CHAPTER 5

TRANSPORTATION & CIRCULATION

of the City of Rawlins Comprehensive General Plan

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EXECUTIVE SUMMARY

Rawlins has relatively uncongested roadways and traffic volumes have been static, or slightly decreasing, for the past two decades. There is an extensive trail network throughout Rawlins, with the exception of the southeast quadrant. The main truck routes currently in Rawlins include I-80, North Higley Boulevard, 3rd Street, Cedar Street, and Spruce Street, leading to concern about truck traffic through downtown and the ability to accommodate trucks during winter I-80 closures. Through-truck traffic and safe access to schools are top priorities for the City.

Over the past two decades, the population of Rawlins has been decreasing and traffic volumes have been largely flat to decreasing. However, the energy industry will have an impact to Rawlins' transportation network. The main roadways that are forecasted to see increases in traffic are 3rd Street, Higley Boulevard, Spruce Street, and Cedar Street. These streets accommodate truck and through traffic. Truck volumes are expected to follow similar trends to the traffic volume projections. However, truck volumes tend to be more volatile in nature due to slowdowns in natural resources energy development, completion of construction projects, and initiation of construction projects.

In order to safely and efficiently accommodate Rawlins' current and future transportation needs, the following recommendations have been made. Several implementation steps should be initiated over the next couple of years to determine if changes are needed, or to reaffirm a particular strategy.

Key short-term and mid-term improvements:

- Additional roadway connections - Harshman Drive to Higley Boulevard and Brooks Street to Higley Boulevard
- Expansion of Higley Boulevard bridge over I-80 to accommodate sidewalks (WYDOT is already considering this improvement)
- Modifications to the intersections of Walnut Street/Date Street/7th Street and Colorado Street/Mahoney Street
- Access management for the businesses on the south side of Cedar Street between Alton Lane and Airport Road
- Rerouting trucks travelling to/from the north of Rawlins to/from I-80 from 3rd Street to Higley Boulevard
- Installation of sidewalk infrastructure in areas within one-quarter mile of a school, park, community center or similar pedestrian activity generator
- Maintenance of pedestrian facilities, specifically tunnels under the railroad
- Installation of high-visibility crosswalks at the intersections 3rd Street/Heath Street and 3rd Street/Colorado Street

Key long-term improvements:

- Additional roadway connections - Higley Boulevard across the railroad
- Signalization of the intersections of Pettigrew Drive/Higley Boulveard and Inverness Boulevard/Higley Boulevard
- Reconstruction of the eastern interchange (Exit 215) to accommodate access from all directions on Cedar Street and WY 76
- Access management in the Airport Road area as new development and redevelopment occurs in the area

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INTRODUCTION

In the fall of 2012, the City of Rawlins embarked on the creation of a new Transportation Master Plan (TMP). The TMP is a long-range plan that helps guide the City's capital investments, coordinates transportation improvements with land use plans, and creates a unified vision for the City's transportation future. This TMP will serve as the Transportation Element of Rawlins Comprehensive General Plan update.

The TMP serves to document a vision for the long-term multimodal transportation system that will support the Rawlins community well into the future. The intent is to make the TMP an easy reference guide for the City as it grows and changes. The plan provides priority actions and strategies for implementing future projects and services to meet short-term needs while working toward the long-range goals for the ultimate transportation system.

GOALS

Goals guide the vision for the future of the City. Working with the Steering Committee, and vetted by the public, these following goals were established:

- Develop and sustain a safe, convenient, and efficient transportation system incorporating and integrating many modes of travel including automobiles, transit, bicycles, pedestrians, and equestrian users.
- Maximize efficiency of existing roadways in Rawlins.
- Ensure that vehicles travel at safe speeds through residential neighborhoods.
- Develop and promote walking and bicycling as mode choices for residents of all abilities, ages, and income levels that link recreation, school, municipal centers, and commercial centers.
- Plan, build, and maintain Rawlins' streets, trails, and sidewalks as attractive public spaces.
- Schedule the development and maintenance of the overall system according to the resources of the City.

PUBLIC OUTREACH

A public open house was held on December 12, 2012 in conjunction with the Comprehensive General Plan outreach effort. The open house introduced the project to stakeholders and the public, presented existing conditions, and provide opportunity for feedback. Feedback opportunities were organized as follows:

- Maps for the public to address areas where problems are experienced, improvements to the bicycle and pedestrian networks, and opportunities for safe routes to school
- Board for the public to indicate if they agreed with purposed goals
- Opportunity for public to define what a successful plan meant
- General written comments

CONDITIONS AND TRENDS

This section provides an overview of the City's existing transportation network. It also describes the effects of planned transportation network changes and expected land use growth in Rawlins.

EXISTING CONDITIONS

Land Use

Rawlins' primary land use is public, semi-public, and institutional uses such as the Rawlins Municipal Airport, the Wyoming State Penitentiary, the Wyoming Frontier Prison, and primary and secondary schools. Residential land uses are the second predominant land use within Rawlins. Rawlins is fairly compact, with around 15 percent of land within its existing municipal boundaries undeveloped. See **Map 3.3** for a map of existing land use.

Street System

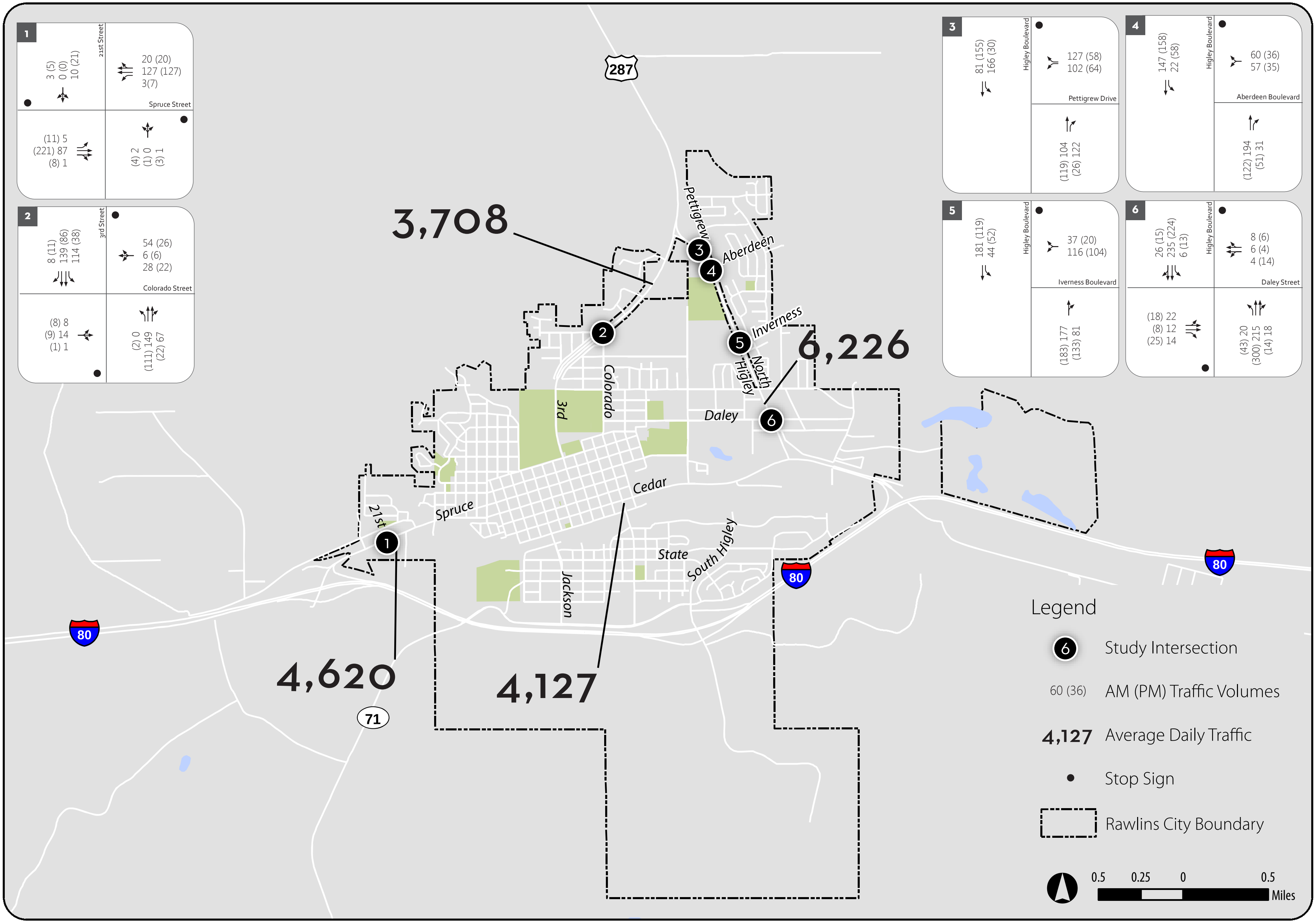
The majority of the City, including downtown, is on a gridded street network, and where present, provides a high level of mobility for vehicle traffic in town. Highways, such as State Route (SR) 789 and SR-71, US-287, US-30, and I-80, provide high-capacity connections to other destinations and other regional transportation facilities.

Major east-west access is provided by I-80, Spruce Street (SR-789), and Cedar Street (US-287). North-south access is provided by 3rd Street (SR-789) and North Higley Boulevard (US-287). The Union Pacific Railroad forms a major barrier between downtown and neighborhoods to the south with an overpass at 6th Street and an underpass at Washington Street. I-80 also provides access across the railroad. Rawlins is bordered to the south by I-80. There are three interstate interchanges within Rawlins city limits: US-30 Business/Spruce Street on the west, South Higley Boulevard, and US-30 Business/Cedar Street on the east. South of I-80, the only access is provided by South Higley Boulevard and Sage Creek Road.

The grid network breaks down east of Harshman, with bigger block size and more spacing between intersections. Newer areas, such as the Highland Hills neighborhood, are tending away from the gridded network and building more cul-de-sacs.

Traffic Volumes

Existing average daily traffic volumes for four of the primary roads (3rd Street, North Higley Boulevard, Spruce Street, Colorado Street) in Rawlins are shown on **Map 5.1** and reported below in **Table 5.1**.



The City of RAWLINS WYOMING

Source: City of Rawlins, Fehr & Peers, WYDOT | Date: June 2013

MAP 5.1

Average Daily Traffic & Intersection Volumes

Table 5.1: 2012 Average Daily Traffic

Location	*Direction*	*Distribution*	*Direction*	*Distribution*	*Total*
3rd Street	NB	51.3%	SB	48.7%	3,708
North Higley Boulevard	NB	50.3%	SB	49.7%	6,226
Spruce Street	EB	49.8%	WB	50.2%	4,620
Colorado Street	NB	49.3%	SB	50.7%	4,127

Source: Fehr & Peers, December 2012

Traffic counts were collected at six locations throughout Rawlins during the AM and PM peak periods and are shown in **Map 5.1**. Locations near schools had higher traffic counts in the AM peak hour, while intersections located away from schools had higher traffic counts in the PM peak hour. Traffic counts collected for this project are available in the Appendix.

Rawlins has relatively uncongested roadways, with traffic volumes that have been static, or slightly decreasing, since 1991, according to historic count data from WYDOT. Example roadway segment volumes are shown in the charts below on page 5-5.

Traffic Operations

Traffic operations were determined for the following locations in Rawlins where traffic counts were collected:

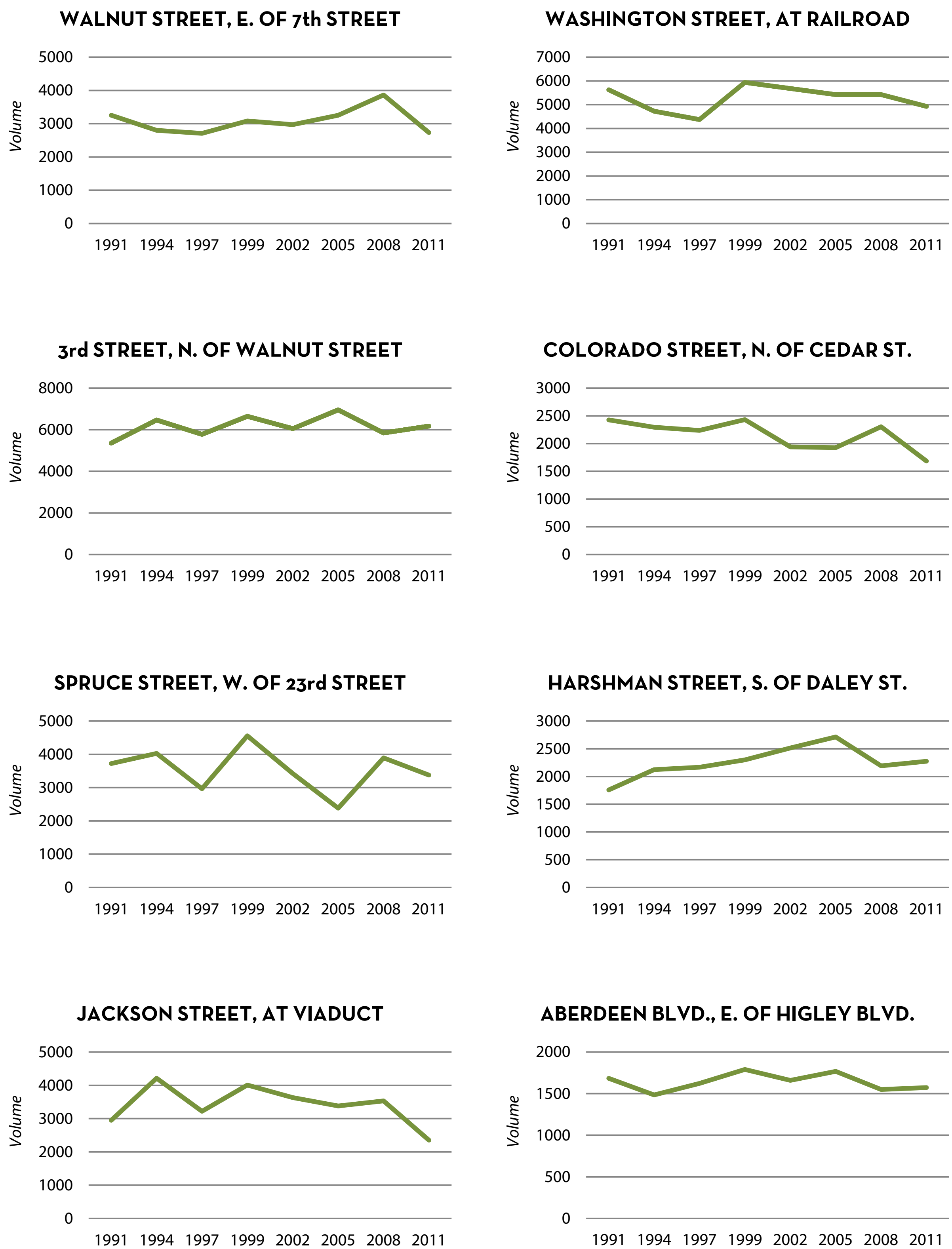
- Spruce Street / 21st Street
- 3rd Street / Colorado Street
- Pettigrew Drive / North Higley Boulevard
- Aberdeen Boulevard / North Higley Boulevard
- Inverness Boulevard / North Higley Boulevard
- Daley Street / North Higley Boulevard

Analysis Methodology

Level of Service (LOS) is a term that describes the operating performance of an intersection or roadway. LOS is measured quantitatively and reported on a scale from A to F, with A representing the best performance and F the worst. **Table 5.2** provides a brief description of each LOS letter designation and an accompanying average delay per vehicle for both signalized and unsignalized intersections.

The Highway Capacity Manual 2000 (HCM 2000) methodology was used in this study to remain consistent with "state-of-the-practice" professional standards. This methodology has different quantitative evaluations for signalized and unsignalized intersections. For signalized intersections, the LOS is provided for the overall intersection (weighted average of all approach delays). For unsignalized intersections, LOS is reported based on the worst movement. Fehr & Peers has also calculated overall delay values for unsignalized intersections, which provides additional information and represents the overall intersection conditions rather than just the worst movement. Both are reported in their respective tables throughout the report (**Tables 5.3, 5.4, 5.8, and 5.9**).

Historic Roadway Segment Volumes



Source: WYDOT

Level of Service Standards

For the purposes of this study, a minimum overall intersection performance for each of the study intersections was set at LOS D. However, if LOS E or F for an individual approach at an intersection resulted, explanation and/or mitigation measures are presented where feasible and realistic. A LOS D threshold is consistent with "state-of-the-practice" traffic engineering principles for suburban and non-central business district urbanized intersections. With the relatively lower traffic volumes within Rawlins, it is easy to identify the increase of congestion on roadways and intersections with even a small amount of added traffic, although this does not automatically represent poor LOS conditions.

Table 5.2: Level of Service Descriptions

Level of Service	*Description of Traffic Counts*	*Signalized Intersections Delay (sec/veh)*[1]	*Unsignalized Intersections Delay (sec/veh)*[2]
A	*Free Flow / Insignificant Delay* Extremely favorable progression. Individual users are virtually unaffected by others in the traffic stream.	0 to 10	0 to 10
B	*Stable Operations / Minimum Delays* Good progression. The presence of other users in the traffic stream becomes noticeable.	> 10 to 20	> 10 to 15
C	*Stable Operations / Acceptable Delays* Fair progression. The operation of individual users is affected by interactions with others in the traffic stream.	> 20 to 35	> 15 to 25
D	*Approaching Unstable Flows / Tolerable Delays* Marginal progression. Operating conditions are noticeably more constrained.	> 35 to 55	> 25 to 35
E	*Unstable Operations / Significant Delays Can Occur* Poor progression. Operating conditions are at or near capacity.	> 55 to 80	> 35 to 50
F	*Forced, Unpredictable Flows / Excessive Delays* Unacceptable progression with forced or breakdown of operating conditions.	> 80	> 50

1. Overall intersection LOS and average delay (seconds/vehicle) for all approaches.
2. Worst approach LOS and delay (seconds/vehicle) only.
Source: Fehr & Peers Descriptions, based on *Highway Capacity Manual,* 2000 Methodology (Transportation Research Board).

Level of Service Analysis

Using Synchro software and the HCM 2000 methodology, the AM and PM peak hour LOS was computed for each intersection where data was collected. The results of this analysis are reported in **Tables 5.3 and 5.4** (see Appendix for the detailed LOS reports).

Table 5.3: 2012 AM Peak Hour Level of Service

Intersection			Worst Movement			Overall Intersection	
ID	*Location*	*Control*	*Movement*	*Avg. Delay (sec/veh)*	*LOS[1]*	*Avg. Delay*	*LOS[2]*
1	Spruce St. / 21st St.	NB/SB Stop	SB	10.0	A	< 5.0	A
2	3rd St. / Colorado St.	EB/WB Stop	EB	23.1	C	5.6	A
3	Pettigrew Dr. / North Higley Blvd.	WB Stop	WBL	30.8	D	8.5	A
4	Aberdeen Blvd. / North Higley Blvd.	WB Stop	WB	12.7	B	< 5.0	A
5	Inverness Blvd. / North Higley Blvd.	WB Stop	WB	18.8	C	< 5.0	A
6	Daley St. / North Higley Blvd.	EB/WB Stop	EB	15.6	C	< 5.0	A

1. This represents the worst movement LOS and delay (seconds / vehicle) and is only reported for unsignalized intersections.
2. This represents the overall intersection LOS and delay (seconds / vehicle).
Source: Fehr & Peers, December 2012

Table 5.4: 2012 PM Peak Hour Level of Service

Intersection			Worst Movement			Overall Intersection	
ID	*Location*	*Control*	*Movement*	*Avg. Delay (sec/veh)*	*LOS[1]*	*Avg. Delay*	*LOS[2]*
1	Spruce St. / 21st St.	NB/SB Stop	SB	10.9	B	< 5.0	A
2	3rd St. / Colorado St.	EB/WB Stop	EB	11.7	B	< 5.0	A
3	Pettigrew Dr. / North Higley Blvd.	WB Stop	WBL	11.8	B	< 5.0	A
4	Aberdeen Blvd. / North Higley Blvd.	WB Stop	WB	11.0	B	< 5.0	A
5	Inverness Blvd. / North Higley Blvd.	WB Stop	WB	13.7	B	< 5.0	A
6	Daley St. / North Higley Blvd.	EB/WB Stop	WB	16.7	C	< 5.0	A

1. This represents the worst movement LOS and delay (seconds / vehicle) and is only reported for unsignalized intersections.
2. This represents the overall intersection LOS and delay (seconds / vehicle).
Source: Fehr & Peers, December 2012

As shown in **Tables 5.3** and **5.4**, all study intersections operate at LOS D or better in existing conditions. The intersection of Pettigrew Drive and North Higley Boulevard operates at LOS D in the AM peak hour and can be attributed to traffic travelling toward town from the school and not having sufficient gaps in traffic along North Higley Boulevard to make a left turn.

Truck Routes

Truck routes are intended to accommodate goods movement safely and efficiently within and through the city. Based on WYDOT traffic counters and local observation, the roads most used by trucks include I-80, North Higley Boulevard, 3rd Street, Cedar Street, and Spruce Street. Based on input from the public open house for this transportation master plan, there is concern on the amount of truck traffic on 3rd Street and the damage the trucks cause to the intersection infrastructure at the 3rd Street/Spruce Street intersection. There is currently no signage at the junction of 3rd Street and North Higley Boulevard that indicates the preferred truck routes. Local trucks are also utilizing and impacting Cedar Street in the downtown area due to the through traffic restriction on Front Street at 4th Street. In addition, a few times every winter I-80 closes and trucks are forced to park in and around Rawlins wherever they can find space – roads, freeway, parking lots, etc. This causes extensive congestion in many areas due to the sheer number of parked trucks in the area.

Table 5.5 shows the distance and time to access I-80 from the junction of 3rd Street and North Higley Boulevard. Starting and stopping points were the same for each comparative scenario. Although more trucks (based on WYDOT traffic counters) utilize 3rd Street to Spruce Street to/from I-80 westbound and 3rd Street to Cedar Street to/from I-80 eastbound, in three of the four cases, using North Higley Boulevard is actually the faster of the alternatives. A truck driver survey could be done to determine why more trucks use 3rd Street versus North Higley Boulevard. In 2010, WYDOT traffic counters showed that 9-13% of traffic along WY-789 (3rd Street) was truck traffic. Along North Higley Boulevard, 1.6% of traffic was attributed to trucks.

Table 5.5: Truck Travel Times

Direction	*Route*	*Distance (Miles)*	*Time (min)*	*Direction*	*Route*	*Distance (Miles)*	*Time (min)*
SB to WB I-80	3rd St. to Spruce St.	3.9	8	**SB to WB I-80**	North Higley Blvd. to Cedar St.	6.4	9
SB to EB I-80	3rd St. to Cedar St.	4.7	10	**SB to EB I-80**	North Higley Blvd. to Cedar St.	3.0	7
WB I-80 to NB	Spruce St. to 3rd St.	3.9	10	**WB I-80 to NB**	Cedar St. to North Higley Blvd.	7.0	8
EB I-80 to NB	Cedar St. to 3rd St.	4.6	8	**EB I-80 to NB**	Cedar St. to North Higley Blvd.	2.9	4

Source: Google Maps, December 2012

Transit Network

Carbon County Senior Services provides demand-responsive paratransit bus service through the Rawlins Senior Center during weekdays. The service operates throughout the City of Rawlins. The Rawlins Senior transit service receives between $42,000 and $43,000 annually from the Wyoming Department of Transportation (WYDOT) for capital, operating, and administration costs. The City of Rawlins does not provide fixed-route transit service.

Pedestrian and Bicycle Network

Bicycles and pedestrians are a part of the City's overall transportation network. However, although there are a number of trails throughout the City, many areas have not yet seen investments in walking or biking infrastructure, such as sidewalks.

Within the existing downtown the sidewalk network is relatively complete. In other areas, the network is either partially complete with some sections incomplete or fully incomplete. Generally, there are no park strips or buffers between the sidewalk and general lanes of traffic except when on-street parking is allowed. In addition, there are very

few pedestrian amenities. Sidewalks are in various states of repair, with some sidewalks within the City broken or interspersed with grass. There are very few crosswalks in the City – namely:

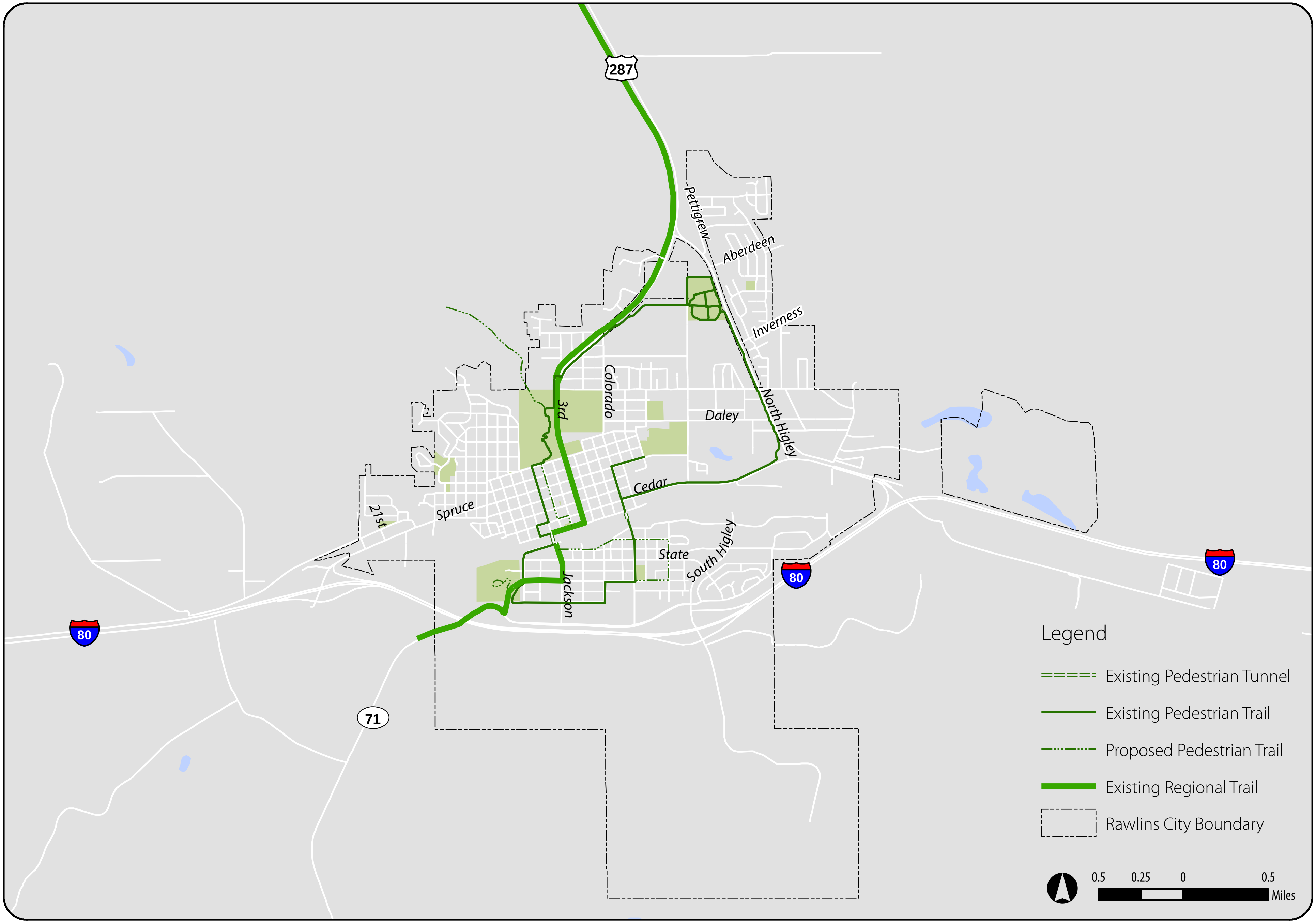
- The intersection of 3rd Street and Spruce Street
- The intersection of 6th Street and Spruce Street
- The intersection of 11th Street and Spruce Street
- Near schools

Two pedestrian passage ways are provided under the Union Pacific Railroad, with crossings at 6th Street and Washington Street. These two pedestrian passages were the subject of a study, *City of Rawlins Non-Motorized Rail Yard Grade-Separated Crossing Study Report,* to determine possible improvements to the two railroad crossings and establish the need for future non-motorized grade crossings. This study revealed that the 6th Street underpass had good structural integrity but had "inadequacies in the areas of safety, security, ADA accessibility, maintenance, and aesthetics." The Washington Street underpass had no critical findings. This report also found the 6th Street underpass to be difficult to find and not well lit. A poll done during the study found that the number one concern of over 80% of those surveyed was concern for safety in the structure. The same poll found the public had safety concerns for the Washington Street underpass regarding uneven surfaces, unsafe hand railings, and limited line of sight. This study did not recommend additional crossings across the railroad track.

There are also a number of small pedestrian connectors such as the Railside Greenway, General Rawlins passageway, St. Joseph's linear park, the Soroptimist Park passageway, and the Jeffery Center connectors.

The existing trail network (as shown in **Map 5.2**) in Rawlins is composed of the Continental Divide National Scenic Trail and the Rawlins Springs Interpretive Trail. The Continental Divide trail runs along 3rd Street from north of the City to Front Street, through the 6th Street tunnel, along Jackson Street to SR-71. The Rawlins Springs Interpretive Trail connects the Rawlins Springs, Historic Wyoming State Penitentiary, and the Uplift. A loop trail around the City connects the part of town south of the I-80, the Historic Wyoming State Penitentiary, the Middle and High Schools, and recreation facilities. *City of Rawlins Non-Motorized Rail Yard Grade-Separated Crossing Study Report* states that the trail network is not well marked and hard to follow. They recommended the path system be marked with wayfinding or additional bike path signage.

There are no existing on-street bicycle lanes in Rawlins and very few bicycle racks within downtown.



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Source: City of Rawlins, Landmark Design | Date: June 2013

MAP 5.2

Trail System

Transportation Network Safety

Statistics on motor vehicle collisions occurring in Rawlins between 2002 and 2012 were reviewed. There were 2,088 reported collisions over the ten-year period. There were no apparent trends in collision types. The roadways with the highest amount of crashes were I-80, Spruce Street, Cedar Street, and North Higley Boulevard. Based on WYDOT traffic counts, these streets are the higher volume roadways in Rawlins.

Over the past ten years, there were twelve reported collisions involving pedestrians. One of these collisions resulted in the death of a pedestrian. This collision happened at the intersection of Spruce Street and 10th Street, an intersection with no marked crosswalks.

FUTURE MULTIMODAL TRANSPORTATION SYSTEM

This section contains recommended steps for Rawlins to refine its transportation networks. It includes discussion of future traffic conditions and projected traffic growth; mitigation measures; potential facilities for bike treatments as well as off-street pathway corridors; priority areas for pedestrian improvements; and an approach for future improvements to accommodate future growth.

FUTURE TRENDS

Anticipated Growth

Between 1990 and 2000, the population in Rawlins declined from 9,380 to 8,538, or roughly -9.0 percent (population from the US Census). Population projections for Rawlins can be difficult due to the energy industry, which brings temporary workers for periods of time. These temporary workers are not typically counted in official population projections, but do have an impact on the transportation system. The Comprehensive General Plan outlines four scenarios for future growth with the official projections made by the State of Wyoming Department of Administration and Information Economic Analysis Division as Scenario1 and each additional scenario progressing in the rate of growth. **Table 5.6** shows population projects from the four scenarios in the Comprehensive General Plan.

Table 5.6: Population Growth Scenarios and Projections through 2030

	2000	*2010*	*2011*	*2012*	*2015*	*2020*	*2025*	*2030*
#1	9,006	9,259	9,262	9,268	9,344	9,548	9,536	9,483
#2	9,006	9,259	9,262	9,268	9,453	10,193	10,165	10,123
#3	9,006	9,259	9,262	9,268	11,234	10,879	11,014	11,219
#4	9,006	9,259	9,262	9,268	13,412	11,815	12,278	13,006

Source: City of Rawlins Comprehensive General Plan

Employment growth from the energy sector was based on projects planned by DKRW (coal-to-liquids), Chokecherry/Sierra Madre (wind), Continental Divide/Creston (oil & gas), Seminoe Road (oil & gas), Lost Creek (uranium), Gateway West (transmission), and Transwest Express (transmission), in addition to core industries such as Sinclair refinery, BP, and Anadarko. Projected employment is shown in **Table 5.7** (for more discussion regarding the energy industry, see Chapter 1).

Table 5.7: Energy Industry Incremental Employment Projects 2013 - 2021

	2013	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*
Construction Employees	2,841	4,372	5,812	3,554	1,134	1,134	1,134	-	-
Operating Employees	-	-	9	592	728	728	728	728	728

Source: City of Rawlins Comprehensive General Plan

FUTURE TRAFFIC CONDITIONS

Traffic Projections

Traffic volumes in Rawlins have been largely flat to decreasing since 2002, as outlined in the previous discussion. To provide a conservative basis for planning a roadway system that accommodates reasonably foreseeable future growth, the WYDOT traffic forecasting model for Rawlins was used. Documentation of the process is detailed in the 2005 report *Major Street and Highway System, Travel Forecasting Process: Rawlins*, WYDOT. Previously, WYDOT did traffic forecasting updated every ten years, however they no longer provide these forecasts; the 2005 report is the most current. However, these projections do not take into account the relocation of schools in Rawlins.

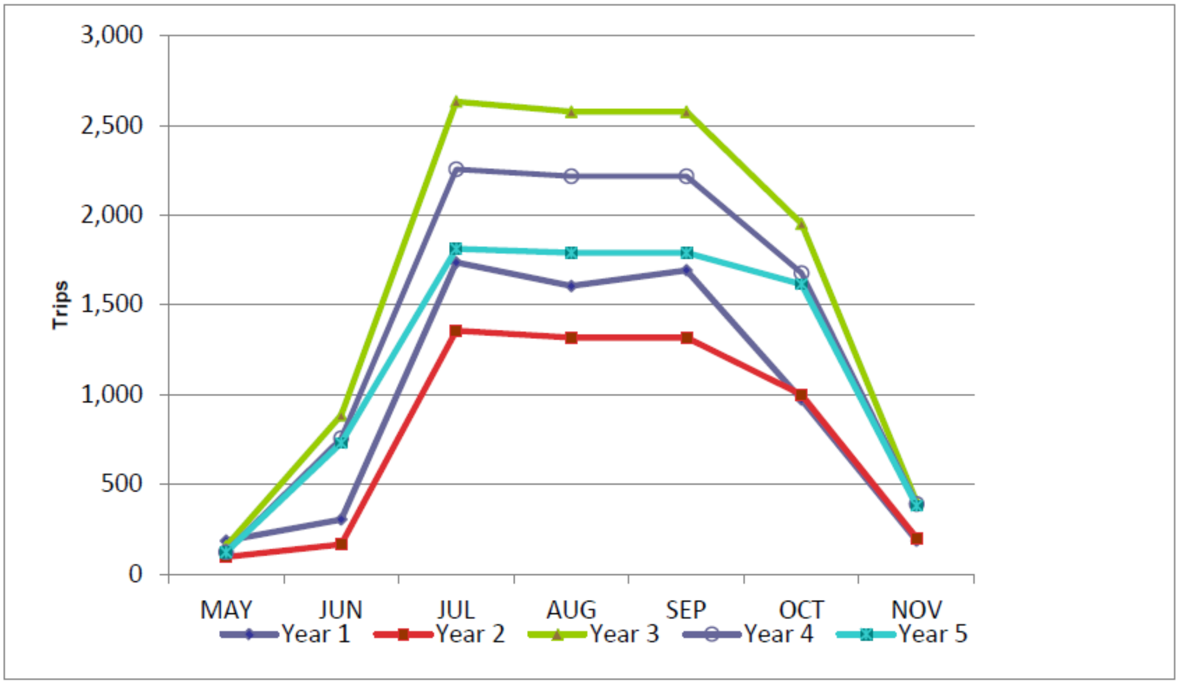
The travel demand model predicts that the busiest roads in Rawlins will be:

- Spruce Street through downtown (9,200 – 13,400 vehicles per day)
- Cedar Street west of downtown (8,600 -13,200 vehicles per day)
- North Higley Boulevard north of Cedar Street (3,100 – 9,700 vehicles per day)
- 3rd Street through downtown (5,800 – 7,600 vehicles per day)
- US-287/SR-789 (3,100 – 4,400 vehicles per day)

Since most areas of Rawlins anticipate little to no residential or employment growth, growth in traffic volumes will not be uniform citywide. The main roadways that are forecasted to see increases in traffic are 3rd Street, North Higley Boulevard, Spruce Street, and Cedar Street. These streets accommodate truck and through traffic.

Truck volumes are expected to follow similar trends to the traffic volume projections. However, truck volumes tend to be more volatile in nature due to slowdowns in natural gas drilling activity, completion of construction projects and initiation of construction projects.

Based on the Applicant Proposed Alternative (Alternative 1R) from the Chokecherry and Sierra Madre (CCSM) Final Environmental Impact Study (EIS), 65 percent of the workforce for those projects will come from the Rawlins Area. The following chart from the CCSM EIS shows the external construction daily traffic estimates by month for Alternative 1R. See the Appendix D for additional CCSM EIS details on the traffic projections.



Note: Estimates are 1-way trips, reflecting both inbound and outbound trips. On average, 50 percent of the trips would be in each direction. Outbound truck trips would generally involve empty trucks.

Source: PCW 2012b.

Two intersections within Rawlins were shown to have a more significant impact due to additional traffic associated with Year 3 of CCSM (with the WY 71/CR 401 Option only). Those intersections include WY 71/Jackson Street and WY 71/S. South Higley Boulevard (as shown by the red circles in the graphics below) which go from a LOS A to E and LOS B to F in the morning peak hour, respectively. The remaining studied intersections in the EIS had minimal to no impacts to LOS during the peak hours. The significantly impacted intersections of WY 71/Jackson Street and WY 71/South Higley Boulevard are located on the south side of town and are not near schools or heavy pedestrian activity.

Changes in the Roadway Network

There are no major improvements to the transportation network scheduled. WYDOT has an overlay project scheduled for I-80 between Rawlins and Sinclair (FY 2014) and a concrete grinding project for I-80 through Rawlins (FY 2018).

FUTURE TRAFFIC RECOMMENDATIONS

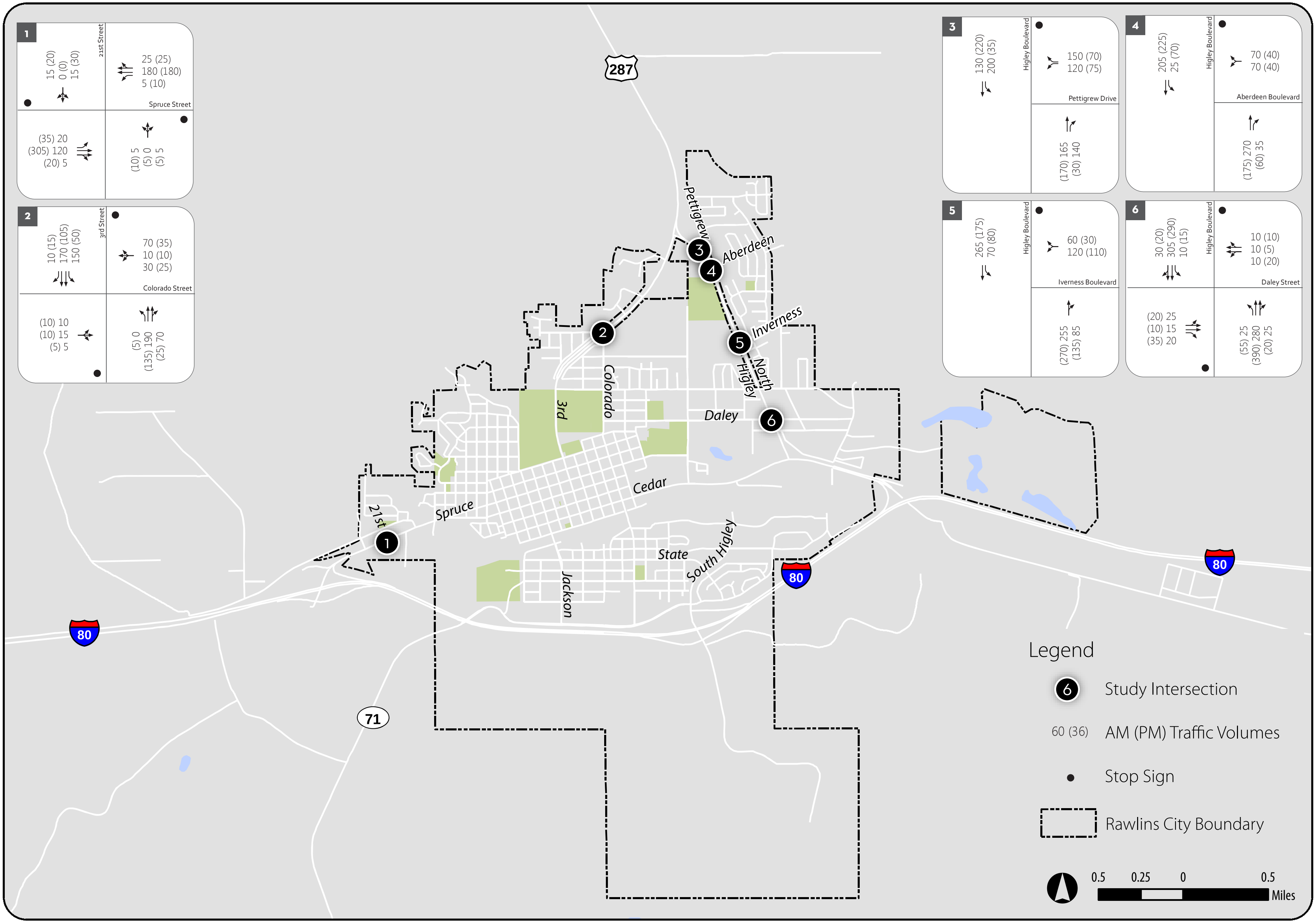
Intersection Improvements

Traffic volumes counted at the six intersections were grown to 2030 volumes using the growth rates from the WYDOT traffic forecasting model, as shown in **Map 5.3**. Although this model has typically higher growth rates than historical traffic volumes indicate, the model was used as a conservative estimation of future demand. As described above, a Synchro analysis was conducted. Results of this analysis are shown in **Tables 5.8 and 5.9**. If truck volumes were to increase on North Higley Boulevard, the LOS on the roadway and intersections would likely see some additional delay and therefore could see an impact to LOS. However, given the forecasted traffic volumes and associated conditions, as discussed below, the LOS would not likely significantly change for the conditions shown the Tables 5.8 and 5.9 below.

Table 5.8: 2030 AM Peak Hour Level of Service

Intersection			*Worst Movement*			*Overall Intersection*	
ID	*Location*	*Control*	*Movement*	*Avg. Delay (sec/veh)*	*LOS*[1]	*Avg. Delay*	*LOS*[2]
1	Spruce St. / 21st St.	NB/SB Stop	SB	10.6	B	< 5.0	A
2	3rd St. / Colorado St.	EB/WB Stop	EB	34.1	D	8.5	A
3	Pettigrew Dr. / North Higley Blvd.	WB Stop	WBL	> 50.0	F	19.6	A
4	Aberdeen Blvd. / North Higley Blvd.	WB Stop	WB	16.3	C	< 5.0	A
5	Inverness Blvd. / North Higley Blvd.	WB Stop	WB	39.5	E	9.0	A
6	Daley St. / North Higley Blvd.	EB/WB Stop	EB	20.5	C	< 5.0	A

1. This represents the worst movement LOS and delay (seconds / vehicle) and is only reported for unsignalized intersections.
2. This represents the overall intersection LOS and delay (seconds / vehicle).
Source: Fehr & Peers, December 2012



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Source: Fehr & Peers | Date: June 2013

MAP 5.3

Future 2030 Intersection Volumes

Table 5.9: 2030 PM Peak Hour Level of Service

Intersection			*Worst Movement*			*Overall Intersection*	
ID	*Location*	*Control*	*Movement*	*Avg. Delay (sec/veh)*	*LOS[1]*	*Avg. Delay*	*LOS[2]*
1	Spruce St. / 21st St.	NB/SB Stop	NB	14.0	B	< 5.0	A
2	3rd St. / Colorado St.	EB/WB Stop	EB	12.4	B	< 5.0	A
3	Pettigrew Dr. / North Higley Blvd.	WB Stop	WBL	13.8	B	< 5.0	A
4	Aberdeen Blvd. / North Higley Blvd.	WB Stop	WB	12.6	B	< 5.0	A
5	Inverness Blvd. / North Higley Blvd.	WB Stop	WB	18.3	C	< 5.0	A
6	Daley St. / North Higley Blvd.	EB/WB Stop	WB	22.8	C	< 5.0	A

1. This represents the worst movement LOS and delay (seconds / vehicle) and is only reported for unsignalized intersections.
2. This represents the overall intersection LOS and delay (seconds / vehicle).
Source: Fehr & Peers, December 2012

As indicated in the **Tables 8 and 9** the intersection of Pettigrew Drive and North Higley Boulevard operates at a LOS F in 2030 AM peak hour due to the westbound left. Signalizing this intersection would improve operations to a LOS A and allow for a pedestrian crossing. However, North Higley Boulevard is a state road and signalization would need to be discussed with WYDOT. The intersection of Inverness Boulevard and North Higley Boulevard operates at LOS E in 2030in AM peak hour. Both intersections warrant a traffic signal with 2030 volumes, but should be monitored to determine when the warrant is met. However, neither of these intersections are an issue in the PM peak hour. As previously mentioned in the Existing Conditions section, both intersections operate with acceptable delay and the recommendation of signalization should not be needed in the near term.

Other intersections that were not studied at an operations level, but which may benefit from improvements are the intersections of Walnut Street/Date Street/7th Street (as shown on the next page) and Colorado Street/Mahoney Street. Both of these intersections have been noted by stakeholders or the public as confusing. The Walnut Street/Date Street/7th Street intersection is a five-legged intersection with a landscaped median/park separating two of the legs. To ease confusion and provided a safer park space, it is recommended that Date Street be closed at Walnut Street through some type of barrier, be it a raised median or extension of park space. This would still allow access by way of 8th Street to the three homes fronting Date Street. The image below shows a rendering of the improvement.

Existing Conditions

Proposed Conditions

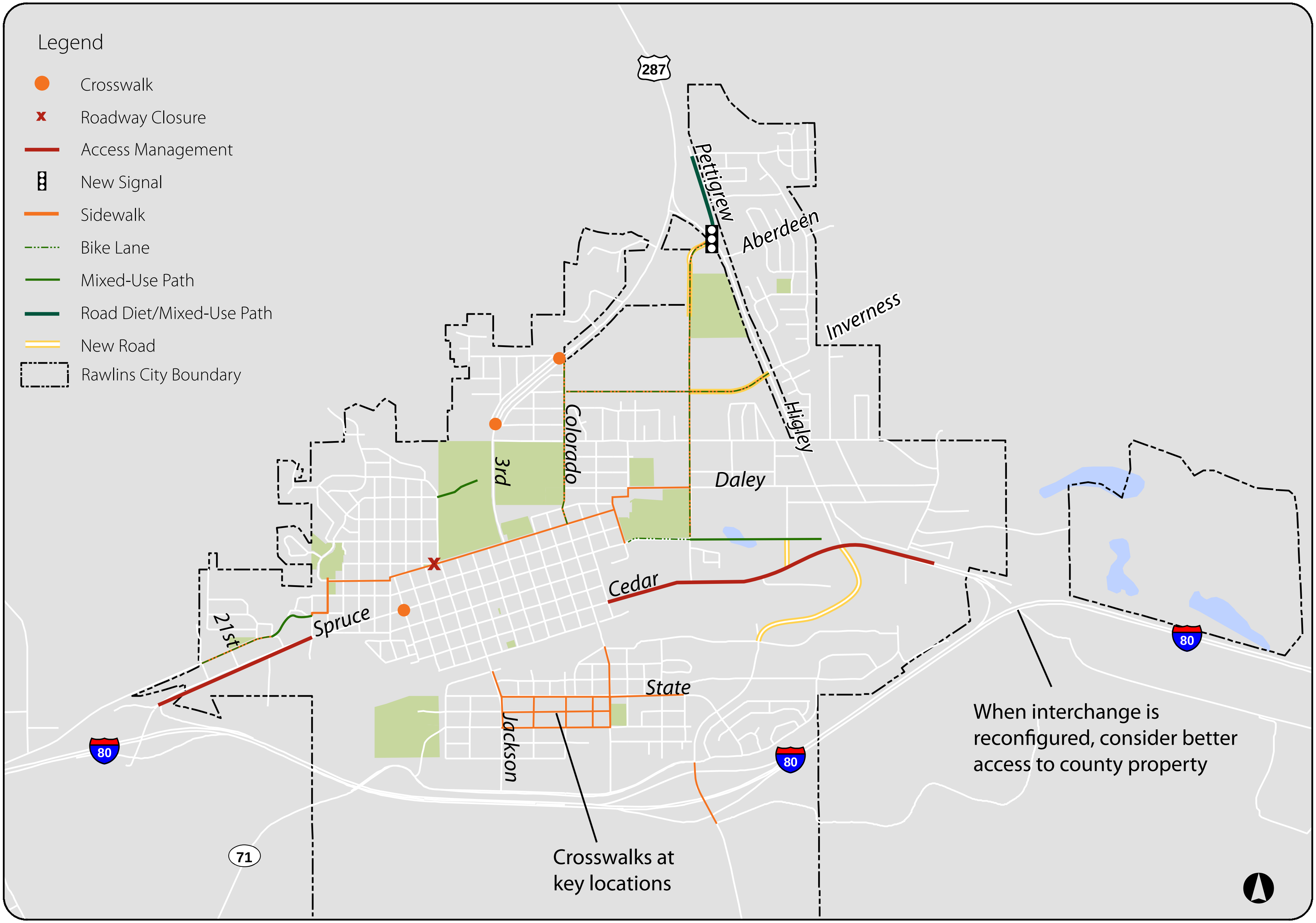
The intersection of Colorado Street and Mahoney Street is a large swath of unmarked concrete. From curb to curb, it is approximately 210 feet across the westbound Mahoney Street leg, which is a two-lane roadway with parking. Thus, it is recommended that the intersection of Colorado Street/Mahoney Street be reconfigured to better align the legs of the intersection. The graphic below shows a potential reconfiguration. This reconfiguration would provide new landscaped areas and would create a raised barrier on the northside of Mahoney Street to provide access to existing driveways.

Existing Conditions

Proposed Conditions

Network Improvements

The more established areas of Rawlins are on a built-out grid network. However, connections to the eastern and southern portions of Rawlins can be improved. Currently, there are two connections for mobility across the railroad. It is recommended that an additional roadway be constructed to connect the north and south portions of Higley Boulevard across the railroad. This connection allows better access for residents south of the railroad to connect to retail opportunities. **Map 5.4** shows the cumulative transportation recommendations.



MAP 5.4

Future Improvements

Source: Fehr & Peers | Date: June 2013

Two other connections are recommended in the northern portion of Rawlins – a connection of Harshman Drive to North Higley Boulevard and a connection of Brooks Street to North Higley Boulevard. The Harshman connection would tie into Pettigrew Drive and provide a linkage to the elementary school and proposed secondary education campus. This connection would also provide a safer route to school for students than North Higley Boulevard. The Brooks connection would extend Brooks Street to North Higley Boulevard, connecting to Inverness Boulevard.

Access to the retail land uses on North Higley Boulevard north of Cedar Street was identified as an issue at the public outreach meeting. To provide better access, a connection could be created through the hotel parking area and aligned with a consolidated access on the south side of Cedar Street. A graphic in the Access Management section shows this recommendation in more detail.

Existing Conditions

Proposed Conditions

In the long-term, the eastern interchange (Exit 215) should be considered for reconstruction to accommodate access from all directions on Cedar Street and WY 76. This will provide better access and circulation to the area southeast of I-80 and Cedar Street. Alternative interchanges could include a Single Point Urban Interchange (SPUI) or a traditional diamond interchange. The alternative interchanges will need to be evaluated to determine which type is most appropriate with the given traffic conditions and right-of-way.

Access Management

Access management principles can increase capacity and safety on a roadway. Wherever possible, consolidation of access points and elimination of unnecessary or redundant accesses should occur. Corridors that should be targeted for access management include Cedar Street and Spruce Street. As parcels along these facilities are redeveloped, Rawlins should consolidate accesses and facilitate cross-access agreements between businesses and developments. This process should involve thorough review of site plans to identify accesses that could be consolidated. It could also include educating developers and community members on the general benefits of access management in reducing congestion and improving traffic flow.

WYDOT access management standards indicate that management can be accomplished through the following means (additional detail on function classification can be found later in this chapter):

- Medians
- Auxiliary lanes
- Signal spacing

- Driveway location and design
- Driveway spacing
- Corner clearance
- Reverse frontage or backage roads
- Internal circulation and connectivity of individual businesses

A priority for Rawlins should be access to the businesses on the south side of Cedar Street between Alton Lane and Airport Road. There is already a frontage road that serves some of these businesses. This frontage road should be expanded to consolidate the accesses between Alton Lane and North Higley Boulevard, as shown on page 5-20. Rawlins should also seek access management in the Airport Road area as new development and redevelopment occurs in the area.

Traffic Calming

A comprehensive traffic calming program for Rawlins can establish a process for identifying, prioritizing, and addressing neighborhood traffic concerns. Typically, a traffic calming program consists of three main components:

- **Education**: Using posted speed limit signs or radar-enhanced speed limit signs to raise driver awareness of posted speeds.
- **Enforcement**: If signage methods are not effective in reducing travel speeds, law enforcement officers can engage in ticketing campaigns in problematic areas.
- **Engineering**: These methods should be applied if education and enforcement tactics have not adequately addressed the issue. Engineering measures can include speed-reducing designs such as curb extensions and speed tables, or volume-control measures such as full or partial street closures. Volume-control measures should be applied if speed-reducing designs have not adequately addressed concerns.

Rawlins could develop a traffic calming program for official adoption. The proposed policy would identify a framework for financing and installing speed humps on select streets, and provides criteria for warrants and placement of speed humps. Rawlins may wish to consider traffic calming measures such as traffic circles, curb extensions, raised crosswalks, and other options for slowing traffic. In addition, Rawlins can develop literature for residents to provide information on traffic calming application procedures.

TRUCK

In the effort to move trucks away from the downtown area, it is recommended that the main truck route for trucks travelling to/from the north of Rawlins to/from I-80 be switched from 3rd Street to North Higley Boulevard (as shown in the graphic to the left). This can be accomplished with the appropriate signage as well as law enforcement. This recommendation will alleviate truck congestion, impact, and noise from the downtown area on 3rd Street and Spruce Street. In addition, local truck deliveries could be restricted to off-peak hours (early morning or late night) to reduce the truck congestion in the day and increase the safety for the schools in the area.

As previously stated, local trucks are utilizing and impacting Cedar Street in the downtown area due to the restrictions on Front Street at 4th Street. It is recommended that local deliveries be either restricted to off-peak delivery hours or an alternative truck route should be designated with signage and enforced. This will alleviate truck congestion and noise in downtown (see page 3-9 of the Comprehensive General Plan for a definition of downtown).

TRANSIT

There are no recommended improvements to the current transit service.

BICYCLE & PEDESTRIAN

Increased walking and bicycling in a community has positive effects on air quality, physical health, economy, and when used extensively, traffic congestion.

Future Bicycle Conditions

Bicycle facilities generally fall into three types: paths, lanes, and routes. Bicycle paths are typically paved, completely separated from roadways, and frequently accommodate both bicyclists and pedestrians. Rawlins has a few bicycle paths throughout the city. Bicycle lanes are striped on roadways, indicating a four-to-six-feet-wide space for bicyclists between the travel lane and the curb. There are no bicycle lanes in Rawlins. Bicycle routes are roadways where signage is provided intermittently along the road alerting motorists to the presence of cyclists, but no specific lane or space on the roadway is allotted for cyclists.

Rawlins has a number of local roads with low traffic volumes and adequate shoulder widths which make them ideal candidates for shared bicycle facilities. Some of these roadways can be modified to accommodate bicycle traffic with only minor changes, and without need for additional right-of-way. In appropriate cases, Rawlins may consider a "road diet". A road diet reduces the number of travel lanes in order to create space for other transportation modes.

Future Pedestrian Conditions

In addition to bicycle infrastructure enhancements, pedestrian networks can be improved as well. Pedestrian facilities vary throughout the city. The current roadway cross-sections present in Rawlins do not always include pedestrian facilities such as sidewalks. Improvements to the pedestrian network will result in a truly friendly pedestrian environment, which enables freedom of mobility, encourages more physical activity, allows children to walk and bike to school, and makes it possible to create economic growth at the same time.

Pedestrian infrastructure improvements can include adding missing lengths of sidewalk; retrofitting to meet requirements established by the ADA; adding aesthetic and safety improvements such as parkstrips; or repairing substandard sidewalk and crossings. Areas within one-quarter mile of a school, park, community center or similar pedestrian activity generator should be a high priority for completing missing sidewalk infrastructure; areas within one-half mile should be a medium priority; and areas outside one-half mile may receive lower priority.

Another recommended strategy for Rawlins is to improve pedestrian crosswalks. Rawlins residents should be able to cross roads safely and access necessary facilities without the use of an automobile. The highest priority should be placed on school routes, especially at crosswalks (marked or unmarked) and in downtown.

Maintenance of pedestrian facilities, specifically tunnels under the railroad, should be considered. Feedback from the public open house indicated that drainage at the Colorado Street tunnel is an issue. Water runs into the tunnel and, during the winter, has the tendency to freeze, creating potentially harmful situations for pedestrians. These concerns were also noted in the 2010 study, *City of Rawlins Non-Motorized Rail yard Grade-Separated Crossing Study Report.*

In addition, the trail system should be updated to include wayfinding and bike path signage. As recommended in the *City of Rawlins Non-Motorized Rail Yard Grade-Separated Crossing Study Report,* maps of the entire trail system and mile markers should be added for public use.

Future Bicycle and Pedestrian Recommendations

Recommendations for the bicycle and pedestrian network are shown in **Map 5.4**. These include:

- Fill in and improve sidewalks along 16th Street, Gallup Place, and Maple Street to connect the mixed-use bypass path to Washington Park.
- Fill in and improve sidewalks along Walnut Street between Washington Park and the Fairgrounds. This path would also serve as a connection to the Wyoming frontier Prison and access to the Middle and High Schools.
- Fill in and improve sidewalks along Rodeo Street, Mahoney Street, and Daley Street around the fairgrounds.
- Fill in and improve sidewalks along Washington Street.
- A formalized crosswalk, possibly a flashing beacon, at the intersection of 3rd Street and Heath Street. The current crosswalk accommodates the paved mixed-use path as it crosses 3rd Street. However 3rd Street is one of the busiest streets in Rawlins and formalizing this crosswalk would help improve pedestrian safety. This should be preceded by signage alerting drivers to a pedestrian crossing.
- A formalized two-stage crosswalk, possibly a flashing beacon, at the intersection of 3rd Street and Colorado Street. Putting a formalized pedestrian refuge area in the median would allow pedestrians to cross one direction of travel at a time, increasing safety. Design should be coordinated with design of the crosswalk at 3rd Street and Heath Street. This should be preceded by signage alerting drivers to a pedestrian crossing.
- Crossing opportunities across North Higley Boulevard.
- Expansion of South Higley Boulevard bridge over I-80 to accommodate sidewalks (WYDOT is already considering this improvement).
- Bike lanes along Spruce Street to proposed "Wetland Park."
- Bike lanes and sidewalk connecting the city center with the hospital along Elm Street.
- Bike lanes and sidewalk along Brooks Street.
- Bike lanes and sidewalk on Colorado Street between Walnut Street and 3rd Street. This connection would improve safety for residents accessing the city center and students accessing schools.
- Bike lanes and sidewalk along Harshman Street to provide connections to the school area.
- Bike lanes and sidewalk along the Harshman Street connection to provide connections to the school area.
- A mixed-use path to connect Elm Street to 16th Street, bypassing Spruce Street. This path would take advantage of the already worn path near Pine Cliff Drive.
- A mixed-use path between Alder Street and 3rd Street behind the Frontier Prison.
- A mixed-use path between Harshman Street and North Higley Boulevard through the proposed "Wetland Park."

- A road diet and mixed-use path along Pettigrew from North Higley Street to Darnley Road. A figure of this road diet is shown on the next page. More detailed engineering would be needed to move this project forward.

SAFE ROUTES TO SCHOOL

Safe Routes to School (SRTS) was a federal program that aimed to improve walking and bicycling conditions for students traveling to and from school. Currently, funding for these types of improvements has been placed into the Federal Highway Administration (FHWA) Transportation Alternatives Program. WYDOT still requires a SRTS plan.

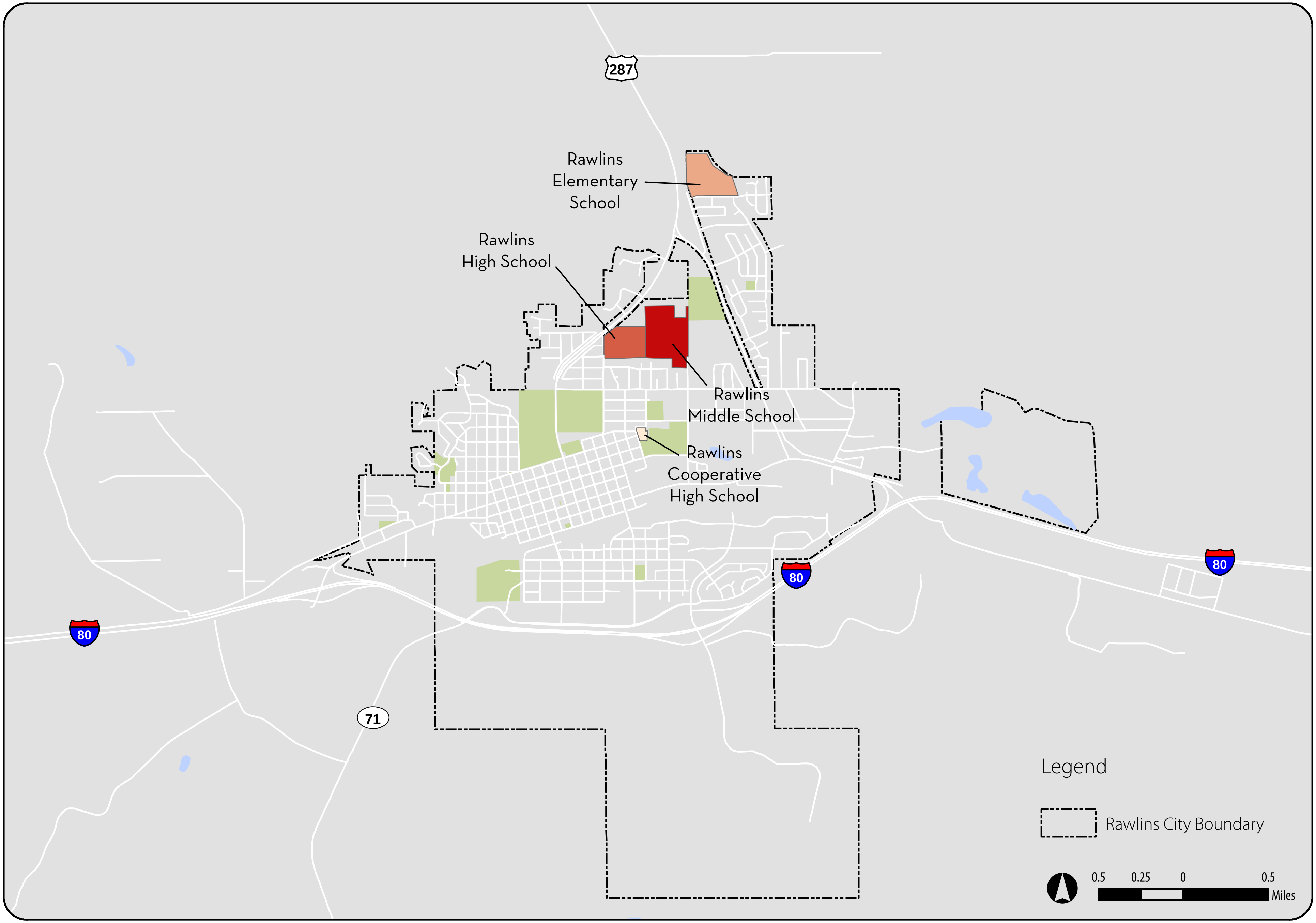
Compared to the early 20th century, most communities have seen a decrease in the number of children who use active transportation as a means of getting to and from school. However, the value of these activities in the daily lives of children has been under estimated. The SRTS program can help empower communities to make walking and biking a daily activity for children improve environmental quality and children's health. This section of the Plan details barriers to safe access to school and addresses ways to improve access and safety for children to walk and bike to school.

BACKGROUND

The City of Rawlins has four local schools: elementary, middle, high, and cooperative. However, the elementary, middle, and high schools are on the periphery of town and to access these schools, many schoolchildren have to cross major arterial roadways or railways. **Map 5.5** presents the school locations in Rawlins. The schools shown in the Rawlins City limits are:

- Rawlins Elementary School
- Rawlins Middle School
- Rawlins High School
- Rawlins Cooperative High School

Rawlins schools operate on four different bell schedules. Rawlins Elementary School starts at 7:55 AM and dismisses at 2:45 PM. Rawlins Middle School and High School start at 8:10 AM. The Middle School dismisses at 3:20 PM and the High School dismisses at 3:35 PM. The Cooperative High School starts at 8:00 AM and dismisses at 4:00 PM Monday through



MAP 5.5

Safe Routes to School

Source: Fehr & Peers | Date: June 2013

Thursday. It is closed Friday for students except those not in good academic standing and/or on an attendance contract.

RAWLINS ELEMENTARY SCHOOL

Existing Conditions

Rawlins Elementary is two buildings, one for kindergarten and first grade (Rawlins K-1) and one for grades two through five (Rawlins Elementary). Rawlins K-1 is located at the intersection of Inverness Boulevard and Darnley Road, while Rawlins Elementary is located down the street at the corner of Pettigrew Drive and Darnley Road. Pettigrew Drive is 46 feet wide with two foot shoulder on both sides and 21 foot lanes.

Both buildings are located at the northern boundary of the City in a residential neighborhood. There are no developed land uses north or directly west of the school. All students who do not live in the Highland Hills Subdivision need to cross North Higley Boulevard, a multi-lane major arterial, to approach the school. The Highland Hills Subdivision is typical of suburban development, with many cul-de-sacs and limited connectivity.

Both buildings front Darnley Road, a two-lane residential collector street. Rawlins Elementary has two parking lots, one located on the southwestern corner of the property, with approximately 175 vehicle parking spaces, and one located on the northwestern corner of the property, with approximately 55 vehicle parking spaces. Rawlins K-1 has one off-street parking lot and on-street parking.

The intersection of Darnley Road and Inverness Boulevard has crosswalks on all legs. These crosswalks provide access across Darnley Road to access the school. There are no sidewalks along Pettigrew Drive. Near the school, there is a trail on the west side of SR-287. However, there are no facilities to cross the highway.

Observations

- Lack of land uses around school
- Pettigrew Drive is wide and unmarked with no facilities for pedestrians
- Sidewalk on north side of Darnley Road abruptly ends at Pettigrew Drive
- Good sidewalks through Highland Hills residential neighborhood
- High speeds and volumes on North Higley Boulevard present a barrier for students coming to school on foot or by bicycle
- Increased truck traffic is expected along North Higley Boulevard

Recommendations

- Restripe Pettigrew Drive to create bike lanes and walking path, as shown in previous chapter
- Mark crosswalk across driveway to Rawlins Elementary
- Need for enhanced crossing opportunities and bicycle facilities along busy North Higley Boulevard corridor, this could be accomplished with signalized intersection at North Higley Boulevard and Pettigrew Drive
- Speed bumps placed near school on Pettigrew Drive, Darnley Road, and Inverness Boulevard

RAWLINS MIDDLE SCHOOL

Existing Conditions

Rawlins Middle School is located at the intersection of Brooks Street and Harshman Street, just east of the High School. Rawlins Middle School fronts onto Brooks Street, with a parking lot located on all sides of the school except the northeast side. Total parking available at the Middle School is approximately 225 spaces. Vehicles enter from Brooks Street.

One marked school crosswalk is provided across Brooks Street between the two vehicular driveways. The intersection of Brooks Street and Harshman Street has crosswalks on each leg of the intersection. There are sidewalks on Brooks Street, but no sidewalks on Harshman Street. There is a worn trail from the residential neighborhood to the south of Brooks Street leading to the crosswalk. Crosswalks also exist near the High School and at the intersection of Colorado Street and Brooks Street. Bicycle racks are not visible.

A trail network exists behind the Middle and High Schools. This network connects to trails along the west side of North Higley Boulevard and the east side of 3rd Street.

Observations

- Lack of sidewalks on Harshman Street
- High speeds and volumes on North Higley Boulevard and 3rd Street present a barrier for students coming to school on foot or by bicycle
- Lack of bicycle access and facilities near the school

Recommendations

- Improve the connection for the path between crosswalk across Brooks Street and residential neighborhood.
- Install sidewalk on Harshman Street
- Need for enhanced crossing opportunities and bicycle facilities along busy North Higley Boulevard and 3rd Street corridors
- Speed bumps placed on Colorado Street, Brooks Street, and Harshman Street near school
- Connect Harshman Street and North Higley Boulevard
- Connect Brooks Street and North Higley Boulevard

RAWLINS HIGH SCHOOL

Although high schools were not eligible for SRTS funding, funding is now available through the Transportation Alternatives Safe Routes for Non-drivers funding.

Existing Conditions

Rawlins High School is located on Brooks Street at the corner of Brooks Street and Colorado Street. The school fronts onto Brooks Street. There is no curb between the parking lot and the roadway, creating a vast expanse of pavement that could create unsafe bicycle and pedestrian conditions. The parking lot on the south side of the High School can accommodate approximately 200 vehicles. There is another parking lot to the east of the school which can accommodate approximately 322 vehicles. A number of other parking stalls exist throughout the campus.

There are sidewalks along both sides of Brooks Street, but no sidewalk along Colorado Street. A crosswalk exists across Brooks Street in the middle of the High School property. A worn trail extends from the crosswalk south across a vacant lot to the residential neighborhood south of the school. Bicycle racks are not visible.

Like the Middle School, trail network exists behind the High School. This network connects to trails along the west side of North Higley Boulevard and the east side of 3rd Street. A trail exists on the west side of third, but there are no pedestrian facilities to cross 3rd Street.

Observations

- Confusing and expansive parking lot/roadway in front of school on Brooks Street
- Colorado has no sidewalk to connect trail to High School
- High speeds and volumes on North Higley Boulevard and 3rd Street present a barrier for students coming to school on foot or by bicycle
- Lack of bicycle access and facilities near the school

Recommendations

- Improve the connection for the path between crosswalk across Brooks Street and residential neighborhood.
- Install sidewalk on Colorado Street
- Install curb on north side of Brooks Street to calm traffic
- Look for opportunities to reconfigure the parking lot to provide delineated pedestrian walkways
- Need for enhanced crossing opportunities and bicycle facilities along busy North Higley Boulevard and 3rd Street corridors
- Stripe crosswalks along Harshman Street at intersecting streets
- Speed bumps placed on Colorado Street, Brooks Street, and Harshman Street near school
- Connect Harshman Street and North Higley Boulevard
- Connect Brooks Street and North Higley Boulevard

RAWLINS COOPERATIVE HIGH SCHOOL

Although high schools were not eligible for SRTS funding, funding is now available through the Transportation Alternatives Safe Routes for Non-drivers funding.

Existing Conditions

The Rawlins Cooperative High School is located at the intersection of Mahoney Street and Rodeo Street, between a residential neighborhood and the Carbon County Fair Grounds. In the immediate area of the school, sidewalks exist along Rodeo Drive south of Mahoney Street (until Maple Street) and on Mahoney Street between the two Rodeo Streets. There are no crosswalks in the immediate area.

Parking is located behind the school building, with an entrance off Rodeo Street. This lot can accommodate approximately 40 vehicles. There is an additional lot for visitors in front of the school along Mahoney Street with parking for eight vehicles. There is also on-street parking available on Rodeo Street south of Mahoney Street. Bicycle racks are not visible.

Observations

- School is located in town with parking in back – good design
- No nearby marked crosswalks
- Sidewalk network near school is relatively complete

Recommendations

- Mark crosswalks in vicinity of school
- Complete sidewalk network near school

CITY-WIDE RECOMMENDATIONS

In addition to the observations and recommendations for each school, there are general observations and recommendations for SRTS that can be made on a city-wide level.

Observations

The main issue with all schools being located on the northern periphery of the City is a disenfranchisement of students who live south of the railroad tracks. These students have only two legal ways across the tracks – one that is of questionable safety due to lack of visibility and the other which can become dangerous in the winter due to icy conditions.

Recommendations

- Improve drainage of the Colorado Street Tunnel. This tunnel provides direct connection to the Middle and High School for students south of the railroad tracks.
- Stripe crosswalks along Colorado Street at intersecting residential streets
- Provide bike parking in safe, easily visible areas at schools

FUTURE CONSIDERATIONS

There are plans for a higher education center and an aquatic center to be built north of the middle school between 3rd Street and North Higley Boulevard. When these centers are constructed, there will be additional demand for crossings at 3rd Street and North Higley Boulevard. Signalized intersections at Colorado Street and 3rd Street and either Pettigrew Drive or Aberdeen Boulevard and North Higley Boulevard could accommodate this demand. Warrants should be conducted to see if these intersections meet signalization criteria. If these intersections are not signalized, a HAWK beacon-type crossing or a grade separation should be applied.

THE FIVE Es

In addition to the infrastructure projects listed above, Rawlins area schools should pursue a comprehensive approach to SRTS. This comprehensive approach includes engineering, education, enforcement, encouragement, and evaluation. FHWA recommends that SRTS programs in the US incorporate all five components, either directly or indirectly:

- Engineering – Creating operational and physical improvements to the infrastructure surrounding schools that reduce speeds and potential conflicts with motor vehicle traffic, and establish safer and fully accessible crossings, walkways, trails and bikeways.
- Education – Teaching children about the broad range of transportation choices, instructing them in important lifelong bicycling and walking safety skills, and launching driver safety campaigns in the vicinity of schools.
- Enforcement - Partnering with local law enforcement to ensure traffic laws are obeyed in the vicinity of schools (this includes enforcement of speeds, yielding to pedestrians in crossings , and proper walking and bicycling behaviors), and initiating community enforcement such as crossing guard programs.
- Encouragement – Using events and activities to promote walking and bicycling.
- Evaluation – Monitoring and documenting outcomes and trends through the collection of data, including the collection of data before and after the intervention(s).

Education tools teach students and parents about pedestrian, bicycle, and motorist safety; creates general awareness, and teaches about the goals of SRTS. Ideas for Education are:

- Lessons incorporated into regular classroom discussions
- Bike rodeos and how to cross the street.
- For parents, activities include learning how to maneuver in the pick-up drop-off areas, how to teach their children about safety, how to drive near schools. This can be accomplished through signage, training sessions, enforcement and printed materials
- Helmet fitting and giveaways

The main focus of the enforcement strategy is to deter unsafe behaviors, and to encourage all roadway users to obey traffic laws. Enforcement is generally done though the police department.

Encouragement activities are about having fun and getting children excited about walking and bicycling. Some examples of Encouragement tools are:

- Walk to School Day
- Walking School Bus
- Contests, such as a SRTS poster contest, joke contest or frequent walker/biker contest where prizes are given away such as a pizza party for the classroom who walks to school the most
- Helmet giveaways

Evaluation is an essential component of any SRTS program, used to determine whether the program goals are being met and to ensure that resources are directed toward efforts with the greatest likelihood of success. Evaluation indicators can include behavior of children and drivers, collision data, and perception of safety.

WYDOT SRTS FUNDING

WYDOT administers SRTS funding in Wyoming through FHWA's Transportation Alternatives program. A project funded by WYDOT is provided with 80 percent federal funding with a 20 percent local match is required. A SRTS plan must be in place before funds are granted for infrastructure. Applications are due in late summer. Applicants can be local governments and school districts.

IMPLEMENTING THE TMP

The recommended projects and programs of the TMP were developed by travel mode, as described in previous chapters. Implementing the TMP will require close coordination among the City departments, the citizens and businesses of Rawlins, and other agencies within the region.

In order to guide the City in implementation of the plan, priority should be assigned to assist in assembling an updated six-year Transportation Improvement Plan (TIP) over the course of the coming 20 years, working toward the 2030 planning horizon. This chapter summarizes the recommended plan and documents the criteria used to prioritize the projects.

The TMP is a living document and will serve as the blueprint for transportation in Rawlins over the next several years. Realistically, the actions in the plan are most useful over the next three to five years, at which point a plan update will be required. Several implementation steps should be initiated over the next couple of years to determine if changes are needed, or to reaffirm a particular strategy.

ROADWAY NETWORK DESIGN GUIDELINES

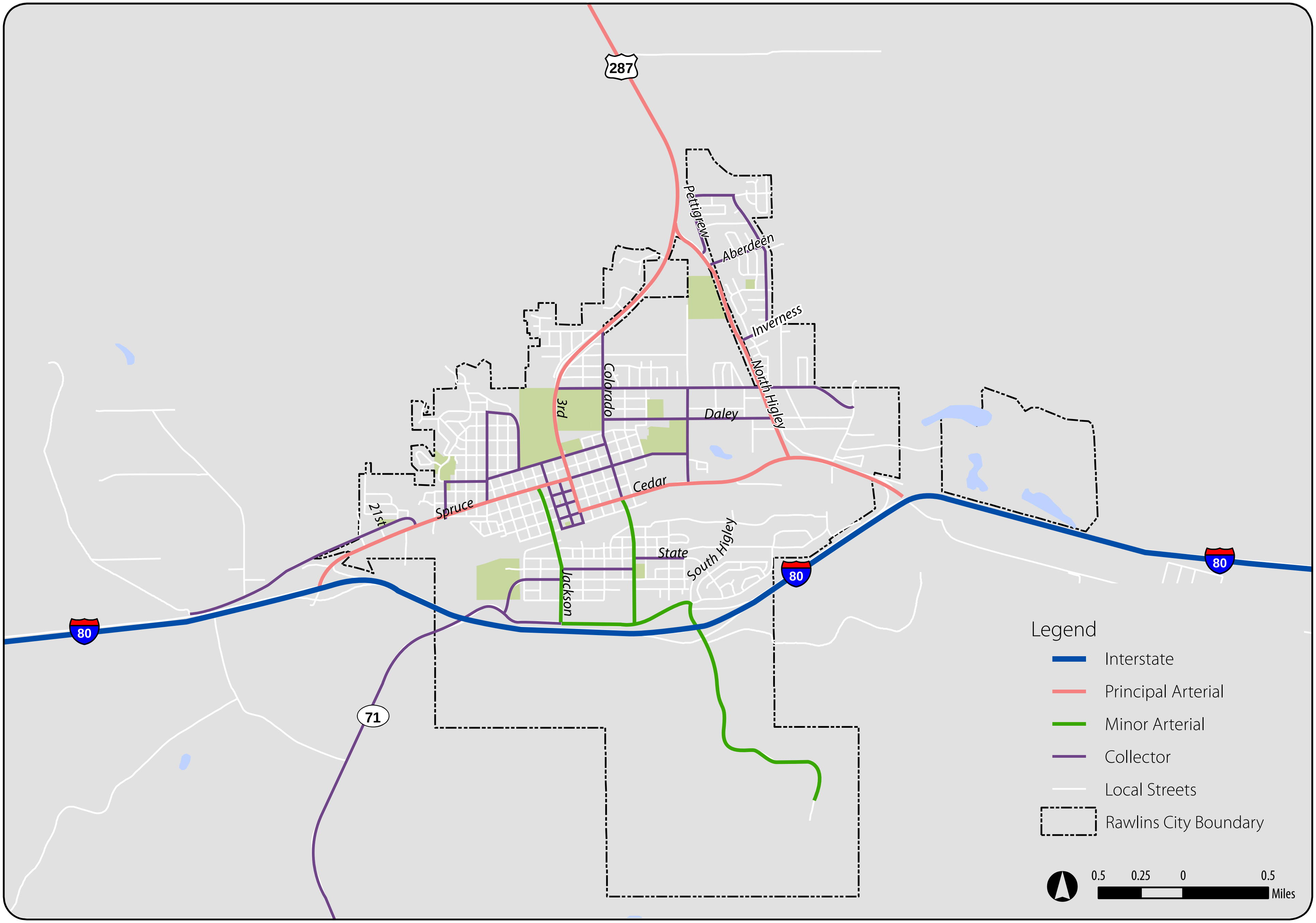
Functional Classifications

The functional classification used for roadways establishes a hierarchy of roads based on the desired function and designates different purposes for different types of roadway facilities. This hierarchy allows for varying degrees of functionality, from access to mobility. As the functional classification of a facility increases, more restrictions are typically placed on access. Local streets serve as the base of the hierarchy and generally provide access to single family residential properties. The roadway hierarchy increases to include collectors, minor arterials, principal arterials, and interstates, which provide links to other regional facilities and destinations. The functional classifications are defined in **Table 5.10** and shown in **Map 5.6**. Example cross-sections for each classification are shown in the section below.

Street section and surfacing guidelines are recommended based on soil sample analysis that was performed at five locations in Rawlins. Developments creating new roadways should refer to the Appendix for detailed information regarding street section and surfacing guidelines.

Table 5.10: Functional Classifications Types and Examples

Type	*Description/Purpose*	*Example*
Local	Primary function is to faciliitate access to residential properties.	Perry Street
Collector	Provide for traffic movement within a community, and have connection to minor and prinicpal arterials. Gives higher priority on local traffic than through traffic.	Colorado Street
Minor Arterial	Connections that accommodate predominately non-local, or through, traffic.	6th Street
Principal Artertial	Designed primarily for through traffic, including freight. Where possible, curb cuts are minimized to control access.	3rd Street
Interstates	Roadways that serve high-speed and high-volume regional traffic. Acces to an Interstate is limited to grade-seperated interchanges.	I-80



The City of RAWLINS WYOMING

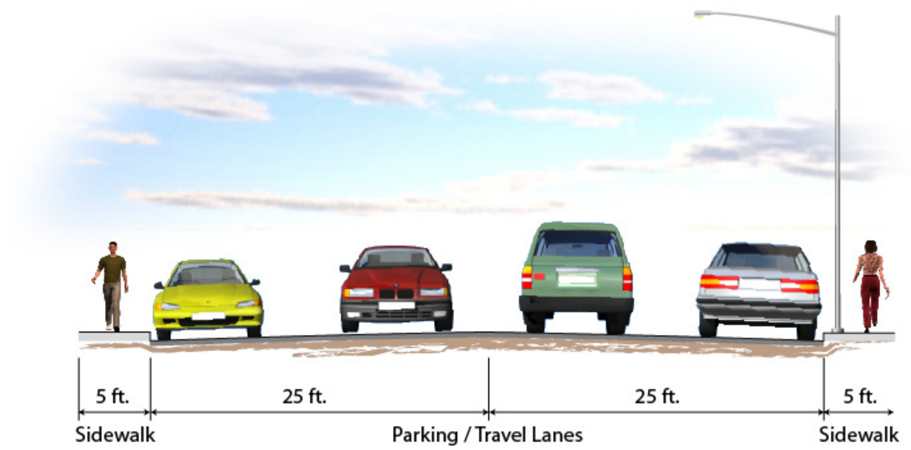
Source: Fehr & Peers | Date: June 2013

MAP 5.6

Functional Classification System

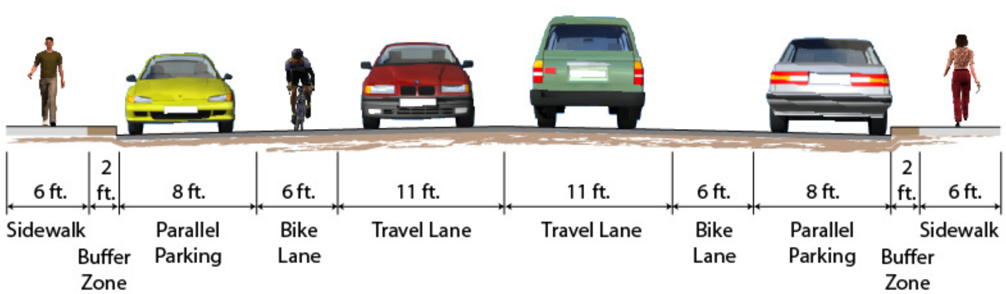
Recommended Cross-Sections

Local



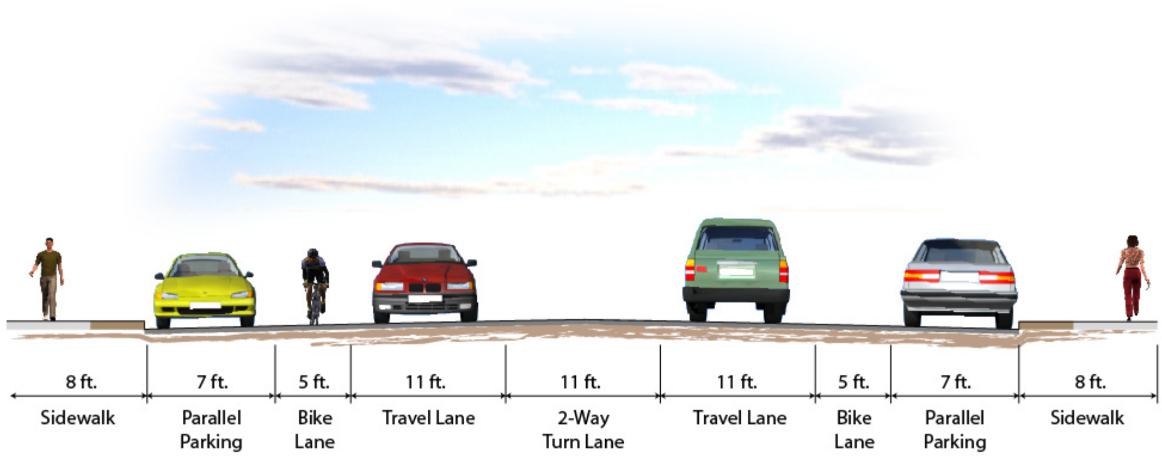
60 feet

Collector

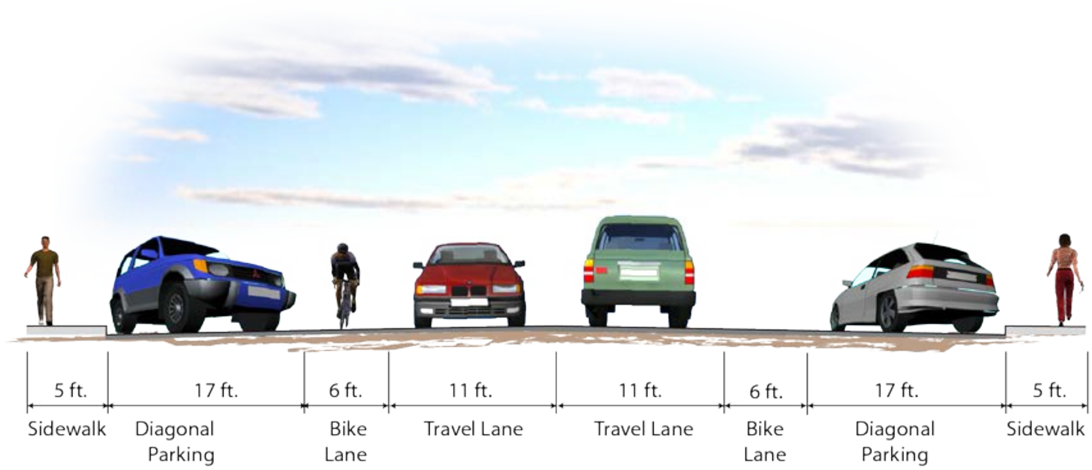


66 feet

Minor Arterial

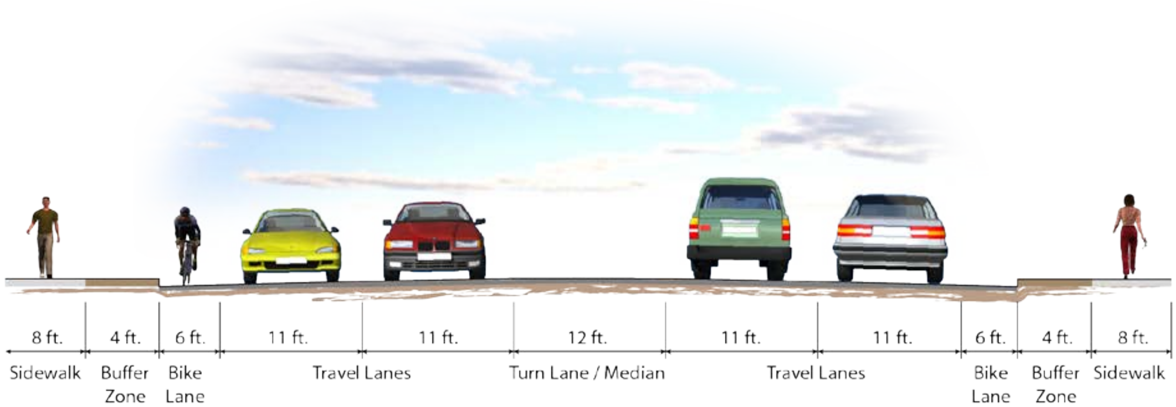


73 feet



78 feet

Principal Arterial



92 feet

SETTING PRIORITIES

Project prioritization is needed to help identify when best to fund and implement the projects since funding is limited. **Table 5.11** shows projects and their respective priorities. **Figure 5.4** (located earlier in the document) shows future improvements.

Table 5.11: Priority Projects

Item	*Ongoing*	*< 3 Years*	*3 – 10 Years*	*10+ Years*	*Cost*
Intersection Improvements					
Signal at Highley Boulevard and Pettigrew Drive				X	Medium
Signal at Highley Boulevard and Inverness Boulevard				X	Medium
Intersection improvements at Walnut Street/Date Street/7th Street			X		Low
Intersection improvements at Colorado Street/Mahoney Street			X		Medium
Network Improvements					
Higley Boulevard Extension				X	High
Harshman Drive connection to North Higley Boulevard		X			High
Brooks Street connection to North Higley Boulevard		X			High
Cedar Street Access Management			X		Medium
Bicycle and Pedestrian					
Fill in and improve sidewalks along 16th Street	X				Low
Fill in and improve sidewalks along Walnut Street	X				Low

Table 5.11: Priority Projects

Item	*Ongoing*	*< 3 Years*	*3 – 10 Years*	*10+ Years*	*Cost*
Fill in and improve sidewalks along Gallup Place	X				Low
Fill in and improve sidewalks along Maple Street	X				Low
Fill in and improve sidewalks along Rodeo Street	X				Low
Fill in and improve sidewalks along Mahoney Street	X				Low
Fill in and improve sidewalks along Daley Street	X				Low
Fill in and improve sidewalks along Washington Street	X				Low
Bike lanes and sidewalk along Brooks Street	X				Low
Bike lanes and sidewalk on Colorado Street	X				Low
Bike lanes and sidewalk along Harshman Street	X				Low
Bike lanes and sidewalk connecting along Elm Street	X				Low
A formalized crosswalk at the intersection of 3rd Street and Heath Street			X		Low
A formalized crosswalk at the intersection of 3rd Street and Colorado Street.			X		Low
Expansion of South Higley Boulevard bridge over I-80 to accommodate sidewalks			X		High
Bike lanes along Spruce Street to proposed "Wetland Park"				X	Low
A mixed-use path between Harshman Street and North Higley Boulevard through the proposed "Wetland Park"				X	Low
A mixed-use path to connect Elm Street to 16th Street, bypassing Spruce Street				X	Low
A mixed-use path between Alder Street and 3rd Street behind the Frontier Prison			X		Low
A road diet and mixed-use path along Pettigrew from North Higley Street to Darnley Road			X		Low
Safe Routes to School*					
Mark crosswalk across driveway to Rawlins Elementary			X		Low
Need for enhanced crossing opportunities along North Higley Boulevard corridor			X		Medium
Speed bumps placed near school on Pettigrew Drive, Darnley Road, and Inverness Boulevard			X		Low
Speed bumps placed on Colorado Street, Brooks Street, and Harshman Street near school			X		Low

Table 5.11: Priority Projects

Item	*Ongoing*	*< 3 Years*	*3 – 10 Years*	*10+ Years*	*Cost*
Improve the connection between crosswalk across Brooks Street and residential neighborhood			X		Low
Look for opportunities to reconfigure the parking lot to provide delineated pedestrian walkways	X				Low
Stripe crosswalks along Harshman Street at intersecting streets	X				Low
Install curb on north side of Brooks Street		X			Low
Improve drainage of the Colorado Street Tunnel.		X			Medium
Stripe crosswalks along Colorado Street at intersecting residential minor streets		X			Low
Provide bike parking in safe, easy visible areas at schools		X			Low

* Needs approved plans to be funded with Safe Routes to School funding

MONITORING AND EVALUATION

The TMP is a long-range plan that enables Rawlins to plan for its current and future transportation needs. Nonetheless, the transportation network is dynamic, constantly changing due to circumstances beyond the scope and influence of this plan. Hence, regular updates are necessary to ensure the plan remains current and relevant.

TRAFFIC MANAGEMENT TOOLBOX

BICYCLE AND PEDESTRIAN

This section includes potential components for bicycle and pedestrian facilities along roadways and at intersections. Components are listed based on how they might match the need of a situation, such as intersection treatments, corridor treatments, or bike parking.

Guidance for Retrofitting Streets

Constructing facilities on existing streets will require a change, or retrofit, to the existing roadway configuration. The following steps should be taken to determine the feasibility of bike lanes on existing streets in Rawlins:

- Evaluate how well the existing cross section serves bicyclists.
- Develop an optimum cross section to balance the needs of all users without significantly compromising safety or level of service for vehicular traffic.

The decision-making process to retrofit arterial includes three steps. The results are driven by specific roadway characteristics.

First, the designer should determine the appropriateness of the roadway as a bicycle route. Second, the designer should analyze the existing roadway cross section and consider modifications to provide space for bicycle lanes. The figures in this document include minimum and preferred widths for bicycle lanes and vehicle travel lanes. Minimum bicycle lane widths are acceptable under retrofit conditions only when a determination is made that the cost of rebuilding to attain the preferred width far exceeds the benefits of the re-build. The following questions are appropriate:

1. Can any existing vehicle lanes be narrowed?
2. Can any existing vehicle lanes be removed (consider travel lanes, turn lanes, and parking lanes)?
3. Can medians or planting strips (buffers) be narrowed?
4. Can the existing pavement be widened, or can the curbs be moved without compromising local standards for widths of lanes, sidewalks, curbs, etc.?

These questions were used in this document. Third, the designer should consider the effect of changes to the existing cross section on:

1. Pedestrian needs (buffers, sidewalk and crossing widths, and medians)
2. Roadway capacity, including traffic volume
3. On-street parking demand and turnover
4. Large traffic (trucks)
5. Horizontal alignment (curved roadway sections)
6. The 85th percentile speed

Vehicle Lanes

Recent research indicates that the use of lanes narrower than 12 feet on urban and suburban arterials does not increase crash frequency (National Cooperative Highway Research Program project 17-26). The researchers recommend that geometric design policies should provide "substantial flexibility" for use of narrower lanes, particularly in retrofit situations where narrow lanes would result in added width for bicycle lanes.

If the analysis finds that bicycle lanes are feasible, the project can move to implementation. If there are constraints, designers should develop alternatives with the goal of improving bicycle safety and access to the highest degree possible.

A common method for retrofitting a street to accommodate bicycle lanes is a road conversion (or road diet). Typically a road conversion is implemented on a four-lane roadway by reducing the vehicle travel lanes from four to three (one travel lane in each direction with a two-way left-turn lane) and adding bicycle lanes. Road conversions are generally considered on roadways that carry up to 20,000 daily vehicles.

Shared Roadways

Shared roadways are intended to provide continuity throughout a bikeway network and are primarily identified with signs. Shared roadways can be used to connect discontinuous segments of a bicycle lane or bicycle path, and are shared facilities with motorists on roadways or with pedestrians on sidewalks (not desirable). Minimum widths for shared roadways are not presented in this document, as the acceptable width is dependent on many factors.

Shared Lane Markings

The Shared Lane Marking, or "Sharrow" is a new design feature that has been added to the 2009 Edition of the *Manual on Uniform Traffic Control Devices* (MUTCD). Sharrows are pavement markings in the vehicle travel lane that allow bicyclists to use the full lane. Sharrows are helpful connectors between multi-use paths or bike lanes when roadway widths are too narrow to accommodate a bike lane. Sharrows are suitable for streets with posted speeds below 35 mph, preferably with on-street parking, except when on-street parking is front-in angled. When using Sharrows, pavement markings should be placed every 250 feet.

The **Table 5.12** presents recommended lane widths based on average daily traffic (ADT) and speed thresholds for shared lane markings.

Table 5.12: Recommended Guidelines for Shared Lane Markings

Shared Lane Width	*ADT Volumes*	*Travel Speed*	*Notes*
Arterial – 12 ft Collector – 11 ft Local Street – No minimum	Less than 12,000	Less than 30 mph	Sharrows are recommended on roadways with on-street parking or lane widths narrower than 14 feet.
14 ft	12,000 – 20,000	30 – 35 mph	Sharrows are strongly recommended on roadways with volumes higher than 7,000 vehicles per day, lane widths narrower than 14 feet, or locations with on-street parking (but not front-in angled parking)
15 ft	Greater than 20,000	Greater than 35 mph	Shared roadways are strongly discouraged under these conditions, special considerations for short stretches connecting bicycle lanes, where sharrows are strongly recommended.

Source: Fehr & Peers, 2011

Bicycle Boulevards

The bicycle boulevard is a bicycle treatment intended for low volume streets (less than 1,500 ADT) adjacent to higher volume arterials where bicycles have the priority and a relatively stop-free, low conflict route to their destinations.

Traffic calming treatments, such as traffic circles, chokers, and medians are often used on bicycle boulevards as traffic calming measures to restrict vehicle speeds.

There are five general issues to address when implementing a bicycle boulevard:[1]

1. Create the look and feel of a bicycle boulevard
2. Slow traffic and discourage diversion of traffic to the bike boulevard by removing unwarranted STOP signs. Unwarranted STOP signs cause excessive stopping and delay for cyclists. They also increase noise and air pollution, increase fuel consumption, and non-compliance compromises safety for all. They often increase speeds mid-block as well.
3. Address school or pedestrian related safety issues
4. Help bicyclists cross major streets
5. Reduce motor vehicle speeds
6. Prevent diversion of motor vehicle traffic onto adjacent neighborhood streets

There are two categories of tools that can help address these issues. The first category is called Basic Tools. These strategies are appropriate for all bicycle boulevards and include:

- Signs
- Unique pavement stencils
- Pavement legends
- Landscaping and street trees

The second category is called Site Specific Tools. These are used to varying degrees on a bicycle boulevard to respond to a specific issue, and they require more analysis and stakeholder involvement:

- Traffic circles
- Bulbouts
- Traffic signals
- High-visibility crosswalks
- Bollards or planters

Bicycle Paths

Bicycle paths are facilities that are separated from the roadway by a physical barrier. Separated paths are attractive to casual and intermediate cyclists as they offer a sense of security not provided by bicycle lanes or bicycle routes. Bicycle paths are valuable as both recreational areas and/or desirable transportation corridors.

Some separated paths are designed to accommodate bicyclists and pedestrians and should be classified as shared use paths. Paths that are designed to be used solely by bicyclists should be well marked and have adequate pedestrians facilities nearby to avoid being confused with a shared use path.

Separated bicycle paths should be designed with graded shoulders on both sides that are flush with the trail. In some cases, a wider path may be appropriate to accommodate a high volume of users, multiple closely-placed access points, limited sight distance, attractions adjacent to the trail, and busy trail or street intersections. Where feasible, bicycle

[1] Berkeley Bicycle Boulevard Tools and Design Guidelines

paths should have an adjacent 4 foot wide, unpaved area to accommodate pedestrians. This pedestrian path should be placed on the side with the best view (e.g. near a river or other vista). Where equestrians are expected, a separate facility should be provided.

Asphaltic concrete or Portland cement concrete should be used for a bicycle path or shared use path. Decomposed granite, which is a better running surface for preventing injuries, is the preferred surface type for side areas and jogging paths.

A yellow centerline stripe may be used to separate opposite directions of travel. A centerline stripe is particularly beneficial to riders who may use unlighted paths after dark. They are also recommended on curves with poor sight distance.

It should be noted that two-way bicycle paths or shared use paths adjacent to roadways (also known as "separated bikeways" or "sidepaths") with intersecting driveways and roadways have a high collision potential for cyclists because drivers who are exiting driveways or intersecting roadways and looking for oncoming vehicle traffic often do not expect cyclists to approach from the opposite direction.[2] For these reasons, when the jurisdictions review plans for development adjacent to proposed shared use facilities, driveways and cross-flow traffic should be minimized. When driveways cross shared use paths, jurisdictions should consider warning signs and pavement markings (such as "BIKE XING" signs or stop bars) for drivers, bicyclists, and pedestrians, as appropriate. These safety issues do not apply to regional shared use paths, which generally have few intersections.

At-Grade Trail Crossings

The following guidance is taken from the American Association of State Highway and Transportation Officials (AASHTO) *Guide to the Development of Bicycle Facilities*, the City of Seattle's Bicycle Master Plan, and the City of San Francisco's Supplemental Bicycle Design Guidelines.

Many variables should be considered when designing shared use path crossings, including:

- Number of roadway lanes to be crossed
- Divided or undivided roadways
- Number of approach legs
- Vehicle speeds and volumes
- Traffic control at the crossing location

Each intersection is unique and requires engineering judgment to determine the appropriate intersection treatment. The safe and convenient passage of all modes through the intersection is the primary design objective.

Regardless of whether a pathway crosses a roadway at an existing intersection, or at a new mid-block location, the principles that apply to general pedestrian safety at crossings (controlled and uncontrolled) are transferable to pathway intersection design.

When trails cross roadways at existing intersections, the trail should generally be assigned the same traffic control as the parallel roadway (i.e., if the adjacent roadway has a green signal, the trail should also have a green/walk signal, or if the parallel roadway is assigned the right-of-way with a stop or yield sign for the intersecting street, the path should also be given priority). At signalized intersections, if the parallel roadway has signals that are set to recall to green

[2] Wachtel, Alan and Diana Lewiston, *Risk Factors for Bicycle-Motor Vehicle Collisions at Intersections*, Institute of Transportation Engineers *Journal*, September 1994. pp. 30-35

every cycle, the pedestrian signal heads for the trail should also be set to recall to the walk phase. Countdown pedestrian signals should be installed at all signalized trail crossings as signal heads are replaced. As required by the MUTCD, the walk signal for any trail shall not conflict with a protected left- or right-turn interval.

Consideration should be given to providing a leading pedestrian interval at trail crossings (i.e., 3 seconds of green/walk signal time are given to trail users before any potentially conflicting motor vehicle movements are given a green signal). This allows pedestrians and bicyclists to have a head start into the roadway and become more visible to turning traffic.

Where the signals for the parallel roadway are actuated, the trail crossing will also need to be actuated. For trail crossings, the minimum WALK interval may be 9-12 seconds to accommodate increased flow. A "USE PED SIGNAL" sign should be used at trail crossings with signalized intersections. Pedestrian push buttons should be located within easy reach of both pedestrians and bicyclists, who should not have to dismount to reach the push button.

The figure on the following page illustrates the preferred approach for a trail at a controlled intersection. An advance loop detector within 100 feet of the intersection should be considered so bicyclists can approach the intersection slowly but without having to stop.

Trail Crossings at Unsignalized Intersections

Trail crossings at stop controlled intersections should provide bicycle/pedestrian stop signs at each trail approach.

Consideration should be given to converting all-way stop controlled intersections to side-street stop controlled intersections, and giving the shared use path and parallel roadway the free movement. An engineering study would need to be conducted before removing or adding any stop signs.

At intersections with stop signs controlling the side-street approach, the trail should be assigned the same right-of-way as the parallel street. Stop signs should not be placed on trail approaches to the intersecting roadway if the parallel street does not have stop signs.

If two intersecting streets have the same roadway classification, and stop signs face the intersecting street that is parallel to the trail, consideration should be given to reversing the stop sign placement, and giving the free movement to the trail and parallel street. An engineering study would need to be conducted before reversing the stop sign placement.

The decision of whether to use a traffic signal at a mid-block trail crossing should be primarily based on the latest version of the MUTCD Pedestrian Signal warrants.

At mid-block crossings, all trail users (including bicyclists) should be included in calculating the "pedestrian volume" for the warrant procedure. When a trail crossing meets the warrants, there may be other reasons why a signal is not necessary at the crossing. Where a decision has been made not to install a traffic signal at a mid-block trail crossing, stop signs should be used to assign the right-of-way to the trail or the roadway. These signs are intended to remind cyclists and pedestrians to stop and look before crossing because although these locations are marked crosswalks, trail users should exercise caution before crossing. To minimize driver confusion, these stop signs should be installed such that they are not visible by drivers on the intersecting street. If the signs are visible to drivers, it may lead them to interpret that they have the right-of-way and do not need to stop for trail users. The assignment of priority at a shared use path/roadway intersection should be assigned with consideration of the following:

- The relative importance of the trail and the roadway.
- The relative volumes of trail and roadway traffic.
- The relative speeds of trail and roadway users.

Bicycle Parking

This section provides guidance on the provision and placement of safe, secure, and convenient bicycle parking facilities.

As the bicycle network in Rawlins grows, so will the population that chooses to ride a bike. The availability of secure and convenient parking is critical to the majority of bicyclists. The availability of short-term and long-term bicycle parking at key destinations such as parks, schools, community centers, and transit stations is a vital component of a complete bicycle network.

Parking should be highly visible, easily accessible, user friendly. Parking facilities should be located in well-lit areas and covered where possible.

Bicycle racks are low-cost devices that provide a short-term location to secure a bicycle. Ideally, bicycle racks should be designed to allow a bicyclist to lock the frame and wheels of their bicycle to the rack. The bicycle rack should be secured to ground in a highly visible location, preferably within 50 feet of a main entrance to a building or facility. Whenever possible, bicycle racks should be visible from the doorways and/or windows of buildings, and not in an out-of-the-way location, such as an alley. Adequate pedestrian clearance needs to be provided, and the design must consider the rack plus the bicycle. . Bicycle racks are short-term parking solutions, commonly used for short trips when cyclists are planning to leave their bicycles for just a few hours.

Sidewalks

It is important to create sidewalks that support the activities and pedestrian levels along a street. This section provides guidelines for designing sidewalk widths, buffer zones, and areas for walking, sitting, and lingering.

Sidewalk Zones

The sidewalk zone is the portion of the street right-of-way between the curb and building front. The sidewalk zone generally consists of four distinct areas that serve different organizational purposes – curb, throughway zone, furnishing zone, and frontage zone – although all four zones are not always necessary.

Sidewalks should be wide enough to support the expected pedestrian demand. The minimum width for sidewalks is four feet on residential and local roadways, and five feet on collectors and arterials. Five feet is desirable for two people to walk side by side comfortably. Sidewalks in areas with high pedestrian volumes, such as downtown areas, should have widths of six feet or more.

Curbs

The curb or curb zone of a sidewalk should have a minimum width of six inches in areas with low pedestrian activity. Other areas, such as downtowns, should have at least an extra foot to prevent conflicts with car doors and pedestrians.

Throughway Zone

The throughway zone of a sidewalk is the primary travel area for pedestrians, and should be clear of any obstructions such as benches, utility poles, bike racks, etc. The minimum width of this zone is four feet on residential and local roadways and five feet on collectors and arterials. Areas with higher pedestrian volumes, such as downtown areas, should have throughway zone widths of six feet or more. Areas where the throughway zone is less than five feet must have a passing space every 200 feet. The passing space must be either a minimum of 60 inches by 60 inches, or at an intersection of two walking surfaces providing a T-shaped space where the base and arms of the T-shaped space extend a minimum of 48 inches beyond the intersection.[3]

The ADA provides standards when designing facilities to accommodate people with disabilities. It is recommended that the throughway zone of the sidewalk remain clear of any obstructions, such as sign posts, newspaper racks, etc.; however, if an object is placed in the throughway zone, the ADA Accessibility Guidelines provide minimum clear width requirements. If the object in the throughway zone has a running width of 24 inches or less, the clear width adjacent to the objects must be at least 32 inches. Multiple obstructions must be at least 48 inches apart. If the throughway zone obstruction is longer than 24 inches, the clear width adjacent to the object must be at least 36 inches.

Furnishing Zone/Buffer

The furnishing zone acts as a buffer between the curb and the throughway zone. Sidewalk amenities such as street trees and benches should be located within the furnishing zone to avoid interference with pedestrians in the throughway zone. If planting strips are included, the minimum required width of the furnishing zone is five feet. Sidewalks adjacent to higher speed roadways should have wider furnishing zones.

Frontage Zone

The frontage zone is the area between the throughway zone and an adjacent building or fence. The primary purpose of this zone is to create a buffer between pedestrians walking in the throughway zone and people coming in and out of buildings. The frontage zone provides opportunities for shops to place signs, planters, or chairs in front of their building without encroaching into the throughway zone. The minimum recommended width of the frontage zone is one foot, although three or more feet is preferred to accommodate opening doors. The frontage zone is only needed in areas with adjacent buildings or fencing.

Surface Treatments

Special surface treatments such as stamped concrete or pavers can be used to distinguish the sidewalk and/or crosswalk from the roadway at roadway crossing locations or driveways. These treatments enhance the overall character of the pedestrian environment. The rougher roadway surface may also slow vehicles and enhance driver awareness to the potential presence of pedestrians.

Examples of special surface treatments include:

- Bricks or pavers
- Stamped or colored concrete
- Stamped asphalt or concrete painted to resemble bricks
- Pavement stencils

When designing special surface treatments consideration should be given to visually and physically impaired pedestrians. Surfaces should be adapted to accommodate wheelchair users. Additionally, a stripe of contrasting color is recommended on either side of a crosswalk, even when special paving treatments are used, to enhance the contrast between the crosswalk and the roadway.

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[3] "2010 ADA Standards for Accessible Design." September 2010. <http://www.ada.gov/regs2010/2010ADAStandards/2010ADAstandards.htm#c4>

Crossing Treatments

Mid-block/Uncontrolled Crossings

Uncontrolled intersection crossing locations include approaches without a stop sign or signal to regulate vehicles. Mid-block crossings are locations where there is a demand for pedestrian crossings in between intersections. Without a formal signal to control traffic, uncontrolled locations and mid-block crossings require unique treatments to ensure pedestrians are visible within the roadway.

Pedestrians tend to walk in the path that provides the shortest distance. If intersection crossings are too far apart, mid-block crossings may be necessary to accommodate these paths, or 'desire lines'. Marking a crosswalk helps identify the most appropriate place for pedestrians to cross the street. Clearly roadways with lower speeds and traffic volumes, and narrower cross sections are better suited for marked crosswalks than multi-lane, high volume roadways. Mid-block crosswalks are not recommended on roadways with six or more lanes and/or a speed limit of 40 mph or more.

When designing a crosswalk at an uncontrolled location, the following should be considered (this approach was used in determining crosswalk locations for Rawlins):

1. Does sufficient demand exist to justify the installation of a crosswalk?
    - Is the location near a school, park, or hospital?
    - Do more than 20 pedestrians cross at the location per hour or 60 in four hours?
    - If the answer is "yes" to either of the questions above, move to the next question. If "no" then a marked-crosswalk is not appropriate.
2. Is there a marked crossing less than 300 feet away?
    - If the answer is "yes" to the question above, then a marked-crosswalk is not appropriate and pedestrians should be directed to the existing crosswalk.
3. Does the crossing location have sufficient sight distance (as measured by stopping sight distance calculations)? Or, can the sight distance be improved prior to crosswalk installation?
    - If the answer is yes, the location is a good candidate for a marked crosswalk.

Mid-block crossing locations must provide adequate sight distance, so pedestrians can be clearly viewed by motorists, and vice versa. Additionally, it is important to consider the "multiple threat" collision situation when designing a crosswalk. Multiple threat collisions are common when pedestrians have to cross more than one lane of traffic in each direction.

Streets should be designed to minimize conflicts between vehicles and pedestrians. Basic crossing treatments such as high visibility striping and advanced yield lines shall be used as a minimum at uncontrolled crossing locations. Enhanced crossing treatments, including flashing beacons or in-street pedestrian signs, should be used in locations with higher vehicle and pedestrian volumes and higher vehicle speeds. The **Table 5.13** provides guidance on crossing treatments.

Table 5.13: Crossing Treatment Recommendations by Roadway Type and Speed

Number of Vehicle Travel Lanes	*Vehicle ADT ≤ 5,000*			*Vehicle ADT > 5,000 to 12,000*			*Vehicle ADT > 12,000 to 20,000*			*Vehicle ADT > 20,000*		
	≤ 30 mph	*35 mph*	*40 mph*	*≤ 30 mph*	*35 mph*	*40 mph*	*≤ 30 mph*	*35 mph*	*40 mph*	*≤ 30 mph*	*35 mph*	*40 mph*
2 lanes	1	1	2	1	1	2	1	1	3	1	2	3
3 lanes	1	1	2	1	2	2	2	2	3	2	3	3
4 or more lanes	1	2	2	2	2	3	2	2	3	3	3	3
4 or more lanes (with raised median)	1	2	3	2	2	3	3	3	3	3	3	3

Notes: Unsignalized locations with a speed limit greater than 40 mph should include more than a striped crosswalk alone.
Crossing Types:
1 = Crossings should include a minimum of High Visibility Crosswalk Striping, and consider additional treatments such as a Pedestrian Refuge Island and/or Advanced Yield Lines.
2 = Crossings should include an enhanced treatment such as a Raised Crosswalk, In-Street Pedestrian Crossing Signs, Overhead Flashing Beacons, or Rectangular Rapid Flashing Beacon.
3 = Controlled crossing treatments such as a HAWK Signal, Pedestrian Signal, or Two-Stage Crossing should be considered. A signal warrant analysis should be performed prior to installation of a traffic signal.

Basic Crossing Treatments

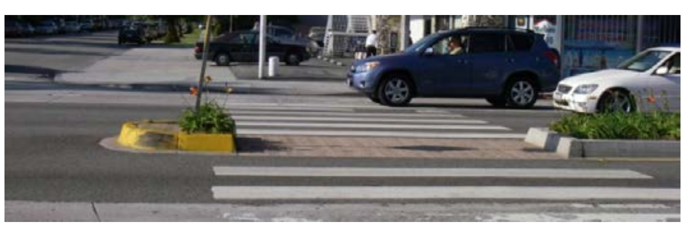
Basic crossing treatments that can be used to improve visibility and safety for pedestrians at uncontrolled locations include pedestrian refuge islands, high visibility crosswalk striping, and advanced yield lines.

Pedestrian Refuge/Median Island

Pedestrian refuge islands, or median islands, are raised islands in the center of a roadway that separate opposing lanes of traffic. A cutout or wheelchair accessible ramps in the median provide a refuge area to allow pedestrians to cross the roadway in two stages. This treatment increases pedestrian comfort by ensuring a reasonable distance to cross at one time.

Pedestrian refuge islands should be considered in locations with two or more lanes of traffic in each direction, or when crossing distances exceed 60 feet, such as on 3rd Street or Cedar Street. The minimum width for a median island is five feet, although six feet is recommended in order to accommodate bicycles. Areas with high pedestrian volumes, high vehicles volumes, and/or multiple lanes of traffic should have wider median islands.

At intersection locations, pedestrian refuge islands should always include a "thumbnail," or raised island, (shown in the figure below) on the intersection side to avoid collisions between vehicles and pedestrians.



Pedestrian Refuge with "Thumbnail"

High Visibility Striping

Continental Striping at the intersection of 3rd Street and Spruce Street

At a minimum, all mid-block/uncontrolled crossing locations should include high visibility crosswalk striping. There are several options for high visibility markings, including Standard, Continental, Zebra, Ladder, and Triple-Four patterns. Rawlins typically uses the Continental striping pattern to mark crosswalks. For consistency, Continental striping should continue to be the standard for the area.

Advanced Yield Line

Advanced yield lines are a treatment used at uncontrolled crosswalks to discourage vehicles from encroaching into the crosswalk, by creating a buffer between the location where vehicles are supposed to stop and the crosswalk. Advanced yield lines should be used in conjunction with high visibility striping to bring extra attention to motorists to reduce their speed for crossing pedestrians. Placement of advanced yield lines should be 20 to 50 feet before a marked crosswalk.

Advanced yield lines are useful on multi-lane streets to reduce the "multiple threat" collision potential. By requiring vehicles to stop well before the crosswalk, pedestrians are more visible to oncoming traffic.

Enhanced Crossing Treatments

Enhanced crossing treatments such as raised crosswalks, in-street pedestrian crossing signs, overhead flashing beacons, and rectangular rapid flashing beacons should be used at locations that require heightened awareness of pedestrian presence. These locations include multi-lane streets (with three or more lanes), streets with ADT greater than 12,000, and streets with a posted speed limit between 30-40 miles per hour. Even though no street in Rawlins has 12,000 ADT, these types of treatments would be appropriate on 3rd Street, North Higley Boulevard, and Cedar Street.

Raised Crosswalk

Raised crosswalks, also known as speed tables, provide an elevated surface above the travel lane that raises awareness of crossing pedestrians. The raised roadway surface acts similarly to a speed bump requiring drivers to slow down as they travel through the crosswalk. These would be appropriate in downtown or school locations.

In-Street Pedestrian Crossing Sign

In-street pedestrian crossing signs are regulatory signs placed on the roadway centerline, either in front of or behind the crosswalk. These signs are approved by the MUTCD, and serve to remind drivers that pedestrians have the right-of-way in a crosswalk. Careful placement of these signs is necessary to avoid maintenance issues, as the signs can easily be knocked over by vehicles. Raised, in-pavement markers can be placed around the sign for protection. In-street pedestrian crossing signs are useful at mid-block locations or intersections with significant pedestrian activity (e.g. near schools).

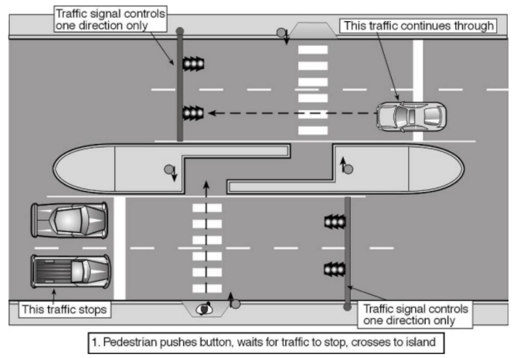
Overhead Flashing Beacon

Overhead flashing beacons enhance driver visibility of pedestrians at uncontrolled crossing locations with overhead or post-mounted, flashing, amber lights. This treatment is useful at locations with limited sight distance. These would be appropriate at crossings on 3rd Street, North Higley, near I-80 interchanges, or in downtown.

Rectangular Rapid Flashing Beacon

The rectangular rapid flashing beacon (RRFB) is also known as the stutter flash. This treatment enhances the overhead flashing beacon by replacing the slow flashing incandescent lamps with rapid flashing LED lamps. The RRFB can be activated by a push-button or with remote pedestrian detection. Design variations include versions with LED lights placed within the pedestrian crossing sign.

Two-Stage Crossing



An enhancement to the pedestrian refuge island is the two-stage crossing, which can be signalized or unsignalized. The two-stage crossing provides a "channel" in the median for the pedestrian to turn right and walk toward the vehicles they are about to cross. This allows drivers and pedestrians to make eye contact. The crosswalks on either side of the median should be separated by at least 10 feet.

Controlled Crossings

Pedestrian Signal

Pedestrian signals are usually provided at mid-block crossing locations with significant pedestrian activity. Vehicles navigate the intersection the same way they would a regular intersection, but rather than regulating vehicle traffic at all approaches, an all pedestrian phase is provided. Pedestrian signals provide the strictest right-of-way control at a pedestrian crossing. Warrants for placement are defined within the 2009 MUTCD.

HAWK Signal

The high-intensity activated crosswalk signal, also known as the HAWK signal, should be used at locations with high vehicle speeds and significant pedestrian activity. The HAWK signal combines a beacon flasher with a traffic control signal to generate a higher driver yield rate. The signal is pedestrian activated and has six steps:

1. A blank signal allows drivers to proceed as usual through the crosswalk.

2. When a pedestrian activates the signal, a flashing yellow light warns drivers that a pedestrian is present.

3. The flashing yellow light becomes a solid yellow light and warns drivers to yield (the same they would at a regular traffic signal)

4. The light turns to red and drivers are required to stop. The pedestrian is given a WALK signal to proceed through the crosswalk.

5. During the "flashing don't walk" phase for pedestrians, drivers see a "wig wag" red signal (alternating, flashing red signal) that operates as a stop sign. When the crosswalk is clear of pedestrians, drivers may proceed.

6. Following the "wig wag" red phase the signal returns to a blank phase and drivers may proceed as usual through the crosswalk.

The HAWK signal is included in the 2009 Federal MUTCD. This would be appropriate at trail and school crossing on 3rd Street and North Higley.

Signalized Intersection

Similar to the pedestrian signal, a signalized intersection provides pedestrians with a protected crossing phase. At a signalized intersection the pedestrian phase operates with the parallel vehicle movement. Pedestrians should be cautious of right-turning vehicles when crossing an intersection.

Two-Stage Crossing

An enhancement to the pedestrian refuge island is the two-stage crossing, which can be signalized or unsignalized. The two-stage crossing provides a "channel" in the median for the pedestrian to turn right and walk toward the vehicles they are about to cross. This allows drivers and pedestrians to make eye contact. The crosswalks on either side of the median should be separated by at least 10 feet. Pedestrian push buttons should be provided in the median at signalized intersections. This would be appropriate at trail crossings on 3rd Street.

Intersection Design

Pedestrian treatments at intersection locations are used to:

- Improve the visibility of pedestrians to motorists and vice-versa
- Communicate to motorists and pedestrians who has the right-of-way
- Accommodate vulnerable populations such as the disabled, children, and seniors
- Reduce conflicts between pedestrians and vehicles
- Reduce vehicular speeds at locations with potential pedestrian conflicts

Curb Ramps

Curb ramps, whether at intersection corners or mid-block locations, should always be designed to standards of the ADA Accessibility Guidelines.

Curb ramps provide safe access to the sidewalk for mobility impaired pedestrians, such as wheelchair users or those with canes. Curb ramps provide a gradual transition from the crosswalk or roadway to the sidewalk. Curb ramp cross slopes should not exceed two percent, while the running slope should be less than 8.33 percent.

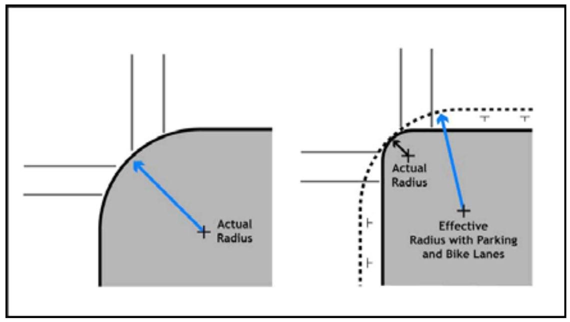
Appropriate curb ramp design depends on the geometrics of the intersection. Directional curb ramps are preferred over diagonal ramps, as they provide direct access to each crosswalk at an intersection corner.

Crossing Distance

Intersections should be designed to minimize pedestrian crossing distances. Shorter crossing distances ultimately reduce the exposure time of pedestrians within the roadway, and are easier to navigate. Consequently, compact intersections are more comfortable for pedestrians, and improve visibility between motorists and pedestrians.

Corner Radii

When designing the corner radii at an intersection, the smallest appropriate radius should be used at each corner, acknowledging that each location has a unique set of factors that determines what is appropriate. A large corner radius (generally 30 feet or greater) allows vehicles to turn at high speeds. If the radius is reduced, it forces approaching vehicles to slow down, thus reducing the frequency and severity of pedestrian collisions at the intersection. As shown in the graphic, on-street parking and bicycle lanes can impact the effective corner radius. In this case, curb extensions can be used to maintain the actual corner radius designed.



While corner radii may be as small as 1.5 feet, locations with any amount of turning traffic cannot accommodate a radius this tight. At locations with on-street parking, a 10 feet radius is recommended. Locations with no on-street parking should have a maximum corner radius of 20 feet. Locations with heavy truck traffic may also require a wider turning radius, such as 3rd Street or Spruce Street.

Table 5.14: Curb Radii

Roadway Type	*Recommended Curb Radius*
Residential	15 feet
Local/Collector	20-30 feet
Arterial	30 feet
Industrial	Up to 50 feet

Source: Fehr & Peers, 2013

Curb Extensions

Also known as bulb-outs, curb extensions increase driver awareness of pedestrians and help slow vehicle traffic. Curb extensions provide a larger space for pedestrians at an intersection corner and prevent cars from parking near the crosswalk. Curb extensions are beneficial near schools, transit centers, and other areas with pedestrian activity.

Curb extensions should be considered at intersections with three or more lanes, or at uncontrolled crossings with poor visibility. Generally, curb extensions should extend a minimum of six feet into the street adjacent to parallel parking, 12 feet adjacent to diagonal parking, and no further than the edge of the vehicle travel lane or bicycle lane in any situation. Designers should consider bicycle lanes when designing curb extensions and avoid situations that force cyclists to "take the lane" at intersections where it is not appropriate. Installing curb extensions may require removal of some on-street parking if it is not already restricted near the intersection. Landscaping within bulb-outs is an additional feature that can enhance the character and comfort of the pedestrian area. Bulb-outs may also create space for pedestrian amenities or bicycle parking.

Pedestrian-Friendly Signal Treatments

There are several innovative treatments that enhance the visibility and convenience of pedestrian crossings at signalized locations. These treatments can be applied in a variety of contexts depending on the pedestrian demand and vehicle movement within the streetscape.

Countdown Signals

Countdown pedestrian signals display the number of seconds remaining for the pedestrian crossing interval. Research has shown that countdown signals improve pedestrian compliance by reducing the tendency for pedestrians to "dash" across an intersection. This treatment is particularly helpful when crossing multi-lane arterials.

Leading Pedestrian Interval

The leading pedestrian interval is a signal timing tool that can be used at locations with heavy right-turn vehicle volumes and frequent pedestrian crossings. The leading pedestrian interval gives pedestrians a head start by displaying the walk signal approximately two to four seconds before vehicles are given a green light. Crossing with a head start allows pedestrians to be more visible to motorists approaching an intersection. Larger intersections may require a "No Right-Turn on Red" restriction if a leading pedestrian interval is used.

Pedestrian Push Buttons

When pedestrian push buttons are used, they should be well-marked, visible, and accessible to all users from a flat surface with a clear reach of no more than 24 inches, consistent with ADA standards. Pedestrian push buttons should be located within five feet of the crosswalk and not further than 10 feet from the curb.

Signals with pedestrian activations for more than 75 percent of the peak hour signal cycles should be timed to accommodate pedestrian crossings during every peak hour cycle.

At intersection locations with low side-street volumes that are not on a direct path to a generator, signals should be partially actuated, i.e. side street pedestrian signals should give a WALK sign on every cycle, but the main street signals should be activated by the pedestrian push button.

Pedestrian push buttons should be designed based on the following criteria:

- Intersection corners with more than one pedestrian push button should have the buttons mounted on separate poles. The closest push button to a crosswalk should call the pedestrian signal for that crosswalk.
- An arrow indicator should be used show which crosswalk the button will affect.
- The push button should be visible to a pedestrian facing the crosswalk, unless space constraints dictate another button placement.
- The push button must be accessible from the level landing (with a maximum cross slope of two percent) at the top of the curb ramp, or from the dropped landing of a parallel curb ramp with a clear side reach of no more than 24 inches. Buttons must be not higher than 48 inches above the level landing.

- Where audible pedestrian signals are installed, audible push buttons should also be used. Newer audible signals have the sound coming from the push button and automatically adjust to background noise. This combination addresses neighborhood concerns about the noise associated with audible signals.

- Tactile symbols should be installed for visually impaired persons.

- Crossing locations with pedestrian refuge islands or medians and crossing distances greater than 60 feet should include a pedestrian push button in the median.

Audible Signal

Pedestrian phases are typically difficult to recognize by the visually impaired. Audible signals can be used to communicate to pedestrians in a non-visual way, through a verbal message, bell, buzzer, or vibrating surface. The pedestrian is notified when the WALK signal is on.

Where audible signals are installed, it is recommended that they be placed on a separate pole close to the crosswalk line. If more than one signal is used at an intersection corner, the signals should be placed a minimum of 10 feet apart to allow people to decipher which direction is communicating.

TRAFFIC CALMING TOOLBOX

This section of the "toolbox" contains devices that address neighborhood traffic-related concerns such as speeding vehicles, high traffic volumes, cut-through traffic, or safety concerns. The devices vary in their ability to treat various traffic-related concerns. An important aspect of traffic calming is selecting the most appropriate devices given the type of specific traffic-related concern and street being treated.

Edgeline Striping

Edgelines are used to visually narrow the travel lanes for vehicles, thereby inducing drivers to lower their speeds. Edgelines have the added benefit of clearly delineating the roadway shoulder, which can provide a more comfortable space for pedestrians. Though past evidence on speed reductions due to edgeline striping has been inconclusive, striping in conjunction with other measures is likely to contribute to the overall traffic calming effect.

Advantages:

- Inexpensive to stripe
- Can be used to create bicycle lanes or delineate on-street parking

Disadvantages:

- Has not been shown to significantly reduce travel speeds
- Requires regular maintenance

Speed Feedback Sign

A speed feedback sign is a permanent device that measures each approaching vehicle's speed and displays it next to the legal speed limit in clear view of the driver. The display usually flashes when speeds exceed the posted limit. Other cities have experienced success using speed feedback signs at other locations and residents generally have a positive impression of their effectiveness.

Advantages:

- Real-time speed feedback
- Permanent installation

Disadvantages:

- May require power source
- Only effective for one direction of travel
- Long-term effectiveness uncertain
- Subject to vandalism

Center Island Narrowing

Center island narrowings are raised islands located along the centerline of a street that narrow the travel lanes at that location. Placed at the entrance to a neighborhood, and often combined with textured pavement or landscaping, they are called "gateways." Fitted with a gap to allow pedestrians to walk through at a cross-walk, they are often called "pedestrian refuges." They can also be landscaped to increase visual aesthetics.

In certain situations center islands have been observed to reduce traffic volumes by influencing drivers to shift to alternate routes. The corresponding increase in traffic on alternate routes can potentially create new problems, especially if they occur on neighborhood streets.

The magnitude of speed reduction is dependent on the spacing of center island narrowings between points that require drivers to slow. On average, center island narrowings achieve a seven percent reduction in speeds.

Fitted With Pedestrian Refuge

Advantages:

- Can increase pedestrian safety
- Aesthetic upgrades can have positive aesthetic value
- Reduces traffic volumes if alternative routes are available

Disadvantages:

- Effect on vehicle speeds is limited by the absence of any vertical or horizontal deflection
- Potential loss of on-street parking

Speed Lumps

Speed lumps are rounded raised areas placed across the road with two wheel cut-outs designed to allow large vehicles, such as emergency vehicles and buses, to pass with minimal slowing. The design limits passenger cars and mid-size SUVs from fully passing through the cut-outs and requires travel over the lump. They are slightly less than four inches high, typically parabolic in shape, and have a design speed of 15 to 20 mph. They are usually constructed with a taper on each side to allow unimpeded drainage between the lump and curb. When placed on a street with rolled curbs or no curbs, bollards are placed at the ends of the speed lump to discourage vehicles from veering outside of the travel lane to avoid the device.

Advantages:

- Effective in reducing speeds
- Maintains rapid emergency response times
- Relatively easy for bicyclists to cross

Disadvantages:

- Problematic for snow removal
- Aesthetics
- Signs may be unwelcome by adjacent residents
- Increased noise for nearby residents

Raised Crosswalk

Raised crosswalks are speed tables striped with crosswalk markings and signage to channelize pedestrian crossings, providing pedestrians with a level street crossing. Also, by raising the level of the crossing, pedestrians are more visible to approaching motorists.

The magnitude of speed reduction is dependent on the spacing of raised crosswalks between points that require drivers to slow. On average, raised crosswalks achieve an 18 percent reduction in speeds.

Advantages:

- Improve safety for both vehicles and pedestrians
- Aesthetic upgrades can have positive aesthetic value
- Effective in reducing speeds, though not to the extent of speed humps

Disadvantages:

- Textured materials, if used, can be expensive
- Impact to drainage needs to be considered
- Textured pavement can increase noise to adjacent residents

Textured Pavement

Textured pavement includes the use of concrete or stamped asphalt to create an uneven surface for vehicles to traverse. Textured pavement may have limited effectiveness as a standalone device and should be used to supplement other devices such as raised crosswalks or center median islands. Little data has been collected to predict the reduction in speed, traffic volumes, or collisions, and use of this device may not result in significant decreases.

Harsh winter conditions, road salt, snow tires, and snow removal methods deteriorate the colored surface treatment quickly. Therefore, any in-street application of texture pavement should be constructed with concrete to ensure durability.


Textured And Colored Concrete With Center Island

Advantages:

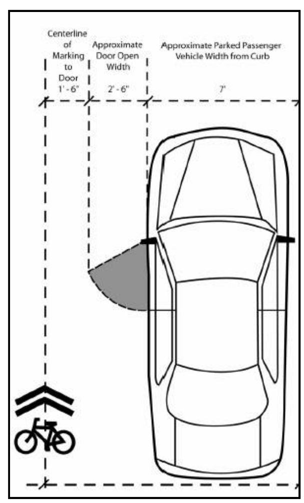
- Can reduce vehicle speeds
- Aesthetic upgrades can have positive value
- Placed at an intersection, it can slow two streets at once

Disadvantages:

- Expensive, varying by materials used
- Can be uncomfortable for bicyclists or handicapped
- Textured pavement can increase noise to adjacent properties

Shared Lane Marking (sharrow)

Shared lane markings, or "sharrows", are pavement markings used in travel lanes shared by vehicles and bicyclists. Sharrows guide bicyclists to position themselves laterally within lanes that are too narrow for a vehicle and bicyclist to travel side-by-side. When on-street parallel parking is present, sharrows help bicyclists to position far enough away from parked vehicles to avoid the door zone. Additionally, sharrows alert road users to the presence of bicyclists, encourage safe passing, and reduce wrong-way bicycling.



APPENDIX A:
TRAFFIC COUNTS

FEHR & PEERS TRANSPORTATION CONSULTANTS

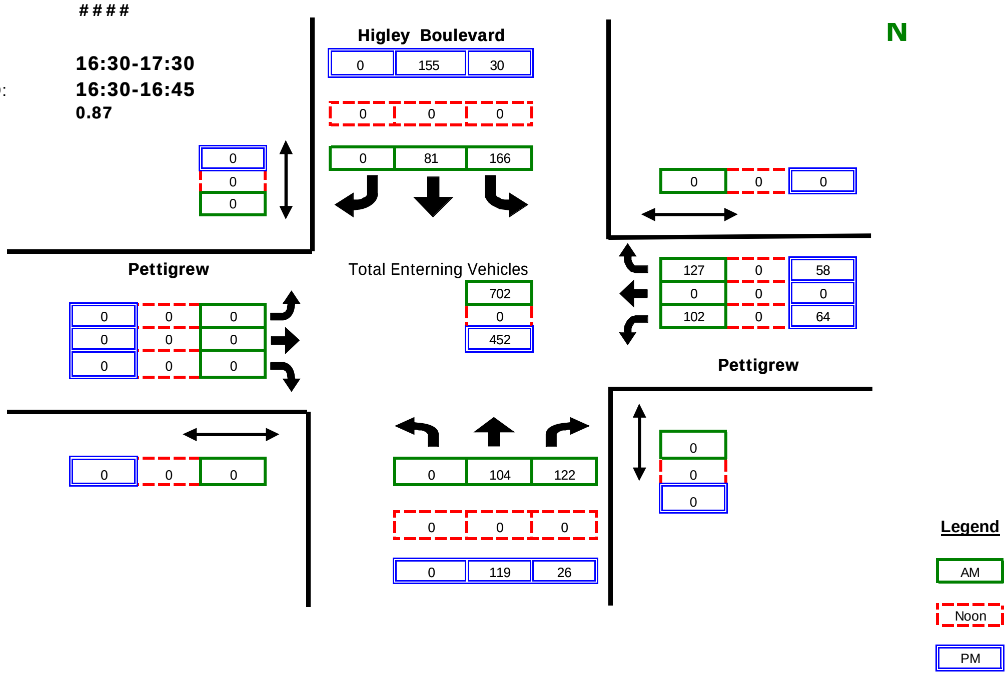
Intersection Turning Movement Summary

Intersection:	**Higley Boulevard/Pettigrew**	**Date:**	**11-28-12, Wed**
	North/South: Higley Boulevard	**Day of Week Adjustment:**	**100.0%**
	East/West: Pettigrew	**Month of Year Adjustment:**	**100.0%**
Jurisdiction:	**Rawlins, WY**	**Adjustment Station #:**	
Project Title:	**Rawlins TMP**	**Growth Rate:**	**0.0%**
Project No:	**UT12-955**	**Number of Years:**	**0**
Weather:			

AM PEAK HOUR PERIOD: **7:15-8:15**
AM PEAK 15 MINUTE PERIOD: **7:45-8:00**
AM PHF: **0.67**

NOON PEAK HOUR PERIOD: **12:00-13:00**
NOON PEAK 15 MINUTE PERIOD:
NOON PHF: **####**

PM PEAK HOUR PERIOD: **16:30-17:30**
PM PEAK 15 MINUTE PERIOD: **16:30-16:45**
PM PHF: **0.87**



RAW COUNT SUMMARIES	Higley Boulevard Northbound				Higley Boulevard Southbound				Pettigrew Eastbound				Pettigrew Westbound				
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
AM PERIOD COUNTS																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**TOTAL**
7:00-7:15	0	17	7	0	10	15	0	0	0	0	0	0	2	0	5	0	56
7:15-7:30	0	17	23	0	33	19	0	0	0	0	0	0	7	0	9	0	108
7:30-7:45	0	30	45	0	61	22	0	0	0	0	0	0	27	0	40	0	225
7:45-8:00	0	32	38	0	65	22	0	0	0	0	0	0	44	0	60	0	261
8:00-8:15	0	25	16	0	7	18	0	0	0	0	0	0	24	0	18	0	108
8:15-8:30	0	18	7	0	3	17	0	0	0	0	0	0	7	0	1	0	53
8:30-8:45	0	12	6	0	7	22	0	0	0	0	0	0	4	0	4	0	55
8:45-9:00	0	24	2	0	0	12	0	0	0	0	0	0	3	0	3	0	44
NOON PERIOD COUNTS																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**TOTAL**
12:00-12:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15-12:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30-12:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45-13:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:00-13:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:15-13:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:30-13:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:45-14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM PERIOD COUNTS																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**TOTAL**
16:00-16:15	0	21	5	0	6	30	0	0	0	0	0	0	4	0	6	0	72
16:15-16:30	0	31	5	0	9	31	0	0	0	0	0	0	15	0	5	0	96
16:30-16:45	0	29	5	0	5	37	0	0	0	0	0	0	23	0	31	0	130
16:45-17:00	0	31	2	0	5	41	0	0	0	0	0	0	16	0	11	0	106
17:00-17:15	0	25	11	0	15	36	0	0	0	0	0	0	10	0	10	0	107
17:15-17:30	0	34	8	0	5	41	0	0	0	0	0	0	15	0	6	0	109
17:30-17:45	0	16	6	0	7	24	0	0	0	0	0	0	5	0	7	0	65
17:45-18:00	0	20	6	0	6	16	0	0	0	0	0	0	6	0	3	0	57

FEHR & PEERS
TRANSPORTATION CONSULTANTS

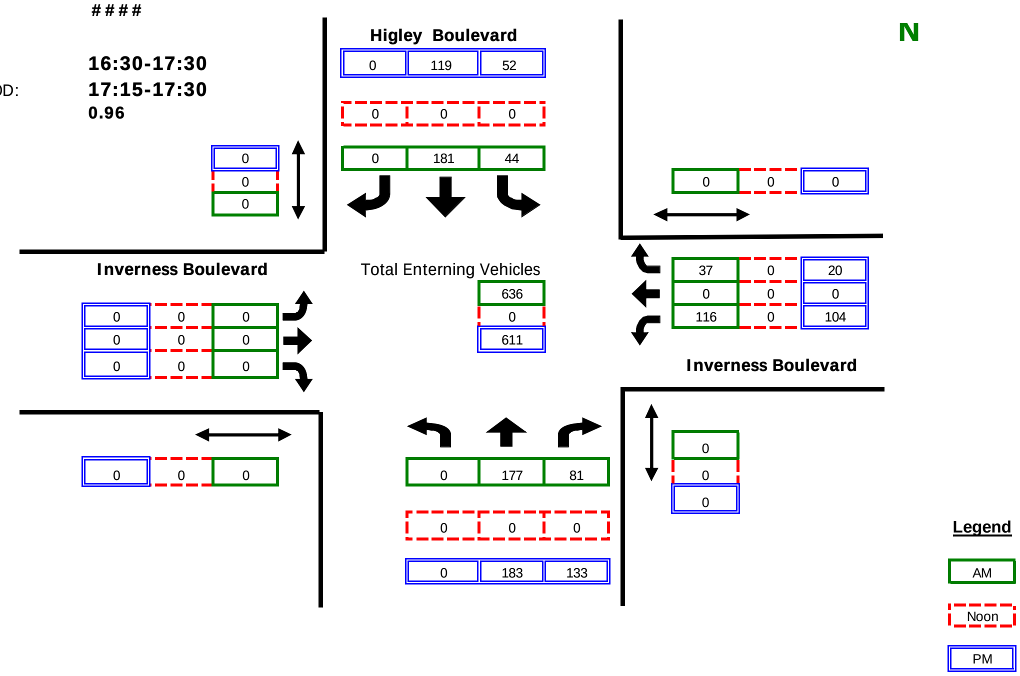
Intersection Turning Movement Summary

Intersection:	**Higley Boulevard / Inverness Boulevard**	**Date:**	**11-20-12, Tue**
	North/South: Higley Boulevard	**Day of Week Adjustment:**	**100.0%**
	East/West: Inverness Boulevard	**Month of Year Adjustment:**	**100.0%**
Jurisdiction:	**Rawlins, WY**	**Adjustment Station #:**	
Project Title:	**Rawlins TMP**	**Growth Rate:**	**0.0%**
Project No:	**UT12-955**	**Number of Years:**	**0**
Weather:			

AM PEAK HOUR PERIOD: **7:15-8:15**
AM PEAK 15 MINUTE PERIOD: **7:45-8:00**
AM PHF: **0.75**

NOON PEAK HOUR PERIOD: **12:00-13:00**
NOON PEAK 15 MINUTE PERIOD:
NOON PHF: **####**

PM PEAK HOUR PERIOD: **16:30-17:30**
PM PEAK 15 MINUTE PERIOD: **17:15-17:30**
PM PHF: **0.96**



RAW COUNT SUMMARIES	Higley Boulevard Northbound				Higley Boulevard Southbound				Inverness Boulevard Eastbound				Inverness Boulevard Westbound				
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
AM PERIOD COUNTS																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**TOTAL**
7:00-7:15	0	24	7	0	1	18	0	0	0	0	0	0	9	0	2	0	61
7:15-7:30	0	42	9	0	4	18	0	0	0	0	0	0	18	0	3	0	94
7:30-7:45	0	60	11	0	8	59	0	0	0	0	0	0	35	0	13	0	186
7:45-8:00	0	46	32	0	16	69	0	0	0	0	0	0	33	0	15	0	211
8:00-8:15	0	29	29	0	16	35	0	0	0	0	0	0	30	0	6	0	145
8:15-8:30	0	27	14	0	11	19	0	0	0	0	0	0	19	0	3	0	93
8:30-8:45	0	18	14	0	7	28	0	0	0	0	0	0	21	0	4	0	92
8:45-9:00	0	19	21	0	4	20	0	0	0	0	0	0	14	0	6	1	84
NOON PERIOD COUNTS																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**TOTAL**
12:00-12:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15-12:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30-12:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45-13:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:00-13:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:15-13:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:30-13:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:45-14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM PERIOD COUNTS																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**TOTAL**
16:00-16:15	0	38	32	0	6	22	0	0	0	0	0	0	21	0	9	0	128
16:15-16:30	0	43	29	1	5	29	0	0	0	0	0	0	22	0	12	0	140
16:30-16:45	0	51	29	0	6	36	0	0	0	0	0	0	26	0	3	0	151
16:45-17:00	0	40	32	0	19	27	0	0	0	0	0	0	25	0	7	0	150
17:00-17:15	0	38	42	0	16	24	0	0	0	0	0	0	26	0	5	0	151
17:15-17:30	0	54	30	0	11	32	0	0	0	0	0	0	27	0	5	0	159
17:30-17:45	0	42	37	0	3	29	0	0	0	0	0	0	17	0	6	0	134
17:45-18:00	0	44	47	0	7	31	0	0	0	0	0	0	24	0	5	0	158

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TRANSPORTATION CONSULTANTS

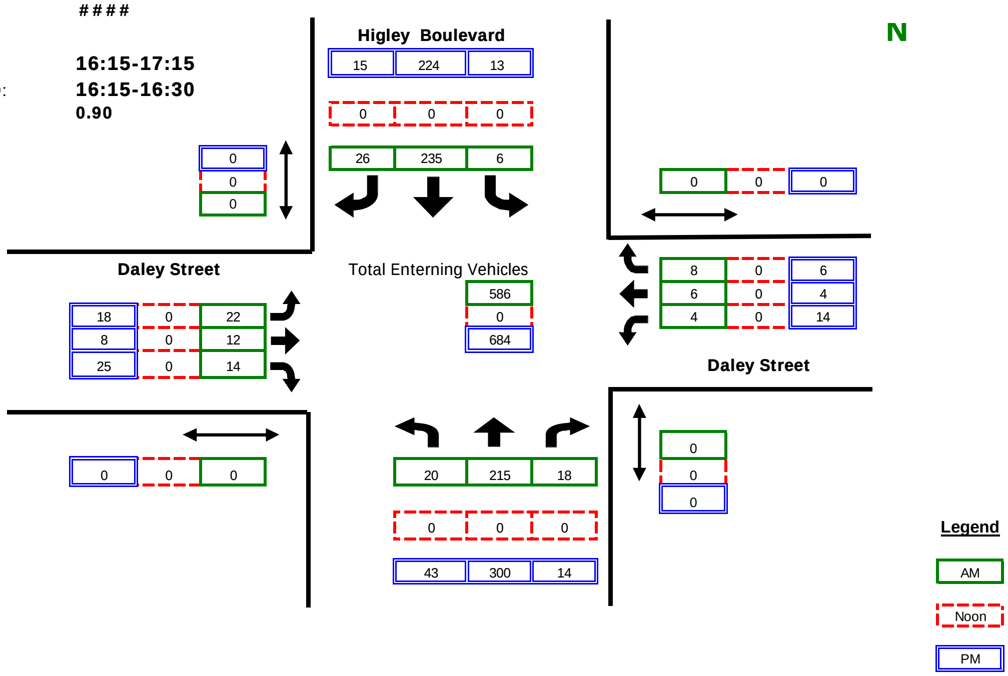
Intersection Turning Movement Summary

Intersection:	**Higley Boulevard/Daley Street**		**Date:**	**11-27-12, Tue**
	North/South:	**Higley Boulevard**	**Day of Week Adjustment:**	**100.0%**
	East/West:	**Daley Street**	**Month of Year Adjustment:**	**100.0%**
Jurisdiction:	**Rawlins, WY**		**Adjustment Station #:**	
Project Title:	**Rawlins TMP**		**Growth Rate:**	**0.0%**
Project No:	**UT12-955**		**Number of Years:**	**0**
Weather:				

AM PEAK HOUR PERIOD: **7:15-8:15**
AM PEAK 15 MINUTE PERIOD: **7:30-7:45**
AM PHF: **0.80**

NOON PEAK HOUR PERIOD: **12:00-13:00**
NOON PEAK 15 MINUTE PERIOD:
NOON PHF: **####**

PM PEAK HOUR PERIOD: **16:15-17:15**
PM PEAK 15 MINUTE PERIOD: **16:15-16:30**
PM PHF: **0.90**



RAW COUNT SUMMARIES	Higley Boulevard Northbound				Higley Boulevard Southbound				Daley Street Eastbound				Daley Street Westbound				
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
AM PERIOD COUNTS																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**TOTAL**
7:00-7:15	1	24	3	0	3	37	2	0	2	0	6	0	3	1	1	0	83
7:15-7:30	4	53	2	0	1	46	5	0	2	5	6	0	0	1	3	0	128
7:30-7:45	13	63	8	0	5	61	10	0	9	4	3	0	2	4	2	0	184
7:45-8:00	0	52	6	0	0	62	2	0	6	2	3	0	1	0	2	0	136
8:00-8:15	3	47	2	0	0	66	9	0	5	1	2	0	1	1	1	0	138
8:15-8:30	4	19	5	0	2	39	4	0	3	0	3	0	3	2	1	0	85
8:30-8:45	7	47	0	0	3	29	2	0	3	1	3	0	3	2	0	0	100
8:45-9:00	8	23	3	0	1	32	0	0	2	1	3	0	4	0	2	0	79
NOON PERIOD COUNTS																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**TOTAL**
12:00-12:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15-12:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30-12:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45-13:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:00-13:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:15-13:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:30-13:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:45-14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM PERIOD COUNTS																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**TOTAL**
16:00-16:15	10	61	3	0	1	63	6	0	4	0	8	0	4	2	0	1	162
16:15-16:30	11	80	4	0	1	63	6	0	6	2	9	0	3	2	2	0	189
16:30-16:45	9	85	1	0	1	37	4	0	5	3	8	0	2	0	1	0	156
16:45-17:00	9	60	6	0	6	62	2	0	5	3	1	0	5	2	1	0	162
17:00-17:15	14	75	3	0	5	62	3	0	2	0	7	0	4	0	2	0	177
17:15-17:30	7	68	4	0	2	55	0	0	4	1	5	0	4	5	2	0	157
17:30-17:45	3	73	0	0	1	48	1	0	6	1	7	0	6	1	2	2	149
17:45-18:00	3	61	4	0	4	52	2	0	2	0	2	0	3	0	0	1	133

FEHR & PEERS
TRANSPORTATION CONSULTANTS

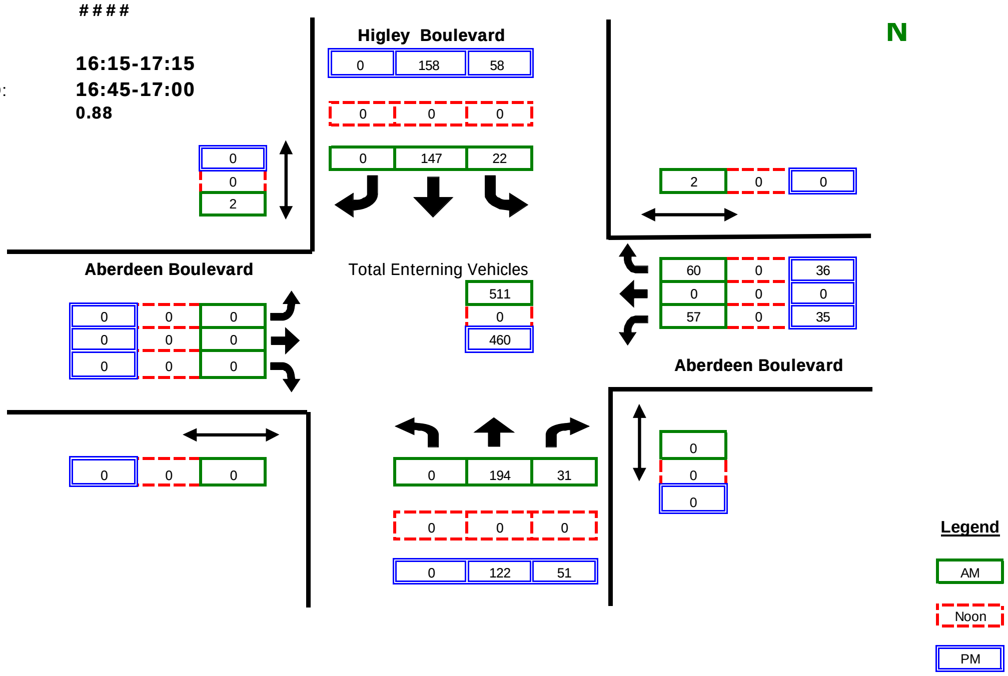
Intersection Turning Movement Summary

Intersection:	**Higley Boulevard/Aberdeen Boulevard**		**Date:**	**11-14-12, Wed**
	North/South:	**Higley Boulevard**	**Day of Week Adjustment:**	**100.0%**
	East/West:	**Aberdeen Boulevard**	**Month of Year Adjustment:**	**100.0%**
Jurisdiction:	**Rawlins, WY**		**Adjustment Station #:**	
Project Title:	**Rawlins TMP**		**Growth Rate:**	**0.0%**
Project No:	**UT12-955**		**Number of Years:**	**0**
Weather:				

AM PEAK HOUR PERIOD: **7:15-8:15**
AM PEAK 15 MINUTE PERIOD: **7:45-8:00**
AM PHF: **0.76**

NOON PEAK HOUR PERIOD: **12:00-13:00**
NOON PEAK 15 MINUTE PERIOD:
NOON PHF: **####**

PM PEAK HOUR PERIOD: **16:15-17:15**
PM PEAK 15 MINUTE PERIOD: **16:45-17:00**
PM PHF: **0.88**



RAW COUNT SUMMARIES	Higley Boulevard Northbound				Higley Boulevard Southbound				Aberdeen Boulevard Eastbound				Aberdeen Boulevard Westbound				
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
AM PERIOD COUNTS																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**TOTAL**
7:00-7:15	0	21	1	0	8	16	0	0	0	0	0	0	8	0	11	0	65
7:15-7:30	0	40	6	0	8	18	0	1	0	0	0	0	9	0	10	1	91
7:30-7:45	0	70	8	0	1	45	0	0	0	0	0	0	21	0	13	0	158
7:45-8:00	0	58	8	0	5	56	0	0	0	0	0	0	17	0	24	1	168
8:00-8:15	0	26	9	0	8	28	0	1	0	0	0	0	10	0	13	0	94
8:15-8:30	0	22	3	0	4	22	0	0	0	0	0	0	4	0	4	0	59
8:30-8:45	0	16	6	0	4	15	0	0	0	0	0	0	6	0	4	0	51
8:45-9:00	0	21	5	0	1	14	0	0	0	0	0	0	3	0	7	0	51
NOON PERIOD COUNTS																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**TOTAL**
12:00-12:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15-12:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30-12:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45-13:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:00-13:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:15-13:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:30-13:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:45-14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM PERIOD COUNTS																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**TOTAL**
16:00-16:15	0	25	11	0	17	27	0	0	0	0	0	0	9	0	6	0	95
16:15-16:30	0	30	8	0	12	32	0	0	0	0	0	0	9	0	9	0	100
16:30-16:45	0	27	13	0	16	47	0	0	0	0	0	0	11	0	9	0	123
16:45-17:00	0	31	20	0	11	55	0	0	0	0	0	0	6	0	8	0	131
17:00-17:15	0	34	10	0	19	24	0	0	0	0	0	0	9	0	10	0	106
17:15-17:30	0	26	12	0	7	34	0	0	0	0	0	0	7	0	8	0	94
17:30-17:45	0	24	3	0	6	19	0	0	0	0	0	0	8	0	5	0	65
17:45-18:00	0	19	7	0	8	34	0	0	0	0	0	0	6	0	4	0	78

FEHR & PEERS
TRANSPORTATION CONSULTANTS

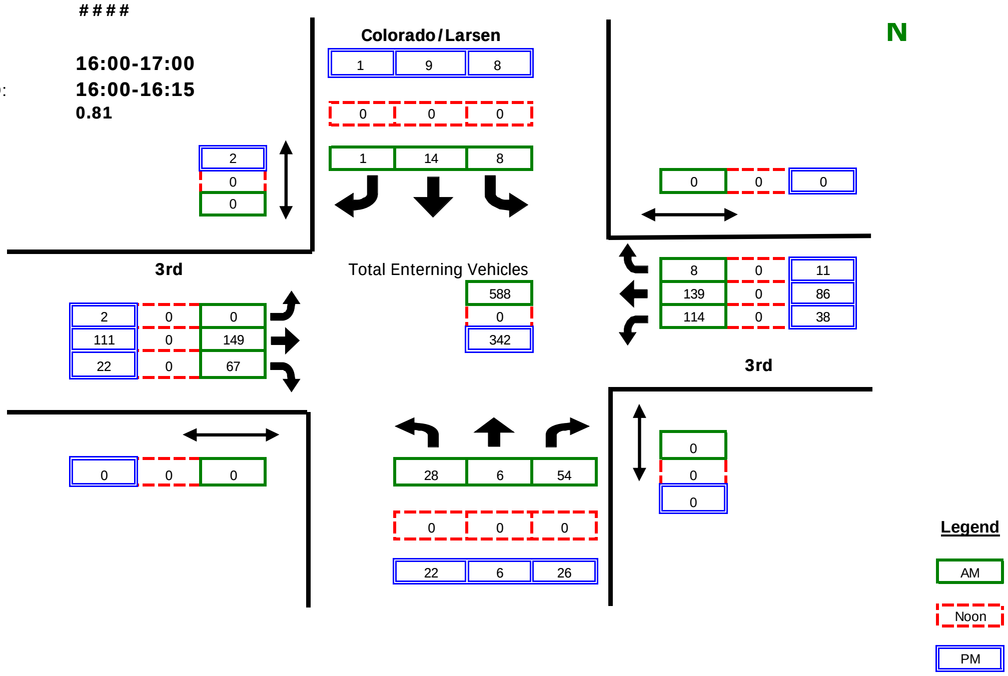
Intersection Turning Movement Summary

Intersection:	**Colorado/Larsen/3rd**	**Date:**	**11-29-12, Thu**
	North/South: Colorado/Larsen	**Day of Week Adjustment:**	**100.0%**
	East/West: 3rd	**Month of Year Adjustment:**	**100.0%**
Jurisdiction:	**Rawlins, WY**	**Adjustment Station #:**	
Project Title:	**Rawlins TMP**	**Growth Rate:**	**0.0%**
Project No:	**UT12-955**	**Number of Years:**	**0**
Weather:			

AM PEAK HOUR PERIOD: **7:15-8:15**
AM PEAK 15 MINUTE PERIOD: **7:45-8:00**
AM PHF: **0.66**

NOON PEAK HOUR PERIOD: **12:00-13:00**
NOON PEAK 15 MINUTE PERIOD:
NOON PHF: **####**

PM PEAK HOUR PERIOD: **16:00-17:00**
PM PEAK 15 MINUTE PERIOD: **16:00-16:15**
PM PHF: **0.81**



RAW COUNT SUMMARIES	**Colorado/Larsen** Northbound Left	Thru	Right	Peds	**Colorado/Larsen** Southbound Left	Thru	Right	Peds	**3rd** Eastbound Left	Thru	Right	Peds	**3rd** Westbound Left	Thru	Right	Peds	
AM PERIOD COUNTS																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**TOTAL**
7:00-7:15	1	2	5	0	5	1	1	0	0	18	3	0	7	7	2	0	52
7:15-7:30	1	1	10	0	3	0	0	0	0	42	7	0	9	12	1	0	86
7:30-7:45	5	1	18	0	2	2	0	0	0	47	23	0	27	38	1	0	164
7:45-8:00	11	2	14	0	2	9	1	0	0	47	23	0	56	52	5	0	222
8:00-8:15	11	2	12	0	1	3	0	0	0	13	14	0	22	37	1	0	116
8:15-8:30	3	1	5	0	3	0	1	0	0	11	0	0	4	16	4	0	48
8:30-8:45	0	1	2	0	1	2	0	0	0	14	1	0	4	12	0	0	37
8:45-9:00	1	2	1	0	4	4	0	0	1	16	4	0	3	22	1	0	59
NOON PERIOD COUNTS																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**TOTAL**
12:00-12:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15-12:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30-12:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45-13:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:00-13:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:15-13:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:30-13:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:45-14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM PERIOD COUNTS																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**TOTAL**
16:00-16:15	16	2	15	0	3	4	0	0	1	25	5	0	10	23	2	0	106
16:15-16:30	0	3	2	0	0	1	0	0	0	27	8	0	9	19	5	0	74
16:30-16:45	2	0	1	0	1	2	1	2	1	29	5	0	3	26	2	0	73
16:45-17:00	4	1	8	0	4	2	0	0	0	30	4	0	16	18	2	0	89
17:00-17:15	3	4	5	0	1	0	0	0	3	36	4	0	8	21	6	0	91
17:15-17:30	2	5	11	0	5	2	1	0	0	24	2	0	9	22	1	0	84
17:30-17:45	6	1	9	0	2	1	0	0	1	23	7	0	7	13	2	0	72
17:45-18:00	4	1	3	0	0	1	0	0	0	14	9	0	8	23	2	2	65

FEHR & PEERS TRANSPORTATION CONSULTANTS

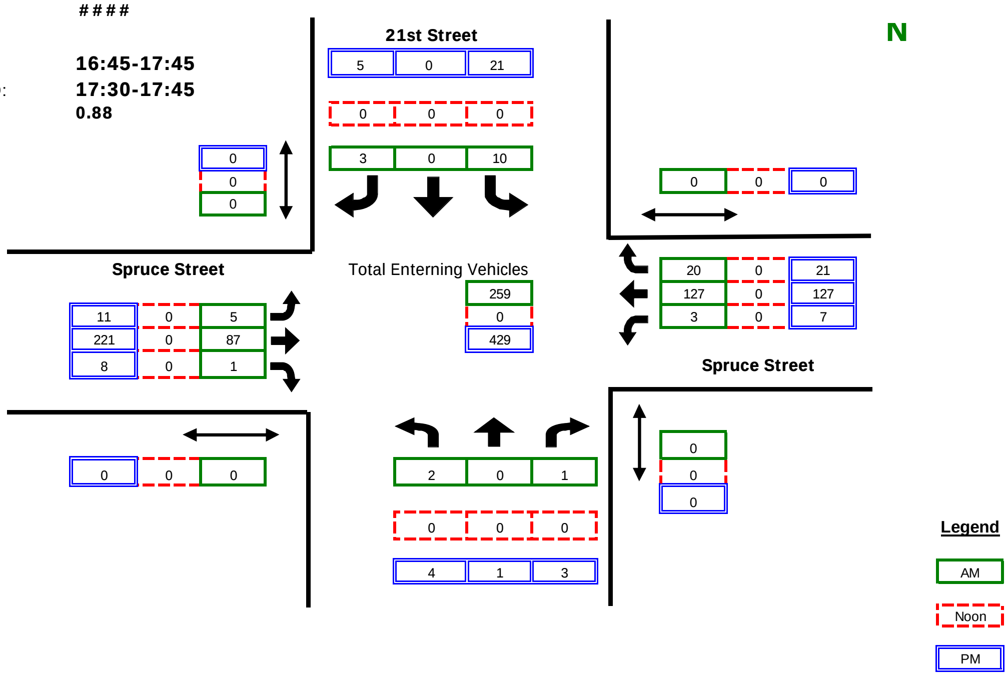
Intersection Turning Movement Summary

Intersection:	**21st Street / Spruce Street**	**Date:**	**11-15-12, Thu**
	North / South: 21st Street	**Day of Week Adjustment:**	**100.0%**
	East / West: Spruce Street	**Month of Year Adjustment:**	**100.0%**
Jurisdiction:	**Rawlins, WY**	**Adjustment Station #:**	
Project Title:	**Rawlins TMP**	**Growth Rate:**	**0.0%**
Project No:	**UT12-955**	**Number of Years:**	**0**
Weather:			

AM PEAK HOUR PERIOD: **8:00-9:00**
AM PEAK 15 MINUTE PERIOD: **8:45-9:00**
AM PHF: **0.83**

NOON PEAK HOUR PERIOD: **12:00-13:00**
NOON PEAK 15 MINUTE PERIOD:
NOON PHF: **####**

PM PEAK HOUR PERIOD: **16:45-17:45**
PM PEAK 15 MINUTE PERIOD: **17:30-17:45**
PM PHF: **0.88**



RAW COUNT SUMMARIES	21st Street Northbound				21st Street Southbound				Spruce Street Eastbound				Spruce Street Westbound				
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
AM PERIOD COUNTS																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**TOTAL**
7:00-7:15	1	0	0	0	0	0	0	0	0	18	0	0	1	25	9	0	54
7:15-7:30	1	0	1	0	4	0	1	0	1	21	2	0	3	25	5	0	64
7:30-7:45	1	0	0	0	3	0	0	0	0	15	2	0	0	29	6	0	56
7:45-8:00	1	0	0	0	1	0	0	0	1	19	0	0	0	38	8	0	68
8:00-8:15	1	0	0	0	5	0	1	0	1	28	1	0	0	28	6	0	71
8:15-8:30	1	0	0	0	1	0	1	0	1	17	0	0	1	27	6	0	55
8:30-8:45	0	0	0	0	2	0	1	0	1	15	0	0	1	33	2	0	55
8:45-9:00	0	0	1	0	2	0	0	0	2	27	0	0	1	39	6	0	78
NOON PERIOD COUNTS																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**TOTAL**
12:00-12:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15-12:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30-12:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45-13:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:00-13:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:15-13:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:30-13:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13:45-14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM PERIOD COUNTS																	
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**TOTAL**
16:00-16:15	0	0	0	0	3	0	0	1	0	68	0	0	1	34	3	0	109
16:15-16:30	2	0	1	0	3	0	0	0	1	41	3	0	0	35	2	0	88
16:30-16:45	0	0	0	0	10	0	1	2	1	60	0	0	1	32	4	0	109
16:45-17:00	0	1	1	0	3	0	2	0	2	62	1	0	0	36	7	0	115
17:00-17:15	0	0	0	0	9	0	0	0	0	48	2	0	1	25	3	0	88
17:15-17:30	2	0	2	0	1	0	1	0	4	45	3	0	3	36	7	0	104
17:30-17:45	2	0	0	0	8	0	2	0	5	66	2	0	3	30	4	0	122
17:45-18:00	0	0	1	0	2	0	0	0	2	43	2	0	0	30	9	0	89

APPENDIX B:
DETAILED LOS REPORTS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	8	9	1	22	6	26	2	111	22	38	86	11
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	10	11	1	27	7	32	2	137	27	47	106	14
Pedestrians								1				
Lane Width (ft)								12.0				
Walking Speed (ft/s)								4.0				
Percent Blockage								0				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	309	369	54	310	369	82	120			164		
vC1, stage 1 conf vol							0			0		
vC2, stage 2 conf vol							0			0		
vCu, unblocked vol	309	369	54	310	369	82	120			164		
tC, single (s)	7.5	6.5	6.9	7.9	6.9	7.3	4.5			4.5		
tC, 2 stage (s)							3.5			3.5		
tF (s)	3.5	4.0	3.3	3.7	4.2	3.5	2.4			2.4		
p0 queue free %	98	98	100	95	99	96	100			95		
cM capacity (veh/h)	568	530	1001	545	495	909	967			949		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3	SB 4
Volume Total	22	67	2	91	73	47	53	53	14
Volume Left	10	27	2	0	0	47	0	0	0
Volume Right	1	32	0	0	27	0	0	0	14
cSH	561	666	967	1700	1700	949	1700	1700	1700
Volume to Capacity	0.04	0.10	0.00	0.05	0.04	0.05	0.03	0.03	0.01
Queue Length 95th (ft)	3	8	0	0	0	4	0	0	0
Control Delay (s)	11.7	11.0	8.7	0.0	0.0	9.0	0.0	0.0	0.0
Lane LOS	B	B	A			A			
Approach Delay (s)	11.7	11.0	0.1			2.5			
Approach LOS	B	B							

Intersection Summary				
Average Delay	3.4			
Intersection Capacity Utilization	21.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	35	36	122	51	58	158
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	40	41	139	58	66	180
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	450	139			197	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	450	139			197	
tC, single (s)	6.4	6.2			4.3	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.4	
p0 queue free %	93	96			95	
cM capacity (veh/h)	538	910			1286	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	81	139	58	66	180
Volume Left	40	0	0	66	0
Volume Right	41	0	58	0	0
cSH	678	1700	1700	1286	1700
Volume to Capacity	0.12	0.08	0.03	0.05	0.11
Queue Length 95th (ft)	10	0	0	4	0
Control Delay (s)	11.0	0.0	0.0	8.0	0.0
Lane LOS	B			A	
Approach Delay (s)	11.0	0.0		2.1	
Approach LOS	B				

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	23.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	30	155	119	26	64	58
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	34	178	137	30	74	67
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	167				384	137
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	167				384	137
tC, single (s)	4.3				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.4				3.5	3.3
p0 queue free %	97				88	93
cM capacity (veh/h)	1320				603	912

Direction, Lane #	SE 1	SE 2	NW 1	NW 2	SW 1	SW 2
Volume Total	34	178	137	30	74	67
Volume Left	34	0	0	0	74	0
Volume Right	0	0	0	30	0	67
cSH	1320	1700	1700	1700	603	912
Volume to Capacity	0.03	0.10	0.08	0.02	0.12	0.07
Queue Length 95th (ft)	2	0	0	0	10	6
Control Delay (s)	7.8	0.0	0.0	0.0	11.8	9.3
Lane LOS	A				B	A
Approach Delay (s)	1.3		0.0		10.6	
Approach LOS					B	

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	18.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	104	20	183	133	52	119
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	108	21	191	139	54	124
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	492	260			329	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	492	260			329	
tC, single (s)	6.4	6.2			4.3	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.4	
p0 queue free %	79	97			95	
cM capacity (veh/h)	511	779			1146	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	129	329	54	124
Volume Left	108	0	54	0
Volume Right	21	139	0	0
cSH	541	1700	1146	1700
Volume to Capacity	0.24	0.19	0.05	0.07
Queue Length 95th (ft)	23	0	4	0
Control Delay (s)	13.7	0.0	8.3	0.0
Lane LOS	B		A	
Approach Delay (s)	13.7	0.0	2.5	
Approach LOS	B			

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	38.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	11	221	8	7	127	20	4	1	3	21	0	5
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	12	251	9	8	144	23	5	1	3	24	0	6
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	167			260			374	464	130	326	457	84
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	167			260			374	464	130	326	457	84
tC, single (s)	4.6			4.6			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.4			2.4			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			99	100	100	96	100	99
cM capacity (veh/h)	1268			1162			547	486	895	592	490	959

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	12	167	93	8	96	71	9	30
Volume Left	12	0	0	8	0	0	5	24
Volume Right	0	0	9	0	0	23	3	6
cSH	1268	1700	1700	1162	1700	1700	629	639
Volume to Capacity	0.01	0.10	0.05	0.01	0.06	0.04	0.01	0.05
Queue Length 95th (ft)	1	0	0	1	0	0	1	4
Control Delay (s)	7.9	0.0	0.0	8.1	0.0	0.0	10.8	10.9
Lane LOS	A			A			B	B
Approach Delay (s)	0.4			0.4			10.8	10.9
Approach LOS							B	B

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	19.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	18	8	25	14	4	6	43	300	14	13	224	15
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	20	9	28	16	4	7	48	333	16	14	249	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	724	731	257	747	731	341	266			349		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	724	731	257	747	731	341	266			349		
tC, single (s)	7.3	6.7	6.4	7.3	6.7	6.4	4.3			4.3		
tC, 2 stage (s)												
tF (s)	3.7	4.2	3.5	3.7	4.2	3.5	2.4			2.4		
p0 queue free %	93	97	96	94	99	99	96			99		
cM capacity (veh/h)	302	313	744	280	313	666	1211			1126		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	57	27	48	349	14	266
Volume Left	20	16	48	0	14	0
Volume Right	28	7	0	16	0	17
cSH	430	335	1211	1700	1126	1700
Volume to Capacity	0.13	0.08	0.04	0.21	0.01	0.16
Queue Length 95th (ft)	11	6	3	0	1	0
Control Delay (s)	14.6	16.7	8.1	0.0	8.2	0.0
Lane LOS	B	C	A		A	
Approach Delay (s)	14.6	16.7	1.0		0.4	
Approach LOS	B	C				

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	33.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	8	14	1	28	6	54	0	149	67	114	139	8
Peak Hour Factor	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Hourly flow rate (vph)	12	21	2	42	9	82	0	226	102	173	211	12
Pedestrians								1				
Lane Width (ft)								12.0				
Walking Speed (ft/s)								4.0				
Percent Blockage								0				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	755	883	106	740	845	164	223			327		
vC1, stage 1 conf vol							0			0		
vC2, stage 2 conf vol							0			0		
vCu, unblocked vol	755	883	106	740	845	164	223			327		
tC, single (s)	7.5	6.5	6.9	7.8	6.8	7.2	4.4			4.4		
tC, 2 stage (s)							3.4			3.4		
tF (s)	3.5	4.0	3.3	3.7	4.2	3.5	2.4			2.4		
p0 queue free %	95	91	100	81	96	90	100			81		
cM capacity (veh/h)	221	229	927	221	220	807	938			900		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3	SB 4
Volume Total	35	133	0	151	177	173	105	105	12
Volume Left	12	42	0	0	0	173	0	0	0
Volume Right	2	82	0	0	102	0	0	0	12
cSH	233	398	1700	1700	1700	900	1700	1700	1700
Volume to Capacity	0.15	0.34	0.00	0.09	0.10	0.19	0.06	0.06	0.01
Queue Length 95th (ft)	13	36	0	0	0	18	0	0	0
Control Delay (s)	23.1	18.5	0.0	0.0	0.0	9.9	0.0	0.0	0.0
Lane LOS	C	C				A			
Approach Delay (s)	23.1	18.5	0.0			4.3			
Approach LOS	C	C							

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	29.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	57	60	194	31	22	147
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Hourly flow rate (vph)	75	79	255	41	29	193
Pedestrians	2					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	509	257			298	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	509	257			298	
tC, single (s)	6.4	6.2			4.3	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.4	
p0 queue free %	85	90			98	
cM capacity (veh/h)	510	780			1165	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	154	255	41	29	193
Volume Left	75	0	0	29	0
Volume Right	79	0	41	0	0
cSH	620	1700	1700	1165	1700
Volume to Capacity	0.25	0.15	0.02	0.02	0.11
Queue Length 95th (ft)	24	0	0	2	0
Control Delay (s)	12.7	0.0	0.0	8.2	0.0
Lane LOS	B			A	
Approach Delay (s)	12.7	0.0		1.1	
Approach LOS	B				

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	30.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	166	81	104	122	102	127
Peak Hour Factor	0.67	0.67	0.67	0.67	0.67	0.67
Hourly flow rate (vph)	248	121	155	182	152	190
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	337				772	155
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	337				772	155
tC, single (s)	4.3				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.4				3.5	3.3
p0 queue free %	78				47	79
cM capacity (veh/h)	1128				287	891
Direction, Lane #	**SE 1**	**SE 2**	**NW 1**	**NW 2**	**SW 1**	**SW 2**
Volume Total	248	121	155	182	152	190
Volume Left	248	0	0	0	152	0
Volume Right	0	0	0	182	0	190
cSH	1128	1700	1700	1700	287	891
Volume to Capacity	0.22	0.07	0.09	0.11	0.53	0.21
Queue Length 95th (ft)	21	0	0	0	72	20
Control Delay (s)	9.1	0.0	0.0	0.0	30.8	10.1
Lane LOS	A				D	B
Approach Delay (s)	6.1		0.0		19.4	
Approach LOS					C	

Intersection Summary			
Average Delay	8.5		
Intersection Capacity Utilization	28.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	116	37	177	81	44	181
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	155	49	236	108	59	241
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	649	290			344	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	649	290			344	
tC, single (s)	6.4	6.2			4.3	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.4	
p0 queue free %	62	93			95	
cM capacity (veh/h)	412	749			1121	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	204	344	59	241
Volume Left	155	0	59	0
Volume Right	49	108	0	0
cSH	462	1700	1121	1700
Volume to Capacity	0.44	0.20	0.05	0.14
Queue Length 95th (ft)	55	0	4	0
Control Delay (s)	18.8	0.0	8.4	0.0
Lane LOS	C		A	
Approach Delay (s)	18.8	0.0	1.6	
Approach LOS	C			

Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	36.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	87	1	3	127	20	2	0	1	10	0	3
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	6	105	1	4	153	24	2	0	1	12	0	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	177			106			205	302	53	238	290	89
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	177			106			205	302	53	238	290	89
tC, single (s)	4.4			4.4			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.4			2.4			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	98	100	100
cM capacity (veh/h)	1300			1386			728	605	1003	692	614	952

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	6	70	36	4	102	75	4	16
Volume Left	6	0	0	4	0	0	2	12
Volume Right	0	0	1	0	0	24	1	4
cSH	1300	1700	1700	1386	1700	1700	801	738
Volume to Capacity	0.00	0.04	0.02	0.00	0.06	0.04	0.00	0.02
Queue Length 95th (ft)	0	0	0	0	0	0	0	2
Control Delay (s)	7.8	0.0	0.0	7.6	0.0	0.0	9.5	10.0
Lane LOS	A			A			A	A
Approach Delay (s)	0.4			0.2			9.5	10.0
Approach LOS							A	A

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	14.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	22	12	14	4	6	8	20	215	18	6	235	26
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	28	15	18	5	8	10	25	269	22	8	294	32
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	658	666	310	664	671	280	326			291		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	658	666	310	664	671	280	326			291		
tC, single (s)	7.3	6.7	6.4	7.3	6.7	6.4	4.3			4.3		
tC, 2 stage (s)												
tF (s)	3.7	4.2	3.5	3.7	4.2	3.5	2.4			2.4		
p0 queue free %	92	96	97	98	98	99	98			99		
cM capacity (veh/h)	336	348	690	323	346	718	1139			1174		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	60	22	25	291	8	326
Volume Left	28	5	25	0	8	0
Volume Right	18	10	0	22	0	32
cSH	399	440	1139	1700	1174	1700
Volume to Capacity	0.15	0.05	0.02	0.17	0.01	0.19
Queue Length 95th (ft)	13	4	2	0	0	0
Control Delay (s)	15.6	13.6	8.2	0.0	8.1	0.0
Lane LOS	C	B	A		A	
Approach Delay (s)	15.6	13.6	0.7		0.2	
Approach LOS	C	B				

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	28.4%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX C:
SOIL SAMPLE ANALYSIS REPORT

RAWLINS
P.O. BOX 1104
RAWLINS, WY 82301
P: 307-324-5262

Preliminary Street Section Guidelines-Analysis Summary

Soil Types

The attached soils map from a previous National Resource Conservation Service (NRCS) soil survey was used as a basis to determine the primary soil groups in the Rawlins area. Five main soil groups are present in the area (see attached soil type exhibit):

Sample No.	Soil Group (per NRCS)	Map Number
1	Ryan Park-River Rock association	260
2	Rentsac-Shinbara complex	202
3	McFadden gravelly sandy loam	27B
4	McFadden sandy loam	527
5	Dines complex	449

Soil Sample Collection and Analysis

Samples of the five soil types were collected at the approximate locations as shown on the attached soils map. The samples were obtained at a minimum depth of six inches in order to be below top soil. Atterberg Limit and Gradation test were performed for each of the five samples to determine a general soil type (refer to test summaries in the Appendix). A reasonable range of CBR (California Bearing Ratio) values was utilized based on this soil classification.

Street Right-of-Way widths and projected Traffic Volumes

The basic four street classifications for the City of Rawlins, pursuant to the city subdivision code, are as follows:

Classification	Right-of-way width
Major Collector	80 ft
Minor Collector	66 ft
Local Street-Commercial/Industrial	66 ft
Local Street-Residential	60 ft

This classification does not apply to the highways through the city; which have larger right-of-way widths and are under the jurisdiction of the Wyoming Department of Transportation. Projected Average Daily Traffic volumes were determined utilizing projected volumes of a similar city when compared with the Average Daily Traffic (ADT) counts for various streets in Rawlins as collected by the Wyoming Department of Transportation (see attached publications from Medford, Oregon; and the Wyoming Department of Transportation). These projected volumes are designated as follows:

Classification	ADT	Percentage of Trucks
Major Collector	5,000 - 10,000	8% (assumed)
Minor Collector	2,500 - 5,000	5% (assumed)
Local Street-Commercial/Industrial	1,500 – 3,000	5% (assumed)
Local Street-Residential	up to 1,500	2% (assumed)

Results - Recommended and Minimum Street Section Guidelines

Samples 1-4 were determined to be primarily Silty Sand. Two of the samples are in NRCS groups classified as Loams (samples 3 and 4); which are very similar to Silty Sand. Sample 5 was extracted from the area designed by the NRCS as the "Dines Complex". That sample was a Silty Clayey Sand. This area will generally require larger asphalt and aggregate base thicknesses than the rest of the city due to the presence of greater amounts of clay. Hence, we recommend that this area be designated as a "Special Design Area". An exhibit defining this area is included in the Appendix.

A range of CBR values was established for the two kinds of soils to establish the preliminary asphalt paving and aggregate thickness guidelines (see attached calculations in the Appendix). The following are the minimum and recommended asphalt and aggregate base (Type "W") thicknesses for the four street classifications based on accepted AASHTO methodology. The "strongly" recommended sections maintain a minimum asphalt thickness of 4-inches and a minimum aggregate thickness of 6-inches; which is required in certain jurisdictions in Wyoming. The City can potentially adopt lesser street standards than the recommended sections for public streets in Rawlins.

RECOMMENDED MINIMUM SURFACING GUIDELINES FOR STREET PROJECTS OUTSIDE OF THE "SPECIAL DESIGN AREA" (ASPHALT THICKNESS/BASE THICKNESS)

LOCAL RESIDENTIAL	LOCAL COMMERCIAL	MINOR COLLECTOR	MAJOR COLLECTOR
4" AC over 6" aggregate base	4" AC over 6" aggregate base	4" AC over 6" aggregate base	4" AC over 6" aggregate base

MINIMUM COMPUTED SURFACING THICKNESSES FOR STREET PROJECTS OUTSIDE THE "SPECIAL DESIGN AREA" (ASPHALT THICKNESS/BASE THICKNESS)

LOCAL RESIDENTIAL	LOCAL COMMERCIAL	MINOR COLLECTOR	MAJOR COLLECTOR
2" AC over 5" aggregate base	3" AC over 5" aggregate base	4" AC over 4" aggregate base	4" AC over 6" aggregate base

RECOMMENDED MINIMUM SURFACING GUIDELINES FOR STREET PROJECTS WITHIN THE "SPECIAL DESIGN AREA" (ASPHALT THICKNESS/BASE THICKNESS)

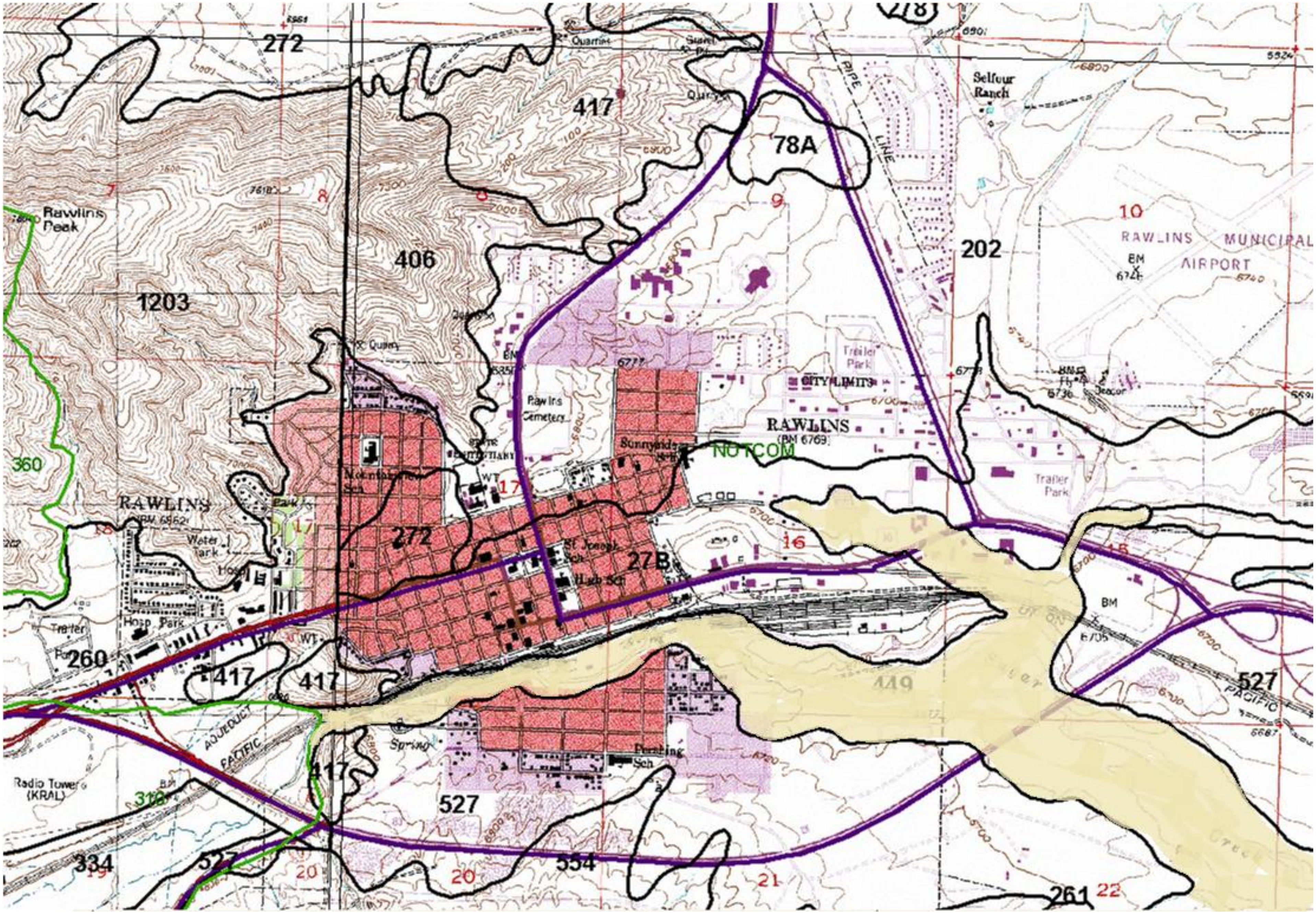
LOCAL RESIDENTIAL	LOCAL COMMERCIAL	MINOR COLLECTOR	MAJOR COLLECTOR
4" AC over 6" aggregate base	4" AC over 6" aggregate base	4" AC over 6" aggregate base	6" AC over 6" aggregate base

MINIMUM COMPUTED SURFACING THICKNESSES FOR STREET PROJECTS WITHIN THE "SPECIAL DESIGN AREA" (ASPHALT THICKNESS/BASE THICKNESS)

LOCAL RESIDENTIAL	LOCAL COMMERCIAL	MINOR COLLECTOR	MAJOR COLLECTOR
3" AC over 4" aggregate base	4" AC over 4" aggregate base	4" AC over 6" aggregate base	5" AC over 6" aggregate base

It is important to note that soil conditions can vary greatly in a project area of any size. This analysis is intended to provide general guidelines for planning purposes only. A site specific geotechnical exploration with paving and aggregate thickness recommendations, prepared by a Professional Geotechnical Engineer, should be performed for any future street improvements.

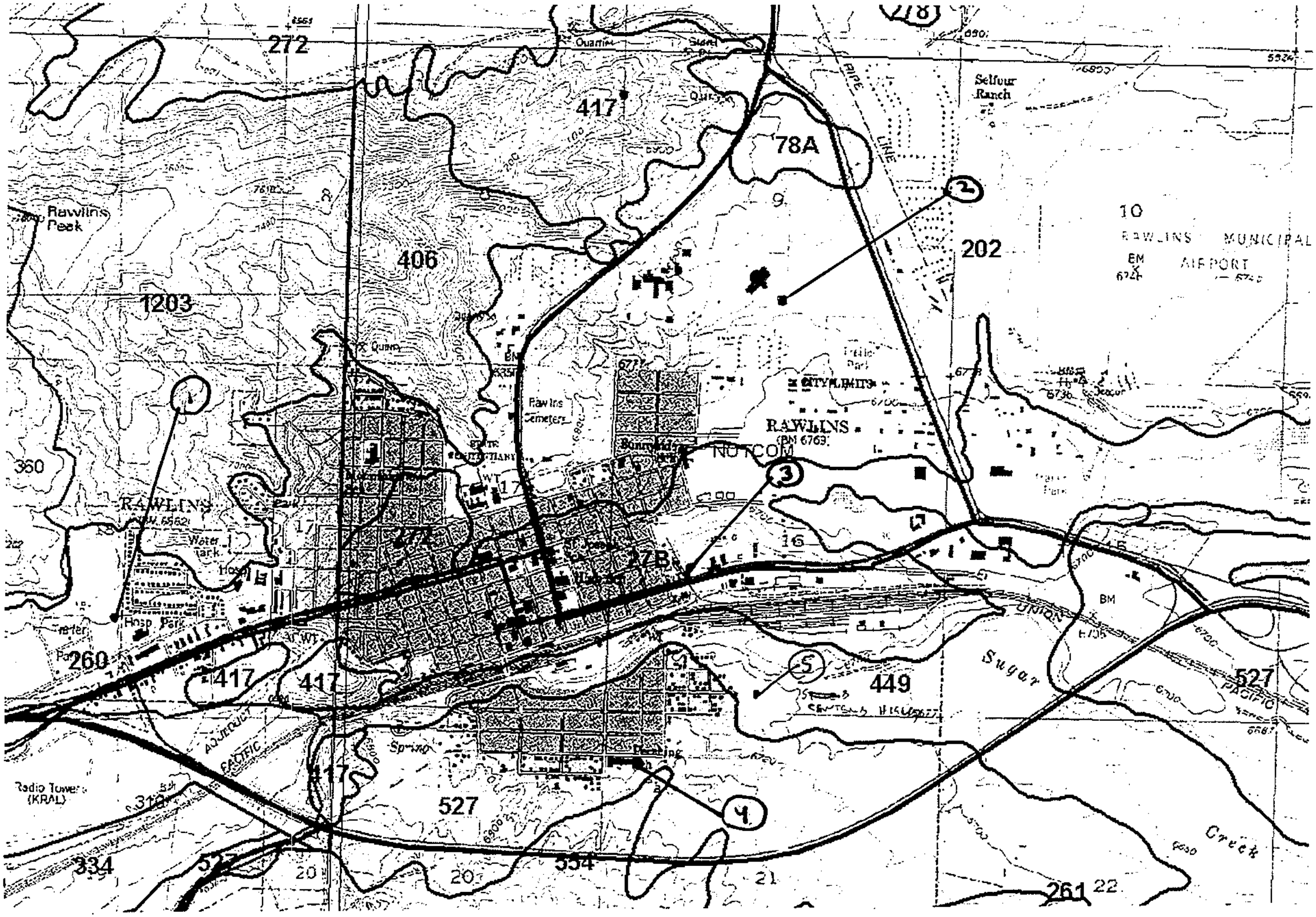
APPENDIX



RAWLINS – SPECIAL DESIGN AREA

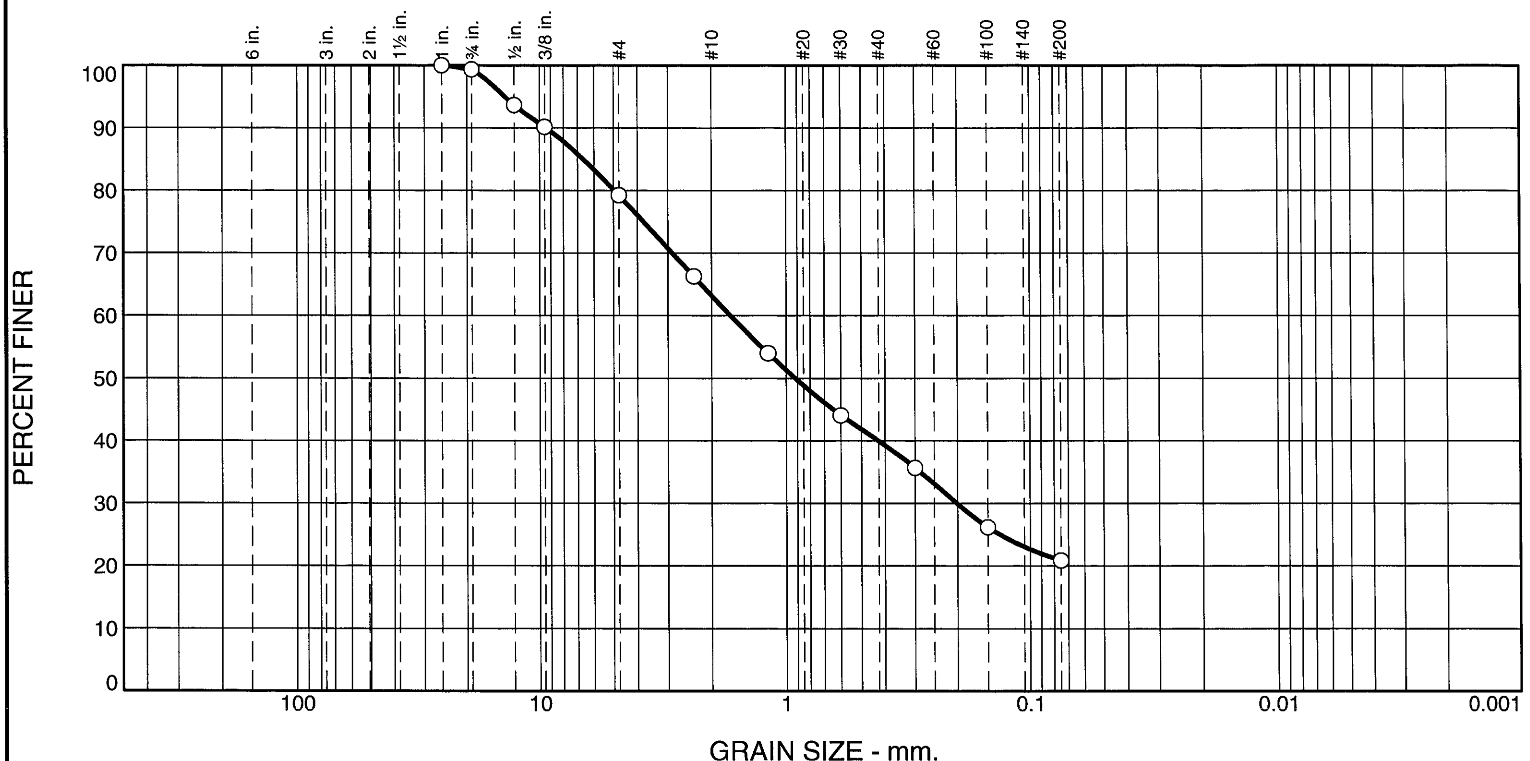
SOILS MAP

SOIL TESTING RESULTS



Old Soils Information for Rawlins, WY

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.7	20.1	16.0	23.3	19.1	20.8	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	99.3		
1/2"	93.6		
3/8"	90.1		
#4	79.2		
#8	66.2		
#16	54.0		
#30	44.1		
#50	35.7		
#100	26.2		
#200	20.8		

* (no specification provided)

Material Description

260-Ryan Park - River Rock Ass.

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 9.4130 D_{85}= 6.6436 D_{60}= 1.6739
D_{50}= 0.9167 D_{30}= 0.2015 D_{15}=
D_{10}= C_u= C_c=

Remarks

F.M.=3.05

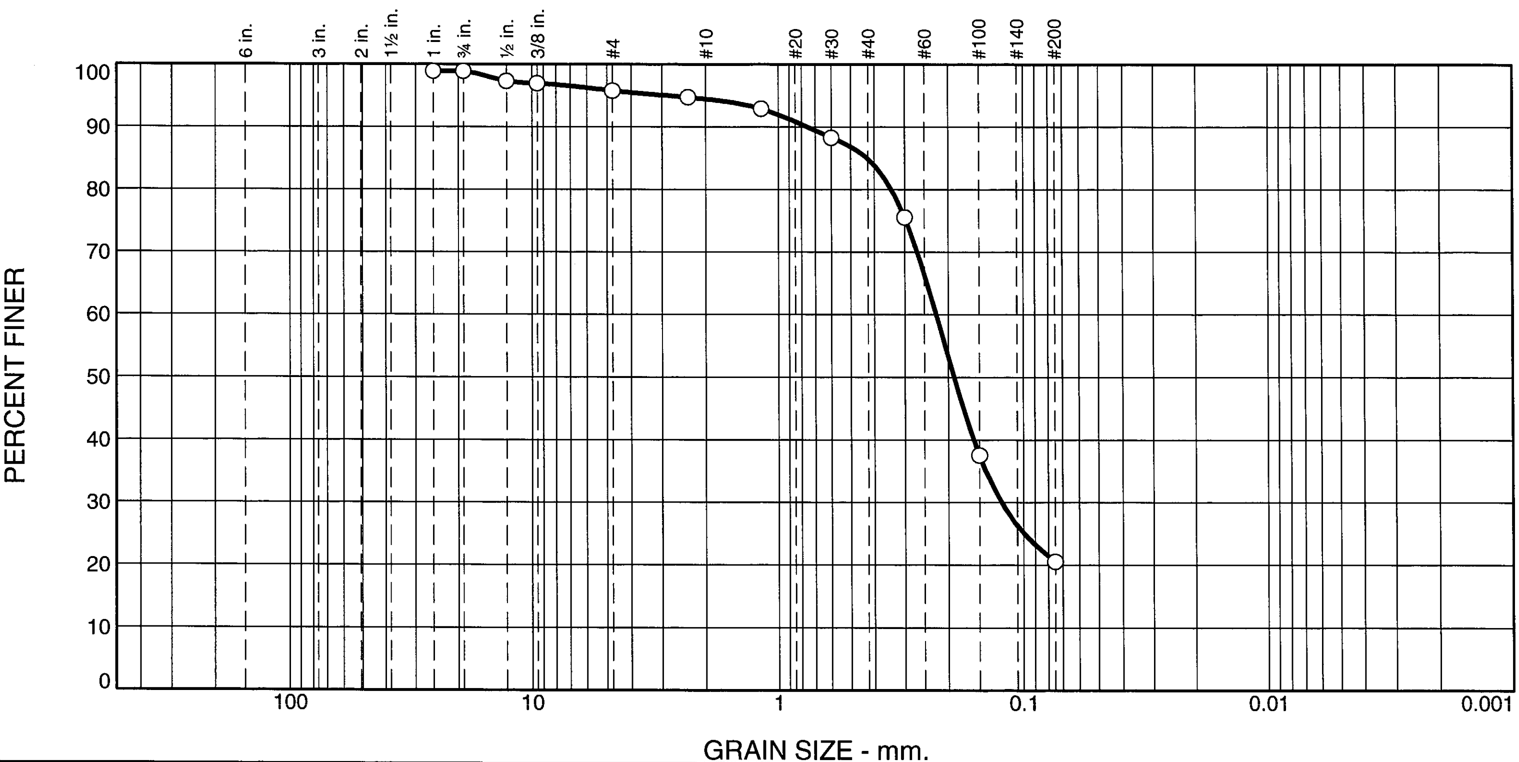
Date Received: **Date Tested:** 2-11-13
Tested By: BJF
Checked By:
Title:

Sample Number: #1 **Date Sampled:** 2-4-13

WLC Engineering, Surveying, Casper, WY

Client: Fehr & Peers
Project: Rawlins Transportation Plan
Project No: 14875 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
		3.2	1.3	9.5	64.4	20.5	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	98.9		
3/4"	98.9		
1/2"	97.3		
3/8"	96.9		
#4	95.7		
#8	94.7		
#16	92.8		
#30	88.3		
#50	75.5		
#100	37.5		
#200	20.5		

* (no specification provided)

Material Description

202 - Rentsac-Shinbara Complex

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.7591 D_{85}= 0.4275 D_{60}= 0.2235
D_{50}= 0.1893 D_{30}= 0.1226 D_{15}=
D_{10}= C_u= C_c=

Remarks

F.M.=1.20

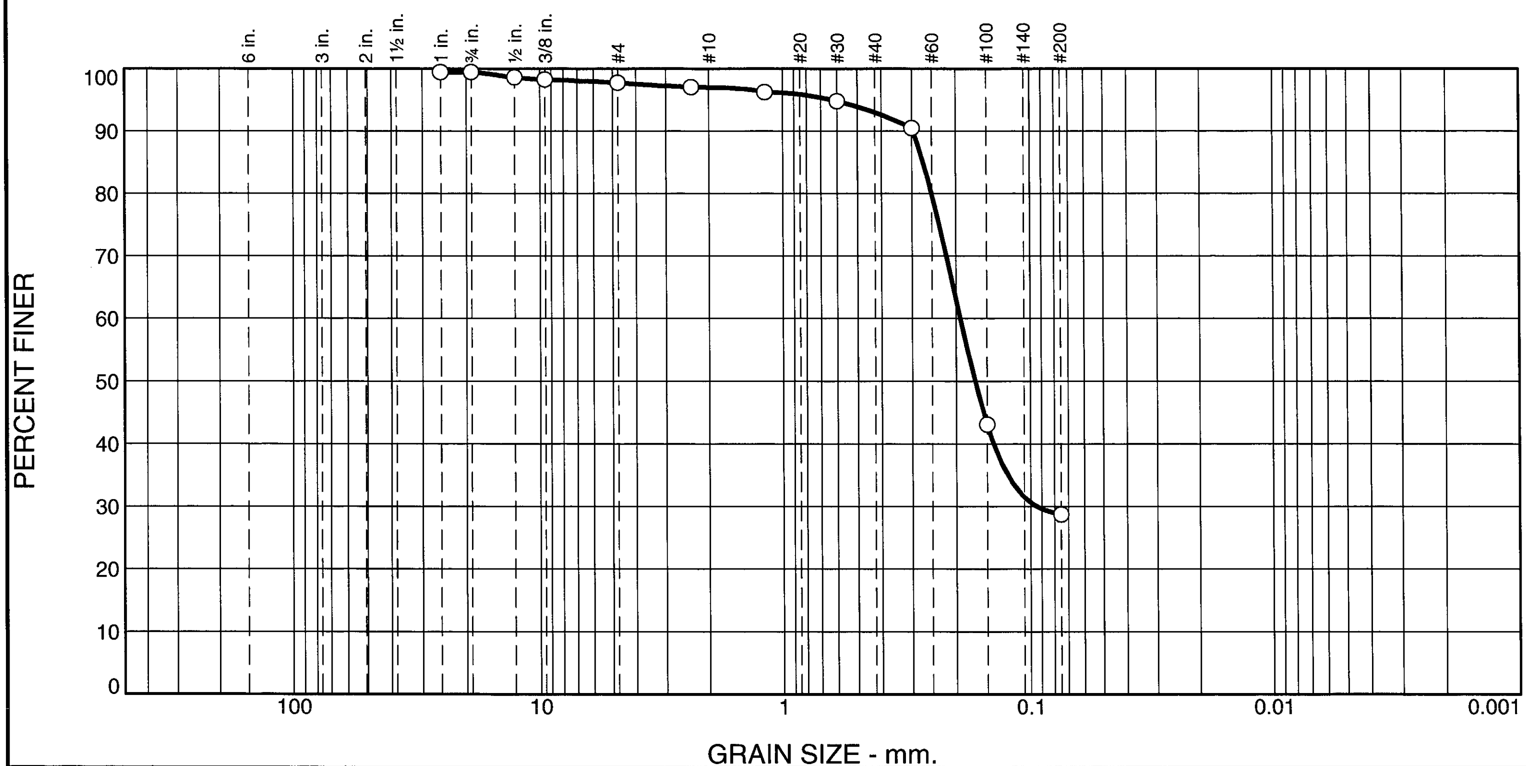
Date Received: **Date Tested:** 2-12-13
Tested By: BJF
Checked By:
Title:

Sample Number: #2 **Date Sampled:** 2-4-13

WLC Engineering, Surveying, Casper, WY

Client: Fehr & Peers
Project: Rawlins Transportation Plan
Project No: 14875 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
		1.7	0.7	4.0	64.3	28.7	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	99.4		
3/4"	99.4		
1/2"	98.6		
3/8"	98.2		
#4	97.7		
#8	97.0		
#16	96.2		
#30	94.7		
#50	90.4		
#100	43.1		
#200	28.7		

* (no specification provided)

Material Description

27B - McFadden Gravelly Sandy Loam

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.2971 D_{85}= 0.2703 D_{60}= 0.1921
D_{50}= 0.1676 D_{30}= 0.0945 D_{15}=
D_{10}= C_u= C_c=

Remarks

F.M.=0.83

Date Received: **Date Tested:** 2-12-13

Tested By: BJF

Checked By:

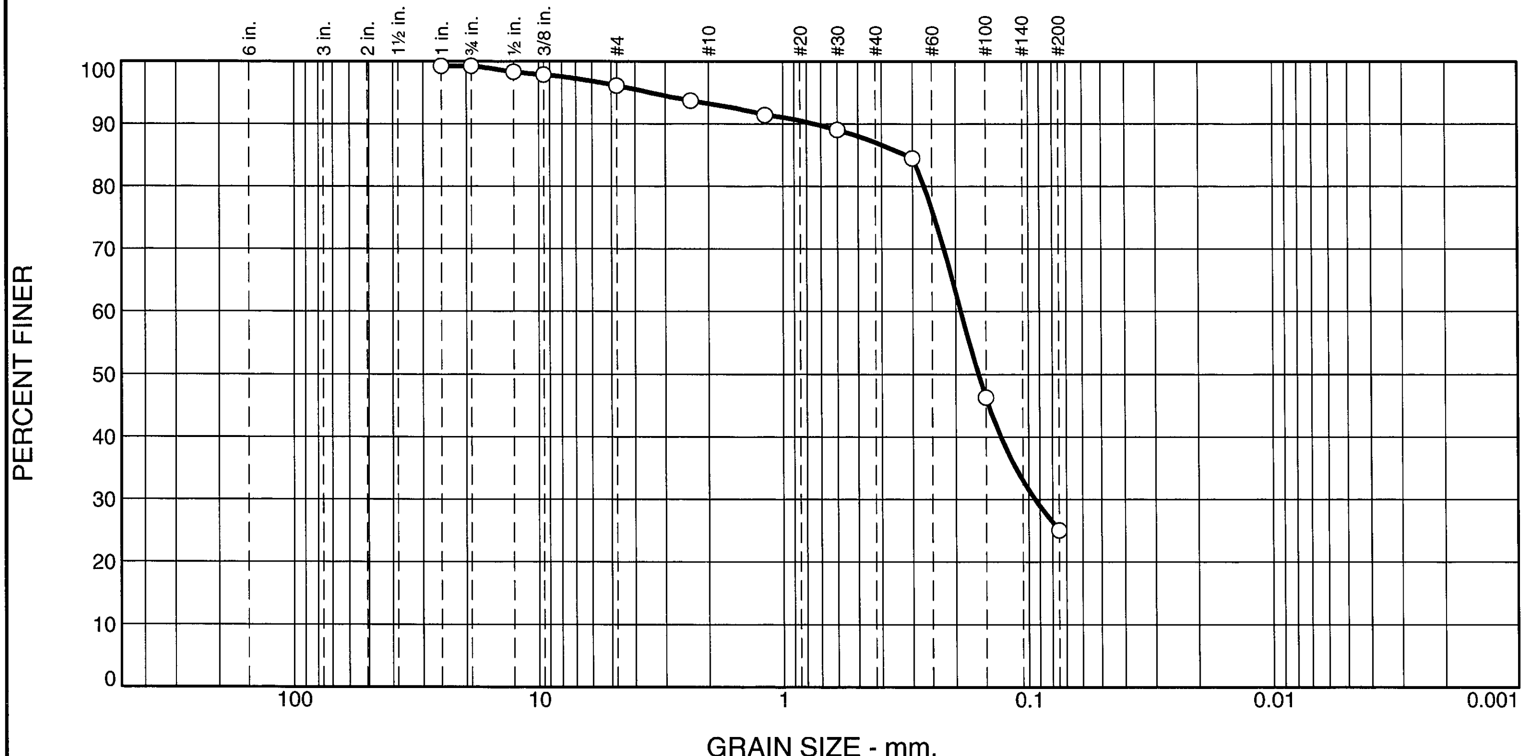
Title:

Sample Number: #3 **Date Sampled:** 2-4-13

WLC Engineering, Surveying, Casper, WY

Client: Fehr & Peers
Project: Rawlins Transportation Plan
Project No: 14875 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
		3.1	2.9	6.2	62.0	25.0	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	99.2		
3/4"	99.2		
1/2"	98.3		
3/8"	97.8		
#4	96.1		
#8	93.7		
#16	91.4		
#30	89.0		
#50	84.4		
#100	46.3		
#200	25.0		

* (no specification provided)

Material Description

527 - McFadden Sandy Loam

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.7488 D_{85}= 0.3217 D_{60}= 0.1901
D_{50}= 0.1608 D_{30}= 0.0942 D_{15}=
D_{10}= C_u= C_c=

Remarks

F.M.=1.02

Date Received: **Date Tested:** 2-13-13

Tested By: BJF

Checked By:

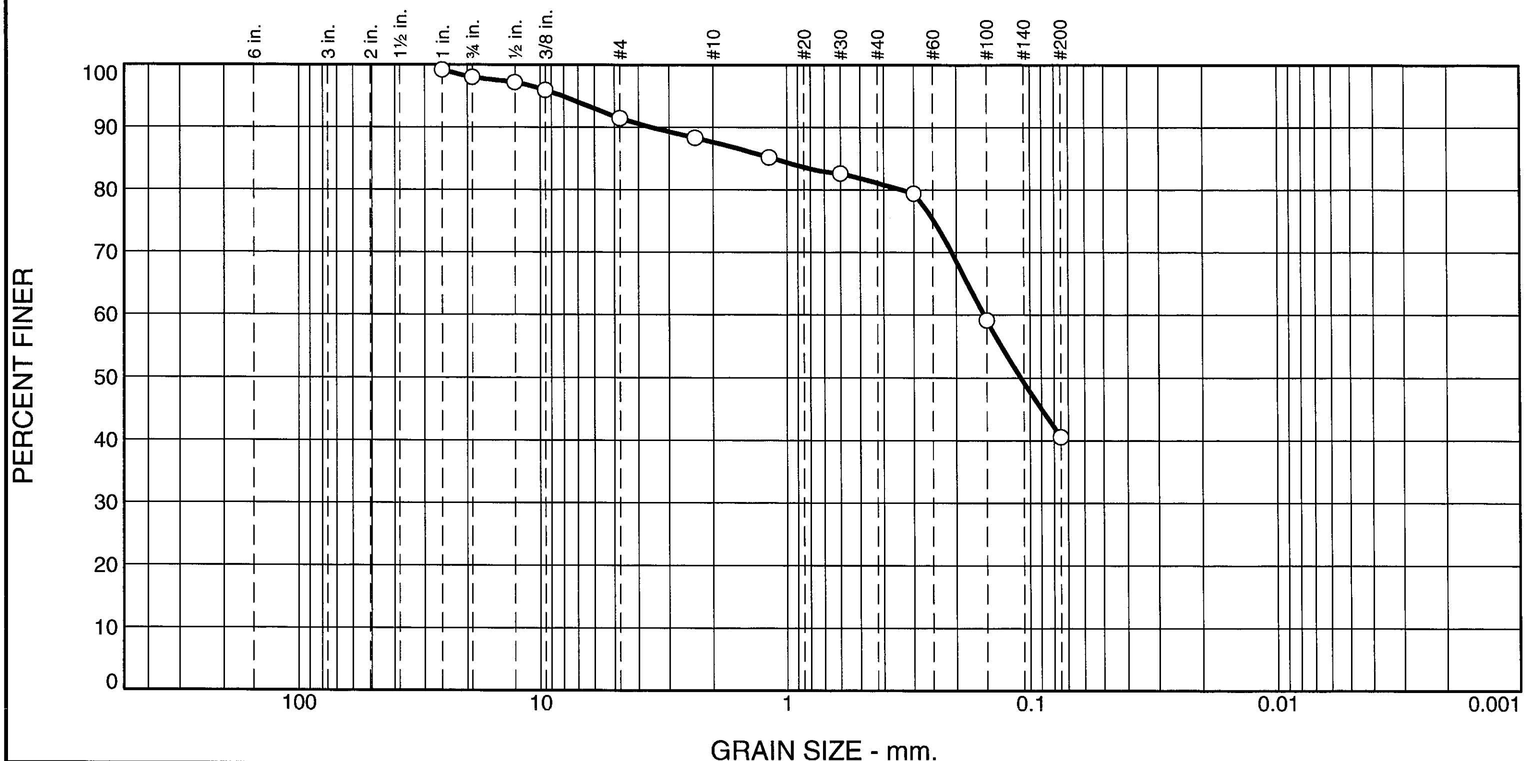
Title:

Sample Number: #4 **Date Sampled:** 2-4-13

WLC Engineering, Surveying, Casper, WY

Client: Fehr & Peers
Project: Rawlins Transportation Plan
Project No: 14875 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
		6.6	3.8	6.5	40.5	40.6	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	99.2		
3/4"	98.0		
1/2"	97.1		
3/8"	95.9		
#4	91.4		
#8	88.3		
#16	85.2		
#30	82.6		
#50	79.4		
#100	59.1		
#200	40.6		

* (no specification provided)

Material Description

449 - Dines Complex

Atterberg Limits (ASTM D 4318)

PL= 22 **LL=** 26 **PI=** 4

Classification

USCS (D 2487)= SC-SM **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 3.5720 D_{85}= 1.1388 D_{60}= 0.1541
D_{50}= 0.1092 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

F.M.=1.20

Date Received: **Date Tested:** 2-18-13
Tested By: BJF
Checked By:
Title:

Sample Number: #5

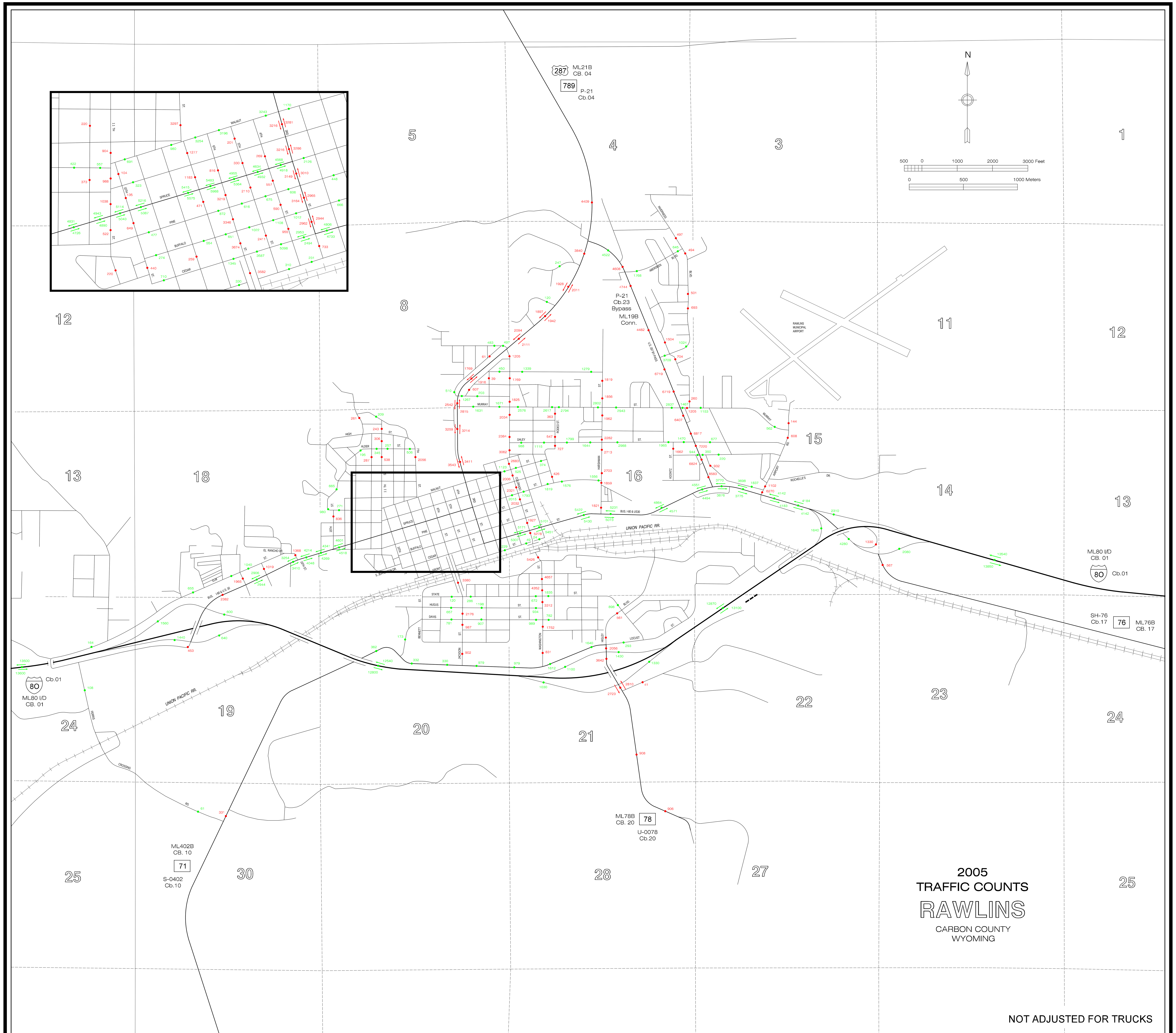
Date Sampled: 2-4-13

WLC Engineering, Surveying, Casper, WY

Client: Fehr & Peers
Project: Rawlins Transportation Plan

Project No: 14875 **Figure**

WyDOT TRAFFIC COUNTS



2005
TRAFFIC COUNTS
RAWLINS
CARBON COUNTY
WYOMING
NOT ADJUSTED FOR TRUCKS
N
500 0 1000 2000 3000 Feet
0 500 1000 Meters
287 ML21B CB. 04
789 P-21 Cb.04
P-21 Cb.23 Bypass
ML19B Conn.
ML80 I/D CB. 01
80 Cb.01
SH-76 Cb.17
76 ML76B CB. 17
ML78B CB. 20
78 U-0078 Cb.20
ML402B CB. 10
71 S-0402 Cb.10
UNION PACIFIC RR.
RAWLINS MUNICIPAL AIRPORT
1
3
4
5
8
11
12
13
14
15
16
18
19
20
21
22
23
24
25
27
28
30

Counter #	Route	Location	2011	2008	2005	2002	1999	1997	1994	1991	1988	1986	1984	1983	1982	1981	1980	1979	1977	1976	1975	1974	<>
30	3RD STREET	SOUTH OF CEDAR STREET	393	351	733	533	344	456	599	539	817												
31	3RD STREET NORTHBOUND	NORTH OF CEDAR STREET	2843		2944	2780	2569	4456	2258	3725	4785		5264					5470	4093				
32	3RD STREET	NORTH OF CEDAR STREET	5233		5906	5545	5231	4456	2258	3725	4785		5264					5470	4093				
33	3RD STREET SOUTHBOUND	NORTH OF CEDAR STREET	2390		2962	2765	2662																
34	3RD STREET NORTHBOUND	NORTH OF BUFFALO STREET	2423		2965	2813	2808																
35	3RD STREET	NORTH OF BUFFALO STREET	5012		6128	5771	5612																
36	3RD STREET SOUTHBOUND	NORTH OF BUFFALO STREET	2598		3163	2958	2804																
38	3RD STREET NORTHBOUND	SOUTH OF SPRUCE STREET	2531		3010	2824	2950	3966	3620	4673	4250	5050	5766			5553							
39	3RD STREET	SOUTH OF SPRUCE STREET	5108		6159	5706	5757	3966	3620	4673	4250	5050	5766			5553							
40	3RD STREET SOUTHBOUND	SOUTH OF SPRUCE STREET	2577		3149	2882	2807																
41	3RD STREET NORTHBOUND	NORTH OF SPRUCE STREET	3096		3286	2946	3463	4914	6935	5393	5959	5687	5821			6108							
42	3RD STREET	NORTH OF SPRUCE STREET	6032		6502	5887	6861	4914	6935	5393	5959	5687	5821			6108							
43	3RD STREET SOUTHBOUND	NORTH OF SPRUCE STREET	2936		3216	2941	3398																
50	3RD STREET/U.S. 287 NORTHBOUND	SOUTH OF WALNUT STREET	3037		3281	2827	3129	2700	3010	2481	2921												
51	3RD STREET/U.S. 287	SOUTH OF WALNUT STREET	5935	1637	6497	5803	6193	5491	6020	4962	5842												
52	3RD STREET/U.S. 287 SOUTHBOUND	SOUTH OF WALNUT STREET	2898		3216	2976	3064	2791	3010	2481	2921												
53	3RD STREET/U.S. 287 NORTHBOUND	NORTH OF WALNUT STREET	3105	2783	3411	2944	3307	2757	3232	2680	3076		3285			3822	3751	3114					
54	3RD STREET/U.S. 287	NORTH OF WALNUT STREET	6173	5848	6954	6055	6646	5777	6465	5361	6153		6570			7644	7502	6228					
55	3RD STREET/U.S. 287 SOUTHBOUND	NORTH OF WALNUT STREET	3068	3065	3543	3111	3339	3020	3233	2681	3077		3285			3822	3751	3114					
60	3RD STREET/U.S. 287 NORTHBOUND	SOUTH OF MURRAY STREET	3076	2930	3214	2902	3183	2785	3212	2795	2976		2930									2064	
61	3RD STREET/U.S. 287	SOUTH OF MURRAY STREET	6139	5861	6473	5999	6421	4807	6424	5590	5953		5860									4128	
62	3RD STREET/U.S. 287 SOUTHBOUND	SOUTH OF MURRAY STREET	3063	2931	3259	3097	3238	2022	3212	2795	2977		2930									2064	
69	3RD STREET/U.S. 287 NORTHBOUND	NORTH OF MURRAY STREET	2541	2231	2815	2426	2774	2702	2475	1494	2469		1747										
70	3RD STREET/U.S. 287	NORTH OF MURRAY STREET	5396	5152	5357	4787	5335	4521	4925	2834	4932		3494										
71	3RD STREET/U.S. 287 SOUTHBOUND	NORTH OF MURRAY STREET	2855	2221	2542	2361	2561	1819	2450	1340	2463		1747										
80	3RD STREET/U.S. 287 NORTHBOUND	NORTH OF HEATH STREET	1979	1499	1916	1650	1852		1626		1447					1956							
81	3RD STREET/U.S. 287	NORTH OF HEATH STREET	3816	3033	3685	3276	3589		3235		2831					3717							
82	3RD STREET/U.S. 287 SOUTHBOUND	NORTH OF HEATH STREET	1837	1534	1769	1626	1737		1609		1384					1761							
89	3RD STREET/U.S. 287 NORTHBOUND	NORTH OF LARSEN STREET	2163	1754	2111	1784	1950	1301	1488	1530	1684		1636										
90	3RD STREET/U.S. 287	NORTH OF LARSEN STREET	4294	3597	4205	3597	3873	2602	2975	2915	3133		3272										
91	3RD STREET/U.S. 287 SOUTHBOUND	NORTH OF LARSEN STREET	2131	1843	2094	1813	1923	1301	1487	1385	1449		1636										
97	3RD STREET/U.S. 287 NORTHBOUND	SOUTH OF HAPPY HOLLOW COURT	2097		1942	1551	1787																
98	3RD STREET/U.S. 287	SOUTH OF HAPPY HOLLOW COURT	4073	3416	3839	3269	3573																
99	3RD STREET/U.S. 287 SOUTHBOUND	SOUTH OF HAPPY HOLLOW COURT	1976		1897	1718	1786																
100	3RD STREET/U.S. 287 NORTHBOUND	SOUTH OF SCARLET DRIVE	2162	1697	2011	1542	1794			1450			1588										
101	3RD STREET/U.S. 287	SOUTH OF SCARLET DRIVE	4233	3472	3839	3267	3588			3004			3176										
102	3RD STREET/U.S. 287 SOUTHBOUND	SOUTH OF SCARLET DRIVE	2071	1775	1928	1725	1794			1554			1588										
110	3RD STREET/U.S. 287	SOUTH OF JCT WITH U.S. 287	4126	3348	3840	3391	3550	3068	3280	2863	3049	3012	3151	3516		3531			1428				
115	3RD STREET/U.S. 287	NORTH OF JCT WITH U.S. 287	4102	5052	4409	3453	3640	2911	2925	3294	2594	2823	3130	3508		3701			1442				
125	4TH STREET	SOUTH OF BUFFALO STREET	615	1628	955	1019	1156																
130	4TH STREET	SOUTH OF PINE STREET	510	903	590	585	559						1116										
135	4TH STREET	SOUTH OF SPRUCE STREET	803		557	713	562																
140	4TH STREET	NORTH OF SPRUCE STREET	160		269	262	338																
160	5TH STREET	NORTH OF CEDAR STREET	1944	1888	2411	2602	3084		3370	4133			4556			6309							
170	5TH STREET	SOUTH OF SPRUCE STREET	1638		2110	2355	2675			3150			4548			6346							
175	5TH STREET	NORTH OF SPRUCE STREET	264		330	339	413	368		469						737			1171				
180	5TH STREET	SOUTH OF WALNUT STREET	194	155	201	242	264						334										
200	6TH STREET	NORTH OF SPRUCE STREET	590	4401	816	766	662	478		418			544						1361				
205	6TH STREET	SOUTH OF SPRUCE STREET	2324	8714	3219	2947	3307	2778	2708	2990			3668			4568						4729	
207	6TH STREET	NORTH OF BUFFALO STREET	2607	8376	3346	3269	3860																
210	6TH STREET	NORTH OF CEDAR STREET	2680	8140	3674	3579	4199	3516	4165	3317	3771		5753			7089							
215	6TH STREET	SOUTH OF CEDAR STREET		3562	3582	3630	4009	3218	4213	2950	3609		3359										
230	7TH STREET	SOUTH OF SPRUCE STREET	398	613	471	798	607			621	757												
235	7TH STREET	NORTH OF SPRUCE STREET	1251	2326	1183	1818	1632			1437	1584		2410			2982			1320				
240	7TH STREET	SOUTH OF WALNUT STREET	1175	1994	1277	1372	1594		1317	1328	1580											2792	
245	7TH STREET	NORTH OF DATE STREET	2628	1626	3297	3440	3326	2991	2822	3164	3393		3566			1896			3574				
250	7TH STREET	SOUTH OF ALDER STREET	1564	1803	2056	1963	1941			1744			2308										
270	8TH STREET	NORTH OF CEDAR STREET	210	311	259	224	240						346										
280	10TH STREET	NORTH OF JEFFERS DRIVE	298	501	440	324	385				564												
285	10TH STREET	SOUTH OF SPRUCE STREET	537	714	649	503	490	986															
287	10TH STREET	NORTH OF SPRUCE STREET	90	184	135	149	126	134															
290	10TH STREET	SOUTH OF WALNUT STREET	61	118	104	64	87		83	120	79												
300	11TH STREET	NORTH OF S. JEFFERS DRIVE	150	187	220	199	216			202			357										
310	11TH STREET	SOUTH OF SPRUCE STREET	349	382	522	512	626	565		644	805					828							
315	11TH STREET	NORTH OF SPRUCE STREET	571	968	1038	918	990	1105	1072	1052	1246		1507						2171				
320	11TH STREET	SOUTH OF WALNUT STREET	551	940	988	879	926		987	1139			1012			1210	1454						
325	11TH STREET	NORTH OF WALNUT STREET	588	734	904	794	830	1013	948	1138	992		907			1066							
330	11TH STREET	SOUTH OF ALDER STREET	317	489	538	437	463	276		601													
335	11TH STREET	NORTH OF ALDER STREET	264	283	306	282	323	323	301	314	360		424						632				

340	11TH STREET	NORTH OF HIGH STREET	148	208	243	220	229	168	187	313	269		215						
350	12TH STREET	NORTH OF SPRUCE STREET	248			413	409			308			288					471	
360	12TH STREET	SOUTH OF WALNUT STREET	187	312	373	297	292			269									
370	12TH STREET	NORTH OF DATE STREET	122	235	220	293	208			205			245						
372	12TH STREET	SOUTH OF ALDER STREET	90	205	287	199	241			202									
375	13TH STREET	NORTH OF NIEMAN STREET	212	240	261	298	199	85											
380	15TH STREET	NORTH OF SPRUCE STREET	601			1013	1007	865	914	940	632					1402		839	
390	15TH STREET	SOUTH OF WALNUT STREET	542	609	836	900	914	724	707	752	844								
400	18TH STREET	NORTH OF SPRUCE STREET	1036	1242	1368	1353	1482	1275	1385	1381	1694		2833			2230		2693	2986
410	21ST STREET	NORTH OF SPRUCE STREET	795	701	1019	947	861	783											
430	23RD STREET	NORTH OF SPRUCE STREET	1510	1670	1965	1850	2061	1258		1484	1460		1680		1379				
450	ABERDEEN BOULEVARD	EAST OF U.S. 287 MARGINAL	1573	1550	1768	1659	1790	1623	1484	1684	1615		1447						
460	ABERDEEN BOULEVARD	WEST OF INVERNESS BOULEVARD	557	1510	645	575	687	615	458	656			734						
470	ALDER STREET	WEST OF 7TH STREET	304	487	506	467	480			408			457						
480	ALDER STREET	EAST OF 11TH STREET	177	336	257	313	287	352		308									
485	ALDER STREET	WEST OF 11TH STREET	127	275	345	264	300	269		302									
490	ALDER STREET	WEST OF 12TH STREET	91	139	195	169	188			240									
495	ALDER STREET	SOUTH OF CHERRY STREET	387	438	665	758	765			779									
500	AIRPORT ROAD	NORTH OF U. S. 30 E	5025	4830	6270	3230	3941	2633	2611	2224	1941								
505	AIRPORT ROAD	NORTH OF FUTURE STREET	1374	1456	1102	1042	504	726	794	536	554		726						
510	AIRPORT ROAD	SOUTH OF MURRAY STREET	530	733	608	666	659		515	511									
515	AIRPORT ROAD	NORTH OF MURRAY STREET	137	106	144	105	158	77											
516	ARIZONA ST	NORTH OF HEATH ST	567	608	607	715	715												
518	BROOKS STREET	WEST OF COLORADO STREET	411	441	450		488	522											
520	BROOKS STREET	EAST OF COLORADO STREET	1642	1225	1339	1535	2668	1942		788									
523	BROOKS STREET	WEST OF HARSHMAN STREET	1238	1122	1279	1092	1150	1210											
530	BUFFALO STREET	EAST OF 2ND STREET	582		666	691	891						1992						
535	BUFFALO STREET	WEST OF 3RD STREET	823		1012	1235	1284	1031		1128			2256						
540	BUFFALO STREET	EAST OF 5TH STREET	834	1055	1108	1091	1345	1491		1203			2423						
541	BUFFALO STREET	EAST OF 6TH STREET	796	1430	1022	1193	541												
542	BUFFALO STREET	WEST OF 6TH STREET	527	753	651	734	1337	737											
545	BUFFALO STREET	WEST OF 7TH STREET	434	5384	554	558	647						658						
547	BUFFALO STREET	EAST OF 10TH STREET	231	311	274	306	489												
549	CEDAR STREET WESTBOUND	WEST OF JCT WITH U.S. 287 MARGINAL	4088	5384	4551	4447	4579	7809	6195	6533	8616	9193	11093	10307		11672	11208		
550	CEDAR STREET	WEST OF JCT WITH U.S. 287 MARGINAL	8166	10801	9045	8906	9460	7809	6195	6533	8616	9193	11093	10307		11672	11208		
551	CEDAR STREET EASTBOUND	WEST OF JCT WITH U.S. 287 MARGINAL	4078	5417	4494	4459	4881												
555	CEDAR STREET WESTBOUND	EAST OF ALTON LANE	4280	5824	4864	4570	4655												
556	CEDAR STREET	EAST OF ALTON LANE	8475	11482	9435	9240	9360												
557	CEDAR STREET EASTBOUND	EAST OF ALTON LANE	4195	5658	4571	4670	4705												
560	CEDAR STREET WESTBOUND	EAST OF HARSHMAN STREET	4400	5739	5231	4808	4875	8414	7280	6271	8606		10526			11372			
561	CEDAR STREET	EAST OF HARSHMAN STREET	8762	11568	10304	9660	9904	8414	7280	6271	8606		10526			11372			
562	CEDAR STREET EASTBOUND	EAST OF HARSHMAN STREET	4362	5829	5073	4852	5029												
564	CEDAR STREET WESTBOUND	WEST OF HARSHMAN STREET	4670	6171	5422	4821	4990	8998	7490	7608	9236					12008			
565	CEDAR STREET	WEST OF HARSHMAN STREET	9221	12402	10852	9694	10312	8998	7490	7608	9236					12008			
566	CEDAR STREET EASTBOUND	WEST OF HARSHMAN STREET	4551	6231	5430	4873	5322												
570	CEDAR STREET WESTBOUND	EAST OF COLORADO STREET	4931	6216	5701	4865	5404	9371		9412	10319					13672			
571	CEDAR STREET	EAST OF COLORADO STREET	9548	13045	11152	10462	10810	9371		9412	10319					13672			
572	CEDAR STREET EASTBOUND	EAST OF COLORADO STREET	4617	6829	5451	5597	5406												
574	CEDAR STREET WESTBOUND	WEST OF COLORADO STREET	4363	5175	5171	4769	5129	8924		8558	9970		13265			13510			
575	CEDAR STREET	WEST OF COLORADO STREET	8546	10425	10478	9641	10147	8924		8558	9970		13265			13510			
576	CEDAR STREET EASTBOUND	WEST OF COLORADO STREET	4183	5250	5307	4872	5018												
580	CEDAR STREET WESTBOUND	EAST OF 3RD STREET	3979	4940	4806	4674	4969	8712	6249	8183	8928	9245	12282	9330		11382	15626		
581	CEDAR STREET	EAST OF 3RD STREET	7897	10427	9539	9502	9811	8712	6249	8183	8928	9245	12282	9330		11382	15626		
582	CEDAR STREET EASTBOUND	EAST OF 3RD STREET	3918	5487	4733	4828	4842												
583	CEDAR STREET WESTBOUND	WEST OF 3RD STREET	1958	4599	2953	2606	3261	4456	4979	5238	6220	5691	7472	5317		8614			
584	CEDAR STREET	WEST OF 3RD STREET	4061	9695	5447	5314	6292	4456	4979	5238	6220	5691	7472	5317		8614			
585	CEDAR STREET EASTBOUND	WEST OF 3RD STREET	2103	5096	2494	2708	3031												
590	CEDAR STREET	EAST OF 5TH STREET	4025	9119	5098	5181	5973		4917	4892			7945						
595	CEDAR STREET	WEST OF 5TH STREET	2910	8025	3587	3389	3737	3074	3167	2473	2864		4568			3998			
600	CEDAR STREET	WEST OF 6TH STREET	985	1656	1345	1235	1379	1317		598	1034		1533			1822			
610	CEDAR STREET	EAST OF 10TH STREET	504	827	710	622	645			646	598		855						
640	COLORADO STREET/WASHINGTON STREET	SOUTH OF CEDAR STREET	2125	1437	5278	5760	5864	4374	4725	5629	5153								
645	COLORADO STREET	NORTH OF CEDAR STREET	1685	2305	1927	1942	2433	2237	2296	2428	2600		2774			3457		2169	
650	COLORADO STREET	SOUTH OF SPRUCE STREET	1690	2210	2032	2042	2086		2404	2284	2487								
655	COLORADO STREET	NORTH OF SPRUCE STREET	1872	2275	2321	2452	2307	2118	2491	2548	2718		2164						
660	COLORADO STREET	SOUTH OF WALNUT STREET	1895	2294	2006	2133	2226			2749						2771			1763
665	COLORADO STREET	NORTH OF WALNUT STREET	1998	3054	2683	2347	2429			2567						2920			
670	COLORADO STREET	SOUTH OF DALEY STREET	2446	3187	3062	2355	2512	2364	2658	2240	2864		2407						
675	COLORADO STREET	NORTH OF DALEY STREET	1847	2160	2384	1898	2053		2181	1779	2409								
680	COLORADO STREET	SOUTH OF MURRAY STREET	1596	1863	2034	1475	1761	1564	1808	1523	1883		1611			1819		1949	

685	COLORADO STREET	NORTH OF MURRAY STREET	1388	1639	1825	1409	1565	1318	1641	1343	1807		1072			1592		1090		
690	COLORADO STREET	SOUTH OF BROOKS STREET	1369	1492	1769	1565	1458			1125										
700	COLORADO STREET	EAST OF 3RD STREET/U.S. 287	1463	1272	1205	1259	1395	1453	1488	1429	1271		744			1044				
720	DALEY STREET	EAST OF U.S. 287 MARGINAL	479	1108	677	585	469		395		344									
725	DALEY STREET	WEST OF U.S. 287 MARGINAL	1381	1709	1470	1507	1129	1143	1033	844	813		854			1536		870		1099
730	DALEY STREET	WEST OF KOONTZ STREET	3467	2999	1965	2381	2440			2128			1782							
740	DALEY STREET	EAST OF HARSHMAN STREET	2520	2809	2988	1414	2551	2122	2482	2253	1730		1534			2586		1610		
745	DALEY STREET	WEST OF HARSHMAN STREET	1391	1873	1644	1463	1345	1119	1228	1058	979		1047			1547		1694		
750	DALEY STREET	EAST OF RODEO STREET	1439	1973	1799	1349	1464			1192										
755	DALEY STREET	WEST OF RODEO STREET	1023	1305	1115	700	671			442										
760	DALEY STREET	EAST OF COLORADO STREET	896	1215	988	552	640	483	719	667	530					918		1046		447
770	DAVIS STREET	NORTH OF WYO 71	129	146	173	138	168	99	118	93	141		144							
780	DAVIS STREET	WEST OF JACKSON STREET		688	781	802	917	559	675	763			1011							
785	DAVIS STREET	EAST OF JACKSON STREET		886	907	796	1017	889	974	1019			1200							
790	DAVIS STREET	WEST OF WASHINTON STREET	532	1206	989	1228	1149	864	1214	1085			1427							
795	DAVIS STREET	EAST OF WASHINTON STREET	536	1633	782	880	1026	664		1420			1008							
830	EDINBURGH STREET	NORTH OF MURRAY STREET		732	260	282	199			253			980							
840	EDINBURGH STREET	SOUTH OF INVERNESS STREET	743	658	704	653	631			696										
845	EDINBURGH STREET	NORTH OF INVERNESS STREET	1518	1391	1504	1675	1768			1202			1294							
870	ELM STREET	EAST OF 23RD STREET	523	718	1040	726	771	696		564	555		1239							
875	ELM STREET	WEST OF 23RD STREET	837	1138	1064	941	1537	688	461	1220	1053				833					
880	ELM STREET	WEST OF WESTERN HILLS TRAILER PARK	472	640	655	479	680	416		357	688		1597							
881	ELM STREET/SERVICE ROAD	.6 MILE WEST OF WESTERN HILLS TRAILER PARK	99	165	164	117	129													
885	FERRIS CROSSING ROAD	WEST OF WYO 71 SOUTH OF I-80	107	122	61	93	82	39	69	46	53		122						15	
887	FERRIS CROSSING ROAD	SOUTH OF I-80 SERVICE ROAD SOUTH OF I-80	90	173	108	105	111													
890	FRONT STREET	EAST OF COLORADO STREET	16	25	24	30	34			17										
895	FRONT STREET	WEST OF COLORADO STREET	33	32	49	56	54			83										
900	FRONT STREET	EAST OF 2ND STREET	174	209	229	218	250						679							
905	FRONT STREET	WEST OF 3RD STREET	199	267	231	273	191	174	818											
910	FRONT STREET	EAST OF 5TH STREET	221	342	310	413	273	288					969							
920	FRONT STREET	WEST OF 6TH STREET	255	331	330	343	314			505			479							
930	PLAZA STREET	WEST OF AIRPORT ROAD	1823	2024	1837	1497	1349	839	797	853	939		1036							
935	PLAZA STREET	SOUTH OF MAHONEY STREET	1006	1498	932	1328	1184	1066												
940	HAPPY HOLLOW CIRCLE	WEST OF 3RD STREET	80	98	120	71	89			80			67							
950	HARSHMAN STREET	NORTH OF CEDAR STREET	1389	1942	1821	1733	1730	1120	1745	1515	1631		1341			2913		1917		1238
960	HARSHMAN STREET	SOUTH OF SPRUCE STREET	1415	1961	1859	1876	1613			1571										
965	HARSHMAN STREET	NORTH OF SPRUCE STREET	2551	2194	2703	2550	2315			2060										
970	HARSHMAN STREET	SOUTH OF DALEY STREET	2275	2192	2713	2515	2299	2167	2124	1758	2109		2271			2708		2022		
975	HARSHMAN STREET	NORTH OF DALEY STREET	2116	2250	2282	2310	2049	2074	1432	1910	1911		1742			1911				
980	HARSHMAN STREET	SOUTH OF MURRAY STREET	1696	1803	1962	1873	1615	2169	1211	1374	1591					1471				
985	HARSHMAN STREET	NORTH OF MURRAY STREET	1802	1586	1856	1936	1628	1834	780	1578	1413		433							
987	HARSHMAN STREET	SOUTH OF BROOKS STREET	1742	1575	1819	1921	1556													
988	HARSHMAN STREET	NORTH OF BROOKS STREET	767			1256	673													
989	HEATH STREET	WEST OF ARIZONA ST	782	1272	1267	1336														
990	HEATH STREET	EAST OF ARIZONA ST	126	155	203	408	210													
993	HIGLEY BOULEVARD	SOUTHWEST OF STATE STREET	571	481	561	504	536		528	462										
1000	HIGLEY BOULEVARD	NORTH OF WYO 71		508	562	506		381	376	462	627	1412	477	449	337					
1005	HIGLEY BOULEVARD (WYO 78)	NORTH OF I-80 NORTH RAMPS	2086	3037	2056	2082	2420	1940	1929	1918	2210									
1010	HIGLEY BOULEVARD (WYO 78)	OVER I-80	3600	4378	3642	3881	5047		2771	3995	3879		272		803					
1020	HIGLEY BOULEVARD (WYO 78) NORTHBOUND	SOUTH OF I-80 EASTBOUND ON RAMP	3081	3383	2810	3814	4694	6475	5247	5433	5782				745					
1021	HIGLEY BOULEVARD (WYO 78)	SOUTH OF I-80 EASTBOUND ON RAMP	6049	6618	5533	7894	9395	6475	5247	5433	5782				745					
1022	HIGLEY BOULEVARD (WYO 78) SOUTHBOUND	SOUTH OF I-80 EASTBOUND ON RAMP	2968	3235	2723	4080	4701													
1024	HIGLEY BOULEVARD (WYO 78) NORTHBOUND	SOUTH OF I-80 SERVICE ROAD SOUTH OF RAMPS	2271			2625	2963	4473												
1025	HIGLEY BOULEVARD (WYO 78)	SOUTH OF I-80 SERVICE ROAD SOUTH OF RAMPS	4372			5136	5871	4473												
1026	HIGLEY BOULEVARD (WYO 78) SOUTHBOUND	SOUTH OF I-80 SERVICE ROAD SOUTH OF RAMPS	2101			2511	2908													
1030	HIGLEY BOULEVARD (WYO 78)	NORTH OF PRISON	933	873	908	1115	1470	731				683	328	589	400					
1045	HUGUS STREET	WEST OF JACKSON STREET	695	540	657	624	954			536						1306		1296		
1050	HUGUS STREET	EAST OF JACKSON STREET	1147	924	1198	1306	1374		1403	1252	1433		2312			2325		1127		
1055	HUGUS STREET	WEST OF WASHINGTON STREET	846	866	934	1043	1070		1030	884	1070		1334			1470		474		
1069	I-80 WESTBOUND	WEST OF SPRUCE STREET INTERCHANGE	9364	12587	13500	9833	12262	8392	6629	6035	4212	5819	3097	6604	5003	7357		6755		
1070	I-80	WEST OF SPRUCE STREET INTERCHANGE	18473	25336	27100	21755	24053	17256	12887	11179	8637	11626	6291	12125	10012	13963		11643		
1071	I-80 EASTBOUND	WEST OF SPRUCE STREET INTERCHANGE	9109	12749	13600	11922	11791	8864	6258	5144	4425	5807	3194	5521	5009	6606		4888		
1079	I-80 WESTBOUND	EAST OF SPRUCE STREET INTERCHANGE	8891	12465	12540	14396	11459	7660	5905	5186	3760	4602	2194	5909	3622	5417	4999			
1080	I-80	EAST OF SPRUCE STREET INTERCHANGE	17141	24693	25340	27573	22217	15878	11155	9570	7571	9290	4296	11748	7226	10717	9789			
1081	I-80 EASTBOUND	EAST OF SPRUCE STREET INTERCHANGE	8250	12228	12800	13177	10758	8218	5250	4384	3811	4688	2102	5839	3604	5300	4790			
1089	I-80 WESTBOUND	WEST OF CEDAR STREET INTERCHANGE	9586	12911	12870	14189	11605	8084	6478	6224	4095	4653	2364	6098	3797	4541			1620	
1090	I-80	WEST OF CEDAR STREET INTERCHANGE	18575	25843	25970	30377	22654	16680	11842	11185	8007	9373	4729	12299	7085	8919			3190	
1091	I-80 EASTBOUND	WEST OF CEDAR STREET INTERCHANGE	8989	12932	13100	16188	11049	8596	5364	4961	3912	4720	2365	6201	3288	4378			1570	
1099	I-80 WESTBOUND	EAST OF CEDAR STREET INTERCHANGE	9357	13077	13540	10479	12501	8812	7666	6387	4863		3552	7193	4334	7561		7789	3790	
1100	I-80	EAST OF CEDAR STREET INTERCHANGE	18306	26356	27390	21155	24281	18321	14525	11748	9750		7330	14824	9108	15231		14729	7690	

1101	I-80 EASTBOUND	EAST OF CEDAR STREET INTERCHANGE	8949	13279	13850	10676	11780	9509	6859	5361	4887		3778	7631	4774	7670			6940	3900		
1120	I-80 WESTBOUND OFF RAMP	AT CEDAR STREET INTERCHANGE	2032	2918	2310	2350	2514	1779	2298	1826	1627		2160		1733					2380		
1123	I-80 WESTBOUND ON RAMP	AT CEDAR STREET INTERCHANGE	1658	2629	1640	1655	1618	1051	1110	1663	859		972		820					110		
1125	I-80 EASTBOUND OFF RAMP	AT CEDAR STREET INTERCHANGE	2165	6061	4280	4079	1513	861	856	1192	596		705		653					90		
1126	I-80 EASTBOUND OFF RAMP	AT CEDAR STREET INTERCHANGE	1695	2450	1330	1377																
1127	I-80 EASTBOUND ON RAMP	AT CEDAR STREET INTERCHANGE	1814	2247	2080	1996	2244	1774	2351	1592	1571		2118		1687					2420		
1140	I-80 WESTBOUND OFF RAMP	AT HIGLEY STREET INTERCHANGE	1630	1971	1430	1724	1622	1463	1396	2142	1577		410		395							
1142	I-80 WESTBOUND ON RAMP	AT HIGLEY STREET INTERCHANGE	1578	1459	1100	1207	1476	1039	823	1104	1242		240		157							
1145	I-80 EASTBOUND OFF RAMP	AT HIGLEY STREET INTERCHANGE	1177	1764	1030	1525	1863	1299	1230	914	1491		164		184							
1147	I-80 EASTBOUND ON RAMP	AT HIGLEY STREET INTERCHANGE	1723	2195	1330	1853	2154	1677	1344	1491	1602		427		355							
1160	I-80 WESTBOUND OFF RAMP	AT SPRUCE STREET INTERCHANGE	399	685	600	567	674	431	571	571	524		563		502	904			1179	380		
1162	I-80 WESTBOUND ON RAMP	AT SPRUCE STREET INTERCHANGE	1152	1004	1560	1272	1477	1163	1295	1420	976		1466		1478					1850		
1165	I-80 EASTBOUND OFF RAMP	AT SPRUCE STREET INTERCHANGE	1313	1283	1440	1590	1746	1136	1552	1326	1105		1606		1653					1650		
1167	I-80 EASTBOUND ON RAMP	AT SPRUCE STREET INTERCHANGE	453	934	640	487	713	490	544	566	491		514		492					350		
1200	INVERNESS BOULEVARD	EAST OF U.S. 287 MARGINAL	170	3624	3709	3583	4209	3361	3161	3124	3238		1965			3417						
1205	INVERNESS BOULEVARD	EAST OF DUNPHAIL DRIVE	746	813	1024	830	982		677	795												
1210	INVERNESS BOULEVARD	SOUTH OF GLASGOW BOULEVARD	517	494	693	490	548	470		763			254									
1230	INVERNESS BOULEVARD	NORTH OF GLASGOW BOULEVARD	484	522	501	504	571				391											
1240	INVERNESS BOULEVARD	SOUTH OF ABERDEEN BOULEVARD	552	583	494	247	601	511	334	489			502									
1245	INVERNESS BOULEVARD	NORTH OF ABERDEEN BOULEVARD	496	526	497	466	532		184	415			404									
1248	INVERNESS BOULEVARD	NORTH OF CROSS STREET NORTH OF ABERDEEN																				
1260	JACKSON STREET	AT THE VIADUCT	2352	3533	3380	3630	4009	3218	4213	2950	3608		3359			5347				3107	3037	3388
1265	JACKSON STREET	NORTH OF HUGUS STREET				3630	4009	3218	3513	2950	3337		4335									
1270	JACKSON STREET	SOUTH OF HUGUS STREET		2472	2176	2484	2524	3199	2160	2760	2206		2446			2764			2006			
1275	JACKSON STRET	SOUTH OF DAVIS STREET		1623	987	1425	1360	1078	1143	1301												
1280	JACKSON STREET	SOUTH OF DONNEL STREET	819	1382	902	1135	1098	860	1005	802	776		762		570							
1320	LARSEN STREET	WEST OF U.S. 287	527	958	497	447		609	634	412	357					446						
1321	LARSEN STREET	WEST OF PACIFIC STREET	447	497	483	362	504															
1370	LOCUST STREET	EAST OF HIGLEY BOULEVARD	565	865	293	301	441	212	312	277	1051		1340		185							
1375	KOONTZ STREET	SOUTH OF DALEY STREET	1652	1712	1662	1434	1422															
1400	MAPLE STREET	EAST OF 10TH STREET	249	498	323	337	302						462									
1428	MAHONEY STREET	WEST OF U.S. 287 MARGINAL	2390	2833	944	1140	816															
1430	MAHONEY STREET	EAST OF U.S. 287 MARGINAL	2844	3947	350	2728	824	2152					2084									
1435	MAHONEY STREET	EAST OF PLAZA STREET	191	536	220	1025	824	493														
1440	MONTANA STREET	SOUTH OF BROOKS STREET	35	43	39	115	64	57														
1450	MURRAY STREET	EAST OF 3RD STREET/U.S. 287	1355	1523	1631	1482	1572		1815	1562	1699		1919			2548			1284			
1455	MURRAY STREET	WEST OF COLORADO STREET	1388	1551	1671	1573	1508		1815	1511	1683		2061			2475						
1460	MURRAY STREET	EAST OF COLORADO STREET	2044	2347	2576	2208	2444	1569	2670	2103	2517		2986			3590			1111			
1465	MURRAY STREET	WEST OF RODEO STREET	2207	2463	2617	2448	2482	1689		2229												
1470	MURRAY STREET	EAST OF RODEO STREET	2384	2756	2794	2591	2625	1797		2286												
1475	MURRAY STREET	WEST OF HARSHMAN STREET	2429	2814	2802	2840	2584	2210	2528	2279	2658		3326			3806	2373		1224			
1480	MURRAY STREET	EAST OF HARSHMAN STREET	2937	3192	2943	2961	2827	2543	2378	2533	3176		3616			3784						
1485	MURRAY STREET	WEST OF U.S. 287 MARGINAL	2903	4195	2837	2893	2854	2403	2902	2466	3158		3436			3171						
1490	MURRAY STREET	EAST OF U.S. 287 MARGINAL	2926		1467	1545	2221	1591	1835	784	3805		3310			1774						
1492	MURRAY STREET	WEST OF EDINBURGH STREET	1382		1205	1349																
1495	MURRAY STREET	EAST OF EDINBURGH STREET	845		1153	983	1062			666												
1500	MURRAY STREET	WEST OF AIRPORT ROAD	556		562	532	593		475	410			348									
1552	NIEMAN STREET	WEST OF 11TH STREET	108	162	209	269	144	122														
1570	PACIFIC STREET	SOUTH OF NEVADA ST	507	589	510	553	701			429			596									
1580	PACIFIC STREET	SOUTH OF LARSEN ST	44	62	61	53	68															
1600	PENITENTIARY ROAD (WYO 78)	NORTH OF PEN SOUTH OF I-80		872	906	1115	1470	731	734	764	703								60	71		
1610	PINE STREET	EAST OF 2ND STREET	308	252	448	404	447						578									
1620	PINE STREET	WEST OF 3RD STREET	445		606	571	558	384		513			882									
1630	PINE STREET	EAST OF 5TH STREET	542	1002	675	612	582			604												
1640	PINE STREET	EAST OF 6TH STREET	507	1050	616	729	639	648					1128									
1650	PINE STREET	WEST OF 6TH STREET	641	907	872	833	1061	1000					732									
1660	PINE STREET	EAST OF 10TH STREET	296	362	477	224	356						380									
1670	RODEO STREET	SOUTH OF MURRAY STREET	336	367	363		335	325		323	230		458						454			
1680	RODEO STREET	NORTH OF DALEY STREET	494	538	547	522	489	467		469												
1685	RODEO STREET	SOUTH OF DALEY STREET	489	669	727	724	709	621		487			634									
1690	RODEO STREET	NORTH OF WALNUT STREET	499			816	713			564												
1695	RODEO STREET	SOUTH OF WALNUT STREET	307			464	413			367			406									
1700	RODEO STREET	NORTH OF SPRUCE STREET	314	344	426	418	422			297	425								547			
1710	SCARLET DRIVE	WEST OF 3RD STREET	215	214	247	287	163			88			78									
1720	SERVICE ROAD -Removed	SOUTH OF I-80 WEST INTERCHANGE		209	453	166	157		152	119	165		191									
1725	SERVICE ROAD	SOUTHEAST OF THAYER	23	220	41	39	68		71													
1740	SPRUCE STREET	WEST OF 23RD STREET	3374	3892	2382	3422	4556	2966	4026	3723	3483	5437		4446		5800		8582				
1745	SPRUCE STREET WESTBOUND	EAST OF 23RD STREET	2233	2462	2906	2195	2756		4907	4881	4879		6038		5841	8094			9191	3850		
1746	SPRUCE STREET	EAST OF 23RD STREET	4579	5026	5850	4423	5816		4907	4881	4879		6038		5841	8094			9191	3850		
1747	SPRUCE STREET EASTBOUND	EAST OF 23RD STREET	2346	2564	2944	2228	3060															

1759	SPRUCE STREET WESTBOUND	WEST OF 18TH STREET	1836	2941	3254	2774	3338		5681	6116	6339		6348									
1760	SPRUCE STREET	WEST OF 18TH STREET	4670	5870	6664	5593	6851		5681	6116	6339		6348									
1761	SPRUCE STREET EASTBOUND	WEST OF 18TH STREET	2834	2929	3410	2819	3513															
1763	SPRUCE STREET WESTBOUND	EAST OF 18TH STREET	3215	3557	4214	3437	4305			7565	8469		10821									
1764	SPRUCE STREET	EAST OF 18TH STREET	6584	7128	8262	7155	8732			7565	8469		10821									
1765	SPRUCE STREET EASTBOUND	EAST OF 18TH STREET	3369	3571	4048	3718	4427															
1770	SPRUCE STREET WESTBOUND	WEST OF 15TH STREET	3522		4341	3855	4592	7777	7681													
1771	SPRUCE STREET	WEST OF 15TH STREET	7114		8610	7734	9297	7777	7681													
1772	SPRUCE STREET EASTBOUND	WEST OF 15TH STREET	3592		4269	3879	4705															
1773	SPRUCE STREET WESTBOUND	EAST OF 15TH STREET	3724		4601	4290	4975	8116	8430	8110	9551											
1774	SPRUCE STREET	EAST OF 15TH STREET	7361		9119	8604	9845	8116	8430	8110	9551											
1775	SPRUCE STREET EASTBOUND	EAST OF 15TH STREET	3637		4518	4314	4870															
1780	SPRUCE STREET WESTBOUND	WEST OF 12TH STREET	3844		4831	4465	5140			8647			12627									
1781	SPRUCE STREET	WEST OF 12TH STREET	7749		9557	9016	10333			8647			12627									
1782	SPRUCE STREET EASTBOUND	WEST OF 12TH STREET	3905		4726	4551	5193															
1784	SPRUCE STREET WESTBOUND	WEST OF 11TH STREET	3937	3913	4943	4550	5183	8952	9221	8913	10526					15408			15082			
1785	SPRUCE STREET	WEST OF 11TH STREET	7971	7922	9833	9246	10577	8952	9221	8913	10526					15408			15082			
1786	SPRUCE STREET EASTBOUND	WEST OF 11TH STREET	4034	4009	4890	4696	5394															
1789	SPRUCE STREET WESTBOUND	EAST OF 11TH STREET	4130	3837	5114	4709	5339		9421	9419	10783		12594			15152						
1790	SPRUCE STREET	EAST OF 11TH STREET	8328	7876	10157	9575	10776		9421	9419	10783		12594			15152						
1791	SPRUCE STREET EASTBOUND	EAST OF 11TH STREET	4198	4039	5043	4866	5437															
1792	SPRUCE STREET WESTBOUND	EAST OF 10TH STREET	4089		5216	4664	5317	9570														
1793	SPRUCE STREET	EAST OF 10TH STREET	8414		10603	9884	10950	9570														
1794	SPRUCE STREET EASTBOUND	EAST OF 10TH STREET	4325		5387	5220	5633															
1796	SPRUCE STREET WESTBOUND	WEST OF 7TH STREET	4379		5415	4898	5507		9775	9427	11605											
1797	SPRUCE STREET	WEST OF 7TH STREET	8979		10990	10071	11260		9775	9427	11605											
1798	SPRUCE STREET EASTBOUND	WEST OF 7TH STREET	4600		5575	5173	5753															
1800	SPRUCE STREET WESTBOUND	WEST OF 6TH STREET	4543		5483	5093	5653	10302	10300	9778	12206		13489					12503				
1801	SPRUCE STREET	WEST OF 6TH STREET	9439		11471	10772	11793	10302	10300	9778	12206		13489					12503				
1802	SPRUCE STREET EASTBOUND	WEST OF 6TH STREET	4896		5988	5679	6140															
1803	SPRUCE STREET WESTBOUND	EAST OF 6TH STREET	4133		4955	4565	5173	9260	9531	8895			12621			16034		12503	10985			
1804	SPRUCE STREET	EAST OF 6TH STREET	8759		10319	9563	10640	9260	9531	8895			12621			16034		12503	10985			
1805	SPRUCE STREET EASTBOUND	EAST OF 6TH STREET	4626		5364	4998	5467															
1809	SPRUCE STREET WESTBOUND	EAST OF 5TH STREET	3936		4634	4246	4687			5562												
1810	SPRUCE STREET	EAST OF 5TH STREET	8305		9566	8794	9533			5562												
1811	SPRUCE STREET EASTBOUND	EAST OF 5TH STREET	4369		4932	4548	4846															
1814	SPRUCE STREET WESTBOUND	WEST OF 3RD STREET	3936		4568	4187	4589	7502	7803	6479	7058	6787		8929		10761	6626					1490
1815	SPRUCE STREET	WEST OF 3RD STREET	8212		9486	8607	9324	7502	7803	6479	7058	6787		8929		10761	6626					1490
1816	SPRUCE STREET EASTBOUND	WEST OF 3RD STREET	4276		4918	4420	4735															
1820	SPRUCE STREET	EAST OF 3RD STREET	1768		2126	1767	1832	1466		1437	2303		2137			3062			1651			
1825	SPRUCE STREET	WEST OF COLORADO STREET	1537	482	2015	1594	1613	1478	1323	1588	1615		1779						1092			
1830	SPRUCE STREET	EAST OF COLORADO STREET	1285	633	1793	1284	1331	1348	783	1411	1312								901			
1835	SPRUCE STREET	WEST OF RODEO STREET	1425	797	1819	1443	1427			1175			1531									
1840	SPRUCE STREET	EAST OF RODEO STREET	1327	790	1576	1267	1208			1082												
1845	SPRUCE STREET	WEST OF HARSHMAN STREET	1287	767	1556	1486	1168			1073	1146		1411						1152			
1868	STATE STREET	WEST OF JACKSON STREET	96	77	120	101	143	92														
1870	STATE STREET	EAST OF JACKSON STREET	171	179	286	347		234		300												
1880	STATE STREET	WEST OF WASHINGTON STREET	553	540	672	686	769	500	525	944	815		930									
1885	STATE STREET	EAST OF WASHINGTON STREET	1480		1835	1661	1479	1359	1239	1546	1572		1148									
1890	STATE STREET	NORTHWEST OF HIGLEY BOULEVARD	1091		898	968	925	536	626	734	938		824									
1895	STATE STREET	SOUTH OF HIGLEY BOULEVARD	747			618	561			421	469		802									
1899	U.S. 30 WESTBOUND	EAST OF JCT WITH U.S. 287 MARGINAL	3812	5631	3770	3726	3637	6956	5566	5174	4995	5333	6060	6646		8857		9804				
1900	U.S. 30	EAST OF JCT WITH U.S. 287 MARGINAL	7709	11081	7646	7600	7435	6956	5566	5174	4995	5333	6060	6646		8857		9804				
1901	U.S. 30 EASTBOUND	EAST OF JCT WITH U.S. 287 MARGINAL	3897	5450	3876	3874	3798															
1910	U.S. 30 WESTBOUND	WEST OF AIRPORT ROAD	3767	5650	3698	3635	3533		5130	5261												
1911	U.S. 30	WEST OF AIRPORT ROAD	7673	11147	7473	7369	7302		5130	5261												
1912	U.S. 30 EASTBOUND	WEST OF AIRPORT ROAD	3906	5497	3775	3734	3769															
1915	U.S. 30 WESTBOUND	EAST OF AIRPORT ROAD	3708	5768	4142	4056	3628	6097	6660	5900												
1916	U.S. 30	EAST OF AIRPORT ROAD	7518	11280	8325	8083	7410	6097	6660	5900												
1917	U.S. 30 EASTBOUND	EAST OF AIRPORT ROAD	3810	5512	4183	4027	3782															
1920	U.S. 30 WESTBOUND	WEST OF I-80 RAMPS EAST INTERCHANGE	3766		4142	4056	3891	6017	6944	5900	5060		6271						8185	5160		
1921	U.S. 30	WEST OF I-80 RAMPS EAST INTERCHANGE	7565		8326	8083	7975	6017	6944	5900	5060		6271						8185	5160		
1922	U.S. 30 EASTBOUND	WEST OF I-80 RAMPS EAST INTERCHANGE	3799		4184	4027	4084															
1930	U.S. 287 MARGINAL	NORTH OF JCT WITH U.S. 30	8668	12287	8583	8572	9160	7070	6897	6958	7139	7180	8236	8165		8021		6357	4555			
1933	U.S. 287 MARGINAL	SOUTH OF MAHONEY STREET	7150	10095	6824	6943	7077	5466														
1935	U.S. 287 MARGINAL	SOUTH OF DALEY STREET	7763	10902	7220	7115	7268	5661	5474	5216	5429											
1940	U.S. 287 MARGINAL	NORTH OF DALEY STREET	7175	10479	6817	6770	6793			5439	5251		5988									
1945	U.S. 287 MARGINAL	SOUTH OF MURRAY STREET	6784	9677	6407	6274	6677	4531	5488	5439	4628					6233						
1950	U.S. 287 MARGINAL	NORTH OF MURRAY STREET	7023	9110	6719	6342	4209	5631		5468	4883		4640			5590	3792		2892			
1955	U.S. 287 MARGINAL	SOUTH OF INVERNESS BOULEVARD	6418	9069	6719	6342	6925	5631	5052	5468	4657											

1960	U.S. 287 MARGINAL	NORTH OF INVERNESS BOULEVARD	4952	6584	4482	3768	3962			3361	2643		2720			3320						
1965	U.S. 287 MARGINAL	SOUTH OF ABERDEEN BOULEVARD	4956	6631	4744	3768	3962	2830	3331	3361	2663											
1970	U.S. 287 MARGINAL	NORTH OF ABERDEEN BOULEVARD	4650	6232	4608	3913	3688			3597			2335									
1975	U.S. 287 MARGINAL	EAST OF JCT WITH U.S. 287	4563	6142	4522	3887	3849	3003	3781	3597	2555	2855	2556	3233		3015			1457			
2010	WALNUT STREET	WEST OF 15TH STREET	557	577	900	1251	875	696														
2020	WALNUT STREET	EAST OF 15TH STREET	204	232	271	266	295	254	212	949	812		383									
2025	WALNUT STREET	WEST OF 12TH STREET	348	422	422	398	444			649												
2030	WALNUT STREET	WEST OF 11TH STREET	393	519	557	574	351	480	558	729	537		731			609			400			
2035	WALNUT STREET	EAST OF 11TH STREET	620	932	691	658	709	604	693	925	781		1056			930			591			
2040	WALNUT STREET	WEST OF 7TH STREET	887	1325	980	962	919	732	766	1174	971		1160									
2045	WALNUT STREET	EAST OF 7TH STREET	2732	3863	3254	2972	3084	2708	2801	3254	3208		2834			3958						
2050	WALNUT STREET	EAST OF 6TH STREET	2731	4165	3196	2936	3102			3261												
2055	WALNUT STREET	WEST OF 3RD STREET	2729	2719	3243	3460	2908	2693	2928	3232	3062		2701			3994						
2060	WALNUT STREET	EAST OF 3RD STREET	2060	1941	1170	1208	1140	1073	1290	1209	1182		1454			1684						
2065	WALNUT STREET	WEST OF COLORADO STREET	924	1815	1123	1075	1124			1373			1349			1958			2654			
2070	WALNUT STREET	EAST OF COLORADO STREET	334	597	525	712	690	558		773			902			1385						
2075	WALNUT STREET	WEST OF RODEO STREET	238	407	374	466	414			407			371						518			
2100	WASHINGTON STREET	NORTH OF LOCUST STREET (WYO 71)	748	1784	831	840	904	768	800	861	985		714									
2105	WASHINGTON STREET	SOUTH OF DAVIS STREET	1771	3517	1752	1888	1998	989		2074					426	958						
2110	WASHINGTON STREET	SOUTH OF HUGUS STREET	2520	4040	3312	3080	3359	2032		2585	1070					2093						
2115	WASHINGTON STREET	NORTH OF HUGUS STREET	3832		4352	4650	4485		2226	3059	3119		3190			2988						
2120	WASHINGTON STREET	NORTH OF STATE STREET	4157	4444	4657	4780	4819	3129	3535	3825	4472											
2125	WASHINGTON STREET	AT THE RAILROAD UNDERPASS	4929	5425	5426	5680	5934	4374	4725	5629	5764		6637		5424	3856			5897			3976
2150	WYO 71	WEST OF HIGLEY BOULEVARD	1521	2924	1640	1707	1940		1695	1540	1696		1293		679							
2155	WYO 71	EAST OF WASHINGTON STREET	1485	2923	1612	1653	1909	1498	1688													
2160	WYO 71	WEST OF WASHINGTON STREET		1440	979	1057	1207	961		846	884											
2165	WYO 71	EAST OF JACKSON STREET	898	1447	979	1051	1207		1054	846	865		811		606							
2170	WYO 71	WEST OF JACKSON STREET		515	330	309	422		217	181					238							
2175	WYO 71	EAST OF DAVIS STREET	393	514	332	309	422	196		181	229		309		108							
2180	WYO 71	NORTH OF I-80	378	496	362	342	493	184	233	179	224		301	401	301	576		395	500			
2185	WYO 71	NORTH OF FERRIS CROSSING ROAD	298		331	376	287	137	200	164	201											
2190	WYO 71	SOUTH OF FERRIS CROSSING ROAD	303		291	250	244	114		133	170		172									
2200	WYO 76	EAST OF I-80 ON RAMPS EAST	649	857	567	735	543	527	472	621	530		418	486								

VOLUME STUDY

1/3

FOR MEDFORD, OREGON

APPENDIX H

Analysis of Functional Classification System Changes

2/3

LOCAL - COMM./IND.

LOCAL RESIDENTIAL

Table H-1
Existing Functional Classification Standards

Feature	Arterial Streets	Collector Streets	Standard Residential (1)	Minor Residential
Right-of-way width	96 feet	74 feet	62 feet	55 feet
Curb-to-curb width	66 feet	44 feet	36 feet	28 feet
Travel Lanes	4	2	2	2
Turn Lanes	1 (2)	1 (3)	No	No
Bike Lanes	2 @ 5' (4)	2 @ 5' (4)	No	No
On-Street Parking Lane	No	No	Both sides	Both sides
Planter Strip	10 feet	10 feet	8 feet	8 feet
Sidewalks	2 @ 5' (5)	2 @ 5' (5)	2 @ 5'	2 @ 5'
Typical Range of Daily Traffic Volumes	15,000 - 50,000 ADT	3,000 - 15,000 ADT	1,500 - 3,000 ADT	1,500 ADT max

Source: City of Medford, 2002 (except for range of daily traffic volumes)

(1) Features of commercial, industrial and standard residential are all the same. The classification depends on adjacent zoning with a specific designation being made at the time of development review.
(2) At all intersections where turns are allowed.
(3) Where required at or between intersections.
(4) Bicycle lanes will be provided on all new collector and arterial street construction (ODC Chapter 10, Table IV-1).
(5) Unless located in downtown or where adjacent to the curb and on an arterial or collector street where the sidewalk should be 7 feet wide.

Non-vehicular modes also need to be considered in functional classification designations. The Transportation Planning Rule (TPR) requires that bicycle facilities (typically bicycle lanes) and pedestrian facilities (typically sidewalks) be provided on arterial and major collector streets. The City's existing cross-sections for all publicly-maintained arterial and collector roadways include bicycle and pedestrian facilities on both sides with one exception. On streets with a 10-foot shared bikeway on one side, only a sidewalk is required on the side of the street opposite the bikeway. Existing standard and minor residential street cross-sections require sidewalks on both sides but bicycle lanes are not required. Residential lanes and minimum access streets are not required to have bicycle lanes, but sidewalks are required along one side of residential lanes.

Policy Context

The *Regional Transportation Plan (RTP)*, prepared for the greater Medford urban area by the Rogue Valley Council of Governments and adopted in 2002, establishes policy direction for creating and updating a street classification system within the Medford UGB. The RTP recognizes the need to "*Create an integrated and linked network of arterial and collector streets that serves the mobility and multimodal travel needs of the region ...*" (Policy 3-1.3)

The City's existing *Comprehensive Plan* also contains goals, policies and implementation strategies that address street classification. Specifically, the *Comprehensive Plan* provides that *"Streets shall be designated as arterial streets, and officially identified as such in the Arterial Streets Plan. All other streets shall function as collectors or residential streets"* (Goal 2, Policy 1). The Comprehensive Plan further establishes as policy the intent that *"Streets shall be designated as arterial streets in advance of actual function, thereby allowing for the application of the proper planning criteria necessary to integrate the street function into the adjacent land use pattern with minimum impact to neighborhood*

Table H-2
Functional Classification Evaluation Factors

Classification	Functions	Forecast Year Average Daily Traffic (ADT)	Desired Spacing (miles)	Land Access Function	Minimum Intersection Spacing	Speed Limit (mph)	On-Street Parking
Major Arterial	Primary: regional and sub-regional traffic movement Secondary: land access	15,000 or more	1-2 miles	Limited to major generators	½ mile	35-45	Prohibited
Minor Arterial	Primary: sub-regional traffic movement Secondary: land access	10,000 to 15,000	½ to 1 mile	Some movements restricted; driveway spacing controlled	¼ mile	30-40	Prohibited
Major Collector	Primary: traffic collection/distribution between local and arterial streets Secondary: land access	5,000 to 10,000	½ mile	Limited regulation; subject to safety controls	300 feet	25-35	Limited
Minor Collector	Primary: Inter-neighborhood traffic and direct land access	2,500 to 5,000	¼ mile	Subject to safety controls only	300 feet	25-30	Allowed

Sources: *Transportation and Land Development,* Institute of Transportation Engineers; The Traffic Institute, Northwestern University; Parametrix.

3/3

ASPHALT AND AGGREGATE THICKNESS CALCULATIONS

RAWLINS TRANSPORTATION PLAN

SAMPLE	MATERIAL DESCRIPTION	SYMBOL	CBR RANGE	CBR USED FOR CALCULATIONS	SURFACING RECOMMENDATIONS (ASPHALT THICKNESS/BASE THICKNESS) LOCAL - RESIDENTIAL (UP TO 1,500)	LOCAL - COMMERCIAL (1,500-3,000 ADT)	MINOR COLLECTOR (2,500-5,000 ADT)	MAJOR COLLECTOR (5,000-10,000 ADT)
1	Silty Sand	SM	10 - 40	15	4"/6"	4"/6"	4"/6"	4"/6"
2	Silty Sand	SM	10 - 40	15	4"/6"	4"/6"	4"/6"	4"/6"
3	Silty Sand	SM	10 - 40	15	4"/6"	4"/6"	4"/6"	4"/6"
4	Silty Sand	SM	10 - 40	15	4"/6"	4"/6"	4"/6"	4"/6"
5	Silty Clayey Sand	SC-SM	5 - 30	10	4"/6"	4"/6"	4"/6"	6"/6"

SAMPLE	MATERIAL DESCRIPTION	SYMBOL	CBR RANGE	CBR USED FOR CALCULATIONS	MINIMUM SURFACING (ASPHALT THICKNESS/BASE THICKNESS) LOCAL - RESIDENTIAL (UP TO 1,500)	LOCAL - COMMERCIAL (1,500-3,000 ADT)	MINOR COLLECTOR (2,500-5,000 ADT)	MAJOR COLLECTOR (5,000-10,000 ADT)
1	Silty Sand	SM	10 - 40	15	2"/5"	3"/5"	4"/4"	4"/6"
2	Silty Sand	SM	10 - 40	15	2"/5"	3"/5"	4"/4"	4"/6"
3	Silty Sand	SM	10 - 40	15	2"/5"	3"/5"	4"/4"	4"/6"
4	Silty Sand	SM	10 - 40	15	2"/5"	3"/5"	4"/4"	4"/6"
5	Silty Clayey Sand	SC-SM	5 - 30	10	3"/4"	4"/4"	4"/6"	5"/6"

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare Computer Software Product

WLC

Flexible Structural Design Module

Rawlins Transportation Master Plan
Samples 1 - 4
Local Residential - 1,500 ADT, 2% Trucks
Recommended Section

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	163,123
Initial Serviceability	4.2
Terminal Serviceability	2
Reliability Level	90 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	22,500 psi
Stage Construction	1
Calculated Design Structural Number	1.66 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	1,500
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	50 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	2 %
Average Initial Truck Factor (ESALs/truck)	1.25
Annual Truck Factor Growth Rate	1 %
Annual Truck Volume Growth Rate	1 %
Growth	Simple
Total Calculated Cumulative ESALs	163,123

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Crushed Base	0.14	1.1	6	12	0.92
2	AC	0.44	1.1	4	12	1.94
Total	-	-	-	10.00	-	2.86

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare Computer Software Product

WLC

Flexible Structural Design Module

Rawlins Transportation Master Plan
Samples 1 - 4
Local Residential - 1,500 ADT, 2% Trucks
Minimum Section

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	163,123
Initial Serviceability	4.2
Terminal Serviceability	2
Reliability Level	90 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	22,500 psi
Stage Construction	1
Calculated Design Structural Number	1.66 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	1,500
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	50 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	2 %
Average Initial Truck Factor (ESALs/truck)	1.25
Annual Truck Factor Growth Rate	1 %
Annual Truck Volume Growth Rate	1 %
Growth	Simple
Total Calculated Cumulative ESALs	163,123

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Crushed Base	0.14	1.1	5	12	0.77
2	AC	0.44	1.1	2	12	0.97
Total	-	-	-	7.00	-	1.74

*Note: This value is not represented by the inputs or an error occurred in calculation.

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Flexible Structural Design Module

Rawlins Transportation Master Plan
Samples 1 - 4
Local Commercial - 3,000 ADT, 5% Trucks
Recommended Section

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	815,615
Initial Serviceability	4.2
Terminal Serviceability	2
Reliability Level	90 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	22,500 psi
Stage Construction	1
Calculated Design Structural Number	2.17 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	3,000
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	50 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	5 %
Average Initial Truck Factor (ESALs/truck)	1.25
Annual Truck Factor Growth Rate	1 %
Annual Truck Volume Growth Rate	1 %
Growth	Simple
Total Calculated Cumulative ESALs	815,615

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Crushed Base	0.14	1.1	6	12	0.92
2	AC	0.44	1.1	4	12	1.94
Total	-	-	-	10.00	-	2.86

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Flexible Structural Design Module

Rawlins Transportation Master Plan
Samples 1 - 4
Local Commercial - 3,000 ADT, 5% Trucks
Minimum Section

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	815,615
Initial Serviceability	4.2
Terminal Serviceability	2
Reliability Level	90 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	22,500 psi
Stage Construction	1
Calculated Design Structural Number	2.17 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	3,000
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	50 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	5 %
Average Initial Truck Factor (ESALs/truck)	1.25
Annual Truck Factor Growth Rate	1 %
Annual Truck Volume Growth Rate	1 %
Growth	Simple
Total Calculated Cumulative ESALs	815,615

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Crushed Base	0.14	1.1	5	12	0.77
2	AC	0.44	1.1	3	12	1.45
Total	-	-	-	8.00	-	2.22

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Flexible Structural Design Module

Rawlins Transportation Master Plan
Samples 1 - 4
Minor Collector - 5,000 ADT, 5% Trucks
Recommended Section

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	1,359,358
Initial Serviceability	4.2
Terminal Serviceability	2
Reliability Level	90 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	22,500 psi
Stage Construction	1
Calculated Design Structural Number	2.35 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	5,000
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	50 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	5 %
Average Initial Truck Factor (ESALs/truck)	1.25
Annual Truck Factor Growth Rate	1 %
Annual Truck Volume Growth Rate	1 %
Growth	Simple
Total Calculated Cumulative ESALs	1,359,358

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Crushed Base	0.14	1.1	6	12	0.92
2	AC	0.44	1.1	4	12	1.94
Total	-	-	-	10.00	-	2.86

1993 AASHTO Pavement Design

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Flexible Structural Design Module

Rawlins Transportation Master Plan
Samples 1 - 4
Minor Collector - 5,000 ADT, 5% Trucks
Minimum Section

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	1,359,358
Initial Serviceability	4.2
Terminal Serviceability	2
Reliability Level	90 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	22,500 psi
Stage Construction	1
Calculated Design Structural Number	2.35 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	5,000
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	50 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	5 %
Average Initial Truck Factor (ESALs/truck)	1.25
Annual Truck Factor Growth Rate	1 %
Annual Truck Volume Growth Rate	1 %
Growth	Simple
Total Calculated Cumulative ESALs	1,359,358

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Crushed Base	0.14	1.1	4	12	0.62
2	AC	0.44	1.1	4	12	1.94
Total	-	-	-	8.00	-	2.55

1993 AASHTO Pavement Design

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Computer Software Product
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Flexible Structural Design Module

Rawlins Transportation Master Plan
Samples 1 - 4
Major Collector - 10,000 ADT, 8% Trucks
Recommended Section

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	4,349,945
Initial Serviceability	4.2
Terminal Serviceability	2
Reliability Level	90 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	22,500 psi
Stage Construction	1
Calculated Design Structural Number	2.82 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	10,000
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	50 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	8 %
Average Initial Truck Factor (ESALs/truck)	1.25
Annual Truck Factor Growth Rate	1 %
Annual Truck Volume Growth Rate	1 %
Growth	Simple
Total Calculated Cumulative ESALs	4,349,945

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Crushed Base	0.14	1.1	6	12	0.92
2	AC	0.44	1.1	4	12	1.94
Total	-	-	-	10.00	-	2.86

1993 AASHTO Pavement Design

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Flexible Structural Design Module

Rawlins Transportation Master Plan
Samples 1 - 4
Major Collector - 10,000 ADT, 8% Trucks
Minimum Section

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	4,349,945
Initial Serviceability	4.2
Terminal Serviceability	2
Reliability Level	90 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	22,500 psi
Stage Construction	1
Calculated Design Structural Number	2.82 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	10,000
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	50 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	8 %
Average Initial Truck Factor (ESALs/truck)	1.25
Annual Truck Factor Growth Rate	1 %
Annual Truck Volume Growth Rate	1 %
Growth	Simple
Total Calculated Cumulative ESALs	4,349,945

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Crushed Base	0.14	1.1	6	12	0.92
2	AC	0.44	1.1	4	12	1.94
Total	-	-	-	10.00	-	2.86

1993 AASHTO Pavement Design

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Flexible Structural Design Module

Rawlins Transportation Master Plan
Sample 5
Local Residential - 1,500 ADT, 2% Trucks
Recommended Section

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	163,123
Initial Serviceability	4.2
Terminal Serviceability	2
Reliability Level	90 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	15,000 psi
Stage Construction	1
Calculated Design Structural Number	1.95 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	1,500
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	50 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	2 %
Average Initial Truck Factor (ESALs/truck)	1.25
Annual Truck Factor Growth Rate	1 %
Annual Truck Volume Growth Rate	1 %
Growth	Simple
Total Calculated Cumulative ESALs	163,123

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Crushed Base	0.14	1.1	6	12	0.92
2	AC	0.44	1.1	4	12	1.94
Total	-	-	-	10.00	-	2.86

*Note: This value is not represented by the inputs or an error occurred in calculation.

1993 AASHTO Pavement Design

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Flexible Structural Design Module

Rawlins Transportation Master Plan
Sample 5
Local Residential - 1,500 ADT, 2% Trrucks
Minimum Section

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	163,123
Initial Serviceability	4.2
Terminal Serviceability	2
Reliability Level	90 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	15,000 psi
Stage Construction	1
Calculated Design Structural Number	1.95 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	1,500
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	50 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	2 %
Average Initial Truck Factor (ESALs/truck)	1.25
Annual Truck Factor Growth Rate	1 %
Annual Truck Volume Growth Rate	1 %
Growth	Simple
Total Calculated Cumulative ESALs	163,123

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Crushed Base	0.14	1.1	4	12	0.62
2	AC	0.44	1.1	3	12	1.45
Total	-	-	-	7.00	-	2.07

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Flexible Structural Design Module

Rawlins Transportation Master Plan
Sample 5
Local Commercial - 3,000 ADT, 5% Trucks
Recommended Section

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	815,615
Initial Serviceability	4.2
Terminal Serviceability	2
Reliability Level	90 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	15,000 psi
Stage Construction	1
Calculated Design Structural Number	2.52 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	3,000
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	50 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	5 %
Average Initial Truck Factor (ESALs/truck)	1.25
Annual Truck Factor Growth Rate	1 %
Annual Truck Volume Growth Rate	1 %
Growth	Simple
Total Calculated Cumulative ESALs	815,615

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Crushed Base	0.14	1.1	6	12	0.92
2	AC	0.44	1.1	4	12	1.94
Total	-	-	-	10.00	-	2.86

1993 AASHTO Pavement Design

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Flexible Structural Design Module

Rawlins Transportation Master Plan
Sample 5
Local Commercial - 3,000 ADT, 5% Trucks
Minimum Section

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	815,615
Initial Serviceability	4.2
Terminal Serviceability	2
Reliability Level	90 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	15,000 psi
Stage Construction	1
Calculated Design Structural Number	2.52 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	3,000
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	50 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	5 %
Average Initial Truck Factor (ESALs/truck)	1.25
Annual Truck Factor Growth Rate	1 %
Annual Truck Volume Growth Rate	1 %
Growth	Simple
Total Calculated Cumulative ESALs	815,615

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Crushed Base	0.14	1.1	4	12	0.62
2	AC	0.44	1.1	4	12	1.94
Total	-	-	-	8.00	-	2.55

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

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Computer Software Product
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Flexible Structural Design Module

Rawlins Transportation Master Plan
Sample 5
Minor Collector - 5,000 ADT, 5% Trucks
Recommended Section

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	1,359,358
Initial Serviceability	4.2
Terminal Serviceability	2
Reliability Level	90 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	15,000 psi
Stage Construction	1
Calculated Design Structural Number	2.73 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	5,000
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	50 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	5 %
Average Initial Truck Factor (ESALs/truck)	1.25
Annual Truck Factor Growth Rate	1 %
Annual Truck Volume Growth Rate	1 %
Growth	Simple
Total Calculated Cumulative ESALs	1,359,358

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Crushed Base	0.14	1.1	6	12	0.92
2	AC	0.44	1.1	4	12	1.94
Total	-	-	-	10.00	-	2.86

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

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Flexible Structural Design Module

Rawlins Transportation Master Plan
Sample 5
Minor Collector - 5,000 ADT, 5% Trucks
Minimum Section

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	1,359,358
Initial Serviceability	4.2
Terminal Serviceability	2
Reliability Level	90 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	15,000 psi
Stage Construction	1
Calculated Design Structural Number	2.73 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	5,000
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	50 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	5 %
Average Initial Truck Factor (ESALs/truck)	1.25
Annual Truck Factor Growth Rate	1 %
Annual Truck Volume Growth Rate	1 %
Growth	Simple
Total Calculated Cumulative ESALs	1,359,358

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Crushed Base	0.14	1.1	6	12	0.92
2	AC	0.44	1.1	4	12	1.94
Total	-	-	-	10.00	-	2.86

*Note: This value is not represented by the inputs or an error occurred in calculation.

1993 AASHTO Pavement Design

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Flexible Structural Design Module

Rawlins Transportation Master Plan
Sample 5
Major Collector - 10,000 ADT, 8% Trucks
Recommended Section

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	4,349,945
Initial Serviceability	4.2
Terminal Serviceability	2
Reliability Level	90 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	15,000 psi
Stage Construction	1
Calculated Design Structural Number	3.25 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	10,000
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	50 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	8 %
Average Initial Truck Factor (ESALs/truck)	1.25
Annual Truck Factor Growth Rate	1 %
Annual Truck Volume Growth Rate	1 %
Growth	Simple
Total Calculated Cumulative ESALs	4,349,945

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Crushed Base	0.14	1.1	6	12	0.92
2	AC	0.44	1.1	6	12	2.90
Total	-	-	-	12.00	-	3.83

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Flexible Structural Design Module

Rawlins Transportation Master Plan
Sample 5
Major Collector - 10,000 ADT, 8% Trucks
Minimum Section

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	4,349,945
Initial Serviceability	4.2
Terminal Serviceability	2
Reliability Level	90 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	15,000 psi
Stage Construction	1
Calculated Design Structural Number	3.25 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	10,000
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	50 %
Percent Trucks in Design Direction	100 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	8 %
Average Initial Truck Factor (ESALs/truck)	1.25
Annual Truck Factor Growth Rate	1 %
Annual Truck Volume Growth Rate	1 %
Growth	Simple
Total Calculated Cumulative ESALs	4,349,945

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Crushed Base	0.14	1.1	6	12	0.92
2	AC	0.44	1.1	5	12	2.42
Total	-	-	-	11.00	-	3.34

TYPICAL PROPERTIES OF COMPACTED SOILS (NAVFAC DM 7.2, Table 1, p7.2-39)

Group Symbol	Soil Type	Range of Maximum Dry Unit Weight, pcf	Range of Optimum Moisture, Percent	Typical Value of Compression: At 1.4 tsf (20 psi) Percent of Original Height	Typical Value of Compression: At 3.6 tsf (50 psi) Percent of Original Height	Typical Strength Characteristics: Cohesion (as compacted) psf	Typical Strength Characteristics: Cohesion (saturated) psf	Typical Strength Characteristics: PHI (Effective Stress Friction Angle Degrees)	Typical Strength Characteristics: Tan PHI	Typical Coefficient of Permeability ft/miin.	Range of CBR Values	Range of Subgrade Modulus k lbs/cu in
GW	Well-graded clean gravels, gravel-sand mixture	125 - 135	11 - 8	0.3	0.6	0	0	>38	>0.79	5×10^{-2}	40 - 80	300 - 500
GP	Poorly graded clean gravels, gravel-sand mix	115 - 125	14 - 11	0.4	0.9	0	0	>37	>0.74	10^{-1}	30 - 60	250 - 400
GM	Silty gravels, poorly graded gravel-sand-silt	120 - 135	12 - 8	0.5	1.1	--	--	>34	>0.67	$>10^{-6}$	20 - 60	100 - 400
GC	Clayey gravels, poorly graded gravel-sand-clay	115 - 130	14 - 9	0.7	1.6	--	--	>31	>0.60	$>10^{-7}$	20 - 40	100 - 300
SW	Well graded clean sands, gravelly sands	110 - 130	16 - 9	0.6	1.2	0	0	38	0.79	$>10^{-3}$	20 - 40	200 - 300
SP	Poorly graded clean sands, sand-gravel mix	100 - 120	21 - 12	0.8	1.4	0	0	37	0.74	$>10^{-3}$	10 - 40	200 - 300
SM	Silty sands, poorly graded sand-silt mix	110 - 125	16 - 11	0.8	1.6	1050	420	34	0.67	5×10^{-5}	10 - 40	100 - 300
SM-SC	Sand-silt clay mix with slightly plastic fines.	110 - 130	15 - 11	0.8	1.4	1050	300	33	0.66	2×10^{-6}	5 - 30	100 - 300
SC	Clayey sands, poorly graded sand-clay-mix	105 - 125	19 - 11	1.1	2.2	1550	230	31	0.60	5×10^{-7}	5 - 20	100 - 300
ML	Inorganic silts and clayey silts	95 - 120	24 - 12	0.9	1.7	1400	190	32	0.62	$>10^{-5}$	15 or less	100 - 200
ML-CL	Mixture of inorganic silt and clay	100 - 120	22 - 12	1.0	2.2	1350	460	32	0.62	5×10^{-7}	--	--
CL	Inorganic clays of low to medium plasticity	95 - 120	24 - 12	1.3	2.5	1800	270	28	0.54	$>10^{-7}$	15 or less	50 - 200
OL	Organic silts and silt-clays, low plasticity	80 - 100	33 - 21	--	--	--	--	--	--	--	5 or less	50 - 100
MH	Inorganic clayey silts, plastic silts	70 - 95	40 - 24	2.0	3.8	1500	420	25	0.47	5×10^{-7}	10 or less	50 - 100
CH	Inorganic clays of high plasticity	75 - 105	36 - 19	2.6	3.9	2150	230	19	0.35	$>10^{-7}$	15 or less	50 - 150
OH	Organic clays and silty clays	65 - 100	45 - 21	--	--	--	--	--	--	--	5 or less	25 - 100

Notes: All properties are for Conditions of Standard Proctor maximum density, except values of k and CBR, which are for Modified Proctor maximum density. Typical strength values are effective strengths from USBR data. Compression values are for vertical loading with complete lateral confinement.

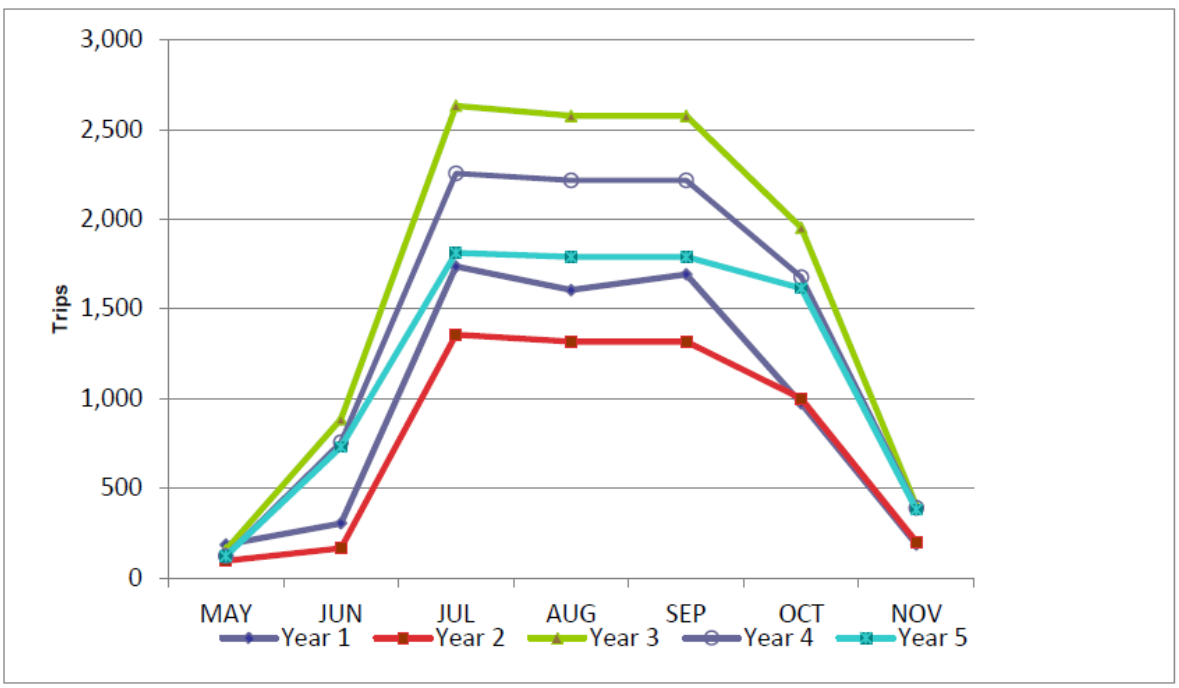
APPENDIX D:
CHOKECHERRY SIERRA MADRE EIS

CHOKECHERRY AND SIERRA MADRE FINAL EIS (CCSM EIS)

The CCSM EIS states the following regarding the chart shown below and traffic projections for the project. For additional details see the full CCSM EIS on the Bureau of Land Management website here: http://www.blm.gov/wy/st/en/info/NEPA/documents/rfo/Chokecherry.html

Average daily trips would be low to moderate at the beginning and end of each construction year, and rise to a peak during the summer and early fall. During Year 1, the majority of external trips would involve aggregate deliveries, comprising about two-thirds (1,154 trips/day) of the total 1,736 daily trips during the peak month of Year 1 (July). Work force commuting would account for virtually all of the remaining trips. Aggregate deliveries would originate at a yet to be identified location outside of the alternative boundary. Currently it is assumed that one third of all aggregate trips would originate north of Rawlins and access the project area via US 287, using the 287 bypass in Rawlins and I-80; one-third of the aggregate trips would originate west of Rawlins and one-third would originate east of Sinclair. All aggregate trips during Year 1 would access the project area via I-80/Exit 221, WY 71 and CR 407 (CIG Road).

After the RDF becomes operational, PCW anticipates deliveries of equipment and material to begin approximately 2 months ahead of the onset of actual construction activity. External traffic would decrease during Year 2, peaking at1 357 trips/day during the peak month (July), as aggregate and 90 percent of other deliveries arrive by rail and the construction workforce remains relatively moderate. No deliveries of WTGs are anticipated during Year 2.



Note: Estimates are 1-way trips, reflecting both inbound and outbound trips. On average, 50 percent of the trips would be in each direction. Outbound truck trips would generally involve empty trucks.

Source: PCW 2012b.

External traffic in Year 3 would peak at about 2,600 trips/day during July, August, and September. Year 4 peak external traffic during those months would be between 2,200 and 2,250 trips. For comparison, average daily traffic on WY 76 at a point north of the I-80 Exit 221 westbound off-ramp was 1,830 trips during August of 2010, which was the peak month of the year. During that same period, average daily traffic on WY 71 south of the I-80 underpass was 450 trips and average daily *traffic on CR 407 (CIG Road) south of I-80 was 120 trips. During the peak month of Year 3, workforce commuting would total about 80 percent of all external trips.*