Chapter 3.0: Impacts and Mitigation

3.1 Land Use and Zoning

3.1.1 Existing Land Use

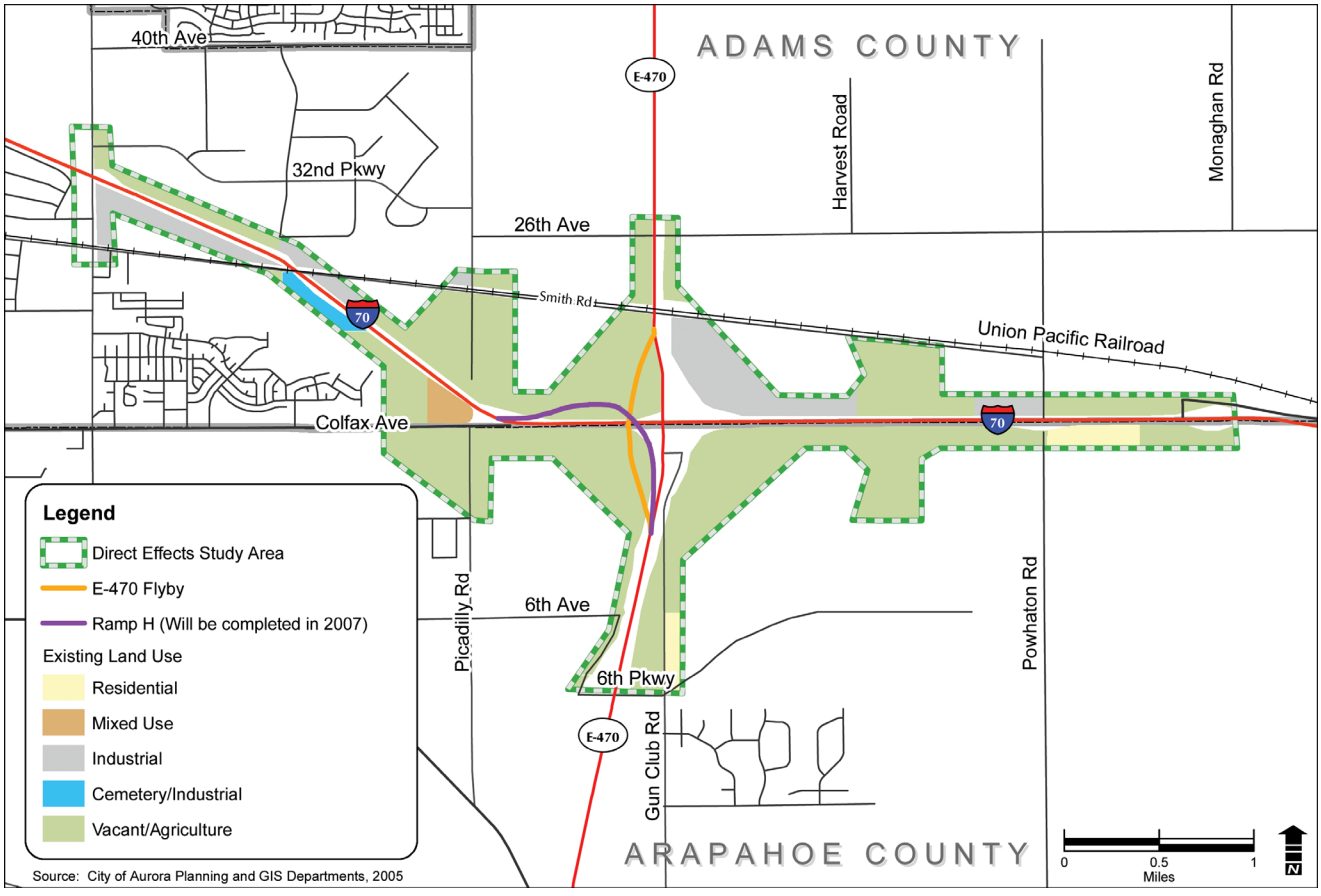
As shown in **Figure 3-1**, the predominant land use in the study area is agricultural. Additional land uses include industrial, residential, public, and commercial developments.

In the northern portion of the study area, several parcels of land support light industry. A number of warehouses and buildings associated with the UPRR are located partially inside the study area, just west of Picadilly Road. The British Petroleum Gas Plant and Blue Spruce Energy Center are located along Powhaton Road, just outside the study area.

Commercial development is scattered throughout the study area and caters mostly to agricultural uses. The most substantial business near the study area is Prologis business park, which is located northeast of the existing I-70/E-470 interchange.

Several residential developments are located in or near the study area. Foxridge Farm Mobile Home Park is south of I-70 on Powhaton Road. Approximately half of this subdivision lies inside of the study area. Cross Creek, a medium-density residential subdivision, lies east of Gun Club Road and

Figure 3-1
Existing Land Uses Within the Study Area



south of East 6th Avenue. A small section of the western part of the subdivision lies within the study area. There is a small residential/mixed-use area located just to the west of where Colfax and I-70 merge. This parcel consists of one single-family home, one multiunit residence, and a small business.

Public land uses within the study area include a cemetery, and E-470-owned and state-owned right-of-way for transportation uses related to I-70 and E-470.

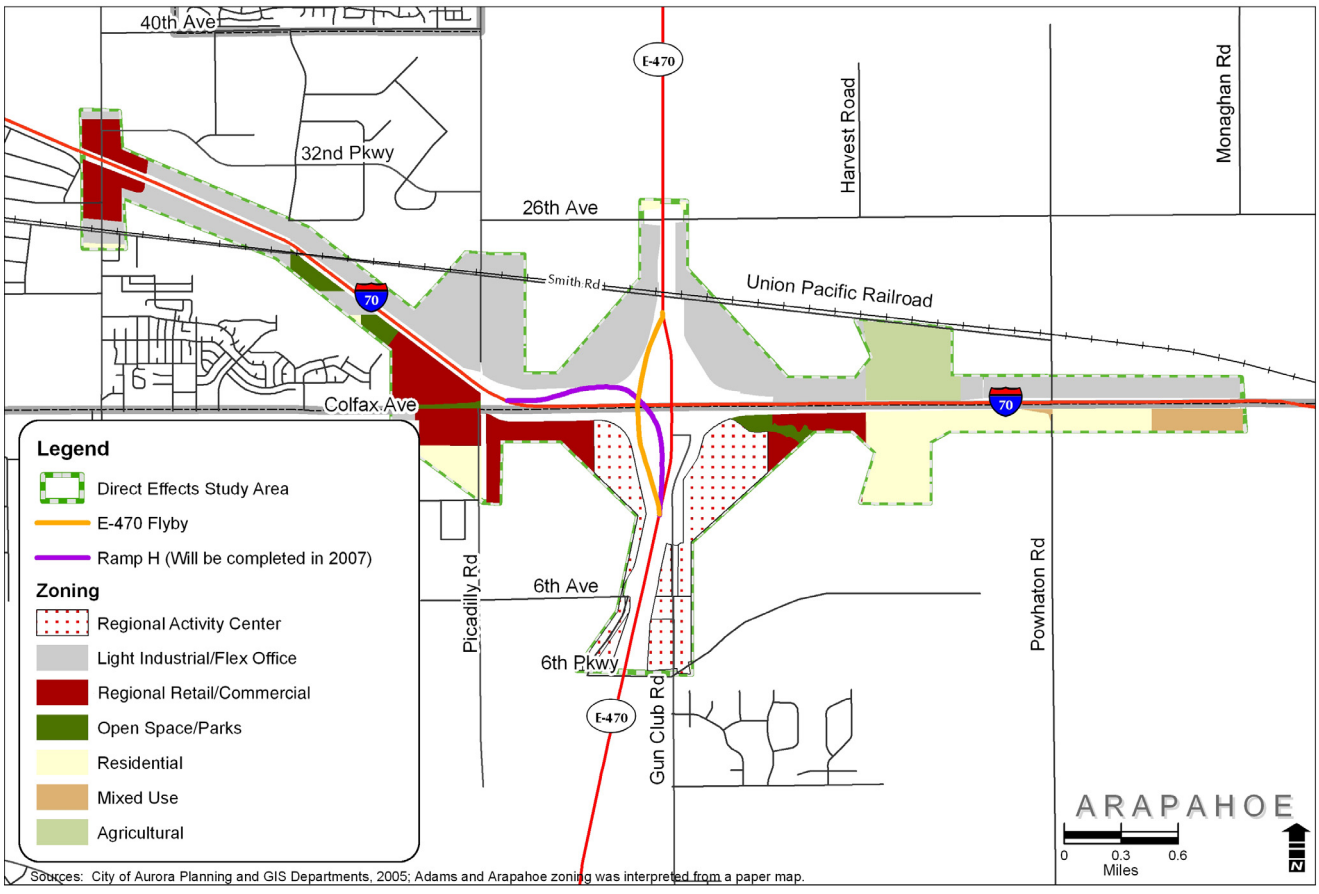
3.1.2 Existing Zoning

Existing zoning within and adjacent to the study area is shown in **Figure 3-2**. Land within the study area is zoned by the City of Aurora, Adams County, or Arapahoe County. The majority of the land is zoned by the City of Aurora.

The E-470 zoning district was created by the City of Aurora and includes the land making up the four quadrants surrounding the existing I-70/E-470 interchange (from Picadilly Road to Harvest Road and 6th Parkway to 26th Avenue). E-470 zoning districts within the study area include:

Regional Activity Center Sub-Area: a sub-area intended to generate economic activity. These large-scale, attractive, urban regional activity centers are to be visually pleasing and would serve as Aurora's "image makers" along the E-470 corridor. The primary interest is to create major economic generators using a mix of concentrated land uses in an organized fashion. Examples of development ideas

Figure 3-2
Existing Zoning Within and Adjacent to the Study Area



include restaurants, theatres, and shopping malls. Additionally, the areas are serviced by mass transit facilities (FastConnects) and are pedestrian-friendly, in order to reduce demand for auto-travel and enhance visual appeal.

Light Industrial/Flex Office Sub-Area: a sub-area to be used for high-quality distribution, industrial, technology, and assembly land uses. Both vehicular and rail transportation systems are used to support the industry and flex office/warehouse development within these areas. Residential uses are not permitted within this sub-area.

Regional Retail/Commercial Sub-Area: a sub-area intended to facilitate the development of high-quality retail and employment centers. Land use in this area takes full advantage of major transportation corridors. Examples of development ideas include shopping centers, hotels, and motels. Office and residential uses are allowed, but are not intended to be the primary use of this sub-area. The intensity of development in this sub-area is intended to be less than that of the Regional Activity Center sub-area.

Open Space/Parks Sub-Area: a sub-area designated as unoccupied space open to the sky. It is used as a recreational area exclusively for pedestrian and non-motorized traffic.

Additional zoning within the study area includes residential, agriculture, and mixed use.

3.1.3 Future Land Use

The following plans and reports are used to guide land use in the study area:

- *City of Aurora Comprehensive Plan*, 2003
- *DRCOG Metro Vision 2030 Plan,* 2005
- *Adams County Comprehensive Plan*, 2004
- *Arapahoe County Comprehensive Plan*, 2001

The *City of Aurora Comprehensive Plan*, 2003, is the only plan that specifically addresses land use in the study area. The Comprehensive Plan is a strategic document that is used to guide the City's policy making. It is designed to help the City make informed choices about future growth and redevelopment. The plan addresses a range of issues from land use and development to urban design and maintenance, and enhancement of a sound financial process.

The City of Aurora has extensive plans for renewal and redevelopment in the study area. According to the Comprehensive Plan, the E-470 corridor provides a critical opportunity for high-quality economic and residential development.

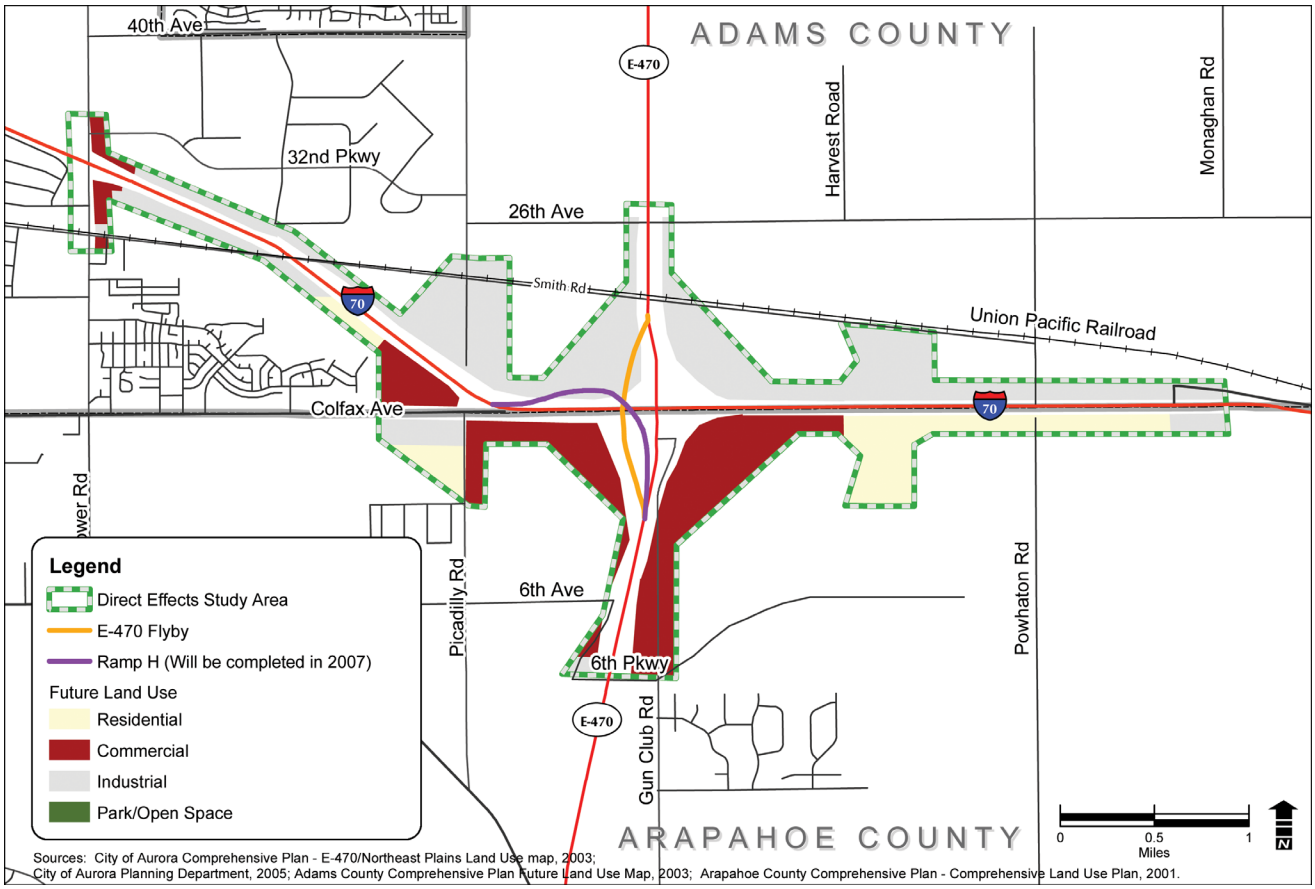
Low-density residential neighborhoods located outside the study area are expected to grow, and the medium-density residential area of Cross Creek (East 6th Parkway and Gun Club Road), located partially inside the study area, is in the process of expanding. Light industrial parcels found north of I-70 are also in the process of expansion.

The *Metro Vision 2030 Plan* is the Denver region's plan for future growth. It integrates previously separate plans for growth, development, transportation, and water quality management.

The Arapahoe and Adams County comprehensive plans recognize the adopted land use plans for the City of Aurora as being consistent with county planning efforts.

Figure 3-3 shows future land use in the study area.

Figure 3-3
Future Land Use in the Study Area



3.1.4 Land Use Impacts

This section addresses impacts to land use.

How much growth is anticipated? Population is expected to grow in the City of Aurora, as well as in Adams and Arapahoe Counties by a range of 30 to 60 percent between now and 2030. The housing trend is also growing: there are 9 percent more housing units in the City of Aurora in 2000 than there were in 1990, and is anticipated to continue.

Would this project encourage more growth? This project would support the growth that has already been planned in the area. Without the proposed interchange and roadway improvements, the planned development could be constrained by traffic congestion causing secondary problems to overall mobility and business access.

No-Action Alternative. Substantial growth and development is expected to continue regardless of whether or not the proposed action is constructed. Increased residential and commercial development would lead to increased congestion and travel time delays along I-70, E-470, and local roads adjacent to the study area. The No-Action Alternative would restrict accessibility and overall mobility in and beyond the study area. Therefore, the No-Action Alternative by itself is not compatible with future local and area development plans.

Preferred Alternative. Construction of the Preferred Alternative would result in a direct conversion of land to a transportation use. Thirteen properties in the study area would be impacted for right-of-way purposes (see Section 3.4, Right-of-Way). The Preferred Alternative is consistent with planned devel-

opment in the general area and it would more adequately support through traffic with a strong arterial network.

The Preferred Alternative would encourage development in currently undeveloped rural areas. However, such development is consistent with local and regional land use plans and is supported by local planning and zoning agencies (see Section 3.1.6 for more detail).

How is the rural landscape going to change? The rural and suburban patterns of development that are common along the I-70/E-470 corridors between Smith Road and 6th Parkway, and Picadilly and Airpark Roads have become affected by the rapid and substantial regional growth.

The land surrounding I-70/E-470 interchange is in a special zoning district created by the City of Aurora in 2003 to encourage reasonable development and employment growth. The interchange improvement would support the planned growth.

The City of Aurora has adopted a regional Smart Growth development and zoning plan for the E-470 corridor to better manage anticipated growth. This plan is based on the objective of developing town and community activity centers. Zoning districts require centers that would be primarily situated at E-470 interchanges. These centers would be characterized by higher development density than surrounding areas, mixed land uses, compact development form with defined edges, more traditionally urban pattern of buildings set close to streets and sidewalks. Plans include high-quality connections to the existing road and transit networks, and an extensive pedestrian network and bicycle connections. These connections are discussed further in Section 3.6.4.2 of this EA.

3.1.5 Land Use Mitigation

No mitigation is necessary for land use impacts. See Section 3.4.3, Right-of-Way, for mitigation measures associated with the acquisition of property.

3.1.6 Indirect Effects and Induced Growth

The Delphi Plus methodology was used to assess the indirect induced growth effects of the design alternatives being considered for the improvement of the I-70/E-470 interchange complex. The results of this analysis for the No-Action and Preferred Alternatives are summarized below. They are documented fully in the *Indirect Effects Technical Mem-*

What is causing all the growth? This area was targeted for growth by the *City of Aurora Comprehensive Plan* 2003, and supported by the *Metro Vision 2030 Plan, Adams County Comprehensive Plan,* 2004, and *Arapahoe County Comprehensive Plan,* 2001. Market forces that contribute to attractiveness of development include proximity to employment, land values, supportive public policies, availability of water, and proximity to Denver International Airport. The *City of Aurora Comprehensive Plan* (adopted October 27, 2003) contains a variety of key provisions that assist in the successful implementation of Smart Growth development. The following is a description of City policies directed at accomplishing Smart Growth:

E-470 Corridor: The zoning that has been adopted for the E-470 corridor is based on the objective of developing activity centers. Zone districts require centers at the neighborhood, community, and regional levels (situated primarily at the existing and planned E-470 interchanges). The centers would have the following consistent set of characteristics:

- Higher development density than surrounding areas
- Mixed land uses
- Compact development form and defined edges
- High-quality connections to the existing road and transit network
- An extensive pedestrian network and bike connections, and buildings set close to streets and walkways in a traditional urban pattern

Water and Other Natural Resources: Creeks, wetlands, and other water features shall be preserved, to the greatest extent possible, in their natural state. These features would be used for water quality enhancement, storm water management, open space, and recreational purposes when appropriate. Use of vegetative buffers to protect wetlands and other water features from development encroachment is required. Open space corridors shall be preserved and interconnected as much as possible in order to preserve existing wildlife corridors and extend the urban trail system.

Smart Growth in General: New town centers would exist at a variety of the zoned Regional Activity Centers within the E-470 corridor. These centers would be developed in a synergistic manner, affording work/shop/live/play opportunities for area residents, as well as acting as regional draws for employment, recreation, hospitality, and shopping activities. These centers would be intensive, mixed-use developments at the E-470 interchanges. The centers would feature walkable main streets and focal points (prominent buildings with distinctive architecture). The E-470 corridor plan also includes mixed-use employment areas and areas for new, high-quality neighborhoods. Design standards for the corridor require quality materials and integration throughout each center.

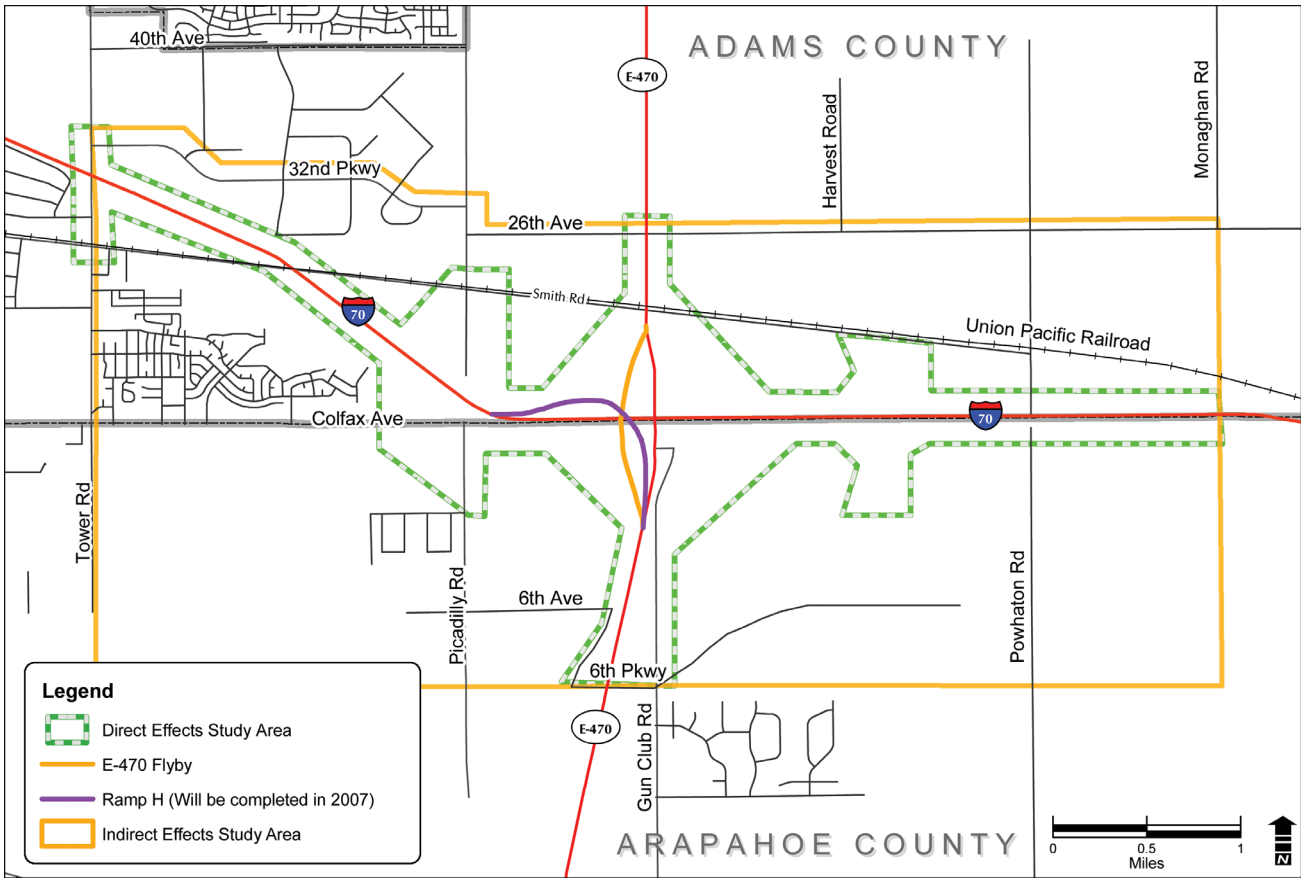
orandum prepared for this EA (Carter & Burgess, 2004).

Indirect effects, as defined by the Council on Environmental Quality (CEQ), are those effects that are caused by a proposed action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR § 1508.8).

The Delphi Plus methodology relies on established models of transportation analysis and geographical research to predict how land use would change with a new transportation project. The technique applies the results of research on the land use impacts of transportation projects to local data, such as infrastructure plans, growth policies, and existing and future zoning and land uses. Once assembled, this information is utilized to identify potential land use impacts. A team of land use, socioeconomic, and economic experts review the data and finalize the prediction of potential indirect effects. Related impacts to environmental resources are then assessed.

The study area for the analysis of indirect induced growth effects was chosen to represent the area that would most likely be influenced by the construction of an improved/new interchange at I-70/E-470. Study area boundaries included Tower Road on the west, Monaghan Road on the east, 6th Avenue, 6th Parkway on the south, and 26th Avenue/32nd Parkway on the north. The study area for the indirect effects analysis is shown in **Figure 3-4.**

Figure 3-4
Indirect Effects Study Area



Overall, the analysis determined that the No-Action Alternative would have more indirect impacts to certain natural resources as a result of possible land use changes, when compared to the Preferred Alternative. This is because indirect impacts resulting from the No-Action Alternative would include a shift in land development patterns to the south part of the study area. Here, there would be greater impacts to prairie dog and white-tailed deer habitat, riparian areas, wetlands, and the 100-year floodplains associated with the study area. This shift is largely because Adams County, Arapahoe County, and the City of Aurora have identified the E-470 area along I-70 as a strong employment growth area and have zoned the study area and planned future land uses accordingly. Therefore, the growth would occur whether or not improvements are completed along I-70. If they are not completed, growth would simply occur farther south where there are larger areas of floodplain, wildlife habitat, and wetland/riparian areas. **Table 3-1** shows a comparison of the potential indirect effects to environmental resources in the study area.

Table 3-1
Potential Indirect Effects to Environmental Resources in the Study Area

Resource	No-Action Alternative(1)	Preferred Alternative(1)
Wildlife Habitat	1,678 acres	1,225 acres
Wetlands/ Riparian Areas	36 acres	12 acres
Floodplains	Intense development in and adjacent to floodplain.	Open space in, and less intense development adjacent to, floodplain.

(1) Values reported in this table are approximate and are based on predicted land use changes derived from input received from the indirect effects panel (2004), as well as Aurora, Adams County, and Arapahoe County zoning data. Impacts would be minimized with the Preferred Alternative.

The analysis also showed that indirect impacts of land use changes could result in increases in noise, traffic, and other effects to rural quality of life. These impacts would be more noticeable to areas along Picadilly and Harvest Road as development occurs at those new interchanges.

Typical mitigation for the indirect growth-related impacts of a project includes the adoption of Smart Growth policies, open space acquisition, and/or the implementation of transportation demand management policies and design standards.

Mitigation that could be considered for local jurisdictions includes:

- Commitments to enforcing Smart Growth policies as evidenced in the differential figures of the impacts shown in **Table 3-1** (see letter from the City of Aurora in **Appendix A** committing to Smart Growth principles).
- Commitments for open space set asides or acquisitions, particularly along the floodplains of Sand Creek and First Creek.
- Adequate and timely investments in supportive infrastructure, such as the local street system underway as demonstrated in the No-Action Alternative.
- Commitments to appropriate design standards to minimize air pollution and traffic impacts (development in the vicinity of the new interchanges would replace rural, undeveloped land potentially impacting visual quality and quality of life for residents currently living in this mostly rural area).

3.2 FARMLAND

3.2.1 Existing Conditions

The Farmland Protection Policy Act of 1981 protects prime and unique farmland as identified by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). The purpose of the act is to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses. It also assures that federal programs are

administered in a manner that, to the extent practicable, would be compatible with government and private programs and policies to protect farmland.

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and can economically produce sustained high yields of these crops when treated and managed according to acceptable farming practices. Unique farmland is land other than prime farmland that is used to produce specific high-value food and fiber crops. It can economically produce sustained high yields of these specialized crops when treated and managed according to acceptable farming practices. Farmland of statewide importance is land that has been identified by criteria determined by the Colorado State Experiment Station, the Colorado State Department of Agriculture and the Colorado State Soil Conservation Board. Farmland of local importance is land that has not been identified as having national or statewide importance, yet may have local significance based on the goals of the community and of the various agricultural enterprises that maintain a viable agricultural community.

Information defining prime and unique farmlands and farmlands of statewide or local importance in the study area was obtained from the NRCS Brighton Service Center. Soils surveys of Adams County (1974) and Arapahoe County (1971) were also referenced.

The NRCS identified several soil types in the vicinity of the study area as prime farmland if irrigated; however, the majority of the study area is planned for development and has been zoned for industrial, commercial, or residential development. Under the Farmland Protection Policy Act, lands that are in urban use or that would be developed in the near future are not considered farmland. Additionally, existing transportation right-of-way is not considered farmland. One parcel within the study area, located between I-70 and Smith Road just east of Harvest Road, has been zoned for agricultural use. Because the land upon this parcel is not irrigated, it is not considered prime farmland. Therefore, there are no prime or unique farmlands or farmlands of statewide or local importance within the study area. Correspondence with the NRCS Brighton Service Center and form AD-1006 is located in **Appendix A**.

Research of organic and truck farms in Colorado (Organic Commodities Statistics, Colorado Department of Agriculture--Division of Plant Industry, 1998) did not identify any such farms within or adjacent to the proposed interchange location.

3.2.2 Farmland Impacts

There are no prime or unique farmlands or farmlands of statewide or local importance within the study area. Therefore, no impacts to farmlands would occur under either the No-Action or the Preferred Alternative.

3.2.3 Farmland Mitigation

Because there are no impacts to prime or unique farmlands or farmlands of statewide importance, no mitigation is required.

3.3 Social

3.3.1 Existing and Forecasted Conditions

The study area is located partly in Adams County and partly in Arapahoe County, and mainly lies within the City of Aurora. The areas surrounding the study area have experienced considerable population growth over the past decade. Substantial growth is expected to continue in the region and study area. **Table 3-2** shows current and projected population statistics for the state of Colorado, Adams County, Arapahoe County, and the City of Aurora.

Table 3-2
Current and Projected Population Statistics

Location	1990[1]	2000[1]	Percent Change 1990-2000	2025	2030
Colorado	3,294,394	4,301,261	31%	6,652,082[2]	7,156,422[2]
Adams County	265,038	363,857	37%	635,685[2]	699,541[2]
Arapahoe County	391,591	487,967	25%	648,279[2]	668,776[2]
City of Aurora	222,103	276,393	24%	423,577[3]	460,456[3]

(1) US Census Bureau, 1990 and 2000.
(2) Colorado Demography Section, Department of Local Affairs (DOLA), November 2004.
(3) City of Aurora, Colorado, 2004 Population Projections (based on DRCOG Exponential Projection).

3.3.2 Community Facilities

Many of the community facilities that serve the residents of this region lie outside the study area. However, area residents generally use the E-470 and I-70 highways to access these facilities. There are 77 public schools (only one of which is located east of E-470 as of March 2006), a community college, a public library, and three hospitals within the Aurora city limits. None of these facilities are located within the study area. East of E-470, just outside the study area, the Front Range Airport provides services for non-commercial, corporate, and private aircraft, and as an air freight hub with a roadway connection to DIA.

There is a small, active cemetery located south of I-70 and west of E-470 within the study area. It is not considered to be historic; however, it is an important community feature. It would not be affected.

3.3.3 Emergency Services

A number of emergency service entities provide response services to residents in the study area. The City of Aurora Fire Department and the Sable Altura Fire Department provide fire and other emergency response services. All fire and emergency service dispatching is controlled by the City of Aurora. The Arapahoe County and Adams County Sheriff Departments provide law enforcement services to the unincorporated areas in and around the study area. Along the I-70 and E-470 corridors the Colorado State Patrol holds jurisdiction over all traffic violations. The City of Aurora Police Department provides law enforcement services to the areas that have been annexed into the City of Aurora.

3.3.4 Housing Availability in the Study Area

After experiencing only a minimal increase in population during the economic slump between 1980 and 1990, the City of Aurora experienced much greater population growth from 1990 to 2000. According to the *City of Aurora Comprehensive Plan,* 2003, this growth was due primarily to a decrease in the number of vacant residences and to an increase in household size. This occurred because of a resurgence of economic development and job creation. **Table 3-3** shows a comparison of housing statistics for Aurora in 1990 and 2000.

Table 3-3
Comparison for 1990 and 2000 Census Housing Statistics for the City of Aurora

	1990	2000
Total Housing Units	99,890	109,260
- Occupied	89,132	105,625
- Owner	52,313	67,489
- Renter	36,819	38,136
- Vacant	10,758	3,635
Household Size	2.47	2.6

Source: US Census Bureau, 2000.

The study area includes partial sections of two residential areas in Aurora. Foxridge Farm Mobile Home Park is located south of I-70 on Powhaton Road. Approximately half of this neighborhood lies within the study area. Cross Creek, a subdivision located at Gun Club Road and East 6th Avenue, also lies partially within the study area. Finally, the former Candle Lite Motel, which is used as a multi-unit residence, and a single-family residence are located within the study area at the interchange of Colfax and I-70.

3.3.5 Social Impacts

This section describes impacts to the social environment.

Would this project encroach into my neighborhood? The immediate construction of the I-70/E-470, Picadilly Road, and Harvest Road Interchanges would not directly encroach on any existing neighborhood, except for the Feed Store complex centered within the existing Colfax /I-70 interchange. However, the proposed City of Aurora roadway improvements to Picadilly and Harvest Roads and the future relocation of Colfax Avenue are designed to carry more traffic into and around the adjacent residential areas. These road improvements are planned to respond to the increased population and residential and commercial development projected for this portion of Aurora and Arapahoe/Adams Counties. The planned development at Horizon City Center would provide new right-of-way required for roadway improvements to Picadilly Road. It is anticipated that no new right-of-way would be required from existing residential property owners except at the Feed Store complex.

What changes would this project cause to my neighborhood? Although the interchange project limits do not intrude upon any neighborhood within the study area, some impacts would result from locally planned roadway upgrades and improvements. These impacts include temporary disturbances associated with construction, such as equipment noise, traffic diversions or access changes, would be disclosed and coordinated with neighborhoods in advance of construction activity.

No-Action Alternative. The No-Action Alternative would not change population growth trends or development patterns within the study area. Because substantial growth is planned for the area surrounding the interchange (as evidenced by population statistics and the approved land use plans of the administering jurisdictions), increased congestion along I-70, E-470, and local connectors is expected. This would result in time delays, safety concerns, and out-of-direction travel for residential areas near the study area. Response times for emergency service vehicles would also increase. Planned arterial roadways, such as a six-lane Picadilly Road, along residential developments would add to the changing rural character of these existing neighborhoods.

Preferred Alternative. Construction of the Preferred Alternative would result in improved local and regional accessibility. Reduced travel times and improved mobility for local residents to regional destinations is expected to occur. The Preferred Alternative is consistent with local and area development plans and would alleviate traffic congestion as the area progresses from primarily agricultural to mixed, commercial, and residential uses.

Under the Preferred Alternative, planned development would happen smoother and faster in the location of the study area. However, development would still occur under the No-Action Alternative, but in different locations (see Section 3.1.6, Indirect Effects and Induced Growth)

Response times for emergency vehicles would improve with increased mobility and reduced congestion. Community facilities and services would not be disrupted, nor would neighborhoods be divided.

Impacts to the former Candle Lite Motel and the nearby residence would include an increase in traffic-related noise, air pollution, traffic, and a decrease in visual quality.

3.3.6 Social Mitigation

No social mitigation is needed.

3.3.7 Environmental Justice

3.3.7.1 Environmental Justice Existing Conditions

In February 1994, President Clinton issued Executive Order 12898 requiring federal agencies to incorporate consideration of environmental justice into the NEPA evaluation process. The purpose of

this order is to ensure that minority and low-income populations and minority-owned businesses do not receive disproportionately high and adverse human health or environmental impacts as a result of federal actions. This analysis is done in compliance with CDOT's *Title VI and Environmental Justice Guidelines for NEPA Projects* released in December, 2004.

3.3.7.2 Minority Populations and Minority-Owned Businesses

The discussion of minority populations is based upon information from *Census 2000* data at the block level because that is all that is available. Minority populations are comprised of ethnic and/or racial minorities. According to census data, race information is broken down into seven mutually exclusive categories: White, Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, some other race, and two or more races. It is important to note that Hispanic is not listed as a race category; data pertaining to the people of Hispanic origin is accounted for under euthanasic.

The percentages of minority populations within each census block are compared to county averages. Adams County and Arapahoe County as a whole contain minority populations of 36.7 percent and 26.1 percent, respectively. Of the blocks located within the study area in Adams County, three blocks (Tract 83.53, Block Group 1, blocks 1069, 1095, and 1073) have a minority population greater than the county average (see **Table 3-4** and **Figure 3-5**). However, these blocks contain only one or two households each, since the populations of these blocks are three, six, and nine persons. In addition, in these three blocks, there are no residential units in the portion of the block that falls within the study area. The households are outside of the study area boundary. Of the blocks located in Arapahoe County, two blocks within the study area (Tract 71.02, Block Group 2, Block 1014, and Tract 71.02, Block Group 3, and Block 2045) have a minority population greater than the county average (see **Table 3-4** and **Figure 3-5**). One of these blocks (Block 1014) is likely to have only a few households since the block has a population of 22. However, again there are no residential units in this block found in the study area. The other block (Block 2045), which is 33 percent minority, represents part of the Foxridge Farm Mobile Home Park located south of I-70 on Powhaton. According to CDOT guidance, based on the minority percentage, this block should be evaluated for disproportionately high and adverse effects.

3.3.7.3 Low-Income Populations

For purposes of privacy, available income information as reported from the government is limited to the census block group. CDOT's recommended approach in determining low-income populations in the study area is to utilize the income thresholds set annually by the U.S. Department of Housing and Urban Development (HUD).

There are five block groups in the study area, which include over 2,000 households, most of which are not within the study area. The geographic boundaries of the block groups extend well outside of the study area. However, household and income data from these block groups were used to representatively describe the study area.

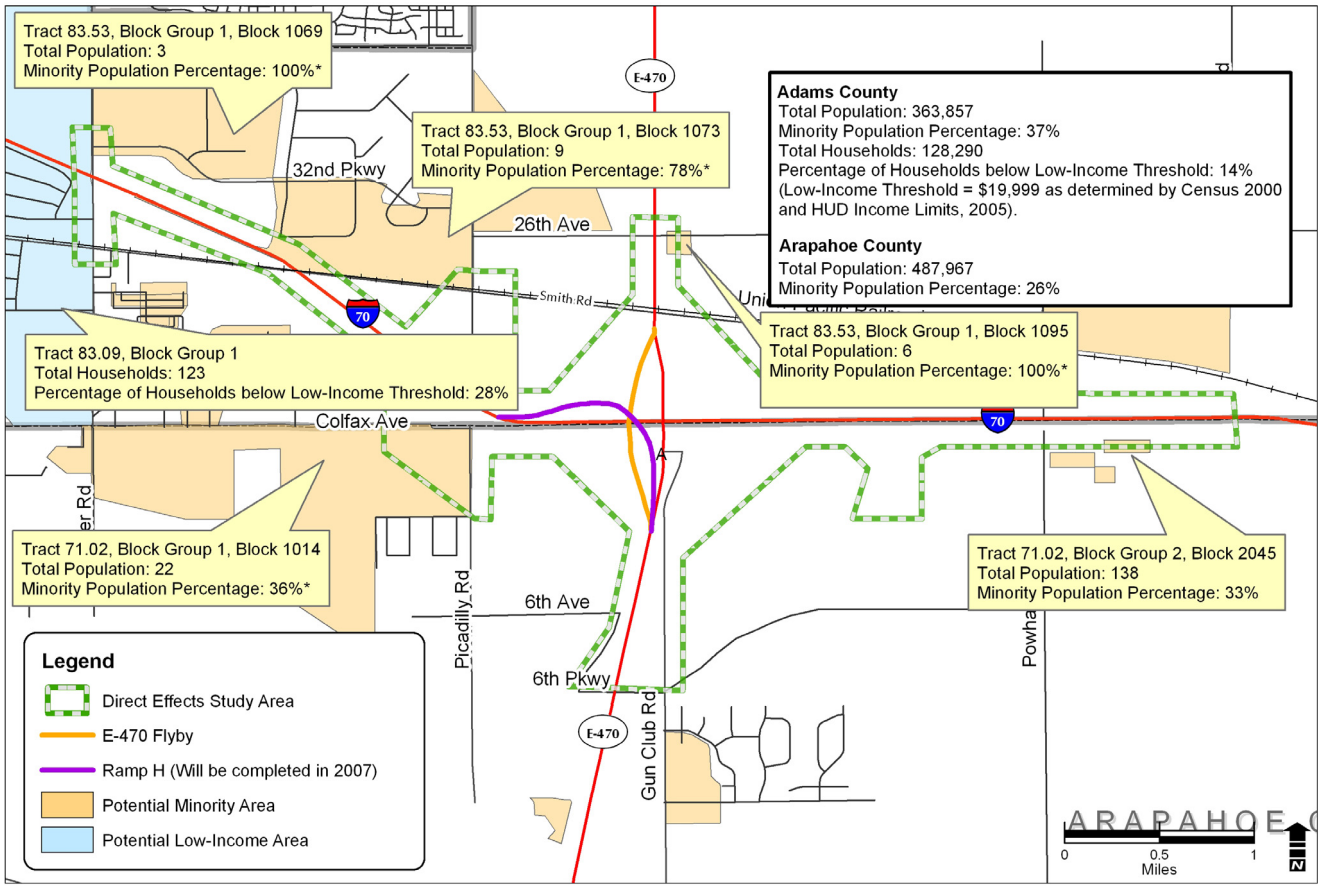
The median family income in the Denver Metropolitan Statistical Area (MSA) is $71,300 (2006 HUD Income Limits). The study area is located in two counties, Arapahoe and Adams. The average household size is used to determine the average median income (AMI) for each county. The average household size for Adams County is 2.81 persons, while the average household size for Arapahoe County is 2.53 persons. The income limits for 30 percent of the AMI, for Arapahoe and Adams Counties are $18,339 and $18,941, respectively. Income limits for 30 percent of the AMI are used as a threshold for determining low income, consistent with the methodology identified in the CDOT's *Title VI and Environmental Justice Guidelines for NEPA Projects*. Because census income statistics are divided into increments of $5,000, the income threshold of $19,999 is used in this analysis. Any households in the study area with average household incomes below $19,999 are considered to be low-income and are to be evaluated as a low-income community.

Table 3-4
Potential Minority Populations in the Study Area*

Total Population	Total Population	Minority Population	Percent Minority
Tract 71.02, Block Group 1, Block 1014	22	8	36%
Tract 71.02, Block Group 2, Block 2045	138	45	33%
Tract 83.53, Block Group 1, Block 1073	9	7	78%**
Tract 83.53, Block Group 1, Block 1095	6	6	100%**
Tract 83.53, Block Group 1, Block 1069	3	3	100%**
Adams County	363,857	133,357	37%
Arapahoe County	487,967	127,223	26%

Source: *Census 2000.*
* Although the study area stretches east to Monaghan Road and west to Tower Road, the populations in the census block located near these areas would not be directly impacted by the proposed action.
**The minority populations that live in these census blocks are physically located outside of the study area.

Figure 3-5
Potential Low-Income and Minority Populations



* The minority population that live in these census blocks are physically located outside of the study area.

According to *Census 2000* data at the block group level, 14.4 percent of the households in Adams County and 11.8 percent of the households in Arapahoe County fall below the $19,999 low-income level. Census block groups with a higher percentage of low-income populations than their respective counties would be evaluated for disproportionately high and adverse effects. Only one block group in the study area has a higher percentage of low-income population than its respective county (Tract 83.09, Block Group 1). However, this block group, which has 28 percent of households below the threshold, extends well beyond the study area (see **Figure 3-5**). In addition, an examination of aerial photography revealed that there are no homes within the portion of the block group found within the study area. Therefore, according to census data, there does not appear to be a low-income population within the study area that would experience disproportionately high and adverse impacts.

3.3.7.4 Other Data Sources

Because the data collected by the U.S. Census Bureau is geographically broad and does not present the level of detail needed to identify individual environmental justice impacts, additional sources of data were utilized. Field visits were conducted in July 2004 and August 2005. The former Candle Lite Motel (located at 21561 East Colfax) and a nearby residence were determined to be of concern. According to a property manager, the former motel contains 12 units, but only six people were living there at the time of the first visit. The property manager noted that the rents in the building were low, the building is rarely fully occupied, and it has a high turnover rate. Based on the proximity to the former Candle Lite Motel and transportation infrastructure, the residence may also be considered low-income. Although census data does not identify this location (of the former motel and residence) as an area of low-income concern, it has been evaluated for disproportionately high and adverse effects.

3.3.7.5 Outreach to Low-Income and Minority Populations

Specialized outreach to low-income and minority populations was conducted as part of the public involvement process to gather comments and concerns regarding the project. Outreach included project mailings, which announced upcoming meetings and described the project process, and fliers distributed to businesses and residences in the study area prior to every open house. In addition, a Spanish translator attended the public open houses to answer questions and facilitate comments, and project material was translated and available. In depth description of outreach and public involvement is contained in Section 4.1 of this document.

A brief conversation was held with the business owner of the feed store and the manager of the former motel located on the parcel that is of low-income concern at Colfax and I-70. The owner and manager both indicated support for the project and no concerns. No individuals located in the low-income areas of concern attended the public meetings or requested correspondence with the consultant team despite the specialized outreach.

3.3.8 Environmental Justice Impacts

This section describes impacts to low-income and minority populations.

Why are low-income and minority populations given special consideration? Because some federal actions in the past have had disproportionate impacts to low-income and minority populations, President Clinton signed an Executive Order in 1994 that requires us to look at these particular impacts more closely.

No-Action Alternative. The No-Action Alternative would not result in any disproportionate adverse impacts to minority or low-income populations. Increased congestion, particularly at the I-70/Gun Club Road interchange, associated with the No-Action Alternative would hinder access to employment and housing in the study area. Because of the new and expanded roadways at Picadilly Road and Harvest Road, the No-Action Alternative may

require property acquisitions; however, these are not known at this time.

Preferred Alternative. The Preferred Alternative would not require the relocation of any businesses or residences in the study area.

Residents of the Foxridge Farm Mobile Home Park would benefit from improved mobility and access to housing, businesses, and community facilities throughout the region. Temporary impacts to the community would include increased noise, and traffic during construction. In addition, temporary air quality impacts may include increases in dust and dirt. However, only a portion of the park lies inside the study area. This portion is only 24 percent of the population of the census block. Further, the block itself is only partially within the study area. Both minority and non-minority populations will equally experience these impacts. Therefore, these impacts would not be disproportionately high and adverse because they would not be predominately borne by minority populations, nor would they be appreciably more severe or greater in magnitude than the impacts borne by non-minority populations.

Although there would be impacts to the low-income population identified by the property manager of the former Candle Lite Motel (the former motel and adjacent residence), these impacts would not be large; existing conditions for the former motel and residence would not drastically change. Temporary impacts would include increased noise during construction, as well as an increase in dust and dirt which affects air quality. This would subside once construction is complete. Measures implemented to avoid impact to the area include revising the design plan for Picadilly so as to reduce noise and visual impairment to the parcel, adding a connector roadway over the eastbound on ramp to relocate Colfax, and to maintain access to the parcel. Residents in the parcel would cumulatively benefit from the proposed action due to an increase in development and an increase in economic activity compared to the No-Action Alternative. In addition, because the former motel has only a transient population, there does not seem to be a cohesive community in the area. For these reasons, low-income populations would not experience a disproportionately high and adverse impact.

3.3.9 Environmental Justice Mitigation

Because there would be no disproportionate adverse impacts to low-income or minority populations in the study area, no mitigation measures are required. Mitigation for noise, visual, and construction-related impacts are addressed in Section 3.9.4, Section 3.19.3, and Section 3.21.2, respectively.

3.4 Right-of-Way and Relocation

3.4.1 Existing Conditions

The information necessary for the analysis of existing right-of-way for the study area was provided from measurements of preliminary concept plans. The existing right-of-way varies depending on the specific road. The approximate widths of existing right-of-way for roads within the study area are found in **Table 3-5**.

Table 3-5
Approximate Right-of-Way Widths for Existing Roads

Road	Approximate Width
I-70 Mainline	Varies from 250 feet to 325 feet
Colfax Avenue	200 feet
E-470 Mainline	Varies from 315 feet to 325 feet
Picadilly Road	25 feet
Gun Club Road	30 feet

3.4.2 Right-of-Way Impacts

No-Action Alternative. The No-Action Alternative would not require any relocations.

Preferred Alternative. The Preferred Alternative would require the acquisition of approximately 235 acres of new right-of-way. At the I-70/Picadilly Road and I-70/Harvest Road interchanges, approximately 75 and 160 acres of new right-of-way would be acquired, respectively. Based on current design, construction of the Preferred Alternative would

require partial acquisition of 13 parcels. No relocations would be required.

The relocation of Picadilly Road and the new interchange at I-70 would primarily affect vacant properties north and south of I-70. The only effect to these properties would be the conversion of the land that is adjacent to I-70 to highway right-of-way. There would not be property segmentation or access changes. In addition to the vacant properties that will be impacted, the land that contains the former motel parcel on Colfax Avenue would be connected to the relocation of Colfax Avenue by a new bridge over the eastbound on-ramp to I-70. The location of Harvest Road and the new I-70 interchange would be located entirely on vacant property or farm property. Description of the right-of-way road widths for the Preferred Alternative are found in **Table 3-6. Figure 3-6** is a map showing the new right-of-way that will be required. **Table 3-7** shows the impact to individual parcels.

Table 3-6
Approximate Right-of-Way Widths for Proposed Roads

Road	Approximate Width
I-70 Mainline	Varies from 250 feet to 325 feet
Relocated Colfax Avenue	Undetermined*
E-470 Mainline	No proposed right-of-way**
Harvest Road	Varies from 250 feet to 300 feet
Picadilly Road	150 feet

* The proposed six-lane Colfax alignment has several proposed alignments varying in width.

** Right-of-way for E-470 mainline has already been acquired by the E-470 Authority; therefore, there would be no change.

Figure 3-6
Existing and Proposed Right-of-Way

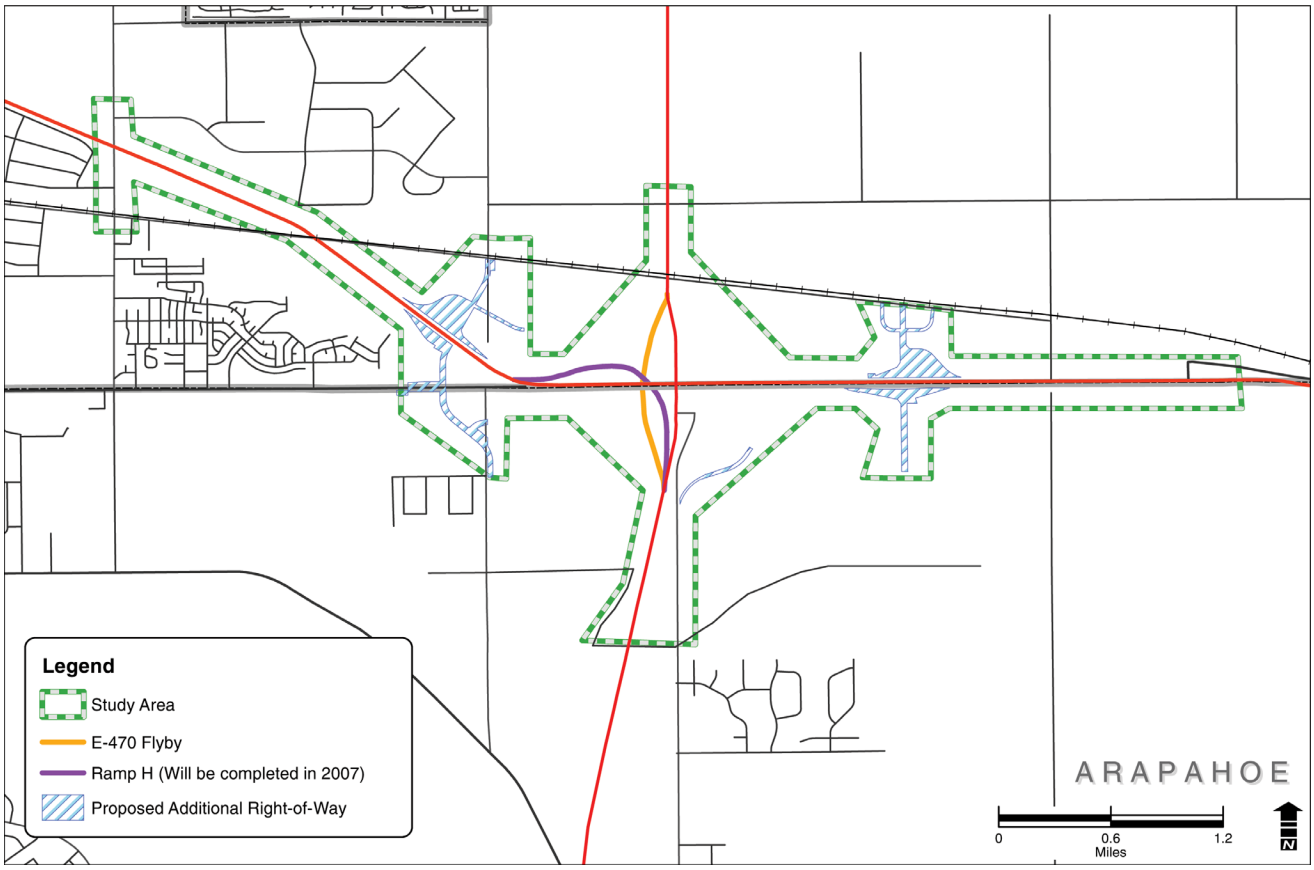


Table 3-7
Right-of-Way Impact to Parcels in the Study Area

Parcel Owner	Total Area of Parcel in Acres	Area of Impact to Parcel in Acres
Cordillera	140.19	31.89
Catellus	294.43	3.24
Gennesse	136.92	9.22
Denver Group	20.61	3.11
Sells	77.64	0.34
Bounds	74.12	1.13
Coakes	74.63	12.14
Horizon	492.35	1.75
Gun Club	226.45	5.16
Grim	318.56	35.16
Property Reserve	999.63	21.23
TOTAL	**2,855.53**	**124.36**

3.4.3 Right-of-Way Mitigation

Acquisition of land for right-of-way would begin when the proposed action is fully designed, funded, and moves toward construction. Right-of-way acquisition for the I-70/E-470 interchange complex would comply with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646), as amended, which contains specific requirements that govern the manner in which a government entity acquires property for public use. The purpose of the Uniform Act is to provide a uniform policy for fair and equitable treatment of persons displaced from their homes, businesses, or farms as a result of federal and federally assisted programs. The law is designed to ensure just compensation for all acquired properties and minimal impact to the current owners.

The Uniform Act requires that a property owner be notified of the interest to acquire their property before a real property appraisal is completed. Each property owner is given the opportunity to accompany the appraiser during the inspection of the property. Just compensation is established based on a current appraisal. The owner of real property acquired for right-of-way would be compensated at fair market value, in accordance with the Uniform Act, state statutes, and CDOT policies and procedures. No owner would be required to surrender possession of the real property until paid the agreed purchase price or the amount deemed to be just compensation has been deposited with the court for the benefit of the owner. Other entities, such as the City of Aurora, may acquire the property on behalf of CDOT but would be bound by the requirements of the Uniform Act.

3.5 Economic

3.5.1 Existing Economic Conditions

Site surveys, aerial photographs, and the *City of Aurora Comprehensive Plan,* 2003 indicate that most land within the study area is used for either agricultural or light industrial purposes and does not contain many other economic enterprises. According to the Comprehensive Plan and information gained from the City of Aurora and E-470 Authority, substantial economic development is planned for the area. The proximity of the area to retailers and services in Aurora is a sound incentive to alleviate future arterial traffic congestion. The City of Aurora, along with Adams and Arapahoe Counties, expects that these land use changes would lead to an increase in property tax revenues and personal incomes for area residents.

A strong service sector exists in Aurora. Most industry lies in education, health, and social services (16.6 percent), retail (14.6 percent), and professional, scientific, management, administrative, and waste management services (13.8 percent). An increase in population, as discussed in Section 3.3, Social Conditions, has contributed to development and growth in the area. However, according to the Colorado Department of Labor and Employment, unemployment has increased by 4.7 percentage points (2.2 percent in 2000 to 6.9 percent in 2004). The statistics shown in **Table 3-8** indicate labor trends in the City of Aurora.

Table 3-8
Year 2003 Labor Force Statistics for the City of Aurora

	Aurora
In Labor Force*	163,877
Employed	147,608
Unemployed	15,187
Median Household Income	$44,401
Per Capita Income	$22,107

*Population aged 16 or over.
Source: US Census Bureau, 2003 American Community Survey Summary Tables

According to the 2003-2004 Aurora Economic Profile, the City of Aurora has over 12,300 businesses employing more than 118,700 people. Strong industries in the Aurora economy include retail trade, government, health care, accommodation and food service, and construction. In addition, high-technology firms such as Raytheon, The Boeing Company, Lockheed Martin, and Northrop Grumman are located in the area.

DRCOG and Adams and Arapahoe Counties have identified the E-470 corridor at I-70 as a strong employment growth area. Because of this planned growth along the I-70/E-470 corridor, especially in the interchange area, land use is expected to change from agricultural to a higher intensity of land use, including light industrial regional retail and Regional Activity Centers. The *City of Aurora Comprehensive Plan,* 2003 defines Regional Activity Centers as intensive, mixed-use developments featuring walkable main streets and prominent buildings.

3.5.2 Economic Impacts

This section describes impacts to the economic environment.

Is it true that this project would actually improve the economy in the area? Yes. As with most transportation improvement projects, the local economy not only gets a boost due to the construction project itself, but improved facilities tend to allow for increased business activity and improved mobility. New businesses generate tax revenue, and new residents generate property tax revenue.

No-Action Alternative. Economic conditions would improve under the No-Action Alternative, but not to the extent of the Preferred Alternative because of traffic congestion and limited business access. Substantial growth and development is expected to continue regardless of whether or not this project is constructed. The lack of the system to service interchanges could slow development and limit the overall marketability of properties in the area. Under the No-Action Alternative, the flyover being built by the E-470 Authority is to be completed in 2006. This would allow northbound and southbound E-470 commuters to bypass traffic signals when crossing I-70. Also Ramp H that is currently being constructed would allow northbound E-470 traffic to bypass signals when changing to westbound I-70. However, these improvements alone would not accommodate the traffic that is anticipated to occur with planned development of the area.

Preferred Alternative. The Preferred Alternative would result in improved mobility and increased accessibility to business establishments within and adjacent to the study area. Under this alternative, the development of economic enterprises would be supported resulting in a growth in employment. This would be consistent with future land use plans for the study area.

Businesses near the proposed interchanges would experience increased noise levels and traffic with ultimately improved visibility and access. In addition, access to businesses in the study area may be temporarily impaired during construction.

The Preferred Alternative would not require the displacement of any businesses.

3.5.3 Economic Impact Mitigation

During the construction phase, good communication with emergency service providers, local businesses, government agencies, and residents is recommended with regard to traffic delays and access changes. Such notifications could be accomplished through radio and public announcements, newspaper notices, and on-site signage. If access to a business is compromised, alternate access routes would be provided during construction.

3.6 Transportation (Including Pedestrians and Bicyclists)

3.6.1 Existing Traffic Conditions

Figure 3-7 shows existing daily traffic volumes on major study area roadways based on traffic counts obtained in 2004 and 2005. Traffic data show I-70 traffic volumes of 39,000 vehicles per day (vpd) west of E-470 and 29,000 vpd east of E-470. E-470 traffic counts show 19,000 vpd north of I-70 and 28,000 vpd south of I-70. Traffic volumes on other roads in the study area are 10,000 vpd or less.

Figure 3-8 shows current peak hour levels of service on study area roads and intersections. Level of service (LOS) is a standardized measure of congestion for highway segments, ramp merge and diverge areas, and intersections. LOS is measured on a scale from A to F, where LOS A refers to essentially uninterrupted traffic flow with minimal delays; LOS F refers to very high levels of congestion, with traffic volumes exceeding the levels for which a road or intersection was designed. Intermediate grades of B, C, D, and E reflect incremental increases in congestion. LOS D or better is CDOT's desired level to achieve for peak period operations.

Figure 3-8 shows that current peak hour operations are LOS C or better at all locations throughout the study area. Forecasted LOS is discussed in Section 3.6.2.4 of this EA.

3.6.1.1 Safety Analysis

Until 2006, the principal traffic safety concern in the study area has been the presence of four at-grade, signalized intersections (at Colfax Avenue/ gun Club Road, the I-70 Gun Club ramp terminal intersections, and 19th Avenue/Gun Club Road) on the otherwise free-flowing E-470 tollway. The flyby, opened in 2006, has eliminated these conflicts for E-470 through traffic. The programmed Ramp H construction that is part of the NO-Action alternative will eliminate these intersection conflicts for northbound E-470 to westbound I-70 traffic. These recent and programmed improvements can be expected to substantially improve traffic safety in the study area.

3.6.2 2030 Traffic Projections

Traffic forecasts were developed using the Denver Regional Council of Governments (DRCOG) 2030 regional travel demand model as a basis. The principal features of the regional model were retained for the EA forecasting process, including population and employment forecasts and all DRCOG model procedures and parameters.

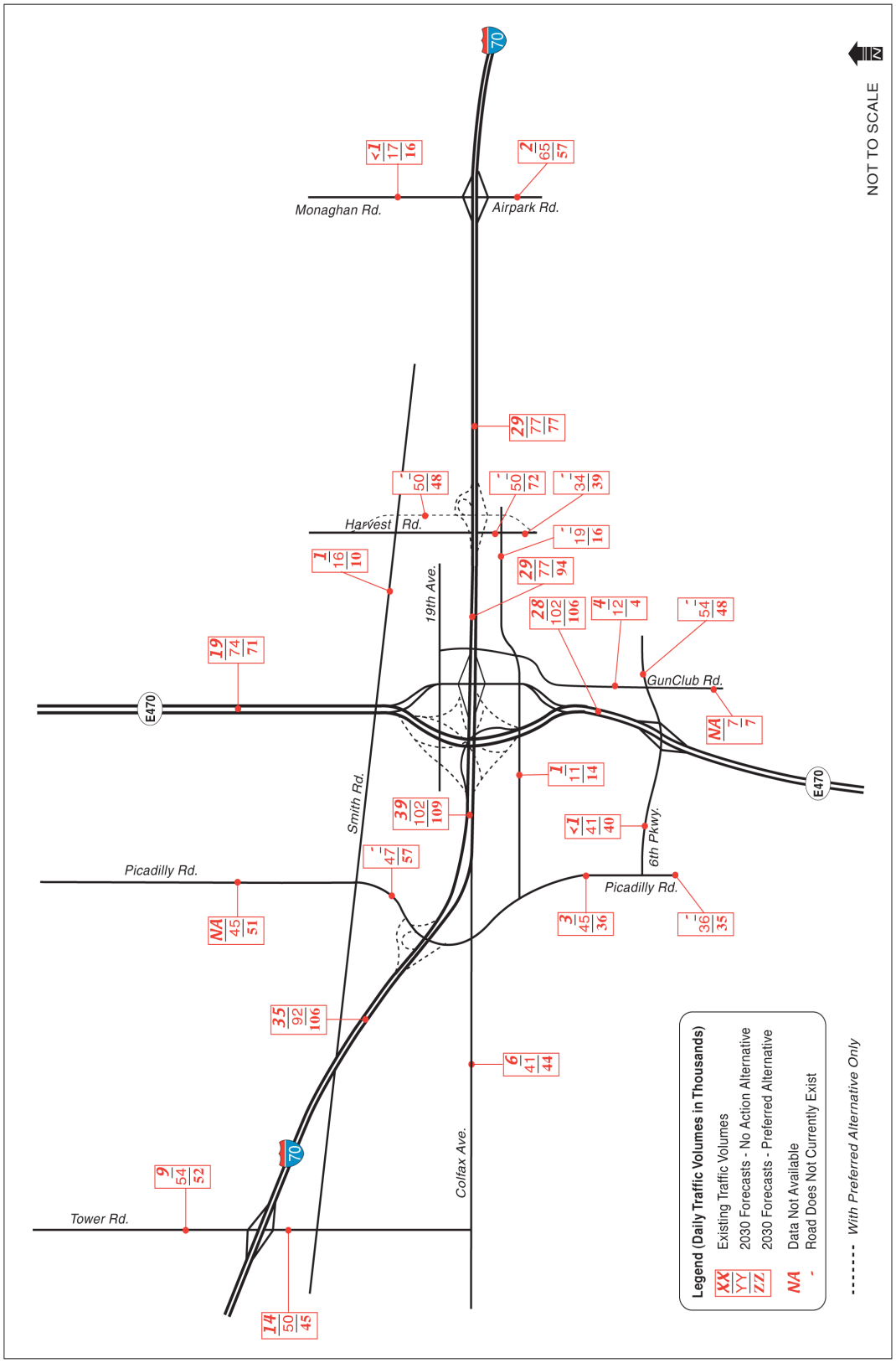
3.6.2.1 Development Forecasts

The study area and surrounding parts of eastern Aurora are rapidly developing. The study area is within the Denver-Aurora Urban Growth Boundary determined by DRCOG. DRCOG 2030 population forecast for the larger study area shown is 192,000; nearly four times the existing population for the same area. Employment forecasts for 2030 show 76,044 people employed, more than 15 times the 2005 level.

The forecasts for the TAZs in the immediate study area surrounding the E-470/I-70 interchange show more than 8,500 population and 8,600 people employed in 2030. Specifically, development plans include the major industrial development to the north, some of which has recently occurred and a mixed-use Regional Activity Center to the south. **Figure 3-9** shows the transportation analysis zone (TAZ) system in the area, and **Table 3-9** shows the existing and forecasted population and number of people employed.

Figure 3-7
Existing and Forecasted Daily Traffic Volume Comparisons

Figure 2-10
Existing and Forecasted Daily Traffic Volume Comparisons



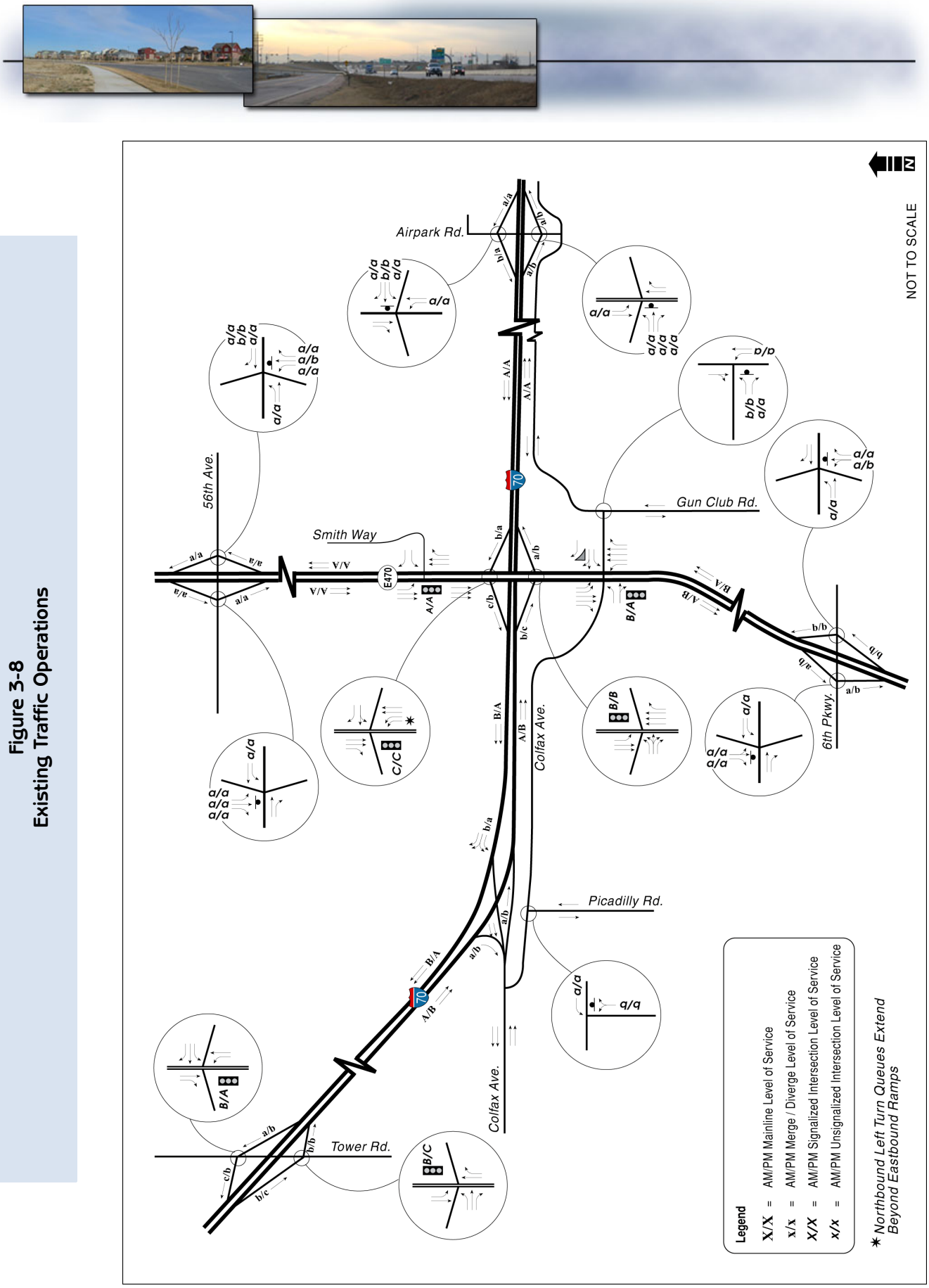
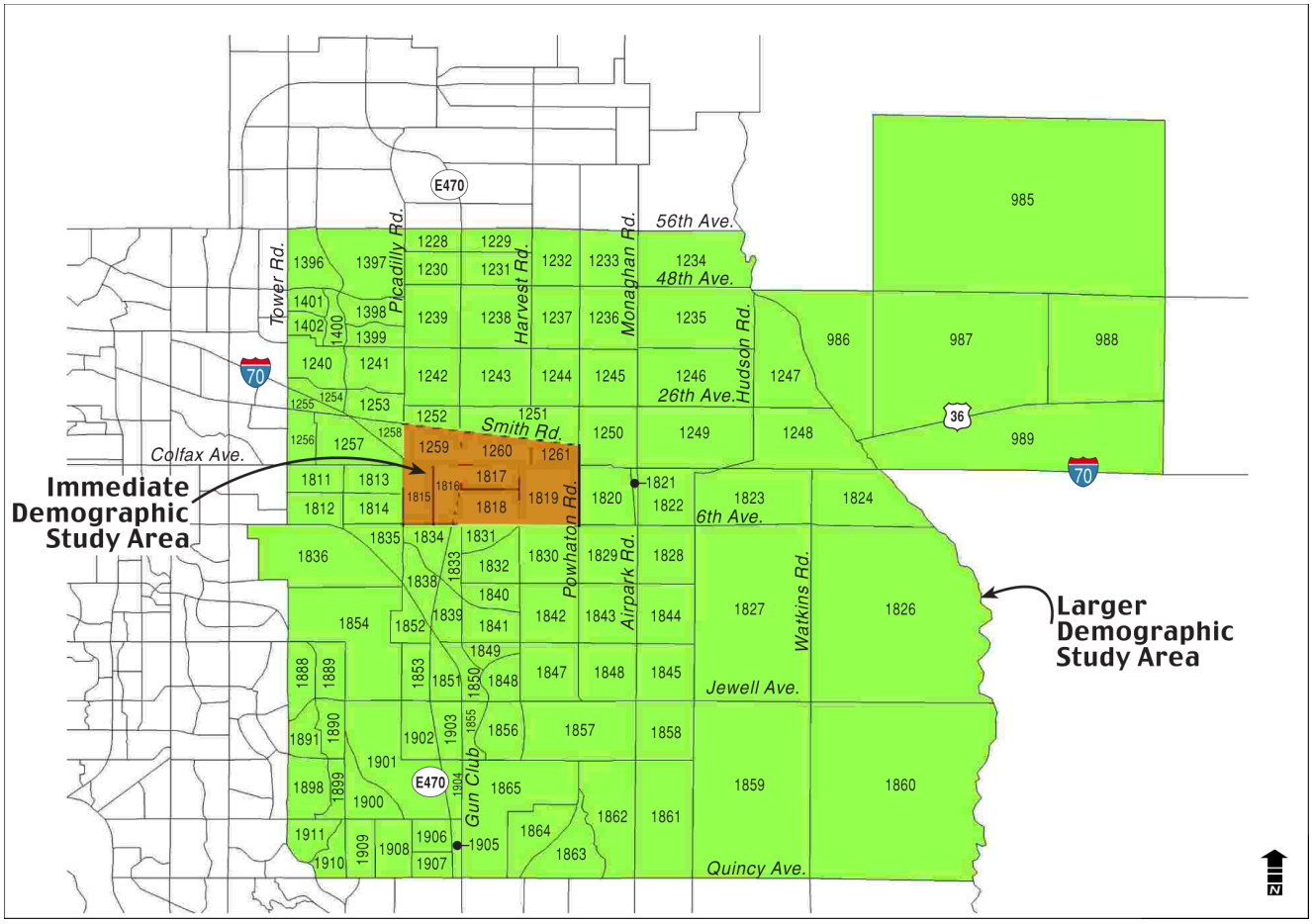


Figure 3-8
Existing Traffic Operations

Figure 3-9
Transportation Analysis Zones



3.6.2.2 Roadway Networks

For the traffic model, roadway networks were developed to represent the No-Action Alternative (Alternative 1) and Alternative 9 (the Preferred Alternative), which includes two separate full-movement I-70 interchanges at Picadilly Road and Harvest Road and is, therefore, consistent with DRCOG's fiscally constrained 2030 MVRTP base network. Both networks include the RTP lane assumptions of the existing four lanes on I-70 through the study area and widening of E-470 from four to six lanes.

Several refinements were made to the roadway network in and around the study area, in coordination with DRCOG. Refinements included changes to numbers of through lanes or functional classification on surface streets to better reflect evolving City of Aurora planning and refinements to TAZ connections to the roadway network. Specific network refinements include:

- Widening 6th Parkway west between E-470 and SH 30 to four lanes.
- Adding the segment of Monaghan Road between 6th Parkway and 26th Avenue (connecting with the Airpark Interchange).
- Widening Monaghan Road between 26th Avenue and 56th Avenue to four lanes.
- Widening Harvest Road between Jewell Avenue and 56th Avenue to six lanes.

Table 3-9
2005 and 2030 Population and Employment in the Immediate and Larger Study Area

TAZ	2005		2030	
	Population	Number of People Employed	Population	Number of People Employed
1259	0	0	0	831
1260	0	43	225	1,380
1261	1	0	3	189
1815	0	0	1,296	915
1816	0	0	812	1,813
1817	0	0	482	1,150
1818	0	68	1,388	2,244
1819	7	0	4,324	116
Immediate Demographic Study Area Total	**8**	**111**	**8,530**	**8,638**
Larger Demographic Study Area	49,078	4,804	192,082	76,044

Source: U.S. Census Bureau and DRCOG

3.6.2.3 Traffic Forecasts

Figure 3-7 shows daily traffic forecasts for 2030 with the No-Action Alternative and Alternative 9, or the Preferred Alternative, and provides a comparison of those traffic forecasts with existing traffic volumes. The map shows that traffic forecasts are expected to increase sharply throughout the study area between now and 2030.

I-70 traffic volumes are forecasted to increase west of E-470 from 39,000 vehicles per day (vpd) to 102,000 vpd with the No-Action Alternative and 109,000 vpd with the Preferred Alternative. East of E-470, I-70 volumes are forecasted to increase from 29,000 vpd currently to 77,000 vpd in 2030 with the No-Action Alternative and 94,000 vpd with the Preferred Alternative. I-70 traffic forecasts with the Preferred Alternative are higher than with the No-Action on study area segments because of the more direct across to I-70 afforded by the Preferred Alternative. Specifically, some of the traffic that would use surface streets, such as 6th Parkway, Colfax Avenue and Smith Road to travel across the study area under the No-Action, would use the Harvest or Picadilly interchanges to access I-70 and use the higher speed interstate to travel through the study area.

Figure 3-7 also shows forecasts on E-470 that are more than three times existing traffic volumes. The rapid development in and around the study area is forecasted to generate traffic of 40,000 and 70,000 vpd on segments of north-south arterial roadways, including Tower Road, Picadilly Road, Harvest Road, and Airpark Road.

Figure 3-10 and **Figure 3-11** show forecasted peak-hour traffic volumes on freeway segments and at major intersections with the No-Action and Preferred Alternatives.

What will happen to local Gun Club Road traffic? There are several features of the proposed action that will enable existing traffic on Gun Club Road to continue to conveniently travel to and from regional roads and destinations. First, access to and from the new E-470 tollway will continue to be provided via ramps to and from the existing E-470 roadway south of Colfax Avenue and north of 19th Avenue. Second, a new relocation of Gun Club Road is planned to be built swinging east from its current location to intersect with Colfax Avenue, pass over I-70,and intersect with 19th Avenue. Finally, access for existing and future development to the regional highway system will be available using the local street system at four locations, each approximately one mile from the new I-70/E-470 interchange: I-70/Picadilly Road, I-70/Harvest Road, E-470/6th Parkway, and E-470/56th Avenue.

Figure 3-10
No-Action Year 2030 Peak Hour Traffic Forecasts

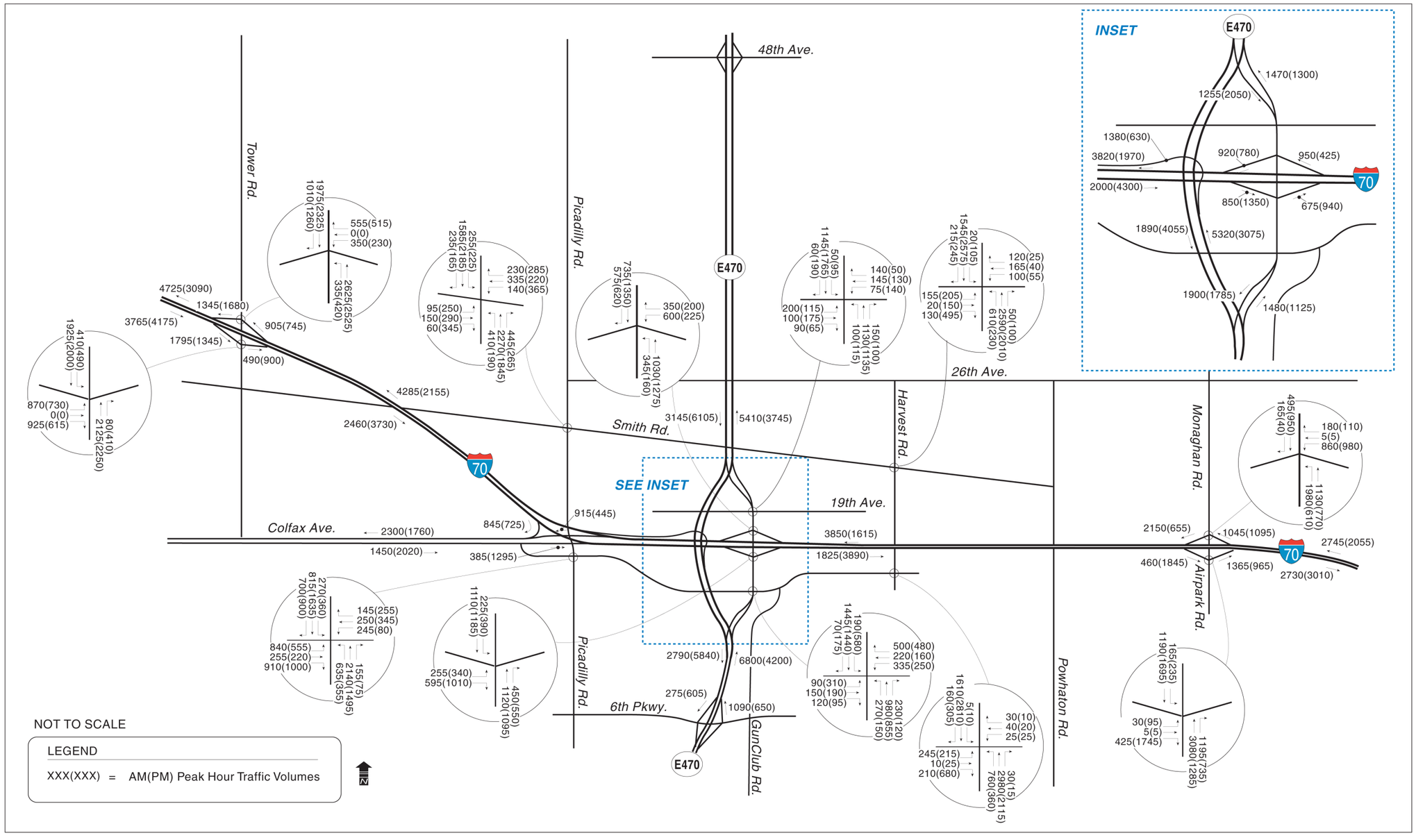
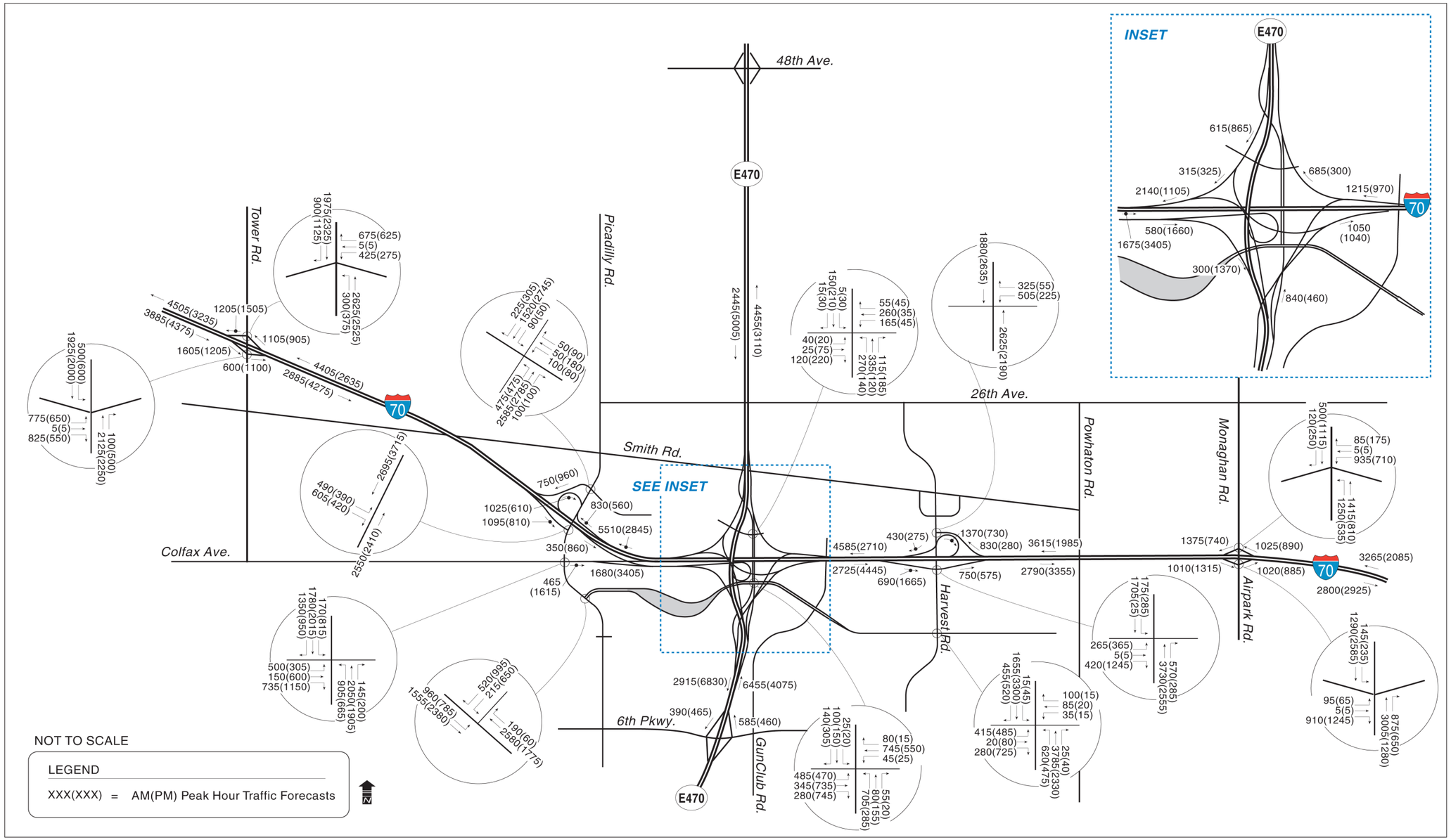


Figure 3-11
Proposed Action - Year 2030 Peak Hour Traffic Forecasts



3.6.2.4 Traffic Operations

2030 peak-hour traffic operations were evaluated based on the forecasts displayed on **Figure 3-10** and **Figure 3-11**. **Figure 3-12** shows LOS findings for the No-Action Alternative. LOS F conditions, with volumes in excess of roadway capacity and resulting severe congestion, were calculated on freeway segments of both I-70 and E-470.

Figure 3-13 shows LOS with Alternative 9, or the Preferred Alternative. LOS reflects the additional I-70 access and additional auxiliary lanes on I-70 and on E-470 that are associated with the Preferred Alternative. These additional features would eliminate all of the LOS F conditions and would result in LOS D or better on I-70, and LOS E or better on E-470.

3.6.3 Local Access and Planned Improvements

3.6.3.1 Existing Conditions

The properties to the south of I-70, including residential developments outside the study area, currently have local access via collector roadways that connect with Colfax Avenue, Gun Club Road, or Picadilly Road. To the north of I-70, 26th Avenue and Picadilly Road serve as access for residential developments to the northwest of the study area. East Smith Road serves as access to the industrial development to the northeast of the I-70 interchange at Gun Club Road. Local access to I-70 is provided at Gun Club Road. Partial access to I-70 is also available at Colfax Avenue just east of Picadilly Road.

Local access to E-470 is provided by full interchanges at 6th Parkway and at 56th Avenue. The current access to E-470 at Gun Club Road is being modified by the current flyby construction, but access both north and south on E-470 is being maintained.

3.6.3.2 Forecasted Conditions

With the construction of the new I-70/E-470 interchange, local access to E-470 is planned to be maintained. New local access interchanges with I-70 are included at Picadilly Road and at Harvest Road in the Preferred Alternative. Both would be full interchanges with ramps serving eastbound and westbound traffic. Picadilly Road would be relocated to a more westerly location between East 11th Avenue and Smith Road and would pass under two new (or widened) bridges carrying I-70. Harvest Road would also be relocated slightly east of its section line location and would have a new bridge to carry it over I-70.

3.6.4 Transit

3.6.4.1 Existing Conditions

Public transportation service within the Denver metropolitan area is provided by RTD. Because of the rural character of this portion of the City of Aurora, Adams County, and Arapahoe County, there is presently limited bus service near the study area. Although no bus routes pass directly through the study area, a limited route (Route 15 Ltd) running east-west along Colfax Avenue serves a residential area approximately two miles west of the I-70/E-470 interchange. An express route (Route 47X) serves the Green Valley Ranch residential area approximately three miles northwest of the proposed interchange. Another express route (Route 185X) runs north-south along Tower Road and Airport Road, approximately three miles west of the I-70/E-470 interchange, from DIA to southern Aurora.

3.6.4.2 Forecasted Conditions

Currently, there are plans to improve transit options near the study area beyond what currently exists. As part of its FasTracks program, RTD is planning a new East Corridor rail line linking downtown Denver and DIA. A station is planned just north of I-70 west of Tower Road at Airport Boulevard with a major park-n-Ride facility. This project is the subject of the *I-70 East Corridor EIS* currently being conducted by RTD. Also as part of FasTracks, RTD is planning a series of expanded bus routes called FastConnects. This would include feeder bus routes to the new East Corridor, as well as circumferential routes serving outlying areas, including the study area. The City of Aurora is planning a Regional Activity Center south of I-70 at Picadilly Road (see

Section 3.1.2 for a definition of a Regional Activity Center). This activity center would include mass transit facilities. Additionally, there is a park-n-Ride facility planned at the Horizon City Center development.

3.6.5 Pedestrians and Bicyclists

3.6.5.1 Existing Conditions

There are no established pedestrian/bicycle trails in the study area, and none of the existing roadways have attached or detached sidewalk facilities. As a result of the lack of facilities and the existing rural character of the area, there is very little bicycle and pedestrian use.

3.6.5.2 Forecasted Conditions

There would be a multiuse pedestrian/bike paved trail built along E-470 in the future. Preliminary design and provisions for its future construction are included in the current preliminary design plans. Provisions for sidewalks have been included in the current flyby construction at the bridges over relocated Colfax Avenue. Plans for the E-470/I-70 interchange area were coordinated with the City of Aurora Department of Parks and Open Space to provide routes for both the E-470 trail and the proposed First Creek Trail.

3.6.6 Transportation Impacts

This section describes impacts to transportation in the area.

Would I have to pay a toll to get to I-70? Local Gun Club Road traffic is forecasted to be primarily local traffic serving adjacent neighborhoods. The planned development of Harvest Road as a new major parallel north-south arterial to the east would serve much of the traffic accessing I-70. Gun Club Road north of 6th Parkway would be relocated to a more easterly alignment with a new bridge over I-70 providing a connection to the commercial area east of Smith Road. Some traffic currently using Gun Club Road may also choose to use Picadilly Road to the west, which is planned to be widened and extended from Colfax Avenue north under I-70, with the new interchange at I-70. These alternate routes would not require a toll payment. See **Figure 3-14** for a graphic representation of these changes.

What is going to happen to Colfax? Colfax Avenue is planned to remain as a major state highway, west of Picadilly Road. Colfax Avenue would join I-70 at the new Picadilly Road interchange. East of Picadilly Road, as part of the No-Action Alternative, Colfax Avenue would be relocated to the south to a location parallel to I-70 as part of planned developments.

Would conditions along Picadilly Road be addressed? The EA includes Picadilly Road north of East 11th Avenue. In this area, Picadilly Road would be relocated to the west of its current location to a new intersection with Colfax Avenue. Safety concerns have been expressed about the limited sight distance on Picadilly Road south of East 11th Avenue. This area is adjacent to the planned Horizon City Center development. In this area, the City of Aurora and the developer are examining alternate concepts to improve Picadilly Road to meet Aurora's arterial design standards while maintaining its local access function.

Would out-of-direction travel be required? No, there would not be a need for out-of-direction travel with the closure of the Gun Club Road local ramps at I-70. The new interchange one mile to the west at Picadilly Road would provide convenient access for traffic wishing to go to and from the west on I-70, and the new interchange at Harvest Road, one mile to the east, would serve traffic to and from the east on I-70. Planned improvements included in the No-Action Alternative plan for 6th Parkway, Smith Road, and relocated Colfax Avenue would provide convenient east-west connections to both Picadilly Road and Harvest Road. Little or no added travel distance would be required with the new accesses to I-70 (see **Figure 3-14**). Those who use E-470 would still be able to do

No-Action Alternative. The No-Action Alternative would result in future peak-hour delays at the I-70 interchanges on the arterials approaching the freeway at both Gun Club Road and at Colfax Avenue. In addition, queues of vehicles on the interchange off ramps would continue to increase in length and duration, which would impact freeway traffic operations. The short weaving distance between the westbound entrance ramp to I-70 from Gun Club Road and the left-hand exit ramp from westbound I-70 to Colfax would result in LOS F operations in the future. The flyby, currently under construction, is part of the No-Action Alternative and is designed to remove the signals from the E-470 mainline. This

Figure 3-12
No-Action Year 2030 Traffic Operations

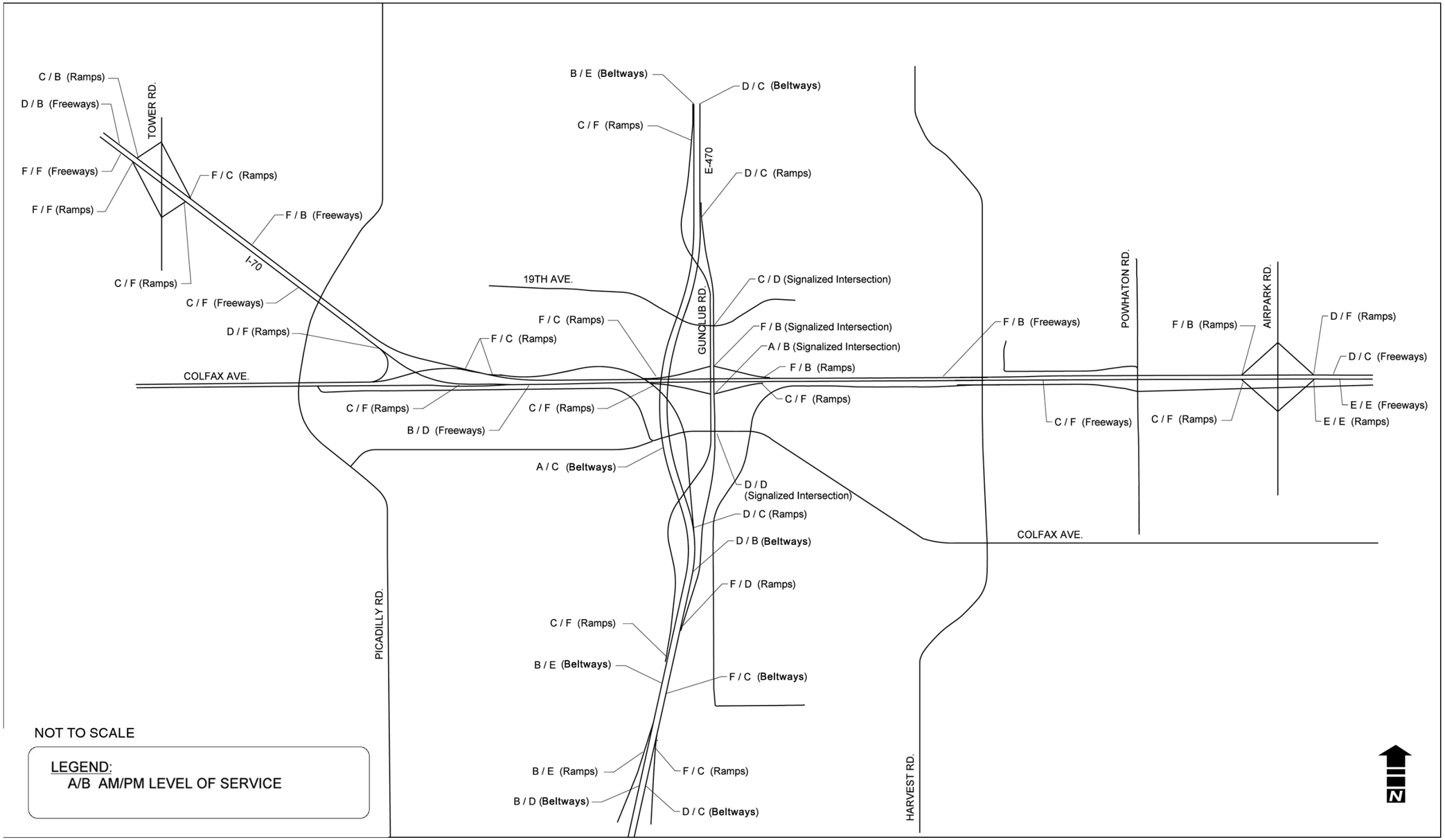


Figure 3-13
Proposed Action - Year 2030 Traffic Operations

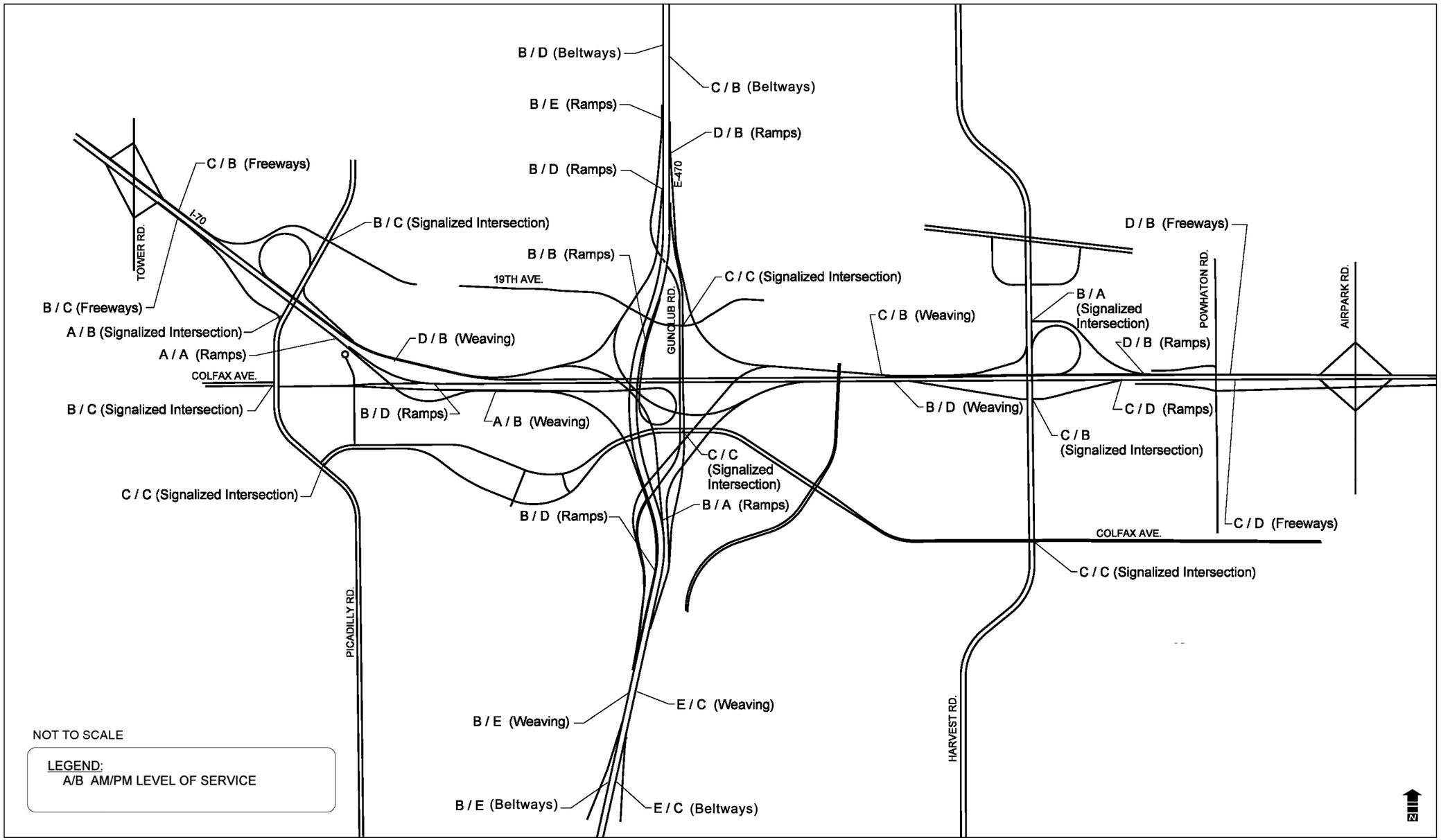
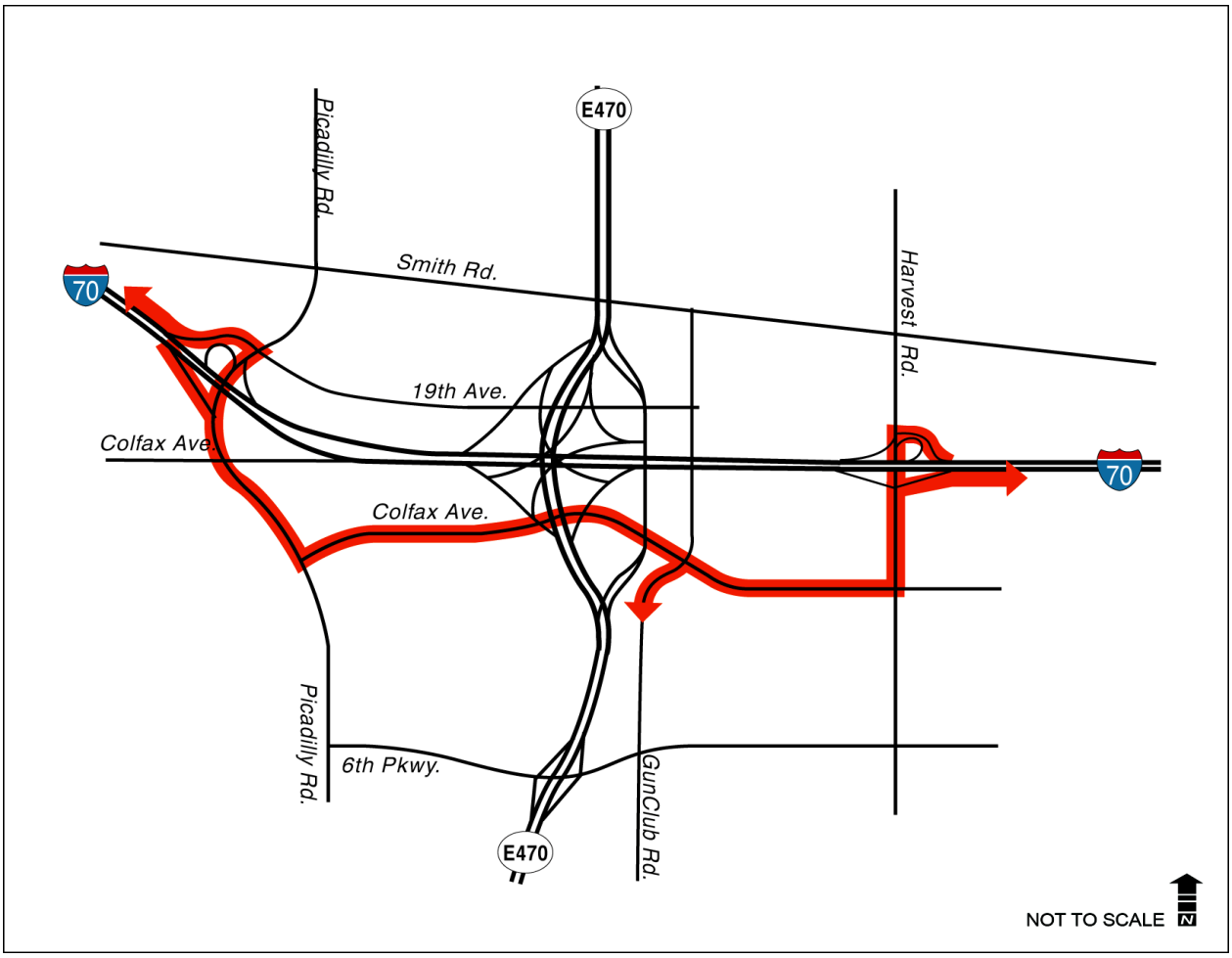


Figure 3-14
Gun Club Road Access Change (Preferred Alternative)



will create a free-flow mainline roadway for E-470 through-traffic. Also under construction is Ramp H, which will allow northbound E-470 traffic to access westbound I-70 in a free-flow movement.

Preferred Alternative. The Preferred Alternative is designed to create a full-movement interchange between I-70 and E-470. The Preferred Alternative would also improve access to the surrounding land uses and planned developments by constructing two new full interchanges on I-70 at Picadilly Road and at Harvest Road. The area's LOS would be improved as well.

The 2030 daily forecast volumes do not show a discernible difference in LOS between the No-Action and Preferred Alternative on roadways and intersections outside of the interchange. The LOS within the interchange area would be maintained with the Preferred Alternative. The LOS on I-70 is greatly improved over the No-Action Alternative. In part, this is because of the addition of the Harvest Road interchange, which would reduce the heavy volumes forecasted for the I-70/Airpark Road interchange. Addition of auxiliary lanes in the Preferred Alternative would also result in improved LOS for sections of I-70.

3.6.7 Transportation Mitigation

The Preferred Alternative does not require mitigation.

3.7 Parks and Recreational Resources

There are no existing parks, recreational facilities, or designated open space in the study area. Therefore, there would be no impacts to parks or recreational facilities, and no mitigation is required. The areas that are zoned for parks/open space and plans for recreational facilities have already taken this proposed action into consideration.

3.8 Air Quality

3.8.1 Existing Conditions

The geographical and meteorological characteristics of the Denver metropolitan area are a major cause of the air quality conditions that exist within the study area. The study area is located within the valley of the South Platte River, making it susceptible to temperature inversions during the winter months. However, local winds on the eastern plains often gust quite strongly as they move off the mountains to the east and tend to blow the pollution away.

The E-470/I-70 interchange complex is located on the eastern edge of the Denver metropolitan area, in the City of Aurora, on the border of Arapahoe and Adams Counties. It is within the Denver metropolitan attainment/maintenance area. Effective October 16, 2002, the U.S. Environmental Protection Agency (EPA) designated the Denver metropolitan area as an attainment/maintenance area for fine particulate matter less than ten microns in diameter (PM10). The Denver metropolitan area had previously received designation as an attainment/maintenance area for carbon monoxide (CO) and the 1-hour ozone (0_3) standard. The data from the last 5-year period show that the decline in both 1-hour and 8-hour carbon monoxide levels are still declining from 1970s levels, and the statewide 8-hour average has remained less than one half of the level of the standard. However, ozone levels show a decade-long trend in increases of 1-hour and 8-hour concentrations. EPA-mandated Maintenance Plans have been prepared and approved by the EPA for the Denver metropolitan area CO, 0_3, and PM_{10} maintenance areas. In July 2004, an Early Action Compact (EAC) for ozone was submitted to the EPA to establish a plan of action and implementation milestones to lower 8-hour ozone levels in the metropolitan area before December 31, 2007. This effort was in response to violations in the 8-hour ozone standards between 2002 and 2003. EPA has deferred nonattainment designation for 8-hour ozone as long as the area meets the milestones in the EAC.

The Colorado Department of Public Health and Environment (CDPHE), Air Pollution Control Division, oversees the process to determine air quality impacts. The process includes both regional and project-level air quality analysis. The EPA evaluates projects on a regional level to assure they do not have a negative impact on air quality, and the air quality impacts fit into the regional budget emissions established by the EPA. Projects that meet these criteria (and are financially constrained) are included in a current Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP). Projects are also evaluated on a project level to determine impacts related to carbon monoxide concentrations.

The pollutants of primary concern in the Denver metropolitan area are CO, PM_{10} and ozone. Generally speaking, CO concentrations increase as vehicular congestion rises, and PM_{10} emissions increase with growth in vehicle-miles-of-travel (vmt). Ozone is not directly emitted by motor vehicles; it is an indirect by-product of motor vehicle emissions. Based on input from the Interagency Consultation Team, which is described in Section 3.8.3, it was decided that the approach for the air quality analysis for the EA would include the following areas of analysis:

- Intersection "Hot-spot" analysis for CO
- Qualitative analysis for PM_{10}

3.8.2 Transportation Conformity

The transportation air quality conformity regulations of July 2004 require that regionally important and/or federally funded transportation projects demonstrate conformity to state implementation and maintenance plans. The I-70/E-470 interchange complex is not federally funded, but is considered a regionally important project and would undergo conformity determination.

The transportation conformity regulations require that:

- The project be included in a fiscally constrained RTP.
- The project be included in a fiscally constrained TIP.
- The project does not cause or contribute to any new or existing violations of National Ambient Air Quality Standards (NAAQS).

The I-70/E-470, I-70/Harvest Road and I-70/Picadilly Road interchanges are in DRCOG's *2030 Metro Vision Regional Transportation Plan*. The proposed I-70 auxiliary lanes between Tower Road and Picadilly Road interchanges are currently being evaluated in DRCOG's 2007-2012 TIP. The I-70/E-470 interchange complex is not included in the most recent TIP because it is locally funded.

3.8.3 Interagency Consultation Team

An Interagency Consultation team met on July 18, 2003, to provide direction regarding the scope of the air quality analysis for the EA and to review the results. The team consisted of representatives from the CDPHE, Air Pollution Control Division; CDOT; and the consultant team.

3.8.4 Air Quality Impacts

This section describes impacts to air quality.

What would happen to the quality of the air because of this project? It is not anticipated that any violation of air quality conformity or exceedance of ambient air quality standards will result from this project.

No-Action Alternative. The signalized intersections at old E 470 and 19th Avenue would operate at morning and evening peak Levels of Service (LOS) C/D. The westbound I-70 ramps would operate at morning and evening peak LOS F/B. The signalized intersection of future Colfax Frontage Road and Gun Club Road would operate at morning and peak hour LOS D/D. CO "hot-spot" analysis was done for the three intersections showing that no violations of 1-hour or 8-hour standards for CO concentrations would occur in 2030. The results for 8-hour average concentrations of CO for morning and evening peak-hour traffic volumes at the existing E-470/19th Avenue intersection, existing E-470/westbound I-70 ramps, and existing E-470/Colfax Avenue signalized intersections are 1.2/1.3 ppm, 1.5/1.4 ppm and 3.5/2.1 ppm, respectively. The 8-hour standard is 9.0 ppm.

Preferred Alternative. There are no signalized intersections identified in the Preferred Alternative that would operate less than LOS C at either morning peak or evening peak hours; therefore, no project-level CO analysis was performed for the Preferred Alternative.

A qualitative analysis of PM_{10} emissions was conducted for the study area. Most PM_{10} is fugitive dust generated by vehicle re-entrainment of excess roadway sand from winter sanding operations or from windblown dirt and sand from fields and construction sites. Vehicle emissions contribute comparatively little to PM_{10}. According to the *Colorado Air Quality Control Commission Report to the Public*, 2001-2002, there are no monitors in the study area to provide PM_{10} air quality data; therefore, actual levels of this pollutant in the study area are not available.

The *Federal Clean Air Act Amendments* of 1990 requires a TIP or RTP to conform to the State Implementation Plan. As part of the State Implementation

Plan development process, an emissions budget for PM_{10} is established for attainment and maintenance areas to meet the NAAQS. Because the Denver metropolitan area is classified as attainment/maintenance for PM_{10}, projected emissions of the pollutant resulting from the TIP or RTP must not exceed the emissions budget set forth in the plan.

The *PM_{10} Maintenance Plan for the Denver Metropolitan Area*, recently approved by the EPA, estimates through dispersion modeling the effect of emissions in 5-year increments through 2030 to demonstrate continued maintenance of the standard during this time period. The modeling domain for regional PM_{10} concentrations described in the technical support document to the *Maintenance Plan* shows that the highest modeled concentration nearest to the interchange is 101 μg/m3, below the 150 μg/m3 standard. Because the proposed action is included within the current conformity model, exceedances of the PM_{10} standard are unlikely.

3.8.5 Air Quality Mitigation

No mitigation for air quality is necessary.

3.8.6 Mobile Source Air Toxics

On February 3, 2006, the FHWA released its interim guidance on when and how to analyze MSATs in the NEPA process for highways. The following discussion and discussion in the Air Quality Technical Memorandum (Appendix G) are in accordance with the interim guidance.

In addition to the criteria air pollutants for which there are NAAQS, the EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries). The FHWA has prepared guidance (dated February 3, 2006) on the analysis of mobile source air toxics for highway projects.

Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics defined by the Clean Air Act. MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline. See document No. EPA420-R-00-023 (December 2000).

The EPA is the lead Federal Agency for administering the Clean Air Act and has certain responsibilities regarding the health effects of MSATs. The EPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources. 66 FR 17229 (March 29, 2001). This rule was issued under the authority in Section 202 of the Clean Air Act. In its rule, EPA examined the impacts of existing and newly promulgated mobile source control programs, including its reformulated gasoline (RFG) program, its national low emission vehicle (NLEV) standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and its proposed heavy duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements. Between 2000 and 2020, FHWA projects that even with a 64 percent increase in VMT, these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57 percent to 65 percent, and will reduce on-highway diesel PM emissions by 87 percent, as shown in **Figure 3-15**.

As a result, EPA concluded that no further motor vehicle emissions standards or fuel standards were necessary to further control MSATs. The agency is preparing another rule under authority of CAA Section 202(l) that will address these issues and could make adjustments to the full 21 and the primary six MSATs.

3.8.6.1 Unavailable Information for Project Specific MSAT Impact Analysis

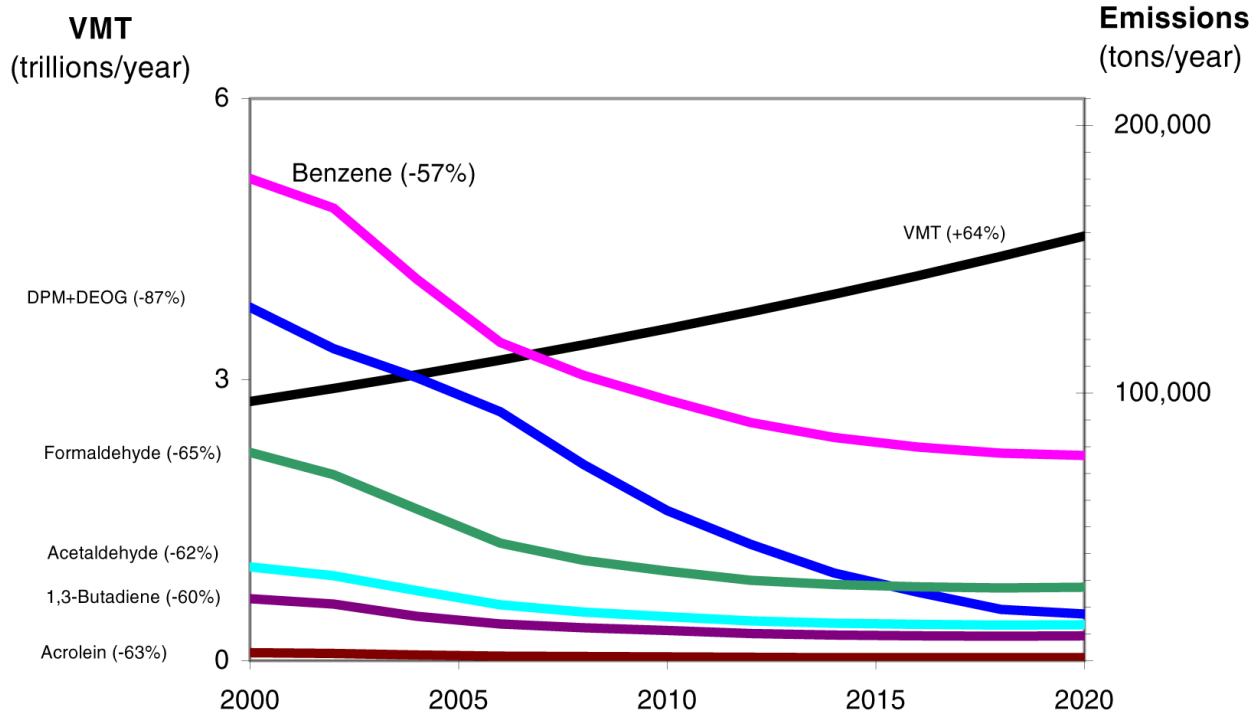
This EA includes a basic analysis of the likely MSAT emission impacts of this project. However, available technical tools do not enable us to predict the project-specific health impacts of the emission changes associated with the alternatives in this EA.

Due to these limitations, the following discussion is included in accordance with CEQ regulations (40 CFR 1502.22(b)) regarding incomplete or unavailable information:

Information that is Unavailable or Incomplete. Evaluating the environmental and health impacts from MSATs on a proposed highway project would involve several key elements, including emissions modeling, dispersion modeling in order to estimate ambient concentrations resulting from the estimated emissions, exposure modeling in order to estimate human exposure to the estimated concentrations, and then final determination of health impacts based on the estimated exposure. Each of these steps is encumbered by technical shortcomings or uncertain science that prevents a more complete determination of the MSAT health impacts of this project.

1. Emissions: The EPA tools to estimate MSAT emissions from motor vehicles are not sensitive to key variables determining emissions of MSATs in the context of highway projects. While MOBILE 6.2 is used to predict emissions at a regional level, it has limited applicability at the project level. MOBILE 6.2 is a trip-based model–emission factors are projected based on a typical trip of 7.5 miles, and on average speeds for this typical trip. This means that MOBILE 6.2 does not have the ability to predict emission factors for a specific vehicle operating

Figure 3-15
U.S. Annual Vehicle Miles Traveled (VMT) vs. Mobile Source Air Toxics Emissions, 2000-2020



Notes: For on-road mobile sources. Emissions factors were generated using MOBILE6.2. MTBE proportion of market for oxygenates is held constant, at 50%. Gasoline RVP and oxygenate content are held constant. VMT: *Highway Statistics 2000*, Table VM-2 for 2000, analysis assumes annual growth rate of 2.5%. "DPM + DEOG" is based on MOBILE6.2-generated factors for elemental carbon, organic carbon and SO4 from diesel-powered vehicles, with the particle size cutoff set at 10.0 microns.

condition at a specific location at a specific time. Because of this limitation, MOBILE 6.2 can only approximate the operating speeds and levels of congestion likely to be present on the largest-scale projects, and cannot adequately capture emissions effects of smaller projects. For particulate matter, the model results are not sensitive to average trip speed, although the other MSAT emission rates do change with changes in trip speed. Lastly, in its discussions of PM under the conformity rule, EPA has identified problems with MOBILE6.2 as an obstacle to quantitative analysis.

These deficiencies compromise the capability of MOBILE 6.2 to estimate MSAT emissions. MOBILE6.2 is an adequate tool for projecting emissions trends, and performing relative analyses between alternatives for very large projects, but it is not sensitive enough to capture the effects of travel changes tied to smaller projects or to predict emissions near specific roadside locations.

2. Dispersion. The tools to predict how MSATs disperse are also limited. The EPA's current regulatory models, CALINE3 and CAL3QHC, were developed and validated more than a decade ago for the purpose of predicting episodic concentrations of carbon monoxide to determine compliance with the NAAQS. The performance of dispersion models is more accurate for predicting maximum concentrations that can occur at some time at some location within a geographic area. This limitation makes it difficult to predict accurate exposure patterns at specific times at specific highway project locations across an urban area to assess potential health risk. The NCHRP is conducting research on best practices in applying models and other technical methods in the analysis of MSATs. This work also will focus on identifying appropriate methods of documenting and communicating MSAT impacts in the NEPA process and to the general public. Along with these general limitations of dispersion models, FHWA is also faced with a lack of monitoring data in most areas for use in establishing project-specific MSAT background concentrations.

3. Exposure Levels and Health Effects. Finally, even if emission levels and concentrations of MSATs could be accurately predicted, shortcomings in current techniques for exposure assessment and risk analysis preclude us from reaching meaningful conclusions about project-specific health impacts. Exposure assessments are difficult because it is difficult to accurately calculate annual concentrations of MSATs near roadways, and to determine the portion of a year that people are actually exposed to those concentrations at a specific location. These difficulties are magnified for 70-year cancer assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over a 70-year period. There are also considerable uncertainties associated with the existing estimates of toxicity of the various MSATs, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population. Because of these shortcomings, any calculated difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with calculating the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against other project impacts that are better suited for quantitative analysis.

Summary of Existing Credible Scientific Evidence Relevant to Evaluating the Impacts of MSATs. Research into the health impacts of MSATs is ongoing. For different emission types, there are a variety of studies that show that some either are statistically associated with adverse health outcomes through epidemiological studies (frequently based on emissions levels found in occupational settings) or that animals demonstrate adverse health outcomes when exposed to large doses.

Exposure to toxics has been a focus of a number of EPA efforts. Most notably, the agency conducted the

National Air Toxics Assessment (NATA) in 1996 to evaluate modeled estimates of human exposure applicable to the county level. While not intended for use as a measure of or benchmark for local exposure, the modeled estimates in the NATA database best illustrate the levels of various toxics when aggregated to a national or State level.

The EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The EPA Integrated Risk Information System (IRIS) is a database of human health effects that may result from exposure to various substances found in the environment. The IRIS database is located at http://www.epa.gov/iris. The following toxicity information for the six prioritized MSATs was taken from the IRIS database Weight of Evidence Characterization summaries. This information is taken verbatim from EPA's IRIS database and represents the Agency's most current evaluations of the potential hazards and toxicology of these chemicals or mixtures.

- **Benzene** is characterized as a known human carcinogen.
- The potential carcinogenicity of **acrolein** cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.
- **Formaldehyde** is a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.
- **1,3-butadiene** is characterized as carcinogenic to humans by inhalation.
- **Acetaldehyde** is a probable human carcinogen based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.
- **Diesel exhaust** is likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust as reviewed in this document is the combination of diesel particulate matter and diesel exhaust organic gases.
- **Diesel exhaust** also represents chronic respiratory effects, possibly the primary noncancer hazard from MSATs. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.

There have been other studies that address MSAT health impacts in proximity to roadways. The Health Effects Institute, a non-profit organization funded by EPA, FHWA, and industry, has undertaken a major series of studies to research near-roadway MSAT hot spots, the health implications of the entire mix of mobile source pollutants, and other topics. The final summary of the series is not expected for several years.

Some recent studies have reported that proximity to roadways is related to adverse health outcomes-particularly respiratory problems[1]. Much of this research is not specific to MSATs, instead surveying the full spectrum of both criteria and other pollutants. The FHWA cannot evaluate the validity of these studies, but more importantly, they do not provide information that would be useful to alleviate the uncertainties listed above and enable us to perform a more comprehensive evaluation of the health impacts specific to this project.

Relevance of Unavailable or Incomplete Information to Evaluating Reasonably Foreseeable Significant Adverse Impacts on the Environment, and Evaluation of impacts based upon theoretical

1.South Coast Air Quality Management District, Multiple Air Toxic Exposure Study-II (2000); Highway Health Hazards, The Sierra Club (2004) summarizing 24 Studies on the relationship between health and air quality); NEPA's Uncertainty in the Federal Legal Scheme Controlling Air Pollution from Motor Vehicles, Environmental Law Institute, 35 ELR 10273 (2005) with health studies cited therein.

approaches or research methods generally accepted in the scientific community. Because of the uncertainties outlined above, FHWA believes a quantitative assessment of the effects of air toxic emissions impacts on human health cannot be made at the transportation project level. While available tools do allow us to reasonably predict relative emissions changes between alternatives for larger projects, the amount of MSAT emissions from each of the project alternatives and MSAT concentrations or exposures created by each of the project alternatives cannot be predicted with enough accuracy to be useful in estimating health impacts. (As noted above, the current emissions model is not capable of serving as a meaningful emissions analysis tool for smaller projects.) Therefore, the relevance of the unavailable or incomplete information is that it is not possible to make a determination of whether any of the alternatives would have "significant adverse impacts on the human environment."

In this document, FHWA has provided a qualitative analysis of MSAT emissions relative to the various alternatives and has acknowledged that the two project alternatives (Preferred and Optional) may result in increased exposure to MSAT emissions in certain locations, although the concentrations and duration of exposures are uncertain, and because of this uncertainty, the health effects from these emissions cannot be estimated.

3.8.6.2 Project-Level Analysis

As discussed above, FHWA believes technical shortcomings of emissions and dispersion models and uncertain science with respect to health effects prevent meaningful or reliable estimates of MSAT emissions and effects of this transportation project. However, even though reliable methods do not exist to accurately estimate the health impacts of MSATs at the transportation project level, it is possible to qualitatively assess the levels of future MSAT emissions under the project. Although a qualitative analysis cannot identify and measure health impacts from MSATs, it can give a basis for identifying and comparing the potential differences among MSAT emissions-if any-from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives, found at: www.fhwa.dot.gov/environment/airtoxic/msatcompare/msatemissions.htm.

For each EA alternative, the amount of MSATs emitted would be proportional to the vmt assuming that other variables such as fleet mix are the same for each alternative. The vmt estimated for the Preferred Alternative is slightly higher than that for the No-Action Alternative because the additional capacity would increases the efficiency of the roadway and attracts rerouted trips from elsewhere in the transportation network. The Preferred Alternative includes all three interchange ramp configurations. The No-Action Alternative includes upgrading and improving local arterial roadways to six-lanes (Picadilly, Harvest and Colfax extensions). The .001 percent increase in vmt would lead to slightly higher MSAT emissions for the Preferred Alternative. The emissions increase is offset somewhat by lower MSAT emission rates due to increased speeds; according to EPA's MOBILE6 emissions model, emissions of all of the priority MSATs except for diesel particulate matter decrease as speed increases. The extent to which the decreases in these speed-related emissions would offset the increases of vmt-related emissions cannot be reliably projected because of the inherent deficiencies of technical models.

It is anticipated that the Preferred Alternative would move traffic closer to future sensitive receivers, thus increasing exposure to MSATs. However, the Preferred Alternative would result in a free-flowing LOS lowering overall MSAT concentrations; congestion resulting from the No-Action Alternative would contribute to higher MSAT levels. Also, regardless of the alternative chosen, emissions (with either the No-Action or Preferred Alternatives) would likely be lower than present levels in 2030 as a result of EPA's national control programs that are projected to reduce MSAT emissions by 57 to 87 percent between 2000 and 2020. The magnitude of the EPA-projected reductions is so great (even after accounting for vmt growth) that MSAT emissions in

the study area are likely to be lower in the future in nearly all cases.

3.9 Noise

Noise levels are measured in decibels, abbreviated dB, and are adjusted to better match the response of the human ear by a method called A-weighting (dBA). Noise level measurements are also averaged to replicate an hour-long period to better represent the multiple noise events occurring in an area rather than measuring a single noise event. This measurement is referred to as the Leq(h). The measured noise levels are used to validate a Traffic Noise Model (TNM) v2.5 of the site. Noise levels from computer modeling incorporate free-flowing peak-hour traffic volumes, traffic speeds, local topography, roadway configurations, and the location of receivers relative to the roadway.

CDOT has adopted criteria by which to determine noise impacts from traffic sources on certain land uses. These noise abatement criteria (NAC) are shown in **Table 3-10.**

The criteria are typically applied to outdoor areas of use, which for residences is usually described as a first-floor outdoor patio/deck area. If a project would result in noise levels above these thresholds, noise mitigation would need to be considered as a part of the project. Additionally, a noise impact is considered to be substantial if the project would result in a noise increase of 10 dBA or greater over existing noise levels. Mitigation would then need to be considered. Generally, an increase of 3 to 5 dBA is noticeable to the human ear, and an increase of 10 dBA is perceived by the human ear as a doubling of noise levels.

3.9.1 Existing Conditions

Land uses in the study area are primarily transportation and agricultural, with some commercial and residential uses. Noise-sensitive land uses include the former Candle Lite Motel, a single-family residence, and residential subdivisions between I-70 and East Colfax Avenue, and 11th Avenue and Picadilly. Much of the currently undeveloped agricultural land is platted for commercial and light industrial development. Commercial, light industrial facilities are located northeast of the current I-70/E-470 interchange, and a natural gas compression station is north of I-70 near Harvest Road.

Table 3-10
CDOT Noise Abatement Criteria (NAC)

Category	Leq(h)* Decibels of A wave	Description of Activity Category
A	56 Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	66 Exterior	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals.
C	71 Exterior	Developed lands, properties or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	51 Interior	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: CDOT
*Leq(h) describes the hourly value of Leq. Leq is the mean noise level during the peak traffic period.

Noise analyses were conducted for the study area. Current CDOT noise policy requires a noise analysis to include all receivers within a study area that is defined as receivers within a 500-foot distance in all directions from any of the proposed action's roadways (see **Figure 2-12**). Field noise measurements were taken at three locations around the study area where outdoor activity is likely to occur. Results of existing noise levels for the monitored sites are shown in **Table 3-11** and locations shown on **Figure 3-16**. For more detailed information, please refer to the *I-70/E-470 Noise Analysis Technical Memorandum* (Carter & Burgess, 2006).

The existing noise levels approach or exceed the NAC at two of the monitoring locations. These sites fall under Activity Category B of the NAC. These field measurements were also used to verify the model of existing noise levels for all receivers in the study area, using the STAMINA 2.0 software according to CDOT noise modeling guidelines.

CDOT noise policy states that noise impacts must be determined for future developments that have been platted and have issued building permits at the time of the analysis. At the time of this study, most of the study area between Picadilly Road and Harvest Road, and Smith Road and Colfax Avenue, has been planned or platted for development. The northeast quadrant of the existing I-70/E-470 interchange is platted and permitted for a business park. The northwest quadrant of the existing I-70/E-470 interchange is platted for warehouse and light industrial development. The City of Aurora has recently disclosed planning for Horizon City Center, a 2,800-unit residential development with associated retail and commercial development centered on the relocated Colfax Avenue.

Receivers have been placed to represent noise sensitive sites in accordance with the CDOT Noise Policy and Guidelines (2002). There are currently no plats or building permits for this development.

3.9.2 Future Noise Levels

Future traffic volumes and future interchange roadway alignments were modeled to determine future noise levels with the Preferred Alternative. Receivers were placed at the monitored sites and seven other sites within the study area to determine future noise levels and impacts under both the No-Action and the Preferred Alternative (see **Figure 3-16** for the locations of the noise model receivers). The sites modeled represent current and future noise-sensitive uses within the study area. Predicted noise levels in 2030 at the impacted locations are listed in **Table 3-12**.

Table 3-11
Field Noise Monitoring Results

Site ID	Activity Category	Location	Monitored Noise Level (dBA) During a.m. Peak Hours	Monitored Noise Level (dBA) During p.m. Peak Hours	Modeled Existing Noise Level (dBA) During p.m. Peak Hours
R4	B	East end of residential motel	59.5	67.6	68.6
R5	B	West end of residential motel	57.6	71.5	67.6
R6	B	Picadilly and East 11th Street	53.6	54.7	60.3

Figure 3-16
Noise Monitoring and Model Receiver Locations

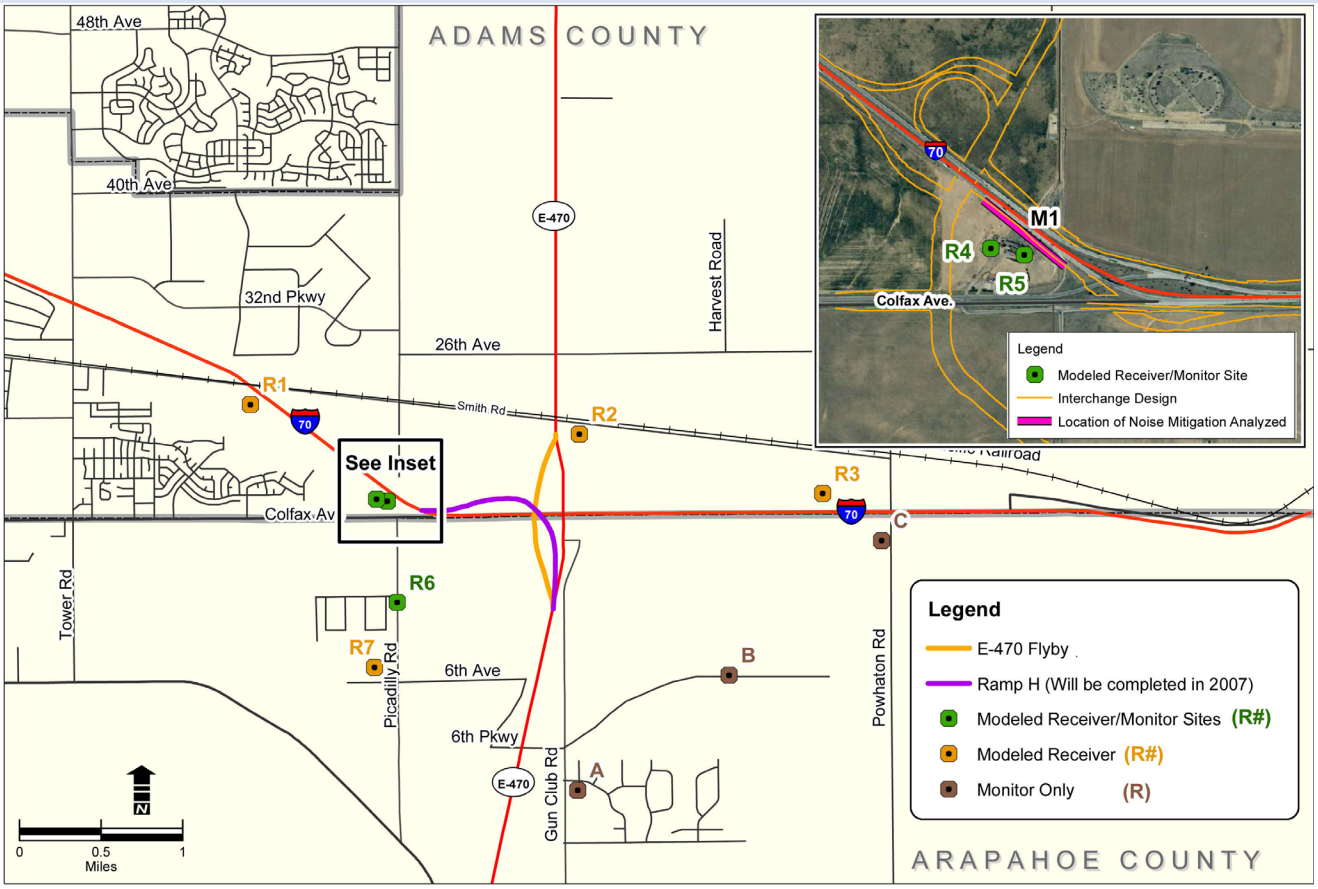


Table 3-12
Predicted Noise Levels at Modeled Locations

Site ID	NAC Category	Description of Receiver	Existing 2005 Traffic (dBA)	No-Action Including Flyby Alternative 2030 AM/PM Peak Traffic (dBA)	Preferred Alternative 2030 AM/PM Peak Traffic (dBA)
R1	B	Cemetery 300 feet from I-70	65.2	67.3/67.3	67.9/68.0
R2	C	Commercial site at East 19th Avenue	57.8	57.8/57.4	61.5/61.2
R3	B	Grimm Farm, 2580 I-70 Frontage Road	--	59.3/59.6	61.3/61.4
R4	B	Single residence at I-70 Colfax ramps	69.7	62.9/63.4	63.8/64.1
R5	B	Former motel at I-70 Colfax ramps	68.2	65.5/66.4	65.5/66.0
R6	B	Representative residence at East 11th Street & Picadilly	56.0	62.3/63.2	63.6/65.1
R7	B	Representative residence along Picadilly Road	--	64.4/65.6	65.9/67.7

3.9.3 Noise Impacts

This section describes noise impacts.

Would this project increase noise levels? The noise levels predicted for the new interchanges along I-70 at E-470 and Harvest Road would not greatly increase the noise levels at any existing neighborhood. The resident-motel at I-70 and Picadilly would remain impacted above federally established thresholds. It is currently impacted by the existing I-70 mainline traffic. The neighborhood at Picadilly Road and 11th Avenue would experience an increase of 7 to 9 decibels over the existing noise levels because of the modification planned on Picadilly Road.

No-Action Alternative. Noise levels near the interchange are expected to increase as traffic increases. The No-Action Alternative includes the widened six-lane Picadilly Road, extended, six-lane Harvest Road, relocated and extended Colfax Avenue, the E-470 Flyby, the modified old E-470 alignment, I-70 access ramps, and a northbound E-470 to westbound I-70 ramp. 2030 traffic projections developed using the DRCOG regional model show that the Gun Club Road daily traffic south of Colfax Avenue would average 12,000 vehicles per day (vpd). Traffic counts on Gun Club Road in 2004 totaled 3,600 vehicles on the average day. The No-Action Alternative continues to focus interstate-destined traffic onto E-470 and Gun Club Road, increasing the effect of noise along those routes.

Predicted noise levels are listed in **Table 3-12**. All modeled noise receiver locations are highlighted in **Figure 3-16**. The former motel at the I-70 Colfax ramps (R4) and the cemetery south of I-70 (R1) would experience noise at or above the 66 dBA Colorado NAC, while the Picadilly residential subdivision (R6, R7) and Grimm Farm (R3) located near I-70 at Harvest Road would not exceed the NAC. The existing Category C commercial receiver located at East 19th Avenue east of E-470 (R2) would not experience noise at or above 71 dBA commercial abatement criterion.

Preferred Alternative. The Preferred Alternative has three separate interchanges. A series of complex braided and flyover ramps would provide freeway-to-freeway access between I-70 and E-470. The existing E-470 alignment would be reconfigured and existing signalized intersections would be preserved to provide local access at 19th Avenue and relocated Colfax Avenue. This alternative would allow the through traffic on north- and southbound E-470 to flow freely while allowing local access through the existing intersections.

Under the Preferred Alternative, the present diamond interchange at Gun Club Road would be replaced by a new full interchange with an overpass at a continuous, widened Harvest Road. The Preferred Alternative would also replace the partial interchange at Colfax Avenue with a full interchange including a continuous, widened Picadilly Road. The main roadway of Picadilly Road would be depressed and pass under I-70. Colfax Avenue would be relocated to an offset location south along Picadilly Road and continue east to connect with Harvest Road.

The receivers in the Preferred Alternative would generally experience the same or slightly increased noise as the No-Action Alternative, as shown in **Table 3-12**. The former motel at the I-70 Colfax ramps (R4), the cemetery south of I-70 (R1), and residences along Picadilly Road (R7) would experience noise at or above the 66 dBA Colorado NAC. Residential noise receivers exceeding the abatement criterion require consideration of mitigation measures. The existing Category C commercial receiver located at East 19th Avenue east of E-470 (R2) would not experience noise at or above 71 dBA commercial abatement criterion. Additional discussion of noise issues can be found in **Section 3.22**.

3.9.4 Noise Mitigation

According to FHWA and CDOT, the "feasibility and reasonableness" of mitigation needs to be considered for all locations that are projected to experience noise impacts. The feasibility analysis of mitigation considers such factors as the effectiveness of a barrier to achieve a 5-dBA reduction in predicted future noise levels, construction, engineering, maintenance, or other design issues. Mitigation measures are considered feasible if they can achieve a minimum of a 5-dBA noise reduction for at least one receiver. They should not create any

safety or unacceptable maintenance problems. Noise mitigation is considered reasonable if it meets certain criteria, such as the cost per receiver per decibel of noise reduction and type of land use protected. For example, business districts typically do not receive noise mitigation, as noise barriers would block the view of businesses from motorists.

Mitigation should consider all possible noise abatement measures for reasonableness and feasibility. These include noise barriers or walls, earthen berms, creating buffer zones of undeveloped land, planting vegetation, traffic management, installing noise insulation on buildings, and relocating the highway.

What would happen to local Gun Club Road traffic? Would the noise levels increase in the Gun Club Road neighborhoods south of the interchanges? More than 8,000 new residents and jobs are projected for the immediate area around I-70/E-470 by 2030. Access with I-70 and E-470 would be provided by ramps to and from the existing system at three locations, each approximately one mile from the new I-70/E-470 interchange: I-70/Picadilly Road, I-70/Harvest Road, and E-470/6th Parkway. Access would also be provided at E-470 and 6th and E-470 and 56th. A new alignment of Gun Club Road in the vicinity of I-70 is planned, removing direct accessibility from the interstate and E-470. Most local, interstate and tollway traffic would be distributed to the improved Picadilly and Harvest Roads by the new interchanges and ramp configurations. This would eliminate much of the through traffic that currently utilizes Gun Club Road and is responsible for much of the noise in the neighborhoods today. Morning and afternoon rush hour measurements of 58.0 and 58.3 decibels were taken at the vicinity of Gun Club and 6th Parkway. Today's traffic on Gun Club Road averages 3,600 vehicles per day (vpd). If no interchanges are built, the 2030 traffic would be over 8,000 vpd with a corresponding increase in noise levels of about 2 to 3 decibels, still under the threshold for noise impacts. With the installation of the three interchanges, that number drops to 4,000 vpd. These new and improved Picadilly and Harvest Roads are expected to carry more than 21,000 vpd resulting from growth and the new facilities in 2030. The composition of traffic on Gun Club (high heavy truck volumes) would likely change because of the lack of direct interstate access. The net result to outlying subdivisions, particularly in the vicinity of E-470 and 6th Parkway, would be increased traffic, and therefore increased noise levels on the improved Picadilly and Harvest Roads. Noise levels on Gun Club Road would remain at levels similar to the existing conditions.

Creating buffer zones, constructing earth berms, and planting vegetation may be feasible south of the I-70 corridor. Although these abatement measures require large amounts of land to achieve the necessary noise reductions, the early planning stages of development and surrounding land use in the southern half of the study area could allow the City of Aurora to require abatement measures, such as dedicated landscaped buffers and set-backs for areas of development with concentrated sensitive receivers.

Traffic management, such as limiting truck traffic on the highway, is not feasible because the interstate is the designated national transport route. Tolling on E-470 already is effective in controlling traffic volumes and composition. However, restriction of truck traffic on arterial streets would create difficulties because of the limited local roadway network connectivity and the high demand for truck access at both the Quincy Road landfill and warehouse-light industry businesses of the northern quadrants of the study area.

Because of the high cost, installing noise insulation on buildings is usually reserved for public buildings such as schools or hospitals. For this reason, noise barriers are the most appropriate noise abatement measure for the Preferred Alternative.

Site R1 is a cemetery, which in the future with the No-Action and Preferred Alternatives, would exceed the FHWA and CDOT Noise Abetment Criteria. Because the cemetery has only sporadic use, a barrier at this location would constitute little recognizable benefit, thus a barrier is not feasible and reasonable and not recommended.

Barrier M1. Noise walls of various lengths and heights were modeled for the impacted receiver at the former motel location to determine if mitigation would be reasonable and feasible. The mitigation analysis addressed walls located adjacent to the I-70 eastbound clear zone running at varying lengths between the Picadilly Road bridge to near the proposed E-470 southbound ramp. As shown in the summary of mitigation analysis in **Table 3-13**, to achieve the minimum 5-decibel reduction required by CDOT, portions of the wall would need to be at

Table 3-13
Results of Mitigation Analysis for the Preferred Alternative

Barrier	Barrier Height (ft)	Barrier Length (ft)	Barrier Cost	Benefited Receivers	Average Noise Reduction (dBA)	Cost per Benefited Received per dBA	Reasonable or Feasible
M1a	14	1,300	$546,000	6	1.9	$47,890	No
M1b	18	1,300	$702,000	6	3.3	$35,450	No
M1c	20	1,300	$780,000	6	5.4	$21,660	No
M1d	20	900	$540,000	6	4.6	$19,565	No

least 20 feet tall. A 20-foot-tall noise barrier would exceed $19,500 per decibel reduction for all receptors that experienced a reduction in noise. ***For this reason, noise mitigation for the Preferred Alternative was found to be not reasonable or feasible.***

Picadilly Road. Noise impacts to the Picadilly Road residential subdivision represented by receivers R6 and R7 require consideration of noise abatement mitigation. Each residence would require driveway access to the existing Picadilly alignment. A mitigation barrier would not be reasonable or feasible for multiple reasons. The continuity of the noise barrier would be broken by gaps created at each driveway. Line-of-sight restrictions from these driveways accessing the existing Picadilly alignment would require large gaps in the noise barrier, which dramatically reduce the barrier's overall effectiveness. Additionally, the relatively wide spacing of homes along Picadilly would require a 4,000- to 5,000-foot-long wall to achieve an effective noise reduction for the first row of receivers. The cost-benefit for such a barrier with this low-density housing is typically not reasonable.

If the alignment of Picadilly Road were shifted east of the current alignment, noise reduction would result. A major change of alignment would allow for other noise abatement measures to be employed to further reduce noise at this subdivision, such as use of the existing Picadilly Road as a frontage road to maintain access to existing driveways while providing limited access to a new mainline Picadilly arterial road located farther east. This scenario would address feasibility flaws created by safety issues and allow future consideration of noise abatement barrier. This mitigation measure would be the responsibility of the City of Aurora or developers.

3.10 WATER RESOURCES AND WATER QUALITY

3.10.1 Existing Conditions

The study area falls within the South Platte River Basin, which covers approximately 24,300 square miles. The South Platte River originates in the mountains of central Colorado at altitudes higher than 14,000 feet above sea level. The river flows northeastward for approximately 270 miles through the Front Range urban corridor and across the eastern plains. Elevations in the vicinity of the project average 5,117 feet above sea level.

The City of Aurora's water supply comes primarily from snowmelt runoff in Colorado. Water is transported from as far as 180 miles away to meet daily needs. The City of Aurora has a comprehensive plan to provide for the current and future water needs of Aurora residents. Aurora's goal is to double storage capacity by the year 2030 to 300,000 acre-feet, which would meet projected water demand. The plan includes developments for improving water

storage capabilities and maintaining and upgrading pipes, pumps, and treatment plants. In addition, it actively encourages conservation.

The only surface water within the study area includes one intermittent stream, First Creek. Sand Creek is next closest drainageway just to the south of the study area. Because of the intermittent nature of these creeks, there is no water quality or flow information available for either creek.

The proposed action's location falls under the CDPHE Phase I and Phase II Storm Water Regulations, "Urbanized Areas," and would follow the requirements of CDOT's Municipal Separate Storm Sewer System (MS4) permit.

3.10.2 Water Resources and Water Quality Impacts

No-Action Alternative. The No-Action Alternative would likely have no impact on First Creek in the near term; however, based on the expected locations and amount of impervious roadway surface of the No-Action Alternative roadway network, impacts to the creek would occur in the future.

Preferred Alternative. The Preferred Alternative would impact First Creek. Construction of the new interchanges, in addition to placement of new roadways, would increase the amount of impervious surfaces, thereby increasing storm runoff. Another impact associated with construction is soil erosion, which could result in increased contamination of waterways. In addition, due to construction activities, permanent modification to First Creek, an intermittent stream channel, would be necessary. These water quality impacts are expected to be minimal because of the intermittent nature of First Creek and the implementation of temporary and permanent Best Management Practices (BMPs) (see Section 3.10.3). By implementing the BMPs, there would not be a major long-term impact to the water quality of First Creek or downstream waterways in the South Platte River Basin.

No impacts to ground water quality are expected because of the Preferred Alternative.

3.10.3 Water Resources and Water Quality Mitigation

The use of standard erosion and sediment control BMPs in accordance with Erosion Control and Storm Water Quality Guide, CDOT, 2002, would be included in the final design plans. A drainage master plan would be prepared in cooperation with the Urban Drainage and Flood Control District, E-470, CDOT, the City of Aurora, and the Counties of Adams and Arapahoe, ensuring that new interchange drainage facilities are compatible with adjacent facilities.

All work on the proposed action shall be in conformity with Subsection 107.25 and Section 208 of the *CDOT Standard Specifications for Road and Bridge Construction*. As previously mentioned, the proposed action's location falls under the CDPHE Phase I and Phase II Storm Water Regulations and would follow the requirements of CDOT's MS4 permit. Specifically, the two CDOT Storm Water Management Programs that would apply are the Construction Sites Storm Water Management Program and the New Development and Redevelopment Planning Procedures for Storm Water Management.

After a highway project is identified, the permanent BMP planning process under MS4 is to determine if there would be water quality impacts. If there are, permanent BMPs are required. The permanent BMPs should be included in the proposed action's preliminary design, including cost consideration. Once this design, is underway, an environmental review can be performed that includes the conceptual BMPs. As the environmental document is being prepared, final determination on the BMPs is made. Once this is completed, field review and preliminary design modifications are conducted, which is then followed by final BMP design and CDOT review.

Through continuous collaboration with the flyby design team, the E-470 Authority, and CDOT, the interim and ultimate condition analyses for the full I-70/E-470 interchange were coordinated so that permanent BMPs designed for the flyby phase

would also be used in the full I-70/E-470 interchange. This is documented in the *Final Storm Drainage Design Report: I-70/E-470 Interchange Complex Project, Flyby Phase 1*, February 2005 and revised in April 2005. The flyby did not impact the Harvest Road interchange area or the Picadilly Road interchange area; therefore, new water quality facilities have been proposed for those areas and are described in the *I-70/E-470 Interchange Complex Preliminary Storm Drainage Design Report, (Parsons* Brinckerhoff, 2006). This report will be submitted to CDOT before the completion of the EA process. Proposed permanent BMP water quality facilities were preliminarily sized using the Water Quality Control Volume (WQCV) equation presented in the *Urban Drainage and Flood Control District* (UDFCD) *Urban Storm Drainage Criteria Manual* (USDCM) *Volume 3, Best Management Practices*. This equation bases the size of the basin on the amount of impervious area contributing to the basin. All permanent BMPs were designed to capture 100 percent of the runoff from the impervious surface.

The following specific BMPs from the *Erosion Control and Storm Water Quality Guide*, CDOT, 2002, would be required during construction to reduce construction-related and/or long-term impacts to water resources:

- Adjacent disturbed fill slopes would be revegetated with native plant species to protect exposed soils from erosion.
- Disturbance to vegetated areas would be minimized, and revegetation of disturbed vegetated surfaces would occur within seven days of earthwork as required by the Colorado Discharge Permit System regulations. Where temporary or permanent seeding operations are not feasible because of seasonal constraints (e.g., summer and winter months), mulch and mulch tackifier or soil binder would be applied to protect soils from erosion.
- Erosion control blankets would be used on, a minimum, steep (2:1 or greater, or 3:1 or greater on slopes facing south or west), newly seeded slopes to control erosion and to promote the establishment of vegetation. Slopes should be roughened at all times.
- Concrete washout must be contained and properly disposed.
- Erosion bales and straw logs would be used as sediment barriers and filters along the toes-of-fill adjacent to surface waterways and at inlets where appropriate.
- Silt fences, erosion logs, or temporary berms would be used to intercept sediment-laden runoff before it enters a wetland or surface water feature.
- Sediment catch basins would be built during construction and permanently maintained to capture the sand from the road surface during winter sanding operations.
- Where appropriate, slope drains would be used to convey concentrated runoff from the top to bottom of disturbed slopes. Slope and cross-drain outlets would be constructed to trap sediment.
- Storm drain inlet barriers would be used where appropriate to trap sediment before it enters the cross-drain.
- Check dams would be used where appropriate to slow the velocity of water through roadside ditches and in swales.
- Temporary retention ponds would be used to allow sediment to settle out of runoff before it leaves the construction area. These ponds may be combined with permanent detention ponds.
- Structural BMPs can include the following: extended detention basins with sediment forebays, wetland grass swales, wetland grass buffers, and constructed wetland basins. Non-structural BMPs can include litter and debris control, and landscaping and vegetative practices.
- Settling ponds for effluent from dewatering operations would be used, if needed.

During the design, the CDOT Hydraulic Engineer and Landscape Architect would review the project plans and provide comments as necessary.

3.11 Wetlands and other Waters of the U.S.

Wetlands of the study area were delineated by ERO Resources in September and November 2000, and were reviewed and rechecked in April 2003 by Carter & Burgess. Wetland areas were determined based on the presence of hydrophytic vegetation, hydric soils, and wetland hydrology as specified in the *1987 U.S. Army Corps of Engineers Wetlands Delineation Manual*. Wetlands were present in the southwest quadrant of the interchange and in the First Creek swale (see **Figure 3-17**).

3.11.1 Existing Conditions

As shown in **Figure 3-17** and **Table 3-14**, two wetland sites and one other Waters of the U.S. site are present within the study area. As determined by the U.S. Army Corps of Engineers (USACE), jurisdictional wetlands and Waters of the U.S. are present in the First Creek swale (correspondence from the USACE is included in **Appendix A**).

3.11.2 Wetlands and other Waters of the U.S. Within the Study Area

Wetland delineations were conducted in spring 2003 to verify previously identified wetlands. Although wetland area has decreased recently because of severe drought, it is anticipated that wetlands would recover as hydrology is restored.

Figure 3-17
Existing Wetlands

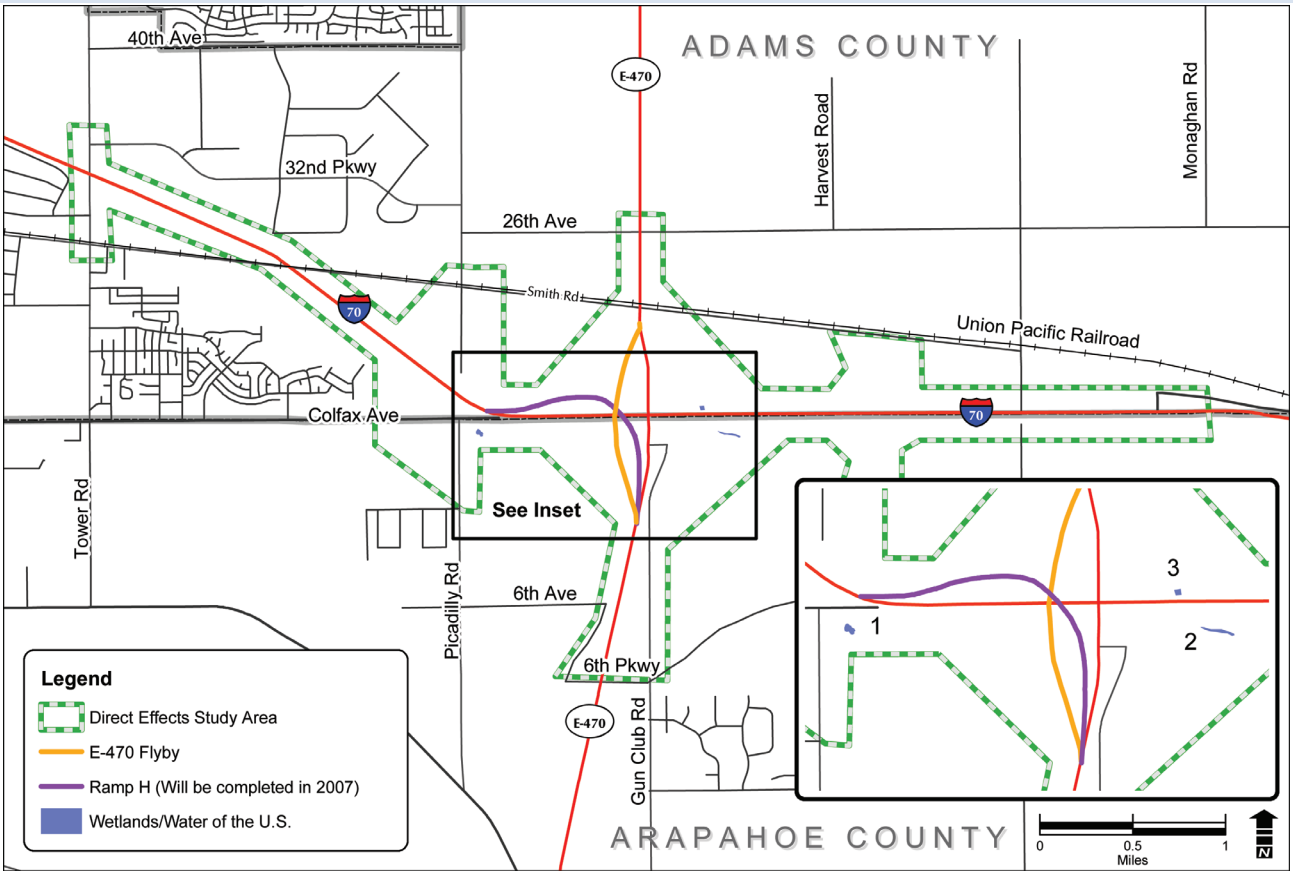


Table 3-14
Wetlands and other Waters of the U.S. in the Study Area

Site ID	Existing Acres within the Study Area	USACE Jurisdictional?	Cowardin Wetland Type	Comment
1	2*	No	Palustrine emergent	Isolated marsh
2	1*	Yes	Palustrine emergent	First Creek swale
3	<.01	Yes	Waters of the U.S.	First Creek
Total	**3 acres**			

*Maximum area based on 2000 surveys.

Site 1 is a wetland that appeared to be in transition to a drier vegetation community, probably due to the severe drought condition of the two previous summers. The area was mapped as possibly wetland based on saturated soils, borderline soil colors, and presence of senescent bulrush (*Schoenoplectus lacustris*, obligate wetland). Much of the former wetland area has been invaded by noxious weed Canada thistle (*Breea arvensis*, facultative upland) and by alien kochia (*Bassia sieversiana*, facultative upland).

Site 2 is a cattail (Typha angustifolia, obligate) wetland with a mature peach-leaved willow (Salix amygdaloides, facultative wetland) in the First Creek swale. Soils were saturated and had low-chroma colors. A Canada thistle infestation was present adjacent to the wetland.

The USACE has determined that wetlands in the First Creek swale may be jurisdictional wetlands. First Creek is an intermittent stream that flows only after storm events. Much of the swale is vegetated by upland species and is under cultivation.

In general, wetland functions include channel stabilization, food chain support, wildlife habitat, flood control, and groundwater recharge/discharge.

Site 3 is the First Creek swale just north of I-70. The 50-foot section at the I-70 concrete box culvert outlet meets streambed qualifications and is considered a Waters of the U.S. under USACE jurisdiction.

3.11.3 Wetlands and Other Waters of the U.S. Impacts

No-Action Alternative. No wetlands or other Waters of the U.S. would be impacted under the No-Action Alternative.

Preferred Alternative. The Preferred Alternative would not impact wetlands but would impact the jurisdictional portion of the First Creek swale adjacent to I-70. The culvert would be extended about 50 feet to the north because of widening of the I-70 mainline. USACE anticipates use of Nationwide Permit 18 for fill in the First Creek Waters of the U.S.; no mitigation is required with this permit.

3.11.4 Practicable Alternatives

Because the Preferred Alternative would involve construction of an auxiliary lane on I-70 westbound, no practicable alternatives were present to avoid impacts to the jurisdictional portion of the First Creek swale.

3.11.5 Wetland Mitigation

Because no wetlands would be impacted, wetland mitigation would not be required.

3.12 Vegetation and Noxious Weeds

3.12.1 Vegetation Existing Conditions

Highly altered since European settlement, the study area is dominated by noxious weeds and other non-native plants. Probably less than one percent of the existing vegetation cover is comprised of plants native to the eastern plains of Colorado. Soils of the project area appear to be very dry and most trees appear drought-stressed. Currently most of the study area is fields or cropland which is either fallow or too dry to support crop species. Vegetation of the highway rights-of-way is mainly smooth brome, kochia, State of Colorado Noxious Weed field bindweed, and Canada thistle with minor cover by native western wheatgrass. Dominant vegetation of the fields adjacent to the roads includes State of Colorado Noxious Weeds field bindweed, Canada thistle, common mullein, musk thistle, diffuse knapweed, leafy spurge, and weedy species such as plumeless thistle, kochia, and prickly lettuce. Minor areas of planted trees including pinyon pine, juniper, Chinese elm, and locust are present at the eastern end of the project area. A grove of native plains cottonwood with Chinese elm is present west of E-470 and north of I-25. In the old farm area in the northeast quadrant of the intersection are very scattered Chinese elm, juniper, pine, plains cottonwood, tree-of-heaven, and Russian olive, a State of Colorado Noxious Weed. A small grove of plains cottonwood and native peach-leaved willow is present at the First Creek culvert outlet north of I-70. A band of scattered Russian olive is present south of the frontage road adjacent to eastbound I-25.

3.12.2 Noxious Weeds Existing Conditions

Noxious weeds are invasive, non-native plants introduced to Colorado by accident or which spread after being planted for another purpose and which result in lands with decreased economic and environmental value. The Colorado Noxious Weed Act (35-5.5-101 through 119, C.R.S.) recognizes that, "certain undesirable plants constitute a present threat to the continued economic and environmental value of the lands of the state and if present in any area of the state must be managed." The legislation places all public and private lands in Colorado under the jurisdiction of local governments to manage noxious weeds. According to the Act, a noxious weed meets one or more of the following criteria:

- Aggressively invades or is detrimental to economic crops of native plant communities
- Is poisonous to livestock
- Is a carrier of detrimental insects, diseases, or parasites
- Has direct or indirect effects that are detrimental to the environmentally sound management of natural or agricultural ecosystems.

Under the Noxious Weed Act, the State of Colorado Noxious Weed lists are categorized by control priority:

- List A: Rare noxious weeds and all county noxious weeds in dispersal conduits. High priority species are designated for eradication.
- List B: Well established noxious weeds with discrete statewide distributions which must be managed to stop continued spread.
- List C: Extensive, wide-spread, well-established infestations for which control is recommended.

It is the duty of all persons to use integrated methods to manage noxious weeds if the weeds are likely to be materially damaging to the land of neighboring land owners.

Additionally, both Adams and Arapahoe Counties have published county lists of Noxious Weed Species.

A weed survey of the study area was conducted in August 2006. Nearly 100 percent of vegetation cover in the study area is by non-native species although not all these species are currently listed as State of Colorado Noxious Weeds.

No weed species from the State of Colorado High Priority List (List A) were noted in the study area during weed surveys. Weed species from the State Medium Priority List (List B), Low Priority List (List C) and CDOT's Top 25 List were observed in the study area during the surveys. These weed species are listed in **Table 3-15**. Other State listed species

not blooming during the weed survey or lacking persistent stalks may be present in the project area.

Weeds not currently listed by the State of Colorado or by CDOT noted in the study area were kochia, curly dock, and prickly lettuce.

3.12.3 Vegetation Impacts

No-Action Alternative. As planned development continues in the study area, impacts would continue to occur to vegetation.

Preferred Alternative. Direct impacts to vegetation would occur from clearing, excavation, and grading for the proposed improvements. There are no conservation sites or sensitive plant communities within the study area. Impacts to native vegetation are anticipated to be minimal since the entire undeveloped portion of the study area is dominated by weedy species.

3.12.4 Noxious Weeds Impacts

No-Action Alternative. Construction of projects under the No-Action Alternative would disturb areas that are already inhabited by weeds, resulting in the potential for the introduction of new weed species into those areas.

Preferred Alternative. Construction of the Preferred Alternative would disturb areas that are already inhabited by weeds and would disturb areas that currently have a relative minor weed cover, resulting in the potential for the introduction of weeds into those areas. Temporary work areas would also be susceptible to weed invasion.

Table 3-15
State of Colorado, Adams County and Arapahoe County Listed Weed Species and Common Vegetation Species Observed in the I-70/E-470 Study Area

Common Name	Scientific Name	Adams County Weed List*	Arapahoe County Weed List*	CDOT Weed List**	State Noxious Weed List***
Canada thistle	*Cirsium arvense*	X	X	X	B
Common mullein	*Verbascum thapsus*				C
Diffuse knapweed	*Centaurea diffusa*	X	X	X	B
Downy brome	*Bromus tectorum*				C
Field bindweed	*Convolvulus arvensis*	X	X	X	C
Leafy spurge	*Ephorbia esula*	X	X		B
Musk thistle	*Carduus nutans*	X	X	X	B
Plumeless thistle	*Carduus acanthoides*			X	B
Russian-olive	*Elaeagnus angustifolia*			X	B
Chinese elm	*Ulmus pumila*				-
Juniper	*Sabina osteosperma*				-
Kochia	*Bassia sieversiana*				-
Locust	*Robinia* spp.				
Peach-leaved willow	*Salix amygdaloides*				-
Pinyon pine	*Pinus edulis*				-
Plains cottonwood	*Populus deltoides* subsp. *monilifera*				-
Plumeless thistle	*Carduus acanthoides*				-
Smooth brome	*Bromopsis inermis*				-
Tree-of-heaven	*Ailanthus altissima*				-
Western wheatgrass	*Pascopyrum smithii*				-

* From Colorado State University Cooperative Extension website
** From CDOT Noxious Weed Management Plan top 25 weed species to be mapped.
***Colorado Department of Agriculture Noxious Weed Management Program Website, Colorado Noxious Weed list of 5/30/06.

Soil disturbance associated with construction of the Preferred Alternative is anticipated to provide further conditions for invasion of new noxious weed species. Nearly all of the study area is vegetated by non-native, highly invasive species; however, the listed noxious weed species known in the study area which are most likely to spread to construction sites include Canada thistle, diffuse knapweed, musk thistle, common mullein, field bindweed, downy brome, and plumeless thistle.

3.12.5 Vegetation and Noxious Weeds Impact Mitigation

All CDOT revegetation BMPs and guidelines will be followed to ensure adequate revegetation of the study area. All disturbed areas will be seeded in phases throughout construction. Although specific BMPs to be used in the study area will not be determined until final design, mitigation measures are anticipated to include:

- Minimize the amount of disturbance and limit the amount of time that disturbed areas are allowed to be non-vegetated.
- Implement the project Integrated Weed Management Plan.
- Avoid existing trees not included in the Colorado Noxious Weed list, and areas with a minor weed cover to the maximum extent possible.
- Implement temporary and permanent erosion control measures to limit erosion and soil loss. Erosion control blankets will be used on steep, newly seeded slopes to control erosion and to promote the establishment of vegetation. Slopes should be roughened at all times and concrete washout contained.
- Time tree removal for outside of nesting season per the Migratory Bird Treaty Act.
- All disturbed areas will be revegetated with native grass and forb species. Seed, mulch and mulch tackifier will be applied in phases throughout construction.
- Removed native trees and shrubs will be replaced on a 1:1 basis, if practicable, as required by CDOT Region 1.

Since soil disturbance with accompanying invasion by noxious weed species can be associated with highway construction, an Integrated Weed Management Plan will be written during design per CDOT guidelines, reviewed by CDOT, incorporated into the project design and implemented during construction. Specific BMPs will be required during construction to reduce the potential for introduction and spread of noxious weed species and include:

- Mapping will be included in the construction documents along with appropriate control methods for noxious weeds.
- Highway right-of-way areas will periodically be inspected by a noxious weed specialist from the city or its consultants during construction and during post-construction weed monitoring for invasion of noxious weeds.
- Weed management measures will include removal of heavily infested topsoil (>61% cover by noxious weeds), chemical treatment of more lightly infested topsoil (<60% cover by noxious weeds), limiting disturbance areas, phased seeding with native species throughout the project, monitoring during and after construction, other chemical and/or mechanical treatments.
- Use of herbicides will include selection of appropriate herbicides and timing of herbicide spraying.
- Certified weed-free hay and/or mulch will be used in all revegetated areas.
- No fertilizers will be allowed on the project site.
- Supplemental weed control measures may be added during design and construction planning.

Preventative Control Measures for project design and construction may include:

- Native Plants: Use of native species in revegetation sites.

- Weed Free Forage Act: Materials used for the project will be inspected and regulated under the Weed Free Forage Act, Title 35, Article 27.5, CRS.
- Topsoil Management: When salvaging topsoil from on-site construction locations, the potential for spread of noxious weeds will be considered. Importing topsoil onto the project site will not be allowed.
- Equipment Management: Equipment will remain on designated roadways and stay out of weed- infested areas until the areas are treated. All equipment will be cleaned of all soil and vegetative plant parts prior to arriving on the project site.

3.13 Floodplains

3.13.1 Existing Conditions

For the purpose of this existing condition assessment, only the effective floodplain information would be presented. The Federal Emergency Management Agency (FEMA) regulates the effective floodplain in conjunction with any proposed development activity, such as the I-70/E-470 interchange complex.

First Creek is the only drainageway within the study area. A 100-year floodplain has been delineated for First Creek. Floodplain boundaries are shown on the effective Flood Insurance Rate Map (FIRM) Panel Number 08002 0205E, dated August 16, 1995. Following the construction of E-470 in this vicinity in 1998, a floodplain boundary revision was issued by FEMA to document impacts of E-470 to the First Creek floodplain. This revision became effective on January 23, 2002. **Figure 3-18** shows the revised floodplain boundary. **Table 3-16** lists the peak flood discharges used to determine the floodplain boundaries.

First Creek is an east bank tributary to the South Platte River. First Creek originates in central Arapahoe County and has a total basin area of approximately 47 square miles. E-470 crosses First Creek about 21 miles upstream from its confluence with the South Platte River. The tributary area upstream of the study area is approximately 13 square miles. There are no flow-regulating structures of any kind on the main stem of First Creek upstream of the interchange.

Currently through the study area, First Creek crosses I-70, Smith Way, and the E-470 mainline. Each of the crossings is a multicelled concrete box culvert structure. None of these roadways are inundated by the 100-year floodplain.

Through the study area, the existing natural channel is poorly defined and flows are intermittent. The creek does not support any fish habitat. The regulated floodplain in the vicinity of the study area ranges from 500 to 1,180 feet in width. The creek is vegetated with native grasses and stands of cottonwood and willow trees, with cultivated cropland in the overbank areas. The streambed crosses through the study area flowing generally from southeast to northwest. The channel bottom is sandy, and the average stream gradient is about 0.3 percent.

3.13.2 Floodplain Impacts

This section describes impacts to floodplains in the study area.

Would the flooding along Picadilly Road be addressed in this project? No. The flooding on Picadilly Road occurs south of East 11th Avenue, which is the southerly limit of the proposed improvements to Picadilly Road included in the Preferred Alternative. However, improvements to the portion of Picadilly Road south of East 11th Avenue are included in the *City of Aurora Comprehensive Plan* and are planned in conjunction with the proposed Horizon City Center project. As part of that project, new drainage facilities are planned to provide for carrying storm water south to Coal Creek, alleviating the current flooding west of Picadilly. The City of Aurora would review these plans as part of the development process.

No-Action Alternative. Under the No-Action Alternative, Gun Club Road is proposed to be relocated approximately 0.5 mile east of its current location, while Colfax Avenue would be relocated approximately 0.5 mile south of I-70. Both of these roadway relocations would cross the First Creek

Figure 3-18
Existing Floodplains

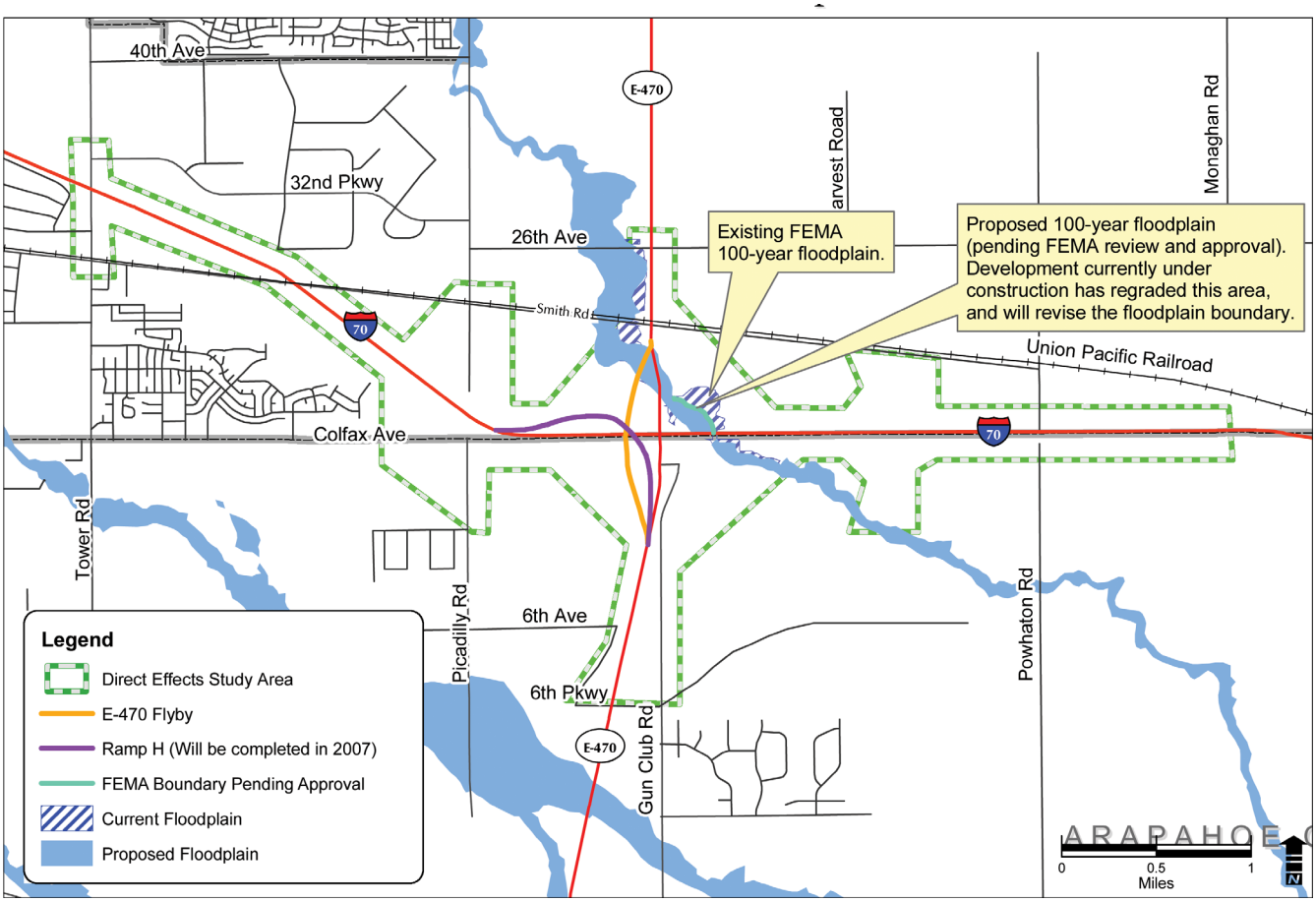


Table 3-16
First Creek Effective FEMA Flood Discharges (cfs)

Location	10-year	50-year	100-year	500-year
Downstream of I-70	1,022	1,594	3,035	4,128
Downstream of Smith Way	1,046	1,628	3,085	4,198

floodplain. Harvest Road would also cross the First Creek floodplain just south of the intersection with relocated Colfax Avenue. Each of these crossings would require bridges or box culverts that meet FEMA regulations for impacts to the water surface. These three crossings of First Creek impact approximately 11.4 acres of the floodplain.

In addition, there is currently a development underway within the northeast quadrant for Prologis Park. This development placed fill along the northeastern edge of the floodplain, to one foot above the effective water surface elevation, to remove the site from the floodplain. It also required a realignment of Smith Way, and an extension of the existing box culvert for about 35 feet upstream.

Preferred Alternative. The Preferred Alternative impacts the effective First Creek floodplain at several locations.

Beginning in the southeast quadrant, Ramp K would carry traffic from northbound E-470 to eastbound I-70. The slope limits from this ramp would fill in approximately 2.9 acres of the floodplain. An extension of the existing six-celled 10- by 9-foot concrete box culvert would be required for about 150 feet upstream. This culvert extension would need to be designed such that any floodplain modifications would not cause a large increase to the water surface elevation within the southeast quadrant (less than one foot, in accordance with FEMA regulations). The area that would be affected by any floodplain backwater increase consists mainly of cultivated cropland, thus minimizing any risk associated with the proposed action.

The E-470 construction in 1998 mainly impacted the northeast quadrant of the interchange. Construction of E-470 caused a water surface elevation increase from the new concrete box culverts under Smith Way and the E-470 mainline (six-celled 10- by 6-foot concrete box culverts). This backwater resulted in a very wide, shallow floodplain in this quadrant, as shown by the revised effective floodplain delineation. The proposed ramp from westbound I-70 to northbound E-470 (Ramp O) parallels First Creek for much of its alignment. This ramp can be seen on **Figure 2-12** in Chapter 2. Because of the ramp geometry relative to the floodplain boundary, and since there has already been a large impact to the floodplain in this quadrant, Ramp O would be placed mainly on structure rather than fill. Consequently, the impacts to the First Creek floodplain in the northeast quadrant would be relatively minor from a floodplain management standpoint (approximately 0.5 acre). This design would minimize potential floodplain impacts resulting from a longitudinal encroachment.

The main impact area is at the downstream side of the existing box culvert crossing under I-70. This culvert would need to be extended about 50 feet to the north because of widening of the I-70 mainline. There would also be impacts where bridge piers would be required within the floodplain. Pier scour analysis would be required under these conditions.

Another impact to the First Creek floodplain would occur in the northwest quadrant of the interchange. The existing E-470 mainline utilizes the old Gun Club Road bridge over I-70. Under the Preferred Alternative, the E-470 crossing of I-70 would be shifted approximately 800 feet to the west. The E-470 mainline and various ramps and collector/distributor roads would be placed on fill and would cross the floodplain boundary in this quadrant, impacting a total of about 80 acres. These fill slopes would require major extensions of the existing box culvert crossings under E-470 and Smith Way (about 1,000 feet total). However, since these extensions would occurring on the downstream side of the culverts, once the full flood flow has already entered the barrel, the fill being placed within the floodplain should have little impact on the upstream water surface elevations.

The impacts to the First Creek floodplain from the Preferred Alternative are summarized in **Table 3-17**. As stated in the No-Action Alternative section, other potential developments within the study area could have an impact on the First Creek floodplain. A Conditional Letter of Map Revision (CLOMR) request was submitted to FEMA for the Prologis development in February 2003. This CLOMR proposes the establishment of a floodway throughout the study area. Once established, recognition of this floodway would be required for the interchange improvements.

Table 3-17
First Creek Floodplain Impacts

Location	Acreage
Southeast Quadrant	2.9
Northeast Quadrant	0.5
Northwest Quadrant	8.0
TOTAL	**11.4**

The City of Aurora, in cooperation with the Urban Drainage and Flood Control District (UDFCD), has an *Outfall Systems Planning Study* (OSP) for First

Creek. This report is used as a Master Plan for drainage improvements as areas develop. Because of the improvements in the Preferred Alternative, the City and UDFCD may require implementation of various Master Plan improvements throughout the study area, which could include improvements to the channel. The design of these types of improvements would be coordinated with adjacent developments, such as the proposed Eastgate development in the northwest quadrant.

3.13.3 Floodplain Mitigation

Mitigation measures would be required to minimize impacts to the First Creek floodplain. New construction within regulated floodplains requires compliance with FEMA regulations and criteria. The design of all roadway, drainage, and structural features would be in accordance with these criteria, as well as local jurisdictional requirements. This would require close coordination during the design process with several parties, including FEMA, CDOT, UDFCD, the City of Aurora, and any affected property owners.

As noted previously, there is a Master Plan for drainage improvements on First Creek. This report was prepared in anticipation of future developments, such as including the I-70/E-470 interchange complex. One of the purposes of such a report is to determine potential drainage problems and impacts of future development on the drainage system, and to develop proposed improvements to reduce these impacts. Implementation of various proposed improvements may be required as a mitigation measure, which would minimize risk associated with the action. These measures would also restore and preserve the natural and beneficial floodplain values.

In addition to permanent measures to help control future flooding, other temporary measures would be required along First Creek during construction of the interchange. This includes use of standard CDOT and UDFCD erosion control techniques to minimize impacts to the drainageway. Implementation of BMPs would be required to help control erosion and sedimentation within the drainage basin. This would also improve water quality for the runoff being delivered further downstream.

3.14 Wild and Scenic Rivers

First Creek, the only water resource in the study area, is not considered a wild and scenic river. No impacts to a wild and scenic river would occur as a result of either the No-Action Alternative or the Preferred Alternative; therefore, no mitigation is necessary.

3.15 Wildlife and Fisheries

3.15.1 Wildlife Existing Conditions

Wildlife habitat of the study area is associated with wetlands, mature tree groves, and uncultivated grasslands. Toads are reported in wetter areas. Areas disturbed by agricultural activity are considered poor wildlife habitat by the Colorado Division of Wildlife (CDOW).

The 2003 natural resources site review conducted by ERO Resources reported nests for great horned owl, Swainson's hawk, barn swallow, and possibly for raptors. These birds are protected under the Migratory Bird Treaty Act.

3.15.1.1 Burrowing Owl (*Athene cunicularia*)

Burrowing owls, a State of Colorado threatened species, occur in prairie dog colonies and use abandoned prairie dog burrows for roosting and nesting. Federal and state laws, including the Migratory Bird Treaty Act, prohibit killing or harassing burrowing owls. Burrowing owl surveys are not required since no prairie dog colonies are present in the study area.

3.15.1.2 Mountain Plover (*Charadrius montanus*)

Mountain plovers are ground nesting birds of prairie grasslands and fields. Once common, the mountain plover is a Species of Special Concern in Colorado. Very little potential habitat for mountain plover is present in the study area, and no mountain plover were observed during the 2003 survey.

3.15.1.3 Ferruginous Hawk (*Buteo regalis*)

Ferruginous hawks are primarily winter residents on the Colorado eastern plains. Sensitive to human disturbance, the ferruginous hawk is a Species of Special Concern in Colorado. Ferruginous hawks prefer wintering habitat with prairie dog colonies. Since no prairie dog colonies are present in the study area, ferruginous hawks are unlikely to winter in the study area.

3.15.1.4 Raptors and Migratory Birds

No raptor nests were observed in the study area. Groves of mature trees providing important raptor and migratory bird habitat are present in the northwest and northeast quadrants of the interchange and in the First Creek swale south of I-70. Bank swallow nests were present in the First Creek concrete box culvert under I-70.

3.15.1.5 Black-tailed Prairie Dogs (*Cynomys ludovicianus*)

Black-tailed prairie dogs, a keystone species of prairie grasslands, are burrowing rodents which live in colonies. Because of habitat fragmentation, urban development, sylvatic plague, poisoning, and recreational shooting, prairie dog populations are greatly reduced, and they are a Species of Special Concern in Colorado. No colonies are present in the study area, although small colonies are present south of the study area.

3.15.1.6 Northern Leopard Frog (*Rana pipiens*)

Northern leopard frog is potentially present in wetland areas and is a Species of Special Concern in Colorado.

3.15.2 Fisheries Existing Conditions

No fisheries are present in the study area since First Creek is an intermittent stream.

3.15.3 Wildlife and Fisheries Impacts

Wildlife impacts would include loss of some mature trees in the northeast quadrant of I-70 and E-470 as well as loss of disturbed grassland. Because of wider road surface areas, habitat connectivity would decrease. Traffic noise levels would increase, potentially lessening areas of active wildlife use. As with any human development, wildlife species sensitive to human disturbance, such as raptors, are likely to decrease in abundance or abandon the area, while other wildlife species adapted to urban development, such as red fox and raccoon, are likely to increase in abundance.

No-Action Alternative. As planned development continues in the study area, impacts would occur to wildlife resources. No fisheries are present in the study area.

Preferred Alternative. Tree groves which provide nesting and roosting sites for birds would be impacted by the Preferred Alternative. Additionally, construction of the Preferred Alternative would impact undeveloped lands that provide wildlife habitat in the study area. No fisheries are present in the study area.

3.15.4 Wildlife and Fisheries Mitigation

No fisheries mitigation is required since no fisheries are present in the study area. The following mitigation measures are proposed to limit impacts to wildlife resources:

- As possible, retention of large trees that have the potential to serve as raptor nesting habitat as specified by CDOW wildlife biologist or project biologist.
- Removal of any trees with nests would be performed outside of the nesting period to be confirmed by CDOW. New three-inch caliper trees would be planted at a 1:1 replacement ratio when the area is landscaped which would replace the removed trees.
- Bird nest removal would be timed to avoid active/nesting seasons and/or birds would be actively excluded. If necessary, nest surveys would be conducted immediately prior to construction.
- Removal of any bank swallow nests in the First Creek culverts under I-70 would be performed

outside of the nesting period to be confirmed by CDOW.

- Addition of culverts for small wildlife to cross I-70, E-470, and other roadways.
- Use of temporary and permanent erosion control measures to limit impacts to the First Creek channel, consistent with the project stormwater management plan.

3.16 Threatened and Endangered Species

3.16.1 Existing Conditions

Habitat assessments were conducted in 2000 and 2003 to determine if potential habitat for threatened and endangered species was present in the study area. The 2005 U.S. Fish and Wildlife Service (USFWS) list of threatened, endangered, and proposed threatened species potentially occurring in this area of Adams and Arapahoe Counties includes:

- Bald eagle - federally and state threatened
- Black-footed ferret - federally endangered
- Preble's meadow jumping mouse - federally and state threatened
- Mexican spotted owl - federally threatened
- Ute ladies'-tresses orchid - federally threatened

Any additional surveys for threatened and endangered species would be conducted prior to construction. Descriptions of each wildlife species habitat and their potential for presence in the study area are discussed below. All references can be found in the *Wildlife Assessment* (ERO, 2005) that was completed for the EA.

3.16.1.1 Bald Eagle (*Haliaeetus leucocephalus*)

Bald eagles are primarily winter residents in Colorado, although nesting along the Colorado Front Range has increased in recent years (CDOW, 2001). Most nesting in Colorado occurs near lakes, reservoirs, or along rivers. Typical bald eagle nesting habitat consists of forests or wooded areas that contain many tall, aged, dying, and dead trees (Martell, 1992). No designated critical or essential eagle habitat occurs in the study area. No large lakes, reservoirs, or rivers occur in the study area. Several large cottonwoods that could provide bald eagle perching or roosting sites exist at the old farm site in the First Creek drainage south of I-70 and in the northwest quadrant of the interchange. Bald eagles may be occasional transients in the study area.

3.16.1.2 Black-footed Ferret (*Mustela nigripes*)

Current USFWS criteria for defining potential black-footed ferret habitat consist of any black-tailed prairie dog town or complex greater than 80 acres in area (USFWS, 1989). Although the Colorado Natural Heritage Program (CNHP) reports that there are historical records in the area for this species, the study area does not meet the criteria for black-footed ferret habitat in the 1989 USFWS guidelines. No prairie dog colonies are present in the study area, although several small colonies are present south of the study area. Black-footed ferret are very unlikely to occur in the study area.

3.16.1.3 Preble's Meadow Jumping Mouse (*Zapus hudsonius preblei*)

The study area does not provide appropriate habitat for Preble's meadow jumping mouse since the structured tree and shrub habitat criteria of the USFWS' *Interim Survey Guidelines for Preble's Meadow Jumping Mouse* (revised May 19, 1999) is not present, and the area is isolated from known populations of this species. Letters received from the USFWS in April 2001 and June 2003 exclude the area from potential habitat for Preble's meadow jumping mouse. Therefore, a survey is not necessary.

3.16.1.4 Mexican Spotted Owl (*Strix occidentalis lucida*)

Mexican spotted owl habitat is forests and canyons. No habitat for this species is present in the study area.

3.16.1.5 Ute Ladies'-tresses Orchid (*Spiranthes diluvialis*)

A survey for Ute ladies'-tresses orchid is not required under USFWS guidelines since First Creek is not a perennial tributary to the South Platte River.

3.16.1.6 Other Species

Since no depletions to the South Platte River are anticipated as a result of construction, no impacts are anticipated to downstream populations of least tern, pallid sturgeon, piping plover, or whooping crane.

3.16.2 Threatened and Endangered Species Impacts

No-Action Alternative. This alternative would have no direct impacts upon any threatened and endangered wildlife or plant species.

Preferred Alternative. The Preferred Alternative is not anticipated to directly impact any threatened and endangered wildlife or plant species. The study area lacks the typical habitat for the wildlife and plant species described above. Bald eagles could occasionally forage in and near the study area. Construction of the Preferred Alternative is not expected to directly impact bald eagles or their nesting habitat, although minor foraging habitat would be impacted.

3.16.3 Threatened and Endangered Species Mitigation

Since no threatened and endangered species would be affected by the Preferred Alternative, no mitigation is required.

3.17 Historic and Archaeological Resources

3.17.1 Historic and Archaeological Resources

Historic and archaeological resources are protected under the National Historic Preservation Act (NHPA) of 1966 (as amended), which sets forth the process federal agencies must follow when planning undertakings that have the potential to affect sites eligible for or listed on the National Register of Historic Places (NRHP). Pursuant to Section 106 of NHPA and 36 CFR 800, the Advisory Council on Historic Preservation's implementing regulations, the Area of Potential Effect (APE) established for the EA was surveyed for historic and archaeological properties in 2000 and 2004 (see **Figure 3-19**).

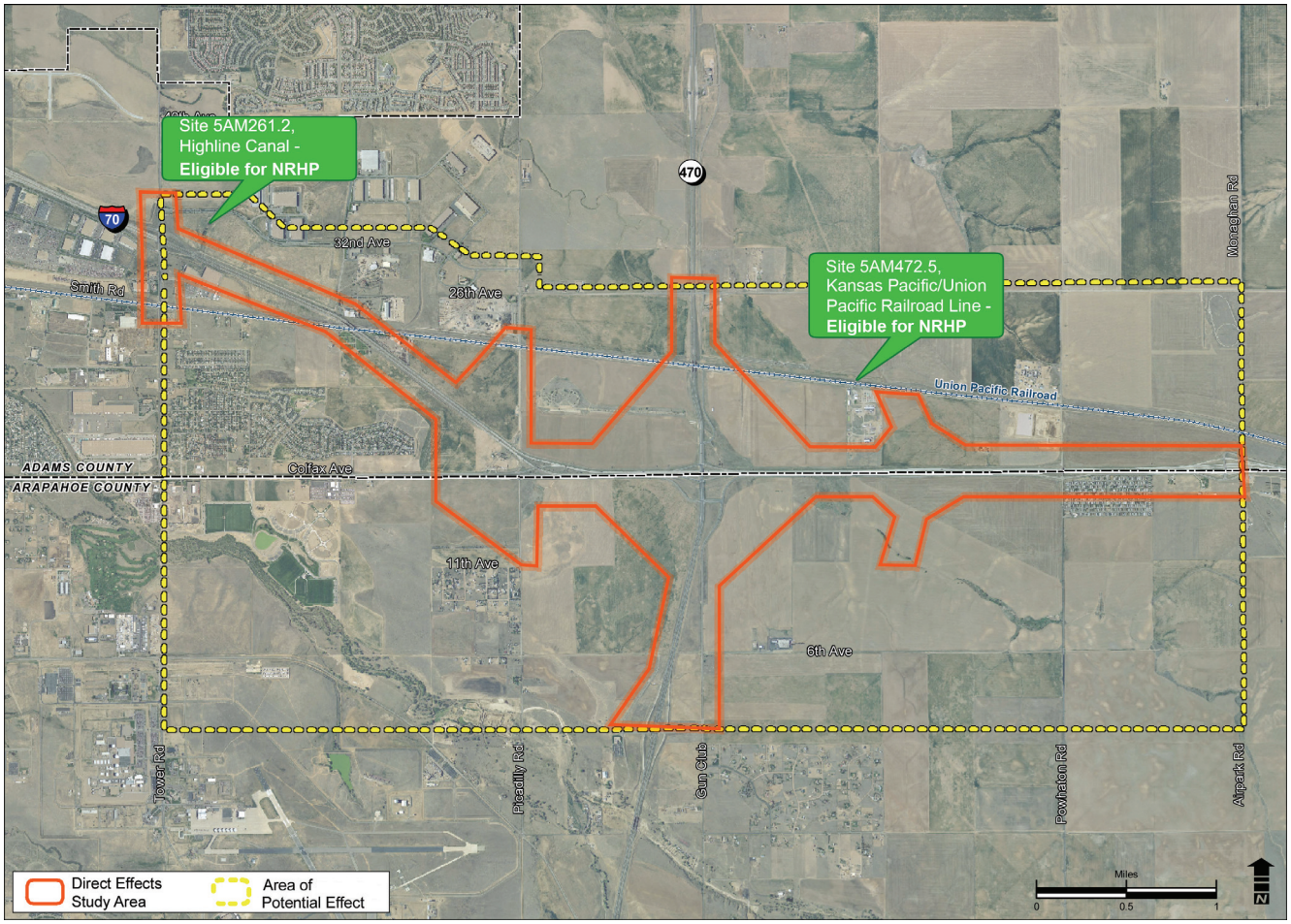
Eight historic sites, one prehistoric site, and four isolated finds are located within the APE. The sites include two homestead remnants, one of which has an associated wagon road, a windmill, two farmsteads, a segment of irrigation canal, a segment of Colfax Avenue, and a segment of railroad grade; the isolates consist of individual artifacts such as prehistoric stone tool debris and fragments of historic bottle glass.

Two of the sites are eligible for listing on the NRHP (Site 5AM261.2, a segment of the Highline Canal; and Site 5AM472.5, a segment of Kansas Pacific/ Union Pacific Railroad Line). Colfax Avenue as it traverses Arapahoe County is an NRHP eligible resource. However, the portion of Colfax within the study area (Site 5AH2914.1) has been realigned and rebuilt, and therefore does not convey the setting, feel, or association necessary to support the eligibility of the entire resource. The remaining sites and isolated finds have been determined not eligible for the NRHP. Pertinent correspondence with the State Historic Preservation Officer (SHPO) specific to these findings is located in **Appendix A**.

3.17.2 Native American Consultation

Preservation regulations (36 CFR 800) mandate that federal agencies must involve interested Native American tribes in the planning process for federal undertakings. Consultation with a Native American tribe recognizes the government-to-government relationship between the United States government and sovereign tribal groups. Federal agencies must be sensitive to the fact that historic properties of religious and cultural significance to one or more tribes may be located on ancestral, aboriginal, or ceded lands beyond modern reservation boundaries. Con-

Figure 3-19
Historic and Archaeological Resources Eligible for NRHP



sulting tribes are offered the opportunity to identify concerns about cultural resources and comment on how a project might affect them. If it is found that a project would impact cultural resources that are eligible for inclusion on the NRHP and are of religious or cultural significance to one or more consulting tribes, their role in the consultation process may also include participation in resolving how best to avoid, minimize, or mitigate those impacts. By describing the proposed undertaking and the nature of known cultural sites, and consulting with the interested Native American community, CDOT and FHWA strive to effectively protect areas important to American Indian people.

In July 2003, CDOT Native American liaison Dan Jepson contacted 12 federally recognized tribes with an established interest in Adams and Arapahoe Counties. The tribes invited via letter to participate as consulting parties included:

- Apache Tribe of Oklahoma
- Cheyenne and Arapaho Tribes of Oklahoma
- Comanche Nation of Oklahoma
- Kiowa Tribe of Oklahoma
- Cheyenne River Sioux Tribe
- Crow Creek Sioux Tribe

- Oglala Sioux Tribe
- Pawnee Nation of Oklahoma
- Rosebud Sioux Tribe
- Northern Arapaho Tribe
- Northern Cheyenne Tribe

The Comanche Nation of Oklahoma and the Kiowa Tribe of Oklahoma responded to the solicitation, each indicating the desire to be a consulting tribe for the undertaking. Neither tribe indicated that they had concerns or issues and that the Preferred Alternative would not affect properties of religious and cultural significance. Both tribes would be notified if human remains, items of cultural patrimony or other artifacts related to Native American occupation of the study area are exposed during construction.

By initiating, encouraging, and facilitating Native American consultation, FHWA and CDOT have fulfilled their legal obligations in this regard as stipulated in the Section 106 and Advisory Council regulations.

3.17.3 Paleontological Resources

A paleontologic field survey of the study area was conducted on June 1, 2003. The paleontological study area was sized to encompass the maximum area of potential impact to potentially significant paleontologic resources.

The field survey consisted of spot checks of vegetation-free areas within the study area for surface fossils, exposures of potentially fossiliferous rocks, and areas in which fossiliferous rocks or younger potentially fossiliferous surficial deposits could be exposed or otherwise impacted during construction. Prior to the field survey, literature and museum record searches were conducted to assess the paleontologic sensitivity of the study area and the geologic units present within it.

Previously documented fossil occurrences from just west of the study area are recorded in the databases of the Denver Museum of Nature and Science, and include plant fossils from the Denver Formation (DMNH fossil localities 1682, 2235, and 2236). No fossils were found during the field survey, and no exposures of Denver Formation are present within the study area.

3.17.4 Historic and Archaeological Resources Impacts

No-Action Alternative. The No-Action Alternative would have no impacts on historic and archaeological resources.

Preferred Alternative. Kansas Pacific/Union Pacific Railroad (5AM472.5): A new bridge structure will be built over the Kansas Pacific (now Union Pacific) Railroad. The new overpass will carry a northbound on-ramp to E-470. It will extend for a length of 300 feet and will feature a 24-foot vertical clearance over the railroad. Although final design is pending, the new overpass is anticipated to be 27 feet wide. Design will likely require placement of a new pier in the railroad right-of-way that will be in line with the piers of two existing structures. The new overpass will be immediately adjacent to the two existing railroad overpasses. Like the proposed bridge, the existing overpasses are both 300 feet long and feature vertical clearances of 24 feet over the railroad. The existing bridges need to be widened by 10 feet. CDOT, on behalf of FHWA, has determined that these improvements will result in no adverse effect to the historic Kansas Pacific/Union Pacific Railroad.

Colfax Avenue Segment (5AH2914.1): The original alignment of Colfax Avenue east of Picadilly Road was destroyed during the construction of I-70 in the mid-1960s. At that time the Colfax Avenue moniker was applied to the south frontage road, which was built as part of the I-70 project. The existing south frontage road along I-70 between Picadilly Road east to Powhaton Road is signed as Colfax Avenue. To provide space for the ramps and connecting roadways between Picadilly Road and E-470, and space for the ramps at the I-70/Harvest Road interchange, the existing south frontage road would be relocated to the south between E-470 and Powhaton Road. CDOT, on behalf of FHWA, has

determined that these proposed improvements would result in no adverse effect to Site 5AH2914.1, as this part of the roadway already lacks historic integrity.

High Line Canal Segment (5AM261.2): There would be no project impacts to the eligible segment (Site 5AM261.2) of the High Line Canal. CDOT, on behalf of FHWA, has determined that this would result in no historic properties affected.

Table 3-18 summarizes the effect determination of the eligible properties in the APE.

Table 3-18
Effect Determination of Eligible Historic Properties in the Study Area

Name	Site #	Effect Determination
Kansas Pacific/Union Pacific Railroad	5AM472.5	No adverse effect
Colfax Avenue (non-supporting segment)	5AH2914.1	No adverse effect
High Line Canal Segment	5AM261.2	No historic properties affected

Source: Colorado SHPO.

There would be no archaeological resource impacts.

3.17.5 Paleontological Resources Impacts

Despite the lack of exposed bedrock within the study area, it is likely that the Denver Formation occurs at a shallow depth because it was mapped as a surficial geologic unit by Trimble and Machette (1979). It was not possible, however, to ascertain the depth of bedrock during the field survey. Depending upon the depth of the excavations for the bridge piers and retaining walls, paleontologically sensitive bedrock and the fossils preserved within it could be impacted.

3.17.6 Historic and Archaeological Resources Mitigation

In the event that cultural materials are exposed during the construction process, all activity would be immediately suspended in the area of discovery. The CDOT Staff Archaeologist would be notified in order for the cultural materials to be properly evaluated for NRHP significance.

3.17.7 Paleontological Resources Mitigation

Because of the paleontologic sensitivity of the Denver Formation, a qualified paleontologist would monitor construction activities in all areas where construction impacts to this geologic unit are likely to occur. When the design plans are finalized, the CDOT Staff Paleontologist would examine them in order to estimate the scope and locations of probable construction impact to the Denver Formation and the scope and locations of paleontological monitoring work, if any, which are required.

If any subsurface bones or other potential fossils are found anywhere within the study area during construction, the CDOT Staff Paleontologist would be notified immediately to assess their significance.

3.18 Hazardous Waste

Hazardous waste may be encountered during the construction of a transportation project. Therefore, it is important to identify properties that may contain contamination prior to right-of-way acquisition and construction. Hazardous waste is defined as any waste product that is considered flammable, corrosive, reactive, or toxic. Hazardous waste can be found in various forms and can originate from a variety of sources. Examples of potential sites that may contain hazardous waste include landfills, service stations, industrial areas, railroad corridors, and mine sites. It is important to be aware of known hazardous waste sites so they can be avoided or their impacts minimized.

CDOT's standard process for assessing the potential for encountering hazardous waste prior to right-of-

way acquisition and construction is a two-phased approach. Phase One involves the completion of an Initial Site Assessment (ISA) that generally provides background information on sites that may contain hazardous waste. A Modified Phase I Environmental Site Assessment (MESA) is a frequently conducted version of an ISA. Phase Two is a Site Investigation (SI) that typically includes a subsurface investigation and analytical testing of soil and/or groundwater to further assess the type and extent of contamination that may be present. The need for conducting an SI is based on the outcome of the ISA.

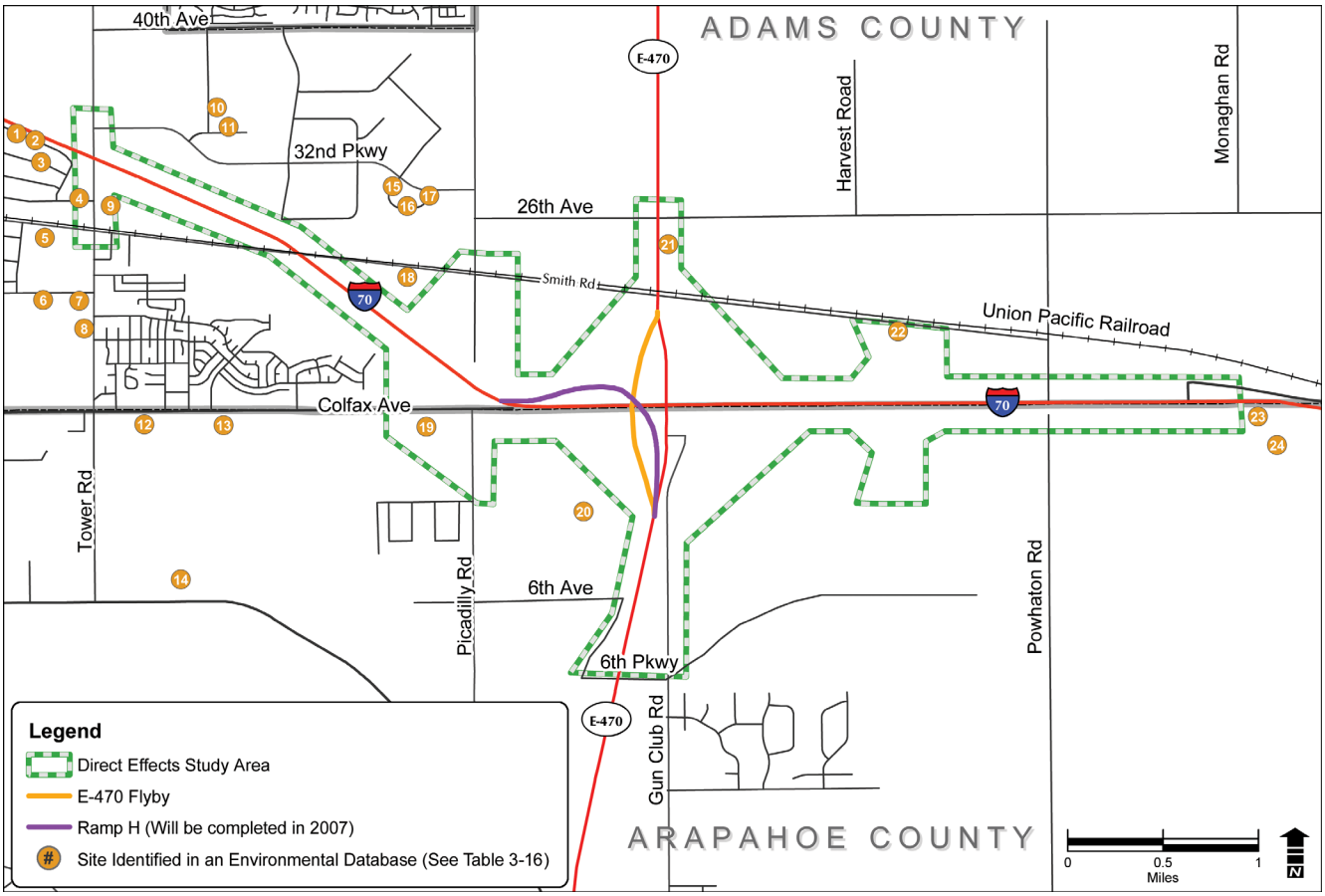
Carter & Burgess conducted a MESA dated January 24, 2006, to evaluate the potential for encountering soil and/or groundwater contamination within the study area. The MESA is based on information obtained from a review of environmental regulatory records, historical topographical maps and aerial photographs, Colorado Oil and Gas Conservation Commission records, and an on-site inspection.

3.18.1 Hazardous Waste Existing Conditions

Land use within the study area has historically been agricultural in nature. Industrial/light industrial and mixed-use development exists in localized areas in the vicinity of the study area.

In January 2006, an MESA was completed for an approximate two-mile radius from the study area. **Figure 3-20** shows the MESA study area.

Figure 3-20
Hazardous Waste Sites



Review of the environmental regulatory records database revealed 36 sites of potential environment contamination. These sites included 8 registered hazardous waste generators, 1 Emergency Response Notification (ERNS) site, 1 Resource Conservation Recovery Act (RCRA) Corrective Action site, 14 Underground Storage Tank (UST) sites, 13 Leaking Underground Storage Tank sites, 3 Colorado Storage Tank Trust Fund sites, 1 above-ground storage tank site, 7 Facility Index System sites, one Colorado ERNS site, and one Department of Defense site (Buckley Air Force Base). **Table 3-19** lists sites of potential concern discovered during the assessment of the study area.

After evaluating the degree of potential hazards presented by these sites, the list of sites was reduced to the 24 sites shown on **Figure 3-20** and in **Table 3-19**.

Table 3-19
Sites of Potential Hazardous Waste Concern Based on Federal and State Records

Map ID #	Site Name	Site Address	Identified Environmental Issues
1	Crown Lift Trucks	1770 E. 32nd Place	Small quantity generator of hazardous waste
2	VWR International	17750 E. 32nd Place	Small quantity generator of hazardous waste
3	17900 E. 32nd Ave.	17900 E. 32nd Avenue	Reported releases of oil or hazardous substances
4	Ames Construction	18450 E. 28th Avenue	Air permit
5	Wagner Equipment Co.	18000 E. Smith Road	Small quantity generator of hazardous waste Air permit Underground petroleum storage tanks Leaking underground petroleum storage tank - case closed Leaking underground petroleum storage tank - case closed Leaking underground petroleum storage tank - case open
6	Case Power & Equipment	18000 E. 22nd Avenue	Underground petroleum storage tanks Leaking underground petroleum storage tank - case closed Leaking underground petroleum storage tank - case closed
7	Wagner Equipment Co.	18201 E. 22nd Avenue	Underground petroleum storage tanks
8	Super Valu Holding Inc.	1983 Tower Road	Underground petroleum storage tanks Leaking underground petroleum storage tank - case closed Leaking underground petroleum storage tank - case closed
9	Albertsons Dist. Center	2780 N. Tower Road	Small quantity generator of hazardous waste Underground petroleum storage tanks Leaking underground petroleum storage tank - case closed Leaking underground petroleum storage tank - case closed Leaking underground petroleum storage tank - case closed
10	Loreal USA Sales Inc.	19503 E. 34th Drive	Large quantity generator of hazardous waste
11	Sprint Denver Web Hosting	3431 N. Windsor Drive	Underground petroleum storage tanks

Table 3-19 (continued)
Sites of Potential Hazardous Waste Concern Based on Federal and State Records

Map ID #	Site Name	Site Address	Identified Environmental Issues
12	Co. Dept. of Transportation	18800 E. Colfax Avenue	Hazardous waste corrective action completed 1997 Small quantity generator of hazardous waste
13	M&M Auto Reconditioning	19900 E. Colfax Avenue	Underground petroleum storage tanks Leaking underground petroleum storage tank - case closed
14	Buckley Air Force Base		Department of Defense site
15	Provisioners	21200 E. 31st Circle	Underground petroleum storage tanks Leaking underground petroleum storage tank - case closed
16	Sulzer Bingham Pumps Inc.	21201 E. 31st Circle	Leaking underground petroleum storage tank - case closed
17	Schlumberger Well Service	21250 E. 31st Circle	Underground petroleum storage tanks Leaking underground petroleum storage tank - case closed
18	Ames Construction	20790 E. Smith Road	Underground petroleum storage tanks Small quantity generator of hazardous waste
19	Don Sessions	21481 E. Colfax Avenue	Underground petroleum storage tanks Leaking underground petroleum storage tank - case closed
20	Ringsbyland Trust	SEC 1, T4S, R66W	Underground petroleum storage tanks
21	E-470 Public Highway Authority	1650 Gun Club Road	Small quantity generator of hazardous waste
22	Watkins Compressor Station	24650 E. Smith Road	Underground petroleum storage tanks Leaking underground petroleum storage tank - case closed Leaking underground petroleum storage tank - case closed Leaking underground petroleum storage tank - case closed Leaking underground petroleum storage tank - case closed Leaking underground petroleum storage tank - case closed
23	Silco Oil/Barn Store	28100 E. Colfax Avenue	Underground petroleum storage tanks Above ground petroleum storage tanks Leaking underground petroleum storage tank - case open
24	Aurora Airpark	28580 E. Colfax Avenue	Underground petroleum storage tanks Leaking underground petroleum storage tank - case open

Of these sites, one site of concern was the former Silco Oil/Barn Store (Site #23) located along Colfax Avenue at the east end of the study area. No sites of concern have been identified within the study area.

A review of the former Silco Oil/Barn Store file at the Colorado Division of Oil and Public Safety revealed that a Leaking Storage Tank Event was reported there on February 1, 1999. Records indicate that petroleum product was released from underground piping into the surrounding soil and

groundwater. During investigation of the release, 12 groundwater monitoring wells were installed. A subsurface soil and groundwater remediation system began operation in March 2000.

Data from the groundwater monitoring wells indicate that shallow groundwater flows to the west-northwest under the I-70 right-of-way, the total extent of the plume is unknown, and the water table is about 40 feet below the ground level.

In addition to the Silco Oil/Barn Store site, the UPRR tracks traverse the study area and parallel the north side of Smith Road (see **Figure 3-20**). Although the railroad has not been identified as a site of concern, historical railroad operations are potential sources of contamination from herbicides, petroleum hydrocarbons, and liquid spills from tank cars.

3.18.2 Hazardous Waste Impacts

No-Action Alternative. The No-Action Alternative would have no impact on known hazardous waste sites.

Preferred Alternative. The Preferred Alternative would have no impact on known hazardous waste sites. The Silco Oil/Barn Store site is located east of Powhaton Road. No new construction or right-of-way acquisition is anticipated east of Powhaton Road. The UPRR right-of-way and railroad tracks would not be directly affected by the Preferred Alternative.

3.18.3 Hazardous Waste Mitigation

CDOT carefully considers the potential risks associated with hazardous waste on construction projects and utilizes Section 250 of the *Standard Specifications for Road and Bridge Construction* (CDOT, 2005). Section 250 "Environmental Health and Safety Management" provides for the protection of the environment, persons and property from contaminants and includes special requirements for addressing hazardous waste, if encountered.

Encountering hazardous waste in soils or groundwater with the Preferred Alternative is not anticipated. Therefore, no Site Investigation (SI) is recommended. Pay items and appropriate notes placed in the final design plans as a precautionary measure would adequately protect worker health and safety, as well as provide the contractor and project engineer with suitable measures in the event that contamination is encountered from any source.

3.19 Visual Resources

3.19.1 Existing Conditions

Visual character is highly correlated with existing land use in the area. Existing land use within the study area consists of a mixture of agricultural and rural roadway/interstate land uses. The I-70/E-470 interchange is the largest feature of the study area and is visible from many viewpoints in the area. The UPRR runs through the study area along its northern alignment with Smith Road.

Visual resources are considered as part of either the foreground, middleground, or background visual range. Foreground elements are those features nearest to the viewer, and background elements are features at a great distance from the viewer. The middleground of a view is intermediate between the foreground and background. Generally, the closer a resource is to the viewer, the more dominant and important it is in the visual range.

Within the study area, the foreground element is pavement, with undeveloped, residential, or industrial land adjacent to the roadways. The majority of the study area is undeveloped. The middleground views are primarily of agricultural lands and roadway structures. Large power lines north and south of the existing I-70/E-470 interchange are a substantial feature of the foreground and middleground in the eastern portion of the study area. The background views to the west and northwest are of the Rocky Mountains. Background views to the south and east consist of agricultural land with scattered residential and some light industrial development.

The City of Aurora expects the future land uses for the study area to consist of commercial, retail, light industrial, and open space.

Photos taken of the study area in February 2005 are on the following page.

3.19.2 Visual Impacts

This section describes impacts to the visual landscape.

What would the project look like? The proposed action would add elevated ramps to the I-70/E-470 interchange (which already includes an elevated flyby and Ramp H as part of the No-Action Alternative), as well as an elevated interchange at Harvest Road. Picadilly Road would be relocated west of its existing location and would pass under I-70, reducing the visual effect to the current highway view for surrounding neighborhoods. There could be temporary impacts associated with construction. In general, construction of the interchanges and supporting structures would intensify the presence of transportation-related land uses in the viewshed.

Harvest Road would have a new bridge over I-70 and a new full interchange would be constructed at I-70 and E-470. These structures would dominate the foreground view for motorists approaching the I-70/E-470 interchange complex and for residents of the Foxridge Farm Mobile Home Park.

View west of the Powhaton Road overpass. Pavement, rural, and industrial land form the foreground view.

View south of the Powhaton Road overpass. Power lines and agricultural land uses dominate the middleground and background views.

Looking west from I-70. View of the existing I-70/E-470 interchange.

View south and west of Smith Road, toward Picadilly Road. The Rocky Mountains form the background view; I-70 and a residential development form the middleground view.

No-Action Alternative. Visual impacts associated with the No-Action Alternative would occur as a result of constructing the E-470 flyby over I-70 and Ramp H, which are currently under construction. The elevated structure would impact background views of the Rocky Mountains (to the west) and rural undeveloped lands (to the east) for those traveling on I-70 and local roads. No additional impacts would occur to area residents, motorists, bicyclists, or pedestrians as a result of the No-Action Alternative.

Preferred Alternative. Visual impacts associated with the Preferred Alternative would occur as a result of constructing interchanges at Harvest Road, Picadilly Road, and relocating portions of Colfax Avenue. In general, construction of the interchanges and supporting structures would intensify the presence of transportation-related land uses in the viewshed. The Preferred Alternative would include three levels of elevated structures, which would noticeably impact background views.

Under the Preferred Alternative, Picadilly Road would be relocated west of its existing location and would pass under new bridges which would carry I-70 over Picadilly Road. Background views would be somewhat obstructed by the elevated structures. In the middleground and foreground, new transportation facilities would break up the views of rural, undeveloped lands. Colfax Avenue along I-70 east of Picadilly Road would be relocated south of its current location and would be routed under E-470 toward elevated ramps connecting to I-70. Bridge and ramp structures would include retaining walls, which would block views from all directions and would degrade background views for residents southeast of I-70. Harvest Road would have a new bridge over I-70, and a new full interchange would be constructed at I-70 and E-470. These structures would dominate the foreground view for motorists approaching the I-70/E-470 interchange complex.

The Preferred Alternative is consistent with local planning efforts. The land in the four quadrants of the I-70/E-470 interchange is zoned for commercial and light industrial uses and would consist of commercial and Regional Activity Centers south of I-70 and light industrial activities north of I-70. Land in the vicinity of the new interchanges at Harvest Road and Picadilly Road is zoned for commercial, industrial, and some residential uses. As these land uses develop, the visual character of the study area will change from a more rural undeveloped landscape to an urban activity center, regardless of whether or not the Preferred Alternative is constructed. The transportation infrastructure that would come to dominate the viewshed under the Preferred Alternative would be more consistent with the visual character associated with the types of lands uses that are planned in the study area.

3.19.3 Visual Resources Mitigation

The following measures would reduce impacts to the existing visual landscape:

- All disturbed areas would be revegetated throughout construction, occurring during each seeding season.
- All new structures, signing, and lighting would be consistent with local standards and guidelines.
- Architectural interest (such as texture, color, or design) would be provided for retaining walls, bridges, and other structural features. Wall materials and design would be coordinated with CDOT, local landowners, the E-470 Authority, and the City of Aurora, and will match their surroundings.
- Visual enhancements would be consistent with the principles of Context Sensitive Solutions as described in CDOT's *Context Sensitive Solutions Policy Memo* dated October 31, 2005.

3.20 Energy

3.20.1 Energy Impacts

No-Action Alternative. The following impacts to energy consumption would be expected with the No-Action Alternative:

- Vehicular fuel consumption would increase as traffic congestion on I-70 and E-470 begins to occur.
- The No-Action Alternative would result in slightly less energy use for roadway maintenance than the Preferred Alternative since there would be less roadway surface to maintain.

Preferred Alternative. The Preferred Alternative would have the following impacts to energy consumption:

- Energy consumption during construction would be somewhat greater than with the No-Action Alternative because of the need to construct interchange ramps.
- Maintenance energy requirements would be slightly greater with the Preferred Alternative compared with the No-Action Alternative.
- Vehicular energy consumption would be slightly less than the No-Action Alternative because congestion would be less.

3.20.2 Energy Mitigation

Mitigation that would be implemented to reduce energy consumption during construction includes:

- Maximum use of on-site material to reduce haulage requirements.
- Proper maintenance of construction vehicles.
- Turning off equipment when not in use.
- Design of construction access roads and location of construction staging areas to minimize distances traveled.

3.21 CONSTRUCTION

3.21.1 Construction Impacts

No-Action Alternative. The No-Action Alternative would have no construction-related impacts in the study area at the time of this proposed action.

Preferred Alternative. There would be several impacts associated with the construction of the Preferred Alternative. Construction-related impacts are expected to be short term and include:

- **Noise and Vibration.** The operation of various types of machinery, such as heavy earth-moving equipment, paving equipment, power tools, pile drivers, and trucks would create an undesirable noise condition. Impacts from vibration are also likely during the construction period.
- **Air Quality.** Exhaust emissions and fugitive dust would increase during construction as a result of the operation of heavy equipment, lower traffic speed (start/stop driving), and earth excavation activities associated with construction.
- **Water Quality.** If spills of fuel, oil, grease, or other chemicals occur during construction activities, they could pollute soils and/or aquatic habitat and affect aquatic biota, especially in the First Creek swale. Sensitive aquatic organisms would be most affected should spills into waterways occur.
- **Visual.** Stockpiles of earth materials, stacks of construction materials, and parked equipment may cause a temporary visual impact to the residents near the locations of construction activities.
- **Access.** Local access to intersecting roads and to residences would be maintained during construction. However, limited access and minor detours may be necessary at certain locations during this period.

3.21.2 Construction Mitigation

Construction impacts would be mitigated by the contractor through implementation of control measures during construction. These measures include:

- Requiring the use of appropriate dust suppression measures to minimize dust impact associated with the construction activities.
- Designing a suitable construction staging area, and requiring that the contractor store materials

and equipment within that area to minimize the visual impact.

- Disturbance of vegetation and the creek channel would be kept to a minimum to reduce water quality impacts. Construction contractors would practice good management practices to reduce the likelihood of chemical spills. Cleanup of spills would be conducted in compliance with Colorado hazardous waste regulations in 6 CCR 1007-3.
- Construction staging and traffic control plans would be developed that minimize the disruption to traffic and access.
- CDOT, the City of Aurora, and the E-470 Authority would provide adequate public notice and maintain coordination with area residents and with the area's emergency service providers to keep the public apprised of the construction progress and to inform the public of closures and detours.
- The City of Aurora construction noise code requirements limiting noise levels at the neighborhood property lines to be no higher than 80 dBA between 5:00 p.m. and 7:00 a.m. and 75 dBA between 7:00 a.m. and 5:00 p.m. would be enforced during construction.
- Where feasible, construction percussion operations, and truck loading, hauling, and routing would be scheduled during daytime hours and managed to minimize noise and vibration levels to surrounding neighborhoods.

The following BMPs would be used to mitigate impacts to vegetation associated with the Preferred Alternative:

- Minimize the amount of disturbance and limit the amount of time that disturbed areas are allowed to be non-vegetated.
- Avoid existing trees, shrubs, and vegetation to the maximum extent possible, especially wetlands and riparian plant communities.
- Salvage weed-free topsoil for use in revegetation.

Specific BMPs would be required during construction to reduce the potential for introduction and spread of noxious weed species and include:

- Weed mapping would be included in the construction documents along with appropriate control methods for noxious weeds.
- Highway right-of-way areas would periodically be inspected by CDOT and others during construction and during post-construction weed monitoring for invasion of noxious weeds.
- Weed management measures would include removal or burial of heavily infested topsoil, chemical treatment of lightly infested topsoil, limiting disturbance areas, phased seeding with native species throughout construction, monitoring during and after construction, and other chemical and/or mechanical treatments.
- Use of herbicides would include selection of appropriate herbicides and timing of herbicide spraying, and use of a backpack sprayer in and adjacent to sensitive areas such as wetlands and riparian areas. In locations where spot application is not practicable, a wildlife biologist would inspect the area prior to spraying to ensure crucial habitat would not be impacted.
- Certified weed-free hay and/or mulch would be used in all revegetated areas.
- Fertilizers would neither be used nor stored on the project site.
- Supplemental weed control measures may be added during design and construction planning.

Preventative control measures for design and construction may include:

- **Native Plants:** Use of native species in revegetation sites.
- **Weed Free Forage Act:** Materials used for the project would be inspected and regulated under the Weed Free Forage Act, Title 35, Article 27.5, CRS.

- **Topsoil Management:** When salvaging topsoil from on-site construction locations, the potential for spread of noxious weeds would be considered. Importing topsoil onto the project site would not be allowed.
- **Equipment Management:** Equipment would remain on designated roadways and stay out of weed-infested areas until the areas are treated. All equipment would be cleaned of all soil and vegetative plant parts prior to arriving on the project site.

3.22 Cumulative Impacts

This section addresses the cumulative impacts of the No-Action and Preferred Alternatives. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7).

The environmental resources addressed under cumulative impacts are those that have been identified as resources of particular concern that could be potentially impacted by the proposed action. The cumulative effects analysis addresses the "incremental impacts" of the proposed action related to those resources and compares them to the impacts that would occur from all reasonably foreseeable activities without the proposed action.

3.22.1 Methodology

The cumulative impacts study area was chosen to represent the extent of land use impacts from the Preferred Alternative, which includes reconstructing the E-470 interchange complex at I-70 and building two new interchanges on I-70 at Picadilly and Harvest Roads. Generally, a four-mile radius is considered to be the outside limit of such impacts. To ensure that land use impacts were fully captured, an eight-mile diameter study area surrounding the proposed I-70/E-470 interchange complex was selected. **Figure 3-21** shows the boundaries of the cumulative impacts study area.

Through scoping and coordination with EPA, it was decided by the consultant team and resource agencies (EPA, USACE, CDOW) that the four most important issues to be analyzed for cumulative impacts are land use changes, noise, wildlife and wetlands. For these analyses, data were derived from the *1987 E-470 Environmental Overview*, DRCOG mapping, CDOW - Natural Diversity Information Source mapping, USACE 404 permit applications, USFWS - National Wetlands Inventory mapping, field research, and aerial photography. Data on reasonably foreseeable land use and transportation projects was gathered from Adams County, Arapahoe County, the USACE, the City of Aurora, and CDOT.

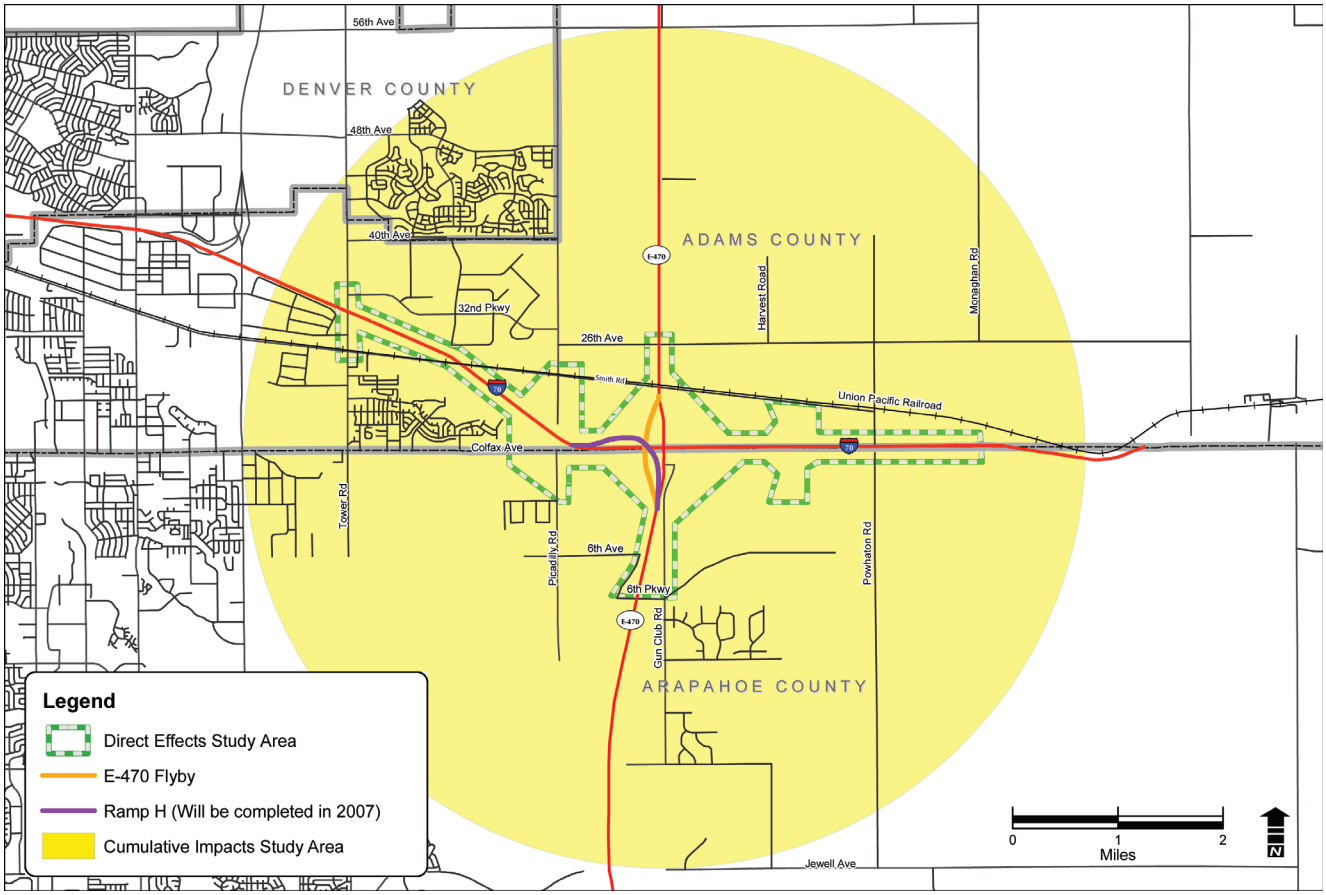
3.22.2 Past and Existing Conditions

This section describes the conditions of the E-470 corridor from 1987 to the present. The corridor includes portions of Douglas, Adams, and Arapahoe Counties; the City and County of Denver; the Town of Parker, and the Cities of Aurora, Commerce City, Brighton, and Thornton.

Land Use. Prior to the construction of E-470 almost 20 years ago, a majority of the land along the E-470 corridor was used for agricultural, ranching, and low-density residential purposes. The southern segment of the corridor area consisted of scattered, low-density, usually large lot residential subdivisions of middle to upper income level families seeking a more rural life style. Because of the undulating topography of this area, agricultural activities were not the predominant feature. Some commercial/retail and office park developments were evident in the vicinity of I-25 South and SH 83.

The more consistent topography in the central and airport sections of the E-470 corridor accommodated predominantly agricultural and ranching activities. Scattered residential buildings were inhabited mostly by farmers and ranchers who either owned their agricultural land or had sold it or

Figure 3-21
Cumulative Impacts Study Area



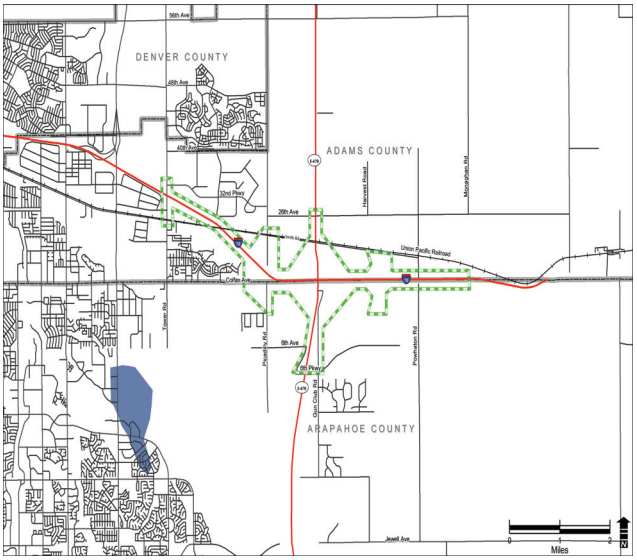
leased back portions of it to continue farming operations.

DRCOG maps quantifying the extent of urbanization between 1920 and 2000 in the metropolitan Denver region show that land uses changed very little between 1920 and 1980. However, between 1980 and 2000, rapid urbanization occurred in the western part of the study area, which is consistent with the completion of the first three segments of E-470 in 1991, 1999, and 2003, respectively. The extent of urbanization in the study area in 1940, 1960, 1980, and 2000 is shown in **Figure 3-22**.

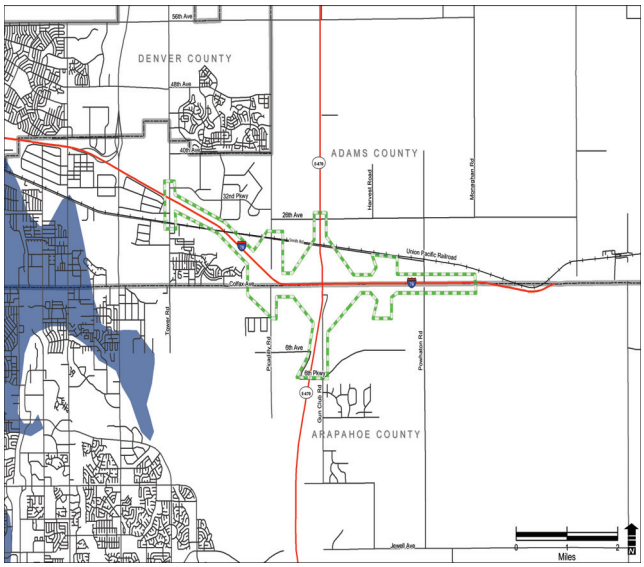
Since the construction of E-470, land along the completed southern portions of the highway between I-25 and East Mississippi Avenue have been converted from vacant or agricultural uses to residential and commercial uses. Between Smoky Hill Road and East Mississippi Avenue, commercial uses are generally located closer to E-470 with residential developments behind them. In some locations, the larger residential developments occur within 200 feet of the highway.

The northern and southern quadrants of the existing I-70/E-470 interchange are dominated by agricultural uses. Approximately 75 percent of the land immediately adjacent to the I-70/E-470 interchange is undeveloped. The remaining 25 percent consists of low-density residential (east of Gun Club Road and south of 6th Parkway), mixed-use and multifamily residential (Murphy Creek east of E-470 and south of Mississippi Avenue), and light industrial uses (Prologis Park 70 between the UPRR and E-470).

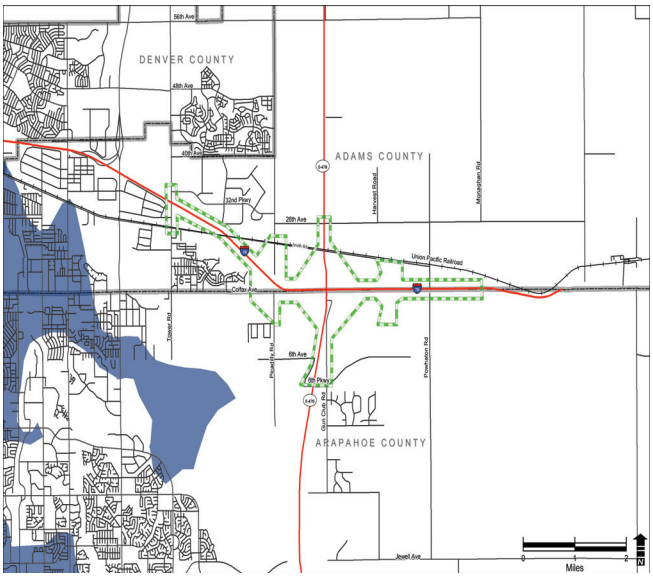
Figure 3-22
Extent of Urbanization in the Study Area: 1940, 1960, 1980, and 2000



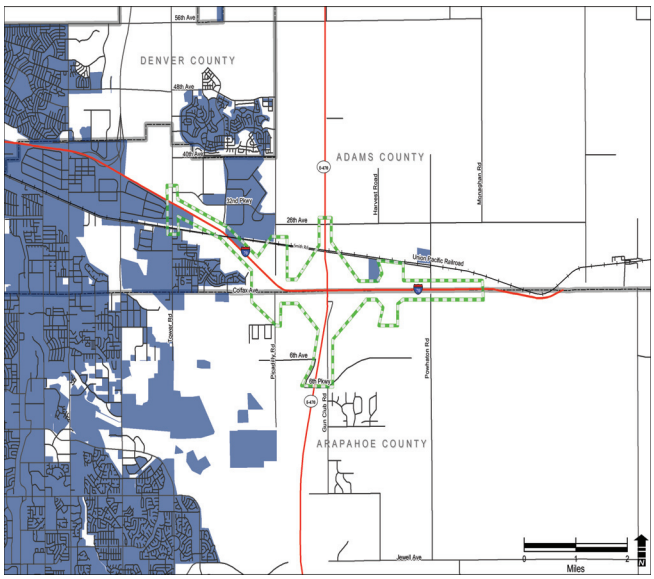
1940



1960



1980



2000

Legend

Direct Effects Study Area

Extent of Urbanization

Agricultural land uses give way to light industrial and medium-density residential developments in the northwestern portion of the study area. The southwestern portion of the study area is interspersed with mixed-use and light industrial land uses. Buckley Air Force Base is the predominant feature located south and west of SH 30 in the southwestern corner of the study area.

The area along E-470 is projected to continue to experience major growth. According to the *1987 E-470 Environmental Overview*, areas along E-470 were expected to capture 41 percent of the regional population growth between 1980 and 2010 without the construction of E-470. With the construction of E-470, the area in 1987 was projected to capture 52 percent of the population growth. Because of the construction of DIA and continued strong market forces, the 1987 estimate may have increased over time. Along the newly completed northern portion of E-470, new development is already in place and developers are making additional plans to build new office, retail, and residential developments.

Noise. Prior to construction of E-470, noise levels in the corridor were typical for rural and suburban environments and were dependent on the distance to nearby noise sources, usually the nearest road or highway. Major sources for noise in the area included I-70, Buckley Air Force Base, and the UPRR. DIA was not yet constructed. Three measurements were taken outside the immediate study area to estimate the overall noise environment existing at surrounding residential areas as shown in **Figure 3-16** on page 3-39 and summarized in **Table 3-20**. Most noise levels were typically 5 to 10 dBA lower than the 66 dBA NAC. Receivers that were closer than 100 feet to roads, or were near the airfield or railroad, experienced noise levels at, or a couple of decibels above, the 66 dBA NAC.

Most residential areas in the study area today are over 1,000 feet from the highway, well outside the 66-decibel noise contour around E-470. These residences typically experience noise levels that range from 50 to 60 decibels. The major source of noise in these areas is the closest road or highway. Noise from Buckley Air Force Base and DIA also contribute to the noise levels in the study area. Since the construction of E-470, new development along the highway has been planned so that noise-sensitive uses are located outside of the noise contour.

Wildlife. According to the wildlife report prepared for the *E-470 Corridor Environmental Overview*, wildlife habitat in the proposed 50-mile corridor consisted primarily of shortgrass prairie and some riparian habitat along drainages. Within the cumulative study area, the Coal Creek riparian habitat was of particular interest, as was a homerange habitat for a herd of approximately 35 to 50 pronghorns. This shortgrass prairie habitat was located north of I-70 and south of 104th Avenue, where DIA and Peña Boulevard are currently located. Aerial photography in the report showed that raptors of various species, including the bald eagle, used many of the drainages and wetlands for nesting, roosting, and foraging. Numerous prairie dog towns existed, supporting burrowing owl populations. There were no fishery resources of concern within the cumulative study area.

Table 3-20
Noise Measurements Outside the Study Area

Site ID	Activity Category	Location	Monitored Noise Level (dBA) During Peak Hours	
			a.m.	p.m.
A	B	Gun Club Road (south)	58.0	58.3
B	B	Future Harvest Road and East 6th Parkway	54.7	56.6
C	B	Foxridge Farm Mobile Home Park	60.1	58.2

According to wildlife habitat mapping provided by the CDOW-Natural Diversity Information Source, these species could be present in the cumulative study area today: bald eagle (portions of the study area contain roosting sites and are included in the winter range for this species) and other raptors, burrowing owl, prairie dogs (colonies may be located throughout the study area), and white tailed deer (a portion of their overall range crosses the study area and they are known to occur along the riparian area associated with Sand Creek). First, Coal, and Sand Creeks are intermittent streams providing habitat for area wildlife.

A portion of the overall range for mule deer and pronghorn occurs east of Picadilly Road, but there are no known migration corridors, resident populations, or population concentrations of these species within the study area. In addition, the study area falls within the overall range for the Preble's meadow jumping mouse, but is not included in the occupied range for this species.

Wetlands. Historically, wetlands in the E-470 corridor were associated with First and Coal Creeks. The *E-470 Corridor Environmental Overview* described 28 wetlands of varying function and quality covering 58.01 acres within the proposed 50-mile E-470 right-of-way.

Today, there are approximately 154 acres of wetlands in the cumulative impacts study area (National Wetland Inventory, 2004). These wetlands vary by type and function, and are generally located along Coal Creek south of the interchange, and First Creek north of the interchange.

3.22.3 Planned Development and Transportation Actions

Table 3-21 includes development projects which are reasonably foreseeable, are identified in area plans, and are expected to occur regardless of the proposed improvements to the I-70/E-470 interchange. These projects include those that are under construction or have been approved, as well as those that are known by planners or developers to be reasonably certain, but which had not been approved or permitted as of August 2005.

Table 3-21
Reasonably Foreseeable Developments

Development Name	Type	Acres	Stage	Location
Adonea	Residential	447.5	Site Plan/Plats Approved	Northwest corner of Alameda and Powhaton Road.
Airways Park	Commercial/ Industrial	195	Planning Stages	Smith Road and Tower Road. An industrial/ business park with finished commercial and industrial sites.
APS Site	Residential	100	N.A.	Between 6th Parkway and future 6th Avenue Ext., east of Cross Creek. Site for high and middle school.
Aurora Commerce Center	Commercial/ Industrial	162	Plats Approved	Bordered by 26th Avenue, E-470, Smith Road, and Picadilly Road. Business and industrial, distribution.
Bounds Sell Coakes	Residential	444	Proposed	West of E-470, south of I-70. 3,263 dwelling units.
Buckboard	Commercial	NA	Inactive	South of 6th Avenue and 0.25 mile west of Picadilly Road.

Table 3-21 (continued)
Reasonably Foreseeable Developments

Development Name	Type	Acres	Stage	Location
Celtic IV parcel	Residential	323	N.A.	Between Alameda Avenue and future 6th Avenue extension, approximately 1.0 mile east of E-470. Tarco/CLS.
Celtic V parcel	Residential	149	N.A.	Between 6th Parkway and future 6th Avenue extension, approximately 1.5 miles east of E-470.
Celtic VI parcel	Residential	149	N.A.	Between 6th Parkway and future 6th Avenue extension, approximately 1.5 miles east of E-470.
Coal Creek Reserve	Residential	615	Proposed	South of Jewell Avenue. Proposed adult community.
Conservatory of the Plains	Residential	490	Approved for Construction	Between Hampden and Jewell Avenues, west of E-470.
Cross Creek	Residential	218	Under Construction	East of Gun Club Road, south of 6th Avenue. 1,070 dwelling units, commercial development.
Day-Hartland Property	Residential	194	N.A.	North of 26th Avenue, east of E-470. Rezoning application for E-470 Medium Density Residential.
Denver International Business Center	Commercial	450	Under Construction	West of E-470, south of Peña Boulevard. Commercial, hospitality and residential development.
Eastern Hills	Residential	3,385	Plats Approved	Between Alameda and Yale Avenues, Harvest Road to Hayesmount.
EastGate Business Center	Commercial/ Industrial	295	Planning Stages	Northwest corner of I-70/E-470. Aurora. Light industrial and distribution warehouse.
EastPark 70-Master Plan	Commercial	110	Under Construction	Southwest corner of Smith Road and Himalaya Road. Master plan for industrial park.
First Creek Ranch	Mixed-Use	320	Master Plan Approved	East of Sand Creek Ranch development.
Green Valley Ranch	Mixed-Use	2,212	Planning Stages	Between 26th and 56th Avenues bounded by Picadilly Road and Powhaton Road. 70 percent single family; commercial, retail, school, parks, golf course.
Horizon City Center - RealtiCorp	Mixed-Use	503	Planning Stages	Southwest corner of I-70 and the E-470 toll road. To include more than 500 homes and 5 million square feet of commercial/retail/office space.

Table 3-21 (continued)
Reasonably Foreseeable Developments

Development Name	Type	Acres	Stage	Location
Intermodal Facility at Front Range Airport	Transit	50	Not Funded	Front Range Airport.
International Airport Commerce Center	Commercial	880	Proposed	South of DIA along 56th Avenue, east side of E-470. Office, retail, industrial distribution.
Majestic Commercenter	Commercial/ Industrial/ Office	1,000	Under Construction	I-70 and Tower Road.
Murphy Creek	Mixed-Use	1,277	Under Construction	East of E-470, south of Mississippi Avenue. Residential and mixed used development, golf course community.
Northeast Plains	Residential	1,674	Proposed	East of Gun Club Road, between Alameda and I-70.
Prologis Park 70	Commercial/ Industrial	182	Under Construction	The intersection of E-470 and I-70. 2.9 million square feet of distribution and warehouse space at build out.
Proposed golf course & conference center	Commercial	N.A.	Site Plan	East of the DIA Business Center.
Sand Creek Ranch	Mixed-Use	480	Proposed	Southeast corner of Powhaton and Alameda. Residential/commercial.
Singletree at DIA	Residential	141	Under Construction	North of 56th Avenue, west of Himalaya, Aurora.
Southlands	Mixed-Use	300	Under Construction	Northeast corner of E-470 near Smokey Hill Road.
Sterling Hills	Residential	435	Under Construction	South of Jewell, east of Tower Road.
Traditions	Residential	290	Under Construction	Southeast corner of 6th Avenue and Harvest Road; northeast corner of Harvest Road and Alameda Avenue. Single family.
TransPort	Commercial	6,300	Proposed	Northeast of town of Watkins; north of I-70, south of 56th Avenue, at Front Range Airport.
Wal-Mart at Gateway Park IV East	Commercial	NA	Complete	Northwest corner of I-70 and Tower Road. Supercenter.

Table 3-21 (continued)
Reasonably Foreseeable Developments

Development Name	Type	Acres	Stage	Location
Windler Homestead/Pulte Homes	Mixed-Use	711	Under Construction	Aurora. Northeast, northwest and southwest corner of 48th Avenue and E-470, plus the northeast corner of 52nd Avenue, plus the northeast corner of 48th Avenue and Gun Club Road. Up to 22.7 million square-feet of commercial and 1,748 residential homes.
WorldPort	Commercial	40	Proposed	South of Peña Boulevard between 68th and 71st Avenues.

Table 3-22 includes transportation actions that are expected to occur within the study area regardless of whether or not the Preferred Alternative is constructed.

Adams County, Arapahoe County, and the City of Aurora have identified E-470 along I-70 as a strong employment growth area and have assigned compatible land uses throughout the study area. Land use plans have included the assumption of new interchanges at I-70 within the study area. For this reason, the No-Action Alternative would have the greatest incremental impact to land uses. In the absence of interchanges at Picadilly and Harvest Roads, regional commercial land uses would likely shift towards 6th Parkway at the E-470 interchange. This would result in incremental impacts to wetlands, floodplains, riparian habitat, and wildlife.

Construction of the Preferred Alternative would be more consistent with planned land uses in the study area. Regional commercial land uses would develop away from and, therefore, avoid existing wetlands, floodplains, and riparian and wildlife habitat, resulting in fewer incremental impacts to these resources.

Table 3-22
Reasonably Foreseeable Transportation Actions

Jurisdiction	Location	Description	Status
City of Aurora	Tower Road between I-70 and 38th Avenue	Reconstruction and widening of Tower Road from I-70 northward to 38th Avenue. Phase II would complete widening to the City limits at 44th Avenue.	Phase II construction scheduled 2005/2006.
City of Aurora	Picadilly Road: 26th Avenue to 38th Avenue	Construct the street to four-lane arterial standards, including median landscaping. Property owners are responsible for curb, gutter, walk, and the outside 18 feet of pavement on each side.	Design and construction in 2008.
City of Aurora	6th Avenue from Airport Boulevard to Tower Road	The entrance to Buckley Air Force Base at 6th Avenue (SH 30) would be widened from two lanes to a six-lane arterial with a raised median from Airport Boulevard to Tower Road.	Construction anticipated in 2007.
RTD and CDOT	I-70 East Corridor/I-225 Corridor	FasTracks - Denver metro regional transit improvements	In the NEPA process.

Sources: CDOT State Transportation Improvement Program, 2005-2010; Aurora Capital Improvement Program, 2004; City of Aurora; Adams County; Arapahoe County.

Noise. As development has followed E-470 into the area, traffic and traffic-related noise has increased on local roads. However, some of the local traffic has moved onto E-470, drawing heavier traffic and noise from local roads. Large development projects and transportation actions are expected to occur within the study area regardless of whether or not the Preferred Alternative is constructed. As property development within the cumulative study area continues, noise would increase near roads as traffic increases. The Preferred Alternative would attract incremental traffic volume, but the dominant effect of the interchange installations would be to redistribute the interstate and E-470 bound traffic away from Gun Club Road and onto a local network of Colfax, Picadilly, and Harvest Roads. Existing residential subdivisions located south of the study area near Harvest Road and East 6th Parkway and near Picadilly Road and East 6th Avenue would experience increased traffic noise levels approaching or exceeding the Colorado NAC as a result of these 2030 traffic changes. Noise analyses were not conducted for these specific residential neighborhoods; however, they were monitored to establish existing noise levels as noted in **Table 3-20**.

2030 traffic projections developed using the DRCOG regional model for the No-Action Alternative (that would retain the existing I-70 ramps at Gun Club Road) show that the Gun Club Road daily traffic south of Colfax Avenue would average 12,000 vehicles per day. Traffic projections developed for the Preferred Alternative (that removes the I-70 ramps at Gun Club and provides full interchanges for I-70 at Harvest Road and at Picadilly Road) show the 2030 Gun Club Road traffic volume would average 4,000 vehicles per day. Official traffic counts on Gun Club Road in 2004 found that daily traffic was 3,600 vehicles on the average day. In the absence of interchanges at Picadilly and Harvest Roads, noise levels would remain similar to existing in the immediate interchange areas but would increase on I-70, E-470, and local arterial roads, which would have to accommodate planned growth. The No-Action Alternative focuses interstate-destined traffic onto E-470 and Gun Club Road, increasing the noise along those locations. The Preferred Alternative is estimated to better distribute traffic, and, therefore, better distribute noise across a network of local arterials with interstate access.

Construction of the Preferred Alternative would result in increased noise levels around new interchanges, particularly around Picadilly and Harvest Road arterials. However, some traffic would utilize the interchanges and related improvements instead of local roads, drawing heavier traffic and noise away from local roads and adjacent land uses.

Planned business and residential development inside the study area and projected growth outside the study area would generate new traffic demand on the local and highway systems. Anticipation of this growth has resulted in planned capacity and linkage improvements in the local roadway network concurrent with development. These improvements would occur independently of the proposed action. Traffic composition and distribution would likely change from the existing traffic patterns because of future network modifications and the proposed interchange.

Because there is minimal difference (.001 percent) between future traffic resulting from building the or not building the Preferred Alternative, and because 2030 traffic volumes are expected to exceed 20,000 vehicles per day on major arterials such as Harvest and Picadilly Roads, increased noise levels and impacts are expected to existing neighborhoods located along Picadilly Road and outside the study area south of East 6th Parkway.

Wildlife. Since the time that E-470, DIA, and Peña Boulevard were constructed, there has been a general loss and degradation of wildlife habitat as new development has followed these projects into the cumulative study area. It is unclear how this has affected populations of specific species. However, it is reasonable to assume that wildlife populations have declined in the area, especially those that are sensitive to noise and human activity. As undeveloped and agricultural lands in the cumulative study area are developed, a large amount of the wildlife

habitat would be removed and individual populations would likely be displaced.

Wildlife within the study area depends upon the riparian habitat associated with the First and Sand Creek drainages. In the absence of an interchange at Picadilly Road, regional commercial land uses would likely shift towards 6th Parkway/E-470, potentially impacting Sand Creek and associated wildlife. If a new interchange were not constructed at Harvest Road/I-70, residential development would occur in the north. While there is a prairie dog colony in this area, impacts to prairie dog habitat from residential development would not differ substantially from those incurred by the light industrial/office development planned in this area.

Construction of the Preferred Alternative would be more consistent with planned land uses in the study area. Regional commercial land uses would develop away from existing riparian and wildlife habitat, resulting in fewer impacts to wildlife.

Wetlands. According to USACE records, 5.18 acres of wetlands have been impacted in the cumulative study area, not including E-470. Most of this impacted acreage was not replaced through mitigation because of the small size covered by each of more than 30 permits. Additional impacts can be expected as development occurs on undeveloped and agricultural lands in the cumulative study area.

Indirect, induced growth impacts associated with the No-Action Alternative would result in greater incremental impacts to wetlands than would the Preferred Alternative. In the absence of interchanges at Picadilly and Harvest Roads, regional commercial land uses would likely shift towards 6th Parkway at the E-470 interchange. Under this scenario, the most intensive development could occur near the riparian area associated with the Sand Creek corridor. Indirect effects to wetlands are discussed in detail in the *Indirect Effects/Induced Growth Technical Report* prepared for this EA (**Appendix D**).

3.22.4 Conclusion

The incremental impact of the Preferred Alternative does not result in effects that cause an unacceptable deterioration in the human quality of life. Its impact to study area wetlands and wildlife habitat would be less than the No-Action Alternative. The Preferred Alternative is consistent with local planning efforts. Adams County, Arapahoe County and the City of Aurora have already identified E-470 and I-70 as a strong growth area. DRCOG has projected large increases in population and employment within the study area. All of these agencies have assumed that by 2030 there would be two new interchanges on I-70 on either side of the I-70/E-470 interchange. In the absence of the proposed improvements, planned commercial land uses would likely shift from the interchange locations south to areas not currently planned for development that contain substantial environmental resources. For this reason, the Preferred Alternative has less of an impact to the resources of concern than the No-Action Alternative.

3.22.5 Mitigation

The following mitigation measures could reduce the proposed action's portion of the cumulative impacts to the resources of concern:

- The City of Aurora has implemented zoning and comprehensive plans that assume open space set asides and that encourage Smart Growth development. These general principles should be specifically applied to new development proposals (see letter from the City of Aurora in **Appendix A**).
- Commitments by the City of Aurora to enforce Smart Growth principles and enforce open space set asides are recommended.
- The City of Aurora, which has zoning jurisdiction over much of the E-470 corridor, does not permit new residential zoning where existing or projected airport noise may exceed day-night noise level (Ldn) 60 decibels.

- Implementation of a setback requirement has been discussed by the City of Aurora and is recommended to minimize noise impacts.
- Addition of cross culverts for small urban mammals.

Creek impacts would be minimized and mitigated, as directed by the USACE in the Section 404 permitting process.

3.23 Permits Required

The following permits or coordination would be required for the Preferred Alternative and would be obtained prior to construction:

- **National Pollutant Discharge Elimination System (NPDES)** issued by the CDPHE. This stormwater discharge permit would be required to assure the quality of stormwater runoff.
- **Section 404 permit** issued by the USACE. This permit would be required for filling in Waters of the U.S. located in the interchange area.
- **Section 402 permit** issued by the CDPHE. This permit would be required for dewatering of construction areas, if necessary.
- **Permits for storm sewer crossings**.
- **Erosion control/grading permit issued by the CDPHE**.
- **State Access permit**, issued by CDOT, is required for all requests for new or modified access to E470/I70. Any existing accesses adversely affected by the proposed action will be notified of the proposed changes.
- **Construction Access permits** from CDOT, Adams County, and the City of Aurora for detours and lane closures along I-70, E-470, and other roads that may be affected during construction.
- **Fugitive Dust permit** is issued by CDPHE, Air Pollution Control Division. It may be required if more than 25 acres of land is impacted and/or construction duration is longer than six months.
- **Other Local permits,** such as utility or survey.
- **Floodplain permits**, issued by FEMA include a Conditional Letter of Map Revision and Letter of Map Revision.

3.24 Irreversible and Irretrievable Commitments of Resources

Implementation of the Preferred Alternative would involve a commitment of a range of natural, physical, human, and fiscal resources. Land that would be used in the construction of the Preferred Alternative would be considered an irreversible commitment during the time period that the land is used.

The Preferred Alternative would remove the existing Gun Club Road interchange ramps before the life of that structure is reached. This interchange was intended to be temporary when E-470 was originally built until the full I-70/E-470 interchange could be constructed.

Considerable amounts of fossil fuels, labor, and construction materials, such as cement, aggregate material, and bituminous material, would be expended in the construction of the Preferred Alternative. Additionally, large amounts of labor and natural resources would be used in the fabrication and preparation of construction materials. These materials are generally not retrievable. However, they are not in short supply and their use would not have an adverse effect on continued availability of these resources. Any construction would also require allocation of funds which could be used by other projects.

Both build and no-build alternatives may affect environmental resources not regulated at the federal, state, or local level. Such impacts would include the consumption of natural resources such as fossil fuels and raw materials like gravel. The type of alternative selected may also affect social

resources such as landfill capacity. In most cases, such impacts cannot be quantified, and cannot entirely be avoided. It is recognized that these impacts should be minimized to the extent practicable.

Sustainable practices incorporated into the project planning, construction, and maintenance can minimize resource impacts. As part of its environmental ethic and policy, CDOT encourages its staff, consultants, and contractors to identify and utilize opportunities and methods to reduce the impact of projects and programs on environmental resources through innovative programs and by providing flexibility in project planning and construction for the use of sustainable processes and materials. This may include such concepts as natural resource conservation; waste minimization; materials reuse; minimal use of native virgin materials; conservation and efficient use of water and energy; air pollution prevention, preference for "green" purchasing such as recycled; minimally processed and packaged items; and preference for locally-available resources. CDOT encourages the identification and incorporation of proven alternative materials that are as long or longer-lasting as traditional materials, and which require the same or less amount of maintenance, as long as such materials do not impact CDOT's ability to meet its primary obligations for providing a safe and efficient transportation system.

3.25 Mitigation and Benefits Summary

A summary of mitigation and benefits is depicted in **Table 3-23** and **Table 3-24**.

Table 3-23
Mitigation Measures for the Preferred Alternative

Resources and Impacts	Mitigation or Benefit
Land Use and Zoning	No mitigation is necessary for land use impacts. See Section 3.4.3, Right-of-Way, for mitigation measures associated with the acquisition of property.
Indirect Effects	Typical mitigation for the indirect growth-related impacts of a project includes the adoption of Smart Growth policies, open space acquisition, and/or the implementation of transportation demand management policies and design standards. Mitigation that could be considered for local jurisdictions includes: ▸ Commitments to enforcing Smart Growth policies as evidenced in the differential figures of the impacts shown in **Table 3-1** (see letter from the City of Aurora in **Appendix A** committing to Smart Growth Principles). ▸ Commitments for open space set asides or acquisitions, particularly along the floodplains of Sand Creek and First Creek. ▸ Adequate and timely investments in supportive infrastructure, such as the local street system underway as demonstrated in the No-Action Alternative.
Indirect Effects (continued)	▸ Commitments to appropriate design standards to minimize air pollution and traffic impacts (development in the vicinity of the new interchanges would replace rural, undeveloped land potentially impacting visual quality and quality of life for residents currently living in this mostly rural area).
Farmland	Because there are no impacts to prime or unique farmlands or farmlands of statewide importance, no mitigation is required.

Table 3-23 (continued)
Mitigation Measures for the Preferred Alternative

Resources and Impacts	Mitigation or Benefit
Social	No social mitigation is needed.
Environmental Justice	Because there would be no disproportionate adverse impacts to low-income or minority populations in the study area, no mitigation measures are required. Mitigation for noise, visual, and construction-related impacts are addressed in Section 3.9.4, Section 3.19.3, and Section 3.21.2, respectively.
Right-of-Way and Relocation	Acquisition of land for right-of-way would begin when the proposed action is fully designed, funded, and moves toward construction. Right-of-way acquisition for the I-70/E-470 interchange complex would comply with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646), as amended, which contains specific requirements that govern the manner in which a government entity acquires property for public use. The purpose of the Uniform Act is to provide a uniform policy for fair and equitable treatment of persons displaced from their homes, businesses, or farms as a result of federal and federally assisted programs. The law is designed to ensure just compensation for all acquired properties and minimal impact to the current owners.
Right-of-Way and Relocation (continued)	The Uniform Act requires that a property owner be notified of the interest to acquire their property before a real property appraisal is completed. Each property owner is given the opportunity to accompany the appraiser during the inspection of the property. Just compensation is established based on a current appraisal. The owner of real property acquired for right-of-way would be compensated at fair market value, in accordance with the Uniform Act, state statutes, and CDOT policies and procedures. No owner would be required to surrender possession of the real property until paid the agreed purchase price or the amount deemed to be just compensation has been deposited with the court for the benefit of the owner. Other entities, such as the City of Aurora, may acquire the property on behalf of CDOT but would be bound by the requirements of the Uniform Act.
Economic	During the construction phase, good communication with emergency service providers, local businesses, government agencies, and residents is recommended with regard to traffic delays and access changes. Such notifications could be accomplished through radio and public announcements, newspaper notices, and on-site signage. If access to a business is compromised, alternate access routes would be provided during construction.
Transportation (including pedestrians and bicyclists)	The Preferred Alternative does not require mitigation.
Parks and Recreation Resources	There are no existing parks, recreational facilities, or designated open space in the study area. Therefore, there would be no impacts to parks or recreational facilities, and no mitigation is required. The areas that are zoned for parks/open space and plans for recreational facilities have already taken this proposed action into consideration.
Air Quality	No mitigation for air quality is necessary.
Noise	Noise mitigation for the Preferred Alternative was found to be not reasonable or feasible.

Table 3-23 (continued)
Mitigation Measures for the Preferred Alternative

Resources and Impacts	Mitigation or Benefit
Water Resources and Water Quality	The use of standard erosion and sediment control BMPs in accordance with Erosion Control and Storm Water Quality Guide, CDOT, 2002, would be included in the final design plans. A drainage master plan would be prepared in cooperation with the Urban Drainage and Flood Control District, E-470, CDOT, the City of Aurora, and the Counties of Adams and Arapahoe, ensuring that new interchange drainage facilities are compatible with adjacent facilities. All work on the proposed action shall be in conformity with Subsection 107.25 and Section 208 of the *CDOT Standard Specifications for Road and Bridge Construction*. As previously mentioned, the proposed action's location falls under the CDPHE Phase I and Phase II Storm Water Regulations and would follow the requirements of CDOT's MS4 permit. Specifically, the two CDOT Storm Water Management Programs that would apply are the Construction Sites Storm Water Management Program and the New Development and Redevelopment Planning Procedures for Storm Water Management. After a highway project is identified, the permanent BMP planning process under MS4 is to determine if there would be water quality impacts. If there are, permanent BMPs are required. The permanent BMPs should be included in the proposed action's preliminary design, including cost consideration. Once this design, is underway, an environmental review can be performed that includes the conceptual BMPs. As the environmental document is being prepared, final determination on the BMPs is made. Once this is completed, field review and preliminary design modifications are conducted, which is then followed by final BMP design and CDOT review. Through continuous collaboration with the flyby design team, the E-470 Authority, and CDOT, the interim and ultimate condition analyses for the full I-70/E-470 interchange were coordinated so that permanent BMPs designed for the flyby phase would also be used in the full I-70/E-470 interchange. This is documented is the *I-70/E-470 Flyby Phase I Plan*, February 2005. The flyby did not impact the Harvest Road interchange area or the Picadilly Road interchange area; therefore, new water quality facilities have been proposed for those areas and are described in the *I-70/E-470 Interchange Complex Preliminary Storm Drainage Design Report, (Parsons* Brinckerhoff, 2006). This report would be submitted to CDOT before the completion of the EA process. Proposed permanent BMP water quality facilities were preliminarily sized using the Water Quality Control Volume (WQCV) equation presented in the *Urban Drainage and Flood Control District* (UDFCD) *Urban Storm Drainage Criteria Manual* (USDCM) *Volume 3, Best Management Practices*. This equation bases the size of the basin on the amount of impervious area contributing to the basin. All permanent BMPs were designed to capture 100 percent of the runoff from the impervious surface. The following specific BMPs from the *Erosion Control and Storm Water Quality Guide*, CDOT, 2002, would be required during construction to reduce construction-related and/or long-term impacts to water resources: ▸ Adjacent disturbed fill slopes would be revegetated with native plant species to protect exposed soils from erosion. ▸ Disturbance to vegetated areas would be minimized, and revegetation of disturbed vegetated surfaces would occur within seven days of earthwork as required by the Colorado Discharge Permit System regulations. Where temporary or permanent seeding operations are not feasible because of seasonal constraints (e.g., summer and winter months), mulch and mulch tackifier would be applied to protect soils from erosion.

Table 3-23 (continued)
Mitigation Measures for the Preferred Alternative

Resources and Impacts	Mitigation or Benefit
Water Resources and Water Quality (continued	▸ Sediment catch basins would be built during construction and permanently maintained to capture the sand from the road surface during winter sanding operations. ▸ Where appropriate, slope drains would be used to convey concentrated runoff from the top to bottom of disturbed slopes. Slope and cross-drain outlets would be constructed to trap sediment. ▸ Storm drain inlet barriers would be used where appropriate to trap sediment before it enters the cross-drain. ▸ Check dams would be used where appropriate to slow the velocity of water through roadside ditches and in swales. ▸ Temporary retention ponds would be used to allow sediment to settle out of runoff before it leaves the construction area. These ponds may be combined with permanent detention ponds. ▸ Structural BMPs can include the following: extended detention basins with sediment forebays, wetland grass swales, wetland grass buffers, and constructed wetland basins. Nonstructural BMPs can include litter and debris control, and landscaping and vegetative practices. ▸ Settling ponds for effluent from dewatering operations would be used, if needed. ▸ During the design, the CDOT Hydraulic Engineer and Landscape Architect would review the project plans and provide comments as necessary.
Wetlands and Other Waters of the U.S.	Because no wetlands would be impacted, wetland mitigation would not be required.
Floodplains	Mitigation measures would be required to minimize impacts to the First Creek floodplain. New construction within regulated floodplains requires compliance with FEMA regulations and criteria. The design of all roadway, drainage, and structural features would be in accordance with these criteria, as well as local jurisdictional requirements. This would require close coordination during the design process with several parties, including FEMA, CDOT, UDFCD, the City of Aurora, and any affected property owners. As noted previously, there is a Master Plan for drainage improvements on First Creek. This report was prepared in anticipation of future developments, such as including the I-70/E-470 interchange complex. One of the purposes of such a report is to determine potential drainage problems and impacts of future development on the drainage system, and to develop proposed improvements to reduce these impacts. Implementation of various proposed improvements may be required as a mitigation measure, which would minimize risk associated with the action. These measures would also restore and preserve the natural and beneficial floodplain values.

Table 3-23 (continued)
Mitigation Measures for the Preferred Alternative

Resources and Impacts	Mitigation or Benefit
Floodplains (continued)	In addition to permanent measures to help control future flooding, other temporary measures would be required along First Creek during construction of the interchange. This includes use of standard CDOT and UDFCD erosion control techniques to minimize impacts to the drainage-way. Implementation of Best Management Practices (BMPs) would be required to help control erosion and sedimentation within the drainage basin. This would also improve water quality for the runoff being delivered further downstream.
Wild and Scenic Rivers	Since no wild and scenic rivers are present in the study area, no mitigation is necessary.
Wildlife and Fisheries	No fisheries mitigation is required since no fisheries are present in the study area. The following mitigation measures are proposed to limit impacts to wildlife resources: ▸ As possible, retention of large trees that have the potential to serve as raptor nesting habitat as specified by CDOW wildlife biologist or project biologist. ▸ Removal of any trees with nests would be performed outside of the nesting period to be confirmed by CDOW. New trees would be planted when the area is landscaped which would replace the removed trees. ▸ Bird nest removal would be timed to avoid active/nesting seasons and/or birds would be actively excluded. If necessary, nest surveys would be conducted immediately prior to construction. ▸ Removal of any bank swallow nests in the First Creek culverts under I-70 would be performed outside of the nesting period to be confirmed by CDOW. ▸ Addition of culverts for small wildlife to cross I-70, E-470, and other roadways. ▸ Use of temporary and permanent erosion control measures to limit impacts to the First Creek channel, consistent with the project stormwater management plan.
Threatened and Endangered Species	Since no threatened and endangered species would be affected by the Preferred Alternative, no mitigation is required.
Historic and Archaeological Resources	In the event that cultural materials are exposed during the construction process, all activity would be immediately suspended in the area of discovery. The CDOT Staff Archaeologist would be notified in order for the cultural materials to be properly evaluated for NRHP significance. Because of the paleontologic sensitivity of the Denver Formation, a qualified paleontologist would monitor construction activities in all areas where construction impacts to this geologic unit are likely to occur. When the design plans are finalized, the CDOT Staff Paleontologist would examine them in order to estimate the scope and locations of probable construction impact to the Denver Formation and the scope and locations of paleontological monitoring work, if any, which are required. If any subsurface bones or other potential fossils are found anywhere within the study area during construction, the CDOT Staff Paleontologist would be notified immediately to assess their significance.

Table 3-23 (continued)
Mitigation Measures for the Preferred Alternative

Resources and Impacts	Mitigation or Benefit
Hazardous Waste	CDOT carefully considers the potential risks associated with hazardous waste on construction projects and utilizes Section 250 of the *Standard Specifications for Road and Bridge Construction* (CDOT, 2005). Section 250 "Environmental Health and Safety Management" provides for the protection of the environment, persons and property from contaminants and includes special requirements for addressing hazardous waste, if encountered. Encountering hazardous waste in soils or groundwater with the Preferred Alternative is not anticipated. Therefore, no Site Investigation (SI) is recommended. Pay items and appropriate notes placed in the final design plans as a precautionary measure would adequately protect worker health and safety, as well as provide the contractor and project engineer with suitable measures in the event that contamination is encountered from any source.
Visual Resources	The following measures would reduce impacts to the existing visual landscape: ▸ All disturbed areas would be revegetated with native grasses as soon as practicable. ▸ All new structures, signing, and lighting would be consistent with local standards and guidelines. ▸ Architectural interest (such as texture, color, or design) would be provided for retaining walls, bridges, and other structural features. Wall materials and design would be coordinated with CDOT, local landowners, the E-470 Authority, and the City of Aurora. ▸ Visual enhancements would be consistent with the principles of Context Sensitive Solutions as described in CDOT's *Context Sensitive Solutions Policy Memo* dated October 31, 2005.
Energy	Mitigation that would be implemented to reduce energy consumption during construction includes: ▸ Maximum use of on-site material to reduce haulage requirements. ▸ Proper maintenance of construction vehicles. ▸ Turning off equipment when not in use. ▸ Design of construction access roads and location of construction staging areas to minimize distances traveled.
Construction	Construction impacts would be mitigated by the contractor through implementation of control measures during construction. These measures include: ▸ Requiring the use of appropriate dust suppression measures to minimize dust impact associated with the construction activities. ▸ Designing a suitable construction staging area, and requiring that the contractor store materials and equipment within that area to minimize the visual impact. ▸ Disturbance of vegetation and the creek channel would be kept to a minimum to reduce water quality impacts. Construction contractors would practice good management practices to reduce the likelihood of chemical spills. Cleanup of spills would be conducted in compliance with Colorado hazardous waste regulations in 6 CCR 1007-3.

Table 3-23 (continued)
Mitigation Measures for the Preferred Alternative

Resources and Impacts	Mitigation or Benefit
Construction (continued)	▸ Construction staging and traffic control plans would be developed that minimize the disruption to traffic and access. ▸ CDOT, the City of Aurora, and the E-470 Authority would provide adequate public notice and maintain coordination with area residents and with the area's emergency service providers to keep the public apprised of the construction progress and to inform the public of closures and detours. ▸ The City of Aurora construction noise code requirements limiting noise levels at the neighborhood property lines to be no higher than 80 dBA between 5:00 p.m. and 7:00 a.m. and 75 dBA between 7:00 a.m. and 5:00 p.m. would be enforced during construction. ▸ Construction percussion operations, and truck loading, hauling, and routing would be scheduled during daytime hours and managed to minimize noise and vibration levels to surrounding neighborhoods. The following BMPs would be used to mitigate impacts to vegetation associated with the Preferred Alternative: ▸ Minimize the amount of disturbance and limit the amount of time that disturbed areas are allowed to be non-vegetated. ▸ Avoid existing trees, shrubs, and vegetation to the maximum extent possible, especially wetlands and riparian plant communities. ▸ Salvage weed-free topsoil for use in revegetation. Specific BMPs would be required during construction to reduce the potential for introduction and spread of noxious weed species and include: ▸ Weed mapping would be included in the construction documents along with appropriate control methods for noxious weeds. ▸ Highway right-of-way areas would periodically be inspected by CDOT and others during construction and during post-construction weed monitoring for invasion of noxious weeds. ▸ Weed management measures would include removal or burial of heavily infested topsoil, chemical treatment of lightly infested topsoil, limiting disturbance areas, phased seeding with native species throughout construction, monitoring during and after construction, and other chemical and/or mechanical treatments. ▸ Use of herbicides would include selection of appropriate herbicides and timing of herbicide spraying, and use of a backpack sprayer in and adjacent to sensitive areas such as wetlands and riparian areas. In locations where spot application is not practicable, a wildlife biologist would inspect the area prior to spraying to ensure crucial habitat would not be impacted. ▸ Certified weed-free hay and/or mulch would be used in all revegetated areas. ▸ No fertilizers would be stored on the project site. ▸ Supplemental weed control measures may be added during design and construction planning.

Table 3-23 (continued)
Mitigation Measures for the Preferred Alternative

Resources and Impacts	Mitigation or Benefit
Construction (continued)	Preventative control measures for design and construction may include: ▸ **Native Plants:** Use of native species in revegetation sites. ▸ **Weed Free Forage Act:** Materials used for the project would be inspected and regulated under the Weed Free Forage Act, Title 35, Article 27.5, CRS. ▸ **Topsoil Management:** When salvaging topsoil from on-site construction locations, the potential for spread of noxious weeds would be considered. Importing topsoil onto the project site would not be allowed. ▸ **Equipment Management:** Equipment would remain on designated roadways and stay out of weed-infested areas until the areas are treated. All equipment would be cleaned of all soil and vegetative plant parts prior to arriving on the project site.

Table 3-24
Local Commitments for Cumulative Impacts

Resource and Impacts	Mitigation of Benefit
Cumulative Impacts	The following mitigation measures could reduce the proposed action's portion of the cumulative impacts to the resources of concern: ▸ The City of Aurora has implemented zoning and comprehensive plans that assume open space set asides and that encourage Smart Growth development. These general principles should be specifically applied to new development proposals (see letter form the City of Aurora in **Appendix A**). ▸ Commitments by the City of Aurora to enforce Smart Growth principles and enforce open space set asides are recommended. ▸ The City of Aurora, which has zoning jurisdiction over much of the E-470 corridor, does not permit new residential zoning where existing or projected airport noise may exceed day-night noise level (Ldn) 60 decibels. ▸ Implementation of a setback requirement has been discussed by the City of Aurora and is recommended to minimize noise impacts. ▸ Addition of cross culverts for small urban mammals. Creek impacts would be minimized and mitigated, as directed by the USACE in the Section 404 permitting process.