

CHAPTER 1 PURPOSE AND NEED

1.1 INTRODUCTION

In 2006, the Federal Highway Administration (FHWA) and Colorado Department of Transportation (CDOT) completed an Environmental Assessment (EA) with a Preferred Alternative for addition of tolled express lanes to address traffic congestion on Colorado State Highway 470 (C-470) between Kipling Parkway and Interstate 25 (I-25), in the southern portion of the Denver metropolitan area. Due to lack of funding and other factors, the project did not advance to a decision document or construction at that time.

Since 2006, CDOT and local governments have worked together and with extensive public outreach to develop the funding and support needed to implement corridor improvements. As the result of those efforts, some design and operational aspects of the 2006 Preferred Alternative have been modified.

Now, in 2015, there is funding and local support for corridor improvements. FHWA and CDOT prepared this Revised EA both because portions of the approved 2006 EA are out of date and because various features of the previous Preferred Alternative have been changed. The project changes are detailed in **Chapter 2, Alternatives Considered**. The purpose and Need from 2006 remain valid and have been carried forward into this Revised EA.

1.1.1 Environmental Requirements

An EA is a document that describes a project's purpose and need, considers alternatives, and examines the social, economic and environmental consequences of alternatives to address the project need, in accordance with the National Environmental Policy Act (NEPA) of 1969.

NEPA applies to actions that would use Federal funds or require Federal approval. NEPA applies to the C-470 Corridor because the proposed improvements would be funded in part by FHWA. Also, C-470 connects to two U.S. highways, I-25 and US 85. Additionally, between Wadsworth Boulevard and US 85 (South Santa Fe Drive), C-470 is located on a property easement granted by the U.S. Army Corps of Engineers (USACE). USACE is a Cooperating Agency but not a signatory party for this Revised EA.

1.1.2 Location

C-470 is a 26-mile freeway beginning at I-70 west of Denver (milepost 0) and looping around the southwestern quadrant of the metro area to end at its junction with north-south I-25. E-470, a private toll highway, proceeds eastward from I-25 and turns northward toward Denver International Airport. This Revised EA addresses the eastern half of C-470, from Kipling Parkway to I-25, a distance of 13.75 miles, as seen in the yellow-highlighted portion of **Figure 1-1**.

**Figure 1-1
Project Location**

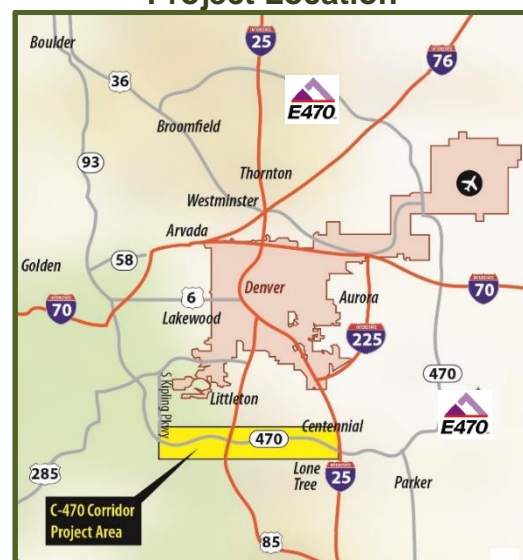


Figure 1-2
C-470 Corridor Project Area



Figure 1-2 shows that the C-470 project area spans portions of three counties, Jefferson, Douglas and Arapahoe. Approximately 75% of this C-470 segment is located within Douglas County, immediately south of County Line Road. Communities adjacent to C-470 include the cities of Littleton, Centennial and Lone Tree, as well as the Highlands Ranch development in unincorporated Douglas County.

All cities and counties along this highway segment are members of the C-470 Corridor Coalition, which formed in early 2011 to find a way to meet the corridor's needs. More information about this group is provided in **Section 2.6.1, C-470 Corridor Coalition Explores Funding Options**.

This Revised EA (with its technical appendices) is a stand-alone analysis that presents all information needed for project decision-making. It does not require the reader to access the 2006 EA. To avoid duplication of effort and cost, it makes use of 2006 EA findings to the extent that they remain applicable. The 2006 EA examined impacts through the 2025 planning horizon. This Revised EA looks out to the year 2035.

This chapter presents the project purpose and need, which are the foundation for consideration of alternative solutions that are discussed in **Chapter 2**.

The Purpose and Need for the project have not changed since 2006, but the supporting projections of future traffic growth, congestion and delay have been updated to address the planning horizon year of the *Metro Vision 2035 Regional Transportation Plan* (RTP) adopted by the Denver Regional Council of Governments (DRCOG). DRCOG adopted a *2040 Fiscally Constrained Element* (i.e., new project listing) of the RTP in February 2015, after this Revised EA was largely completed.

1.2 PURPOSE

The purpose of this project is to address existing and future C-470 congestion between Kipling Parkway and I-25, reduce traveler delay, and improve travel time reliability for corridor users through the year 2035.

1.3 NEED FOR ACTION

C-470 is a four-lane freeway that opened in 1990, with two through lanes in each direction. Extensive and rapid land

development took place along the corridor in the following decade, causing traffic growth to exceed original projections. Unacceptable levels of traffic congestion occurring by 2003 led to the preparation of the 2006 EA. C-470 has experienced routine congestion for years and will be more congested in the future due to continued local and regional growth.

Existing 2013 and predicted 2035 traffic levels on C-470 are presented in **Figure 1-3**. The traffic volumes shown for 2035 assume no improvements to the existing highway, and thus are constrained by current capacity.

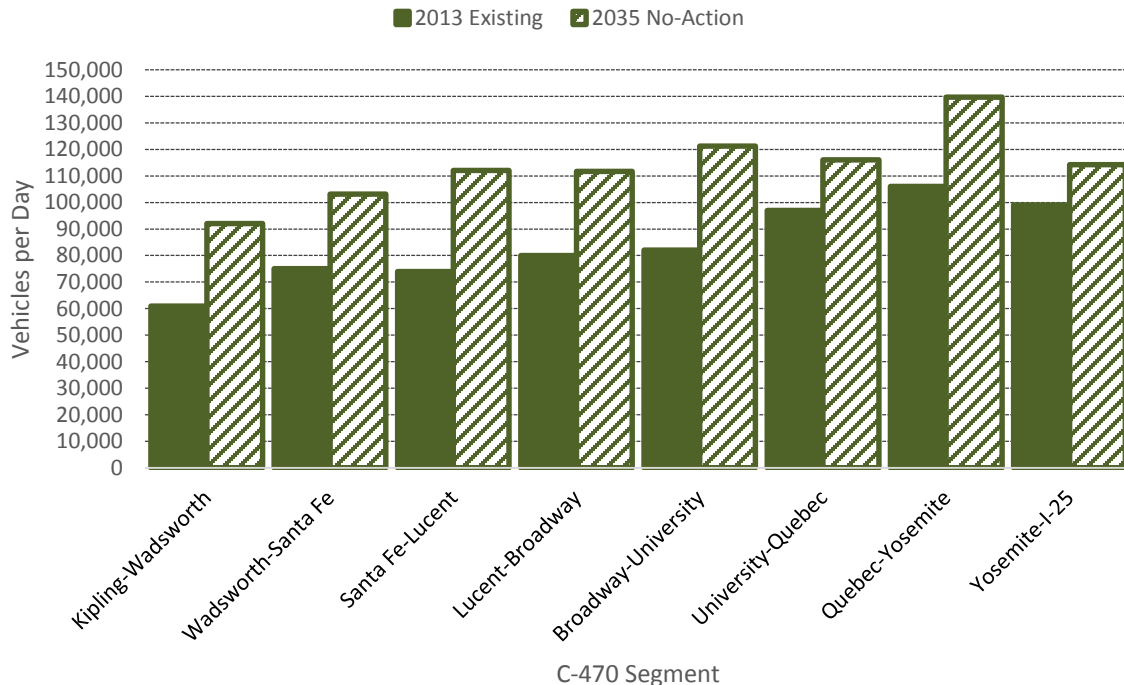
As of 2013, C-470 carried a range of 61,000 to 106,000 vehicles per day (vpd) within the project area. The 2013 volumes are CDOT traffic counts and estimates of annual average daily traffic (AADT). The 2035 No-Action Alternative traffic projections are average weekday traffic (AWDT) derived using the FOCUS travel model maintained

by DRCOG, which is the federally designated regional transportation planning agency for the Denver metro area.

The western end of the project area, between Kipling Parkway and Santa Fe Drive, carries the least C-470 traffic, while the most traffic is carried near the eastern end, between University Boulevard and I-25. The 55,000 vpd difference in the volumes on opposite ends of the corridor (61,000 vpd near Kipling Parkway, 106,000 vpd near Quebec Street) reflects the fact that C-470 is heavily used to access the cross-streets in-between.

Figure 1-3 shows that daily traffic volumes are 80,000 vehicles or more between Lucent Boulevard and I-25. Traffic will exceed this level corridor-wide by 2035. Generally, this amount of traffic on a four-lane freeway indicates congested conditions during peak hours, as reflected in DRCOG's congestion analysis discussed below.

Figure 1-3
Existing 2013 and Predicted 2035 Daily Traffic Volumes by C-470 Segment



1.3.1 Population and Employment Growth Leads to Congestion

Rapid growth over the past two decades has resulted in the reported 2014 residential build-out of the unincorporated Highlands Ranch development adjacent to C-470 between Santa Fe Drive and Quebec Street. Begun in 1981, Highlands Ranch is a 22,000-acre development with roughly 93,000 residents. Residential build-out reportedly has occurred, but there are plans to boost employment in the area.

Looking to the future, growth in the immediate vicinity of C-470 will continue. The 30 Census tracts that include or are adjacent to C-470 correspond to 88 Transportation Analysis Zones (TAZs) for which DRCOG has developed small area population forecasts. **Table 1-1** indicates the total current and projected population and employment for these TAZs, which include part of Highlands Ranch, but not all of it. By 2035, an additional 33,000 residents and 47,000 new jobs are expected in this area.

Table 1-1
DRCOG-Projected Growth along the
C-470 Corridor, 2015 to 2035

Year	Population	Employment
2015	123,372	90,584
2035	156,953	137,705
Change	+33,591	+47,121
% Change	+21%	+52%

DRCOG, 2010.

Not reflected in **Table 1-1**, because it is slightly more distant from C-470, is the Sterling Ranch development located four miles south of C-470, west of US 85. Approved in 2013, it is expected to add 12,000 homes in the next 25 years. This will increase traffic at the C-470 interchanges with Santa Fe Drive and Wadsworth Boulevard and on the C-470 mainline. This development is accounted for in regional growth forecasts as discussed below.

Looking at the bigger picture, the DRCOG 2035 RTP reflects projected population growth of 1.4 million residents, or 50% population growth, within its Denver Transportation Management Area (TMA) between 2010 and 2035. The RTP assumes that employment within the TMA will increase by 1 million jobs, a 66% increase, during the same 25 years. As a regional facility, C-470 will receive additional traffic due to this general growth in the region.

C-470 has been identified as a “key congested area” on the regional transportation system by DRCOG.

1.3.2 Congestion

C-470 in the project area has been identified as a “key congested area” in DRCOG’s *2013 Annual Report of Traffic Congestion in the Denver Region* (DRCOG, 2013). In this assessment, DRCOG assigned mobility grades based on five criteria: duration and magnitude of congestion, total delay time per mile, variation in travel time between peak and off-peak periods, and the number of crashes per mile. Considering these metrics, they assigned an overall mobility grade of A (best) through F (worst). Roadways scoring a D or F were declared to be congested.

The report specified the following C-470 elements as being “key congested locations” on the regional roadway network:

- C-470 between I-25 and Santa Fe Drive was congested as of 2011.
- C-470 between Santa Fe Drive and Kipling Boulevard will be congested by 2035.
- Two regional freeway system bottlenecks are C-470 between I-25 and Yosemite Street, and C-470 between Lucent Drive and Santa Fe Drive.
- Three congested arterial/ramp intersections are the C-470 ramps at Quebec Street, Broadway, and Santa Fe Drive.

DRCOG's findings regarding freeway mainline congestion match the roadway segments with volumes greater than 80,000 vehicles per day that were identified in **Figure 1-3**. This equates to 2,000 vehicles per lane in the peak direction during the peak hour, with the peak hour comprising one-tenth of all day traffic. (Quantitative congestion analysis uses hourly or even part-hour volumes, not daily traffic.)

Appendix 1 of the RTP includes a C-470 Corridor Vision with DRCOG's specific quantitative projections of travel characteristics for the entire 26-mile C-470 highway. This analysis compared projected 2035 conditions with base conditions in 2006. The DRCOG analysis indicates that C-470 congestion that lasted one to two hours daily in the base year will lengthen to three to four hours daily by 2035, assuming no corridor improvements are made.

1.3.3 Delay

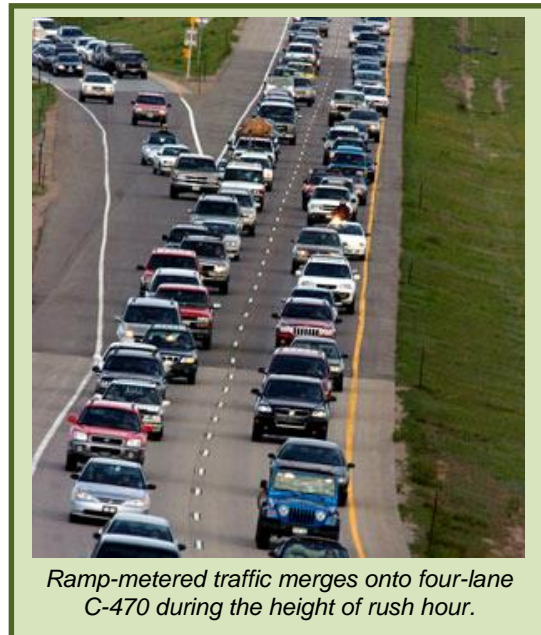
Congestion slows traffic flow, resulting in longer travel times during peak periods than during off-peak, free-flow conditions. The posted speed limit on C-470 is 65 miles per hour (mph), so in free-flow conditions it takes just under one minute to travel one mile. At a congested travel speed of 30 mph, it takes two minutes to travel one mile, including more than one minute of delay. Travel time sampling in 2013 found an average speed of 24 mph, or 2.5 minutes per mile, westbound during the evening peak between I-25 and Lucent Boulevard.

Appendix 1 of the DRCOG 2035 RTP provides the following estimates regarding daily vehicle hours of delay for the entire 26-mile C-470 highway:

- 2006: 6,650 daily hours of delay
- 2035: 41,940 daily hours of delay

Since the eastern half of C-470 has much higher traffic volumes today than the western half, the project area would account for well over half of the corridor-wide delay estimated by DRCOG.

Another delay metric from the same report is the percentage of peak period travel time in delay. For C-470 as a whole, DRCOG estimated that this would increase from 21 percent in 2006 to 49 percent in 2035. Again, delays for the C-470 project area would be worse than this corridor-wide prediction.



Ramp-metered traffic merges onto four-lane C-470 during the height of rush hour.

1.3.4 Reliability

Under highly congested conditions, travel on the corridor becomes extremely unpredictable. Any minor incident can disrupt upstream traffic flow for miles, and driver curiosity can disrupt flow in the other direction as well.

DRCOG assesses reliability with a metric called travel time variation, calculated as the ratio of peak-hour travel time to non-peak travel time. In its previously cited corridor vision, DRCOG reported a regional baseline average of 1.27 for this metric. DRCOG predicted the following for C-470 as a whole:

- 2006 travel time variation ratio, 1.44
- 2035 travel time variation ratio, 2.93

Travel time reliability is important to the successful operation of fixed route bus service. Currently, no bus routes of the

extensive Regional Transportation District (RTD) transit system use C-470. RTD has indicated a willingness to consider using C-470 if reliable travel times can be assured in the future.

1.4 OTHER CONSIDERATIONS

In addition to addressing traffic-related needs, it is appropriate to consider safety and to ensure that any proposed action would be financially feasible. These considerations are discussed below.

Safety

The 2006 EA indicated that C-470 generally did not experience major safety concerns, except at the Santa Fe interchange. Since then, a new flyover ramp opened in 2010 to carry southbound Santa Fe traffic to eastbound C-470. This safety improvement greatly reduces southbound left-turn volumes through the interchange complex, thus reducing traffic backups.

A new C-470 Corridor safety assessment based on 2008-2012 crash data was prepared as part of this Revised EA. This new safety assessment did not identify any crash types that could be attributed to roadway geometric deficiencies in specific locations. However, it shows – as did the prior study – that rear-end collisions account for about half of all reported C-470 crashes, and that rear-end collisions occur at much higher rates during weekday peak hours. Safety improvement is not specifically part of the project need, but the prevalence of rear-end collisions on C-470 is likely to decline if corridor improvements reduce traffic congestion.

Financial Feasibility

Proposed C-470 Corridor improvements will be feasible only if there are funds available for project construction. The 2006 EA examined a non-tolled general purpose lanes alternative and a tolled express lanes alternative. No available funding for general purpose lanes has arisen since then, but the

tolled express lane alternative has recently become financially feasible.

CDOT has determined that major reconstruction work on C-470 would be needed to provide adequate pavement condition and address horizontal and vertical curvature deficiencies. In a 2014 grant application to the U.S. Department of Transportation, CDOT estimated that \$77 million, or about one third of the C-470 project cost, would be needed for reconstruction to maintain existing lanes, and the remainder would provide for increased capacity (CDOT, 2014). [CDOT was not successful in its effort to secure a TIGER funds grant to help pay for the C-470 Proposed Action.] More recently, this estimate was revised upward due to Colorado highway cost escalation. The DRCOG 2040 RTP currently reflects total costs of \$385 million for C-470 improvements.

A new CDOT funding initiative created in 2013 is called the “Responsible Acceleration of Maintenance and Partnerships” (RAMP) Program. In 2013, the Colorado Transportation Commission approved funding for 44 projects totaling \$580 million under this one-time program. The largest single allocation was \$100 million (17% of the statewide total) awarded for C-470, in response to a C-470 Corridor Coalition request for twice that amount.

The \$100 million RAMP allocation could meet the C-470 reconstruction needs discussed above, but would not be sufficient to also provide capacity improvements. No other major sources of government funding appear to be available for the corridor in the foreseeable future. Therefore, the remaining funding for C-470 improvements would need to come from toll revenues collected from users of new C-470 lanes. Preliminary studies indicate that this funding approach would be financially feasible. Local agencies along the corridor are also contributing financially to the project.

1.5 SUMMARY

Nine years have passed since the 2006 EA proposed adding tolled express lanes to address traffic congestion and travel time reliability needs on C-470. Local and regional growth has continued. With continued growth, future traffic demand will increase on this already-congested highway, causing travel speeds to decline and trip reliability to worsen.

DRCOG has identified this portion of C-470 as a “key congested area” on the regional transportation system. If nothing is done to accommodate future traffic demand, DRCOG predicts that C-470 daily delay will increase from thousands of vehicle hours today to tens of thousands of vehicle hours by 2035. The daily duration of congested traffic is expected to double by 2035. DRCOG notes that C-470 travel time reliability is worse than the current regional average and will worsen substantially by 2035.

Cooperative efforts by CDOT and the members of the C-470 Corridor Coalition have made combined reconstruction and capacity improvements financially feasible in 2015, assuming toll collection on newly added lanes.