TRANSPORTATION TECHNICAL MEMORANDUM

April 2014

EB I-70 Peak Period Shoulder Lane

CATEGORICAL EXCLUSION

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Acronyms and Abbreviations

AADT	Annual Average Daily Traffic
AAWDT	Annual Average Weekday Traffic
ATR	Automatic Traffic Recorder
Cat Ex	Categorical Exclusion
CDOT	Colorado Department of Transportation
DRCOG	Denver Regional Council of Governments
DTA	Dynamic Traffic Assignment (model)
DTD	Department of Transportation Development
EJMT	Eisenhower Johnson Memorial Tunnel
FHWA	Federal Highway Administration
HCM	Highway Capacity Manual
HCS	Highway Capacity Software
HOV	High-Occupancy Vehicle
HPTE	High Performance Transportation Enterprise
I-70	Interstate 70
LOS	Level of Service
mph	miles per hour
OD	Origin-Destination
PDO	Property Damage Only
PEIS	I-70 Mountain Corridor Programmatic Environmental Impact Statement
PPSL	Peak Period Shoulder Lane
RTMS	Remote Traffic Monitoring System
RTP	Regional Transportation Plan
SA	Safety Assessment
SH	State Highway
SPF	Safety Performance Function
TTI	Travel Time Indicator
VHT	Vehicle Hours of Travel
VMS	Variable Message Sign
VMT	Vehicle Miles of Travel

VOT	Value of Time
vpd	vehicles per day
vph	vehicles per hour
VTTS	Value of Travel Time Savings
WAC	Weighted Accident Concentrations

Section 1. Purpose of the Memorandum

The Federal Highway Administration (FHWA), in cooperation with the Colorado Department of Transportation (CDOT), is preparing a Categorical Exclusion (Cat Ex) for the proposed use of the shoulder as a travel lane in the eastbound direction of Interstate 70 (I-70) during peak periods. The area from US 40 at Empire Junction to the Twin Tunnels can be one of the most congested corridors in the state. The addition of a Peak Period Shoulder Lane (PPSL) would enhance safety, operations, and travel time reliability in this area of I-70. The improvements would be consistent with the *I-70 Mountain Corridor Final Programmatic Environmental Impact Statement* (PEIS) Record of Decision (ROD), I-70 Mountain Corridor Context Sensitive Solutions process, and other commitments of the I-70 PEIS.

This technical memorandum discusses the regulatory setting and describes the affected environment and impacts of the No Action Alternative and Proposed Action on transportation resources within the study area. It also documents mitigation measures, as identified in the I-70 Mountain corridor Final PEIS, which would reduce impacts during construction and operation. The I-70 PEIS identified comprehensive improvements for the corridor. The Proposed Action would address safety, mobility, and operations in the eastbound direction between Empire Junction and east Idaho Springs. The Proposed Action would not preclude other improvements needed and approved by the I-70 PEIS ROD.

Section 2. How Does the Analysis Relate to the Tier 1 PEIS?

The Tier 1 *I-70 Mountain Corridor Final Programmatic Environmental Impact Statement* (CDOT, 2011a) and the *I-70 Mountain Corridor PEIS Travel Demand Technical Report* (CDOT, 2010) provide information about existing and future transportation conditions in the study area. Some of the key findings of the PEIS that are relevant to the PPSL study area are that 2035 peak period congestion is expected to occur for longer periods during the day and over more days of the week. These conditions are expected to deteriorate even more by 2050.

2.1 What Process was Followed to Analyze Transportation Conditions?

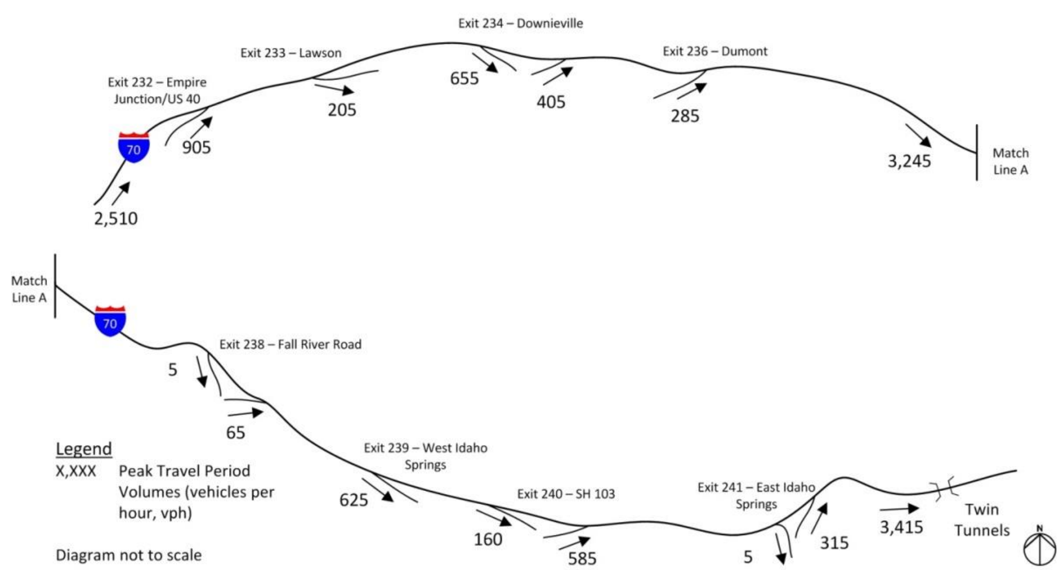
The process followed to forecast future traffic volumes for the I-70 Eastbound Peak Period Shoulder Lane project was identical to that used for the Twin Tunnels project, as described in Section 6 of the *Twin Tunnels Transportation Technical Memorandum* (CDOT, 2012b). As a point of reference a traffic growth factor of 1.22 is used for 2035 peak period forecasts.

Section 3. Existing Traffic Conditions

3.1 What Segments of I-70 are Being Analyzed for this Study?

I-70 currently carries two travel lanes in each direction within the project corridor, with the Twin Tunnels segment to the east of the project recently expanded to three lanes. At least one, two-lane local road is also present through the entire corridor, running approximately parallel to I-70. The eastbound and westbound lanes of I-70 are separated by a narrow median with guardrail or concrete barrier. The speed limit is posted at 65 miles per hour (mph) entering the west end of the project corridor, but is reduced to 60 mph at MP 238, and further reduced to 55 mph at MP 242. The corridor's Annual Average Daily Traffic (AADT) ranges from 39,000 to 45,000 vehicles per day (vpd) (CDOT, 2011b), with Design Hourly Volumes (DHV) in the peak direction at approximately 7.5 percent of the AADT. Figure 1 depicts eastbound I-70 average hourly traffic volumes during the peak travel period, based on data from the 2013 No Action DynusT model of the corridor. There are a total of eight grade-separated interchanges along I-70 within the project limits, including a Commercial Vehicle Weigh Station near MP 234.

Figure 1. 2013 Daily Volumes



3.2 What Field Devices Are Used to Collect Traffic Data?

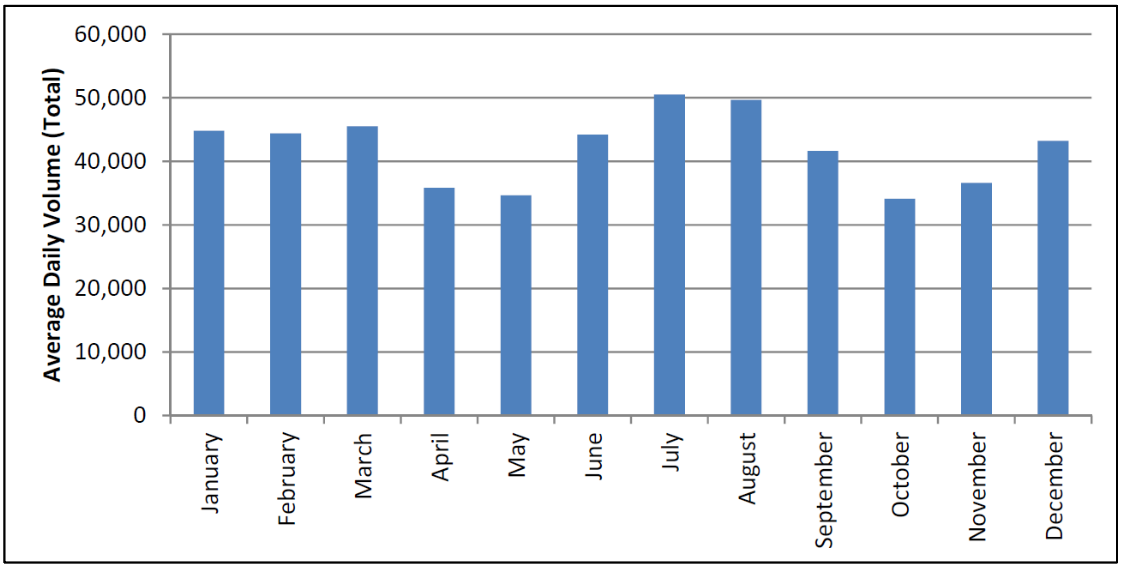
CDOT collects a significant amount of traffic data along the I-70 Mountain Corridor using a variety of electronic devices as listed below. These devices provided the following summary of the existing conditions for the Peak Period Shoulder Study project area.

- Automatic Traffic Recorders (ATR)—These devices record volumes, speeds, and vehicle classifications on an hourly basis.
- Remote Traffic Monitoring Systems (RTMS)—These devices use radar to record the speed of each vehicle. They are typically located on poles along the road and can also record speed data for each lane of a multi-lane facility.
- Travel Time Indicators (TTI)—These devices record the time it takes for individual vehicles to travel between two indicators. Electronic devices are located along the road, and pick up unique identifying vehicle information from E-470 toll tags or Bluetooth devices carried in vehicles. The information gathered serves as the basis for the messages on variable message signs (VMS) indicating the travel time to major destinations.

3.3 What are the Seasonal Patterns of Traffic?

Based on data taken from the *I-70 Twin Tunnels Transportation Technical Memorandum* (CDOT, 2012b) and the established traffic patterns, the summer season (June through September) generates the highest peak as a result of summer recreational activities. The second highest peak in average daily volumes is in the winter months (December through March) as a result of the winter recreational opportunities. Traffic volumes during the spring and fall months are notably lower (see Figure 2).

Figure 2. Average Total Daily Traffic Volumes by Month (January 2009 thru December 2011)

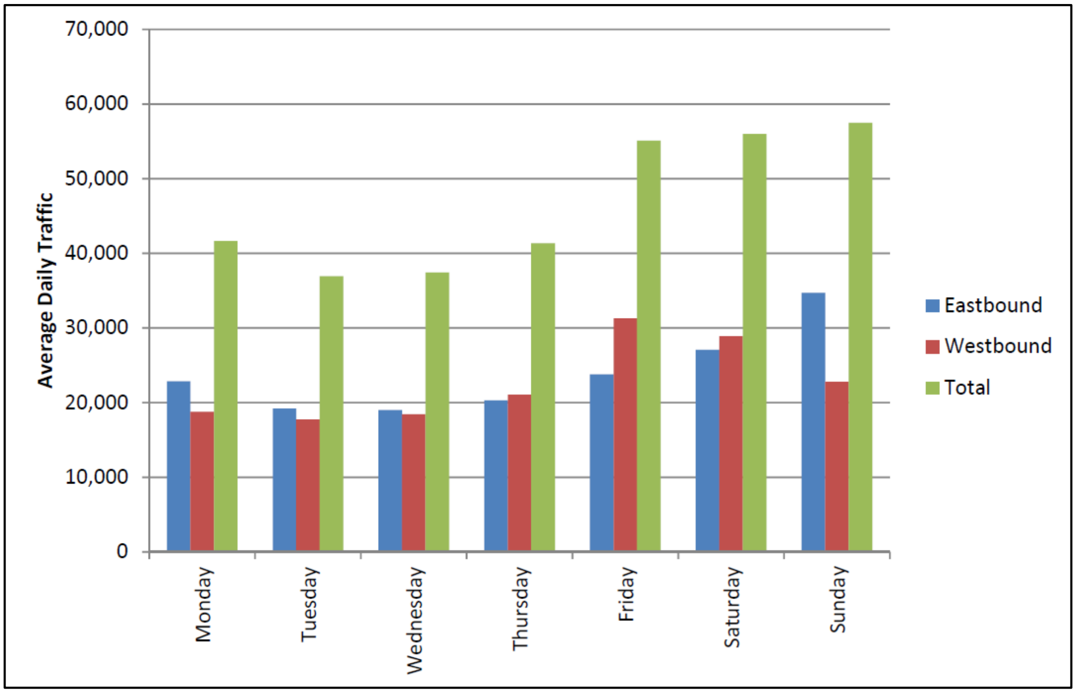


Source: I-70 Twin Tunnels Transportation Technical Memorandum, (CDOT, 2012b)

3.4 What are the Daily Patterns of Traffic?

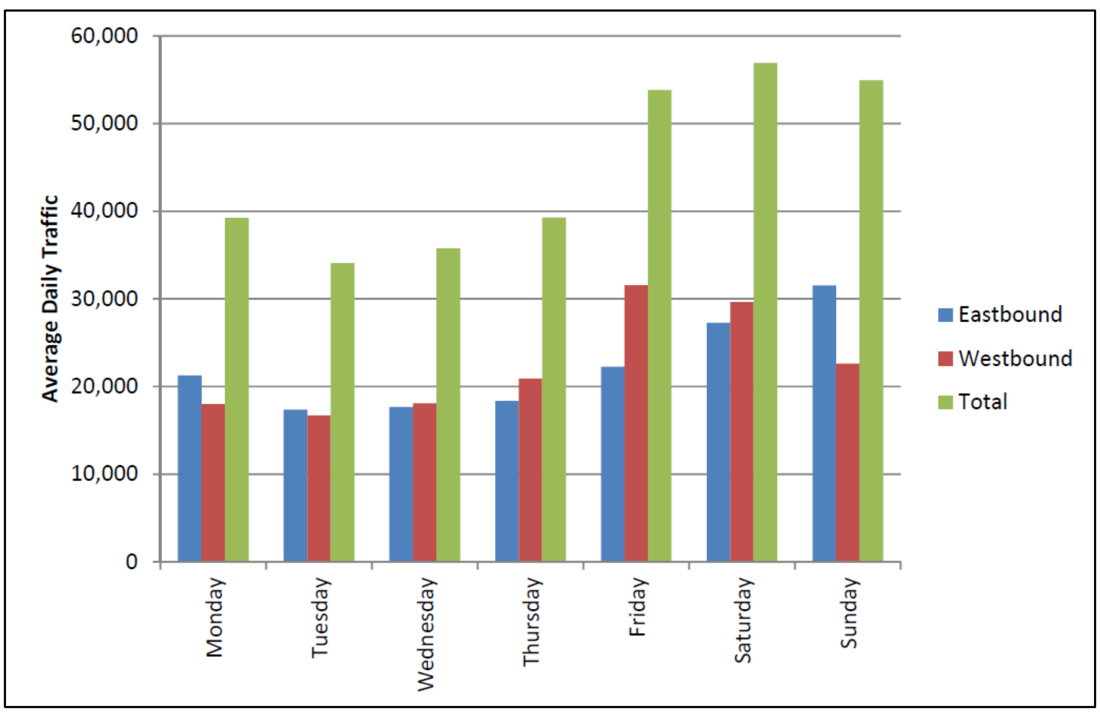
I-70 is used for different purposes on weekdays (work, shopping, medical, and social trips) and weekends (primarily recreation). Figure 3 (summer) and Figure 4 (winter) (from the *I-70 Twin Tunnels Transportation Technical Memorandum*) show that daily volumes patterns during both seasons are highest on Friday through Sunday. Volumes on these figures show westbound and eastbound volume trends. A peak in the westbound direction is seen on Friday as travelers drive to the mountains for recreational activities. There is slightly less westbound traffic on Saturdays. Patterns show that all of these vehicles add to the Sunday volumes as recreational travelers return to the Denver metropolitan area in order to be at work or school on Monday morning. Thus, Sundays have the highest eastbound volumes of the week, notably contributing to congestion on Sundays during these two peak seasons.

Figure 3. Summer Daily Traffic Patterns (June through September)



Source: I-70 Twin Tunnels Transportation Technical Memorandum (CDOT, 2012b)

Figure 4. Winter Daily Traffic Patterns (December through March)



Source: I-70 Twin Tunnels Transportation Technical Memorandum (CDOT, 2012b)

3.5 How many trucks use the I-70 Mountain Corridor?

The *I-70 Twin Tunnels Transportation Technical Memorandum* (CDOT, 2012b) measured the annual average percentage of trucks traveling through the Twin Tunnels at 8.5 percent in 2010, with a higher percentage to the west of the study area because of fewer passenger vehicles. Truck percentages also vary by season due to variations in truck volume as well as variations in passenger vehicle traffic. Further, truck volumes are lower and passenger traffic is highest during the weekend peak periods. Thus, truck percentages during the peak period are noticeably less than the average: winter is the lowest (2 percent to 3 percent), summer is next (3 percent to 4 percent) and the offseason (5 percent to 6 percent) is highest.

The Dumont Port of Entry (POE) is located within the study area, and is operated by the Colorado State Patrol (CSP). There is only one chain station within the study area, located just west of the Twin Tunnels on eastbound I-70 (approximately mile marker 241). The chain station was recently reconstructed as part of the Twin Tunnels project.

3.6 How was the Peak Period Selected?

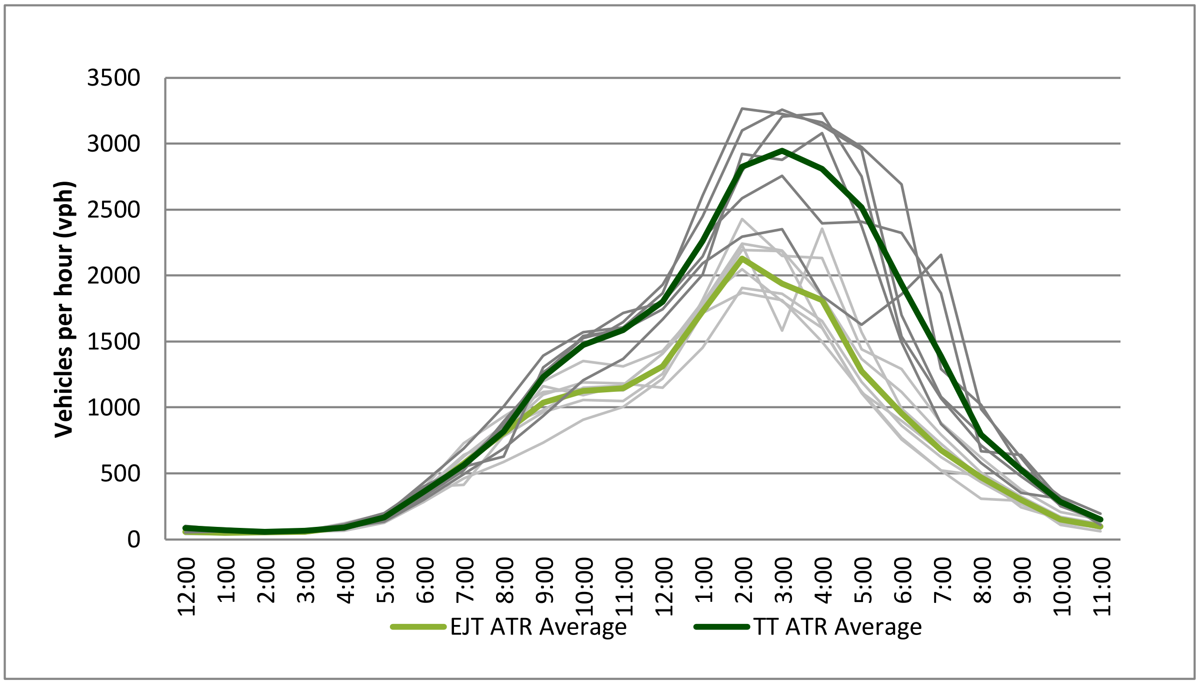
The goal of the Proposed Action for this project is to ease congestion in the eastbound direction of travel during peak periods. As indicated in Section 3.3, the Twin Tunnels Technical Memorandum defined the peak period as a typical Sunday during the summer and winter months. However, the Proposed Action may be operational during other heavily congested times, which may include Saturdays, Sundays, and holidays.

A full accounting of the determination for hours of operation of the PPSL is contained in the *Concept of Operations Report for I-70 Peak Period Shoulder Lane* (HDR and Apex Design, 2014), a summary of which is contained in this technical memorandum.

The heaviest flows of eastbound traffic are on Saturdays and Sunday afternoons during the winter months. By examining the traffic volumes, average speed data and congestion data for identified segments of the corridor, a recommendation for initial hours of operation for the PPSL can be made. These recommendations should be reevaluated once the program has been implemented, and the hours/days of operation can be revised based on “lessons learned” from observations, such as queue lengths and driver behavior.

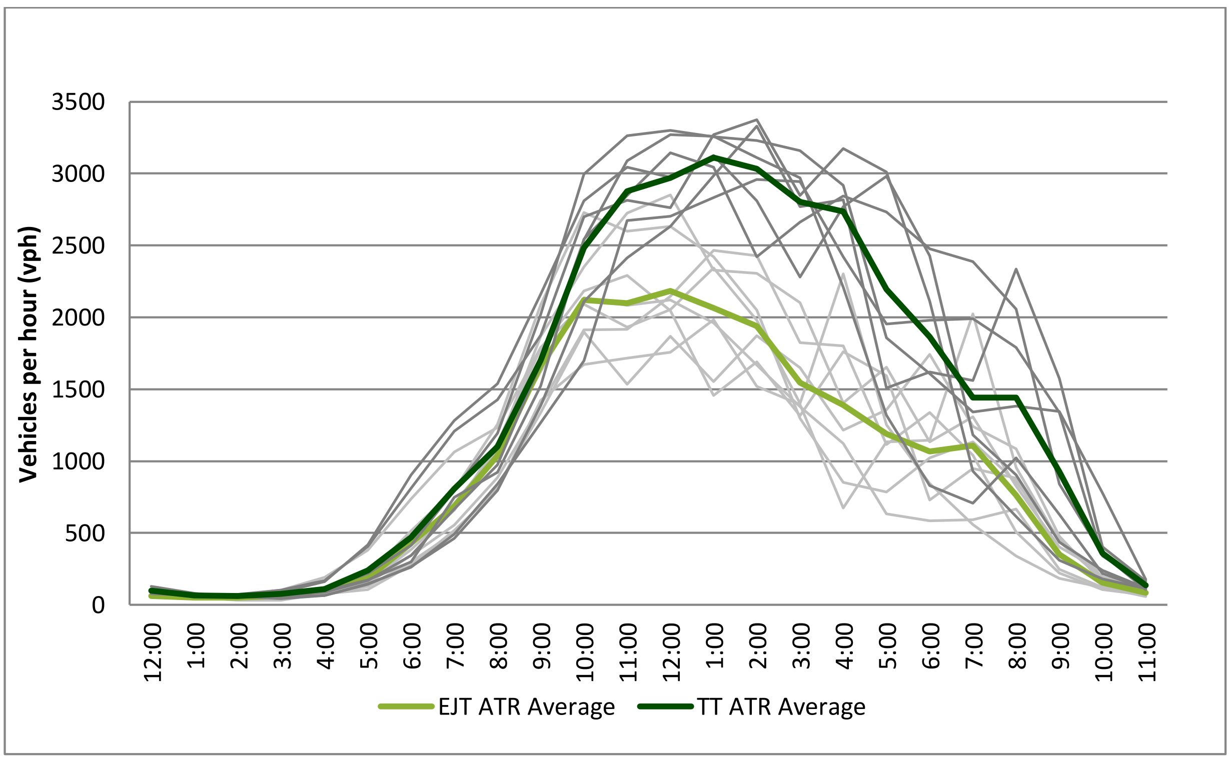
Volume data selected for analysis in the *I-70 Peak Period Shoulder Lane Traffic Analysis Feasibility Study* (Atkins and Apex Design, 2013) are from Saturdays and Sundays in 2010, which represent the typical of peak travel conditions for the I-70 corridor during ski season. These data were also collected prior to any speed harmonization trials that were performed by CDOT that would have affected throughput volumes. Figure 5 and Figure 6 show CDOT ATR data from the two permanent recorders located within the study area; one located east of the Eisenhower Tunnel and the other west of the Twin Tunnels, on Saturdays and Sundays. Eight weekends in January and February 2010 were selected, as well as the two Monday holidays during those months (Martin Luther King, Jr. Day and Presidents Day). Traffic was equivalent on the Sunday and Monday of those holiday weekends, and was, therefore, included in this analysis. The average for each ATR is shown in bold color; the gray lines correspond to the daily data points.

Figure 5. I-70 ATR Traffic Data (Saturdays in Winter 2010/2011)



Source: I-70 ATR Traffic Data (Saturdays in Winter 2010/2011)

Figure 6. I-70 ATR Traffic Data (Sundays in Winter 2010/2011)



Source: I-70 ATR Traffic Data (Sundays in Winter 2010/2011)

On Saturdays in 2010, total volumes began to increase at the same rate at both locations, at about the same time. The Eisenhower Tunnel ATR measured the maximum traffic volume of over 2000 vph at around 2:00 p.m., at which point volumes began to decrease. At the Twin Tunnels ATR, volumes reached a peak of just below 3000 vph later in the day, at about 3:00 p.m. On Sundays, total volumes began to sharply increase at the same rate at both locations, at about the same time. The Eisenhower Tunnel ATR measured the maximum traffic volume of over 2000 vph at around 12:00 p.m., at which point volumes began to decrease. At the Twin Tunnels ATR, volumes reached a peak of over 3000 vph later in the day, at about 1:00 p.m. In general, the Saturday peak occurred slightly later than Sunday, and had lower total traffic volumes.

Using data collected by CDOT RTMS devices, average speeds for the eastbound I-70 segment from US 40 to Idaho Springs were plotted for Saturdays and Sundays during the winter 2010–2011 season, between the hours of 9:00 a.m. and 11:00 p.m. Figure 7 and Figure 8 show the individual daily data in grey with the average data in bold color. In general, the average hours of congestion on Saturdays are shorter, beginning at about 2:00 p.m. and lasting until about 9:00 p.m. In contrast, the hours of congestion on Sundays lasts from about 11:00 a.m. until 9:00 p.m. Both of these average speed curves correspond with the volume data from the same time period, i.e., volume increases closely correspond with average speed decreases over the same time period.

Figure 7. I-70 Average Speeds (Saturdays in Winter 2010/2011)

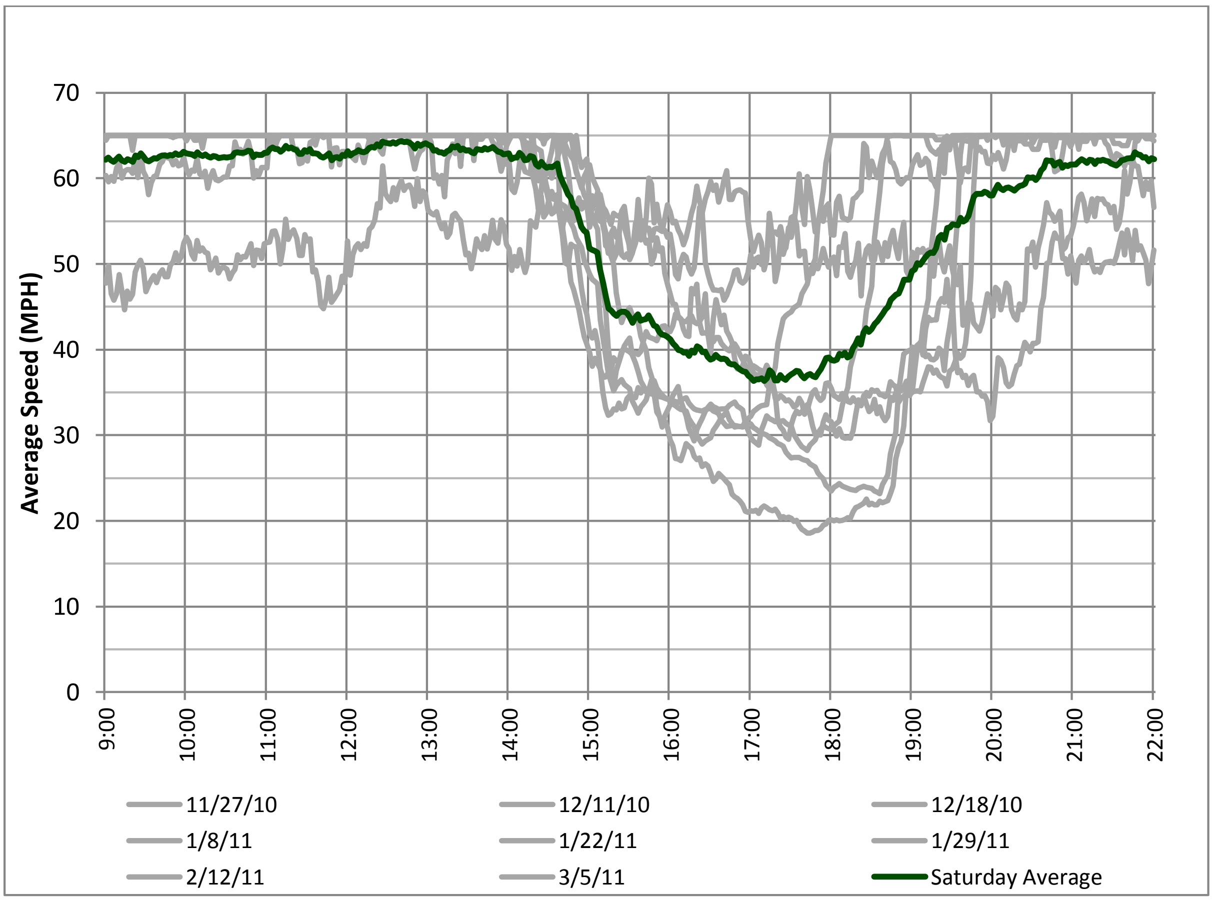
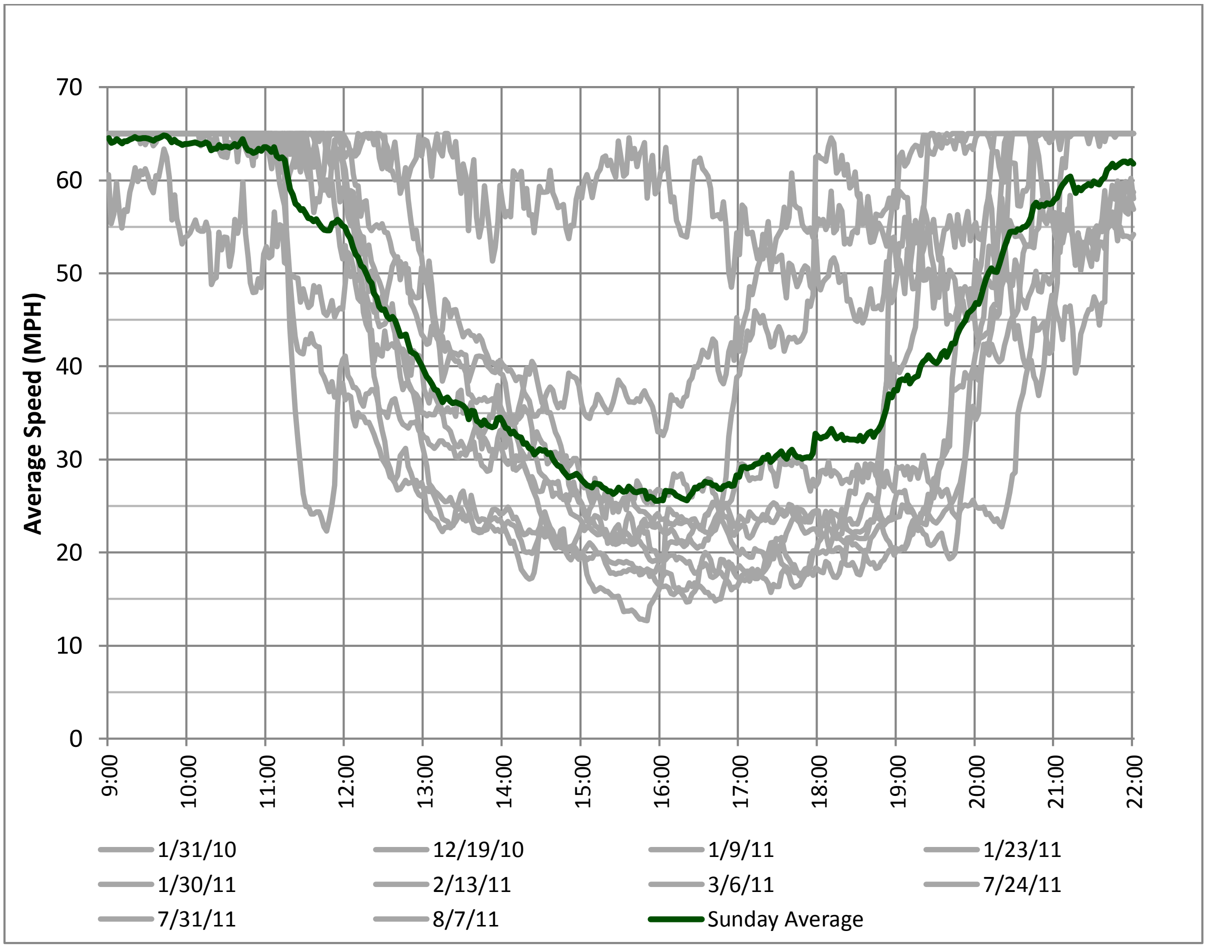


Figure 8. I-70 Average Speeds (Sundays in Winter 2010/2011)



Eastbound travel time segment data were analyzed as part of the *I-70 Eisenhower Johnson Tunnel Continuous Flow Metering (CFM) Study* (CDOT, 2012a). Segment data was collected along I-70 by CDOT RTMS devices and plotted by time. Segments were counted as congested when the average travel speed dropped below free flow speeds. Figure 9 shows data for Saturdays and Sundays during winters in 2010 through 2012, and three days in late July/August 2011, similar to proposed implementation dates for the PPSL.

The observations below, based on the data in Figure 9, indicate the need for flexibility in the implementation of the PPSL which will allow the ability to adapt to traffic conditions as they evolve.

- Only five dates had little to no congestion during the entire time period. Four of those dates were in conjunction with Christmas, and one was in late March after peak ski season.
- Approximately 1/3 of the days showed congestion that lasted fewer than 5 hours.
- Approximately 1/6 of the days showed congestion that began prior to 11:00 a.m.
- Approximately 1/3 of the days showed congestion that began at or after 11:00 a.m. and continued for more than 5 hours, equally distributed between Saturdays and Sundays.

Based on the information collected and analyzed, and other historical data, it is apparent that the PPSL typically would be most effective on Saturdays, Sundays, and holidays in July through September, and December through March, between the hours of 11:00 a.m. and 9:00 p.m. Specific operational parameters would be determined during final design of the PPSL, in an agreement between FHWA and CDOT.

3.7 How Much Traffic Uses the Frontage Road that parallels I-70?

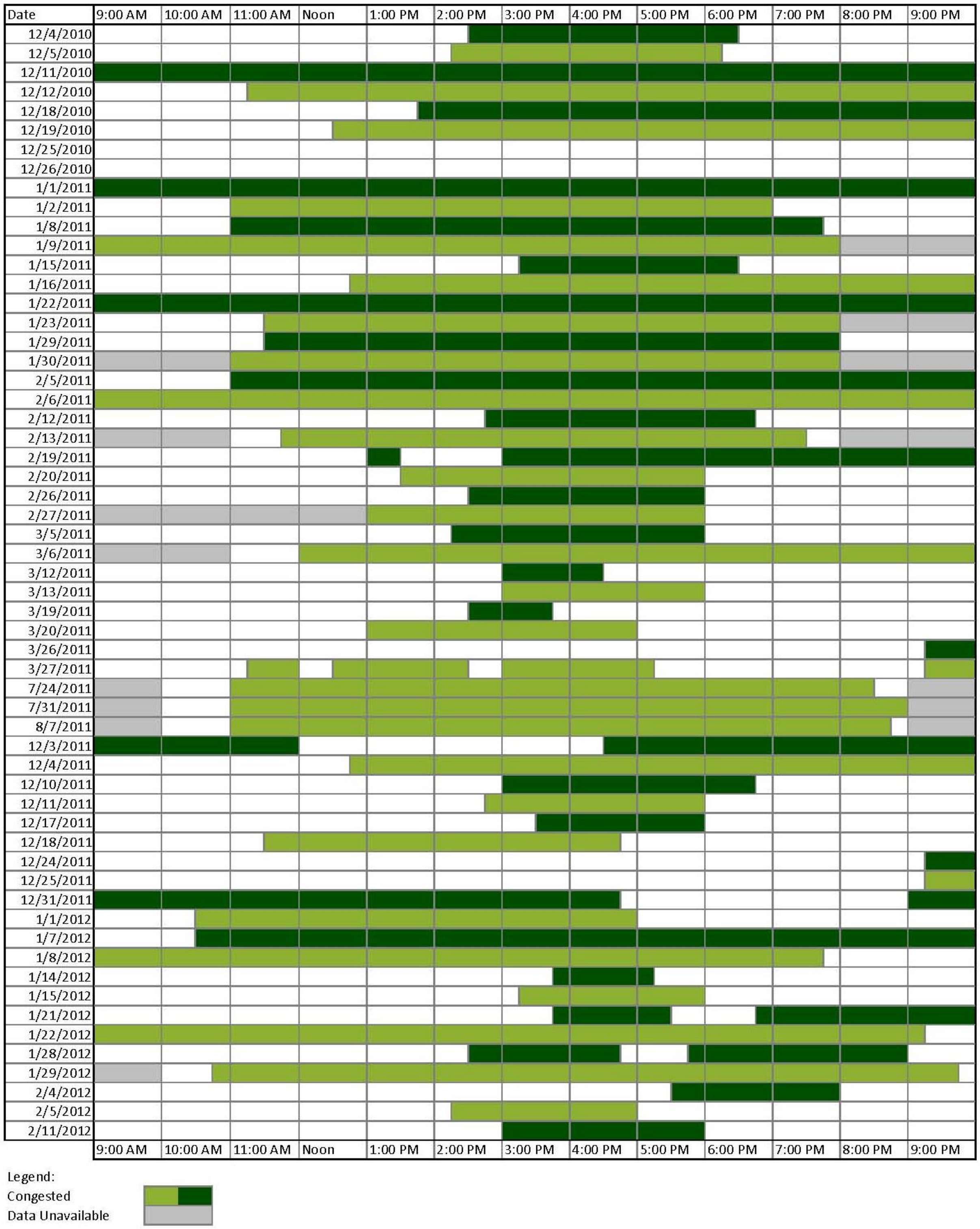
The DynusT traffic analysis model used by Atkins included the Frontage Road network along with the I-70 main lanes and interchange ramps. Traffic volume data for existing and opening year were reported for the action and no-action alternatives. Peak period traffic volumes for the 2013 no-action alternative along the frontage roads are shown in Table 1. The volumes on these frontage roads, particularly the large imbalance in flows dominated by the eastbound direction, are indicative that traffic is diverting from I-70 main lanes during periods of congestion.

Table 1. 2013 Peak Period Local Road Volumes

	CR 308 at Lawson	Stanley Road at Fall River	Colorado Blvd. at SH 103	Colorado Blvd. at East Idaho Springs
Westbound Volume	1974	471	784	1932
Eastbound Volume	7472	4214	11,113	3580

Source: ATKINS PPSL DynusT Model, 2013

Figure 9. I-70 Eastbound Traffic Congestion Summary—US 40 to Idaho Springs (2010 to 2012 Winter Peak Saturdays and Sundays)



Source: *Concept of Operations for I-70 Peak Period Shoulder Lane* (HDR and Apex Design, 2014)

Section 4. Existing Safety Assessment

4.1 What is the Study Area for the Safety Assessment?

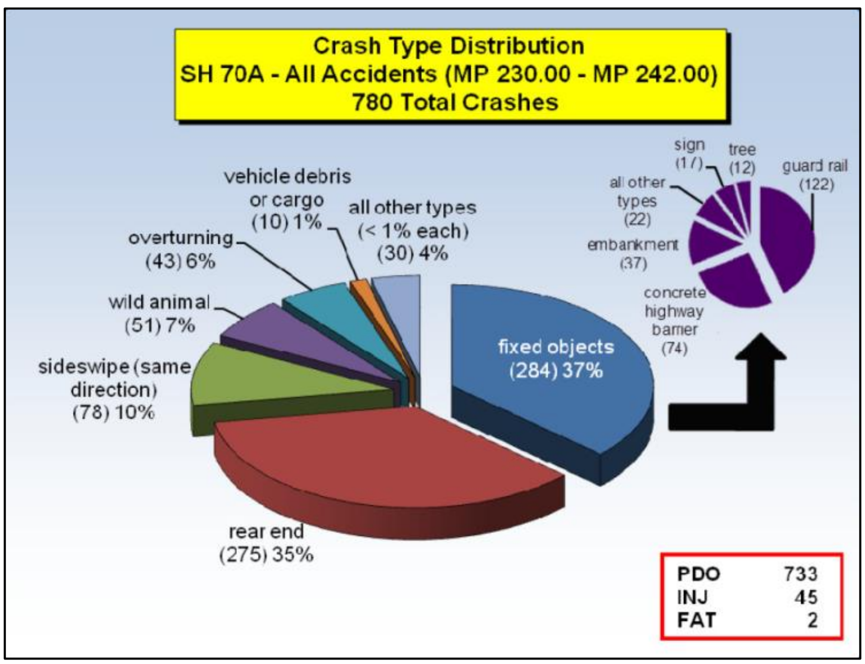
The following findings are taken from the *I-70 Eastbound Peak Period Shoulder Lane (PPSL) Safety Report* (FHU, 2013). The Safety Report focused on crashes that occurred between January 1, 2008, and December 31, 2012, on a 12-mile segment of highway on I-70 between MP 230 and MP 242. This would cover the PPSL study area which goes from Empire Junction (MP 232) to east Idaho Springs (MP 241).

The 2010 average annual daily traffic (AADT) for this 12-mile corridor varied between approximately 30,000 vpd and 44,000 vpd. As a percentage of the total vehicular traffic volume, the average truck percent at the twin tunnels is 8.5, but is substantially less during peak periods due to higher auto traffic and lower truck volumes.

4.2 What are the Crash Patterns in the Study Area?

A total of 780 crashes were reported during the 5-year time period. Of these crashes, 94 percent were Property Damage Only (PDO) crashes and 6 percent were injury or fatal crashes. The most common types of crashes were fixed object (37 percent), rear end (35 percent), and sideswipe (10 percent). Figure 10 shows a distribution of crash types that occurred.

Figure 10. Crash Type Distribution



Source: *I-70 Peak Period Shoulder Lane Safety Report* (FHU, 2013)

The most predominant type of crashes involved fixed objects or rear-end collisions. The majority of fixed object crashes occurred during winter weekdays when high travel speeds and/or poor road conditions were factors. Crashes that occurred in the eastbound direction include 69 percent rear-end crashes and 71 percent sideswipe crashes. These types of crashes occurred more frequently during winter weekends in the eastbound direction. This is most likely because of the high levels of congestion that are experienced in the eastbound direction.

4.3 What Are the Locations Where Crashes Are Most Likely to Occur?

In order to facilitate a more detailed crash analysis, the 12-mile corridor was split into 7 segments. The segmentation of the corridor is presented in Figure 11.

There are several locations of crash concentrations through the study area. Most of these peaks are around the several horizontal curves in the corridor. The largest peak on the graph coincides with the curves at the Empire Junction in segment 1, with 189 crashes; more than any other segments analyzed. Of those 189 crashes, 56 were on a horizontal curve between MP 231.70 and MP 232.20. Of the 56 crashes on this horizontal curve, 30 were rear-end collisions, and 28 of those 30 rear-end collisions occurred in the eastbound direction. This trend is consistent with most of the segments that were analyzed. Some factors that could be causing such a high frequency of eastbound rear-end collisions include: traffic congestion, steep downhill grade, and insufficient lighting.

Section 5. Future Growth Forecasting Methodology

5.1 What is the Basis for Off-Peak Volume Forecasts?

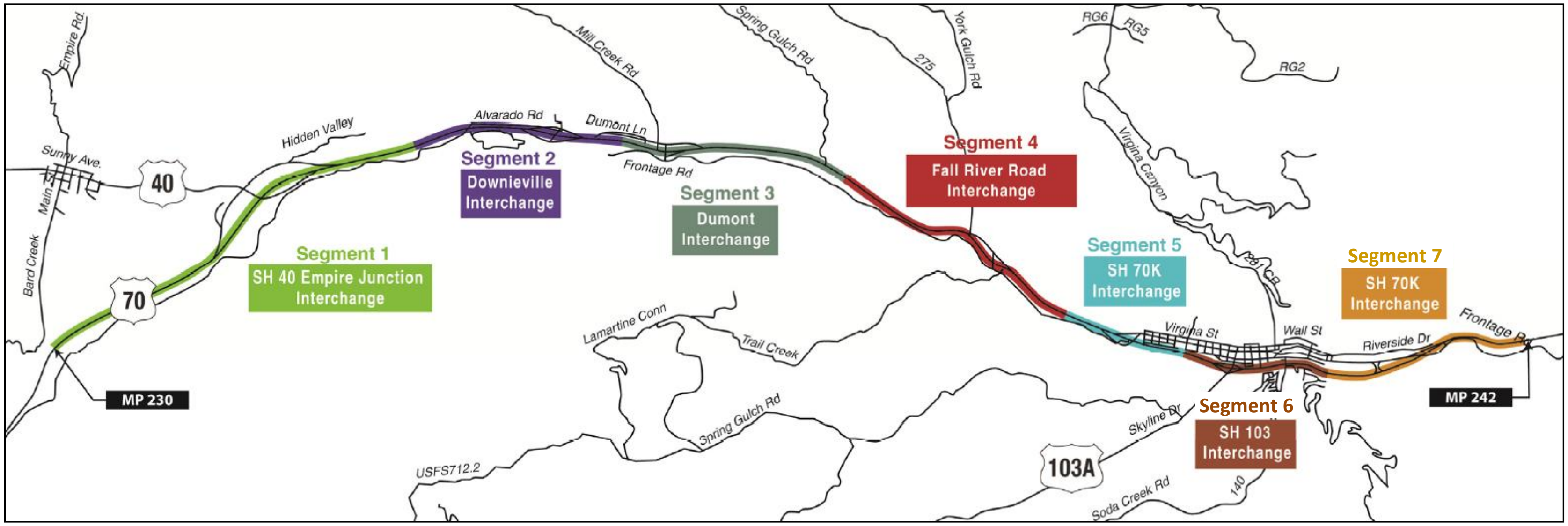
Off-peak volume forecasts, generally consisting of weekdays, were provided and analyzed as part of the *I-70 Twin Tunnels Transportation Technical Memorandum* (CDOT, 2012b). The Proposed Action and No Action alternatives presented in this technical memorandum are based on a managed lane operating during the peak period as previously defined. As such, this study did not analyze off-peak conditions and did not forecast those volumes.

5.2 What is the Process for Forecasting Peak Period Volumes?

Traffic volumes utilized in this report are defined in the *I-70 Peak Period Shoulder Lane Traffic Analysis Feasibility* Study (Atkins and Apex Design, 2013) for the condition described as managed lane with a left side PPSL. This condition is defined as follows:

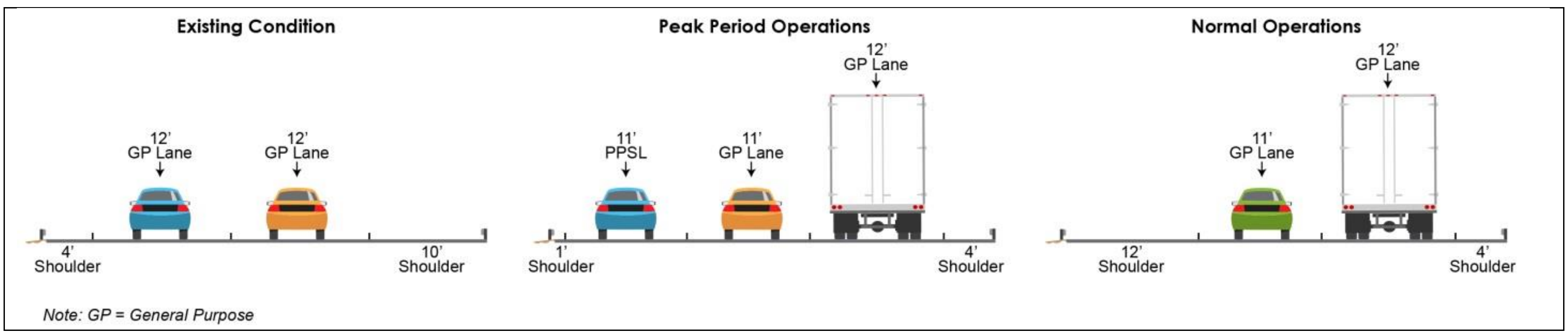
The proposed PPSL will utilize the inside shoulder of eastbound I-70 for hard shoulder running from US 40 to the tie-in point with eastbound I-70 widening at the Twin Tunnels. The PPSL will be tolled during peak periods of travel, and will function as a shoulder for emergency stopping during the off-peak periods. Figure 12 illustrates the existing and typical cross section for the left side PPSL.

Figure 11. Corridor Segmentation



Source: I-70 Peak Period Shoulder Lane Safety Report (FHU, 2013)

Figure 12. Typical Cross-Section with Lane Assignment



Section 6. Overview of Operational Analyses Procedures

6.1 What Methodology was Used to Analyze Peak Day Conditions?

DynusT is a dynamic traffic assignment (DTA) model that supplements and bridges the gap between travel forecasting models and microscopic traffic simulation models. One of the explicit benefits of using DynusT is its inherent capabilities to analyze the managed lane (tolled) operational option to address peak day, congested conditions. The DynusT modeling for the PPSL analyses included the following assumptions:

- Traffic volumes represented a peak Sunday during the winter.
- The model represents traffic conditions between the hours of 9:00 a.m. and 11:00 p.m.
- The base model and calibration process was completed by the University of Arizona.
- Calibration of the model was confined to the I-70 corridor and more specifically the I-70 mainlines.
- Most of the results of the analyses refer only to eastbound traffic operations between Empire Junction and Floyd Hill unless otherwise noted.
- The analysis assumed dry roadway conditions, no adverse weather, and no incidents on I-70.
- The analysis assumed all alternative routes, such as frontage roads and other roadways, included in the model were also free of incidents and adverse weather.

  The analysis assumed that all vehicle types (passenger vehicles and trucks) were allowed to use all roadways and all lanes.

6.2 What Performance Measures Were Used to Compare Scenarios?

Measures of Effectiveness (MOEs) evaluated as part of the *I-70 Peak Period Shoulder Lane Traffic Analysis Feasibility Study* included the following:

- Travel Times
- Link Speeds
- Link Volumes
- VHT and VMT
- Toll prices and potential revenue

Speed, VMT, and VHT are reiterated in this technical memorandum as they provide an adequate representation of travel conditions. Travel times are simply an inverse function of speed, and volume is a direct function of VMT and the corridor length.

At the time of this technical memorandum, toll pricing and potential revenue analyses are being conducted and are not currently available. However, it should be noted that toll pricing concepts may include a combination of the following:

- Static Pricing—A single, fixed price is charged regardless of congestion.
- Variable Pricing—Price is based upon time of day for each day of the week; although, in some circumstances it may also be established for certain days of the month or year.
- Dynamic Pricing—Different price levels are triggered by traffic flow thresholds using real time traffic detection equipment. Prices fluctuate based on actual traffic conditions in the managed lane in order to maintain free flow speeds. While dynamic pricing is not intended for use during the initial implementation, it is possible that future traffic growth might make it a viable option.

Toll rates are the prices that are charged for the segment(s) of the tolled facility. As mentioned, they may be fixed, variable by time-of-day, or dynamic based upon prevailing congestion. The rates may be determined through a pricing model as part of a Traffic and Revenue Study.

In the *I-70 Peak Period Shoulder Lane Traffic Analysis Feasibility Study*, the tolling was modeled with dynamic pricing aimed to achieve the desired lane use in order to keep the lane operating at a speed of 45 mph, typically. Based upon traffic engineering principles, 45 mph is the speed where one can maintain the highest volume and density (spacing between vehicles) without experiencing congestion and compromising safety. This operating speed would also allow for the safe and efficient movement of emergency response vehicles through the study area, as well as additional travel time reliability for emergency responders during peak and non-peak operations.

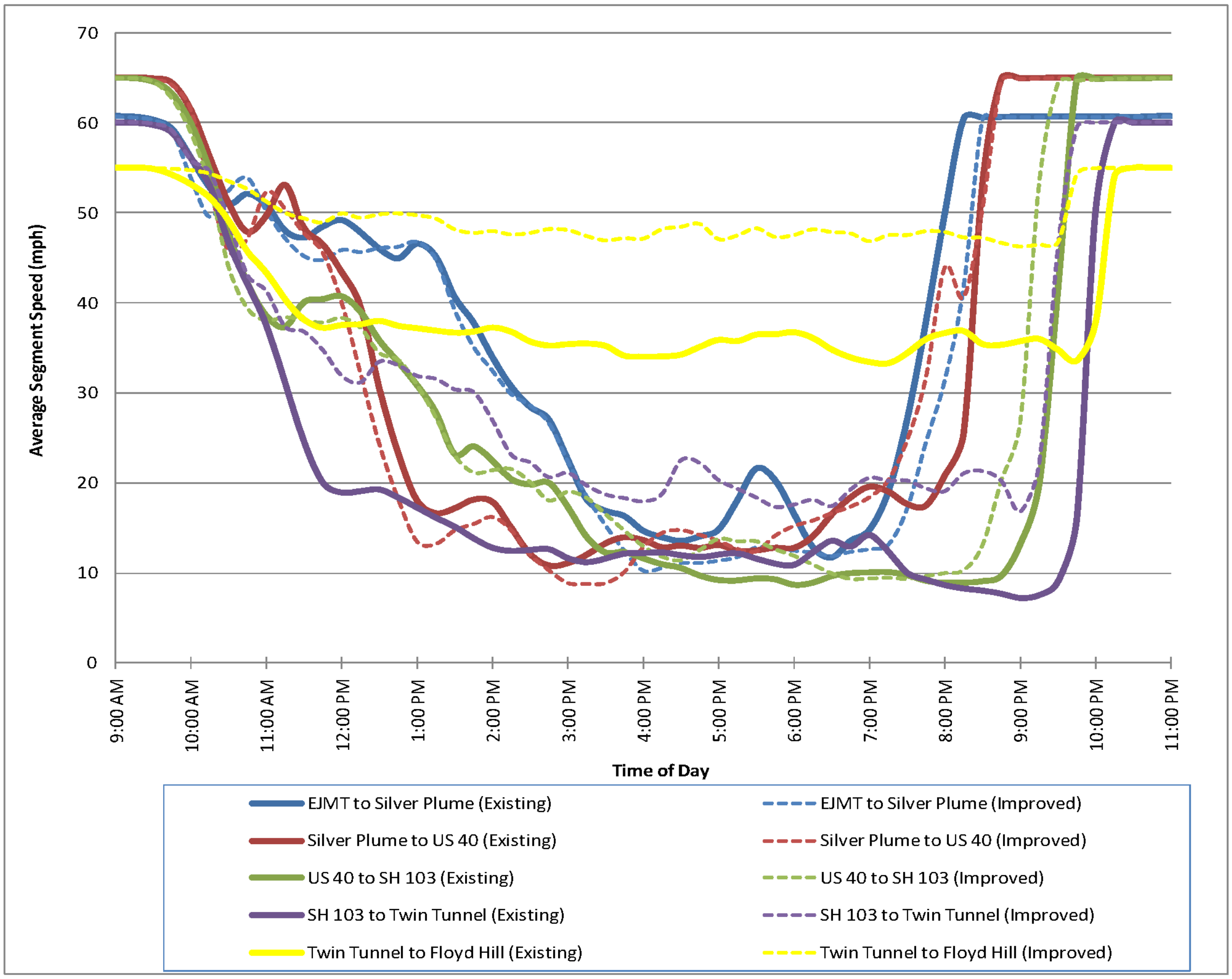
Section 7. No Action Alternative

7.1 How will the I-70 Corridor Operate Under the No Action Alternative in 2015?

Future traffic conditions in this segment of I-70 were estimated in the *I-70 Peak Period Shoulder Lane Traffic Analysis Feasibility Study*. To determine the impact of the Twin Tunnels widening project, the DynusT model was utilized to evaluate 2013 existing conditions without the Twin Tunnels widening and 2013 "Improved" conditions, which assumed that the Twin Tunnels widening improvements will be complete and open to traffic. Figure 13 shows the results of the comparison between these two models and the changes that are expected once the Twin Tunnels widening is complete.

As shown, the Twin Tunnels widening project (now completed) is expected to improve travel speeds in the vicinity of the tunnel and generally shorten the total congestion period. However, speeds are still expected to be low for many of the segments between the EJMT and Floyd Hill.

Figure 13. Eastbound I-70 Peak Period Speeds for Year 2013 Existing and "Improved" Conditions



Source: I-70 Peak Period Shoulder Lane Traffic Analysis Feasibility Study, ATKINS, 2013

7.2 How will the I-70 Corridor Operate under the No Action Alternative in 2035?

Table 2 shows that because there are no changes to the roadway network for the 2035 No Action conditions, the large growth in background traffic between 2015 and 2035 will result in a modest increase in the VMT and a significant increase in VHT on I-70. Thus, the corridor is serving a few more trips, but the trips are taking much longer to complete.

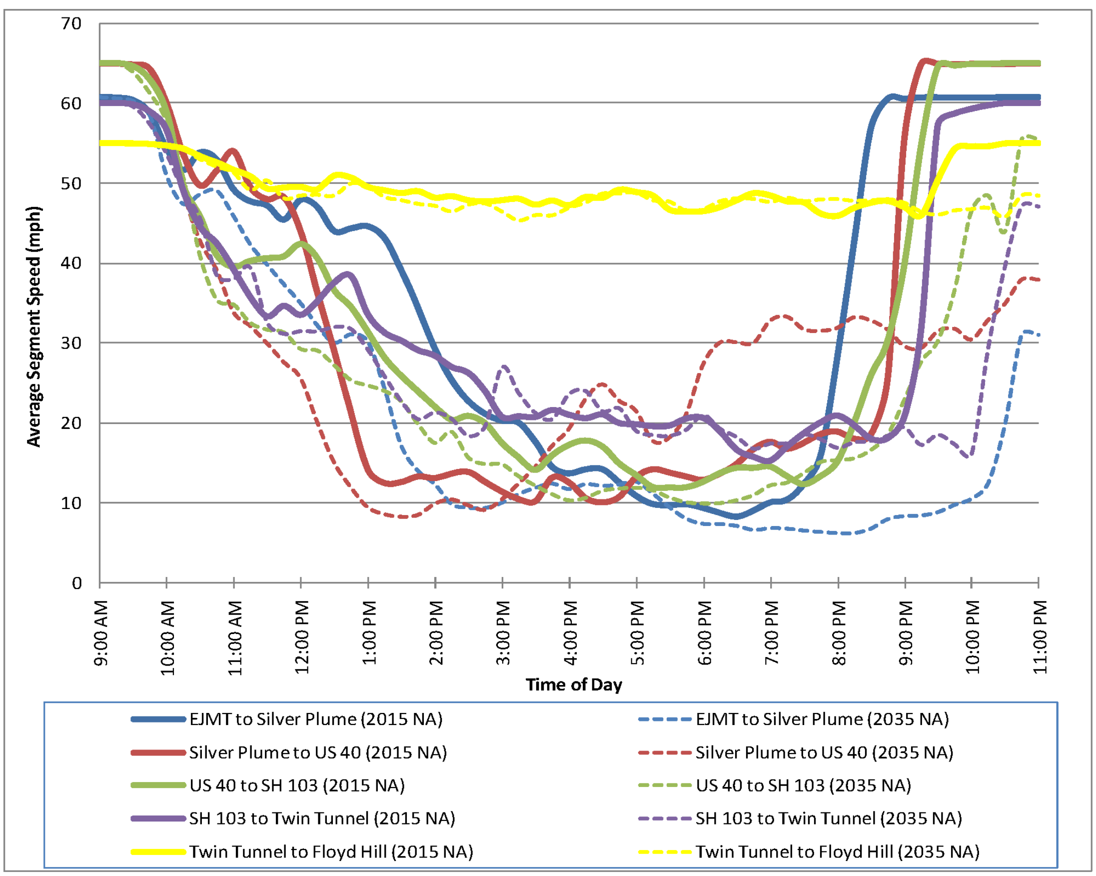
Table 2. Eastbound I-70 Peak Period VMT and VHT for 2015 and 2035 No Action Conditions

	VMT	VHT
2015 No Action	1,108,928	49,878
2035 No Action	1,233,449	70,197
Difference	11%	41%

Source: I-70 Peak Period Shoulder Lane Traffic Analysis Feasibility Study, ATKINS, 2013

Additional congestion because of increased travel demand was also modeled for 2015 and 2035 No Action scenarios, where no additional improvements are implemented. Since the corridor already operates at capacity for many hours during peak weekend afternoons, the lower travel speeds are expected to remain unchanged (see Figure 14); however, the duration of the peak period will increase with the additional demand. Whereas congestion is expected to end between 7:00 p.m. and 8:00 p.m. during peak Sundays with the completion of the Twin Tunnels widening project, it is expected to extend to 9:00 p.m. in 2015 and beyond 10:00 p.m. by 2035. In order to shorten the peak period duration and improve travel times, additional improvements along this segment of eastbound I-70 will be required.

Figure 14. Eastbound I-70 Peak Period Speeds for Year 2015 and 2035 No Action Condition



Source: I-70 Peak Period Shoulder Lane Traffic Analysis Feasibility Study, ATKINS, 2013

Section 8. Proposed Action

8.1 What is the Proposed Action?

The purpose of the I-70 PPSL project is to provide short-term eastbound operational improvements to relieve traffic congestion during periods when traffic volumes are highest. This segment is the most congested stretch of the entire I-70 Mountain Corridor. During both the summer and winter peak season, traffic volumes are highest on weekends when recreational travelers comprise more than 90 percent of traffic. In 2010 drivers experienced speeds of less than 20 miles per hour for 35 percent of the time on Sundays, which have the highest volume. Some motorists divert to the frontage road along I-70, which affects its ability to function as a local access county road.

The Proposed Action would add a peak period shoulder lane between the US 40/I-70 interchange and east Idaho Springs. This managed lane would be used during peak periods, defined as Saturdays, Sundays, and holidays, improving travel times and operations. The project extends from milepost 230 to milepost 243, with improvements proposed as follows:

- Milepost 230 to milepost 232: signage improvements only. Signage would notify motorists of the status of the managed lane, entrance and exit points, and cost.
- Milepost 232 to milepost 242: roadway improvements, including: up to 3.5 feet of widening in select areas to accommodate the managed lane, up to 14 feet of widening at the SH 103 on ramp and 4 feet to 8 feet of widening at all other on-ramps in the corridor, replacement of the existing SH 103 bridge, bridge replacement and interchange improvements at Exit 241, improvements to Water Wheel Park, signage, rock fall mitigation in two locations, and construction of 11 retaining walls.
- Milepost 242 to milepost 243: signage improvements only.

The managed lane, which would be tolled, would operate up to, but not exceed, 20 percent of the annual days or 7.5 percent of the time, and connect to the three-lane section provided by the Twin Tunnels project, east of Idaho Springs, thereby capitalizing on that investment.

The improvements will be consistent with the *I-70 Mountain Corridor Programmatic Environmental Impact Statement* (PEIS) *Record of Decision* (ROD), I-70 Mountain Corridor Context Sensitive Solutions process, and other commitments of the PEIS. The Proposed Action fits within the definition of “expanded use of existing transportation infrastructure in and adjacent to the corridor” as an element of the Preferred Alternative Minimum Program.

See Figure 15 for an overview of the proposed improvements.

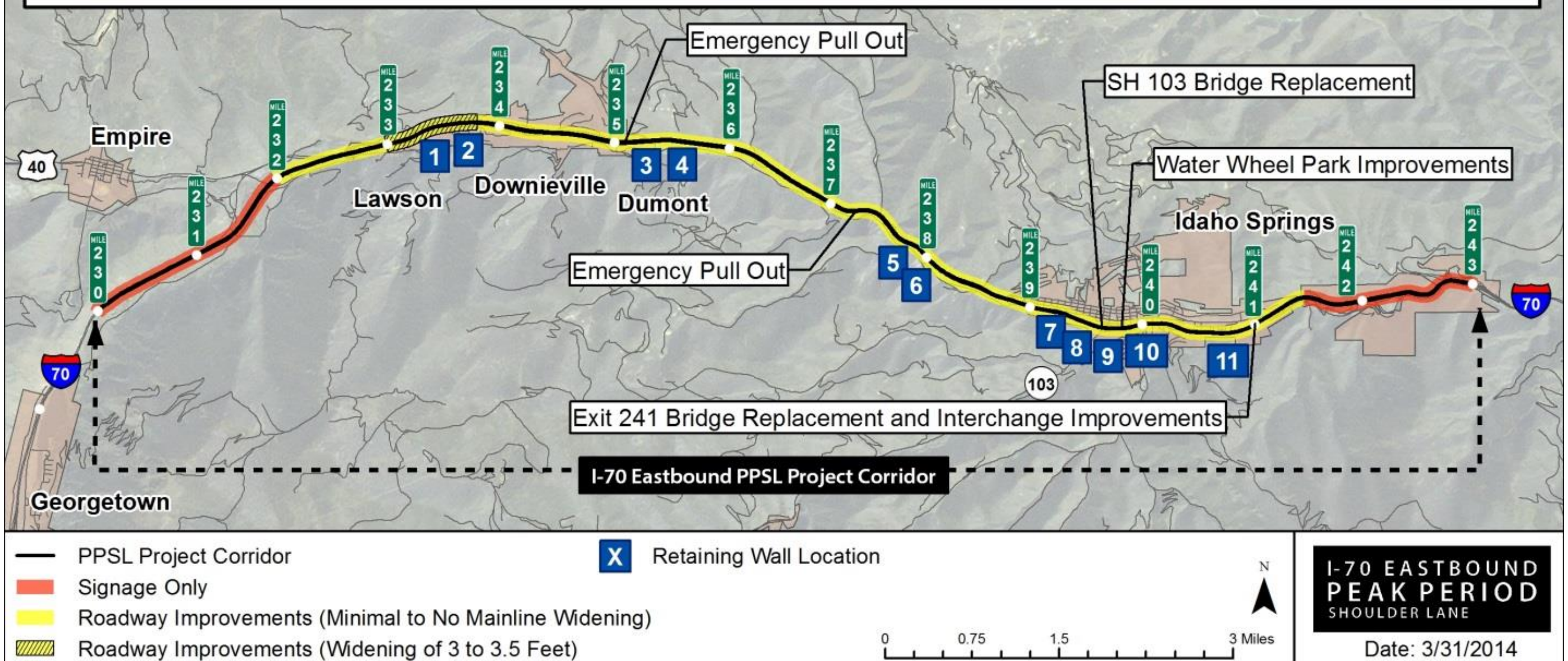
Figure 15. Proposed Improvements

Proposed Improvements

- Widening to accommodate a peak period shoulder lane.
- SH 103 bridge replacement and the Exit 241 bridge replacement and interchange improvements, including a new retaining wall.
- Construction of 10 retaining walls and rehabilitation of an existing retaining wall.
- Construction of 2 emergency pull outs.
- Signage throughout the corridor.
- Up to 14 feet of widening at the SH 103 on-ramp and approximately 4-8 feet of widening at all other on-ramps.
- Improvements to Water Wheel Park.
- Water quality treatment measures throughout the corridor.
- Two areas of rock fall mitigation near milepost 240.

Retaining Wall Summary

	Wall Location Description	Mainline or Ramp Widening	Length Wall (Feet)	Maximum Exposed Wall Height (Feet)
1	Lawson	Mainline	750	4.3
2	East of Lawson	Mainline	375	2.4
3	Dumont On-Ramp	Ramp	275	2.6
4	Between Dumont and Fall River	Mainline	875	2.6
5	Fall River On-Ramp Wall #1	Ramp	325	3.4
6	Fall River On-Ramp Wall #2	Ramp	325	2.9
7	SH 103 Off-Ramp	Ramp	210	5.8
8	SH 103 Off-Ramp (existing wall to be rehabilitated)	Ramp	400	Existing
9	SH 103 On-Ramp	Ramp	TBD	4.0
10	Approach to Bridge over Clear Creek	Ramp	75	2.0
11	Exit 241 Ramp (walls on both sides)	Ramp	500	12.0
			4,110	N/A

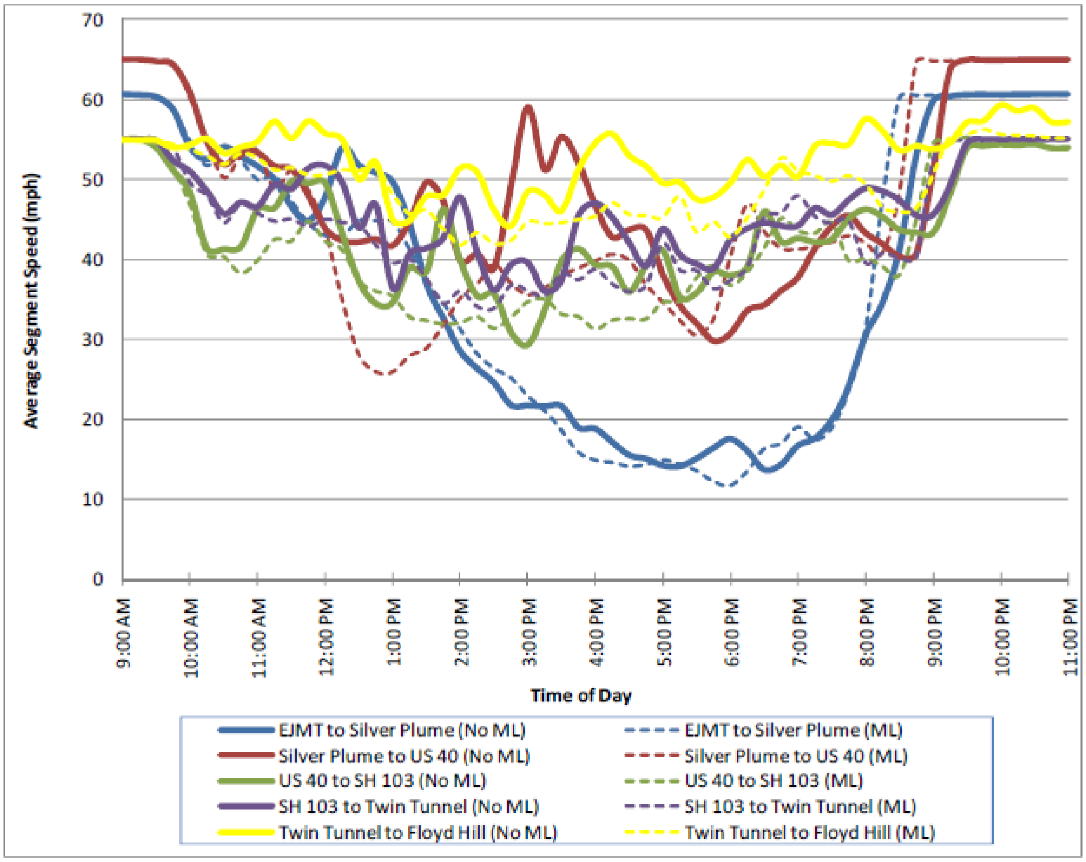


Data Source: Clear Creek County,CDOT, HDR Note: TBD=To Be Determined N/A=Not Applicable

8.2 What will the Operations be Under the Action Alternative in 2015?

Operational conditions with the PPSL were summarized during the *I-70 Peak Period Shoulder Lane Traffic Analysis Feasibility Study*. These results, as presented on Figure 16, showed a significant reduction in congestion in the eastbound direction of I-70 through the study area.

Figure 16. Eastbound Peak Period Speeds for 2015 Left Side PPSL



Source: I-70 Peak Period Shoulder Lane Traffic Analysis Feasibility Study, ATKINS, 2013

As a result of reducing congestion at the interchange of US 40, areas to the west of the study area also realize a reduction in delay extending beyond the limits of this study. It should be noted that benefits beyond what is recorded in the Feasibility Study may be realized by implementing the Proposed Action described in this technical memorandum. Lower travel speeds are anticipated west of US 40 because of the volume of vehicles using the two general purpose lanes. Those speeds increase as the proposed managed lane is developed just past the US 40 interchange. Overall, speeds increase significantly during the peak period with the proposed action.

Travel times analyzed along I-70 between EJMT and the top of Floyd Hill for 2015 demonstrate that there is a 42 percent to 48 percent reduction in the maximum travel time when compared to the No Action alternative.

Eastbound I-70 peak period VMT/VHT for the 2015 No Action and 2015 build conditions as reported in the Feasibility Study are shown in Table 3.

Table 3. Eastbound I-70 Peak Period VMT and VHT for 2015 No Action and 2015 Build Conditions

	VMT	VHT
No Action	1,108,928	49,878
Proposed Action	1,140,488	34,458
Difference	3%	-31%

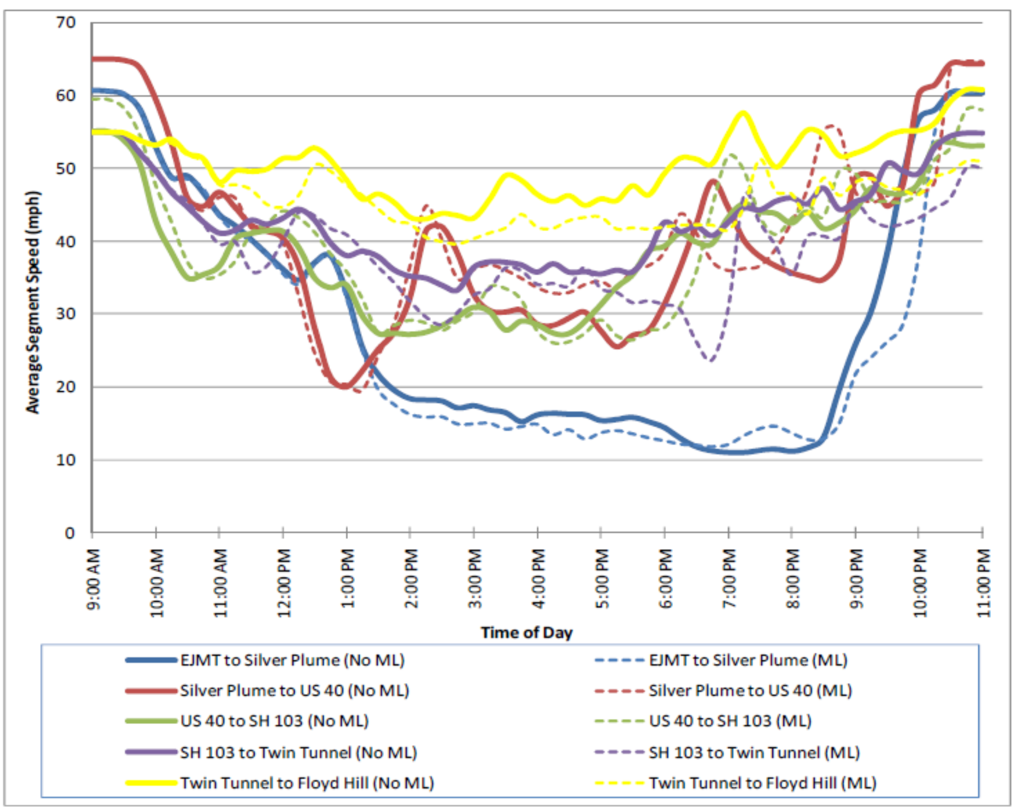
Source: I-70 Peak Period Shoulder Lane Traffic Analysis Feasibility Study, ATKINS, 2013

The results show that the VMT will increase by 3 percent, but the travel time will decrease by 31 percent if the proposed action is implemented.

8.3 What will the Operations be Under the Action Alternative in 2035?

Operational conditions with the PPSL were summarized during the *I-70 Peak Period Shoulder Lane Traffic Analysis Feasibility Study*. The results (presented on Figure 17) showed a significant reduction in congestion in the eastbound direction of I-70 through the study area.

Figure 17. Eastbound Speeds for 2035 Peak Period Left Side PPSL



Source: I-70 Peak Period Shoulder Lane Traffic Analysis Feasibility Study, ATKINS, 2013

Operations along the corridor will be significantly enhanced by the proposed action. Without the proposed action speeds between Silver Plume and SH 103 will typically range from 10 to 20 miles per hour during the heart of the peak period. With the proposed action speeds will improve to 30 to 40 miles per hour, and better. Travel times analyzed along I-70 between EJMT and the top of Floyd Hill for 2035 demonstrate that there is up to a 50 percent reduction in the maximum travel time when compared to the No Action alternative.

Eastbound I-70 VMT/VHT for the 2035 No Action and 2035 build conditions as reported in the Feasibility Study are shown in Table 4.

These results show that the VMT will increase by 6 percent, but the travel time will decrease by 33 percent if the proposed action is implemented.

Table 4. Eastbound I-70 Peak Period VMT and VHT for 2035 No Action and 2035 Build Conditions

	VMT	VHT
No Action	1,233,449	70,197
Proposed Action	1,312,691	46,993
Difference	6%	-33%

Source: I-70 Peak Period Shoulder Lane Traffic Analysis Feasibility Study, ATKINS, 2013

8.4 How will the Frontage Road Volumes be Impacted by the Implementation of the Proposed Action

Although analysis of the Frontage Road was not accounted for as part of the *I-70 Peak Period Shoulder Lane Traffic Analysis Feasibility Study*, volumes for the 2015 Proposed Action and No Action Alternative were provided by Atkins, as a supplement to their study. These volumes were produced using the same method and were extracted from the calibrated DynusT model produced as part of that study.

The DynusT traffic analysis model used by Atkins included the Frontage Road network along with the I-70 main lanes and interchange ramps. Traffic volume data for existing and opening year were reported for the Proposed Action and No Action Alternative. Peak period eastbound traffic volumes for the 2015 Proposed Action and No Action alternative along the frontage road are shown in Table 5. Westbound traffic is not shown because there is very little change between the two conditions. These data indicate that the greatest reduction in frontage road traffic will occur through Idaho Springs where traffic flow during the peak period decreases by up to 3,632 vehicles. The comparison between Proposed Action and No Action conditions in 2035 is likely to show similar changes that occur in 2015; however, 2035 No Action frontage road volumes are not available for analysis.

Table 5. 2015 Peak Period Local Road Eastbound Volumes

	CR 308 at Lawson	Stanley Rd. at Fall River	Colorado Blvd. at SH 103	Colorado Blvd. at East Idaho Springs
No Action	7183	4867	11,709	3754
Proposed Action	6893	4901	8077	1711
Percent Reduction	-4%	+1%	-31%	-54%

Source: ATKINS PPSL DynusT Model, 2013

This dramatic reduction in traffic on local roads has many benefits to the adjacent communities. These include:

- Access and mobility improvements to roads intersecting with the frontage roads
- Safety improvements
- Emergency response time improvements
- Noise improvements
- Emissions reductions

8.5 What are the Advantages of Managed Lane Operations?

Managed lanes provide many advantages over general purpose lanes in the efficient operation of highway facilities. These advantages include improved operations, efficiency, flexibility, mode choice, safety, and economy. Advantages of the Proposed Action include:

Travel Time Reliability

As travel demand on I-70 continues to grow, congestion, long travel times, and uncertain travel time reliability will increase. Congestion, which in 2013 is confined primarily to peak periods on weekends, will grow over time to encompass weekday periods as well. A managed lane provides a mechanism for CDOT to assure a reliable and efficient travel time for 2035 and beyond as travel time reliability degrades in the general purpose lanes. Studies have shown that travelers are willing to pay a toll for travel time reliability.

Managed Lanes Provide Options

Managed lanes that are added in the same corridor as existing general purpose lanes provide options for travelers. Travelers are not required to use the facility, and many will only use them periodically, but travelers are provided the option for a faster, more reliable trip.

Managed Lanes are More Consistent with a User Pay Philosophy

Nationwide, highway funding and environmental groups have been advocating funding of highway capacity that ties highway travel more closely to a user pay philosophy. A managed lane that clearly matches an increasing cost with higher demand is more likely to encourage alterations in travel behavior.

Environmental groups nationwide support this approach because it more clearly passes on transportation costs to the user and serves to encourage transit use or carpooling, which increase person throughput rather than vehicle throughput.

Managed Lanes are a More Efficient Use of a Highway

There is a substantial premium in adding highway capacity in most highway corridors, and the I-70 Mountain Corridor has greater constraints than most. Providing the long-term ability to maintain a lane of free-flow travel will greatly enhance the capacity of the corridor.

Managed Lanes Can Encourage Transit and Carpooling

The pricing of highway usage has been clearly shown to encourage travelers to consider transit options and to increase vehicle occupancy rates. Travelers can gain the advantages of faster and more reliable travel time afforded by managed lanes at a lower per person cost by using transit or carpooling.

Managed Lanes Improve Emergency Response Reliability
Emergency vehicles will be allowed to use the lanes without paying a toll as long as they have been dispatched to run with lights and sirens for emergency purposes. The managed lane will provide a less congested alternative for emergency vehicles, increasing their reliability and response time.

In addition, the PPSL is available for use during off-peak hours for emergency vehicles thus improving emergency service response times during off-peak periods, as well as peak periods.

Managed Lanes Improve Economic Viability
In contrast to congestion gridlock, managed lanes provide an option for those willing to pay to travel through the corridor with a reliable travel time. This not only will improve conditions for recreational travelers, as well as other providers of goods and services along the I-70 corridor. This enhances the economic competitiveness of all users of I-70, as well as those communities adjacent to I-70.

Section 9. Future Safety Conditions

9.1 What are Current Safety Conditions at Similar Facilities?

The overall experience with facilities similar to a peak period shoulder lane in the United States is positive. Although research on the safety benefits is still inconclusive in the United States (because of the small sample size of facilities and the short amount of time each facility has been in place), managed lanes in Europe are seeing positive results. Europe uses part-time shoulder use as a congestion management strategy and is intended to reduce speed variance. By reducing the speed variance, the high levels of weaving traffic are able to merge and diverge between the main line and the managed lane effortlessly.

Listed below are examples of part-time shoulder lanes and their current safety conditions in the United States and in Europe:

- I-35W (Minneapolis, MN)—The left shoulder on the westbound side of I-35 in Minneapolis was converted to a priced dynamic shoulder lane. Although an in-depth investigation has not been performed, MnDOT believes the facility is operating safely and with more efficiency than before. The dynamic shoulder lane, along with variable speed limits, are reducing speed differentials and increasing mobility.
- I-66 (between Merrifield, VA and Washington D.C.)—Photo 1 shows I-66 from an on-ramp. Similar to the previous example, there has been no evidence that the facility negatively impacts the safety of I-66. In fact, the facility is designed to maximize driver knowledge and safety. Signs are placed strategically on the facility to inform drivers when the lane is open and closed. The shoulder lane is also paved with red pavement material to distinguish itself from the rest of the facility, and double white lines were placed on

Photo 1. I-66 between Merrifield, VA and Washington D.C.

the left side of the lane to indicate areas where merging and diverging is allowed and prohibited.

- California—There are 490 corridors in California that were either converted from a four-lane to a five-lane or from a five-lane to a six-lane using the shoulder. A safety evaluation was performed for these sites, and it was discovered that projects that converted from four lanes to five lanes resulted in 10 percent to 11 percent increase in the crash frequency. This could be a result of speed differential between the high-occupancy vehicle (HOV) lane and the general purpose lane. The analysis also suggested that crash frequencies upstream of the facility may be reduced despite an increase in crash frequency within the project limits.
- The Netherlands—The Dutch have implemented hard shoulder running on six freeways. This, along with speed harmonization, is resulting in crash reduction between 10 percent and 48 percent.
- Germany—A similar system to the Dutch is employed in Germany (hard shoulder running with speed harmonization). These facilities have seen a 27 percent to 29 percent reduction in more serious crashes (injury and heavy material damage).
- M 42 (Great Britain)—Hard shoulder running and speed harmonization are also used on Great Britain's highway M 42 near Birmingham, England. After 36 months of operation, personal injury crashes were reduced by 55 percent (from 5.08 percent to 2.25 percent per month) and the accident severity index (ratio of fatal and serious crashes to all crashes) was reduced by 54 percent (from 0.16 percent to 0.07 percent).

9.2 What are PPSL Safety Concerns?

Some significant differences are noticeable between the I-70 Peak Period Shoulder Lane project and other projects in the United States and Europe.

- The purpose of the added lane in the shoulder in other projects is to address peak period traffic during commuting hours. Therefore, users of the added lane become familiar with the facility's operation more quickly.
- During off-peak periods for the PPSL project, the shoulder would act as a safety shoulder on the left hand side of the road; whereas for other projects in the United States, this safety shoulder is located on the right side of the road.
- Instead of reverting back to a two-lane roadway as the PPSL ends, the third lane would merge with the existing third lane highway that starts at the Twin Tunnels. This means that there would not be any downstream bottlenecking, which may help to decrease crash frequency near the end of the PPSL.
- There would be limited speed limit enforcement opportunities during peak hours for the PPSL project, because of high volumes and limited space in the mountain corridor.

The safety analysis was split into two parts: effects on safety because of geometric changes and effects on safety because of congestion reduction. The expected change in crash frequencies because of geometric changes was calculated using crash modification factors from the Highway Safety Manual (HSM). These crash modification factors adjust the expected number of crashes based on particular treatments, design modifications, or changes in operation. Calculations were done for single vehicle run-off-the-road crashes and total crashes in the peak period and off-peak periods. The results of this analysis showed that there was a potential for an increase of 7.6 crashes per year based on the proposed geometric changes to the corridor.

The *I-70 Eastbound Peak Period Shoulder Lane (PPSL) Safety Report* (FHU, 2013) concluded that during operation of the PPSL, crash rates would decline because of a reduction in congestion. The results of the analysis for the I-70 Mountain Corridor show that there may be a 53 percent decrease in crashes during peak period of usage because of lower traffic density. This equates to between 9.4 and 12.8 crashes per year. This, combined with the expected increase in crashes because of geometric changes, gives a net value of 1.8 to 5.2 reduced crashes per year after the PPSL is built.

9.3 What are the Impacts of Various PPSL Design Elements on Safety?

The purpose of this section is to discuss how specific design elements of the proposed PPSL will minimize and mitigate safety impacts. Listed below are a number of these design elements, along with a small discussion on how they improve the safety of the corridor.

- Merge and Diverge Areas—As mentioned previously, the proposed PPSL is different from other projects, in that the hard shoulder would be on the left side instead of the right. This means that the hard shoulder would not be interfering with traffic from ramps at interchanges. Therefore, there would be a slight improvement to safety at these locations.
- Intermediate Access and Egress Points—Access points should be limited along the PPSL corridor to avoid areas where crashes may occur.
- Variable Speed Limit (VSL) Signs—VSL signs will help control speed differentials between the managed lanes and the two general purpose lanes. The PPSL should not experience adverse safety conditions as long as the speed differential between managed lane vehicles and general purpose vehicles is less than 15 mph to 20 mph.
- Emergency Pull Outs—The average spacing for emergency pull outs along the PPSL corridor is planned to be one pull out per mile. This will help minimize disturbance if a vehicle breakdown occurs.
- Monitoring of Operations by CDOT Staff—Personnel at the Colorado Traffic Management Center will be able to monitor activity on the PPSL through Closed Circuit Television (CCTV) cameras placed strategically along the corridor to make sure it is operating efficiently.
- Signs—Proper signage along the managed lane, including dynamic message signs, is critical for traffic control and operation of the lane.
- Opening Procedures—The PPSL should only be opened to traffic after the lane has been cleared of all obstructions.
- Emergency Response—Clear Creek County would be responsible for emergency response along the PPSL corridor. A summary of emergency response procedures has been prepared. CDOT would need to prepare predetermined message sequences for the dynamic message signs to implement immediately when an incident has occurred.

All of these design elements would ensure a reasonably safe corridor, effectively mitigating the safety concerns with minimal changes expected in the average crash frequency. The Proposed Action addresses and, therefore, provides mitigation measure for each of the above mentioned safety concerns. The Proposed Action developed a left side PPSL, only has two access points to the managed lane, provides VSL signs, provides emergency pullouts, would be monitored by CDOT operations staff, has dynamic signing for active traffic management (ATM), developed a

Concept of Operations addressing opening procedures, and have been working with emergency responders in Clear Creek County to develop appropriate emergency response protocol for the project.

However, it should be noted that there may be a benefit in reduced emergency response times on weekdays and off-peak periods as a result of implementing the Proposed Action as Emergency responders will be authorized to use the shoulder to access incidents even when the PPSL is closed.

Section 10. Construction Phase Operational Analyses

10.1 How will Traffic be Detoured During Construction?

For the majority of the study area, traffic would not need to be detoured because most of the work would occur on the shoulder. However, the bridge at Exits 240 and 241 (Idaho Springs/SH 103 and East Idaho Springs) will be replaced during the PPSL construction, which would create a need for detours in all directions. The roads surrounding the bridge at exit 240 (SH 103) include I-70 going east-west, SH 103 going north-south, Fall River Road to the west of the bridge construction, and Colorado Boulevard to north of the bridge construction. Colorado Boulevard eventually merges with I-70 at Exit 241A, 2 miles east of the bridge. The roads surrounding the bridge at Exit 241 include I-70 going east-west, Colorado Boulevard/US 40 going east-west over I-70, and CR 314 south of the bridge. Colorado Boulevard eventually connects with I-70 at Exit 240, 2 miles west of the bridge via 13th Avenue.

There are four detours that would need to be in place throughout the entire Exit 240 bridge construction project, and one that would only be done temporarily during nighttime construction. The directions for these detours are as follows:

1. I-70 eastbound traffic traveling into Idaho Springs on Exit 240 would be redirected to Exit 239 or Exit 241A. This would place vehicles on Colorado Boulevard, which could then be taken back into the town of Idaho Springs.
2. I-70 westbound traffic traveling southbound on SH 103 would be detoured west to the Fall River Road exit (Exit 238). Traffic would then get back on I-70 in the eastbound direction and return to its planned route at Exit 240. Large westbound trucks may need to be diverted further west to Exit 235 in Dumont to make the U-Turn.
3. SH 103 traffic crossing the bridge would exit off the bridge and follow the same route outlined above.
4. In order to ensure the safety of vehicles traveling on I-70, parts of the construction would be done at night, and all traffic would be detoured to the exit and entrance ramps around the bridge.

The bridge replacement at Exit 241 may be done in conjunction with an intersection reconfiguration. While that design is still being developed, and specific construction traffic control has not been determined, it would likely be similar to the Exit 240 bridge construction detours. There may be periods when traffic on any of the ramps onto or off of I-70 may be redirected to the adjacent Exit 240.

10.2 How will Construction Affect Travel on the I-70 Highway?

Because I-70 would maintain two travel lanes in each direction for most of the construction, this project would not have a large effect on traffic and would not adversely affect the overall operations in the corridor. However, the travel lanes would be narrow, and the speed limit would be reduced in the construction area. Motorists traveling through the study area from beginning to end should only see an increase in travel time because of reduced speed limit (except when construction is happening at night). The largest impacts to traveling behavior in the study area should be around Exits 240 and 241 near the town of Idaho Springs.

Certain detours as described above will significantly increase travel time for some motorists. The biggest increases in travel time would be for travelers crossing I-70 at SH 103 (Exit 240) and at Colorado Boulevard (Exit 241). They would be diverted to Exit 238 and back down to Exit 240 in the eastbound direction. This detour would add approximately 4 miles of travel for these motorists. All other detours should only add 1 mile to 2 miles of additional travel for vehicles traveling around Idaho Springs. These detours would be in place for approximately eight to ten weeks while the new bridge is being constructed.

10.3 How will traffic impacts be mitigated during the construction period?

CDOT will continue to work closely with local agencies (including Clear Creek County and Idaho Springs) through the Context Sensitive Solutions (CSS) process regarding the design of the PPSL project. Construction phasing, blasting, bridge closures, and other activities will be planned to minimize the impact to the traveling public and area residents and businesses.

Most work will occur on the shoulder; however, one lane closures will be necessary at various points along the project during activities related to constructing the new third lane. The Region 1 Lane Closure Strategy—Second Edition, 2008 (LCS) provides general guidance for lane closures along I-70. The LCS also provides procedures that allow variances to the basic schedules for unique projects and activities. Any variances must be approved by the Region 1 Traffic Engineer. It is anticipated that specific lane closures schedules encompassing the multitude of construction activities will be developed during the design phase of the project in close coordination with the contractor and Region 1 Traffic Engineer. The lane closure schedule will be developed using the wealth of specific traffic data provided by the Twin Tunnels ATR. In addition, queues and delays will be monitored throughout the construction phases to make sure that impacts to travelers are minimized to the greatest extent possible.

Advanced notice will be provided for construction activities through variable message signs (VMS) to provide motorists with real-time information. CDOT's Public Information Office will provide frequent and timely updates about construction activities through all relevant media. Table 6 outlines the mitigation commitments for transportation resources.

Table 6. Mitigation Measures

Activity	Location	Impact	Mitigation
Construction on or adjacent to I-70	Project wide	Traffic backups due to lane restriction during construction in the peak direction during peak periods.	Lane closures will follow the guidelines of the Region 1 Lane Closure Strategy.
Construction on or adjacent to I-70	Project wide	Traffic backups due to lane restriction during construction in the peak direction during peak periods.	CDOT will work with local communities to minimize impacts to local traffic.
Construction on or adjacent to I-70	Project wide	Traffic backups due to lane restriction during construction in the peak direction during peak periods.	Work requiring closure of one lane will be conducted at night as much as possible. CDOT will work closely with the contractor to avoid closures to the greatest extent practicable. Closures will be minimized to the greatest extent possible during peak periods (WB—Friday afternoon, Saturday morning) (EB—Sunday afternoon).
Roadway closures for blasting	Project wide, multiple locations	Traffic backups	Advance signage along I-70 will be given warning of impending closures.
Roadway closures for construction on or adjacent to I-70	Project wide, multiple locations	Disruption of emergency vehicles	CDOT and the contractor will notify emergency service providers (CSP, sheriff, police, fire dispatchers, ambulance providers, etc.) of the timing of impending closures.
Bridge closures over I-70 for replacement	SH 103 and Exit 241	Disruption of local travel routes	Alternate routes will be identified that minimize to the extent possible any out of direction travel and traffic volume increases in town. Detour signing will clearly define alternate routes. The bridges will not be taken out of operation at the same time.
Bridge closures over I-70 for replacement	SH 103 and Exit 241	Economic losses due to drivers not stopping to patronize local businesses.	CDOT will provide frequent and timely updates about construction activities and remind the public that the corridor is open except for necessary interruptions.
Effective directional signing during construction	Project wide	Economic losses due to drivers not stopping to patronize local businesses.	Signs notifying drivers of access to local business will be placed in both directions in advance of the East Idaho Springs interchange (Exit 241), SH 103 interchange (Exit 240), and West Idaho Springs interchange (Exit 239) as appropriate based on actual closures.
Safety during construction	Project wide	Increased potential for crashes.	There will be extensive warning of the work zone before the detour for affected traffic so that they know to slow to the appropriate posted speed limit.
Traffic shifts from I-70 during construction	US 285 and SH 9	Increased volumes shifted to less capable facilities.	As feasible, CDOT will minimize I-70 construction activities on weekends that could shift travel to alternative routes (SH 9 and US 285, in particular).
Traffic using alternates routes during construction	US 285 and SH 9	Increased traffic volumes moving to less capable facilities.	CDOT will monitor signal operations and timing on these alternative routes during peak periods and may modify.

Section 11. References

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