

**US 36 Managed Lane Project:
Federal Boulevard To Interlocken Loop With A
Potential Extension To McCaslin Boulevard**

***Attachment E:
Changes in Access to the Managed Lane***

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INTRODUCTION

The US 36 Managed Lane Project represents one phase of planned improvements identified as Phase 1 of the Preferred Alternative in the US 36 Record of Decision (ROD). The US 36 Managed Lane Project is a multi-modal, toll integrated project that will include reconstruction of the US 36 mainline pavement from Federal Boulevard to Interlocken Loop, with a potential extension to McCaslin Boulevard. The project will also include widening to accommodate a new buffer-separated Managed Lane in each direction of US 36, replacement of the Wadsworth Parkway, Wadsworth Boulevard, and Lowell Boulevard bridges, construction of retaining walls and sound walls, installation of Intelligent Transportation Systems, and construction of portions of a commuter bikeway.

The purpose of this report is to discuss changes in access to the managed lanes impacts which have changed from those evaluated in the Final Environmental Impact Statement (FEIS) or ROD. Changes could include new impacts that occur outside of the original US 36 EIS study area for this first phase of planned improvements. Additional changes to the FEIS environmental impacts (design related) have occurred since the release of the ROD in December 2009 because of ongoing design activities and refinements. The quantitative analysis of direct permanent impacts presented in the FEIS was based on conceptual roadway plans and assumed highway configurations while the current level of design for the US 36 Managed Lane Project has advanced to preliminary design. This NEPA re-evaluation is being conducted pursuant to the requirements of 23 CFR 771.129.

BACKGROUND

The US-36 FEIS "Implementation Plan for Managed Lanes" report recommended separate ingress/egress access zones along the managed lanes of US-36. Between each toll point, a 1500' egress zone, a variable no access zone, and then a 1500' ingress zone was proposed as the base option.

Since the FEIS, managed lane access zones options have been considered and analyzed in more detail as the 2015 Phase 1 preliminary analysis and design have progressed. The project team including CDOT agreed the appropriate option was to provide combined ingress/egress access zones instead of separate ingress/egress access zones.

Listed below are reasons why the project team made this decision.

Operations

HCS+ software was used to analyze the weaving maneuver of the combined access zones. Given that the 3,000 ft access zone exceeds the HCM recommended weave distance of 2,500 ft, we believe the operations would be similar to a separate ingress/egress zone and therefore the weave analysis would provide conservative results. More specifically, weaving conflicts are anticipated to be reduced because drivers entering or exiting the managed lane will have more distance to complete their maneuver and will not likely execute the ingress and egress in the same location.

Refer to **Table 1** and **Table 2** (below) for HCS+ weaving analysis results for the combined ingress/egress access zones assuming Phase 1 2015 traffic volumes. The weaving analysis results show all the access zones within the study area would operate at a level of service (LOS) D or better except the westbound access zone between Church Ranch Blvd and Wadsworth Parkway. This access zone would operate at LOS E during the AM peak hour.

Table 1: HCS+ Weaving LOS Results for Managed Lane Combined Ingress/Egress Access Zone
(2015 Westbound AM & PM Peak Traffic Volumes)

Highway US-36 Section	Direction	2015 Volumes	Non-Weaving Volume		Weaving Volume		Speed Limit	Weave Analysis	
			GP Volume Upstream	Managed Lane Volume Upstream	From Managed Lane to GP	From GP to Managed Lane		Density	LOS
			A -> C	B -> D	B -> C	A -> D			
			(vph)	(vph)	(vph)	(vph)	(mph)	(vpmpl)	
Between Pecos & Federal	WB	AM	5,855	0	0	850	55	27.4	C
Between Federal & Sheridan	WB	AM	4,755	820	30	230	55	33.5	C
Between Sheridan & Church Ranch	WB	AM	4,360	995	55	205	65	39.1	D
Between Church Ranch & Wadsworth	WB	AM	4,630	965	235	135	65	38.4	E
Between Wadsworth & Flatiron	WB	AM	5,300	815	285	85	65	28.4	C
Highway US-36 Section	Direction	2015 Volumes	Non-Weaving Volume		Weaving Volume		Speed Limit	Weave Analysis	
			GP Volume Upstream	Managed Lane Volume Upstream	From Managed Lane to GP	From GP to Managed Lane		Density	LOS
			A -> C	B -> D	B -> C	A -> D			
			(vph)	(vph)	(vph)	(vph)	(mph)	(vpmpl)	
Between Pecos & Federal	WB	PM	5,595	495	105	505	55	27.4	C
Between Federal & Sheridan	WB	PM	4,940	950	50	120	55	33.1	C
Between Sheridan & Church Ranch	WB	PM	3,555	1,015	55	125	65	38.4	C
Between Church Ranch & Wadsworth	WB	PM	3,210	840	300	35	65	35.2	C
Between Wadsworth & Flatiron	WB	PM	3,425	525	350	20	65	22.4	B

Table 2: HCS+ Weaving LOS Results for Managed Lane Combined Ingress/Egress Access Zone (2015 Eastbound AM & PM Peak Traffic Volumes)

Highway US-36 Section	Direction	2015 Volumes	Non-Weaving Volume		Weaving Volume		Speed Limit	Weave Analysis	
			Managed Volume Upstream	GP Volume Upstream	From GP to Managed Lane	From Managed Lane to GP		Density	LOS
			A -> C	B -> D	B -> C	A -> D			
			(vph)	(vph)	(vph)	(vph)	(mph)	(vpmpl)	
Between Flatiron & Wadsworth	EB	AM	295	3,025	205	5	65	19.8	B
Between Wadsworth & Church Ranch	EB	AM	450	2,940	500	50	65	29.4	C
Between Church Ranch & Sheridan	EB	AM	895	3,305	205	55	65	29.0	C
Between Sheridan & Federal	EB	AM	1,065	3,995	135	35	55	41.9	D
Between Federal & Pecos	EB	AM	1,125	4,865	225	75	55	33.7	D
Highway US-36 Section	Direction	2015 Volumes	Non-Weaving Volume		Weaving Volume		Speed Limit	Weave Analysis	
			Managed Volume Upstream	GP Volume Upstream	From GP to Managed Lane	From Managed Lane to GP		Density	LOS
			A -> C	B -> D	B -> C	A -> D			
			(vph)	(vph)	(vph)	(vph)	(mph)	(vpmpl)	
Between Flatiron & Wadsworth	EB	PM	785	4,255	350	15	65	22.8	B
Between Wadsworth & Church Ranch	EB	PM	1,010	3,410	260	125	65	30.5	C
Between Church Ranch & Sheridan	EB	PM	1,190	3,135	10	75	65	28.5	C
Between Sheridan & Federal	EB	PM	1,165	3,490	35	35	55	34.2	C
Between Federal & Pecos	EB	PM	990	3,815	10	210	55	25.3	C

This LOS is a result of the general purpose lanes exceeding capacity adjacent to the managed lane access zone; therefore, the results would be similar regardless of separate or combined access. Within the buffer separated segments of the managed lane, it is expected that LOS C or better will be maintained by the tolling agency with variable tolling.

During the peak periods when the density of traffic is high, it is expected that acceptable gaps would be reduced. A combined ingress/egress zone of 3,000 ft vs. the separate ingress/egress zone of 1,500 ft would provide motorists considerably more time/distance to find an acceptable gap to merge or diverge to or from the managed lane.

In addition, the combined access zone allows vehicles entering US-36 from an interchange ramp the option to enter the managed lane earlier in the traffic stream, rather than navigating the additional one-half mile to enter at the shorter, 1,500 ft ingress zone in the separated access concept.

Design

Signing - During the initial signing layout for the managed lanes and general purpose lanes, it became apparent that the number of signs, sign spacing, and sign clutter would be an issue for the separate ingress/egress access zone configuration. Separate ingress/egress access zones would require additional overhead signs to designate the ingress vs. egress compared to the combined zone configuration.

Spacing - In an urban environment, the space constraints lend themselves better to a combined 3,000 ft ingress/egress access zone instead of the 4,500 ft required for the separate ingress/egress access zone. In the case of US-36, this is especially true for the access zones between the closely spaced interchanges of Federal Blvd and Pecos St.

Applicability

Other agencies implementing managed lanes, such as Caltrans, Washington State Department of Transportation (WSDOT), and Utah Department of Transportation (UDOT) are utilizing the combined ingress/egress zone configuration.

The proposed combined ingress/egress access zone for managed lanes on US-36 follows the guidance provided in section 2G.16 of the 2009 MUTCD. The 2009 MUTCD does not provide any examples or guidance for signing separate ingress/egress access zones where the managed lane is buffer separated by a narrow distance of 4 ft.

CONCLUSION

Based on the acceptable results from the operations analysis, the consideration for geometric design constraints, and the applicability of the managed lane combined ingress/egress access zone, the project team advanced the combined ingress/egress access zone as the preferred design option.

Changes in the proposed access to and from the managed lane have been evaluated from a safety perspective. The proposed combined access does not change the safety of the motorists in the managed lane from that evaluated in the FEIS. In either case (separate access vs. combined access), the motorist is subject to merging, diverging, and weaving maneuvers to and from the managed lane. The separate access provides 1500 feet per egress and ingress separated by approximately 1000 feet. The combined access zone provides additional distance and opportunity for executing these maneuvers by providing a minimum of 1500 feet per egress

and ingress without separation for a combined total of 3000 feet of access. The increased distance in the ability to maneuver is offset by the action of combining the ingress/egress zone into a single zone.

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