

9.0 OPTIMIZATION OF FINAL ALTERNATIVE

The optimization of the final alternative sought to refine the express lane configuration and develop an alternative with the highest potential to be financially feasible.

Ultimately, cost and operations played the biggest part in shaping the final alternative. The roadway design was revised to provide a cost-effective design that would allow for the best operation and highest express lane ridership.

9.1 ACCESS LOCATION REFINEMENT

Through numerous micro-simulation model runs, alternatives were evaluated to determine the final access configuration, ramp type, and location. Based on the previous screening analyses, the locations of I-25, Quebec Street, Lucent Boulevard, and Wadsworth Boulevard required further analysis before finalizing their configurations. During the public outreach process, representatives from the City of Centennial and Arapahoe County requested that further analysis be performed along Colorado Boulevard to ensure the impacts imposed by providing an express lane access at Colorado Boulevard would not significantly impact the adjacent surface street network. These topics were considered in this study phase, and are discussed below.

9.1.1 I-25 Interchange

Seven alternatives were evaluated for providing access to I-25 from C-470. The alternatives, which included both direct and non-direct connections, are described below.

- **Direct Connection A.** Direct connection from existing Southbound I-25 ramp to Westbound express lanes and direct connection from Eastbound express lanes to existing Northbound I-25 fly-over ramp.
- **Direct Connection B.** Direct connection from Southbound I-25 to Westbound C-470 express lanes. Direct connection flyover ramp from Eastbound C-470 express lanes to Northbound I-25.
- **Slip Ramp A.** Full access to and from C-470 express lanes at I-25.
- **Slip Ramp B.** Full access to and from C-470 express lanes at I-25. C-470 express lane access to and from Yosemite Street.
- **Slip Ramp with Westbound Collector Distributor.** Full access to and from C-470 express lanes at I-25.
- **Direct Connection C.** Direct connection from Southbound I-25 to Westbound express lanes and Eastbound express lanes to Northbound I-25. (Different ramp configurations from Direct Connection A.)
- **Direct Connection C.** Direct connection from Southbound I-25 to Westbound C-470 express lanes. Separate flyover for direct connection of Eastbound C-470 express lanes to Northbound I-25. (Different ramp configurations from Direct Connection B.)

Plan views of these alternatives are included in Appendix E.

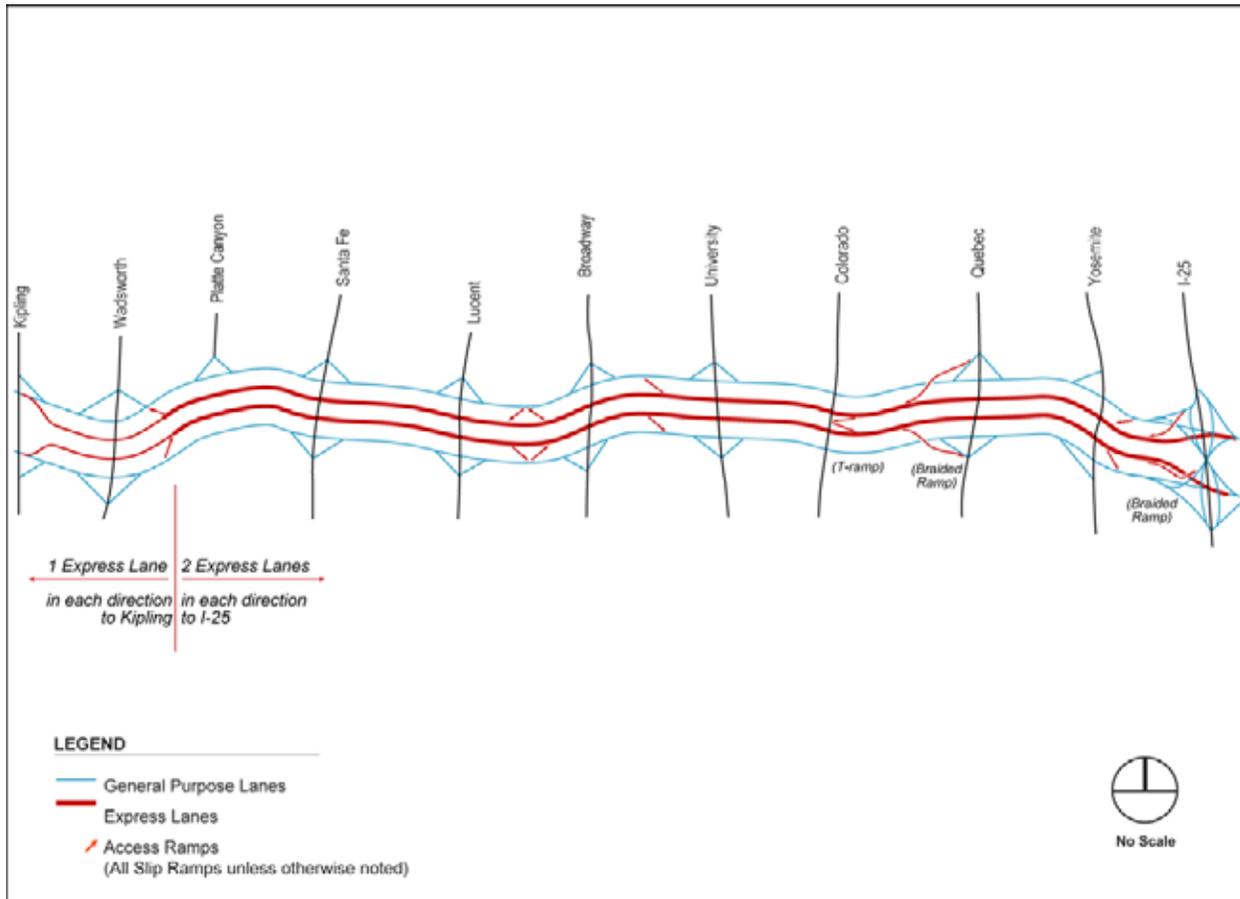
Throughout the screening process, portions of each alternative were substituted to determine the interchange configuration that provided the best combination of accessibility, operations, and cost.

To provide adequate operations from C-470 to and from the north along I-25, some form of direct access needed to be provided. The projected volume destined to and from the south along I-25 was accommodated via a slip ramp positioned just east of Yosemite Street. Two main direct access alternatives considered in the analysis were a variation of the Direct Connection Alternative A and Alternative B. The variation provided a slip ramp access just east of Yosemite Street to allow for vehicles to access I-25 to and from the south. The only difference between the two alternatives was the connection between eastbound C-470 express lanes and I-25 northbound.

Alternative A included a braided ramp from the eastbound C-470 express lanes to the northbound I-25 flyover ramp. This option required no widening to the existing structure over I-25. Alternative B provided a direct flyover access ramp from eastbound C-470 to northbound I-25.

Model runs were performed to determine the potential benefit in operations and increase in revenue versus the construction cost difference for each alternative. Alternative B was estimated to cost approximately \$25 to \$30 million more than Alternative A. The micro-simulation model showed little operational benefits combined with little increase in traffic with Alternative B. The model showed that in Alternative A, the eastbound distance where the express lanes merge into the general purpose flyover ramp needed to be lengthened to improve operations. With this modification, operations were determined to be adequate. Therefore, the variation of Alternative A was recommended. Figure 9.1 shows the recommended alternative at I-25.

Figure 9.1
I-25/C-470 Interchange



9.1.2 Quebec Street

In the previous screening analysis, providing slip ramp access at Quebec Street resulted in operational problems along both the express lanes and general purpose lanes due to the amount of weaving between facilities. For that reason, a braided ramp between the existing general purpose lane ramp and the express lanes to and from the west was evaluated. It was determined that operations on both facilities improved significantly with the braided ramp in place. A cursory cost benefit analysis was performed to confirm the projected revenue generated by providing access at Quebec Street. The estimated construction cost for providing direct access at this location was approximately \$16 million, in 2004 dollars. The projected revenue exceeded the construction cost and therefore a direct connection at Quebec Street has been proposed.

9.1.3 Colorado Boulevard

Providing express lane access at Colorado Boulevard was logical due to the projected high volumes, good overall operations, and good access spacing, because the access

provides a new interchange along the corridor, several issues were raised during the public involvement process regarding the potential change in travel patterns along Colorado Boulevard. Members of the public both supported and disapproved of the proposed interchange.

The concerns stem from the perception of increased traffic along Colorado Boulevard and the potential for increased cut-through traffic in the adjacent neighborhoods. Support for providing an access at Colorado Boulevard was also documented. Proponents liked the increased efficiency of reaching the C-470 corridor; and the added reliability over taking surface streets such as County Line Road and Quebec Street to access the existing corridor interchanges.

The analysis showed that there would be minimal increase in traffic along Colorado Boulevard and the adjacent arterial street network. Traffic volumes along Colorado Boulevard and County Line Road were expected to increase by approximately 800 vehicles in vicinity of the interchange during the peak hour. Due to the additional reserve capacity along both Colorado Boulevard and County Line Road, the additional traffic can easily be accommodated within the existing geometry. Due to the excess reserve capacity on the major arterials in the area, it is anticipated that there would be little demand for drivers to use local streets to bypass arterial congestion. Therefore, express lane access at Colorado Boulevard to and from the east has been proposed. This analysis is summarized in Appendix F.

9.1.4 Lucent Boulevard

The previous screening analysis identified the Lucent Boulevard location as having the best overall potential for accommodating an express lane access. The Lucent Boulevard location was analyzed in the micro-simulation model to determine whether a single express lane access would accommodate the demand for this location. It was determined that a single express lane access between Lucent Boulevard and Broadway would likely fail operationally. Before evaluating a direct access at this location, additional slip ramps were evaluated due to the minimal construction cost associated with them. Supplemental slip ramp access points were evaluated to the east of Broadway to serve as a relief valve for access between Lucent Boulevard and Broadway. It was determined that providing access eastbound and westbound, just west of Broadway, would provide for adequate operations on the express lane facility. For this area, full access between Lucent and Broadway and an Eastbound exit and Westbound exit between Broadway and University was prepared.

9.1.5 Wadsworth Boulevard

Due to the projected through traffic remaining on and entering the express lanes before and after the Wadsworth Boulevard Interchange, consideration was given to extending the express lanes to Kipling Parkway. This would provide eastbound drivers a queue

jump to bypass the congestion at Wadsworth Boulevard and offer westbound drivers a better opportunity to complete the merge from three lanes into two lanes. Based on the analysis, extending a single lane to the Kipling Parkway overpass would enhance operations. It is anticipated that single lane in each direction could be constructed in the existing median, utilizing a buffer separation between the express lanes and general purpose lanes. This section would also be tolled.

9.1.6 Final Access Alternative

Figures 9.2 and 9.3 show the proposed access locations, access types, and corresponding AM and PM peak hour volumes for the preferred alternative.

Figure 9.2
Projected AM Peak Hour Volumes Final Configuration

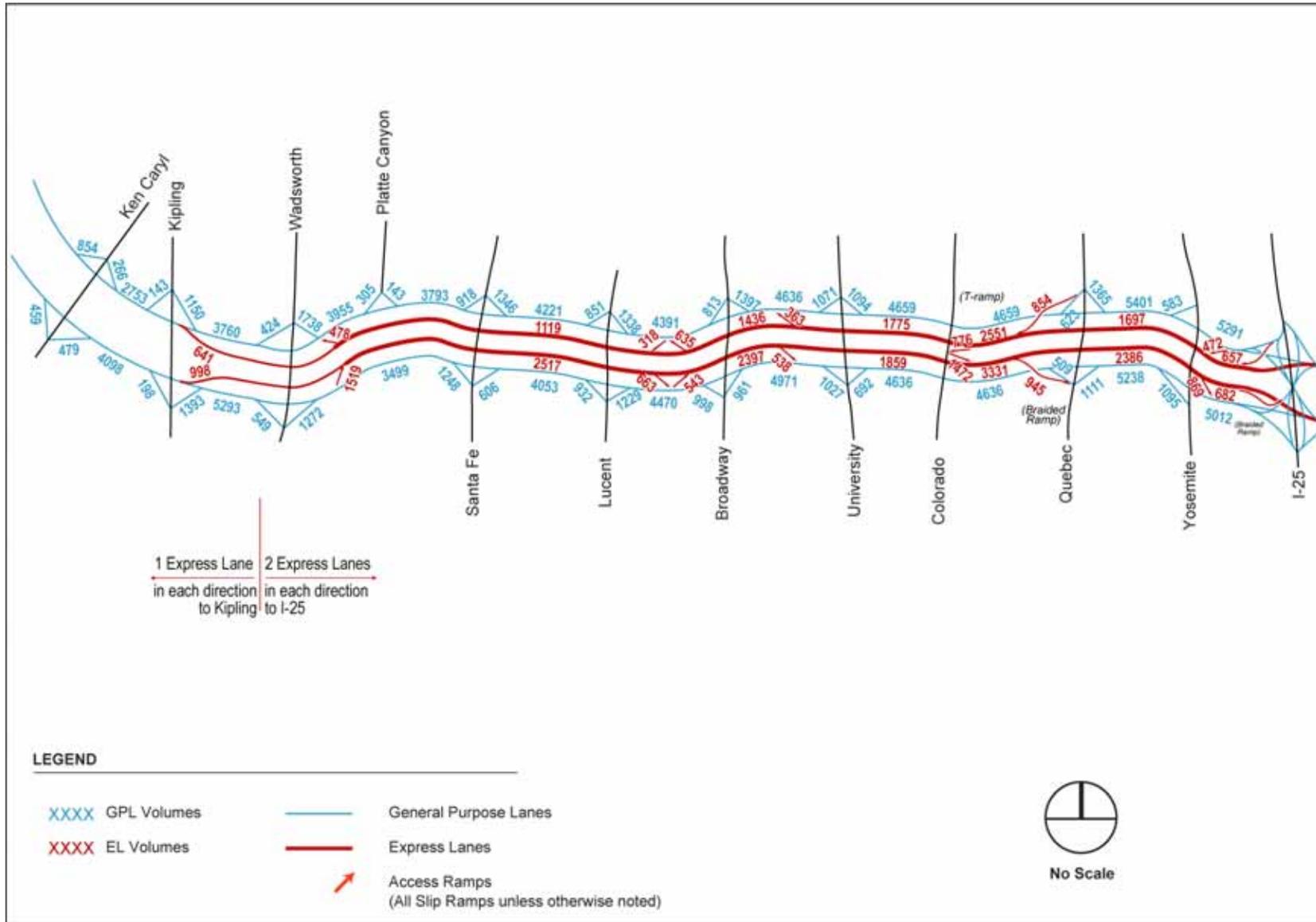


Figure 9.3
Projected PM Peak Hour Volumes Final Configuration

