RESOLUTION NO. 09-71

INTRODUCED BY:

Councilperson Neely

Councilperson Clark

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF CASTLE PINES NORTH ADOPTING THE DOUGLAS COUNTY 2020 TRANSPORTATION PLAN AS THE CITY'S 2020 TRANSPORTATION PLAN

WHEREAS, the "DOUGLAS COUNTY 2020 TRANSPORATION PLAN – AN ELEMENT OF THE DOUGLAS COUNTY 2020 COMPREHENSIVE MASTER PLAN" (the "Transportation Plan") was prepared by the transportation engineering consulting firm of Felsburg Holt & Ullevig for and on behalf of the Douglas County Departments of Public Works and Community Development; and

WHEREAS, a copy of the Transportation Plan is attached hereto as Exhibit A and is incorporated herein by reference; and

WHEREAS, the Transportation Plan emphasizes the need to encourage a multi-modal approach to the overall development of the Douglas County transportation system which include: (a) strategies to expand transit options and bikeway/pedestrian facilities; (b) strategies to incorporate travel demand management techniques into the process of transportation supply expansion; and (c) active pursuit of right-of-way preservation as an important method to insure long term flexibility for new transportation technologies; and

WHEREAS, the main goal of the Transportation Plan is to sufficiently plan for transportation infrastructure that is safe, efficient, and responsible to current and future residents, and visitors of Douglas County; and

WHEREAS, the Transportation Plan has been reviewed by the Community Development Department and the Public Works Department of the City of Castle Pines North, and the departments have recommended that City Council consider formally adopting the Transportation Plan as the City of Castle Pines North 2020 Transportation Plan.

THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF CASTLE PINES NORTH, COLORADO:

Section 1. The City Council of the City of Castle Pines North hereby adopts the Transportation Plan as the City of Castle Pines North 2020 Transportation Plan, in substantially the form attached hereto as Exhibit A.

Section 2. This Resolution shall become effective immediately upon passage and approval.

INTRODUCED, READ AND ADOPTED AT A REGULAR MEETING OF THE CITY COUNCIL OF THE CITY OF CASTLE PINES NORTH the 24th day of September, 2009.

Maureen A. Shul, Mayor

ATTEST:

Janie Berry, City Clerk

APPROVED AS TO FORM:

Linda C. Michow, City Attorney

Exhibit A
Douglas County 2020 Transportation Plan

Douglas County 2020 Transportation Plan

An element of the Douglas County 2020 Comprehensive Master Plan

DOUGLAS COUNTY
2020 TRANSPORTATION PLAN

AN ELEMENT OF THE DOUGLAS COUNTY 2020 COMPREHENSIVE MASTER PLAN

Adopted by the Douglas County Planning Commission
June 2003

Prepared for:

Douglas County Departments of
Public Works and Community Development
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Castle Rock, Colorado 80104

Prepared by:

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FHU Reference No. 01-072
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Updated April 2004

ACKNOWLEDGEMENTS

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INTRODUCTION

I. INTRODUCTION

A. Historical Perspective

In 1991, and again in 1996, Douglas County adopted a 20-year transportation plan for inclusion in the County's *Comprehensive Master Plan*. Because Douglas County adopted an updated *Comprehensive Master Plan* in 2001, it is appropriate that the Transportation Element be similarly updated.

The study area for these plans encompassed all of Douglas County. Each plan was based upon a thorough analysis of development and growth potentials, which reflected both current day market realities at the time, along with land use policy direction provided by Douglas County and its municipalities. From these analyses a comprehensive, long-range system plan was identified along with interim implementation phases for new roadway and transit construction or reconstruction. As a consequence, the *Transportation Plan* follows the philosophy and partially implements the goals and objectives of the *Comprehensive Master Plan*.

The original technical analyses also documented basic travel characteristics unique to Douglas County. From the updated development projections, travel demands were forecast both for trip-making within and through Douglas County and between the County and the remainder of the metropolitan area. This resulted in increased emphasis upon the development of a system of minor arterial and collector facilities to support the regionally oriented network. In addition, as the County has grown, the need for and the feasibility of multi-modal transportation solutions has increased. Again, these elements of the *Transportation Plan* are a direct response to the direction provided by the *Comprehensive Master Plan*.

B. Purpose of Transportation Plan

The purpose of this current planning effort, therefore, is to update the *2015 Transportation Plan* and to extend the planning horizon to the year 2020. Primary elements included in this update are:

- Revised socio-economic forecasts of households and employment to better reflect current trends and countywide land use plans;
- Updated travel demand forecasts based upon the socio-economic projections to modify or verify previously identified travel characteristics;
- A multi-modal transit element supportive of commuter rail, light rail, express bus, and circulator technologies; and
- A functional hierarchy of roadways which enhance travel efficiency and safety.

In addition, the updated *2020 Transportation Plan* continues and re-emphasizes the need to encourage a multi-modal approach to the overall development of the Douglas County transportation system which were initiated in the original *2010 Transportation Plan*. These include, in addition to a basic roadway network and transit plan, the following elements:

- Strategies to enhance multi-modal transportation including transit options and bikeway/pedestrian facilities.
- Strategies to incorporate travel demand management techniques into the process of transportation supply expansion.

- Active pursuit of right-of-way preservation as an important method to insure long term flexibility for new transportation technologies.

Douglas County will utilize the products of the *2020 Transportation Plan* to evaluate the general compatibility of a wide variety of development proposals, update its 5-year Capital Improvement Program (CIP), and assess its overall growth management activities.

C. County Planning Context

On May 1, 2001, the Douglas County Planning Commission adopted the *2020 Comprehensive Master Plan*. Within this document there is vision for transportation planning supported by a series of goals and objectives relating to physical construction, modal balance, and system management. As a consequence, the *2020 Transportation Plan* is developed in response to and in support of the *Comprehensive Master Plan*.

Mission Statement:
To provide Douglas County with an effective transportation infrastructure that is safe, efficient, and responsible to current and future residents, and visitors of the county.

The goals and objectives relevant to the preparation of the *2020 Transportation Plan* have been extracted from the *Comprehensive Master Plan* and reorganized to address specific transportation modes and management strategies. Summarized in the following text are the qualitative and quantitative responses to each applicable goal/objective of the *Comprehensive Master Plan*.

TRANSIT GOALS AND OBJECTIVES

Source: *Douglas County 2020 Comprehensive Master Plan*

Goal 8-1
Develop an efficient multi-modal transportation network that addresses issues including design, safety, operations, maintenance and overall efficiency.

Objective 8-1B
Integrate alternative modes of travel into the *Transportation Plan*.

Transportation Plan Response:
The *2020 Transportation Plan* incorporates three mass transportation service types, supports a variety of travel demand management strategies, and is supportive of the previously adopted Parks, Trails, and Open Space Comprehensive Master Plan (1998).

Goal 8-3
Provide enhanced public transit in Douglas County

Objective 8-3A
Develop a public transit network plan for Douglas County.

Transportation Plan Response:
The *2020 Transportation Plan* includes local transit circulation services for Highlands Ranch, Castle Rock, Parker and Lone Tree. Transit circulators are already in operation in Highlands Ranch and Castle Rock and similar services are proposed for Parker and Lone Tree.

Objective 8-3B
Incorporate transit facilities within development in urban areas.

Transportation Plan Response:
Transit-oriented development (TOD) is a planning strategy supported by the *2020 Transportation Plan*. Areas where TOD may have application include the area in the vicinity of C-470 and Lucent Boulevard, the I-25 corridor south of Lincoln Avenue, US 85 through Highlands Ranch, and in Castle Rock where the US 85 and I-25 rapid transit corridors merge.

Goal 8-4
Establish an integrated Transportation Demand and System Management Program (TDSM) to reduce traffic congestion, improve air quality, and conserve energy.

Objective 8-4A
Provide transportation alternatives in the County that reduce dependence on the automobile.

Transportation Plan Response:
Douglas County has an adopted the Parks, Trails, and Open Space Plan (1998) which identifies an entire network of facilities for walk, bike, and equestrian travel. The efficiency and safety of this system is ensured by the conflict reduction measures included in the *2020 Transportation Plan*. In addition, the transit element of the plan defines a wide range of options to the automobile.

Objective 8-4B
Establish commuting alternatives that reduce traffic congestion.

Transportation Plan Response:
The *2020 Transportation Plan* supports transit-oriented development (TOD) as a key strategy in changing basic travel patterns. Further, the rapid transit corridors contained in the *2020 Transportation Plan* provide real alternatives for the commuter.

ROADWAY NETWORK GOALS AND OBJECTIVES

Source: *Douglas County 2020 Comprehensive Master Plan*

Goal 8-1

Develop an efficient multi-modal transportation network that addresses issues including design, safety, operations, maintenance and overall efficiency.

Objective 8-1A

Ensure consistency between the *Transportation Plan* and local and regional transportation plans of Castle Rock, Parker and Lone Tree.

Transportation Plan Response:

The Douglas County 2020 Transportation Plan conforms to DRCOG guidelines for County and municipal subarea plans. It was prepared in parallel with the *Castle Rock Transportation Plan* with comment and input from Parker, Lone Tree, and a variety of other groups and individuals.

Objective 8-1C

Consider safety a major element of transportation improvements in the County.

Transportation Plan Response

Minimum and desired design dimensions for each roadway functional classification are presented in the *2020 Transportation Plan*. The primary purpose of these design guidelines is to insure optimal safety characteristics. In addition, the *2020 Transportation Plan* includes conflict reduction concepts for application to various travel modes.

Safety and mobility within the network can be improved through various intersection treatments. Treatments to intersections may include building auxiliary lanes, installing traffic signals or installing alternative intersection control measures such as modern roundabouts. Appropriate intersection control and intersection improvements are typically determined through a detailed engineering study on a case by case basis.

Build intersection control and intersection improvements such as auxiliary lanes, traffic signals or modern roundabouts where studies indicate that these measures would improve the safety and mobility of the system.

Goal 8-2

Develop and maintain an efficient and safe road network in harmony with natural features and existing neighborhoods.

Objective 8-2A

Plan and construct an efficient road network.

Transportation Plan Response:

The efficiency of the roadway network is a direct consequence of the hierarchy of functional classifications contained in the *2020 Transportation Plan*. The primary determinant of efficiency is the degree to which access movements can be separated from mobility movements.

Objective 8-2B

Provide adequate primary, secondary and emergency connections for subdivisions.

Transportation Plan Response:

Access improvements for major subareas are included in the *2020 Transportation Plan*. These areas are the Roxborough and Perry Park subarea and the Meadows in Castle Rock. In addition, the *2020 Transportation Plan* identifies capacity deficiencies across the C-470/E-470 corridor and across the Cherry Creek drainage along with future actions.

Objective 8-2C
Design local roads to serve the purpose and scale of the neighborhood and to encourage pedestrian-oriented communities.

Transportation Plan Response:
The protection of local neighborhood streets is implicit in the functional classification hierarchy which provides separate roadways for traffic that is incompatible with neighborhood characteristics.

Utilize traffic calming measures on local residential streets where studies indicate they are appropriate and where the impacted population and agencies agree they would be beneficial.

Objective 8-2D
Widen or improve existing roads, as possible, prior to constructing additional roads.

Transportation Plan Response:
All of the roadway improvements necessary to develop the Regional Arterial System for the *2020 Transportation Plan* occur on existing roadways. Completion of the Principal Arterial System, however, will require the construction of several new facilities as shown in the *2020 Transportation Plan*.

MODAL INTERFACE GOALS AND OBJECTIVES

Source: *Douglas County 2020 Comprehensive Master Plan*

Goal 8-5
Refine land use compatibility within the Centennial Airport Review Area (CARA) to ensure air and ground safety.

Objective 8-5A
Achieve consistency in land use planning within the CARA.

Objective 8-5B
Coordinate land use planning activities with other jurisdictions adjacent to the CARA.

Transportation Plan Response:
Actions and programs to implement Goal 8-5 and Objectives 8-5A and 8-5B are contained in other County plans.

Goal 8-6
Achieve compatibility between the railways, other transportation corridors, and surrounding land uses.

Objective 8-6B
Achieve land use compatibility between the railways and adjoining land uses.

Transportation Plan Response:
Actions and programs to implement Goal 8-6 and Objective 8-6B are contained in other County plans.

Objective 8-6C
Continue to pursue passenger commuter service.

Transportation Plan Response:
The *2020 Transportation Plan* identifies two commuter rail options along US 85 and I-25 and is supportive of the ongoing evaluation of this technology.

MANAGEMENT GOALS AND OBJECTIVES

Source: *Douglas County 2020 Comprehensive Master Plan*

Goal 8-4
Establish an integrated Transportation Demand and System Management Program (TDSM) to reduce traffic congestion, improve air quality, and conserve energy.

Objective 8-4A
Provide transportation alternatives in the County that reduce dependence on the automobile.

Transportation Plan Response:
Douglas County has an adopted Parks, Trails, and Open Space Comprehensive Master Plan which identifies an entire network of facilities for walk, bike, and equestrian travel. The efficiency and safety of this system is ensured by the conflict reduction measures included in the *2020 Transportation Plan*. In addition, the transit element of the plan defines a wide range of options to the automobile

Objective 8-4B
Establish commuting alternatives that reduce traffic congestion.

Transportation Plan Response:
The *2020 Transportation Plan* supports transit-oriented development (TOD) as a key strategy in changing basic travel patterns. Further, the rapid transit corridors contained in the *2020 Transportation Plan* provide real alternatives for the commuter.

Objective 8-4C
Use land use planning to help reduce travel needs.

Transportation Plan Response:
Actions and programs to implement Goal 8-4 and Objective 8-4C are contained in other County plans.

Objective 8-4D
Integrate TSM into the County's transportation planning program.

Transportation Plan Response:
This has been done with the definition and description of a separate management element to the *2020 Transportation Plan*.

STUDY AREA CHARACTERISTICS

II. STUDY AREA CHARACTERISTICS

A. Physical Features

The study area shown in Figure 1 encompasses slightly less than 900 square miles of land. From the broader metropolitan perspective, the study area is defined by significant regional elements including Pike National Forest, historic free-standing communities, and significant parcels of open space.

The study area exhibits both mountainous terrain and rolling terrain with some relatively flat plains primarily located in the eastern third of the County. Most prominent of the natural features are the numerous drainageways crossing the study area primarily in a south to north direction. The two major drainages, include Plum Creek and its tributaries generally paralleling the Santa Fe corridor and the Cherry Creek drainage system, which generally parallels SH 83 (Parker Road).

Included within the various land uses designated in the *Comprehensive Master Plan* are special lands designated as conserved or preserved lands. Together with the Pike National Forest, these lands represent a significant commitment to preserving open space, managing urban development and minimizing the need for urban transportation facilities. As shown in Figure 1, these lands extend throughout the County from Chatfield State Recreation Area in the northwest to Greenland Ranch in the south-central portion of the County.

B. Roadway Network

The primary component of the existing Douglas County transportation system is the roadway network with the federal and state highway system comprising the backbone of this network. The facilities which comprise the major elements of the existing roadway network are illustrated in Figure 2.

In a north-south direction there are three corridors providing continuity throughout the County. Interstate 25, which is central to the County, is the primary transportation route through the County. US 85/County Road 105 (Perry Park Road) to the west and Parker Road to the east also provide continuity through the County but carry substantially lower through traffic volumes.

The C-470/E-470 corridor along the north county line and the SH 86 corridor located easterly from Castle Rock, comprise the two primary east-west facilities serving the County.

Due to their design, freeways require grade separations at all locations where arterial and collector streets either interchange or cross. Because such grade separations are major cost items, I-25 and C-470/E-470 represent significant constraints to the development of an integrated and continuous system of lower functional roadways.

C. Existing Traffic Volumes

Traffic volumes, both daily and peak hour, provide a basis for understanding current levels of usage and congestion as well as indicating the types of roadway improvements needed to meet the goals of the *Comprehensive Master Plan*. In addition, future travel demand forecasts are based, in part, on an understanding of existing traffic volumes generated by existing land uses.

Figure 1

EXISTING FEATURES AND CONSTRAINTS

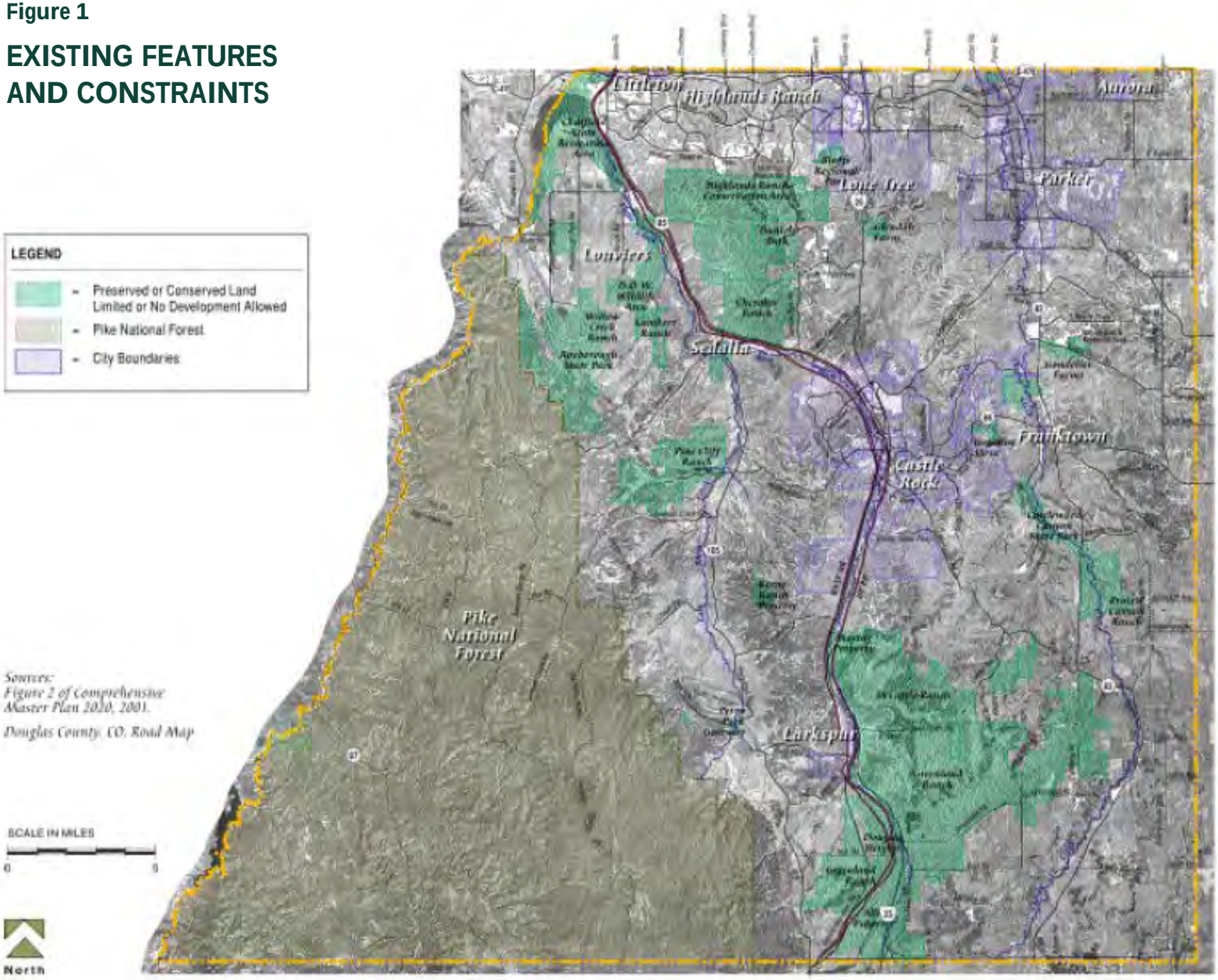
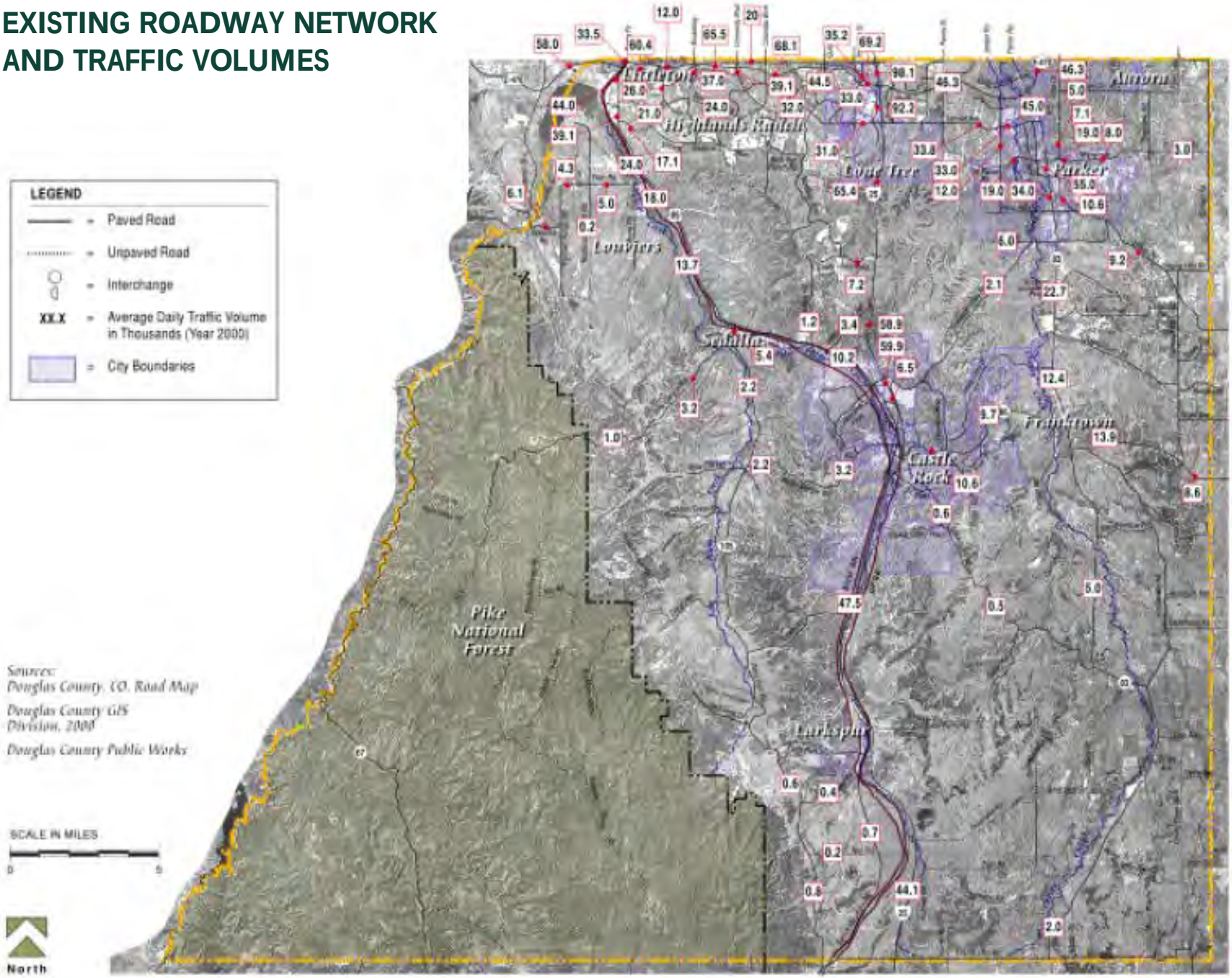


Figure 2

EXISTING ROADWAY NETWORK AND TRAFFIC VOLUMES



Available resources were researched to obtain recent traffic count data for roadways within Douglas County. These data were compiled and are presented in Figure 2. Daily traffic volumes on I-25 through the County range between 44,000 and 98,000 vehicles per day. Current traffic levels on C-470 between US 85 and I-25 are between 60,000 and 69,000 vehicles per day. Both US 85 (Santa Fe) and SH 83 are presently carrying between 10,000 and 45,000 vehicles per day. Other existing facilities carrying significant traffic volumes are Quebec Street, Broadway, University Boulevard, Lincoln Avenue, and County Line Road. Current daily traffic volumes on these roadways range between 12,000 to 45,000 vehicles per day.

Presently, sections of US 85, I-25, and C-470 located within the northern portion of the County are experiencing congested roadway operations. Portions of Mainstreet and Hilltop Road in the Town of Parker, and sections of Wolfensberger Road, Wilcox Street, and 5th Street in the Town of Castle Rock are also operating under congested levels during peak travel hours.

The remainder of the Douglas County roadway network generally operates at acceptable levels of service under normal operating conditions.

D. Existing Transit Services

Figure 3 illustrates the current levels of bus service in terms of geographic coverage provided in Douglas County. In general, bus service is limited to the northern portion of the County, including Highlands Ranch and Parker with express service to Franktown.

Most of the public transit services are provided by the Regional Transportation District (RTD). Local transit services are provided via Routes 0, 401, 403, 426, and 66. The County is also served, at least in part, by four express routes (24X, 78X, 85X and 475X), two regional routes (P and W), and three limited routes (402 Ltd, 470 Ltd, and 66 Ltd). In addition, the AT skyride route provides direct service to Denver International Airport.

The Town of Castle Rock currently has a commercial transit system, which is privately operated, that provides service in the Town. The Clean Air Transit Company (CATCO) operates two clean air shuttles, which run 9 AM to 5 PM, Monday through Saturday. The Downtown Shuttle serves downtown and the factory outlet stores, while the Crosstown Shuttle serves the Meadows and Founders Village in addition to downtown and the factory outlet stores.

Light Rail Transit (LRT) is currently operating along the Santa Fe corridor between downtown Denver and Mineral Avenue. Additionally, the TREX project will ultimately result in LRT service along the I-25 corridor between downtown Denver and Lincoln Avenue in Douglas County. These facilities will initially provide accessibility to Douglas County via park-n-Ride and kiss-n-ride modes. Ultimately, it is anticipated that rapid transit service (e.g. light rail or commuter rail) will be extended into Douglas County.

E. System Conflict Points

The continued development of a roadway and transit network will result in increased interface and potentially hazardous conflicts with other movement systems. Within Douglas County the primary concerns are the freight rail corridors and the bike and trail system. Figure 4 illustrates the major locations where these diverse systems overlap or coincide.

Figure 3

EXISTING TRANSIT SERVICES AND FACILITIES

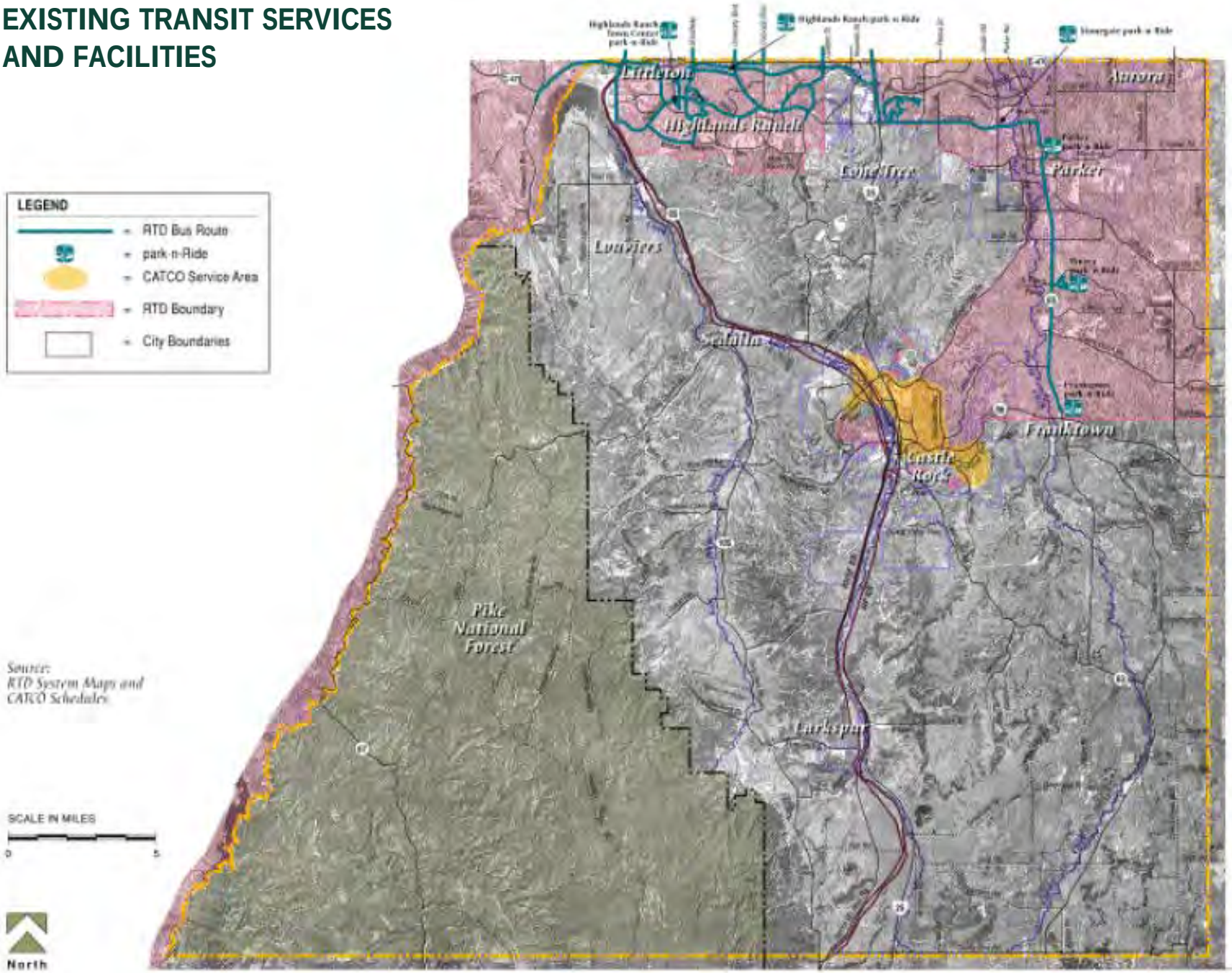
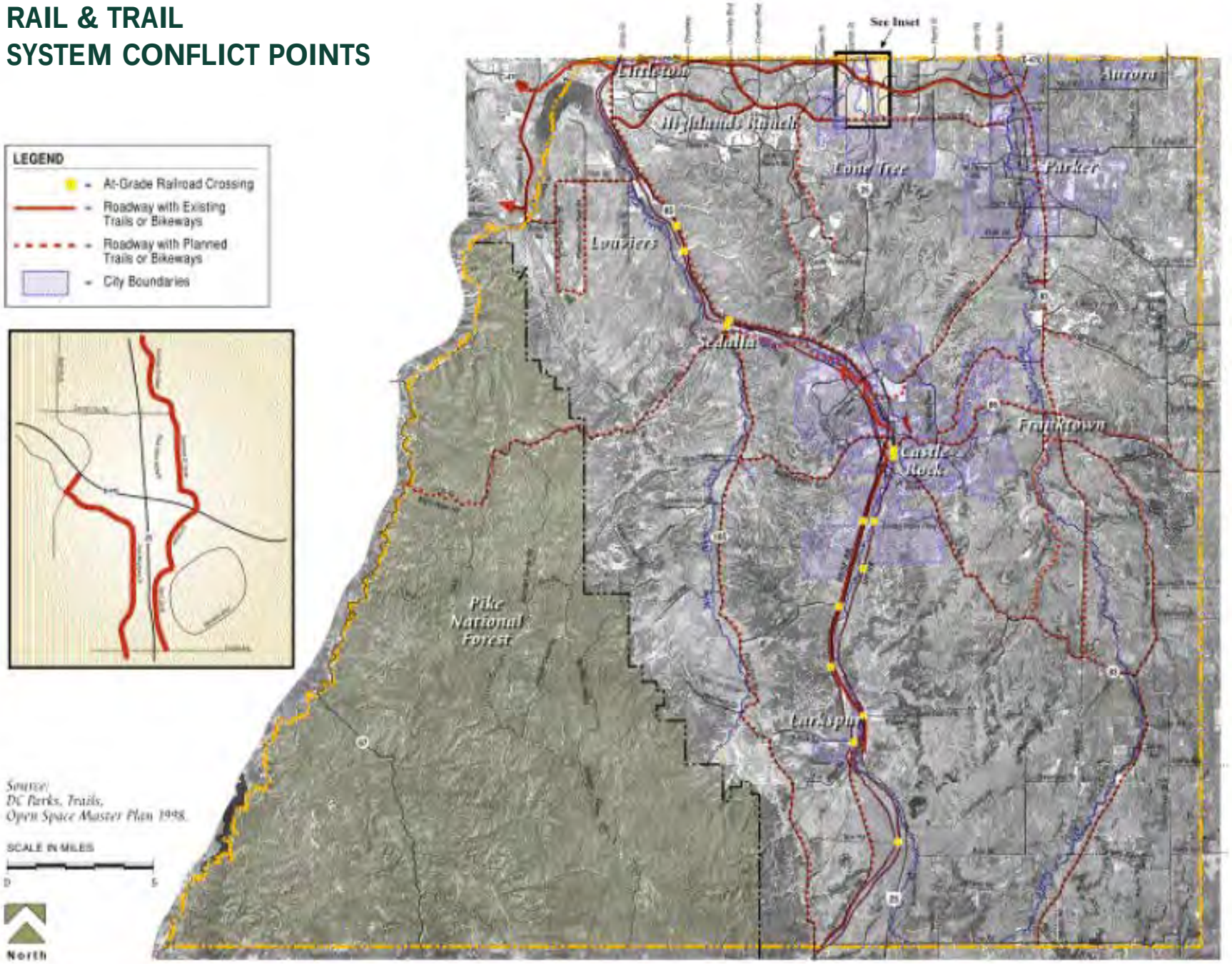


Figure 4

RAIL & TRAIL SYSTEM CONFLICT POINTS



Two major railroad lines pass through Douglas County. The Burlington Northern Santa Fe and Union Pacific Railroad both parallel US 85 (primarily on the south and west sides) from County Line Road to Meadows Parkway in the Town of Castle Rock. The Union Pacific Railroad crosses I-25 north of the Wolfensberger Road/I-25 interchange and passes through downtown Castle Rock. The Burlington Northern Santa Fe Railroad maintains its right-of-way on the west side of I-25.

This rail corridor has historically carried very high train traffic. In addition, the long-range forecast for these rail lines is to remain a major freight corridor. Therefore, the construction of roadways across the rail corridor will remain both a safety concern and a cost factor.

The Parks, Trails, and Open Space Comprehensive Master Plan (1998) identifies an extensive network of regional and local trails also shown in Figure 4. This system allows for a variety of bike, pedestrian, and equestrian uses. Wherever the trails system crosses or coincides with the county roadway network, special provisions should be made to minimize the potential for crossing conflicts and hazardous operations.

FORECASTS

III. FORECASTS

A. Socio-Economic Characteristics

County & Regional Statistical Area Forecasts

Demographic data sets, including household and employment estimates and forecasts associated with a system of Transportation Analysis Zones (TAZs), form the basis for travel demand forecasting.

DRCOG's regional demographic forecasting process begins at the metropolitan and county level, then proceeds to forecast growth at the level of Regional Statistical Areas (RSA's). Figure 5 shows the five RSA's that are within Douglas County. The Douglas County Community Development Department developed Year 2020 forecasts of households and employment in the County and its RSA's. These forecasts are consistent with County forecasts that are contained in the *Douglas County Comprehensive Master Plan* that was adopted by the County in 2000 and with forecasts that have been developed by the Towns of Parker and Castle Rock for their planning areas.

Table 1 and Table 2 provide a comparison of DRCOG and Douglas County's year 2020 forecasts of households and employment. Table 1 shows Douglas County's forecast of more than 146,000 households. This represents more than 2.5 times the number of households in the County today. This forecast is approximately 22% higher than DRCOG's 2020 forecast for the County.

Table 2 shows the employment forecasts that have been prepared by Douglas County after an extensive analysis of both high and low growth potentials. The forecast of nearly 145,000 employees in 2020 represents 2.7 times the County's current employment level. DRCOG's employment forecast of 113,000 employees is, by comparison, 2.1 times the current employment level.

Table 1
County and RSA Household Forecast Comparison

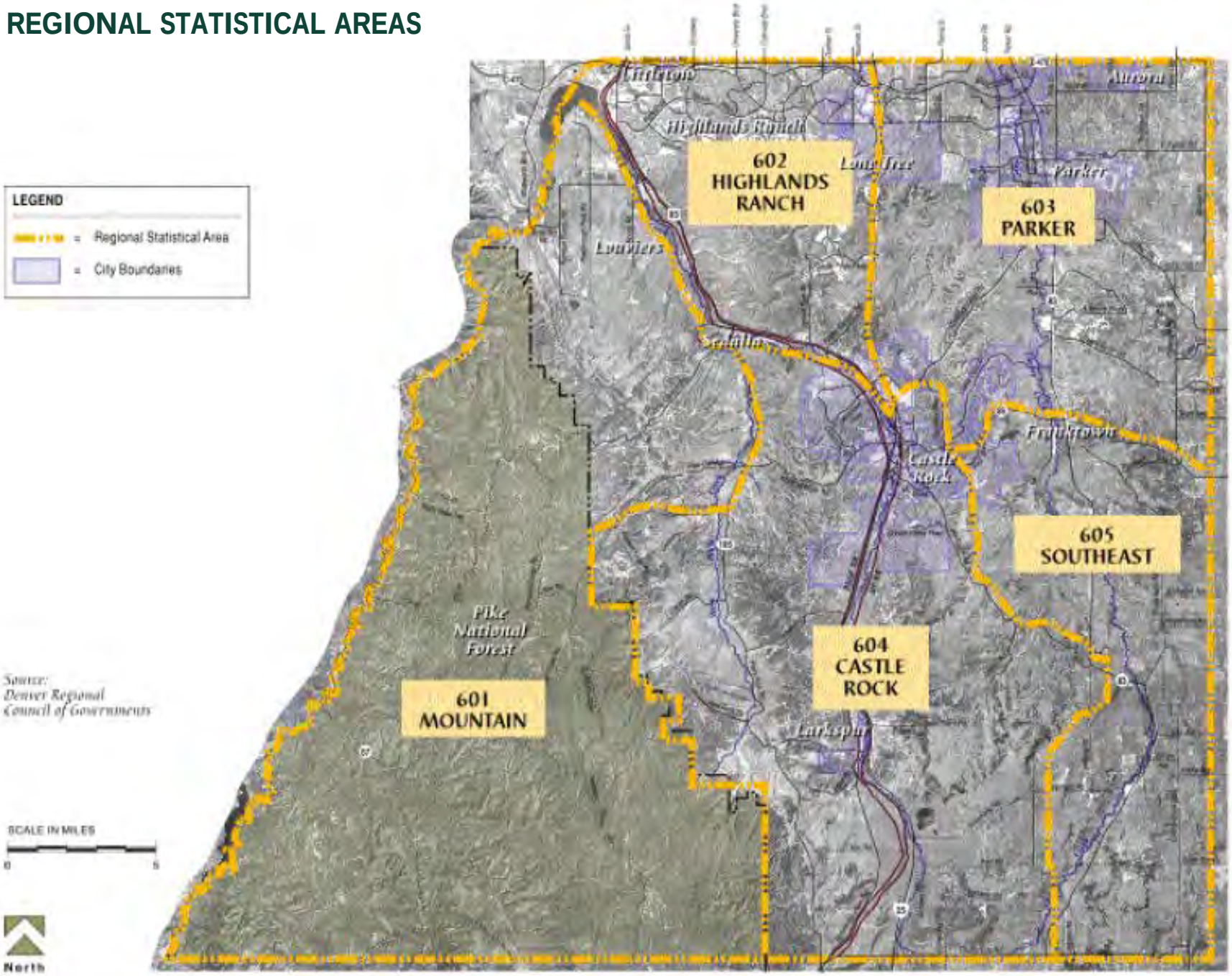
Regional Statistical Area (RSA)	2001 Estimate	DRCOG 2020 Forecast	Douglas County 2020 Forecast
601 - Mountains	2,700	4,200	5,800
602 - Highlands Ranch	28,300	48,700	55,600
603 - Parker Area	15,400	38,500	48,200
604 - Castle Rock Area	8,300	24,200	27,400
605 - Southeast	2,200	4,300	9,100
Douglas County Total	**56,900**	**119,900**	**146,100**

Table 2
County and RSA Employment Forecast Comparison

Regional Statistical Area (RSA)	2001 Estimate	DRCOG 2020 Forecast	Douglas County 2020 Forecasts
601 - Mountains	1,200	1,500	3,000
602 – Highlands Ranch	20,900	43,500	53,900
603 - Parker	19,900	45,000	64,100
604 – Castle Rock	11,000	22,000	22,100
605 - Southeast	900	1,000	1,500
Douglas County Total	**54,000**	**113,000**	**144,600**

Figure 5

REGIONAL STATISTICAL AREAS



Transportation Analysis Zone Forecasts

The Transportation Analysis Zone (TAZ), similar to a census tract, is a defined geographic area within which various data and travel demand information is summarized. The Transportation Analysis Zone system that has been established by DRCOG within Douglas County is included in the Appendix. The Douglas County RSA-level forecasts were distributed to TAZs using a three-step process:

- Distribute RSA-level household and employment forecasts to TAZs based on DRCOG's TAZ distribution;
- Substitute Town of Parker's and Castle Rock's recent TAZ-level forecasts for TAZs in the Parker and Castle Rock Planning Areas; and
- Adjust TAZ forecasts for reasonableness based on estimated TAZ capacity.

The travel demand forecasting model forecasts trip generation based on three categories of households, including Low Income, Moderate Income, and High Income, and three categories of employment, including Production (industrial, agricultural, etc.), Retail, and Service (most office employment). Douglas County TAZ forecasts were distributed among these household and employment categories based on DRCOG's distribution. Similarly, DRCOG's household size forecasts were used to develop population forecasts.

TAZ Disaggregation

DRCOG has developed a regional TAZ system (Appendix A Figure A-1) that represents a refinement of the TAZ system that is currently in use for regional modeling and has been described in the previous section. The refined TAZ system (Appendix A Figure A-2) provides additional detail, increasing the number of TAZs in the Denver region from 1530 to more than 2500, and approximately doubling the number of TAZs in Douglas County. DRCOG has not yet adapted its demographic forecasts or its modeling process to this refined TAZ system. However, Douglas County has elected to use the refined TAZ system in its current transportation planning process. Use of this refined TAZ system provides benefits to the County relative to refinement of its traffic forecasting and enhanced ability to coordinate demographic forecasting with DRCOG.

The refined TAZ system for Douglas County is also included in the Appendix. Demographic forecasts with the TAZ system described in the previous section were disaggregated to match the refined TAZ system.

The resulting demographic forecasts associated with the refined TAZ system are included in the Appendix A Table A-1. These data are used as the basis for travel demand forecasting for the *Douglas County Transportation Plan*.

B. Travel Demand Forecasts

Trip Types

Different trip types require differing roadway design elements to serve their speed and trip length characteristics. The three basic types of trips included in the travel forecast model are defined below and illustrated in Figure 6.

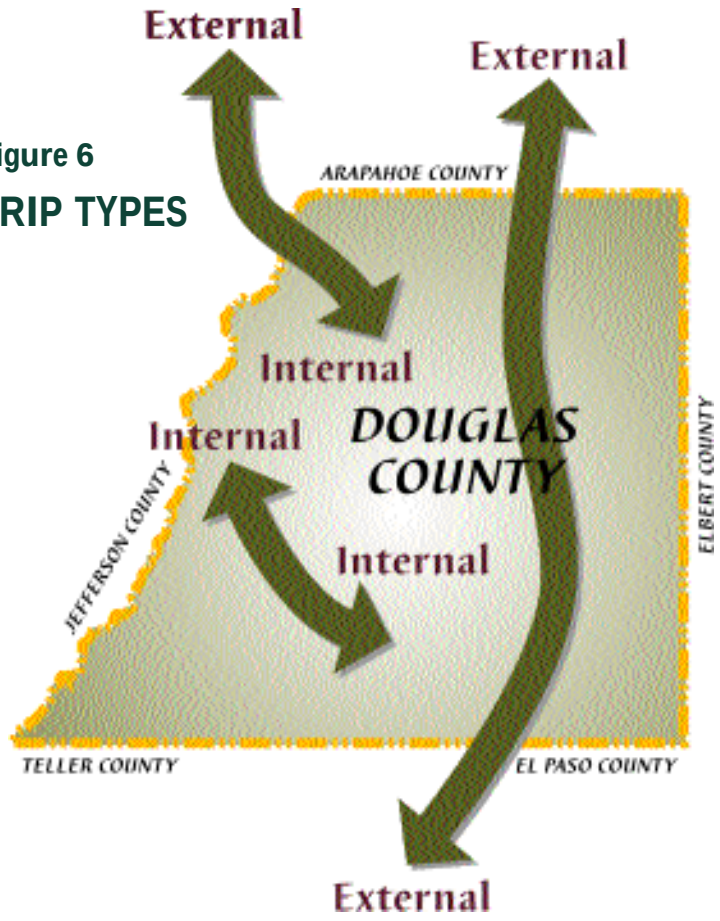


Figure 6

TRIP TYPES

- Internal/Internal - This trip category is comprised of all trips that have both the origin and the destination within Douglas County. As a consequence, these trips generally occur on the lower classifications of roadways with relatively fewer trips occurring on major roadways. In addition, these trips tend to be relatively short compared to other trip types and occur at relatively low average speeds.

- Internal/External - This category of trips has one end (origin or destination) within Douglas County, and the other trip end outside of Douglas County. Thus, these trips typically utilize the entire hierarchy of road classifications to complete their movement. Trip lengths tend to be relatively long and occur at higher average speeds than internal/internal trips.

- External/External - This trip category has neither its origin nor its destination within Douglas County, but passes through the County to complete its movement. These trips generally utilize only the higher roadway classifications and are unique in that they are not generated by any land use activity within the County. These trips occur at the highest average speeds and are generally the longest in length.

Travel Demand Summary

The Denver Regional Council of Governments (DRCOG) year 2020 travel demand model was revised to incorporate the socio-economic forecasts for Douglas County. The model was then used as the basis for forecasting future year traffic volumes for the *2020 Transportation Plan*.

Table 3 summarizes the county-wide travel demand forecasts and compares them to the Denver metropolitan area. Travel demand within Douglas County is projected to more than double over the 20-year planning horizon. In addition, Douglas County's share of the total travel in the metropolitan area is projected to continually increase.

Table 3
Douglas County Travel Demand Forecasts

Year	Douglas County Vehicle Trip Generation	Denver Metro Vehicle Trip Generation	Douglas County % of Region
2001	432,000	7,102,000	6.1%
2010	764,000	8,618,000	8.9%
2020	1,096,000	10,133,000	10.8%

Forecast of 2020 Traffic Volumes

Year 2020 traffic forecasts were prepared for several different roadway plan scenarios during development of the *Douglas County 2020 Transportation Plan*. A final scenario of 2020 daily traffic volume forecasts on the *Douglas County 2020 Transportation Plan* roadway network is provided in the Appendix A. A comparison of these forecasts with existing traffic volumes shows that traffic levels on the County's major arteries, including Interstate 25, State Highway 83, State Highway 85 and C-470, are projected to double over the next 20 years. Also included in the Appendix A is a map showing the number of lanes needed to accommodate the projected traffic volumes (Figure A-4).

Sensitivity Analysis

It should be noted that traffic forecasting is directly related to socio-economic forecasts that are incorporated in the traffic forecasting process. While socio-economic forecasts are prepared with the best available information and prediction techniques, the actual growth that will occur over 20 years is subject to a complex set of economic and social variables. In order to assess the sensitivity of travel demands based upon different socio-economic forecast levels, traffic associated with the lower DRCOG household/employment forecasts and with the high Douglas County employment forecast scenario (presented in Table A-1 in the appendix) were modeled and compared with the 2020 traffic forecasts that are shown in the Appendix. This comparison showed that DRCOG's lower socio-economic forecasts would generate traffic volumes on major roads that are generally 10% to 20% lower than forecasts shown in the Appendix. Douglas County's high employment growth scenario would generate traffic volumes that range from no change to approximately 10% greater than 2020 forecasts provided in the Appendix.

SUBAREA ANALYSES

IV. SUBAREA ANALYSES

A. System Level Evaluation Measures

Operational Evaluation Measures

There are a number of quantitative indices that are used to evaluate vehicular traffic flow along roadways and through intersections. The three most widely used are Level of Service (LOS), the volume to capacity ratio (V/C), and delay.

Level of service (LOS) is a measure of roadway efficiency and is specified on an interval scale consisting of six levels. These levels are graded from an optimal Level of Service A to an unacceptable Level of Service F. Intermediate grades between level A and F designate decreasing roadway efficiency. Within major metropolitan regions, Level of Service A, B, C, and D are considered acceptable, while Level of Service E and F are generally considered unacceptable and typically require some form of corrective action to achieve Level of Service D or better.

The V/C ratio is a measure of capacity sufficiency, which determines whether the roadway or intersection provides sufficient capacity for specific movements. As volume increases on a roadway facility, speed typically decreases, freedom to maneuver decreases due to the presence of more vehicles, and driver comfort decreases due to the need to watch the movement of more vehicles to maintain safe spacing.

Delay is a measure of the quality of service provided to the road user, which includes driver discomfort and frustration, fuel consumption, and lost travel time.

Qualitative Evaluation Measures

Besides the quantitative technical measures of performance, there are several qualitative elements of a transportation circulation system that need to be addressed and include:

- Arterial Continuity;
- Network Redundancy; and
- Hazard Areas.

Arterial Continuity - Because a primary function of the arterial network is to serve the longer trip lengths at a relatively high level of mobility (e.g. I-E and E-E trips), it is highly desirable to provide as much continuity to this element of the network as possible. This means that where topographic and financial considerations permit, it is preferable to extend arterial corridors even in the absence of high traffic volumes. At a minimum, such extensions should be made to interconnect with facilities that have an equal or higher functional classification.

The significance of insufficient “through” corridors is illustrated when compared to similar situations in the metropolitan area. One example is Arapahoe Road, which connects I-25 and Parker Road. Along this corridor there are no parallel and continuous arterials over the 4 to 5 mile separation between I-225 and E-470. As a consequence, traffic volumes on Arapahoe Road exceed even 6 lane arterial capacity, and turning movement volumes at major intersections must be accommodated with triple left turn lanes and associated inefficient traffic signal phasings.

Network Redundancy - Another qualitative element in network evaluation is the level of redundancy provided by the network. It is preferable to have an overall system plan that provides alternative routing between various origin and destination

pairs, rather than a single route that can shutdown a major portion of the system if an incident should occur (e.g., accident, weather). To provide sufficient network redundancy requires that various portions of the system incorporate parallel facilities and multiple interconnections to allow the traveler route choices. The principle of network redundancy applies equally to both the lower functional classifications (collectors and locals) and the higher arterial functional class.

Conflict Areas - Another set of qualitative, system-level evaluation measures reflect the need to improve certain corridors or spot locations for the purpose of eliminating or reducing hazardous characteristics. Such improvement recommendations include both high-and low-volume corridors, as well as corridors exhibiting deficient design characteristics, even if excessive accident rates had not yet occurred. Of particular significance are those areas where incompatible travel modes interface or cross each other. In Douglas County, the interface of the road network with freight rail operations and with the trails system are the most important.

B. Roxborough Subarea

Secondary Access to SH 85

The Roxborough area currently has one regional roadway connection to the east (Titan Road at US 85) and one regional roadway connection to the west (Waterton Road to Wadsworth Boulevard). As Roxborough and its adjacent subarea continues to grow, additional access will be needed to provide redundancy for emergencies and additional capacity.

The 2020 travel demand forecasts were prepared for two network scenarios. One scenario consisted of the existing network which provides two points of ingress/egress to the Roxborough area: 1) via Titan Road at SH 85; and 2) via Waterton Road across the South Platte River into Jefferson County. The other scenario added a hypothetical link between Roxborough Road and SH 85 generally following CR 16 south of Louviers.

The results of this analysis indicate that 59% of the trip generation in Roxborough is oriented to the east and 41% to the west. Approximately one-fifth of the easterly oriented trips (12% - 13%) could be diverted to a secondary access to US 85.

A general examination of the road network serving the Roxborough area indicates that reasonable network redundancy is lacking. If an event should close either Titan Road or Waterton Road, the entire area is isolated from both general access convenience and emergency services.

It is recommended that a new roadway corridor be identified in the *2020 Transportation Plan* connecting Roxborough Road and US 85. The basis for this recommendation is the lack of access options for emergency services (network redundancy) and that sufficient general purpose travel demand will exist to warrant its construction.

Waterton Road (CR 7)

Waterton Road provides the only access to the Roxborough area from the west. As a consequence, traffic volumes have continuously increased to a current level in excess of 6,000 vehicles per day. Primary causes of the existing travel demand are work trips generated in the foothills area destined to Castle Rock and El Paso County who access US 85 via Wadsworth Boulevard and Waterton Road.

The 2020 travel demand forecast is 13,000 vehicles per day. This indicates that this roadway will be operating near capacity. As a consequence, improvement options, including roadway widening and major bridge reconstruction will have to be evaluated. Such an improvement project will be of particular concern in this area due to:

- The proximity of Chatfield State Park and Recreation area;
- Crossing of the South Platte River, particularly at the base of Waterton Canyon; and
- The sensitivity of adjacent environmental features including wetlands and wildlife habitat.

Therefore, it is recommended that the *Douglas County 2020 Transportation Plan* incorporate the following elements:

- Waterton Road is part of a Minor Arterial route consisting of SH 121 (Wadsworth Boulevard), Rampart Range Road, and Titan Road linking C-470 with US 85.
- Future improvements to the roadway system should be evaluated in the context of the entire South Platte River Valley extending from Waterton Canyon to Chatfield Reservoir (Wadsworth-Chatfield environs).

Local Transit Service Expansion

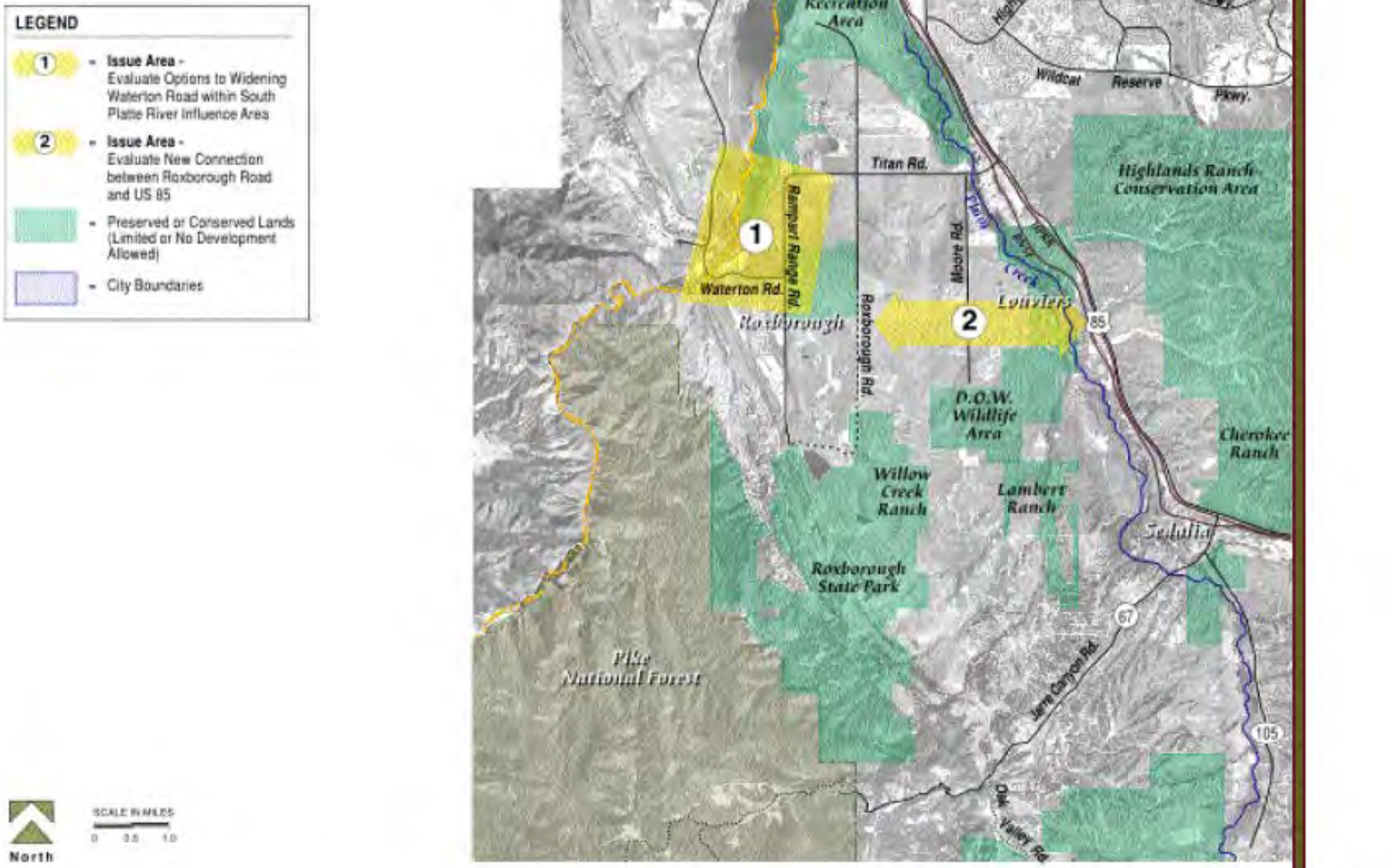
Existing regional rapid transit along the Santa Fe corridor could eventually be extended south into Douglas County as far as Castle Rock. As a part of this expansion, major stations, including major park-n-rides, will occur along US 85. Appropriate locations for future transit stations occur at C-470 with an extension into Highlands Ranch in the vicinity of Lucent Boulevard. Additionally, rapid transit stations should be considered in the vicinity of Titan Road and CR 16 south of Louviers. Feeder bus services (similar to the Ranch Rider) could connect residential areas in Roxborough with these stations.

In the interim, regional express bus operations could serve these future rail transit stations, functioning as a transfer point for local feeder bus services.

It is recommended that these future transit stations be included in the *2020 Transportation Plan* for continued evaluation. The County should initiate measures to preserve the necessary rights-of-way.

Figure 7

ISSUES AND ALTERNATIVES
ROXBOROUGH SUBAREAS



C. C-470/E-470 Corridor Subarea

Travel Demand Across the Corridor

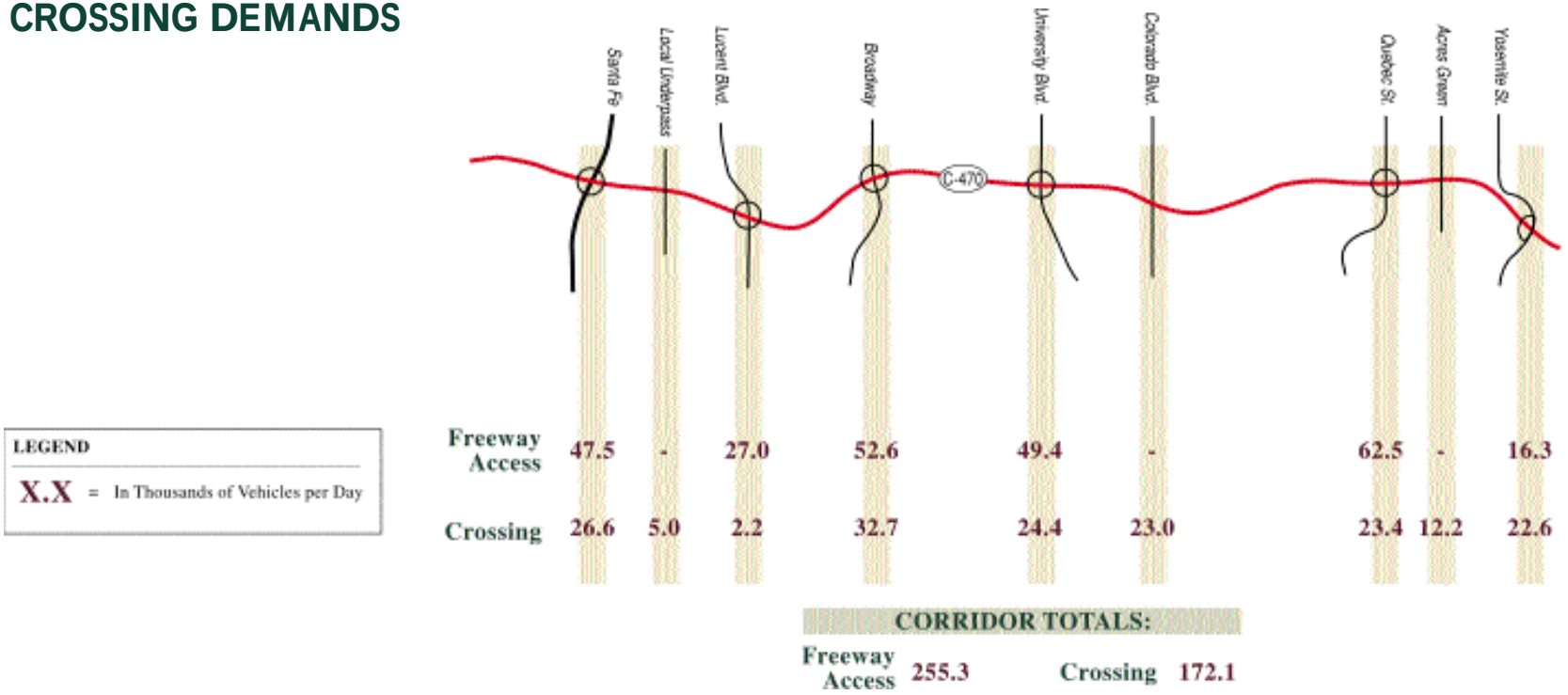
The 2020 travel demand forecasts indicate that the travel demand for crossing C-470 is growing significantly. To the east of I-25, the travel demand across E-470 is partially limited by Centennial Airport and less intensive land uses. In addition, a much sparser north-south arterial network exists east of I-25 as compared to the street network west of I-25.

Figure 8 indicates that, between Santa Fe and Yosemite, the travel demand across C-470 is 40% of the total demand occurring at all interchanges and bridges. This means that 40% of the traffic approaching the freeway wants to cross the freeway and has no particular desire to travel through the interchanges. This group of travelers would use an alternative overpass route if available.

An evaluation of the travel demand benefits of a potential new crossing of C-470 indicates the greatest relief would occur at the first adjacent interchange east of the crossing and that traffic volumes on such an overpass could range from 20,000 to 25,000 vehicles per day. This would be generally true of any overpass located between Lucent Boulevard and Quebec Street.

Figure 8

C-470 ACCESS / CROSSING DEMANDS



Potential locations for additional crossings of C-470 are severely limited due to topography and existing developments. However, if land uses change or redevelopment occurs, Douglas County should consider right-of-way acquisition in the following segments of the C-470 corridor: 1) Santa Fe to Broadway, 2) Broadway to University, and 3) Colorado to Quebec, see Figure 9. However all of these areas would require extensive technical analysis, environmental evaluation, and funding reviews prior to identification of a specific project. It is recommended that feasibility studies be conducted along the C-470 corridor to determine if additional crossings can be implemented cost-effectively.

Travel Demand Accessing the Corridor

The 2020 traffic forecasts also indicate a significant increase in access demands onto the C-470/E-470 corridor, especially from northwest Douglas County toward the east. This is due to the DTC/Inverness/Meridian employment complex.
Ramps at Colorado Boulevard to and from the east would each carry 7,000 to 8,000 vehicles per day (vpd). About 40% of Colorado Boulevard ramp traffic would be drawn from University Boulevard ramps and about 20% would be drawn from Quebec Street ramps.

The traffic reduction of through traffic on University Boulevard north and south of C-470 would be approximately 5% as a result of the Colorado Boulevard ramps. The reduction of volumes on the east ramps at University/C-470 would be significant (about 25%), but traffic on the higher volume west ramps at University/C-470 would not be affected.

It is recommended that a systems and project level feasibility study be initiated in conjunction with CDOT at Colorado Boulevard. Further, it is suggested that this project be combined with the overpass feasibility studies as a unified approach toward addressing freeway access and arterial capacity needs.

Rapid Transit Improvements

Regional rapid transit should be included in the *Douglas County 2020 Transportation Plan* as future extensions of RTD's Santa Fe corridor and I-25 corridor (to be completed in approximately 2007). The provision for the future extension of rapid transit service along the Santa Fe corridor and into Highlands Ranch has been previously discussed relative to the Roxborough subarea.

Rapid transit service along the I-25 corridor will initially terminate at Lincoln Avenue. However, provisions should be made to extend this corridor to Castle Rock and south into El Paso County. Both LRT and Commuter Rail technologies should be analyzed. Rights-of-way should be preserved as opportunities arise and transit-oriented development (TOD) incentives should be evaluated.

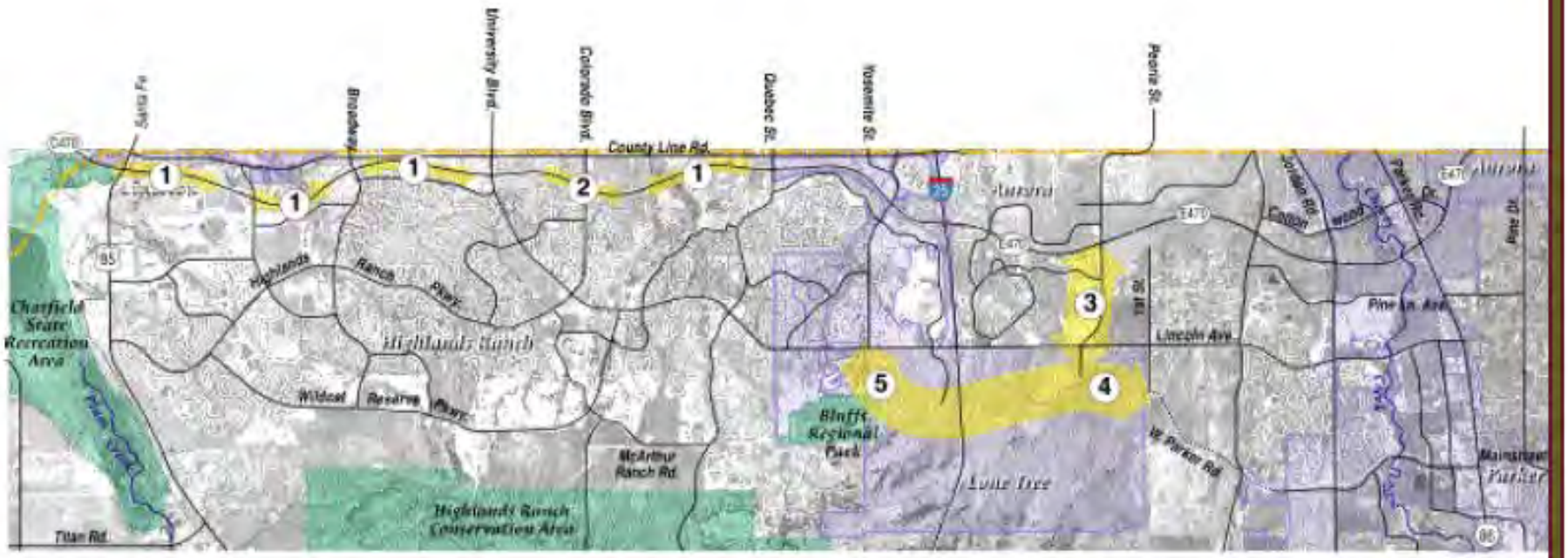
Transit Services

Local transit services should be expanded across much of northern Douglas County. The Highlands Ranch Ranch Rider currently provides local circulation service throughout much of Highlands Ranch. This service should be maintained and expanded incrementally as Highlands Ranch develops.

Similarly local circulation services should be initiated in Lone Tree and in Parker similar to the Ranch Rider or the CATCO circulator in Castle Rock. In addition to serving public buildings and social service providers, these local transit services should also be coordinated with feeder transit services connecting to LRT on I-25 (via Lincoln Avenue) and LRT on I-225 (via Parker Road).

Figure 9

ISSUES AND ALTERNATIVES
C-470 / E-470 CORRIDOR SUBAREA



LEGEND

- (1) - **Issue Area -** Evaluate Location for Future North-South Crossing of C-470
- (2) - **Issue Area -** Add Access Ramps to C-470 at Colorado Boulevard
- (3) - **Issue Area -** Extend Peoria South to W. Parker Road Extended
- (4) - **Issue Area -** Extend W. Parker Road West to I-25
- (5) - **Issue Area -** Extend Yosemite Street South to I-25
- Preserved or Conserved Lands (Limited or No Development Allowed)
- City Boundaries

North

D. Parker Subarea

East-West Capacity Needs

The Town of Parker completed a comprehensive analysis of its Capital Improvement Program in 2001. As a part of this process numerous issues were evaluated and resolved. However, a basic question relating to east-west travel involves a larger area than just the Town of Parker. As a consequence, the Douglas County travel demand forecasts have been used to analyze the characteristics of east-west travel demand occurring south of E-470 and north of SH 86.

The travel demand forecasts summarized in Figure 10 indicate that in the year 2020 there will be approximately one-quarter million (256,300) vehicle trips per day across Cherry Creek in the area between E-470 and SH 86. Detailed analyses of the origins and destinations of these trips indicates that while there is a significant proportion of trips associated with Elbert County, the vast majority of trips originate in Douglas County and are associated with the bulk of the metropolitan area to the north and west.

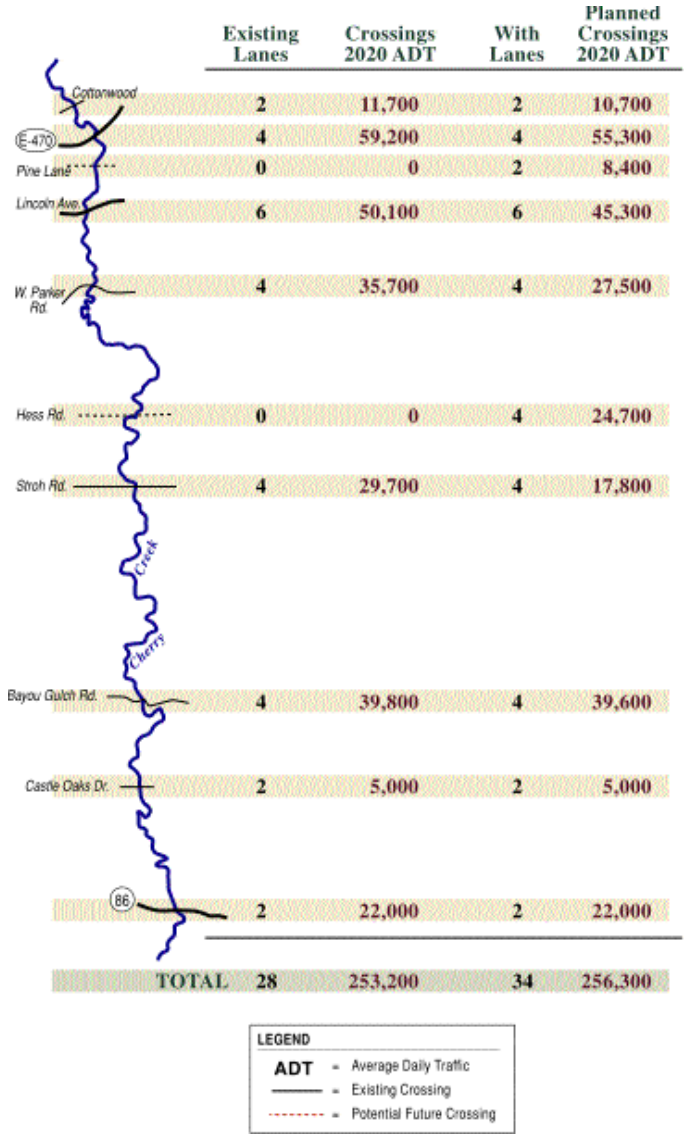
As a consequence of the projected east-west travel demands, it is recommended that West Parker Road be extended west to I-25, that Hess Road be extended west to the future Chambers Road alignment, and that Stroh Road be extended west to I-25.

Chambers-Jordan Corridors

With the exception of Parker Road (SH 83), this portion of Douglas County is currently lacking in facilities which provide adequate north-south travel continuity. Development adjacent to the Jordan Road corridor is projected to be 80% to 90% of its buildout potential by year 2020 and development adjacent to the Chambers Road corridor is projected to be 60% of its buildout by year 2020.

Figure 10

CHERRY CREEK CROSSING DEMAND



	Existing Lanes	Crossings 2020 ADT	With Lanes	Planned Crossings 2020 ADT
Cottonwood	2	11,700	2	10,700
E-470	4	59,200	4	55,300
Pine Lane	0	0	2	8,400
Lincoln Ave.	6	50,100	6	45,300
W. Parker Rd.	4	35,700	4	27,500
Hess Rd.	0	0	4	24,700
Stroh Rd.	4	29,700	4	17,800
Bayou Gulch Rd.	4	39,800	4	39,600
Castle Oaks Dr.	2	5,000	2	5,000
86	2	22,000	2	22,000
TOTAL	28	253,200	34	256,300

In the year 2020, traffic volumes on Jordan Road and Chambers Road south of Stroh Road are projected to range between 6,000 and 10,000 vehicles per day on each of these facilities. Therefore, if these roadways were not provided, Parker Road south of Stroh Road would have to carry an additional 12,000 to 20,000 vehicles per day. The operational impacts would generally be classified as Level of Service E/F and would require additional widening of Parker Road.

Additionally, it is estimated that "out-of-direction" travel would increase to nearly 2-miles per trip, creating an additional 25,000 to 40,000 vehicle miles of travel per day. This is a significant affect upon both air quality and driver convenience.

Northeast Douglas County

The northeast area of Douglas County is rural in character containing low density single family homes and several gravel roadways. The roadway system within this section of the County is oriented primarily in an east-west direction towards Parker Road, which provides the primary access to the regional network for this section of the County. This area is currently lacking in roadways that provide for north-south travel and that tie into the regional arterial network located to the north of Douglas County.

Therefore, a major objective of the system planning in this area is to provide increased accessibility while maintaining the rural character and local road status associated with this part of the County. In order to achieve this objective, it is necessary to provide multiple connections, so that newly generated trips are dispersed without unduly overloading any of the north-south or east-west routes. Of particular concern in this regard is Inspiration Drive which will require widening and significant alignment improvements if adequate relief is not provided.

The necessary multiple connections needed to retain the existing rural character of northeast Douglas County were determined to consist of improving Gartrell Road north to E-470 and both Piney Lake Road and Delbert Road into southern Aurora.

Therefore, it is recommended that the roadway network in northeast Douglas County generally be extended northerly to provide supplemental continuity and connections. These improvements would allow traffic destined to and from the north to utilize these facilities without first having to travel on one of the east-west local facilities to reach Parker Road.

Pine Drive Extension Across E-470

An extension of Pine Drive north, to connect with the proposed Aurora Parkway, is forecast to carry approximately 20,000 vpd. Traffic levels would be reduced on Cottonwood Drive, Gartrell Road, and Parker Road across E-470. Forecasts show that the Pine Drive extension would cause slight reductions to minor Douglas County streets, such as Inspiration Drive and Pine Lane.

Local Transit Service Improvements

The Town of Parker and surrounding areas do not have the same proximity to regional rapid transit as do Roxborough, Highlands Ranch, and Lone Tree. As a consequence, Parker and Franktown will remain more reliant upon regional express bus services and the eventual development of local circulator services, such as the Ranch Rider in Highlands Ranch and the Clean Air Shuttle in Castle Rock.

It is recommended that the *Douglas County 2020 Transportation Plan* designate Parker as a local transit service area. As transit funding for new starts changes over time or demonstration grants become available, such designation would assist the Town in initiating a pilot program. In addition, Parker, Franktown, and the SH 83 corridor should continue to be designated by the RTD as a primary regional express service corridor.

E. Castle Rock Subarea

The Castle Rock subarea is shown in Figure 11. Many of the issues within the subarea have also been addressed by the Town's *Transportation Plan*.

Meadows Access Improvements

Similar to the eastern half of the County, the central and western portion of Douglas County has a very limited number of roadway facilities providing north-south continuity. Interstate 25 and US 85 currently serve as the primary north-south through routes.

Additionally, two major developing areas lack sufficient access capacity. These areas are the Roxborough subarea and the Meadows in Castle Rock. Both areas require improved access capacity, which will provide greater convenience to the user, enhance emergency response options, and reduce out-of-direction travel.

Travel demand forecasts were analyzed and tested in terms of new linkages between the Meadows and north to US 85, west to SH 105, and south to Wolfensberger Road. All combinations of these access improvements were considered. However, the County has decided not to pursue a connection to Wolfensberger. A westerly extension to SH 105 is projected to carry approximately 7,000 vehicles per day, many of which would otherwise use Wolfensberger Road.

The Town of Castle Rock has recently completed a town-wide *Transportation Plan* which incorporates a northerly extension to US 85 and to a new half-diamond interchange at I-25. A potential westerly connection to SH 105 is also included in the *Castle Rock Transportation Plan* as a potential corridor requiring further planning.

Douglas Lane Extension, I-25 to Lake Gulch Road

This connection is forecast to carry approximately 3,000 vpd between I-25 and Lake Gulch Road, with about half representing a reduction on Plum Creek Parkway to the north. This roadway should be implemented in conjunction with an overall development plan in the area.

Regional Rapid Transit Improvements

The current plans for regional rapid transit include the Santa Fe corridor south to Mineral Avenue in Littleton and the I-25 corridor south to Lincoln Avenue. The RTD has not specifically identified a next phase of rapid transit development in either of these corridors. As a consequence, it is recommended that the *Douglas County 2020 Transportation Plan* include three rapid transit expansion concepts.

- The Santa Fe (Highway 85) corridor should be extended south of C-470 to Castle Rock. Appropriate actions to facilitate the eventual implementation of this extension are right-of-way preservation, station location identification, and land use planning coordination.

- Similarly, the I-25 corridor should be extended southerly to Castle Rock and through Douglas County to El Paso County. Again, preservation of rights-of-way, station location identification, and land use planning coordination should be conducted in conjunction with on-going development proposals.

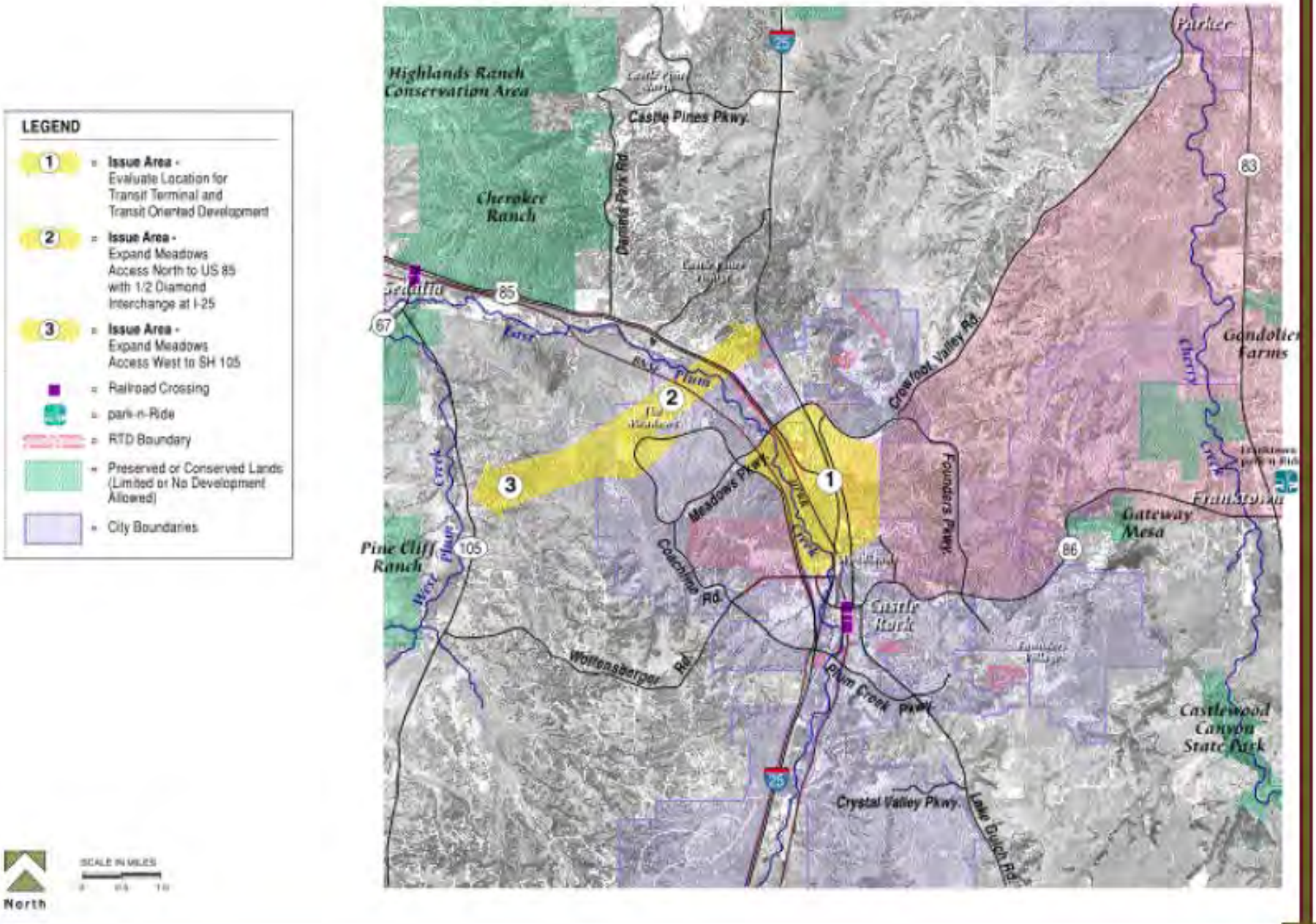
- Major transit-oriented development opportunities should be pursued in the vicinity of the junction of Santa Fe and I-25 and along both transit corridors. Douglas County should coordinate with the Town of Castle Rock, the City of Lone Tree, RTD and other affected parties to pursue current or future opportunities for land acquisition or right-of-way preservation.

Clean Air Transit Company (CATCO) Service Improvements
CATCO completed a transit feasibility study several years ago and has continued to implement a wide variety of management and service improvements. These system enhancements include:

- Level of service improvements in terms of both geographic coverage and frequency of service;
- Consideration of paratransit options including various ride-share programs; and
- Expanding agency coordination activities with Douglas County and the RTD.

Figure 11

ISSUES AND ALTERNATIVES
CASTLE ROCK SUBAREA



2020 TRANSPORTATION PLAN

V. 2020 TRANSPORTATION PLAN

A. The Vision

The Vision for the *2020 Transportation Plan* is to complement the *Comprehensive Master Plan* and to provide Douglas County with an effective transportation infrastructure that is safe, efficient and responsible to County citizens.

The *2020 Transportation Plan* is organized and presented in Figure 12 relative to its three major elements:

- Transit Element
- Roadway Element
- Management Element

Supportive details and documentation is also contained in the Appendix.

B. Transit Element

The 2020 transit element of the *Douglas County Transportation Plan* reflects the current plans for the greater Denver metropolitan area along with additional services directly applicable to the needs of Douglas County. The basic features of the 2020 transit service element include expanded bus services and corridor preservation actions for regional rapid transit.

Regional Rapid Transit Services

The *Douglas County 2020 Transportation Plan* identifies both US 85 and I-25 as future rapid transit corridors. These corridors are logical extensions of the RTD light rail system with both corridors capable of providing rapid transit service between the Denver metropolitan area and Castle Rock. South from Castle Rock to El Paso County, a single rapid transit corridor should be preserved along I-25.

While the technology currently being used by the RTD is light rail in both the US 85 and I-25 corridors, the potential for commuter rail should be evaluated for application to these corridors especially in terms of the longer term potential to connect the Denver metropolitan area with the Colorado Springs metropolitan area. Such a system would be similar to the CalTrain commuter rail system connecting San Francisco and San Jose.

Local Transit Services

It is anticipated that in the next 20 years, the basic level of transit service will need to be expanded to cover a broader geographic area. These service expansions are anticipated to include the mostly residential areas of Roxborough, Highlands Ranch, Lone Tree, Parker, and Castle Rock. Both Highlands Ranch Parkway and Lincoln Avenue have the potential to become major transit service corridors, especially for express bus services.

Figure 12

2020 TRANSPORTATION PLAN

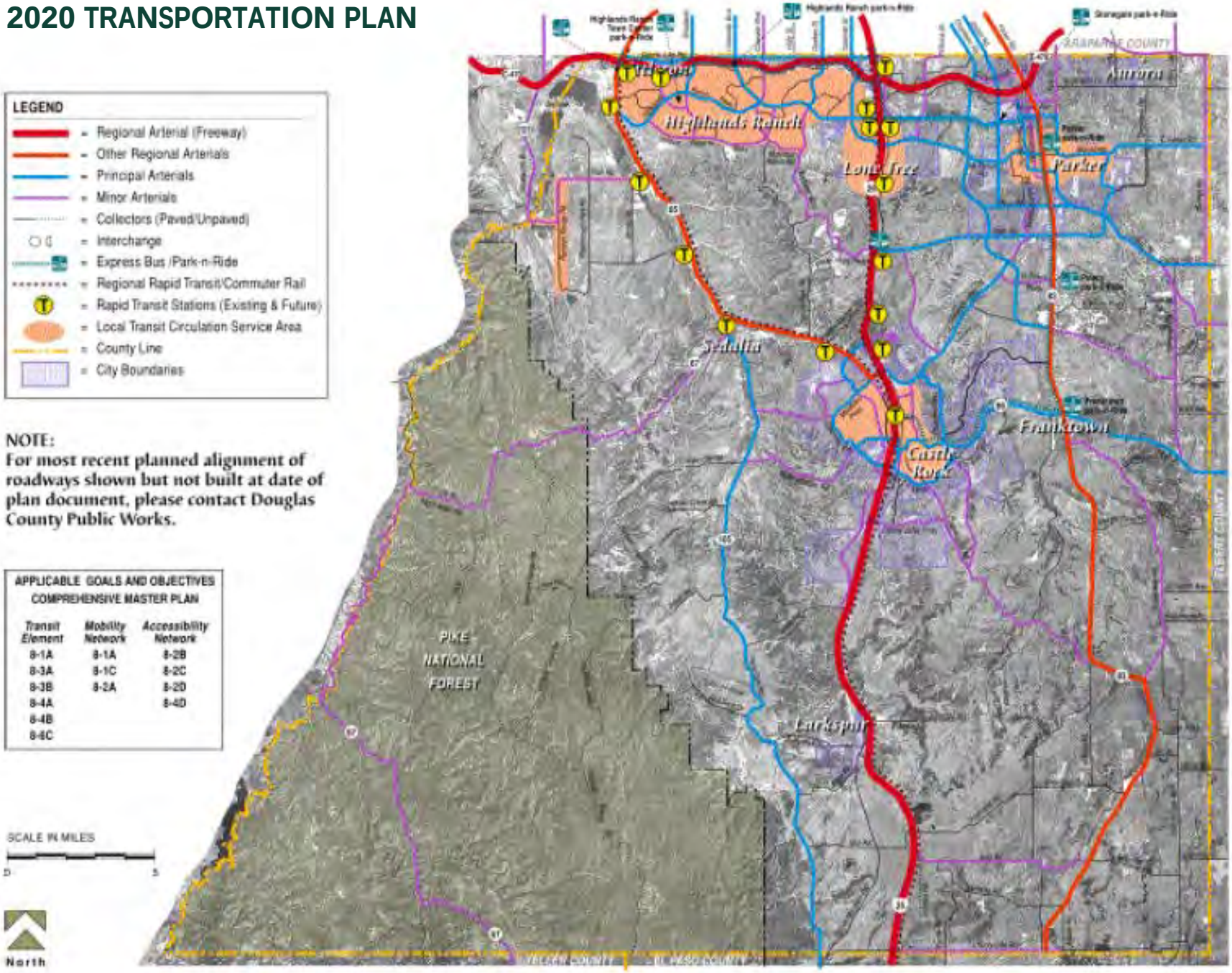


Figure 12 schematically depicts the concept plan for expanded transit services into the study area. Existing bus routes operating on Broadway, University, and Parker Road can be extended and supplemented by new services.

Extension of transit service and transit facilities to the study area should include consideration of the following general principles:

- Development of transit supportive land use patterns such as residential and employment mixed-uses;
- Establishing new bus routes to serve major activity centers within the study area; and
- Developing new park-n-Ride facilities to serve the study area.

All of these future service areas can also be served by potential new regional express services operating in the C-470/E-470 corridor. These services might initially consist of express routes and Sky Ride (service to Denver International Airport).

C. Roadway Element

Classification Criteria

There are several types of roadway criteria classification systems, of which the most important for community network planning is the functional classification. Functional classification is a classification system distinct from classification by design type or classification by jurisdiction. Roadway function establishes the type of transportation service provided, while roadway design specifies the physical requirements needed to carry the forecasted traffic volume. Jurisdictional classification, on the other hand, identifies agency responsibilities for construction, maintenance, and funding.

The primary function of a roadway is to provide either a high level of mobility or to provide a high level of accessibility. In addition, there are intermediate roadway facilities whose function is to provide a transition between mobility and accessibility. It should be noted that the primary determinants of functional classification are length of trip, average travel speed, frequency of access points, and continuity. Traffic volumes, while often higher on mobility facilities, do not, by themselves, determine roadway function. It is possible, and frequently the case, that accessibility roadways carry relatively high traffic volumes (e.g., access to major office parks, regional shopping centers) and require multiple traffic lanes to accommodate the demand. By the same token, a mobility roadway serving relatively long trips at higher speeds between low density land uses may require only two traffic lanes to accommodate the demand.

To further clarify the distinctions between the mobility function and the accessibility function, Table 4 presents general characteristics for five types of roadway function.

Table 4
Functional Classification Criteria Characteristics

Characteristics	Functional Priority				
	Regional Arterials Mobility Only	**Principal Arterials** Mobility Primary Accessibility Secondary	**Minor Arterials** Mobility Primary Accessibility Secondary	**Collectors** Accessibility Primary Mobility Secondary	**Locals** Accessibility Only
Service Performed	Traffic movement, highest speed, no direct land access.	Traffic movement, high speed, minimal land access.	Traffic movement, relatively high speed, minimal land access.	More frequent land access, relatively low speeds.	Direct land access, lowest speeds.
Typical Trip Lengths	Interstate and between major regions of metro area.	Between major regions of metro area.	Within major regions of metro area and between communities.	Within communities.	Within neighborhoods and business centers.
Continuity	Totally interconnected and continuous over an entire metro area.	Interconnected and continuous over major portions of metro area.	Interconnected and continuous within major regions of metro area.	Interconnected and continuous within communities.	Not applicable
Access Type and Spacing	Interchanges at 1 to 1-1/2 mile spacing and at-grade signalized intersections at 1/2 to 1 mile spacing. No private access.	At-grade signalized intersections at 1/2 mile spacing. Private access restricted.	At-grade signalized intersections at 1/4 to 1/2 mile spacing. Private access usually restricted.	Signalized and stop controlled intersections at 1/8 mile spacing. Some restrictions on private access. Consideration of alternative intersection control measures on a site specific basis.	Stop signed controlled or uncontrolled intersections. Unrestricted private access. Consideration of alternative intersection control measures on a site specific basis.
Roadway Spacing	2 - 3 Miles	1 - 2 Miles	1/2 - 1 Mile	1/4 - 1/2 Mile	As Needed
% System Mileage	5 - 10%	5 - 10%	5 - 20%	5 - 10%	65 - 80%
% Vehicle Miles of Travel Carried	40 - 55%	10-15%	20 - 35%	5 - 10%	15 - 30%

Regional Arterial Network

The *Douglas County 2020 Transportation Plan* includes four regional arterials which are consistent with the intent of the Denver Regional Council of Governments *Regional Transportation Plan*.

These facilities are also shown in Figure 12 and include:

- C-470/E-470 – This freeway is the only east-west regional roadway in Douglas County. Jurisdiction is split between the Colorado Department of Transportation which controls C-470 and the E-470 Toll Authority which operates and maintains E-470. The entire corridor will require a 6-lane cross-section to accommodate future travel demands.

- I-25 – This Federal-Aid Interstate freeway is proposed to evolve into a major multi-modal corridor. To achieve its alternate function the roadway will need to be widened to 8-lanes north of Castle Rock and 6-lanes through Castle Rock. Rights-of-way should be obtained to incorporate a rapid transit service such as commuter rail and to provide adequate space for transit access. These transit access points should include both typical "change-of-mode" stations as well as potential transit-oriented development (TODs).

- US 85 (Santa Fe) – This facility is also intended to become a multi-modal corridor. The roadway needs to be a minimum of 4-lanes with the segment north of Highlands Ranch Parkway needing to be 6 lanes.

  Rights-of-way should be obtained for both roadway and transit purposes. Transit access in this corridor should consider TOD's in Highlands Ranch and at the junction of the I-25 and US 85 rapid transit lines.

- SH 83 (Parker Road) – This roadway exhibits typical radial-corridor characteristics with future traffic volumes in excess of 60,000 vehicles per day at E-470, approximately 30,000 vehicles per day north of Franktown, and less than 10,000 vehicles per day in southern Douglas County. These traffic volumes indicate that SH 83 be 6-lanes (plus auxiliary lanes) north of Bayou Gulch Road, and 4-lanes to the south.

  SH 83 also functions as a redundant corridor to I-25 in the case of short-term emergencies or longer-term detours.

Principal Arterial Network

The principal arterial network included in the *Douglas County 2020 Transportation Plan* includes several different facilities serving six travel sheds or "sub" corridors.

These roadways are shown in Figure 12 and include:

- County Line Road serving east-west travel demand north of C-470 between US 85 and I-25.

- Highlands Ranch Parkway/Lincoln Avenue/Mainstreet serving east-west travel demand south of C-470/E-470 across virtually all of Douglas County. This travel shed also includes portions of Broadway, University, Quebec, and Yosemite/West Parker Road. This is the only non-freeway corridor connecting Santa Fe and Parker Road south of the Hampden/Havana corridor approximately seven miles to the north.

- Stroh Road/Hess Road/Hilltop Road serving east-west travel demand between I-25 and the east County limits.

- SH 86/Founders Parkway serving east-west travel to Castle Rock with north-south connections to US 85 and I-25.

- Chambers Road providing additional north-south capacity as a reliever to Parker Road and as an alternative access to E-470.

- SH 105 providing historical continuity between Perry Park, Larkspur, and El Paso County and the Denver metropolitan area.

Detailed Functional Networks

Beyond the regional and principal arterial networks there is a complete support network of minor arterials, collectors, and local streets. More detailed line diagrams have been prepared for four areas where the total network is too dense to be clearly defined in Figure 12. These line diagrams document the functional classification of the roadway and number of lanes needed to accommodate the travel demand.

Typical cross sections for each functional classification category are shown in the Appendix. These figures are consistent with current Douglas County standards.

Right-of-Way Preservation Actions

The long-range transportation concept plan for the Denver metropolitan area has identified various corridors for future transit improvements. Until specific projects are identified and funding becomes available it is recommended that corridor preservation actions be taken in the short-term to ensure that future options are not precluded. These preservation actions may include a combination of regulatory measures or the purchase of various properties as they may become available.

D. Management Element

Four general categories of travel demand and system management are recommended for consideration in Douglas County:

- Land Use
- Transit Corridor Preservation
- Ridesharing
- Conflict Reduction Measures

Land Use

The first category consists of the continued review and regulation of land uses. This process can typically affect such items as limiting the magnitude of development, encouraging different combinations of development in mixed use projects, and implementing alternative travel mode facilities, such as bikeways and pedestrian paths within major development projects.

Specifically within Douglas County, the limited capacity available to cross major travel barriers, such as I-25, Cherry Creek, and others, means that certain areas are severely limited in terms of development potential unless major capacity improvements are implemented. This means that major transportation improvements and their related costs may not prove feasible unless the scale of the development is matched to the ability to provide appropriate accessibility. Design elements can be combined to reduce the need for travel such as:

- Mixing land uses so they can interact more closely;
- Creating a highly interconnected street network;
- Designing streets to accommodate pedestrians and bicyclists, as well as automobiles;
- Locating work and shopping opportunities close to home, which encourages the use of alternative modes of transportation (walking, bicycling, and transit) for short distance trips.

Transit Corridor Preservation

A second area of activity is identified as transit corridor preservation. While Douglas County will likely not attract major regional transit services for several years, the County should review major development projects and major public works projects for the potential to preserve corridors and right-of-way for future mass transit use whether it be for regional rapid transit, local circulator transit services, or bus access facilities.

In order to maximize the effectiveness of transit facilities and transit service in general, Douglas County and its towns and cities must work closely with RTD and other local circulator transit services to make the use of transit more attractive and competitive with automobile travel. Within the study area, US 85 and I-25 have been designated as multi-modal corridors. Initial candidate station locations have been identified at Titan Road, Louviers, Sedalia, Surrey Ridge, Castle Pines Parkway, and Founders. A major transit-oriented development and station has been identified in Castle Rock.

Towns and cities in Douglas County exhibit travel patterns that are ill-suited to take full advantage of traditional fixed route services. Therefore, transit services must be more flexible, demand-responsive, and suitable to serving dispersed origins and destinations. Transit service could involve smaller buses and vans providing circulation services between and within communities. These smaller, circulating vehicles could also provide connection to routes serving other suburbs or downtown Denver at timed-transfer and transit centers.

The primary areas of realistic transit enhancements (such as bus staging areas and transfer points) occur in the northern portions of the County along Santa Fe, I-25, Parker Road, and C-470/E-470.

Ridesharing

The third general area of travel demand management involves participating in a variety of ride share incentives. These incentives can range from general promotional activities to actual zoning incentives and development credits for projects that provide a real and significant ride share component to their project. For example, formalized vanpool or carpool programs or the institution of variable work hours could provide a basis for a variety of development credits.

Another option for commuter service would be to establish a carpool or vanpool program for Castle Rock residents. Carpool and vanpool services could be developed using resources currently provided by the new Southeast Transportation Management Organization (SETMO) and/or DRCOG. Both of these agencies have programs to identify and implement options to single-occupancy vehicle travel. SETMO focuses on the southeast corridor of the Denver metro area, primarily working with employers along I-25, between I-225 and Lincoln Avenue. DRCOG operates a carpool locator service and a vanpool program for the whole metro area.

Carpooling or vanpooling could be established between Castle Rock and the Meridian Office Park, the Arapahoe park-n-Ride, the Denver Tech Center, and/or downtown Denver. Such programs could be established based on a single employer or on a group of employers located within a defined geographic area. For the Castle Rock area, several scenarios exist, all of which would involve either DRCOG or the newly created SETMO. Under one scenario, DRCOG and SETMO would assist in the creation of carpools or vanpools from Castle Rock to various locations throughout Denver. Vanpools could be created based on employment of Castle Rock residents at the Meridian Office Park, the Denver Tech Center, downtown Denver, or other locations including Colorado Springs.

Through a similar process, employers in Castle Rock could work together to identify commuter patterns for their employees. Carpools or vanpools could be established from various locations within the southeast metro area to Castle Rock. For example, one or more employers in Castle Rock could establish a vanpool operating to and from the Arapahoe park-n-Ride lot on weekdays. Employees traveling to one or more employment sites in Castle Rock could meet at the Arapahoe park-n-Ride lot (or an another location) and ride together to and from Castle Rock each weekday.

There are a variety of other, similar types of activities that may be considered by the County over time. New concepts and feasibility studies are being conducted both nationally and within Colorado to develop a whole range of travel demand management techniques, which can be applied in varying degrees to suit the unique characteristics of local jurisdictions, such as Douglas County.

Conflict Reduction Measures

The roadway network plan identifies those locations where the arterial network crosses railroad tracks and major trails.

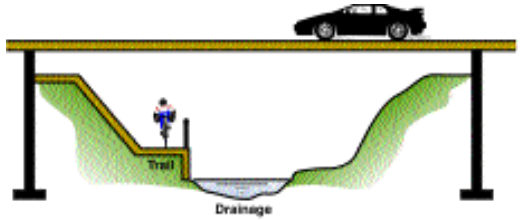
Guidelines for grade separating arterial roadways from railroad tracks have historically been related to an "exposure factor." This factor can be measured in different ways but is typically the product of daily train movements multiplied by daily traffic volumes. The *National Transportation Planning Study, Manual B*, February 1970, USDOT suggests that when the exposure factor of an at-grade railroad crossing exceeds a value of 75,000 (train volume times auto volume), grade separations should be considered.

Within the study area, this guideline would suggest that projected daily traffic volumes in the range of 5,000 to 10,000 vehicles per day would begin to warrant grade separations.

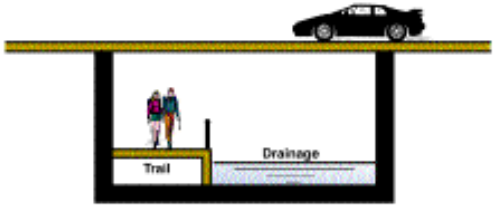
Grade separations should also be considered for all trails that cross arterials. When appropriate, a grade-separated trail and drainageway could utilize the typical sections shown in Figure 13. Both of these typical sections can be made equestrian compliant if a 10-foot concrete trail and a 4-to 6-foot soft surface equestrian trail are separated by a 2-foot buffer and are 12 feet high.

Figure 13

TRAIL SYSTEM GRADE SEPARATION



TYPICAL BRIDGE SECTION



TYPICAL BOX CULVERT SECTION

E. Summary of Recommendations

The *2020 Transportation Plan* includes a broad range of future actions and potential decisions which will require on-going evaluation and monitoring before a specific policy is adopted or a distinct project is constructed. However, within the *2020 Transportation Plan*, the following recommendations have been summarized.

Summary of Transit Recommendations

The *2020 Transportation Plan* includes the following recommendations which are illustrated in Figure 14.

- Pursue commuter rail as a regional rapid transit option along the I-25 and US 85 corridors between the Denver and Colorado Springs metropolitan areas.
- Identify potential rapid transit station locations and take actions to preserve their eventual acquisition including support of transit-oriented development concepts.
- Maintain and expand regional express bus services and park-n-Ride development in Highlands Ranch, along the I-25 corridor, in Parker, and in Franktown.
- Expand local transit circulation services that now operate in Castle Rock and Highlands Ranch into Parker and Lone Tree.

Summary of Roadway Recommendations

In addition to adopting the functional classification system and network, the *2020 Transportation Plan* identifies or implies that a broad range of improvements be programmed, funded, and implemented over the next 20 years.

These additions and upgrades to the roadway network are shown in Figure 15 and consist of the following items:

- Potential new roadways which typically have to proceed through detailed route location studies, environmental clearances, and funding before implementation can occur.
- Upgrading of existing roadways which typically involves additional traffic lanes but which can also involve safety improvements to the horizontal and vertical alignment of the roadway.
- Surface improvements to provide safer traffic operations and to reduce adverse environmental effects, usually dust.

Summary of Management Recommendations

The management element of the *2020 Transportation Plan* emphasizes the following areas:

- Pursue land use and development (e.g. transit-oriented development) concepts which encourage ridesharing.
- Preserve potential transit rights-of-way through appropriate regulatory control or purchase.
- Participate in ridesharing and transit programs at both the regional and local level.
- Incorporate conflict reduction projects into the 5-Year Capital Improvement Program (CIP) as an on-going transportation system improvement strategy where possible.

Figure 14

SUMMARY OF TRANSIT RECOMMENDATIONS

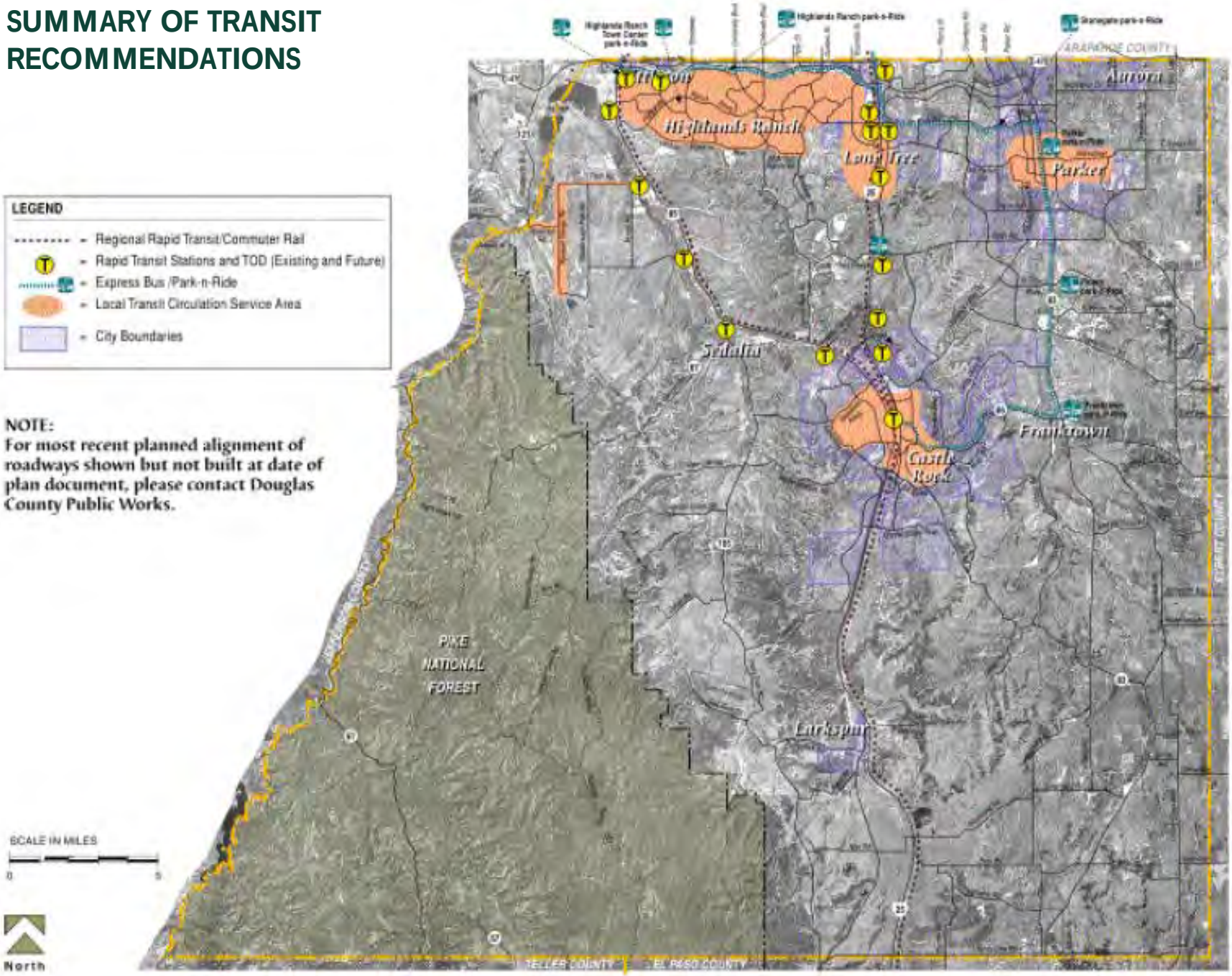
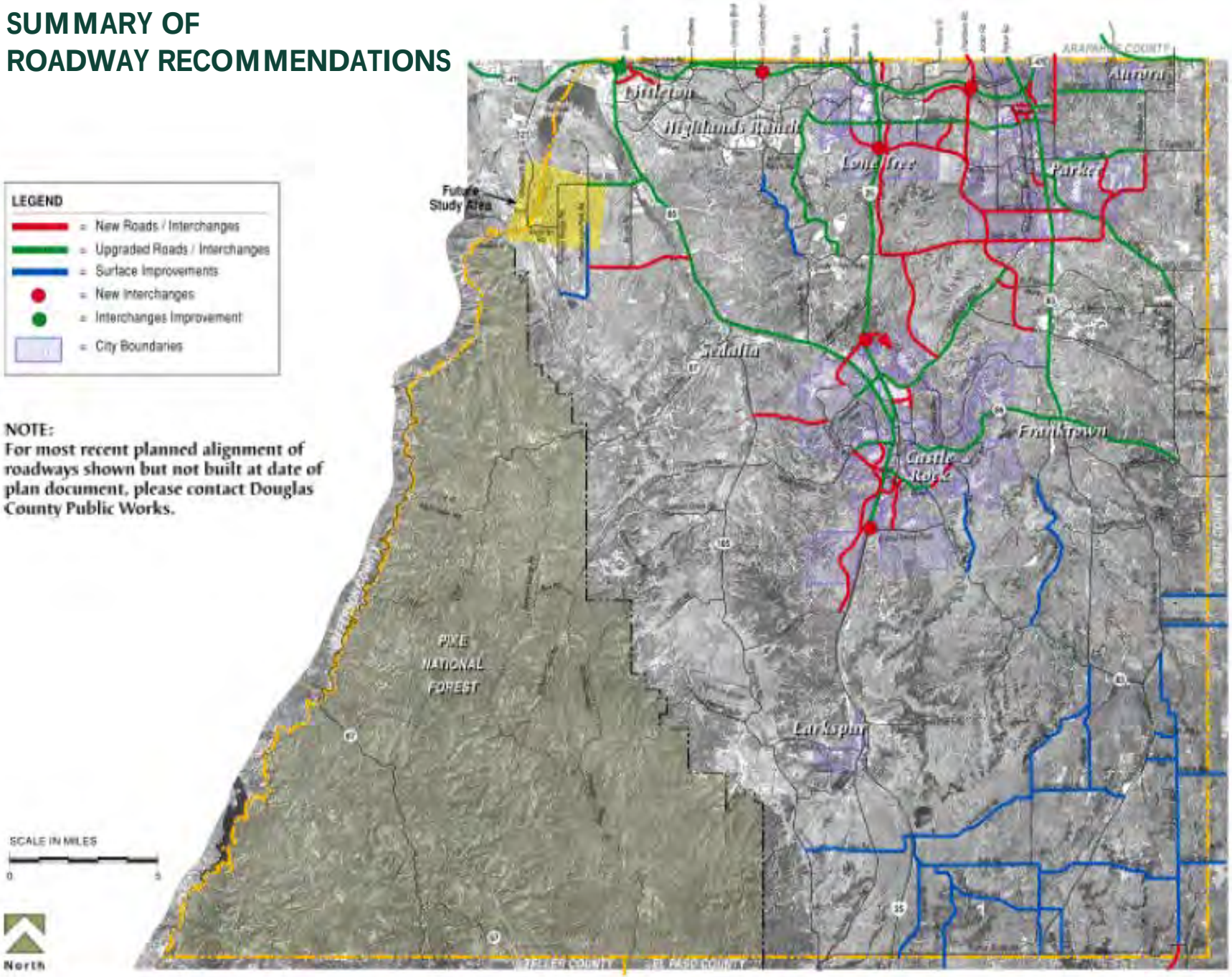


Figure 15

SUMMARY OF ROADWAY RECOMMENDATIONS



APPENDICES

APPENDIX A

TRAVEL DEMAND MODEL

Figure A-1

2020 DRCOG TRANSPORTATION ANALYSIS ZONE SYSTEM

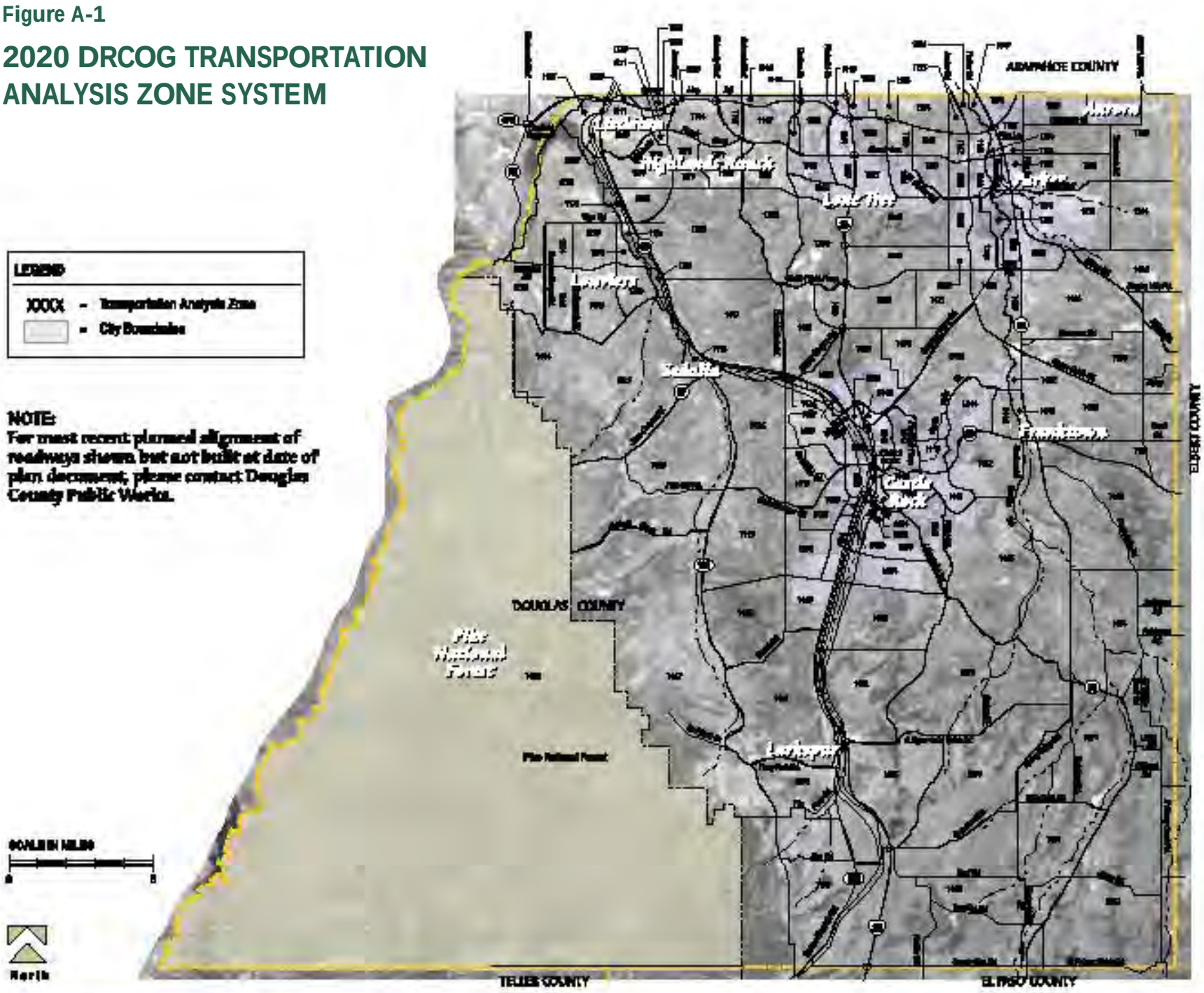


Figure A-2

REFINED TRANSPORTATION ANALYSIS ZONE SYSTEM

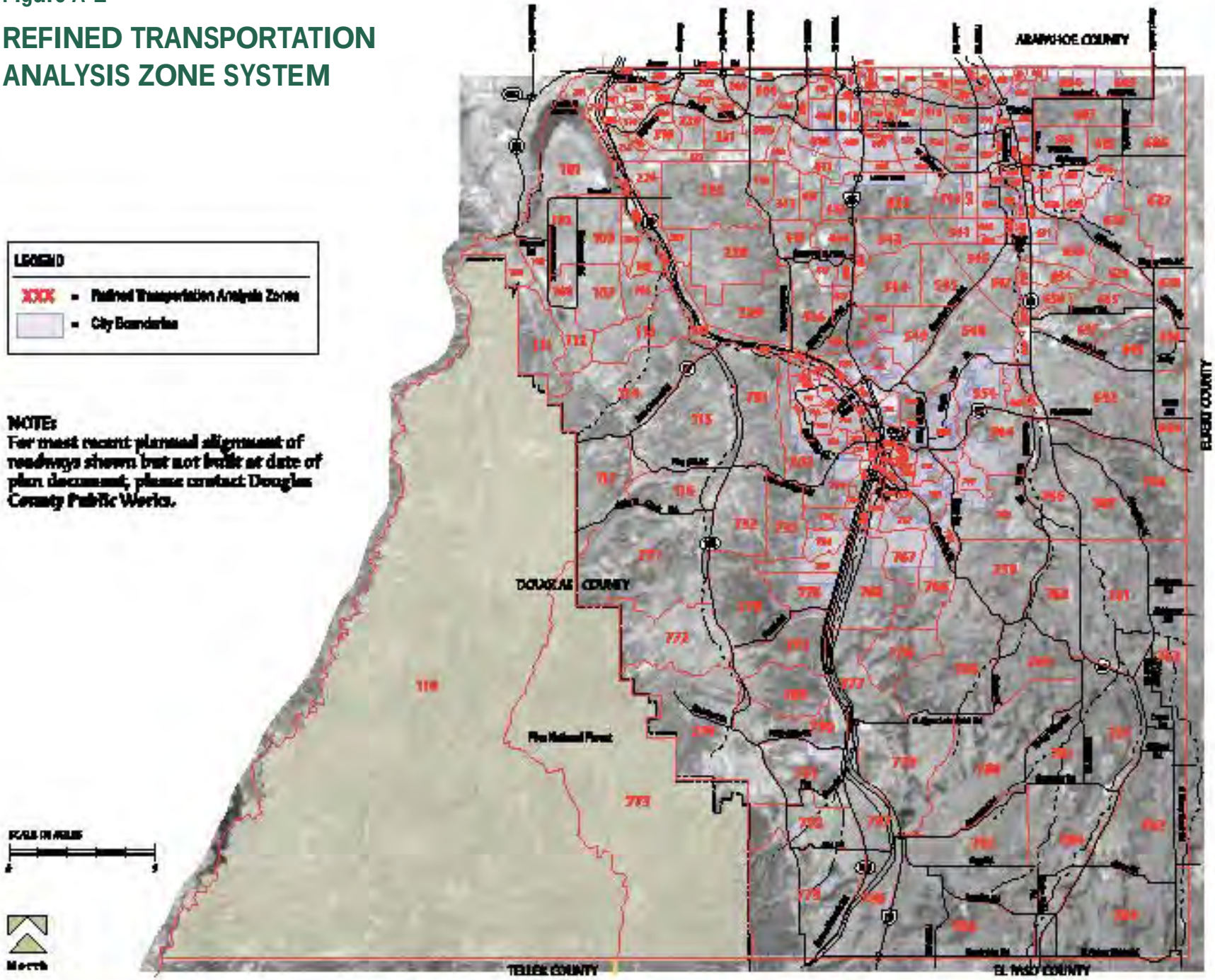


Figure A-3

YEAR 2020 TRAFFIC FORECASTS

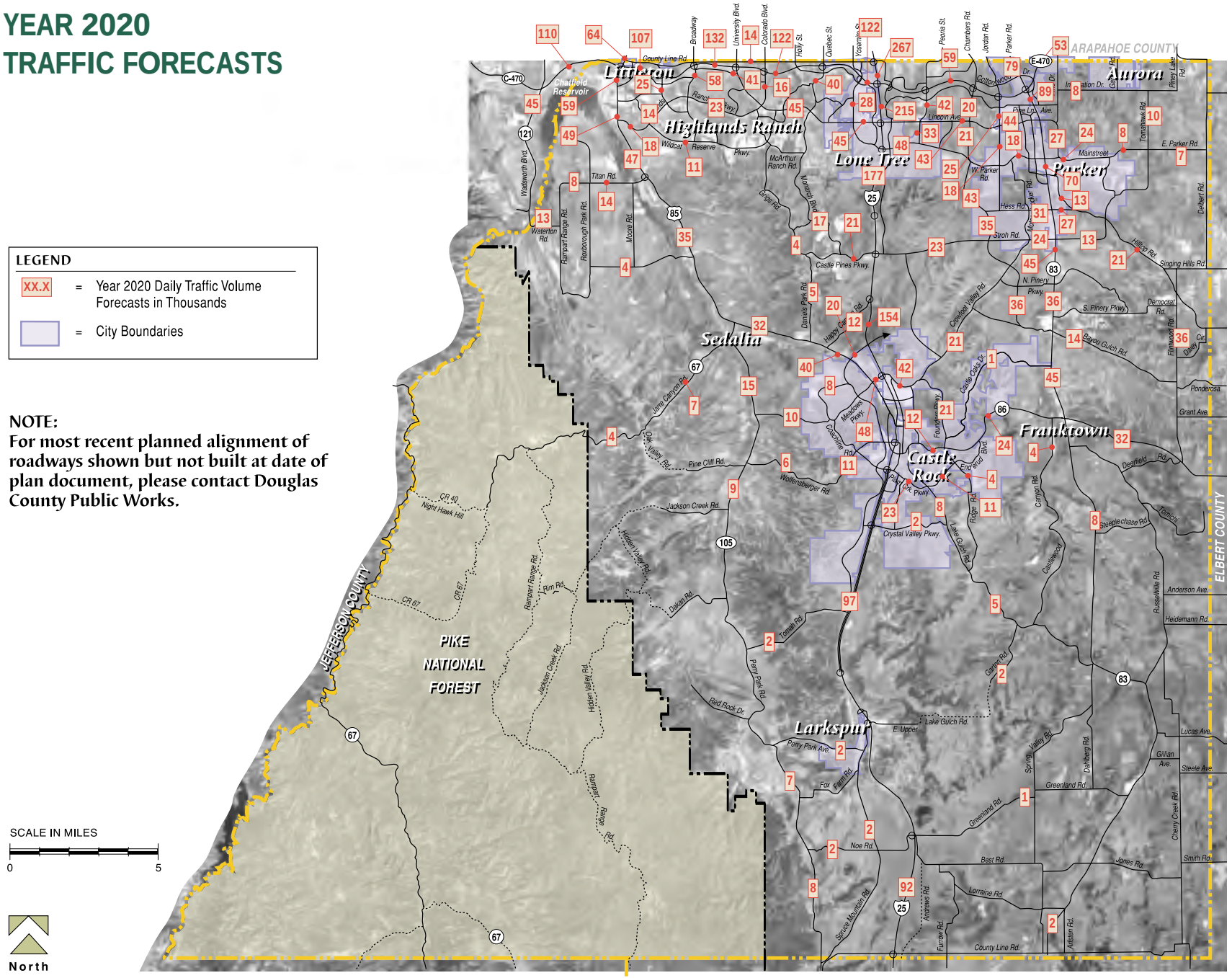
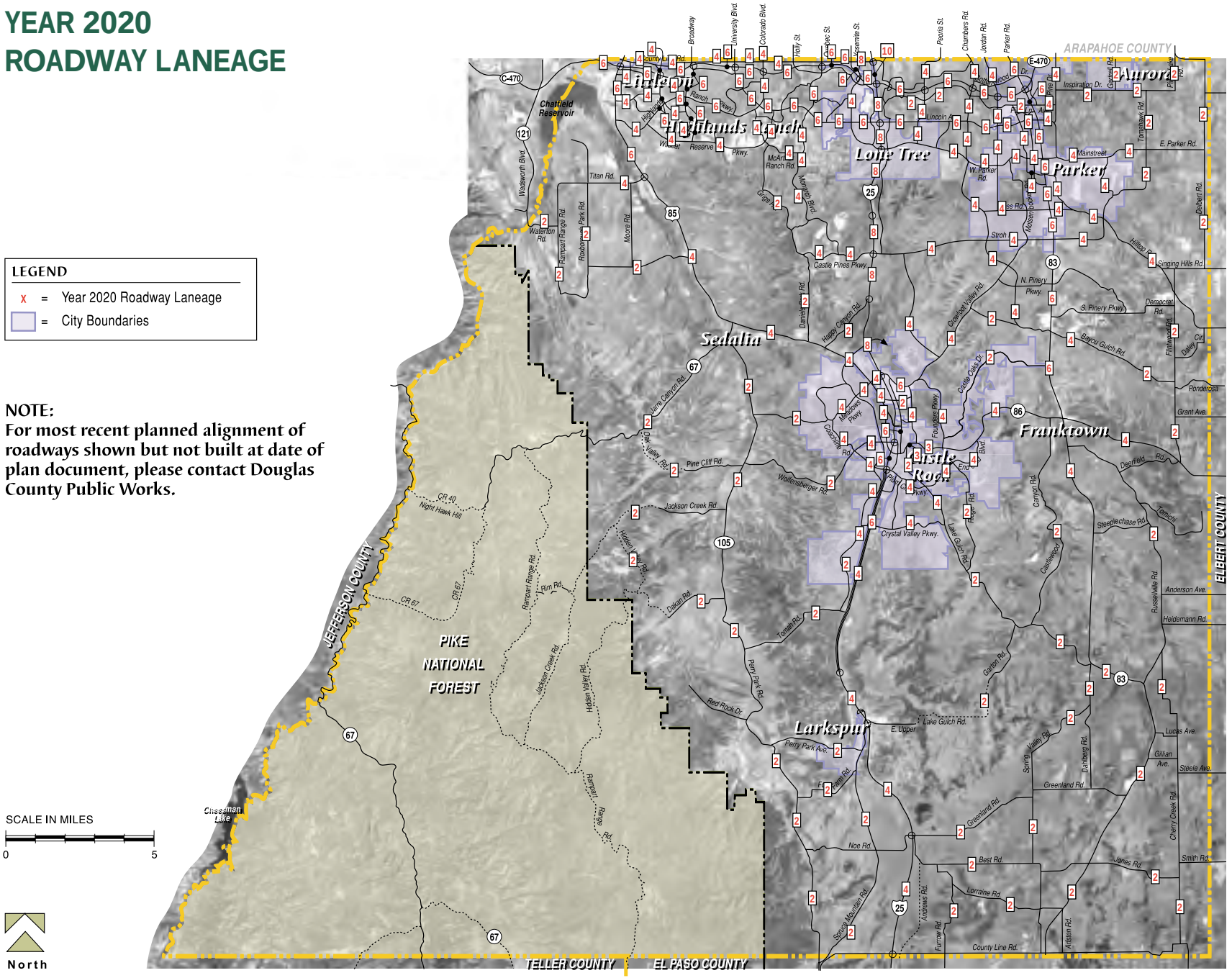


Figure A-4

YEAR 2020 ROADWAY LANEAGE

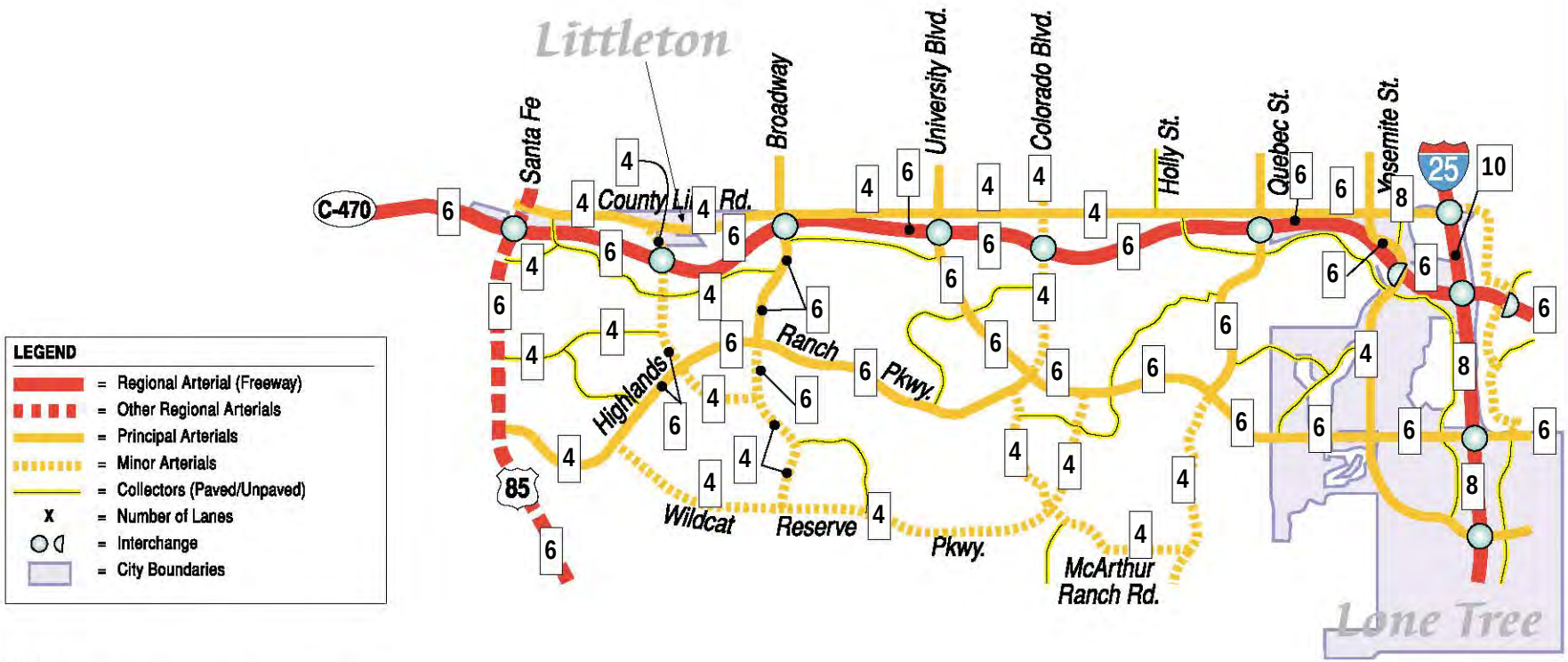


APPENDIX B

SUBAREA ROAD NETWORK MAPS

Figure B-1

HIGHLANDS RANCH / LONE TREE AREA
2020 ROAD NETWORK



NOTE:
For most recent planned alignment of roadways shown but not built at date of plan document, please contact Douglas County Public Works.

North

NOT TO SCALE

Figure B-2

NORTH PARKER AREA
2020 ROAD NETWORK

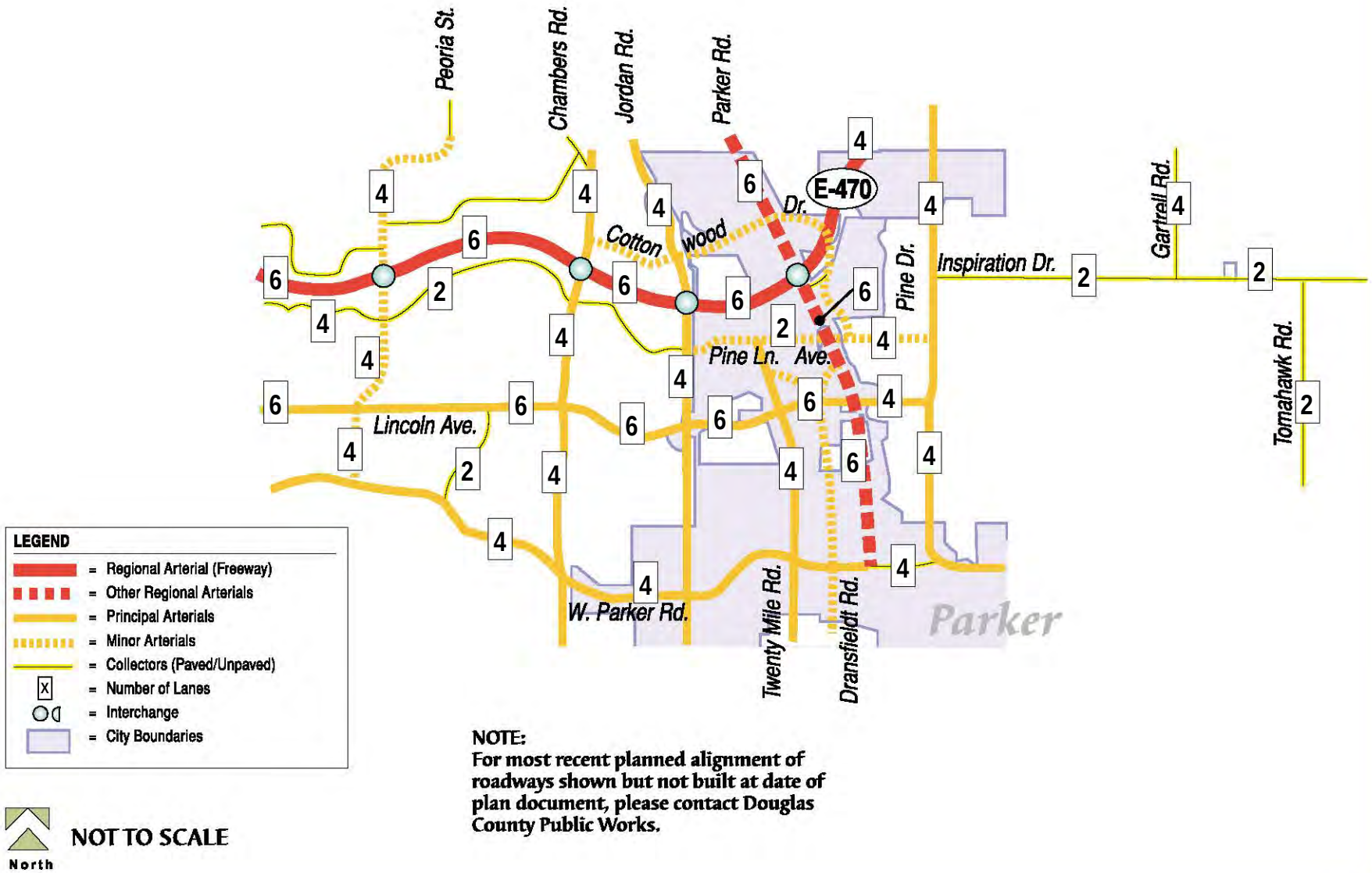
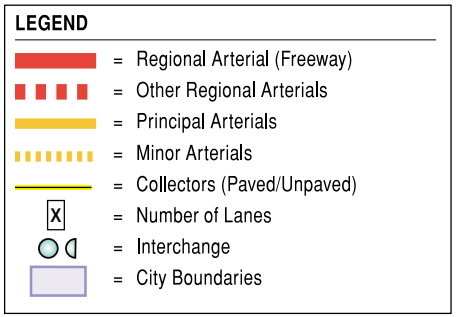


Figure B-3

PARKER / PINERY AREA 2020 ROAD NETWORK



NOTE:
For most recent planned alignment of roadways shown but not built at date of plan document, please contact Douglas County Public Works.

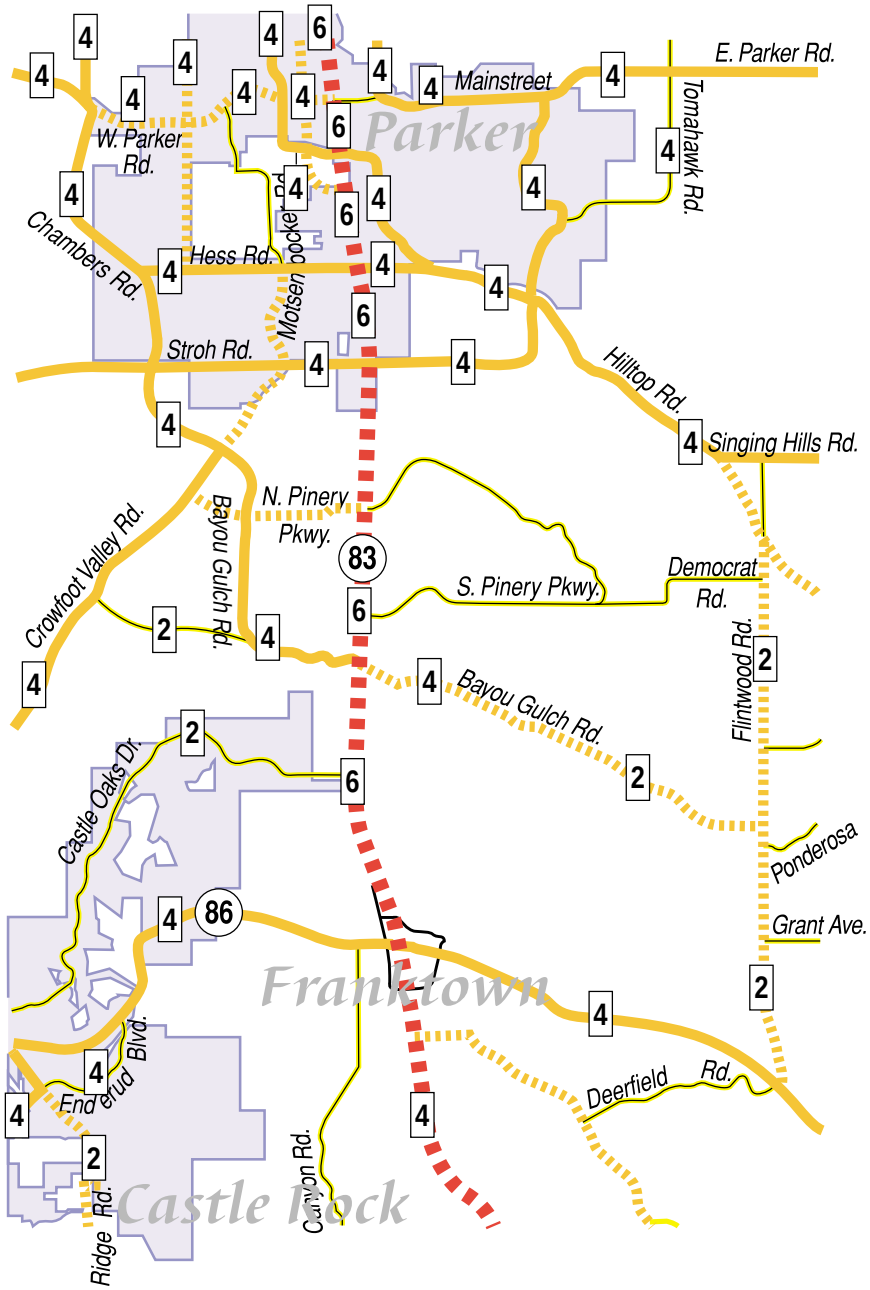


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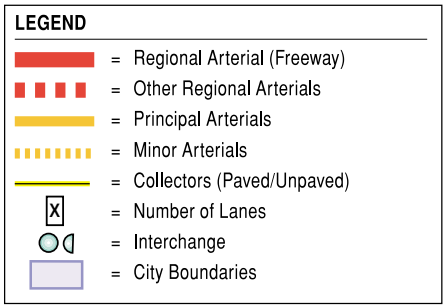
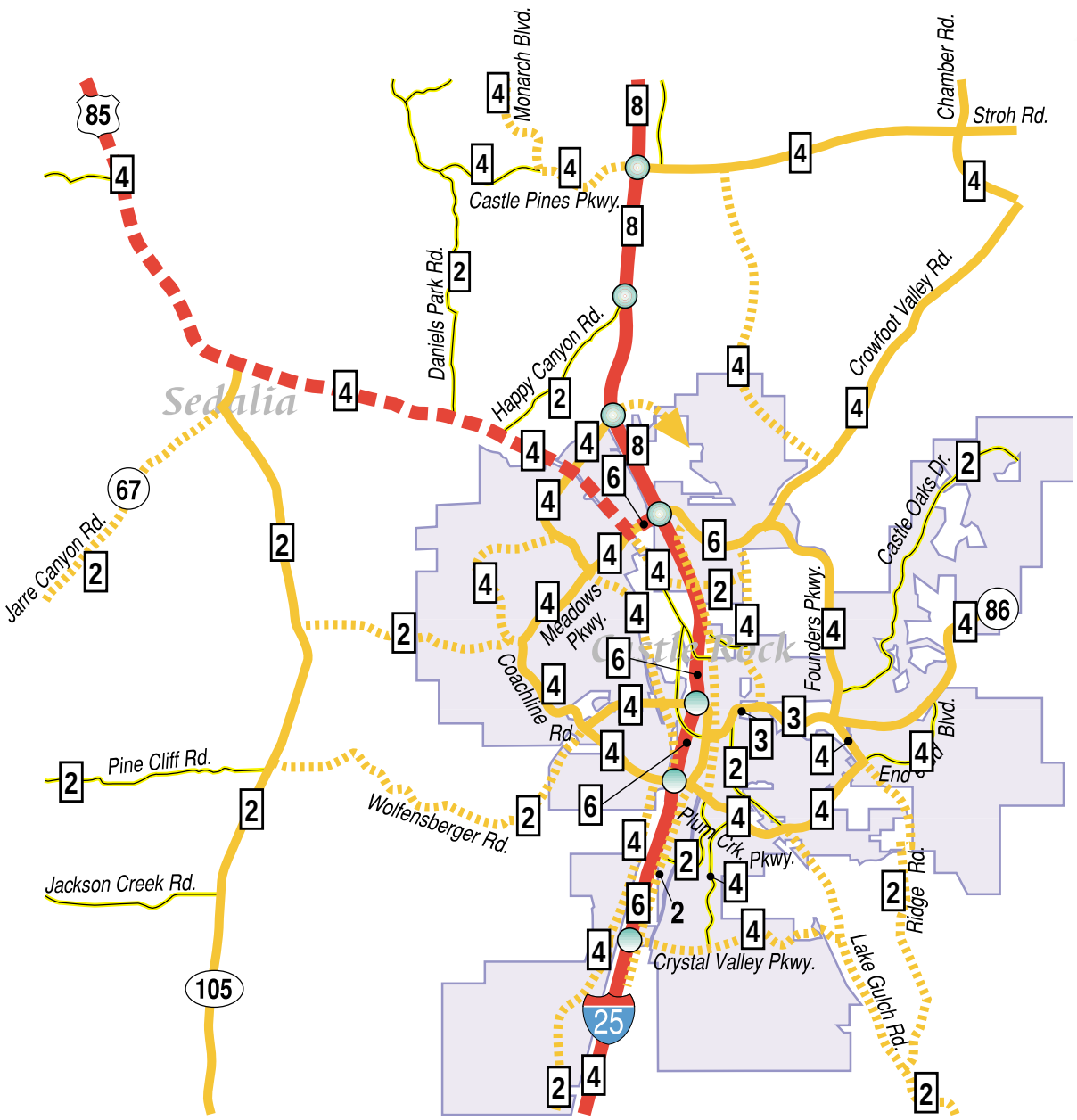
Figure B-4

CASTLE ROCK AREA 2020 ROAD NETWORK



NOTE:
For most recent planned alignment of roadways shown but not built at date of plan document, please contact Douglas County Public Works.



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North

APPENDIX C

CROSS SECTIONS

Figure C-1

4 - LANE MAJOR COLLECTOR CROSS SECTION

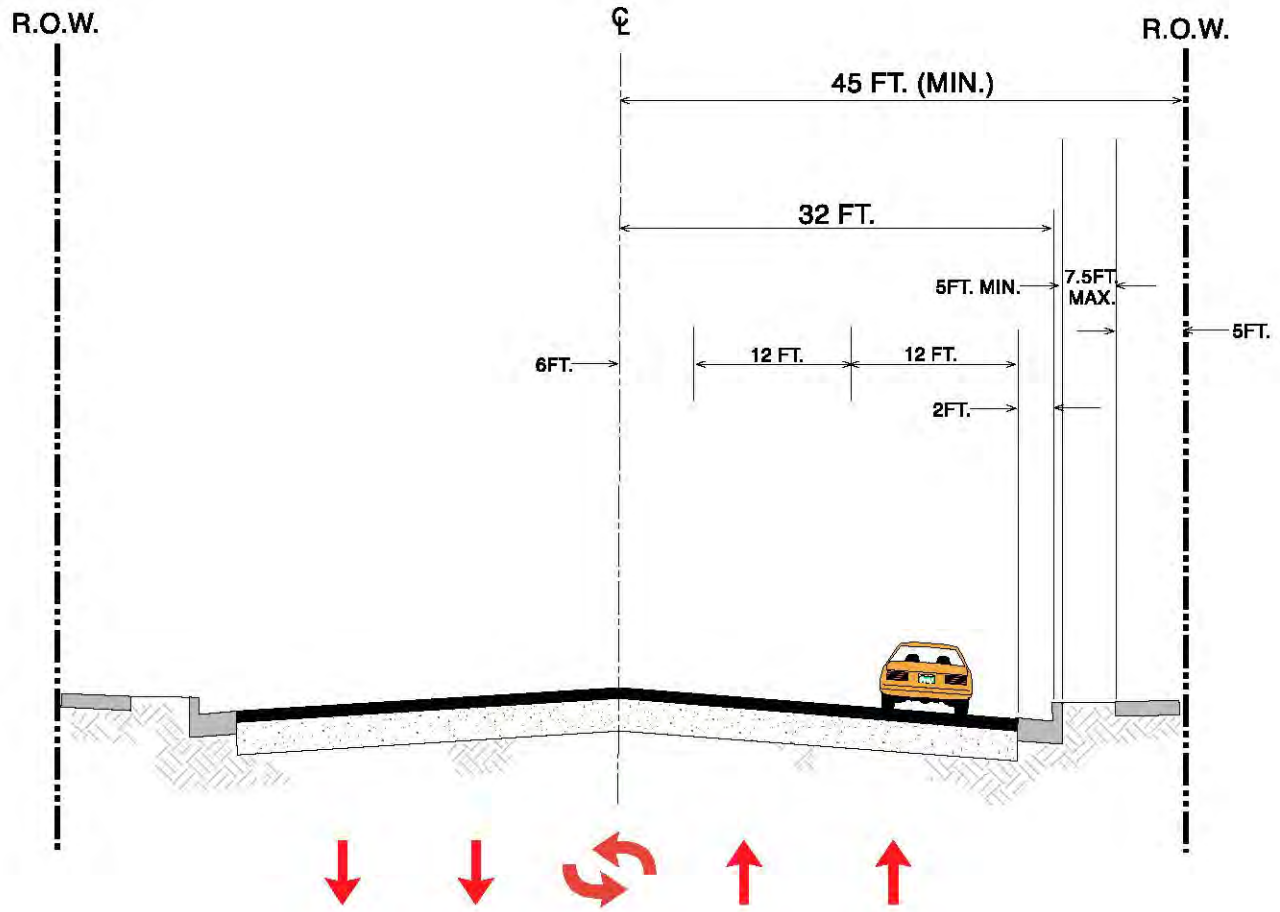

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Figure C-2

4 - LANE MINOR ARTERIAL CROSS SECTION

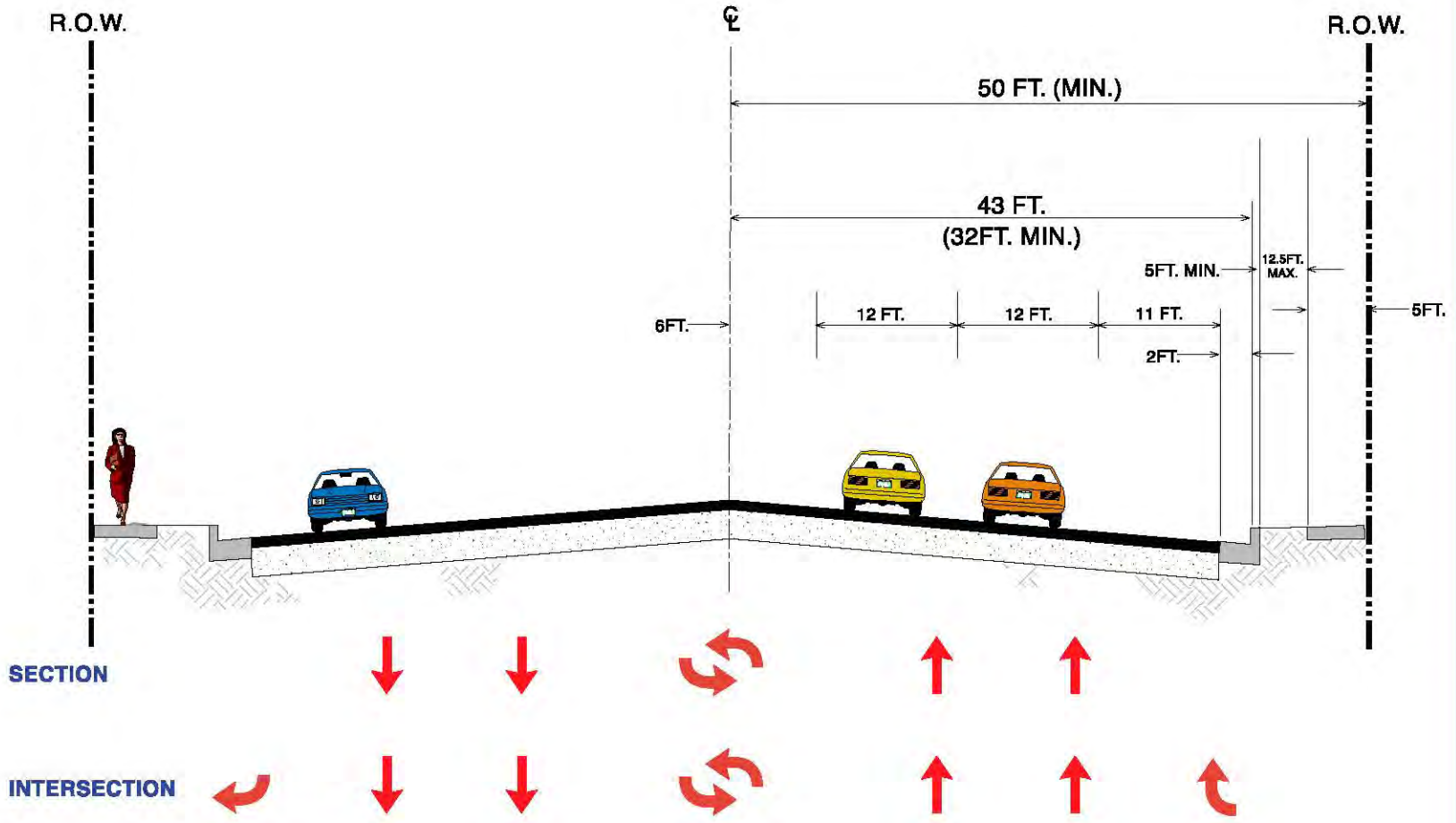

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Figure C-3

4 - LANE MAJOR ARTERIAL CROSS SECTION

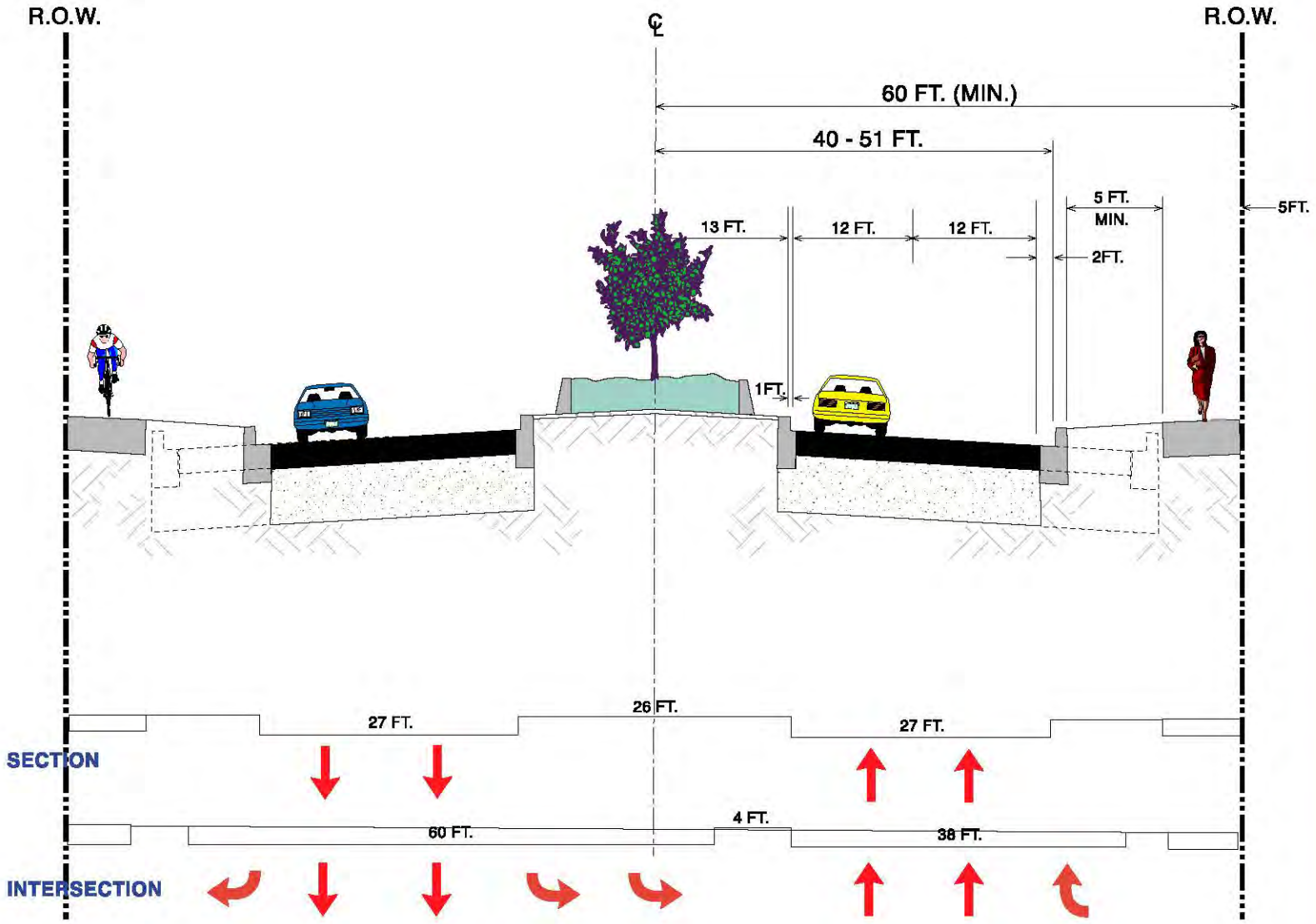
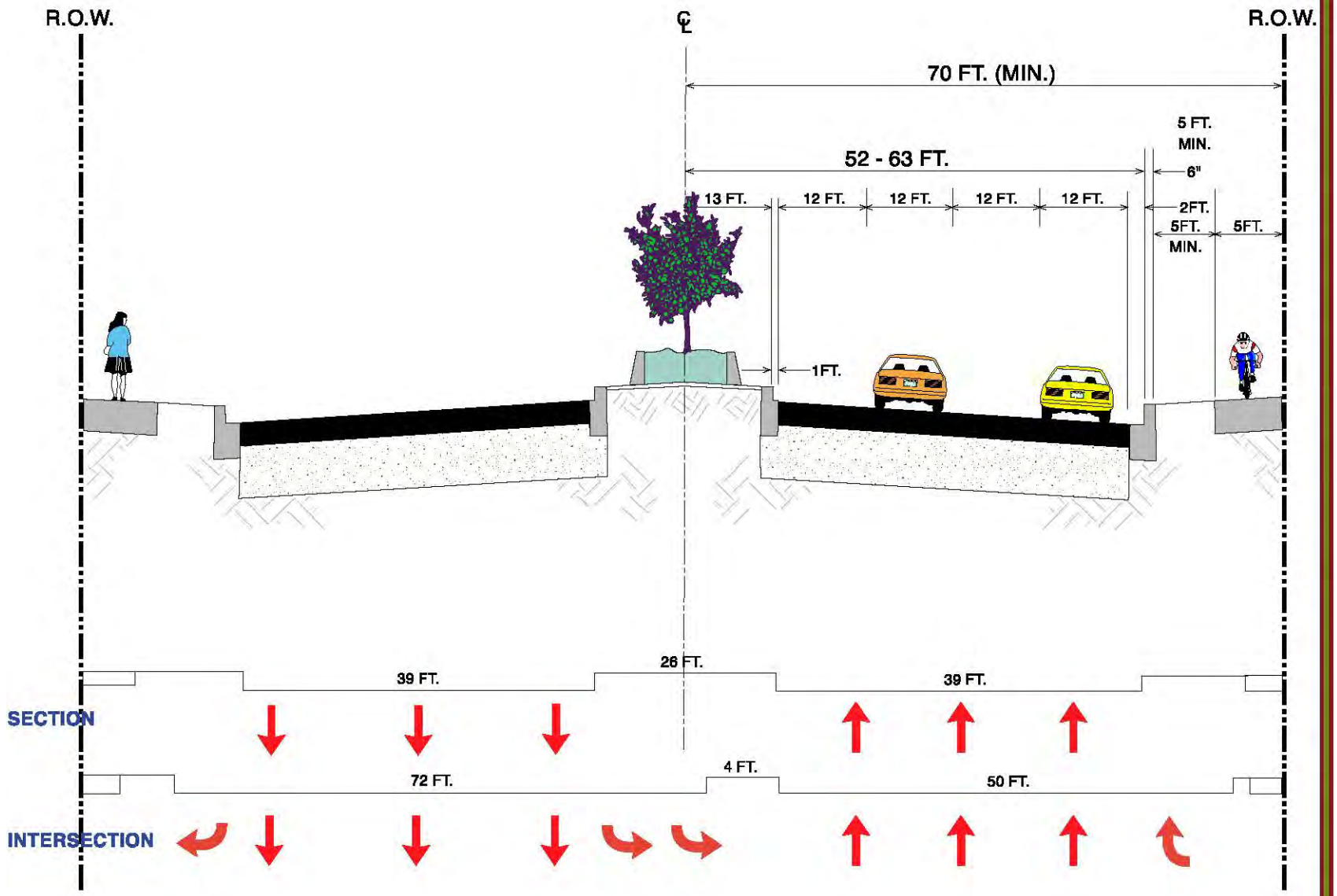


Figure C-4

6 - LANE MAJOR ARTERIAL CROSS SECTION



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APPENDIX D

TRANSPORTATION PLANS

Figure D-1

CASTLE ROCK
RECOMMENDED ROADWAY PLAN

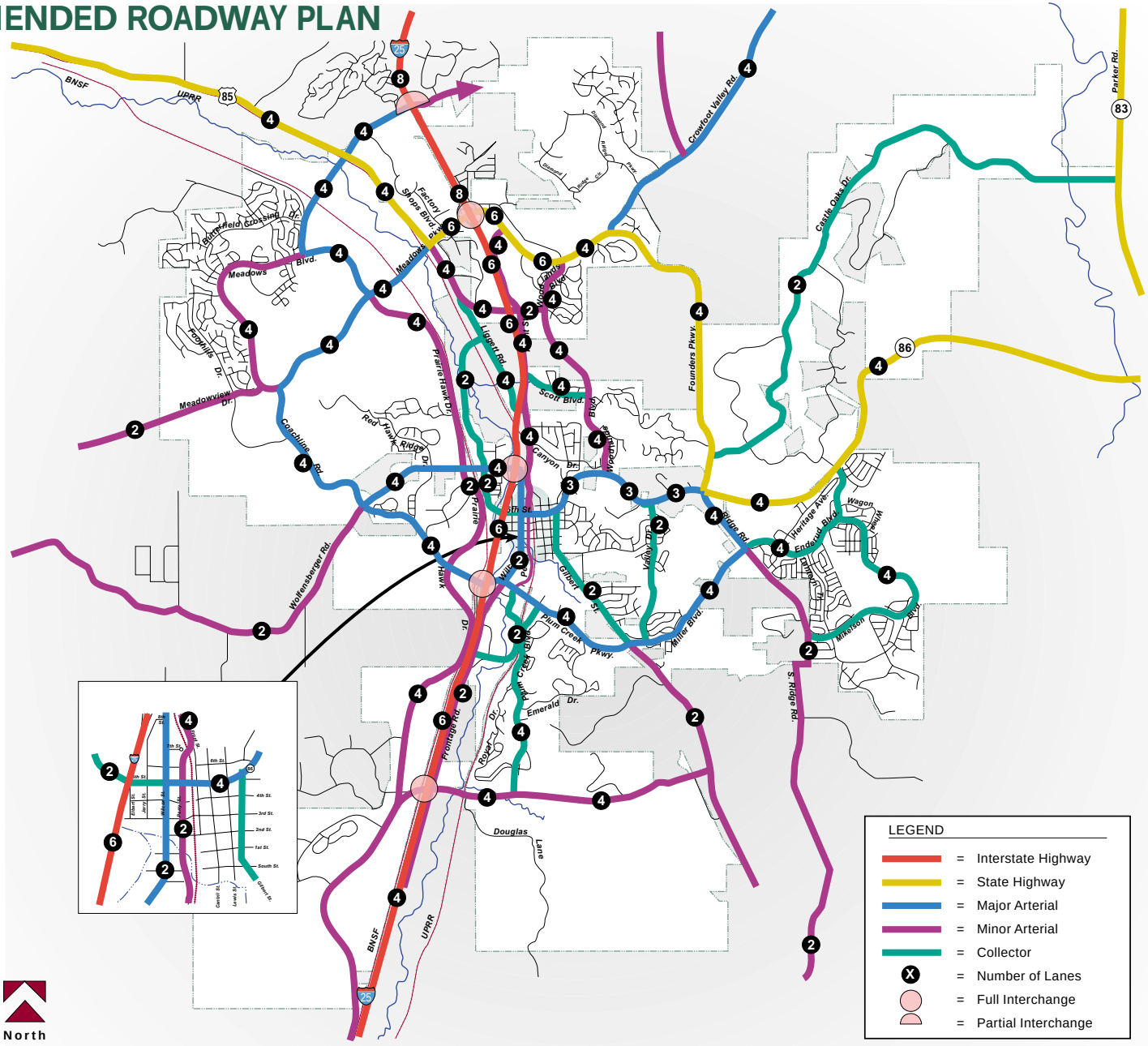


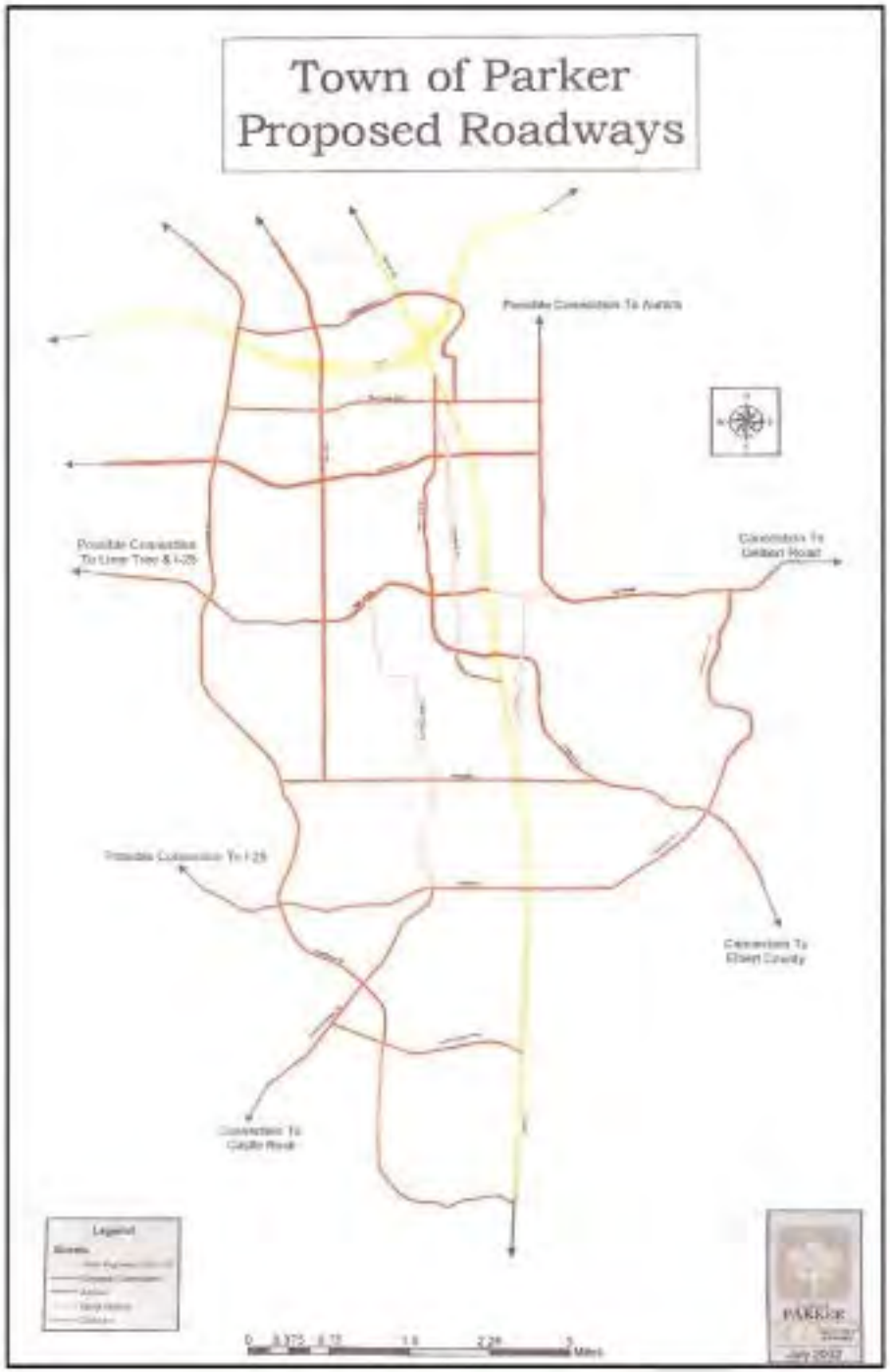
Figure D-2

CITY OF AURORA TRAVEL FRAMEWORK

Resolution R-002-273
Reception # 2002138461

Figure D-3

TOWN OF PARKER



Within city limits the City's latest Transportation Plan should be referenced.

The cities of Lone Tree, Larkspur, and Littleton do not have current Transportation Plans adopted.

APPENDIX E

GLOSSARY OF TERMS

GLOSSARY

Accessibility – The degree to which the traveler is able to directly access private property from the public transportation system.

CDOT – Colorado Department of Transportation

Connectivity – A roadway facility that connects to other roads creating an entire network and network redundancy.

Continuity – A roadway facility that is continuous through a region and accommodates long trips.

Delay – A measure of the quality of service provided to the road user. Typically measured in seconds.

Functional Classification – Identifies the type of transportation service provided by a facility. Facilities providing a high level of mobility have a high functional classification such as a freeway or expressway. Facilities providing a high level of accessibility have a low functional classification such as a local street with driveway access.

Level of Service (LOS) – A measure of the congestion on a roadway an a scale of A to F, with "A" representing little or no traffic delay and "F" representing long delays and a high level of congestion.

Mobility – The degree to which the traveler is able to achieve uninterrupted motion in completing a trip.

Network Redundancy – Alternative routes between various origins.

Out-of-Direction Travel – The additional distance added to a trip when the shortest or more reasonable path is not available to the traveler.

Regional Arterial – A road that serves major centers of activity in a metropolitan area, the longest trips and the highest proportion of the total urban travel.

Regional Statistical Areas (RSAs) – Subareas within a regional model that encompass a number of TAZs.

Transportation Analysis Zones (TAZs) – An area that is defined, for the purpose of travel demand forecasting, to have a certain road network, number of households and number of employees.

Transit Corridor Preservation – Obtaining control of right of way, through regulation or ownership, to ensure that development does not preclude future transit options.

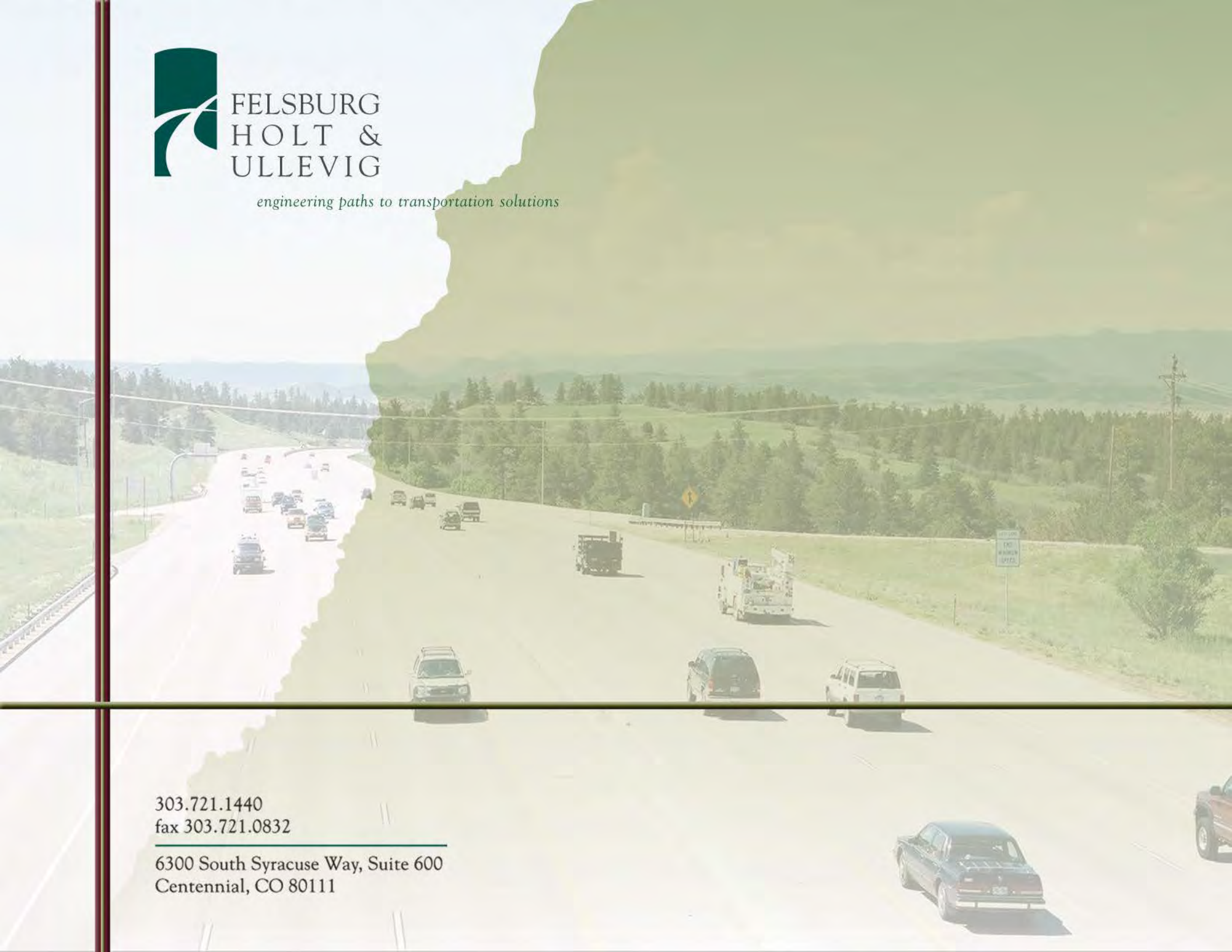
Travel Demand Forecasting – Modeling of transportation demand in a region or subarea that accounts for changes in household, employment and roadway network characteristics.

Transportation Demand Management Program – Programs that reduce and manage the number of private auto trips made by a single occupant in order to improve the efficiency of the overall transportation network.

Transportation System Management – Tools and techniques used to enhance traffic operations through more efficient use of roadway resources or driver communications.

TREX – Transportation expansion project along the I-25 southeast corridor. The project includes extending light rail and widening of I-25 and I-225.

V/C Ratio (Volume over capacity ratio) – Indicates the portion of roadway capacity being utilized. Volume over capacity ratios greater than 1.0 indicate that the roadway facility is over capacity.



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