Metropolitan Planning Organization

MEMO

TO: **Laramie County Planning Commission Members**

FROM: **Tom Mason, MPO Director**

SUBJECT: **January 12, 2017 County Planning Commission**
Planning Commission Approval of 10% Corridor Plan

DATE: **December 27, 2016**

The MPO contracted with Western Research and Development, LLC to prepare a 10% Design Plan for the future arterial of Storey Boulevard/Summit Road to Whitney Road and future collector Van Buren Avenue north of Dell Range to the Storey future alignment. The plan will be on the January 12th Laramie County Planning Commission agenda for recommendation of approval to the BOCC on February 7, 2017. The draft plan can be found at:
http://www.plancheyenne.org/wp-content/uploads/2013/03/Study-Report-V6-Nov-2nd.pdf

In addition, an Official Map amendment for the proposed Storey and Van Buren alignments will be presented to the City Planning Commission during a Public Hearing on January 17, 2017 and then forwarded to the City Governing Body to adopt by ordinance on January 23rd.

More information regarding this action can be obtained by contacting our office at 638-4385.

Thank you for your time.

Official Map for Storey Boulevard/Summit Road and Van Buren Avenue including 10% Design Plan

FINAL REPORT

prepared for

Cheyenne Metropolitan Planning Organization

by

Western Research and Development, Limited

November 2016

In Cooperation with:

DRAFT

"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 (SPR) 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."

Official Map for Storey Boulevard/Summit Road and Van Buren Avenue including 10% Design Plan

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September 2016

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Executive Summary

Lands surrounding the Storey and Van Buren corridors have a high probability to develop and it is necessary to preserve rights of way for future collector and arterial streets to serve future neighborhoods. Steep terrain presents an obstacle for construction, so alignments must take that into account, along with soils, drainage patterns, property and section lines, forecast traffic, potential environmental impacts, and agency, neighborhood and property owner perspectives. Analysis results and recommended cross sections are described in this document. Recommended alignments and rights of way are depicted in the associated document entitled "Official Map."

Legal Authority

An Official Map is authorized by State of Wyoming enabling legislation under statute § 15-1-508 and 509, as follow:

Universal Citation: WY Stat § 15-1-508 (2014)

2014 Wyoming Statutes
TITLE 15 - CITIES AND TOWNS
CHAPTER 1 - GENERAL PROVISIONS
ARTICLE 5 - PLANNING
15-1-508. Major street plan; official map; contents; procedure; effect; recording ordinance.

(a) After the commission has adopted a major street plan, the governing body may establish an official map of the whole or any part of the existing public streets. The map may also show the location of the lines of streets on plats of subdivisions which the commission has approved. The governing body may make other additions to or modifications of the official map by extending the lines of proposed new streets or street extensions, widenings, narrowings or vacations which have been accurately surveyed and definitely located. Before taking any such action the governing body shall hold a public hearing thereon. Any proposed addition to or modification of the official map shall be submitted to the commission for its approval. If the commission disapproves, approval of the addition or modification then requires an affirmative vote of not less than a majority of the governing body.

(b) The placing of any street or street lines upon the official map does not of itself constitute the opening or establishment of any street or the taking or acceptance of any land for street purposes.

(c) The governing body shall direct that the adopted ordinance creating the official map be recorded in the office of the county clerk.

Universal Citation: WY Stat § 15-1-509 (2014)

15-1-509. Major street plan; preserving integrity of map; building permits; necessary findings; specifications

(a) To preserve the integrity of the official map, the governing body may provide by ordinance, subject to appropriate eminent domain proceeding, that no permit may be issued for any building or structure which encroaches upon land located within the lines of any street as shown on the official map. The ordinance shall provide that the board of adjustment, which the governing body may create by ordinance, has the power, upon an appeal filed with it by the owner of any such land, to authorize a permit for a building or structure within any mapped-street location when it finds that:

(i) The property of the appellant a portion of which lies within the street lines will not yield a reasonable return to the owner unless the permit is granted; or

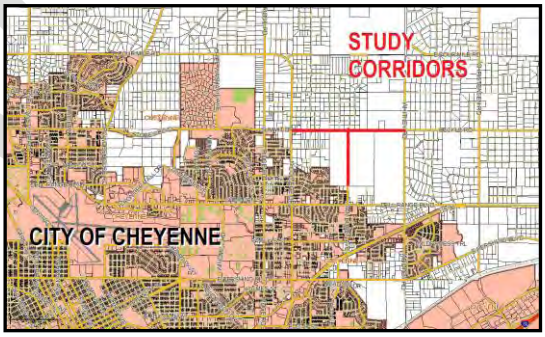
(ii) Balancing the interest of the municipality in preserving the integrity of the official map and the interest of the owner in the use and benefits of the property, the grant of the permit is required by justice and equity.

(b) Before taking any action, the board shall hold a public hearing thereon. If the board decides to authorize a building permit, it may specify the exact location, ground area, height and other details and conditions of extent and character and also the duration of the building or structure to be permitted.

Purpose and Need

Storey Boulevard and Van Buren Avenue have been identified as future arterial and collector streets in the Cheyenne Metropolitan Long Range Transportation Plan (LRP), "PlanCheyenne." Preservation of rights of way for the roads is essential to prevent undue construction costs, congestion, and crashes. A recent development action - a 160-acre plat - preserved part of the future alignment of Storey Blvd. This official map defines the remaining alignments so there will be no need to revisit this issue whenever a development occurs in the area.

Study Location

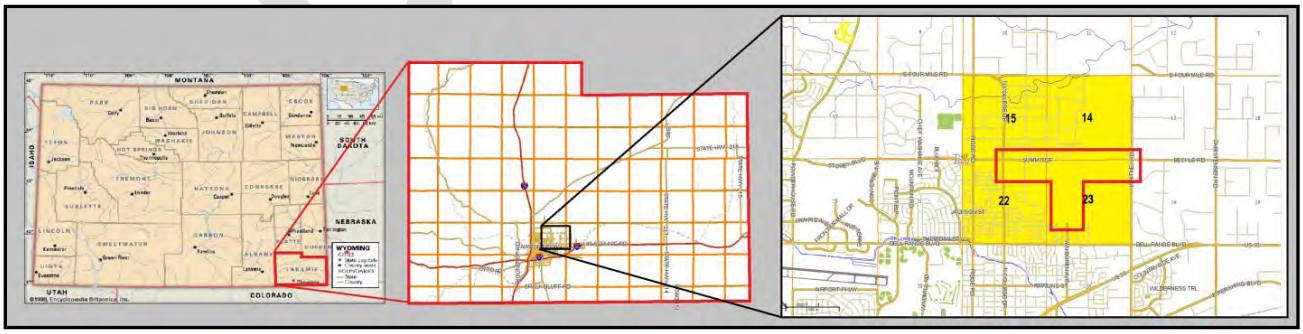


The study corridors are in Township 14 North, Range 66 West, Sections 14, 15, 22, and 23, in Laramie Co, Wyoming.

The location is on the urban periphery immediately northeast of the City of Cheyenne. Areas to the south and west are developed as urban low-to-medium density single-family residential. Areas north and east are mostly 5-20 acre residential estates known locally as "ranchettes."

This study defines two alignments:

1. The future "*Storey Boulevard*" from the Summit Drive / College Drive intersection eastward to the intersection of Whitney Road and Beckle Road.
2. The future "*Van Buren Avenue*" from its current terminus 950 feet north of Dell Range Boulevard north to intersect Storey Blvd. at either the Van Buren or Woods Road intersection.



Van Buren Alignment:

Van Buren Avenue is currently a north-south collector street from Dell Range Boulevard to US-30.

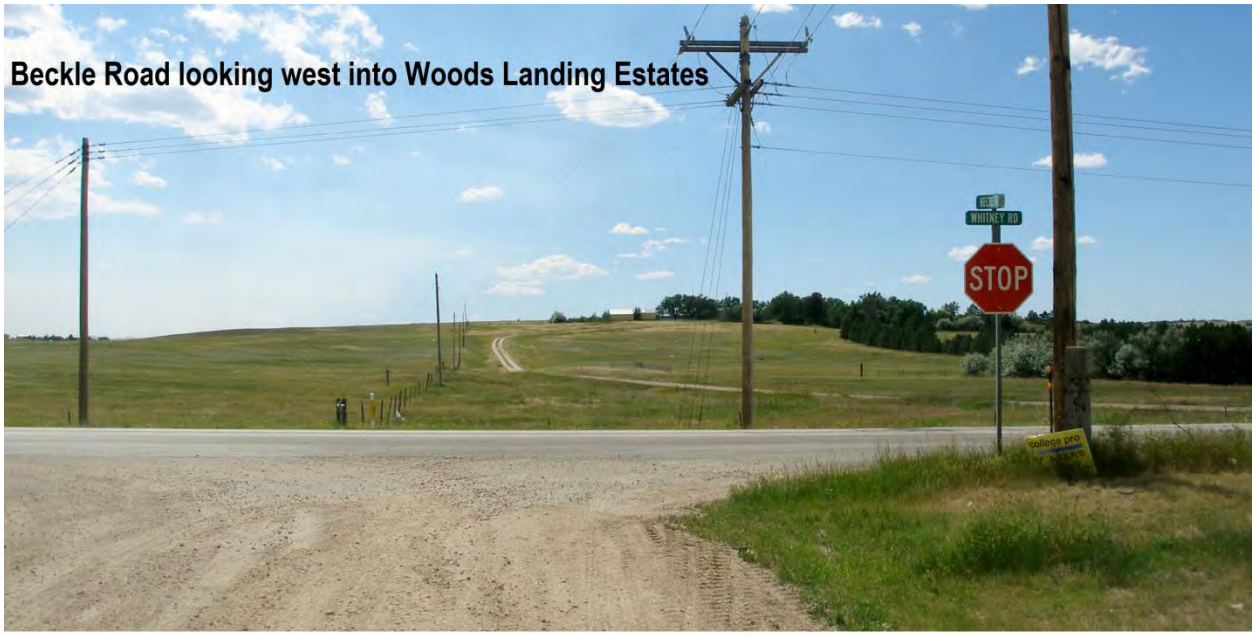
North of Dell Range, Van Buren was platted by H. Irving Gysel and Betty C. Gysel in July 1952 as "Gary Road," within the Hill Heights Addition. The 80' right of way width was named "Van Buren Avenue" in January 2005 in the Crown Subdivision, 1st Filing, platted by James O. Woods. The platted right of way ends 1320' (1/4 mile) north of Dell Range Boulevard, with the south 950 feet currently paved. Van Buren north of Storey also has an 80' ROW, as described in the Antelope Hills 2nd Filing plat of 1974.

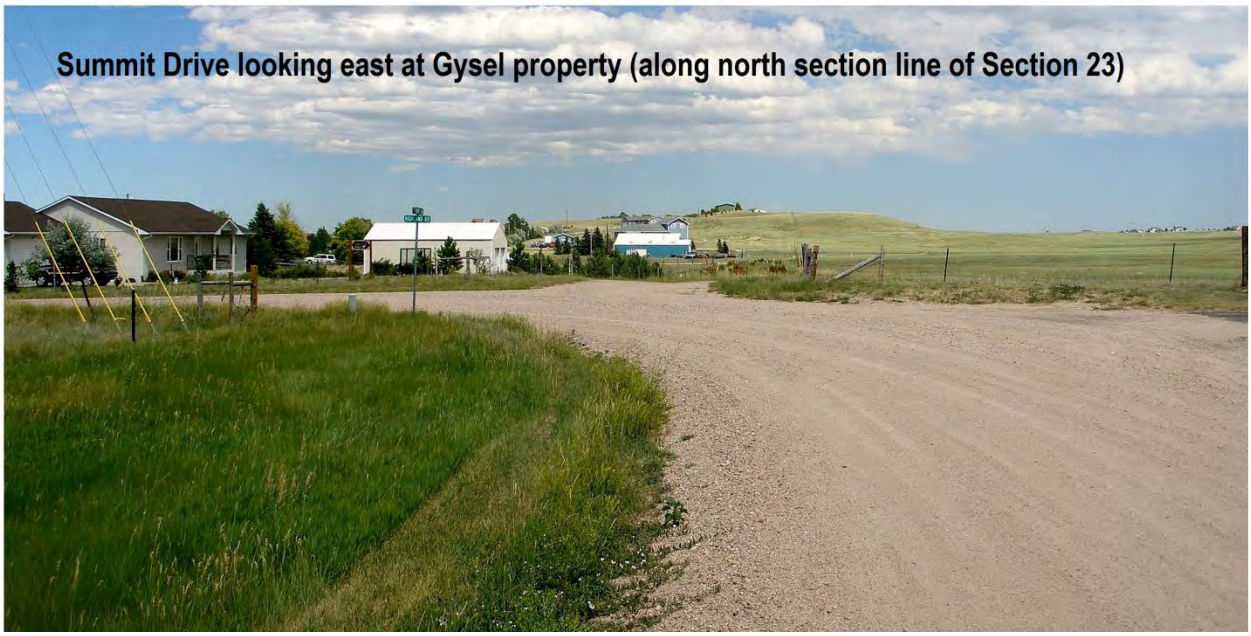
The paved portion of Van Buren has a gradient ranging from 1% in the south to 3% at its north terminus. North of the current terminus is steeply rising terrain to a bluff top, then a gentler slope down to the north terminus at the future Storey Boulevard alignment.

Storey Boulevard Alignment

The east-west Storey Boulevard corridor was once discontinuous and so has several street names, including Western Hills Boulevard, Storey Boulevard, Summit Drive, Beckle Road, and Stewart Road.

The study segment from College Drive to Highland Road is currently called "Summit Drive" and parallels the north section line of sections 22 and 23 (see photos below). A steep hill presents an obstacle along the section line, necessitating a detour slightly south to avoid steep slopes. Small potential wetlands along the alignment also present obstacles.





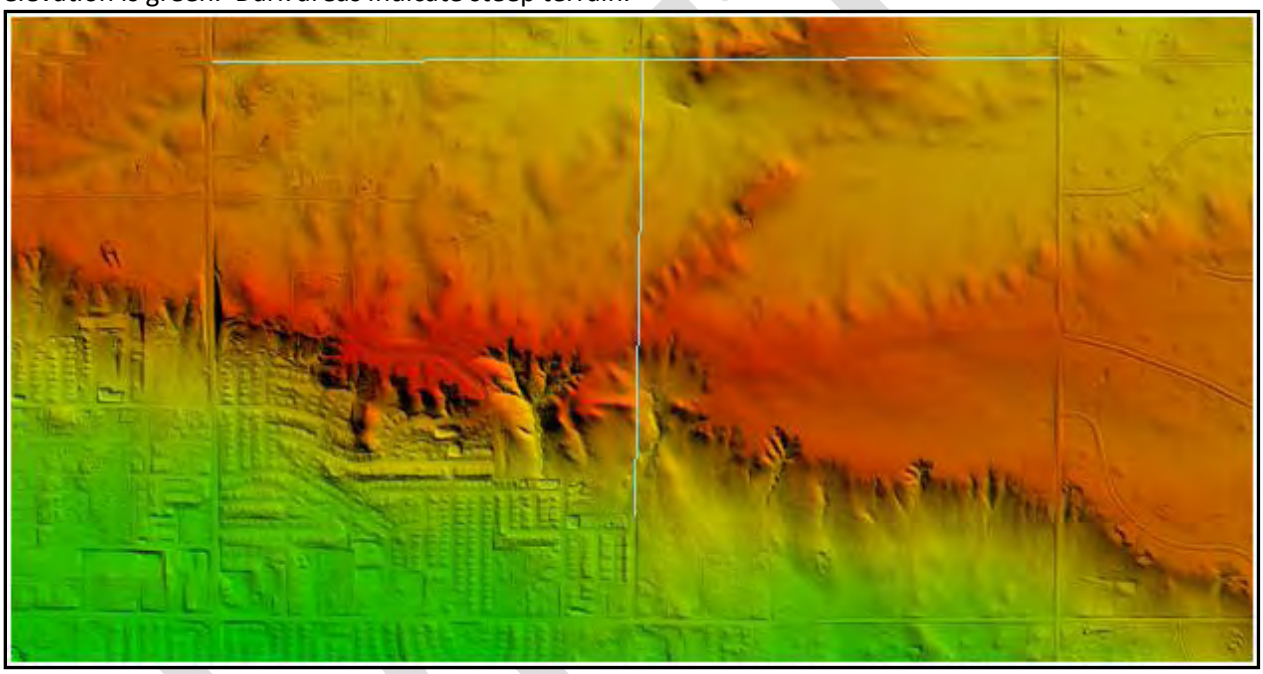
Existing Conditions

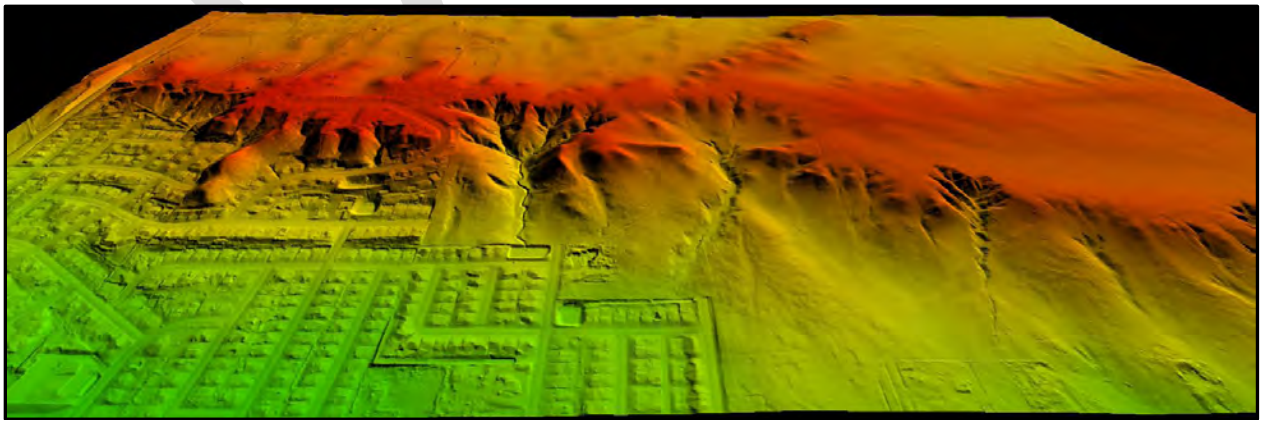
- **Terrain**

Study area terrain ranges from 6,030 to 6,160 feet elevation, and consists of upland prairie biome along a steep ridge. Generally, gentler slopes make construction easier. Locations exceeding 5% slope require soil cuts and fill. When possible, it is best to avoid such sites in order to minimize excess construction cost and environmental damage.

Slope (USDA Soil/Slope Criteria)	0-6% Slope	6-10% Slope	3-15% Slope
Percent of Storey Boulevard Corridor	70.2%	5.5%	24.2%
Percent of Van Buren Boulevard Corridor	50.1%	18.9%	31.1%

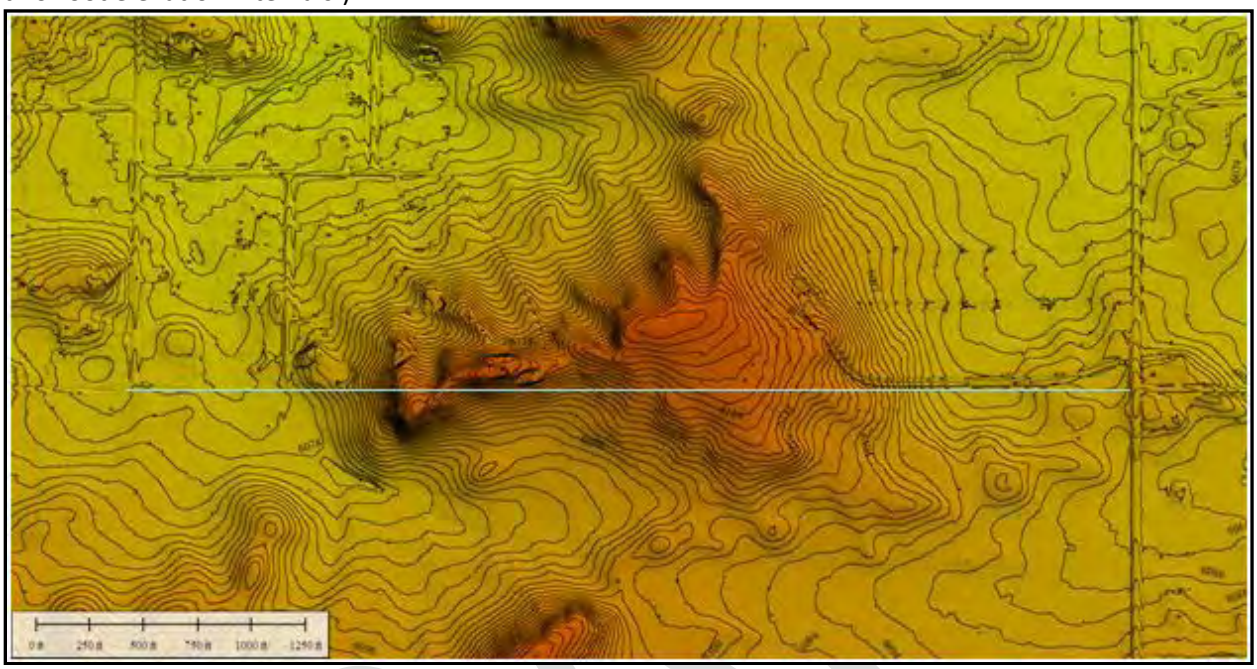
The terrain elevation map below illustrates the two study corridors in light blue lines. Storey Boulevard runs east-west and Van Buren runs north-south. In the image below, highest elevation is red and lowest elevation is green. Dark areas indicate steep terrain.

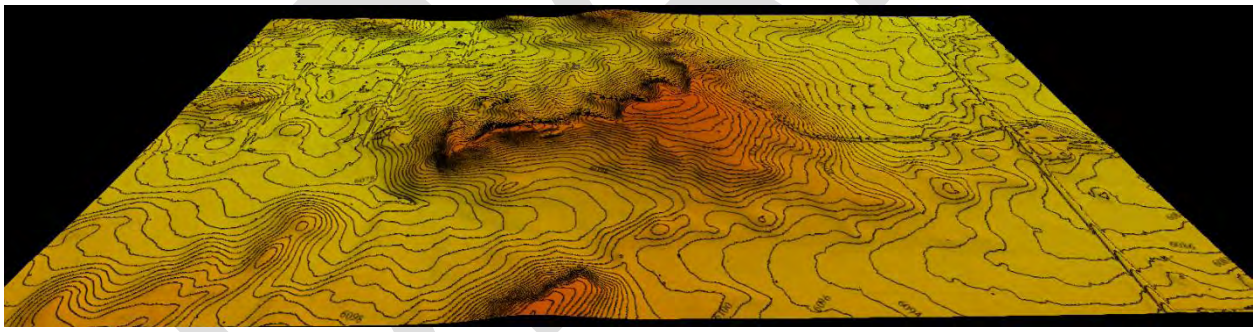




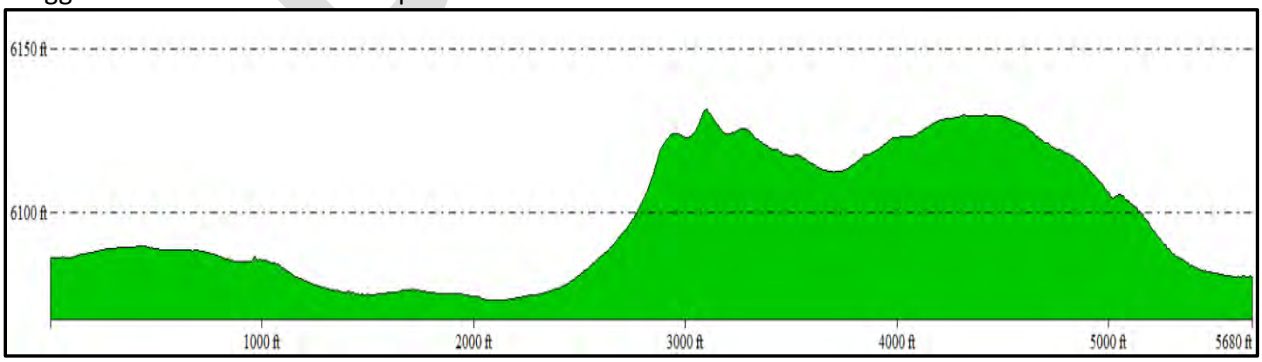
Storey Corridor Terrain:

The main site constraints on the Storey corridor (light blue line) are a hill located approximately 650' east of north Van Buren Avenue, and a wetland (prairie pothole) located just west of Woods Road. The optimal alignment should curve south to avoid the hill and wetland. (Contour lines below represent two-foot elevation intervals.)



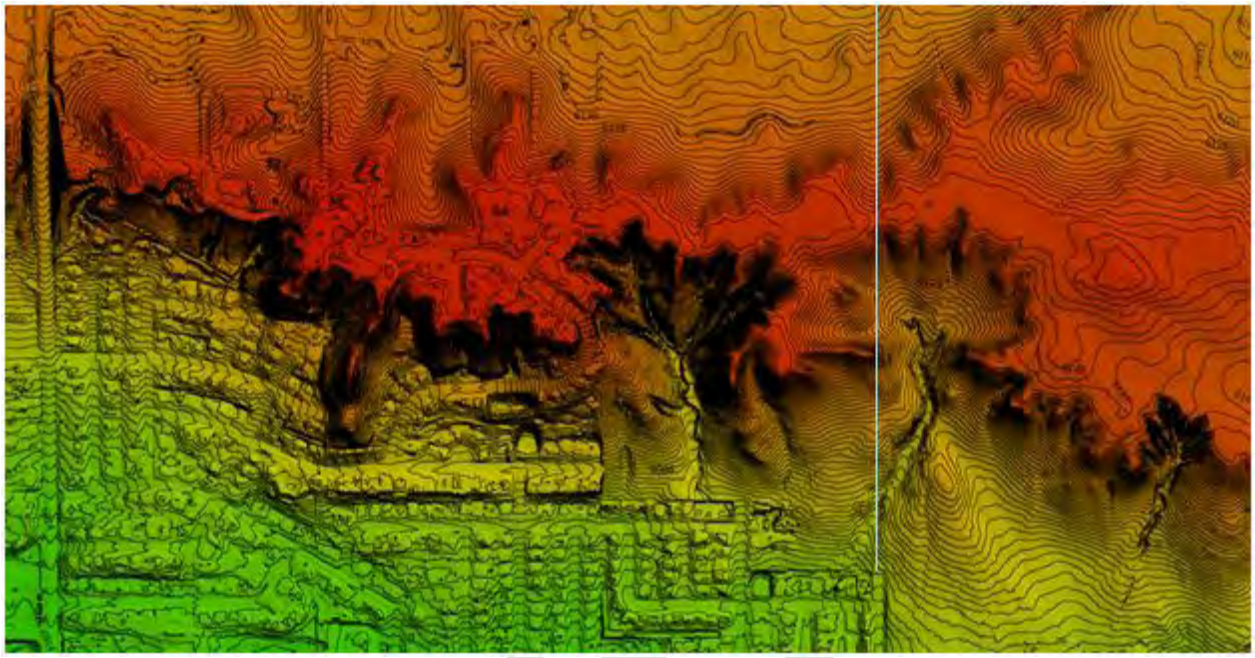


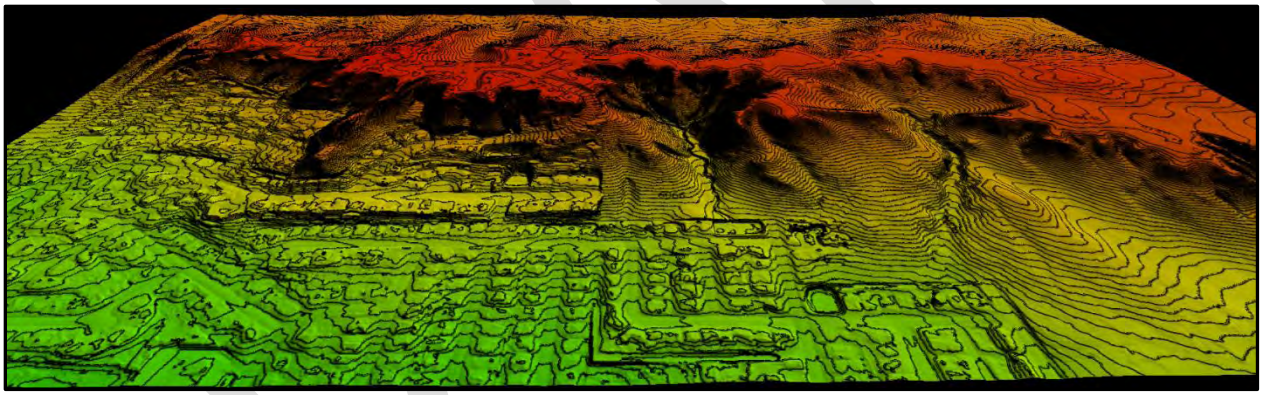
The green profile below follows the section line above (light blue line). Vertical elevations below are exaggerated to illustrate the steep terrain on the west side of the hill.



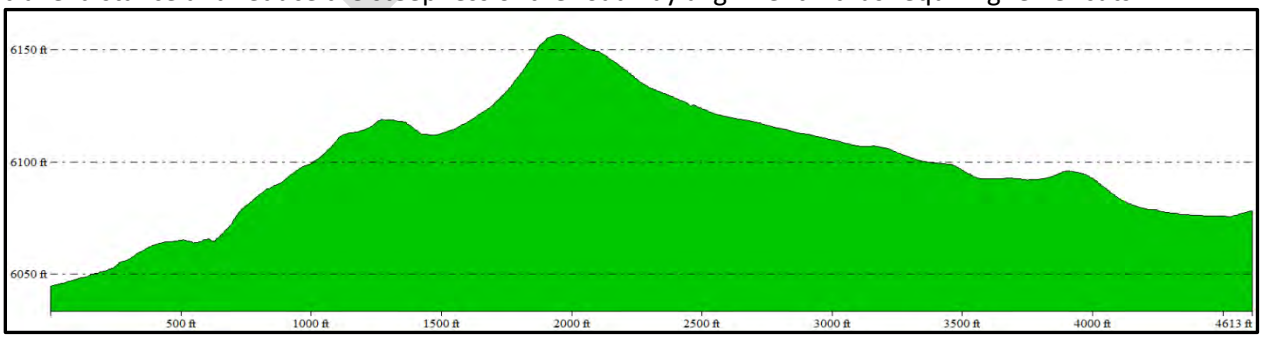
Van Buren Corridor Terrain:

The principal site constraint in the Van Buren Corridor is the steep ridge line, 130 feet above the surrounding terrain, peaking about 1600' north of the current terminus of Van Buren. A connection to the north will require cut and fill to achieve an acceptable roadway gradient.





The profile below follows the light blue line due north of Van Buren. This direct alignment results in slopes greater than 10% and would involve extensive cuts. A curved alignment would increase the travel distance and reduce the steepness of the roadway alignment – thus requiring fewer cuts.

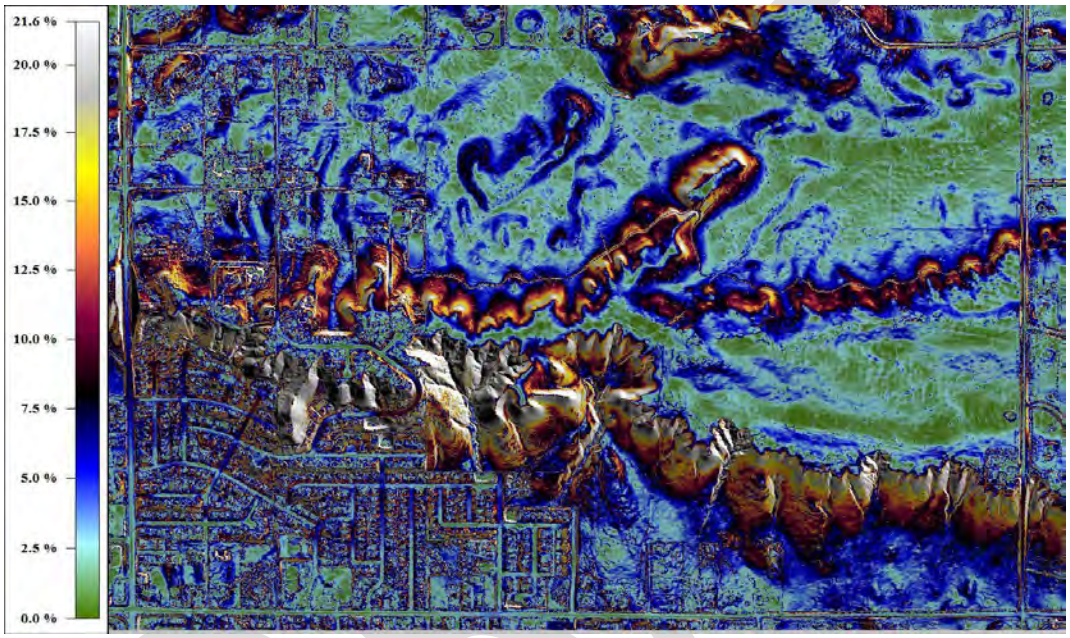


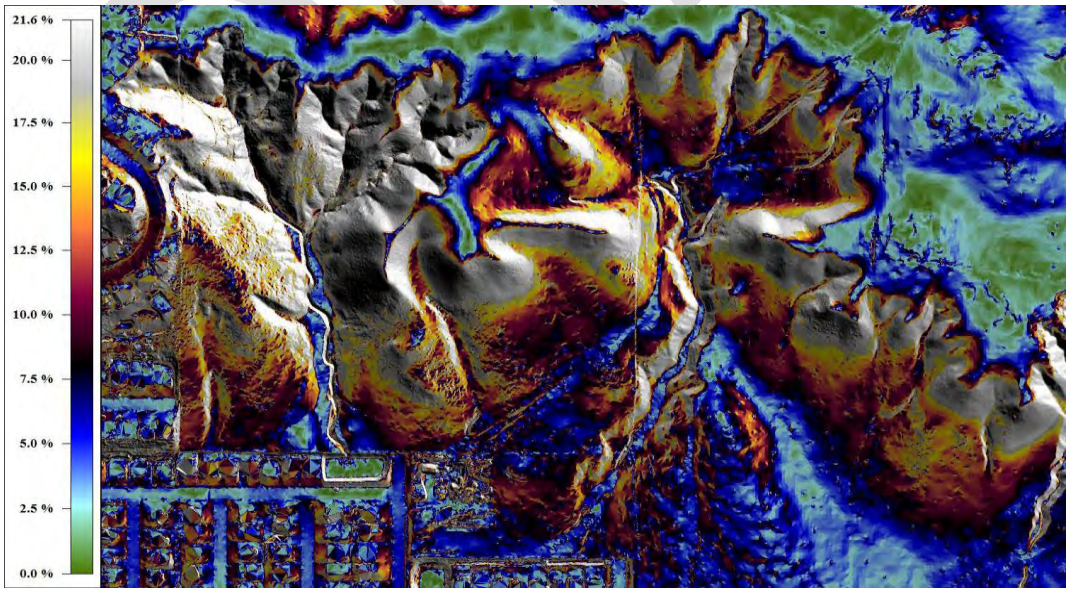
Slopes

The maps below illustrate slopes in the study area. In explanation, a 20% slope, for example, rises 20' vertically for every 100 feet horizontally. The maximum allowable roadway grade is 10%, and preferably 5% or less to comply with the Americans with Disabilities Act (ADA).

Areas colored green, light blue and blue range are from almost flat (0%) to 5% grade. Areas colored black, red, yellow, and white, are 7%, 10%, 15%, and 20% slopes, respectively, and would require increasingly more earth removal to achieve a 5-7% roadway grade.

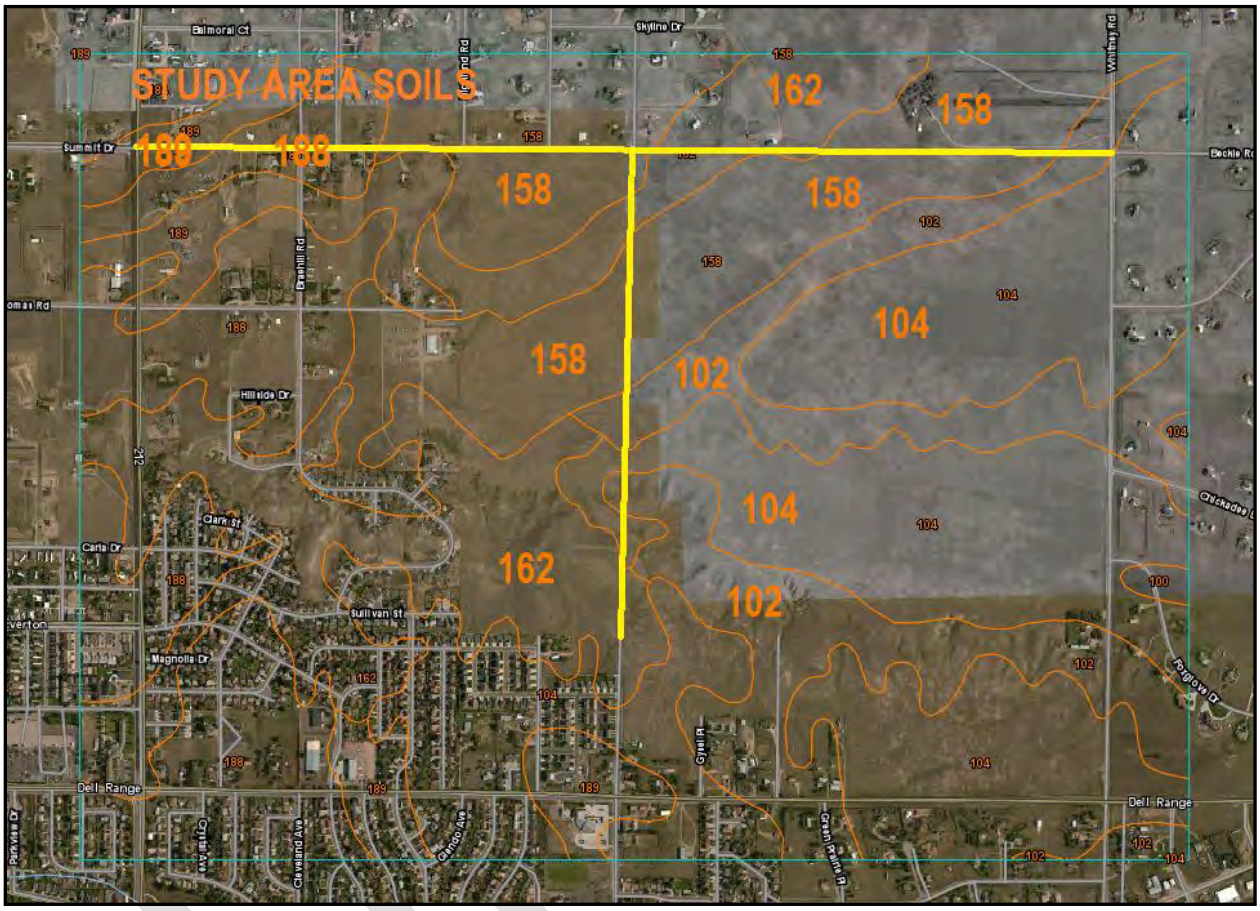
The most difficult area for construction lies in the arroyo just north of the south terminus of Van Buren Avenue.





Soils

Soils have been previously surveyed by the US Department of Agriculture, Natural Resource Conservation Service (USDA/NRCS). Roadway corridors traverse soil types 102, 104, 158, 162, 188, and 189. These soil types are described in the following section excerpted from the US Department of Agriculture, Soil Survey of Laramie County Wyoming. These are general soil conditions, and test borings will be needed prior to completing roadway design.



Description of USDA/NRCS Soil Ratings for Construction of Streets

Excerpt:

"Ratings are based on the soil properties that affect the ease of excavation and grading, and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

The ratings are both verbal and numeric. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that

the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Storey Corridor Soils:

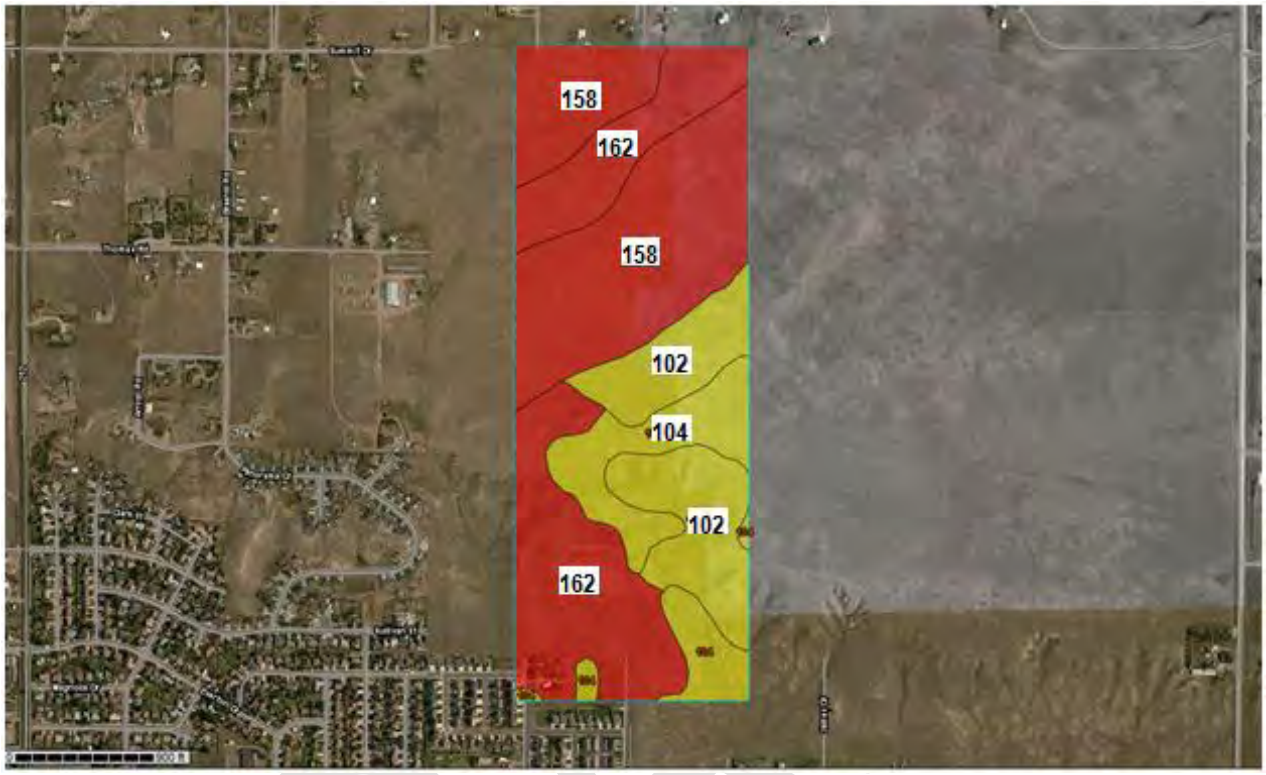
USDA Soil Ratings
Grey = Not Rated Yellow = Somewhat Limited Red = Very Limited

Summary for Storey Corridor — Laramie County, Wyoming, Western Part (WY721)						
Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI[1]	Percent of AOI
102	Altvan-Dix complex, 6 to 10 percent slopes	Somewhat limited	Altvan (60%)	Frost action (0.50)	4.5	5.5%
104	Ascalon loam, 0 to 6 percent slopes	Somewhat limited	Ascalon (85%)	Frost action (0.50)	1.2	1.5%
				Low strength (0.05)		
				Shrink-swell (0.00)		
158	Poposhia silt loam, 0 to 6 percent slopes	Very limited	Poposhia (85%)	Low strength (1.00)	41.8	51.6%
162	Poposhia-Trimad complex, 3 to 15 percent slopes	Very limited	Poposhia (50%)	Low strength (1.00)	9.1	11.2%
188	Urban land-Poposhia complex, 0 to 6 percent slopes	Not rated	Urban land (65%)		13.9	17.1%
			Blazon (5%)			
			Piezon (5%)			
189	Urban land-Poposhia-Trimad complex, 3 to 15 percent slopes	Not rated	Urban land (60%)		10.5	13.0%
			Piezon (5%)			
			Rock outcrop (5%)			
Totals for Storey Boulevard Corridor					81.0	100.0%

Summary by Soil Rating Values - Storey Corridor		
Street Construction Rating	Acres in AOI	Percent of AOI
Very limited	50.9	62.9%
Somewhat limited	5.7	7.0%
Null or Not Rated	24.4	30.1%
Totals for Area of Interest	81.0	100.0%

[1] AOI = "Area of Interest" as shown in color on the soils maps.
[2] City of Cheyenne Unified Development Code http://www.cheyennecity.org/DocumentCenter/View/20776

Van Buren Corridor Soils:



USDA Soil Ratings
Grey = Not Rated Yellow = Somewhat Limited Red = Very Limited

Summary for Van Buren Corridor — Laramie County, Wyoming, Western Part (WY721)						
Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
102	Altvan-Dix complex, 6 to 10 percent slopes	Somewhat limited	Altvan (60%)	Frost action (0.50)	28.5	18.9%
104	Ascalon loam, 0 to 6 percent slopes	Somewhat limited	Ascalon (85%)	Frost action (0.50) Low strength (0.05) Shrink-swell (0.00)	22.5	14.9%
158	Poposhia silt loam, 0 to 6 percent slopes	Very limited	Poposhia (85%)	Low strength (1.00)	53.2	35.2%
162	Poposhia-Trimad complex, 3 to 15 percent slopes	Very limited	Poposhia (50%)	Low strength (1.00)	47.0	31.1%
Totals for Area of Interest					151.2	100.0%

Summary by Rating Value – Van Buren Corridor		
Rating	Acres in AOI	Percent of AOI
Very limited	100.2	66.3%
Somewhat limited	51.0	33.7%
Totals for Area of Interest	151.2	100.0%

Climate

The mean annual air temperature is 41 to 45 degrees F. The average July high is around 83 degrees Fahrenheit and average January low is 16F. The mean annual rainfall is 15 to 17 inches, with 55 inches in the form of snow. The table depicts the rainfall intensity and duration for storm events in Cheyenne:

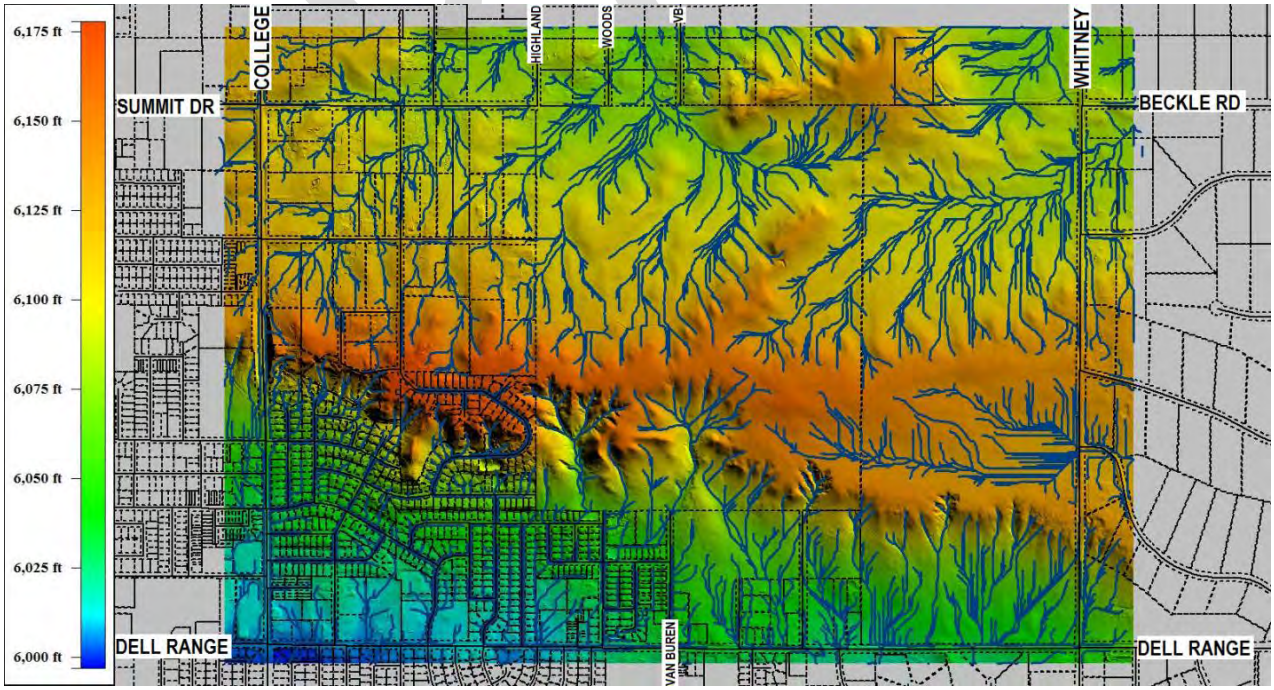
Rainfall Intensity – Duration and Frequency[2]						
Duration	**Rainfall Intensity (inches per hour)**					
	(2 Yr)	**(5 Yr)**	**(10 Yr)**	**(25 Yr)**	**(50 Yr)**	**(100Yr)**
5 Minutes	3.42	4.75	5.70	6.98	8.00	9.07
10 Minutes	2.64	3.66	4.38	5.40	6.12	6.90
15 Minutes	2.20	3.04	3.60	4.36	4.96	5.56
30 Minutes	1.34	1.96	2.42	3.06	3.56	4.12
1 Hour	0.73	1.10	1.41	1.87	2.27	2.73
2 Hours	0.41	0.63	0.83	1.16	1.46	1.84
24 Hours	0.06	0.08	0.10	0.13	0.15	0.18

Drainage

Alignments that minimize the number of stream crossings require fewer culverts and cost less to build.

Study area surface drainage is depicted in the map below. The study area drains toward two regional watersheds that flow into the South Platte River.

- North of the ridge (dark orange area below), the study area drains north toward Child's Draw.
- South of the ridge, the study area drains through a number of gullies into an urban drainage system and eventually to Dry Creek.



[2] City of Cheyenne Unified Development Code http://www.cheyennecity.org/DocumentCenter/View/20776

Groundwater

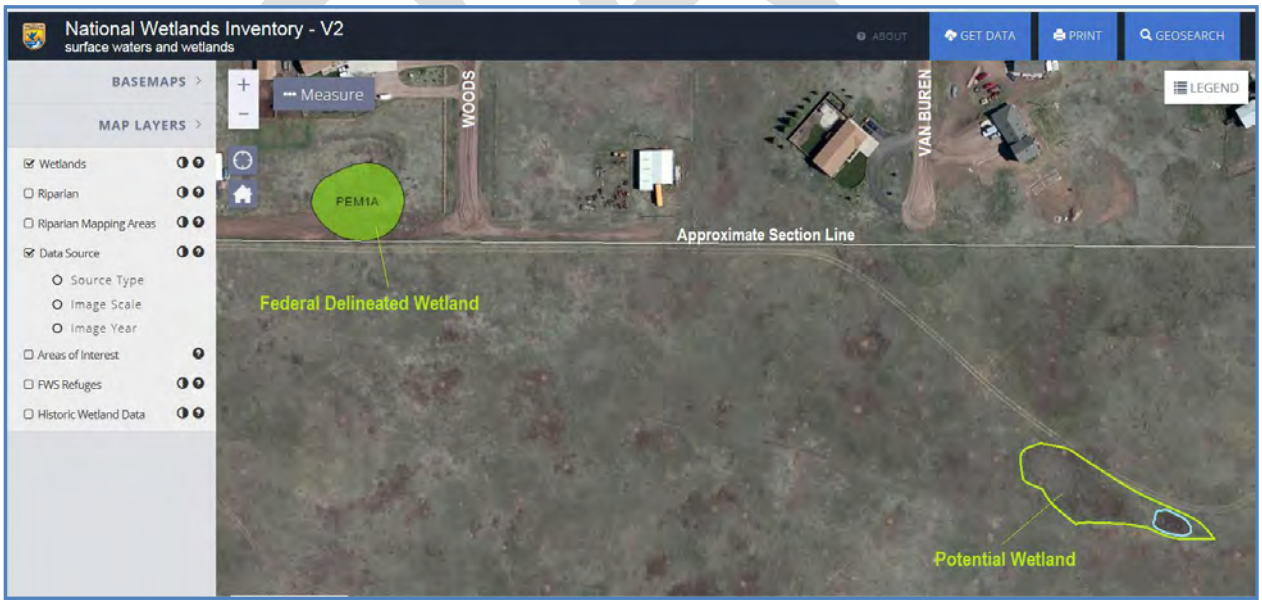
The groundwater table does not appear to be a significant factor in selecting preferred roadway alignments. The shallowest groundwater in the study area occurs south of the ridge, closest to Dell Range Boulevard, with depths ranging from 101 to 115' near existing Van Buren Avenue. North of the ridge, well records reveal a depth of 121' to 150' to the static water level along the proposed Storey Boulevard Corridor.[3]

Known and Potential Wetlands

It is best to align roadways to avoid wetlands. Hydric soils may increase construction costs, and federal wetland regulations may require wetland mitigation.

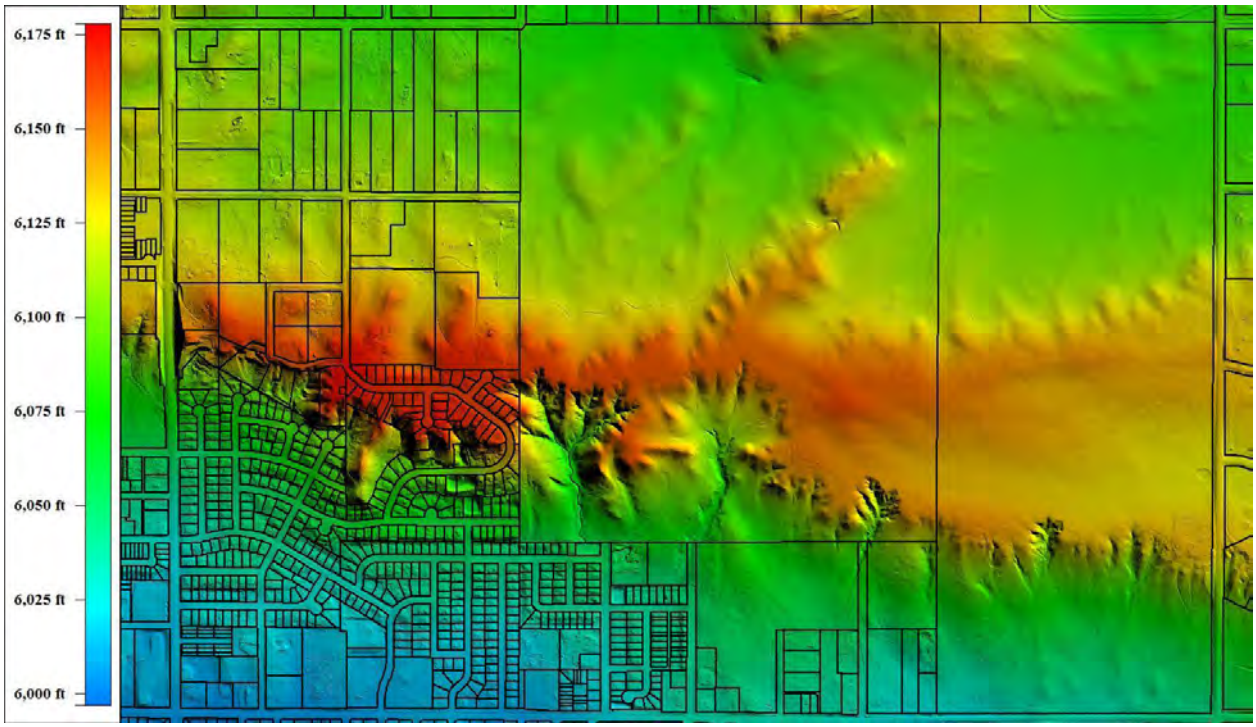
The US Fish and Wildlife Service National Wetlands Inventory maps indicate small areas of "Freshwater Emergent Wetland" on and near the proposed alignment of Storey Boulevard.[4] One small emergent wetland is depicted near the section line between the termini of Woods Road and Highland Road (below). This wetland must be field verified, and if it is a wetland then it must be either avoided or mitigated to meet federal regulations.

Aerial imagery and terrain mapping identify a second potential wetland near the proposed Storey Boulevard alignment, located about 525' southeast of the north terminus of Van Buren Avenue. This location exhibits signs of intermittent ponding and should be inspected for wetland species for environmental clearance prior to construction.

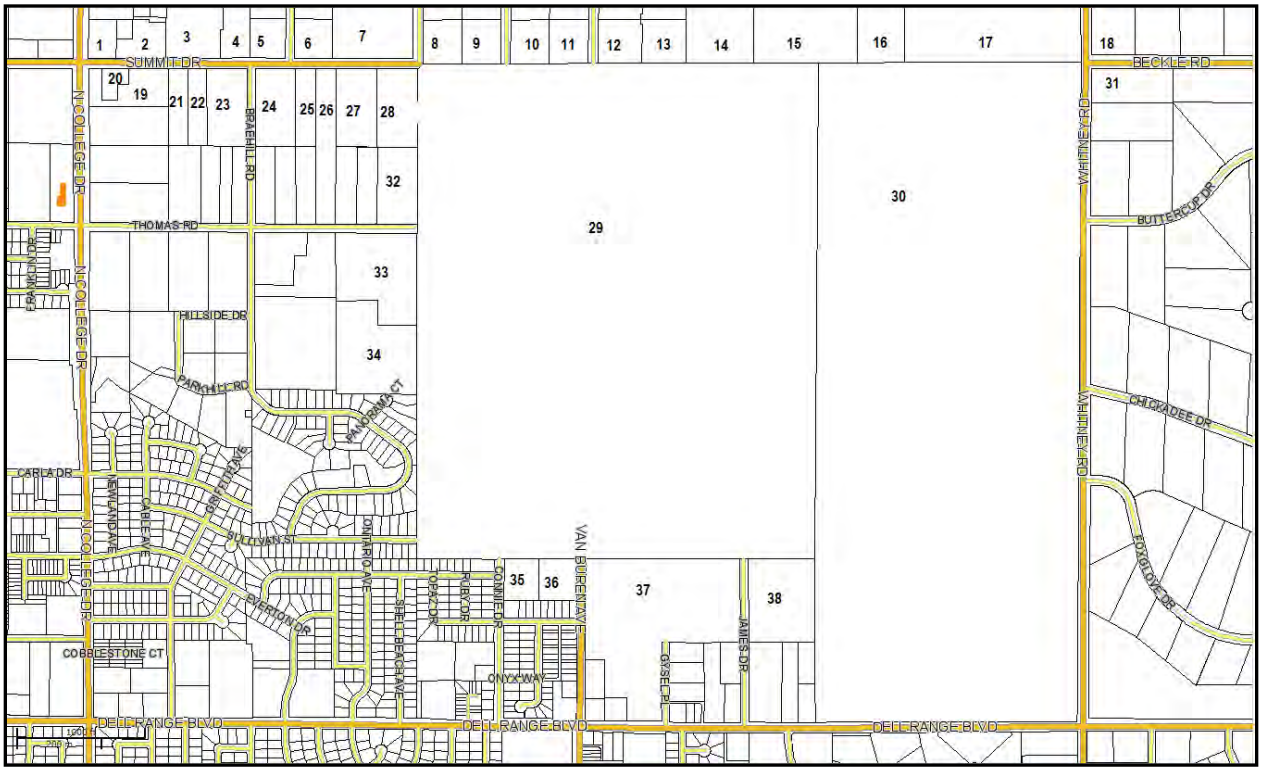


[3] Source: State of Wyoming http://seoweb.wyo.gov/e-Permit/common/login.aspx?ReturnUrl=%2fe-Permit%2f
[4] US Fish and Wildlife Service, National Wetlands Inventory, Wetland Mapper, Version 2. https://www.fws.gov/wetlands/Data/Mapper.html

Property Ownership



Several large vacant properties (15, 16, 17, 29, 30, 37, and 38) are owned by three family trusts.

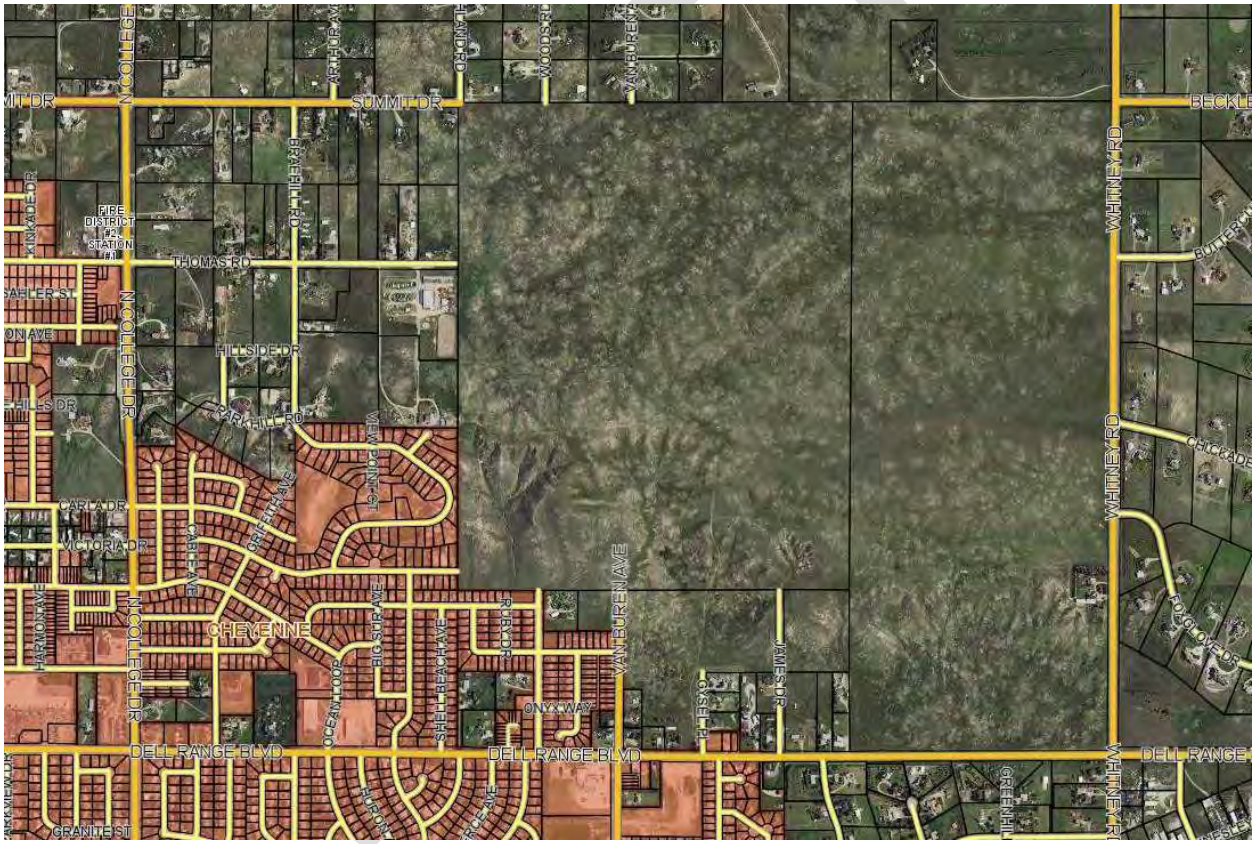


2016 Survey and Aerial Imagery:

Western Research and Development conducted a helicopter aerial LiDAR survey at 1400' above ground level (AGL) on August 17, 2016, coupled with high resolution aerial photography. The LiDAR point density was 10-12 points per square meter, with aerial imagery at 2" pixel resolution. Aerial survey data was rectified with field survey "check shots" collected simultaneously along Summit Road and Van Buren Avenue. The error of the survey was 1.1 $RMSE_z$ which meets ASPRS accuracy guidelines for generating 1 foot terrain contours.

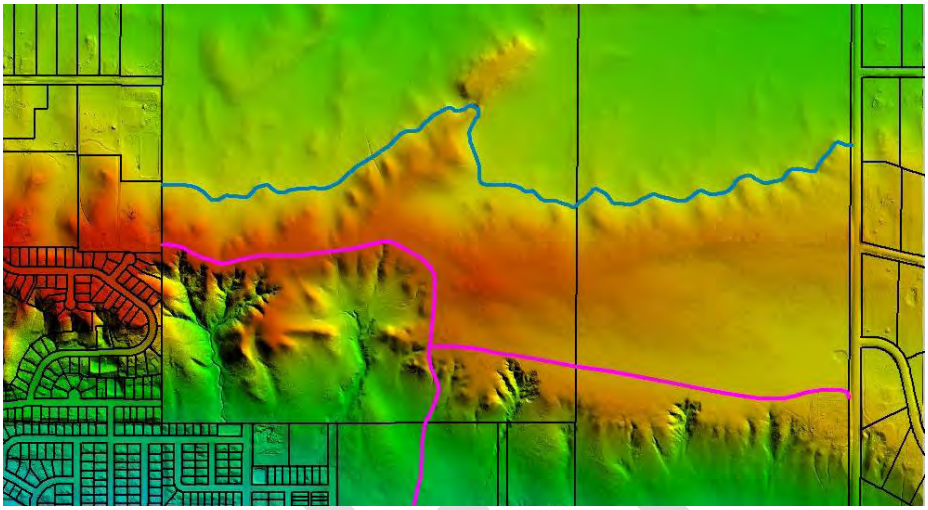
Built Environment and Existing Land Uses

With the exception of the recently platted *Woods Landing Estates*, all lots on or adjacent to the study corridors have a residence built on them. One parcel (#33) is listed in county GIS records as *commercial* and appears to be in use as a horse stables and riding training facility.



Abandoned Irrigation Ditch

An unused irrigation ditch is evident running west to east across the study area (blue line below). Local recollections are that it may have been called "Ogden Ditch," that it was hand dug before 1900, and that it never carried water.[5]



The ditch extends beyond the study area and has been obliterated in many locations. The original beginning and end points are not known. The ditch is roughly 18"-24" deep and 6' across. The ditch enters the study area at a 6127' elevation at the horse paddock on Thomas Road, and exits at a 6122' elevation at Whitney Road. Stream channels cross it repeatedly, showing that it is not functional.

Existing Trails

A few trails and cultural features are already evident in the study area (pink lines above). One 2-track trail follows the crest of the ridge from east to west, from the Whitney family homestead on Whitney Road to the equine training facility on Thomas Road. A second trail connects from the Geysel family estate on Gysel Road north to the previously mentioned east-west trail.

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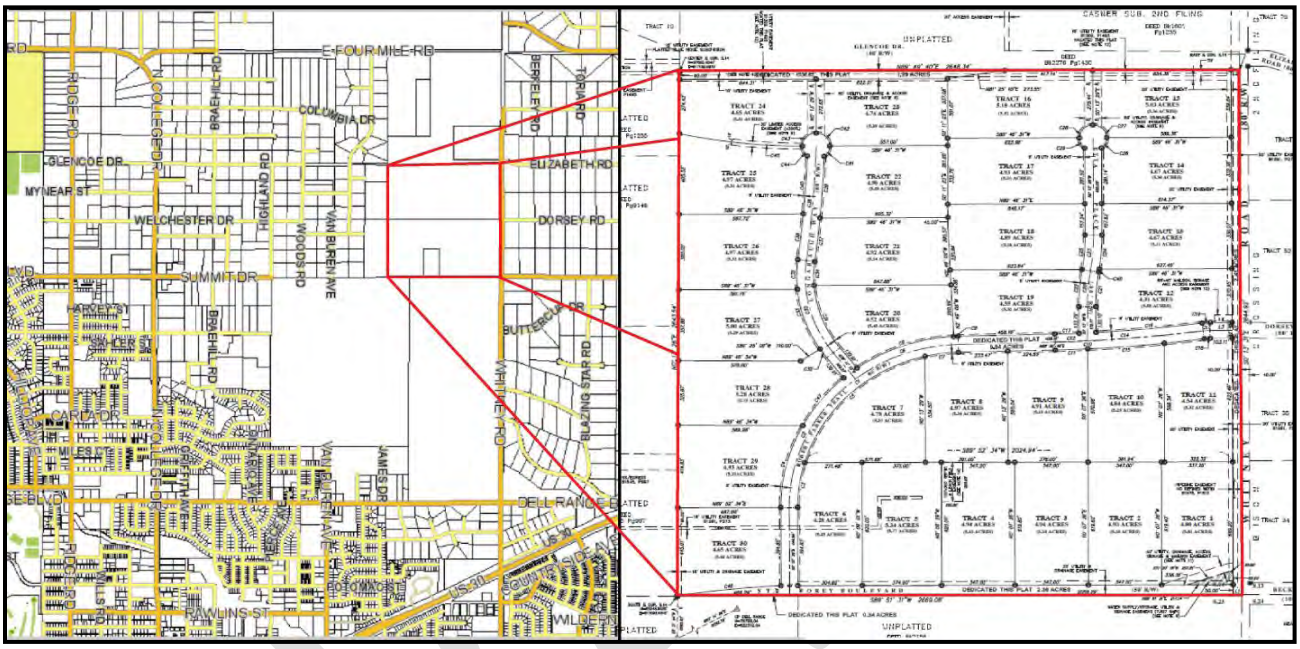
[5] Interview with Frank Cole, Oct 10, 2016

Development Plans

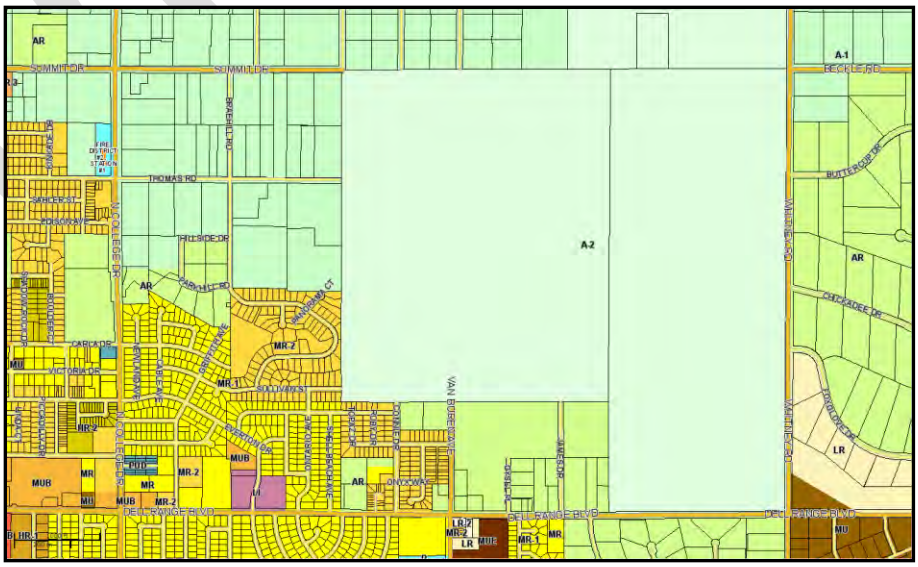
- **Recent Plats**

The 2016 plat of "Woods Landing Estates" depicts 30 residential "ranchette" lots on the 160 acres of the southeast 1/4 of Section 14. Lot sizes are about five acres. The plat includes a 50' half right of way for Storey Boulevard curving south at the west end, and an 80' full ROW for Robert Parker Trail: an interior street connecting from the Whitney / Dorsey Road intersection to Storey Boulevard. This study has incorporated the roads platted with the City and County *Woods Landing Estates* development action.



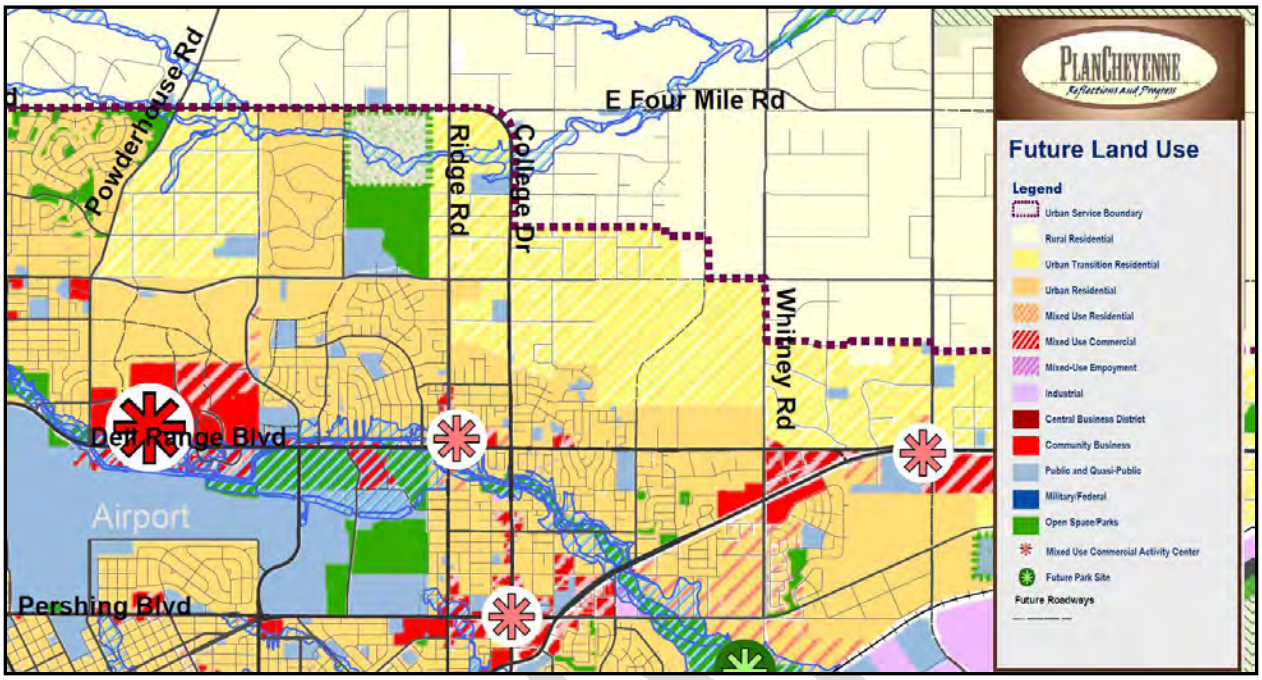
- **Current Zoning**

Land within the study area is currently zoned A-2: *Agricultural*. The minimum lot size in the A-2 district is 20 acres. Adjacent areas are zoned AR (*Agricultural Residential*) and A-1 (*Agriculture and Rural Residential*), with minimum lot sizes of 5 and 10 acres respectively. Appendix 2 provides relevant excerpts from the Laramie County Land Use Regulations, as adopted February 15, 2011. Adjacent City land is developed as MR-2 (*medium density residential*) with a typical lot size of 6000 square feet: approximately 6 dwelling units per acre.



Future Land Use

PlanCheyenne shows land within the study area proposed for '*Urban Transition Residential*.' The following text and image from PlanCheyenne describe this proposed land use:



*"The **Urban Transition Residential** category, along with the Rural Residential category, provides a gradual transition from the urbanized areas of the Cheyenne Area to the rural areas on the periphery. It includes existing homes and neighborhoods, as well as some planned and recent new growth areas.*

Uses

Primary Uses: Limited range of lower density residential uses, blending urban and rural standards. It allows single family residences and multi-family duplexes, patio homes, and townhomes.

Secondary Uses: Supporting and complementary uses, including open space and recreation, equestrian uses, schools, places of worship, and other public or civic uses are also appropriate in this category. Senior housing is appropriate if compatible with the surrounding area. Farm animals and horses are appropriate as permitted by City and County regulations.

Location

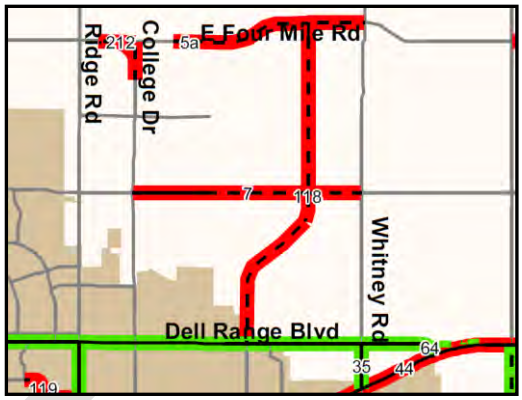
Generally located along the northern edge of the City of Cheyenne where some large lot development has already occurred on well and septic systems. It also occurs at the "edge" of other parts of the Urban Service Boundary (USB).

Density

Existing residential densities vary, and new residential developments are generally less than 2 dwelling units per acre."

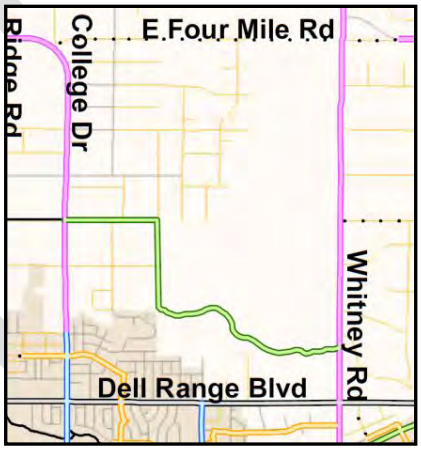
Current 2040 Transportation Plan

The Long Range Plan for metro Cheyenne (County Version) was updated in 2014. The Roadway Vision Plan proposed new roadways (red) along the Storey Boulevard alignment from College to Whitney, and connecting north from Van Buren Avenue at Dell Range to Four Mile Road. The Fiscally Constrained Plan does not depict these new roadways because funds have not been identified for their construction. Dell Range Boulevard is proposed for future capacity improvements (Green).



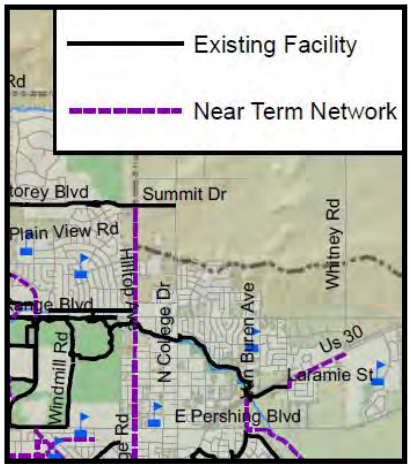
Non-Motorized Plans

Long term bicycle and pedestrian facility plans call for extension of a Greenway type shared-use facility through the study corridors. Called the "Northeast Ridgeline" the trail would extend 2.12 miles from north College Drive to Whitney Road.[6] The combined route has been depicted following Storey Boulevard from College Drive to Highland Road, then approximately south along the property lines to the ridgeline, then along the ridgeline and property lines to Whitney Road (solid green line below). Further proposals call for a bike facility along Beckle Road from Whitney to Reese (two miles), however the precise type of facility (bike lane, bike-path) is not yet specified.



Guidelines for design of Non-Motorized facilities in New Developments call for:

- *"Sidewalks separated from the street and different types of bicycle facilities on all collector and arterial streets, depending on traffic speed and volume.*
- *Safe and convenient pedestrian and bicycle access from the development site to existing, planned, and proposed trails or greenways located on or adjacent to the development site."*[7]



2012 Bikeway and Greenway Plan

The 2012 Bikeway and Greenway Plan update depicts existing Greenway along Dry Creek, and on Summit east to College. Near term plans call for Greenway extensions along Ridge Road.

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[6] "*Cheyenne On-Street Bicycle Plan and Greenway Plan Update, Volume I,*" Cheyenne MPO, June 2012
[7] Ibid , pg 36.

Traffic and Safety Analysis

Crash patterns on surrounding streets and intersections indicate current safety performance in the study area. Completion of Storey and Van Buren will alter traffic patterns on surrounding arterial streets, and change surrounding crash patterns at these intersections. Western assembled records of traffic crashes and traffic count volumes in the surrounding road network from 2011 to 2015. Crash data for the surrounding road network is useful for several purposes in this study:

A. Bypassing volume away from existing intersections will reduce volumes for some movements, and therefore reduce the probable crashes involving those movements.
B. New intersections can be expected to have crash patterns similar to other area intersections with similar geometry and volume.
C. Expectation of potentially higher crashes at new locations may suggest alternative intersection geometries to prevent the problem from occurring.

WYDOT Highway Safety Section provided crash data for study area road segments and intersections for the five year period 2011 to 2015, inclusive. The following is a summary of that data:

Corridor Crashes:

- **College Drive** experienced six crashes unrelated to intersections or drives, including horse, deer, and reckless or weather events with no correctable pattern.
- **Woods Road (County Road 598) from Columbia to Terminus (Storey Extension)**

One "*Property Damage Only*" (PDO) crash occurred on this link during the study period. A vehicle turned left without signaling.

- **Van Buren from RM 0 (Terminus) to 0.18 (Skyline Drive)**

No crashes

- **Arthur Avenue from Summit to Welchester**

No crashes

Intersection Crashes:

WY 212 (College Drive) at Welchester Drive (Mile Point 9.42)

This is a two-way stop controlled CROSS type intersection with approximately 4000 entering vehicles per day (VPD). All four legs are paved.

This intersection experienced 2 crashes including one injury crash (50%) injuring one person. Both crashes were angle crashes.

- **WY 212 (College Drive) at Balmoral Ct. (Mile Point 9.33)**

This is a stop controlled TEE intersection. No crashes were reported.

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- **WY 212 (College Drive) at Summit Drive (Intersection # 12663)**

This is a two-way stop controlled CROSS intersection with about 7500 entering vehicles per day. The E-W direction stops. The west leg is paved, with a 10' shared-use trail on the north side of the road. The east leg is unpaved and dead ends at Highland Road, so the intersection functions similarly to a TEE intersection. One PDO rear-end crash occurred eastbound at this intersection with no injuries.

- **WY 212 (College Drive) at Thomas Road (Intersection #12664 – Mile Point 8.89)**

This is a two-way stop controlled CROSS type intersection serving about 7800 vehicles daily. The E-W roadway stops. The east and west legs are unpaved.
Eleven crashes occurred at this intersection, including 4 (36%) injury crashes which injured 6 persons.
Six crashes (54%) were rear end collisions on the N-S paved roadway.
Of the 4 injury crashes, 2 (50%) were rear end crashes, one was an angle crash, and one was a loss of control crash.
Two PDO crashes were reported at mile point 8.90 (50' north of Thomas). Both were northbound rear-end collisions.

- **WY 212 (College Drive) at Carla Drive (Mile Point 8.53)**

This is a two-way stop controlled CROSS Intersection. The west leg of Carla Drive is unpaved.
The intersection experienced one PDO crash involving a vehicle entering from Carla which failed to yield to traffic southbound on College.

- **WY 212 (College Drive) at Victoria Drive (Mile Point 8.46)**

No crashes were reported.

- **WY 212 (College Drive) at Everton Drive (Mile Point 8.41)**

This is a two-way stop controlled CROSS type intersection. Everton is a paved minor collector.
One PDO angle crash was reported involving a vehicle entering from Everton and failing to yield.

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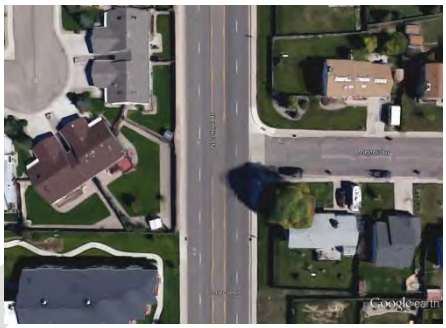
- **WY 212 (College Drive) at Magnolia Dr. (Mile Point 8.36)**

This is a paved TEE intersection with a local street.
No crashes were reported.



- **WY 212 (College Drive) at Rogers Ave (Mile Point 8.31)**

This is a TEE intersection with all legs paved.
This intersection experienced one angle crash resulting in one injury. A westbound entering vehicle failed to yield.

- **WY 212 (College Drive) at Gregg Way (Mile Point 8.28)**

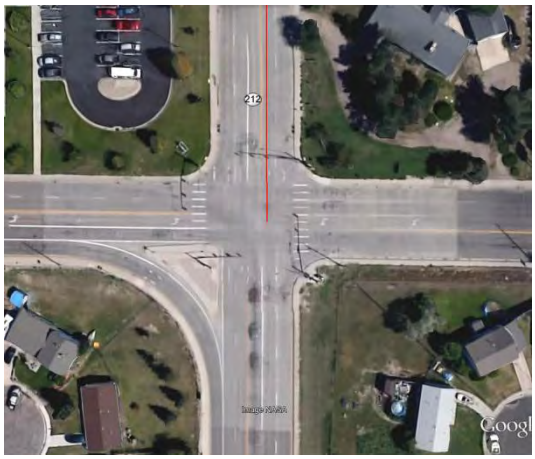
This is a TEE intersection of a local street.
No crashes were reported.

- **WY 212 (College Drive) at Cobblestone Court (Mile Point 8.25)**

This is a paved TEE intersection of a cul-de-sac serving 18 dwelling units. No crashes were reported.

- **WY 212 (College Drive) at Dell Range Boulevard (Intersection #12674 - Mile Point 8.15)**

This intersection is one of the highest crash locations in Wyoming. It is a signalized CROSS intersection processing about 32,000 vehicles per day. All legs are paved. The North, east, and south legs are 5-lane. The west leg has a RT Bypass lane.`



67 crashes occurred at this location, including 54 PDO crashes, 12 'serious' and 1 'critical' crash. 17 persons were injured in the 13 injury crashes.

31 crashes (46%) were angle crashes, which are common at CROSS type geometric configurations.
26 (39%) were rear end crashes, which commonly occur at intersections with signal control.
6 (9%) were head-on crashes, primarily due to misjudging a gap in oncoming traffic while executing a left turn.

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Extension of Storey Boulevard can be expected to reduce the East-West through volume on Dell Range, and reduce the volume of interaction between the north and east legs of the intersection.

- **Summit Drive (CR 590) at Ridge Road (CR-127) (Intersection #13843)**

This is a two way stop controlled CROSS intersection. The E-W direction stops. A 10' shared-used path follows the north side of Summit Drive.

25 crashes occurred at this intersection, including 8 injury crashes (32%) which injured 12 persons. 21 crashes (84%) were angle crashes.

Of the injury crashes, 2 (25%) were head-on collisions and 6 (75%) were angle crashes.

- **Summit Drive at Arthur Road**

This is a TEE intersection of two gravel roads.
No crashes were reported.

- **Summit Drive at Highland Road**

This is an ELL intersection of two gravel roads.
No crashes were reported.

- **Whitney Road at Beckle Road**

This is a TEE intersection with the east leg unpaved.
No crashes were reported.

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- **Dell Range Blvd at Van Buren Avenue (Intersection #13475)**

This is a two-way stop controlled CROSS intersection with the north leg a short stub. It functions similarly to a TEE intersection. All legs are paved.
Van Buren slopes downhill at a 1% grade near Dell Range.

One PDO crash occurred at this location. A southbound vehicle rear-ended another vehicle that had stopped at Dell Range. The road was icy.

- **Braehill Road (CR 605) at Thomas Road (CR 610) (Intersection # 13848)**

This is a two-way stop controlled CROSS intersection. Braehill (N-S) stops at Thomas (E-W). Both roads are gravel.
One fixed object PDO crash occurred at this location due to sliding on ice/snow.

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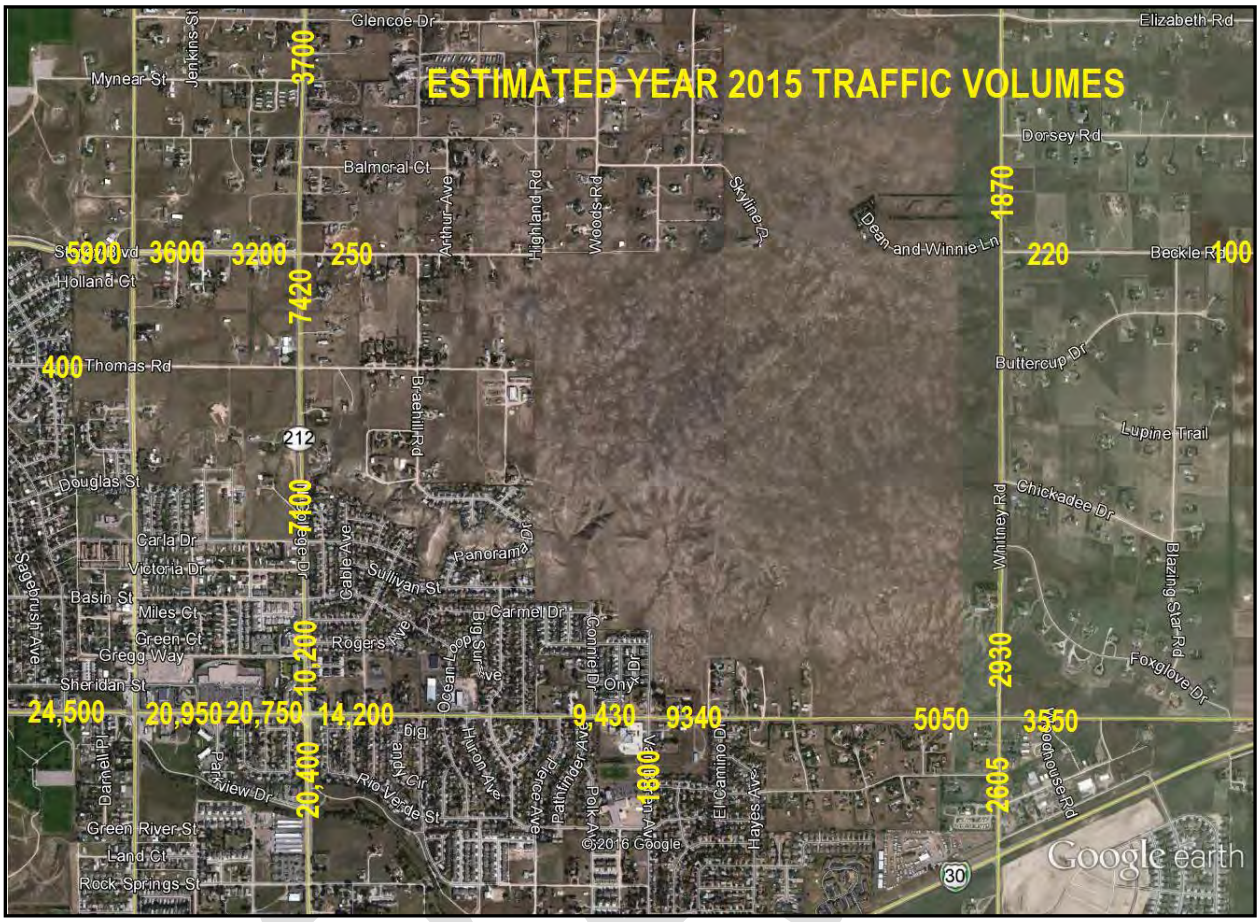
- **Existing Traffic Counts**

Traffic counts on nearby streets have been assembled by Cheyenne MPO and are listed in the following table. Green indicates actual counts and yellow are projected volumes.

Count Station ID	Street	Location	Annual Growth Rate	2015	2014	2013	2012	2011	2010	Jurisdiction	Class	Source
N/A	AVERAGE	Local Area	6.0%									
1418	Storey	W of Converse	2.0%	7,962	7,806	7,653	7,503	7,356	7,212	Cheyenne	Minor Arterial	HPMS
1419	Storey	E of Converse	2.0%	9,450	9,264	9,083	8,905	8,730	8,559	Cheyenne	Minor Arterial	HPMS
1329	Summit	W of Ridge	3.5%	5,905	5,697	5,489	5,281	5,207	5,132	Laramie Co.	Minor Arterial	HPMS
1334	Summit	E of Ridge	19.6%	3,630	2,918	2,206	1,494	1,513	1,532	Laramie Co.	Minor Arterial	HPMS
1203	Summit	W of College	2.0%	3,191	3,128	3,067	3,007	2,948		Laramie Co.	Minor Arterial	MPO
986	Summit	E of College	2.0%	242	238	233	228	224		Laramie Co.	Minor Arterial	MPO
		SUMMIT	11.6%									
191	Beckle	E of Whitney	2.0%	213	209	205	201	197		Laramie Co.	Collector	MPO
1210	Beckle	W of Christensen	2.0%	99	97	95	93	91		Laramie Co.	Collector	MPO
998	Thomas	W of Ridge		408	400	392	385	344	403	Laramie Co.	Local	HPMS
381	Dell Range	W of Ridge	-1.0%	24,242	24,492	24,743	24,993	23,510	24,129	Cheyenne	Primary Arterial	HPMS
367	Dell Range	E of Ridge	1.7%	21,315	20,951	20,587	20,223	18,279		Cheyenne	Primary Arterial	HPMS
372	Dell Range	W of College	1.5%	21,068	20,743	20,417	20,092			Cheyenne	Primary Arterial	HPMS
358	Dell Range	E of College	13.5%	14,161	12,248	10,334	8,421			Cheyenne	Primary Arterial	HPMS
383	Dell Range	W of Van Buren	2.0%	9,432	9,247	9,066	8,888	8,714	8,543	Cheyenne	Primary Arterial	HPMS
368	Dell Range	E of Van Buren	12.8%	9,339	7,315	5,291			3,267	Cheyenne	Primary Arterial	HPMS
384	Dell Range	W of Whitney	1.9%	5,035	4,936	4,839	4,744	4,651	4,560	Laramie Co.	Primary Arterial	MPO
369	Dell Range	E of Whitney	0.2%	3,548	3,541			3,519		Laramie Co.	Primary Arterial	HPMS
1126	Dell Range	W of US-30	18.7%	4,092	3,327	3,135	2,944	3,633		Laramie Co.	Primary Arterial	HPMS
		DELL RANGE	6.8%									
1303	College	S of Four Mile	7.3%	3,685	3,415	3,145			2,335	State	Primary Arterial	HPMS
1367	College	S of Summit	2.0%	7,420	7,274	7,131	6,992	6,302	7,274	State	Primary Arterial	MPO
310	College	N of Carla	7.3%	7,075	6,559	6,043	5,527	6,356		State	Primary Arterial	HPMS
311	College	N of Dell Range	7.6%	10,202	9,430	8,657	7,885	9,218	8,713	State	Primary Arterial	HPMS
325	College	S of Dell Range	NA	20,403						State	Primary Arterial	HPMS
		COLLEGE	7.4%									
1009	Van Buren	S of Dell Range	-9.1%	1,743	1,902		2,219			Cheyenne	Collector	HPMS
1007	Van Buren	N of US-30	-7.9%	2,534	2,735	2,936			2,190	Cheyenne	Collector	HPMS
		VAN BUREN	-8.5%									
1458	Whitney	N of Four Mile	4.2%	1,287	1,233	1,178	1,124			S?	Collector	HPMS
642	Whitney	N of Beckle Rd.	NA	1,865						S?	I?	HPMS
1072	Whitney	N of Dell Range	19.5%	2,925	2,355	2,202	2,049	2,264		Laramie Co.	Collector	HPMS
1074	Whitney	N of US-30	-9.3%	2,605	2,846			3,570		Laramie Co.	Minor Arterial	HPMS
		WHITNEY	4.8%									
297	Christensen	N Of Beckle	9.4%	1,557	1,411	1,010	990	971		Laramie Co.	Minor Arterial	MPO
298	Christensen	N of US-30	9.4%	2,114	1,915			1,318		Laramie Co.	Minor Arterial	HPMS
		CHRISTENSEN	9.4%									



- **Growth Rates**

Traffic counts in the immediate area showed a general growth rate of 6% between 2011 and 2015. Growth rates on various streets range from *negative* 8.5% annually on Van Buren south of Dell Range, to 9.4% annual increase on Christensen.

Six percent is a reasonable average growth rate on a developing urban periphery. However these are short range trends based on few observations and should not be used for long term (30-year) traffic projections.

- **Regional Traffic Model**

Cheyenne MPO maintains an urban travel demand model for the metropolitan area. The Base year of the model is designed to replicate travel patterns that occurred in the year 2010, and the model forecast year is 2040. The MPO modeled two scenarios for 2040: the *2040 Vision*, which includes all road improvements desired by2040, and the *2040 Fiscally Constrained* model, which includes only those road improvements for which funds have been identified. Plots of the study area are included in Appendix 4.

2010 Base Year Model

Urban travel demand models do not perfectly replicate traffic counts. Link volumes need to be adjusted for the over or under prediction inherent in modeling. The 2010 Base Model approximated study area 2010 traffic counts as follows:

Model Corridors	Average Corridor 2010 Over or Under Prediction
Storey/Summit Corridor west of Van Buren	102% over prediction
Storey/Beckle Corridor east of Van Buren	62% under prediction
College Drive Corridor north of Dell Range	4.2% over prediction
Dell Range west of Van Buren	26% over prediction
Dell Range east of Van Buren	70% over prediction
Van Buren south of Dell Range	54% under prediction
Whitney Road north of Dell Range	37% under prediction

2040 Models

The purpose of the 2040 "Fiscally Constrained" (FC) model is to project the traffic effects of expected new land use developments, as well as the "existing + committed" (E+C) road improvements. In this case, the FC model acts as the "No-Build" scenario, because it does not include the extensions of Storey Boulevard and Van Buren Avenue. We can use the prediction error from the 2010 model to adjust the model volumes for the 2040 FC Model, and the difference between the different 2040 models to examine changes in the system caused by the new roads. Any interpretation needs to bear in mind that the 2040 Vision model includes Storey Boulevard in roughly its proposed configuration, but the Van Buren Corridor has been changed and the 2040 vision model will be an imperfect representation of the new planned alignment.

Model Links	2010 Count / Est.	2010 Model Volume	Adjust. Factor	2040 FC Volume	Adj. FC Volume	2040 Vision Volume	Adj. Vision Volume	Unadj. effects of New Streets	Adj. Effects of New Streets
Summit west of College	2889	4016	.61	6156	3755	6842	4173	+686	+418
Summit east of College	224	638	.34	1004	341	1744	593	+740	+248
Storey Extension west of Van Buren	**~**	**~**	**~**	**~**	**~**	**1037**			
Storey Extension east of Van Buren	**~**	**~**	**~**	**~**	**~**	**735**			
Beckle Rd. east of Whitney	193	8	24.00	46	1104	538	12912	+492	+11808
College Drive north of Dell Range	8713	10620	0.82	14803	12138	14359	11774	-444	-363
Dell Range west of Van Buren	8543	8697	0.98	17792	17436	15736	15421	-2056	-2015
Dell Range east of Van Buren	4065	7973	.51	18019	9189	15255	7780	-2764	-1408
Van Buren north of Storey	**100**	**~**	**~**	**~**	**~**	**68**			

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Extension									
Van Buren south of Storey Extension	**~**	**~**	**~**	**~**	**~**	**251**			
Van Buren north of Dell Range	**~**	**~**	**~**	**~**	**~**	**304**			
Van Buren south of Dell Range	2131	987	2.16	2365	5108	2398	5180	+33	+72
Whitney Road north of Dell Range	2092	1420	1.47	4152	6103	2429	3570	-1723	-2532

Observed Model Effects of New Roadways:

Decreases:

- A significant traffic volume is diverted off of Dell Range Boulevard (1400-2800 vehicles per day).
- College Drive is reduced by 360-450 vehicles per day.

No Change:

- Van Buren south of Dell Range shows no change due to the new roadway. This suggests that a Van Buren extension will function as a collector street: primarily providing as access from development north of Dell Range to the Dell Range arterial.

Increases:

- Summit east of College increases by 250-750 vehicles per day.
- Beckle Road increases significantly, but the forecast is very imprecise and can be interpreted anywhere from 500 to more than 12,000 vehicles per day, which is not plausible.

Study Corridors

- The model shows Storey Extension with 750-1050 vehicles per day.
- The model shows Van Buren Extension with 70-300 vehicles per day.

Weaknesses in Urban Travel Demand Model Forecasts:

Traffic models are designed to replicate large areas and major flows, and are normally calibrated to most closely reflect major flows on high volume regional arterials. Lower volume collectors and local streets can vary a great deal, and forecasts for specific links can be very inaccurate.

Model assumptions for Cheyenne incorporated a simple background growth rate of 1.25%. Traffic generated in traffic analysis zones (TAZ's) was assumed to increase 1.25% annually, resulting in a total increase of 45% in 30 years. However, the traffic zones adjacent to the study corridors are the last large developable lots on the north side of Cheyenne - and they currently have just one dwelling in each zone. Consequently, these TAZ's have significantly more development potential than 45%. We would expect the Cheyenne area model to significantly under-predict traffic from these zones.

Significant Model Findings:

The 2040 model shows that extension of Storey will divert about 2060 vehicles per day off of Dell Range Boulevard. This is a reasonable expectation and the model is likely well calibrated for major arterials.

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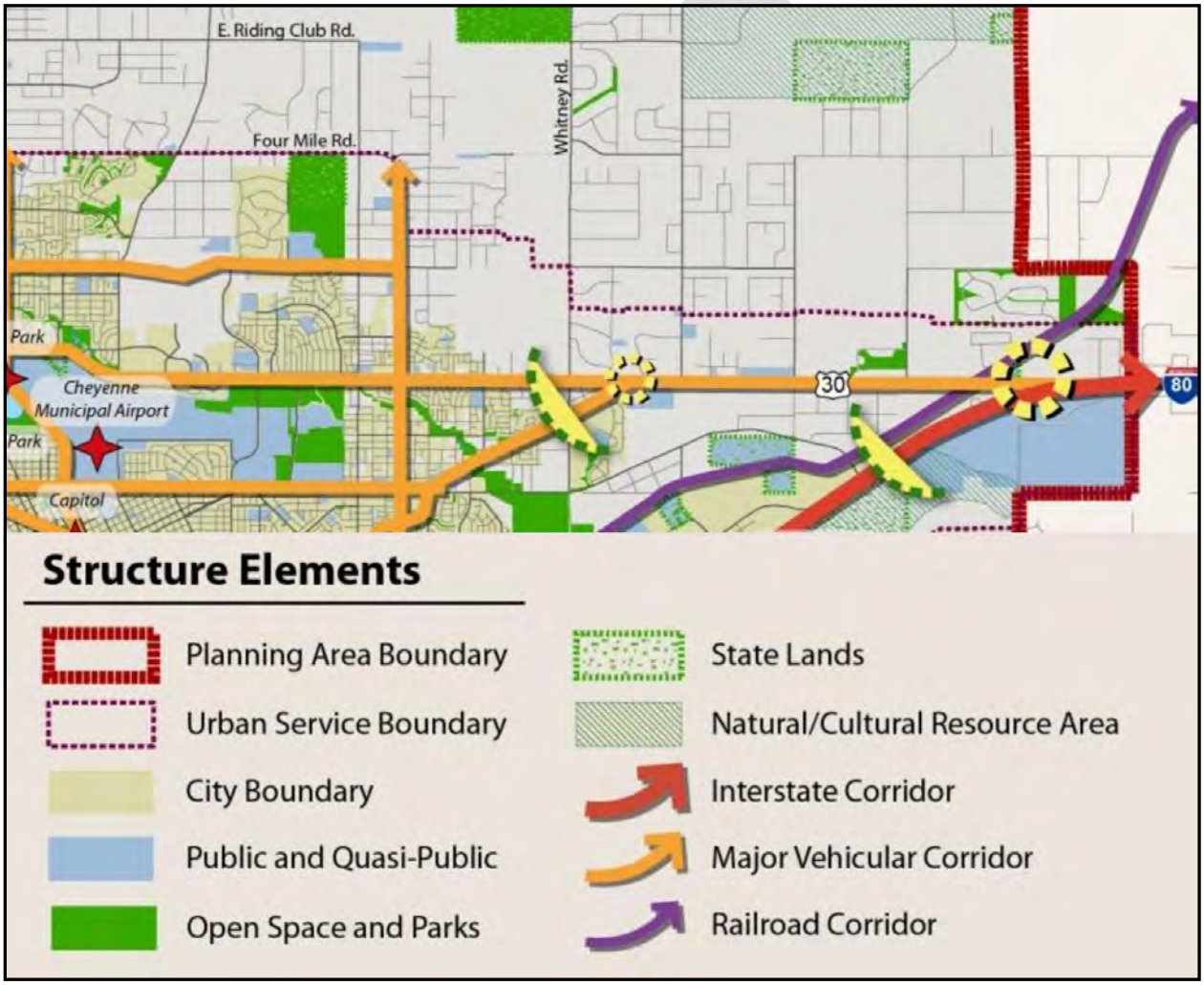
Recent Changes in Potential Land Use Intensity

The April 2014 update of PlanCheyenne now depicts the urban service boundary encompassing the study area.[8] The boundary (dashed purple line below) follows Four Mile Rd to College, then south to Welchester, east to Van Buren, southeast to Summit, east to Whitney, and south. Plans to make water and sewer available opens more development options, including anything from the current zoning (20 acre lots) to urban residential or commercial neighborhoods. The pattern of development will not be known until developments are approved in coming years.

This suggests that a more "urban" land use assumption would be prudent for street reservations within the study area.



[8] Structure Diagram, Community Plan: *PlanCheyenne: Reflections and Progress*, Cheyenne MPO, April, 2014. pg 47

Land Use Assumptions / Range of Potential Land Use Intensities

Future development is unknown. The adjacent land is within the urban services boundary, and it could be annexed to Cheyenne and developed with urban water and sewer – potentially allowing much higher densities. Depending on the development scenario, undeveloped parcels along the corridors could generate a range of traffic volumes from 580 to 31,000 ADT. For engineering design purposes, it's prudent to use a more conservative (on the reasonably high side) estimate of future traffic.

New Vehicular Trips on Land Adjacent to Proposed Streets*											
ITE Trip Generation Rates			ITE Land Use #210: Single Family Homes			2.25/HH	9.57	0.19	0.56	0.64	0.37
Location	Acres	Developable Area (~90%)	Zoning	Development Density (Units/Acre)	Dwelling Units	Population	Trips Per Day	AM PEAK IN	AM PEAK OUT	PM PEAK IN	PM PEAK OUT
LOW: Current Plats & Zoning					61	136	580	12	34	39	22
Woods Landing	160.0	144.0	Platted	0.1875	30	68	287	6	17	19	11
Gysel Lot 29	290.6	261.5	County A-2	0.05	13	29	125	2	7	8	5
Whitney Lot 30	256.2	230.6	County A-2	0.05	12	26	110	2	6	7	4
Gysel Lot 37/38	33.5	30.2	County AR	0.2	6	14	58	1	3	4	2
MEDIUM: PlanCheyenne Future Land Use					1,101	2,477	10,535	209	616	705	407
Woods Landing	160.0	144.0	Platted	0.1875	30	68	287	6	17	19	11
Gysel Lot 29	290.6	261.5	Urban Transition	1.9	497	1118	4756	94	278	318	184
Whitney Lot 30	256.2	230.6	Urban Transition	1.9	438	986	4193	83	245	280	162
Gysel Lot 37/38	33.5	30.2	Urban Residential	4.5	136	306	1300	26	76	87	50
HIGH: Cheyenne MR-2 & Standard Lot DD-6					3,280	7,381	31,392	623	1,837	2,099	1,214
Woods Landing	160.0	144.0	Platted	0.1875	30	68	287	6	17	19	11
Gysel Lot 29	290.6	261.5	MR-2	6.2	1628	3662	15575	309	911	1042	602
Whitney Lot 30	256.2	230.6	MR-2	6.2	1435	3228	13732	273	804	918	531
Gysel Lot 37/38	33.5	30.2	MR-2	6.2	188	423	1798	36	105	120	70
*Source: ITE Trip Generation, 8th Edition											

Manual Traffic Forecast

While we know the existing land uses and traffic volumes, future land uses and traffic volume forecasts inevitably carry some degree of uncertainty, and overdesign carries added construction cost. Engineers compensate for traffic variation by using the 85th percentile travel speed, and 30th high traffic hour, rather than the maximum possible volume and speed.

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Manual Trip Generation:

In the case of the above development scenarios, we are uncertain as to the future build out land use intensity and traffic volumes. Since underestimation carries the risk of under building the roadway, we will estimate the 85th percentile trip generation estimate for each parcel, where:

Mean = X = (L+4M+H)/6 Standard Deviation = S = (H-L)/6 85th Percentile = X + ZS

Estimated Trip Generation for Developable Parcels

	MEAN (X)	St Dev. (S)	Z	85th Percentile
Daily Trips	(O+4*ML+P)/6	(P-O)/6	1.05	= X + 1.05 S
Woods Landing	287	0	0	**287**
Gysel Lot 29	5,787	2,575	2,704	**8491**
Whitney Lot 30	5,102	2,270	2,384	**7486**
Gysel Lot 37/38	1,176	290	304	**1480**

Manual Trip Distribution

Trips were distributed according to the approximate "mass" of urban development in each cardinal direction. The parcels are located in the northeast quadrant of the urban area, so most daily trips will be oriented toward the south and west of the parcels. We will assign 50% to the west, 30% to the south, 10% to the east, and 10% to the north.

MANUAL TRIP DISTRIBUTION MATRIX					
FROM V	TO >	NORTH	EAST	SOUTH	WEST
		10%	10%	30%	50%
WOODS LANDING					
WL A	48	5	5	14	24
WL B	57	6	6	17	29
WL C	182	18	18	55	91
GEYSEL ESTATE		-	-	-	-
29 A	340	34	34	102	170
29 B	509	51	51	153	255
29 C	1,019	102	102	306	509
29 D	2,887	289	289	866	1,443
29 E	2,038	204	204	611	1,019
29 F	1,698	170	170	509	849
WHITNEY ESTATE		-	-	-	-
30 A	749	75	75	225	374
30 B	749	75	75	225	374
30 C	3,743	374	374	1,123	1,871
30 D	749	75	75	225	374
30 E	749	75	75	225	374
30 F	749	75	75	225	374
GEYSEL FARM		**-**	**-**	**-**	**-**
37 A	**1,036.25**	**104**	**104**	**311**	**518**
37 B	**444.11**	**44**	**44**	**133**	**222**
TOTAL	17,744	1,774	1,774	5,323	8,872

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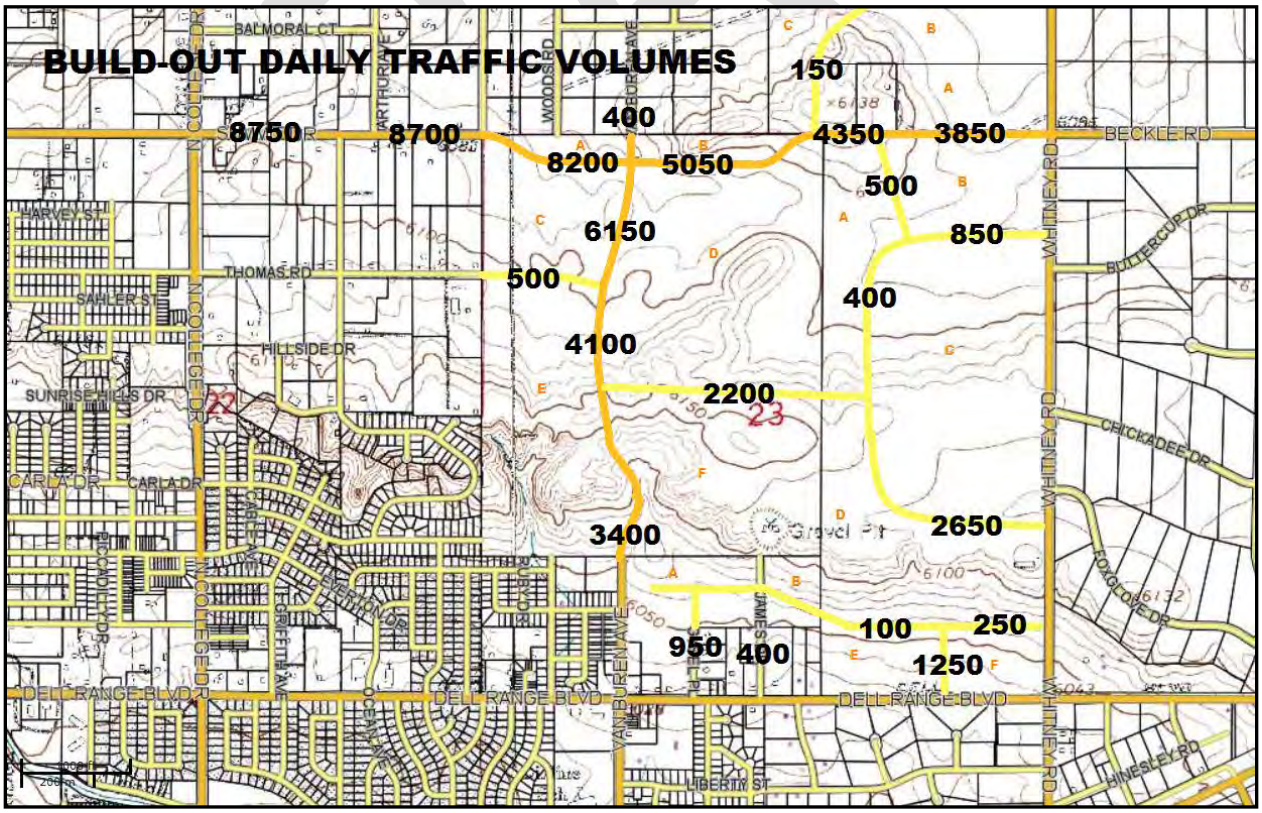
Manual Traffic Assignment Methodology

1. Traffic on existing streets was taken from current traffic counts.
2. Traffic from future build out development was assigned to streets by the following method:
    a. Proposed roadways and connecting local streets were drawn atop the lot boundaries for each developable parcel.
    b. Resulting polygons were treated as sub-zones, with each assigned a portion of the total daily trips generated in each existing.
    c. Traffic from each sub-zone was assigned to streets using the 'all or nothing' method, which assigns 100% of daily trips to the shortest path from each zone to the nearest arterial leading toward each cardinal direction.
3. With a new travel route, the 2040 Cheyenne area traffic models predict a diversion of 2060 vehicles per day from Dell Range to Storey Extension. This volume was added to the Storey corridor, along with existing volumes (#1 above) and traffic from new development (2 above).
4. Link volumes were rounded to the nearest fifty vehicles.

Manual Traffic Assignment Map

The map below illustrates the resulting traffic assignment of new trips from the study area, plus traffic from traffic counts and regional modeling. New trips are added to existing traffic volumes, and to the traffic volumes which the 2040 model shows will divert from other arterials. These forecasts represent a reasonable estimate of future build-out volumes on the Van Buren and Storey Boulevard corridors. These do not represent a specific forecast year (2030, 2040, etc.) but instead replicate a hypothetical build-out scenario.



Functional Classification

Using either Laramie County or City of Cheyenne standards, projected volumes would classify Storey Boulevard as a "Minor Arterial." Van Buren is a Minor Collector (UDC A) south of the bluff and Major Collector (UDC B) north of the bluff. For consistency, the regional functional classification map should list Van Buren as a "Major Collector" throughout its length, with a consistent 80' ROW reservation. Laramie County classifies roadways by volume as follows:[9]

Roadway Link	County Volume Range	County Functional Class
Storey Boulevard Extension west of Van Buren	7,000 – 15,000	Minor Arterial
Van Buren north of bluff	3,500 – 7,000	Major Collector
Van Buren south of bluff	1,000 – 3,500	Minor Collector

Excerpt from the Laramie County Land Use Regulations:

"c. Minor Arterial Streets

These streets serve major traffic generators and link collector streets with the principal arterials. These streets have a design traffic volume of between 7,000 and 15,000 vehicles ADT.

d. Major Collectors

Collectors provide a lower level of mobility than arterials at lower speeds and are of shorter distance. These streets connect local roads to arterials and have more direct access dependent on use and geographic setting. The design volume for these streets ranges from 3,500 to 7,500 ADT.

e. Minor Collector

The collector street system serves intermediate and short-distance travel. Traffic volumes on such facilities are usually lower than those found on arterial facilities. Although collectors provide access to residential, business, and commercial areas, they do not expedite the through movement of traffic. The design volume of these streets ranges from 1,000 to 3,500 ADT."[10]

Functional classifications are the same using the Cheyenne Unified Development Code.

Excerpt from Cheyenne Unified Development Code (UDC) Table 4-5: Functional Classifications and Applicability [11]		
Minor Arterial	*A street of moderate continuity over medium distances that provides direct access between adjacent neighborhoods or districts for medium volumes of traffic. Minor Arterial streets are occasionally interrupted or diverted by neighborhood destinations or natural barriers.*	*Minor Arterials Streets should be located every 1/3 to 1 mile apart, except more frequent location of Collector Streets can result in less frequent need for Minor Arterial Streets.* *Volume Range : 7,500 to 35,000 ADT*
Collector	*A street of moderate continuity over medium distances that provides direct access between adjacent neighborhoods or districts for low volumes of traffic. Collector Streets are occasionally interrupted or diverted by neighborhood destinations or natural barriers, or intersections with higher order streets.*	*Collector Streets should be located every ¼ to ½ mile apart.* *Volume Range : 2,500 to 7,500 ADT*

[9] The Laramie County Land Use Regulations, Ch 5: Chapter 5 - Road/Street Design Standards, Adopted February 15, 2011,

[10] *Ibid.* pg 188.

[11] *Cheyenne Unified Development Code*, City of Cheyenne, WY, Amended January 20, 2016, pg 4-9

With completion of this section, Storey Boulevard will extend 7.5 miles from I-25 Access Drive (Hynds Boulevard) in the west, to Reese Road in the east, forming a natural minor arterial across north metro Cheyenne. Forecast volumes fall into the range from 7500-18,000 ADT, which is normal for roadways of this class. The road has comparatively few driveways and serves primarily to provide mobility rather than access. The nearest parallel arterials, Four Mile Road and Dell Range Boulevard, are spaced one mile distant to the north and south, respectively. There are no parallel collector streets. The roadway is correctly classified as a *Minor Arterial*.

Van Buren Avenue, traversing a shorter distance and serving a smaller area, will function as a collector street. Extending 2.75 miles, from US-30 to the future Four Mile Road, the roadway will serve less as a mobility function and more of an access function connecting surrounding neighborhoods to local arterials. The parallel arterials on either side (College Road to the west and Whitney Road to the east), are about ¾ mile distant, making a collector necessary to serve the neighborhoods in between.
Laramie County Land Use Regulations differentiate between major and Minor Collector Streets. With a projected average daily traffic (ADT) of 4100-6150 vehicles, Van Buren Avenue north of the bluff falls into the *Major Collector* category. South of the bluff, Van Buren will have little or no new development, and the projected ADT of 3400 falls into the Laramie County *Minor Collector* category.

Roadway Design Standards
The design criteria used for these roadways come from several sources. The primary source will be the Laramie County Land Use Regulations. Cross section and alignment design are supplemented using AASHTO, Cheyenne Greenway design standards, and Cheyenne UDC as appropriate.

- Primary: Laramie County Design Standards[12]
- Secondary: AASHTO (Green Book) Standards[13], Cheyenne City Unified Development Code (UDC)[14]

** The recommended right of way reservations for Storey and Van Buren will be sufficient to develop roadways meeting either Laramie County's or the City of Cheyenne's current street design regulations.**

[12] *Laramie County Land Use Regulations*, Chapter 5 - Road/Street Design Standards, adopted February 15, 2011
[13] American Association of State Highway and Transportation Officials (AASHTO) "*A Policy on Geometric Design of Roads and Streets*," (Green Book) CH VI: *Collector Roads and Streets*, Washington DC, 2004.
[14] *City of Cheyenne Wyoming Unified Development Code* (UDC), Section 4.3, updated October 14, 2015

Design Standards and Technical Criteria				
Street Segment	**Storey west of Van Buren**	**Storey east of Van Buren**	**Van Buren north of Bluff**	**Van Buren south of Bluff**
Forecast (ADT/DHV)	8,750/960	5,050/560	6,150/740	3,400/410
Functional Classification	County Minor Arterial	County Minor Arterial	County Urban Collector (UDC B)	County Urban Collector UDC (A)
Laramie County Design Criteria				
Roadway Width (Back of Curb to Back of Curb)	36' Min	36' Min	36' 44' with left turn lane	36' 44' with left turn lane
Right-of-Way Width	100' min	100' min	80' min*[15]	70' min
Travel Lanes	2x12'	2x12'	2x12'	2x12'
Left Turn Lane	12' at Intersections. Continuous as determined by county.	12' at Intersections. Continuous as determined by county.	12' at Intersections where needed.	12' at Intersections where needed.
Bicycle Lane / Shoulder	6'	6'	6' (5' at intersections)	6' (5' at intersections)
Parking	None	None	None	None
Parkway Tree Lawn / Landscape Strip	6' minimum, landscaped	6' minimum, landscaped	8' (min), 6' at intersections with left turn lane	8' (min), 6' at intersections with left turn lane
Sidewalk / Greenway* Pedestrian Area Width	10' on N Side* 8' on S Side	10' on N Side* 8' on S Side	10' on E side* 6' on W side	10' on E side* 6' on W Side
Median	None	None	None	None
Maximum Grade	6%	6%	10%	10%
Maximum Superelevation	.04	.04	.04	.04
Speed Limit	40 MPH	40 MPH	35 MPH	30 MPH
Access	Limited	Limited	Limited	Limited
Curb and Gutter	Vertical	Vertical	Vertical	Vertical
Utilities	Main lines for water, sewer, and storm drains shall be placed under the street with individual taps running to the property line.	Main lines for water, sewer, and storm drains shall be placed under the street with individual taps running to the property line.	Main lines for water, sewer, and storm drains shall be placed under the street with individual taps running to the property line.	Main lines for water, sewer, and storm drains shall be placed under the street with individual taps running to the property line.
Design Sight Distance along Street (per Table 106-1)	325'	325'	250'	200'
Minimum Sight Distance Along Street (per Table 106-1)[16]	275'	275'	225'	200'
Design Vehicle (per Table 106-3)	Multi Unit Truck	Multi Unit Truck	Multi Unit Truck	Multi Unit Truck

[15] * Asterisk indicates standard from a source other than County Land Use Regulations.
[16] See Table 106-4: Stopping and Deceleration Adjustment Factors for Highway Grade, Laramie County Land Use Regulations, pg 206.

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Entering Sight Distance for Controlled Intersections	680’	680’	595’	510’
Supplemental AASHTO and ADAAG Design Criteria				
Terrain	Level	Level	Level	Rolling
“The longer sight distance and curve radii commensurate with higher design speeds result in safer highways and should be used to the extent practical.” – AASHTO				
Maximum Rate of Vertical Curvature K (Crest / Sag)	61/79	61/79	29 / 49	29 / 49
Max Grade (Urban / Rural)	6%	6%	7%	11% / 9%
Min Grade	0.3-0.5%	0.3-0.5%	0.3-0.5%	0.3-0.5%
Cross Slope	1.5 – 3%	1.5 – 3%	1.5% - 3%	1.5% - 3%
ADAAG Pedestrian Max Grade	5%	5%	5%	5% (Terrain Permitting)

Cheyenne UDC Technical Criteria				
Standard Roadway Classification	**Min. Arterial**	**Min. Arterial**	**Collector B**	**Collector A**
Daily Traffic Volume Range	7,500-18,000	7,500-18,000	6,000-10,000	5,000-7,000
Forecast (ADT/DHV)	8,750/960	5,050/560	6,150/740	3,400/410
Design Speed	45	45	35	35
Speed Limit	30-45	30-45	30-35	30-35
Design Vehicle	WB-67	WB-67	B-40	B-40
Minimum Sight Distance (Driveway / Intersections)	830’	830’	660’	660’
Stopping Sight Distance	325’	325’	200’	200’
Minimum Intersection Spacing	660’	660’	330’	330’
Distance between Signals	1320’	1320’	n/a	n/a
Minimum Access Separation – Corner	330’	330’	150’	150’
Minimum Access Separation – other access	330’	330’	75’	150’
Driveway Approach and Street Configuration	Radial Curb Return	Radial Curb Return	Flared	Flared
Required Curb and Gutter Type	6” Vertical	6” Vertical	6” Vertical	6” Vertical
Minimum Full depth HPB Section	7”	7”	6”	6”
Minimum Composite Sections Depth (HBP/ABC)	5” / 8”	5” / 8”	4” / 8”	4” / 8”
Grade Max / Min	6% / 0.5%	6% / 0.5%	8% / 0.5%	8% / 0.5%
Maximum Super-elevation	0.6	0.6	0.6	0.6
Acceleration/Deceleration Lanes	Per UDC Section 4.3.7	Per UDC Section 4.3.7	n/a	n/a

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Cheyenne UDC Geometric and Urban Design Standards				
Standard Roadway Classification	**Min. Arterial**	**Min. Arterial**	**Collector B**	**Collector A**
A: Number of Lanes (width)	2 X 12’	2 X 12’	2 x 12’	2 x 12’
B: Median Type (width)	Painted (12’)	Painted (12’)	Painted (12’)	None
C: Parking	None	None	None	None
D: Bike Lane / Shoulder	6’	6’	6’	6’
E: Roadway Width (BC-BC)	48’ Minimum (2-Lane w/Median)	48’ Minimum (2-Lane w/Median)	48’ Minimum	36’ Minimum
F: Tree Lawn / Landscape Strip	8’ minimum	8’ minimum	8’	8’
G: Pedestrian Area	6’ Minimum	6’ Minimum	6’	6’
H Right of Way Width	100’ Minimum	100’ Minimum	80’ Minimum	70’ Minimum

Basic City of Cheyenne UDC Road Cross Sections:

The cross sections illustrated below correspond to the table above from the Cheyenne UDC.

Storey Blvd would be designed to UDC “Minor Arterial” standards with 10’ greenway on the north side.

Van Buren north of the bluff may be designed as a Class B Collector with a 10’ pathway on the east side.

South of the bluff, Van Buren may be designed as a Class A Collector Street (without a center turn lane). The 80’ ROW should be retained throughout Van Buren to allow flexibility in the horizontal and vertical alignment of the 10’ non-motorized pathway.

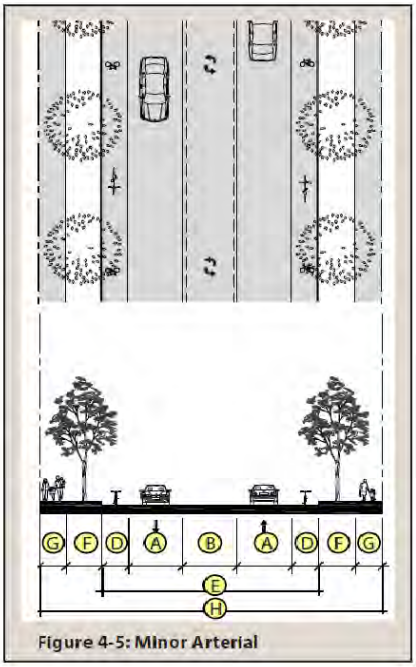


Figure 4-5: Minor Arterial

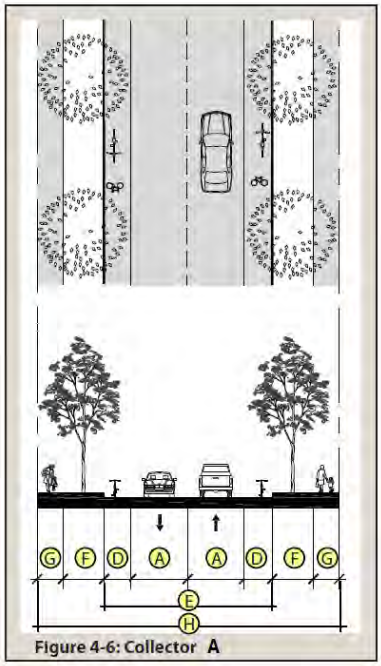


Figure 4-6: Collector A

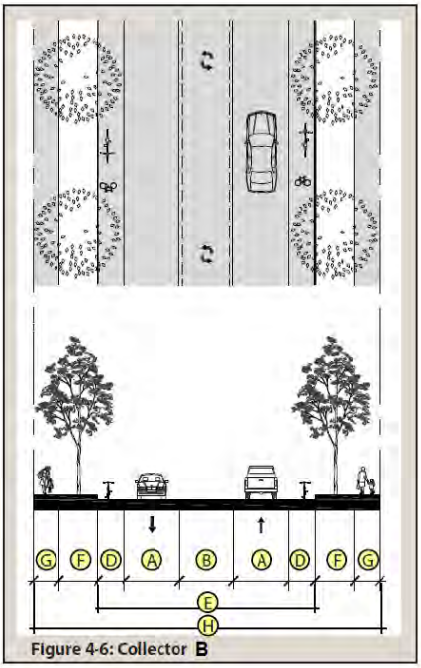
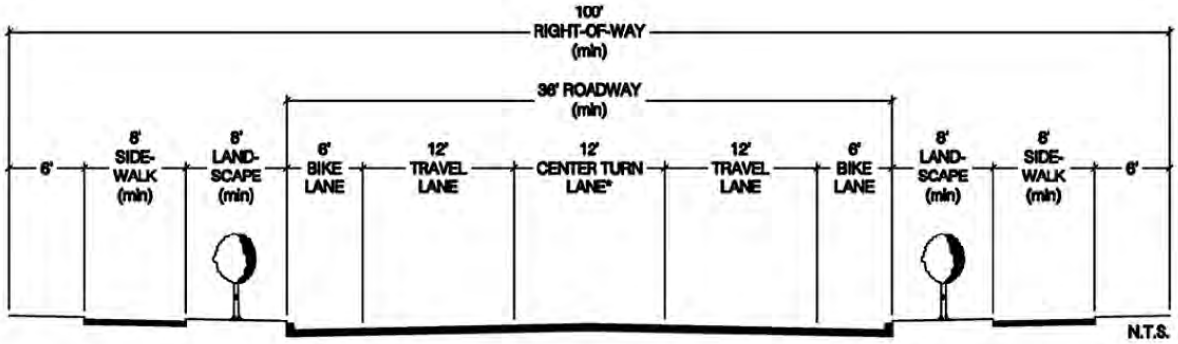


Figure 4-6: Collector B

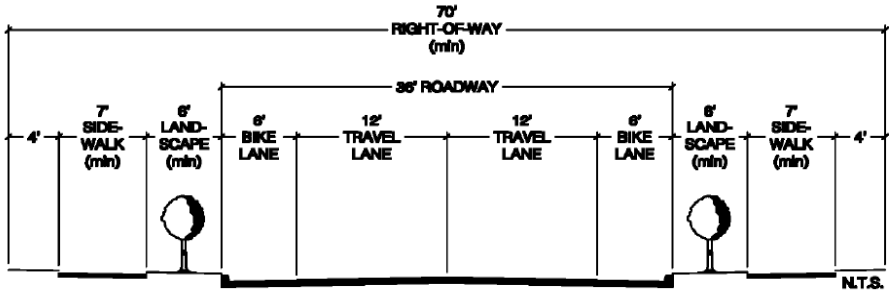
Basic Laramie County Road Cross Sections:

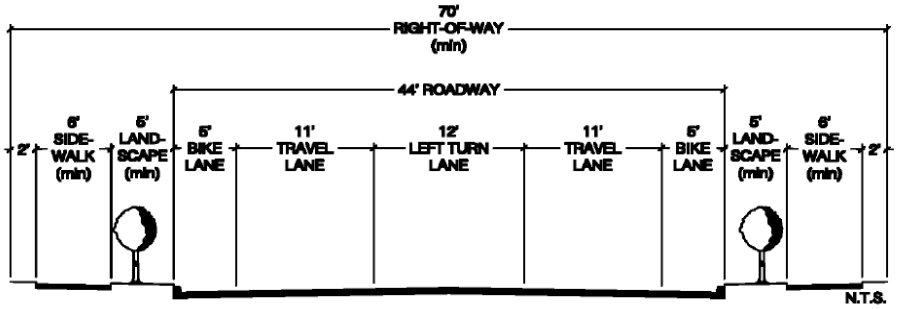
The study will reference these three basic County and City cross sections as minimal requirements, with the addition of a ten-foot shared use path along the north side of Storey, and the east side of Van Buren. Storey will be an urban minor arterial. Van Buren will be a three lane collector north of the bluff, and a 2-lane south of the bluff, with an 80' right of way throughout.

Urban Minor Arterial Street



Urban Collector Street Without Parking





Preliminary Alignments Considered

The map below depicts potential alignments of the roadways superimposed on a map showing terrain, soils, drainage, and the existing ridgeline private trail.

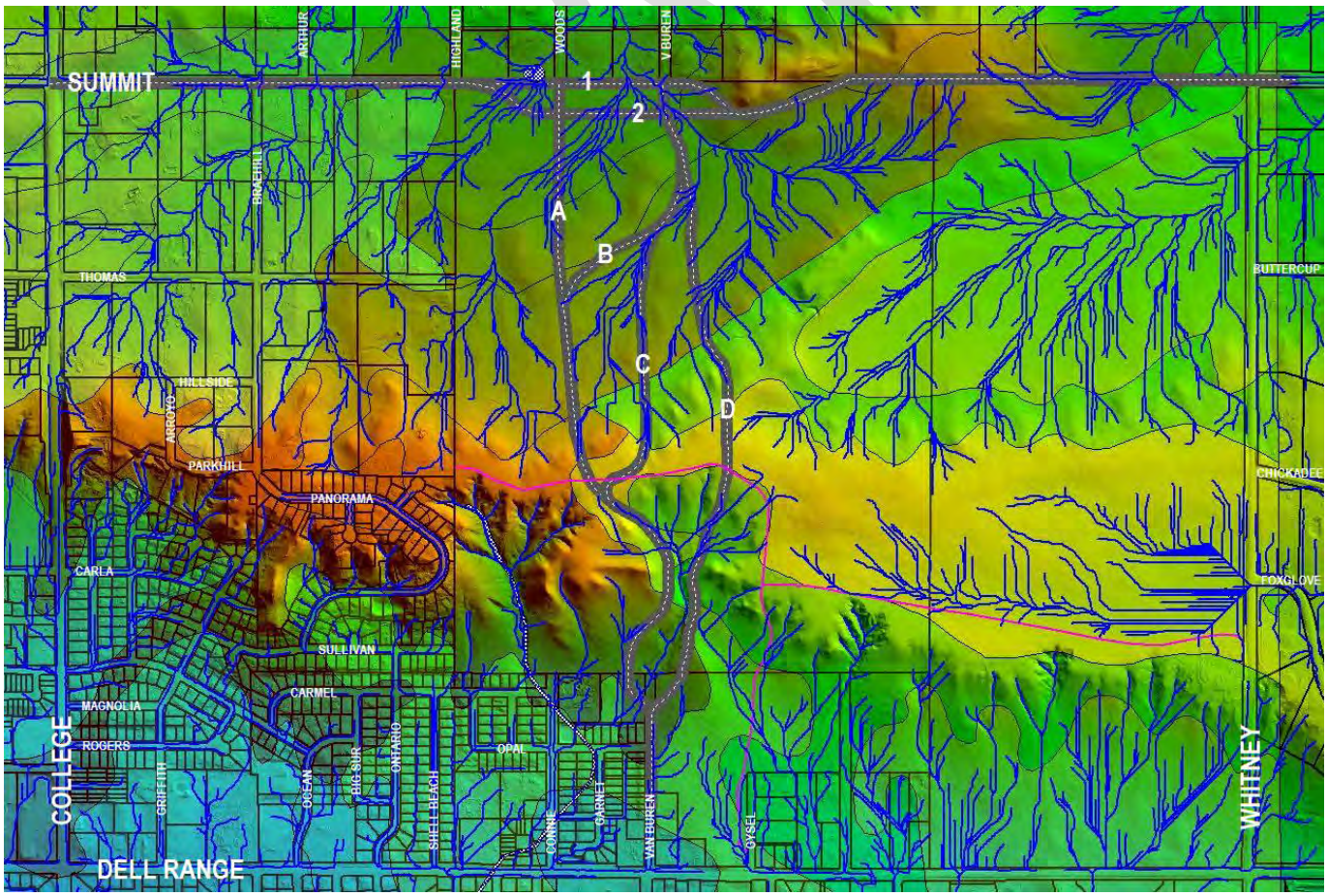
- **Storey Boulevard Alignments**

Most of the Storey Extension follows the north section lines of sections 22 and 23. Because of the obvious terrain limitations and environmental impacts imposed by cutting through the steep hill, a direct alignment of Storey along the section line was rejected. This left two preliminary alternatives which were evaluated for extension of Storey (map below).

The northern alignment (Storey 1) follows the section line as closely as possible while avoiding the hill. This alignment impacts the federally designated wetland between Highland and Woods Roads, and is closer to existing homes on the north.

The southern alignment (Storey 2) avoids both the steep hill and the wetland. It follows a line approximately one typical lot width south of the section line. This leaves space for new developable lots on the north side of Storey Boulevard, and locates the alignment further away from existing homes.

The study recommended eliminating the Storey 1 alignment, and further refinement of the Storey 2 alignment to meet geometric design criteria, maximize performance, and minimize costs and impacts.



- **Van Buren Avenue Alignments**

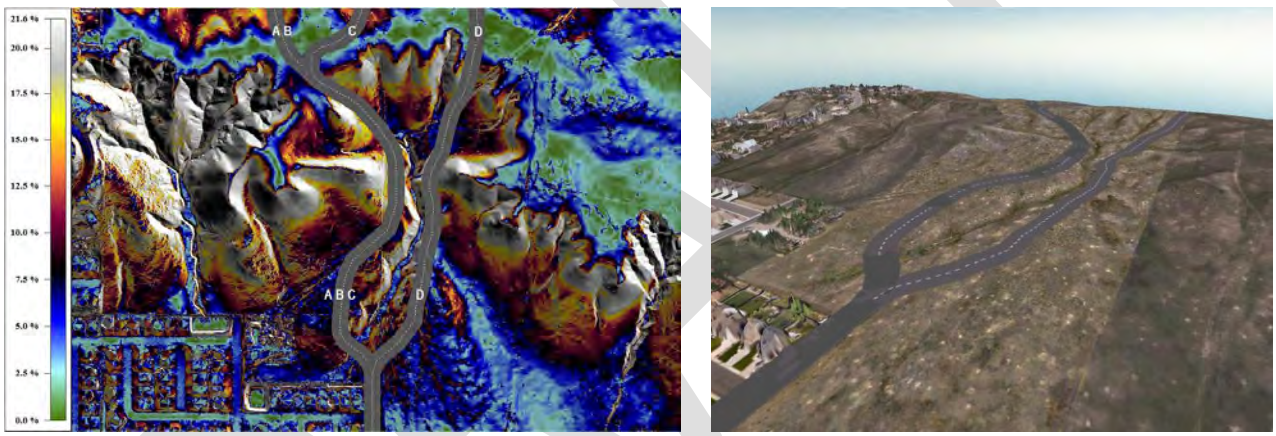
The Van Buren Extension has two potential alignments south of the bluff, and four alignments north of the bluff.

South of the bluff, Van Buren can follow west or east of the creek that drains the arroyo. Steep terrain is the major constraint for street construction.

The west alignment (Van Buren ABC below) follows a natural shelf (blue, 5% slope) along the west bank of the arroyo. Route ABC crosses a drain just north of the current Van Buren terminus and gradually spirals uphill as it rounds the left embankment. This route would entail less earth moving and less environmental risk from construction.

The east alignment (Van Buren D) remains east of the existing drain. It would cross an intermediate ridge and then steep terrain on the north bank of the arroyo. Construction along route D would involve more earth moving and risk environmental impacts than alignment ABC.

Image: Slopes and South Van Buren Alignments



North of the bluff, the gently sloping terrain presents less of a constraint. Soils, drainage, and network considerations increase in relative importance.

Route *"Van Buren A"* It follows a slight ridge and avoids crossing drains until past the route B cutoff. It then crosses a number of small drainages and creates a new intersection at points 1A or 2A. Soils are less desirable on the west. Route A aligns with Woods Road. Connections north on Woods Road terminate at Columbia Drive, 0.64 miles east of College.

Route *"Van Buren B"* departs from route A and avoids crossing drainages by following a slight ridge northeast to align with Van Buren. It creates a new intersection with Storey Extension at either point 1B or 2B. Connections north on Van Buren continue 1000' north; jog 385 feet east along Skyline Drive, then 0.85 miles north to Four Mile Road. Four Mile Road is envisioned as a future east-west arterial and provides a logical terminus for a collector street.

Route *"Van Buren C"* turns sharply on top of the bluff and follows the bottom of a drainage north to an intersection at 1B or 2B and intersects Van Buren Avenue. Other characteristics are identical to route B.

Route *"Van Buren D"* is the easternmost route. Once atop the bluff, soil conditions are slightly better than alignments further west. The alignment crosses two major drains north of the bluff. Intersections and other considerations are identical to routes B and C.

The position of the intersection 2B (at the bottom of a sag vertical curve) creates good intersection stopping sight distance.

Recommended Alignments

The study team recommended Storey Alignment 2 for further geometric refinement for the following reasons:

- Alignment 2 avoids both the steep hill and the wetland along the section line.
- Alignment 2 is further from existing homes, offering less potential for impacts.
- Alignment 2 provides space for new high quality lots on south side of the hill and section line.

The study team recommended Van Buren Alignment "B" for further geometric refinement for the following reasons:

- Alignment B is on the west side of the arroyo (gulch) north of Dell Range. The west side provides a shallower gradient on a shelf above the stream bed. This requires less earth moving to achieve a shallower gradient and gentler vertical and horizontal curvatures.
- Alignment B connects to the Van Buren north terminus and provides better service as a collector street connecting to the future extension of Four Mile Road.
- Alignment B stays higher on the slope than alignment C, avoiding impacts on streams and drainage.
- Alignment B provides a better location for a future TEE intersection of Thomas Road. Thomas is shorter, with less drainage issues and superior sight distance at the future intersection.

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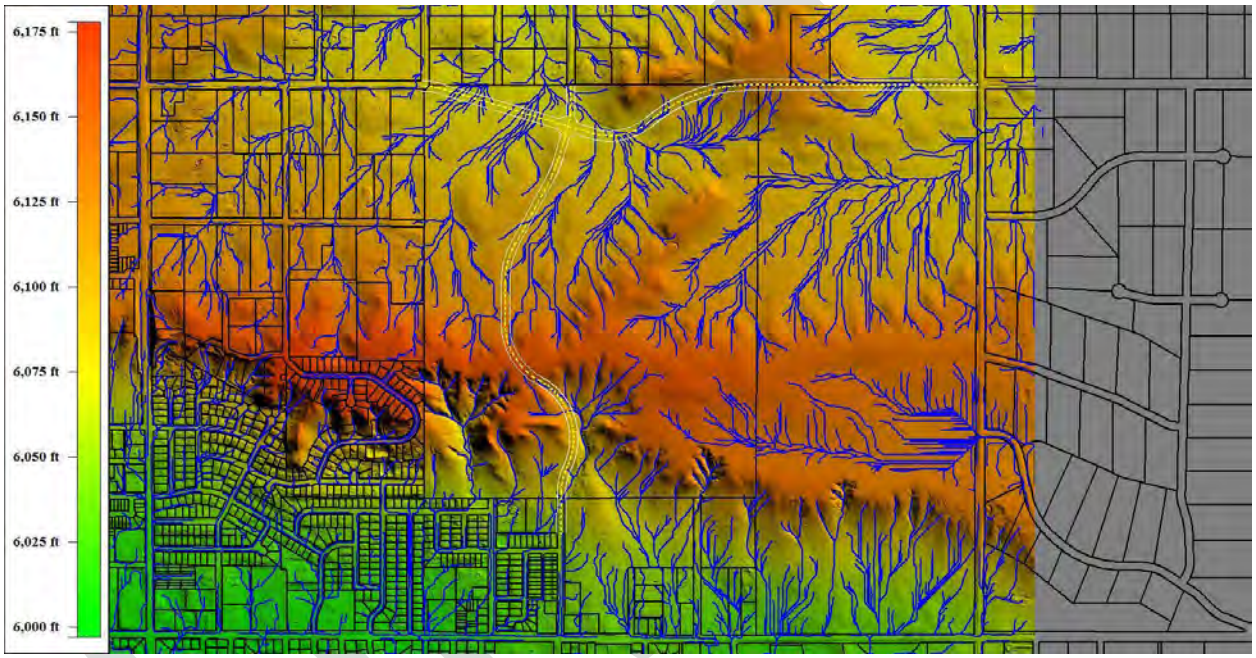
Refinement of Alignments 2 and B

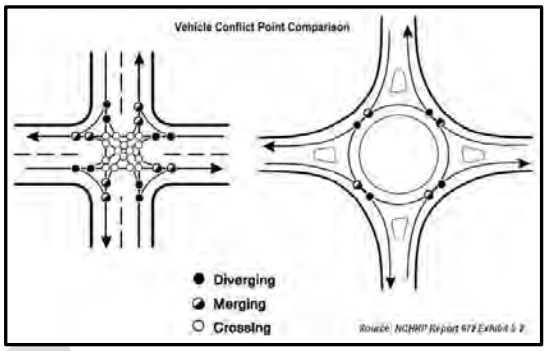
Using Alignments 2 and B as a basis, Western refined the alignments to minimize earth moving, accomplish gradual vertical grades and contours, smooth horizontal curvatures, and achieve an intersection at an angle of 80-90 degrees per Laramie County road design regulations.

This had the effect of realigning Storey Boulevard on a more NW-SE diagonal, with a slight relocation of the Van Buren intersection to maintain a 90-degree crossing.

While this realignment creates a narrow triangular lot near Highland Avenue, the lot is very low and would be suited to future use as runoff detention – which will be required for any development.

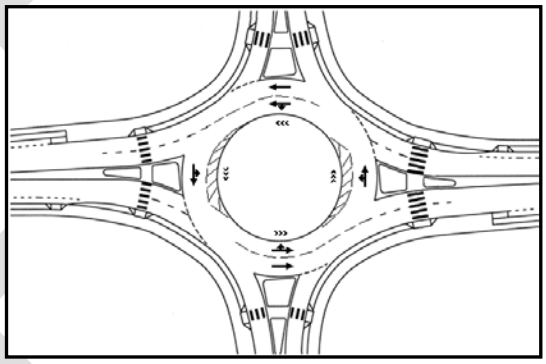


Intersection Recommendations



Existing study area intersections consistently show more injury crashes where crossing movements are allowed. CROSS intersections have more conflict points and angle crashes. Roundabouts produce a low-speed environment and substantial safety advantages.[17] For this reason, this study recommends that new cross intersections be avoided when possible, that the network use TEE or roundabout instersections instead, and that cross intersections be converted to roundabouts, space and budget permitting.[18]

Intersection of Storey Extension at Van Buren Extension

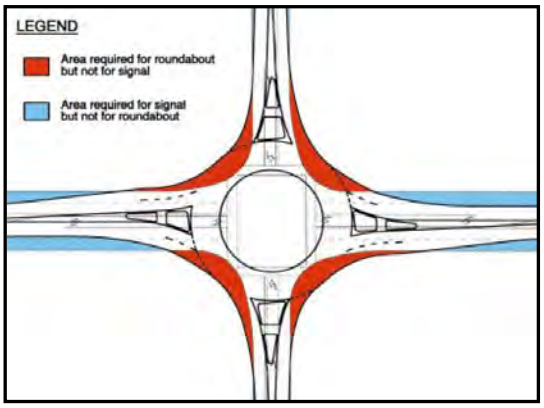


Van Buren and Storey will cross south of the existing terminus of Van Buren. Build-out volumes indicate that a flared 2-lane east-west by 1-lane north-south would meet any likely capacity contingency (diagram[19]). Such a design could be staged - as a temporary single lane for interim capacity requirements. The diameter for this type of roundabout is about 180 feet. A ten foot outer ring for landscaping, utilities and pedestrian space yields a suitable right-of-way reservation of a 100-foot right of way radius.

Until traffic volumes develop, the right of way is adequate for whatever intersection type the responsible road jurisdiction may decide is appropriate.

Roundabout Intersection Space Requirements[20]

Roundabouts need less overall space than people tend to expect. While they usually require more space within the intersection, they save space on corridors between intersections because flared entry designs can accommodate more vehicles per travel lane. Right of way space along the roadway can instead provide added space for pedestrians, landscaping, parking, or other uses. The following are typical diameters for various roundabout types:



- Mini-roundabout 14–28 m (46–92 ft)
- Urban compact 25–30 m (80–100 ft)
- Urban single lane 30–40 m (100–130 ft)
- Urban double lane 45–55 m (150–180 ft)
- Rural double lane 55–60 m (180–200 ft)

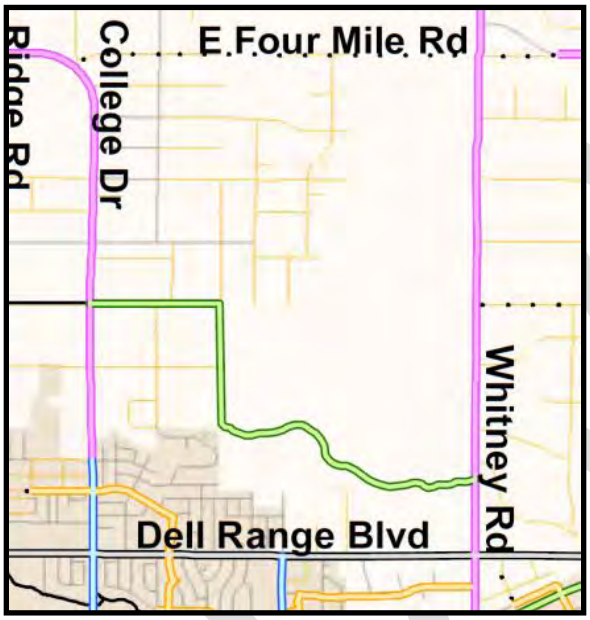
[17] *Proven Safety Countermeasures – Roundabouts*, US Federal Highway Administration, Oct., 2014.
[18] National Cooperative Highway Research Program (NCHRP) Report 672: *Roundabouts: An Informational Guide – Second Edition*, 2010. pg 71.
[19] *Roundabouts: An Informational Guide*, US Federal Highway Administration, FHWA-RD-00-067, June 2000, Appendix B Example of a typical flared-entry roundabout. pg 262.
[20] Source: National Cooperative Highway Research Program (NCHRP) Report 672: *Roundabouts: An Informational Guide – Second Edition* : Appendix B: Example Roundabout Designs

Non-Motorized Facilities

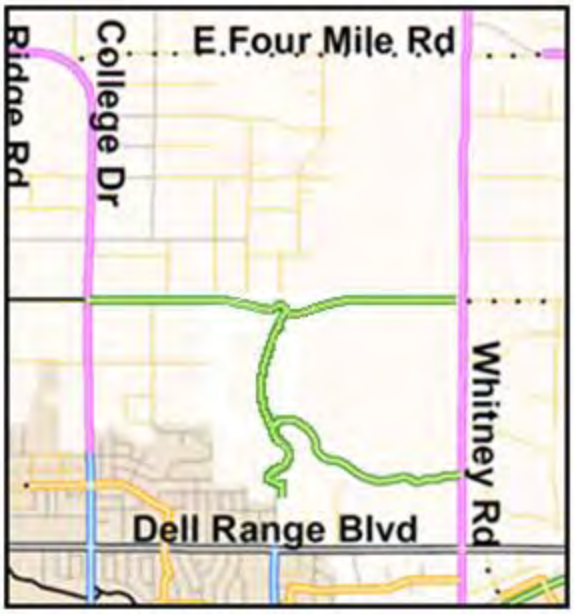
PlanCheyenne 2014 included proposed routes for extension of the Greenway system through the study area. That proposed alignment followed Summit to Highland, then south on the west Gysel property lines to the ridge line, then east along the ridge to Whitney Road (left map below). With extension of Van Buren up the gully and across the ridge, that trail alignment would have resulted in a pedestrian crosswalk at a location with potentially restricted visibility.

Instead, the route was redesigned to follow the new roadways (map at right, below). A greenway facility (10' shared use trail) will follow the north side of the new Storey alignment from College to Whitney. A 10' trail facility will also be provided on the east side of Van Buren – eliminating the need for a pedestrian crossing at the ridge line. Safe crossings will be provided at the roundabout at Van Buren and Storey.

Left: 2014 Plan Cheyenne Trail Alignment



Right: Recommended Trail Alignment



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Recommended Cross Sections

The recommended cross sections are described generally as follows:

Storey from College Drive to Highland Road

This 80' right of way is not wide enough to accommodate all of the features in county and city codes for minor arterials. For that reason, and for consistency, this section is identical to the section west of College. The roadway will have two 12-foot travel lanes, a 12-foot center left turn lane, two 6' bike lanes, and two 2-foot gutters with 6 inch vertical curb. The north side will have a 10-foot Greenway shared use path with no parkway, and the south side will have a 5-foot landscape strip and 5' sidewalk.

Storey from Highland Road to Whitney Road

This minor arterial will have a 100-foot right of way, sufficient for full compliance with City and County regulations. The roadway will have two 12-foot travel lanes, a 12-foot center left turn lane, two 6' bike lanes, and two 2-foot gutters with a 6-inch vertical curb. The north side will have an 8-foot landscape strip and 10-foot Greenway. The south side will have an 8-foot landscape strip and an 8' sidewalk.

Van Buren north of the bluff

This collector segment will have an 80-foot right of way with a cross section fully compliant with both City and County design regulations. The roadway will consist of two 12-foot travel lanes, a 12-foot center left turn lane, two 6-foot bike lanes, and two 2-foot gutters with 6-inch vertical curb. The east side will have a 6-foot landscape strip and 10-foot Greenway. The west side will have a 6-foot landscape strip and 6' sidewalk.

Van Buren south of the bluff

The steeper grade south of the bluff requires more flexibility within the 80' right of way. For that reason, it is proposed as a UDC Collector Type A: without a center left turn lane. The roadway will consist of two 12-foot travel lanes, two six-foot bikes lanes, and two 2-foot gutters with a 6-inch vertical curb. The landscape strip will be of variable width to allow maximum flexibility for vertical and horizontal alignment of the pedestrian facility to meet the requirements of the Americans with Disabilities Act (ADA). A ten-foot Greenway shared use path will follow the east side of the roadway, with a six-foot sidewalk on the west side of the roadway.

New Right of Way Requirements

Storey Boulevard will be 100 feet wide. A 50' half right of way has already been reserved in Section 14. In section 23, Storey will have an area of 2.4 acres on the Whitney Property (parcel 30), and 7.5 acres on the Gysel property (parcel 29). Van Buren would have an 80' right of way and a total area of 8.0 acres. The total right of way for both right of way will be 17.9 acres.

Recommended Alignments and Rights of Way

Diagrams on the following pages depict the recommended alignments and rights of way for the corridors.

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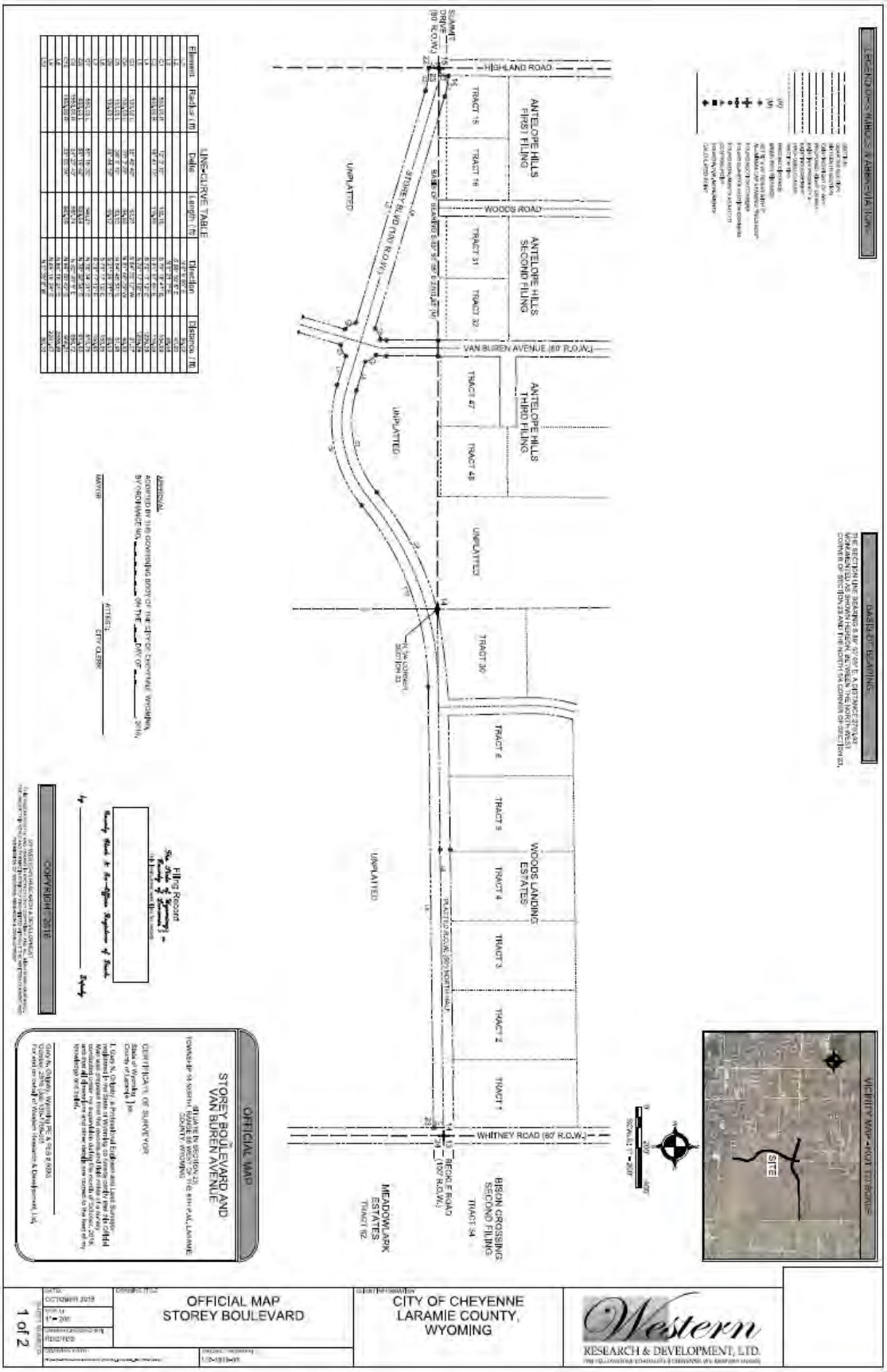
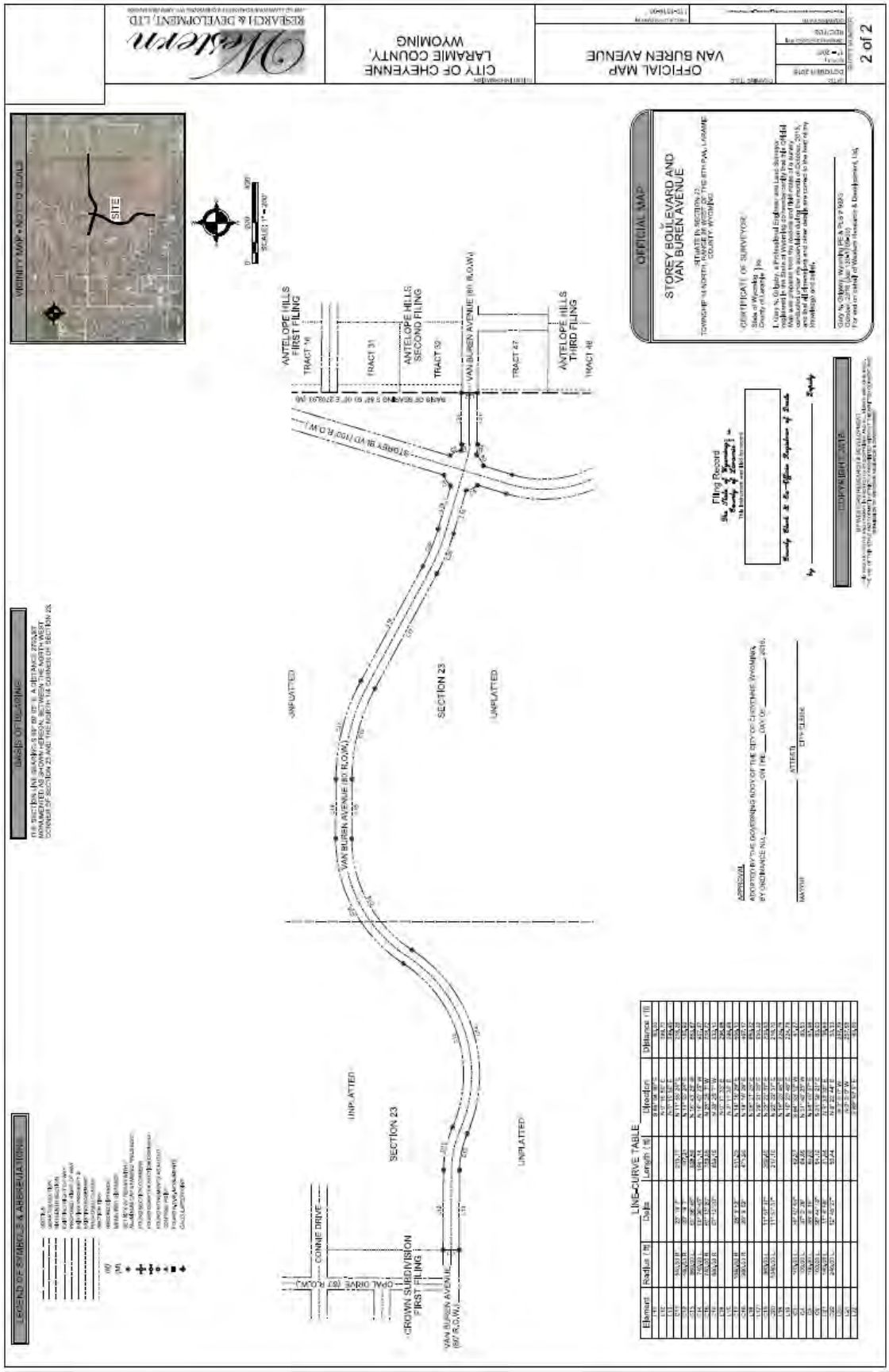

OFFICIAL MAP
STOREY BOULEVARD AND VAN BUREN AVENUE
OFFICIAL MAP
STOREY BOULEVARD
CITY OF CHEYENNE
LARAMIE COUNTY, WYOMING
Western
RESEARCH & DEVELOPMENT, LTD.
1 of 2
HIGHLAND ROAD
WOODS ROAD
VAN BUREN AVENUE (80' R.O.W.)
WHITNEY ROAD (80' R.O.W.)
ANTELOPE HILLS FIRST FILING
ANTELOPE HILLS SECOND FILING
ANTELOPE HILLS THIRD FILING
WOODS LANDING ESTATES
BISON CROSSING SECOND FILING
MEADOWLARK ESTATES
UNPLATTED
SITE


OFFICIAL MAP
VAN BUREN AVENUE
CITY OF CHEYENNE
LARAMIE COUNTY,
WYOMING
2 of 2
VICINITY MAP
SITE
OFFICIAL MAP
STOREY BOULEVARD AND
VAN BUREN AVENUE
ANTELOPE HILLS
FIRST FILING
TRACT 46
TRACT 31
ANTELOPE HILLS
SECOND FILING
TRACT 32
VAN BUREN AVENUE (80' R.O.W.)
TRACT 47
ANTELOPE HILLS
THIRD FILING
TRACT 48
STOREY BLVD (100' R.O.W.)
UNPLATTED
SECTION 23
CONNIE DRIVE
OPAL DRIVE (60' R.O.W.)
CROWN SUBDIVISION
FIRST FILING
LINE-CURVE TABLE

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Recording Ordinance(s)

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APPENDIX 1

4-1-101 ZONING DISTRICTS

Portions of Laramie County, Wyoming are divided into districts and classified as follows:

AR Agricultural Residential

4-2-100 DISTRICT AR - AGRICULTURAL RESIDENTIAL

Areas primarily used for large lot detached residential development at a density which typifies a rural lifestyle and which may include some agricultural uses are considered agricultural residential.

a. Uses by Right

i. Accessory structures

ii. Family child care home

iii. Home occupations

iv. Single-family residential

v. Family child care centers

vi. Bed and breakfasts

vii. Churches, temples or other places of worship

viii. Primary and secondary schools

ix. Accessory living quarters

x. Small Wind Energy Systems. (Small Wind Energy Systems setbacks shall be equal to the largest district setbacks or the total height of the system, whichever is greater.)

b. Uses Requiring Board Approval

i. Animal hospitals or clinics

ii. Commercial stables, arenas, kennels, bird farms and show barns

iii. Child care centers - minor and major

iv. Commercial nurseries or landscaping businesses

v. Other uses similar to those permitted in this district

c. Density

<u>Minimum area for any use in this district is 5 acres</u> computed consistent with the following exceptions:

i. If the property is served by an approved central water distribution system, and/or sewer collection and treatment system, the minimum residential use lot or residential use tract area in this district may be reduced subject to a review and approval from the State Department of Environmental Quality. The computation of lot or tract sizes in this exception shall not include adjacent public or private rights-of-way, easements or reservations for roadway purposes.

ii. Lots or tracts platted and recorded with the County Clerk prior to May 5, 1987 shall be a minimum of 2.5 acres for any use in this district.

iii. Lots or tracts platted and recorded with the County Clerk prior to June 5, 1979 may be used as building sites for uses allowed in this district if adequate provisions can be made for water and sewer/septic.

d. Setbacks

<u>All single family structures and shall be set back twenty-five (25) feet from primary lot frontage lines, fifteen (15) feet from all other property lines. All other non-residential principal structures shall be set back twenty-five (25) feet from all property lines.</u> Accessory structures shall conform to section 2-2-118 of this regulation.

e. Site Plan

A County-approved site plan shall be required in accordance with section 2-2-133 these regulations.

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A1 Agriculture and Rural Residential

4-2-101 DISTRICT A1 - AGRICULTURAL AND RURAL RESIDENTIAL

Areas in a natural state or in which the growing of crops, flowers, trees, or pasture, or the production of livestock or other farming or ranching activity is practiced, are considered agricultural and rural residential.

a. Uses by Right

i. Agriculture and uses incidental to an agricultural operation

ii. Family child care home

iii. Family child care centers

iv. Home occupations

v. Single-family residential

vi. Small Wind Energy Systems (Small Wind Energy Systems setbacks shall be equal to the largest district setbacks or the total height of the system, whichever is greater.)

vii. Animal Hospitals or Clinics

viii. Bed and breakfasts

ix. Cemeteries

x. Churches, Temples or other places of worship

xi. Duplexes

xii. Primary and Secondary Schools

xiii. Commercial nurseries and landscaping businesses

xiv. Road side Farm Stands

xvi. Accessory living quarters

b. Uses Requiring Board Approval

The following uses may be permitted by the Board:

i. Commercial sales of agricultural related products, not including fuel or petroleum products

ii. Work camps

iii. Any other similar use

iv. Commercial stables, arenas, kennels, bird farms and show barns

c. Density

<u>The minimum lot size for any use in this district is ten (10) acres.</u> For single family uses, the density may be averaged within the subdivision/development, provided that no lot or tract shall be less than six (6) acres gross.

The following exceptions are permissible:

i. Lots or tracts platted and recorded with the County Clerk prior to 256 Adopted February 15, 2011 November 2, 1999, shall be a minimum of 5-acres.

ii. Lots or tracts platted and recorded with the County Clerk prior to May 5, 1987, may be a minimum of 2.5-acres.

iii. Lots or tracts platted and recorded with the County Clerk prior to June 5, 1979, may be used as building sites if adequate provisions can be made for water and sewer/septic.

d. Setbacks

All principal structures shall be set back twenty-five (25) feet from all property lines.

Accessory structures shall conform to section 2-2-118 of this regulation.

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e. Site Plan
A County-approved site plan shall be required in accordance with section 2-2-133 of these regulations.

A2 Agricultural
4-2-102 DISTRICT A2 - AGRICULTURAL
Areas in a natural state or in which the growing of crops, flowers, trees, or pasture, or the production of livestock, or other farming or ranching activity is practiced, are considered agricultural.
a. Uses by Right
i. Agriculture and uses incidental to an agricultural operation
ii. Animal Hospitals, Clinics
iii. Bed and breakfasts
iv. Cemeteries
v. Commercial nurseries or landscaping businesses
vi. Family child care home
vii. Family child care centers
viii. Home occupations
ix. Single-family residential
x. Small Wind Energy Systems (Small Wind Energy Systems setbacks shall be equal to the largest district setbacks or the total height of the system, whichever is greater.
xi. Churches, temples or other places of worship
xii. Duplexes
xiii. Child care centers - minor
xiv. Primary and secondary schools.
xv. Commercial stables, arenas, kennels, bird farms and show barns
xvi. Farm stands
xvii. Accessory living quarters
b. Uses Requiring Board Approval
The following uses may be permitted by the Board:
i. Agricultural equipment or product sales
ii. Commercial animal processing plants
iii. Commercial feed lots
iv. Golf Course
v. Race tracks
vi. Work camps
vii. Any other similar use
c. Density
<u>The minimum lot size for any use in this district is twenty (20) acres.</u>
258 Adopted February 15, 2011
d. Setbacks
<u>All principal structures shall be set back twenty-five (25) feet from all property lines.</u>
Accessory structures shall conform to section 2-2-118 of this regulation.
e. Site Plan

DRAFT

A County-approved site plan shall be required in accordance with section 2-2-133 of these regulations."

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