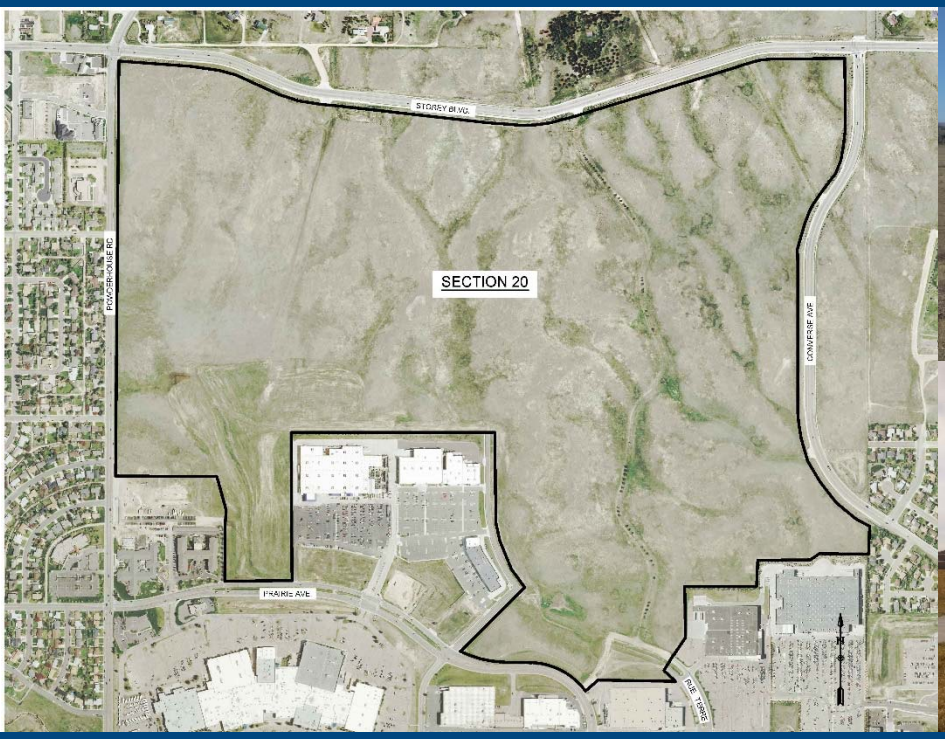
Dell Range Boulevard Corridor Study

PHASE II – SECTION 20



Prepared for:

Cheyenne Metropolitan Planning Organization

Adopted February 8, 2016

HireSmart®

AYRES ASSOCIATES

Dell Range Corridor Study Phase II: Section 20

(Section 20 is bordered by Powderhouse Road on the west, Storey Boulevard on the north, Converse Avenue on the east, and Prairie Avenue on the south.)

Cheyenne, WY

Final Report

Prepared for:
Cheyenne Metropolitan Planning Organization

Adopted February 8, 2016

"The preparation of this report has been financed in part through grant[s] from the Federal Highway Administration and Federal Transit Administration, U.S. Department of Transportation, under the State Planning and Research Program, Section 505 [or Metropolitan Planning Program, Section 104(f)] of Title 23, U.S. Code. The contents of this report do not necessarily reflect the official views or policy of the U.S. Department of Transportation."

Approved as to form only:
Date: 1/19/16

RESOLUTION NO. 5745

ENTITLED: "A RESOLUTION ADOPTING THE *DELL RANGE/ PRAIRIE AVE/ SECTION 20 CORRIDOR STUDY.*"

WHEREAS, Dell Range Boulevard is a vital piece of the transportation network in the Cheyenne community; and

WHEREAS, the intersections along Dell Range Boulevard and Prairie Avenue experience a larger volume of vehicular accidents compared to similar intersections in the Cheyenne community; and

WHEREAS, the last transportation study for Dell Range Boulevard and Prairie Avenue was completed in 2001; and

WHEREAS, the need for an updated study was identified because the Dell Range corridor continues to grow and develop; and

WHEREAS, the Cheyenne MPO received a Highway Safety Improvement Program grant for $30,000 to complete road safety audits at intersections within the Dell Range Boulevard and Prairie Avenue transportation study area because several of the intersections are reaching capacity or failing altogether; and

WHEREAS, the Cheyenne Metropolitan Planning Organization (MPO) retained Ayres & Associates on October 8, 2012 to produce the *Dell Range/Prairie/Section 20 Corridor Study;* and

WHEREAS, the *Dell Range/Prairie/Section 20 Corridor Study* planning process included extensive stakeholder engagement from surrounding business and land owners; and

WHEREAS, the *Dell Range/Prairie/Section 20 Study* includes Dell Range and Prairie Avenue between Powderhouse Road and College Drive and the undeveloped Section 20 area north of Frontier Mall; and

WHEREAS, the *Dell Range/Prairie/Section 20 Corridor Study* looks at improving the safety and efficiency of all users who travel on this busy corridor by including low cost safety improvements at intersections; and

WHEREAS, the City of Cheyenne Planning Commission held a Public Meeting on January 19, 2016, accepted public comments, and recommended that the Governing Body of the City of Cheyenne approve the *Dell Range/Prairie/Section 20 Corridor Study*; and

WHEREAS, the Cheyenne MPO's Technical Committee reviewed the Plan and recommended its adoption to the MPO Policy Committee.

NOW, THEREFORE, BE IT RESOLVED BY THE GOVERNING BODY OF THE CITY OF CHEYENNE, WYOMING:

THAT, the *Dell Range/Prairie/Section 20 Corridor Study* dated January 2016, is hereby approved as a guide for future improvements to the Dell Range Boulevard/Prairie Avenue and Section 20 area.

PRESENTED, READ AND ADOPTED THIS 8th **DAY OF** February **, 2016.**

Richard L. Kaysen, Mayor
City of Cheyenne

(Seal)

ATTEST:

Carol Intlekofer, City Clerk

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STUDY BACKGROUND

The Cheyenne Metropolitan Planning Organization (MPO) has requested a transportation and planning study of Section 20. The purpose of this study is to evaluate alternatives for development of a future street network inside Section 20 that will maximize traffic safety and future traffic distribution in Section 20.

The need for a comprehensive analysis of the future road network inside Section 20 was identified in the Dell Range Boulevard Corridor Study. The purpose of the Dell Range Boulevard Corridor Study was to evaluate the existing and future traffic operating conditions and safety along the Dell Range Boulevard corridor between Powderhouse Road and North College Drive and to identify improvements to maintain acceptable traffic safety and operating conditions through the year 2040. During that study it was identified that a complete street network through Section 20 would reduce the amount of vehicles using Dell Range Boulevard. This is significant because the existing volumes on Dell Range Boulevard are at 30,000 vehicles per day (vpd), which is reflected in selected peak hour traffic movements operating at a Level of Service (LOS) 'E' and 'F'. LOS 'E' indicates severe congestion; LOS 'F' indicates extreme congestion.

A planned street network inside Section 20 will provide connectivity and reduce the need for traffic to use Dell Range Boulevard as the primary access to existing and future corridor development. A collector street extension between Powderhouse Road and Converse Avenue, with continuous north-south street connections between Dell Range Boulevard and Storey Boulevard, has the ability to provide traffic demand relief for Dell Range Boulevard as well as provide access to future development for the undeveloped land between Prairie Avenue and Storey Boulevard.

STUDY AREA

Section 20 consists of nearly 350 acres of undeveloped land in northern Cheyenne. This land is bordered on the west by Powderhouse Road, the north by Storey Boulevard, the east by Converse Avenue, and the south by Prairie Avenue. The majority of the land in the study area is unplatted and is not planned for immediate development. Scenic Development Group LLC owns a parcel within Section 20 in the southeast corner. This parcel is currently undergoing development review for the Frontier Ridge Apartment complex. Laramie County School District Number One owns a parcel on the west side of Section 20 for a future fifth- and sixth-grade school. Rue Terre has recently been constructed, which completes this roadway through Frontier Mall Drive. A hotel, Staybridge Suites, is being constructed at the northeast corner of Frontier Mall Drive and Prairie Avenue. The remainder of the land is owned by two groups of private citizens.

Figure 1 – Section 20 Area Map

EXISTING CONDITIONS

The following intersections are included in this study of Section 20:

- Powderhouse Road and Melton Street
- Powderhouse Road and Carlson Street
- Powderhouse Road and Storey Boulevard
- Storey Boulevard and Converse Avenue

Powderhouse Road/Melton Street

The intersection of Powderhouse Road and Melton Street is one-way stop sign controlled, with the traffic on Melton Street yielding to Powderhouse Road. The Melton Street approach has a single shared left turn/right turn lane with a single through/right turn lane and a two-way-left-turn lane provided on Powderhouse Road.

Powderhouse Road/Carlson Street

The intersection of Powderhouse Road and Carlson Street is one-way stop sign controlled, with the traffic on Carlson Street yielding to Powderhouse Road. The Carlson Street approach has a single shared left turn/right turn lane with a single through/right turn lane and a two-way-left-turn lane provided on Powderhouse Road.

Powderhouse Road/Storey Boulevard

The intersection of Powderhouse Road and Storey Boulevard is traffic signal controlled. The approaches each have a dedicated left turn lane, a single through lane, and a dedicated right turn lane. All left turns operate as permitted/protected movements and right turns on red are allowed.

Storey Boulevard/Converse Avenue

The intersection of Storey Boulevard and Converse Avenue is traffic signal controlled. The existing intersection has three legs with the potential to extend Converse Avenue to the north, if needed in the future. The west leg has a single through lane and a dedicated right turn lane; the east leg has a single through lane and a dedicated left turn lane, and the south leg has dedicated left and right turn lanes. All left turns operate as permitted/protected movements, and right turns on red are allowed.

Existing Traffic

Figure 2 shows 24-hour daily traffic volumes on the existing street system in the Section 20 study area.

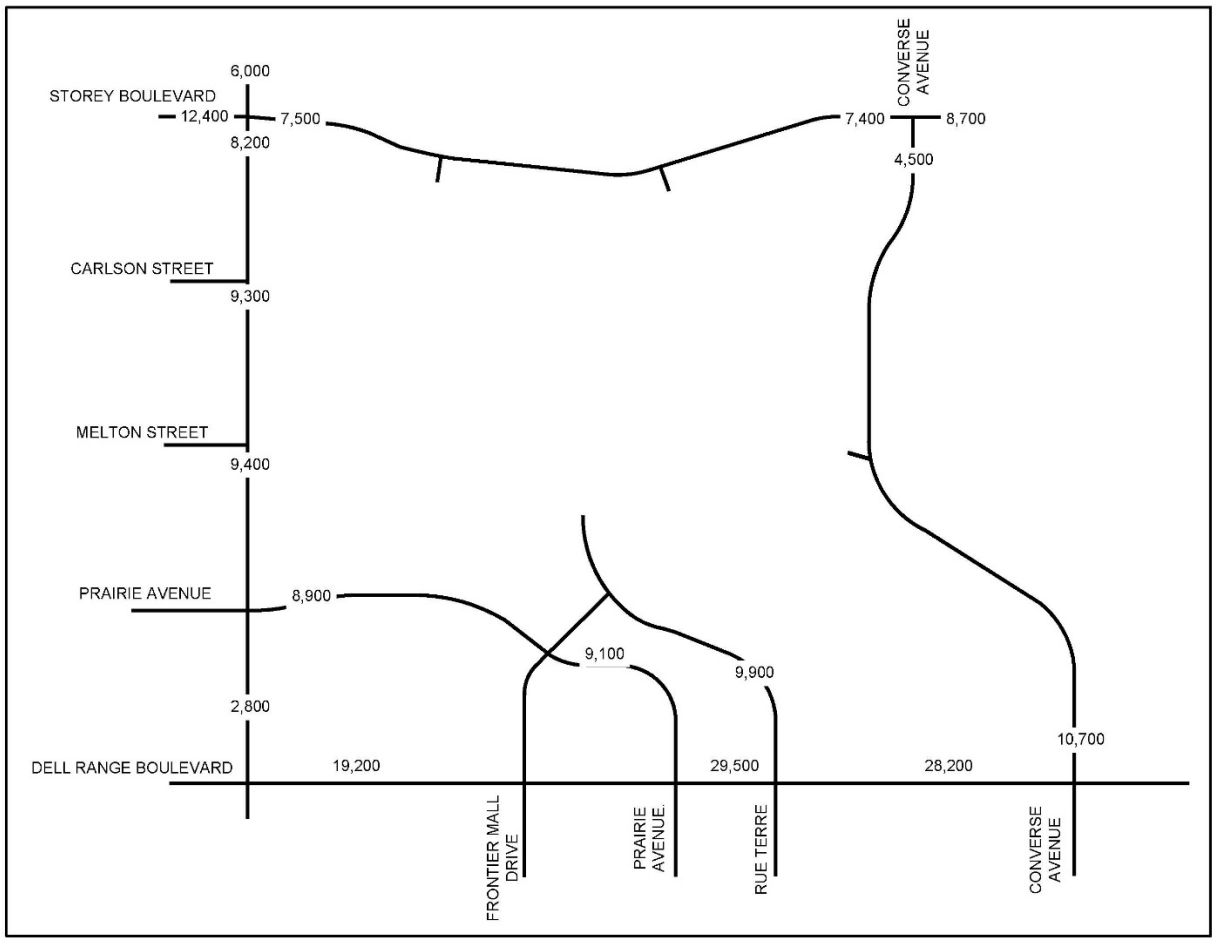

Figure 2 – 24-Hour Daily Traffic Volumes (2010 and 2011 MPO Traffic Counts)

As shown on Figure 2, Dell Range Boulevard daily traffic volumes range between 19,200 vehicles per day (vpd) to a high of 29,500 vpd. In comparison, Powderhouse Road volumes are at 8,200 vpd to 9,400 vpd except for the segment from Prairie Avenue to Dell Range Boulevard, which is at 2,800 vpd. Traffic on Storey Boulevard is currently at 7,500 vpd with traffic on Converse Avenue at 10,700 vpd north of Dell Range Boulevard and at 4,500 vpd south of Storey Boulevard. Traffic is at 9,100 vpd on Prairie Avenue and at 9,900 vpd on Rue Terre.

Existing Intersection Operation

Hi-Star traffic counters were used to collect traffic speeds and volume data at several locations along the perimeter roadways including: Powderhouse Road – south of Storey Boulevard, Storey Boulevard – east of Powderhouse Road, and Converse Avenue – south of Storey Boulevard. One-hour weekday evening and Saturday noon peak hour traffic turning movement counts were collected at the following intersections: Powderhouse Road at Melton Street, Carlson Street, and Storey Boulevard; and Storey Boulevard at Converse Avenue. Crash data was obtained from the Wyoming Department of Transportation (WYDOT) for the approximate six-year time period between 2009 and May 2015.

Traffic volume data was collected at two separate locations within Section 20 using Hi-Star traffic counters. Data was collected from Wednesday through Thursday, March 12-13, 2014, at the intersection of Storey Boulevard and Powderhouse Road for northbound and southbound traffic south of Storey Boulevard, and eastbound and westbound traffic east of Powderhouse Road. The second data collection location was at the intersection of Storey Boulevard and Converse Avenue. Data was collected Wednesday through Thursday, March 19-20, 2014, for northbound and southbound traffic south of Storey Boulevard.

Traffic volume data was recorded in 15-minute intervals throughout the 48-hour data collection periods to identify peak traffic volume hours. From the data collected it was determined that the peak traffic period for the Converse Avenue/Storey Boulevard location was between 3:00 PM and 5:00 PM, and the peak traffic period for the Powderhouse Road/Storey Boulevard location was between 4:00 PM and 6:00 PM. The volume data collected by the Hi-Star traffic counters is included in Appendix A.

The peak hour information was then used to determine the most appropriate times to collect turning movement data for several intersections throughout Section 20. The peak hour varied from 3:00 PM to 6:00 PM for the two data collection locations; it was determined that collecting turning movement counts from 4:30 PM to 5:30 PM at all intersections would incorporate the varying traffic peaks. The area tends to experience significant traffic during the weekend as well due to its proximity to Dell Range Boulevard corridor; turning movement counts were collected during an additional period on Saturday from noon to 1:00 PM. Turning movement counts were taken at the four study intersections.

The analysis of existing intersection operating conditions was done using Synchro 8.0 software and the 2000 Highway Capacity Manual for unsignalized and signalized intersections outputs for Level of Service (LOS). Intersection operation is typically evaluated on its LOS during peak traffic volume conditions. This analysis uses the *2000 Highway Capacity Manual* (HCM) for guidance on reporting LOS for the study intersections. Below is a description of LOS for traffic entering an intersection.

Table 1 – Intersection Level of Service Criteria

Alpha LOS	Numeric LOS	Signalized Delay (sec/veh)	Unsignalized Delay (sec/veh)	Description
A	1.01 to 2.00	< 10	< 10	No Congestion
B	2.01 to 3.00	> 10 – 20	> 10 – 15	No Congestion
C	3.01 to 4.00	> 20 – 35	> 15 – 25	Minimal Congestion
D	4.01 to 5.00	> 35 – 55	> 25 – 35	Moderate Congestion
E	5.01 to 6.00	> 55 – 80	> 35 – 50	Severe Congestion
F	> 6.00	> 80	> 50	Extreme Congestion

LOS is a numeric ranking with LOS 'A' requiring minimal driver interaction. This allows speed and vehicle path decisions to be unaffected by other roadway users, resulting in no congestion and minimal delays. In comparison, LOS 'F' requires constant driver interaction. Speed and vehicle paths are totally dictated by interaction with other users, resulting in high congestion levels and delays.

As previously noted, existing intersection traffic turning movement counts were collected during the weekday PM peak from 4:30 PM to 5:30 PM and during the weekend midday peak from noon to 1:00 PM. The turning movement counts were taken on the following days in 2014:

- Powderhouse Road/Melton Street – Wednesday, March 12, and Saturday, March 15
- Powderhouse Road/Carlson Street – Thursday, March 13, and Saturday, March 15
- Powderhouse Road/Storey Boulevard – Tuesday, March 18, and Saturday, March 29
- Storey Boulevard/Converse Avenue – Wednesday, March 19, and Saturday, March 29

Turning movement counts collected during these time periods are provided in Appendix B.

Table 2 summarizes the existing volume to capacity ratio, LOS, and delay for each intersection; all related Synchro analysis is provided in Appendix C. As shown in Table 2, all intersection traffic movements are currently operating at LOS 'C' or better during peak hour traffic conditions. LOS 'C' or better is considered acceptable for peak traffic period operation.

Table 2 – Existing Intersection Level of Service Summary

EXISTING 2014	**Powderhouse Rd.& Melton St.**		**Eastbound** (Stop Control)	**Westbound** (N/A)	**Northbound** (Free)	**Southbound** (Free)
	Weekday PM	v/c Ratio	0.15	--	0.03	0.3
		LOS	B	--	A	A
		Delay (sec)	12.5	--	1.0	0.0
	Weekend MD	v/c Ratio	0.09	--	0.03	0.29
		LOS	B	--	A	A
		Delay (sec)	12.0	--	0.9	0.0
EXISTING 2014	**Powderhouse Rd. & Carlson St.**		**Eastbound** (Stop Control)	**Westbound** (N/A)	**Northbound** (Free)	**Southbound** (Free)
	Weekday PM	v/c Ratio	0.34	--	0.12	0.19
		LOS	B	--	A	A
		Delay (sec)	13.4	--	3.2	0.0
	Weekend MD	v/c Ratio	0.32	--	0.1	0.22
		LOS	B	--	A	A
		Delay (sec)	13.3	--	3.1	0.0
EXISTING 2014	**Powderhouse Rd. & Storey Blvd.**		**Eastbound** (Signalized)	**Westbound** (Signalized)	**Northbound** (Signalized)	**Southbound** (Signalized)
	Weekday PM	v/c Ratio	0.78	0.42	0.27	0.19
		LOS	C	C	B	B
		Delay (sec)	28.4	20.7	15.4	14.9
	Weekend MD	v/c Ratio	0.44	0.43	0.26	0.23
		LOS	C	C	B	B
		Delay (sec)	22.9	20.4	12.1	12.1
EXISTING 2014	**Storey Blvd. & Converse Ave.**		**Eastbound** (Signalized)	**Westbound** (Signalized)	**Northbound** (Signalized)	**Southbound** (N/A)
	Weekday PM	v/c Ratio	0.70	0.47	0.36	--
		LOS	B	B	B	--
		Delay (sec)	15.7	13.6	10.0	--
	Weekend MD	v/c Ratio	0.39	0.45	0.14	--
		LOS	B	B	A	--
		Delay (sec)	14.8	15.7	5.0	--

Historic Crash Patterns

Historic traffic crash data was provided by WYDOT for the following street segments and time periods.

Table 3 – Crash Data Locations

ROADWAY	EVALUTION PERIOD	FROM	TO
Storey Blvd. from Powderhouse Rd. to Converse Ave.	6 Years, 5 Months	1/1/2009	5/1/2015
Powderhouse Rd. from Prairie Ave. to Storey Blvd.	6 Years, 5 Months	1/1/2009	5/1/2015
Rue Terre north of Dell Range Blvd.	6 Years, 5 Months	1/1/2009	5/13/2015
Prairie Ave. from Powderhouse Rd. to Dell Range Blvd.	6 Years, 5 Months	1/1/2009	5/13/2015

Several of the crashes reported from WYDOT were included in multiple reports for the intersections of the evaluated streets. The crash data was broken out by either intersection or roadway segment for evaluation. The intersection segment collision diagrams are provided in Appendix D. The original crash data provided by WYDOT is included in Appendix E along with the roadway segment and intersection crash statistics. Figure 3 illustrates the historic crash frequency pattern on the Section 20 study area street network.

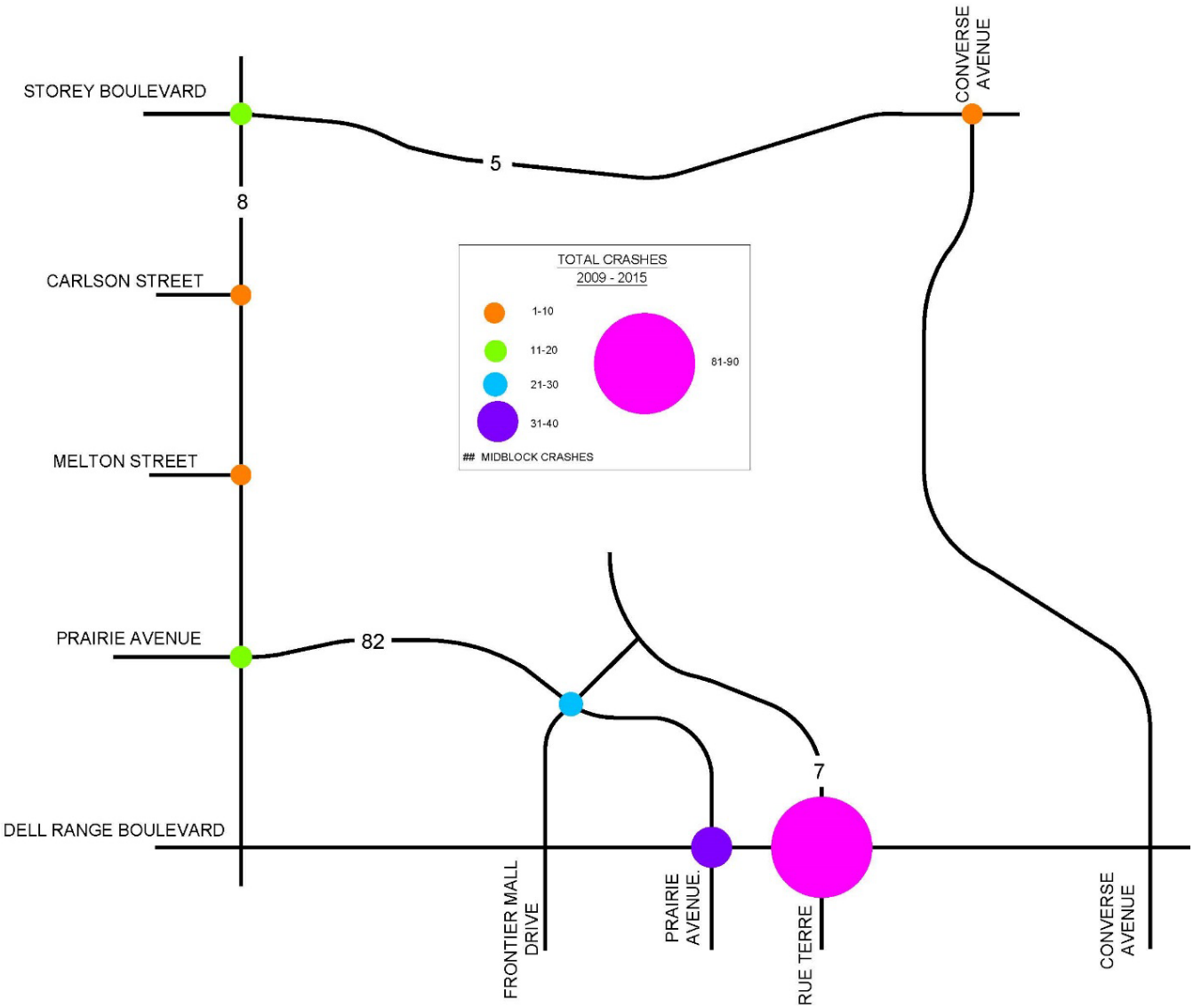

Figure 3 – Study Area Crash Frequency Pattern: 2009-2015

Intersection Crash Analysis

Table 4 and Table 5 summarize the historic crash frequency and collision patterns at the study intersections for the year 2009 through June 2015 time period with a crash analysis of each intersection described in the following text. As shown in Table 4 and in Table 5, the highest crash location is at the intersection of Dell Range and Rue Terre with 84 crashes. Other high crash locations are at the Prairie Avenue intersections including: Dell Range Boulevard with 38 crashes, Frontier Mall Drive with 26 crashes, and Powderhouse Road with 18 crashes. It is noted that a traffic safety analysis was completed as part of the Dell Range Boulevard Corridor Study with recommendations to mitigate existing traffic safety problems on Dell Range Boulevard.

Table 4 – Section 20 Intersection Crash History

SECTION 20 INTERSECTION CRASH HISTORY: 2009-JULY 2015								
INTERSECTION	CRASHES/YEAR							TOTAL
	2009	2010	2011	2012	2013	2014	2015	
POWDERHOUSE/PRAIRIE	0	4	1	1	6	6	0	18
POWDERHOUSE/MELTON	1	0	2	1	0	0	0	4
POWDERHOUSE/CARLSON	0	1	1	2	0	1	0	5
POWDERHOUSE/STOREY	4	3	0	1	1	2	1	12
STOREY/CONVERSE	1	0	2	0	1	2	1	7
RUE TERRE/DELL RANGE	18	18	8	10	12	12	6	84
PRAIRIE/FRONTIER MALL	4	0	4	6	5	6	1	26
PRAIRIE/DELL RANGE	5	6	5	7	8	5	2	38
TOTAL	3	15	4	6	5	6	5	194

Table 5- Section 20 Intersection Collision Patterns

SECTION 20 INTERSECTION CRASH PATTERNS: 2009-JULY 2015									
INTERSECTION	CRASHES/YEAR								TOTAL
	PDO	INJURY	FATALITY	ANGLE	REAR-END	HEAD-ON	SS-SAME	OTHER/UNKN.	
POWDERHOUSE/PRAIRIE	10	8	0	10	4	4	0	0	18
POWDERHOUSE/MELTON	3	1	0	2	1	0	0	1	4
POWDERHOUSE/CARLSON	5	0	0	0	4	1	0	0	5
POWDERHOUSE/STOREY	8	4	0	5	4	3	0	0	12
STOREY/CONVERSE	4	3	0	5	1	1	0	0	7
RUE TERRE/DELL RANGE	59	25	0	22	52	4	3	3	84
PRAIRIE/FRONTIER MALL	21	4	1	25	0	0	0	1	26
PRAIRIE/DELL RANGE	30	8	0	13	20	0	2	3	38
TOTAL	140	53	1	82	86	13	5	8	194

Powderhouse Road and Prairie Avenue Intersection

Over the evaluation period a total of 18 crashes were reported at the intersection of Powderhouse Road and Prairie Avenue. The number of crashes ranged from zero to 4 per year from 2009-2015. Of the crashes reported, a majority (75%) occurred during dry road conditions. Approximately 50% occurred during the midday period from 10:00 AM to 3:00 PM. 83% of the crashes occurred during daylight hours. Eight of the crashes (44%) resulted in injuries; no fatalities were reported during the evaluation period. The predominant crash type involved angle collisions, which comprised 56% of the total crashes.

Powderhouse Road and Melton Street Intersection

Over the evaluation period a total of 4 crashes were reported at the intersection of Powderhouse Road and Melton Street. The number of crashes ranged from 0 to 1 per year from 2009-2015. Of the crashes reported, all occurred during snowy/icy road conditions. Approximately 75% occurred during the midday period from 10:00 AM to 3:00 PM. 75% of the crashes occurred during daylight hours. One crash (25%) resulted in injuries; no fatalities were reported during the evaluation period. The predominant crash type involved angle collisions which comprised 50% of the total crashes.

Powderhouse Road and Carlson Street Intersection

Over the evaluation period a total of 5 crashes were reported at the intersection of Powderhouse Road and Carlson Street. The number of crashes ranged from 0 to 2 per year from 2009-2015, with 2 crashes occurring in 2012. Of the crashes reported, all occurred during dry road conditions. The crashes were spread out throughout the day and did not have a dominant time period. Crashes were reported predominantly during daylight conditions: 60% occurred during daylight hours. None of the crashes resulted in injury, and no fatalities were reported during the evaluation period. The predominant crash type was rear-end, which comprised 80% of the total crashes.

Powderhouse Road and Storey Boulevard Intersection

Over the evaluation period a total of 12 crashes were reported at the intersection of Powderhouse Road and Storey Boulevard. The number of crashes ranged from 0 to 4 per year from 2009-2015, with 4 crashes occurring in 2009. Of the crashes reported, 83% occurred during dry road conditions. The crashes recorded occurred more frequently (67%) in the PM peak period from 3:00 PM to 7:00 PM. Crashes were evenly (50/50) split between daylight and dark conditions. Four of the crashes resulted in injuries; no fatalities were reported during the evaluation period. The crash types recorded were split between rear-end (33%), head-on (25%), and angle (42%).

Storey Boulevard and Converse Avenue Intersection

Over the evaluation period a total of 7 crashes were reported at the intersection of Storey Boulevard and Converse Avenue. The number of crashes was steady each year, ranging from 0 to 2 in the evaluation period. Of the crashes reported, 43% occurred during dry road conditions and 43% occurred during icy road conditions. The crashes recorded occurred more frequently (57%) in the PM peak period from 3:00 PM to 7:00 PM. Crashes were reported primarily during daylight hours (71%). Three of the crashes resulted in injuries; no fatalities were reported during the evaluation period. The predominant crash type involved angle collisions, which compromised 71% of the total crashes.

Rue Terre and Dell Range Boulevard Intersection

Over the evaluation period a total of 84 crashes were reported at the intersection of Rue Terre and Dell Range Boulevard. The number of crashes was fairly steady each year, ranging from 6 to 18 in the evaluation period, with 18 crashes occurring in both 2009 and 2010. Of the crashes reported, 86% occurred during dry road conditions. The crashes recorded occurred more frequently in the midday peak period from 10:00 AM to 3:00 PM (44%) and the PM peak period from 3:00 PM to 7:00 PM (42%). 84% of the crashes occurred during daylight hours. Twenty-five of the crashes resulted in injuries; no fatalities were reported during the evaluation period. The predominant crash type involved rear-end collisions, 62%

Prairie Avenue and Frontier Mall Drive Intersection

Over the evaluation period a total of 26 crashes were reported at the intersection of Prairie Avenue and Frontier Mall Drive. The number of crashes was steady each year, ranging from 0 to 6 in the evaluation period, with 6 crashes occurring in both 2012 and 2014. Of the crashes reported, 96% occurred during dry road conditions. The crashes recorded occurred more frequently (65%) during the midday peak period from 10:00 AM to 3:00 PM. 85% of the crashes were reported during daylight hours. Four of the crashes resulted in injuries; one

fatality was reported during the evaluation period. The fatality crash report indicated that a vehicle was attempting to turn left from Prairie Avenue onto Frontier Mall Drive when the vehicle was struck by another vehicle speeding on Prairie Avenue. The fatal crash was classified as a right-angle collision. Of the 26 crashes recorded, 25 (96%) were classified as angle collisions, showing a predominant trend.

Prairie Avenue and Dell Range Boulevard Intersection

Over the evaluation period a total of 38 crashes were reported at the intersection of Prairie Avenue and Dell Range Boulevard. The number of crashes was steady each year, ranging from 2 to 8 in the evaluation period, with 8 crashes occurring in 2013. Of the crashes reported, 79% occurred during dry road conditions. The crashes recorded occurred more frequently during the midday peak period from 10:00 AM to 3:00 PM (50%) and the PM peak period from 3:00 PM to 7:00 PM (39%). 76% of the crashes were reported during daylight hours. Eight of the crashes resulted in injuries; no fatalities were reported during the evaluation period. The crashes recorded were predominantly rear-end (53%) and angle collisions (34%).

Street Segment Crash Analysis

Table 6 and Table 7 summarize the historic crash frequency and collision patterns on the study area street segments for the year 2009 through June 2015 time period with a crash analysis for each segment described in the following text. As shown on Table 6, the highest crash street segment involves Prairie Avenue from Powderhouse Road to Dell Range Boulevard with 82 crashes.

Table 6 – Section 20 Street Segment Crash History

SECTION 20 SEGMENT CRASH HISTORY: 2009-JULY 2015								
SEGMENT	CRASHES/YEAR							TOTAL
	2009	2010	2011	2012	2013	2014	2015	
POWDERHOUSE	1	0	0	2	3	0	1	7
STOREY	1	0	0	2	1	1	0	5
RUE TERRE	1	2	1	0	3	0	0	7
PRAIRIE	19	16	13	8	14	11	1	82
TOTAL	22	18	14	12	21	12	2	101

Table 7 – Section 20 Street Segment Collision Patterns

SECTION 20 SEGMENT CRASH HISTORY: 2009-JULY 2015									
SEGMENT	CRASHES/YEAR								TOTAL
	PDO	INJURY	FATALITY	ANGLE	REAR-END	HEAD-ON	SS-SAME	OTHER/UNKN.	
POWDERHOUSE	6	1	0	0	2	0	2	3	7
STOREY	4	1	0	0	2	0	1	2	5
RUE TERRE	6	1	0	6	0	0	0	1	7
PRAIRIE	56	26	0	60	3	2	5	12	82
TOTAL	72	29	0	66	7	2	8	18	101

Powderhouse Road from Prairie Avenue to Storey Boulevard

Over the evaluation period a total of 7 crashes were reported along the roadway study segment of Powderhouse Road. The number of crashes per year remained relatively stable from 2009-2015 with 1 crash on average per year. Of the crashes reported, a majority (71%) occurred during dry road conditions. Approximately 57% of the crashes occurred during the PM peak time period from 3:00 PM to 7:00 PM and the remaining 43% occurred during the midday period from 10:00 AM to 3:00 PM. 86% of the crashes occurred during daylight hours. One of the crashes resulted in injuries; no fatal crashes were reported during the evaluation period. The segment did not appear to have a predominant collision pattern.

Storey Boulevard from Powderhouse Road to Converse Avenue

Over the evaluation period a total of 5 crashes were reported along the street study segment of Storey Boulevard. The number of crashes per year remained relatively stable from 2009-2015 with 1 crash on average per year; 2 crashes were reported in 2012 while no crashes were reported in several other years. Of the crashes reported, a majority (60%) occurred during dry road conditions. The reported crashes were spread out throughout the day and were not concentrated during a peak period, although 80% occurred during daylight hours. One of the crashes resulted in injuries; no fatal crashes were reported during the evaluation period. The segment did not have a predominant collision pattern.

Rue Terre north of Dell Range Boulevard

Over the evaluation period a total of 7 crashes were reported on Rue Terre north of Dell Range Boulevard. This total includes crashes reported at access points to commercial developments along the roadway as well as on the roadway segments between accesses. The number of crashes recorded was minimal; this may be due to the fact that during the evaluation period the north end of Rue Terre was a dead end, therefore the road only provided access to commercial developments and was not a through street. Of the crashes reported 71% occurred during dry road conditions. 71% occurred during the midday period from 10:00 AM to 3:00 PM. Crashes were reported predominantly during daylight conditions with 86% occurring during daylight hours. One crash resulted in injury; no fatal crashes were reported during the evaluation period. The predominant crash type for this segment is angle crashes, which comprised 86% of the total crashes.

Prairie Avenue from Powderhouse Road to Dell Range Boulevard

Over the evaluation period a total of 82 crashes were reported along the study segment of Prairie Road. The number of crashes per year averaged 14/year from 2009-2014. The evaluation period for 2015 does not include the entire year, therefore the number of crashes recorded is lower than the average. Of the crashes reported, a majority (83%) occurred during dry road conditions. Approximately 54% occurred during the midday period from 10:00 AM to 3:00 PM, and 30% of the crashes occurred during the PM peak time period from 3:00 PM to 7:00 PM. 81% of the crashes occurred during daylight hours. Twenty-six of the crashes (32%) resulted in injuries with no fatalities reported during the evaluation period. The predominant crash type involved angle collisions, which comprised 73% of the total crashes.

FUTURE STREET NETWORK

As a starting point, Ayres Associates used the proposed roadway network for Section 20 from the "2040 Roadway Vision" in the *Cheyenne Area Master Transportation Plan*, City of Cheyenne Version, adopted April 2014 and shown in Figure 4. As the study progressed the proposed street network was more closely examined and reevaluated based on input from the landowners.

Based on an evaluation of landowner comments and the PlanCheyenne 2040 Roadway Vision for Section 20 it is recommended that the following network of collector streets be constructed inside Section 20. Storey Boulevard to the north of the analysis area was originally constructed with two planned future north-south roadway connections to Prairie Avenue. These two connections are shown as streets "8e" and "8f" in Figure 4. It is anticipated that an east-west collector between Storey Boulevard and Prairie Avenue will alleviate some of the congestion on Dell Range Boulevard. This collector has been labeled "8d" and will align with Carlson Street on the west side of Powerhouse Road and connect to Converse Avenue on the east. Carlson Street west of Powderhouse Road is an existing collector roadway that connects to Yellowstone Road, an arterial roadway. The *Cheyenne Area Master Transportation Plan* also included a second east-west collector roadway that would align with Melton Street on the west side of Powderhouse. During this study it was determined that this second east-west collector would not significantly reduce traffic volumes on Dell Range Boulevard but it could increase the volume of traffic on existing Melton Street west of Powderhouse Road. Melton Street is classified as a local road leading into the Indian Hills subdivision, which is zoned as a Low Density Residential (LR-1, LR-2) neighborhood. Additionally, because Melton Street does not connect to an arterial roadway, making this east-west connection at Melton Street, through Section 20, is not recommended. A local road is recommended at Melton Street, between Powderhouse Road and street "8e," to provide access to the road network and the future development inside Section 20. The proposed street network evaluated for this report is shown in Figure 5.

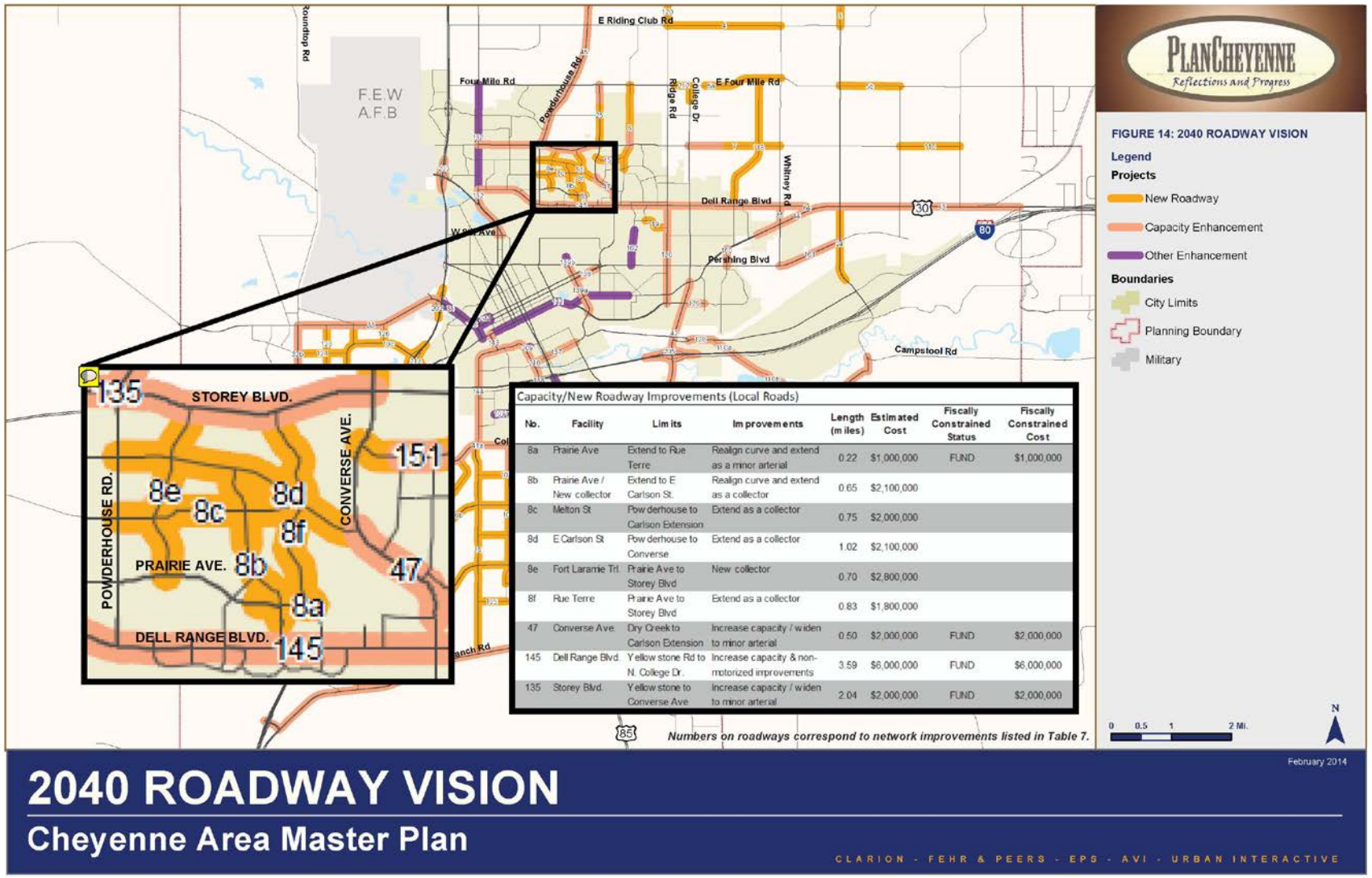

Figure 4 – PlanCheyenne 2040 Roadway Vision Section 20

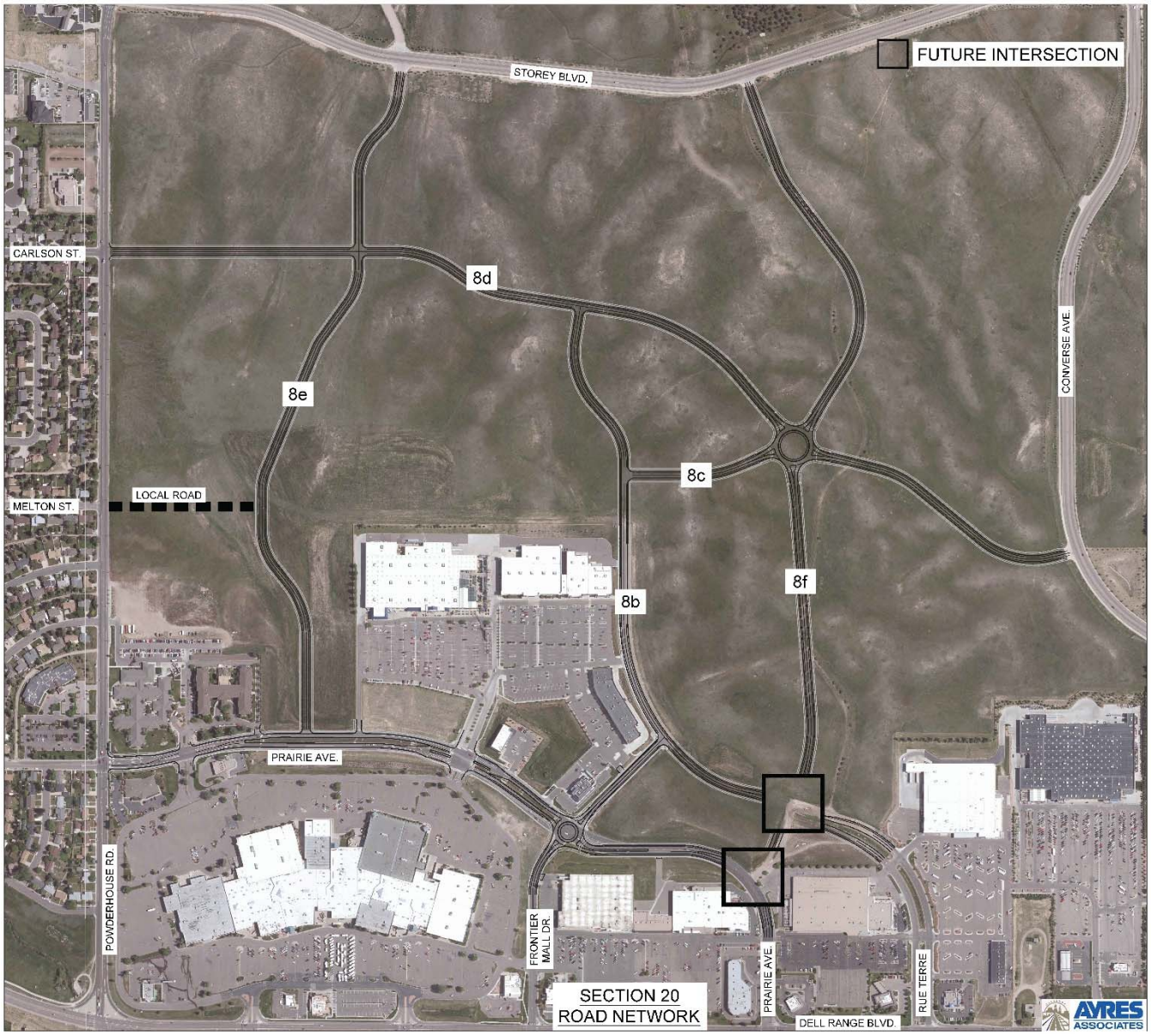

Figure 5 – Section 20 Proposed Street Network

The exact horizontal and vertical alignment of these roadways may vary from those shown in the plan and profiles contained in Appendix F. Alignment of the collector roadways have been preliminarily located based on existing topography and potential future detention pond locations.

Year 2040 Traffic Projections

The Cheyenne MPO provided year 2040 traffic volume projections for the Section 20 roadway network based on the MPO's Transportation Analysis Zone (TAZ) model. The model includes full land use development of Section 20. Section 20 land development by the year 2040 is projected to include a mix of retail, office, residential, medical, hotel, and school development. The MPO TAZ model indicated that a fully built-out Section 20 will

generate a total of approximately 56,000 trips per day. Figure 6 shows the projected future traffic volumes without a defined connected street network within Section 20.

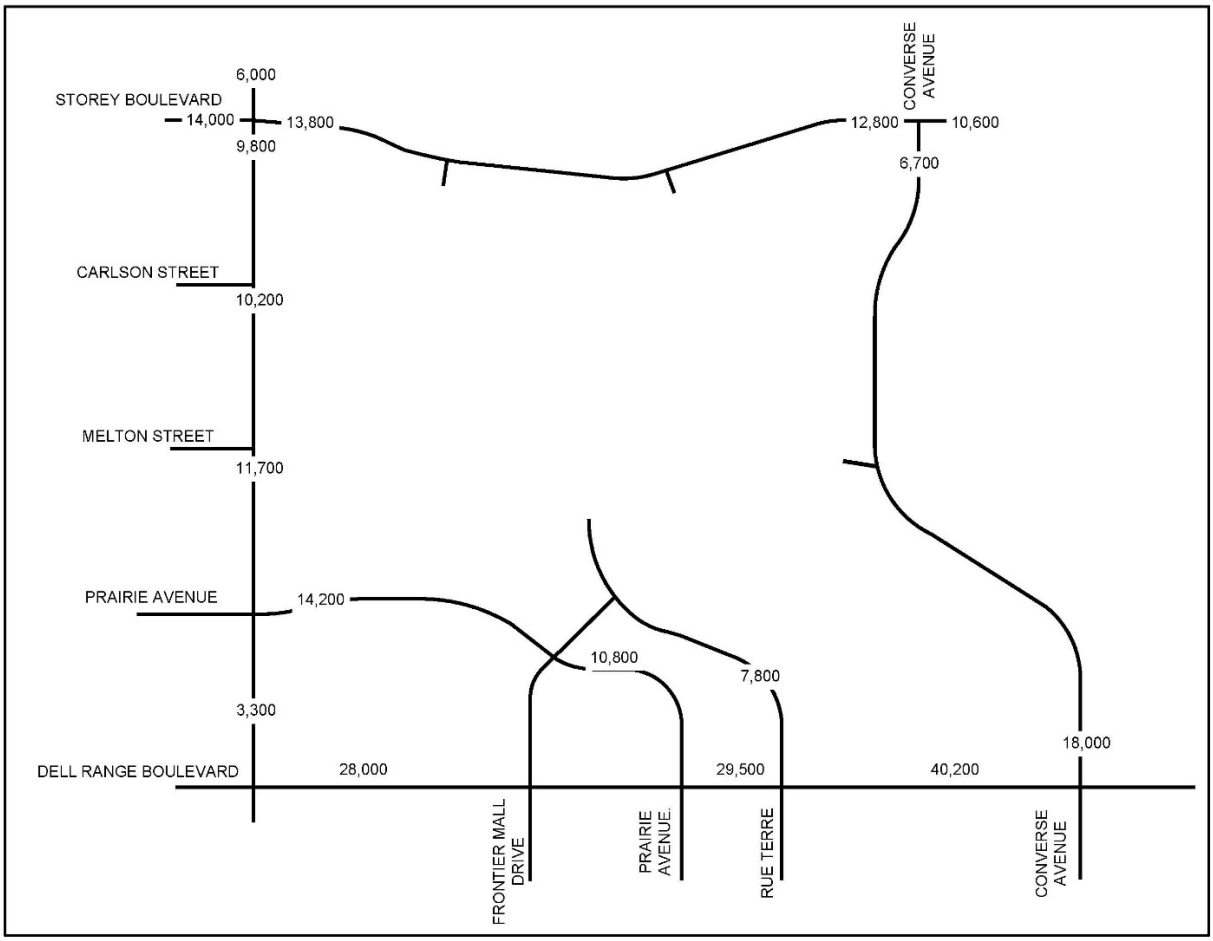

Figure 6 – Future Daily Traffic Volumes Without a Connected Section 20 Street Network

The Figure 6 traffic projections for Section 20 with a full build-out development scenario indicates that existing volumes on Dell Range Boulevard will increase from an existing 29,200 vpd to 40,200 vpd with similar increases on Converse Avenue from 10,700 vpd to 18,000 vpd; on Storey Boulevard from 7,500 vpd to 13,800 vpd; on Prairie Avenue from 8,900 vpd to 14,200 vpd; and on Powderhouse Road from 9,400 vpd to 11,700 vpd.

The MPO also prepared a traffic projection analysis of Section 20 with a connected internal street network as shown on Figure 7. Figure 7 shows the projected year 2040 traffic volumes expected with full land use development of Section 20 and its internal roadway network. The traffic projections represent the basic proposed street network for Section 20 with and without a direct east/west connection to Melton Street. If a Melton Street connection is constructed it would carry 6,100 vpd in the year 2040. The connection of Melton Street to Powderhouse Road has the effect of improving Section 20 accessibility and reducing circuitous travel on other Section 20 roadway network links. Overall, the difference in traffic levels on the Section 20 street network with or without a Melton Street connection does not create major changes in street traffic levels that would require a change in design parameters, such as adding additional traffic lanes.

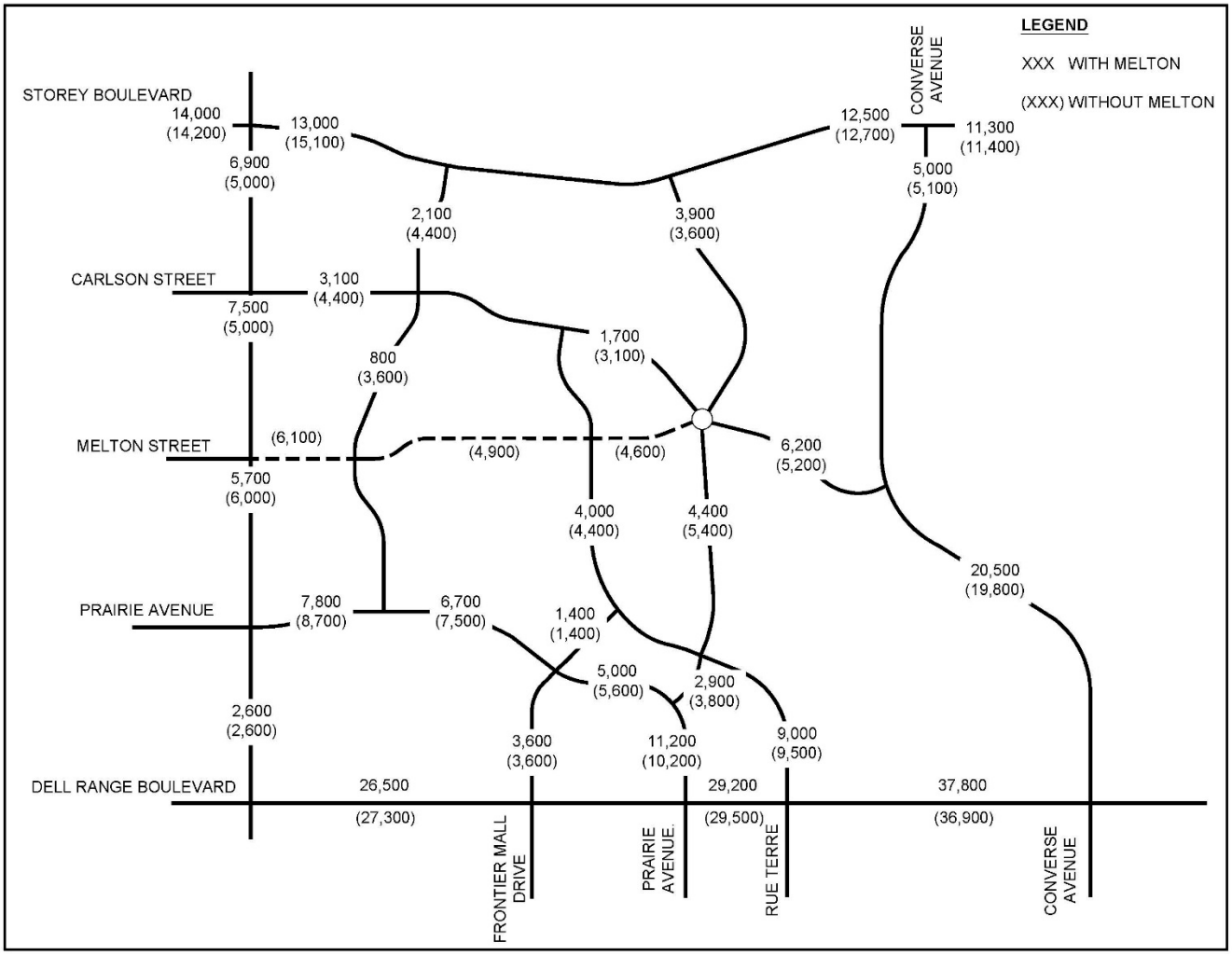

Figure 7 – Section 20 Year 2040 Development Daily Traffic Volumes with a Connected Street Network (MPO Supplied Volumes based on TAZ data)

A comparison of the year 2040 projected Section 20 traffic volumes shown on Figure 7 to existing traffic levels previously shown on Figure 2 indicates that traffic on Dell Range Boulevard is expected to increase significantly from 28,200 vpd to 37,800 vpd, an increase of 34%, over the next 25 years. It is noted that without a connected internal street system in Section 20, year 2040 traffic on Dell Range Boulevard is projected to reach a volume of 40,200 vpd. Likewise daily traffic on Converse Avenue is also expected to significantly increase from 10,700 vpd to 20,500 vpd, or by about 92%. Interestingly, with a connected complete internal network in Section 20, traffic volumes on Powderhouse Road south of Melton Street are projected to decrease from about 9,400 vpd to 5,700 vpd and on Prairie Avenue east of Frontier Mall Drive from 9,100 vpd to 5,600 vpd.

A comparison of the future traffic projections in Figure 6 to projections for the same land use development assumptions shown in Figure 7 indicates that an internal connected Section 20 street network will reduce traffic pressure on Dell Range Boulevard by lowering future traffic volumes from 40,200 vpd to 37,000 vpd. Dell Range Boulevard has been identified in the Dell Range Boulevard Corridor Study as experiencing significant traffic congestion and safety problems. Similar connected street network traffic volume reductions are also identified

on Prairie Avenue from 14,200 vpd to 7,800 vpd and on Powderhouse Road from 11,700 vpd to 7,600 vpd. Based on this comparison of street network impacts with an internal connected Section 20 street network, it is expected that traffic conflicts on the adjacent street system bordering Section 20 will be greatly reduced, resulting in improved traffic flow and accessibility to future development within Section 20.

Street Design

All roadways within Section 20 will adhere to the requirements of the Cheyenne Unified Development Code (UDC) for technical design criteria. This includes geometric and urban design standards, access separation, grades, and speed limits, among others. Figure 8 shows the cross section for Section 20 in accordance with a Collector Type A Street, Section 4.3, Cheyenne UDC October 14, 2015. Conceptual plans have been developed for the roadways inside Section 20. These plan and profile sheets are located in Appendix F.

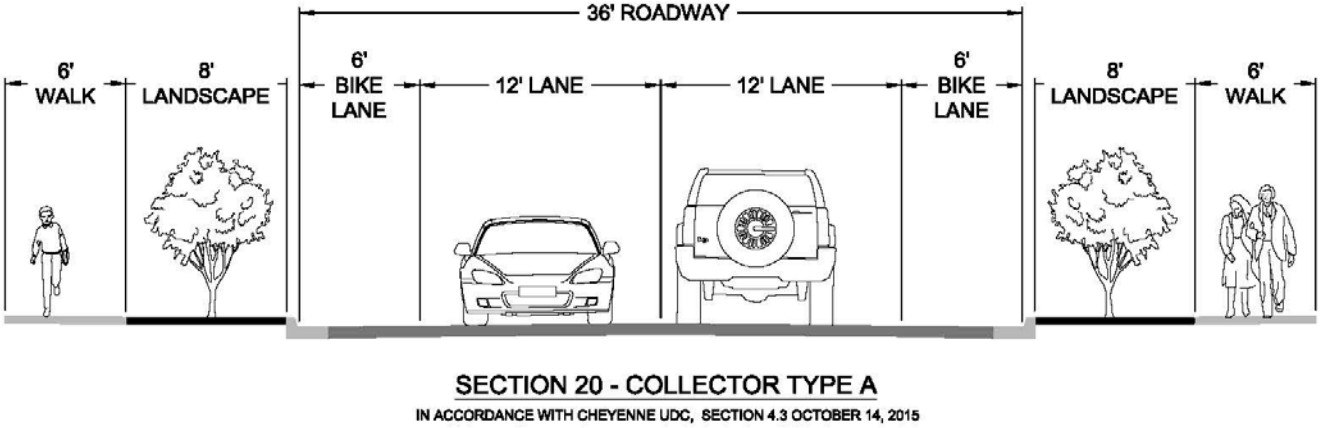

Figure 8 – Section 20 Roadway Cross Section

Preliminary Intersection Design

The Section 20 proposed street network contains numerous intersections. This network previously referenced in Figure 5 is shown again below. Several intersections shown in Figure 5 and listed below have black squares drawn around them. These three intersections have been identified, through this planning effort, as requiring additional design detailing and operational analysis as adjacent development occurs. These intersections are:

- Frontier Mall Drive and Prairie Avenue
- Cutoff Road and Prairie Avenue
- Rue Terre and Cutoff Road

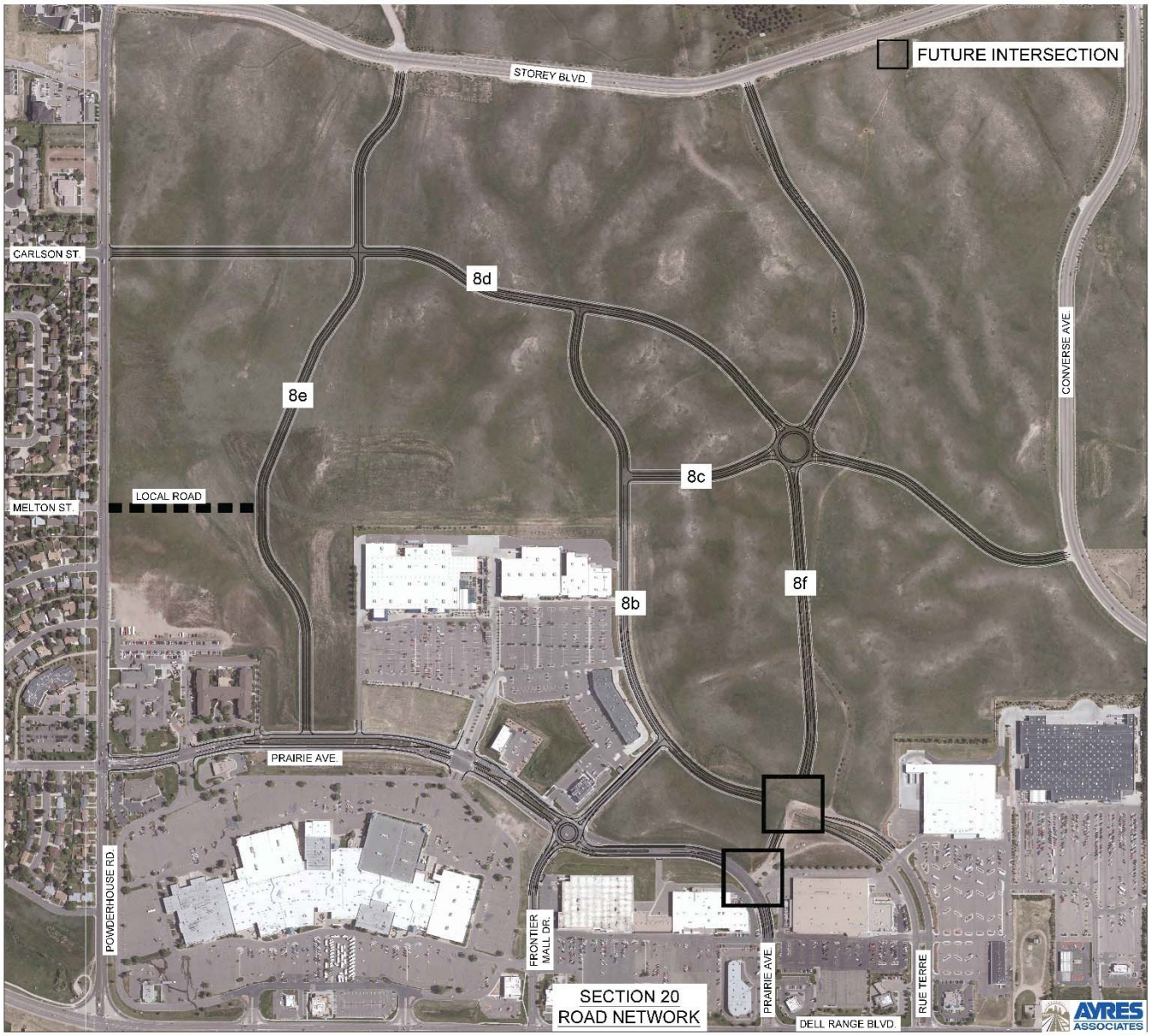

Figure 5 – Section 20 Proposed Road Network

The Cheyenne UDC states that a Traffic Impact Study (TIS) is required for all new developments within the City of Cheyenne, unless this requirement is waived by the City Engineer. The TIS must include an analysis of all adjacent streets, intersections, high-volume driveways, nearest off-site major intersections, and internal roads[1]. The TIS must analyze the following: existing traffic conditions; future traffic conditions without the proposed development; and future traffic forecasts with the proposed development. As part of the proposed intersection analysis the TIS shall provide recommended traffic-control devices for intersections; these may include stop-control and yield control signs, school flashers, crosswalks, traffic signals or roundabouts.[2] Without knowing the

[1] Section 3.1.3,d,UDC, Amended October 14, 2015
[2] Section 3.1.4,a,14, UDC, Amended October 14, 2015

type of development that may occur, it is premature at this time to indicate the type of intersection that will function best at these three intersections.

The TIS must include a crash analysis that identifies geometric deficiencies for high-accident locations. As part of the analysis, the applicant shall identify problems that currently exist and how the proposed improvements will mitigate these problems[3]. The intersection of Frontier Mall Drive and Prairie Avenue is a location with many angle crashes, indicating a potential geometric deficiency. Development inside Section 20 will likely increase the amount of traffic at this intersection, which will warrant an intersection analysis. The existing horizontal curve on Prairie Avenue between the Target/PetCo site and the Kmart site is a high-accident location. The geometrics of this curve, coupled with the traffic patterns associated with the access points to the shopping destinations, cause this portion of Prairie Avenue to be a high-accident location as well.

Figure 9 – Prairie Avenue Horizontal Curve at Petco/Kmart Access

The future intersection of Prairie Avenue and Cutoff Road is planned just north of the existing access to shopping destinations. Developers of property adjacent to Prairie Avenue, Rue Terre, and Cutoff Road will submit a TIS inclusive of an intersection analysis as part of the development process. The intersection type and configuration will be studied and selected at that time. Other intersections inside Section 20 have been included in Figure 5, but are likewise subject to the same TIS requirements with a development plan.

One of the intersections in Section 20 has been conceptually drawn as a roundabout controlled intersection. The final intersection design will be determined through the development process and the TIS analysis.

[3] Section 3.1.4,a,2(c), UDC Amended October 14, 2015

As prescribed in the UDC, all intersections adjacent to proposed development will be analyzed for capacity and safety. It is recommended that with any future proposed development adjacent to Cutoff Road, Rue Terre, or Prairie Avenue that both the intersections of Prairie Avenue and Cutoff Road, as well as the intersection of Cutoff Road and Rue Terre, be analyzed in the traffic report. These two proposed intersections will likely be spaced relatively close together. Proposed intersection type and traffic control of one intersection will likely influence the other adjacent intersection.

Based on the traffic levels projected for the year 2040 it may be expected to install traffic signals at the Converse Avenue intersection with 8c and at the Powderhouse Road intersection with Carlson Street. Similar considerations may apply to the Storey Boulevard intersections with the 8e and 8f north/south streets proposed as part of the Section 20 street network. Traffic signals should not be installed in advance of future traffic volumes reaching specific levels as defined in the national Manual on Uniform Traffic Control Devices (MUTCD). It is therefore recommended that hourly traffic volumes be monitored at these intersections as Section 20 development generates new traffic at the study intersections.

A preliminary year 2040 peak period traffic operation analysis was conducted for the Powderhouse Road intersections with Melton Street, Carlson Street, and Storey Boulevard; at the Storey Boulevard intersections with 8e, 8f, and Converse Avenue; and at the Converse Avenue intersection with 8d, under basic intersection geometric considerations. Table 8 summaries the year 2040 peak period operation projected for these intersections. The full Synchro analysis results are provided in Appendix G.

Table 8 – Year 2040 Intersection Level of Service Summary

PROPOSED 2040	Powderhouse Rd.& Melton St.		Eastbound (Stop Control)	Westbound (N/A)	Northbound (Free)	Southbound (Free)
	Weekday PM	v/c Ratio	0.17	--	0.17	0.24
		LOS	B	--	A	A
		Delay (sec)	10.5	--	8.2	0.0
	Weekend MD	v/c Ratio	0.04	--	0.13	0.27
		LOS	B	--	A	A
		Delay (sec)	10.6	--	8.3	0.0
PROPOSED 2040	Powderhouse Rd. & Carlson St.		Eastbound (Stop Control)	Westbound (Stop Control)	Northbound (Free)	Southbound (Free)
	Weekday PM	v/c Ratio	0.31	0.25	0.15	0.16
		LOS	C	C	A	A
		Delay (sec)	15.8	18.7	2.5	1.8
	Weekend MD	v/c Ratio	0.31	0.36	0.13	0.18
		LOS	C	D	A	A
		Delay (sec)	15.9	19.7	2.6	1.9
PROPOSED 2040	Powderhouse Rd. & Storey Blvd.		Eastbound (Signalized)	Westbound (Signalized)	Northbound (Signalized)	Southbound (Signalized)
	Weekday PM	v/c Ratio	0.78	0.61	0.28	0.27
		LOS	C	B	B	B
		Delay (sec)	20.5	15.6	14.7	14.6
	Weekend MD	v/c Ratio	0.39	0.57	0.28	0.33
		LOS	B	B	B	B
		Delay (sec)	15.6	14.9	13.1	13.5
PROPOSED 2040	Storey Blvd. & Road 8e (West Intersection)		Eastbound (Free)	Westbound (Free)	Northbound (Stop Control)	Southbound (N/A)
	Weekday PM	v/c Ratio	0.29	0.40	0.32	--
		LOS	A	A	C	--
		Delay (sec)	0.0	8.9	15.7	--
	Weekend MD	v/c Ratio	0.12	0.20	0.29	--
		LOS	A	A	B	--
		Delay (sec)	0.0	8.2	14.1	--
PROPOSED 2040	Storey Blvd. & Road 8f (East Intersection)		Eastbound (Free)	Westbound (Free)	Northbound (Stop Control)	Southbound (N/A)
	Weekday PM	v/c Ratio	0.36	0.40	0.72	--
		LOS	A	A	E	--
		Delay (sec)	0.0	9.2	42.5	--
	Weekend MD	v/c Ratio	0.14	0.21	0.41	--
		LOS	A	A	C	--
		Delay (sec)	0.0	8.0	15.1	--
PROPOSED 2040	Storey Blvd. & Converse Ave.		Eastbound (Signalized)	Westbound (Signalized)	Northbound (Signalized)	Southbound (N/A)
	Weekday PM	v/c Ratio	0.60	0.44	0.34	--
		LOS	B	B	A	--
		Delay (sec)	10.9	15.0	7.0	--
	Weekend MD	v/c Ratio	0.33	0.41	0.14	--
		LOS	A	B	A	--
		Delay (sec)	8.6	16.1	3.7	--
PROPOSED 2040	Converse Ave. & Road 8d (South Intersection)		Eastbound (Stop Control)	Westbound (N/A)	Northbound (Free)	Southbound (Free)
	Weekday PM	v/c Ratio	0.60	--	0.41	0.19
		LOS	D	--	A	A
		Delay (sec)	26.6	--	9.0	0.0
	Weekend MD	v/c Ratio	0.24	--	0.08	0.14
		LOS	B	--	A	A
		Delay (sec)	11.2	--	2.5	0.0

The peak hour LOS analysis summarized in Table 8 assumes that the new Section 20 street connections to Powderhouse Road, Storey Boulevard, and Converse Avenue will operate with partial stop sign control. As shown in Table 8, all intersection traffic movements will be operating at LOS 'C' or better during peak hour traffic conditions except for the westbound approach to Carlson Street at Powderhouse Road, which operates at LOS 'D' during the Saturday midday peak traffic period; the northbound approach at the intersection of street 8f with Storey Boulevard, which will operate at LOS 'E' during the weekday evening peak traffic period; and the eastbound approach of street 8d to Converse Avenue, which is expected to operate at LOS 'D' during the weekday evening peak traffic period. As previously noted, LOS 'C' peak hour operation is considered an acceptable operating condition. When an intersection operates at LOS 'D' through 'F' conditions it typically requires additional improvements to bring it back to LOS 'C' operation.

Table 9 summarizes operation improvement with the installation of traffic signals to improve traffic operation to LOS 'C' peak hour conditions.

Table 9 – Year 2040 Intersection Level of Service Summary with Selected Traffic Signal Installation

PROPOSED 2040 W/ SIGNAL	**Storey Blvd. & Road 8e (West Intersection)**		**Eastbound** (Signalized)	**Westbound** (Signalized)	**Northbound** (Signalized)	**Southbound** (N/A)
	Weekday PM	v/c Ratio	0.44	0.61	0.12	--
		LOS	A	A	B	--
		Delay (sec)	4.4	4.0	14.1	--
	Weekend MD	v/c Ratio	0.20	0.36	0.17	--
		LOS	A	A	B	--
		Delay (sec)	3.7	3.2	14.1	--
PROPOSED 2040 W/ SIGNAL	**Storey Blvd. & Road 8f (East Intersection)**		**Eastbound** (Signalized)	**Westbound** (Signalized)	**Northbound** (Signalized)	**Southbound** (N/A)
	Weekday PM	v/c Ratio	0.55	0.61	0.24	--
		LOS	A	A	B	--
		Delay (sec)	5.9	7.8	18.5	--
	Weekend MD	v/c Ratio	0.29	0.42	0.21	--
		LOS	A	A	B	--
		Delay (sec)	8.4	8.7	11.9	--
PROPOSED 2040 W/ SIGNAL	**Converse Ave. & Road 8d (South Intersection)**		**Eastbound** (Signalized)	**Westbound** (N/A)	**Northbound** (Signalized)	**Southbound** (Signalized)
	Weekday PM	v/c Ratio	0.16	--	0.59	0.27
		LOS	B	--	A	A
		Delay (sec)	14.4	--	5.2	3.6
	Weekend MD	v/c Ratio	0.12	--	0.26	0.01
		LOS	A	--	A	A
		Delay (sec)	8.8	--	3.6	3.9

As shown in Table 9, the installation of traffic signals at the Powderhouse Road intersection with Carlson Street, the Storey Boulevard intersection with street 8f, and the Converse Avenue intersection with street 8d are expected to operate at LOS 'C' or better during peak traffic time periods in the year 2040. It is noted that hourly traffic volumes should be monitored at these three intersections to determine when they may meet the warrants for traffic signal consideration as set forth in the MUTCD. Premature installation of traffic signals without meeting the MUTCD warrant standards can create additional traffic crashes.

It is also recommended that any future proposed development adjacent to Cutoff Road, Rue Terre, or Prairie Avenue submit a traffic impact study for the intersection of Prairie Avenue and Cutoff Road, as well as the

intersection of Cutoff Road and Rue Terre. These two proposed intersections will likely be spaced relatively close together. Proposed intersection type and traffic control of one intersection can influence control of the adjacent intersection.

SUMMARY

This study examines existing intersection traffic operation and safety on the roadways surrounding Section 20. Its purpose is to provide a framework for design of a future Section 20 street network that provides connectivity within and to the adjacent roadways, while reducing the need for traffic to use Dell Range Boulevard as the only access to existing and future Section 20 development.

Currently, Powderhouse Road carries approximately 9,400 vpd, Storey Boulevard carries 7,500 vpd, Converse Avenue carries 10,700 vpd, Prairie Avenue carries 9,100 vpd, Rue Terre carries 9,900 vpd, and Dell Range Boulevard carries 29,500 vpd. From this study it is concluded that the existing Section 20 intersections of Powderhouse Road with Melton Street, Carlson Street, and Storey Boulevard and the Converse Avenue intersection with Storey Boulevard are currently operating with all peak hour movements at LOS 'C' or better conditions.

This report also shows there were a total of 194 intersection crashes reported on the existing Section 20 area street network over the 2009 through May 2015 time period. The highest crash intersections are located at the Rue Terre intersection with Dell Range Boulevard (84 crashes) and Prairie Avenue intersections with Dell Range Boulevard (38 crashes), Frontier Mall Drive (26 crashes), and Powderhouse Road (18 crashes). Prairie Avenue is identified as the study area street segment with the highest number of crashes with a total of 82 crashes between Powderhouse Road and Dell Range Boulevard.

The "2040 Roadway Vision" in the *Cheyenne Area Master Transportation Plan* was used as a base model to compare Section 20 street network traffic projections. Without a connected Section 20 street network it is projected that traffic volumes by the year 2040 will reach 40,200 vpd on Dell Range Boulevard, 11,700 vpd on Powderhouse Road, and 14,200 vpd on Prairie Avenue. Dell Range Boulevard has been reported to already be experiencing peak traffic congestion problems in the *Dell Range Boulevard Corridor Study* and is projected to experience higher traffic congestion levels by the year 2040, which may require reconstruction to a 6-lane roadway. The results of this study with traffic projections for a connected Section 20 street system show a reduction in adjacent street traffic levels for the year 2040 with volumes on Dell Range Boulevard of 37,000 vpd, Powderhouse Road volumes of 7,600 vpd, and Prairie Avenue volumes of 10,200 vpd. A secondary analysis was conducted to compare the connected Section 20 street network without an intersection with Melton Street. That analysis concluded that year 2040 traffic volume impacts did not significantly change with or without a Melton Street connection to Section 20.

Finally, an analysis was conducted for all existing and new connected street network intersections with Section 20. With year 2040 projected traffic, all study intersections are expected to operate at LOS 'C' or better except for the westbound approach to Carlson Street at Powderhouse Road, which operates at LOS 'D' during the Saturday midday peak traffic period; the northbound approach of street 8f to Storey Boulevard, which will

operate at LOS ‘E’ during the weekday evening peak traffic period; and the eastbound approach of street 8d to Converse Avenue, which is expected to operate at LOS ‘D’ during the weekday evening peak traffic period. Peak hour traffic operation at these three intersections can be improved to LOS ‘C’ and better with the future installation of traffic signals. Future traffic should be monitored to assure that the MUTCD warrants for traffic signals are met to avoid increasing traffic safety problems.

This study also concluded that any future proposed development adjacent to either Cutoff Road, Rue Terre, or Prairie Avenue should require a detailed traffic analysis as part of the required Traffic Impact Study for the intersection of Prairie Avenue and Cutoff Road and the intersection of Cutoff Road and Rue Terre. These two proposed intersections will likely be spaced relatively close together, with operations at one intersection affecting the other.