WEST OF STEAMBOAT SPRINGS
US HIGHWAY 40 - NEPA STUDY

US 40 Highway NEPA Study - West of Steamboat Springs:
Traffic
Technical Memo

DRAFT

October 2009

City of Steamboat Springs
DOT
U.S. Department of Transportation Federal Highway Administration
ROUTT COUNTY Board of County Commissioners
JACOBS

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INTRODUCTION

This technical memo describes the methodology used to forecast future volumes in the West Steamboat Springs Area and the operational analysis of the no action and preferred alternatives. The focus of the projections was on US 40 from 13th Street to the Urban Growth Boundary approximately 5 miles west of side of downtown Steamboat Springs.

Since the area is not covered by a regional forecasting model, the project team had to base forecasts on historic traffic information, previous studies, existing land use plans, and developer plans for properties under consideration for annexation. Each of these pieces offered information that needed to be accounted for in the final methodology.

1. PREVIOUS STUDIES

The previously prepared studies that were specifically reviewed as a part of this study included:

1. *Northwest Transportation Planning Region 2035 Regional Transportation Plan*, Northwest Regional Planning Commission, Colorado Department of Transportation, January 2008
2. *State Transportation Improvement Program*, Colorado Department of Transportation, Adopted March 20, 2008
3. *Steamboat 700 Annexation Submittal*, Steamboat 700, LLC, November 2007
4. *Steamboat Springs Area Community Plan,* City of Steamboat Springs and Routt County, adopted May 2004
5. *Steamboat Springs Area Community Plan, Draft Transportation & Mobility Analysis,* City of Steamboat Springs, October 2003
6. *Steamboat Springs Area Open Space & Trails Master Plan,* City of Steamboat Springs Parks, Open Space & Recreational Services, August 2008
7. *US 40 Safety Assessment*, Colorado Department of Transportation, October 20, 2008
8. *Vision 2020*, First Report of Recommendations, September 1994
9. *West Steamboat Preliminary Buildout Analysis*, June 2008
10. *West Steamboat US 40 Access Plan*, City of Steamboat Springs, Routt County, Colorado Department of Transportation, January 31, 2008 draft

Brief summaries of the information contained in these reports that influenced the current study are included below:

1 The Northwest TPR 2035 RTP – Provided summary information on US 40 Transit Services, existing (2005) ADT's, projected 2035 ADT's and corridor vision information.

2 State TIP – Provides information on currently funded projects. Included in the study area is a resurfacing project from MP 131 (East of Elk River Road) to MP 134 (west of Downtown Steamboat). No other projects are currently identified by the STIP in the project area.

3 Steamboat 700 Annexation Submittal – This submittal includes the developers Traffic Impact Analysis based on their current development plans. This includes mixed multi use development with aggressive measures to increase transit ridership, pedestrian trips, bicycle trips, and other design features to try to minimize trips generated by their development.

4 Steamboat Springs Area Community Plan – The purpose of this plan was to "direct the type, location, and quality of growth, while addressing its impacts and reinforcing its desirable characteristics"[1]. Chapter 6 of this document describes the community vision for enhanced transit, pedestrian, and bicycle infrastructure. It also recognized and identified improvements necessary in the current study area. Specific roadway capacity improvements identified on US 40 west of 13th Street include:

   a 4 lanes between Elk River Road and 13th Street by 2008

   b 4 Lanes between Steamboat II and Elk River Road by 2022

   c 4 Lanes on Elk River Road between Downhill Drive and US 40 by 2027.

   d Expected congestion in years beyond 2027 at 13th. (Note 2 in table T-2 page 6-23 of Community Plan)

5 Steamboat Springs Area Community Plan, Draft Transportation & Mobility Plan – This plan prepared a forecast of traffic volumes in the Steamboat Springs area to identify improvements necessary to accommodate projected future traffic. The resulting recommendations for West Steamboat Springs include:

   a Four lanes from Steamboat II to 13th Street (completed in phases).

   b Yampa or Howlsen Extension to address congestion at 13th Street.

   c Intersection Improvements at Elk River Road and US 40. (The study evaluated the use of a roundabout at this intersection and concluded that because of the heavy through movements on US 40 and the need for 3 circulating lanes, a roundabout was not recommended. See the US-40 & Elk River Rd. Roundabout Analysis for more detail.)

6 Steamboat Springs Area Open Space & Trails Master Plan – Includes a vision plan for expansion of trail facilities including the core trail west of Steamboat Springs.

7 US 40 Safety Assessment – An assessment of historical crash patterns prepared by CDOT. This study concluded that given the traffic exposure and the accident frequency, the roadway was "performing better than average when compared to other statewide similar facilities"[2]identified 4 locations with concentrations of crashes. These were:

[1] Steamboat Springs Community Area Plan, City of Steamboat Springs and Routt County, adopted May 2004, page 1-3.
[2] US 40 Safety Assessment, Colorado Department of Transportation, October, 2008, page 13

a The curve between MP 126.9 and MP 127.2 (West of the Urban Growth Boundary – outside of the current study area). Countermeasures recommended included advanced warning signs/ beacons.

b The curve between MP 128.3 to MP 128.49 (between CR 42 and Slate Creek) Potential countermeasures identified included improving sight distance at the intersection with CR 42 and the advanced "T" intersection warning signs

c MP 130.27 to MP 130.40 (Between Evergreen Drive and County Shop Road). No countermeasures were identified since the recorded accidents were unrelated to site conditions.

d MP 130.50 to MP 130.70 (US 40 and Elk River Road Intersection). To address the nature of crashes occurring at this intersection, CDOT recommended considering a protected/permitted left turn phase for both US 40 approaches.

8 Vision 2020 – Provided a long term vision for the development of the Steamboat Springs area. Includes general recommendations for improvements to lessen the relative importance of roadways for transportation.

9 West Steamboat Preliminary Build-out Analysis (Provided by the City of Steamboat Springs)– This map provided information on the potential dwelling units and commercial development in the West Steamboat Springs area.

10 West Steamboat US 40 Access Plan – Drafted in January, 2008. Adopted by CDOT in September, 2008 this document guides the consolidation and locations of access to parcels along US 40. It identifies where access can occur and whether the access is Right in/ Right Out, ¾ (typically a left in along with the right turn movements), and full movement locations.

As part of the Access study, an analysis of roadway capacity and future volumes was included. This traffic analysis was used as the basis of background traffic for the Steamboat 700 Annexation Submittal analysis.

2. EXISTING TRAFFIC CONDITIONS

Currently in the project area there are three signalized intersections. All other intersections are two-way stop controlled on the side streets. Based on previous studies and comments from City Staff, CDOT staff, and residents, traffic currently is consistently delayed in the peak hour at two of the signalized intersections; Elk River Road and 13th Street.

The roadway is a rural 2 lane section from the western limit of the study area categorized by CDOT as NRA, Urban Regional Highway. At milepost 129 (east of CR 42) the CDOT categorization changes from NRA to NRB, Urban Arterial which it remains through the eastern boundary of the project area. At the more traveled intersections acceleration/deceleration lanes are provided. From Riverside Plaza (approx. MP 130) east the section becomes three lanes (two through lanes with a center two way left turn lane) with auxiliary lanes at major intersections.

Elk River Road is the first signal encountered from the west. Because of the skewed intersection geometry and insufficient turning radius to allow north/south left turning vehicles to

pass each other concurrently, the signal is set to run split phased. Split phasing means that the side streets are given green indications only one direction at a time, requiring excessive time be devoted to serving the side street movements and minimizing green time for US 40. Currently the US 40 movements are given 50 seconds of the total 90 second cycle. In addition there is currently a heavy Southbound to Eastbound left turn movement (and WB to NB right turn). These two factors cause the Elk River Road intersection to fail under existing peak hour conditions.

East of Elk River Road the section remains three lanes with auxiliary lanes to the entrance of Dream Island. Included in this section is a signal at the entrance to the Stockbridge Multimodal Center. At the entrance of Dream Island the section becomes 5 lanes (2 through lanes in each direction with a center two way left turn lane) which continues into downtown Steamboat Springs.

The Yampa Core Trail provides a physically separated bicycle/ pedestrian path from downtown Steamboat Springs to Shield Drive approximately one mile west of 13th Street. Intermittent sidewalks are provided throughout the corridor; but, the pedestrian facilities are unconnected discouraging pedestrian trips. Shoulders are provided next to the vehicle travelway in both directions of US 40. The shoulders provide space for bicycles trips, though the speed and proximity of vehicle traffic may also limit bicycle trips along the corridor especially west of downhill drive where convenient parallel routes are limited to non-existent.

Bus service is provided by Steamboat Springs Transit (SST) as far west as Steamboat Campground. The red line provides the western portion of SST's service. Transfers to the Blue line occur at the Stockbridge Multimodal Center where trips east are continued/ served. In addition to these local bus routes, SST provides a regional bus for AM and PM peak periods that serves Hayden and Craig as well as the West Steamboat area. Regional stops within the West Steamboat Springs study area are provided at Steamboat II, Riverside Drive, and the 7-11 just east of Elk River Road.

While these pedestrian, bicycle, and bus facilities provide important travel options for the corridor, they carry a small number of the overall daily trips in the corridor. Bus ridership and pedestrian/ bicycle estimates provided by the City of Steamboat Springs indicate that approximately 2% of all current trips in the corridor occur by these alternative transportation modes. These trips are not evaluated separately for operations purposes. However, the growth of alternative modes is taken into account as part of the future vehicle volume projections.

3. HISTORIC DATA

The Colorado Department of Transportation maintains a permanent count station on US 40 at milepost 135 (just west of Walton Creek Road). This count station records traffic volumes continuously throughout the year. **Figure 1** shows the monthly variation in daily trips recorded each month for the most recent 5 years of available data (from 2000 – 2005). July is the month with the highest traffic volumes while April is the lowest. (Note the volumes shown are for the EB direction at the count station.)

Figure 1: Monthly Variations in Daily Traffic

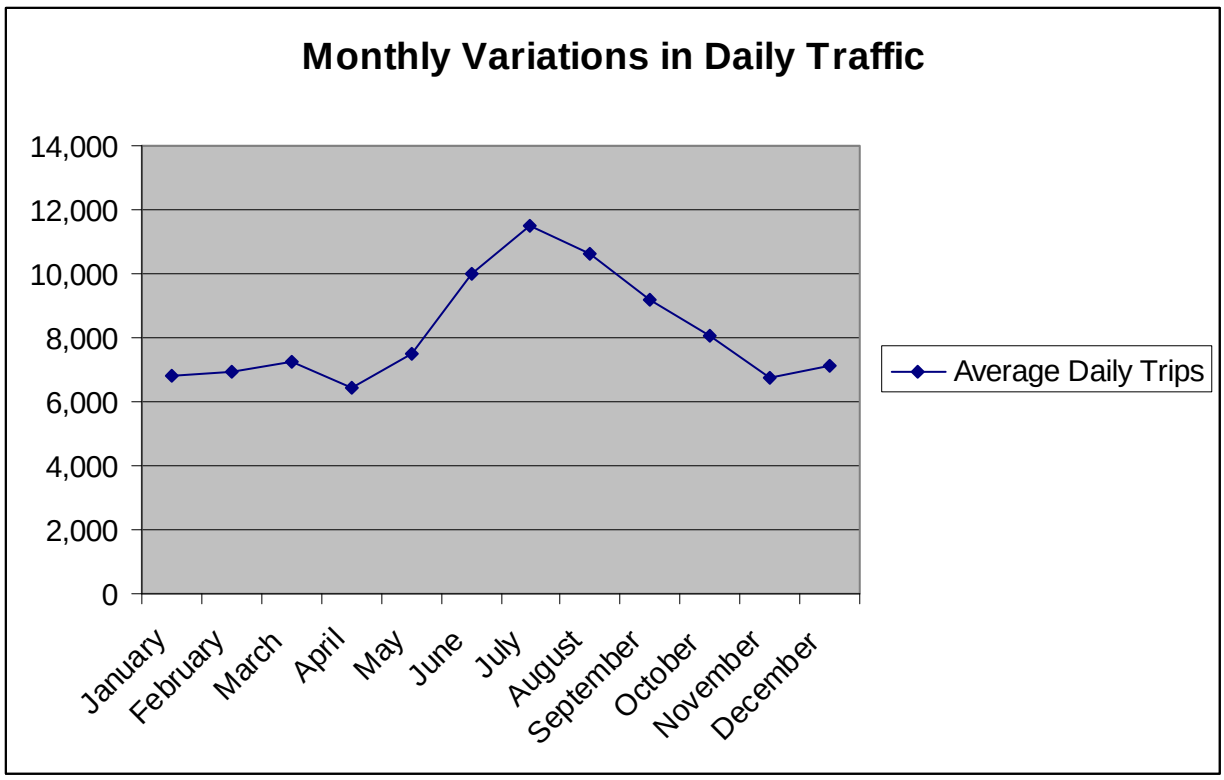


Table 1 shows the ratio of average trips between months. To convert the volumes collected in December of 2008 to summer (July) volumes the recorded historical factor of 1.62 was used.

Table 1: Steamboat Springs Monthly ADT Data Conversion Table

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan	1.00	1.02	1.06	0.94	1.10	1.47	1.69	1.56	1.35	1.19	0.99	1.04
Feb	0.98	1.00	1.04	0.92	1.08	1.44	1.66	1.53	1.32	1.16	0.97	1.02
Mar	0.94	0.96	1.00	0.89	1.04	1.38	1.59	1.47	1.27	1.12	0.93	0.98
Apr	1.06	1.08	1.12	1.00	1.17	1.56	1.79	1.66	1.43	1.26	1.05	1.11
May	0.91	0.92	0.96	0.85	1.00	1.33	1.53	1.42	1.22	1.07	0.89	0.94
Jun	0.68	0.69	0.72	0.64	0.75	1.00	1.15	1.06	0.92	0.81	0.67	0.71
Jul	0.59	0.60	0.63	0.56	0.65	0.87	1.00	0.92	0.80	0.70	0.58	0.62
Aug	0.64	0.65	0.68	0.60	0.71	0.94	1.08	1.00	0.86	0.76	0.63	0.67
Sep	0.74	0.76	0.79	0.70	0.82	1.09	1.26	1.16	1.00	0.88	0.73	0.77
Oct	0.84	0.86	0.89	0.80	0.93	1.24	1.43	1.32	1.14	1.00	0.83	0.88
Nov	1.01	1.03	1.07	0.96	1.12	1.49	1.71	1.58	1.36	1.20	1.00	1.06
Dec	0.96	0.98	1.02	0.90	1.06	1.41	1.62	1.50	1.29	1.14	0.95	1.00

In addition CDOT conducts annual counts along US 40 at Milepost 129 (East of County Road 42) and Milepost 132 (near 13th Street). These historic counts (data obtained annually from 1986 through 2005) provide the historic pattern of growth in the study area. **Figure 2** shows the data at MP 129. **Figure 3** shows the data at MP 132. Based on these historic counts, CDOT calculates a 20 year growth factor. This factor is 1.42 and 1.47 for MP 129 and MP 132 respectively. The summer adjusted counts taken for this study have been included as 2009 in these charts for reference.

Figure 2: Milepost 129 Data (East of CR 42)

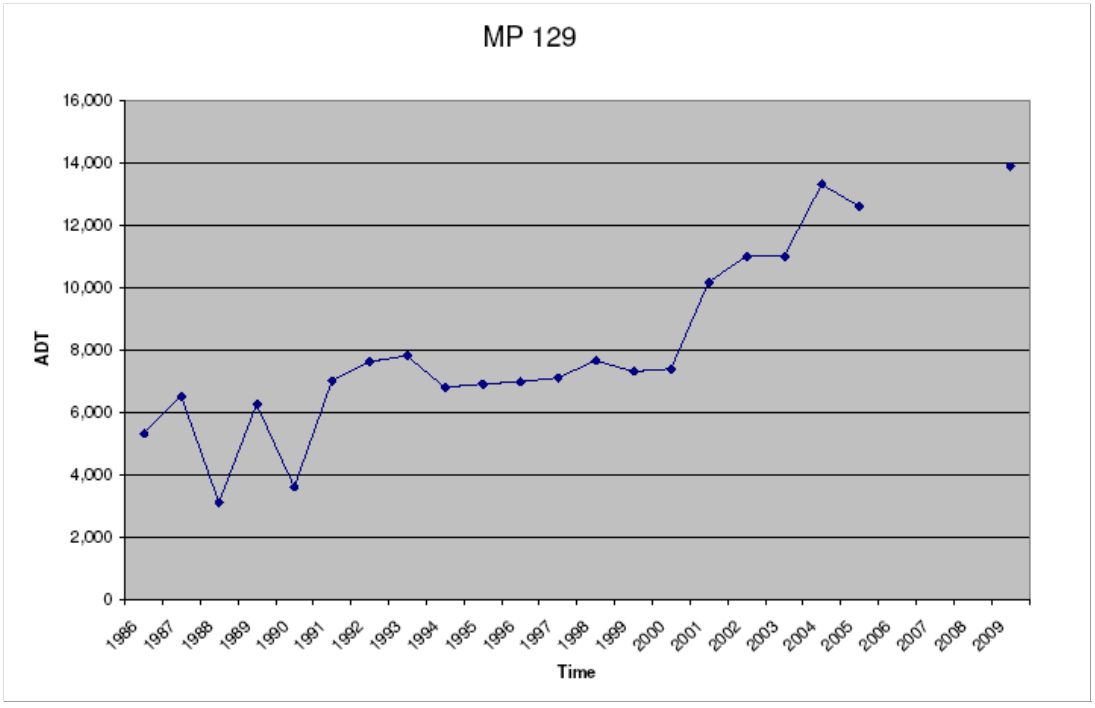
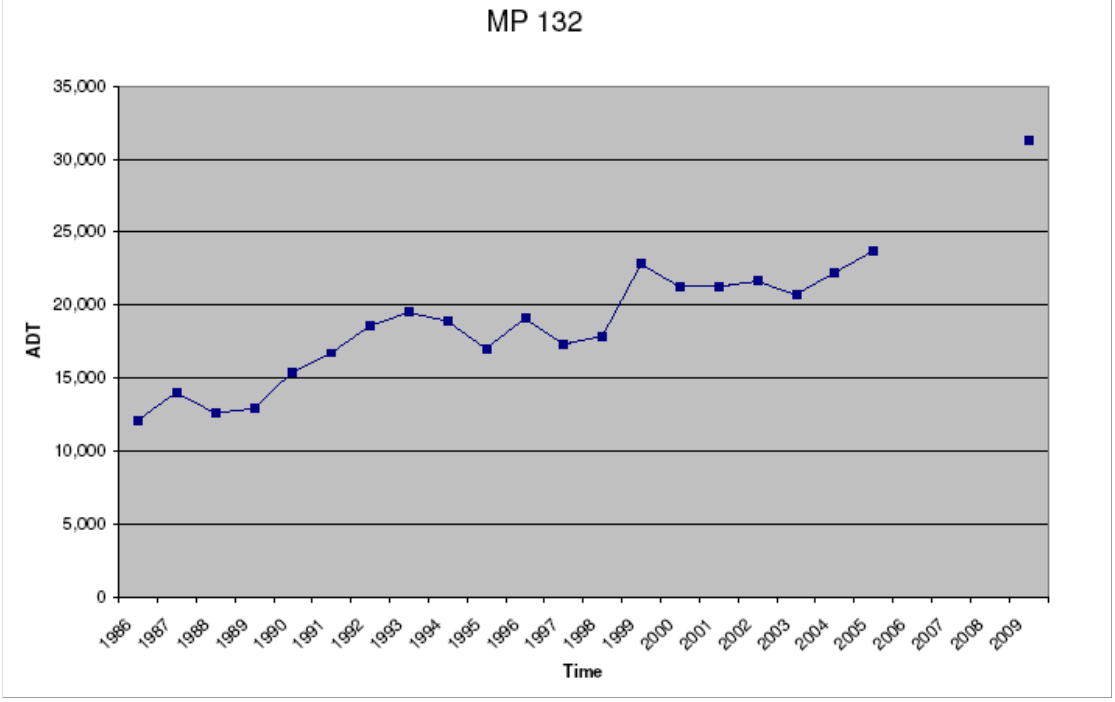


Figure 3: Milepost 132 Data (near 13th Street)



4. TRAFFIC DATA COLLECTION

For this project, existing traffic counts were taken in December of 2008. Based on historic traffic patterns, the PWG decided that Christmas counts could be used with adequate adjustments to model existing summer heavy traffic times. The City determined that the week of Christmas would most accurately reflect the patterns seen during the most heavy traffic season which occurs in July. Peak hour turning movement counts were recorded at seven locations:

- US 40 & 13th Street
- US 40 & Elk River Road
- US 40 & County Shop Road
- US 40 & Downhill Drive
- US 40 & CR 42
- US 40 & Brandon Circle
- Elk River Road & Downhill Drive

Twenty four hour directional vehicle classification counts were recorded at six locations:

- US 40 West of 13th Street
- US 40 West of Elk River Road
- US 40 East of Slate Creek
- US 40 West of Brandon Circle
- CR 42 North of US 40
- Elk River Road North of Downhill Drive

These locations are shown in **Figure 4.**

Because Steamboat Springs receives a considerable amount of snowfall, the daily counts were recorded with radar detectors rather than the more standard pneumatic tube counts. During the counting period, a snow event did occur which, because of Steamboat Springs ski industry tends to increase traffic rather than diminish it.

Appendix A Traffic Count Data includes the raw data collection sheets recorded for this study.

Figure 5 shows a summary of the existing turning movement counts at all major intersections in the study area. These counts do not exactly match the traffic count data as they have been balanced between intersections accounting for land uses adjacent to US 40. Peak hour volumes in the morning are much higher going into Steamboat Springs and peak hour volumes in the evening are much greater leaving Steamboat Springs.

Figure 4: December 2008 Traffic Count Locations

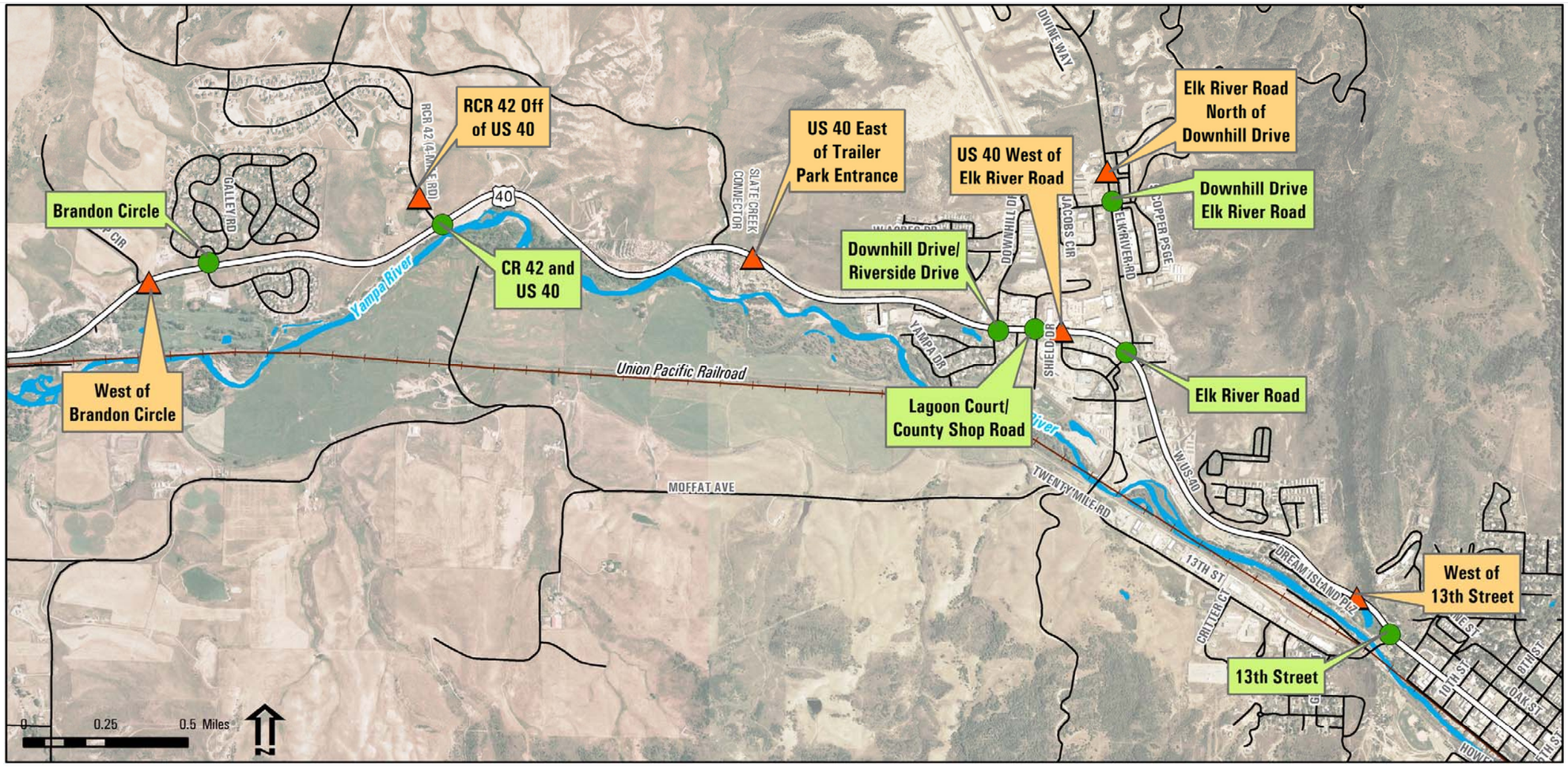
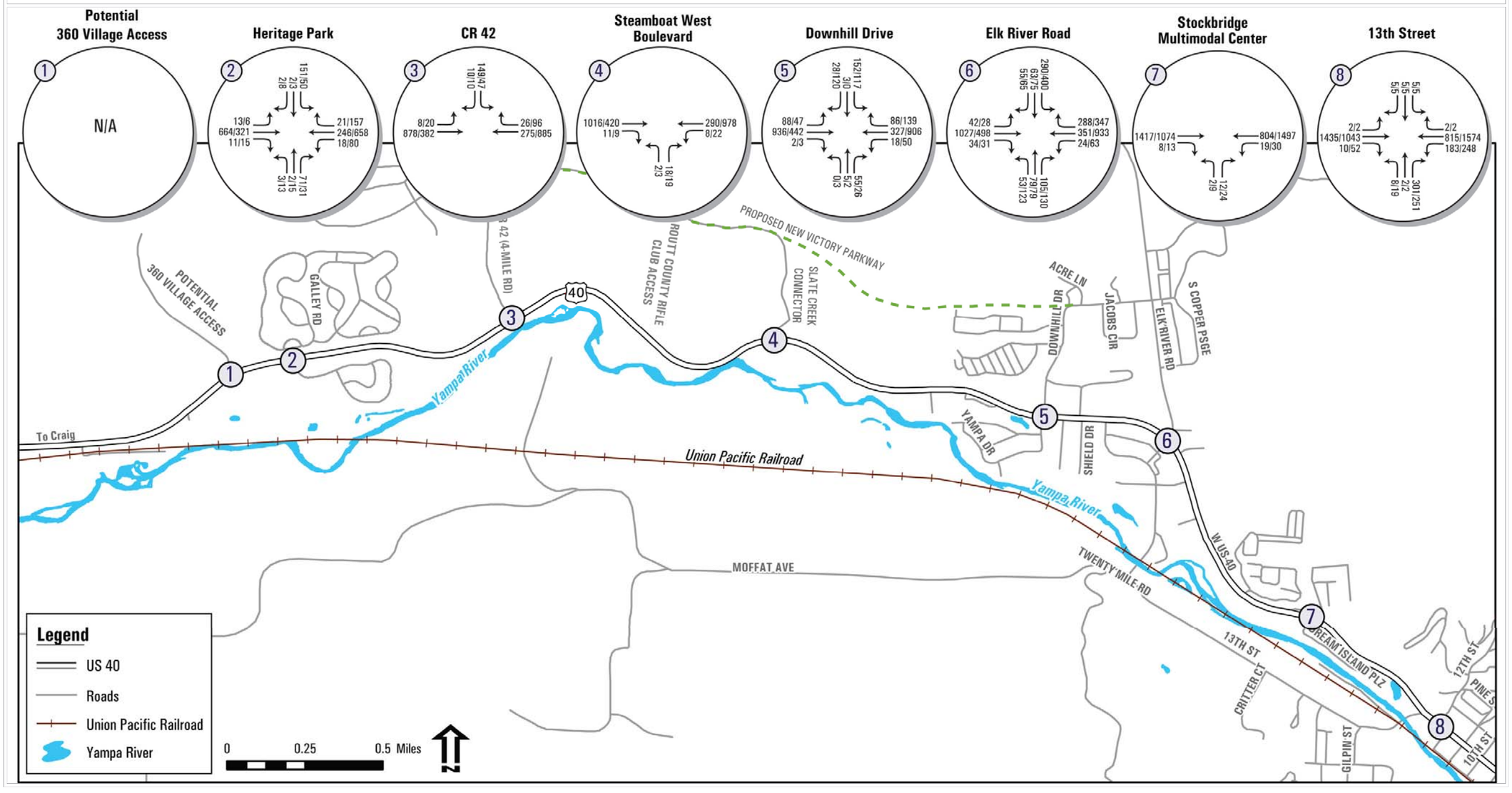


Figure 5: Traffic Volumes Existing



5. EXISTING LEVELS OF SERVICE

Using the data collected for this study, an existing conditions model was constructed using Synchro/SimTraffic version 7 (build 761). This model was used to calibrate the Synchro results with observed field conditions. The calibrated model could then be used to analyze future intersection operations. Concern was expressed about the high level of truck traffic that is observed currently on the roadways. Currently, there are six gravel pits located off of US 40 west of the project limits. In the summer of 2007 and 2008 Steamboat Springs experienced significant construction with 5 multi-use projects in the downtown area. Based on the vehicle classification data collected in the December 2008 video traffic counts, the truck volumes in the peak hour were below 2%. As volumes build in the peak hour, passenger vehicles make up a larger portion of the vehicle mix. As the volumes grow in the future, the same is true. The overall number of trucks will increase; but, likely at a slower rate than passenger vehicles serving to actually lower the *percentage* of trucks even though the overall volume of trucks is increasing. The project working group agreed that a 2% peak hour truck percentage was adequate for future intersection operations analysis.

For calibration purposes, the primary intersections of concern were the intersections of US 40/ Elk River Road and US 40/ 13th Street. Existing signal timing was received from CDOT and input in the existing conditions model.

Figure 6 and **Figure 7** show the turning movements and resulting existing Level of Service at Elk River Road in the AM and PM respectively. **Figure 8** and **Figure 9** show the same for the 13th Street Intersection.

The reported LOS "B" shown at 13th Street initially caused some concern with the Project Working Group because long queues at the intersection in both directions are observed by the PWG members and are reported by the public. The modeled operations were reviewed in SimTraffic in detail. The heavy right turn from 13th Street sees some delay as those vehicles wait for gaps in the EB US 40 traffic to make a right turn on red. The lane utilization allows the right turning vehicles to enter the outside lane; but, the move may be uncomfortable as both US 40 lanes are seldom clear. The left turn from WB US 40 onto 13th Street is operating at capacity and those vehicles sometimes experience excessive delay. While delay is shown for some movements, the overall average delay at the intersection is LOS B. After reviewing the move by move operations the PWG was comfortable that the model was adequately representing current operations.

The Elk River Road intersection is failing (LOS F) under existing conditions. This is due to the geometry of the intersection precluding the side street traffic from being served by the signal concurrently. Queues in the model were long but the PWG felt they were adequately representing observed operations. Since the side street traffic must be served sequentially (split phasing), the amount of time left in the signal cycle to serve US 40 is severely restricted. Correcting the geometry of this intersection should be an early action item that will remove the most pressing bottle neck in the corridor.

Appendix B Existing Conditions includes the Existing Conditions Synchro Intersection operation reports for signalized intersections on US 40. (Elk River Road, The Stockbridge Multimodal Center, and 13th Street.)

Figure 6: Summer 2009 Elk River Road AM Peak

Figure 7: Summer 2009 Elk River Road PM Peak

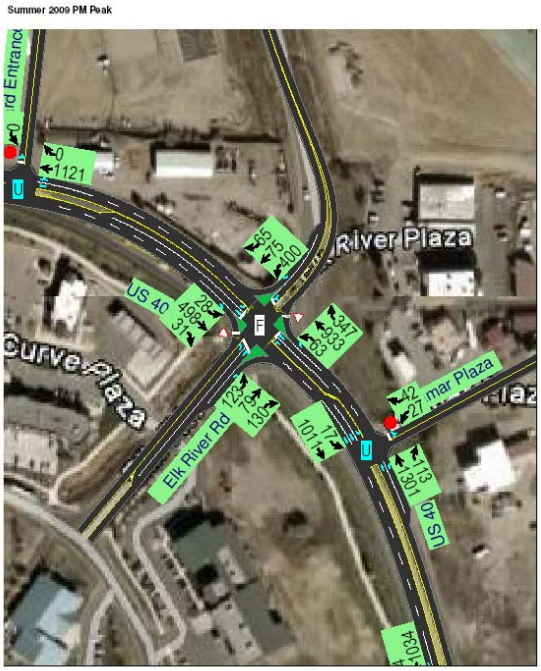
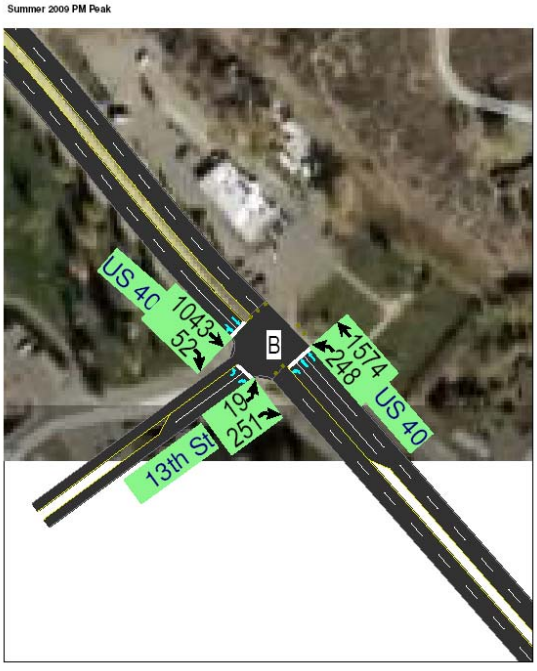


Figure 8: Summer 200913th Street Intersection AM Peak

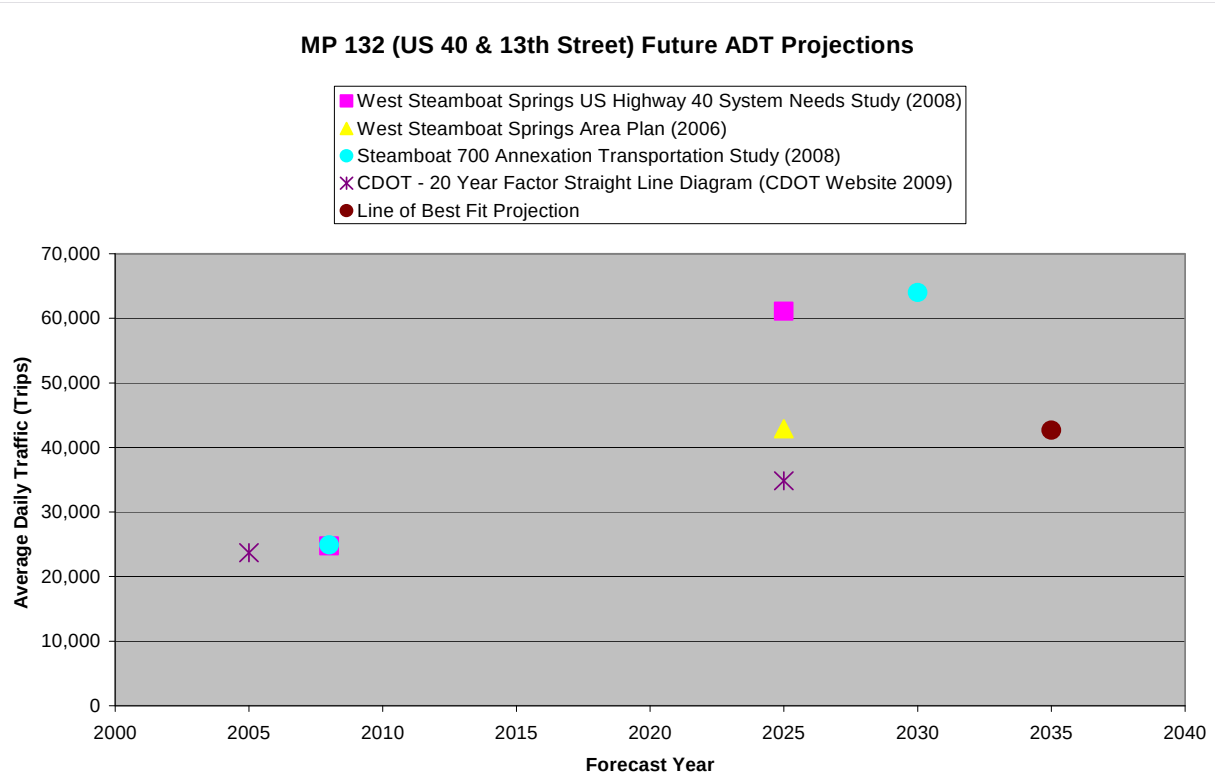
Figure 9: Summer 2009 13th Street Intersection PM Peak



6. FORECAST METHODOLOGY

Forecasting future volumes in the West Steamboat Springs study area was complicated by various factors. Many previous studies had been completed that projected future traffic volumes based on an assumption of up to 2,600 new dwelling units and various amounts of commercial development. **Figure 10** graphically displays the projections for volumes at MP 132 (near 13th Street). In 2008, the Needs Assessment completed by Stolfus and Associates and the Steamboat 700 traffic impact analysis assumed a build out of up to 4,500 dwelling units. Because of the greater development assumptions, these two studies showed volumes approaching or exceeding 60,000 vehicles per day at 13th Street.

Figure 10: MP 132 Future ADT Projections



As part of this study it was determined early on that a typical ITE Trip Generation Manual assessment of new development was not appropriate. ITE trip generation rates are geared toward assessing the traffic impact of specific development projects. The rates are not intended to be used on a regional basis and if used, tend to greatly over predict the traffic generated from a large area.

In addition, Steamboat Springs is encouraging and promoting New Urbanist, multimodal developments that have been shown to reduce overall trips as compared to traditional developments. The Steamboat 700 Annexation Transportation Study documents the trips

anticipated from just such a development. With some minor modifications, the assumptions used in that study were used as a basis for projecting future volumes from the type of development being promoted by Steamboat Springs.

The Project working group settled on a combined projection method that used historic growth patterns as a base and added trips above and beyond historic growth using the Steamboat 700 study as a basis.

7. HISTORIC TRAFFIC GROWTH

Historically, straight line projections of historic growth rates have been used as a basis for projecting future traffic where a regional transportation model is not maintained. In areas where significant development is occurring, this straight line of best fit (minimizing the total error of the line with known data points) actually tends to over predict future volumes. This is the result of various factors including the availability of undeveloped land, improved services in a built out area, etc. In high growth areas, vacant land that can easily be developed decreases substantially as time goes on. Additionally, as the density of development increases, the incremental increase in traffic volumes generated tends to decrease. In other words a new dwelling unit added to a dense area does not generate as many trips as an isolated dwelling unit.

A standard linear regression assumes that the standard deviation of errors in the series is constant. In an area such as Steamboat where traffic increases are subject to development patterns that are highly dependent on the health of the general economy, availability of undeveloped land, increasing density, etc., that assumption is not valid. To address this error, a Box-Cox transformation can be applied to the linear regression. This transformation tends to curve the future projection downward and provides a more accurate projection of future traffic with the constraints described above. The resulting future projections based on historic growth at MP 129 and 132 are shown in **Figure 11** and **Figure 12** below: These figures include the standard linear projection as a comparison to the Box-Cox transformation projections.

Figure 11: Future Projections Milepost 129

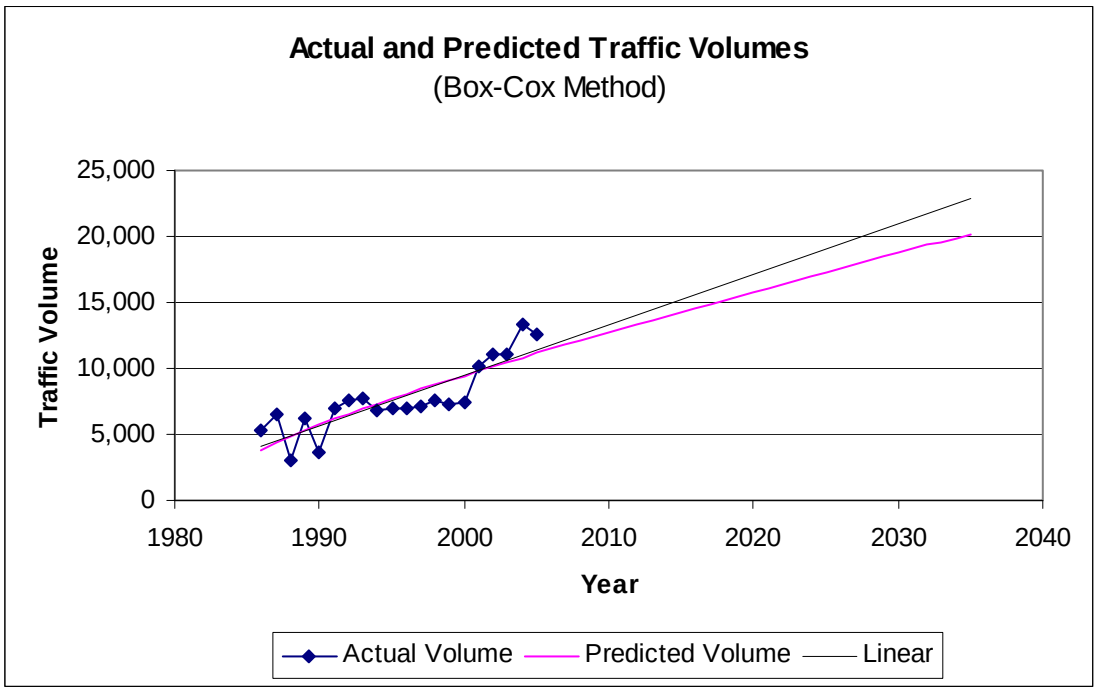
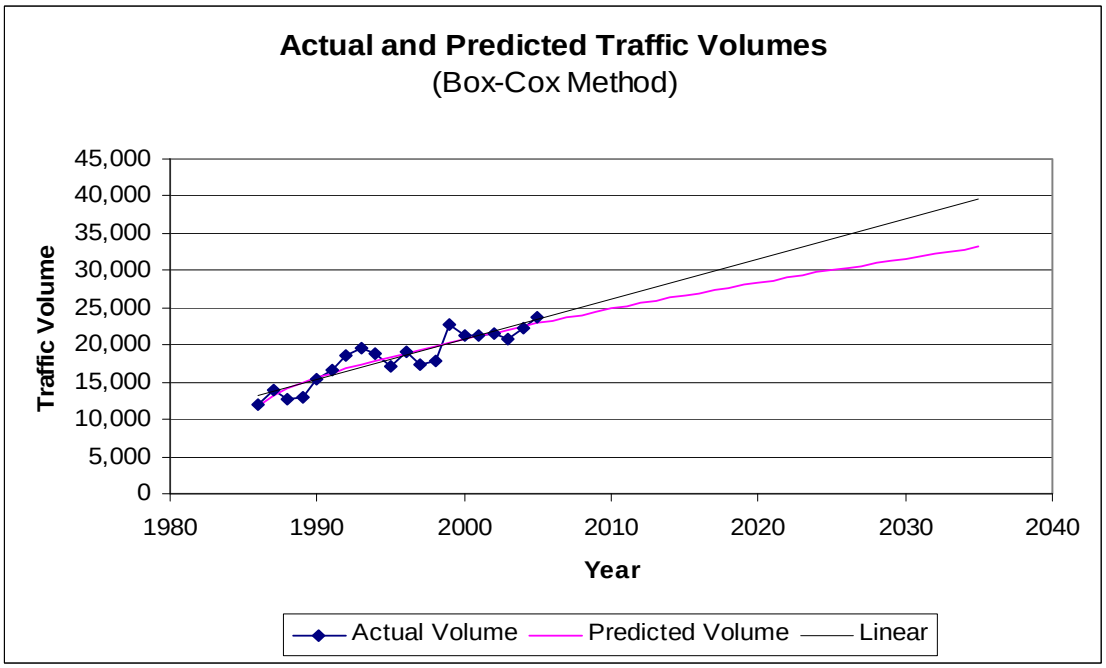


Figure 12: Future Projections Milepost 132



8. GROWTH BEYOND HISTORIC

Growth planned in the West Steamboat area includes over 4,500 new dwelling units. Historic growth alone can not account for all of the new trips that will be generated in the area. The Steamboat 700 development exemplifies the type of mixed use development that is being encouraged in the study area. The assumptions included in the Steamboat 700 Annexation Submittal were used as a basis for approximating an overall new trip generation using new dwelling units as the basis for new trips. The total trips calculated as part of the Steamboat 700 submittal included reductions for trips that would be completely contained within the development (internal capture, e.g. home to local store and back home), trips diverted from existing roadways (passby trips, e.g. a trip that would previously have gone to another existing destination that will now come to the new development. –No trip is added, only diverted from existing volumes), and accounted for significant alternative mode use.

The Steamboat 700 analysis assumed that up to 15% of certain trips would occur by walking, bicycle, or transit. The PWG thought this specific assumption was too aggressive for the entire West Steamboat Springs area and the alternative mode split was reduced to 5%. The existing transit split for Steamboat Springs does not exceed 3% of all trips while bicycle and pedestrian trips account for a very small number of total trips. Achieving 15% is desirable; but, did not seem reasonable to the PWG based on the transit and other infrastructure investment that would be required to achieve 15% for all new development. This change accounts for a small difference in the overall number of trips being generated by the site as not all trips generated by a site are subject to the alternative mode reduction.

After taking all of the reductions (modified as described), a general trip generation rate was calculated based on the total number of dwelling units. The Steamboat 700 development with its mix of uses and emphasis on pedestrian, bicycle, and transit facilities exemplifies the type of mixed used development desired by Steamboat Springs. As such the overall trip generation rate was assumed to be indicative of the overall trip generation from new developments in the West Steamboat Springs study area.

The Steamboat 700 Traffic Impact Analysis assumed 2,044 new dwelling units. The total modified trip generation from the Steamboat 700 development was calculated to be a little more than 19,000 new trips per day. This number was divided by the number of proposed dwelling units to arrive at a rough representation of the amount of trips that will be generated by new mixed used developments in the West Steamboat Springs Area. The approximate trip generation rate per dwelling unit was calculated to be 9.34. It should be restated that this is a combined rate for the entire mixed use development (including all land uses commercial, retail, and residential) using dwelling units as the most easily compared independent variable. This rate can not be directly compared to standard ITE trip generation rates.

The West Steamboat Preliminary Build out Analysis showed as many as 4,264 new dwelling units. Accounting for historic growth that would be already included in the historic growth calculation, approximately 2,300 additional units would need to be accounted for in the study area. Using the mixed use assumption above this additional development added another 21,000 total trips to the project area.

After distributing the traffic appropriately the highest volume roadway links were exceeding 60,000 vehicles per day. This value was consistent with the value calculated by the 2008 Needs Assessment and used by the Steamboat 700 TIA. This level of traffic would require at least a six lane section to accommodate build out volumes of traffic.

9. PLANNING HORIZON

The Project Working Group decided that the City of Steamboat Springs Planning Commission and City Council needed to weigh in on the level of development being proposed. The WSSAP had accounted for approximately 2,600 new dwelling units in the area and now up to 4,500 new dwelling units were being proposed. The Planning Commission and City council wanted to know how much development could be supported by a four lane cross section. In an effort to address this question while still moving forward with the Categorical Exclusion, the PWG reviewed historic building permit issuance rates and determined how much development could conceivably be constructed within a reasonable planning horizon.

The City of Steamboat Springs staff determined that the historic average number of building permits issued has been approximately 37 building permits per year. Assuming the focused growth in the West Steamboat Springs area significantly increased this rate, the PWG determined that a reasonable maximum number of building permits that could be issued in a year was 100. The year 2035 is 26 years from the current year and has been used around Colorado as a reasonable planning year. Assuming that 100 dwelling units could be constructed over the 26 years to the planning horizon of 2035, a total of 2,600 new dwelling units by 2035 was a reasonable maximum that would be constructed.

10. FUTURE VOLUME PROJECTIONS

To arrive at the total Average Daily Trips that would occur on the study area roadway links, the PWG reviewed the volumes projected by the historic growth rates. Using the projected 2035 volume from the Box-Cox projections and dividing by the 2005 recorded volumes, a simple growth multiplier can be obtained. At MP 129 this multiplier is calculated to be 1.81. At MP 132 the multiplier is 1.45. The PWG decided that both of these growth rates should be included in the future volume projections. East of Elk River Road, the base volume of traffic is lower and the area of undeveloped land is greater than what is found east of Elk River Road. The 1.81 growth factor is appropriate to the lower base and higher growth potential while the 1.45 factor is appropriate to the more developed eastern end of the study area.

The volumes counted in December of 2008 and adjusted to summer volumes were multiplied by the growth factors above to arrive at future daily volumes. This methodology resulted in approximately 45,000 vehicles per day at the eastern end of the study area 13th Street. The actual operational analysis was based on peak hour turning movement volumes. The use of these two different factors actually leads to higher volumes being carried into the links east of Elk River Road in the future turning movement calculations as the intersection movements are balanced. Balancing involves matching the number of vehicles leaving one intersection with the number arriving at the next intersection. Some loss or addition of traffic is acceptable based on the type of access points not included in the model; but, physically occur between the intersections. The volumes routed east of Elk River Road are higher than what would be projected by looking solely at the calculated ADT growth factors since large additions or

subtractions are not acceptable in the balancing process. **Table 2** below shows the ADT calculations for the more significant links in the model.

This methodology was determined by the PWG to be an adequate projection of the peak hour volumes that can be anticipated by the 2,600 new dwelling units in the West Steamboat Springs area including growth in traffic outside of the study area. No attempt was made to distinguish how many trips were due to growth outside of the study area and how many trips were attributable to new development. This approach was a holistic approach that resulted in a total volume. The methodology does not lend itself well to determining how much volume comes from various developments or development types.

Existing data collected for this project was used to determine the percentage of daily traffic that occurs in the peak hours. Based on this information, the AM peak was assumed to be 8% of ADT and the PM peak 9%.

The existing data also showed a very pronounced directional split in peak hour traffic. In the AM approximately 70% of the traffic is eastbound and this direction reverses in the PM. As development progresses, it is anticipated that this directional split will remain; but, not be as pronounced. For this study a future year peak hour directional split of 60/40 was assumed.

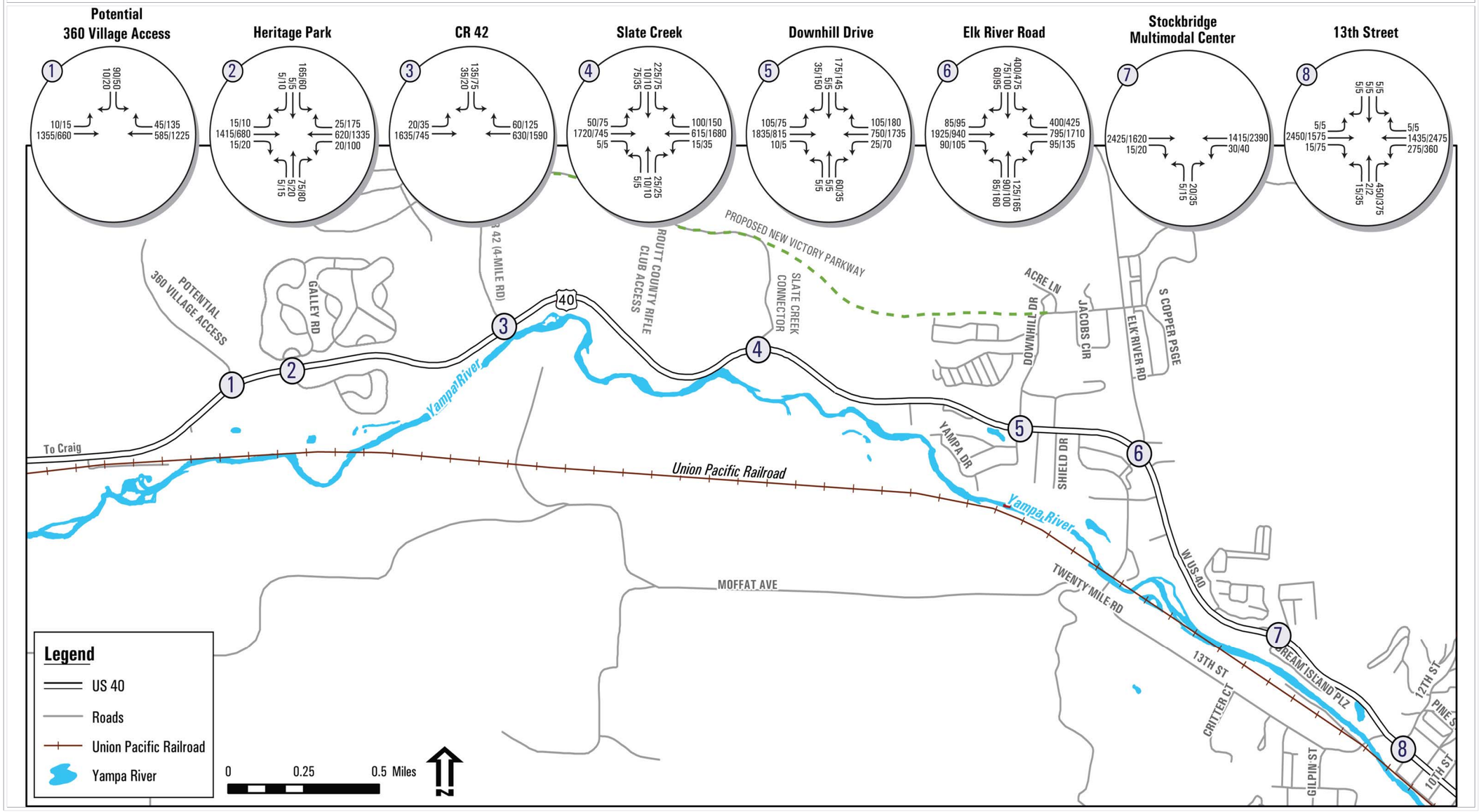
Once the future peak hour link volumes were determined, the process described in the National Cooperative Highway Research Program Report 255 was used as a basis for determining future turning movement volumes. Volumes were then balanced as described above through the system so that no inordinate amounts of vehicles were added or lost between intersections.

The resulting future turning movement volumes for key intersections are shown in **Figure 13**. Appendix C Projected Turning Movements shows the turning movements at all intersections in the corridor and the Synchro out put for the No Action operations analysis.

Table 2: 2035 ADT Projections

Description	US 40 West of Brandon Circle			US 40 East of Sleepy Bear Trailer Park Entrance			US 40 West of Elk River Road			US 40 West of 13th Street			Elk River Road North of Downhill Drive			CR 42 North of US 40		
	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	NB	SB	Total	NB	SB	Total
Dec'08	4,186	4,378	8,564	4,578	4,274	8,852	6,797	6,145	12,942	9,873	9,437	19,310	2,238	2,406	4,644	391	420	811
Split	49%	51%		52%	48%		53%	47%		51%	49%		48%	52%		48%	52%	
Summer'09 multiplier	1.62	1.62		1.62	1.62		1.62	1.62		1.62	1.62		1.62	1.62		1.62	1.62	
	6,781	7,092	13,874	7,416	6,924	14,340	11,011	9,955	20,966	15,994	15,288	31,282	3,626	3,898	7,523	633	680	1,314
2035 Growth Rate (Box-Cox)	1.81	1.81		1.81	1.81		1.81	1.81		1.45	1.45		1.45	1.45		1.81	1.81	
	12,274	12,837	25,111	13,424	12,532	25,956	19,930	18,018	37,949	23,192	22,168	45,359	5,257	5,652	10,909	1,146	1,232	2,378
Final 2035 ADTs			**25,111**			**25,956**			**37,949**			**45,359**			**10,909**			**2,378**

Figure 13: Future Traffic Volumes 2035



11. NO-ACTION ALTERNATIVE ANALYSIS

No Action Description

The no-action alternative includes the existing transportation network and all reasonably foreseeable improvements that will occur whether or not the US 40 improvements move forward. The no action for this project includes the proposed 360 Village development and the Steamboat 700 development. Roadway improvements include signalized accesses to these developments -360 Village Access and Steamboat West Boulevard (formerly referred to as the Slate Creek Connector) as well as the construction of New Victory Parkway.

Plans for the Stockbridge Multimodal Center include relocating the entrance to the East side of the facility when improvements to US 40 occur. The signal would be located in conjunction with the access relocation.

No Action Operations

Level of Service at the intersections included in the graphic above are shown in the table below. In addition to the delay and LOS rating, a Synchro calculated "Intersection Capacity Utilization" (ICU) is provided. While the HCM methodologies for calculating delay vary significantly between signalized and unsignalized intersections, the ICU calculation is relatively consistent and provides a relative value to compare demand vs. capacity. A value significantly less than 1.0 indicates the intersection should have some excess capacity. A value approaching 1.0 indicates the intersection is at capacity and a value over 1.0 means demand exceeds a theoretical capacity.

Table 3: 2035 No Action Operations

		AM			PM	
Location	**ICU**	**Ave. Delay (sec.)**	**LOS*** **	**ICU**	**Ave. Delay (sec.)**	**LOS**
360 Village Access*	0.84	26.9	C	0.75	17.6	B
Heritage Park**	0.98	>300	f	0.94	>300	f
CR 42**	1.02	>300	f	0.96	>300	f
Steamboat West Boulevard*	1.01	116.4	F	1.01	116.4	F
Downhill Drive**	1.77	>300	f	1.36	>300	f
Elk River Road	1.49	843	F	1.37	996	F
Stockbridge Multimodal Center	1.39	268	F	1.37	233	F
13th Street	1.04	120.7	F	0.81	26.5	C

* Development assumed as part of 2035 No Action including signalized intersection. No capacity improvements to US 40 assumed.

** In 2035 No Action intersection is unsignalized. Sidestreet delay reported.

*** Capital Letter indicates signalized intersection LOS, lower case indicates unsignalized intersection LOS

12. PREFERRED ALTERNATIVE

The alternatives selection report describes the various alternatives considered to address the project purpose and need. This section of the Traffic Technical Memorandum focuses on analysis of the Preferred Alternative.

Preferred Alternative Description

The Preferred Alternative consists of roadway widening throughout the corridor providing two through lanes in each direction with appropriate median treatments (painted or raised) from the proposed new development Access Point west of Steamboat II to 13th Street. Intersections throughout the corridor will be improved including the addition of appropriate auxiliary turn lanes and/or traffic signals where warranted. Access to all businesses and residences along the project corridor would be maintained as outlined in the US 40 Access Control Plan. The Preferred Alternative would provide multi-use paths for the length of the project corridor. Also, it would enhance bus transit services for western Steamboat including the extension of two bus lines and additional amenities at proposed stops.

The roadway improvements proposed as part of the Preferred Alternative vary throughout the project corridor based on projected travel demand, corridor character, environmental constraints, and other criteria related to the project needs and goals. The project corridor has been divided into four segments based on similar travel needs and corridor character:

- **Segment 1** – Urban Growth Boundary to proposed 360 Village Access Point,
- **Segment 2** – proposed 360 Village Access Point to Routt County Rifle Club Access,
- **Segment 3** – Routt County Rifle Club Access to Downhill Drive, and
- **Segment 4** – Downhill Drive to 13th Street.

For each of these segments, the project team identified a set of improvements that best meet transportation needs while minimizing environmental impacts (see **Table 4**).

Table 4: Roadway Improvements by Segment

Segment	Travel Lanes	Median Treatment	Shoulder Treatment	Multi-Use Path*
Segment 1	2-lanes (one per direction)	No median	8' Shoulders with ditch	Detached path on one side
Segment 2	4-lanes (two per direction)	Flush (painted) median	8' shoulders with ditch	Detached path on one or both sides
Segment 3	4-lanes (two per direction)	Raised median	8' shoulders with ditch	Detached path on one or both sides
Segment 4	4-lanes (two per direction)	Raised median	4' shoulder with outside curb and gutter	Detached path on one or both sides

* The placement of the multi-use path in all segments depends upon existing and projected land-use in the area.

Intersection improvements proposed as part of the Preferred Alternative include necessary auxiliary left and right turn lanes at all major access points where warranted, as well as traffic signals at the following intersections:

- Proposed 360 Village Access Point
- Heritage Park/Brandon Circle
- County Road 42
- Steamboat West Boulevard
- Downhill Drive
- Elk River Road
- Relocated Stockbridge Multimodal Center access
- 13th Street

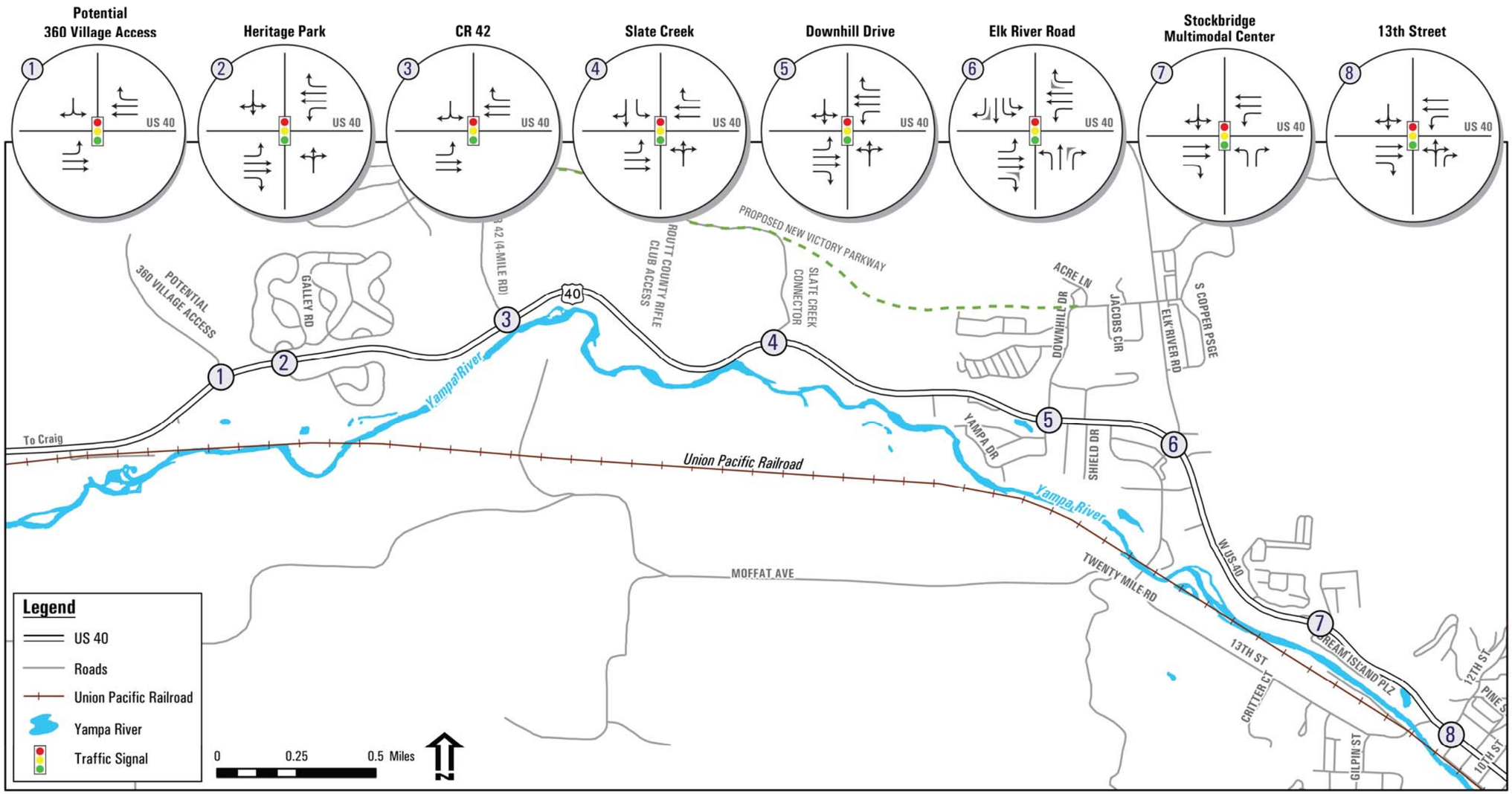
See Error! Reference source not found. for proposed laneage at the above intersections.

Bus transit improvements proposed as part of the Preferred Alternative include extensions of both the Red Line and Blue Line--existing transit services provided by Steamboat Springs Transit. The Red Line currently terminates at the Steamboat Campground, but would be extended along US 40 to Heritage Park/Steamboat II, maintaining its current 20-minute service frequency. The Blue Line currently terminates at the Stockbridge Multimodal Center just east of Conestoga Circle. It would be extended along US 40 to Elk River Road, up to the proposed New Victory Parkway and along New Victory Parkway through existing and new developments to the proposed 360 Village development, also maintaining its current 20-minute service frequency. New stops would provide passenger amenities such as route information, waiting areas, and in some cases, shelters and benches.

Bicycle and pedestrian improvements proposed as part of the Preferred Alternative include the multi-use paths provided for the length of the project corridor on one or both sides of the roadway, depending upon existing and projected land-use in the area. Also, connections to the Yampa Core Trail are proposed at various locations along the project corridor. The Preferred Alternative would provide grade-separated crossings of US 40 at the following intersections:

- Heritage Park/Brandon Circle
- Steamboat West Boulevard
- Elk River Road
- Community Center / Relocated Stockbridge Multimodal Center Access

Figure 14: Preferred Alternative Laneage



In addition to the main roadway improvements, the Preferred Alternative includes the following Transportation System Management (TSM) and Travel Demand Management (TDM) elements:

TSM
Traffic signal optimization and coordination`
Improved signing and wayfinding
Intersection re-configuration

TDM
The Preferred Alternative allows transit queue jumps to be phased into the corridor as congestion increases at intersections along the project corridor.

Preferred Alternative Operations
The proposed improvements will provide level of service E or better operations at all of the key intersections shown. The other minor stop controlled intersections could see substantial side street delay in the peak hour as the US 40 will have few gaps to allow vehicles to enter the traffic stream. The signals will help to create the necessary gaps and the preferred alternative incorporates the adopted Access Control Plan.

Table 5 shows the resulting operations at the same intersections shown in the No Action.

Table 5: 2035 Preferred Alternative Operations

		AM			PM	
Location	**ICU**	**Ave. Delay (sec.)**	**LOS**	**ICU**	**Ave. Delay (sec.)**	**LOS**
New Dev. Access	0.51	6.1	A	0.46	11.3	B
Heritage Park	0.64	12.7	B	0.64	3.6	A
CR 42	0.63	7.5	A	0.58	3.7	A
Slate Creek	0.73	12.9	B	0.69	5.4	A
Downhill Drive	0.85	11.9	B	0.89	21.6	C
Elk River Road	0.89	23.8	C	0.83	43.8	D
Stockbridge Multimodal Center	0.79	10.0	A	0.78	9.0	A
13th Street	1.02	58.5	E	0.88	24.8	C

By improving the geometry at Elk River Road to allow concurrent service of the side street plus the addition of a second left turn lane for SB Elk River Road to EB US 40, the intersection has sufficient capacity to provide acceptable level of service through 2035.

13th Street in the preferred alternative is at capacity (as shown by the ICU of 1.02) in the morning because of the heavy inbound (east bound) US 40 traffic conflicting with the WB US 40 left turn at 13th Street. While the modeling shows an overall average delay of less than 60 seconds, specific movements are likely to fail (experience average delays in excess of 80 seconds) at times as traffic volumes approach 2035 projected volumes. The City of Steamboat

Springs has studied several options to try to address the current bottleneck at 13th Street including parallel routes to US 40 that are not part of this study.

Appendix D Preferred Alternative Operations includes the Synchro output for the analysis of each of these intersections.

13. CONCLUSIONS

For the US 40 Documented Categorical Exclusion a planning horizon of 2035 was used for traffic projections and design purposes. The West Steamboat Springs area will not reach build out by 2035. A conservative assumption for the amount of development that could occur within the planning horizon was developed based on the historic number of building permits issued by the City of Steamboat Springs and background growth rates. A practical maximum of 100 dwelling units per year could be constructed between the current year and 2035. The resulting 2,600 new dwelling units and accompanying mixed use development will result in projected traffic volumes of approximately 25,000 vehicles per day at the west end of the study area to over 45,000 vehicles per day at 13th Street.

The existing Elk River Road intersection is failing today because the geometry of the intersection prevents allowing the side streets to be served by the signal concurrently. Improvements to this intersection can provide immediate benefits to existing traffic as well as provide sufficient capacity for projected future traffic volumes. The Elk River Road approaches should be reconstructed so as to provide more perpendicular approach angles. Constructing the intersection to allow the left turn movements on Elk River Road adequate space to turn past each other without conflict will allow the Elk River Road movements to be served concurrently. This will free up time in the signal cycle to improve capacity through the intersection for US 40. Providing the recommended turn lanes will provide adequate capacity to serve future vehicle volume projections as well as provide adequate pedestrian crossing time without adversely impacting US 40 operations.

The 13th Street intersection improvements will provide adequate operations for the planning horizon used for this project. However, meeting community needs such as connectivity by providing parallel routes are being studied by various groups in the Steamboat Springs. The alternative proposed at this intersection does not preclude those options.

The preferred alternative includes specific improvements to bicycle and pedestrian facilities to allow for a connected system through the entire project area. Transit service recommendations are included along with the option to use right turn lanes as queue bypass lanes for buses. While the pedestrian, bicycle, and transit improvements are included as part of the preferred alternative, the operation of these facilities was not specifically examined beyond being incorporated into the future vehicle volume projections and providing adequate signal timing to accommodate these modes.

The proposed vehicle improvements to US 40 ultimately widening the roadway to provide 4 through lanes (2 lanes in each direction) from the proposed 360 Village access point to 13th Street and the provision of signalized intersection control at the following intersections:

- 360 Village Access
- Heritage Park
- County Road 42
- Steamboat West Boulevard
- Downhill Drive
- Elk River Road
- Stockbridge Multimodal Center
- 13th Street

The final design of the preferred alternative will include acceleration and deceleration lanes as needed at the stop controlled intersections as well as necessary turn lanes.

The results of the traffic analysis indicate that the preferred alternative will provide adequate operations (LOS E or better) for the study area through 2035.

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Appendix

Appendix A:
Traffic Count Data

Appendix B:
Existing Conditions

Appendix C:
Projected Turning Movements

Appendix D:
Preferred Alternative Operations