Sheridan Lake Road Traffic Study Report

Corral Drive to Albertta Drive

CITY OF RAPID CITY

Rapid City, South Dakota

July 18, 2019

9489
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FAGERNESS
7/18/2019

I hereby certify that this technical report was prepared by me or under my direct supervision and that I am a duly registered Professional Engineer under the laws of the State of South Dakota.

7/18/2019

Aaron Fagerness, 9489 07/18/2019

My license renewal date is March 31, 2020

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1.0 Introduction

1.1 Study Purpose

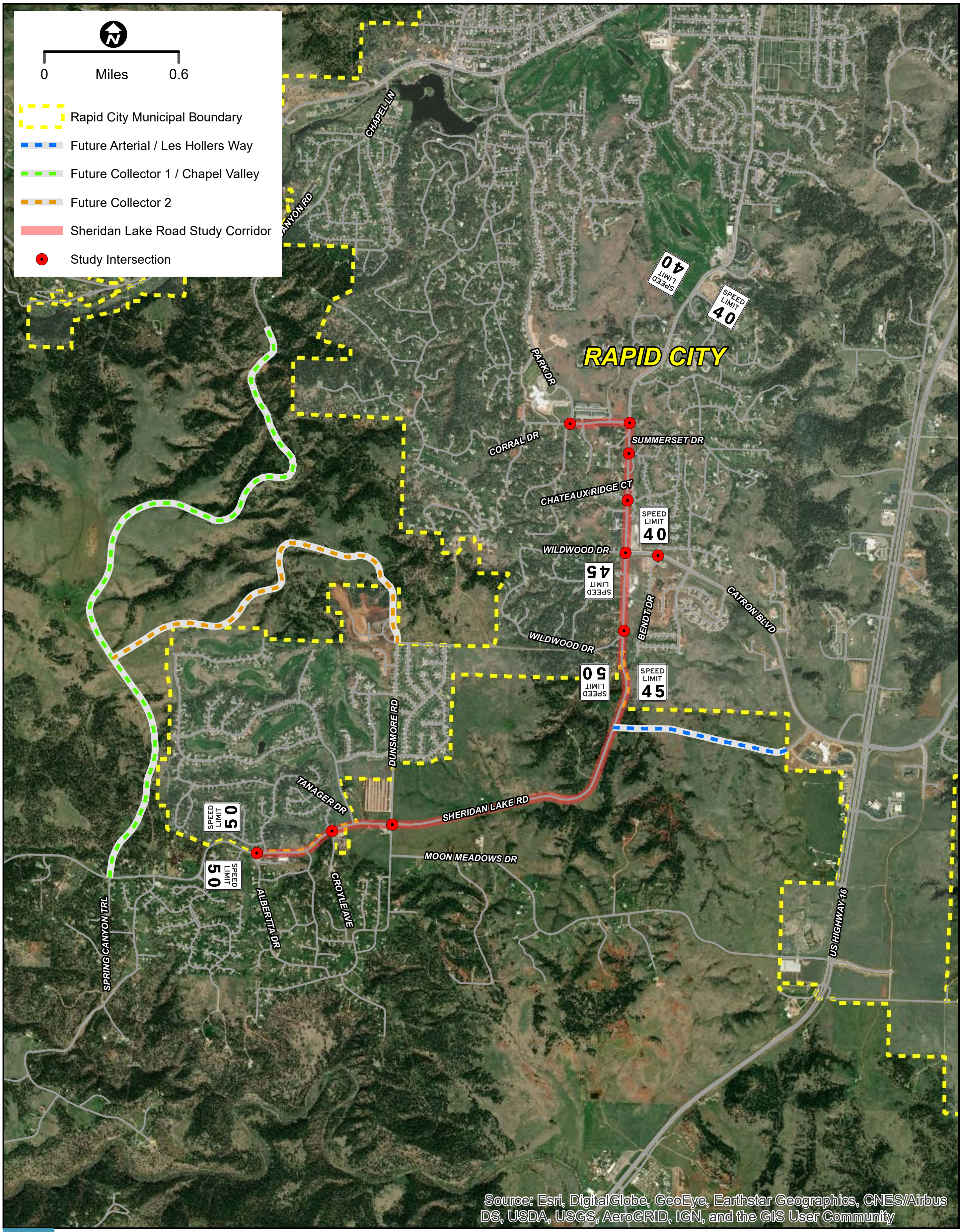
Sheridan Lake Road is an arterial street near the southern municipal limits of Rapid City, South Dakota. When Sheridan Lake Road was reconstructed in 1995, it had an average daily traffic (ADT) volume of nearly 4,000 vehicles per day. Due to significant growth in and around this area, the current ADT is approximately 16,000 vehicles per day and expected to continue growing. Recent traffic and planning studies have shown that the intersections of Sheridan Lake Road / Catron Boulevard and Sheridan Lake Road / Corral Drive function at substandard levels of service during times of peak traffic. This is evidenced by traffic congestion during the morning commute to school and work. Continued growth of the area from housing and commercial development will further increase congestion without improvements to the roadway capacity. With limited ability to create additional north / south transportation routes, preserving right of way or widening Sheridan Lake Road to handle additional traffic is a great need for the City of Rapid City. This corridor study evaluates existing (year 2017) and future (year 2045) traffic conditions in order to develop roadway and intersection improvement concepts that will provide greater travel efficiency, safety and reliability for the users of Sheridan Lake Road. The methods and assumptions used for the analysis are included in Appendix A.

1.2 Location of Study

The study area is located at the southwest limits of Rapid City in western South Dakota as shown in Figure 1. The study limits include Sheridan Lake Road from Albertta Drive through Corral Drive, and Corral Drive from Sheridan Lake Road to Park Drive. Traffic data was collected at 10 intersections along the corridor. The study intersections are also shown in Figure 1 and include the following:

- Corral Drive / Park Drive
- Sheridan Lake Road / Corral Drive
- Sheridan Lake Road / Summerset Drive
- Sheridan Lake Road / Chateaux Ridge / Summerset Drive
- Sheridan Lake Road / Catron Boulevard
- Catron Boulevard / Bendt Drive
- Sheridan Lake Road / Wildwood Drive
- Sheridan Lake Road / Dunsmore Road
- Sheridan Lake Road / Tanager Drive / Croyle Avenue
- Sheridan Lake Road / Albertta Drive

A portion of the southern study area lies outside of the Rapid City municipal limits and is currently under the jurisdiction of Pennington County. This area is expected to be annexed into Rapid City in the future. Three Future Street Alternatives were also evaluated since future network improvements will likely be constructed as development continues to occur in the study area. The location of these Future Street segments are shown in Figure 1 and discussed in detail within the No-Build Traffic and Alternatives Analysis sections.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

SHERIDAN LAKE ROAD STUDY CORRIDOR WITH FUTURE STREET ALTERNATIVES

FIGURE 1

2.0 Baseline Conditions

2.1 Existing Traffic Volumes and Level of Service

2.1.1 Average Annual Daily Traffic & Turning Movement Counts

Average Annual Daily Traffic (AADT) volumes were provided by the City of Rapid City for portions of the corridor, as follows:

- Sheridan Lake Road, north of Corral Drive – 11,200 vpd
- Corral Drive, west of Sheridan Lake Road – 4,600 vpd
- Sheridan Lake Road, between Corral Drive and Catron Boulevard – 16,000 vpd
- Catron Boulevard, east of Bendt Drive – 11,700 vpd
- Sheridan Lake Road, between Catron Boulevard and Wildwood Drive – 13,100 vpd
- Sheridan Lake Road, between Wildwood Drive and Dunsmore Road – 12,600 vpd
- Dunsmore Road, south of Sheridan Lake Road – 3,900
- Sheridan Lake Road, west of Dunsmore Road – 11,400 vpd

Traffic turning movement counts were collected at the ten study intersections on September 19, 2017. Additional traffic counts were collected at the Sheridan Lake Road / Corral Drive and Sheridan Lake Road / Catron Boulevard intersections on December 12, 2017 after the opening of the new Black Hills Corporation Headquarters. Black Hills Corporation is located in the southwest quadrant of the Mount Rushmore Road (US16) / Catron Boulevard intersection. The intent of the second phase of traffic counts was to capture the effects of additional traffic generated by the new development.

The additional counts showed an increase in through-traffic on Catron Boulevard and Sheridan Lake Road north of Catron Boulevard. A slight increase in traffic using Corral Drive and Park Drive was also noted. A slight decrease in traffic was observed on Sheridan Lake Road south of Catron Boulevard. Slight decreases in level of service were observed at the intersections of Sheridan Lake Road / Catron Boulevard and Catron Boulevard / Bendt Drive in the AM peak hour. Other levels of service were unchanged.

Peak hour turning movement volumes are shown in Figure 2. The volumes represent conditions after the Black Hills Corporation opening. Technical memos documenting existing condition traffic before and after the Black Hills Corporation opening can be found in Appendix B.

The study area intersections were analyzed using Highway Capacity Software (HCS), the new peak hour turning volumes and the existing traffic controls. The resulting level of service (LOS), displayed in Figure 2, produced the following findings:

- Two of the signalized intersections (Sheridan Lake Road / Corral Drive, Sheridan Lake Road / Catron Boulevard) operate at level of service below current standards for the AM peak hour. The third signalized intersection in the study area (Sheridan Lake Road / Dunsmore Road) operates at acceptable peak hour levels of service. Long queues have also been noted at the signalized intersections, particularly during the AM peak hour.

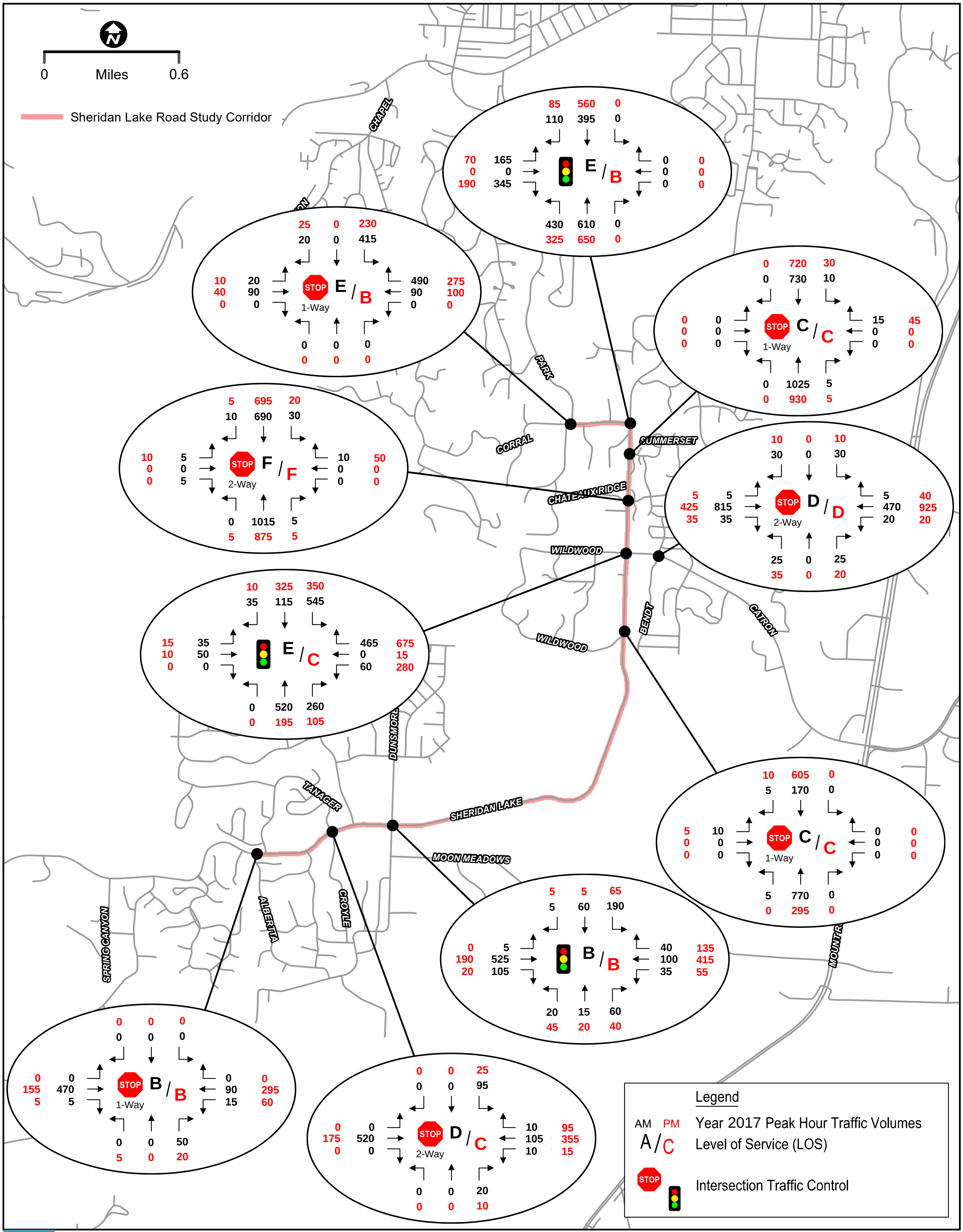
- Several of the stop sign-controlled side street approaches have a low peak hour level of service. This, however, is fairly common on arterial roadways and is not necessarily a reason for additional lanes or changes in traffic control.

2.2 Existing Conditions Safety

Crash records for the study area were obtained from the SDDOT online mapping tool for the years 2013-2017 (5 years). The crash data shows concentrations of crashes at several intersections in the corridor. A secondary concentration of crashes is evident in the area south of Wildwood Drive where Sheridan Lake road curves and is flanked by steep, forested property. Each of the crash concentrations is addressed below:

- Sheridan Lake Road / Corral Drive – 7 crashes in 5 years. No clear trends were evident in the crash data, although 3 of the 7 occurred in snow-covered road conditions.
- Sheridan Lake Road / Catron Boulevard – 21 crashes in 5 years. A pattern was discernable involving left-turning vehicles becoming involved in angle crashes with driver contributions including “failure to yield” and “disregard of traffic signal”. The crash pattern appears to be related to the growth of Catron Boulevard as a crosstown route. Southbound drivers on Sheridan Lake Road wishing to turn left onto Catron Boulevard frequently encounter peak hour queues and congestion. Their reaction to this congestion is to use small gaps in oncoming traffic or push the left turn phase into subsequent yellow and red intervals, resulting in increased crash frequency. Adding capacity to this intersection through additional lanes and revised signalization will help to alleviate the crash problem.
- Sheridan Lake Road / Dunsmore Road – 9 crashes in 5 years. The majority of the crashes involved angle incidents that occurred prior to signalization of the intersection. The occurrence of this crash type should reduce in the coming years due to the control provided by the traffic signal.
- Non-intersection area south of Wildwood Drive – 21 crashes in 5 years. The crashes were scattered across a roadway segment a little less than a mile long and included run-off-road crashes and animal hits. The roadway in this area is a curving two-lane rural roadway with an asphalt surface. Crash incidence could be improved with lighting and a high-friction surface treatment, features that may be implemented as the area becomes more urbanized. The geometric layout in this area includes two reverse horizontal curves with a minimum radius of 650 feet. Depending on the actual superelevation at the curve, this equates to approximately a 45 mph design speed. The curves are signed with an advisory speed of 45 mph, but the adjacent roadway segments are relatively long tangent sections and driver expectation could be a contributing factor. Other approaches would include reducing the advisory speed to 40 mph or flattening the curvature when the road is reconstructed.

A technical memo documenting existing safety conditions with supporting information is included as Appendix C.



EXISTING TRAFFIC VOLUME & LEVEL OF SERVICE

FIGURE 2

2.3 Existing Roadway Cross-Sections

Sheridan Lake Road is characterized by an urban roadway cross-section in the northern portion of the corridor and a rural cross-section in the south portion of the corridor. The transition between urban and rural occurs in the vicinity of the Wildwood Drive intersection. The urban roadway cross-section in the north portion of the corridor is constructed of Portland cement concrete and is in generally good condition. The rural cross-section in the south portion of the corridor is constructed of asphalt concrete and is in generally good condition, although slight rutting has been observed in the wheel tracks. Existing typical sections for the corridor are shown in Figures 3A and 3B.

The right-of-way for Sheridan Lake Road is variable throughout the study area. The urban section varies from about 80’ to over 100’, while the rural section varies from 66’ to 100’.

The urban street portion of the corridor currently has a 5’ sidewalk on the east side of the roadway and an 8’ sidewalk on the west side of the roadway to address multi-use needs. The rural roadway portion of the corridor has wide shoulders which may be used by bicyclists and pedestrians. The Bicycle Fiscally Restrained Plan in the current RapidTRIP 2040 Plan includes these existing facilities in their current roles, enhanced with signing and marking.

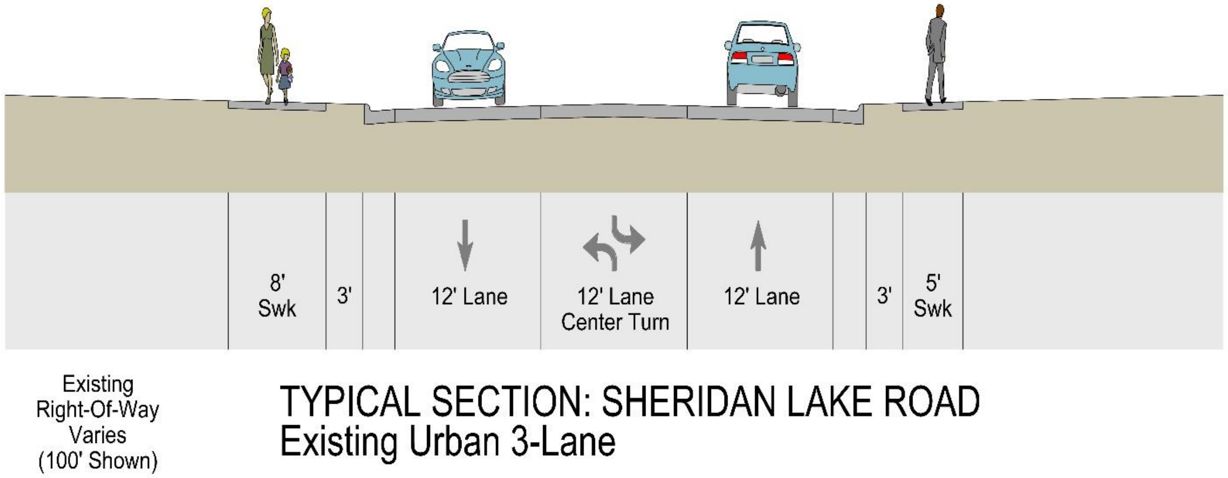


FIGURE 3A. EXISTING URBAN ROADWAY CROSS-SECTIONS (TYPICAL)

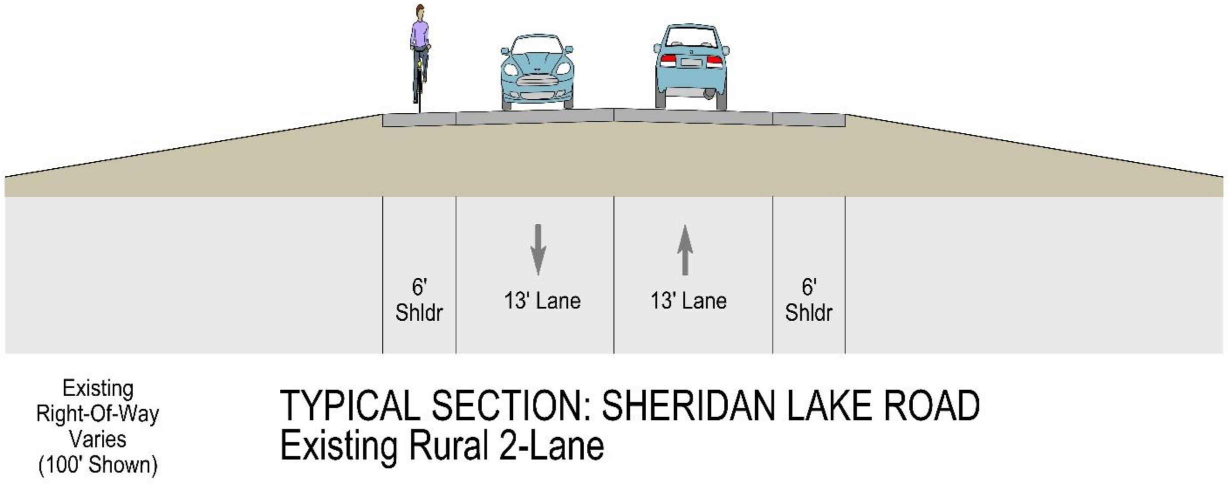


FIGURE 3B. EXISTING RURAL ROADWAY CROSS-SECTIONS (TYPICAL)

2.4 Existing Utilities

A cursory review of public and private utilities was conducted in order to identify any potential major conflicts with a future roadway reconstruction project.

The following utility companies provided a description of their facilities or included utility maps within the project area:

- SDN Communications
- Black Hills Corporation
- Vast Broadband
- Midcontinent Communications
- Montana Dakota Utilities

Critical private facilities in this corridor that were identified with the initial coordination include the MDU regulator station at the southwest corner of Corral Drive and Sheridan Lake Road and the 10” steel gas line (155 psi) that parallels Sheridan Lake Road beginning north of Corral Drive and continuing south through Catron Boulevard. The 10” gas line is on the west side of the roadway. Modification to the MDU facilities will have significant cost. Whether or not the City would bear this potential cost was not determined since right-of-way research and easement information was not collected as part of this study. Figure 4 shows some of the above ground utilities located along Corral Drive near Sheridan Lake Road. Additional detail and utility maps for private and public facilities can be found in Appendix D.

FIGURE 4. UTILITIES AT CORRAL DRIVE AND SHERIDAN LAKE ROAD

Significant City utilities along the study corridor include the following:

- Sanitary Sewer: 15”-18” sewer main along Sheridan Lake Road throughout study area
- Water: 2 pump stations (Well No. 11 Pumphouse and Southwest Booster Station) with 14” water main on Corral Drive; 12”-14” water main along Sheridan Lake Road between Corral Drive and Wildwood Drive; Well No. 12 Booster Pump on Catron Boulevard between Bendt Drive and Nugget Gulch Road
- Storm Sewer: 48” RCP crossing of Corral Drive near Park Drive; dual 54” RCP crossing of Sheridan Lake Road north of Corral Drive; triple 60” RCP driveway crossing and dual RCP Arch crossing of Sheridan Lake Road in front of Calvary Lutheran Church

3.0 Future No-Build Traffic Conditions

3.1 2045 No-Build Traffic Conditions

Future transportation needs in the Sheridan Lake Road corridor were determined by forecasting the travel demand in the horizon year (2045) and analyzing the capability of the future transportation network to handle the future transportation demand. Future traffic demand was determined using the travel demand model maintained by the Rapid City Area Metropolitan Planning Organization (MPO) and the City of Rapid City. The 2045 peak hour turning volumes and levels of service are shown in Figure 5. The existing and future annual daily traffic by Segment is shown in Table 1.

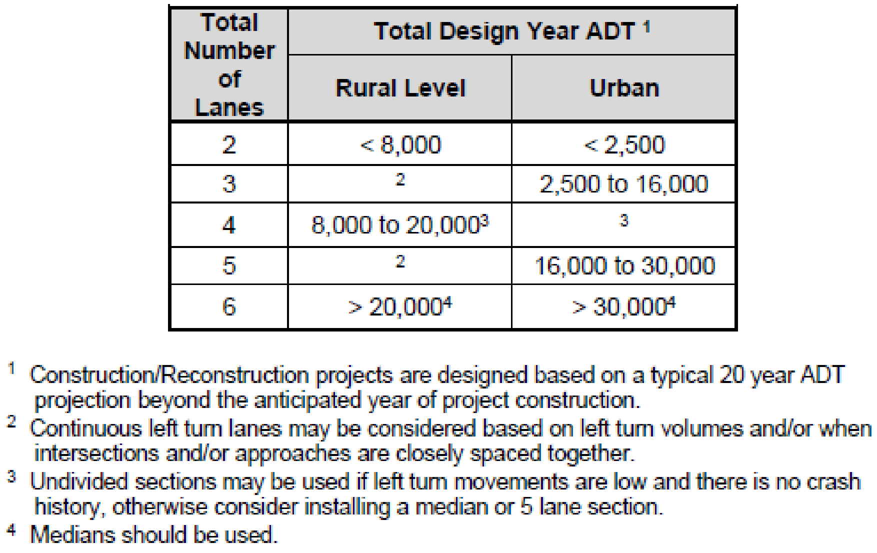
The capacity analysis shows that all the currently signalized intersections will require improvements to maintain desired traffic capacity by 2045. Minor intersections with stop sign-controlled approaches may also require selected improvements. High through-volumes on Sheridan Lake Road indicate that the roadway would benefit from additional lanes throughout the corridor. Expansion of the existing rural cross-section portion of the roadway to an urban cross-section will likely be needed before the planning horizon.

Table 2 is extracted from the SDDOT Road Design Manual (Table 15-10) and provides guidance for the estimated number of lanes required to accommodate the proposed traffic volumes. All Sheridan Lake Road segments are projected to require 4 lanes before 2045 with inclusion of a fifth, center turn lane where there is a high density of driveways.

Table 1. Existing and Future AADT by Segment

Segment	2017 AADT	2045 AADT
Sheridan Lake Road, North of Corral Drive	11,200	20,700
Corral Drive, West of Sheridan Lake Road	4,600	7,600
Sheridan Lake Road, between Corral Drive & Catron Boulevard	16,000	29,600
Catron Boulevard, East of Bendt Drive	11,700	18,800
Sheridan Lake Road, Between Catron Boulevard & Wildwood Drive	13,100	24,200
Sheridan Lake Road, Between Wildwood Drive & Dunsmore Road	12,600	21,900
Dunsmore Road, South of Sheridan Lake Road	3,900	7,200
Sheridan Lake Road, West of Dunsmore Road	11,400	19,800

Table 2. Number of Lanes Based on Traffic Volumes (courtesy SDDOT)



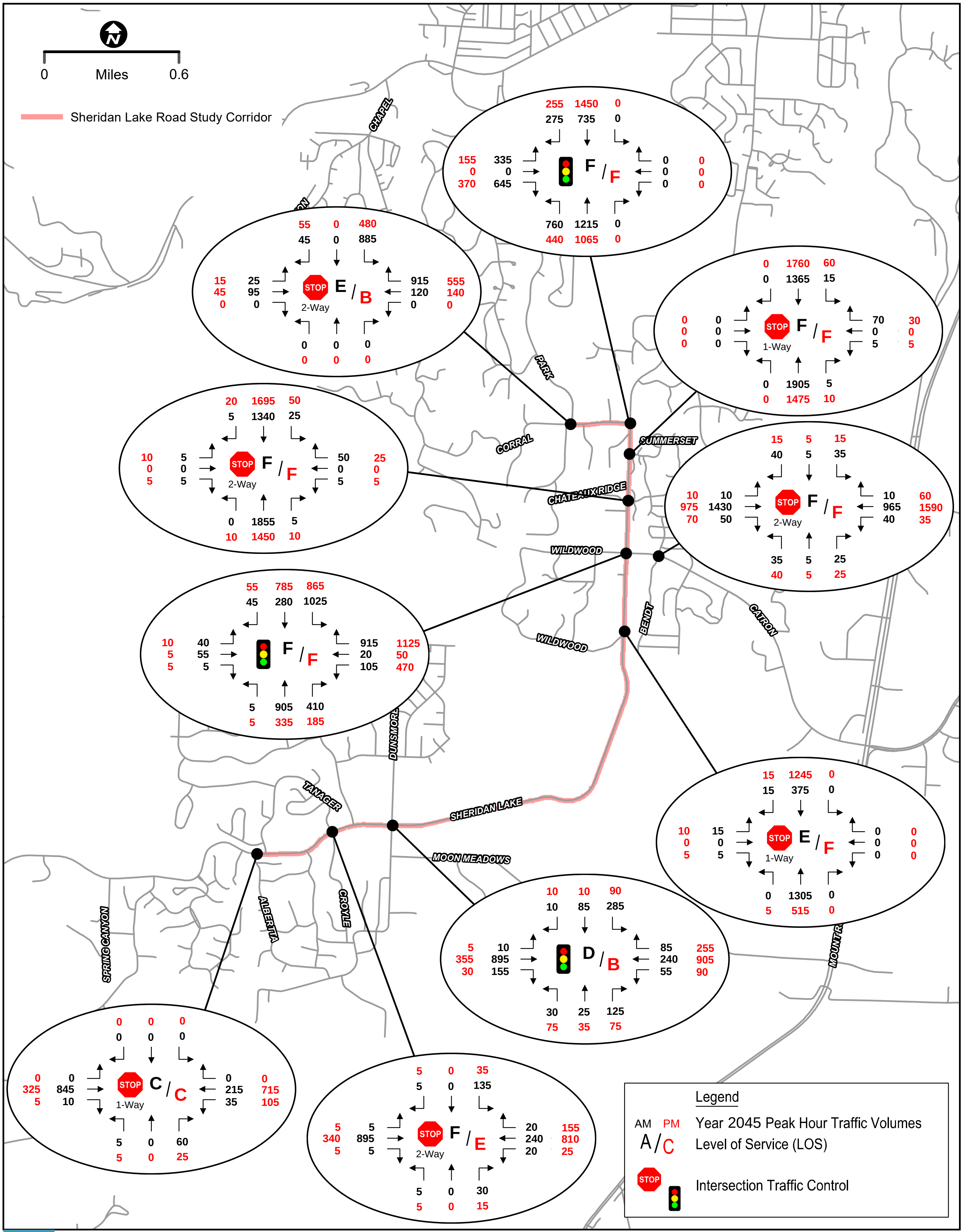
Total Number of Lanes	Total Design Year ADT [1]	
	Rural Level	Urban
2	< 8,000	< 2,500
3	[2]	2,500 to 16,000
4	8,000 to 20,000[3]	[3]
5	[2]	16,000 to 30,000
6	> 20,000[4]	> 30,000[4]

[1] Construction/Reconstruction projects are designed based on a typical 20 year ADT projection beyond the anticipated year of project construction.

[2] Continuous left turn lanes may be considered based on left turn volumes and/or when intersections and/or approaches are closely spaced together.

[3] Undivided sections may be used if left turn movements are low and there is no crash history, otherwise consider installing a median or 5 lane section.

[4] Medians should be used.



2045 NO-BUILD VOLUME & LEVEL OF SERVICE

FIGURE 5

SHERIDAN LAKE ROAD TRAFFIC STUDY

3.2 2045 No-Build Traffic Conditions with Alternative Network Improvements

In addition to the true no-build scenario discussed in the previous section, three future street segments were incorporated into the MPO model in order to assess their potential impact on the Sheridan Lake Road study corridor. These segments are shown in Figure 1 and identified as:

- Future Arterial / Les Hollers Way Alternative
- Future Collector 1 / Chapel Valley Alternative
- Future Collector 2

The Future Arterial / Les Hollers Way Network Alternative adds a single link to the existing roadway network between Catron Boulevard and Sheridan Lake Road. A portion of Les Hollers Way was recently constructed as part of the Black Hills Corporation headquarters development. For this alternative, it is assumed that Les Hollers Way would continue west to Sheridan Lake Road from its current terminus on the south side of Catron Boulevard near Mount Rushmore Road (US16).

The Future Collector 1 / Chapel Valley Alternative adds two links to the existing roadway network. It includes the Les Hollers Way extension between Catron Boulevard and Sheridan Lake Road. It also includes a future collector street indirectly connecting Sheridan Lake Road with Jackson Boulevard. The collector would extend from the intersection of Sheridan Lake Road / Spring Canyon Trail and continue north to the Chapel Valley Subdivision with a connection at the existing Red Rock Canyon Road.

The Future Collector 2 Alternative was eliminated from consideration since it did not provide a benefit to the arterial network.

The 2045 peak hour turning volumes and levels of service for the 2 network improvement alternatives are shown in Figures 6 and 7.

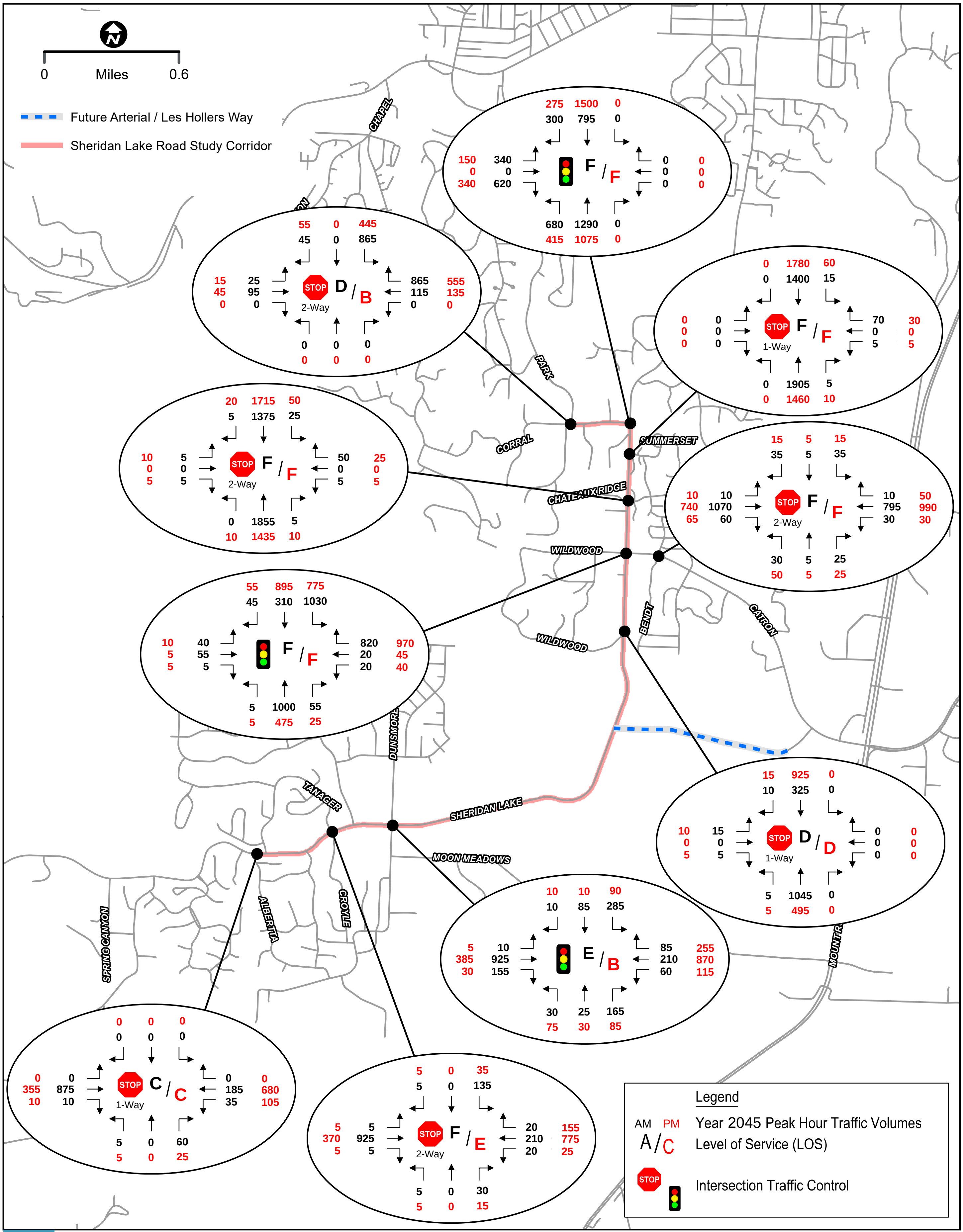
The capacity analysis shows that signalized intersections on the Sheridan Lake Road corridor, operate at unacceptable levels of service with the identified arterial and collector street network improvements under 2045 traffic conditions. The signalized intersection level of service for the Alternative Network Improvements are summarized in Table 3.

Table 3. 2045 No-Build Network Alternative Comparison

Network Alternative	Study Intersection	AM		PM	
		LOS	DELAY	LOS	DELAY
No-Build	Corral Drive / Sheridan Lake Road	F	227.6	F	209.7
	Catron Boulevard / Sheridan Lake Road	F	216.2	F	116.8
	Dunsmore Road / Sheridan Lake Road	D	44.5	B	18.8
Les Hollers Way	Corral Drive / Sheridan Lake Road	F	218.3	F	206.6
	Catron Boulevard / Sheridan Lake Road	F	248.9	F	116.0
	Dunsmore Road / Sheridan Lake Road	E	57.4	B	17.2
Chapel Valley & Les Hollers Way	Corral Drive / Sheridan Lake Road	E	68.0	D	43.4
	Catron Boulevard / Sheridan Lake Road	D	48.3	C	20.7
	Dunsmore Road / Sheridan Lake Road	F	87.2	C	25.3

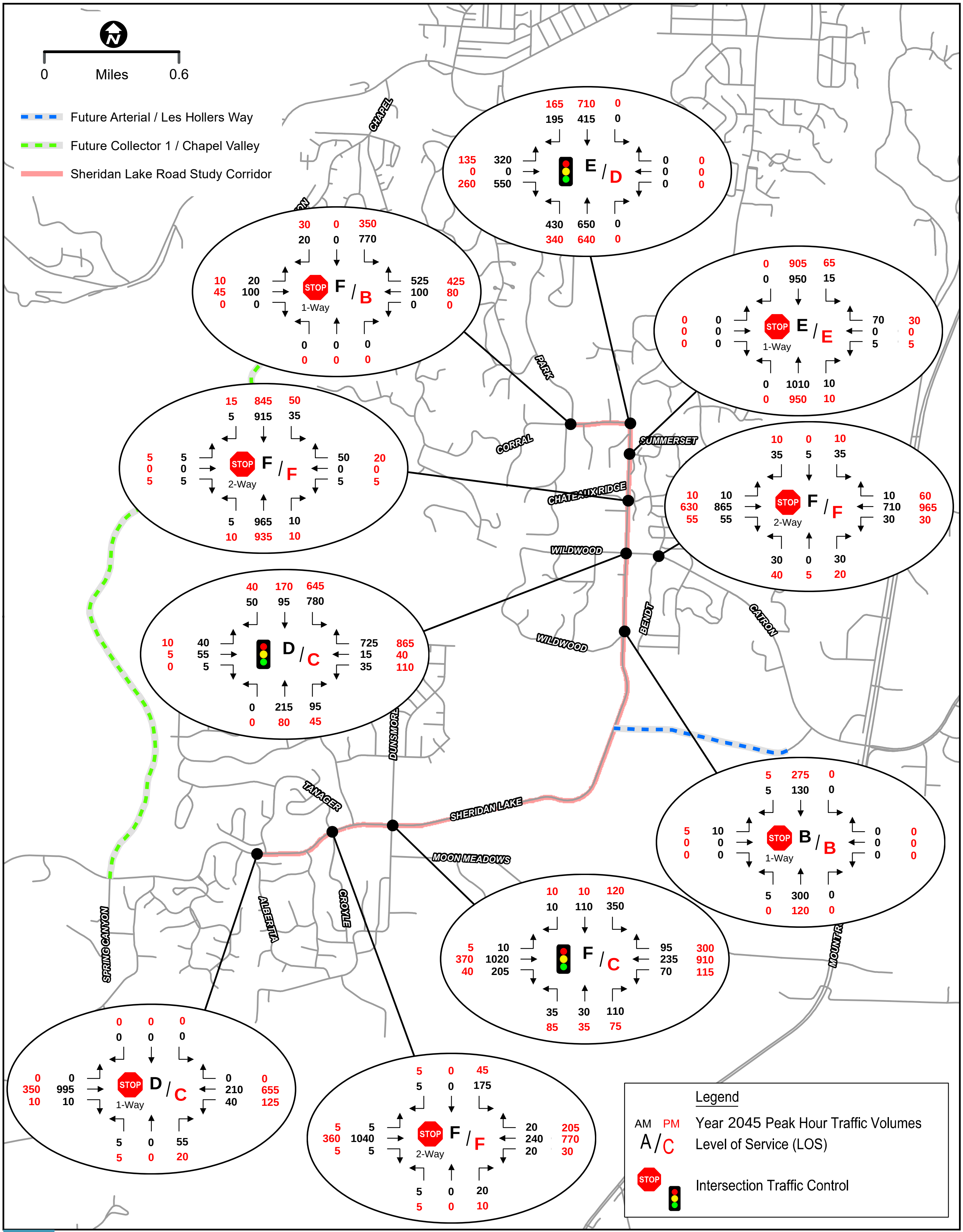
The level of service at signalized intersections demonstrates that both Network Alternatives are beneficial in reducing future volumes and providing relief to the Sheridan Lake Road Corridor. However, improvements to the Sheridan Lake Road Corridor are still necessary to accommodate 2045 traffic volumes at an acceptable level of service under these scenarios. The main benefit from implementing either scenario is the reduced footprint required for improvements at the Sheridan Lake Road / Catron Boulevard intersection in order to meet the future needs. This is described in further detail in the Alternatives Analysis section.

Technical Memos documenting the No-Build Analysis and Alternative Network Improvements Analysis can be found in Appendix E and Appendix F.



2045 NO-BUILD VOLUME & LEVEL OF SERVICE
LES HOLLERS WAY ALTERNATIVE

FIGURE 6



2045 NO-BUILD VOLUME & LEVEL OF SERVICE
CHAPEL VALLEY & LES HOLLERS WAY ALTERNATIVE

FIGURE 7

4.0 Alternatives Analysis

The traffic analysis conducted as part of the study revealed that all three signalized intersections within the study corridor require capacity improvements to meet future needs. The anticipated segment volumes within the corridor also indicate additional lane capacity will be needed as the area continues to develop. The general solution for the corridor to meet the future needs is to expand the current roadway to two through lanes in each direction and add turn lanes at the major intersections as needed. A number of conceptual layouts were developed for the Sheridan Lake Road / Catron Boulevard intersection due to large volumes of through and turning traffic at the intersection. Layouts were also developed for the intersections of Sheridan Lake Road / Corral Drive and Sheridan Lake Road / Dunsmore Road. In addition to these, the impact of implementing the future Network Improvements (Les Hollers Way) was also evaluated at the Sheridan Lake Road / Catron Boulevard intersection.

4.1 Alternative Identification and Screening

Seven initial intersection concepts were identified for the Sheridan Lake Road / Catron Boulevard Intersection in collaboration with City staff. These initial concepts were intended to address intersection needs under 2045 future No Build traffic conditions without consideration of future network improvements. These include the following:

4.1.1 Alternative 1 – At-Grade Intersection - Wildwood Drive Right-In/Right-Out

Conversion of Wildwood Drive to a right-in/right-out access and provision of dual southbound through and left turn lanes and dual northbound through lanes with a free right turn on Sheridan Lake Road. Provision of dual westbound left turn lanes and free right turn movement on Catron Boulevard approach. The resulting level of service for Alternative 1 is C/C (AM/PM).

4.1.2 Alternative 2 – Flyover Southbound to Eastbound

Provision for a grade separated “flyover” for southbound to eastbound left turns on Sheridan Lake Road, a southbound thru and thru/right lane, dual northbound through lanes, a northbound left turn lane, and free right turn on Sheridan Lake Road. Provision of dual left turn lanes, a through lane and free right turn for westbound Catron Boulevard and a left turn lane and a combined thru/right turn lane for eastbound Wildwood Drive. The resulting level of service for Alternative 2 is B/C (AM/PM).

4.1.3 Alternative 3 – Continuous Flow Intersection (North Leg)

Provision of continuous flow intersection on the north leg of Sheridan Lake Road intersection to accommodate southbound to eastbound left turns. The southbound intersection approach would also provide dual through lanes and a right turn lane, while the northbound approach would provide for dual through lanes and a free right turn. Westbound Catron Boulevard would contain dual left turns and a free right turn. Wildwood Drive would have full access. The resulting level of service for Alternative 3 is B/C (AM/PM).

4.1.4 Alternative 4 – 2-Lane Roundabout

Provision of 2-lane roundabout with dual lanes entering and exiting on Sheridan Lake Road and Catron Boulevard approaches and single lane entry/exit on Wildwood approach. The resulting level of service for Alternative 4 is F/F (AM/PM). Free right turns for the northbound (Sheridan Lake Road) and westbound (Catron Boulevard) approaches were also examined, but did not improve the level of service.

4.1.5 Alternative 5 – Northbound Overpass

Provision of 2-lane overpass (grade separated northbound through movement) with northbound free right turn, dual southbound left turns, a southbound through lane and southbound combined thru/right turn lane on Sheridan Lake Road. Westbound Catron Boulevard would contain dual left turns, a through lane, and a free right turn lane. The resulting level of service for Alternative 5 is B/B (AM/PM).

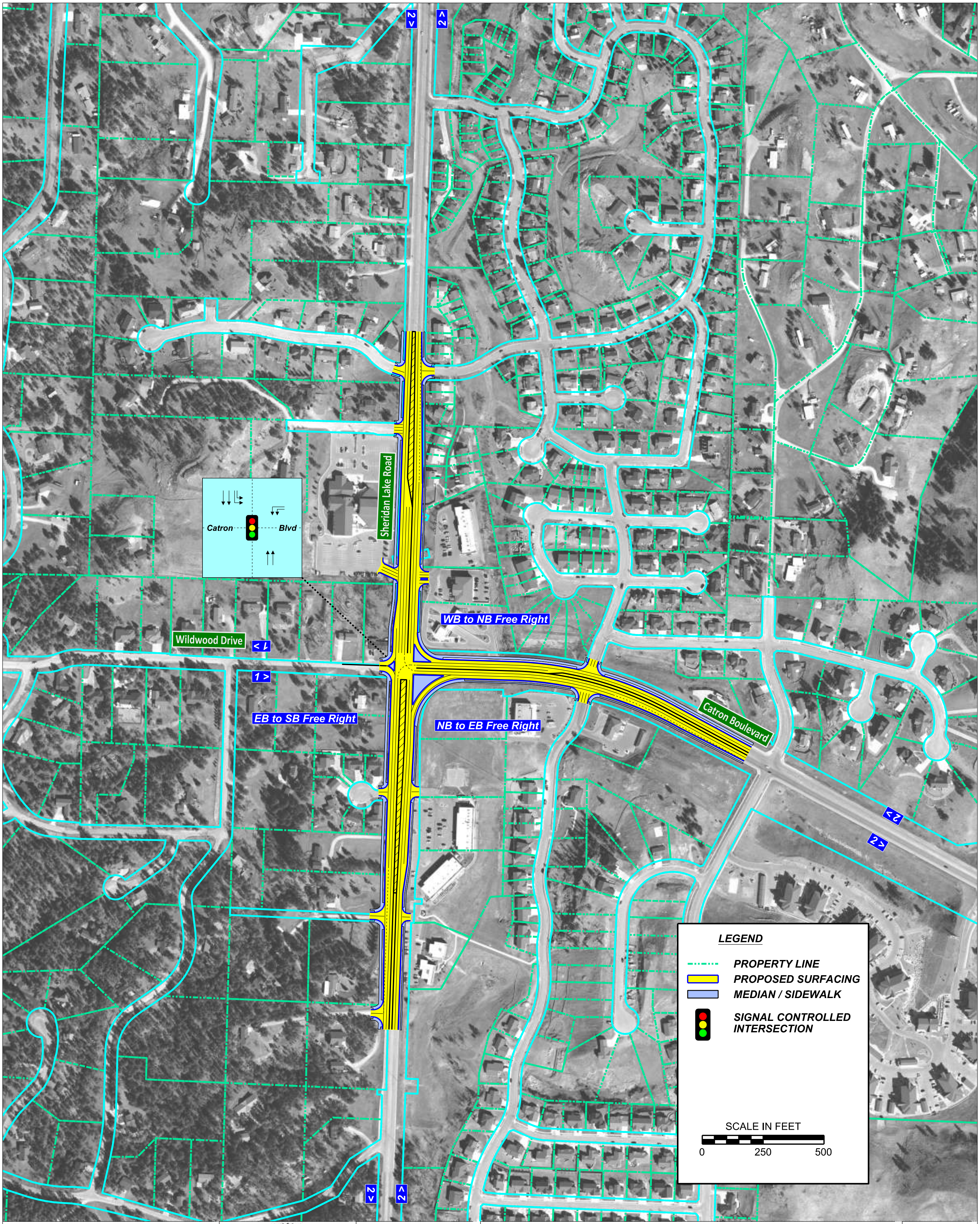
4.1.6 Alternative 6 – Single Point Interchange

Provision of grade separated northbound/southbound through movements on Sheridan Lake Road with dual southbound left turn lanes and a single northbound left turn lane at the interchange. The Catron Boulevard approach would provide a left turn lane and a through lane, and the Wildwood Drive approach would provide a left turn lane and through lane. All right turns would be accommodated via a merge/diverge “ramp” approach. The resulting level of service for Alternative 6 is B/C (AM/PM).

4.1.7 Alternative 7A – At-Grade Intersection

Alternative provides for an at-grade intersection without future arterial/collector network improvements being constructed. The southbound Sheridan Lake Road approach includes triple left turn lanes, a through lane, and a combined thru/right turn lane. The northbound approach includes a left turn lane, triple through lanes, and a free right turn lane. The westbound approach includes dual left turn lanes, a through lane, and free right turn lane and the eastbound approach includes a left turn lane and a combined thru/right turn lane. The resulting level of service for Alternative 7A is C/C (AM/PM).

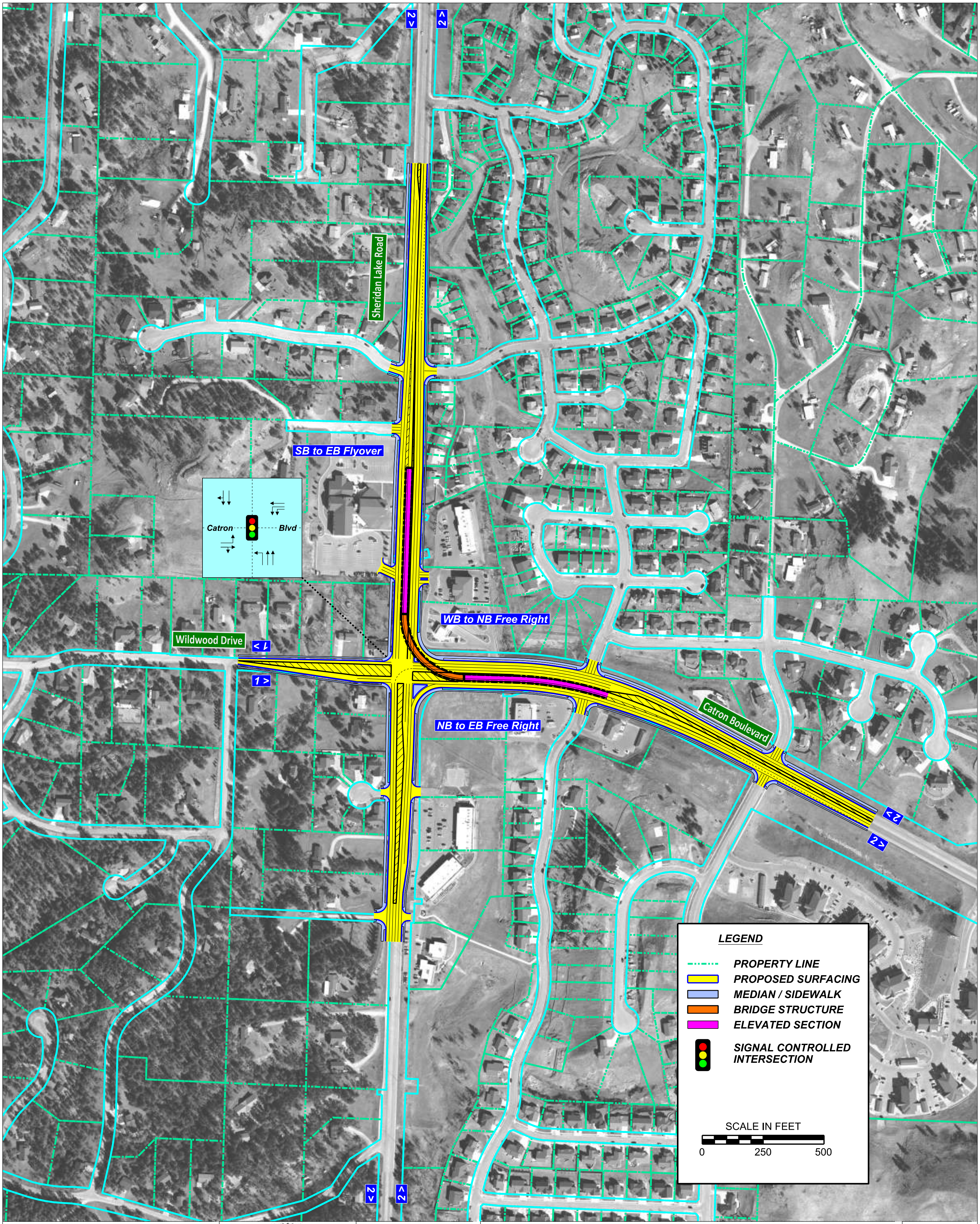
Conceptual layouts were developed and the intersection configurations were evaluated for traffic operations. The traffic evaluation for build alternatives under future traffic conditions can be found in Appendix G. The conceptual layouts for these alternatives are included in Figures 8 through 16. Alternatives 4, 5, and 6 were eliminated after consideration of level of service, constructability, construction cost, impacts to access, and property impacts. The remaining alternatives 1, 2, 3 and 7A were recommended to be carried forward for further evaluation. At-grade intersection layouts were also developed for the Sheridan Lake Road / Corral Drive and Sheridan Lake Road / Dunsmore Road intersections.



Catron Blvd Int
LOS C/C [AM/PM]

Alt 1 - At-Grade Wildood Drive Right-In-Right-Out
Sheridan Lake Road Traffic Study
Rapid City, SD

Figure
8

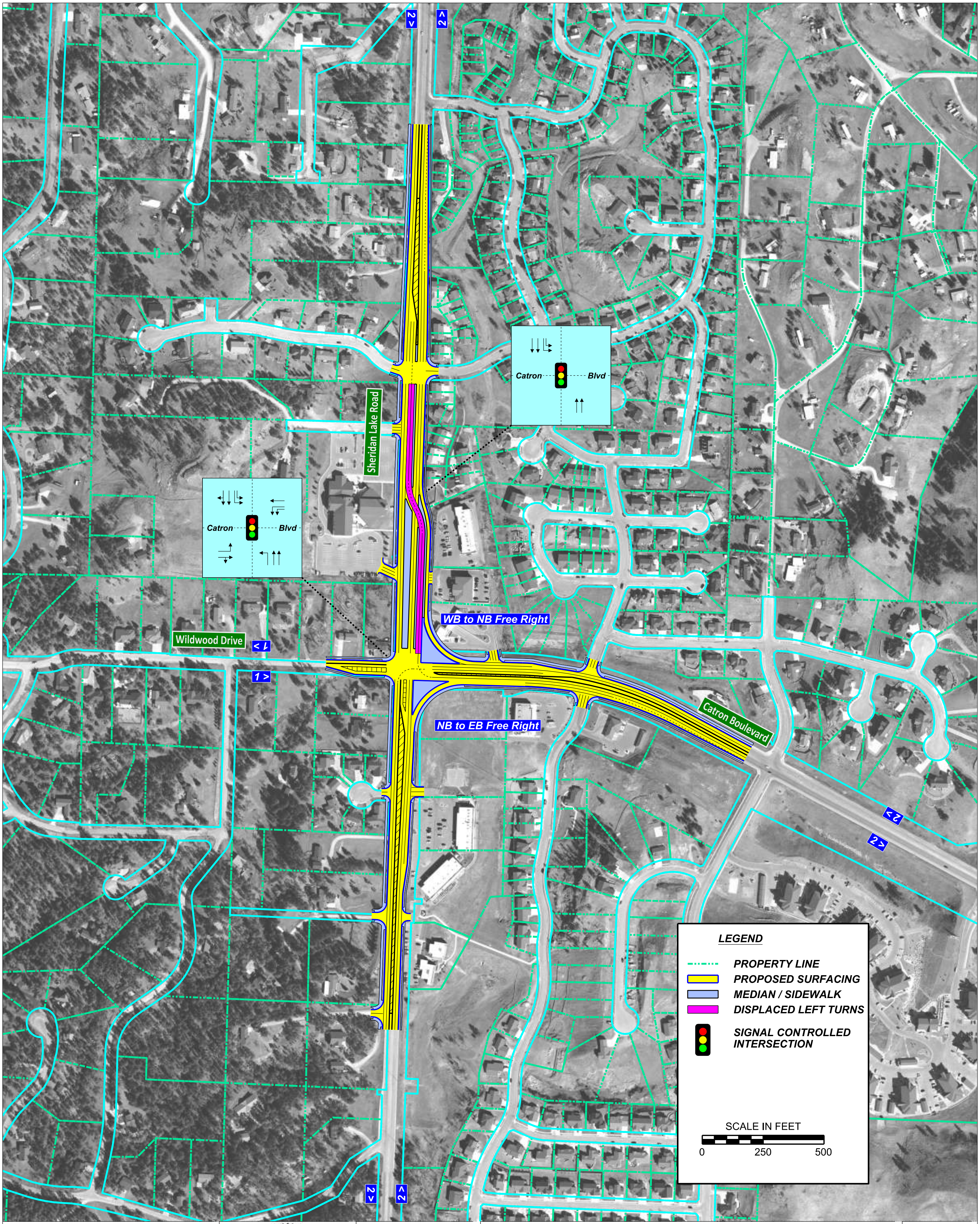


Catron Blvd Int
LOS B/C [AM/PM]

Alt 2 - Flyover Southbound to Eastbound

Sheridan Lake Road Traffic Study Rapid City, SD

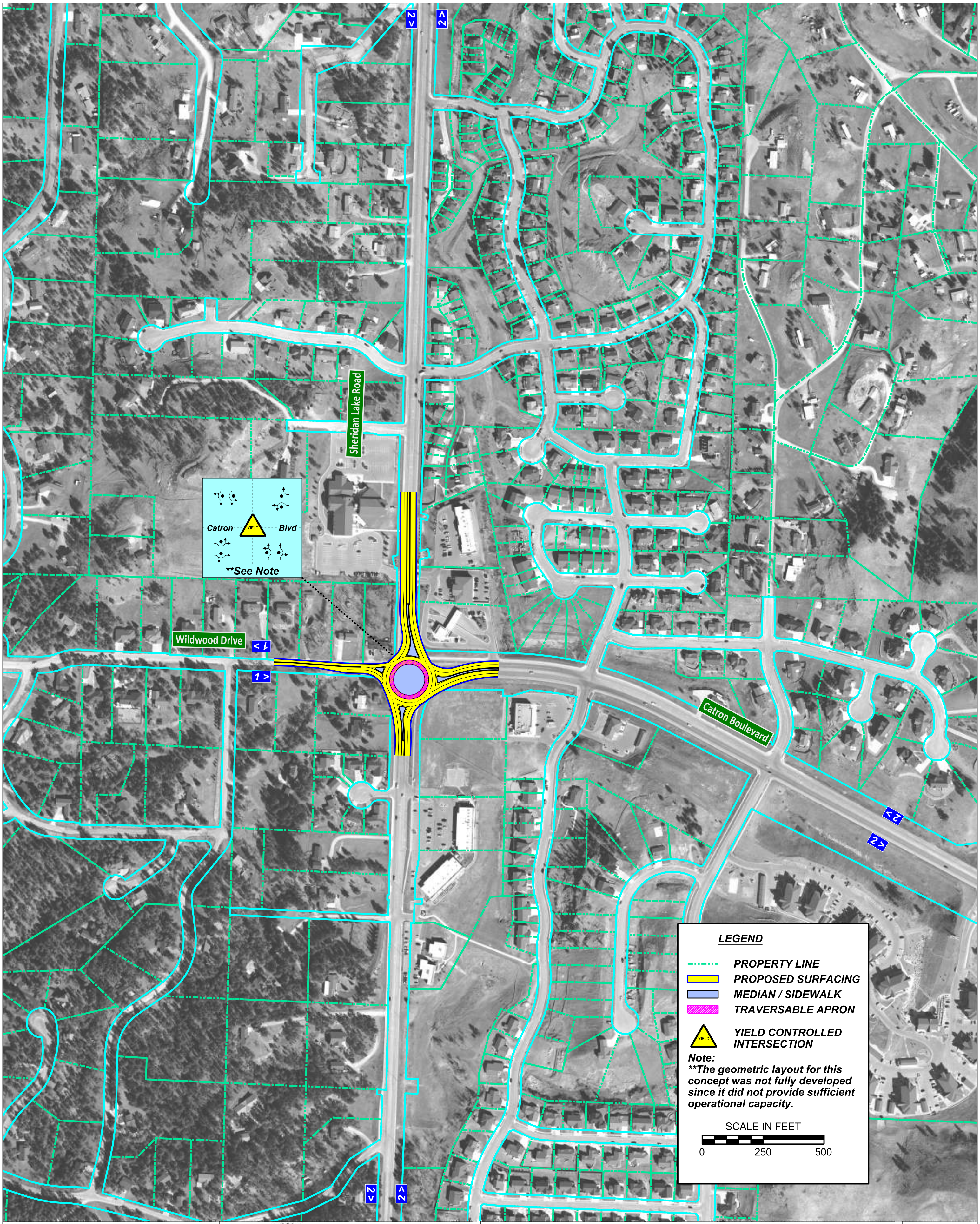
Figure
9



Catron Blvd Int
LOS B/C [AM/PM]

Alt 3 - Continuous Flow Intersection (North Leg)
Sheridan Lake Road Traffic Study Rapid City, SD

Figure
10

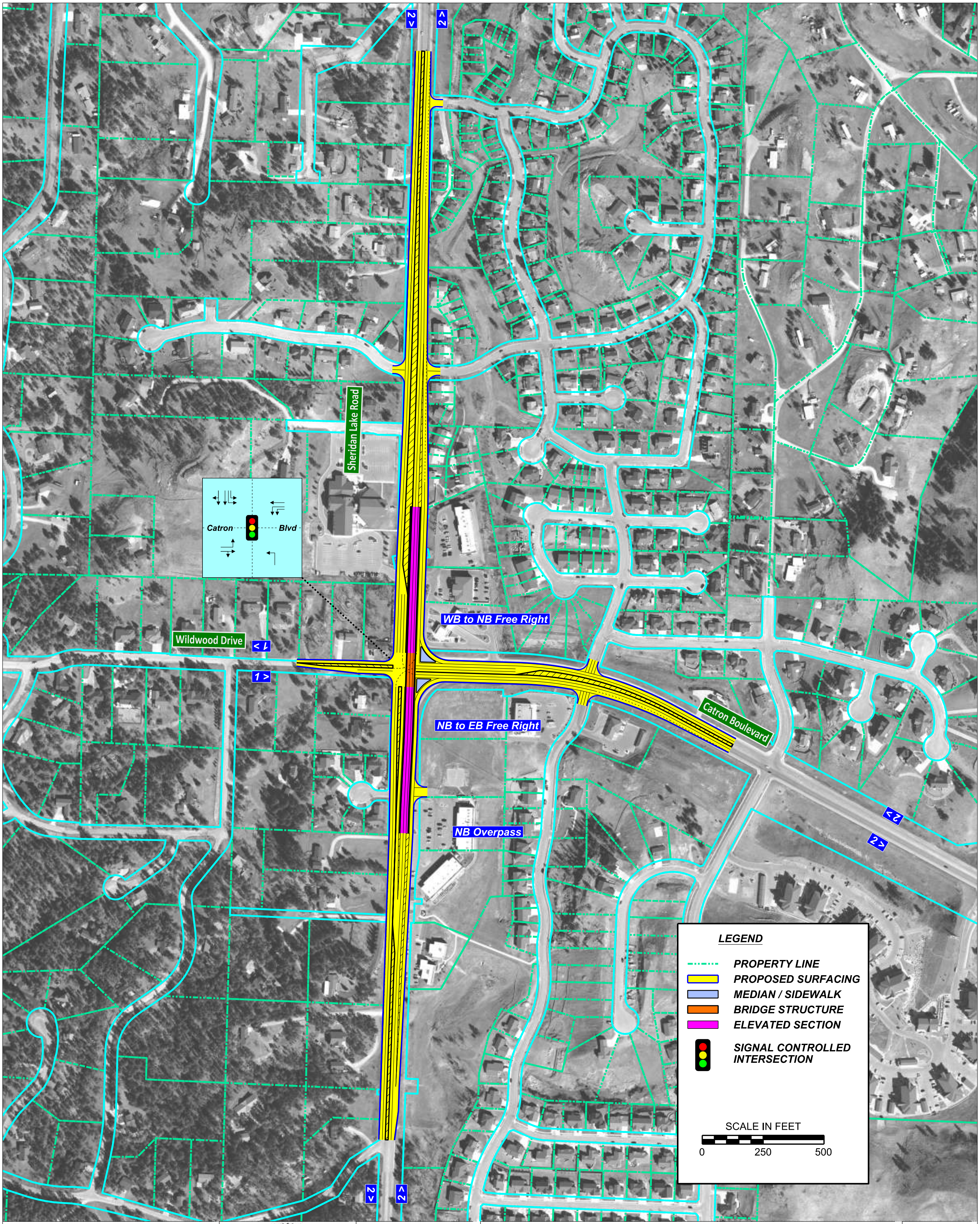


Catron Blvd Int
LOS F/F [AM/PM]

Alt 4 - Roundabout (2-Lane)
Sheridan Lake Road Traffic Study

Rapid City, SD

Figure
11

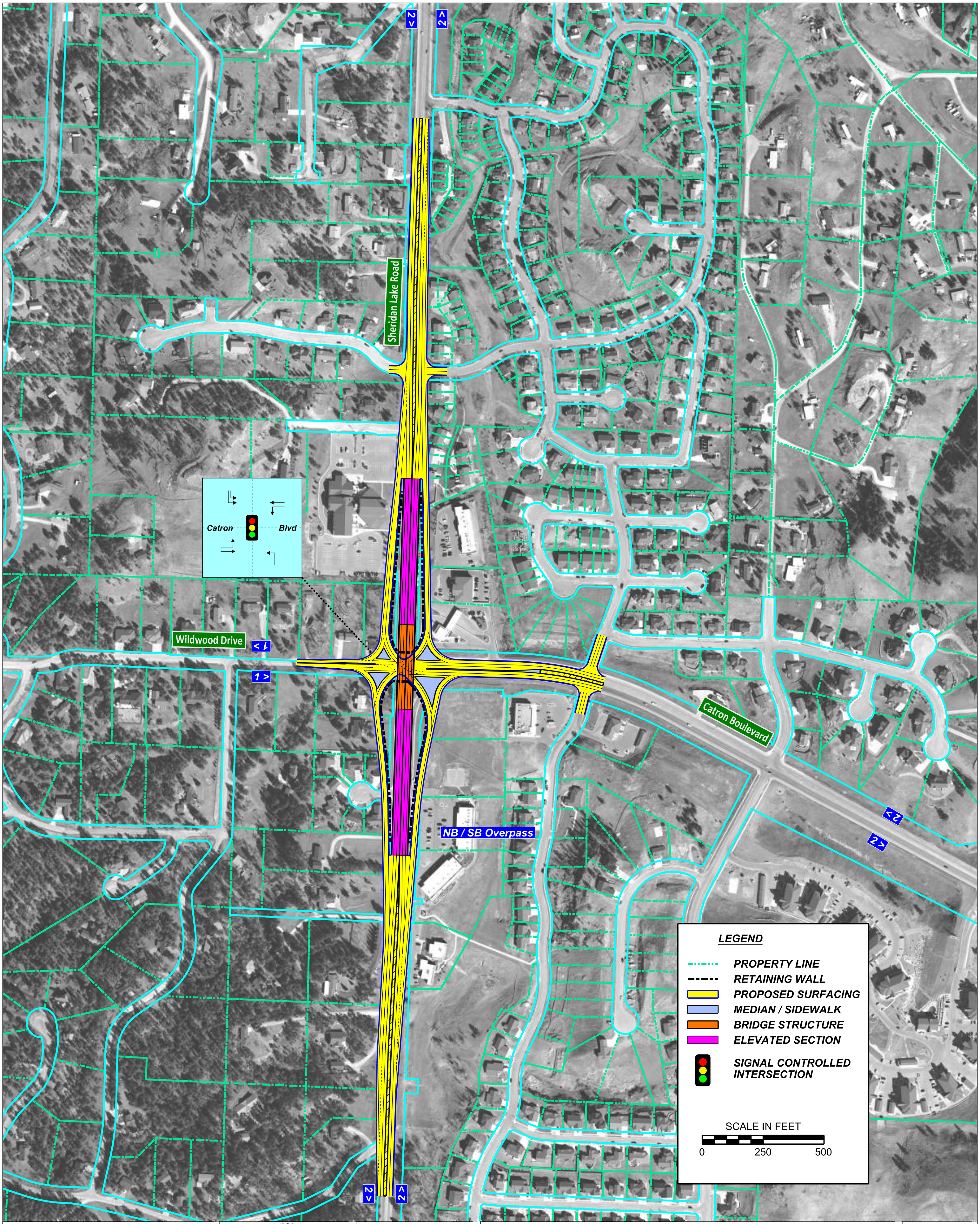


Catron Blvd Int
LOS B/B [AM/PM]

Alt 5 - Northbound Overpass
Sheridan Lake Road Traffic Study

Rapid City, SD

Figure
12

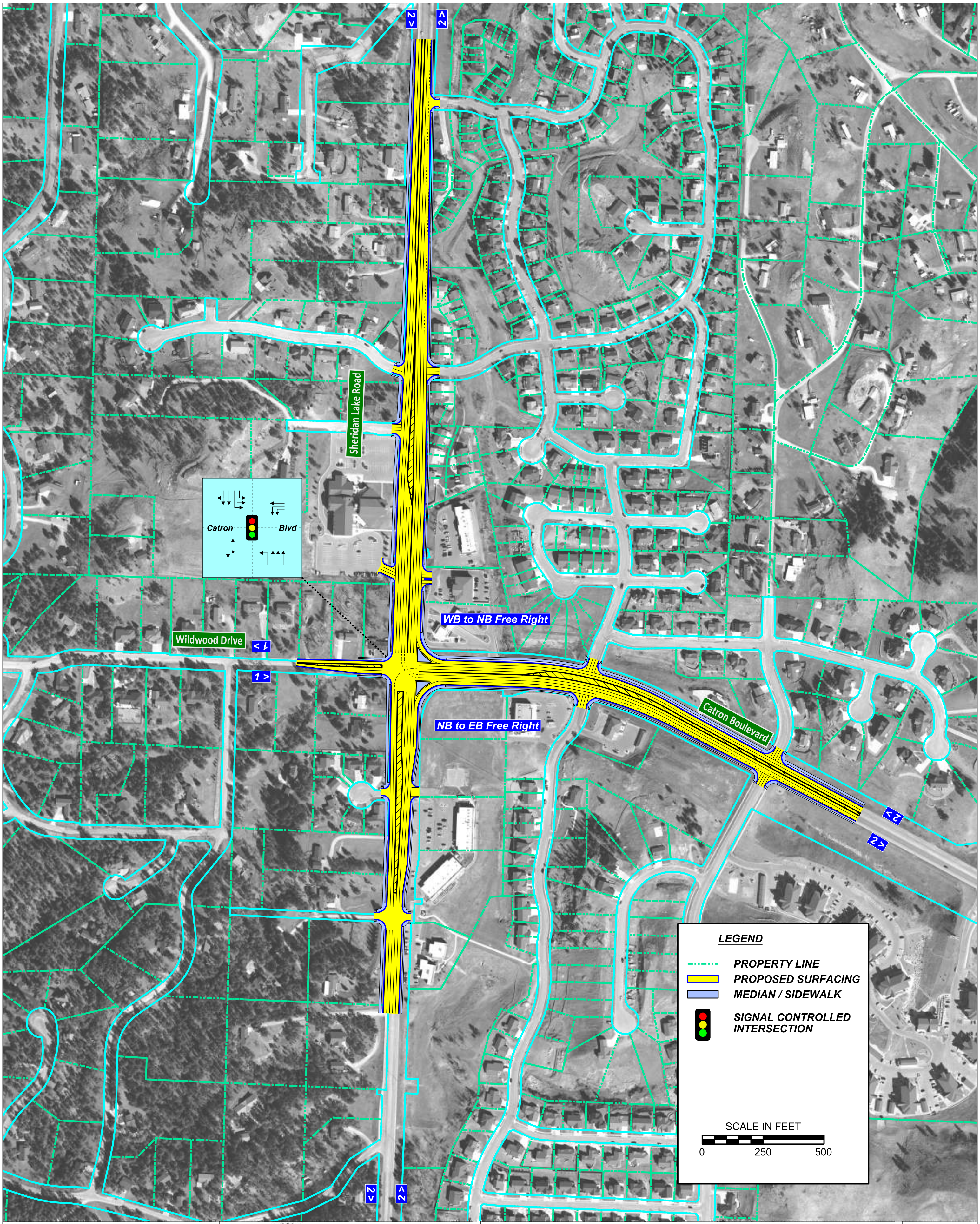


Catron Blvd Int
LOS B/C [AM/PM]

Alt 6 - Single Point Interchange
Sheridan Lake Road Traffic Study

Rapid City, SD

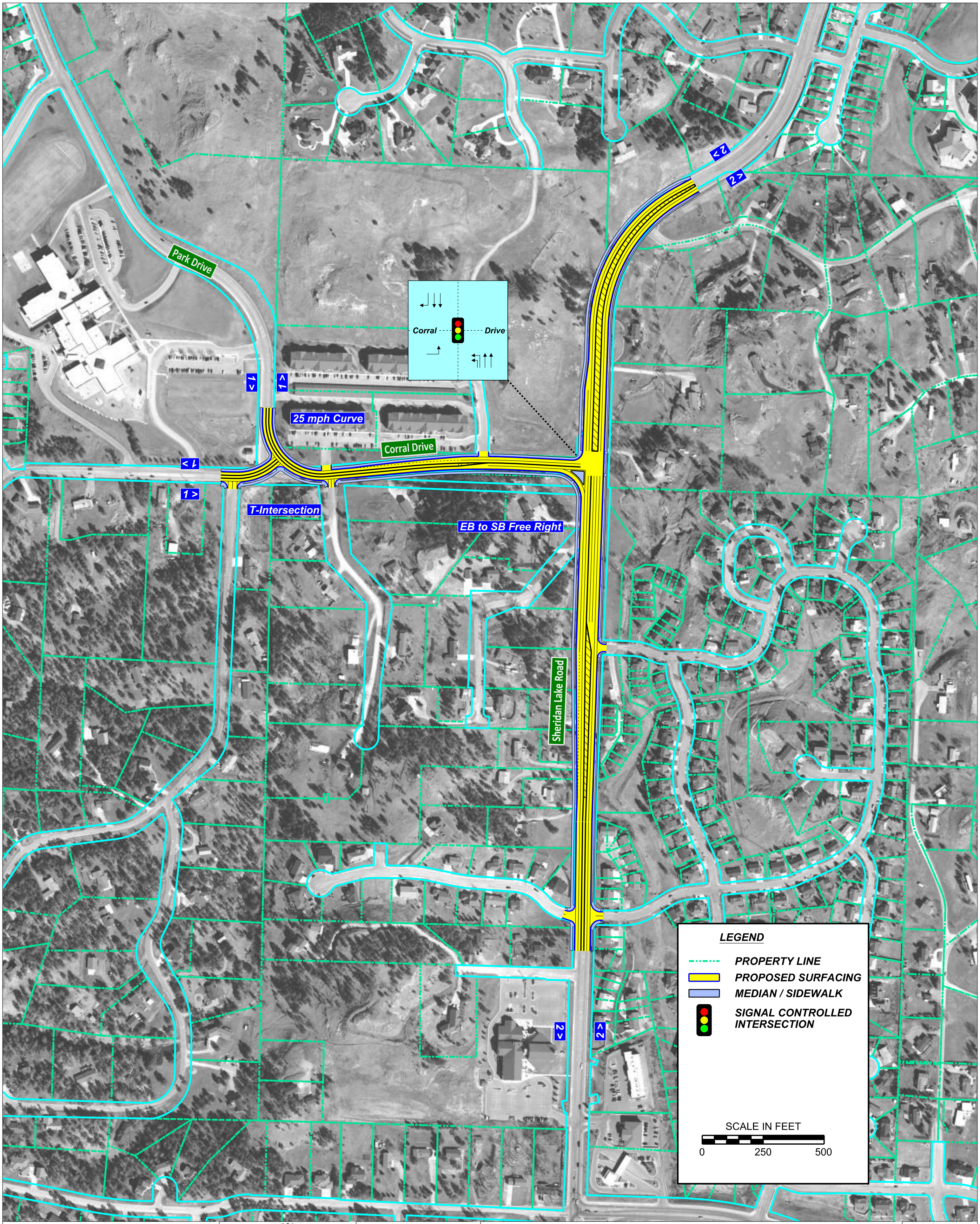
Figure
13



Catron Blvd Int
LOS C/C [AM/PM]

Alt 7A - At-Grade Int. (without Future Roadways)
Sheridan Lake Road Traffic Study Rapid City, SD

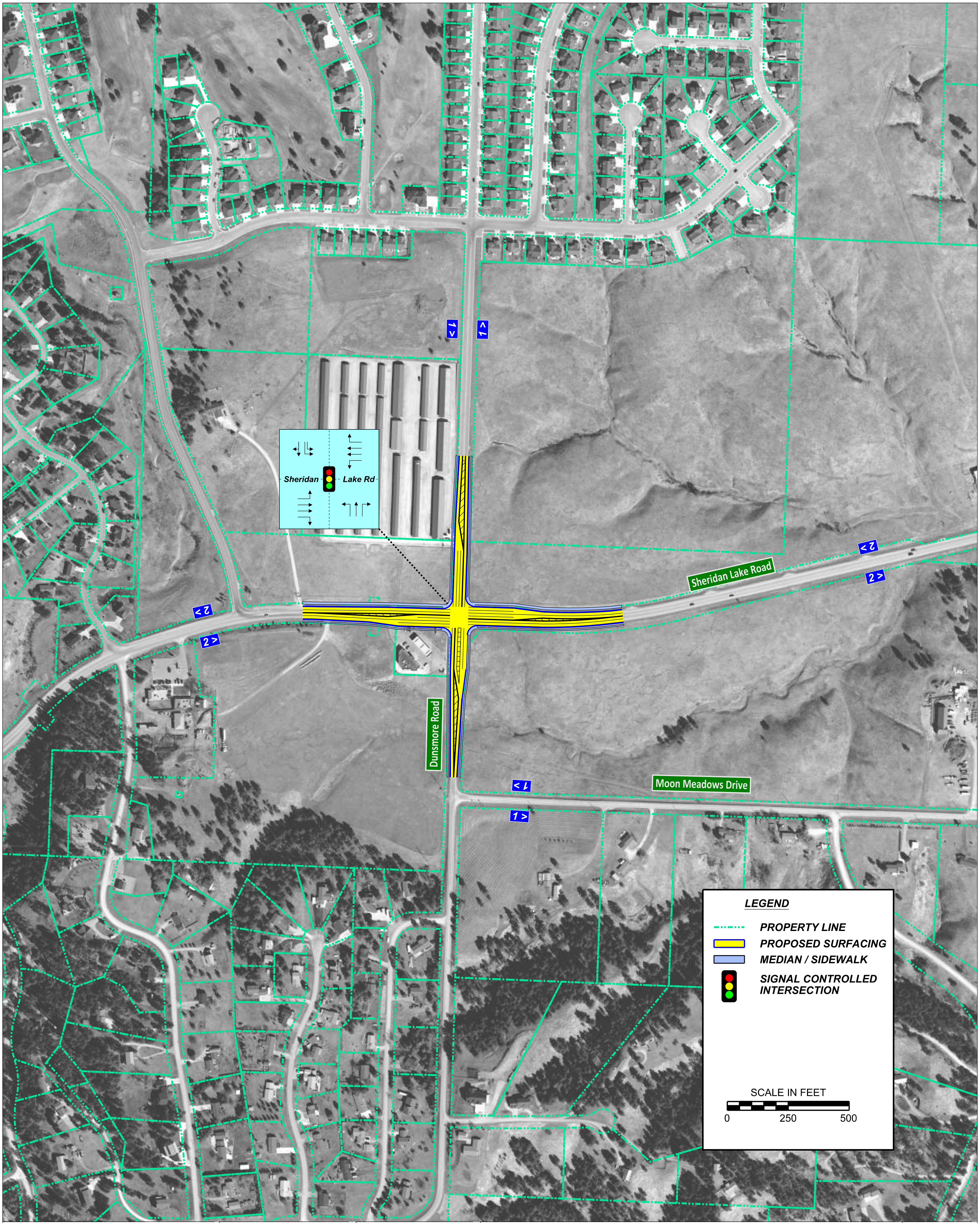
Figure
14



Corral Drive Int
LOS C/C [AM/PM]

Alt 1 - At-Grade Int. Corral Drive and Park Drive
Sheridan Lake Road Traffic Study Rapid City, SD

Figure
15



Dunsmore Rd Int
LOS C/B [AM/PM]

Alt 1 - At-Grade Int. Dunsmore
Sheridan Lake Road Traffic Study
Rapid City, SD

Figure
16

The Sheridan Lake Road / Catron Boulevard intersection alternatives that were carried forward were evaluated based on a number of categories as shown in Table 4. The alternatives were ranked / scored in a relative manner for comparison. Discussion of each evaluation category is included below.

Table 4. Catron Boulevard Intersection Alternative Comparison Matrix

Alternative	Description	Meets Traffic Operational Goals	Multimodal Mobility	Driver Familiarity	Constructability	Construction Cost ($ Millions)	Construction Cost	Right-of-Way Impacts (Acre)	Right-of-Way Impacts	Access Impacts	Score	Rank
1	At-Grade Intersection – Wildwood Drive Right-In/Right-Out	Yes	3	3	3	7.56	3	1.98	2	1	235	**1**
2	Flyover Southbound to Eastbound	Yes	3	2	1	21.19	1	2.83	1	1	130	**4**
3	Continuous Flow Intersection	Yes	2	1	2	10.13	2	3.22	1	2	165	**3**
7A	At-Grade Intersection	Yes	2	2	3	10.60	2	2.92	1	3	205	**2**
		Relative Weight	*10*	*10*	*10*		*25*		*25*	*20*		

*Criteria were scored relatively with “1” representing the worst score and “3” representing the best.

Multimodal Mobility

All alternatives provide similar configurations for bicycle and pedestrian accessibility. Alternative 3 and 7A have longer routes for pedestrians crossing the intersection. Pedestrian crossings will be protected by the traffic signal with the exception of free right-turn movements.

Driver Familiarity

A typical at-grade intersection would have the highest score for driver familiarity due to the abundance of existing at-grade, signal controlled intersections. However, Alternative 7A was scored lower than Alternative 1 since it has triple left turn lanes on one approach leg. Alternative 2 was also scored lower since it has a flyover ramp in the middle of the roadway that could generate driver decision issues. Alternative 3 received the lowest score since there are currently no continuous flow intersections in South Dakota and the intersection itself is asymmetric with displaced left turn lanes on a single leg.

Constructability

The at-grade intersections in Alternatives 1 and 7A will be the easiest to implement from a constructability perspective since they will allow better traffic maintenance during construction. Alternative 3 will be slightly more challenging with the raised medians that are required to guide traffic on the north leg. The raised embankment and bridge structure in Alternative 2 will be the most challenging of the alternatives due to the grade differences required in the middle of the roadway.

Construction Cost

Construction costs were estimated for each alternative and are included in Appendix J. The alternatives were scored 3 (best) if the estimated construction cost was between 0 and $10M. The alternatives were scored 2 if the estimated cost was between $10M and $20M. If the cost was greater than $20M, the alterative was scored 1 (worst).

Right-of-Way Impacts

Right of way impact scores were determined by estimating total area of right-of-way required to implement the alternative. The area was determined by overlaying the alternative footprint on the GIS parcel geodatabase for Pennington County (with a 1-foot offset). If the area was less than 1 acre, the alternative received a score of 3 (best). If it was between 1 and 2 acres, the alternative received a score of 2, and alternatives impacting more than 2 acres received a score of 1 (worst).

Access Impacts

Alternatives 1 and 2 were scored lowest for access considerations. Alternative 1 changes the Wildwood Drive approach from full access to right-in-right-out access which impacts a number of residences. Alternative 2 impacts are associated with the raised embankments on Sheridan Lake Road and Catron Boulevard which will limit several driveway to right-in-right-out movements. Alternative 3 was discounted due to the raised medians required for the displaced left turn lanes which also limits access at several commercial driveways. Alternatives 1, 2 and 3 may require inclusion of u-turns at adjacent intersections to address the limitations to access associated with each alternative.

Summary

Alternative 1 ranked highest in all categories except access. This is due to the conversion of the Wildwood Drive approach into a right-in-right-out access. There is an alternate route available for residents in the vicinity of the intersection that would provide full access to Sheridan Lake Road at a stop-controlled intersection approximately 2000-feet south of Catron Boulevard. Another option would be to provide a u-turn on Sheridan Lake Road, north and south of the intersection to accommodate access to Wildwood Drive.

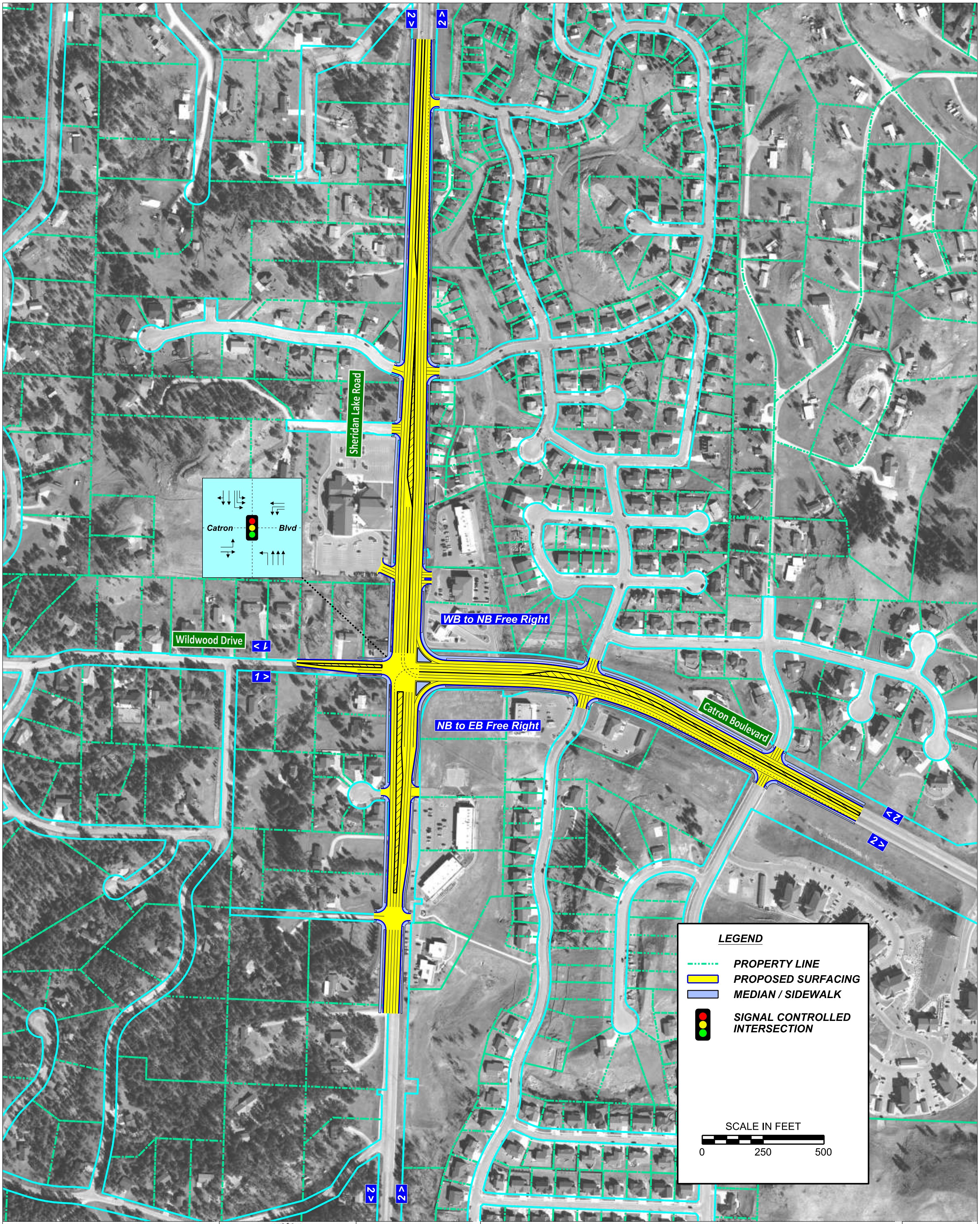
Another important consideration are the Network Improvements discussed below that would allow for the elimination of some of the lanes required for the at-grade intersection. The reduced at-grade intersection would have a similar footprint to Alternative 1, but would maintain full access to Wildwood Drive. This configuration is preferable to Alternative 1, but will be dependent on the implementation of Les Hollers Way.

4.2 Network Improvements Evaluation

As previously discussed, the Network Improvement scenarios will have an impact on future traffic levels. There were two future street alignments (Les Hollers Way and Chapel Valley) that were incorporated into the future traffic models to gage the impacts on the Sheridan Lake Road corridor. Implementation of Les Hollers Way (creating another traffic link between Catron Boulevard and Sheridan Lake Road) has a significant impact on turn lane requirements at the Catron Boulevard intersection. Without Les Hollers Way, the intersection would require three northbound thru lanes and three southbound left turn lanes (additional lane requirements are indicated in Figure 17). With the implementation of Les Hollers Way, only two northbound through lanes and two southbound left turn lanes are required. The same intersection lane configuration would have a level of service of C/B (AM/PM) under future traffic conditions with Les Hollers Way or D/D (AM/PM) without Les Hollers Way. The impact of implementing Les Hollers Way is evidenced in Figures 17-19 with lane requirements and associated level of service. Build Alternative network improvements were not evaluated for Chapel Valley since it was determined to provide minimal benefit in addition to Les Hollers Way.

4.3 Access Review

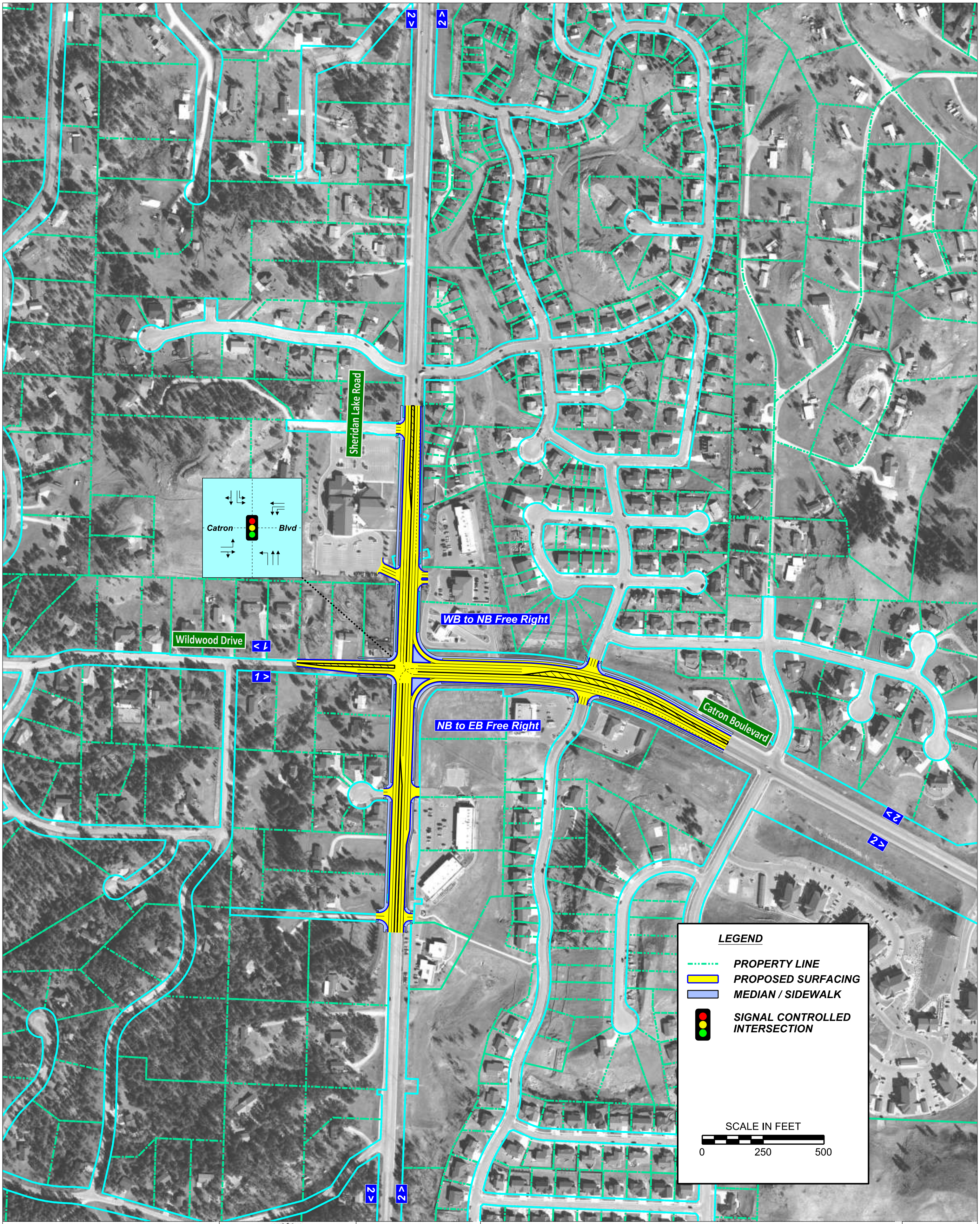
An inventory of current access locations within the study corridor area was developed as part of the project. Each access point was evaluated to determine if it meets current standards or if improvements should be considered. Documentation of the access review can be found in Appendix H. Future traffic volumes generally do not require implementation of a median within the study corridor. However, installation of a median could be considered at major intersections to protect turn lanes and promote safe access.



Catron Blvd Int
LOS C/C [AM/PM]

Alt 7A - At-Grade Int. (without Future Roadways)
Sheridan Lake Road Traffic Study Rapid City, SD

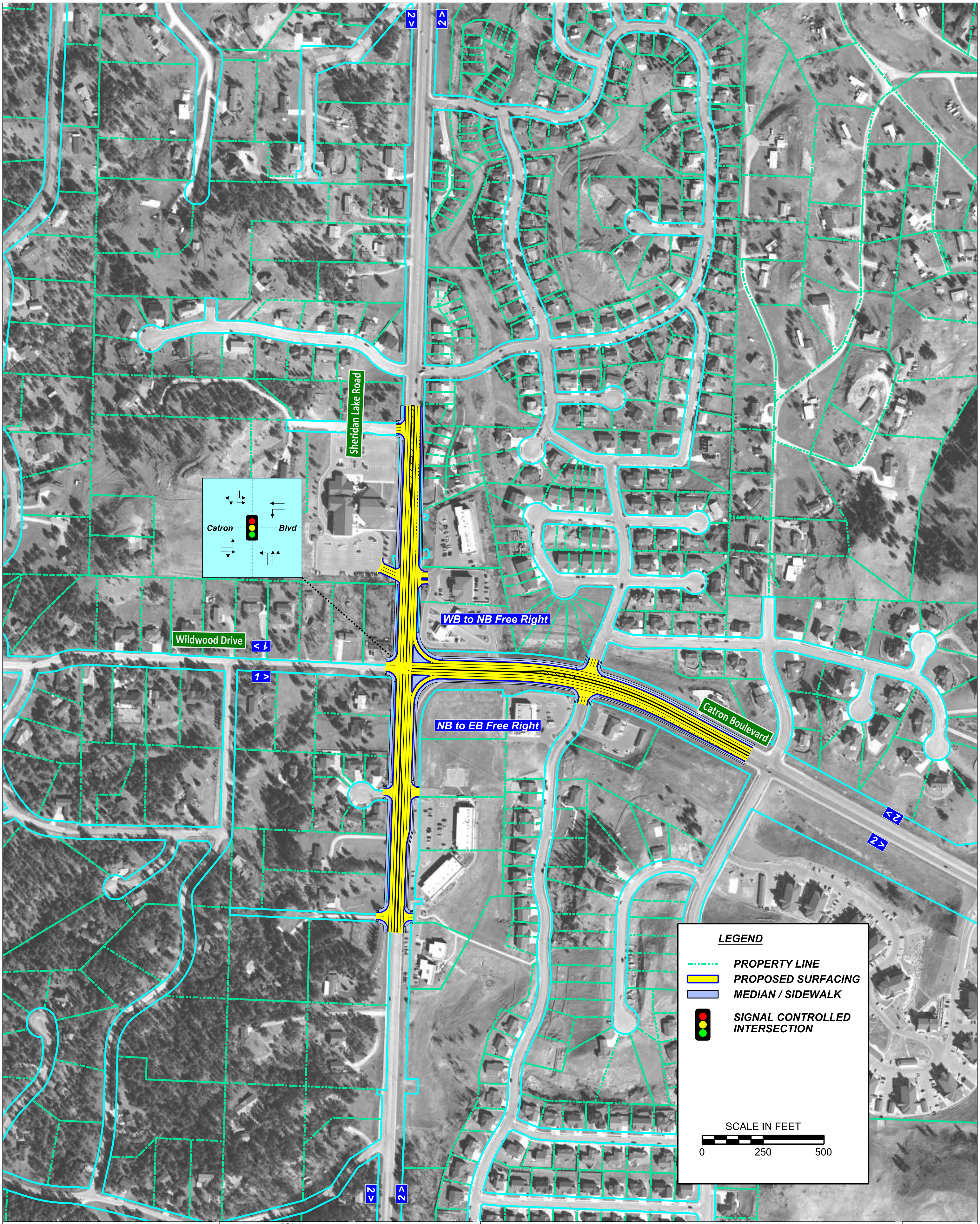
Figure
17



Catron Blvd Int
LOS D/D [AM/PM]

Alt 7B - At-Grade Int. (without Future Roadways)
Sheridan Lake Road Traffic Study Rapid City, SD

Figure
18



Catron Blvd Int
LOS C/B [AM/PM]

Alt 8 - At-Grade Int. (with Future Roadways)
Sheridan Lake Road Traffic Study Rapid City, SD

Figure
19

4.4 Future Typical Roadway Sections

4.4.1 Corral Drive to Wildwood Drive

The future typical roadway section for Sheridan Lake Road between Corral Drive and Wildwood Drive will require two through lanes in each direction due to the volume of traffic through this area. The numerous driveways, intersecting roads and turn lane requirements suggest a center turn lane will be needed in addition. The proposed typical section for Sheridan Lake Road is shown in Figure 20. Pedestrian and bicycle traffic is accommodated with boulevard sidewalk on both sides of the roadway and a 10 foot wide path on one side. The proposed typical section will require approximately 100’ right-of-way, excluding additional turn lane needs at major intersections.

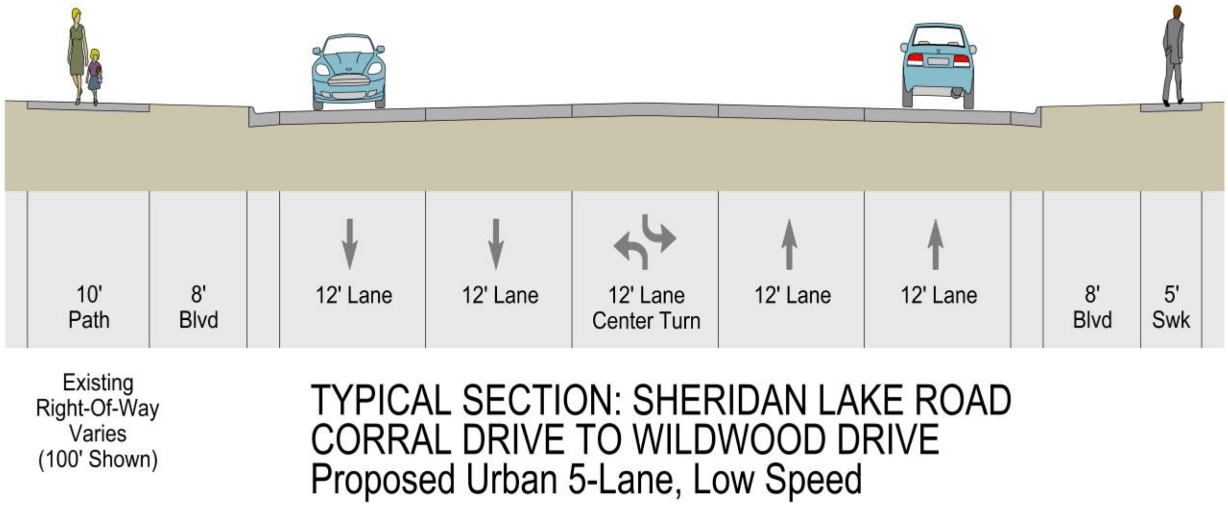


FIGURE 20. FUTURE TYPICAL ROADWAY CROSS-SECTION, CORRAL DRIVE TO WILDWOOD DRIVE

4.4.2 Wildwood Drive to Albertta Drive

The Sheridan Lake Road corridor south of Wildwood Drive carries a high volume of traffic, but is less developed than the section north of Wildwood Drive with fewer driveways and intersecting streets. For this reason a four lane section is recommended for this area instead of the five lane section discussed above. Several variations of the four lane section are considered including a rural section, urban section with shared bicycle lanes and an urban section with a side path. These typical roadway sections are shown in Figures 21A, 21B and 21C.

The rural option shown in Figure 21A is likely the lowest cost option. This provides four lanes to address traffic needs as well as a shoulder bicycle lane that would accommodate bicycle traffic. This portion of the corridor is identified as a “Pedestrian Gap” in the RapidTRIP 2040 Pedestrian Needs Plan with an identified sidewalk need on both sides of Sheridan Lake Road. A rural section does not directly address pedestrian needs.

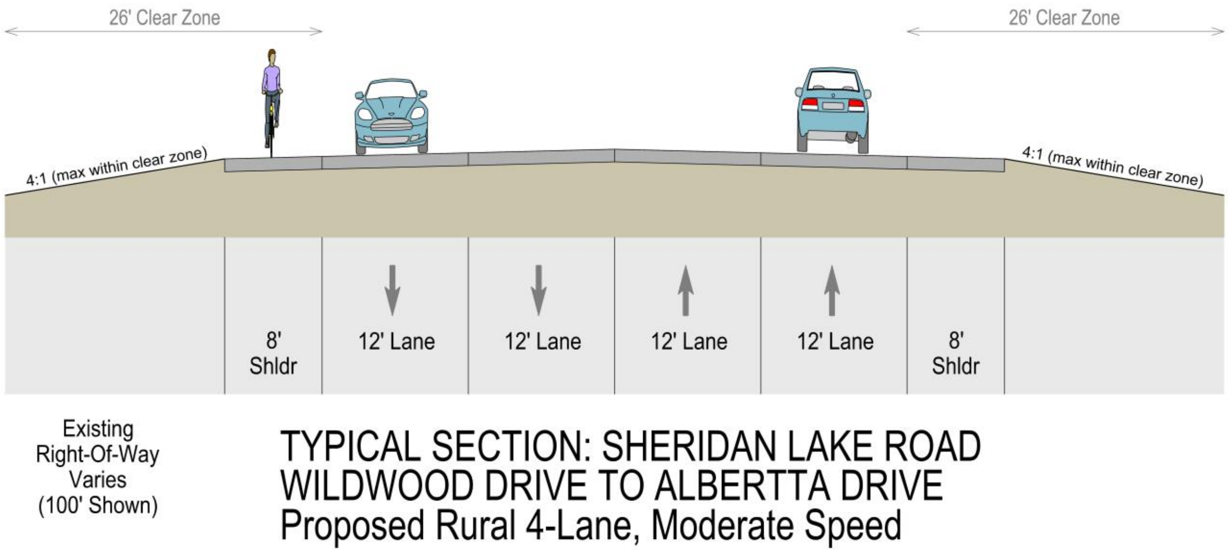


FIGURE 21A. FUTURE TYPICAL ROADWAY CROSS-SECTION, RURAL OPTION

With the anticipated development and lower speed traffic, an urban roadway section for this area is likely. Two potential urban configurations are shown in Figures 21B and 21C. The difference between the two sections is based on how bicycle use will be accommodated. Figure 21B shows a widened outside lane to accommodate bicycle traffic while Figure 21C includes a side path. Both options include sidewalk to address pedestrian needs.

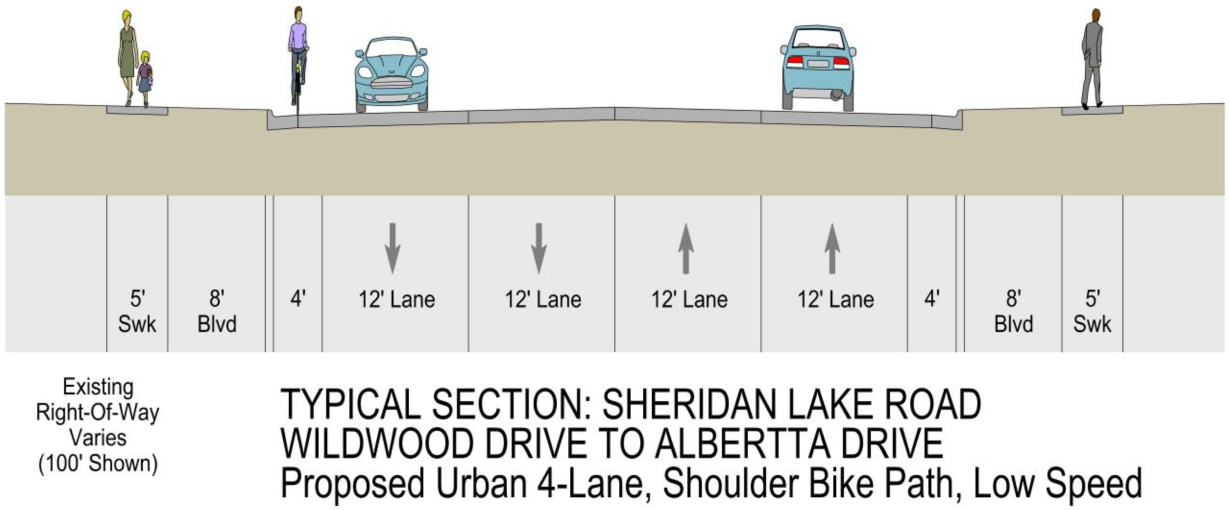


FIGURE 21B. FUTURE TYPICAL ROADWAY CROSS-SECTION, URBAN OPTION WITH SHARED LANE

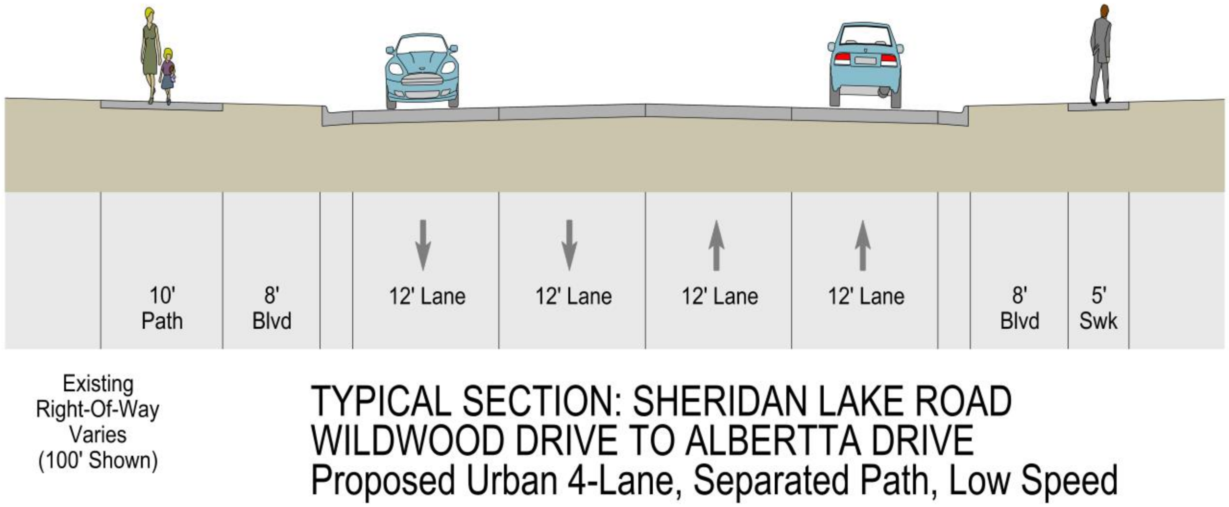


FIGURE 21C. FUTURE TYPICAL ROADWAY CROSS-SECTION, URBAN OPTION WITH SEPARATED PATH

The urban section is also consistent with preliminary plans for the Pennington County project that will reconstruct Sheridan Lake Road between US385 and Albertta Drive. The County project includes a three lane urban section beginning at Albertta Drive and continuing west.

4.5 Public Outreach

As part of the Traffic Study, a website was established to communicate study information and allow feedback on the study alternatives. Approximately 1000 landowners within the study area corridor were notified of the website through a post card mailing. As a result of the mailing, 16 unique comments were received. Identified themes were as follows:

- Maintain full access at Wildwood Drive.
- Promote multi-modal (sidewalk and bicycle) use of the corridor.
- Residents experience difficulty making left turns from stop-controlled, side streets.
- Some residents who live south of Wildwood Drive prefer an overpass-type intersection at Catron Boulevard to expedite through traffic.
- Some residents who live north of Wildwood Drive prefer a neighborhood-feel that promotes slower traffic speeds and higher safety for pedestrians.
- School traffic is contributing to congestion and may be relieved with construction of a new school south of town.
- There is a safety concern related to children walking to school with current and expected traffic volumes at Corral Drive.

There were two comments requesting consideration of Restricted Crossing U-Turns (RCUT; also known as a J-Turn). This configuration eliminates conflict points for left turn maneuvers by changing it to a right turn maneuver followed by a u-turn. It typically includes a wide, raised median when implemented as an intersection alternative because of the need to accommodate truck turning. Travelers that want to make a left turn at an intersection would be forced to make a right turn and then complete a u-turn at a planned median opening. This option was not formally evaluated with the study. Additional information regarding the comments can be found in Appendix I.

4.6 Estimated Construction Cost and Right-of-Way Impacts for Future Improvements

Budgetary cost estimates and right-of-way impacts are summarized in Table 5 for the Sheridan Lake Road / Catron Boulevard intersection alternatives considered in this study. Cost estimates have also been developed for the Sheridan Lake Road / Corral Drive intersection alternative shown in Figure 15. Additional detail is included in Appendix J.

Table 5. Estimated Construction Cost and ROW Impacts

Alternative	Segment	Estimated Construction Cost ($M)	Estimated Right-of-Way Impact (Acre)
1	**Sheridan Lake Road / Catron Boulevard Intersection**	7.56	1.98
2	**Sheridan Lake Road / Catron Boulevard Intersection**	21.19	2.83
3	**Sheridan Lake Road / Catron Boulevard Intersection**	10.13	3.22
7A	**Sheridan Lake Road / Catron Boulevard Intersection**	10.60	2.92
8	**Sheridan Lake Road / Catron Boulevard Intersection**	5.95	0.60
1	**Sheridan Lake Road / Corral Drive Intersection**	7.21	2.30

5.0 Recommendations and Conclusions

Section 4 provides a detailed comparison of alternatives for the Sheridan Lake Road / Catron Boulevard intersection. The Alternative Comparison Matrix (Table 4) ranked Alternative 1 as the best option where future network improvements, such as the Les Hollers Way extension, are not considered. Table 6 provides a comparison of Alternative 1 and Alternative 8, since Alternative 8 accounts for the Les Hollers Way extension. Alternative 8 (shown in Figure 19) is clearly favorable since it provides a lower cost / lower impact alternative and allows full access for Wildwood Drive. Implementation of Alternative 8 is recommended since the extension of Les Hollers Way to Sheridan Lake Road is part of the City's growth plan and Alternative 8 will meet the current and future traffic needs at the Sheridan Lake Road / Catron Boulevard intersection.

Table 6. Catron Boulevard Intersection Alternative Comparison Matrix with Alternative 8

Alternative	Description	Meets Traffic Operational Goals	Multimodal Mobility	Driver Familiarity	Constructability	Construction Cost ($ Millions)	Construction Cost	Right-of-Way Impacts (Acre)	Right-of-Way Impacts	Access Impacts	Score	Rank
1	At-Grade Intersection – Wildwood Drive Right-In/Right-Out	Yes	3	3	3	7.56	3	1.98	2	1	235	**2**
8	At-Grade Intersection	Yes	3	3	3	5.95	3	0.60	3	3	300	**1**
Relative Weight			*10*	*10*	*10*		*25*		*25*	*20*		

*Criteria were scored relatively with "1" representing the worst score and "3" representing the best.

Two construction projects are envisioned to provide necessary capacity improvements for Sheridan Lake Road:

- Sheridan Lake Road - Springbrook Road to Summerset Drive (Corral Drive Int.)
- Sheridan Lake Road - Summerset Drive to Esval Drive (Catron Boulevard Int.)

These projects are represented by the layouts shown in Figures 15 and 19. The associated construction cost estimates and estimated right-of-way impacts are included in Table 5.

Sheridan Lake Road Traffic Study Report

Corral Drive to Albertta Drive

CITY OF RAPID CITY

Rapid City, South Dakota

Appendix A

Methods and Assumptions

Methods and Assumptions Document

Date: Friday, October 06, 2017

Project: Sheridan Lake Road Corridor Study

To: Study Team Members

From: HDR

Subject: Methods and Assumptions Documentation

This Methods and Assumptions document was developed in preparation for the Methods and Assumptions Meeting held as part of the project kick-off meeting with representatives from the City of Rapid City, the Rapid City MPO, and HDR. This document is intended to serve as a historical record of the process, dates, and decisions made by the study team representatives for the **Sheridan Lake Road Corridor Study.**

1. Stakeholder Acceptance Page

Formal stakeholder acceptance was not required as part of the study since it typically applies to FHWA acceptance of the study Methods and Assumptions.

2 Introduction and Project Description

The City of Rapid City has retained HDR to conduct a study of the Sheridan Lake Road corridor in southern Rapid City. This document outlines the procedures to be used in the study.

2.1 Project Background and Understanding

Sheridan Lake Road has experienced considerable traffic growth in the past 20 years due to urban expansion in the study area. In addition, Sheridan Lake Road now serves as part of cross-town route, with connections to Catron Boulevard and other arterial roadways.
The study will evaluate the current traffic operations, forecast future operational demand, and develop concepts to address congestion problems.

2.2 Location

The study corridor includes Sheridan Lake Road from Albertta Drive to Corral Drive and Corral Drive from Sheridan Lake Road to Park Drive. The corridor is shown in **Figure 1**.

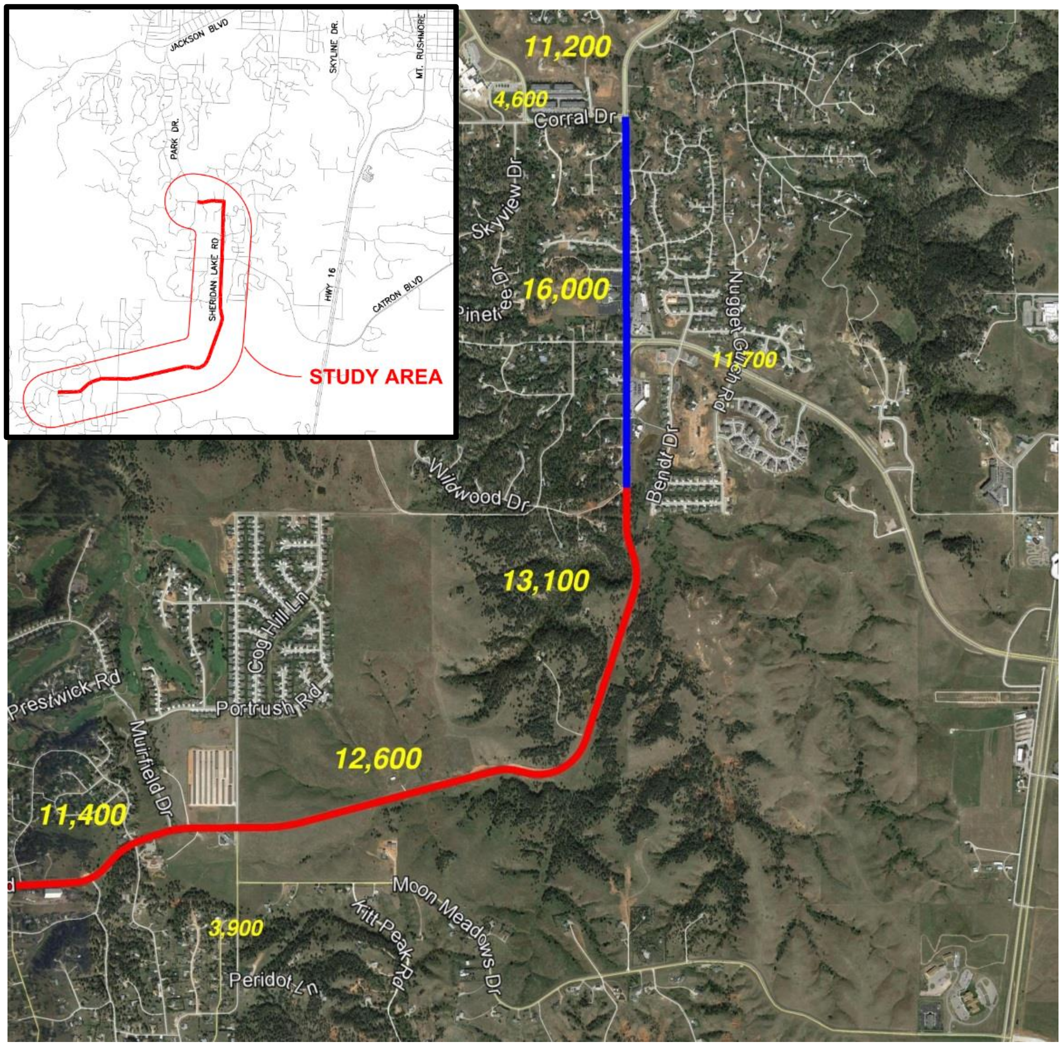


Figure 1 – Study Area

2.3 Need for Study

The corridor study will identify areas of existing and future traffic congestion and develop roadway improvement concepts to provide greater travel efficiency, safety and reliability.

Study Schedule

- August 2017 – NTP
- September 2017 – Data Gathering
- October 2017 – Provide Methods and Assumptions document, Address Comments
- October 2017 – Provide Existing Conditions Technical Memo
- November 2017 – Provide Future No-Build Conditions Technical Memo
- December 2017 – Alternatives Identification
- March 2018 – Provide Alternatives Analysis Technical Memo
- April 2018 – Provide Draft Study Report
- July 2018 – Provide Final Study Report

2.4 Facilities Affected by the Study

The study corridor includes Sheridan Lake Road from Albertta Drive to Corral Drive and Corral Drive from Sheridan Lake Road to Park Drive. Intersections receiving specific analysis include:

- Corral Drive/Park Drive
- Sheridan Lake Road/Corral Drive
- Sheridan Lake Road/N. Summerset Drive
- Sheridan Lake Road/Chateaux Ridge/Summerset Drive
- Sheridan Lake Road/Catron Boulevard
- Catron Boulevard/Bendt Drive
- Sheridan Lake Road/Wildwood Drive
- Sheridan Lake Road/Dunsmore Road
- Sheridan Lake Road/Tanager Drive/Croyle Avenue
- Sheridan Lake Road/Albertta Drive

2.5 Previous Studies

Two previous studies have overlapped into the corridor study area:

- Stony Creek Development Traffic Impact Study (2015)
- US 16/US 16B/Catron Blvd. Traffic Study, South Dakota Department of Transportation, City of Rapid City, Rapid City MPO (2016)
- Traffic Impact Analysis for the Black Hills Corporation Office Complex
- Chapel Valley Access and Route Alignment Study

The results of the previous studies will be reviewed and used as input to the current corridor study.

2.6 Alternate Routes

The following future routes will be included in Future Build Scenarios for study analysis:

- Les Hollers to Sheridan Lake Road (arterial roadway)
- A north-south collector from Sheridan Lake Road at Spring Canyon Trail to SD 44 via Red Rock Canyon
- An east-west collector between Dunsmore Road and the north-south collector on the north side of the Red Rocks Development.

Recommendations for implementation of these alternate routes will be included in the study report.

2.7 Study Advisory Team Members

A Study Advisory Team has been formed to guide the study through completion. The Study Advisory Team is comprised of representative parties of the City of Rapid City and Rapid City MPO. Members of the Study Advisory Team are:

PARTICIPANT	AGENCY
Todd Peckosh	CORC
Dale Tech	CORC
Stacey Titus	CORC
Steve Frooman	CORC
Kip Harrington	CORC / MPO
Patsy Horton	CORC / MPO
Aaron Fagerness	HDR
Rick Laughlin	HDR

Additional team members may be added as the study progresses or agency representatives not included in the above list may be part of the study to provide material reviews on behalf of that agency.

3. Analysis Years/Periods

Existing Conditions: 2017
Future No-Build Scenario: 2045
Future Build Scenario: 2045

4. Data Collection

Data collection will occur in two phases: 1) compile existing data inventory items, and 2) collect turning movement counts. The existing data inventory items include:

- Base mapping
- Aerial photography
- Traffic counts
- Crash data

- Traffic and saturation flow studies
- Design standards, ordinances and guidelines
- Transit route mapping
- Truck and delivery routes
- Existing land use and land use plans
- Known historical properties and areas of environmental significance

New turning movement counts will be gathered at the following locations/periods:

- Corral Drive/Park Drive (12-hour)
- Sheridan Lake Road/Corral Drive (12-hour before and after BHC opening)
- Sheridan Lake Road/Summerset Drive (North) (4-hour)
- Sheridan Lake Road/Chateaux Ridge/Summerset Drive (4-hour)
- Sheridan Lake Road/Catron Boulevard (12-hour before and after BHC opening)
- Catron Boulevard/Bendt Drive (4-hour)
- Sheridan Lake Road/Wildwood Drive (4-hour)
- Sheridan Lake Road/Dunsmore Road (12-hour)
- Sheridan Lake Road/Tanager Drive/Croyle Avenue (4-hour)
- Sheridan Lake Road/Albertta Drive (4-hour)

5. Traffic Forecasting and Volume Development

HDR will coordinate with the Rapid City MPO to develop year 2045 average daily traffic volumes. The MPO will conduct travel demand modeling and HDR will develop the model outputs to create balanced peak hour networks for analysis.

6. Traffic Operations Analysis

Analysis of existing and proposed intersection operations will be conducted using HCM 6 software current addition. HCS 7 analysis reports will be provided in the study documentation and will serve as the basis for intersection analysis. Specific operational variables are listed below:

Variables

- Peak Hour Factor (PHF) – use peak hour factors developed from turning movement counts for existing conditions. Use a default PHF of .90 for future year conditions.
- Saturation Flow Rate – Saturation flow rates will be based on SDDOT recommendations.
- Right Turn on Red percentage – right turn on red percentage will be based on sampling of actual operations.
- Heavy Vehicle Percentage - Based on new turning movement counts.
- Phase Change Intervals – Existing signal timing phase change intervals will be used in analyzing existing conditions. Future condition vehicle clearance times will be based on NCHRP 731 calculation methods.
- Existing signal timing pedestrian clearance times will be used in analyzing existing conditions. Future condition pedestrian clearance times will be based on MUTCD guidance.
- Speeds – based on approach speed limits.

7. Safety and Access Issues

SDDOT crash data for the study area will be analyzed and safety problems within the study area will be identified. A period of 5 years will be used for this study.

Existing accesses will be inventoried and compared with access standards. Recommendations for disposition of existing access points and new access locations will be presented in the study documentation.

8. Selection of Measures of Effectiveness (MOE)

The effectiveness of traffic operations in the study area will be based on the appropriate level of service measurement. All signalized intersections will need to meet a minimum requirement of level of service C. Approach levels of service for signalized intersections will be balanced to the extent possible. Stop sign-controlled intersections may have a lower level of service as it is reported on the side street.

Measures of Effectiveness (MOE's) provided will include: level of service (LOS).

9. Data Provided

The following will be provided by the participating agencies to aid the consultant in performing the study:

- Existing crash data via SDDOT online mapping tool and City records
- Existing Signal Timing Data
- Available GIS data, including aerial photography
- Available traffic counts
- Previous traffic, operations and saturation flow studies
- Future roadway alignments for E-W arterial and N-S collector alternate routes
- Historic plans for Sheridan Lake Road corridor
- Existing design standards and ordinances
- Existing land use and land use plans
- Information on bicycle and pedestrian facilities, transit routes, truck routes

10. Deviations/Justifications

No deviations from standards are currently known. If it is determined during the study that deviations are required, the methods and assumptions document will be amended prior to proceeding.

11. Conclusion

All sections contained in this document will guide the traffic data collection and traffic assessment for this study.

12. Appendices

The appendix includes the following:

- Methods and Assumptions Study Team Meeting Minutes

APPENDIX

Meeting Minutes

Project:	Sheridan Lake Road Corridor Study	
Subject:	Methods and Assumptions meeting	
Date:	Tuesday, October 03, 2017	
Location:	City Hall	
Attendees:	Todd Peckosh, CORC	Stacey Titus, CORC
	Steve Frooman, CORC	Kip Harrington, CORC/MPO
	Patsy Horton, CORC/MPO	Aaron Fagerness, HDR
	Rick Laughlin, HDR	Stacia Slowey, HDR
	Dustin Hamilton, HDR	

A meeting was held October 3, 2017 at the CORC City Hall to review the draft Methods and Assumptions document and prepare for the Sheridan Lake Road Corridor Study. The following items were discussed:

- Section 2.4 – an intersection will be added to the list for Sheridan Lake Road/North Summerset Drive. The intersection was counted as part of the data gathering and the additional data will be used to evaluate intersection operations.
- Section 2.5 – Kip will provide two additional studies for review:
    - Traffic Impact Analysis for the Black Hills Corporation Office Complex
    - Chapel Valley Access and Route Alignment Study
- Add a Section to identify our intention to study three alternate routes:
    - Les Hollers to Sheridan Lake Road (arterial)
    - A north-south collector from Sheridan Lake Road at Spring Canyon Trail to SD 44 via Red Rock Canyon
    - An east-west collector between Dunsmore Road and the north-south collector on the north side of the Red Rocks Development
- Section 2.6 – CORC will coordinate with representatives of Pennington County and the Rapid City School District regarding the study, rather than adding additional members to the Study Advisory Team.
    - School District coordination to include location, type and timing of new school and details of potential expansion of existing Southwest School
- Section 6 – the text will be changed to indicate that the existing signal timings will be used for phase change intervals and pedestrian signal timing under existing conditions. Saturation flow rate to be based on State data.
- Section 7 – the text will be changed to indicate that access management will be addressed in the same memo with safety analysis, and access management will be included in the study report.
- Section 8 – the level of service goals will be set at LOS C, with LOS D acceptable when faced with tight constraints. Approach levels of service should be balanced to the extent possible.
- The study report will document recommendations for lane width and typical sections.

Sheridan Lake Road Traffic Study Report

Corral Drive to Albertta Drive

CITY OF RAPID CITY

Rapid City, South Dakota

Appendix B

Existing Conditions Traffic

Technical Memo

Date: Monday, February 26, 2018
Project: Sheridan Lake Road Corridor Study
To: Study Advisory Team
From: Rick Laughlin

Subject: Follow-up Existing Conditions Analysis

Additional turning movement vehicle counts were conducted after the opening of the Black Hills Corporation campus in late 2017, in accordance with the scope of services for the Sheridan Lake Corridor Study project. These counts were made on December 12, 2017 at the following intersections:

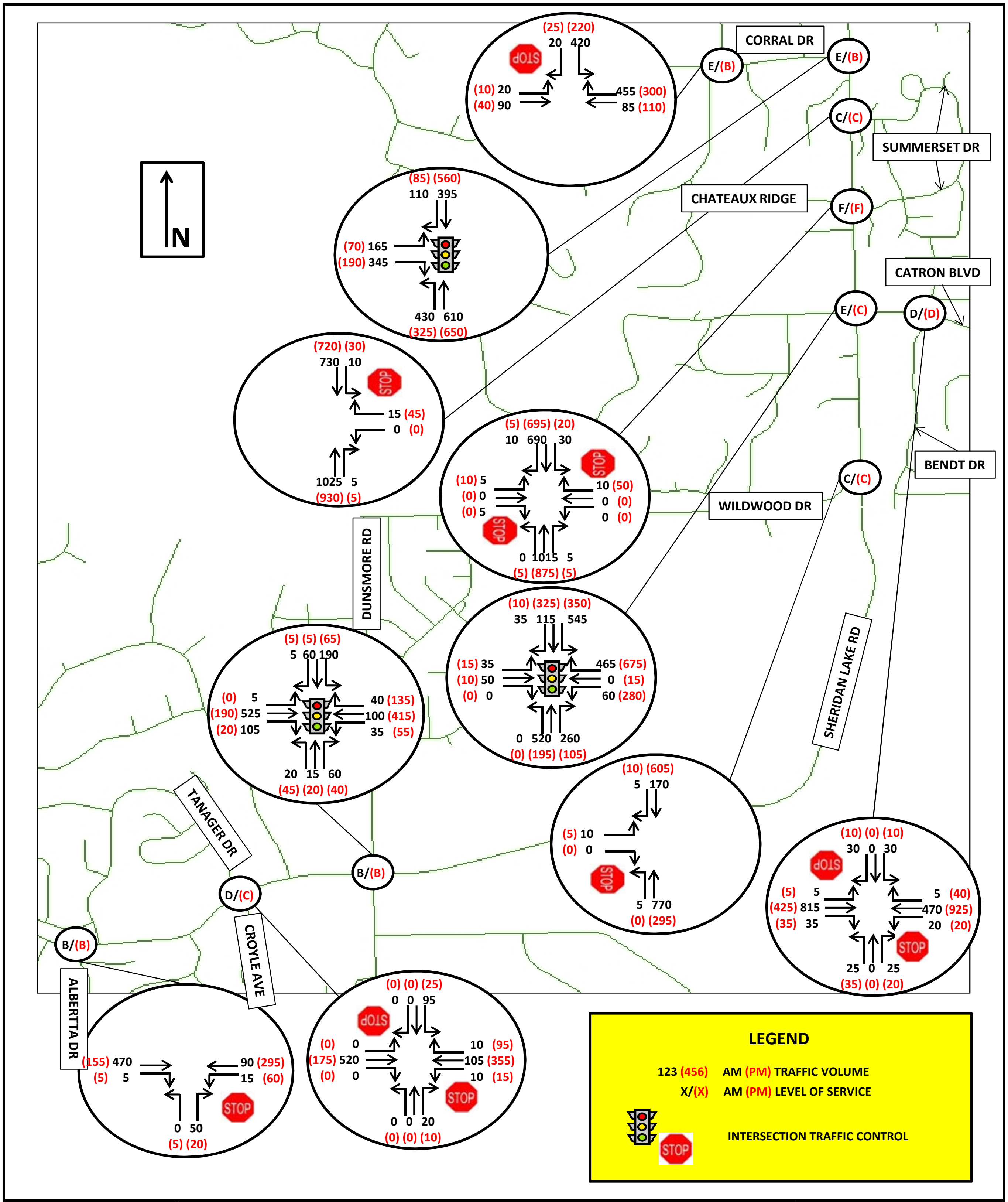
- Sheridan Lake Road/Corral Drive
- Sheridan Lake Road/Catron Boulevard

The existing conditions analysis (see Technical Memo #1) was updated with the follow-up traffic counts and the results are shown in **Figure 3A**.

The counts show an increase in through-traffic on Catron Boulevard and Sheridan Lake Road north of Catron Boulevard. A slight increase in traffic using Corral Drive and Park Drive was also noted. A slight decrease in traffic was observed on Sheridan Lake Road south of Catron Boulevard.

Slight decreases in level of service were observed at Sheridan Lake Road/Catron Boulevard and Catron Boulevard/Bendt Drive in the AM peak hour. Other levels of service were unchanged.

Peak hour traffic counts were also conducted at the Sheridan Lake Road/Muirfield Drive intersection to determine the volume of traffic relative to the adjacent intersections. The counts showed that more traffic is currently using Muirfield Drive than Tanager Drive. Copies of the peak hour traffic volume sheets are attached to the end of this memo.



SHERIDAN LAKE ROAD CORRIDOR STUDY
RAPID CITY, SD

FIGURE 3A
EXISTING FOLLOW-UP VOLUME &
LEVEL OF SERVICE

SLR/CORRAL FOLLOW-UP

Leg	Old State Hwy 40				Old State Hwy 40				Corral Dr				
Direction	Southbound				Northbound				Eastbound				
Start Time	Right	Thru	U-Turn	**App Total**	Thru	Left	U-Turn	**App Total**	Right	Left	U-Turn	**App Total**	**Int Total**
2017-12-12 07:15:00	30	89	0	**119**	152	151	0	**303**	66	23	0	**89**	**511**
2017-12-12 07:30:00	53	98	0	**151**	192	169	0	**361**	106	54	0	**160**	**672**
2017-12-12 07:45:00	24	98	0	**122**	157	88	0	**245**	111	68	0	**179**	**546**
2017-12-12 08:00:00	5	110	0	**115**	107	23	0	**130**	63	22	0	**85**	**330**
Grand Total	112	395	0	**507**	608	431	0	**1039**	346	167	0	**513**	**2059**
% Approach	22.1%	77.9%	0.0%		58.5%	41.5%	0.0%		67.4%	32.6%	0.0%		
% Total	5.4%	19.2%	0.0%	**24.6%**	29.5%	20.9%	0.0%	**50.5%**	16.8%	8.1%	0.0%	**24.9%**	
PHF (7:15AM - 8:15AM)	0.528	0.898	0	**0.839**	0.792	0.638	0	**0.72**	0.779	0.614	0	**0.716**	**0.766**
Lights	107	385	0	**492**	602	424	0	**1026**	339	163	0	**502**	**2020**
% Lights	95.5%	97.5%	0.0%	**97.0%**	99.0%	98.4%	0.0%	**98.7%**	98.0%	97.6%	0.0%	**97.9%**	**98.1%**
Articulated Trucks	2	3	0	**5**	0	1	0	**1**	0	0	0	**0**	**6**
% Articulated Trucks	1.8%	0.8%	0.0%	**1.0%**	0.0%	0.2%	0.0%	**0.1%**	0.0%	0.0%	0.0%	**0.0%**	**0.3%**
Buses and Single-Unit Trucks	3	7	0	**10**	6	6	0	**12**	7	4	0	**11**	**33**
% Buses and Single-Unit Trucks	2.7%	1.8%	0.0%	**2.0%**	1.0%	1.4%	0.0%	**1.2%**	2.0%	2.4%	0.0%	**2.1%**	**1.6%**

SLR/CORRAL FOLLOW-UP

Leg	Old State Hwy 40				Old State Hwy 40				Corral Dr				
Direction	Southbound				Northbound				Eastbound				
Start Time	Right	Thru	U-Turn	**App Total**	Thru	Left	U-Turn	**App Total**	Right	Left	U-Turn	**App Total**	**Int Total**
2017-12-12 16:30:00	17	158	0	**175**	153	73	0	**226**	54	16	0	**70**	**471**
2017-12-12 16:45:00	27	164	0	**191**	162	81	0	**243**	49	11	0	**60**	**494**
2017-12-12 17:00:00	28	161	0	**189**	160	73	0	**233**	45	17	0	**62**	**484**
2017-12-12 17:15:00	12	76	0	**88**	175	99	0	**274**	42	27	0	**69**	**431**
Grand Total	84	559	0	**643**	650	326	0	**976**	190	71	0	**261**	**1880**
% Approach	13.1%	86.9%	0.0%		66.6%	33.4%	0.0%		72.8%	27.2%	0.0%		
% Total	4.5%	29.7%	0.0%	**34.2%**	34.6%	17.3%	0.0%	**51.9%**	10.1%	3.8%	0.0%	**13.9%**	
PHF (4:30PM - 5:30PM)	0.75	0.852	0	**0.842**	0.929	0.823	0	**0.891**	0.88	0.657	0	**0.932**	**0.951**
Lights	84	555	0	**639**	646	326	0	**972**	188	70	0	**258**	**1869**
% Lights	100.0%	99.3%	0.0%	**99.4%**	99.4%	100.0%	0.0%	**99.6%**	98.9%	98.6%	0.0%	**98.9%**	**99.4%**
Articulated Trucks	0	1	0	**1**	1	0	0	**1**	0	0	0	**0**	**2**
% Articulated Trucks	0.0%	0.2%	0.0%	**0.2%**	0.2%	0.0%	0.0%	**0.1%**	0.0%	0.0%	0.0%	**0.0%**	**0.1%**
Buses and Single-Unit Trucks	0	3	0	**3**	3	0	0	**3**	2	1	0	**3**	**9**
% Buses and Single-Unit Trucks	0.0%	0.5%	0.0%	**0.5%**	0.5%	0.0%	0.0%	**0.3%**	1.1%	1.4%	0.0%	**1.1%**	**0.5%**

SLR/CATRON FOLLOW-UP

Leg	Old State Hwy 40					Catron Blvd					Old State Hwy 40					Wildwood Dr					
Direction	Southbound					Westbound					Northbound					Eastbound					
Start Time	Right	Thru	Left	U-Turn	**App Total**	Right	Thru	Left	U-Turn	**App Total**	Right	Thru	Left	U-Turn	**App Total**	Right	Thru	Left	U-Turn	**App Total**	**Int Total**
2017-12-12 07:15:00	5	15	133	0	**153**	139	1	9	0	**149**	61	182	0	0	**243**	0	7	11	0	**18**	**563**
2017-12-12 07:30:00	17	26	132	0	**175**	146	0	12	0	**158**	73	160	0	0	**233**	0	23	20	0	**43**	**609**
2017-12-12 07:45:00	10	40	151	0	**201**	99	0	20	0	**119**	70	121	0	0	**191**	0	19	4	0	**23**	**534**
2017-12-12 08:00:00	2	32	129	0	**163**	79	0	20	0	**99**	54	56	0	0	**110**	0	3	0	0	**3**	**375**
Grand Total	34	113	545	0	**692**	463	1	61	0	**525**	258	519	0	0	**777**	0	52	35	0	**87**	**2081**
% Approach	4.9%	16.3%	78.8%	0.0%		88.2%	0.2%	11.6%	0.0%		33.2%	66.8%	0.0%	0.0%		0.0%	59.8%	40.2%	0.0%		
% Total	1.6%	5.4%	26.2%	0.0%	**33.3%**	22.2%	0.0%	2.9%	0.0%	**25.2%**	12.4%	24.9%	0.0%	0.0%	**37.3%**	0.0%	2.5%	1.7%	0.0%	**4.2%**	
PHF (7:15AM - 8:15AM)	0.5	0.706	0.902	0	**0.861**	0.793	0.25	0.763	0	**0.831**	0.884	0.713	0	0	**0.799**	0	0.565	0.438	0	**0.506**	**0.854**
Lights	34	112	529	0	**675**	458	1	61	0	**520**	258	511	0	0	**769**	0	52	34	0	**86**	**2050**
% Lights	100.0%	99.1%	97.1%	0.0%	**97.5%**	98.9%	100.0%	100.0%	0.0%	**99.0%**	100.0%	98.5%	0.0%	0.0%	**99.0%**	0.0%	100.0%	97.1%	0.0%	**98.9%**	**98.5%**
Articulated Trucks	0	1	1	0	**2**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	**2**
% Articulated Trucks	0.0%	0.9%	0.2%	0.0%	**0.3%**	0.0%	0.0%	0.0%	0.0%	**0.0%**	0.0%	0.0%	0.0%	0.0%	**0.0%**	0.0%	0.0%	0.0%	0.0%	**0.0%**	**0.1%**
Buses and Single-Unit Trucks	0	0	15	0	**15**	5	0	0	0	**5**	0	8	0	0	**8**	0	0	1	0	**1**	**29**
% Buses and Single-Unit Trucks	0.0%	0.0%	2.8%	0.0%	**2.2%**	1.1%	0.0%	0.0%	0.0%	**1.0%**	0.0%	1.5%	0.0%	0.0%	**1.0%**	0.0%	0.0%	2.9%	0.0%	**1.1%**	**1.4%**

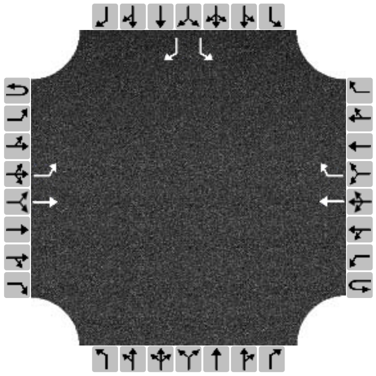
SLR/CATRON FOLLOW-UP

Leg	Old State Hwy 40					Catron Blvd					Old State Hwy 40					Wildwood Dr					
Direction	Southbound					Westbound					Northbound					Eastbound					
Start Time	Right	Thru	Left	U-Turn	**App Total**	Right	Thru	Left	U-Turn	**App Total**	Right	Thru	Left	U-Turn	**App Total**	Right	Thru	Left	U-Turn	**App Total**	**Int Total**
2017-12-12 16:30:00	1	95	93	0	**189**	167	2	54	0	**223**	29	50	0	0	**79**	0	0	1	0	**1**	**492**
2017-12-12 16:45:00	4	87	103	0	**194**	167	3	71	0	**241**	22	54	1	0	**77**	0	3	5	0	**8**	**520**
2017-12-12 17:00:00	2	99	90	0	**191**	173	8	76	0	**257**	18	47	0	0	**65**	0	1	3	0	**4**	**517**
2017-12-12 17:15:00	4	52	65	0	**121**	168	4	79	0	**251**	36	45	1	0	**82**	0	4	4	0	**8**	**462**
Grand Total	11	333	351	0	**695**	675	17	280	0	**972**	105	196	2	0	**303**	0	8	13	0	**21**	**1991**
% Approach	1.6%	47.9%	50.5%	0.0%		69.4%	1.7%	28.8%	0.0%		34.7%	64.7%	0.7%	0.0%		0.0%	38.1%	61.9%	0.0%		
% Total	0.6%	16.7%	17.6%	0.0%	**34.9%**	33.9%	0.9%	14.1%	0.0%	**48.8%**	5.3%	9.8%	0.1%	0.0%	**15.2%**	0.0%	0.4%	0.7%	0.0%	**1.1%**	
PHF (4:30PM - 5:30PM)	0.688	0.841	0.852	0	**0.896**	0.975	0.531	0.886	0	**0.946**	0.729	0.907	0.5	0	**0.924**	0	0.5	0.65	0	**0.656**	**0.957**
Lights	11	332	345	0	**688**	672	17	279	0	**968**	103	194	2	0	**299**	0	7	13	0	**20**	**1975**
% Lights	100.0%	99.7%	98.3%	0.0%	**99.0%**	99.6%	100.0%	99.6%	0.0%	**99.6%**	98.1%	99.0%	100.0%	0.0%	**98.7%**	0.0%	87.5%	100.0%	0.0%	**95.2%**	**99.2%**
Articulated Trucks	0	0	1	0	**1**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	**1**
% Articulated Trucks	0.0%	0.0%	0.3%	0.0%	**0.1%**	0.0%	0.0%	0.0%	0.0%	**0.0%**	0.0%	0.0%	0.0%	0.0%	**0.0%**	0.0%	0.0%	0.0%	0.0%	**0.0%**	**0.1%**
Buses and Single-Unit Trucks	0	1	5	0	**6**	3	0	1	0	**4**	2	2	0	0	**4**	0	1	0	0	**1**	**15**
% Buses and Single-Unit Trucks	0.0%	0.3%	1.4%	0.0%	**0.9%**	0.4%	0.0%	0.4%	0.0%	**0.4%**	1.9%	1.0%	0.0%	0.0%	**1.3%**	0.0%	12.5%	0.0%	0.0%	**4.8%**	**0.8%**

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	CORRAL/PARK
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/12/2018	East/West Street	CORRAL DRIVE
Analysis Year	2017	North/South Street	PARK DRIVE
Time Analyzed	AM EXISTING	Peak Hour Factor	0.68
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume, V (veh/h)		20	90				85	455						420		20
Percent Heavy Vehicles (%)		1												1		1
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized	No				Yes				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

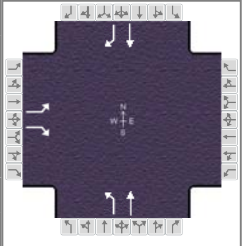
Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.11												6.41		6.21
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.21												3.51		3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		29												618		29
Capacity, c (veh/h)		1467												665		928
v/c Ratio		0.02												0.93		0.03
95% Queue Length, Q_{95} (veh)		0.1												12.5		0.1
Control Delay (s/veh)		7.5												44.5		9.0
Level of Service, LOS		A												E		A
Approach Delay (s/veh)	1.4												42.9			
Approach LOS													E			

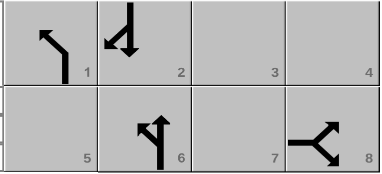
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Sep 27, 2017	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM EXISTING	PHF	0.77
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2017	Analysis Period	1> 7:00
Intersection	CORRAL DRIVE	File Name	SLR-CORRAL.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	165		345				430	610			395	110

Signal Information										
Cycle, s	91.0	Reference Phase	2							
Offset, s	0	Reference Point	End	Green	29.0	25.0	20.0	0.0	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.5	1.5	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8			1	6		2
Case Number		9.0			1.0	4.0		7.3
Phase Duration, s		26.0			34.5	65.0		30.5
Change Period, (*Y+R* $_c$), s		6.0			5.5	5.5		5.5
Max Allow Headway (*MAH*), s		4.3			5.1	4.0		4.0
Queue Clearance Time (*g* $_s$), s		22.0			26.0	27.1		27.0
Green Extension Time (*g* $_e$), s		0.0			3.0	0.0		0.0
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		1.00			0.13	1.00		1.00

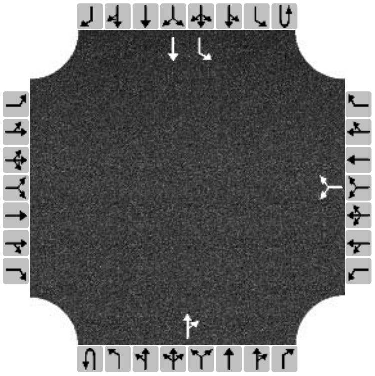
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3		18				1	6			2	12
Adjusted Flow Rate (*v*), veh/h	214		448				558	792			513	78
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688		1502				1701	1786			1758	1490
Queue Service Time (*g* $_s$), s	10.3		20.0				24.0	25.1			25.0	3.6
Cycle Queue Clearance Time (*g* $_c$), s	10.3		20.0				24.0	25.1			25.0	3.6
Green Ratio (*g/C*)	0.22		0.22				0.62	0.65			0.27	0.27
Capacity (*c*), veh/h	371		330				621	1167			483	409
Volume-to-Capacity Ratio (*X*)	0.578		1.357				0.900	0.679			1.062	0.190
Back of Queue (*Q*), ft/ln (95 th percentile)	193.6		919.2				462	326.8			656.5	57.9
Back of Queue (*Q*), veh/ln (95 th percentile)	7.6		36.2				18.3	13.0			25.6	2.3
Queue Storage Ratio (*RQ*) (95 th percentile)	1.94		0.00				4.62	0.00			0.00	0.48
Uniform Delay (*d* $_1$), s/veh	31.7		35.5				22.6	9.8			33.0	25.2
Incremental Delay (*d* $_2$), s/veh	2.2		179.3				11.4	1.6			58.3	0.2
Initial Queue Delay (*d* $_3$), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	33.9		214.7				34.1	11.4			91.3	25.5
Level of Service (LOS)	C		F				C	B			F	C
Approach Delay, s/veh / LOS	156.2	F		0.0			20.8	C		82.6	F	
Intersection Delay, s/veh / LOS	69.3						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.96	B	2.03	B	0.67	A	1.92	B
Bicycle LOS Score / LOS		F			2.72	C	1.46	A

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN LAKE/SUMMERSET
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/12/2018	East/West Street	SUMMERSET DRIVE
Analysis Year	2017	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	AM EXISTING	Peak Hour Factor	0.81
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume, V (veh/h)						0		15			1025	5		10	730	
Percent Heavy Vehicles (%)						0		0						3		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.23		

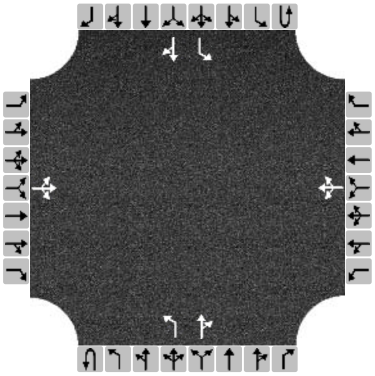
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							19							12		
Capacity, c (veh/h)							208							542		
v/c Ratio							0.09							0.02		
95% Queue Length, Q_{95} (veh)							0.3							0.1		
Control Delay (s/veh)							24.0							11.8		
Level of Service, LOS							C							B		
Approach Delay (s/veh)					24.0								0.2			
Approach LOS					C											

HCS7 Two-Way Stop-Control Report

General Information		**Site Information**	
Analyst	RL	Intersection	SHERIDAN LAKE/CHATEAUX
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/12/2018	East/West Street	CHATEAUX RIDGE
Analysis Year	2017	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	AM EXISTING	Peak Hour Factor	0.81
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	0
Configuration			LTR				LTR			L		TR		L		TR
Volume, V (veh/h)		5	0	5		0	0	10		0	1015	5		30	690	10
Percent Heavy Vehicles (%)		0	0	0		0	0	0		1				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

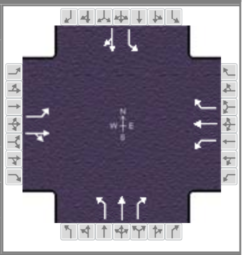
Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.10	6.50	6.20		7.10	6.50	6.20		4.11				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.00	3.30		2.21				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			12				12			0				37		
Capacity, c (veh/h)			54				211			783				549		
v/c Ratio			0.23				0.06			0.00				0.07		
95% Queue Length, Q_{95} (veh)			0.8				0.2			0.0				0.2		
Control Delay (s/veh)			89.8				23.1			9.6				12.0		
Level of Service, LOS			F				C			A				B		
Approach Delay (s/veh)	89.8				23.1				0.0				0.5			
Approach LOS	F				C											

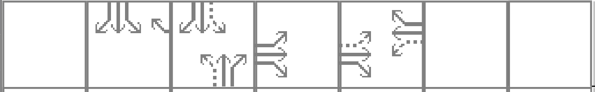
HCS7 Signalized Intersection Results Summary

General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Sep 27, 2017	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM EXISTING	PHF	0.85
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2017	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	SLR-CATRON.xus		
Project Description	SLR CORRIDOR STUDY				

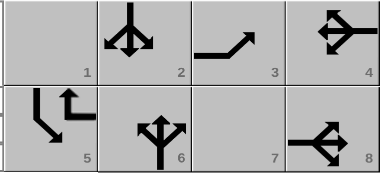


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	35	50	0	60	0	465	0	520	260	545	115	35

Signal Information			
Cycle, s	159.4	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	45.0	64.0	4.4	24.0	0.0	0.0
Yellow	3.0	5.0	3.0	4.0	0.0	0.0
Red	2.0	2.0	1.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8		4		6	5	2
Case Number	1.0	4.0		5.3		5.3	1.0	4.0
Phase Duration, s	8.4	38.4		30.0		71.0	50.0	121.0
Change Period, (*Y+R* $_c$), s	4.0	6.0		6.0		7.0	5.0	7.0
Max Allow Headway (*MAH*), s	4.1	5.3		5.3		5.1	5.1	5.1
Queue Clearance Time (g_s), s	5.2	6.4		26.0		52.3	47.0	6.9
Green Extension Time (g_e), s	0.0	2.8		0.0		4.6	0.0	7.2
Phase Call Probability	0.84	1.00		1.00		1.00	1.00	1.00
Max Out Probability	1.00	0.00		1.00		0.44	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	41	0		71	0	324	0	612	194	641	165	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	0		1355	1786	1514	1221	1772	1502	1674	1703	
Queue Service Time (g_s), s	3.2	0.0		7.4	0.0	24.0	0.0	50.3	14.2	45.0	4.9	
Cycle Queue Clearance Time (g_c), s	3.2	0.0		7.4	0.0	24.0	0.0	50.3	14.2	45.0	4.9	
Green Ratio (*g/C*)	0.19			0.15	0.15	0.43	0.40	0.40	0.40	0.70	0.72	
Capacity (*c*), veh/h	305			249	269	655	45	711	603	587	1218	
Volume-to-Capacity Ratio (*X*)	0.135	0.000		0.283	0.000	0.494	0.000	0.860	0.322	1.093	0.135	
Back of Queue (*Q*), ft/ln (95 th percentile)	63.4	0		118.6	0	354.3	0	819	233.8	1166.7	81.4	
Back of Queue (*Q*), veh/ln (95 th percentile)	2.5	0.0		4.7	0.0	14.1	0.0	32.2	9.2	45.6	3.2	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.38	0.00		0.99	0.00	1.57	0.00	0.00	1.00	9.33	0.00	
Uniform Delay (d_1), s/veh	53.5			60.7	0.0	32.6	0.0	43.6	32.8	42.6	7.2	
Incremental Delay (d_2), s/veh	0.2	0.0		0.9	0.0	0.8	0.0	12.9	1.4	64.9	0.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	53.7			61.5	0.0	33.4	0.0	56.5	34.2	107.5	7.4	
Level of Service (LOS)	D			E		C		E	C	F	A	
Approach Delay, s/veh / LOS	53.1		D	38.5		D	51.1		D	87.0		F
Intersection Delay, s/veh / LOS	62.6						E					

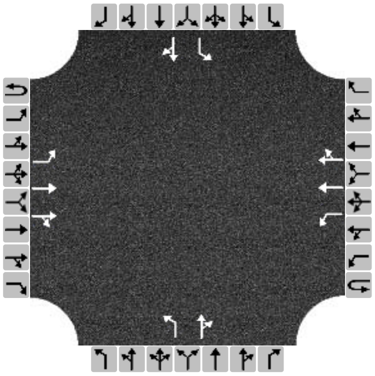
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	1.97	B	2.39	B	1.87	B
Bicycle LOS Score / LOS	0.65	A	1.14	A	1.82	B	1.82	B

HCS7 Two-Way Stop-Control Report

General Information / Site Information

General Information		Site Information	
Analyst	RL	Intersection	CATRON/BENDT
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/12/2018	East/West Street	CATRON BOULEVARD
Analysis Year	2017	North/South Street	BENDT DRIVE
Time Analyzed	AM EXISTING	Peak Hour Factor	0.89
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		1	1	0		1	1	0
Configuration		L	T	TR		L	T	TR		L		TR		L		TR
Volume, V (veh/h)		5	815	35		20	470	5		25	0	25		30	0	30
Percent Heavy Vehicles (%)		2				1				0	0	0		2	2	2
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.14				4.12				7.50	6.50	6.90		7.54	6.54	6.94
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.21				3.50	4.00	3.30		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		6				22				28		28		34		34
Capacity, c (veh/h)		1030				722				121		539		169		731
v/c Ratio		0.01				0.03				0.23		0.05		0.20		0.05
95% Queue Length, Q_{95} (veh)		0.0				0.1				0.8		0.2		0.7		0.1
Control Delay (s/veh)		8.5				10.1				43.6		12.0		31.6		10.2
Level of Service, LOS		A				B				E		B		D		B
Approach Delay (s/veh)	0.0				0.4				27.8				20.9			
Approach LOS									D				C			

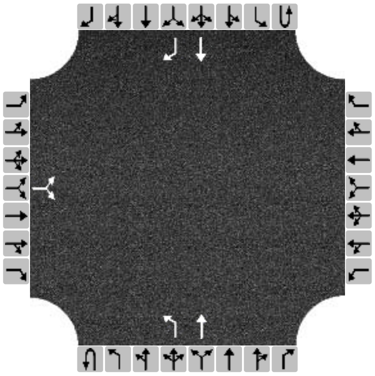
HCS7 Two-Way Stop-Control Report

General Information

Site Information

Analyst	RL	Intersection	SHERIDAN/WILDWOOD
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/12/2018	East/West Street	WILDWOOD DRIVE
Analysis Year	2017	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	AM EXISTING	Peak Hour Factor	0.80
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	1
Configuration			LR							L	T				T	R
Volume, V (veh/h)		10		0						5	770				170	5
Percent Heavy Vehicles (%)		0		0						1						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

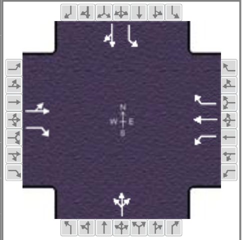
Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.11						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.21						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			13							6						
Capacity, c (veh/h)			209							1356						
v/c Ratio			0.06							0.00						
95% Queue Length, Q_{95} (veh)			0.2							0.0						
Control Delay (s/veh)			23.3							7.7						
Level of Service, LOS			C							A						
Approach Delay (s/veh)	23.3								0.0							
Approach LOS	C															

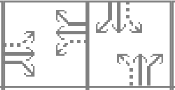
HCS7 Signalized Intersection Results Summary

General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Sep 27, 2017	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM EXISTING	PHF	0.83
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2017	Analysis Period	1> 7:00
Intersection	DUNSMORE ROAD	File Name	SLR-DUNSMORE.xus		
Project Description	SLR CORRIDOR STUDY				

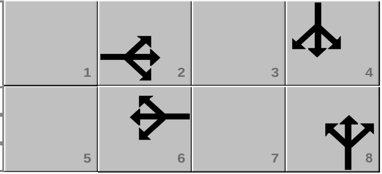


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	5	525	105	30	100	40	20	15	60	190	60	5

Signal Information			
Cycle, s	82.7	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	47.0	19.7	0.0	0.0	0.0	0.0
Yellow	5.0	3.0	0.0	0.0	0.0	0.0
Red	4.0	4.0	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		7.0		5.0		8.0		6.0
Phase Duration, s		56.0		56.0		26.7		26.7
Change Period, (*Y+R* $_c$), s		9.0		9.0		7.0		7.0
Max Allow Headway (*MAH*), s		4.0		4.0		4.3		4.3
Queue Clearance Time (g_s), s		21.9		24.6		5.4		19.2
Green Extension Time (g_e), s		3.5		3.4		1.4		0.6
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.01		0.02		0.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h		639	78	36	120	24		84		229	78	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1784	1514	782	1744	1478		1549		1332	1734	
Queue Service Time (g_s), s		0.0	2.0	2.7	2.7	0.6		0.0		13.8	3.0	
Cycle Queue Clearance Time (g_c), s		19.9	2.0	22.6	2.7	0.6		3.4		17.2	3.0	
Green Ratio (*g/C*)		0.57	0.57	0.57	0.57	0.57		0.24		0.24	0.24	
Capacity (*c*), veh/h		1057	859	343	990	839		426		351	414	
Volume-to-Capacity Ratio (*X*)		0.604	0.091	0.105	0.122	0.029		0.198		0.653	0.189	
Back of Queue (*Q*), ft/ln (95 th percentile)		280.9	25.3	23.2	40	7.6		58.7		209.7	57.2	
Back of Queue (*Q*), veh/ln (95 th percentile)		11.1	1.0	0.9	1.6	0.3		2.3		8.2	2.2	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.51	0.31	0.00	0.04		0.00		1.82	0.00	
Uniform Delay (d_1), s/veh		12.0	8.1	19.6	8.3	7.9		25.3		32.1	25.1	
Incremental Delay (d_2), s/veh		2.6	0.2	0.6	0.3	0.1		0.2		3.1	0.2	
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh		14.6	8.4	20.3	8.6	7.9		25.5		35.2	25.3	
Level of Service (LOS)		B	A	C	A	A		C		D	C	
Approach Delay, s/veh / LOS	13.9		B	10.8		B	25.5		C	32.7		C
Intersection Delay, s/veh / LOS	18.7						B					

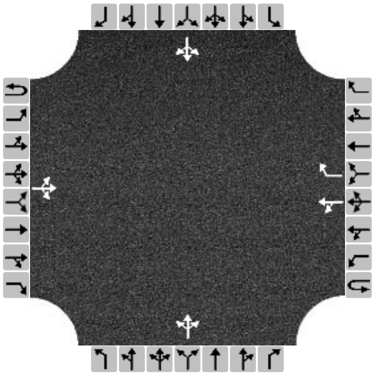
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.69	B	1.88	B	2.14	B	1.98	B
Bicycle LOS Score / LOS	1.67	B	0.79	A	0.63	A	0.99	A

HCS7 Two-Way Stop-Control Report

General Information / Site Information

General Information		**Site Information**	
Analyst	RL	Intersection	SHERIDAN/TANAGER/CROYLE
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/12/2018	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2017	North/South Street	TANAGER DRIVE
Time Analyzed	AM EXISTING	Peak Hour Factor	0.83
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	1		0	1	0		0	1	0
Configuration			LTR			LT		R			LTR				LTR	
Volume, V (veh/h)		0	520	0		10	105	10		0	0	20		95	0	0
Percent Heavy Vehicles (%)		1				5				8	8	8		2	2	2
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.11				4.15				7.18	6.58	6.28		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.21				2.24				3.57	4.07	3.37		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

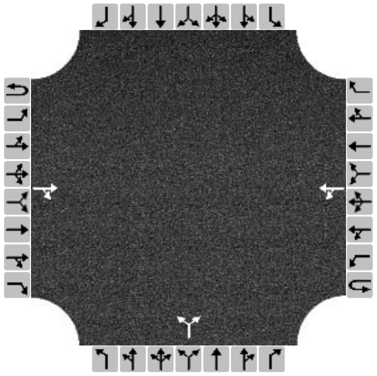
Flow Rate, v (veh/h)		0				12					24				114	
Capacity, c (veh/h)		1450				942					473				289	
v/c Ratio		0.00				0.01					0.05				0.40	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.2				1.8	
Control Delay (s/veh)		7.5				8.9					13.0				25.3	
Level of Service, LOS		A				A					B				D	
Approach Delay (s/veh)	0.0				0.8				13.0				25.3			
Approach LOS									B				D			

HCS7 Two-Way Stop-Control Report

General Information / Site Information

Analyst	RL	Intersection	SHERIDAN/ALBERTTA
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/12/2018	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2017	North/South Street	ALBERTTA DRIVE
Time Analyzed	AM EXISTING	Peak Hour Factor	0.83
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			470	5		15	90			0		50				
Percent Heavy Vehicles (%)						4				3		3				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.14				7.13		6.23				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.24				3.53		3.33				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						18					60					
Capacity, c (veh/h)						990					519					
v/c Ratio						0.02					0.12					
95% Queue Length, Q_{95} (veh)						0.1					0.4					
Control Delay (s/veh)						8.7					12.8					
Level of Service, LOS						A					B					
Approach Delay (s/veh)					1.4				12.8							
Approach LOS									B							

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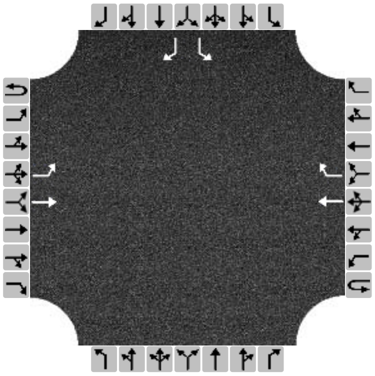
HCS7 Two-Way Stop-Control Report

General Information

Site Information

Analyst	RL	Intersection	CORRAL/PARK
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/12/2018	East/West Street	CORRAL DRIVE
Analysis Year	2017	North/South Street	PARK DRIVE
Time Analyzed	PM EXISTING	Peak Hour Factor	0.91
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume, V (veh/h)		10	40				110	300						220		25
Percent Heavy Vehicles (%)		2												1		1
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized	No				Yes				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

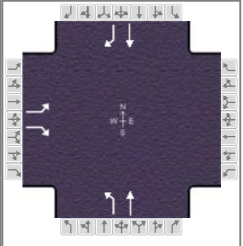
Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.12												6.41		6.21
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.22												3.51		3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		11												242		27
Capacity, c (veh/h)		1465												798		933
v/c Ratio		0.01												0.30		0.03
95% Queue Length, Q_{95} (veh)		0.0												1.3		0.1
Control Delay (s/veh)		7.5												11.5		9.0
Level of Service, LOS		A												B		A
Approach Delay (s/veh)	1.5												11.2			
Approach LOS													B			

HCS7 Signalized Intersection Results Summary

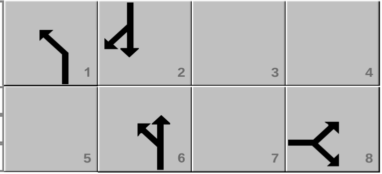
General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Sep 28, 2017	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM EXISTING	PHF	0.95
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2017	Analysis Period	1> 7:00
Intersection	CORRAL DRIVE	File Name	SLR-CORRAL.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	70		190				325	650			560	85

Signal Information			
Cycle, s	60.7	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	9.9	23.4	10.4	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.5	1.5	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8			1	6		2
Case Number		9.0			1.0	4.0		7.3
Phase Duration, s		16.4			15.4	44.3		28.9
Change Period, (*Y+R* $_c$), s		6.0			5.5	5.5		5.5
Max Allow Headway (*MAH*), s		4.3			5.1	4.0		4.0
Queue Clearance Time (g_s), s		9.7			8.4	15.6		20.8
Green Extension Time (g_e), s		0.7			1.5	3.8		2.5
Phase Call Probability		0.99			1.00	1.00		1.00
Max Out Probability		0.03			0.09	0.48		0.13

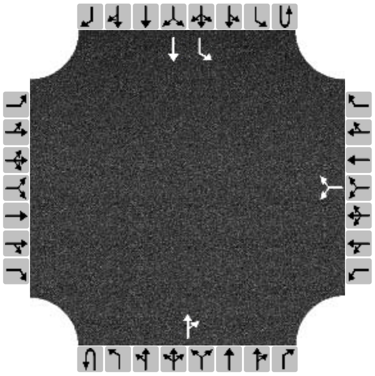
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3		18				1	6			2	12
Adjusted Flow Rate (*v*), veh/h	74		200				342	684			589	47
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688		1502				1701	1786			1758	1490
Queue Service Time (g_s), s	2.3		7.7				6.4	13.6			18.8	1.2
Cycle Queue Clearance Time (g_c), s	2.3		7.7				6.4	13.6			18.8	1.2
Green Ratio (*g/C*)	0.17		0.17				0.58	0.64			0.39	0.39
Capacity (*c*), veh/h	290		258				459	1142			679	576
Volume-to-Capacity Ratio (*X*)	0.254		0.776				0.746	0.599			0.868	0.082
Back of Queue (*Q*), ft/ln (95 th percentile)	39.1		128.3				91.4	151.3			288.7	16.3
Back of Queue (*Q*), veh/ln (95 th percentile)	1.5		5.1				3.6	6.0			11.3	0.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.39		0.00				0.91	0.00			0.00	0.14
Uniform Delay (d_1), s/veh	21.8		24.1				11.6	6.4			17.2	11.8
Incremental Delay (d_2), s/veh	0.5		5.0				3.4	0.9			3.8	0.1
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	22.3		29.1				15.0	7.3			21.0	11.9
Level of Service (LOS)	C		C				B	A			C	B
Approach Delay, s/veh / LOS	27.2	C		0.0			9.9	A		20.3	C	
Intersection Delay, s/veh / LOS	15.8						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	2.00	B	0.65	A	1.90	B
Bicycle LOS Score / LOS		F			2.18	B	1.54	B

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN LAKE/SUMMERSET
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/12/2018	East/West Street	SUMMERSET DRIVE
Analysis Year	2017	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	PM EXISTING	Peak Hour Factor	0.91
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume, V (veh/h)						0		45			930	5		30	720	
Percent Heavy Vehicles (%)						0		0						1		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.11		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.21		

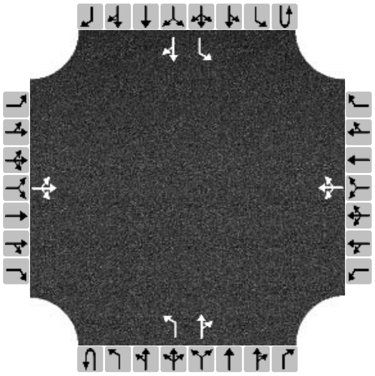
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							49							33		
Capacity, c (veh/h)							288							680		
v/c Ratio							0.17							0.05		
95% Queue Length, Q_{95} (veh)							0.6							0.2		
Control Delay (s/veh)							20.1							10.6		
Level of Service, LOS							C							B		
Approach Delay (s/veh)					20.1								0.4			
Approach LOS					C											

HCS7 Two-Way Stop-Control Report

General Information		**Site Information**	
Analyst	RL	Intersection	SHERIDAN LAKE/CHATEAUX
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/12/2018	East/West Street	CHATEAUX RIDGE
Analysis Year	2017	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	PM EXISTING	Peak Hour Factor	0.89
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	0
Configuration			LTR				LTR			L		TR		L		TR
Volume, V (veh/h)		10	0	0		0	0	50		5	875	5		20	695	5
Percent Heavy Vehicles (%)		0	0	0		0	0	0		1				1		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

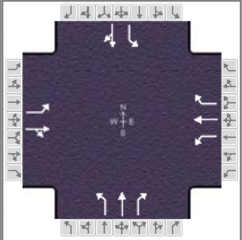
Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.10	6.50	6.20		7.10	6.50	6.20		4.11				4.11		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.00	3.30		2.21				2.21		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			11				56			6				22		
Capacity, c (veh/h)			45				303			837				703		
v/c Ratio			0.25				0.19			0.01				0.03		
95% Queue Length, Q_{95} (veh)			0.8				0.7			0.0				0.1		
Control Delay (s/veh)			108.7				19.5			9.3				10.3		
Level of Service, LOS			F				C			A				B		
Approach Delay (s/veh)	108.7				19.5				0.1				0.3			
Approach LOS	F				C											

HCS7 Signalized Intersection Results Summary

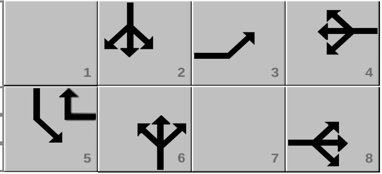
General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Sep 28, 2017	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM EXISTING	PHF	0.96
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2017	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	SLR-CATRON.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	15	10	0	280	15	675	0	195	105	350	335	10

Signal Information			
Cycle, s	83.6	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	15.2	20.8	1.5	24.1	0.0	0.0
Yellow	3.0	5.0	3.0	4.0	0.0	0.0
Red	2.0	2.0	1.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8		4		6	5	2
Case Number	1.0	4.0		5.3		5.3	1.0	4.0
Phase Duration, s	5.5	35.6		30.1		27.8	20.2	48.0
Change Period, (*Y+R* $_c$), s	4.0	6.0		6.0		7.0	5.0	7.0
Max Allow Headway (*MAH*), s	4.1	5.2		5.2		5.0	5.1	5.0
Queue Clearance Time (*g* $_s$), s	2.5	2.3		21.9		10.1	14.7	12.5
Green Extension Time (*g* $_e$), s	0.0	5.6		2.2		2.1	0.5	3.6
Phase Call Probability	0.30	1.00		1.00		1.00	1.00	1.00
Max Out Probability	0.02	0.01		1.00		0.52	1.00	0.00

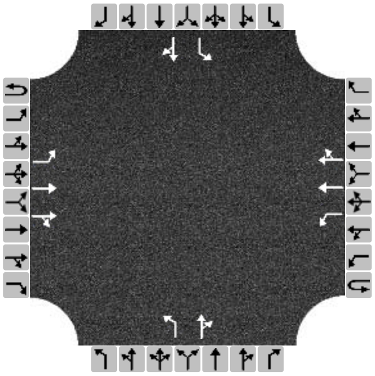
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	16	0		292	16	469	0	203	63	365	0	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	0		1415	1786	1514	1032	1772	1502	1674	1744	
Queue Service Time (*g* $_s$), s	0.5	0.0		15.4	0.5	19.9	0.0	8.1	2.7	12.7	0.0	
Cycle Queue Clearance Time (*g* $_c$), s	0.5	0.0		15.5	0.5	19.9	0.0	8.1	2.7	12.7	0.0	
Green Ratio (*g/C*)	0.33			0.29	0.29	0.47	0.25	0.25	0.25	0.45	0.49	
Capacity (*c*), veh/h	510			494	514	710	86	442	374	568		
Volume-to-Capacity Ratio (*X*)	0.031	0.000		0.591	0.030	0.660	0.000	0.460	0.167	0.642	0.000	
Back of Queue (*Q*), ft/ln (95 th percentile)	8.9	0		222.1	9.7	270.7	0	167	46.6	212.5	0	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.4	0.0		8.8	0.4	10.7	0.0	6.6	1.8	8.3	0.0	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.05	0.00		1.85	0.00	1.20	0.00	0.00	0.20	1.70	0.00	
Uniform Delay (*d* $_1$), s/veh	19.0			26.7	21.4	17.1	0.0	26.6	24.6	16.8		
Incremental Delay (*d* $_2$), s/veh	0.0	0.0		1.9	0.0	2.3	0.0	3.4	1.0	2.5	0.0	
Initial Queue Delay (*d* $_3$), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	19.0			28.6	21.4	19.3	0.0	30.0	25.5	19.3		
Level of Service (LOS)	B			C	C	B		C	C	B		
Approach Delay, s/veh / LOS	18.4	B		22.8	C		29.0	C		17.2	B	
Intersection Delay, s/veh / LOS	21.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.17	B	1.93	B	2.44	B	1.89	B
Bicycle LOS Score / LOS	0.53	A	1.77	B	0.93	A	1.66	B

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	CATRON/BENDT
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/12/2018	East/West Street	CATRON BOULEVARD
Analysis Year	2017	North/South Street	BENDT DRIVE
Time Analyzed	PM EXISTING	Peak Hour Factor	0.86
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		1	1	0		1	1	0
Configuration		L	T	TR		L	T	TR		L		TR		L		TR
Volume, V (veh/h)		5	425	35		20	925	40		35	0	20		10	0	10
Percent Heavy Vehicles (%)		1				1				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.12				4.12				7.50	6.50	6.90		7.50	6.50	6.90
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.21				2.21				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

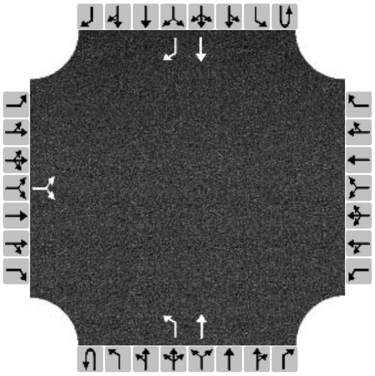
Flow Rate, v (veh/h)		6				23				41		23		12		12
Capacity, c (veh/h)		624				1036				159		737		96		476
v/c Ratio		0.01				0.02				0.26		0.03		0.12		0.02
95% Queue Length, Q_{95} (veh)		0.0				0.1				1.0		0.1		0.4		0.1
Control Delay (s/veh)		10.8				8.6				35.4		10.0		47.8		12.7
Level of Service, LOS		B				A				E		B		E		B
Approach Delay (s/veh)	0.1				0.2				26.2				30.3			
Approach LOS									D				D			

HCS7 Two-Way Stop-Control Report

General Information / Site Information

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN/WILDWOOD
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/12/2018	East/West Street	WILDWOOD DRIVE
Analysis Year	2017	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	PM EXISTING	Peak Hour Factor	0.88
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	1
Configuration			LR							L	T				T	R
Volume, V (veh/h)		5		0						0	295				605	10
Percent Heavy Vehicles (%)		0		0						1						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

	Eastbound				Westbound				Northbound				Southbound			
Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.11						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.21						

Delay, Queue Length, and Level of Service

	Eastbound				Westbound				Northbound				Southbound			
Flow Rate, v (veh/h)			6							0						
Capacity, c (veh/h)			263							902						
v/c Ratio			0.02							0.00						
95% Queue Length, Q_{95} (veh)			0.1							0.0						
Control Delay (s/veh)			19.0							9.0						
Level of Service, LOS			C							A						
Approach Delay (s/veh)	19.0								0.0							
Approach LOS	C															

HCS7™ TWSC Version 7.4
SLR-WILDWOOD.xtw

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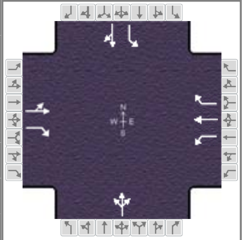
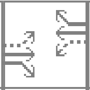
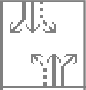
HCS7 Signalized Intersection Results Summary

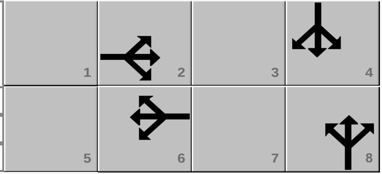
General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Sep 28, 2017	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM EXISTING	PHF	0.86
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2017	Analysis Period	1> 7:00
Intersection	DUNSMORE ROAD	File Name	SLR-DUNSMORE.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	0	190	20	55	415	135	45	20	40	65	5	5

Signal Information			
Cycle, s	74.7	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

						
Green	48.0	10.7	0.0	0.0	0.0	0.0
Yellow	5.0	3.0	0.0	0.0	0.0	0.0
Red	4.0	4.0	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		7.0		5.0		8.0		6.0
Phase Duration, s		57.0		57.0		17.7		17.7
Change Period, (*Y+R* $_c$), s		9.0		9.0		7.0		7.0
Max Allow Headway (*MAH*), s		4.0		4.0		4.2		4.2
Queue Clearance Time (g_s), s		5.8		12.2		6.5		10.5
Green Extension Time (g_e), s		3.2		3.2		0.4		0.3
Phase Call Probability		1.00		1.00		0.98		0.98
Max Out Probability		0.00		0.00		0.01		0.21

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h		0	12	64	483	87		105		76	12	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		0	1514	1142	1744	1478		1558		1341	1613	
Queue Service Time (g_s), s		0.0	0.2	1.8	10.2	1.7		2.5		4.1	0.5	
Cycle Queue Clearance Time (g_c), s		0.0	0.2	5.6	10.2	1.7		4.5		8.5	0.5	
Green Ratio (*g/C*)			0.64	0.64	0.64	0.64		0.14		0.14	0.14	
Capacity (*c*), veh/h			973	772	1121	950		295		209	231	
Volume-to-Capacity Ratio (*X*)		0.000	0.012	0.083	0.431	0.092		0.354		0.362	0.050	
Back of Queue (*Q*), ft/ln (95 th percentile)		0	2.2	16.8	130.2	18		76.4		63.2	8.4	
Back of Queue (*Q*), veh/ln (95 th percentile)		0.0	0.1	0.7	5.0	0.7		3.1		2.5	0.3	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.04	0.22	0.00	0.10		0.00		0.55	0.00	
Uniform Delay (d_1), s/veh			4.8	6.6	6.6	5.1		29.3		33.2	27.6	
Incremental Delay (d_2), s/veh		0.0	0.0	0.2	1.2	0.2		0.7		1.1	0.1	
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh			4.8	6.8	7.8	5.3		30.0		34.3	27.7	
Level of Service (LOS)			A	A	A	A		C		C	C	
Approach Delay, s/veh / LOS	5.8	A		7.4	A		30.0	C		33.4	C	
Intersection Delay, s/veh / LOS	11.4						B					

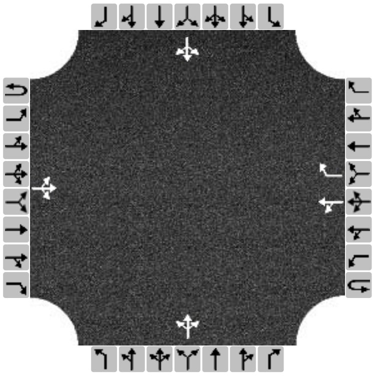
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.66	B	1.86	B	2.21	B	1.94	B
Bicycle LOS Score / LOS	0.87	A	1.53	B	0.66	A	0.63	A

HCS7 Two-Way Stop-Control Report

General Information / Site Information

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN/TANAGER/CROYLE
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/12/2018	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2017	North/South Street	TANAGER DRIVE
Time Analyzed	PM EXISTING	Peak Hour Factor	0.88
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	1		0	1	0		0	1	0
Configuration			LTR			LT		R			LTR				LTR	
Volume, V (veh/h)		0	175	0		15	355	95		0	0	10		25	0	0
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

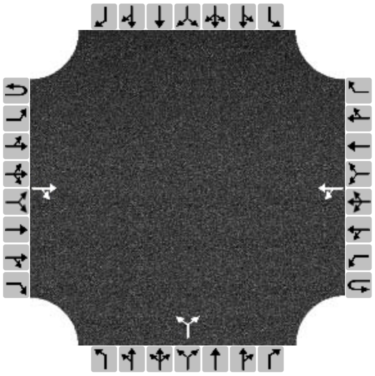
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		0				17					11				28	
Capacity, c (veh/h)		1065				1386					847				380	
v/c Ratio		0.00				0.01					0.01				0.07	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.0				0.2	
Control Delay (s/veh)		8.4				7.6					9.3				15.3	
Level of Service, LOS		A				A					A				C	
Approach Delay (s/veh)	0.0				0.3				9.3				15.3			
Approach LOS									A				C			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN/ALBERTTA
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/12/2018	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2017	North/South Street	ALBERTTA DRIVE
Time Analyzed	PM EXISTING	Peak Hour Factor	0.94
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			155	5		60	295			5		20				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				7.10		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						64					27					
Capacity, c (veh/h)						1420					705					
v/c Ratio						0.04					0.04					
95% Queue Length, Q_{95} (veh)						0.1					0.1					
Control Delay (s/veh)						7.7					10.3					
Level of Service, LOS						A					B					
Approach Delay (s/veh)					1.6				10.3							
Approach LOS									B							

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PHF CALCULATOR

LOCATION: SHERIDAN LAKE ROAD/MUIRFIELD DRIVE
TIME: 7:15 AM - 8:15 AM

TIME		**SB**		**APPROACH**		**WB**		**APPROACH**		**NB**		**APPROACH**		**EB**		**APPROACH**	**PERIOD**
PERIOD	**LEFT**	**THRU**	**RIGHT**	**TOTAL**	**LEFT**	**THRU**	**RIGHT**	**TOTAL**	**LEFT**	**THRU**	**RIGHT**	**TOTAL**	**LEFT**	**THRU**	**RIGHT**	**TOTAL**	**TOTAL**
7:15-7:30	34	0	1	35	1	14	3	18	0	0	0	0	2	148	0	150	203
7:30-7:45	43	0	2	45	0	13	3	16	0	0	0	0	0	132	0	132	193
7:45-8:00	44	0	5	49	0	27	11	38	0	0	0	0	1	85	0	86	173
8:00-8:15	20	0	3	23	0	13	6	19	0	0	0	0	1	49	0	50	92
MOVEMENT TOTAL	141	0	11		1	67	23		0	0	0		4	414	0		
APPROACH TOTAL		152				91				0				418			661
APPROACH PHF		0.78				0.60				#####				0.70	**OVERALL PHF:**		0.81

TRUCK PERCENT EAST/WEST: 0%
TRUCK PERCENT NORTH/SOUTH: 0%

PHF CALCULATOR

LOCATION: SHERIDAN LAKE ROAD/MUIRFIELD DRIVE
TIME: 4:30 PM - 5:30 PM

TIME		**SB**		**APPROACH**		**WB**		**APPROACH**		**NB**		**APPROACH**		**EB**		**APPROACH**	**PERIOD**
PERIOD	**LEFT**	**THRU**	**RIGHT**	**TOTAL**	**LEFT**	**THRU**	**RIGHT**	**TOTAL**	**LEFT**	**THRU**	**RIGHT**	**TOTAL**	**LEFT**	**THRU**	**RIGHT**	**TOTAL**	**TOTAL**
16:30-16:45	8	0	2	10	2	76	11	89	0	0	0	0	0	32	0	32	131
16:45-17:00	4	0	1	5	1	85	20	106	0	0	0	0	0	54	0	54	165
17:00-17:15	4	0	2	6	1	78	22	101	0	0	0	0	1	38	0	39	146
17:15-17:30	13	0	2	15	1	111	24	136	0	0	0	0	1	35	0	36	187
MOVEMENT TOTAL	29	0	7		5	350	77		0	0	0		2	159	0		
APPROACH TOTAL		36				432				0				161			629
APPROACH PHF		0.60				0.79				#####				0.75	**OVERALL PHF:**		0.84

TRUCK PERCENT EAST/WEST: 0%
TRUCK PERCENT NORTH/SOUTH: 0%

APPENDIX

Technical Memo 1 - Existing Traffic Conditions
(Original Submittal)

Technical Memo

Date:	Tuesday, November 28, 2017
Project:	Sheridan Lake Road Corridor Study
To:	Study Advisory Team
From:	Rick Laughlin
Subject:	Existing Conditions Analysis

The City of Rapid City, in cooperation with the Rapid City Metropolitan Planning Organization (MPO), has retained HDR to study a portion of the Sheridan Lake Road corridor in southern Rapid City. The study area, shown in **Figure 1**, includes Sheridan Lake Road from Corral Drive to Albertta Drive and a small portion of Corral Drive. Intersections identified for specific analysis include:

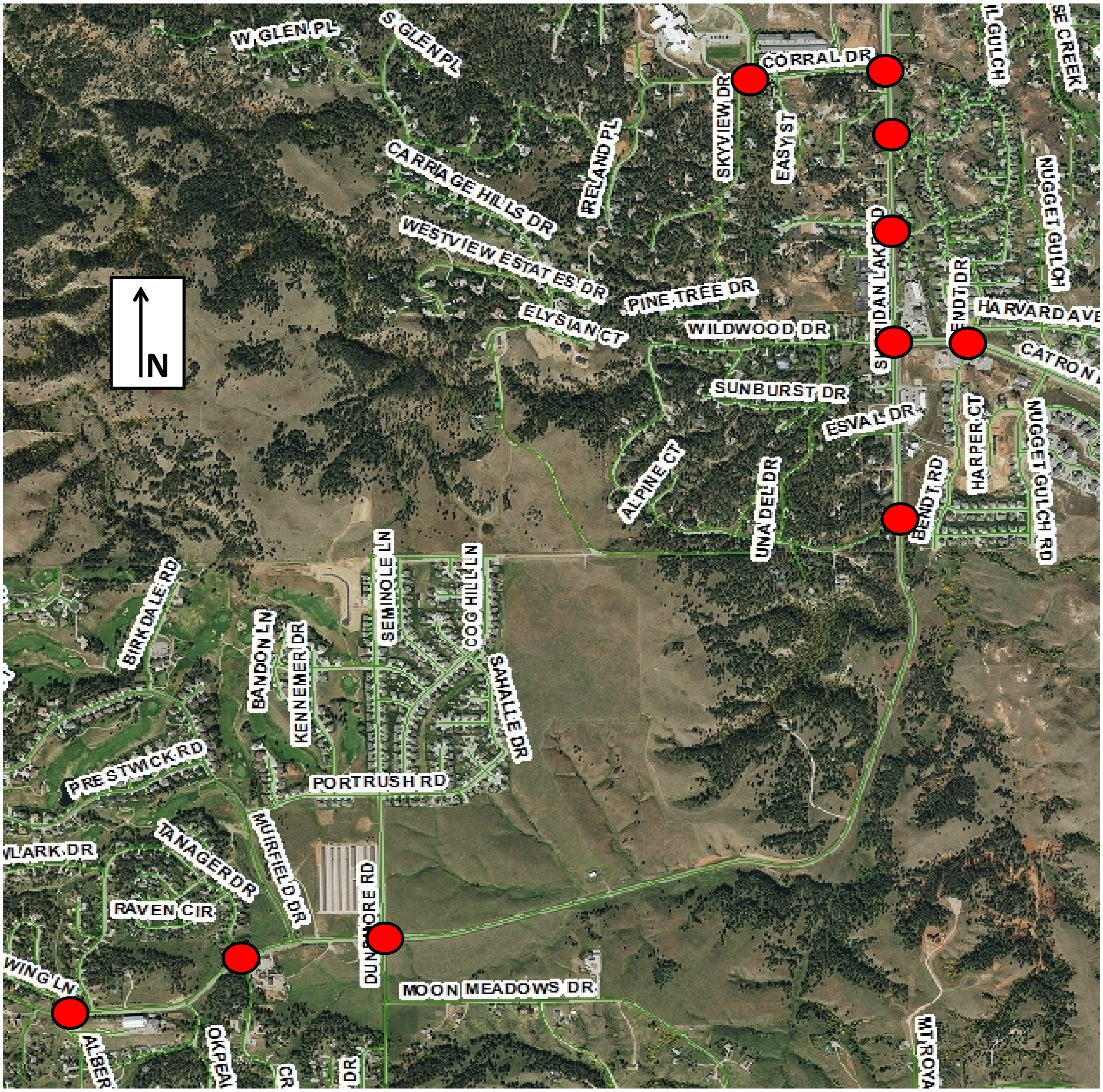
- Corral Drive/Park Drive
- Sheridan Lake Road/Corral Drive
- Sheridan Lake Road/Summerset Drive
- Sheridan Lake Road/Chateaux Ridge/Summerset Drive
- Sheridan Lake Road/Catron Boulevard
- Catron Boulevard/Bendt Drive
- Sheridan Lake Road/Wildwood Drive
- Sheridan Lake Road/Dunsmore Road
- Sheridan Lake Road/Tanager Drive/Croyle Avenue
- Sheridan Lake Road/Albertta Drive

This memo describes the current corridor based on data gathering and analysis conducted by HDR during September and October, 2017.

Geometrics

Lane configurations were determined for the existing study area intersections. The intersections are listed below with the approach lane configurations (T=thru lane, L=left turn lane, R=right turn lane, TL=combined thru/left lane, TR=combined thru/right lane, LTR=combined left/thru/right lane, LR=combined left/right lane, LT=combined left/thru lane):

- Corral Drive/Park Drive
    - SB – L, R
    - WB – T, R
    - EB – L, T



LEGEND

● ANALYSIS INTERSECTION

SHERIDAN LAKE ROAD CORRIDOR STUDY
RAPID CITY, SD

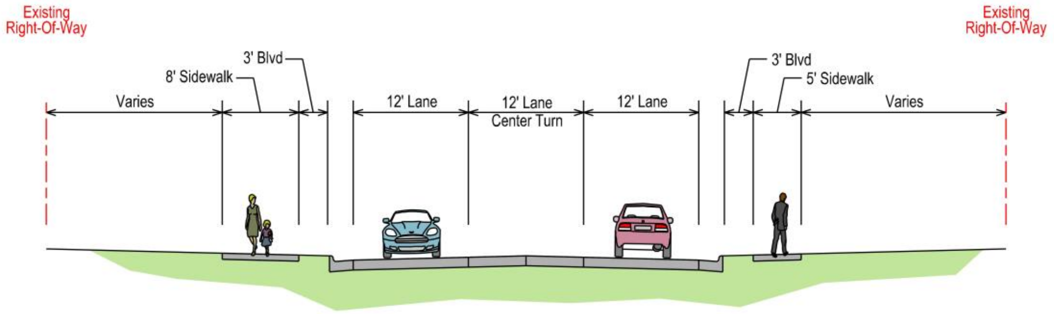
FIGURE 1
STUDY AREA

- Sheridan Lake Road/Corral Drive
    - SB – T, R
    - NB – L,T
    - EB – L, R
- Sheridan Lake Road/Summerset Drive
    - SB – L, T
    - WB – LR
    - NB – TR
- Sheridan Lake Road/Chateaux Ridge/Summerset Drive
    - SB – L, TR
    - WB – LTR
    - NB – L, TR
    - EB - LTR
- Sheridan Lake Road/Catron Boulevard
    - SB – L, TR
    - WB – L, T, R
    - NB – L, T, R
    - EB – L, TR
- Catron Boulevard/Bendt Drive
    - SB – L, TR
    - WB – L, T, TR
    - NB – L, TR
    - EB – L, T, TR
- Sheridan Lake Road/Wildwood Drive
    - SB – T, R
    - NB – L, T
    - EB - LR
- Sheridan Lake Road/Dunsmore Road
    - SB – L, TR
    - WB – L, T, R
    - NB – LTR
    - EB – LT, R
- Sheridan Lake Road/Tanager Drive/Croyle Avenue
    - SB – LTR
    - WB – LT, R
    - NB – LTR
    - EB - LTR
- Sheridan Lake Road/Albertta Drive
    - WB – LT
    - NB – LR
    - EB - TR

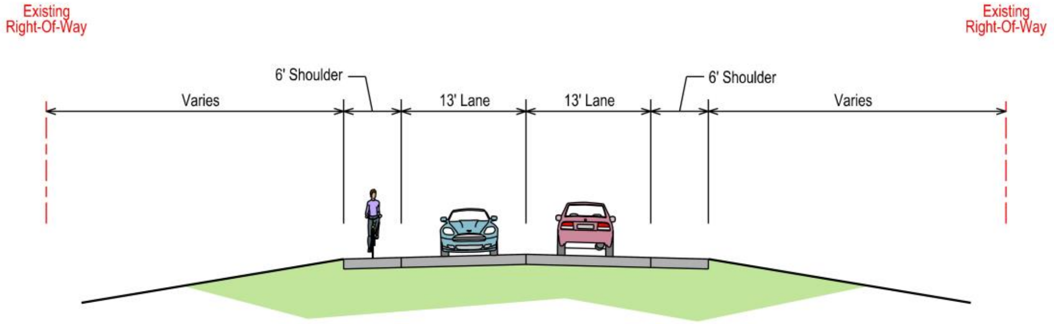
Typical Sections

An urban roadway cross-section exists in the northern portion of the corridor and a rural cross-section exists in the south portion of the corridor, with the transition occurring in the vicinity of the Wildwood Drive intersection. Typical sections for the corridor are shown below.

Figure 2 – Typical Sections



Typical Section: Sheridan Lake Road - Corral Drive to Wildwood Drive
Existing Urban 3-Lane



Typical Section: Sheridan Lake Road - Wildwood Drive to Albertta Drive
Existing Rural 2-Lane

Pavement Conditions

The urban roadway cross-section in the north portion of the corridor is constructed in Portland cement concrete and is in generally good condition. The rural cross-section in the south portion of the corridor is constructed of asphalt concrete and is in generally good condition, although slight rutting has been observed in the wheel tracks.

AADT & Turning Movement Counts

Average Annual Daily Traffic counts were provided by the City of Rapid City for portions of the corridor, as follows:

- Sheridan Lake Road, north of Corral Drive – 11,200 vpd
- Corral Drive, west of Sheridan Lake Road – 4,600 vpd
- Sheridan Lake Road, between Corral Drive and Catron Boulevard – 16,000 vpd
- Catron Boulevard, east of Bendt Drive – 11,700 vpd
- Sheridan Lake Road, between Catron Boulevard and Wildwood Drive – 13,100 vpd
- Sheridan Lake Road, between Wildwood Drive and Dunsmore Road – 12,600 vpd
- Dunsmore Road, south of Sheridan Lake Road – 3,900
- Sheridan Lake Road, west of Dunsmore Road – 11,400 vpd

Peak hour turning movement volumes are shown in **Figure 3**. Full turning movement count files have been provided electronically.

Traffic Operations

The study area intersections were analyzed using Highway Capacity Software (HCS), the new peak hour turning volumes and the existing traffic controls. The resulting level of service (LOS), displayed in **Figure 3**, produced the following findings:

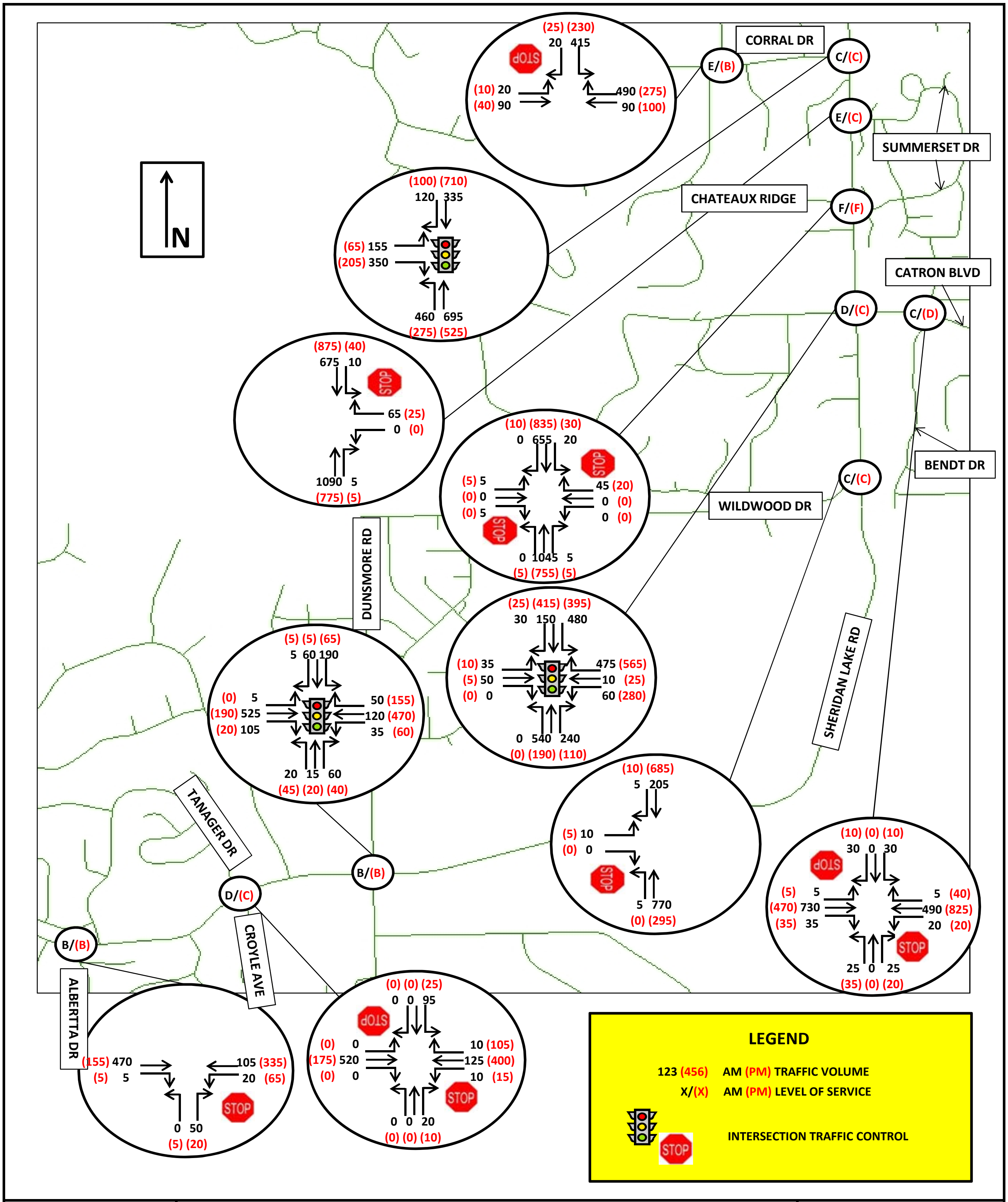
- The signalized intersections (Sheridan Lake Road/Corral Drive, Sheridan Lake Road/Catron Boulevard, Sheridan Lake Road/Dunsmore Road) show acceptable peak hour levels of service, except for Sheridan Lake Road/Catron Boulevard during the AM peak hour. Long queues have also been noted at the signalized intersections, particularly during the AM peak hour.
- Several of the stop sign-controlled side street approaches have a low peak hour level of service. This, however, is fairly common on arterial roadways and is not necessarily a reason for additional lanes or changes in traffic control.

ITS Deployments

No ITS services are currently available in the corridor.

Transit Operations & Stop Locations

Rapid City fixed route transit services are currently not available in the corridor, although a special middle school tripper route serves students at Southwest Middle School adjacent to the corridor. Dial-a-Ride services are, however, available throughout the city.



SHERIDAN LAKE ROAD CORRIDOR STUDY
RAPID CITY, SD

FIGURE 3
EXISTING VOLUME & LEVEL OF SERVICE

Bicycle and Pedestrian Accommodations

The urban street portion of the corridor currently has an 8’ multi-use off-street path on the west side of the roadway and regular sidewalk on the east side of the roadway. The rural roadway portion of the corridor has wide shoulders which may be used by bicyclists and pedestrians. The Bicycle Fiscally Restrained Plan in the current RapidTRIP 2040 Plan include these existing facilities in their current roles, enhanced with signing and marking.

Lighting

Street lighting exists on the urban street portion of the corridor, in compliance with the Rapid City Design Criteria. The rural roadway portion of the corridor has lighting only at the Dunsmore Road intersection.

Conformance with the current land development code (LDC)

Much of the corridor exists at the edge of the urbanized area where older rural residential developments are being infilled with new urban residential neighborhoods and neighborhood commercial uses. The rural residential developments frequently don’t satisfy current development standards, but are grandfathered and must be accommodated as the city continues to grow.

Right of Way

The right-of-way for Sheridan Lake Road is variable throughout the study area. The urban section varies from about 80’ to over 100’, while the rural section varies from 66’ to 100’.

Encroachments

No existing right-of-way encroachments were observed.

Existing Utilities

The following is a summary of known City and Public Utilities within the Study Corridor. Additional information will be developed as part of the study.

Sanitary Sewer

Corral Drive:

- 8” main along south side of road (EB) between Winestone Lane and Park Drive
- 8” to 10” main in boulevard along north side of road between Park Drive and Sheridan Lake Road

Sheridan Lake Road:

- 15” main in boulevard along east side of road from Corral Drive to 150’ south of Summerset Drive

- 15” main along west side of road (SB) from 150’ south of Summerset Drive to Wildwood Drive
- 18” main at edge of surfacing along west side of road (SB) from Wildwood Drive to 1/2 mile east of Dunsmore Road
- 15” main at edge of surfacing along west side of road (WB) from 1/2 mile east of Dunsmore Road to Muirfield Drive

Water

Corral Drive:

- 8” main along south side of road (EB) between Winestone Lane and Skyview Drive
- 14” main in boulevard and street along north side of road between Park Drive and Sheridan Lake Road; 200’ of dual 14” mains on the east end of Corral Drive from Southwest Booster Station to Sheridan Lake Road.

Sheridan Lake Road:

- 14” main along east side of road from Corral Drive to 500’ south of Summerset Drive
- 14” main reducing to 12” main along west side of road (SB) from 500’ south of Summerset Drive to Wildwood Drive, generally in boulevard
- No water main between Wildwood Drive and Muirfield Drive
- 12” main at edge of surfacing along north side of road (WB) from Muirfield Drive to Tanager Drive

Storm Sewer

Corral Drive:

- 48” and 54” trunk line in boulevard along north side of roadway between Park Drive and Sheridan Lake Road

Sheridan Lake Road:

- 18” to 24” trunk line on east side of roadway between Summerset Drive (North) and Summerset Drive (South)
- Large culvert crossing 400’ north of Catron Boulevard
- Other small diameter segments and culvert crossings
- Roadside ditch and culvert crossings beyond City limits

Private Utilities

Private utility facilities are present within the corridor. Additional utility coordination will be conducted as part of the study to identify major conflicts.

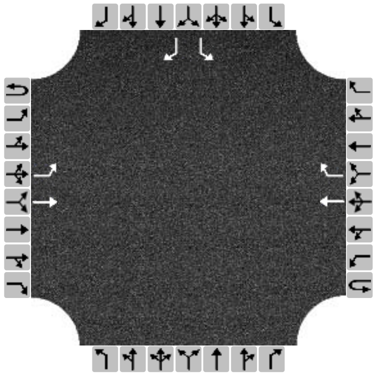
HCS7 Two-Way Stop-Control Report

General Information

Site Information

Analyst	RL	Intersection	CORRAL/PARK
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	9/27/2017	East/West Street	CORRAL DRIVE
Analysis Year	2017	North/South Street	PARK DRIVE
Time Analyzed	AM EXISTING	Peak Hour Factor	0.68
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume, V (veh/h)		20	90				90	490						415		20
Percent Heavy Vehicles (%)		1												1		1
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized	No				Yes				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.11												6.41		6.21
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.21												3.51		3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		29												610		29
Capacity, c (veh/h)		1459												660		920
v/c Ratio		0.02												0.92		0.03
95% Queue Length, Q_{95} (veh)		0.1												12.3		0.1
Control Delay (s/veh)		7.5												43.9		9.0
Level of Service, LOS		A												E		A
Approach Delay (s/veh)	1.4												42.3			
Approach LOS													E			

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CORRAL-PARK.xtw

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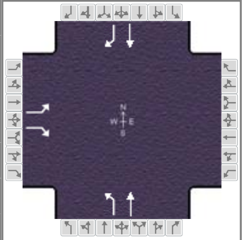
HCS 2010 Signalized Intersection Results Summary

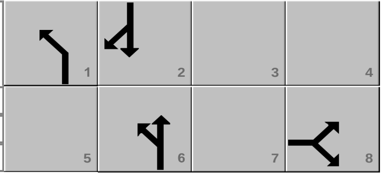
General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Sep 27, 2017	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM EXISTING	PHF	0.91
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2017	Analysis Period	1> 7:00
Intersection	CORRAL DRIVE	File Name	SLR-CORRAL.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	155		350				460	695			335	120

Signal Information			
Cycle, s	75.3	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	20.0	18.3	20.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.5	1.5	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8			1	6		2
Case Number		9.0			1.0	4.0		7.3
Phase Duration, s		26.0			25.5	49.3		23.8
Change Period, (*Y+R* $_c$), s		6.0			5.5	5.5		5.5
Max Allow Headway (*MAH*), s		4.3			5.1	4.0		4.0
Queue Clearance Time (g_s), s		21.2			16.8	25.6		17.2
Green Extension Time (g_e), s		0.0			3.1	0.0		1.1
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		1.00			0.01	1.00		0.56

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3		18				1	6			2	12
Adjusted Flow Rate (*v*), veh/h	170		385				505	764			368	77
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1681		1496				1697	1782			1748	1481
Queue Service Time (g_s), s	6.2		19.2				14.8	23.6			15.2	3.1
Cycle Queue Clearance Time (g_c), s	6.2		19.2				14.8	23.6			15.2	3.1
Green Ratio (*g/C*)	0.27		0.27				0.54	0.58			0.24	0.24
Capacity (*c*), veh/h	446		397				589	1037			426	361
Volume-to-Capacity Ratio (*X*)	0.382		0.969				0.858	0.736			0.865	0.213
Back of Queue (*Q*), ft/ln (95 th percentile)	107.3		395.9				235.3	317.6			284	47.7
Back of Queue (*Q*), veh/ln (95 th percentile)	4.2		15.6				9.3	12.7			11.4	1.9
Queue Storage Ratio (*RQ*) (95 th percentile)	1.07		0.00				2.33	0.00			0.00	0.40
Uniform Delay (d_1), s/veh	22.6		27.4				14.2	11.5			27.3	22.8
Incremental Delay (d_2), s/veh	0.5		37.0				5.3	2.8			10.0	0.3
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	23.2		64.4				19.5	14.3			37.3	23.0
Level of Service (LOS)	C		E				B	B			D	C
Approach Delay, s/veh / LOS	51.8		D	0.0			16.4		B	34.8		C
Intersection Delay, s/veh / LOS	28.6						C					

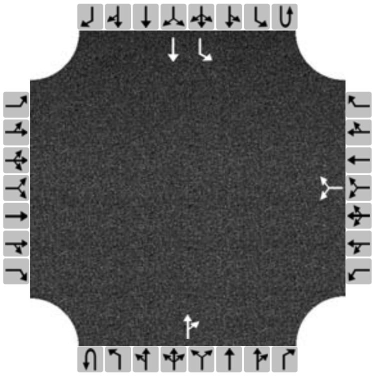
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.3	B	2.4	B	0.7	A	2.3	B
Bicycle LOS Score / LOS		F			2.6	B	1.2	A

TM1 Existing Traffic Conditions (Original Submittal)

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN LAKE/SUMMERSET
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	9/27/2017	East/West Street	SUMMERSET DRIVE
Analysis Year	2017	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	AM EXISTING	Peak Hour Factor	0.81
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						0		65			1090	5		10	675	
Percent Heavy Vehicles						0		0						3		
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)							80							12		
Capacity							186							506		
v/c Ratio							0.43							0.02		
95% Queue Length							2.0							0.1		
Control Delay (s/veh)							38.1							12.3		
Level of Service (LOS)							E							B		
Approach Delay (s/veh)					38.1								0.2			
Approach LOS					E											

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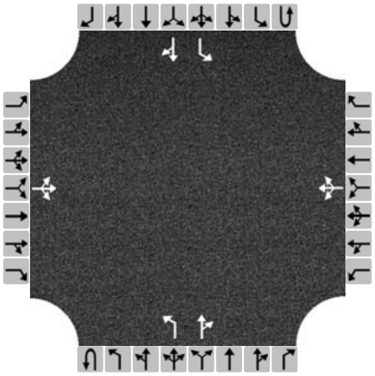
HCS 2010 Two-Way Stop Control Summary Report

General Information		**Site Information**	
Analyst	RL	Intersection	SHERIDAN LAKE/CHATEAUX
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	9/27/2017	East/West Street	CHATEAUX RIDGE
Analysis Year	2017	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	AM EXISTING	Peak Hour Factor	0.81
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	0
Configuration			LTR				LTR			L		TR		L		TR
Volume (veh/h)		5	0	5		0	0	45		0	1045	5		20	655	0
Percent Heavy Vehicles		0	0	0		0	0	0		1				3		
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)			12				56			0				25		
Capacity			44				201			821				531		
v/c Ratio			0.27				0.28			0.00				0.05		
95% Queue Length			0.9				1.1			0.0				0.1		
Control Delay (s/veh)			114.7				29.7			9.4				12.1		
Level of Service (LOS)			F				D			A				B		
Approach Delay (s/veh)	114.7				29.7				0.0				0.4			
Approach LOS	F				D											

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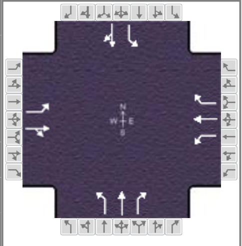
TM1 Existing Traffic Conditions (Original Submittal)

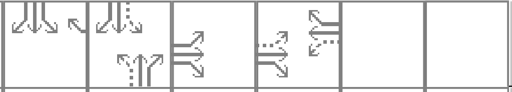
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Sep 27, 2017	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM EXISTING	PHF	0.89
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2017	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	SLR-CATRON.xus		
Project Description	SLR CORRIDOR STUDY				

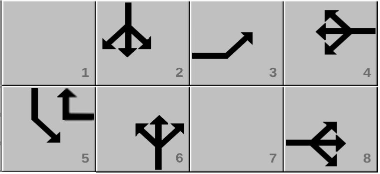


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	35	50	0	60	10	475	0	540	240	480	150	30

Signal Information			
Cycle, s	154.1	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	39.4	64.6	4.1	24.0	0.0	0.0
Yellow	3.0	5.0	3.0	4.0	0.0	0.0
Red	2.0	2.0	1.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8		4		6	5	2
Case Number	1.0	4.0		5.3		5.3	1.0	4.0
Phase Duration, s	8.1	38.1		30.0		71.6	44.4	116.0
Change Period, (*Y+R* $_c$), s	4.0	6.0		6.0		7.0	5.0	7.0
Max Allow Headway (*MAH*), s	4.1	5.3		5.3		5.0	5.1	5.0
Queue Clearance Time (g_s), s	5.0	6.0		26.0		48.6	37.4	7.6
Green Extension Time (g_e), s	0.0	2.8		0.0		5.2	2.0	7.1
Phase Call Probability	0.81	1.00		1.00		1.00	1.00	1.00
Max Out Probability	1.00	0.00		1.00		0.27	0.54	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	39	0		67	11	320	0	607	163	539	191	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	0		1358	1786	1514	1192	1772	1502	1674	1721	
Queue Service Time (g_s), s	3.0	0.0		6.8	0.8	24.0	0.0	46.6	10.9	35.4	5.6	
Cycle Queue Clearance Time (g_c), s	3.0	0.0		6.8	0.8	24.0	0.0	46.6	10.9	35.4	5.6	
Green Ratio (*g/C*)	0.20			0.16	0.16	0.41	0.42	0.42	0.42	0.69	0.71	
Capacity (*c*), veh/h	302			258	278	623	47	743	630	569	1218	
Volume-to-Capacity Ratio (*X*)	0.130	0.000		0.261	0.040	0.514	0.000	0.816	0.259	0.948	0.157	
Back of Queue (*Q*), ft/ln (95 th percentile)	58	0		107.9	17.1	352.4	0	749.4	187.7	804.5	95.2	
Back of Queue (*Q*), veh/ln (95 th percentile)	2.3	0.0		4.3	0.7	14.0	0.0	29.5	7.4	31.4	3.7	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.35	0.00		0.90	0.00	1.57	0.00	0.00	0.80	6.44	0.00	
Uniform Delay (d_1), s/veh	51.1			57.8	55.3	33.9	0.0	39.5	29.1	37.1	7.4	
Incremental Delay (d_2), s/veh	0.2	0.0		0.8	0.1	1.0	0.0	9.6	1.0	23.2	0.3	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	51.3			58.5	55.3	34.9	0.0	49.1	30.1	60.2	7.7	
Level of Service (LOS)	D			E	E	C		D	C	E	A	
Approach Delay, s/veh / LOS	50.6	D		39.4	D		45.1	D		46.5	D	
Intersection Delay, s/veh / LOS	44.7						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	1.97	B	2.39	B	1.87	B
Bicycle LOS Score / LOS	0.65	A	1.15	A	1.76	B	1.69	B

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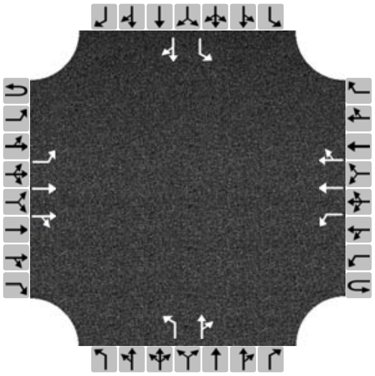
TM1 Existing Traffic Conditions (Original Submittal)

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	RL	Intersection	CATRON/BENDT
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	9/27/2017	East/West Street	CATRON BOULEVARD
Analysis Year	2017	North/South Street	BENDT DRIVE
Time Analyzed	AM EXISTING	Peak Hour Factor	0.89
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		1	1	0		1	1	0
Configuration		L	T	TR		L	T	TR		L		TR		L		TR
Volume (veh/h)		5	730	35		20	490	5		25	0	25		30	0	30
Percent Heavy Vehicles		2				1				0	0	0		2	2	2
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		6				22				28		28		34		34
Capacity		1010				784				139		579		177		719
v/c Ratio		0.01				0.03				0.20		0.05		0.19		0.05
95% Queue Length		0.0				0.1				0.7		0.2		0.7		0.1
Control Delay (s/veh)		8.6				9.7				37.2		11.5		30.1		10.3
Level of Service (LOS)		A				A				E		B		D		B
Approach Delay (s/veh)	0.1				0.4				24.4				20.2			
Approach LOS									C				C			

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CATRON-BENDT.xtw

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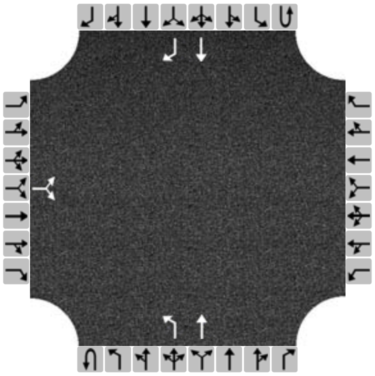
TM1 Existing Traffic Conditions (Original Submittal)

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN/WILDWOOD
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	9/27/2017	East/West Street	WILDWOOD DRIVE
Analysis Year	2017	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	AM EXISTING	Peak Hour Factor	0.80
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0	0	1	1	0	0	0	1	1
Configuration			LR							L	T				T	R
Volume (veh/h)		10		0						5	770				205	5
Percent Heavy Vehicles		0		0						1						
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

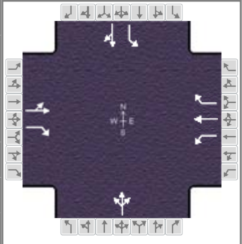
Delay, Queue Length, and Level of Service

Flow Rate (veh/h)			12							6						
Capacity			197							1308						
v/c Ratio			0.06							0.00						
95% Queue Length			0.2							0.0						
Control Delay (s/veh)			24.4							7.8						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)	24.4								0.0							
Approach LOS	C															

TM1 Existing Traffic Conditions (Original Submittal)

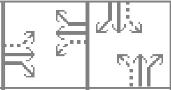
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Sep 27, 2017	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM EXISTING	PHF	0.83
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2017	Analysis Period	1> 7:00
Intersection	DUNSMORE ROAD	File Name	SLR-DUNSMORE.xus		
Project Description	SLR CORRIDOR STUDY				

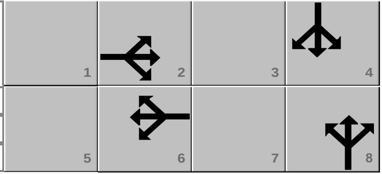


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	5	525	105	35	120	50	20	15	60	190	60	5

Signal Information			
Cycle, s	82.7	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	47.0	19.7	0.0	0.0	0.0	0.0
Yellow	5.0	3.0	0.0	0.0	0.0	0.0
Red	4.0	4.0	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		7.0		5.0		8.0		6.0
Phase Duration, s		56.0		56.0		26.7		26.7
Change Period, (*Y+R* $_c$), s		9.0		9.0		7.0		7.0
Max Allow Headway (*MAH*), s		4.0		4.0		4.3		4.3
Queue Clearance Time (*g* $_s$), s		21.9		25.1		5.4		19.2
Green Extension Time (*g* $_e$), s		3.7		3.6		1.4		0.6
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.01		0.02		0.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h		639	78	42	145	36		84		229	78	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1784	1514	782	1744	1478		1549		1332	1734	
Queue Service Time (*g* $_s$), s		0.0	2.0	3.2	3.2	0.9		0.0		13.8	3.0	
Cycle Queue Clearance Time (*g* $_c$), s		19.9	2.0	23.1	3.2	0.9		3.4		17.2	3.0	
Green Ratio (*g/C*)		0.57	0.57	0.57	0.57	0.57		0.24		0.24	0.24	
Capacity (*c*), veh/h		1057	859	343	990	839		426		351	414	
Volume-to-Capacity Ratio (*X*)		0.604	0.091	0.123	0.146	0.043		0.198		0.653	0.189	
Back of Queue (*Q*), ft/ln (95 th percentile)		280.9	25.3	27.4	48.9	11.6		58.7		209.7	57.2	
Back of Queue (*Q*), veh/ln (95 th percentile)		11.1	1.0	1.1	1.9	0.4		2.3		8.2	2.2	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.51	0.37	0.00	0.06		0.00		1.82	0.00	
Uniform Delay (*d* $_1$), s/veh		12.0	8.1	19.8	8.4	7.9		25.3		32.1	25.1	
Incremental Delay (*d* $_2$), s/veh		2.6	0.2	0.7	0.3	0.1		0.2		3.1	0.2	
Initial Queue Delay (*d* $_3$), s/veh		0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh		14.6	8.4	20.5	8.7	8.0		25.5		35.2	25.3	
Level of Service (LOS)		B	A	C	A	A		C		D	C	
Approach Delay, s/veh / LOS	13.9		B	10.9		B	25.5		C	32.7		C
Intersection Delay, s/veh / LOS	18.5						B					

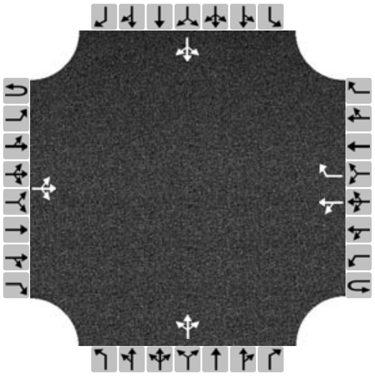
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.69	B	1.88	B	2.14	B	1.98	B
Bicycle LOS Score / LOS	1.67	B	0.86	A	0.63	A	0.99	A

TM1 Existing Traffic Conditions (Original Submittal)

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN/TANAGER/CROYLE
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	9/27/2017	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2017	North/South Street	TANAGER DRIVE
Time Analyzed	AM EXISTING	Peak Hour Factor	0.83
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	1		0	1	0		0	1	0
Configuration			LTR			LT		R			LTR				LTR	
Volume (veh/h)		0	520	0		10	125	10		0	0	20		95	0	0
Percent Heavy Vehicles		1				5				8	8	8		2	2	2
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

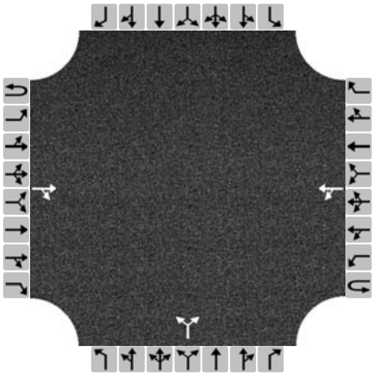
Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		0				12					24				114	
Capacity		1421				942					473				279	
v/c Ratio		0.00				0.01					0.05				0.41	
95% Queue Length		0.0				0.0					0.2				1.9	
Control Delay (s/veh)		7.5				8.9					13.0				26.6	
Level of Service (LOS)		A				A					B				D	
Approach Delay (s/veh)	0.0				0.7				13.0				26.6			
Approach LOS									B				D			

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN/ALBERTTA
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	9/27/2017	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2017	North/South Street	ALBERTTA DRIVE
Time Analyzed	AM EXISTING	Peak Hour Factor	0.83
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			470	5		20	105			0		50				
Percent Heavy Vehicles						4				3		3				
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)						24					60					
Capacity						990					519					
v/c Ratio						0.02					0.12					
95% Queue Length						0.1					0.4					
Control Delay (s/veh)						8.7					12.8					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					1.6				12.8							
Approach LOS									B							

HCS 2010™ TWSC Version 6.80
SLR-ALBERTTA.xtw

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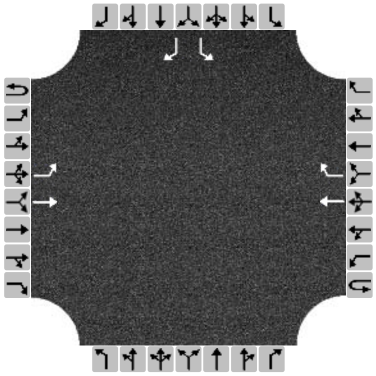
TM1 Existing Traffic Conditions (Original Submittal)

HCS7 Two-Way Stop-Control Report

General Information		**Site Information**	
Analyst	RL	Intersection	CORRAL/PARK
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	9/28/2017	East/West Street	CORRAL DRIVE
Analysis Year	2017	North/South Street	PARK DRIVE
Time Analyzed	PM EXISTING	Peak Hour Factor	0.91
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume, V (veh/h)		10	40				100	275						230		25
Percent Heavy Vehicles (%)		2												1		1
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized	No				Yes				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.12												6.41		6.21
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.22												3.51		3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		11												253		27
Capacity, c (veh/h)		1479												810		946
v/c Ratio		0.01												0.31		0.03
95% Queue Length, Q_{95} (veh)		0.0												1.3		0.1
Control Delay (s/veh)		7.5												11.5		8.9
Level of Service, LOS		A												B		A
Approach Delay (s/veh)	1.5												11.2			
Approach LOS													B			

HCS7™ TWSC Version 7.1
CORRAL-PARK.xtw

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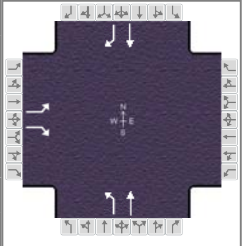
TM1 Existing Traffic Conditions (Original Submittal)

HCS7 Signalized Intersection Results Summary

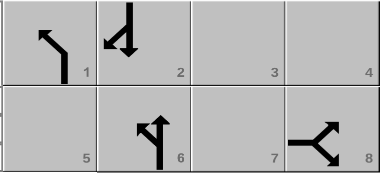
General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Sep 28, 2017	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM EXISTING	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2017	Analysis Period	1> 7:00
Intersection	CORRAL DRIVE	File Name	SLR-CORRAL.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	65		205				275	525			710	100

Signal Information			
Cycle, s	82.6	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	12.1	38.7	14.8	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.5	1.5	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8			1	6		2
Case Number		9.0			1.0	4.0		7.3
Phase Duration, s		20.8			17.6	61.8		44.2
Change Period, (*Y+R* $_c$), s		6.0			5.5	5.5		5.5
Max Allow Headway (*MAH*), s		4.3			5.1	4.0		4.0
Queue Clearance Time (g_s), s		14.2			10.9	14.8		37.8
Green Extension Time (g_e), s		0.6			1.1	4.5		0.8
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		0.44			0.20	0.49		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3		18				1	6			2	12
Adjusted Flow Rate (*v*), veh/h	72		228				306	583			789	67
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688		1502				1701	1786			1758	1490
Queue Service Time (g_s), s	3.0		12.2				8.9	12.8			35.8	2.1
Cycle Queue Clearance Time (g_c), s	3.0		12.2				8.9	12.8			35.8	2.1
Green Ratio (*g/C*)	0.18		0.18				0.64	0.68			0.47	0.47
Capacity (*c*), veh/h	302		268				361	1219			825	699
Volume-to-Capacity Ratio (*X*)	0.239		0.849				0.847	0.479			0.957	0.095
Back of Queue (*Q*), ft/ln (95 th percentile)	55.2		225.5				181.5	160.3			621.9	28.9
Back of Queue (*Q*), veh/ln (95 th percentile)	2.2		8.9				7.2	6.4			24.3	1.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.55		0.00				1.82	0.00			0.00	0.24
Uniform Delay (d_1), s/veh	29.2		32.9				21.4	6.2			21.2	12.2
Incremental Delay (d_2), s/veh	0.4		13.1				10.3	0.3			20.8	0.1
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	29.6		46.1				31.7	6.5			41.9	12.3
Level of Service (LOS)	C		D				C	A			D	B
Approach Delay, s/veh / LOS	42.1		D	0.0			15.2		B	39.6		D
Intersection Delay, s/veh / LOS	29.4						C					

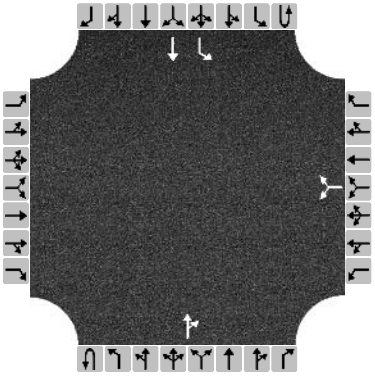
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.3	B	2.4	B	0.7	A	2.3	B
Bicycle LOS Score / LOS		F			2.0	B	1.9	B

TM1 Existing Traffic Conditions (Original Submittal)

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN LAKE/SUMMERSET
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	9/28/2017	East/West Street	SUMMERSET DRIVE
Analysis Year	2017	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	PM EXISTING	Peak Hour Factor	0.91
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume, V (veh/h)						0		25			775	5		40	875	
Percent Heavy Vehicles (%)						0		0						1		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.11		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.21		

Delay, Queue Length, and Level of Service

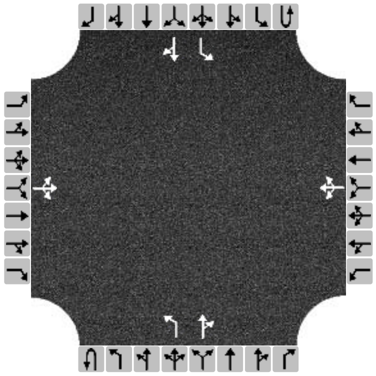
Flow Rate, v (veh/h)							27							44		
Capacity, c (veh/h)							361							788		
v/c Ratio							0.07							0.06		
95% Queue Length, Q_{95} (veh)							0.2							0.2		
Control Delay (s/veh)							15.8							9.8		
Level of Service, LOS							C							A		
Approach Delay (s/veh)					15.8								0.4			
Approach LOS					C											

TM1 Existing Traffic Conditions (Original Submittal)

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN LAKE/CHATEAUX
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	9/28/2017	East/West Street	CHATEAUX RIDGE
Analysis Year	2017	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	PM EXISTING	Peak Hour Factor	0.89
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	0
Configuration			LTR				LTR			L		TR		L		TR
Volume, V (veh/h)		5	0	0		0	0	20		5	755	5		30	835	10
Percent Heavy Vehicles (%)		0	0	0		0	0	0		1				1		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.10	6.50	6.20		7.10	6.50	6.20		4.11				4.11		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.00	3.30		2.21				2.21		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			6				22			6				34		
Capacity, c (veh/h)			49				363			728				790		
v/c Ratio			0.12				0.06			0.01				0.04		
95% Queue Length, Q_{95} (veh)			0.4				0.2			0.0				0.1		
Control Delay (s/veh)			88.2				15.6			10.0				9.8		
Level of Service, LOS			F				C			A				A		
Approach Delay (s/veh)	88.2				15.6				0.1				0.3			
Approach LOS	F				C											

HCS7™ TWSC Version 7.1
SLR-CHATEAUX.xtw

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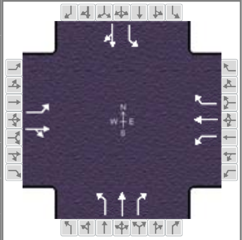
TM1 Existing Traffic Conditions (Original Submittal)

HCS7 Signalized Intersection Results Summary

General Information			
Agency	HDR		
Analyst	RL	Analysis Date	Sep 28, 2017
Jurisdiction	RAPID CITY	Time Period	PM EXISTING
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2017
Intersection	CATRON BOULEVARD	File Name	SLR-CATRON.xus
Project Description	SLR CORRIDOR STUDY		

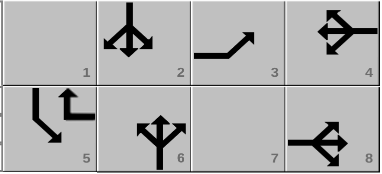
Intersection Information	
Duration, h	0.25
Area Type	Other
PHF	0.86
Analysis Period	1> 7:00



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	5	0	280	25	565	0	190	110	395	415	25

Signal Information			
Cycle, s	81.4	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	17.0	19.0	1.2	22.3	0.0	0.0
Yellow	3.0	5.0	3.0	4.0	0.0	0.0
Red	2.0	2.0	1.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8		4		6	5	2
Case Number	1.0	4.0		5.3		5.3	1.0	4.0
Phase Duration, s	5.2	33.4		28.3		26.0	22.0	48.0
Change Period, (*Y+R* $_c$), s	4.0	6.0		6.0		7.0	5.0	7.0
Max Allow Headway (*MAH*), s	4.1	5.2		5.2		5.0	5.1	5.0
Queue Clearance Time (g_s), s	2.4	2.2		19.6		10.9	18.4	18.2
Green Extension Time (g_e), s	0.0	5.2		2.7		2.7	0.0	4.8
Phase Call Probability	0.23	1.00		1.00		1.00	1.00	1.00
Max Out Probability	0.01	0.00		0.68		0.70	1.00	0.05

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	12	0		326	29	395	0	221	76	459	500	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	0		1421	1786	1514	898	1772	1502	1674	1747	
Queue Service Time (g_s), s	0.4	0.0		17.6	1.0	14.9	0.0	8.9	3.3	16.4	16.2	
Cycle Queue Clearance Time (g_c), s	0.4	0.0		17.6	1.0	14.9	0.0	8.9	3.3	16.4	16.2	
Green Ratio (*g/C*)	0.31			0.27	0.27	0.48	0.23	0.23	0.23	0.47	0.50	
Capacity (*c*), veh/h	474			477	489	730	88	413	350	581	879	
Volume-to-Capacity Ratio (*X*)	0.025	0.000		0.682	0.059	0.542	0.000	0.534	0.216	0.791	0.569	
Back of Queue (*Q*), ft/ln (95 th percentile)	6.7	0		251.3	17.9	206.4	0	187	57.1	282	262.5	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.3	0.0		10.0	0.7	8.2	0.0	7.4	2.2	11.0	10.3	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.04	0.00		2.09	0.00	0.92	0.00	0.00	0.24	2.26	0.00	
Uniform Delay (d_1), s/veh	19.4			27.9	21.8	14.8	0.0	27.3	25.2	17.2	14.1	
Incremental Delay (d_2), s/veh	0.0	0.0		3.3	0.1	0.9	0.0	4.9	1.4	7.7	2.7	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	19.5			31.2	21.9	15.7	0.0	32.2	26.6	24.9	16.7	
Level of Service (LOS)	B			C	C	B		C	C	C	B	
Approach Delay, s/veh / LOS	19.0	B		22.7	C		30.8	C		20.6	C	
Intersection Delay, s/veh / LOS	22.9						C					

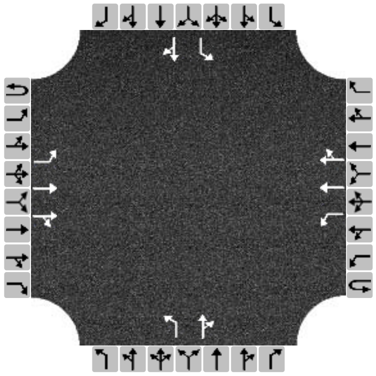
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.17	B	1.93	B	2.44	B	1.89	B
Bicycle LOS Score / LOS	0.52	A	1.73	B	0.98	A	2.07	B

TM1 Existing Traffic Conditions (Original Submittal)

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	CATRON/BENDT
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	9/28/2017	East/West Street	CATRON BOULEVARD
Analysis Year	2017	North/South Street	BENDT DRIVE
Time Analyzed	PM EXISTING	Peak Hour Factor	0.86
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		1	1	0		1	1	0
Configuration		L	T	TR		L	T	TR		L		TR		L		TR
Volume, V (veh/h)		5	470	35		20	825	40		35	0	20		10	0	10
Percent Heavy Vehicles (%)		1				1				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.12				4.12				7.50	6.50	6.90		7.50	6.50	6.90
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.21				2.21				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

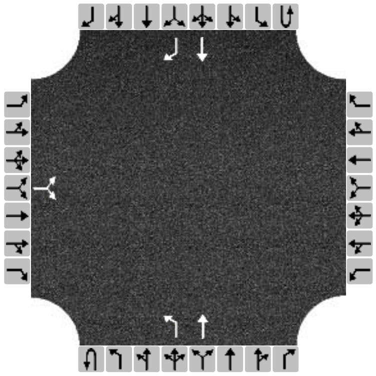
Flow Rate, v (veh/h)		6				23				41		23		12		12
Capacity, c (veh/h)		691				990				160		708		111		519
v/c Ratio		0.01				0.02				0.26		0.03		0.11		0.02
95% Queue Length, Q_{95} (veh)		0.0				0.1				1.0		0.1		0.4		0.1
Control Delay (s/veh)		10.3				8.7				35.1		10.3		41.2		12.1
Level of Service, LOS		B				A				E		B		E		B
Approach Delay (s/veh)	0.1				0.2				26.1				26.6			
Approach LOS									D				D			

TM1 Existing Traffic Conditions (Original Submittal)

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN/WILDWOOD
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	9/28/2017	East/West Street	WILDWOOD DRIVE
Analysis Year	2017	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	PM EXISTING	Peak Hour Factor	0.88
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0	0	1	1	0	0	0	1	1
Configuration			LR							L	T				T	R
Volume, V (veh/h)		5		0						0	295				685	10
Percent Heavy Vehicles (%)		0		0						1						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.40		6.20						4.11						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.50		3.30						2.21						

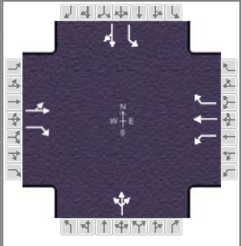
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			6							0						
Capacity, c (veh/h)			233							835						
v/c Ratio			0.03							0.00						
95% Queue Length, Q_{95} (veh)			0.1							0.0						
Control Delay (s/veh)			20.9							9.3						
Level of Service, LOS			C							A						
Approach Delay (s/veh)	20.9								0.0							
Approach LOS	C															

TM1 Existing Traffic Conditions (Original Submittal)

HCS7 Signalized Intersection Results Summary

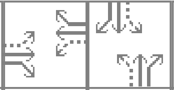
General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Sep 28, 2017	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM EXISTING	PHF	0.86
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2017	Analysis Period	1> 7:00
Intersection	DUNSMORE ROAD	File Name	SLR-DUNSMORE.xus		
Project Description	SLR CORRIDOR STUDY				



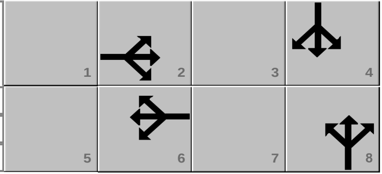
Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	0	190	20	60	470	155	45	20	40	65	5	5

Signal Information

Cycle, s	74.7	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	48.0	10.7	0.0	0.0	0.0	0.0
Yellow	5.0	3.0	0.0	0.0	0.0	0.0
Red	4.0	4.0	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		7.0		5.0		8.0		6.0
Phase Duration, s		57.0		57.0		17.7		17.7
Change Period, (*Y+R* $_c$), s		9.0		9.0		7.0		7.0
Max Allow Headway (*MAH*), s		4.0		4.0		4.2		4.2
Queue Clearance Time (g_s), s		5.8		14.2		6.5		10.5
Green Extension Time (g_e), s		3.7		3.6		0.4		0.3
Phase Call Probability		1.00		1.00		0.98		0.98
Max Out Probability		0.00		0.00		0.01		0.21

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h		0	12	70	547	110		105		76	12	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		0	1514	1142	1744	1478		1558		1341	1613	
Queue Service Time (g_s), s		0.0	0.2	2.0	12.2	2.2		2.5		4.1	0.5	
Cycle Queue Clearance Time (g_c), s		0.0	0.2	5.8	12.2	2.2		4.5		8.5	0.5	
Green Ratio (*g/C*)			0.64	0.64	0.64	0.64		0.14		0.14	0.14	
Capacity (*c*), veh/h			973	772	1121	950		295		209	231	
Volume-to-Capacity Ratio (*X*)		0.000	0.012	0.090	0.488	0.116		0.354		0.362	0.050	
Back of Queue (*Q*), ft/ln (95 th percentile)		0	2.2	18.4	156.6	23.1		76.4		63.2	8.4	
Back of Queue (*Q*), veh/ln (95 th percentile)		0.0	0.1	0.7	6.1	0.9		3.1		2.5	0.3	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.04	0.25	0.00	0.13		0.00		0.55	0.00	
Uniform Delay (d_1), s/veh			4.8	6.6	7.0	5.2		29.3		33.2	27.6	
Incremental Delay (d_2), s/veh		0.0	0.0	0.2	1.5	0.2		0.7		1.1	0.1	
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh			4.8	6.9	8.5	5.4		30.0		34.3	27.7	
Level of Service (LOS)			A	A	A	A		C		C	C	
Approach Delay, s/veh / LOS	5.8	A		7.8	A		30.0	C		33.4	C	
Intersection Delay, s/veh / LOS	11.4						B					

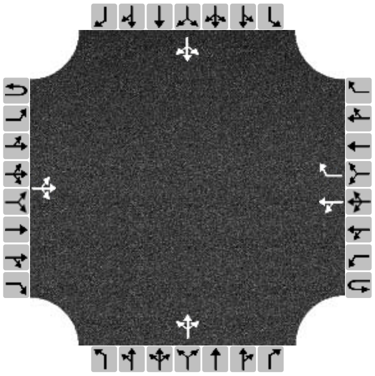
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.66	B	1.86	B	2.21	B	1.94	B
Bicycle LOS Score / LOS	0.87	A	1.69	B	0.66	A	0.63	A

TM1 Existing Traffic Conditions (Original Submittal)

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN/TANAGER/CROYLE
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	9/28/2017	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2017	North/South Street	TANAGER DRIVE
Time Analyzed	PM EXISTING	Peak Hour Factor	0.88
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	1		0	1	0		0	1	0
Configuration			LTR			LT		R			LTR				LTR	
Volume, V (veh/h)		0	175	0		15	400	105		0	0	10		25	0	0
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				17					11				28	
Capacity, c (veh/h)		1009				1386					847				350	
v/c Ratio		0.00				0.01					0.01				0.08	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.0				0.3	
Control Delay (s/veh)		8.6				7.6					9.3				16.2	
Level of Service, LOS		A				A					A				C	
Approach Delay (s/veh)	0.0				0.3				9.3				16.2			
Approach LOS									A				C			

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SLR-TANAGER.xtw

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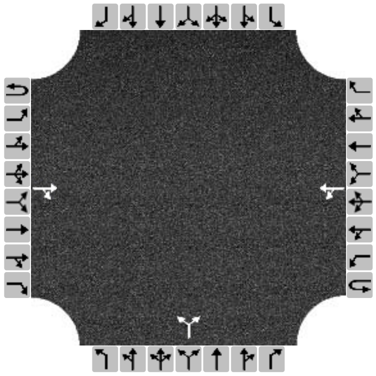
TM1 Existing Traffic Conditions (Original Submittal)

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN/ALBERTTA
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	9/28/2017	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2017	North/South Street	ALBERTTA DRIVE
Time Analyzed	PM EXISTING	Peak Hour Factor	0.94
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			155	5		65	335			5		20				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				7.10		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						69					26					
Capacity, c (veh/h)						1420					690					
v/c Ratio						0.05					0.04					
95% Queue Length, Q_{95} (veh)						0.2					0.1					
Control Delay (s/veh)						7.7					10.4					
Level of Service, LOS						A					B					
Approach Delay (s/veh)					1.6				10.4							
Approach LOS									B							

TM1 Existing Traffic Conditions (Original Submittal)

Sheridan Lake Road Traffic Study Report

Corral Drive to Albertta Drive

CITY OF RAPID CITY

Rapid City, South Dakota

Appendix C

Existing Conditions Safety and Access

Technical Memo

Date: Monday, November 06, 2017

Project: Sheridan Lake Road Corridor Study

To: Study Advisory Team

From: Rick Laughlin

Subject: Safety/Access – Existing Conditions

The City of Rapid City, in cooperation with the Rapid City Metropolitan Planning Organization (MPO), has retained HDR to study a portion of the Sheridan Lake Road corridor in southern Rapid City. The study area includes Sheridan Lake Road from Corral Drive to Albertta Drive and a small portion of Corral Drive.

This memo describes the crash records for the most recent 5-year period and identifies potential safety problems in the corridor. An access inventory is also presented for the corridor and existing access conditions are referenced to access management standards.

Crash Records

Crash records for the study area were obtained from the SDDOT online mapping tool. The crash records covered the years 2013-2017. A map of crash locations and a summary of the crash records are attached to this memo.

Safety Evaluation

The crash map shows concentrations of crashes at several intersections in the corridor. A secondary concentration of crashes is evident in the area south of Wildwood Drive where Sheridan Lake road curves and is flanked by steep, forested property. Each of the crash concentrations is addressed below:

- Sheridan Lake Road/Corral Drive – 7 crashes in 5 years. No clear trends were evident in the crash data, although 3 of the 7 occurred in snow-covered road conditions.
- Sheridan Lake Road/Catron Boulevard – 21 crashes in 5 years. A pattern was discernable involving left-turning vehicles becoming involved in angle crashes with driver contributions including “failure to yield” and “disregard of traffic signal.” The crash pattern appears to be related to the growth of Catron Boulevard as a crosstown route. Southbound drivers on Sheridan Lake Road wishing to turn left onto Catron Boulevard frequently encounter peak hour queues and congestion. Their reaction to this congestion is to try to use small gaps in oncoming traffic or push the left turn phase into subsequent yellow and red intervals, resulting in increased crash frequency. Adding capacity to this intersection through additional lanes and revised signalization will help to alleviate the crash problem.

- Sheridan Lake Road/Dunsmore Road – 9 crashes in 5 years. The majority of the crashes involved angle incidents that occurred prior to signalization of the intersection. The incidence of this crash type should fall in the coming years due to the control provided by the traffic signal.
- Non-intersection area south of Wildwood Drive – 21 crashes in 5 years. The crashes were scattered across a roadway segment a little less than a mile long and included run-off-road crashes and animal hits. The roadway in this area is a curving two-lane rural roadway with an asphalt surface. Crash incidence could be improved with lighting and a high-friction surface treatment, features that may be implemented as the area becomes more urbanized.

Access Inventory

An inventory of all the access points throughout the corridor is summarized in the access inventory table and access location maps attached to this memo. Recommendations for each access point will be finalized through further analysis as the corridor study proceeds and will be included in later versions of the access inventory table. The completed table will then become an implementable access plan for the corridor.

Access Standards and Evaluation

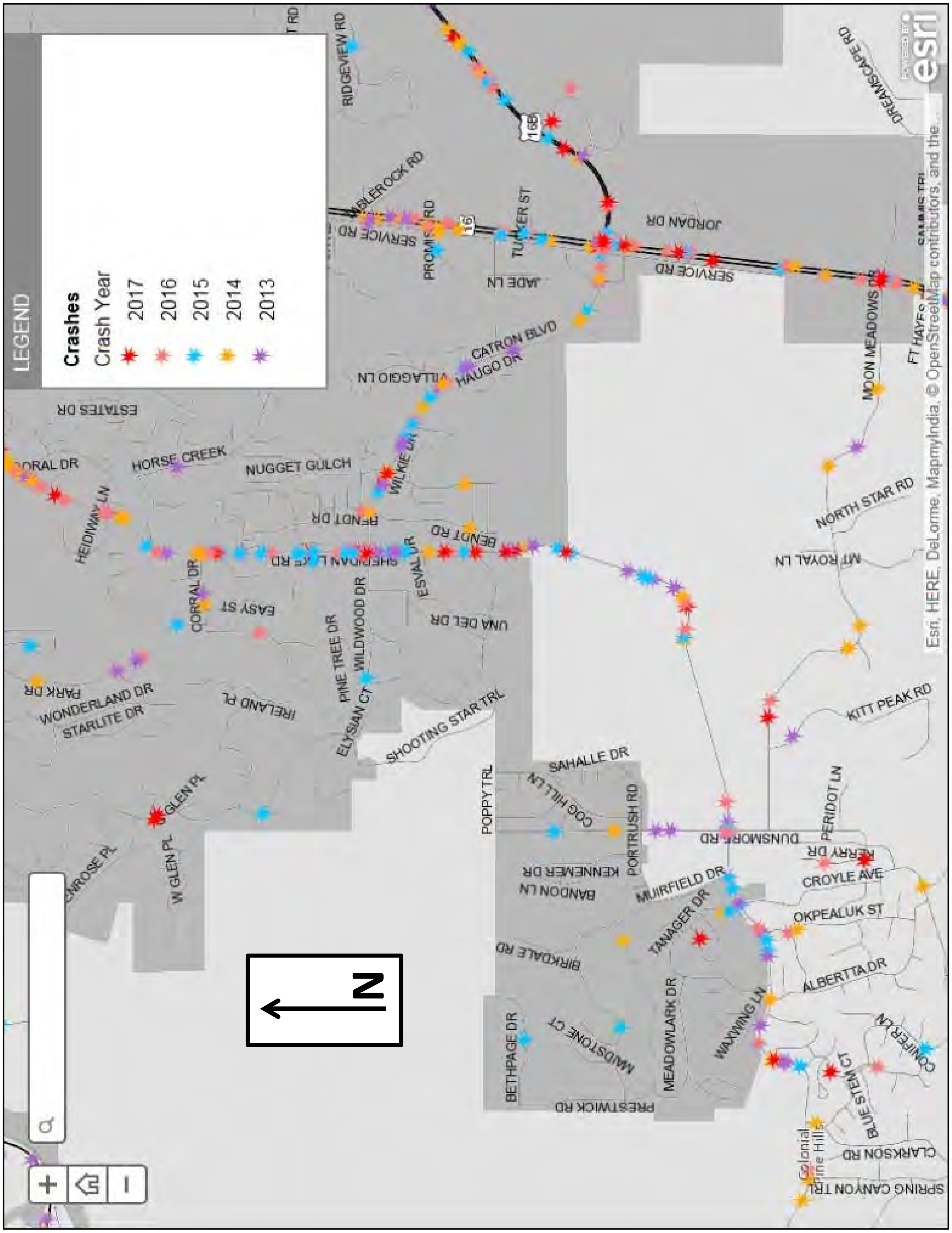
Design of roadways and other facilities in Rapid City are governed by the Design Criteria Manual. The Manual has a number of standards for access spacing, including:

- Minimum distance between intersections – 125’
- Minimum signalized approach spacing – 1200’
- Minimum corner clearance (arterial) – 250’ from signalized intersection, 150’ from unsignalized intersection

The Manual also addresses the number of driveways allowable from residential, commercial and industrial uses.

The existing access points throughout the corridor have either been permitted or grandfathered because they pre-date the Manual. As property develops or re-develops, the property access will be reviewed for compliance with the Manual.

This study will consider alternatives for development of collector and arterial streets intersecting the corridor. Any recommended intersecting collector and arterial streets will drive access recommendations on Sheridan Lake Road to preserve the safety and efficiency of the collector and arterial street roadways in the study area.



Crash Map – Sheridan Lake Road Corridor

CRASH RECORDS SUMMARY

SHERIDAN LAKE ROAD CORRIDOR STUDY

CORRAL/PARK

DATE	MANNER OF COLLISION	INJURY	MANEUVER	ROAD CONTRIBUTION	LIGHT	DRIVER CONTRIBUTION	WEATHER
NO CRASHES IN DATABASE							

SHERIDAN LAKE RD/CORRAL

DATE	MANNER OF COLLISION	INJURY	MANEUVER	ROAD CONTRIBUTION	LIGHT	DRIVER CONTRIBUTION	WEATHER
8/9/2013	BIKE	NON-INCAPACITATING	TURN RIGHT	(NONE)	DAY	(NONE)	CLOUDY
10/4/2013	ANGLE	NO	TURN LEFT	SNOW	DAY	TOO FAST	SNOW
2/1/2014	REAR-END	NON-INCAPACITATING	STOPPED	(NONE)	DAY	FAIL YIELD	CLEAR
4/16/2014	1-VEHICLE	NO	TURN LEFT	(NONE)	DARK-LIGHTED	DWI	CLEAR
12/28/2014	REAR-END	NO	STRAIGHT	SNOW	DARK-LIGHTED	TOO FAST	SNOW
12/28/2014	1-VEHICLE	NO	TURN LEFT	SNOW	DARK-LIGHTED	TOO FAST	SNOW
9/5/2017	REAR-END	NO	STRAIGHT	(NONE)	DAY	TOO CLOSE	CLEAR

SHERIDAN LAKE RD/SUMMERSET NORTH

DATE	MANNER OF COLLISION	INJURY	MANEUVER	ROAD CONTRIBUTION	LIGHT	DRIVER CONTRIBUTION	WEATHER
5/3/2013	REAR-END	NO	STRAIGHT	(NONE)	DAY	FAIL YIELD	CLEAR
11/5/2015	REAR-END	NON-INCAPACITATING	STRAIGHT	(NONE)	DAY	TOO CLOSE	CLOUDY

SHERIDAN LAKE RD/CHATEAUX

DATE	MANNER OF COLLISION	INJURY	MANEUVER	ROAD CONTRIBUTION	LIGHT	DRIVER CONTRIBUTION	WEATHER
12/20/2014	PEDESTRIAN	NON-INCAPACITATING	TURN LEFT	(NONE)	DARK-LIGHTED	(NONE)	
11/20/2015	ANGLE	NO	STRAIGHT	SNOW	DAY	TOO FAST	SNOW

SHERIDAN LAKE ROAD/CATRON

DATE	MANNER OF COLLISION	INJURY	MANEUVER	ROAD CONTRIBUTION	LIGHT	DRIVER CONTRIBUTION	WEATHER
3/4/2013	ANGLE	NO	TURN LEFT	(NONE)	DAY	IMPROPER TURN	CLEAR
7/12/2013	ANGLE	POSSIBLE	TURN LEFT	(NONE)	DAY	FAILURE TO YIELD	CLOUDY
8/9/2013	REAR-END	NO	STRAIGHT	(NONE)	DAY	(NONE)	CLEAR
8/21/2013	ANGLE	NON-INCAPACITATING	TURN RIGHT	(NONE)	DAY	DISREGARD SIGNAL	CLOUDY
8/30/2014	ANGLE	NO	TURN LEFT	(NONE)	DAY	FAILURE TO YIELD	CLEAR
9/6/2014	ANGLE	NO	STRAIGHT	(NONE)	DAY	DISREGARD SIGNAL	CLEAR
4/6/2015	ANGLE	NO	STRAIGHT	SNOW	DARK-LIGHTED	DISREGARD SIGNAL	SNOW
5/1/2015	REAR-END	INCAPACITATING	STOPPED	(NONE)	DAY	TOO CLOSE	CLEAR
7/22/2015	REAR-END	NO	STOPPED	(NONE)	DAY	FAILURE TO YIELD	CLEAR
8/21/2015	ANGLE	NO	TURN LEFT	(NONE)	DAY	FAILURE TO YIELD	CLEAR
11/6/2015	ANGLE	INCAPACITATING	STRAIGHT	(NONE)	DAY	DISREGARD SIGNAL	CLEAR
1/25/2016	ANGLE	NO	TURN LEFT	(NONE)	DARK-LIGHTED	FAILURE TO YIELD	CLEAR
2/5/2016	ANGLE	NO	TURN LEFT	(NONE)	DAY	FAILURE TO YIELD	CLEAR
2/18/2016	REAR-END	NO	TURN RIGHT	(NONE)	DARK-LIGHTED	TOO CLOSE	CLEAR
4/7/2016	ANGLE	NO	TURN RIGHT	(NONE)	DAY	DISREGARD SIGNAL	CLEAR
8/5/2016	SIDESWIPE	NO	CHG LANE	(NONE)	DAY	SWERVING	CLOUDY
8/8/2016	ANGLE	NO	TURN LEFT	(NONE)	DAY	FAILURE TO YIELD	CLEAR
9/14/2016	ANGLE	NO	TURN LEFT	(NONE)	DAY	FAILURE TO YIELD	CLEAR
3/7/2017	ANGLE	NON-INCAPACITATING	TURN LEFT	(NONE)	DAY	FAILURE TO YIELD	CLEAR
7/6/2017	ANGLE	NO	TURN LEFT	(NONE)	DAY	FAILURE TO YIELD	CLEAR
9/15/2017	REAR-END	POSSIBLE	STRAIGHT	(NONE)	DAY	TOO CLOSE	RAIN

CATRON/BENDT

DATE	MANNER OF COLLISION	INJURY	MANEUVER	ROAD CONTRIBUTION	LIGHT	DRIVER CONTRIBUTION	WEATHER
12/5/2014	ANGLE	POSSIBLE	TURN LEFT	(NONE)	DAY	FAILURE TO YIELD	CLEAR
11/4/2015	ANGLE	NON-INCAPACITATING	TURN LEFT	(NONE)	DAY	FAILURE TO YIELD	CLOUDY
1/9/2017	ANGLE	NO	TURN LEFT	(NONE)	DAY	FAILURE TO YIELD	CLEAR

SHERIDAN LAKE RD/WILDWOOD

DATE	MANNER OF COLLISION	INJURY	MANEUVER	ROAD CONTRIBUTION	LIGHT	DRIVER CONTRIBUTION	WEATHER
5/20/2016	REAR-END	NO	STRAIGHT	(NONE)	DAY	TOO CLOSE	CLEAR
2/7/2017	ANGLE	NO	U-TURN	(NONE)	DAY	FAILURE TO YIELD	CLOUDY

SHERIDAN LAKE ROAD/DUNSMORE

DATE	MANNER OF COLLISION	INJURY	MANEUVER	ROAD CONTRIBUTION	LIGHT	DRIVER CONTRIBUTION	WEATHER
5/20/2013	ANGLE	NO	TURN LEFT	(NONE)	DAY	FAILURE TO YIELD	CLOUDY
10/8/2014	ANGLE	NO	TURN LEFT	(NONE)	DAY	FAILURE TO YIELD	CLEAR
4/26/2015	ANGLE	NO	TURN LEFT	(NONE)	DAY	FAILURE TO YIELD	RAIN
7/14/2015	ANGLE	NO	TURN RIGHT	(NONE)	DAY	DISREGARD SIGNAL	CLEAR
9/15/2015	ANGLE	NO	STRAIGHT	(NONE)	DAY	FAILURE TO YIELD	CLOUDY
2/11/2016	ANGLE	NO	STRAIGHT	(NONE)	DARK	FAILURE TO YIELD	CLEAR
4/22/2016	ANGLE	INCAPACITATING	TURN LEFT	(NONE)	DAY	FAILURE TO YIELD	CLEAR
8/13/2016	REAR-END	POSSIBLE	STRAIGHT	(NONE)	DAY	SWERVING	CLEAR
3/3/2017	ANIMAL				DARK		CLEAR

SHERIDAN LAKE ROAD/TANAGER

DATE	MANNER OF COLLISION	INJURY	MANEUVER	ROAD CONTRIBUTION	LIGHT	DRIVER CONTRIBUTION	WEATHER
7/18/2013	1-VEHICLE	NO	TURN LEFT	ANIMAL	DARK	RUN OFF ROAD	CLEAR
9/9/2014	REAR-END	NO	STRAIGHT	(NONE)	DAY	TOO CLOSE	RAIN
11/24/2015	ANIMAL				DARK		CLEAR

SHERIDAN LAKE RD/ALBERTTA

DATE	MANNER OF COLLISION	INJURY	MANEUVER	ROAD CONTRIBUTION	LIGHT	DRIVER CONTRIBUTION	WEATHER
11/5/2014	ANIMAL				DARK		CLEAR

ACCESS INVENTORY AND RECOMMENDATION

SHERIDAN LAKE ROAD

ACCESS NUMBER	LOCATION (MILE)	SIDE	ACCESS IDENTIFICATION	RECOMMENDATION
1	0.00	RIGHT	ALBERTTA DRIVE	
2	0.05	LEFT	TANAGER DRIVE	
3	0.11	LEFT	RESIDENTIAL DRIVEWAY	
4	0.16	RIGHT	COMMERCIAL DRIVEWAY	
5	0.18	RIGHT	FIELD ENTRANCE	
6	0.23	RIGHT	OKPEALUK STREET	
7	0.37	LEFT	TANAGER DRIVE	
8	0.37	RIGHT	COYLE AVENUE	
9	0.42	RIGHT	COMMERCIAL DRIVEWAY	
10	0.52	LEFT	MUIRFIELD DRIVE	
11	0.57	LEFT	RESIDENTIAL DRIVEWAY	
12	0.59	RIGHT	FIELD ENTRANCE	
13	0.64	RIGHT	COMMERCIAL DRIVEWAY	
14	0.64	LEFT	FIELD ENTRANCE	
15	0.69	BOTH	DUNSMORE ROAD	
16	1.13	LEFT	FIELD ENTRANCE	
17	1.13	RIGHT	FIELD ENTRANCE	
18	1.33	RIGHT	FIELD ENTRANCE	
19	1.53	RIGHT	FIELD ENTRANCE	
20	1.65	LEFT	RESIDENTIAL DRIVEWAY	
21	1.91	LEFT	RESIDENTIAL DRIVEWAY	
22	1.91	RIGHT	FIELD ENTRANCE	
23	2.16	RIGHT	FIELD ENTRANCE	
24	2.32	LEFT	WILDWOOD DRIVE	
25	2.42	LEFT	RESIDENTIAL DRIVEWAY	
26	2.50	LEFT	ESVAL DRIVE	
27	2.50	RIGHT	COMMERCIAL DRIVEWAY	
28	2.54	RIGHT	COMMERCIAL DRIVEWAY	
29	2.56	LEFT	RESIDENTIAL DRIVEWAY	
30	2.60	LEFT	FINCH PLACE	
31	2.60	RIGHT	COMMERCIAL DRIVEWAY	
32	2.65	LEFT	RESIDENTIAL DRIVEWAY	
33	2.70	LEFT	WILDWOOD DRIVE	
34	2.70	RIGHT	CATRON BOULEVARD	
35	2.77	LEFT	CHURCH	
36	2.77	RIGHT	COMMERCIAL DRIVEWAY	
37	2.89	LEFT	SUNSHINE TRAIL	
38	2.93	LEFT	CHATEAUX RIDGE	
39	2.93	RIGHT	SUMMERSET DRIVE	
40	3.01	LEFT	RESIDENTIAL DRIVEWAY	
41	3.03	LEFT	RESIDENTIAL DRIVEWAY	
42	3.04	LEFT	RESIDENTIAL DRIVEWAY	
43	3.08	LEFT	RESIDENTIAL DRIVEWAY	
44	3.14	RIGHT	SUMMERSET DRIVE	
45	3.23	LEFT	VISTA HILLS DRIVE	
46	3.28	LEFT	CORRAL DRIVE	
CORRAL DRIVE ACCESS LISTED BELOW				
47	0.09	RIGHT	SEVERSON STREET	
48	0.21	LEFT	EASY STREET	
49	0.22	RIGHT	RESIDENTIAL DRIVEWAY	
50	0.26	RIGHT	PARK DRIVE	

Sheridan Lake Road Access – Map 1

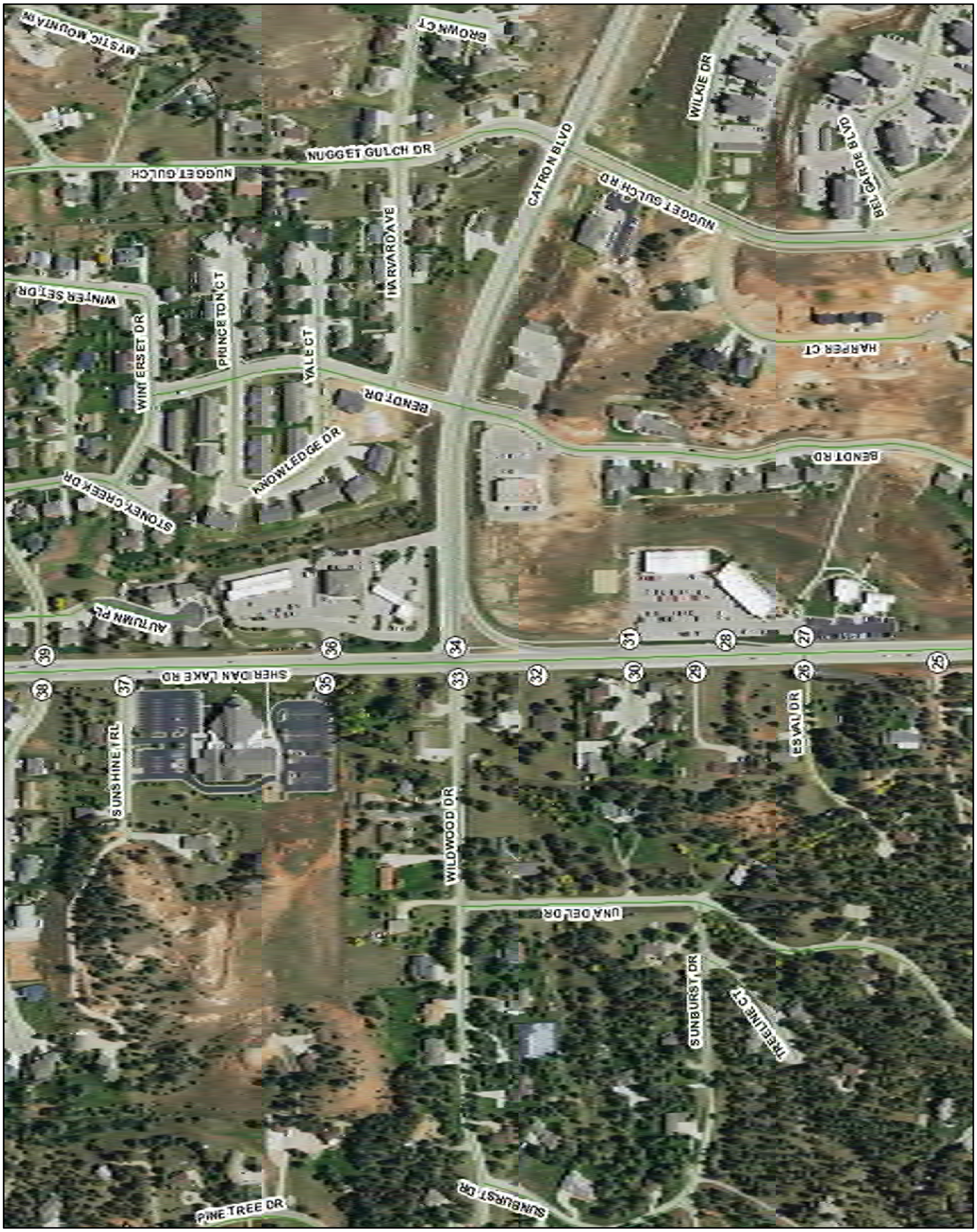
Sheridan Lake Road Access – Map 2

N

Sheridan Lake Road Access – Map 3

Sheridan Lake Road Access – Map 4

N



Sheridan Lake Road Access – Map 5

N

Sheridan Lake Road Access – Map 6

Sheridan Lake Road Traffic Study Report

Corral Drive to Albertta Drive

CITY OF RAPID CITY

Rapid City, South Dakota

Appendix D

Private Utility Review

and City Utility Maps

Memo

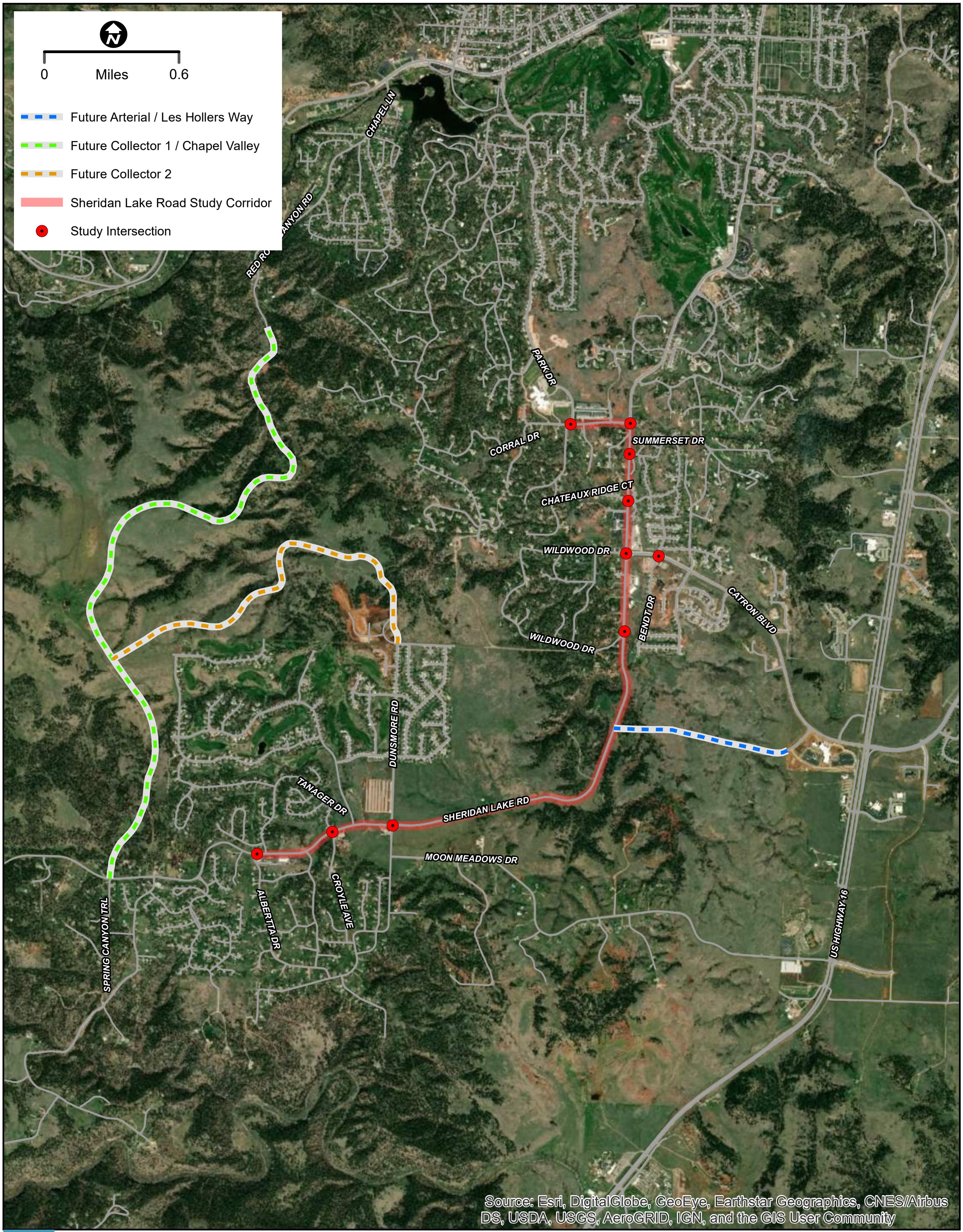
Date:	Wednesday, August 01, 2018
Project:	Sheridan Lake Road Traffic Study
To:	Todd Peckosh / CORC
From:	HDR
Subject:	Private Utility Review

The Sheridan Lake Road Traffic Study limits are shown in Figure 1 and includes the Sheridan Lake Road corridor between Corral Drive and Albertta Drive and the Corral Drive corridor between Park Drive and Sheridan Lake Road. As part of the traffic study, a high level review of public and private utilities was conducted in order to identify any potential major conflicts with a future roadway reconstruction project. This memo documents coordination conducted with private utilities.

The following utility companies provided a description of their facilities or included utility maps within the project area:

- SDN Communications (Paul Lowe)
- Black Hills Corporation (Rob Usera)
- Vast Broadband (Julie Burckhard)
- Midcontinent Communications (Terry Hofer)
- Montana Dakota Utilities (Kip Easton)

Critical facilities in this corridor that were identified with the initial coordination include the MDU regulator station at the southwest corner of Corral Drive and Sheridan Lake Road and the 10" steel gas line (155 psi) that parallels Sheridan Lake Road beginning north of Corral Drive and continuing south through Catron Boulevard. Modification of these facilities will have significant cost. Whether or not the City would bear this potential cost was not determined since right-of-way research and easement information was not collected as part of this study. Figure 2 shows some of the above ground utilities located along Corral Drive near Sheridan Lake Road.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

SHERIDAN LAKE ROAD STUDY CORRIDOR WITH FUTURE STREET ALTERNATIVES

FIGURE 1

Figure 2. Utilities at the southwest corner of Corral Drive and Sheridan Lake Road.

A summary of private facilities is included below. The utility maps are included at the end of this memo.

<u>SDN Communications</u>

- Corral Drive – north side of roadway from school to Sheridan Lake Road
- Sheridan Lake Road – west side of roadway between Corral Drive and Catron Boulevard
- Catron Boulevard – south side of roadway from Sheridan Lake Road and continuing east

<u>Black Hills Corporation</u>

- Corral Drive – Overhead Electric south side of roadway
- Sheridan Lake Road – Underground Electric east side of roadway between Corral Drive and extending 300’ south of Sunshine Trail
- Catron Boulevard – north side of roadway beginning 400’ east of Sheridan Lake Road (at drainageway) and continuing east

Vast Broadband

- Corral Drive – north side of roadway from Severson Street to Sheridan Lake Road
- Sheridan Lake Road – east side of roadway from Corral Drive and continuing north
- Sheridan Lake Road – 600’ section on east side of roadway at Summerset Drive and continuing south (to drainageway)
- Sheridan Lake Road – east side of roadway between Catron Boulevard and Esval Drive
- Sheridan Lake Road – west/north side from Wildwood Drive to Croyle Avenue.
- Catron Boulevard – south side of roadway from Sheridan Lake Road to Bendt Drive where it crosses to the north side
- Catron Boulevard - north side of roadway beginning 400’ east of Sheridan Lake Road (at drainageway) and continuing east

Midcontinent Communications

- Corral Drive – overhead on south side of roadway, underground crossing at Sheridan Lake Road
- Sheridan Lake Road – underground on east side of roadway between Corral Drive and Sunshine Trail
- Sheridan Lake Road – underground on east side of roadway between Catron Boulevard and Esval Drive
- Sheridan Lake Road – underground on east/south side of roadway from Wildwood Drive continuing through Albertta Drive with crossings at Dunsmore Road, Muirfield Drive and Tanager Drive
- Catron Boulevard – underground south side of roadway from Sheridan Lake Road and continuing east; crossing at Bendt Drive

Montana Dakota Utilities

- Corral Drive – Regulator station in the southwest quadrant of Corral Drive and Sheridan Lake Road
- Sheridan Lake Road – 4” Steel and Poly from Corral Drive and continuing north; 10” intermediate pressure steel from Corral Drive and continuing north
- Sheridan Lake Road – 4” poly and 10” intermediate pressure steel from Corral Drive and continuing south through Catron Boulevard; crossings at Corral Drive (2” poly), Summerset Drive (3” poly) and Catron Boulevard (4” poly).

Sheridan Lake Road Traffic Study
Utility Coordination Maps

Fagerness, Aaron

From:	Paul Lowe <Paul.Lowe@sdncommunications.com>
Sent:	Wednesday, July 25, 2018 11:01 AM
To:	Fagerness, Aaron
Subject:	RE: Sheridan Lake Road Project - Corral Drive to Albertta Drive

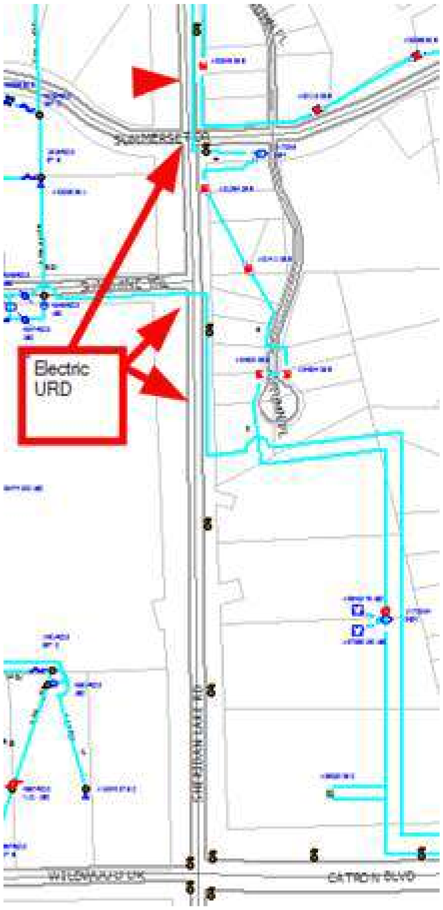
We have facilities going to the school on the north side of Corral then going south on the west side of Sheridan Lake Road and east on the south side of Catron-3x1.25 Inch Conduit with a fiber in one conduit-Thanks Paul

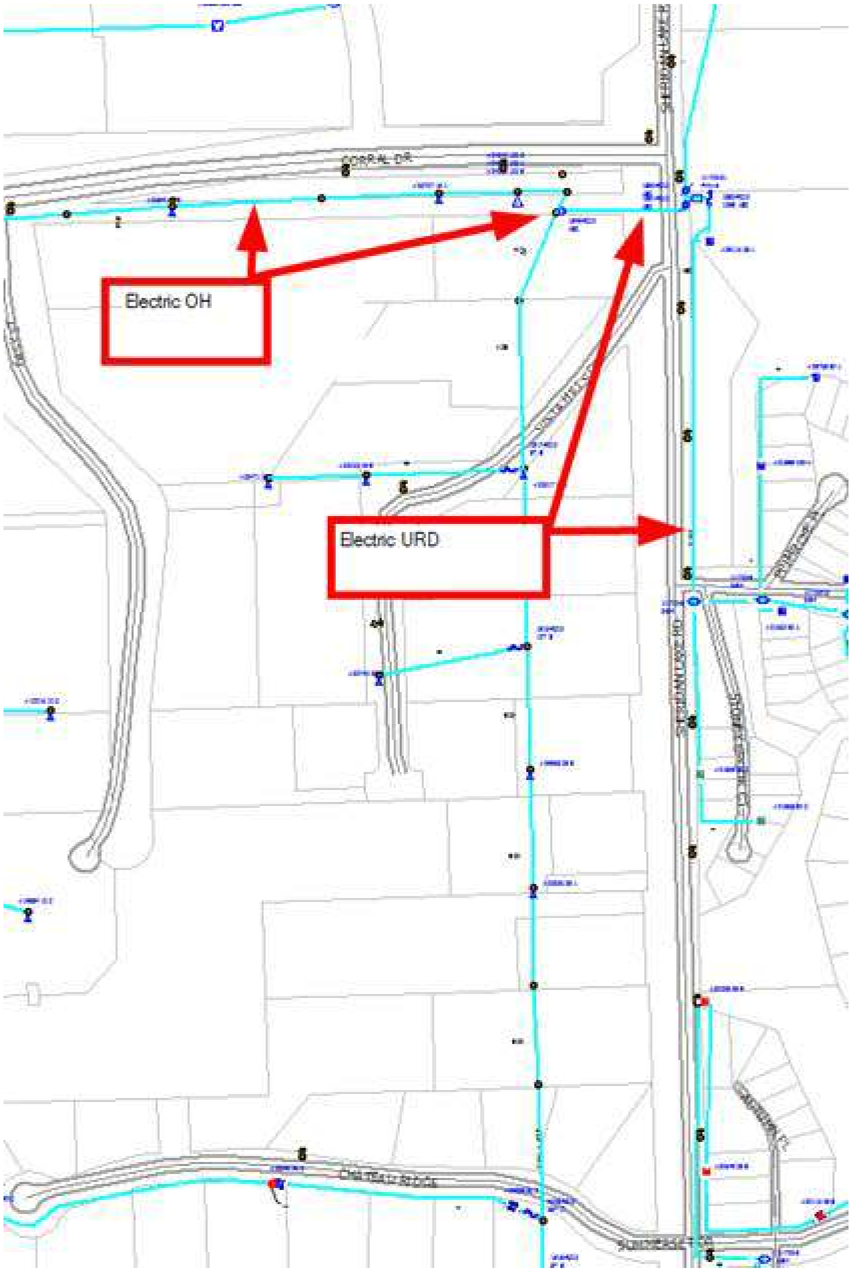
Fagerness, Aaron

From:	Usera, Rob <Rob.Usera@blackhillscorp.com>
Sent:	Wednesday, July 25, 2018 2:58 PM
To:	Fagerness, Aaron
Cc:	Lewis, Brian
Subject:	FW: Sheridan Lake Road Project - Corral Drive to Albertta Drive
Attachments:	Sheridan Lake Road Study - Location Map.pdf; ATT00001.htm

Aaron,

Here is a general area of our facilities that may be impacted along that route. Let me know if you have any questions.





Thanks

Robert M. Usera

Manager of Utility Construction Planning
Office: 605-721-2618
Mobile: 605-391-7587

From: Schwengler, Louie
Sent: Wednesday, July 25, 2018 12:22 PM
To: Usera, Rob <Rob.Usera@blackhillscorp.com>
Subject: Fwd: Sheridan Lake Road Project - Corral Drive to Albertta Drive

Sent from my iPhone

From: Julie Burckhard <Julie.Burckhard@vastbroadband.com>
Sent: Wednesday, July 25, 2018 3:50 PM
To: Fagerness, Aaron
Subject: RE: Sheridan Lake Road Project - Corral Drive to Albertta Drive
Attachments: SKM_C364e18072503050.pdf

Hi Aaron,

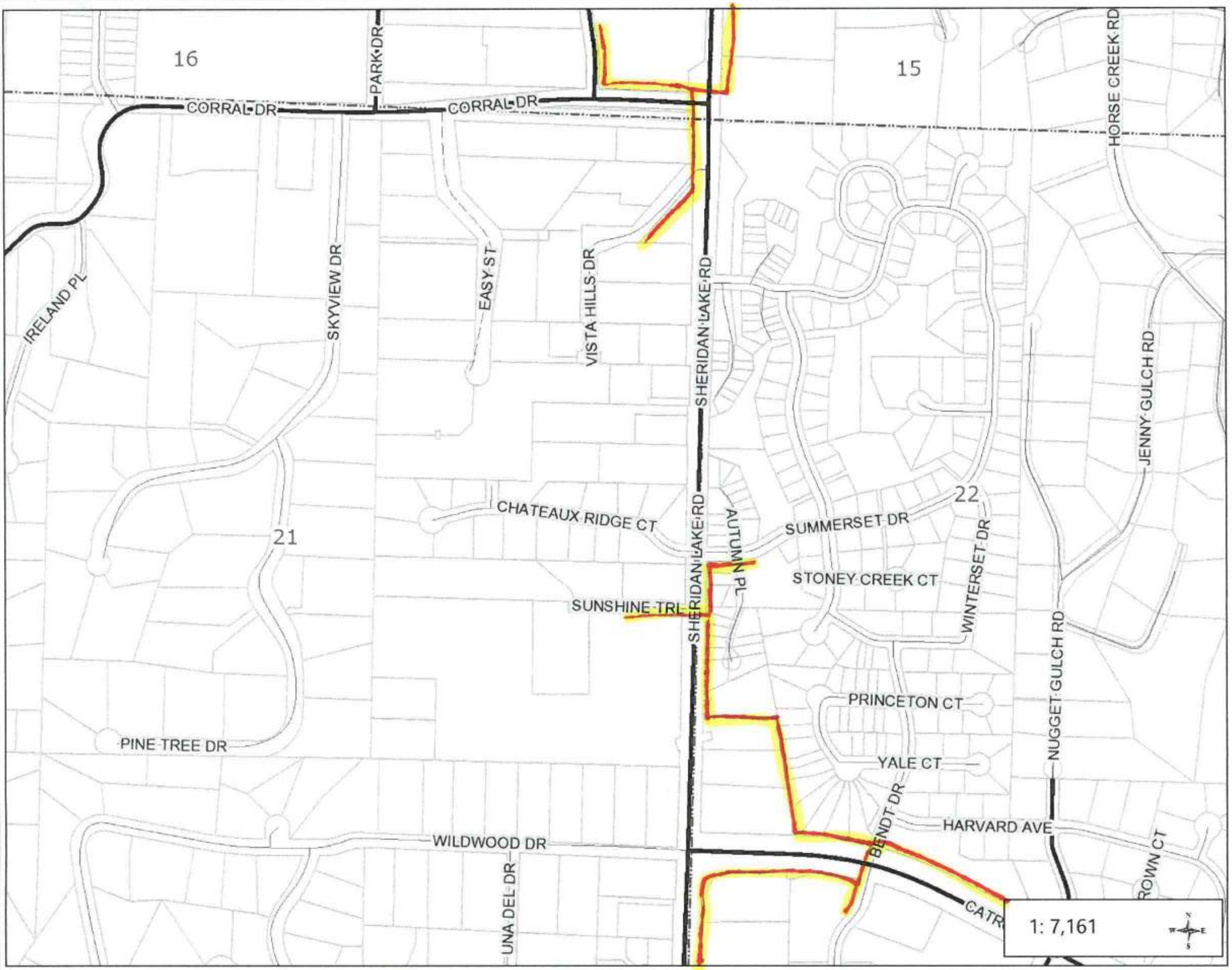
I've attached a couple maps to give you a rough idea where Vast has underground plant. Also we do have plant on the pole lines in this area. I don't show those on the maps. If you need that information let me know. If you have questions feel free to email or call.

Thanks,

Julie Burckhard
Construction Supervisor

809 Deadwood Avenue
Rapid City, SD 57702
Tel: **605-716-3769**
Cell: **605-415-0692**

RapidMap Rapid City - Pennington County GIS



1,193.6 0 596.79 1,193.6 Feet

NAD_1983_2011_StatePlane_South_Dakota_South_FIPS_4002_Ft_US

Legend

Roads

- Interstate
- US highway
- SD highway
- County highway
- Main road
- Minor arterial
- Collector
- Ramp
- Paved road
- Unpaved road
- Unimproved road
- Trail
- Airport Runway
- Not yet coded

Section Lines 0-25k

- 0
- 7

☐ Tax Parcels

Lot Lines

- <Null>
- Lot Line
- Parcel Line

Map Notes:

— = Vast Underground coax/fiber

RapidMap Rapid City - Pennington County GIS

2,638.1 0 1,319.03 2,638.1 Feet

NAD_1983_2011_StatePlane_South_Dakota_South_FIPS_4002_Ft_US

Legend

Roads
- Interstate
- US highway
- SD highway
- County highway
- Main road
- Minor arterial
- Collector
- Ramp
- Paved road
- Unpaved road
- Unimproved road
- Trail
- Airport Runway
- Not yet coded

Section Lines 0-25k
- 0
- 7

☐ Tax Parcels

Lot Lines
- <Null>
- Lot Line
- Parcel Line

Map Notes:

= Vast Underground coax / fiber

From: Terry Hofer <Terry.Hofer@Midco.com>
Sent: Thursday, July 26, 2018 11:23 AM
To: Fagerness, Aaron
Subject: RE: [EXTERNAL] - Sheridan Lake Road Project - Corral Drive to Albertta Drive
Attachments: Sheridan Lake Road.dwg

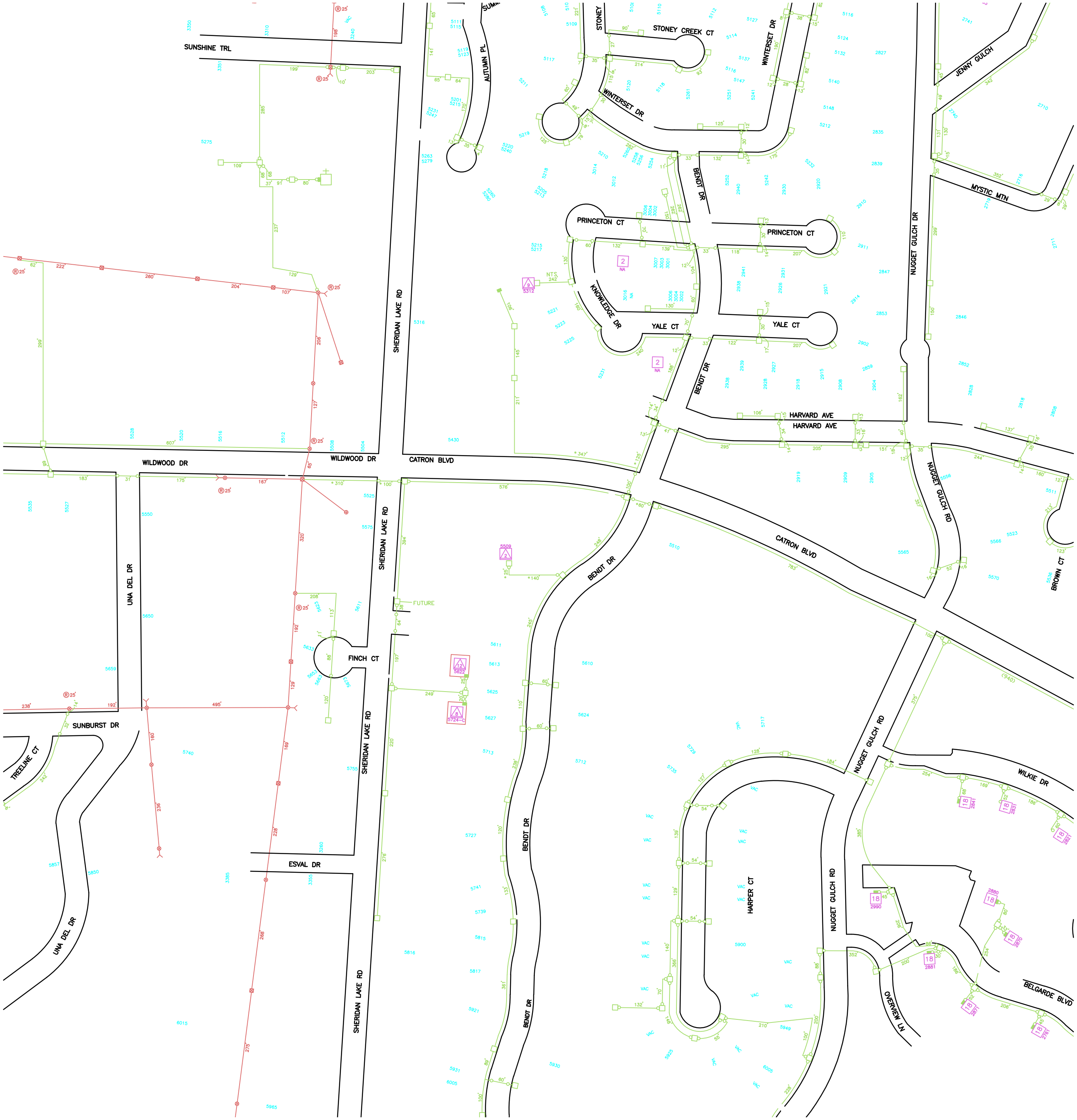
Here you go
Anything in green is underground facility
Anything in red is overhead facility.
Let me know if you need anything else.

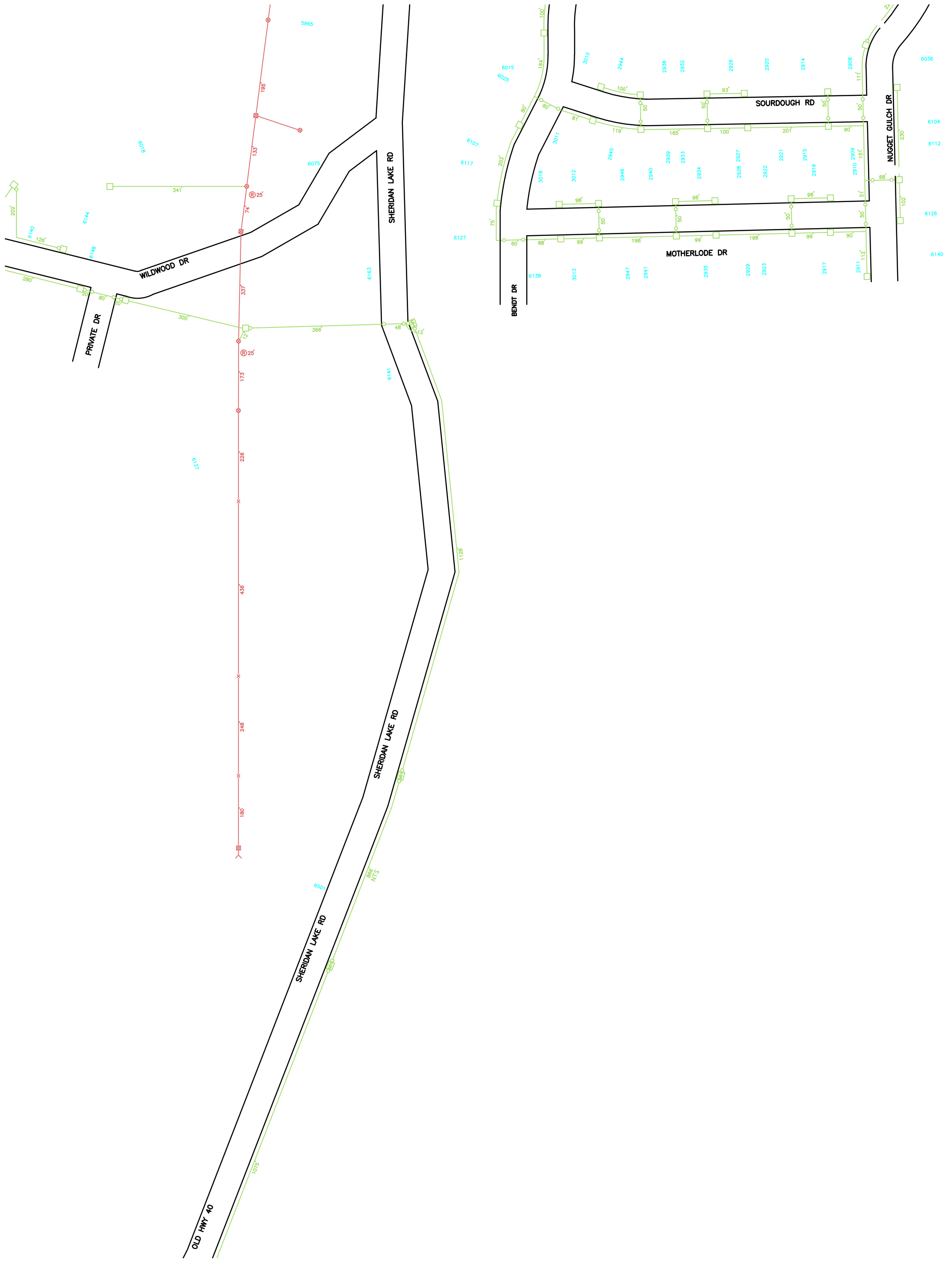
Terry Hofer
CONSTRUCTION COORDINATOR III

Office: 605.791.7123
Terry.Hofer@Midco.com

Midco.com

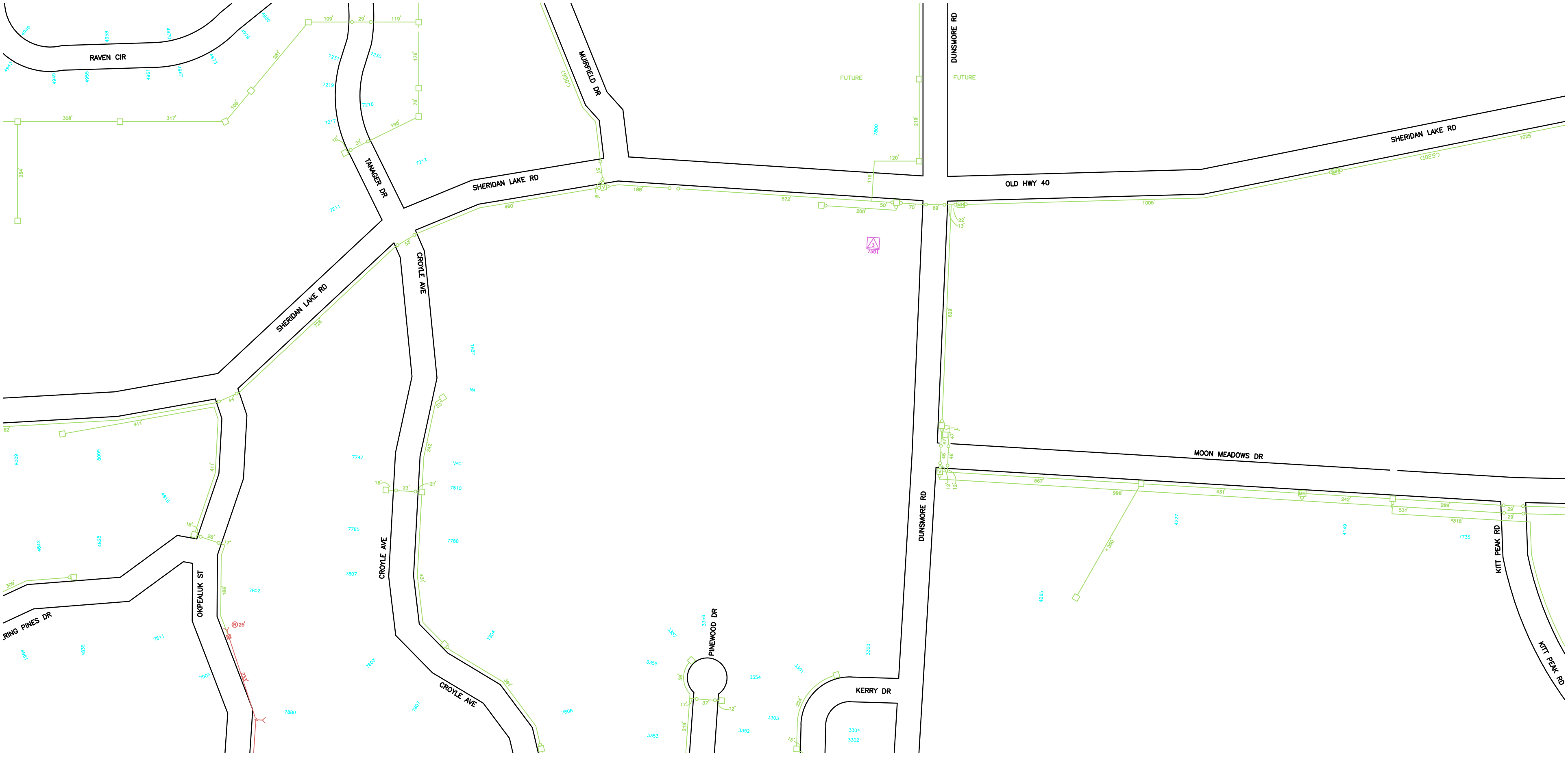

PARK DR
EMPTY CONDUIT
SHERIDAN LAKE RD
SPRINGBROOK RD
BOBTAIL GULCH
WINESTONE LN
SEVERSON ST
CORRAL DR
CORRAL DR
NEEDS ATTACHMENT
CORRAL DR
IRELAND PL
SKYVIEW DR
EASY ST
VISTA HILLS DR
SHERIDAN LAKE RD
PRIMROSE PT
SUNNY HILLS CIR
RIDGECREST CT
SUMMERSET DR
SUMMERSET DR
PRAIRIE ROSE PT
PRAIRIE ROSE PL
STONEY CREEK DR
SPRINGTREE CT
SUMMERSET DR
CHATEAUX RIDGE CT
SHERIDAN LAKE RD
AUTUMN PL
SUMMERSET DR
STONEY CREEK DR
STONEY CREEK CT
WINTERSET DR
SUNSHINE TRL
AUTUMN PL
48
3440
48
3420
48
3430
48
3410
VAC

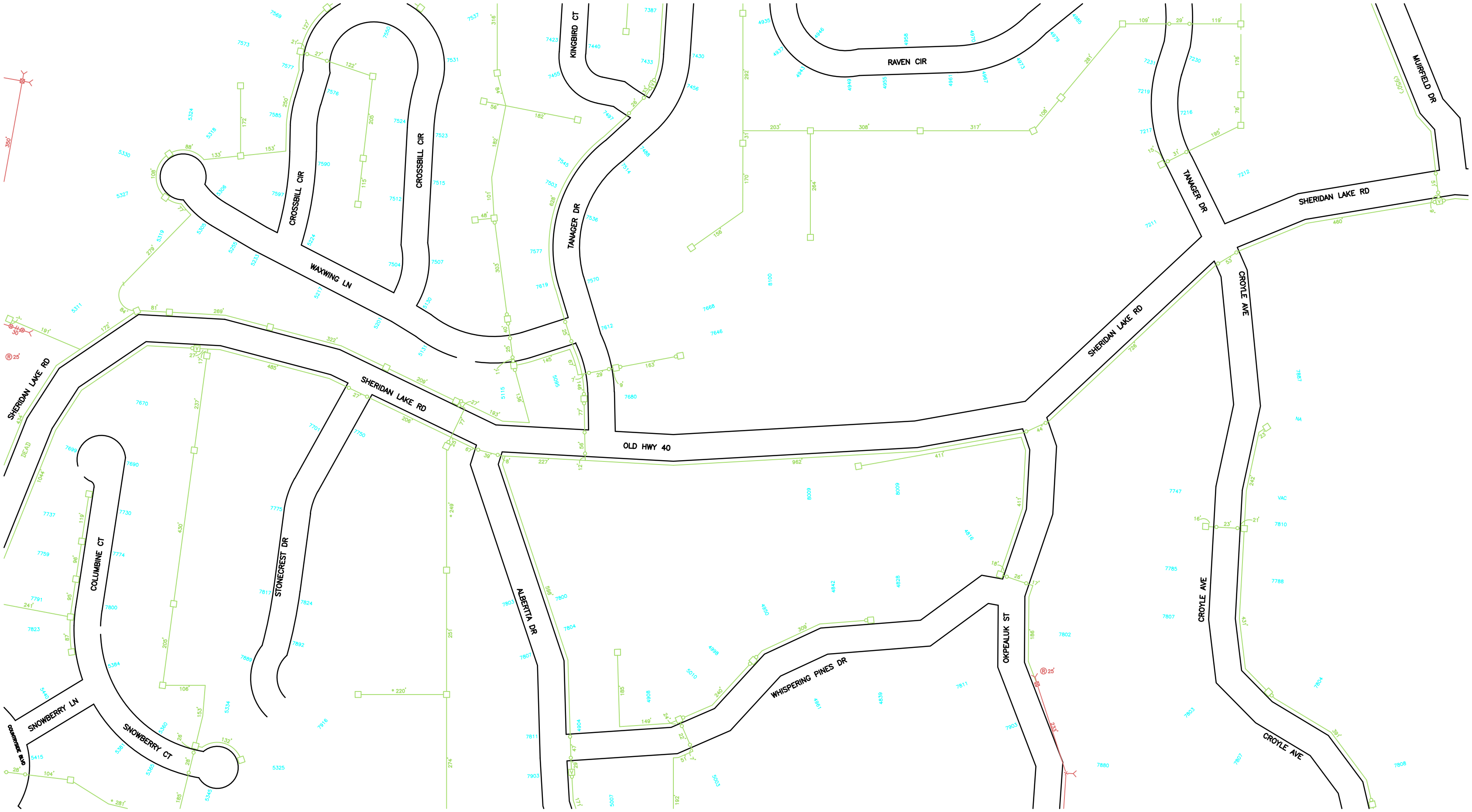

SUNSHINE TRL
AUTUMN PL
STONEY
STONEY CREEK CT
WINTERSET DR
WINTERSET DR
JENNY GULCH
MYSTIC MTN
NUGGET GULCH DR
PRINCETON CT
PRINCETON CT
BENDT DR
KNOWLEDGE DR
YALE CT
YALE CT
BENDT DR
HARVARD AVE
HARVARD AVE
SHERIDAN LAKE RD
WILDWOOD DR
WILDWOOD DR
CATRON BLVD
CATRON BLVD
NUGGET GULCH RD
BROWN CT
BENDT DR
SHERIDAN LAKE RD
UNA DEL DR
FUTURE
NTS
FINCH CT
SUNBURST DR
TREELINE CT
SHERIDAN LAKE RD
NUGGET GULCH RD
WILKIE DR
BENDT DR
HARPER CT
NUGGET GULCH RD
ESVAL DR
UNA DEL DR
OVERVIEW LN
BELGARDE BLVD
SHERIDAN LAKE RD
BENDT DR



SHERIDAN LAKE RD
SHERIDAN LAKE RD
SHERIDAN LAKE RD
OLD HWY 40
WILDWOOD DR
PRIVATE DR
BENDT DR
SOURDOUGH RD
MOTHERLODE DR
NUGGET GULCH DR
5965
6018
6075
6144
6140
6148
6163
6141
6137
6501
6107
6117
6127
6015
6025
6036
6104
6112
6126
6140
6138
3010
2944
2938
2932
2926
2920
2914
2908
3011
2945
2939
2933
2927
2921
2915
2909
3018
3012
2946
2940
2934
2928
2922
2916
2910
3013
2947
2941
2935
2929
2923
2917
2911
195'
133'
74'
337'
173'
226'
436'
248'
180'
®25'
®25'
341'
202'
126'
280'
20'
80'
20'
300'
12'
366'
48'
12'
MH
MH
MH
1128'
866'
NTS
1075'
100'
164'
80'
203'
75'
60'
60'
81'
119'
100'
93'
165'
100'
201'
90'
50
50'
50'
50'
111'
151'
68'
51'
50'
230'
102'
98'
98'
98'
50'
50
50'
88'
99'
198'
99'
198'
99'
90'
112'


6501
866'
NTS
SHERIDAN LAKE RD
MH
1075'
OLD HWY 40
MH
SHERIDAN LAKE RD
1144'
SHERIDAN LAKE RD
MH
OLD HWY 40
1120'
MH
SHERIDAN LAKE RD
1010'
OLD HWY 40
MH
1025'
3920 ½
3920


RAVEN CIR
TANAGER DR
MUIRFIELD DR
SHERIDAN LAKE RD
SHERIDAN LAKE RD
SHERIDAN LAKE RD
DUNSMORE RD
DUNSMORE RD
OLD HWY 40
FUTURE
FUTURE
CROYLE AVE
CROYLE AVE
CROYLE AVE
MOON MEADOWS DR
KITT PEAK RD
KITT PEAK RD
OKPEALUK ST
RING PINES DR
PINEWOOD DR
KERRY DR
308'
317'
109'
29'
119'
1005'
(1025')
460'
188'
572'
200'
50'
70'
69'
567'
431'
242'
289'
VAC


SHERIDAN LAKE RD
CROSSBILL CIR
CROSSBILL CIR
WAXWING LN
KINGBIRD CT
TANAGER DR
RAVEN CIR
TANAGER DR
MURFFIELD DR
SHERIDAN LAKE RD
SHERIDAN LAKE RD
SHERIDAN LAKE RD
CROYLE AVE
OLD HWY 40
STONECREST DR
COLUMBINE CT
ALBERTA DR
OKPEALUK ST
WHISPERING PINES DR
CROYLE AVE
CROYLE AVE
SNOWBERRY LN
SNOWBERRY CT

From: Easton, Kip <Kip.Easton@mdu.com>
Sent: Friday, July 27, 2018 11:45 AM
To: Fagerness, Aaron
Subject: FW: Sheridan Lake Road Project - Corral Drive to Albertta Drive
Attachments: Sheridan Lk Rd - Corral to Catron - Page 1.pdf; Sheridan Lk Rd - Corral to Catron - Page 2.pdf; Sheridan Lk Rd - Corral to Catron - Page 3.pdf; Sheridan Lk Rd - Corral to Catron - Page 4.pdf

Aaron,

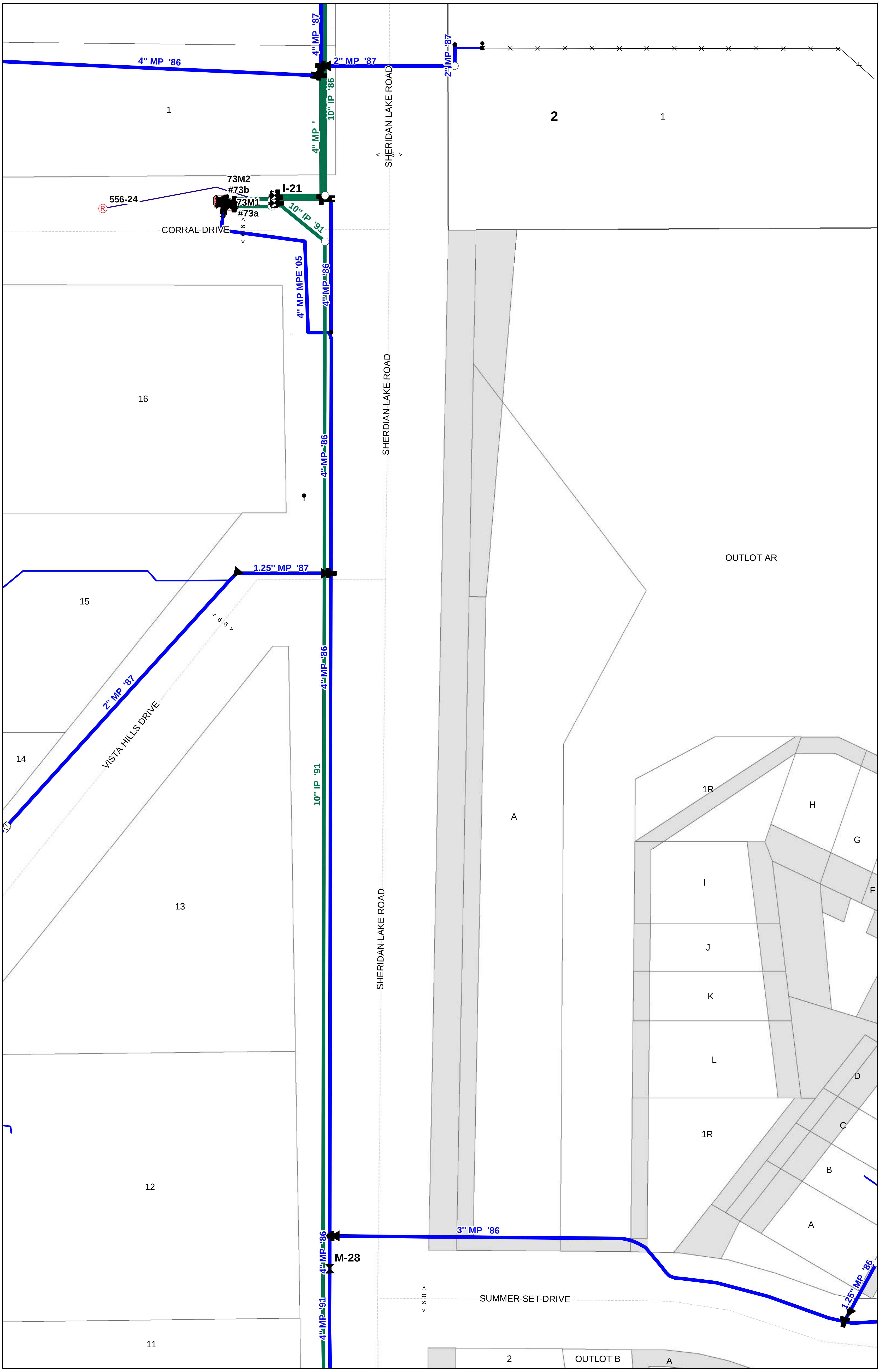
I have included a few snap shots of our system from Corral Dr. to Catron Blvd. Page 1 will show our regulator station on the Southwest corner of Sheridan Lake Rd. and Corral Dr. The station is a very significant part of our infrastructure and will be difficult and expense to move or adjust. The following pages will show our distribution system to include medium pressure and intermediate pressure lines on Sheridan lake Rd.

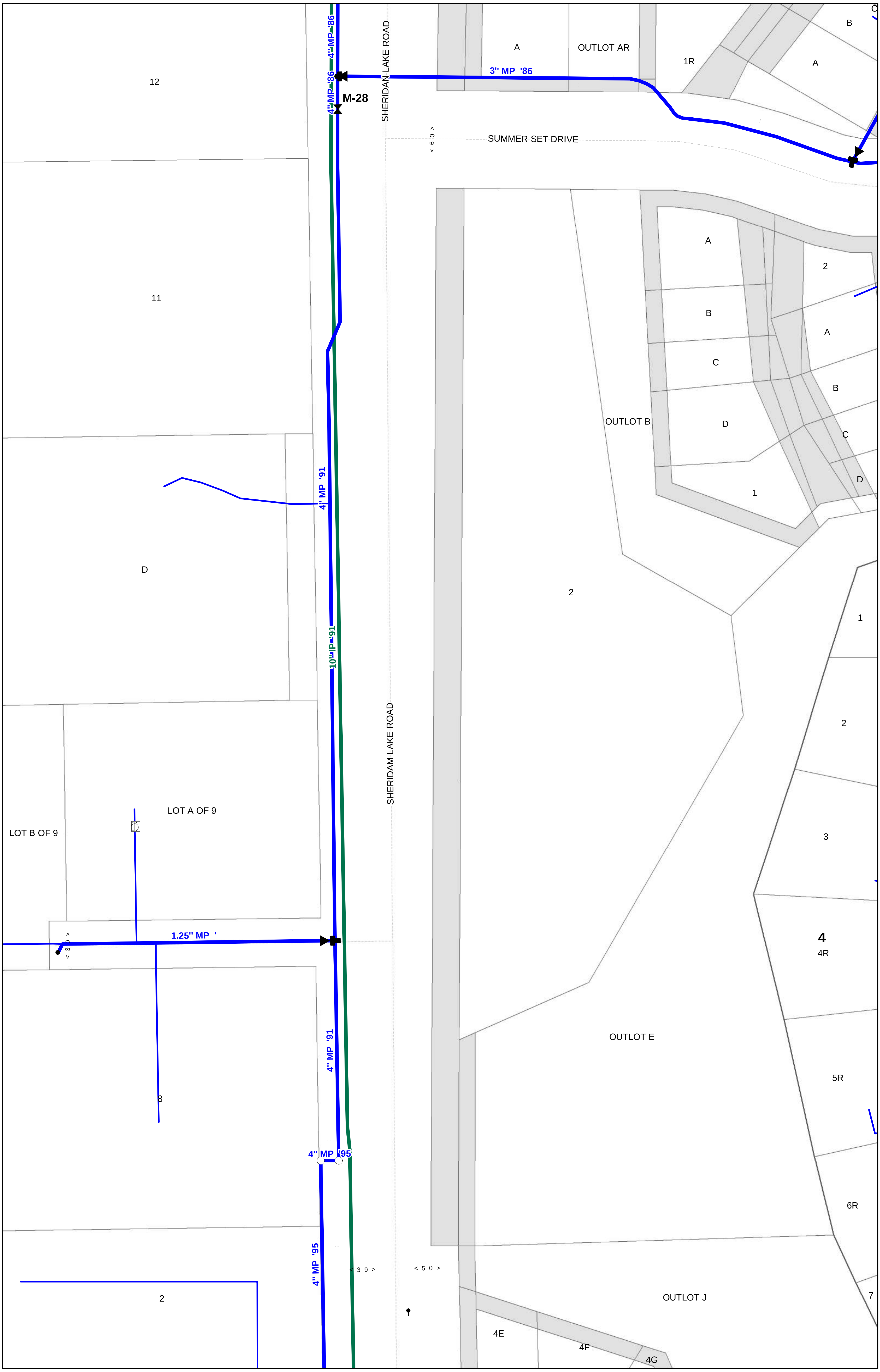
A blue line will indicate a poly line and green will be a steel line, both will be marked with size, pressure class and vintage.

For example: 10” IP ’91 in green would indicate a 10” steel line with intermediate pressure (155psi) and installed in 1991.

If I can be of further help let me know.

Kip Easton
Engineering Associate
Montana Dakota Utilities
Black Hills Region
Cell: 605-391-8932
Office: 605-355-4032
kip.easton@mdu.com


4" MP '87
4" MP '86
2" MP '87
2" MP '87
10" IP '86
4" MP '
SHERIDAN LAKE ROAD
2
1
1
73M2
#73b
556-24
Ⓡ
I-21
73M1
#73a
10" IP '91
CORRAL DRIVE
< 6 6 >
4" MP MPE '05
4" MP '86
16
SHERIDAN LAKE ROAD
4" MP '86
OUTLOT AR
1.25" MP '87
15
< 6 6 >
4" MP '86
2" MP '87
VISTA HILLS DRIVE
14
10" IP '91
1R
H
A
G
I
F
13
SHERIDAN LAKE ROAD
J
K
L
D
C
1R
B
12
A
3" MP '86
4" MP '86
M-28
1.25" MP '86
< 6 0 >
SUMMER SET DRIVE
4" MP '91
11
2
OUTLOT B
A


12
4" MP '86
4" MP '86
M-28
SHERIDAN LAKE ROAD
A
OUTLOT AR
3" MP '86
1R
B
A
C
< 6 0 >
SUMMER SET DRIVE
11
A
2
B
A
C
B
OUTLOT B
D
C
D
1
4" MP '91
D
2
1
10" IP '91
SHERIDAM LAKE ROAD
2
LOT A OF 9
LOT B OF 9
3
< 3 0 >
1.25" MP '
4
4R
OUTLOT E
4" MP '91
5R
8
4" MP '95
6R
4" MP '95
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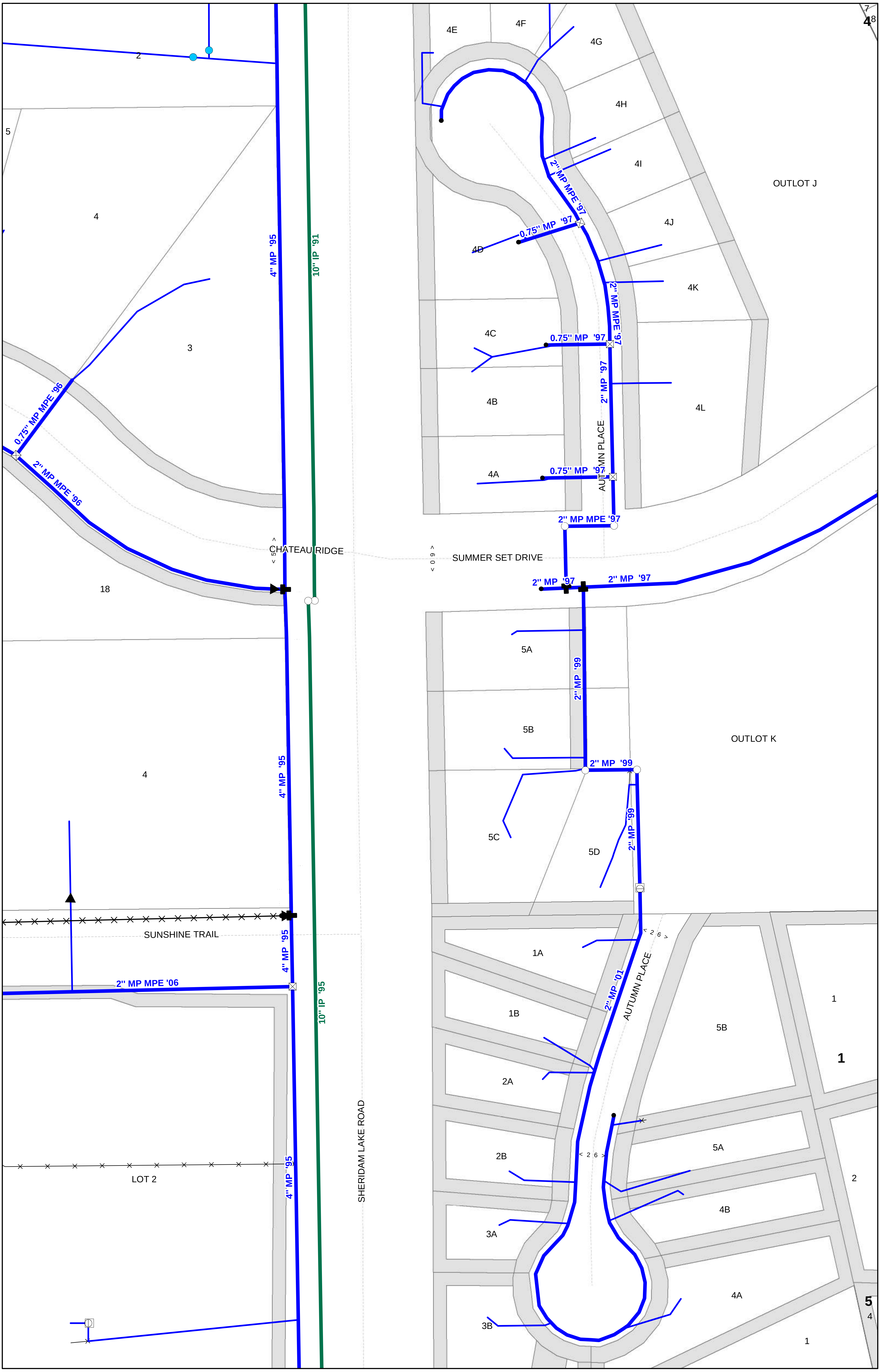
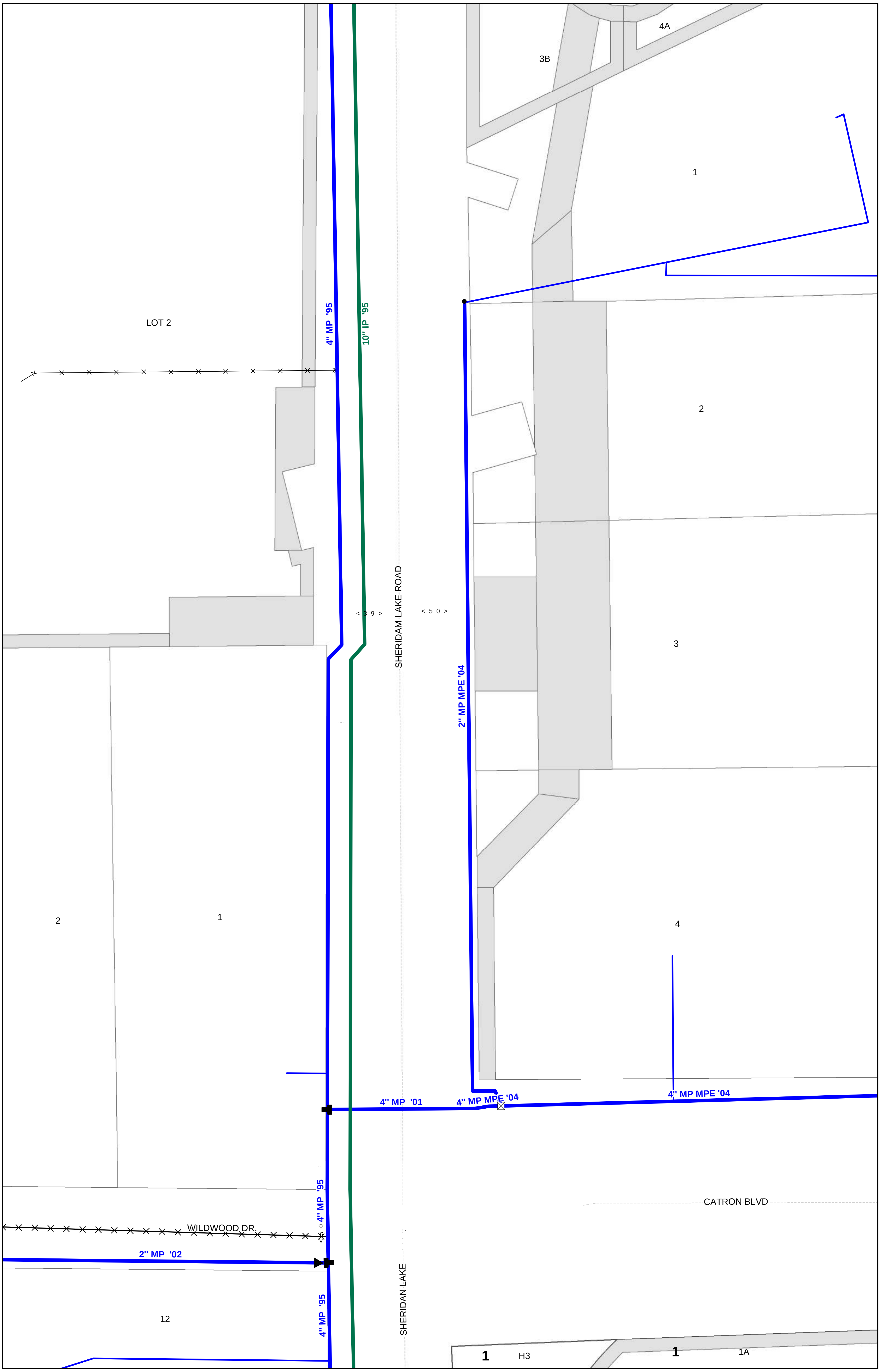
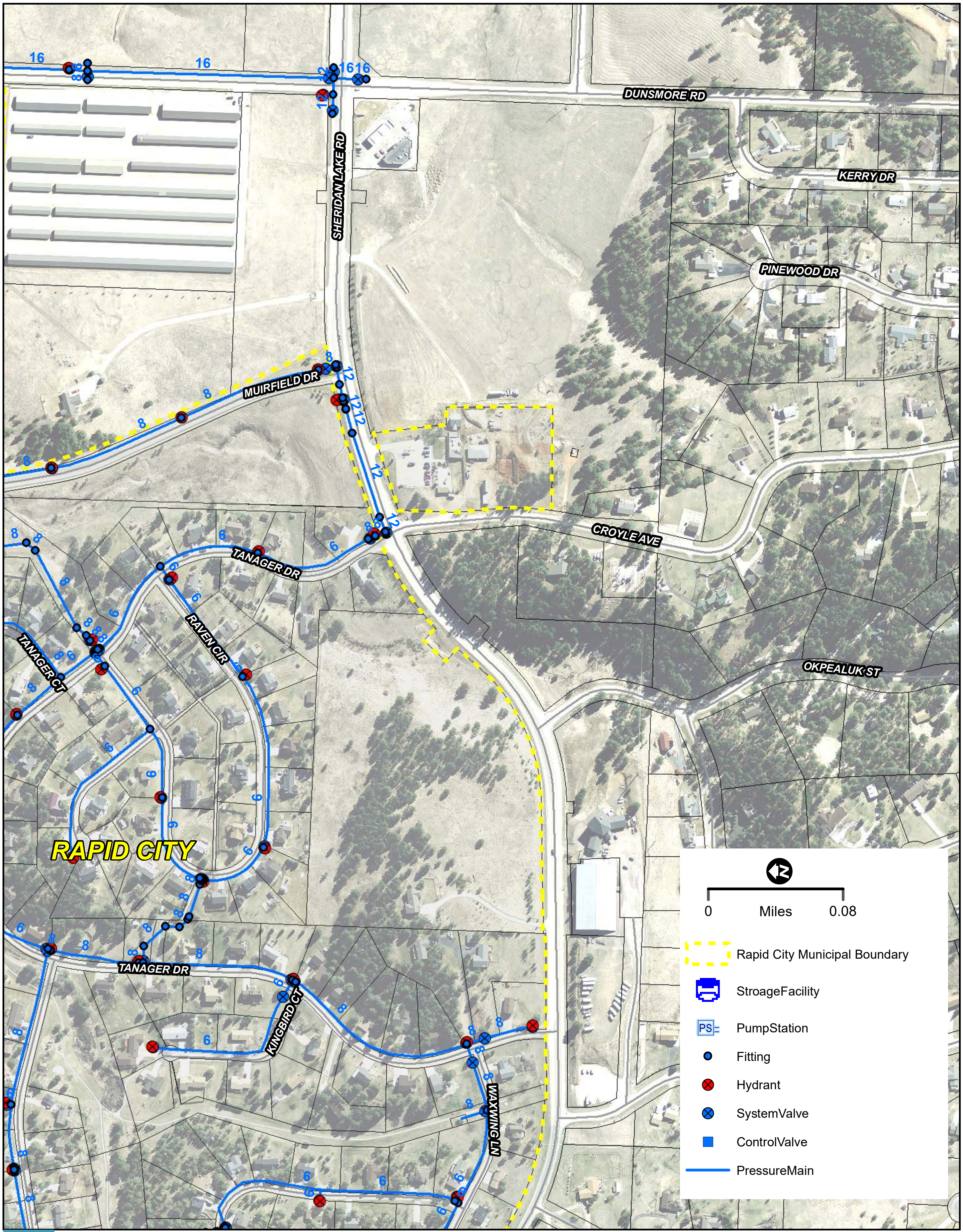
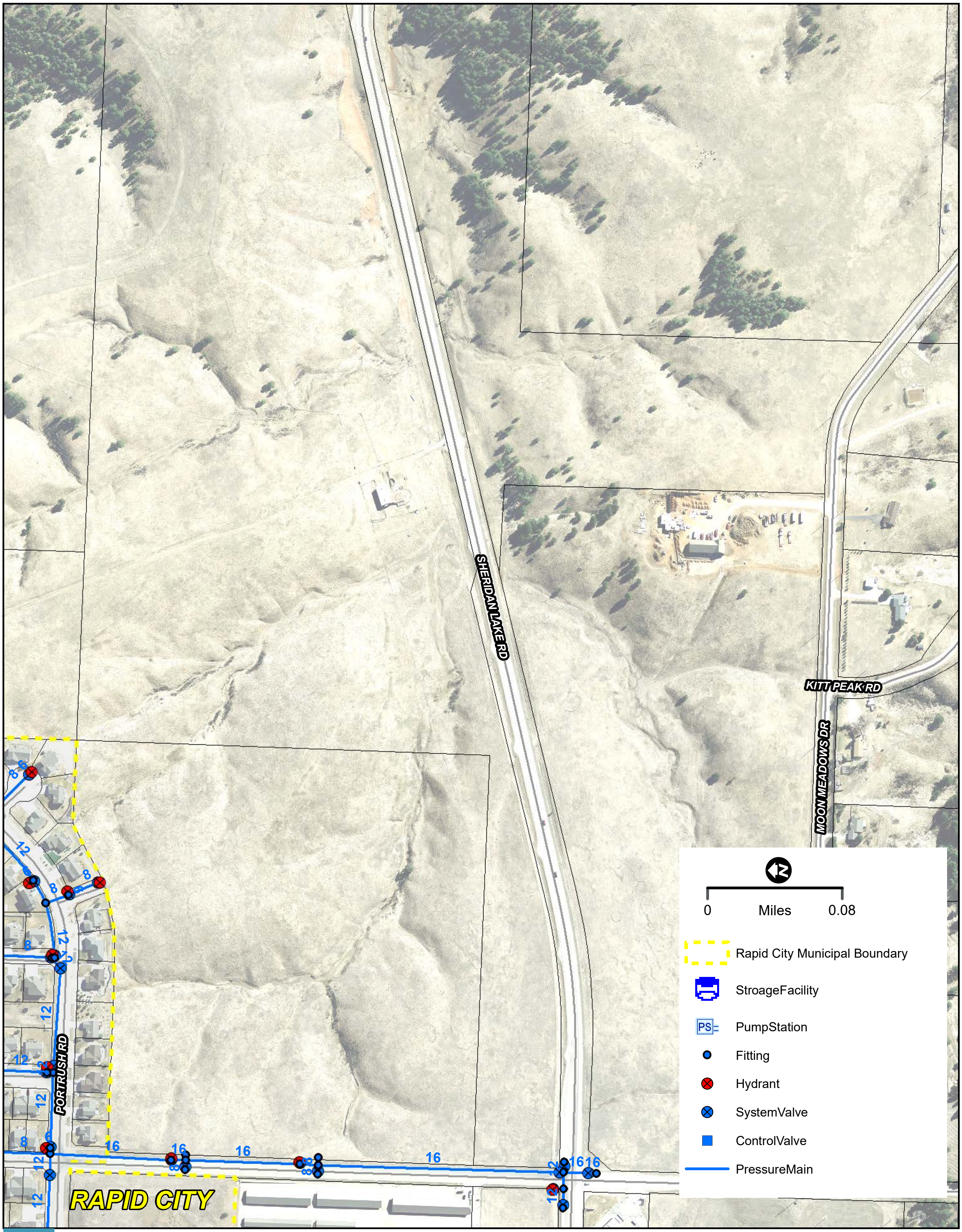
< 5 0 >
2
OUTLOT J
7
4E
4F
4G


7
4
8
2
4E
4F
4G
4H
4I
OUTLOT J
5
4
4J
4K
4D
0.75" MP '97
2" MP MPE '97
4" MP '95
10" IP '91
3
4C
0.75" MP '97
2" MP MPE '97
2" MP '97
4B
4L
0.75" MP MPE '96
2" MP MPE '96
4A
0.75" MP '97
AUTUMN PLACE
2" MP MPE '97
CHATEAU RIDGE
< 5 >
< 0 9 >
SUMMER SET DRIVE
2" MP '97
2" MP '97
18
5A
2" MP '99
5B
OUTLOT K
4
4" MP '95
2" MP '99
5C
5D
2" MP '99
SUNSHINE TRAIL
< 2 6 >
1A
4" MP '95
2" MP MPE '06
10" IP '95
2" MP '01
AUTUMN PLACE
1B
1
5B
1
2A
2B
< 2 6 >
5A
LOT 2
4" MP '95
SHERIDAM LAKE ROAD
2
4B
3A
4A
5
4
3B
1

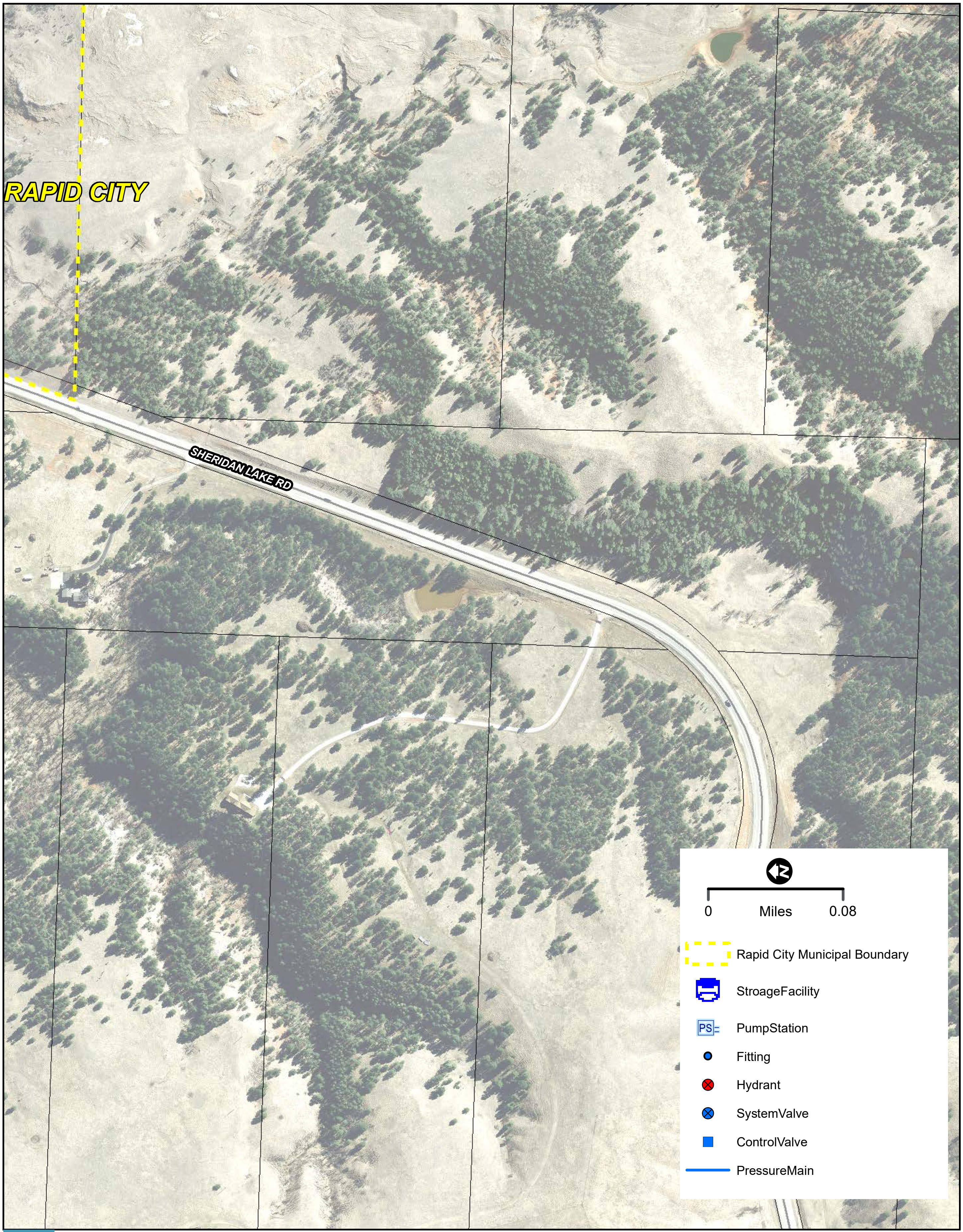

4A
3B
1
LOT 2
4" MP '95
10" IP '95
2
< 3 9 >
SHERIDAM LAKE ROAD
< 5 0 >
3
2" MP MPE '04
2
1
4
4" MP '01
4" MP MPE '04
4" MP MPE '04
CATRON BLVD
WILDWOOD DR.
4" MP '95
2" MP '02
12
4" MP '95
SHERIDAN LAKE
1
H3
1
1A



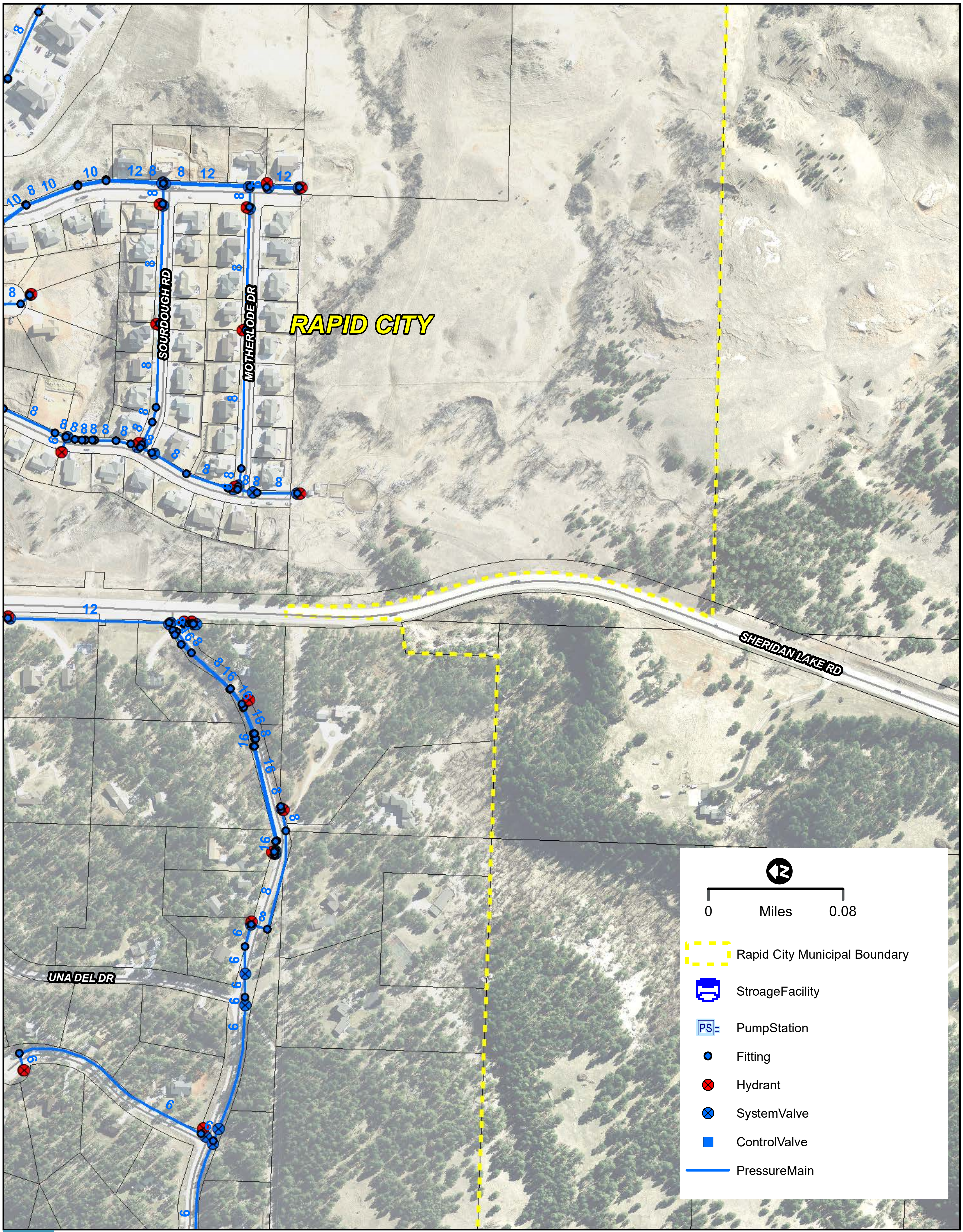
SHERIDAN LAKE ROAD GIS - WATER MAP 1



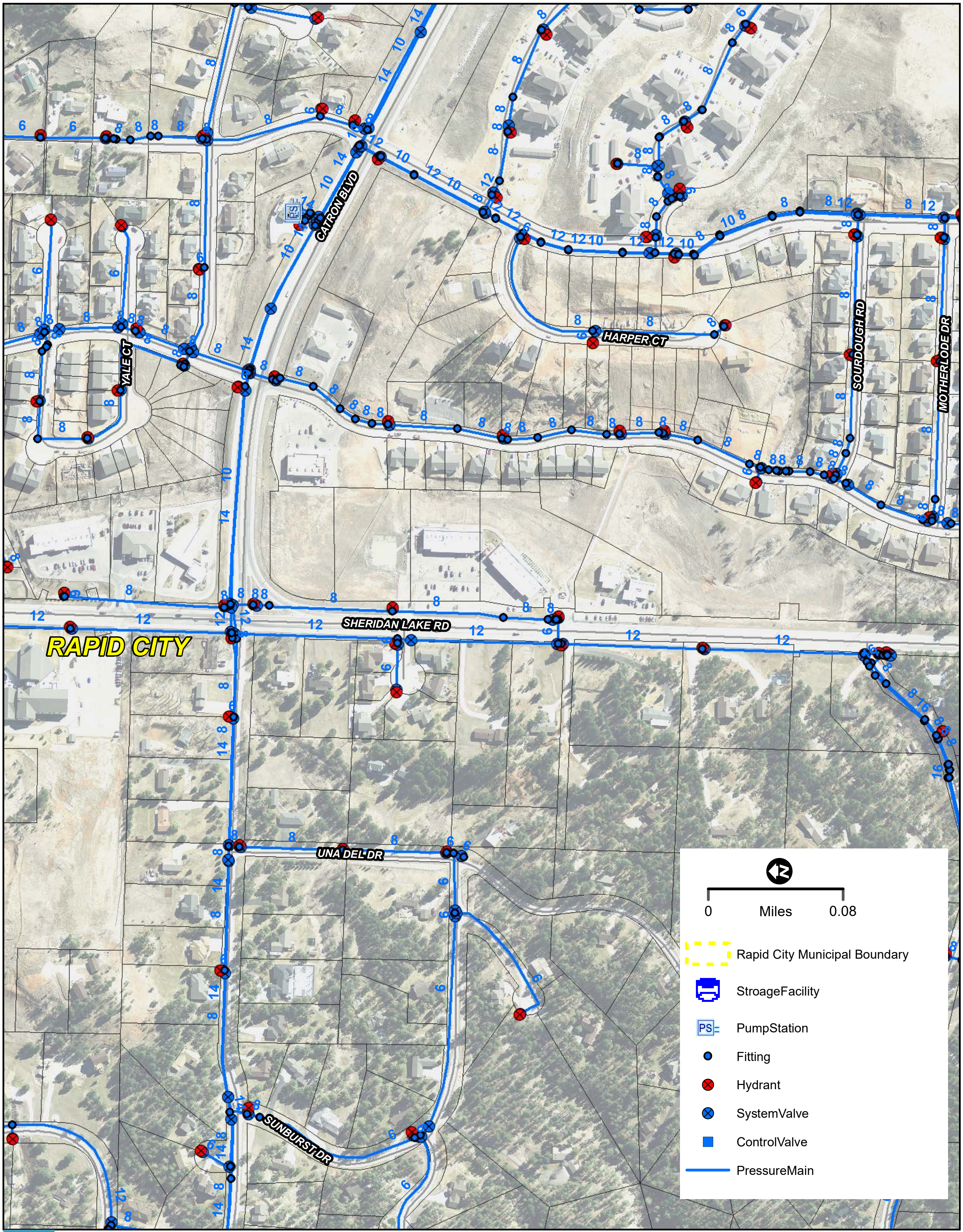
SHERIDAN LAKE ROAD GIS - WATER MAP 2



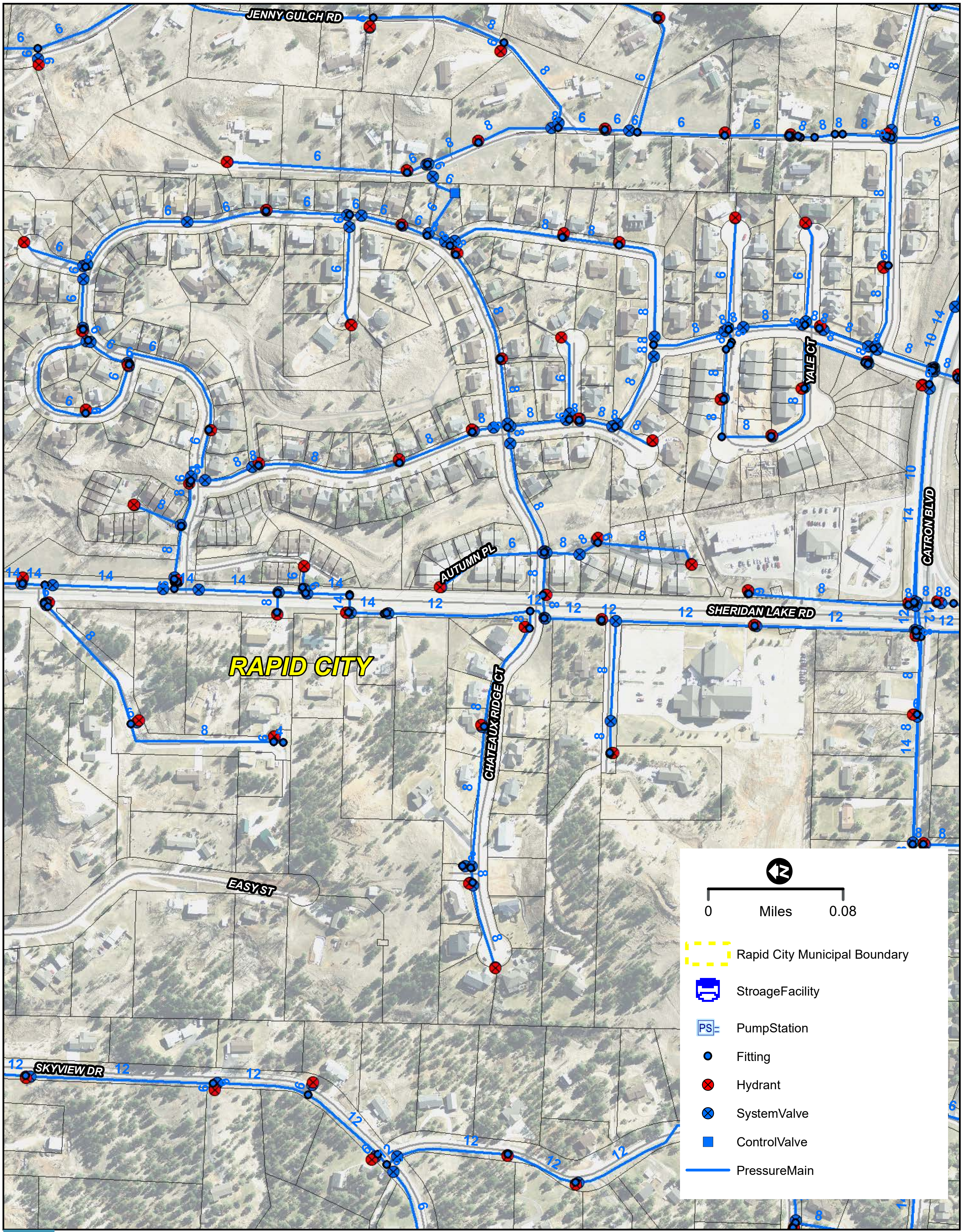
SHERIDAN LAKE ROAD GIS - WATER MAP 3



SHERIDAN LAKE ROAD GIS - WATER MAP 4

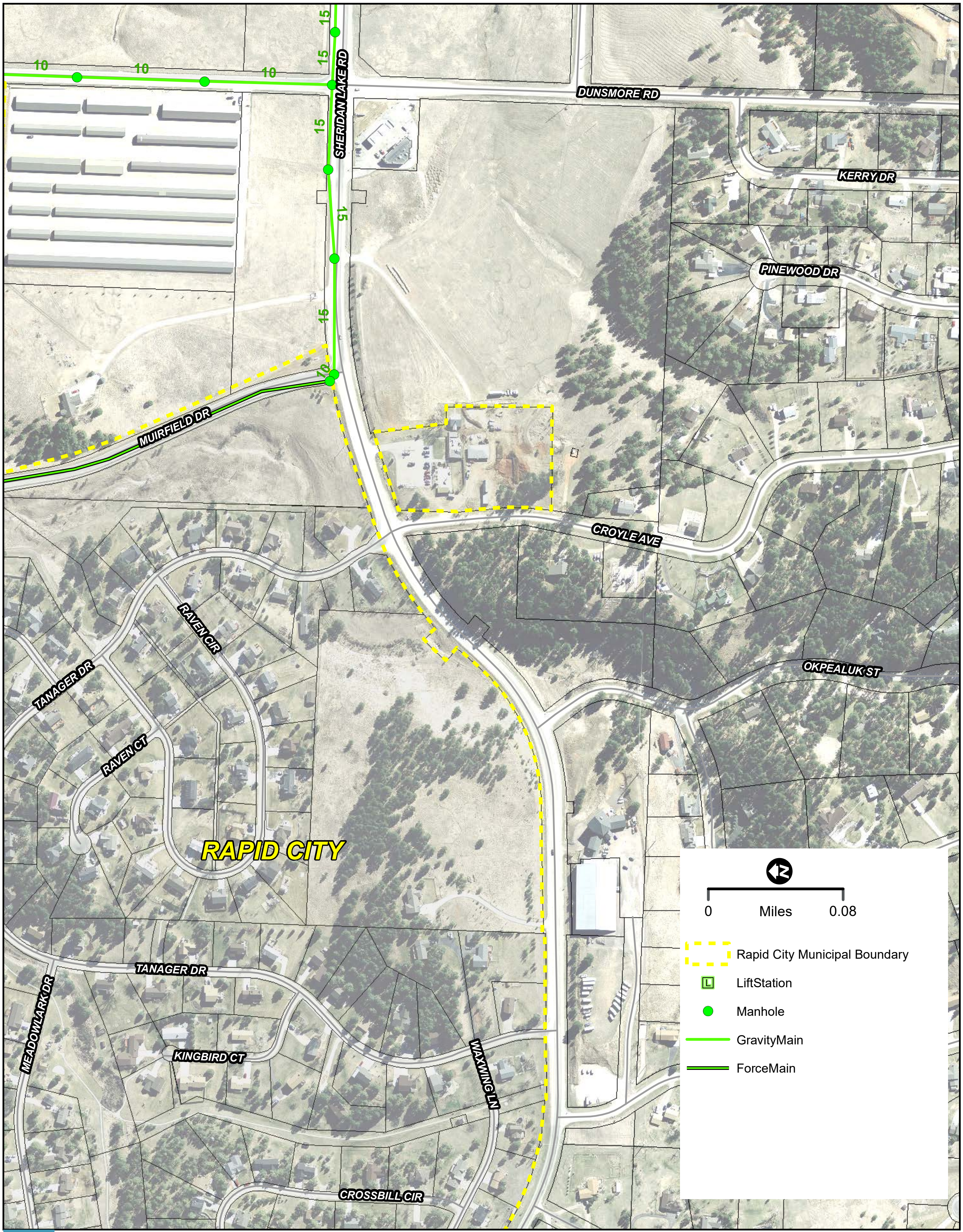


SHERIDAN LAKE ROAD GIS - WATER MAP 5

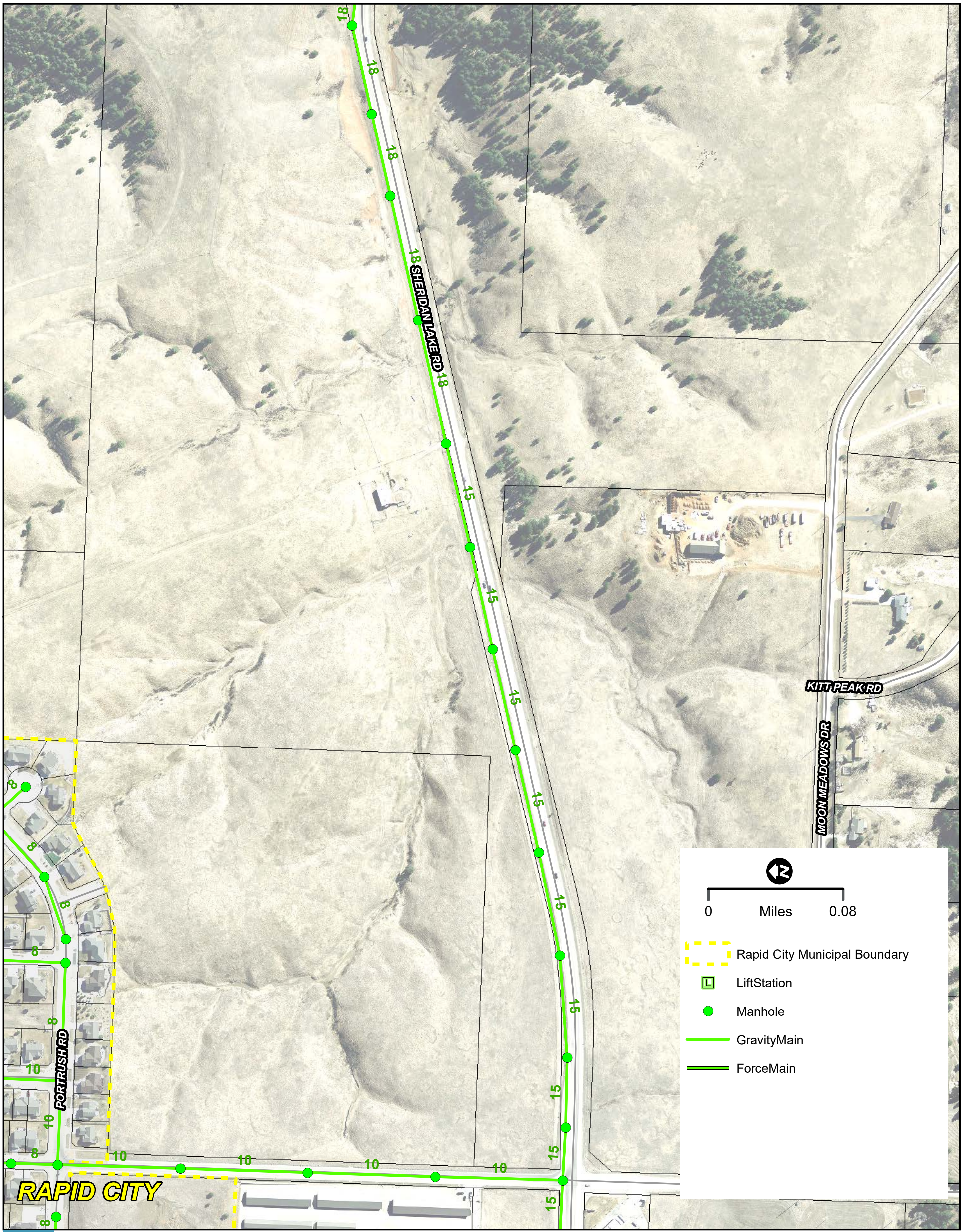


SHERIDAN LAKE ROAD GIS - WATER MAP 6

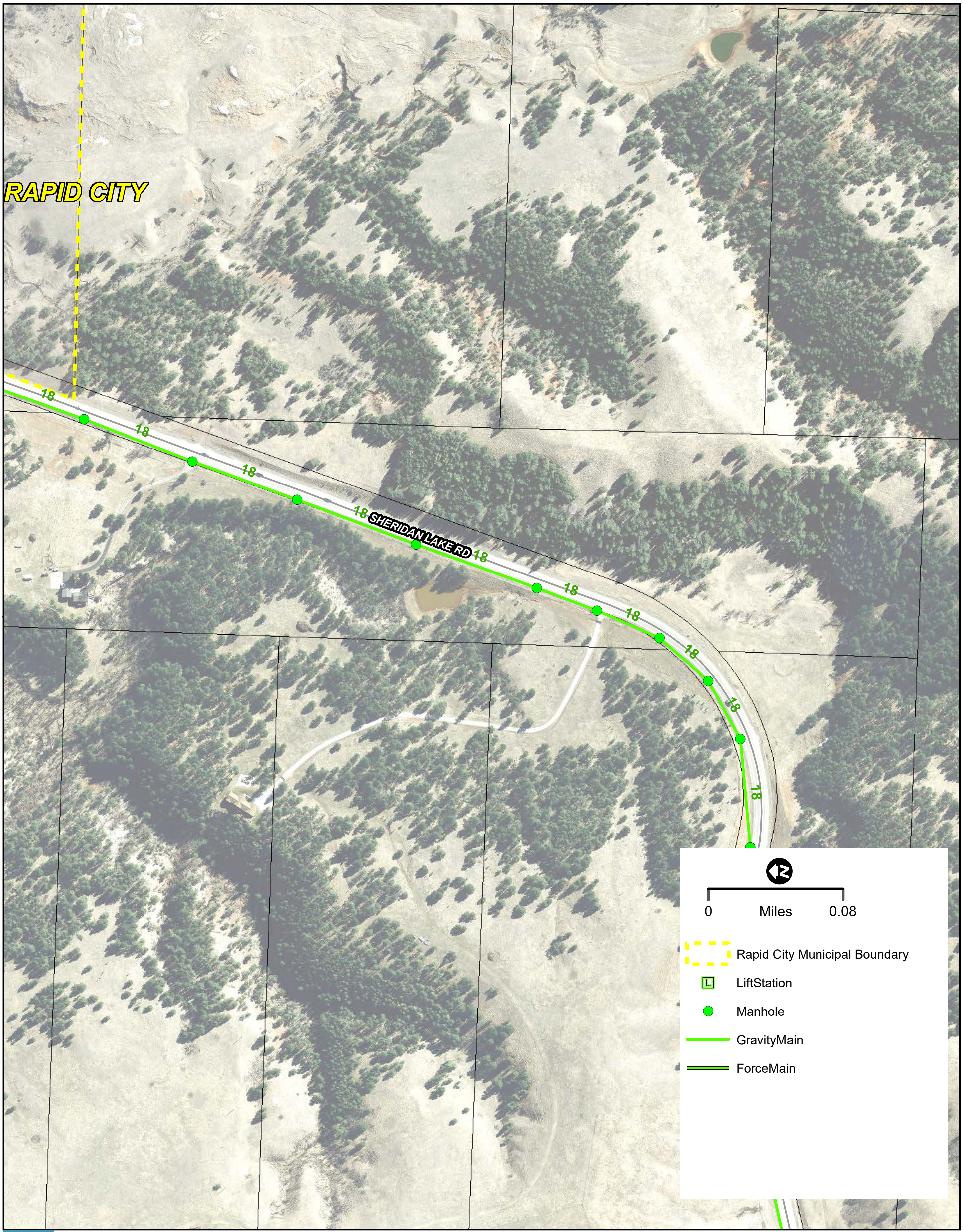
SHERIDAN LAKE ROAD GIS - WATER MAP 7



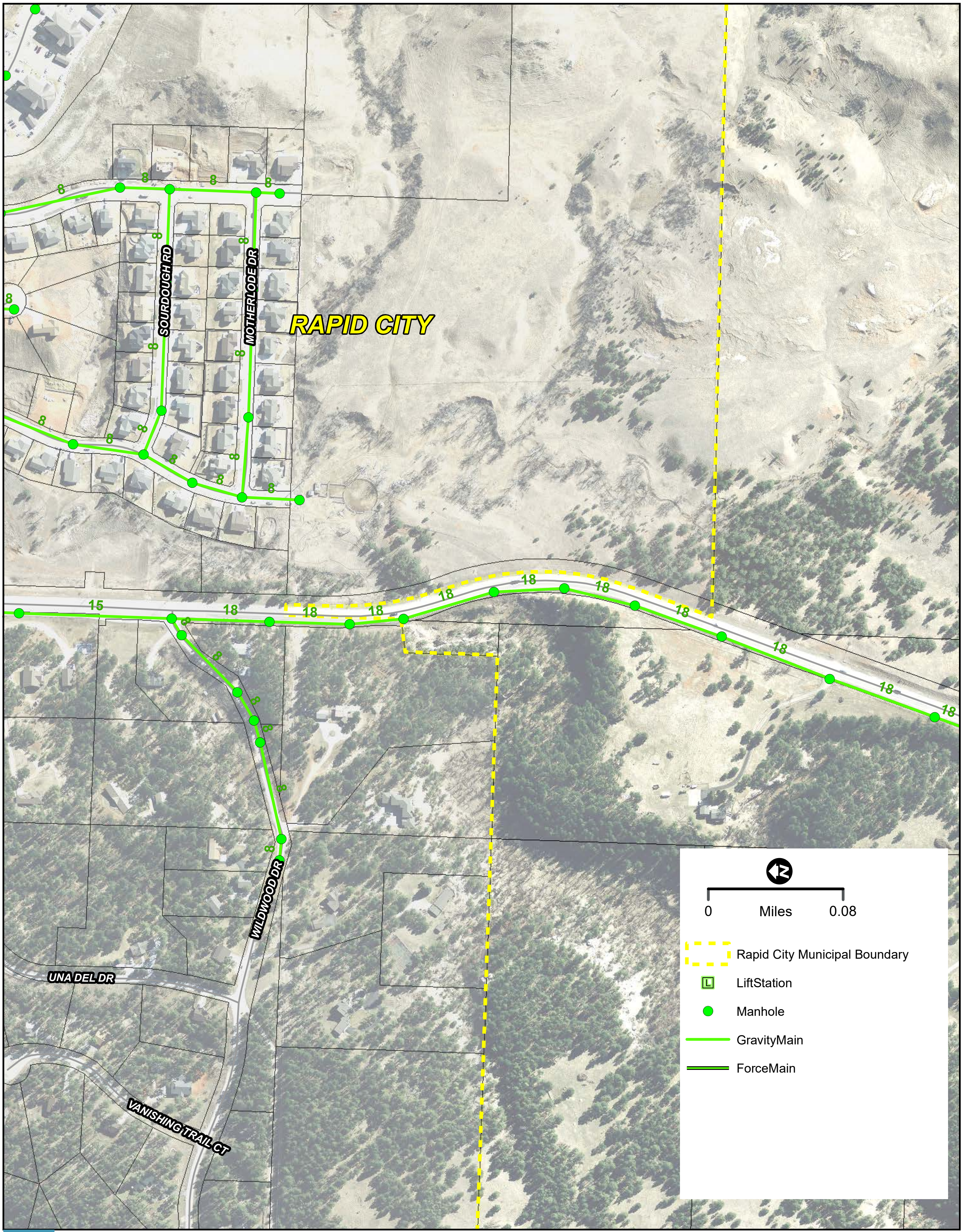
SHERIDAN LAKE ROAD GIS - SANITARY SEWER MAP 1



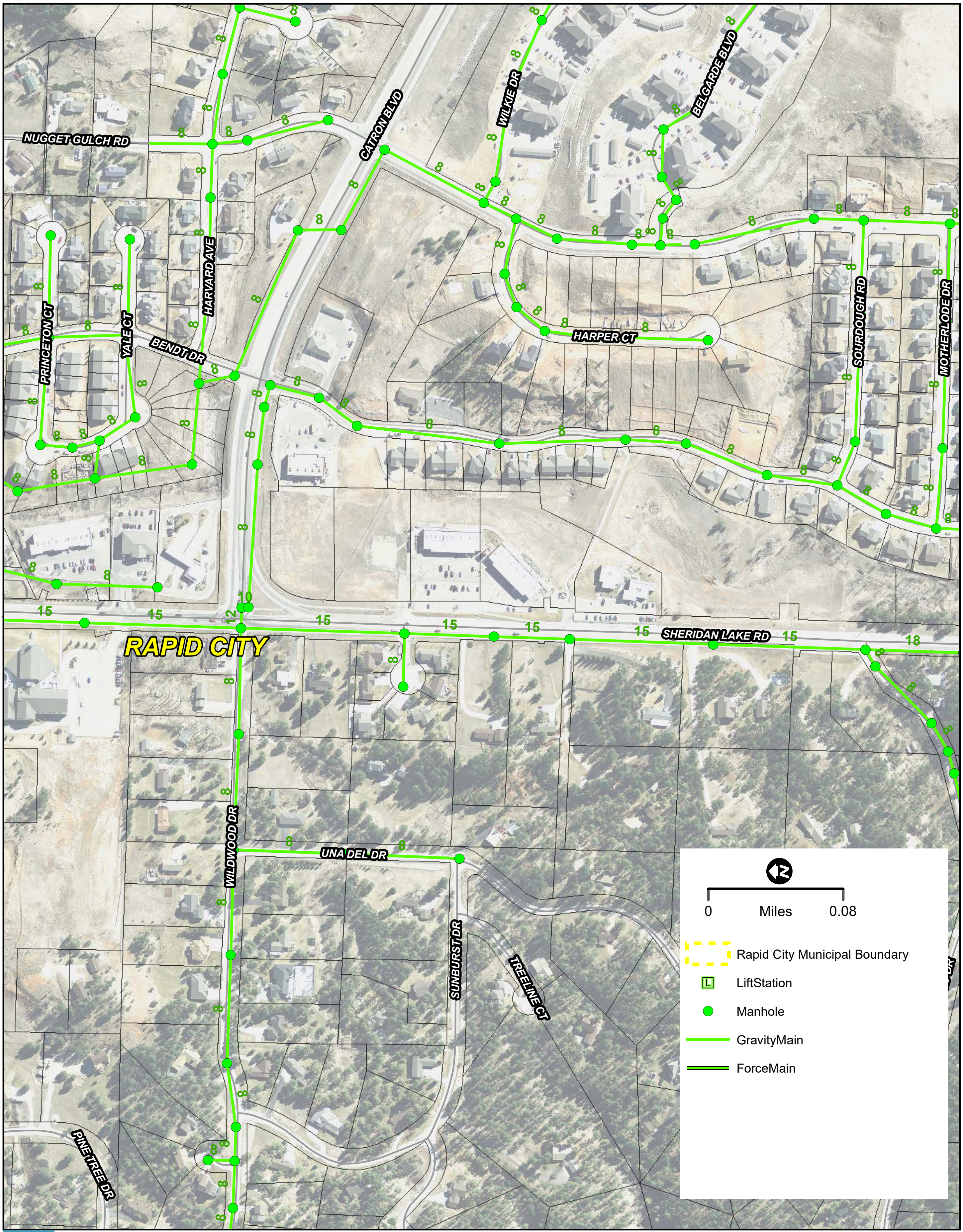
SHERIDAN LAKE ROAD GIS - SANITARY SEWER MAP 2



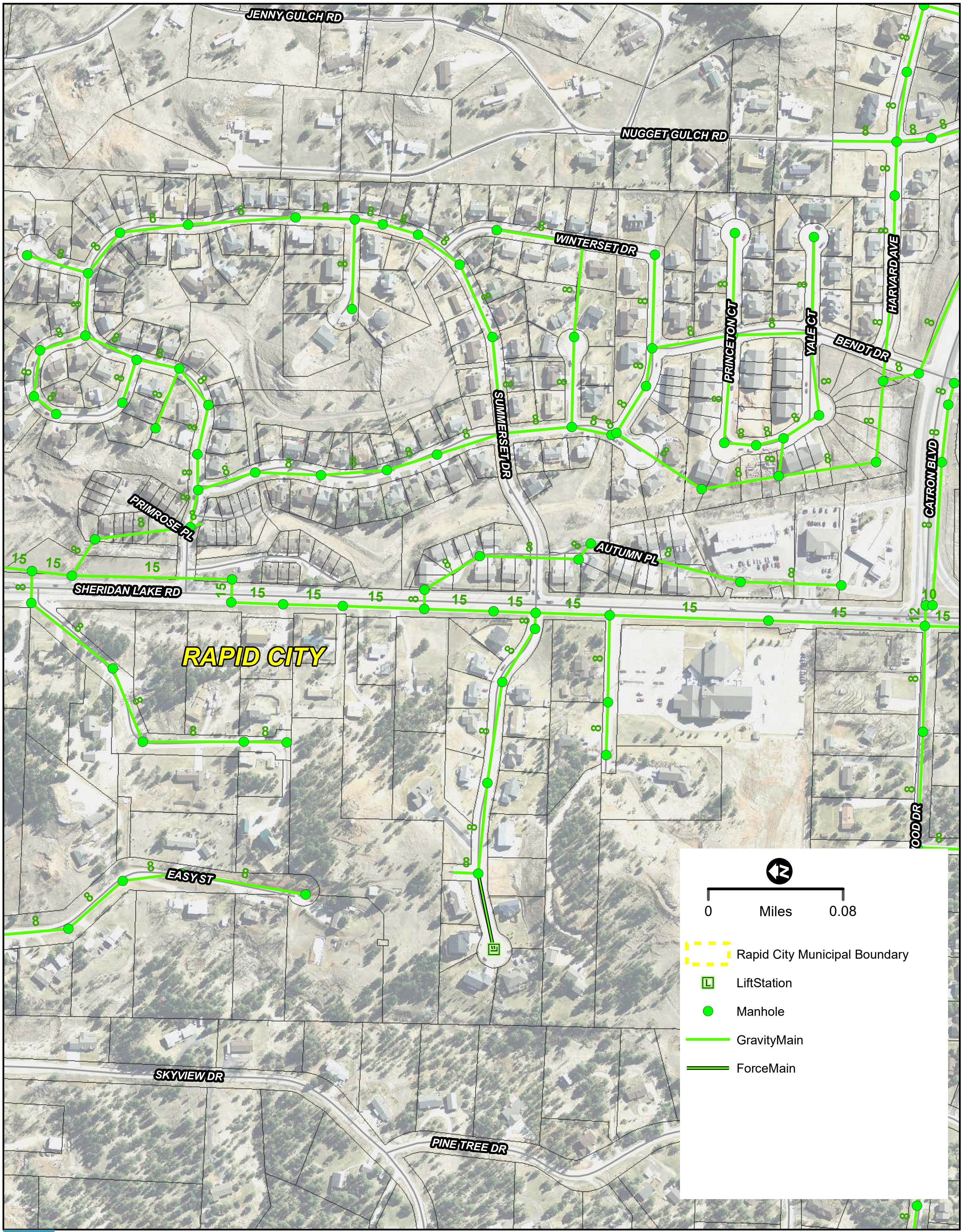
SHERIDAN LAKE ROAD GIS - SANITARY SEWER MAP 3



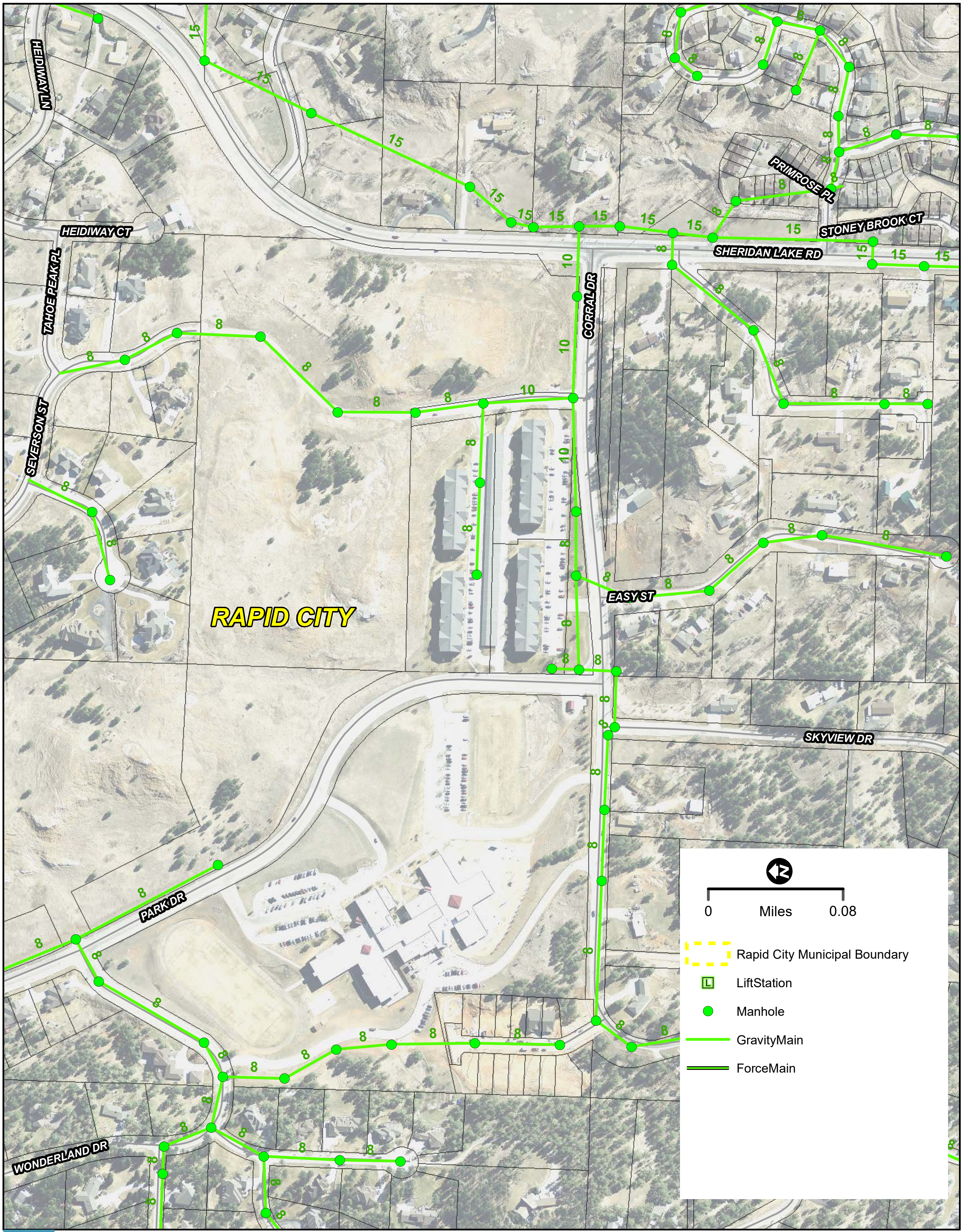
SHERIDAN LAKE ROAD GIS - SANITARY SEWER MAP 4



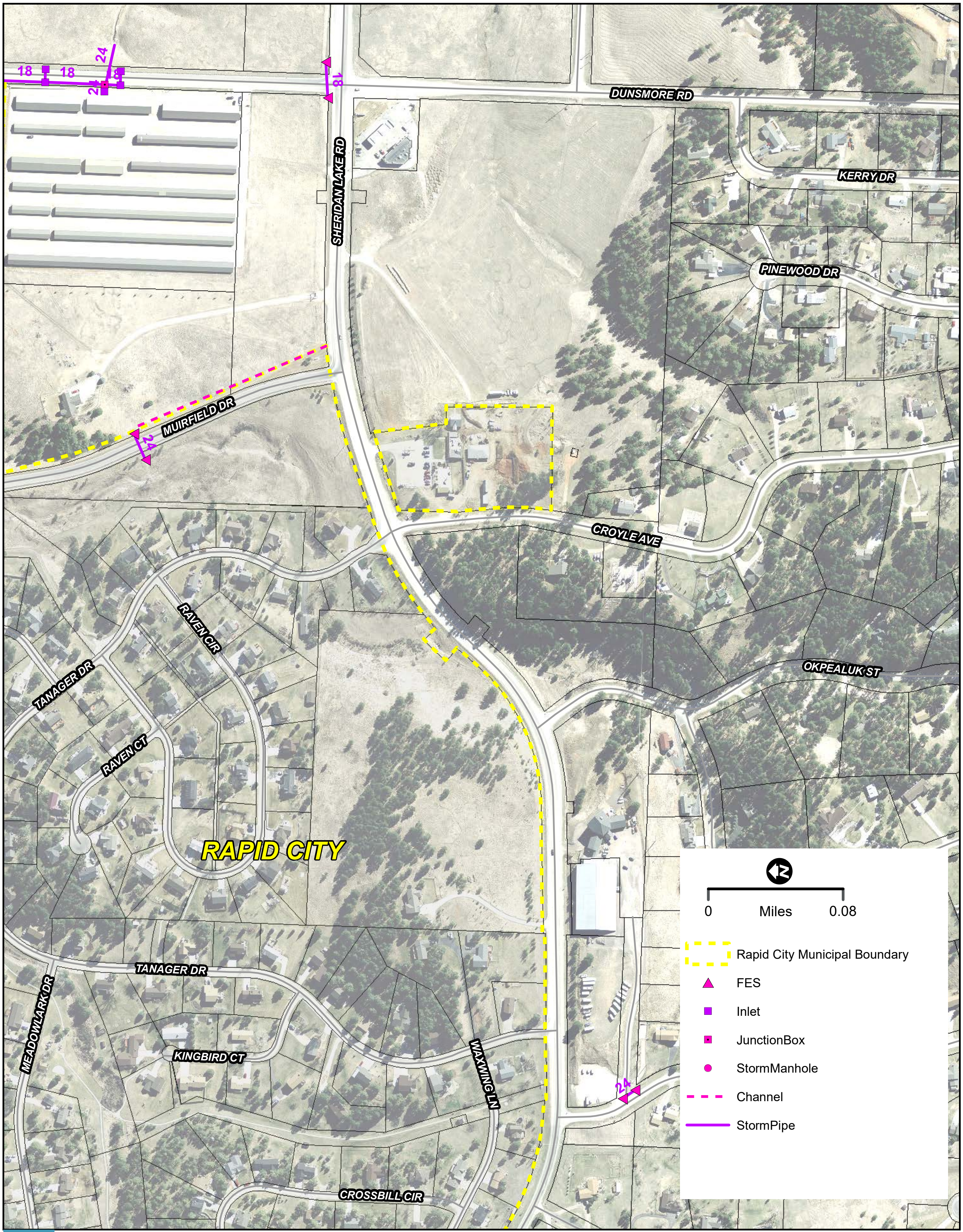
SHERIDAN LAKE ROAD GIS - SANITARY SEWER MAP 5



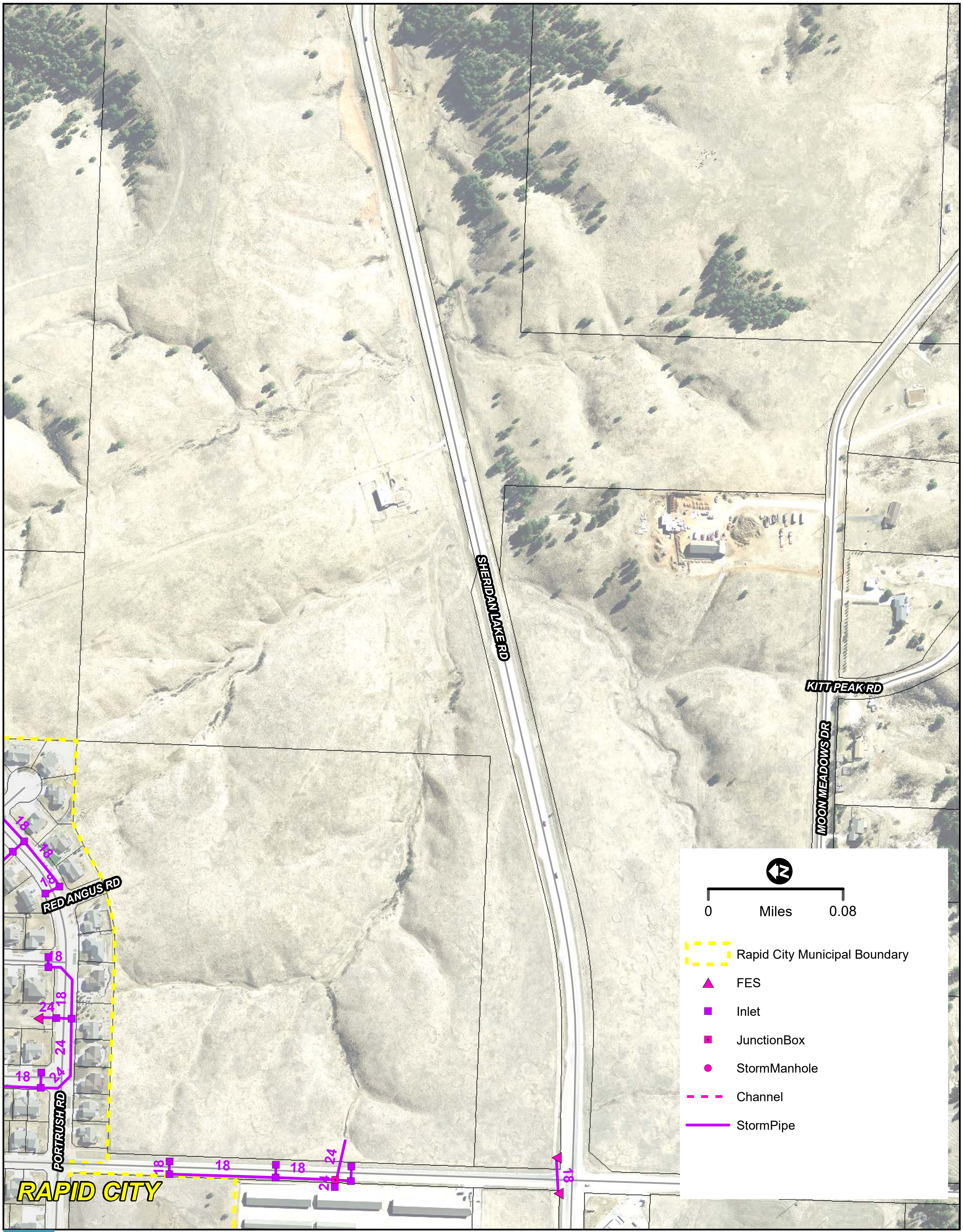
SHERIDAN LAKE ROAD GIS - SANITARY SEWER MAP 6



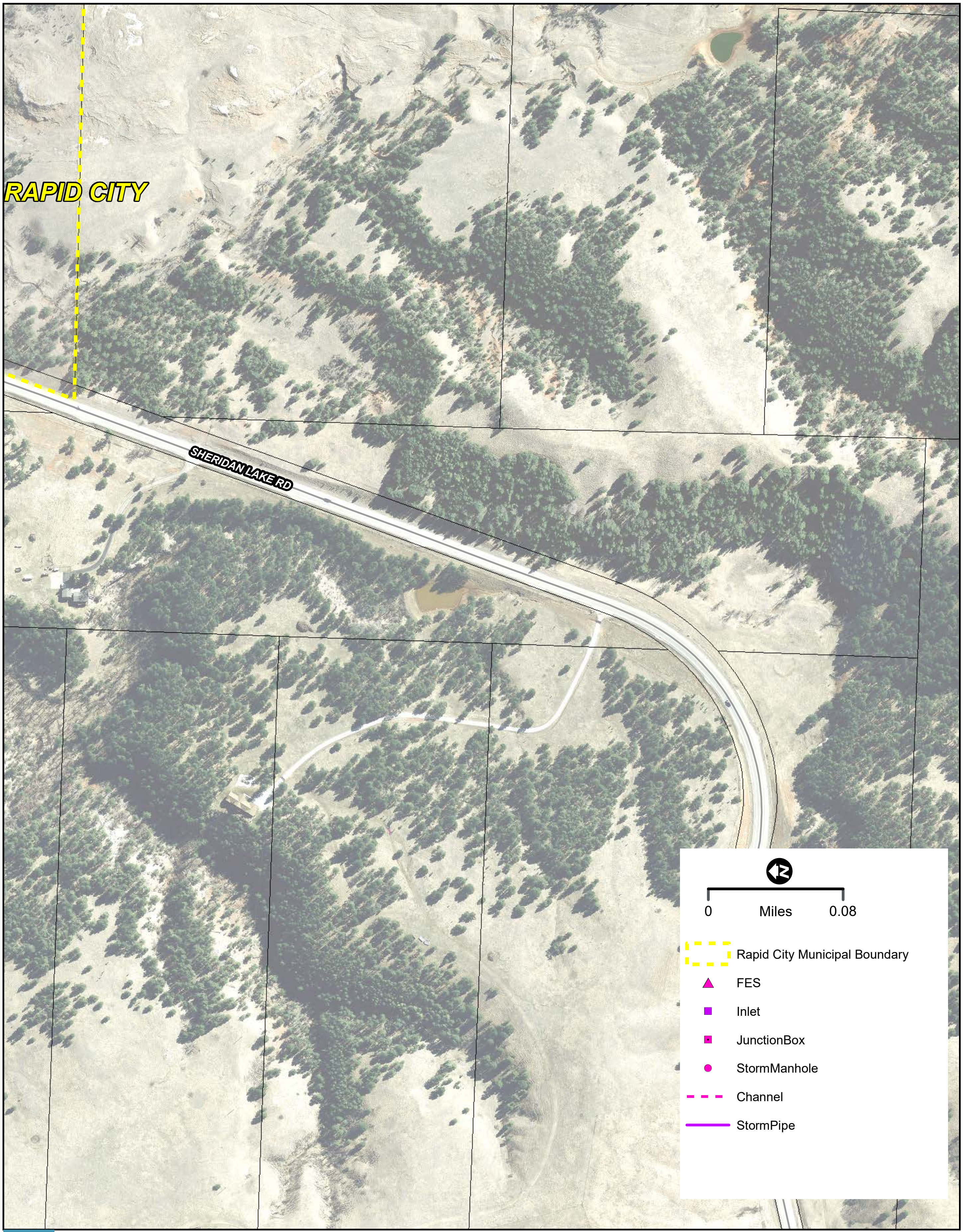
SHERIDAN LAKE ROAD GIS - SANITARY SEWER MAP 7



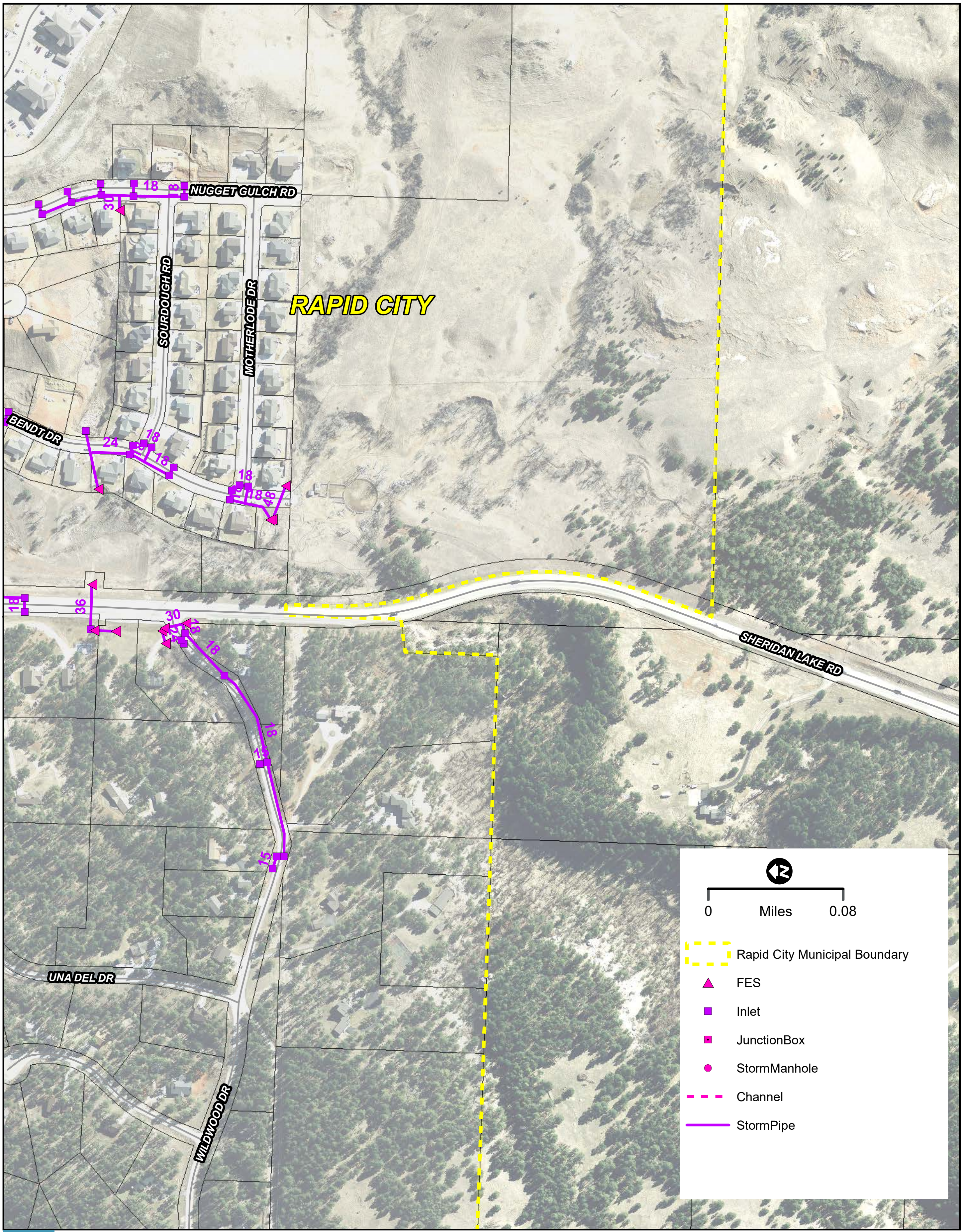
SHERIDAN LAKE ROAD GIS - STORM SEWER MAP 1



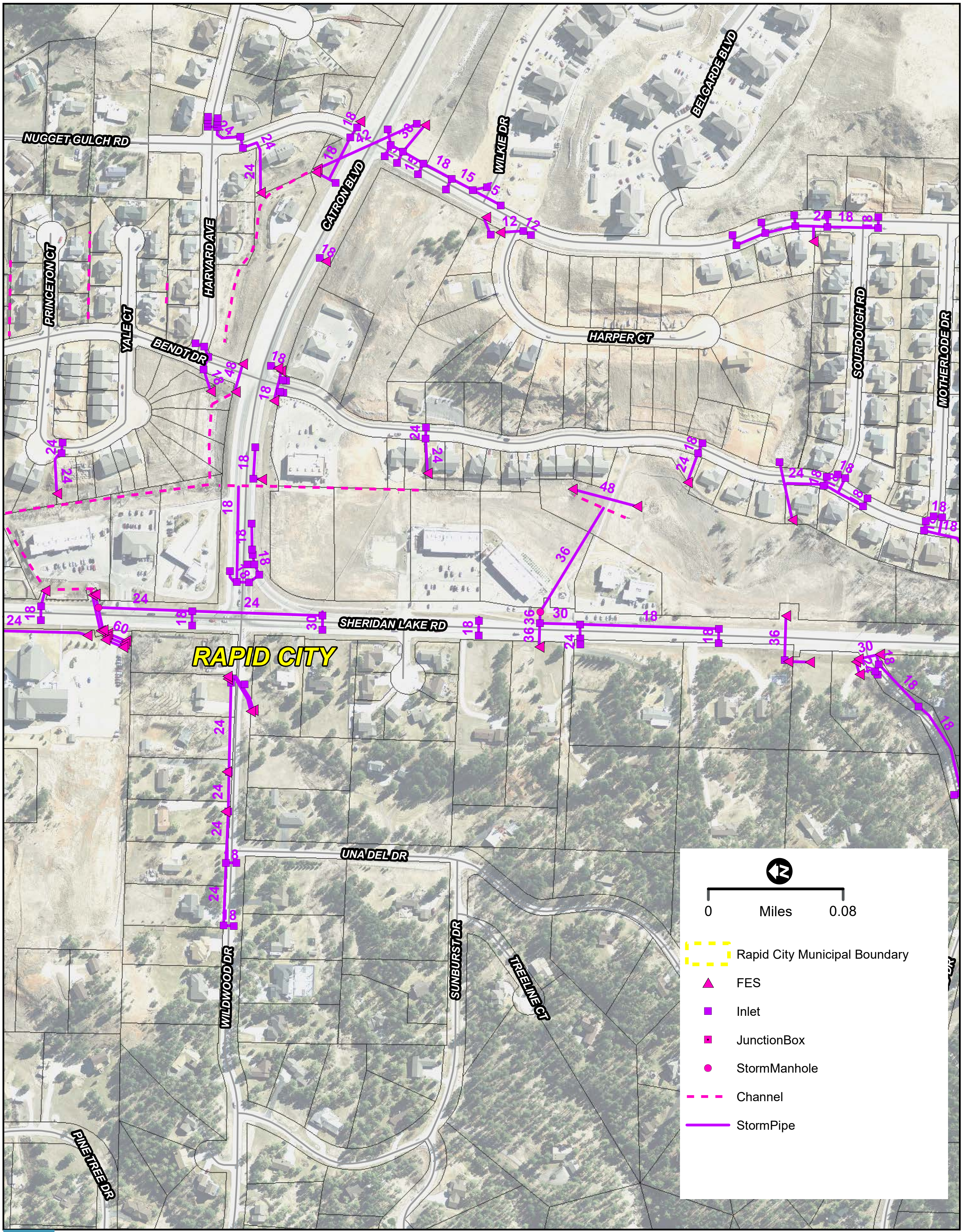
SHERIDAN LAKE ROAD GIS - STORM SEWER MAP 2



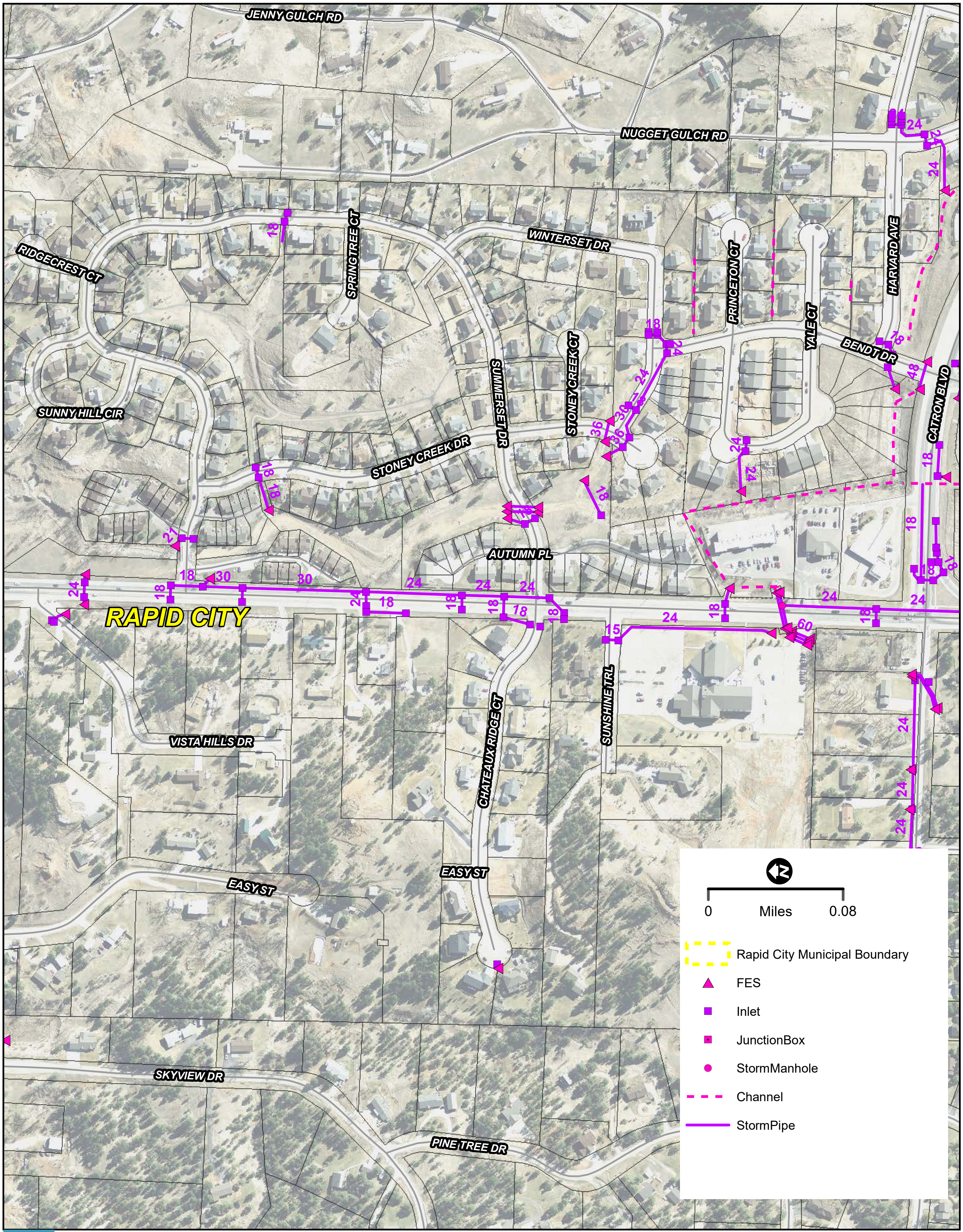
SHERIDAN LAKE ROAD GIS - STORM SEWER MAP 3



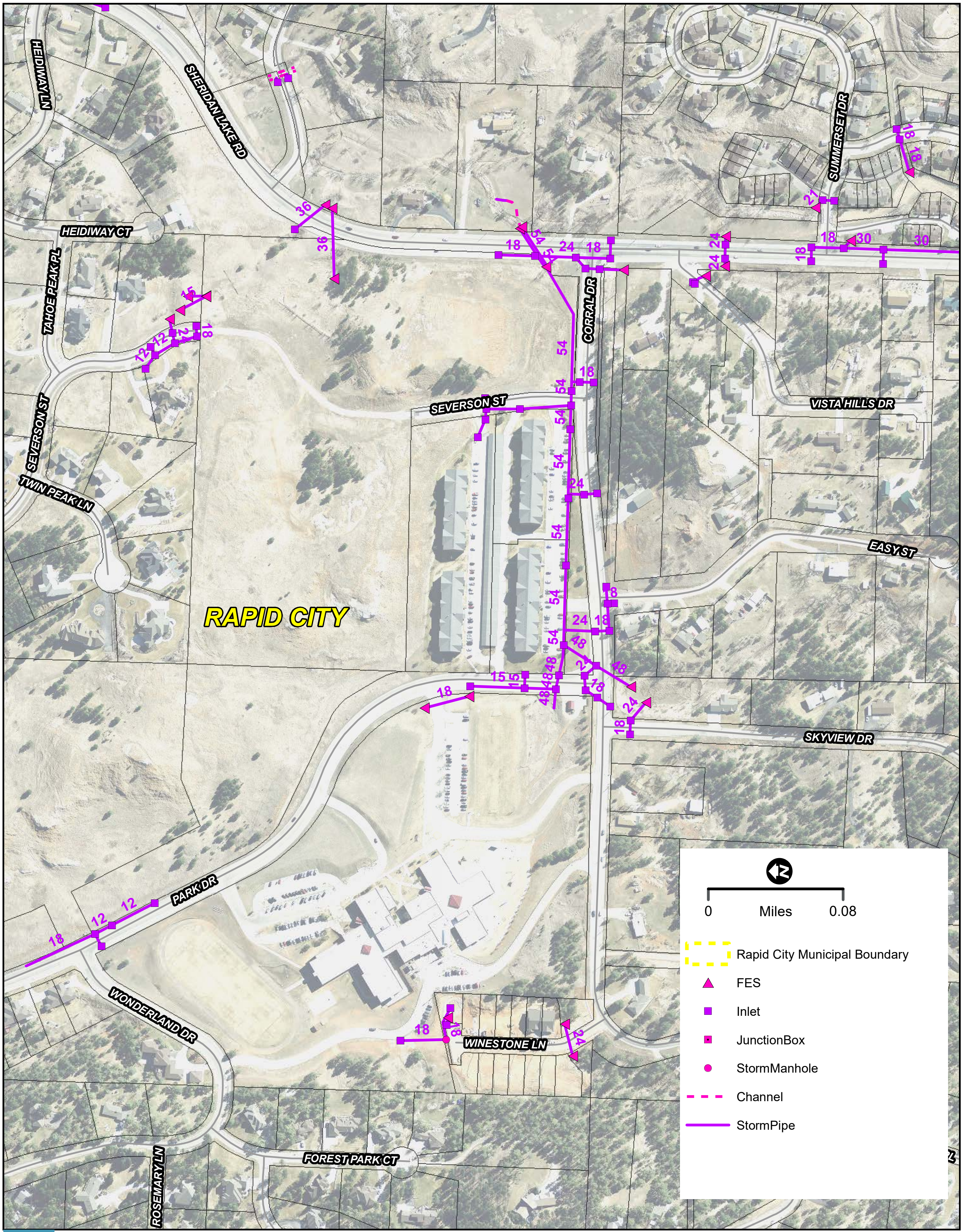
SHERIDAN LAKE ROAD GIS - STORM SEWER MAP 4



SHERIDAN LAKE ROAD GIS - STORM SEWER MAP 5



SHERIDAN LAKE ROAD GIS - STORM SEWER MAP 6



SHERIDAN LAKE ROAD GIS - STORM SEWER MAP 7

Sheridan Lake Road Traffic Study Report

Corral Drive to Albertta Drive

CITY OF RAPID CITY

Rapid City, South Dakota

Appendix E

2045 No-Build Traffic Analysis

Technical Memo

Date: Monday, December 24, 2018

Project: Sheridan Lake Road Corridor Study

To: Study Advisory Team

From: Dustin Hamilton

Subject: 2045 No-Build Conditions Analysis (updated)

Future transportation needs in the Sheridan Lake Road corridor have been determined by forecasting the travel demand in the horizon year (2045) and analyzing the capability of the existing transportation system to handle the future transportation demand. This memorandum documents the analysis of the existing roadways under 2045 traffic conditions (2045 No-Build scenario).

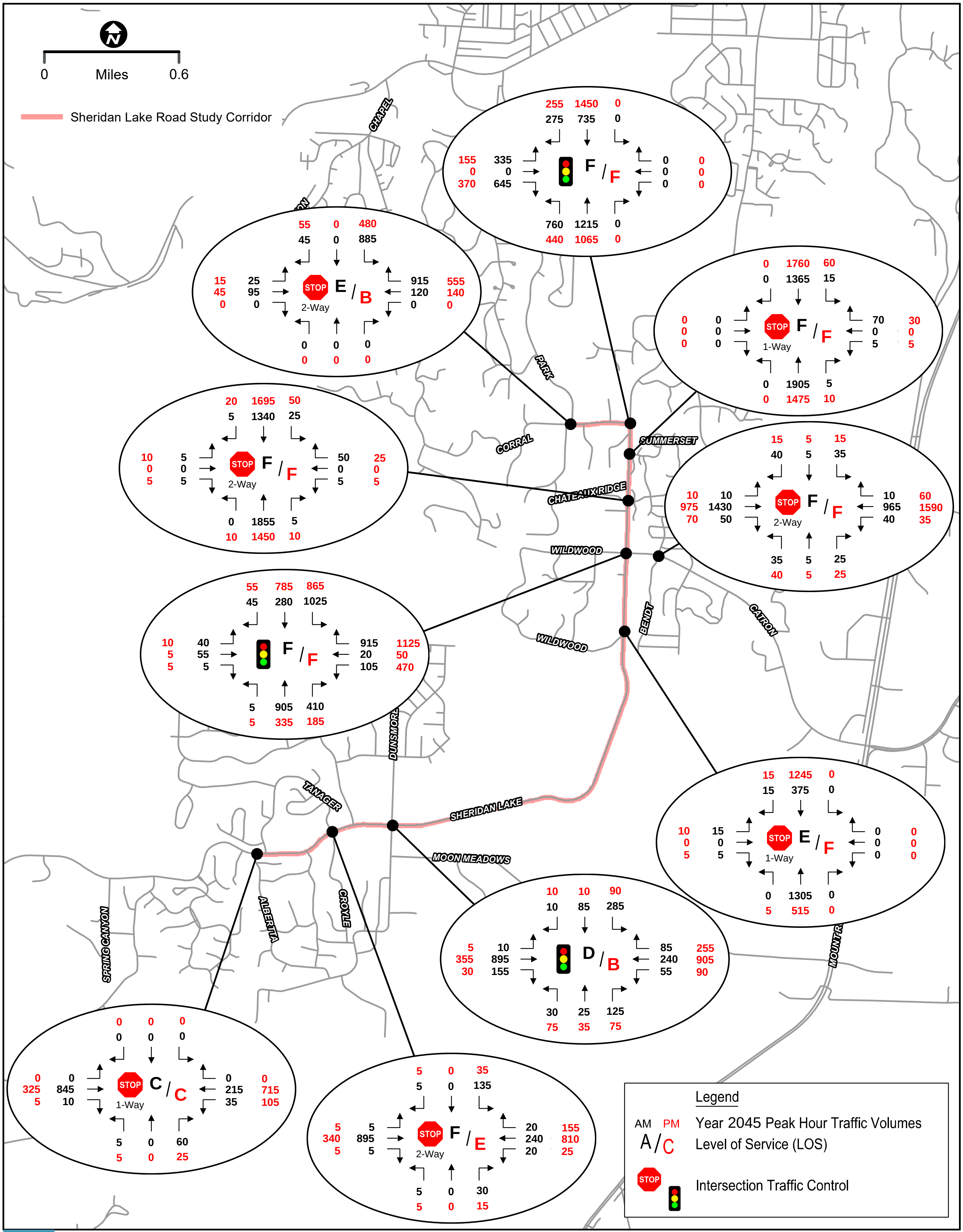
Future traffic demand was determined using the travel demand model maintained by the Rapid City MPO and the City of Rapid City. Link data for the 2013 and 2040 models were compared to determine link growth factors which were then adjusted by straight-line annual growth to determine growth factors to the 2045 horizon year. Those factors were used to create 2045 peak hour turning volumes. The turning volume forecasts were balanced to create a homogenous network for capacity analysis.

Each of the study area intersections were analyzed with 2045 forecast volumes using Highway Capacity Manual techniques, as implemented in the Highway Capacity Software (McTrans Center and FHWA).

The 2045 peak hour turning volumes and levels of service are shown in **Figure 4** and the capacity analysis output sheets are provided in the **Appendix**. Comparisons of the average annual daily traffic for segments of the study corridor are shown in **Table 1** under existing and forecast traffic conditions.

The capacity analysis shows that all the currently signalized intersections will require improvements to maintain desired traffic capacity by 2045. Minor intersections with stop sign-controlled approaches may also need selected improvements. High through-volumes on Sheridan Lake Road indicate that the roadway would benefit from additional lanes throughout the corridor. Expansion of the existing rural cross-section portion of the roadway to an urban cross-section will likely be needed before the planning horizon.

Alternatives for corridor improvement and alternative routes will be vetted during the next phase of the study process.



2045 NO-BUILD VOLUME & LEVEL OF SERVICE

FIGURE 4

SHERIDAN LAKE ROAD TRAFFIC STUDY

TABLE 1 - EXISTING AND FUTURE AADT

SHERIDAN LAKE ROAD CORRIDOR STUDY

SECTOR	2016 AADT	2045 AADT
SHERIDAN LAKE ROAD, NORTH OF CORRAL DRIVE	11,200	20,700
CORRAL DRIVE, WEST OF SHERIDAN LAKE ROAD	4,600	7,600
SHERIDAN LAKE ROAD, BETWEEN CORRAL & CATRON	16,000	29,600
CATRON BOULEVARD, EAST OF BENDT DRIVE	11,700	18,800
SHERIDAN LAKE ROAD, BETWEEN CATRON & WILDWOOD	13,100	24,200
SHERIDAN LAKE ROAD, BETWEEN WILDWOOD & DUNSMORE	12,600	21,900
DUNSMORE ROAD, SOUTH OF SHERIDAN LAKE ROAD	3,900	7,200
SHERIDAN LAKE ROAD, WEST OF DUNSMORE ROAD	11,400	19,800

APPENDIX

Capacity Analysis Output Sheets

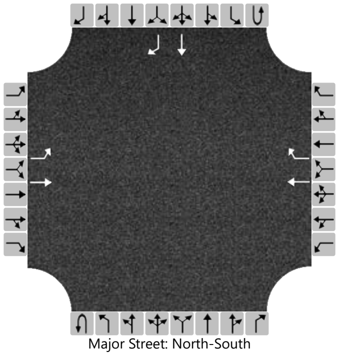
HCS7 Two-Way Stop-Control Report

General Information

Site Information

Analyst	DH	Intersection	CORRAL/PARK
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	CORRAL DRIVE
Analysis Year	2045	North/South Street	PARK DRIVE
Time Analyzed	AM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	1	0		0	1	1	0	0	0	0	0	0	1	1
Configuration		L	T				T	R							T	R
Volume (veh/h)		25	95				120	915							885	45
Percent Heavy Vehicles (%)		2	3				3	3								
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized					Yes								No			
Median Type | Storage	Undivided															

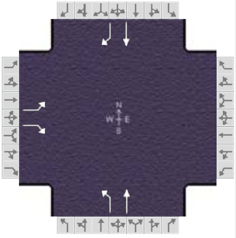
Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5				6.5	6.2								
Critical Headway (sec)		6.42	6.53				6.53	6.23								
Base Follow-Up Headway (sec)		3.5	4.0				4.0	3.3								
Follow-Up Headway (sec)		2.22	4.03				4.03	3.33								

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		28	106				133	1017								
Capacity, c (veh/h)		1563	248				231	1082								
v/c Ratio		0.02	0.43				0.58	0.94								
95% Queue Length, Q_{95} (veh)		0.1	2.0				3.2	15.9								
Control Delay (s/veh)		7.3	29.9				39.8	34.6								
Level of Service (LOS)		A	D				E	D								
Approach Delay (s/veh)	25.2				35.2											
Approach LOS	D				E								F			

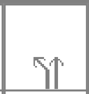
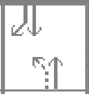
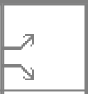
HCS7 Signalized Intersection Results Summary

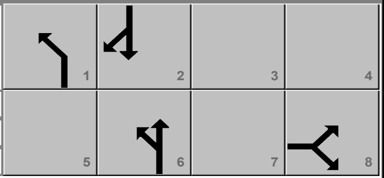


General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Oct 23, 2017	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 NO BUILD	Analysis Period	1> 7:00
Intersection	CORRAL DRIVE	File Name	SLR-CORRAL.xus		
Project Description	SLR CORRIDOR STUDY				

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	335		645				760	1215			735	275

Signal Information			
Cycle, s	148.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

						
Green	44.5	55.5	31.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.5	1.5	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8			1	6		2
Case Number		9.0			1.0	4.0		7.3
Phase Duration, s		37.0			50.0	111.0		61.0
Change Period, ($Y+R_c$), s		6.0			5.5	5.5		5.5
Max Allow Headway (MAH), s		4.2			5.1	4.0		4.0
Queue Clearance Time (g_s), s		33.0			46.5	107.5		57.5
Green Extension Time (g_e), s		0.0			0.0	0.0		0.0
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		1.00			1.00	1.00		1.00

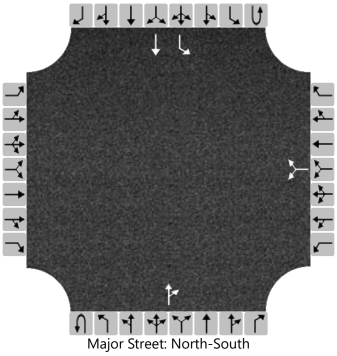
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3		18				1	6			2	12
Adjusted Flow Rate (v), veh/h	372		717				844	1350			817	206
Adjusted Saturation Flow Rate (s), veh/h/ln	1688		1502				1688	1772			1772	1502
Queue Service Time (g_s), s	31.0		31.0				44.5	105.5			55.5	14.7
Cycle Queue Clearance Time (g_c), s	31.0		31.0				44.5	105.5			55.5	14.7
Green Ratio (g/C)	0.21		0.21				0.69	0.71			0.38	0.38
Capacity (c), veh/h	353		315				556	1263			664	563
Volume-to-Capacity Ratio (X)	1.053		2.279				1.519	1.069			1.229	0.365
Back of Queue (Q), ft/ln (95 th percentile)	688.9		2516.7				2171	1764			1633.8	233.4
Back of Queue (Q), veh/ln (95 th percentile)	27.1		99.1				85.5	69.4			64.3	9.2
Queue Storage Ratio (RQ) (95 th percentile)	6.89		0.00				21.71	0.00			0.00	1.94
Uniform Delay (d_1), s/veh	58.5		58.5				45.8	21.3			46.3	33.5
Incremental Delay (d_2), s/veh	62.5		585.4				242.5	45.9			116.0	0.4
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (d), s/veh	121.0		643.9				288.3	67.1			162.2	33.9
Level of Service (LOS)	F		F				F	F			F	C
Approach Delay, s/veh / LOS	465.1		F	0.0			152.2		F	136.4		F
Intersection Delay, s/veh / LOS	227.6						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.97	B	2.10	B	0.67	A	1.93	B
Bicycle LOS Score / LOS		F			4.11	D	2.17	B

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	SHERIDAN LAKE/SUMMERSET
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	SUMMERSET DRIVE
Analysis Year	2045	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	AM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						5		70			1905	5		15	1635	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

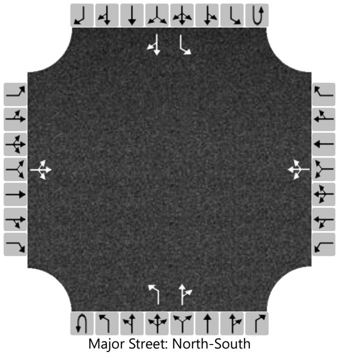
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							83							17		
Capacity, c (veh/h)							28							256		
v/c Ratio							2.97							0.07		
95% Queue Length, Q_{95} (veh)							10.0							0.2		
Control Delay (s/veh)							1181.1							20.0		
Level of Service (LOS)							F							C		
Approach Delay (s/veh)					1181.1								0.2			
Approach LOS					F											

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	SHERIDAN LAKE/CHATEAUX
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	CHATEAUX RIDGE
Analysis Year	2045	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	AM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	0
Configuration			LTR				LTR			L		TR		L		TR
Volume (veh/h)		5	0	5		5	0	50		0	1855	5		25	1340	5
Percent Heavy Vehicles (%)		2	2	2		2	2	2		2				2		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

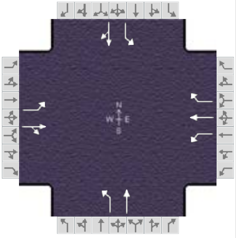
Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.12	6.52	6.22		7.12	6.52	6.22		4.12				4.12		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.52	4.02	3.32		3.52	4.02	3.32		2.22				2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			11				61			0				28		
Capacity, c (veh/h)			1				21			449				269		
v/c Ratio			11.37				2.95			0.00				0.10		
95% Queue Length, Q_{95} (veh)			2.8				7.9			0.0				0.3		
Control Delay (s/veh)			10948.1				1266.8			13.0				19.9		
Level of Service (LOS)			F				F			B				C		
Approach Delay (s/veh)	10948.1				1266.8				0.0				0.4			
Approach LOS	F				F											

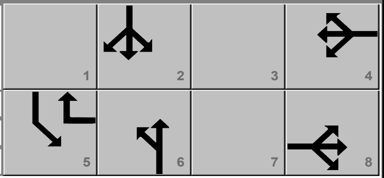
HCS7 Signalized Intersection Results Summary

General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 14, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 NO BUILD	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	SLR-CATRON.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	55	5	105	20	915	5	905		1025	280	45

Signal Information										
Cycle, s	150.0	Reference Phase	2							
Offset, s	0	Reference Point	End	Green	55.0	58.0	19.0	0.0	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.0	5.0	4.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4		6	5	2
Case Number		6.0		5.0		6.3	1.0	4.0
Phase Duration, s		25.0		25.0		65.0	60.0	125.0
Change Period, (*Y+R* $_c$), s		6.0		6.0		7.0	5.0	7.0
Max Allow Headway (*MAH*), s		5.3		5.3		5.0	5.1	5.0
Queue Clearance Time (*g* $_s$), s		8.0		21.0		60.0	57.0	9.7
Green Extension Time (*g* $_e$), s		4.6		0.0		0.0	0.0	14.6
Phase Call Probability		1.00		1.00		1.00	1.00	1.00
Max Out Probability		0.51		1.00		1.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6		5	2	12
Adjusted Flow Rate (*v*), veh/h	44	67		117	22	678	6	1006		1139	339	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1389	1746		1335	1772	1502	1042	1772		1688	1746	
Queue Service Time (*g* $_s$), s	4.4	5.2		13.0	1.7	19.0	0.5	58.0		55.0	7.7	
Cycle Queue Clearance Time (*g* $_c$), s	6.0	5.2		18.2	1.7	19.0	0.5	58.0		55.0	7.7	
Green Ratio (*g/C*)	0.13	0.13		0.13	0.13	0.49	0.39	0.39		0.77	0.79	
Capacity (*c*), veh/h	209	221		171	224	741	451	685		667	1374	
Volume-to-Capacity Ratio (*X*)	0.213	0.301		0.683	0.099	0.915	0.012	1.468		1.708	0.247	
Back of Queue (*Q*), ft/ln (95 th percentile)	72.2	107.8		219.1	34.8	851.7	5.8	2530.6		3261.6	108.6	
Back of Queue (*Q*), veh/ln (95 th percentile)	2.8	4.2		8.6	1.4	33.5	0.2	99.6		128.4	4.3	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.44	0.00		1.83	0.00	3.79	0.03	0.00		26.09	0.00	
Uniform Delay (*d* $_1$), s/veh	60.6	59.5		67.8	57.9	35.1	28.4	46.0		43.0	4.2	
Incremental Delay (*d* $_2$), s/veh	0.7	1.1		11.8	0.3	16.2	0.0	218.4		325.0	0.1	
Initial Queue Delay (*d* $_3$), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	61.3	60.6		79.5	58.2	51.3	28.4	264.4		368.0	4.4	
Level of Service (LOS)	E	E		E	E	D	C	F		F	A	
Approach Delay, s/veh / LOS	60.9	E		55.5	E		263.1	F		284.6	F	
Intersection Delay, s/veh / LOS	216.2						F					

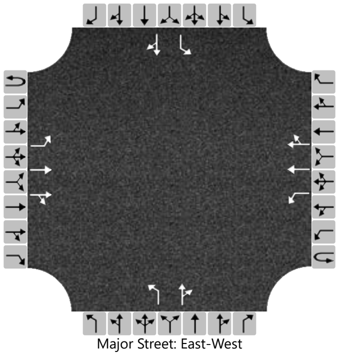
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.22	B	1.99	B	2.56	C	1.85	B
Bicycle LOS Score / LOS	0.67	A	1.84	B	1.83	B	2.93	C

HCS7 Two-Way Stop-Control Report

General Information / Site Information

General Information		Site Information	
Analyst	DH	Intersection	CATRON/BENDT
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	CATRON BOULEVARD
Analysis Year	2045	North/South Street	BENDT DRIVE
Time Analyzed	AM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		1	1	0		1	1	0
Configuration		L	T	TR		L	T	TR		L		TR		L		TR
Volume (veh/h)	0	10	1430	50	0	40	965	10		35	5	25		35	5	40
Percent Heavy Vehicles (%)	2	2			2	2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.14				4.14				7.54	6.54	6.94		7.54	6.54	6.94
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

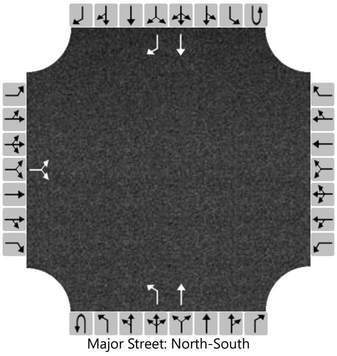
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		11				44				39		33		39		50
Capacity, c (veh/h)		640				389				13		75		22		108
v/c Ratio		0.02				0.11				3.01		0.45		1.80		0.46
95% Queue Length, Q_{95} (veh)		0.1				0.4				5.8		1.8		5.0		2.0
Control Delay (s/veh)		10.7				15.4				1495.9		87.4		760.7		64.2
Level of Service (LOS)		B				C				F		F		F		F
Approach Delay (s/veh)	0.1				0.6				845.8				368.9			
Approach LOS									F				F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	SHERIDAN/WILDWOOD
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	WILDWOOD DRIVE
Analysis Year	2045	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	AM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	1
Configuration			LR							L	T				T	R
Volume (veh/h)		15		5						0	1305				375	15
Percent Heavy Vehicles (%)		2		2						2						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

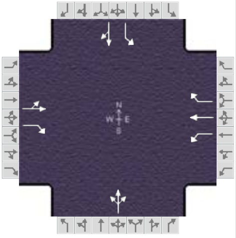
Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.42		6.22						4.12						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			22							0						
Capacity, c (veh/h)			102							1125						
v/c Ratio			0.22							0.00						
95% Queue Length, Q_{95} (veh)			0.8							0.0						
Control Delay (s/veh)			49.8							8.2						
Level of Service (LOS)			E							A						
Approach Delay (s/veh)	49.8								0.0							
Approach LOS	E															

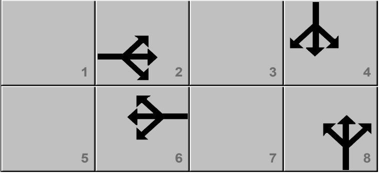
HCS7 Signalized Intersection Results Summary

General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 14, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 NO BUILD	Analysis Period	1> 7:00
Intersection	DUNSMORE ROAD	File Name	SLR-DUNSMORE.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	895	155	55	240	85	30	25	125	285	85	10

Signal Information									
Cycle, s	110.0	Reference Phase	2						
Offset, s	0	Reference Point	End	Green	63.0	31.0	0.0	0.0	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	5.0	3.0	0.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	4.0	4.0	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		7.0		5.0		8.0		6.0
Phase Duration, s		72.0		72.0		38.0		38.0
Change Period, (*Y+R* $_c$), s		9.0		9.0		7.0		7.0
Max Allow Headway (*MAH*), s		4.0		4.0		4.4		4.4
Queue Clearance Time (*g* $_s$), s		64.0		65.0		10.6		33.0
Green Extension Time (*g* $_e$), s		0.0		0.0		2.3		0.0
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		1.00		1.00		0.01		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h		1006	89	61	267	56		156		317	100	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1768	1502	566	1772	1502		1516		1269	1754	
Queue Service Time (*g* $_s$), s		22.0	3.0	1.0	8.3	1.8		1.5		22.4	4.8	
Cycle Queue Clearance Time (*g* $_c$), s		62.0	3.0	63.0	8.3	1.8		8.6		31.0	4.8	
Green Ratio (*g/C*)		0.57	0.57	0.57	0.57	0.57		0.28		0.28	0.28	
Capacity (*c*), veh/h		1046	860	71	1015	860		467		324	494	
Volume-to-Capacity Ratio (*X*)		0.962	0.103	0.866	0.263	0.065		0.333		0.979	0.202	
Back of Queue (*Q*), ft/ln (95 th percentile)		909.1	40.6	131.5	134.5	24.7		150.8		473.8	94.6	
Back of Queue (*Q*), veh/ln (95 th percentile)		35.8	1.6	5.2	5.3	1.0		5.9		18.7	3.7	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.81	1.75	0.00	0.13		0.00		4.12	0.00	
Uniform Delay (*d* $_1$), s/veh		23.2	10.7	55.0	11.8	10.4		31.4		45.9	30.1	
Incremental Delay (*d* $_2$), s/veh		19.2	0.1	63.3	0.1	0.0		0.4		44.1	0.2	
Initial Queue Delay (*d* $_3$), s/veh		0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh		42.5	10.7	118.3	12.0	10.5		31.9		90.0	30.3	
Level of Service (LOS)		D	B	F	B	B		C		F	C	
Approach Delay, s/veh / LOS	39.9	D		28.7	C		31.9	C		75.7	E	
Intersection Delay, s/veh / LOS	44.5						D					

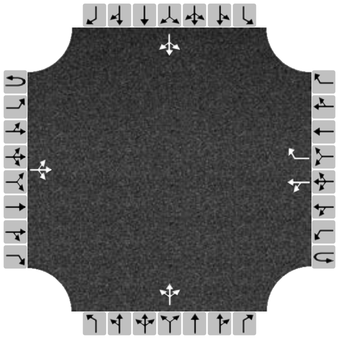
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.72	B	1.90	B	2.17	B	2.04	B
Bicycle LOS Score / LOS	2.29	B	1.12	A	0.74	A	1.18	A

HCS7 Two-Way Stop-Control Report

General Information | Site Information

Analyst	DH	Intersection	SHERIDAN/TANAGER/CROYLE
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2045	North/South Street	TANAGER DRIVE
Time Analyzed	AM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	1		0	1	0		0	1	0
Configuration			LTR			LT		R			LTR				LTR	
Volume (veh/h)		5	895	5		20	240	20		5	0	30		135	0	5
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized					No											
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	Eastbound U	L	T	R	Westbound U	L	T	R	Northbound U	L	T	R	Southbound U	L	T	R
Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

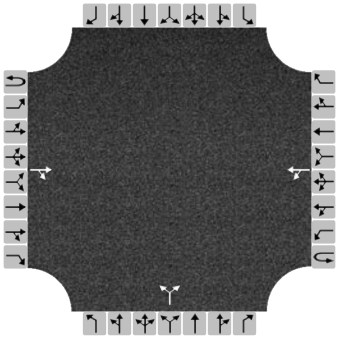
Delay, Queue Length, and Level of Service

	Eastbound U	L	T	R	Westbound U	L	T	R	Northbound U	L	T	R	Southbound U	L	T	R
Flow Rate, v (veh/h)		6				22					39				156	
Capacity, c (veh/h)		1272				692					248				115	
v/c Ratio		0.00				0.03					0.16				1.35	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.5				10.6	
Control Delay (s/veh)		7.8		0.1		10.4					22.2				274.4	
Level of Service (LOS)		A		A		B					C				F	
Approach Delay (s/veh)	0.1				1.1				22.2				274.4			
Approach LOS									C				F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	SHERIDAN/ALBERTTA
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2045	North/South Street	ALBERTTA DRIVE
Time Analyzed	AM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			845	10		35	215			5		60				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				7.12		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

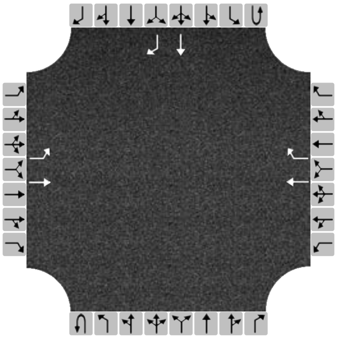
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						39					72					
Capacity, c (veh/h)						722					289					
v/c Ratio						0.05					0.25					
95% Queue Length, Q_{95} (veh)						0.2					1.0					
Control Delay (s/veh)						10.3					21.5					
Level of Service (LOS)						B					C					
Approach Delay (s/veh)					2.0				21.5							
Approach LOS									C							

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	CORRAL/PARK
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	CORRAL DRIVE
Analysis Year	2045	North/South Street	PARK DRIVE
Time Analyzed	PM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	1	0		0	1	1	0	0	0	0	0	0	1	1
Configuration		L	T				T	R							T	R
Volume (veh/h)		15	45				140	555							480	55
Percent Heavy Vehicles (%)		2	3				3	3								
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized					Yes								No			
Median Type | Storage	Undivided															

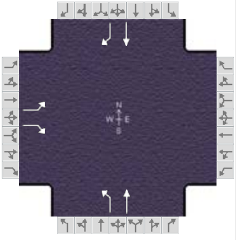
Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5				6.5	6.2								
Critical Headway (sec)		6.42	6.53				6.53	6.23								
Base Follow-Up Headway (sec)		3.5	4.0				4.0	3.3								
Follow-Up Headway (sec)		2.22	4.03				4.03	3.33								

Delay, Queue Length, and Level of Service

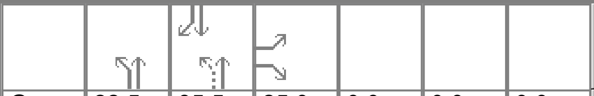
Flow Rate, v (veh/h)		17	50				156	617								
Capacity, c (veh/h)		1622	451				416	1082								
v/c Ratio		0.01	0.11				0.37	0.57								
95% Queue Length, Q_{95} (veh)		0.0	0.4				1.7	3.7								
Control Delay (s/veh)		7.2	14.0				18.7	12.6								
Level of Service (LOS)		A	B				C	B								
Approach Delay (s/veh)	12.3				13.9											
Approach LOS	B				B								C			

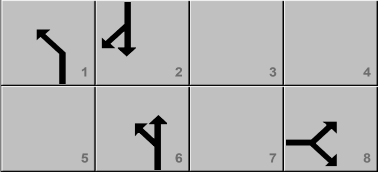
HCS7 Signalized Intersection Results Summary



General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 14, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 NO BUILD	Analysis Period	1> 7:00
Intersection	CORRAL DRIVE	File Name	SLR-CORRAL.xus		
Project Description	SLR CORRIDOR STUDY				

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	155		370				440	1065			1450	255





Signal Information										
Cycle, s	150.0	Reference Phase	2							
Offset, s	0	Reference Point	End	Green	22.5	85.5	25.0	0.0	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.5	1.5	2.0	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8			1	6		2
Case Number		9.0			1.0	4.0		7.3
Phase Duration, s		31.0			28.0	119.0		91.0
Change Period, (*Y*+*R* *c*), s		6.0			5.5	5.5		5.5
Max Allow Headway (*MAH*), s		4.3			5.1	4.0		4.0
Queue Clearance Time (*g* *s*), s		27.0			24.5	75.4		87.5
Green Extension Time (*g* *e*), s		0.0			0.0	30.7		0.0
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		1.00			1.00	0.78		1.00

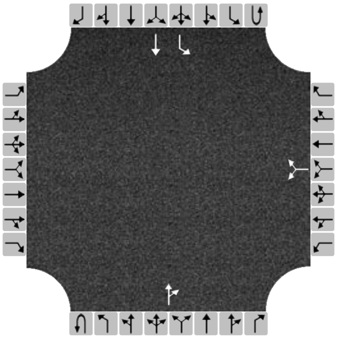
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3		18				1	6			2	12
Adjusted Flow Rate (*v*), veh/h	172		411				489	1183			1611	200
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688		1502				1688	1772			1772	1502
Queue Service Time (*g* *s*), s	14.2		25.0				22.5	73.4			85.5	9.9
Cycle Queue Clearance Time (*g* *c*), s	14.2		25.0				22.5	73.4			85.5	9.9
Green Ratio (*g/C*)	0.17		0.17				0.73	0.76			0.57	0.57
Capacity (*c*), veh/h	281		250				301	1341			1010	856
Volume-to-Capacity Ratio (*X*)	0.612		1.643				1.624	0.883			1.595	0.234
Back of Queue (*Q*), ft/ln (90 th percentile)	242.3		1160.1				1317.2	851.6			4187	146.1
Back of Queue (*Q*), veh/ln (90 th percentile)	9.5		45.7				51.9	33.5			164.8	5.8
Queue Storage Ratio (*RQ*) (90 th percentile)	2.42		0.00				13.17	0.00			0.00	1.22
Uniform Delay (*d* *1*), s/veh	58.0		62.5				55.6	13.4			32.3	16.0
Incremental Delay (*d* *2*), s/veh	3.9		306.5				295.4	7.2			272.5	0.1
Initial Queue Delay (*d* *3*), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	61.9		369.0				350.9	20.6			304.8	16.1
Level of Service (LOS)	E		F				F	C			F	B
Approach Delay, s/veh / LOS	278.4	F		0.0			117.2	F		272.9	F	
Intersection Delay, s/veh / LOS	209.7						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.97	B	2.08	B	0.66	A	1.90	B
Bicycle LOS Score / LOS		F			3.25	C	3.48	C

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	SHERIDAN LAKE/SUMMERSET
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	SUMMERSET DRIVE
Analysis Year	2045	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	PM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						5		30			1475	10		60	1760	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

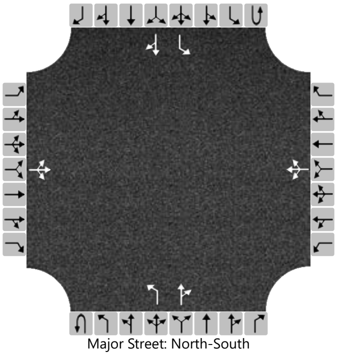
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							39							67		
Capacity, c (veh/h)							24							391		
v/c Ratio							1.63							0.17		
95% Queue Length, Q_{95} (veh)							4.9							0.6		
Control Delay (s/veh)							660.4							16.1		
Level of Service (LOS)							F							C		
Approach Delay (s/veh)					660.4								0.5			
Approach LOS					F											

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	SHERIDAN LAKE/CHATEAUX
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	CHATEAUX RIDGE
Analysis Year	2045	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	PM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	0
Configuration			LTR				LTR			L		TR		L		TR
Volume (veh/h)		10	0	5		5	0	25		10	1450	10		50	1695	20
Percent Heavy Vehicles (%)		2	2	2		2	2	2		2				2		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

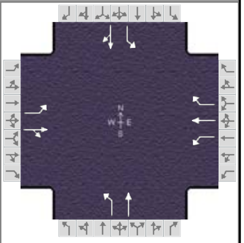
Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.12	6.52	6.22		7.12	6.52	6.22		4.12				4.12		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.52	4.02	3.32		3.52	4.02	3.32		2.22				2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			17				33			11				56		
Capacity, c (veh/h)			3				12			311				401		
v/c Ratio			6.08				2.68			0.04				0.14		
95% Queue Length, Q_{95} (veh)			3.5				5.1			0.1				0.5		
Control Delay (s/veh)			4676.4				1377.0			17.0				15.4		
Level of Service (LOS)			F				F			C				C		
Approach Delay (s/veh)	4676.4				1377.0				0.1				0.4			
Approach LOS	F				F											

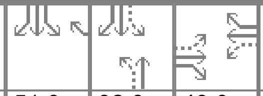
HCS7 Signalized Intersection Results Summary

General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 14, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM NO BUILD	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	SLR-CATRON.xus		
Project Description	SLR CORRIDOR STUDY				

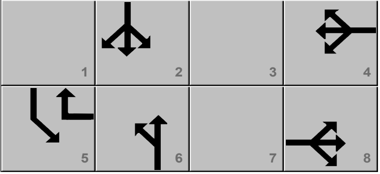


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	5	5	470	50	1125	5	335		865	785	45

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	51.0	32.0	49.0	0.0	0.0	0.0
Yellow	3.0	5.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4		6	5	2
Case Number		6.0		5.0		6.3	1.0	4.0
Phase Duration, s		55.0		55.0		39.0	56.0	95.0
Change Period, (*Y+R* $_c$), s		6.0		6.0		7.0	5.0	7.0
Max Allow Headway (*MAH*), s		5.2		5.2		5.0	5.1	5.0
Queue Clearance Time (*g* $_s$), s		6.1		51.0		33.4	53.0	66.7
Green Extension Time (*g* $_e$), s		14.5		0.0		0.0	0.0	9.1
Phase Call Probability		1.00		1.00		1.00	1.00	1.00
Max Out Probability		0.14		1.00		1.00	1.00	0.30

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6		5	2	12
Adjusted Flow Rate (*v*), veh/h	11	11		522	56	844	6	372		961	900	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1348	1626		1403	1772	1502	619	1772		1688	1762	
Queue Service Time (*g* $_s$), s	0.9	0.7		48.3	3.3	49.0	1.1	31.4		51.0	64.7	
Cycle Queue Clearance Time (*g* $_c$), s	4.1	0.7		49.0	3.3	49.0	9.9	31.4		51.0	64.7	
Green Ratio (*g/C*)	0.33	0.33		0.33	0.33	0.67	0.21	0.21		0.57	0.59	
Capacity (*c*), veh/h	459	531		500	579	1001	144	378		626	1034	
Volume-to-Capacity Ratio (*X*)	0.024	0.021		1.045	0.096	0.844	0.039	0.985		1.535	0.871	
Back of Queue (*Q*), ft/ln (95 th percentile)	13.3	12.8		912	65.4	762.6	8.5	642.4		2345.5	929.8	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.5	0.5		35.9	2.6	30.0	0.3	25.3		92.3	36.6	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.08	0.00		7.60	0.00	3.39	0.05	0.00		18.76	0.00	
Uniform Delay (*d* $_1$), s/veh	36.5	34.2		53.2	35.1	19.0	54.0	58.8		42.0	26.2	
Incremental Delay (*d* $_2$), s/veh	0.0	0.0		52.4	0.1	6.9	0.2	42.1		248.9	8.4	
Initial Queue Delay (*d* $_3$), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	36.6	34.3		105.5	35.2	26.0	54.2	100.9		290.9	34.6	
Level of Service (LOS)	D	C		F	D	C	D	F		F	C	
Approach Delay, s/veh / LOS	35.4	D		55.5	E		100.2	F		166.9	F	
Intersection Delay, s/veh / LOS	116.3						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.05	B	1.97	B	2.66	C	1.90	B
Bicycle LOS Score / LOS	0.52	A	2.83	C	0.96	A	3.56	D

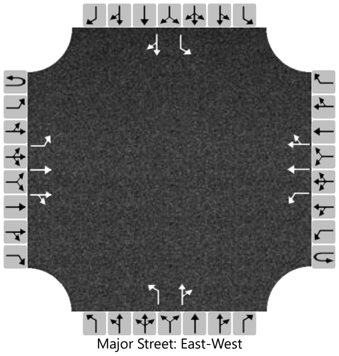
HCS7 Two-Way Stop-Control Report

General Information

Site Information

Analyst	DH	Intersection	CATRON/BENDT
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	CATRON BOULEVARD
Analysis Year	2045	North/South Street	BENDT DRIVE
Time Analyzed	PM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		1	1	0		1	1	0
Configuration		L	T	TR		L	T	TR		L		TR		L		TR
Volume (veh/h)	0	10	975	70	0	35	1590	60		40	5	25		15	5	15
Percent Heavy Vehicles (%)	2	2			2	2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.14				4.14				7.54	6.54	6.94		7.54	6.54	6.94
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

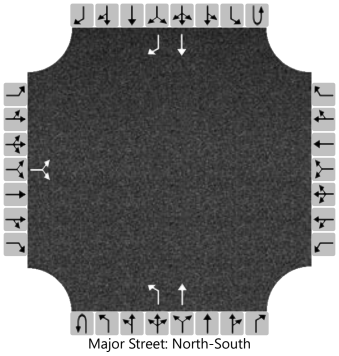
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		11				39				44		33		17		22
Capacity, c (veh/h)		329				597				15		59		9		39
v/c Ratio		0.03				0.07				2.88		0.56		1.95		0.57
95% Queue Length, Q_{95} (veh)		0.1				0.2				6.3		2.3		3.1		2.0
Control Delay (s/veh)		16.3				11.4				1357.9		125.4		1286.2		180.5
Level of Service (LOS)		C				B				F		F		F		F
Approach Delay (s/veh)	0.2				0.2				829.7				654.3			
Approach LOS									F				F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	SHERIDAN/WILDWOOD
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/12/2018	East/West Street	WILDWOOD DRIVE
Analysis Year	2045	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	PM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	1
Configuration			LR							L	T				T	R
Volume (veh/h)		10		5						5	515				1245	15
Percent Heavy Vehicles (%)		2		2						2						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

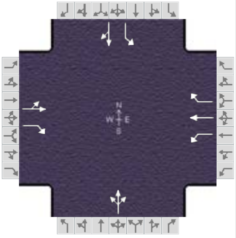
Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.42		6.22						4.12						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			17							6						
Capacity, c (veh/h)			86							488						
v/c Ratio			0.19							0.01						
95% Queue Length, Q_{95} (veh)			0.7							0.0						
Control Delay (s/veh)			56.8							12.5						
Level of Service (LOS)			F							B						
Approach Delay (s/veh)	56.8								0.1							
Approach LOS	F															

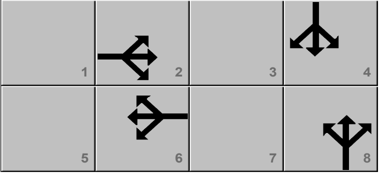
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 14, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 NO BUILD	Analysis Period	1> 7:00
Intersection	DUNSMORE ROAD	File Name	SLR-DUNSMORE.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	5	355	30	90	905	255	75	35	75	90	10	10

Signal Information										
Cycle, s	73.3	Reference Phase	2							
Offset, s	0	Reference Point	End	Green	45.3	12.0	0.0	0.0	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	5.0	3.0	0.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	4.0	4.0	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		7.0		5.0		8.0		6.0
Phase Duration, s		54.3		54.3		19.0		19.0
Change Period, (*Y+R c*), s		9.0		9.0		7.0		7.0
Max Allow Headway (*MAH*), s		4.0		4.0		4.2		4.2
Queue Clearance Time (*g s*), s		38.1		38.7		9.8		14.0
Green Extension Time (*g e*), s		6.5		6.3		0.2		0.0
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.44		0.46		1.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h		400	17	100	1006	161		172		100	17	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1755	1502	990	1772	1502		1523		1308	1672	
Queue Service Time (*g s*), s		0.0	0.3	4.2	36.7	3.4		6.2		4.0	0.6	
Cycle Queue Clearance Time (*g c*), s		36.1	0.3	13.4	36.7	3.4		7.8		12.0	0.6	
Green Ratio (*g/C*)		0.62	0.62	0.62	0.62	0.62		0.16		0.16	0.16	
Capacity (*c*), veh/h		1137	930	587	1098	930		321		170	273	
Volume-to-Capacity Ratio (*X*)		0.352	0.018	0.170	0.916	0.173		0.536		0.590	0.061	
Back of Queue (*Q*), ft/ln (95 th percentile)		96.6	3.2	34.4	457.3	33.9		131		92.6	11.4	
Back of Queue (*Q*), veh/ln (95 th percentile)		3.8	0.1	1.4	18.0	1.3		5.2		3.6	0.5	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.06	0.46	0.00	0.18		0.00		0.80	0.00	
Uniform Delay (*d 1*), s/veh		6.9	5.4	10.5	12.3	6.0		28.9		35.3	26.0	
Incremental Delay (*d 2*), s/veh		0.2	0.0	0.1	9.8	0.1		1.8		5.3	0.1	
Initial Queue Delay (*d 3*), s/veh		0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh		7.1	5.4	10.6	22.1	6.1		30.7		40.6	26.1	
Level of Service (LOS)		A	A	B	C	A		C		D	C	
Approach Delay, s/veh / LOS	7.0	A		19.2	B		30.7	C		38.6	D	
Intersection Delay, s/veh / LOS	18.8						B					

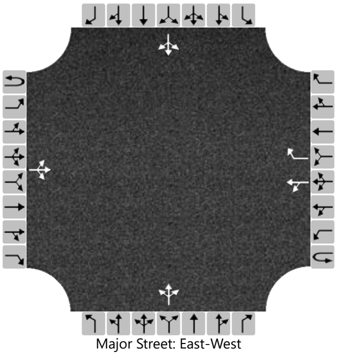
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.68	B	1.87	B	2.27	B	1.95	B
Bicycle LOS Score / LOS	1.18	A	2.58	C	0.77	A	0.68	A

HCS7 Two-Way Stop-Control Report

General Information | Site Information

Analyst	DH	Intersection	SHERIDAN/TANAGER/CROYLE
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2045	North/South Street	TANAGER DRIVE
Time Analyzed	PM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	1		0	1	0		0	1	0
Configuration			LTR			LT		R			LTR				LTR	
Volume (veh/h)		5	340	5		25	810	155		5	0	15		35	0	5
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized					No											
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

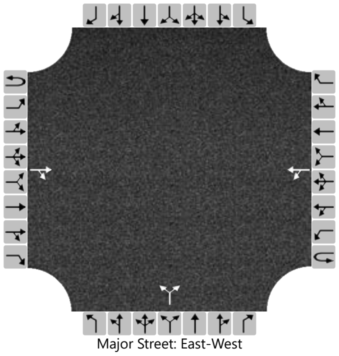
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		6				28					22				44	
Capacity, c (veh/h)		650				1174					284				128	
v/c Ratio		0.01				0.02					0.08				0.35	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.3				1.4	
Control Delay (s/veh)		10.6		0.1		8.1					18.7				47.3	
Level of Service (LOS)		B		A		A					C				E	
Approach Delay (s/veh)	0.3				0.5				18.7				47.3			
Approach LOS									C				E			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	SHERIDAN/ALBERTTA
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2045	North/South Street	ALBERTTA DRIVE
Time Analyzed	PM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			325	5		105	715			5		25				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				7.12		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						117					33					
Capacity, c (veh/h)						1191					361					
v/c Ratio						0.10					0.09					
95% Queue Length, Q_{95} (veh)						0.3					0.3					
Control Delay (s/veh)						8.4					16.0					
Level of Service (LOS)						A					C					
Approach Delay (s/veh)					2.3				16.0							
Approach LOS									C							

Sheridan Lake Road Traffic Study Report

Corral Drive to Albertta Drive

CITY OF RAPID CITY

Rapid City, South Dakota

Appendix F

2045 No-Build Traffic Analysis

with Alternative Network Improvements

Technical Memo

Date:	Monday, December 24, 2018
Project:	Sheridan Lake Road Corridor Study
To:	Study Advisory Team
From:	Dustin Hamilton
Subject:	2045 No-Build Conditions with Alternative Network Improvements (updated)

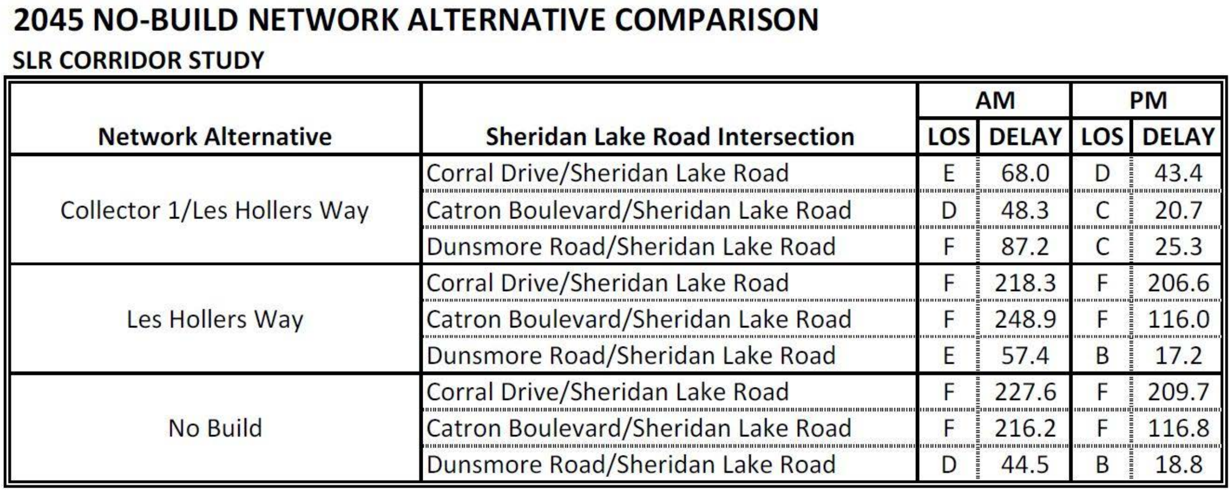
Future transportation needs in the Sheridan Lake Road corridor have been determined by forecasting the travel demand in the horizon year (2045) and analyzing the capability of the future transportation network to handle the future transportation demand. This memorandum documents the analysis of the existing Sheridan Lake Road corridor under 2045 traffic conditions with selected arterial and collector network improvements (2045 No-Build scenario – with Alternative Network Improvements).

Future traffic demand was determined using the travel demand model maintained by the Rapid City Metropolitan Planning Organization (MPO) and the City of Rapid City. Link data for the 2013 and 2040 models were compared to determine link growth factors which were then adjusted by straight-line annual growth to determine growth factors to the 2045 horizon year. Those factors were used to create 2045 peak hour turning volumes. The turning volume forecasts were balanced to create a homogenous network for capacity analysis.

Each of the Sheridan Lake Road study area intersections were analyzed with 2045 forecast volumes using Highway Capacity Manual techniques, as implemented in the Highway Capacity Software (McTrans Center and FHWA) for Alternative Network Improvements associated with Collector 1 and Les Hollers Way. Collector 1 includes a future street from the intersection of Sheridan Lake Road and Spring Canyon Trail, north to the Chapel Valley Subdivision with a connection at the existing Red Rock Canyon Road. The Les Hollers Way extension would continue west to Sheridan Lake Road from its current terminus just west of Catron Boulevard. The Collector 1 scenario also includes the Les Hollers Way extension/connection while the Les Hollers Way scenario includes only the Les Hollers Way extension. The two Alternative Network Improvements are depicted in **Figure 1**. Future Collector 2, as depicted in Figure 1, was not analyzed as it does not provide benefit to the arterial network.

The 2045 peak hour turning volumes and levels of service are shown for each existing Sheridan Lake Road intersection based upon the identified Network Alternative Improvements in **Figure 2 (no network improvements), Figure 3 (Collector 1/Les Hollers), and Figure 4 (Les Hollers).** The intersection capacity analysis output sheets are provided in the **Appendix**.

The capacity analysis shows that signalized intersections on the Sheridan Lake Road corridor, operate at unacceptable levels of service with the identified arterial and collector street network improvements under 2045 traffic conditions. The signalized intersection level of service for the Alternative Network Improvements are summarized as follows:

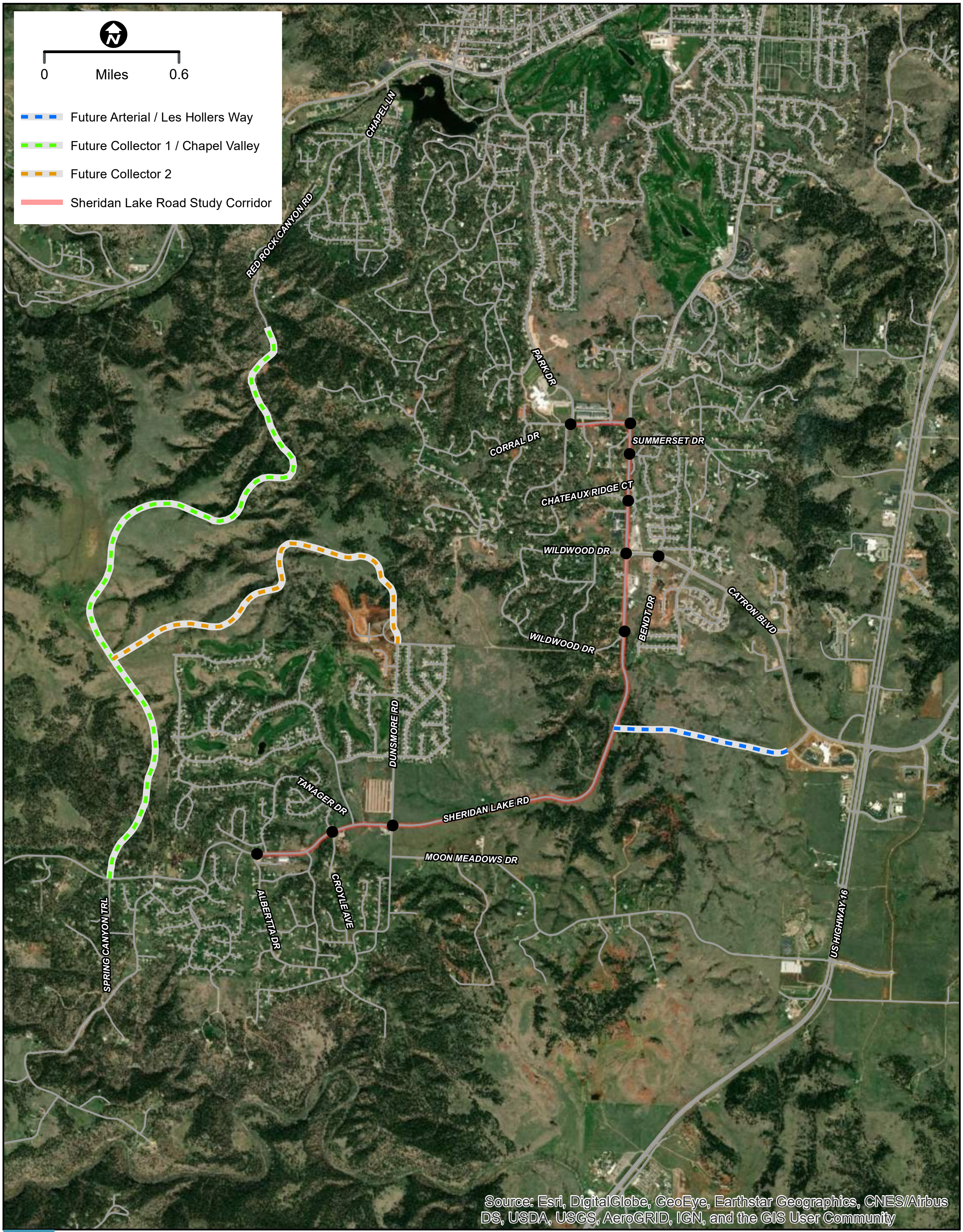


2045 NO-BUILD NETWORK ALTERNATIVE COMPARISON

SLR CORRIDOR STUDY

Network Alternative	Sheridan Lake Road Intersection	AM		PM	
		LOS	DELAY	LOS	DELAY
Collector 1/Les Hollers Way	Corral Drive/Sheridan Lake Road	E	68.0	D	43.4
	Catron Boulevard/Sheridan Lake Road	D	48.3	C	20.7
	Dunsmore Road/Sheridan Lake Road	F	87.2	C	25.3
Les Hollers Way	Corral Drive/Sheridan Lake Road	F	218.3	F	206.6
	Catron Boulevard/Sheridan Lake Road	F	248.9	F	116.0
	Dunsmore Road/Sheridan Lake Road	E	57.4	B	17.2
No Build	Corral Drive/Sheridan Lake Road	F	227.6	F	209.7
	Catron Boulevard/Sheridan Lake Road	F	216.2	F	116.8
	Dunsmore Road/Sheridan Lake Road	D	44.5	B	18.8

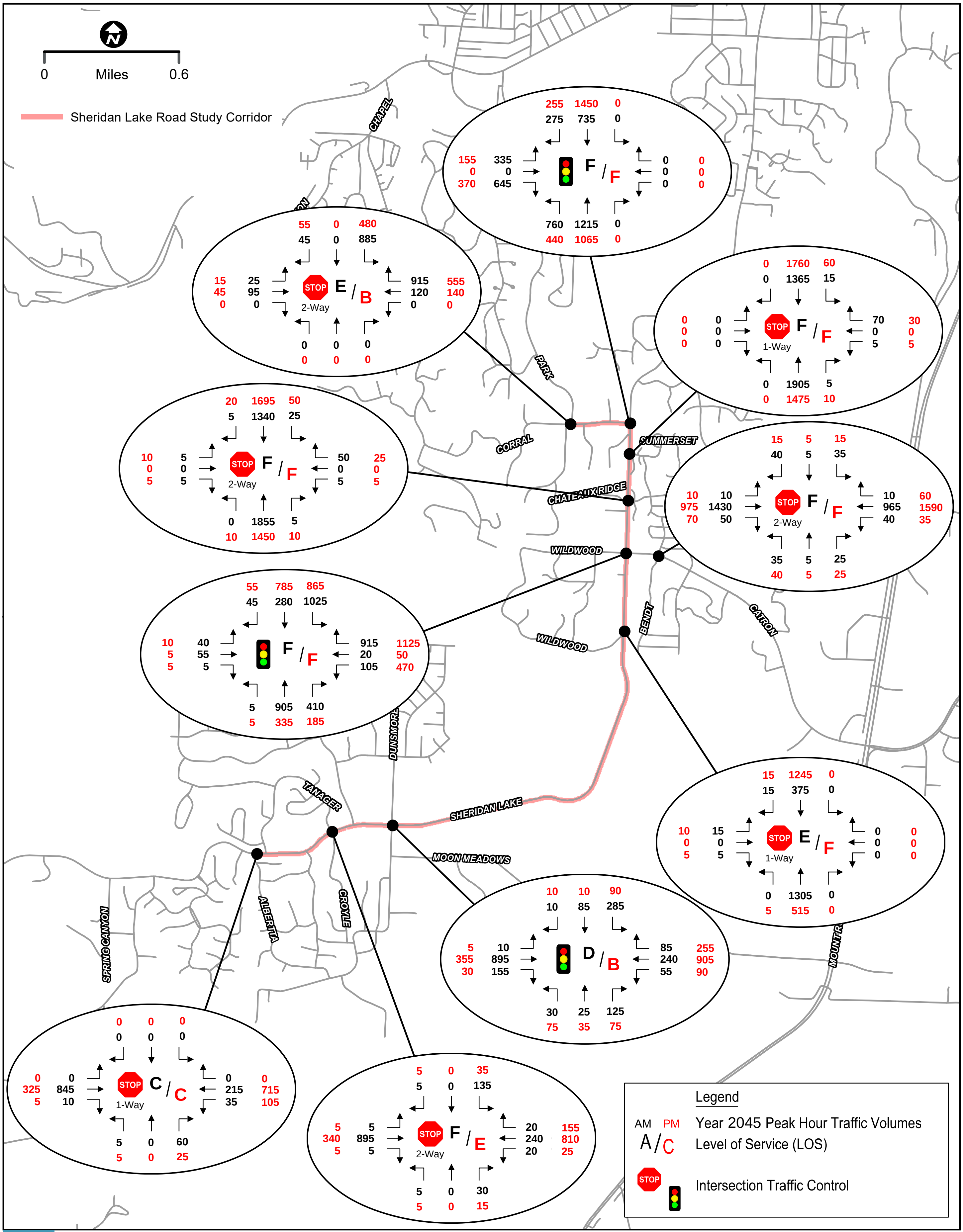
The intersection level of service analysis identifies that building Collector 1/Les Hollers Way reduces future volumes and provides some relief to the Sheridan Lake Road Corridor. However, improvements to the Sheridan Lake Road Corridor are still necessary to accommodate 2045 traffic volumes at an acceptable level of service. Sheridan Lake Road Alternatives will be developed and will be analyzed in subsequent phases of the Sheridan Lake Road Corridor Study.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FUTURE STREET ALTERNATIVES

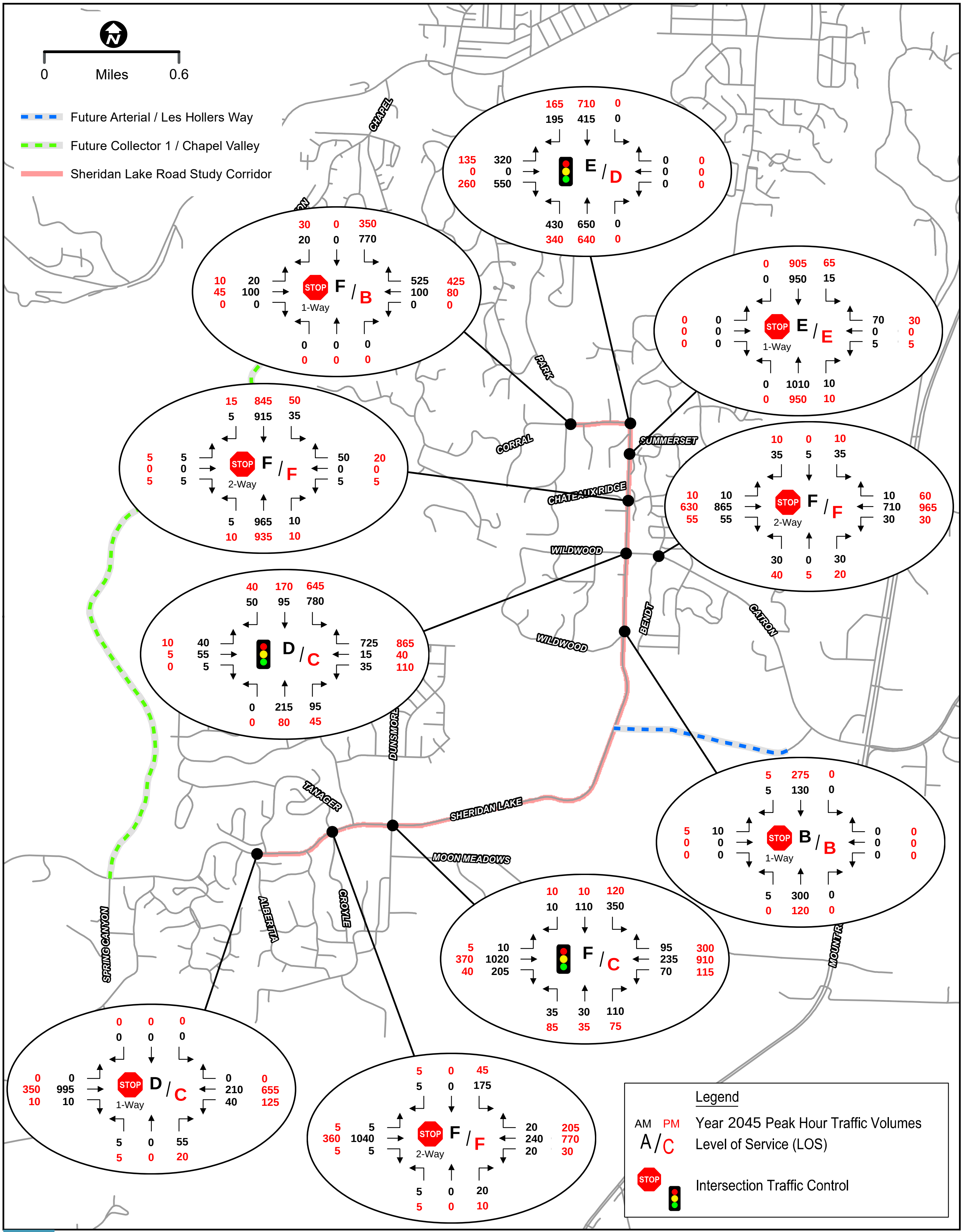
FIGURE 1



2045 NO-BUILD VOLUME & LEVEL OF SERVICE

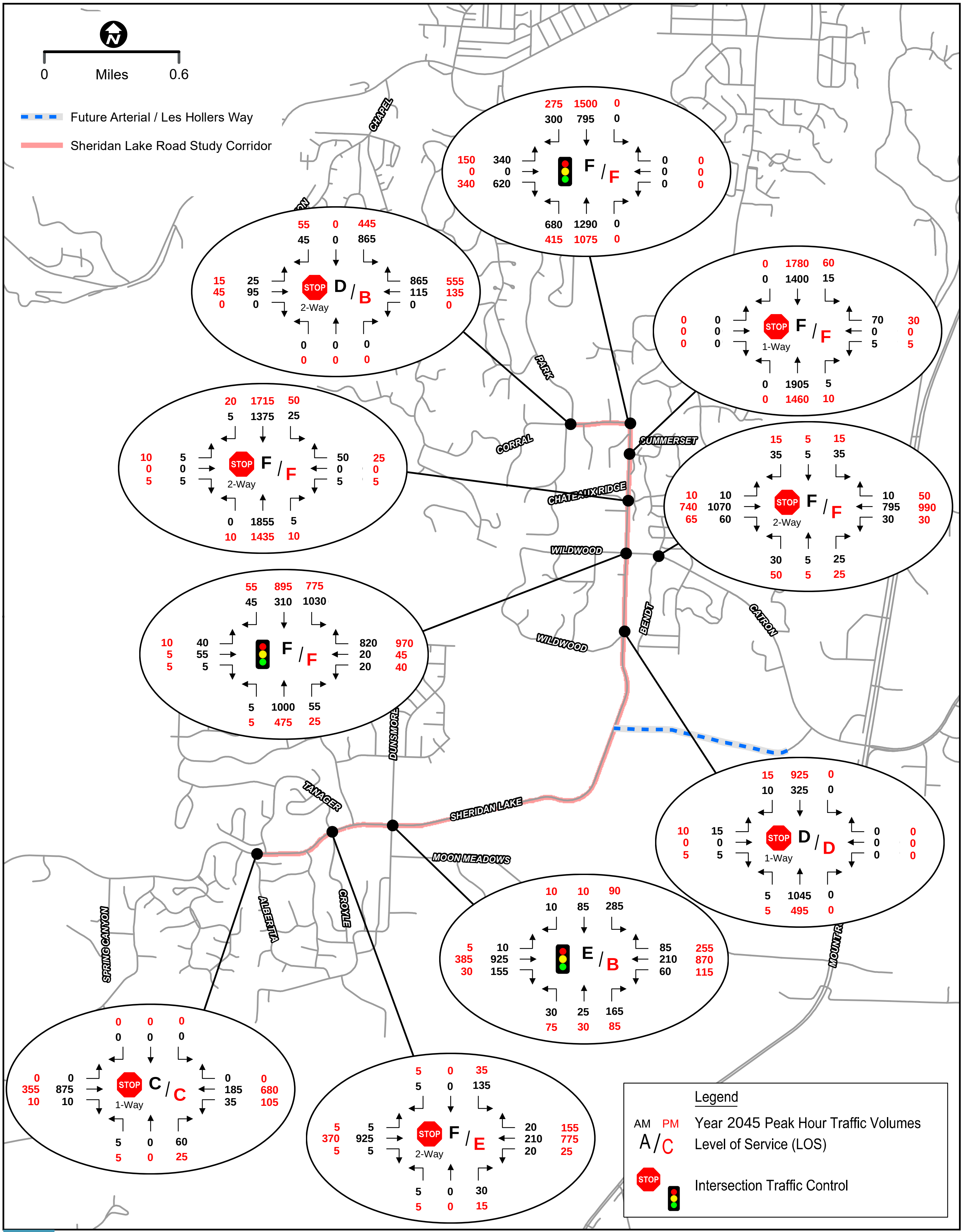
FIGURE 2

SHERIDAN LAKE ROAD TRAFFIC STUDY



2045 NO-BUILD VOLUME & LEVEL OF SERVICE
FUTURE COLLECTOR 1 / LES HOLLERS WAY ALTERNATIVE

FIGURE 3



2045 NO-BUILD VOLUME & LEVEL OF SERVICE
FUTURE ARTERIAL / LES HOLLERS WAY ALTERNATIVE

FIGURE 4

APPENDIX

Capacity Analysis Output Sheets

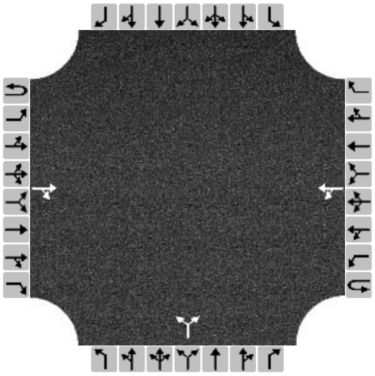
COLLECTOR 1

HCS7 Two-Way Stop-Control Report

General Information / Site Information

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN/ALBERTTA
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/14/2018	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2045	North/South Street	ALBERTTA DRIVE
Time Analyzed	AM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			995	10		40	210			5		55				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

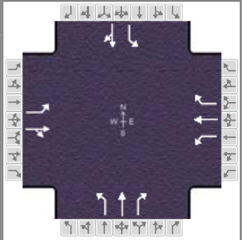
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				7.12		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						44					67					
Capacity, c (veh/h)						625					227					
v/c Ratio						0.07					0.29					
95% Queue Length, Q_{95} (veh)						0.2					1.2					
Control Delay (s/veh)						11.2					27.3					
Level of Service, LOS						B					D					
Approach Delay (s/veh)					2.6				27.3							
Approach LOS									D							

HCS7 Signalized Intersection Results Summary

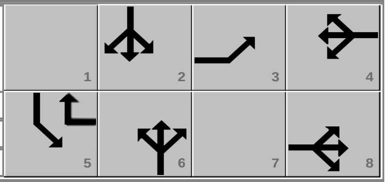
General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Feb 14, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 NO BUILD COLLECTOR 1	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	SLR-CATRON.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	55	5	35	15	725	0	215	95	780	95	50

Signal Information			
Cycle, s	123.4	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	53.0	20.1	3.9	24.3	0.0	0.0
Yellow	3.0	5.0	3.0	4.0	0.0	0.0
Red	2.0	2.0	1.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8		4		6	5	2
Case Number	1.0	4.0		5.3		5.3	1.0	4.0
Phase Duration, s	7.9	38.2		30.3		27.1	58.0	85.1
Change Period, (*Y+R c*), s	4.0	6.0		6.0		7.0	5.0	7.0
Max Allow Headway (*MAH*), s	4.1	5.3		5.3		5.0	5.1	5.0
Queue Clearance Time (*g s*), s	4.5	5.6		23.9		18.1	55.0	6.0
Green Extension Time (*g e*), s	0.0	4.2		0.5		2.1	0.0	2.6
Phase Call Probability	0.78	1.00		1.00		1.00	1.00	1.00
Max Out Probability	0.59	0.01		1.00		0.05	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	44	67		39	17	483	0	239	61	867	139	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1746		1335	1772	1502	1250	1772	1502	1688	1699	
Queue Service Time (*g s*), s	2.5	3.6		3.0	0.9	21.9	0.0	16.1	4.4	53.0	4.0	
Cycle Queue Clearance Time (*g c*), s	2.5	3.6		3.0	0.9	21.9	0.0	16.1	4.4	53.0	4.0	
Green Ratio (*g/C*)	0.25	0.26		0.20	0.20	0.63	0.16	0.16	0.16	0.61	0.63	
Capacity (*c*), veh/h	377	456		321	349	941	58	289	245	821	1076	
Volume-to-Capacity Ratio (*X*)	0.118	0.146		0.121	0.048	0.514	0.000	0.826	0.249	1.056	0.129	
Back of Queue (*Q*), ft/ln (95 th percentile)	47.6	70.9		45.3	19	284.8	0	310.2	76.1	1039.2	64.9	
Back of Queue (*Q*), veh/ln (95 th percentile)	1.9	2.8		1.8	0.7	11.2	0.0	12.2	3.0	40.9	2.6	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.29	0.00		0.38	0.00	1.27	0.00	0.00	0.32	8.31	0.00	
Uniform Delay (*d 1*), s/veh	36.1	35.0		41.0	40.1	12.7	0.0	49.9	45.0	26.4	9.0	
Incremental Delay (*d 2*), s/veh	0.1	0.2		0.2	0.1	0.6	0.0	8.3	0.7	47.2	0.1	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	36.3	35.2		41.2	40.2	13.3	0.0	58.3	45.8	73.6	9.1	
Level of Service (LOS)	D	D		D	D	B		E	D	F	A	

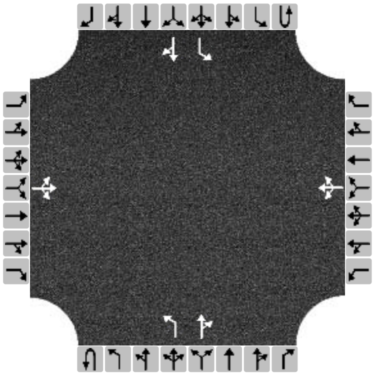
	EB		WB		NB		SB	
Approach Delay, s/veh / LOS	35.6	D	16.2	B	55.7	E	64.7	E
Intersection Delay, s/veh / LOS	48.3				D			

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.19	B	1.97	B	2.55	C	1.88	B
Bicycle LOS Score / LOS	0.67	A	1.38	A	0.98	A	2.15	B

HCS7 Two-Way Stop-Control Report

General Information		**Site Information**	
Analyst	RL	Intersection	SHERIDAN LAKE/CHATEAUX
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/14/2018	East/West Street	CHATEAUX RIDGE
Analysis Year	2045	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	AM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	0
Configuration			LTR				LTR			L		TR		L		TR
Volume, V (veh/h)		5	0	5		5	0	50		5	965	10		35	915	5
Percent Heavy Vehicles (%)		2	2	2		2	2	2		2				2		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

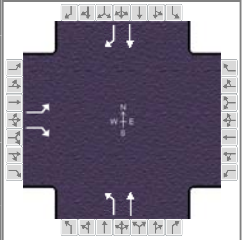
Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.12	6.52	6.22		7.12	6.52	6.22		4.12				4.12		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.52	4.02	3.32		3.52	4.02	3.32		2.22				2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			11				61			6				39		
Capacity, c (veh/h)			43				156			679				644		
v/c Ratio			0.26				0.39			0.01				0.06		
95% Queue Length, Q_{95} (veh)			0.9				1.7			0.0				0.2		
Control Delay (s/veh)			114.1				42.2			10.3				11.0		
Level of Service, LOS			F				E			B				B		
Approach Delay (s/veh)	114.1				42.2				0.1				0.4			
Approach LOS	F				E											

HCS7 Signalized Intersection Results Summary

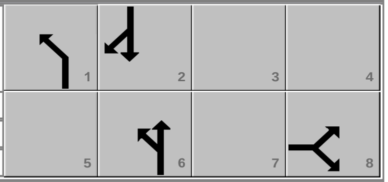
General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Feb 14, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 NO BUILD COLLECTOR 1	Analysis Period	1> 7:00
Intersection	CORRAL DRIVE	File Name	SLR-CORRAL.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	320		550				430	650			415	195

Signal Information			
Cycle, s	121.6	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	29.0	36.6	39.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.5	1.5	2.0	0.0	0.0	0.0



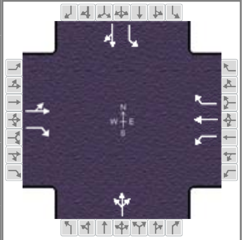
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8			1	6		2
Case Number		9.0			1.0	4.0		7.3
Phase Duration, s		45.0			34.5	76.6		42.1
Change Period, (*Y+R* $_c$), s		6.0			5.5	5.5		5.5
Max Allow Headway (*MAH*), s		4.2			5.1	4.0		4.0
Queue Clearance Time (g_s), s		41.0			27.4	36.7		31.9
Green Extension Time (g_e), s		0.0			1.5	5.9		4.8
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		1.00			0.67	0.00		0.22

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3		18				1	6			2	12
Adjusted Flow Rate (*v*), veh/h	356		611				478	722			461	117
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688		1502				1688	1772			1772	1502
Queue Service Time (g_s), s	22.0		39.0				25.4	34.7			29.9	7.2
Cycle Queue Clearance Time (g_c), s	22.0		39.0				25.4	34.7			29.9	7.2
Green Ratio (*g/C*)	0.32		0.32				0.56	0.58			0.30	0.30
Capacity (*c*), veh/h	541		482				513	1036			534	452
Volume-to-Capacity Ratio (*X*)	0.657		1.269				0.932	0.697			0.864	0.258
Back of Queue (*Q*), ft/ln (95 th percentile)	362		1210.9				471.2	496			510.6	118.9
Back of Queue (*Q*), veh/ln (95 th percentile)	14.3		47.7				18.5	19.5			20.1	4.7
Queue Storage Ratio (*RQ*) (95 th percentile)	3.62		0.00				4.71	0.00			0.00	0.99
Uniform Delay (d_1), s/veh	35.5		41.3				29.1	17.7			40.1	32.2
Incremental Delay (d_2), s/veh	2.9		136.5				21.3	1.5			9.1	0.3
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	38.4		177.8				50.4	19.3			49.2	32.5
Level of Service (LOS)	D		F				D	B			D	C
Approach Delay, s/veh / LOS	126.5		F	0.0			31.6		C	45.8		D
Intersection Delay, s/veh / LOS	68.0						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.97	B	2.09	B	0.69	A	1.93	B
Bicycle LOS Score / LOS		F			2.47	B	1.44	A

HCS7 Signalized Intersection Results Summary

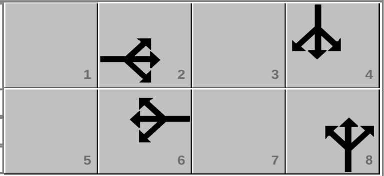
General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Feb 14, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 NO BUILD COLLECTOR 1	Analysis Period	1> 7:00
Intersection	DUNSMORE ROAD	File Name	SLR-DUNSMORE.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	1020	205	70	235	95	35	30	110	350	110	10

Signal Information			
Cycle, s	136.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	78.0	42.0	0.0	0.0	0.0	0.0
Yellow	5.0	3.0	0.0	0.0	0.0	0.0
Red	4.0	4.0	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		7.0		5.0		8.0		6.0
Phase Duration, s		87.0		87.0		49.0		49.0
Change Period, (*Y+R* c), s		9.0		9.0		7.0		7.0
Max Allow Headway (*MAH*), s		4.1		4.1		4.4		4.4
Queue Clearance Time (*g* s), s		80.0		80.0		13.7		44.0
Green Extension Time (*g* e), s		0.0		0.0		2.9		0.0
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		1.00		1.00		0.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h		1144	139	78	261	61		144		389	128	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1768	1502	497	1772	1502		1429		1288	1758	
Queue Service Time (*g* s), s		31.4	5.9	0.0	10.0	2.5		4.4		30.3	7.4	
Cycle Queue Clearance Time (*g* c), s		78.0	5.9	78.0	10.0	2.5		11.7		42.0	7.4	
Green Ratio (*g/C*)		0.57	0.57	0.57	0.57	0.57		0.31		0.31	0.31	
Capacity (*c*), veh/h		1041	861	53	1016	861		475		340	543	
Volume-to-Capacity Ratio (*X*)		1.100	0.161	1.469	0.257	0.071		0.304		1.145	0.235	
Back of Queue (*Q*), ft/ln (95 th percentile)		1641.3	87.2	276.4	174.1	36.2		173.1		779.8	149.2	
Back of Queue (*Q*), veh/ln (95 th percentile)		64.6	3.4	10.9	6.9	1.4		6.8		30.7	5.9	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	1.74	3.69	0.00	0.20		0.00		6.78	0.00	
Uniform Delay (*d* 1), s/veh		29.9	13.6	68.0	14.5	12.9		36.3		55.2	35.0	
Incremental Delay (*d* 2), s/veh		59.3	0.1	288.9	0.1	0.0		0.4		94.2	0.2	
Initial Queue Delay (*d* 3), s/veh		0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh		89.3	13.7	356.9	14.6	12.9		36.7		149.5	35.3	
Level of Service (LOS)		F	B	F	B	B		D		F	D	

	EB		WB		NB		SB	
Approach Delay, s/veh / LOS	81.1	F	80.9	F	36.7	D	121.2	F
Intersection Delay, s/veh / LOS	87.2				F			

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.74	B	1.91	B	2.18	B	2.05	B
Bicycle LOS Score / LOS	2.61	C	1.15	A	0.73	A	1.34	A

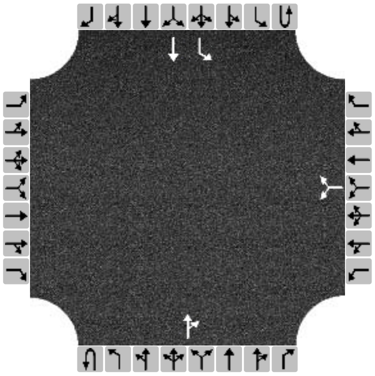
HCS7 Two-Way Stop-Control Report

General Information

Site Information

Analyst	RL	Intersection	SHERIDAN LAKE/SUMMERSET
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/14/2018	East/West Street	SUMMERSET DRIVE
Analysis Year	2045	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	AM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume, V (veh/h)						5		70			1010	10		15	950	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

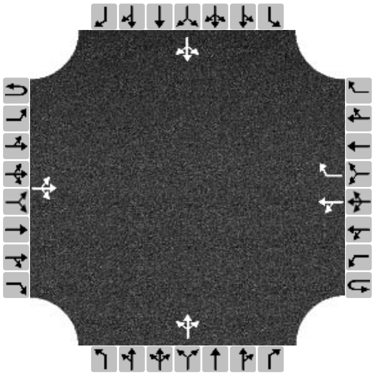
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							83							17		
Capacity, c (veh/h)							193							616		
v/c Ratio							0.43							0.03		
95% Queue Length, Q_{95} (veh)							2.0							0.1		
Control Delay (s/veh)							37.1							11.0		
Level of Service, LOS							E							B		
Approach Delay (s/veh)					37.1								0.2			
Approach LOS					E											

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN/TANAGER/CROYLE
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/14/2018	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2045	North/South Street	TANAGER DRIVE
Time Analyzed	AM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	1		0	1	0		0	1	0
Configuration			LTR			LT		R			LTR				LTR	
Volume, V (veh/h)		5	1040	5		20	240	20		5	0	20		175	0	5
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		6				22					28				200	
Capacity, c (veh/h)		1272				601					184				91	
v/c Ratio		0.00				0.04					0.15				2.21	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.5				17.9	
Control Delay (s/veh)		7.8				11.2					28.0				654.0	
Level of Service, LOS		A				B					D				F	
Approach Delay (s/veh)	0.1				1.2				28.0				654.0			
Approach LOS									D				F			

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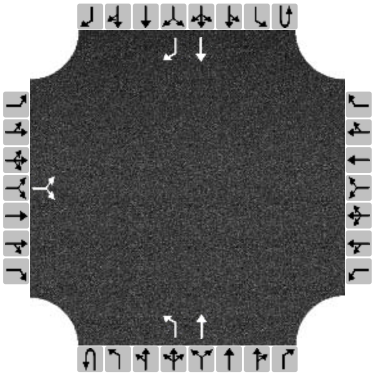
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN/WILDWOOD
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/14/2018	East/West Street	WILDWOOD DRIVE
Analysis Year	2045	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	AM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	1
Configuration			LR							L	T				T	R
Volume, V (veh/h)		10		0						5	300				130	5
Percent Heavy Vehicles (%)		2		2						2						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.42		6.22						4.12						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

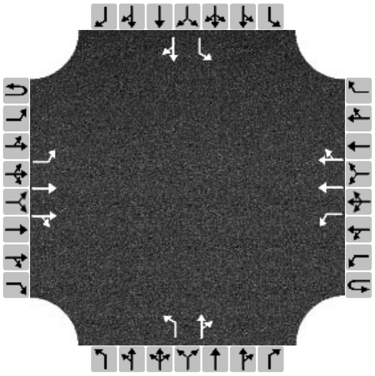
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			11							6						
Capacity, c (veh/h)			536							1430						
v/c Ratio			0.02							0.00						
95% Queue Length, Q_{95} (veh)			0.1							0.0						
Control Delay (s/veh)			11.9							7.5						
Level of Service, LOS			B							A						
Approach Delay (s/veh)	11.9								0.1							
Approach LOS	B															

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	CATRON/BENDT
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/14/2018	East/West Street	CATRON BOULEVARD
Analysis Year	2045	North/South Street	BENDT DRIVE
Time Analyzed	AM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		1	1	0		1	1	0
Configuration		L	T	TR		L	T	TR		L		TR		L		TR
Volume, V (veh/h)		10	865	55		30	710	10		30	0	30		35	5	35
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.14				4.14				7.54	6.54	6.94		7.54	6.54	6.94
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

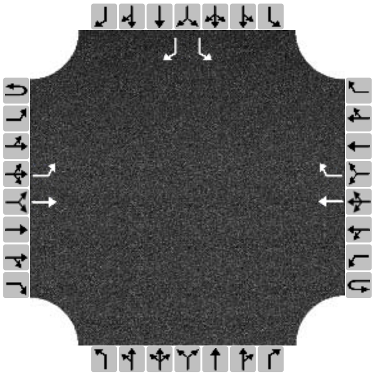
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		11				33				33		33		39		44
Capacity, c (veh/h)		819				675				73		508		95		292
v/c Ratio		0.01				0.05				0.46		0.07		0.41		0.15
95% Queue Length, Q_{95} (veh)		0.0				0.2				1.8		0.2		1.7		0.5
Control Delay (s/veh)		9.5				10.6				90.8		12.6		67.3		19.5
Level of Service, LOS		A				B				F		B		F		C
Approach Delay (s/veh)	0.1				0.4				51.7				41.8			
Approach LOS									F				E			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	CORRAL/PARK
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/14/2018	East/West Street	CORRAL DRIVE
Analysis Year	2045	North/South Street	PARK DRIVE
Time Analyzed	AM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume, V (veh/h)		20	100				100	525						770		20
Percent Heavy Vehicles (%)		2												2		2
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized	No				Yes				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.12												6.42		6.22
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.22												3.52		3.32

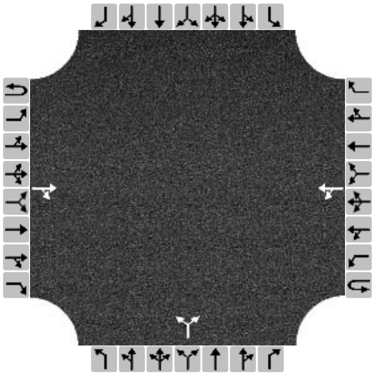
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		22												856		22
Capacity, c (veh/h)		1478												711		942
v/c Ratio		0.02												1.20		0.02
95% Queue Length, Q_{95} (veh)		0.0												29.1		0.1
Control Delay (s/veh)		7.5												125.3		8.9
Level of Service, LOS		A												F		A
Approach Delay (s/veh)	1.2												122.3			
Approach LOS													F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN/ALBERTTA
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/14/2018	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2045	North/South Street	ALBERTTA DRIVE
Time Analyzed	PM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			350	10		125	655			5		20				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

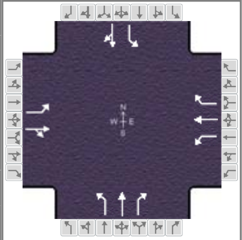
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				7.12		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						139					28					
Capacity, c (veh/h)						1158					317					
v/c Ratio						0.12					0.09					
95% Queue Length, Q_{95} (veh)						0.4					0.3					
Control Delay (s/veh)						8.5					17.4					
Level of Service, LOS						A					C					
Approach Delay (s/veh)					2.8				17.4							
Approach LOS									C							

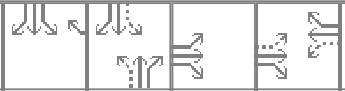
HCS7 Signalized Intersection Results Summary

General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Feb 14, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM NO BUILD COLLECTOR 1	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	SLR-CATRON.xus		
Project Description	SLR CORRIDOR STUDY				

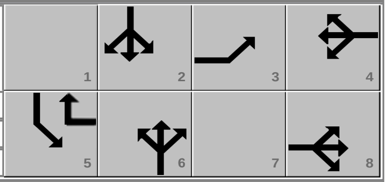


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	5	0	110	40	865	0	80	45	645	170	40

Signal Information			
Cycle, s	104.1	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	40.7	15.0	1.4	25.0	0.0	0.0
Yellow	3.0	5.0	3.0	4.0	0.0	0.0
Red	2.0	2.0	1.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8		4		6	5	2
Case Number	1.0	4.0		5.3		5.3	1.0	4.0
Phase Duration, s	5.4	36.4		31.0		22.0	45.7	67.7
Change Period, (*Y+R* $_c$), s	4.0	6.0		6.0		7.0	5.0	7.0
Max Allow Headway (*MAH*), s	4.1	5.3		5.3		5.0	5.1	5.0
Queue Clearance Time (*g* $_s$), s	2.5	2.2		26.0		6.7	36.2	8.2
Green Extension Time (*g* $_e$), s	0.0	5.6		0.0		1.8	4.5	1.9
Phase Call Probability	0.27	1.00		1.00		1.00	1.00	1.00
Max Out Probability	0.01	0.02		1.00		0.00	0.14	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	11	0		122	44	578	0	89	28	717	217	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1626		1410	1772	1502	1165	1772	1502	1688	1732	
Queue Service Time (*g* $_s$), s	0.5	0.0		7.5	2.0	24.0	0.0	4.7	1.7	34.2	6.2	
Cycle Queue Clearance Time (*g* $_c$), s	0.5	0.0		7.5	2.0	24.0	0.0	4.7	1.7	34.2	6.2	
Green Ratio (*g/C*)	0.27	0.37		0.24	0.24	0.63	0.14	0.14	0.14	0.55	0.58	
Capacity (*c*), veh/h	392			408	426	948	69	255	216	859	1010	
Volume-to-Capacity Ratio (*X*)	0.028	0.000		0.300	0.104	0.609	0.000	0.348	0.128	0.835	0.214	
Back of Queue (*Q*), ft/ln (95 th percentile)	9.2	0		116.9	39.6	295.4	0	95.3	28.7	484.3	100.4	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.4	0.0		4.6	1.6	11.6	0.0	3.8	1.1	19.1	4.0	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.06	0.00		0.97	0.00	1.31	0.00	0.00	0.12	3.87	0.00	
Uniform Delay (*d* $_1$), s/veh	27.8			32.9	30.8	11.5	0.0	40.1	38.8	18.4	10.3	
Incremental Delay (*d* $_2$), s/veh	0.0	0.0		0.6	0.2	1.4	0.0	1.2	0.4	5.5	0.1	
Initial Queue Delay (*d* $_3$), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	27.8			33.5	31.0	12.9	0.0	41.3	39.2	23.9	10.5	
Level of Service (LOS)	C			C	C	B		D	D	C	B	
Approach Delay, s/veh / LOS	27.3		C	17.3		B	40.8		D	20.8		C
Intersection Delay, s/veh / LOS	20.7						C					

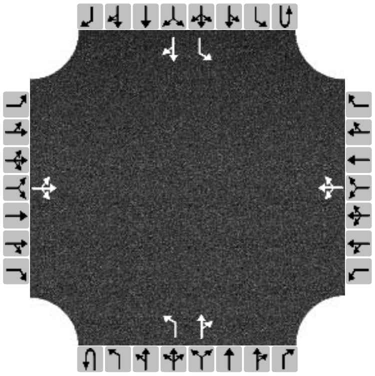
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.15	B	1.96	B	2.63	C	1.89	B
Bicycle LOS Score / LOS	0.52	A	1.72	B	0.68	A	2.03	B

HCS7 Two-Way Stop-Control Report

General Information / Site Information

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN LAKE/CHATEAUX
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/14/2018	East/West Street	CHATEAUX RIDGE
Analysis Year	2045	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	PM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	0
Configuration			LTR				LTR			L		TR		L		TR
Volume, V (veh/h)		5	0	5		5	0	20		10	935	10		50	845	15
Percent Heavy Vehicles (%)		2	2	2		2	2	2		2				2		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

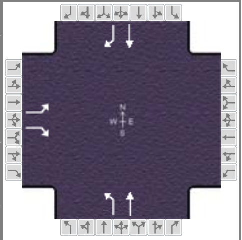
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.12	6.52	6.22		7.12	6.52	6.22		4.12				4.12		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.52	4.02	3.32		3.52	4.02	3.32		2.22				2.22		

Delay, Queue Length, and Level of Service

	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Flow Rate, v (veh/h)			11				28			11				56		
Capacity, c (veh/h)			55				112			719				663		
v/c Ratio			0.20				0.25			0.02				0.08		
95% Queue Length, Q_{95} (veh)			0.7				0.9			0.0				0.3		
Control Delay (s/veh)			85.5				47.6			10.1				10.9		
Level of Service, LOS			F				E			B				B		
Approach Delay (s/veh)	85.5				47.6				0.1				0.6			
Approach LOS	F				E											

HCS7 Signalized Intersection Results Summary

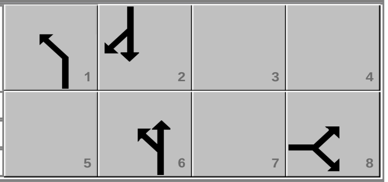
General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Feb 14, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 NO BUILD COLLECTOR 1	Analysis Period	1> 7:00
Intersection	CORRAL DRIVE	File Name	SLR-CORRAL.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	135		260				340	640			710	165

Signal Information			
Cycle, s	128.1	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	24.7	59.5	26.9	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.5	1.5	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8			1	6		2
Case Number		9.0			1.0	4.0		7.3
Phase Duration, s		32.9			30.2	95.2		65.0
Change Period, (*Y+R c*), s		6.0			5.5	5.5		5.5
Max Allow Headway (*MAH*), s		4.2			5.1	4.0		4.0
Queue Clearance Time (*g s*), s		26.1			24.1	27.8		57.1
Green Extension Time (*g e*), s		0.8			0.6	8.6		2.0
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		0.77			1.00	0.00		0.92

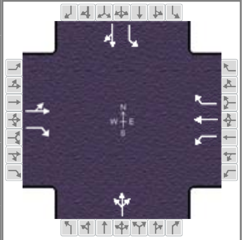
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3		18				1	6			2	12
Adjusted Flow Rate (*v*), veh/h	150		289				378	711			789	111
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688		1502				1688	1772			1772	1502
Queue Service Time (*g s*), s	9.9		24.1				22.1	25.8			55.1	5.5
Cycle Queue Clearance Time (*g c*), s	9.9		24.1				22.1	25.8			55.1	5.5
Green Ratio (*g/C*)	0.21		0.21				0.67	0.70			0.46	0.46
Capacity (*c*), veh/h	355		315				405	1241			823	697
Volume-to-Capacity Ratio (*X*)	0.423		0.916				0.933	0.573			0.959	0.159
Back of Queue (*Q*), ft/ln (95 th percentile)	190.2		420				528.5	351.8			907	87.2
Back of Queue (*Q*), veh/ln (95 th percentile)	7.5		16.5				20.8	13.9			35.7	3.4
Queue Storage Ratio (*RQ*) (95 th percentile)	1.90		0.00				5.28	0.00			0.00	0.73
Uniform Delay (*d 1*), s/veh	43.9		49.5				39.4	9.6			33.1	19.8
Incremental Delay (*d 2*), s/veh	0.8		25.3				26.8	0.6			20.9	0.1
Initial Queue Delay (*d 3*), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	44.7		74.8				66.1	10.3			54.0	20.0
Level of Service (LOS)	D		E				E	B			D	B

	EB		WB		NB		SB	
Approach Delay, s/veh / LOS	64.5	E	0.0		29.6	C	49.8	D
Intersection Delay, s/veh / LOS	43.4				D			

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.97	B	2.06	B	0.67	A	1.91	B
Bicycle LOS Score / LOS		F			2.28	B	1.97	B

HCS7 Signalized Intersection Results Summary

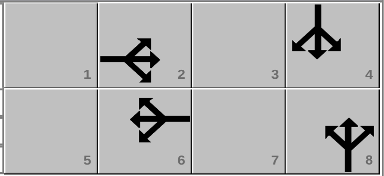
General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Feb 14, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 NO BUILD COLLECTOR 1	Analysis Period	1> 7:00
Intersection	DUNSMORE ROAD	File Name	SLR-DUNSMORE.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	5	370	40	115	910	300	85	35	75	120	10	10

Signal Information			
Cycle, s	114.2	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	72.6	25.7	0.0	0.0	0.0	0.0
Yellow	5.0	3.0	0.0	0.0	0.0	0.0
Red	4.0	4.0	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		7.0		5.0		8.0		6.0
Phase Duration, s		81.6		81.6		32.7		32.7
Change Period, (*Y+R* $_c$), s		9.0		9.0		7.0		7.0
Max Allow Headway (*MAH*), s		4.0		4.0		4.3		4.3
Queue Clearance Time (*g* $_s$), s		59.6		67.1		13.7		24.5
Green Extension Time (*g* $_e$), s		9.4		8.5		1.1		0.7
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.15		0.27		0.00		0.33

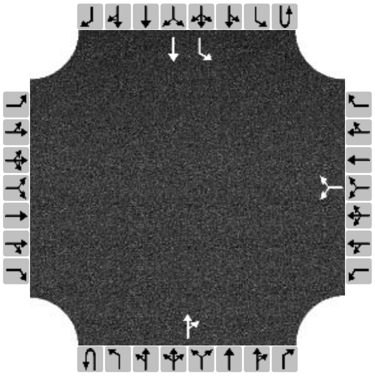
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h		417	28	128	1011	200		183		133	17	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1656	1502	975	1772	1502		1506		1308	1672	
Queue Service Time (*g* $_s$), s		1.3	0.8	14.1	56.0	6.5		9.8		11.0	0.9	
Cycle Queue Clearance Time (*g* $_c$), s		57.6	0.8	65.1	56.0	6.5		11.7		22.5	0.9	
Green Ratio (*g/C*)		0.64	0.64	0.64	0.64	0.64		0.22		0.22	0.22	
Capacity (*c*), veh/h		1064	935	225	1103	935		401		236	391	
Volume-to-Capacity Ratio (*X*)		0.392	0.030	0.567	0.916	0.214		0.457		0.566	0.043	
Back of Queue (*Q*), ft/ln (95 th percentile)		198.6	10.4	155	730.3	84.9		198.6		171.1	16.4	
Back of Queue (*Q*), veh/ln (95 th percentile)		7.8	0.4	6.1	28.8	3.3		7.8		6.7	0.6	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.21	2.07	0.00	0.46		0.00		1.49	0.00	
Uniform Delay (*d* $_1$), s/veh		10.5	8.1	44.8	18.5	9.2		37.1		46.9	33.1	
Incremental Delay (*d* $_2$), s/veh		0.2	0.0	2.2	8.1	0.1		0.8		2.1	0.0	
Initial Queue Delay (*d* $_3$), s/veh		0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh		10.7	8.1	47.0	26.7	9.3		37.9		49.1	33.1	
Level of Service (LOS)		B	A	D	C	A		D		D	C	
Approach Delay, s/veh / LOS	10.6	B		26.0	C		37.9	D		47.3	D	
Intersection Delay, s/veh / LOS	25.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.70	B	1.89	B	2.30	B	1.96	B
Bicycle LOS Score / LOS	1.22	A	2.70	C	0.79	A	0.74	A

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN LAKE/SUMMERSET
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/14/2018	East/West Street	SUMMERSET DRIVE
Analysis Year	2045	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	PM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume, V (veh/h)						5		30			950	10		65	905	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							39							72		
Capacity, c (veh/h)							155							653		
v/c Ratio							0.25							0.11		
95% Queue Length, Q_{95} (veh)							0.9							0.4		
Control Delay (s/veh)							35.9							11.2		
Level of Service, LOS							E							B		
Approach Delay (s/veh)					35.9								0.8			
Approach LOS					E											

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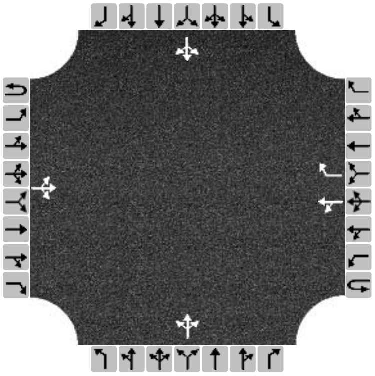
HCS7 Two-Way Stop-Control Report

General Information / Site Information

Analyst	RL	Intersection	SHERIDAN/TANAGER/CROYLE
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/14/2018	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2045	North/South Street	TANAGER DRIVE
Time Analyzed	PM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	1		0	1	0		0	1	0
Configuration			LTR			LT		R			LTR				LTR	
Volume, V (veh/h)		5	360	5		30	770	205		5	0	10		45	0	5
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

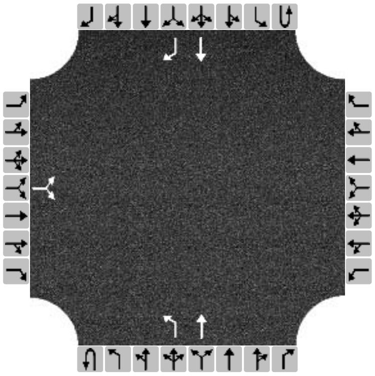
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		6				33					17				56	
Capacity, c (veh/h)		644				1152					228				127	
v/c Ratio		0.01				0.03					0.07				0.44	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.2				1.9	
Control Delay (s/veh)		10.6				8.2					22.0				53.8	
Level of Service, LOS		B				A					C				F	
Approach Delay (s/veh)	0.3				0.7				22.0				53.8			
Approach LOS									C				F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	SHERIDAN/WILDWOOD
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/14/2018	East/West Street	WILDWOOD DRIVE
Analysis Year	2045	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	PM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	1
Configuration			LR							L	T				T	R
Volume, V (veh/h)		5		0						0	120				275	5
Percent Heavy Vehicles (%)		2		2						2						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.42		6.22						4.12						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

Delay, Queue Length, and Level of Service

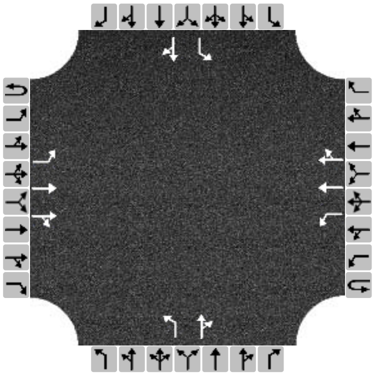
Flow Rate, v (veh/h)			6							0						
Capacity, c (veh/h)			575							1249						
v/c Ratio			0.01							0.00						
95% Queue Length, Q_{95} (veh)			0.0							0.0						
Control Delay (s/veh)			11.3							7.9						
Level of Service, LOS			B							A						
Approach Delay (s/veh)	11.3								0.0							
Approach LOS	B															

HCS7 Two-Way Stop-Control Report

General Information / Site Information

General Information		Site Information	
Analyst	RL	Intersection	CATRON/BENDT
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/14/2018	East/West Street	CATRON BOULEVARD
Analysis Year	2045	North/South Street	BENDT DRIVE
Time Analyzed	PM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		1	1	0		1	1	0
Configuration		L	T	TR		L	T	TR		L		TR		L		TR
Volume, V (veh/h)		10	630	55		30	965	60		40	5	20		10	0	10
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.14				4.14				7.54	6.54	6.94		7.54	6.54	6.94
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

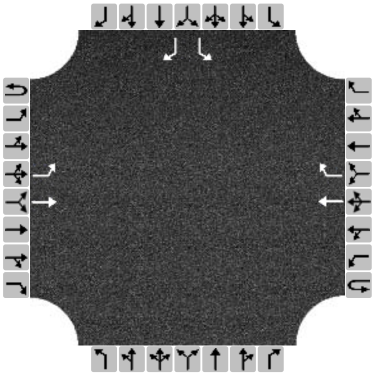
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		11				33				44		28		11		11
Capacity, c (veh/h)		609				847				101		214		67		465
v/c Ratio		0.02				0.04				0.44		0.13		0.17		0.02
95% Queue Length, Q_{95} (veh)		0.1				0.1				1.9		0.4		0.6		0.1
Control Delay (s/veh)		11.0				9.4				66.3		24.3		69.6		12.9
Level of Service, LOS		B				A				F		C		F		B
Approach Delay (s/veh)	0.2				0.3				50.2				41.3			
Approach LOS									F				E			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	RL	Intersection	CORRAL/PARK
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	2/14/2018	East/West Street	CORRAL DRIVE
Analysis Year	2045	North/South Street	PARK DRIVE
Time Analyzed	PM 2045 NO BUILD	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume, V (veh/h)		10	45				80	425						350		30
Percent Heavy Vehicles (%)		2												2		2
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized	No				Yes				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.12												6.42		6.22
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.22												3.52		3.32

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		11												389		33
Capacity, c (veh/h)		1505												823		969
v/c Ratio		0.01												0.47		0.03
95% Queue Length, Q_{95} (veh)		0.0												2.6		0.1
Control Delay (s/veh)		7.4												13.2		8.8
Level of Service, LOS		A												B		A
Approach Delay (s/veh)	1.3												12.9			
Approach LOS													B			

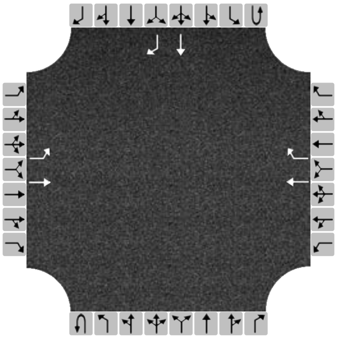
LES HOLLERS WAY

HCS7 Two-Way Stop-Control Report

General Information / Site Information

Analyst	DH	Intersection	CORRAL/PARK
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	CORRAL DRIVE
Analysis Year	2045	North/South Street	PARK DRIVE
Time Analyzed	AM 2045 NO BUILD - LHW	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	1	0		0	1	1	0	0	0	0	0	0	1	1
Configuration		L	T				T	R							T	R
Volume (veh/h)		25	95				115	865							865	45
Percent Heavy Vehicles (%)		2	3				3	3								
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized					Yes								No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

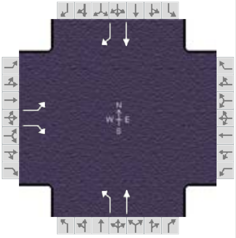
Base Critical Headway (sec)		7.1	6.5				6.5	6.2								
Critical Headway (sec)		6.42	6.53				6.53	6.23								
Base Follow-Up Headway (sec)		3.5	4.0				4.0	3.3								
Follow-Up Headway (sec)		2.22	4.03				4.03	3.33								

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		28	106				128	961								
Capacity, c (veh/h)		0	255				239	1082								
v/c Ratio			0.41				0.54	0.89								
95% Queue Length, Q_{95} (veh)			1.9				2.9	12.9								
Control Delay (s/veh)			28.7				36.3	27.5								
Level of Service (LOS)			D				E	D								
Approach Delay (s/veh)					28.5											
Approach LOS					D											

HCS7 Signalized Intersection Results Summary

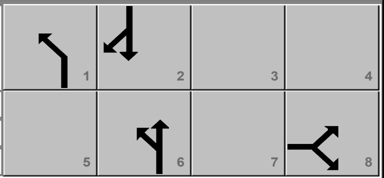
General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 14, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 NO BUILD - LHW	Analysis Period	1> 7:00
Intersection	CORRAL DRIVE	File Name	SLR-CORRAL-LHW.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	340		620				680	1290			795	300

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	39.5	61.5	32.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.5	1.5	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8			1	6		2
Case Number		9.0			1.0	4.0		7.3
Phase Duration, s		38.0			45.0	112.0		67.0
Change Period, ($Y+R_c$), s		6.0			5.5	5.5		5.5
Max Allow Headway (*MAH*), s		4.2			5.1	4.0		4.0
Queue Clearance Time (g_s), s		34.0			41.5	108.5		63.5
Green Extension Time (g_e), s		0.0			0.0	0.0		0.0
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		1.00			1.00	1.00		1.00

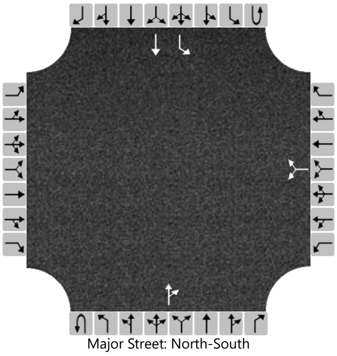
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3		18				1	6			2	12
Adjusted Flow Rate (*v*), veh/h	378		689				756	1433			883	233
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688		1502				1688	1772			1772	1502
Queue Service Time (g_s), s	32.0		32.0				39.5	106.5			61.5	16.3
Cycle Queue Clearance Time (g_c), s	32.0		32.0				39.5	106.5			61.5	16.3
Green Ratio (*g/C*)	0.21		0.21				0.69	0.71			0.41	0.41
Capacity (*c*), veh/h	360		320				492	1258			726	616
Volume-to-Capacity Ratio (*X*)	1.049		2.150				1.534	1.139			1.216	0.379
Back of Queue (*Q*), ft/ln (95 th percentile)	700.2		2364.7				1985.8	2177.8			1730.8	251.9
Back of Queue (*Q*), veh/ln (95 th percentile)	27.6		93.1				78.2	85.7			68.1	9.9
Queue Storage Ratio (*RQ*) (95 th percentile)	7.00		0.00				19.86	0.00			0.00	2.10
Uniform Delay (d_1), s/veh	59.0		59.0				48.7	21.8			44.3	30.9
Incremental Delay (d_2), s/veh	60.9		528.0				250.6	72.8			109.5	0.4
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	119.9		587.0				299.3	94.5			153.8	31.3
Level of Service (LOS)	F		F				F	F			F	C
Approach Delay, s/veh / LOS	421.6	F		0.0			165.2	F		128.2	F	
Intersection Delay, s/veh / LOS	218.3						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.97	B	2.10	B	0.67	A	1.93	B
Bicycle LOS Score / LOS		F			4.10	D	2.33	B

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	SHERIDAN LAKE/SUMMERSET
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	SUMMERSET DRIVE
Analysis Year	2045	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	AM 2045 NO BUILD-LHW	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						5		65			1905	5		15	1400	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

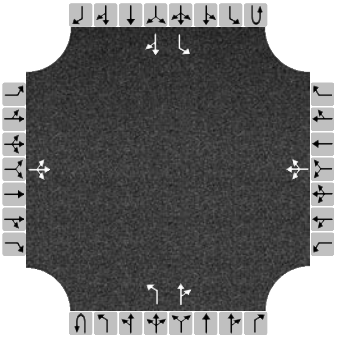
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							78							17		
Capacity, c (veh/h)							34							256		
v/c Ratio							2.30							0.07		
95% Queue Length, Q_{95} (veh)							8.8							0.2		
Control Delay (s/veh)							846.7							20.0		
Level of Service (LOS)							F							C		
Approach Delay (s/veh)					846.7								0.2			
Approach LOS					F											

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	SHERIDAN LAKE/CHATEAUX
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	CHATEAUX RIDGE
Analysis Year	2045	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	AM 2045 NO BUILD-LHW	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	0
Configuration			LTR				LTR			L		TR		L		TR
Volume (veh/h)		5	0	5		5	0	50		0	1855	5		25	1375	5
Percent Heavy Vehicles (%)		2	2	2		2	2	2		2				2		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

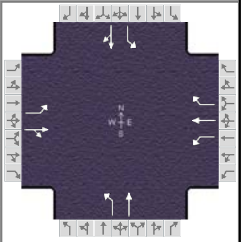
Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.12	6.52	6.22		7.12	6.52	6.22		4.12				4.12		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.52	4.02	3.32		3.52	4.02	3.32		2.22				2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			11				61			0				28		
Capacity, c (veh/h)			1				20			434				269		
v/c Ratio			12.16				3.10			0.00				0.10		
95% Queue Length, Q_{95} (veh)			2.8				8.0			0.0				0.3		
Control Delay (s/veh)			11733.4				1352.3			13.3				19.9		
Level of Service (LOS)			F				F			B				C		
Approach Delay (s/veh)	11733.4				1352.3				0.0				0.4			
Approach LOS	F				F											

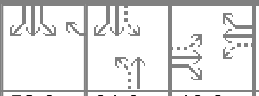
HCS7 Signalized Intersection Results Summary

General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 14, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 NO BUILD-LHW	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	SLR-CATRON-LHW.xus		
Project Description	SLR CORRIDOR STUDY				

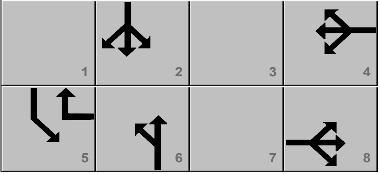


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	55	5	20	20	820	5	1000		1030	310	45

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	52.0	61.0	19.0	0.0	0.0	0.0
Yellow	3.0	5.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4		6	5	2
Case Number		6.0		5.0		6.3	1.0	4.0
Phase Duration, s		25.0		25.0		68.0	57.0	125.0
Change Period, ($Y+R_c$), s		6.0		6.0		7.0	5.0	7.0
Max Allow Headway (*MAH*), s		5.3		5.3		5.0	5.1	5.0
Queue Clearance Time (g_s), s		8.0		21.0		63.0	54.0	10.7
Green Extension Time (g_e), s		3.6		0.0		0.0	0.0	18.9
Phase Call Probability		1.00		1.00		1.00	1.00	1.00
Max Out Probability		0.40		1.00		1.00	1.00	0.01

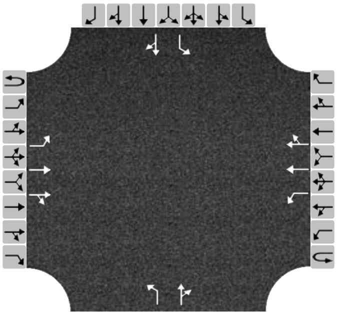
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6		5	2	12
Adjusted Flow Rate (*v*), veh/h	44	67		22	22	572	6	1111		1144	372	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1389	1746		1335	1772	1502	1010	1772		1688	1748	
Queue Service Time (g_s), s	4.4	5.2		2.3	1.7	19.0	0.5	61.0		52.0	8.7	
Cycle Queue Clearance Time (g_c), s	6.0	5.2		7.5	1.7	19.0	0.5	61.0		52.0	8.7	
Green Ratio (*g/C*)	0.13	0.13		0.13	0.13	0.47	0.41	0.41		0.77	0.79	
Capacity (*c*), veh/h	209	221		171	224	711	459	721		633	1375	
Volume-to-Capacity Ratio (*X*)	0.213	0.301		0.130	0.099	0.805	0.012	1.542		1.808	0.271	
Back of Queue (*Q*), ft/ln (95 th percentile)	72.2	107.8		36.7	34.8	651.9	5.6	2940		3434.8	122.7	
Back of Queue (*Q*), veh/ln (95 th percentile)	2.8	4.2		1.4	1.4	25.7	0.2	115.7		135.2	4.8	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.44	0.00		0.31	0.00	2.90	0.03	0.00		27.48	0.00	
Uniform Delay (d_1), s/veh	60.6	59.5		62.9	57.9	33.6	26.5	44.5		44.4	4.3	
Incremental Delay (d_2), s/veh	0.7	1.1		0.5	0.3	7.1	0.0	250.8		369.8	0.1	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	61.3	60.6		63.4	58.2	40.7	26.6	295.3		414.2	4.5	
Level of Service (LOS)	E	E		E	E	D	C	F		F	A	
Approach Delay, s/veh / LOS	60.9	E		42.1	D		294.0	F		313.6	F	
Intersection Delay, s/veh / LOS	248.9						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.22	B	1.99	B	2.55	C	1.85	B
Bicycle LOS Score / LOS	0.67	A	1.51	B	2.00	B	2.99	C

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	CATRON/BENDT
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	CATRON BOULEVARD
Analysis Year	2045	North/South Street	BENDT DRIVE
Time Analyzed	AM 2045 NO BUILD-LHW	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		1	1	0		1	1	0
Configuration		L	T	TR		L	T	TR		L		TR		L		TR
Volume (veh/h)	0	10	1070	60	0	30	795	10		35	5	25		35	5	30
Percent Heavy Vehicles (%)	2	2			2	2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.14				4.14				7.54	6.54	6.94		7.54	6.54	6.94
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

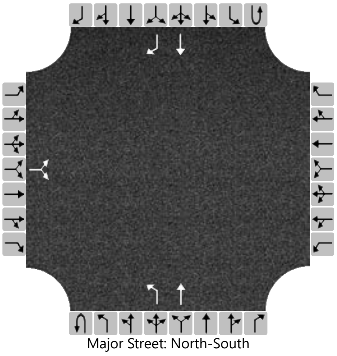
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate, v (veh/h)		11				33				39		33		39		39
Capacity, c (veh/h)		754				550				43		165		58		192
v/c Ratio		0.01				0.06				0.91		0.20		0.66		0.20
95% Queue Length, Q_{95} (veh)		0.0				0.2				3.6		0.7		2.8		0.7
Control Delay (s/veh)		9.8				12.0				254.8		32.3		146.4		28.4
Level of Service (LOS)		A				B				F		D		F		D
Approach Delay (s/veh)	0.1				0.4				152.1				87.4			
Approach LOS									F				F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	SHERIDAN/WILDWOOD
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	WILDWOOD DRIVE
Analysis Year	2045	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	AM 2045 NO BUILD-LHW	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	1
Configuration			LR							L	T				T	R
Volume (veh/h)		15		5						5	1045				325	10
Percent Heavy Vehicles (%)		2		2						2						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

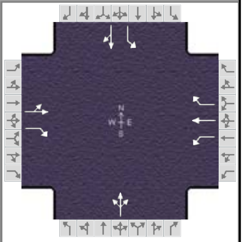
Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.42		6.22						4.12						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			22							6						
Capacity, c (veh/h)			160							1185						
v/c Ratio			0.14							0.00						
95% Queue Length, Q_{95} (veh)			0.5							0.0						
Control Delay (s/veh)			31.1							8.1						
Level of Service (LOS)			D							A						
Approach Delay (s/veh)	31.1								0.0							
Approach LOS	D															

HCS7 Signalized Intersection Results Summary

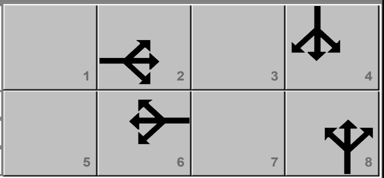
General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 14, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 NO BUILD - LHW	Analysis Period	1> 7:00
Intersection	DUNSMORE ROAD	File Name	SLR-DUNSMORE-LHW.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	925	155	60	210	85	30	25	165	285	85	10

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	54.0	30.0	0.0	0.0	0.0	0.0
Yellow	5.0	3.0	0.0	0.0	0.0	0.0
Red	4.0	4.0	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		7.0		5.0		8.0		6.0
Phase Duration, s		63.0		63.0		37.0		37.0
Change Period, (*Y*+*R* $_c$), s		9.0		9.0		7.0		7.0
Max Allow Headway (*MAH*), s		4.1		4.1		4.4		4.4
Queue Clearance Time (g_s), s		56.0		56.0		12.2		32.0
Green Extension Time (g_e), s		0.0		0.0		2.5		0.0
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		1.00		1.00		0.02		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h		1039	89	67	233	56		200		317	100	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1768	1502	549	1772	1502		1519		1219	1754	
Queue Service Time (g_s), s		19.1	2.9	0.0	7.0	1.8		0.9		19.8	4.2	
Cycle Queue Clearance Time (g_c), s		54.0	2.9	54.0	7.0	1.8		10.2		30.0	4.2	
Green Ratio (*g/C*)		0.54	0.54	0.54	0.54	0.54		0.30		0.30	0.30	
Capacity (*c*), veh/h		991	811	72	957	811		498		313	526	
Volume-to-Capacity Ratio (*X*)		1.048	0.110	0.926	0.244	0.069		0.402		1.012	0.190	
Back of Queue (*Q*), ft/ln (95 th percentile)		1086.1	39.4	146.8	111.8	24		174.3		469.4	82.4	
Back of Queue (*Q*), veh/ln (95 th percentile)		42.8	1.6	5.8	4.4	0.9		6.9		18.5	3.2	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.79	1.96	0.00	0.13		0.00		4.08	0.00	
Uniform Delay (d_1), s/veh		24.0	11.2	50.0	12.2	11.0		28.1		42.4	26.0	
Incremental Delay (d_2), s/veh		42.0	0.1	80.7	0.1	0.0		0.5		53.9	0.2	
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh		66.0	11.3	130.7	12.3	11.0		28.6		96.3	26.2	
Level of Service (LOS)		F	B	F	B	B		C		F	C	
Approach Delay, s/veh / LOS	61.7		E	34.3		C	28.6		C	79.5		E
Intersection Delay, s/veh / LOS	57.4						E					

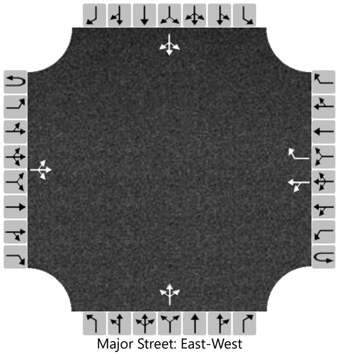
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.72	B	1.90	B	2.17	B	2.03	B
Bicycle LOS Score / LOS	2.35	B	1.07	A	0.82	A	1.18	A

HCS7 Two-Way Stop-Control Report

General Information / Site Information

General Information		Site Information	
Analyst	DH	Intersection	SHERIDAN/TANAGER/CROYLE
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2045	North/South Street	TANAGER DRIVE
Time Analyzed	AM 2045 NO BUILD-LHW	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	1		0	1	0		0	1	0
Configuration			LTR			LT		R			LTR				LTR	
Volume (veh/h)		5	925	5		20	210	20		5	0	30		135	0	5
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized					No											
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

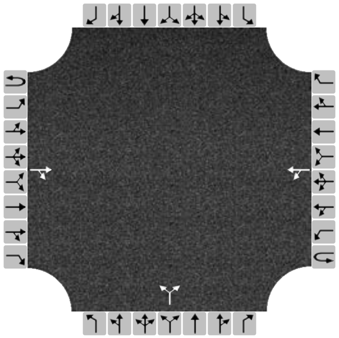
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		6				22					39				156	
Capacity, c (veh/h)		1308				672					240				114	
v/c Ratio		0.00				0.03					0.16				1.36	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.6				10.6	
Control Delay (s/veh)		7.8		0.1		10.5					22.9				278.0	
Level of Service (LOS)		A		A		B					C				F	
Approach Delay (s/veh)	0.1				1.2				22.9				278.0			
Approach LOS									C				F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	SHERIDAN/ALBERTTA
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2045	North/South Street	ALBERTTA DRIVE
Time Analyzed	AM 2045 NO BUILD-LHW	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			875	10		35	185			5		60				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				7.12		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

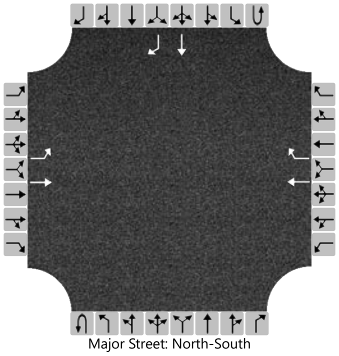
Flow Rate, v (veh/h)						39					72					
Capacity, c (veh/h)						702					278					
v/c Ratio						0.06					0.26					
95% Queue Length, Q_{95} (veh)						0.2					1.0					
Control Delay (s/veh)						10.4					22.4					
Level of Service (LOS)						B					C					
Approach Delay (s/veh)					2.2				22.4							
Approach LOS									C							

HCS7 Two-Way Stop-Control Report

General Information / Site Information

General Information		Site Information	
Analyst	DH	Intersection	CORRAL/PARK
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	CORRAL DRIVE
Analysis Year	2045	North/South Street	PARK DRIVE
Time Analyzed	PM 2045 NO BUILD-LHW	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	1	0		0	1	1	0	0	0	0	0	0	1	1
Configuration		L	T				T	R							T	R
Volume (veh/h)		15	45				135	555							445	55
Percent Heavy Vehicles (%)		2	3				3	3								
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized					Yes								No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

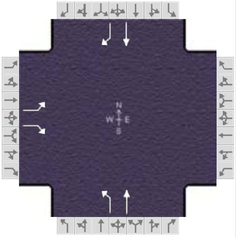
Base Critical Headway (sec)		7.1	6.5				6.5	6.2								
Critical Headway (sec)		6.42	6.53				6.53	6.23								
Base Follow-Up Headway (sec)		3.5	4.0				4.0	3.3								
Follow-Up Headway (sec)		2.22	4.03				4.03	3.33								

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		17	50				150	617								
Capacity, c (veh/h)		0	475				438	1082								
v/c Ratio			0.11				0.34	0.57								
95% Queue Length, Q_{95} (veh)			0.4				1.5	3.7								
Control Delay (s/veh)			13.5				17.4	12.6								
Level of Service (LOS)			B				C	B								
Approach Delay (s/veh)					13.6											
Approach LOS					B											

HCS7 Signalized Intersection Results Summary

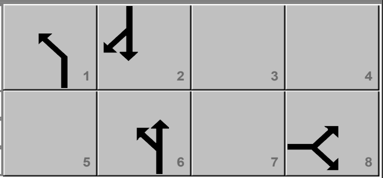
General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 14, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 NO BUILD - LHW	Analysis Period	1> 7:00
Intersection	CORRAL DRIVE	File Name	SLR-CORRAL.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	150		340				415	1075			1500	275

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	20.5	87.5	25.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.5	1.5	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8			1	6		2
Case Number		9.0			1.0	4.0		7.3
Phase Duration, s		31.0			26.0	119.0		93.0
Change Period, (*Y+R* $_c$), s		6.0			5.5	5.5		5.5
Max Allow Headway (*MAH*), s		4.3			5.1	4.0		4.0
Queue Clearance Time (*g* $_s$), s		27.0			22.5	77.5		89.5
Green Extension Time (*g* $_e$), s		0.0			0.0	30.6		0.0
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		1.00			1.00	0.84		1.00

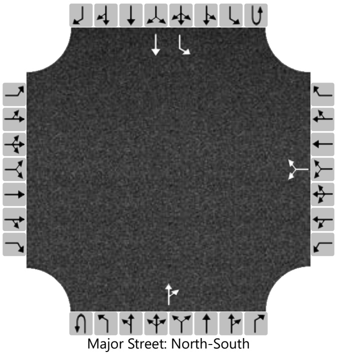
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3		18				1	6			2	12
Adjusted Flow Rate (*v*), veh/h	167		378				461	1194			1667	222
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688		1502				1688	1772			1772	1502
Queue Service Time (*g* $_s$), s	13.7		25.0				20.5	75.5			87.5	10.9
Cycle Queue Clearance Time (*g* $_c$), s	13.7		25.0				20.5	75.5			87.5	10.9
Green Ratio (*g/C*)	0.17		0.17				0.73	0.76			0.58	0.58
Capacity (*c*), veh/h	281		250				279	1341			1034	876
Volume-to-Capacity Ratio (*X*)	0.593		1.509				1.655	0.891			1.612	0.254
Back of Queue (*Q*), ft/ln (90 th percentile)	233.9		999.9				1264.9	877.6			4376.1	156
Back of Queue (*Q*), veh/ln (90 th percentile)	9.2		39.4				49.8	34.6			172.3	6.1
Queue Storage Ratio (*RQ*) (90 th percentile)	2.34		0.00				12.65	0.00			0.00	1.30
Uniform Delay (*d* $_1$), s/veh	57.8		62.5				56.1	13.6			31.3	15.3
Incremental Delay (*d* $_2$), s/veh	3.3		248.9				310.2	7.8			280.1	0.2
Initial Queue Delay (*d* $_3$), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	61.1		311.4				366.3	21.5			311.4	15.4
Level of Service (LOS)	E		F				F	C			F	B
Approach Delay, s/veh / LOS	234.8		F	0.0			117.5		F	276.6		F
Intersection Delay, s/veh / LOS	206.6						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.97	B	2.08	B	0.66	A	1.90	B
Bicycle LOS Score / LOS		F			3.22	C	3.60	D

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	SHERIDAN LAKE/SUMMERSET
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	SUMMERSET DRIVE
Analysis Year	2045	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	PM 2045 NO BUILD - LHW	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						5		30			1460	10		60	1780	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

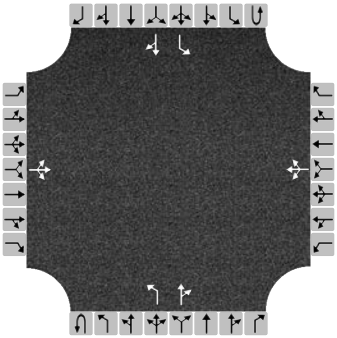
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							39							67		
Capacity, c (veh/h)							24							397		
v/c Ratio							1.63							0.17		
95% Queue Length, Q_{95} (veh)							4.9							0.6		
Control Delay (s/veh)							661.3							15.9		
Level of Service (LOS)							F							C		
Approach Delay (s/veh)					661.3								0.5			
Approach LOS					F											

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	SHERIDAN LAKE/CHATEAUX
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	CHATEAUX RIDGE
Analysis Year	2045	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	PM 2045 NO BUILD - LHW	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	0
Configuration			LTR				LTR			L		TR		L		TR
Volume (veh/h)		10	0	5		5	0	25		10	1435	10		50	1715	20
Percent Heavy Vehicles (%)		2	2	2		2	2	2		2				2		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

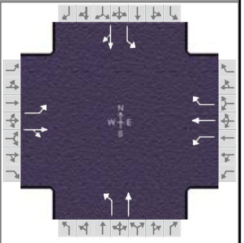
Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.12	6.52	6.22		7.12	6.52	6.22		4.12				4.12		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.52	4.02	3.32		3.52	4.02	3.32		2.22				2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			17				33			11				56		
Capacity, c (veh/h)			3				12			305				407		
v/c Ratio			6.10				2.71			0.04				0.14		
95% Queue Length, Q_{95} (veh)			3.5				5.1			0.1				0.5		
Control Delay (s/veh)			4688.7				1390.6			17.2				15.2		
Level of Service (LOS)			F				F			C				C		
Approach Delay (s/veh)	4688.7				1390.6				0.1				0.4			
Approach LOS	F				F											

HCS7 Signalized Intersection Results Summary

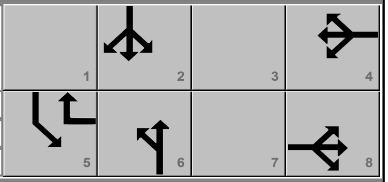
General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 14, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM NO BUILD - LHW	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	SLR-CATRON.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	5	5	40	45	970	5	475		775	895	55

Signal Information			
Cycle, s	146.3	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	51.0	32.0	45.3	0.0	0.0	0.0
Yellow	3.0	5.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4		6	5	2
Case Number		6.0		5.0		6.3	1.0	4.0
Phase Duration, s		51.3		51.3		39.0	56.0	95.0
Change Period, (*Y+R* $_c$), s		6.0		6.0		7.0	5.0	7.0
Max Allow Headway (*MAH*), s		5.3		5.3		5.0	5.1	5.0
Queue Clearance Time (g_s), s		5.8		42.5		34.0	53.0	85.0
Green Extension Time (g_e), s		6.6		2.8		0.0	0.0	2.4
Phase Call Probability		1.00		1.00		1.00	1.00	1.00
Max Out Probability		0.00		0.85		1.00	1.00	1.00

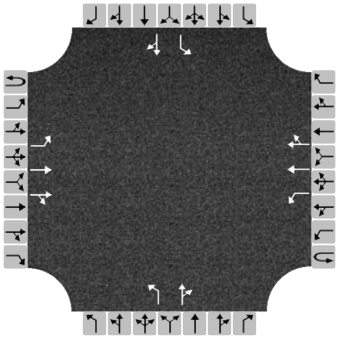
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6		5	2	12
Adjusted Flow Rate (*v*), veh/h	11	11		44	50	672	6	528		861	1033	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1355	1626		1403	1772	1502	546	1772		1688	1760	
Queue Service Time (g_s), s	0.9	0.7		3.3	2.9	40.5	1.5	32.0		51.0	83.0	
Cycle Queue Clearance Time (g_c), s	3.8	0.7		4.0	2.9	40.5	28.4	32.0		51.0	83.0	
Green Ratio (*g/C*)	0.31	0.31		0.31	0.31	0.66	0.22	0.22		0.58	0.60	
Capacity (*c*), veh/h	442	504		477	549	989	68	387		637	1058	
Volume-to-Capacity Ratio (*X*)	0.025	0.022		0.093	0.091	0.680	0.082	1.362		1.351	0.976	
Back of Queue (*Q*), ft/ln (95 th percentile)	13.2	12.8		52.9	58.8	492.1	9.8	1266		1768.8	1242.1	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.5	0.5		2.1	2.3	19.4	0.4	49.8		69.6	48.9	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.08	0.00		0.44	0.00	2.19	0.06	0.00		14.15	0.00	
Uniform Delay (d_1), s/veh	37.2	35.1		36.5	35.9	15.5	68.9	57.2		41.0	28.2	
Incremental Delay (d_2), s/veh	0.0	0.0		0.1	0.1	2.0	0.7	178.9		168.2	22.1	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	37.2	35.1		36.6	36.0	17.5	69.7	236.1		209.2	50.3	
Level of Service (LOS)	D	D		D	D	B	E	F		F	D	
Approach Delay, s/veh / LOS	36.2	D		19.8	B		234.3	F		122.5	F	
Intersection Delay, s/veh / LOS	116.0						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.05	B	1.97	B	2.66	C	1.90	B
Bicycle LOS Score / LOS	0.52	A	1.75	B	1.22	A	3.61	D

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	CATRON/BENDT
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	CATRON BOULEVARD
Analysis Year	2045	North/South Street	BENDT DRIVE
Time Analyzed	PM 2045 NO BUILD - LHW	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	2	0	0	1	2	0		1	1	0		1	1	0
Configuration		L	T	TR		L	T	TR		L		TR		L		TR
Volume (veh/h)	0	10	730	65	0	30	990	50		50	5	25		15	5	15
Percent Heavy Vehicles (%)	2	2			2	2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.14				4.14				7.54	6.54	6.94		7.54	6.54	6.94
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

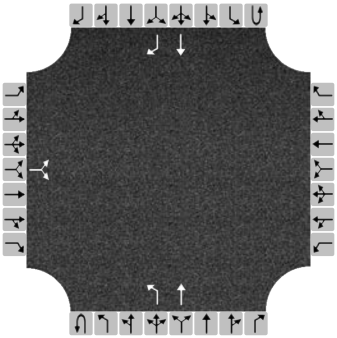
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		11				33				56		33		17		22
Capacity, c (veh/h)		600				762				72		204		56		146
v/c Ratio		0.02				0.04				0.77		0.16		0.30		0.15
95% Queue Length, Q_{95} (veh)		0.1				0.1				3.7		0.6		1.0		0.5
Control Delay (s/veh)		11.1				9.9				145.2		26.1		94.1		34.0
Level of Service (LOS)		B				A				F		D		F		D
Approach Delay (s/veh)	0.1				0.3				100.5				59.7			
Approach LOS									F				F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	SHERIDAN/WILDWOOD
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/12/2018	East/West Street	WILDWOOD DRIVE
Analysis Year	2045	North/South Street	SHERIDAN LAKE ROAD
Time Analyzed	PM 2045 NO BUILD - LHW	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	1
Configuration			LR							L	T				T	R
Volume (veh/h)		10		5						5	495				925	15
Percent Heavy Vehicles (%)		2		2						2						
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized													No			
Median Type | Storage	Undivided															

Critical and Follow-up Headways

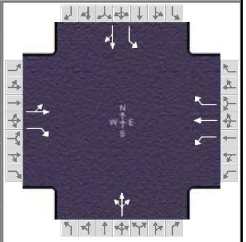
Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.42		6.22						4.12						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.52		3.32						2.22						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			17							6						
Capacity, c (veh/h)			146							666						
v/c Ratio			0.11							0.01						
95% Queue Length, Q_{95} (veh)			0.4							0.0						
Control Delay (s/veh)			32.8							10.5						
Level of Service (LOS)			D							B						
Approach Delay (s/veh)	32.8								0.1							
Approach LOS	D															

HCS7 Signalized Intersection Results Summary

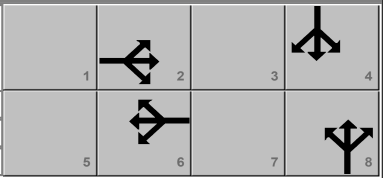
General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 14, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 NO BUILD - LHW	Analysis Period	1> 7:00
Intersection	DUNSMORE ROAD	File Name	SLR-DUNSMORE.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	5	385	30	115	870	255	75	35	75	90	10	10

Signal Information			
Cycle, s	70.7	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	42.7	12.0	0.0	0.0	0.0	0.0
Yellow	5.0	3.0	0.0	0.0	0.0	0.0
Red	4.0	4.0	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		7.0		5.0		8.0		6.0
Phase Duration, s		51.7		51.7		19.0		19.0
Change Period, (*Y+R* $_c$), s		9.0		9.0		7.0		7.0
Max Allow Headway (*MAH*), s		4.0		4.0		4.2		4.2
Queue Clearance Time (g_s), s		11.1		35.6		9.4		14.0
Green Extension Time (g_e), s		9.3		7.0		0.3		0.0
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.05		0.36		1.00		1.00

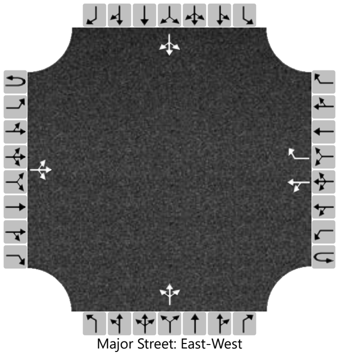
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h		433	17	128	967	161		172		100	17	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1762	1502	960	1772	1502		1525		1308	1672	
Queue Service Time (g_s), s		0.0	0.3	5.7	33.6	3.4		5.7		4.6	0.6	
Cycle Queue Clearance Time (g_c), s		9.1	0.3	14.8	33.6	3.4		7.4		12.0	0.6	
Green Ratio (*g/C*)		0.60	0.60	0.60	0.60	0.60		0.17		0.17	0.17	
Capacity (*c*), veh/h		1116	907	558	1070	907		335		187	284	
Volume-to-Capacity Ratio (*X*)		0.388	0.018	0.229	0.904	0.178		0.515		0.533	0.059	
Back of Queue (*Q*), ft/ln (95 th percentile)		107.1	3.1	45.3	411.7	33.8		122.3		84.4	10.8	
Back of Queue (*Q*), veh/ln (95 th percentile)		4.2	0.1	1.8	16.2	1.3		4.8		3.3	0.4	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.06	0.60	0.00	0.18		0.00		0.73	0.00	
Uniform Delay (d_1), s/veh		7.3	5.6	11.2	12.2	6.2		27.3		33.4	24.6	
Incremental Delay (d_2), s/veh		0.2	0.0	0.2	7.9	0.1		1.4		2.9	0.1	
Initial Queue Delay (d_3), s/veh		0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh		7.6	5.6	11.4	20.1	6.3		28.7		36.3	24.7	
Level of Service (LOS)		A	A	B	C	A		C		D	C	
Approach Delay, s/veh / LOS	7.5	A		17.5	B		28.7	C		34.6	C	
Intersection Delay, s/veh / LOS	17.2						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.68	B	1.87	B	2.27	B	1.95	B
Bicycle LOS Score / LOS	1.23	A	2.56	C	0.77	A	0.68	A

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	SHERIDAN/TANAGER/CROYLE
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2045	North/South Street	TANAGER DRIVE
Time Analyzed	PM 2045 NO BUILD - LHW	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	1		0	1	0		0	1	0
Configuration			LTR			LT		R			LTR				LTR	
Volume (veh/h)		5	370	5		25	775	155		5	0	15		35	0	5
Percent Heavy Vehicles (%)		2				2				2	2	2		2	2	2
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized					No											
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.12				4.12				7.12	6.52	6.22		7.12	6.52	6.22
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.22				2.22				3.52	4.02	3.32		3.52	4.02	3.32

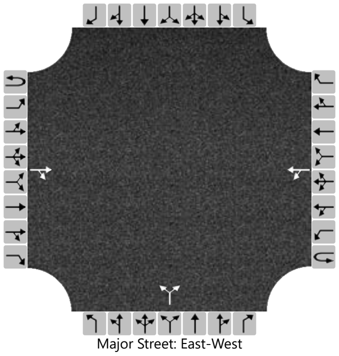
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		6				28					22				44	
Capacity, c (veh/h)		672				1141					282				130	
v/c Ratio		0.01				0.02					0.08				0.34	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.3				1.4	
Control Delay (s/veh)		10.4		0.1		8.2					18.8				46.6	
Level of Service (LOS)		B		A		A					C				E	
Approach Delay (s/veh)	0.2				0.5				18.8				46.6			
Approach LOS									C				E			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DH	Intersection	SHERIDAN/ALBERTTA
Agency/Co.	HDR	Jurisdiction	RAPID CITY
Date Performed	12/14/2018	East/West Street	SHERIDAN LAKE ROAD
Analysis Year	2045	North/South Street	ALBERTTA DRIVE
Time Analyzed	PM 2045 NO BUILD - LHW	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SLR CORRIDOR STUDY		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			355	10		105	680			5		25				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				7.12		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						117					33					
Capacity, c (veh/h)						1152					353					
v/c Ratio						0.10					0.09					
95% Queue Length, Q_{95} (veh)						0.3					0.3					
Control Delay (s/veh)						8.5					16.2					
Level of Service (LOS)						A					C					
Approach Delay (s/veh)					2.4				16.2							
Approach LOS									C							

Sheridan Lake Road Traffic Study Report

Corral Drive to Albertta Drive

CITY OF RAPID CITY

Rapid City, South Dakota

Appendix G

Future Build Alternatives Traffic

Technical Memo

Date:	Wednesday, January 23, 2019
Project:	Sheridan Lake Road Corridor Study
To:	Study Advisory Team
From:	Dustin Hamilton
Subject:	2045 Build Conditions Analysis (Updated)

Future transportation needs in the Sheridan Lake Road corridor have been determined by forecasting the travel demand in the horizon year (2045) and analyzing the capability of potential improvements to the transportation system to handle the future transportation demand. This memorandum documents the analysis of options necessary to carry traffic volumes under 2045 traffic conditions (2045 Build scenario) without additional network improvements. Selected scenarios were also evaluated with the Les Hollers Way network improvement.

Future traffic demand was determined using the travel demand model maintained by the Rapid City Metropolitan Planning Organization (MPO) and the City of Rapid City. Link data for the 2013 and 2040 models were compared to determine link growth factors which were then adjusted by straight-line annual growth to determine growth factors to the 2045 horizon year. Those factors were used to create 2045 peak hour turning volumes. The turning volume forecasts were balanced to create a homogenous network for capacity analysis.

The Sheridan Lake Road/Catron Boulevard, Sheridan Lake Road/Corral Drive, and Sheridan Lake Road/Dunsmore Road intersections were analyzed with 2045 forecast volumes using Highway Capacity Manual techniques, as implemented in the Highway Capacity Software (McTrans Center and FHWA) for options to adequately handle the forecast 2045 traffic at minimum level of service (LOS) threshold of LOS “C”. Due to HCS limitations, free movements (i.e. free right turn lanes, flyovers, or overpasses) are not included in the HCS model and if manually incorporated, the average intersection delay would likely decrease.

2045 Build Alternatives – Sheridan Lake Road/Catron Boulevard Intersection

A total of eight (8) alternatives were evaluated using the 2045 traffic volumes for the Sheridan Lake Road/Catron Boulevard intersection. The eight (8) alternatives are:

Alternative 1 – At-Grade Intersection - Wildwood Drive Right-In/Right-Out

Conversion of Wildwood Drive to a right-in/right-out access and provision of dual southbound through and left turn lanes and dual northbound through lanes with a free right turn on Sheridan Lake Road. Provision of dual westbound left turn lanes and free right turn movement on Catron Boulevard approach. Alternative 1 is depicted in **Figure 1.**

The resulting level of service for Alternative 1 is **C/C** (AM/PM).

Alternative 2 – Flyover Southbound to Eastbound

Provision for a grade separated “flyover” for southbound to eastbound left turns on Sheridan Lake Road, a southbound thru and thru/right lane, dual northbound through lanes, a northbound left turn lane, and free right turn on Sheridan Lake Road. Provision of dual left turn lanes, a through lane and free right turn for westbound Catron Boulevard and a left turn lane and a combined thru/right turn lane for eastbound Wildwood Drive. Alternative 2 is depicted in **Figure 2.**

The resulting level of service for Alternative 2 is **B/C** (AM/PM).

Alternative 3 – Continuous Flow Intersection (North Leg)

Provision of continuous flow intersection on the north leg of Sheridan Lake Road intersection to accommodate southbound to eastbound left turns. The southbound intersection approach would also provide dual through lanes and a right turn lane, while the northbound approach would provide for dual through lanes and a free right turn. Westbound Catron Boulevard would contain dual left turns and a free right turn. Wildwood Drive would be a right-in/right-out approach. Alternative 3 is depicted in **Figure 3.**

The resulting level of service for Alternative 3 is **B/C** (AM/PM).

Alternative 4 – 2-Lane Roundabout

Provision of 2-lane roundabout with dual lanes entering and exiting on Sheridan Lake Road and Catron Boulevard approaches and single lane entry/exit on Wildwood approach. Alternative 4 is depicted in **Figure 4.**

The resulting level of service for Alternative 4 is **F/F** (AM/PM). Free right turns for the northbound (Sheridan Lake Road) and westbound (Catron Boulevard) approaches were also examined, but did not improve the level of service.

Alternative 5 – Northbound Overpass

Provision of 2-lane overpass (grade separated northbound through movement) with northbound free right turn, dual southbound left turns, a southbound through lane and southbound combined thru/right turn lane on Sheridan Lake Road. Westbound Catron Boulevard would contain dual left turns, a through lane, and a free right turn lane. Eastbound Wildwood Drive would contain a left turn lane and combined thru/right turn lane. Alternative 5 is depicted in **Figure 5.**

The resulting level of service for Alternative 5 is **B/B** (AM/PM).

Alternative 6 – Single Point Interchange

Provision of grade separated northbound/southbound through movements on Sheridan Lake Road with dual southbound left turn lanes and a single northbound left turn lane at the interchange. The Catron Boulevard approach would provide a left turn lane and a through lane, and the Wildwood Drive approach would provide a left turn lane and through lane. All right turns would be accommodated via a merge/diverge “ramp” approach. Alternative 6 is depicted in **Figure 6.**

The resulting level of service for Alternative 6 is **B/C** (AM/PM).

Alternative 7A – At-Grade Intersection (without Future Roadways)

Alternative provides for an at-grade intersection without future arterial/collector network improvements being constructed. The southbound Sheridan Lake Road approach includes triple left turn lanes, a through lane, and a combined thru/right turn lane. The northbound approach includes a left turn lane, triple through lanes, and a free right turn lane. The westbound approach includes dual left turn lanes, a through lane, and free right turn lane and the eastbound approach includes a left turn lane and a combined thru/right turn lane. Alternative 7A is depicted in **Figure 7A.**

The resulting level of service for Alternative 7A is **C/C** (AM/PM).

Alternative 8 – At-Grade Intersection (with Future Roadways)

Alternative provides for an at grade intersection with future arterial/collector network improvements being constructed. The future network improvements are depicted in “Future Street Alternatives” - **Figure 11**. The southbound Sheridan Lake Road approach provides dual left turn lanes and a combined thru/right turn lane. The northbound approach includes a left turn lane, dual through lanes, and a free right turn lane. The westbound approach includes dual left turn lanes, a through lane, and a free right turn lane and the eastbound approach includes a left turn lane and a combined thru/right turn lane. Alternative 8 is depicted in **Figure 8.**

The resulting level of service for Alternative 8 is **C/B** (AM/PM).

2045 Build Alternatives – Sheridan Lake Road/Corral Drive/Park Drive Intersections

Improvements to the Sheridan Lake Road/Corral Drive intersection and Corral Drive/Park Drive intersection were also evaluated for improvements using the 2045 traffic volumes.

Alternative 1 - Corral Drive and Park Drive

Provide at-grade intersection improvements at Sheridan Lake Road to include two southbound through lanes and a right turn lane, dual northbound left turn lanes and dual northbound through lanes, and eastbound left turn lane and an eastbound free right turn lane on the Corral Drive approach. Reconfigure Corral Drive/Park Drive intersection to allow for through traffic on Park Drive and provide a “T” intersection of Corral Drive into Park Drive. The proposed improvements for Corral Drive/Park Drive are depicted in **Figure 9.**

The resulting level of service for the Sheridan Lake Road/Corral Drive intersection improvements is **C/C** (AM/PM). This intersection was also analyzed with the future Les Hollers Way network improvement in place and the resulting level of service for the Les Hollers Way scenario was **C/C** (AM/PM).

2045 Build Alternatives – Sheridan Lake Road/Dunsmore Road Intersection

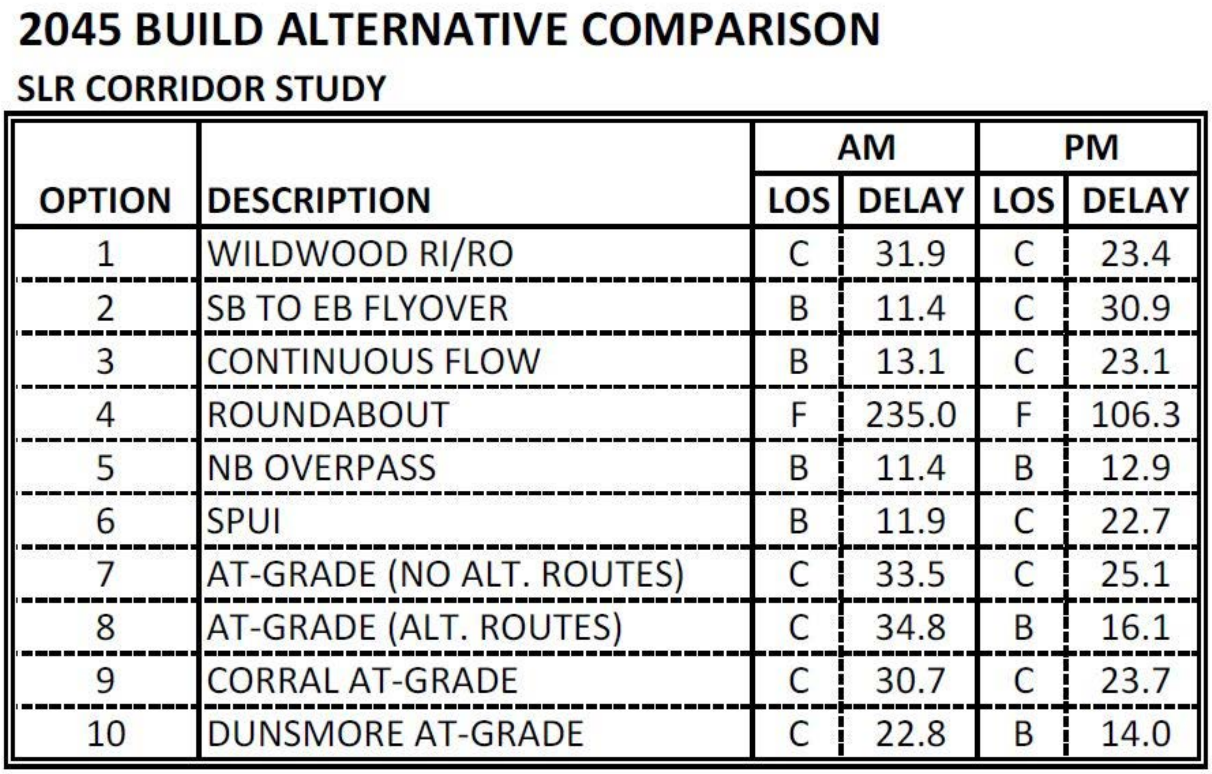
The Sheridan Lake Road/Dunsmore Road intersection was also evaluated for improvements using the 2045 traffic volumes.

Alternative 1 – Sheridan Lake Road/Dunsmore Road

Alternative provides for an at-grade intersection with dual through lanes, a left turn lane and a right turn lane on the eastbound and westbound Sheridan Lake Road approaches, a dual left turn and a combined thru/right turn on the southbound Dunsmore Road approach, and a left turn, thru, and right turn lane for the northbound Dunsmore Road approach. The proposed improvements for the Sheridan Lake Road/Dunsmore Road are depicted in **Figure 10**.

The resulting level of service for the Sheridan Lake Road/Dunsmore Road intersection improvements is **C/B** (AM/PM). This intersection was also analyzed with the future Les Hollers Way network improvement in place and the resulting level of service for the Les Hollers Way scenario was **C/B** (AM/PM).

The 2045 Build Alternatives level of service results are summarized as follows:



2045 BUILD ALTERNATIVE COMPARISON

SLR CORRIDOR STUDY

OPTION	DESCRIPTION	AM		PM	
		LOS	DELAY	LOS	DELAY
1	WILDWOOD RI/RO	C	31.9	C	23.4
2	SB TO EB FLYOVER	B	11.4	C	30.9
3	CONTINUOUS FLOW	B	13.1	C	23.1
4	ROUNDABOUT	F	235.0	F	106.3
5	NB OVERPASS	B	11.4	B	12.9
6	SPUI	B	11.9	C	22.7
7	AT-GRADE (NO ALT. ROUTES)	C	33.5	C	25.1
8	AT-GRADE (ALT. ROUTES)	C	34.8	B	16.1
9	CORRAL AT-GRADE	C	30.7	C	23.7
10	DUNSMORE AT-GRADE	C	22.8	B	14.0

The analysis reports are included in the Appendix for reference.

Additional Considerations to 2045 Build Alternatives Analysis

After consideration of level of service, constructability/cost, impact to access, and needed property acquisition, Alternatives 4, 5, and 6 were removed from further consideration.

Additionally, modifications to Alternative 7 was examined as follows:

Alternative 7B – At-Grade Intersection (without Future Roadways) – Reduced Lanes

Alternative 7A was further examined with reduced lanes on Sheridan Lake Road and provides for an at-grade intersection without future arterial/collector network improvements being constructed. The southbound Sheridan Lake Road approach provides dual left turn lanes and a combined thru/right turn lane. The northbound approach includes a left turn lane, dual through lanes, and a free right turn lane. The westbound approach includes dual left turn lanes, a through lane, and a free right turn lane and the eastbound approach includes a left turn lane and a combined thru/right turn lane. The reduction in lanes results in a downgrade of level of service from C (33.5 sec delay) to D (42.7 sec delay) in the AM and downgrade from level of service C (25.1 sec delay) to a level of service D (42.9 sec delay) in the PM.

Alternative modification does not meet minimum level of service requirement.

Preferred Alternatives

Based upon the operational analysis the following alternatives will be carried forward for further consideration:

Sheridan Lake Road/Catron Boulevard Intersection

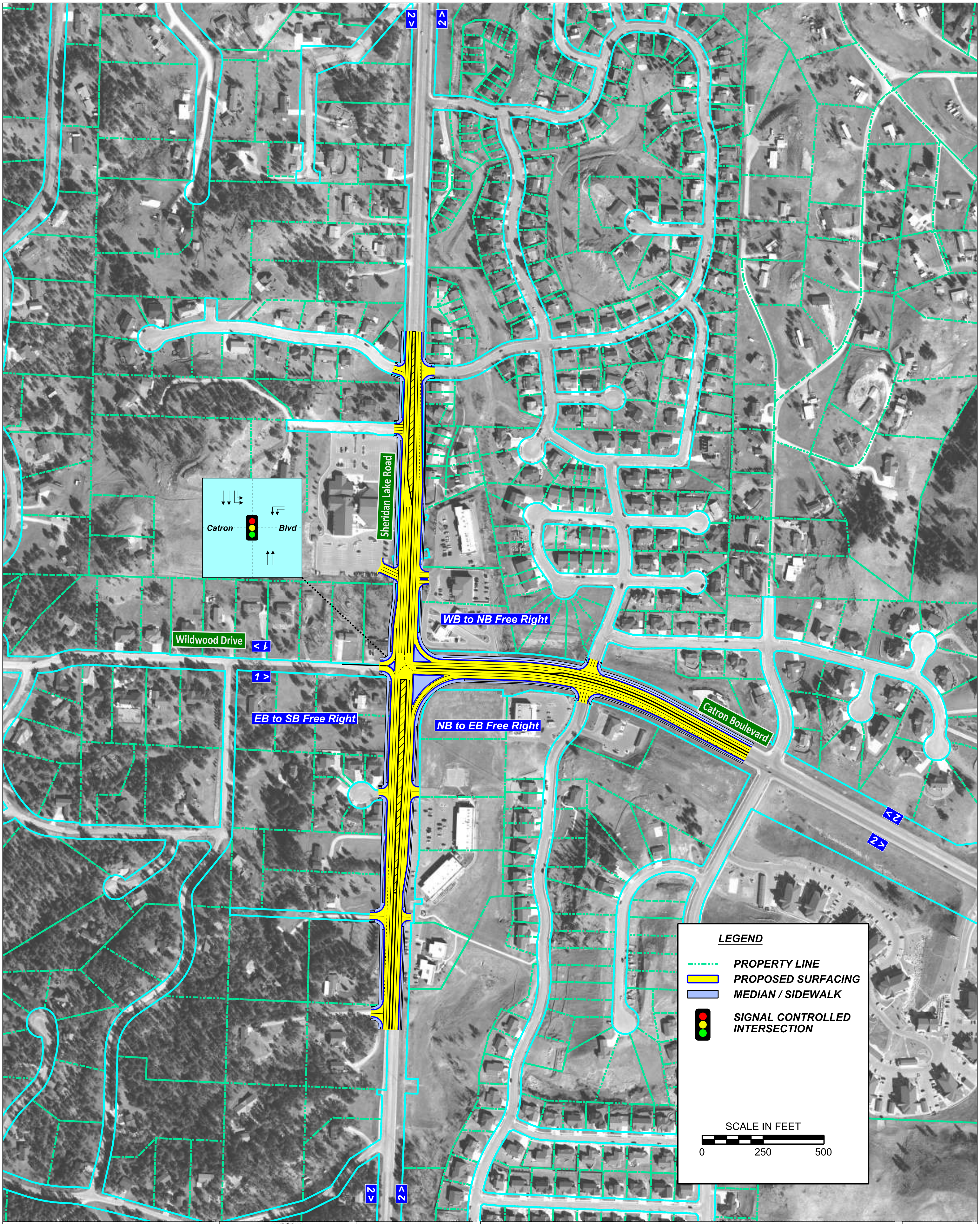
- Alternative 1 – At-grade - Wildwood Right-In/Right-Out
- Alternative 2 – Flyover Southbound to Eastbound
- Alternative 3 – Continuous Flow (North Leg)
- Alternative 7 – At Grade Intersection (without Future Roadways)
- Alternative 8 – At Grade Intersection (with Future Roadways – Les Hollers Way)

Sheridan Lake Road/Corral Drive/Park Drive

- Alternative 1 – Corral Drive and Park Drive

Sheridan Lake Road/Dunsmore Road Intersection

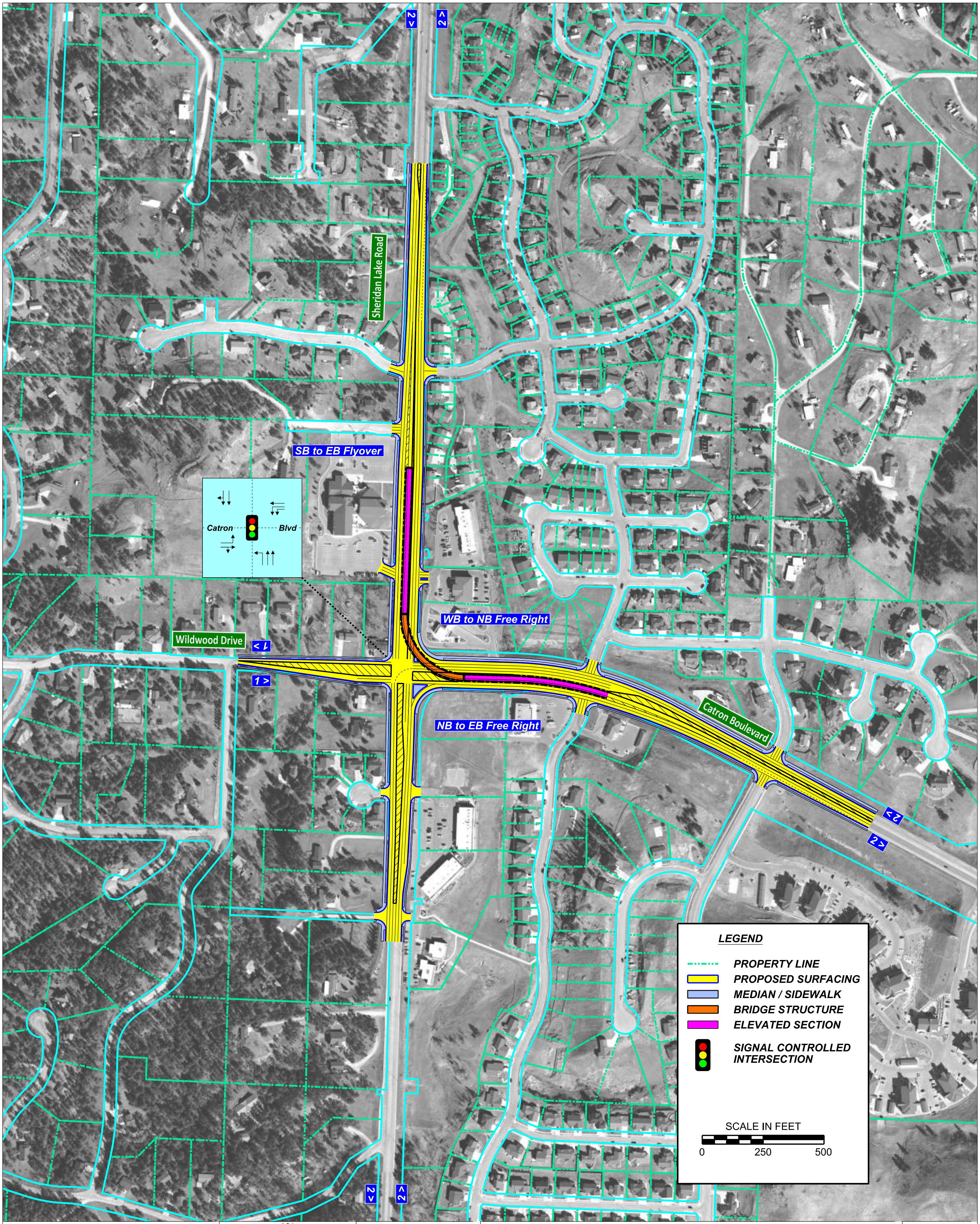
- Alternative 1 – Sheridan Lake Road/Dunsmore Road



Catron Blvd Int
LOS C/C [AM/PM]

Alt 1 - At-Grade Wildood Drive Right-In-Right-Out
Sheridan Lake Road Traffic Study Rapid City, SD

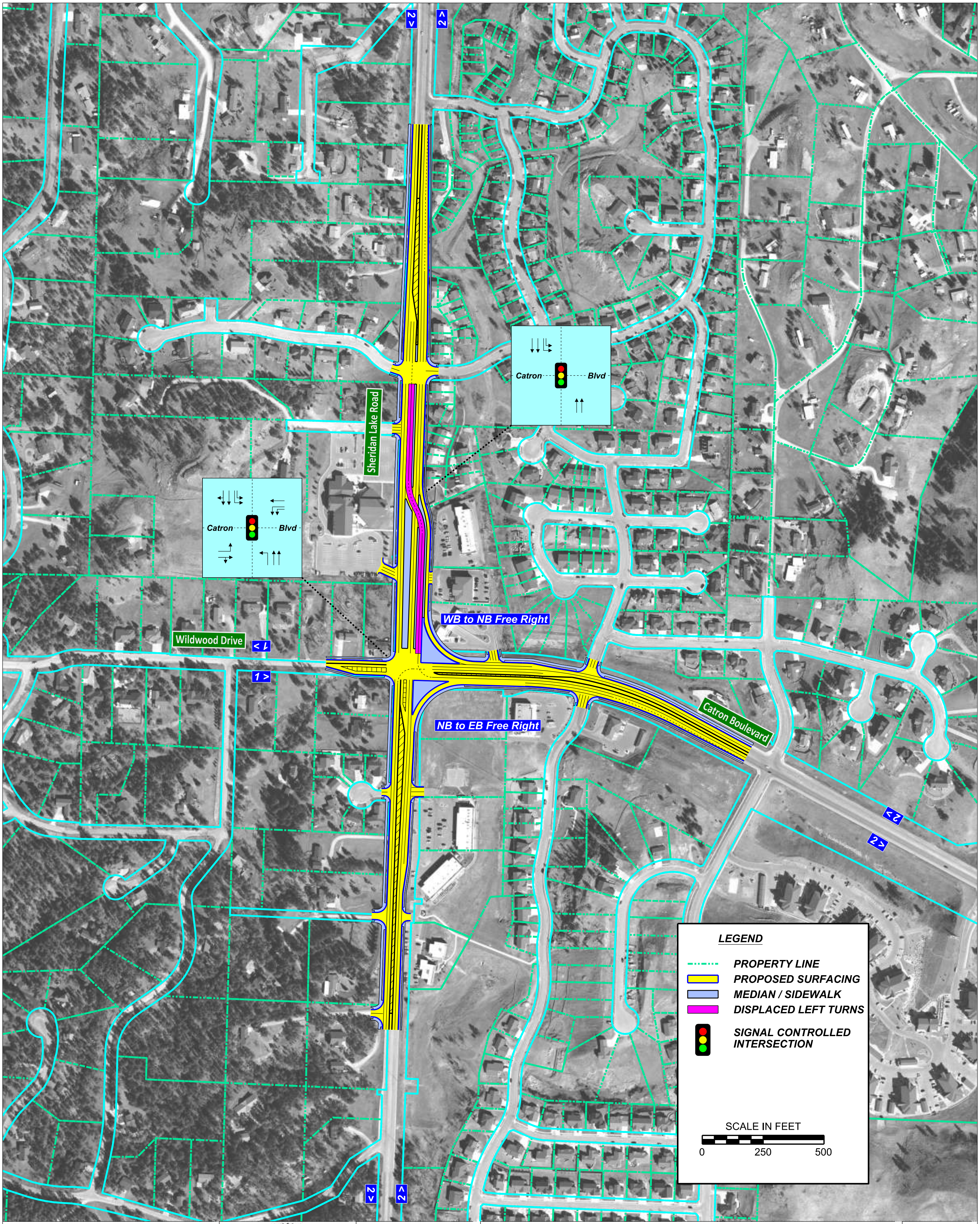
Figure
1



Catron Blvd Int
LOS B/C [AM/PM]

Alt 2 - Flyover Southbound to Eastbound
Sheridan Lake Road Traffic Study Rapid City, SD

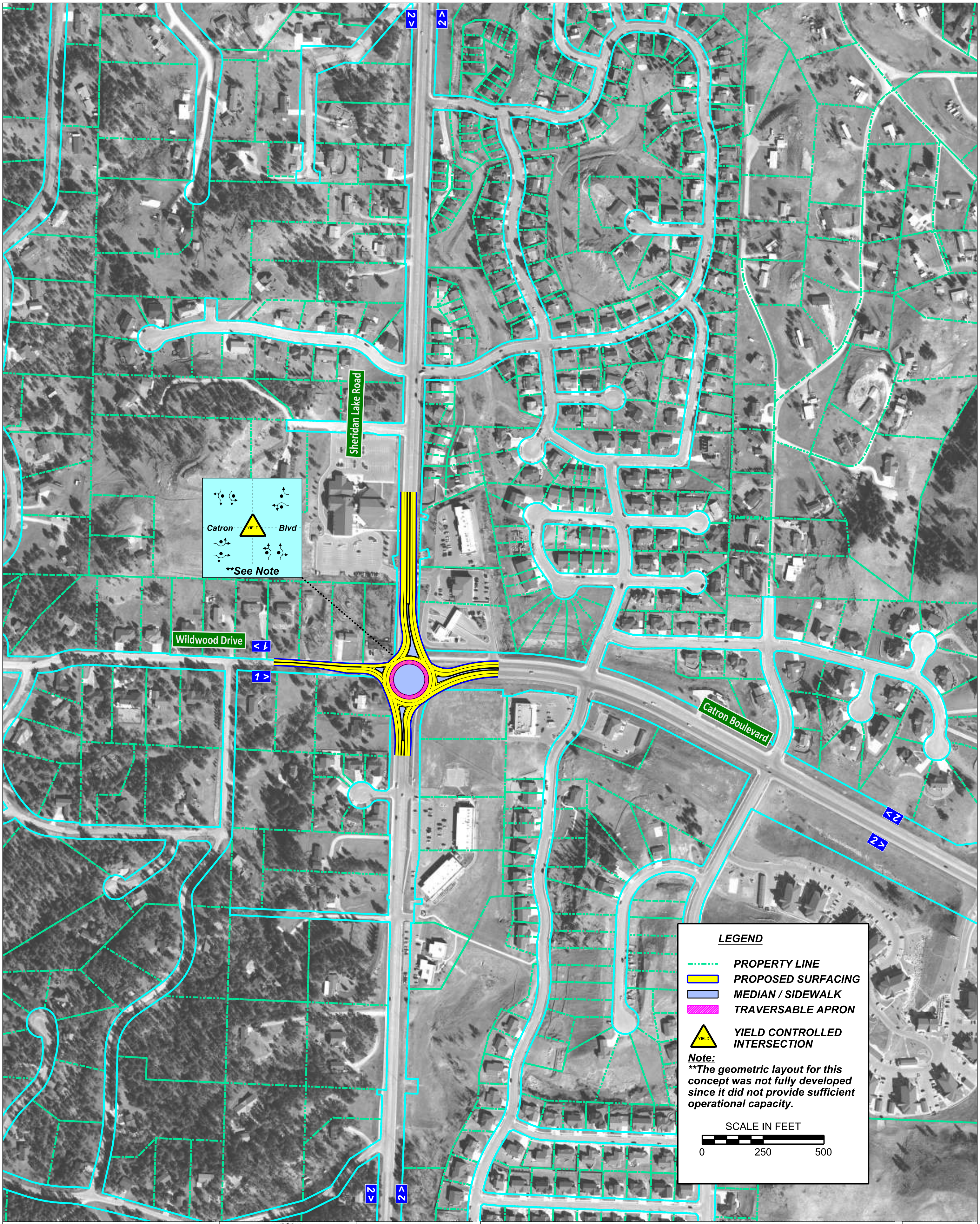
Figure
2



Catron Blvd Int
LOS B/C [AM/PM]

Alt 3 - Continuous Flow Intersection (North Leg)
Sheridan Lake Road Traffic Study Rapid City, SD

Figure
3



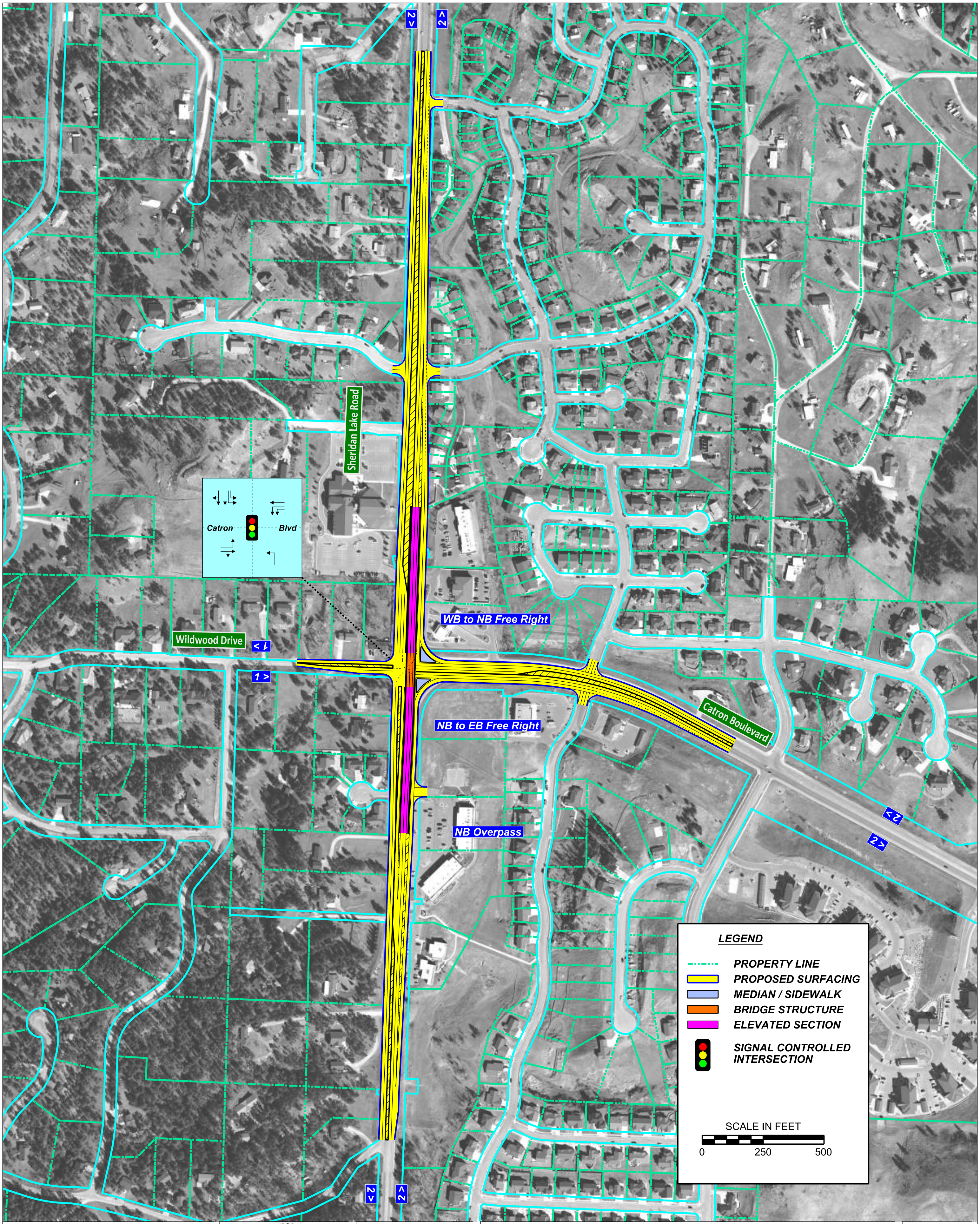
Note:
**The geometric layout for this concept was not fully developed since it did not provide sufficient operational capacity.

Catron Blvd Int
LOS F/F [AM/PM]

Alt 4 - Roundabout (2-Lane)
Sheridan Lake Road Traffic Study

Rapid City, SD

Figure
4

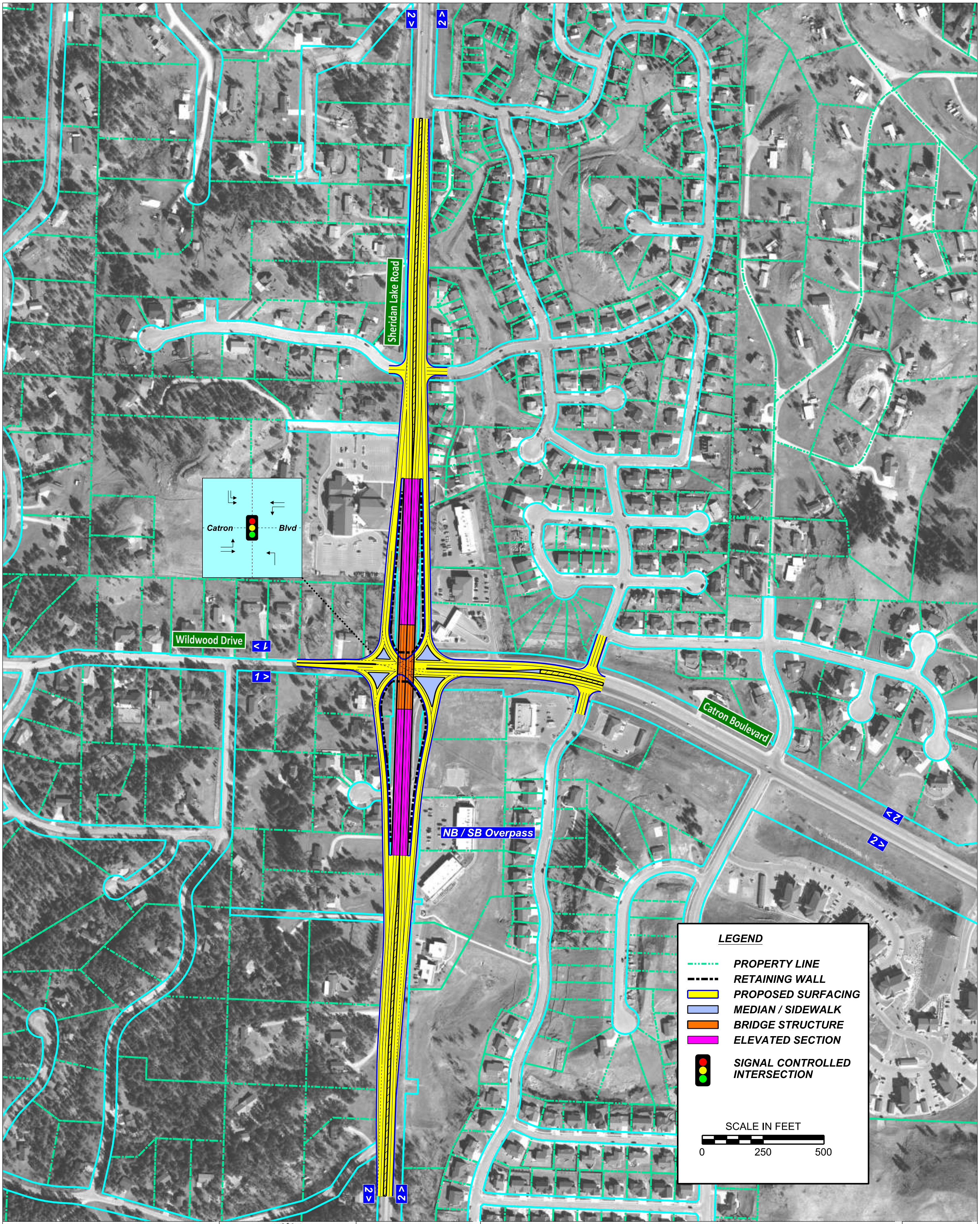


Catron Blvd Int
LOS B/B [AM/PM]

Alt 5 - Northbound Overpass
Sheridan Lake Road Traffic Study

Rapid City, SD

Figure
5

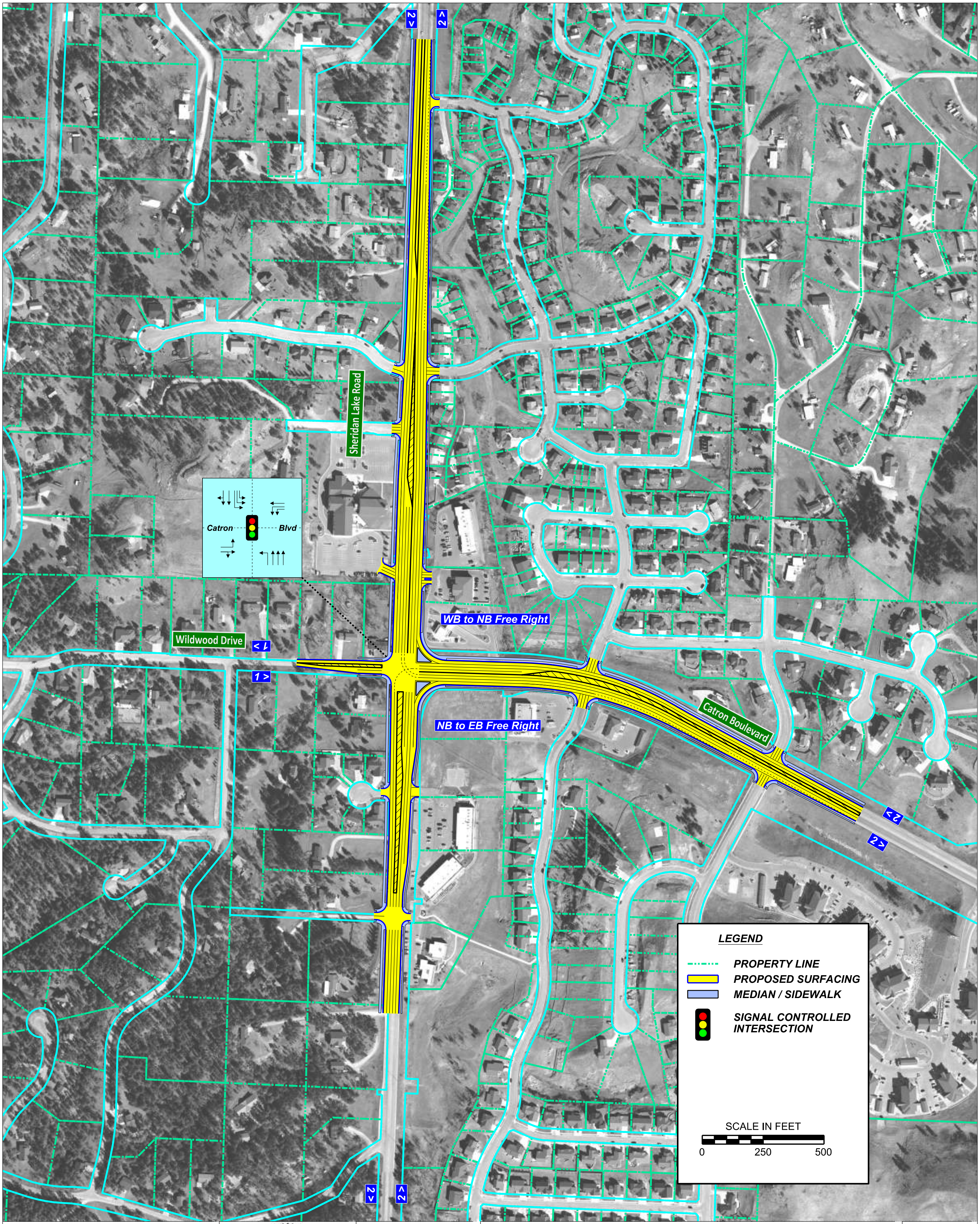


Catron Blvd Int
LOS B/C [AM/PM]

Alt 6 - Single Point Interchange
Sheridan Lake Road Traffic Study

Rapid City, SD

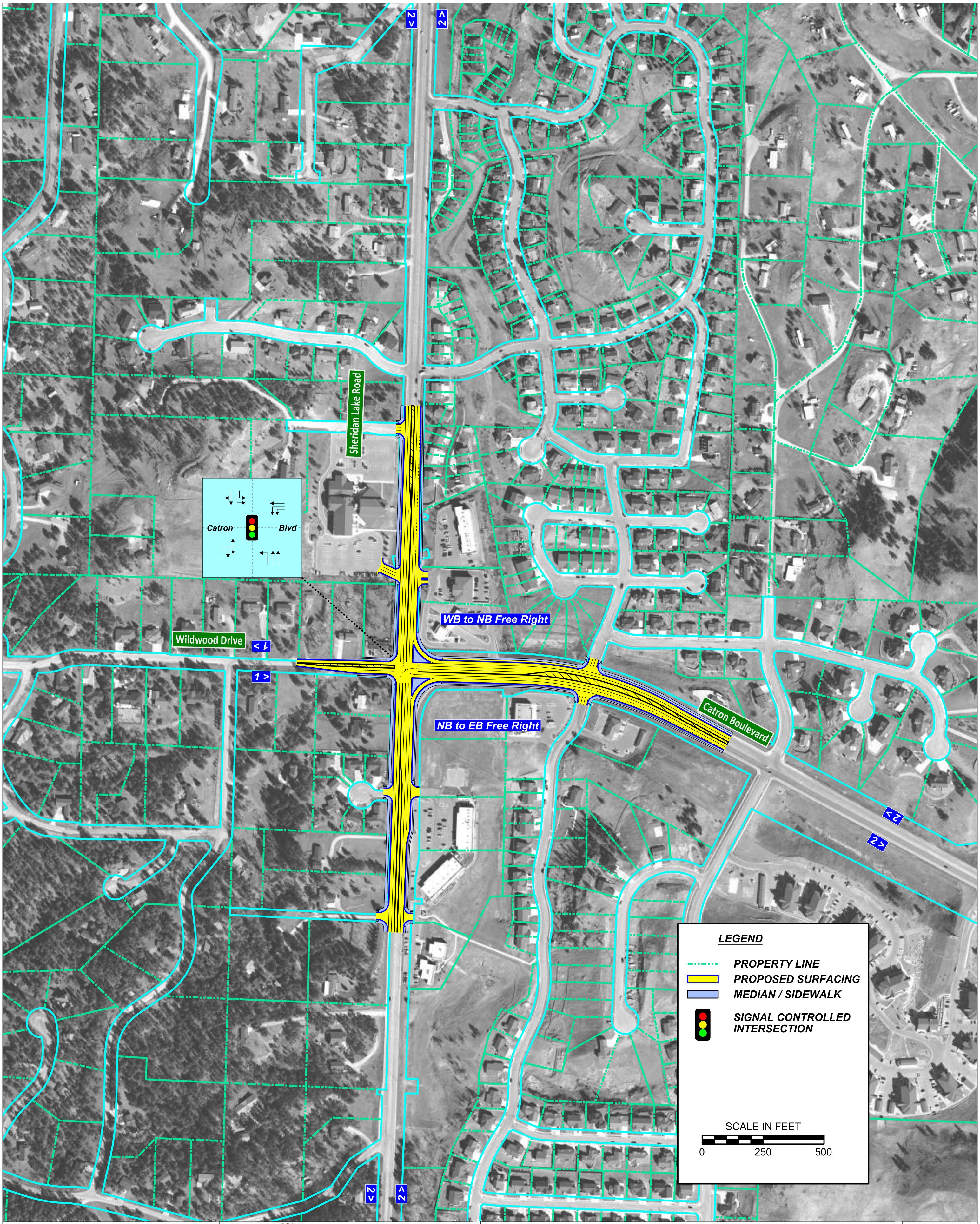
Figure
6



Catron Blvd Int
LOS C/C [AM/PM]

Alt 7A - At-Grade Int. (without Future Roadways)
Sheridan Lake Road Traffic Study Rapid City, SD

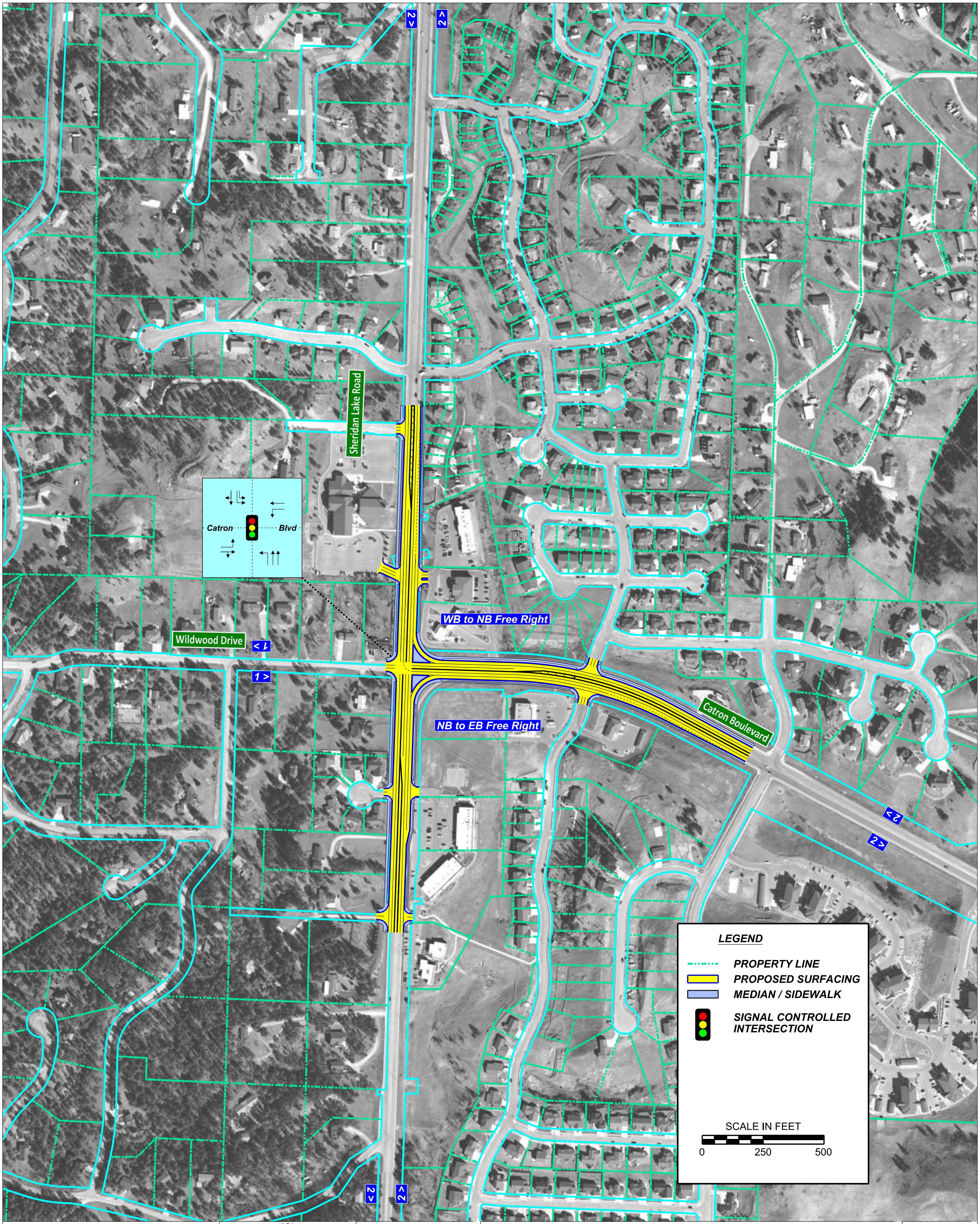
Figure
7A



Catron Blvd Int
LOS D/D [AM/PM]

Alt 7B - At-Grade Int. (without Future Roadways)
Sheridan Lake Road Traffic Study Rapid City, SD

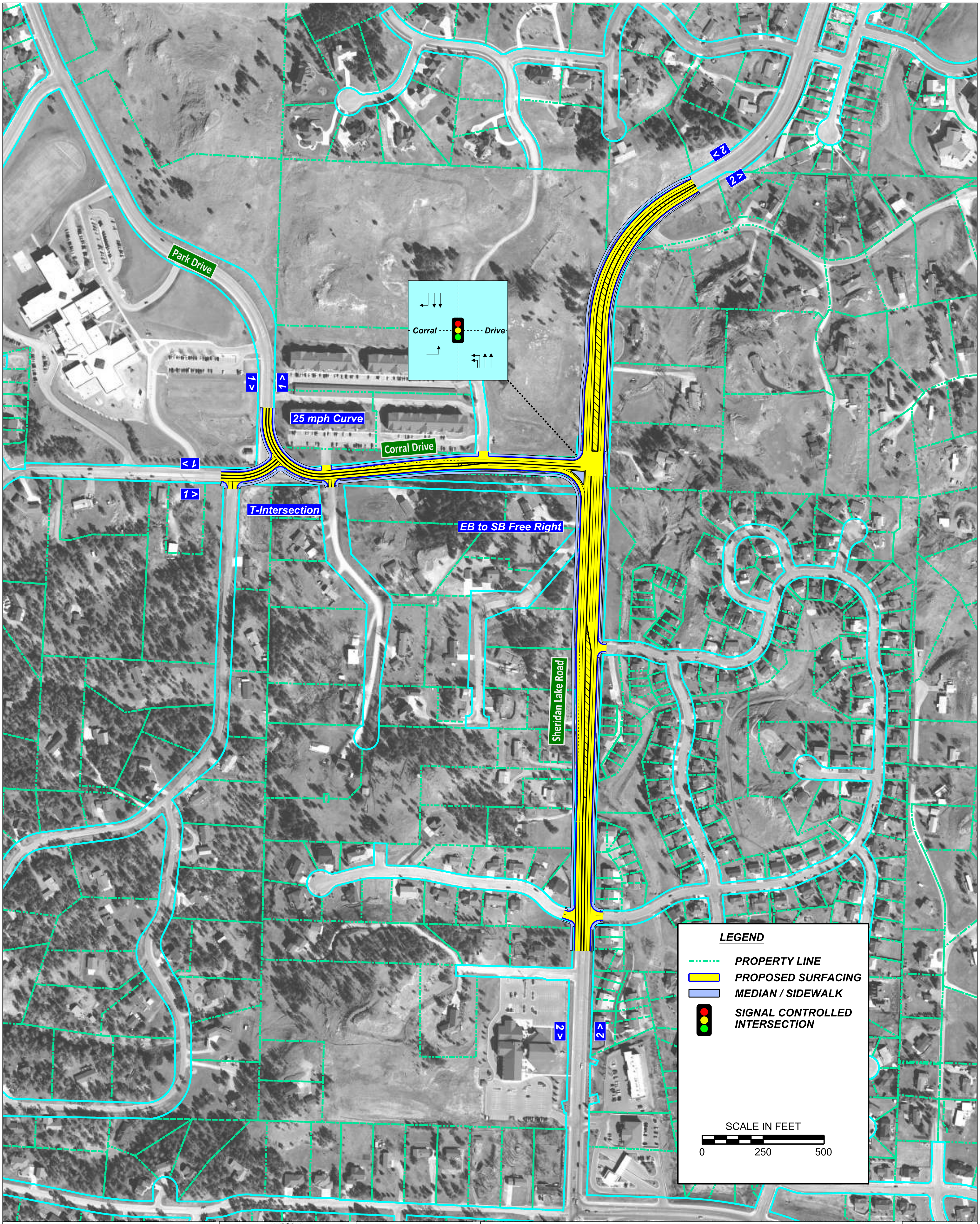
Figure
7B



Catron Blvd Int
LOS C/B [AM/PM]

Alt 8 - At-Grade Int. (with Future Roadways)
Sheridan Lake Road Traffic Study Rapid City, SD

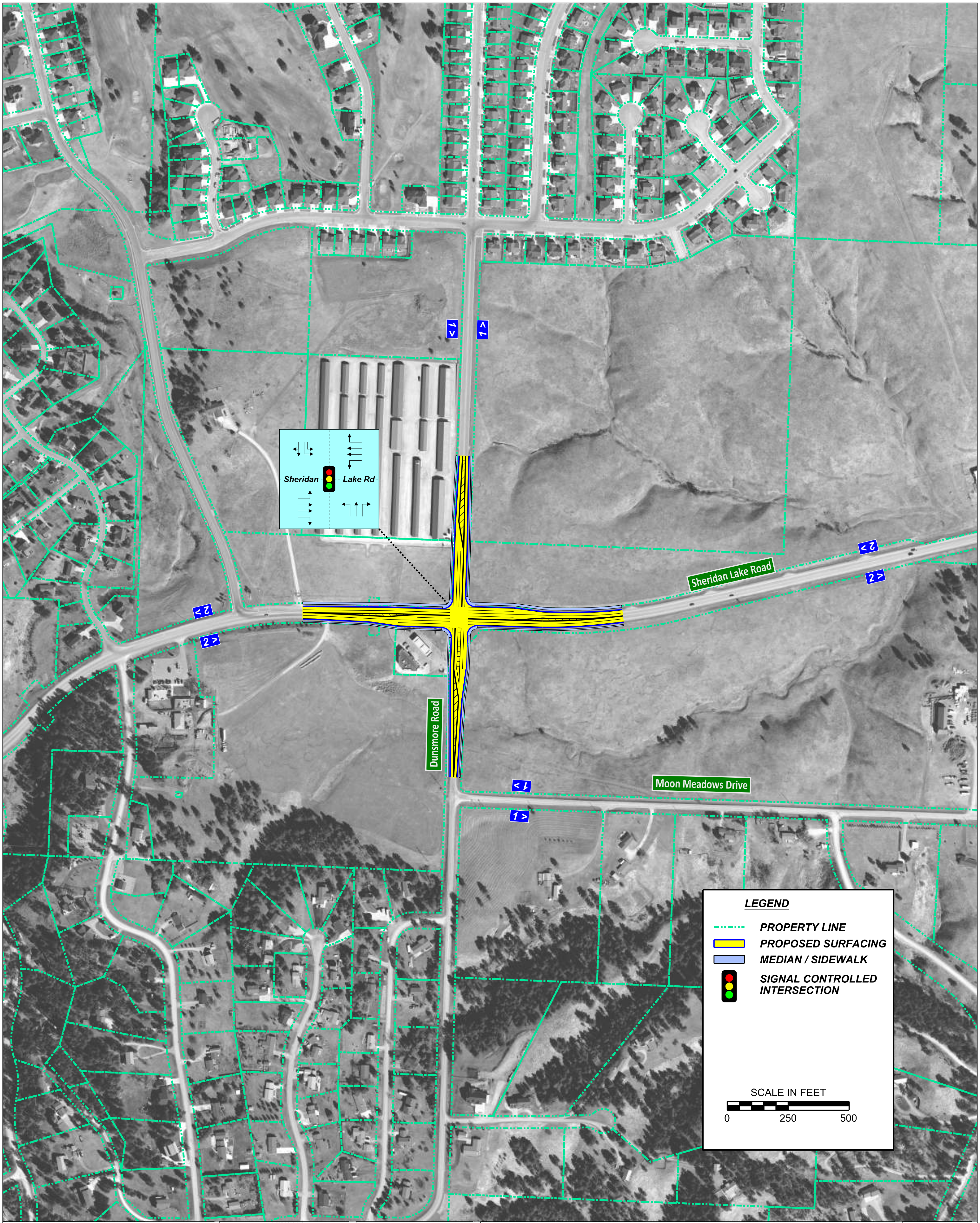
Figure
8



Corral Drive Int
LOS C/C [AM/PM]

Alt 1 - At-Grade Int. Corral Drive and Park Drive
Sheridan Lake Road Traffic Study Rapid City, SD

Figure
9



Dunsmore Rd Int
LOS C/B [AM/PM]

Alt 1 - At-Grade Int. Dunsmore
Sheridan Lake Road Traffic Study
Rapid City, SD

Figure
10

APPENDIX

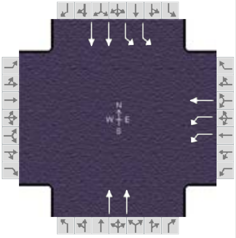
Capacity Analysis Output Sheets

SHERIDAN LAKE ROAD/CATRON BOULEVARD

ALTERNATIVE 1 – AT-GRADE - WILDWOOD RIGHT-IN/RIGHT-OUT

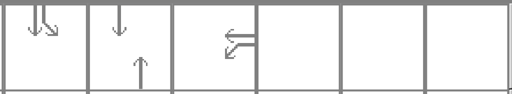
HCS7 Signalized Intersection Results Summary

General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 14, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 OPTION 1	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	SLR-CATRON-WB Slip Right.xus		
Project Description	SLR CORRIDOR STUDY				

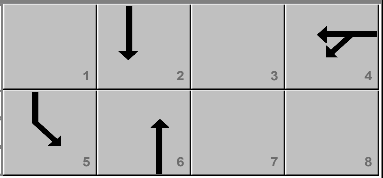


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				125	0			945		1025	280	

Signal Information			
Cycle, s	79.2	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	30.1	26.7	5.5	0.0	0.0	0.0
Yellow	3.0	5.0	3.5	0.0	0.0	0.0
Red	2.0	2.0	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				4		6	5	2
Case Number				10.0		8.3	2.0	4.0
Phase Duration, s				10.5		33.7	35.1	68.8
Change Period, (*Y+R* $_c$), s				5.0		7.0	5.0	7.0
Max Allow Headway (*MAH*), s				5.1		5.0	5.1	5.0
Queue Clearance Time (g_s), s				5.3		25.7	28.2	3.8
Green Extension Time (g_e), s				0.5		1.0	1.9	12.6
Phase Call Probability				0.95		1.00	1.00	1.00
Max Out Probability				0.02		1.00	1.00	0.01

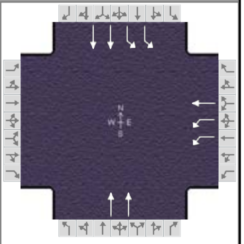
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				7	4			6		5	2	
Adjusted Flow Rate (*v*), veh/h				139	0			1050		1139	311	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1639	1772			1687		1639	1687	
Queue Service Time (g_s), s				3.3	0.0			23.7		26.2	1.8	
Cycle Queue Clearance Time (g_c), s				3.3	0.0			23.7		26.2	1.8	
Green Ratio (*g/C*)				0.07	0.07			0.34		0.38	0.78	
Capacity (*c*), veh/h				226	122			1137		1244	2630	
Volume-to-Capacity Ratio (*X*)				0.614	0.000			0.924		0.916	0.118	
Back of Queue (*Q*), ft/ln (95 th percentile)				62.3	0			402.7		411.3	12.1	
Back of Queue (*Q*), veh/ln (95 th percentile)				2.5	0.0			15.9		16.2	0.5	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.06	0.00			0.00		0.69	0.00	
Uniform Delay (d_1), s/veh				35.9	0.0			25.3		23.4	2.1	
Incremental Delay (d_2), s/veh				3.8	0.0			12.4		10.4	0.0	
Initial Queue Delay (d_3), s/veh				0.0	0.0			0.0		0.0	0.0	
Control Delay (*d*), s/veh				39.7	0.0			37.7		33.8	2.2	
Level of Service (LOS)				D				D		C	A	

	EB		WB		NB		SB	
Approach Delay, s/veh / LOS	0.0		39.7	D	37.7	D	27.0	C
Intersection Delay, s/veh / LOS	31.9				C			

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.40	B	2.49	B	2.71	C	1.31	A
Bicycle LOS Score / LOS			0.16	A	1.19	A	1.67	B

HCS7 Signalized Intersection Results Summary

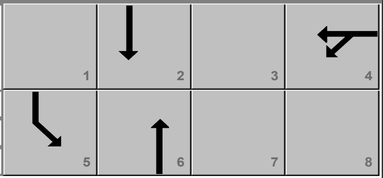
General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Oct 23, 2017	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 OPTION 1	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	SLR-CATRON w WB Slip Right.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				520	0			345		865	765	

Signal Information			
Cycle, s	86.6	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	31.3	18.8	19.5	0.0	0.0	0.0
Yellow	3.0	5.0	3.5	0.0	0.0	0.0
Red	2.0	2.0	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				4		6	5	2
Case Number				10.0		8.3	2.0	4.0
Phase Duration, s				24.5		25.8	36.3	62.1
Change Period, (*Y+R* $_c$), s				5.0		7.0	5.0	7.0
Max Allow Headway (*MAH*), s				5.1		5.0	5.1	5.0
Queue Clearance Time (*g* $_s$), s				16.4		10.7	25.0	12.6
Green Extension Time (*g* $_e$), s				3.1		8.1	6.3	10.6
Phase Call Probability				1.00		1.00	1.00	1.00
Max Out Probability				0.12		0.21	0.17	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				7	4			6		5	2	
Adjusted Flow Rate (*v*), veh/h				578	0			383		961	850	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1639	1772			1687		1639	1687	
Queue Service Time (*g* $_s$), s				14.4	0.0			8.7		23.0	10.6	
Cycle Queue Clearance Time (*g* $_c$), s				14.4	0.0			8.7		23.0	10.6	
Green Ratio (*g/C*)				0.23	0.23			0.22		0.36	0.64	
Capacity (*c*), veh/h				738	399			732		1185	2147	
Volume-to-Capacity Ratio (*X*)				0.783	0.000			0.524		0.811	0.396	
Back of Queue (*Q*), ft/ln (95 th percentile)				242.7	0			157.1		342	143.5	
Back of Queue (*Q*), veh/ln (95 th percentile)				9.6	0.0			6.2		13.5	5.6	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.24	0.00			0.00		0.57	0.00	
Uniform Delay (*d* $_1$), s/veh				31.6	0.0			30.0		25.0	7.7	
Incremental Delay (*d* $_2$), s/veh				2.7	0.0			0.8		2.7	0.2	
Initial Queue Delay (*d* $_3$), s/veh				0.0	0.0			0.0		0.0	0.0	
Control Delay (*d*), s/veh				34.3	0.0			30.8		27.7	7.8	
Level of Service (LOS)				C				C		C	A	
Approach Delay, s/veh / LOS	0.0			34.3		C	30.8		C	18.4		B
Intersection Delay, s/veh / LOS	23.4						C					

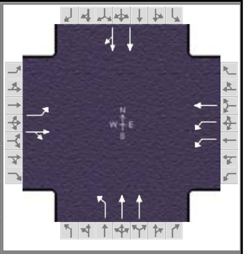
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.26	B	2.50	B	2.81	C	1.35	A
Bicycle LOS Score / LOS			0.77	A	0.73	A	1.96	B

SHERIDAN LAKE ROAD/CATRON BOULEVARD

ALTERNATIVE 2 – FLYOVER SB TO EB

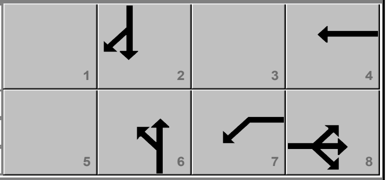
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Oct 23, 2017	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 OPTION 2	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	SLR-CATRON - Final.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	55	5	105	20		5	905			280	45

Signal Information										
Cycle, s	45.4	Reference Phase	2							
Offset, s	0	Reference Point	End	Green	20.5	3.9	4.1	0.0	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	5.0	3.5	3.5	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	1.5	1.5	0.0	0.0	0.0



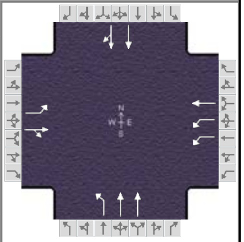
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8	7	4		6		2
Case Number		6.3	2.0	4.0		6.0		8.0
Phase Duration, s		9.1	8.9	17.9		27.5		27.5
Change Period, (*Y+R* $_c$), s		5.0	5.0	5.0		7.0		7.0
Max Allow Headway (*MAH*), s		5.0	5.1	5.0		5.0		5.0
Queue Clearance Time (g_s), s		3.6	3.5	2.4		12.6		6.1
Green Extension Time (g_e), s		0.4	0.1	0.6		7.9		9.3
Phase Call Probability		0.81	0.77	0.96		1.00		1.00
Max Out Probability		0.01	1.00	0.00		0.38		0.22

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4		1	6			2	12
Adjusted Flow Rate (*v*), veh/h	44	67		117	22		6	1006			171	168
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1389	1746		1639	1772		1042	1687			1772	1721
Queue Service Time (g_s), s	1.4	1.6		1.5	0.4		0.2	10.6			4.1	2.7
Cycle Queue Clearance Time (g_c), s	1.4	1.6		1.5	0.4		4.2	10.6			4.1	2.7
Green Ratio (*g/C*)	0.09	0.09		0.08	0.28		0.45	0.45			0.45	0.45
Capacity (*c*), veh/h	283	157		278	504		535	1522			799	776
Volume-to-Capacity Ratio (*X*)	0.157	0.426		0.419	0.044		0.010	0.661			0.214	0.216
Back of Queue (*Q*), ft/ln (95 th percentile)	18.4	30.9		25.1	6.1		1.3	124.3			32.7	31.9
Back of Queue (*Q*), veh/ln (95 th percentile)	0.7	1.2		1.0	0.2		0.0	4.9			1.3	1.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.18	0.00		0.03	0.00		0.01	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	19.4	19.6		19.7	11.8		9.3	9.7			7.6	7.6
Incremental Delay (d_2), s/veh	0.4	2.6		1.4	0.1		0.0	0.7			0.2	0.2
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	19.8	22.2		21.1	11.8		9.3	10.5			7.8	7.8
Level of Service (LOS)	B	C		C	B		A	B			A	A
Approach Delay, s/veh / LOS	21.2	C		19.7	B		10.4	B		7.8	A	
Intersection Delay, s/veh / LOS	11.4						B					

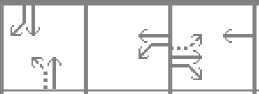
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.53	C	2.12	B	2.50	B	1.87	B
Bicycle LOS Score / LOS	0.67	A	0.16	A	1.16	A	0.77	A

HCS7 Signalized Intersection Results Summary

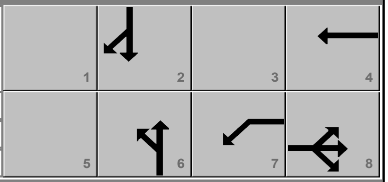
General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 19, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 OPTION 2	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	SLR-CATRON - FINAL.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	5	5	470	50		5	335			785	55



Signal Information										
Cycle, s	47.5	Reference Phase	2							
Offset, s	0	Reference Point	End	Green	21.3	7.0	3.2	0.0	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	5.0	3.5	3.5	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	0.5	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8	7	4		6		2
Case Number		6.3	2.0	4.0		6.0		8.0
Phase Duration, s		8.2	11.0	19.2		28.3		28.3
Change Period, (*Y+R* $_c$), s		5.0	4.0	5.0		7.0		7.0
Max Allow Headway (*MAH*), s		5.0	5.1	5.0		5.0		5.0
Queue Clearance Time (g_s), s		2.4	9.0	3.1		16.0		15.6
Green Extension Time (g_e), s		0.2	0.0	0.3		5.3		5.4
Phase Call Probability		0.64	1.00	1.00		1.00		1.00
Max Out Probability		0.00	1.00	0.00		0.65		0.62

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4		1	6			2	12
Adjusted Flow Rate (*v*), veh/h	11	11		522	56		6	372			459	452
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1348	1626		1639	1772		612	1687			1772	1745
Queue Service Time (g_s), s	0.4	0.3		7.0	1.1		0.4	3.3			13.6	9.2
Cycle Queue Clearance Time (g_c), s	0.4	0.3		7.0	1.1		14.0	3.3			13.6	9.2
Green Ratio (*g/C*)	0.07	0.07		0.15	0.30		0.45	0.45			0.45	0.45
Capacity (*c*), veh/h	243	110		483	530		250	1513			794	782
Volume-to-Capacity Ratio (*X*)	0.046	0.101		1.082	0.105		0.022	0.246			0.578	0.578
Back of Queue (*Q*), ft/ln (95 th percentile)	4.9	5.4		283.1	16.3		2.1	38.7			121.5	117.9
Back of Queue (*Q*), veh/ln (95 th percentile)	0.2	0.2		11.1	0.6		0.1	1.5			4.8	4.7
Queue Storage Ratio (*RQ*) (95 th percentile)	0.05	0.00		0.38	0.00		0.01	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	20.8	20.8		20.3	12.0		16.9	8.1			9.8	9.8
Incremental Delay (d_2), s/veh	0.1	0.6		64.7	0.1		0.1	0.1			0.9	1.0
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	20.9	21.4		85.0	12.2		16.9	8.2			10.7	10.7
Level of Service (LOS)	C	C		F	B		B	A			B	B
Approach Delay, s/veh / LOS	21.2		C	78.0		E	8.4		A	10.7		B
Intersection Delay, s/veh / LOS	30.9						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.39	B	2.12	B	2.59	C	1.88	B
Bicycle LOS Score / LOS	0.52	A	0.77	A	0.73	A	1.24	A

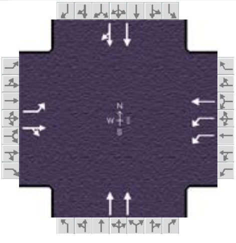
SHERIDAN LAKE ROAD/CATRON BOULEVARD

ALTERNATIVE 3 – CONTINUOUS FLOW INTERSECTION

(NORTH LEG)

HCS7 Signalized Intersection Results Summary

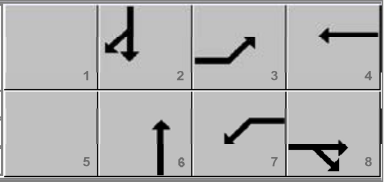
General Information				**Intersection Information**	
Agency				Duration, h	0.25
Analyst		Analysis Date	1/2/2019	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Sheridan Lake Road	Analysis Year	2019	Analysis Period	1> 7:00
Intersection	Catron Boulevard	File Name	SLR-Catron CFI - Copy.xus		
Project Description	OPTION 3 - CFI 2045 AM				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	55	5	105	20			905			280	45

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

Green	91.5	4.6	1.3	6.1	0.0	0.0
Yellow	4.0	4.0	0.0	4.0	0.0	0.0
Red	1.5	1.5	0.0	1.5	0.0	0.0



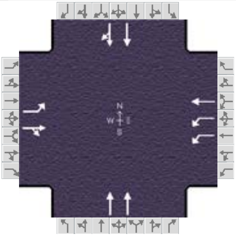
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4		6		2
Case Number	2.0	4.0	2.0	4.0		8.0		8.0
Phase Duration, s	10.1	11.6	11.4	12.9		97.0		97.0
Change Period, (*Y+R* $_c$), s	5.5	5.5	5.5	5.5		5.5		5.5
Max Allow Headway (*MAH*), s	3.1	3.0	3.1	3.0		0.0		0.0
Queue Clearance Time (*g* $_s$), s	4.8	6.1	5.8	3.3				
Green Extension Time (*g* $_e$), s	0.0	0.1	0.1	0.1		0.0		0.0
Phase Call Probability	0.77	0.99	0.98	1.00				
Max Out Probability	0.00	0.00	0.01	0.00				

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4			6			2	12
Adjusted Flow Rate (*v*), veh/h	43	65		114	22			984			179	174
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1872		1757	1900			1809			1900	1808
Queue Service Time (*g* $_s$), s	2.8	4.1		3.8	1.3			10.8			5.6	3.2
Cycle Queue Clearance Time (*g* $_c$), s	2.8	4.1		3.8	1.3			10.8			5.6	3.2
Green Ratio (*g/C*)	0.04	0.05		0.05	0.06			0.76			0.76	0.76
Capacity (*c*), veh/h	69	96		172	118			2758			1448	1379
Volume-to-Capacity Ratio (*X*)	0.628	0.680		0.664	0.185			0.357			0.124	0.126
Back of Queue (*Q*), ft/ln (50 th percentile)	33.9	50.3		43.1	15.7			87			27.5	26.8
Back of Queue (*Q*), veh/ln (50 th percentile)	1.4	2.0		1.7	0.6			3.5			1.1	1.1
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00			0.00			0.00	0.00
Uniform Delay (*d* $_1$), s/veh	56.9	56.0		56.1	53.4			4.8			4.0	4.0
Incremental Delay (*d* $_2$), s/veh	3.4	3.1		1.6	0.3			0.4			0.2	0.2
Initial Queue Delay (*d* $_3$), s/veh	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Control Delay (*d*), s/veh	60.3	59.1		57.7	53.7			5.1			4.2	4.2
Level of Service (LOS)	E	E		E	D			A			A	A
Approach Delay, s/veh / LOS	59.6	E		57.1	E		5.1	A		4.2	A	
Intersection Delay, s/veh / LOS	13.1						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.15	B	2.15	B	2.04	B	1.85	B
Bicycle LOS Score / LOS	0.67	A	0.71	A	1.30	A	0.78	A

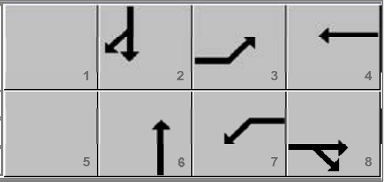
HCS™ Streets Version 7.6 Generated: 1/7/2019 10:06:12 AM

HCS7 Signalized Intersection Results Summary



General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	1/2/2019	Area Type	Other
Jurisdiction		Time Period		PHF	0.92
Urban Street	Sheridan Lake Road	Analysis Year	2019	Analysis Period	1> 7:00
Intersection	Catron Boulevard	File Name	SLR-Catron CFI - Copy PM.xus		
Project Description	OPTION 3 - CFI 2045 PM				

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	5	5	470	50			335			785	45



Signal Information										
Cycle, s	120.0	Reference Phase	2							
Offset, s	0	Reference Point	End	Green	78.8	1.8	11.9	5.5	0.0	0.0
Uncoordinated	No	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.5	1.5	1.5	1.5	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4		6		2
Case Number	2.0	4.0	2.0	4.0		8.0		8.0
Phase Duration, s	7.3	11.0	24.7	28.4		84.3		84.3
Change Period, (*Y+R* $_c$), s	5.5	5.5	5.5	5.5		5.5		5.5
Max Allow Headway (*MAH*), s	3.1	3.1	3.1	3.1		0.0		0.0
Queue Clearance Time (*g* $_s$), s	2.7	2.7	19.1	4.9				
Green Extension Time (*g* $_e$), s	0.0	0.1	0.1	0.1		0.0		0.0
Phase Call Probability	0.30	0.92	1.00	1.00				
Max Out Probability	0.00	0.00	1.00	0.00				

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4			6			2	12
Adjusted Flow Rate (*v*), veh/h	11	11		511	54			984			461	452
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1743		1757	1900			1809			1900	1863
Queue Service Time (*g* $_s$), s	0.7	0.7		17.1	2.9			15.4			19.1	13.4
Cycle Queue Clearance Time (*g* $_c$), s	0.7	0.7		17.1	2.9			15.4			19.1	13.4
Green Ratio (*g/C*)	0.02	0.05		0.16	0.19			0.66			0.66	0.66
Capacity (*c*), veh/h	28	80		563	363			2374			1247	1223
Volume-to-Capacity Ratio (*X*)	0.395	0.135		0.908	0.150			0.414			0.370	0.370
Back of Queue (*Q*), ft/ln (50 th percentile)	8.8	8		220.7	33.5			145.1			137.8	135.3
Back of Queue (*Q*), veh/ln (50 th percentile)	0.4	0.3		8.8	1.3			5.8			5.5	5.4
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00			0.00			0.00	0.00
Uniform Delay (*d* $_1$), s/veh	58.5	54.9		49.5	40.4			9.7			9.6	9.6
Incremental Delay (*d* $_2$), s/veh	3.4	0.3		17.8	0.1			0.5			0.8	0.8
Initial Queue Delay (*d* $_3$), s/veh	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Control Delay (*d*), s/veh	61.9	55.2		67.3	40.5			10.2			10.4	10.4
Level of Service (LOS)	E	E		E	D			B			B	B
Approach Delay, s/veh / LOS	58.6		E	64.8		E	10.2		B	10.4		B
Intersection Delay, s/veh / LOS	23.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.15	B	2.14	B	2.07	B	1.88	B
Bicycle LOS Score / LOS	0.52	A	1.42	A	0.79	A	1.23	A

SHERIDAN LAKE ROAD/CATRON BOULEVARD

ALTERNATIVE 4 – ROUNDABOUT (2 LANE)

HCS7 Roundabouts Report

General Information		Site Information	
Analyst	DH	Intersection	SLR/CATRON
Agency or Co.	HDR	E/W Street Name	CATRON BLVD
Date Performed	12/17/2018	N/S Street Name	SHERIDAN LAKE ROAD
Analysis Year	2045	Analysis Time Period (hrs)	0.25
Time Analyzed	AM OPTION 4	Peak Hour Factor	0.90
Project Description	SHERIDAN LAKE ROAD CORRIDOR STUDY	Jurisdiction	RAPID CITY

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	1	1	0	0	0	2	0	0	0	2	0
Lane Assignment			LTR		L		TR		LT		TR		LT		TR	
Volume (V), veh/h	0	40	55	5	0	105	20	915	0	5	905	410	0	1025	280	45
Percent Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Flow Rate (v_{PCE}), pc/h	0	46	63	6	0	120	23	1047	0	6	1036	469	0	1173	320	52
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	2				2				2				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.3276		4.6453	4.3276		4.6453	4.3276		4.5436	4.5436	
Follow-Up Headway (s)		2.5352		2.6667	2.5352		2.6667	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		115		120	1070		710	801		1173	372	
Entry Volume veh/h		112		117	1039		689	778		1139	361	
Circulating Flow (v_c), pc/h	1613			1088			1282			149		
Exiting Flow (v_{ex}), pc/h	1705			81			2129			446		
Capacity (c_{pce}), pc/h		360		496	563		415	478		1240	1240	
Capacity (c), veh/h		350		482	547		403	464		1204	1204	
v/c Ratio (x)		0.32		0.24	1.90		1.71	1.68		0.95	0.30	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		16.6		11.1	430.0		354.1	335.5		33.3	5.8	
Lane LOS		C		B	F		F	F		D	A	
95% Queue, veh		1.3		0.9	67.3		42.0	45.6		17.0	1.3	
Approach Delay, s/veh	16.6			387.7			344.3			26.6		
Approach LOS	C			F			F			D		
Intersection Delay, s/veh | LOS	235.0						F					

HCS7 Roundabouts Report

General Information / Site Information

General Information		Site Information	
Analyst	DH	Intersection	SLR/CATRON
Agency or Co.	HDR	E/W Street Name	CATRON BLVD
Date Performed	12/17/2018	N/S Street Name	SHERIDAN LAKE ROAD
Analysis Year	2045	Analysis Time Period (hrs)	0.25
Time Analyzed	PM OPTION 4	Peak Hour Factor	0.90
Project Description	SHERIDAN LAKE ROAD CORRIDOR STUDY	Jurisdiction	RAPID CITY

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	1	1	0	0	0	2	0	0	0	2	0
Lane Assignment			LTR		L		TR		LT		TR		LT		TR	
Volume (V), veh/h	0	10	5	5	0	470	50	1125	0	5	335	185	0	865	785	55
Percent Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Flow Rate (v_{PCE}), pc/h	0	11	6	6	0	538	57	1288	0	6	383	212	0	990	898	63
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	2				2				2				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.3276		4.6453	4.3276		4.6453	4.3276		4.5436	4.5436	
Follow-Up Headway (s)		2.5352		2.6667	2.5352		2.6667	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		23		538	1345		282	319		990	961	
Entry Volume veh/h		22		522	1306		274	309		961	933	
Circulating Flow (v_c), pc/h	2426			400			1007			601		
Exiting Flow (v_{ex}), pc/h	1208			126			1682			1442		
Capacity (c_{pce}), pc/h		181		934	1011		535	603		822	822	
Capacity (c), veh/h		175		907	981		519	586		798	798	
v/c Ratio (x)		0.13		0.58	1.33		0.53	0.53		1.20	1.17	

Delay and Level of Service

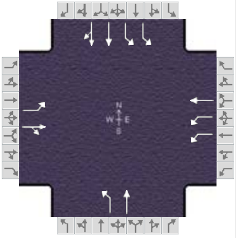
Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		24.1		12.1	171.0		17.1	15.5		123.1	109.5	
Lane LOS		C		B	F		C	C		F	F	
95% Queue, veh		0.4		3.8	50.3		3.1	3.1		31.8	29.0	
Approach Delay, s/veh	24.1			125.6			16.2			116.4		
Approach LOS	C			F			C			F		
Intersection Delay, s/veh | LOS	106.3						F					

SHERIDAN LAKE ROAD/CATRON BOULEVARD

ALTERNATIVE 5 – NB OVERPASS

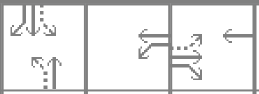
HCS7 Signalized Intersection Results Summary

General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 17, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 OPTION 5	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	SLR-CATRON Final.xus		
Project Description	SLR CORRIDOR STUDY				

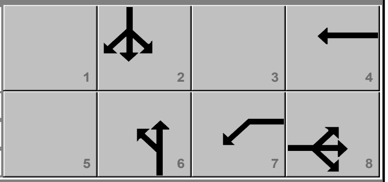


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	55	5	105	20		5	0		1025	280	45

Signal Information			
Cycle, s	48.3	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	23.2	4.0	4.2	0.0	0.0	0.0
Yellow	5.0	3.5	3.5	0.0	0.0	0.0
Red	2.0	1.5	1.5	0.0	0.0	0.0



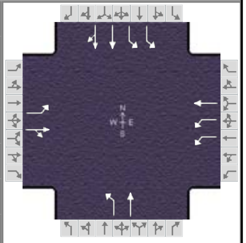
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8	7	4		6		2
Case Number		6.3	2.0	4.0		6.0		6.0
Phase Duration, s		9.2	9.0	18.1		30.2		30.2
Change Period, (*Y+R* $_c$), s		5.0	5.0	5.0		7.0		7.0
Max Allow Headway (*MAH*), s		5.0	5.1	5.0		5.0		5.0
Queue Clearance Time (*g* $_s$), s		3.8	3.6	2.4		4.9		14.8
Green Extension Time (*g* $_e$), s		0.4	0.1	0.6		11.0		8.4
Phase Call Probability		0.83	0.79	0.97		1.00		1.00
Max Out Probability		0.01	1.00	0.00		0.25		0.49

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4		1	6		5	2	12
Adjusted Flow Rate (*v*), veh/h	44	67		117	22		6	0		1139	171	168
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1389	1746		1639	1772		1042	1772		1639	1772	1721
Queue Service Time (*g* $_s$), s	1.5	1.8		1.6	0.4		0.1	0.0		12.8	2.7	2.7
Cycle Queue Clearance Time (*g* $_c$), s	1.5	1.8		1.6	0.4		2.9	0.0		12.8	2.7	2.7
Green Ratio (*g/C*)	0.09	0.09		0.08	0.27		0.48	0.48		0.48	0.48	0.48
Capacity (*c*), veh/h	269	151		269	482		590	850		1870	850	825
Volume-to-Capacity Ratio (*X*)	0.165	0.442		0.434	0.046		0.009	0.000		0.609	0.201	0.204
Back of Queue (*Q*), ft/ln (95 th percentile)	20.1	33.8		27.5	6.9		1.2	0		149.2	33.4	32.4
Back of Queue (*Q*), veh/ln (95 th percentile)	0.8	1.3		1.1	0.3		0.0	0.0		5.9	1.3	1.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.20	0.00		0.07	0.00		0.00	0.00		0.43	0.00	0.00
Uniform Delay (*d* $_1$), s/veh	20.8	21.0		21.1	13.0		8.1	0.0		9.9	7.2	7.2
Incremental Delay (*d* $_2$), s/veh	0.4	2.9		1.6	0.1		0.0	0.0		0.5	0.2	0.2
Initial Queue Delay (*d* $_3$), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	21.2	23.8		22.7	13.0		8.1	0.0		10.3	7.4	7.4
Level of Service (LOS)	C	C		C	B		A			B	A	A
Approach Delay, s/veh / LOS	22.8	C		21.1	C		8.1	A		9.7	A	
Intersection Delay, s/veh / LOS	11.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.36	B	2.29	B	2.67	C	1.87	B
Bicycle LOS Score / LOS	0.67	A	0.16	A	0.17	A	1.71	B

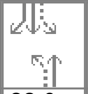
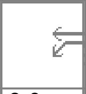
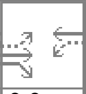
HCS7 Signalized Intersection Results Summary

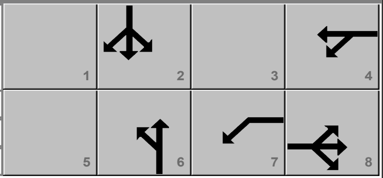
General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 17, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 OPTION 5	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	SLR-CATRON Final.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	5	5	470	50		5	0		865	785	55

Signal Information			
Cycle, s	50.4	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

						
Green	22.0	8.0	3.3	0.0	0.0	0.0
Yellow	5.0	3.5	3.5	0.0	0.0	0.0
Red	2.0	1.5	1.5	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8	7	4		6		2
Case Number		6.3	1.0	4.0		6.0		6.0
Phase Duration, s		8.3	13.0	21.3		29.0		29.0
Change Period, (*Y+R* $_c$), s		5.0	5.0	5.0		7.0		7.0
Max Allow Headway (*MAH*), s		5.0	5.1	5.0		5.0		5.0
Queue Clearance Time (g_s), s		2.4	9.0	3.1		12.2		13.3
Green Extension Time (g_e), s		0.2	0.0	0.3		9.3		8.8
Phase Call Probability		0.66	1.00	1.00		1.00		1.00
Max Out Probability		0.00	1.00	0.00		0.70		0.73

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4		1	6		5	2	12
Adjusted Flow Rate (*v*), veh/h	11	11		522	56		6	0		961	459	452
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1348	1626		1639	1772		612	1772		1639	1772	1745
Queue Service Time (g_s), s	0.4	0.3		7.0	1.1		0.3	0.0		11.3	9.9	9.9
Cycle Queue Clearance Time (g_c), s	0.4	0.3		7.0	1.1		10.2	0.0		11.3	9.9	9.9
Green Ratio (*g/C*)	0.07	0.07		0.26	0.32		0.44	0.44		0.44	0.44	0.44
Capacity (*c*), veh/h	232	107		974	574		291	776		1720	776	764
Volume-to-Capacity Ratio (*X*)	0.048	0.104		0.536	0.097		0.019	0.000		0.559	0.592	0.592
Back of Queue (*Q*), ft/ln (95 th percentile)	5.3	5.8		102.9	16.8		2	0		143.6	138.5	134.4
Back of Queue (*Q*), veh/ln (95 th percentile)	0.2	0.2		4.1	0.7		0.1	0.0		5.7	5.5	5.4
Queue Storage Ratio (*RQ*) (95 th percentile)	0.05	0.00		0.26	0.00		0.00	0.00		0.41	0.00	0.00
Uniform Delay (d_1), s/veh	22.2	22.1		16.3	11.9		14.6	0.0		11.1	10.7	10.7
Incremental Delay (d_2), s/veh	0.1	0.6		0.8	0.1		0.0	0.0		0.4	1.0	1.1
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	22.3	22.7		17.0	12.0		14.7	0.0		11.5	11.8	11.8
Level of Service (LOS)	C	C		B	B		B			B	B	B
Approach Delay, s/veh / LOS	22.5	C		16.5	B		14.7	B		11.7	B	
Intersection Delay, s/veh / LOS	12.9						B					

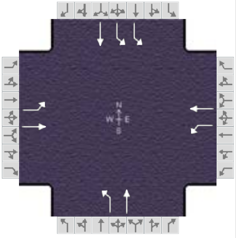
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.23	B	2.28	B	2.76	C	1.88	B
Bicycle LOS Score / LOS	0.52	A	0.77	A	0.35	A	2.03	B

SHERIDAN LAKE ROAD/CATRON BOULEVARD

ALTERNATIVE 6 – SINGLE POINT INTERCHANGE

HCS7 Signalized Intersection Results Summary

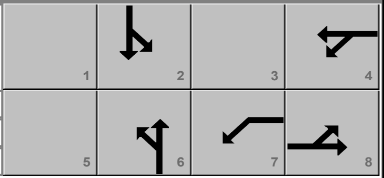
General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 17, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 OPTION 6	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	2045 AM OPTION 6.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	55		105	20		5	0		1025	0	

Signal Information			
Cycle, s	46.5	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	21.5	3.9	4.0	0.0	0.0	0.0
Yellow	5.0	3.5	3.5	0.0	0.0	0.0
Red	2.0	1.5	1.5	0.0	0.0	0.0



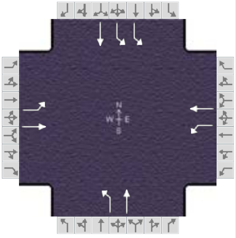
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8	7	4		6		2
Case Number		6.3	1.0	4.0		6.0		6.0
Phase Duration, s		9.0	8.9	17.9		28.5		28.5
Change Period, (*Y*+*R* *c*), s		5.0	5.0	5.0		7.0		7.0
Max Allow Headway (*MAH*), s		5.0	5.1	5.0		5.0		5.0
Queue Clearance Time (*g* *s*), s		3.6	4.7	2.5		2.1		14.7
Green Extension Time (*g* *e*), s		0.4	0.0	0.5		9.0		6.8
Phase Call Probability		0.81	0.78	0.96		1.00		1.00
Max Out Probability		0.01	1.00	0.00		0.09		0.33

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8		7	4		1	6		5	2	
Adjusted Flow Rate (*v*), veh/h	44	61		117	22		6	0		1139	0	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1389	1662		1688	1658		1688	1656		1639	1656	
Queue Service Time (*g* *s*), s	1.4	1.6		2.7	0.5		0.1	0.0		12.7	0.0	
Cycle Queue Clearance Time (*g* *c*), s	1.4	1.6		2.7	0.5		0.1	0.0		12.7	0.0	
Green Ratio (*g/C*)	0.09	0.09		0.21	0.28		0.46	0.46		0.46	0.46	
Capacity (*c*), veh/h	276	145		366	461		937	768		1829	768	
Volume-to-Capacity Ratio (*X*)	0.161	0.423		0.318	0.048		0.006	0.000		0.623	0.000	
Back of Queue (*Q*), ft/ln (95 th percentile)	19.1	29.6		42.1	6.5		1	0		147.4	0	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.8	1.2		1.7	0.3		0.0	0.0		5.8	0.0	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.38	0.00		0.14	0.00		0.00	0.00		0.33	0.00	
Uniform Delay (*d* *1*), s/veh	20.0	20.1		15.6	12.3		6.7	0.0		10.1	0.0	
Incremental Delay (*d* *2*), s/veh	0.4	2.8		0.7	0.1		0.0	0.0		0.5	0.0	
Initial Queue Delay (*d* *3*), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	20.4	22.9		16.3	12.3		6.7	0.0		10.6	0.0	
Level of Service (LOS)	C	C		B	B		A			B		
Approach Delay, s/veh / LOS	21.8		C	15.7		B	6.7		A	10.6		B
Intersection Delay, s/veh / LOS	11.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.17	B	2.12	B	2.50	B	1.87	B
Bicycle LOS Score / LOS	0.66	A	0.16	A	0.17	A	2.33	B

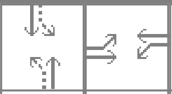
HCS7 Signalized Intersection Results Summary

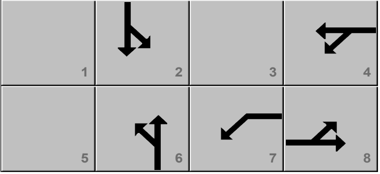
General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 17, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 OPTION 6	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	2045 PM OPTION 6.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	5		470	50		5	0		865	0	

Signal Information										
Cycle, s	62.0	Reference Phase	2							
Offset, s	0	Reference Point	End	Green	21.8	22.0	1.3	0.0	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	5.0	3.5	3.5	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	1.5	1.5	0.0	0.0	0.0





Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4		6		2
Case Number		10.0		10.0		6.0		6.0
Phase Duration, s		6.3		27.0		28.8		28.8
Change Period, (*Y+R*$_c$), s		5.0		5.0		7.0		7.0
Max Allow Headway (*MAH*), s		5.0		5.1		5.0		5.0
Queue Clearance Time (g_s), s		2.4		20.0		2.1		18.0
Green Extension Time (g_e), s		0.0		2.0		6.8		3.8
Phase Call Probability		0.25		1.00		1.00		1.00
Max Out Probability		0.00		0.64		0.07		0.66

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8		7	4		1	6		5	2	
Adjusted Flow Rate (*v*), veh/h	11	6		522	56		6	0		961	0	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1657		1688	1663		1688	1656		1639	1656	
Queue Service Time (g_s), s	0.4	0.2		18.0	1.4		0.1	0.0		16.0	0.0	
Cycle Queue Clearance Time (g_c), s	0.4	0.2		18.0	1.4		0.1	0.0		16.0	0.0	
Green Ratio (*g/C*)	0.02	0.02		0.35	0.35		0.35	0.35		0.35	0.35	
Capacity (*c*), veh/h	34	33		598	589		709	582		1385	582	
Volume-to-Capacity Ratio (*X*)	0.326	0.166		0.874	0.094		0.008	0.000		0.694	0.000	
Back of Queue (*Q*), ft/ln (95 th percentile)	10.3	4.8		308.7	21.1		2	0		237.6	0	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.4	0.2		12.2	0.8		0.1	0.0		9.4	0.0	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.21	0.00		0.88	0.00		0.00	0.00		0.53	0.00	
Uniform Delay (d_1), s/veh	30.0	29.9		18.7	13.4		13.1	0.0		18.2	0.0	
Incremental Delay (d_2), s/veh	7.7	3.3		10.5	0.1		0.0	0.0		1.3	0.0	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	37.7	33.2		29.3	13.5		13.1	0.0		19.5	0.0	
Level of Service (LOS)	D	C		C	B		B			B		
Approach Delay, s/veh / LOS	36.2		D	27.8		C	13.1		B	19.5		B
Intersection Delay, s/veh / LOS	22.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.06	B	2.15	B	2.61	C	1.90	B
Bicycle LOS Score / LOS	0.52	A	0.77	A	0.35	A	2.04	B

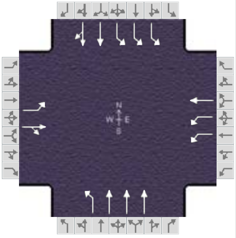
SHERIDAN LAKE ROAD/CATRON BOULEVARD

ALTERNATIVE 7 – AT-GRADE WITHOUT FUTURE ROADWAYS

(TRIPLE SB LEFTS/TRIPLE NB THRUS)

HCS7 Signalized Intersection Results Summary

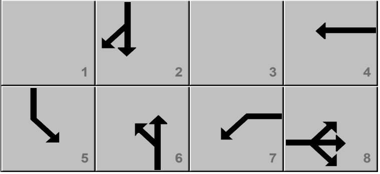
General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 17, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 OPTION 7	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	2045 AM OPTION 7.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	55	5	105	20		5	905		1025	280	45

Signal Information			
Cycle, s	65.3	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	15.0	20.3	4.4	4.6	0.0	0.0
Yellow	3.5	5.0	3.5	3.5	0.0	0.0
Red	0.5	2.0	1.5	1.5	0.0	0.0



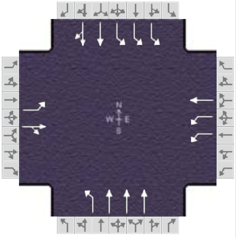
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8	7	4		6	5	2
Case Number		6.3	2.0	4.0		6.3	2.0	4.0
Phase Duration, s		9.6	9.4	19.0		27.3	19.0	46.3
Change Period, (*Y+R* $_c$), s		5.0	5.0	5.0		7.0	4.0	7.0
Max Allow Headway (*MAH*), s		5.0	5.1	5.0		5.0	5.1	5.0
Queue Clearance Time (*g* $_s$), s		4.4	4.2	2.7		13.8	17.0	4.8
Green Extension Time (*g* $_e$), s		0.4	0.0	0.6		6.5	0.0	11.0
Phase Call Probability		0.91	0.88	0.99		1.00	1.00	1.00
Max Out Probability		0.01	1.00	0.00		0.54	1.00	0.05

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4		1	6		5	2	12
Adjusted Flow Rate (*v*), veh/h	44	67		117	22		6	1006		1139	171	168
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1389	1746		1639	1772		1042	1609		1639	1772	1721
Queue Service Time (*g* $_s$), s	2.0	2.4		2.2	0.7		0.2	11.8		15.0	2.8	2.8
Cycle Queue Clearance Time (*g* $_c$), s	2.0	2.4		2.2	0.7		0.2	11.8		15.0	2.8	2.8
Green Ratio (*g/C*)	0.07	0.07		0.07	0.21		0.31	0.31		0.23	0.60	0.60
Capacity (*c*), veh/h	207	122		221	379		435	1503		1129	1068	1037
Volume-to-Capacity Ratio (*X*)	0.214	0.547		0.528	0.059		0.013	0.669		1.008	0.160	0.162
Back of Queue (*Q*), ft/ln (95 th percentile)	30.4	51.2		41.4	11.7		2.4	182.2		329.4	34.7	33.9
Back of Queue (*Q*), veh/ln (95 th percentile)	1.2	2.0		1.6	0.5		0.1	7.2		13.0	1.4	1.4
Queue Storage Ratio (*RQ*) (95 th percentile)	0.30	0.00		0.10	0.00		0.01	0.00		0.55	0.00	0.00
Uniform Delay (*d* $_1$), s/veh	29.2	29.4		29.4	20.4		15.6	19.5		25.1	5.7	5.7
Incremental Delay (*d* $_2$), s/veh	0.7	5.4		2.8	0.1		0.0	0.8		28.8	0.1	0.1
Initial Queue Delay (*d* $_3$), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	29.9	34.7		32.2	20.5		15.6	20.4		54.0	5.8	5.8
Level of Service (LOS)	C	C		C	C		B	C		F	A	A
Approach Delay, s/veh / LOS	32.8	C		30.3	C		20.3	C		42.9	D	
Intersection Delay, s/veh / LOS	33.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.70	C	2.73	C	2.85	C	1.86	B
Bicycle LOS Score / LOS	0.67	A	0.16	A	0.93	A	1.71	B

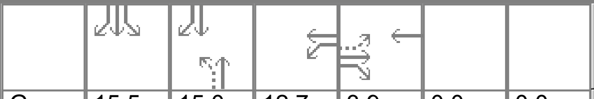
HCS7 Signalized Intersection Results Summary

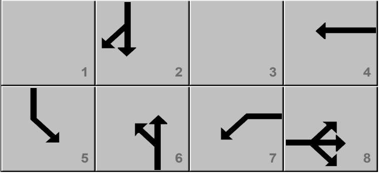
General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 17, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 OPTION 7	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	2045 PM OPTION 7.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	10	5	5	470	50		5	335		865	785	55

Signal Information										
Cycle, s	68.1	Reference Phase	2							
Offset, s	0	Reference Point	End	Green	15.5	15.0	12.7	3.9	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.5	5.0	3.5	3.5	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.5	2.0	1.5	1.5	0.0	0.0





Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8	7	4		6	5	2
Case Number		6.3	2.0	4.0		6.3	2.0	4.0
Phase Duration, s		8.9	17.7	26.5		22.0	19.5	41.5
Change Period, (Y+R c), s		5.0	5.0	5.0		7.0	4.0	7.0
Max Allow Headway (MAH), s		5.0	5.1	5.0		5.0	5.1	5.0
Queue Clearance Time (g s), s		2.5	12.5	3.5		6.4	14.8	13.7
Green Extension Time (g e), s		0.2	0.2	0.3		7.9	0.8	9.5
Phase Call Probability		0.77	1.00	1.00		1.00	1.00	1.00
Max Out Probability		0.00	1.00	0.00		0.28	1.00	0.09

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4		1	6		5	2	12
Adjusted Flow Rate (v), veh/h	11	11		522	56		6	372		961	459	452
Adjusted Saturation Flow Rate (s), veh/h/ln	1348	1626		1639	1772		612	1609		1639	1772	1745
Queue Service Time (g s), s	0.5	0.4		10.5	1.5		0.5	4.4		12.8	11.7	11.7
Cycle Queue Clearance Time (g c), s	0.5	0.4		10.5	1.5		0.5	4.4		12.8	11.7	11.7
Green Ratio (g/C)	0.06	0.06		0.19	0.32		0.22	0.22		0.23	0.51	0.51
Capacity (c), veh/h	182	92		611	561		241	1064		1121	899	885
Volume-to-Capacity Ratio (X)	0.061	0.121		0.855	0.099		0.023	0.350		0.857	0.511	0.511
Back of Queue (Q), ft/ln (95 th percentile)	7.9	8.4		210	25.9		3.1	71.3		226.2	176.7	171.4
Back of Queue (Q), veh/ln (95 th percentile)	0.3	0.3		8.3	1.0		0.1	2.8		8.9	7.0	6.9
Queue Storage Ratio (RQ) (95 th percentile)	0.08	0.00		0.52	0.00		0.01	0.00		0.38	0.00	0.00
Uniform Delay (d 1), s/veh	30.5	30.5		26.8	16.4		20.9	22.4		25.2	11.1	11.1
Incremental Delay (d 2), s/veh	0.2	0.8		11.4	0.1		0.1	0.3		6.7	0.6	0.7
Initial Queue Delay (d 3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Control Delay (d), s/veh	30.7	31.3		38.2	16.5		20.9	22.7		31.9	11.8	11.8
Level of Service (LOS)	C	C		D	B		C	C		C	B	B
Approach Delay, s/veh / LOS	31.0		C	36.1		D	22.7		C	22.1		C
Intersection Delay, s/veh / LOS	25.1						C					

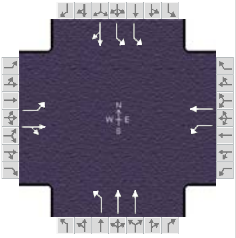
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.56	C	2.72	C	2.95	C	1.88	B
Bicycle LOS Score / LOS	0.52	A	0.77	A	0.65	A	2.03	B

SHERIDAN LAKE ROAD/CATRON BOULEVARD

ALTERNATIVE 8 – AT-GRADE WITH FUTURE ROADWAYS

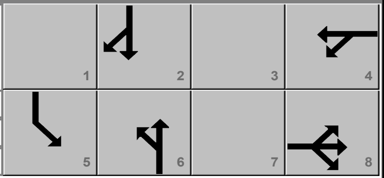
HCS7 Signalized Intersection Results Summary

General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 17, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 OPTION 8	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	2045 AM OPTION 8 101518 Les Hollers.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	55	5	20	20		5	1000		1030	310	55

Signal Information										
Cycle, s	107.2	Reference Phase	2							
Offset, s	0	Reference Point	End	Green	41.7	39.8	8.3	0.0	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.0	5.0	4.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	1.5	0.0	0.0	0.0



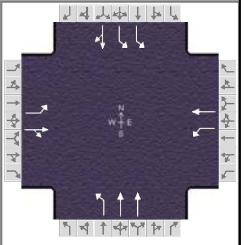
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4		6	5	2
Case Number		6.0		6.0		6.3	2.0	4.0
Phase Duration, s		13.8		13.8		46.8	46.7	93.5
Change Period, (*Y+R* $_c$), s		5.5		5.5		7.0	5.0	7.0
Max Allow Headway (*MAH*), s		5.0		5.0		5.0	5.1	5.0
Queue Clearance Time (*g* $_s$), s		6.6		7.7		35.1	37.2	7.9
Green Extension Time (*g* $_e$), s		0.5		0.6		4.7	4.5	14.9
Phase Call Probability		0.99		0.99		1.00	1.00	1.00
Max Out Probability		0.02		0.00		0.88	0.76	0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4		1	6		5	2	12
Adjusted Flow Rate (*v*), veh/h	44	67		22	22		6	1111		1144	383	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1389	1746		1335	1772		1000	1687		1639	1740	
Queue Service Time (*g* $_s$), s	3.3	3.9		1.7	1.3		0.4	33.1		35.2	5.9	
Cycle Queue Clearance Time (*g* $_c$), s	4.6	3.9		5.7	1.3		0.4	33.1		35.2	5.9	
Green Ratio (*g/C*)	0.08	0.08		0.08	0.08		0.37	0.37		0.39	0.81	
Capacity (*c*), veh/h	158	135		121	137		438	1252		1273	1403	
Volume-to-Capacity Ratio (*X*)	0.281	0.494		0.183	0.162		0.013	0.887		0.899	0.273	
Back of Queue (*Q*), ft/ln (95 th percentile)	54.2	83.3		27.7	26.2		4	514.2		528.7	57	
Back of Queue (*Q*), veh/ln (95 th percentile)	2.1	3.3		1.1	1.0		0.2	20.2		20.8	2.2	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.54	0.00		0.07	0.00		0.01	0.00		0.76	0.00	
Uniform Delay (*d* $_1$), s/veh	48.4	47.5		50.2	46.2		21.3	31.6		30.8	2.6	
Incremental Delay (*d* $_2$), s/veh	1.4	3.9		1.0	0.8		0.0	7.7		8.2	0.1	
Initial Queue Delay (*d* $_3$), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	49.7	51.4		51.2	47.0		21.3	39.3		39.0	2.7	
Level of Service (LOS)	D	D		D	D		C	D		D	A	
Approach Delay, s/veh / LOS	50.7	D		49.1	D		39.2	D		29.9	C	
Intersection Delay, s/veh / LOS	34.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.23	B	2.34	B	2.51	C	1.83	B
Bicycle LOS Score / LOS	0.67	A	0.05	A	1.35	A	3.01	C

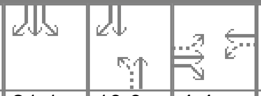
HCS7 Signalized Intersection Results Summary

General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 17, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 OPTION 8	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	2045 PM OPTION 8 w Les Hollers 101518.xus		
Project Description	SLR CORRIDOR STUDY				

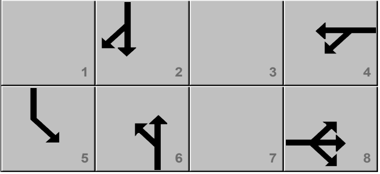


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	10	5	5	40	45		5	475		775	895	55

Signal Information			
Cycle, s	63.4	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	21.1	19.9	4.4	0.0	0.0	0.0
Yellow	3.0	5.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4		6	5	2
Case Number		6.0		6.0		6.3	2.0	4.0
Phase Duration, s		10.4		10.4		26.9	26.1	53.0
Change Period, ($Y+R_c$), s		6.0		6.0		7.0	5.0	7.0
Max Allow Headway (*MAH*), s		5.0		5.0		5.0	5.1	5.0
Queue Clearance Time (g_s), s		4.2		4.3		10.1	17.1	26.7
Green Extension Time (g_e), s		0.4		0.4		9.9	4.0	15.1
Phase Call Probability		0.87		0.87		1.00	1.00	1.00
Max Out Probability		0.00		0.00		0.60	0.47	0.26

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4		1	6		5	2	12
Adjusted Flow Rate (*v*), veh/h	11	11		44	50		6	528		861	1033	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1355	1626		1403	1772		546	1687		1639	1760	
Queue Service Time (g_s), s	0.5	0.4		1.9	1.7		0.4	8.1		15.1	24.7	
Cycle Queue Clearance Time (g_c), s	2.2	0.4		2.3	1.7		0.4	8.1		15.1	24.7	
Green Ratio (*g/C*)	0.07	0.07		0.07	0.07		0.31	0.31		0.33	0.73	
Capacity (*c*), veh/h	170	112		201	122		285	1061		1091	1278	
Volume-to-Capacity Ratio (*X*)	0.065	0.099		0.221	0.410		0.019	0.497		0.789	0.809	
Back of Queue (*Q*), ft/ln (95 th percentile)	7.4	7.4		29.6	35.5		2.4	128.1		232	208.8	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.3	0.3		1.2	1.4		0.1	5.0		9.1	8.2	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.07	0.00		0.07	0.00		0.01	0.00		0.39	0.00	
Uniform Delay (d_1), s/veh	29.3	27.7		28.8	28.3		15.1	17.7		19.1	5.8	
Incremental Delay (d_2), s/veh	0.2	0.5		0.8	3.1		0.0	0.5		2.8	2.7	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	29.6	28.2		29.6	31.4		15.1	18.2		22.0	8.5	
Level of Service (LOS)	C	C		C	C		B	B		C	A	
Approach Delay, s/veh / LOS	28.9	C		30.5	C		18.1	B		14.6	B	
Intersection Delay, s/veh / LOS	16.1						B					

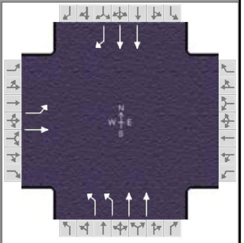
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.21	B	2.32	B	2.50	B	1.83	B
Bicycle LOS Score / LOS	0.52	A	0.13	A	0.87	A	3.61	D

SHERIDAN LAKE ROAD/CORRAL DRIVE/PARK DRIVE

ALTERNATIVE 1 – CORRAL DRIVE/PARK DRIVE

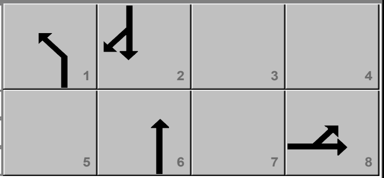
HCS7 Signalized Intersection Results Summary

General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 20, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 CORRAL 1	Analysis Period	1> 7:00
Intersection	CORRAL DRIVE	File Name	2045 AM CORRAL 1 - No Les Hollers 101518.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	335	0					760	1215			735	275

Signal Information										
Cycle, s	83.9	Reference Phase	2							
Offset, s	0	Reference Point	End	Green	22.0	25.9	20.6	0.0	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.0	1.5	2.0	0.0	0.0	0.0



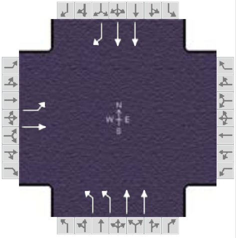
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8			1	6		2
Case Number		10.0			2.0	4.0		7.3
Phase Duration, s		26.6			26.0	57.4		31.4
Change Period, ($Y+R_c$), s		6.0			4.0	5.5		5.5
Max Allow Headway (*MAH*), s		4.1			5.1	4.0		4.0
Queue Clearance Time (g_s), s		19.9			23.5	23.4		20.5
Green Extension Time (g_e), s		0.6			0.0	14.4		5.3
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		0.62			1.00	0.27		0.86

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8					1	6			2	12
Adjusted Flow Rate (*v*), veh/h	372	0					844	1350			817	206
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1800					1639	1687			1687	1502
Queue Service Time (g_s), s	17.9	0.0					21.5	21.4			18.5	9.2
Cycle Queue Clearance Time (g_c), s	17.9	0.0					21.5	21.4			18.5	9.2
Green Ratio (*g/C*)	0.25	0.25					0.26	0.62			0.31	0.31
Capacity (*c*), veh/h	414	441					859	2085			1040	463
Volume-to-Capacity Ratio (*X*)	0.900	0.000					0.983	0.648			0.786	0.444
Back of Queue (*Q*), ft/ln (95 th percentile)	345.3	0					419	269.7			301.5	143.1
Back of Queue (*Q*), veh/ln (95 th percentile)	13.6	0.0					16.5	10.6			11.9	5.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.92	0.00					0.42	0.00			0.00	0.36
Uniform Delay (d_1), s/veh	30.7	0.0					30.8	10.2			26.5	23.3
Incremental Delay (d_2), s/veh	16.9	0.0					26.5	0.7			3.6	0.7
Initial Queue Delay (d_3), s/veh	0.0	0.0					0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	47.6	0.0					57.3	10.9			30.1	23.9
Level of Service (LOS)	D						E	B			C	C
Approach Delay, s/veh / LOS	47.6		D	0.0			28.7		C	28.9		C
Intersection Delay, s/veh / LOS	30.7						C					

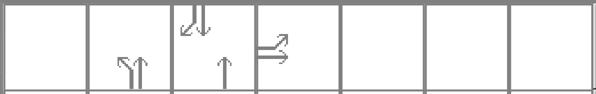
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.47	B	2.44	B	1.35	A	2.11	B
Bicycle LOS Score / LOS	1.10	A			2.30	B	1.33	A

HCS7 Signalized Intersection Results Summary

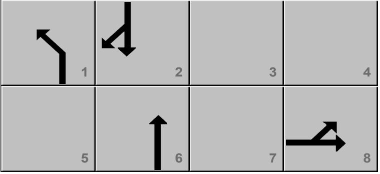
General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 20, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 CORRAL 1	Analysis Period	1> 7:00
Intersection	CORRAL DRIVE	File Name	2045 AM CORRAL 1 - w Les Hollers 101518.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	340	0					680	1290			795	300



Signal Information										
Cycle, s	84.6	Reference Phase	2							
Offset, s	0	Reference Point	End	Green	21.5	26.7	21.0	0.0	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.0	1.5	2.0	0.0	0.0	0.0



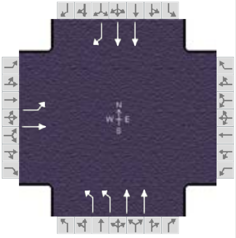
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8			1	6		2
Case Number		10.0			2.0	4.0		7.3
Phase Duration, s		27.0			25.5	57.6		32.2
Change Period, ($Y+R_c$), s		6.0			4.0	5.5		5.5
Max Allow Headway (*MAH*), s		4.1			5.1	4.0		4.0
Queue Clearance Time (g_s), s		20.4			20.9	26.0		22.5
Green Extension Time (g_e), s		0.6			0.5	15.2		4.1
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		0.76			1.00	0.38		0.96

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8					1	6			2	12
Adjusted Flow Rate (*v*), veh/h	378	0					756	1433			883	233
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1800					1639	1687			1687	1502
Queue Service Time (g_s), s	18.4	0.0					18.9	24.0			20.5	10.7
Cycle Queue Clearance Time (g_c), s	18.4	0.0					18.9	24.0			20.5	10.7
Green Ratio (*g/C*)	0.25	0.25					0.25	0.62			0.32	0.32
Capacity (*c*), veh/h	418	446					832	2079			1063	473
Volume-to-Capacity Ratio (*X*)	0.903	0.000					0.909	0.689			0.831	0.493
Back of Queue (*Q*), ft/ln (95 th percentile)	355	0					339	299.8			335.4	166
Back of Queue (*Q*), veh/ln (95 th percentile)	14.0	0.0					13.3	11.8			13.2	6.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.95	0.00					0.34	0.00			0.00	0.41
Uniform Delay (d_1), s/veh	30.8	0.0					30.6	10.8			26.9	23.5
Incremental Delay (d_2), s/veh	17.7	0.0					13.6	0.9			5.4	0.8
Initial Queue Delay (d_3), s/veh	0.0	0.0					0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	48.5	0.0					44.2	11.8			32.3	24.3
Level of Service (LOS)	D						D	B			C	C
Approach Delay, s/veh / LOS	48.5	D		0.0			23.0	C		30.6	C	
Intersection Delay, s/veh / LOS	27.9						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.47	B	2.44	B	1.35	A	2.11	B
Bicycle LOS Score / LOS	1.11	A			2.29	B	1.41	A

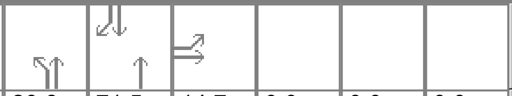
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 20, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 CORRAL 1	Analysis Period	1> 7:00
Intersection	CORRAL DRIVE	File Name	2045 PM CORRAL 1 No Les Hollers 101518.xus		
Project Description	SLR CORRIDOR STUDY				

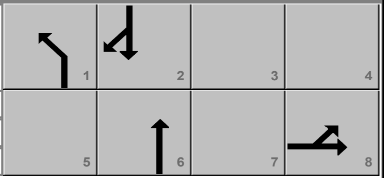


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	155	0					440	1065			1450	255

Signal Information			
Cycle, s	123.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	20.8	71.5	14.7	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	0.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8			1	6		2
Case Number		10.0			2.0	4.0		7.3
Phase Duration, s		20.7			24.8	102.4		77.5
Change Period, ($Y{+}R_c$), s		6.0			4.0	6.0		6.0
Max Allow Headway (*MAH*), s		4.1			5.1	4.0		4.0
Queue Clearance Time (g_s), s		14.3			19.9	16.4		49.1
Green Extension Time (g_e), s		0.4			0.9	33.0		22.4
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		0.01			1.00	0.10		0.44

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8					1	6			2	12
Adjusted Flow Rate (*v*), veh/h	172	0					489	1183			1611	200
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1800					1639	1687			1687	1502
Queue Service Time (g_s), s	12.3	0.0					17.9	14.4			47.1	7.9
Cycle Queue Clearance Time (g_c), s	12.3	0.0					17.9	14.4			47.1	7.9
Green Ratio (*g/C*)	0.12	0.12					0.17	0.78			0.58	0.58
Capacity (*c*), veh/h	201	215					555	2643			1961	873
Volume-to-Capacity Ratio (*X*)	0.856	0.000					0.880	0.448			0.821	0.229
Back of Queue (*Q*), ft/ln (95 th percentile)	244.2	0					329.4	171.1			618.2	117
Back of Queue (*Q*), veh/ln (95 th percentile)	9.6	0.0					13.0	6.7			24.3	4.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.70	0.00					0.33	0.00			0.00	0.29
Uniform Delay (d_1), s/veh	53.2	0.0					49.9	4.5			20.7	12.4
Incremental Delay (d_2), s/veh	10.1	0.0					13.7	0.1			2.1	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0					0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	63.3	0.0					63.6	4.6			22.7	12.6
Level of Service (LOS)	E						E	A			C	B
Approach Delay, s/veh / LOS	63.3	E		0.0			21.8	C		21.6	C	
Intersection Delay, s/veh / LOS	23.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.48	B	2.43	B	1.32	A	2.08	B
Bicycle LOS Score / LOS	0.77	A			1.87	B	1.98	B

HCS™ Streets Version 7.5

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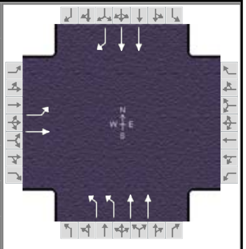
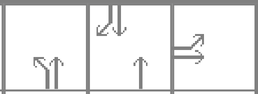
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 20, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 CORRAL 1	Analysis Period	1> 7:00
Intersection	CORRAL DRIVE	File Name	2045 PM CORRAL 1 w Les Hollers 101518.xus		
Project Description	SLR CORRIDOR STUDY				

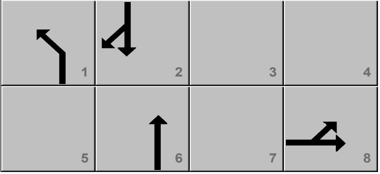


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	150	0					415	1075			1500	275

Signal Information			
Cycle, s	124.3	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	20.1	73.8	14.4	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	0.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8			1	6		2
Case Number		10.0			2.0	4.0		7.3
Phase Duration, s		20.4			24.1	103.9		79.8
Change Period, ($Y+R_c$), s		6.0			4.0	6.0		6.0
Max Allow Headway (*MAH*), s		4.1			5.1	4.0		4.0
Queue Clearance Time (g_s), s		14.0			19.1	16.5		51.3
Green Extension Time (g_e), s		0.4			1.0	35.5		22.4
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		0.00			1.00	0.12		0.50

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8					1	6			2	12
Adjusted Flow Rate (*v*), veh/h	167	0					461	1194			1667	222
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1800					1639	1687			1687	1502
Queue Service Time (g_s), s	12.0	0.0					17.1	14.5			49.3	8.8
Cycle Queue Clearance Time (g_c), s	12.0	0.0					17.1	14.5			49.3	8.8
Green Ratio (*g/C*)	0.12	0.12					0.16	0.79			0.59	0.59
Capacity (*c*), veh/h	195	208					531	2658			2003	891
Volume-to-Capacity Ratio (*X*)	0.853	0.000					0.869	0.449			0.832	0.249
Back of Queue (*Q*), ft/ln (95 th percentile)	239.9	0					314.1	169.6			642.4	129.2
Back of Queue (*Q*), veh/ln (95 th percentile)	9.4	0.0					12.4	6.7			25.3	5.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.69	0.00					0.31	0.00			0.00	0.32
Uniform Delay (d_1), s/veh	53.9	0.0					50.8	4.3			20.3	12.0
Incremental Delay (d_2), s/veh	10.0	0.0					12.4	0.1			2.4	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0					0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	64.0	0.0					63.2	4.5			22.7	12.2
Level of Service (LOS)	E						E	A			C	B
Approach Delay, s/veh / LOS	64.0	E		0.0			20.8	C		21.4	C	
Intersection Delay, s/veh / LOS	23.1						C					

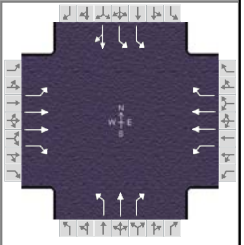
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.48	B	2.43	B	1.32	A	2.08	B
Bicycle LOS Score / LOS	0.76	A			1.85	B	2.05	B

SHERIDAN LAKE ROAD/DUNSMORE ROAD

ALTERNATIVE 1

HCS7 Signalized Intersection Results Summary

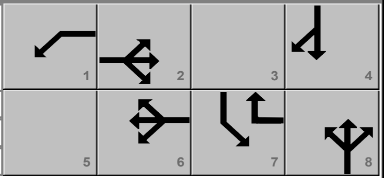
General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 20, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM PEAK	PHF	0.83
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	DUNSMORE ROAD	File Name	SLR-DUNSMORE 2045 AM No Les Hollers 1015…		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	895	155	55	240	85	30	25	125	285	85	10

Signal Information			
Cycle, s	64.8	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	4.2	25.0	8.7	7.0	0.0	0.0
Yellow	3.5	5.0	3.5	3.0	0.0	0.0
Red	0.5	2.0	0.5	2.0	0.0	0.0



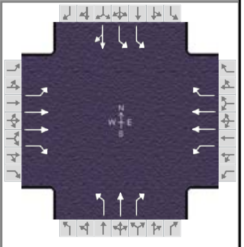
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8	7	4
Case Number		5.3	1.0	3.0		5.3	2.0	4.0
Phase Duration, s		32.0	8.2	40.2		12.0	12.7	24.6
Change Period, ($Y+R_c$), s		7.0	4.0	7.0		5.0	4.0	5.0
Max Allow Headway (*MAH*), s		3.9	3.0	3.9		4.3	3.3	4.3
Queue Clearance Time (g_s), s		20.5	3.4	5.0		7.0	8.6	5.2
Green Extension Time (g_e), s		2.8	0.0	7.7		0.0	0.0	0.9
Phase Call Probability		1.00	0.70	1.00		1.00	1.00	1.00
Max Out Probability		0.93	1.00	0.06		1.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	12	1078	139	66	289	78	36	30	120	343	114	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1107	1700	1514	1661	1660	1478	1298	1800	1525	1626	1725	
Queue Service Time (g_s), s	0.4	18.5	4.0	1.4	3.0	1.3	1.7	1.0	5.0	6.6	3.2	
Cycle Queue Clearance Time (g_c), s	0.4	18.5	4.0	1.4	3.0	1.3	1.7	1.0	5.0	6.6	3.2	
Green Ratio (*g/C*)	0.39	0.39	0.39	0.48	0.51	0.65	0.11	0.11	0.11	0.13	0.30	
Capacity (*c*), veh/h	538	1312	584	270	1700	954	251	194	164	434	522	
Volume-to-Capacity Ratio (*X*)	0.022	0.822	0.237	0.245	0.170	0.082	0.144	0.156	0.734	0.791	0.219	
Back of Queue (*Q*), ft/ln (95 th percentile)	4.5	280	57.3	18.4	39.1	12	22.5	18.7	107.9	136.9	57.2	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.2	11.1	2.3	0.7	1.5	0.5	0.9	0.7	4.3	5.3	2.2	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.29	0.12	0.00	0.12	0.00	0.00	0.00	0.37	0.00	
Uniform Delay (d_1), s/veh	12.4	17.9	13.5	12.8	8.5	4.3	26.5	26.2	28.0	27.2	16.9	
Incremental Delay (d_2), s/veh	0.1	5.9	1.0	0.2	0.2	0.2	0.3	0.4	15.5	8.1	0.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	12.4	23.8	14.4	13.0	8.7	4.5	26.8	26.6	43.6	35.3	17.1	
Level of Service (LOS)	B	C	B	B	A	A	C	C	D	D	B	
Approach Delay, s/veh / LOS	22.6		C	8.6		A	37.6		D	30.7		C
Intersection Delay, s/veh / LOS	22.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.12	B	2.07	B	2.47	B	2.48	B
Bicycle LOS Score / LOS	1.50	B	0.85	A	0.80	A	1.24	A

HCS7 Signalized Intersection Results Summary

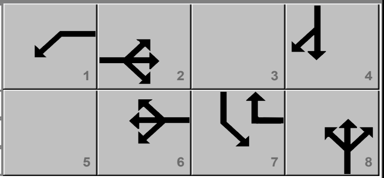
General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 20, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM PEAK	PHF	0.83
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	DUNSMORE ROAD	File Name	SLR-DUNSMORE 2045 AM w Les Hollers 10151…		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	10	925	155	60	210	85	30	25	165	285	85	10

Signal Information			
Cycle, s	65.1	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	4.4	25.0	8.7	7.0	0.0	0.0
Yellow	3.5	5.0	3.5	3.0	0.0	0.0
Red	0.5	2.0	0.5	2.0	0.0	0.0



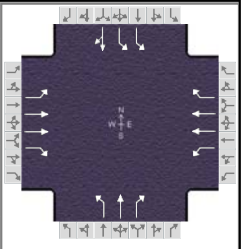
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8	7	4
Case Number		5.3	1.0	3.0		5.3	2.0	4.0
Phase Duration, s		32.0	8.4	40.4		12.0	12.7	24.7
Change Period, ($Y+R_c$), s		7.0	4.0	7.0		5.0	4.0	5.0
Max Allow Headway (*MAH*), s		3.9	3.0	3.9		4.3	3.3	4.3
Queue Clearance Time (g_s), s		21.5	3.5	4.6		9.0	8.7	5.2
Green Extension Time (g_e), s		2.2	0.0	7.8		0.0	0.0	1.1
Phase Call Probability		1.00	0.73	1.00		1.00	1.00	1.00
Max Out Probability		1.00	1.00	0.05		1.00	1.00	0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	12	1114	139	72	253	78	36	30	169	343	114	
Adjusted Saturation Flow Rate (s), veh/h/ln	1144	1700	1514	1661	1660	1478	1298	1800	1525	1626	1725	
Queue Service Time (g_s), s	0.4	19.5	4.0	1.5	2.6	1.3	1.7	1.0	7.0	6.7	3.2	
Cycle Queue Clearance Time (g_c), s	0.4	19.5	4.0	1.5	2.6	1.3	1.7	1.0	7.0	6.7	3.2	
Green Ratio (*g/C*)	0.38	0.38	0.38	0.48	0.51	0.65	0.11	0.11	0.11	0.13	0.30	
Capacity (c), veh/h	550	1307	582	264	1703	955	250	194	164	434	522	
Volume-to-Capacity Ratio (X)	0.022	0.853	0.238	0.274	0.149	0.082	0.144	0.156	1.028	0.792	0.219	
Back of Queue (Q), ft/ln (95 th percentile)	4.5	298.6	57.7	20.2	33.7	12	22.6	18.8	159.4	137.7	57.5	
Back of Queue (Q), veh/ln (95 th percentile)	0.2	11.8	2.3	0.8	1.3	0.5	0.9	0.8	6.4	5.4	2.2	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.29	0.13	0.00	0.12	0.00	0.00	0.00	0.37	0.00	
Uniform Delay (d_1), s/veh	12.5	18.3	13.6	13.3	8.3	4.3	26.6	26.3	29.0	27.3	16.9	
Incremental Delay (d_2), s/veh	0.1	7.2	1.0	0.2	0.2	0.2	0.3	0.4	77.7	8.2	0.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (d), s/veh	12.5	25.5	14.5	13.5	8.5	4.5	26.9	26.7	106.7	35.5	17.2	
Level of Service (LOS)	B	C	B	B	A	A	C	C	F	D	B	
Approach Delay, s/veh / LOS	24.2		C	8.6		A	84.2		F	30.9		C
Intersection Delay, s/veh / LOS	28.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.12	B	2.07	B	2.47	B	2.48	B
Bicycle LOS Score / LOS	1.53	B	0.82	A	0.88	A	1.24	A

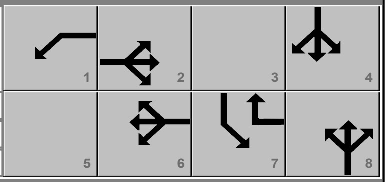
HCS7 Signalized Intersection Results Summary

General Information				**Intersection Information**	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Sep 27, 2017	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM PEAK	PHF	0.83
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	DUNSMORE ROAD	File Name	SLR-DUNSMORE 2045 PM No Les Hollers 1015…		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	5	355	30	90	905	255	75	30	75	90	10	10

Signal Information										
Cycle, s	63.2	Reference Phase	2							
Offset, s	0	Reference Point	End	Green	5.1	24.0	6.3	6.7	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.5	5.0	3.0	3.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.5	2.0	2.0	2.0	0.0	0.0

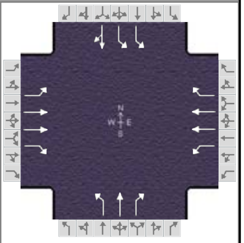


Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		4
Case Number		5.3	1.0	3.0		9.0		10.0
Phase Duration, s		31.0	9.1	40.1		11.7		11.3
Change Period, (*Y+R* c), s		7.0	4.0	7.0		5.0		5.0
Max Allow Headway (*MAH*), s		3.9	3.0	3.9		4.2		4.3
Queue Clearance Time (*g* s), s		8.1	4.2	16.7		5.1		4.0
Green Extension Time (*g* e), s		7.3	0.0	7.4		0.1		0.1
Phase Call Probability		1.00	0.85	1.00		0.96		0.90
Max Out Probability		0.32	1.00	0.31		1.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	6	428	0	108	1090	283	90	36	60	108	24	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	525	1700	1514	1661	1660	1478	1714	1800	1525	1626	1613	
Queue Service Time (*g* s), s	0.5	5.6	0.0	2.2	14.7	5.6	3.1	1.2	2.3	2.0	0.9	
Cycle Queue Clearance Time (*g* c), s	6.1	5.6	0.0	2.2	14.7	5.6	3.1	1.2	2.3	2.0	0.9	
Green Ratio (*g/C*)	0.38	0.38	0.38	0.49	0.52	0.62	0.11	0.11	0.11	0.10	0.10	
Capacity (*c*), veh/h	267	1292	575	523	1740	922	183	192	163	325	161	
Volume-to-Capacity Ratio (*X*)	0.023	0.331	0.000	0.207	0.627	0.307	0.494	0.188	0.370	0.334	0.149	
Back of Queue (*Q*), ft/ln (95 th percentile)	2.9	84	0	27.9	190.9	55.2	58.7	22	38.2	35.2	15.7	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.1	3.3	0.0	1.1	7.4	2.1	2.3	0.9	1.5	1.4	0.6	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.28	0.00	0.18	0.00	0.00	0.00	0.10	0.00	
Uniform Delay (*d* 1), s/veh	16.0	13.9	0.0	9.2	10.6	5.5	26.6	25.7	26.2	26.5	26.0	
Incremental Delay (*d* 2), s/veh	0.2	0.7	0.0	0.1	1.7	0.9	2.1	0.5	1.4	0.6	0.4	
Initial Queue Delay (*d* 3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	16.2	14.6	0.0	9.3	12.4	6.4	28.7	26.2	27.6	27.1	26.4	
Level of Service (LOS)	B	B		A	B	A	C	C	C	C	C	
Approach Delay, s/veh / LOS	14.6		B	11.0		B	27.9		C	26.9		C
Intersection Delay, s/veh / LOS	14.0						B					

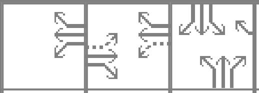
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.12	B	2.07	B	2.48	B	2.48	B
Bicycle LOS Score / LOS	0.85	A	1.71	B	0.80	A	0.71	A

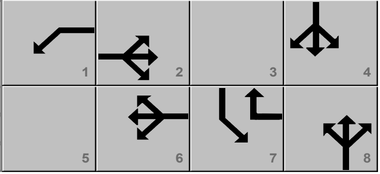
HCS7 Signalized Intersection Results Summary



General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	RL	Analysis Date	Sep 27, 2017	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM PEAK	PHF	0.83
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045	Analysis Period	1> 7:00
Intersection	DUNSMORE ROAD	File Name	SLR-DUNSMORE 2045 PM w Les Hollers 10151…		
Project Description	SLR CORRIDOR STUDY				

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	5	385	30	115	870	255	75	30	85	90	10	10





Signal Information										
Cycle, s	63.6	Reference Phase	2							
Offset, s	0	Reference Point	End	Green	5.5	24.0	6.3	6.8	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.5	5.0	3.0	3.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.5	2.0	2.0	2.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		4
Case Number		5.3	1.0	3.0		9.0		10.0
Phase Duration, s		31.0	9.5	40.5		11.8		11.3
Change Period, (*Y+R* *c*), s		7.0	4.0	7.0		5.0		5.0
Max Allow Headway (*MAH*), s		3.9	3.0	3.9		4.2		4.3
Queue Clearance Time (*g* *s*), s		8.3	4.9	15.9		5.2		4.0
Green Extension Time (*g* *e*), s		7.2	0.0	7.5		0.1		0.1
Phase Call Probability		1.00	0.91	1.00		0.97		0.90
Max Out Probability		0.32	1.00	0.28		1.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	6	464	0	139	1048	283	90	36	72	108	24	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	547	1700	1514	1661	1660	1478	1714	1800	1525	1626	1613	
Queue Service Time (*g* *s*), s	0.5	6.3	0.0	2.9	13.9	5.6	3.2	1.2	2.8	2.0	0.9	
Cycle Queue Clearance Time (*g* *c*), s	4.9	6.3	0.0	2.9	13.9	5.6	3.2	1.2	2.8	2.0	0.9	
Green Ratio (*g/C*)	0.38	0.38	0.38	0.49	0.53	0.63	0.11	0.11	0.11	0.10	0.10	
Capacity (*c*), veh/h	282	1283	571	511	1748	925	183	192	163	323	160	
Volume-to-Capacity Ratio (*X*)	0.021	0.361	0.000	0.271	0.600	0.306	0.494	0.188	0.444	0.335	0.150	
Back of Queue (*Q*), ft/ln (95 th percentile)	2.8	94.4	0	36.6	180.9	55.9	59.1	22.2	47	35.5	15.8	
Back of Queue (*Q*), veh/ln (95 th percentile)	0.1	3.7	0.0	1.4	7.0	2.2	2.4	0.9	1.9	1.4	0.6	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.37	0.00	0.19	0.00	0.00	0.00	0.10	0.00	
Uniform Delay (*d* *1*), s/veh	15.4	14.3	0.0	9.5	10.4	5.5	26.8	25.9	26.6	26.7	26.2	
Incremental Delay (*d* *2*), s/veh	0.1	0.8	0.0	0.1	1.5	0.9	2.1	0.5	1.9	0.6	0.4	
Initial Queue Delay (*d* *3*), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	15.5	15.1	0.0	9.6	12.0	6.4	28.8	26.4	28.5	27.3	26.6	
Level of Service (LOS)	B	B		A	B	A	C	C	C	C	C	
Approach Delay, s/veh / LOS	15.1		B	10.7		B	28.3		C	27.2		C
Intersection Delay, s/veh / LOS	14.1						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.12	B	2.07	B	2.48	B	2.48	B
Bicycle LOS Score / LOS	0.88	A	1.70	B	0.82	A	0.71	A

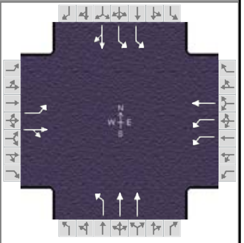
SHERIDAN LAKE ROAD/CATRON BOULEVARD

ALTERNATIVE 7B

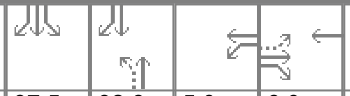
At-Grade Intersection (without Future Roadways) – Reduced Lanes

HCS7 Signalized Intersection Results Summary

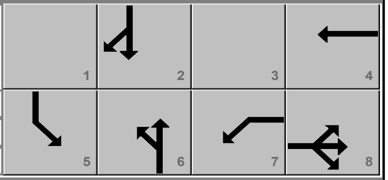
General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 17, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	AM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 OPTION 7	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	2045 AM OPTION 7B.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	40	55	5	105	20		5	905		1025	280	45



Signal Information										
Cycle, s	102.2	Reference Phase	2							
Offset, s	0	Reference Point	End	Green	37.5	32.6	5.0	6.0	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.5	5.0	3.5	3.5	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.5	2.0	1.5	1.5	0.0	0.0



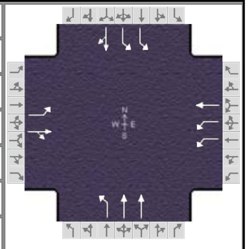
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8	7	4		6	5	2
Case Number		6.3	2.0	4.0		6.3	2.0	4.0
Phase Duration, s		11.0	10.0	21.0		39.6	41.5	81.1
Change Period, (*Y+R* $_c$), s		5.0	5.0	5.0		7.0	4.0	7.0
Max Allow Headway (*MAH*), s		5.0	5.1	5.0		5.0	5.1	5.0
Queue Clearance Time (g_s), s		5.8	5.6	3.1		31.5	36.4	8.7
Green Extension Time (g_e), s		0.3	0.0	0.6		1.1	1.1	12.2
Phase Call Probability		0.98	0.96	1.00		1.00	1.00	1.00
Max Out Probability		0.06	1.00	0.00		1.00	1.00	0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4		1	6		5	2	12
Adjusted Flow Rate (*v*), veh/h	44	67		117	22		6	1006		1139	339	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1389	1746		1639	1772		1042	1687		1639	1746	
Queue Service Time (g_s), s	3.2	3.8		3.6	1.1		0.4	29.5		34.4	6.7	
Cycle Queue Clearance Time (g_c), s	3.2	3.8		3.6	1.1		0.4	29.5		34.4	6.7	
Green Ratio (*g/C*)	0.06	0.06		0.05	0.16		0.32	0.32		1.10	0.73	
Capacity (*c*), veh/h	152	103		160	278		403	1077		1204	1267	
Volume-to-Capacity Ratio (*X*)	0.292	0.647		0.727	0.080		0.014	0.933		0.946	0.267	
Back of Queue (*Q*), ft/ln (95 th percentile)	51.9	86.3		82.1	21.8		4.2	498.2		549.8	88.1	
Back of Queue (*Q*), veh/ln (95 th percentile)	2.0	3.4		3.2	0.9		0.2	19.6		21.6	3.5	
Queue Storage Ratio (*RQ*) (95 th percentile)	0.52	0.00		0.21	0.00		0.02	0.00		0.92	0.00	
Uniform Delay (d_1), s/veh	46.7	47.0		47.9	36.8		23.8	33.7		31.3	4.8	
Incremental Delay (d_2), s/veh	1.5	9.3		16.4	0.2		0.0	14.2		14.8	0.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	48.2	56.4		64.4	37.0		23.8	47.9		46.2	4.9	
Level of Service (LOS)	D	E		E	D		C	D		D	A	
Approach Delay, s/veh / LOS	53.1	D		60.0	E		47.8	D		36.7	D	
Intersection Delay, s/veh / LOS	42.7						D					

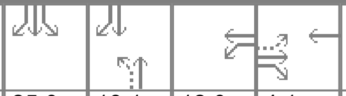
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.57	C	2.33	B	2.72	C	1.85	B
Bicycle LOS Score / LOS	0.67	A	0.16	A	1.16	A	2.93	C

HCS7 Signalized Intersection Results Summary

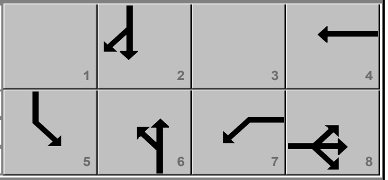
General Information				Intersection Information	
Agency	HDR			Duration, h	0.25
Analyst	DH	Analysis Date	Dec 17, 2018	Area Type	Other
Jurisdiction	RAPID CITY	Time Period	PM	PHF	0.90
Urban Street	SHERIDAN LAKE ROAD	Analysis Year	2045 OPTION 7	Analysis Period	1> 7:00
Intersection	CATRON BOULEVARD	File Name	2045 PM OPTION 7B.xus		
Project Description	SLR CORRIDOR STUDY				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	10	5	5	470	50		5	335		865	785	55



Signal Information										
Cycle, s	80.2	Reference Phase	2							
Offset, s	0	Reference Point	End	Green	25.0	18.1	12.0	4.1	0.0	0.0
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.5	5.0	3.5	3.5	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.5	2.0	1.5	1.5	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8	7	4		6	5	2
Case Number		6.3	2.0	4.0		6.3	2.0	4.0
Phase Duration, s		9.1	17.0	26.1		25.1	29.0	54.1
Change Period, (Y+R c), s		5.0	5.0	5.0		7.0	4.0	7.0
Max Allow Headway (MAH), s		5.0	5.1	5.0		5.0	5.1	5.0
Queue Clearance Time (g s), s		2.6	14.0	3.9		9.7	24.9	37.6
Green Extension Time (g e), s		0.2	0.0	0.3		8.4	0.1	8.7
Phase Call Probability		0.82	1.00	1.00		1.00	1.00	1.00
Max Out Probability		0.00	1.00	0.00		0.41	1.00	0.37

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4		1	6		5	2	12
Adjusted Flow Rate (v), veh/h	11	11		522	56		6	372		961	911	
Adjusted Saturation Flow Rate (s), veh/h/ln	1348	1626		1639	1772		612	1687		1639	1758	
Queue Service Time (g s), s	0.6	0.5		12.0	1.9		0.6	7.7		22.9	35.6	
Cycle Queue Clearance Time (g c), s	0.6	0.5		12.0	1.9		7.2	7.7		22.9	35.6	
Green Ratio (g/C)	0.05	0.05		0.15	0.26		0.23	0.23		0.31	0.59	
Capacity (c), veh/h	159	83		490	467		178	762		1021	1032	
Volume-to-Capacity Ratio (X)	0.070	0.133		1.065	0.119		0.031	0.489		0.942	0.883	
Back of Queue (Q), ft/ln (95 th percentile)	9.6	10.2		347.4	35.2		4.3	136.4		400.5	487.6	
Back of Queue (Q), veh/ln (95 th percentile)	0.4	0.4		13.7	1.4		0.2	5.4		15.8	19.2	
Queue Storage Ratio (RQ) (95 th percentile)	0.10	0.00		0.87	0.00		0.02	0.00		0.67	0.00	
Uniform Delay (d 1), s/veh	36.4	36.3		34.1	22.5		29.7	27.0		26.9	14.2	
Incremental Delay (d 2), s/veh	0.3	1.0		59.0	0.2		0.1	0.7		16.2	7.4	
Initial Queue Delay (d 3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay (d), s/veh	36.6	37.4		93.1	22.6		29.8	27.7		43.1	21.6	
Level of Service (LOS)	D	D		F	C		C	C		D	C	
Approach Delay, s/veh / LOS	37.0		D	86.4		F	27.7		C	32.6		C
Intersection Delay, s/veh / LOS	42.9						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.41	B	2.31	B	2.80	C	1.87	B
Bicycle LOS Score / LOS	0.52	A	0.77	A	0.73	A	3.58	D

Sheridan Lake Road Traffic Study Report
Corral Drive to Albertta Drive

CITY OF RAPID CITY

Rapid City, South Dakota

Appendix H

Access Review

Technical Memo

Date: Wednesday, January 23, 2019

Project: Sheridan Lake Road Corridor Study

To: Study Advisory Team

From: Dustin Hamilton

Subject: Access – Build Conditions

The City of Rapid City, in cooperation with the Rapid City Metropolitan Planning Organization (MPO), retained HDR to study a portion of the Sheridan Lake Road corridor in southern Rapid City. The study area includes Sheridan Lake Road from Corral Drive to Albertta Drive, Corral Drive from Sheridan Lake Road to Park Drive, and Catron Boulevard from Sheridan Lake Road to Nugget Gulch Road. Sheridan Lake Road and Catron Boulevard are functionally classified as arterial streets and Corral Drive is functionally classified as a collector street in accordance with the Rapid City Major Street Plan.

This memo provides recommendations for each existing access point with regard to current access management standards and the future build conditions scenario.

Access Inventory

An inventory of all the access points throughout the corridor is summarized in the access inventory table and access location maps attached to this memo. Recommendations for each access point are included in the inventory table and can become an implementable access plan for the corridor.

Access Standards and Evaluation

Design of roadways and other facilities in Rapid City are governed by the Design Criteria Manual (see Appendix). The Manual has a number of standards for access spacing, including:

- Minimum distance between intersections – 150’ (arterial – unsignalized) and 90’ (collector – unsignalized)
- Minimum signalized approach spacing – 1200’
- Minimum corner clearance (arterial) – 250’ from signalized intersection, 150’ from unsignalized intersection
- Minimum corner clearance (collector) – 175’ from unsignalized intersection, 90’ from unsignalized intersection

The Manual also addresses the number of driveways allowable from residential, commercial and industrial uses. Additionally, the Access Management Manual – Second Edition prepared by the Transportation Research Board (TRB) was reviewed for accesses near major street intersections.

The existing access points throughout the corridor have either been permitted or grandfathered because they pre-date the Manual. As property develops or re-develops, each property access should be reviewed for compliance with the Manual and Urban Arterial Access Management Guidelines.

This study considered alternatives for development of collector and arterial streets intersecting the corridor. Any recommended intersecting collector and arterial streets will drive access recommendations on Sheridan Lake Road to preserve the safety and efficiency of the collector and arterial street roadways in the study area.

ACCESS INVENTORY AND RECOMMENDATIONS

ACCESS NUMBER	LOCATION (MILE)	SIDE	ACCESS IDENTIFICATION	RECOMMENDATION
SHERIDAN LAKE ROAD ACCESS				
1	0.00	RIGHT	ALBERTTA DRIVE	Maintain Local Street Intersection
2	0.05	LEFT	TANAGER DRIVE	Maintain Local Street Intersection
3	0.11	LEFT	RESIDENTIAL DRIVEWAY	Maintain Existing Driveway Until Property Redevelops
4	0.16	RIGHT	COMMERCIAL DRIVEWAY	Field Observed Poor Grades/Sight Distance/Spacing - Revise with Opportunity
5	0.18	RIGHT	FIELD ENTRANCE	Spacing Criteria Not Met - Coordinate with Access #4 with Re-development
6	0.23	RIGHT	OKPEALUK STREET	Maintain Local Street Intersection
7	0.37	LEFT	TANAGER DRIVE	Maintain Local Street Intersection
8	0.37	RIGHT	COYLE AVENUE	Maintain Local Street Intersection
9	0.42	RIGHT	COMMERCIAL DRIVEWAY	Maintain Existing Driveway Until Property Redevelops
10	0.52	LEFT	MUIRFIELD DRIVE	Maintain Local Street Intersection
11	0.57	LEFT	RESIDENTIAL DRIVEWAY	Maintain Existing Driveway Until Property Redevelops - Align with #12
12	0.59	RIGHT	FIELD ENTRANCE	Coordinate with Future Development - Align with #11
13	0.64	RIGHT	COMMERCIAL DRIVEWAY	Driveway Does Not Meet 250' Corner Clearance - Revise with Opportunity
14	0.64	LEFT	FIELD ENTRANCE	Driveway Does Not Meet 250' Corner Clearance - Revise with Opportunity
15	0.69	BOTH	DUNSMORE ROAD	Maintain Signalized Intersection
16	1.13	LEFT	FIELD ENTRANCE	Coordinate with Future Development.
17	1.13	RIGHT	FIELD ENTRANCE	Coordinate with Future Development.
18	1.33	RIGHT	FIELD ENTRANCE	Coordinate with Future Development.
19	1.53	RIGHT	FIELD ENTRANCE	Address Sight Distance and Coordinate with Future Development
20	1.65	LEFT	RESIDENTIAL DRIVEWAY	Maintain Existing Driveway Until Property Redevelops
21	1.91	LEFT	RESIDENTIAL DRIVEWAY	Maintain Existing Driveway Until Property Redevelops
22	1.91	RIGHT	FIELD ENTRANCE	Coordinate with Future Development
23	2.16	RIGHT	FIELD ENTRANCE	Coordinate with Future Development
24	2.32	LEFT	WILDWOOD DRIVE	Maintain Local Street Intersection
25	2.42	LEFT	RESIDENTIAL DRIVEWAY	Maintain Existing Driveway Until Property Redevelops
26	2.50	LEFT	ESVAL DRIVE	Maintain Local Street Intersection
27	2.50	RIGHT	COMMERCIAL DRIVEWAY	Maintain Existing Driveway Until Property Redevelops
28	2.54	RIGHT	COMMERCIAL DRIVEWAY	Maintain Existing Driveway Until Property Redevelops - Align with #29
29	2.56	LEFT	RESIDENTIAL DRIVEWAY	Maintain Existing Driveway Until Property Redevelops - Align with #28
30	2.60	LEFT	FINCH PLACE	Street at Edge of Intersection Functional Distance* - Revise with Opportunity
31	2.60	RIGHT	COMMERCIAL DRIVEWAY	Driveway within Intersection Functional Distance* - Revise with Opportunity
32	2.65	LEFT	RESIDENTIAL DRIVEWAY	Driveway within Intersection Functional Distance* - Revise with Opportunity
33	2.66	LEFT	RESIDENTIAL DRIVEWAY	Driveway within Intersection Functional Distance* - Revise with Opportunity
34	2.70	LEFT	WILDWOOD DRIVE	Maintain Signalized Intersection
35	2.70	RIGHT	CATRON BOULEVARD	Maintain Signalized Intersection
36	2.77	LEFT	CHURCH	Driveway within Intersection Functional Distance* - Revise with Opportunity
37	2.77	RIGHT	COMMERCIAL DRIVEWAY	Driveway within Intersection Functional Distance* - Revise with Opportunity
38	2.89	LEFT	SUNSHINE TRAIL	Maintain Local Street Intersection
39	2.93	LEFT	CHATEAUX RIDGE	Maintain Local Street Intersection
40	2.93	RIGHT	SUMMERSET DRIVE	Maintain Local Street Intersection
41	3.01	LEFT	RESIDENTIAL DRIVEWAY	Driveway Does Not Meet Spacing Criteria - Shared Driveway with Opportunity
42	3.03	LEFT	RESIDENTIAL DRIVEWAY	Driveway Does Not Meet Spacing Criteria - Shared Driveway with Opportunity
43	3.04	LEFT	RESIDENTIAL DRIVEWAY	Driveway Does Not Meet Spacing Criteria - Shared Driveway with Opportunity
44	3.08	LEFT	RESIDENTIAL DRIVEWAY	Maintain Existing Driveway Until Property Redevelops
45	3.14	RIGHT	SUMMERSET DRIVE	Maintain Local Street Intersection
46	3.23	LEFT	VISTA HILLS DRIVE	Maintain Local Street Intersection
47	3.28	LEFT	CORRAL DRIVE	Maintain Signalized Intersection
53	3.30	RIGHT	RESIDENTIAL DRIVEWAY	Driveway within Intersection Functional Distance* - Revise with Opportunity
54	3.36	RIGHT	RESIDENTIAL DRIVEWAY	Maintain Existing Shared Driveway Until Property Redevelops
55	3.40	RIGHT	RESIDENTIAL DRIVEWAY	Driveway Meets Standard - Revise with Opportunity due to Arterial Street
CORRAL DRIVE ACCESS				
48	0.09	RIGHT	SEVERSON STREET	Maintain Local Street Intersection
49	0.21	LEFT	RESIDENTIAL DRIVEWAY	Maintain Existing Driveway Until Property Redevelops
50	0.21	LEFT	EASY STREET	Maintain Local Street Intersection
51	0.22	RIGHT	RESIDENTIAL DRIVEWAY	Maintain Existing Driveway Until Property Redevelops
52	0.26	RIGHT	PARK DRIVE	Maintain Local Street Intersection
CATRON BOULEVARD ACCESS				
56	0.06	LEFT	COMMERCIAL DRIVEWAY	Driveway within Intersection Functional Distance* - Revise with Opportunity
57	0.14	RIGHT	BENDT DRIVE	Maintain Local Street Intersection
58	0.14	LEFT	BENDT DRIVE	Maintain Local Street Intersection
59	0.23	LEFT	COMMERCIAL DRIVEWAY	Maintain Existing Driveway Until Property Redevelops
60	0.30	RIGHT	NUGGET GULCH ROAD	Maintain Local Street Intersection
61	0.30	LEFT	NUGGET GULCH ROAD	Maintain Local Street Intersection

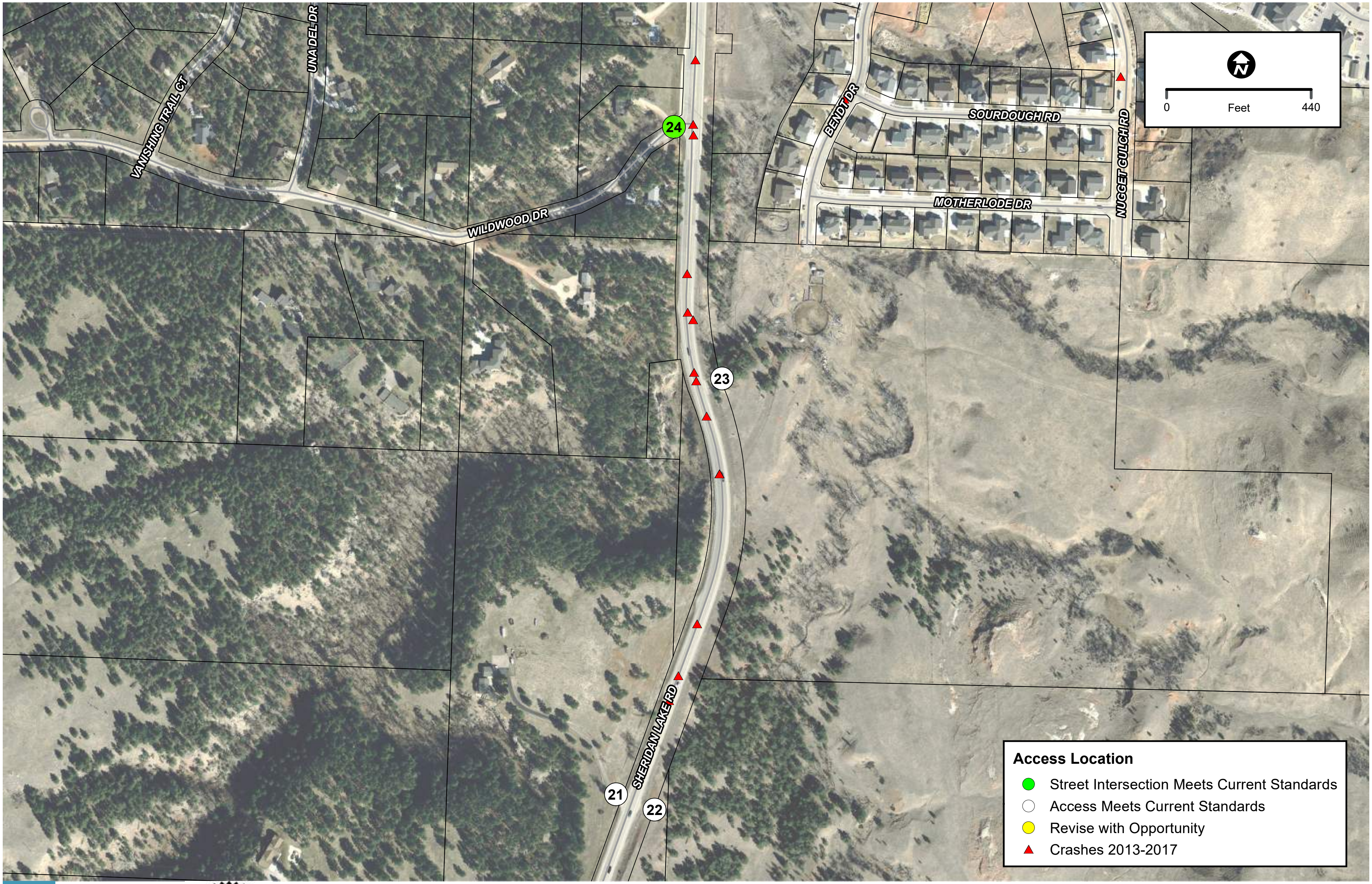
🟩	Street Intersection Meets Current Standards
⬜	Access Meets Current Standards
🟨	Revise with Opportunity

* Recommendation Based Upon Access Management Manual (TRB) Guidelines for Intersection Functional Distance, not Rapid City Design Critera.

SHERIDAN LAKE ROAD ACCESS - MAP 1

SHERIDAN LAKE ROAD ACCESS - MAP 2

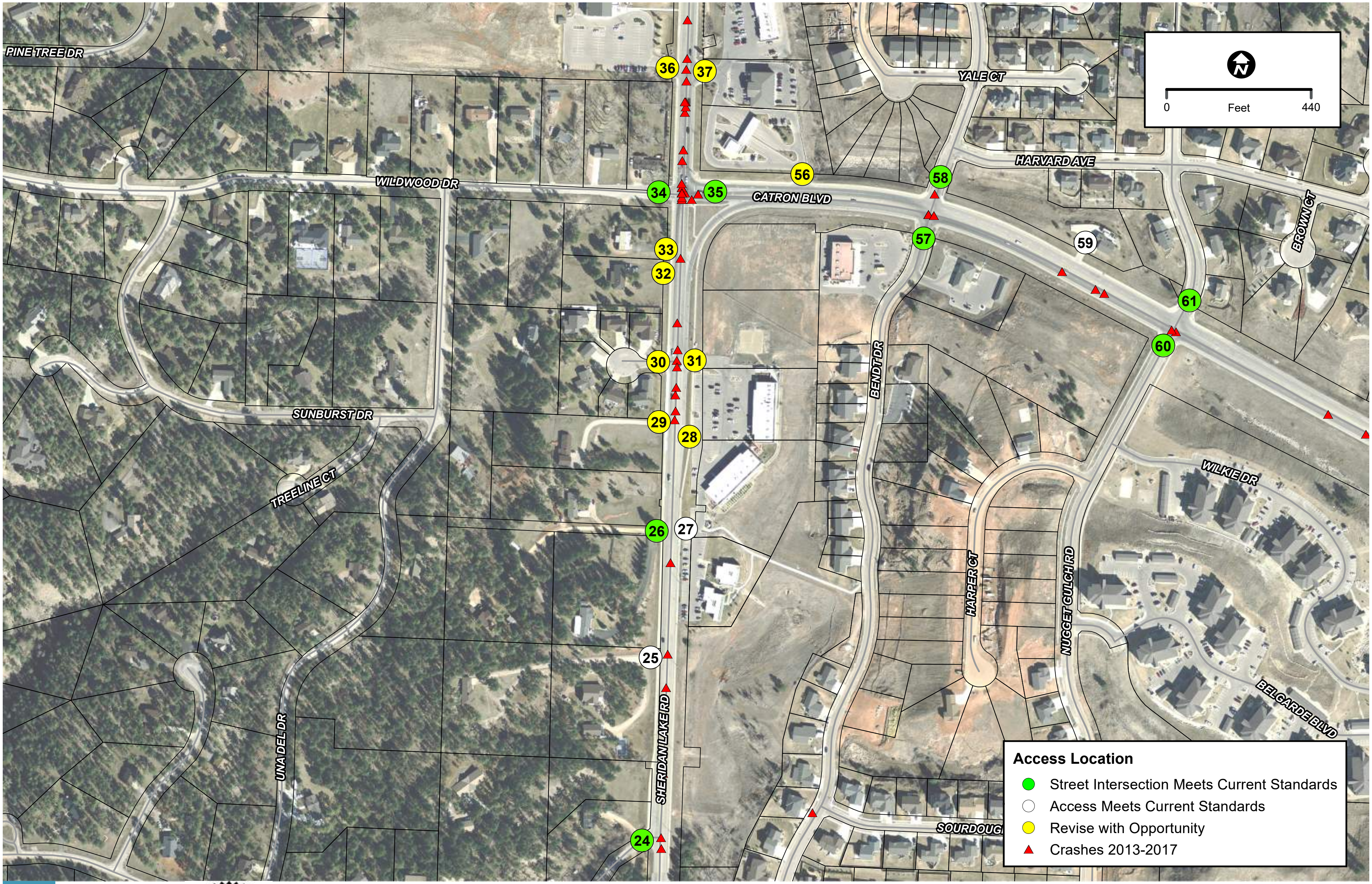
SHERIDAN LAKE ROAD ACCESS - MAP 3



Access Location

- 🟢 Street Intersection Meets Current Standards
- ○ Access Meets Current Standards
- 🟡 Revise with Opportunity
- ▲ Crashes 2013-2017

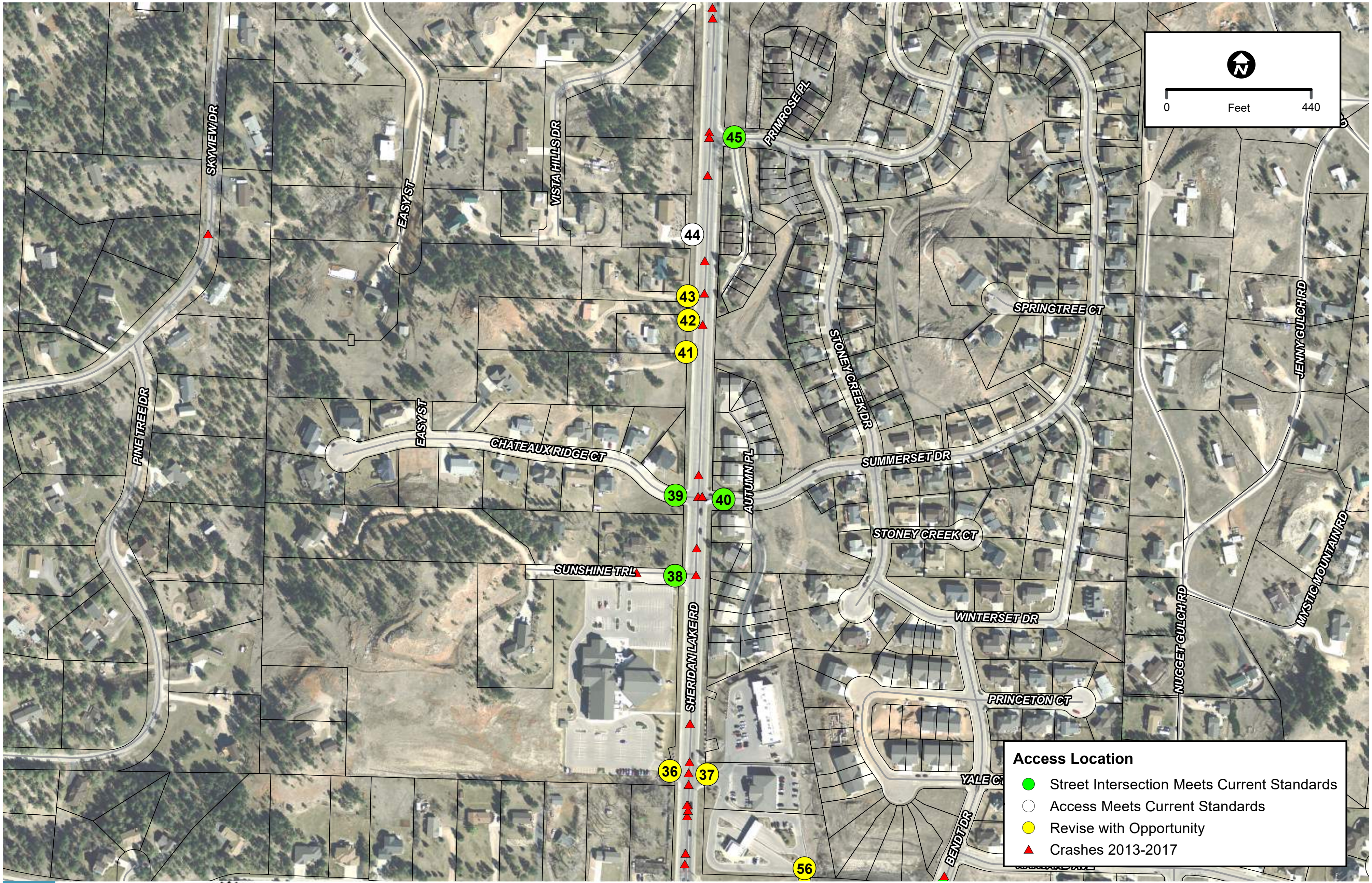
SHERIDAN LAKE ROAD ACCESS - MAP 4



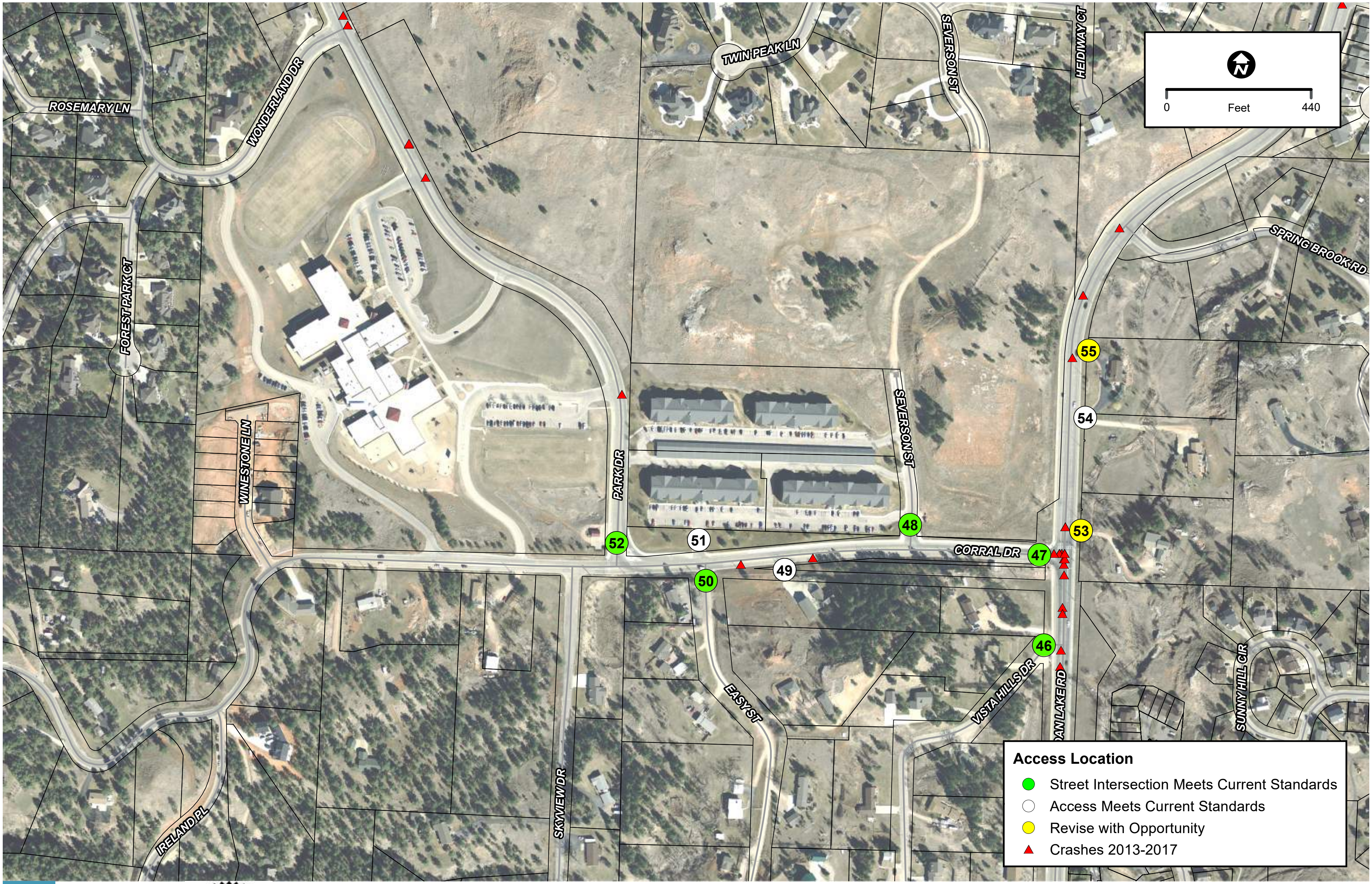
Access Location

- 🟢 Street Intersection Meets Current Standards
- ○ Access Meets Current Standards
- 🟡 Revise with Opportunity
- ▲ Crashes 2013-2017

SHERIDAN LAKE ROAD ACCESS - MAP 5



SHERIDAN LAKE ROAD ACCESS - MAP 6



SHERIDAN LAKE ROAD ACCESS - MAP 7

APPENDIX

RAPID CITY DESIGN CRITERIA
ACCESS APPROACHES
SECTION 2.16
AND
FIGURE 2-9

2.15.7 Sidewalk Grades:

Longitudinal sidewalk grades shall, where possible, match the profile grade of the adjacent street. Sidewalks for steep streets shall, where possible, be designed to comply with ADA requirements. If ADA requirements cannot be met, an exception to these criteria may be granted allowing the deletion of sidewalks. Steps in the sidewalk will not be permitted. Transverse grades shall slope toward the street and not exceed two percent (2%).

2.15.8 Handicapped Accessibility:

Walkways (sidewalks, crosswalks, ramps, etc) shall be in compliance with the Americans with Disability Act (ADA) accessibility guidelines except when the unique characteristics of terrain prevent the full incorporation of accessibility features. Handicapped access ramps shall be constructed at all intersections where sidewalks are required and shall conform to the City's Standard Specifications.

2.16 Access Approaches

The design and location of access approaches onto streets is directly related to the specific use of the approach and the functional classification of the street the approach is fronting. Also, where work is being done in areas previously developed, exceptions to the access requirements may need to be considered in order to allow sensible re-development.

All access approaches shall be constructed in accordance with the City's Standard Specifications, unless exceptions are granted.

2.16.1 General Requirements:

All access approaches constructed, relocated, widened, or altered in any way shall be in compliance with the following conditions:

1) No access approach shall be so located as to interfere with a utility facility.

2) Any necessary adjustments to a private or public utility facility or public structure must be approved by the City of Rapid City. Approved adjustments shall be at no cost to the utility.

3) No access approach shall be located so as to create a hazard to pedestrians or motorists or so as to invite or compel illegal or unsafe vehicular movements.

4) City Street and highway right-of-ways shall not be used for private or commercial purposes. Parking shall not be allowed within the boulevard area. An approach access permit shall not be issued unless all vehicles to be serviced can maneuver and park entirely within the private property lines. However, backing from the property into the street may be allowed in residential areas.

5) If a property borders or fronts on more than one Lane / Place or Local Street, approach access may be granted on either street, at the request of the property owner.

6) Lots with street frontage of two hundred feet (200 ft.) or less shall be limited to one access approach.

7) The setback distance in Section 2.16 shall be measured from the property line, unless otherwise noted.

8) Access approach driveway aprons and / or curbs shall not encroach past the extended adjacent property line. The driveway opening shall be located a minimum of five feet (5 ft.) from the extended adjacent property line.

9) Access Approach Spacing shall be in accordance with Section 2.16.7.

10) Where several adjacent properties exist along a collector or higher classification of street, each having limited frontage, or where there is a probability of such development, consideration shall be given to shared access points, and frontage or rear age roads so as to reduce the number of accesses to the street. Frontage or rear age road access to the street shall be at the extremities of the frontage or rear age road from street intersections or at well spaced intervals along it. Intervals shall be at least the distance of normal intersection spacing.

2.16.2 Residential Areas

In addition to the requirements of Section 2.16.1 the following items shall also apply to access approaches.

Number of Openings:

1) Not more than one access approach will be allowed to a single residence except as noted below.

2) Two access approaches are permitted if no traffic operation or safety problems result for:

    a) Lots with three hundred feet (300 ft.) or more of combined frontage on two Local Street in a residential area. Second access approaches will not be permitted on Collector or Arterial Streets.

    b) To accommodate circular driveways, mid-block lots with two hundred feet (200 ft.) or more of street frontage which meet the standards listed in Section 2.16.4, or mid block lots that have severe terrain prohibiting a standard two (2) or three (3) stall side-by-side garage.

2.16.3 Width of Access Approach and Driveway in Right of Way

1) A twenty feet (20 ft.) maximum access approach and driveway in the ROW plus five feet (5 ft.) tapers is allowed for the following situations:

    a) One and two stall (side-by-side) garage at all setback distances;

    b) Three stall (side-by-side) garage with a garage setback distance of thirty (30) or more feet;

    c) On the bulb of cul-de-sacs, for one and two stall (side-by-side) garages.

2) A twenty four feet (24 ft.) maximum access approach and driveway in the ROW plus five feet (5 ft.) tapers is allowed where two family units or larger are built or where a shared approach is used.

3) A thirty feet (30 ft.) maximum access approach and driveway in the ROW plus five feet (5 ft) tapers is allowed for the following situations:

    a) Three stall (side-by-side) garage with a garage setback distance of less than thirty feet (30 ft.)

    b) A shared driveway for townhouses and duplexes with adjoining two or three stall (side-by-side) garages with a setback distance of thirty (30) or more feet.

    c) On the bulb of cul-de-sacs for a three or more stall (side-by-side) garage.

4) A forty feet (40 ft.) maximum access approach and driveway in the ROW plus five feet (5 ft.) tapers is allowed where a shared driveway for townhouses and duplexes with adjoining two or three stall (side-by-side) garages with a setback distance of less than thirty feet (30 ft.)

2.16.4 Circular Driveways

Circular driveways are permitted if all the following conditions are met:

1) The lot has two hundred feet (200 ft.) or more of street frontage,

2) The inside radius of the driveway is not less than twenty feet (20 ft.),

3) The radius point is located at or inside the property line,

4) The minimum acute angle, measured from the edge of pavement, is eighty degrees (80^0).

5) The maximum width of the access approach and driveway in the ROW is sixteen feet (16 ft.) plus five feet (5 ft.) tapers.

2.16.5 Commercial and Industrial Areas

In addition to the requirements of Section 2.16.1, the following items shall also apply to access approaches in commercial and industrial areas.

1) The number of access approaches allowed to a commercial or industrial establishment will be dependent on the size and design of the establishment or development. The developer or owner shall be responsible to show the need for the proposed number of access points.

2) In commercial and industrially zoned areas, the access approach openings shall be not less than sixteen feet (16 ft.) in width for one way traffic, not less than twenty four feet (24 ft.) in width for two way traffic, and no more than forty feet (40 ft.) in width, exclusive of the curb tapers or radii.

3) Access approaches for commercial and industrial sites shall be designed as radius approaches, similar to an intersection. Radii shall be as specified elsewhere in these criteria.

2.16.6 Access Approach Spacing

The distance between adjacent access approaches must be sufficient to allow vehicles to safely queue, accelerate, decelerate, and cross-conflicting traffic streams without excessive interference with through traffic or traffic using adjacent access approaches.

Where access approaches are to be signalized, a minimum spacing of one thousand two hundred feet (1,200 ft.) to any other signalized intersection is required. Access approach signals shall be interconnected with any other signals within two thousand five hundred feet (2,500 ft.) of the signalized approach.

Access approach signalization shall be in accordance with City and/or State of South Dakota standards in effect at the time the permit is acquired. The access approach signalization shall be at no cost to the City or State. The City will assume maintenance and utility costs upon completion and acceptance of the installation.

2.16.7 Approach Corner Clearance

Minimum access approach clearances for street intersections shall be as indicated on Figure 2-9. All distances in Figure 2-9 shall be measured from the back of curb or, where there is no curb, from the edge of the pavement or gravel.

2.16.8 Location Coordination

Commercial and industrial access approaches on opposite sides of a street, where possible and reasonable, will be located so opposing lanes lineup to provide the best possible vision of drivers entering the street. Adequate sight distance shall be provided for vehicles exiting and entering an approach. Approach locations will be evaluated to determine whether sight obstructions such as buildings, signs, vegetation, parked vehicles, highway alignments, etc. exist.

2.16.9 Joint or Shared Access Easement

When one access approach is to be used or shared by adjacent properties under different ownership, each property owner must provide the necessary legal documents to establish an access easement agreement. Joint access is encouraged whenever practical.

2.16.10 Driveway Grades

Driveway grades shall be compatible with their intended use and in compliance with the City's Standard Specifications.

2.17 Traffic Studies

2.17.1 Responsibilities for Traffic Report

1) Traffic impact reports shall be required by the City, on projects as specified below, in order to adequately assess the impact of a proposal on the existing or planned street system. The primary responsibility for assessing the traffic impacts associated with a proposed development will rest with the developer with the City serving in a review capacity.

2) Unless waived by the Public Works Director and Community Planning & Development Services Director, a written report meeting the City guidelines will be required for any nonresidential development proposal when trip generation during the peak hour is expected to exceed one hundred (100) vehicles as determined by section 2.17.2.2, or any multifamily residential development with one hundred fifty (150) or more dwelling units.

3) Preparation of the report shall be the responsibility of the developer and must be prepared by a South Dakota licensed Professional Engineer with experience in traffic engineering. Upon submission of a draft traffic report, the City will review the study data sources, methods, and findings. Comments will be provided in a written form. The developer and his engineer preparing the report will then have an opportunity to incorporate necessary revisions prior to submitting a final report. All reports shall be reviewed and accepted by the City.

4) When a new phase of a development is submitted for review, all previous traffic reports relating to the development that are more than two years old must be updated, unless it is determined by the Public Works Director, that conditions have not changed enough to warrant an update.

5) Traffic reports will be required if the trip generation or dwelling unit criteria as noted in Section 2.17.1.2 are exceeded for the following:

   a) For a rezoning application or Conditional Use Permit.

   b) For a final plan or final development plan if the property has already been rezoned for the proposed use and no traffic report was required for the rezoning.

   c) Prior to issuance of a building permit, if the property has already been zoned / platted and no previous traffic report less than two (2) years old exists.

   d) Additional access off an arterial street to an existing use is being requested.

   e) The developer shall be required to submit a new traffic report if, after submitting the original traffic report, the land use intensity and traffic generation area increase by more than fifteen percent (15%).

   f) Where access points are not defined or a site plan is not available at the time the traffic report is prepared, additional traffic analysis may be required when a site plan becomes available or the access points are defined.

   g) The developer will be notified at the planning stage if a traffic report will be required, provided sufficient information is available for the City to determine whether the trip generation / dwelling unit criteria have been met. If insufficient information is available but the property appears to involve a sufficiently intense land use, a traffic report may be required.

2.17.2 Traffic Report Format

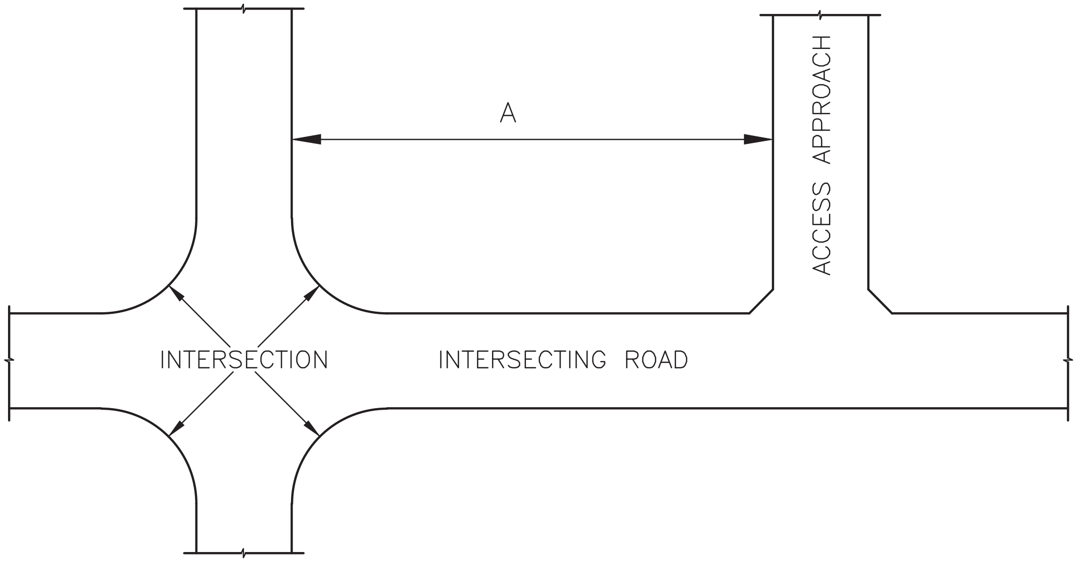
Traffic consultants are encouraged to discuss projects with the applicable City Department prior to starting the study. Topics for possible discussion at such meetings may include directional distribution of traffic, definition of the study area, intersections requiring critical lane analysis, and methods for projecting build-out volume. A firm base of cooperation and communication between the City, the owner or developer, and the consultant in creating traffic characteristics that are in the best interest of the total community is desired. Specific requirements will vary depending on the site location; however, all traffic reports shall contain, as a minimum, the following information:

1) Introduction:

   A brief description of the size of the land parcel, general terrain features, the location within the jurisdiction and the region should be included in this section. In addition, the roadways that afford access to the site, and are included in the study area, must be identified. The exact limits of the study area are to be based on engineering judgment, and an understanding of existing traffic conditions at the site. In all instances, however, the study

FIGURE 2–9

MINIMUM ACCESS APPROACH CLEARANCES



	CLASSIFICATION OF INTERSECTING ROAD							
	ARTERIAL		MINOR ARTERIAL		COLLECTOR		LOCAL & LANE/PLACE	
INTERSECTION CONTROL	SIGNALIZED	UNSIGNALIZED	SIGNALIZED	UNSIGNALIZED	SIGNALIZED	UNSIGNALIZED	SIGNALIZED	UNSIGNALIZED
MINIMUM CORNER CLEARANCE A (FEET)	250	150	200	125	175	90	100	50

CITY of RAPID CITY
DESIGN CRITERIA MANUAL

NOT TO SCALE

JANUARY 2012

Sheridan Lake Road Traffic Study Report

Corral Drive to Albertta Drive

CITY OF RAPID CITY

Rapid City, South Dakota

Appendix I

Website Comment Summary

Website Comment Summary

Project:	Sheridan Lake Road Traffic Study
Subject:	Website Comment Summary
Date:	Monday, June 17, 2019
Location:	N/A

Introduction

As part of the Sheridan Lake Road Traffic Study, a website was established for posting study materials and receiving comments from the public. Post cards were mailed to approximately 1000 landowners along the study corridor to notify residents of the study and request comments through the study website. The post card mailing list was developed from GIS parcel data using a 1500' buffer along the study corridor. This area is shown in Figure 1.

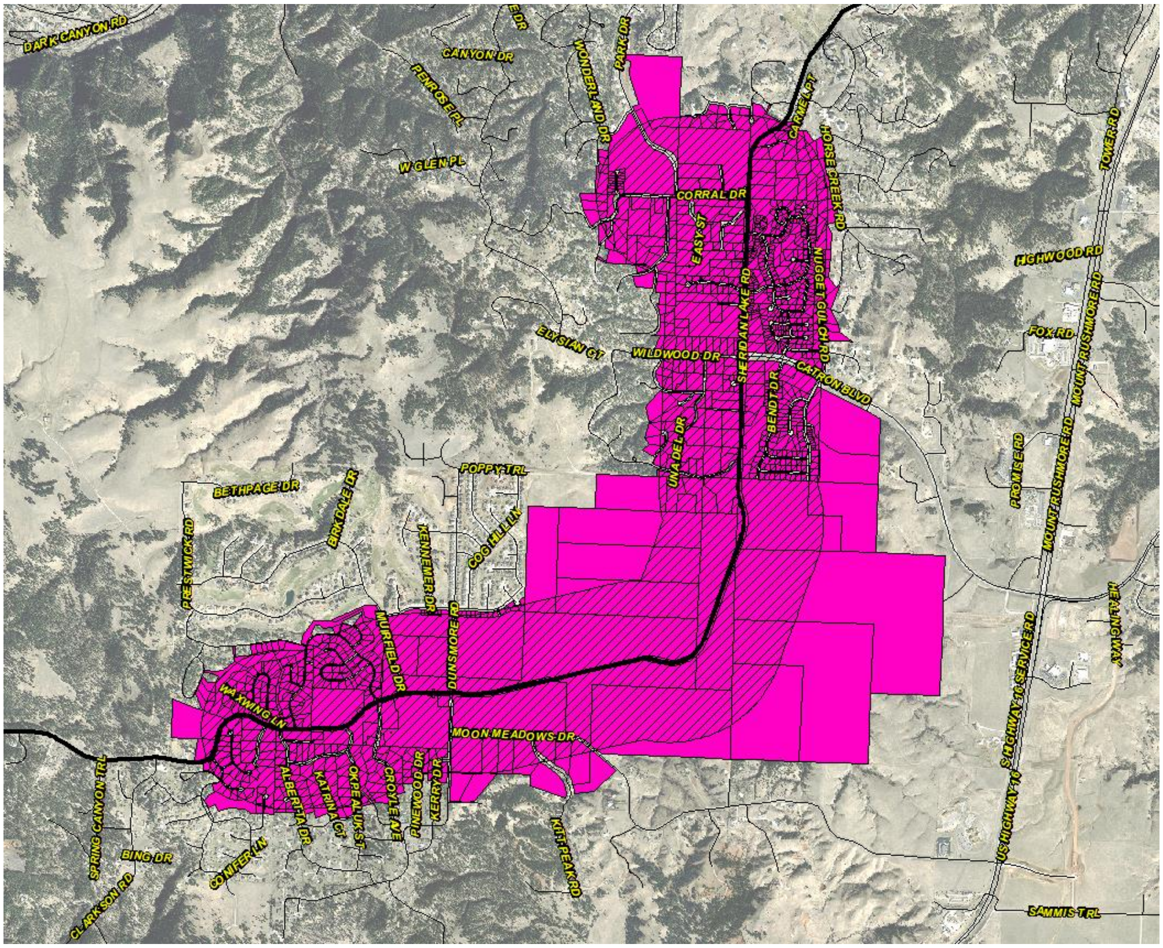


Figure 1. GIS Parcels used for post card mailing list.

The post cards were mailed on April 17, 2019 and comments on the study materials were received through May 17, 2019. As a result of the mailing, 16 unique comments were received with several duplicate comments.

Identified themes are as follows:

- Maintain full access at Wildwood Drive.
- Promote multi-modal (sidewalk and bicycle) use of the corridor.
- Residents experience difficulty making left turns from stop-controlled, side streets.
- Some residents who live south of Wildwood Drive prefer an overpass-type intersection at Catron Boulevard to expedite through traffic.
- Some residents who live north of Wildwood Drive prefer a neighborhood-feel that promotes slower traffic speeds and higher safety for pedestrians.
- School traffic is contributing to congestion and may be relieved with construction of a new school south of town.
- There is concern related to children walking to school with current and expected traffic volumes at Corral Drive.

There were two comments requesting consideration of Restricted Crossing U-Turns (RCUT, or J-Turn). This configuration eliminates conflict points for left turn maneuvers by changing it to a right turn maneuver followed by a u-turn. It typically includes a wide, raised median when implemented as an intersection alternative because of the need to accommodate truck turning. Travelers that want to make a left turn at an intersection would be forced to make a right turn and then complete a u-turn at a planned median opening. This option was not formally evaluated with the study. The commenter suggested implementation of the RCUT at the Catron Boulevard (Wildwood Drive) and Corral Drive intersections. Elimination of the left-turn movement at the west approach of the Catron Boulevard intersection was considered with Alternative 1. However, elimination of the left-turn movement at the west approach of the Corral Drive intersection was not considered. The eastbound left-turn traffic volumes at Corral Drive are significantly higher than the Catron Boulevard intersection and the RCUT may not be able to accommodate the turning traffic volume and associated weaving. Implementation of a median would have safety benefits. A median would also require change to current access patterns and should be coordinated with the adjacent landowners. An evaluation of truck accommodation would also be an important consideration since it will directly affect the median width requirement and associated right-of-way impacts. Since Alternative 8 is ranked higher than Alternative 1, an evaluation of the RCUT is not recommended at the Catron Boulevard Intersection. The RCUT would be viewed similar to Alternative 1 with lower rankings in a number of categories.

Comments

The comments are included below. Personal information including name and address numbers have been removed.

COMMENT 1:

I am glad that the city is trying to address this issue. I live at Wildwood Drive which is generally close to the Sheridan Lake Road/Catron Boulevard Intersection. Out of the alternatives I prefer the recommended alternative of construction of the Les Hollers Way route with alternative 8 at the intersection. As a city street that also serves as access to many peoples place of residence I don't think the city should look at dramatically expanding the intersection into a major highway as some of the alternatives propose. Sheridan Lake road serves as a major bike and walking route for many of the areas residences and turning the road into a major highway as some of the alternatives propose will make such activities unattractive. I think that adding the Les Hollers Way route will improve all of that while also improving the overall traffic noise in the area by routing the significant Red Rocks traffic to the east before Catron Blvd. I also like alternative 8 because it will cause the least impact on the right of way. Some of the alternatives look like they would dramatically increase the width of Sheridan Lake Road taking out existing homes in my neighborhood.

I think the city should also try and address road traffic noise as a part of the construction by looking at using quiet asphalt or other quiet materials. As a major roadway located adjacent to homes the city should try to reduce future road noise in the area.

I also think the city needs to look at addressing the need for a new elementary/middle school in the Red Rocks Area. Much of the traffic congestion that occurs in the morning and afternoon is due to the location of Corral Drive School and the large numbers of individuals that must travel from the Red Rocks Area to Corral Drive. With Corral Drive already above capacity forcing some kids to travel to other school areas it makes sense to build a new school to serve the newly expanded area. A new school is directly related to the congestion along Sheridan Lake Road and should be tied to this project. A new school, the Les Hollers Way Route, and the improvements to the Sheridan Lake Road/Catron Intersection would greatly improve the quality of life in southwest Rapid City.

COMMENT 2:

Current plans by the County is to widen Sheridan Lake from Tanager out five miles. This proposal incorporates sidewalks adjacent to the Countryside Developments. I'd recommend that the City consider sidewalks that will connect from City limits to the Countryside Developments, thereby ensuring safety for people that run and bike.

COMMENT 3:

Please, you HAVE TO build it for the future, not for the right now, as Rapid City has the tendancy to do!! We spend way more money fixing our underbuilds than just doing it right the first time. If Catron Blvd is truly the thoroughfare it's supposed to be then make it that way, no stop lights. Please stop underbuilding our streets. Please make Sheridan Lake road a 4 lane with a turning lane to at least countryside. This is the city of bottlenecks, deadends and shortcuts through neighborhoods. Thank you!!

COMMENT 4:

I live on Chateaux Ridge Ct. As a retiree with plenty of time and a little planning I am able to avoid the traffic nightmare during certain times of the day that exists on Sheridan Lake Road. However, on very rare occasions I'm force to "run the gauntlet" and attempt a left hand turn onto Sheridan Lake between 7:45 AM and 8:15 AM. If any of the proposals being considered, involve allowing north bound travel to move unimpeded, are put into effect it'll be almost impossible for someone needing to enter north bound traffic from Chateaux Ridge at certain times of the day. I'm sure you've considered this, but I just wanted to respectfully make you aware of the potential problems.

COMMENT 5:

I appreciate that this study is being done now before the roads get more crowded in a few years. However, I'm wondering if simply expanding Sheridan Lake Road so that there are more lanes on both sides would be an option? I'm also curious what time these studies were conducted. I've noticed that yes, traffic is heavier at certain times in the morning but that if I take my kids to school just 5 minutes later (at 7:45, for example), that traffic is cleared out and not that bad. If I leave between 7:30-40, though, it's nearly impossible to turn left onto Catron from Bendt Drive. I sure wish there was another access out of our neighborhood besides just onto Catron.

COMMENT 6:

As a resident in the Wildwood subdivision, our family often times opt to use the existing light at the wildwood/Catron/Sheridan lake intersection, even though my residence is closer to using the South loop/portion of Wildwood. Losing east-west access from wildwood to catron would be difficult for residences in this area. The primary reason being is that the South wildwood (stop sign) control to Sheridan lake road is substantially more dangerous to use. The reasons being are that it is an extremely steep grade to come down in the winter with no run out at the bottom, visibility looking to the south (down Sheridan lake) can be cumbersome at times as vehicles are approaching rapidly from around the corner further south, and because of the extreme amounts of traffic that are traveling. It often times will back up to this location in the AM and can be impossible to make a left turn (north bound onto Sheridan lake) through the traffic until a polite driver waves you in. Therefore the light becomes a necessary area to get out of our subdivision.

COMMENT 7:

I really like the steady flow of Alt 6 where there's an elevated bridge to keep traffic flowing over the intersection at Catron on Sheridan Lake Road, and I think that would solve a lot of the bottleneck at that Sheridan/Catron intersection.

COMMENT 8:

I live just off of SLR and access it from Summer Set Drive. Most of the day it is impossible to make a left hand turn, and a dangerous challenge to make a right hand turn onto SLR. There is a slight rise in SLR to the south that makes seeing vehicles traveling north impossible to see till they are very close. And most seem to one exceeding the speed limit. The speed limit should be reduced, or a stop light should be installed to allow residents from the neighborhood to safely access SLR.

Thanks, It's dangerous out there!!!

COMMENT 9:

I live in the Whispering Pines region and access Sheridan Lake Road from Dunsmore. For the Dunsmore-Sheridan Lake Rd intersection I would suggest having just 1 through lane in each direction in addition to the right and left turn lanes in each directions. There are a lot of unsafe drivers who come through this intersection and having two through lanes would just be an excuse to race and cut people off. On the Catron-Sheridan Lake Rd Interchange I definitely would not do a roundabout as nothing worse than excessive traffic full of parents and workers in a hurry to lead to poor and dangerous traffic flow. The Northbound overpass here might make the most sense, facilitating the dramatically backed up Northbound traffic, allowing more flow of Southbound traffic more easily under the Northbound ramp, not having to contend with as many straight Northbound drivers. This arrangement would also facilitate the Southbound flow in the evenings when the traffic load is somewhat reversed without having the expense and size necessary to accommodate the two way overpass in another one of the options. As for the Corral Drive interchange, I think that is a reasonable option for getting drivers into the Coral Drive region in the AM, as long as the subsequent drivers don't get bogged down in the Coral Drive-Southwest Middle school region at the school site itself which is also part of the traffic congestion issue in the area.

COMMENT 10:

I live in the Wildwood Drive neighborhood and feel alternate 1 would greatly increase my families risk to get places safely. The back side of wildwood drive is in HORRIBLE condition and is not sufficient to hold two way traffic if that is the only exit point onto SLR. Plus, taking away our stop light to turn safely left onto SLR or straight onto catron (which 99% of our neighborhood does) increases our risk of getting out onto SLR at the other intersection. We won't have a stoplight to assist us and have 4 lanes of traffic to cross. Two of those coming off pretty much a blind corner of SLR. I would be devastated if this alternate option occurred and would have to seriously consider moving to somewhere that is safer for my family. The amount of traffic on SLR is massive and I don't feel by cutting off Wildwood that it will help anyone and in fact only hurts our entire neighborhood.

COMMENT 11:

In reviewing the SLR plan, I want to draw your attention to the concept of "Alternative Intersections: Restricted Crossing U-Turns" viewable at https://www.youtube.com/watch?v=BLwl01NCp9I.

Visualize the median for West Blvd. the grass with trees and very pedestrian friendly. Why can't this be an option for SLR? Instead of 2 lanes each direction, the city could install one lane each way and utilize the "super street" concept. The video mentions 43,000 cars per day on that facility. SLR future volume for 2045 is 29,000.

SLR is classified as a principal arterial. To me it functions more like a minor arterial such as park drive, or canyon lake drive. If a full road redo is imminent, I would recommend changing SLR to a minor arterial as the area SLR goes through is too residential.

My concern is if SLR goes to 5 lanes the speed limit signs will not work and people will pass each other and go very fast. The fatal rate of a ped/vehicle crash goes up exponentially as speed increases. How many kids have to die or be permanently injured for us to prioritize use alternatives to stop light intersections?

COMMENT 12:

To whom it may concern:
Thank you for the postcard notification to provide comments on the Sheridan Lake Road Traffic Study report. Our family lives at Summerset Drive, Autumn Hills Subdivision. We use the north entrance of Summerset Drive to access Sheridan Lake Road daily. We understand the traffic delay concerns the city has for all the intersections in the SLR (Sheridan Lake Road) study area. This traffic delay could become a big problem if a good traffic plan is not in place. Rapid City lacks collector roads to feed traffic to the multi-lane highways SD44 and US16. I like the 2045 No-build option of constructing the Future Collector 1/ Les Hollers Way to reduce traffic pressure on SLR. Improvements to Moon Meadows could also reduce the traffic pressure on SLR. If a new school is built south of Catron and west of US16, as proposed in the RC Schools' "Forward" plan, an even greater reduction in traffic pressure could occur.
The 7 lanes proposed at the intersection of SLR and Corral will have a negative impact on the Autumn Hills neighborhood for children crossing and going to school, as well as for vehicles trying to take a left from our neighborhood onto SLR. The cost to add lanes appears high with minimal travel-time benefit during the AM or PM traffic rush. Adding lanes will increase the crash rate if not properly designed. If it is absolutely necessary to widen, then please consider a 40' wide median and U-turn access. This median width would allow a delivery truck or school bus to perform a U-turn maneuver. A passenger vehicle could store in the median and then turn left into the inside lane. Pedestrians could refuge in the median when crossing SLR. Please consider the Restricted Crossing U-Turn intersection design at the Corral intersection and the Wildwood/Catron intersections. It is my understanding that this is a very safe intersection design and once signalized could be synchronized with the Catron/Wildwood signal to improve the traffic flow thru the SLR corridor.
Restricting the left-out of Corral should be considered in the study. I usually see many cars on SLR being impacted by a few vehicles turning left from Corral. The double left turn lane construction on SLR could be implemented without reconstructing Corral Drive if the left turn lane on Corral was converted to an additional westbound lane. A U-turn and median would be needed on SLR south of Corral to allow eastbound Corral vehicles to head north on SLR. Reducing the number of signal phases from 3 to 2 would have a positive impact on the traffic flow thru this intersection. The crash rate would also be improved with the left-out restriction.
The 4-lane section of SLR north of Corral might function like a 3-lane due to stopped vehicles waiting in the inside lanes to turn left if the build 2045 traffic volume of 20,700 ADT is allowed to occur. Please consider a study to convert SLR from 4 to 3 lanes from Corral Drive to the W. Flormann intersection. The potential outcomes of this conversion would be the following:
1) a reduction of the crash rate (adding a 2-way left turn lane) without adversely impacting the traffic flow
2) the addition of bike lanes
3) an increase of the separation distance between vehicles and pedestrians
   the sidewalk
This conversion would be an enhancement to the city and the property owners along SLR. Currently, children regularly run across 4 lanes of traffic at the Common Cents store location. If converted to a 3-lane, they could cross one lane, refuge in the median and then cross the second lane. This would improve pedestrian accessibility, safety and enhance the adjacent neighborhood.
Please consider bike lanes with any reconstruction efforts. The neighborhood street system is poorly connected and SLR is our only option to access bicycle friendly roads. If the 4 to 3 lane conversion occurred as previously stated, then SLR could be considered a bicycle friendly road. Let's make Rapid City a desirable community in which to live. To achieve this, the goals for SLR could be the following:
1) improve traffic operations
2) reduce crashes
3) create a pedestrian friendly environment.

Please keep these three goals in mind for the completion of the SLR traffic study. Thank You.

COMMENT 13:

I've spent some time over the last few weeks reviewing the proposals for the SLR construction. I am a resident in the Wildwood development and feel one of the proposals would have a huge effect on my commute and safety. I don't know if I should be directing these questions towards you but I'm having a hard time understanding the thought process behind the "right in right out" (Alt. #1) option for SLR. Maybe you can help.

I do understand this. Alt. #1 eliminates the need for a light coming out of wildwood and would allow traffic to flow more consistently on SLR. However I see so many issues and dangerous situations with this proposal. To access SLR north residents would have two options. 1) use the Wildwood south exit or 2) "u turn" on SLR after turning right out of wildwood north.

1) Exiting Wildwood south proposes a number of issues. The first is the grade of the road. Often times during the peak morning hours there are 3-7 cars backed up on wildwood north exit in the left turn lane. If 3-7 cars are backed up using the wildwood south exit during wet and slippery conditions it's going to be very difficult to avoid hitting cars stopped in front of you. Or sliding into oncoming traffic on SLR. The second issue with the Wildwood south exit is crossing a potential two lanes of traffic without a light to access SLR north. How does the city not see this as an issue? To take it a step further, a car that wanted to access Catron Blvd would need to do the following…. Cross two lanes of traffic, merge into two lanes of traffic and merge over two lanes to access the right turn to Catron. All in a short distance. How does the SLR planning study take into effect these situation?
On top of all this the smaller roads in the Wildwood subdivision are not updated or safe. Sunburst, and Una Del are in horrible condition and traffic will only increase on these two roads with the Alt. #1 option.

2) If a commuter were to use the right out option exiting Wildwood north and need to access Catron or SLR north would there be a U turn lane? I turn left on to SLR every morning and I don't understand how I would be able to access SLR north without doing a u turn or using the Wings N Rings parking lot as a turn around. Again, this seems like another dangerous situation. How does the study suggest commuters use SLR north out of the Wildwood north exit?

I can't stress enough the issues that present themselves with the Alt. #1 option. Traffic always seems to find the quickest route and with a restriction such as this it's going to cause dangerous situations. I don't understand that if we are building for the future why we would create restrictions. My proposal is Alt 7B in the SLR study. SLR is not a residential arterial. It's a principal arterial. It's a main thoroughfare connecting residents in the Red Rock, Red Rock Meadows, High Point Ranch, Countryside S and N and other neighborhoods to Rapid City west and other major employers. Adding lanes in all directions and not restricting Wildwood residents is my hope for the future of SLR.

COMMENT 14:

I've been thinking about this more--it would be helpful if you could survey drivers and find out where they're going in the morning when traffic is the worst. If they're just dropping kids off at school, one of these alternate routes doesn't work. If they're going up Catron to get to the other side of town, another road up to Mt. Rushmore Road seems in order. If they're going downtown, then perhaps other options may be better--either another route to get up to Mt. Rushmore faster (the windy Moon Meadows road gets there but it's definitely not faster)--you almost need another road straight from Sheridan Lake to Mt. Rushmore--there are several big fields/cattle grazing areas that don't seem to be used. Adding another access area through one of those fields might clear up a ton of congestion in the morning...again, depending on where people are going in the mornings.

COMMENT 15:

Our address is Skyview Drive. We wish to comment on the 3-way intersection at Corral and Park Drive. In our opinion, this intersection is currently very dysfunctional. Traffic arriving from the east and west have a stop sign, but northbound traffic does not. This results in two issues that need to be addressed:

1. School: This is the main problem. During the school year...particularly during the early morning and afternoon when the traffic volume is highest due to parents and buses...this intersection becomes clogged with traffic. Cars and buses coming from the west must stop. Cars coming from the east must stop. So there are long lines of vehicles from both directions on Corral. There is also a long line of traffic coming from the north. This traffic moves very slowly because it often must stop for children crossing this intersection before turning east.

In addition, for those of us who live on Skyview Drive, the situation is particularly frustrating because: (1) we are blocked from entering Corral from the south by eastbound traffic backed up at the stop sign, and (2) after passing through the intersection from the east, we are blocked from making a left turn onto Skyview Drive by eastbound traffic backed up at the stop sign.

2. Other Times: During non-school hours this intersection is also confusing because southbound vehicles have a dead end and tend to stop for east and west bound vehicles (who are waiting at the stop sign) before proceeding through the intersection.

Both of these issues are a hindrance to the smooth flow of traffic through this intersection. It seems that the best solution would be to install a traffic light.

COMMENT 16:

As a homeowner in the Autum Hills area - Closest to Corral Drive. We would just like to know when this construction is likely to start and how long it might take to complete. We KNOW it needs to be done for sure and appreciate the options that are being looked at. Thanks!

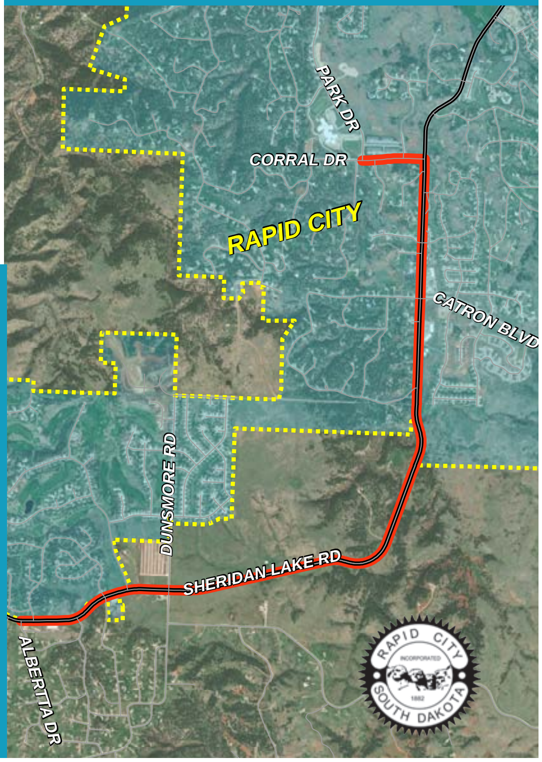
Sheridan Lake Road Study Website

http://www.sheridanlakeroadstudy.com

The City of Rapid City has teamed with HDR Engineering to conduct a traffic study of Sheridan Lake Road between Corral Drive and Albertta Drive.

Please visit the website to view the Draft Study Report and submit any comments you may have by May 17, 2019.

aaron.fagerness@hdrinc.com
605.977.7744



Sheridan Lake Road Traffic Study Report

Corral Drive to Albertta Drive

CITY OF RAPID CITY

Rapid City, South Dakota

Appendix J

Construction Cost Calculations

ALTERNATIVE 1

At-Grade Intersection - Wildwood Drive Right-In/Right-Out
(Sheridan Lk Rd & Catron Blvd Intersection)

NO.	ITEM NO.	ITEM DESCRIPTION	APPROX QTY	UNIT	UNIT BID PRICE	EXTENDED PRICE
Roadway						
1	009	Mobilization	1	LS	$ 430,000.00	$ 430,000.00
2	009	Construction Staking	1	LS	$ 31,300.00	$ 31,300.00
3	100	Clearing	1	LS	$ 41,000.00	$ 41,000.00
4	110	Remove Concrete Curb & Gutter	1,000	LF	$ 5.50	$ 5,500.00
5	110	Remove Concrete Pavement	25,600	SY	$ 6.00	$ 153,600.00
6	110	Remove ACC Pavement	3,200	SY	$ 3.50	$ 11,200.00
7	110	Remove Luminaire Pole	18	EA	$ 250.00	$ 4,500.00
8	120	Unclassified Excavation	34,400	CY	$ 4.50	$ 154,800.00
9	120	Borrow Unclassified Excavation	8,000	CY	$ 5.50	$ 44,000.00
10	230	Remove & Place Topsoil	3,000	CY	$ 2.50	$ 7,500.00
11	260	Gravel Cushion / Base Course	14,300	TON	$ 15.00	$ 214,500.00
12	320	Asphalt Concrete Composite (6" ACC / 9" Base)	500	TON	$ 100.00	$ 50,000.00
13	380	10" Nonreinforced PCC Pavement (10" PCC / 5" Base)	38,900	SY	$ 50.00	$ 1,945,000.00
14	380	6" Median PCC Pavement (6" ACC / 15" Base)	900	SY	$ 60.00	$ 54,000.00
15	450	Storm Sewer	4,300	LF	$ 90.00	$ 387,000.00
16	633	Pavement Marking	39,400	LF	$ 0.60	$ 23,600.00
17	634	Traffic Control	1	LS	$ 329,500.00	$ 329,500.00
18	651	Concrete Sidewalk (6" PCC / 2" Base)	70,200	SF	$ 6.50	$ 456,300.00
19	635	Roadway Lighting	1	LS	$ 180,000.00	$ 180,000.00
20	635	Traffic Signal System	1	EA	$ 350,000.00	$ 350,000.00
21	650	Type B66 Concrete Curb and Gutter	500	LF	$ 22.00	$ 11,000.00
22	650	Type B610 Concrete Curb and Gutter	15,000	LF	$ 23.00	$ 345,000.00
23	650	Concrete Barrier Curb and Gutter	0	LF	$ 220.00	$ -
24	670	Drainage Structure	62	EA	$ 3,500.00	$ 217,000.00
25	730-732	Seeding, Fertilizing, Mulching	4	AC	$ 19,000.00	$ 76,000.00
26	734	Erosion Control and Landscaping Restoration	1	LS	$ 179,700.00	$ 179,700.00
27	671	Sanitary Sewer - Reconstruct Manhole	16	EA	$ 2,000.00	$ 32,000.00
28	451	Water Main - Hydrant Relocation (Furnish New)	14	EA	$ 6,000.00	$ 84,000.00
					Subtotal:	$ 5,818,000.00
					Contingency (30%)	$ 1,745,400.00
					Construction Cost Subtotal:	$ 7,563,000.00

NO.	ITEM NO.	ITEM DESCRIPTION	APPROX QUANTITY	UNIT	UNIT BID PRICE	EXTENDED PRICE
Bridge Structure and Walls						
29	460	Bridge Structures - Flyover	0	LS	$ -	$ -
30	530	MSE Large Panel Wall	0	SQFT	$ 78.00	$ -
					Subtotal:	$ -
					Contingency (30%)	$ -
					Structure & Wall Subtotal:	$ -

Construction Total: $ 7,563,000.00

NO.	ITEM NO.	ITEM DESCRIPTION	APPROX QUANTITY	UNIT	UNIT BID PRICE	EXTENDED PRICE
Right-of-Way And Utilities						
31		Right-of-Way Impacts	86,127	SQFT	$ 3.50	$ 301,444.50
					Subtotal:	$ 301,444.50
					Contingency (30%)	$ 90,433.35
					ROW Subtotal:	$ 392,000.00

Grand Total: $ 7,955,000.00

ALTERNATIVE 2

Flyover Southbound to Eastbound
(Sheridan Lk Rd & Catron Blvd Intersection)

NO.	ITEM NO.	ITEM DESCRIPTION	APPROX QTY	UNIT	UNIT BID PRICE	EXTENDED PRICE
		Roadway				
1	009	Mobilization	1	LS	$ 630,000.00	$ 630,000.00
2	009	Construction Staking	1	LS	$ 47,100.00	$ 47,100.00
3	100	Clearing	1	LS	$ 50,000.00	$ 50,000.00
4	110	Remove Concrete Curb & Gutter	1,800	LF	$ 5.50	$ 9,900.00
5	110	Remove Concrete Pavement	31,100	SY	$ 6.00	$ 186,600.00
6	110	Remove ACC Pavement	5,900	SY	$ 3.50	$ 20,700.00
7	110	Remove Luminaire Pole	22	EA	$ 250.00	$ 5,500.00
8	120	Unclassified Excavation	71,400	CY	$ 4.50	$ 321,300.00
9	120	Borrow Unclassified Excavation	29,400	CY	$ 5.50	$ 161,700.00
10	230	Remove & Place Topsoil	4,400	CY	$ 2.50	$ 11,000.00
11	260	Gravel Cushion / Base Course	18,900	TON	$ 15.00	$ 283,500.00
12	320	Asphalt Concrete Composite (6" ACC / 9" Base)	1,000	TON	$ 100.00	$ 100,000.00
13	380	10" Nonreinforced PCC Pavement (10" PCC / 5" Base)	56,800	SY	$ 50.00	$ 2,840,000.00
14	380	6" Median PCC Pavement (6" ACC / 15" Base)	400	SY	$ 60.00	$ 24,000.00
15	450	Storm Sewer	6,700	LF	$ 90.00	$ 603,000.00
16	633	Pavement Marking	57,000	LF	$ 0.60	$ 34,200.00
17	634	Traffic Control	1	LS	$ 363,600.00	$ 363,600.00
18	651	Concrete Sidewalk (6" PCC / 2" Base)	88,900	SF	$ 6.50	$ 577,900.00
19	635	Roadway Lighting	1	LS	$ 220,000.00	$ 220,000.00
20	635	Traffic Signal System	1	EA	$ 350,000.00	$ 350,000.00
21	650	Type B66 Concrete Curb and Gutter	900	LF	$ 22.00	$ 19,800.00
22	650	Type B610 Concrete Curb and Gutter	12,900	LF	$ 23.00	$ 296,700.00
23	650	Concrete Barrier Curb and Gutter	2,800	LF	$ 220.00	$ 616,000.00
24	670	Drainage Structure	80	EA	$ 3,500.00	$ 280,000.00
25	730-732	Seeding, Fertilizing, Mulching	5	AC	$ 19,000.00	$ 95,000.00
26	734	Erosion Control and Landscaping Restoration	1	LS	$ 206,100.00	$ 206,100.00
27	671	Sanitary Sewer - Reconstruct Manhole	22	EA	$ 2,000.00	$ 44,000.00
28	451	Water Main - Hydrant Relocation (Furnish New)	17	EA	$ 6,000.00	$ 102,000.00
					Subtotal:	$ 8,499,600.00
					Contingency (30%)	$ 2,549,880.00
					Construction Cost Subtotal:	$ 11,049,000.00

NO.	ITEM NO.	ITEM DESCRIPTION	APPROX QUANTITY	UNIT	UNIT BID PRICE	EXTENDED PRICE
		Bridge Structure and Walls				
29	460	Bridge Structures - Flyover	11,100	SQFT	$ 211.00	$ 2,342,100.00
30	530	MSE Large Panel Wall	70,000	SQFT	$ 78.00	$ 5,460,000.00
					Subtotal:	$ 7,802,100.00
					Contingency (30%)	$ 2,340,630.00
					Structure & Wall Subtotal:	$ 10,143,000.00

Construction Total: $ 21,192,000.00

NO.	ITEM NO.	ITEM DESCRIPTION	APPROX QUANTITY	UNIT	UNIT BID PRICE	EXTENDED PRICE
		Right-of-Way And Utilities				
31		Right-of-Way Impacts	123,418	SQFT	$ 3.50	$ 431,963.00
					Subtotal:	$ 431,963.00
					Contingency (30%)	$ 129,588.90
					ROW Subtotal:	$ 562,000.00

Grand Total: $ 21,754,000.00

ALTERNATIVE 3
Continuous Flow Intersection
(Sheridan Lk Rd & Catron Blvd Intersection)

NO.	ITEM NO.	ITEM DESCRIPTION	APPROX QTY	UNIT	UNIT BID PRICE	EXTENDED PRICE
Roadway						
1	009	Mobilization	1	LS	$ 580,000.00	$ 580,000.00
2	009	Construction Staking	1	LS	$ 35,100.00	$ 35,100.00
3	100	Clearing	1	LS	$ 50,000.00	$ 50,000.00
4	110	Remove Concrete Curb & Gutter	1,300	LF	$ 5.50	$ 7,200.00
5	110	Remove Concrete Pavement	29,500	SY	$ 6.00	$ 177,000.00
6	110	Remove ACC Pavement	4,400	SY	$ 3.50	$ 15,400.00
7	110	Remove Luminaire Pole	22	EA	$ 250.00	$ 5,500.00
8	120	Unclassified Excavation	42,000	CY	$ 4.50	$ 189,000.00
9	120	Borrow Unclassified Excavation	10,900	CY	$ 5.50	$ 60,000.00
10	230	Remove & Place Topsoil	3,900	CY	$ 2.50	$ 9,800.00
11	260	Gravel Cushion / Base Course	21,100	TON	$ 15.00	$ 316,500.00
12	320	Asphalt Concrete Composite (6" ACC / 9" Base)	700	TON	$ 100.00	$ 70,000.00
13	380	10" Nonreinforced PCC Pavement (10" PCC / 5" Base)	49,600	SY	$ 50.00	$ 2,480,000.00
14	380	6" Median PCC Pavement (6" ACC / 15" Base)	5,000	SY	$ 60.00	$ 300,000.00
15	450	Storm Sewer	5,200	LF	$ 90.00	$ 468,000.00
16	633	Pavement Marking	44,600	LF	$ 0.60	$ 26,800.00
17	634	Traffic Control	1	LS	$ 420,500.00	$ 420,500.00
18	651	Concrete Sidewalk (6" PCC / 2" Base)	85,700	SF	$ 6.50	$ 557,100.00
19	635	Roadway Lighting	1	LS	$ 220,000.00	$ 220,000.00
20	635	Traffic Signal System	2	EA	$ 350,000.00	$ 700,000.00
21	650	Type B66 Concrete Curb and Gutter	700	LF	$ 22.00	$ 15,400.00
22	650	Type B610 Concrete Curb and Gutter	16,300	LF	$ 23.00	$ 374,900.00
23	650	Concrete Barrier Curb and Gutter	0	LF	$ 220.00	$ -
24	670	Drainage Structure	72	EA	$ 3,500.00	$ 252,000.00
25	730-732	Seeding, Fertilizing, Mulching	5	AC	$ 19,000.00	$ 95,000.00
26	734	Erosion Control and Landscaping Restoration	1	LS	$ 206,100.00	$ 206,100.00
27	671	Sanitary Sewer - Reconstruct Manhole	23	EA	$ 2,000.00	$ 46,000.00
28	451	Water Main - Hydrant Relocation (Furnish New)	19	EA	$ 6,000.00	$ 114,000.00
					Subtotal:	$ 7,791,300.00
					Contingency (30%)	$ 2,337,390.00
					Construction Cost Subtotal:	$ 10,129,000.00

NO.	ITEM NO.	ITEM DESCRIPTION	APPROX QUANTITY	UNIT	UNIT BID PRICE	EXTENDED PRICE
Bridge Structure and Walls						
29	460	Bridge Structures - Flyover	0	LS	$ -	$ -
30	530	MSE Large Panel Wall	0	SQFT	$ 78.00	$ -
					Subtotal:	$ -
					Contingency (30%)	$ -
					Structure & Wall Subtotal:	$ -

Construction Total: $ 10,129,000.00

NO.	ITEM NO.	ITEM DESCRIPTION	APPROX QUANTITY	UNIT	UNIT BID PRICE	EXTENDED PRICE
Right-of-Way And Utilities						
31		Right-of-Way Impacts	140,329	SQFT	$ 3.50	$ 491,151.50
					Subtotal:	$ 491,151.50
					Contingency (30%)	$ 147,345.45
					ROW Subtotal:	$ 638,000.00

Grand Total: $ 10,767,000.00

ALTERNATIVE 7A

At-Grade Intersection
(Sheridan Lk Rd & Catron Blvd Intersection)

NO.	ITEM NO.	ITEM DESCRIPTION	APPROX QTY	UNIT	UNIT BID PRICE	EXTENDED PRICE
Roadway						
1	009	Mobilization	1	LS	$ 600,000.00	$ 600,000.00
2	009	Construction Staking	1	LS	$ 38,900.00	$ 38,900.00
3	100	Clearing	1	LS	$ 56,000.00	$ 56,000.00
4	110	Remove Concrete Curb & Gutter	1,500	LF	$ 5.50	$ 8,300.00
5	110	Remove Concrete Pavement	34,600	SY	$ 6.00	$ 207,600.00
6	110	Remove ACC Pavement	5,100	SY	$ 3.50	$ 17,900.00
7	110	Remove Luminaire Pole	25	EA	$ 250.00	$ 6,300.00
8	120	Unclassified Excavation	47,700	CY	$ 4.50	$ 214,700.00
9	120	Borrow Unclassified Excavation	12,300	CY	$ 5.50	$ 67,700.00
10	230	Remove & Place Topsoil	5,100	CY	$ 2.50	$ 12,800.00
11	260	Gravel Cushion / Base Course	20,300	TON	$ 15.00	$ 304,500.00
12	320	Asphalt Concrete Composite (6" ACC / 9" Base)	900	TON	$ 100.00	$ 90,000.00
13	380	10" Nonreinforced PCC Pavement (10" PCC / 5" Base)	61,200	SY	$ 50.00	$ 3,060,000.00
14	380	6" Median PCC Pavement (6" ACC / 15" Base)	400	SY	$ 60.00	$ 24,000.00
15	450	Storm Sewer	6,700	LF	$ 90.00	$ 603,000.00
16	633	Pavement Marking	60,700	LF	$ 0.60	$ 36,400.00
17	634	Traffic Control	1	LS	$ 454,500.00	$ 454,500.00
18	651	Concrete Sidewalk (6" PCC / 2" Base)	96,000	SF	$ 6.50	$ 624,000.00
19	635	Roadway Lighting	1	LS	$ 250,000.00	$ 250,000.00
20	635	Traffic Signal System	1	EA	$ 350,000.00	$ 350,000.00
21	650	Type B66 Concrete Curb and Gutter	800	LF	$ 22.00	$ 17,600.00
22	650	Type B610 Concrete Curb and Gutter	13,300	LF	$ 23.00	$ 305,900.00
23	650	Concrete Barrier Curb and Gutter	0	LF	$ 220.00	$ -
24	670	Drainage Structure	82	EA	$ 3,500.00	$ 287,000.00
25	730-732	Seeding, Fertilizing, Mulching	6	AC	$ 19,000.00	$ 114,000.00
26	734	Erosion Control and Landscaping Restoration	1	LS	$ 232,600.00	$ 232,600.00
27	671	Sanitary Sewer - Reconstruct Manhole	23	EA	$ 2,000.00	$ 46,000.00
28	451	Water Main - Hydrant Relocation (Furnish New)	21	EA	$ 6,000.00	$ 126,000.00
					Subtotal:	$ 8,155,700.00
					Contingency (30%)	$ 2,446,710.00
					Construction Cost Subtotal:	$ 10,602,000.00

NO.	ITEM NO.	ITEM DESCRIPTION	APPROX QUANTITY	UNIT	UNIT BID PRICE	EXTENDED PRICE
Bridge Structure and Walls						
29	460	Bridge Structures - Flyover	0	LS	$ -	$ -
30	530	MSE Large Panel Wall	0	SQFT	$ 78.00	$ -
					Subtotal:	$ -
					Contingency (30%)	$ -
					Structure & Wall Subtotal:	$ -

Construction Total: $ 10,602,000.00

NO.	ITEM NO.	ITEM DESCRIPTION	APPROX QUANTITY	UNIT	UNIT BID PRICE	EXTENDED PRICE
Right-of-Way And Utilities						
31		Right-of-Way Impacts	127,021	SQFT	$ 3.50	$ 444,573.50
					Subtotal:	$ 444,573.50
					Contingency (30%)	$ 133,372.05
					ROW Subtotal:	$ 578,000.00

Grand Total: $ 11,180,000.00

ALTERNATIVE 8

At-Grade Intersection with Future Roadways
(Sheridan Lk Rd & Catron Blvd Intersection)

NO.	ITEM NO.	ITEM DESCRIPTION	APPROX QTY	UNIT	UNIT BID PRICE	EXTENDED PRICE
Roadway						
1	009	Mobilization	1	LS	$ 340,000.00	$ 340,000.00
2	009	Construction Staking	1	LS	$ 28,000.00	$ 28,000.00
3	100	Clearing	1	LS	$ 36,000.00	$ 36,000.00
4	110	Remove Concrete Curb & Gutter	800	LF	$ 5.50	$ 4,400.00
5	110	Remove Concrete Pavement	22,200	SY	$ 6.00	$ 133,200.00
6	110	Remove ACC Pavement	2,700	SY	$ 3.50	$ 9,500.00
7	110	Remove Luminaire Pole	16	EA	$ 250.00	$ 4,000.00
8	120	Unclassified Excavation	30,500	CY	$ 4.50	$ 137,300.00
9	120	Borrow Unclassified Excavation	6,100	CY	$ 5.50	$ 33,600.00
10	230	Remove & Place Topsoil	2,600	CY	$ 2.50	$ 6,500.00
11	260	Gravel Cushion / Base Course	10,500	TON	$ 15.00	$ 157,500.00
12	320	Asphalt Concrete Composite (6" ACC / 9" Base)	500	TON	$ 100.00	$ 50,000.00
13	380	10" Nonreinforced PCC Pavement (10" PCC / 5" Base)	30,200	SY	$ 50.00	$ 1,510,000.00
14	380	6" Median PCC Pavement (6" ACC / 15" Base)	500	SY	$ 60.00	$ 30,000.00
15	450	Storm Sewer	3,300	LF	$ 90.00	$ 297,000.00
16	633	Pavement Marking	28,600	LF	$ 0.60	$ 17,200.00
17	634	Traffic Control	1	LS	$ 250,000.00	$ 250,000.00
18	651	Concrete Sidewalk (6" PCC / 2" Base)	54,400	SF	$ 6.50	$ 353,600.00
19	635	Roadway Lighting	1	LS	$ 160,000.00	$ 160,000.00
20	635	Traffic Signal System	1	EA	$ 350,000.00	$ 350,000.00
21	650	Type B66 Concrete Curb and Gutter	400	LF	$ 22.00	$ 8,800.00
22	650	Type B610 Concrete Curb and Gutter	7,800	LF	$ 23.00	$ 179,400.00
23	650	Concrete Barrier Curb and Gutter	0	LF	$ 220.00	$ -
24	670	Drainage Structure	51	EA	$ 3,500.00	$ 178,500.00
25	730-732	Seeding, Fertilizing, Mulching	3	AC	$ 19,000.00	$ 57,000.00
26	734	Erosion Control and Landscaping Restoration	1	LS	$ 158,900.00	$ 158,900.00
27	671	Sanitary Sewer - Reconstruct Manhole	11	EA	$ 2,000.00	$ 22,000.00
28	451	Water Main - Hydrant Relocation (Furnish New)	11	EA	$ 6,000.00	$ 66,000.00
					Subtotal:	$ 4,578,400.00
					Contingency (30%)	$ 1,373,520.00
					Construction Cost Subtotal:	$ 5,952,000.00

NO.	ITEM NO.	ITEM DESCRIPTION	APPROX QUANTITY	UNIT	UNIT BID PRICE	EXTENDED PRICE
Bridge Structure and Walls						
29	460	Bridge Structures - Flyover	0	LS	$ -	$ -
30	530	MSE Large Panel Wall	0	SQFT	$ 78.00	$ -
					Subtotal:	$ -
					Contingency (30%)	$ -
					Structure & Wall Subtotal:	$ -

Construction Total: $ 5,952,000.00

NO.	ITEM NO.	ITEM DESCRIPTION	APPROX QUANTITY	UNIT	UNIT BID PRICE	EXTENDED PRICE
Right-of-Way And Utilities						
31		Right-of-Way Impacts	26,188	SQFT	$ 3.50	$ 91,658.00
					Subtotal:	$ 91,658.00
					Contingency (30%)	$ 27,497.40
					ROW Subtotal:	$ 119,000.00

Grand Total: $ 6,071,000.00

ALTERNATIVE 1

At-Grade Intersection
(Sheridan Lk Rd & Corral Drive Intersection)

NO.	ITEM NO.	ITEM DESCRIPTION	APPROX QTY	UNIT	UNIT BID PRICE	EXTENDED PRICE
Roadway						
1	009	Mobilization	1	LS	$ 410,000.00	$ 410,000.00
2	009	Construction Staking	1	LS	$ 32,700.00	$ 32,700.00
3	100	Clearing	1	LS	$ 45,000.00	$ 45,000.00
4	110	Remove Concrete Curb & Gutter	300	LF	$ 5.50	$ 1,700.00
5	110	Remove Concrete Pavement	27,400	SY	$ 6.00	$ 164,400.00
6	110	Remove ACC Pavement	1,000	SY	$ 3.50	$ 3,500.00
7	110	Remove Luminaire Pole	20	EA	$ 250.00	$ 5,000.00
8	120	Unclassified Excavation	38,200	CY	$ 4.50	$ 171,900.00
9	120	Borrow Unclassified Excavation	6,400	CY	$ 5.50	$ 35,200.00
10	230	Remove & Place Topsoil	3,300	CY	$ 2.50	$ 8,300.00
11	260	Gravel Cushion / Base Course	11,200	TON	$ 15.00	$ 168,000.00
12	320	Asphalt Concrete Composite (6" ACC / 9" Base)	200	TON	$ 100.00	$ 20,000.00
13	380	10" Nonreinforced PCC Pavement (10" PCC / 5" Base)	31,600	SY	$ 50.00	$ 1,580,000.00
14	380	6" Median PCC Pavement (6" ACC / 15" Base)	200	SY	$ 60.00	$ 12,000.00
15	450	Storm Sewer	5,900	LF	$ 90.00	$ 531,000.00
16	633	Pavement Marking	34,100	LF	$ 0.60	$ 20,500.00
17	634	Traffic Control	1	LS	$ 375,000.00	$ 375,000.00
18	651	Concrete Sidewalk (6" PCC / 2" Base)	83,400	SF	$ 6.50	$ 542,100.00
19	635	Roadway Lighting	1	LS	$ 200,000.00	$ 200,000.00
20	635	Traffic Signal System	1	EA	$ 350,000.00	$ 350,000.00
21	650	Type B66 Concrete Curb and Gutter	200	LF	$ 22.00	$ 4,400.00
22	650	Type B610 Concrete Curb and Gutter	10,200	LF	$ 23.00	$ 234,600.00
23	650	Concrete Barrier Curb and Gutter	0	LF	$ 220.00	$ -
24	670	Drainage Structure	66	EA	$ 3,500.00	$ 231,000.00
25	730-732	Seeding, Fertilizing, Mulching	4	AC	$ 19,000.00	$ 76,000.00
26	734	Erosion Control and Landscaping Restoration	1	LS	$ 196,700.00	$ 196,700.00
27	671	Sanitary Sewer - Reconstruct Manhole	13	EA	$ 2,000.00	$ 26,000.00
28	451	Water Main - Hydrant Relocation (Furnish New)	17	EA	$ 6,000.00	$ 102,000.00
					Subtotal:	$ 5,547,000.00
					Contingency (30%)	$ 1,664,100.00
					Construction Cost Subtotal:	$ 7,211,000.00

NO.	ITEM NO.	ITEM DESCRIPTION	APPROX QUANTITY	UNIT	UNIT BID PRICE	EXTENDED PRICE
Bridge Structure and Walls						
29	460	Bridge Structures - Flyover	0	LS	$ -	$ -
30	530	MSE Large Panel Wall	0	SQFT	$ 78.00	$ -
					Subtotal:	$ -
					Contingency (30%)	$ -
					Structure & Wall Subtotal:	$ -

Construction Total: $ 7,211,000.00

NO.	ITEM NO.	ITEM DESCRIPTION	APPROX QUANTITY	UNIT	UNIT BID PRICE	EXTENDED PRICE
Right-of-Way And Utilities						
31		Right-of-Way Impacts	100,259	SQFT	$ 3.50	$ 350,906.50
					Subtotal:	$ 350,906.50
					Contingency (30%)	$ 105,271.95
					ROW Subtotal:	$ 456,000.00

Grand Total: $ 7,667,000.00