

INTRODUCTION

As the population of Colorado continues to grow we often have intersections and roadway corridors that have reached their operational capacity due to the resultant increase in traffic volumes.

Intersection congestion has increased over time at the Mineral Avenue intersection with a high level of vehicle activity during the peak hours of commuter travel. To assess potential improvements, the City hired Felsburg Holt & Ullevig to evaluate an interchange concept at this intersection to improve vehicle flow.



This Executive Summary provides information on:

- Existing Conditions – How bad is congestion today?
- Long-Range Interchange Solution – What are the impacts and associated costs?
- Short-Term Alternative – Is there an effective solution that can be constructed sooner and what are its benefits and cost?

EXISTING CONDITIONS

Surrounding Constraints – Any improvement options must recognize existing constraints that surround this intersection. Both light rail and freight rail tracks exist along the east side of Santa Fe Drive. The Regional Transportation District (RTD) light rail station and park-n-Ride facilities are on both sides of Santa Fe Drive and the pedestrian bridge that provides station access spans Santa Fe Drive to the north of Mineral Avenue.

Intersection Geometry – Both Santa Fe Drive and Mineral Avenue have two through lanes for each direction of travel. One or two left turn lanes exist in each direction and there are right turn lanes in each direction also.



Traffic Volume Levels – 24-hour traffic volumes on Mineral Avenue are 25,000 – 26,000 vehicles per day (vpd), while traffic volume on Santa Fe Drive ranges from 50,000 to 52,000 vpd. Year 2035 traffic projections see these levels increasing to 32,000 – 37,000 vpd on Mineral Avenue and to 79,000 – 85,000 vpd on Santa Fe Drive. This equates to an increase of about 25-40% on Mineral Avenue and about 50-70% on Santa Fe Drive.

Intersection Operations – This intersection operates at Level of Service (LOS) F during both the AM and PM peak hours of commuter travel times; almost all individual intersection movements operate at LOS F also. LOS F indicates that the average motorist is waiting at least 80 seconds to travel through the

Santa Fe Drive/Mineral Avenue intersection during these time periods. Without improvements, average vehicle delay is expected to increase over three times by the Year 2035.

Transit Facilities – RTD serves this area of Littleton via the southwest light rail line and also via five bus routes. A 1,227 space parking lot with a passenger pick-up and drop-off area is housed in the northwest quadrant directly adjacent to Santa Fe Drive. The light rail station platform is located in the northeast quadrant of this intersection.

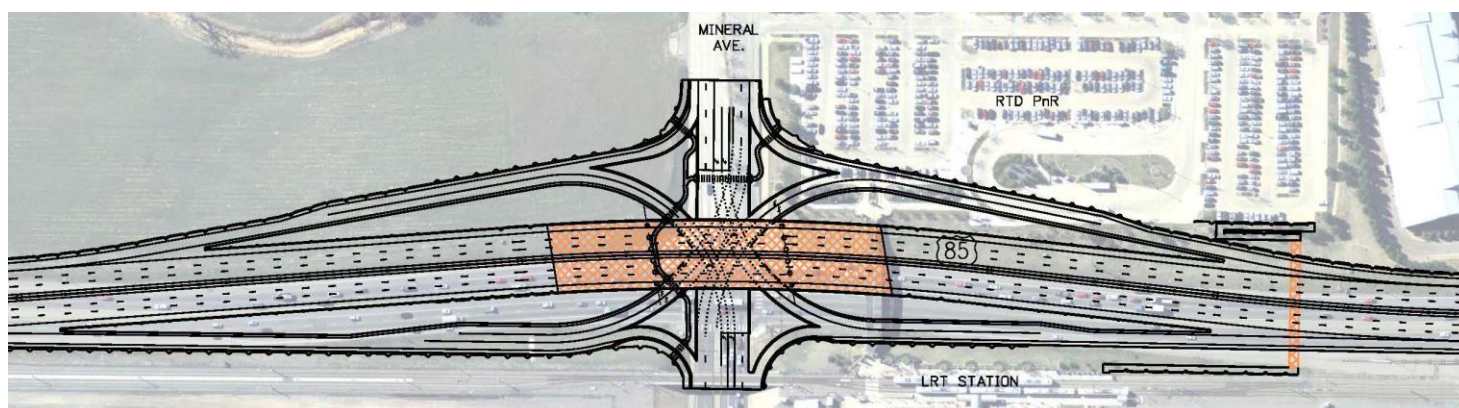
Bicycle & Pedestrian Access - Pedestrian facilities exist in most areas of the project corridor and they provide reasonable access along Mineral Avenue and to/from RTDs Littleton/Mineral light rail station. Bicyclist and pedestrian movements along Mineral Avenue are largest along the north side of Mineral Avenue where access to the light rail station is the most convenient.



LONG-RANGE INTERCHANGE DESIGN

Improvement Options – The goal of the Long-Range analyses was to determine an interchange alternative that would fit within the physical constraints surrounding the intersection, or to at least minimize the physical impacts, specifically the Littleton/Mineral light rail line and station, the RTD park-n-Ride, and the freight rail lines.

During discussions between City of Littleton and consultant staffs, it became evident that certain interchange types required too large of a design footprint to fit within the physical constraints of the project. The Long-Range interchange plan quickly focused on an interchange type that already exists within the City along Santa Fe Drive at Belleview Avenue. This interchange type is a Single Point Urban Interchange (SPUI). A SPUI design will elevate Santa Fe Drive over Mineral Avenue and the design would concentrate east/west traffic along Mineral Avenue, and the interchange entrance/exit movements to/from Santa Fe Drive, at one signalized intersection (see the design representation below).



As with any new interchange, there will be impacts. Given the constraints along the east side of Santa Fe Drive, the center of the interchange will need to be shifted towards the west which will have right-of-way impacts to adjoining property owners, specifically, the RTD park-n-Ride lot and the privately held property in the southwest quadrant of the intersection. Additionally, the interchange design requires that the existing RTD pedestrian bridge over Santa Fe Drive be relocated to the northernmost section of the RTD park-n-Ride lot.

Operational Analyses – The Year 2035 operational analyses predict that the signalized traffic movements at the SPUI will operate at LOS C during both the AM and PM peak hours. Average vehicle delay during these peak hours are approximately 66 - 73 seconds less than existing conditions, an approximate 70-75% reduction.

Cost Estimate – An opinion of probable construction costs was prepared to evaluate right-of-way, construction, design and construction management costs of a new SPUI interchange. Construction costs were escalated 2% per year for 11 years to account for inflation. The following table summarizes the conceptual-level estimate.

| Santa Fe Drive / Mineral Avenue Interchange | | | | | |
|--|--------------|-----------|----------|---------------------|--------------|
| Conceptual Estimate of Project Costs | | | | | |
| 2014 Total of Construction Bid Items | | | | \$53,364,000 | (A) |
| 2025 Construction Cost | | | | | |
| Future Cost at 2% Inflation Over 11 years | | | | \$66,353,000 | (B) |
| Environmental and Engineering | | | | | |
| Environmental Clearance | 5% of (B) | 5.0% | | \$3,317,650 | (C) |
| Preliminary & Final Design | 15% of (B) | 15.0% | | \$9,952,950 | (D) |
| Construction Engineering (CDOT Oversight) | 20% of (B) | 20.0% | | \$13,270,600 | (E) |
| Total Environmental & Engineering (C+D+E) | | | | \$26,541,000 | (F) |
| Right of Way | | | | | |
| | Pay Unit | Unit Cost | Quantity | | |
| Right-of-Way and Permanent Easements | SF | \$25.00 | 154,896 | \$3,872,400 | (G) |
| Temporary Easements | SF | \$15.00 | 16,000 | \$240,000 | (H) |
| Total ROW (G+H) | | | | \$4,112,000 | (I) |
| Total Project Cost (B+F+I) | | | | \$97,006,000 | |

SHORT-TERM IMPROVEMENT ALTERNATIVE

The construction of a new interchange will take considerable time to identify funding, to design, and to construct. As an alternative that could provide real operational and congestion benefits within a quicker timeframe, a Short-Term improvement alternative was evaluated. This alternative could continue to use the existing Santa Fe Drive/Mineral Avenue at-grade intersection, but with lane additions, etc. that would provide immediate benefits.

A constant improvement that was considered absolutely essential as a starting point to improve intersection operations was the addition of a third through lane on Santa Fe Drive in both the northbound and southbound directions due to the existing levels of traffic along this street. Additionally, converting the westbound right turn movement to a free-flow, island-separated movement was also considered an essential improvement by City staff.

The Short-Term recommendations for improving vehicle flow at this intersection are shown graphically and include:

- Add a third through lane for northbound and southbound Santa Fe Drive
- Convert the westbound right turn lane to a free-flow movement
- Add a third through lane for eastbound and westbound Mineral Avenue

These intersection improvements will require the following design modifications outside of the basic intersection footprint:

- Continue the westernmost southbound lane on Santa Fe Drive to the existing C-470 flyover ramp; this lane becomes an exit lane onto this ramp
- Modify the existing slope paving underneath the railroad bridges on the south side of Mineral Avenue for relocation of the existing sidewalk to accommodate the 3rd eastbound lane



- Modify the location of the existing RTD light rail station access ramp (east of the railroad bridges; north side of Mineral Avenue); move the westbound right turn lane to the north of the bridge piers



- Make modifications to the existing drainage system to accommodate new stormwater flows; construct a new water quality pond

Operational Evaluation – it is predicted that the Short-Term improvement alternative will operate at LOS D during both peak hours with a reduction in average vehicle delay of 53-54 seconds during each peak hour. When considering the number of vehicles that travel through this intersection that are controlled by the traffic signal, a total of about 300,000 seconds of delay can be saved each day during the AM and PM peak hours. When considering the benefits that these improvements can have over the course of an entire day and over an entire year, the reduction in delay, and the corresponding reductions in gas consumption and carbon monoxide emissions, becomes quite significant.

Cost Estimate – An opinion of probable cost for the proposed Short-Term improvements was developed in a similar fashion as was conducted to estimate the costs of an interchange. The following table summarizes this estimate.

| Santa Fe Dr. / Mineral Ave. Intersection Improvements | | | | | |
|--|--------------|-----------|----------|---------------------|--------------|
| Conceptual Estimate of Project Costs | | | | | |
| 2014 Total of Construction Bid Items | | | | \$7,284,000 | (A) |
| Engineering | | | | | |
| Construction Engineering (CDOT Oversight) | 20% of (A) | 20.0% | | \$1,457,000 | (B) |
| Preliminary & Final Design + Environmental Clearance | 16% of (A) | 16.0% | | \$1,165,440 | (C) |
| Total Engineering (B+C) | | | | \$2,622,000 | (D) |
| Right of Way | | | | | |
| | Pay Unit | Unit Cost | Quantity | | |
| Right-of-Way and Permanent Easements | SF | \$25.00 | 62,436 | \$1,560,900 | (E) |
| Temporary Easements | SF | \$15.00 | 7,907 | \$118,605 | (F) |
| Total ROW (E+F) | | | | \$1,680,000 | (G) |
| Total Project Cost (A+D+G) | | | | \$11,586,000 | |

Life-Cycle Analysis – The Santa Fe Drive/Mineral Avenue intersection currently experiences excessive average vehicle delay which results in a poor level of service rating (LOS F) during the AM and PM peak hours. The Short-Term improvements will reduce delay significantly with a corresponding improvement in levels of service.

The question must be asked relative to how long these improvements will continue to provide good intersection operations when an expenditure of \$12 million dollars must be undertaken. If the traffic volumes expected for year 2035 are realistic, and there is a linear growth in traffic volumes over the next 20 years, analyses indicate that the Santa Fe Drive/Mineral Avenue intersection will begin to deteriorate into LOS F by approximately 2025.

NEXT STEPS

The information contained in the feasibility study provides a framework that the City of Littleton can use to progress the final design and construction of the interchange and the Short-Term alternative improvements for the Santa Fe Drive/Mineral Avenue intersection. The following information summarizes the next steps to completing and implementing these improvements.

Long-Range Improvements

- Begin discussions with the Colorado Department of Transportation (CDOT), RTD, the Denver Regional Council of Governments (DRCOG), and the railroad companies relative to the interchange improvement recommendations
- Begin the process to add this project to the DRCOG MetroVision 2040 Long-Range Transportation Plan
- Investigate funding opportunities, secure funding and add to the DRCOG fiscally-constrained transportation plan
- Prepare preliminary engineering and National Environmental Protection Act (NEPA) documentation, including stakeholder, property owner, and public outreach
- Undergo process to add this project to the Transportation Improvement Program (TIP)
- Prepare final design plans and advertise for construction

Short-Term Improvements

- Begin design discussions with CDOT and RTD
- Begin preliminary and final design engineering and conduct the environmental clearance process.
- Coordinate with adjoining property owners relative to ROW, permanent easement and temporary construction easement needs; purchase ROW and permanent easements once final design is near completion.
- Investigate methods and means of financing the recommended improvements.
- Advertise and select a qualified contractor.