

Appendix F
Colorado Boulevard Interchange Analysis

Traffic Assessment of Colorado T-Ramp Access to Express Lanes

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Executive Summary

Results of the sensitivity analysis for the Colorado T ramp indicates that Colorado Boulevard holds the greatest promise as an express lane access point and serves the most people traveling to and from the east of Colorado Boulevard. All the intersections along Colorado Boulevard operate acceptably and also have reserve capacity to handle some additional traffic despite increased volumes along Colorado due to the proposed T-ramp from the express lane. Provision of an access at University or complete elimination of access in the vicinity of Colorado Boulevard translates to increased burden on already congested intersections on major streets, higher out of way trips and significant congestion on C-470. These detrimental effects due to providing access at other locations or completely eliminating the access to express lanes are not offset by the benefits of lower volumes on Colorado. A significant portion of the additional volume (due to the T ramps) is contained south of Dry Creek. The T ramp serves the residents adjacent to Colorado which helps reduce out of way trips on adjacent streets. The T ramp access also provides better access to C-470 along with a reliable transportation system. It is recommended that the access point at Colorado Boulevard be considered as the preferred option due to the reasons listed above.

Introduction

This analysis addresses concerns raised regarding perceived increase in traffic on Colorado Boulevard through the City of Centennial as a result of providing access to the Express Lane at Colorado Boulevard. Three scenarios were ran in the AIMSUN micro simulation model to describe differences between access scenarios with and without the Colorado access. The results for the PM peak hour are then summarized to assess the findings of the three scenarios.

Scenario 1: Express Lane Access at Colorado (T-ramps) and Quebec (Braided Ramps)

- a. Provides adequate access to traffic oriented to/from the area adjacent to Colorado T-ramps and carry approximately 1800 vehicles in the PM peak hour.
- b. The intersections adjacent to the T-ramp operate at acceptable Levels of Service (D or better) despite carrying higher volumes on Colorado as compared to the General Purpose Lane or the No-build alternative. Colorado south of the T-ramps carries significant volumes to the residential areas adjacent to Colorado and University. Residential parcels in the City of Centennial (north of County Line) contribute 23-31% of the total traffic

using the “T” ramps. Increase in volume between Colorado and County Line along Colorado can be attributed to these residential trips.

- c. Trips entering and exiting the express lanes at Colorado are primarily residential traffic along with some (10-12%) commercial trips. About 80% of the additional trips (due to T-ramp) is contained south of Dry Creek. Approximately 50% of the PM peak traffic entering the express lanes at Colorado is from areas south of C-470 with the other half from north of C-470. Approximately 62% of the PM peak traffic exiting the express lane at Colorado travel south of C-470 and the remaining 38% travel north on Colorado.
- d. Presence of an access point to the express lane at Colorado provides additional options for traffic traveling west from I-25 to south of C-470 between University and Quebec. The T-ramp not only provides an alternative route to busy streets like University or Quebec but also creates additional opportunities for other traffic to share the same route by distributing demand and reducing out of way trips.
- e. The origin-destination percents for general purpose lane alternative as compared to the Express Lane alternative would change due to absence of alternative access to C-470. The origin-destination patterns for the General Purpose Lane alternative would be very similar to existing travel patterns in the vicinity of Colorado.
- f. Traffic analysis indicates that most of the trips served by the Colorado T-ramps are oriented to/from parcels in the vicinity of Colorado Boulevard and do not induce any “cut-through” or out of way trips.

Scenario 2: Express Lane Access at Quebec Street only Without Any Access to Colorado

- a. Express Lane braided ramps at Quebec provides access to and from the west for Express Lane traffic only.
- b. Absence of an access point to and from the east between University and I-25 from the Express Lane precludes any vehicles traveling to these interchanges from using the express lanes. This translates to increased congestion on C-470, and the ramp merge/diverge areas. Presence of significant delays and queues on C-470 encourages out of way trips on the arterial streets and increases the congestion on surface streets.
- c. County Line and Dry Creek road intersections along University and Quebec experience higher delays (15-33% change in delays) for this scenario as compared to the T-ramp option. The Level of Service (LOS) at the intersections of University and Quebec at County Line degrades from LOS E to LOS F (from T-ramp option to this scenario). The Level of Service at the intersections of University and Quebec at Dry Creek remains at LOS E and LOS F respectively with significant increase in overall intersection delay.
- d. Delay along Colorado at all intersections improves (11-20%) while the LOS remains the same when compared to the “T” ramp scenario. A slight increase in traffic along Colorado is observed (4-6%) which could be attributed to trips that use Colorado as a bypass route to avoid congestion along other major streets.
- e. Traffic operations at all the above intersections are better than what would be realized under true demand conditions due to presence of significant congestion along C-470 which would have otherwise caused the intersection operations to degrade.

- f. Express Lane volumes increase significantly due to presence of sustained congestion along the non-toll lanes between Quebec and I-25.

Scenario 3: Express Lane Access at University and Quebec (Braided Ramps) Without Any Access to Colorado

- a. Braided ramps at Quebec provide access to and from the west with no access at Colorado. Express Lane access to and from the east is provided at University using two different access types. The first option was a direct connection to/from the east to the express lanes through braided ramps and the other option was to provide slip ramps on C-470 just east of the University interchange to provide express lane access to/from the east.
- b. The braided ramp access at University adds another 1000 vehicles to the westbound ramp volumes with the eastbound on ramp carrying an additional 700 vehicles.
- c. For the braided ramp option, the Dry Creek, Westbound (WB) C-470 ramp and the Eastbound (EB) C-470 ramp intersections along University experience the highest delay (15-37% increase in delays) among the three scenarios.
- d. Spacing between County Line Road and the WB ramp intersection along University in conjunction with heavy ramp volumes create significant weaving problems. This severe weave causes degradation of intersection operations and queuing of vehicles in the westbound off-ramp which back-propagate to the C-470 toll and non-toll lanes. These queues extend back to the Quebec ramps hampering C-470 operations at that interchange.
- e. Heavy ramp volumes at the University ramp terminals for the braided ramp option also create queuing and congestion between the ramp terminals in both directions and also between County Line Road and Dry Creek Road. This congestion in turn encourages out of way trips increasing volumes on Colorado by 7-10% (as compared to the General Purpose Lane alternative). Colorado Boulevard experiences less delay (5-9% less delays) than the T-Ramp scenario but slightly higher delays than the option with no access at Colorado.
- f. Traffic operations along Quebec are similar to the T-ramp scenario with an increase in congestion (5-14% increase in intersection delays as compared to the T-ramp option) at all the intersections on Quebec Street for the braided ramp option. Express Lanes carry the highest volumes in this scenario due to presence of sustained congestion in the non-toll lanes.
- g. The slip ramp option had similar influence on the system as the braided ramp option and degraded the freeway and surface intersection operations. The arterial intersection delays were 10-21% higher for the slip ramp option as compared to the braided ramp option. However, the slip ramp option degraded the toll and non-toll lane operations significantly more than the braided ramp option since the slip ramp added additional volumes (900-1000 vph) directly to the at-capacity non toll lanes. Significant queuing along C-470 between University and Quebec Street interchanges were observed for the slip ramp option. These queues prevented vehicles oriented to/from University and Quebec interchanges from entering or exiting the freeway causing further gridlock on the arterial streets.