DRAFT
5/21/14 PLT/TT Meeting Agenda
Silverthorne Pavilion

1. **Introduction/Opening remarks (Benjamin and David S.)**

2. **Present Modeling Results (Al Racciatti)**

3. **Break out small groups (suggest 6, that's about 5-8 stakeholders/group)**

    a. **Distribute questions (David and Wendy)**

    b. **Facilitators**
        i. **Benjamin, David S., David K., Al, Mariana, Larry P., Wendy**

4. **Regroup-Presentations from each small group (David S.)**

5. **Break**

6. **Reintroduce Screening matrix and Performance measures (David S. and Wendy)**

7. **Wrap-up/Next Steps (Benjamin)**

    a. **June/July TT to review Screening matrix**
    b. **August PLT to finalize matrix**

I-70 Traffic and Revenue Study
Combined
Project Leadership Team (PLT) Meeting #6
Technical Team (TT) Meeting #3
Meeting Minutes
May 21, 2014
Silverthorne, CO – The Pavilion

Handouts for the meeting included:

A meeting invitation was sent to PLT and TT members on May 8, 2014. At the meeting, the Core Values, Critical Issues, Critical Success Factors, and Level 1 Performance Measures matrix was distributed. This matrix is included as an attachment to the meeting minutes.

Welcome and Introductions

Ben Acimovic (CDOT) opened the combined PLT and TT meeting with welcoming remarks and a request for self-introductions.

The project is currently in Step 5 on the I-70 Mountain Corridor Context Sensitive Solutions Process, which is to Evaluate, Select and Refine Alternatives or Options. This meeting is being held to answer questions and solicit input and comments from the PLT and TT on the Level 1 modeling results for the alternatives under study. A brief review of the alternatives under consideration was provided.

The presentation was passed to Louis Berger Group to present the modeling and revenue findings.

Agenda Item 1 – Present Modeling Results

Al Racciatti (Louis Berger) presented the traffic and revenue study goals, a description of the model, an overview of the forecasting process and assumptions, and the traffic and revenue results for each alternative. A copy of the presentation is attached to these minutes for reference.

This Level 1 process uses existing models and data to develop information that helps us screen alternatives, to the best of our ability. During Level 2 more effort would be put into refining the model, which may include performing stated preference surveys, to gain a better understanding of the feasibility alternatives forwarded for consideration.

For this Level 1 process, a travel demand model was built for the year 2025, based on the I-70 Mountain Corridor PEIS model. A detailed link-level tool was then used to project traffic out to 2075 for each of the 13 alternatives.

Louis Berger walked through the assumptions used for the model. A summary follows and includes questions about the assumptions raised by the PLT/TT members.

A major underlying assumption used for the analysis is that people with constrained budgets tend to make travel choices based on the decision of time versus money, as do people commuting to work. In general, this leads to the distribution curve of Value of Time (VOT). This was also the conclusion of CDOT's Advanced Guideway System (AGS) Feasibility Study stated preference survey.

Carol Kruse (US Forest Service) suggests using "willingness to pay" instead of "Value of Time". Michael Hocevar (Hocevar Campaign) agrees with this sentiment, and understands the need to change the toll rates based on the level of congestion. Erik Sabina (CDOT) echoed the sentiment as well, stating "willingness to pay" really depends on the trip purpose for each specific trip, not on the general budget constraints of the traveler.

Cindy Neely (Clear Creek County) asked what the months were used to define summer/winter/off peak for the model. The project team replied the winter period is defined as the Friday after Thanksgiving through April 15; the summer period is defined as June through September. The off peak periods are the remaining months.

Peter Kozinski (CDOT) asked if the Value of Time (VOT) is based on per person or per vehicle. The project team replied the Value of Time shown in the presentation is a dollar amount per person. Adjustments are then made based on vehicle occupancy.

A range of VOT was used in CDOT's AGS Feasibility Study for recreational trips, hence there are two trip purposes (High VOT Recreation and Low VOT Recreation) with different values used in the Louis Berger model.

Carol Kruse (US Forest Service) asked if the speed differential presented between managed lanes and general purpose lanes is feasible. The project team replied probably not, that there would most likely be less of a difference than shown in the presentation. Erik Sabina (CDOT) added that the design of the alternative also helps govern that speed differential (i.e. stripe or buffer separation versus a concrete barrier separation). Casey Tighe (Jefferson County Commissioner) also added the perception of traffic patterns or perception of travel time reliability and predictability feeds into the value of time. Al Racciatti (Louis Berger) agreed and noted this would be identified through a stated preference survey during a Level 2 analysis.

Patrick Byrne (Colorado Ski Country) asked what the volume to capacity ratio line on the managed lanes graph is demonstrating. The project team replied the line represents the whole facility including both the managed lanes and general purpose lanes together, in a free-flowing condition.

Cindy Neely (Clear Creek County) asked whether tunnel tolls include both Eisenhower Johnson EJMT and Twin Tunnels. The project team replied yes, depending on the termini of the alternative under consideration. These tunnel tolls are in addition to the managed lanes toll rates.

Cindy Neely (Clear Creek County) feels the volumes forecasted are heavily correlated with growth rates, and wondered why we are using a growth rate double that of 0.7% used for the CDOT AGS Feasibility Study. David Krutsinger (CDOT) replied the 0.7% represents the entire region, (rather than just a portion of the I-70 Corridor) with no additional capacity on I-70.

Cindy Neely (Clear Creek County) asked whether the growth rates used in the model can be correlated with the actual growth rates on I-70 from 2000 to 2010. The project team answered yes.

Casey Tighe (Jefferson County Commissioner) asked whether growth at Eagle County airport was considered. The project team answered no.

Cindy Neely (Clear Creek County) asked if growth rates are forecasted assuming steady linear growth projection. The project team answered the growth rates are meant to be a general average over the projected number of years. Erik Sabina (CDOT) commented that the projected growth is correlated with population and employment rates. , A similar projection pattern occurs with these rates. He added that peer economists from state organizations work together to develop and validate population and employment forecasts.

A minimum capture rate of 5% was used in the model. This capture rate would be examined more closely and could be adjusted in a Level 2 process.

The number of trips deducted for AGS (diverted) came from CDOT's AGS Feasibility Study (assuming implementation in year 2035); the number of trips deducted for Bus Rapid Transit (BRT) was developed by the transit issue task force and assumed a potential bus system scenario starting in 2025. Carol Kruse (US Forest Service) and Casey Tighe (Jefferson County Commissioner) are concerned that these methods used to evaluate the transit operations were different, and may result in a false conclusion that alternatives that contain AGS are removing more vehicles than the BRT. Ben Acimovic (CDOT) replied that for the Level 1 study, this information was the best available.

Cindy Neely (Clear Creek County) asked if the BRT was running in the managed lanes. The project team answered the BRT runs in the managed lanes of Alternatives 1 and 2, and is operated by the managed lanes facility operator.

Average vehicle occupancy (AVO) used is averaged for the year, based on the I-70 PEIS data.

Opening year is a range and is dependent on the alternative. For example Alternatives 1 and 2 open in 2025, and Alternatives 5 and 6 open in 2022.

Carol Kruse (US Forest Service) asked why Alternatives 1 and 2 do not contain AGS. David Krutsinger (CDOT) stated that the range of alternatives developed by the PLT/TT represent a wide variety of scenarios. Al Racciatti (Louis Berger) stated that the volumes deducted for transit wouldn't materially alter the results of the analysis, including the revenue projections.

Alternative 3 includes the revenue from the peak period shoulder lane included in the base condition (Floyd Hill to Empire, eastbound), but does not include the capital costs for construction of that peak period shoulder lane.

Alternative 5, Option 5.1 was included and modeled to use for sensitivity analysis, and does not include the third bore at EJMT. This greatly reduces the capital cost but will not be screened during the Level 1 T&R.

Cindy Neely (Clear Creek County) asked whether Alternative 3 assumed the peak period shoulder lane was present. Al Racciatti (Louis Berger) replied the project team would look at this further and get back to the PLT with a clarification. (ACTION ITEM)

Alternatives 1 and 2 include BRT capital costs and associated revenue. Alternatives 3, 4, 5 and 6 do not include AGS capital costs, nor associated revenue. This is because the AGS Feasibility Study concluded that AGS was not financially feasible in the near term.

Melinda Urban (FHWA) asked if there are modeling results for Alternative 3, without with a third bore at EJMT. The project team answered no.

Carol Kruse (US Forest Service) asked if revenue from Alternatives 1 and 2 cover the costs to operate the BRT. The project team answered yes.

Phil Buckland (Clear Creek County Commissioner) asked if the growth rate used was linear. The project team answered yes. Erik Sabina (CDOT) clarified the AGS growth rate listed in CDOT's AGS Feasibility Study was for a broad region and the growth rate used in this model is specific to the corridor. So this is not an "apples-to-apples" comparison and these values should not be compared.

Break

Agenda Item 2 – Small Group Sessions

David Singer (CDOT) asked the group to break into three small groups to facilitate discussions.

Questions posed to the small groups:

1. Do you understand the modeling & revenue information that was presented?

2. What comments & questions do you have on the modeling & revenue information?

Small Group #1 report (David Singer, CDOT):

- Discussed inputs into model. Questions about the assumption of the growth rate being flat (linear) versus variable in future years. Level 2 would get into more detail about growth assumptions.
- The group agreed that employment and Gross Domestic Product (GDP) is a huge driver in determining that growth rate.
- Concerns about the idea of being locked into a 50-year concession term and what that means for CDOT and taxpayers. Ben Acimovic (CDOT) stated that it is too early in the process to determine whether this project could move forward as a P3.
- Cost differences of Capital versus Operations & Maintenance (O&M), and why these were split out. They were split out because a concessionaire would cover the O&M costs, and state or federal funding may be available to partially cover capital costs.

- One member asked if the feasibility of the alternatives has been determined. At Level 1 all of the alternatives are technically feasible, however construction and operations vary considerably based on cost.
- What about improving off-system connections? These costs are not captured in the alternatives. The study is very high-level and conceptual at this point.

Small Group #2 report (Ben Acimovic, CDOT):

- Clarified what the T&R base condition is defined as.
- Discussed growth rates and how it is hard to predict the variability of the future growth rate.
- Clarified differences between alternatives 5 and 6.
- Discussed flat trend of vehicle miles travelled.
- Discussed BRT's role in developing ridership for future AGS.
- What is the assumption used for the base number of cars in these projections? How many cars would there be in the future?
- Discussed changes in assumptions since PEIS model, including Value of Time.
- Discussed minimum capture rate.
- How does vehicle occupancy figure into number of trips?

Small Group #3 report (Al Racciatti, Louis Berger):

- Is it fair to assume AGS conclusion is a given? This study wanted to be conservative regarding highway travel and subsequent toll revenue.
- Given Level 1 study results, would you expect dramatic changes in results for Level 2 study? Typically see a refinement in results, not a wholesale change.
- How would these alternatives really get financed? Low interest loans? Bonds?
- Does BRT have lower demand than AGS? AGS values came from a thorough, more detailed study. BRT values are based on high level assumptions. Potential to do a better forecast for BRT demand in Level 2 study. Could BRT run in a temporary peak period shoulder lane (both on and off peak)? Can the alternatives be refined to include these considerations in Level 2?
- What was the growth rate on US 36 study? Nick Farber (CDOT) answered that Wilbur Smith used1.3%.
- Travel time savings should be considered for entire route (including highways around Denver).
- People with ski passes have greater flexibility in travel times.
- Is there consideration for Eagle Airport to be used more, and become a competitor to I-70?
- Is there any appetite for an alternative route to I-70?

Agenda Item 3 – Review of Core Values, Performance Measures & Screening

David Singer (CDOT) walked through the Core Values, Critical Issues and performance measures developed last year by the TT/PLT for this study. All of the core values and critical issues will be used for evaluation in the screening process, not just the two financial performance measures.

The next step is to use the modeling results to qualitatively evaluate the six alternatives (and various options) against the performance measures. The analysis will be summarized in a screening matrix and will include a qualitative rating.

Cindy Neely (Clear Creek County) asked how alternatives will be rated (i.e. pass/fail or good/medium/low?). David Singer (CDOT) answered the same system will be used that was used in the Twin Tunnel project. There will be good, fair and poor ratings, plus the rationale include for each measure relative to each alternative.

Over the next several weeks CDOT will work to develop a draft evaluation and the screening matrix. The Draft Matrix will be distributed to the TT so that the TT can discuss/refine/change recommendations if needed.

David noted that while reviewing the screening matrix, there were Specific Performances Measures that the group may want to clarify. As a result, language defining Performance Measure 21 was changed to replace the word “access” with “accessibility/mobility”. He believes this better represents the intent of the measure. Performance Measure 26 was split into two measures, in order to better evaluate the alternatives relative to both the O&M and capital costs.

Cindy Neely (Clear Creek County) asked how the study would draw conclusions from the Level 1 screening since performance measures are subjective and should not be weighted for evaluation. David agreed. Wendy added that the group could make recommendations based on review of the matrix to determine if there are key differentiators among the performance measures for each alternative.

David reminded the group that the screening matrix will be used as a tool for decision makers, in order to make a more informed decision.

Cindy Neely (Clear Creek County) agreed the project team should populate the matrix prior to distribution to the TT, but suggested the team also send out an empty matrix ahead of time so that TT members can consider evaluation on their own prior to the next meeting and participate in a more robust conversation.

Melinda Urban (FHWA) stated Alternative 5 has an error on the design sheet. It is missing the two foot buffer. (ACTION ITEM)

Wrap Up/Next Steps

June 11: Distribution of Draft Screening Matrix including recommendations to TT & PLT

June 25: TT Meeting – Level 1 Evaluation and Screening

July 9: TT & PLT final comments due on Screening Results

TBD: PLT Meeting – Level 1 Recommendation and Final Results

Cindy Neely suggested the PLT should have some input on the evaluation and screening, and suggested the June 25 meeting is a combined TT/PLT meeting.

Group decided to send empty and draft populated matrix out with these meeting minutes. (ACTION ITEM)

Meeting adjourned.

Attachments:

1. The entire presentation including the agenda and Louis Berger's traffic and revenue study presentation.

2. Blank screening matrix.

3. Draft populated screening matrix.

4. Core Values, Critical Issues, Critical Success Factors, Level 1 Performance Measures matrix.

5. Sign-in sheet.

COLORADO
Department of Transportation

I-70 Traffic & Revenue Study
2013 - 2014

Project Leadership Team & Technical Team Meeting
May 21, 2014

I-70 Traffic & Revenue Study Agenda

- Welcome & Introductions
- Present Modeling Results
- Small Group Sessions
- Review Small Group Session Comments & Questions
- Break
- Reintroduce Core Values, Performance Measures & Screening Matrix
- Wrap Up / Next Steps & Adjourn

I-70 Mountain Corridor
Context Sensitive Solutions Process

I-70 Traffic & Revenue
6 Alternatives Under Consideration

1. 2 Managed Lanes – 2 options
2. 3 Managed Lanes – 3 options
3. PEIS Minimum Improvements – 4 options
4. PEIS Maximum Improvements – 2 options
5. Permanent Peak Period Shoulder Lane*
6. Temporary Peak Period Shoulder Lane

* One option added as sensitivity analysis

I-70 Traffic & Revenue Study

Modeling
of
Alternatives

Louis Berger Group Presentation

I-70 Traffic and Revenue Study Results

May 21, 2014

THE Louis Berger Group, INC.

COLORADO Department of Transportation

Outline

- T&R Study Goals
- Model description
- Overview of Forecasting Process and Assumptions
- Traffic and Revenue Results for Each Alternative

Goals of Level 1 Traffic and Revenue Forecast

- Estimation of future traffic conditions given anticipated growth in travel and a wide range of alternatives to expand capacity
  - 13 alternatives for capacity improvements with consideration of transit options and revenue generation through toll collection referenced against one future Base Condition.
  - Account for transit options (BRT and AGS)
- Estimation of revenue generation potential
  - Management of capacity through variable/congestion pricing
  - Account for traveler value of time and response to pricing
- Performance Metrics for Screening of Alternatives
  - Traffic, operational, financial, and environmental measures to support screening evaluation
- Integration with CSS process

Level 1 Forecast Development Process

- Network travel demand model for 2025, based on the I-70 Mountain Corridor PEIS Model.
  - Full regional travel network with detailed representation of feeding and competing roadways.
  - Link level representation of capacity, speed, elevation, and geometry.
  - Comprehensive representation of origin and destination patterns and trip purposes (work, non-work, and recreation) with income stratification.
  - Representation of conditions by time of day, day of week and season.
  - Consistent with PEIS assumptions and findings.
- Detailed link-level tool for projection to 2075.
  - Corridor organized into 19 segments summarizing key links with representation of volumes, capacity, and speed on toll lanes and corresponding free lanes by time/day/season.
  - Forecast of managed lanes usage/pricing based on congestion and value of travel time savings.
  - Calculation of annual revenue and traffic performance measures.

Model Results Validation

Model outputs were compared for 2000 and 2010 data:

2000: Compared against PEIS period-specific counts by direction and day which were hard-coded within the GISDK code.

- Summer Saturday (counts in red; model flows in black)

Model Results Validation

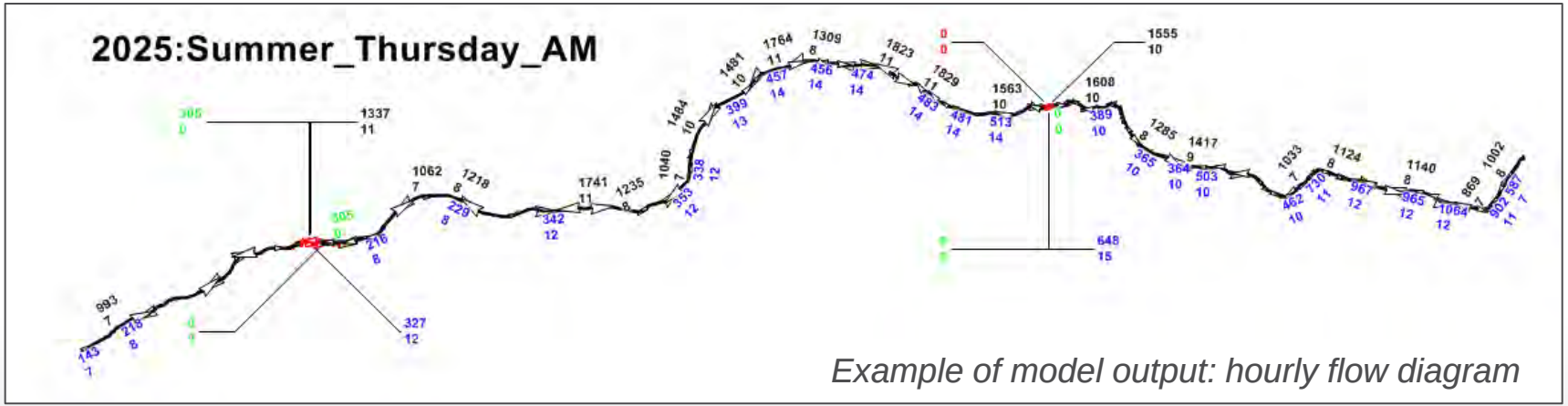
Model outputs were compared for 2000 and 2010 data:

2010: Compared against CDOT continuous hourly counters and a limited number of seasonal counts were aggregated to the 4 time periods; averaged by day and season (e.g. average of all counts for every AM Summer Sunday): 3 Continuous counters that cover all periods, all seasons, all days; 13 Special counters that mostly cover only Summer Thursday and Mud Thursday.

Season	Day	AM Counts	AM Flows	% difference	PM Counts	PM Flows	% difference	Noon Counts	Noon Flows	% difference
Summer	Thursday	49420	59386	20.17%	84189	84569	0.45%	94114	94040	-0.08%
Summer	Friday	37964	41439	9.15%	84729	74859	-11.65%	99494	111229	11.79%
Summer	Saturday	42653	45565	6.83%	63461	86034	35.57%	87159	72214	-17.15%
Summer	Sunday	32316	36063	11.59%	64584	81743	26.57%	96565	102607	6.26%
Winter	Thursday	27656	29606	7.05%	34909	35291	1.09%	36819	35000	-4.94%
Winter	Friday	33247	20027	-39.76%	39770	46852	17.81%	61822	43206	-30.11%
Winter	Saturday	40838	40674	-0.40%	53187	26846	-49.53%	47991	25740	-46.36%
Winter	Sunday	33437	33683	0.74%	44937	55328	23.12%	58353	50030	-14.26%
Mud	Thursday	28141	24411	-13.25%	37438	47508	26.90%	40606	50752	24.99%

2025 Model Development

- Original PEIS TransCAD travel demand model with enhancements:
  - Updated to 2010 Census demographics.
  - Updated value of time by trip purpose consistent with AGS/ICS study and survey.
  - Conflated the I-70 corridor links to aerial photography to reflect true geography and geometry.
  - Added network links to represent features of Base Condition and Alternatives



Example of model output: hourly flow diagram

Forecast Model Description

Measures of the model:

- 4 day types (Weekday, Friday-Sunday)
- 4 times of day (AM, PM, Midday, Night)
- 3 seasons (Summer, Winter, Remainder)
- 80 distinct EB and WB links in TransCAD
- 19 distinct segments in forecast tool

Parameters Considered:

- Value of Time by trip purpose
- Growth rate of corridor and tolled capacity
- Toll values for peak and off-peak times

Structure of the Forecast Model

- **Trip Generation and distribution**: Trip generation and distribution is based on productions and attractions represented in the PEIS model (as updated with 2010 demographics). Volume in each segment of the corridor determined by origins and destinations and the assignment process in the regional network model which accounts for both time and cost of travel. Volumes tend to be higher in eastern segments.

- **Truck routing**: Regional and through trips for trucks are assigned to routes based on the time and cost of travel. Alternative routes like Loveland Pass are represented in the model.

Structure of the Forecast Model - Peak Period Travel Days

- In total, model includes 165 Fridays, Saturdays, Sundays, and Holidays per year.

	Summer	Winter	Spring/Fall (Off peak)
Friday	16	23	13
Saturday	16	23	13
Sunday/Holiday	21	25	15
Weekdays	59	90	51

- Peak periods within the day-types are defined as AM and PM periods.
- The designation of “peak period” is only relevant to define the base (starting) toll rate. ML utilization and the applicable toll rate is exclusively driven by demand regardless of day type, season, or time period.

2025 Baseline - Congested Conditions

The charts below illustrate that flows between the PEIS and our T&R Base Condition are within ± 5% to 10% at Key Locations. Possible reasons for differences include:

1. Revised and updated the model including using 2010 socioeconomic data
2. Addition of tolling and multiple user classes
3. T&R study assignment based on time and cost with VOT. The original PEIS had no tolling, facility assignment purely based on time.
4. Some congestion data presented in PEIS based on hourly results developed in simulation model

Winter Saturday		
Focal Point	PEIS	T&R Study
EJMT	51,000	49,686
East of Empire Junction	77,000	71,529
Genesee	136,300	128,000

Summer Sunday		
Focal Point	PEIS	T&R Study
EJMT	67,000	68,036
East of Empire Junction	88,000	83,177
Genesee	151,300	137,000

Model Parameters - Value of Time

- Forecasts for all alternatives incorporated assumptions for value of time equivalent to those estimated from findings of the Stated-Preference survey implemented for AGS study.
- I-70 Mountain Corridor travel model value of time assumptions were replaced with values from AGS study appropriate for the discrete market segments in the travel model.
- **Value of Time by Trip Purpose / Income Market Segment Used in T&R Study**

Home-Based Work High income	$16/hr
Home-Based Work Upper Income	$15/hr
Home-Based Work Middle Income	$13/hr
Home-Based Work Low Income	$11/hr
Non-work	$9/hr
High VOT Recreation	$18/hr
Low VOT Recreation	$12/hr

HBW: Home Based Work Trips

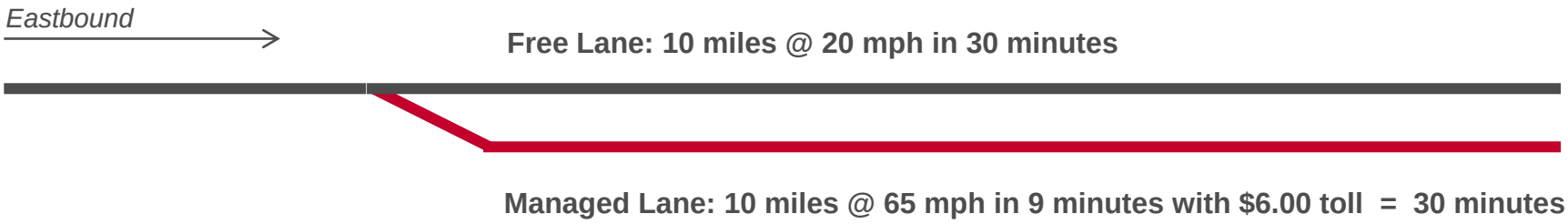
- Combo Truck VOT was derived from DRCOG: $55.02

Example: Traveler Value of Time and Managed Lane Choice

Median Value of Time:

$17.50 = 1 hour of travel *or*
$ 0.29 = 1 minute of travel

$6.00 toll ($0.60/mile) = 21 minutes of travel



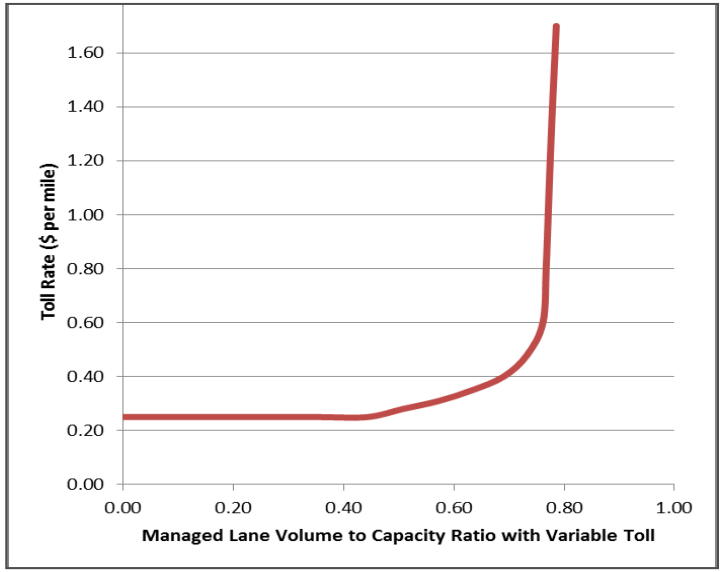
Other Equilibrium Conditions:

Free Lane: 10 miles @ 40 mph in 15 minutes = Managed Lane @ 65mph in 9 min with $1.68 toll ($0.17/mile)

Free Lane: 10 miles @ 50 mph in 12 minutes = Managed Lane @ 65mph in 9 min with $0.80 toll ($0.08/mile)

Managed Lanes Forecasting

- Pricing on managed lanes (single/multi-lane reversible or variable-priced shoulder lanes) is highly sensitive to congestion.
- Forecasts need to consider variations in level of congestion by time of day, day of week and season.
- Detailed examination of value of time, future rate of growth in travel; and lane performance through micro-simulation are appropriate for Level 2 and 3 studies.



Lanes Not Managed - Fixed Toll			*Lanes Managed – Variable Toll*		
V/C	Speed	Toll Rate	Managed V/C	Speed	Toll Rate
0.40	65	$0.25	0.40	65	$0.25
0.70	53	$0.25	0.58	60	$0.40
1.00	35	$0.25	0.75	50	$0.75

Example of increase in toll rate necessary to maintain ML speed and performance.

Model Parameters - Base Tolls and Toll Setting

- The analysis has a peak and off-peak base per mile toll rate, which indicates the lowest toll rate/ mi. charged at that given time regardless of congestion.

	Car	Truck
Peak (AM, PM)	$0.25	$0.75
Off-Peak (Noon, Night)	$0.10	$0.30

- The per mile toll rate is then adjusted based on congestion levels.

Alt 1 Opt 1 - Highest Estimated Toll Values		
	Car	Truck
2035	$0.61	$1.85
2045	$0.57	$1.72
2055	$0.80	$2.40
2065	$0.97	$2.90
2075	$1.15	$3.45

- Tunnel tolls were fixed at $5 for cars and $24 for trucks for all time periods.

Model Parameters - Long-Term Growth Rate

- LBG based long-term growth rate on PEIS assumption to provide consistency in comparison of results
- Sensitivity test were run for range in growth rates reflected in PEIS - 1.4%-3.0% annual growth
- Most recent study in corridor (ICS/AGS) reflects 0.7% overall growth in total travel in I-70 Corridor through 2035
- In general previous studies in the corridor (PEIS and ICS/AGS) indicate that growth in travel in the I-70 Corridor is somewhat lower than overall growth in population and employment.

Growth Rate Benchmarks *(compound annual average growth rates)*

I-70 Mountain Corridor PEIS – Basis for Level 1 T&R Study

2000-2025	Corridor Counties	Denver Metro
Population	2.8%	1.4%
Employment	3.0%	1.5%
Corridor Auto Trips: 1.1% (2010-2025)		

2025-2035	Corridor Counties	Denver Metro
Population	1.9%	1.4%
Employment	0.4%	1.8%
Corridor Auto Trips: 1.4%		

2035-2050
Corridor Auto Trips: 0.5% to 3.0%

ICS-AGS Demand Forecasting Study

2010-2035	Population	Employment
Study Region	1.6%	1.5%
Study Region Auto Trips: 0.71% (Local Non-Work: 0.74%; Work: 0.70%; Visitor: 0.82%)		

Growth Rate Benchmarks *(compound annual average growth rates)*

DRCOG (2010)

2010-2035	Population	Employment
Metro Region	2.0%	2.0%
Clear Creek	1.5%	1.7%
Jefferson	1.2%	1.6%
Denver	1.1%	1.5%

Vehicle Miles Traveled 2010-2035: 1.9%

Number of Visitors 2010-2035: 3.5%

State Demographer / Labor Dept. (2013)

2010-2040	Population	Employment
State	1.4%	2.0%
Clear Creek	1.5%	1.8%
Jefferson	0.6%	N/A
Denver	1.2%	1.5%
Summit	2.0%	2.4%
Eagle	2.2%	2.1%

Other Measures

Denver International Airport Enplanements (2012-2035): 2.5% (Denver Dept. of Aviation, 2011)

Colorado Ski Resort Visitation (2001-2011): 0.6% (HVS Market Intelligence Report Colo. Mountains, 2013)

Managed Lanes - Estimated Capture Rates

- Capture rate of Managed Lanes is defined as vehicle miles traveled (VMT) on managed lanes as a proportion of total VMT on free lanes/managed lanes by direction. Capture rates are calculated in the model considering volumes and VoT.
- Capture rates during high-volume demand periods in the forecast range from 20% to 45%. In low-volume periods, capture rates range from 5% to 20%.
- LBG assumed a minimum capture rate of 5% during low-volume periods where managed lanes offer no demonstrable travel time savings
- Overall Capture Rates in 2025 reflective of an all-day mix of high-volume and low volume periods.

	# of Days	ML Utilization (%)
Overall ML Utilization	365	15%
Summer	112	18%
Winter	161	15%
Spring/Fall (Mud)	92	9%

Capture Rates

2025 Winter (Alt 1 Opt 1)

Overall ML Utilization: 19%

90 Weekdays	6%
23 Fri	5%
23 Sat	37%
25 Sun/Hol	11%

Season	Day	Time	Toll VMT	Free VMT in Toll Direction	Toll Utilzation	Toll Speed	Free Speed	Dir
Winter	Weekday	AM	24,055	457,042	5%	65	46	WB
Winter	Weekday	Midday	40,066	413,175	9%	65	52	WB
Winter	Weekday	PM	20,125	382,367	5%	65	52	WB
Winter	Weekday	Night	18,042	342,796	5%	65	55	WB
Winter	Friday	AM	17,768	337,591	5%	65	51	WB
Winter	Friday	Midday	16,718	317,637	5%	65	54	WB
Winter	Friday	PM	17,683	335,982	5%	65	53	WB
Winter	Friday	Night	13,111	249,117	5%	65	55	WB
Winter	Saturday	AM	459,354	567,316	45%	49	41	WB
Winter	Saturday	Midday	182,482	719,466	20%	63	41	EB
Winter	Saturday	PM	401,705	501,876	44%	56	47	WB
Winter	Saturday	Night	207,574	321,933	39%	64	54	EB
Winter	Sunday	AM	136,523	635,609	18%	64	35	WB
Winter	Sunday	Midday	29,951	550,835	5%	65	49	EB
Winter	Sunday	PM	128,293	780,149	14%	65	33	EB
Winter	Sunday	Night	35,734	680,010	5%	65	51	EB

Treatment of Unmet Demand

- Model uses the unmet demand procedure contained in the I-70 Mountain Corridor PEIS model. Two options:
  - Suppressed trip generation to produce overall volumes in I-70 corridor constrained with respect to capacity (suppressed trips to achieve overall speeds of 30mph or higher)
  - No suppression of trip generation (unconstrained – no minimum speed on corridor)
- Results are presented with <u>no suppression</u> of trip generation to show the full potential of capacity improvements to accommodate demand.
- Most accurate way to look at effect of Unmet Demand is comparison of Build Alternative to Baseline. In general Build Alternatives see higher level of overall VMT than baseline only during high-volume periods of travel when capacity improvement makes a difference.
- Unmet demand is a near-term factor reflected in early year performance – not an element of the growth rate.

Treatment of Unmet Demand – Example

- Table below illustrates how unmet demand is reflected in the model for 2025, based on a comparison of free and toll lane VMT (in the tolled direction) between the Alternative with two reversible lanes (1) and the Base Condition:

Season	Day	Period	Base Case VMT	Alt1 VMT	% Difference
Summer	Weekday	AM	39,091,320	54,958,835	29%
Summer	Friday	PM	8,838,514	9,842,532	10%
Winter	Saturday	AM	14,515,764	23,613,402	39%
Summer	Sunday	Night	11,436,365	15,270,539	34%
Spring/Fall	Sunday	Night	10,175,890	10,184,852	<1%
Spring/Fall	Saturday	PM	5,073,106	5,696,290	11%

2025-2075 Forecast: Transit Assumptions

- BRT deducted from auto travel based on anticipated service provision and capture rate. AGS deducted from auto travel based on published forecast for 2035 extrapolated to 2075 at pace with corridor growth.
- BRT farebox revenue for Alt 1,2 is included as it contributes to the 50 year concession arrangement. Alternatives with an AGS component do not consider AGS revenues or costs since its operations are separate from the highway capacity improvements.
- Average Vehicle Occupancy Rate:
    - Weekdays: 1.68
    - Weekend: 1.75

Number of Transit Trips Deducted in First Year of Operation	
AGS	2.35 M
BRT	0.83 M

Revenue Calculation - Treatment of Inflation

- All numbers presented are in 2014 dollars. The analysis includes no escalation for inflation.
- The Present Value (PV) for the revenue cash flow was discounted at 5% to the first year of revenue service. The 5% rate is a standard rate reflecting a weighted average cost of capital (WAAC) in real dollar terms.
- Toll rates are fixed in current dollars (assume nominal charges keep pace with inflation).

Detailed Evaluation Results of Each Alternative

Alternatives Descriptions

Alternative	Description
Base Condition	Existing roadway including EB Temporary PPSL improvements
1	Two reversible, tolled, managed lanes at 65MPH
2	Three reversible, tolled, managed lanes at 65MPH
3	PEIS Minimum Program – toll at 3rd bore EJMT
4	PEIS Maximum Program – one non-reversible tolled lane EB,WB
5	Permanent PPSL: left side tolled, managed side lane for peak time use
6	Temporary PPSL: Narrower WB tolled, managed lane for peak time use

PPSL: Peak Period Shoulder Lane EB: Eastbound WB: Westbound

Traffic and Revenue Forecast Results - 2025

Alternative	Corridor Vehicle Trips (M)	Tolled Vehicle Trips (M)	Toll Revenue (2014 $M)	Transit Person Trips (M)	Transit Revenue (2014 $M)
Base Condition	25.7	0.37	0.4	-	-
1	26.7	2.10	36.0	0.83	7.8
2	26.8	2.20	37.2	0.83	7.8
3	25.9	0.02	0.9	-	-
4	26.7	0.56	8.2	-	-
5	26.0	0.50	8.0	-	-
5.1	25.7	0.62	4.1	-	-
6	25.7	0.60	4.0	-	-

Base Condition

Existing I-70 with EB Peak Period Shoulder Lane

Base Condition includes the existing highway infrastructure including the planned improvement of the EB peak period shoulder lane from Empire to Floyd Hill. The recently completed widening of the EB Twin Tunnel is part of the peak period shoulder lane project.

Roadway Information

Extent of Roadway Improvements	Empire to Floyd Hill
General Purpose (GP) Lane Information	Additional capacity by restriping existing pavement
Direction of Improvements	EB Only Direction
Design Speed	Match Existing
Trucks, Private Buses, BRT	Allowed in Peak Period Shoulder Lane (Always in GP Lanes)
Tolling	
Capacity Improvements	Dynamic priced toll for EB Peak Period Shoulder Lane
Tunnels	Dynamic priced toll as part of the EB Peak Period Shoulder Lane
Technology	Transponder and license plate recognition
Schedule	
Construction Start	2014 (Assumes NEPA Cat-Ex)
Construction Duration	1 year
First Year Operation	2014 - WB Tunnel / 2015 - EB PPSL
Financial Period	50 years

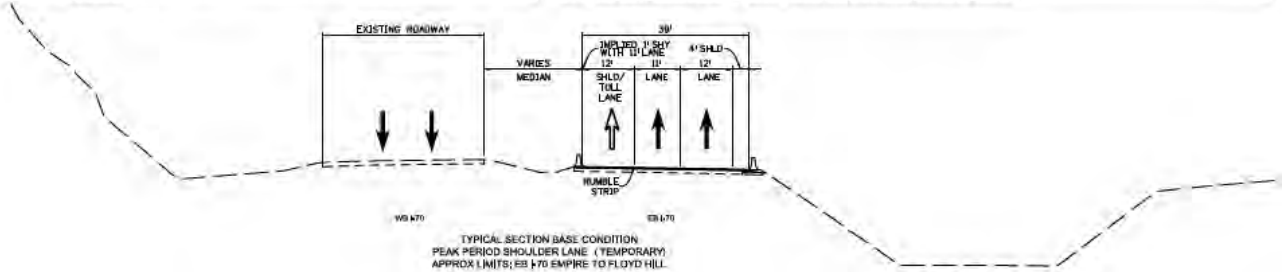
Transit Information

Termini	Glenwood Springs to Denver (CDOT Bus)
Special Infrastructure	N/A
Schedule	Fall 2014
Stations	6 CDOT Bus Stations - Glenwood Springs, Eagle, Vail, Frisco, Denver (2)
Type	
CDOT Bus	TBD by CDOT
BRT	N/A
AGS	N/A

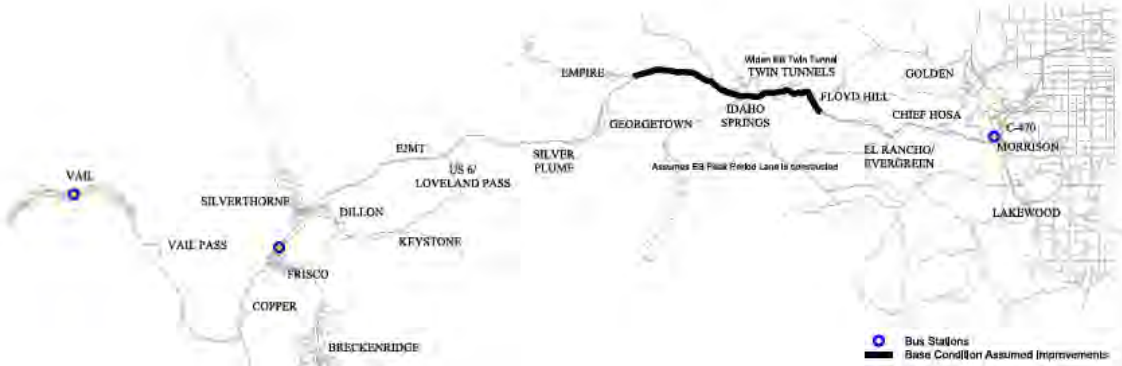
Special Structures

Special Structures	Existing EB Twin Tunnel Widening

GP = General Purpose Lane EJMT = Eisenhower Johnson Memorial Tunnels



TYPICAL SECTION BASE CONDITION
PEAK PERIOD SHOULDER LANE (TEMPORARY)
APPROX LIMITS: EB I-70 EMPIRE TO FLOYD HILL



Forecast Traffic and Revenue Results - Base Condition

	Corridor Vehicle Trips (M)	Toll Vehicle Trips (M)	Toll Revenues (2014 $M)
2025	25.7	0.37	0.44
2035	29.3	0.45	4.1
2045	33.0	0.75	9.0
2055	36.7	0.95	14.0
2065	40.1	1.2	17.7
2075	43.4	1.5	21.5

Toll Revenue PV (at 5% DR, $2014M): $109.7

Alt01_Opt01

2 Tolled Reversible Managed Lanes

Reversible managed lanes designed at 65 mph. The reversible managed lanes are on a separate viaduct structure from East Idaho Springs to Floyd Hill in order to maintain 65 mph design speed. General purpose (GP) lanes designed at 55 mph except from East Idaho Springs to Floyd Hill, where existing design speeds & lanes will remain.

Roadway Information

Extent of Roadway Improvements	Silverthorne to C-470
General Purpose (GP) Lane Information	Align managed lanes with GP lanes except from E Idaho Springs to Floyd Hill
Direction of Improvements	Both directions (EB and WB)
Design Speed	65 mph Managed Lanes, 55 mph GP lanes
Trucks, Private Buses, BRT	Allowed in Managed Lanes (Always in GP Lanes)
Tolling	
Capacity Improvements	Dynamic priced toll for Reversible Managed Lanes
Tunnels	Dynamic priced toll for EJMT 3rd Bore and Twin Tunnels 3rd bore
Technology	Transponder and license plate recognition
Schedule	
Construction Start	2019 (Assumes 4 years NEPA & Procurement)
Construction Duration	4 years
First Year Operation	2023
Financial Period	50 years

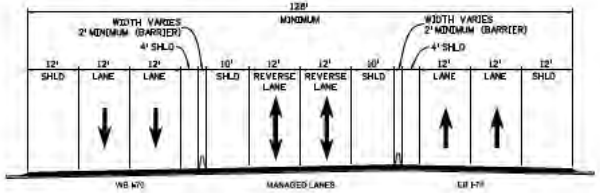
Transit Information

Termini	Vail to Denver
Special Infrastructure	Stations
Schedule	2019 - Limited Startup / 2023 - Full BRT Service
Stations	12 Total
Type	
CDOT Bus	N/A
BRT	Transit option for full 50 year concession
AGS	N/A

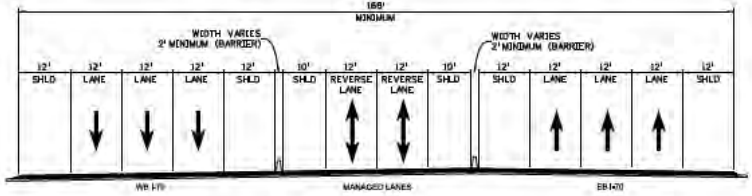
Special Structures

Special Structures	EJMT and Twin Tunnel 3rd Bores
	Managed Lanes on Viaduct from East Idaho Springs to Floyd Hill

GP = General Purpose Lane EJMT = Eisenhower Johnson Memorial Tunnels



TYPICAL SECTION ALT01
2 TOLLED REVERSIBLE MANAGED LANES
EXISTING 2 GENERAL PURPOSE LANES EB & WB I-70
APPROX LIMITS: EJMT TO FLOYD HILL



TYPICAL SECTION ALT01
2 TOLLED REVERSIBLE MANAGED LANES
EXISTING 3 GENERAL PURPOSE LANES EB & WB I-70
APPROX LIMITS: SILVERTHORNE TO EJMT, FLOYD HILL TO C-470

Forecast Traffic and Revenue Results - Alternative 1

	Corridor Vehicle Trips (M)	Toll Vehicle Trips (M)	Toll Revenues (2014 $M)	BRT Person Trips (M)	BRT Revenue (2014 $M)
2025	26.7	2.1	36.0	0.83	7.8
2035	30.6	2.7	63.6	0.95	8.9
2045	34.9	3.6	87.7	1.1	10.2
2055	39.3	4.7	124.2	1.3	11.8
2065	43.8	5.9	167.8	1.4	13.5
2075	48.3	7.0	218.9	1.7	15.5

Alternative 1 Remarks

- Alt1Opt1 has more than 10 times the toll lane mileage as the Base Condition and begins with a higher level of utilization and revenue.
- Utilization increases over 300% during the 50-year life and revenue increases more than 600%.
- Toll rates rise to manage flow during peak periods and utilization increases throughout the day.

Toll Revenue PV (at 5% DR, $2014M): $1,575.38
Capital Cost (M): $4,116
O&M Cost (M): $49.6

Alt02_Opt01

3 Tolled Reversible Managed Lanes

Reversible managed lanes designed at 65 mph. The reversible managed lanes are on a separate viaduct structure from East Idaho Springs to Floyd Hill in order to maintain 65 mph design speed. General purpose (GP) lanes designed at 55 mph except from East Idaho Springs to Floyd Hill, where existing design speeds & lanes will remain.

Roadway Information

Extent of Roadway Improvements	Silverthorne to C-470
General Purpose (GP) Lane Information	Align managed lanes with GP lanes except from E Idaho Springs to Floyd Hill
Direction of Improvements	Both directions (EB and WB)
Design Speed	65 mph Managed Lanes, 55 mph GP lanes
Trucks, Private Buses, BRT	Allowed in Managed Lanes (Always in GP Lanes)
Tolling	
Capacity Improvements	Dynamic priced toll for Reversible Managed Lanes
Tunnels	Dynamic priced toll for EJMT 3rd Bore and Twin Tunnels 3rd bore
Technology	Transponder and license plate recognition
Schedule	
Construction Start	2019 (Assumes 4 years NEPA & Procurement)
Construction Duration	4 years
First Year Operation	2023
Financial Period	50 years

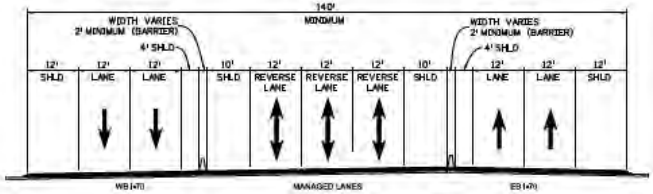
Transit Information

Termini	Vail to Denver
Special Infrastructure	Stations
Schedule	2019 - Limited Startup / 2023 - Full BRT Service
Stations	12 Total
Type	
CDOT Bus	N/A
BRT	Transit option for full 50 year concession
AGS	N/A

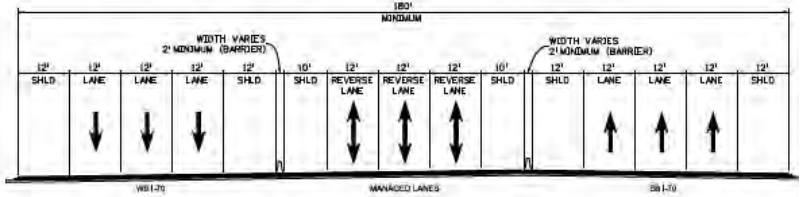
Special Structures

Special Structures	EJMT and Twin Tunnel 3rd Bores
	Managed Lanes on Viaduct from East Idaho Springs to Floyd Hill

GP = General Purpose Lane EJMT = Eisenhower Johnson Memorial Tunnels



TYPICAL SECTION ALT02
3 TOLLED REVERSIBLE MANAGED LANES
EXISTING 2 GENERAL PURPOSE LANES EB & WB I-70
APPROX LIMITS: EJMT TO FLOYD HILL



TYPICAL SECTION ALT02
3 TOLLED REVERSIBLE MANAGED LANES
EXISTING 3 GENERAL PURPOSE LANES EB & WB I-70
APPROX LIMITS: SILVERTHORNE TO EJMT, FLOYD HILL TO C-470

Forecast Traffic and Revenue Results - Alternative 2

	Corridor Vehicle Trips (M)	Toll Vehicle Trips (M)	Toll Revenues (2014 $M)	BRT Person Trips (M)	BRT Revenue (2014 $M)
2025	26.8	2.2	37.2	0.83	7.8
2035	30.7	3.0	56.9	0.95	8.9
2045	35.1	4.1	83.7	1.1	10.2
2055	39.6	5.4	119.1	1.3	11.8
2065	44.4	6.9	162.8	1.4	13.5
2075	49.2	8.5	214.4	1.7	15.5

Alternative 2 Remarks

- Alternative 2 has greater capacity than Alt1 and therefore can accommodate more traffic on the managed lanes. This improves the overall level of volume moving through the corridor on toll and free lanes.

- Given the additional capacity, however, toll lanes not as congested (nor are free lanes) and toll rates do not need to rise as high as Opt1Alt1 to manage volume. Although the lanes see a greater volume of traffic, toll rates are somewhat lower leading to marginally lower revenue than Opt1 Alt1 overall.

Toll Revenue PV (at 5% DR, $2014M): $1,517.97
Capital Cost (M): $5,092.36
O&M Cost (M): $53.86

Alt03_Opt01

Minimum Program per PEIS

Minimum program per PEIS with 55 mph design speed including a 3rd bore at EJMT. Minimum program is generally localized auxiliary lane improvements.

Roadway Information

Extent of Roadway Improvements	EJMT to Floyd Hill
General Purpose (GP) Lane Information	Auxiliary lanes added at localized areas between interchanges
Direction of Improvements	Both directions (EB and WB)
Design Speed	55 mph
Trucks, Private Buses, BRT	Allowed in GP Lanes and auxiliary lanes
Tolling	
Capacity Improvements	No toll for auxiliary lanes
Tunnels	Dynamic priced toll for EJMT 3rd Bore and Twin Tunnels 3rd Lane
Technology	Transponder and license plate recognition
Schedule	
Construction Start	2018 (Assumes 3 years NEPA)
Construction Duration	3 years
First Year Operation	2021
Financial Period	50 years

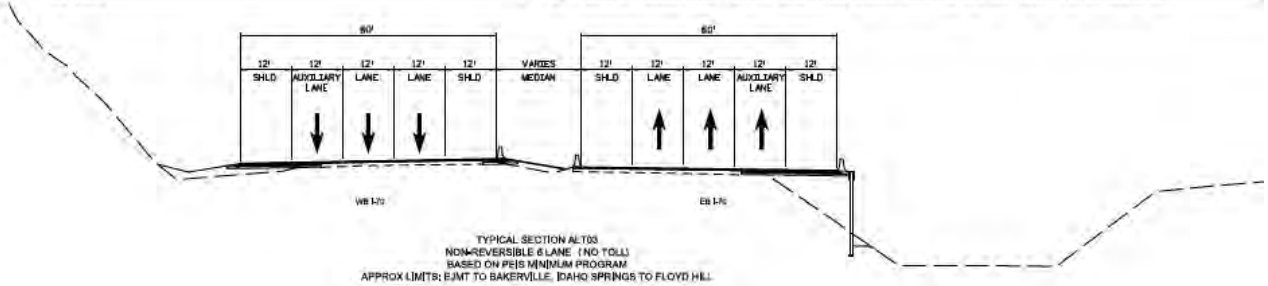
Transit Information

Terminl	Silverthorne-Denver, Service to GWS (CDOT Bus), Breckenridge-Denver (AGS)
Special Infrastructure	AGS System: None for CDOT Bus
Schedule	Fall 2014 - CDOT Bus / After 2035 - AGS
Stations	6 CDOT Bus Stations - GWS, Eagle, Vail, Frisco, Denver (2); 5 AGS Stations
Type	
CDOT Bus	TBD by CDOT
BRT	N/A
AGS	In operation after 2035

Special Structures

Special Structures	EJMT 3rd Bore

GP = General Purpose Lane EJMT = Eisenhower Johnson Memorial Tunnels GWS = Glenwood Springs



Forecast Traffic and Revenue Results - Alternative 3

	Corridor Vehicle Trips (M)	Toll Vehicle Trips (M)	Toll Revenues (2014 $M)	AGS Person Trips (M)
2025	25.9	0.02	0.94	-
2035	27.9	0.04	2.1	3.3
2045	31.8	0.06	3.8	3.7
2055	35.7	0.08	5.8	4.3
2065	39.4	0.11	7.8	4.9
2075	43.1	0.14	9.7	5.7

Alternative 3 Remarks

- This alternative applies tolls to traffic only at the tunnels. As the tunnel segments are relatively short, the time savings offered is lower than the longer managed lane segments represented in the other Alternatives. The model shows that travelers are reluctant to utilize the tolled segments.

- Given the response in initial testing, tolls in this scenario were decreased to $1 for cars and $3 for trucks to maximize revenues and promote utilization of the new capacity.

Toll Revenue PV (at 5% DR, $2014M): $50.98
Capital Cost (M): $2012.52
O&M Cost (M): $10.72

Alt04_Opt01

Maximum Program per PEIS

Maximum program per PEIS with 55 mph design speed including a 3rd bore at EJMT. Maximum program includes one additional non-reversible tolled lane (EB & WB) between EJMT and Floyd Hill.

Roadway Information

Extent of Roadway Improvements	EJMT to Floyd Hill
General Purpose (GP) Lane Information	Additional capacity by widening existing (Non-reversible)
Direction of Improvements	Both directions (EB and WB)
Design Speed	55 mph
Trucks, Private Buses, BRT	Allowed in Toll Lane (Always in GP Lanes)
Tolling	
Capacity Improvements	Dynamic priced toll for 3rd toll lane
Tunnels	Dynamic priced toll for EJMT 3rd Bore and Twin Tunnels 3rd Lane
Technology	Transponder and license plate recognition
Schedule	
Construction Start	2018 (Assumes 3 years NEPA)
Construction Duration	4 years
First Year Operation	2022
Financial Period	50 years

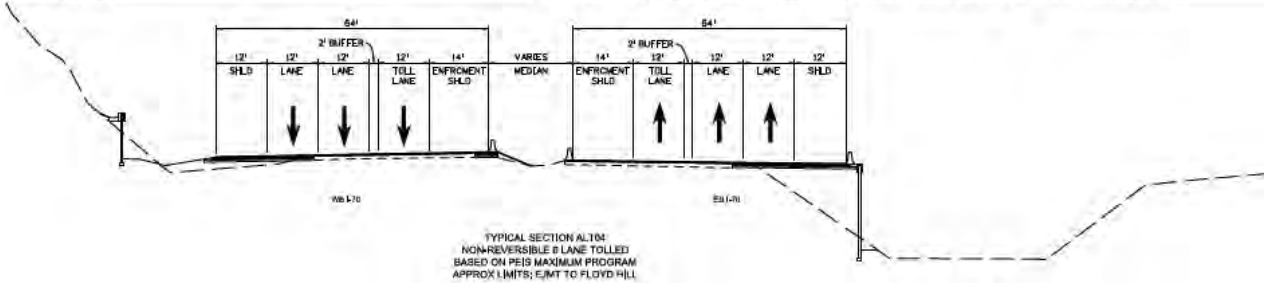
Transit Information

Termini	Silverthorne-Denver, Service to GWS (CDOT Bus), Breckenridge-Denver (AGS)
Special Infrastructure	AGS System: None for CDOT Bus
Schedule	Fall 2014 - CDOT Bus / After 2035 - AGS
Stations	6 CDOT Bus Stations - GWS, Eagle, Vail, Frisco, Denver (2); 5 AGS Stations
Type	
CDOT Bus	TBD by CDOT
BRT	N/A
AGS	In operation after 2035

Special Structures

Special Structures	EJMT 3rd Bore

GP = General Purpose Lane EJMT = Eisenhower Johnson Memorial Tunnels GWS = Glenwood Springs



TYPICAL SECTION ALT04
NON-REVERSIBLE 8 LANE TOLLED
BASED ON PEIS MAXIMUM PROGRAM
APPROX LIMITS: EJMT TO FLOYD HILL

Forecast Traffic and Revenue Results - Alternative 4

	Corridor Vehicle Trips (M)	Toll Vehicle Trips (M)	Toll Revenues (2014 $M)	AGS Person Trips (M)
2025	26.7	0.56	8.2	-
2035	28.7	0.97	21.7	3.3
2045	32.7	1.65	32.5	3.7
2055	36.8	2.46	50.7	4.3
2065	41.0	3.35	73.6	4.9
2075	45.0	4.34	102.5	5.7

Alternative 4 Remarks

- Alternative 4 generates substantial revenues in the later years as the capacity improvements are utilized and free-lane congestion increases.

- Overall, the revenues for this alternative are high relative to other Alternatives because the additional tolled lanes are open at all times in both directions. This is particularly advantageous at those periods where volumes are heavy in each direction.

Toll Revenue PV (at 5% DR, $2014M): $486.60
Capital Cost (M): $2,715.6
O&M Cost (M): $ 14.24

Alt05_Opt01

Permanent Peak Period Shoulder Lane

Widen the existing roadway to accommodate one additional left side managed lane (EB & WB) for use during peak times, during non-peak times operates as a standard shoulder. Provide full width shoulder on right side.

Roadway Information

Extent of Roadway Improvements	EJMT to Floyd Hill
General Purpose (GP) Lane Information	Additional capacity by widening existing
Direction of Improvements	Both directions (EB and WB)
Design Speed	Match Existing
Trucks, Private Buses, BRT	Allowed in Peak Period Lane (Always in GP Lanes)
Tolling	
Capacity Improvements	Dynamic priced toll for EB & WB Peak Period Shoulder Lanes
Tunnels	Dynamic priced toll for EJMT 3rd Bore and Twin Tunnels 3rd Lane
Technology	Transponder and license plate recognition
Schedule	
Construction Start	2019 (Assumes 4 years NEPA)
Construction Duration	4 years
First Year Operation	2023
Financial Period	50 years

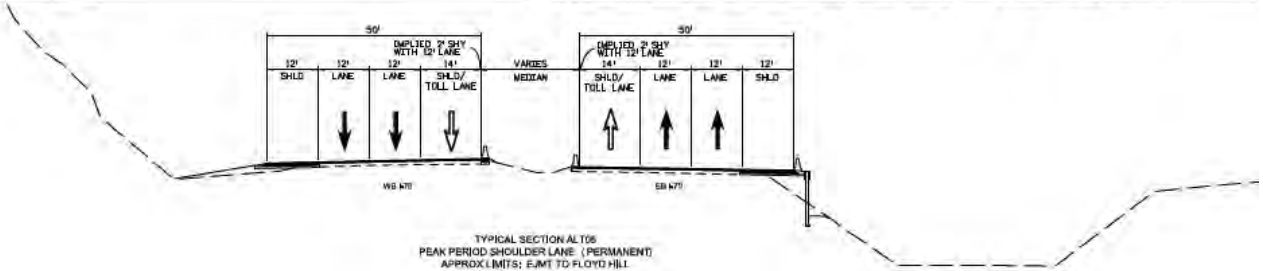
Transit Information

Termini	Silverthorne-Denver, Service to GWS (CDOT Bus), Breckenridge-Denver (AGS)
Special Infrastructure	AGS System: None for CDOT Bus
Schedule	Fall 2014 - CDOT Bus / After 2035 - AGS
Stations	6 CDOT Bus Stations - GWS, Eagle, Vail, Frisco, Denver (2); 5 AGS Stations
Type	
CDOT Bus	TBD by CDOT
BRT	N/A
AGS	In operation after 2035

Special Structures

Special Structures	EJMT 3rd Bore

GP = General Purpose Lane EJMT = Eisenhower Johnson Memorial Tunnels GWS = Glenwood Springs



TYPICAL SECTION ALT05
PEAK PERIOD SHOULDER LANE (PERMANENT)
APPROX LIMITS: EJMT TO FLOYD HILL

Forecast Traffic and Revenue Results - Alternative 5

	Corridor Vehicle Trips (M)	Toll Vehicle Trips (M)	Toll Revenues (2014 $M)	AGS Person Trips (M)
2025	26.0	0.50	8.0	-
2035	27.9	0.73	19.3	3.3
2045	31.6	1.1	28.4	3.7
2055	35.3	1.6	42.8	4.3
2065	39.0	2.1	61.3	4.9
2075	42.2	2.6	85.3	5.7

Alternative 5 Remarks

- Alternative 5 provides additional tolled capacity in both directions which allows it to generate substantial revenue.
- Growth in revenue substantially outpaces growth in volume as toll prices are raised in the out-years of the forecast to manage volumes in the toll lanes.
- In contrast to Alternative 4, Alternative 5 is only open during peak periods, which limits its revenue-generating potential in comparison to Alt4Opt1.

Toll Revenue PV (at 5% DR, $2014M): $440.49
Capital Cost (M): $1,959.17
O&M Cost (M): $13.81

Permanent Peak Period Shoulder Lane

Widen the existing roadway to accommodate one additional left side managed lane (EB & WB) for use during peak times, during non-peak times operates as a standard shoulder. Provide full width shoulder on right side.

Roadway Information

Extent of Roadway Improvements	Empire to top of Floyd Hill
General Purpose (GP) Lane Information	Additional capacity by widening existing
Direction of Improvements	Both directions (EB and WB)
Design Speed	Match Existing
Trucks, Private Buses, BRT	Allowed in Peak Period Lane (Always in GP Lanes)
Tolling	
Capacity Improvements	Dynamic priced toll for EB & WB Peak Period Shoulder Lanes
Tunnels	Dynamic priced toll for Twin Tunnels 3rd Lane
Technology	Transponder and license plate recognition
Schedule	
Construction Start	2019 (Assumes 4 years NEPA)
Construction Duration	4 years
First Year Operation	2023
Financial Period	50 years

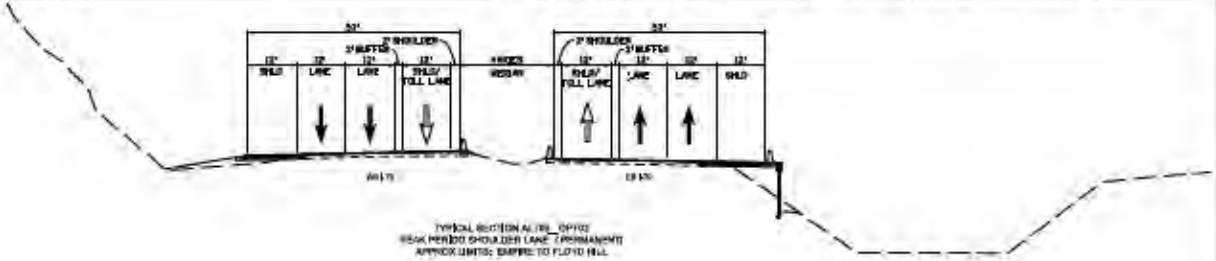
Transit Information

Termini	Silverthorne-Denver, Service to GWS (CDOT Bus), Bloomfield-Denver (AGS)
Special Infrastructure	AGS System: None for CDOT Bus
Schedule	Fall 2014 - CDOT Bus / After 2035 - AGS
Stations	6 CDOT Bus Stations - GWS, Eagle, Vail, Frisco, Denver (2) & 5 AGS Stations
Type	
CDOT Bus	TBD by CDOT
BRT	N/A
AGS	In operation after 2035

Special Structures

Special Structures	

GP = General Purpose Lane EJMT = Eisenhower Johnson Memorial Tunnels GWS = Glenwood Springs



TYPICAL SECTION ALT05_OPT02
PEAK PERIOD SHOULDER LANE (PERMANENT)
APPROX LIMITS: EMPIRE TO FLOYD HILL

Forecast Traffic and Revenue Results - Alternative 5.1

	Corridor Vehicle Trips (M)	Toll Vehicle Trips (M)	Toll Revenues (2014 $M)	AGS Person Trips (M)
2025	25.7	0.62	4.1	-
2035	27.6	0.86	11.9	3.3
2045	31.3	1.2	16.8	3.7
2055	35.1	1.7	25.1	4.3
2065	38.7	2.1	36.0	4.9
2075	42.2	2.6	48.7	5.7

Alternative 5.1 Remarks

- Alt. 5.1 is the equivalent of Alternative 6 except that the PPSL is permanent rather than temporary. Alternative 5.1 does not include a 3rd bore at EJMT.

- The permanent nature of this Alternative makes it wider than the temporary lane in Alternative 6 and therefore provides it with higher capacity.

- Given that this alternative is half the distance of Alternative 5, Alternative 5.1 has lower revenue generation potential.

Toll Revenue PV (at 5% DR, $2014M): $256.65
Capital Cost (M): $99.77
O&M Cost (M): $3.46

Alt06_Opt01

Temporary Peak Period Shoulder Lane

Using the existing roadway, accommodate one additional WB left side managed lane for use during peak times; during non-peak times operates as a standard shoulder. No twelve foot wide shoulders are available during peak periods. During non-peak periods, twelve foot breakdown shoulder is on left side instead of right. Construction of WB peak period lane from Empire to Floyd Hill only. (This alternative assumes EB direction peak period lane from Empire to Floyd Hill is constructed.)

Roadway Information

Extent of Roadway Improvements	Empire to Floyd Hill
General Purpose (GP) Lane Information	Additional capacity by restriping existing
Direction of Improvements	WB Only Direction
Design Speed	Match Existing
Trucks, Private Buses, BRT	Allowed in Peak Period Lane (Always in GP Lanes)
Tolling	
Capacity Improvements	Dynamic priced toll for EB & WB Peak Period Shoulder Lanes
Tunnels	Dynamic priced toll for Twin Tunnels 3rd Lanes
Technology	Transponder and license plate recognition
Schedule	
Construction Start	2016 (Assumes 1.5 years NEPA)
Construction Duration	3 years
First Year Operation	2019
Financial Period	50 years

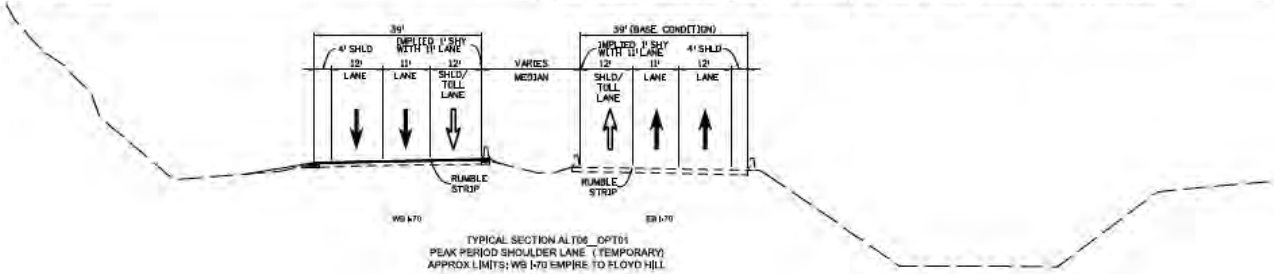
Transit Information

Termini	Silverthorne-Denver, Service to GWS (CDOT Bus), Breckenridge-Denver (AGS)
Special Infrastructure	AGS System: None for CDOT Bus
Schedule	Fall 2014 - CDOT Bus / After 2035 - AGS
Stations	6 CDOT Bus Stations - GWS, Eagle, Vail, Frisco, Denver (2); 5 AGS Stations
Type	
CDOT Bus	TBD by CDOT
BRT	N/A
AGS	In operation after 2035

Special Structures

Special Structures	

GP = General Purpose Lane EJMT = Eisenhower Johnson Memorial Tunnels GWS = Glenwood Springs



TYPICAL SECTION ALT06_OPT01
PEAK PERIOD SHOULDER LANE (TEMPORARY)
APPROX LIMITS: WB I-70 EMPIRE TO FLOYD HILL

Forecast Traffic and Revenue Results - Alternative 6

	Corridor Vehicle Trips (M)	Toll Vehicle Trips (M)	Toll Revenues (2014 $M)	AGS Person Trips (M)
2025	25.7	0.60	4.0	-
2035	27.6	0.83	12.1	3.3
2045	31.4	1.2	17.1	3.7
2055	35.1	1.6	25.7	4.3
2065	38.8	2.1	37.1	4.9
2075	42.2	2.5	49.6	5.7

Alternative 6 Remarks

- Similar to the performance of Alternative 5, this alternative sees an increase in revenue that substantially outpaces the growth in traffic.

- This alternative has lower revenue generating potential in comparison with Alternative 5, as it covers half the distance and is a narrower, lower capacity lane, limiting the volumes it can carry overall.

Toll Revenue PV (at 5% DR, $2014M): $222.57
Capital Cost (M): $99.77
O&M Cost (M): $3.46

Comparison Across Alternatives – Reference Case

	Corridor Vehicle Trips		Toll Revenue		Revenue PV	Costs	
Alt.	2035 (M)	2050 (M)	2035 ($M)	2050 ($M)	(2014 $M)	Capital	O&M
Base Cond	29.3	34.8	4.1	11.3	$109.73	-	-
1	30.6	37.1	63.6	104.4	$1575.4	$4,116.4	$49.7
2	30.7	37.3	56.9	99.9	$1,518.0	$5,092.4	$53.9
3	27.9	33.7	2.1	4.7	$51.0	$2012.5	$10.7
4	28.7	34.7	21.7	40.6	$486.6	$2,715.6	$14.2
5	27.8	33.4	19.3	34.9	$440.5	$1,959.2	$13.8
5.1	27.6	33.2	11.9	20.5	$256.7	$99.8	$3.5
6	27.6	33.2	12.1	21.0	$222.6	$99.8	$3.5

Comparison Across Alternatives – Ranges (1.4%-3.0% Growth Rates)

Alt.	Corridor Vehicle Trips 2050 (M)		Tolled Vehicle Trips 2050 (M)		Toll Revenue 2050 (2014 $M)		Revenue PV (2014$M)	
Growth Rate	**1.4%**	**3.0%**	**1.4%**	**3.0%**	**1.4%**	**3.0%**	**1.4%**	**3.0%**
Base Cond	34.8	44.1	0.85	1.6	11.3	25.7	$109.7	$239.6
1	37.1	49.6	4.1	8.3	104.4	381.0	$1,575.4	$4,473.4
2	37.3	50.6	4.7	10.0	99.9	338.4	$1,518.0	$4,182.6
3	33.7	43.9	0.66	5.5	4.7	13.5	$51.0	$126.6
4	34.7	46.0	2.0	5.9	40.6	223.4	$486.6	$2,097.0
5	33.4	43.3	1.3	3.3	34.9	173.8	$440.5	$1680.1
5.1	33.2	43.0	1.4	3.2	20.5	86.6	$256.7	$847.1
6	33.2	43.0	1.4	3.0	21.0	82.3	$222.6	$668.4

Conclusions

Does the Expected Revenue Cover Expenses?							
	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. .5.1	Alt. 6
Capital + O&M	✗	✗	✗	✗	✗	✓	✓
O&M	✓	✓	✗	✓	✓	✓	✓

- Alternatives 1 and 2 show the greatest improvements in capacity. However, the revenues captured are not able to cover capital and O&M expenses.
- Alternative 3 provides minimal improvements in time savings and therefore minimal revenue.
- Alternatives 4 and 5 provide considerable improvements in capacity and significant revenues. Both can cover O&M but neither can cover capital expenses.
- Alternatives 5.1 and 6 provide limited improvements in capacity but generate an important amount of revenues; both cover all costs.

Level 1 Forecast Limitations

- A TransCAD-based travel demand model is not the most accurate means to model congestion. Weather, grades, and road curvature, among others have a strong impact on congestion and are not fully captured in the PEIS model.
- Level 1 T&R study uses existing data from recent studies, which limits the model's ability to include the most up to date or variable assumptions on Value of Time, vehicle occupancy rates, trip purposes, and other critical measures.
- The standard activities developed in a Level 2 study including the implementation of a micro-simulation tool and the development of a stated preference survey would address most of the limitations listed above and provide a more accurate evaluation of traffic and revenue for the proposed alternatives.

THANK YOU

I-70 Traffic & Revenue Study
Modeling & Revenue Group Sessions

- Do you understand the modeling & revenue information that was presented?

- What comments & questions do you have on the modeling & revenue information?

I-70 Traffic & Revenue Study

SMALL GROUP SESSIONS

I-70 Traffic & Revenue Study
Group Sessions Reporting on Modeling & Revenue

- Do you understand the modeling & revenue information that was presented?

- What comments & questions do you have on the modeling & revenue information?

I-70 Traffic & Revenue Study

BREAK

I-70 Traffic & Revenue Study
Core Values, Critical Issues, Critical Success Factors, Level 1 Performance Measures

Core Values	Critical Issues	Critical Success Factors	Level 1 Performance Measures
Safety	• Safe Traffic Operations • Emergency Response • Incident Management	• Enhancing safety for all is a priority. Balance the anticipated needs of capacity and safety improvements with minimized impacts. • Provide reliable access and protection for emergency responders to / from and through the corridor accident/incident scenes.	• Does the alternative meet minimum design standards (AASHTO, CDOT, etc) of cross section, curvature, sight distance and grades? • Does the alternative provide safe reliable access ? • Does the alternative provide protection for incident responders? • Does the alternative have the potential to reduce crashes?
Mobility	• Travel Time Reliability • Slow Moving Vehicles • Modal Choice • Local Mobility • Incident Management	• Provide a multimodal solution that improves mobility, reliability, increases person trips, efficiently manages slow moving vehicles, provides incident response access, and reduces travel time .	• Does the alternative reduce travel times for long distance trips for all users? • Does the alternative reduce the travel time for short distance trips for all users both on and off the Interstate? • Does the alternative offer competitive modal choices with reliable travel times? • Does the alternative allow for increased person trips? • Does the alternative provide for incident management?
Constructability	• Funding • Efficiency of Operations & Maintenance	• Develop funding priorities to construct financially feasible improvements that use innovative and efficient practices which have the greatest ability to preserve, conserve and maintain existing environment and future improvements. Must be "buildable".	• Is the construction of the alternative financially feasible with the minimal funding? • Does the alternative provide flexibility for future expansion and modification? • Does the alternative have a positive impact on operations and maintenance?
Engineering Criteria and Aesthetic Guidelines	• Aesthetics • Adherence to Accepted Design Standards	• Use the I-70 Mountain Corridor CSS process to create and assess financially feasible infrastructure improvements that adhere to acceptable engineering standards and are inspired compatible with the natural surroundings and provide the best value for their life-cycle while not precluding future opportunities.	• Does the alternative provide opportunities to balance aesthetics and engineering? • Does the alternative adhere to the I-70 CSS Mountain Corridor Guidelines and specific design criteria?

Core Values	Critical Issues	Critical Success Factors	Level 1 Performance Measures
Sustainability	• Preserve Future Transportation Options • Energy Use • Maintenance • Impact of No Action	• Address the continuing decline of mobility and accessibility along the corridor by developing long-term multi-modal transportation solutions that are compatible with the natural surroundings and minimize the use of non-renewable resources.	• Does the alternative protect existing natural resources? • Does the alternative use existing natural resources efficiently to generate improvements in efficiency and mobility? • Does the alternative have the potential to improve operations and maintenance?
Decision Making Process (Local, Regional, Statewide)	• CSS Guidance • Stakeholder Support • Public Acceptance • Identify & Prioritize Mitigation and Enhancement Opportunities	• Conduct a transparent (fair, open, equitable and inclusive) CSS process utilizing relevant and defensible data and a consistent set of assumptions. • Obtain general agreement by the public, the Project Leadership Team, and stakeholders of the study process and results.	• Does the alternative provide opportunities for enhancements (i.e. recreational, community, environmental)? • Is the alternative consistent with the Record of Decision? • Does the alternative have a minimal risk of public or political opposition?
Community (Local, Regional, Statewide)	• Enhance Recreational Opportunities • Enhance Community Values • Improve Economic Vitality & Livability	• Advance a solution that improves local, regional and statewide livability and economic vitality.	• Does the alternative improve access to key destinations along the corridor, including recreation areas? • Does the alternative have the potential to improve livability and vitality locally, regionally, and statewide?
Historic Context	• Preservation & Enhancement of Historic Elements & Landscape	• Enable a positive experience for local residents and tourists through preservation and enhancement of historic elements and landscape.	• Does the alternative have the ability to protect Historic Districts and Landmarks? • Does the alternative have opportunities for mitigation and / or enhancement to historic districts and landmarks?
Healthy Environment	• Environmental Sensitivity • Ability to Mitigate	• Identify solutions that avoid, minimize, enhance and/or mitigate environmental impacts.	• Does the alternative have the potential to avoid immitigable environmental impacts?
Fiscal Responsibility	• Life Cycle Considerations • Benefit - Cost	• Assure fiscal responsibility through sustainable revenue generation and minimized public funding.	• Does the alternative have the ability to be financially self sustaining in terms of capital and operations and maintenance costs with minimal public funding?

I-70 Traffic & Revenue Study Screening Matrix

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 Lane Reversible	3 Lane Reversible	Min PEIS	Max PEIS	Perm PPSL	Temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Safety	1	Does the alternative meet minimum design standards (AASHTO, CDOT, etc) of cross section, curvature, sight distance and grades?						
	2	Does the alternative provide safe reliable access?						
	3	Does the alternative provide protection for incident responders?						
	4	Does the alternative have the potential to reduce crashes?						

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 Lane Reversible	3 Lane Reversible	Min PEIS	Max PEIS	Perm PPSL	Temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Mobility	5	Does the alternative reduce travel times for long distance trips for all users?						
	6	Does the alternative reduce the travel time for short distance trips for all users both on and off the Interstate?						
	7	Does the alternative offer competitive modal choices with reliable travel times?						
	8	Does the alternative allow for increased person trips?						
	9	Does the alternative provide for incident management?						

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 Lane Reversible	3 Lane Reversible	Min PEIS	Max PEIS	Perm PPSL	Temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Constructability	10	Is the construction of the alternative financially feasible with the minimal funding?						
	11	Does the alternative provide flexibility for future expansion and modification?						
	12	Does the alternative have a positive impact on operations and maintenance?						

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 Lane Reversible	3 Lane Reversible	Min PEIS	Max PEIS	Perm PPSL	Temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Engineering & Aesthetic Guidelines	13	Does the alternative provide opportunities to balance aesthetics and engineering?						
	14	Does the alternative adhere to the I-70 CSS Mountain Corridor Guidelines and specific design criteria?						

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 Lane Reversible	3 Lane Reversible	Min PEIS	Max PEIS	Perm PPSL	Temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Sustainability	15	Does the alternative protect existing natural resources?						
	16	Does the alternative use existing natural resources efficiently to generate improvements in efficiency and mobility?						
	17	Does the alternative have the potential to improve operations and maintenance?						

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 Lane Reversible	3 Lane Reversible	Min PEIS	Max PEIS	Perm PPSL	Temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Decision Making Process	18	Does the alternative provide opportunities for enhancements (i.e. recreational, community, environmental)?						
	19	Is the alternative consistent with the Record of Decision?						
	20	Does the alternative have a minimal risk of public or political opposition?						

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 Lane Reversible	3 Lane Reversible	Min PEIS	Max PEIS	Perm PPSL	Temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Community (Local, Regional, Statewide)	21	Does the alternative improve accessibility/mobility to key destinations along the corridor, including recreation areas?						
	22	Does the alternative have the potential to improve livability and vitality locally, regionally, and statewide?						

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 Lane Reversible	3 Lane Reversible	Min PEIS	Max PEIS	Perm PPSL	Temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Historic Content	23	Does the alternative have the ability to protect Historic Districts and Landmarks?						
	24	Does the alternative have opportunities for mitigation and / or enhancement to historic districts and landmarks?						

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 Lane Reversible	3 Lane Reversible	Min PEIS	Max PEIS	Perm PPSL	Temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Healthy Environment	25	Does the alternative have the potential to avoid immitigable environmental impacts?						

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 Lane Reversible	3 Lane Reversible	Min PEIS	Max PEIS	Perm PPSL	Temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Fiscal Responsibility	26 A	Does the alternative have the ability to be financially self sustaining in terms of capital costs and operations and maintenance costs with minimal public funding? *minimal defined as no increase over existing CDOT expenditures.						
	26 B	Does the alternative have the ability to be financially self sustaining in terms of operations and maintenance costs only, with minimal public funding? *minimal defined as no increase over existing CDOT expenditures.						

Sample Screening

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 Lane Reversible	3 Lane Reversible	Min PEIS	Max PEIS	Perm PPSL	Temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Constructability	10	Is the construction of the alternative financially feasible with the minimal funding?	**Poor**.	**Poor**.	**Poor**. **Poor**. AGS not financially feasible at this time.	**Poor**. **Poor**. AGS not financially feasible at this time.	**Poor**. **Poor**. AGS not financially feasible at this time.	**Good**. **Poor**. AGS not financially feasible at this time.
Fiscal Responsibility	26 A	Does the alternative have the ability to be financially self sustaining in terms of capital costs and operations and maintenance costs with minimal public funding? *minimal defined as no increase over existing CDOT expenditures.	**Poor**. Toll revenue does not cover roadway capital costs and operations and maintenance costs.	**Poor**. Toll revenue does not cover roadway capital costs and operations and maintenance costs.	**Poor**. No funding available to cover roadway capital costs and operations and maintenance costs. **Poor**. No funding available to cover AGS costs.	**Poor**. Toll revenue does not cover roadway capital costs and operations and maintenance costs. **Poor**. No funding available to cover AGS costs	**Poor**. Toll revenue does not cover roadway capital costs and operations and maintenance costs. **Poor**. No funding available to cover AGS costs	**Good**. Toll revenue does cover roadway capital costs and operations and maintenance costs.. **Poor**. No funding available to cover AGS costs
Fiscal Responsibility	26 B	Does the alternative have the ability to be financially self sustaining in terms of operations and maintenance costs only, with minimal public funding? *minimal defined as no increase over existing CDOT expenditures.	Good	Good	Poor	Good	Good	Good

I-70 Traffic & Revenue Study Screening Matrix

Questions?

Tentative Future Meetings

- June 25 TT Meeting – Performance Measures
- TBD PLT Meeting – Level 1 Recommendation and Results

Information Review Periods

- June 11 Distribution of Screening Results to TT & PLT
- July 9 TT & PLT Comments due on Screening Results

Wrap up & Action Items Review

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Thank You !!!

COLORADO HPTE

COLORADO Department of Transportation

FHWA

Level 1 Draft Alternatives Screening

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 lane reversible	3 lane reversible	min PEIS	max PEIS	perm PPSL	temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Safety	1	Does the alternative meet minimum design standards (AASHTO, CDOT, etc) of cross section, curvature, sight distance and grades?						
	2	Does the alternative provide safe reliable access?						
	3	Does the alternative provide protection for incident responders?						
	4	Does the alternative have the potential to reduce crashes?						

Level 1 Draft Alternatives Screening

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 lane reversible	3 lane reversible	min PEIS	max PEIS	perm PPSL	temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Mobility	5	Does the alternative reduce travel times for long distance trips for all users?						
	6	Does the alternative reduce the travel time for short distance trips for all users both on and off the Interstate?						
	7	Does the alternative offer competitive modal choices with reliable travel times?						
	8	Does the alternative allow for increased person trips?						
	9	Does the alternative provide for incident management?						

Level 1 Draft Alternatives Screening

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 lane reversible	3 lane reversible	min PEIS	max PEIS	perm PPSL	temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Constructability	10	Is the construction of the alternative financially feasible with the minimal funding?						
	11	Does the alternative provide flexibility for future expansion and modification?						
	12	Does the alternative have a positive impact on operations and maintenance?						
Engineering Criteria and Aesthetic Guidelines	13	Does the alternative provide opportunities to balance aesthetics and engineering?						
	14	Does the alternative adhere to the I-70 CSS Mountain Corridor Guidelines and specific design criteria?						

Level 1 Draft Alternatives Screening

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 lane reversible	3 lane reversible	min PEIS	max PEIS	perm PPSL	temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Sustainability	15	Does the alternative protect existing natural resources?						
	16	Does the alternative use existing natural resources efficiently to generate improvements in efficiency and mobility?						
	17	Does the alternative have the potential to improve operations and maintenance?						
Decision Making Process	18	Does the alternative provide opportunities for enhancements (i.e. recreational, community, environmental)?						
	19	Is the alternative consistent with the Record of Decision?						
	20	Does the alternative have a minimal risk of public or political opposition?						

Level 1 Draft Alternatives Screening

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 lane reversible	3 lane reversible	min PEIS	max PEIS	perm PPSL	temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Community (Local, Regional, Statewide)	21	Does the alternative improve accessibility/mobility to key destinations along the corridor, including recreation areas?						
	22	Does the alternative have the potential to improve livability and vitality locally, regionally, and statewide?						
Historic Context	23	Does the alternative have the ability to protect Historic Districts and Landmarks?						
	24	Does the alternative have opportunities for mitigation and / or enhancement to historic districts and landmarks?						
Healthy Environment	25	Does the alternative have the potential to avoid immitigable environmental impacts?						

Level 1 Draft Alternatives Screening

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 lane reversible	3 lane reversible	min PEIS	max PEIS	perm PPSL	temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Fiscal Responsibility	26A	Does the alternative have the ability to be financially self sustaining in terms of capital costs and operations and maintenance costs with minimal public funding? *minimal defined as no increase over existing CDOT expenditures.						
	26B	Does the alternative have the ability to be financially self sustaining in terms of operations and maintenance costs only, with minimal public funding? *minimal defined as no increase over existing CDOT expenditures.						

Level 1 Draft Alternatives Screening

Core Value		Performance Measure	Alternative 1 2 lane reversible Options 1 & 2	Alternative 2 3 lane reversible Options 1, 2, & 3	Alternative 3 min PEIS Options 1, 2, 3, & 4	Alternative 4 max PEIS Options 1 & 2	Alternative 5 perm PPSL Option 1	Alternative 6 temp PPSL Option 1
Safety	1	Does the alternative meet minimum design standards (AASHTO, CDOT, etc) of cross section, curvature, sight distance and grades?	**Fair.** Option 1 Managed Lanes (MLs) meet Stds. Option 1 existing roadway General Purpose Lanes (GPLs) do not meet Stds. **Good.** Option 2 MLs and GPLs meet Stds.	**Fair.** MLs meet Stds. Opt 1 and 3 existing roadway GPLs do not meet Stds. **Good.** MLs and Opt 2 GPLs meet Stds.	**Fair.** All options meet stds. where improving, but entire corridor will not meet Stds.	**Good.** All options meet Stds.	**Fair**. Opt 1 existing roadway does not meet Stds., no shoulder widths when in operation; only missing buffer; FHWA has ability to grant variances.	**Poor**. Opt 1 existing roadway does not meet Stds., no shoulder widths when in operation; FHWA has ability to grant variances.
Safety	2	Does the alternative provide safe reliable access?	**Good.** MLs provide direct connections at key locations. GPL Interchange improvements.	**Good.** MLs provide direct connections at key locations. GPL Interchange improvements.	**Fair.** Aux lanes will provide marginal operational benefits to access.	**Good.** GPLs access improved. **Fair.** Enter / exit MLs require weaves thru GPLs.	**Poor.** Enter / exit MLs require weaves thru GPLs, no improvements to interchange ramps. Concern in locations where unintended access might occur…	**Poor.** Enter / exit MLs require weaves thru GPLs, no improvements to interchange ramps. Concern in locations where unintended access might occur…
Safety	3	Does the alternative provide protection for incident responders?	**Good.** MLs provide typically 44' roadway width, Stds., direct connections at key locations & VMS traffic control. GPL Interchange improvements; can put all vehicles into ML for full protection in GPLs.	**Good.** MLs provide typically 56' roadway width, Stds., direct connections at key locations & VMS traffic control. GPL Interchange improvements; can put all vehicles into ML for full protection in GPLs.	**Fair.** Roadway width typically 60'. Wide shoulders provide more staging area. Only improving specific locations.	**Good.** Roadway width typically 64'. Wide shoulders provide more staging area.	**Good.** Roadway width typically 50'. While wide shoulders provide more staging area, roadway width is compromised..	**Poor.** Roadway width typically 39'.While shoulders in use for traffic minimizes staging area, roadway width is compromised.
Safety	4	Does the alternative have the potential to reduce crashes?	**Good.** MLs are expected to provide a 10% reduction in accidents based on I-25 North peer study with MNDOT.	**Good.** MLs are expected to provide a 10% reduction in accidents based on I-25 North peer study with MNDOT.	**Fair.** Compared to the base case, and based on NCHRP 299, this alternative has the potential to reduce crashes given its wider shoulders, but only in limited locations.	**Good.** Compared to the base case, and based on NCHRP 299, this alternative has the potential to reduce crashes given its wider shoulders.	**Fair:** Studies report either nonsignificant change or a significant reduction of accidents on inside shoulder lanes . Level of reduction depends on congestion and design details.	**Poor.** While studies report either a nonsignificant change or a significant reduction of accidents on inside shoulder lanes, narrower shoulder lanes with limited barriers can increase crashes by 3-4%.

Level 1 Draft Alternatives Screening

Core Value		Performance Measure	Alternative 1 2 lane reversible Options 1 & 2	Alternative 2 3 lane reversible Options 1, 2, & 3	Alternative 3 min PEIS Options 1, 2, 3, & 4	Alternative 4 max PEIS Options 1 & 2	Alternative 5 perm PPSL Option 1	Alternative 6 temp PPSL Option 1
Mobility	5	Does the alternative reduce travel times for long distance trips for all users?	**Good.** MLs provide additional capacity, reducing overall congestion & travel times in peak hours. MLs provide greater benefits for long distance trips.	**Good.** MLs provide additional capacity, reducing overall congestion & travel times in peak hours. MLs provide greater benefits for long distance trips.	**Poor.** Limited capacity improvements to reduce congestion & travel times.	**Fair.** With some increase in capacity, some reduction in congestion & travel times in peak hours.	**Fair.** Limited capacity improvements to reduce congestion & travel times.	**Poor.** Limited capacity improvements to reduce congestion & travel times.
			Poor. Operations in off-peak direction will suffer in out years.	**Poor.** Operations in off-peak direction will suffer in out years.	Still **Poor** once AGS is in service for ALL users.	**Good.** Operations in off-peak direction will be good in out years.	Still **Poor** once AGS is in service for ALL users.	Still **Poor** once AGS is in service for ALL users.
	6	Does the alternative reduce the travel time for short distance trips for all users both on and off the Interstate?	**Good.** MLs provide additional capacity, reducing overall congestion & travel times in peak hours.	**Good.** MLs provide additional capacity, reducing overall congestion & travel times in peak hours.	**Poor.** Limited capacity improvements to reduce congestion & travel times.	**Fair.** With some increase in capacity, some reduction in congestion & travel times in peak hours.	**Fair.** Limited capacity improvements to reduce congestion & travel times.	**Poor.** Limited capacity improvements to reduce congestion & travel times.
			Fair. Operations in off-peak direction will suffer in out years.	**Fair.** Operations in off-peak direction will suffer in out years.		**Fair.** Operations in off-peak direction will be good in out years.		
	7	Does the alternative offer competitive modal choices with reliable travel times?	**Good.** BRT Provides alternative mode of travel in MLs at start up.	**Good.** BRT Provides alternative mode of travel in MLs at start up.	**Poor.** Prior to 2035 implementation of AGS.	**Poor.** Prior to 2035 implementation of AGS.	**Poor.** Prior to 2035 implementation of AGS.	**Poor.** Prior to 2035 implementation of AGS.
					Good once AGS in service.	**Good** once AGS in service.	**Good** once AGS in service.	**Good** once AGS in service.
	8	Does the alternative allow for increased person trips?	**Good.** Added capacity & reduced congestion allow for increased person trips.	**Good.** Added capacity & reduced congestion allow for increased person trips.	**Poor.** Limited capacity improvements to increase person trips.	**Fair.** With some increase in capacity & reduction in congestion person trips will increase.	**Fair.** Limited capacity improvements may not increase person trips.	**Poor.** Limited capacity improvements may not increase person trips.
					Fair. Persons trips would increase after 2035 implementation of AGS.	**Fair.** Persons trips would increase after 2035 implementation of AGS.	**Fair.** Persons trips would increase after 2035 implementation of AGS.	**Fair.** Persons trips would increase after 2035 implementation of AGS.
	9	Does the alternative provide for incident management?	**Good.** MLs aides in ability to manage, respond, and clear incidents. GPL Interchange improvements.	**Good.** MLs aides in ability to manage, respond, and clear incidents. GPL Interchange improvements.	**Fair.** Improve opportunities in limited areas to manage, respond and clear incidents.	**Good.** Alternative aides in ability to manage, respond, and clear incidents.	**Good.** Alternative aides in ability to manage, respond, and clear incidents.	**Poor.** Active Traffic Management is negligble improvement for long-term.

Level 1 Draft Alternatives Screening

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 lane reversible	3 lane reversible	min PEIS	max PEIS	perm PPSL	temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Constructability	10	Is the construction of the alternative financially feasible with the minimal funding?	Poor.	Poor.	Poor.	Poor.	Poor.	Good.
					Poor. AGS not financially feasible at this time.	Poor. AGS not financially feasible at this time.	Poor. AGS not financially feasible at this time.	Poor. AGS not financially feasible at this time.
	11	Does the alternative provide flexibility for future expansion and modification?	Fair. Wide footprint may not be economically widened further. AGS can be accommodated.	Fair. Wide footprint may not be economically widened further. AGS can be accommodated.	Good. Opportunity to increase capacity with other lanes. AGS is accommodated.	Fair. Wide footprint may not be economically widened further. AGS is accommodated.	Good. Opportunity to increase capacity with Adaptive Management. AGS is accommodated.	Good. Opportunity to increase capacity with Adaptive Management. AGS is accommodated.
	12	Does the alternative have a positive impact on operations and maintenance?	Good. Wide shoulders allows for ease in O&M.	Good. Wide shoulders allows for ease in O&M.	Good. Wide shoulders allows for ease in O&M.	Good. Wide shoulders allows for ease in O&M.	Fair. Narrow shoulders allows for ease in O&M.	Fair. Narrow shoulders allows for ease in O&M.
Engineering Criteria and Aesthetic Guidelines	13	Does the alternative provide opportunities to balance aesthetics and engineering?						
	14	Does the alternative adhere to the I-70 CSS Mountain Corridor Guidelines and specific design criteria?						

Level 1 Draft Alternatives Screening

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 lane reversible	3 lane reversible	min PEIS	max PEIS	perm PPSL	temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Sustainability	15	Does the alternative protect existing natural resources?	**Poor.** Wider footprints would have more impact on natural resources, including secondary effects.	**Poor.** Wider footprints would have more impact on natural resources, including secondary effects.	**Fair.** Minimal construction & narrower footprints would have minimal effects on natural resources. **Poor.** The AGS would have substantial effects on natural resources.	**Poor.** Wider footprints would have more impact on natural resources, including secondary effects. **Poor.** The AGS would have substantial effects on natural resources.	**Fair.** Minimal construction & narrower footprints would have minimal effects on natural resources. resources. **Poor.** The AGS would have substantial effects on natural resources.	**Fair.** Minimal construction & narrower footprints would have minimal effects on natural resources. resources **Poor.** The AGS would have substantial effects on natural resources.
	16	Does the alternative use existing natural resources efficiently to generate improvements in efficiency and mobility?						
	17	Does the alternative have the potential to improve operations and maintenance?	**Fair.** MLs O&M by concessionaire. Wider pavement. Sustainable for longer as are replacing...	**Fair.** MLs O&M by concessionaire. Wider pavement. Sustainable for longer as are replacing...	**Good.** Minimal capacity increase & congestion put pressure on CDOT O&M.	**Fair.** Minimal capacity increase & congestion put pressure on CDOT O&M. Toll revenue available.	**Fair.** Minimal capacity increase & congestion put pressure on CDOT O&M. Toll revenue available. Not sustainable; won't be replacing...	**Fair.** Minimal capacity increase & congestion put pressure on CDOT O&M. Toll revenue available. Not sustainable; won't be replacing...
Decision Making Process	18	Does the alternative provide opportunities for enhancements (i.e. recreational, community, environmental)?	**Good.** Extent (longer/more involved/bigger) of project would provide more opportunities for enhancements.	**Good.** Extent (longer/more involved/bigger) of project would provide more opportunities for enhancements.	**Fair.** Extent of project would provide some opportunity for enhancements.	**Good.** Extent (longer/more involved/bigger) of project would provide more opportunities for enhancements.	**Good.** Extent (longer/more involved/bigger) of project would provide more opportunities for enhancements.	**Poor.** Extent of project would provide little opportunity for enhancements.
	19	Is the alternative consistent with the Record of Decision?	**Poor.** Dismissed in PEIS.	**Poor.** Dismissed in PEIS.	**Good.** Considered in PEIS & ROD.	**Good.** Considered in PEIS & ROD.	**Good.** Considered in PEIS & ROD as non-infrastructure improvement.	**Good.** Considered in PEIS & ROD as non-infrastructure improvement.
	20	Does the alternative have a minimal risk of public or political opposition?			**Good.** Compliant with ROD.	**Good.** Compliant with ROD.		**Good.** Compliant with ROD.

Level 1 Draft Alternatives Screening

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 lane reversible	3 lane reversible	min PEIS	max PEIS	perm PPSL	temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Community (Local, Regional, Statewide)	21	Does the alternative improve accessibility/mobility to key destinations along the corridor, including recreation areas?	**Good.** Less congestion, reduced travel times, & direct connections from MLs.	**Good.** Less congestion, reduced travel times, & direct connections from MLs.	**Poor.** No real capacity improvements to reduce congestion & travel times.	**Good.** Less congestion, reduced travel times, & direct connections from MLs.	**Fair.** With some increase in capacity, some reduction in congestion & travel times.	**Fair.** With some increase in capacity, some reduction in congestion & travel times.
					Good once AGS in service.	**Good** once AGS in service.	**Good** once AGS in service.	**Good** once AGS in service.
	22	Does the alternative have the potential to improve livability and vitality locally, regionally, and statewide?	**Fair.** Less congestion for traveling public; better access to communities; less congestion in communities.	**Fair.** Less congestion for traveling public; better access to communities; less congestion in communities.	**Poor.** Continued congestion; pent-up demand not released.	**Fair.** Less congestion for traveling public; better access to communities; less congestion in communities.	**Poor.** Continued congestion; pent-up demand not released.	**Poor.** Continued congestion; pent-up demand not released.
Historic Context	23	Does the alternative have the ability to protect Historic Districts and Landmarks?	**Fair.** Wider footprints may have more potential to impact historic resources.	**Fair.** Wider footprints may have more potential to impact historic resources.	**Good.** Narrower footprints would have less potential to impact historic resources.	**Fair.** Wider footprints may have more potential to impact historic resources.	**Fair.** Wider footprints may have more potential to impact historic resources.	**Good.** Narrower footprints would have less potential to impact historic resources.
	24	Does the alternative have opportunities for mitigation and / or enhancement to historic districts and landmarks?	**Fair.** Reduced diverted traffic may reduce impacts to historic resources.	**Fair.** Reduced diverted traffic may reduce impacts to historic resources.	**Poor.** No potential to reduce diverted traffic and therefore reduce impacts to historic resources.	**Fair.** Reduced diverted traffic may reduce impacts to historic resources.	**Poor.** No potential to reduce diverted traffic and therefore reduce impacts to historic resources.	**Poor.** No potential to reduce diverted traffic and therefore reduce impacts to historic resources.
Healthy Environment	25	Does the alternative have the potential to avoid immitigable environmental impacts?	**Fair.** Larger footprint may create immitagable environmental impacts; opportunity to improve crossings, water quality…	**Fair.** Larger footprint may create immitagable environmental impacts; opportunity to improve crossings, water quality…	**Fair.** Medium footprint.	**Fair.** Larger footprint may create immitagable environmental impacts; opportunity to improve crossings, water quality…	**Fair.** Medium footprint.	**Good.** Smaller footprint.

Level 1 Draft Alternatives Screening

Core Value		Performance Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
			2 lane reversible	3 lane reversible	min PEIS	max PEIS	perm PPSL	temp PPSL
			Options 1 & 2	Options 1, 2, & 3	Options 1, 2, 3, & 4	Options 1 & 2	Option 1	Option 1
Fiscal Responsibility	26A	Does the alternative have the ability to be financially self sustaining in terms of capital costs and operations and maintenance costs with minimal public funding? *minimal defined as no increase over existing CDOT expenditures.	**Poor.** Toll revenue does not cover roadway capital costs and operations and maintenance costs.	**Poor.** Toll revenue does not cover roadway capital costs and operations and maintenance costs.	**Poor.** No funding available to cover roadway capital costs and operations and maintenance costs.	**Poor.** Toll revenue does not cover roadway capital costs and operations and maintenance costs.	**Poor.** Toll revenue does not cover roadway capital costs and operations and maintenance costs.	**Good.** Toll revenue does cover roadway capital costs and operations and maintenance costs.
					Poor. No funding available to coverAGS costs.	**Poor.** No funding available to coverAGS costs.	**Poor.** No funding available to coverAGS costs.	**Poor.** No funding available to coverAGS costs.
	26B	Does the alternative have the ability to be financially self sustaining in terms of operations and maintenance costs only, with minimal public funding? *minimal defined as no increase over existing CDOT expenditures.	**Good.**	**Good.**	**Poor.**	**Good.**	**Good.**	**Good.**

I-70 Mountain Corridor Traffic & Revenue Study
2013-2014
Core Values, Critical Issues, Critical Success Factors, Level 1 Performance Measures

Core Values	Critical Issues	Critical Success Factors	Level 1 Performance Measures
Safety	• Safe Traffic Operations • Emergency Response • Incident Management	• Enhancing safety for all is a priority. Balance the anticipated needs of capacity and safety improvements with minimized impacts. • Provide reliable access and protection for emergency responders to / from and through the corridor accident/incident scenes.	• Does the alternative meet minimum design standards (AASHTO, CDOT, etc) of cross section, curvature, sight distance and grades? • Does the alternative provide safe reliable access ? • Does the alternative provide protection for incident responders? • Does the alternative have the potential to reduce crashes?
Mobility	• Travel Time Reliability • Slow Moving Vehicles • Modal Choice • Local Mobility • Incident Management	• Provide a multimodal solution that improves mobility, reliability, increases person trips, efficiently manages slow moving vehicles, provides incident response access, and reduces travel time .	• Does the alternative reduce travel times for long distance trips for all users? • Does the alternative reduce the travel time for short distance trips for all users both on and off the Interstate? • Does the alternative offer competitive modal choices with reliable travel times? • Does the alternative allow for increased person trips? • Does the alternative provide for incident management?
Constructability	• Funding • Efficiency of Operations & Maintenance	• Develop funding priorities to construct financially feasible improvements that use innovative and efficient practices which have the greatest ability to preserve, conserve and maintain existing environment and future improvements. Must be "buildable".	• Is the construction of the alternative financially feasible with the minimal funding? • Does the alternative provide flexibility for future expansion and modification? • Does the alternative have a positive impact on operations and maintenance?
Engineering Criteria and Aesthetic Guidelines	• Aesthetics • Adherence to Accepted Design Standards	• Use the I-70 Mountain Corridor CSS process to create and assess financially feasible infrastructure improvements that adhere to acceptable engineering standards and are inspired compatible with the natural surroundings and provide the best value for their life-cycle while not precluding future opportunities.	• Does the alternative provide opportunities to balance aesthetics and engineering? • Does the alternative adhere to the I-70 CSS Mountain Corridor Guidelines and specific design criteria?

I-70 Mountain Corridor Traffic & Revenue Study
2013-2014
Core Values, Critical Issues, Critical Success Factors, Level 1 Performance Measures

Core Values	Critical Issues	Critical Success Factors	Level 1 Performance Measures
Sustainability	• Preserve Future Transportation Options • Energy Use • Maintenance • Impact of No Action	• Address the continuing decline of mobility and accessibility along the corridor by developing long-term multi-modal transportation solutions that are compatible with the natural surroundings and minimize the use of non-renewable resources.	• Does the alternative protect existing natural resources? • Does the alternative use existing natural resources efficiently to generate improvements in efficiency and mobility? • Does the alternative have the potential to improve operations and maintenance?
Decision Making Process (Local, Regional, Statewide)	• CSS Guidance • Stakeholder Support • Public Acceptance • Identify & Prioritize Mitigation and Enhancement Opportunities	• Conduct a transparent (fair, open, equitable and inclusive) CSS process utilizing relevant and defensible data and a consistent set of assumptions. • Obtain general agreement by the public, the Project Leadership Team, and stakeholders of the study process and results.	• Does the alternative provide opportunities for enhancements (i.e. recreational, community, environmental)? • Is the alternative consistent with the Record of Decision? • Does the alternative have a minimal risk of public or political opposition?
Community (Local, Regional, Statewide)	• Enhance Recreational Opportunities • Enhance Community Values • Improve Economic Vitality & Livability	• Advance a solution that improves local, regional and statewide livability and economic vitality.	• Does the alternative improve access to key destinations along the corridor, including recreation areas? • Does the alternative have the potential to improve livability and vitality locally, regionally, and statewide?
Historic Context	• Preservation & Enhancement of Historic Elements & Landscape	• Enable a positive experience for local residents and tourists through preservation and enhancement of historic elements and landscape.	• Does the alternative have the ability to protect Historic Districts and Landmarks? • Does the alternative have opportunities for mitigation and / or enhancement to historic districts and landmarks?
Healthy Environment	• Environmental Sensitivity • Ability to Mitigate	• Identify solutions that avoid, minimize, enhance and/or mitigate environmental impacts.	• Does the alternative have the potential to avoid immitigable environmental impacts?
Fiscal Responsibility	• Life Cycle Considerations • Benefit - Cost	• Assure fiscal responsibility through sustainable revenue generation and minimized public funding.	• Does the alternative have the ability to be financially self sustaining in terms of capital and operations and maintenance costs with minimal public funding?

I-70 Traffic & Revenue Study **May 21, 2014**

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I-70 Traffic & Revenue Study **May 21, 2014**

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I-70 Traffic & Revenue Study **May 21, 2014**

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Project Leadership Team / Technical Team Meeting **Silverthorne, CO**

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Project Leadership Team / Technical Team Meeting **Silverthorne, CO**

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