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**Appendix M**  
**I-25 South Gap Project – Economic Impact**  
**Technical Memorandum**

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# I-25 South Gap Environmental Assessment Economic Assessment of I-25 South

*I-25 South Communities and I-25 South Transportation Investments*



PREPARED FOR

Colorado Department of Transportation



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and

**ARLAND**  
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# Executive Summary

I-25 is a critical transportation corridor and planned corridor improvements represent a strategic transportation investment for the Colorado Department of Transportation. I-25 has been an important “artery” or conduit for regional economic growth. Originally constructed in the 1960s, as the economy has grown, traffic has increased, and the highway has aged, I-25’s deficiencies between the Denver and Colorado Springs metropolitan areas have become glaring. In this section of the highway, shoulder widths are too narrow, climbing grades present challenges, interchanges are deficient, and an increase in the number and severity of accidents make for an increasingly unreliable trip hampering mobility with consequences for economic vitality and quality of life for the region.

In order to address these deficiencies, CDOT has commissioned two projects currently underway: the I-25 Gap Project between Monument and Castle Rock which is intended to address immediate needs and the I-25 PEL project which is intended to identify longer term improvements for the area between southern Denver and northern Colorado Springs. This study focuses on the economic benefits of I-25 to the communities between the southern Denver metropolitan area and Colorado Springs. It also examines the potential economic benefits of transportation improvements.

## *Community Profile:*

- *Study Area:* The Study Area has been defined broadly to include Arapahoe County, Douglas County and El Paso County with a focus on those areas in close proximity to I-25. Southern Arapahoe County is specifically called out in certain circumstances where data could be stratified by geographic area as Arapahoe County stretches to the east. The Gap project area is more narrowly defined as the I-25 corridor area between Castle Rock to Monument.
- *Huge residential growth seen:* Since 2000, the population of Arapahoe, Douglas and El Paso Counties has grown by over 400,000 residents. While household sizes have generally decreased or remained flat in most of the area jurisdictions, Monument and Castle Rock have seen household sizes increase. Larkspur has seen a relatively dramatic decrease in household sizes. It has also aged at a greater rate than the other jurisdictions in the study area. The median ages in all communities have generally increased.
- *Residents are well educated and affluent:* The majority of Douglas County communities near I-25 have median household incomes over \$100,000. Woodmoor, Monument, and Black Forest residents in El Paso County also enjoy high household incomes. This corresponds to high education levels with those communities with higher incomes also having a significant percentage of residents (50% or more) with at least a Bachelor’s Degree.
- *Longer commutes for residents between Castle Rock and Monument:* Forty percent (40%) of residents in the area between Castle Rock and Monument have commutes of over 30 minutes, while residents in and around south Denver and in and around Colorado Springs have lower percentages of their population with long commute times.
- *Significant population growth forecast:* Arapahoe, Douglas, and El Paso Counties are forecast to grow by over 1% per year through 2040. Combined the three counties are forecast to grow by almost 700,000 people with El Paso County forecast to add the most residents at more than 300,000 persons. There are a large number of planned developments and thousands of acres of land slated for development. There is a significant amount of planned growth between Castle Rock and Monument.

### *Study Area Economy*

- *The 3 county region (Arapahoe, Douglas and El Paso Counties) generates 30% of Colorado's Gross State Product:* Colorado's Gross State Product (GSP) is estimated at approximately \$313 billion in 2017. The GSP is a measure of all goods and services produced in the state. The Gross Regional Product for Arapahoe, El Paso and Douglas Counties is estimated at \$94 billion, approximately 30% of GSP.
- *The 3 county region employs 27.5% of Colorado's workers:* There are about 700,000 jobs in Arapahoe, Douglas and El Paso Counties representing 27.5% of all state jobs in 2016.
- *Location of major employers significant to the State:* There are a number of major employers in and near the corridor. In south Denver, Douglas County Schools and Charles Schwab employ the greatest numbers of people. In El Paso County, Fort Carson and Peterson Air Force Base are the largest employers at 32,000 and 9,900 employees respectively. The largest private employer in El Paso County is the UC Health Memorial Health System at 6,200 employees.
- *Location of major industrial clusters significant to the State:* Clusters significant to the state located in this area include Aerospace and Defense; Information Technology/Computer Software/Cybersecurity; Healthcare and Medical Technologies. All clusters are heavily reliant on the freight transportation system, in particular for receipt of supplies and deliveries of product.
  - *Defense and Aerospace:* El Paso County military facilities include Fort Carson, Peterson Air Force Base, Schriever Air Force Base, Cheyenne Mountain, and the Air Force Academy. Both El Paso and Arapahoe Counties receive a significant percentage -- over two-thirds of the State's Department of Defense contracts. Companies like The Harris Corporation, Lockheed Martin, Raytheon, Sierra Nevada Corporation, and United Launch Alliance are all located in the study area.
  - *Information Technology/Software and Cybersecurity:* There are an estimated 11,000 businesses in this cluster in the study area. Both the Denver Metro and the Colorado Springs area are strong in this cluster and the range of activities is broad ranging from support of other business activities such as e-business, telecommunications, gaming, finance and aerospace and defense. Colorado Springs, in particular, is developing a strong niche in the Cybersecurity arena with the recent opening of the National Cybersecurity Center. Many businesses in this cluster provide services to the defense and aerospace cluster.
  - *Healthcare and Medical Technologies:* This cluster not only includes healthcare providers, it also includes research institutions, as well as firms working in medical innovation and biotechnology. The cluster has an estimated 15,000 entities in the study area.
- *Significant growth forecast for employment:* Like the residential growth forecasts, the study area is poised for a significant amount of employment growth. According to the local Council of Governments forecasts, the 3 county region of Arapahoe, El Paso, and Douglas Counties are forecast to add an additional 430,000 jobs by 2040. El Paso County is forecast to add the most at 185,000 jobs with many of the jobs forecast for infill areas along I-25 in Colorado Springs.
- *Workforce demand is currently at all time high:* This study is being conducted during a time of huge labor force needs both in the study area as well as the region. Unemployment is at historic low levels with 5 year forecast demand heaviest for Health Care and Social Assistance, Government, Professional, Scientific and Technical Services. Top current unfilled jobs include truck drivers, registered nurses, and retail sales salespersons.
- *The rising price of housing is encouraging longer commuting:* The Denver metro area has grown tremendously in the past 6 years while the production of single family housing has not kept pace. While apartment production has dramatically increased in recent years, the production of single

family housing has not matched growth, resulting in constrained supply in the Denver metro area and high prices. The average single family house in Douglas County is priced at \$515,000 while the average single family house in El Paso County is \$255,000, making the south Denver single family housing market unattainable except for the highest paid workers. It is encouraging longer commutes in this area. Anecdotally, current broker marketing materials are encouraging and reflecting this trend.

- *Future cross commuting is likely to increase:* While maps of commuting times seem to indicate that the Denver metropolitan and the Colorado Springs markets are two different labor sheds, forecast growth and origin-destination maps indicate that more cross-commuting is likely to occur in the future.

#### *Freight*

- *Truck traffic is significant:* Truck traffic is estimated to comprise up to 12% of all traffic traveling the I-25 corridor in the study area. I-25 is a Congressionally designated High Priority Corridor and is also part of the Primary Highway Freight System which identifies it as one of the most critical highway portions of the U.S. freight system.
- *Area freight movement is valued at an estimated \$60 billion:* The study area is a significant part of the State's import/export economy. Major state trading partners include Wyoming, Nebraska, Texas, California and Utah for a wide variety of Colorado goods. Major international trading partners include Canada and Mexico, with I-25 being a conduit for movement of goods. The State's industrial clusters, particularly those that are the strongest in the study area, are reliant on long distance trucks for the movement of supplies and deliveries.
- *Trucks service a growing retail and industrial inventory:* Mirroring the growth of the economy, there has been a tremendous increase in retail and industrial activity, the great majority of which is serviced by trucks. In the last ten years, the retail and industrial inventory in the study area has increased by 7.4 million square feet. There is currently about 100 million square feet of industrial and retail space in the study area.
- *E-commerce growth points to a future increase in truck traffic:* E-commerce is becoming an ever expanding portion of total retail sales and it is forecast to result in an increase in industrial warehouse space and the need for more trucks to deliver goods to residents. At the same time, there has not been a significant decrease in travel for household shopping trips.

#### *Tourism*

- *Colorado is becoming a national destination:* Formerly, more of a regional destination, the state has transitioned to being a national destination. The Pikes Peak Region welcomed 23 million people in 2016 while Denver welcomed 31.5 million visitors. The nature of travel has changed with more leisure visitors (versus business visitors) and those who visit because they want to (versus because of a family or business obligation).
- *The corridor is a conduit for visitors:* Late week and weekend traffic volumes indicate that the corridor is an important conduit for travel and leisure. There are several retailers in Douglas County (Ikea / Cabela's) that serve a multi-state market. There are a wide variety of special events particularly in the summer like Larkspur's Renaissance Festival. Major professional sporting events encourage travel throughout the year. Sports leagues and school sporting events are also prevalent and I-25 is a conduit to the outdoors particularly in the southern parts of the state.
- *Travel in the study area contributes to the state's economy:* In 2016, direct travel spending in the State of Colorado was estimated at nearly \$20 billion and supported 165,000 jobs. Direct travel spending in Arapahoe, Douglas and El Paso Counties is estimated at \$2.6 billion and employed approximately 24,000 workers.



### *Travel and Mobility*

- *Travel reliability is worsening:* Increasingly, corridor travelers are experiencing long traffic delays, and the need to plan daily activities around traffic congestion is becoming the new norm. Travel delays are the result of congestion and events (e.g. accidents, weather, and sporting events).
- *Safety is a central issue:* This is particularly important for the I-25 South corridor because of the number and type of crashes (accidents) that occur along this stretch of the interstate. From 2011 to 2015 there were 4,710 total crashes, or 2.5 crashes per day on average. Most of these (72 %) resulted in property damage. About 28 % of all crashes during the five-year period resulted in human injury or death. There were 13 fatal crashes during this time, or approximately two to three per year. In the Gap, there were 1,809 crashes between 2011 to 2015 with half occurring in 2014 and 2015 alone, indicating worsening conditions.
- *Truck / Freight traffic comprise a significant portion of traffic in this area:* Heavy trucks account for 8 to 11% of corridor traffic and must deal with climbing grades in both directions in the corridor. Climbing is difficult for heavy trucks and they often must slow down anywhere from 10 to 20 miles per hour depending on the grade.
- *I-25 Gap Project begins to address the most critical challenges:* The 18-mile Gap section between Monument and Castle Rock has been identified through the Planning and Environmental Linkage process as the most critical section of the I-25 Corridor between south Denver and Colorado Springs to be addressed. The project begins to address travel reliability, safety, and freight/truck traffic concerns. There are two build alternatives. One alternative provides for the addition of an express lane and the second provides for the addition of a general-purpose lane.
- *Travel time savings account for the greatest benefit provided by the Gap project.* By 2040, for morning peak period drivers, time savings are estimated at 12 to 20 minutes through the Gap. The time savings is most significant for Friday southbound traffic where time savings would range from 50 to 87 minutes. By 2040, weekday morning northbound travel through the Gap will take 43 minutes. Express lane travelers (the fastest option) will need just 23 minutes. Friday southbound travelers will need nearly 2 hours to get through the Gap by 2040 without improvements. Express lane travelers will need just 32 minutes.
- *The Benefit Cost Analysis shows that either of the build alternatives provides a \$1.7 billion positive benefit to the regional economy.* The net present value of the costs of the project is estimated at \$270 million. The net present value of benefits is estimated at \$1.5 billion. Benefits include the value of travel time savings, operating cost savings, safety benefits, and the residual value of the project (remaining useful life) of the project after a 20 year life cycle. Costs include initial capital and ongoing maintenance and operations costs. Benefits and costs are discounted at a 7% rate.

# 1.0 Introduction

In its 2040 Statewide Transportation Plan, *Transportation Matters*, the Colorado Department of Transportation (CDOT) articulated its goals for safety, mobility, economic vitality, and system maintenance. Its goal for economic vitality includes improving the competitiveness of the state economy through strategic transportation investments.

I-25 is a critical transportation corridor and planned corridor improvements represent a strategic transportation investment. I-25 South connects two of the primary metropolitan areas in the State of Colorado: the Denver metropolitan area and the Colorado Springs metropolitan area. It is the only continuous north-south freeway in Colorado, and the only north-south interstate freeway within roughly 500 miles.

- *Jobs*: There are more than 700,000 jobs in El Paso, Douglas, and Arapahoe Counties, nearly 30% of the State's workforce. The three counties connect the two major metropolitan areas. Major industry clusters important to the state are supported in these counties including Health Care and Medical Technology; IT, Software, and the growing Cybersecurity cluster, in addition to Defense and Aerospace.
- *Freight*: I-25 is part of the National Highway Freight Network supporting both interstate and international commerce and trade. Up to 12% of traffic along I-25 South is truck traffic moving goods and services for area residents and businesses.
- *National Security*: I-25 supports national defense, linking the state's eight major military installations, five of which are in El Paso County. It is part of the National Defense Highway System providing critical defense logistics support for military installations in Colorado. The military installations and supporting industry sectors are also major area employers.
- *Recreation and Tourism*: I-25 helps support the state's growing recreation and tourism industry by providing access to recreational and tourist destinations along the Front Range, as evidenced by the high volumes of weekend traffic.

I-25 has been an important "artery" or conduit for regional economic growth. Originally constructed in the 1960s, as the economy has grown, traffic has increased, and the highway has aged, I-25's deficiencies has become glaring. In this section of the highway, shoulder widths are too narrow, climbing grades present challenges, interchanges are deficient, and an increase in the number and severity of accidents make for an increasingly unreliable trip hampering mobility with consequences for economic vitality and quality of life for the region.

In order to address these deficiencies, CDOT has commissioned two projects currently underway: the I-25 Gap Project between Monument and Castle Rock which is intended to address immediate needs and the I-25 PEL project which is intended to identify longer term improvements for the area between southern Denver and northern Colorado Springs.

The I-25 GAP project begins to address some of the critical infrastructure needs along the corridor. There are three alternatives currently contemplated: The No-Build alternative, the Managed Lane alternative and the General-Purpose Lane alternative.

The alternatives are being contemplated in light of a state economy that is growing and changing. This analysis explores some of the past changes and current trends occurring in the region with a particular focus on the southern Denver metropolitan area and the northern Colorado Springs metropolitan area, and how transportation improvements can continue to help facilitate mobility within the context of Colorado's dynamic growth.

The analysis is divided into the following topic areas:

- *Community Profile:* The southern Denver / northern Colorado Springs area has experienced significant population and employment growth and change in recent years. Forecasts indicate continued growth in this region with potentially greater linkage between the two metropolitan areas.
- *Economy, Jobs and Workforce:* Arapahoe, Douglas and El Paso Counties generate a significant portion of the State Gross Domestic Product. Southern Denver and Northern Colorado Springs are two different labor markets currently. The analysis will explore past jobs and workforce trends, forecasts for the future, and discuss how these two labor markets are increasingly linked. This section will also discuss the role of the military, which is particularly important to the El Paso County/Colorado Springs economy.
- *Freight:* Truck traffic is a significant portion of overall traffic volumes on I-25 South, with increasing concerns about congestion and inability to move goods through the state. Freight's role in the state economy in moving goods to market will be discussed.
- *Travel and Tourism:* Travel and tourism is a huge and growing part of the state economy. The high volumes of weekend traffic attest to the role that tourism plays in the local economy.
- *Transportation Mobility and Cost Benefit Analysis:* The final section will discuss current conditions in the corridor, the costs and potential benefits of transportation improvements in the Gap Project Area. It will discuss potential travel time savings, the forecast increase in reliability, the potential decrease in accidents and compare the benefits and costs of the two "build" alternatives compared to the "no-build" scenario.

# 2.0 Community Profile

## 2.1 Study Area

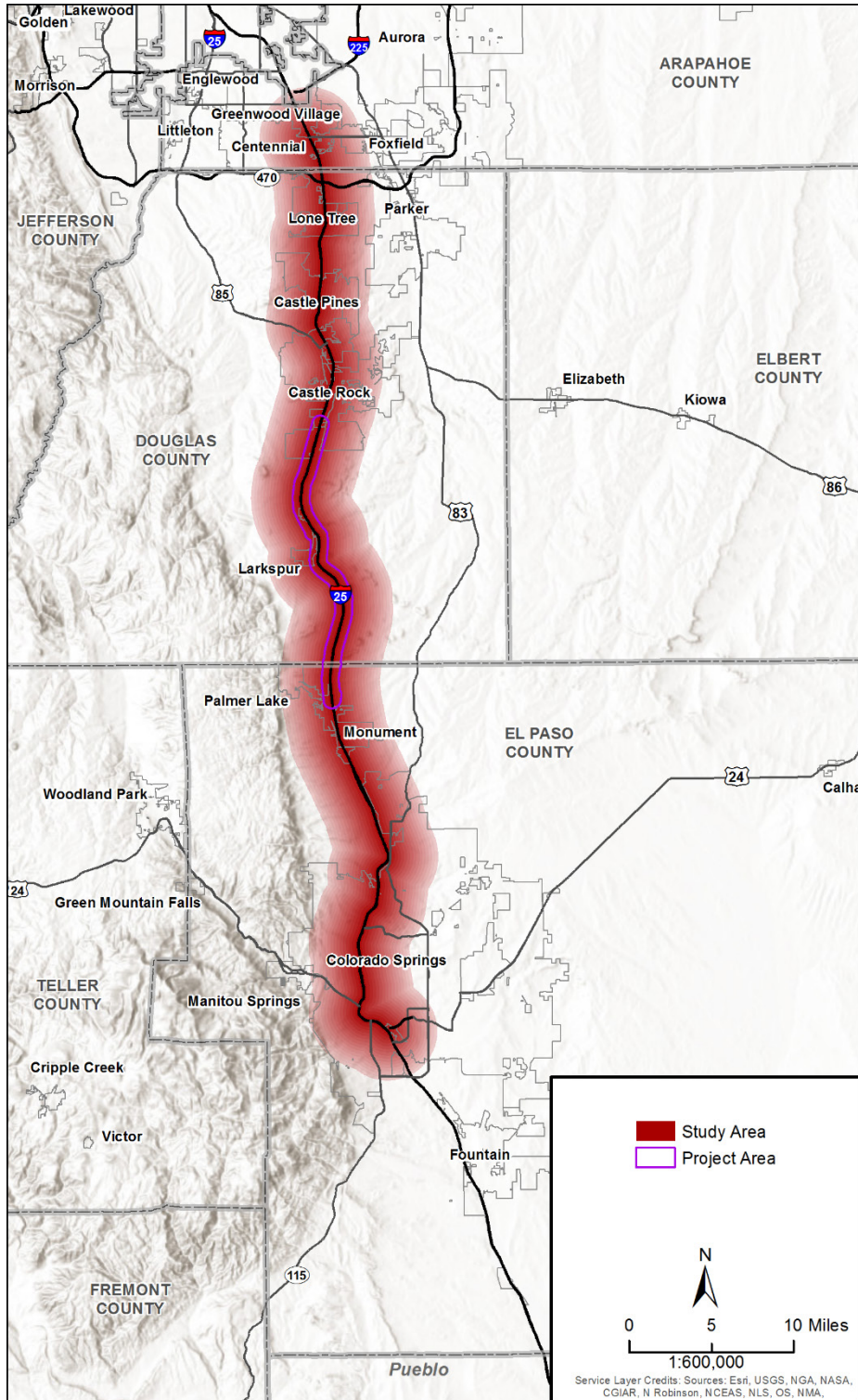


Figure 1. I-25 Gap Project Area and the I-25 South Regional Impact Area

Interstate 25 (I-25) is the only north-south interstate route through Colorado. It connects the state's largest population centers and provides access to recreation and cultural amenities. The stretch of I-25 from the southern Denver metropolitan area near C-470 to Colorado Springs is a particularly well-traveled roadway and a major transportation artery fueling the regional economy and greatly affecting the state's economy. The study area has been defined broadly to include Arapahoe County, Douglas County, and El Paso County adjacent to I-25. Communities within those counties in proximity to the corridor are also shown. Figure 1 depicts the study area from Denver to Colorado Springs. It also shows the Gap Project area which is located between Castle Rock in Douglas County and Monument in El Paso County.

## 2.2 Trends and Existing Conditions

### 2.2.1 Population and Households

The estimated combined population of Arapahoe, Douglas, and El Paso Counties in 2016 was about 1.6 million persons, an increase of over 400,000 persons since the year 2000. As seen in Table 1, all communities in proximity to I-25 South experienced population increases since 2000 except for Larkspur and the Air Force Academy. Douglas County grew by about 3.7% annually, a much higher rate than in Arapahoe and El Paso Counties. At the jurisdictional level, Monument, Castle Rock, and Lone Tree saw the greatest annual percentage gains, growing by more than 6% per year since 2000. Changes in the number of households essentially mirrored population change. The exception is Larkspur where the number of households is estimated to have increased while the population declined slightly, indicating a decrease in household size as seen in Figure 2.

Table 1. Population and Households, 2000-2016

	2000 <sup>a</sup>	2010 <sup>a</sup>	2016 <sup>b</sup>	Growth 2000-2016	CAGR <sup>c</sup> 2000-2016 (percent)
Population					
Arapahoe County	487,967	571,914	617,668	129,701	1.5
Centennial	--	100,377	107,862	--	--
Douglas County	175,766	285,465	314,238	138,472	3.7
Lone Tree	4,873	10,218	12,808	7,935	6.2
Castle Pines	--	10,360	10,389	--	--
Castle Rock	20,224	48,231	53,789	33,565	6.3
Larkspur	234	183	221	-13	-0.4
El Paso County	516,929	622,263	665,171	148,242	1.6
Palmer Lake	2,179	2,420	2,558	379	1.0
Woodmoor CDP	7,177	8,741	8,587	1,410	1.1
Monument	1,971	5,530	6,346	4,375	7.6
Black Forest CDP	13,247	13,116	13,506	259	0.1
Air Force Academy CDP	7,526	6,680	5,957	-1,569	-1.5
Colorado Springs	360,890	417,335	448,759	87,869	1.4
Households					
Arapahoe County	190,909	223,958	231,844	40,935	1.2
Centennial	--	37,449	39,222	--	--

	2000 <sup>a</sup>	2010 <sup>a</sup>	2016 <sup>b</sup>	Growth 2000-2016	CAGR <sup>c</sup> 2000-2016 (percent)
Douglas County	60,924	102,018	114,017	53,093	4.0
Lone Tree	1,848	4,023	5,184	3,336	6.7
Castle Pines	--	3,493	3,653	--	--
Castle Rock	7,226	16,688	18,739	11,513	6.1
Larkspur	92	81	122	30	1.8
El Paso County	192,409	235,959	249,279	56,870	1.6
Palmer Lake	843	955	1,052	209	1.4
Woodmoor CDP	2,374	3,107	2,865	491	1.2
Monument	725	1,802	1,988	1,263	6.5
Black Forest CDP	4,494	4,674	4,837	343	0.5
Air Force Academy CDP	1,128	532	527	-601	-4.6
Colorado Springs	141,516	167,788	177,774	36,258	1.4

Source: U.S. Census, ArLand

<sup>a</sup>Census 2000 and 2010 Census, Table DP-1

<sup>b</sup>2012-2016 ACS 5-year estimates, Tables S0101 and S1101

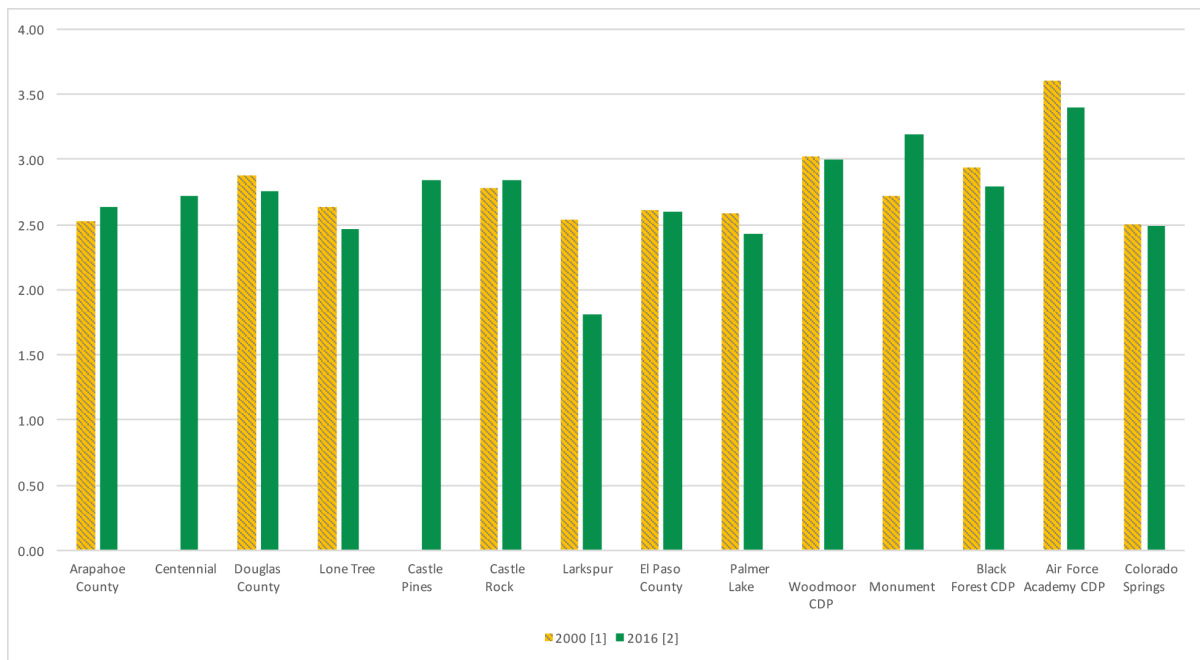
<sup>c</sup>Compound Annual Growth Rate

Note:

CAGR=Compound Annual Growth Rate

## 2.2.2 Average Household Size

Household size has decreased or remained flat in most jurisdictions, as seen in Figure 2. Declines have generally not been sizeable, except for Larkspur where the average household size decreased from 2.54 persons in 2000 to 1.81 in 2016. Arapahoe County, Monument, and Castle Rock experienced increases in average household sizes between 2000 to 2016. Within the study area, average household size is generally between 2 and 3 persons, although Air Force Academy and Monument have average household sizes over 3. The Air Force Academy household sizes can be partially attributed to group living while increases in Monument can be attributed to an increase in family households in the area.

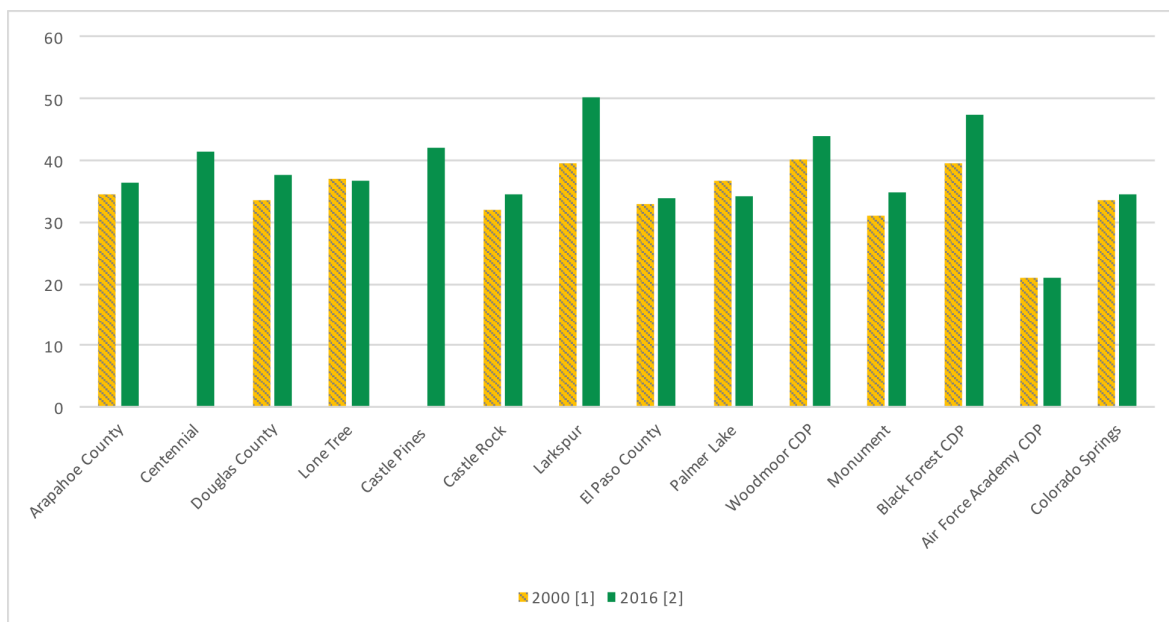


Source: U.S. Census, ArLand

Figure 2. Average Household Size, 2000 and 2016

### 2.2.3 Median Age

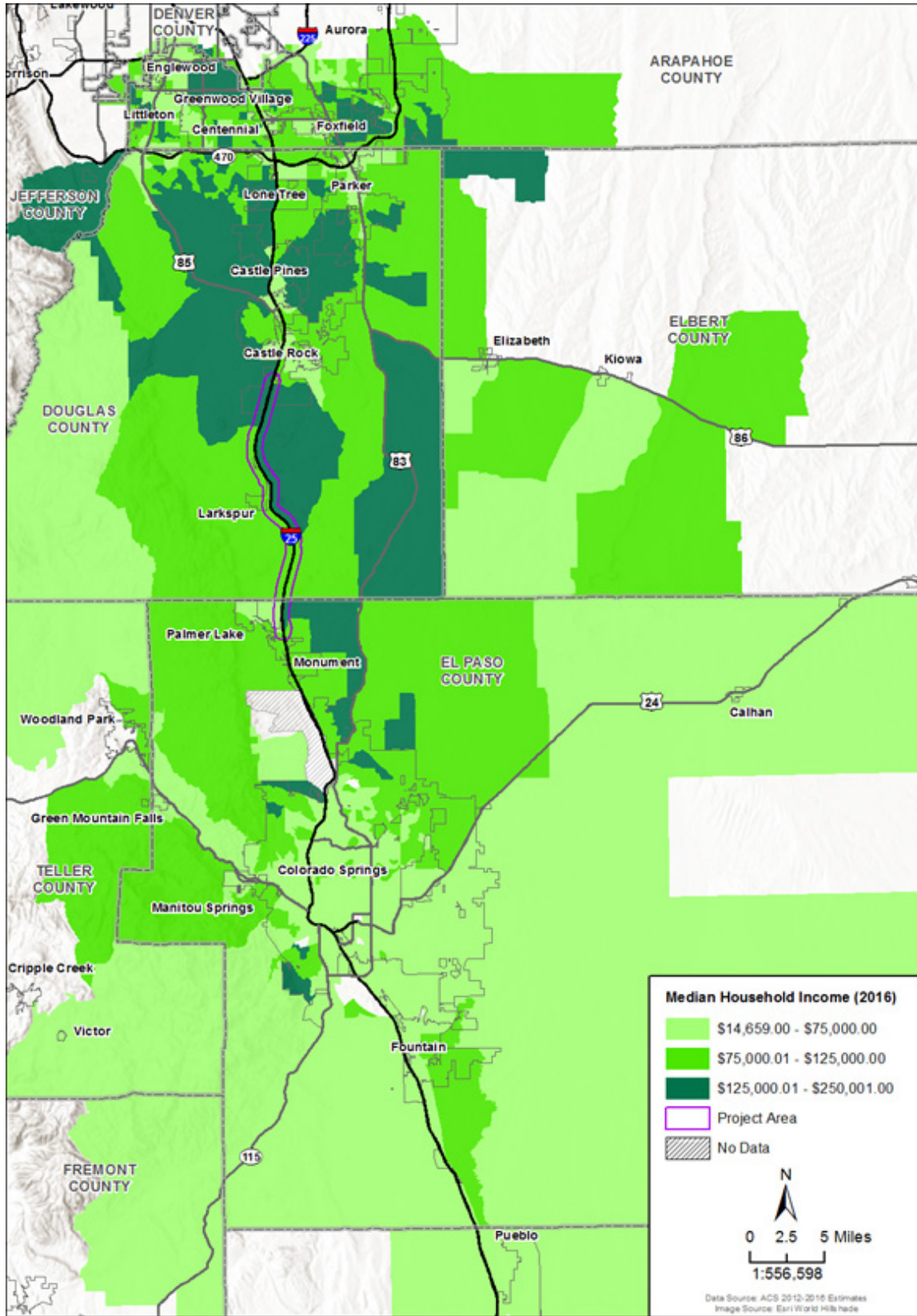
In general, the study area has experienced an increase in median ages as depicted in Figure 3. Larkspur and Black Forest have experienced very large increases in their median ages, which are now 50.1 and 47.3 years in 2016, respectively. Castle Pines and Centennial also have high median ages, both over 40 in 2016. Douglas County and Woodmoor also experienced sizeable increases in median age since 2000. Not surprisingly, the Air Force Academy had the lowest median age in 2016 at just under 21 years, due to the large number of students.



Source: U.S. Census, ArLand

Figure 3. Median Age, 2000 and 2016

### 2.2.4 Median Household Income



Source: U.S. Census, ArLand

Figure 4. Median Household Incomes, 2016



Figure 4 depicts three ranges of median household incomes, with darker green representing higher incomes. Pockets of higher incomes are scattered throughout the area, although a distinct concentration exists between C-470 and Larkspur, including most of the area west of I-25 from south of Highlands Ranch to southern Castle Rock.

A closer look at jurisdictional figures in Table 2 show that of the three counties, Douglas County had the highest estimated median household income in 2016, at about \$106,000. Communities within Douglas County also had very high median household incomes. In 2016, Castle Pines had the highest median household income at just under \$141,000 per year followed by Lone Tree at \$115,000. On the other hand, Larkspur's estimated median household income in 2016 was about \$35,500 which decreased from a 2010 median household income of \$57,250.

In El Paso County, Woodmoor and Black Forest had median household incomes well over \$100,000. The greatest percentage increases in median household incomes between 2010 and 2016 were seen in Monument and the Air Force Academy. Palmer Lake and Colorado Springs were in the mid-\$50,000 range, which is just under the statewide median household income of about \$62,500.

Table 2. Median Household Incomes, 2000-2016

	2000 <sup>a</sup>	2010 <sup>b</sup>	2016 <sup>c</sup>	Growth 2000-2016	CAGR <sup>d</sup> 2000-2016 (percent)
Arapahoe County	\$53,570	\$58,719	\$66,288	\$12,718	1.3
Centennial	--	\$87,007	\$96,422	--	--
Douglas County	\$82,929	\$99,198	\$105,759	\$22,830	1.5
Lone Tree	\$96,308	\$108,190	\$115,049	\$18,741	1.1
Castle Pines	--	\$137,019	\$140,764	--	--
Castle Rock	\$64,138	\$85,461	\$93,153	\$29,015	2.4
Larkspur	\$43,750	\$57,250	\$35,556	-\$8,194	-1.3
El Paso County	\$46,844	\$56,268	\$60,219	\$13,375	1.6
Palmer Lake	\$52,340	\$59,261	\$57,727	\$5,387	0.6
Woodmoor CDP	\$97,359	\$109,849	\$124,301	\$26,942	1.5
Monument	\$50,000	\$89,203	\$98,397	\$48,397	4.3
Black Forest CDP	\$77,085	\$103,551	\$112,544	\$35,459	2.4
Air Force Academy CDP	\$43,417	\$67,083	\$71,705	\$28,288	3.2
Colorado Springs	\$45,081	\$53,074	\$56,227	\$11,146	1.4

Source: U.S. Census, ArLand

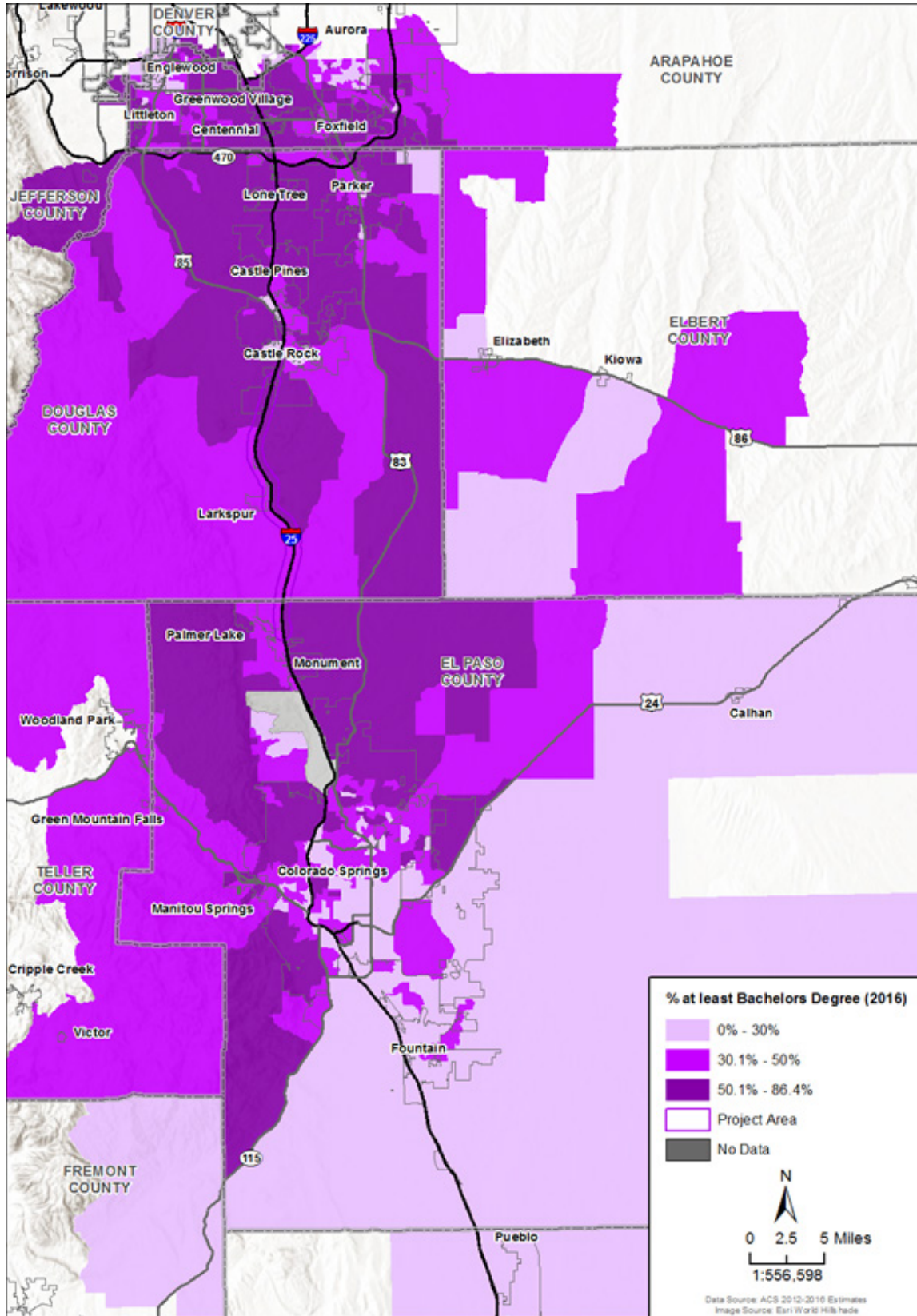
<sup>a</sup>Census 2000, Table P053

<sup>b</sup>2006-2010 ACS 5-year estimates, Table B19013

<sup>c</sup>2012-2016 ACS 5-year estimates, Table B19013

<sup>d</sup>Compound Annual Growth Rate

## 2.2.5 Educational Attainment



Source: U.S. Census, ArLand

Figure 5. Percent of Population 25+ with a Bachelor's Degree, 2016

As seen in Figure 5, the study area has very high levels of educational attainment. At least 30% of the population from the southern Denver metropolitan area to Colorado Springs has at least a bachelor's degree. Higher levels of educational attainment, shown in darker shades of purple, are concentrated in Douglas County along I-25 and north of Colorado Springs.

Those jurisdictions with very high median incomes also have higher levels of educational attainment as seen in Table 3. Almost 60% of Douglas County's population aged 25 years and over had a bachelor's degree or higher in 2016. About 40% of Arapahoe County and 37% of El Paso County's population over the age of 25 had a bachelor's degree or higher in 2016. Within Douglas County, Castle Pines and Lone Tree had approximately 70% of their populations with at least a bachelor's degree. Larkspur had the lowest educational attainment of any jurisdiction in the study area.

Table 3. 2016 Percentage of Population with Bachelor's Degree and Higher

	2016 <sup>a</sup> (percent)
Arapahoe County	40.7
Centennial	55.4
Douglas County	57.5
Lone Tree	69.3
Castle Pines	70.6
Castle Rock	48.5
Larkspur	15.1
El Paso County	36.6
Palmer Lake	38.4
Woodmoor CDP	64.9
Monument	55.0
Black Forest CDP	56.0
Air Force Academy CDP	28.6
Colorado Springs	37.8

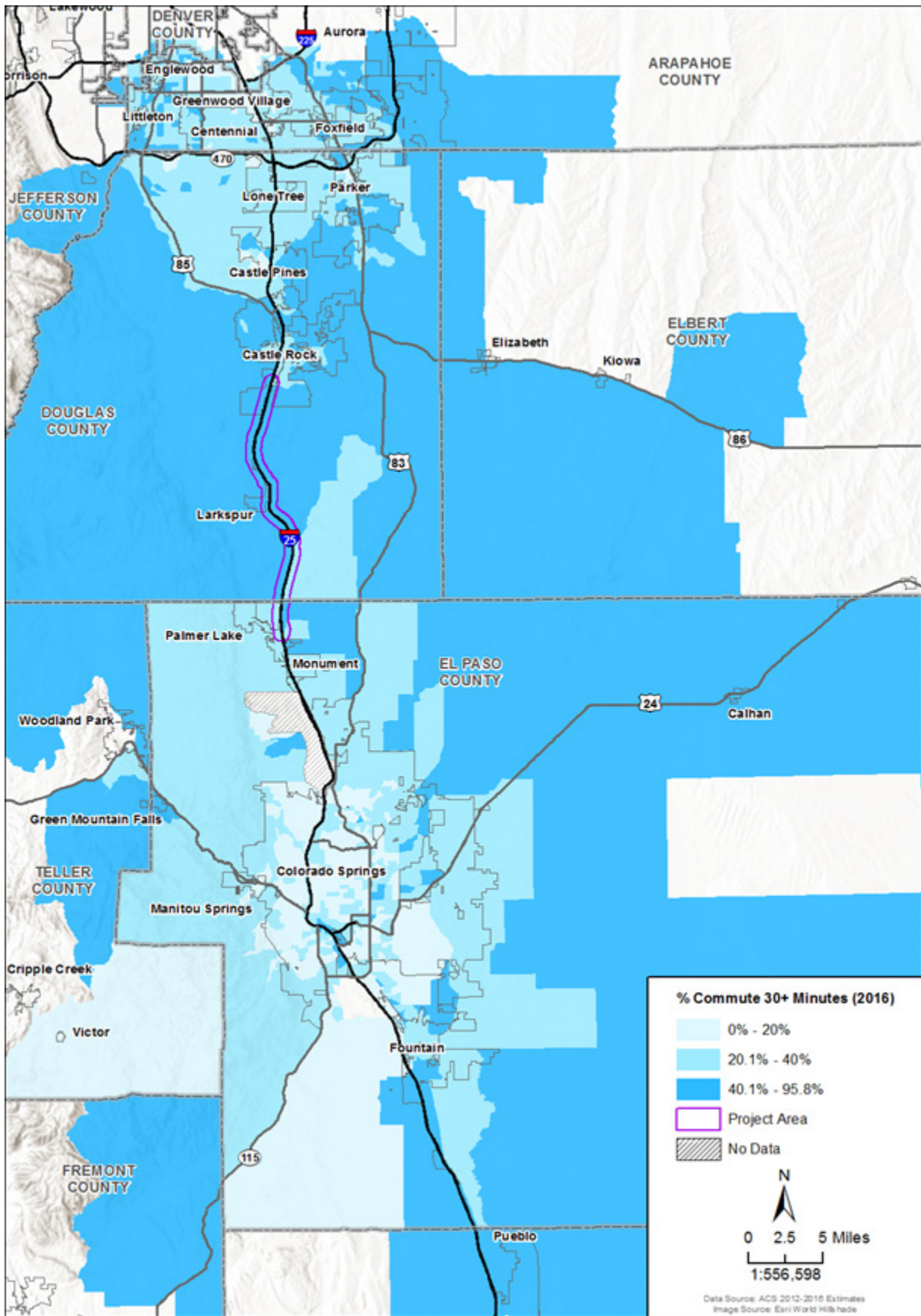
Source: U.S. Census, ArLand

<sup>a</sup>2012-2016 ACS 5-year estimates, Table S1501

## 2.2.6 Journey to Work

Figure 6 depicts the percentage of the population with commuting times in excess of 30 minutes. Most areas along I-25 from the southern end of the Denver metropolitan area to northern El Paso County have at least 20% of the population with 30+ minute commute times. Areas in and around south Denver and in and around Colorado Springs have lower percentages of the population with long commute times compared with the area from Castle Rock to Monument where over 40% of the population has a commute time over 30 minutes.

It illustrates that the Colorado Springs metropolitan area and the Denver metropolitan area are their own respective labor sheds. The location of forecast growth and other workforce trends as further discussed will bring these two labor sheds even closer together with resulting impacts on traffic conditions.



Source: U.S. Census, ArLand

Figure 6. Journey to Work, 2010-2016

## 2.3 Population and Household Forecasts

Arapahoe, Douglas, and El Paso Counties are all expected to grow by over 1% per year through 2040. Combined, the three counties are forecast to grow by almost 700,000 people. El Paso County is forecast to add the most residents at more than 300,000 people, followed by Arapahoe County at just under 250,000. Many of the communities within each county are forecast to grow, but by varying rates as seen in Table 4.

Table 4. Forecast Population and Household Growth, 2015-2040

	2015 ACS <sup>a</sup>	2015 DRCOG / PPACOG	% Difference between ACS and DRCOG / PPACOG (percent)	2040 DRCOG / PPACOG	DRCOG / PPACOG Growth 2015-2040	CAGR 2015-2040 (percent)
<b>Population</b>						
Arapahoe County	608,310	633,268	-4.1	874,708	241,440	1.3
Centennial	106,604	105,216	1.3	113,185	7,969	0.3
Douglas County	306,974	286,572	6.6	422,912	136,340	1.6
Lone Tree	12,462	12,766	-2.4	15,945	3,179	0.9
Castle Pines <sup>b</sup>	10,399					
Castle Rock	52,143	52,506	-0.7	75,807	23,301	1.5
Larkspur	248	377	-52.0	428	51	0.5
El Paso County	655,024	664,407	-1.4	978,349	313,942	1.6
Palmer Lake	2,529	2,284	9.7	3,507	1,223	1.7
Woodmoor CDP	8,427	8,254	2.1	8,873	619	0.3
Monument	6,252	6,295	-0.7	12,218	5,923	2.7
Black Forest CDP	12,918	15,102	-16.9	34,702	19,600	3.4
Air Force Academy CDP	5,864	670	88.6	670	0	0.0
Colorado Springs	442,040	424,506	4.0	557,877	133,371	1.1
<b>Households</b>						
Arapahoe County	229,601	252,608	-10.0	364,030	111,422	1.5
Centennial	38,991	39,800	-2.1	43,402	3,602	0.3
Douglas County	111,113	117,772	-6.0	183,886	66,114	1.8
Lone Tree	4,955	4,695	5.2	6,140	1,445	1.1
Castle Pines <sup>b</sup>	3,683					
Castle Rock	18,721	18,928	-1.1	29,242	10,314	1.8
Larkspur	139	146	-5.0	166	20	0.5
El Paso County	245,287	261,279	-6.5	378,956	117,677	1.5
Palmer Lake	1,038	891	14.2	1,372	481	1.7
Woodmoor CDP	2,795	2,955	-5.7	3,172	217	0.3
Monument	1,909	2,045	-7.1	3,986	1,941	2.7
Black Forest CDP	4,703	5,374	-14.3	12,251	6,877	3.4

	2015 ACS <sup>a</sup>	2015 DRCOG / PPACOG	% Difference between ACS and DRCOG / PPACOG (percent)	2040 DRCOG / PPACOG	DRCOG / PPACOG Growth 2015-2040	CAGR 2015-2040 (percent)
Air Force Academy CDP	515	239	53.6	239	0	0.0
Colorado Springs	174,441	174,862	-0.2	228,802	53,940	1.1

Source: DRCOG, PPACOG, ArLand

<sup>a</sup>2011-2015 ACS 5-year estimates, Tables S0101 and S1101

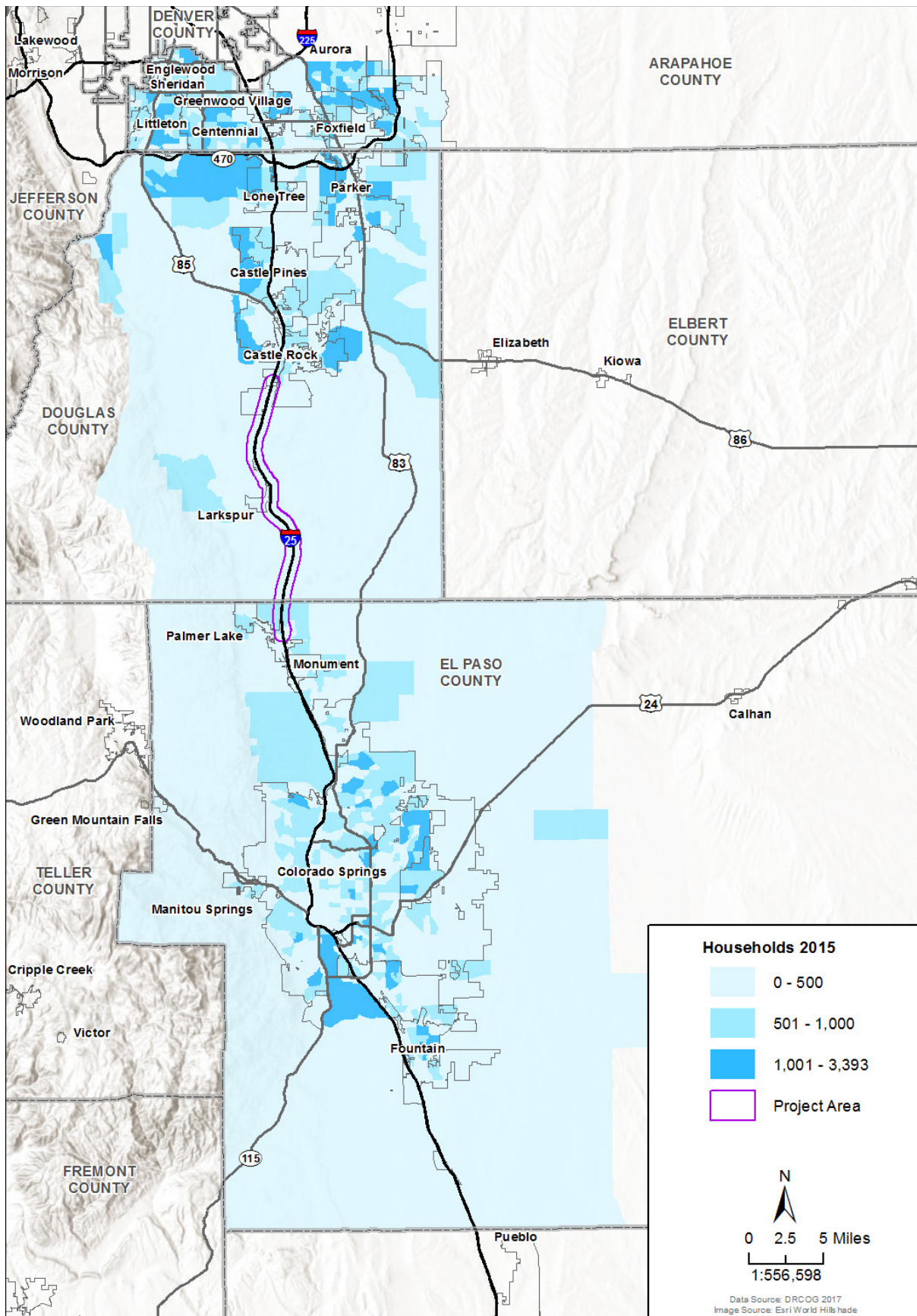
DRCOG Land Use Explorer - <http://landuseexplorer.drcog.org/>

<sup>b</sup> Forecasts for Castle Pines not available from DRCOG. Community is undergoing significant expansion through annexation.

The relative concentration of households is expected to change by 2040, as seen in Figure 7. In 2015, higher household densities were present in the southwestern Denver metropolitan area, southeast Aurora, and in Colorado Springs and areas to its northeast. By 2040, household density is forecast to increase in northeastern Douglas County, along I-25 in the Castle Pines to Castle Rock area, and east/northeast of Colorado Springs in El Paso County.

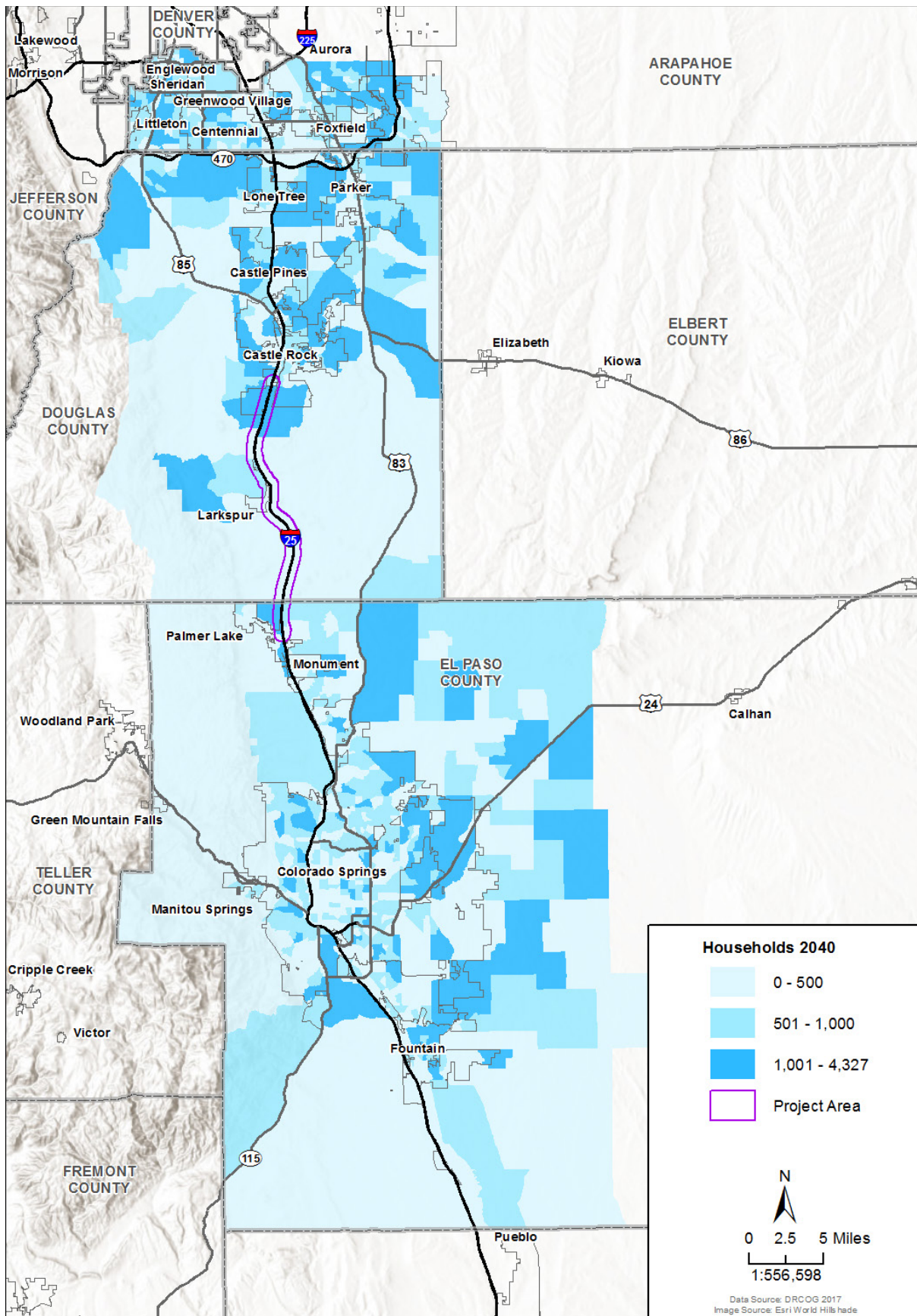
There is a significant amount of household and employment growth planned for the study area which extends beyond 2040. Table 5 and Figure 9 show the planned developments in more detail and where they are planned. Many of these projects are currently under construction and through interviews with the various planning departments, an estimate of what is remaining to be developed has been collected. There are several developments where information about what is being planned is currently not available including Monument Ridge in Monument, and Canyons South in Douglas County. In Douglas County, there is also a significant amount of planned development in and near Parker which is closer to Highway 83. Those Parker-area developments have not been included in this table.

According to Table 5, there are nearly 50,000 dwelling units, 15 million square feet of commercial space that are planned or remaining to be built that have been specifically identified. There are 960 acres of land designated for future commercial uses where square footages are unknown. Additionally, there are 20,000 acres where plans are currently unknown but likely to include a significant amount of residential and commercial development.



Source: DRCOG, ArLand

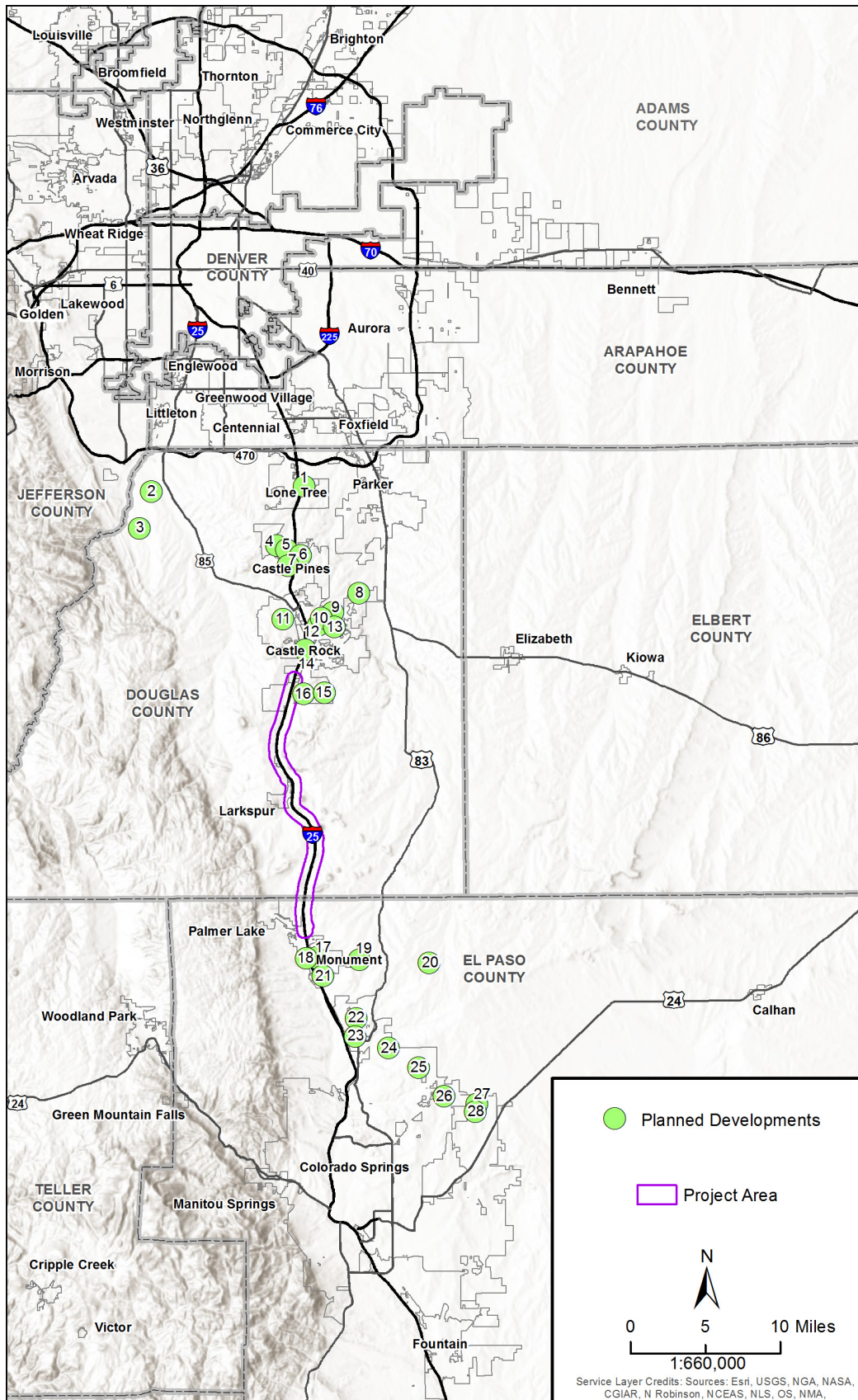
Figure 7. 2015 Households



Source: DRCOG, ArLand

Figure 8. 2040 Households





Source: ArLand

Figure 9. Planned Developments

Table 5. Planned Developments in Study Area, 2015-2040

Map #	Name	City/Town /County	Residential Units	Commercial Space (s.f.)	Commercial Acres	Total Acres (if Plans NA)	Status	Notes
1	RidgeGate	Lone Tree	10,000	10,000,000	---		Under Construction	3,500-acre, mixed-use development south of Lincoln Avenue, east and west of I-25. RTD has started construction of the SE light rail extension from Lincoln to RidgeGate. The RidgeGate station will be a hub for additional mixed-use development on the east side of I-25. Will include parks, trails, open space, and both retail and office development.
2	Plum Creek	Douglas County	1,100	0	---		Preapp Process	Single Family Residential
3	Sterling Ranch	Douglas County	12,050	---	500		Under Construction	3,400 acres including 1,200 acres of open space. 31,000 residents, 20-year buildout.
4	Legacy Village of Castle Pines	Castle Pines	176	0	---		Under Construction	176-unit assisted living facility on 7-acre property at the northwest corner of Castle Pines Parkway and Monarch Blvd.
5	Castle Pines Town Center	Castle Pines	675	500,000	---		Under Construction	A 354-acre planned development which allows for a mix of land uses including parks, open space, trails, schools, civic, community, commercial, retail, agricultural, up to 475 single family residences and 200 multifamily residences. 500,000+ s.f. of mixed use/non-residential, concentrated at Happy Canyon and I-25.
6	The Canyons	Castle Pines	2,500	2,100,000	---		Under Construction	The Canyons is a 3,343-acre master planned community which allows for a mix of land uses including parks, open space, trails, schools, civic, community, commercial, retail, agricultural, and single-family/multifamily land uses. 2,500 DUs. 2.1 million sf of mixed use/non-residential, which is generally concentrated at southeast corner of Hess Road and I-25. To include 20 acres for civic uses, a 4-acre transit station, 1.5 acres for fire stations, 113 acres of public parks, 50 acres for public schools, and 1,400 acres for open space.
7	Castle Pines Valley	Castle Pines	631	400,000	---		Under Construction	Two Phases, with home building in 2017-2019. Located just south of the Village Square Commercial District, Castle Pines Valley (formerly known as Lagae Ranch) is a 249-acre planned development which includes Elk Ridge Park, American Academy Charter School (completed in 2009), up to 231 single-family homes, 400 multi-family residences, an additional elementary school, 76 acres of open space, trails, civic uses, community uses, commercial uses and limited retail uses. Approx. 400,000 s.f. civic/commercial.

2.0 COMMUNITY PROFILE

Map #	Name	City/Town /County	Residential Units	Commercial Space (s.f.)	Commercial Acres	Total Acres (if Plans NA)	Status	Notes
8	Liberty Village	Castle Rock	515	0	---		Under Construction	Located west of Highway 83 along Castle Oaks Drive. 1,337.5 acres. 5,785 DUs total, with about 515 DUs remaining to be built.
9	Canyons South	Douglas County		---	---	1,580	Preapp Process	The property is currently zoned for development and Douglas County is currently working on the PD Plan. Approximately 1,580 acres.
10	Pioneer Ranch	Castle Rock	1,123	400,000	---		Under Review	Located west of Founders Parkway and east of Front Street. Metzler Ranch PD is located to the west, Pinion Soleil to the north and Pine Canyon (A-1) to the south. The site is approximately 388 acres, with 78 acres of open space and 40 acres dedicated public land to include a school site.
11	The Meadows	Castle Rock	4,320	0	---		Under Construction	The Meadows neighborhood (approx. 2,693 acres) on the northern edge of Castle Rock has added an estimated 5,200 homes to the town since 1987 with an additional 600 homes slated to be built in the area in the next three to four years. The town approved more than 10,800 residential units in total. About 60% built out, with approx. 4,320 DUs remaining to be built.
12	Pine Canyon	Castle Rock	1,320	815,000	---		Under Review	Located west of Founders Parkway, east of Front Street. The Woodlands PD is adjacent to the south and Douglas County A-1 property lies to the north. A portion of the property is located west of I-25 and east of Liggett Road. The site is approximately 540 acres. The proposed PD Plan, PD Zoning Regulations and traffic impact analysis are under staff review. 1,320 max. residential (mix of SF and multifamily (attached and detached). 815,000 max. commercial, office, retail (majority west of I-25). 133 acres of site maintained as public or private open space
13	Terrain at Castle Rock	Castle Rock	1,700	0	---		Under Construction	Located on 1,185 acres about three miles east of I-25, east of Founders Parkway. Nearly 600 acres of Terrain is dedicated for parks, open space and the preservation of historical markers. Approx. 1,700 DUs remaining to be built.
14	Riverwalk	Castle Rock	228	48,000	---		Under Construction	Mixed-use development of two blocks of downtown on both sides of Sellars Gulch on Wilcox Street. 228 apartments and about 48,000 s.f. of office, retail, and restaurant space (14,000 sf of ground level retail, 34,000 sf of commercial office space)

Map #	Name	City/Town /County	Residential Units	Commercial Space (s.f.)	Commercial Acres	Total Acres (if Plans NA)	Status	Notes
15	Crystal Valley Ranch	Castle Rock	980	0	---		Under Construction	Approximately 1,088 acres. 2,889 DUs total, with about 980 remaining to be built.
16	The Lanterns	Castle Rock	1,200	---	---		PD approved	The Lanterns Planned Development is located south of Plum Creek Boulevard and Crystal Valley Parkway. The site is approx. 848 acres. 663 of 1,200 DUs are planned for 55+ years of age. Initial construction phases planned for early 2018.
17	Jackson Creek Senior Living	Monument	150	0	---		Under Construction	Located at Jackson Creek Parkway & Harness Road. Approximately 150 estimated units.
18	Wagons West	Monument	131	---	---		Preliminary PD Approved	Located on Old Denver Highway. 131 DUs. Annexed and preliminary PD Site Plan approved, but not platted.
19	Sanctuary Pointe	Monument	600	---	---		Under Construction	Located along the western edge of the Black Forest at Sanctuary Rim Drive and Baptist Rd. Phase 1 is for 257 DUs, which are under construction. Phase 2 is for 273 DUs. Phase 2 is under review. Phase 3 max is 70 DUs.
20	Flying Horse North	El Paso County	283	---	---		PD approved	1,417 acres. 283 residential lots and either a golf course or open space with trails.
21	Monument Ridge	Monument	---	---	---		Sketch Plan	This residential project located at the southeast corner of Baptist Road and Struthers Road is at sketch plan review. The number of DUs is currently unknown.
22	Flying Horse	Colorado Springs	950	---	118		Under Construction	1,593-acre planned development. 2,715 DUs total at build out. 197-acre golf course; 62 acres office; 76.5 acres commercial. About 65% built out, with approx. 950 DUs and 118 acres of commercial remaining to be built.
23	The Farm	Colorado Springs	723	550,000	---		Under Construction	The property is a 475-acre PUD and located between I-25 and Voyager Parkway, north of Interquest Parkway. Max of 1,446 DUs. Max of 1.1 million s.f. of commercial and employment allowed per the annexation agreement. About 50% built out. Development remaining is approx. 723 DUs and 550,000 s.f. commercial.

2.0 COMMUNITY PROFILE

Map #	Name	City/Town /County	Residential Units	Commercial Space (s.f.)	Commercial Acres	Total Acres (if Plans NA)	Status	Notes
24	Cordera Commercial North	Colorado Springs	---	---	18		Concept Plan Approved	Concept Plan approved October 2017. Approx. 18 acres of commercial in compliance with the Briargate Master Plan.
25	Wolf Ranch	Colorado Springs	3,250	---	29		Under Construction	1,982 acres. About 7,500 DUs, 30 acres mixed use, and 28 acres neighborhood commercial total. About 50% built out. Approx. 3,250 DUs and 29 acres mixed use/commercial remaining to be built.
26	Woodmen Heights	Colorado Springs	1,046	---	295		Under Construction	816.25-acre Master Plan. 38 acres regional commercial/office; 62 acres community commercial/office; 90 acres neighborhood commercial/office, 5 acres office, 100 acres major assembly. Approx. 4,183 DUs. About 75% built out. Approx. 1,046 DUS and 295 acres commercial remaining to be built.
27	Banning Lewis Ranch Village Two	Colorado Springs	2,377	175,000	---		PD Approved	426.9 acres. 2,377 DUs. 175,000 s.f. commercial.
28	Banning Lewis Ranch	Colorado Springs	---	---	---		Under Construction	18,000 acres
29	Forest Lakes	El Paso County	467	---	---		Under Construction	Master planned community located north of the U.S. Air Force Academy, just one mile west of I-25, off Baptist Road. Public and private trails, two neighborhood parks, and 450 acres of open space and 2 community lakes in 990 acres..
<b>TOTAL</b>			<b>48,495</b>	<b>14,988,000</b>	<b>960</b>	<b>20,000+</b>		

Sources: Planning and Community Development Departments of Douglas County, El Paso County, Castle Pines, Castle Rock, Monument, Colorado Springs, ArLand

## 3.0 Study Area Economy

### 3.1 Gross Regional Product

In 2017, Colorado’s Gross State Product was estimated at approximately \$313 billion (Table 6). The Gross State Product (GSP) is the market value of all final goods and services produced in the state in 2017. The Gross Regional Product (GRP) is a similar measure for smaller geographic areas, in this case, the County. As seen in Table 6, the GRP of the three counties encompassing the project area represents about 30% of that of the State of Colorado. Arapahoe County has the highest GRP of the three counties, at almost \$45 billion.

Table 6. Gross Regional and State Products, 2017

	Gross Regional Product	Percent of Total
<b>El Paso County</b>	\$33,101,956,854	10.6%
<b>Douglas County</b>	\$16,560,482,439	5.3%
<b>Arapahoe County</b>	\$44,999,806,101	14.4%
<b>Arapahoe, Douglas, and El Paso Counties</b>	\$94,662,245,395	30.2%
<b>State of Colorado</b>	\$313,513,019,587	100.0%

Source: Arapahoe-Douglas Works, Emsi, ArLand

### 3.2 Jobs

There are a significant number of jobs in Arapahoe, Douglas, and El Paso Counties. As seen in Table 7, total 2016 average employment in the three counties was just over 700,000, which represented 27.5% of all Colorado jobs. In the three-county area, the three sectors with the highest average employment were Health Care and Social Assistance, Retail Trade, and Accommodation and Food Services. The Professional and Technical Services sector was a close fourth.

In the three-county area, as shown in Table 8, there has been an increase of about 124,000 jobs since 2000, which represents about 34% of the state’s job growth over the past decade and a half. Both the state and the three-county area saw the largest employment increase in the Health Care and Social Assistance sector. Employment in the manufacturing sector was hit the hardest since 2000, losing about 47,000 jobs statewide and 16,000 jobs in the three-county area, representing about 35% of statewide job losses in this sector.

Table 7. Average Annual Employment by Industry, 2016

	Arapahoe County	Douglas County	El Paso County	Arapahoe, Douglas, and El Paso Counties	State of Colorado	3-County Percent of State Total
<b>Accommodation and Food Services</b>	26,161	11,962	29,518	67,641	271,208	24.9%
<b>Administrative and Waste Services</b>	26,640	6,070	18,892	51,602	158,622	32.5%
<b>Agriculture, Forestry, Fishing &amp; Hunting</b>	94	193	414	701	16,516	4.2%
<b>Arts, Entertainment, and Recreation</b>	5,470	3,273	5,152	13,895	58,670	23.7%
<b>Construction</b>	20,244	8,363	14,850	43,457	158,294	27.5%
<b>Educational Services</b>	22,930	10,732	26,918	60,580	216,536	28.0%
<b>Finance and Insurance</b>	28,516	8,231	12,077	48,824	109,478	44.6%

	Arapahoe County	Douglas County	El Paso County	Arapahoe, Douglas, and El Paso Counties	State of Colorado	3-County Percent of State Total
<b>Health Care and Social Assistance</b>	43,035	11,825	39,496	94,356	327,736	28.8%
<b>Information</b>	17,675	5,912	6,417	30,004	74,394	40.3%
<b>Management of Companies and Enterprises</b>	7,280	3,010	1,219	11,509	36,833	31.2%
<b>Manufacturing</b>	8,148	2,378	11,480	22,006	142,764	15.4%
<b>Mining</b>	714	478	65	1,257	23,575	5.3%
<b>Other Services, Ex. Public Admin</b>	8,959	3,957	10,853	23,769	78,887	30.1%
<b>Professional and Technical Services</b>	31,529	12,032	23,309	66,870	211,593	31.6%
<b>Public Administration</b>	13,051	3,236	13,157	29,444	146,379	20.1%
<b>Real Estate and Rental and Leasing</b>	6,312	1,694	4,653	12,659	49,645	25.5%
<b>Retail Trade</b>	34,614	17,924	32,687	85,225	270,137	31.5%
<b>Transportation and Warehousing</b>	5,069	1,302	5,234	11,605	81,957	14.2%
<b>Unclassified</b>	28	9	39	76	764	9.9%
<b>Utilities</b>	260	430	2,493	3,183	14,176	22.5%
<b>Wholesale Trade</b>	14,836	3,800	5,525	24,161	104,882	23.0%
Total, All Industries	321,566	116,808	264,447	702,821	2,553,045	27.5%

Source: Labor Market Information, Quarterly Census of Employment and Wages Program, ArLand

Table 8. Average Annual Employment Change, 2000 to 2016

	Arapahoe County	Douglas County	El Paso County	Arapahoe, Douglas, and El Paso Counties	State of Colorado	3-County Percent of State Total
Accommodation and Food Services	5,474	5,773	6,427	17,674	67,017	26.4%
Administrative and Waste Services	4,092	4,177	1,167	9,436	12,996	72.6%
Agriculture, Forestry, Fishing & Hunting	-59	95	123	159	1,686	9.4%
Arts, Entertainment, and Recreation	1,376	2,190	1,241	4,807	12,183	39.5%
Construction	-2,090	242	-583	-2,431	-8,489	28.6%
Educational Services <sup>a</sup>	5,214	---	7,799	13,013	57,782	22.5%
Finance and Insurance	4,094	5,318	1,165	10,577	7,916	133.6%
Health Care and Social Assistance	20,915	9,647	18,257	48,819	138,302	35.3%
Information	-10,965	2,271	-5,829	-14,523	-34,186	42.5%
Management of Companies and Enterprises	1,705	2,670	270	4,645	18,735	24.8%
Manufacturing	-2,906	539	-13,731	-16,098	-46,614	34.5%
Mining	142	398	-24	516	11,883	4.3%
Other Services, Ex. Public Admin	1,250	1,870	1,366	4,486	13,424	33.4%
Professional and Technical Services	5,045	8,712	3,116	16,873	59,079	28.6%
Public Administration	2,427	1,429	2,258	6,114	22,338	27.4%

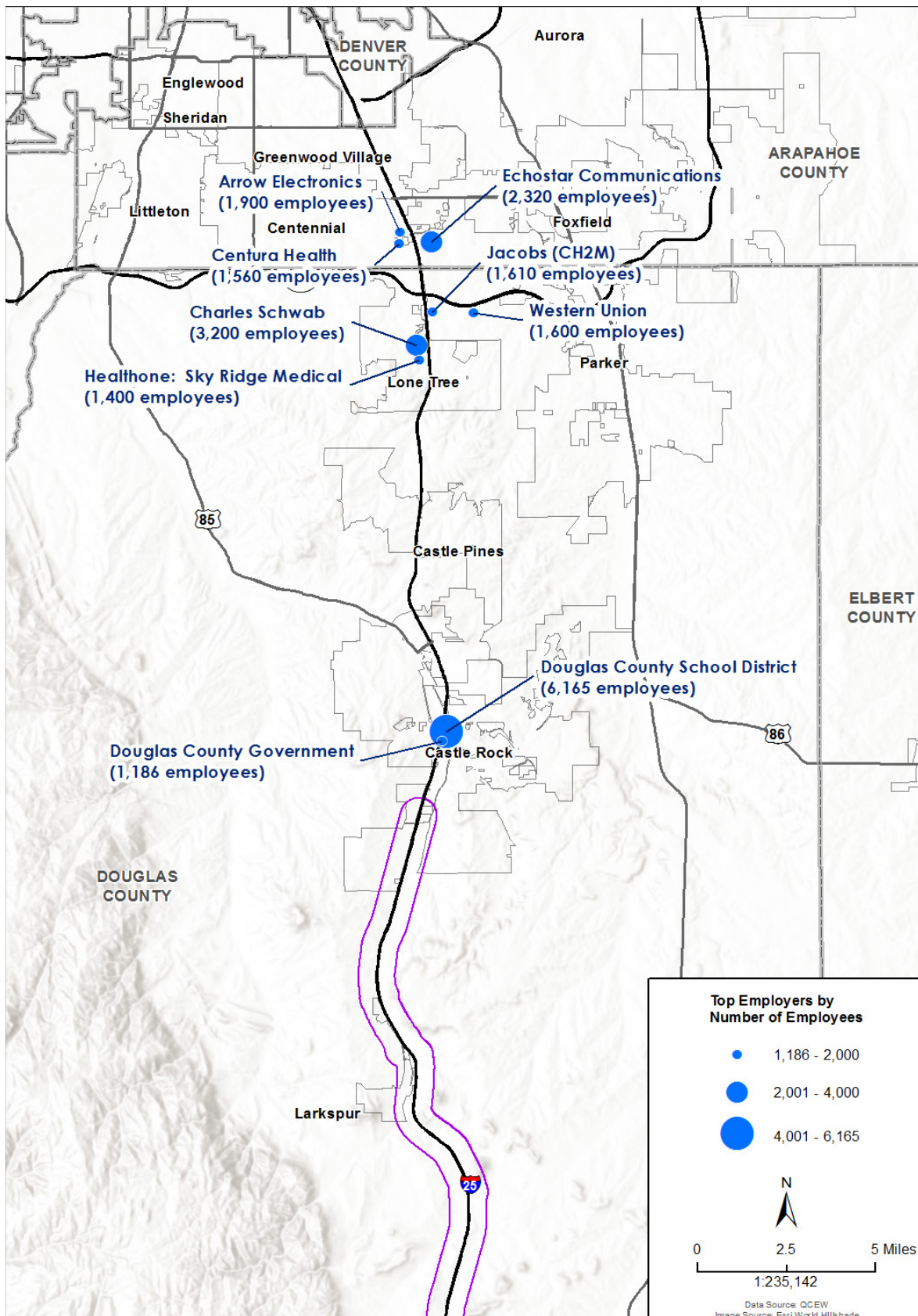
	Arapahoe County	Douglas County	El Paso County	Arapahoe, Douglas, and El Paso Counties	State of Colorado	3-County Percent of State Total
Real Estate and Rental and Leasing	-97	1,037	605	1,545	3,616	42.7%
Retail Trade	3,356	5,780	4,051	13,187	25,034	52.7%
Transportation and Warehousing	324	799	-71	1,052	-2,685	-39.2%
Unclassified <sup>b</sup>	---	---	---	---	730	---
Utilities	-133	160	-94	-67	801	-8.4%
Wholesale Trade	-1,853	1,372	-844	-1,325	4,839	-27.4%
<b>Total</b>	<b>37,336</b>	<b>60,154</b>	<b>26,708</b>	<b>124,198</b>	<b>366,388</b>	<b>33.9%</b>

Source: Labor Market Information, Quarterly Census of Employment and Wages Program, ArLand

<sup>a</sup> Douglas County Avg. Annual Employment Change not accounted for because 2000 data is confidential. 2016 avg. annual employment was 10,732.

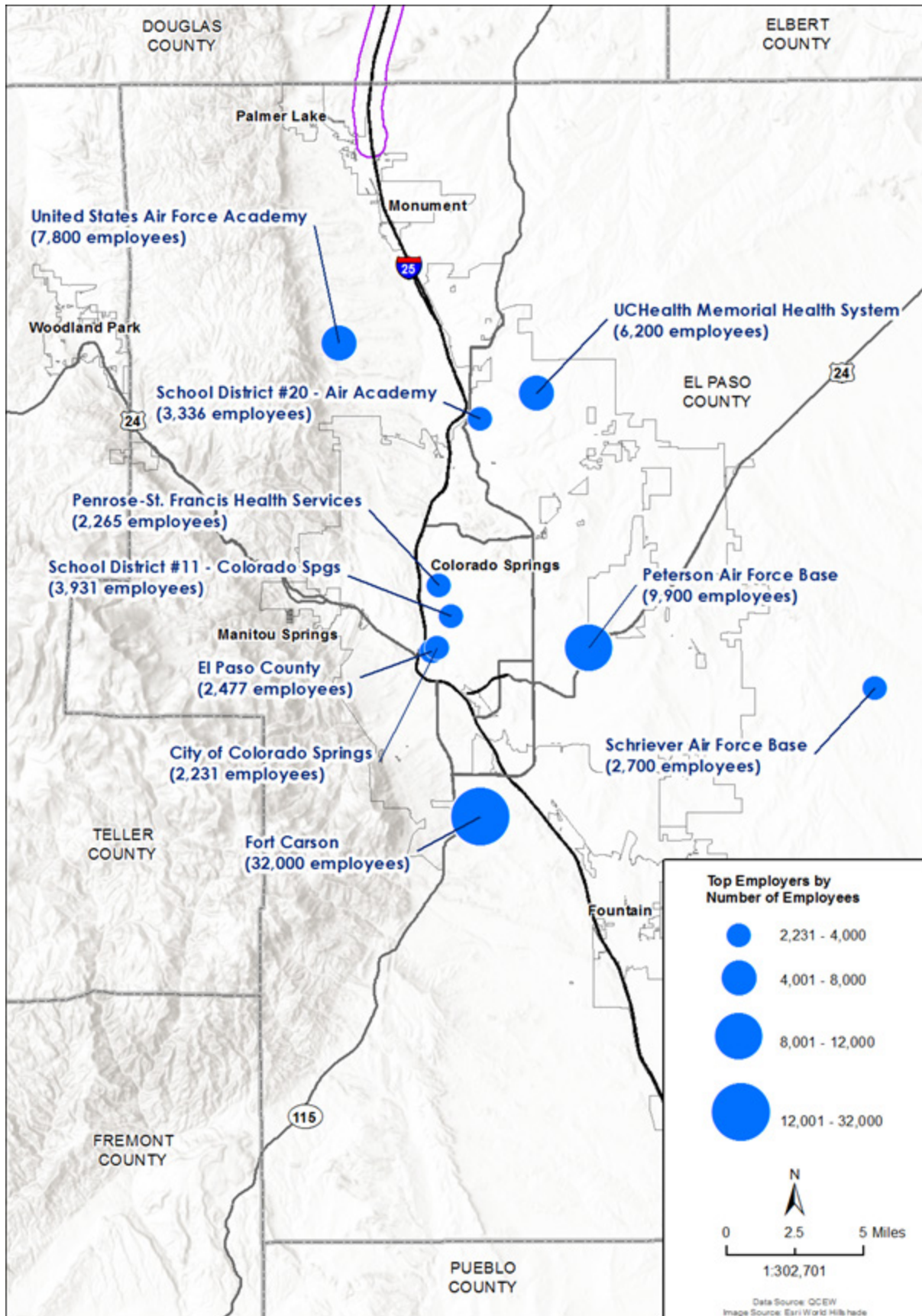
<sup>b</sup> Unclassified sector employment was confidential in 2000 in all three counties. 2016 three-county total was 76.





Source: 2016 Douglas County Comprehensive Annual Financial Report, ArLand

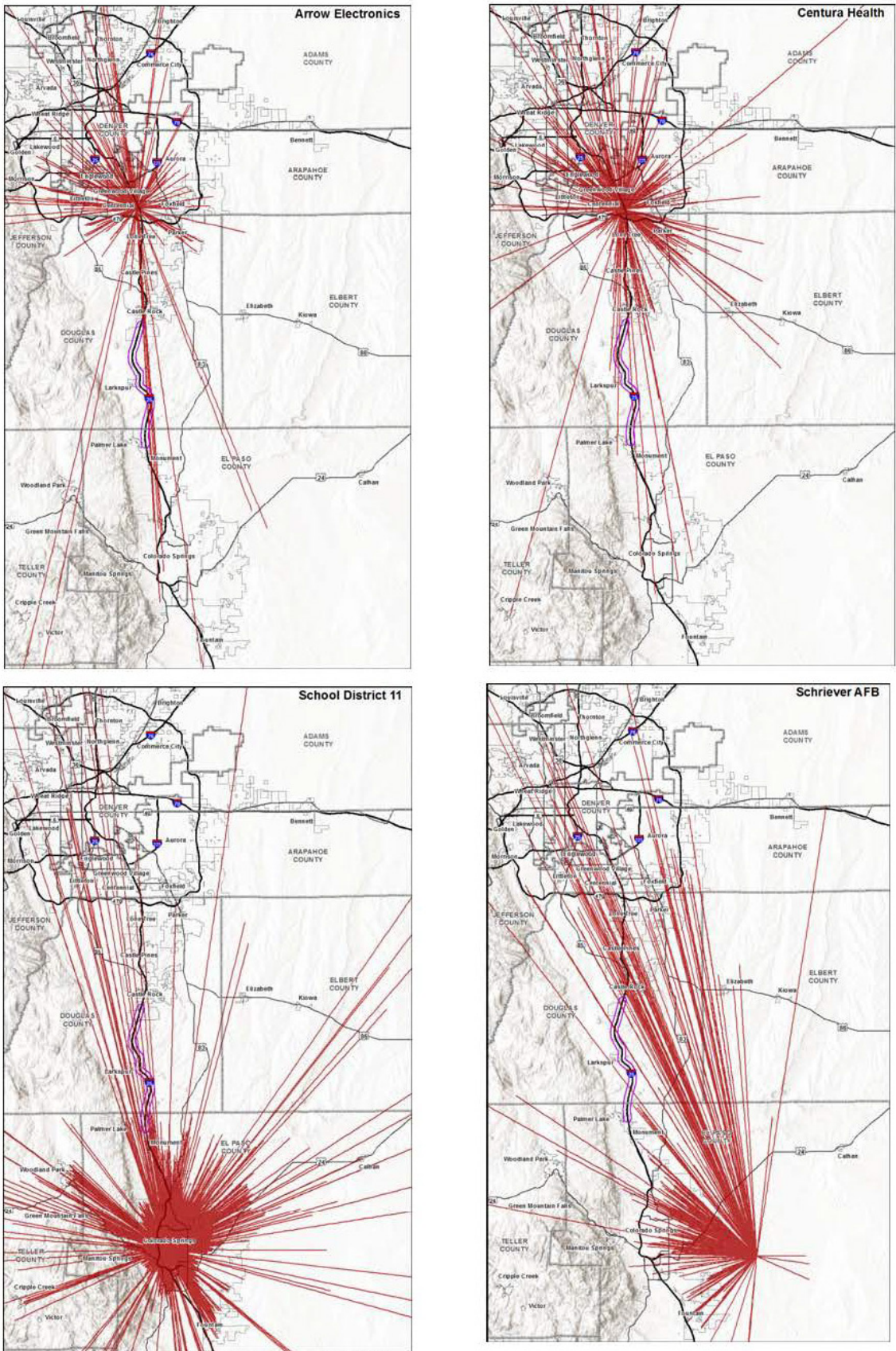
Figure 10. Major Employers in Southwest Arapahoe and Douglas Counties, 2016



Source: 2016 El Paso County Comprehensive Annual Financial Report

Figure 11. Major Employers in El Paso County, 2016

3.0 STUDY AREA ECONOMY



Source: Local Employment Household Dynamics, US Census

Figure 12. Origin-Destination of Select Major Employers (Block Group Analysis), 2016

There are a number of significant employers in southwest Arapahoe, Douglas and El Paso Counties as shown in Figure 10 and Figure 11. . The largest employer in southwest Arapahoe and Douglas Counties in 2016 was the Douglas County School District with just over 6,000 employees. The second and third largest employers were Charles Schwab (3,200 employees) and Echostar Communications (2,320 employees) (Figure 10). Douglas County School District jobs are shown in the head office location, although school district employees such as teachers are scattered throughout the County.

The largest employer in El Paso County (Figure 11) is the United State military with approximately 57,000 employees. The largest military installation is Fort Carson with 32,000 employees, followed by about 9,900 at Peterson Air Force Base, 7,700 at Schriever Air Force Base, and nearly 8,000 at the U.S. Air Force Academy. The largest private employer in the county is the UCHealth Memorial Health System with 6,200 employees.

Figure 12 shows generalized origin-destination information for the same census blocks as select major employers. The radial lines map workers' respective home location destinations. It helps to illustrate that while Denver metro and Colorado Springs commuting tends to take place within each respective labor shed, there are not insignificant numbers of commuters who travel long distances from their homes to work.

### 3.3 Major Industrial Clusters

State and regional economic development corporations monitor economic development “clusters”. Clusters are groups of interrelated industries which represent regional economic relationships that help drive regional economies. Clusters can also include universities and research laboratories that help drive innovation as well as supporting industries. Clusters help attract employees who have a larger potential job pool from which to choose.

The Metro Denver Economic Development Corporation and the Colorado Springs Chamber of Commerce and Economic Development Corporation monitor a number of key industry clusters closely because of their importance to the state and regional economy.

Key industry clusters in the Metro Denver/Northern Colorado region include:

- Aerospace
- Aviation
- Beverage Production
- Bioscience
- Broadcasting and Telecommunications
- Energy
- Financial Services
- Healthcare and Wellness
- Information Technology / Software

Key industry clusters in the Colorado Springs region include:

- Aerospace and Defense
- Information Technology / Cybersecurity
- Healthcare and Medical Technologies
- Sports
- Manufacturing (Advanced Manufacturing)

Our analysis focused on those clusters that were important to both metropolitan areas. Overlapping clusters include:

- Aerospace and Defense

- Information Technology / Computer Software / Cybersecurity
- Healthcare and Medical Technologies

Some of the clusters were collapsed in order to reflect the close relationships among the sectors. The clusters were defined using the North American Industrial Classification Codes as follows:

- Aerospace and Defense:
  - 332993 – Ammunition (except small arms) Manufacturing
  - 334511 - Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing
  - 33641 – Aerospace Product and Parts Manufacturing
  - 541713 – Research and Development in Nanotechnology
  - 541715 – Research and Development in Physical, Engineering, and Life Sciences
  - 9271 – Space Research and Technology
  - 92811 – National Security
- Information Technology / Computer Software / Cybersecurity:
  - 334614 – Software Reproducing
  - 511210 – Software Publishers
  - 518210 – Data Processing, Hosting, and Related Services
  - 541511 – Custom Computer Programming Services
  - 541512 – Computer Systems Design Services
  - 541513 – Computer Facilities Management Services
  - 541519 – Other Computer Related Services
- Healthcare and Medical Technologies:
  - 621-623 – Ambulatory Health Care Services, Hospital, Nursing and Residential Care Facilities
  - 3391 – Medical Equipment and Supplies Manufacturing
  - 3254 – Pharmaceutical and Medicines Manufacturing
  - 3334510 – Electromedical and Electrotherapeutic Apparatus
  - 42345 & 42346 - Medical and Dental Hospital Equipment and Supplies
  - 4242 – Drugs and Druggist Sundries Wholesalers
  - 541713 - Research and Development in Nanotechnology
  - 541714 – Research and Development in Biotechnology
  - 541715 - Research and Development in Physical, Engineering, and Life Sciences

### Aerospace and Defense

The defense and aerospace cluster is a major economic driver in Colorado. The state is home to the second largest space economy in the United States after California and has a sizeable military presence. Colorado has major Department of Defense, NASA, and related commercial activities and is the US center for military space (National Space Defense Center). The presence of the state's four military commands – the primary customers for space based research, development, acquisition, and operations – ensure that this cluster remains strong.

The cluster is dependent on air freight connections and road and rail networks to develop, build, and deploy defense technologies and forces. It relies heavily on the state's highways, including I-25 South, part of the Strategic Highway Network (STRAHNET) system of public highways developed by the Federal Highway Administration (FHWA) and the Department of Defense (DOD) to provide access, continuity, and emergency transportation of personnel and equipment for national defense and security. Connectivity to STRAHNET and the Colorado freight network is very important to the state's active

military installations and many Colorado National Guard facilities. It is particularly important to Fort Carson in El Paso County because it is a major military deployment site with direct access to I-25/U.S. Highway 87, which is on the STRAHNET and the Colorado freight network. Additionally, companies and military facilities in this cluster rely on a multimodal freight transportation options to receive and ship final goods. The state is currently competing with other states to launch the space industry and position space transport as a future freight and cargo mode.

This cluster has a significant presence in the study area. Major private companies in the Aerospace/Defense cluster in the southwestern Arapahoe, Douglas, and El Paso Counties include:

- The Harris Corporation
- Lockheed Martin
- Raytheon
- Sierra Nevada Corporation
- United Launch Alliance

The defense sector in El Paso County, in particular, is an important driver of the regional economy. El Paso County facilities include: Fort Carson, Peterson Air Force Base, Schriever Air Force Base, Cheyenne Mountain, and the Air Force Academy.

The Northern Colorado region also has a strong cluster of companies involved in geospatial technologies, remote sensing, imaging, and related industries. There are companies involved in research, development, design, and manufacturing of products and systems for commercial, military, and civil space applications. This includes products like navigation and detection instruments, guided missiles, spacecraft, satellites, and communications equipment. There are strong relationships among companies in this cluster throughout the Front Range.



Figure 13 shows the locations of the entities in this cluster in the study area. There is significant overlap between this and the following cluster, the Information Technology, Software and Cybersecurity Cluster shown in Figure 14. There is a relatively high concentration of entities in this cluster between I-25 and Foxfield in Arapahoe County and in and around Colorado Springs. Unlike other clusters, this cluster has a number of large employers employing between 200 and 500 persons each. The military bases also employ a significant number of military personnel with Fort Carson employing the most at over 30,000 military and civilian persons.

The Department of Defense (DOD) “industry” in Colorado not only plays a big role in supporting national security, but also the state’s economy. According to a recent study of the economic impact of defense, military, and veterans related activities:

- Total defense sector related employment in Colorado is estimated at nearly 250,000 jobs, 9% of total Colorado wage and salary employment. This includes both persons employed directly by the Defense Sector as well as the multiplier effect of indirect and induced jobs.
- Eight major military installations in the Front Range help generate \$11 billion in total labor income in El Paso, Arapahoe, Pueblo, and Weld Counties. About 41% of El Paso County’s labor income and 12% of Arapahoe County’s labor income is estimated to be defense-sector related.

Much of the state’s DOD-related employment is tied directly to the installations themselves, as seen in Table 9. In 2016, there were over 65,000 people working on military installations in Arapahoe, Weld, Pueblo and El Paso Counties. About 81% of this installation-specific employment was in El Paso County, and about 60% of that was at Fort Carson, which has more than 30,000 employees.

**Table 9. Employment on Colorado’s Front Range Major Military Installations, 2016**

	Military	Civilian	Total
Arapahoe County Installations (Buckley Air Force Base)	7,925	3,802	11,727
Weld County Installations (Greeley Air National Guard)	305	12	317
Pueblo County (Chemical Depot & Preparedness Program)	400	115	515
El Paso County Installations	39,285	13,377	52,662
Fort Carson	25,514	6,527	32,041
Peterson Air Force Base / Cheyenne Mountain	5,632	4,297	9,929
Schriever Air Force Base	2,026	675	2,701
Air Force Academy	6,113	1,878	7,991
<b>3-County Total</b>	<b>47,915</b>	<b>17,306</b>	<b>65,221</b>

Source: Department of Military and Veterans Affairs, ArLand

<sup>a</sup>Military employment includes Active Duty, National Guard and Reserves (estimated on FTE basis); Civilian includes professional and non-professional categories

In part, jobs and labor income are also related to DOD contracts, which are another important component of the DOD “industry” in the state. As seen in Table 10, Arapahoe and El Paso Counties received over two-thirds of the \$6.5 billion in DOD contracts in the state in 2016. Arapahoe County received about 35.3% of all contract dollars, followed by El Paso County at 32.8%.



**Table 10. DOD Contract Value by County, 2016**

	Contract Value <sup>a</sup>	Percent of Statewide Total
Arapahoe	\$2,306,136,422	35.3%
Douglas	\$9,126,923	0.1%
El Paso	\$2,143,956,817	32.8%
Pueblo	\$53,135,687	0.8%
Weld	\$2,522,382	<0.1%
<b>County Total</b>	<b>\$4,514,878,231</b>	<b>69.1%</b>
<b>State of Colorado</b>	<b>\$6,536,208,170</b>	<b>100.0%</b>

Source: Summit Economics, ArLand

<sup>a</sup> Direct contracts and assistance awards; dollars shown represent obligated amounts

Recipients of DOD contracts span multiple sectors but include one particularly important sector in the state - private aerospace contractors. According to the Denver Metro Chamber of Commerce, Colorado's aerospace industry employs more than 7 percent of the nation's aerospace workforce and multiple national aerospace contractors have operations in the state, with key locations along the Front Range.

Arapahoe and El Paso Counties, in particular, are home to base installations and private defense contractors that support the DOD. In addition, defense and military activities benefit other counties in the state due to DOD contracts, National Guard and Reserve activity, and benefits received by Veterans. All of this translates into significant contributions to the state's total job base, labor income, and Gross Regional Product.

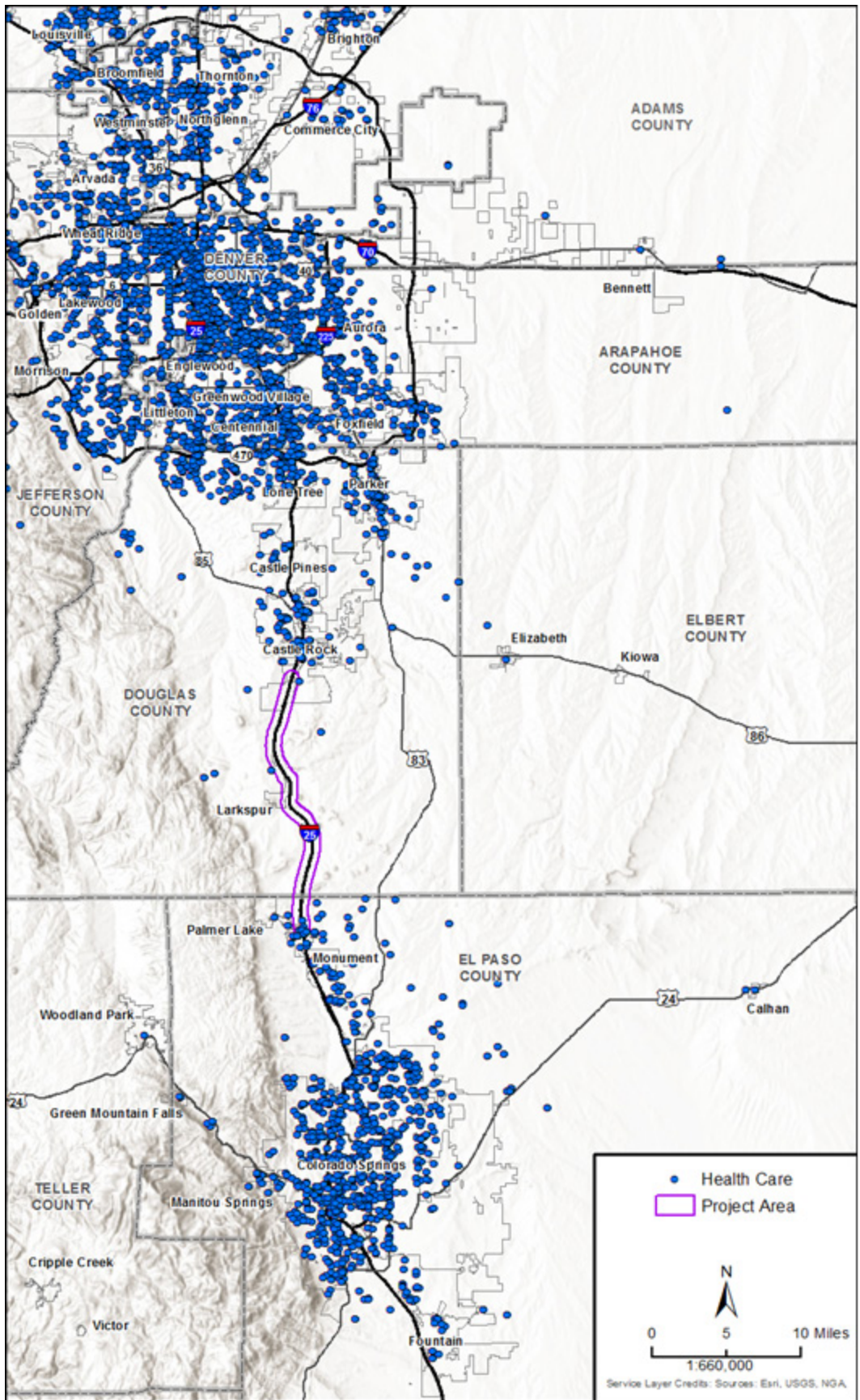
### 3.3.1 Information Technology, Software, and Cybersecurity

The information technology (IT) cluster is comprised of high-knowledge, human-capital-based businesses. The cluster is expanding globally, in Colorado and along the I-25 corridor. Enterprises in the IT/Computer Software portion of this cluster provide products and services in support of other business activities. The range of products and services provided is broad and includes computer security programs and virus protection, customer software and computer integrated systems design. The region is home to companies developing software for a variety of industries, including e-business, telecommunications, gaming, finance, and aerospace and defense.

This cluster includes digital companies which rely on many types of supplies and products to be delivered or exported via the freight transportation network, such as computer components and electronics. Some companies in this cluster have a direct connection to the freight and logistics industry cluster, including those technology companies that provide logistics and supply chain management and big data services.



3.0 STUDY AREA ECONOMY



Source: CDLE QCEW, ArLand

Figure 15. Healthcare Cluster



The cybersecurity presence in the area is also robust and growing. Colorado Springs is home to the National Cybersecurity Center along with large companies that provide services to other businesses and the military. Cybersecurity companies provide a wide range of services including managing military satellite operations and control systems, tracking arsenal, and providing datacenter control and protection. There are strong interrelationships between this cluster and defense / aerospace.

As seen in Figure 14, there were almost 12,000 entities operating in the IT, software and cybersecurity cluster in 2016, including startups and major corporations. Businesses in this cluster are highly concentrated in southwestern Arapahoe County and northwestern Douglas County. Southeast Aurora, Parker, Castle Rock, and northern Colorado Springs are also home to relatively high numbers of businesses in this cluster.

### 3.3.2 Healthcare and Medical Technology

The healthcare sector has a large and growing presence in the Study Area. This includes healthcare providers, medical and specialty hospitals, kidney dialysis centers, among others. It is supported by renowned clinical systems and top-rated research institutions, as well as medical innovation and technology firms. Firms working in biotechnology and the medical device and diagnostic fields are working on everything from engineering custom artificial limbs to developing nutritional eye health support solutions.

This cluster has over 15,000 entities in the Study Area and is heavily scattered with concentrations along I-25 as depicted in Figure 15 and Figure 16.

As a net domestic importer of medical goods and products, this cluster is heavily reliant on the freight transportation system for receipt of supplies that are critical to their operations. This includes medicine and bandages, among many others. Over 97,000 tons of pharmaceuticals were shipped to Colorado from other states, primarily transported via truck on the state's highway system. Valued at over \$6.5 billion dollars, this is just one type of product this industry cluster requires for its day-to-day operations.

## 3.4 Jobs Forecast

Based on forecasts prepared by the Denver Regional Council of Governments (DRCOG) and the Pikes Peak Area Council of Governments (PPACOG), there will be an estimated 430,000 additional jobs in Arapahoe, Douglas, and El Paso Counties by 2040. This growth figure is based on 2015 DRCOG/PPACOG Council of Governments figures, which are quite different from the Quarterly Census of Employment and Wage (QCEW) data from the Colorado Department of Labor and Employment, as seen in Table 11. Job growth is expected to be particularly high in places like Monument and Black Forest. For purposes of this analysis, jobs growth forecast are based on the Council of Governments estimates.

El Paso County is forecast for an additional 185,000 jobs, followed by Arapahoe and then Douglas Counties. Figure 18 shows that both the southern Denver and the Colorado Springs metropolitan areas are forecast to see more employment infill in their respective areas.

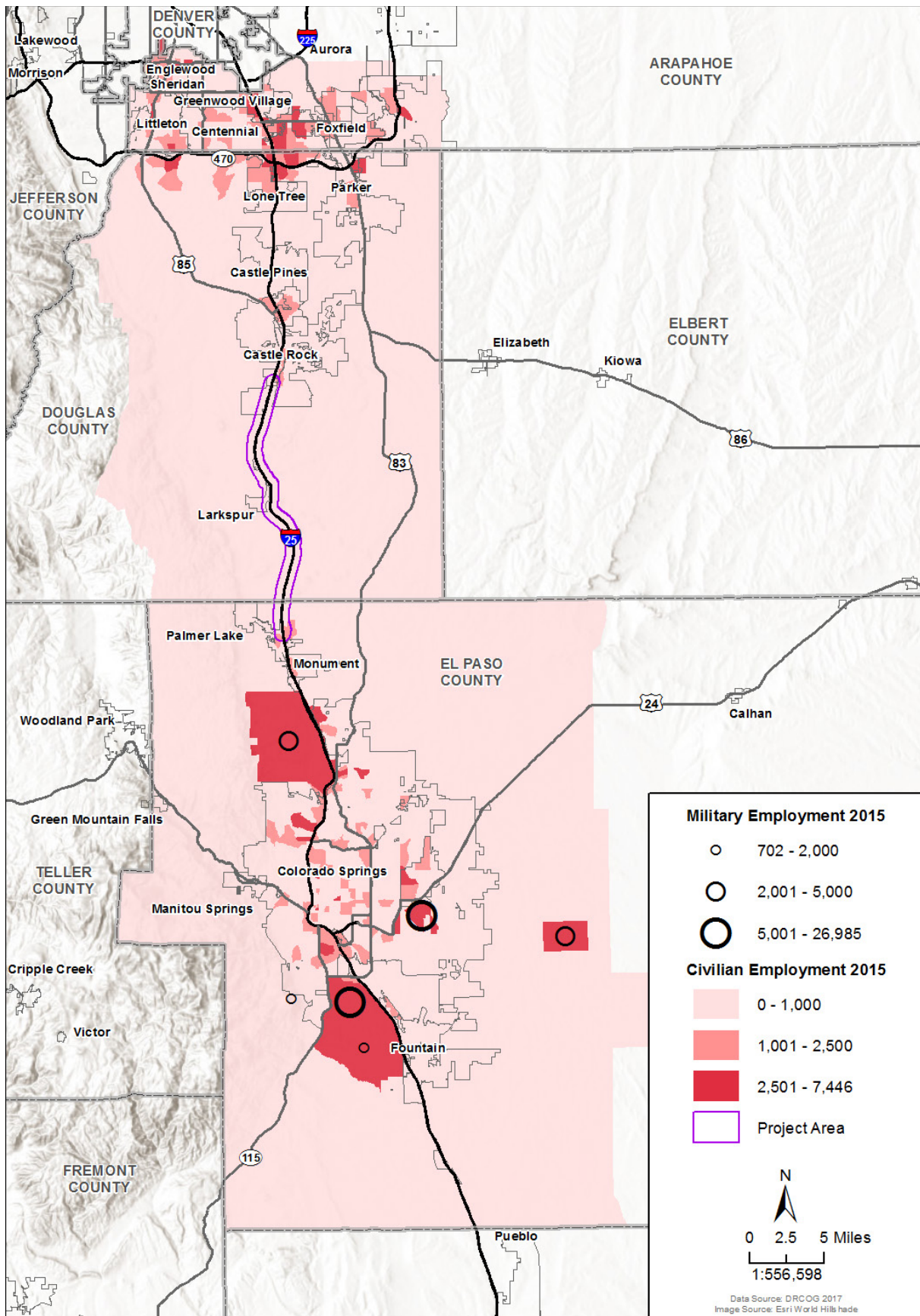
Table 11. Employment Forecasts, 2015-2040

	2015 QCEW <sup>a</sup>	2015 DRCOG / PPACOG	% Difference between QCEW and DRCOG / PPACOG	2040 DRCOG / PPACOG	DRCOG / PPACOG Growth 2015-2040	CAGR <sup>b</sup> 2015-2040
Employment						
Arapahoe County	316,597	345,259	-9.1%	504,770	159,511	1.5%
Centennial	--	66,033	--	81,129	15,096	0.8%
Douglas County	112,883	136,650	-21.1%	221,618	84,968	2.0%
Lone Tree	--	16,781	--	27,549	10,768	
Castle Pines	--	--	--	--	--	--
Castle Rock	--	17,106	--	24,772	7,666	1.5%
Larkspur	--	166	--	215	49	1.0%
El Paso County	256,705	313,133	-22.0%	499,222	186,089	1.9%
Palmer Lake	--	732	--	1,142	410	1.8%
Woodmoor CDP	--	2,490	--	4,250	1,760	2.2%
Monument	--	3,425	--	8,768	5,343	3.8%
Black Forest CDP	--	1,791	--	4,157	2,366	3.4%
Palmer Lake	--	732	--	1,142	410	1.8%
Air Force Academy CDP	--	1,273	--	1,273	0	0.0%
Colorado Springs	--	243,934	--	368,815	124,881	1.7%

Source: Labor Market Information-Quarterly Census of Employment and Wages Program, DRCOG, PPACOG, ArLand

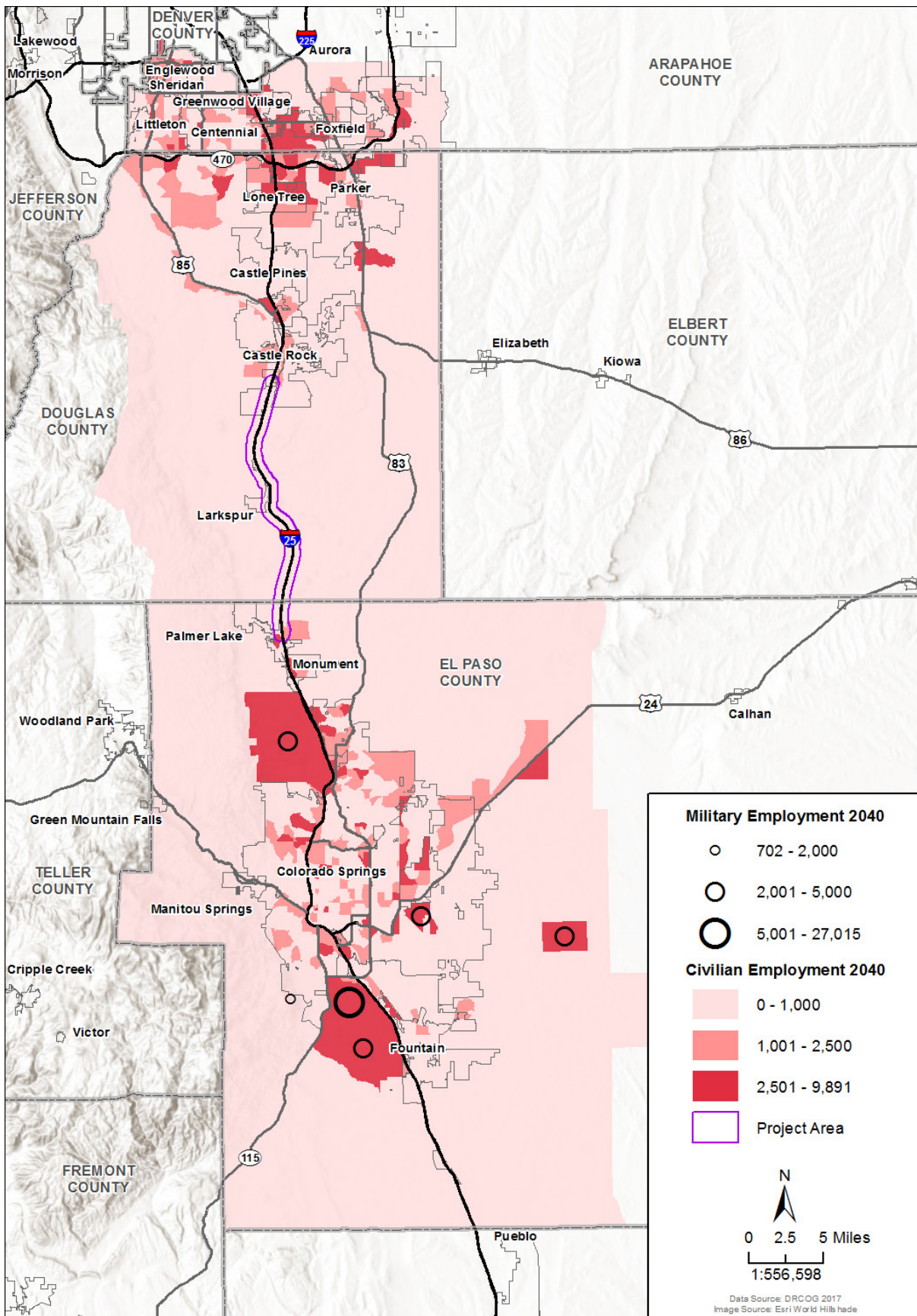
<sup>a</sup> Average annual employment

<sup>b</sup> Compound Annual Growth Rate



Source: DRCOG, PPACOG, ArLand

Figure 17. Civilian and Military Employment, 2015



Source: DRCOG, PPACOG, ArLand

Figure 18. Civilian and Military Employment, 2040



Although jobs line the I-25 corridor, in 2015 civilian jobs were very concentrated along I-25 from Greenwood Village to Lone Tree, in Englewood, and Highlands Ranch, as seen in Figure 17. Military jobs are located in El Paso County, with Fort Carson being home to the largest number of military jobs.

By 2040, the number of military jobs is not forecast to change significantly. Civilian jobs, however, are forecast to intensify in those areas where they are already relatively dense. In addition, southeast Aurora, Parker, and the area between Castle Pines and Castle Rock is expected to see an increase in jobs by 2040. Farther south, Monument and eastern Colorado Springs are also expected to see jobs increases by 2040.

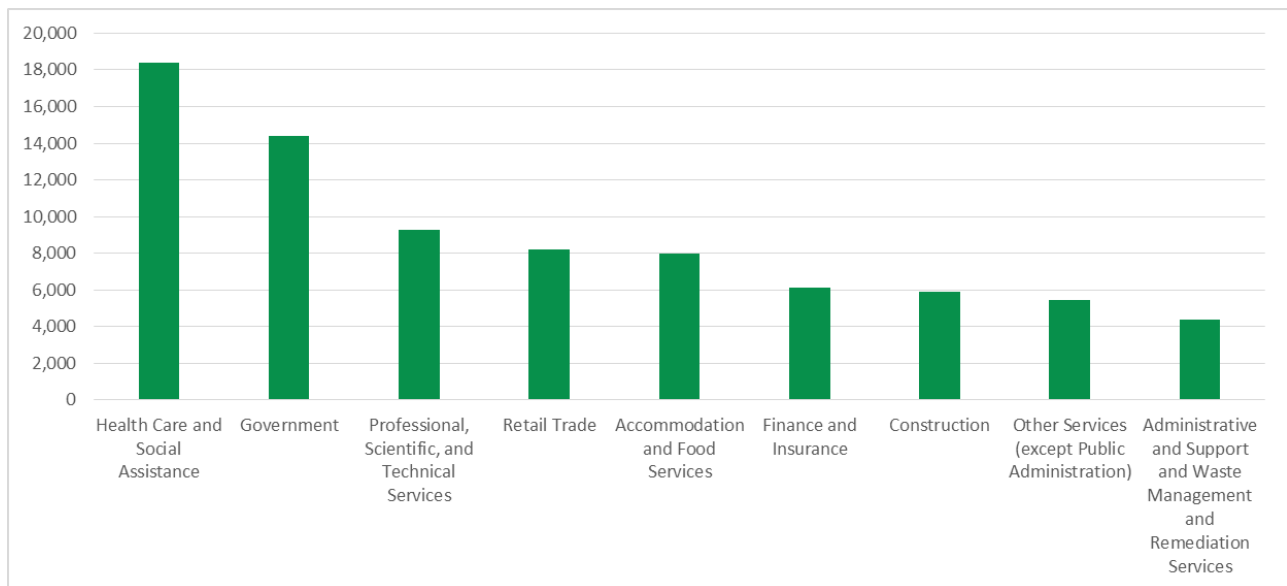
### 3.5 Workforce Demand

While forecasts are for continued growth in both the Denver and Colorado Springs metropolitan area economies, interviews indicate that there are huge workforce needs that are being unmet.

Housing affordability is becoming an increasingly significant challenge impacting workforce demand, the ability to fill jobs and grow the economy. This section will discuss area workforce needs, housing needs, and how the increased unaffordability of metro Denver housing, and the relative affordability of El Paso County has the potential to exacerbate traffic conditions in the I-25 corridor area between the two metropolitan areas.

This study is being conducted during a time of record low unemployment in Arapahoe, Douglas, and El Paso Counties. According to the Bureau of Labor Statistics, unemployment is estimated at 2% for all three areas. Businesses throughout the Front Range are anecdotally having difficulty finding workers.

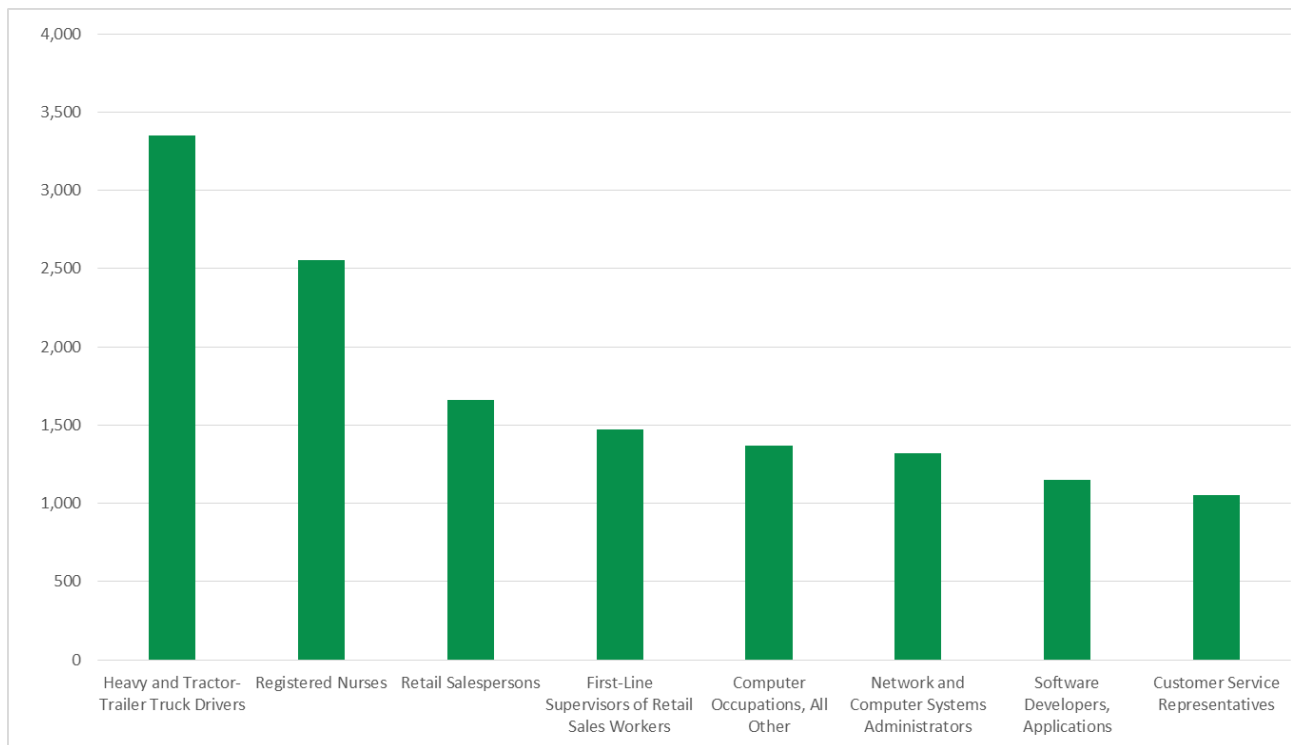
While low unemployment is potentially a temporary phenomenon, State and Arapahoe / Douglas County Workforce Center forecasts indicate that there will be demand for 90,000 jobs in 5 years in the 3-county region with most of the demand forecast in Health Care and Social Assistance, Government, Professional Scientific and Technical Services, and Retail Trade, as seen in Figure 19.



Source: Emsi, Arapahoe/Douglas Works!, ArLand

Figure 19. Workforce Needs in El Paso, Douglas, and Arapahoe Counties, 2016- 2021

Figure 20 shows the current unfilled top jobs in the 3-county region. Jobs driving trucks, nursing, retail, as well as a number of different high tech positions are currently not being filled.



Source: Emsi, Arapahoe/Douglas Works!, ArLand

Figure 20. Top Unfilled Jobs in El Paso, Douglas, and Arapahoe Counties, 2016-2021

While these jobs have a variety of educational and experience requirements, many of them are considered “Very Difficult” to fill, despite high salaries. Among the jobs listed, average salaries range from about \$29,000 for retail sales person jobs to over \$100,000 for software developer jobs (Table 12).

Table 12. Top Unfilled Jobs and Average Wage in 2016

Occupation	Average 2016 Colorado Wage
Heavy and Tractor-Trailer Truck Drivers	\$47,340
Registered Nurses	\$70,550
Retail Salespersons	\$29,040
First-Line Supervisors of Retail Sales Workers	\$49,170
Computer Occupations, All Other	\$95,600
Network and Computer Systems Administrators	\$83,470
Software Developers, Applications	\$105,640
Customer Service Representatives	\$35,440

Source: Emsi, Arapahoe/Douglas Works!, Occupational Employment Statistics, Bureau of Labor Statistics, ArLand

In choosing to take a job or relocate for a job, one of the most important considerations is the location, availability, and price of housing relative to the job location. The increase in price and availability of appropriately priced housing has important implications for fulfilling workforce needs as well as the transportation system that enable workers to get to their jobs.

### 3.5.1 The Rising Price of Housing

According to the US Census, Colorado was ranked the 8<sup>th</sup> fastest growing state in the US between 2010 and 2016 with the addition of half a million people. According to the State Demographers’ Office, the majority of growth came from migration, rather than natural increases in the population. Much of the

growth has been seen in the Denver metro area in the “core” Denver metro counties (Table 13). Denver County grew by the most at over 90,000 new residents, followed by Adams County at 57,000 new residents. Douglas County added nearly 30,000 residents. During this time period, El Paso County grew by approximately 43,000 new residents.

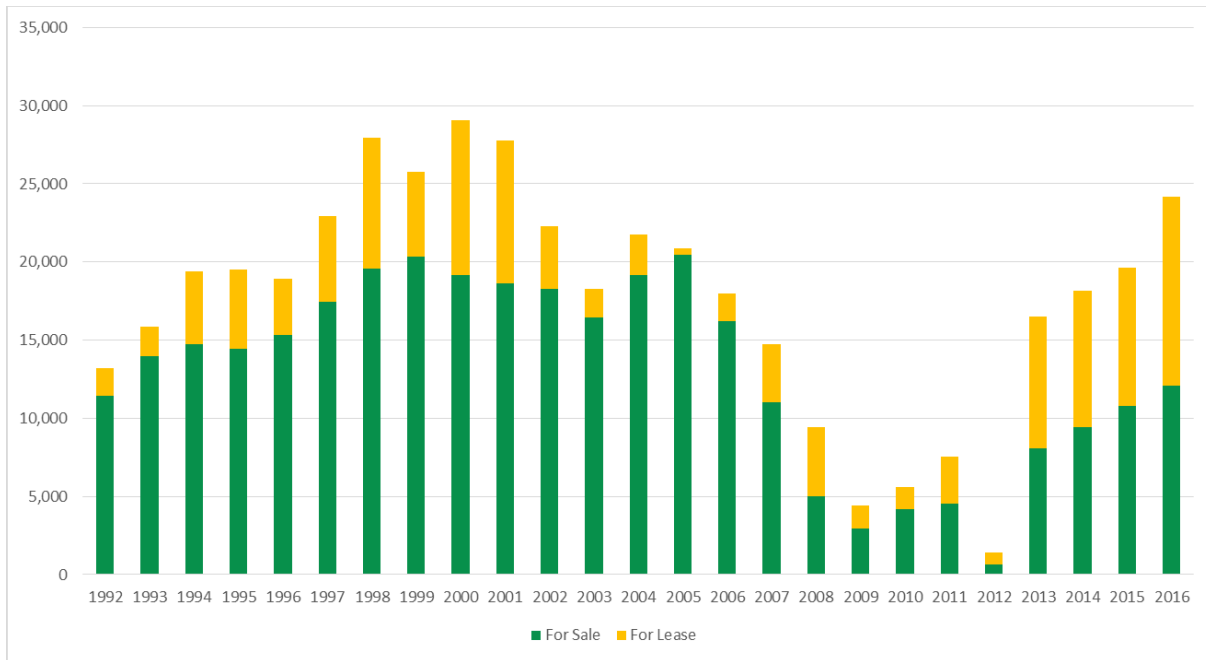
**Table 13. Population Growth 2010-2016**

	2010	2016	Growth 2010-2016	CAGR 2010-2016
Adams County	441,603	498,187	56,584	2.0%
Arapahoe County	571,914	617,668	45,754	1.3%
Boulder County	294,567	322,226	27,659	1.5%
Broomfield County	55,889	66,529	10,640	2.9%
Denver County	600,158	693,060	92,902	2.4%
Douglas County	285,465	314,338	28,873	1.6%
Jefferson County	534,543	571,837	37,294	1.1%
Total	2,784,228	3,117,539	333,311	1.9%
El Paso County	622,263	665,171	42,908	1.1%

Source: US Census, ArLand

Despite the unprecedented growth, the residential market hasn’t rebounded at the same levels and in the same way as seen in previous economic recoveries. Figure 21 shows new housing permits in the Denver metro area, divided by For-Sale and For Lease permits. It includes the same core Denver metro counties as shown in Table 13. Previous economic recoveries in the late 1990s and 2000s have seen a significant amount of single family detached housing built. When housing production restarted in 2013, the building mix shifted to many more for-lease apartments, targeted to the young adult population moving to the state.

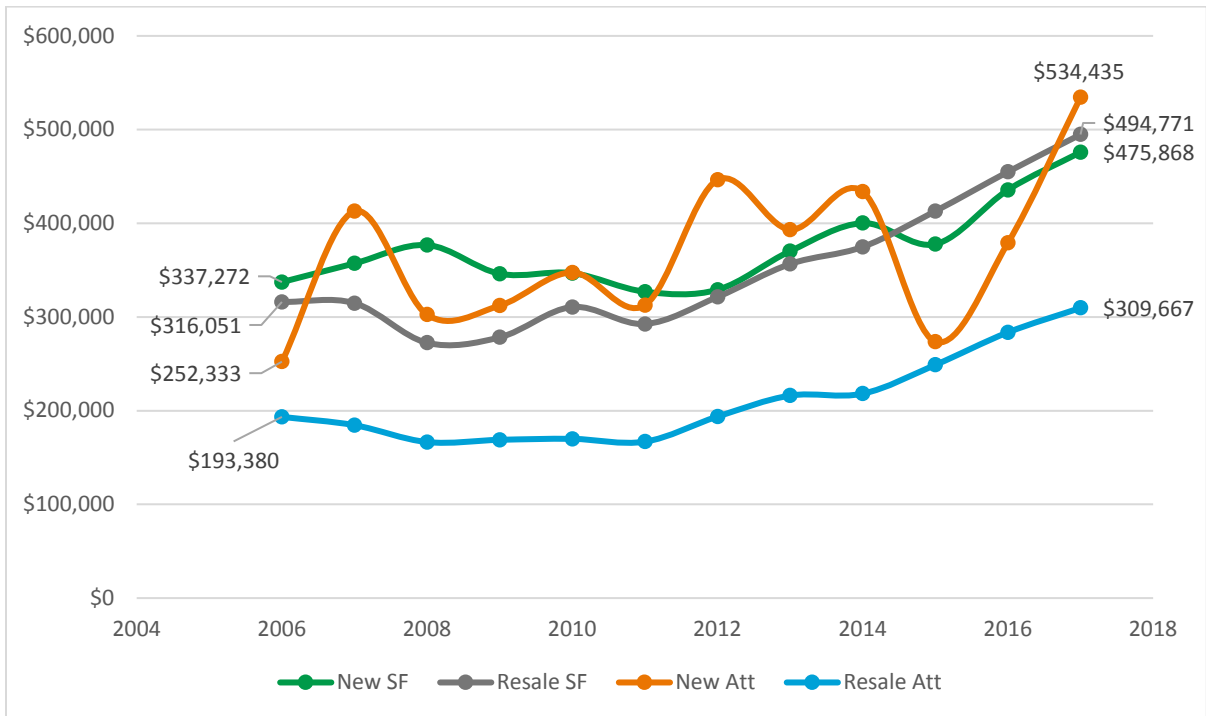
According to the Denver Metro Association of Realtors, developers are building fewer homes compared to previous economic recoveries, and when they do build, they’re building higher-end products to maximize profits in the face of more regulations, and rising construction and labor costs.



Source: Genesis Group, Home Builders Association of Metropolitan Denver, ArLand

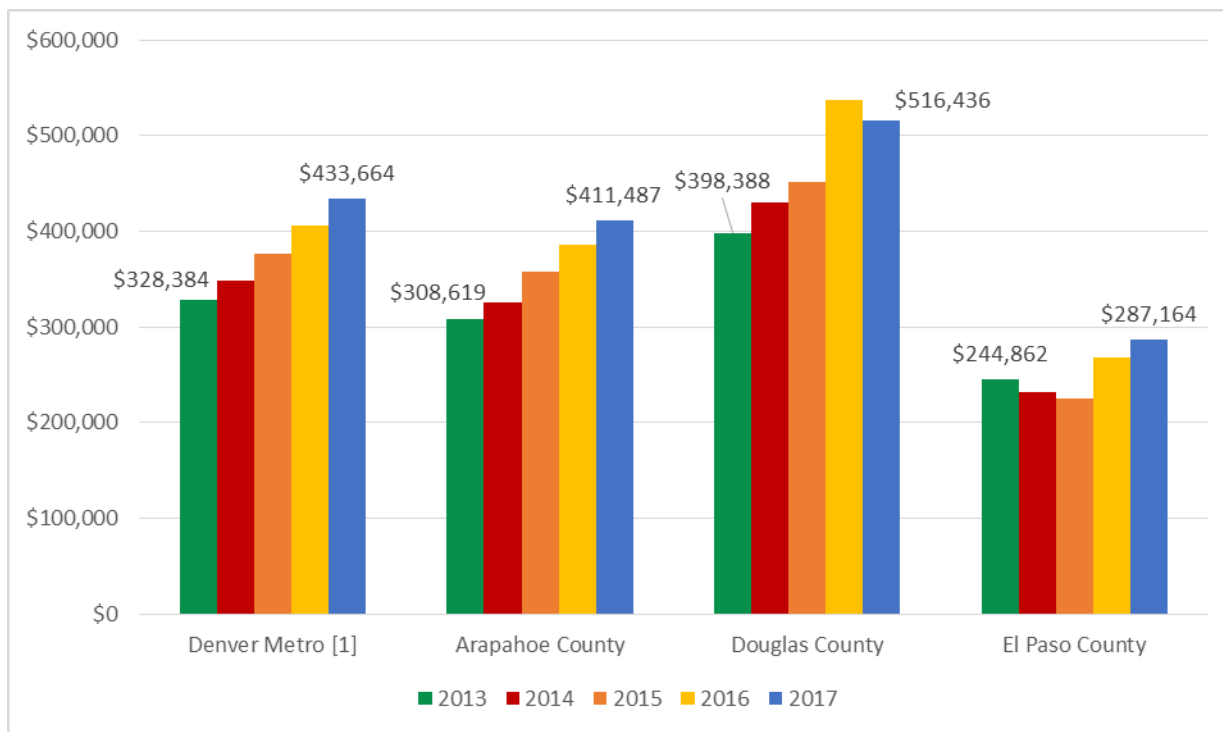
Figure 21. Denver Metro Building Permit Trends, 1992-2016

Partially as a result of more constrained supply, prices of all housing types have seen sustained increases over time. Figure 22 shows the change in Denver metro area housing values for different for-sale housing types. All housing types saw changes in values during this time period. While there have been fluctuations, prices have generally seen a sustained increase in the past ten years. While the average price of resale attached housing (condos and townhomes) in the Denver metro area is approximately \$300,000, the average price in the Denver metro area for other for-sale housing types is currently \$475,000 and higher.



Source: Genesis Group, Home Builders Association of Metropolitan Denver, ArLand

Figure 22. Average Denver Metro Housing Prices



Source: Colorado Comps LLC, ArLand

Figure 23. Average For-Sale Housing Prices

Figure 23 shows the change in average housing prices (for all housing types) for the Denver metro area, Arapahoe, Douglas, and El Paso Counties. Average housing prices in Douglas County are over \$500,000. In Arapahoe County and Denver metro area (defined as Adams, Arapahoe, Boulder, Denver, Douglas, Jefferson Counties), average housing prices are over \$400,000. El Paso County has seen increases in average housing prices, but they are generally under \$300,000. According to the Colorado Association of Realtors, the median price of a single family home in El Paso County is \$255,000.

Low interest rates and high apartment rents are contributing to the demand for for-sale units. Anecdotal evidence and broker interviews indicate that the “drive till you qualify” phenomenon is increasingly being seen in Monument and northern Colorado Springs. Monument is perceived as a location convenient to one spouse who may work in the Denver metro area and the other spouse who may work in the Colorado Springs area.

Although Denver is often cited as a top millennial destination, Colorado Springs has become a city within the U.S. with one of the fastest growing millennial populations. Local officials believe that job availability and housing affordability are contributors to the growing demand.

### 3.5.2 Workforce Demand and Housing Availability

Table 14 shows the workforce occupations in greatest demand in the 3 County area and associated incomes. It assumes that principal, interest, taxes and insurance are 28% of gross income. Assuming that up to 20% down, 5% interest, and a 30 year mortgage, the price an average full time worker can afford is shown on the bottom line. According to Table 14, the professions with the ability to afford an average priced house in Douglas County are those in the highest paid software and computer professions. While many households have dual incomes which this table doesn’t reflect, it begins to indicate that for many households, purchasing a home in the Denver metro area is increasingly difficult.

**Table 14. Housing Prices for Professions Most in Demand**

		Truck Drivers	RNs	Retail Sales	Sales Supervisor
Average Personal Income		\$47,340	\$70,550	\$29,040	\$49,170
Income Available for Housing, Insurance, and Taxes	28%	\$13,255	\$19,754	\$8,131	\$13,768
Monthly Payment		\$1,105	\$1,646	\$678	\$1,147
Mortgage Rate		5%	5%	5%	5%
Mortgage Term		30 years	30 years	30 years	30 years
Financeable Mortgage Amount		\$205,767	\$306,651	\$126,224	\$213,721
20% Down, Supportable Price		\$257,208	\$383,313	\$157,781	\$267,151

Source: Occupational Employment Statistics, Bureau of Labor Statistics, Arland

		Computer	Administrators	Software	Customer Service
Average Personal Income		\$95,600	\$83,470	\$105,640	\$35,440
Income Available for Housing, Insurance, and Taxes	28%	\$26,768	\$23,372	\$29,579	\$9,923
Monthly Payment		\$2,231	\$1,948	\$2,465	\$827
Mortgage Rate		5%	5%	5%	5%
Mortgage Term		30 years	30 years	30 years	30 years
Financeable Mortgage Amount		\$415,532	\$362,808	\$459,172	\$154,042
20% Down, Supportable Price		\$519,415	\$453,510	\$573,965	\$192,553

Source: Occupational Employment Statistics, Bureau of Labor Statistics, Arland

Apartment rents show similar differences between the Denver metro and Colorado Springs economies. Table 15 shows average asking rents, irrespective of unit types. It shows that average rents in El Paso County are 25% lower than average Denver metro rents and 33% lower than average Douglas County rents.

**Table 15. Average Asking Apartment Rents, 2018**

Area	Average Rent
Denver Metro	\$1,319
Arapahoe County	\$1,275
Douglas County	\$1,450
El Paso County	\$983

Source: CoStar, ArLand

## 4.0 Freight

Between Denver and Colorado Springs, truck traffic is estimated to comprise up to 12% of all traffic traveling the I-25 corridor. Given the dominant role of truck traffic, a safe and reliable highway system throughout the state, including I-25 South, is important to economic competitiveness and growth. Inefficiencies in supply chains, (including transportation safety and reliability issues), impose direct costs on businesses and reduce the state's economic competitiveness. It is estimated that transportation costs can represent anywhere from 5% to 50% of business revenue. Congestion can include additional costs in the form of additional wages, wasted fuel, and idle equipment. This downtime has the potential to disrupt the supply chain and production schedules. Congestion in the Denver metro area alone is estimated to cost each truck moving through the area an additional \$25,000 per year in lost time and added fuel costs.

In addition to congestion, degraded roads add to maintenance costs due to tire wear, etc. Removing such inefficiencies enhances the ability of businesses to utilize just-in-time inventory management systems and minimize transportation-related costs. Improving safety and reliability is an important part of connecting the economy and maintaining and enhancing the state's economic competitiveness.

This section provides details on the freight economy, the National Highway Freight Program, freight's importance to the Colorado economy as well as the jurisdictions within the project area, and key industry clusters and their reliance on the state's freight transportation network.

### 4.1.1 The Freight Economy and the National Highway Freight Network

The United States is the world's largest economy, and the freight economy plays a vital supporting role in the economies of the United States and the State of Colorado. Freight is moved throughout the country and Colorado over the freight transportation system, an extensive network of highways, railroads, waterways, pipelines, and airways. In Colorado, trucks carried about 77% of all shipments by tonnage to, from, and within the state in 2015.

I-25 is part of the Camino Real Corridor, which runs from El Paso, Texas, to the Canadian border in Montana. The Camino Real Corridor is a Congressionally designated High Priority Corridor established by the Intermodal Surface Transportation Efficiency Act of 1991.

A National freight policy was established in the Moving Ahead for Progress in the 21st Century (MAP-21) Act, signed into law in July 2012. Map-21 was soon replaced, in December 2015, by the Fixing America's Surface Transportation (FAST) Act as the overall federal surface transportation legislation. The FAST Act built on Map-21's provisions to make federal surface transportation more streamlined, performance-based, and multimodal. The FAST Act also established a new National Highway Freight Program to improve the efficient movement of freight. It had a series of goals including ongoing investment, improving safety, security, resiliency, and efficiency among others. It established several subsystems of roadways including the Primary Highway Freight System (PHFS) which is a network of highways identified as the most critical highway portions of the U.S. freight transportation system. The entire length of Interstate 25 (I-25) and Interstate 70 (I-70) in the state, as well as Interstate 225 (I-225) in the Denver metro area are all part of the PHFS (Primary Highway Freight System). I-25 (South) is a particularly critical component of I-25, helping connect the state's economy and the two largest metropolitan areas.

### 4.1.2 Freight's Importance to the Colorado Economy

On a statewide basis, Colorado's freight system has a significant impact on Colorado's economy. A few important statewide statistics are included below.

- \$155.8 billion of Colorado's Gross State Product of \$313 billion is generated by freight and freight-reliant industries.
- More than 1 in 6 jobs and one-third of the state's economy rely on the day-to-day movement of goods as a core business function.
- Over 420 million tons of products valued at over \$341 billion dollars moved within, in, and out of Colorado in 2016.
- Nearly \$8 billion in goods were exported from Colorado to destinations around the world in 2015.
- 4,500 new businesses are started in Colorado on average each quarter, many of which ship goods around Colorado, across the country, or overseas.
- Nearly 400,000 Colorado workers are employed in businesses that rely on freight movement. This includes 382,298 workers and 30,431 businesses operating in critical trades that, deliver packages, produce food, stock store shelves, manufacture goods, and supply other businesses.
- Colorado's robust freight, rail, transportation, trade, and logistics industries directly employed 40,836 workers in 3,405 companies in 2015. An additional 17,591 workers are self-employed in the transportation industry, including owner-operators of trucking, trade, and logistics businesses.
- The trucking industry in Colorado employs over 20,000 workers and generates significant motor fuel taxes and transportation fees.

And given other shifts in consumer behavior, like the rapid growth in e-commerce and on-demand shopping that is driving up demand for small package home delivery, among other trends, freight volume is expected to increase by more than 40 % by 2045 nationwide. In Colorado, the movement of goods by trucks is forecasted to increase 37 % and total over 279 million tons by 2045.

### 4.1.3 The Trading Economy

Colorado imports and exports goods from around the country and across the world. The state exports to more than 125 countries and simultaneously imports consumer products and production inputs, among others. Measured by the value of goods, Colorado is a net importer; measured by the weight of goods, Colorado is a net exporter of goods, albeit only slightly. Maintaining and enhancing the state's components of the global supply chain will enhance the state's economic competitiveness. A key part of this effort is connecting the economy through the multimodal freight transportation system.

Colorado's top domestic trading partners differ when comparing inbound and outbound movement of goods and whether goods are measured by weight (tons) or value (dollars). By the weight and value of goods, Colorado imports the most from Wyoming, Nebraska, Texas, California and Utah. Colorado imports the most goods by weight from, and by value from California. The state exports the most goods by weight to Wyoming, followed by Nebraska, Texas, Oklahoma, and Kansas. Colorado also exports the most goods by value to Wyoming. The other states in the top five by value are Nebraska, California, Utah, and Texas (Table 16).



Table 16. Colorado's Top Domestic Trading Partners (2015)

	Top Inbound Trading Partners					Top Outbound Trading Partners				
<b>Forestry, Farm &amp; Food</b>										
Weight (tons)	Iowa 624,600 (6%)	Texas 649,200 (7%)	California 884,100 (9%)	Idaho 1,142,800 (12%)	Nebraska 3,317,600 (34%)	Nebraska 3,937,600 (16%)	New Mexico 798,400 (6%)	Kansas 701,500 (6%)	Texas 666,900 (5%)	California 637,100 (5%)
Value (dollars)	Idaho \$566,000 (5%)	Wyoming \$574,500 (5%)	Texas \$1,020,820 (9%)	Nebraska \$1,378,400 (13%)	California \$2,093,080 (19%)	Nebraska \$2,210,370 (16%)	California \$1,297,240 (9%)	Texas \$1,110,160 (8%)	New Mexico \$735,170 (5%)	Oregon \$695,790 (5%)
<b>Manufactured Goods</b>										
Weight (tons)	Illinois 475,900 (5%)	Oregon 634,300 (7%)	Utah 743,300 (8%)	California 1,123,200 (12%)	Texas 1,400,100 (14%)	Wyoming 1,180,700 (17%)	Texas 913,800 (13%)	Utah 657,000 (9%)	New Mexico 527,100 (7%)	California 478,300 (7%)
Value (dollars)	Michigan \$3,272,690 (5%)	Illinois \$3,467,810 (5%)	Utah \$5,095,400 (7%)	Texas \$11,583,410 (17%)	California \$13,364,380 (19%)	California \$5,194,260 (10%)	Texas \$4,918,040 (9%)	Utah \$4,414,660 (8%)	Wyoming \$3,448,200 (7%)	Arizona \$2,721,790 (5%)
<b>Mining &amp; Bulk Material</b>										
Weight (tons)	Utah 419,100 (6%)	Texas 425,900 (6%)	Oklahoma 793,600 (11%)	Minnesota 1,106,400 (15%)	Wyoming 1,206,300 (17%)	Oklahoma 3,875,600 (44%)	South Dakota 738,200 (8%)	Utah 551,500 (6%)	New Mexico 496,300 (6%)	Wyoming 475,000 (5%)
Value (dollars)	California \$257,710 (6%)	Illinois \$285,050 (7%)	Tennessee \$321,720 (8%)	Texas \$372,750 (9%)	Minnesota \$787,450 (19%)	Utah \$1,019,690 (23%)	Missouri \$545,450 (12%)	Wyoming \$424,010 (10%)	Pennsylvania \$246,930 (6%)	Iowa \$226,630 (5%)
<b>Coal, Oil &amp; Natural Gas</b>										
Weight (tons)	Louisiana 427,900 (1%)	Oklahoma 480,900 (1%)	Utah 923,000 (2%)	Nebraska 14,331,500 (29%)	Wyoming 32,412,400 (65%)	Wyoming 33,479,400 (34%)	Nebraska 19,733,100 (20%)	New Mexico 11,540,200 (12%)	Kansas 6,217,500 (6%)	Utah 5,174,600 (5%)

4.0 FREIGHT

	Top Inbound Trading Partners					Top Outbound Trading Partners				
Value (dollars)	Texas \$364,740 (3%)	Louisiana \$454,910 (4%)	Illinois \$516,060 (5%)	Nebraska \$3,651,040 (33%)	Wyoming \$4,733,790 (43%)	Wyoming \$7,863,540 (30%)	Nebraska \$4,765,420 (18%)	New Mexico \$2,317,380 (9%)	Kansas \$1,814,110 (7%)	Oklahoma \$1,434,980 (5%)
<b>Chemicals, Plastics, Pharmaceuticals, etc.</b>										
Weight (tons)	Oklahoma 265,400 (8%)	California 275,300 (8%)	Texas 276,400 (8%)	Wyoming 531,700 (16%)	New Mexico 554,300 (16%)	Illinois 370,500	Utah 283,500	New Mexico 230,900	Arizona 80,700	Wyoming 73,400
Value (dollars)	New York \$579,630 (4%)	Minnesota \$681,050 (5%)	Texas \$957,270 (8%)	California \$1,770,950 (13%)	Ohio \$3,219,480 (24%)	New York \$811,080 (9%)	Missouri \$697,740 (7%)	Nebraska \$549,940 (6%)	Wyoming \$542,090 (6%)	Texas \$528,450 (6%)

Source: Colorado Freight Plan, ArLand

In addition to domestic trade, Colorado is also heavily involved in international trade. Canada is Colorado's top export market, followed by Mexico and China. Colorado's highways, including I-25 South, serve as key corridors in the movement of goods between Colorado and Canada and Mexico. Movement of goods between Colorado and major shipping ports on California's west coast facilitate trade with China and other countries in Asia, including China, Japan and South Korea. Colorado's top international export categories by value include computer and electronic products and processed foods.

Within the state, a total of 5,810 companies exported from Colorado in 2014 and about 87% of these companies were small and medium sized. Of all exporters, the majority of these companies are located on the Front Range.

The Denver-Aurora-Lakewood metropolitan area exports the highest value of goods of all metropolitan areas in the state at \$3.9 billion in 2015. This represents just over 44% of state exports to foreign markets and makes it the 66<sup>th</sup> largest metropolitan area reporting international exports nationwide.

**Table 17. Value of Colorado Metropolitan Area Exports (2015)**

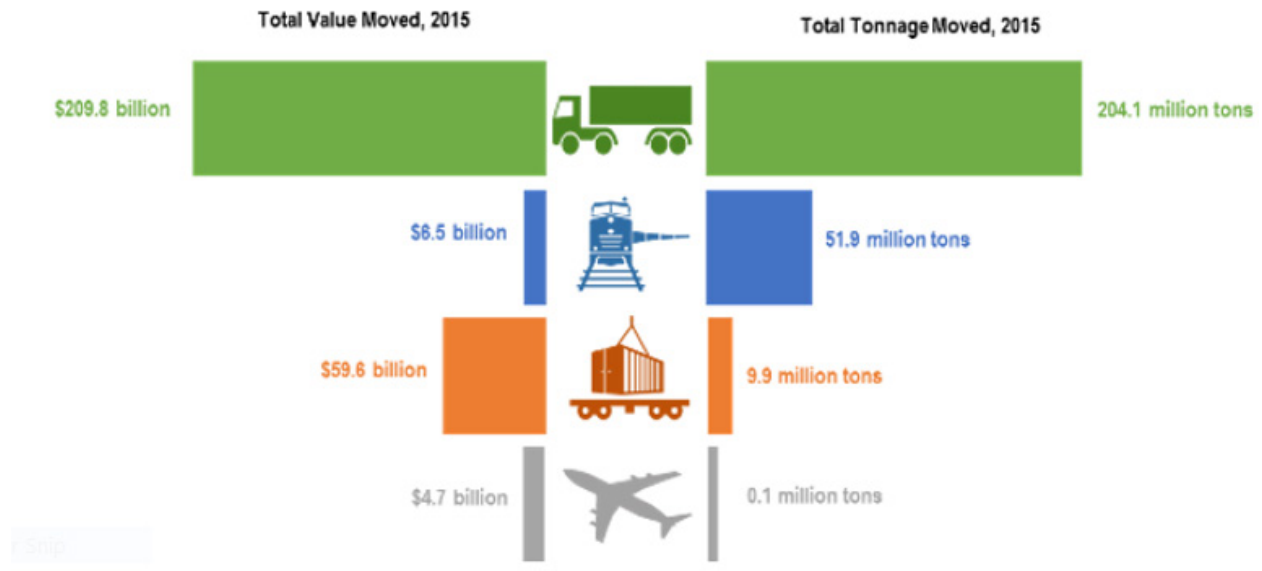
Metropolitan Area	2015 Goods Export Value	Share of State Exports
Denver-Aurora-Lakewood	\$3.9 billion	44.2%
Greeley	\$1.2 billion	14.0%
Boulder	\$1.0 billion	11.8%
Fort Collins	\$991 million	11.2%
Colorado Springs	\$832 million	9.4%
Pueblo	\$205 million	2.3%
Grand Junction	\$125 million	1.4%

Source: Office of Trade and Economic Analysis, International Trade Administration, U.S. Department of Commerce; ARLand

Colorado Springs has a very high export value of goods at \$832 million. The \$4.7 billion combined value of goods exported from the Denver-Aurora-Lakewood and Colorado Springs metropolitan areas represents over half (53.6%) of Colorado's total exports by value. And this doesn't account for other large Front Range metropolitan areas that rely on the efficient movement of goods to, from, and within the region, including Greeley, Boulder, and Fort Collins.

Every sector of the economy is heavily reliant on robust supply chains, including the safe and reliable movement of goods and supplies. For major industries in the state, including key industry clusters, their supply chains have many links and rely on a variety of inputs and materials. The efficient movement of freight is critical to business success and the state's economic competitiveness.

### 4.1.4 Value of Freight



Source: Colorado Freight Plan

Figure 24. Colorado Freight: Value and Tons Moved

According to the Colorado Freight Plan, trucks move the vast majority of freight throughout the state. The total estimated value of freight moved at the State level in 2015 is estimated at \$282.8 billion with \$209.8 billion of that moved by truck. In order to calculate the value of freight produced / moved in the study area, the ratio of freight value to State Gross State Product is assumed to apply to the 3-county region. An estimate was made of the portion of Arapahoe County’s Gross Regional Product just in the southern portion of the County near I-25. The total estimated value of freight moved in the study area is estimated at nearly \$60 billion.

Table 18. Estimate of Freight Value in Study Area, 2015-2016

County	Gross Regional Product	Estimated Value of Freight Flow
El Paso	\$33.1 billion	\$24.1 billion
Douglas	\$16.6 billion	\$12.1 billion
Arapahoe (southern portion only)	\$32.4 billion	\$23.6 billion
<b>Total</b>	<b>\$82.1 billion</b>	<b>\$59.7 billion</b>




















Source: Colorado Freight Plan, Arapahoe Douglas Works!, ArLand

### 4.1.5 Economic Development Clusters and Freight

There are fourteen key industry clusters that are vital to Colorado’s economic future according to the Colorado Office of Economic Development and International Trade (OEDIT). As seen in Figure 25, key industry clusters in the state have varying reliance on more than one mode of transporting goods and materials. All clusters rely to varying degrees on rail (carload or intermodal) and truck (long-distance and delivery) transportation. Three of the key industry clusters do not rely on air cargo to move freight.

The clusters previously profiled as particularly important to the economy in the study area includes Defense and Aerospace; Information Technology, Software and Cybersecurity, Health Care and Medical Technology.

Aerospace and Defense are reliant on long distance trucks and to a lesser degree on delivery trucks. Technology and Information are reliant on delivery trucks and air cargo. Healthcare (Health and Wellness) are somewhat reliant on both delivery and long distance trucks.

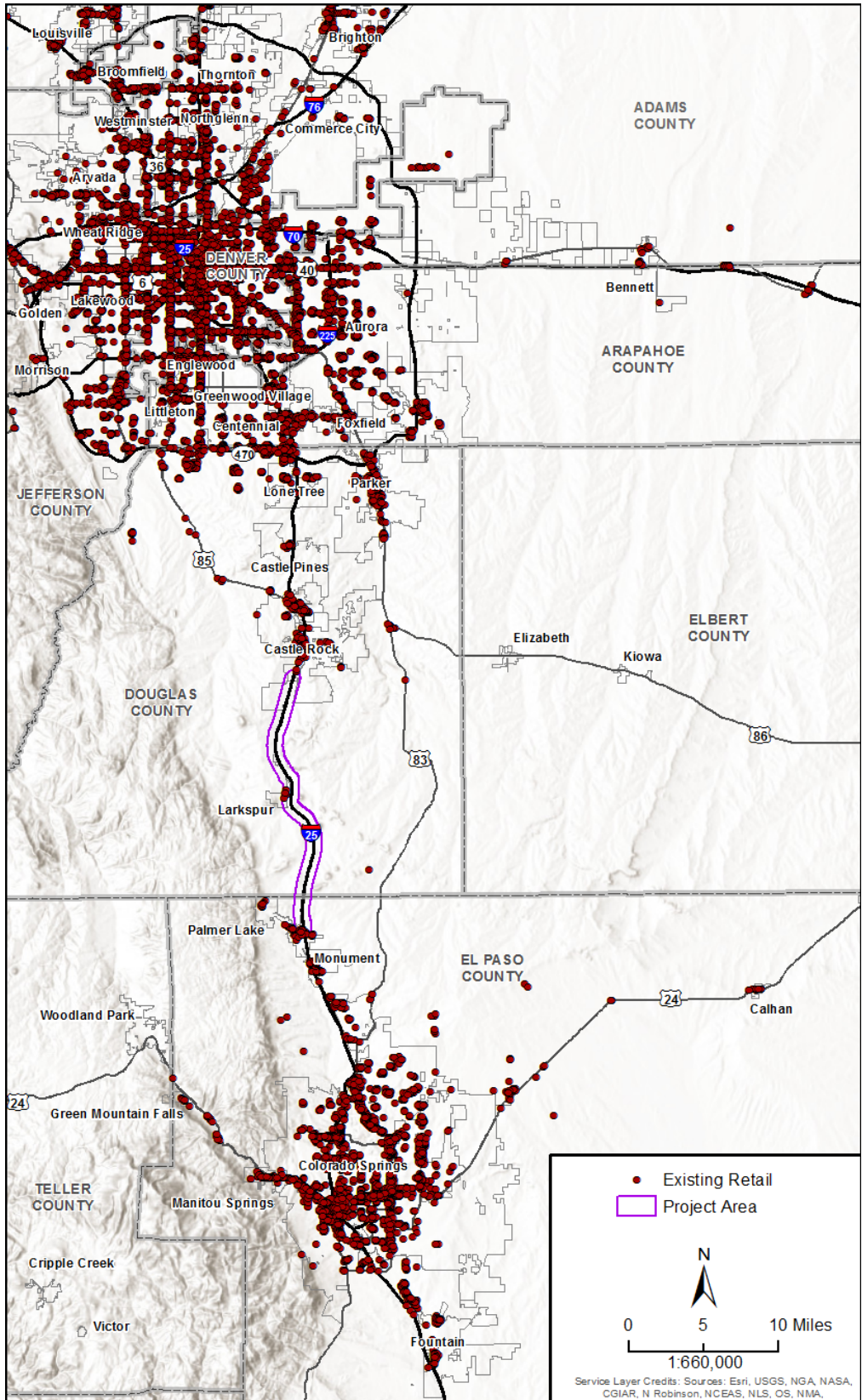
OEDIT Key Industry Cluster					
	Delivery Truck	Long-Distance Truck	Air Cargo	Rail Carload	Rail Intermodal
 Transportation & Logistics	●●●	●●●	●●●	●●●	●●●
 Food & Agriculture	●●	●●●		●●●	●
 Advanced Manufacturing	●	●●●	●●●	●	●●
 Energy & Natural Resources	●	●●●		●●●	●●
 Infrastructure Engineering	●	●●		●●●	●●
 Aerospace	●	●●●	●●		●
 Electronics	●●	●●●	●●●		●
 Technology & Information	●●●	●●	●●●		●
 Tourism & Outdoor Recreation	●●●	●●	●●		●
 Bioscience	●●	●●	●●●		●
 Health & Wellness	●●	●●	●		●
 Creative Industries	●●	●	●		●
 Defense & Homeland Security	●●	●●●	●●		●●
 Financial Services	●●	●	●		●

More Reliant ●●●      Somewhat Reliant ●●      Less Reliant ●

Source: Colorado Freight Plan, 2018, ArLand

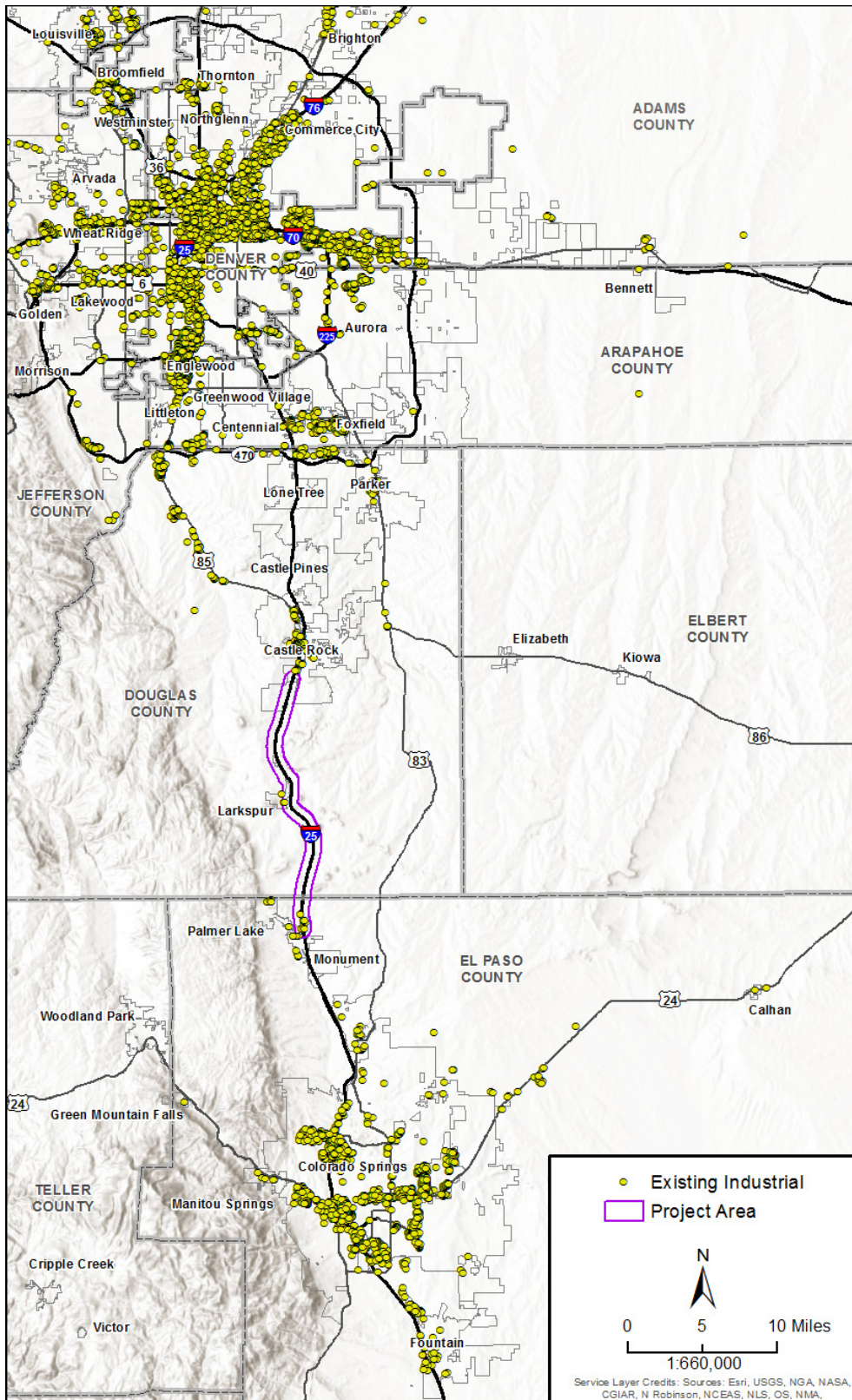
Figure 25. State Industry Clusters Freight Reliance

### 4.1.6 Retail and Industrial Activity



Source: Colorado Department of Labor and Employment, ArLand

Figure 26. Existing Retail Locations



Source: Colorado Department of Labor and Employment, ArLand

Figure 27. Existing Industrial Locations

Businesses in the retail and industrial sectors, in particular, are heavily reliant on trucks of all sizes for deliveries both to and from the business. The spatial arrangement of retail and industrial activity drives, and is driven by, the configuration of transportation infrastructure, particularly major roadways and interstates.

As seen in Figure 26, retailers are heavily concentrated in population centers like the Denver and Colorado Springs metropolitan areas. Within the Denver metropolitan area, retailers line major commercial corridors, including I-25. Within Colorado Springs, retailers are concentrated near downtown and along U.S. 24, as well as in the northern portion of the city, including along I-25. Additional concentrations of retail activity occur along U.S. 83 in and north of Parker, in Lone Tree, Castle Rock, and Monument. A few retailers are present in Castle Pines and Larkspur.

Location of industrial activity, in particular, has also historically been aligned with the location of railroads and waterways. As shown in Figure 27, industrial activity is heavily concentrated along major roadways and in areas where such activity is allowed and encouraged. Within the Denver metropolitan area, industrial activity is concentrated north of I-70 in parts of Denver, Commerce City, Aurora, and other surrounding communities. A general north-south concentration exists beginning (to the north) along I-76 in Commerce City. It then generally aligns with I-25 through downtown Denver and continues south along U.S. 85 (Santa Fe Boulevard) into Englewood and Littleton. Industrial activity is also heavily concentrated along I-70, particularly east of I-25 to its intersection with E-470. Some, albeit limited, industrial activity is present between the Denver metropolitan area and Colorado Springs. These areas include along U.S. 85 south of C-470, and in Castle Rock and Monument. Heavy concentrations are again present within Colorado Springs. Primary concentrations are present near the intersection of I-25 and West Garden of the Gods Road. In this area, most industrial activity occurs west and southeast of this intersection. Additional concentrations are present near downtown and along U.S. 24 to the east of downtown, especially just west of Peterson Air Force Base and the Colorado Springs Airport. Another concentration of activity is present in southeast Colorado Springs.

Table 19. Retail and Industrial Inventory in Study Area 2007-2016

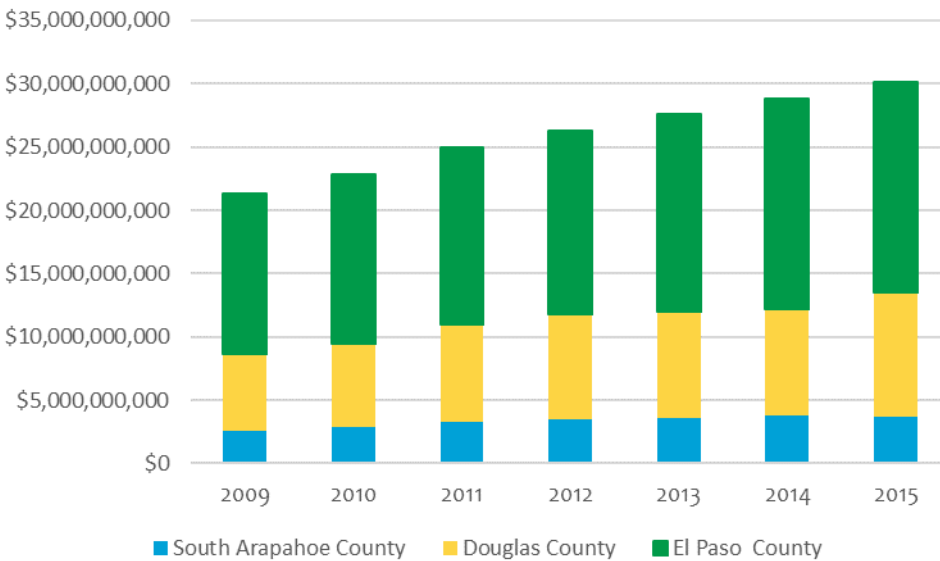
Sector	2007	2016	Change 2007-2016	Change % of 2016
Retail Square Feet	55.3 Million	60.7 Million	5.4 Million	8.9
Industrial Square Feet	43.8 Million	45.8 Million	1.9 Million	4.2
Total	99.1 Million	106.5 Million	7.4 Million	6.9

Source: CoStar, ArLand

Table 19 shows the growth in retail and industrial inventory in the study area in the last ten years. It shows the addition of 5.4 million square feet of retail and 1.9 million square feet of industrial. In addition to regular trip generation by employees, customers, visitors, and others, this additional commercial inventory has generated a significant increase in truck traffic either delivering goods to and from the facility or addressing e-commerce demands.

The significant growth in retail inventory over the past decade is tied to robust growth in retail sales. As seen in Figure 28, retail sales grew in south Arapahoe, Douglas, and El Paso Counties from 2009 through 2015, the most recent year data is available. The largest growth in retail sales was in Douglas and El Paso Counties. Combined estimated retail sales in the three areas was about \$30 billion in 2015. This is about a \$9 billion dollar (41%) increase from 2009 retail sales or about 6% annual growth over the six-year period. And, as will be discussed further, expected growth in e-commerce is expected to drive more demand for industrial facilities.

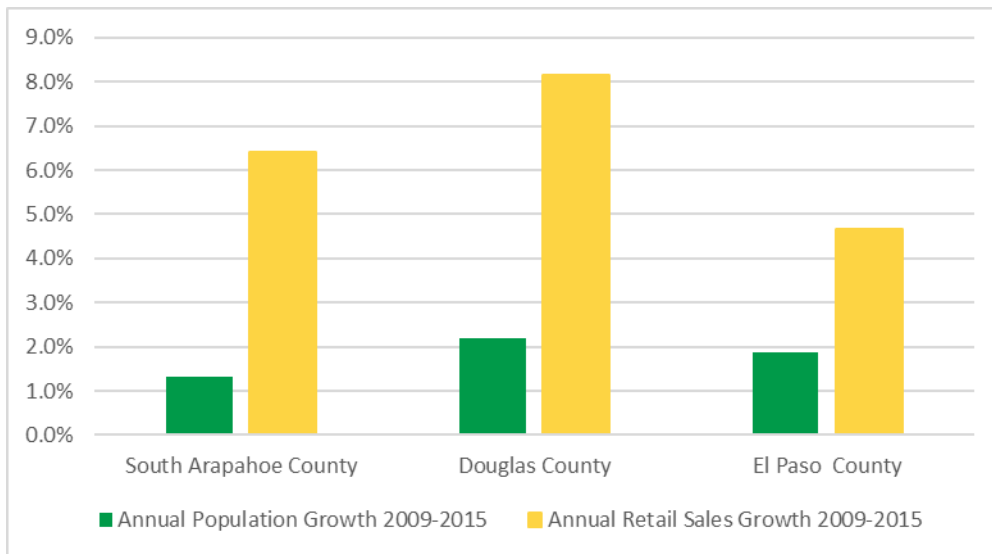




Source: Colorado Department of Revenue

Figure 28. Retail Sales, 2009-2015

Between 2009 and 2015, the population in South Arapahoe, Douglas and El Paso Counties grew between 1.3 and 2.2% annually as shown in Figure 29. During this same time period, retail sales grew by 4.7% in El Paso County, 6.4% in Southern Arapahoe County and 8.1% in El Paso County. While a recovering economy and greater spending per household are partial explanations, an increase in the number of restaurant and retail outlets, an increase in tourism, and an increase in the number of regional destinations are also other explanations. These changing variables all serve to put more cars on the road.



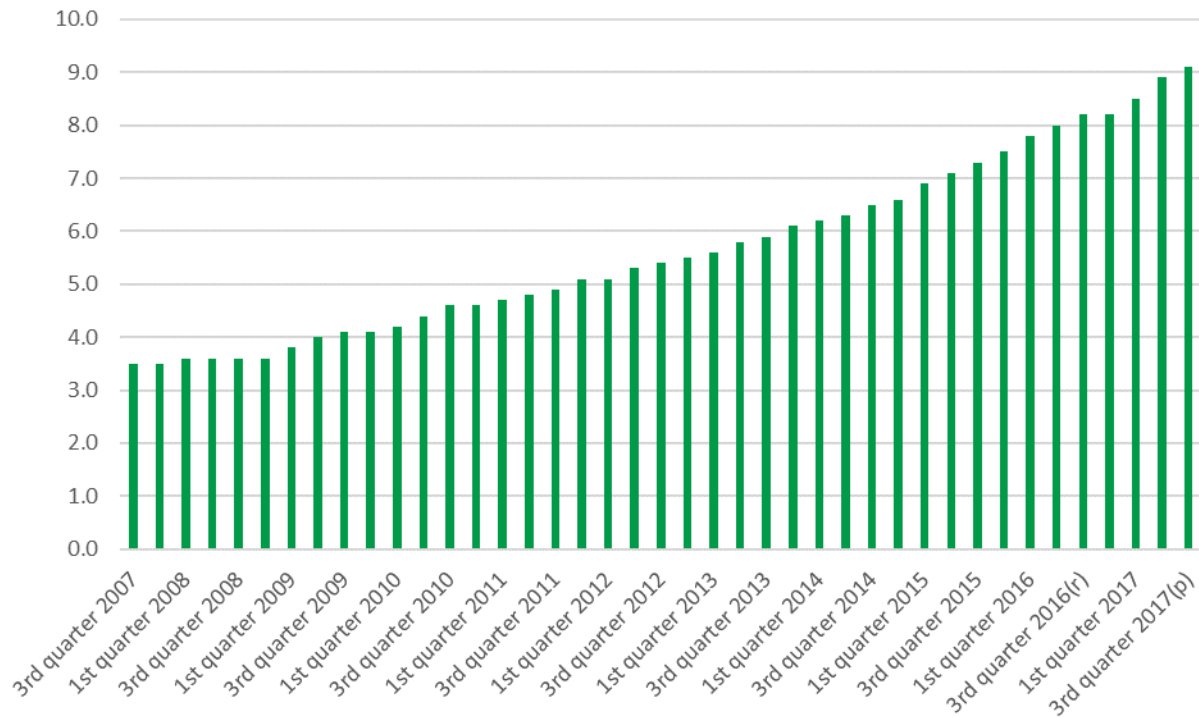
Source: US Census Bureau, Colorado Department of Revenue

Figure 29. Population Growth vs. Retail Sales Growth, 2009-2015

### 4.1.7 Changing Shopping Habits and Impact on Freight

Retail purchases are increasingly occurring online, which is altering demand for industrial space and increasing the number of trucks required to transport small packages to people’s door steps. It may also alter the number of shopping trips by vehicle.

As seen in Figure 30, the e-commerce share of total retail sales in the United States has climbed dramatically over the past 10 years. Ten years ago, e-commerce sales only accounted for about 3.5 % of total retail sales. As of the third quarter of 2017, the most recent data available, preliminary US Census Bureau estimates suggest that this figure had climbed to 9.1 %, with over \$115 billion in e-commerce sales during that quarter alone. This trend is expected to continue.



Source: U.S. Census Bureau, ArLand

Note: sales estimates are adjusted for seasonal variation, but not for price changes. Total sales estimates are also adjusted for trading-day differences and moving holidays. (p) is a preliminary estimate and (r) is a revised estimate.

Figure 30. Estimated Quarterly U.S E-Commerce Retail Sales as a Percentage of Total Retail Sales, 2007-2017

Colorado’s Front Range has and will continue to feel the effect of the growth of e-commerce and the related drive for companies to deliver their products to consumers very quickly (e.g. same-day and next-day delivery). The impact of this trend is continued growth in industrial warehouse space. The goal of expediting delivery is leading to construction of very large distribution centers near large population centers along with smaller warehouses in urban areas to facilitate last-mile delivery. A local example is Amazon’s recently opened 450,000+ square foot sorting center in Aurora in close proximity to hubs for FedEx and the U.S. Postal Service. The growth of these centers results in more truck traffic to deliver goods to residences.

In addition to driving growth and utilization of industrial space, the rise of e-commerce sales has the potential to affect the number of shopping trips consumers make in a vehicle. More than one in five household trips is a shopping trip and as the volume of e-commerce continues to increase, travel associated with shopping may change. However, according to the U.S. Department of Transportation, this has yet to result in a significant effect on travel for household shopping trips.

Another factor that will impact traffic is the “buy online, pick up in store” option that many retailers now provide. The evolution of consumer behavior and demand for this type of shopping will also play a role in future shopping traffic. According to Nielsen, Millennials are more likely than Boomers to shop in this manner, which indicates that despite growth in e-commerce, some percentage of purchases will still involve the use of a vehicle to pick them up.

These trends point to an increase in truck traffic, particularly in urban areas like those along I-25, required to deliver goods to residences. All of these factors combined with population growth forecasts will likely result in more Front Range traffic related to shopping and the movement of goods.

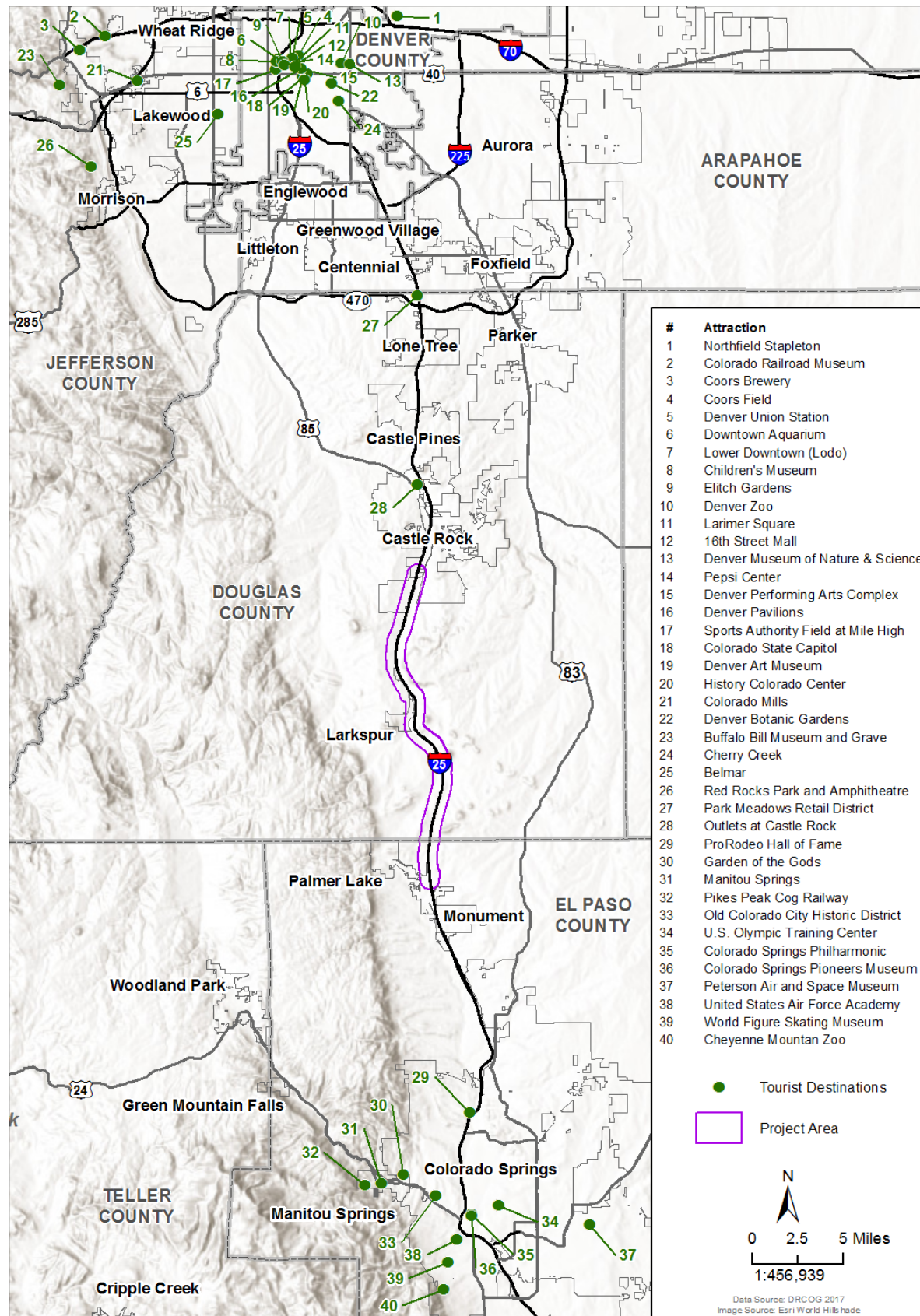
## 5.0 Tourism

Colorado's travel industry has grown in terms of number of visitors, travel spending, employment, and contributions to state and local tax revenues over the past 20 years. The Denver and Colorado Springs metropolitan areas have multiple tourist attractions that are of regional and national interest which are depicted in Figure 31, all of which are popular tourist draws. Many hold regular events drawing tens of thousands to hundreds of thousands of visitors annually. Because of marketing and other reasons, the state is transitioning from being a regional destination to a national destination, according to state tourism officials.

- *Pikes Peak Region:* According to Longwoods International and the Colorado Springs Convention and Visitors Bureau (El Paso, Teller, and Fremont Counties), visitors to the Pikes Peak Region welcomed 23 million people in 2016, which is a 12% increase over visitation in 2015 (20.5 million). More than half of visitors (57%) took a day trip, while 43% stayed overnight. The nature of visitation has changed. In previous years, "visiting friends and relatives" was the top reason for travelers to come to the area. In 2016, 50% surveyed reported that they visited, not because it was an obligation, but because they chose to visit.
- Since 2012, overnight travel has risen 32% with the top visitor states (other than Colorado) including California, Texas, Kansas, New York, Florida, Arizona, New Mexico, Missouri, and Illinois. Eighty nine percent (89%) of visitors arrive in a vehicle.
- *Denver:* According to Longwoods International and Visit Denver, there were an estimated 31.5 million visitors to Denver in 2016. 17.3 million of these visitors were estimated to be overnight visitors. Overnight leisure visitors have increased while business travelers have remained flat. Within the leisure travel category, the majority were visiting friends and relatives followed by "marketable" visitors, those who visit because they choose to visit. Denver also generated 14.2 million day visitors. While specific origin information isn't available, the majority of visitors are from other parts of Colorado. It can be assumed that residents from El Paso County, the rest of the Pikes Peak region and residents further to the south are among these visitors using I-25 as their conduit.

Beyond the tourist activities suggested by Figure 31, high traffic volumes on the weekends indicate that I-25 is a gateway for a wide variety of recreational and tourism-oriented activities.

- *Shopping:* Large retail and shopping districts along the Front Range attract visitors from surrounding states who visit and shop, often on weekends. Cabelas and Ikea are examples of retailers located in the southern Denver metro area with very large trade areas serving Colorado and adjoining states.
- *Special Events:* Larkspur holds an annual Renaissance Festival which attracts tens of thousands of visitors on weekends during the summer months. It's indicative of the growing number of festivals, concerts, and other activities taking place throughout the Front Range.
- *Sporting Events:* In addition to large professional sporting events which attract visitors from a wide ranging area, Colorado is a very active state with sports leagues and school-related sporting events which require travel for games and other activities.
- *Outdoor Access:* While there is a significant amount of local and regional outdoor space, the study area is also at the gateway to significant open space and recreational destinations in southern and western Colorado as well as adjoining states. The Pike and Isabel National Forests and the Great Sand Dunes, among other destinations, is located south of Colorado Springs.



Source: ArLand

Figure 31. Regional Tourist Destinations

Table 20. Overnight Travel Impacts, 2006-2016

	Arapahoe, Douglas, and El Paso Counties			Denver Metro Region <sup>b</sup>			Pikes Peak Region <sup>c</sup>		
	2006	2016 <sup>p</sup>	CAGR <sup>a</sup>	2006	2016 <sup>p</sup>	CAGR <sup>a</sup>	2006	2016 <sup>p</sup>	CAGR <sup>a</sup>
Total Direct Travel Spending (\$Million)	\$1,922	\$2,626	3.2	\$5,963	\$8,932	4.1	\$1,185	\$1,543	2.7
Industry Earnings Generated by Travel Spending (\$Million)	\$476	\$706	4.0	\$1,797	\$2,720	4.2	\$273	\$410	4.2
Industry Employment Generated by Travel Spending (000 Jobs)	19.0	24.1	2.4	46.9	57.0	2.0	13.5	16.0	1.7
Government Revenue Generated by Travel Spending (\$Million)	\$104	\$166	4.8	\$317	\$523	5.1	\$60	\$95	4.7

Source: Dean Runyan Associates 2017, ArLand

<sup>a</sup> Compound Annual Growth Rate

<sup>b</sup> Denver Metro region includes Adams, Arapahoe, Broomfield, Denver, Douglas, and Jefferson counties.

<sup>c</sup> Pikes Peak region includes El Paso, Fremont, and Teller counties.

As seen in Table 20, all metrics related to overnight travel have increased in the 10-year period from 2006 to 2016 in Arapahoe, Douglas, and El Paso Counties which are part of the Denver metro and Pikes Peak Regions. These three counties have seen a 3.2% average annual growth rate in total direct travel spending, 4% growth in earnings, an almost 5% annual growth rate in combined state and local tax generation, and over 2% growth in employment generated by travel spending.

Travel spending statewide has increased by about 4.0% per year on average since 1996. In 2016 direct travel spending was over \$19.7 billion and supported 165,000 jobs. The travel industry also contributes significantly to state and local tax revenue, generating about \$560 in tax revenue per household statewide in 2016 (Dean Runyan Associates 2017). And while travel and tourism is important throughout the state, the Denver metro and Pikes Peak Regions, including Arapahoe, El Paso, and Douglas Counties are particularly important to this industry, with almost half of all overnight travel spending in the state occurring in the Denver metro region, which includes Arapahoe and Douglas Counties.

## 6.0 Travel and Mobility: Benefits and Costs

### 6.1 Key Issues

There are three central issues related to the movement of people and goods along I-25 South - travel reliability, safety, and the movement of goods via truck. This section discusses all three of these issues within the context of CDOT's planned near-term corridor improvements at the Gap between Monument and Castle Rock. The project is designed to enhance the safety of roadway users, increase travel reliability, and allow for more efficient movement of goods while simultaneously enhancing safety and increasing travel reliability. The costs and benefits of these improvements are also discussed.

#### 6.1.1 Travel Reliability

Travel reliability, or the ability of travelers to get to their destination without unexpected or unreasonably long traffic delays comes up often in public meetings and workshops. It is one of the central reasons for the I-25 Gap Project as well as future I-25 improvements. Increasingly, corridor travelers are experiencing long traffic delays, and the need to plan daily activities around traffic congestion is becoming the new norm. Travel delays are the result of congestion and events (e.g. crashes, weather, and sporting events).

Peak period delays typically occur in northbound lanes during weekday mornings and in southbound lanes during weekday afternoons. Events, however, also cause travel delays during the week. In the Gap, travel delays are equally the result of events (50 %) and congestion (50 %), and these delays are getting worse. Travel delays are worse in the southbound direction than northbound, worse on weekday afternoons, and during summer and fall. The longest travel times are regularly an hour or longer, which is three times as long as similar trips should take without delay. Delays that are multiple hours in duration now also occur in the Gap area. From 2015 to 2016 there was a 20% increase in congestion-related delays.

#### 6.1.2 Safety

Safety has become an increasingly important issue in the corridor. From 2011 to 2015 there were 4,710 total crashes (accidents), or 2.5 crashes per day on average. Most of these (72%) resulted in property damage, and about 28% of all crashes during the 5-year period resulted in human injury or death. There were 13 fatal crashes during this time, or approximately 2 to 3 per year.

Information gathered over a 5-year period through 2015 shows that numerous crash types occur along I-25 South at all times of day and night throughout each year. The majority of crashes (57 %) are rear-end or sideswipe events where vehicles are traveling in the same direction. Incidents where vehicles crash into fixed objects like concrete barriers or guardrails account for about 24% of crashes. About 6% of crashes are the result of vehicle-wildlife collisions, although this type of crash may be underreported. In terms of month, day of the week, and time of day, the highest crash frequencies occur during summer months (June, July, August), on Saturdays, and during commuting times - 7:00-8:00am and 3:00-4:00pm. Most crashes occur below posted speed limits and about one quarter occur on wet road surfaces. Other physical roadway elements pose safety issues, such as interchanges and changes in the number of lanes. When compared to all crashes in the corridor, fatal crashes are much more likely to involve alcohol or drugs and to occur at dark or on curves.

### 6.1.3 Freight/Truck Traffic

The inability of heavy trucks to maintain their speed on roadway grade changes is another central issue of the project, impacting safety and travel reliability. Heavy trucks account for 8 to 11% of corridor traffic and they must deal with climbing grades in both directions in the corridor. Climbing is difficult for heavy trucks and they often must slow down anywhere from 10 to 20 miles per hour depending on the grade. This impacts traffic flow as faster vehicles then try to pass, which leads to a lot of variability in travel speed and reduced travel safety for truck drivers and all other roadway users.

### 6.1.4 Gap Project Improvements

The Planning and Environmental Linkages study identified a long term vision for I-25 between South Denver and Northern Colorado Springs. During the course of this study, it identified the “Gap” as the most urgent priority. I-25 is 6 to 8 lanes wide from just south of Castle Rock through Denver, and 6 lanes wide from Monument south to Colorado Springs. The 18 mile “Gap section between Monument and Castle Rock narrows to only 4 lanes (2 lanes in each direction) and has been identified as the most critical area for immediate improvements. Specific project improvements include:

- Widen 18 miles of I-25 from south of Castle Rock to Monument by adding an Express or General-Purpose Lane in each direction. In the express lane option drivers would have the choice of using the Express Lane for a reliable trip in exchange for a variable toll or ride the two existing general-purpose lanes for free. Carpoolers (vehicles with 3 or more people) could ride the Express Lane for free. In the general-purpose lane option, an additional general-purpose lane would be added.
- Widen shoulders outside and inside the travel lanes
- Add new wildlife crossings
- Add new overlay to existing pavement
- Repair or replace bridges
- Modernize highway with communications and power to enable advanced technology

As previous sections have outlined, I-25 in this section of the state connects two of the state’s largest urban centers, fast growing, well-educated and dynamic communities that contribute significantly to the State’s Gross Domestic Product. The Gap project improvements will continue to help support these vibrant local economies in this region.

### 6.1.5 Benefit Cost Analysis

A Benefit Cost Analysis (BCA) was conducted for the I-25 South Gap project to help quantify the return on investment to the region through a comparison of costs and benefits that measure productivity and safety for all. The BCA was conducted following a process consistent with U.S. Department of Transportation (US DOT) guidance where annual costs and benefits are projected over the 20 year life-cycle of the project. Per this guidance, future costs and benefits are also discounted at a 7% rate.

Other cost and benefit assumptions are outlined below.

#### Costs

- *Capital Costs:* Capital costs for the Gap project are estimated at \$320 million, expressed in 2016 dollars. Assuming that construction starts in November 2018 and finishes in 2020, the net present value (NPV) at a 7% discount rate for the capital costs is estimated to be \$255 million as shown in Table 21.
- *Annual Operating and Maintenance Costs:* Based on CDOT’s previous project experience, annual operating and maintenance costs are estimated at approximately \$7,200 per lane mile between the 2021 and 2030 (while the improvements are newer) at nearly \$1.5 million annually through 2030. In



2031, that cost increases to \$14,200 per lane mile and nearly \$2.9 million annually. Total Operations and Maintenance through 2040 is estimated at \$43.7 million. As seen in Table 22 at a 7% discount rate, the net present value (NPV) of operations and maintenance up to 2040 is estimated at \$15.8 million.

Table 21. Estimated Gap Capital Costs

Cost Item	Amount (2016\$)
<b>Project Schedule</b>	
2018	\$15,950,000
2019	\$191,400,000
2020	\$111,650,000
Total Costs	\$319,000,000
Net Present Value at 7%	\$255,348,012

Source: CH2M/Jacobs

Table 22. Operating and Maintenance Costs

Cost Item	Unit Cost (\$/lane mile)	Lane Miles	Annual O&M (2016\$)	Total O&M (2016\$)
O&M 2021-2030	\$7,200	204	\$1,468,800	\$14,688,000
O&M 2031-2040	\$14,200	204	\$2,896,000	\$28,968,000
<b>Total O&amp;M (2021-2040)</b>				<b>\$43,656,000</b>
Net Present Value at 7%				<b>\$15,760,703</b>

Source: CH2M/Jacobs

## Benefits

The U.S. Department of Transportation outlines the benefits that can be measured including travel time savings, operating cost savings, safety benefits, and residual value of the project after 20 years. While these guidelines also suggest including benefits such as the environmental benefits of reduced congestion (fewer pollutants released into the environment), these measures have not been included at this point in order to focus on the benefits which appeared to be most important to the public. The three most significant measures include travel time savings, decrease in vehicle operating costs, and safety improvements.

- *Travel Time Savings:* Travel time savings account for the greatest benefit provided by the I-25 Gap project. Travel time savings are shown in Table 23. In 2040 for morning peak period drivers, time savings are estimated at 12 to 20 minutes through the Gap from Monument to Castle Rock. The time savings is most significant for Friday, southbound traffic where time savings range from 50 to 87 minutes, depending on the alternative.

Table 24 describes the projected travel times through the Gap by 2040 with and without proposed project improvements. It shows that by 2040, weekday morning northbound travel through the Gap will take 43 minutes without improvements. Express lane travelers will need just 23 minutes. Friday southbound travelers will need nearly 2 hours to get through the Gap by 2040 without improvements. With the express lane concept, that time will be shortened to 32 minutes by 2040.

- *Vehicle Operating Costs:* This benefits measures the decrease in vehicle operating costs for drivers which incorporates vehicle costs related to fuel, maintenance, regular repairs and depreciation.

Project improvements are the result of improved average speeds, greater reliability, improved road conditions, and increased safety.

- *Safety*: Safety improvements are becoming a growing concern along the I-25 South corridor. The additional lanes are expected to significantly reduce congestion and stop-start conditions which in turn are expected to reduce the occurrence of crashes.

With both the build alternatives (2 general-purposes + 1 express and 3 general-purpose lanes), there would be a reduction in severe crashes where there is an injury or someone is either incapacitated or killed.

By 2040,

- Non-incapacitating (although an injury is involved): there would be a reduction from 58 to 49 accidents of this type
- Incapacitating: a reduction of 12 to 10 accidents of this type
- Killed: a reduction of 5 to 4 fatalities

Table 23. Travel Time Savings with Additional Lanes (in minutes) by 2040

Time Period	General-Purpose Lanes (2040)	Express Lanes (2040)
Weekday NB 6:30 – 9:00 AM	12	20
Weekday SB 3:00-7:00 PM	36	53
Friday SB 3:00-7:00 PM	50	87
Sunday NB 11:30 AM-3:00 PM	11	17

Source: CH2M/Jacobs

Table 24. Projected Travel Times through the Gap (in minutes)

Time Period	No Build (2040)	General-Purpose Lanes (2040)	Express Lanes (2040)
Weekday NB 6:30 – 9:00 AM	43	31	23
Weekday SB 3:00-7:00 PM	79	43	26
Friday SB 3:00-7:00 PM	119	69	32
Sunday NB 11:30 AM-3:00 PM	40	29	23

Source: CH2M/Jacobs

### Benefit-Cost Calculation

The BCA considers both capital and operating costs, as well as annual benefits that accrue during operations.

Assumptions include the following:

- A 20 year life cycle assumed (US DOT 2017 BCA Guidance)
- 7% real discount rate (US DOT 2017 BCA Guidance)
- Percent Car Traffic: 91.5% (based on traffic demand model)

- Percent Truck Traffic: 8.5% (based on traffic demand model)
- Passengers per Car: 1.39 (based on US DOT 2017 BCA Guidance)
- Passengers per Truck: 1.00 (based on US DOT 2017 BCA Guidance)
- Value of Time for Private Vehicle (\$ per person-hour): \$14.10 (2016\$) (US DOT 2017 BCA Guidance)
- Value of Time for Commercial Vehicle Truck Driver (\$per person-hour): \$27.20 (2016\$) US DOT 2017 BCA Guidance)
- Annual Growth in Value of Time: 1% (2014 US DOT Guidance)
- Crashes and injuries are valued (based on US DOT 2017 BCA Guidance)
  - No Injury: \$3,700
  - Possible Injury: \$63,900
  - Non-Incapacitating: \$125,000
  - Incapacitating: \$459,100
  - Killed: \$9,600,000
  - Injured (severity unknown): \$174,000
  - Accidents (unknown if injury): \$132,200
- Traffic Growth Rates (based on traffic demand model)
  - No Build:
    - Vehicle Hours Travelled: 3.3% average annual growth rate between 2021-2040
    - Vehicle Miles Travelled: 2.2% average annual growth rate between 2021-2040
  - 2 General-Purpose and 1 Express Lane Option:
    - Vehicle Hours Travelled: 3.2% average annual growth rate between 2021-2040
    - Vehicle Miles Travelled: 2.2% average annual growth rate between 2021-2040
  - 3 General-Purpose Lanes Option:
    - Vehicle Hours Travelled: 3.1% average annual growth rate between 2021-2040
    - Vehicles Miles Travelled: 2.2% average annual growth rate between 2021-2040

The summary benefit cost calculation for the build alternatives is shown in Table 25. In this particular analysis, benefits were somewhat limited to the measures as described. Additional measures such as the benefits derived from a reduction in pollutants would undoubtedly change the calculations. Assuming a 7% real discount rate, an investment in capital, operating and maintenance costs would result, in both scenarios of a net present value benefit for the project of approximately \$1.7 billion. The net present value of costs is approximately \$270 million. The project would result in greater productivity, lower vehicle costs, and greater safety for the traveling public in this important part of the state of Colorado.

Table 25. Summary of Net Present Value, Benefits and Costs

Benefits and Costs	2GP + 1 Exp	3 GP
Benefits		
Value Travel Time Savings	\$1,584,137,481	\$1,652,436,283
Vehicle Operating Cost Savings	\$5,907,704	\$3,372,538
Safety Benefits	\$83,760,080	\$83,769,080
Residual Value	\$37,733,863	\$37,733,863
<b>Total Benefits</b>	<b>\$1,711,548,128</b>	<b>\$1,777,311,764</b>
Costs		
Capital	(\$255,348,012)	(\$255,348,012)
Operating & Maintenance	(\$15,760,703)	(\$15,760,703)
<b>Total Costs</b>	<b>(\$271,108,714)</b>	<b>(\$271,108,714)</b>

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