



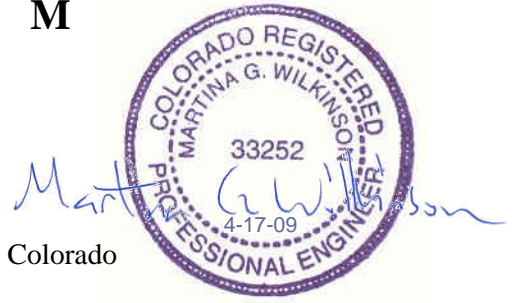
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## T R A N S P O R T A T I O N M E M O R A N D U M

Date: April 17, 2009

From: Martina G. Wilkinson, P.E. PTOE

RE: Roadway Segment Review – US 24/ US 285 Trout Creek Pass - Colorado  
For Nestle Waters Chaffee County Project



### EXECUTIVE SUMMARY

This memorandum summarizes the existing function of US 24 (also US 285) between Johnson's Village at approximate milepost 213 and the top of Trout Creek Pass at milepost 225.5, and details the impacts from the proposed project traffic.

#### *Corridor Classification and Jurisdiction*

The corridor is a US Highway, designated by the Colorado Department of Transportation (CDOT) as a Truck Route, and is on the National Highway System. Within these designations, the purpose of the roadway is to provide inter-regional mobility for both people and commerce. CDOT has jurisdiction of the roadway, and has approved the Traffic Impact Study for the proposed project.

#### *Existing Conditions*

The existing corridor is an approximate 12-mile section of two-lane roadway with an average uphill grade of 2.6%. There are no climbing lanes, but 40% of the corridor allows passing, and there are more than a dozen pullouts suitable for use by a slow moving vehicle.

The annualized average daily traffic is 2,400 vehicles per day (vpd) which increases to 3,500 vpd during the peak month of July. Trucks represent from 8 – 10% of all traffic. During the peak hour of the peak month, there are approximately 158 eastbound (uphill) vehicles, including 13 trucks.

#### *Proposed Project Traffic*

The proposed project will add one (1) eastbound truck per hour to the corridor. The impact of the proposed project traffic on the corridor is less than 2% on an annualized basis and less than 1% during the peak travel month. This is considered nominal in traffic analysis standards and per CDOT warranted no additional study beyond the traffic impact study (TIS) completed and approved by CDOT for the site access.

### *Function of Corridor*

The function of the corridor was analyzed using the national standard Highway Capacity Manual (HCM) and Highway Capacity Software, and is expressed in Level of Service (LOS) with letter grades A-F used to describe how well traffic flows in the corridor. The LOS was evaluated with respect to both roadway capacity and the overall traffic flow or freedom to maneuver expressed as Percent Time Spent Following (PTSF).

The maximum daily capacity of this roadway corridor can be calculated several ways and is between 13,000 and 20,000 vehicles per day. Capacities that reflect good function (LOS A or B) are at least 5,000 vehicles per day. The current peak daily volumes (3,500 vpd during July) are well below the capacity, and reflect good levels of service (A or B). CDOT estimates the roadway is functioning at 18% of overall capacity.

When PTSF is evaluated for existing conditions for the entire corridor during peak traffic times, the PTSF is 68.7%, which represents a Level of Service (LOS) C. This is a typical and acceptable roadway function. With the addition of the proposed site traffic, the PTSF is 69.4%. The addition of the project traffic does not change the LOS in the corridor. The impact of the site traffic is considered by CDOT as nominal. Even with the addition of the project traffic, for more than 90% of the year, the PTSF shows the corridor functioning at a Level of Service A or B.

### *Need for Climbing Lanes*

The American Association of State Highway And Transportation Officials *Geometric Design of Highways and Streets 2004* (also known as the AASHTO Green Book) identifies criteria for when to consider climbing lanes in a corridor. Short sections of the Trout Creek Pass roadway have grades and lengths that could qualify for climbing lanes; however, the traffic volumes (with project traffic added) do not meet the volume warrant or thresholds for climbing lanes.

### *Comparing this Corridor to Others*

This corridor is not unlike other state and federal highways in the Colorado mountains. In fact, there are a number of other highways in the state with longer and steeper grades that carry significantly more truck traffic than the Trout Creek Pass corridor.

## **Conclusions Regarding the Traffic Function of the Trout Creek Pass Corridor**

1. The roadway is a US Highway and designated by CDOT as a Truck Route intended for regional travel and transport of commerce.
2. CDOT has jurisdiction for the corridor, has approved the project's Traffic Impact Study and signed a Highway Access Permit.
3. The corridor has traffic volumes that are not near capacity. The corridor has good levels of service for 90% of the year and typical and acceptable levels of service during peak traffic times.
4. The proposed project traffic volume has an impact of less than 2%. The addition of one truck per hour along eastbound US 24 is insignificant and does not impact the level of service in the corridor even during peak traffic times.
5. The corridor includes short sections of grade and length that could qualify for climbing lanes, but the current and proposed project traffic volumes do not warrant the additional lanes.

## FULL REPORT

### Introduction

This document is a transportation memorandum that reviews the function of roadway segment US 24 (also US 285) between Johnson’s Village at approximate milepost 213 and the top of Trout Creek Pass at milepost 225.5.

This roadway is under the jurisdiction of the Colorado Department of Transportation (CDOT). The evaluation of traffic impacts on CDOT facilities related to development or changes in land use are governed by the CDOT State Highway Access Code. Section 2.3(5) outlines the breadth and scope of a traffic impact study (TIS). Subsection (a) indicates that traffic studies are required when a land use’s design hourly volume (DHV) is 100 vehicles. This proposed land use has a DHV of two (2) vehicles. The study area for a TIS should include areas where newly generated site traffic represents 5% or more the roadway’s capacity. The impact of the proposed project traffic on the US 24 corridor during peak travel times is less than 1% of the existing volumes, and less than ½ of 1% of the capacity.

Because traffic for the proposed project will access from US 24, a traffic impact study complying with the requirements and standards of CDOT was submitted and approved. A CDOT highway access permit has been signed, and CDOT has had no further comment or concerns related to the proposal.

Chaffee County staff has requested a further review of corridor function to the east of the site access. Of specific interest is the impact of proposed additional truck traffic to the eastbound (uphill) segment of the corridor. The following pages represent that review. It should be noted that this type of corridor analysis is not typical, was not requested by the governing jurisdiction of the roadway, the corridor is not within the traffic impact area of the proposed use, and the impact of the proposed site traffic of just one eastbound vehicle per hour is in fact difficult to measure using industry standard methodologies.

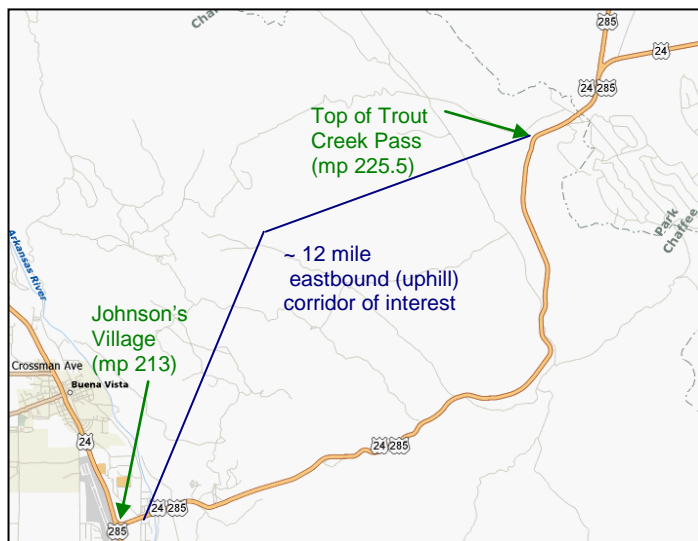


Figure 1 - Vicinity Map

### Existing Conditions

US Highway 24 overlaps with US Highway 285 in this area. This is a federal highway and the jurisdiction for the roadway is delegated to the Colorado Department of Transportation.

*Classification.* The Federal Government and Colorado Department of Transportation have assigned the roadway the following distinctions:

- Primary Rural Arterial as a functional classification listed in the CDOT Highways data. Arterials are roadways intended for higher speed travel, between communities, interregional, and most appropriate for commercial traffic.

- RA (Regional Highway) as defined in the Colorado State Highway Access Category Assignment Schedule. This is a CDOT classification and helps to identify the relative importance of mobility versus access. The CDOT State Highway Access Code describes the functional characteristics of an RA regional highway in section 3.8(1) as providing interregional, intra-regional, and intercity travel needs. It is a category assigned to routes of regional significance and typically on the National Highway System routes (see below).
- Designated Truck Route indicating this facility is intended for trucks and commerce. CDOT identifies roadways where truck traffic is appropriate; truck routes help to minimize truck traffic on local roads.
- On the National Highway System (NHS) as designated by the United State Department of Transportation, Federal Highway Administration (FHWA). These are highways in rural and urban areas which provide access between communities, ports, airports, or other intermodal transportation facility. As noted by FHWA, the NHS is a key conduit for the timely and reliable delivery of goods.

*Roadway Width.* The highway is a paved two-lane roadway with shoulders varying from 2 – 4 feet. In the area closest to Johnson’s Village, the roadway widens to a five-lane section (two lanes in each direction and a center turn lane).

*Speed Limit.* The posted speed limit is 45 mph through Johnson’s Village, 55 mph between milepost 213 – 222 and 65 mph from milepost 222 – 225.5.

*Geometrics.* Horizontal geometrics reflect the somewhat mountainous terrain, although horizontal curves are quite gentle and large enough that they do not require braking or significantly impact travel speeds. Vertical geometrics indicate an average grade of 2.6% throughout the entire corridor. There are a number of sections in the corridor with level or rolling terrain, and several shorter sections (between 0.5 and 1.5 miles of length) where grades are between 4 and 5%.

*Opportunities to Pass Slow Moving Vehicles.* There are no climbing lanes (additional auxiliary lanes) on the uphill section of the corridor. However, roadway markings (striping) in the corridor allow uphill passing to occur in about 40% of the corridor. In addition, there are more than a dozen roadside pullouts on the uphill section of the corridor that would be suitable for use by a slow moving vehicle. Slow moving vehicles could include trucks, RVs, cars pulling trailers, or sightseeing recreational traffic.

*Vehicle Speeds.* A field review of travel speeds of both passenger cars and heavy vehicles (trucks, RVs, etc.) was conducted. This included spot speed studies in the steepest sections of the corridor, and continuous speeds of individual vehicles as they traveled through the entire corridor.

The relatively shallow grade (2.6%) allows most passenger cars to maintain an uphill speed of at least 50 miles per hour. Heavy vehicle speeds in the corridor are typically above 40 miles per hour, except in four short sections ranging in length from 0.5 mile to 1.3 miles. The grades in these steepest sections are between 4 and 5%, and heavy vehicles speeds are reduced to between 30 and 40 mph.

Figure 2 and 3 on the following pages graphically depict information regarding the corridor.

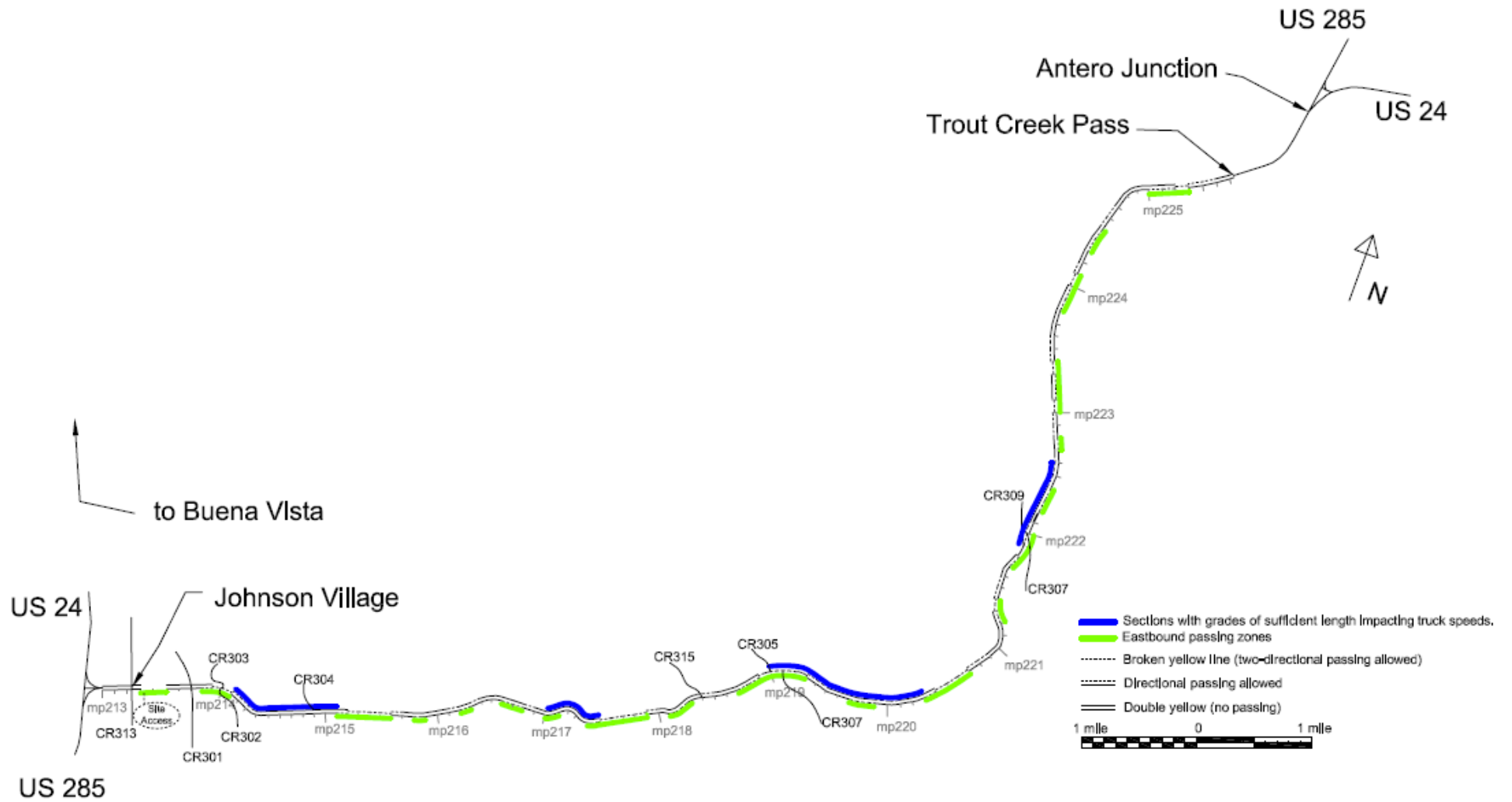


Figure 2 – Corridor Plan View Information

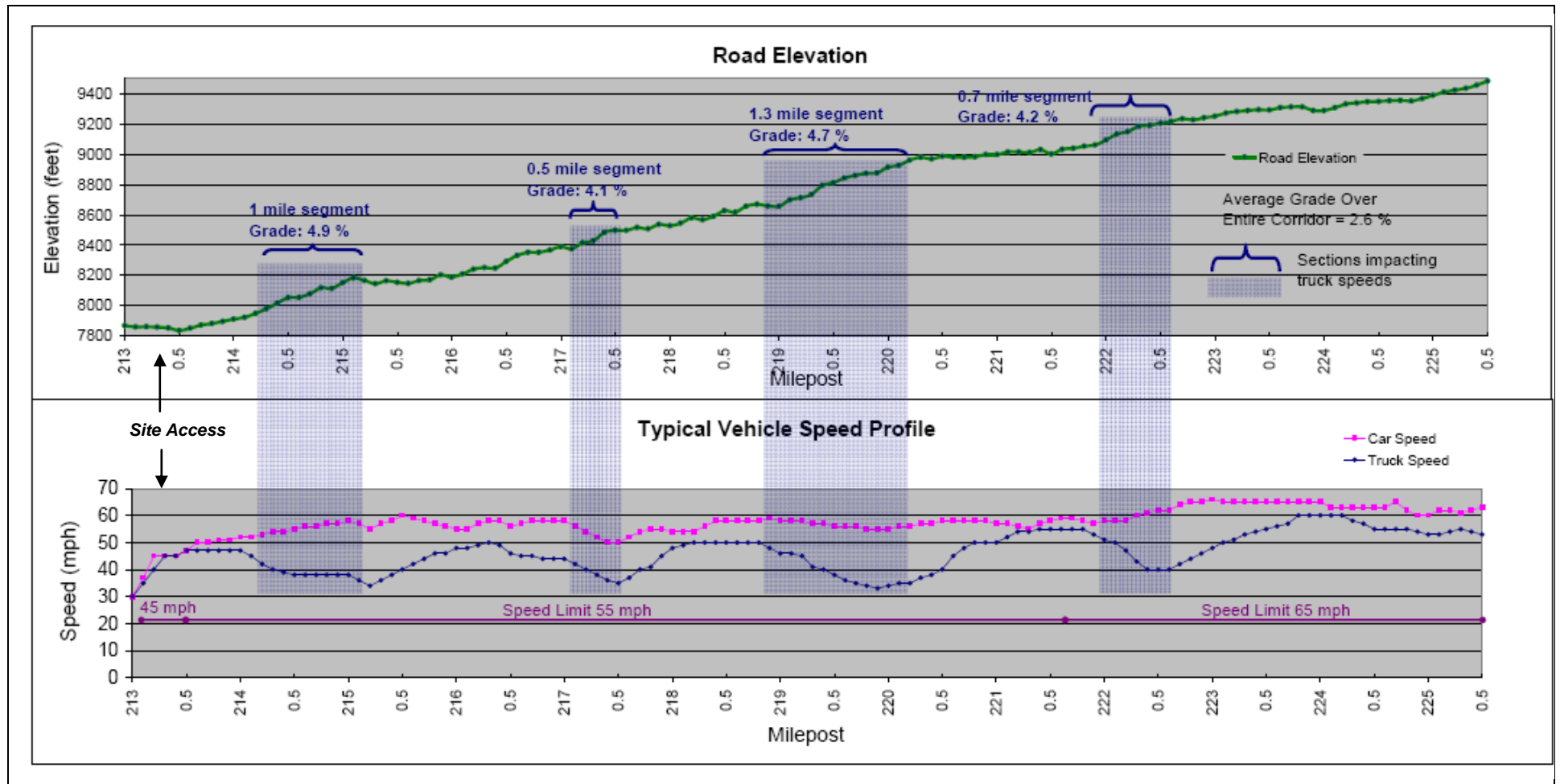


Figure 3 – Corridor Profile View Information

## **Existing Volumes in the Corridor**

Based upon counts completed by CDOT, the existing annualized average daily traffic in the corridor from east of Johnson’s Village to Antero Junction is 2,400 vehicles per day (vpd). The peak travel month of the year is July, and the average daily traffic in this section of roadway in July is 3,500 vpd.

During the peak hour, the percent of vehicles that are heavy vehicles (semi tractor trailers) is 8.2%. During the off-peak hours, the percent trucks is 9.9%. This doesn’t mean that there are fewer trucks using the roadway during the peak hour, but rather that there are more cars during the peak hour. Trucks tend to have relatively consistent volumes throughout the day, while passenger car volumes vary.

The peak travel time during the day in this area occurs during the middle of the day. This is not a typical urban peak hour of 7 am or 5 pm (commonly known as ‘rush hour’). The reason for this is that many vehicles in this section of roadway are traveling longer distances such as to or from Denver. Therefore, the peak time is shifted towards the middle of the day. Volumes increase throughout the morning and peak in the early afternoon (the latest July counts show a peak hour between 3 and 4 pm).

The July peak hour traffic in the corridor is 292 vehicles per hour, with 158 eastbound. Thirteen of those 158 vehicles are typically heavy vehicles. This equates to two to three vehicles per minute, and one truck every four to five minutes. Volume information is included in the Appendix.

## **The Existing Function of the Corridor**

The existing function of a transportation facility can be evaluated using the national standard of the Transportation Research Board’s Highway Capacity Manual (HCM). The manual contains analysis techniques for a Level Of Service (LOS) analysis. Letter values A-F are assigned to reflect the function of the facility.

Level of Service A and B are very good levels of service with free flow traffic, little delay, or demand for passing. Level of Service C depicts stable traffic flow and is a typical level of service for roadways. Within roadway segments, LOS C includes noticeable formation of platoons and an increasing frequency of passing impediments. Level of Service D describes the beginning of unstable traffic flow, vehicles experience delay, and passing becomes extremely difficult. LOS E traffic conditions occur when speeds are reduced, delays are pronounced, and passing becomes virtually impossible. LOS F is used when the volume utilizing a roadway exceeds the capacity.

The CDOT State Highway Access Code is silent on specifically acceptable levels of service for state highways. However, the American Association of State Highway And Transportation Officials *Geometric Design of Highways and Streets* 2004 (also known as the AASHTO Green Book) in Exhibit 3-32 provides guidelines for the selection of appropriate levels of service for design of roadways. The exhibit indicates that in rural, mountainous areas, arterials should strive to maintain an overall Level of Service C. Certain conditions may make the use of LOS D appropriate, but it should be used sparingly.

Function Related to Capacity

In typical analysis techniques, especially for intersection review, the function is often tied to the volume over capacity ratio (v/c). This requires comparing the actual volumes to the maximum theoretical capacity of the facility. If the volumes are higher than the capacity, congestion ensues and the function is not acceptable.

The capacity of the corridor (or maximum possible number of vehicles that could travel the corridor in one day) can be computed using the assumptions and processes detailed in the Highway Capacity Manual (HCM). This was completed using two different methods, both detailed in the appendix.

The HCM states in Chapter 20 that the maximum capacity of a two lane highway is 3,200 vehicles per hour (vph) total in both directions. But this number needs to be adjusted for the specific corridor conditions, including 2.6% grade for 13 miles (with 4% grade for a 2 mile segment), 2 ft. shoulders, 10% trucks and 4% RVs. The analysis, completed using the Highway Capacity Software (results are included in the appendix), show a maximum roadway capacity (total in both directions) for the Trout Creek Pass corridor of about 2,000 vehicles per hour (down from a theoretical maximum of 3,200 vph). This represents a maximum daily volume of 20,000 vehicles per day.

The calculation can also be completed using information from Chapter 12 that shows volume capacities for mountainous corridors. When adjusted for the two-lane geometrics in Trout Creek Pass, the maximum daily capacity is 13,000 vehicles per day.

Similarly, CDOT data indicates that the corridor is functioning at 18% of capacity (a v/c ratio of 0.18). CDOT’s maximum capacity for the corridor can be computed at 13,000 vehicles per day.

Beyond the maximum possible capacity, the function of the corridor can be further defined by volumes for various Levels of Service. Using the maximum daily volumes noted above, a range of maximum volumes for specific Levels of Service in this corridor can be calculated and are shown in Table 1.

*Table 1 – Capacity Level of Service (LOS) Thresholds for Trout Creek Pass Corridor*

<b>Level of Service (LOS)</b>	<b>Maximum Vehicles Per Day (vpd) for Each Level of Service</b>
A	3,000 -3,600 vpd
B	5,000 – 6,000 vpd
C	7,000 – 8,000 vpd
D	~ 11,000 vpd
E	13,000 - 20,000 vpd

Source: Highway Capacity Manual, Transportation Research Board, 2000

The ‘capacity’ of the corridor is at least 13,000 vehicles per day. With an existing daily volume of 2,400 average and 3,500 vehicles on a peak summer day, the volume is far below the capacity. In fact, the existing volumes would reflect a capacity level of service of A or B.

Function Related to Percent Time Spent Following (PTSF)

As noted in the HCM, the typical measurement of function for corridors is not only capacity, but also percent time spent following (PTSF).

Percent time spent following represents the average percentage of travel time that a vehicle is traveling in a platoon behind slower vehicles (any slower vehicles such as heavy vehicles, RVs, or sight-seeing passenger cars). This doesn't necessarily mean that there is congestion, just that a vehicle is not traveling at their free flow speed due to the inability to pass. These measurements can be assigned to a Level of Service and are shown in Table 2.

*Table 2 – Level of Service (LOS) Criteria for Two Lane Highways*

<b>Level of Service (LOS)</b>	<b>Percent Time Spent Following (PTSF)</b>
A	≤40 %
B	>40 – 55 %
C	>55 – 70 %
D	>70 – 85 %
E	>85 %

Source: *Highway Capacity Manual, Transportation Research Board, 2000*

Using the existing volumes, condition, and information on geometrics the corridor function can be analyzed using the two-lane corridor analysis procedures in Chapter 20 of the HCM. The analysis results are shown in Table 3 and analysis sheets included in the appendix.

The parameters for this analysis includes peak month of July, and peak time of day volumes. Therefore, this analysis reflects the most conservative time during the entire year.

The results show that although the steeper section has lower truck speeds, it is shorter in length, and with the passing zones, passenger cars are not as likely to be delayed in a platoon, and therefore the average speed is slightly higher than the average in the overall corridor. The longer section has less average grade, but because it is 12 miles long, the chance of a vehicle traveling behind another is higher. Both analysis indicate very acceptable levels of service.

*Table 3 – Existing Corridor Function in the July Peak Hour*

	<b>Entire Corridor</b>	<b>Steepest Section</b>
Peak hour Eastbound Total Volume	158 vehicles	
Percent Trucks	8.2%	
Percent Grade and Length	2.6% grade for 12 miles	5.0 % for 1 mile
Volume / Capacity Ratio (v/c)	0.17	0.20
Average Travel Speed	45.0 mph	46.5 mph
% Time Spent Following	68.7 %	48.6 %
Level of Service (LOS)	C	B

### **Proposed Facility and Anticipated Traffic Volumes**

*Proposed Volumes from Facility.* As noted in the CDOT approved traffic impact study, the proposed project will generate a maximum number of 25 trucks per day into and out of the facility (for a total number of 50 trips). This results in on average, one (1) truck per hour utilizing the eastbound US 24 corridor to the top of Trout Creek Pass.

*Vehicle Type.* The type of vehicles that will be used for the proposed site traffic have 400 horsepower (hp) engines. A fully loaded vehicle with a gross weight of 80,000 lbs will have a weight to power ratio of 200 lbs / hp. This ratio is very typical of semi tractor trailer traffic used throughout the United States, and this ratio is used in all analysis.

*Total Traffic Volumes and Volume Impact on the Corridor.* Table 4 shows the site traffic volumes and their relative impact on the corridor.

*Table 4 – Volumes*

	<b>Existing Volumes</b>	<b>Site Traffic</b>	<b>Proposed Volumes</b>	<b>% Impact</b>
Annualized Daily Traffic	2,400 vpd	50	2,450	2.0%
July Daily Traffic	3,500 vpd	50	3,550	1.4%
July Peak Hour Traffic	292 vph	2	294	0.6%
July Eastbound Peak Hour Traffic Up Trout Creek Pass	158	1	159	0.6%

In traffic engineering analysis, anything less than a 2.0% volume impact is considered nominal and insignificant. In this area, the proposed project traffic has a very limited impact on the volumes in the corridor. With a peak hour site volume of only two (2) trips, CDOT requires no analysis beyond the access point analysis completed in the approved traffic impact study. In fact, it can be difficult to detect a change in function between existing and proposed volumes when completing the analysis.

### The Proposed Function of the Corridor

The proposed function of the corridor with the addition of the project traffic was completed using the Percent Time Spent Following (PTSF) analysis recommended for corridors in the HCM and can be compared to the analysis results shown in Table 3. These results are shown below.

The addition of one eastbound truck per hour in the corridor has such limited overall impact, that the analysis software has difficulty detecting any change. Obviously, there will be some vehicles each hour in the corridor that will end up traveling behind a truck from the proposed project. However, even without the project traffic, that same vehicle would end up traveling behind another slower vehicle for a significant portion of the corridor.

The PTSF is almost identical with or without the project, and the Level of Service in the corridor does not change with the addition of the project traffic.

*Table 5 – Existing and Proposed Corridor Function In July Peak Hour*

	Entire Corridor		Steepest Section	
Peak hour Eastbound Total Volume	158 vehicles			
Percent Trucks	8.2%			
Percent Grade and Length	2.6% grade for 12 miles		5.0 % for 1 mile	
	Existing Conditions	Proposed Conditions	Existing Conditions	Proposed Conditions
Volume / Capacity Ratio (v/c)	0.17	0.17	0.20	0.21
Average Travel Speed	45.0 mph	45.0	46.5 mph	46.3
% Time Spent Following	68.7 %	69.4 %	48.6 %	48.7 %
Level of Service (LOS)	C	C	B	B

The above analysis was completed for peak month of July during the peak hour of the day and shows the minimal difference between the existing conditions and the proposed conditions. Using the proposed conditions (the addition of the truck traffic to the corridor), the same analysis can be completed for other times during the day and year and results are shown in Table 6.

*Table 6 – Corridor Level of Service Throughout the Day and Year Using Proposed Volumes*

Time of Day	0	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 noon	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	Total EB Daily Traffic	Total Daily Traffic
January	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	A	A	A	A	A	A	733	1,465
February	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	A	A	A	A	A	A	778	1,556
March	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	A	A	A	A	A	868	1,736
April	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	A	A	A	A	A	879	1,759
May	A	A	A	A	A	A	A	A	A	B	B	B	B	C	C	B	B	B	B	B	A	A	A	A	1,116	2,232
June	A	A	A	A	A	A	A	A	B	B	B	B	C	C	C	C	C	C	C	B	B	A	A	A	1,409	2,818
July	A	A	A	A	A	A	A	A	B	B	B	C	C	C	C	C	C	C	C	B	B	B	A	A	1,776	3,551
August	A	A	A	A	A	A	A	A	B	B	B	C	C	C	C	C	C	C	C	B	B	A	A	A	1,477	2,954
September	A	A	A	A	A	A	A	A	A	B	B	B	B	C	C	C	C	C	B	B	A	A	A	A	1,195	2,390
October	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	A	A	A	A	969	1,939
November	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	A	A	A	A	A	857	1,713
December	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	A	A	A	A	A	A	744	1,488

Using the volumes that include the proposed truck traffic, the corridor will experience a Level of Service A or B more than 90% of the time. The addition of the proposed project truck traffic does not change the level of service and no levels of service are less than LOS C.

### **Consideration for Climbing Lanes**

The American Association of State Highway And Transportation Officials *Geometric Design of Highways and Streets* 2004 (also known as the AASHTO Green Book) discusses vertical alignment, grades, critical length of grade and justifications for climbing lanes.

Maximum grades for a design speed of 70 mph are 5%. Maximum grades for a design speed of 30 mph are 7-8%. But grade in itself is not a complete design control. It is also appropriate to consider the length of a particular grade. The term ‘critical length of grade’ is used to indicate the maximum length of a designated upgrade on which a loaded truck can operate without an unreasonable reduction in speed. A guideline for the limit for reduction in speed is 10-15 mph below the average running speed of all traffic. Figure 3 on page 6 can be used to indicate where the heavy vehicles (trucks, RVs, etc.) have a running speed that is at least 10-15 mph less than typical passenger car traffic. This occurs for short segments of length in the corridor.

In addition to critical length of grade, the AASHTO Green Book identifies two other criteria that should be met before climbing lanes can be justified. This includes an uphill traffic flow rate of 200 vehicles per hour and an uphill heavy vehicle flow rate of 20 vehicles per hour (see page 244 AASHTO Green Book).

The peak hour uphill flow rate in the US 24 corridor throughout the year is 120 vehicles / hour with about 12 trucks per hour. During the month of July, the peak hour uphill flow rate is 158 vehicles / hour with about 13 trucks.

These volume criteria for climbing lanes are NOT met at any time during the year, and the addition of the proposed traffic (1 truck per hour) to the eastbound section of the corridor does not change the conclusion that climbing lanes are not currently justified in this corridor.

### **Comparing this Corridor to Other Colorado Mountain Corridors**

This is a corridor with an average uphill grade of 2.6% with a few shorter segments of about 4-5%. It may be helpful to compare this segment to other US highways in Colorado that also carry trucks. The comparison is shown in Table 7.

It is clear from the table that the US 24 corridor is less severe than a number of other facilities in the state from all perspectives of grades, length, and volumes. Even the short sections of 4-5% grade for less than 1.5 miles in the US 24 corridor are neither as steep nor as long as other roadways also carrying significant truck volumes.

It should be noted that US 6 over Loveland Pass carries significantly more truck traffic, has an average grade almost twice as steep as US 24 in the Trout Creek Pass area and also does not have any climbing lanes.

*Table 7 – Comparing US 24 (Trout Creek Pass) to Other Colorado Truck Highways*

<b>Highway</b>	<b>Location</b>	<b>Grade</b>	<b>Length</b>	<b>Daily Traffic and Percent Trucks</b>
US 24	Eastbound Johnson’s Village to Trout Creek Pass	2.6 %	12.0 miles	2,400 (8.2%)
US 6	Westbound Loveland Ski Area to Loveland Pass	5.9%	3.7 miles	1,300 (20.0%)
US 50	Westbound Poncha Springs to Monarch Pass	5.1%	11.1 miles	1,800 (20.0%)
US 285	Southbound Poncha Springs to Poncha Pass Summit	4.3 %	6.9 miles	2,200 (13%)
US 160	Wolf Creek Pass	6.5%	8.5 miles	2,800 (13.1%)
US 40	Steamboat Springs to Rabbit Ears Pass	3.9%	12.9 miles	2,700 (15%)
I-70	Eastbound Dillon to Eisenhower Tunnel	5.5%	8.0 miles	eastbound traffic: 15,200 (9.7%)

### **Summary of Findings**

This study reviewed the existing and proposed function of the State Highway 285 (also US 24) corridor between Johnson’s Village (MP 213) and the top of Trout Creek Pass (MP 225.5). The following conclusions can be drawn from the study:

#### *Corridor Jurisdiction and Classification*

- This corridor is a US Highway, designated as a Truck Route by the Colorado Department of Transportation and is on the National Highway System. The purpose of the facility is to provide inter-regional mobility for both people and commerce. As a Truck Route, the movement of good and commerce is encouraged to use this type of facility in lieu of local roads.
- Jurisdiction for state and federal highways rest with the Colorado Department of Transportation instead of local entities because they are expected to carry inter-regional trucks and commerce in addition to local traffic. The Colorado Department of Transportation has approved the Traffic Impact Study for the proposed project.

#### *Existing Conditions*

- The existing conditions in the corridor include an approximate 12 mile section of two-lane roadway with an average uphill grade of 2.6%. There are no climbing lanes, but 40% of the corridor allows passing, and there are more than a dozen pullouts suitable for use by a slow moving vehicle.

- The current annualized average daily traffic is 2,400 vpd. This increases to 3,500 vpd during the peak month of July. Trucks represent 8 – 10% of total traffic.
- During the peak hour of the peak month, there are approximately 158 uphill vehicles, including 13 trucks.

#### *Proposed Additional Traffic*

- The proposed project will add one (1) eastbound truck per hour to the corridor.
- The percent impact of the proposed site traffic on the corridor is less than 2% on an annualized basis and less than 1% during the peak travel times. CDOT did not require additional study beyond the project access intersection.

#### *Function of Corridor*

- The function of the corridor is expressed in Level of Service (LOS) with letter grades A-F used to describe how well traffic flows.
- The maximum capacity of the roadway as calculated using methods described in the Highway Capacity Manual is between 13,000 and 20,000 vpd. CDOT estimates the maximum capacity at 13,000 vpd. Maximum daily volumes that reflect good function are at least 5,000 vpd.
- The current volumes are well below the capacity, and reflect good capacity related levels of service (A or B). CDOT estimates the roadway is functioning at 18% of capacity.
- Another analysis more applicable to roadway segments reviews Percent Time Spent Following (PTSF). Table 5 on page 11 shows the comparison of function with and without the additional traffic from the proposed use.
- The addition of one eastbound truck per hour results in a very nominal change in function, and the level of service is not impacted by the additional traffic.
- Function as analyzed using PTSF throughout the year with the additional traffic will remain at a Level of Service A or B more than 90% of the time. No levels of service are lower than LOS C, which represents a typical and acceptable roadway function.

#### *Need for Climbing Lanes*

- The AASHTO Green Book identifies criteria needed to consider climbing lanes in a corridor. Although short sections of the roadway have grades and lengths that could qualify for climbing lanes, the current and proposed volumes do not meet the threshold identified by AASHTO to justify climbing lanes.

#### *Comparing this Corridor to Others*

- This corridor is not unlike other state and federal highways in the Colorado mountains. In fact, there are a number of other highways in the state with longer and steeper grades that carry significantly more truck traffic than the Trout Creek Pass corridor.

## **Conclusions Regarding the Traffic Function of the Trout Creek Pass Corridor**

The following conclusions can be stated for this particular corridor:

- The roadway is designated, classified and intended for regional travel, including transport of commerce. It is a designated truck route.
- The jurisdiction for the corridor rests with the CDOT. The Department has approved the proposed project Traffic Impact Study and signed a Highway Access Permit.
- The corridor has traffic volumes that are well below capacity. The capacity levels of service is A or B throughout the year.
- The corridor has a Percent Time Spent Following level of service A or B for 90% of the year. During peak traffic times, the level of service is a typical and acceptable level of service C.
- The proposed project has a traffic volume impact of less than 2% and less than 1% during peak travel times. The addition of only one truck per hour along eastbound US 24 is difficult to quantify and does not impact the level of service in the corridor even during peak traffic times.
- The corridor includes short sections of grade and length that could qualify for climbing lanes, but the current traffic (even with the project traffic) does not meet volume thresholds to warrant the lanes.

Please do not hesitate to contact me with any questions.