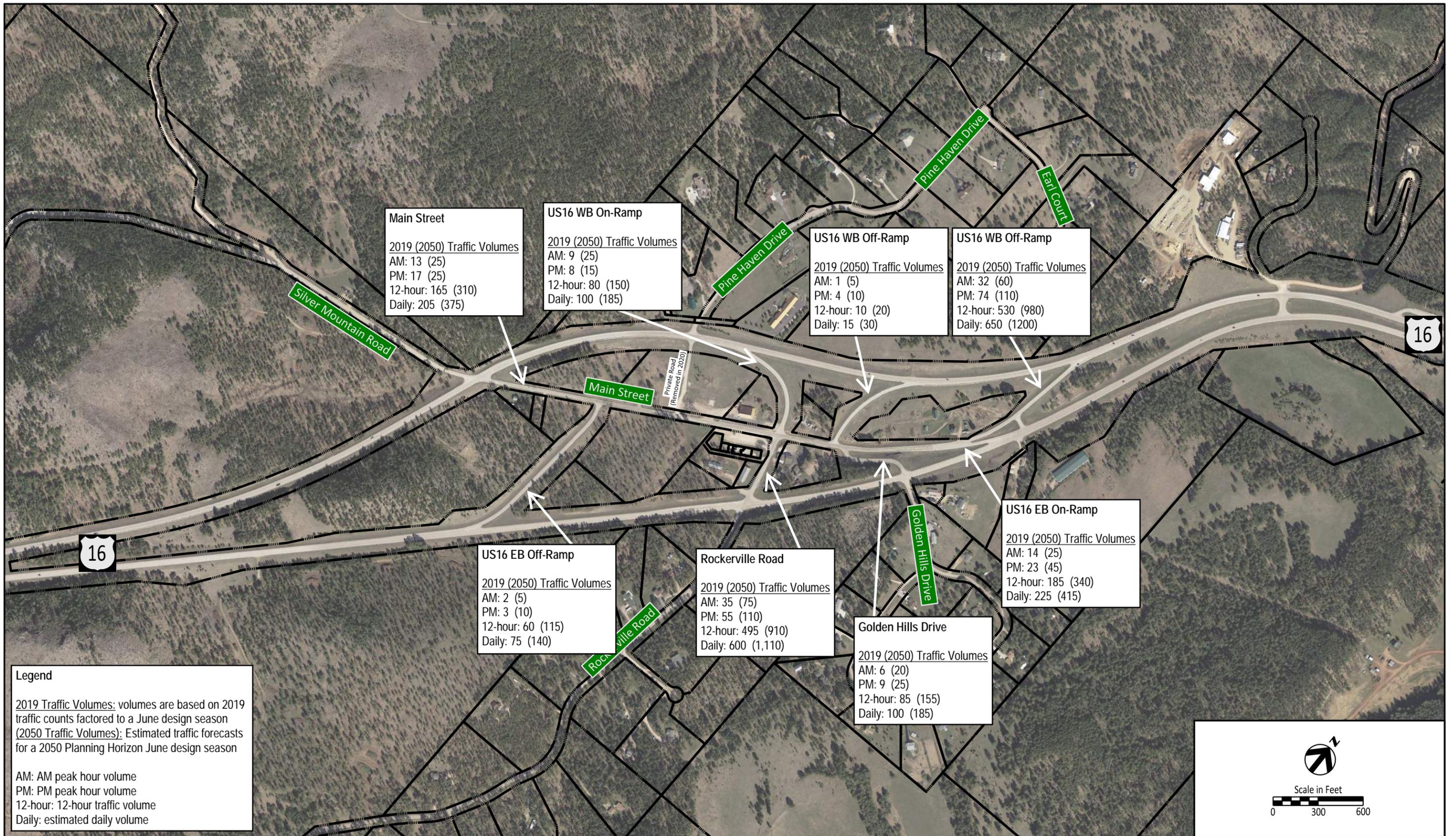
- Remove second US16 WB off-ramp
- Remove US16 EB off-ramp

#### **Priority Tier 1b**

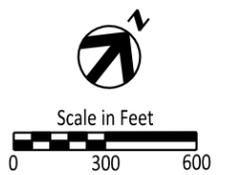
- Remove US16 WB on-ramp and construct at-grade intersection and two-way travel on Rockerville Road.
  - Install warranted turn lanes
  - Provide connectivity with Pine Haven Drive

#### **Priority Tier 3**

- First US16 WB off-ramp could be removed after US16 WB/Rockerville Road intersection is improved to accommodate all movements
- Remove US16 EB on-ramp in conjunction with removal of corresponding US16 WB off-ramp



Rockerville Area Traffic Volumes  
 US16 Corridor Study



## 18.4 Predictive Safety Analysis

The IHSDM predictive safety analysis is shown in **Table 60**.

**Table 60: Rockerville Area Predicted Crashes (2026-2050)**

Intersection	F&I Crashes +/- from baseline	% Increase / Decrease	Total Crashes +/- from baseline	% Increase / Decrease
No Build (baseline)	68	-	193	-
Scenario 1	-13	-19%	-15	-7%
Scenario 2	-35	-51%	-73	-18%
Scenario 3	-30	-44%	-60	-16%

*Grade separation of US16/Silver Mountain Road/Main Street would improve predictive safety.*

All three scenarios include various options of reducing conflict points, improving local network connectivity, and minimizing short-distance local travel on US16 mainline. Combining US16 mainline to either the north side (Scenario 2) or south side (Scenario 3) of Rockerville provides the greatest safety benefit due to:

- Reduction in high speed intersections/conflict points on US16 mainline
- Incorporating RCIs in lieu of the traditional stop-controlled intersections

Scenario 1 and 2 results include an at-grade US16/Silver Mountain Road/Main Street intersection. Grade separation would be expected to provide additional safety benefits to the area in these scenarios.

## 18.5 Future Pavement Needs Summary

A summary of upcoming investment needs along the corridor segment includes:

- Roadway pavement (*SDDOT Needs Book* timeline)
  - Mill and Overlay (2025-2030)

At this point, the *SDDOT Needs Book* does not identify a need for full reconstruction through year 2040.

## 18.6 Public Comment Summary

Feedback from the third public meeting primarily centered on:

- Comments were mixed across the scenarios, though Scenario 1 and Scenario 3 options were generally favored
  - Factors associated with these comments included cost, visibility of development along the corridor, and travel patterns
  - In general, commentors tended to prefer the highway combined on the opposite side of Rockerville from their residence
- Several comments expressed concern about the recent ‘private road’ closure between Pine Haven Drive and Main Street

- Noted some traffic using the Rockerville Road on-ramp (Rockerville Road to WB US16) in the wrong direction as the new route from Pine Haven Drive to Main Street
- Safety, inconvenience, and unfamiliar drivers were the most frequently identified concerns
- RCI concerns primarily centered on large vehicle turning movements, inconvenience, and safety concerns

## 18.7 Short-Term US16/Pine Haven Drive Access Options

The study team received comments in the third public meeting stating safety and operational concerns due to the recent closure of the ‘Private Road’ connecting Pine Haven Drive and Main Street, including:

- Wrong-way travel on US16 and the US16 on-ramp
- Difficulty making a left turn on westbound US16 at Silver Mountain Road/Main Street due to existing intersection skew/angle
  - Left turn occurs from the westbound US16 passing lane

Based on this feedback, the study team developed several short-term ‘Wrong-way Travel’ mitigation options to address these concerns. Each option can be integrated into the overarching Rockerville Area scenarios (**Figure 52**):

### Option 1

- Remove westbound on-ramp to reduce temptation to travel in the wrong direction on US16 as a shortcut
- Provide U-turn at first downstream location where US16 eastbound and westbound come together (approximately 1.5 miles west of Pine Haven Drive)
  - This U-turn location is further west than the existing US16/Silver Mountain Road/Main Street intersection and would likely not be utilized due to the extensive out-of-the-way travel

### Option 2

- 2a: Realign Pine Haven Drive along the US16 ROW line (south of hotel) and reconstruct US16 on-ramp to provide 2-way traffic
- 2b: Construct new Pine Haven Drive roadway along property line east of hotel and reconstruct US16 on-ramp to provide 2-way traffic

### Option 3

- 3a: Construct westbound US16 left turn lane at US16/Silver Mountain Road/Main Street intersection
- 3b: Construct left turn lane at US16/Silver Mountain Road/Main Street intersection and reconstruct intersection to reduce skew



Option 1a - Ramp Closure

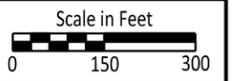
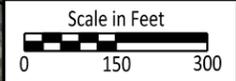
Option 3a - Left Turn Lane at Main St

Option 3b - Reduce Skew at Main Street

Option 2b - Realign Pine Haven

Option 2a - Realign Pine Haven

- Legend**
- Proposed Roadway
  - Depressed Median
  - Concrete Median
  - Roadway Removal
  - Existing ROW / Property Line
  - ROW/Easement Acquisition
  - STOP Controlled Intersection
  - X Access Closure



US16 at Rockerville  
 Short-Term US16/Pine Haven Drive Access Options  
 US16 Corridor Study

Rapid City, SD

## 18.8 Constructability Summary

Constructability is likely one of the more notable factors when considering feasibility of a future US16 alignment through the Rockerville Area.

### Rock Excavation

- Considerably greater risk of rock impacts with Scenario 3 (see **Figure 53**)
- Higher risk areas
  - Scenario 1: US16 EB/Rockerville Road and US16 WB/Main Street/Silver Mountain Road intersections
  - Scenario 2: US16/Main Street/Silver Mountain Road intersection and west
  - Scenario 3: Along most of the alignment, particularly in the US16/Rockerville Road intersection area

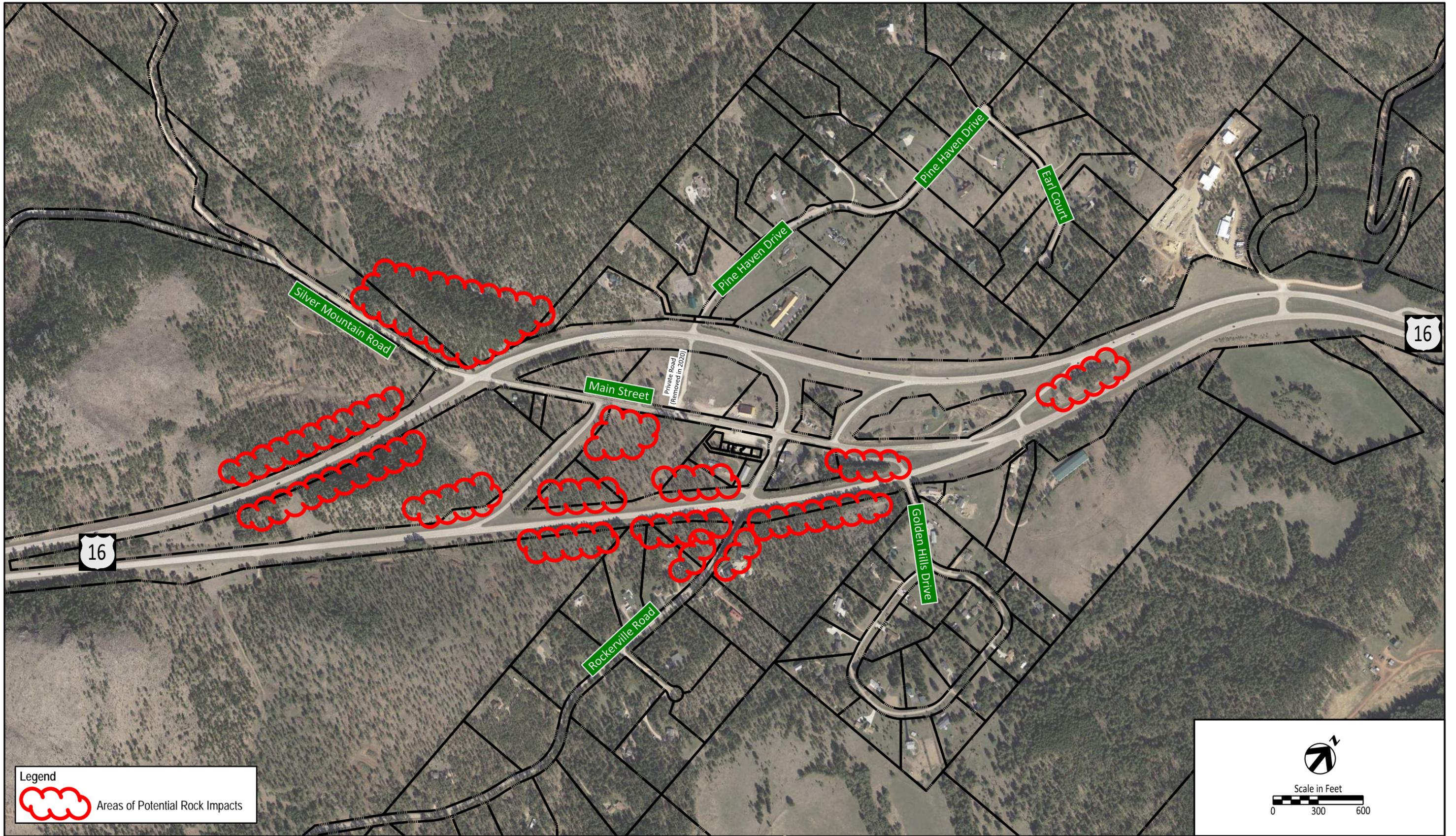
### Potential ROW/Development Impacts

- Scenario 2 and 3 US16 lanes centered within available ROW to minimize impacts
- Generally greater ROW width along US16 WB than US16 EB
- High risk areas
  - Scenario 1: Main Street/Rockerville Road intersection and Main Street realignment
  - Scenario 2: Main Street/Rockerville Road intersection and US16/Silver Mountain Road RCI
  - Scenario 3: US16 mainline west of existing US16 EB off-ramp and east of Rockerville Road, Main Street/Rockerville Road intersection and US16/Rockerville Road RCI

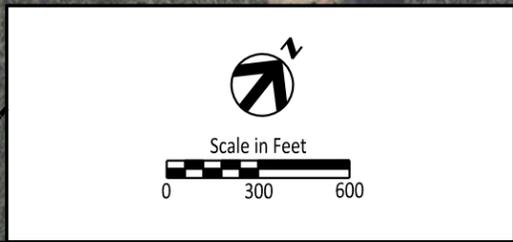
### Constructability

- US16 traffic could be maintained head-to-head during reconstruction in all scenarios
- Traffic impacts within Rockerville likely
- Scenarios 1 and 2 likely require more earth moving, but exhibit notably less risk for rock impacts than Scenario 3
- High risk areas
  - Scenario 1: US16 WB may need to be lowered approximately 10 feet through future Pine Haven intersection
  - Scenario 2: US16 may need to be lowered approximately 10 feet through future Pine Haven intersection
  - Scenario 3: Grade on north side of US16 through US16/Rockerville Road intersection and potential property impacts

Overall, between the two combined alignment scenarios, Scenario 2 was found to exhibit the greatest feasibility from a constructability standpoint when considering risk of potential rock impacts, ROW/development impacts, and constructability.



Legend  
 Areas of Potential Rock Impacts



Rockerville Area Potential Rock Impacts  
 US16 Corridor Study

Rapid City, SD  
 Figure  
**53**

## 18.9 Evaluation Summary and Recommendations

Table 61 summarizes scenario components, measures, and drawbacks.

US16 Rockerville Area and West scenario recommendations and planning level timeline are as follows:

### US16 Rockerville Area and West Recommendations

**Wrong-way Travel Mitigation Option:** Realign Pine Haven Drive w/ 2-way travel (ROW line/hotel driveway option)

- Close existing Pine Haven Drive access with US16 and on-ramp
- Construct new 2-way Pine Haven Drive connection:
  - West side: along ROW line/hotel driveway
  - East side: within existing on-ramp ROW

**2050 Planning Horizon Scenario:** Combine US16 on north side of Rockerville (Scenario 3)

**2050 Planning Horizon Corridor:** 4-Lane Divided Rural

#### **Timeline:**

##### *Short-term:*

- Close NB to WB on-ramp
- Construct 'Wrong-way Travel Mitigation Option' Realign Pine Haven Drive w/ 2-way travel
  - ROW line/hotel driveway option

##### *Interim:*

- Close redundant ramps

##### *Beyond 2040 (long range):*

- 'Combine US16 on North Side' (Scenario 2)
  - Center w/in available ROW (full reconstruction)
  - Consider grade separation with Silver Mountain Road/Main Street

**Table 61: Rockerville Area (Components, Matrix, and Benefits/Drawbacks)**

1. Maintain split US16 EB and WB lanes with area improvements	2. Combine US16 EB and WB lanes on north side with area improvements.	3. Combine US16 EB and WB lanes on south side with area improvements.
<ul style="list-style-type: none"> <li>Existing US16 alignment</li> <li>Removes redundant ramps</li> <li>Pine Haven Drive extension to Rockerville Road</li> <li>US16 EB/Rockerville Road intersection improvements (skew)</li> <li>US16 WB/Main Street intersection improvements (skew and sight distance)</li> </ul>	<ul style="list-style-type: none"> <li>Reconstructs US16 north of Rockerville (existing US16 WB ROW)</li> <li>Removes all ramps</li> <li>Pine Haven Drive extension to Rockerville Road</li> <li>US16 intersection improvements (RCIs)</li> </ul>	<ul style="list-style-type: none"> <li>Reconstructs US16 south of Rockerville (existing US16 EB ROW)</li> <li>Removes all ramps</li> <li>Pine Haven Drive extension to Rockerville Road options</li> <li>US16 intersection improvements (RCIs)</li> </ul>

Scenario	2050 Traffic Operations			Predicted Safety (2026 - 2050)			ROW Needed (acres)	Costs	
	Overall Intersection LOS AM / PM	Pine Haven Dr WCSC Approach LOS AM / PM	Rockerville Rd WCSC Approach LOS AM / PM	Scenario Option	F&I Crashes (+/- from baseline)	Total Crashes (+/- from baseline)		US16 Mainline Construction Scenario	ROW & Construction Costs (\$mil)
No Build	<b>A / A</b>	C / C	C / <b>D</b>		68	193			\$0
1. Maintain split US16 EB and WB lanes with area improvements	<b>A / A</b>	C / <b>D</b>	C / <b>D</b>	US16 EB/Main St Open: US16 EB/Main St Closed:	-19% -29%	-7% -10%	5.1	New pavement only: Full reconstruction:	<b>\$3.6</b> \$13.1
2. Combine US16 EB and WB lanes on north side with area improvements.	<b>A / A</b>	B / C	- / -		<b>-51%</b>	<b>-18%</b>	3.2	Full reconstruction:	\$13.8
3. Combine US16 EB and WB lanes on south side with area improvements.	<b>A / A</b>	- / -	C / C	Rockerville Rd on Alignment: Rockerville Rd Realignment:	<b>-44%</b>	<b>-16%</b>	2.9 - 5.1	Full reconstruction:	\$14.3 - 15.0

Favorable measures indicated in **Bold Green**. Unfavorable measures indicated in **Bold Orange**. Black text indicates measure that was in the middle when compared to other options.

Scenario	Benefits	Drawbacks
1. Maintain split US16 EB and WB lanes with area improvements	<ul style="list-style-type: none"> <li>Does not require US16 mainline reconstruction</li> <li>Up to 29% predicted reduction in F&amp;I crashes</li> <li>Removes internal roadways near potential wetland areas</li> <li>Minimal rock excavation (primarily with intersection improvements)</li> </ul>	<ul style="list-style-type: none"> <li>Some intersection options increase need for short-distance local travel on US16</li> </ul>
2. Combine US16 EB and WB lanes on north side with area improvements.	<ul style="list-style-type: none"> <li>51% predicted reduction in F&amp;I crashes, greatest of all scenarios</li> <li>Less rock impacts/excavation needs than Scenario 3</li> <li>Rockerville development no longer within US16 median</li> <li>Removes wildlife barrier with current US16 split, improves habitat connectivity</li> </ul>	<ul style="list-style-type: none"> <li>More US16 horizontal curvature than Scenario 2</li> <li>Requires reconstruction of US16</li> <li>Cost</li> <li>Larger US16 footprint crossing potential wetland areas</li> </ul>
3. Combine US16 EB and WB lanes on south side with area improvements.	<ul style="list-style-type: none"> <li>44% predicted reduction in F&amp;I crashes</li> <li>Straighter US16 alignment (fewer curves) than Scenario 2</li> <li>Rockerville development no longer within US16 median</li> <li>Removes wildlife barrier with current US16 split, improves habitat connectivity</li> <li>Removes US16 and internal roadways near potential wetland areas</li> </ul>	<ul style="list-style-type: none"> <li>Requires reconstruction of US16</li> <li>Cost</li> <li>Greatest potential rock excavation needs outside of existing ROW</li> <li>Additional local roadways may be required when compared to Scenario 2</li> </ul>
All Scenarios	<ul style="list-style-type: none"> <li>Removes redundant ramps</li> <li>Improves local network connectivity and reduces need for short-distance local travel on US16</li> <li>Reduces total number of intersection conflict points</li> <li>Supports area-wide incremental improvements through a long-range plan</li> <li>Provides access framework for future development</li> </ul>	<ul style="list-style-type: none"> <li>Unknown impacts to historic and archeological resources due to proposed modifications</li> </ul>

## 19.0 Intelligent Transportation System Recommendations

Intelligent Transportation System (ITS) recommendations focus on three primary areas of transportation systems management and operations (TSMO) needs to compliment potential capital improvements:

- Traveler Information Systems
- Event Management
- Intersection Safety Improvements

The ITS process tracked with the overarching study process of stakeholder/public meetings and SAT workshops. Recommendations were developed as part of a June 9, 2020, meeting with the SAT and additional SDDOT staff. Discussions centered on the three focus areas and potential implementations, leading to recommendations contained herein. Further discussion on this process is provided in the *ITS Recommendations* technical memo in **Appendix AA**. Recommended locations for ITS deployment are shown in **Figure 54**.

### Focus Area 1: Traveler information systems

**Need:** Crash history and route reliability/variability issues due to severe winter weather events, poor visibility due to fog/snow, high winds, large animal conflicts, and congestion from seasonal tourist traffic.

**Recommendation:** consider the following deployments to collect data, monitor the corridor, and disseminate information to travelers.

- Road weather information system (RWIS) and visibility monitoring
- High wind warning system (incorporate a dynamic element to the static sign)
- Large animal detection systems (LADS)
- Closed circuit television cameras (CCTV) with Pan-Tilt-Zoom (PTZ) capabilities
- Dynamic message signs (DMS)

### Focus Area 2: Event management

**Need:** Recurring congestion associated with tourist events, such as Independence Day around Mount Rushmore, Bear Country USA, Reptile Gardens, and the Sturgis Motorcycle Rally.

**Recommendation:** Employ DMS to inform motorist of slow/stopped traffic or traffic queues extending back from access points onto US16 shoulders or through lanes.

### Focus Area 3: Intersection safety improvements

**Need:** If the US16/Moon Meadows Drive intersection is signalized, it will be the first signalized intersection when entering the Rapid City urban area from the south. For southbound traffic, this intersection will be the first (and likely only) signalized intersection south of the proposed US16/US16B/Catron Boulevard SPI.

**Recommendation:** Install an Advanced Warning System (AWS) in conjunction with any future signalization of the US16/Moon Meadows Drive intersection. An AWS is intended to provide drivers with situational awareness of an impending signal phase change from green to red, which has been found to be a benefit to intersection safety.

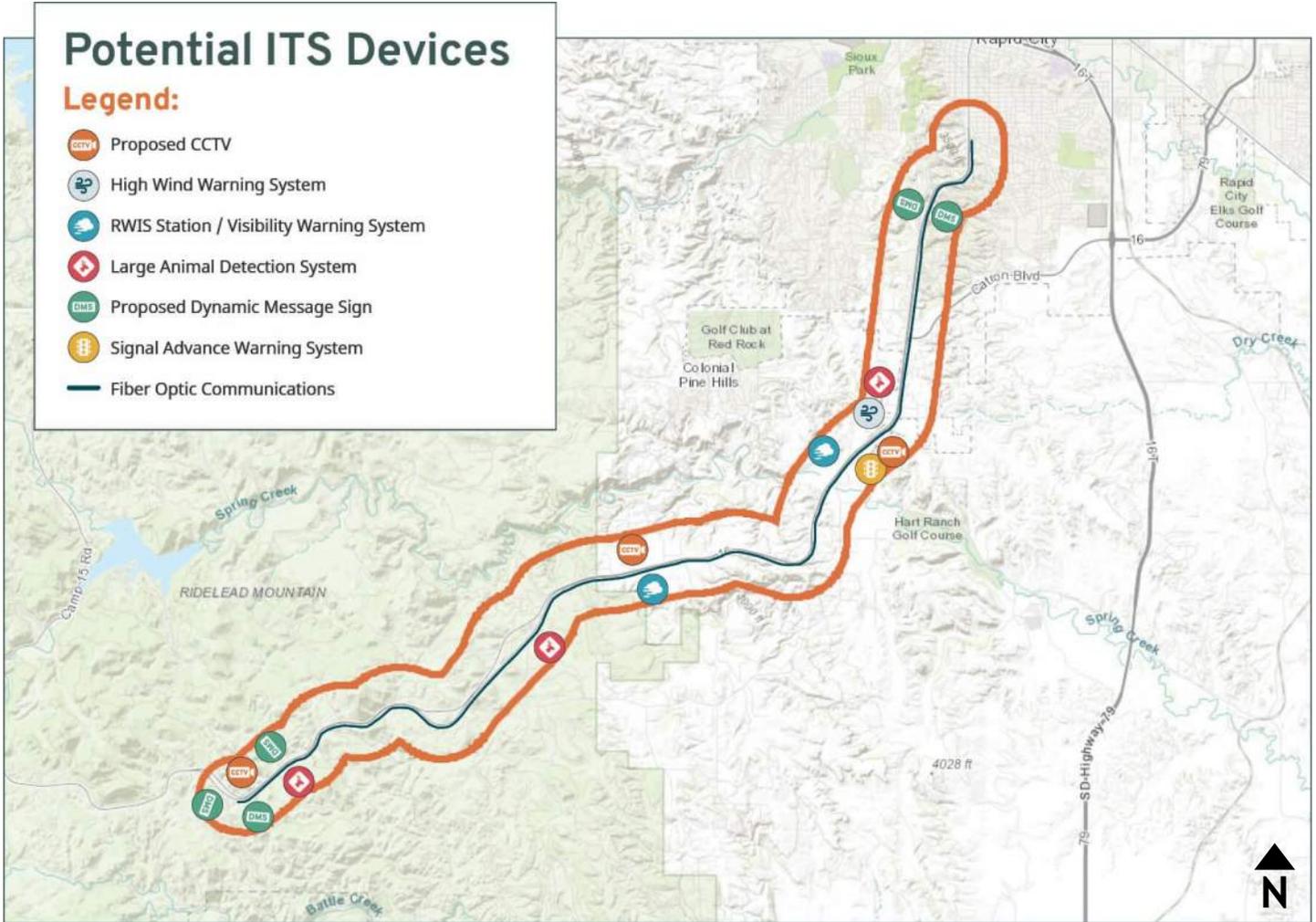


Figure 54: ITS Recommendations

## 20.0 Blowing Snow Recommendations

At the onset of the study, several problematic blowing and drifting snow areas were identified by the SAT, SDDOT maintenance staff, public, and study stakeholders. The unexpectedness of slippery road conditions was a commonly cited concern, such as nighttime/morning refreeze or continual depositing of snow on the roadway well after the winter weather event has ended and the remainder of the corridor is at normal driving conditions. A winter-weather crash analysis found that the problematic locations identified anecdotally aligned with higher winter-weather crash locations.

It is recommended that a multi-faceted approach of the following design and seasonal operations measures be considered to address blowing and drifting snow:

### Roadway typical sections

- Height above surrounding terrain for fill sections
- Barn roof design for large fill sections
- Flat-bottom ditches for cut sections

### Safety barriers

- Concrete barrier considerations; poor performance for blowing and drifting snow
- W-beam considerations; poor performance for blowing and drifting snow
- Box-beam and cable rail provide better performance for blowing and drifting snow

### Snow fences

- Structural snow fence
- Living snow fence
- Seasonal snow fence
- V-plowing

### High-friction surface treatments

- At problematic horizontal curve locations

The following snow fence location recommendations, shown in **Figure 55**, include areas that would benefit from installation of snow fences as a short-term solution:

- **MRM 57.5 to 59**
- **MRM 60 to 60.5**
  - Snow fence at the top of the rock race to help drop snow blowing through the quarry area before it reaches the roadway
- **MRM 63 to 64.5**
  - It is anticipated that future blowing snow impacts will diminish to some degree through this area as development continues southward along the US16 corridor

Long-term, incorporating blowing snow design considerations into the typical section and safety barrier design is recommended. Further discussion is provided in the *Blowing Snow Analysis* technical memo provided in **Appendix BB**.

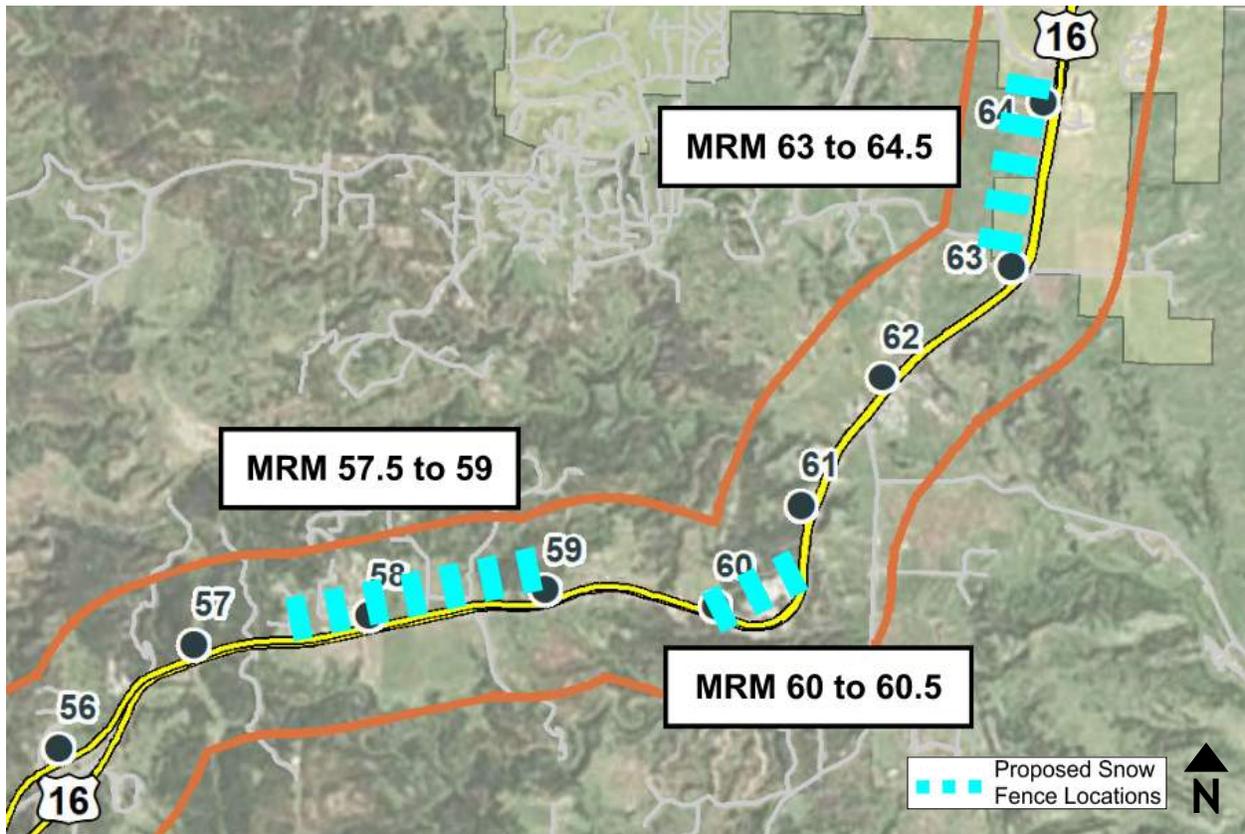


Figure 55: Snow Fence Location Recommendations

## 21.0 Median Cable Barrier Recommendations

US16 corridor segments with a median width of less than 30 feet (measured inside edge line to inside edge line) were reviewed with respect for median cable barrier warrants. The review focused on two primary variables, daily traffic volumes and median width, and was based on methodology developed by the Center for Transportation Research and Education (CTRE) *In-Service Performance Evaluation of Median Cable Barriers in Iowa* research project.

Two Benefit/Cost (B/C) analyses were conducted for applicable segments across a 20-year horizon starting in 2026. One used unadjusted ‘predicted’ average crashes from the CTRE-developed negative binomial (NB) regression models. The second incorporated segment crash history through a site-specific Empirical Bayes method adjustment to the NB regression model output to calculate ‘expected’ average crashes. Crash costs were obtained from the SDDOT. Median cable barrier installation and maintenance costs were based on Iowa DOT costs and obtained from the CTRE report.

Based on these findings, shown in **Table 62** and **Figure 56**, it is recommended that median cable barrier or other median treatments (i.e. raised median with a more urban/suburban cross-section) be considered along the narrow, depressed median US16 corridor segments north of Neck Yoke Road in conjunction with future corridor segment planning.

Narrow, depressed median segments between Sitting Bull Road and Neck Yoke Road area should continue to be monitored for changes in crash history and traffic volumes. Recently installed high-friction surface treatment for the eastbound direction showed successful results in winter 2019/2020. This was not accounted for in this analysis and is expected to reduce roadway departure/median crossing crashes along this segment during inclement weather, which has been problematic over the last several years.

Additional information on the median cable barrier warrant review is provided in **Appendix CC**.

**Table 62: 20-Year Median Cable Barrier Design Life Benefit/Cost Ratio Summary - Starting in Year 2026**

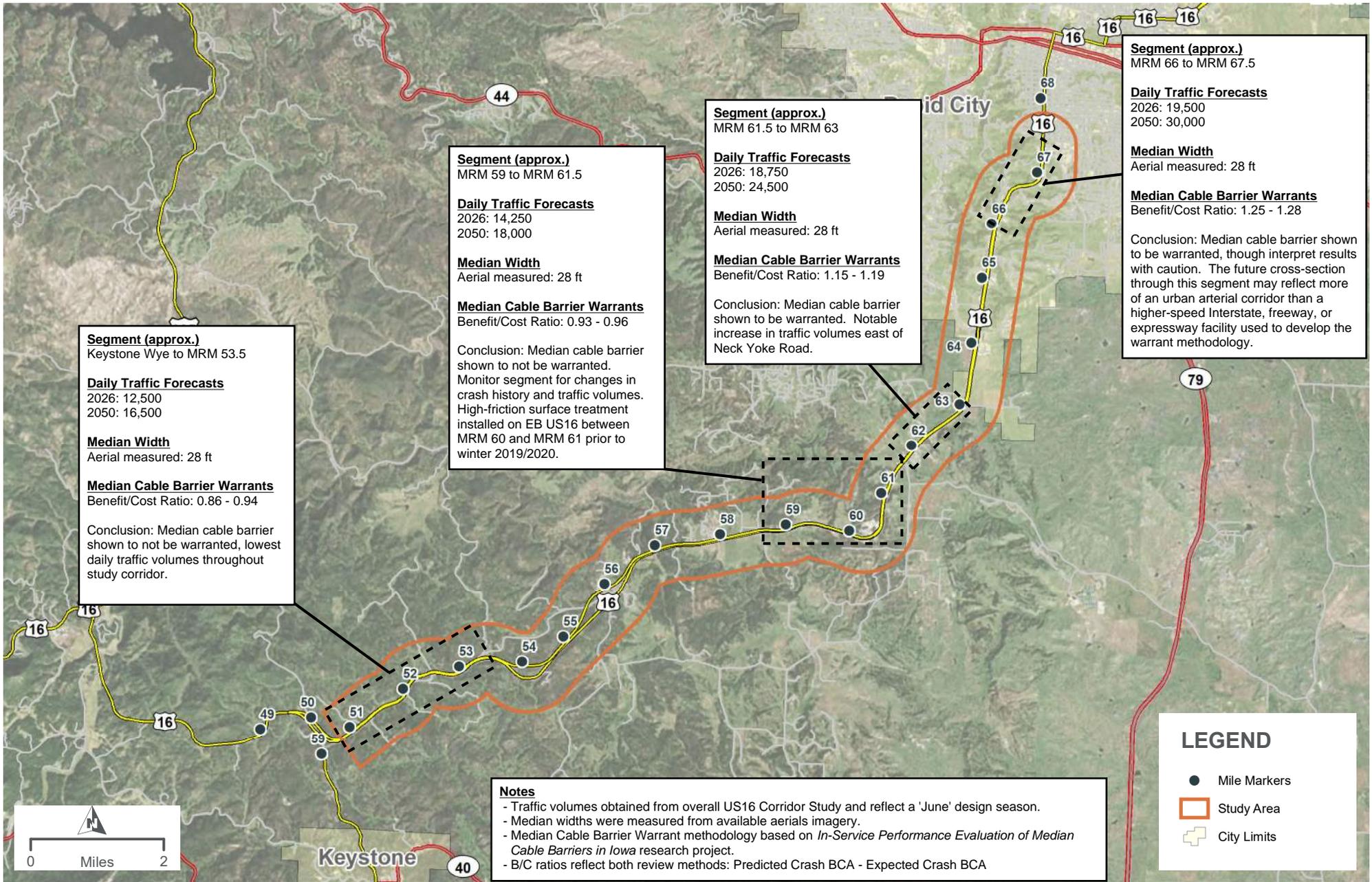
Segment	Daily Traffic Volumes 2026 / 2050	Median Width* (ft)	Length (mi)	Crash History**	Predicted Crash BCA			Expected Crash BCA		
				K / A / B / C / O	Annual Crash Cost Savings (\$/mile)	Average Annual Agency Cost (\$/mile)	B/C Ratio	Annual Crash Cost Savings (\$/mile)	Average Annual Agency Cost (\$/mile)	B/C Ratio
Keystone Wye to Rockerville area	12,500 / 16,500	28	2.9	0 / 0 / 0 / 2 / 2	\$26,078	\$30,289	0.86	\$28,560	\$30,262	0.94
Sitting Bull Road to Neck Yoke Road area	14,250 / 18,000	28	2.95	0 / 2 / 2 / 1 / 4	\$28,350	\$30,366	0.93	\$29,194	\$30,352	0.96
Neck Yoke Road to Moon Meadows Drive	18,750 / 24,500	28	1.15	0 / 0 / 1 / 0 / 0	\$35,212	\$30,621	1.15	\$36,346	\$30,502	1.19
Tower Road (south) to Cathedral Drive	19,500 / 30,000	28	1.3	0 / 0 / 0 / 1 / 2	\$38,409	\$30,754	1.25	\$39,173	\$30,680	1.28

\* Measured from Google Earth (inside edge line to inside edge line)

\*\* Reported crashes along the respective segment between 2014-2018 that noted ‘crossed median/centerline’ in the crash report ‘Event’ section

K = fatal injury, A - incapacitating injury, B - non-incapacitating injury, C - possible injury, O - PDO

20-year design horizon used in B/C analysis starts with Year 2026



**Segment (approx.)**  
Keystone Wye to MRM 53.5

**Daily Traffic Forecasts**  
2026: 12,500  
2050: 16,500

**Median Width**  
Aerial measured: 28 ft

**Median Cable Barrier Warrants**  
Benefit/Cost Ratio: 0.86 - 0.94

Conclusion: Median cable barrier shown to not be warranted, lowest daily traffic volumes throughout study corridor.

**Segment (approx.)**  
MRM 59 to MRM 61.5

**Daily Traffic Forecasts**  
2026: 14,250  
2050: 18,000

**Median Width**  
Aerial measured: 28 ft

**Median Cable Barrier Warrants**  
Benefit/Cost Ratio: 0.93 - 0.96

Conclusion: Median cable barrier shown to not be warranted. Monitor segment for changes in crash history and traffic volumes. High-friction surface treatment installed on EB US16 between MRM 60 and MRM 61 prior to winter 2019/2020.

**Segment (approx.)**  
MRM 61.5 to MRM 63

**Daily Traffic Forecasts**  
2026: 18,750  
2050: 24,500

**Median Width**  
Aerial measured: 28 ft

**Median Cable Barrier Warrants**  
Benefit/Cost Ratio: 1.15 - 1.19

Conclusion: Median cable barrier shown to be warranted. Notable increase in traffic volumes east of Neck Yoke Road.

**Segment (approx.)**  
MRM 66 to MRM 67.5

**Daily Traffic Forecasts**  
2026: 19,500  
2050: 30,000

**Median Width**  
Aerial measured: 28 ft

**Median Cable Barrier Warrants**  
Benefit/Cost Ratio: 1.25 - 1.28

Conclusion: Median cable barrier shown to be warranted, though interpret results with caution. The future cross-section through this segment may reflect more of an urban arterial corridor than a higher-speed Interstate, freeway, or expressway facility used to develop the warrant methodology.

**Notes**

- Traffic volumes obtained from overall US16 Corridor Study and reflect a 'June' design season.
- Median widths were measured from available aerials imagery.
- Median Cable Barrier Warrant methodology based on *In-Service Performance Evaluation of Median Cable Barriers in Iowa* research project.
- B/C ratios reflect both review methods: Predicted Crash BCA - Expected Crash BCA

**LEGEND**

- Mile Markers
- ▭ Study Area
- ⊕ City Limits



**US16 MEDIAN CABLE BARRIER WARRANT REVIEW**

**US16 CORRIDOR STUDY**

**FIGURE 56**

## 22.0 US16 Urban Area Bicycle and Pedestrian Recommendations

The US16 urban area pedestrian and bicycle recommendations shown in **Figure 57** present a long-range plan for facilities along the urban area US16 corridor. This plan serves as an overarching guide to incorporate shared-use path and sidewalk facilities in future projects and promote a continuous and connected network throughout the area.

### 22.1 Bicycle and Pedestrian Plan

Key bicycle and pedestrian features along the US16 urban area corridor include:

- Continuous shared-use path on east side of US16 corridor
- Continuous sidewalk on west side of US16 corridor south of Tower Road
  - Located west of US16 service road to minimize pedestrian/vehicle conflicts

Potential connections to existing and future facilities are noted in the figure. Future coordination is encouraged to identify other beneficial ‘mid-segment’ connections.

### 22.2 Grade Separated (Underpass) Locations

Grade-separated (underpass) bicycle and pedestrian crossings of high-speed, high volume corridors is a notable benefit to bicycle/pedestrian safety, corridor intersection traffic operations, and area multimodal connectivity. For example, an east-west crossing of US16 at a traditional US16/Moon Meadows Drive intersection signalized intersection would exhibit:

- Crossing:
  - Seven lanes of traffic, plus shoulder and median (approximately 135 feet)
  - US16 travel speeds of 60 mph (based on 65 mph design speed)
- Signal timing:
  - A pedestrian-actuated signal phase would require approximately 48 seconds
  - If eastbound/westbound vehicular movements also have a protected left before the pedestrian phase, the side-street phases could extend beyond 60 seconds before transitioning back to US16 phases

Potential US16 underpass locations within the urban area are based on two key items:

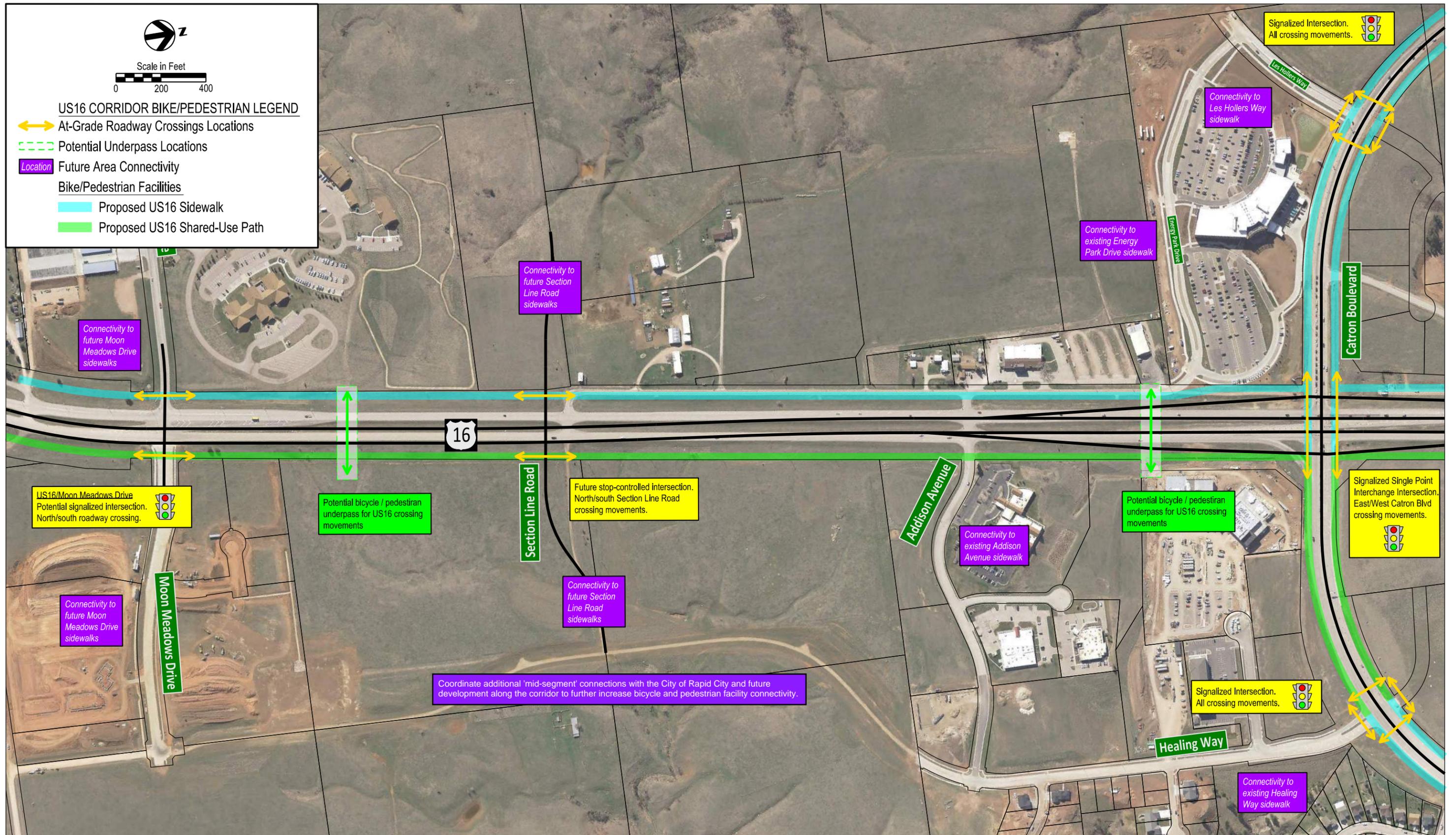
1. Location
  - Near major intersections to encourage use of underpass instead of intersection
  - Along potential high-use routes
  - Distributed across the corridor to minimize out-of-the-way travel
2. Natural low spots where existing terrain is conducive to constructing a bicycle/pedestrian underpass



Scale in Feet  
0 200 400

**US16 CORRIDOR BIKE/PEDESTRIAN LEGEND**

- At-Grade Roadway Crossings Locations
- Potential Underpass Locations
- Future Area Connectivity
- Bike/Pedestrian Facilities**
- Proposed US16 Sidewalk
- Proposed US16 Shared-Use Path



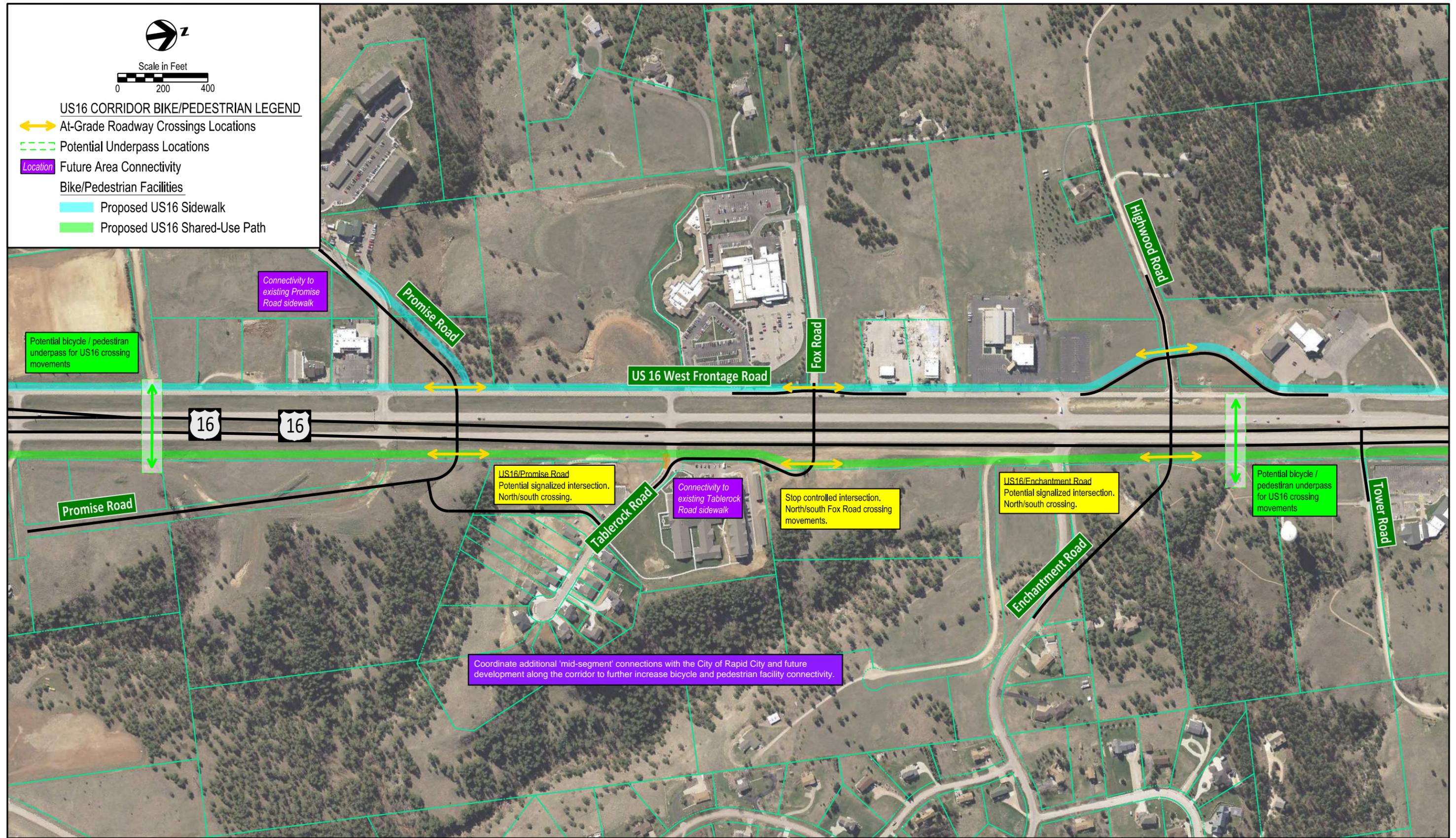
US16 Corridor Urban Area - Bicycle and Pedestrian Network Recommendations  
Moon Meadows to Catron Blvd  
US16 Corridor Study



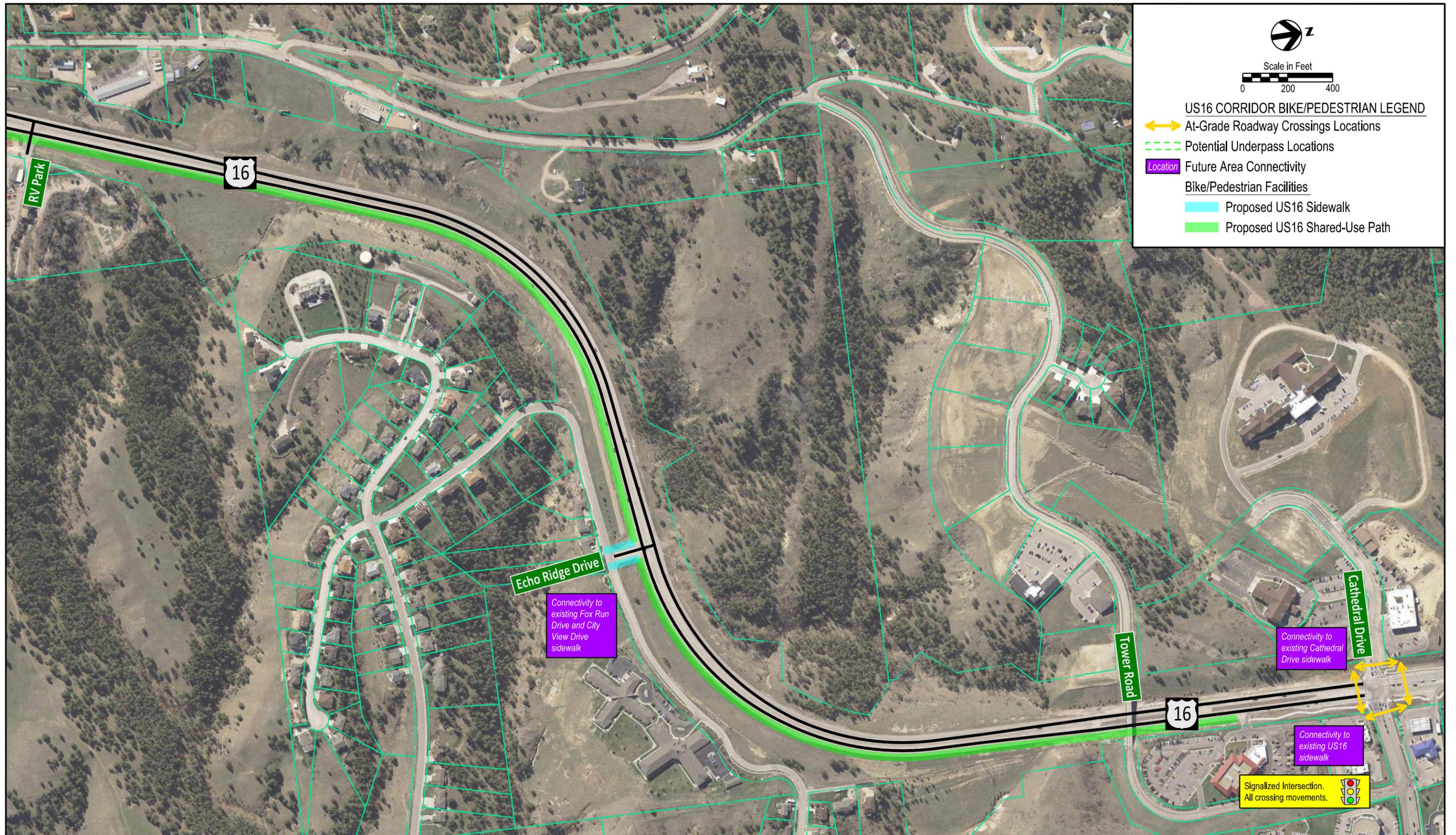
Scale in Feet  
0 200 400

**US16 CORRIDOR BIKE/PEDESTRIAN LEGEND**

-  At-Grade Roadway Crossings Locations
-  Potential Underpass Locations
-  Future Area Connectivity
- Bike/Pedestrian Facilities**
-  Proposed US16 Sidewalk
-  Proposed US16 Shared-Use Path



US16 Corridor Urban Area - Bicycle and Pedestrian Network Recommendations  
Promise Road to Tower Road  
US16 Corridor Study



US16 Corridor Urban Area - Bicycle and Pedestrian Network Recommendations  
 RV Park to Cathedral Drive  
 US16 Corridor Study

## 23.0 Access Management

The US16 Corridor Study long-range vision for the corridor prioritizes mobility and safety south of US16B/Catron Boulevard due to the regional importance of the corridor, high traffic volumes that fluctuate significantly during the summer tourist season, and typical trip purposes that reflect long-distance trips. Mobility is balanced with access north of US16B/Catron Boulevard to reflect surrounding development and more localized trips.

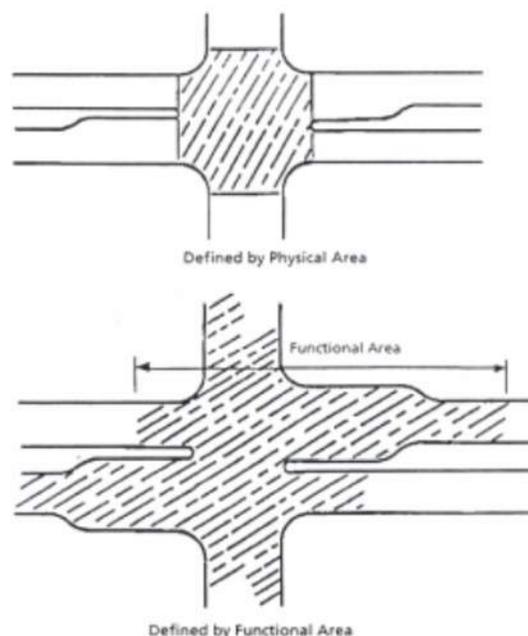
Current access was reviewed on a need-driven basis throughout the US16 Corridor Study area using these guiding principles. Planning documents such as the *City of Rapid City Major Streets Plan* and *RCAMPO Rapid Trip 2045 Metropolitan Transportation Plan* also provided a framework for designating major full-access intersections in the US16 Urban Area. Potential access management techniques were presented in various corridor scenarios and analyzed on their respective merits in the corresponding traffic operations and safety analysis. In several instances, access modifications are required due to spacing and intersection functional area impacts from improvements at adjacent major intersections.

A summary of access modifications incorporated in the US16 Corridor Study recommendations is provided in **Table 63**.

It is recommended that current SDDOT access classification criteria (**Table 2**), designations (**Figure 4**), and long-range recommendations presented in this report be used as the foundation for an opportunistic approach to access management through future projects, development, and redevelopment. The State of South Dakota access policy provides for opportunities to weigh benefits and drawbacks of each individual access. The policy outlines steps for requesting new or modifications to an existing access.

### Intersection Functional Area

A key element of long-term access management is to protect the functional area of major intersections within urban areas to minimize conflicts through queue and driver perception and maneuver distances. The functional area upstream of the physical intersection accounts for 1) distance traveled during the perception-reaction time, 2) deceleration distance while the driver maneuvers to a stop, and 3) queue storage. Downstream functional area typically accounts for stopping sight distance and is shorter than the upstream functional area.



**Figure 58: Intersection Physical Area and Functional Area**

Source: *SDDOT Road Design Manual*

**Table 63: Recommended Access Management Treatment Summary**

Area	US16 Crossroad	Proposed Modification in Scenario Recommendations
US16 Urban Area	Major Intersections	Moon Meadows Drive (future traffic signal*) US16/US16B/Catron Blvd SPI (future traffic signal) Promise Road (future traffic signal*) Enchantment Road (RCI) Cathedral Drive/Fairmont Boulevard (existing traffic signal) Catron Blvd/Les Hollers Way (existing traffic signal) US16B/Catron Blvd/Healing Way (existing traffic signal)
	Fort Hays	RIRO access or closed Extend rearage road to Moon Meadows Drive
	Section Line Road	RIRO access Future overpass
	Addison Avenue and Tucker Street	Close
	Tablerock Road	¾ access and realign with Fox Road
	Tower Road (south)	RIRO or closed Extend local network connection to Enchantment Road on east side
	RV park access	Full access with improvements Close if opportunity arises
	Echo Ridge Drive	¾ access
	US16B/Catron Blvd/Wellington Drive (west)	RIRO access
	US16B/Catron Blvd/Wellington Drive (east)	¾ access with eastbound left turn lane extension back to Wellington Drive (west) intersection (RCI elements)
US16/Neck Yoke Road Area	Neck Yoke Road	RCI (Build Option 1.1d or 1.1e)
	Minor access points	Close in accordance with RCI 1.1d or 1.1e
Bear Country / Croell Quarry Area	Rushmore Candy Company	RCI
	Bear Country Exit	RCI
	American Buffalo Resort Area	Access consolidation through closures, restrictions of full access, and/or local network connection to Wilderness Canyon Road
Busted Five / Wilderness Canyon Area	Strato Rim Drive, Busted Five Lane, and Wilderness Canyon Road	RCI
	Christmas Store access	Restrict to ¾ or RIRO access or close and construct rearage connection to Busted Five Lane
Rockerville Area and West	Minor access points	Review access in conjunction with future development, redevelopment, or projects with consideration to long-range recommendations for the area
	Hillside Country Cabins	Construct turn lanes

\* When warranted by traffic volumes

## 24.0 Environmental Overview

An environmental scan of the study area was conducted throughout the study process to identify direct, indirect, and cumulative impacts anticipated for the potential improvements. At the onset of this process, a map was created to illustrate environmental resource considerations during the concept and scenario development steps of the study (**Figure 59**).

The *US16 Corridor Environmental Overview* memo, included in **Appendix DD**, summarizes findings from the scan regarding the following resources.

### Threatened and Endangered Species

The United States Fish and Wildlife Service Information Planning and Consultation (IPaC) tool was used to generate a list of federally listed threatened and endangered species for the study area. IPaC noted the potential for northern long-eared bat, rufa red knot, and whooping crane. Suitable habitat for the northern long-eared bat is present in the study area and consultation with USFWS will be needed as part of the NEPA phase of project development.

### Wildlife

Suitable habitat for many wildlife species is present within the grassland and forested portions of study area. Between 2014 and 2018, there were 276 vehicle-wildlife crashes, primarily with white tailed deer. Crashes are more common at night and during late fall. Individual projects should be reviewed for suitable wildlife crash reduction mitigation strategies.

### Archaeological/Historical Properties

There is one property listed in and two properties eligible for the National Register of Historic Places (NRHP). There are approximately 47 historic-age (45 years or older) architectural properties in the study area that have not been evaluated for the NRHP but will need additional review for individual projects during the NEPA phase of project development. There are ten previously recorded archaeological sites identified within the study area; one site is eligible for the NRHP and two sites need additional evaluation and coordination with SHPO. Substantial portions of the study area have not been surveyed and will need to be surveyed during the NEPA phase of project development.

### Section 4(f)/6(f)

There are no publicly owned parks, recreation area or wildlife and waterfowl refuges in the study area. There are known historic properties in the study area and use determinations for these properties will need to be evaluated for individual projects.

### Wetlands and Other Waters of the U.S.

Five wetlands totaling 14.37 acres are present in the study area based on a desktop review and windshield survey. Field delineation of these wetlands will need to be completed for individual projects. If impacts to the wetlands cannot be avoided, a Section 404 permit authorization will need to be obtained.

## **Floodplains**

A Federal Emergency Management Agency (FEMA) 100-year floodplain has been mapped along Spring Creek. A hydraulic analysis will be needed for the individual project in this location to determine potential impacts to the floodplain.

## **Noise**

Noise-sensitive receptors are located in the study area. Therefore, noise modeling at discrete, individual noise receptors is warranted during development of individual projects.

## **Hazardous Materials**

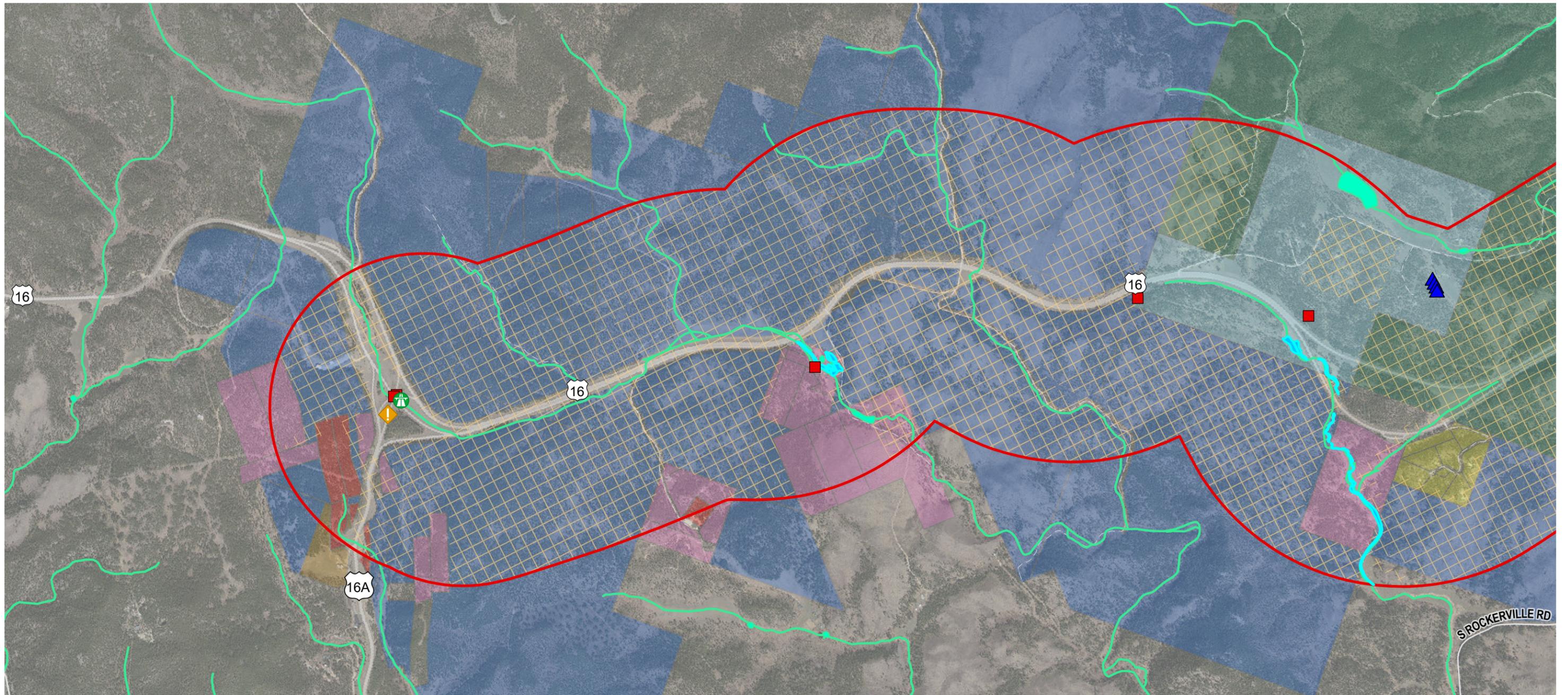
A Limited Phase 1 Environmental Site Assessment was completed for the study area and two Recognized Environmental Conditions were identified near Cathedral Drive and Strato Rim Drive. Additional consideration will be need for individual projects near these properties.

## **Future land use**

The land use along the northern portion of the corridor within Rapid City and the Rapid City Area Metropolitan Planning Organization (MPO) planning boundary is a mix of residential, industrial, office, and commercial development and is primarily privately owned. Urbanization of this area is expected to continue as documented in the Rapid City Comprehensive Plan (2014) and the Pennington County Comprehensive Plan (2020). South and west of Rapid City, land use is mix of agriculture; rural residential; and roadside commercial/tourist destinations. Beyond the MPO planning boundary much of the study area is forest land, owned and managed as the Black Hills National Forest in accordance with the Black Hills National Forest Land and Resource Management Plan (2007) for recreation, minerals, timber and livestock. Individual projects are not expected to change the future land use designation within Rapid City or the MPO planning boundaries or adversely affect national forest management.

## **Socioeconomics**

Socioeconomics impacts were reviewed for each of the scenarios, focusing elements such as potential displacement, loss of direct access, alterations to property, and changes in area traffic patterns. These impacts were incorporated into the corridor segment scenario and intersection sub-area evaluations.

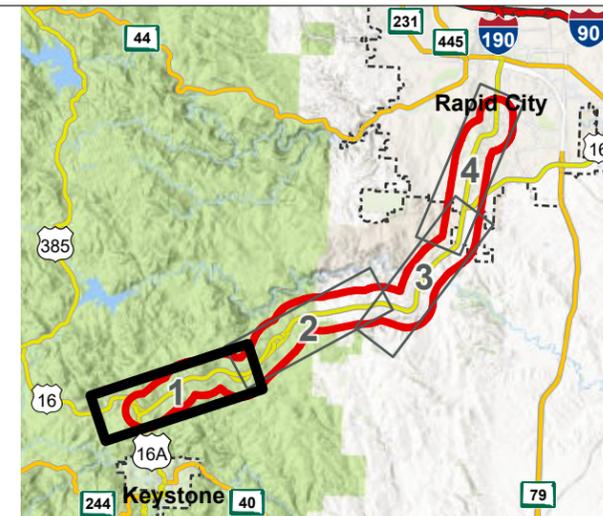


**Legend**

- Study Area
- City Limits
- 66 dBA Contour
- DOE, NomStatus**
- Eligible
- Eligible - Listed
- Unevaluated
- NRHP Eligible Bridge
- Structures Requiring NHRP Evaluation

- Previously Recorded Cultural Survey
- Recognized Environmental Condition
- Cemetery
- NWI (Wetlands)
- Delineated Wetland**
- Desktop Delineation
- Field Delineation

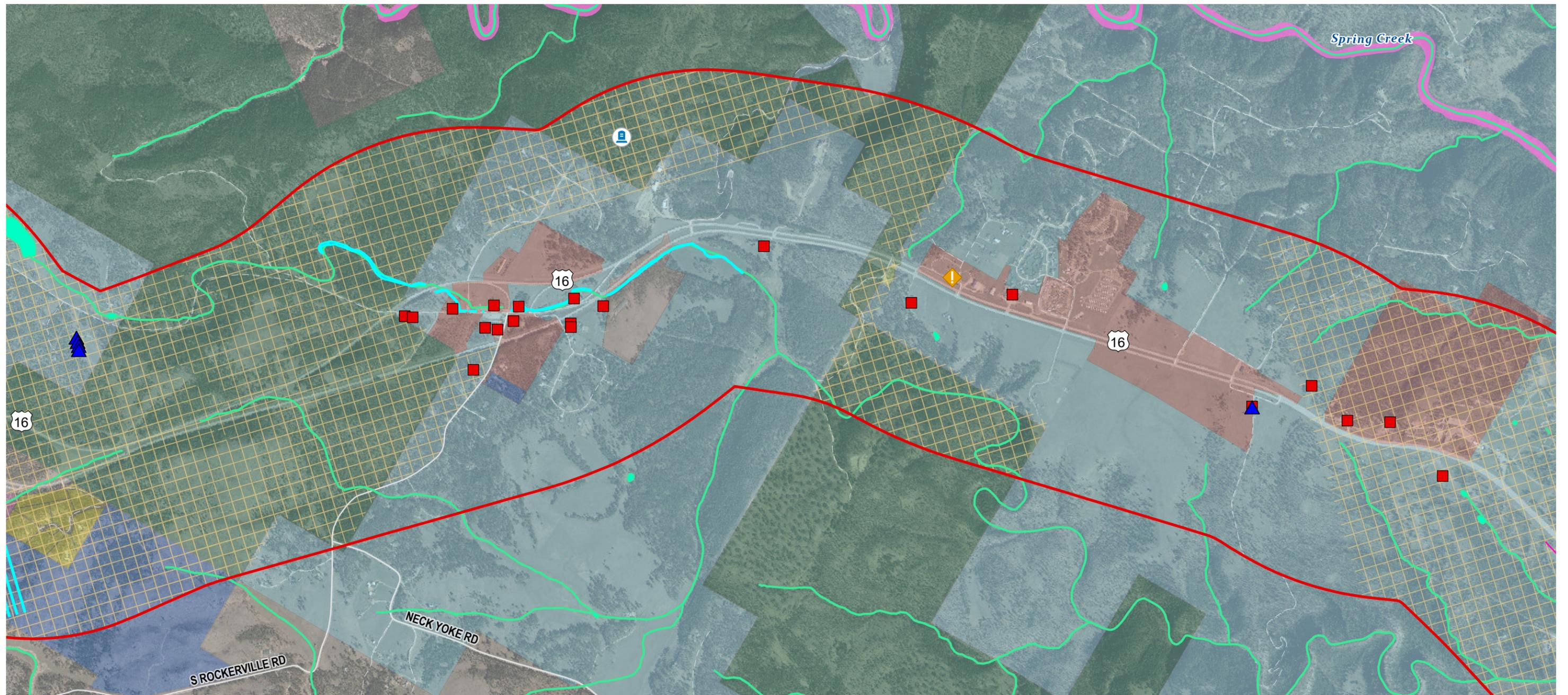
- FEMA Flood Plain**
- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Future Land Use**
- Forest Conservation (FC)
- National Forest (NF)
- Commercial
- Highway Service District
- Low Density Residential District
- Planned Development
- Public



**ENVIRONMENTAL RESOURCES**

US16 CORRIDOR STUDY  
FIGURE 59, PAGE 1 OF 4





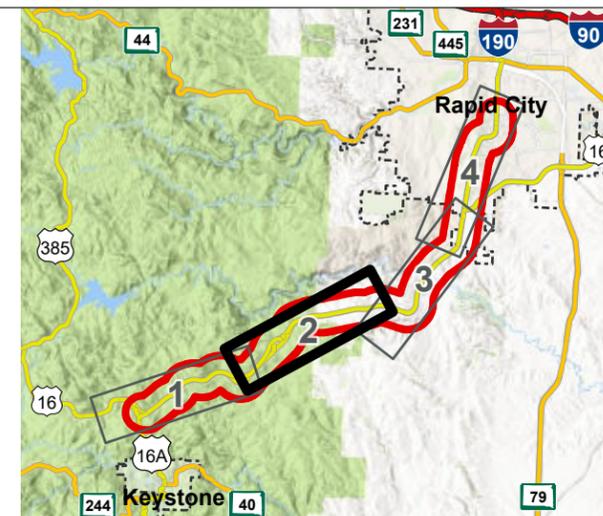
**Legend**

- Study Area
- City Limits
- 66 dBA Contour
- DOE, NomStatus**
- Eligible
- ▲ Eligible - Listed
- ▲ Unevaluated
- ⊕ NRHP Eligible Bridge
- Structures Requiring NHRP Evaluation
- Previously Recorded Cultural Survey

- ◆ Recognized Environmental Condition
- Cemetery
- ~ NWI (Wetlands)
- Delineated Wetland**
- ~ Desktop Delineation
- ~ Field Delineation
- FEMA Flood Plain**
- 1% Annual Chance Flood Hazard
- ~ Regulatory Floodway

**Future Land Use**

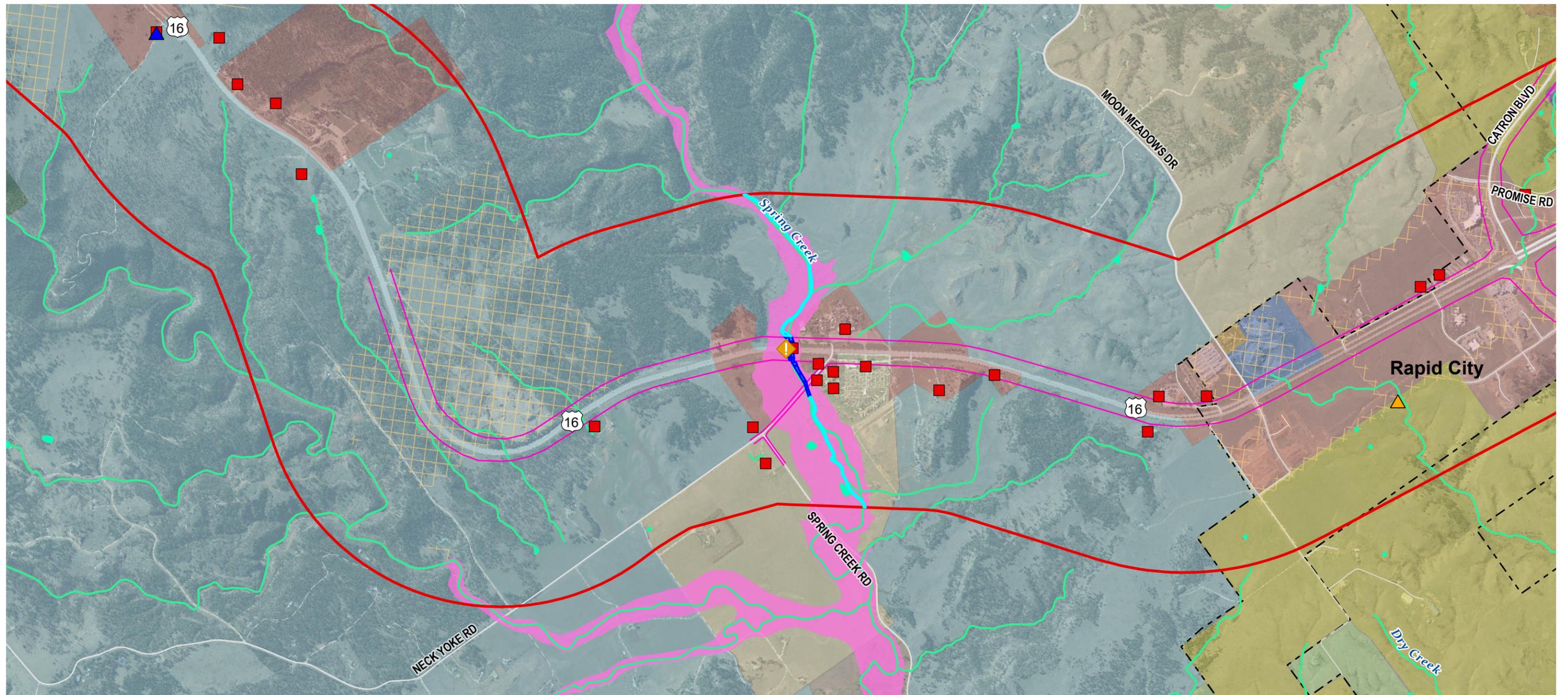
- Rural Residential (RR)
- Mixed Use Commercial (MUC)
- Light Industrial (LI)
- Agriculture (AG)
- Forest Conservation (FC)
- National Forest (NF)
- Public/Quasi-Public (P/QP)
- Commercial
- Highway Service District
- Low Density Residential District
- Planned Development
- Public



**ENVIRONMENTAL RESOURCES**

US16 CORRIDOR STUDY  
FIGURE 59, PAGE 2 OF 4



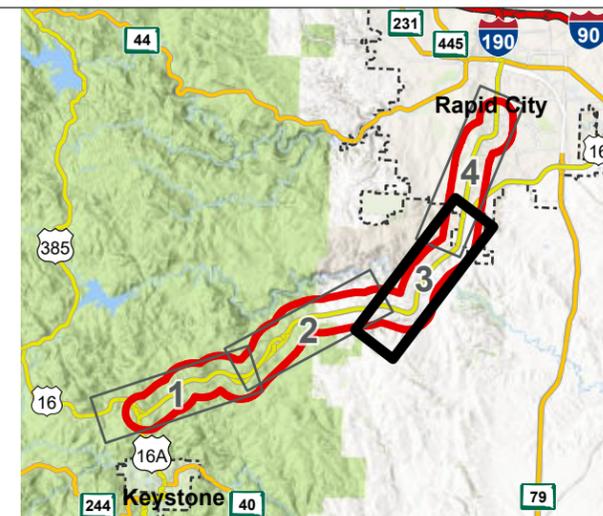


**Legend**

- Study Area
- City Limits
- 66 dBA Contour
- DOE, NomStatus**
- ▲ Eligible
- ▲ Eligible - Listed
- ▲ Unevaluated
- ⊕ NRHP Eligible Bridge
- Structures Requiring NHRP Evaluation
- ⊗ Previously Recorded Cultural Survey

- ◆ Recognized Environmental Condition
- Cemetery
- NWI (Wetlands)
- Delineated Wetland**
- Desktop Delineation
- Field Delineation
- FEMA Flood Plain**
- 1% Annual Chance Flood Hazard
- Regulatory Floodway

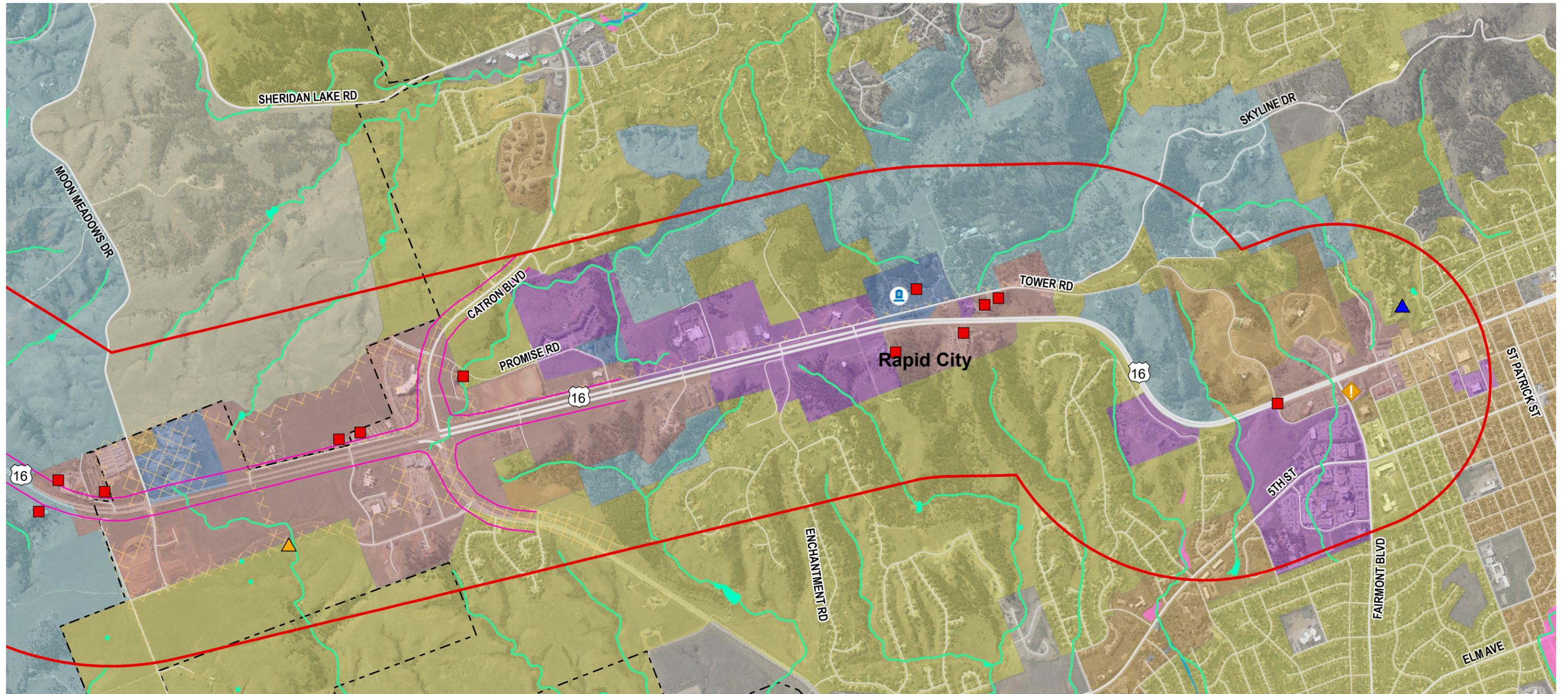
- Future Land Use**
- Rural Residential (RR)
  - Low Density Neighborhood (LDN)
  - Urban Neighborhood (UN)
  - Mixed Use Commercial (MUC)
  - Entrance Corridor (EC)
  - Agriculture (AG)
  - Forest Conservation (FC)
  - National Forest (NF)
  - Public/Quasi-Public (P/QP)
  - Highway Service District
  - Low Density Residential District



**ENVIRONMENTAL RESOURCES**

**US16 CORRIDOR STUDY**  
FIGURE 59, PAGE 3 OF 4



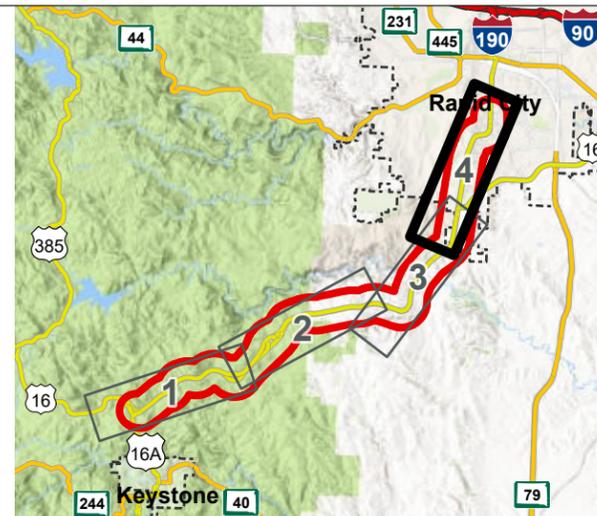


**Legend**

- Study Area
- City Limits
- 66 dBA Contour
- DOE, NomStatus**
- Eligible
- Eligible - Listed
- Unevaluated
- NRHP Eligible Bridge
- Structures Requiring NHRP Evaluation
- Previously Recorded Cultural Survey
- Recognized Environmental Condition
- Cemetery
- NWI (Wetlands)
- Delineated Wetland**
- Desktop Delineation
- Field Delineation
- FEMA Flood Plain**
- 1% Annual Chance Flood Hazard
- Regulatory Floodway

**Future Land Use**

- Rural Residential (RR)
- Low Density Neighborhood (LDN)
- Urban Neighborhood (UN)
- Mixed Use Commercial (MUC)
- Entrance Corridor (EC)
- Light Industrial (LI)
- Forest Conservation (FC)
- Public/Quasi-Public (P/QP)
- Highway Service District
- Low Density Residential District



**ENVIRONMENTAL RESOURCES**

US16 CORRIDOR STUDY  
FIGURE 59, PAGE 4 OF 4



## 25.0 Summary of Recommendations and Implementation Timelines

The following tables and figure present a summary of recommended short-term and long-range capital improvements, generalized timeline, and planning-level costs as identified in this study. Several recommended opportunistic or interim improvements are also identified to support continued access management and the long-range vision of the corridor.

Additional considerations and recommendations in conjunction with the identified capital improvements in involve:

- ITS
- Blowing and drifting snow
- US16 Urban Area bicycle and pedestrian facilities
- Median cable barrier

**Table 64: Recommendations and Planning Timelines (to Year 2040)**

Planning Timeline	Improvement	Corridor Segment	Long-Range Segment Scenario	US16 Cross-Section	Construction & ROW Cost (\$mil)
2025 - 2026	US16/Neck Yoke Rd RCI *	US16/Neck Yoke Road Sub-Area	Option 1.1d or 1.1e	4-lane divided rural (modified)	\$10.8 - \$11.2
	RCI at US16/Strato Rim Dr, US16/Busted Five Ln, and US16/Wilderness Canyon Rd **	Busted Five/Wilderness Canyon Area	Scenario 1	4-lane divided rural	\$2.9
	RCI at US16/Bear Country Exit **	Bear Country/Croell Quarry Area	Scenario 1	4-lane divided rural (modified)	\$1.0
	RCI at US16/Rushmore Candy Company **	Bear Country/Croell Quarry Area	Scenario 1	4-lane divided rural (modified)	\$2.2
2026 - 2027	<b>US16/US16B/Catron Blvd SPI ***</b> <i>US16 intersection improvements:</i> <ul style="list-style-type: none"> <li>Section Line Rd (RIRO)</li> <li>Addison Ave (closed)</li> <li>Tucker St (closed)</li> <li>Promise Rd (signalized)</li> <li>Tablerock Rd/Fox Rd (¾)</li> </ul> <i>US16B/Catron Blvd improvements:</i> <ul style="list-style-type: none"> <li>Les Hollers Way (signalized)</li> <li>Healing Way (signalized)</li> <li>Wellington Drive (RIRO west, ¾ east)</li> </ul>	US16/US16B/Catron Blvd Sub-Area	SPI 1.1a with modifications	4-lane divided w/40' raised median (suburban) - shifted east	\$49.8
2028 - 2040	<b>US16 Urban Area corridor reconstruction, north of SPI project limits (Tablerock Rd/Fox Rd) ****</b> <i>Shift Enchantment Rd north to align with Highwood Rd and construct RCI</i> <i>Maintain ¾ access at Echo Ridge Dr</i>	US16 Urban Area (North)	Scenario 2	4-lane divided w/40' raised median (suburban) - shifted east; 4-lane divided with variable (12' to 28') raised median (urban)	\$18.2
	<b>US16/Moon Meadows Drive intersection and US16 corridor reconstruction south of SPI project limits</b>	US16 Urban Area (South)	Scenarios 1 or 2	4-lane divided w/40' raised median (suburban) - shifted east	\$16.1

2022-2025 SDDOT STIP: \* PCN 06X3 \*\* PCN 07Y6  
 2026-2029 SDDOT Developmental STIP: \*\*\* PCN 6874 \*\*\*\* PCN 078D

**Table 65: Recommendations and Planning Timelines (Opportunistic & Interim Improvements to Support Access Management)**

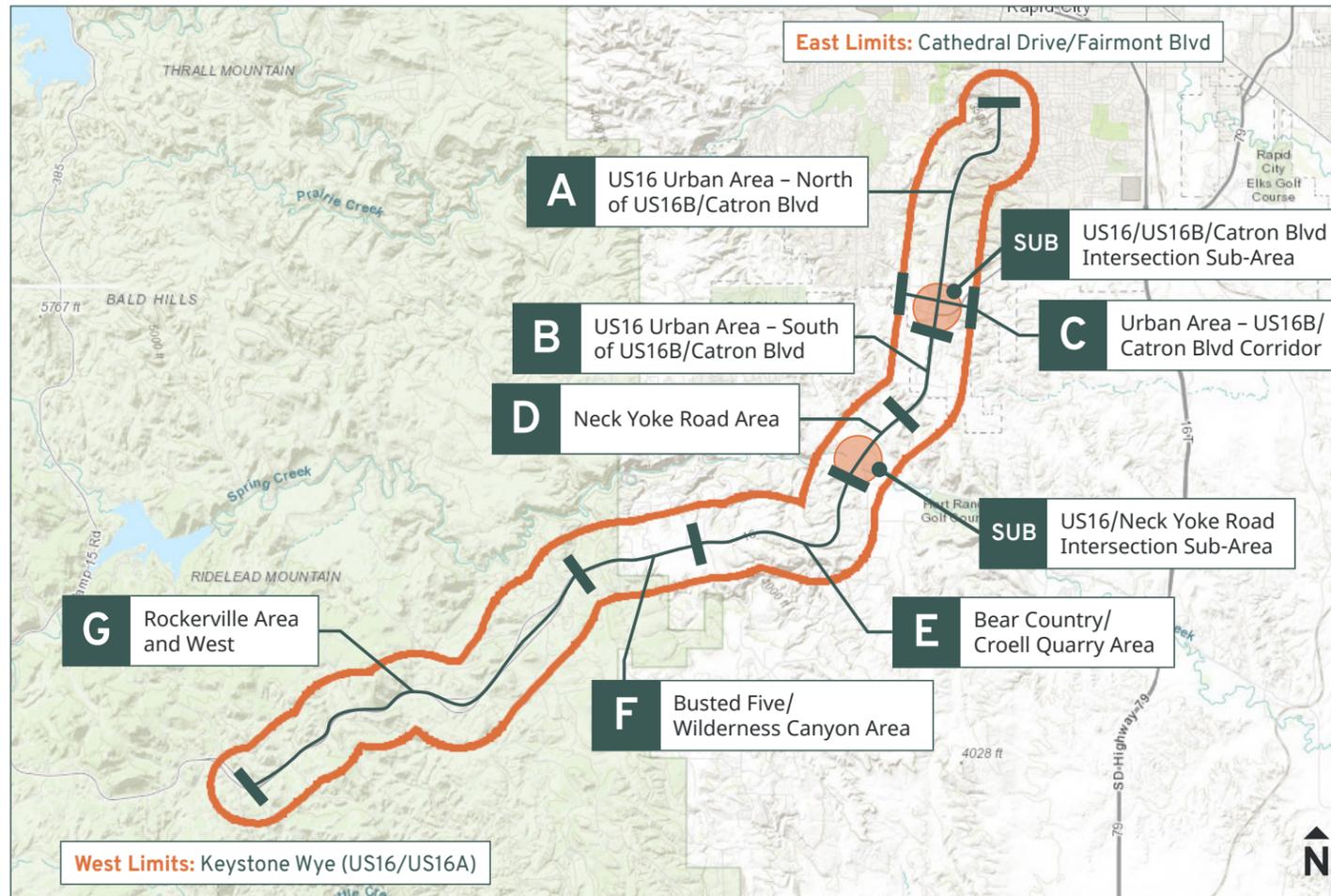
Planning Timeline	Improvement	Corridor Segment	Construction & ROW Cost (\$mil)
Dependent on need and timeline of future projects, development, and other opportunities to implement improvements	Fort Hays to Moon Meadows Dr rearage road (west of US16)	US16 Urban Area (South)	\$0.7
	Tower Rd (south) to Enchantment Rd local network connections (east of US16)	US16 Urban Area (North)	\$1.4
	Sitting Bull Crystal Caverns to US16/Wilderness Canyon Rd local network connection; access management at existing full access intersections	Busted Five/ Wilderness Canyon Area	\$1.9
	American Buffalo Resort area access management and intersection improvements	Bear Country/ Croell Quarry Area	\$1.0 - \$3.2
	Close US16 ramps 1a. <ul style="list-style-type: none"> <li>• Remove second US16 WB off-ramp</li> <li>• Remove US16 EB off-ramp</li> </ul> 1b. <ul style="list-style-type: none"> <li>• Remove US16 WB on-ramp. Consider ‘Wrong-Way Travel Mitigation’ option to realign Pine Haven Drive w/ 2-way travel</li> </ul> 2. <ul style="list-style-type: none"> <li>• Remove first US16 WB off-ramp following US16 WB/Rockerville Road improvements</li> <li>• Remove US16 EB on-ramp in conjunction with removal of corresponding first US16 WB off-ramp</li> </ul>	Rockerville Area	1a - \$0.1 1b - \$0.5 2 - \$0.1

Projects identified in this table do not have a specific planning timeline. Future development/redevelopment, coordination with local agencies, property owners, and other area projects, and changing conditions will dictate timeline.

**Table 66: Recommendations and Planning Timelines (Long Range, Beyond Year 2040)**

Planning Timeline	Improvement	Corridor Segment	Long-Range Segment Scenario	US16 Cross-Section	Construction & ROW Cost (\$mil)
Long- Range (Beyond 2040)	US16/Moon Meadows Dr interchange	US16 Urban Area (South)	Supports Scenarios 1 and 2	4-lane divided w/40' raised median (suburban) - shifted east	Interchange only: \$17.9
	Section Line Road overpass at US16	US16 Urban Area (South)	Supports Scenarios 1 and 2	4-lane divided w/40' raised median (suburban) - shifted east	\$4.2
	Reconstruct US16 to north side of Rockerville	Rockerville Area	Scenario 2	4-Lane Divided Rural	\$14.9

# US16 Corridor Study – Recommendations and Planning Timeline



Improvement	Corridor Segment
<b>Long-Range Project Improvements</b>	
US16/Moon Meadows Dr interchange	<b>B</b> US16 Urban Area (South)
Section Line Rd overpass at US16	<b>B</b> US16 Urban Area (South)
Reconstruct US16 to north side of Rockerville	<b>G</b> Rockerville Area
<b>Interim Project Improvements</b>	
Fort Hays to Moon Meadows Dr rearage road (west of US16)	<b>B</b> US16 Urban Area (South)
Tower Rd (south) to Enchantment Rd local network connections (east of US16)	<b>A</b> US16 Urban Area (North)
Sitting Bull Crystal Caverns to US16/Wilderness Canyon Rd local network connection; access management at existing full access intersections	<b>F</b> Busted Five/Wilderness Canyon Area
American Buffalo Resort area access management and intersection improvements	<b>E</b> Bear Country / Croell Quarry Area
US16 ramp closures: 1a. • Remove second US16 WB off-ramp • Remove US16 EB off-ramp 1b. • Remove US16 WB on-ramp. Consider 'Wrong-Way Travel Mitigation' option to realign Pine Haven Dr w/ 2-way travel 2. • Remove first US16 WB off-ramp following US16 WB/Rockerville Road improvements • Remove US16 EB on-ramp in conjunction with removal of corresponding first US16 WB off-ramp	<b>G</b> Rockerville Area

Planning Timeline	Improvement	Corridor Segment	Long-Range Segment Scenario	US16 Cross-Section
2025 - 2026	US16/Neck Yoke Rd RCI	<b>SUB</b> US16/Neck Yoke Rd Sub-Area	Option 1.1d or 1.1e	4-lane divided rural ( <i>modified</i> )
	RCI at US16/Strato Rim Dr, US16/Busted Five Ln, and US16/Wilderness Canyon Rd	<b>F</b> Busted Five/Wilderness Canyon Area	Scenario 1	4-lane divided rural
	RCI at US16/Bear Country Exit	<b>E</b> Bear Country/Croell Quarry Area	Scenario 1	4-lane divided rural ( <i>modified</i> )
	RCI at US16/Rushmore Candy Company access	<b>E</b> Bear Country/Croell Quarry Area	Scenario 1	4-lane divided rural ( <i>modified</i> )
2026 - 2027	US16/US16B/Catron Blvd SPI: US16 intersection improvements • Section Line Rd (RIRO) • Addison Ave (closed) • Tucker St (closed) • Promise Rd (signalized) • Tablerock Rd/Fox Rd (¾) US16B/Catron Blvd improvements • Les Hollers Way (signalized) • Healing Way (signalized) • Wellington Dr (RIRO west, ¾ east)	<b>SUB</b> US16/US16B/ Catron Blvd Sub-Area	SPI 1.1a with modifications	4-lane divided ( <i>suburban</i> ) – shifted east
2028 - 2040	US16 Urban Area corridor reconstruction, north of SPI project limits (Tablerock Rd/Fox Rd)	<b>A</b> US16 Urban Area ( <i>North</i> )	Scenario 2	4-lane divided ( <i>suburban</i> ) – shifted east; 4-lane divided ( <i>urban</i> )
	US16/Moon Meadows Dr intersection and US16 corridor reconstruction south of SPI project limits	<b>B</b> US16 Urban Area ( <i>South</i> )	Scenarios 1 or 2	4-lane divided ( <i>suburban</i> ) – shifted east

## Appendix A. Methods and Assumptions Document

## Appendix B. US16 Corridor Study Horizontal and Vertical Curve Review Memo

## Appendix C. US16 Corridor Study Crash History Review Report

## Appendix D. Truck Escape Ramp Review Memo

## Appendix E. Traffic and Reliability Analysis Memo

## Appendix F. US16 Corridor Study Traffic Forecasts Technical Memo

## Appendix G. HCM6 LOS Thresholds and HCS Limitations

## Appendix H. Urban or Rural Classification Review Memo

# Appendix I. 2019 Existing Conditions Traffic Operations Technical Memo

## Appendix J. 2026 No Build Conditions Traffic Operations Technical Memo

## **Appendix K. 2050 No Build Conditions Traffic Operations Technical Memo**

## Appendix L. Unsignalized Intersection Turn Lane Volume Warrants Review Technical Memo

## Appendix M. Traffic Signal Warrant Review Technical Memo

## Appendix N. Public Involvement Summary

Public Meeting No. 1 Summary Report

Public Meeting No. 2 Summary Report

Public Meeting No. 3 Summary Report

Travel Survey Report

## Appendix O. US16 Corridor Study Concepts Memo

Memo

Concept Layouts

SAT Workshop Minutes

US16/Neck Yoke Road Concept Evaluation Memo

## Appendix P. US16 Urban Area Intersection Control Evaluation Report

## Appendix Q. US16 Feasible Scenarios Memo

Memo  
Scenario Layouts  
Workshop Minutes  
Costs

## Appendix R. Build Condition Traffic Operations Summary Technical Memo

## Appendix S. Predictive Safety Analysis - Corridor Scenarios Technical Memo

## **Appendix T. US16/US16B/Catron Boulevard Intersection Study Area Design Considerations**

Technical Memo

SPI Constructability Discussion with Utah DOT Meeting Minutes

## **Appendix U. US16 Urban Area Alternative Intersection Design Notes Technical Memo**

## **Appendix V. US16/US16B/Catron Boulevard Intersection Sub-Area Build Option Minor Road Access Evaluation Memo**

## **Appendix W. US16/US16B/Catron Boulevard Intersection Build Option Technical Report**

## **Appendix X. US16/US16B/Catron Boulevard Intersection Build Option Evaluation Report**

## Appendix Y. US16/Neck Yoke Road Intersection Build Option Technical Report

## **Appendix Z. US16/Neck Yoke Road Intersection Build Option Evaluation Report**

## Appendix AA. ITS Recommendations Technical Memo

## Appendix BB. Blowing Snow Analysis Technical Memo

## **Appendix CC. US16 Corridor Median Cable Barrier Warrant Review Technical Memo**

## Appendix DD. Environmental Overview Report