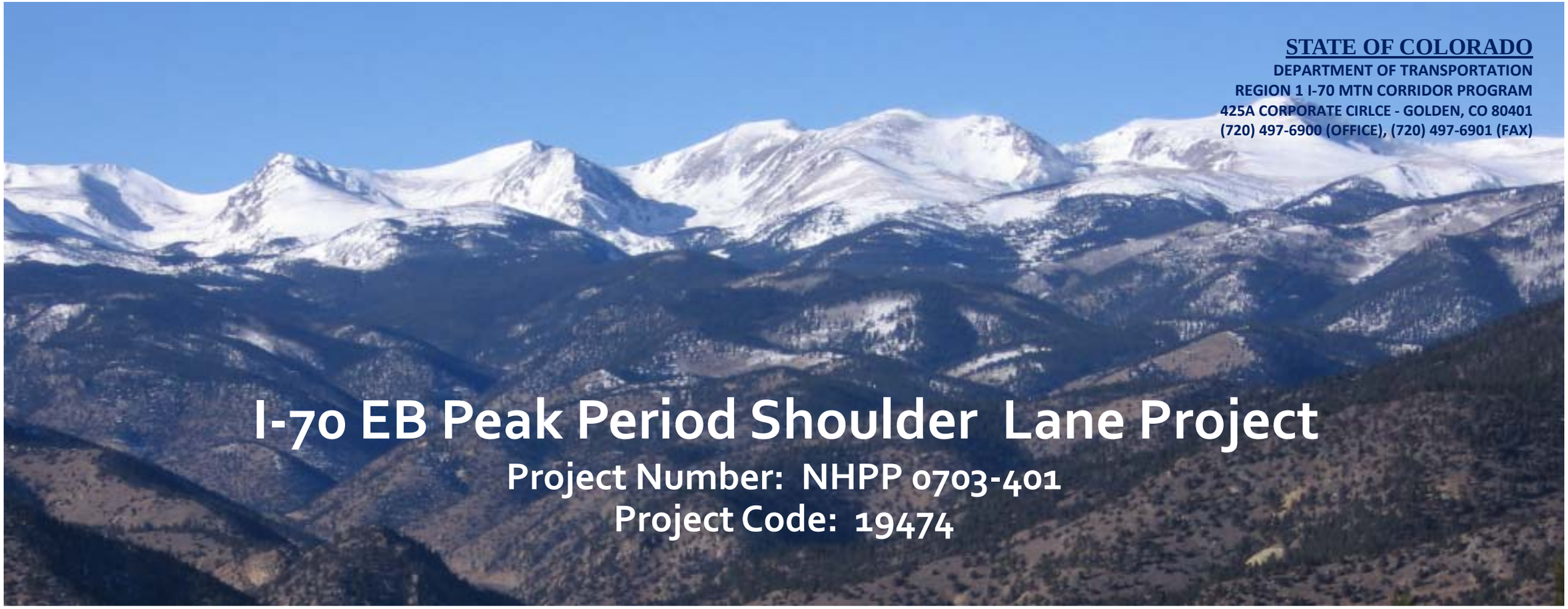

STATE OF COLORADO
DEPARTMENT OF TRANSPORTATION
REGION 1 I-70 MTN CORRIDOR PROGRAM
425A CORPORATE CIRLCE - GOLDEN, CO 80401
(720) 497-6900 (OFFICE), (720) 497-6901 (FAX)

I-70 EB Peak Period Shoulder Lane Project

Project Number: NHPP 0703-401
Project Code: 19474

Technical Team Meeting

July 22, 2013

CDOT I-70 Mountain Corridor | HDR Engineering, Inc.

Revised July 26, 2013

Meeting Agenda

9:05	Introductions and Agenda
9:05	Technical Team: Roles & Responsibilities
9:10	Review of Project Work Plan Elements
9:15	Finalize Project Criteria
9:20	Feasibility Study Results
10:00	Break
10:10	Decision Matrix: Left Side vs. Right Side
11:00	Issues Schedule
11:15	Develop Criteria for Roadway Widths and Median Widening vs. Creek Encroachment
11:30	Conclusions/Next Steps

Technical Team

Roles and Responsibilities

- Assuring that local context is integrated into the project
- Recommending and guiding methodologies involving data collection, criteria, and analysis
- Preparing and reviewing technical project reports
- Supporting and providing insight with respect to community and agency issues and regulations
- Assisting in developing criteria
- Assisting in developing alternatives and options
- Assisting in evaluating, selecting, and refining alternatives/options
- Coordinating and communicating with respective agencies

Technical Team

Meeting Topics/Format

- Meeting topics will parallel the project-specific decision-making process
- The process will detail the interaction between members
- Meeting format will be structured for open conversations and information sharing

Technical Team

Ground Rules

To be discussed on July 22

Technical Team

Decision-Making

The decision-making process during the Technical Team meetings will consist of using the Decision-Making Matrix to evaluate each decision used to make sure that the option chosen is best for the Core Values.

DEPARTMENT OF TRANSPORTATION
Region 1 I-70 Mountain Corridor
425A Corporate Circle, Golden
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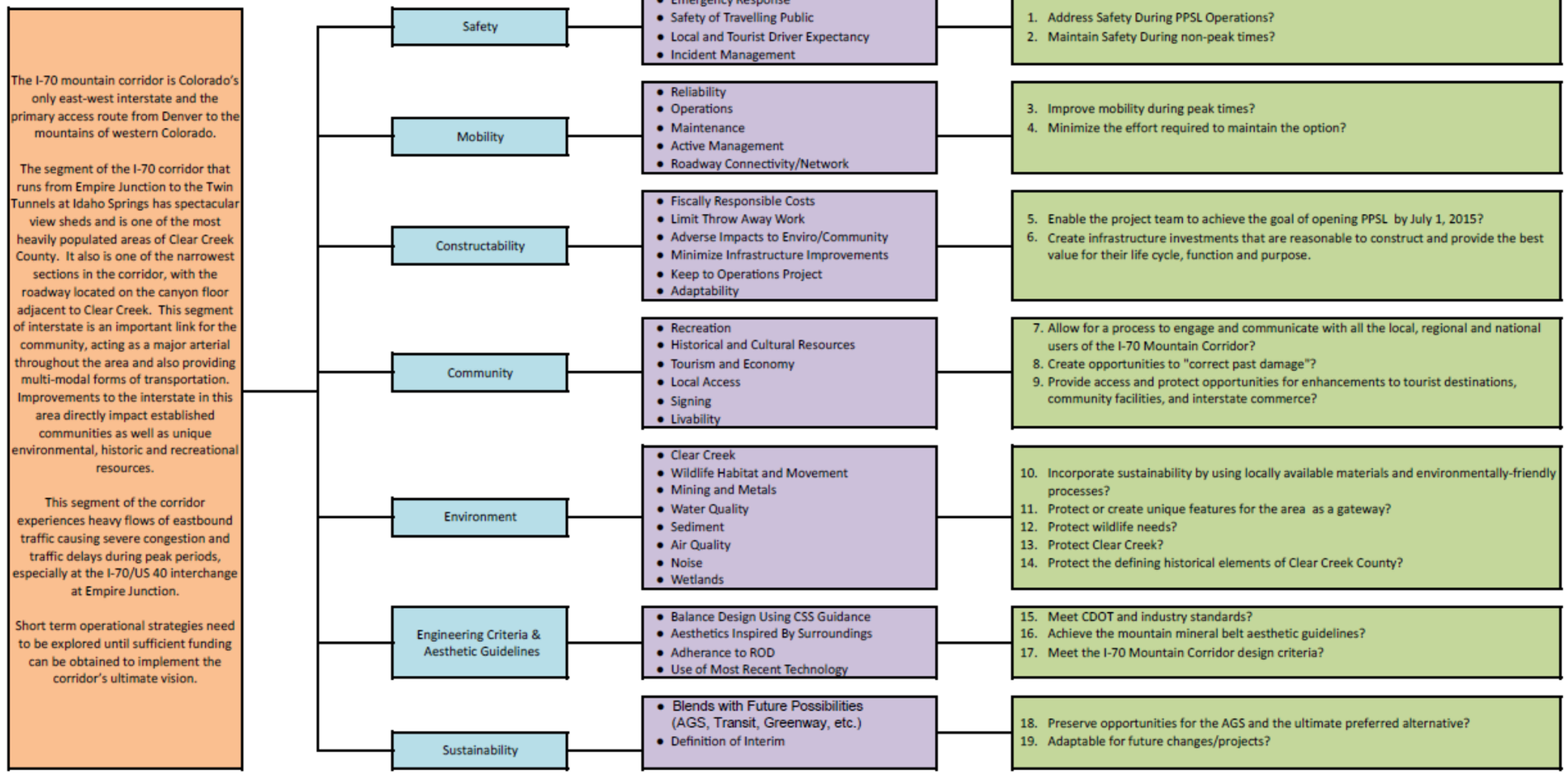
I-70 EB Peak Period Shoulder Lane
Project Criteria Flow Chart



Project Work Plan Elements—Project Criteria

1. Address Safety During PPSL Operations?
2. Maintain Safety During non-peak times?
3. Improve mobility and reliability during peak times?
4. Minimize the effort required to maintain the option?
5. Enable the project team to achieve the goal of opening PPSL by July 1, 2015?
6. Create infrastructure investments that are reasonable to construct and provide the best value for their life cycle, function and purpose.
7. Allow for a process to engage and collaborate with all the local, regional and national users of the I-70 Mountain Corridor?
8. Create opportunities to "correct past damage"?
9. Provide access and protect opportunities for enhancements to tourist destinations, community facilities, and interstate commerce?
10. Incorporate sustainability by using locally available materials and environmentally-friendly processes?
11. Protect or create unique features for the area as a gateway?
12. Protect wildlife needs?
13. Protect Clear Creek?
14. Protect the defining historical elements of Clear Creek County?
15. Meet CDOT and industry standards?
16. Achieve the mountain mineral belt aesthetic guidelines?
17. Meet the I-70 Mountain Corridor design criteria?
18. Preserve opportunities for the AGS and the ultimate preferred alternative?
19. Adaptable for future changes/projects?

Presentation of the Main Findings of the Feasibility Study

Purpose of the Feasibility Study

Assess the traffic operational feasibility of implementing a PPSL for I-70 eastbound traffic between US 40/Empire Junction and the Twin Tunnels.

Study Considerations

- Consider the PPSL an interim operational improvement until the ultimate improvements are constructed.
- Determine the technical feasibility of the PPSL without being influenced by the potential revenue from a ML.
- Will PPSL improve operations during peak hours?
- Does it provide a travel option with a more reliable trip time?
- Can two general purpose lanes be maintained?

Study Considerations

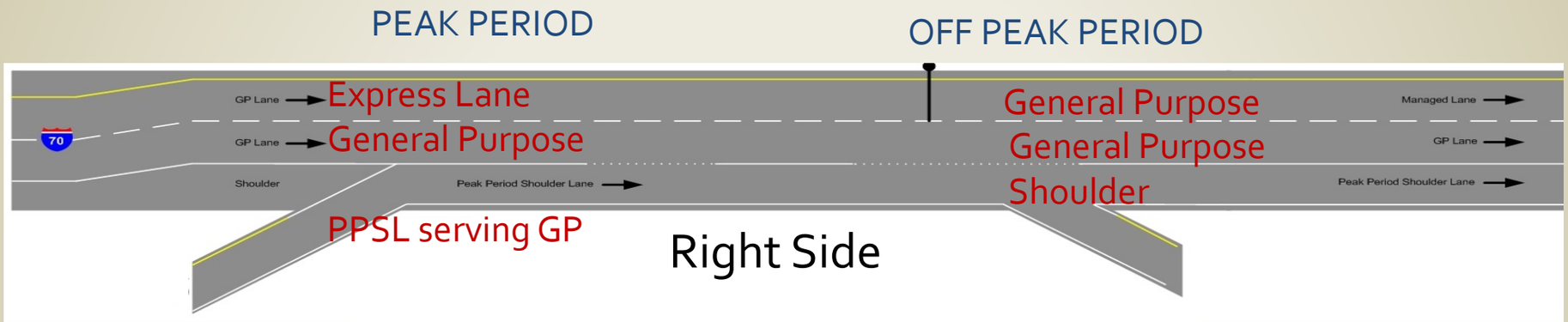
- Develop roadway configuration, striping, and signing concepts
- Achieve efficient and safe tie-in to the Twin Tunnels Project, which should minimize "throw away."
- Will operational improvements that supplement the expected benefits from the Twin Tunnels widening?
- Identify if the PPSL provides benefits to I-70 west of US 40.

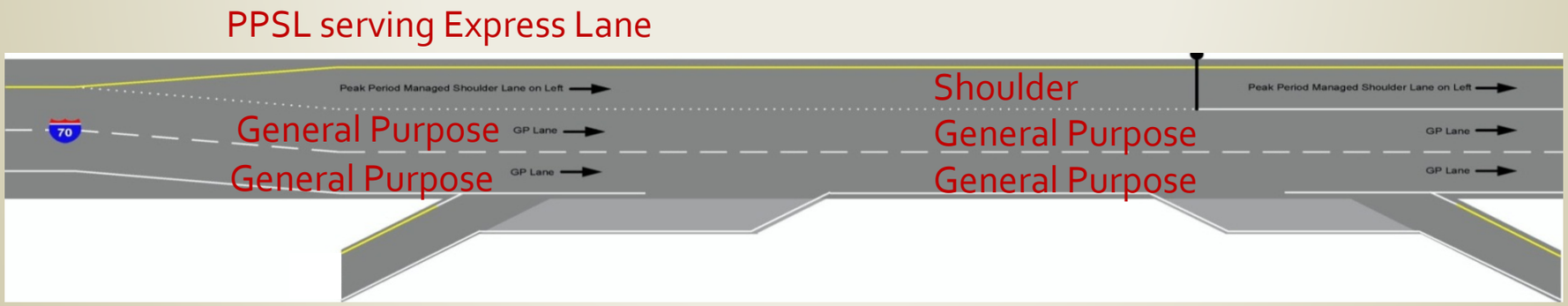
Major Work Elements

- Left side and right side PPSL studied
- Simulation modeling
- Signing and striping concepts
- Tolling elements considered
- Provided general considerations for next steps

Design Concepts

PPSL Configuration – Right vs. Left Side





Signing Concepts

Advance Warning

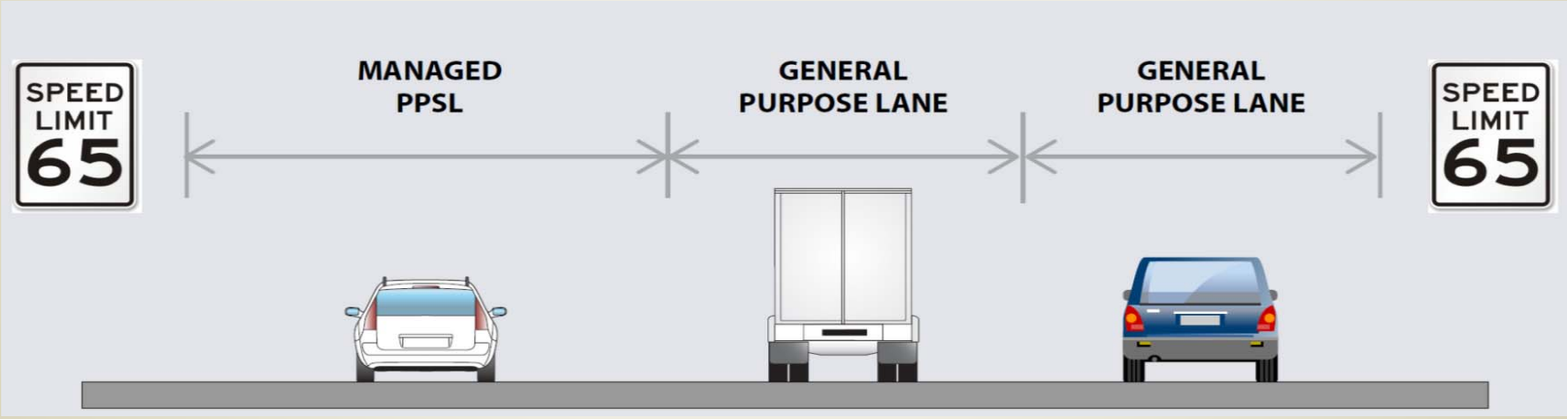
Regulatory

Guide

Speed Limit Concepts

Static Signs

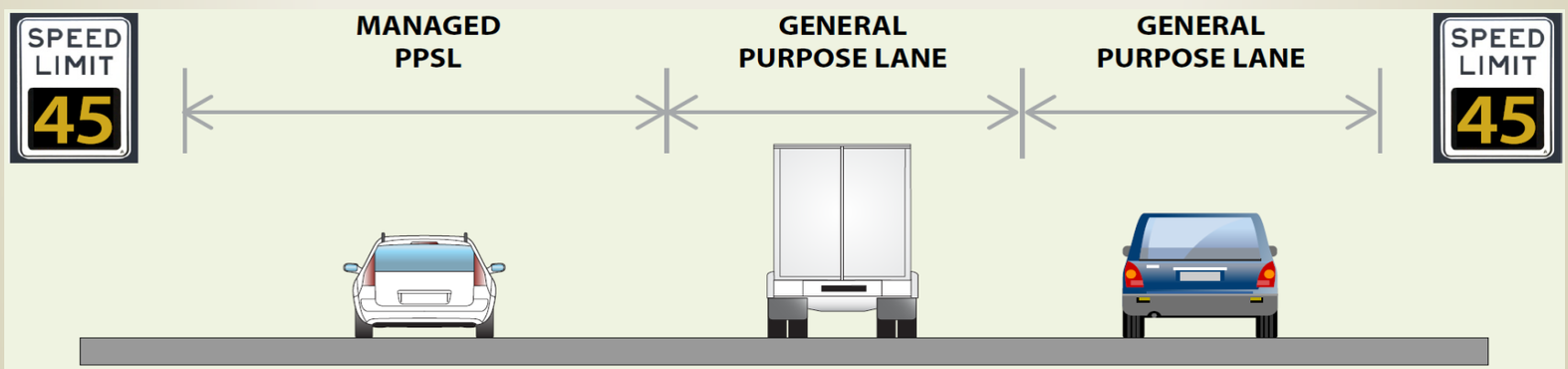
Speeds in general purpose lanes will decrease as traffic density increases, while the less dense PPSL will maintain a higher speed. Existing static speed limit signs provide no opportunity to manage speed differentials between GP and PPSL. PPSLs will flow at higher speeds as they will likely have less vehicles.



Speed Limit Concepts

Variable Speed Limit

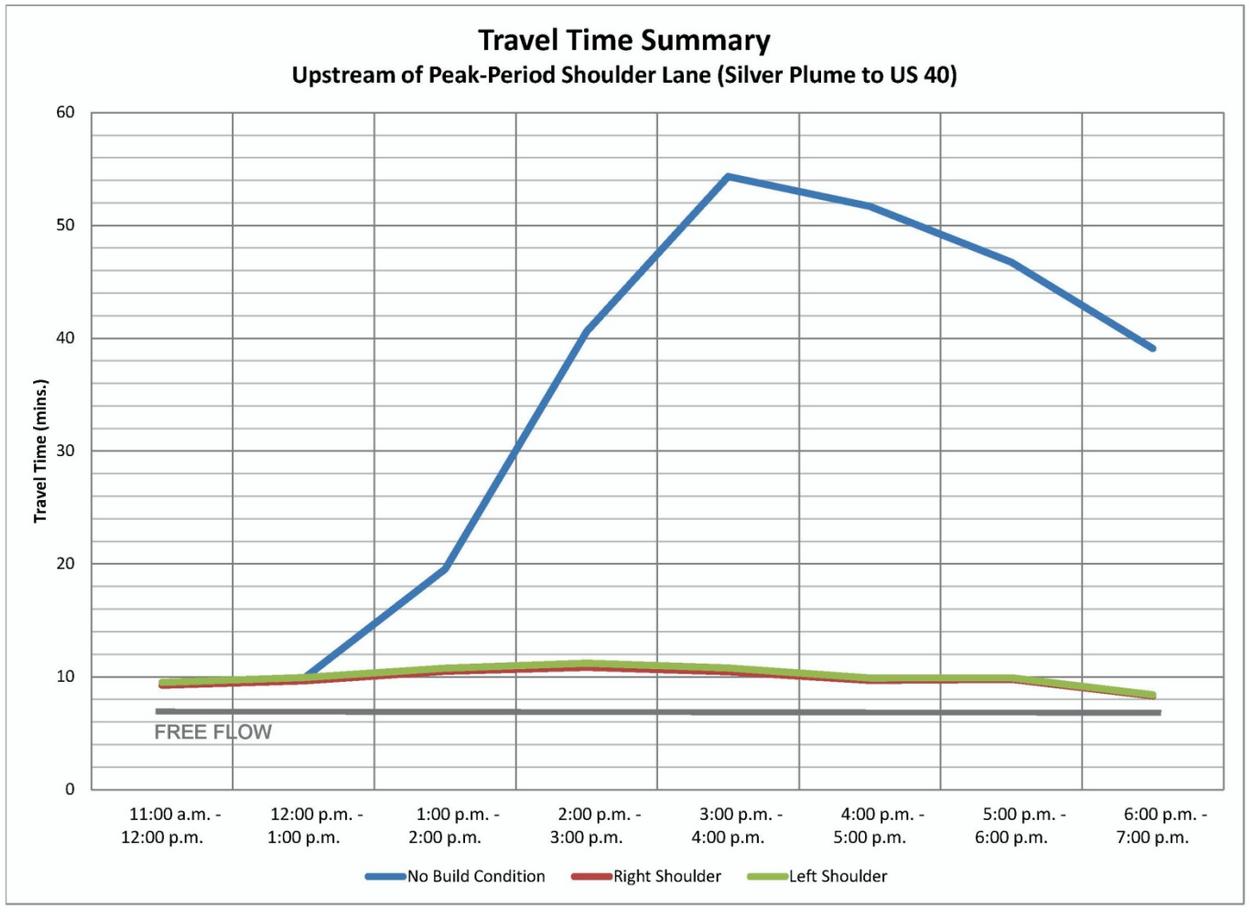
Variable speed limits will allow for modification of speeds along the corridor for safety and/or weather conditions on a roadway segment by segment basis.



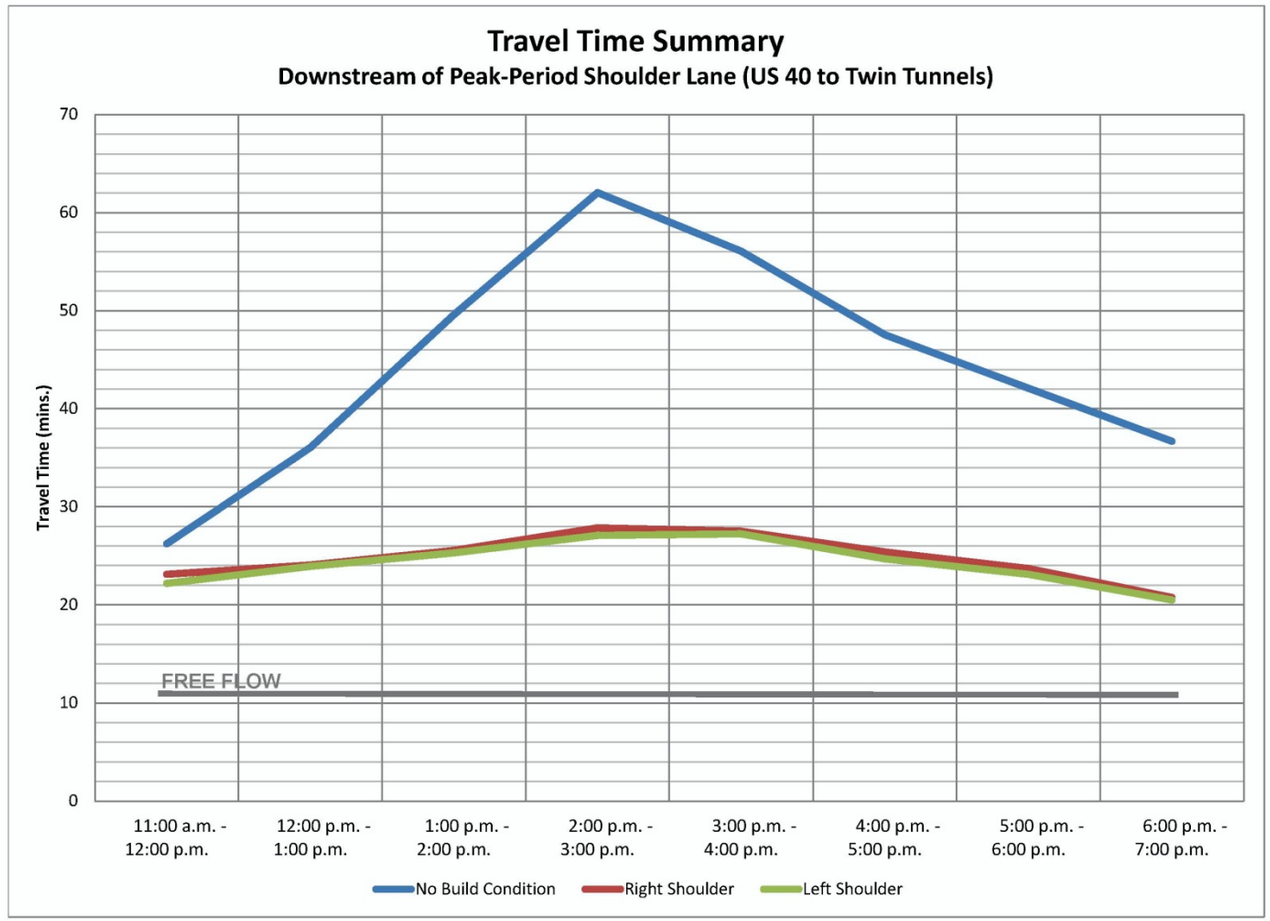
Summary of Findings

- Feasible for both a left and right-side PPSL options
- Pros and cons for each option
- Travel time savings occur in the project limits and upstream as well

VISSIM


Travel Time Summary
Upstream of Peak-Period Shoulder Lane (Silver Plume to US 40)
Travel Time (mins.)
60
50
40
30
20
10
0
FREE FLOW
11:00 a.m. - 12:00 p.m.
12:00 p.m. - 1:00 p.m.
1:00 p.m. - 2:00 p.m.
2:00 p.m. - 3:00 p.m.
3:00 p.m. - 4:00 p.m.
4:00 p.m. - 5:00 p.m.
5:00 p.m. - 6:00 p.m.
6:00 p.m. - 7:00 p.m.
No Build Condition
Right Shoulder
Left Shoulder

VISSIM

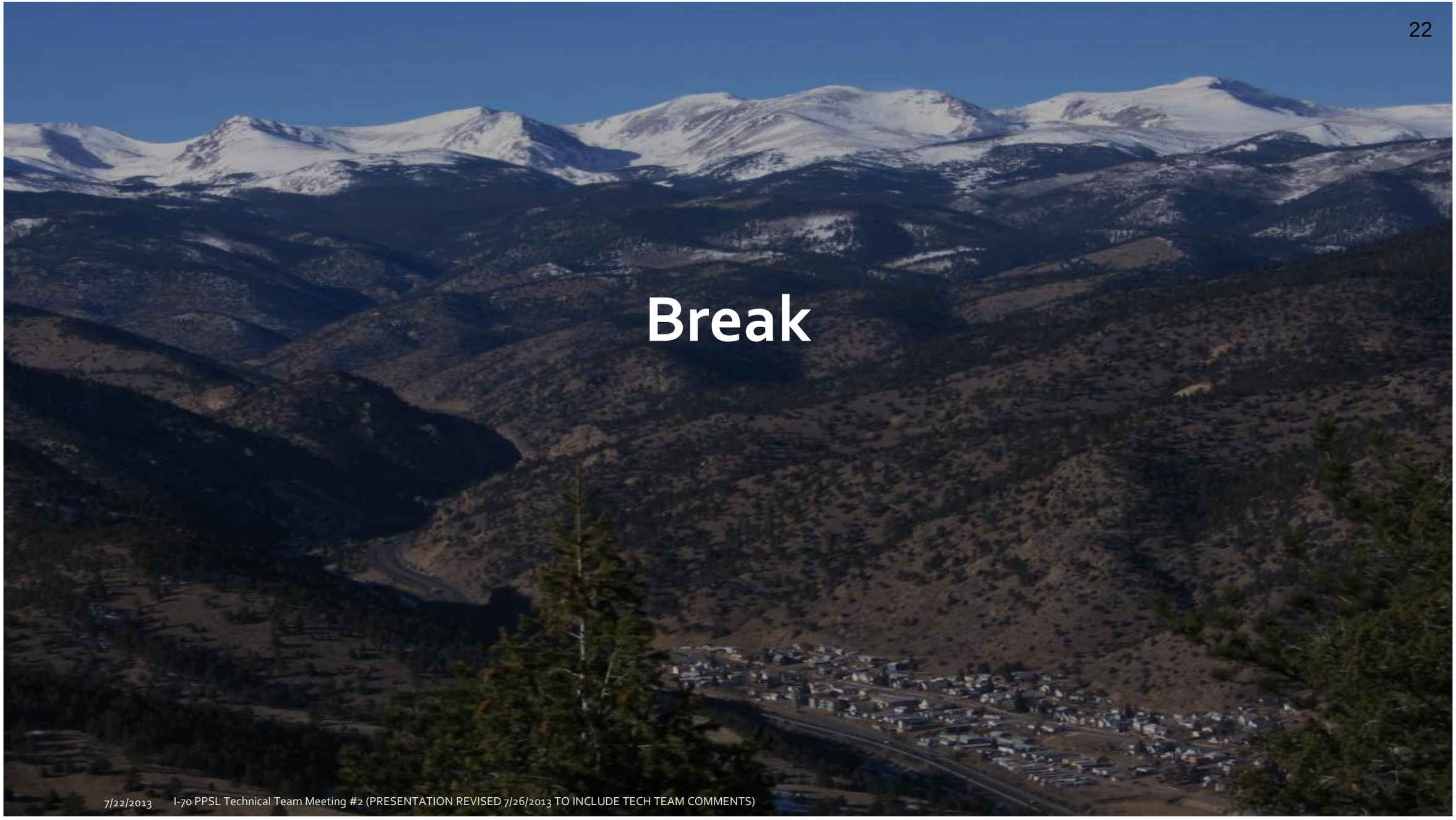

Travel Time Summary
Downstream of Peak-Period Shoulder Lane (US 40 to Twin Tunnels)
Travel Time (mins.)
70
60
50
40
30
20
10
0
FREE FLOW
11:00 a.m. - 12:00 p.m.
12:00 p.m. - 1:00 p.m.
1:00 p.m. - 2:00 p.m.
2:00 p.m. - 3:00 p.m.
3:00 p.m. - 4:00 p.m.
4:00 p.m. - 5:00 p.m.
5:00 p.m. - 6:00 p.m.
6:00 p.m. - 7:00 p.m.
No Build Condition
Right Shoulder
Left Shoulder

Purpose of Concept of Operations

- Further refinement of Feasibility Study
- Follows a stepwise process
- Provides decision-making framework
- Feeds into design
- Documents process and outcomes

Overview of the Concept of Operations Document

- State of the industry
- Best management practices
- Alternatives
- Access
- Signing
- Striping
- Technology
- Operational description
  - (alternatives and system overview)
- Policies
- Tolling Operations
- Enforcement
- Maintenance
- Incident Management
- Performance Requirements
- Roles and responsibilities



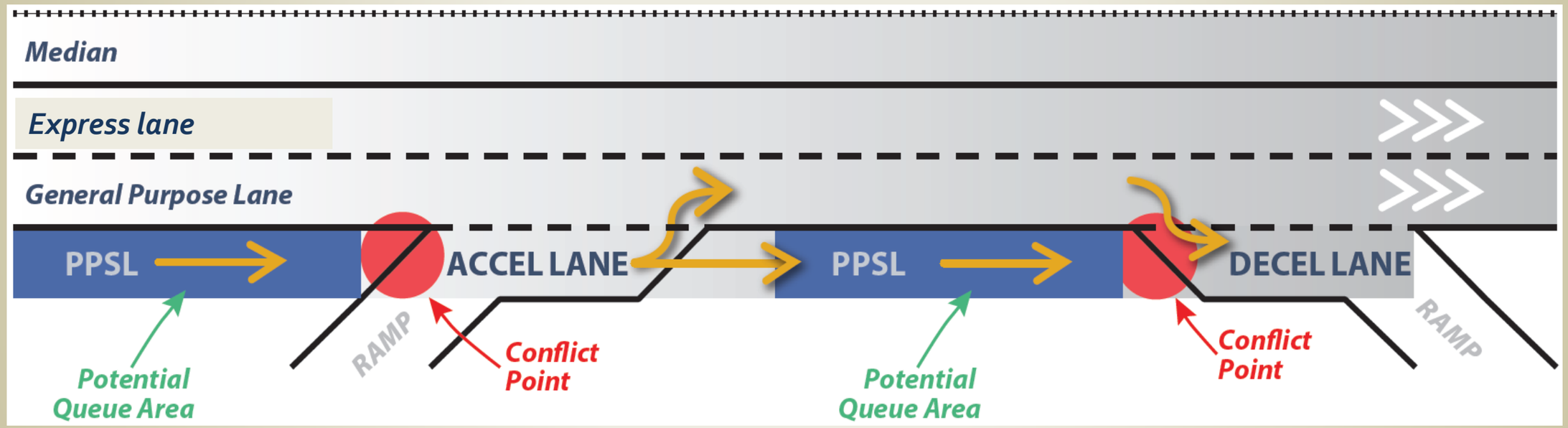
Break

Input Requested from Technical Team

- Are there any additional project evaluation criteria needed for the decision matrix for left side vs. right side?

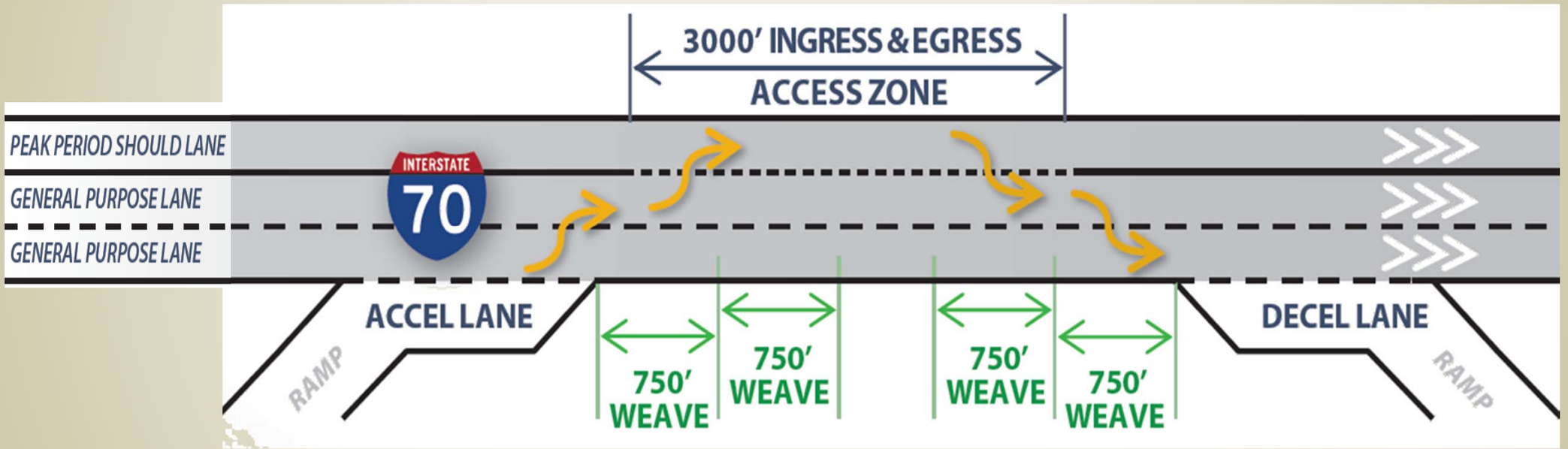
Access to Express Lane

Ingress/Egress Diagram (Right Side)



Access to Express Lane

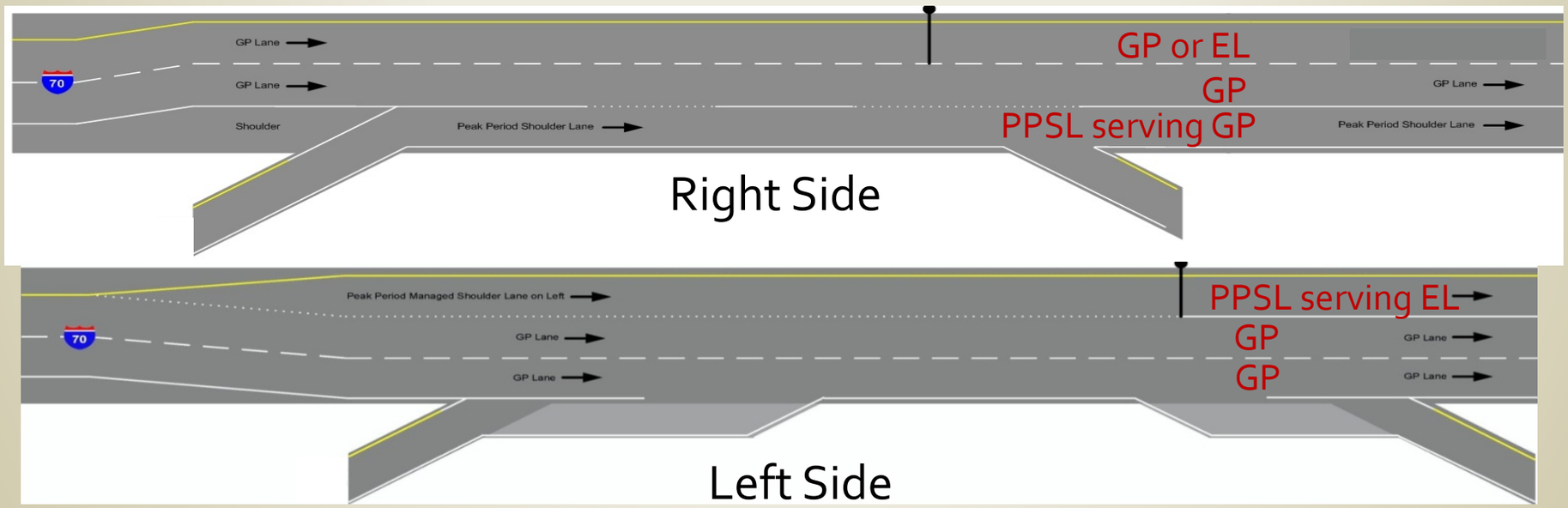
Ingress/Egress Diagram (Left Side)



PPSL and/or Managed Lane Access

Access to the PPSL and/or express lane needs:

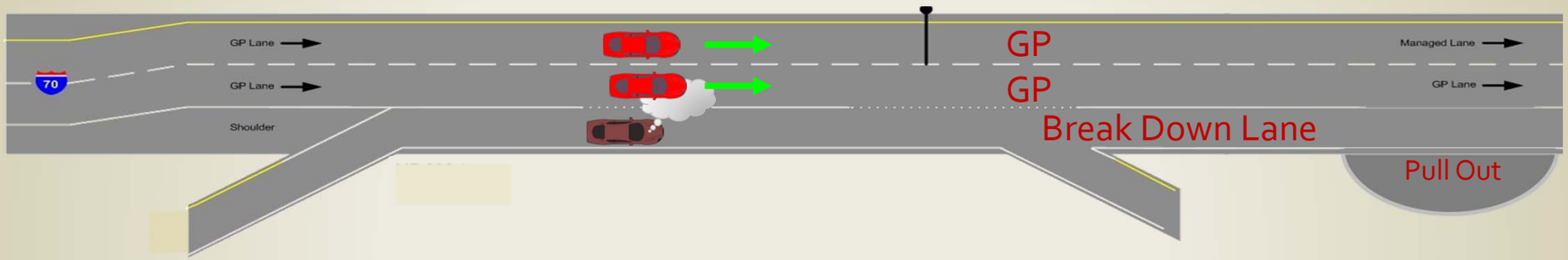
- At Entrance Points (beginning and intermittently).
- At Exit Points
- Change in Striping
- Specifics addressed during the design process and through analysis



Incident Management

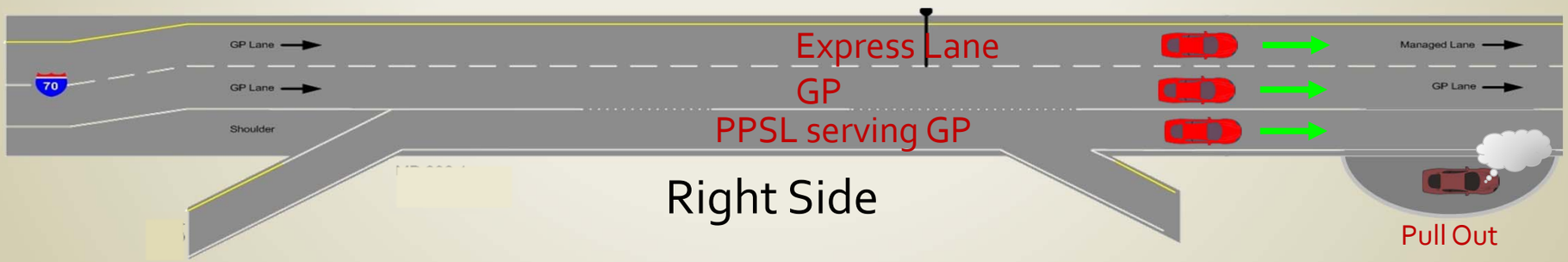
Breakdown Lane (Off-Peak Period) Right-Side

- Disabled vehicles can utilize shoulder lane



Breakdown Lane (Peak Period) Right-Side

- Disabled vehicles should get to the nearest pull out

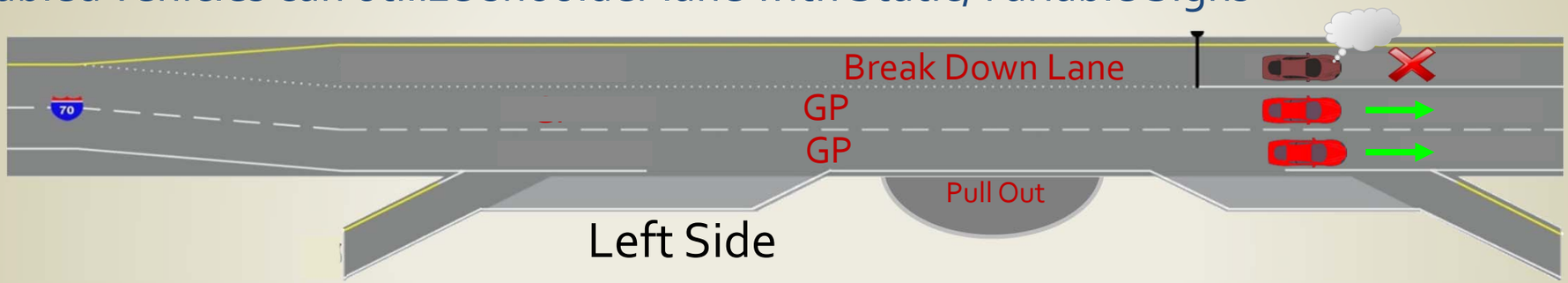


Right Side

Incident Management

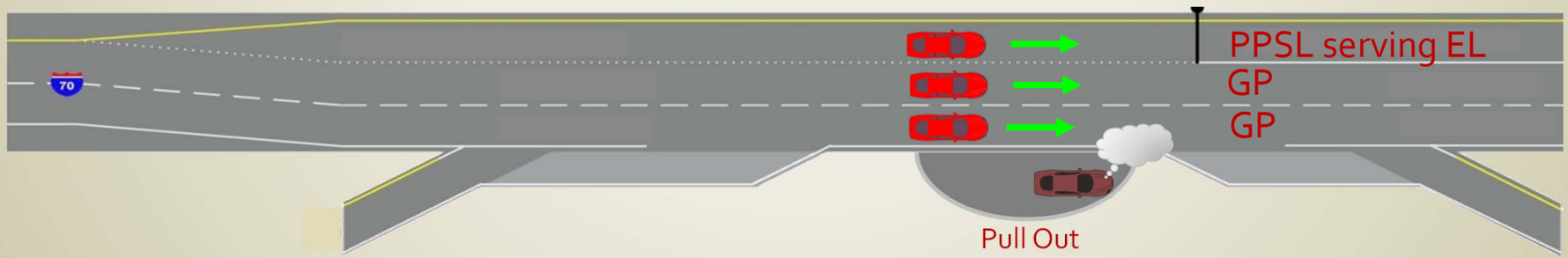
Breakdown Lane (Off-Peak Period) Left-Side

- Disabled vehicles can utilize shoulder lane with Static/Variable Signs



Breakdown Lane (Peak Period) Left-Side

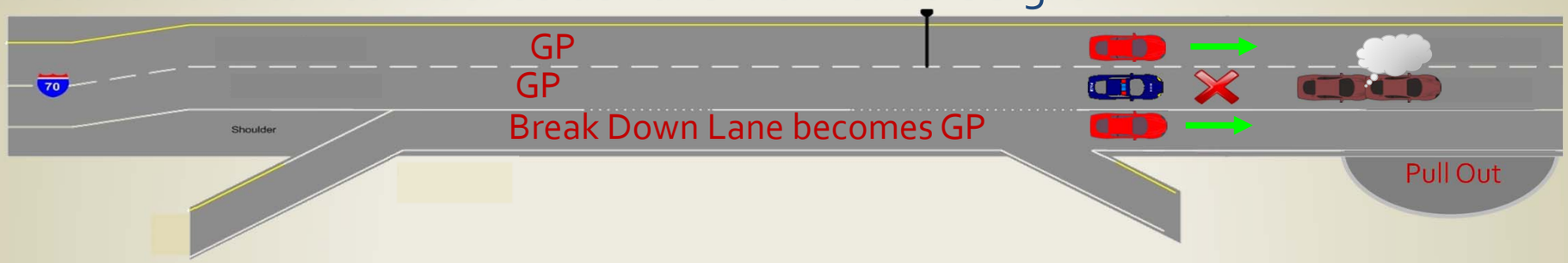
- Disabled vehicles should get to the nearest pull out



Incident Management (Active Management)

Emergency Lane in GP (Off-Peak Period) Right-Side

- Disabled vehicles can utilize shoulder lane with Variable Signs



Emergency in GP (Off-Peak Period) Right-Side

- Disabled vehicles can utilize shoulder lane with Variable Signs

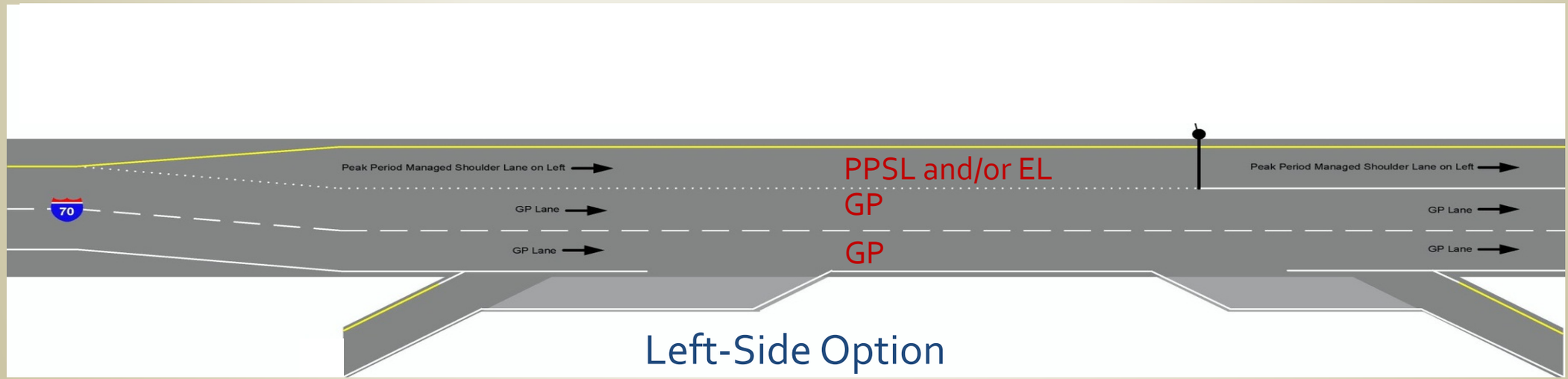
Design Concepts (Right-Side Option)

Benefits	Drawbacks
• Breakdown lane remains on the right side of the highway • On-Ramp traffic would enter a continuous add lane at entrance point	• Left lane would be an EL during peak periods; forces non-toll traffic to merge right • EL would be separated by a broken white lane (not a solid line); unconventional • Different peak/off-peak ramp merging • Increase costs by signing the left/right sides • Increases visual impacts

Right-Side Option

Design Concepts (Left-Side Option)

Benefits	Drawbacks
• Managed Lane clearly delineated • GP lanes would remain consistently on the right-side in both the peak/off-peak periods • PPSL and/or EL is separated by a solid white lane line • Reduces required signing on the right-side by up to 50%	• Breakdown lane is on the left side, during off-peak periods; unconventional • Need breakdown pullouts on right side.



Left-Side Option

Project Evaluation Criteria

Safety

1. Addresses safety during PPSL operations
2. Maintains safety during non-peak times

Project Evaluation Criteria

Mobility

3. Improves mobility during peak times
4. Minimizes the effort to maintain the option

Project Evaluation Criteria

Constructability

5. Enables the project team to achieve the goal of opening PPSL by July 1, 2015
6. Creates infrastructure investments that are reasonable to construct and provide the best value for their life cycle, function, and purpose

Project Evaluation Criteria

Community

7. Allows for a process to engage and communicate with all the local, regional and national users of the I-70 Mountain Corridor
8. Creates opportunities to "correct past damage"
9. Provides access and protects opportunities for enhancements to tourist destinations, community facilities, and interstate commerce.

Project Evaluation Criteria

Environment

10. Incorporates sustainability by using locally available materials and environmentally-friendly processes
11. Protects or creates unique features for the area as a gateway
12. Protects wildlife needs
13. Protects Clear Creek
14. Protects and defining historical elements of Clear Creek County.

Project Evaluation Criteria

Engineering Criteria/Aesthetic Guidelines

15. Meets CDOT and industry standards
16. Achieves the mountain mineral belt aesthetic guidelines
17. Meet the I-70 Mountain Corridor design criteria

Project Evaluation Criteria

Sustainability

18. Preserves opportunities for the AGS and the ultimate preferred alternative
19. Adaptable for future changes/projects.

Issue Specific Criteria

1. Meets driver expectations/roadway environment/precedence set for express lanes in the state
2. Minimizing signing types and locations throughout the corridor
3. Maintains fluid ramp access and standard ramp geometry on and off-ramps accesses and ramp geometry
4. Adaptability with future projects, such as potential tolling ITS installations, and the Twin Tunnel Project

ID	Criteria	Options Ranking (Fair / Better / Best)	
		Left-Side	**Right-Side**
Evaluation Criteria			
1	Addresses safety during PPSL operations	• Standard EL striping with solid white line • Same off peak ramp merge/diverge points • GP lanes are consistent on peak and off peak	• Unconventional EL striping with dashed line. • Different off peak ramp merge/diverge points • GP lanes shift between on peak and off peak operations
2	Maintains safety during non-peak times	• Left-side breakdown lane (non-standard) • Provides additional right-side pullouts	• Right-side breakdown lane (standard) • Provides additional right-side pullouts (no left-side shoulder)
3	Improves mobility during peak times	• Enhances travel time • Commercial vehicles may operate in right lane	• Commercial vehicles may operate in middle lane
4	Minimizes the effort required to maintain the option	• Reduces signing and structures • Creates snow removal/ sediment control challenges • Conventional striping patterns	• Increases signing and structures ~~• Increases on-ramp widening~~ • Unconventional striping patterns
5	Enables the project team to achieve the goal of opening PPSL by July 1, 2015	~~• Shorter construction and design schedule (less widening)~~ ~~• Increase construction and design schedule (more widening)~~ • No differentiator	
6	Creates infrastructure investments that are reasonable to construct and provide the best value for their life cycle, function, and purpose.	~~• Decreases pavement infrastructure~~ • Compatible with Twin Tunnels widening • Configuration constant with CDOT similar projects on North I-25, US-36	~~• Increase pavement infrastructure~~ • Increases signing infrastructure than left-side option • Compatible with Twin Tunnels widening • Configuration not consistent with CDOT similar projects
7	Allows for a process to engage and communicate with all the local, regions and national users of the I-70 Mountain Corridor	• Not a differentiator	
8	Creates opportunities to "correct past damage"	• Not a differentiator	
9	Provides access and protects opportunities for enhancements to tourist destinations, community facilities, and interstate commerce.	• Same off peak ramp merge/diverge points	• Different off peak ramp merge/diverge points

ID	Criteria	Options Ranking (Fair / Better / Best)	
		Left-Side	**Right-Side**
Evaluation Criteria (Continued)			
10	Incorporates sustainability by using locally available materials and environmentally-friendly processes	• Minimal pavement "throw away" with Twin Tunnel Project • Minimal pavement "throw away" with Twin Tunnel Project ~~• Potential additional widening~~ • Not a differentiator	
11	Protects or creates unique features for the area as a gateway	• Not a Differentiator	
12	Protects wildlife needs	• Not a Differentiator	
13	Protects Clear Creek	• Challenges with snow removal and sediment control	• Additional impervious surface • Potential for encroachment into creek
14	Protects the defining historical elements of Clear Creek County	~~• Less potential encroachment~~ ~~• Potential for more encroachment~~ • Not a differentiator	
15	Meets CDOT's and industry standards	• Requires a typical CDOT lane configuration • Lane widths do not meet industry standard • Right shoulder does not meet standard	• Requires an atypical lane configuration • Lane widths do not meet industry standard
16	Achieves the mountain mineral belt aesthetic guidelines	• Requires less signing than right-side option	• Requires more signing than left-side option
17	Meets the I-70 Mountain Corridor design criteria	• Decreased potential of impacting the median • Decreased potential for additional guardrail	• Greater potential of impacting the median • Greater potential for additional guardrail
18	Preserves opportunities for the AGS and the ultimate preferred alternative	• Not a Differentiator	
19	Adaptable for future changes/projects	• Less infrastructure removal	• Additional infrastructure removal

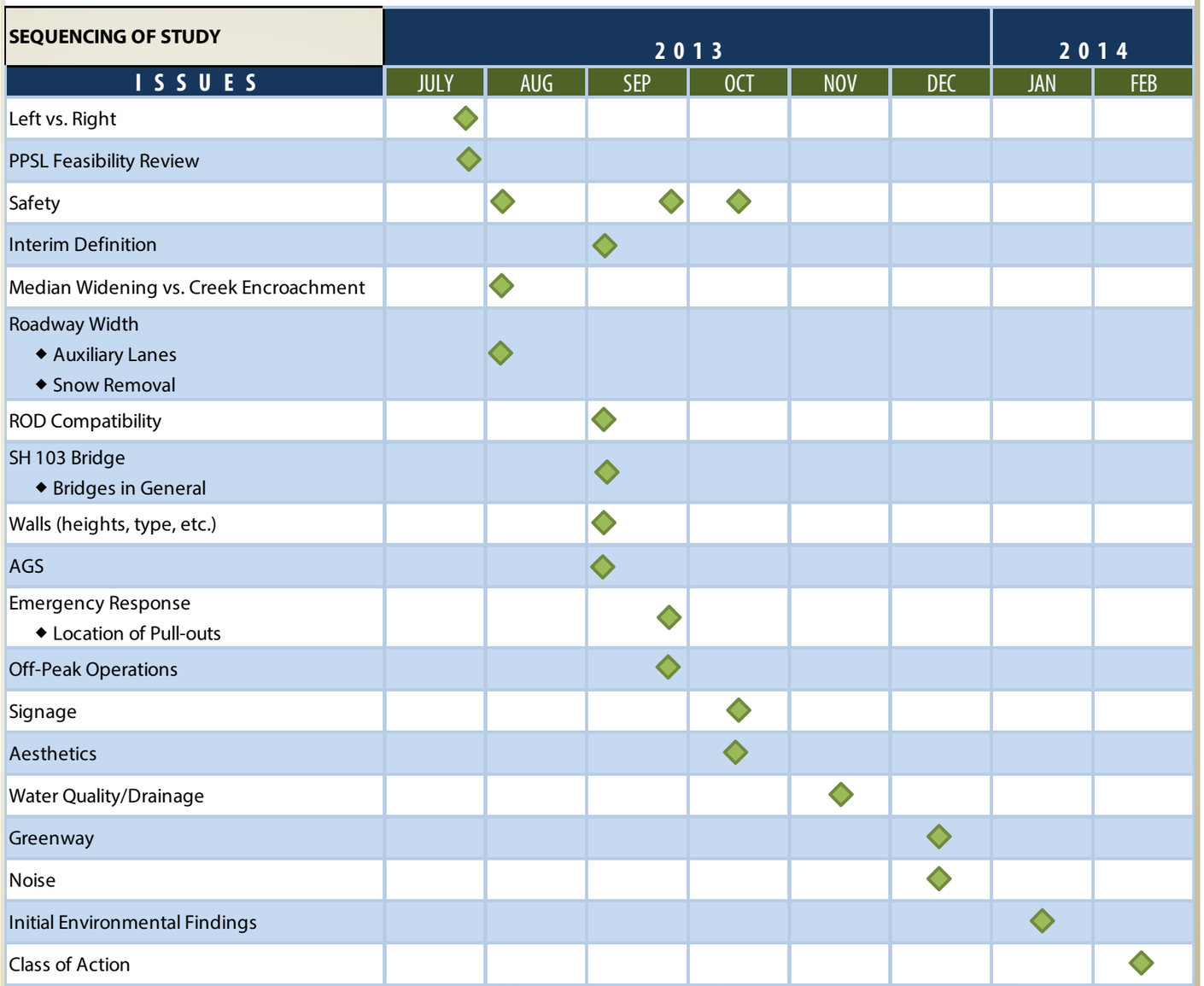
ID	Criteria	Options Ranking Fair / Better / Best	
		Left-Side	**Right-Side**
Issue Specific Criteria			
1	Meets driver expectations/roadway environment/precedence set for express lanes in the state	• Standard ML striping with solid white line • Same off peak ramp merge/diverge points • GP lanes are in the same configuration • Consistent with US 36 and North I-25	• Unconventional ML striping with dashed line. • Different off peak ramp merge/diverge points • GP lanes are in different configurations • Non consistent with north I-25 and US 36
2	Minimizing signing types and locations throughout the corridor	• Requires less signing than right-side option	• Requires more signing than left-side option
3	Maintains fluid ramp access and standard ramp geometry on and off-ramps accesses and ramp geometry.	• Same off peak ramp merge/diverge points	• Requires additional pavement for on ramps • Different off peak ramp merge/diverge points
4	Adaptability with future projects, such as potential tolling ITS installations, and the Twin Tunnel Project	• Less infrastructure removal	• More infrastructure removal

Issues Schedule

Schedule will be used to determine when critical issues will be discussed at the Technical Team meetings.

ISSUES FOR TECHNICAL TEAM PRELIMINARY SCHEDULE

July 15, 2013



Conclusions/ Next Steps

6-Step Process	Month	PLT	Technical Team/ITF
Step 1 – Define Outcomes/Actions Step 2 – Endorse the Process	Spring-Summer	Present the process, schedule, and roles, present project, gather questions, confirm TT, develop work plan	
Step 3 – Establish Criteria	**Summer**		**Present the process, and roles, present project, gather questions, discuss current data and criteria**
Step 4 – Develop Alternatives or Options	**Summer -Fall**	**Present data and determine "deal breakers"**	**Develop concept of operations and brainstorm solutions**
Step 5 – Evaluate, Select and Refine Alternatives or Option	Fall-Winter	Review project status	Discuss Benefits/Challenges and Mitigations, review deal breakers, formulate recommendation
Step 6 – Finalize Docs and Evaluate Process	Spring	Present to Management, Commission and Elected Officials	Complete design plans and conduct lessons learned exercise

Meeting Dates

August 12—Golden

August 26—Idaho Springs

September 9—Golden

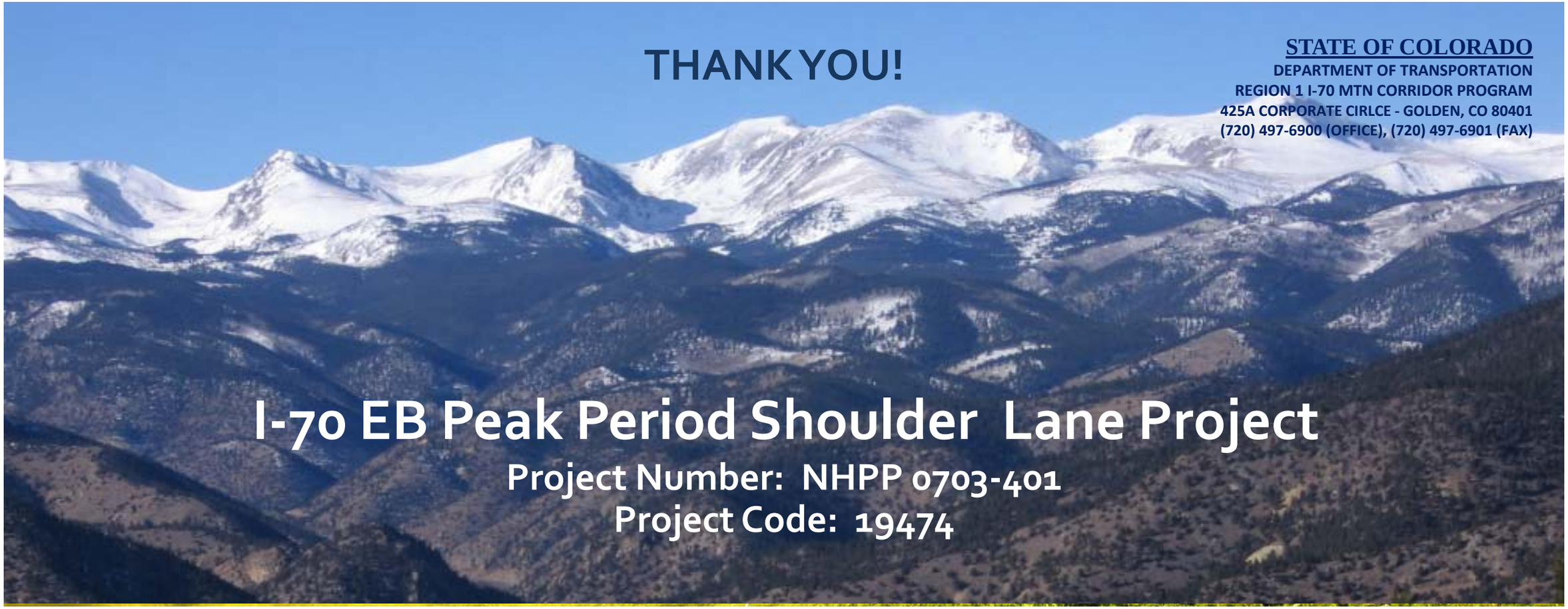
September 23—Idaho Springs

All meetings begin at 9:00 a.m.

PLT & TT Recurring Meeting Time

Week No.	Mon	Tues	Wed	Thurs	Fri
1	FHWA Afternoons	CCC Commission	I-70 Coalition Board 10-12		
2	**PPSL PLT/TT - Morning** FHWA Afternoons	CCC Commission	AGS PLT	Incident Mgmt/I-70 Coalition	
3	FHWA Afternoons	CCC Commission	Commission CDOT Accountability	Commission 470 Meeting (Afternoon)	
4	**PPSL PLT/TT - Morning** FHWA Afternoons	CCC Commission	T&R PLT	Twin Tunnels TT I-25 Region 4	

Meeting Locations: Split between Golden and Idaho Springs



THANK YOU!

STATE OF COLORADO
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I-70 EB Peak Period Shoulder Lane Project

Project Number: NHPP 0703-401
Project Code: 19474

Technical Team Meeting

July 22, 2013

CDOT I-70 Mountain Corridor | HDR Engineering, Inc.