

Study Purpose

South Broadway is a regional arterial that extends along the eastern edge of the City of Littleton from County Line Road to the Littleton/Englewood boundary. From C-470 to Mineral Avenue, Broadway is a six lane road, and at Mineral, Broadway transitions down to four lanes. The purpose of this study was to evaluate the feasibility of widening the 1 ½ mile stretch of Broadway between Mineral Avenue and Arapahoe Road to six lanes. The study also considered alternative improvements to enhance the mobility and safety of Broadway.

Existing Conditions

From Mineral Avenue to Fremont Avenue, both the east and west sides of Broadway are in the City of Littleton. North of Fremont Avenue, the east side of Broadway is in the City of Centennial, with a few exceptions. The land uses adjacent to the corridor include commercial, medical, and retail uses, multi-family and single family residential neighborhoods. While most of the residential uses are oriented away from Broadway, with access from the local street system, the homes between Geddes Avenue and Lincoln Way (in Centennial) front Broadway with driveway access onto Broadway.

This section of Broadway currently has four travel lanes (two lanes in each direction) with painted medians within an approximate 100 foot right-of-way. The outside lanes are wide (20 to 24 feet) and accommodate right turn lanes, bus pullouts, and on-street parking on the east side of Broadway between Geddes Avenue and Lincoln Way.

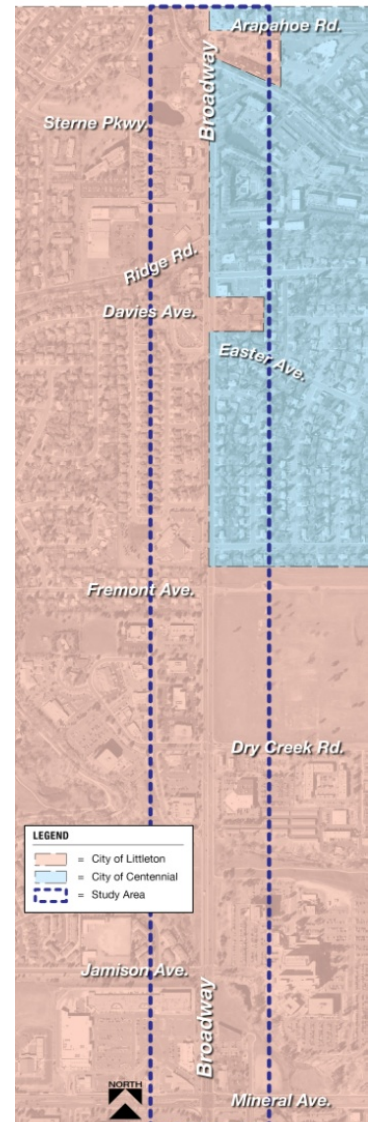
Broadway carries daily traffic volumes in the range of 35,000 to nearly 40,000 vehicles per day (vpd). Traffic volumes are higher in the northbound direction in the morning and in the southbound direction in the evening – indicating a pattern of commuter traffic oriented to and from Denver and points north of Littleton. There are eight traffic signals along Broadway and numerous other accesses and streets that are not signalized. Operational analysis of the signalized intersections shows that all of the intersections currently operate at an acceptable level of service (LOS D or better) during the morning and afternoon peak hours, with the exception of Arapahoe Road, which was found to operate at LOS E during the PM peak hour.

The Regional Transportation District (RTD) operates five local and limited bus routes within the study area, and there are 26 bus stops along this section of Broadway or in close proximity on the cross streets. The bus stops represent points of pedestrian origins and destinations. Sidewalks along Broadway are generally five to six feet wide with no buffer between the sidewalk and the travel lanes, creating a less than ideal condition for pedestrians. There are local and regional trails within the study area, including the High Line Canal Trail and the Lee Gulch Trail. The High Line Canal Trail crosses Broadway twice within this section (at Ridge Road and Arapahoe Road) and the Lee Gulch Trail crosses Broadway at Jamison Avenue. On street bike facilities or routes exist on several east-west streets that cross Broadway.

The crash history for this section of Broadway shows that there were 201 crashes over a three year period (2011 through 2013), including 22 injury crashes. Nearly half of the crashes at signalized intersections were rear-end crashes, which is typical for an urban arterial. Approach turn or broadside crashes account for half of the total injuries sustained. The Broadway and Mineral Avenue intersection experienced the highest number of total crashes (79). There were eight crashes involving either a bicycle or a pedestrian, 6 of which resulted in injuries.

Future Conditions

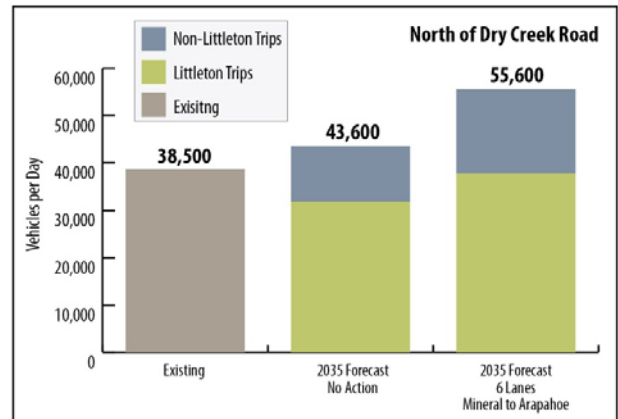
Traffic projections for Broadway were developed for 2035 using the Denver Regional Council of Governments' (DRCOG) travel demand model. The model accounts for local and regional land use growth, and estimates future traffic volumes in the context of the regional transportation network. Daily traffic volumes along Broadway are forecast to increase 10 to 20 percent



over the next 20 years with no widening, with volumes ranging from 40,000 to 44,000 vpd. By widening Broadway to six lanes, the traffic volumes in 2035 are expected to further increase, reflecting a latent demand for north-south travel on Broadway. Daily traffic on Broadway is expected to increase an additional 25 to 28 percent with six-lane widening.

The regional model was also used to estimate how much of the traffic using Broadway is Littleton traffic versus pass-through traffic. Littleton trips are defined as those trips having either an origin or a destination (or both) within the City of Littleton. Non-Littleton trips have neither an origin nor a destination within Littleton. In 2035, an estimated 70 percent of the trips using Broadway are Littleton trips.

Of the additional 12,000 vpd associated with widening Broadway to six lanes, half of the new trips are projected to be Littleton trips, and the other half would be non-Littleton trips.



With increased traffic on Broadway, if no improvements were made by 2035, the Mineral Avenue and Arapahoe Road intersections would operate at LOS E during the PM peak hour. The other six intersections are projected to continue to operate at acceptable levels of service (LOS D or better). The latent demand associated with widening Broadway to six lanes would result in additional congestion at these two intersections.

Six-Lane Widening

Because the outside lanes of Broadway are wide, in parts of the corridor six lane widening could be implemented through restriping and reducing travel lanes to 11 feet. Other segments of the corridor would require more extensive widening of Broadway. Following is a description of the requirements in each of three segments:

- **Mineral Avenue to Dry Creek Road**
 - The majority of the six lane widening for this segment could be implemented within the existing infrastructure and pavement width. A southbound right turn lane at Mineral Avenue will require additional pavement, the curb and gutter and sidewalk to be relocated and a retaining wall in order to avoid impacting the adjacent businesses, as well as additional right-of-way. The southwest quadrant of the Broadway and Dry Creek Road intersection would require additional pavement, the curb and gutter and sidewalk to be relocated and a small retaining wall located behind the sidewalk.
- **Dry Creek Road to Fremont Avenue**
 - This segment will be modified with the Littleton Village development. Since the planned median is wider than 10 feet, Broadway would have to be widened to the west to accommodate three southbound travel lanes. This widening would require additional pavement, the curb and gutter and sidewalk to be relocated and a retaining wall located behind the sidewalk. Three northbound lanes could be added within the proposed improvements that will be constructed by Littleton Village.
- **Fremont Avenue to Arapahoe Road**
 - This segment of Broadway would be the most difficult to widen to six lanes. The residences located on the east side of Broadway between Geddes and Lincoln would be impacted because the widening would require elimination of the on-street parking. Because Broadway would be capacity constrained north of Arapahoe Road (four lanes), a significant increase in turning movements at Broadway and Arapahoe is anticipated. This intersection would require some reconfiguration (conversion of the west leg to right-in/right-out only access) and phasing modifications to achieve acceptable levels of service.

In summary, extending six lanes through the intersection of Mineral Avenue would help to alleviate congestion at this key intersection, and the widening of Broadway from Mineral Avenue to Dry Creek Road could be done relatively easily. The future travel demand does not indicate a strong need to widen Broadway to six lanes all the way to Arapahoe Road; in fact, the latent demand suggest that doing so would result in more traffic and congestion. Additional intersection improvements

beyond the addition of through lanes would be needed at Mineral Avenue and Arapahoe Road. Widening the sections of Broadway from Dry Creek Road to Arapahoe Road would require additional roadway width, relocation of curb, gutter, and sidewalk, and would eliminate the existing on-street parking resulting in impacts to the adjacent residents in Centennial.

Access Control and Intersection Improvements

To address the shortcomings of widening Broadway to six lanes, an alternative set of corridor improvements were considered. It includes widening the section of Broadway between Mineral Avenue and Dry Creek Road to six lanes (since this can be implemented predominately through using the existing pavement width), and the installation of raised medians and access restrictions to minimize conflict points, and intersection improvements at key locations to address specific operational and safety problems.

Regulating the number, location, and type of accesses onto a major arterial corridor like Broadway can create a safer environment for drivers with less congestion and delay. Access control helps maximize investment in a corridor by improving operating efficiency and prolonging the functional life of the facility. In commercial areas like some sections of Broadway, access control can improve traffic flow and circulation patterns, allow for more predictable development/redevelopment, and stabilize property values.

By implementing raised medians along Broadway, the residences that front Broadway and several businesses in both Littleton and Centennial would be restricted to right-in/right-out (RIRO) access. Eleven residential driveways, eight business accesses, four local streets would be converted to RIRO.

The Broadway and Arapahoe Road intersection would require some reconfiguration and phasing modifications to achieve an acceptable level of service. The west leg of the intersection (which provides access to a single use) would be converted to RIRO only, simplifying the signal phasing and allowing for additional green time to handle the heavy movements. The northbound right turn movement would have a right turn green arrow during the westbound phase. At the Broadway and Mineral Avenue intersection, a northbound dual left turn lane would be required to accommodate the heavy movement in the afternoon.

Recommendations and Phasing Plan

The corridor improvement options were compared using a series of evaluation criteria: safety, traffic operations, throughput, bicycle and pedestrian comfort and safety, transit operations, access restrictions, residential impacts, aesthetics, ROW impacts, and construction costs. Based on the benefits and impacts associated with the different concepts, following are the recommended improvements and phasing plan for South Broadway:

Phase 1 (Short Term): Widen Broadway to six lanes from Mineral to Dry Creek Road, including the addition of a second northbound left turn lane at the Mineral Avenue intersection, raised medians, and auxiliary lanes designed to handle 2035 forecasted traffic volumes.

Phase 2 (Mid-term): Construct the raised medians and access modifications from Fremont Avenue to Arapahoe Road over time as agreements can be made with the City of Centennial and adjacent property owners, and as redevelopment occurs. If safety concerns with conflicting traffic movements become problematic along the corridor, consideration should be given to expediting the access modifications. Widen the sidewalks to a minimum of eight feet in conjunction with roadway improvements, particularly between the two High Line Canal Trail crossings at Ridge Road and Arapahoe Road. Traffic operations should be monitored at the Broadway and Arapahoe Road intersection to determine when congestion levels warrant implementation of the intersection reconfiguration with conversion of the west leg to RIRO access allowing for improved signal phasing.

Phase 3 (Long Term): Preserve the opportunity to widen Broadway from Dry Creek Road to Arapahoe Road to six lanes in the long term future. Widening to six lanes may be deemed appropriate in the future as a regional project, with widening extending north of Arapahoe Road. If six lane widening is implemented in the future, consideration should be given to time restrictions allowing the adjacent properties to use the outside travel lane for parking during non-peak travel periods.